Environmental Sensitivity Atlas for Lake Superior's Canadian Shoreline

Environment Canada
Conservation and Protection

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Conservation et Protection

Environmental Protection
Ontario Region

Legend

Shoreline Habitats

ESI* Ranking

Bedrock or Impermeable Shores

- 1a Exposed Bedrock Bluff less than 1 metre elevation
- 1b Exposed Bedrock Bluff 1-5 metre elevation
- 1c Exposed Bedrock Bluff greater than 5 metre elevation
- 2 Retaining Wall/Harbour Structure/ Breakwaters
- 3 Shelving Bedrock

Unconsolidated Sediment Shores

- 4 Exposed Sediment Bluff
- 5a Sand Beach: Depositional
- 5b Sand Beach: Erosional or Transitory
- 6 Sand Barrier With Lagoon
- 7a Pebble Beach
- 7b Pebble/Cobble Beach
- 7c Cobble Beach
- 8 Rip Rap
- 9 Boulder Beach
- 10 Mixed Beach (% by sediment in DOE Database)

Vegetated Shores

- 11 Low Vegetated Bank (Grass or Trees)
- 12 Delta Mud Flat
- 13a Fringing Wetland
- 13b Broad Wetland

* ESI - Environmental Sensitivity Index
Higher numbers indicate greater sensitivity

Biological Resources

Fish

- Area of Seasonal Fish Spawning
- Location of Seasonal Fish Migration

Birds

- Migratory Waterfowl
- Colonial Nesting Birds (total nests - all species)
- Wading Birds (total nests - all species)
- Shore Birds
- Raptors

Shore Associated Mammals

- Furbearers (such as Muskrat, Mink, and Beaver)

Human-Use Resources

High Recreational Usage

- Marinas and Small Craft Harbours
- Anchorage Sites
- Residential, Recreational or Cottage Use
- High-Use Recreational Beach

Resource Extraction

- Water Intakes - Industrial
- Water Intakes - Municipal
- Commercial Fisheries Activity

Special Status Areas

- Highly Sensitive Classified Feature (within 2km)
- First Nation
- National Park
- Provincial Park, Nature Reserve or Wilderness Area
- Conservation Area or Municipal Park
- Environmentally Sensitive Area*
- Areas of Natural and Scientific Interest*
- Area of Ecological Significance (*e.g.* Wetland)
- Dune Formations

* As identified by Ontario Ministry of Natural Resources or Conservation Authorities

Countermeasures

- Access Site (for land vehicles)
- Approach Concerns: Foreshore Flats/Rocky Reef
- Exposed Rock
- Coast Guard Light Station
- Boat Launch: Excellent
- Boat Launch: Good
- Boat Launch: Poor
- Helicopter Landing Site
- Staging Area: Excellent
- Staging Area: Good
- Staging Area: Poor
- Automated Weather Stations

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Great Lakes Action Plan

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Environmental Sensitivity Atlas for Lake Superior's Canadian Shoreline

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Environmental Sensitivity Atlas for Lake Superior's Canadian Shoreline

Prepared by:
Environment Canada
Conservation and Protection Branch
Environmental Protection
Ontario Region
1993

These maps are not to be used for navigational purposes.

Acknowledgements

Environment Canada's office of Environmental Protection - Ontario Region, would like to express its appreciation for the time and effort of all those who contributed to the development of the Environmental Sensitivity Atlas for Lake Superior's Canadian Shoreline. Appendix A has a list of these agencies and the data they contributed.

We would particularly like to acknowledge the extensive help we received from the Ontario Ministry of Natural Resources district offices along Lake Superior, Dan Badger of Canadian Coast Guard's Parry Sound District Office, the Canadian Petroleum Products Institute, the Ontario Ministry of the Environment, and the Canadian Wildlife Service's Nepean office.

The project was funded by Environment Canada, with the support of the Great Lakes Action Plan and Canada's Green Plan.

Atlas and Supplement Project Team

The following people were key members of the project team:

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1.0 Introduction

The **"Environmental Sensitivity Atlas for Lake Superior's Canadian Shoreline"** is a publication designed for use in response to spills of oil and other hazardous materials. This Atlas will allow responders to work from a common basis to rapidly identify the resources at risk during a spill. Information in the Atlas will assist decision makers to quickly assign priorities for protection measures.

This project is a collaboration of Environment Canada's (DOE) Ontario Region office of Environmental Protection (EP-OR) and Transport Canada's Canadian Coast Guard (CCG) Central Region office.

Two versions of this information have been produced; a softbound Atlas, and a hardbound Supplement to the Great Lakes Annex of the Canada-United States Joint Marine Pollution Contingency Plan. A limited number of copies of the hardbound, laminated Supplement have been produced. This version is designed for the day to day operational use by several agencies and organizations which have major spill related jurisdictional responsibilities, or deal with environmental emergencies on the Great Lakes on numerous occasions.

The Supplement is designed to complement the Joint Marine Pollution Contingency Plan, which contains additional spill response information such as spill response personnel and procedures. The Supplement differs from the Atlas only in its requirement for field durability, and the addition of several types of spill response countermeasures information that is critical to spill response decision makers.

A softbound version of the Lake Superior Atlas has been prepared for broad distribution to assist agencies and companies in spill preparedness and response. While it will be useful for resource management in general, this Atlas has been designed for the use of spill responders.

Numerous references are made in this publication to the Atlas, and to the Supplement. These references indicate the two versions described above. Both versions have been generated from Environment Canada's master database, which is the major product of the project. All data which have been collected and represented on the paper maps reside digitally in an electronic desktop environmental sensitivity mapping system, similar to a Geographic Information System (GIS). This system will readily allow additions or changes to the database so that updated versions of the Atlas could be released periodically. More importantly, the system will allow for enhanced spill response management at the time of a spill.

The electronic desktop environmental sensitivity mapping system is a continually evolving system. EP-OR would welcomes additional information and updates that could enhance the master database. For questions, suggestions or concerns about this publication or the master database, please contact:

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Environment Canada
4905 Dufferin St., Downsview, Ontario
CANADA, M3H 5T4
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2.0 Project Background

In June, 1991, Environment Canada asked many agencies to assist in the development of the Environmental Sensitivity Atlas for Lake Superior's Canadian Shoreline. EP-OR received an excellent response, with many firms or agencies expressing interest or cooperating to provide data and expertise.

The Lake Superior project consisted of six major phases; digital base map preparation, data collection, data digitizing, legend definition, data overlay layer creation, and finally, Atlas layout design.

During the data collection phase in 1991-92, videotaped helicopter shoreline surveys were made of the lake, which facilitated the completion of shoreline classification, and identification of many countermeasure features. Biological and human-use resources data were assembled from reviews of existing information from partner agencies.

Environment Canada was given access to various agencies' resource information. Appendix A has a list of these agencies and the data they contributed. This resource information was subsequently transcribed and digitized to suit the electronic requirements of the production process.

A great deal of care was directed to the selection of legend features and symbols which would serve the immediate needs of spill responders on the Great Lakes. Specific electronic layers were created to present geomorphological, cultural, biological and human-use information.

With input from many response experts, the project team has designed the Atlas to convey critical information to a spill responder in a concise, straightforward manner, with a minimum of extraneous detail. Before final publication, these map pages for Lake Superior were reviewed extensively (for both accuracy and utility) by the key response and resource agencies instrumental in its development and future use.

2.1 Regional Approach within a National and International Framework

Every effort has been made to ensure that the Ontario Region master database will be compatible with the recommendations of Environment Canada's National Sensitivity Mapping Program, which is currently being developed. Consultations with the United States National Oceanic and Atmospheric Administration (N.O.A.A.) have ensured that data and sensitivity representation is similar to Atlas production underway for the American shorelines of the Great Lakes. Close cooperation with Canadian Coast Guard operational officers dictated many of the design layout features of the Atlas and Supplement.

3.0 Environment Canada's Desktop Environmental Sensitivity Mapping System

The maps in this publication have been generated from Environment Canada's electronic desktop environmental sensitivity mapping system. The system currently employs MapInfo™ software and MapBasic™ programming language to overlay sensitivity and countermeasure data on electronic base maps.

To show all data at once on paper maps would impact on the clarity and utility of the publication. The specific resource agency information supplied to Environment Canada in the data collection phase of this project has been entered into a comprehensive master database. Information in this database will be readily available to responders in contact with Environment Canada during a spill. This database will also form an appendix to the Supplement version.

For base maps, National Topographic System (NTS) digital map sheets at 1:250,000 have been used as this is the only available scale for Lake Superior. On each map page of the publication, reference is made to the relevant NTS map sheet(s) covering that portion of shoreline displayed. Once data overlays (or 'layers') are added to the base maps, the assembled Atlas information is printed at a scale of 1:50,000, covering the entire 2,400 kilometres of Lake Superior shoreline in 82 map pages.

The system displays a latitude/longitude graticule superimposed over each map, with hatch marks for every minute of latitude or longitude, and darker hatch marks for every 5 minutes. A full degree is denoted by the thickest mark. Arrows in the corners of each map page point to the exact location of the displayed coordinates. This system has created maps employing an unprojected latitude and longitude coordinate system.

4.0 Nature of Data

4.1 Data Collection and Levels of Confidence

EP-OR staff contacted or made visits to all contributing partner agencies between June 1991 and December 1992. Existing and new data sets were gathered or surveyed for the project. For collection of existing data, relevant maps, publications and databases were reviewed, and pertinent information transcribed then digitized by Environment Canada. A new shoreline classification scheme, most suitable for spill response on the Great Lakes, defined 19 different shoreline habitats. This was the major component of new information specifically surveyed for this project.

Data in digital form existed for only a few Legend features for Lake Superior. To some degree, data availability on the Great Lakes has dictated definition of Legend features and the manner they are displayed on the maps. To use a cross-hatched or coloured polygon to represent an area implies a level of certainty regarding the boundaries of that area. Such detailed boundary accuracy was not always available at the time of the data collection phase of the project.

For example, since fish spawning activity information was often supplied for general areas rather than for specific areas or points, a decision was made to use a point symbol, but one defined as an area, hence the Legend feature 'Area of Seasonal Fish Spawning'. This works well considering that the source information does not allow for the rigorous definition of exact boundaries of all fish activity; it more customarily identifies general areas of observed activity, or of suitable habitat. For spill response, it can be assumed that activity occurs in the general vicinity of each fish spawning symbol, with more specific information often being found in the 'Notes' column when available.

Fish spawning and migration data for the lake were often based more on suitable habitat identification than recent specific activity observations. Consultations with local resource experts can assist in defining boundaries more specifically at the time of a spill.

The majority of the Bird information is based on recent, thorough surveys by the Canadian Wildlife Service and the Ontario Ministry of Natural Resources, and is quite accurate and up to date. 'Shore Associated Mammal' information is based on observations, or identification of suitable habitats. 'High Recreational Usage', and 'Resource Extraction' features are based on documented surveys. Prior to publication, these locations were thoroughly reviewed and modified by local individuals familiar with the lake's different regions.

For 'Special Status Areas', polygon boundaries have been digitized as provided by various agencies and are considered accurate and up to date. 'Countermeasures' symbols were placed following joint CCG - EP-OR video review sessions and helicopter and ground surveys between July 1991 and July 1992. These symbols were then reviewed for accuracy and modified where necessary by local experts familiar with the areas involved.

The geomorphology of approximately 98 percent of the Canadian shoreline of Lake Superior was newly classified by the project geomorphologist during the 1991 and 1992 helicopter surveys which where undertaken specifically for this project. Videotapes were filmed during these surveys then reviewed to confirm the shore classifications that comprise the 'Shoreline Habitat' layer of information. The confidence level for these data is excellent.

These 'Shoreline Habitat' classifications are an excellent guide for responders at the time of a spill. On-site examination (or 'ground truthing') will ensure that any minor discrepancies are identified during spill response.

5.0 Atlas Design and Function

5.1 Symbology and Use of Colour

Each Legend 'feature' represents a different 'layer' of information. These features have been defined by three types of symbols: point symbols, line symbols, and areas, or polygons. A municipal water intake is an example of a point symbol, a Shoreline Habitat classification is a line symbol, and a National Park is an example of an area or polygon, with defined boundaries.

Colour has been used to provide a richness in display and to denote differences among similar symbols, such as an excellent and a poor boat launch. It also distinguishes different shoreline classifications. To assist users in discerning one shoreline colour from another, a removable Legend guide has been included with the Atlas in a pocket attached to the back cover. If required, users may line up this card over the shoreline habitat in question to determine the exact colour of a given habitat.

During spill response, photocopying and facsimile transmission form a large part of information transfer. Each of the symbols chosen are unique (with only a few exceptions) so that black and white reproductions of the Atlas pages will result in minimal information loss.

For Shoreline Habitats, colours are the best manner to convey this key information without obscuring other valuable data on the maps. In situations where colour cannot be conveyed, the electronic system can produce maps showing Shoreline Habitats by Environmental Sensitivity Index (ESI) number, rather than colour, to meet these needs.

5.2 Sensitivity Ranking

Much international work has gone into determining environmental sensitivity ranking schemes. It is a very complex undertaking. Shoreline habitats, biological, cultural and human-use resources all form an intricate system with many different potential impacts at the time of an oil spill. Some ranking schemes endeavour to weigh many factors and values to come up with a single numerical ranking indicating relative sensitivities of all resources in question. From this ranking, protection and clean up priorities are assigned when deploying limited response equipment and available resources. Alternatively, some atlases limit information to identifying the location of resources at risk without ranking them.

Some sensitivities are readily identified and ranked, such as shoreline habitats. Other resources' relative sensitivities can be completely dependent on circumstances surrounding the spill itself. During any significant spill, a consultation among spill response experts will consider those spill-specific circumstances before coming up with the set of protection and clean up priorities appropriate for that particular incident.

Taking this into consideration, the Environmental Sensitivity Atlas (and Supplement) for Lake Superior's Canadian Shoreline ranks 'Shoreline Habitats' in order of increasing sensitivity based on factors such as oil residence time, cleaning potential and exposure. Features such as 'Biological Resources' and 'Human-Use Resources' are identified on the maps, but are not specifically ranked in relation to one another. Broad terms such as low, moderate or high priority are used in the 'Notes' column on many map pages to give an indication of relative sensitivity, and relative sensitivities are broadly discussed in the text of Section 7.0, but the final prioritizing decisions will be made by qualified response experts at the time of the spill.

6.0 Description of Atlas Legend Features

A colour example of the Environmental Sensitivity Atlas legend is shown in Figure 1. Figure 2 identifies standard features on the base maps in the Atlas and Supplement. A definition of each Environmental Sensitivity Atlas legend feature follows in Sections 6.1 through 6.4. Section 9.0 defines the Shoreline Habitats found in the Atlas.

The size of the symbols in the legend do not represent the exact size shown on the individual maps, due to space constraints.

Figure 1

Legend

Shoreline Habitats

ESI* Ranking

Bedrock or Impermeable Shores

- 1a Exposed Bedrock Bluff less than 1 metre elevation
- 1b Exposed Bedrock Bluff 1-5 metre elevation
- 1c Exposed Bedrock Bluff greater than 5 metre elevation
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Unconsolidated Sediment Shores

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* ESI - Environmental Sensitivity Index
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Biological Resources

Fish

- Area of Seasonal Fish Spawning
- Location of Seasonal Fish Migration

Birds

- Migratory Waterfowl
- Colonial Nesting Birds (total nests - all species)
- Wading Birds (total nests - all species)
- Shore Birds
- Raptors

Shore Associated Mammals

- Furbearers (such as Muskrat, Mink, and Beaver)

Human-Use Resources

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- Residential, Recreational or Cottage Use
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- Water Intakes - Industrial
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- Commercial Fisheries Activity

Special Status Areas

- Highly Sensitive Classified Feature (within 2km)
- First Nation
- National Park
- Provincial Park, Nature Reserve or Wilderness Area
- Conservation Area or Municipal Park
- Environmentally Sensitive Area*
- Areas of Natural and Scientific Interest*
- Area of Ecological Significance (*e.g.* Wetland)
- Dune Formations

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Countermeasures

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- Approach Concerns: Foreshore Flats/Rocky Reef
- Exposed Rock
- Coast Guard Light Station
- Boat Launch: Excellent
- Boat Launch: Good
- Boat Launch: Poor
- Helicopter Landing Site
- Staging Area: Excellent
- Staging Area: Good
- Staging Area: Poor
- Automated Weather Stations

Standard Base Map Features

- Hard surface, all weather, more than 2 lanes
- Hard surface, all weather, 2 lanes
- Hard surface, all weather, less than 2 lanes
- Loose or stabilized surface, all weather, 2 lanes or more
- Loose or stabilized surface, all weather, less than 2 lanes
- Trail or cut line
- Railway
- Pipeline (underground)

Figure 2: Standard Cartographic Legend for Base Maps

6.1 'Notes'

One current constraint of the electronic desktop mapping system is that it does not allow the use of symbology to identify both species and their seasonality in a clear, easily understood manner. The central objective of the Environmental Sensitivity Atlas for Lake Superior's Canadian Shoreline is to present mapped sensitivity information that may be readily understood at a glance for the purposes of spill responders.

To maintain this objective, the 'Notes' column on the side of each map page was used to display species and seasonality information, when available. The symbol on the maps for 'Notes' is a red exclamation point with a white number inside it. Each numbered 'Note' symbol on a map corresponds to the same number in the 'Notes' column for that page. These 'Notes' also highlight important site-specific facts or concerns for the responder. The 'Notes' are anecdotal. They can be expanded in future Atlas updates as more sensitivity information becomes available.

6.2 Biological Resources

Biological Resources include broad groupings entitled Fish, Birds and Shore Associated Mammals. While specific species information is valuable to the responder, the 'top layer' of an Atlas should provide a straightforward initial indication of the general biological activity in an area. The responder can quickly get a sense of local sensitivities without deciphering complex symbology, or cross-referenced tables of data. This latter detail will be required, but it can reside in the 'hidden layers' of the master database, for use by responders in consultation with local resource experts at the time of a spill.

Limited data were available for rare plants along the Lake Superior shoreline. These rare plants (such as Arctic-Alpine plants) are highly sensitive to human activity, and to some degree, to oiling. Reported locations have been described in the 'Notes' column. In general, they are sporadically located along the Lake Superior shoreline, from Pigeon River to Pic River, on Michipicoten Island, Caribou Island, the Slate Islands, in Michipicoten Harbour, and in Old Woman Bay. "They occur almost exclusively on cliffs, ledges, headlands, or beaches in close proximity to the water's edge, sometimes within reach of the spray from high waves" (Soper, 1962).

6.2.1 Fish

'Area of Seasonal Fish Spawning' and 'Location of Seasonal Fish Migration'

In the Lake Superior Atlas, the available data collected focused mainly on known areas of spawning and migration activity for fish species having commercial or recreational value. Site-specific information on non-commercial or non-sport fish species was not readily available during data collection for Lake Superior. The primary forage fish on Lake Superior include herring and smelt, and appropriate references have been made throughout the Atlas and Supplement. As more information becomes available, it will be incorporated into Environment Canada's master database, and Atlas updates.

As explained in Section 4.1, to use a polygon to represent an area implies a level of certainty regarding the boundaries of that area. Since fish spawning activity information was supplied for general areas, a point symbol defined as an area is used. The symbol for 'Area of Seasonal Fish Spawning' is used to denote habitats such as fish spawning streams, reefs and beaches, and also locations where sensitive life stages (egg, larvae and juvenile) are concentrated. For 'Location of Seasonal Fish Migration', the symbol is typically placed at the mouth of a river or stream known to be used for migration.

For spill response, it can be assumed that activity occurs in the general vicinity of each fish symbol, with more specific information often being found in the 'Notes' column when available. Consultations with local resource experts can assist in defining boundaries more specifically at the time of a spill. In times of emergency, the Atlas symbols will provide critical initial information regarding fish spawning and fish migration.

The following species and seasonality information for Lake Superior is derived from information supplied by the various District offices of the Ontario Ministry of Natural Resources (OMNR). This general information will complement details found on the individual maps.

Commercial fish species in Lake Superior include lake herring, lake trout, lake whitefish, chub and smelt. Sport fishing species include lake trout, coho, chinook and pink salmon, yellow perch and walleye in some bays, smelt in most streams during the spring, and brook trout and rainbow trout along the shores of Lake Superior and in most tributaries. Burbot and suckers are present in the lake in reduced numbers, and deepwater sculpin and lake sturgeon are no longer common.

The lean lake trout variant in Lake Superior spawns between late September and early November on gravelly beaches and rocky shoals in shallow water.

Lake whitefish are especially abundant along the shorelines of Lake Superior in the fall. Adults congregate in shallow water (usually at depths of less than 8 metres) in November and December to spawn. Young whitefish are found in the shallow inshore waters until the early summer when they move into deeper water.

Lake herring generally occupy the open lake in water 15 to 50 metres deep. They spawn in late fall to early winter.

Brook trout are present in the lake during the summer months and move up most tributaries to spawn in the fall. They prefer clear, cool streams and shorelines.

Rainbow trout enter most tributaries to spawn during April and May after the peak smelt runs and, to some extent, in the fall months (smaller runs).

Brown trout enter tributaries to spawn in late fall.

Smelt are present in most streams in spring.

Coho and chinook salmon are fall spawners occurring in many Lake Superior tributaries. Pink salmon are also present in the lake.

The sea lamprey migrate up streams in spring and early summer to spawn. Significant populations have been found in 10 Canadian tributaries to Lake Superior.

6.2.2 Birds

Areas requiring protection in the case of an oil spill include staging areas for migrating birds, breeding colony sites, important wetlands along the shore, and endangered species habitat. Through a combination of Notes and symbols, these areas have been identified, or the information is available in the master database wherever such data were supplied for the lake.

'Migratory Waterfowl'

This category is comprised of both migrants and breeders which are present on the lake for at least part of the year. Species include those found on shoreline wetlands and sheltered waters such as Canada geese and various dabbling ducks (including the mallard, black duck, American wigeon and teal), plus those species of more open water such as loons, grebes and the diving ducks (including common goldeneye, scaup, oldsquaw, scoters and mergansers). Often the 'Notes' column will identify critical staging areas and wetlands.

'Colonial Nesting Birds (total nests - all species)', and 'Wading Birds (total nests - all species)'

Regarding colonial waterbirds, the information presented in this Atlas was obtained as part of a program to census all gulls, terns, cormorants, herons and egrets nesting on the Great Lakes during 1989 to 1991. This program was carried out simultaneously in Canada and the U.S. In Canada the program was coordinated and supervised by the Canadian Wildlife Service (CWS).

CWS is preparing a number of Technical Reports, which together will constitute the Atlas of Colonial Waterbirds Nesting on the Canadian Great Lakes. The CWS Technical Reports will provide detailed

information, compare present (1989-91) breeding distribution and abundance data with data for earlier years, and discuss the census findings in a biological context.

The Technical Reports will also deal with the relative scarcity of different species and habitats, and their needs for conservation. For more information on the Atlas of Colonial Waterbirds Nesting on the Great Lakes, please contact Dr. Hans Blokpoel, Canadian Wildlife Service (see Appendix A under 'Bird Information').

There are ten species of colonial waterbirds that nest regularly on the Canadian Great Lakes, but there are only five species nesting in the Canadian portion of Lake Superior: herring gulls (by far the most widespread and numerous), double-crested cormorants (the second most numerous species), great blue herons, ring-billed gulls, and common terns (with only one small colony).

Cormorants are large, dark-plumaged birds with long necks and long bills with a sharp hook at the tip. Terns are small to medium sized, light coloured birds with forked tails and long narrow wings. Gulls are medium sized birds with long wings and rounded tails. Wading birds such as the Great Blue Heron are easily recognized by their distinctive long legs, neck, and bill.

All nesting locations were provided by CWS from their 1989 to 1991 census. In the Environmental Sensitivity Atlas for Lake Superior's Canadian Shoreline, two symbols are used to indicate nesting colonies of waterbirds. One symbol, a gull in flight ('Colonial Nesting Birds'), represents nesting locations for gulls, terns and cormorants. The other symbol, a standing heron ('Wading Birds'), represents nesting or breeding by herons and egrets.

Where they occur on the individual map pages, these two symbols are followed by a number representing the total number of nests for all species at that location. Note that the species-specific nest numbers are available in the master database. The total nests number was used for a quick reference to give responders an order of magnitude idea of site-specific occurrence of the category; for instance, less than 10 nests is a lower priority; 10 to 100 is of higher priority; and over 100 nests is a high priority concentration.

Of course, number of nests is not the only consideration in setting spill response priorities, but this information will assist responders in initial assessments. The numbers are provided only as a guideline for deploying limited resources; in the event of a spill, the Canadian Wildlife Service will be consulted for specific species information that may change priorities. When a 'Wading Bird' or 'Colonial Nesting Bird' symbol occurs without a number in brackets, it represents a foraging location and is typically mentioned in the 'Notes' column.

'Shore Birds'
This category includes species such as sandpipers and plovers which are small, active birds with short to medium length legs and bills. They can be found nesting and feeding on sand or gravel beaches along Lake Superior during the ice free season.

'Raptors'
The three most important raptor species found along the shores of Lake Superior are osprey, peregrine falcons, and bald eagles. Both the bald eagle and peregrine falcon are endangered species (CWS). Exact nesting locations of these raptors remain classified in the master database for use by responders during an environmental emergency. In general, the head of Black Bay is a significant osprey nesting area, while the entire Black Bay Peninsula-St. Ignace Island region is a bald eagle nesting area.

6.2.3 Shore Associated Mammals

'Furbearers (such as Muskrat, Mink and Beaver)'
This biological grouping includes mammals such as otters, muskrats, or beavers, that are known to occur along the shorelines of the Great Lakes and its tributary rivers. Wetlands are the most important habitat for these species. Several species, such as muskrat, beaver and mink have economic importance.

The 'Notes' column will also periodically make reference to shore associated mammals. Larger mammals, such as moose and bears, also occasionally come to the shore but their locations cannot be pinpointed on the maps. Rather, a general comment can be made to alert responders to be prepared for possible encounters with these mammals during shore clean up activities. Oiled carcasses should be removed from shores whenever practical to prevent their ingestion by mammals such as bears or wolves.

Note that no symbol was used to denote reptiles. Relatively few species of reptiles are associated with the shorelines of the Great Lakes. Water snakes and several species of turtles that use wetlands are likely to be found in some Lake Superior habitats (Owens et al., 1992), but no specific data were reported.

There was essentially no information available for amphibian distribution. Amphibians are at risk during an oil spill, but mapping their distribution would not be practical. Amphibians are dependent on water, especially wetlands. (Owens et al., 1992). The Atlas identifies wetland habitats. By protecting these areas against oiling, reptile and amphibian populations will be taken into account, along with birds, fish, and mammals. In the few exceptions where specific information exists, the 'Notes' column includes a reference.

6.3 Human-Use Resources

Human-Use Resources are features that have a heightened sensitivity or value because of their use or importance to humans. Locations with these symbols will typically have higher protection and clean up priorities associated with them. These features include areas of high recreational usage, economic benefit or special status (cultural, scientific or ecological importance).

6.3.1 High Recreational Usage

'Marinas and Small Craft Harbours'
In order for a facility to receive the 'marina' symbol, it must have fuel, docking, parking and telephone facilities. Small Craft Harbours, under the jurisdiction of the Department of Fisheries and Oceans, are included.

'Anchorage Sites'
These sites offer suitable and secure anchorage for small craft. They are often located in sheltered bays or inlets.

'Residential, Recreational or Cottage Use'
This symbol includes cottages, seasonal and permanent dwellings, resorts, campgrounds, picnic areas, and trailer parks. Residential 'clusters' were often grouped together and denoted as a single symbol.

'High-Use Recreational Beach'
These areas have a heightened sensitivity during the summer months.

6.3.2 Resource Extraction

'Water Intakes - Industrial'
This symbol denotes locations where water is extracted from Lake Superior for industrial, non-food related uses.

'Water Intakes - Municipal'
This symbol denotes locations where water is extracted from Lake Superior for community use for drinking water or food processing.

'Commercial Fisheries Activity'

"Commercial fishing is a significant industrial use of the aquatic biota of Lake Superior. The activity is most dependent on that area within two kilometres of the shoreline." (pers. comm.; OMNR, Wawa, 1993). Note that commercial fishing is restricted in a one kilometre radius around every stream or river mouth on the lake.

The 'Commercial Fisheries Activity' symbol was used whenever such activity was specifically identified in source data either for shore activity such as a primary fish processing facility, or areas along the shores where commercial fishing activity takes place, including harvesting and stocking. Individual map pages identify specific commercial and recreational fishing areas. Generally though, this activity can occur anywhere on Lake Superior unless otherwise noted (for instance, restricted areas). No commercial fish farms were identified on Lake Superior. More specific Commercial Fisheries Activity data may be added to the database as they become available.

6.3.3 Special Status Areas

These are areas where implementation of protection measures and/or assessment of the effects of oil spills are considered a high priority.

'Highly Sensitive Classified Feature (within 2 km)'

Certain information sets were of a restricted nature due to the high biological, cultural or physical sensitivity of the features described. Endangered species information and archaeological sites are two examples. Exact locations and details are maintained in Environment Canada's master database, but agencies providing the source data did so only with the understanding that this information would not be made readily available, except to responders.

In the event of a spill, responders will report all occurrences of this symbol in an effected area. By reporting the number inside the symbol, they will immediately receive the appropriate information and response advice from Environment Canada (416-346-1971) and the agency that provided the source data, so that they can effectively implement protection and clean up measures.

'First Nation'

There are 6 First Nations identified along the shoreline of Lake Superior. A reference to the local First Nation Chief in each case is made in the 'Notes' column so that responders may contact them when responding to a spill in their local area.

'National Park'

National Parks managed by the Canadian Parks Service are identified by a polygon symbol on the map pages. These can include underwater parks, although none are present on Lake Superior.

'Provincial Park, Nature Reserve or Wilderness Area'

Provincial Parks, Nature Reserves or Wilderness Areas are areas representing different classes of provincial parks under the jurisdiction of the Ontario Ministry of Natural Resources. Whenever possible, the 'Notes' column addresses sensitive features specific to the identified area.

'Conservation Area or Municipal Park'

These are areas along the lakeshore managed either by Conservation Authorities or municipalities, and may include urban recreation areas.

'Environmentally Sensitive Area'

These are areas designated by various Conservation Authorities, or sensitive areas identified by the Ontario Ministry of Natural Resources in series such as their Sensitive Area Reports (SAR). They have especially sensitive features which are identified in the 'Notes' column.

'Area of Natural and Scientific Interest'

An Area of Natural and Scientific Interest (ANSI) is designated by the Ontario Ministry of Natural Resources and is an "area of land and water containing natural landscapes or features which have been identified as having values related to protection, natural heritage appreciation, scientific study or education.

"Where ANSIs occur on public lands managed by the Ministry, it will ensure that the land uses and activities which occur, provide for the protection of the identified values.

"On private lands, the Ministry will, through cooperation with others, attempt to ensure that landowners are aware of significant features on their properties and seek the owner's cooperation in protecting such features." (OMNR, 1983)

Site-specific information for ANSIs is detailed in the 'Notes' column.

'Area of Ecological Significance (e.g. Wetland)'

Significant wetland areas along the shores of Lake Superior have been identified by several agencies providing source data. Their particular sensitivities are represented by a combination of Biological Resources symbols and entries in the 'Notes' column. These areas defined by polygons are in addition to the broad and fringing wetland habitats that have been identified along the shore as part of the shoreline geomorphological classification (Shoreline Habitats). The polygons are used to show the extent of the most significant wetland areas.

"Wetlands support many species of water-associated terrestrial animals. Waterfowl (ducks, geese and swans) and herons are dependent on wetlands, primarily during migration and nesting periods. Many species of amphibians are especially dependent on wetlands throughout their annual cycles. Several species of mammals use wetlands during parts of their annual cycles, but a few, such as muskrats, beaver and mink, are essentially year-round inhabitants. Lakeshore and connecting channel marshes in particular, provide critical feeding, nesting, rearing and moulting habitats for a wide variety of waterbirds and waterfowl." (Owens et al., 1992).

For a discussion of the different types of wetlands present on the Great Lakes, see Environment Canada's "Oil Spill Shoreline Clean Up Assessment Team (SCAT) Manual for the Ontario Great Lakes and St. Lawrence River Shorelines", or consult the Ontario Ministry of Natural Resources.

Areas with unique or regionally or seasonally significant habitats (e.g. migratory stopovers) are also considered to be Areas of Ecological Significance.

'Dune Formations'

This line symbol denotes areas along the shore where vegetated or unvegetated sand dunes exist. Their sensitivity is outlined in the 'Notes' column for responders. Damage to vegetation on dunes can lead to further dune erosion.

6.4 Countermeasures

'Access Site (for land vehicles)'

This symbol identifies locations where a good road is close enough to the shore, and an existing trail is adequate to walk to the water and drag boom and light equipment for response purposes. Note that any access over private property will require permission from the landowner before response activities commence at that location. The same applies to the use of private boat launches. Comments regarding private property are noted on the Supplement version and in the master database.

'Approach Concerns: Foreshore Flats/Rocky Reef'

These markings denote some of the features that will be of concern to responders when approaching a shore from the water. These markings are meant to reinforce existing navigational aids and charts, not replace them.

'Exposed Rock'
This marking denotes a feature that will be of concern to responders during response activity. These markings are meant to reinforce existing navigational aids and charts, not replace them.

'Coast Guard Light Station'
This symbol shows the approximate location of manned or unmanned Canadian Coast Guard light station installations. Equipment and facility details vary by location; full information is maintained in the master database. Often, facilities such as helicopter pads and buildings will also be identified by their own corresponding symbol.

'Boat Launch: Excellent'
A boat launch is rated "excellent" if it has a large, firm surface ramp into deep water, is protected from waves, has good road access, and has sufficient space for manoeuvring large trailers. Docks for large boats must also be present.

'Boat Launch: Good'
A "good" boat launch has a solid ramp for small vessels leading into deep water.

'Boat Launch: Poor'
A "poor" boat launch symbol marks a site where a ramp of gravel exists, or merely a trail over the beach. Such sites may need additional work before being useable for response efforts. Certain additional locations have been described in the 'Notes' column as suitable sites for dragging small craft over the sand or cobble beach, but these have not received boat launch symbols.

'Helicopter Landing Site'
Only designated sites with proper pads for helicopters up to the Coast Guard's '212' (or equivalent) size are noted. Pilots will advise on other acceptable landing sites, as required, during response to a spill.

'Staging Area: Excellent'
Staging areas are locations for setting up and deploying response equipment and for establishing command centres or outposts. Before a staging area is rated "excellent", it must have large parking and storage space, a building suitable for operational headquarters, adequate power and telephone, road and water access, and docking facilities.

'Staging Area: Good'
A "good" staging area has road and water access, telephone, power, parking space, and facilities adequate enough to establish a small or secondary command post/headquarters.

'Staging Area: Poor'
A "poor" staging area is in a more remote location, and is probably the only site available. It will have road and water access, as well as space for a command post trailer.

'Automated Weather Stations'
These locations have been identified by Environment Canada's Atmospheric Environment Service to give an indication of the nearest station to a given spill. Portable emergency equipment is available for site specific weather reporting in case of an environmental emergency.

Additional Countermeasures Note:
The Supplement version of this Atlas includes additional layers of information for use by spill response experts, as outlined below:

'Equipment Depot' and 'Boom Storage Site (Marine Emergency Response Trailer)'
Canadian Coast Guard and Canadian Petroleum Products Institute response equipment depots and boom storage sites (Marine Emergency Response Trailers) are identified on the appropriate map page in the 'Notes' column, and as symbols in the Supplement.

'Location of Collection and Recovery Site'
These locations mark areas where oil will likely collect naturally, and where clean up activities could be carried out, for instance on sand beaches or platform rock. In some cases, booms could be used to direct oil to these locations to facilitate clean up and protect more sensitive adjacent shores.

'Suggested Boom Deployment'
These markings show only suggested positioning of boom. They do not give boom length requirements. The master database will describe the use for the boom *i.e.* whether deflection, exclusion or containment booming should be used, or suggest the sealing of a culvert in a causeway.

These boom deployments are only suggestions for protection measures. The actual deployment of boom during an environmental emergency will be guided by spill response experts, after a prompt review of the circumstances related to the actual spill.

7.0 Sensitivities of Biological Resources; Vulnerability to Spilled Oil on the Great Lakes

This section includes direct quotes or summaries of information from the Canadian Wildlife Service and the Natural Resource Response Guide Series produced by the U.S. National Oceanic and Atmospheric Administration (N.O.A.A.). Such guides, along with local resource experts, may be consulted to obtain specific information regarding life history, habitat preferences, behaviour, and other ecological factors that influence sensitivity to spilled pollutants.

A short description of the sensitivity to spilled oil or hazardous materials will follow for the biological groupings of fish, birds and shore associated mammals. Prior to discussing individual biological groupings, a few definitions will assist responders in determining the expected impact of spills.

Aromatic hydrocarbons are a major group of cyclic petroleum hydocarbons such as benzene and toluene that are moderately soluble in water and are generally highly toxic to aquatic organisms. **Refined oil** is the product of distillation of crude oil into light or heavy components. Light refined oils include gasoline, kerosene, diesel oil, and individual components such as benzene or toluene. Heavy refined oils include fuel oil Numbers 4 (Heating Oil), 5, and 6 (Bunker C). The **water-soluble fraction (WSF)** is that portion of an oil that is soluble in water under equilibrium conditions. The water-soluble fraction of petroleum hydrocarbons is composed mostly of aromatic hydocarbons, such as benzene or toluene (N.O.A.A., 1987).

7.1 Fish

Regarding fish, the adverse impacts associated with spills of crude and refined oils are primarily caused by the chemical toxicity of the water-soluble fraction.

> "The WSF is the portion of oil that marine fish are most likely to be exposed to during an oil spill. Oils that are relatively soluble in water will be more likely to cause toxic effects to fish. For this reason, refined petroleum products (especially gasoline) present a much more severe threat to open-water marine fish than do crude oils.
>
> "A review of experimental and accidental oil spills shows that...the average concentrations of oil likely to be encountered by open-water fish are about 100 to 10,000 times lower than the acute toxicity values of most petroleum hydrocarbons. Therefore, an oil slick floating on the water surface is unlikely to affect adult fish, but there is some potential for toxic effects to...eggs and larvae" (N.O.A.A., 1987).

Toxic effects may also occur as a result of direct contamination of the shallow habitats used by fish and it is therefore important to identify critical fish habitats.

> "Such contamination may result in acute short term toxic effects from the oil or long term effects from residual hydrocarbons that are persistent in sediments. Heavy refined oils (including Heating Oil and Bunker C) contain a high proportion of these hydrocarbons known to cause chronic contamination of shorelines. This type of contamination can cause toxic effects to fish species that spawn in shallow areas, and these effects may occur long after the spawning sites were initially exposed to oil" (N.O.A.A., 1987).

According to the Ontario Ministry of Natural Resources, all wetlands on the shore of Lake Superior (*e.g.* Mission Marsh, Neebing Marsh, McKellar Marsh, Pine Bay, Pigeon Bay) are considered critical fish habitat which should be given high priority for protection (pers. comm.; OMNR Thunder Bay, 1992). Other areas of critical fish habitat such as spawning beds and migration routes are identified throughout Lake Superior on the individual maps.

Much of the data represented in the Atlas refers to anadromous fish. These are fish species that live in brackish (slightly salty) or salt water as adults and ascend freshwater coastal rivers to spawning and nursery grounds. Many freshwater fish such as lake sturgeon, walleye, trout and salmon are considered to be anadromous fish in the Great Lakes where they ascend tributary rivers during spawning.

"All anadromous species are considered to be at moderate to high risk from oil and hazardous materials spills occurring in navigable waters due to their dependence on certain nearshore and shallow water habitats for critical stages of their life cycle" (N.O.A.A., 1987). Adult fish are at moderate risk during spawning runs since they must pass through nearshore areas where spills are likely to pose a significant threat of toxic exposure.

> "Eggs and larvae are at a high risk of exposure at spawning areas. These life stages are unable to avoid waterborne pollutants due to poor swimming ability or dependence on certain habitats such as gravel streambeds. Spills that result in contamination of bottom sediments pose the most serious threat to anadromous fish populations because eggs of many species adhere to or are buried in sediments. Salmonids are probably the most sensitive to contamination of spawning areas because their eggs are spawned in shallow waters, and they remain in the sediments for many months prior to hatching and downstream migration" (N.O.A.A., 1987).

Juvenile fish are dependent on shallow, nearshore nursery areas. This places them at a moderate to high risk of exposure to toxic concentration of pollutants during spills.

7.2 Birds

> "Most of the negative effects of oil spills on marine birds are the result of the birds coming into direct contact with floating oil. Exposure of birds to oil has the primary effect of fouling the plumage. Oil causes disruption of the fine structure of the small strands that form the feathers, causing loss of their water-repellent characteristics. The plumage of oiled birds also becomes matted, allowing water to penetrate to the body surface, which results in chilling and hypothermia as well as a loss of buoyancy" (N.O.A.A., 1988).

Some bird species are more vulnerable to oil spills than others. "Presumably, those species that are able to leave the water and thereby reduce or avoid hypothermia (such as gulls, wading birds, and some waterfowl) are more tolerant to oil" (N.O.A.A., 1988).

"Oiled birds can also readily ingest oil during preening. The effects of ingested oil include anemia, pneumonia, intestinal irritation, kidney damage, altered blood chemistry, decreased growth, and decreased production and viability of eggs" (N.O.A.A., 1988). Direct exposure of eggs to oil has the greatest potential for reproductive damage. Exposure to oil during the early stages of incubation is most toxic. Oiled adult birds can easily transfer toxic doses to eggs.

Certain behavioural characteristics of birds can increase their vulnerability to impacts of oil spills. "Feeding, flocking and roosting behaviours of many species result in repeated or prolonged diving into or sitting on the water surface where contact with floating oil is possible" (N.O.A.A., 1988).

There have been various indices developed to determine relative sensitivities of birds to oil. These typically consider factors such as range, population, habits, mortality, and annual exposure in a given region (N.O.A.A., 1988). As discussed in Section 5.2, such factors will be taken into account by local resource experts at the time of spill. For the purposes of this Atlas, some considerations have been listed to give a general idea of relative sensitivities.

The following paragraphs summarize the vulnerability of the various bird categories symbolized in the Atlas legend. Again, the Canadian Wildlife Service and N.O.A.A.'s Natural Resource Response Guide for Marine Birds are the main sources for this information.

7.2.1 Migratory Waterfowl

The vulnerability of waterfowl to spilled oil is highly variable, depending primarily on habitat preference. Geese and many diving ducks are highly vulnerable because they concentrate, often in large flocks, on relatively exposed offshore and nearshore waters during migration. Dabbling ducks are less vulnerable due to their preference for more protected coastal wetlands. Loons and grebes are highly adapted to an aquatic existence and rarely leave the open water where they are present during much of the year. This increases their vulnerability to an oil spill, but they do not form large flocks. They tend to occur in small groups or as scattered individual birds.

7.2.2 Colonial Nesting Birds

"The most significant offshore terrestrial animal resources at risk from an oil spill are nesting colonies of gulls, terns, and cormorants. Although colonies on the Great Lakes are widely scattered, an oil spill could have a significant effect if large colonies are within the spill zone" (Owens et al., 1992).

For the Lake Superior Atlas, as noted in Section 6.2.2, the Colonial Nesting Birds category includes gulls, terns and cormorants. Only one species of cormorant nests on the Great Lakes. Terns and cormorants are highly vulnerable in that they feed on fish and are therefore forced to use waterbodies for foraging. Cormorants are true divers (*i.e.* they dive from the surface of the water and swim underwater pursuing their prey), whereas terns plunge dive from the air. The feeding behaviour of diving birds such as cormorants results in regular entry into the water, increasing their vulnerability to spilled oil. On the other hand, terns and cormorants tend to roost on islands, structures, *etc.*, rather than on the water itself. "These birds do not form large flocks or roost on the water, so mass mortalities are not likely" (N.O.A.A., 1988).

Gulls (ring-bills and herring) often feed on sources such as dumps or farm fields, but they also forage along the shores of the Great Lakes, catching fish by plunge diving, as terns do. Surface feeding birds such as gulls...

> "...often form large flocks that regularly roost on the open water. This behaviour can result in large kills from spilled oil, but based on numerous case histories, impacts to these birds are usually not severe. This is due in large part to their highly adaptable nature. Gulls are well known for their ability to exploit a wide range of habitats and food sources and they also are relatively prolific breeders. They are readily able to avoid oil spills, and their populations can recover from mortalities if they occur" (N.O.A.A., 1988).

The breeding season varies for colonial waterbird species. Gulls usually return to the colonies before snow and ice has melted, but terns normally return several weeks later (feeding exclusively on fish, they need to be assured of open water). In Lake Superior, most activities at the nesting colonies will take place during May through August.

7.2.3 Wading Birds

Herons, egrets, and cranes have much lower vulnerability to floating oil because they are rarely immersed in the water and do not flock or roost on the water. For this reason they are identified separately on the maps, even though herons and egrets are also considered to be colonial waterbirds. Herons and egrets stalk shallow pools, immersing only their heads to catch prey. These types of birds tend to avoid oiled areas, but responders must be aware of the possibility of contamination of their food sources in the water column of shallow, sheltered waters (N.O.A.A., 1988). In Lake Superior, most activities at the nesting colonies will take place during May through August.

7.2.4 Shore Birds

Most shorebirds have low to moderate vulnerability to spilled oil. They are rarely immersed in water and are unlikely to encounter spilled oil. They do not form large staging flocks along the Lake Superior shore. At certain times in other areas (for instance, on Lake Ontario), their habit of flocking by the thousands to a limited number of specific locations (very shallow, productive waters) increases their vulnerability, due to the impact that oil spills could have on their highly localized food source (on which they are heavily reliant).

7.2.5 Raptors

Bald eagles are considered to be highly vulnerable in the event of an oil spill. Although they rarely enter the water and are unlikely to be oiled, they have a small population and a very long recovery rate. Osprey are much more marine oriented and will capture fish directly from the water. They are ranked as moderately vulnerable (lower than bald eagles) because they are more common and more widely distributed than bald eagles (N.O.A.A., 1988). For both of these species, and for peregrine falcons, consumption of oiled prey is a concern.

7.2.6 Bird Seasonality

When such information is available, the 'Notes' column on individual map pages gives site specific descriptions of seasonality. In the following table, a general description is provided for species occurring on Lake Superior.

Table 1A: Lake Superior Bird Seasonality: Colonial Waterbirds

				Category			Abundance		
Species	Period Present on Lake Superior	Breeding Period Δ	Nest Location	Migrant	Summer Resident	Winter Visitor	Common	Uncommon	Rare
Double-crested Cormorant	April to October	April to August	On ground and in trees (islands)	√	√			√	
Great Blue Heron	April to October	April to August	In trees (islands and coast line)	√	√			√	
Herring Gull	March to December	April to August	On ground (islands)	√	√	√	√		
Ring-billed Gull	April to November	April to August	On ground (islands)	√	√			√	

Δ From establishing nesting territories through fledgling chicks.

Table 1B: Lake Superior Bird Seasonality: Waterfowl, Shorebirds, Raptors

Species	Status	Period Present on Lake Superior
Common Loon	Common migrant and summer visitor; occasional breeder	During ice-free period, particularly May, August and September
Grebe species	Common migrants	During ice-free period, particularly May, August and September
Canada Goose	Very common migrant; some local breeding	April to May, Mid-August to Early November
Dabbling Ducks (including mallard, black duck, northern pintail, american wigeon, teals)	Common migrants and summer visitors; local breeding	April to May, August to Late October
Diving Ducks (including scaups, oldsquaw, common goldeneye, scoters, mergansers)	Common to very common migrants; common summer visitors; uncommon breeding	During ice-free period; highest counts during migration (April, May, August to September)
Shorebirds (including sandpipers and plovers)	Locally common migrants; uncommon breeders	Mostly during migration (May, August to Mid-September)
Bald Eagles	Rare migrant; very rare breeder	March to December
Osprey	Uncommon migrant and breeder	April to November
Peregrine Falcon	Very rare migrant and extremely rare breeder	April to November

7.3 Shore Associated Mammals

A shore associated mammal's exposure to spilled oil can result in a significant reduction in the insulative property of its fur. Once exposed to oil, a mammal's grooming activity may lead to ingestion of oil. (N.O.A.A., 1989).

8.0 Sensitivities of Human-Use Resources; Vulnerability to Spilled Oil on the Great Lakes

Factors to consider when establishing sensitivities of Human-Use Resources include economic value, resource 'replaceability', risk to public health, and cultural/archaeological value.

No rigorous ranking scheme has been employed for these features, as discussed in Section 5.2. Broad terms such as "highly valued" have been used in the 'Notes' column to give an indication of the level of priority likely to be assigned to a Human-Use Resource during spill response.

9.0 Shoreline Habitats and Associated Countermeasures

9.1 Lake Superior Shoreline Habitat Classification Scheme

The Canadian shoreline of Lake Superior has been classified as shown below. The Environmental Sensitivity Index (ESI) number for each shore type indicates the sensitivity ranking of that type. Higher numbers indicate greater relative sensitivity to the impacts of an oil spill. Colours range from "coldest" for shore type 1c to "hottest" for 'Broad Wetland', shore type 13b.

ESI Ranking	
	Bedrock or Impermeable Shores
1a.	Exposed Bedrock Bluff less than 1 metre elevation
1b.	Exposed Bedrock Bluff 1-5 metre elevation
1c.	Exposed Bedrock Bluff greater than 5 metre elevation
2.	Retaining Wall/Harbour Structure/Breakwaters (Anthropogenically modified shore)
3.	Shelving Bedrock
	Unconsolidated Sediment Shores
4.	Exposed Sediment Bluff
5a.	Sand Beach: Depositional
5b.	Sand Beach: Erosional or Transitory
6.	Sand Barrier with Lagoon
7a.	Pebble Beach
7b.	Pebble/Cobble Beach
7c.	Cobble Beach
8.	Rip Rap (Anthropogenically modified shore)
9.	Boulder Beach
10.	Mixed Beach (% by sediment in DOE Database)
	Vegetated Shores
11.	Low Vegetated Bank (Grass or Trees)
12.	Delta Mud Flat
13a.	Fringing Wetland
13b.	Broad Wetland

9.2 Shoreline Habitat Characteristics and Appropriate Countermeasures

In this section, the major physical characteristics of each Shoreline Habitat will be discussed. A photograph is provided for each shoreline type, depicting a typical example on Lake Superior. Expected oil behavior and residence time for each Shoreline Habitat will be described. Suggestions for appropriate clean up methods for each shore type will be made.

The following shoreline characteristics will be addressed:

i) Shoreline Morphology- includes a description of shoreline width, slope and characteristic topography, component sediment type(s), and the wave/littoral drift environment. Littoral drift is sedimentary material that is transported in the littoral (coastal) zone under the influence of waves and currents.

ii) Shoreline Sensitivity- includes oil residence time, natural oil removal processes/rate, and the impact to immediate flora and terrestrial fauna.

iii) Clean Up Operations- involves identifying effective clean up methods for each shoreline type, as well as indicating potential environmental hazards that the clean up operation may pose..

In general, in the Great Lakes the water volume and distances between shores are insufficient to "absorb" large quantities of oil. Oil moved off one shoreline will likely reappear on an adjacent shore. Environment Canada recommends cleaning any oil deposits which can be removed safely and without causing further habitat damage.

All of the clean up methods outlined are suggestions only. Each has certain implications or drawbacks that must be weighed on a site by site basis by spill response experts in the event of a spill. **All clean up methods employed require measures to ensure the collection and proper disposal of oil as it is liberated from the shore.**

9.2.1 Bedrock or Impermeable Shores

1a. Exposed Bedrock Bluff
less than 1 metre elevation

ESI 1a, 1b, and 1c. Exposed Bedrock Bluff

The combination of resistant bedrock surfaces, little sediment, steep slopes, and a constant, high wave energy environment make exposed bedrock bluffs the least sensitive shoreline to oiling.

If the stranded oil is below the normal limit of wave action, it would persist for only a few days to weeks. If shoreline oiling occurred during a storm event then the material would be stranded and unaffected by normal wave action, until the recurrence of a subsequent storm event of similar magnitude. Lower bluffs (< 1 m elevation) are generally more sensitive since they usually have rough surfaces, containing many fractures and depressed pockets. Oil may collect within these surfaces and persist for up to several seasons.

Bedrock bluff shorelines are not especially biologically sensitive due to scant flora and terrestrial fauna. Exceptions would include those locations where Arctic-Alpine plants occur on cliff faces.

Bedrock bluff shorelines with a heightened Human-Use value or bluffs which were oiled during storm events, will likely require remedial clean up measures. Low-pressure hosing and manual oil scraping are the preferred clean up methods. Steam cleaning and/or high-pressure hosing may be considered for the most resistant rock surfaces.

Access to these shores is often poor by land and hazardous by water. Bedrock bluff shorelines in locations without heightened Human-Use value may be permitted to self-clean through natural wave abrasion, if manual removal is unsafe or logistically impossible.

All clean up methods employed require measures to ensure the collection and proper disposal of oil as it is liberated from the shore.

1b. Exposed Bedrock Bluff
1-5 metre elevation

1c. Exposed Bedrock Bluff
greater than 5 metre elevation

ESI 2. Retaining Wall/Harbour Structure/Breakwaters

When artificial shorelines are created through construction, the shoreline is designated as Retaining Wall/Harbour Structure/Breakwaters. Retaining walls are usually small isolated features used to protect private property from bank erosion. They are composed of wood pilings, structural steel, asphalt, or concrete. When concentrated in near-continuous stretches (such as along large ports) they are termed harbour structures. Rip rap material encased within wire netting can be used to front shorelines, resulting in a vertical shore classified as harbour structure.

Retaining wall/harbour structure shores are not particularly sensitive to oil, or clean up operations. This shoreline type commonly supports very little plant or animal life, except for some birds along the structure's upper portions. There is minimal oil persistence along sections exposed to waves, but long term oil persistence is possible along sheltered sections.

Hard, durable harbour structure surfaces permit the use of high-pressure hosing or steam cleaning for clean up. Recently spilled oil can be effectively cleaned by means of low-pressure hosing. Ships docked along harbour facilities will similarly require all traces of oil residue removed from their hulls before leaving the port.

All clean up methods employed require measures to ensure the collection and proper disposal of oil as it is liberated from the shore.

ESI 3. Shelving Bedrock

Shelving bedrock shores are wide, flat expanses of bedrock, at or immediately below normal water levels.

Generally, shelving bedrock shores are lower energy wave environments than bedrock bluff shores. Waves could carry oil across the full width of the shelf.

Continued wave exposure would likely readily cleanse oil from the lower reaches of the shelf. Oil deposited during a storm would be stranded above normal water levels and would be cleansed only during storms of similar magnitude.

Inaccessible shelving bedrock shores may naturally self-clean (perhaps within two seasons). Other shores, including those with high aesthetic or recreational value will likely require remedial clean up measures. Oil which collects within depressed regions of the shelf may be cleaned manually or by sump/pump removal. Stranded deposits could be removed by low or high-pressure hosing or steam cleaning for the most resistant rock surfaces. Shelving bedrock shores which support high populations of birds, especially nesting sites, should be cleaned manually to minimize disturbance.

All clean up methods employed require measures to ensure the collection and proper disposal of oil as it is liberated from the shore.

9.2.2 Unconsolidated Sediment Shores

Unconsolidated sediment shores differ from bedrock shores in that the material is loose and non-cemented.

ESI 4. Exposed Sediment Bluff

These bluffs are predominantly erosional forms, carved by wind, wave and surface water erosion. They form where accumulations of glacial material border the shoreline and are exposed to direct wave action. Lake Superior contains very few sections of exposed sediment bluff shoreline. There is little biological activity along these bluffs.

Shoreline sections are commonly steep and relatively narrow (< 4 metres). Very high (up to 45 metres), wide sections are restricted to the east banks of the Nipigon River, near Nipigon.

Spilled oil would be deposited along the lowest portion of the bluff, where wave energy is high, and the oil would be self-cleaned within days or weeks through wave abrasion. Oil deposited during storms may be stranded above this level and may persist until manually removed or subsequent storm surges self-clean the area.

The clean up of stranded oil along unconsolidated sediment bluffs is made difficult by the lack of a shore zone beach, steep bluff slopes, and the ease of bluff erosion. Heavy machinery would be unable to access high or extensive sediment bluff sections. The removal of material at the base of the bluff could promote slumping or landsliding; a serious hazard to clean up crews, and land owners residing on the crest of the bluff. Similarly the use of low/high-pressure hosing or steam cleaning could remove sufficient sediment to induce slope failure.

In the case of small sediment bluffs where shore zone access is available, manual clean up is recommended. Very steep or high sediment bluff sections are generally not accessible; in these instances it is recommended that the oil deposit naturally self-clean.

All clean up methods employed require measures to ensure the collection and proper disposal of oil as it is liberated from the shore.

ESI 5a. Sand Beach: Depositional

Depositional sand beaches occur where wave and littoral drift deposited sand has accumulated along a cove or other sheltered environment. Offshore regions tend to be shallow and uniformly sloping.

Small coves and bays tend to produce a thinner beach face, which rarely terminates with elevated sand dunes. These thin beach faces are typical of sand beaches along Lake Superior.

The beaches of Pancake Bay and Batchawana Bay are examples where large coves often produce very wide sand beaches, with a series of backshore dunes. Vegetation growing on the dunes enhances their stability. Destruction of this vegetation by clean up crews will lead to wind erosion of the dunes.

Biological activity typically includes the presence of shorebirds, and sand beaches are often of high recreational value.

Spilled oil would be deposited along the upper limit of wave action. Heavy or viscous oil rarely penetrates more than 2 centimetres, though with higher temperatures or lighter oil, penetration depth will likely increase.

If water levels were normal the stranded oil deposit may be buried by subsequent storm beach deposits. It is important to locate and remove oil before subsequent burial, when possible. When buried, stranded oil can persist for decades, requiring regular clean up for several years, as the deposits resurface.

In times of elevated water levels, oil may be stranded above the normal swash zone, where it could weather to form an "asphalt pavement". Eroded asphalt pavement material is often deposited over a wide area as small "tar balls".

Sand beaches, due to their shallow slopes, load bearing capacity, lack of vegetation, and many access roads often permit the use of heavy machinery such as graders/scrapers. Note that sediment removal must be minimized; if too much sand is removed, the beach may be destabilized, causing accelerated beach erosion.

Beach cleaning machines may be used to remove stray tar ball deposits from effected beaches. On very narrow beaches, or those without road access, manual raking is a slow but effective method.

All clean up methods employed require measures to ensure the collection and proper disposal of oil as it is liberated from the shore.

ESI 5b. Sand Beach: Erosional or Transitory

No erosional or transitory sand beaches were observed along Lake Superior.

ESI 6. Sand Barrier with Lagoon

This shore type occurs where littoral drift causes a smooth barrier of sand to form and effectively seal a cove. Coves containing a stream typically have a very small opening (the "outlet") in the sand barrier. The backwater cove which forms is termed a lagoon. The mouth of the Pancake River west of Sault Ste Marie is a good example.

The thin, low sand barrier now protects the lagoon from wave action, and a wetland often develops. Such wetlands are especially sensitive to disturbances of the protective sand barrier.

The impact of an oil spill on the sand barrier would be similar to that for a depositional sand beach. It is unlikely that oil could cross the barrier through wave splash or beach erosion. Oil could, however, enter the lagoon if waves cross the outlet. This is likely in storm events.

In the event of a spill, boom should be deployed to seal the barrier outlet, and diversion booms used to deflect oil from the sand barrier. Heavy machinery must not be employed for clean up. The removal of sand during clean up, compaction of sand by machinery, plus the potential of vegetation disturbance along the barrier crest could result in extensive barrier erosion and the inundation of the lagoon environment. In this instance manual raking of effected shorelines is the only acceptable clean up method.

All clean up methods employed require measures to ensure the collection and proper disposal of oil as it is liberated from the shore.

ESI 7a. Pebble Beach

Pebble beaches are shore accumulations of coarse sediment (0.2-4 cm diameter) that form in a higher energy wave environment compared to sand beaches. Pebble beaches are characteristically narrower and steeper than sand beaches; widths of 2-5 metres are common along Lake Superior.

Oil will penetrate a pebble beach to occupy the spaces between pebbles; common penetration depths are 0.5 metres. Very light oil, though able to penetrate the sediment, would be washed through the beach sediment and into the lake by wave action. Heavy oil may remain on the surface and, after weathering, cement pebble grains to form asphalt pavement.

On a pebble beach, where the sediment moves more readily with wave action, subsequent storms tend to bury stranded oil. Oil buried at a depth of 0.5 metres or more could persist for years before natural abrasion by wave action removed the deposit.

Sensitive flora and fauna may be adversely affected by oil on shore and in the water column.

Most pebble beaches are thin, relatively steep, and lack easy road access, so use of heavy machinery is restricted. The load bearing capacity of pebble beaches can often support light equipment such as bobcats. Aeration using long tynes dragged through the pebble can be effective in bringing oil nearer to the surface for self-cleaning and weathering.

Low-pressure flushing may assist in moving light oil through the sediment into the lake for collection. The use of steam cleaning, and low or high-pressure hosing should be avoided on pebble beaches, since they temporarily reduce the viscosity of the oil and could drive oil deeper through the pebble material, making removal more difficult.

Manual cleaning can be an effective clean up option. Responders must be careful to minimize sediment removal.

All clean up methods employed require measures to ensure the collection and proper disposal of oil as it is liberated from the shore.

ESI 7b. Pebble/Cobble Beach

Pebble/cobble beaches are common along the Lake Superior shoreline. They consist of a mixture of pebbles (0.2-4 cm diameter) and larger cobble material (4.5-25 cm). Generally pebble/cobble beaches are narrower and steeper than pebble beaches; widths of 2-3 metres are common.

Oil may rapidly seep into the spaces between pebble/cobble sediment. Even heavy oil may penetrate to a depth of 1 m or more, where it can persist for years before natural abrasion by wave action would remove the deposit.

Very light oil, though able to penetrate the sediment, would be washed through the beach sediment and into the lake by wave action. Heavy or viscous oil may remain on the surface and, after weathering, cement pebble/cobble material to form an asphalt pavement.

Sensitive flora and fauna may be adversely affected by oil on shore and in the water column.

Most pebble/cobble beaches are very thin, relatively steep, and do not have easy road access, so use of heavy machinery is restricted. The load bearing capacity of pebble/cobble beaches may support light equipment such as bobcats. If the cobbles are not too large, aeration using long tynes dragged through the sediment can be effective in bringing oil nearer to the surface for self-cleaning and weathering.

Low-pressure flushing may assist in moving light oil through the sediment into the lake for collection. The use of steam cleaning, and low or high-pressure hosing should be avoided on pebble/cobble beaches, since they temporarily reduce the viscosity of the oil and could drive oil deeper through the shore material, making removal more difficult.

Manual cleaning can be an effective clean up option. Responders must be careful to minimize sediment removal.

All clean up methods employed require measures to ensure the collection and proper disposal of oil as it is liberated from the shore.

ESI 7c. Cobble Beach

Cobble beaches are less common along the Lake Superior shoreline than pebble/cobble beaches. Cobble beaches contain well sorted sediment clasts, 4.5-25 cm in diameter.

Cobble beaches are generally narrower and steeper than pebble/cobble beaches; widths of 2 metres or less are common. Cobble-sized material cannot pack tightly, permitting oil to rapidly infiltrate cobble sediment.

Heavy oil is likely to penetrate to a depth of 1 metre or more, where it can persist for years before natural abrasion by wave action would remove the deposit. Very light oil, though able to penetrate the sediment, would be washed through the beach sediment and into the lake by wave action. Heavy or very viscous oil may remain on the surface, and, after weathering, cement cobble clasts to form an asphalt pavement.

Sensitive flora and fauna may be adversely affected by oil on shore and in the water column.

Most cobble beaches are extremely thin, steep, and rarely have easy road access, so use of heavy machinery is very restricted. The load bearing capacity of cobble beaches may support light equipment such as bobcats. If the cobbles are not too large, aeration using long tynes dragged through the sediment can be effective in bringing oil nearer to the surface for self-cleaning and weathering.

Low-pressure flushing may assist in moving light oil through the sediment into the lake for collection. The use of steam cleaning, and low or high-pressure hosing should be avoided on cobble beaches, since they temporarily reduce the viscosity of the oil and could drive oil deeper through the shore material, making removal more difficult.

Manual cleaning can be an effective clean up option. Responders must be careful to minimize sediment removal.

All clean up methods employed require measures to ensure the collection and proper disposal of oil as it is liberated from the shore.

ESI 8. Rip Rap (Anthropogenically Modified Shore)

When natural shorelines are mantled with debris to protect the shore from wave-induced bank erosion, the resulting shoreline is termed rip rap. Rip rap usually takes the form of large, coarse material which is inexpensive and locally available. On Lake Superior most rip rap shores are composed of roughly quarried granite blocks. Other locally available material used includes scrap wood, damaged concrete castings, or pulp/paper mill refuse.

Most rip rap shores are narrow and fairly steep. Wave energy within these locales tends to be high (hence the need for rip rap).

Rip rap can be an important substrate for some bird and fish activity.

The large blocks often used in rip rap behave as a boulder beach, having large interstitial pockets between blocks that can retain oil if not thoroughly cleaned. For these reasons, certain rip rap shores may be a priority for protection measures.

In most cases, good road access permits the use of several forms of heavy equipment. In some cases, the large, blocky nature of rip rap permits the use of high-pressure hosing or steam cleaning without significantly endangering (through erosion) the underlying protected shoreline.

Recently spilled oil can often be effectively cleaned by low-pressure hosing. Small spills can be cleaned by employing manual labour and scraping the rip rap, or through the use of sorbent material to remove pooled oil.

All clean up methods employed require measures to ensure the collection and proper disposal of oil as it is liberated from the shore.

ESI 9. Boulder Beach

Boulder beaches are common along Lake Superior shores. Boulder beaches are accumulations of large boulders (25+ centimetres diameter), the smaller sediments having been washed away by wave action in the high energy environment.

Boulder beaches are extremely narrow and often quite steep; beach widths of 2 metres or less are common.

Boulder beach sediment, due to its large size, cannot pack densely. Light oil, when washed onshore, will rapidly penetrate boulder sediment and be washed through the beach sediment and returned to the lake by wave action. Abrasion by breaking waves and a very permeable sediment combine to remove trapped light oil relatively quickly.

Heavy oil is likely to penetrate to a depth of 1 metre or more, and oil could remain trapped between boulders from where it will seep out over time if not cleaned. Very viscous oil may remain on the surface, and adhere to boulders where it will eventually weather and form an asphalt pavement.

Sensitive flora and fauna may be adversely affected by oil on shore and in the water column.

Since boulder beaches are extremely thin, steep, and rarely have easy road access, the use of heavy machinery for clean up operations is severely limited. Where possible, steam cleaning or low/high-pressure hosing may be effective in speeding the removal of recently stranded oil. Due to the permeable nature of boulder beaches, oil buried to a great depth (+0.5 metres) can be effectively removed by these methods.

If these methods are not feasible, isolated boulder beaches may be considered for self-cleaning through wave abrasion, as long as adjacent sensitive shores are protected. Boulder beaches with sensitive features or high Human-Use value may be cleaned manually, using aids such as sorbent pads and scrapers.

All clean up methods employed require measures to ensure the collection and proper disposal of oil as it is liberated from the shore.

ESI 10. Mixed Beach (% by sediment in DOE Database)

Mixed beaches are common along the Lake Superior shoreline. They are accumulations of very poorly sorted sediment including large amounts of coarse sediment (boulders and cobbles), and some finer materials (e.g. sand). The percentage of component sediment types in each shore's case is expressed in descending order (e.g. boulders-70%; cobbles-30%) in Environment Canada's master database.

Mixed beaches are typically shallow sloped, very small (less than 100 metres in length), fairly wide, and restricted to pockets/coves between headlands, in well-sheltered, low energy wave environments. The sheltered wave environment permits the finer sediment to remain and fill the spaces between larger cobble/boulder sized material.

Oil washed ashore along mixed beaches with finer sediment is unlikely to penetrate much; this sediment limits the downward movement of oil. Only very light oils could penetrate this material. Since the sheltered wave environment limits the oil's removal by wave abrasion, deposits of oil are likely to persist for a long time on the surface of mixed beaches. Heavier oils could slowly weather to form asphalt pavements.

Sensitive flora and fauna may be adversely affected by oil on shore and in the water column.

Generally, road access is uncommon along mixed beaches on Lake Superior. Heavy machinery can be quite destructive to the beach surface; the sheltered wave environment ensures beach damage will not quickly be repaired by natural deposition and reworking of shoreline sediments.

On newly deposited oil, low-pressure hosing and flushing, and manual clean up with shovels, pitchforks, and sorbent pads can be effective. Sump/pump operations can be effective on thick accumulations of oil on the beach surface.

All clean up methods employed require measures to ensure the collection and proper disposal of oil as it is liberated from the shore.

9.2.3 Vegetated Shores

Shorelines dominated by vegetation are common features in sheltered environments along Lake Superior. Coves protected by peninsulas, or the leeward edges of major Lake Superior islands often are dominated by vegetated shores.

ESI 11. Low Vegetated Bank (Grass or Trees)

Low vegetated banks are sheltered environments nearly covered in vegetation, with no erosive bluffs or exposed sediment immediately above the waterline; vegetation covers all land surfaces along the shore. Low vegetated bank shorelines are distinguished from broad and fringing wetland shores by the absence of aquatic vegetation.

Most low vegetated shorelines exist in low wave energy environments. Generally gentle in slope, these shores include environments such as forests, meadows, fields and lawns.

Due to the very low energy environment, stranded oil is unlikely to be removed naturally. The impact of spilled oil can be effectively reduced if there is time to manually spread sorbent material along the shore prior to oiling.

Great care must be taken not to harm the vegetation during clean up, since it serves to stabilize the banks. Low-pressure flushing and hosing may be used to remove recently stranded oil as long as smaller vegetation species are not apt to be damaged, and if topsoil will not be removed by the process. Runoff water must be collected and removed. This method may drive residual oil into soil, complicating clean up operations.

An on-site expert is recommended for supervision during clean up.
All clean up methods employed require measures to ensure the collection and proper disposal of oil as it is liberated from the shore.

ESI 12. Delta Mud Flat

There is only one deltaic mud flat on Lake Superior, extending along the mouth of the Harmony River in Batchawana Bay. Deltaic mud flats form when flowing river water slows abruptly upon reaching the lake, allowing suspended sediment to be deposited at the mouth of the river.

Delta mud flats have very gentle slopes and scant vegetation. Commonly, large portions of the mud flat are submerged (the Harmony River delta extends offshore for almost 300 metres). Delta flat sediments range from sand to clay-sized particles; silt appears dominant in the Harmony River delta.

Fringing wetlands commonly bound the margins of delta mud flats. The western edge of the Harmony River delta is fringing wetland; the eastern edge contains a depositional sand beach.

The Harmony River delta mud flat is a very low energy environment due to the sheltering effect of the Batchawana Islands.

Due to the shallow slope, oil spills would affect up to 10 metres of shoreline width at Harmony River. The low wave energy environment ensures that spilled oil will persist. Oil deposited during normal water levels would mix with new incoming delta sediment and be buried. Oil deposited during a storm would persist above the normal swash zone, and weathering could form an asphalt pavement.

Some bird species such as shorebirds, and burrowing organisms could be affected by oil in the delta.

Oil on the surface of mud flats would be very difficult to clean. Deltaic sediments have a very low bearing capacity, prohibiting the use of heavy machinery (except during winter months, when delta sediments are frozen). Manual clean up is recommended, but separating saturated sediment from spilled oil will be extremely difficult. The removal of delta sediment is unlikely to destabilize the delta flat since fluvial deposition is ongoing.

Further complications include ensuring safe access to the oiled portions of the mud flat; extreme care is required due to the low weight bearing capacity of the sediment. All clean up methods employed require measures to ensure the collection and proper disposal of oil as it is liberated from the shore.

ESI 13a. Fringing Wetland

Fringing wetlands are a type of vegetated shoreline containing an abundance of aquatic vegetation. They are usually much smaller than broad wetlands. Along Lake Superior, marsh communities are the most common form of fringing wetland. Characteristically, they are restricted to shallow water coves protected from wind or waves. They closely border the shore to form a narrow belt of aquatic vegetation offshore. The shores of Batchawana Island contain excellent examples.

Oil spills pose a serious threat to fringing wetlands, which are highly valued for their importance as significant fauna habitats (nesting and spawning sites of various, often endangered species), or for the sensitive flora they contain.

Oil spilled in fringing wetlands could persist for years since wave abrasion processes are absent. The use of floating barrier booms at the mouth of coves, or deflection booms updrift of fringing wetlands could reduce oil damage to these sensitive environments.

All wetland environments are extremely sensitive to destructive clean up practices, especially when vegetation or sediment is removed, since wetland regeneration happens very slowly. The use of heavy equipment is potentially more hazardous to the wetland community than the spill itself due to the risk of vegetation destruction, compaction of organic matter, grinding of oil into marsh soil, and the spreading of oil adhered to equipment surfaces to uncontaminated wetland regions.

Low-pressure flushing and hosing, and manual use of sorbents are the safest clean up methods. Usually road access does not exist; clean up crews would likely have to be transported to and from the site by small flat-bottomed boats. The use of low-pressure hosing to herd thin sheens of oil away from vegetation and towards deeper water (where it may be collected by skimming), is one method that has been effective.

Cutting oiled vegetation should only be considered as a last resort, but great care must be taken not to damage or trample roots.

An on-site expert is recommended for supervision during clean up. All clean up methods employed require measures to ensure the collection and proper disposal of oil as it is liberated from the shore.

ESI 13b. Broad Wetland

Broad wetlands are vegetated shorelines which contain an unusual abundance of diverse aquatic vegetation. Along Lake Superior shores, marsh communities are the most common form of broad wetland.

Broad wetlands are usually quite large (1 to 2 km long), and occupy shallow water coves (often containing creek outlets) protected from wind or wave action in very low energy environments. They may extend into bay waters for hundreds of metres.

Oil spills pose a serious threat to broad wetlands, which are highly valued for their importance as significant fauna habitats (nesting and spawning sites of various, often endangered species), or for the sensitive flora they contain.

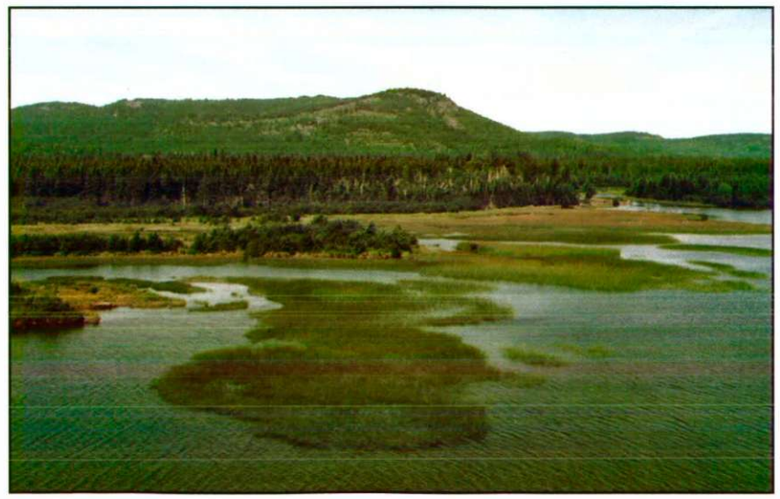
Oil spilled in broad wetlands could persist for years since wave abrasion processes are absent. The use of floating barrier booms at the mouth of coves, or deflection booms updrift of broad wetlands could reduce oil damage to these sensitive environments. In very dense wetlands, oil is unlikely to penetrate past the outer edge of the vegetation.

All wetland environments are extremely sensitive to destructive clean up practices, especially when vegetation or sediment is removed, since wetland regeneration happens very slowly. The use of heavy equipment is potentially more hazardous to the wetland community than the spill itself due to the risk of vegetation destruction, compaction of organic matter, grinding of oil into marsh soil, and the spreading of oil adhered to equipment surfaces to uncontaminated wetland regions.

Low-pressure flushing and hosing, and manual use of sorbents are the safest clean up methods. Usually road access does not exist; clean up crews would likely have to be transported to and from the site by small flat-bottomed boats. The use of low-pressure hosing to herd thin sheens of oil away from vegetation and towards deeper water (where it may be collected by skimming), is one method that has been effective.

Cutting oiled vegetation should only be considered as a last resort, but great care must be taken not to damage or trample roots.

An on-site expert is recommended for supervision during clean up. All clean up methods employed require measures to ensure the collection and proper disposal of oil as it is liberated from the shore.



10.0 Lake Superior: Physical Overview

Lake Superior is the largest of the Great Lakes in surface area and volume, and is one of the largest freshwater lakes in the world. Including islands, the Canadian shoreline of Lake Superior is 2,380 kilometres in length. The lakeshore is sparsely populated, and many of the islands and peninsulas are remote. Although the Trans-Canada Highway and railway run along the north shore of the lake, much of the irregular shoreline is fairly inaccessible. Since much of the shoreline is largely unpopulated and undeveloped, Lake Superior has not been subject to the degree of study applied to the southern Great Lakes.

The exposed coasts of Lake Superior are high wave energy environments; maximum fetches (the area of open water over which waves are generated by wind) are approximately 500 kilometres (Owens, et al., 1992). The coast is characterized by low resistant rock outcrops with few areas of sediment accumulation. The northwest and southeast sections of the coast have complex shorelines due to erosion of relatively unresistant outcrops that has produced a series of large sheltered embayments (Owens, 1979).

10.1 Water Circulation and Shoreline Transport

In the event of a spill, wind and wave conditions must be monitored to assist in predicting the trajectory of a contaminant. When the trajectory and destination of a spill have been defined, the target shoreline should be assessed for shoreline transport. While overviews of circulation are not necessarily reliable measures of transport, the following information will assist response decision makers in assessing spill impact.

Longshore sediment transport is the mechanism by which sediment material is moved parallel to the coast (by wave-induced processes). Figure 3 shows the coastal environments and primary shore-zone transport directions for the Lake Superior region. Table 2 summarizes the main features of each of the five subdivisions in Figure 3.

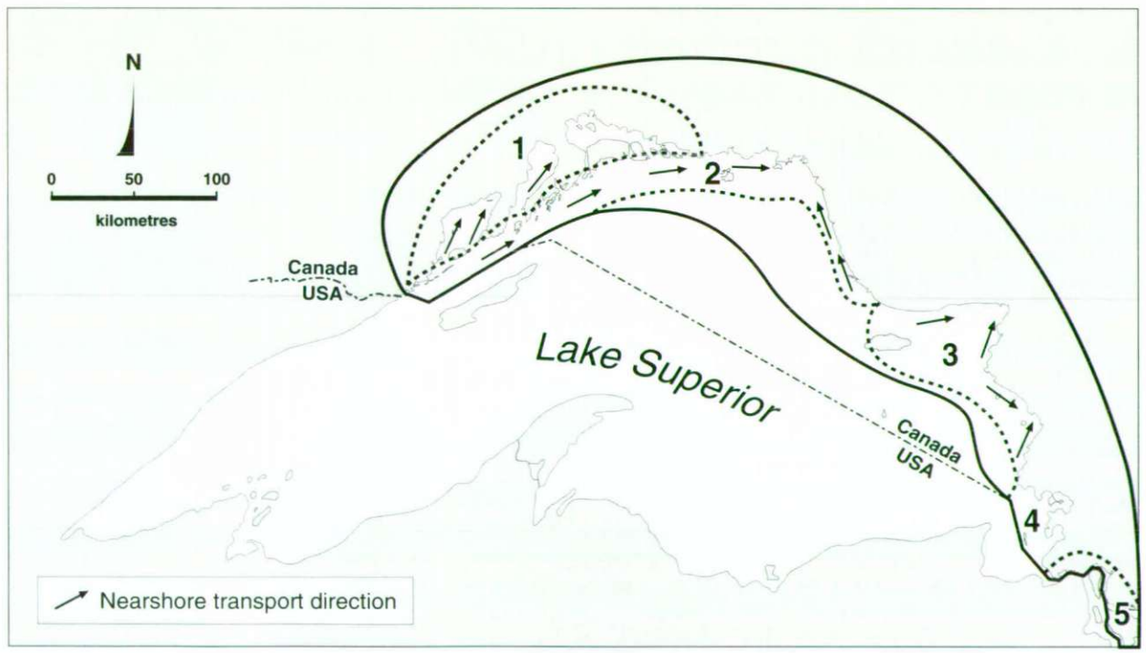


Figure 3: Coastal environments and primary shore-zone transport directions - Lake Superior region.

(Owens, 1979)

Table 2: Coastal Environments of Lake Superior

Subdivision	Relief and Geology	Coastal Zone: Shore-zone Character	Coastal Zone: Beach Character	Fetch, Wave Exposure and Ice	Sediment Availability and Transport
1. Northwest Bays	Resistant Shield rocks eroded to form 3 large bays; backshore relief high in some areas	Upland coasts of low rocky shores with many bays and islands; few beaches or marshes; large delta at mouth of River Kaministikwia	Absent or narrow, predominantly poorly sorted, coarse sediments	Low energy coasts: fetch <50 km; shore-zone ice up to 5 months/year	Sediments generally very scarce; some local accumulations adjacent to rivers; local transport systems
2. North Coast	Resistant Shield rocks outcrop in shore-zone; southwest-northeast structural trends in western area form narrow peninsulas, islands and bays; elsewhere high backshore relief (up to 100 m) in many sections	Relatively straight coasts, except in western areas, with predominantly rocky shore-zone but cliffs not common; few beaches	Absent or narrow, restricted to bays; sediments generally pebble-cobble-boulder; where present, beaches have high storm ridge and log debris lines	Exposed, high energy coast; fetch distances up to 500 km; some local sheltering due to headlands and bays; shore-zone ice up to 5 months/year	Sediments very scarce; transport directions converge near Marathon but system interrupted by numerous small bays and headlands that act as local traps
3. Northeast Coast	Resistant Shield rocks outcrop in shore-zone; high backshore relief in many sections	Relatively straight coasts, but few cliffs despite high backshore relief; few beaches, predominantly rocky shore-zone	Absent or narrow in most areas; beaches have developed at heads of reentrants and, where present, usually have coarse sediments with high storm ridge and log debris lines	Exposed, high energy coast; maximum fetch up to 500 km; shore-zone ice up to 5 months/year	Sediments very scarce; two separate transport systems converge in Michipicoten and Agawa Bays; transport discontinuous due to numerous small headlands and bays
4. Whitefish Bay	Resistant Shield rocks and less resistant sedimentary rocks outcrop in shore-zone; less resistant rocks eroded to form large bays; generally low relief	Indented coast with rock headlands and large bays; some beach and marsh development in bays; delta at Goulais River	Absent or narrow on exposed sections; wide sand or pebble-cobble beach in some bays; sand beaches backed by low dunes and have parallel bars in nearshore zone	Some exposed headlands but predominantly sheltered, low energy coasts with fetches <50 km; shore-zone ice up to 5 months/year	Generally scarce but locally abundant in some sections; local transport systems
5. St. Mary's River	Resistant Shield and sedimentary rocks outcrop in shore-zone; low relief	Riverine coast with channels, islands and linear lakes; mixed character of low rocky coast or narrow coarse-sediment beaches with extensive marshes in shallow areas	Beaches narrow and predominantly poorly-sorted sand to boulder size sediments	Very low energy levels; predominantly riverine environment; shore-zone ice up to 5 months/year	Sediments scarce; general transport direction follows river channels into Lake Huron

(Owens, 1979)

Figure 4: Lake Superior Overview, and Summer Surface Currents

(Ontario Ministry of Natural Resources, 1985)
(Population Data Source: Statistics Canada Census, 1991)

The general pattern of the summer surface circulation in Lake Superior is counterclockwise (see Figure 4). In the western basin, the predominantly western winds of summer combine with surface warming to generate an easterly drift along the south and upwelling along the north shore. In the eastern basin upwelling occurs throughout the mid-lake area. Maximum water surface temperatures on Lake Superior range from 12°C in the centre to 22°C in protected bays (Ontario Ministry of Natural Resources, 1987).

Figure 4 also gives general information such as recreational fishing areas, and the location of communities with their populations.

10.2 Ice Cover

Normally ice begins to form in sheltered and shallow waters along the northern and western shores of Lake Superior in late November or early December. Once the entire perimeter of the lake becomes covered, ice begins to extend out into the lake until it reaches a maximum coverage (usually in February) of 75%. Lake Superior's east central region of the lake generally remains ice-free throughout the year. (Saulesleja, 1986).

Ice thicknesses vary during the winter months, and from year to year. In a normal season, the nearshore shallow and sheltered areas can have ice thicknesses between 45 centimetres and 1 metre. Ice cover on Lake Superior starts to break up in the beginning of March and usually dissipates by the end of April, but has persisted as late as mid-May. The average maximum and minimum ice coverage on Lake Superior, at the normal time of greatest ice coverage is shown in Figure 5, for the period of 1972 to 1985.

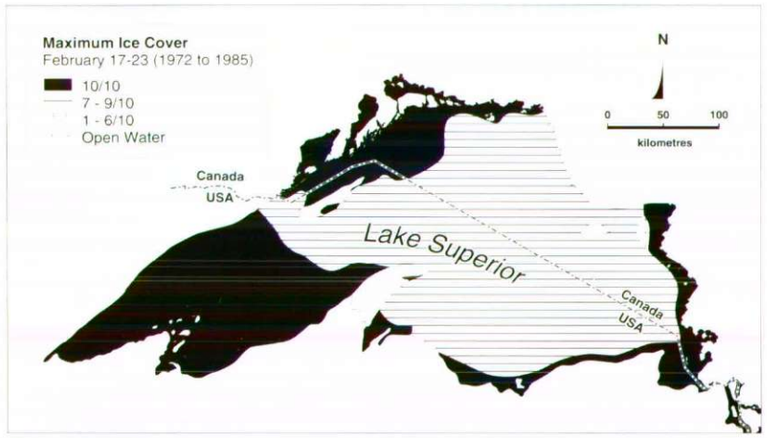


Figure 5a: Lake Superior Maximum Ice Cover

(Saulesleja, 1986)

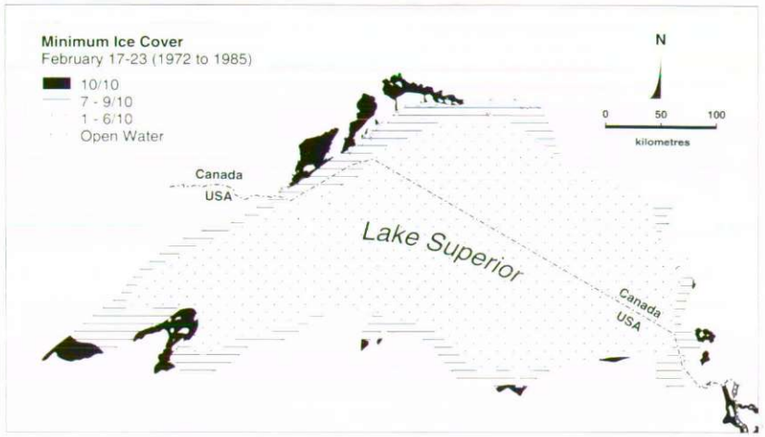


Figure 5b: Lake Superior Minimum Ice Cover

(Saulesleja, 1986)

10.3 Wind and Waves

Figure 6 shows the mean winds information for Lake Superior in summer and winter. Winter wave heights on Lake Superior exceed 1 metre 80% of the time, with rare maximums of 5 to 8 metres possible. Summer wave heights exceed 1 metre only 35% of the time, with rare maximums of 2 to 5 metres possible.

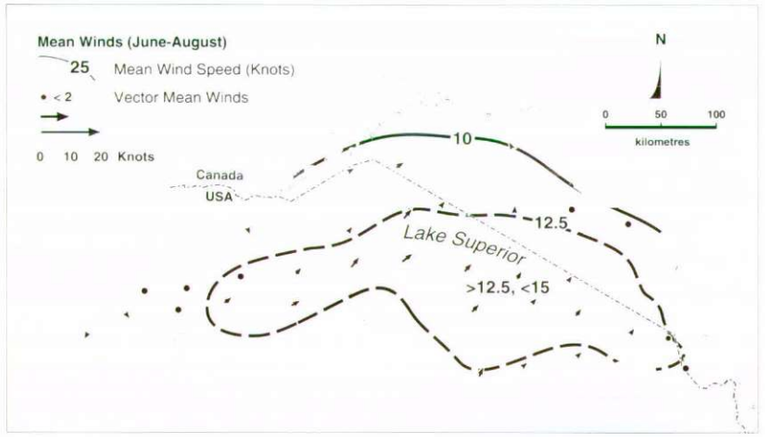


Figure 6a: Lake Superior Summer Wind Information

(Saulesleja, 1986)

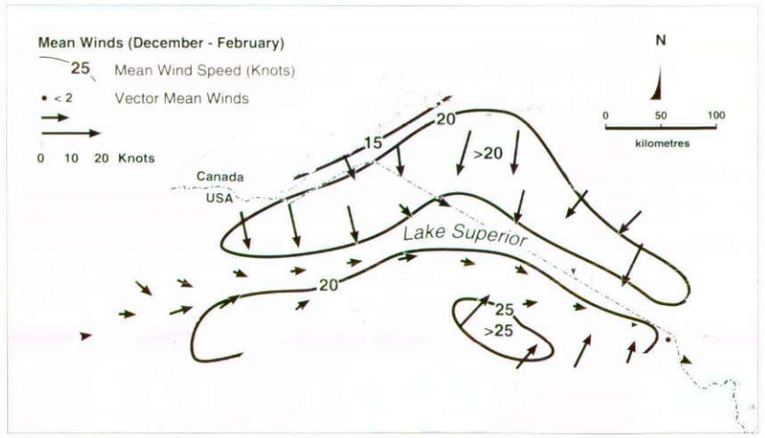
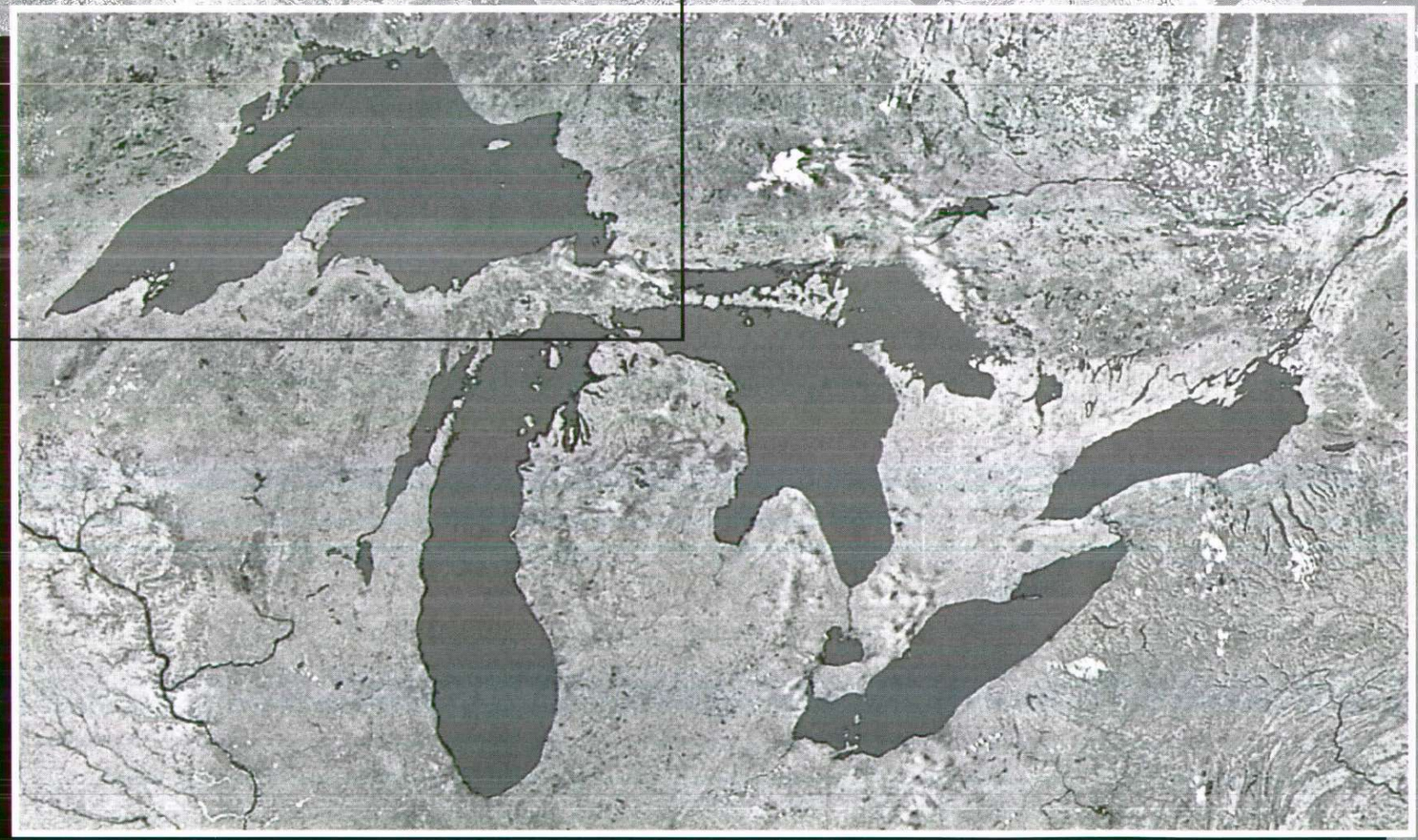


Figure 6b: Lake Superior Winter Wind Information

(Saulesleja, 1986)

Environmental Sensitivity Maps for Lake Superior's Canadian Shoreline



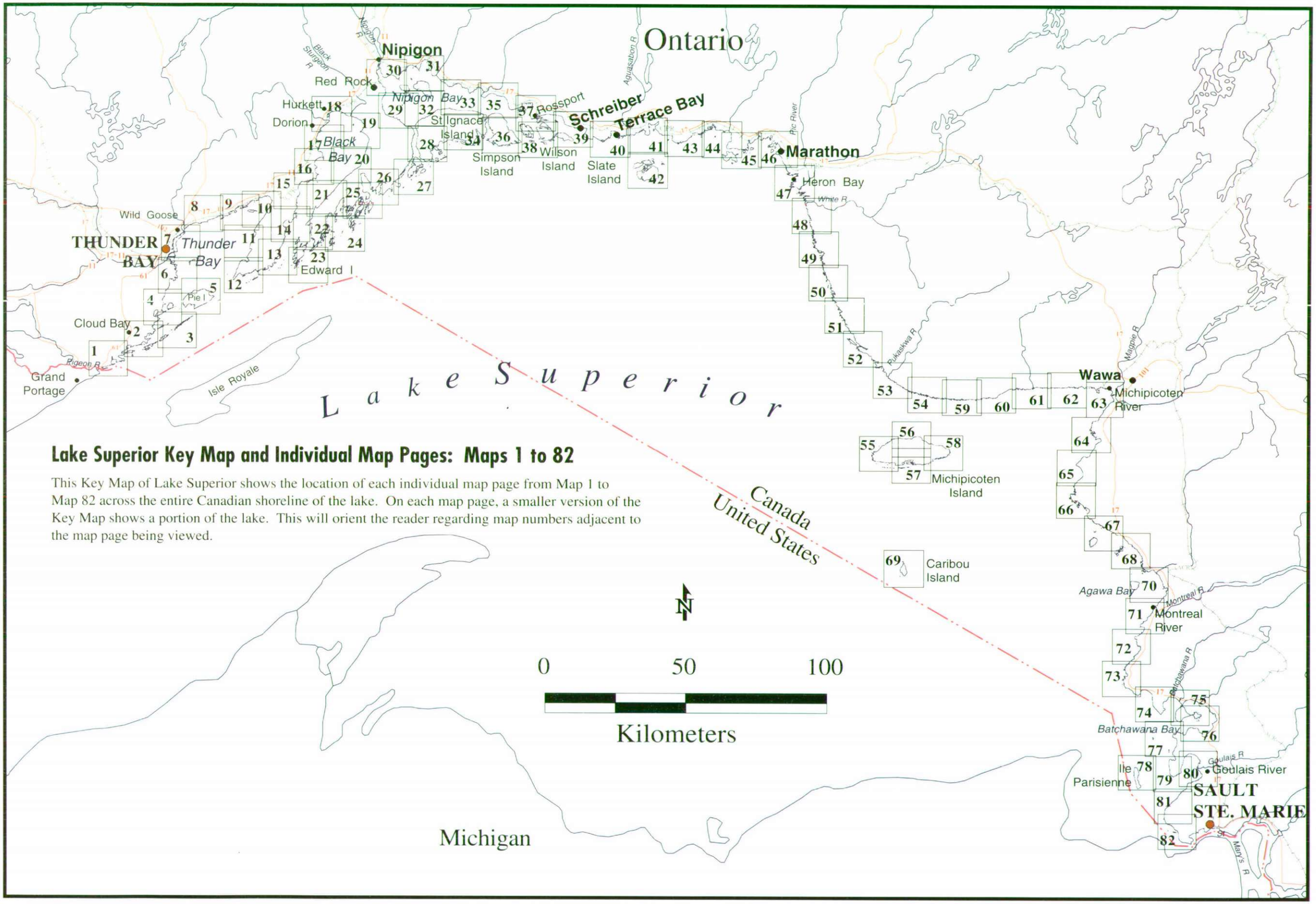
Environment Canada | Environnement Canada

Conservation and Protection | Conservation et Protection

Environmental Protection
Ontario Region

Lake Superior Key Map and Individual Map Pages: Maps 1 to 82

This Key Map of Lake Superior shows the location of each individual map page from Map 1 to Map 82 across the entire Canadian shoreline of the lake. On each map page, a smaller version of the Key Map shows a portion of the lake. This will orient the reader regarding map numbers adjacent to the map page being viewed.



NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

1. Canada Customs, Highway 61 border crossing - For trans-border spill response activity, call (807) 964-2093 in advance.

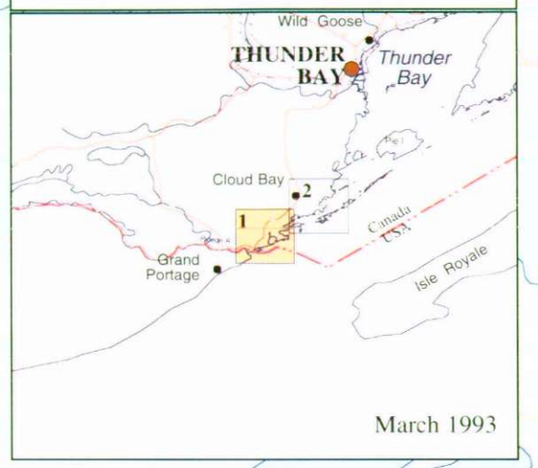
2. Seasonal fish spawning occurs at the mouth of Pigeon River: Chinook Salmon in Fall, Walleye in Spring.

3. The Pine Bay Wetland is an active feeding area for colonial waterbirds, a habitat for several species of furbearing mammals, and is regionally important for fish spawning. Commercial and recreational fishing have seasonal significance in the area. The area also has local significance as a winter cover for deer and moose.

4. 1992 improvements to the Little Trout Bay Conservation Area resulted in the addition of a good boat launch and staging area, and a parking area with room for helicopter landings. Road access continues directly into the Conservation Area. There is no direct road access from Little Trout Bay to Cloud Bay: the old wooden bridge over the Cloud River has been washed out.

Map 1

Contains Sections From NTS Map Numbers:
52A/4 and 52A/3



March 1993

48° 6' 9" N
89° 37' 6" W

48° 6' 9" N
89° 26' 5" W

Scale
0 2
Kilometres
1:50,000

Hwy. 61

Little Trout Bay Conservation Area

Little Trout Bay

Big Trout Bay

Pine Point

Pine River

Crystal Lake

Bearpad Lake

Little Pine River

Lenore Lake

Pine Bay

Naomi Island

Lake Superior

Middle Falls Provincial Park

Pigeon River

Owen Island

Little Pigeon Bay

Marin Island

Finger Point

Boundary Islands

Pigeon Bay

Ontario

Minnesota

Canada

United States of America

Outside Study Area; See United States
N.O.A.A. Environmental Sensitivity Information

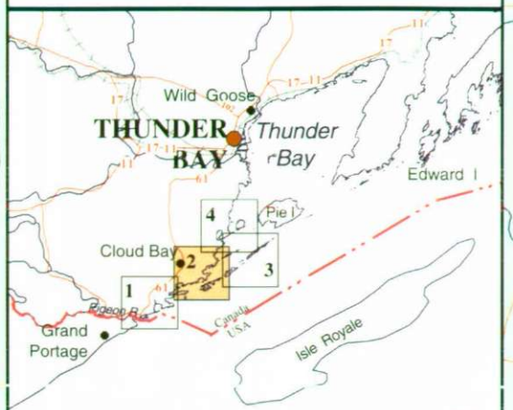
47° 59' 8" N
89° 37' 6" W

47° 59' 8" N
89° 26' 5" W

48° 10' 1" N
89° 27' 0" W

Map 2

Contains Sections From NTS Map Numbers:
52A/3



March 1993

48° 10' 1" N
89° 15' 58" W

Jarvis River

Nisbet Island

Mink Bay

Muskrat Island

Mink Island

Mink Point

8

15

Prince Bay

Beaver Island

14

7

Jarvis Bay

Jarvis Point

10

Spar Reef

9

Caldwell Lake

The Sugarloaf

16

Jarvis Rock

Bradshaw Island

Spar Channel

13

Crystal Bay

Devil Island

Jarvis Island

Caldwell Point

12

Sucker Island

Caldwell Shoal

6

Victoria Island

Victoria Cove

5

(143)

Rolland Rock

11

Cloud Bay

10

Iroquois Rock

Cosgrave Bay

(80)

Tiger Rock

Tiger Island

Albert Islands

Little Trout Bay

9

McKellar Point

8

Pinnacle Rock

(26)

Cloud Islands

(3)

(482)

Cloud River

Lake Superior

Scale
0 1 2
Kilometres
1:50,000

48° 2' 59" N
89° 27' 0" W

48° 2' 59" N
89° 15' 58" W

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

5 Seasonal fish spawning around Victoria Island: Fall, beginning in November.

6 Seasonal fish spawning around Caldwell Shoal: Fall, beginning in November.

7 Seasonal fish spawning occurs southwest of Beaver Island: Fall, beginning in November. Whitefish spawning occurs in the southwest area of Jarvis Bay.

8 Recreational fishing is seasonally popular around Mink Island.

9 Caldwell Lake is an important habitat for local and migratory birds.

10 Recreational fishing is seasonally popular around Spar Island.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

8 Recreational fishing is seasonally popular around Mink Island.

10 Recreational fishing is seasonally popular around Spar Island.

11 Spar Island is Crown Land which is designated as an Area of Natural and Scientific Interest. The provincial significance of the island arises from its unique geological features and arctic-alpine plant species which can be damaged by human activity.

12 Various fish spawning locations are found within this area, the most significant being Sturgeon Bay.

48° 11' 45" N
89° 17' 29" W

48° 11' 45" N
89° 6' 27" W

Wiley Point
Zealand Spit
Sturgeon Island
Sturgeon Point
Windigo Island
Sly Rock
Sister Islands
(42)
White Island
Mink Island
Thompson Island
South McKellar Island
Magee Island
Hawken Island
Anderson Island
(127)
(131)
Eva Islands
Prefontaine Island
(53)
Moonshine Island
(21)
Slipper Island
(44)
Robertson Islands
Cohen Rock
Harty Island
Arabian Rock
Swan Rock
Spar Island
Spar Reef
The Sugarloaf
Bradshaw Island
Spar Channel

Lake Superior

N

Scale

0 1 2

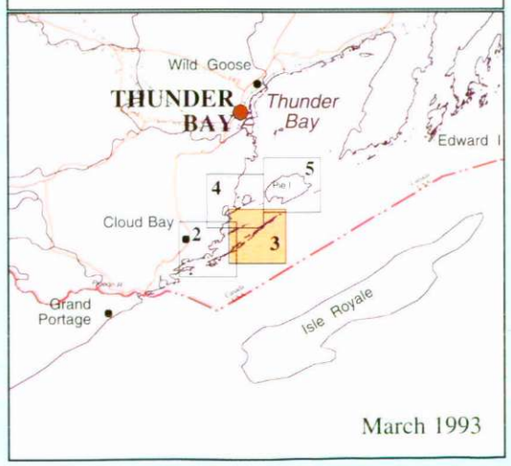
Kilometres

1:50,000

Map 3

Contains Sections From NTS Map Numbers:

52A/3



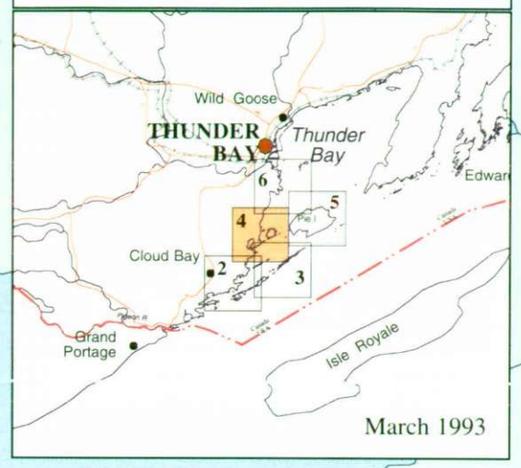
March 1993

48° 4' 43" N
89° 17' 29" W

48° 4' 43" N
89° 6' 27" W

Map 4

Contains Sections From NTS Map Numbers:
52A/3 and 52A/6



48° 16' 13" N
89° 21' 38" W

48° 16' 13" N
89° 10' 34" W

Lomond River

Thunder Bay

(Lake Superior)

Loch Lomond

Russell Point

Bonnet Island

Birch Island

Flatland Island

Campbell Island

Steamboat Island

Alexander Reef

Deadman Island (98)

Flatland Harbour

Singleton Island

Wiley Point

Sturgeon Bay

Zealand Spit

Sturgeon Island

Sturgeon Point

Windigo Island

Sly Rock

Sister Islands

(42) White Island

Thompson Island

20 13 19 18 17 12

Scale
0 1 2
Kilometres
1:50,000

48° 9' 11" N
89° 21' 38" W

48° 9' 11" N
89° 10' 34" W

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

12 Various fish spawning locations are found within this area, the most significant being Sturgeon Bay.

13 The wetlands along the northwest shore of Sturgeon Bay provide a suitable breeding habitat for various raptors, waterfowl and furbearing mammals.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

14 Recreational fishing is seasonally popular in Dawson Bay. Le Paté Nature Reserve is so designated because of the nature of this landform feature: a flat-topped mountain known as a mesa.

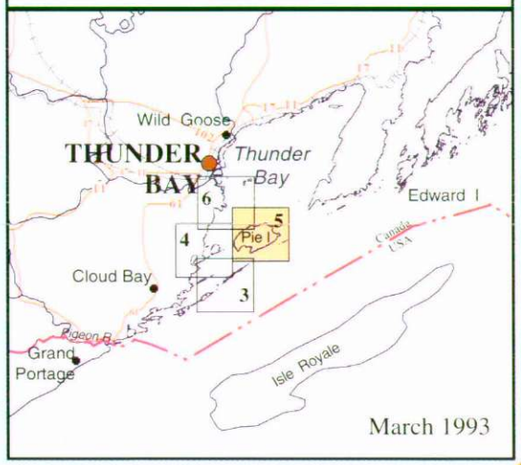
15 Seasonal fish spawning occurs around Pie Island: Fall, from September through November.

48° 18' 19" N
89° 10' 46" W

48° 18' 19" N
88° 59' 42" W

Map 5

Contains Sections From NTS Map Numbers:
52A/3 and 52A/6



Pie Island is 8 kilometres east of the mainland.

N

Scale
0 1 2
Kilometres
1:50,000

15

(26)

Turtle Head

Pie Island

Le Paté Nature Reserve

Angus Islands
(115)
(104)
(11)
(11)

Hamilton Islands

Craig Rock

Cone Island
(167)

Dawson Bay
14

Keefer Point

Greenstone Point

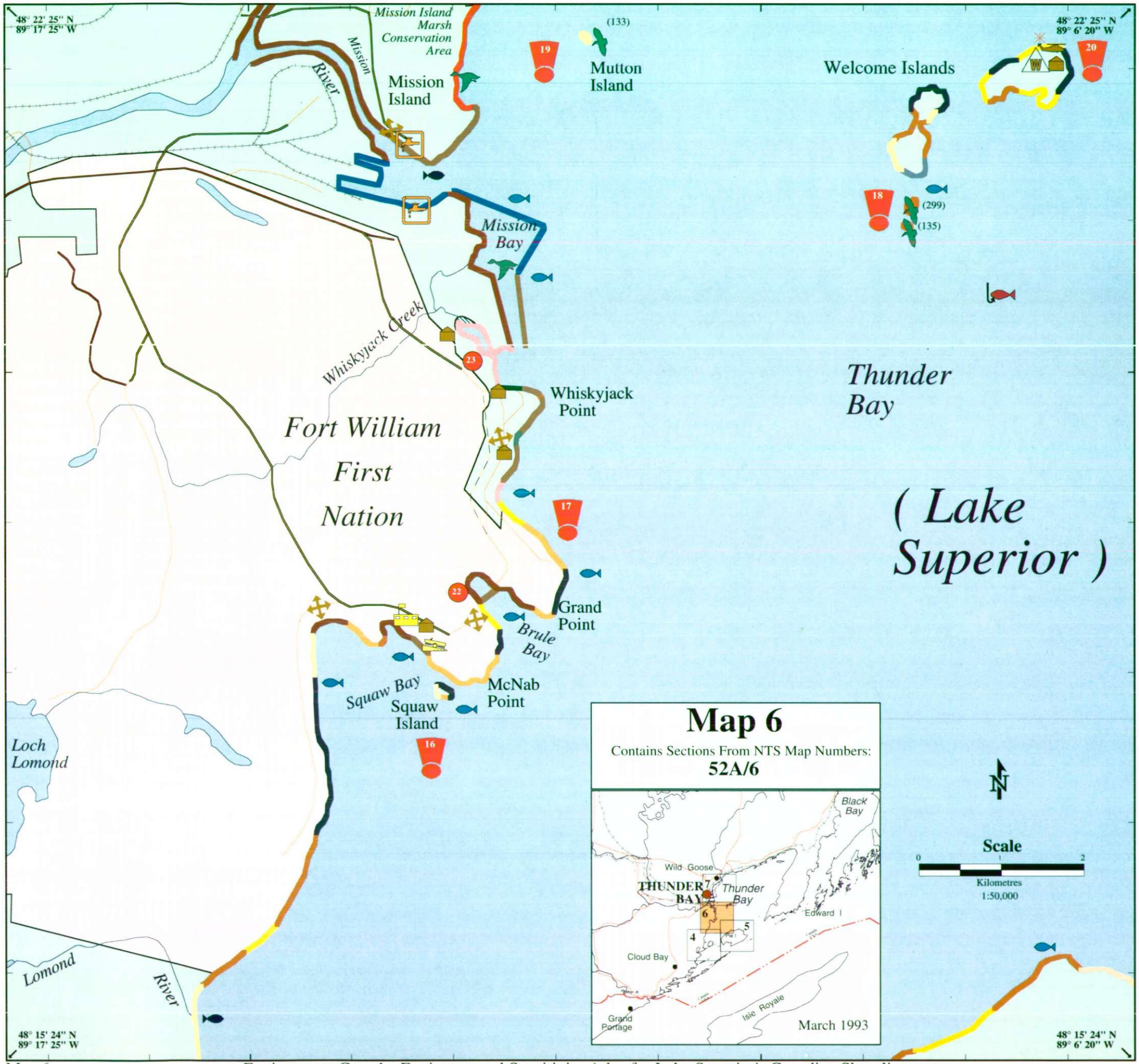
Baker Rock

Lord Stanley Rock

Lake Superior

48° 11' 17" N
89° 10' 46" W

48° 11' 17" N
88° 59' 42" W



NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

16 Seasonal fish spawning occurs around Squaw Island and Squaw Bay: Fall, beginning in September. Responders should contact the Chief of the Fort William First Nation before commencing response activity in this area.

17 Seasonal fish spawning occurs from McNab Point to Whiskyjack Point: Fall, from September to October.

18 Seasonal fish spawning occurs around the southernmost Welcome Islands, beginning in late Fall.

19 Spawning times vary within the region, but are generally confined to the Fall season, between September and December. All of the creeks and rivers along the northern shores of Thunder Bay support cold water migratory fish species.

20 There is heavy seasonal recreational fishing activity in the shallow depths around the Welcome Islands.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

19 Spawning times vary within the region, but are generally confined to the Fall season, between September and December. All of the creeks and rivers along the northern shores of Thunder Bay support cold water migratory fish species.

20 There is heavy seasonal recreational fishing activity in the shallow depths around the Welcome Islands.

21 Highly sensitive features in the Thunder Bay area include water intakes, and the three wetland areas: Mission Island Marsh, Neebing Marsh and McKellar Marsh. These three areas provide an excellent breeding and feeding habitat for regionally significant bird, mammal, fish and invertebrate populations, as well as a valuable habitat for aquatic plants. Aviation fuel is available at the Thunder Bay Airport, where there is also a meteorological station, and runways for large aircraft. The Canadian Coast Guard and the Canadian Petroleum Products Institute (CPPI) equipment depot and boom storage site are located adjacent to the harbour in Thunder Bay.

22 Neebing Marsh is an important stopover for migratory birds, and an important area for fish spawning.

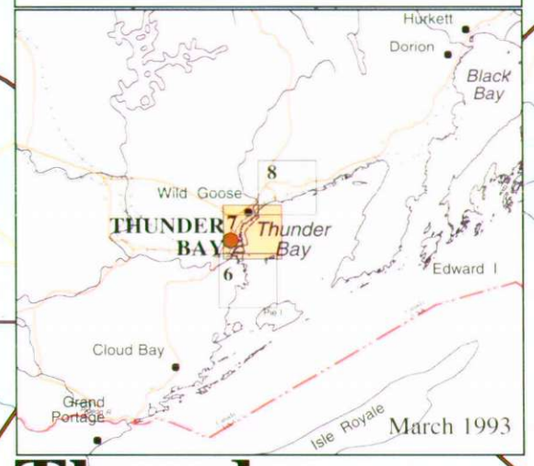
23 Canada Malting Co. Food Processing Water Intake - Call (807) 343-5460. Seasonal fish spawning extends along the breakwaters from Bare Point to Neebing Marsh.

24 Thunder Bay Drinking Water Treatment Plant Intake - Call (807) 625-2471. High cottage densities are found along the north shores of Thunder Bay. As a result, recreational fishing activity is very heavy along these shores.

48° 28' 41" N
89° 16' 37" W

Map 7

Contains Sections From NTS Map Numbers:
52A/6



Thunder Bay

48° 28' 41" N
89° 5' 30" W

Current River
Boulevard Lake
McVicar Creek
Bare Point
Lakehead Harbour
Thunder Bay
(Lake Superior)
Neebing Marsh
McIntyre River
Thunder Bay Harbour
Neebing River
Kaministiquia River
McKellar Island
McKellar River
Mission Island Marsh Conservation Area
Mission River
Mission Island
Mutton Island
(133)
Welcome Islands
N
Scale
0 1 2
Kilometres
1:50,000
48° 21' 39" N
89° 16' 37" W
48° 21' 39" N
89° 5' 30" W

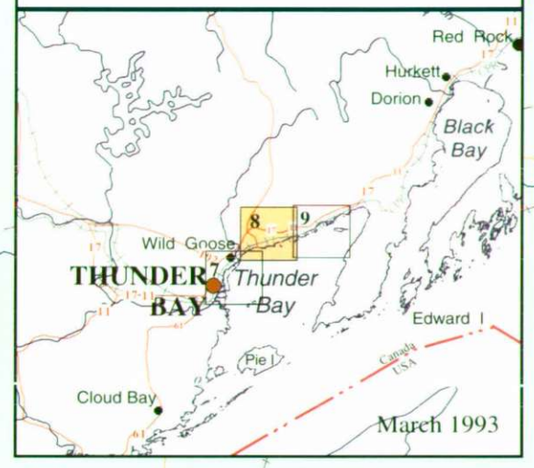
48° 34' 23" N
89° 10' 3" W

48° 34' 23" N
88° 58' 55" W

Map 8

Contains Sections From NTS Map Numbers:

52A/11 and 52A/6



Creek

Savigny

Hwy. 527

Hwy. 17 and 11

Wild Goose Creek

Blind Creek

Mary Harbour

Mary Island

Wild Goose Beach

Navilus

Green Bay Beach

Wild Goose

Green Point

Green Bay

Melancon Point

Wild Goose Point

(150) Papoose Islands (44)

Thunder Bay

(Lake Superior)

Scale

0 1 2

Kilometres

1:50,000

48° 27' 22" N
89° 10' 3" W

48° 27' 22" N
88° 58' 55" W

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

24 Thunder Bay Drinking Water Treatment Plant Intake - Call (807) 625-2471. High cottage densities are found along the north shores of Thunder Bay. As a result, recreational fishing activity is very heavy along these shores.

25 Seasonal fish spawning occurs along the areas of Melancon Point, Wild Goose Point, and the Papoose Islands: Fall, from September to December. All of the creeks and rivers along Thunder Bay's north shore support cold water migratory fish species.

26 Many cottages are located along the shores of Mary Harbour, and recreational fishing is very popular in the surrounding waters.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

27 Le-Caine Bailey Bird Sanctuary on Buck Island is a designated Environmentally Sensitive Area.

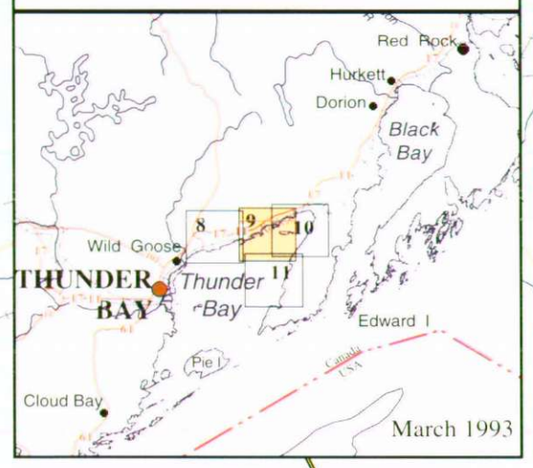
28 Fish spawning around Thunder Bay generally commences in September and ends in October, or as late as December in some cases. Many fish species are found in the region. Most of the rivers and creeks flowing into Thunder Bay support cold water migratory fish species.

29 Seasonal cottage and recreational use, and recreational fishing are very widespread along the northern shores of Thunder Bay and Sibley Peninsula. Note that there are no cottages on Sleeping Giant (formerly Sibley) Provincial Park.

30 Seasonal fish spawning occurs around the southern and northern shores of Caribou Island during October.

Map 9

Contains Sections From NTS Map Numbers:
52A/10 and 52A/7



48° 34' 42" N
88° 59' 53" W

48° 34' 42" N
88° 48' 45" W

Mackenzie River
Hwy. 17
Mackenzie Falls
Sunnyside Beach
Amethyst Beach
Amethyst Harbour
Amethyst Harbour
Perry Point
Birch Beach
Sour Island
Knobel Point
Chipman Rock
Crystal Beach
Palette Island
Lambert Island
(135)
Kent Island
Amethyst Bay
Temple Rock
(180)
Buck Islands
Caribou Island
30
Mackenzie Point Conservation Area
Mackenzie Beach
26
Mackenzie Bay
Conmee Point
Bacon Island
(17)
27
28
29
Silver Harbour Conservation Area
25
Lefebvre Island
Mary Harbour
Silver Harbour
Mary Island
Thunder Bay
(Lake Superior)

Scale
0 1 2
Kilometres
1:50,000

48° 27' 41" N
88° 59' 53" W

48° 27' 41" N
88° 48' 45" W

48° 35' 15" N
88° 53' 36" W

48° 35' 15" N
88° 42' 29" W

Hwy. 17

Amethyst Beach

Amethyst Harbour

Amethyst Harbour

Perry Point

Lambert Island

Temple Rock

Caribou Island

Birch Beach

Sour Island

Knobel Point

O'Connor Point

Chipman Rock

Thunder Bay

(Lake Superior)

Blende River

Upper Pass Lake

Pass Lake

Vigars Point

Milkshake Lake

Wiswell Lake

Pounsford Lake

Sleeping Giant (formerly Sibley) Provincial Park

Kay Lake

Lizard Lake

Joeboy Lake

27

28

29

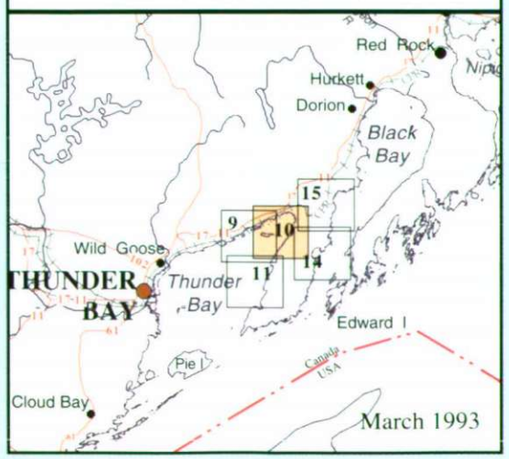
30

31

Map 10

Contains Sections From NTS Map Numbers:

52A/10 and 52A/7



Scale

0 1 2

Kilometres
1:50,000

48° 28' 14" N
88° 53' 36" W

48° 28' 14" N
88° 42' 29" W

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

28 Fish spawning around Thunder Bay generally commences in September and ends in October, or as late as December in some cases. Many fish species are found in the region. Most of the rivers and creeks flowing into Thunder Bay support cold water migratory fish species.

29 Seasonal cottage and recreational use, and recreational fishing are very widespread along the northern shores of Thunder Bay and Sibley Peninsula. Note that there are no cottages on Sleeping Giant (formerly Sibley) Provincial Park.

30 Seasonal fish spawning occurs around the southern and northern shores of Caribou Island during October.

31 The wetland area at the mouth of Blende River has abundant wildlife. The marsh and bog environment is a suitable habitat for migratory waterfowl and shorebirds. The area is a preferred nesting site for a variety of wading birds and raptors, and is an ideal location for fish spawning. As a result of this diverse species utilization, this wetland is highly valued.

NOTES

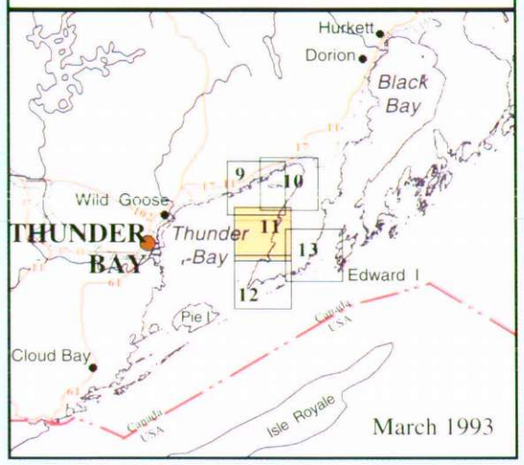
A red exclamation point symbol is used on the maps to catch the responder's attention.

32 Seasonal fish spawning occurs along Sibley Peninsula during Fall. Species include Lake Trout, Herring and Whitefish. Recreational fishing is widespread along these shores.

48° 28' 42" N
88° 58' 40" W

Map 11

Contains Sections From NTS Map Numbers:
52A/7



48° 28' 42" N
88° 47' 34" W

Clavet Point

Holt Lake

Clavet Bay

Norwegian Lake

Twinpine Lake

32

(Lake Superior)

Thunder Bay

Hoorigan Point

Verandah Lake

Hoorigan Bay

Sleeping Giant (formerly Sibley) Provincial Park

Marie Louise Lake

Sawyer Bay

N

Scale
0 1 2
Kilometres
1:50,000

48° 21' 40" N
88° 58' 40" W

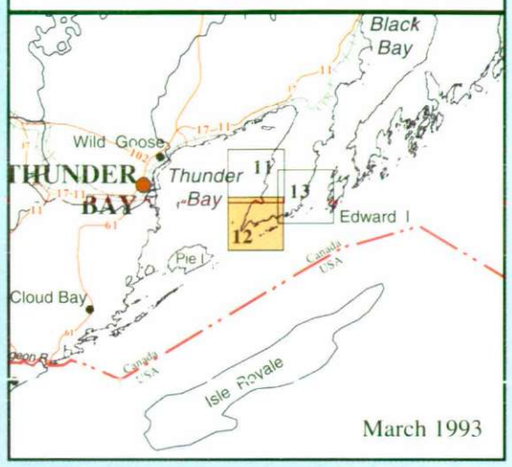
48° 21' 40" N
88° 47' 34" W

48° 22' 27" N
88° 58' 43" W

Map 12

Contains Sections From NTS Map Numbers:

52A/7



March 1993

48° 22' 27" N
88° 47' 39" W

Sawyer Bay

Sawbill Lake

Sibley Creek

Sleeping Giant (formerly Sibley) Provincial Park

Ravine Lake

Grassy Lake

Sibley Cove

Surprise Lake

Camp Bay

Perry Bay

M

Burnt Island

Anorthite Islet

Crosse Rocks

(386)

Silver Islet

Nana Steps

The Sleeping Giant

33

Hare Island

(252)

29

Tee Harbour

Pyritic Island

(67)

Shangoina Island

(139)

Ship Island

Majestic Rock

Marvin Island

(215)

Trowbridge Island

Thunder Cape

Lake Superior

N

Scale

0 1 2

Kilometres

1:50,000

48° 15' 25" N
88° 58' 43" W

48° 15' 25" N
88° 47' 39" W

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

33 Seasonal Lake Trout spawning occurs around Hare Island and along Sibley Peninsula to Thunder Cape: Fall, from September through November. Seasonal recreational fishing is widespread along the western shores of Sibley Peninsula. The Thunder Cape bird observatory at the tip of Thunder Cape is a migratory bird landing.

NOTES

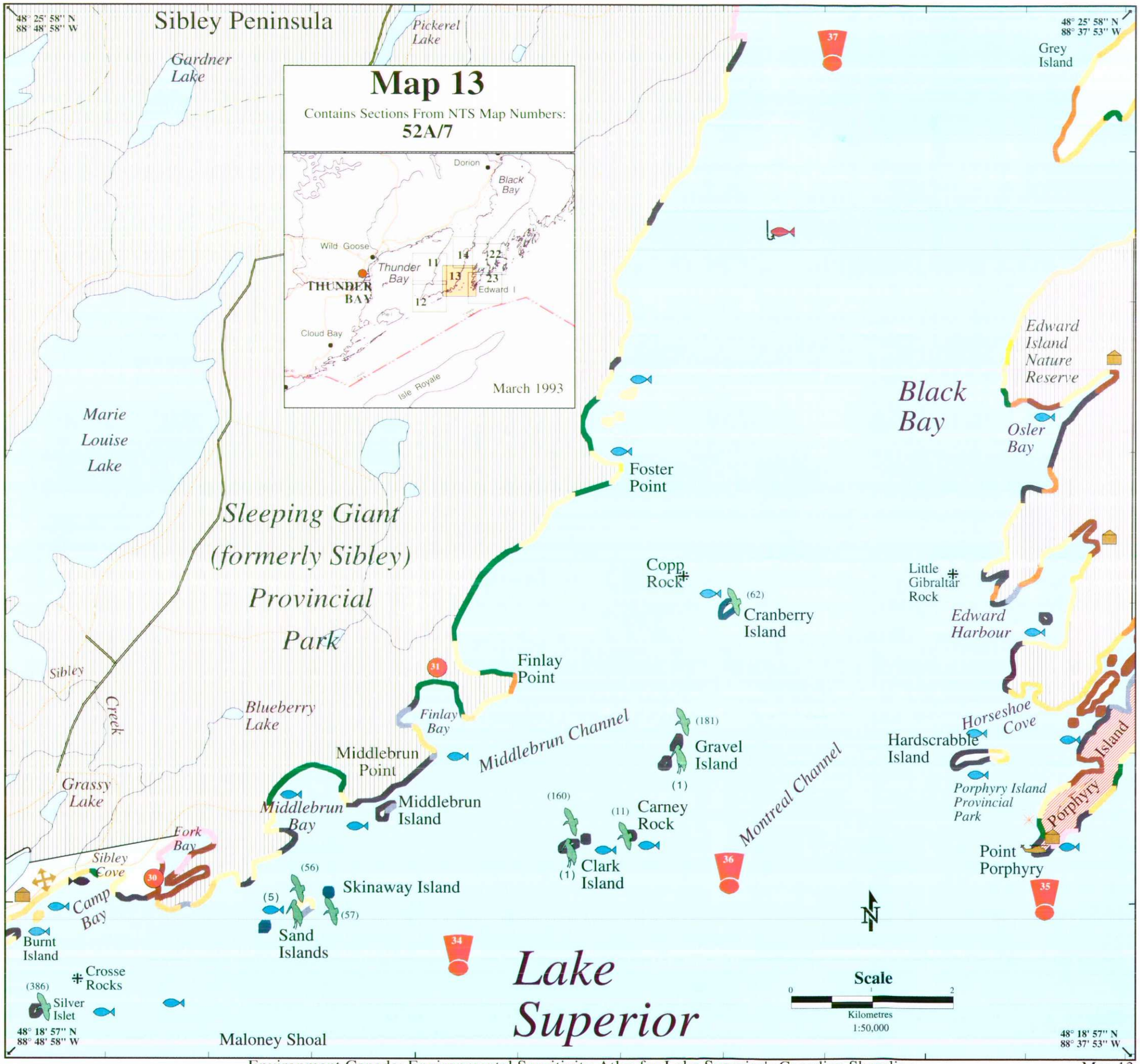
A red exclamation point symbol is used on the maps to catch the responder's attention.

34 Numerous colony birds inhabit the small islands south of Black Bay.

35 Porphyry Island Provincial Park has been designated as an Environmentally Sensitive Area since it is the only location in the middle latitudes of Canada where the rare plant species known as Devil's Club grows.

36 Seasonal fish spawning occurs around many of the islands at the mouth of Black Bay: Fall, September through October.

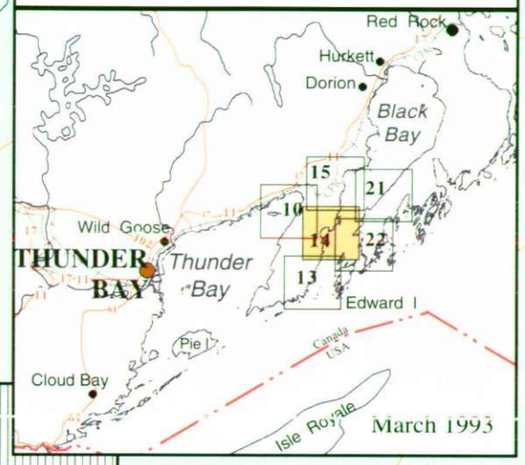
37 Black Bay is a significant resource area for the commercial fishing industry, and forms the largest Herring spawning grounds in Lake Superior.



Map 14

Contains Sections From NTS Map Numbers:

52A/7 and 52A/10



48° 32' 26" N
88° 45' 25" W

48° 32' 26" N
88° 34' 18" W

Moonlight Beach

Louse Cove

Black Bay

Squaw Island

(Lake Superior)

Kidd Point

Squaw Bay

George Point

Miles Bay

Cowie Point

Cowie Bay

Wiswell Lake

Sleeping Giant (formerly Sibley) Provincial Park

Kay Lake

Lizard Lake

Joeboy Lake

Rita Lake

Pickerel Lake

Demers Point

Arno Island

Grey Island

Seagram Rock

48° 25' 25" N
88° 45' 25" W

48° 25' 25" N
88° 34' 18" W

38

37

51

Scale

0 1 2

Kilometres
1:50,000

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

37 Black Bay is a significant resource area for the commercial fishing industry, and forms the largest Herring spawning grounds in Lake Superior.

38 Most of the rivers and creeks flowing into Black Bay support cold water migratory fish species.

51 Seasonal fish spawning extends from George Point south to Magnet Island: Fall, commencing in September.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

39 Year round residences, docking facilities and commercial fisheries are found at Johnsons Landing in Black Bay.

40 Most of the rivers and creeks flowing into Black Bay support cold water migratory fish species.

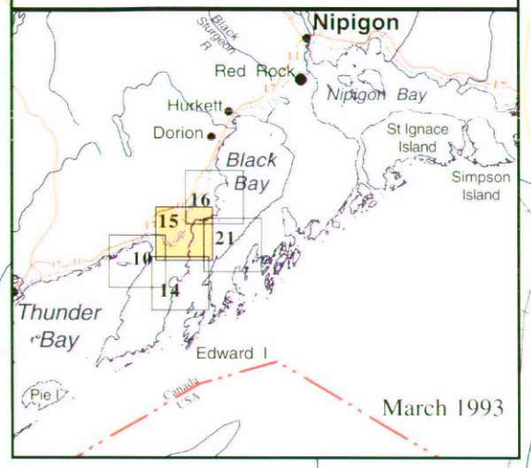
41 Black Bay is a significant resource area for the commercial fishing industry, and forms the largest Herring spawning grounds in Lake Superior.

48° 38' 53" N
88° 44' 40" W

48° 38' 53" N
88° 33' 32" W

Map 15

Contains Sections From NTS Map Numbers:
52A/10



Iron Lake

Deception Lake

Caribou Lake

Pearl River

D'Arcy Creek

D'Arcy Lake

Black Bay

(Lake Superior)

Upper Pass Lake

Pass Lake

Knudsens Corner

Johnsons Landing

Hornick Cove

Scale
0 1 2
Kilometres
1:50,000

48° 31' 51" N
88° 44' 40" W

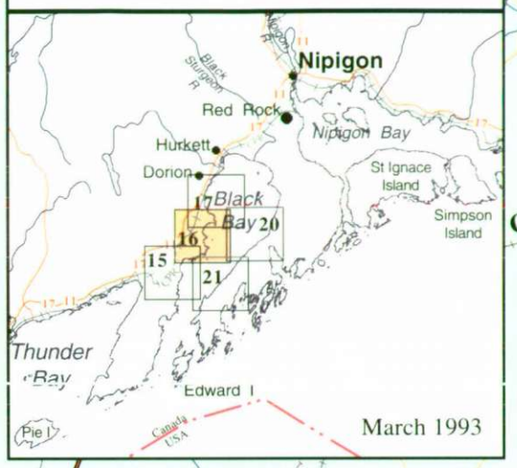
48° 31' 51" N
88° 33' 32" W

48° 43' 38" N
88° 38' 49" W

Map 16

Contains Sections From NTS Map Numbers:

52A/10 and 52A/9



48° 43' 38" N
88° 27' 39" W

Granite Point Conservation Area

Enterprise Bay

Granite Point

McEachan Island

Green Island

CN Rail

Ancliff

42

Black Bay

Nuttal Island

(4)

Moose Bay

Welch Creek

Pearl Lake

Pearl River

Bent Island

40

41

(Lake Superior)

Scale

0 1 2

Kilometres

1:50,000

48° 36' 36" N
88° 38' 49" W

48° 36' 36" N
88° 27' 39" W

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

40 Most of the rivers and creeks flowing into Black Bay support cold water migratory fish species.

41 Black Bay is a significant resource area for the commercial fishing industry, and forms the largest Herring spawning grounds in Lake Superior.

42 The wetland area north of Moose Bay has abundant wildlife. The marsh and bog environment is a suitable habitat for shorebirds and migratory waterfowl, making this wetland a regionally significant seasonal staging area for migratory birds. Beaver, mink and marten are also found in the area, and fish spawning occurs all along the bay. As a result of this diverse species utilization, this wetland is highly valued.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

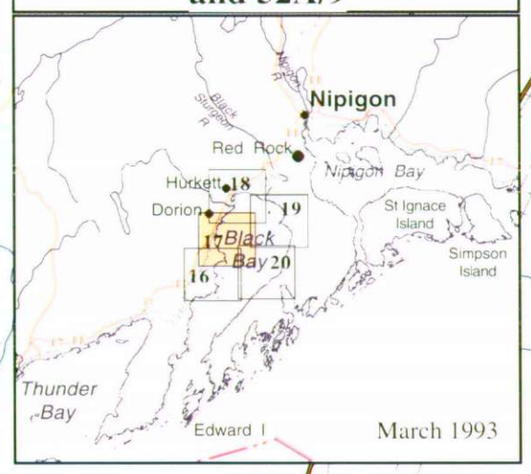
43 Year round residents are found at Dorion Landing.

44 Black Bay is a significant resource area for the commercial fishing industry, and forms the largest Herring spawning grounds in Lake Superior. The north end of Black Bay is the most important migration staging area for Migratory Waterfowl on Lake Superior, with Spring migration occurring from April to May. Seasonal fish spawning in Black Bay generally commences in September.

45 Most of the rivers and creeks flowing into Black Bay support cold water migratory fish species.

Map 17

Contains Sections From NTS Map Numbers:
52A/10, 52A/15, 52A/16 and 52A/9



48° 48' 12" N
88° 36' 7" W

48° 48' 12" N
88° 24' 56" W

Dorion

Dorion Landing

45

44

43

Black Bay

(Lake Superior)

Ouimet

CP Rail

Hwy. 17/11

CN Rail

Ancliff

Granite Point Conservation Area

Enterprise Bay

Granite Point

McEachan Island

Green Island

(40)

(3920)

Granite Island

N

Scale

0 1 2

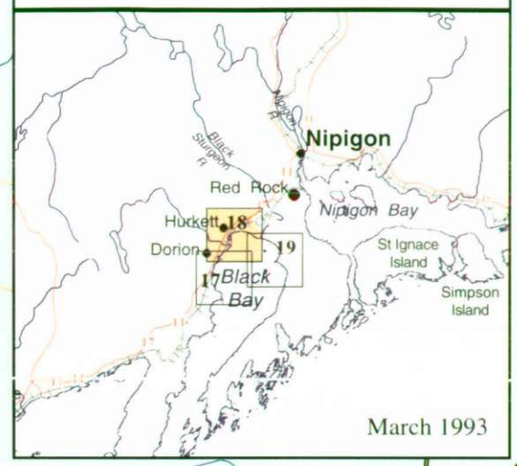
Kilometres
1:50,000

48° 41' 10" N
88° 36' 7" W

48° 41' 10" N
88° 24' 56" W

Map 18

Contains Sections From NTS Map Numbers:
52A/16 and 52A/15



48° 53' 50" N
88° 34' 3" W

48° 53' 50" N
88° 22' 51" W

Stewart Lake

Hwy. 17/11

Little Squaw Creek

Big Squaw Creek

CP Rail

CN Rail

Morrow Creek

Hurkett Creek

Hwy. 582

Hurkett

Cranberry Bay

Black Sturgeon River

M

Hurkett Cove

46

Hurkett Cove Conservation Area

Black Bay

(Lake Superior)

Wolf River

Coldwater Creek

Dorion

45

44

43

Dorion Landing

N

Scale
0 1 2
Kilometres
1:50,000

48° 46' 49" N
88° 34' 3" W

48° 46' 49" N
88° 22' 51" W

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

43 Year round residents are found at Dorion Landing.

44 Black Bay is a significant resource area for the commercial fishing industry, and forms the largest Herring spawning grounds in Lake Superior. The north end of Black Bay is the most important migration staging area for Migratory Waterfowl on Lake Superior, with Spring migration occurring from April to May. Seasonal fish spawning in Black Bay generally commences in September.

45 Most of the rivers and creeks flowing into Black Bay support cold water migratory fish species.

46 The wetlands around Hurkett Cove and Cranberry Bay are important feeding and breeding grounds for migratory waterfowl. Mink, raccoons and foxes are present, and the area is a feeding ground for colony birds as well. The area provides a suitable habitat for fish spawning in late Summer and into Fall. Wild rice and other regionally unique aquatic plants are also found in this area. The head of Black Bay is an Osprey nesting area.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

47 One of the best examples of shoreline peatland along Lake Superior occurs in the Black Bay Peninsula Peatland. Unlike other peatlands, which commonly form as a result of insufficient drainage, this area formed as a result of localized fog and high humidity. These unique characteristics have led to the area's recognition as a provincially significant Area of Natural and Scientific Interest. Site degradation and damage could occur if countermeasure activities interfere with the peatland ecosystem. Access is by road in winter and by boat in summer.

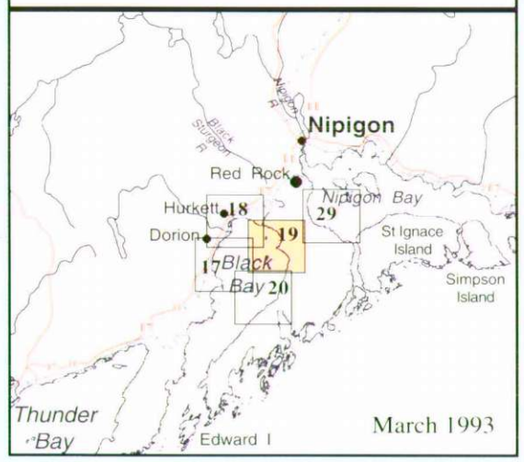
48 Black Bay is a significant resource area for the commercial fishing industry, and forms the largest Herring spawning grounds in Lake Superior. Seasonal fish spawning in Black Bay generally commences in September. The north end of Black Bay is the most important migration staging area for Migratory Waterfowl on Lake Superior, with Spring migration occurring from April to May. Most of Black Bay Peninsula is accessible overland by logging road only. Contact the Ministry of Natural Resources in Nipigon for road conditions and maps.

48° 50' 33" N
88° 26' 1" W

48° 50' 33" N
88° 14' 50" W

Map 19

Contains Sections From NTS Map Numbers:
52A/16 and 52A/9



Delaney Island (12)

47

Black Bay Peninsula Peatland

Ham Point

Scimming Island

Black Bay

Scale
0 1 2
Kilometres
1:50,000

48

(Lake Superior)

Laurie Lake

48° 43' 31" N
88° 26' 1" W

48° 43' 31" N
88° 14' 50" W

48° 43' 54" N
88° 28' 33" W

(40)

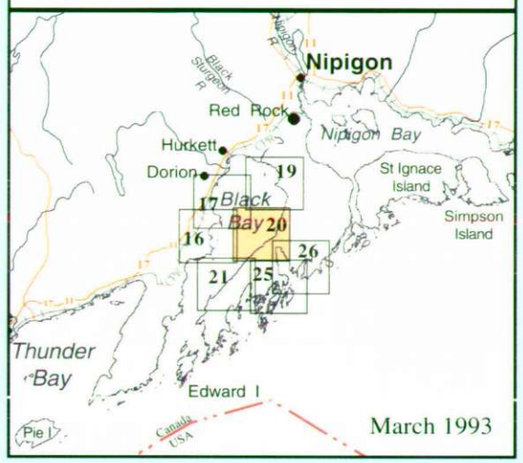
(3920)

Granite
Island

Map 20

Contains Sections From NTS Map Numbers:

52A/9



Scale

0 1 2

Kilometres
1:50,000

48° 43' 54" N
88° 17' 23" W

Laurie Lake

Black Bay

(Lake Superior)

49

32

Black Bay Peninsula

Shesheeb Bay

48° 36' 53" N
88° 28' 33" W

48° 36' 53" N
88° 17' 23" W

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

49 Black Bay is a significant resource area for the commercial fishing industry. Most of Black Bay Peninsula is accessible overland by logging road only. Contact the Ministry of Natural Resources in Nipigon for road conditions and maps.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

50 Black Bay is a significant resource area for the commercial fishing industry, and forms the largest Herring spawning grounds in Lake Superior. Most of Black Bay Peninsula is accessible overland by logging road only. Contact the Ministry of Natural Resources in Nipigon for road conditions and maps.

48° 37' 24" N
88° 25' 17" W

Bent Island

48° 37' 24" N
88° 24' 10" W

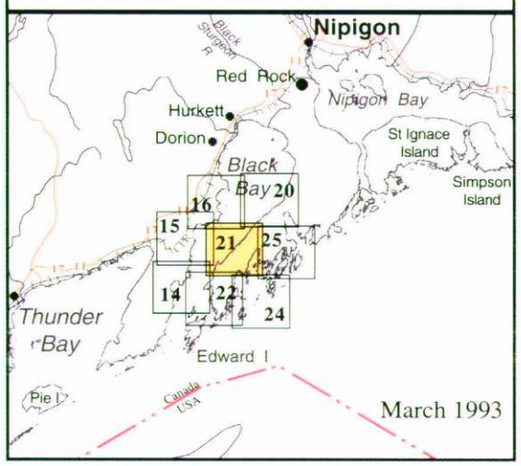
Scale
0 1 2
Kilometres
1:50,000

Black Bay

(Lake Superior)

Map 21

Contains Sections From NTS Map Numbers:
52A/10 and 52A/9



Sturgeon River

Sturgeon Bay

Zeolite Bay

Copper Point

Louise Bay

Black Bay Peninsula

Bourbonnais Island

33

Mood Island

(60)

Jean Pierre Bay

Jean Pierre Point

Hanbury Island

50

48° 30' 22" N
88° 35' 17" W

48° 30' 22" N
88° 24' 10" W

48° 30' 55" N
88° 39' 4" W

Black Bay

Squaw Island

(Lake Superior)

50

34

George Point

Miles Bay

Jean Pierre Bay

48° 30' 55" N
88° 27' 58" W

Jean Pierre Point

52

35

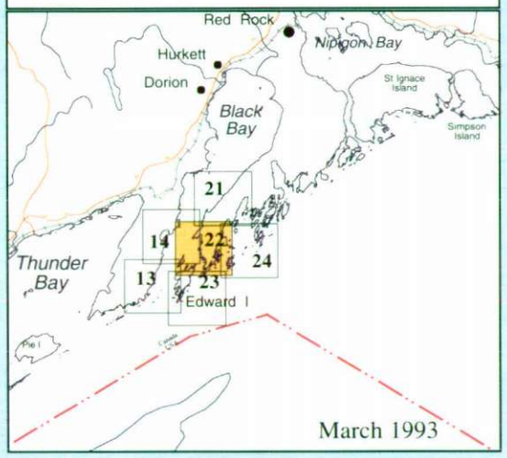
Hughes Island

Black Bay Peninsula

Bruneau Point

Map 22

Contains Sections From NTS Map Numbers:
52A/7, 52A/8 and 52A/10



Cowie Point

Cowie Bay

Black Bay Peninsula

Barclay Islands

Bennett Island

Phlox Island

Emerson Island

51

Arno Island

Grey Island

Seagram Rock

Schell Bay

No. 10 Island

Gunn Island

Shaganash Island

Longtin Island

Ariel Island

Doris Island

(20)

(10)

Tunnel Island

Cargill Island

(47)

Magnet Channel

Magnet Point

(1)

Edward Island

(8)

(21)

Magnet Island

Poynter Rock

Scale
0 1 2
Kilometres
1:50,000

48° 23' 54" N
88° 39' 4" W

48° 23' 54" N
88° 27' 58" W

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

50 Black Bay is a significant resource area for the commercial fishing industry, and forms the largest Herring spawning grounds in Lake Superior. Most of Black Bay Peninsula is accessible overland by logging road only. Contact the Ministry of Natural Resources in Nipigon for road conditions and maps.

51 Seasonal fish spawning extends from George Point south to Magnet Island: Fall, commencing in September.

52 Seasonal fish spawning occurs in the area south of Jean Pierre Point: Fall, October through November.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

35 Porphyry Island Provincial Park has been designated as an Environmentally Sensitive Area since it is the only location in the middle latitudes of Canada where the rare plant species known as Devil's Club grows.

53 Seasonal fish spawning occurs around many of the islands at the mouth of Black Bay: Fall, September through October.

54 Numerous Colonial Nesting Birds inhabit the small islands at the mouth of Black Bay.

48° 24' 25" N
88° 40' 25" W

48° 24' 25" N
88° 29' 20" W

Edward Island

(8) (21) Magnet Island

Sybil Island

Edward Island Nature Reserve

Black Bay

Osler Bay

Lennox Rock

54

Little Gibraltar Rock

(14) Monk Island

Edward Harbour

53

Horseshoe Cove

Hardscrabble Island

Porphyry Island

Porphyry Island Provincial Park

(85) Dreadnought Island

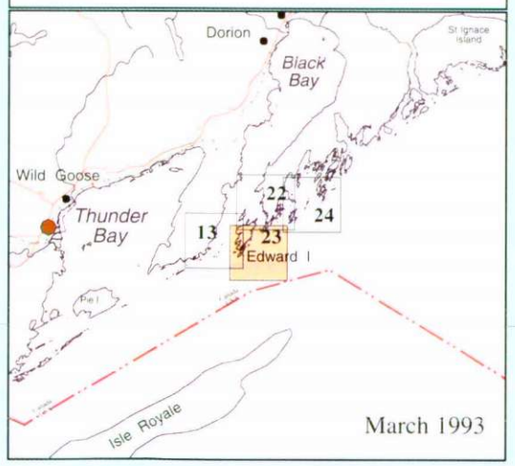
Point Porphyry

35

Lake Superior

Map 23

Contains Sections From NTS Map Numbers:
52A/7



Scale
0 1 2
Kilometres
1:50,000

48° 17' 23" N
88° 40' 25" W

48° 17' 23" N
88° 29' 20" W

48° 30' 35" N
88° 30' 11" W

48° 30' 35" N
88° 19' 5" W

Jean Pierre Point

52

Stanton Island

Chapleau Island

Gladys Island

(25)

Swede Island

Cartwright Island

Grenfell Rock

(159)

Evelyn Rocks

35

Hughes Island

Black Bay Peninsula

Bruneau Point

Boardman Rock

Sweetland Island

Blair Rock

Burpee Rock

Perly Island

Coates Island

(30)

Macoun Island

Paterson Rocks

Barclay Islands

(7)

Bennett Island

Irwin Rock

(78)

Nest Island

Ayre Shoal

Emerson Island

Magee Rock

No. 10 Island

55

Shaganash Island

Gunn Island

Tyrwhitt Island

Cargill Island

(47)

St. Andrew Island

Poynter Rock

Lake Superior

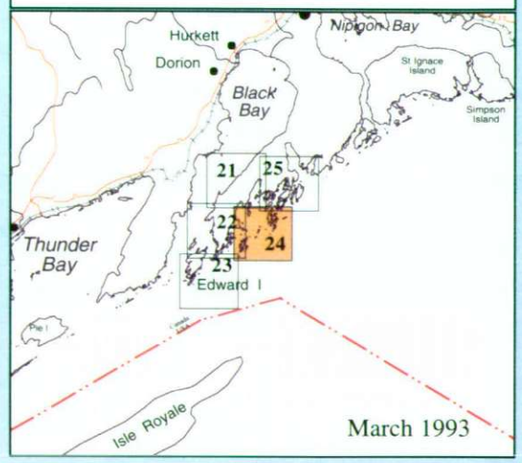
Scale
0 1 2
Kilometres
1:50,000

48° 23' 33" N
88° 30' 11" W

48° 23' 33" N
88° 19' 5" W

Map 24

Contains Sections From NTS Map Numbers:
52A/8



NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

52 Seasonal fish spawning occurs in the area south of Jean Pierre Point: Fall, October through November.

55 Seasonal fish spawning occurs during the Fall, in scattered areas along the southern shores of the Black Bay Peninsula.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

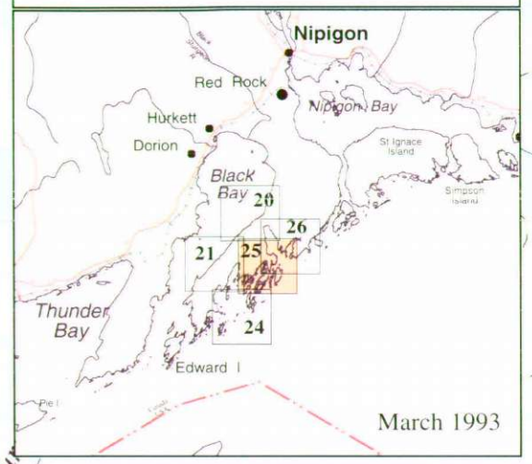
56 Seasonal fish spawning occurs during the Fall, in scattered areas along the southern shores of the Black Bay Peninsula.

57 Shesheeb Bay Provincial Nature Reserve encompasses the lower eastern shore of Shesheeb Bay, the point east of Marcil Bay, Otter Island, Herron Point and Roche Debout Point.

48° 37' 3" N
88° 25' 15" W

Map 25

Contains Sections From NTS Map Numbers:
52A/9



48° 37' 3" N
88° 14' 8" W

Shesheeb Bay
Marcil Bay
Otter Cove
McKay Island
Dawson Lake
Herron Point
Otter Island
Roche Debout Channel
Roche Debout Point
Shesheeb Point
Davies Island
Jobin Island
Lowrey Island
(67)
Arthur Island
Clark Bay
Helen Island
Coutlee Island
Brodeur Island
Gordon Island
Root Bay
Zeolite Bay
Lasher Island
Blaisdell Island
Pugsley Island
Loon Harbour
Newton Island
Montgomery Island
Zeolite Point
Spain Island
Gourdeau Island
Rex Island
Borden Island
Bachand Island
Chapleau Island

Scale
0 1 2
Kilometres
1:50,000

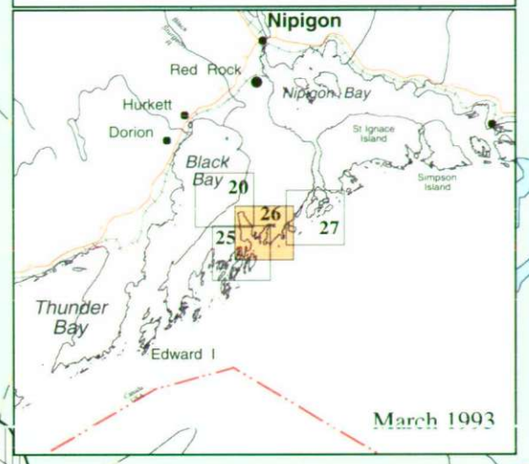
Lake Superior

48° 30' 1" N
88° 25' 15" W

48° 30' 1" N
88° 14' 8" W

Map 26

Contains Sections From NTS Map Numbers:
52A/9



48° 39' 38" N
88° 20' 55" W

48° 39' 38" N
88° 9' 47" W

Shesheeb Bay

Moss Lake

Owen Channel

Otter Lake

Spar Island

57

Shesheeb Bay

Marcil Bay

Otter Cove

Dawson Creek

Agate Cove

McKay Island

Dawson Lake

Agate Point

Otter Island

Herron Point

58

Roche Debout Channel

Roche Debout Point

(8)

(106)

Hawk Island

Shesheeb Point

Scale
0 1 2
Kilometres
1:50,000

Davies Island

Lowrey Island

(67)

Jobin Island

Arthur Island

Lake Superior

Helen Island

Coutlee Island

Brodeur Island

48° 32' 37" N
88° 20' 55" W

48° 32' 37" N
88° 9' 47" W

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

57 Shesheeb Bay Provincial Nature Reserve encompasses the lower eastern shore of Shesheeb Bay, the point east of Marcil Bay, Otter Island, Herron Point and Roche Debout Point.

58 Seasonal fish spawning occurs during the Fall, in scattered areas along the southern shores of the Black Bay Peninsula. Many rivers and creeks flowing to Lake Superior in this area support cold water migratory fish species.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

59 Seasonal fish spawning occurs during the Fall, in scattered areas along the southern shores of the Black Bay Peninsula. Many rivers and creeks flowing to Lake Superior in this area support cold water migratory fish species.

60 Many colony bird nesting sites are found on the smaller islands along the eastern side of the Black Bay Peninsula.

61 Puff Island has been classified as an Environmentally Sensitive Area due to its unusual geological features, which include several spectacular funnels along the shore. The northern portion of the island has also been declared a Provincial Nature Reserve. A sensitive bog area is also located on the island.

48° 41' 38" N
88° 11' 6" W

48° 41' 38" N
87° 59' 57" W

Blind Channel

Fluor Island

Newash Point (15)(31)(39)

McGhie Rock

Ford Island

Tisdall Island

Birch Island

Sarrat Island

Irvine Island

Mystery Island

61

Provincial Nature Reserve

Fluor Island

36

Puff Island

Willard Island

Moss Island

(15)

(21)

(35)

Tremblay Island

Bill & Jim Islands

Moss Harbour

Starke Point

59

Dacres Rock

(51)

60

Cedar Island

Owen Channel

Spar Island

(63)

Lamb Island

N

Lake Superior

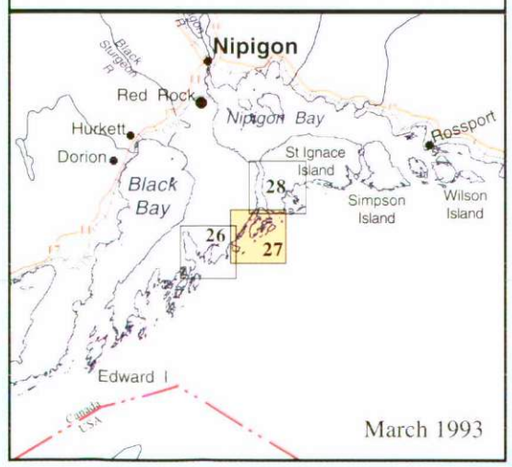
Scale
0 1 2
Kilometres
1:50,000

48° 34' 36" N
88° 11' 6" W

48° 34' 36" N
87° 59' 57" W

Map 27

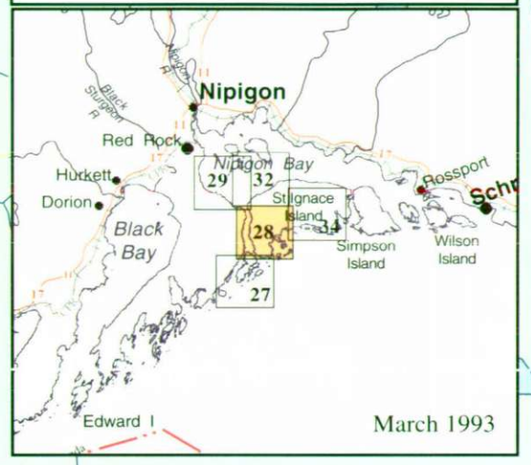
Contains Sections From NTS Map Numbers:
52A/9



March 1993

Map 28

Contains Sections From NTS Map Numbers:
52A/9, 52A/16, 42D/12 and 42D/13



48° 48' 2" N
88° 7' 20" W

48° 48' 2" N
87° 56' 10" W

Point a la Gourganne

McEachan Lake

N

Scale
0 1 2
Kilometres
1:50,000

Nipigon Strait

Brook River

Zillah Lake

Brook Lake

St. Ignace Island

Duncan Cove

38

Iron Lake

Shelling Lake

Black Bay Peninsula

65

Dupuis Point

Bowman Island

64

37

63

(4)

Squaw Bay

Owl Island

Paradise Island

(Lake Superior)

Raven Island

62

Agate Island

Talbot Island

(162)

Angelica Island

Beeton Point

Stowe Point

Blind Channel

Fluor Island

(39)

(15)

Newash Point

Longcroft Island

48° 41' 1" N
88° 7' 20" W

48° 41' 1" N
87° 56' 10" W

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

62 Agate Island Provincial Wilderness Area has been designated as an Environmentally Sensitive Area. The island is a source of Lake Superior Agate, a particularly beautiful variety of agate used for jewellery.

63 The southeastern tip of Bowman Island has been designated as an Environmentally Sensitive Area. This is the location of the gravesite of a lighthouse keeper who died in 1869.

64 Bowman and Paradise Islands have been designated as an Area of Natural and Scientific Interest. Both islands have cobble beaches with ridges that indicate the past glacial history of Ontario. Also, archaeological features are evident along the shore, and there are superb examples of wind-stunted vegetation and lichen heath present called Krummholz. These features can be damaged by human activity.

65 Many creeks and rivers flowing into Lake Superior in this area support cold water migratory fish species.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

66 This is a Rainbow Trout seasonal migration route south into Nipigon Strait.

67 Seasonal fish spawning occurs along the southern shores of Outan and Vert Islands: Fall, beginning in September.

48° 54' 30" N
88° 15' 28" W

48° 54' 30" N
88° 4' 16" W

Burnt Island

Outan Island

39

67

Frog Island

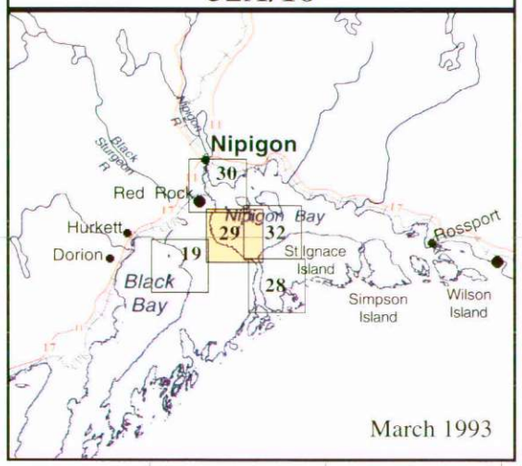
Nipigon Bay

(Lake Superior)

Map 29

Contains Sections From NTS Map Numbers:

52A/16



March 1993

N

Scale

0 1 2

Kilometres
1:50,000

66

Point a la Gourganne

48° 47' 29" N
88° 15' 28" W

48° 47' 29" N
88° 4' 16" W

49° 0' 57" N
88° 18' 45" W

49° 0' 57" N
88° 7' 32" W

Nipigon

Hwy. 17

CP Rail

Ruby Creek

Ruby Lake

McLennan Lake

Stillwater Creek

Stillwater Bay

Nipigon River

Cook Point

69

68

40

Hughes Point

Jossie Island

Beckie Island

Speckle Islands

70

Nipigon Bay

Red Rock

Hwy. 628

Big Trout Creek

Five Mile Point

(Lake Superior)

La Grange Island

Burnt Island

N

Scale

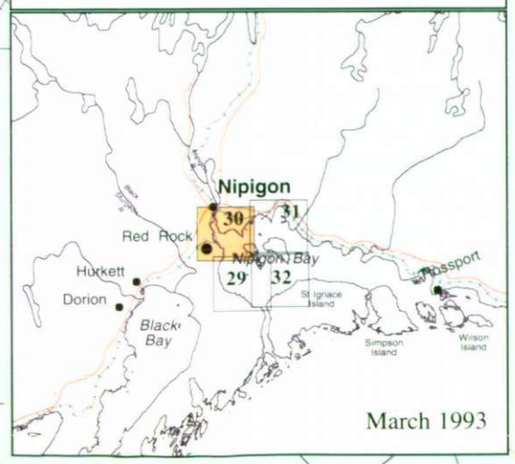
0 1 2

Kilometres

1:50,000

Map 30

Contains Sections From NTS Map Numbers:
52A/16 and 52H/1



March 1993

48° 53' 56" N
88° 18' 45" W

48° 53' 56" N
88° 7' 32" W

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

68 Red Rock Drinking Water Treatment Plant Intake - Call (807) 475-1305. Nipigon Drinking Water Treatment Plant Intake (up Nipigon River) - Call (807) 887-3135. Most of the creeks and rivers flowing into Nipigon Bay support cold water migratory fish species.

69 Well preserved and distinct pictographs are found along the Cook Point area, making it a designated Environmentally Sensitive Area. The area also supports diverse bird populations.

70 Seasonal fish spawning occurs north of Burnt Island and La Grange Island: Fall, beginning in September.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

71 Seasonal fish spawning occurs along both sides of Cooper Point: Fall, beginning in September.

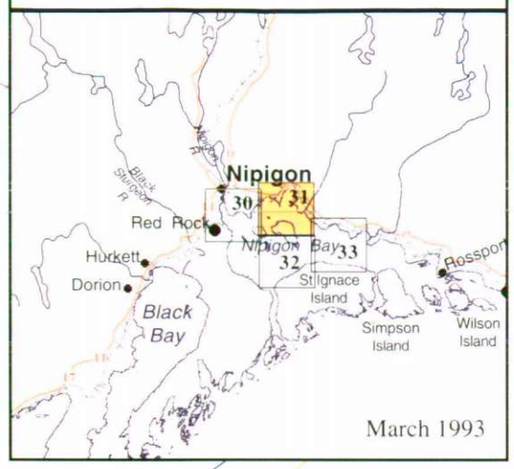
72 Most of the creeks and rivers flowing into Nipigon Bay support cold water migratory fish species.

49° 1' 47" N
88° 8' 21" W

49° 1' 47" N
87° 57' 8" W

Map 31

Contains Sections From NTS Map Numbers:
52A/16, 52H/1 and 42D/13



March 1993

Fire Hill Lake
Fire Hill Creek
Hwy. 17
CP Rail
Jackfish River
Condon Island
(310)
(20)
Fire Hill Bay
Cooper Point
Kama Bay
Kama Hills
Kama Point
Jackpine River
71
72
Crichton Island
Dublin
Creek
Nipigon Bay
(Lake Superior)
Vert Island
La Grange Island

Scale
0 1 2
Kilometres
1:50,000

48° 54' 45" N
88° 8' 21" W

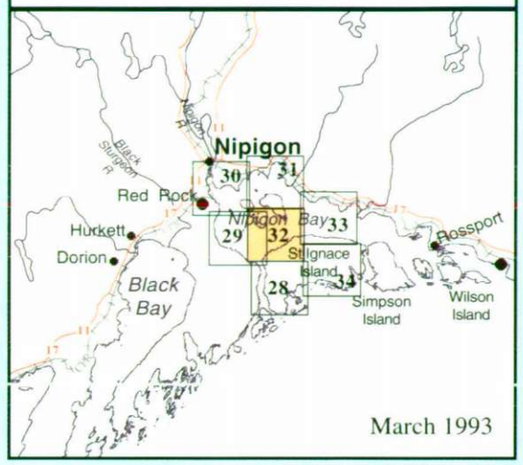
48° 54' 45" N
87° 57' 8" W

48° 54' 59" N
88° 8' 7" W

48° 54' 59" N
87° 56' 56" W

Map 32

Contains Sections From NTS Map Numbers:
52A/16 and 42D/13



Vert Island

MacKinnon Point

Outan Island

39

67

Nipigon Bay

(Lake Superior)

Scale
0 1 2
Kilometres
1:50,000

Cape Nano

Caribou Island

Caribou Point

Caribou Cove

Muir Lake

Antler Lake

McEachan Lake

66

48° 47' 57" N
88° 8' 7" W

48° 47' 57" N
87° 56' 56" W

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

66 This is a Rainbow Trout seasonal migration route south into Nipigon Strait.

67 Seasonal fish spawning occurs along the southern shores of Outan and Vert Islands: Fall, beginning in September.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

73 Most of the creeks and rivers flowing into Nipigon Bay support cold water migratory fish species.

48° 57' 6" N
87° 57' 59" W

48° 57' 6" N
87° 46' 47" W

MacInnes Creek

Hwy. 17

Cypress River

Little Cypress River

CP Rail

Cypress Bay

MacInnes Point

73

Gurney Point

41

Mountain Bay

Grant Point

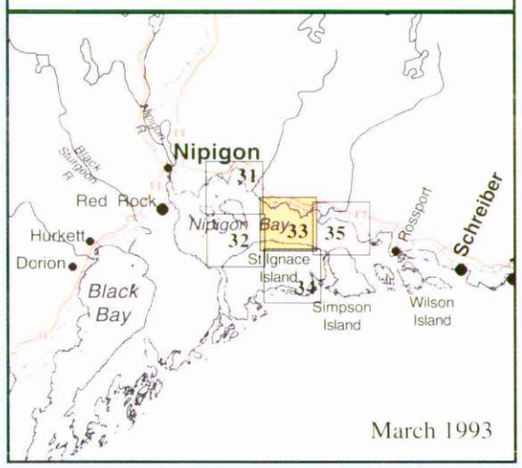
(63)

Scale
0 1 2
Kilometres
1:50,000

Nipigon Bay

Map 33

Contains Sections From NTS Map Numbers:
42D/13



(Lake Superior)

Burnt Point

Burnt Point Lake

St. Ignace Island

Ruth Lake

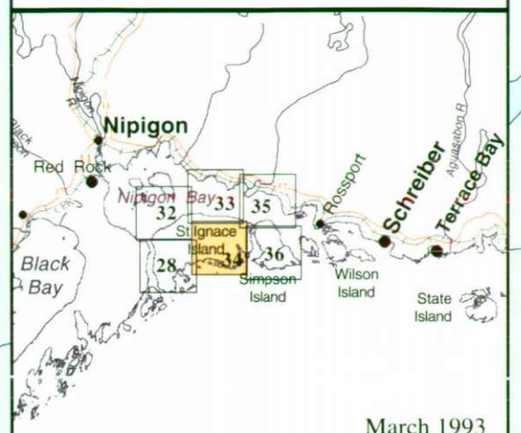
48° 50' 5" N
87° 57' 59" W

48° 50' 5" N
87° 46' 47" W

48° 50' 24" N
87° 57' 15" W

Map 34

Contains Sections From NTS Map Numbers:
42D/13 and 42D/12



March 1993

48° 50' 24" N
87° 46' 4" W

Ruth Lake

Otter Lake

Todesco Lake

Scale
0 1 2
Kilometres
1:50,000

St. Ignace Island

Sky Lake

King Lake

St. Ignace Harbour

Rainbow Lake

Zillah Lake

Bead Island Channel

Bead Island

Fisher Rock

75

Bignell Point

St. Joe Islands

French Harbour

Armour Harbour

Armour Island

Fraser Point

74

Hope Island

(42)

Burnet Island

(71)

(43)

Nest Island

(8)

(44)

McNab Harbour

McNab Peninsula

Bullers Bay

Bullers Island

Bullers Gap

(15)

Reid Island

Lake Superior

48° 43' 23" N
87° 57' 15" W

48° 43' 23" N
87° 46' 4" W

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

74 Seasonal fish spawning occurs around Fraser Point, the southern shores of Hope Island, and the western and eastern shores of Armour Island: Fall, typically during the month of October.

75 Seasonal fish spawning occurs along the eastern shores of the St. Joe Islands, around Fisher Rock and the surrounding area, and along the eastern shores of Grotto Point: Fall, November to December.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

76 Most of the creeks and rivers flowing into Nipigon Bay support cold water migratory fish species.

77 The Gravel River Provincial Nature Reserve is an important staging area for migratory waterfowl, and is the home for a colony of Black Cormorants.

48° 56' 32" N
87° 47' 43" W

48° 56' 32" N
87° 36' 31" W

Map 35

Contains Sections From NTS Map Numbers:
42D/13

March 1993

Gravel River

Gravel River Provincial Nature Reserve

Mountain Bay

76

Gravel

Dead River

Gravel Point

77

Nuttal Point

Gravel Bay

Claire Lake

Hwy. 17

Cavers

Cavers Hill

Wabasta Lake

Cathy's Lake

Cavers Bay

Nipigon Bay

(Lake Superior)

CP Rail

Crow Point

(38)

West Anguros Island

Finch Head

Moffat Strait

St. Ignace Island

Simpson Island

Molinski Creek

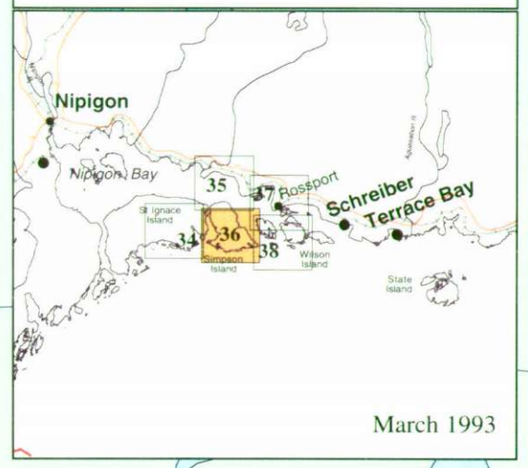
Scale
0 1 2
Kilometres
1:50,000

48° 49' 30" N
87° 47' 43" W

48° 49' 30" N
87° 36' 31" W

Map 36

Contains Sections From NTS Map Numbers:
42D/13 and 42D/12



March 1993

48° 49' 48" N
87° 46' 30" W

48° 49' 48" N
87° 35' 20" W

48° 42' 47" N
87° 46' 30" W

48° 42' 47" N
87° 35' 20" W

Molinski Creek
Cebina Island
Leon Island
Moffat Strait
St. Ignace Island
Wickham Bay
Bead Island Channel
Bead Island
Simpson Island
Simpson Channel
Rip Lake
Blues Lake
Caribou Lake
Kenny Lake
Josephine Lake
O'Brien Lake
Elizabeth Lake
Vein Island
Grotto Point
Woodbine Harbour
Hiller Lake
Morn Harbour
Morn Point
Dunmore Island
Mooley Island
McKay Lake
McKay Cove
Beetle Point
Raymond Island
Legault's Rock
Grebe Point
Lake Superior

(1)
(1)
(7)
(14)
(9)
(49)

75
78
79
80

N

Scale
0 1 2
Kilometres
1:50,000

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

75 Seasonal fish spawning occurs along the eastern shores of the St. Joe Islands, around Fisher Rock and the surrounding area, and along the eastern shores of Grotto Point: Fall, November to December.

78 The area from Grotto Point to Dunmore Island is a designated Environmentally Sensitive Area. Spectacular columnar basalts are found in this area. The columns are polygonal, 12-20 cm across, with a smooth, polished finish, giving them a honeycomb appearance. Freeze thaw processes have developed staircase features in some areas. Responders should exercise extreme care when operating in the area, so as not to damage these features.

79 This small island is a designated Environmentally Sensitive Area, due to the Great Blue Heron rookery present.

80 The waters surrounding the eastern, western and southern shores of Simpson Island, and the waters surrounding Vein Island and Battle Island are closed to gill net fishing.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

80 The waters surrounding the eastern, western and southern shores of Simpson Island, and the waters surrounding Vein Island and Battle Island are closed to gill net fishing.

81 The area around Pays Plat River has great historical and archaeological significance. Responders should contact Environment Canada ((416) 346-1971), and the Chief of the Pays Plat First Nation before response activities commence.

82 Many of the creeks and rivers along the North Shore of Lake Superior support cold water migratory fish species.

83 Rossport Drinking Water Treatment Plant Intake - Call (807) 824-3370. The area around Rossport is classified as an Environmentally Sensitive Area due to a variety of geological, historical and recreational considerations. The oldest fossils known to exist in Precambrian rock have been found around Rossport. Rossport was an important port when Lake Trout were abundant in Lake Superior. Rossport is an active tourism centre, with headquarters for the annual Rossport Fishing Derby.

84 The eastern end of Channel Island is an Area of Natural and Scientific Interest, with a 1.5 km exposed outcrop of the Rossport Formation, with vertical walls extending to heights of 12 metres. The outcrop represents the type section, where the geological feature was first described. The preservation of the outcrop is important for comparative purposes. The site has high scientific and educational value. Channel Island is private land so access is restricted.

85 Seasonal fish spawning occurs around the shores of Cobinosh Island, Steamboat Island, the east end of Copper Island, and the area between Channel, Quarry and Healey Islands: Fall, generally between October and December.

86 The waters of Schreiber Channel, surrounding Wilson Island, Cobinosh Island, Copper Island, Channel, Quarry and Healey Islands, and the waters along the mainland from Rossport Point east to Schreiber Point are closed to gill net fishing.

48° 54' 3" N
87° 37' 12" W

48° 54' 3" N
87° 26' 0" W

48° 47' 1" N
87° 37' 12" W

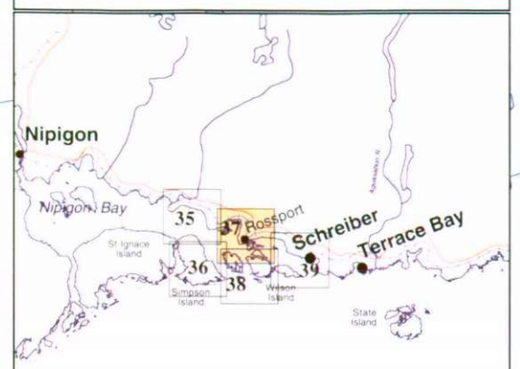
48° 47' 1" N
87° 26' 0" W

Pays Plat River
Little Pike Lake
Pays Plat First Nation
Nishin Creek
Willie White Creek
Hwy. 17
Pays Plat
Wieben's Point
Mileage 19 Bay
Powder Islands
Pays Plat Bay
Albert Lake
Bear Trap Lake
Lonely Island Lake
(38)
West Anguros Island
Anguros Island
Little Lake
CP Rail
Morrisan Creek
Nicol Island
Rossport Provincial Park
Rossport
Rossport Harbour
Gut Point
Boone Island
(Lake Superior)
Blanket Island
Whiskey Island
Rossport Point
Cat Islands
Healey Island
Quarry Island
Simpson Channel
Schreiber Channel
Salter's Bay
Mary Ann Bay
Channel Island
Vein Island
Wilson Channel
Steamboat Channel
Kingcome Island
Daylight Point
Little Lake Harbour
Colpoy's Bay
Steamboat Island
Lesarge Lake
Vein Island
Wilson Island

Scale
0 1 2
Kilometres
1:50,000

Map 37

Contains Sections From NTS Map Numbers:
42D/13 and 42D/14



March 1993

48° 48' 54" N
87° 36' 30" W

48° 48' 54" N
87° 25' 20" W

80

Salter's Bay

Vein Island

Wilson Channel

Schreiber Channel

86

84

Mary Ann Bay

Channel Island

85

Kingcome Island

Steamboat Channel

46

Daylight Point

Little Lake Harbour

Colpoy's Bay

Steamboat Island

Lesarge Lake

Wilson Island

52

Vein Island

Simpson Channel

Chummy's Harbour

Oldmans Pocket

Larson Island

Chummy's Point

Swedes Gap

Chummy's Island

Minnie Island

Harry Island

47

87

Wilson Island Harbour

(49)

Barr Island Harbour

Barr Island

51

Morn Point

Battle Island

48

(8)

Small Lake Harbour

Lindsay Head

(65)

(1)

49

50

Cobinosh Island

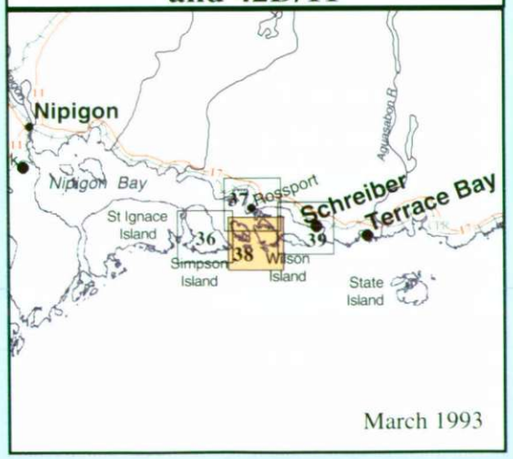
88

(22)

Map 38

Contains Sections From NTS Map Numbers:

42D/13, 42D/12, 42D/14 and 42D/11



March 1993

Lake Superior

N

Scale

0 1 2

Kilometres

1:50,000

48° 41' 52" N
87° 36' 30" W

48° 41' 52" N
87° 25' 20" W

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

80 The waters surrounding the eastern, western and southern shores of Simpson Island, and the waters surrounding Vein Island and Battle Island are closed to gill net fishing.

84 The eastern end of Channel Island is an Area of Natural and Scientific Interest, with a 1.5 km exposed outcrop of the Rossport Formation, with vertical walls extending to heights of 12 metres. The outcrop represents the type section, where the geological feature was first described. The preservation of the outcrop is important for comparative purposes. The site has high scientific and educational value. Channel Island is private land so access is restricted.

85 Seasonal fish spawning occurs around the shores of Cobinosh Island, Steamboat Island, the east end of Copper Island, and the area between Channel, Quarry and Healey Islands: Fall, generally between October and December.

86 The waters of Schreiber Channel, surrounding Wilson Island, Cobinosh Island, Copper Island, Channel, Quarry and Healey Islands, and the waters along the mainland from Rossport Point east to Schreiber Point are closed to gill net fishing.

87 Seasonal fish spawning occurs south of Vein Island, between Harry Island and Minnie Island, and at the northwest end of Vein Island: Fall, from November to December.

88 Cobinosh Island is an important Area of Natural and Scientific Interest because its shores are comprised of a series of cobble ridges representative of ancient Lake Superior wave energy. The unconsolidated materials in these ridges make them sensitive to disturbances so responders must exercise extreme care. Cobinosh Island is private land so access is restricted. Several sensitive archaeological sites exist on the island, as well as Precambrian geological features indicative of lava flow activity.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

86 The waters of Schreiber Channel, surrounding Wilson Island, Cobinosh Island, Copper Island, Channel, Quarry and Healey Islands, and the waters along the mainland from Rossport Point east to Schreiber Point are closed to gill net fishing.

89 Many of the creeks and rivers along the North Shore of Lake Superior support cold water migratory fish species.

90 Eastern Cat Island is an Environmentally Sensitive Area due to the Great Blue Heron rookery located there.

91 An Environmentally Sensitive Area exists near the mouth of the Hewitson River. The area has important archaeological significance, and responders should contact Environment Canada ((416) 346-1971) for exact locations before commencing response activity. An important Microfossil site is located further east on Flint Island and its adjacent shore.

92 Sensitive pictographs exist along the shore in this area. Responders should contact Environment Canada ((416) 346-1971) for exact locations before commencing response activity.

Map 39

Contains Sections From NTS Map Numbers:
42D/14 and 42D/11

March 1993

48° 50' 56" N
87° 26' 43" W

48° 50' 56" N
87° 15' 33" W

48° 43' 54" N
87° 26' 43" W

48° 43' 54" N
87° 15' 33" W

Rainbow Falls Provincial Park
Hewitson River
Whitesand Lake
Hwy. 17
Boswell's Point
Selim
Cat Islands
(121)
(45)
Winston Point
CP Rail
Provincial Nature Reserve Park
Flint Island
(97)
Flat Point
Twin Harbours
(12)
Blind Creek
Schreiber Beach
West Pond
Schreiber
Cook Lake
Walker Lake
Walker Lake Hill
Collingwood Bay
Schreiber Channel
Swedes Gap
Copper Island
Lindsays Harbour
Copper Point
(10)
Schreiber Point
Mount Gwynne
Bread Rock
Lake Superior

Nipigon
Nipigon Bay
Rossport
Schreiber
Terrace Bay
St Ignace Island
Simpson Island
Wilson Island
State Island

Scale
0 1 2
Kilometres
1:50,000

48° 49' 3" N
87° 16' 24" W

48° 49' 3" N
87° 5' 14" W

Schreiber

Terrace Bay

Lamont Lake

Hays Lake

Big Duck Creek

Terrace Bay Airfield

CP Rail

Hwy. 17

Creek

Worthington Creek

Lost Lake

Terrace Bay

Old Ned Island

Bell Island

Taylor Island

Aguasabon Gorge

Aguasabon Falls

Lyda Bay

Keith Rocks

Kelly's Harbour

Blain Island

Douglas Island

Rock Island

Chase Rock

Worthington Bay

Noname Bay

Les Petits Ecrits Channel

Les Petits Ecrits

(1)
(14)
(154)
(56)
(60)
(38)
(113)

56
57
58
92
93
94
95
96

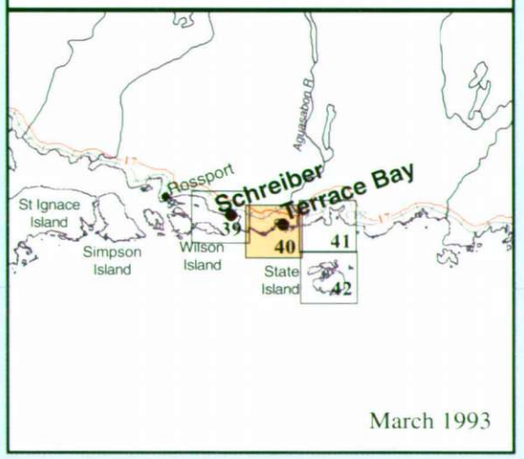
Lake Superior

N

Scale
0 1 2
Kilometres
1:50,000

Map 40

Contains Sections From NTS Map Numbers:
42D/14 and 42D/11



March 1993

48° 42' 1" N
87° 16' 24" W

48° 42' 1" N
87° 5' 14" W

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

92 Sensitive pictographs exist along the shore in this area. Responders should contact Environment Canada ((416) 346-1971) for exact locations before commencing response activity.

93 Les Petits Ecrits Islands have been designated as an Environmentally Sensitive Area due to the existence of prehistoric lichenglyphs along the shores in this area. This is a prehistoric art form where pictures were scraped into the lichens on a cliff face. Responders must exercise great care in the area, and contact Environment Canada ((416) 346-1971) for details.

94 Responders should note that a deer yard extends inland and along the shores of Lake Superior from Kelly's Harbour, around Terrace Bay to Lyda Bay.

95 Responders should note that the area around the community of Terrace Bay is a high use recreational area, with a golf course, recreational beach, and the Aguasabon Gorge Environmentally Sensitive Area. These sensitivities must be considered when using this location as a staging area. The Terrace Bay Airfield has a runway and fuelling facilities.

96 The Terrace Bay Drinking Water Treatment Plant Intake is the same as the industrial intake for Kimberly-Clark Ltd. - Call (807) 825-9929. Many of the creeks and rivers along the North Shore of Lake Superior support cold water migratory fish species. Seasonal fish spawning occurs along the southern shores of Les Petits Ecrits Islands, around Keith Rocks, between Blain and Douglas Islands, and at the mouth of the Aquasabon River. Seasonal fish spawning also occurs along the western portion of Victoria Bay, and in Moberley Bay. The spawning activity for all of these areas occurs in Fall, generally between October and December.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

96 The Terrace Bay Drinking Water Treatment Plant Intake is the same as the industrial intake for Kimberly-Clark Ltd. - Call (807) 825-9929. Many of the creeks and rivers along the North Shore of Lake Superior support cold water migratory fish species. Seasonal fish spawning occurs along the southern shores of Les Petits Ecrits Islands, around Keith Rocks, between Blain and Douglas Islands, and at the mouth of the Aquasabon River. Seasonal fish spawning also occurs along the western portion of Victoria Bay, and in Moberley Bay. The spawning activity for all of these areas occurs in Fall, generally between October and December.

97 The Jackfish Village area along the shoreline is an Environmentally Sensitive Area due to its historical significance as a location for coal storage during the period when steam engines were used. An industrial outfall exits Blackbird Creek into Moberley Bay.

103 Lawson Island is an Environmentally Sensitive Area with a Great Blue Heron rookery that is sensitive typically from April to August.

48° 49' 44" N
87° 6' 0" W

48° 49' 44" N
86° 54' 49" W

Lake B
Moberley Lake
Jackfish Lake
Sawmill Lake
Blackbird Creek
Hwy. 17
Observation Point
Tunnel Bay
Moberley Bay
Bennett Island
Little Nick Rock
Bare Rock
Cody Island
Cape Harbour
Victoria Bay
Cape Victoria
St. Patrick Island
Jackfish
CP Rail
Jackfish Bay
Santoy
(31)
(87)
(1)
(22)
(13)
(7)
(28)
59
60
61
62
96
97
103

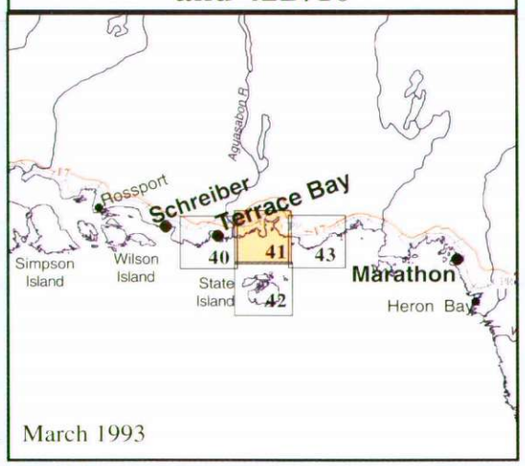
Jackfish Channel

(Lake Superior)

Lawson Island

Map 41

Contains Sections From NTS Map Numbers:
42D/14, 42D/15, 42D/11 and 42D/10



March 1993

Scale
0 1 2
Kilometres
1:50,000

48° 42' 43" N
87° 6' 0" W

48° 42' 43" N
86° 54' 49" W

48° 43' 2" N
87° 5' 53" W

48° 43' 2" N
86° 54' 44" W

The Slate Islands are 8 kilometres south of Cape Victoria on the mainland.

Jackfish Channel

Frank Rock
(3)

98

Mortimer

Island

Copper Harbour

63

Delaute Island

Francois Island

64

Dupuis Island

Bowes Island

McColl Island

McGreevy Harbour

Jacks Island

Edmonds Island

Barnard Point

(10)

(5)

Jacks Bay

Veronica Lake

Slate Islands Provincial Park

William Point

Lawrence Bay

King Lake

Hart Lake

Mud Lake

Patterson Island

Horace Cove Lake

Peninsula Lake

Logging Camp Lake

Two Bog Lake

Long Lake

Grass Hill Lake

Flood Lake

Horace Cove

Horace Point

Sunday Harbour

65

Sunday Point

99

Spar Island

102

Cape Island

Leadman Island

101

Fish Island

(25)

(80)

Leadman Islands

Slate Islands

100

Cove Island

Shell Island

Pearl Island

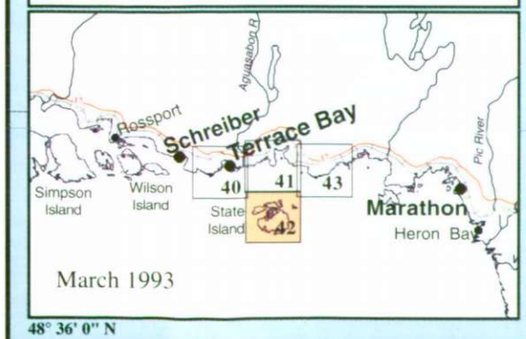
N

Scale
0 1 2
Kilometres
1:50,000

Lake Superior

Map 42

Contains Sections From NTS Map Numbers:
42D/11 and 42D/10



March 1993

48° 36' 0" N
87° 5' 53" W

48° 36' 0" N
86° 54' 44" W

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

98 The waters surrounding the Leadman Islands and Slate Islands Provincial Park are closed to commercial fishing.

99 All marked areas of seasonal fish spawning around the Slate Islands denote areas of activity that typically commence in September and continue for several weeks. Spawning times are longer in sheltered areas.

100 Slate Islands Provincial Park is designated as an Environmentally Sensitive Area. The islands are the most southerly habitat for Eared Chickweed. The furbearer symbol refers to the most southerly occurrence of the Arctic Mouse, and Caribou are also present on the island.

101 The Leadman Islands are designated as an Environmentally Sensitive Area. A Herring Gull breeding colony located there is sensitive during the normal egg laying and development period between May and August.

102 Seasonal fish spawning occurs around the Leadman Islands in Fall, beginning in November.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

103 Lawson Island is an Environmentally Sensitive Area with a Great Blue Heron rookery that is sensitive typically from April to August.

104 The Environmentally Sensitive Area along the Steel River is a significant wilderness area. Migratory waterfowl rely on the area as a stopover, and several species of raptors and wading birds nest and feed within the area. The mouth of the Steel River supports cold water migratory fish species and is a popular lakeside summer recreation area, with a high use recreational beach.

105 The shore between Bottle Cove and Cork Cove is an Environmentally Sensitive Area due to the number of confirmed Caribou sightings here.

106 The Prairie River Mouth Provincial Nature Reserve consists of relatively flat plains of sand, gravel, pebble and cobble, surrounded by steep walls of bedrock. A large sandbar has formed at the river's mouth. Beach ridges and dunes are also present. The beach ridges represent successive lowering of glacial lake waters in the Lake Superior Basin. Responders must take care not to disrupt these ridges or the sand bar. The Prairie River supports cold water migratory fish species. The mouth of the river is a popular summer resort area.

107 Fitzsimmons Rocks and Barclay Islands are designated as Environmentally Sensitive Areas due to their large Herring Gull and Great Blue Heron breeding and nesting colonies.

48° 49' 13" N
86° 55' 38" W

48° 49' 13" N
86° 44' 27" W

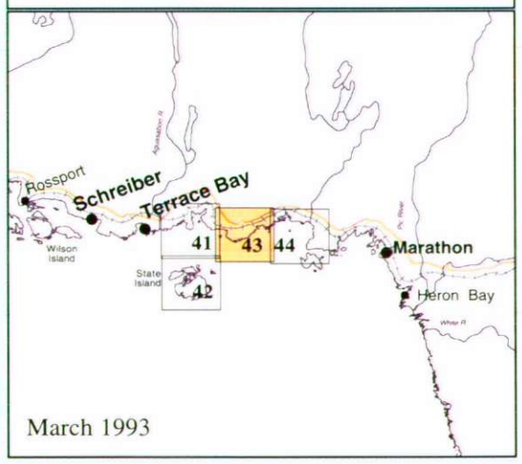
Little Santoy Lake
Foxxe Lake
Steel River
Johnny Lake
Black Fox Lake
Hwy. 17
CP Rail
Steel
Prairie River
Ripple Creek
Santoy
Little Steel Lake
Prairie River Mouth Provincial Nature Reserve
Prairie Cove
Jims Harbour
Sandy Lake
Angel Lake
Santoy Bay
Haiste Rocks
Prince Point
Fitzsimmons Rocks
Lawson Island
Bottle Cove
Cork Cove
Bottle Point

66 104 106 107 103 105

(28) (8) (372) (4) (8) (147)

Map 43

Contains Sections From NTS Map Numbers:
42D/15 and 42D/10



March 1993

N

Scale
0 1 2
Kilometres
1:50,000

Lake Superior

48° 42' 11" N
86° 55' 38" W

48° 42' 11" N
86° 44' 27" W

48° 49' 3" N
86° 45' 12" W

48° 49' 3" N
86° 34' 2" W

Ripple Creek

Little Pic River

Hwy. 17

CP Rail

Middleton

McKellar Harbour

Ripple Bay

Jims Harbour

Prisoner Cove

Neys

Neys Provincial Park

Barclay Islands

Ashburton Bay

(Lake Superior)

Coldwell Peninsula

Guse Point

Moss Point

Thompson Channel

Johnson Harbour

Windy Bay

Pic Island

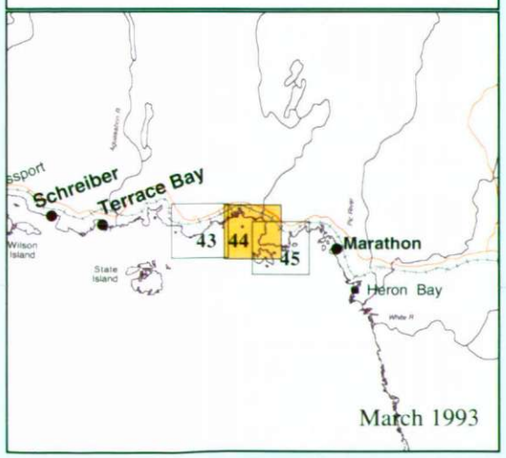
McDonald Islands

(30) (8) (147) (64) (100)

107 108 109 110 111 112 67 68 69 70

Map 44

Contains Sections From NTS Map Numbers:
42D/10 and 42D/15



Scale
0 1 2
Kilometres
1:50,000

48° 42' 1" N
86° 45' 12" W

48° 42' 1" N
86° 34' 2" W

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

107 Fitzsimmons Rocks and Barclay Islands are designated as Environmentally Sensitive Areas due to their large Herring Gull and Great Blue Heron breeding and nesting colonies.

108 Many of the creeks and rivers along the North Shore of Lake Superior support cold water migratory fish species.

109 There are two campgrounds and a popular recreational beach at the west end of Neys Provincial Park.

110 Pic Island has been designated as an Environmentally Sensitive Area due to its local population of Woodland Caribou.

111 Seasonal fish spawning in Thompson Channel east of Guse Point and east of Moss Point (Pic Island), generally beginning in November.

112 The McDonald Islands have been designated as an Environmentally Sensitive Area because of the Herring Gull breeding colonies and wildlife breeding areas located there. The islands are also composed of a unique rock type called Laurvilcite.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

110 Pic Island has been designated as an Environmentally Sensitive Area due to its local population of Woodland Caribou.

111 Seasonal fish spawning in Thompson Channel east of Guse Point and east of Moss Point (Pic Island), generally beginning in November.

112 The McDonald Islands have been designated as an Environmentally Sensitive Area because of the Herring Gull breeding colonies and wildlife breeding areas located there. The islands are also composed of a unique rock type called Laurvilcite.

113 Allouez Island is an Environmentally Sensitive Area because of the Herring Gull breeding colonies and wildlife breeding areas located there.

114 Sullivan Island and its smaller neighbour are designated as an Environmentally Sensitive Area due to their Herring Gull breeding colonies, Great Blue Heron rookery, and wildlife breeding areas. The islands are also composed of a unique rock type called Laurvilcite.

115 Detention Island is an Environmentally Sensitive Area due to its Herring Gull breeding colonies and wildlife breeding areas. Several raised beaches, as well as sites of archaeological importance dictate that responders must proceed with caution when employing activities that could disturb these shores. Seasonal fish spawning along the western shores of Detention Island typically begins in September.

116 The northern end of Port Caldwell is an Environmentally Sensitive Area due to its historical significance from the early days of trout fishing on Lake Superior. The harbour is also very picturesque. This is an excellent anchorage site for large craft.

48° 46' 55" N
86° 39' 41" W

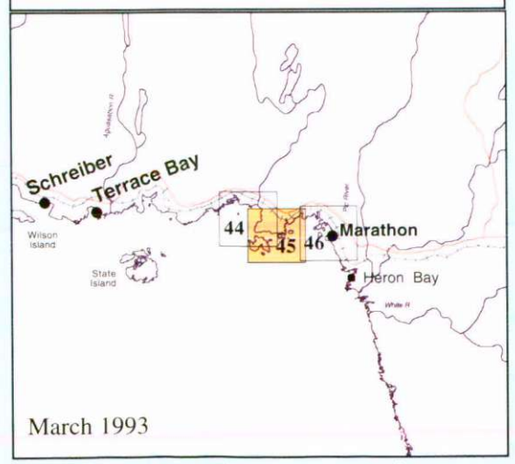
48° 46' 55" N
86° 28' 31" W

Prisoner Cove
Neys
Hwy. 17
Neys Provincial Park
Ashburton Bay
Neys Creek
Neys Lake
Dam Lake
Mink Creek
CP Rail
Red Sucker Cove
Coldwell
Mink Harbour
Echo Lake
Port Coldwell
Lone Pine Point
Coldwell Peninsula
Peninsula Bay
Devils Cove
Devils Gap
Detention Island
Guse Point
Johnson Harbour
Thompson Channel
Foster Island
Moss Point
Windy Bay
Pic Island
McDonald Islands
Sullivan Island
Slyboots Rock
McKay Rocks
Black Rock
South Bay
Allouez Island
Lake Superior

Scale
0 2
Kilometres
1:50,000

Map 45

Contains Sections From NTS Map Numbers:
42D/10, 42D/15, 42D/9 and 42D/16



March 1993

48° 39' 53" N
86° 39' 41" W

48° 39' 53" N
86° 28' 31" W

48° 47' 11" N
86° 29' 32" W

Little Red Sucker Creek

Red Sucker Point Provincial Nature Reserve

Red Sucker Cove

Craddock Creek

Maw Island

Port Munroe

Craddock Cove

Glasgow Island

Good Hope Island

Monmouth Island

Sturdee Cove

Mons Point

Peninsula Bay

Beatty Cove

Carden Cove

Neuve Chapelle Point

Yser Point

Ypres Point

Blondin Island

Peninsula Harbour

Skin Island

Hawkins Island

Jellicoe Cove

The Peninsula

Peninsula Hill

Marathon

Hare Creek

Hare Lake

Hwy. 17

Angler Creek

CP Rail

Shack Lake

Marathon Airfield

Penn Lake

Three Finger Lake

Craigs Pit Nature Reserve Provincial Park

Lake Superior

48° 47' 11" N
86° 18' 22" W

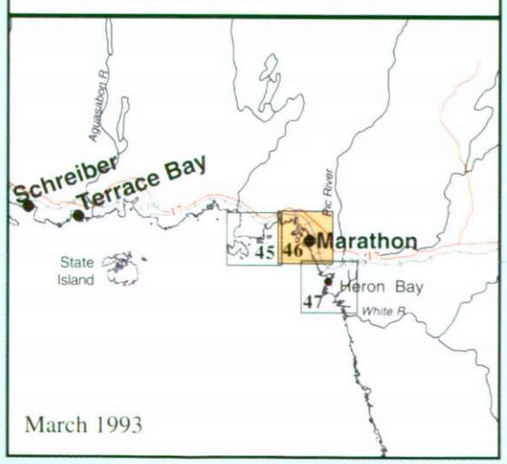
48° 40' 10" N
86° 29' 32" W

48° 40' 10" N
86° 18' 22" W

Scale
0 1 2
Kilometres
1:50,000

Map 46

Contains Sections From NTS Map Numbers:
42D/9 and 42D/16



March 1993

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

117 Red Sucker Point Provincial Nature Reserve has several sensitive archaeological sites as well as raised beaches.

118 Monmouth Island is an Environmentally Sensitive Area with a Great Blue Heron rookery present. On the mainland east of the island, an Environmentally Sensitive Area called Angler is the site of a Second World War prisoner of war camp which is sometimes used for recreational purposes. Many creeks and rivers along the North Shore of Lake Superior, such as Angler creek, support cold water migratory fish species.

119 Marathon is a small industrial community with airfield facilities (with a runway and fuelling) and accommodation for responders. There is no municipal water intake shown since the community draws its drinking water from wells.

120 This designated Environmentally Sensitive Area is an important Hawk watch area.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

121 Seasonal fish spawning occurs in the areas as marked, typically commencing in September.

122 The Pic River First Nation Drinking Water Treatment Plant Intake is located on Pic River - Call (807) 229-1171. The Pukaskwa National Park Drinking Water Intake is located on Hattie Cove - Call (807) 229-2939. An Area of Natural and Scientific Interest exists on the north side of the mouth of the Pic River. There are large sand dunes along the beach there. The eastern side of the dunes is still migrating inland due to prevailing westerly winds. Features of scientific and archaeological interest have been found along and beneath the dunes. Access to the beach should only be along established paths in order to prevent damage to the dunes. Any sand removal required during clean up activities must be kept to a minimum, and should be supervised by a spill response expert. Also, when considering response activities in this area, contact the Chief of the Pic River First Nation. The Pukaskwa National Park Coastal Hiking Trail extends from Hattie Cove 60 kilometres south to the North Swallow River.

123 Many creeks and rivers along the North Shore of Lake Superior, such as Pic River and White River, support cold water migratory fish species.

48° 40' 41" N
86° 24' 50" W

48° 40' 41" N
86° 13' 42" W

Lake Superior

Lunam Lake

Heron Bay

Hwy. 627

Black River

CP Rail

Randle Point

Lash Rock

Keating Rock

C.P.R. Island

Dampier Islands

Heron Bay

121

(37)

Boulton Reef

(29)

Prospect Cove

Happy Harbour

(48)

(21)

(181)

Ogilvy Point

Channel Island

122

Pic River

77

Pic River First Nation

Pic River

Halfway Lake

Pukaskwa

78

Hattie Cove

Pulpwood Harbour

National Park

(1)

Campbell Point

Playter Harbour

(15)

123

Picture Island

Picture Rock Harbour

White River

N

Scale

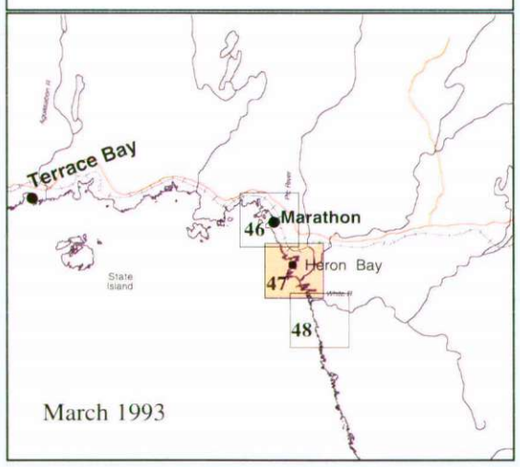
0 1 2

Kilometres

1:50,000

Map 47

Contains Sections From NTS Map Numbers:
42D/9



March 1993

48° 33' 39" N
86° 24' 50" W

48° 33' 39" N
86° 13' 42" W

48° 34' 16" N
86° 20' 3" W

123

Picture Island

Picture Rock Harbour

White River

48° 34' 16" N
86° 8' 56" W

79

(25)

Lake Superior

Pukaskwa National Park

80

(35)

81

Willow River

Brush Creek

82

Shot Watch Cove

Caribou Lake

124

(17)

48° 27' 15" N
86° 20' 3" W

48° 27' 15" N
86° 8' 56" W

N

Scale

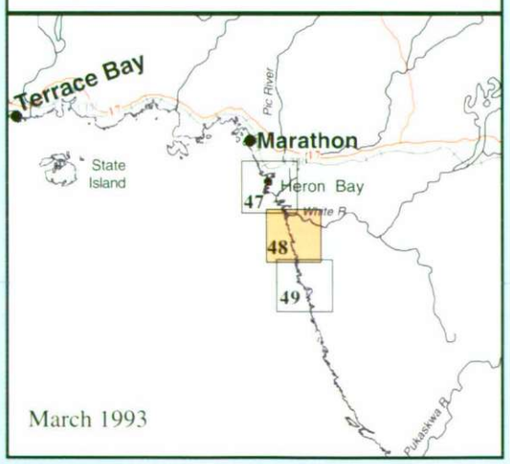
0 1 2

Kilometres
1:50,000

Map 48

Contains Sections From NTS Map Numbers:

42D/9 and 42D/8



March 1993

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

123 Many creeks and rivers along the North Shore of Lake Superior, such as Pic River and White River, support cold water migratory fish species.

124 The shores of Pukaskwa National Park are very remote, with access by water only (or limited helicopter access). The Pukaskwa National Park Coastal Hiking Trail extends from Hattie Cove at the Park's north entrance, 60 kilometres south to the North Swallow River.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

124 The shores of Pukaskwa National Park are very remote, with access by water only (or limited helicopter access). The Pukaskwa National Park Coastal Hiking Trail extends from Hattie Cove at the Park's north entrance, 60 kilometres south to the North Swallow River.

48° 27' 44" N
86° 17' 57" W

48° 27' 44" N
86° 6' 52" W

124

(17)

Morrison Harbour

(58)

(12)

Fish Harbour

(5)

Cave Harbour

Sewell Point

(1)

Gids Harbour

Ahdik Lake

Lake Superior

Pukaskwa National Park

83

(13)

(18)

Oiseau Bay

Oiseau Creek

(13)

Dampier Cove

Oiseau Point

Nicols Cove

Nicols Cove Creek

(1)

N

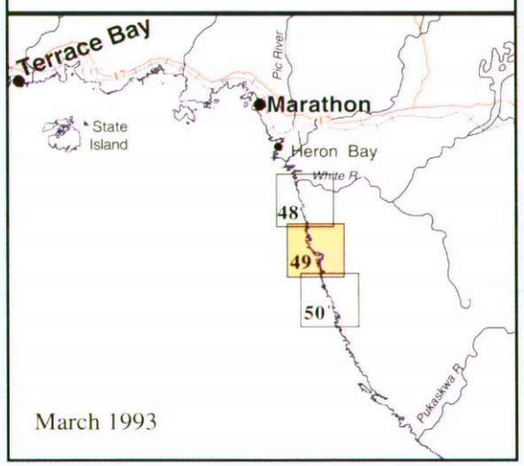
Scale

0 1 2

Kilometres
1:50,000

Map 49

Contains Sections From NTS Map Numbers:
42D/8



March 1993

48° 20' 43" N
86° 17' 57" W

48° 20' 43" N
86° 6' 52" W

48° 21' 15" N
86° 15' 17" W

48° 21' 15" N
86° 4' 14" W

Lake Superior

(26)
One Lake Island

84

White Gravel River

Pukaskwa National Park

125

(2)
(111)

Stench Rock

White Spruce Harbour

White Spruce River

Simons Harbour

(5)
(13)
(1)

126

Hideaway Lake

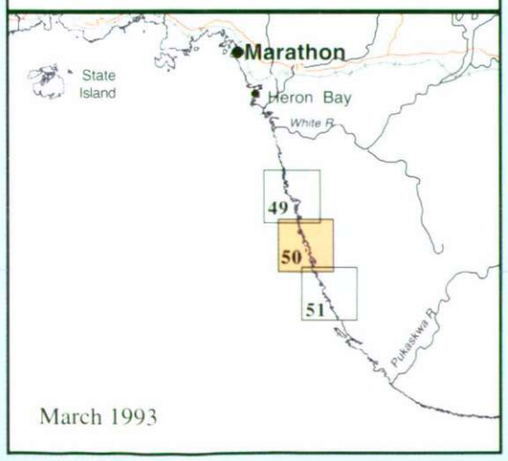
48° 14' 13" N
86° 15' 17" W

48° 14' 13" N
86° 4' 14" W

Scale
0 1 2
Kilometres
1:50,000

Map 50

Contains Sections From NTS Map Numbers:
42D/8 and 42D/1



March 1993

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

125 Seasonal Rainbow Trout migration of major significance occurs at the mouth of the White Spruce River and at the mouth of the White Gravel River. An area of seasonal fish spawning extends north and south along the shoreline from the mouth of White Gravel River, beginning in September and continuing into November. Spawning also occurs in and around White Spruce Harbour.

126 The shores of Pukaskwa National Park are very remote, with access by water only (or limited helicopter access). The Pukaskwa National Park Coastal Hiking Trail extends from Hattie Cove at the Park's north entrance, 60 kilometres south to the North Swallow River.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

126 The shores of Pukaskwa National Park are very remote, with access by water only (or limited helicopter access). The Pukaskwa National Park Coastal Hiking Trail extends from Hattie Cove at the Park's north entrance, 60 kilometres south to the North Swallow River.

127 Seasonal Rainbow Trout migration occurs at the Swallow River mouth. Responders should also note the pockets of vegetated shores and boulder beaches in this area.

48° 14' 55" N
86° 10' 44" W

48° 14' 55" N
85° 59' 42" W

126

Hideaway Lake

English Fishery Harbour

Lake Superior

Swallow River

North

85

(34)

Newman's Bay

Pukaskwa National Park

Grandma Stevens Pond

(1)

River

86

Swallow

Trapper Harbour

(67)

127

87

Triangle Harbour

88

Cascade River

Cascade Falls

48° 7' 53" N
86° 10' 44" W

48° 7' 53" N
85° 59' 42" W

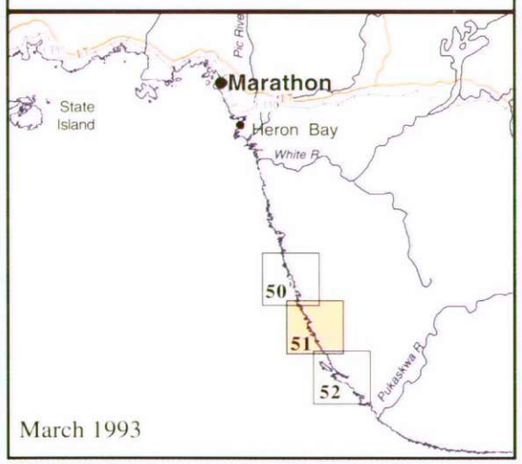
N

Scale
0 1 2
Kilometres
1:50,000

Map 51

Contains Sections From NTS Map Numbers:

42D/1



March 1993

48° 8' 22" N
86° 5' 39" W

48° 8' 22" N
85° 54' 37" W

Cascade Falls

89

Old Daves Harbour

(106)

Otter Island

90

(57)

91

128

Steeres Lake

Scapula Lake

Pukaskwa National Park

Otter Cove Creek

Weidman's Island

129

Deep Harbour

Otter Head Sund Lake

Otter Cove

Holly Creek

Tagouche Creek

(5)

Perry Lake

Buchanan Lake

92

(61)

93

(1)

(1)

130

Richardson Harbour

Tug Harbour

94

Richardson Island

95

Bonamie Cove

96

131

Lake Superior

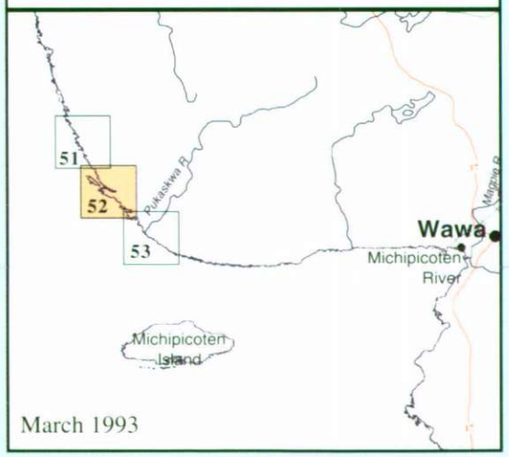
48° 1' 20" N
86° 5' 39" W

48° 1' 20" N
85° 54' 37" W

Scale
0 1 2
Kilometres
1:50,000

Map 52

Contains Sections From NTS Map Numbers:
42D/1 and 42C/4



March 1993

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

128 Otter Cove, east of Weidman's Island, is a priority for protection in this area, given the shore types, and the occurrence of Rainbow Trout migration up Holly Creek. Otter Cove Creek is also a significant migratory salmonid stream.

129 Seasonal fish spawning occurs around the islands northwest of Deep Harbour, typically from September to October.

130 Seasonal fish spawning occurs around Richardson Island, typically commencing in September.

131 The shores of Pukaskwa National Park are very remote, with access by water only (or limited helicopter access).

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

131 The shores of Pukaskwa National Park are very remote, with access by water only (or limited helicopter access).

132 Seasonal Rainbow Trout migration occurs at the mouth of the Emogene River and the Pukaskwa River. Seasonal fish spawning occurs along the shore by the Pukaskwa River beginning in September.

133 Crane Island is a nesting location for Great Blue Herons. Many Herring Gull nests are scattered around Crane Island.

48° 2' 17" N
85° 57' 17" W

48° 2' 17" N
85° 46' 16" W

Emogene River

Pukaskwa National Park

Pukaskwa River

Schist Falls

Imogene Cove

Pointe La Canadienne

Davis Island

Pukaskwa Point

Chimney Point

The Wheat Bin

Loon Lake

Kink Lake

Julia River

Brown Lake

Crane Island

Lake Superior

96

131

132

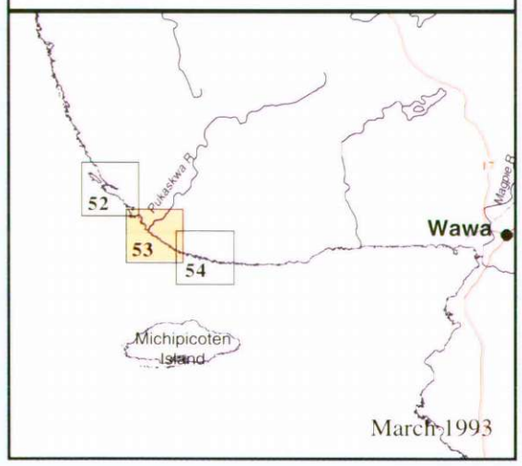
133

(1) (2) (3) (5) (10) (12) (28) (54)

Scale
0 1 2
Kilometres
1:50,000

Map 53

Contains Sections From NTS Map Numbers:
41N/13 and 42C/4



March 1993

47° 55' 15" N
85° 57' 17" W

47° 55' 15" N
85° 46' 16" W

47° 59' 27" N
85° 47' 39" W

47° 59' 27" N
85° 36' 40" W

Little Pipe River

Pipe Lake

Pipe River

False Ganley Harbour

Ganley Harbour Provincial Wilderness Area

Redsucker Cove

Ganley Harbour

Crane Island

(10)

(54)

(12)

133

(28)

134

Le Petit Mort Rocks

(3)

(26)

135

Lake Superior

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

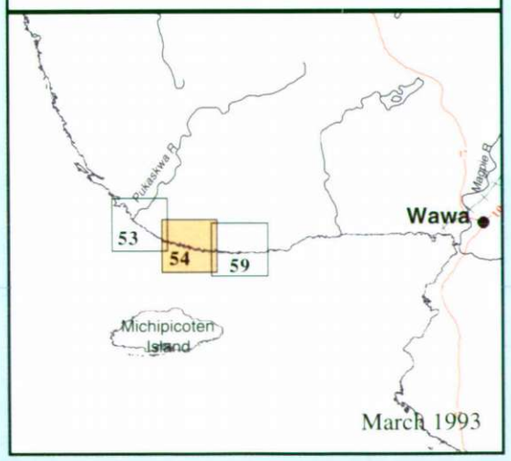
133 Crane Island is a nesting location for Great Blue Herons. Many Herring Gull nests are scattered around Crane Island.

134 Seasonal Rainbow Trout and Salmon migration occurs at the Pipe River mouth.

135 This shoreline area of Lake Superior is very remote, with access by water only (or limited helicopter access).

Map 54

Contains Sections From NTS Map Numbers:
41N/13



Scale
0 1 2
Kilometres
1:50,000

47° 52' 25" N
85° 47' 39" W

47° 52' 25" N
85° 36' 40" W

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

136 An area of seasonal fish spawning extends along the shoreline of Michipicoten Island from west of the Quebec Rocks, northeast, then east to the Claybanks, and again around Bonner Head: Fall, during October and November.

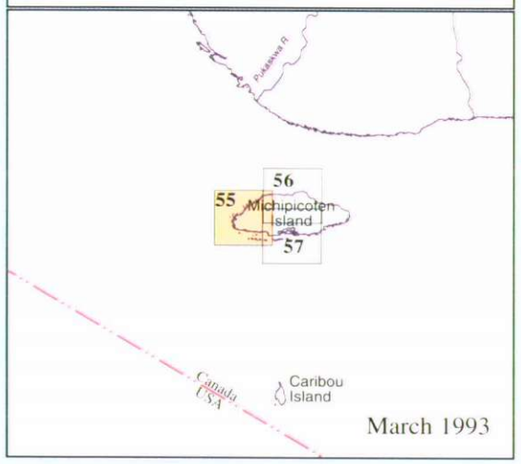
137 Well vegetated dunes are located along the backshore of the northwestern shore of West Sand Bay. Responders must take great care not to damage this vegetation or the dunes.

138 All response activity access to Michipicoten Island is by air or water.

47° 47' 53" N
86° 0' 58" W

Map 55

Contains Sections From NTS Map Numbers:
41N/12 and 41N/13



March 1993

Michipicoten Island is 15 km south of the mainland.

47° 47' 53" N
85° 50' 1" W

136

Philipps Creek

Balsam Lake

Quebec Rocks

Michi Lake

Michipicoten Island Provincial Park

Loon Lake

Schafer Bay

Cotton Cove

Cedar Lake

West End Island

Andesite Island

The Junction

West Sand Bay

137

Black Rock

138

Antelope Rock

The Breeders

Green Island

Stack Island

Ship Island

Lake Superior

N

Scale

0 1 2

Kilometres

1:50,000

47° 40' 52" N
86° 0' 58" W

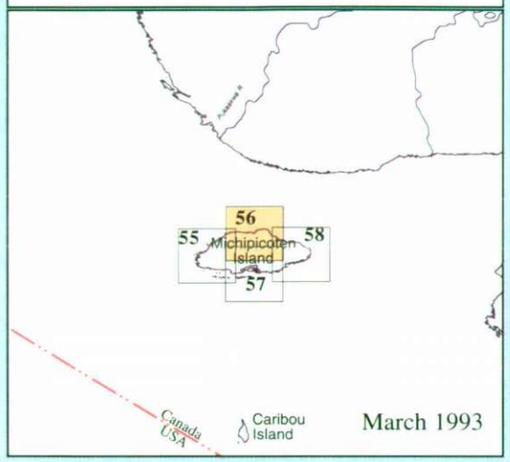
47° 40' 52" N
85° 50' 1" W

47° 50' 45" N
85° 51' 51" W

47° 50' 45" N
85° 40' 54" W

Map 56

Contains Sections From NTS Map Numbers:
41N/13 and 41N/12



Michipicoten Island is 15 km south of the mainland.

N

Scale

0 1 2

Kilometres
1:50,000

Lake Superior

136

139

The Claybanks

Bonner Head

Bonner Head Bay

Philipps Creek

Frying Pan Lake

Balsam Lake

Deep Water Lake

Coldwater Lake

Cuesta Scarp

Triangle Lake

Curtis Lake

Loon Lake

Michipicoten Island

Michipicoten Island Provincial Park

Birch Lake

Channel Lake

47° 43' 44" N
85° 51' 51" W

47° 43' 44" N
85° 40' 54" W

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

136 An area of seasonal fish spawning extends along the shoreline of Michipicoten Island from west of the Quebec Rocks, northeast, then east to the Claybanks, and again around Bonner Head: Fall, during October and November.

139 All response activity access to Michipicoten Island is by air or water.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

137 Well vegetated dunes are located along the backshore of the northwestern shore of West Sand Bay. Responders must take great care not to damage this vegetation or the dunes.

140 All response activity access to Michipicoten Island is by air or water. There is a Coast Guard light station and helicopter landing on the northeast shore of Davieaux Island.

141 Quebec Harbour is a small island community. The furbearer symbols denote areas of beaver activity. False Harbour and Quebec Harbour would both be protection priorities in the event of a spill affecting this area. There are numerous Bald Eagle sightings in this area in the Fall. The shores of Michipicoten Island are a habitat for Arctic-Alpine vascular plants; responders must exercise care when walking shorelines.

47° 45' 34" N
85° 51' 57" W

47° 45' 34" N
85° 41' 1" W

Coldwater Lake

Cuesta Scarp

Triangle Lake

Curtis Lake

Loon Lake

Michipicoten Island

Michipicoten Island Provincial Park

Birch Lake

Channel Lake

Cedar Lake

Quebec Harbour

Agate Island

Billys Island

MacMeekin Island

Quebec Harbour

98

False Harbour

West Sand Bay

137

97

141 Purvis Point

Four Mile Point

Dixon Reef

Stack Island

Davieaux Island

Hope Island

Ship Island

140

Lake Superior

Caribou Island is 35 km south of Michipicoten Island.

N

Scale

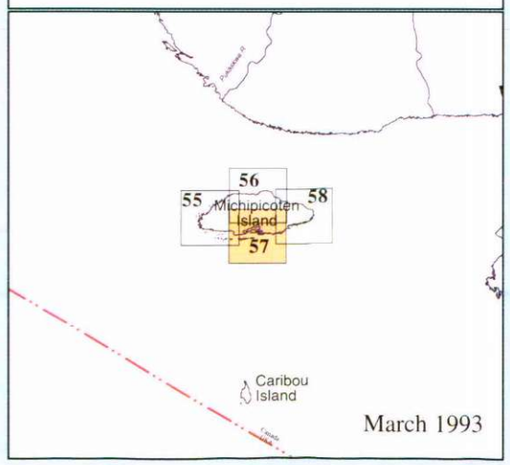
0 1 2

Kilometres

1:50,000

Map 57

Contains Sections From NTS Map Numbers:
41N/12



March 1993

47° 38' 32" N
85° 51' 57" W

47° 38' 32" N
85° 41' 1" W

47° 48' 3" N
85° 43' 1" W

47° 48' 3" N
85° 32' 3" W

Michipicoten Island is 15km south of the mainland.

Bonner Head Bay

N

Scale
0 1 2
Kilometres
1:50,000

Triangle Lake

Curtis Lake

Michipicoten Island Provincial Park

Point Maurepas

142

99

Cozens Cove

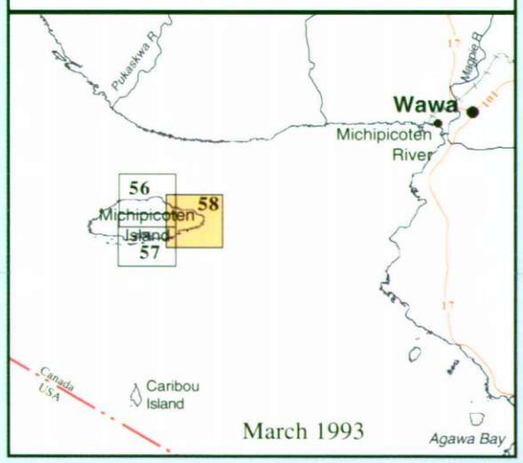
East Sand Bay

Dixon Reef

Lake Superior

Map 58

Contains Sections From NTS Map Numbers:
41N/12 and 41N/13



47° 41' 2" N
85° 43' 1" W

47° 41' 2" N
85° 32' 3" W

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

142 All response activity access to Michipicoten Island is by air or water. There is Agate on the pebble/cobble shores above and below the East End Coast Guard light station.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

143 This shoreline area of Lake Superior is very remote, with access by water only (or limited helicopter access).

47° 58' 59" N
85° 37' 52" W

47° 58' 59" N
85° 26' 53" W

Paugon Hill

Campbell Creek

Floating Heart River

Cairn Point

(90) (1) (1) *Pilot Harbour*

(18) *Floating Heart Bay* (4) (37)

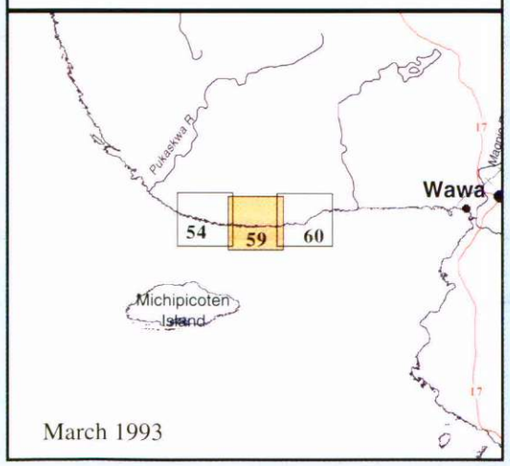
143

Lake Superior

Scale
0 1 2
Kilometres
1:50,000

Map 59

Contains Sections From NTS Map Numbers:
41N/13 and 41N/14



March 1993

47° 51' 58" N
85° 37' 52" W

47° 51' 58" N
85° 26' 53" W

47° 59' 23" N
85° 28' 21" W

47° 59' 23" N
85° 17' 21" W

Bare
Summit

Eagle River

Ghost River

Little
Trout
Lake

The Flats

Tamarack
Bay

(41)

144

Point
Isacor

143

Lake Superior

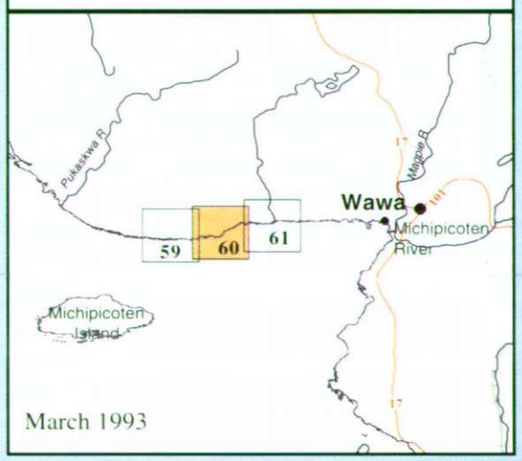
Scale
0 1 2
Kilometres
1:50,000

47° 52' 22" N
85° 28' 21" W

47° 52' 22" N
85° 17' 21" W

Map 60

Contains Sections From NTS Map Numbers:
41N/14



March 1993

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

143 This shoreline area of Lake Superior is very remote, with access by water only (or limited helicopter access).

144 The mouth of Eagle River is a location of seasonal Rainbow Trout migration. Seasonal fish spawning occurs along the shoreline east of Point Isacor, typically beginning in September. Just offshore, from Point Isacor east to Doré Point, is a major staging area each Spring for Old Squaw Ducks and other divers.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

145 Seasonal Rainbow Trout, Brook Trout, Salmon and Walleye migration occurs at the mouth of Dog (University) River. Seasonal fish spawning occurs typically during September.

146 This shoreline area of Lake Superior is quite remote, with access by water only (or limited helicopter access). Just offshore, from Point Isacor east to Doré Point, is a major staging area each Spring for Old Squaw Ducks and other divers.

48° 0' 16" N
85° 18' 31" W

48° 0' 16" N
85° 7' 31" W

Denison Lake

Denison Falls

Dog (University) River

Mountain Ash Hill

Mountain Ash River

Dog Harbour

100

False Dog Harbour

(1)

(20)

(33)

145

(8)

(30)

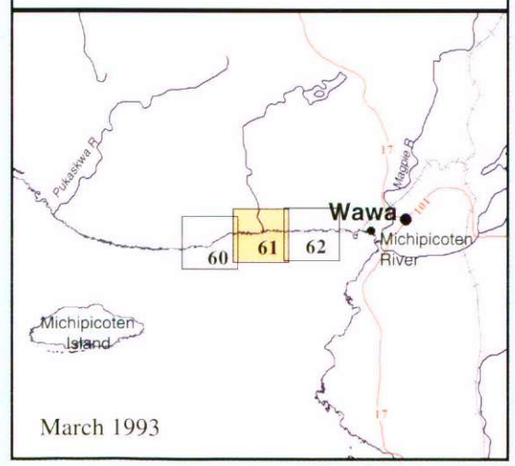
146

Lake Superior

Scale
0 1 2
Kilometres
1:50,000

Map 61

Contains Sections From NTS Map Numbers:
41N/14



March 1993

47° 53' 15" N
85° 18' 31" W

47° 53' 15" N
85° 7' 31" W

48° 0' 29" N
85° 8' 41" W

48° 0' 29" N
84° 57' 41" W

Little Bear River

Mountain Ash River

Makwa River

Little Makwa River

Gravel Beach

McCoy's Harbour

146

147

(27)

(42)

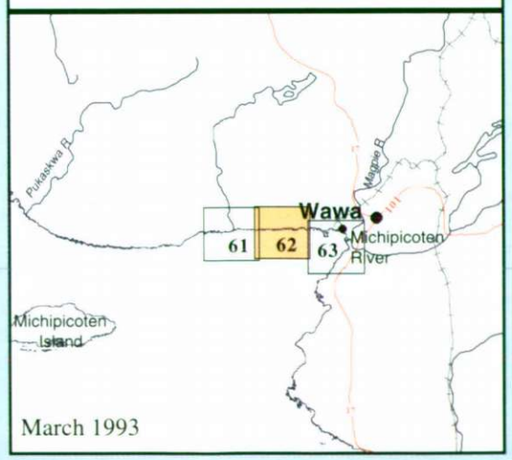
Minnekona Point

Doré Point

Lake Superior

Map 62

Contains Sections From NTS Map Numbers:
41N/14 and 41N/15



March 1993

Scale
0 1 2
Kilometres
1:50,000

47° 53' 28" N
85° 8' 41" W

47° 53' 28" N
84° 57' 41" W

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

146 This shoreline area of Lake Superior is quite remote, with access by water only (or limited helicopter access). Just offshore, from Point Isacor east to Doré Point, is a major staging area each Spring for Old Squaw Ducks and other divers.

147 The mouth of the Little Bear River is a location of Rainbow Trout migration, and the mouth of the Makwa River is a location of Rainbow Trout and Brook Trout migration. The mouth of Little Makwa River, to the east of Gravel Beach, is a location of Rainbow Trout migration.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

148 Many Herring Gulls and Ringbilled Gulls are located on the islands in Doré Bay. The mouth of the Doré River is a location for Rainbow Trout and Brook Trout migration. Sensitive features exist along Indian Beach. Contact the Chief of the Gros Cap First Nation before commencing response activities in this area. Just offshore, from Doré Point west to Point Isacor is a major staging area each Spring for Old Squaw Ducks and other divers.

149 Wooden pile piers line the west side of Michipicoten Harbour. The islands east of the harbour provide a habitat for many Herring Gulls.

150 The recreational beach depicted here is actually a narrow line of vegetated dunes and sandy beach which is very popular in the summer months. Responders must exercise caution so as not to disturb vegetation and damage the dunes. The shore south of Sandy Beach has concentrated private residential use.

151 Seasonal Rainbow Trout spawning occurs along the north shores of Michipicoten Bay in May and June. The area east of a line across the bay from Perkwakwia Point to Smoky Point is an area of restricted fishing.

152 The community of Wawa and the Wawa Airport are several kilometres up the Trans-Canada Highway.

153 The mouth of the Michipicoten River is a migration location of major significance for Rainbow, Lake, and Brook Trout, Sturgeon, Salmon, Walleye, Northern Pike and Whitefish, and is also used heavily for recreation. It is a high priority for protection. Driftwood and Sandy Beach are both staging areas for Mergansers, Mallards, Teals and Blacks in Spring, until inland ice is out.

154 The mouth of Fort Creek, south of the recreational beach at Michipicoten Provincial Park, is a location of Rainbow Trout and Pink Salmon migration.

47° 58' 37" N
84° 58' 12" W

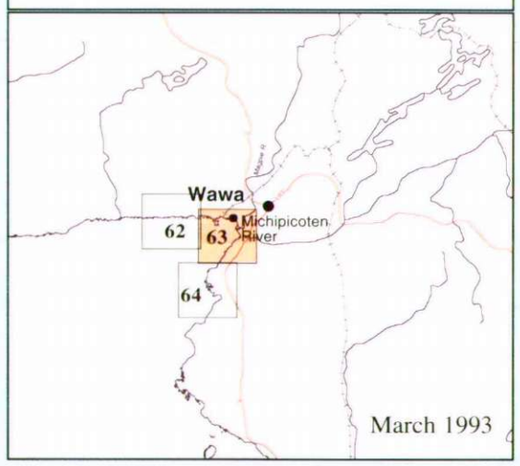
47° 58' 37" N
84° 47' 12" W

Doré Falls
Doré River
Gros Cap First Nation 49
Felcite Lake
Brient
Gros Cap First Nation 49
Magpie River
Wawa 5km
Michipicoten
Indian Beach
Doré Bay
Oakes Cove
Michipicoten Harbour
Magpie Falls
Legarde Mountain
Hwy. 17
Wawa Creek
Reid Point
Perkwakwia Point
Michipicoten Bay
Sandy Beach
Mission Falls
Michipicoten River
Simmon Hill
Lake Superior
Michipicoten Post Provincial Park
Dead River
Driftwood Beach
Fort Creek
Mission Lake
Roller Lake
Crozier Lake
Hilltop Lake
Nezwa Lake
Blackington Lake
Bridget Lake
Hwy. 17
Dodds Lake
Junction Lake
Underhill Lake
Greenwood Lake
Smoky Point
Treeby Lake
Shakwa Lake
Noisy River
Line Lake
Lake Superior Provincial Park

Scale
0 2
Kilometres
1:50,000

Map 63

Contains Sections From NTS Map Numbers:
41N/15



March 1993

47° 51' 36" N
84° 58' 12" W

47° 51' 36" N
84° 47' 12" W

47° 51' 42" N
85° 1' 54" W

47° 51' 42" N
84° 50' 57" W

Lake Superior

Noisy Bay

Noisy Lake

Fenton Lake

Beauvier Point

Hwy. 17

Neilly Lake

Brule Hill

Brule Point

(22)

Brule Harbour

Henry Lake

Lake Superior Provincial Park

Salter Lake

Inner Harbour

(8)

Entrance Island

(181)

Old Woman River

South Old Woman River

Old Woman Bay

(1)

The Pepper Lakes

Alpine Lake

Till Lake

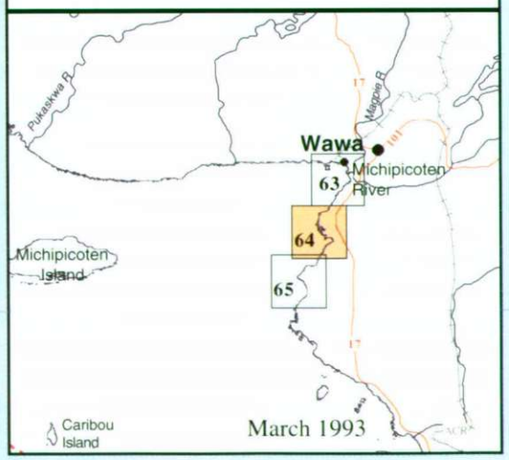
47° 44' 41" N
85° 1' 54" W

47° 44' 41" N
84° 50' 57" W

Scale
0 1 2
Kilometres
1:50,000

Map 64

Contains Sections From NTS Map Numbers:
41N/15 and 41N/14



NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

155 The river mouth in Noisy Bay is a location of Brook and Lake Trout, Northern Pike, and Whitefish migration activity.

156 Entrance Island is a habitat for the Great Blue Heron, as well as a large colony of Herring Gulls. Seasonal fish spawning also occurs along the shores in this area, typically beginning in September. Arctic-Alpine plants are found all along the rocky shoreline in this area; responders should take care not to damage vegetation.

157 Well vegetated dunes and sandy beaches line the eastern shores of Old Woman Bay, making this area a popular recreational spot during the summer months. Arctic-alpine plants unique to the region are found in areas along the southern shore of the bay. Responders must be careful not to damage vegetation in this area. The mouth of Old Woman River is a seasonal migration location for Rainbow and Brook Trout, and Salmon. During September, seasonal fish spawning begins along the northwest shore of Old Woman Bay. Arctic-Alpine plants are found on the cliff face at the south section of Old Woman Bay.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

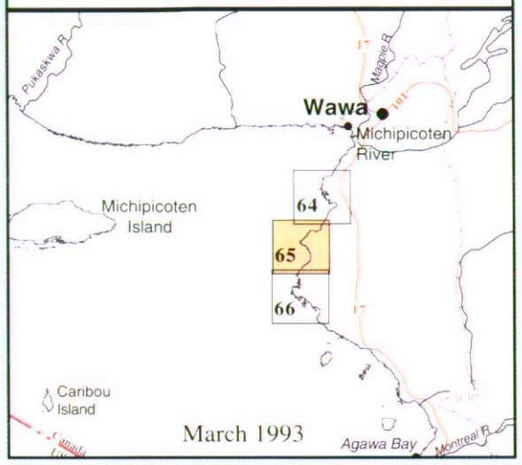
158 Responders should note the approach concern of rocky reefs along Grindstone Point.

159 This area of the Lake Superior shoreline is relatively remote, with access by water only (or limited helicopter access).

47° 45' 14" N
85° 5' 55" W

Map 65

Contains Sections From NTS Map Numbers:
41N/10



March 1993

47° 45' 14" N
84° 54' 58" W

Till Lake

Grindstone Point

158

Bushy Bay

107

108

(1)

Cap Chaillon

Lake Superior Provincial Park

Gravel Lake

Chalmers Lake

Chaillon Lake

Red Rock River

Dural Lake

Lake Superior

Villian Lake

Sommers Lake

(1)

109

159

N

Scale
0 1 2
Kilometres
1:50,000

47° 38' 12" N
85° 5' 55" W

47° 38' 12" N
84° 54' 58" W

47° 38' 48" N
85° 6' 3" W

47° 38' 48" N
84° 55' 8" W

Lake Superior

Lake Superior Provincial Park

Squaw Island

Chalfant Island

Indian Harbour

Devils Chair

Hursley Island

Cape Gargantua

Jordan Island

Tugboat Channel

Warp Bay

Pearson Island

Fawcett Island

Peerless Island

Dixon Island

Gargantua Hill

Devils Warehouse Island

Wilde Island

Gargantua

Gargantua Harbour

Gargantua Island

Gargantua Bay

Montgomery Lake

Miron Lake

Gargantua River

Grangousier Hill

Buckshot Creek

159 160 161 162 163 164

(88) (9) (28) (1) (2) (25) (69) (9) (30) (10) (9) (30)

109 110 111 112 113 114

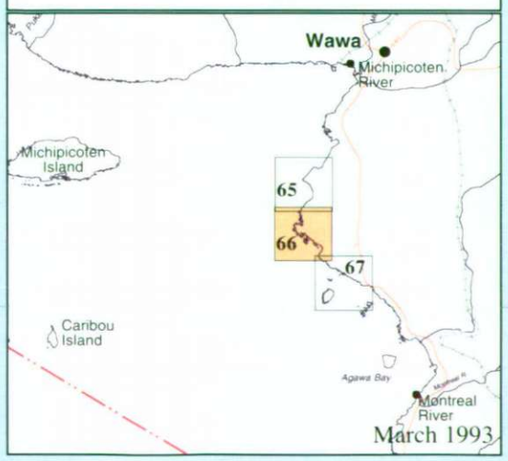
47° 31' 46" N
85° 6' 3" W

47° 31' 46" N
84° 55' 8" W

Scale
0 1 2
Kilometres
1:50,000

Map 66

Contains Sections From NTS Map Numbers:
41N/10



March 1993

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

159 This area of the Lake Superior shoreline is relatively remote, with access by water only (or limited helicopter access).

160 There is a large Herring Gull colony on Squaw Island. Chalfant Island, further south, is a habitat for the Great Blue Heron. A provincial park hiking trail extends along the shoreline from Indian Harbour south to Sinclair Cove.

161 There is a large Herring Gull colony on Jordan Island.

162 Vegetated dunes are found along the sandy shores at the mouth of the Gargantua River. This is a popular recreational area in the summer months. Responders must take care not to damage the dune vegetation. The river mouth is a location for Rainbow and Brook Trout and Salmon migration activity.

163 Devils Warehouse Island is a habitat for the Great Blue Heron, and a large colony of Herring Gulls. A small herd of re-introduced Caribou frequently swim among the islands, and between the islands and the mainland in the Gargantua area.

164 Gargantua Harbour is a sheltered anchorage and a popular summertime recreational beach. The harbour provides a resting/feeding area for migrating shorebirds, as well as a breeding area for the Northerly Toad. There is a fair access site as marked, with good road access. Small aluminum and Zodiak type boats can be dragged across the cobble beach here.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

165 The mouth of Buckshot Creek is a location of migration activity for Rainbow and Brook Trout, and Salmon.

166 Ella Islet has seasonal fish spawning from October to November, and is a habitat for Double-crested Cormorants as well as Herring Gulls. Seasonal fish spawning occurs on the north, east, and south ends of Leach Island (a part of Lake Superior Park) during October.

167 The mouth of Bald Head River is a location of migration activity for Rainbow and Brook Trout, with major significance. The area is also a recreational beach. From May to November, backpackers hike the Coastal Trail and, along with kayakers and canoeists, camp at numerous campsites on sand and cobble beaches. Rhyolite Cove, Beatty Cove, Buckshot Creek and Baldhead River have major concentrations of camping.

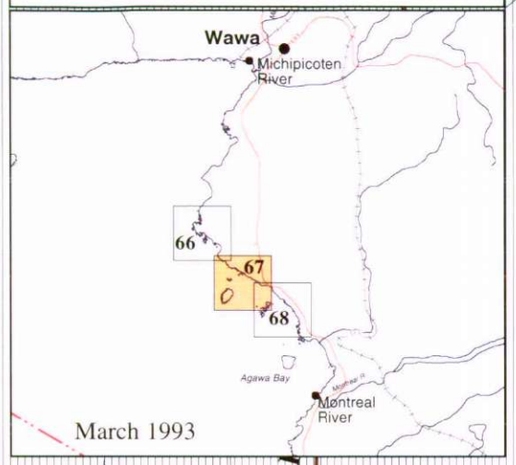
168 Seasonal fish spawning occurs in October in the northeastern, central, and southern areas of the Lizard Islands. Several large Herring Gull colonies and Great Blue Herons nest on these islands.

47° 32' 24" N
84° 58' 24" W

47° 32' 24" N
84° 47' 30" W

Map 67

Contains Sections From NTS Map Numbers:
41N/7 and 41N/10



Lake Superior Provincial Park

Rhyolite Cove

Buckshot Creek

115

165

(1)

Telegraph Rock

(44)

Beatty Cove

116

Baldhead

Orphan Lake

Doc Greig Lake

Ella Islet

(42)

166

167

Bald Head

Leach Island

N

Scale

0 2

Kilometres

1:50,000

Lake Superior

168

Rowe Island

Barr Reef

Lizard Islands

47° 25' 22" N
84° 58' 24" W

47° 25' 22" N
84° 47' 30" W

47° 28' 57" N
84° 50' 48" W

47° 28' 57" N
84° 39' 55" W

Bald Head

Coldwater River

Boggy Pond

Robertson Cove

Hwy. 17

Katherine Cove

Peyton Lake

Crooked Cane Lake

Sand River

Clay River

Tee Bone Lake

Rowe Island

Barr Reef

Lizard Islands

168

169

117

170

Lake Superior Provincial Park

(38)

(1)

South Lizard Island

(21)

(35)

Lake Superior

Craza Creek

Barrett River

118

Barrett Island

(110)

171

Sinclair Cove

119

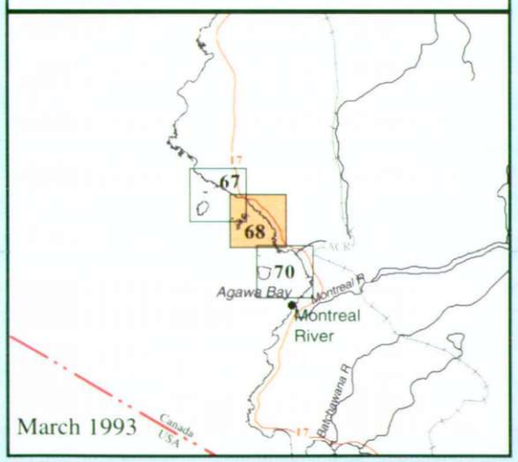
Sinclair Island

Agawa Rock

Map 68

Contains Sections From NTS Map Numbers:

41N/7



March 1993

Scale

0 1 2

Kilometres
1:50,000

47° 21' 56" N
84° 50' 48" W

47° 21' 56" N
84° 39' 55" W

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

168 Seasonal fish spawning occurs in October in the northeastern, central, and southern areas of the Lizard Islands. Several large Herring Gull colonies and Great Blue Herons nest on these islands.

169 The sandy beaches and dunes surrounding Katherine Cove make it a popular summer recreational area. Rough access sites for small craft can be used to drag boats over sand beaches at Katherine Cove, Sand River, Coldwater River, and the north side of Agawa River. Notify the Park Superintendent prior to any response activity.

170 The mouth of the Sand River is a seasonal location of migration activity for Rainbow, Brook and Lake Trout, and Salmon. The surrounding shores are popular recreational use beaches.

171 Barrett Island has a large Herring Gull colony. Further south, Sinclair Cove is a popular anchorage, with a newly restored boat launch. Agawa Rock is the site of significant Native pictographs which are located within three metres of the water line on a wave washed cliff.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

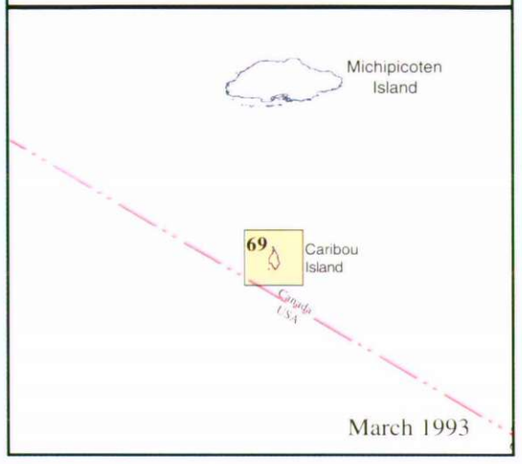
172 Caribou Island has a very sensitive shore and is close to the shipping lanes. Several dune systems exist along the shores of Caribou Island; the most prominent being at the island's southern tip. The dunes range in height from 1 to 5 metres, and are often vegetated. Responders must take care not to damage these dunes. Wetland areas are found in pockets along the northwestern and western shores of Caribou Island. The lone cottage on the island is on the eastern shore and is privately owned, as is the island itself. Seasonal fish spawning occurs along the western shores of Caribou Island, generally in October. All access to the island for response activity must be by air or water. A Coast Guard lighthouse and helicopter pad are located on Lighthouse Island. Caribou Island is an important resting spot for migratory shorebirds. For Gull nesting colonies, contact the Canadian Wildlife Service.

47° 25' 31" N
85° 54' 6" W

47° 25' 31" N
85° 42' 52" W

Map 69

Contains Sections From NTS Map Numbers:
41N/5



Caribou Island is 40 kilometres south of Michipicoten Island.

Lake Superior

N

Scale
0 1 2
Kilometres
1:50,000

Canada
USA

47° 18' 6" N
85° 54' 6" W

47° 18' 6" N
85° 42' 52" W

47° 22' 17" N
84° 45' 39" W

47° 22' 17" N
84° 34' 48" W

Agawa Rock
Rock Island
(255)
Ganley Island
Agawa Islands
Agawa Point
Griffon Reef
Agawa River
Cliff Marsh
Fraters Road
Hwy. 17
Frater Creek
Agawa Bay
Lake Superior Provincial Park
Speckled Trout Creek
Montreal Island
Lake Superior
(263)
Vrooman Island
MacGregor Cove
(34)

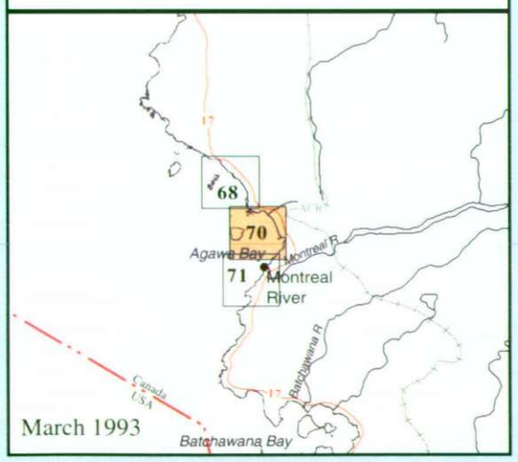
173 120 121 122 123 174 175 176

47° 15' 16" N
84° 45' 39" W

47° 15' 16" N
84° 34' 48" W

Map 70

Contains Sections From NTS Map Numbers:
41N/7



Scale
0 1 2
Kilometres
1:50,000

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

173 A very large Herring Gull colony is located in the Agawa Islands, as is the Great Blue Heron. Also, sensitive archaeological features exist in the area. Responders should contact Environment Canada ((416) 346-1971) before commencing activity.

174 The mouth of the Agawa River is a location of Rainbow and Brook Trout, Salmon, and Whitefish migration of major significance. Seasonal fish spawning in this area begins in late Fall. Rainbow Trout spawn in Spring. South of the Agawa River, the shore is lined with sand beaches and dunes that are very popular for recreational use in summer. Responders should use only established access routes. Further south, the mouth of the Frater Creek is a migration location for Rainbow Trout. The mouth of the Speckled Trout Creek is a migration location for Rainbow Trout and Salmon.

175 Seasonal fish spawning occurs from October to December along the southern and northwestern shores of Montreal Island, which is a part of Lake Superior Provincial Park. Caribou are located on the northeast part of the island, and waterfowl nest and feed along the northern shore of the island.

176 Vrooman Island has a very large Ring-billed Gull colony, and a large Herring Gull colony. The Laughing Brook, emptying into MacGregor Cove, is a migration location for Brook and Rainbow Trout.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

177 The mouth of the Montreal River Harbour offers a good staging area for response operations. This is also a location for migration of major significance for Rainbow Trout and Salmon. Seasonal spawning occurs in September and October for Lake Trout and Salmon. Walleye spawn in Spring. The shore of the harbour is an excellent example of the Cobble Beach shoreline classification.

178 The Montreal River Shoal is an area of seasonal spawning for Lake Trout and Salmon, beginning in October and lasting as late as December, with Walleye spawning in the Spring.

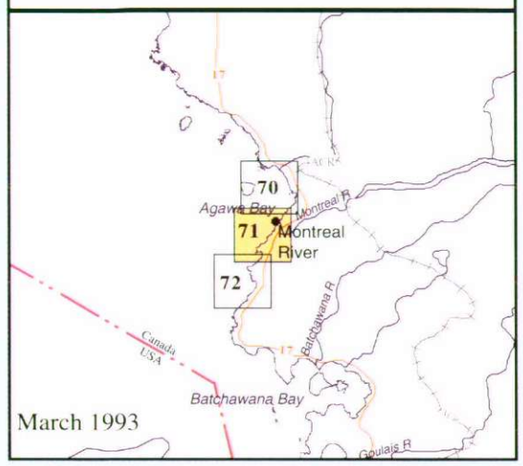
179 The Montreal River Provincial Nature Reserve Park offers one of the best preserved examples of backshore cobble bars found in Ontario. A moraine system is found along the north shore of the Park.

180 Ossifrage Island is an Environmentally Sensitive Area due to its importance as a nesting site for the Great Blue Heron. A large Herring Gull colony also exists on the island. In Alona Bay, at the north side of Alona Bay Creek, there is fair access, by dragging small boats over the cobble.

47° 16' 8" N
84° 46' 53" W

Map 71

Contains Sections From NTS Map Numbers:
41N/2 and 41N/7



March 1993

Scale
0 1 2
Kilometres
1:50,000

47° 16' 8" N
84° 36' 3" W

177
Montreal River Harbour
124
Hwy. 17
178
179
Montreal River Provincial Nature Reserve Park
Montreal River
Beta Lake
Metheany Creek
Gamma Lake
Caysee Lake
Theano Point
(118)
180
Ossifrage Island
(5)
Alona Bay Creek
Alona Bay
Queminico Lake
Alpha Lake

47° 9' 6" N
84° 46' 53" W

47° 9' 6" N
84° 36' 3" W

Lake Superior

47° 10' 7" N
84° 50' 38" W

47° 10' 7" N
84° 39' 49" W

Alona Bay

Pointe aux Mines

Cozens Cove

Dobson Creek

Islay Lake

Mica Bay

Flour Bay

Trout Lake

Kincaid River

181

182

183

(84)

(90)

(235)

Lake Superior

N

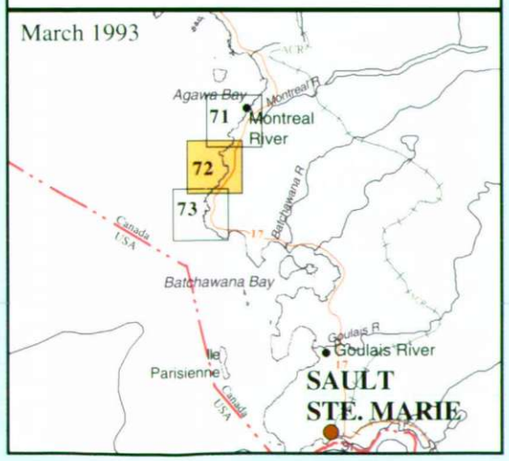
Scale

0 1 2

Kilometres
1:50,000

Map 72

Contains Sections From NTS Map Numbers:
41N/2



47° 3' 5" N
84° 50' 38" W

47° 3' 5" N
84° 39' 49" W

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

181 A Lake Trout spawning area exists on the shoal 6 kilometres west of Alona Bay, with activity typically beginning in October.

182 A very large group of Herring Gull colonies is located in the Cozens Cove area.

183 A Lake Trout spawning area exists on the shoal 5 kilometres west of Mica Bay, with activity typically beginning in October.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

184 A primary fish processing facility, and response staging area are located at Mamainse Point, along with a poor boat launch.

185 Seasonal Lake Trout spawning extending from Hibbard Bay south past Deadman's Cove, typically begins in October.

186 Seasonal Lake Trout spawning extending from Deadman's Cove south around Pancake Point typically begins in October. From Mamainse Point to Coppermine Point each Fall, flocks of Diving Ducks, Loons and Grebes migrate close to the shore. Many of them stop and feed along the shallows.

47° 3' 47" N
84° 53' 19" W

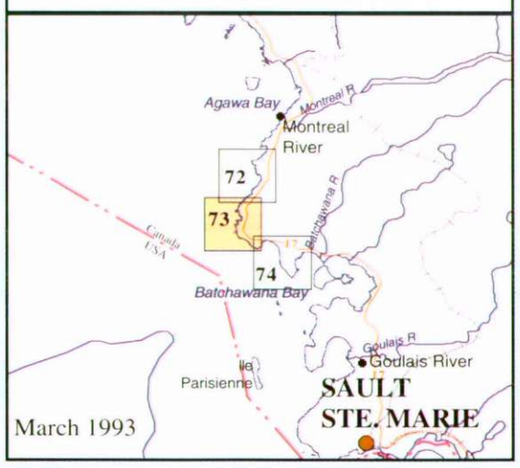
47° 3' 47" N
84° 42' 32" W

Lake Superior

Scale
0 1 2
Kilometres
1:50,000

Map 73

Contains Sections From NTS Map Numbers:
41N/2 and 41K/15



March 1993

184
Mamainse Island
(39)
(31)
Mamainse Point
Wilson Lake
(67)
Hibbard Rock
(1)
185
Hibbard Bay
Deadman's Cove
Agates Harbour
Beardens Lake
Mamainse Creek
186
(112)
(112)
(112)
Rousseau Island
Coppermine Rock
Coppermine Point
Whiskey Point
Cottrell Cove
Hwy. 17
(1)
(42)
Pancake Bay Provincial Park
Sawpit Bay
Pancake Point

46° 56' 45" N
84° 53' 19" W

46° 56' 45" N
84° 42' 32" W

Map 74

Contains Sections From NTS Map Numbers:

41K/15

March 1993

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

187 Seasonal Lake Trout spawning extends from Pancake Point along the shore to Corbeil Point, and typically begins in October.

188 Pancake Bay Provincial Park Drinking Water Intake - Call (705) 882-2209. Pancake Bay Provincial Park is a very popular recreational area. Its boundary extends over the Bay and this area is closed to commercial fishing. The shore has a good response staging area, but a poor boat launch. The mouth of the Pancake River is a priority location for protection in the event of a spill. An approach concern (foreshore flats) extends along the north and east shores of the Bay. To contact the Park Superintendent, call (705) 882-2209.

189 Rainbow Trout migration occurs at the mouth of Black Creek and Pancake River in Pancake Bay, and Carp River in Batchawana Bay. These are runs of high regional significance. When considering response activities in the area around Corbeil Point, contact the Chief of the Obadjiwan First Nation.

190 The western shores of Outer Batchawana Bay are heavily used for residential and recreational purposes. Foreshore flats extend all along the Bay from Corbeil Point to Sand Point. Rainbow Trout and Coho Salmon spawn at the mouth of Carp River in Spring and Fall respectively. Batchawana River is a location for Rainbow Trout and Pike migration and is a protection priority in the event of a spill. The boundaries of Batchawana Bay Provincial Park extend across the water. Lake freighters often shelter from storms in the southern part of Batchawana Bay.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

190 The western shores of Outer Batchawana Bay are heavily used for residential and recreational purposes. Foreshore flats extend all along the Bay from Corbeil Point to Sand Point. Rainbow Trout and Coho Salmon spawn at the mouth of Carp River in Spring and Fall respectively. Batchawana River is a location for Rainbow Trout and Pike migration and is a protection priority in the event of a spill. The boundaries of Batchawana Bay Provincial Park extend across the water. Lake freighters often shelter from storms in the southern part of Batchawana Bay.

191 Batchawana Island is a designated Environmentally Sensitive Area. The marshlands in the interior and around the island are an important Fall stopover for migratory waterfowl. The Narrows between Sand Point and Batchawana Island are a high priority for boom deployment to protect Harmony Bay.

192 Harmony Bay (Inner Batchawana Bay) is heavily populated with residential and recreational usage. Foreshore flats extend along its length. The mouth of the Harmony River is a priority for protection in the event of a spill. Large colonies of Ring-billed Gulls and Common Terns are located there, and it is a location of Rainbow Trout, Salmon, and Smelt migration. The river mouth is also the only Lake Superior example of a Delta Mud Flat. Commercial fishing in the Bay is restricted by law.

193 Seasonal fish spawning between Batchawana Island and the Flowerpot Islands, and at the southwest side of Batchawana Island occurs in Fall, beginning typically in October. Large concentrations of Great Blue Herons and Herring Gulls are located among the Flowerpot Islands. This is the only known concentration of Small Mouth Bass on eastern Lake Superior.

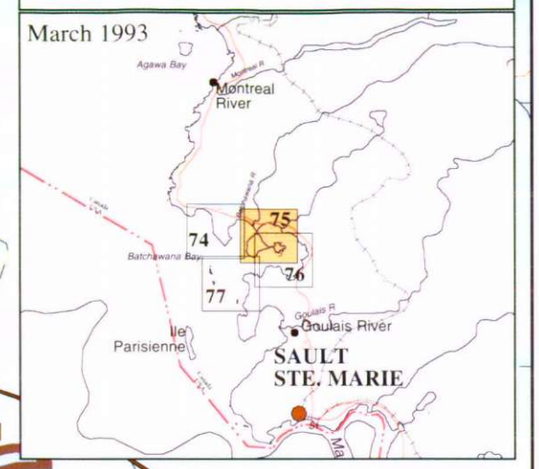
46° 58' 9" N
84° 34' 9" W

46° 58' 9" N
84° 23' 22" W

Map 75

Contains Sections From NTS Map Numbers:
41K/16 and 41K/15

March 1993



Kerwin Creek

Batchawana Bay Provincial Park

Batchawana River

Hwy. 17

190

M

The Narrows

Sand Point

M

192

(68)

Harmony River

Harmony Bay

191

125

Batchawana Island

193

(97)

(36)

Flowerpot Islands

Tugis Island

Batchawana Bay

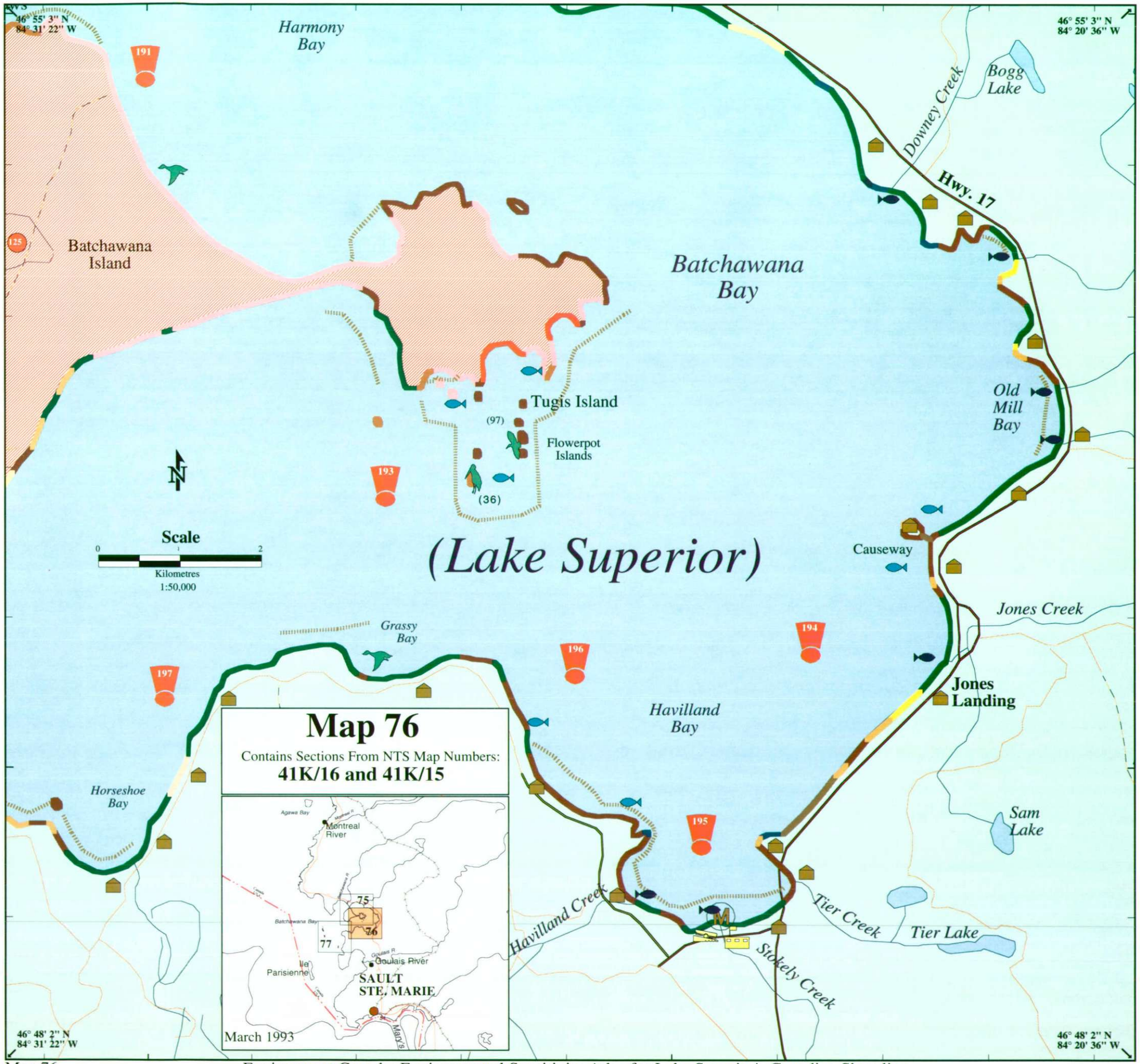
N

Scale
0 1 2
Kilometres
1:50,000

(Lake Superior)

46° 51' 7" N
84° 34' 9" W

46° 51' 7" N
84° 23' 22" W



Map 76

Contains Sections From NTS Map Numbers:
41K/16 and 41K/15

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

191 Batchawana Island is a designated Environmentally Sensitive Area. The marshlands in the interior and around the island are an important Fall stopover for migratory waterfowl. The Narrows between Sand Point and Batchawana Island are a high priority for boom deployment to protect Harmony Bay.

193 Seasonal fish spawning between Batchawana Island and the Flowerpot Islands, and at the southwest side of Batchawana Island occurs in Fall, beginning typically in October. Large concentrations of Great Blue Herons and Herring Gulls are located among the Flowerpot Islands. This is the only known concentration of Small Mouth Bass on eastern Lake Superior.

194 The creeks along Old Mill Bay and Havilland Bay generally are locations of migration for Rainbow Trout, Salmon or Smelt. Old Mill Bay, Jones Landing, and Havilland Bay are all heavily populated with residential and recreational usage. Seasonal fish spawning occurs around the Causeway, typically beginning in October. Rainbow Trout and Smelt spawn in the Spring.

195 Havilland Creek is the location of an important Rainbow Trout migration run in the Spring. A good response staging area and boat launch is located in Havilland Bay. Seasonal fish spawning occurs along the western shores of Havilland Bay, typically beginning in October.

196 Commercial fishing in Batchawana Bay is restricted by law.

197 Horseshoe Bay is heavily populated with residential and recreational usage.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

198 This small wetland habitat warrants protection (SEPA site - Shoreline Environmental Protection Area; contact Ministry of Natural Resources, Sault Ste. Marie). Commercial fishing east of Grindstone Point is restricted by law.

199 Steamboat Island is designated as an Environmentally Sensitive Area due to its importance as a nesting habitat for Herring Gulls and Double-crested Cormorants. Foreshore flats surround the western sides of North and South Sandy Islands. Seasonal Lake Trout spawning occurs all around these two islands in the Fall, typically beginning in October.

200 Seasonal Lake Trout spawning occurs along the shore from Bluewater Bay south to Sand Bay. The area between Maple Island and the mainland is very shallow. This shoreline is quite populated with recreational and residential usage.

46° 51' 58" N
84° 41' 19" W

46° 51' 58" N
84° 30' 34" W

199

Steamboat Island

(161)

(5)

North Sandy Island

South Sandy Island

(56)

Batchawana Bay

198

Grindstone Point

Marlette's Bay

Rudderhead Point

Bluewater Bay

200

Maple Island

Nils Bay

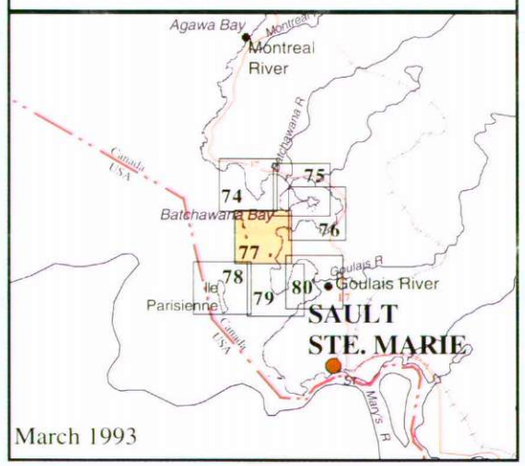
Whitefish Bay

(Lake Superior)

Map 77

Contains Sections From NTS Map Numbers:

41K/15



March 1993

Scale

0 1 2

Kilometres
1:50,000

46° 44' 57" N
84° 41' 19" W

46° 44' 57" N
84° 30' 34" W

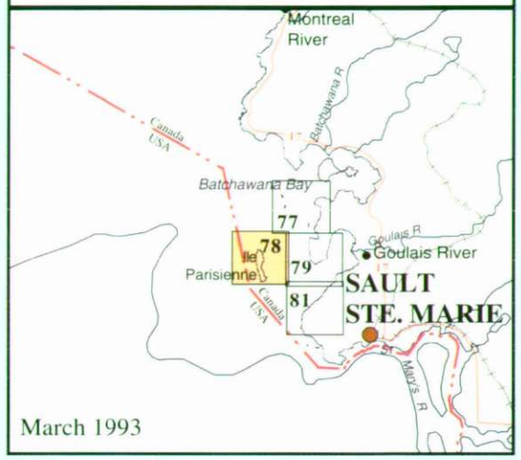
46° 45' 18" N
84° 48' 54" W

46° 45' 18" N
84° 38' 9" W

Parisienne Shoal

Map 78

Contains Sections From NTS Map Numbers:
41K/10

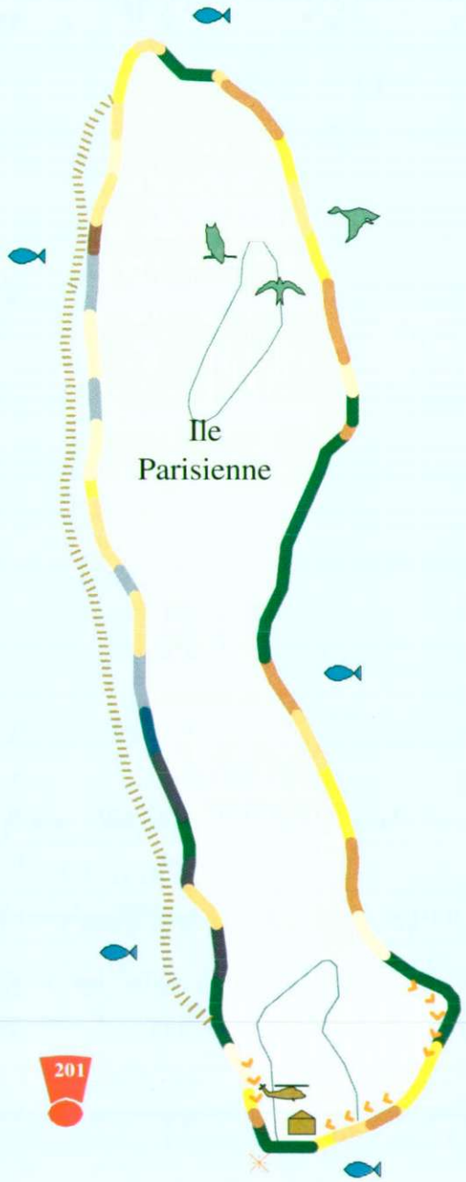


March 1993

Whitefish Bay

(Lake Superior)

Ontario
Michigan
United States of America
Canada



N

Scale
0 1 2
Kilometres
1:50,000

46° 38' 17" N
84° 48' 54" W

46° 38' 17" N
84° 38' 9" W

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

201 Foreshore flats exist along the entire western side of Ile Parisienne. Small vegetated dunes are located along the backshore of the southeast tip of the island, and a sandy beach with dunes along its backshore runs along the southwest side of the island, near the lighthouse. Seasonal Lake Trout spawning occurs in the waters surrounding Ile Parisienne and the Parisienne Shoal, typically beginning in October. Large boulders are interspersed along the shallow waters off the western shore of Ile Parisienne. Waterfowl use the shore area along the northeast side for breeding, nesting, and feeding. Raptors and shorebirds use the interior and shores for breeding and feeding. Lake freighters shelter from storms on the east side of Ile Parisienne.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

202 The shores of Sand Bay are densely populated, with residential and recreational usage. The mouths of the two creeks emptying into Sand Bay are high priorities for protection. The area offshore from Sand Bay is shallow with interspersed boulders; approach with caution. A productive wetland area is located adjacent to Sand Bay; responders must exercise care to not damage the area. Seasonal Lake Trout spawning extends along the shore from Sand Bay to Horseshoe Harbour, beginning typically in October.

203 There is a good boat launch near Goulais Mission, but responders should contact the Chief of the local First Nation before seeking access from this location. This entire shoreline is heavily populated. Note the small wetland area in Horseshoe Harbour.

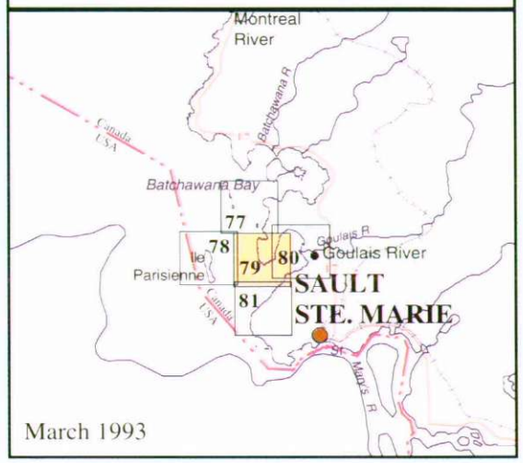
204 Seasonal fish spawning occurs along the shore from Kelly Creek to Maple Point, typically beginning in August.

205 All creeks emptying into Goulais Bay are locations of Rainbow Trout migration. Goulais Bay is restricted to commercial fishing. Much of the foreshore is very shallow sand flats. Most of the Goulais Bay shoreline is heavily populated, with residential and recreational usage. It is common for lake freighters to take shelter from storms in Goulais Bay.

46° 45' 3" N
84° 38' 59" W

Map 79

Contains Sections From NTS Map Numbers:
41K/10 and 41K/9



March 1993

46° 45' 3" N
84° 28' 15" W

Sand Bay
202
Sand Bay
205
Goulais Bay First Nation
Goulais Mission
M
203
Goulais Bay
Horseshoe Harbour
Goulais Point
(Lake Superior)
204
Maple Point

N

Scale
0 1 2
Kilometres
1:50,000

46° 38' 2" N
84° 38' 59" W

46° 38' 2" N
84° 28' 15" W

46° 46' 9" N
84° 31' 47" W

46° 46' 9" N
84° 21' 3" W

Kars Creek

Little Goulais River

Hwy. 17

Black Creek

Stony Point

Scale
0 1 2
Kilometres
1:50,000

Hwy. 522

205

Goulais Bay First Nation

Goulais Bay

North Channel

Goulais Bay

Goulais River

Goulais River

206

South Channel

Goulais Mission

M

203

Goulais Bay

Cranberry Creek

(Lake Superior)

Thielman Creek

Kelly Lake

204

Kelly Creek

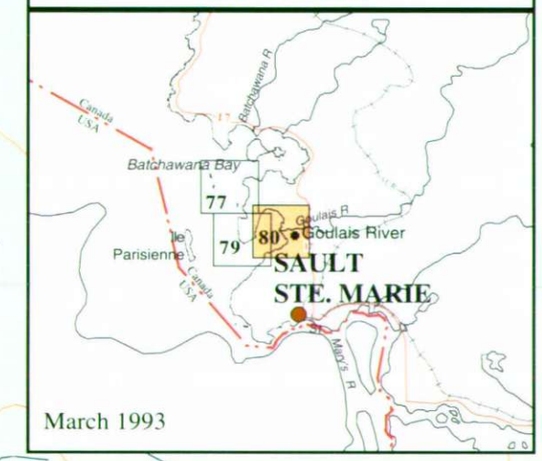
Maple Point

46° 39' 7" N
84° 31' 47" W

46° 39' 7" N
84° 21' 3" W

Map 80

Contains Sections From NTS Map Numbers:
41K/9, 41K/16, 41K/10 and 41K/15



March 1993

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

203 There is a good boat launch near Goulais Mission, but responders should contact the Chief of the local First Nation before seeking access from this location. This entire shoreline is heavily populated. Note the small wetland area in Horseshoe Harbour.

204 Seasonal fish spawning occurs along the shore from Kelly Creek to Maple Point, typically beginning in August.

205 All creeks emptying into Goulais Bay are locations of Rainbow Trout migration. Goulais Bay is restricted to commercial fishing. Much of the foreshore is very shallow sand flats. Most of the Goulais Bay shoreline is heavily populated, with residential and recreational usage. It is common for lake freighters to take shelter from storms in Goulais Bay.

206 The Goulais River mouth, from the opening of the South Channel, to the creek north of the North Channel opening, is a designated Environmentally Sensitive Area. This area, and the area marked at the mouth of Cranberry Creek further south, are both important wetland habitats that serve as stopovers for migratory waterfowl in Fall and Spring. Certain ducks breed here, as does the Woodcock, a game migratory bird. The Sandhill Crane, a wading bird species, is also found in the Goulais River delta. The mouths of all of these creeks and channels are therefore high priorities for protection in the event of a spill.

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

207 Seasonal Lake Trout spawning extends along the shore from Red Rock to North Gros Cap. The creeks emptying in this area are locations of seasonal Rainbow Trout migration activity.

208 Seasonal Lake Trout spawning occurs around Jackson Island, typically beginning in October.

209 Sault Ste. Marie Drinking Water Treatment Plant Intake - Call (705) 759-6500. Gros Cap is a small community with a good response staging area and access site. There are several Sensitive Classified Features in the area; contact Environment Canada ((416) 346-1971) before commencing response activity.

46° 38' 45" N
84° 38' 48" W

46° 38' 45" N
84° 28' 5" W

Red Rock

Whitefish Bay
(Lake Superior)

207

208

North Gros Cap

Jackson Island

Walls Lake

Prince Lake

209

126

Gros Cap

Canada
USA

46° 31' 43" N
84° 38' 48" W

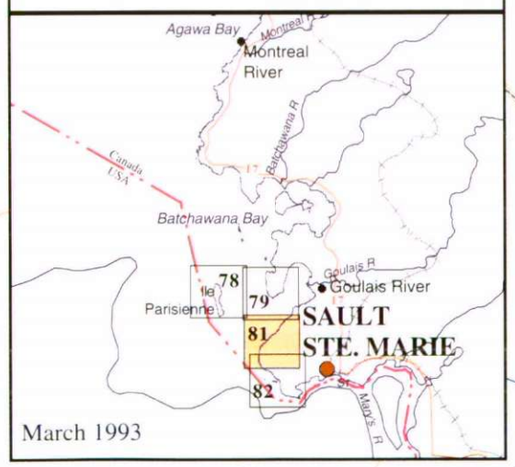
46° 31' 43" N
84° 28' 5" W

N

Scale
0 1 2
Kilometres
1:50,000

Map 81

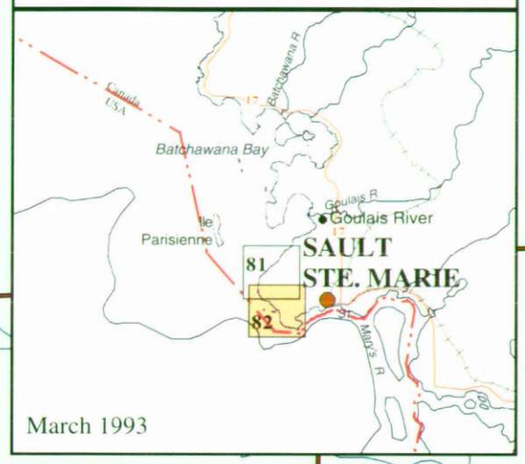
Contains Sections From NTS Map Numbers:
41K/10



March 1993

Map 82

Contains Sections From NTS Map Numbers:
41K/10, 41K/9 and 41K/8



March 1993

46° 33' 40" N
84° 37' 41" W

46° 33' 40" N
84° 26' 59" W

Prince Lake

Walls Lake

Scale
Kilometres
1:50,000

Jackson Island

208

209

126

Gros Cap

Gros Cap Reefs

211

(304)

210

Chéne Island

127

(255)

Shore Ridges Conservation Area

Hwy. 565

Little Carp River

Big Carp River

Carpin Beach

United States of America

Canada

Ontario

Michigan

Mary Ann Lake

Sault Ste. Marie Airport

Marks Bay

Point des Chénes Municipal Park

Pointe aux Pins

213

Pointe des Chénes

Pointe des Chénes

Pointe Louise

212

Pointe Louise

Map 82 is the easternmost map of the Lake Superior Study Area.
For information outside the study area, see the St. Mary's River Atlas (Sensitivity of Coastal Environments and Wildlife to Spilled Oil, Environment Canada).

Lake Superior

46° 26' 39" N
84° 37' 41" W

46° 26' 39" N
84° 26' 59" W

NOTES

A red exclamation point symbol is used on the maps to catch the responder's attention.

208 Seasonal Lake Trout spawning occurs around Jackson Island, typically beginning in October.

209 Sault Ste. Marie Drinking Water Treatment Plant Intake - Call (705) 759-6500. Gros Cap is a small community with a good response staging area and access site. There are several Sensitive Classified Features in the area; contact Environment Canada ((416) 346-1971) before commencing response activity.

210 Chéne Island and the island to its west are habitats for Great Blue Herons, and large colonies of Herring Gulls. The entire offshore area from Gros Cap Reefs downstream into Marks Bay is a very important spawning area for Whitefish in the Fall and also for commercial fishing activity.

211 Shore Ridges Conservation Area is comprised of beach terraces surrounded by a marsh. The marsh provides a natural habitat for a variety of wildlife and plants. Beavers are found in this area, as are Great Blue Herons, and Broad-winged Hawks. The rare Sandhill Crane is also found in the Conservation Area.

212 From Chéne Island south then east to Pointe aux Pins is a high use recreational beach and residential area.

213 This channel is the freighter entrance to the St. Mary's River. A submerged gas pipeline crosses the channel here. Ministry of Natural Resources launch their aircraft from Marks Bay. For sensitive features along the Canadian shoreline east of this area, refer to the St. Mary's River Environmental Sensitivity Atlas. For environmental sensitivity of United States shorelines in this area, contact the U.S. National Oceanic and Atmospheric Administration (N.O.A.A.).

Appendix A

Data Sources

Source agencies for data used in the creation of the Environmental Sensitivity Atlas for Lake Superior's Canadian Shoreline are listed below.

A.1 Biological Resources

A.1.1 Bird Information

Colonial Waterbird Nesting Sites
Contact - Dr. Hans Blokpoel
Contact - Gaston Tessier
Canadian Wildlife Service
49 Camelot Drive, Nepean, ON, K1A 0H3
(613) 952-2410

Waterfowl, Raptor, and Shorebird Data
Contact - Joe Carreiro
Canadian Wildlife Service
49 Camelot Drive, Nepean, ON, K1A 0H3
(613) 952-0931

Waterfowl Specialist
Contact - Ken Ross
Canadian Wildlife Service
49 Camelot Drive, Nepean, ON, K1A 0H3
(613) 952-2299

Waterfowl Specialist
Contact - D. Dennis
Canadian Wildlife Service
London, Ontario
(519) 681-0980

Ducks Unlimited
1-800-665-DUCK

Long Point Bird Observatory
Contacts - Ron Ridout
Raptor Information
John McCracken
Bird Migration Specialist
Dr. Richard Knapton
Waterfowl Specialist
P. O. Box 106
Port Rowan, Ontario
N0E 1M0
(519) 586-3531

Ministry of Natural Resources - Nipigon
Contact - Rosemary Hartly
Area Biologist Nipigon East
Nipigon, Ontario
(807) 887-2120

Ministry of Natural Resources - Thunder Bay
Contact - Carl Cooper
Wildlife Biologist
435 S. James St.
Thunder Bay, Ontario
P7C 5G6
(807) 475-1231

National Museum of Canada/Royal Ontario Museum
Flora and Fauna (including rare) information, historic data (geological, meteorological)

Royal Ontario Museum
Contact - Ross James
Curator of Ornithology

Thunder Bay Field Naturalist Club

University of Waterloo
Mike Cadman
Migratory Waterfowl
(519) 885-1211 ext. 3237

A.1.2 Fish Information

Canada Centre for Inland Waters
Fish and Ocean Charts
Burlington, Ontario
(416) 366-4549

Ministry of Natural Resources - Sault Ste. Marie
Fisheries Branch

Ministry of Natural Resources - Thunder Bay
Contact - Wayne McCallum
Fish Biologist
435 S. James St.
Thunder Bay, Ontario
P7C 5G6
(807) 475-1635

Ministry of Natural Resources - Nipigon, Terrace Bay, Wawa

A.1.3 Shore Associated Mammals

Ministry of Natural Resources - Thunder Bay, Nipigon, Terrace Bay, Wawa, Sault Ste. Marie

A.2 Countermeasures

Canadian Coast Guard (CCG)
Contact - Dan Badger
CCG Parry Sound District
Parry Sound, Ontario
(705) 746-2196

Canadian Coast Guard (CCG)
Contact - D. Clow
CCG Flight Supervisor
Parry Sound, Ontario
(705) 746-2196

Canadian Coast Guard (CCG)
Contact - Bob Carter
CCG Pilot
Parry Sound, Ontario
(705) 746-2196 ext. 249

Canadian Petroleum Products Institute
Contact - Chuck Bailey
Toronto, Ontario
(416) 492-5713

Ontario Ministry of the Environment - Sault Ste. Marie, Thunder Bay

Regional Environmental Emergencies Coordinator
Environmental Protection - Ontario Region
Environment Canada
(416) 973-1059

Janet Huehn (Contractor) in consultation with Environment Canada and Canadian Coast Guard
Contact - Environment Canada

Weather Information

Atmospheric Environment Service
Contact - Brian Smith
Meterological Station Sites, Meterological Data (wind, temperature, precipitation etc.)
8th Floor
25 St. Clair Ave. East
Toronto, Ontario

A.3 Human-Use Resources

A.3.1 High Recreational Usage

Ontario Ministry of the Environment - Thunder Bay, Sault Ste. Marie

Ministry of Natural Resources - Thunder Bay, Nipigon, Terrace Bay, Wawa, Sault Ste. Marie

Various Conservation Authorities

Anchorage Sites

Richardson's Chartbook and Cruising Guide: Lake Superior Edition

Small Craft Harbours

Department of Fisheries and Oceans (DFO)
Contact - Serge Metikosh
Small Craft Harbours
(416) 336-4637

A.3.2 Resource Extraction

Water Intakes

Canadian Great Lakes Basin Intake and Outfall Atlas, Ontario Ministry of the Environment

Commercial Fisheries Activity

Department of Fisheries and Oceans (DFO)
(416) 336-4637

Ministry of Natural Resources - Thunder Bay, Nipigon, Terrace Bay, Wawa, Sault Ste. Marie

A.3.3 Special Status Areas

Archaeological Site Information

The Ontario Ministry of Culture, Tourism and Recreation includes the following statement as a matter of standard policy with data distribution: "While the Ministry of Culture, Tourism and Recreation attempts to maintain a current and reliable database covering all known archaeological occurrences in the province, the Ministry waives responsibility for the quality, accuracy and completeness of this information and any damages which may be incurred through its use."

Heritage Policy Branch
Ontario Ministry of Culture, Tourism and Recreation
Contact - Bernice Field
Archaeological Site Database
77 Bloor St. West
Toronto, Ontario
(416) 314-7161
(416) 314-7790 (Fax)

Area of Ecological Significance

Canadian Wildlife Service
Nepean, ON
(613) 952-0931

Ministry of Natural Resources - Thunder Bay, Nipigon, Terrace Bay, Wawa, Sault Ste. Marie

Areas of Natural and Scientific Interest (ANSI)

Ministry of Natural Resources - Nipigon
Contact - Lands Division
Areas of Natural and Scientific Interest
Nipigon, Ontario
(807) 475-1451

Ministry of Natural Resources - Terrace Bay
Contact - Lands Division
Areas of Natural and Scientific Interest
Terrace Bay, Ontario
(807) 825-3205

Ministry of Natural Resources - Thunder Bay
Contact - Lands Division, Dave Coons
Areas of Natural and Scientific Interest
435 S. James St.
Thunder Bay, Ontario
P7C 5G6
(807) 475-1451

Conservation Area Information

Association of Conservation Authorities of Ontario
Contact - Jan Street
Suite 127
Times Square
380 Armour Road
Peterborough, Ontario
K9H 7L7
(705) 749-9131

Lakehead Region Conservation Authority
(807) 344-5857

Ministry of Natural Resources Conservation Authority Information
Contact - Phyllis Miller
Toronto, Ontario
(416) 314-1978
Sault Ste. Marie Region Conservation Authority
(705) 946-8530

Dune Formation Information

Canada Mapping Company
211 Yonge Street
Toronto, Ontario
(416) 362-9297

Energy, Mines and Resources Geological Survey of Canada
Ottawa, Ontario
(613) 995-4342

Federal Publications
165 University Ave.
Toronto, Ontario
(416) 581-1552

Ministry of Natural Resources Crown Lands
77 Wellesley St., MacDonald Block
Toronto, Ontario
M7A 2C1
(416) 314-2001

Ministry of Natural Resources
Surveys, Mapping and Remote Sensing Branch
Geographic Information Services
Topographic Data Base
90 Sheppard Ave., East, 4th Floor
North York, Ontario
M2N 3A1
(416) 392-2510

Ministry of Northern Development and Mines
900 Bay St.
Toronto, Ontario
(416) 314-3790

Ontario Geological Survey
Mines and Minerals Information Centre Library
c/o Janet Heitshu
Rm. M2-17
900 Bay Street, MacDonald Block
Toronto, Ontario
M7A 1C3
(416) 314-3803

Ontario Government Book Store
(Publications, road maps, and Provincial Electorial Districts)
Toronto, Ontario
(416) 326-5300

Environmentally Sensitive Areas

Association of Conservation Authorities of Ontario
Contact - Jan Street
Suite 127
Times Square
380 Armour Road
Peterborough, Ontario
K9H 7L7
(705) 749-9131

Lakehead Region Conservation Authority
(807) 344-5857

Ministry of Natural Resources Conservation Authority Information
Contact - Phyllis Miller
Toronto, Ontario
(416) 314-1978

Ministry of Natural Resources - Thunder Bay, Nipigon, Terrace Bay, Wawa, Sault Ste. Marie

Sault Ste. Marie Region Conservation Authority
(705) 946-8530

First Nation Information

Indian and Northern Affairs Canada
Toronto, Ontario
(416) 973-6234

Ministry of Natural Resources
Native Register Population (maps of settlements - numbers, locations, resources used)

National Parks

Canadian Parks Service
Pukaskwa National Park Warden
(807) 229-0801

Provincial Parks, Nature Reserves or Wilderness Areas

Ministry of Natural Resources - Thunder Bay, Nipigon, Terrace Bay, Wawa, Sault Ste. Marie

A.4 Shoreline Habitats

Shoreline Classifications

Regional Environmental Emergencies Coordinator
Environment Protection - Ontario Region
Environment Canada
(416) 973-1059

Andrew Podor (Contractor)
Geomorphologist
Contact - Environment Canada

Aerial Photos

Energy, Mines and Resources
Air Photo Sales
Ottawa, Ontario
((613) 995-4560

Ministry of Natural Resources
Aerial Mapping Service
First floor, Room # M173
900 Bay (Corner of Bay and Wellesley)
Toronto, ON
(416) 314-2001

Ministry of Natural Resources
Air Photos (road, forestry and ground)
77 Wellesley St., MacDonald Block
Toronto, Ontario
M7A 2C1
(416) 314-2001

Ministry of Natural Resources
Surveys, Mapping and Remote Sensing Branch
Geographic Information Services
Topographic Data Base
90 Sheppard Ave., East, 4th Floor
North York, Ontario
M2N 3A1
(416) 392-2510

University of Toronto Mapping Library
Toronto, Ontario

University of Waterloo Map and Design Library
Environmental Studies Building #1
University of Waterloo
Waterloo, Ontario
(519) 885-1211

A.5 Base Maps and Mapping System

Digital Layer Creation

Environment Canada and Digimap Data Services Inc. (Contractor)
Contacts - Bruce Mooney & Michael Quinn
Digimap Data Services Inc.
37 Kodiac Crescent, Unit 3
North York, Ontario
(416) 633-2213
(416) 633-3248 (Fax)

Municipal Maps

Ontario Base Maps (OBM) 1:2 000
Ministry of Natural Resources
Topographic Mapping Section
90 Sheppard Ave., East, 4th Floor
North York, Ontario
M2N 3A1
(416) 733-5090

Topographical Maps

Natural Resources Canada
615 Booth Street
Ottawa, Ontario K1A 0E9
(800) 661-2638

Ministry of Natural Resources
Crown Lands (land titles, patents and leases)
77 Wellesley St., MacDonald Block
Toronto, Ontario
M7A 2C1
(416) 314-2001

Ministry of Natural Resources
Topographical Maps
77 Wellesley St., MacDonald Block
Toronto, Ontario
M7A 2C1
(416) 314-1666

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Appendix B - Listing of National Topographic System (NTS) Map Sheets

The following NTS map sheets (1:50,000 scale) cover the Canadian portion of the Lake Superior shoreline.

Map Sheet	Year	Map Sheet	Year
52A/4	1975	42D/8	1987
52A/3	1975	42D/1	1987
52A/6	1990	42C/4	1979
52A/11	1979	41N/13	1986
52A/10	1975	41N/12	1986
52A/7	1975	41N/5	1986
52A/8	1988	41N/14	1986
52A/9	1975	41N/15	1976
52A/15	1975	41N/10	
52A/16	1976	& 41N/11	1976
42D/13	1979	41N/7	1976
42D/12	1987	41N/2	1987
42D/14	1979	41K/16	1975
42D/11	1987	41K/15	1975
42D/10	1986	41K/10	1983
42D/15	1980	41K/9	1983
42D/16	1979	41K/8	
42D/9	1979	& 41K/7	1983

Appendix C

References and Suggestions for Further Reading

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To assist users in discerning one shoreline colour from another, a removable Legend insert has been included with the atlas. If required, users may line up this card over the shoreline habitat in question, to determine the exact colour of a given habitat.

Legend

Shoreline Habitats

ESI* Ranking

Bedrock or Impermeable Shores

- 1a Exposed Bedrock Bluff less than 1 metre elevation
- 1b Exposed Bedrock Bluff 1-5 metre elevation
- 1c Exposed Bedrock Bluff greater than 5 metre elevation
- 2 Retaining Wall/Harbour Structure/ Breakwaters
- 3 Shelving Bedrock

Unconsolidated Sediment Shores

- 4 Exposed Sediment Bluff
- 5a Sand Beach: Depositional
- 5b Sand Beach: Erosional or Transitory
- 6 Sand Barrier With Lagoon
- 7a Pebble Beach
- 7b Pebble/Cobble Beach
- 7c Cobble Beach
- 8 Rip Rap
- 9 Boulder Beach
- 10 Mixed Beach (% by sediment in DOE Database)

Vegetated Shores

- 11 Low Vegetated Bank (Grass or Trees)
- 12 Delta Mud Flat
- 13a Fringing Wetland
- 13b Broad Wetland

* ESI - Environmental Sensitivity Index
Higher numbers indicate greater sensitivity

Biological Resources

Fish

- Area of Seasonal Fish Spawning
- Location of Seasonal Fish Migration

Birds

- Migratory Waterfowl
- Colonial Nesting Birds (total nests - all species)
- Wading Birds (total nests - all species)
- Shore Birds
- Raptors

Shore Associated Mammals

- Furbearers (such as Muskrat, Mink, and Beaver)

Human-Use Resources

High Recreational Usage

- Marinas and Small Craft Harbours
- Anchorage Sites
- Residential, Recreational or Cottage Use
- High-Use Recreational Beach

Resource Extraction

- Water Intakes - Industrial
- Water Intakes - Municipal
- Commercial Fisheries Activity

Special Status Areas

- Highly Sensitive Classified Feature (within 2km)
- First Nation
- National Park
- Provincial Park, Nature Reserve or Wilderness Area
- Conservation Area or Municipal Park
- Environmentally Sensitive Area*
- Areas of Natural and Scientific Interest*
- Area of Ecological Significance (*e.g.* Wetland)
- Dune Formations

* As identified by Ontario Ministry of Natural Resources or Conservation Authorities

Countermeasures

- Access Site (for land vehicles)
- Approach Concerns: Foreshore Flats/Rocky Reef
- Exposed Rock
- Coast Guard Light Station
- Boat Launch: Excellent
- Boat Launch: Good
- Boat Launch: Poor
- Helicopter Landing Site
- Staging Area: Excellent
- Staging Area: Good
- Staging Area: Poor
- Automated Weather Stations

Canada