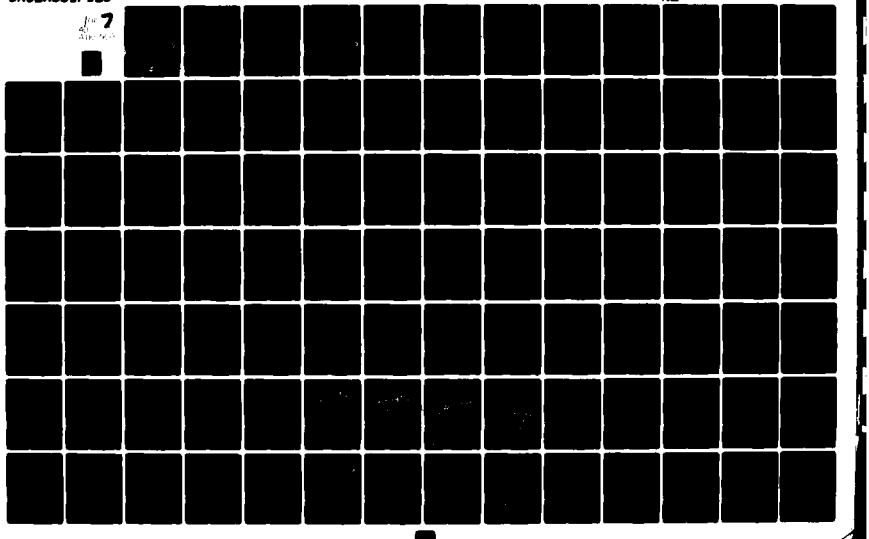
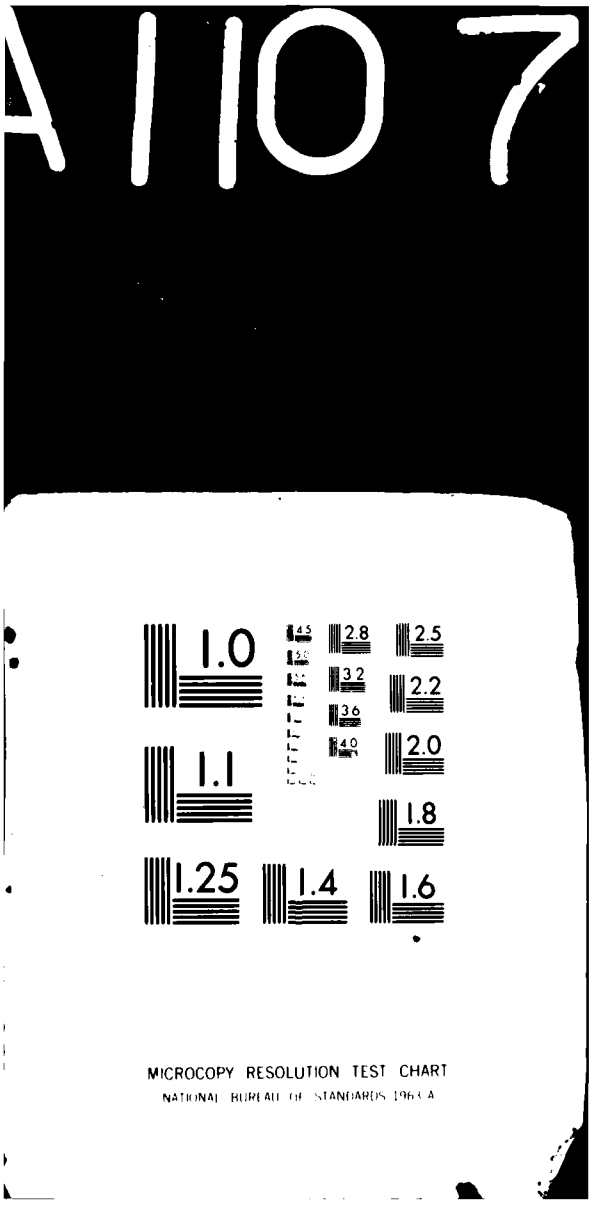
AD-A110 760 FISH AND WILDLIFE SERVICE CORTLAND NY F/G 6/3
BIOLOGICAL SURVEY ALONG THE ST. LAWRENCE RIVER FOR THE ST. LAWR--ETC(U)
1979

UNCLASSIFIED NL




A110 7
1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963 A

LEVEL II

BIOLOGICAL SURVEY ALONG THE ST. LAWRENCE RIVER FOR THE ST. LAWRENCE SEAWAY ADDITIONAL LOCKS AND OTHER NAVIGATION IMPROVEMENTS STUDY

1979

by

U.S. Fish & Wildlife Service
Cortland, New York

AD A110760

DTIC FILE COPY

DTIC ELECTE FEB 9 1982 S D H

DISTRIBUTION STATEMENT A
Approved for public release;
Distribution Unlimited

82 02 09 088

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A110760 / 3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* Biological Survey Along the St. Lawrence River for the St. Lawrence Seaway Additional Locks and Other Navigation Improvements Study.	5. TYPE OF REPORT & PERIOD COVERED Final Report, May-Nov. 1979
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s)	8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Fish and Wildlife Service, 100 Grange Place, Room 202, Cortland, New York 13045	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS	12. REPORT DATE 1979
	13. NUMBER OF PAGES 574
14. MONITORING AGENCY NAME & ADDRESS *(if different from Controlling Office)* U.S. Army Corps of Engineers, Buffalo District, 1776 Niagara Street, Buffalo, New York 14027	15. SECURITY CLASS. *(of this report)* Unclassified
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT *(of this Report)*

Distribution Unlimited.

17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*

18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Amphibians, benthos, benthic, biological, biomass, birds, fish, invertebrates, locks, mammals, methods, reptiles, St. Lawrence River, substrates, survey, vegetation.

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

Biological surveys were conducted between May-November 1979.

Samples of benthic invertebrates were collected on the St. Lawrence River from May through October, 1979. Oligochaeta, Chironomidae, and Amphipoda were the dominant taxa by frequency and abundance. Molluscs, particularly Unionidae and Hydrobiidae, dominated the standing crop biomass. Depth, substrate, location and season played major roles in the benthic community.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

structure.

Five sites in the lower Grasse River were sampled in May - November 1979 for fish populations by using trap nets, while six sites were sampled with seines. A total of 35 species of fish were captured. The most abundant species were spottail shiner, golden shiner, logperch and bluegill.

Bird studies were conducted along the international section of the St. Lawrence River from June through November, 1979. The primary effort was concentrated in the Massena area. Several methods were utilized to census the populations. Among these were direct observations and listening to songs along transects, roadside fringe areas and river overlooks. Waterbird colonies were also surveyed. Islands in the area were occupied by gulls and terns. Open water areas are important as staging areas for Canada Geese and migratory ducks. A variety of upriver areas where also surveyed.

Mammals were sampled with a variety of live traps during the summer of 1979. Tracking was done during the winter. Of the 37 species believed to occur in the vicinity of Massena, 18 are considered common, 5 common to rare, 11rare, and 3 seasonal. Hardwood and old-field sites had the highest species richness and abundance, while grassland sites were typically inhabited by a few species with low abundance.

Amphibians and reptiles were sampled with a variety of traps and observed in other ways such as turning over logs, sifting through debris, and listening to mating calls. This survey was done during the summer of 1979. Seven frog, one toad, and one salamander species were found in the area, although one other frog and seven other salamander species probably occur here. Among the reptiles, two snake and four turtle species were discovered inhabiting the area. Seven others may be present.

Habitat mapping was completed for the Eisenhower-Snell locks area during 1979. Cover types were delineated: open areas, grasses and perennials, shrublands, deciduous forests, coniferous forests, wetlands and urban-industrial areas.

(6)

BIOLOGICAL SURVEY ALONG THE ST. LAWRENCE RIVER FOR THE ST. LAWRENCE SEAWAY ADDITIONAL LOCKS AND OTHER NAVIGATION IMPROVEMENTS STUDY

1979

DTIC
ELECTE
FEB 9 1982
S D
H

by

U.S. Fish & Wildlife Service
Cortland, New York

DISTRIBUTION STATEMENT A
Approved for public release;
Distribution Unlimited

Executive Summary

Benthos

Samples of benthic invertebrates were collected on the St. Lawrence River from May through October, 1979. Oligochaeta, Chironomidae, and Amphipoda were the dominant taxa by frequency and abundance. Molluscs, particularly Unionidae and Hydrobiidae, dominated the standing crop biomass.

Depth, substrate, location, and season played major roles in the benthic community structure. Upriver sites were higher in abundance, biomass, and diversity than Massena sites. Abundance and biomass increased and changes were prevalent in the community structure between May and October. More organisms (particularly Amphipoda) were found in samples containing large quantities of aquatic macrophytes than in those without macrophytes.

Few differences were present between the channel and non-channel sites on transects, except for those due to substrate. The Wiley-Dondero Canal has a relatively low productivity due to the poor substrate (clay and sand), water level fluctuations from lock operations, ship activity, and dredging.

The distribution of benthic invertebrates was aggregated, and, within similar depths, substrates, and habitat, abundance, biomass, and diversity were variable.

DTIC COPY INSPECTED

Accession For
NTIS GRA&I
DTIC TAB
Unannounced
Justification
By
Distribution/
Availability Codes
Dist
A

Fish

Five sites in the lower Grasse River were sampled in 1979 with trap nets, while six sites were sampled with seines. A total of 35 species of fish were captured, most of them in the seines. The most abundant species were spottail shiner, golden shiner, logperch, and bluegill.

The most productive sites were those around the mouth of the Grasse River.

Birds

Bird studies were conducted along the international section of the St. Lawrence River from June through November, 1979. The primary effort was concentrated in the Massena area. Several methods were utilized to census the populations. Among these were direct observations and listening to songs along transects, roadside fringe areas, and river overlooks. Waterbird colonies were also surveyed.

In the locks area near Massena, Red-winged Blackbirds, Starlings, American Robins, and sparrows occurred frequently, with Red-winged Blackbirds being the most abundant species. The islands in the area were occupied by gulls and terns. Some of these islands are important nesting sites. The open water areas are important as staging areas for Canada Geese and migratory ducks such as Common Mergansers, Redheads, Ring-necked Ducks, and Black Ducks, and are used as feeding areas by many gulls and tree swallows.

A variety of upriver areas where dredging may occur were surveyed throughout the sampling season. Wilson Hill Game Management Area, islands and shoal areas near Jacques Cartier State Park, the American Island corridor, the Oak Point corridor, and the Blind Bay corridor were important as waterfowl migration staging areas. Common Terns and several species of gulls utilized many of the islands in the area. Common Loons were frequently observed in October in the Oak Point and Blind Bay corridors.

Mammals

Mammals were sampled with a variety of live traps during the summer of 1979. Tracking was done during the winter. Of the 37 species believed to occur in the vicinity of Massena, 18 are considered common, 5 common to rare, 11 rare, and 3 seasonal. Hardwood and old-field sites had the highest species richness and abundance, while grassland sites were typically inhabited by a few species with low abundance.

Trapping on islands showed that the greatest variety of mammals was found on large islands near the mainland. The small and distant islands harbored dense populations of typically one species, the meadow vole.

Amphibians and Reptiles

Amphibians and reptiles were sampled with a variety of traps and observed in other ways such as turning over logs, sifting through debris, and listening to mating calls. This survey was done during the summer of 1979. Seven frog, one toad, and one salamander species were found in the area, although one other frog and seven other salamander species

probably occur here. Amphibians are generally absent from the Wiley-Dondero Canal-Robinson Creek area, probably due to rapid water-level fluctuations. Frogs are more common in the lower Grasse River where conditions are more hospitable.

Among the reptiles, two snake and four turtle species were discovered inhabiting the area. Seven others may be present. The garter snake is the most common reptile, while snapping turtles and painted turtles occur in most aquatic areas having standing water year-round. The Blanding's turtle, which is especially sensitive to environmental perturbations and has been proposed for "threatened" status, has been found in the study area.

Vegetation

Habitat mapping was completed for the Eisenhower-Snell locks area during 1979. Six cover types were delineated. Open areas included powerline rights-of-way and open fields. Grasses and perennials such as goldenrod and milkweed predominated. Shrublands represented a successional intermediary between open fields and deciduous forests and were dominated by such species as hawthorn, buckthorn, staghorn sumac, and dogwood. Deciduous forests included stands of early successional species such as aspens, American elm, and white ash, as well as mature stands consisting of mixtures of sugar maple, white ash, shagbark hickory, basswood, and oak. Coniferous forests were represented by one small white pine stand near the mouth of Robinson Creek. Wetlands were represented by small riverine cattail marshes. Urban-industrial areas included factories, concentrations of dwellings, Seaway maintenance and support function areas, and other developed areas.

BIOLOGICAL SURVEY
ALONG THE ST. LAWRENCE RIVER
FOR THE ST. LAWRENCE SEAWAY ADDITIONAL LOCKS
AND OTHER
NAVIGATION IMPROVEMENTS STUDY, 1979

TABLE OF CONTENTS

EXECUTIVE SUMMARY I

INTRODUCTION VI

BENTHOS . . . . . A

FISH . . . . . B

BIRDS C

MAMMALS . . . . . D

AMPHIBIANS AND REPTILES . . . . . E

VEGETATION . . . . . F

EXISTING CONDITIONS PROFILE . . . . . G

APPENDIX . . . . . a

INTRODUCTION

During the period of May through November, 1979, the U. S. Fish and Wildlife Service's Cortland Field Office conducted field studies along the St. Lawrence River in connection with the St. Lawrence Additional Locks Study. These studies covered benthos, mammals, fish, birds, amphibians, reptiles, and vegetation. The major focus of these studies was on the area surrounding the Eisenhower and Snell Locks near Massena, New York. However, some studies extended upriver to cover areas that could be impacted by potential dredging activities.

The purpose of these studies was to develop information that could be used in determining the direct impact of constructing new lock facilities on the study site. These studies were not intended and cannot be used alone as a basis for evaluating the impacts of the Additional Locks proposal on the ecology of the St. Lawrence River. This type of analysis would require a broader and more intensive study effort that would encompass the whole system in question.

The studies presented in this report do not include an analysis of the impacts the different alternatives may have on fish and wildlife resources; rather they provide a basis for analysis of direct impacts as stated above. Impact analysis of the different alternatives developed for this project will be considered in a planning aid letter to be sent under separate cover to the Buffalo District Corps of Engineers by September 15, 1980.

SECTION:A

BENTHOS

TABLE OF CONTENTS

	Page
List of Figures	A-II
List of Tables	A-III
List of Abbreviations and Symbols	A-VI
Introduction	A-1
Materials and Methods	A-2
Field	A-2
Laboratory	A-5
Data Conversion	A-8
Results and Discussion	A-9
Species Composition	A-9
Geographical Distribution of Benthic Invertebrates	A-10
Seasonal Trends of Benthic Communities	A-14
Most Productive and Least Productive Sampling Sites	A-16
Transects	A-17
Wiley-Dondero Canal Between Locks	A-28
Grasse River	A-29
Oil Pollution	A-30
Benthic Invertebrate Association with Aquatic Macrophytes	A-30
Island and Shoal Comparisons	A-33
ISLANDS	A-33
SHOALS	A-39
Maintenance Dredging	A-41
Dominant Taxa	A-41
Comparison with Previous Studies	A-51
Summary and Conclusions	A-52
Literature Cited	A-55
Figures	A-56
Tables	A-83

LIST OF FIGURES

Figure Number		Page
1	Locations of benthos stations B01-B02.	A-56
2	Locations of benthos stations B03-B11.	A-57
3	Locations of benthos stations B12-B35.	A-58
4	Locations of benthos stations B36-B57 and B69.	A-59
5	Locations of benthos stations B58-B65.	A-60
6	Locations of benthos stations B66-B68.	A-61
7	Locations of benthos stations B70-B73.	A-62
8	Location of benthos station B74.	A-63
9	Locations of benthos stations G01-G02 and G08-G12.	A-64
10	Locations of benthos stations G03-G07, G13-G15, Q01-Q05, and B75-B77.	A-65
11	Location of benthos station B79.	A-66
12	Locations of benthos stations B78 and B80-B81.	A-67
13	Locations of benthos stations B82-B84.	A-68
14	Location of benthos station B85.	A-69
15	Locations of benthos stations D06-D10 and B86-B88.	A-70
16	Locations of benthos stations D01-D05.	A-71
17	Locations of benthos stations B89-B90.	A-72
18	Locations of benthos stations B91-B92.	A-73
19	Locations of benthos stations B93-B100, C01-C10, and A01-A10.	A-74
20	Locations of benthos stations 001-010.	A-75
21	Location of benthos station B101.	A-76
22	Location of benthos station B102.	A-77
23	Location of benthos station B103.	A-78
24	Locations of benthos stations B104-B106.	A-79
25	Locations of benthos stations B107-B115 and R01-R02.	A-80
26	Locations of benthos stations B116-B118 and R03-R07.	A-81
27	Locations of benthos stations B119-B120.	A-82

LIST OF TABLES

Table Number		Page
1	Locations of Benthic Sampling Stations in the St. Lawrence River.	A-83
2	Site Conditions of Benthic Sampling Stations in the St. Lawrence River.	A-84
3	Benthos Station Transects.	A-85
4A	Substrates and Depths - Massena Sites.	A-86
4B	Substrates and Depths - Islands and Shoals.	A-87
4C	Substrates and Depths - Upriver Sites.	A-88
4D	Average Secchi Disk Readings at Benthic Sampling Stations in the St. Lawrence River in 1979.	A-89
4E	Secchi Disk Readings - Massena Sites.	A-90
4F	Secchi Disk Readings - Upriver Sites.	A-92
4G	Secchi Disk Readings - Islands and Shoals Sites.	A-93
4H	Weather Conditions During Benthos Sampling.	A-94
5	Phylogenetic List of Invertebrates Collected on the St. Lawrence River in 1979.	A-95
6	Occurrence of Taxa at Benthos Stations by Month.	A-97
7A	Abundance of Benthic Invertebrates by Station (May, Massena Sites).	A-99
7B	Abundance of Benthic Invertebrates by Station (July, Upriver Sites).	A-100
7C	Abundance of Benthic Invertebrates by Station (August, Massena Sites).	A-101
7D	Abundance of Benthic Invertebrates by Station (August, Islands and Shoals).	A-102
7E	Abundance of Benthic Invertebrates by Station (October, Massena Sites).	A-103
7F	Abundance of Benthic Invertebrates by Station (October, Upriver Sites).	A-104
8A	Biomass of Benthic Invertebrates by Station (May, Massena Sites).	A-105
8B	Biomass of Benthic Invertebrates by Station (July, Upriver Sites).	A-106
8C	Biomass of Benthic Invertebrates by Station (August, Massena Sites).	A-107
8D	Biomass of Benthic Invertebrates by Station (August, Islands and Shoals).	A-108
8E	Biomass of Benthic Invertebrates by Station (October, Massena Sites).	A-109
8F	Biomass of Benthic Invertebrates by Station (October, Upriver Sites).	A-110
9	Average Weights Used in Estimating Biomass	A-111
10	Shannon-Weaver Diversity Indices.	A-112

List of Tables (continued)

Table Number		Page
11	Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979 - All Stations.	A-113
12	Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979 - All Massena Stations.	A-116
13	Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979 - May Massena Stations.	A-118
14	Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979 - August Massena Stations.	A-120
15	Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979 - October Massena Stations.	A-122
16	Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979 - All Upriver Stations.	A-124
17	Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979 - July Upriver Stations.	A-126
18	Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979 - October Upriver Stations.	A-128
19	Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979 - Stations In Channel Between Locks.	A-130
20	Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979 - Stations Non-channel Between Locks.	A-131
21	Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979 - Stations with Dominant Macrophyte Vallisneria americana.	A-132
22	Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979 - Stations with Dominant Macrophyte Myriophyllum exalbescens.	A-134
23	Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979 - Stations with Dominant Macrophyte Heteranthra dubia.	A-136
24	Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979 - Stations Channel Side of Cedar Island.	A-138

List of Tables (continued)

Table Number		Page
25	Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979 - Stations Non-Channel Side of Cedar Island.	A-140
26	Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979 - Stations Channel Side of Atlantis Island.	A-141
27	Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979 - Stations Non-Channel Side of Atlantis Island.	A-143
28	Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979 - Chimney Island Shoal Stations.	A-145
29	Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979 - Clark Island Shoal Stations.	A-146
30	Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979 - Samples Containing Oil.	A-147

LIST OF ABBREVIATIONS AND SYMBOLS

ABBREVIATIONS

A = adult

Avg. = average (mean)

Bio. = biomass

Cum. = cumulative

g = grams

L = larvae

m = meters

mm = millimeters

Mol. = molluscs

no. = number

Occur. = occurrences

P = pupae

Unid. = unidentified

w/o = without

SYMBOLS

< = less than

% = percent

= number

+ = < 0.1% or $\leq$ 0.0001 g/m^2 or < $1/m^2$

* = colonies; can't be enumerated

X = no biomass estimate made

> = greater than

INTRODUCTION

The St. Lawrence River is an important navigational waterway linking the Atlantic Ocean with the Great Lakes. In recent years several projects have been proposed for the river. Among these proposals are an extended navigation season and the construction of additional locks in the Massena area. The impacts of these activities are poorly understood since little is known about the ecology of the St. Lawrence River. Studies of the river are rare, with the most notable being the Environmental Assessment of the FY 1979 Winter Navigation Demonstration on the St. Lawrence River.

Benthic invertebrates were chosen to be studied for many reasons. Some serve as indicator organisms of clean or polluted waters, and many are important components of the decomposition process. They also serve as an important link in the food chain. Mills, Smith, and Forney (1978) stated that benthos are important because of their association with the sediment/water interface, and therefore disturbances due to environmental modifications should be carefully evaluated.

The Additional Locks proposal involves twinning the existing locks or building a new canal with one lock, extensive upriver dredging to widen and deepen the channel to permit the passage of larger vessels, and island removal to permit turning of larger vessels. Among the probable impacts on the benthic community from this proposal are degradation of habitat from construction, spoil disposal, and operation and maintenance; changes in the community due to water level fluctuations; and changes

resulting from increased navigational use. Among the probable impacts from dredging are changes in species diversity and abundance; changes in movement patterns of organisms caused by changes in current patterns and velocities; change in bottom type; and destruction of existing communities by spoil disposal (U. S. Dept. of Interior 1976).

This study was divided into three parts - the immediate construction area around Massena, the upriver areas where potential dredging sites exist, and important islands and shoals located near potential dredging sites along the river. The goal of this study was to obtain information on the benthic community structure in these areas which would enable us to evaluate probable impacts.

MATERIALS AND METHODS

Field

Locations of sampling stations are shown in Figures 1-27. Stations were divided into three groups. The first group - the Massena sites - consisted of 69 stations numbered B01 through B69, located from the International Border near the mouth of the St. Regis River upriver to Richards Point. These stations were each sampled four times - in May, June, August, and October. The second group - the upriver sites - consisted of 51 stations

numbered B70 - B120, located from Cat Island Shoal upriver to Calumet Shoal (off Clayton, New York). These stations were sampled three times each - in July, September, and October. The sites of the third group, the islands and shoals, were sampled once in late July or early August. These stations were numbered as follows: A01-A10 (Atlantis Island), C01-C10 (Cedar Island), D01-D10 (Chimney Island Shoal), G01-G15 (Goose Neck Island Shoal), O01-O10 (Oak Island), Q01-Q05 (Clark Island Shoal), and R01-R07 (Little Round Island).

The original plan called for sampling just the Massena sites around the immediate construction area. These sites were to be sampled monthly. In June, when new information on potential upriver dredging sites became available, the upriver sites were added. Both groups were then sampled bi-monthly, beginning with the upriver sites in July. The last samples for the upriver group were taken in October instead of November due to time and weather considerations.

The sites in the Massena group were selected to provide transects across areas of potential dredging, and to sample areas where siltation from dredging might settle out. Depth, current, and substrate were other factors influencing site selection. Several stations were proposed for the channel downriver of Polly's Gut, but the current was too swift and the substrate too hard for proper sampling.

The sites of the upriver group were selected in the same manner. Numerous sites were rejected due to swift currents and hard substrates.

The island and shoal study was devised to determine the possible effects of dredging, island removal, ship wakes, and other disturbances on islands and shoals, which provide important habitat for fish and wildlife. Cedar Island was chosen due to its proximity to the channel near an area of potential dredging. Atlantis Island was chosen because it was directly inshore of Cedar Island and thus was protected from ship wakes and other disturbances. Oak Island was chosen because it was located in the same general area, was open to the channel but further away, and was larger in size. Five samples were taken at different depths on each of two sides of the island - the side facing the channel and the opposite side.

Little Round Island and several adjacent small islands were chosen as a sampling site because island removal may occur in this area to allow larger ships to turn. Five samples were taken on the channel side of this island group, although several were small due to rocky substrates. Only two samples could be obtained in the hard substrate on the non-channel side.

Clark Island Shoal was also selected because of possible island removal in that vicinity. A transect of five samples was taken across the shoal. Goose Neck Island Shoal was selected because it is a large shoal just downriver of several potential dredging sites. Fifteen samples were taken on the shoal at various depths. Chimney Island Shoal was selected because it is adjacent to a large area of potential dredging, and because

it was sampled during the environmental assessment for winter navigation. Ten samples were taken at various depths around the island and the adjacent shoal.

Samples were taken during daylight with a Ponar grab sampler, which samples an area of 49,450 mm^2 to a depth of approximately 150 mm (depth varied with substrate hardness, but most invertebrates are on or near the substrate surface). Each collection consisted of one grab which was placed in a plastic trash bag with a label indicating the date and location. A turbidity measurement (to the nearest 0.1 m) was taken at each station using a Secchi disk. Air and surface water temperatures were taken with a thermometer. Weather, wind, and wave height were also recorded at each station.

Within one or two days after collection, samples were sieved through a 235 micron mesh screen and preserved in jars containing 10% formalin with rose bengal dye (a stain which turns most animal proteins pink). Beginning with the August samples, a small portion of the substrate of each sample was preserved (before sieving) in a plastic bag containing 10% formalin. These bags were placed in the jars containing the samples for later use in organic analysis.

Laboratory

Samples were rinsed through a 235 micron mesh screen to remove the formalin and some fine sediments. The contents were then placed in an enamel pan and organisms were separated by sucrose floatation and water

sorting and placed in a labelled vial containing 40% isopropyl alcohol. Any plants found in the samples were identified and the approximate percentages of each were noted (this step was not done in May and July when few plants were present).

Organisms were then identified down to family or sub-family, enumerated, and stored in 40% isopropyl alcohol for later use in estimating biomass, after which time they were discarded. When sample processing was completed, estimates of biomass were made (time did not permit exact biomass measurements for each sample). Several representative samples were selected for each taxon (except the rare ones), and 100 organisms (or less for large or somewhat rare organisms) from each sample were counted into separate vials of water. The organisms and water were then placed in a tared crucible and dried for 24 hours at 60°C. After cooling in a dessicator for one hour, the crucibles were reweighed to determine the dry weight of the organisms. The weight was not corrected for preservatives. The dry weight was then divided by the number of organisms to obtain the number of grams per organism. The samples for a given taxon were then averaged. The biomass of molluscs included the shell because energy is used in the formation of the shell, and time constraints prohibited the dissection of the molluscs from their shells.

An analysis was also done to determine the percent organic matter in each substrate. After separating the organisms from a sample, a uniform portion of the substrate was placed in an aluminum dish and dried overnight

in an oven at 60°C. The substrate samples that were saved prior to sieving were also dried. The samples were then crushed with a mortar and pestle and placed in a tared crucible. The crucibles were then placed in a furnace at 550°C for one hour and twenty minutes to burn off the organic matter. After cooling, the crucibles were reweighed and the percent organic matter was calculated.

Due to time and manpower constraints, not all samples could be processed. It was assumed that one man could process 1.5 samples per day (based on prior experiences), but the samples taken from August through October proved to be much slower to process due to the large numbers of invertebrates and macrophytes. The actual rate of processing declined from about two samples per man-day down to about 0.7 samples per man-day. In addition, hiring restrictions prevented the acquisition of additional personnel.

Since all samples could not be processed, a priority system was set up to provide the best data possible. The first and last samples of each group were processed to show the seasonal variations. These included the May and October samples for the Massena group and the July and October samples for the upriver group. August samples were processed for those stations that showed tremendous variability between May and October.

Since the island and shoal samples took an exceptionally long time to process due to the substrates and the large number of organisms, only

certain ones could be completed. Cedar Island and Atlantis Island were chosen to allow a comparison between a protected island and an island open to the channel. Little Round Island was eliminated due to the poor quality of the samples. Chimney Island and Clark Island shoals were chosen over Goose Neck Island Shoal due to their closer proximity to potential dredging sites.

Organisms were identified according to Pennak (1978), Borror and DeLong (1964), Harman and Berg (1971), Merritt and Cummins (1978), and Ross (1967).

Data Conversion

All data were converted from raw numbers to number per square meter. This was accomplished by multiplying numbers by 20.222 (1 m^2 ÷ area sampled by Ponar = X).

Biomass estimates were made for each sample by multiplying the number of organisms of a given taxon by the average biomass per organism of that taxon. These figures are rough approximations of the biomass contained in each sample (Table 9). Biomass estimates were converted to grams per square meter by multiplying by 20.222.

All figures were also converted to a percent of the total for that station. Cumulative percent is the percentage of a given taxon plus the percentage of all those taxa ranked higher in that sample. "Biomass without molluscs" refers to the percentage of the biomass each taxon would occupy if the molluscs were excluded. This procedure was done to determine the relative value of the non-molluscs, since the molluscs completely dominated the overall total.

Diversities were calculated for each sample using the Shannon-Weaver diversity index. The formula for this index is $\bar{H} = -\sum_i P_i \log_e P_i$ where P_i is the decimal fraction of the total number of individuals belonging to the ith taxon. The higher the value of H, the greater the diversity. Diversity indices ranged from 0.000 to 2.185.

RESULTS AND DISCUSSION

Species Composition

Forty-seven taxa were taken in 294 samples, 292 of which contained organisms (Table 5). Twenty-one taxa were found in all months, while 13 were found in only one month (Table 6). Nine phylums were represented - Porifera, Coelenterata, Platyhelminthes, Nematoda, Nematomorpha, Bryozoa, Annelida, Arthropoda, and Mollusca. Two taxa were found only in upriver samples - Hydrozoa and Piscicolidae. Several taxa occurred only in Massena samples - Spongillidae, Collembola, Hemiptera, Corydalidae, Sisyridae, Hydrophilidae, Elmidae, Chaoborinae, and Athericidae. Three taxa were found only in the island and shoal samples - Curculionidae, Coccinellidae, and Elateridae.

The most abundant taxa on the river were Oligochaeta and Chironomidae, comprising 57.6% of the organisms taken (Table 11). Next in abundance were Amphipoda, Hydrobiidae, Sphaeriidae, Isopoda, Planorbidae, and Nematoda, which, together with Oligochaeta and Chironomidae, comprised 90.9% of the population.

Standing crop was dominated by molluscs, with Unionidae and Hydrobiidae comprising 95.8% of the biomass (Table 11). Other dominant taxa included Sphaeriidae, Oligochaeta, Pleuroceridae, Amphipoda, Chironomidae, Valvatidae, Planorbidae, and Physidae. All are molluscs except Oligochaeta, Amphipoda, and Chironomidae. Oligochaeta comprised 50.2% of the biomass excluding molluscs, and, together with Amphipoda, Chironomidae, and Trichoptera, comprised 91.9% (excluding molluscs).

The most common taxon was Chironomidae, which was found in 96.6% of the samples (Table 11). Other common taxa were Oligochaeta (92.2%), Amphipoda (71.4%), Sphaeriidae (65.0%), Trichoptera (65.0%), Nematoda (53.7%), and Hydrobiidae (53.4%).

Geographical Distribution of Benthic Invertebrates

Major differences were found in different sections of the river. Downriver of Snell Lock, most of the samples were taken in fairly shallow inshore areas, where the substrate is silty and high in organic matter (Table 4). Between Eisenhower Lock and Snell Lock, the substrate is generally clay or sand. The remainder of the Massena group sites are mostly sand or clay, with some silt. Between Cat Island Shoal and Galop Island, the upriver group sites are predominantly sand with some clay. Sand predominates around Chippewa Bay. Upriver of Kring Point, silt and shells predominate at the inshore sites, while rocks dominate the channel and deep sites.

The variations in benthic communities along the river are partly due to these substrate differences. The upriver sites were higher in abundance than the Massena sites (8852/m^2 and 7087/m^2, respectively), and the mean diversity was higher - 1.369 compared to 1.088 (Tables 12 and 16). Biomass was also greater in the upriver sites (446.0885 g/m^2 versus 197.5672 g/m^2). However, a greater number of taxa occurred in the Massena sites - 42 compared to 33. This latter difference is essentially accounted for by several taxa of Insecta (particularly several families of Coleoptera) that occurred in only one or two samples.

The water is much clearer upriver, as indicated by the much higher Secchi disk readings, which averaged 3.0m in the upriver sites compared to 1.8m in the Massena sites (Table 4D). Several factors could influence this, among which are the preponderance of silty clays and fine sands around Massena, the operation of the locks, the influx of several large, slow-moving tributaries near Massena, and the accumulation of suspended particles as the river travels from Lake Ontario. The lower turbidity in the upriver areas means more light reaches the bottom, resulting in greater primary productivity, which in turn promotes a larger benthic community. This may help account for the greater abundances in the upriver sites.

Since samples were taken in different months, it is difficult to compare the totals for the upriver sites and the Massena sites. However, all 120 sites were sampled in a two-week period in early October, so a

comparison can be made among these samples (Tables 15 and 18). The average Secchi readings for October were 3.6m upriver and 1.8m in Massena, and the average diversities were 1.528 and 1.202, respectively.

The dominant taxa by abundance and biomass were similar between the upriver sites and the Massena sites in October. The most abundant taxa were Oligochaeta (25.3%), Chironomidae (20.7%), and Amphipoda (17.5%) upriver, and Oligochaeta (48.0%) and Chironomidae (27.8%) in the Massena area. Unionidae dominated the biomass, with 82.6% and 83.6%, respectively. The only other taxon exceeding 10% of the total biomass was Hydrobiidae (12.8% upriver). Excluding molluscs, the biomass dominants were Oligochaeta (44.1%), Amphipoda (30.5%), and Chironomidae (12.0%) at the upriver sites, and Oligochaeta (73.0%) and Chironomidae (14.1%) at the Massena sites.

The most common taxa, based on frequency of occurrence, were similar for both areas, but their rank was different. In the upriver sites, Amphipoda (100.0%), Oligochaeta (100.0%), Chironomidae (96.1%), Bryozoa (88.2%), Hydrobiidae (84.3%), Sphaeriidae (82.4%), Planorbidae (80.4%), Trichoptera (72.5%), Nematoda (70.6%), and Valvatidae (66.7%) were dominant. In the Massena sites, molluscs were less common, with the dominants being Oligochaeta (98.6%), Chironomidae (95.7%), Sphaeriidae (85.5%), Trichoptera (82.6%), Nematoda (82.6%), Nematomorpha (73.9%), Amphipoda (66.7%), Hydracarina (65.2%), Ceratopogonidae (62.3%), and Bryozoa (59.4%).

The major differences between the October samples in Massena and those in the upriver sites were in abundance and frequency, with biomass having similar dominants. Among the notable differences in rank by number were Planorbidae (5th upriver, 14th Massena), Isopoda (6th and 12th), Nematoda (11th and 6th), Ceratopogonidae (23rd and 8th), and Haliplidae, which ranked 10th in Massena but did not occur upriver. The major differences in rank by frequency were in Amphipoda (1st upriver, 7th Massena), Bryozoa (4th and 10th), Hydrobiidae (5th and 13th), Nematomorpha (13th and 6th), Hydracarina (16th and 8th), and Ceratopogonidae (25th and 9th). Based on average number of organisms per occurrence, Planorbidae was ranked 5th upriver and 18th in Massena, Valvatidae was 10th and 20th (respectively), and Haliplidae ranked 6th in Massena but did not occur upriver. These rankings tend to show a trend toward molluscs upriver and insect larvae in the Massena area. These same trends are found when all of the samples taken during the year are used, rather than just the October samples.

Twenty of the twenty-seven most common taxa had their greatest abundance for one sample in October (ten in the upriver sites, ten in the Massena sites). Only three taxa exceeded 20,000 organisms per square meter in a given sample, and all but one of the five occurrences was in October (one taxon had three samples exceeding 20,000/m^2). These taxa were Chironomidae (B20, October, 27,077/m^2 ; B03 October, 26,309/m^2 ; B14, May, 25,176/m^2), Oligochaeta (B116, October, 22,770/m^2), and Amphipoda (B102, October, 21,476/m^2).

Seasonal Trends of Benthic Communities

Seasonal trends were also in evidence on the St. Lawrence River during 1979. The number of taxa, abundance, biomass, diversity, and Secchi readings all increased in a given area between May and October (Tables 12-18). In the Massena group, the average number per square meter increased from 2501 in May to 11,870 in October and the average biomass (g/m^2) increased from 147.3016 to 263.6374. The number of taxa jumped from 29 to 38, and the mean diversity was up to 1.202 from 0.984.

Ten taxa were found in more than 50% of the Massena area samples in October, compared to only four taxa in May, and Oligochaeta replaced Chironomidae as the number one taxon in biomass without molluscs, abundance, and frequency. The top ten taxa by abundance were similar (although the rank was slightly different), but the ranks of the next ten taxa were drastically different. Biomass rankings were almost identical, due to the much higher weight per organism of molluscs, which dominated almost all of the samples they occurred in.

Most taxa and most stations showed greater abundance and biomass in October than in May (Table 7). Diversities were varied, however, with 40 stations higher in October and 29 lower.

Similar seasonal trends were found in the upriver sites (Tables 17 and 18). Between July and October, diversities were up 0.319 (Table 10),

Secchi readings were up 1.2 meters (Table 4D), and the average number of taxa increased by 6. The average number per sample increased from 3624/m^2 to 14,081/m^2, although the average biomass was down from 460.7289 g/m^2 to 431.2606 g/m^2. This latter discrepancy was due to a decline in Unionidae clams. Without Unionidae, the average biomass increased from 36.6714 g/m^2 to 75.0523 g/m^2.

The three most abundant taxa were Amphipoda (34.1%), Chironomidae (24.1%), and Hydrobiidae (21.3%) in July, and Oligochaeta (25.3%), Chironomidae (20.7%), and Amphipoda (17.5%) in October. Unionidae dominated the biomass with 92.0% and 82.6%, respectively. Hydrobiidae comprised 12.8% of the biomass in October. Excluding molluscs, 90% of the biomass consisted of four taxa - Amphipoda, Chironomidae, Oligochaeta, and Trichoptera - in each month, but Amphipoda dominated July (60.6%) while both Amphipoda (30.5%) and Oligochaeta (44.1%) dominated October. Thirteen taxa occurred in over 50% of the samples in October, compared to only six in July.

Big increases occurred from July to October in Planorbidae, Ancylidae, Turbellaria, and Nematoda, whereas big decreases occurred in Unionidae and Nematomorpha. However, most taxa increased in abundance and biomass. Most diversities were higher in October (43 out of 51), but the ranking of the stations differed.

Most Productive and Least Productive Sampling Sites

Most individual stations showed major differences between May and October (Tables 7 and 8). The August samples tended to show more agreement with the October samples than with the May samples. The July and October upriver samples also showed major differences at most stations.

The samples with the greatest diversity were B95 (July), D10 (August), B105 (October), B101 (July), and B94 (October). These samples varied from 12 to 30 feet in depth. The substrates ranged from silt to rock (Table 4). All except B105 contained a large quantity of aquatic macrophytes, although each station had different plant species. The samples with the lowest diversity were B66, B55, B50, B46, and B45 - all from May. These samples were taken from various depths, but most were clay (B50 had a sand substrate), and all were in the vicinity of the locks in a channelized area. These substrates generally support low populations of invertebrates.

The samples with the greatest abundance were B102 (October) - 69,140/m^2; B116 (October) - 56,095/m^2; B20 (October) - 51,017/m^2; B113 (October) - 45,621/m^2; and B19 (October) - 43,093/m^2. The substrates at these sites varied, but most of the sites were relatively shallow (only B116 exceeded 13 feet). All five sites had large crops of aquatic macrophytes, with Myriophyllum exalbescens (water milfoil) dominant at all sites except B19, where Vallisneria americana (wild celery) was predominant. The

least abundant samples, all from May, were B66 (0/m^2), B55 (0/m^2), B50 (20/m^2), B35 (60/m^2), B31 (60/m^2), and B12 (60/m^2). All of these stations had a sand or clay substrate, except B12 which had a silty substrate with a large quantity of oil present (B12 was located off an outflow from Reynolds Metal). Four of the stations were located near or between the locks, and all except B12 and B35 were in areas over 30 feet deep. No plants were present at these sites and the substrates were very poor.

The greatest biomass occurred in B93 (July) - 5541.0342 g/m^2; B93 (October) - 3894.3709 g/m^2; B91 (July) - 3838.5846 g/m^2; B86 (October) - 3481.8685 g/m^2; and B10 (October) - 2782.6321 g/m^2. All of these samples were dominated by Unionidae clams. The substrates varied, but no aquatic macrophytes were present. All of the samples were taken at depths between 18 and 30 feet. The smallest biomasses occurred in May at stations B66 (0.0000 g/m^2), B55 (0.0000 g/m^2), B50 (0.0040 g/m^2), B35 (0.0100 g/m^2), and B34 (0.0127 g/m^2). These samples were the same as those with the least abundance and all had low diversities. The substrates at these stations were generally unfavorable for Unionidae, which is by far the dominant organism by weight over the whole river (86.7%).

Transects

Thirteen transects were established across areas of potential dredging (Table 3). Each transect consisted of three stations - one on the northern side of the channel in water shallower than the channel; one station in the channel; and one station on the southern side at approximately the same depth as the station

on the northern side. Transect I (Cat Island Shoal) has four stations; an additional station was added on the shoal. Two sets of samples were taken at each transect - one each in May and October for transects A through H, and one each in July and October for transects I through M.

Transect A (stations B15,B16,B20) stretches across the river from Polly's Gut to the mouth of the Grasse River. Extensive dredging could occur in this area. Station B15 had a soft clay substrate, while stations B16 and B20 had a silt substrate (Table 4). In May, the diversity and number of taxa were much lower in the channel sample (B16). Biomass was much greater in B15 due to the presence of Unionidae. Without molluscs, biomass was similar in all three stations. Oligochaeta and Chironomidae were the two most abundant taxa at all three sites, comprising 73.7% to 100.0% of the organisms.

In October, station B20 was significantly higher in abundance, biomass, diversity, and number of taxa (Tables 7 and 8). Station B16 generally ranked higher than station B15, which could be due to the substrate differences. Species composition varied, with Oligochaeta dominating stations B15 and B16, and Chironomidae dominating B20. Amphipoda was abundant in B20, but absent in B15, while Unionidae dominated the biomass in B15 and B16 but was absent in B20.

Overall, no real trends could be seen for transect A. This is probably due to the different substrates.

Transect B (stations B32,B31,B29) is located just upriver of Snell Lock. Station B32 had a sand substrate (Table 4), while the others had a soft clay substrate. Diversity was much greater in the channel (B31), but abundance

and biomass were considerably lower (Tables 7 and 8). Stations B32 and B29 were similar. Chironomidae dominated in May, while Oligochaeta and Chironomidae ranked first and second, respectively, in October. No molluscs were present in any of the samples.

The overall trends for transect B show a smaller, less diverse benthic community in the channel, although the same invertebrates dominate all three samples.

Transect C (stations B34,B33,B35) is located under the power lines between the locks. The channel substrate (B33) was sand, whereas the others were silty clay (Table 4). Chironomidae dominated all samples in May, while Chironomidae and Oligochaeta dominated the October samples. Very few organisms were present in May, with station B33 having the highest total (Tables 7 and 8). Station B34 had the highest totals for October, with station B33 ranking slightly ahead of station B35.

The overall trends for transect C show little difference between channel and non-channel samples, with the same dominants being present in all samples. Abundance, biomass, and diversity increased in all samples from May to October.

Transect D (stations B36,B38,B37) is located just downriver of the mouth of Robinson Creek. Station B37 contains silty clay, while the others have a soft clay substrate (Table 4). In May, Chironomidae dominated all samples, with Oligochaeta ranking second or third. These two species

also dominated the biomass, comprising 84% to 91% of each sample. Station B37 had lower abundance and biomass totals, but a slightly higher diversity than the other two stations (Tables 7 and 8).

In October, station B37 had considerably greater abundance and biomass totals. Oligochaeta and Chironomidae ranked first and second, respectively, at all three stations, comprising 85.4% to 93.3% of the total abundance. The same two taxa dominated the biomass along with Sphaeriidae clams. Ceratopogonidae and Trichoptera were important components of the biomass (excluding molluscs) in all three samples.

The trends for transect D show no significant differences between channel and non-channel samples. The biggest variable was the substrate, with stations B36 and B38 (both soft clay) being somewhat similar in numbers and biomass, while station B37 was higher (October) or lower (May).

Transect E (stations B40,B41,B42) is located just downriver of Eisenhower Lock above the mouth of Robinson Creek. Extensive dredging could occur in this area (Table 2). The channel (B41) substrate was hard clay, while the other two stations had a silty clay substrate (Table 4). In May, the channel sample, which was more diverse, contained more taxa, a greater abundance, and a larger biomass than the other two sites (Tables 7 and 8). The percent organic matter after screening was considerably higher in the channel sample, indicating more fine particles in the non-channel samples. The dominants varied.

In October there was more variability among the three samples, with B40 having the greatest diversity, B42 the greatest abundance, and B41 the greatest biomass (molluscs occurred only in B41). Oligochaeta and Chironomidae ranked first and second, respectively, in both abundance and biomass without molluscs in all three samples, while Nematoda, Nematomorpha,and Ceratopogonidae rounded out the top five in abundance in all cases.

The trends for transect E showed a larger, more diverse benthic community in the channel during May when organisms were scarce. When the populations increased, the non-channel sites surpassed the channel site in some categories. The percent organic matter was higher in the channel.

Transect F (stations B51,B50,B49) is located just upriver of Eisenhower Lock. Extensive dredging could occur in this area. The channel sample (B50) has a sand substrate, whereas the other samples have a silty clay substrate (Table 4). Diversity, abundance, and biomass were all lower in the channel in May, as only one organism (Chironomidae) was found there (Tables 7 and 8). Chironomidae, Oligochaeta, and Ceratopogonidae comprised the top three in both abundance and biomass in the non-channel samples. Both abundance and biomass were much greater in station B51 than in station B49.

In October, biomass, abundance, and number of taxa were all considerably lower in the channel than in the non-channel samples. Station B49 exceeded station B51 in abundance and biomass. Oligochaeta and Chironomidae dominated both the abundance and the biomass without molluscs in all three samples.

Sphaeriidae ranked second in biomass in both non-channel samples, but was absent from the channel.

The overall trends for transect F indicate a poorer habitat in the channel, probably due to the sand substrate. Diversities were similar from May to October, but abundance and biomass showed large increases in October.

Transect G (stations B54,B55,B56) is located upriver of Eisenhower Lock opposite Long Sault Lookout. Extensive dredging could occur in this area(Table 2). The substrate in the channel sample (B55) was hard clay, while in the non-channel samples it was sand (Table 4). In May, no organisms were found in the channel. Station B56 had much greater abundance and biomass totals than station B54, but the dominants were basically the same (Tables 7 and 8). Chironomidae and Ceratopogonidae ranked first and second, respectively, in total abundance, and Chironomidae ranked first in biomass without molluscs. No molluscs were present at station B54, whereas they comprised 99.7% of the biomass at station B56.

In October, the channel sample had a considerably smaller total abundance and biomass than the non-channel samples. Station B56 again had much greater abundance and biomass totals, but the dominants were basically the same. Oligochaeta, Chironomidae, and Sphaeriidae ranked first, second, and third, respectively, in abundance, while Sphaeriidae ranked first in biomass.

The overall trends for transect G indicate a poorer habitat in the channel, probably due to the hard clay substrate.

Transect H (stations B63,B64,B65) is located near Hopson's Bay. The channel sample had a hard clay substrate, while soft clay was present at the non-channel sites (Table 4). The channel sample had the highest diversity but the lowest abundance and biomass in May (Tables 7 and 8). No molluscs were present, and Oligochaeta and Chironomidae were the dominants in all three samples. Station B63 was considerably more productive than station B65.

In October, the channel had considerably lower abundance and biomass totals than the non-channel samples. Oligochaeta dominated the channel site, whereas Chironomidae dominated the non-channel sites. Sphaeriidae dominated the biomass at all three sites. B65 had a much greater abundance and biomass than B63. The macrophyte M. exalbescens was present in large quantities at B63.

The overall trends for transect H indicate a poor habitat in the channel, probably due to the hard clay substrate.

Transect I (stations B73,B72,B71,B70) is located across Cat Island Shoal. Station B71 is located in the channel and station B72 is on the shoal. Station B70 had a soft clay substrate, while the others had a sand substrate (Table 4). The channel had a very low diversity and the lowest biomass total in July (Table 8). Chironomidae and Oligochaeta dominated all samples, except in the channel where Amphipoda replaced Oligochaeta. Small numbers of organisms were present in all samples.

In October, Oligochaeta was the most abundant taxon in all samples. Other dominant taxa were Sphaeriidae, Amphipoda, and Chironomidae. Bryozoa was present at all sites. Sphaeriidae ranked first in biomass at all sites except B70, where Unionidae was dominant. All sites were similar in abundance and diversity, but site B72 (located on the shoal) was slightly higher.

The overall trends for transect I indicate no major differences between channel and non-channel samples. The shoal itself provided a slightly more productive habitat.

Transect J (stations B97,B96,B95) is located opposite Blind Bay, just downriver of Chippewa Bay. Station B95 had a silt substrate, while sand was present in the other stations (Table 4). In July, the five most abundant taxa were Hydrobiidae, Chironomidae, Amphipoda, Oligochaeta, and Sphaeriidae in all samples except B97, which lacked Chironomidae. Hydrobiidae was number one in abundance in B97 and B96, while Amphipoda ranked first in B95. Hydrobiidae and Sphaeriidae dominated the biomass except in B97 where Unionidae dominated.

The October samples were highly variable, with the channel sample having the greatest diversity and the highest abundance and biomass, the latter due to a larger number of Unionidae (Tables 7 and 8). Oligochaeta ranked first in abundance in B97 and B96, but third in B95. Amphipoda was first in B95, second in B96, and seventh (only 0.4%) in B97. Chironomidae ranked second

in B95 and third in B96, but was absent in B97. Biomass was dominated by Unionidae, Hydrobiidae, and Sphaeriidae, which ranked first, second, and third, respectively, and comprised between 98.6% and 99.8% of the biomass at each station. Station B95 had a large amount of the macrophyte Heteranthra dubia (water stargrass).

No overall trends were apparent for transect J.

Transect K (stations B98,B100,B99) is located between Cedar Island and Jorstadt (Dark) Island. Station B98 had a sand substrate, B100 a rock substrate, and B99 a detritus substrate (Table 4). In July, station B98 had much greater abundance and biomass totals than the other two stations (Tables 7 and 8). Very few organisms were present in the channel.

In October, the channel sample had the lowest diversity, abundance, biomass, and number of taxa. The macrophyte M. exalbescens was present in large quantities in the two non-channel samples. Oligochaeta, Chironomidae, and Amphipoda were abundant in all three samples, while Bryozoa colonies were present in both non-channel samples.

The overall trends for transect K indicate a poor habitat in the channel. This is due to the rock substrate, the swift current, and the small size of the sample obtained at this site. Station B98 is located too far from the channel to make a good transect, but deep waters prevented sampling closer to the channel.

Transect L (stations B112, B111, B110) is located between Tidd Island and Mason Point. Station B112 had a sand substrate, B111 a shell substrate, and B110 a rock substrate (Table 4). Hydrobiidae ranked first in abundance at all three stations in July (Table 7). Oligochaeta and Sphaeriidae ranked second and third, respectively, at stations B112 and B111, but were scarce or absent at B110. The channel (B111) had the greatest total abundance. Unionidae, Hydrobiidae, and Sphaeriidae ranked first, second, and third, respectively, at B112 and B111, but only Hydrobiidae was present at B110, where it comprised 98.3% of the biomass.

In October, the channel sample was lowest in abundance, biomass, and diversity (Tables 7 and 8). Hydrobiidae and Oligochaeta were important in all three samples. Bryozoa colonies were present at each site.

No overall trends were present for transect L due to the variability among the substrates.

Transect M (stations B118, B117,B116) is located near Round Island. A shell substrate was found at station B116, while rock substrates were found at the other two sites (Table 4). In July, the channel sample (B117) had the lowest diversity, abundance (Table 7), and number of taxa of the three stations. Hydrobiidae ranked in the top three in abundance at all three stations, ranking first at B117. Chironomidae and Amphipoda ranked first at B118 and B116, respectively. Hydrobiidae, Sphaeriidae, and Amphipoda ranked second and third, respectively, in total biomass for all three samples.

In October, the channel had the lowest diversity but the highest abundance and biomass (the latter due to the large number of Hydrobiidae present) (Tables 7 and 8). The species composition was similar, but the dominants differed. No plants were found in the channel; Elodea canadensis (common waterweed) and Ceratophyllum demersum (coontail) were abundant at B118 and M. exalbescens and C. demersum were abundant at B116. Hydrobiidae dominated the biomass, comprising between 75.2% and 89.0% of the total biomass at each station. Bryozoa colonies were present at all sites.

The overall trends for transect M show a lower diversity in the channel. This could be due to the rock substrate and lack of aquatic macrophytes. The biomass at all stations was dominated by the same molluscs. The most abundant taxa varied among the three sites.

Several additional transects were planned but could not be sampled due to currents, depths, or hard substrates. Many of the transects showed little difference between the channel and the non-channel sites. In most cases where the transects did show differences between channel and non-channel sites, the differences were most likely due to the substrate, which was generally harder in the channel due to the swift currents which prevent fine material from settling out.

In general, molluscs seemed to increase as you move from Massena upriver. Unionidae begins gaining prominence around Chippewa Bay.

Wiley-Dondero Canal Between Locks

Much of the potential dredging activity will take place in the Wiley-Dondero Canal between Eisenhower Lock and Snell Lock. Eighteen stations were located in this area - four in the channel and fourteen not in the channel (Table 2).

The diversities were similar between channel and non-channel sites, but both were lower than the overall average. Abundance and biomass were greater in the non-channel sites than in the channel sites (Tables 19 and 20). Chironomidae, Oligochaeta, and Ceratopogonidae were the most frequently occurring taxa. Oligochaeta and Chironomidae ranked first and second, respectively, in abundance. The dominant taxa by biomass differed. In the non-channel sites, Sphaeriidae comprised 44.4% of the biomass, followed by Oligochaeta at 39.7%. In the channel sites, Oligochaeta comprised 60.2%, Sphaeriidae 23.0%, and Chironomidae 12.6%.

The dominant species were similar between the channel and non-channel areas, but differed from those on the overall river. Ceratopogonidae ranked 13th in abundance overall, but 3rd in the area between the locks; Nematomorpha ranked 14th overall but 7th in the channel sites and 5th in the non-channel sites between the locks. Ceratopogonidae ranked 18th overall in biomass, but 4th in the channel and 6th in the non-channel sites, and Trichoptera ranked 11th overall but 5th between the locks.

In general, the habitat between the locks is considerably poorer than in other areas on the river. The abundances, biomasses, and diversities are generally lower in the locks area. This is probably due to several factors, including the clay and sand substrates, the water level fluctuations, the ship activity, and the dredging that has taken place there. The high turbidity between the locks makes the area less habitable for filter feeders such as clams. Many benthic invertebrates survive best in a stable environment, but the water level fluctuations from lock operations and wave action from ships passing through the narrow canal reduce the quality of the habitat in this area.

Grasse River

Six stations were sampled in the lower Grasse River. Three of these stations (B21,B22,and B23) were in an area where dredging is being considered as part of the Additional Locks project (Table 2). The other three stations (B24,B25, and B26) were upriver of the potential dredging areas. The dredging areas had a greater abundance, biomass, and diversity than the non-dredging areas, although both areas ranked below the overall average for the St. Lawrence River.

Oligochaeta and Chironomidae dominated both areas, just as they did for the St. Lawrence River. Unionidae dominated the biomass in the dredging sites, whereas Sphaeriidae and Oligochaeta dominated the non-dredging sites. Rankings for abundance and biomass were similar between potential dredging and non-dredging areas. Haliplidae was more abundant in the Grasse

River than in the overall samples, ranking 5th and 15th, respectively. Trichoptera ranked higher in biomass in the Grasse River (7th dredging, 5th non-dredging) than in the overall samples (11th).

The depths and substrates were similar at all six sites. Few differences were evident between the potential dredging sites and the non-dredging sites. In general, the Grasse River was not as productive as the overall average.

Oil Pollution

Several samples contained an oily substance which resembled diesel fuel (Table 30). Samples at stations B11, B12, and B15 contained oil in both May and October, while station B16 contained oil in May but not in October. In general, these samples had a lower abundance and biomass than the overall average for the river (3992/m^2 and 159.6520g/m^2 in the samples with oil, 7804/m^2 and 273.9887 g/m^2 overall). The dominants were similar, except that Nematoda and Erpobdellidae were more abundant in the samples with oil, and Hydrobiidae was less abundant. Nematoda are characteristic of sewer effluent and Hydrobiidae need a fairly clean environment.

Benthic Invertebrate Association with Aquatic Macrophytes

Aquatic macrophytes were found in many of the samples (Tables 21-23). The most common were Myriophyllum exalbescens (water milfoil), Heteranthra dubia (water stargrass), and Vallisneria americana (wild celery). Each of

these three species frequently dominated a site. Other important macrophytes were Ceratophyllum demersum (coontail), Elodea canadensis (common waterweed), Lemna trisulca (star duckweed), Chara vulgaris (muskgrass), and Najas flexilis (naiads).

A comparison was made among those samples dominated by a single macrophyte (an estimated 95% or more of the plant material) to determine whether different invertebrates preferred different species of macrophytes. Nineteen samples were dominated by M. exalbescens, thirteen by H. dubia, and six by V. americana. All three plant species had higher mean diversities than the overall average for the whole river of 1.236 (1.441, 1.756, and 1.573, respectively). The average abundance also exceeded the overall average of 7804/m^2. V. americana had the greatest average abundance (28,616/m^2), followed by M. exalbescens (18,946/m^2) and H. dubia (8685/m^2). V. americana also ranked first in average biomass (550.8173 g/m^2), followed by H. dubia (167.1469 g/m^2) and M. exalbescens (75.7091 g/m^2). The overall average was 273.9887 g/m^2. Since Unionidae clams comprise over 90% of the biomass of most samples they occur in, the comparisons could be somewhat biased. Eliminating Unionidae, the rankings were V. americana (143.7221 g/m^2), M. exalbescens (41.7845 g/m^2), and H. dubia (31.4485 g/m^2). The overall average was 36.5165 g/m^2.

Amphipoda, Chironomidae, and Oligochaeta occurred in 100% of the 38 samples being considered here, compared to 71.4%, 96.6%, and 92.2%, respectively, for all samples. Trichoptera occurred in 100% of the M. exalbescens samples, and Hydrobiidae, Nematoda, Nematomorpha, Sphaeriidae,

and Valvatidae occurred in 100% of the V. americana samples. Biomass was dominated by Unionidae and Hydrobiidae in all cases, which is consistent with the trends for the overall river. Chironomidae (34.3%) and Oligochaeta (26.9%) were the most abundant taxa in the V. americana samples, while Amphipoda (26.9%), Oligochaeta (23.9%), and Chironomidae (20.5%) dominated the M. exalbescens samples, and Oligochaeta (23.5%), Amphipoda (23.1%), and Chironomidae (19.4%) dominated the H. dubia samples. Amphipoda was generally more abundant in the plant samples than the overall average, which was 14.8%.

Five taxa recorded their greatest single-sample abundance in samples dominated by V. americana, seven in M. exalbescens samples, and one in a H. dubia sample.

The dominant taxa were similar among the three groups. The major differences in abundance were in Planorbidae, which ranked 4th in M. exalbescens samples, 8th in H. dubia samples, and 17th in V. americana samples; Valvatidae, 8th in M. exalbescens samples, 9th in H. dubia samples, and 15th in V. americana samples; and Ancylidae, 5th in V. americana samples, 7th in M. exalbescens samples, and 17th in H. dubia samples. The major differences in biomass were in Valvatidae (15th, 6th, and 9th, respectively, in V. americana, H. dubia, and M. exalbescens amples); Ancylidae (9th, 20th, and 13th, respectively); and Planorbidae (19th, 11th, and 7th, respectively).

The overall trends show the same general taxa dominating all three plant groups as those that dominated the overall samples, although the population was generally larger in the areas where macrophytes were concentrated. Among the three plant groups, V. americana appeared to be the most productive, followed by M. exalbescens and H. dubia. Many samples had combinations of these and other macrophytes.

Island and Shoal Comparisons

ISLANDS

A study was done to determine the possible effects of dredging, increased ship activity, island removal, and other activities on the islands and shoals of the St. Lawrence River.

Cedar Island was chosen because it represents an island near a potential dredging site. Five sites were sampled on each side of the island. The sites on the channel side had a higher mean diversity and much greater abundance (8870/m^2) and biomass (85.8864 g/m^2) than those on the non-channel side (3643/m^2 and 4.8911 g/m^2) (Tables 24 and 25). Amphipoda and Chironomidae were the most frequently occurring taxa on both sides of the island, and also ranked first and second, respectively, in abundance. Biomass was dominated by Unionidae and Sphaeriidae on the channel side and Sphaeriidae and Amphipoda on the non-channel side.

One major difference between the channel and non-channel sides of Cedar Island was the presence of Unionidae on the channel side, where it dominated the biomass. Other differences occurred in the ranking by abundance, where Glossiphoniidae was ranked 6th on the channel side but 12th on the non-channel side; Turbellaria was 9th and 20th, respectively; Planorbidae was 11th and 5th; Nematomorpha was 12th and 8th; and Lepidoptera was 17th and 9th, respectively.

The depths (in feet) at the five channel-side stations were 3, 6, 10, 13, and 21, and at the non-channel sites 3, 6, 10, 14, and 20 feet (Table 4). A comparison between the sites of the same or similar depths shows a wide variance in diversity, number of taxa, abundance, biomass, and percent organic matter. This could be due to the fact that the substrates varied between each pair of samples, and the aquatic macrophytes were different, or present at one site and absent at the other. The dominant taxa were generally similar at sites of similar depth, except in those instances where one of the dominants was absent at one site or the other.

Different organisms tended to dominate at different depths. Based on abundance, Amphipoda and Oligochaeta dominated at three feet, Isopoda and Chironomidae increased in importance at six feet, and Chironomidae dominated at 20 feet. Sphaeriidae dominated the biomass at shallow depths, with other taxa assuming dominance at the 20-foot stations. Excluding molluscs, Amphipoda dominated the biomass at the shallow sites, with Oligochaeta and Chironomidae more important at the deeper sites.

In general, there were no major differences in species composition between the channel and non-channel sides of Cedar Island, but the channel side had a more productive habitat, which could be due to the deposition of greater quantities of detritus on the channel side. The average percent organic matter after screening was 37% on the channel side compared to 24% on the non-channel side (the figures before screening were 6.2% and 8.5%, respectively).

Atlantis Island was chosen because it is near Cedar Island, is protected from the channel, and has a habitat similar to that of Cedar Island surrounding it. Five sites were sampled on each side of the island. The side referred to as the channel side is not open to the channel, but is shielded from it by Cedar Island. The samples from the non-channel side had a greater average abundance, but the channel side had a greater biomass and diversity (Tables 26 and 27). Five taxa (Amphipoda, Chironomidae, Hydrobiidae, Nematoda, and Oligochaeta) occurred at all ten sites, while Trichoptera and Glossiphoniidae occurred at all sites on the channel side, and Turbellaria and Isopoda occurred at all sites on the non-channel side. Amphipoda, Oligochaeta, and Chironomidae were the most abundant taxa on both sides, while the biomass was dominated by Sphaeriidae and Hydrobiidae, with Oligochaeta, Amphipoda, and Chironomidae being important on the non-channel side.

The major differences between the two sides of Atlantis Island were the ranking by abundance (Amphipoda 31.6% on the channel side, 16.5% on the non-channel side, and Chironomidae 11.0% and 41.8%, respectively) and the ranking by biomass

(Sphaeriidae 58.8% on the channel side, Hydrobiidae 38.5% on the non-channel side). Other differences in abundance were Sphaeriidae, ranked 4th and 11th (channel and non-channel, respectively), and Nematoda, 11th and 4th, respectively.

The depths (in feet) at the five stations on the channel side were 3, 6, 8, 10, and 12, while the depths on the non-channel side were 3,5,7,8, and 9 (Table 4). All of the stations had a silt substrate except one, which was predominantly sand. A comparison between sites of the same or similar depth shows a wide variance in abundance, biomass, and percent organic matter. Diversities were comparable at similar depths and the number of taxa did not differ greatly. Plant species were generally different at different stations.

The dominant taxa were similar at similar depths. Amphipoda and Oligochaeta were the most abundant taxa in the shallow sites, whereas Chironomidae was most abundant at the deeper sites. Hydrobiidae dominated the biomass at all but the shallowest sites.

In general, there were no major differences in species composition between the channel and non-channel sides of Atlantis Island. The non-channel side was more productive in terms of abundance, although the channel side had a greater biomass due to the much larger number of Sphaeriidae clams. The average percent organic matter was greater on the non-channel side (13.4% before screening, 48.8% after screening) than on the channel side (8.7% before, 28.9% after). A higher percent organic matter usually indicates a more productive habitat.

A comparison was also done between Atlantis Island and Cedar Island to determine whether the position relative to the channel was a factor in the benthic community composition. Atlantis had a greater diversity, greater abundance, and a larger number of taxa than Cedar, but Cedar had a larger average biomass, due to the presence of Unionidae (without Unionidae, Atlantis exceeded Cedar in average biomass). Chironomidae, Oligochaeta, and Amphipoda were the most abundant taxa at each island, but Isopoda was also important on Cedar. Sphaeriidae and Hydrobiidae dominated the biomass at Atlantis Island, while Unionidae and Sphaeriidae were predominant at Cedar Island. The most important components of the biomass, excluding molluscs, were Amphipoda, Oligochaeta, Chironomidae, Glossiphoniidae, and Isopoda, which comprised 92.2% of the total at Atlantis and 94.8% at Cedar.

The major differences in abundance were Turbellaria (ranked 7th at Atlantis, 12th at Cedar), Nematoda (5th and 9th, respectively), Hydrobiidae (9th and 16th), and Planorbidae (13th and 7th). The one major difference in biomass was the absence of Unionidae - which was ranked first at Cedar - at Atlantis.

Atlantis Island, in general, seemed to possess a better habitat than Cedar Island. This could be due to the higher percent organic matter in the substrates, which in turn may be due to the sheltered aspect of the island, as well as the shallower water.

A comparison of the channel sides of the two islands shows Cedar with a greater abundance and biomass, but Atlantis with a greater diversity and biomass without molluscs. The taxa occurring most frequently were basically the same, as

were the most abundant taxa, although Isopoda was important at Cedar Island but not at Atlantis Island. The major difference in the biomass dominants was the presence of Unionidae at Cedar Island. The major difference in abundance rankings was Hydrobiidae, which ranked 6th at Atlantis but only 14th at Cedar.

A comparison of the non-channel sites shows Atlantis Island with a larger number of taxa, a higher diversity, and a greater abundance and biomass than Cedar Island. The most abundant taxa were the same, but comprised different percentages of the total. Hydrobiidae was a more important component of the biomass at Atlantis, while Oligochaeta and Chironomidae were also important at Atlantis but not at Cedar.

There were many major differences in abundance rankings between the non-channel sides of the two islands. Nematoda ranked 4th at Atlantis but 11th at Cedar; Turbellaria was 6th and 20th; Glossiphoniidae was 8th and 12th; Planorbidae was 18th and 5th; and Hydrobiidae, Sphaeriidae, Nematomorpha, and Lepidoptera were ranked in the top ten at one island but not at the other. The major differences in biomass rankings concerned Turbellaria and Planorbidae. Turbellaria was ranked 9th on Atlantis but 20th on Cedar, while Planorbidae was 7th on Cedar but 15th on Atlantis.

In general, the comparisons of comparable sides of the two islands showed the same trends as the comparison between the whole islands. A comparison between the channel side of Atlantis Island and the non-channel side of Cedar Island (which are facing each other, separated only by a few tiny islands) showed essentially the same trends (Atlantis Island having a somewhat better habitat).

Other island sites were sampled but could not be processed due to lack of time and manpower. Little Round Island had a very hard substrate (essentially bedrock) and could not be properly sampled with the available equipment. Oak Island was also sampled but these samples contained basically the same substrates and plants as those samples from Cedar and Atlantis Islands.

SHOALS

Three shoals were also sampled. Samples from Goose Neck Island Shoal could not be processed due to time constraints. Clark Island Shoal and Chimney Island Shoal were chosen for processing due to their proximity to potential dredging areas. Data from Goose Neck Island Shoal would have been useful but was not vital to the study.

Chimney Island Shoal is located near an extensive area of potential dredging. The average diversity was very similar to the overall river - 1.276 compared to 1.236. This shoal differed considerably from the overall averages on the river for abundance and biomass (Table 28).

The average abundance was 10,051/m^2, compared to 7804/m^2 overall. The average biomass was somewhat lower, 233.9124 g/m^2 versus 273.9887 g/m^2 . Amphipoda ranked first in abundance, comprising 59.7%, compared to only 14.8% overall. Isopoda comprised 9.7%, compared to 2.7% overall; Oligochaeta comprised only 6.6% versus 31.0% overall; and Chironomidae comprised only 9.4% compared to 26.6% overall. Biomass dominants were similar, with Unionidae, Hydrobiidae, and Sphaeriidae ranking first, second, and third, respectively, in both instances. Excluding molluscs, Amphipoda

comprised 73.6% of the biomass on the shoal, compared to 24.0% overall.

In general, Chimney Island Shoal had a different species composition than the overall average on the river, due primarily to the large amounts of aquatic macrophytes present, particularly M. exalbescens. These plants tend to attract such organisms as Amphipoda and Isopoda in large numbers. Overall, however, the shoal was no more productive than many of the other areas on the river.

Clark Island Shoal is located in a potential turning area. Extensive dredging and possible island removal could occur in this area. Five sites were sampled at different depths on the shoal. The average diversity was somewhat lower than the average diversity over the whole river - 1.050 compared to 1.236 (Table 10). Amphipoda was more abundant than the average on the river, averaging 2981/m^2 and comprising 70.2% by abundance, compared to 1156/m^2 and 14.8% overall (Table 29). Amphipoda also dominated the biomass, comprising 49.8% of the total, compared to 0.3% overall. Sphaeriidae was also an important component of the biomass. The average abundance on the shoal was 4245/m^2 compared to 7804/m^2 overall, and the average biomass was 3.5918 g/m^2, compared to 273.9887 g/m^2 overall (36.5165 g/m^2 without Unionidae).

In general, Amphipoda was far more important on Clark Island Shoal than on the overall river. This is due to the large quantities of the macrophyte M. exalbescens, which tends to attract Amphipoda. Overall, however, the shoal

was less productive than many of the other areas on the river. The biomass was considerably less, due to the relative scarcity of molluscs.

Maintenance Dredging

Several sites were proposed for maintenance dredging in the summer of 1979. Sampling sites were selected in these areas. These four stations were B17, B31, B41, and B69. Each of these stations was sampled in May (before dredging occurred) and again in October (after dredging was done).

Samples from stations B17 and B31 contained very few organisms, so no major changes were seen from May to October. A moderate number of organisms was found at station B41. Chironomidae and Oligochaeta ranked first and second, respectively, in abundance in May, but reversed positions in October. Sphaeriidae dominated the biomass in May, while Oligochaeta dominated in October. No major changes were seen at station B69.

Overall there were no apparent trends in the dredged sites. The hard clay and sand substrates are relatively unproductive. A longer term study would be needed to assess the actual impacts of dredging on the benthic communities.

Dominant Taxa

Several taxa consistently ranked in the top ten in abundance or biomass (Tables 11-18). A discussion of these taxa (in phylogenetic order) and their habitats follows.

Nematoda (roundworms) occurred in 53.7% of the samples and ranked 8th overall in abundance. This taxon was more abundant at the Massena sites than at the upriver sites, ranking 6th and 11th, respectively. The number of Nematoda may be somewhat underestimated, due to their small size, which allows some to slip through the screen. Some may also be overlooked during the separation of organisms from the substrate. Nematoda had the lowest biomass per organism of any taxon sampled (0.00003 g).

The greatest abundance of Nematoda, 3640/m^2 , occurred in August at station A06. The substrate at this station was silt with a large quantity of the macrophyte V. americana present. The sample was taken at a depth of three feet. Nematoda are very adaptable and are found in a variety of habitats. Other samples which had comparatively large Nematoda populations (> 900/m^2) generally had a silt or soft clay substrate with a large amount of macrophytes, and were taken at shallow depths (13 feet or less). Mills, Smith, and Forney (Unpub.) found large numbers of nematodes near sewage outflows.

Nematomorpha (horsehair worms) occurred in 46.9% of the samples (ranked 8th), and ranked 14th overall in abundance. This taxon ranked higher in abundance in May and July than in October.

Nematomorpha can occur anywhere where an appropriate host, such as snails, insects, or oligochaetes, exists (Pennak 1978). The greatest abundance (1557/m^2) occurred at station B40 in October, which had a moderate number of

Oligochaetes and Chironomidae larvae. The substrate at this station was silty clay with no abundant macrophytes, and the depth was seven feet. Only one other sample contained more than 800/m^2. This station had a sand substrate and was dominated by Amphipoda and Chironomidae larvae.

Bryozoa (moss animalcules) are normally found in quiet areas with sunken logs, vegetation, or other suitable points of attachment (Pennak 1978). Due to their colonial nature, it is difficult to count individuals. Since our biomass estimates were calculated based on an average weight per organism, we were unable to compute biomass for Bryozoans. None were found in May or July. However, they occurred in 33.3% of the samples for the year, mostly in the upriver sites, where they ranked fourth in frequency in October (88.2%). Mills, Smith, and Forney (1978) recorded numerous "theca" in their study. After conferring with them, it was determined that these organisms were more likely an overwintering form of Bryozoa. Therefore, their "theca" is equivalent to Bryozoa, although we did collect growing Bryozoan colonies.

Oligochaeta (aquatic earthworms) feed on bottom mud and can thrive on low concentrations of dissolved oxygen. According to Pennak (1978), their relative abundance is determined by temperature. Oligochaeta are generally considered pollution indicators, as they tend to thrive in areas that are unfit for other organsims. Brinkhurst (1967) suggests that the proportion of oligochaetes to the other invertebrates is a good indicator of the organic pollution in an area.

Oligochaeta were found in 92.2% of the samples, second only to Chironomidae larvae, and ranked first in abundance, averaging 2421/m^2. This taxon ranked fourth in biomass and first in biomass without molluscs. It was less dominant in May and July (where it ranked second and fourth, respectively, in abundance) than in August and October (where it ranked first in both abundance and frequency).

The greatest abundance (22,770/m^2) occurred at station B116 in October. This station had a depth of 24 feet and a substrate of shells with the macrophyte M. exalbescens. Four other samples exceeded 16,000/m^2. These samples had either silt or sand substrates with no abundant macrophytes. Depths varied from 4 to 39 feet. All of these samples were taken in October.

In general, Oligochaeta was the most abundant taxa and frequently was found in very large concentrations. It occurred in all substrates, all months, and all parts of the river.

Isopoda (aquatic sow bugs) are usually found among rocks, vegetation, and debris in unpolluted shallows, usually one meter or less. They are seldom found in open water (Pennak 1978). Isopoda ranked 6th in abundance overall, but was ranked much lower (12th) in the Massena area than in upriver areas. It also ranked much higher (7th) in frequency upriver than in the Massena area (17th).

The greatest abundance of Isopoda occurred in August at station D08 (6936/m^2). This station was in a shallow area (9 feet) and had a sand substrate and large amounts of vegetation. Six other samples with more than 2000/m^2 were all in relatively shallow water (6-13 feet) and most contained plants.

In general, Isopoda was very abundant where plants were present, but relatively scarce at other sites.

Amphipoda (scuds) are normally found in unpolluted clear waters in vegetation or under debris or stones. An abundance of dissolved oxygen is necessary for their existence (Pennak 1978). Amphipoda ranked third in abundance, sixth in biomass, second in biomass without molluscs, and third in frequency. This taxon dominated the island and shoal samples where vegetation was abundant. Amphipoda ranked about the same in all months and sections of the river.

The greatest abundance of Amphipoda (21,476/m^2) occurred in October at station B102, which had a soft clay substrate with an abundance of the macrophyte M. exalbescens. The depth was nine feet. Seven other samples had 8000 or more Amphipoda per square meter. Most of these had vegetation (usually M. exalbescens), and all but one were in shallow water.

Amphipoda generally dominated the samples that had large quantities of vegetation and were frequently abundant in other samples.

Trichoptera (caddisflies) are found in all substrates where adequate dissolved oxygen is available (Pennak 1978). This taxon ranked 4th in frequency, but only 9th in abundance and 11th in biomass. Trichoptera larvae, found in 65% of the samples but frequently in rather low numbers, were ranked equally in all months and sections of the river.

The greatest abundance of Trichoptera larvae (9949/m^2) occurred at station B83 in October. This station had a soft clay substrate with large amounts of H. dubia and V. americana. Four other samples contained more than 1200 larvae per square meter. The substrates and depths of these samples varied, and only one had plants.

Trichoptera were abundant in the rocky areas with swift currents. They occurred in most samples but were usually rare.

Haliplidae larvae (crawling water beetles) are found most commonly among vegetation or trash in shallows or floating algal masses. This taxon ranked 9th in abundance in the Massena samples, but a ranking of 27th in the upriver sites resulted in an overall ranking of 15th. It was more abundant in May than in later months. Haliplidae occurred in only 11.6% of the samples, but averaged 295/m^2 in those samples where it occurred.

The greatest abundance of Haliplidae (4469/m^2) occurred in October at station B19. The sample had a soft clay substrate with V. americana, and was taken at a depth of ten feet. Only two other samples exceeded 1100 Haliplidae per square meter, and both were collected at station B03, where the substrate is almost totally detritus.

Chironomidae larvae (midges) was one of the dominant taxa on the river, ranking first in frequency (96.6%), second in abundance, and third in biomass without molluscs. It was the dominant taxon in May, but was overtaken by Oligochaeta in later months. Chironomids are an important fish food (Pennak 1978) and occur in all substrates in fresh water.

The greatest abundance of any organism was the 27,077/m^2 Chironomidae captured at station B20 in October. This station was three feet deep and had a silt substrate. Four other samples exceeded 16,000/m^2. The substrates in these samples were variable, but the depths were under 14 feet.

Chironomidae were found in almost every sample. They are frequently found in very large numbers and are one of the most important components of the benthic community.

Ceratopogonidae are frequently littoral or found around detritus. This taxon ranked eighth in the Massena area in abundance and fourth in frequency, but was relatively unimportant in the upriver areas. The greatest abundance (1982/m^2) occurred in October at station B37, which had a silty clay substrate. No other samples exceeded 800/m^2.

In general, Ceratopogonidae occurred in most of the samples in the Massena area (where poor substrates like clay and sand predominated) but usually in small numbers.

Dissolved oxygen is an important limiting factor for Gastropoda (snails), especially Ancylidae. They are usually found in shallow waters less than three meters deep (Pennak 1978). Several gastropods are important on the St. Lawrence River, where they comprise a large portion of the biomass.

Valvatidae are usually associated with aquatic plants. This taxon ranked 8th in biomass and 11th in abundance. It was of greater importance in the relatively good habitats of the upriver sites than in the poorer Massena sites. It was not found in any of the May samples. The greatest abundance ($3802/m^2$) occurred at station B102 in October. This sample, taken in nine feet of water, had a soft clay substrate and a large amount of M. exalbescens. Two other samples exceeded 1500 Valvatidae per square meter, and both had an abundance of M. exalbescens.

Hydrobiidae, also common around plants, was the most important gastropod on the St. Lawrence River. It ranked second in biomass, fourth in abundance, and seventh in frequency, and was ranked similarly for all months and all sections of the river. The greatest abundance ($12,821/m^2$) occurred at station B08 in October, at a depth of 16 feet in a silt substrate. V. americana was the dominant macrophyte in that sample. Six other samples exceeded $6000/m^2$; the substrates varied, only some had macrophytes, and the depths exceeded 13 feet.

Hydrobiidae is important because it is found in over half of the samples and is the second largest component of the standing crop biomass.

Pleuroceridae are usually found in rocks and sand. This taxon had the second highest biomass per organism (0.0775 g), and ranked fifth in overall biomass, fourth in the upriver area. It only ranked 22nd in abundance and 24th in frequency, however. Only one sample exceeded 250/m^2. This was station D02 in August, which had an abundance of 324/m^2. The sample was taken in four feet of water in a sand substrate. Pleuroceridae were rare but comprised a major portion of the biomass where they occurred.

Physidae are common where there is a moderate amount of aquatic vegetation or organic matter, but rare among dense mats of vegetation (Pennak 1978). This taxon ranked 10th in biomass, but only 17th in abundance and 18th in frequency. Only one sample exceeded 200/m^2. This sample was taken at station B102 in October in nine feet of water. The abundance was 1618/m^2.

Planorbidae ranked seventh in abundance, ninth in biomass, and ninth in frequency. It was most common in October, particularly in the upriver sites containing macrophytes. The greatest abundance (15,268/m^2) occurred at station B102 in October in a soft clay substrate with large quantities of M. exalbescens. Two other samples exceeded 6000/m^2; the substrates and depths varied, but both contained large amounts of vegetation.

Ancylidae (limpets) ranked 10th in abundance, but only 20th in frequency. This taxon was rare in May and July, but ranked ninth in abundance in October. The greatest abundance (6390/m^2) occurred at station B98 in October.

M. exalbescens was the dominant macrophyte in the sand substrate at this site. Three other samples exceeded 2000/m^2; all had a clay substrate, a depth of less than ten feet, and an abundance of macrophytes.

Pelecypoda (clams) occur in all types of unpolluted habitats but are most abundant in the shallow areas (< 2 meters deep). The largest populations are found in stable gravel or sand substrates. Bare rock, mud, and shifting sands are unsuitable as habitat (Pennak 1978).

Unionidae (freshwater mussels) does not usually occur around rooted vegetation. This proved to be the case on the St. Lawrence River. This taxon was not very abundant (21st) and occurred in only one quarter (23.8%) of the samples. However, it dominated the biomass in every sample it occurred in and easily ranked first for the entire year (86.7%), as well as in every month and every section of the river. This dominance is due to the fact that the average biomass per organism was 16.9623 grams, which was 219 times as heavy as the next highest (Pleuroceridae), and 410 times as heavy as the heaviest of the abundant taxa (Hydrobiidae).

Sphaeriidae (fingernail clams) are more widespread and occur on most substrates except clay and rock (Pennak 1978). This taxon ranked fifth in abundance, third in biomass, and fourth in frequency (65.0%). It was slightly less abundant in the upriver sites. The greatest abundance (4590/m^2) occurred at station B08 in October. This sample, taken in 16 feet of water, contained a silt substrate with large quantities of V. americana. Four other samples exceeded 3000/m^2. Three of these samples

had sand substrates, the depths varied, and plants were not abundant in any of them.

Overall, the most important taxa found on the St. Lawrence River were Oligochaeta, Chironomidae, and Amphipoda, which dominated the abundance (72.4% combined) and the non-molluscan biomass (88.6% combined), and Unionidae, Hydrobiidae, and Sphaeriidae, which dominated the overall biomass (98.5% combined).

Comparison With Previous Studies

Previous studies were done on the benthos of the St. Lawrence River in winter and summer of 1978 by Mills, Smith, and Forney as part of the Environmental Assessment for Winter Navigation Demonstration in FY 1979. Most of their sample sites were located in different areas than our sites. However, the same general sampling procedures were used, and some data comparisons can be made.

Mills, Smith, and Forney found that the benthic invertebrate standing crop was greatest near Lake Ontario where molluscs were abundant. Our data supported this conclusion. They also found that non-shelled biomass increased downriver and was dominated by chironomids, oligochaetes, and amphipods. Our data also concurred with these results. This shift to coarse particle feeders from fine-particle feeding molluscs was due to the velocity increase and the prevalence of sand, clay, and gravel downriver,

as opposed to the soft organic substrates found upriver.

Mills, Smith, and Forney also found that the benthic invertebrate distribution was aggregated, and that within similar depths, substrates, and habitats, the population and biomass are highly variable. Our data agreed with these results. Oligochaeta, Amphipoda, and Mollusca were the most abundant taxa in both studies. Mollusca dominated the biomass in both studies.

One major difference between this study and previous studies was that Mills' group found polychaetes throughout the river, most frequently at deep sites at Cape Vincent and Lake St. Lawrence. No polychaetes were found in the 1979 samples. This discrepancy could be due to several factors. No samples were taken at Cape Vincent in 1979, and few deep samples were taken in Lake St. Lawrence. Polychaetes were relatively rare on the rest of the river in 1978.

In general, the 1979 study tends to support the conclusions drawn in 1978.

SUMMARY AND CONCLUSIONS

A total of 294 samples from 155 sites on the St. Lawrence River were collected and processed between May and October 1979. Approximately 200 other samples were collected but could not be processed due to time and manpower constraints. The samples processed were chosen to encompass seasonal changes, various substrates, and all geographic locations. The samples that were not processed would have provided more in-depth coverage but were not vital to the study.

Oligochaeta and Chironomidae were the most abundant taxa, while Amphipoda, Isopoda, Nematoda, and Mollusca were also abundant. The standing crop biomass was dominated by molluscs, particularly Unionidae and Hydrobiidae. Oligochaeta, Amphipoda, and Chironomidae comprised the bulk of the non-molluscan biomass. Chironomidae, Oligochaeta, and Amphipoda occurred most frequently.

Molluscs dominated the biomass upriver, while the non-shelled biomass increased downriver. Unionidae dominated the biomass in almost all samples in which it occurred. It was most prevalent upriver from Chippewa Bay. Insecta were more dominant in the Massena area sites than in upriver locations.

Depth, substrate, location, and season played major roles in the benthic community structure. Upriver sites were higher in abundance, biomass, and diversity than the Massena sites. Abundance and biomass increased and changes were prevalent in the community structure between May and October. More organisms were found in samples containing large quantities of aquatic macrophytes than in those without macrophytes. Those sites dominated by the macrophyte Vallisneria americana were the most productive, followed by those dominated by Myriophyllum exalbescens. Shoals were important habitats due to their large concentrations of macrophytes, particularly M. exalbescens.

Few differences were present between the channel and non-channel sites on transects, except for those due to substrate. The area between Eisenhower Lock

and Snell Lock has a relatively low productivity due to the poor substrate (clay and sand), water level fluctuations from lock operation, ship activity, and dredging. The sites dredged during the summer of 1979 were relatively unproductive and no changes were evident after dredging, except those that could be attributed to seasonal changes.

In samples containing an oily substance, Nematoda and Erpobdellidae ranked much higher in abundance than in other samples. Hydrobiidae was ranked much lower in these oily samples than in other samples.

Atlantis Island, which is protected from the channel by other islands, has a more productive benthic community than Cedar Island, which is open to the channel. This higher productivity is probably due to the higher organic content of the substrates around Atlantis Island. The side of Atlantis Island facing the channel was slightly less productive than the inshore side, due mainly to a lower organic content in the substrate. The species composition was similar between the sites on the two sides. The same situation existed on Cedar Island, except that the channel side was more productive than the non-channel side, also due to a higher organic content.

The distribution of benthic invertebrates was aggregated, and, within similar depths, substrates, and habitat, abundance, biomass, and diversity were variable.

These conclusions generally agree with the conclusions from the 1978 studies by Mills, Smith,and Forney.

LITERATURE CITED

Borror, D.J. and D.M. DeLong. 1964. An Introduction to the Study of Insects. Holt, Rinehart and Winston, New York. 819pp.

Brinkhurst, R.O. 1967. The Distribution of Aquatic Oligochaetes in Saginaw Bay, Lake Huron. Limnol. Oceanogr. 12:137-143.

Fassett, N.C. 1957. A Manual of Aquatic Plants. University of Wisconsin Press. 405pp.

Harman, W.N. and C.O. Berg. 1971. The Freshwater Snails of Central New York. Search Agriculture 1:4. Cornell University Agricultural Experiment Station, Ithaca, New York. 67pp.

Hart, C.W.Jr. and S.L.H. Fuller. (Ed.) 1974. Pollution Ecology of Freshwater Invertebrates. Academic Press, New York. 387pp.

Merritt, R.W. and K.W. Cummins. (Ed). 1978. An Introduction to the Aquatic Insects of North America. Kendall/Hunt Publishing Co., Dubuque, Iowa. 441pp.

Mills, E.L., S.B. Smith, and J. L. Forney. 1978A. Benthic Sampling and Substrate Analysis at Ice Boom Sites. I. Benthic Invertebrate Populations. In: Environmental Assessment of the FY 1979 Winter Navigation on the St. Lawrence River. Technical Reports Vol. I. SUNY College of Environmental Science and Forestry, Syracuse, New York. 41pp.

_____. 1978B. Characterization of the Primary and Secondary Components of the St. Lawrence River Food Web During Summer 1978. Dept. of Natural Resources Cornell University, Ithaca, New York. 159pp.

_____. Unpublished. The St. Lawrence River in Winter: Population Structure, Biomass, and Pattern of its Primary and Secondary Food Web Components. 27pp.

Pennak, R.W. 1978. Fresh-water Invertebrates of the United States. 2nd Ed. J. Wiley and Sons, New York. 803pp.

Ross, H.H. 1967. A Textbook of Entomology. 3rd Ed. J. Wiley and Sons, New York. 539pp.

U.S. Department of the Interior. 1976. Ecological Studies for Navigation Season Extension on the St. Lawrence River. Fish and Wildlife Service, Cortland, New York. 166pp.

170

U. S. DEPARTMENT OF COMMERCE
NOAA–NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226

24th Ed., Aug. 31/74
14761
(formerly LS 11)

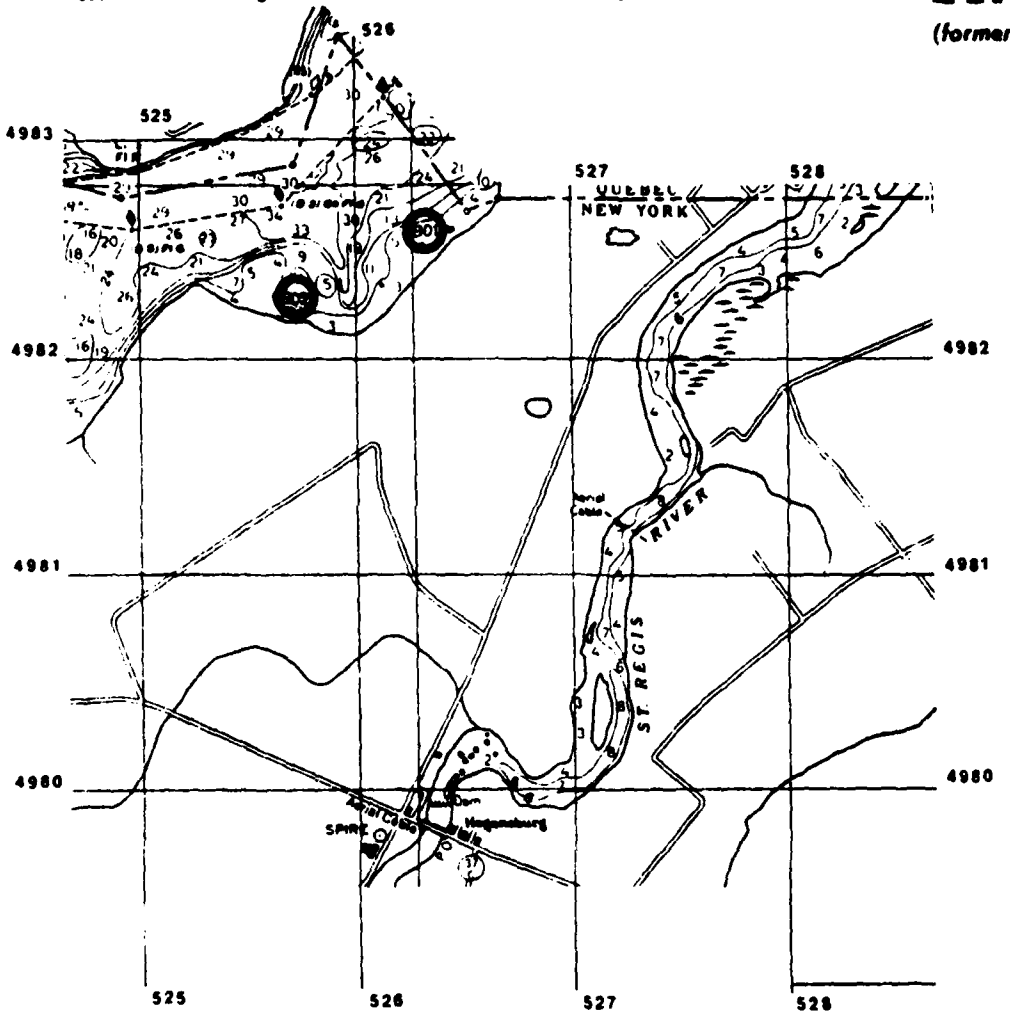


Fig. 1. Locations of benthos stations B01-B02.

B

COUNTERPART TO
HOGANSBURG

SOUNDINGS IN FEET

168

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

24th Ed., Aug. 31/74

14761

(formerly LS 11)

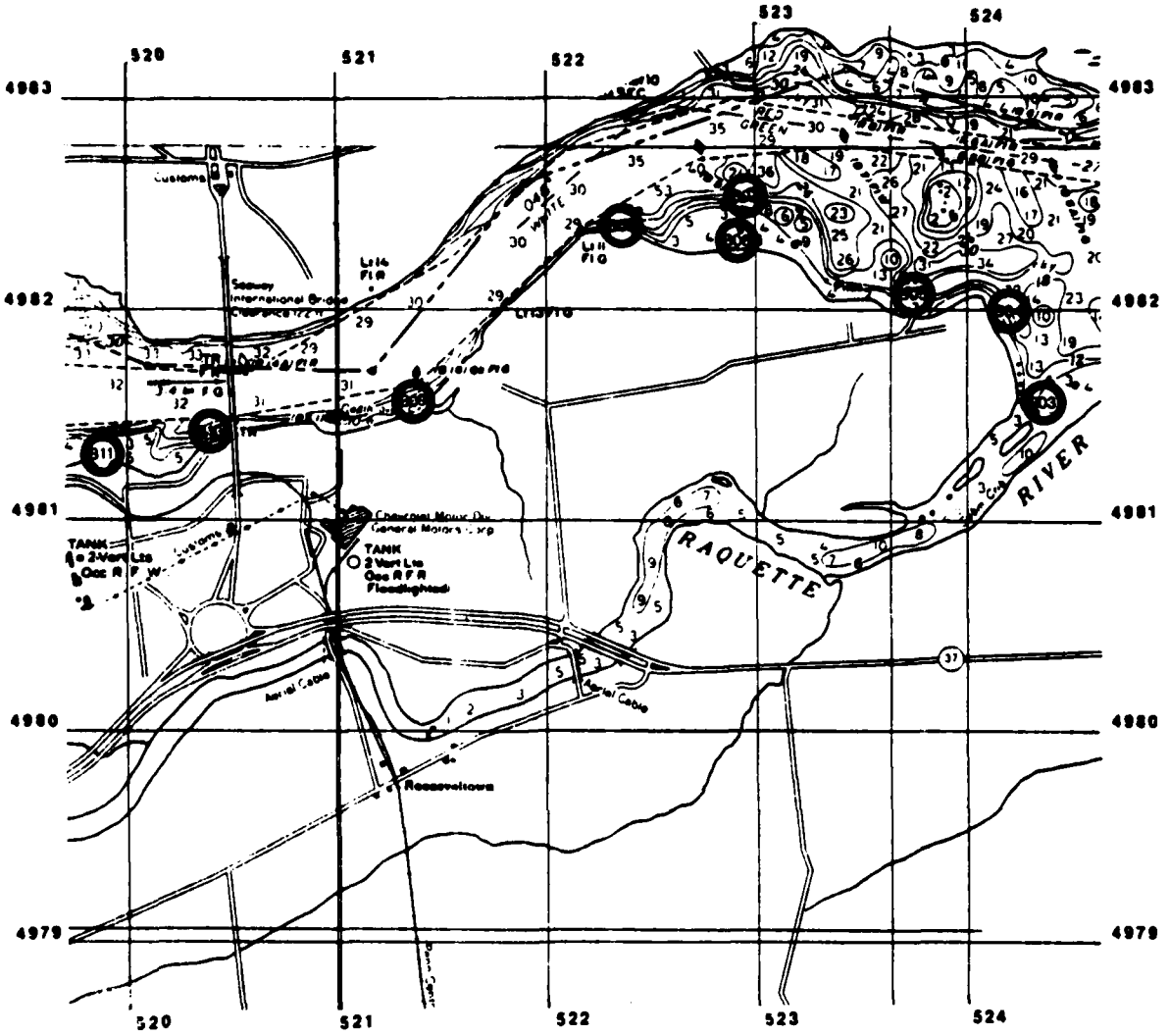


Fig. 2. Locations of benthos stations B03-B11.

A

COUNTERPART TO HOGANSBURG

SOUNDINGS IN FEET

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

24th Ed., Aug. 31/74

14761

(formerly LS 11)

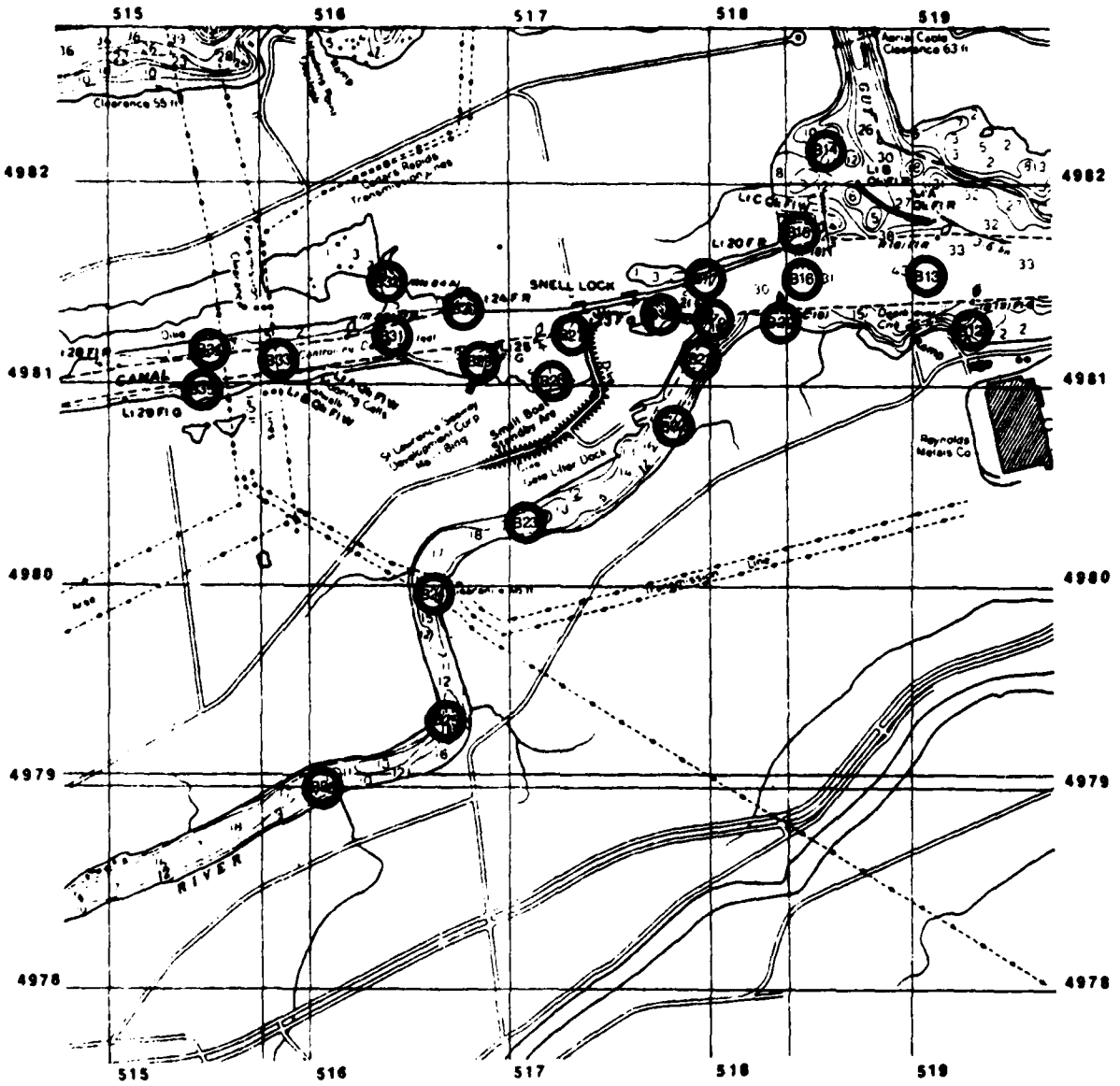


Fig. 3. Locations of benthos stations B12-B35.

B

COUNTERPART TO
RAQUETTE RIVER

SOUNDINGS IN FEET

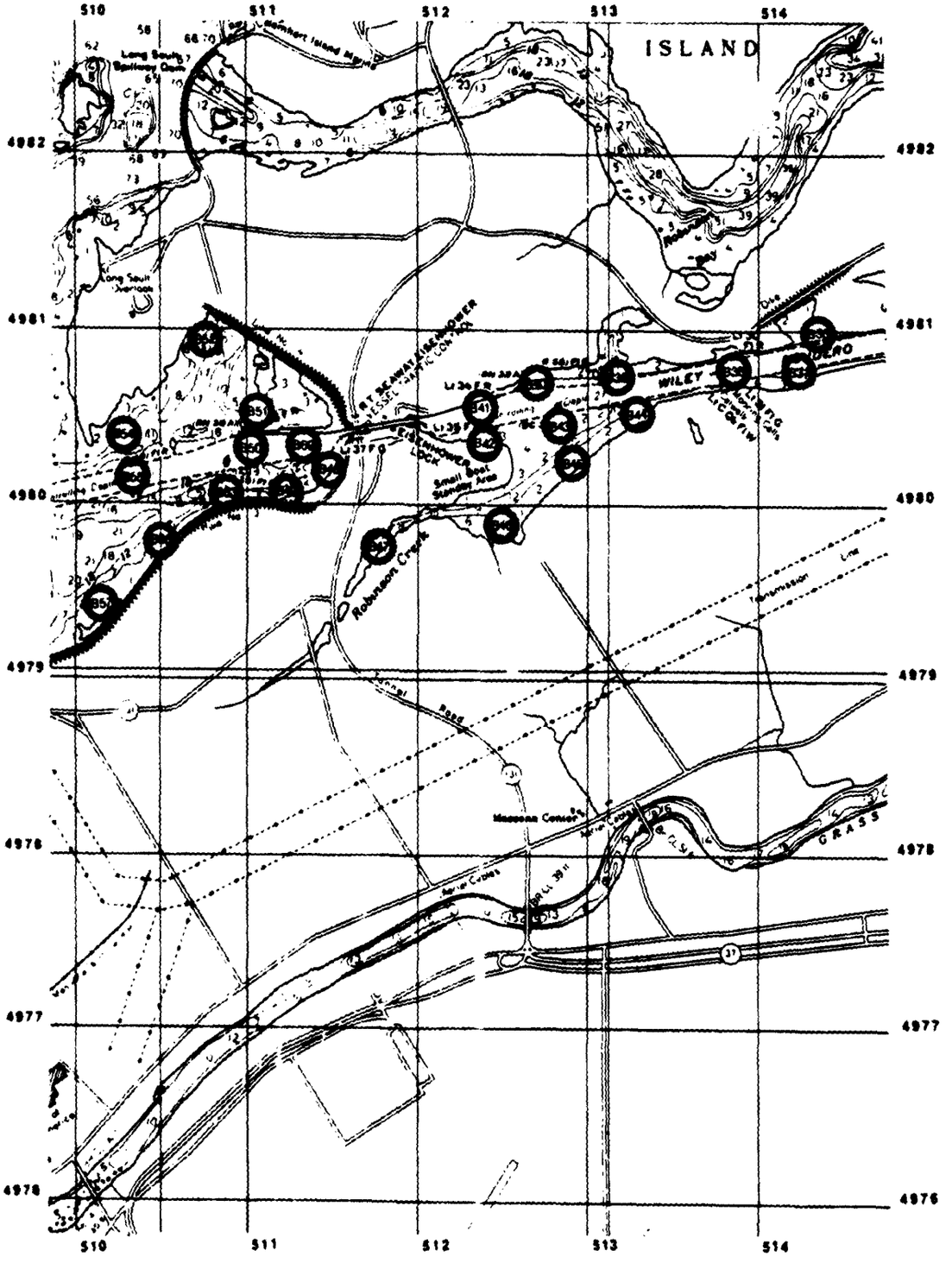
160

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

24th Ed., Aug. 31/74

14761

(formerly LS 11)



A

COUNTERPART TO
RAQUETTE RIVER

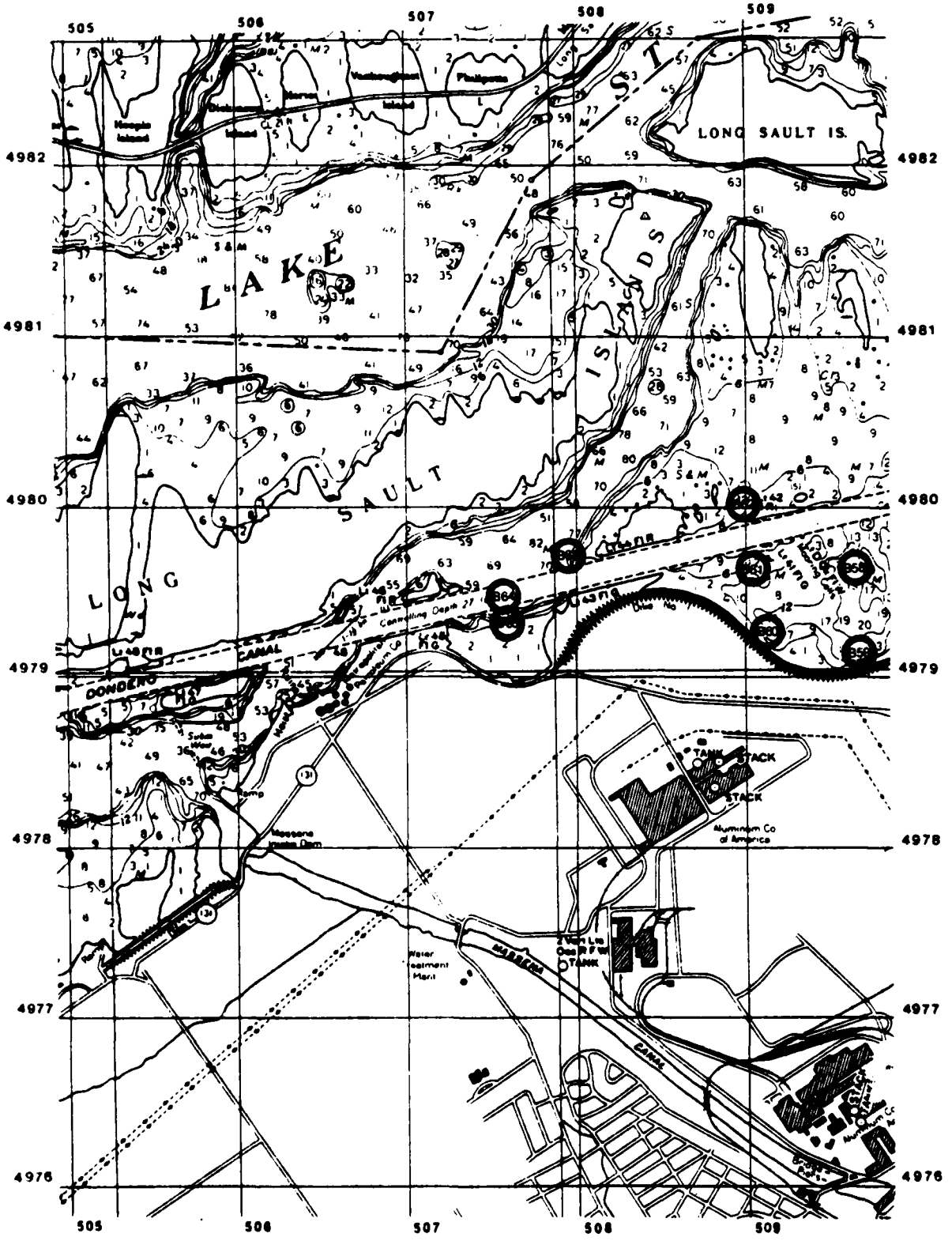
SOUNDINGS IN FEET

Fig. 4. Locations of benthos stations B36-B57 and B69.

154

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

14761
(formerly LS 11)



B

COUNTERPART TO MASSENA

SOUNDINGS IN FEET

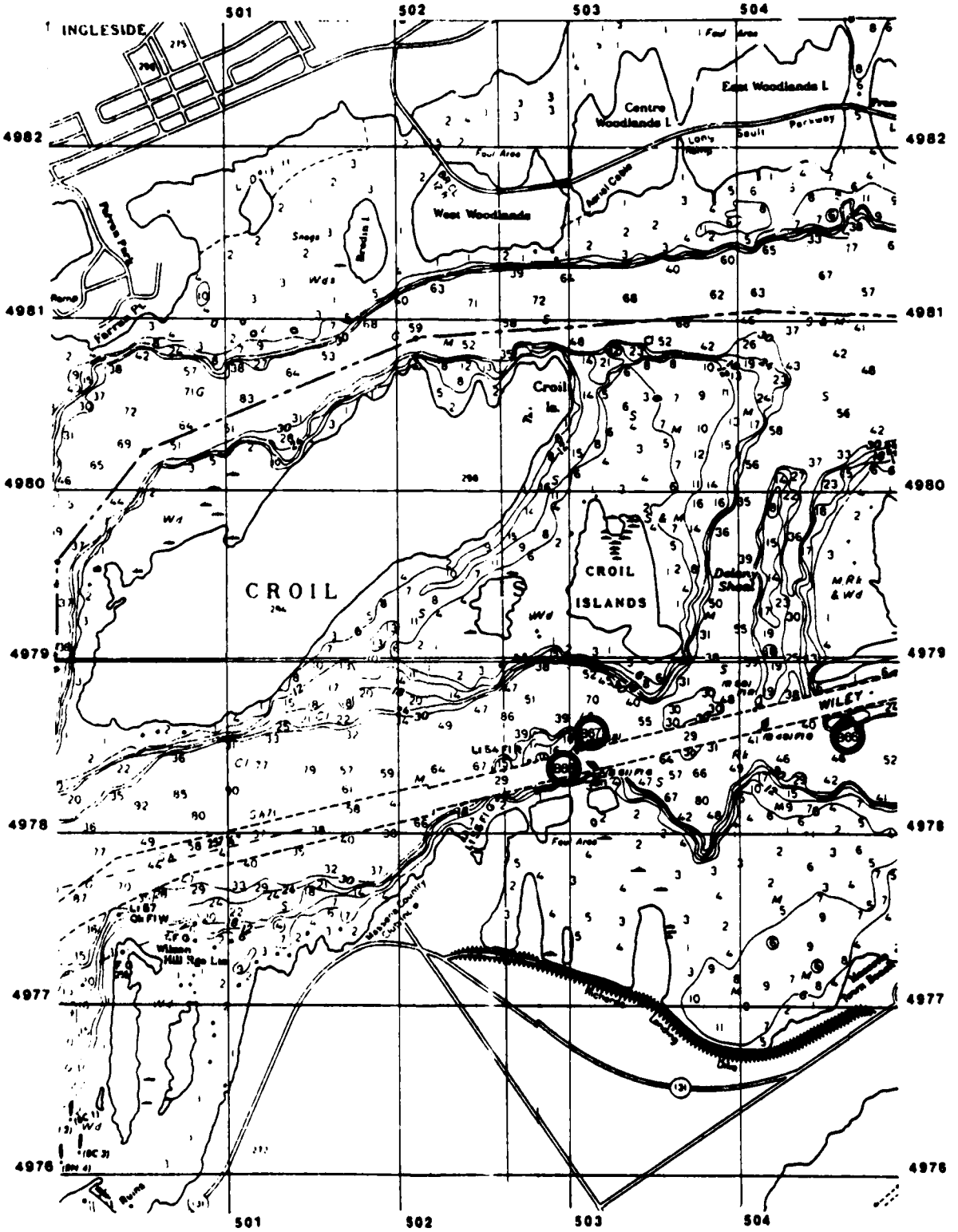
Fig. 5. Locations of benthos stations B58-B65.

152

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

24th Ed., Aug. 31/74 23rd Ed., Aug. 31/74

14761 (formerly LS 11) **14762** (formerly LS 12)



COUNTERPART TO MASSENA

SOUNDINGS IN FEET

Fig. 6. Locations of benthos stations B66-B68.

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

14762
(formerly LS 12)

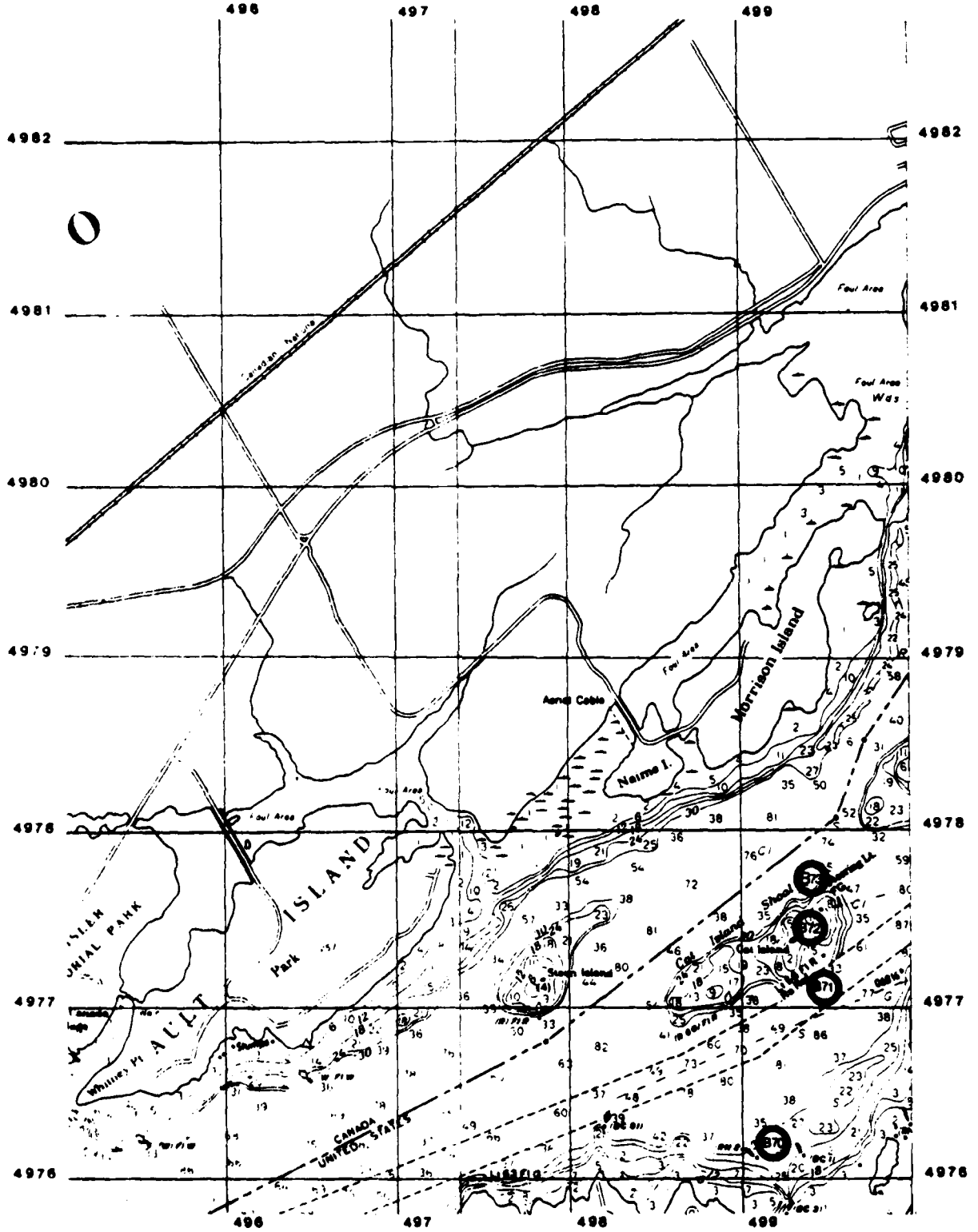


Fig. 7. Locations of benthos stations B70-B73.

150

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

23rd Ed., Aug. 31/74
14762
(formerly LS 12)

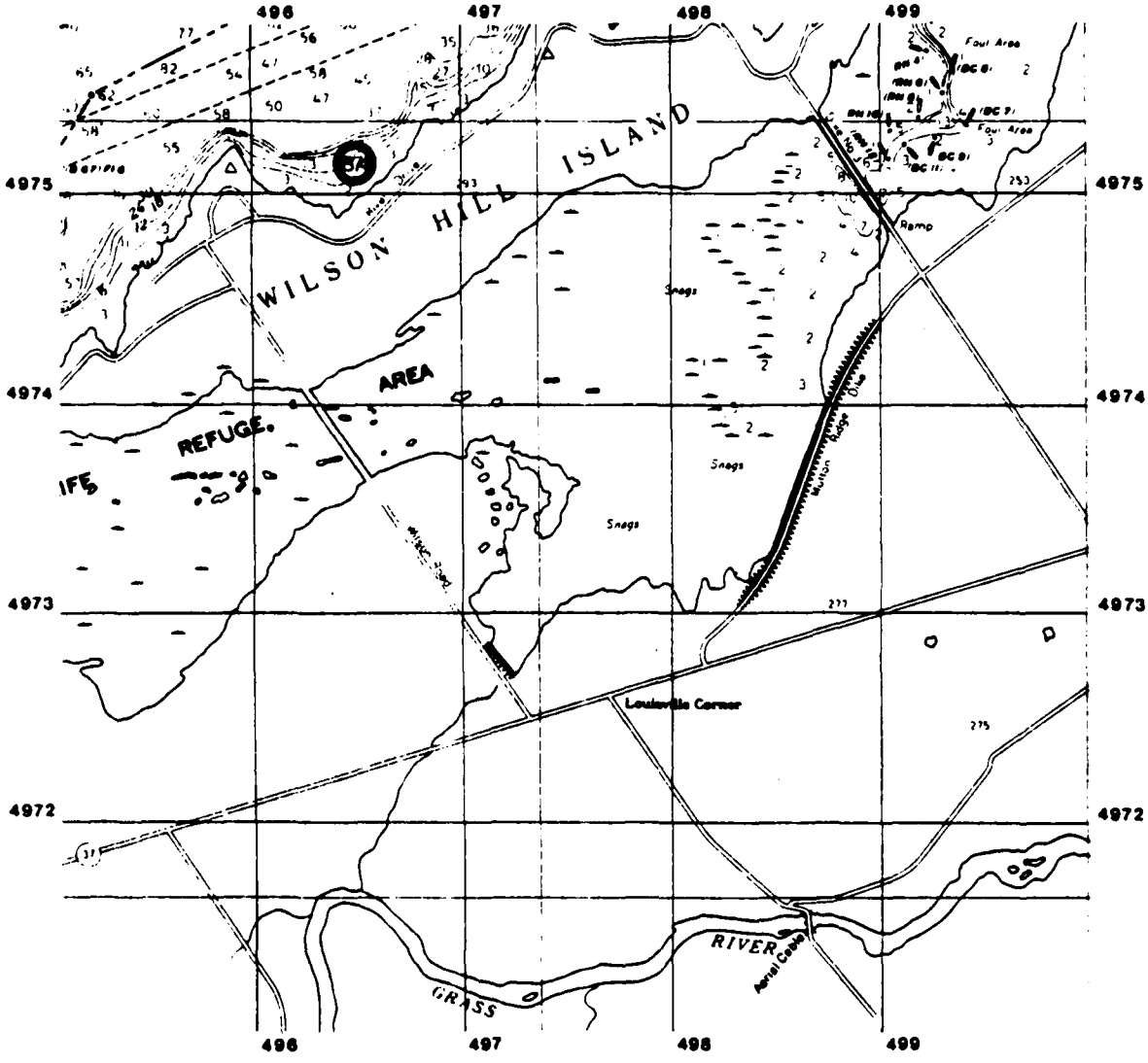


Fig. 8. Location of benthos station B74.

D

COUNTERPART TO
LOUISVILLE

SOUNDINGS IN FEET

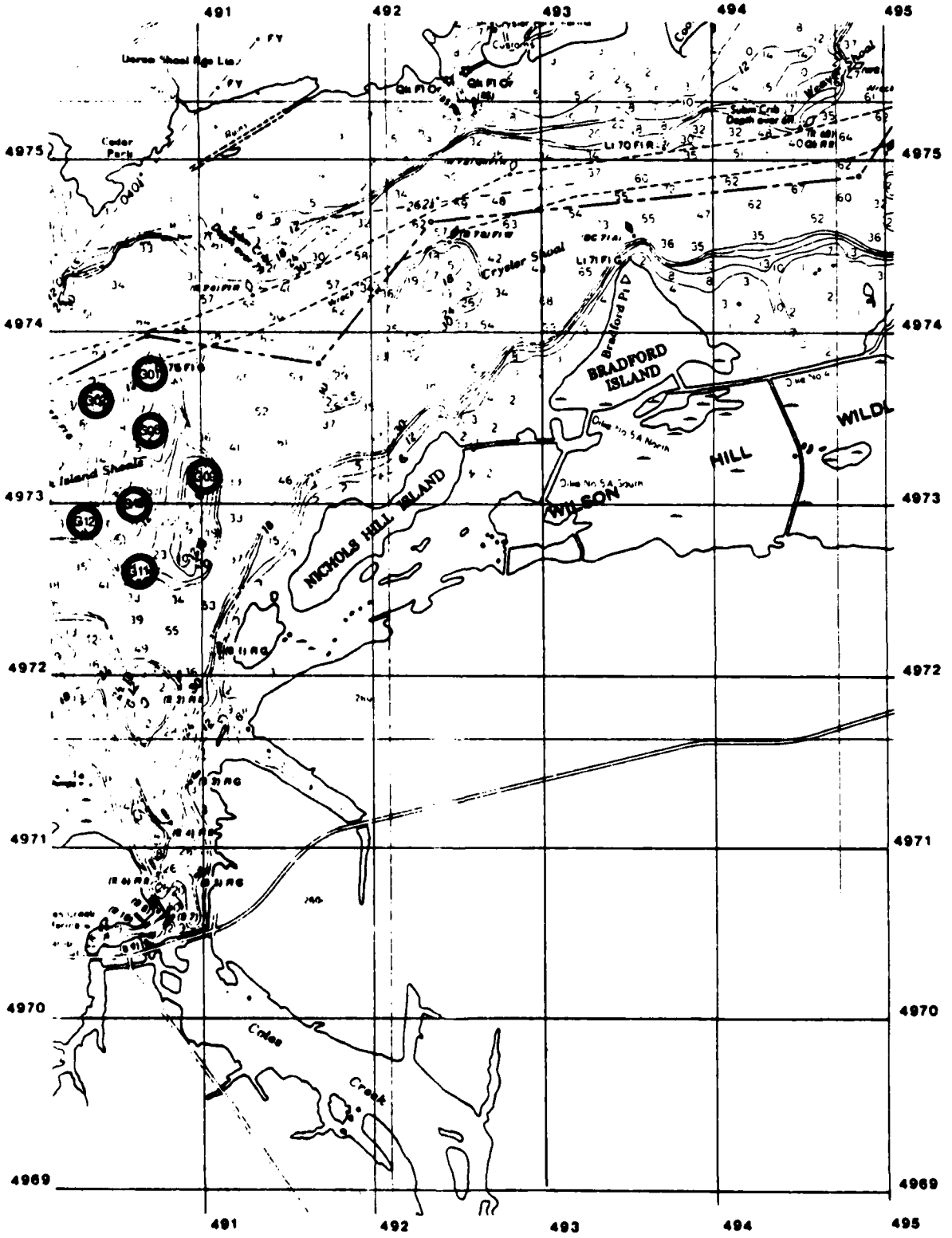
148

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

23rd Ed., Aug. 31/74

14762

(formerly LS 12)



C

COUNTERPART TO
LOUISVILLE

SOUNDINGS IN FEET

Fig. 9. Locations of benthos stations G01-G02 and G08-G12.

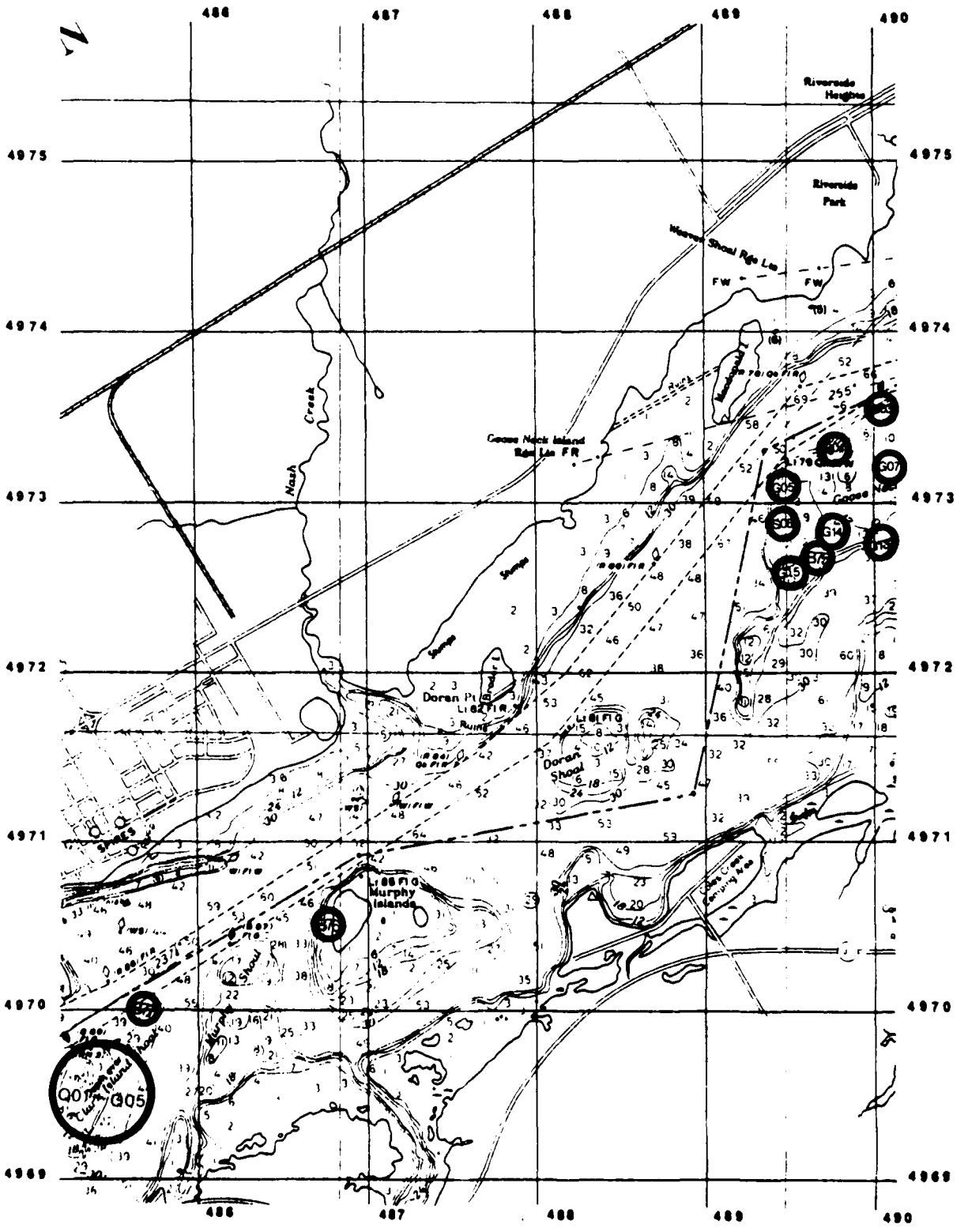
142

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

23rd Ed., Aug. 31/74

14762

(formerly LS 12)



D

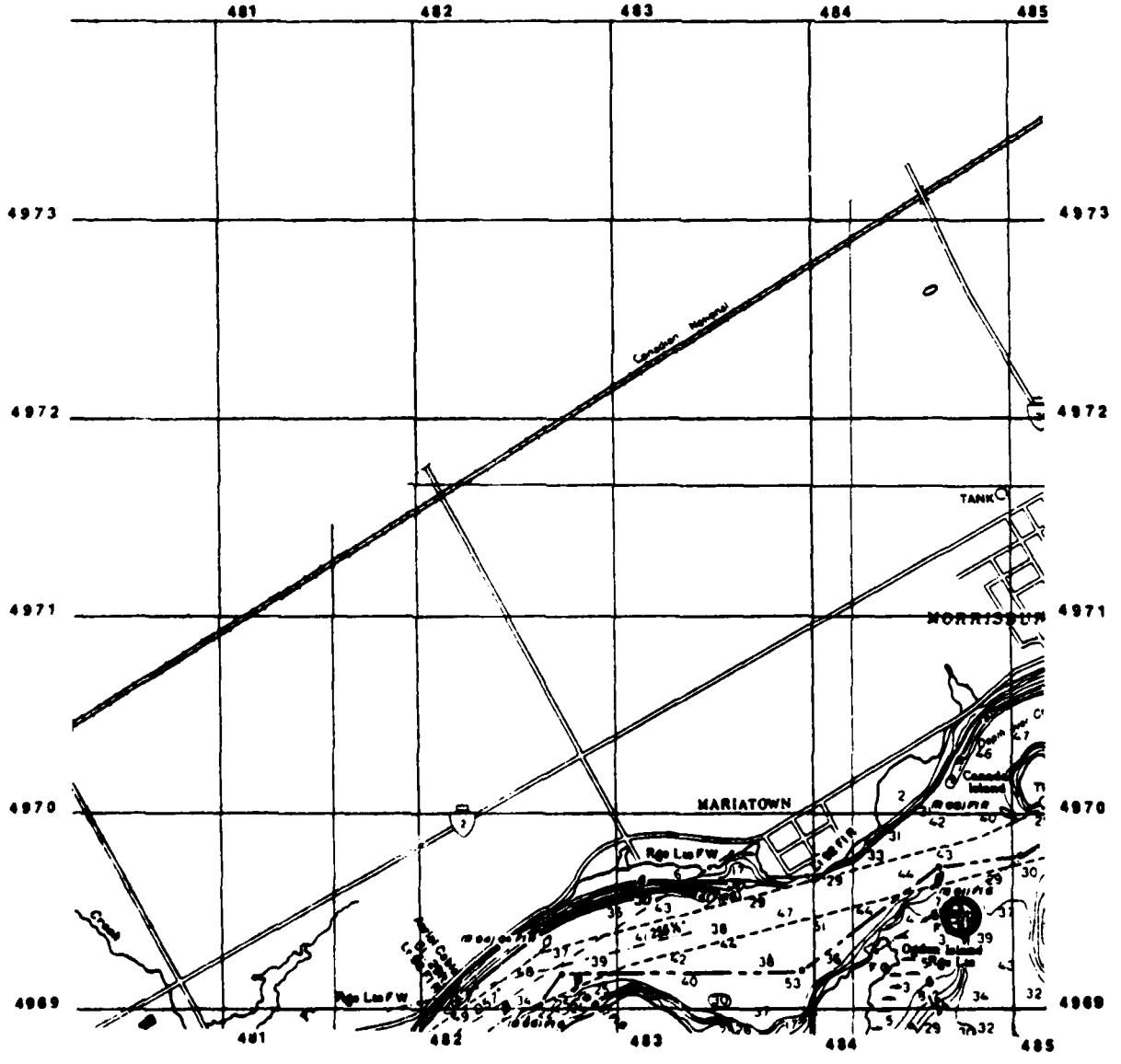
COUNTERPART TO MORRISBURG

SOUNDINGS IN FEET

Fig. 10. Locations of benthos stations G03-G07, G13-G15, Q01-Q05, and B75-B77.

140 U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

23rd Ed., Aug. 31/74
14762
(formerly LS 12)



C COUNTERPART TO MORRISBURG

SOUNDINGS IN FEET

Fig. 11. Location of benthos station B79.

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

23rd Ed., Aug. 31/74
14762
(formerly LS 12)

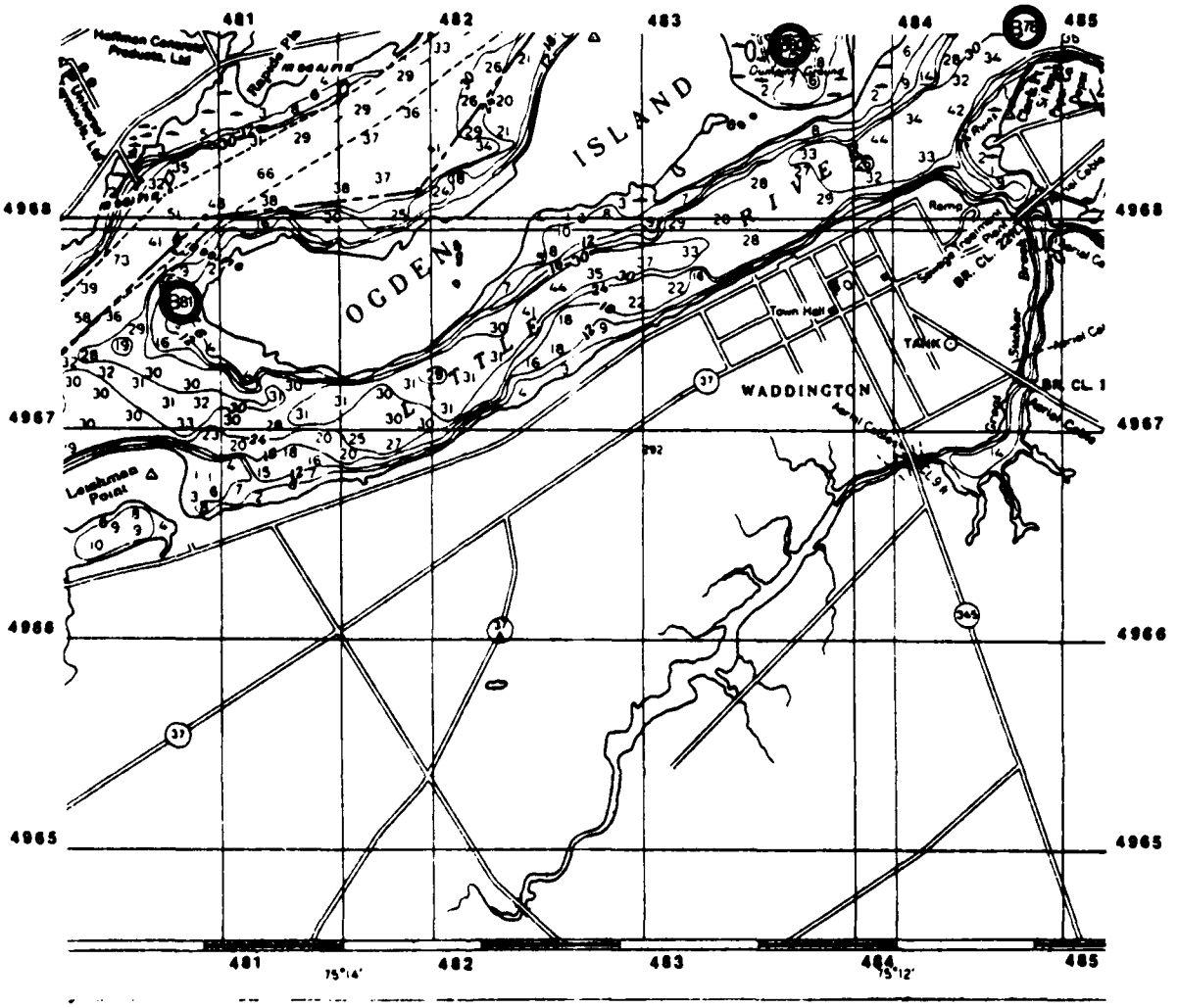


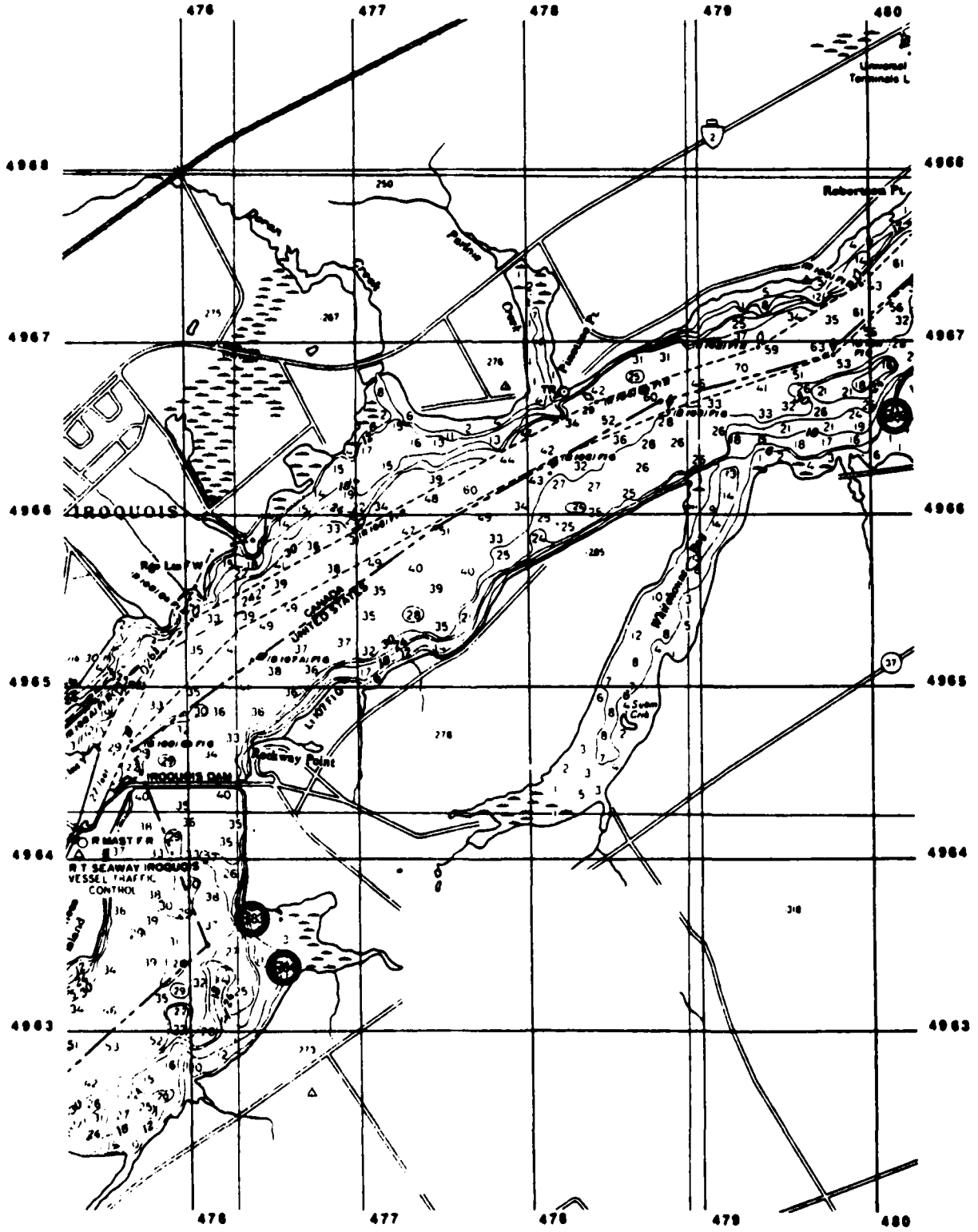
Fig. 12. Locations of benthos stations B78 and B80-B81.

A

COUNTERPART TO
WADDINGTON

SOUNDINGS IN FEET

U. S. DEPARTMENT OF COMMERCE
NOAA–NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226



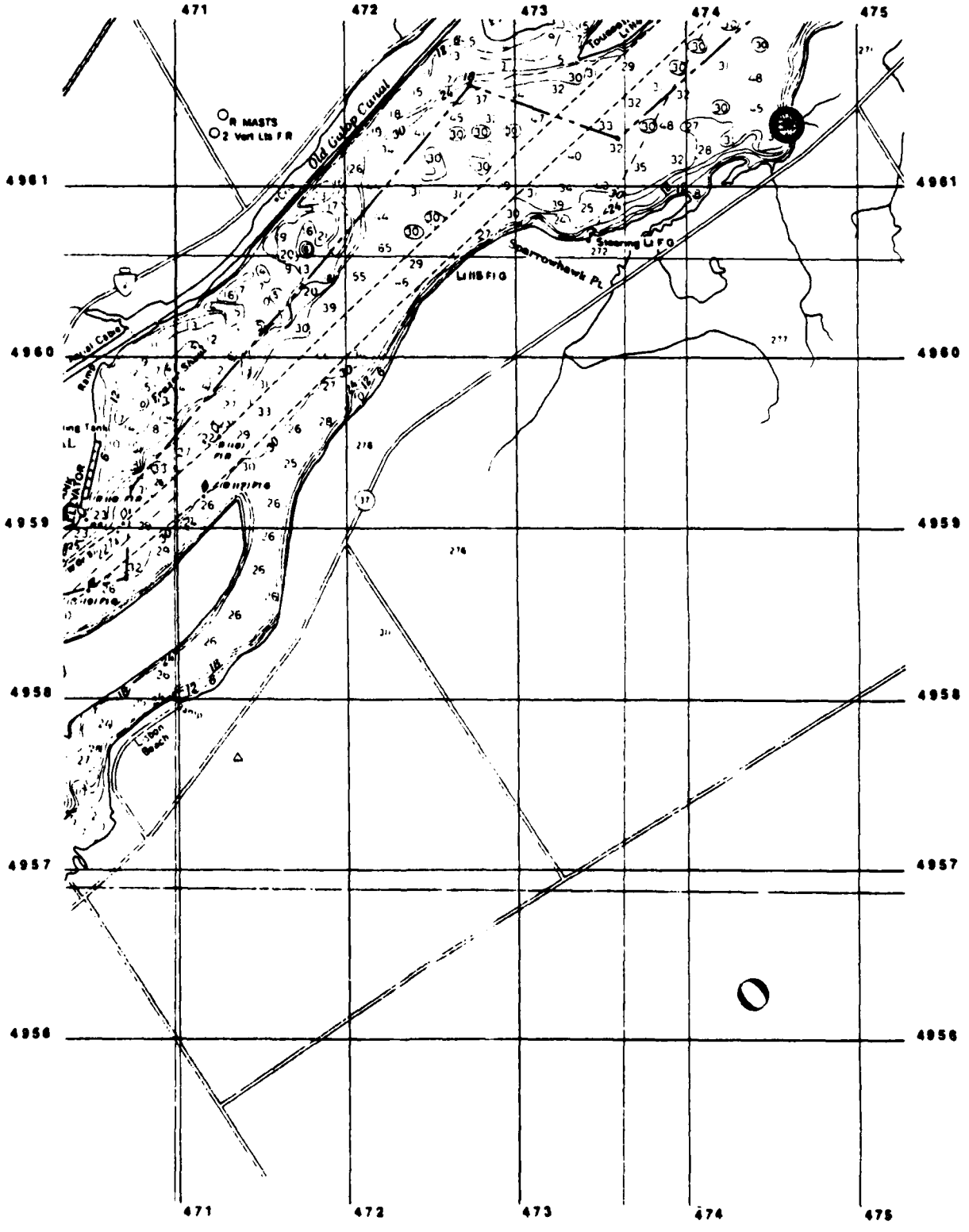
B

COUNTERPART TO
SPARROWHAWK POINT

SOUNDINGS IN FEET

Fig. 13. Locations of benthos stations B82-B84.

U. S. DEPARTMENT OF COMMERCE
NOAA–NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226



C COUNTERPART TO SPARROWHAWK POINT

SOUNDINGS IN FEET

Fig. 14. Location of benthos station B85.

U. S. DEPARTMENT OF COMMERCE
NOAA–NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226

25th Ed., April 12/74
13

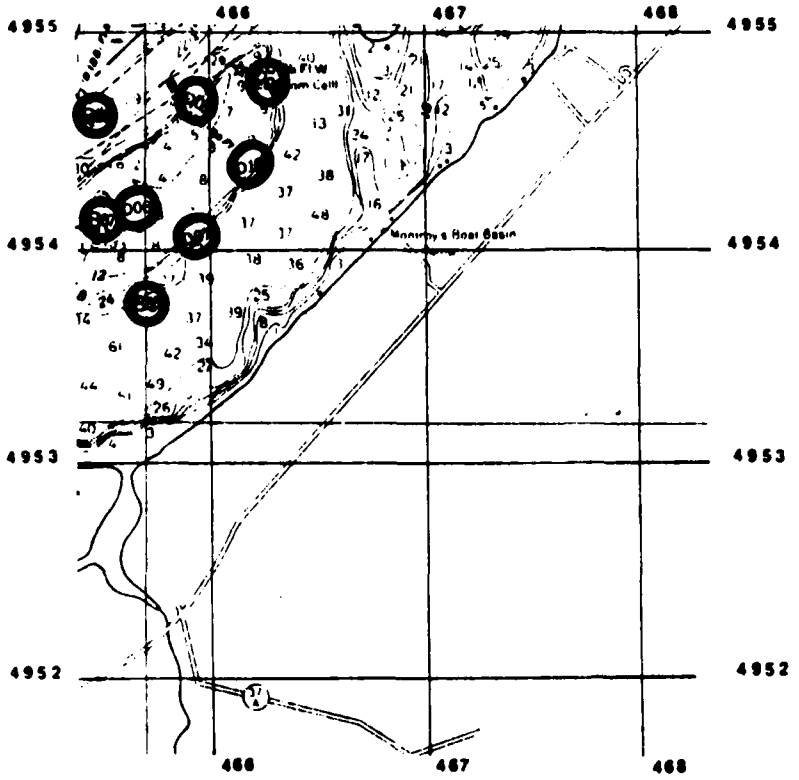


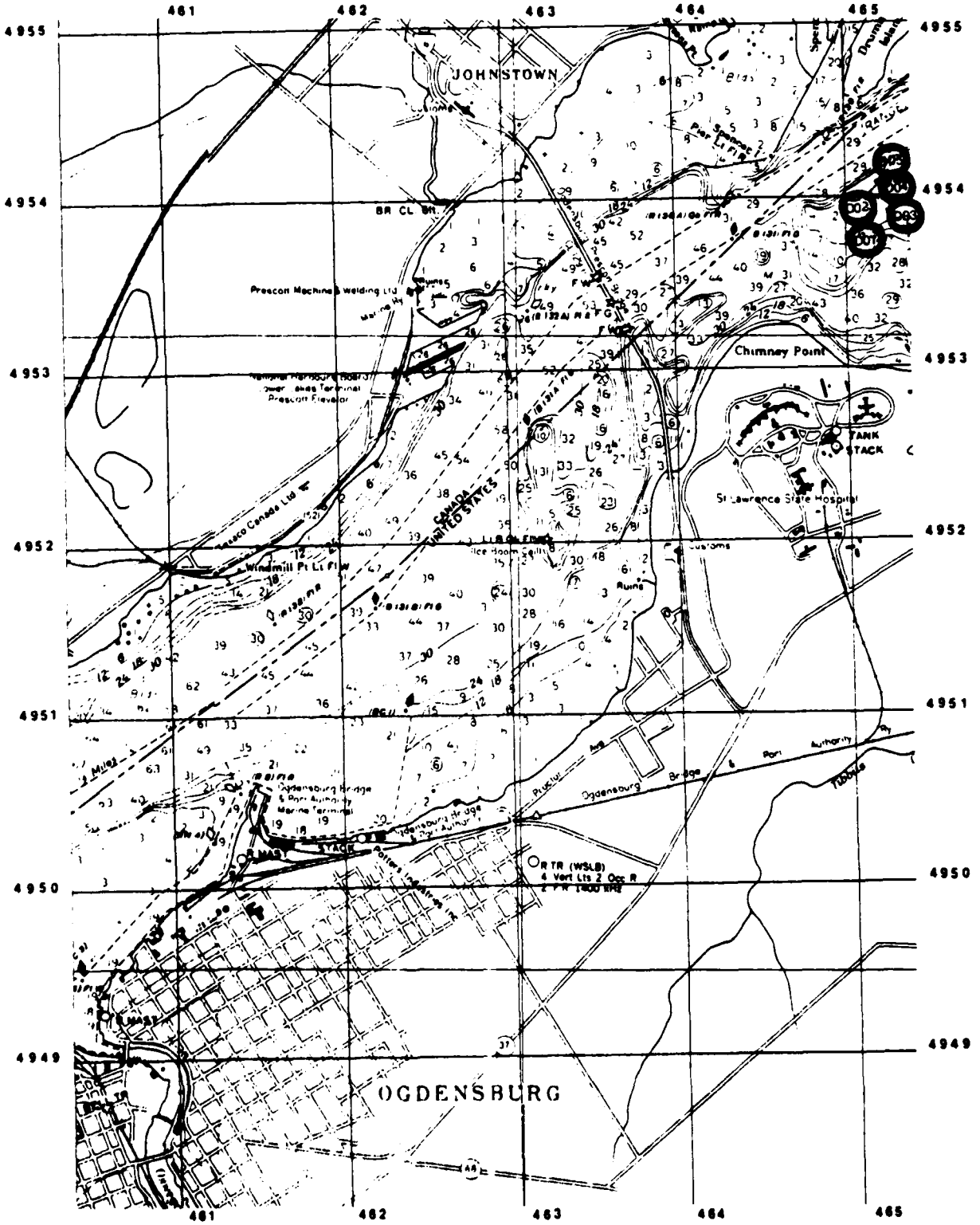
Fig. 15. Locations of benthos stations D06-D10 and B86-B88.

B

COUNTERPART TO
OGDENSBURG EAST

SOUNDINGS IN FEET

U. S. DEPARTMENT OF COMMERCE
NOAA–NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226



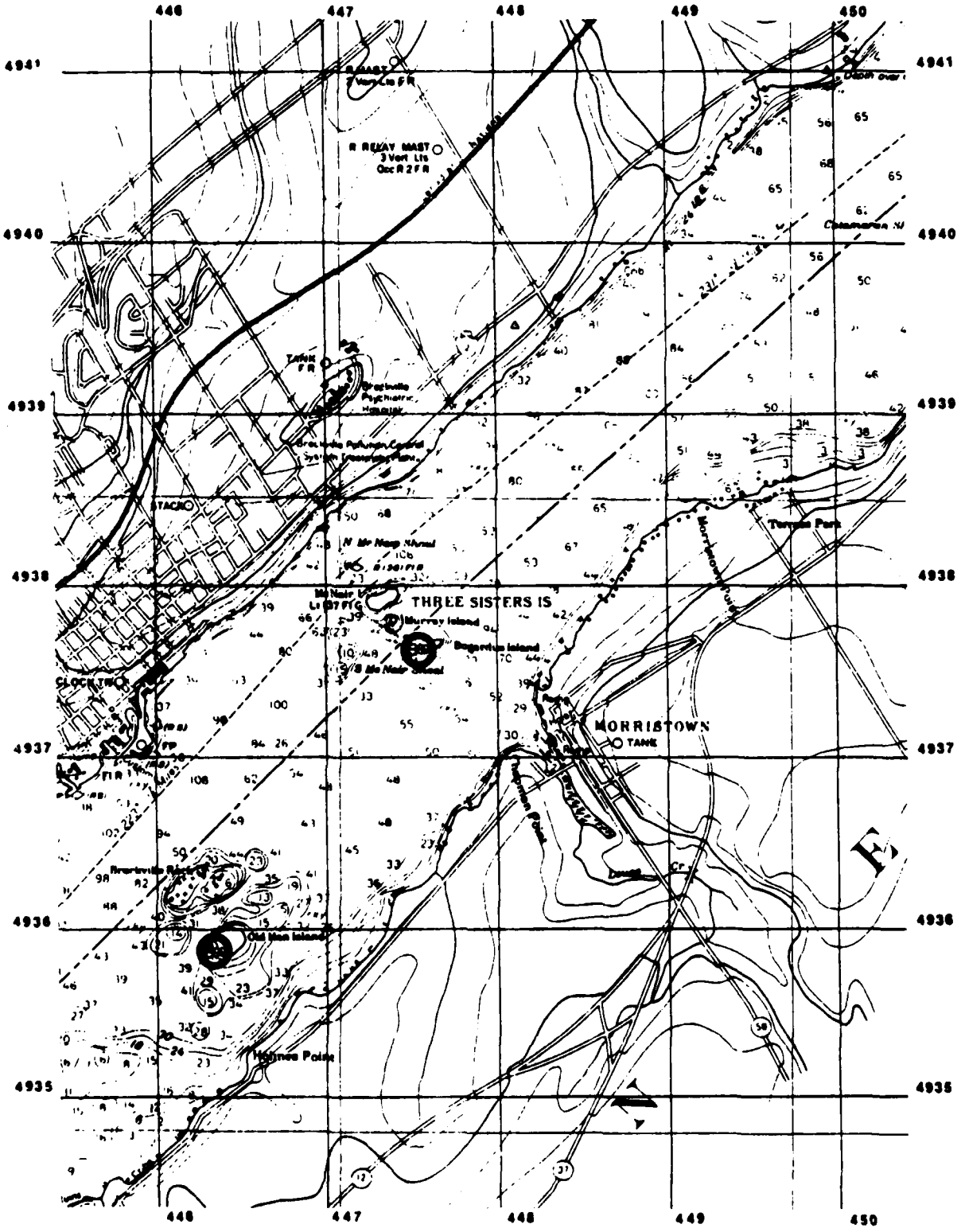
A

COUNTERPART TO
OGDENSBURG EAST

SOUNDINGS IN FEET

Fig. 16. Locations of benthos stations D01-D05.

U. S. DEPARTMENT OF COMMERCE
NOAA–NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226



B

COUNTERPART TO
MORRISTOWN

SOUNDINGS IN FEET

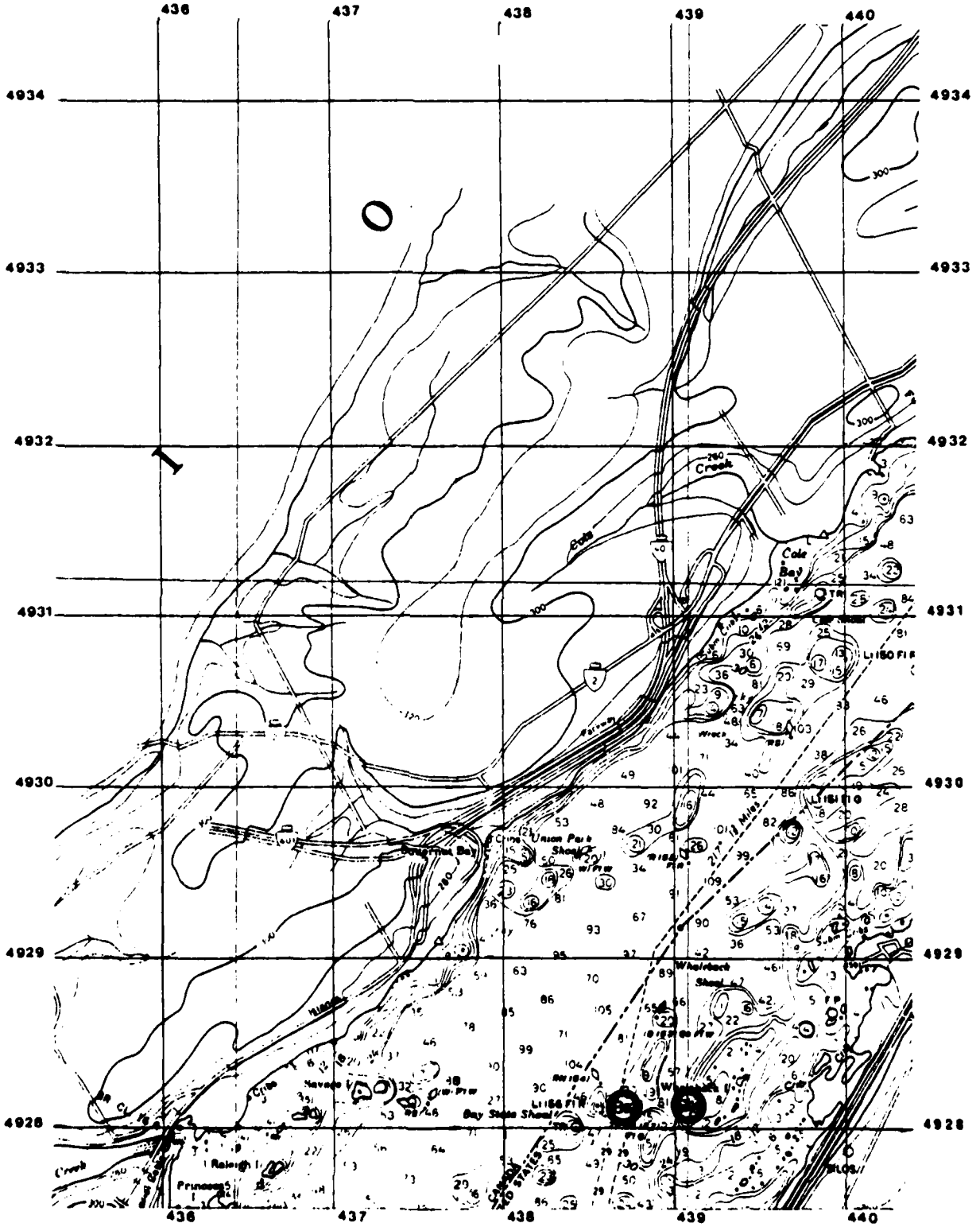
Fig. 17. Locations of benthos stations B89-B90.

104

U. S. DEPARTMENT OF COMMERCE
NOAA–NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226

25th Ed., June 12/74

15



E COUNTERPART TO MORRISTOWN

SOUNDINGS IN FEET

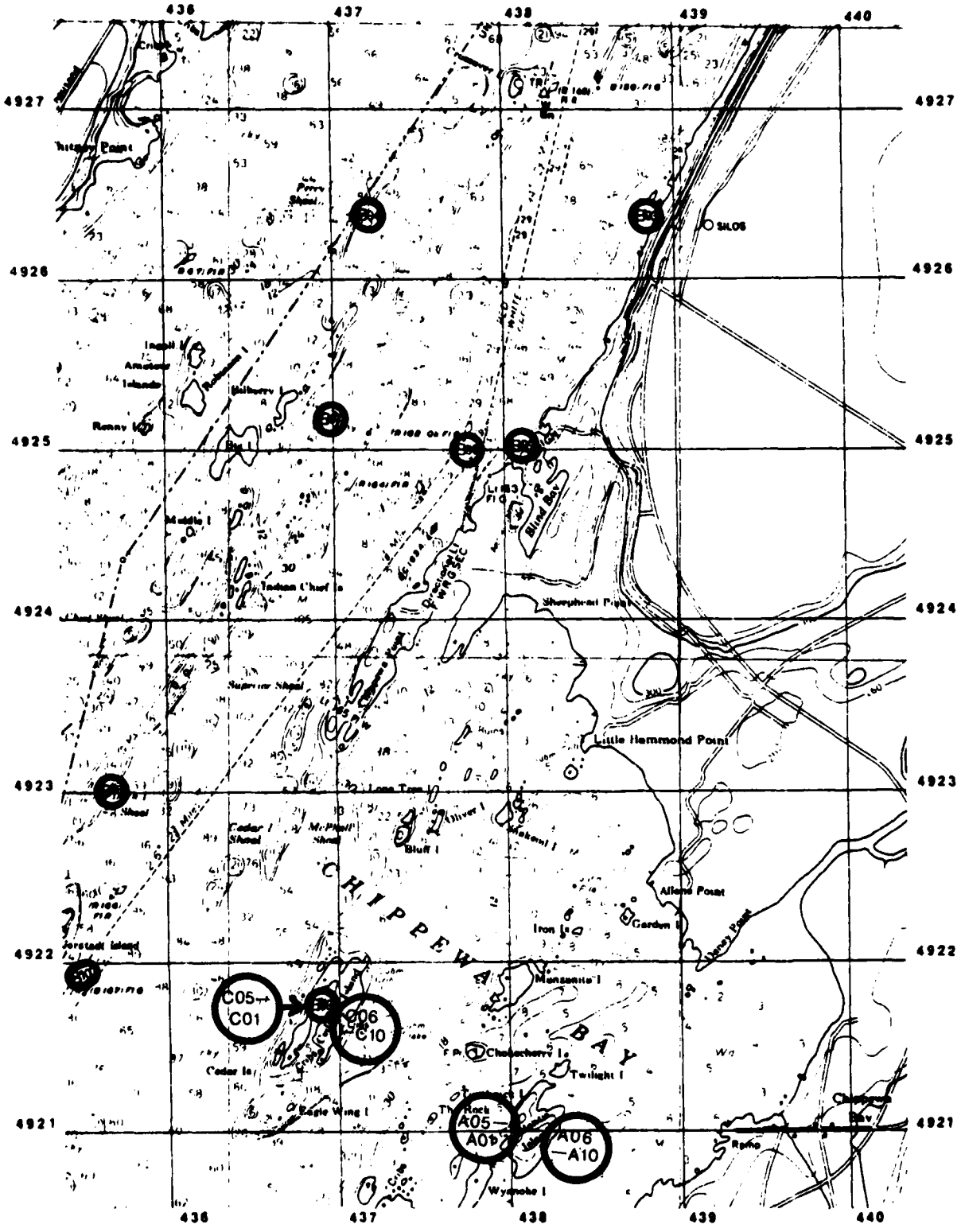
Fig. 18. Locations of benthos stations B91-B92.

86

U. S. DEPARTMENT OF COMMERCE
NOAA–NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226

25th Ed., June 12/74

15



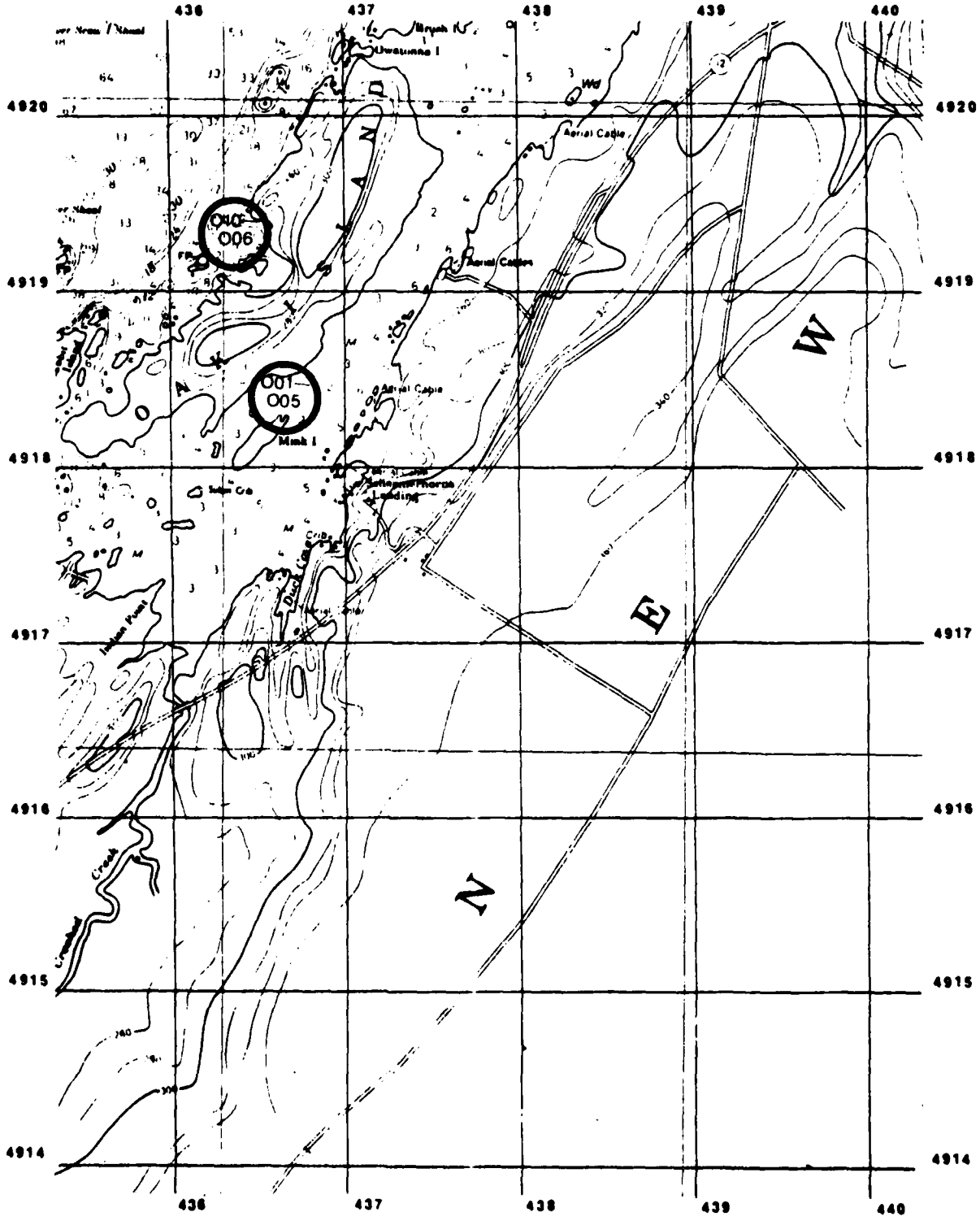
B

COUNTERPART TO CHIPPEWA BAY

SOUNDINGS IN FEET

Fig. 19. Locations of benthos stations B93-B100, C01-C10, and A01-A10.

U. S. DEPARTMENT OF COMMERCE
NOAA-NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226



COUNTERPART TO
CHIPPEWA BAY

D

SOUNDINGS IN FEET

Fig. 20. Locations of benthos stations 001-010.

72

U. S. DEPARTMENT OF COMMERCE
NOAA–NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226

25th Ed., June 12/74
15

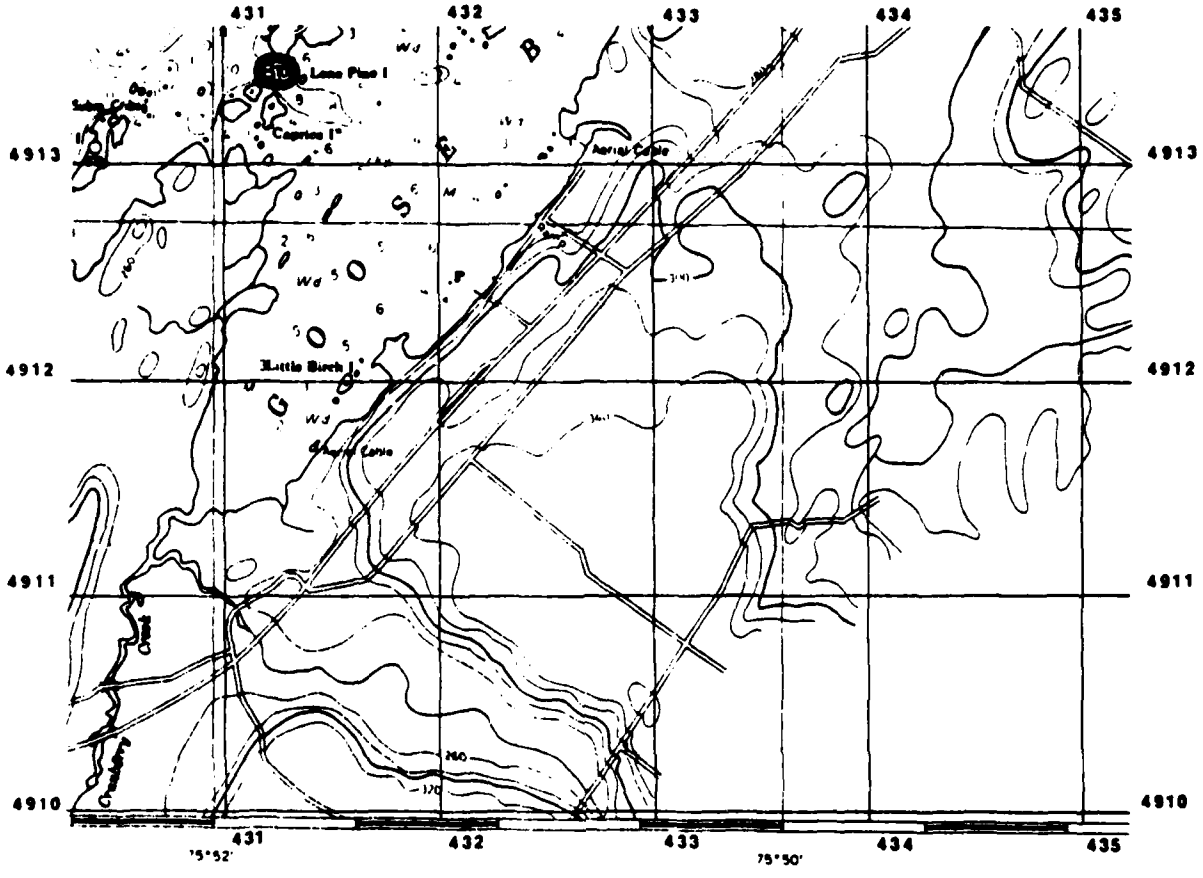


Fig. 21. Location of benthos station B101.

A

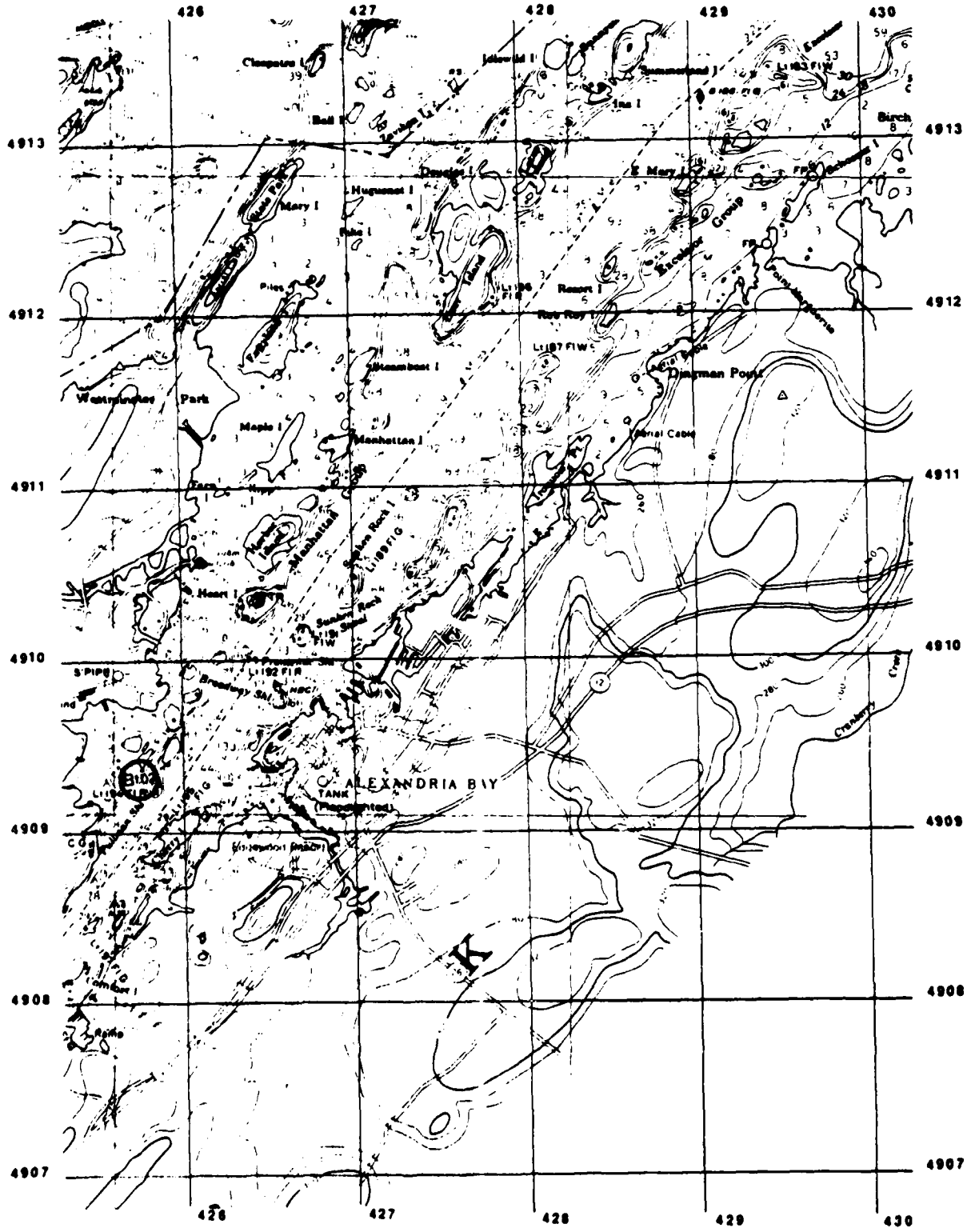
COUNTERPART TO
REDWOOD

SOUNDINGS IN FLET

68

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

25th Ed., Aug. 31/74
14766
(formerly LS 16)



COUNTERPART TO ALEXANDRIA BAY

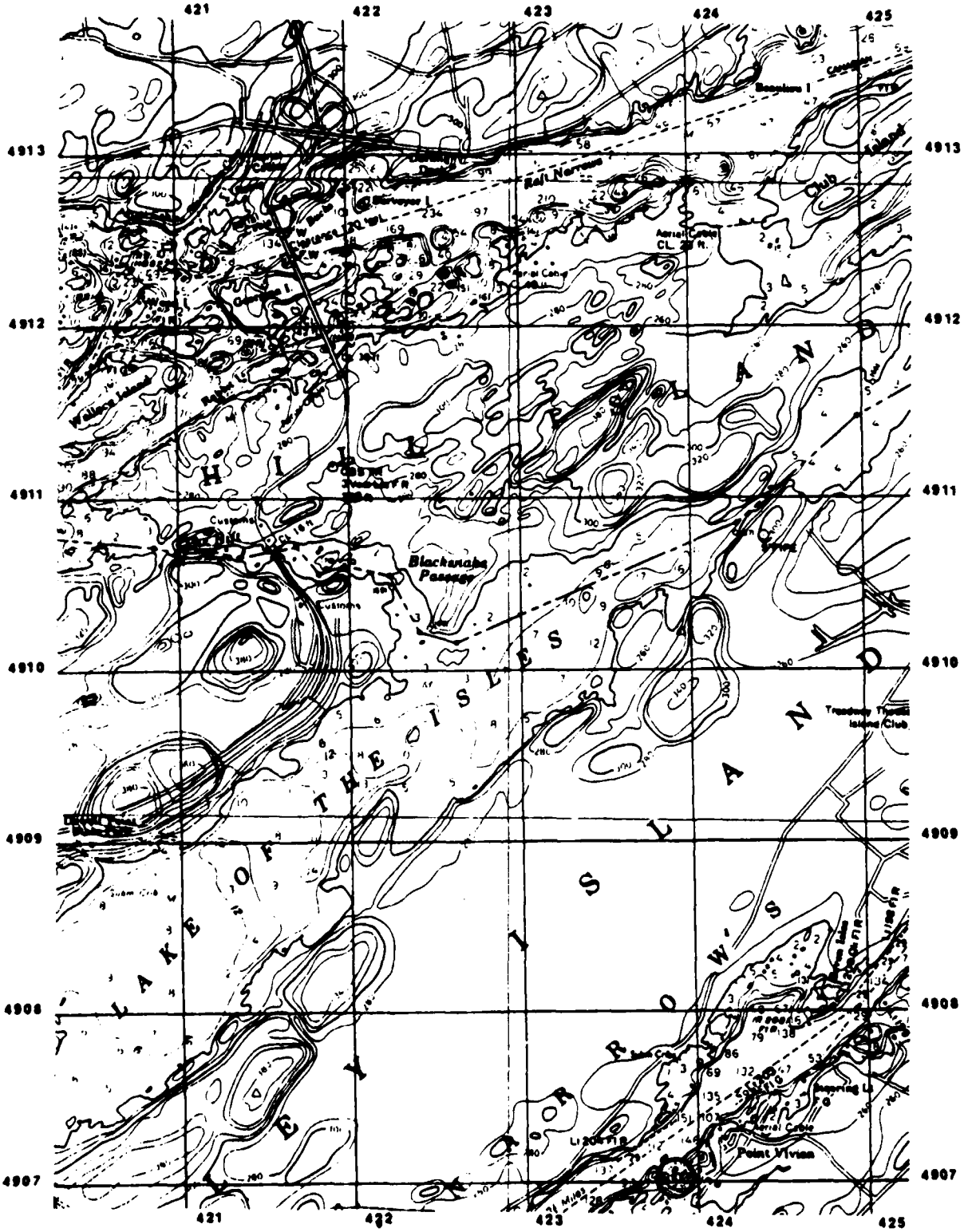
SOUNDINGS IN FEET

Fig. 22. Location of benthos station B102.

66

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

25th Ed., Aug. 31/74
14766
(formerly LS 16)



A

COUNTERPART TO
ALEXANDRIA BAY

SOUNDINGS IN FEET

Fig. 23 Location of benthos station B103.

70

U. S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

25th Ed., Aug. 31/74
14766
(formerly LS 16)

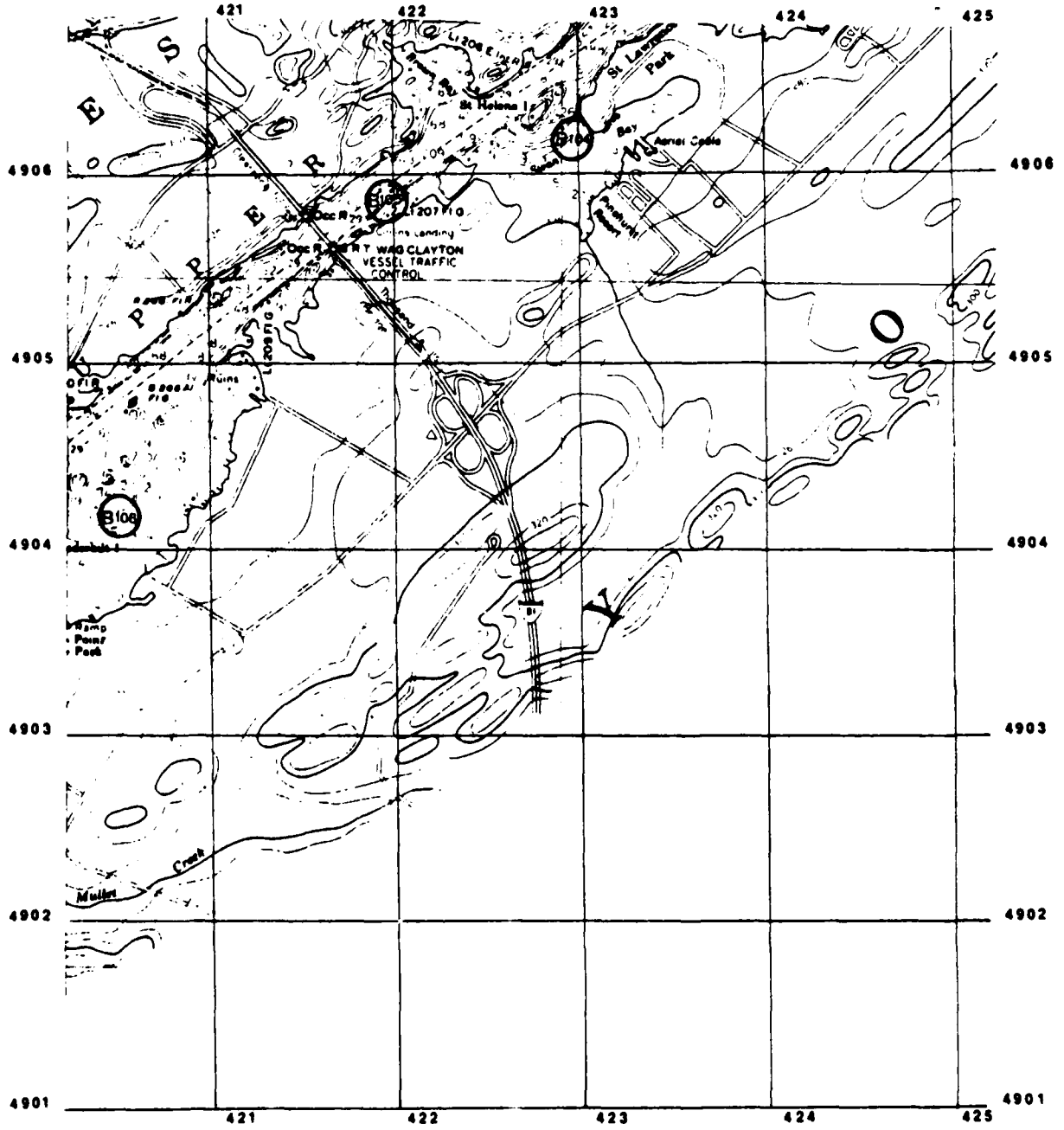


Fig. 24. Locations of benthos stations B104-B106.

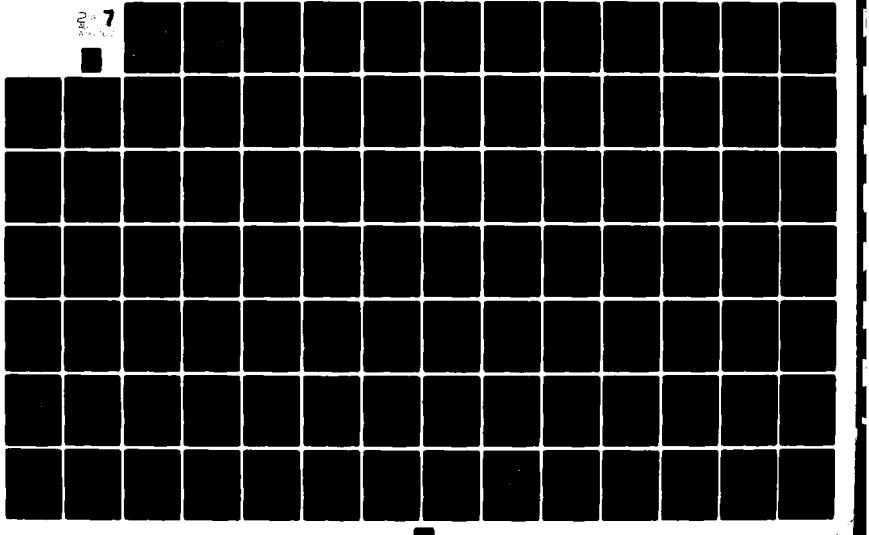
C

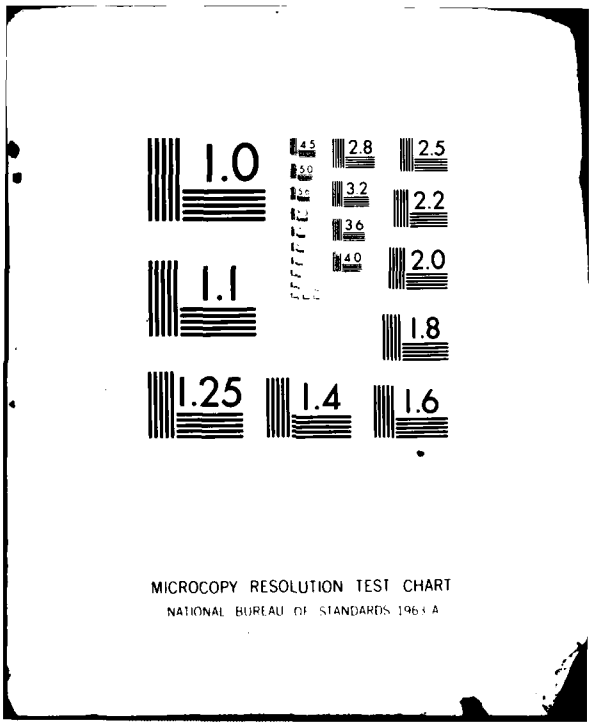
COUNTERPART TO
ALEXANDRIA BAY

SOUNDINGS IN FEET

AD-A110 760 FISH AND WILDLIFE SERVICE CORTLAND NY F/G 6/3
BIOLOGICAL SURVEY ALONG THE ST. LAWRENCE RIVER FOR THE ST. LAWR--ETC(U)
1979

UNCLASSIFIED NL




1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963 A

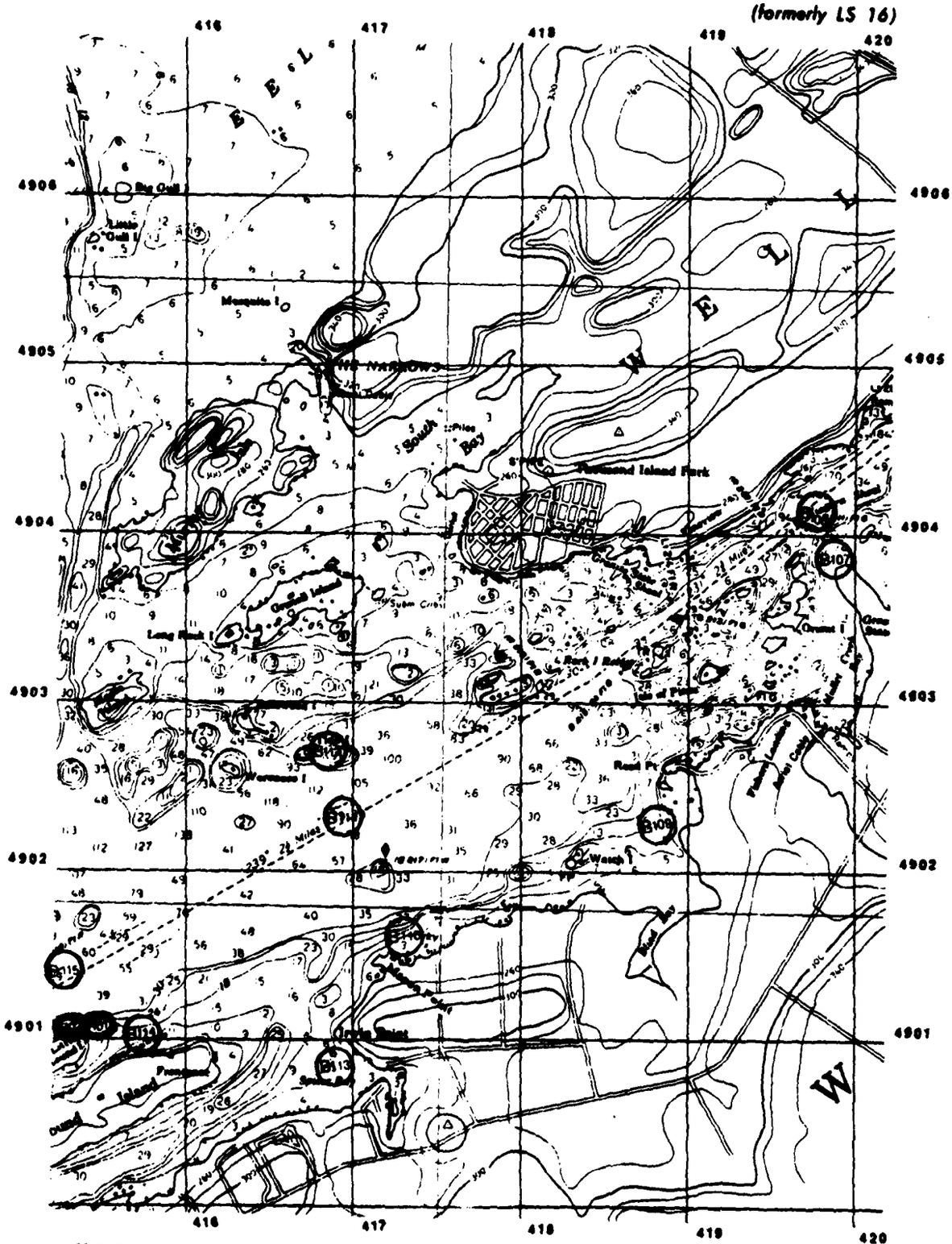
64

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

25th Ed., Aug. 31/74

14766

(formerly LS 16)



COUNTERPART TO THOUSAND ISLAND PARK

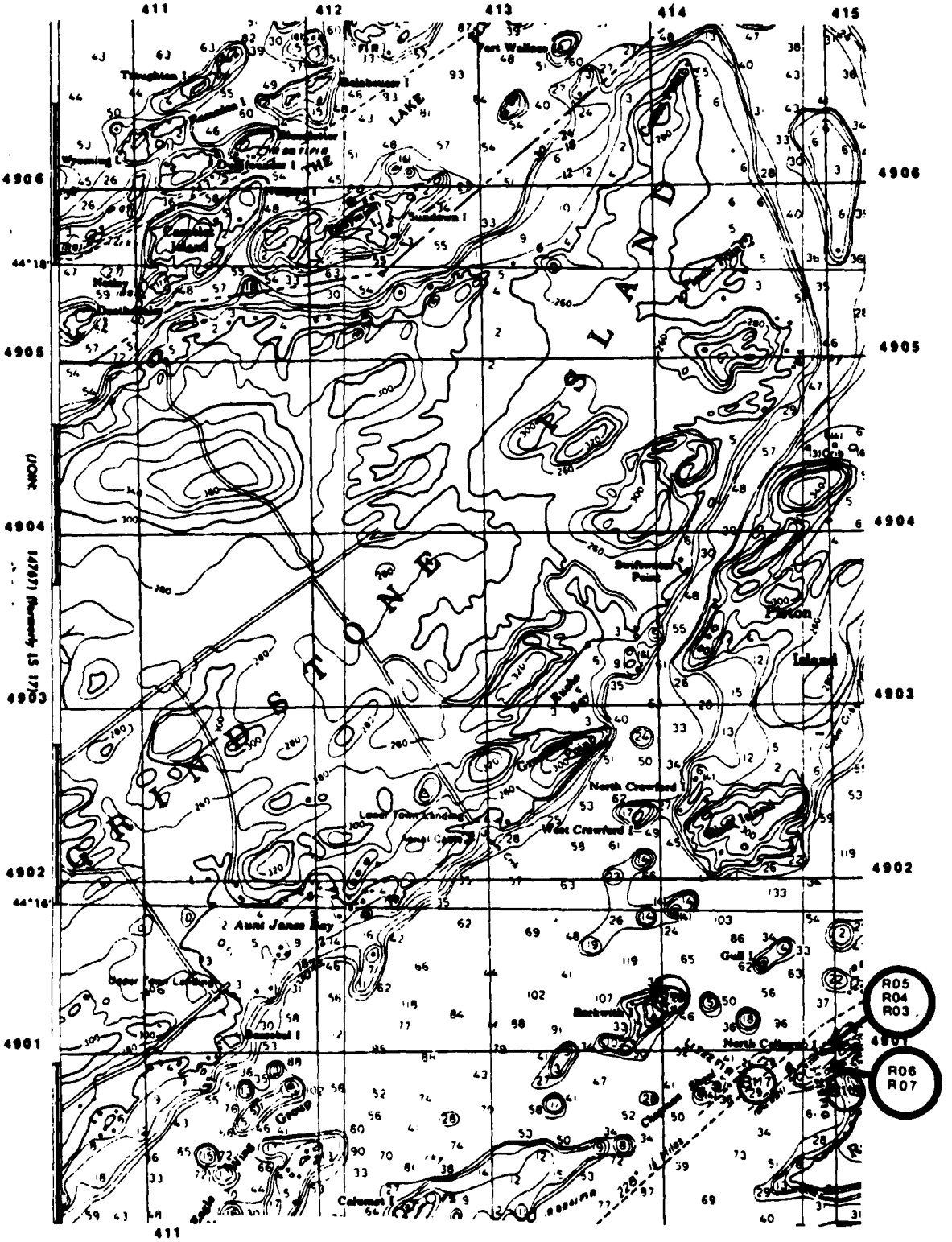
SOUNDINGS IN FEET

Fig. 25. Locations of benthos stations B107-B115 and R01-R02.

62

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

25th Ed., Aug. 31/74
14766
(formerly LS 16)



C

COUNTERPART TO
THOUSAND ISLAND
PARK

SOUNDINGS IN FEET

Fig. 26. Locations of benthos stations B116-B118 and R03-R07.

38

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

25th Ed., Aug. 31/74
14766
(formerly LS 16)

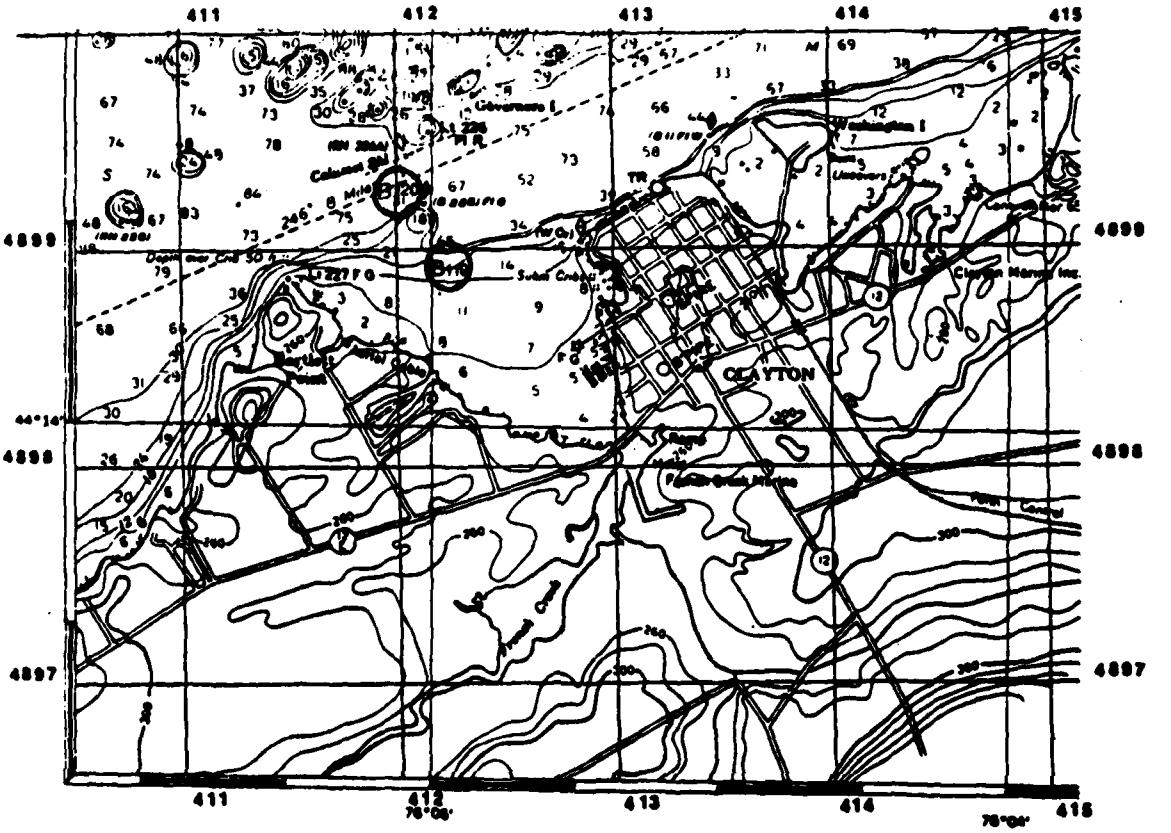


Fig. 27 ... tions of benthos stations B119-B120.

A

COUNTERPART TO CLAYTON

SOUNDINGS IN FEET

Table 1. - Locations of Benthic Sampling Stations in the St. Lawrence River.

Station Numbers	USGS Quad
B01 - B11	Hogansburg
B12 - B57, B69	Raquette River
B58 - B68	Massena
B70 - B74, G01-G02, G08-G12	Louisville
B75-B77, B79, Q01-Q05, G03-G07, G13-G15	Morrisburg
B78,B80,B81	Waddington
B82-B85	Sparrowhawk Point
B86-B88, D01-D10	Ogdensburg East
B89-B92	Morristown
B93-B100, A01-A10,C01-C10, 001-010	Chippewa Bay
B101	Redwood
B102-B106	Alexandria Bay
B107-B118, R01-R07	Thousand Islands Park
B119-B120	Clayton

Table 2. - Site Conditions of Benthic Sampling Stations in the St. Lawrence River.

Dredging sites are based on Army Corps of Engineers maps for the Additional Locks Proposals. Current speed is a subjective judgement.

C = Located in channel
D = Located in proposed dredging area
F = Fast current
M = Moderate current
S = Slow current or no current

NC = Not located in channel
ND = Not located in proposed dredging area

B01 - NC,ND,S
B02 - NC,ND,S
B03 - NC,ND,S
B04 - NC,ND,S
B05 - NC,ND,S
B06 - NC,ND,S
B07 - NC,ND,M
B08 - NC,ND,M
B09 - NC,ND,S
B10 - NC,ND,M
B11 - NC,ND,S
B12 - NC,ND,S
B13 - C,D,M
B14 - NC,ND,S
B15 - NC,ND,S
B16 - C,D,M
B17 - C,D,S
B18 - C,D,S
B19 - C,D,S
B20 - NC,ND,M
B21 - C,D,M
B22 - NC,D,M
B23 - NC,D,M
B24 - NC,ND,M
B25 - NC,ND,M
B26 - NC,ND,M
B27 - NC,D,S
B28 - NC,ND,S
B29 - NC,D,S
B30 - NC,ND,S
B31 - C,D,M
B32 - NC,ND,S
B33 - C,D,M
B34 - NC,ND,M
B35 - NC,ND,M
B36 - NC,ND,M
B37 - NC,ND,M
B38 - C,D,M
B39 - NC,ND,M
B40 - NC,ND,M
B41 - C,D,M
B42 - NC,D,M
B43 - NC,D,M
B44 - NC,ND,M
B45 - NC,ND,M
B46 - NC,ND,S
B47 - NC,ND,S
B48 - NC,D,S
B49 - NC,ND,S
B50 - C,D,M
B51 - NC,ND,S
B52 - NC,ND,S
B53 - NC,D,M
B54 - NC,ND,S
B55 - C,D,M
B56 - NC,D,S
B57 - NC,ND,S
B58 - NC,ND,S
B59 - NC,ND,S
B60 - NC,ND,S
B61 - NC,ND,M
B62 - NC,ND,M
B63 - NC,ND,M
B64 - C,D,M
B65 - NC,ND,S
B66 - NC,ND,M
B67 - NC,ND,F
B68 - C,D,F
B69 - C,D,M
B70 - NC,ND,M
B71 - C,D,M
B72 - NC,ND,M
B73 - NC,ND,M
B74 - NC,ND,S
B75 - NC,ND,M
B76 - NC,ND,S
B77 - NC,ND,F
B78 - NC,ND,M
B79 - NC,ND,S
B80 - NC,ND,S
B81 - NC,ND,M
B82 - NC,ND,S
B83 - NC,ND,S
B84 - NC,ND,S
B85 - NC,ND,S
B86 - NC,ND,M
B87 - NC,ND,M
B88 - C,D,F
B89 - NC,ND,M
B90 - NC,ND,M
B91 - NC,ND,M
B92 - C,D,M
B93 - NC,ND,M
B94 - NC,ND,M
B95 - NC,ND,M
B96 - C,D,M
B97 - NC,ND,M
B98 - NC,ND,M
B99 - NC,ND,S
B100- C,D,F
B101- NC,ND,S
B102- NC,ND,S
B103- NC,ND,S
B104- NC,ND,S
B105- C,D,F
B106- NC,ND,M
B107- NC,ND,S
B108- C,D,F
B109- NC,ND,M
B110- NC,ND,S
B111- C,D,M
B112- NC,ND,M
B113- NC,ND,S
B114- NC,ND,M
B115- C,D,M
B116- NC,ND,M
B117- C,D,M
B118- NC,ND,S
B119- NC,ND,M
B120- C,D,M

Table 3. - Transects. (North, Channel, South)

Massena Sites

A.	Polly's Gut, Grasse River	B15,B16,B20
B.	Snell Lock	B32,B31,B29
C.	Power Lines Between Locks	B34,B33,B35
D.	Robinson Creek	B36,B38,B37
E.	Below Eisenhower Lock	B40,B41,B42
F.	Above Eisenhower Lock	B51,B50,B49
G.	Long Sault Point	B54,B55,B56
H.	Hopson's Bay	B63,B64,B65

Upriver Sites

I.	Cat Island Shoal	B73,B71,B70,B72 (on Shoal)
J.	Blind Bay (Hammond)	B97,B96,B95
K.	Cedar Island, Dark Island	B98,B100,B99
L.	Mason Point	B112,B111,B110
M.	Round Island	B118,B117,B116

Table 4A. Substrates and Depths - Massena Sites.

STATION	MAIN SUBSTRATE	DEPTHS (FT.) MAY	AUG.	OCT.	STATION	MAIN SUBSTRATE	DEPTHS (FT.) MAY	AUG.	OCT.
B01	Silt	18	20	11	B36	Soft Clay	10	10	9
B02	Silt	28	24	21	B37	Silty Clay	6	11	12
B03	Detritus	7	6	6	B38	Soft Clay	27	33	30
B04	Silt	15	15	8	B39	Sand	4	4	4
B05	Silt	23	25	21	B40	Silty Clay	16	6	7
B06	Silt	6	4	5	B41	Hard Clay	26	27	28
B07	Silt	13	13	16	B42	Silty Clay	3	3	3
B08	Silt	15	15	16	B43	Silty Clay	5	5	4
B09	Silt	11	15	11	B44	Silty Clay	10	4	7
B10	Silt	14	21	18	B45	Silty Clay	10	4	4
B11	Silt	7	7	6	B46	Soft Clay	4	4	3
B12	Silt	10	4	6	B47	Soft Clay	5	5	5
B13	Sand	36	42	39	B48	Sand	8	4	7
B14	Hard Clay	14	19	8	B49	Silty Clay	20	4	13
B15	Soft Clay	12	13	12	B50	Sand	35	29	37
B16	Silt	32	34	34	B51	Silty Clay	10	10	7
B17	Hard Clay	37	31	39	B52	Sand	14	12	11
B18	Hard Clay	14	12	13	B53	Silty Clay	15	14	10
B19	Soft Clay	11	12	10	B54	Sand	7	10	14
B20	Silt	5	4	3	B55	Hard Clay	38	36	36
B21	Silt	12	6	12	B56	Sand	20	9	13
B22	Silt	14	10	13	B57	Soft Clay	12	10	11
B23	Silt	18	18	21	B58	Soft Clay	25	15	14
B24	Silt	18	16	20	B59	Silt	10	6	5
B25	Silt	24	10	18	B60	Soft Clay	15	11	15
B26	Silt	17	15	16	B61	Soft Clay	9	13	13
B27	Sand	11	10	14	B62	Silt	13	15	15
B28	Soft Clay	12	10	12	B63	Soft Clay	13	15	10
B29	Soft Clay	5	7	5	B64	Hard Clay	34	26	34
B30	Soft Clay	9	9	8	B65	Soft Clay	13	7	6
B31	Soft Clay	31	31	34	B66	Hard Clay	32	48	48
B32	Sand	4	3	4	B67	Soft Clay	46	50	41
B33	Sand	31	30	31	B68	Hard Clay	32	37	34
B34	Silty Clay	14	5	7	B69	Sand	34	33	32
B35	Silty Clay	6	5	6					

Table 4B. Substrates and Depths - Islands and Shoals

STATION	MAIN SUBSTRATE	DEPTH (FT.)
A01	Sand	3
A02	Silt	6
A03	Silt	8
A04	Silt	10
A05	Silt	12
A06	Silt	3
A07	Silt	5
A08	Silt	7
A09	Silt	8
A10	Silt	9
C01	Sand	3
C02	Sand	6
C03	Silt	10
C04	Rock	21
C05	Silt	13
C06	Silt	3
C07	Silt	6
C08	Silt	10
C09	Soft Clay	14
C10	Silt	20
D01	Sand	8
D02	Sand	4
D03	Soft Clay	13
D04	Sand	3
D05	Silt	10
D06	Sand	11
D07	Sand	12
D08	Sand	9
D09	Silt	14
D10	Sand	13
Q01	Silty Clay	12
Q02	Rock	7
Q03	Sand	5
Q04	Sand	6
Q05	Sand	8

Table 4C. Substrates and Depths - Upriver Sites

STATION	MAIN SUBSTRATE	DEPTHS (FT.) JULY	DEPTHS (FT.) OCT.	STATION	MAIN SUBSTRATE	DEPTHS (FT.) JULY	DEPTHS (FT.) OCT.
B70	Soft Clay	34	28	B106	Silt	8	8
B71	Sand	32	25	B107	Sand	5	13
B72	Sand	14	10	B108	Shells	42	29
B73	Sand	25	21	B109	Soft Clay	11	10
B74	Silty Clay	13	11	B110	Rock	18	15
B75	Sand	18	15	B111	Shells	45	34
B76	Sand	5	5	B112	Sand	32	25
B77	Sand	34	31	B113	Soft Clay	10	13
B78	Sand	34	33	B114	Silt	11	20
B79	Sand	7	6	B115	Rock	34	41
B80	Hard Clay	13	7	B116	Shells	24	24
B81	Sand	13	12	B117	Rock	35	35
B82	Silty Clay	3	4	B118	Rock	16	16
B83	Soft Clay	4	6	B119	Soft Clay	16	16
B84	Soft Clay	19	15	B120	Rock	27	40
B85	Soft Clay	11	14				
B86	Soft Clay	33	30				
B87	Sand	8	8				
B88	Rock	35	35				
B89	Rock	6	7				
B90	Rock	5	4				
B91	Sand	22	20				
B92	Rock	38	35				
B93	Sand	22	22				
B94	Sand	22	22				
B95	Silt	12	12				
B96	Sand	39	38				
B97	Sand	35	39				
B98	Sand	15	15				
B99	Detritus	13	13				
B100	Rock	35	35				
B101	Soft Clay	12	13				
B102	Soft Clay	10	9				
B103	Silt	5	7				
B104	Silt	8	7				
B105	Rock	30	30				

Table 4D. Average Secchi Disk Readings at Benthic Sampling Stations in the St. Lawrence River in 1979.

Massena		Upriver		Islands and Shoals	
May	1.2	July	2.4	Atlantis	1.6
June	0.9	September	3.1	Cedar	4.0
August	1.4	October	3.6	Chimney	2.9
October	1.8	Average	3.0	Goose Neck	3.5
Average	1.3			Oak	2.5
				Clark	2.8
				Round	3.1

All secchi readings in meters.

At some stations the secchi was visible to the bottom; therefore the visibility was greater than the recorded number. These samples were not included in the calculations of averages.

Table 4E. Secchi disk readings - Massena sites.

STATION	SECCHI READINGS (m) MAY	JUNE	AUG.	OCT.	STATION	SECCHI READINGS (m) MAY	JUNE	AUG.	OCT.
B01	2.0	2.0	3.7	2.4	B28	0.4	0.4	0.3	0.8
B02	2.0	1.5	3.4	3.4	B29	0.5	0.3	0.4	0.6
B03	1.5	>1.5	>2.2	1.6	B30	0.5	0.3	0.3	0.5
B04	1.6	1.6	3.4	1.8	B31	0.4	0.3	0.4	0.6
B05	0.6	1.5	2.6	3.9	B32	0.4	0.2	0.3	0.5
B06	1.5	1.6	>1.7	1.1	B33	0.5	0.5	0.3	0.8
B07	1.8	1.5	2.5	3.5	B34	0.5	0.3	0.2	0.7
B08	2.0	1.6	3.0	3.4	B35	0.5	0.5	0.3	0.9
B09	1.5	1.7	2.0	3.0	B36	0.5	0.6	0.5	0.9
B10	1.6	1.4	2.3	2.4	B37	0.5	0.6	0.5	1.2
B11	1.5	1.0	>1.5	>1.7	B38	0.5	0.6	0.5	1.0
B12	1.6	1.3	1.2	1.5	B39	0.5	>0.7	0.5	0.9
B13	1.5	1.2	2.0	2.9	B40	0.6	0.6	0.5	1.2
B14	1.6	1.8	2.2	2.0	B41	0.6	0.6	0.5	1.3
B15	1.0	0.7	1.8	3.0	B42	0.3	0.9	0.5	>1.0
B16	0.6	0.7	1.3	2.6	B43	0.9	0.4	0.7	>1.0
B17	0.2	0.7	0.4	0.6	B44	0.5	0.5	0.5	0.6
B18	0.4	0.6	0.5	0.7	B45	0.4	0.4	0.5	0.5
B19	0.5	0.5	0.5	0.9	B46	0.3	0.3	0.2	0.3
B20	0.7	>0.8	1.7	>1.0	B47	0.2	0.2	0.2	0.3
B21	1.1	1.0	0.8	1.5	B48	1.7	0.7	1.1	1.2
B22	0.9	1.1	1.2	1.7	B49	1.7	0.8	1.2	1.5
B23	1.0	0.7	1.6	1.7	B50	1.6	0.7	1.2	1.2
B24	0.8	0.8	1.9	1.6	B51	1.1	0.7	0.9	1.3
B25	0.9	1.2	1.0	1.8	B52	1.5	0.9	0.8	1.5
B26	0.8	0.8	2.2	1.9	B53	1.5	0.9	1.5	1.7
B27	0.4	0.4	0.3	0.6	B54	1.4	0.7	1.3	2.2

lable 4E (continued)

STATION	SECCHI READINGS (m) MAY	JUNE	AUG.	OCT.	STATION	SECCHI READINGS (m) MAY	JUNE	AUG.	OCT.
B55	1.8	1.1	1.7	2.9					
B56	2.0	0.7	2.0	1.6					
B57	1.8	0.9	1.7	1.9					
B58	2.2	0.8	1.7	1.9					
B59	2.4	1.1	1.1	>1.5					
B60	2.5	0.8	1.5	1.9					
B61	1.5	1.0	1.6	3.2					
B62	2.4	1.3	2.8	3.2					
B63	1.6	1.5	3.0	2.5					
B64	2.0	1.5	2.6	3.2					
B65	2.0	1.5	1.9	>1.8					
B66	2.0	1.8	3.7	4.2					
B67	2.2	1.7	3.3	4.3					
B68	2.0	1.5	3.9	4.5					
B69	1.4	0.7	1.2	1.3					

Table 4F. Secchi disk readings - Upriver sites.

STATION	SECCHI READINGS (m)			STATION	SECCHI READINGS (m)		
	JULY	SEPT.	OCT.		JULY	SEPT.	OCT.
B70	1.5	2.5	4.6	B97	2.1	4.5	4.4
B71	2.5	3.0	4.6	B98	2.4	4.2	4.3
B72	2.1	2.7	>3.0	B99	3.0	3.4	2.6
B73	2.5	3.0	5.2	B100	2.5	---	4.4
B74	1.9	2.2	>3.0	B101	3.5	3.6	3.3
B75	2.3	2.5	>4.2	B102	3.5	2.3	1.0
B76	>2.0	>2.4	>1.3	B103	>2.0	1.4	0.8
B77	2.1	4.4	4.6	B104	2.5	3.9	>2.1
B78	2.2	3.6	4.6	B105	2.7	3.6	4.4
B79	>2.2	>1.4	>1.6	B106	>2.8	3.2	>2.3
B80	1.0	2.0	>1.9	B107	>1.7	1.1	3.9
B81	2.6	3.0	>3.9	B108	3.2	3.6	4.0
B82	>1.2	>0.9	>1.2	B109	2.5	3.0	>3.0
B83	>1.7	>1.0	>1.8	B110	2.2	3.5	3.5
B84	2.6	2.7	2.4	B111	2.3	3.3	3.0
B85	1.7	2.2	2.8	B112	2.3	3.4	2.7
B86	2.3	4.0	4.8	B113	2.0	2.6	3.2
B87	2.4	2.9	2.3	B114	2.3	2.2	4.1
B88	2.5	3.5	4.4	B115	2.2	3.5	3.0
B89	>2.2	1.6	>2.2	B116	2.2	3.7	3.3
B90	1.7	>2.7	>1.3	B117	2.4	3.5	3.6
B91	2.9	3.5	3.8	B118	2.2	3.4	4.1
B92	2.9	4.6	4.4	B119	2.5	3.6	4.0
B93	2.6	4.1	3.3	B120	2.0	3.3	3.0
B94	3.4	4.0	3.8				
B95	2.5	3.6	3.7				
B96	2.7	4.3	3.7				

Table 4G. Secchi disk readings - Islands and shoals sites.

STATION	SECCHI READINGS (m)	STATION	SECCHI READINGS (m)	STATION	SECCHI READINGS (m)
A01	>0.7	D08	>2.3	Q10	4.3
A02	1.6	D09	3.5	Q01	2.8
A03	1.9	D10	3.0	Q02	>2.0
A04	>2.6	G01	3.2	Q03	>1.4
A05	>3.3	G02	3.5	Q04	>1.3
A06	>0.9	G03	3.3	Q05	>2.6
A07	1.0	G04	4.0	R01	3.3
A08	1.7	G05	4.0	R02	2.8
A09	>2.1	G06	3.3	R03	>2.0
A10	>2.2	G07	2.7	R04	3.3
C01	>0.6	G08	>2.6	R05	>1.0
C02	>1.6	G09	>1.7	R06	>1.2
C03	>2.8	G10	>1.5	R07	>3.0
C04	>4.2	G11	4.4		
C05	3.7	G12	2.5		
C06	>0.5	G13	3.8		
C07	>2.4	G14	3.9		
C08	>3.0	G15	3.6		
C09	3.9	O01	>0.6		
C10	4.3	O02	>0.9		
D01	>2.0	O03	>1.2		
D02	>1.1	O04	>1.5		
D03	3.3	O05	>1.8		
D04	>0.7	O06	0.6		
D05	>2.7	O07	1.6		
D06	2.7	O08	>2.6		
D07	1.8	O09	3.4		

Table 4H. Weather conditions during benthos sampling.*

Month	Area	Stations	Sky	Wind (mph)
May	Massena	B01-B20	Partly Cloudy	5-15
		B-21-B47	Mostly Cloudy	10-15; higher gusts
		B48-B69	Clear	0-5
June	Massena	B01-B18	Overcast	10-20; higher gusts
		B19-B35	Clear	5-10
		B36-B49, B51-B53	Overcast	20-30; higher gusts
		B50, B54-B69	Overcast; rain	15-25; higher gusts
August	Massena	B01-B20	Clear-P. Cloudy	0-5
		B21-B35	Overcast	20-30
		B36-B49, B51, B52, B54	Clear	0-15
		B50, B53, B55-B69	Clear-P. Cloudy	0-5
October	Massena	B01-B26	Overcast	Calm
		B27-B47, B67-B68	Overcast	0-5
		B48-B66, B69	Overcast	10-15
July	Upriver	B70-B80	Clear-P. Cloudy	20-30
		B81-B91	Mostly Cloudy	5-10
		B92-B103	Clear	Calm
		B104-B120	Overcast; hazy	5-15
September	Upriver	B70-B75	Overcast	25-30; higher gusts
		B76-B90	Mostly Cloudy	10-15
		B91-B104, B106-B107, B109, B113	Partly Cloudy	10-20; higher gusts
		B108, B110-B112, B114-B120	Partly Cloudy	10-20
October	Upriver	B70-B88	Partly Cloudy	Calm
		B89-B100	Partly Cloudy	10-15
		B101-B120	Partly Cloudy	15-30
August	Islands and Shoals	A01-A10, C01-C10, O01-O10	Clear	Calm
		D01-D10, Q01-Q05	Mostly Cloudy	0-5
		G01-G15	Overcast	0-5
July	Islands and Shoals	R01-R07	Clear	Calm

* Wind and sky conditions influence secchi readings.

Table 5. Phylogenetic List of Invertebrates Collected on the St. Lawrence River in 1979.

Phylum Porifera
- Order Haplosclerina
  - Family Spongillidae (Sponges)

Phylum Coelenterata
- Class Hydrozoa (Hydroids) - colonies

Phylum Platyhelminthes
- Class Turbellaria (Flatworms)

Phylum Nematoda (Roundworms)

Phylum Nematomorpha (Horsehair worms)

Phylum Bryozoa (Moss animalcules) - colonies

Phylum Annelida
- Class Oligochaeta (Aquatic earthworms)
- Class Hirudinea (Leeches)
  - Order Rhynchobdellidae
    - Family Glossiphoniidae
    - Family Piscicolidae
  - Order Gnathobdellidae
    - Family Hirudinidae
  - Order Pharyngobdellidae
    - Family Erpobdellidae

Phylum Arthropoda
- Class Crustacea
  - Subclass Malacostraca
    - Division Peracarida
      - Order Isopoda (Aquatic sow bugs)
      - Order Amphipoda (Scuds)
- Class Arachnoidea
  - Family Hydrachnellae (Hydracarina) (Water mites)
- Class Insecta
  - Order Collembola (Springtails) - adults
  - Order Ephemeroptera (Mayflies) - larvae
  - Order Odonata (Dragonflies, Damselflies) - larvae
  - Order Hemiptera (Bugs) - adults
  - Order Megaloptera (Alderflies, Dobsonflies, Fishflies)
    - Family Sialidae - larvae
    - Family Corydalidae - larvae
  - Order Sisyridae (Spongilla flies) - larvae
  - Order Trichoptera (Caddisflies) - larvae, pupae

Table 5 continued.

- Order Lepidoptera (Aquatic caterpillars) - larvae
- Order Coleoptera (Beetles)
  - Family Haliplidae (Crawling water beetles) - larvae
  - Family Dytiscidae (Predaceous diving beetles) - larvae, adults
  - Family Hydrophilidae (Water scavenger beetles) - larvae
  - Family Elmidae (Riffle beetles) - larvae
  - Family Curculionidae (Weevils) - larvae
  - Family Coccinellidae (Ladybird beetles) - adults
  - Family Elateridae (Click beetles) - adults
- Order Diptera (Flies)
  - Suborder Nematocera
    - Family Tipulidae (True crane flies) - larvae
    - Family Culicidae
      - Subfamily Chaoborinae (Phantom midges) - larvae
    - Family Chironomidae (Midges) - larvae, pupae
    - Family Ceratopogonidae (Punkies) - larvae
  - Suborder Brachycera
    - Family Athericidae - larvae

Phylum Mollusca
- Class Gastropoda (Snails, limpets)
  - Subclass Prosobranchia
    - Order Mesogastropoda
      - Family Valvatidae
      - Family Hydrobiidae
      - Family Pleuroceridae
  - Subclass Pulmonata
    - Order Bosommatophora
      - Family Lymnaeidae
      - Family Physidae
      - Family Planorbidae
      - Family Ancylidae
- Class Pelecypoda (Clams, mussels)
  - Family Unionidae (Freshwater mussels)
  - Family Sphaeriidae (Fingernail clams)

Table 6. Occurrence of Taxa at Benthos Stations by Month.

Taxa / Month / Location		May Massena	July Upriver	Aug. Massena	Oct. Massena	Oct. Upriver	Aug. Islands & Shoals	All Massena	All Upriver
Family Spongillidae (Sponges)	A				X			X	
Class Hydrozoa (Hydroids)	A					X			X
Class Turbellaria (Flatworms)	A		X		X	X	X	X	X
Phylum Nematoda (Roundworms)	A	X	X	X	X	X	X	X	X
Phylum Nematomorpha (Horsehair worms)	A	X	X	X	X	X	X	X	X
Phylum Bryozoa (Moss animalcules)	A			X	X	X		X	X
Class Oligochaeta (Aquatic earthworms)	A	X	X	X	X	X	X	X	X
Family Glossiphoniidae (Leech)	A	X	X	X	X	X	X	X	X
Family Piscicolidae (Leech)	A					X			X
Family Hirudinidae (Leech)	A		X		X	X		X	X
Family Erpobdellidae (Leech)	A	X	X	X	X	X	X	X	X
Order Isopoda (Aquatic sow bugs)	A	X	X	X	X	X	X	X	X
Order Amphipoda (Scuds)	A	X	X	X	X	X	X	X	X
Family Hydracarina (Water mites)	A	X	X	X	X	X	X	X	X
Order Collembola (Springtails)	A				X			X	
Order Ephemeroptera (Mayflies)	L	X	X	X	X	X	X	X	X
Order Odonata (Dragonflies)	L	X			X	X	X	X	X
Order Hemiptera (Bugs)	A	X						X	
Family Sialidae (Alderflies)	L	X			X	X	X	X	X
Family Corydalidae (Dobsonflies)	L				X			X	
Order Sisyridae (Spongilla flies)	L				X			X	
Order Trichoptera (Caddisflies)	L	X	X	X	X	X	X	X	X
Order Trichoptera (Caddisflies)	P			X			X	X	
Order Lepidoptera (Aquatic caterpillars)	L	X	X	X	X	X	X	X	X
Order Coleoptera (Unidentified beetles)	L				X			X	
Order Coleoptera (Unidentified beetles)	A				X			X	
Family Haliplidae (Crawling water beetles)	L	X	X	X	X		X	X	X
Family Dytiscidae (Predaceous diving beetles)	L				X	X		X	X
Family Dytiscidae (Predaceous diving beetles)	A				X		X	X	
Family Hydrophilidae (Water scavanger beetles)	L				X			X	
Family Elmidae (Riffle beetles)	L	X						X	
Family Curculionidae (Weevils)	L						X		
Family Coccinellidae	A						X		
Family Elateridae	A						X		
Order Diptera (Unidentified flies)	L	X						X	

Table 6 continued.

Taxa	Month / Location		May Massena	July Upriver	Aug. Massena	Oct. Massena	Oct. Upriver	Aug. Islands & Shoals	All Massena	All Massena
Family Tipulidae (True crane flies)		L	X			X	X		X	X
Subfamily Chaoborinae (Phantom midges)		L	X						X	
Family Chironomidae (Midges)		L	X	X	X	X	X	X	X	X
Family Chironomidae (Midges)		P	X	X	X	X	X	X	X	X
Family Ceratopogonidae		L	X	X	X	X	X	X	X	X
Family Athericidae		L				X			X	
Family Valvatidae		A		X	X	X	X	X	X	X
Family Hydrobiidae		A	X	X	X	X	X	X	X	X
Family Pleuroceridae		A	X	X	X	X	X	X	X	X
Family Lymnaeidae		A	X	X	X	X	X	X	X	X
Family Physidae		A	X	X	X	X	X	X	X	X
Family Planorbidae		A	X	X	X	X	X	X	X	X
Family Ancylidae (Limpets)		A	X	X		X	X	X	X	X
Class Pelecypoda (Unidentified clams)		A				X			X	
Family Unionidae (Freshwater mussels)		A	X	X	X	X	X	X	X	X
Family Sphaeriidae (Fingernail clams)		A	X	X	X	X	X	X	X	X

A=Adult P=Pupae L=Larvae

Table 7A. Abundance of Benthic Invertebrates by Station. (May, Massena sites)

#/m^2	Station	#/m^2	Station	#/m^2	Station
30,391	B14	1,821	B15	465	B64
13,246	B07	1,780	B16	404	B45
11,889	B03	1.395	B53	323	B33
7,361	B06	1,394	B51	283	B18
7,319	B01	1,232	B21	283	B37
6,329	B08	1,193	B47	282	B58
6,006	B05	1,051	B32	201	B17
5,662	B59	970	B65	182	B43
5,641	B10	970	B36	181	B67
5,499	B02	950	B25	141	B49
5,439	B04	948	B11	141	B40
4,933	B09	910	B38	101	B54
4,772	B60	889	B26	100	B68
4,691	B56	869	B29	81	B34
4,650	B61	849	B30	81	B39
3,519	B13	767	B28	60	B12
2,810	B41	707	B52	60	B31
2,629	B62	688	B46	60	B35
2,425	B23	687	B24	20	B50
2,384	B20	585	B27	0	B55
2,365	B63	564	B48	0	B66
2,285	B69	546	B19		
2,143	B44	525	B22		
2,001	B57	505	B42		

Table 7B. Abundance of Benthic Invertebrates by Station. (July, Upriver sites)

#/m^2	Station	#/m^2	Station	#/m^2	Station
20,099	B86	2,123	B92	243	B78
15,773	B90	2,083	B108	222	B73
15,104	B83	2,062	B116	100	B100
12,153	B81	1,880	B93		
9,988	B87	1,820	B109		
8,390	B114	1,699	B88		
7,056	B107	1,698	B80		
6,268	B103	1,496	B[illegible]		
6,087	B111	1,434	B120		
6,044	B85	1,334	B96		
5,054	B98	1,283	B97		
4,933	B112	1,173	B117		
4,892	B76	1,112	B72		
4,832	B89	828	B94		
4,509	B118	788	B95		
3,559	B113	768	B101		
3,477	B110	708	B77		
3,256	B75	687	B115		
3,012	B119	666	B70		
2,547	B106	525	B105		
2,383	B91	525	B99		
2,324	B84	505	B71		
2,243	B102	486	B74		
2,223	B104	364	B82		

Table 7C. Abundance of Benthic Invertebrates by Station. (August, Massena sites)

#/m^2	Station
15,973	B07
15,226	B52
12,516	B38
10,898	B32
10,454	B54
9,868	B65
9,645	B37
8,392	B27
7,421	B47
5,176	B01
3,133	B34
2,830	B49
2,285	B45
2,122	B58
1,899	B22
1,032	B16
747	B04
728	B19
606	B39

Table 7D. Abundance of Benthic Invertebrates by Station. (August, Islands and Shoals)

Atlantis Island	
#/m^2	Station
37,794	A06
12,073	A02
10,110	A01
7,581	A10
7,463	A03
5,943	A07
5,378	A04
4,326	A08
2,365	A09
1,616	A05

Chimney Island Shoal	
#/m^2	Station
19,492	D08
18,039	D02
12,821	D09
11,908	D06
11,465	D01
7,542	D04
7,257	D07
6,532	D10
3,012	D05
2,446	D03

Cedar Island	
#/m^2	Station
12,900	C02
10,049	C07
9,242	C03
9,078	C01
8,189	C05
5,258	C06
4,953	C04
1,535	C09
971	C10
403	C08

Clark Island Shoal	
#/m^2	Station
8,350	Q02
6,713	Q05
3,274	Q03
1,921	Q04
972	Q01

Table 7E. Abundance of Benthic Invertebrates by Station. (October, Massena sites)

#/m^2	Station	#/m^2	Station	#/m^2	Station
51,017	B20	13,367	B29	5,400	B10
43,093	B19	12,660	B56	4,994	B46
41,335	B01	10,555	B06	4,629	B33
34,941	B03	10,232	B63	3,640	B62
33,729	B08	10,131	B42	3,356	B35
29,200	B05	10,091	B58	2,993	B24
26,633	B59	9,990	B61	2,932	B27
24,489	B49	9,504	B60	2,850	B69
23,983	B32	8,613	B57	2,263	B54
23,032	B04	8,372	B47	1,881	B18
22,466	B13	8,290	B38	1,739	B43
21,475	B52	8,047	B34	1,415	B68
20,261	B48	7,986	B41	1,334	B50
20,078	B23	7,764	B21	1,334	B39
19,554	B37	7,522	B40	1,051	B26
19,149	B65	7,360	B66	526	B31
17,250	B11	7,339	B45	525	B67
16,137	B14	6,732	B51	424	B12
15,427	B28	6,328	B36	262	B17
15,125	B07	6,209	B02	262	B64
14,821	B30	5,984	B22	180	B55
14,417	B25	5,723	B15		
13,952	B09	5,680	B44		
13,547	B16	5,498	B53		

Table 7F. Abundance of Benthic Invertebrates by Station. (October, Upriver sites)

#/m^2	Station	#/m^2	Station	#/m^2	Station
69,140	B102	10,718	B77	1,375	B81
56,095	B116	10,151	B118	687	B105
45,621	B113	9,482	B86	445	B100
32,233	B82	8,471	B96		
26,975	B98	8,190	B108		
23,719	B119	8,148	B75		
23,377	B104	8,069	B109		
22,771	B103	5,764	B95		
22,729	B101	4,993	B74		
22,202	B94	4,569	B85		
20,544	B80	4,527	B97		
19,835	B87	4,368	B89		
19,474	B93	4,347	B72		
17,958	B76	4,326	B91		
15,489	B79	4,265	B120		
15,065	B114	4,184	B99		
15,024	B106	4,023	B78		
13,507	B112	3,376	B88		
13,264	B92	3,235	B73		
12,557	B117	3,154	B111		
12,394	B84	2,608	B115		
12,294	B90	2,385	B71		
11,668	B107	2,063	B70		
11,628	B110	1,713	B83		

Table 8A. Biomass of Benthic Invertebrates by Station. (May, Massena sites).

g/m^2	Station	g/m^2	Station	g/m^2	Station
1565.6945	B07	1.5167	B22	0.2062	B29
1397.9915	B13	1.4163	B41	0.2050	B32
1132.5149	B08	1.1606	B60	0.1988	B28
1031.5822	B18	1.1364	B63	0.1740	B48
818.0062	B10	1.1089	B68	0.1440	B64
495.7828	B09	0.9262	B17	0.1415	B42
424.6621	B14	0.8903	B69	0.1375	B46
368.3579	B01	0.8898	B16	0.0829	B58
366.1080	B02	0.8614	B40	0.0809	B33
361.5351	B05	0.7366	B27	0.0808	B45
354.9049	B56	0.6289	B67	0.0687	B43
346.7809	B04	0.4555	B65	0.0627	B37
344.8255	B23	0.4469	B44	0.0370	B39
344.2196	B21	0.4004	B57	0.0364	B49
343.7497	B15	0.3923	B47	0.0282	B31
55.9361	B06	0.3789	B51	0.0202	B54
13.2600	B59	0.3540	B25	0.0127	B34
5.6378	B61	0.3133	B53	0.0101	B35
5.0137	B20	0.2810	B36	0.0040	B50
4.7481	B62	0.2729	B12	0.0000	B55
3.8888	B11	0.2487	B26	0.0000	B66
3.3811	B03	0.2467	B38		
2.7240	B19	0.2386	B52		
1.8078	B24	0.2346	B30		

Table 8B. Biomass of Benthic Invertebrates by Station. (July, Upriver sites)

g/m^2	Station	g/m^2	Station	g/m^2	Station
5541.0342	B93	23.7880	B119	0.1476	B74
3838.5846	B91	22.3999	B75	0.0930	B73
2765.9489	B86	20.4191	B83	0.0809	B82
2201.5166	B112	16.7641	B115		
1456.2832	B87	15.2211	B113		
1268.5218	B114	15.1260	B81		
1040.8424	B101	15.0875	B105		
832.3537	B107	14.7439	B106		
772.9841	B98	9.0938	B95		
716.4008	B120	4.3760	B89		
705.6143	B94	4.2088	B102		
546.4875	B111	3.4847	B85		
496.8120	B90	3.2699	B76		
386.1329	B97	3.1203	B103		
343.9843	B104	1.7593	B84		
343.1369	B78	1.6995	B100		
79.7596	B108	0.9591	B88		
69.5395	B92	0.5216	B80		
66.4314	B110	0.4267	B79		
45.6196	B118	0.3357	B72		
40.2498	B117	0.3215	B99		
33.6393	B109	0.3114	B70		
26.6951	B116	0.2872	B71		
25.6141	B96	0.2594	B77		

Table 8C. Biomass of Bentic Invertebrates by Station. (August, Massena sites)

g/m^2	Station
1810.5850	B07
787.7224	B01
688.7599	B19
12.7679	B65
10.0038	B27
7.9130	B37
7.2424	B52
6.9672	B38
5.0361	B54
4.3032	B34
4.2932	B16
3.5316	B22
3.5065	B32
3.4863	B47
0.9625	B58
0.9408	B49
0.6114	B45
0.2614	B04
0.1848	B39

Table 8D. Biomass of Benthic Invertebrates by Station. (August, Islands and Shoals).

Atlantis Island		Cedar Island		Chimney Island Shoal	
g/m^2	Station	g/m^2	Station	g/m^2	Station
93.1103	A01	358.5122	C04	1033.6683	D07
21.9066	A04	40.4198	C01	389.8801	D09
20.5403	A03	18.8550	C07	359.0374	D01
18.9891	A02	13.2432	C02	356.4329	D05
17.3303	A06	10.5073	C03	133.4610	D02
13.7495	A07	9.9763	C05	28.7585	D10
7.1021	A10	3.3729	C06	24.7700	D08
4.0774	A09	1.2719	C09	15.6275	D06
3.6305	A08	0.7078	C08	11.5731	D04
1.6305	A05	0.2811	C10	8.7764	D03

Clark Island Shoal	
g/m^2	Station
6.4791	Q04
5.1566	Q02
3.9278	Q05
2.1658	Q03
0.3054	Q01

Table 8E. Biomass of Benthic Invertebrates by Station. (October, Massena sites).

g/m^2	Station	g/m^2	Station	g/m^2	Station
2782.6321	B10	20.7458	B23	4.2366	B24
2679.0071	B07	18.9267	B37	3.9837	B17
1791.6570	B19	18.5788	B56	3.9353	B12
1538.3768	B09	18.2849	B32	3.8369	B36
1424.8503	B16	18.0207	B49	3.6629	B47
1362.6866	B08	16.5423	B30	3.6459	B53
1147.6126	B01	14.4666	B22	3.3354	B68
765.7676	B02	14.0219	B58	3.2725	B26
725.5542	B04	12.6772	B44	3.0019	B60
708.5787	B03	12.5882	B29	2.9908	B46
706.5952	B21	12.0058	B28	2.7381	B33
694.4807	B15	11.1693	B54	2.6741	B35
438.5263	B06	7.8258	B45	2.2528	B40
434.4139	B05	7.5799	B43	2.0635	B69
376.7339	B66	7.0536	B57	2.0040	B27
153.5519	B14	6.3505	B34	1.9939	B62
139.4489	B13	6.0653	B51	1.1547	B55
42.4318	B20	5.8502	B61	0.7348	B39
36.2622	B65	5.4297	B63	0.6350	B64
35.4674	B48	5.3670	B18	0.6349	B50
30.5637	B11	5.0331	B41	0.1921	B31
29.7868	B59	4.5621	B67		
29.0113	B25	4.4064	B38		
27.7181	B52	4.3539	B42		

Table 8F. Biomass of Benthic Invertebrates by Station. (October, Upriver sites).

g/m^2	Station	g/m^2	Station	g/m^2	Station
3894.3709	B93	106.6103	B107	2.8380	B88
3481.8685	B86	96.1759	B119	2.2326	B81
2558.7166	B94	78.4756	B111	0.2630	B100
1768.4057	B96	75.9557	B109		
1156.6336	B112	72.1075	B115		
1083.5654	B91	63.7734	B98		
1074.9549	B92	53.8190	B82		
959.2914	B114	52.3264	B118		
722.3704	B77	39.8655	B103		
426.6618	B120	38.4812	B101		
414.7337	B97	34.3653	B76		
389.0429	B87	29.3705	B106		
364.7846	B104	22.9463	B83		
359.3285	B90	19.4435	B80		
354.5731	B95	19.2533	B72		
353.1833	B70	15.8082	B89		
346.7325	B99	14.1137	B74		
317.7909	B117	10.2991	B73		
292.4412	B113	7.7814	B75		
208.0560	B116	7.5004	B105		
194.0563	B108	6.5014	B84		
184.7881	B110	6.2617	B85		
107.8198	B102	5.9054	B78		
107.0145	B79	4.0249	B71		

Table 9. Average Weights Used in Estimating Biomass.

(Figures are in grams per organism and are rounded to the nearest 0.0001 g, except for those that would equal 0.0000, which are rounded to the nearest 0.00001 g).

Amphipoda	0.0006
Ancylidae	0.0003
Ceratopogonidae (L)	0.0002
Chironomidae (L)	0.0002
Chironomidae (P)	0.0002
Ephemeroptera (L)	0.0002
Erpobdellidae	0.0026
Glossiphoniidae	0.0024
Haliplidae (L)	0.0003
Hirudinidae	0.0081
Hydracarina	0.00004
Hydrobiidae	0.0414
Isopoda	0.0003
Lepidoptera (L)	0.0005
Lymnaeidae	0.0127
Nematoda	0.00003
Nematomorpha	0.0001
Odonata (L)	0.0009
Oligochaeta	0.0006
Physidae	0.0035
Planorbidae	0.0007
Pleuroceridae	0.0775
Sphaeriidae	0.0270
Trichoptera (L)	0.0006
Turbellaria	0.0002
Unionidae	16.9623
Valvatidae	0.0016

L = Larvae P = Pupae

Taxa not listed above were not included in biomass estimates due to their rareness or the fact that they occur in colonies and cannot be enumerated.

Table 10. Shannon-Weaver Diversity Indices.

Stations	Mean	Median	Range
All Stations	1.236	1.211	0.000-2.185
Massena Sites (May)	0.984	0.968	0.000-2.069
Massena Sites (August)	1.049	0.960	0.392-1.821
Massena Sites (October)	1.202	1.142	0.581-2.093
Massena Sites (All)	1.088	1.048	0.000-2.093
Upriver Sites (July)	1.209	1.219	0.215-2.185
Upriver Sites (October)	1.528	1.544	0.426-2.124
Upriver Sites (All)	1.369	1.424	0.215-2.185
Between Locks - Channel	0.961	1.007	0.377-1.358
Between Locks - Non-Channel	0.912	0.876	0.281-1.653
Dominant Macrophyte - *V. americana*	1.573	1.689	1.191-1.828
Dominant Macrophyte - *M. exalbescens*	1.441	1.510	0.470-2.155
Dominant Macrophyte - *H. dubia*	1.756	1.745	1.138-2.052
Cedar Island - All	1.701	1.798	1.138-2.052
Cedar Island - Channel	1.734	1.851	1.138-2.052
Cedar Island - Non-Channel	1.667	1.745	1.181-2.022
Atlantis Island - All	1.767	1.734	1.577-2.001
Atlantis Island - Channel	1.809	1.920	1.577-2.001
Atlantis Island - Non-Channel	1.726	1.731	1.634-1.886
Chimney Island Shoal	1.276	1.278	0.470-2.155
Clark Island Shoal	1.050	0.959	0.673-1.574
Samples with Oil	1.138	1.209	0.562-1.505

Table 11 . Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979
Stations: All (B01-B120, A01-A10, C01-C10, D01-D10, Q01-Q05)
Total Number of Samples: 294 Number of Samples Containing Organisms: 292
L=Larvae P=Pupae A=Adult +=<0.1% or <0.0001g or <1/m² *=Colonies X=No biomass estimate made

TAXA	LIFE STAGE	ABUNDANCE MEAN #/m²	% BY NUMBER	CUM. PERCENT	RANK BY NUMBER	FREQUENCY # OF OCCUR.	% OCCUR.	RANK BY FREQUENCY	BIOMASS MEAN BIO. g/m²	% BY BIO.	CUM. PERCENT	% BY BIO w/o MOL.	CUM. % w/o MOL.	RANK BY BIO
Oligochaeta	A	2420	31.0	31.0	1	271	92.2	2	1.4520	0.5	99.0	50.2	50.2	4
Chironomidae	L	2077	26.6	57.6	2	284	96.6	1	0.4154	0.2	99.8	14.4	88.6	7
Amphipoda	A	1156	14.8	72.4	3	210	71.4	3	0.6936	0.3	99.6	24.0	74.2	6
Hydrobiidae	A	602	7.7	80.1	4	157	53.4	7	24.9228	9.1	95.8	--	--	2
Spnaeriidae	A	273	3.5	83.6	5	191	65.0	4	7.3710	2.7	98.5	--	--	3
Isopoda	A	206	2.7	86.3	6	106	36.1	12	0.0624	+	100.0	2.2	96.8	14
Planorbidae	A	196	2.5	88.8	7	123	41.8	9	0.1372	0.1	100.0	--	--	9
Nematoda	A	162	2.1	90.9	8	158	53.7	6	0.0049	+	100.0	0.2	99.9	23
Trichoptera	L	160	2.1	93.0	9	191	65.0	4	0.0960	+	100.0	3.3	91.9	11
Ancylidae	A	88	1.1	94.1	10	52	17.7	20	0.0264	+	100.0	--	--	15
Valvatidae	A	86	1.1	95.2	11	109	37.1	11	0.1376	0.1	99.9	--	--	8
Turbellaria	A	60	0.8	96.0	12	70	23.8	16	0.0120	+	100.0	0.4	98.1	17
Ceratopogonidae	L	56	0.7	96.7	13	113	38.4	10	0.0112	+	100.0	0.4	98.5	18
Nematomorpha	A	51	0.7	97.4	14	138	46.9	8	0.0051	+	100.0	0.2	99.7	22
Haliplidae	L	34	0.4	97.8	15	34	11.6	26	0.0102	+	100.0	0.4	98.9	19
Glossiphoniidae	A	32	0.4	98.2	16	87	29.6	15	0.0768	+	100.0	2.7	94.6	12
Physidae	A	29	0.4	98.6	17	62	21.1	18	0.1015	+	100.0	--	--	10
Hydracarina	A	21	0.3	98.9	18	100	34.0	13	0.0008	+	100.0	+	100.2	27
Ephemeroptera	L	20	0.3	99.2	19	47	16.0	22	0.0040	+	100.0	0.1	100.0	24
Lepidoptera	L	18	0.2	99.4	20	60	20.4	19	0.0090	+	100.0	0.3	99.2	20
Unionidae	A	14	0.2	99.6	21	70	23.8	16	237.4722	86.7	86.7	--	--	1
Pleuroceridae	A	11	0.1	99.7	22	39	13.3	24	0.8525	0.3	99.3	--	--	5
Chironomidae	P	10	0.1	99.8	23	52	17.7	20	0.0020	+	100.0	0.1	100.1	25
Erpobdellidae	A	10	0.1	99.9	23	47	16.0	22	0.0260	+	100.0	0.9	97.7	16

Table 11 continued.

TAXA	LIFE STAGE	ABUNDANCE MEAN #/m²	% BY NUMBER	CUM. PERCENT	RANK BY NUMBER	FREQUENCY # OF OCCUR.	% OCCUR.	RANK BY FREQUENCY	BIOMASS MEAN BIO. g/m²	% BY BIO.	CUM. PERCENT	% BY BIO w/o MOL.	CUM. % w/o MOL	RANK BY BIO.
Lymnaeidae	A	6	0.1	100.0	25	37	12.6	25	0.0762	+	100.0	--	--	13
Odonata	L	3	+	100.0	26	15	5.1	28	0.0018	+	100.0	0.1	100.2	26
Hirudinidae	A	2	+	100.0	27	11	3.7	29	0.0081	+	100.0	0.3	99.5	21
Tipulidae	L	1	+	100.0	27	7	2.4	30	X	X	X	X	X	26
Unid. Coleoptera	L	+	+	100.0	29	2	0.7	32	X	X	X	X	X	28
Sialidae	L	+	+	100.0	29	4	1.4	31	X	X	X	X	X	28
Athericidae	L	+	+	100.0	29	2	0.7	32	X	X	X	X	X	28
Unid. Coleoptera	A	+	+	100.0	29	2	0.7	32	X	X	X	X	X	28
Dytiscidae	A	+	+	100.0	29	2	0.7	32	X	X	X	X	X	28
Curculionidae	L	+	+	100.0	29	2	0.7	32	X	X	X	X	X	28
Dytiscidae	L	+	+	100.0	29	2	0.7	32	X	X	X	X	X	28
Trichoptera	P	+	+	100.0	29	2	0.7	32	X	X	X	X	X	28
Chaoboridae	L	+	+	100.0	29	1	0.3	39	X	X	X	X	X	28
Coccinellidae	A	+	+	100.0	29	1	0.3	39	X	X	X	X	X	28
Collembola	A	+	+	100.0	29	1	0.3	39	X	X	X	X	X	28
Corydalidae	A	+	+	100.0	29	1	0.3	39	X	X	X	X	X	28
Unid. Diptera	L	+	+	100.0	29	1	0.3	39	X	X	X	X	X	28
Elateridae	A	+	+	100.0	29	1	0.3	39	X	X	X	X	X	28
Elmidae	L	+	+	100.0	29	1	0.3	39	X	X	X	X	X	28
Hemiptera	A	+	+	100.0	29	1	0.3	39	X	X	X	X	X	28
Hydrophilidae	L	+	+	100.0	29	1	0.3	39	X	X	X	X	X	28
Unid. Pelecypoda	A	+	+	100.0	29	1	0.3	39	X	X	X	X	X	28
Piscicolidae	A	+	+	100.0	29	1	0.3	39	X	X	X	X	X	28
Sisyridae	L	+	+	100.0	29	1	0.3	39	X	X	X	X	X	28
Bryozoa	A	*	*	*	29	98	33.3	14	X	X	X	X	X	28

Table 11 continued.

TAXA	LIFE STAGE	ABUNDANCE MEAN #/m²	ABUNDANCE % BY NUMBER	ABUNDANCE CUM. PERCENT	ABUNDANCE RANK BY NUMBER	FREQUENCY # OF OCCUR.	FREQUENCY % OCCUR.	FREQUENCY RANK BY FREQUENCY	BIOMASS MEAN BIO. g/m²	BIOMASS % BY BIO.	BIOMASS CUM. % BY BIO. PERCENT	BIOMASS CUM. % BY BIO. w/o MOL.	BIOMASS CUM. % w/o MOL	BIOMASS RANK BY BIO.
Hydrozoa	A	*	*	*	29	17	5.8	27	X	X	X	X	X	28
Porifera	A	*	*	*	29	1	0.3	39	X	X	X	X	X	28
TOTAL	---	7804	---	100.0	51	292	99.3	51	273.9887	---	100.0	---	100.2	51

Table 12 . Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979
Stations: All Massena (B01-B69)
Total Number of Samples: 157 Number of Samples Containing Organisms: 155
L=Larvae P=Pupae A=Adult +=<0.1% or <0.001g or <1/m² *=Colonies X=No biomass estimate made

		ABUNDANCE				FREQUENCY			BIOMASS					
TAXA	LIFE STAGE	MEAN #/m²	% BY NUMBER	CUM. PERCENT	RANK BY NUMBER	# OF OCCUR.	% OCCUR.	RANK BY FREQUENCY	MEAN BIO. g/m²	% BY BIO.	CUM. PERCENT	% BY BIO w/o MOL.	CUM. % w/o MOL.	RANK BY BIO.
Oligocnaeta	A	3060	43.2	43.2	1	144	91.7	2	1.8360	0.9	99.4	69.3	69.3	4
Chironomidae	L	2319	32.7	75.9	2	151	96.2	1	0.4638	0.2	99.6	17.5	86.8	5
Hydrobiidae	A	411	5.8	81.7	3	57	36.3	10	17.0154	8.6	94.5	--	--	2
Sphaeriidae	A	291	4.1	85.8	4	92	58.6	6	7.8570	4.0	98.5	--	--	3
Amphipoda	A	230	3.2	89.0	5	78	49.7	7	0.1380	0.1	99.8	5.2	92.0	7
Nematoda	A	166	2.3	91.3	6	93	59.2	4	0.0050	+	99.8	0.2	99.6	22
Trichoptera	L	107	1.5	92.8	7	103	65.6	3	0.0642	+	99.8	2.4	94.4	9
Ceratopogonidae	L	100	1.4	94.2	8	93	59.2	4	0.0200	+	99.8	0.8	97.2	14
Haliplidae	L	61	0.9	95.1	9	28	17.8	16	0.0183	+	99.8	0.7	97.9	16
Nematomorpha	A	56	0.8	95.9	10	78	49.7	7	0.0056	+	99.8	0.2	99.4	21
Ancylidae	A	48	0.7	96.6	11	17	10.8	21	0.0144	+	99.8	--	--	18
Isopoda	A	39	0.6	97.2	12	22	14.0	17	0.0117	+	99.8	0.4	98.9	19
Ephemeroptera	L	35	0.5	97.7	13	38	24.2	13	0.0070	+	99.8	0.3	99.2	20
Planorbidae	A	28	0.4	98.1	14	46	29.3	12	0.0196	+	99.8	--	--	15
Hydracarina	A	24	0.3	98.4	15	65	41.4	9	0.0010	+	99.8	+	100.0	26
Valvatidae	A	19	0.3	98.7	16	35	22.3	14	0.0304	+	99.8	--	--	11
Turbellaria	A	15	0.2	98.9	17	16	10.2	23	0.0030	+	99.8	0.1	99.9	24
Physidae	A	14	0.2	99.1	18	17	10.8	21	0.0490	+	99.8	--	--	10
Glossiphoniidae	A	12	0.2	99.3	19	19	12.1	19	0.0288	+	99.8	1.1	95.5	12
Unionidae	A	10	0.1	99.4	20	32	20.4	15	169.6230	85.9	85.9	--	--	1
Lepidoptera	L	10	0.1	99.5	20	18	11.5	20	0.0050	+	99.8	0.2	99.8	22
Erpobdellidae	A	9	0.1	99.6	22	15	9.6	24	0.0234	+	99.8	0.9	96.4	13
Chironomidae	P	9	0.1	99.7	22	22	14.0	17	0.0018	+	99.8	0.1	100.0	25
Lymnaeidae	A	6	0.1	99.8	24	15	9.6	24	0.0762	+	99.8	--	--	8

Table 12 continued.

TAXA	LIFE STAGE	ABUNDANCE MEAN #/m²	ABUNDANCE % BY NUMBER	ABUNDANCE CUM. PERCENT	ABUNDANCE RANK BY NUMBER	FREQUENCY # OF OCCUR.	FREQUENCY % OCCUR.	FREQUENCY RANK BY FREQUENCY	BIOMASS MEAN BIO. g/m²	BIOMASS % BY BIO.	BIOMASS CUM. PERCENT	BIOMASS % BY BIO w/o MOL.	BIOMASS CUM. % w/o MOL.	BIOMASS RANK BY BIO
Pleuroceridae	A	3	+	99.8	25	4	2.5	29	0.2325	0.1	99.7	--	--	6
Hirudinidae	A	2	+	99.8	26	7	4.5	27	0.0162	+	99.8	0.6	98.5	17
Odonata	L	1	+	99.8	27	8	5.1	26	0.0009	+	99.8	+	100.0	27
Tipulidae	L	1	+	99.8	27	6	3.8	28	X	X	X	X	X	28
Unid. Coleoptera	L	1	+	99.8	27	2	1.3	30	X	X	X	X	X	28
Athericidae	L	+	+	99.8	30	2	1.3	30	X	X	X	X	X	28
Unid. Coleoptera	A	+	+	99.8	30	2	1.3	30	X	X	X	X	X	28
Dytiscidae	A	+	+	99.8	30	1	0.6	34	X	X	X	X	X	28
Sialidae	L	+	+	99.8	30	2	1.3	30	X	X	X	X	X	28
Chaoboridae	L	+	+	99.8	30	1	0.6	34	X	X	X	X	X	28
Collembola	A	+	+	99.8	30	1	0.6	34	X	X	X	X	X	28
Corydalidae	L	+	+	99.8	30	1	0.6	34	X	X	X	X	X	28
Unid. Diptera	L	+	+	99.8	30	1	0.6	34	X	X	X	X	X	28
Dytiscidae	L	+	+	99.8	30	1	0.6	34	X	X	X	X	X	28
Elmidae	L	+	+	99.8	30	1	0.6	34	X	X	X	X	X	28
Hemiptera	A	+	+	99.8	30	1	0.6	34	X	X	X	X	X	28
Hydrophilidae	L	+	+	99.8	30	1	0.6	34	X	X	X	X	X	28
Unid. Pelecypoda	A	+	+	99.8	30	1	0.6	34	X	X	X	X	X	28
Sisyridae	L	+	+	99.8	30	1	0.6	34	X	X	X	X	X	28
Trichoptera	P	+	+	99.8	30	1	0.6	34	X	X	X	X	X	28
Bryozoa	A	*	*	*	45	53	33.8	11	X	X	X	X	X	28
Porifera	A	*	*	*	45	1	0.6	34	X	X	X	X	X	28
TOTAL	---	7087	---	99.8	46	155	98.7	46	197.5672	---	99.8	---	100.0	46

Table 13 . Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979
Stations: Massena - May (B01-B69)
Total Number of Samples: 69 Number of Samples Containing Organisms: 67
L=Larvae P=Pupae A=Adult +=<0.1% or <0.0001g or <1/m² *=Colonies X=No biomass estimate made

		ABUNDANCE				FREQUENCY			BIOMASS					
TAXA	LIFE STAGE	MEAN #/m²	% BY NUMBER	CUM. PERCENT	RANK BY NUMBER	# OF OCCUR.	% OCCUR.	RANK BY FREQUENCY	MEAN BIO. g/m²	% BY BIO.	CUM. PERCENT	% BY BIO w/o MOL.	CUM. % w/o MOL.	RANK BY BIO
Chironomidae	L	1423	56.9	56.9	1	66	95.7	1	0.2846	0.2	99.5	41.2	41.2	4
Oligochaeta	A	410	16.4	73.3	2	57	82.6	2	0.2460	0.2	99.7	35.6	76.8	5
Hydrobiidae	A	207	8.3	81.6	3	21	30.4	6	8.5698	5.8	97.9	--	--	2
Amphipoda	A	124	5.0	86.6	4	22	31.9	5	0.0744	0.1	100.0	10.8	87.6	7
Ceratopogonidae	L	76	3.0	89.6	5	40	58.0	3	0.0152	+	100.0	2.2	95.3	12
Sphaeriidae	A	76	3.0	92.6	5	20	29.0	8	2.0520	1.4	99.3	--	--	3
Trichoptera	L	36	1.4	94.0	7	36	52.2	4	0.0216	+	100.0	3.1	90.7	9
Haliplidae	L	35	1.4	95.4	8	12	17.4	12	0.0105	+	100.0	1.5	96.8	13
Nematomorpha	A	22	0.9	96.3	9	19	27.5	9	0.0022	+	100.0	0.3	99.1	18
Ephemeroptera	L	17	0.7	97.0	10	13	18.8	11	0.0034	+	100.0	0.5	98.4	15
Nematoda	A	15	0.6	97.6	11	21	30.4	6	0.0005	+	100.0	0.1	99.7	21
Chironomidae	P	8	0.3	97.9	12	7	10.1	15	0.0016	+	100.0	0.2	99.6	20
Unionidae	A	8	0.3	98.2	12	15	21.7	10	135.6984	92.1	92.1	--	--	1
Glossiphoniidae	A	7	0.3	98.5	14	5	7.2	18	0.0168	+	100.0	2.4	93.1	11
Isopoda	A	7	0.3	98.8	14	5	7.2	18	0.0021	+	100.0	0.3	99.4	19
Lepidoptera	L	6	0.2	99.0	16	9	13.0	14	0.0030	+	100.0	0.4	98.8	16
Hydracarina	A	5	0.2	99.2	17	11	15.9	13	0.0002	+	100.0	+	99.7	24
Physidae	A	5	0.2	99.4	17	5	7.2	18	0.0175	+	100.0	--	--	10
Planorbidae	A	4	0.2	99.6	19	7	10.1	15	0.0028	+	100.0	--	--	17
Erpobdellidae	A	3	0.1	99.7	20	5	7.2	18	0.0078	+	100.0	1.1	97.9	14
Pleuroceridae	A	3	0.1	99.8	20	1	1.4	22	0.2325	0.2	99.9	--	--	6
Lymnaeidae	A	3	0.1	99.9	20	6	8.7	17	0.0381	+	100.0	--	--	8
Ancylidae	A	1	+	99.9	23	1	1.4	22	0.0003	+	100.0	--	--	22
Odonata	L	+	+	99.9	24	1	1.4	22	0.0003	+	100.0	+	99.7	22

Table 13 continued.

TAXA	LIFE STAGE	ABUNDANCE MEAN #/m²	ABUNDANCE % BY NUMBER	ABUNDANCE CUM. PERCENT	ABUNDANCE RANK BY NUMBER	FREQUENCY # OF OCCUR.	FREQUENCY % OCCUR.	FREQUENCY RANK BY FREQUENCY	BIOMASS MEAN BIO. g/m²	BIOMASS % BY BIO.	BIOMASS CUM. PERCENT	BIOMASS % BY BIO. w/o MOL.	BIOMASS CUM. % w/o MOL	BIOMASS RANK BY BIO.
Tipulidae	L	+	+	99.9	24	1	1.4	22	X	X	X	X	X	25
Sialidae	L	+	+	99.9	24	1	1.4	22	X	X	X	X	X	25
Unid. Diptera	L	+	+	99.9	24	1	1.4	22	X	X	X	X	X	25
Chaoboridae	L	+	+	99.9	24	1	1.4	22	X	X	X	X	X	25
Elmidae	L	+	+	99.9	24	1	1.4	22	X	X	X	X	X	25
Hemiptera	A	+	+	99.9	24	1	1.4	22	X	X	X	X	X	25
TOTALS	---	2501	---	99.9	30	67	97.1	30	147.3016	---	1000	---	99.7	30

Table 14. Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979
Stations: Massena - August (B01, B04, B07, B16, B19, B22, B27, B32, B34, B37-39, B45, B47, B49, B52, B54, B58, B65)
Total Number of Samples: 19 Number of Samples Containing Organisms: 19
L=Larvae P=Pupae A=Adult +=<0.1% or <0.0001g or <1/m² *=Colonies X=No biomass estimate made

TAXA	LIFE STAGE	ABUNDANCE MEAN #/m²	% BY NUMBER	CUM. PERCENT	RANK BY NUMBER	FREQUENCY # OF OCCUR.	% OCCUR.	RANK BY FREQUENCY	BIOMASS MEAN BIO. g/m²	% BY BIO.	CUM. PERCENT	% BY BIO w/o MOL.	CUM. % w/o MOL.	RANK BY BIO
Oligochaeta	A	3094	48.6	48.6	1	19	100.0	1	1.8564	1.0	99.5	78.8	78.8	4
Chironomidae	L	2015	31.6	80.2	2	19	100.0	1	0.4030	0.2	99.7	17.1	95.9	5
Hydrobiidae	A	467	7.3	87.5	3	5	26.3	13	19.3338	10.4	92.9	--	--	2
Sphaeriidae	A	384	6.0	93.5	4	13	68.4	4	10.3680	5.6	98.5	--	--	3
Nematoda	A	148	2.3	95.8	5	15	78.9	3	0.0044	+	99.9	0.2	99.4	14
Amphipoda	A	50	0.8	96.6	6	10	52.6	7	0.0300	+	99.9	1.3	97.2	8
Trichoptera	L	46	0.7	97.3	7	10	52.6	7	0.0276	+	99.9	1.2	98.4	9
Hydracarina	A	27	0.4	97.7	8	9	47.4	10	0.0011	+	99.9	+	100.1	21
Ceratopogonidae	L	26	0.4	98.1	9	10	52.6	7	0.0052	+	99.9	0.2	99.2	13
Nematomorpha	A	24	0.4	98.5	10	8	42.1	11	0.0024	+	99.9	0.1	99.8	18
Chironomidae	P	21	0.3	98.8	11	11	57.9	6	0.0042	+	99.9	0.2	99.6	15
Planorbidae	A	10	0.2	99.0	12	6	31.6	12	0.0070	+	99.9	--	--	12
Valvatidae	A	10	0.2	99.2	12	3	15.8	15	0.0160	+	99.9	--	--	10
Unionidae	A	9	0.1	99.3	14	3	15.8	15	152.6607	82.5	92.5	--	--	1
Lymnaeidae	A	9	0.1	99.4	14	1	5.3	20	0.1143	0.1	99.9	--	--	7
Ephemeroptera	L	7	0.1	99.5	16	5	26.3	13	0.0014	+	99.9	0.1	100.0	20
Glossiphoniidae	A	6	0.1	99.6	17	2	10.5	18	0.0144	+	99.9	0.6	99.0	11
Lepidoptera	L	4	0.1	99.7	18	3	15.8	15	0.0020	+	99.9	0.1	99.9	19
Haliplidae	L	3	+	99.7	19	1	5.3	20	0.0009	+	99.9	+	100.1	22
Isopoda	A	2	+	99.7	20	2	10.5	18	0.0006	+	99.9	+	100.1	23
Pleuroceridae	A	2	+	99.7	20	1	5.3	20	0.1550	0.1	99.8	--	--	6
Erpobdellidae	A	1	+	99.7	22	1	5.3	20	0.0026	+	99.9	0.1	99.7	17
Physidae	A	1	+	99.7	22	1	5.3	20	0.0035	+	99.9	--	--	16
Trichoptera	P	1	+	99.7	22	1	5.3	20	X	X	X	X	X	24

Table 14 continued.

TAXA	LIFE STAGE	ABUNDANCE: MEAN #/m²	ABUNDANCE: % BY NUMBER	ABUNDANCE: CUM. PERCENT	ABUNDANCE: RANK BY NUMBER	FREQUENCY: # OF OCCUR.	FREQUENCY: % OCCUR.	FREQUENCY: RANK BY FREQUENCY	BIOMASS: MEAN BIO. g/m²	BIOMASS: % BY BIO.	BIOMASS: CUM. PERCENT	BIOMASS: % BY BIO w/o MOL.	BIOMASS: CUM. % w/o MOL	BIOMASS: RANK BY BIO.
Bryozoa	A	*	*	*	25	12	63.2	5	X	X	X	X	X	24
TOTAL	---	6367	---	99.7	25	19	100.0	25	185.0145	---	99.9	---	100.1	25

Table 15. Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979
Stations: Massena - October (B01-B69)
Total Number of Samples: 69 Number of Samples Containing Organisms: 69
L=Larvae P=Pupae A=Adult +=<0.1% or <0.0001g or <1/m² *=Colonies X=No biomass estimate made

TAXA	LIFE STAGE	ABUNDANCE MEAN #/m²	% BY NUMBER	CUM. PERCENT	RANK BY NUMBER	FREQUENCY # OF OCCUR.	% OCCUR.	RANK BY FREQUENCY	BIOMASS MEAN BIO. g/m²	% BY BIO.	CUM. PERCENT	% BY BIO. w/o MOL.	CUM. % w/o MOL.	RANK BY BIO.
Oligochaeta	A	5702	48.0	48.0	1	68	98.6	1	3.4212	1.3	99.2	73.0	73.0	4
Chironomidae	L	3300	27.8	75.8	2	66	95.7	2	0.6600	0.3	99.5	14.1	87.1	5
Hydrobiidae	A	599	5.0	80.8	3	31	44.9	13	24.7986	9.4	93.0	--	--	2
Sphaeriidae	A	482	4.1	84.9	4	59	85.5	3	13.0140	4.9	97.9	--	--	3
Amphipoda	A	384	3.2	88.1	5	46	66.7	7	0.2304	0.1	99.7	4.9	92.0	7
Nematoda	A	323	2.7	90.8	6	57	82.6	4	0.0097	+	99.7	0.2	99.6	22
Trichoptera	L	196	1.7	92.5	7	57	82.6	4	0.1176	+	99.7	2.5	94.5	8
Ceratopogonidae	L	144	1.2	93.7	8	43	62.3	9	0.0288	+	99.7	0.6	98.4	18
Ancylidae	A	108	0.9	94.6	9	16	23.2	15	0.0324	+	99.7	--	--	15
Haliplidae	L	102	0.9	95.5	10	15	21.7	17	0.0306	+	99.7	0.7	97.8	17
Nematomorpha	A	98	0.8	96.3	11	51	73.9	6	0.0098	+	99.7	0.2	99.4	21
Isopoda	A	82	0.7	97.0	12	15	21.7	17	0.0246	+	99.7	0.5	98.9	19
Ephemeroptera	L	60	0.5	97.5	13	20	29.0	14	0.0120	+	99.7	0.3	99.2	20
Planorbidae	A	57	0.5	98.0	14	33	47.8	11	0.0399	+	99.7	--	--	14
Valvatidae	A	41	0.3	98.3	15	32	46.4	12	0.0656	+	99.7	--	--	11
Hydracarina	A	41	0.3	98.6	15	45	65.2	8	0.0016	+	99.7	+	99.9	26
Turbellaria	A	33	0.3	98.9	17	16	23.2	15	0.0066	+	99.7	0.1	99.8	24
Physidae	A	27	0.2	99.1	18	11	15.9	21	0.0945	+	99.7	--	--	9
Erpobdellidae	A	18	0.2	99.3	19	9	13.0	22	0.0468	+	99.7	1.0	95.5	12
Glossiphoniidae	A	17	0.1	99.4	20	12	17.4	20	0.0408	+	99.7	0.9	96.4	13
Lepidoptera	L	14	0.1	99.5	21	6	8.7	26	0.0070	+	99.7	0.1	99.7	23
Unionidae	A	13	0.1	99.6	22	14	20.3	19	220.5099	83.6	83.6	--	--	1
Lymnaeidae	A	7	0.1	99.7	23	8	11.6	23	0.0889	+	99.7	--	--	10
Chironomidae	P	5	+	99.7	24	4	5.8	28	0.0010	+	99.7	+	99.9	27

Table 15 continued.

TAXA	LIFE STAGE	ABUNDANCE MEAN #/m²	ABUNDANCE % BY NUMBER	ABUNDANCE CUM. PERCENT	ABUNDANCE RANK BY NUMBER	FREQUENCY # OF OCCUR.	FREQUENCY % OCCUR.	FREQUENCY RANK BY FREQUENCY	BIOMASS MEAN BIO. g/m²	BIOMASS % BY BIO.	BIOMASS CUM. PERCENT	BIOMASS % BY BIO w/o MOL.	BIOMASS CUM. % w/o MOL.	BIOMASS RANK BY BIO.
Hirudinidae	A	4	+	99.7	25	7	10.1	24	0.0324	+	99.7	0.7	97.1	15
Pleuroceridae	A	4	+	99.7	25	2	2.9	29	0.3100	0.1	99.6	--	--	6
Odonata	L	3	+	99.7	27	7	10.1	24	0.0027	+	99.7	0.1	99.9	25
Tipulidae	L	2	+	99.7	28	5	7.2	27	X	X	X	X	X	28
Unid. Coleoptera	L	1	+	99.7	29	2	2.9	30	X	X	X	X	X	28
Athericidae	L	1	+	99.7	29	2	2.9	30	X	X	X	X	X	28
Unid. Coleoptera	A	1	+	99.7	29	2	2.9	30	X	X	X	X	X	28
Dytiscidae	A	1	+	99.7	29	1	1.4	33	X	X	X	X	X	28
Sialidae	L	+	+	99.7	33	1	1.4	33	X	X	X	X	X	28
Hydrophilidae	L	+	+	99.7	33	1	1.4	33	X	X	X	X	X	28
Sisyridae	L	+	+	99.7	33	1	1.4	33	X	X	X	X	X	28
Dytiscidae	L	+	+	99.7	33	1	1.4	33	X	X	X	X	X	28
Corydalidae	L	+	+	99.7	33	1	1.4	33	X	X	X	X	X	28
Collembola	A	+	+	99.7	33	1	1.4	33	X	X	X	X	X	28
Unid. Pelecypoda	A	+	+	99.7	33	1	1.4	33	X	X	X	X	X	28
Bryozoa	A	*	*	*	40	41	59.4	10	X	X	X	X	X	28
Porifera	A	*	*	*	40	1	1.4	33	X	X	X	X	X	28
TOTAL	---	11870	---	99.7	41	69	100.0	41	263.6374	---	99.7	---	99.9	41

Table 16. Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979
Stations: All Upriver (B1C-B12O)
Total Number of Samples: 102 Number of Samples Containing Organisms: 102
L=Larvae P=Pupae A=Adult +=<0.1% or <0.0001g or <1/m² *=Colonies X=No biomass estimate made

		ABUNDANCE				FREQUENCY			BIOMASS					
TAXA	LIFE STAGE	MEAN #/m²	% BY NUMBER	CUM. PERCENT	RANK BY NUMBER	# OF OCCUR.	% OCCUR.	RANK BY FREQUENCY	MEAN BIO. g/m²	% BY BIO.	CUM. PERCENT	% BY BIO w/o MOL.	CUM. % w/o MOL.	RANK BY BIO
Oligochaeta	A	1895	21.4	21.4	1	93	91.2	3	1.1370	0.3	99.5	36.4	36.4	5
Chironomidae	L	1890	21.4	42.8	2	98	96.1	1	0.3780	0.1	99.8	12.1	84.0	7
Amphipoda	A	1849	20.9	63.7	3	97	95.1	2	1.1094	0.2	99.7	35.5	71.9	6
Hydrobiidae	A	1051	11.9	75.6	4	76	74.5	4	43.5114	9.8	97.3	--	--	2
Planorbidae	A	482	5.4	81.0	5	57	55.9	8	0.3374	0.1	99.9	--	--	8
Isopoda	A	303	3.4	84.4	6	59	57.8	7	0.1818	+	100.0	5.8	89.8	10
Trichoptera	L	254	2.9	87.3	7	60	58.8	6	0.1524	+	100.0	4.9	94.7	12
Sphaeriidae	A	247	2.8	90.1	8	71	69.6	5	6.6690	1.5	98.8	--	--	3
Valvatidae	A	183	2.1	92.2	9	46	45.1	9	0.2928	0.1	100.0	--	--	9
Ancylidae	A	171	1.9	94.1	10	23	22.5	20	0.0513	+	100.0	--	--	15
Nematoda	A	158	1.8	95.9	11	43	42.2	11	0.0047	+	100.0	0.2	99.9	21
Turbellaria	A	107	1.2	97.1	12	35	34.3	14	0.0214	+	100.0	0.7	98.1	16
Physidae	A	51	0.6	97.7	13	28	27.5	17	0.1785	+	100.0	--	--	11
Nematomorpha	A	50	0.6	98.3	14	43	42.2	11	0.0050	+	100.0	0.2	99.7	20
Glossiphoniidae	A	35	0.4	98.7	15	42	41.2	13	0.0840	+	100.0	2.7	97.4	14
Lepidoptera	L	27	0.3	99.0	16	27	26.5	18	0.0135	+	100.0	0.4	99.2	18
Unionidae	A	23	0.3	99.3	17	33	32.4	15	390.1329	87.5	87.5	--	--	1
Pleuroceridae	A	22	0.2	99.5	18	32	31.4	16	1.7050	0.4	99.2	--	--	4
Hydracarina	A	20	0.2	99.7	19	27	26.5	18	0.0008	+	100.0	+	100.0	24
Chironomidae	P	14	0.2	99.9	20	21	20.6	21	0.0028	+	100.0	0.1	100.0	22
Erpobdellidae	A	8	0.1	100.0	21	19	18.6	22	0.0208	+	100.0	0.7	98.8	17
Lymnaeidae	A	7	0.1	100.1	22	16	15.7	24	0.0889	+	100.0	--	--	13
Ceratopogonidae	L	2	+	100.1	23	9	8.8	25	0.0004	+	100.0	+	100.0	25
Ephemeroptera	L	1	+	100.1	24	5	4.9	26	0.0002	+	100.0	+	100.0	26

Table 16 continued.

TAXA	LIFE STAGE	ABUNDANCE: MEAN #/m²	ABUNDANCE: % BY NUMBER	ABUNDANCE: CUM. PERCENT	ABUNDANCE: RANK BY NUMBER	FREQUENCY: # OF OCCUR.	FREQUENCY: % OCCUR.	FREQUENCY: RANK BY FREQUENCY	BIOMASS: MEAN BIO. g/m²	BIOMASS: % BY BIO.	BIOMASS: CUM. PERCENT	BIOMASS: % BY BIO w/o MOL.	BIOMASS: CUM. % w/o MOL.	BIOMASS: RANK BY BIO.
Hirudinidae	A	1	+	100.1	24	4	3.9	27	0.0081	+	100.0	0.3	99.5	19
Odonata	L	1	+	100.1	24	3	2.9	28	0.0009	+	100.0	+	100.0	23
Dytiscidae	L	+	+	100.1	27	1	1.0	29	X	X	X	X	X	28
Haliplidae	L	+	+	100.1	27	1	1.0	29	0.0001	+	100.0	+	100.0	27
Piscicolidae	A	+	+	100.1	27	1	1.0	29	X	X	X	X	X	28
Sialidae	L	+	+	100.1	27	1	1.0	29	X	X	X	X	X	28
Tipulidae	L	+	+	100.1	27	1	1.0	29	X	X	X	X	X	28
Hydrozoa	A	*	*	*	32	17	16.7	23	X	X	X	X	X	28
Bryozoa	A	*	*	*	32	45	44.1	10	X	X	X	X	X	28
TOTAL	---	8852	---	100.1	33	102	100.0	33	46.0885	---	100.0	---	100.0	33

Table 17 . Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979
Stations: Upriver - July (B70-B120)
Total Number of Samples: 51 Number of Samples Containing Organisms: 51
L=Larvae P=Pupae A=Adult +=<0.1% or <0.0001g or <1/m² *=Colonies X=No biomass estimate made

		ABUNDANCE				FREQUENCY			BIOMASS					
TAXA	LIFE STAGE	MEAN #/m²	% BY NUMBER	CUM. PERCENT	RANK BY NUMBER	# OF OCCUR.	% OCCUR.	RANK BY FREQUENCY	MEAN BIO. g/m²	% BY BIO.	CUM. PERCENT	% BY BIO w/o MOL.	CUM. % w/o MOL.	RANK BY BIO.
Amphipoda	A	1235	34.1	34.1	1	46	90.2	2	0.7410	0.2	99.8	60.5	60.6	5
Chironomidae	L	873	24.1	58.2	2	49	96.1	1	0.1746	+	99.8	14.3	74.9	6
Hydrobiidae	A	773	21.3	79.5	3	33	64.7	4	32.0022	6.9	98.9	--	--	2
Oligochaeta	A	228	6.3	85.8	4	42	82.4	3	0.1368	+	99.8	11.2	86.1	7
Isopoda	A	161	4.4	90.2	5	26	51.0	6	0.0483	+	99.8	3.9	94.0	11
Trichoptera	L	81	2.2	92.4	6	23	45.1	7	0.0486	+	99.8	4.0	90.1	10
Sphaeriidae	A	64	1.8	94.2	7	29	56.9	5	1.7280	0.4	99.3	--	--	3
Nematomorpha	A	33	0.9	95.1	8	11	21.6	11	0.0033	+	99.8	0.3	99.7	18
Valvatidae	A	31	0.8	96.0	9	12	23.5	13	0.0496	+	99.8	--	--	9
Lepidoptera	L	28	0.8	96.8	10	9	17.6	15	0.0140	+	99.8	1.1	97.6	13
Unionidae	A	25	0.7	97.5	11	16	31.4	9	424.0575	92.0	92.0	--	--	1
Pleuroceridae	A	20	0.6	98.1	12	13	25.5	12	1.5500	0.3	99.6	--	--	4
Glossiphoniidae	A	13	0.4	98.5	13	18	35.3	8	0.0312	+	99.8	2.5	96.5	12
Planorbidae	A	13	0.4	98.9	13	16	31.4	9	0.0091	+	99.8	--	--	15
Chironomidae	P	11	0.3	99.2	15	7	13.7	17	0.0022	+	99.8	0.2	99.9	19
Lymnaeidae	A	8	0.2	99.4	16	11	21.6	14	0.1016	+	99.8	--	--	8
Turbellaria	A	8	0.2	99.6	16	5	9.8	20	0.0016	+	99.8	0.1	100.0	20
Nematoda	A	5	0.1	99.7	18	7	13.7	17	0.0002	+	99.8	+	100.0	23
Erpobdellidae	A	5	0.1	99.8	18	8	15.7	16	0.0130	+	99.8	1.1	98.7	14
Hydracarina	A	3	0.1	99.9	20	6	11.8	19	0.0001	+	99.8	+	100.0	24
Ceratopogonidae	L	2	0.1	100.0	21	5	9.8	20	0.0004	+	99.8	+	100.0	21
Physidae	A	2	0.1	100.1	21	4	7.8	22	0.0070	+	99.8	--	--	17
Ancylidae	A	1	+	100.1	23	2	3.9	23	0.0003	+	99.8	--	--	22
Hirudinidae	A	1	+	100.1	23	1	2.0	24	0.0081	+	99.8	0.7	99.4	16

Table 17 continued.

TAXA	LIFE STAGE	ABUNDANCE				FREQUENCY			BIOMASS					
		MEAN #/m²	% BY NUMBER	CUM. PERCENT	RANK BY NUMBER	# OF OCCUR.	OCCUR.	RANK BY FREQUENCY	MEAN BIO. g/m²	% BY BIO.	CUM. % PERCENT	% BY BIO. w/o MOL.	CUM. % w/o MOL.	RANK BY BIO.
Ephemeroptera	L	+	+	100.1	25	1	2.0	24	0.0001	+	99.8	+	100.0	24
Haliplidae	L	+	+	100.1	25	1	2.0	24	0.0001	+	99.8	+	100.0	24
TOTAL	---	3624	---	100.1	26	51	100.0	26	460.7269	---	99.8	---	100.0	26

Table 18. **Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979**
Stations: Upriver - October (B70-B120)
Total Number of Samples: 51 **Number of Samples Containing Organisms:** 51
L=Larvae P=Pupae A=Adult +=<0.1% or <0.0001g or <1/m² *=Colonies X=No biomass estimate made

TAXA	LIFE STAGE	ABUNDANCE				FREQUENCY			BIOMASS				
		MEAN #/m²	% BY NUMBER	CUM. PERCENT	RANK BY NUMBER	# OF OCCUR.	% OCCUR.	RANK BY FREQUENCY	MEAN BIO. g/m²	% BY BIO.	CUM. % PERCENT	% BY BIO w/o MOL.	CUM. % w/o MOL.	RANK BY BIO
Oligochaeta	A	3561	25.3	25.3	1	51	100.0	1	2.1366	0.5	98.6	44.1	44.1	4
Chironomidae	L	2908	20.7	46.0	2	49	96.1	3	0.5816	0.1	99.6	12.0	86.6	8
Amphipoda	A	2462	17.5	63.5	3	51	100.0	1	1.4772	0.3	99.3	30.5	74.6	6
Hydrobiidae	A	1329	9.4	72.9	4	43	84.3	5	55.0206	12.8	95.4	--	--	2
Planorbidae	A	951	6.8	79.7	5	41	80.4	7	0.6657	0.2	99.5	--	--	7
Isopoda	A	445	3.2	82.9	6	33	64.7	11	0.1335	+	99.9	2.8	97.5	13
Sphaeriidae	A	430	3.1	86.0	7	42	82.4	6	11.6100	2.7	98.1	--	--	3
Trichoptera	L	426	3.0	89.0	8	37	72.5	8	0.2556	0.1	99.9	5.3	91.9	11
Ancylidae	A	341	2.4	91.4	9	21	41.2	16	0.1023	+	99.9	--	--	14
Valvatidae	A	335	2.4	93.8	10	34	66.7	10	0.5360	0.1	99.7	--	--	9
Nematoda	A	312	2.2	96.0	11	36	70.6	9	0.0094	+	99.9	0.2	99.8	20
Turbellaria	A	207	1.5	97.5	12	30	58.8	12	0.0414	+	99.9	0.9	98.4	16
Physidae	A	100	0.7	98.2	13	24	47.1	14	0.3500	0.1	99.8	--	--	10
Nematomorpha	A	66	0.5	98.7	14	29	56.9	13	0.0066	+	99.9	0.1	99.9	21
Glossiphoniidae	A	57	0.4	99.1	15	24	47.1	14	0.1368	+	99.9	2.8	94.7	12
Hydracarina	A	38	0.3	99.4	16	21	41.2	16	0.0015	+	99.9	+	100.0	24
Lepidoptera	L	26	0.2	99.6	17	18	35.3	19	0.0130	+	99.9	0.3	99.6	19
Pleuroceridae	A	24	0.2	99.8	18	19	37.3	18	1.8600	0.4	99.0	--	--	5
Unionidae	A	21	0.1	99.9	19	17	33.3	20	356.2083	82.6	82.6	--	--	1
Chironomidae	P	17	0.1	100.0	20	14	27.5	22	0.0034	+	99.9	0.1	100.0	22
Erpobdellidae	A	11	0.1	100.0	21	11	21.6	23	0.0286	+	99.9	0.6	99.0	17
Lymnaeidae	A	5	+	100.1	22	5	9.8	24	0.0635	+	99.9	--	--	15
Ceratopogonidae	L	3	+	100.1	23	4	7.8	25	0.0006	+	99.9	+	100.0	25
Ephemeroptera	L	2	+	100.1	24	4	7.8	25	0.0004	+	99.9	+	100.0	26

Table 18 continued.

TAXA	LIFE STAGE	ABUNDANCE MEAN #/m²	ABUNDANCE % BY NUMBER	ABUNDANCE CUM. PERCENT	ABUNDANCE RANK BY NUMBER	FREQUENCY # OF OCCUR.	FREQUENCY % OCCUR.	FREQUENCY RANK BY FREQUENCY	BIOMASS MEAN BIO. g/m²	BIOMASS % BY BIO.	BIOMASS CUM. PERCENT	BIOMASS % BY BIO. w/o MOL.	BIOMASS CUM. % w/o MOL.	BIOMASS RANK BY BIO.
Odonata	L	2	+	100.1	24	3	5.9	27	0.0018	+	99.9	+	100.0	23
Hirudinidae	A	2	+	100.1	24	3	5.9	27	0.0162	+	99.9	0.8	99.8	18
Tipulidae	L	+	+	100.1	27	1	2.0	29	X	X	X	X	X	27
Sialidae	L	+	+	100.1	27	1	2.0	29	X	X	X	X	X	27
Piscicolidae	A	+	+	100.1	27	1	2.0	29	X	X	X	X	X	27
Dytiscidae	L	+	+	100.1	27	1	2.0	29	X	X	X	X	X	27
Bryozoa	A	*	*	*	31	45	88.2	4	X	X	X	X	X	27
Hydrozoa	A	*	*	*	31	17	33.3	20	X	X	X	X	X	27
TOTAL	---	14081	---	100.1	32	51	100.0	32	431.2606	---	99.9	---	100.0	32

Table 19. Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979
Stations: Between Locks - In Channel (B31, B33, B38, B41)
Total Number of Samples: 8 Number of Samples Containing Organisms: 8
L=Larvae P=Pupae A=Adult +=<0.1% or <0.0001g or <1/m² *=Colonies X=No biomass estimate made

		ABUNDANCE				FREQUENCY			BIOMASS					
TAXA	LIFE STAGE	MEAN #/m²	% BY NUMBER	CUM. PERCENT	RANK BY NUMBER	# OF OCCUR.	% OCCUR.	RANK BY FREQUENCY	MEAN BIO. g/m²	% BY BIO.	CUM. PERCENT	% BY BIO w/o MOL.	CUM.% w/o MOL.	RANK BY BIO.
Oligochaeta	A	1769	55.4	55.4	1	8	100.0	1	1.0614	60.2	60.2	78.7	78.7	1
Chironomidae	L	1112	34.8	90.2	2	8	100.0	1	0.2224	12.6	95.8	16.5	95.2	3
Ceratopogonidae	L	149	4.7	94.9	3	5	62.5	3	0.0298	1.7	97.5	2.2	97.4	4
Nematoda	A	35	1.1	96.0	4	2	25.0	8	0.0011	0.1	100.0	0.1	100.0	10
Trichoptera	L	35	1.1	97.1	4	4	50.0	4	0.0210	1.2	98.7	1.6	99.0	5
Hydracarina	A	30	0.9	98.0	6	4	50.0	4	0.0012	0.1	99.9	0.1	99.9	9
Nematomorpha	A	18	0.6	98.6	7	3	37.5	7	0.0016	0.1	99.8	0.1	99.8	8
Amphipoda	A	15	0.5	99.1	8	2	25.0	8	0.0090	0.5	99.2	0.7	99.7	6
Sphaeriidae	A	15	0.5	99.6	8	4	50.0	4	0.4050	23.0	83.2	--	--	2
Valvatidae	A	5	0.2	99.8	10	1	12.5	11	0.0080	0.5	99.7	--	--	7
Ephemeroptera	L	5	0.2	100.0	10	2	25.0	8	0.0010	0.1	100.0	0.1	100.1	11
Turbellaria	A	3	0.1	100.1	12	1	12.5	11	0.0006	+	100.1	+	100.1	12
Bryozoa	A	*	*	*	13	1	12.5	11	X	X	X	X	X	13
TOTAL	---	3191	---	100.1	13	8	100.0	13	1.7623	---	100.1	---	100.1	13

Table 20. Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979
Stations: Between Locks - Non-Channel (30, 32, 34-37, 39, 40, 42-44)
Total Number of Samples: 28 Number of Samples Containing Organisms: 28
L=Larvae P=Pupae A=Adult +=<0.1% or <0.0001g or <1/m² *=Colonies X=No biomass estimate made

TAXA	LIFE STAGE	ABUNDANCE MEAN #/m²	ABUNDANCE % BY NUMBER	ABUNDANCE CUM. PERCENT	ABUNDANCE RANK BY NUMBER	FREQUENCY # OF OCCUR.	FREQUENCY % OCCUR.	FREQUENCY RANK BY FREQUENCY	BIOMASS MEAN BIO. g/m²	BIOMASS % BY BIO.	BIOMASS CUM. PERCENT	BIOMASS % BY BIO w/o MOL.	BIOMASS CUM. % w/o MOL	BIOMASS RANK BY BIO
Oligochaeta	A	2937	57.6	57.6	1	24	85.7	2	1.7622	39.7	84.1	80.7	80.7	2
Chironomidae	L	1485	29.1	86.7	2	27	96.4	1	0.2970	6.7	90.8	13.6	94.3	3
Ceratopogonidae	L	176	3.5	90.2	3	18	64.3	3	0.0352	0.8	98.4	1.6	98.3	6
Nematoda	A	143	2.8	93.0	4	17	60.7	4	0.0043	0.1	99.9	0.2	99.7	11
Nematomorpha	A	88	1.8	94.8	5	17	60.7	4	0.0095	0.2	99.8	0.4	99.5	10
Trichoptera	L	88	1.7	96.5	6	15	53.6	6	0.0534	1.2	97.6	2.4	96.7	5
Sphaeriidae	A	73	1.4	98.0	7	10	35.7	8	1.9710	44.4	44.4	--	--	1
Amphipoda	A	30	0.6	98.6	8	9	32.1	9	0.0180	0.4	99.4	0.8	99.1	8
Hydracarina	A	17	0.3	98.9	9	12	42.9	7	0.0007	+	99.9	+	99.7	13
Valvatidae	A	17	0.3	99.2	9	6	21.4	11	0.0272	0.6	99.0	--	--	7
Planorbidae	A	14	0.3	99.5	11	6	21.4	11	0.0098	0.2	99.6	--	--	9
Hydrobiidae	A	6	0.1	99.6	12	3	10.7	14	0.2484	5.6	96.4	--	--	4
Turbellaria	A	4	0.1	99.7	13	3	10.7	14	0.0008	+	99.9	+	99.7	12
Ephemeroptera	L	3	0.1	99.8	14	4	14.3	13	0.0006	+	99.9	+	99.7	14
Unid. Coleoptera	L	3	0.1	99.9	14	1	3.6	20	X	X	X	X	X	19
Chironomidae	P	2	+	99.9	16	3	10.7	14	0.0004	+	99.9	+	99.7	16
Haliplidae	L	2	+	99.9	16	2	7.1	17	0.0006	+	99.9	+	99.7	14
Ancylidae	A	1	+	99.9	18	2	7.1	17	0.0003	+	99.9	--	--	17
Isopoda	A	1	+	99.9	18	2	7.1	17	0.0003	+	99.9	+	99.7	17
Dytiscidae	L	1	+	99.9	18	1	3.6	20	X	X	X	X	X	19
Tipulidae	L	1	+	99.9	18	1	3.6	20	X	X	X	X	X	19
Bryozoa	A	*	*	*	22	8	28.6	10	X	X	X	X	X	19
TOTAL	---	5100	---	99.9	22	28	100.0	22	4.4397	---	99.9	---	99.7	22

Table 21. Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979
Stations: Dominant Macrophyte - Vallisneria americana (A06, A10; Oct. - B08, B11, B19, B82)
Total Number of Samples: 6 Number of Samples Containing Organisms: 6
L=Larvae P=Pupae A=Adult +=<0.1% or <0.0001g or <1/m² *=Colonies X=No biomass estimate made

TAXA	LIFE STAGE	ABUNDANCE MEAN #/m²	% BY NUMBER	CUM. PERCENT	RANK BY NUMBER	FREQUENCY # OF OCCUR.	% OCCUR.	RANK BY FREQUENCY	BIOMASS MEAN BIO. g/m²	% BY BIO.	CUM. PERCENT	% BY BIO w/o MOL.	CUM. % w/o MOL.	RANK BY BIO.
Chironomidae	L	9828	34.3	34.3	1	6	100.0	1	1.9656	0.4	99.3	20.8	69.7	6
Oligochaeta	A	7695	26.9	61.2	2	6	100.0	1	4.6170	0.8	98.4	48.9	48.9	4
Hydrobiidae	A	2363	8.3	69.5	3	6	100.0	1	97.8282	17.8	91.7	--	--	2
Amphipoda	A	2147	7.5	77.0	4	6	100.0	1	1.2882	0.2	99.5	13.6	83.3	7
Ancylidae	A	1244	4.3	81.3	5	5	83.3	10	0.3732	0.1	99.7	--	--	9
Sphaeriidae	A	1210	4.2	85.5	6	6	100.0	1	32.6700	5.9	97.6	--	--	3
Nematoda	A	1122	3.9	89.4	7	6	100.0	1	0.0337	+	99.9	0.4	99.6	20
Haliplidae	L	779	2.7	92.1	8	2	33.3	22	0.2337	+	99.9	2.5	95.7	14
Isopoda	A	469	1.6	93.7	9	5	83.3	10	0.1407	+	99.9	1.5	97.2	16
Trichoptera	L	401	1.4	95.1	10	6	100.0	1	0.2406	+	99.9	2.5	93.2	13
Turbellaria	A	327	1.1	96.2	11	3	50.0	18	0.0654	+	99.9	0.7	99.1	18
Nematomorpha	A	169	0.6	96.8	12	6	100.0	1	0.0169	+	99.9	0.2	99.9	22
Glossiphoniidae	A	165	0.6	97.4	13	4	66.7	13	0.3960	0.1	99.6	4.2	87.5	8
Erpobdellidae	A	115	0.4	97.8	14	4	66.7	13	0.2990	0.1	99.8	3.2	90.7	10
Ceratopogonidae	L	98	0.3	98.1	15	5	83.3	10	0.0196	+	99.9	0.2	99.7	21
Valvatidae	A	98	0.3	98.4	15	6	100.0	1	0.1568	+	99.9	--	--	15
Planorbidae	A	88	0.3	98.7	17	4	66.7	13	0.0616	+	99.9	--	--	19
Physidae	A	84	0.3	99.0	18	3	50.0	18	0.2940	0.1	99.9	--	--	11
Hydracarina	A	57	0.2	99.2	19	4	66.7	13	0.0023	+	99.9	+	100.0	26
Pleuroceridae	A	34	0.1	99.3	20	2	33.3	22	2.6350	0.5	98.9	--	--	5
Ephemeroptera	L	27	0.1	99.4	21	4	66.7	13	0.0054	+	99.9	0.1	100.0	24
Unionidae	A	24	0.1	99.5	22	2	33.3	22	407.0952	73.9	73.9	--	--	1
Lymnaeidae	A	20	0.1	99.6	23	3	50.0	18	0.2540	+	99.9	--	--	12
Lepidoptera	L	17	0.1	99.7	24	1	16.7	26	0.0085	+	99.9	0.1	100.0	23

Table 21 continued.

TAXA	LIFE STAGE	ABUNDANCE MEAN #/m²	% BY NUMBER	CUM. PERCENT	RANK BY NUMBER	FREQUENCY # OF OCCUR.	% OCCUR.	RANK BY FREQUENCY	BIOMASS MEAN BIO. g/m²	% BY BIO.	CUM. PERCENT	% BY BIO w/o MOL.	CUM. % w/o MOL.	RANK BY BIO.
Hirudinidae	A	14	+	99.7	25	2	33.3	22	0.1134	+	99.9	1.2	98.4	27
Chironomidae	P	3	+	99.7	26	1	16.7	26	0.0006	+	99.9	+	100.1	27
Odonata	L	3	+	99.7	26	1	16.7	26	0.0027	+	99.9	+	100.1	25
Curculionidae	L	3	+	99.7	26	1	16.7	26	X	X	X	X	X	28
Elateridae	A	3	+	99.7	26	1	16.7	26	X	X	X	X	X	28
Sialidae	L	3	+	99.7	26	1	16.7	26	X	X	X	X	X	28
Tipulidae	L	3	+	99.7	26	1	16.7	26	X	X	X	X	X	28
Athericidae	L	3	+	99.7	26	1	16.7	26	X	X	X	X	X	28
Bryozoa	A	*	*	*	33	3	50.0	18	X	X	X	X	X	28
Porifera	A	*	*	*	33	1	16.7	26	X	X	X	X	X	28
TOTAL	---	28616	---	99.7	34	6	100.0	26	550.8173	---	99.9	---	100.1	34

Table 22. Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979
Stations: Dominant Macrophyte - Myriophyllum exalbescens (A04, A08, C05, D01, D06, D08, D10, Q02, Q03, Q05;
Total Number of Samples: 19 Number of Samples Containing Organisms: 19 Oct.-B14, B20, B63, B80, B87, B89
L=Larvae P=Pupae A=Adult +=<0.1% or <0.0001g or <1/m² *=Colonies X=No biomass estimate made B98, B102, B116

		ABUNDANCE				FREQUENCY			BIOMASS					
TAXA	LIFE STAGE	MEAN #/m²	% BY NUMBER	CUM. PERCENT	RANK BY NUMBER	# OF OCCUR.	% OCCUR.	RANK BY FREQUENCY	MEAN BIO. g/m²	% BY BIO.	CUM. PERCENT	% BY BIO w/o MOL.	CUM.% w/o MOL	RANK BY BIO
Amphipoda	A	5090	26.9	26.9	1	19	100.0	1	3.0540	4.0	88.8	41.6	41.6	
Oligochaeta	A	4533	23.9	50.8	2	19	100.0	1	2.7198	3.6	92.4	37.0	78.6	5
Chironomidae	L	3883	20.5	71.3	3	19	100.0	1	0.7766	1.0	96.9	10.6	89.2	8
Planorbidae	A	1558	8.2	79.5	4	13	68.4	10	1.0906	1.4	95.9	--	--	7
Isopoda	A	909	4.8	84.3	5	13	68.4	10	0.2727	0.4	98.9	3.7	92.9	11
Hydrobiidae	A	566	3.0	87.3	6	15	78.9	5	23.4324	31.0	75.8	--	--	2
Ancylidae	A	562	3.0	90.3	7	13	68.4	10	0.1686	0.2	99.4	--	--	13
Valvatidae	A	413	2.2	92.5	8	15	78.9	5	0.6608	0.9	97.9	--	--	9
Sphaeriidae	A	252	1.3	93.8	9	15	78.9	5	6.8040	9.0	84.8	--	--	3
Nematoda	A	210	1.1	94.9	10	14	73.7	8	0.0063	+	99.9	0.1	99.9	23
Trichoptera	L	196	1.0	95.9	11	19	100.0	1	0.1176	0.2	99.8	1.6	97.6	15
Turbellaria	A	167	0.9	96.8	12	13	68.4	10	0.0334	+	99.9	0.5	99.3	18
Physidae	A	150	0.8	97.6	13	13	68.4	10	0.5250	0.7	98.5	--	--	10
Glossiphoniidae	A	94	0.5	98.1	14	10	52.6	15	0.2256	0.3	99.2	3.1	96.0	12
Nematomorpha	A	77	0.4	98.5	15	8	42.1	17	0.0077	+	99.9	0.1	99.8	22
Lepidoptera	L	73	0.4	98.9	16	14	73.7	8	0.0365	+	99.9	0.5	98.8	17
Chironomidae	P	52	0.3	99.2	17	9	47.4	16	0.0104	+	99.9	0.1	99.6	20
Ephemeroptera	L	47	0.2	99.4	18	5	26.3	22	0.0094	+	99.9	0.1	99.7	21
Hydracarina	A	24	0.1	99.5	19	7	36.8	18	0.0010	+	99.9	+	100.1	27
Haliplidae	L	21	0.1	99.6	20	1	5.3	30	0.0063	+	99.9	0.1	100.0	23
Pleuroceridae	A	21	0.1	99.7	20	6	31.6	21	1.6275	2.1	94.5	--	--	6
Erpobdellidae	A	19	0.1	99.8	22	7	36.8	18	0.0494	0.1	99.9	0.7	98.3	16
Lymnaeidae	A	10	0.1	99.9	23	3	15.8	25	0.1270	0.2	99.6	--	--	14
Ceratopogonidae	L	6	+	99.9	24	4	21.1	24	0.0012	+	99.9	+	100.1	26

Table 22 continued.

TAXA	LIFE STAGE	ABUNDANCE				FREQUENCY			BIOMASS					
		MEAN #/m²	% BY NUMBER	CUM. PERCENT	RANK BY NUMBER	# OF OCCUR.	% OCCUR.	RANK BY FREQUENCY	MEAN BIO. g/m²	% BY BIO.	CUM. PERCENT	% BY BIO w/o MOL.	CUM. % w/o MOL	RANK BY BIO.
Odonata	L	5	+	99.9	25	3	15.8	25	0.0045	+	99.9	0.1	100.1	25
Hirudinidae	A	2	+	99.9	26	2	10.5	27	0.0162	+	99.9	0.2	99.5	19
Unionidae	A	2	+	99.9	26	2	10.5	27	33.9246	44.8	44.8	--	--	1
Unid. Coleoptera	A	2	+	99.9	26	1	5.3	30	X	X	X	X	X	26
Tipulidae	L	2	+	99.9	26	2	10.5	27	X	X	X	X	X	26
Bryozoa	A	*	*	*	30	7	36.8	18	X	X	X	X	X	28
Hydrozoa	A	*	*	*	30	5	26.3	22	X	X	X	X	X	28
TOTAL	---	18946	---	99.9	31	19	100.0	31	75.7091	---	99.9	---	100.1	31

Table 23. Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979
Stations: Dominant Macrophyte - Heteranthra dubia (A02, A05, A07, C01, C03, C04, C06, C07, D09; Occ.-B04, B81, B3E, B11C)
Total Number of Samples: 13 Number of Samples Containing Organisms: 13
L=Larvae P=Pupae A=Adult +=<0.1% or <0.0001g or <1/m² *=Colonies X=No biomass estimate made

		ABUNDANCE				FREQUENCY			BIOMASS					
TAXA	LIFE STAGE	MEAN #/m²	% BY NUMBER	CUM. PERCENT	RANK BY NUMBER	# OF OCCUR.	% OCCUR.	RANK BY FREQUENCY	MEAN BIO. g/m²	% BY BIO.	CUM. PERCENT	% BY BIO. w/o MOL.	CUM. % w/o MOL.	RANK BY BIO
Oligochaeta	A	2036	23.4	23.4	1	13	100.0	1	1.2216	0.7	97.9	34.6	34.6	4
Amphipoda	A	2005	23.1	46.5	2	13	100.0	1	1.2030	0.7	98.6	34.1	68.7	5
Chironomidae	L	1686	19.4	65.9	3	13	100.0	1	0.3372	0.2	99.4	9.6	88.2	9
Isopoda	A	520	6.0	71.9	4	12	92.3	4	0.1560	0.1	99.7	4.4	92.6	12
Hydrobiidae	A	414	4.8	76.7	5	10	76.9	9	17.1396	10.3	91.5	--	--	2
Nematoda	A	358	4.1	80.8	6	11	84.6	7	0.0107	+	99.8	0.3	99.3	19
Sphaeriidae	A	355	4.1	84.9	7	9	69.2	10	9.5850	5.7	97.2	--	--	3
Planorbidae	A	274	3.2	88.1	8	6	46.2	14	0.1918	0.1	99.6	--	--	11
Valvatidae	A	244	2.8	90.9	9	11	84.6	7	0.3904	0.2	99.8	--	--	6
Trichoptera	L	156	1.8	92.7	10	12	92.3	4	0.0936	0.1	99.8	2.7	95.3	13
Glossiphoniidae	A	146	1.7	94.4	11	12	92.3	4	0.3504	0.2	99.0	9.9	78.6	7
Turbellaria	A	137	1.6	96.0	12	8	61.5	11	0.0274	+	99.8	0.8	97.9	15
Physidae	A	100	1.2	97.2	13	8	61.5	11	0.3500	0.2	99.2	--	--	8
Nematomorpha	A	64	0.7	97.9	14	7	53.8	13	0.0064	+	99.8	0.2	99.7	22
Lepidoptera	L	39	0.4	98.3	15	4	30.8	19	0.0195	+	99.8	0.6	98.5	17
Ceratopogonidae	L	34	0.4	98.7	16	5	38.5	17	0.0068	+	99.8	0.2	99.5	21
Erpobdellidae	A	25	0.3	99.0	17	6	46.2	14	0.0650	+	99.8	1.8	97.1	14
Ancylidae	A	25	0.3	99.3	17	5	38.5	17	0.0075	+	99.8	--	--	20
Haliplidae	L	16	0.2	99.5	19	4	30.8	19	0.0048	+	99.8	0.1	99.8	23
Hydracarina	A	14	0.2	99.7	20	6	46.2	14	0.0006	+	99.8	+	99.9	27
Chironomidae	P	8	0.1	99.8	21	2	15.4	23	0.0016	+	99.8	+	99.9	25
Unionidae	A	8	0.1	99.9	21	4	30.8	19	135.6984	81.2	81.2	--	--	1
Ephemeroptera	L	5	0.1	100.0	23	2	15.4	23	0.0010	+	99.8	+	99.9	26
Odonata	L	5	0.1	100.1	23	2	15.4	23	0.0045	+	99.8	0.1	99.9	24

Table 23 continued.

TAXA	LIFE STAGE	ABUNDANCE: MEAN #/m²	ABUNDANCE: % BY NUMBER	ABUNDANCE: CUM. PERCENT	ABUNDANCE: RANK BY NUMBER	FREQUENCY: # OF OCCUR.	FREQUENCY: % OCCUR.	FREQUENCY: RANK BY FREQUENCY	BIOMASS: MEAN BIO. g/m²	BIOMASS: % BY BIO.	BIOMASS: CUM. PERCENT	BIOMASS: % BY BIO w/o MOL.	BIOMASS: CUM. % w/o MOL	BIOMASS: RANK BY BIO.
Pleuroceridae	A	3	+	100.1	25	2	15.4	23	0.2325	0.1	99.5	--	--	10
Hirudinidae	A	2	+	100.1	26	1	7.7	27	0.0162	+	99.8	0.5	99.0	18
Lymnaeidae	A	2	+	100.1	26	1	7.7	27	0.0254	+	99.8	--	--	16
Coccinellidae	A	2	+	100.1	26	1	7.7	27	X	X	X	X	X	28
Piscicolidae	A	2	+	100.1	26	1	7.7	27	X	X	X	X	X	28
Bryozoa	A	*	*	*	30	3	23.1	22	X	X	X	X	X	28
TOTAL	---	8685	---	100.1	30	13	100.0	30	167.1469	---	99.8	---	99.9	30

Table 24. Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979
Stations: Cedar Island - Channel Side (C01-C05)
Total Number of Samples: 5 Number of Samples Containing Organisms: 5
L=Larvae P=Pupae A=Adult +=<0.1% or <0.0001g or <1/m² *=Colonies X=No biomass estimate made

TAXA	LIFE STAGE	ABUNDANCE MEAN #/m²	% BY NUMBER	CUM. PERCENT	RANK BY NUMBER	FREQUENCY # OF OCCUR.	% OCCUR.	RANK BY FREQUENCY	BIOMASS MEAN BIO. g/m²	% BY BIO.	CUM. PERCENT	% BY BIO w/o MOL.	CUM.% w/o MOL.	RANK BY BIO
Amphipoda	A	2742	30.9	30.9	1	5	100.0	1	1.6452	1.9	95.3	40.6	40.6	3
Chironomidae	L	1678	18.9	49.8	2	5	100.0	1	0.3356	0.4	99.4	8.3	96.8	8
Isopoda	A	1509	17.0	66.8	3	5	100.0	1	0.4527	0.5	99.0	11.2	88.5	7
Oligochaeta	A	1472	16.6	83.4	4	5	100.0	1	0.8832	1.0	97.8	21.8	62.4	5
Sphaeriidae	A	457	5.2	88.6	5	5	100.0	1	12.3390	14.4	93.4	--	--	2
Glossiphoniidae	A	251	2.8	91.4	6	5	100.0	1	0.6024	0.7	98.5	14.9	77.3	6
Valvatidae	A	129	1.5	92.9	7	5	100.0	1	0.2064	0.2	99.6	--	--	9
Nematoda	A	117	1.3	94.2	8	5	100.0	1	0.0035	+	99.8	0.1	100.1	21
Turbellaria	A	113	1.3	95.5	9	3	60.0	11	0.0226	+	99.8	0.6	98.9	13
Trichoptera	L	101	1.1	96.6	10	4	80.0	9	0.0606	0.1	99.7	1.5	98.3	10
Planorbidae	A	57	0.6	97.2	11	2	40.0	13	0.0399	+	99.8	--	--	12
Nematomorpha	A	40	0.5	97.7	12	2	40.0	13	0.0040	+	99.8	0.1	100.0	20
Ancylidae	A	36	0.4	98.1	13	2	40.0	13	0.0108	+	99.8	--	--	16
Ceratopogonidae	L	32	0.4	98.5	14	3	60.0	11	0.0064	+	99.8	0.2	99.9	19
Hydrobiidae	A	32	0.4	98.9	14	4	80.0	9	1.3248	1.5	96.8	--	--	4
Haliplidae	L	28	0.3	99.2	16	2	40.0	13	0.0084	+	99.8	0.2	99.7	18
Lepidoptera	L	24	0.3	99.5	17	2	40.0	13	0.0120	+	99.8	0.3	99.2	15
Chironomidae	P	16	0.2	99.7	18	1	20.0	19	0.0032	+	99.8	0.1	100.2	22
Hydracarina	A	12	0.1	99.8	19	2	40.0	13	0.0005	+	99.8	+	100.2	24
Ephemeroptera	L	4	+	99.8	20	1	20.0	19	0.0008	+	99.8	+	100.2	23
Erpobdellidae	A	4	+	99.8	20	1	20.0	19	0.0104	+	99.8	0.3	99.5	17
Lymnaeidae	A	4	+	99.8	20	1	20.0	19	0.0508	0.1	99.8	--	--	11
Physidae	A	4	+	99.8	20	1	20.0	19	0.0140	+	99.8	--	--	14
Unionidae	A	4	+	99.8	20	1	20.0	19	67.8492	79.0	79.0	--	--	1

Table 24 continued.

TAXA	LIFE STAGE	ABUNDANCE				FREQUENCY			BIOMASS					
		MEAN #/m²	% BY NUMBER	CUM. PERCENT	RANK BY NUMBER	# OF OCCUR.	% OCCUR.	RANK BY FREQUENCY	MEAN BIO. g/m²	% BY BIO.	CUM. PERCENT	% BY BIO. w/o MOL.	CUM.% w/o MOL	RANK BY BIO.
Sialidae	L	4	+	99.8	20	1	20.0	19	X	X	X	X	X	25
TOTAL	---	8870	---	99.8	25	5	100.0	25	85.5864	---	99.8	---	100.2	25

Table 25. Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979
Stations: Cedar Island - Non-Channel Side (C06-C10)
Total Number of Samples: 5 Number of Samples Containing Organisms: 5
L=Larvae P=Pupae A=Adult +=<0.1% or <0.0001g or <1/m² *=Colonies X=No biomass estimate made

		ABUNDANCE				FREQUENCY			BIOMASS					
TAXA	LIFE STAGE	MEAN #/m²	% BY NUMBER	CUM. PERCENT	RANK BY NUMBER	# OF OCCUR.	% OCCUR.	RANK BY FREQUENCY	MEAN BIO. g/m²	% BY BIO.	CUM. PERCENT	% BY BIO w/o MOL.	CUM.% w/o MOL.	RANK BY BIO.
Amphipoda	A	1096	30.1	30.1	1	5	100.0	1	0.6576	13.4	69.2	43.5	43.5	2
Chironomidae	L	926	25.4	55.5	2	5	100.0	1	0.1852	3.8	86.7	12.3	78.1	5
Oligochaeta	A	562	15.4	70.9	3	4	80.0	3	0.3372	6.9	76.1	22.3	65.8	3
Isopoda	A	206	5.7	76.6	4	3	60.0	8	0.0618	1.3	96.1	4.1	90.0	9
Planorbidae	A	194	5.3	81.9	5	3	60.0	8	0.1358	2.8	92.4	--	--	7
Sphaeriidae	A	101	2.8	84.7	6	3	60.0	8	2.7270	55.8	55.8	--	--	1
Valvatidae	A	89	2.4	87.1	7	4	80.0	3	0.1424	2.9	89.6	--	--	6
Nematomorpha	A	85	2.3	89.4	8	4	80.0	3	0.0085	0.2	99.8	0.6	99.0	14
Lepidoptera	L	77	2.1	91.5	9	2	40.0	12	0.0395	0.8	99.6	2.5	98.4	13
Trichoptera	L	77	2.1	93.6	9	4	80.0	3	0.0462	0.9	97.0	3.1	93.1	10
Nematoda	A	65	1.8	95.4	11	2	40.0	12	0.0020	+	100.0	0.1	99.9	17
Glossiphoniidae	A	49	1.3	96.7	12	4	80.0	3	0.1176	2.4	94.8	7.8	85.9	8
Ceratopogonidae	L	32	0.9	97.6	13	3	60.0	8	0.0064	0.1	99.9	0.4	99.4	15
Haliplidae	L	20	0.5	98.1	14	1	20.0	17	0.0060	0.1	100.0	0.4	99.8	16
Erpobdellidae	A	16	0.4	98.5	15	2	40.0	12	0.0416	0.9	98.8	2.8	95.9	12
Hydracarina	A	12	0.3	98.8	16	1	20.0	17	0.0005	+	100.0	+	100.1	21
Physidae	A	12	0.3	99.1	16	2	40.0	12	0.0420	0.9	97.9	--	--	11
Chironomidae	P	8	0.2	99.3	18	2	40.0	12	0.0016	+	100.0	0.1	100.0	18
Hydrobiidae	A	8	0.2	99.5	18	1	20.0	17	0.3312	6.8	82.9	--	--	4
Ancylidae	A	4	0.1	99.6	20	1	20.0	17	0.0012	+	100.0	--	--	19
Turbellaria	A	4	0.1	99.7	20	1	20.0	17	0.0008	+	100.0	0.1	100.1	20
TOTAL	---	3643	---	99.7	21	5	100.0	21	4.8911	---	100.0	---	100.1	21

Table 26. Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979
Stations: Atlantis Island - Channel Side (A01-A05)
Total Number of Samples: 5 Number of Samples Containing Organisms: 5
L=Larvae P=Pupae A=Adult +=<0.1% or <0.0001g or <1/m² *=Colonies X=No biomass estimate made

		ABUNDANCE				FREQUENCY			BIOMASS					
TAXA	LIFE STAGE	MEAN #/m²	% BY NUMBER	CUM. PERCENT	RANK BY NUMBER	# OF OCCUR.	% OCCUR.	RANK BY FREQUENCY	MEAN BIO. g/m²	% BY BIO.	CUM. PERCENT	% BY BIO w/o MOL.	CUM.% w/o MOL	RANK BY BIO
Amphipoda	A	2313	31.6	31.6	1	5	100.0	1	1.3878	4.4	92.1	40.8	40.8	3
Oligochaeta	A	1889	25.8	57.4	2	5	100.0	1	1.1334	3.6	95.7	33.4	74.2	4
Chironomidae	L	809	11.0	68.4	3	5	100.0	1	0.1618	0.5	98.0	4.8	89.0	7
Sphaeriidae	A	679	9.3	77.7	4	4	80.0	8	18.3330	58.8	58.8	--	--	1
Isopoda	A	522	7.1	84.8	5	4	80.0	8	0.1566	0.5	98.5	3.6	93.6	8
Hydrobiidae	A	218	3.0	87.8	6	5	100.0	1	9.0252	28.9	87.7	--	--	2
Turbellaria	A	158	2.2	90.0	7	4	80.0	8	0.0316	0.1	99.7	0.9	98.7	13
Valvatidae	A	146	2.0	92.0	8	4	80.0	8	0.2336	0.7	97.5	--	--	6
Glossiphoniidae	A	142	1.9	93.9	9	5	100.0	1	0.3408	1.1	96.8	10.0	84.2	5
Trichoptera	L	138	1.9	95.8	10	5	100.0	1	0.0828	0.3	99.2	2.4	96.0	10
Nematoda	A	53	0.7	96.5	11	5	100.0	1	0.0016	+	99.8	+	99.8	20
Nematomorpha	A	53	0.7	97.2	11	3	60.0	12	0.0053	+	99.8	0.2	99.7	17
Planorbidae	A	44	0.6	97.8	13	2	40.0	20	0.0308	0.1	99.8	--	--	14
Physidae	A	36	0.5	98.3	14	3	60.0	12	0.1260	0.4	98.9	--	--	9
Lepidoptera	L	28	0.4	98.7	15	2	40.0	18	0.0140	+	99.8	0.4	99.5	16
Erpobdellidae	A	24	0.3	99.0	16	3	60.0	12	0.0624	0.2	99.4	1.8	97.8	11
Ceratopogonidae	L	20	0.3	99.3	17	2	40.0	15	0.0040	+	99.8	0.1	99.8	18
Odonata	L	16	0.2	99.5	18	2	40.0	15	0.0144	+	99.8	0.4	99.1	15
Ancylidae	A	12	0.2	99.7	19	2	40.0	15	0.0036	+	99.8	--	--	19
Chironomidae	P	8	0.1	99.8	20	1	20.0	21	0.0016	+	99.8	+	99.8	20
Hydracarina	A	8	0.1	99.9	20	2	40.0	15	0.0003	+	99.8	+	99.8	22
Lymnaeidae	A	4	0.1	100.0	22	1	20.0	21	0.0508	0.2	99.6	--	--	12
Curculionidae	L	4	0.1	100.1	22	1	20.0	21	X	X	X	X	X	23

Table 26 continued.

TAXA	LIFE STAGE	ABUNDANCE: MEAN #/m²	ABUNDANCE: % BY NUMBER	ABUNDANCE: CUM. PERCENT	ABUNDANCE: RANK BY NUMBER	FREQUENCY: # OF OCCUR.	FREQUENCY: % OCCUR.	FREQUENCY: RANK BY FREQUENCY	BIOMASS: MEAN BIO. g/m²	BIOMASS: % BY BIO.	BIOMASS: CUM. PERCENT	BIOMASS: % BY BIO w/o MOL.	BIOMASS: CUM. % w/o MOL	BIOMASS: RANK BY BIO.
Coccinellidae	A	4	0.1	100.2	22	1	20.0	21	X	X	X	X	X	23
TOTAL	---	7328	---	100.2	24	5	100.0	24	31.2014	---	99.5	---	99.8	24

Table 27. Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979
Stations: Atlantis Island - Non-Channel Side (A06-A10)
Total Number of Samples: 5 Number of Samples Containing Organisms: 5
L=Larvae P=Pupae A=Adult +=<0.1% or <0.0001g or <1/m² *=Colonies X=No biomass estimate made

TAXA	LIFE STAGE	ABUNDANCE MEAN #/m²	% BY NUMBER	CUM. PERCENT	RANK BY NUMBER	FREQUENCY # OF OCCUR.	% OCCUR.	RANK BY FREQUENCY	BIOMASS MEAN BIO. g/m²	% BY BIO.	CUM. PERCENT	% BY BIO w/o MOL.	CUM. % w/o MOL	RANK BY BIO
Chironomidae	L	4849	41.8	41.8	1	5	100.0	1	0.9698	10.6	88.4	22.4	78.2	5
Oligochaeta	A	2107	18.2	60.0	2	5	100.0	1	1.2642	13.8	52.3	29.3	29.3	2
Amphipoda	A	1909	16.5	76.5	3	5	100.0	1	1.1454	12.5	77.8	26.5	55.8	4
Nematoda	A	777	6.7	83.2	4	5	100.0	1	0.0233	0.3	99.2	0.5	99.0	12
Isopoda	A	639	5.5	88.7	5	5	100.0	1	0.1917	2.1	94.4	4.4	90.9	7
Turbellaria	A	469	4.0	92.7	6	5	100.0	1	0.0938	1.0	97.2	2.2	96.8	9
Trichoptera	L	267	2.3	95.0	7	4	80.0	8	0.1602	1.8	96.2	3.7	94.6	8
Glossiphoniidae	A	150	1.3	96.3	8	4	80.0	8	0.3600	3.9	92.3	8.3	86.5	6
Hydrobiidae	A	85	0.7	97.0	9	5	100.0	1	3.5190	38.5	38.5	--	--	1
Valvatidae	A	49	0.4	97.4	10	4	80.0	8	0.0784	0.9	98.1	--	--	10
Haliplidae	L	44	0.4	97.8	11	2	40.0	16	0.0132	0.1	99.5	0.3	99.3	14
Sphaeriidae	A	44	0.4	98.2	11	4	80.0	8	1.1880	13.0	65.3	--	--	3
Ceratopogonidae	L	40	0.3	98.5	13	3	60.0	12	0.0080	0.1	99.7	0.2	99.5	16
Ephemeroptera	L	28	0.2	98.7	14	3	60.0	12	0.0056	0.1	99.9	0.1	99.8	18
Erpobdellidae	A	28	0.2	98.9	14	3	60.0	12	0.0728	0.8	98.9	1.7	98.5	11
Hydracarina	A	28	0.2	99.1	14	2	40.0	16	0.0011	+	100.0	+	99.9	22
Nematomorpha	A	28	0.2	99.3	14	3	60.0	12	0.0028	+	100.0	0.1	99.9	20
Ancylidae	A	16	0.1	99.4	18	2	40.0	16	0.0048	0.1	100.0	--	--	19
Planorbidae	A	16	0.1	99.5	18	2	40.0	16	0.0112	0.1	99.6	--	--	15
Odonata	L	8	0.1	99.6	20	2	40.0	16	0.0072	0.1	99.8	0.2	99.7	17
Lepidoptera	L	4	+	99.6	21	1	20.0	21	0.0020	+	100.0	+	99.9	21
Physidae	A	4	+	99.6	21	1	20.0	21	0.0140	0.2	99.4	--	--	13

Table 27 continued.

TAXA	LIFE STAGE	ABUNDANCE MEAN #/m²	ABUNDANCE % BY NUMBER	ABUNDANCE CUM. PERCENT	ABUNDANCE RANK BY NUMBER	FREQUENCY # OF OCCUR.	FREQUENCY % OCCUR.	FREQUENCY RANK BY FREQUENCY	BIOMASS MEAN BIO. g/m²	BIOMASS % BY BIO.	BIOMASS CUM. PERCENT	BIOMASS % BY BIO. w/o MOL	BIOMASS CUM. % w/o MOL	BIOMASS RANK BY BIO.
Curculionidae	L	4	+	99.6	21	1	20.0	21	X	X	X	X	X	23
Elateridae	A	4	+	99.6	21	1	20.0	21	X	X	X	X	X	23
Trichoptera	P	4	+	99.6	21	1	20.0	21	X	X	X	X	X	23
TOTAL	---	11601	---	99.6	25	5	100.0	25	9.1365	---	100.0	---	99.9	25

Table 28. Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979
Stations: Chimney Island Shoal (D01-D10)
Total Number of Samples: 10 Number of Samples Containing Organisms: 10
L=Larvae P=Pupae A=Adult +=<0.1% or <0.0001g or <1/m² *=Colonies X=No biomass estimate made

TAXA	LIFE STAGE	ABUNDANCE MEAN #/m²	% BY NUMBER	CUM. PERCENT	RANK BY NUMBER	FREQUENCY # OF OCCUR.	% OCCUR.	RANK BY FREQUENCY	BIOMASS MEAN BIO. g/m²	% BY BIO.	CUM. PERCENT	% BY BIO w/o MOL.	CUM. % w/o MOL	RANK BY BIO
Amphipoda	A	6000	59.7	59.7	1	10	100.0	1	3.6000	1.5	97.7	73.6	73.6	4
Isopoda	A	979	9.7	69.4	2	8	80.0	8	0.2937	0.1	99.4	6.0	87.7	8
Chironomidae	L	944	9.4	78.8	3	10	100.0	1	0.1888	0.1	99.7	3.9	97.0	11
Oligochaeta	A	659	6.6	85.4	4	10	100.0	1	0.3954	0.2	99.2	8.1	81.7	6
Hydrobiidae	A	352	3.5	88.9	5	9	90.0	5	14.5728	6.2	93.2	--	--	2
Sphaeriidae	A	263	2.6	91.5	6	10	100.0	1	7.1010	3.0	96.2	--	--	3
Planorbidae	A	174	1.7	93.2	7	7	70.0	10	0.1218	0.1	99.9	--	--	13
Valvatidae	A	152	1.5	94.7	8	9	90.0	5	0.2432	0.1	99.6	--	--	10
Glossiphoniidae	A	111	1.1	95.8	9	8	80.0	8	0.2664	0.1	99.5	5.4	93.1	9
Trichoptera	L	97	1.0	96.8	10	7	70.0	10	0.0582	+	99.9	1.2	99.5	15
Physidae	A	69	0.9	97.7	11	9	90.0	5	0.3115	0.1	99.3	--	--	7
Turbellaria	A	69	0.7	98.4	12	6	60.0	12	0.0138	+	99.9	0.3	99.8	16
Pleuroceridae	A	38	0.4	98.8	13	3	30.0	18	2.9450	1.3	99.0	--	--	5
Erpobdellidae	A	24	0.2	99.0	14	4	40.0	13	0.0624	+	99.9	1.3	98.3	14
Nematoda	A	24	0.2	99.2	14	4	40.0	13	0.0007	+	99.9	+	99.9	21
Nematomorpha	A	16	0.2	99.4	16	4	40.0	13	0.0016	+	99.9	+	99.9	19
Lymnaeidae	A	14	0.1	99.5	17	2	20.0	20	0.1778	0.1	99.8	--	--	12
Unionidae	A	12	0.1	99.6	18	4	40.0	13	203.5476	87.0	87.0	--	--	1
Lepidoptera	L	12	0.1	99.7	18	4	40.0	13	0.0060	+	99.9	0.1	99.9	17
Ancylidae	A	10	0.1	99.8	20	2	20.0	20	0.0030	+	99.9	--	--	18
Chironomidae	P	8	0.1	99.9	21	3	30.0	18	0.0016	+	99.9	+	99.9	19
Dytiscidae	A	2	+	99.9	22	1	10.0	22	X	X	X	X	X	23
Hydracarina	A	2	+	99.9	22	1	10.0	22	0.0001	+	99.9	+	99.9	22
TOTAL	---	10051	---	99.9	23	10	100.0	23	233.9124	---	99.9	---	99.9	23

Table 29. Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979
Stations: Clark Island Shoal (Q01-Q05)
Total Number of Samples: 5 Number of Samples Containing Organisms: 5
L=Larvae P=Pupae A=Adult +=<0.1% or <0.0001g or <1/m² *=Colonies X=No biomass estimate made

TAXA	LIFE STAGE	ABUNDANCE MEAN #/m²	% BY NUMBER	CUM. PERCENT	RANK BY NUMBER	FREQUENCY # OF OCCUR.	% OCCUP.	RANK BY FREQUENCY	BIOMASS MEAN BIO. g/m²	% BY BIO.	CUM. PERCENT	% BY BIO w/o MOL.	CUM.% w/o MOL	RANK BY BIO
Amphipoda	A	2981	70.2	70.2	1	5	100.0	1	1.7886	49.8	49.8	85.1	85.1	1
Chironomidae	L	582	13.7	83.9	2	5	100.0	1	0.1164	3.2	93.1	5.5	96.6	5
Oligochaeta	A	210	4.9	88.8	3	5	100.0	1	0.1260	3.5	86.4	6.0	91.1	3
Planorbidae	A	178	4.2	93.0	4	4	80.0	4	0.1246	3.5	89.9	--	--	4
Trichoptera	L	77	1.8	94.8	5	4	80.0	4	0.0462	1.3	97.2	2.2	98.8	7
Ancylidae	A	77	1.8	96.6	5	3	60.0	7	0.0231	0.6	99.3	--	--	10
Sphaeriidae	A	44	1.0	97.6	7	2	40.0	8	1.1880	33.1	82.9	--	--	2
Lepidoptera	L	40	0.9	98.5	8	4	80.0	4	0.0200	0.6	99.9	1.0	99.8	11
Chironomidae	P	16	0.4	98.9	9	2	40.0	8	0.0032	0.1	100.0	0.2	100.0	12
Valvatidae	A	16	0.4	99.3	9	2	40.0	8	0.0256	0.7	98.7	--	--	9
Physidae	A	8	0.2	99.5	11	1	20.0	12	0.0280	0.8	98.0	--	--	8
Lymnaeidae	A	8	0.2	99.7	11	2	40.0	8	0.1016	2.8	95.9	--	--	6
Nematomorpha	A	4	0.1	99.8	13	1	20.0	12	0.0004	+	100.0	+	100.0	13
Nematoda	A	4	0.1	99.9	13	1	20.0	12	0.0001	+	100.0	+	100.0	14
TOTAL	---	4245	---	99.9	14	5	100.0	14	3.5918	---	100.0	---	100.0	14

Table 30 . Benthic Invertebrate Abundance, Frequency, and Biomass for St. Lawrence Additional Locks Study, 1979
Stations: Samples Containing Oil (May - B11, B12, B15, B16; October - B11, B12, B15)
Total Number of Samples: 7 Number of Samples Containing Organisms: 7
L=Larvae P=Pupae A=Adult +=<0.1% or <0.0001g or <1/m² *=Colonies X=No biomass estimate made

		ABUNDANCE				FREQUENCY			BIOMASS					
TAXA	LIFE STAGE	MEAN #/m²	% BY NUMBER	CUM. PERCENT	RANK BY NUMBER	# OF OCCUR.	% OCCUR.	RANK BY FREQUENCY	MEAN BIO. g/m²	% BY BIO.	CUM. % BY BIO. PERCENT	CUM. % BY BIO. w/o MOL.	CUM.% w/o MOL.	RANK BY BIO
Oligochaeta	A	2718	68.1	68.1	1	6	85.7	2	1.6308	1.0	99.3	74.9	74.9	4
Chironomidae	L	488	12.2	80.3	2	7	100.0	1	0.0976	0.1	99.9	4.5	94.4	8
Nematoda	A	162	4.1	84.4	3	2	28.6	8	0.0049	+	99.9	0.2	99.3	13
Amphipoda	A	116	2.9	87.3	4	2	28.6	8	0.0696	+	99.9	3.2	97.6	11
Erpobdellidae	A	78	2.0	89.3	5	3	42.9	5	0.2028	0.1	99.7	9.3	84.2	6
Sphaeriidae	A	64	1.6	90.9	6	2	28.6	8	1.7280	1.1	99.8	--	--	3
Hydrobiidae	A	61	1.5	92.4	7	4	57.1	3	2.5254	1.6	97.2	--	--	2
Trichoptera	L	55	1.4	93.8	8	4	57.1	3	0.0330	+	99.9	1.5	99.1	12
Glossiphoniidae	A	52	1.3	95.1	9	2	28.6	8	0.1248	0.1	99.8	5.7	89.9	7
Valvatidae	A	49	1.2	96.3	10	2	28.6	8	0.0784	+	99.9	--	--	9
Nematomorpha	A	40	1.0	97.3	11	3	42.9	5	0.0046	+	99.9	0.2	99.5	14
Lymnaeidae	A	32	0.8	98.3	12	3	42.9	5	0.4064	0.3	99.6	--	--	5
Physidae	A	20	0.5	98.8	13	1	14.3	16	0.0700	+	99.9	--	--	10
Ancylidae	A	12	0.3	99.1	14	1	14.3	16	0.0036	+	99.9	--	--	16
Haliplidae	L	9	0.2	99.3	15	1	14.3	16	0.0027	+	99.9	0.1	99.8	17
Lepidoptera	L	9	0.2	99.5	15	2	28.6	8	0.0045	+	99.9	0.2	99.7	15
Unionidae	A	9	0.2	99.7	15	2	28.6	8	152.6607	95.6	95.6	--	--	1
Ceratopogonidae	L	6	0.2	99.9	18	2	28.6	8	0.0012	+	99.9	0.1	99.9	19
Isopoda	A	3	0.1	100.0	19	1	14.3	16	0.0009	+	99.9	+	99.9	20
Planorbidae	A	3	0.1	100.1	19	1	14.3	16	0.0021	+	99.9	--	--	18
Bryozoa	A	*	*	*	21	1	14.3	16	X	X	X	X	X	21
Porifera	A	*	*	*	21	1	14.3	16	X	X	X	X	X	21
TOTAL	---	3992	---	100.1	22	7	100.0	22	159.6520	---	99.9	---	99.9	22

SECTION: B

FISH

TABLE OF CONTENTS

	Page
List of Figures	B-II
List of Tables	B-III
List of Abbreviations and Symbols	B- V
Introduction	B-1
Materials and Methods	B-1
Results and Discussion	B-3
Trap-Netting	B-4
Seining	B-6
Dominant Species	B-9
Summary and Conclusions	B-12
Literature Cited	B-16
Figures	B-17
Tables	B-19
Appendix	B-64

LIST OF FIGURES

Figure Number		Page
1	Locations of seine stations S01-S05 (blue) and trap net stations T01-T03 (red)	B-17
2	Locations of seine station S06 (blue) and trap net stations T04-T05 (red)	B-18

LIST OF TABLES

Table Number		Page
1	Species of Fish Captured from May 7 through November 27, 1979.	B-19
2	Species of Fish Captured in 1979. Monthly Summary	B-20
3	Descriptions of Seine and Trap Net Sites for sampling in the Grasse River in 1979.	B-21
4	Turbidity and Surface Water Temperatures at Seine and Trap Net Sites.	B-22
5	Total Number of Fish Caught by Trap Net in the Grasse River in 1979 at All Stations.	B-25
6	Total Number of Fish Caught by Trap Net in the Grasse River in 1979 at Station T01.	B-26
7	Total Number of Fish Caught by Trap Net in the Grasse River in 1979 at Station T02.	B-27
8	Total Number of Fish Caught by Trap Net in the Grasse River in 1979 at Station T03.	B-28
9	Total Number of Fish Caught by Trap Net in the Grasse River in 1979 at Station T04.	B-29
10	Total Number of Fish Caught by Trap Net in the Grasse River in 1979 at Station T05.	B-30
11	Total Number of Fish Caught by 15' Flat Seine in the Grasse River in 1979 at All Stations.	B-31
12	Total Number of Fish Caught by 15' Flat Seine in the Grasse River in 1979 at Station S01.	B-32
13	Total Number of Fish Caught by 15' Flat Seine in the Grasse River in 1979 at Station S02.	B-33
14	Total Number of Fish Caught by 15' Flat Seine in the Grasse River in 1979 at Station S03.	B-34
15	Total Number of Fish Caught by 15' Flat Seine in the Grasse River in 1979 at Station S04.	B-35
16	Total Number of Fish Caught by 15' Flat Seine in the Grasse River in 1979 at Station S05.	B-36
17	Total Number of Fish Caught by 60' Bag Seine in the Grasse River in 1979 at All Stations.	B-37
18	Total Number of Fish Caught by 60' Bag Seine in the Grasse River in 1979 at Station S01.	B-39
19	Total Number of Fish Caught by 60' Bag Seine in the Grasse River in 1979 at Station S02.	B-40
20	Total Number of Fish Caught by 60' Bag Seine in the Grasse River in 1979 at Station S03.	B-41
21	Total Number of Fish Caught by 60' Bag Seine in the Grasse River in 1979 at Station S04.	B-42
22	Total Number of Fish Caught by 60' Bag Seine in the Grasse River in 1979 at Station S05.	B-44

List of Tables (continued)

Table Number		Page
23	Total Number of Fish Caught by 60' Bag Seine in the Grasse River in 1979 at Station S06.	B-46
24	Total Number of Fish Caught by Seine in the Grasse River in 1979 at All Stations.	B-47
25	Total Number of Fish Caught by Seine in the Grasse River in 1979 at Station S01.	B-49
26	Total Number of Fish Caught by Seine in the Grasse River in 1979 at Station S02.	B-50
27	Total Number of Fish Caught by Seine in the Grasse River in 1979 at Station S03.	B-51
28	Total Number of Fish Caught by Seine in the Grasse River in 1979 at Station S04.	B-52
29	Total Number of Fish Caught by Seine in the Grasse River in 1979 at Station S05.	B-54
30	Total Number of Fish Caught by Seine in the Grasse River in 1979 at Station S06.	B-55
31	Length/Frequency of Golden Shiners Caught in Seines in the Grasse River in 1979.	B-56
32	Length/Frequency of Spottail Shiners Caught in Seines in the Grasse River in 1979.	B-57
33	Length/Frequency of Fallfish Caught in Seines in the Grasse River in 1979.	B-58
34	Length/Frequency of White Suckers Caught in Seines in the Grasse River in 1979.	B-59
35	Length/Frequency of White Perch Caught in Seines in the Grasse River in 1979.	B-60
36	Length/Frequency of Yellow Perch Caught in Seines in the Grasse River in 1979.	B-61
37	Length/Frequency of Logperch Caught in Seines in the Grasse River in 1979.	B-62
38	Length/Frequency of Bluegills Caught in Seines in the Grasse River in 1979.	B-63

LIST OF ABBREVIATIONS AND SYMBOLS

ABBREVIATIONS

Avg. = average (mean)

C = Celsius

m = meters

mm = millimeters

SYMBOLS

' = feet

° = degrees

= number

* = station not sampled

" = inches

INTRODUCTION

An important fisheries resource exists in the St. Lawrence River. In recent years, several navigational projects have been considered for the river. One of these projects, the Additional Locks proposal, includes the possibility of extensive dredging in the lower Grasse River near Massena, New York.

A study of the fish communities of this area was undertaken to determine what species of forage and game fish are found here and at what times of the year they are most abundant and most vulnerable.

MATERIALS AND METHODS

Locations of sampling stations are shown in Figures 1 and 2. Seine sites were numbered S01-S06 and trap net sites were numbered T01-T05.

Due to limited time and manpower, only a small number of sites could be sampled. The lower Grasse River was chosen because large-scale dredging could occur there during construction of a new lock and channel, and little data are available on the fish populations of this area.

Three trap net sites were sampled concurrently. Stations T01,T02, and T03 were sampled during the weeks of May 7 and 29, 1979. Stations T04 and T05 replaced stations T02 and T03 during the week of June 18 due to poor results

during the previous weeks. Nets were set on Monday morning and checked on Tuesday, Wednesday, and Thursday, and then removed. Sampling was repeated at three-week intervals (other duties prevented more frequent sampling). No netting was done in April due to administrative delays on the project. Trap-netting was ended in June because few fish were being taken and our manpower was needed in other phases of the project. Nets were set perpendicular to shore with the trap near shore. Since few fish were captured with this set-up, the trap was placed away from shore with the lead toward shore. This method captured more fish, but catches were still quite small due to the generally deep water.

All fish taken in trap nets were identified, counted, and measured to the nearest millimeter.

Six seine sites were sampled. Stations S01, S04, and S05 were sampled throughout the study, while stations S02 and S03 were sampled May 7 through June 18, and station S06 was sampled from July 7 through August 6. Sites were sampled every third week from May 7 through July 6 and September 27 through November 27, bi-weekly from July 6 through September 27. Each site was sampled once during the sampling week with a 60-foot bag seine (1/4" mesh). During the first three sampling weeks a 15-foot flat seine (1/4" mesh) was also used. The latter was abandoned because it caught very few fish. The only species taken in larger numbers in the 15-foot seine than in the 60-foot seine was the Johnny darter.

Seine sites S02 and S03 were abandoned because they were difficult to seine and few fish were taken. Site S03 also became overgrown with vegetation. Site

S06 was established to replace the other two sites, but was found to be very unproductive and difficult to seine due to a sharp drop-off.

All fish taken in seines were identified, counted, and measured to the nearest millimeter. If more than 100 specimens of a species were present, a random sample of 100 was measured.

A Secchi disk reading for turbidity and a surface water temperature were taken at each trap-netting and seine site (temperatures were not taken late in the year due to defective thermometers). Weather conditions were also recorded at each site.

RESULTS AND DISCUSSION

Thirty-five species of fish were taken in the lower Grasse River in 1979 (Table 1). Fourteen of these were captured in trap nets, nine in a 15-foot flat seine, and 31 in a 60-foot bag seine. Only golden shiners, brown bullhead, and pumpkinseed were taken in all three types of gear. Only 4 of these 35 species were not taken in the 60-foot seine (northern pike, shorthead redhorse, channel catfish, and walleye).

Sampling was conducted from May through November, 1979 (Table 2). Several species were captured in all months. Among these species were golden shiner, spottail shiner, white sucker, white perch, bluegill, black crappie, Johnny darter, and yellow perch. Several species were taken in only one month. These species were rosyface shiner, bridle shiner, common shiner, shorthead redhorse,

greater redhorse, channel catfish, and walleye (all in May); brook silverside (June); and alewife, gizzard shad, and mottled sculpin (September).

Twenty-seven of the species were taken in May. Carp, fallfish, brook silverside, and smallmouth bass were added in June. No new species were added in July. Largemouth bass first occurred in August, while alewife, gizzard shad, and mottled sculpin first appeared in the September samples. No new species were added after September.

Trap-Netting

Fourteen species were captured in trap nets (Table 5). Most of these were gamefish or panfish. The only baitfish taken was the golden shiner. A total of 178 specimens were captured, which represents an average of only 7.7 fish per set. There are several reasons for these low totals. Part of the spawning season was missed due to our late start and only sampling every third week. The Grasse River in the sampling area is fairly deep with steep banks, and offers very few good trap-netting sites. Station T05 was the only station where the net could really be set properly. In addition, no time was available for practice netting, and the sampling problems had to be resolved during the first week of sampling.

A total of 27 sets was attempted. All but four of these sets produced fish. White perch was the most common species, occurring in 13 samples with an average of 4.0 fish per set in which it was present. Brown bullhead and yellow perch were each taken in 12 sets, and golden shiner was taken in ten sets.

Station T05 was the most productive (Table 10), yielding 54 fish in 3 sets, for an average of 18.0 per set. White perch was the most abundant species, with an average of 6.0 per set. This station was sampled only in the third week of sampling. It is located upriver of potential dredging areas.

Station T04 was also sampled only during the third week (Table 9). Only 2.3 specimens were taken per set. This station was also located upriver of potential dredging sites.

Stations T02 and T03, located in potential dredging areas, were sampled only during the first two weeks (Tables 7 & 8). They averaged 3.0 and 6.0 specimens per set, respectively. These sites were abandoned in favor of T04 and T05 because they were too deep and dropped off too rapidly.

Station T01 was the only station sampled throughout the three sampling periods (Table 6). This station was located just upriver of potential dredging areas. All nine sets contained fish, but only an average of 9.0 per set was taken. Some sets contained only one specimen.

No trends were apparent in the trap-netting results. Brown bullhead, bowfin, and walleye decreased from week one to week three, while golden shiner and pumpkinseed increased, but these changes may be due to the change in sampling locations or the small sample size.

The trap-netting was abandoned after three sampling periods because the total number of fish being taken was too small to aid us in defining the populations. The manpower being expended was more useful in seining.

Seining

The bulk of the fisheries sampling effort was expended in seining. Equipment consisted of a 60-foot bag seine with 1/4" mesh and a 15-foot flat seine with 1/4" mesh. After three sampling periods, the 15-foot seine was eliminated because it was capturing essentially the same segment of the population as the 60-foot seine, due to the mesh size.

Spottail shiners and Johnny darters, which dominated the catch in the 15-foot seine, averaged 5.2 and 4.9 specimens per haul present, respectively (Table 11). Only 8.5 specimens per haul were taken overall.

The dominant species taken in the 60-foot seine were spottail shiner (26.1/haul present), golden shiner (22.6/haul present), logperch (20.2/haul present), and bluegill (19.0/haul present) (Table 17). Yellow perch were found in 34 hauls, followed by golden shiner (30), Johnny darter (28), spottail shiner (27), white sucker (25), and bluegill (25).

An average of 77.3 specimens was taken per haul with the 60-foot seine. The number of species per sampling period varied, ranging from 11 (on 10/15)

to 22 (on 9/17) and averaging 15. The total number of specimens taken varied from 53 (on 8/6) to 547 (on 11/6).

The dominant species taken during the week of May 7 were spottail shiner (281) and golden shiner (65). The total number was down from 521 to 125 during the week of May 29, when golden shiner (32), Johnny darter (20), and pumpkinseed (19) dominated. Golden shiner (46) continued to rank among the dominants during the week of June 18, but white sucker (50), logperch (44), and yellow perch (36) were also abundant.

Beginning in July, the schedule allowed for all sites to be sampled on the same day. On July 6, logperch dominated (168), with fallfish also being important (53). On July 23, the same species dominated. Very few fish were taken on August 6, but logperch was still predominant. On August 20, bluegill joined logperch as a dominant. Black crappie and bluegill were most abundant on September 5, while golden shiner and white perch dominated on September 17. Bluegills were more abundant again on September 27, while spottail shiners and black crappie dominated the small catch on October 15.

The total number increased dramatically on November 6, when the largest average per haul was collected (182.3). Golden shiner totally dominated this sample. The last sample was collected on November 27, and was dominated by spottail shiners. Sampling was terminated at this time due to inclement weather.

Johnny darters, yellow perch, white perch, and white suckers were found throughout the year in relatively small numbers. Logperch, spottail shiners, bluegills, and golden shiners were also taken throughout the year, but their numbers fluctuated considerably.

The most productive station was S04 (Table 21). This station was located in a small cove near the mouth of the Grasse River. An average of 105.5 specimens was taken per haul, and fish were captured in all 13 hauls. Spottail shiner ranked first in total abundance at this site, due to large numbers taken on May 7 and November 27. Bluegill ranked second in abundance with large numbers occurring on September 5 and 27. Logperch, golden shiner, and fallfish rounded out the top five in abundance.

The dominant species at station S04, by sampling period, were spottail shiner (5/7), pumpkinseed (5/29), golden shiner (6/18), logperch (7/6), logperch (7/23), logperch (8/6), logperch (8/20), bluegill (9/5), golden shiner (9/17), bluegill (9/27), black crappie (10/15), bluegill (11/6), and spottail shiner (11/27).

Station S05 was the second most productive station (Table 22). It was located in the St. Lawrence River just downstream of the mouth of the Grasse River. Fish were caught in all 13 hauls, averaging 98.5 specimens per haul. Spottail shiner, logperch, white perch, and bluegill dominated this site.

The dominant species at station S05, by sampling period, were spottail shiner (5/7), Johnny darter (5/29), white sucker (6/18), logperch (7/6), yellow perch

(7/23), logperch (8/6), bluegill (8/20), bluegill (9/5), white perch (9/17), white perch (9/27), white perch (10/15), white perch (11/6), and spottail shiner (11/27).

Station S01, located in a marshy area upriver from potential dredging sites, averaged 66.8 specimens per haul in which fish were present (no fish were taken on 10/15) (Table 18). The dominant species were golden shiner (64% of all specimens) and bluegill (13%). Golden shiner dominated seven hauls and bluegill dominated two hauls.

The remaining stations were not sampled often enough and the catches were too small to provide enough data for proper analysis (Tables 19, 20 & 23).

White perch were somewhat abundant outside the mouth of the Grasse River but were not very abundant in the river itself. Spottail shiner were abundant in spring and fall, but were rare during the summer months. Station S05 was more diverse than station S04, with more different species dominating individual samples.

Dominant Species

Spottail shiner ranked number one in abundance at all seine stations combined (Table 24). This ranking was achieved by very large samples on May 7 and November 27, when 80% of the total spottail shiners for the year were captured. They were most prevalent near the mouth of the river, where less emergent vegetation was present at the sampling site. Spottail shiners are an important forage fish, and their prime habitat in the study area is at the point where the

heaviest dredging and siltation is likely to occur.

Spottail shiners taken in the seines ranged from 11-100 mm in size with most being in the 51-60 mm range (Table 32). The size range was fairly consistent from month to month, but the smallest individuals occurred in late July and early August, shortly after the spawning season.

Golden shiners were the second most abundant species (Table 24). They were most abundant in spring, late summer, and fall. They dominated the upriver stations, but were scarce near the mouth of the river. Also an important forage fish, golden shiners are less likely to be affected by potential dredging activities than spottail shiners since they tend to congregate upriver of the areas with the worst potential impacts. Aquatic vegetation is essential for golden shiner spawning (Scott and Crossman 1973), which accounts for their presence in the upriver areas.

Golden shiners taken in the seines ranged from 31-150 mm, with the largest number in the 51-70 mm range (Table 31). The largest specimens were taken during the spring spawning period.

Bluegill ranked third in abundance (Table 24). They were most prevalent in August and September, following the peak spawning season. The bluegills taken in the seines were strictly juveniles, ranging from 21-70 mm, with most being 31-40 mm, and 98.5% being under 50 mm (Table 38). They were very abundant at all stations. Bluegill are an important forage fish, as well as a popular panfish.

Logperch ranked fourth in abundance (Table 24). They dominated the samples in late June and July, but disappeared after October when the water temperatures dropped (Table 4). Logperch were most abundant near the mouth of the Grasse River, where they may be subject to adverse effects from dredging.

The size range of logperch was 41-120 mm, with most being between 61 and 80 mm (Table 37). The specimens taken were somewhat larger each month than the preceding month. Their importance as prey is unknown (Scott and Crossman 1973).

White perch were the fifth most abundant fish, with 83% occurring at station S05 (Table 24). The other 17% occurred at station S04. None were found upriver. The size range of white perch taken in seines was 21-240 mm (Table 35). Most were under 70 mm. Most of those over 120 mm were taken on May 7, when a group of spawning perch was captured (most were ripe). Due to their presense near the mouth of the Grasse River, white perch could be susceptible to dredging through loss of spawning habitat, although the effects of siltation are questionable, since the greatest abundance of white perch was taken in very turbid water with a Secchi disk reading of 0.0 m (tremendous wave activity from winds and ship traffic helped account for the high turbidity) (Table 4).

White suckers ranked sixth overall in abundance (Table 24). They were more prevalent in May and June than in later months, but occurred throughout the year. They had the greatest size range of any species taken in seines (41-480 mm) (Table 34). Most of the specimens were juveniles, although the size range varied throughout the year. White suckers were most common around the mouth of the Grasse River.

Fallfish, the seventh most abundant speices, were captured most frequently in late June and early July, although they were taken in every month except May (Table 24). Most of the specimens were taken around the mouth of the Grasse River. The size range was 51-220 mm, with most being 71-100 mm (Table 33). Size ranges were similar throughout the year.

Yellow perch, ranked ninth in abundance, but was taken in all sampling periods, with the greatest abundance occurring in May and June (Table 24). Yellow perch comprised a larger portion of the upriver samples than of those near the mouth of the Grasse River. The size range was 21-230 mm, and no size was more prevalent than others (Table 36). All size ranges were found in all months.

Juvenile smallmouth bass and largemouth bass were taken in August and September, but only in small numbers (Table 24). A few small alewives and gizzard shad were taken in September. These latter two species were the only anadromous fish taken during the seining program.

SUMMARY AND CONCLUSIONS

Five stations were sampled in the lower Grasse River with trap nets. One station was sampled for three weeks, two for two weeks, and two for one week. Six seine sites were sampled. Three of these sites were sampled 13 times from May through November, two were sampled three times in May and June, and one was sampled three times in July and August.

Thirty-five species of fish were captured by seine and trap net - 21 in seines only, 4 in trap nets only, and 10 in both.

The Grasse River is a difficult area for trap-netting due to deep water and sharp drop-offs. Only one station (T05) was really conducive to good trap netting. A late start due to administrative delays prevented the acquisition of good spawning data. White perch was the most common species collected by trap net.

The bulk of the fisheries sampling effort involved seining. A 15-foot flat seine and a 60-foot bag seine (both with 1/4" mesh) were used. Spottail shiner and Johnny darter dominated the 15-foot seine samples. This gear was eliminated in June due to the duplication of effort with the 60-foot seine.

The most abundant species in the 60-foot seine samples were spottail shiner, golden shiner, logperch, and bluegill. The most frequently occurring species were yellow perch, golden shiner, Johnny darter, spottail shiner, white sucker, and bluegill.

Spottail shiner and golden shiner were the dominant species in May. In June, white sucker, yellow perch, and logperch joined golden shiner as the dominants, while spottail shiners declined. Logperch and fallfish were most abundant in July, but fallfish soon declined. In August, logperch declined

and bluegill became the most abundant species. Black crappie, golden shiner, and white perch joined bluegill as the dominant species in September. All of these species except white perch declined in October, while spottail shiner increased in abundance. Early November samples were dominated by golden shiner and bluegill, but spottail shiner dominated the late November samples.

Johnny darters, yellow perch, white perch, and white suckers were found in relatively small numbers throughout the year. Logperch, spottail shiners, golden shiners, and bluegills were also found throughout the year, but their numbers fluctuated.

The most productive sites were those around the mouth of the Grasse River. Logperch were more prevalent inside the mouth of the river, while white perch were more prevalent just outside the mouth of the Grasse River, where a large concentration of spawning white perch was found on May 7.

Spottail shiners were the most abundant species taken by seine. They dominated the May and November samples, particularly near the mouth of the Grasse River.

Golden shiners were dominant in spring, late summer, and fall. Since they need aquatic vegetation for spawning, they were more dominant upriver where vegetation was more prevalent. Logperch dominated the early summer samples.

All bluegills were juveniles captured shortly after hatching; smallmouth bass and largemouth bass juveniles were taken in August and September in small numbers.

White suckers had the greatest size range and were found throughout the year. Yellow perch were also found throughout the year in all size ranges.

Alewives and gizzard shad were the only anadromous fish captured.

LITERATURE CITED

Bailey, R.M., J.E.Fitch, E.S. Herald, E.A. Lachner, C.C. Lindsey, C.R. Robins, and W.B. Scott. 1970. A list of common and scientific names of fishes from the United States and Canada. 3rd ed. American Fisheries Society, Spec. Pub. No. 6. Washington, D.C. 150pp.

Bigelow, H.B. and W.C. Schroeder. 1953. Fishes of the Gulf of Maine. U.S. Fish and Wildlife Service. Fishery Bulletin 74:53. Washington, D.C. 577pp.

Clay, W.M. 1975. The Fishes of Kentucky. Kentucky Department of Fish and Wildlife Resources. Frankfort, Kentucky. 416pp.

Dunning, D.J., J.T. Evans, and M.J. Tarby. 1978. Baseline biological studies preparatory to the assessment of winter navigation: fisheries data base on the St. Lawrence River, New York State Department of Environmental Conservation, Watertown, NY. 144pp.

Dunning, D.J., M.J. Tarby, and J.T.Evans. 1978. Environmental assessment of the FY 1979 winter navigation demonstration on the St. Lawrence River. Vol. I. Tech. Rep. D. Adult fisheries study. SUNY College of Environmental Science and Forestry. Syracuse, New York. 77pp.

Eddy, S. 1969. The Freshwater Fishes. Wm. C. Brown Company. Dubuque, Iowa. 286pp.

Greeley, J.R., E. Moore, and C.K. Sibley. 1930. A biological survey of the St. Lawrence Watershed. Suppl. 20th Ann. Rept., New York Conservation Department.

Hildebrand, S.F. and W.C. Schroeder. 1972. Fishes of Chesapeake Bay. Smithsonian Institution. T.F.H. Publications, Inc., Neptune, New Jersey. 388pp.

Hubbs, C.L. and K.F. Lagler. 1970. Fishes of the Great Lakes Region. University of Michigan Press. Ann Arbor. 213pp.

Pflieger, W.L. 1975. The Fishes of Missouri. Missouri Department of Conservation. Jefferson City, Missouri. 343pp.

Scott, W.B. and E.J. Crossman. 1973. Freshwater Fishes of Canada. Fisheries Research Board of Canada. Bulletin 184. Ottawa. 966pp.

U. S. Dept. of Interior. 1976A. Ecological studies for navigation season extension on the St. Lawrence River. U. S. Fish and Wildlife Service, Cortland, NY. 166pp.

U. S. Dept. of Interior. 1976B. St. Lawrence River ecological study. 1976: Fisheries studies. U. S. Fish and Wildlife Service, Cortland, NY. 132pp.

162

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

24th Ed., Aug. 31/74
14761
(formerly LS 11)

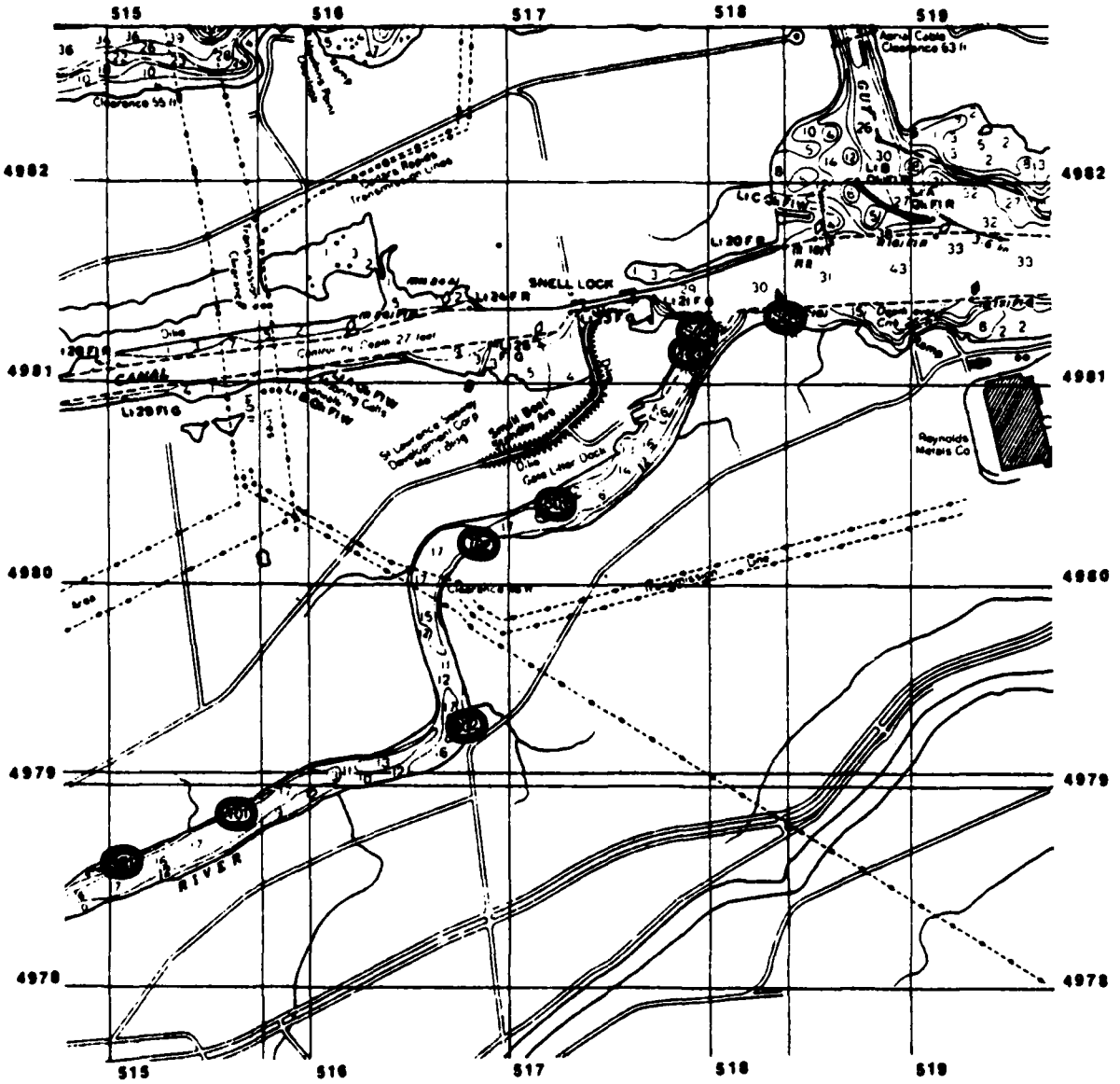


Fig. 1. Locations of seine stations S01-S05 and trap net stations T01-T03.

B

COUNTERPART TO
RAQUETTE RIVER

SOUNDINGS IN FEET

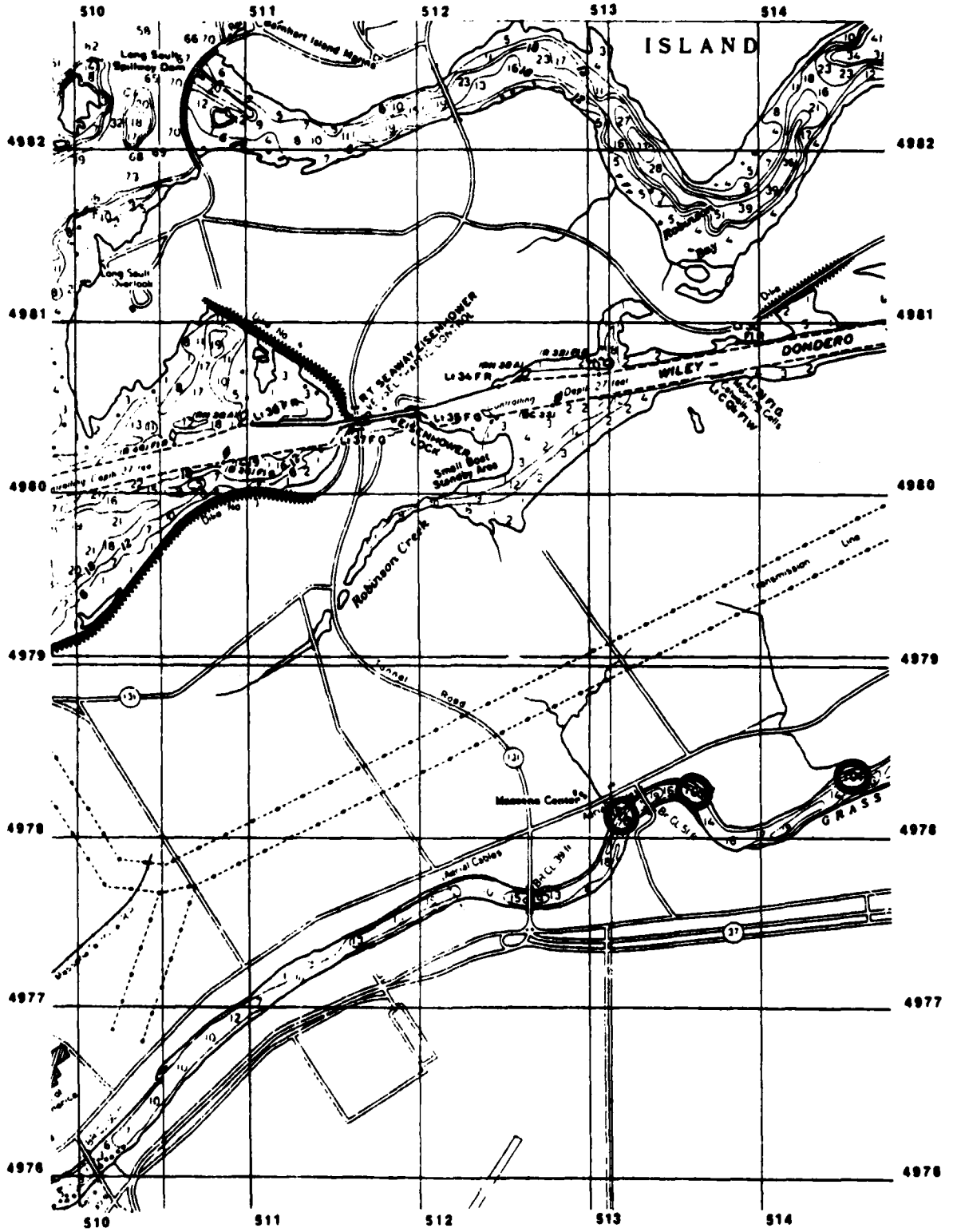
160

U. S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

24th Ed., Aug. 31/74

14761

(formerly LS 11)



A

COUNTERPART TO
RAQUETTE RIVER

SOUNDINGS IN FEET

Fig. 2. Locations of seine station S06 and trap net stations T04-T05.

Table 1 Species of Fish Captured from May 7 through November 27, 1979 in the Lower Grasse River.

All species taken were from the Class Osteichthyes (Bony fishes)

ORDER	FAMILY	GENUS AND SPECIES	COMMON NAME	GEAR Trap Net	15' Seine	60' Seine
Amiiformes	Amiidae	Amia calva Linnaeus	Bowfin	X		X
Anguilliformes	Anguillidae	Anguilla rostrata (Lesueur)	American eel	X		X
Clupeiformes	Clupeidae	Alosa pseudoharengus (Wilson)	Alewife			X
		Dorosoma cepedianum (Lesueur)	Gizzard shad			X
Salmoniformes	Esocidae	Esox lucius (Linnaeus)	Northern pike	X		
Cypriniformes	Cyprinidae	Cyprinus carpio Linnaeus	Carp			X
		Hybognathus nuchalis Agassiz	Silvery minnow		X	X
		Notemigonus crysoleucas (Mitchill)	Golden shiner	X	X	X
		Notropis atherinoides Rafinesque	Emerald shiner		X	X
		Notropis hudsonius (Clinton)	Spottail shiner		X	X
		Notropis rubellus (Agassiz)	Rosyface shiner			X
		Notropis bifrenatus (Cope)	Bridle shiner			X
		Notropis anogenus Forbes	Pugnose shiner		X	X
		Notropis cornutus (Mitchill)	Common shiner			X
		Pimephales notatus (Rafinesque)	Bluntnose minnow			X
		Pimephales promelas Rafinesque	Fathead minnow			X
		Semotilus corporalis (Mitchill)	Fallfish			X
	Catostomidae	Catostomus commersoni (Lacepede)	White sucker	X		X
		Moxostoma macrolepidotum (Lesueur)	Shorthead redhorse	X		
		Moxostoma valenciennesi Jordan	Greater redhorse			X
Siluriformes	Ictaluridae	Ictalurus punctatus (Rafinesque)	Channel catfish	X		
		Ictalurus nebulosus (Lesueur)	Brown bullhead	X	X	X
Atheriniformes	Atherinidae	Labidesthes sicculus (Cope)	Brook silverside			X
Perciformes	Percichthyidae	Morone americana (Gmelin)	White perch	X		X
	Centrarchidae	Ambloplites rupestris (Rafinesque)	Rockbass	X		X
		Lepomis gibbous (Linnaeus)	Pumpkinseed	X	X	X
		Lepomis macrochirus Rafinesque	Bluegill		X	X
		Micropterus dolomieui Lacepede	Smallmouth bass			X
		Micropterus salmoides (Lacepede)	Largemouth bass			X
		Pomoxis nigromaculatus (Lesueur)	Black crappie	X		X
	Percidae	Etheostoma nigrum Rafinesque	Johnny darter		X	X
		Perca flavescens (Mitchill)	Yellow perch	X		X
		Percina caprodes (Rafinesque)	Logperch			X
		Stizostedion vitreum vitreum (Mitchill)	Walleye	X		
	Cottidae	Cottus bairdi Girard	Mottled sculpin			X

Table 2. Species of Fish Captured in 1979 in the Lower Grasse River. Monthly Summary.

SPECIES	May	June	July	Aug.	Sept.	Oct.	Nov.
Bowfin	X		X				
American eel	X	X	X				
Alewife					X		
Gizzard shad					X		
Northern pike	X	X					
Carp		X	X				X
Silvery minnow	X	X			X		X
Golden shiner	X	X	X	X	X	X	X
Emerald shiner	X		X		X	X	X
Spottail shiner	X	X	X	X	X	X	X
Rosyface shiner	X						
Bridle shiner	X						
Pugnose shiner	X			X			
Common shiner	X						
Bluntnose minnow	X	X	X				X
Fathead minnor	X				X		
Fallfish		X	X	X	X	X	X
White sucker	X	X	X	X	X	X	X
Shorthead redhorse	X						
Greater redhorse	X						
Channel catfish	X						
Brown bullhead	X	X		X	X		X
Brook silverside		X					
White perch	X	X	X	X	X	X	X
Rockbass	X	X		X	X		
Pumpkinseed	X	X	X	X	X		X
Bluegill	X	X	X	X	X	X	X
Smallmouth bass		X	X	X	X		
Largemouth bass				X	X		
Black crappie	X	X	X	X	X	X	X
Johnny darter	X	X	X	X	X	X	X
Yellow perch	X	X	X	X	X	X	X
Logperch	X	X	X	X	X	X	
Walleye	X						
Mottled sculpin					X		
Number of species	27	20	17	16	21	11	15
Number of sampling days	10	5	2	2	3	1	2
trap net	6	3	0	0	0	0	0
15' seine	2	1	0	0	0	0	0
60' seine	2	1	2	2	3	1	2

Table 3. Descriptions of seine and trap net sites for sampling in the Grasse River in 1979.

Seine Sites

S01 - Just downstream from rocky shoal; bottom is muddy with much vegetation; bank is marsh and pastureland.

S02 - Small bay with small stream entering; several large, sunken logs; bottom is sand, gravel, and rocks; bank is pastureland.

S03 - Bottom is soft, wet clay with detritus and sticks; emergent vegetation; bank is marsh.

S04 - Small cove; bottom is sandy clay with some detritus and some rocks; bank is tall grasses.

S05 - Right off shipping channel; very shallow almost to channel; very turbid from wave action; bottom is hard clay; bank is a small gravel beach with a high bank leading to pastureland.

S06 - At mouth of small stream; bottom is sand and gravel, drops off rapidly; bank is brushland.

Trap Net Sites

T01 - Bottom rocks and clay, with logs and sticks; shore rocky, drops off fairly fast; bank wooded; current moderate.

T02 - Bottom wet clay; shore marshy, drops off fairly fast; bank marshy; current moderate.

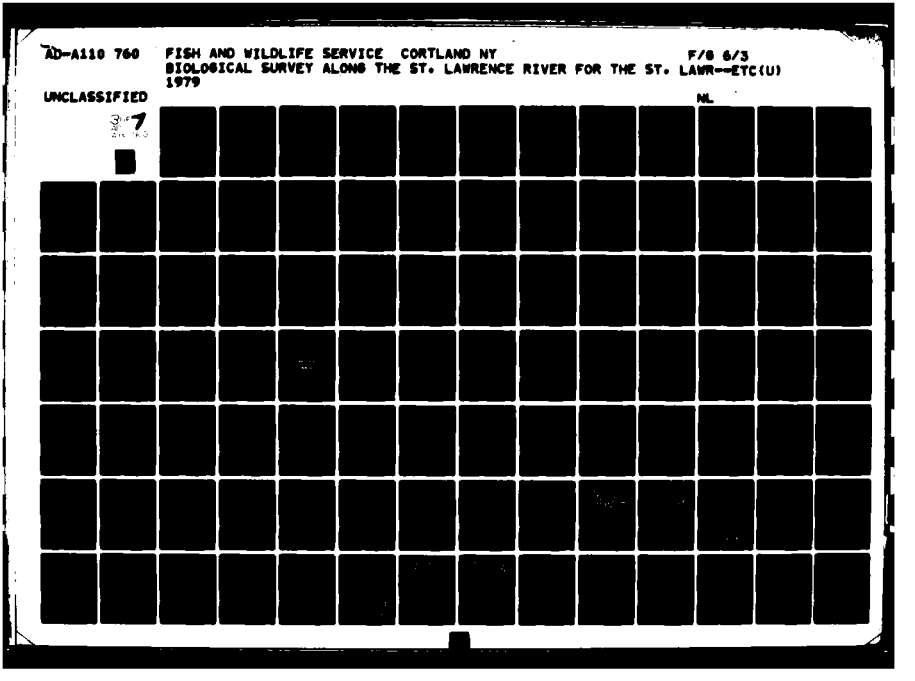
T03 - Bottom sandy clay and detritus, some rocks; shore marshy, drops off gradually; bank tall grasses; current moderate.

T04 - Bottom mud and plants; shore muddy, drops off fairly fast; bank pasture; current moderate.

T05 - Bottom mud, rocks, logs, tires, and plants; shore gravel, drops off gradually; bank brushland; current slow.

Table 4. Turbidity and Surface Water Temperatures at Seine and Trap Net sites in the Lower Grasse River in 1979.

Date	Station	Secchi Reading(m)	Water Temp(°C)
5/7	S01	-----	-----
5/29	S01	1.0	17.0
6/18	S01	1.1	21.0
7/6	S01	1.6	20.5
7/23	S01	3.6	24.0
8/6	S01	2.5	24.0
8/20	S01	3.3	20.0
9/5	S01	2.0	24.0
9/17	S01	0.8	16.5
9/27	S01	1.6	--
10/15	S01	1.4	--
11/6	S01	2.0	--
11/27	S01	0.9	--
5/8	S02	1.0	14.0
5/29	S02	---	17.0
6/18	S02	1.2	21.0
5/8	S03	1.2	16.0
5/30	S03	1.5	17.0
6/18	S03	0.9	21.0
5/8	S04	0.9	16.0
5/30	S04	1.5	16.5
6/18	S04	0.8	19.0
7/6	S04	1.1	19.5
7/23	S04	0.8	22.0
8/6	S04	1.3	24.0
8/20	S04	1.6	20.0
9/5	S04	1.7	24.0
9/17	S04	0.9	16.5
9/27	S04	1.9	----
10/15	S04	1.2	----
11/6	S04	2.4	----
11/27	S04	0.9	----


AD-A110 760
FISH AND WILDLIFE SERVICE CORTLAND NY
F/G 6/3
BIOLOGICAL SURVEY ALONG THE ST. LAWRENCE RIVER FOR THE ST. LAWR--ETC(U)
1979
UNCLASSIFIED
NL

A110 7

1.0
1.1
1.25
1.4
1.6
2.8
3.2
3.6
4.0
2.5
2.2
2.0
1.8

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963 A

Table 4. (continued).

Date	Station	Secchi Reading(m)	Water Temp(°C)
5/9	S05	0.0	----
5/30	S05	0.2	15.0
6/19	S05	0.8	20.0
7/6	S05	0.8	18.0
7/23	S05	0.9	22.0
8/6	S05	0.8	23.5
8/20	S05	1.4	20.5
9/5	S05	1.0	24.0
9/17	S05	0.8	17.0
9/27	S05	1.4	----
10/15	S05	0.8	----
11/6	S05	1.8	----
11/27	S05	0.9	----
7/6	S06	1.5	21.0
7/23	S06	2.8	24.0
8/6	S06	2.2	24.0
5/7	T01	1.1	----
5/8	T01	1.1	13.0
5/9	T01	0.9	----
5/29	T01	1.0	16.0
5/30	T01	1.3	15.5
5/31	T01	0.8	16.0
6/18	T01	1.3	21.0
6/19	T01	1.3	22.0
6/20	T01	1.8	22.0
5/7	T02	0.9	----
5/8	T02	1.0	13.0
5/9	T02	0.7	----
5/29	T02	0.8	15.5
5/30	T02	1.3	15.0
5/31	T02	0.9	16.0

Table 4. (continued).

Date	Station	Secchi Reading(m)	Water Temp(°C)
5/7	T03	0.8	----
5/8	T03	1.0	13.0
5/9	T03	0.8	----
5/29	T03	1.0	15.5
5/30	T03	1.3	15.0
5/31	T03	1.0	16.0
6/18	T04	1.4	21.0
6/19	T04	1.8	22.0
6/20	T04	1.8	22.0
6/18	T05	1.1	22.0
6/19	T05	1.4	23.0
6/20	T05	1.6	23.0

TABLE: 5 .TOTAL NUMBER OF FISH CAUGHT BY TRAP NET IN THE GRASSE RIVER IN 1979 AT ALL STATIONS.

SPECIES	SAMPLING PERIOD												TOTAL	# SETS PRESENT	AVG. # PER SET PRESENT	RANK BY #
	WEEK 1				WEEK 2				WEEK 3							
	5/7	5/8	5/9	WEEK	5/29	5/30	5/31	WEEK	6/18	6/19	6/20	WEEK				
Bowfin	0	0	1	1	0	0	0	0	0	0	0	0	1	1	1.0	12
American eel	0	0	0	0	0	0	1	1	0	1	0	1	2	2	1.0	10
Northern pike	0	1	0	1	0	1	0	1	2	0	0	2	4	3	1.3	9
Golden shiner	1	0	2	3	0	0	5	5	1	5	6	12	20	10	2.0	3
White sucker	5	2	2	9	0	2	0	2	0	0	0	0	11	4	2.8	6
Shorthead redhorse	0	0	0	0	1	0	0	1	0	0	0	0	1	1	1.0	12
Channel catfish	0	0	0	0	0	1	0	1	0	0	0	0	1	1	1.0	12
Brown bullhead	4	1	11	16	4	5	1	10	2	3	1	6	32	12	2.7	2
White perch	[illegible]	0	12	12	5	4	3	12	2	16	10	28	52	13	4.0	1
Rockbass	[illegible]	0	6	6	1	1	5	7	1	1	0	2	15	8	1.9	5
Pumpkinseed	0	0	0	0	0	0	1	1	2	4	3	9	10	4	2.5	7
Black crappie	0	0	0	0	0	0	2	2	0	4	3	7	9	4	2.3	8
Yellow perch	1	1	4	6	1	0	6	7	2	1	2	5	18	12	1.5	4
Walleye	2	0	0	2	0	0	0	0	0	0	0	0	2	1	2.0	10
# Specimens	13	5	38	56	12	14	24	50	12	35	25	72	178	23	7.7	--
# Species	5	4	7	9	5	6	8	12	7	8	6	9	14	--	--	--

TABLE: 6.TOTAL NUMBER OF FISH CAUGHT BY TRAP NET IN THE GRASSE RIVER IN 1979 AT STATION T01.

SPECIES	SAMPLING PERIOD												TOTAL	# SETS PRESENT	AVG. # PER SET PRESENT	RANK BY #
	WEEK 1				WEEK 2				WEEK 3							
	5/7	5/8	5/9	WEEK	5/29	5/30	5/31	WEEK	6/18	6/19	6/20	WEEK				
Bowfin	0	0	1	1	0	0	0	0	0	0	0	0	1	1	1.0	8
American eel	0	0	0	0	0	0	1	1	0	0	0	0	1	1	1.0	8
Golden shiner	0	0	0	0	0	0	1	1	0	1	0	1	2	2	1.0	6
White sucker	5	2	2	9	0	2	0	2	0	0	0	0	11	4	2.8	3
Shorthead redhorse	0	0	0	0	1	0	0	1	0	0	0	0	1	1	1.0	8
Channel catfish	0	0	0	0	0	1	0	1	0	0	0	0	1	1	1.0	8.
Brown bullhead	4	1	11	16	3	3	1	7	0	0	0	0	23	6	3.8	2
White perch	0	0	8	8	4	4	1	9	1	8	1	10	27	7	3.9	1
Rockbass	0	0	1	1	1	1	4	6	0	0	0	0	7	4	1.8	4
Black crappie	0	0	0	0	0	0	1	1	0	0	0	0	1	1	1.0	8
Yellow perch	0	1	1	2	0	0	2	2	0	0	0	0	4	3	1.3	5
Walleye	2	0	0	2	0	0	0	0	0	0	0	0	2	1	2.0	6
# Specimens	11	4	24	39	9	11	11	31	1	9	1	11	81	9	9.0	--
# Species	3	3	6	7	4	5	7	10	1	2	1	2	12	--	--	--

TABLE: 7 .TOTAL NUMBER OF FISH CAUGHT BY TRAP NET IN THE GRASSE RIVER IN 1979 AT STATION T02.

SPECIES	SAMPLING PERIOD												TOTAL	# SETS PRESENT	AVG. # PER SET PRESENT	RANK BY #
	WEEK 1				WEEK 2				WEEK 3*							
	5/7	5/8	5/9	WEEK	5/29	5/30	5/31	WEEK	6/18	6/19	6/20	WEEK				
Northern pike	0	1	0	1	0	1	0	1	--	--	--	--	2	2	1.0	4
Golden shiner	0	0	0	0	0	0	3	3	--	--	--	--	3	1	3.0	1
Brown bullhead	0	0	0	0	1	2	0	3	--	--	--	--	3	2	1.5	1
Rockbass	0	0	0	0	0	0	1	1	--	--	--	--	1	1	1.0	5
Yellow perch	0	0	0	0	1	0	2	3	--	--	--	--	3	2	1.5	1
# Specimens	0	1	0	1	2	3	6	11	--	--	--	--	12	4	3.0	--
# Species	0	1	0	1	2	2	3	5	--	--	--	--	5	--	--	--

* Not sampled

TABLE: 8.TOTAL NUMBER OF FISH CAUGHT BY TRAP NET IN THE GRASSE RIVER IN 1979 AT STATION T03.

SPECIES	SAMPLING PERIOD												TOTAL	# SETS PRESENT	AVG. = PER SET PRESENT	RANK BY #
	WEEK 1				WEEK 2				WEEK 3*							
	5/7	5/8	5/9	WEEK	5/29	5/30	5/31	WEEK	6/18	6/19	6/20	WEEK				
Golden shiner	1	0	2	3	0	0	1	1	--	--	--	--	4	3	1.3	1
White perch	0	0	4	4	1	0	2	3	--	--	--	--	7	3	2.3	1
Rockbass	0	0	5	5	0	0	0	0	--	--	--	--	5	1	5.0	4
Pumpkinseed	0	0	0	0	0	0	1	1	--	--	--	--	1	1	1.0	4
Black crappie	0	0	0	0	0	0	1	1	--	--	--	--	1	1	1.0	4
Yellow perch	1	0	3	4	0	0	2	2	--	--	--	--	6	3	2.0	1
# Specimens	2	0	14	16	1	0	7	8	--	--	--	--	24	4	6.0	--
# Species	2	0	4	4	1	0	5	5	--	--	--	--	6	--	--	--

* Not sampled

TABLE: 9.TOTAL NUMBER OF FISH CAUGHT BY TRAP NET IN THE GRASSE RIVER IN 1979 AT STATION T04.

SPECIES	SAMPLING PERIOD												TOTAL	# SETS PRESENT	AVG. # PER SET PRESENT	RANK BY #
	WEEK 1*				WEEK 2*				WEEK 3							
	5/7	5/8	5/9	WEEK	5/29	5/30	5/31	WEEK	6/18	6/19	6/20	WEEK				
American eel	--	--	--	--	--	--	--	--	0	1	0	1	1	1	1.0	2
Golden shiner	--	--	--	--	--	--	--	--	1	0	3	4	4	2	2.0	1
Brown bullhead	--	--	--	--	--	--	--	--	0	1	0	1	1	1	1.0	2
Yellow perch	--	--	--	--	--	--	--	--	1	0	0	1	1	1	1.0	2
# Specimens	--	--	--	--	--	--	--	--	2	2	3	7	7	3	2.3	--
# Species	--	--	--	--	--	--	--	--	2	2	1	4	4	--	--	--

* Not sampled

TABLE: 10.TOTAL NUMBER OF FISH CAUGHT BY TRAP NET IN THE GRASSE RIVER IN 1979 AT STATION T05.

SPECIES	SAMPLING PERIOD												TOTAL	# SETS PRESENT	AVG. # PER SET PRESENT	RANK BY #
	WEEK 1*				WEEK 2*				WEEK 3							
	5/7	5/8	5/9	WEEK	5/29	5/30	5/31	WEEK	6/18	6/19	6/20	WEEK				
Northern pike	--	--	--	--	--	--	--	--	2	0	0	2	2	1	2.0	7
Golden shiner	--	--	--	--	--	--	--	--	0	4	3	7	7	2	3.5	3
Brown bullhead	--	--	--	--	--	--	--	--	2	2	1	5	5	3	1.7	5
White perch	--	--	--	--	--	--	--	--	1	8	9	18	18	3	6.0	1
Rockbass	--	--	--	--	--	--	--	--	1	1	0	2	2	2	1.0	7
Pumpkinseed	--	--	--	--	--	--	--	--	2	4	3	9	9	3	3.0	2
Black crappie	--	--	--	--	--	--	--	--	0	4	3	7	7	2	3.5	3
Yellow perch	--	--	--	--	--	--	--	--	1	1	2	4	4	3	1.3	6
# Specimens	--	--	--	--	--	--	--	--	9	24	21	54	54	3	18.0	--
# Species	--	--	--	--	--	--	--	--	6	7	6	8	8	--	--	--

* Not sampled

TABLE: 11. TOTAL NUMBER OF FISH CAUGHT BY 15' FLAT SEINE IN THE GRASSE RIVER IN 1979 AT ALL STATIONS.

SPECIES	SAMPLING PERIOD 5/7	5/29	6/18	TOTAL	# HAULS PRESENT	AVG. # PER HAUL PRESENT	RANK BY NUMBER
Silvery minnow	2	0	0	2	2	1.0	7
Golden shiner	14	0	0	14	4	3.5	3
Emerald shiner	10	1	0	11	3	3.7	4
Spottail shiner	29	2	0	31	6	5.2	2
Pugnose shiner	2	3	0	5	3	1.7	5
Brown bullhead	0	1	1	2	2	1.0	7
Pumpkinseed	0	1	1	2	2	1.0	7
Bluegill	1	3	0	4	2	2.0	6
Johnny darter	5	12	22	39	8	4.9	1
# Specimens	63	23	24	110	13	8.5	--
# Species	7	7	3	9	--	--	--

TABLE: 12. TOTAL NUMBER OF FISH CAUGHT BY 15' FLAT SEINE IN THE GRASSE RIVER IN 1979 AT STATION S01.

SPECIES	SAMPLING PERIOD 5/7	5/29	6/18	TOTAL	# HAULS PRESENT	AVG. # PER HAUL PRESENT	RANK BY NUMBER
Golden shiner	5	0	0	5	1	5.0	5
Emerald shiner	2	1	0	3	2	1.5	1
Spottail shiner	1	1	0	2	2	1.0	1
Pugnose shiner	1	3	0	4	2	2.0	1
Brown bullhead	0	0	1	1	1	1.0	5
Pumpkinseed	0	0	1	1	1	1.0	5
Bluegill	1	3	0	4	2	2.0	1
Johnny darter	0	1	0	1	1	1.0	5
# Specimens	10	9	2	21	3	7.0	--
# Species	5	5	2	8	--	--	--

TABLE: 13. TOTAL NUMBER OF FISH CAUGHT BY 15' FLAT SEINE IN THE GRASSE RIVER IN 1979 AT STATION S02.

SPECIES	SAMPLING PERIOD 5/7	5/29	6/18	TOTAL	# HAULS PRESENT	AVG. # PER HAUL PRESENT	RANK BY NUMBER
Silvery minnow	1	0	0	1	1	1.0	2
Golden shiner	4	0	0	4	1	4.0	1
Spottail shiner	1	0	0	1	1	1.0	2
Pumpkinseed	0	1	0	1	1	1.0	2
# Specimens	6	1	0	7	2	3.5	--
# Species	3	1	0	4	--	--	--

TABLE: 14. TOTAL NUMBER OF FISH CAUGHT BY 15' FLAT SEINE IN THE GRASSE RIVER IN 1979 AT STATION S03.

SPECIES	SAMPLING PERIOD 5/7	5/29	6/18	TOTAL	# HAULS PRESENT	AVG. # PER HAUL PRESENT	RANK BY NUMBER
Brown bullhead	0	1	0	1	1	1.0	2
Johnny darter	4	3	0	7	2	3.5	1
# Specimens	4	4	0	8	2	4.0	--
# Species	1	2	0	2	--	--	--

TABLE: 15. TOTAL NUMBER OF FISH CAUGHT BY 15' FLAT SEINE IN THE GRASSE RIVER IN 1979 AT STATION S04.

SPECIES	SAMPLING PERIOD 5/7	5/29	6/18	TOTAL	# HAULS PRESENT	AVG. # PER HAUL PRESENT	RANK BY NUMBER
Golden shiner	4	0	0	4	1	4.0	4
Emerald shiner	8	0	0	8	1	8.0	3
Spottail shiner	23	0	0	23	1	23.0	1
Pugnose shiner	1	0	0	1	1	1.0	5
Johnny darter	1	4	4	9	3	3.0	2
# Specimens	37	4	4	45	3	15.0	--
# Species	5	1	1	5	--	--	--

TABLE: 16. TOTAL NUMBER OF FISH CAUGHT BY 15' FLAT SEINE IN THE GRASSE RIVER IN 1979 AT STATION S05.

SPECIES	SAMPLING PERIOD 5/7	5/29	6/18	TOTAL	# HAULS PRESENT	AVG. # PER HAUL PRESENT	RANK BY NUMBER
Silvery minnow	1	0	0	1	1	1.0	3
Golden shiner	1	0	0	1	1	1.0	3
Spottail shiner	4	1	0	5	2	2.5	2
Johnny darter	0	4	18	22	2	11.0	1
# Specimens	6	5	18	29	3	9.7	--
# Species	3	2	1	4	--	--	--

TABLE: 17. TOTAL NUMBER OF FISH CAUGHT BY 60' BAG SEINE IN THE GRASSE RIVER IN 1979 AT ALL STATIONS.

SPECIES	SAMPLING PERIOD													TOTAL	# HAULS PRESENT	AVG. # PER HAUL PRESENT	RANK BY #
	5/7	5/29	6/18	7/6	7/23	8/6	8/20	9/5	9/17	9/27	10/15	11/6	11/27				
Bowfin	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1.0	28
American eel	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1.0	28
Alewife	0	0	0	0	0	0	0	0	4	0	0	0	0	4	1	4.0	20
Gizzard shad	0	0	0	0	0	0	0	0	5	0	0	0	0	5	2	2.5	19
Cyprinidae	0	0	0	0	6	0	0	0	1	0	0	0	0	7	3	2.3	17
Carp	0	0	1	0	1	0	0	0	0	0	0	1	1	4	4	1.0	20
Silvery minnow	12	5	15	0	0	0	0	0	1	0	0	0	1	34	8	4.3	14
Golden shiner	65	32	46	1	15	0	3	8	82	28	2	380	16	678	30	22.6	2
Emerald shiner	30	1	0	0	1	0	0	36	13	5	2	0	1	89	16	14.8	11
Spottail shiner	281	10	15	1	18	5	0	2	22	14	19	41	277	705	27	26.1	1
Rosyface shiner	2	0	0	0	0	0	0	0	0	0	0	0	0	2	2	1.0	26
Bridle shiner	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1.0	28
Pugnose shiner	0	2	0	0	0	0	1	0	0	0	0	0	0	3	3	1.0	24
Common shiner	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1.0	28
Bluntnose minnow	0	1	1	1	0	0	0	0	0	0	0	0	1	4	4	1.0	20
Fathead minnow	5	0	0	0	0	0	0	0	1	0	0	0	0	6	2	3.0	18
Fallfish	0	0	17	53	32	3	10	2	13	9	1	1	8	149	19	7.8	7
White sucker	25	7	50	16	14	0	14	6	10	8	2	7	7	166	25	6.6	6
Greater redhorse	0	4	0	0	0	0	0	0	0	0	0	0	0	4	2	2.0	20
Brown bullhead	4	5	6	0	0	9	8	0	1	12	0	3	26	74	17	4.4	12
Brook silverside	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1.0	28
White perch	43	3	0	0	10	3	14	14	60	41	30	3	9	230	16	14.4	5
Centrarchidae	0	0	0	0	2	0	0	0	0	0	0	0	0	2	1	2.0	26
Rockbass	0	0	0	0	0	1	0	1	1	0	0	0	0	3	3	1.0	24
Pumpkinseed	7	19	18	3	4	4	1	7	1	1	0	2	0	67	23	2.9	13

TABLE: 17 continued

SPECIES	SAMPLING PERIOD													TOTAL	# HAULS PRESENT	AVG. # PER HAUL PRESENT	RANK BY #
	5/7	5/29	6/18	7/6	7/23	8/6	8/20	9/5	9/17	9/27	10/15	11/6	11/27				
Bluegill	4	2	2	0	1	1	35	182	30	120	8	83	6	474	25	19.0	3
Smallmouth bass	0	0	4	2	2	1	2	4	3	0	0	0	0	18	14	1.3	16
Largemouth bass	0	0	0	0	0	6	4	6	3	4	0	0	0	23	14	1.6	15
Micropterus sp.	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1.0	28
Black crappie	0	0	1	3	0	0	6	67	16	14	12	9	4	132	14	9.4	9
Johnny darter	14	20	11	7	6	1	5	8	8	8	2	10	2	102	28	3.6	10
Yellow perch	26	10	36	8	10	1	7	7	13	10	3	7	2	140	34	4.1	8
Logperch	1	3	44	168	116	17	27	13	33	2	1	0	0	425	21	20.2	4
Mottled sculpin	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1.0	28
# Specimens	521	125	267	263	240	53	137	363	322	276	82	547	361	3557	46	77.3	--
# Species	16	16	15	11	17	13	14	15	22	14	11	12	14	34	--	--	--

TABLE: 18. TOTAL NUMBER OF FISH CAUGHT BY 60' BAG SEINE IN THE GRASS RIVER IN 1979 AT STATION S01.

SPECIES	SAMPLING PERIOD													TOTAL	# HAULS PRESENT	AVG. # PER HAUL PRESENT	RANK BY =
	5/7	5/29	6/18	7/6	7/23	8/6	8/20	9/5	9/17	9/27	10/15	11/6	11/27				
Bowfin	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1.0	19
Cyprinidae	0	0	0	0	5	0	0	0	1	0	0	0	0	6	2	3.0	9
Carp	0	0	1	0	0	0	0	0	0	0	0	1	1	3	3	1.0	11
Silvery minnow	0	0	3	0	0	0	0	0	0	0	0	0	0	3	1	3.0	11
Golden shiner	47	10	14	0	2	0	2	2	47	0	0	380	11	515	9	57.2	1
Emerald shiner	1	1	0	0	0	0	0	10	0	1	0	0	0	13	4	3.3	8
Spottail shiner	12	0	0	0	2	0	0	0	0	0	0	35	0	49	3	16.3	3
Rosyface shiner	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1.0	19
Bridle shiner	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1.0	19
Pugnose shiner	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1.0	19
Bluntnose minnow	0	0	1	0	0	0	0	0	0	0	0	0	1	2	2	1.0	16
Fallfish	0	0	0	2	0	0	0	0	0	0	0	0	1	3	2	1.5	11
White sucker	4	0	1	0	1	0	0	0	0	0	0	7	2	15	5	3.0	7
Brown bullhead	1	4	4	0	0	0	0	0	1	11	0	3	4	28	7	4.0	4
Centrarchidae	0	0	0	0	2	0	0	0	0	0	0	0	0	2	1	2.0	16
Pumpkinseed	5	3	7	1	0	0	0	0	0	0	0	2	0	18	5	3.6	6
Bluegill	3	1	0	0	0	1	0	13	4	16	0	59	5	102	8	12.8	2
Smallmouth bass	0	0	1	0	0	0	0	0	1	0	0	0	0	2	2	1.0	16
Largemouth bass	0	0	0	0	0	3	0	1	1	1	0	0	0	6	4	1.5	9
Micropterus sp.	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1.0	19
Black crappie	0	0	0	0	0	0	0	0	1	0	0	2	0	3	2	1.5	11
Johnny darter	0	3	0	0	0	0	0	0	0	0	0	0	0	3	1	3.0	11
Yellow perch	10	2	2	2	0	0	0	0	0	1	0	7	0	24	6	4.0	5
# Specimens	85	25	34	5	13	5	2	26	56	30	0	496	25	802	12	66.8	--
# Species	10	8	9	3	6	3	1	4	7	5	0	9	7	23	--	--	--

TABLE: 19. TOTAL NUMBER OF FISH CAUGHT BY 60' BAG SEINE IN THE GRASSE RIVER IN 1979 AT STATION S02.

SPECIES	SAMPLING PERIOD													TOTAL	# HAULS PRESENT	AVG. # PER HAUL PRESENT	RANK BY #
	5/7	5/29	6/18	7/6*	7/23*	8/6*	8/20*	9/5*	9/17*	9/27*	10/15*	11/6*	11/27*				
Silvery minnow	0	5	0	--	--	--	--	--	--	--	--	--	--	5	1	5.0	5
Golden shiner	1	2	0	--	--	--	--	--	--	--	--	--	--	3	2	1.5	8
Emerald shiner	6	0	0	--	--	--	--	--	--	--	--	--	--	6	1	6.0	3
Spottail shiner	2	2	0	--	--	--	--	--	--	--	--	--	--	4	2	2.0	7
Pugnose shiner	0	1	0	--	--	--	--	--	--	--	--	--	--	1	1	1.0	10
Bluntnose minnow	0	1	0	--	--	--	--	--	--	--	--	--	--	1	1	1.0	10
White sucker	0	2	3	--	--	--	--	--	--	--	--	--	--	5	2	2.5	5
Brown bullhead	1	0	0	--	--	--	--	--	--	--	--	--	--	1	1	1.0	10
Brook silverside	0	1	0	--	--	--	--	--	--	--	--	--	--	1	1	1.0	10
Pumpkinseed	0	9	3	--	--	--	--	--	--	--	--	--	--	12	2	6.0	1
Bluegill	1	0	0	--	--	--	--	--	--	--	--	--	--	1	1	1.0	10
Johnny darter	1	1	0	--	--	--	--	--	--	--	--	--	--	2	2	1.0	9
Yellow perch	4	3	0	--	--	--	--	--	--	--	--	--	--	7	2	3.5	2
Logperch	0	3	3	--	--	--	--	--	--	--	--	--	--	6	2	3.0	3
# Specimens	16	30	9	--	--	--	--	--	--	--	--	--	--	55	3	18.3	--
# Species	7	11	3	--	--	--	--	--	--	--	--	--	--	14	--	--	--

* Not sampled

TABLE: 20. TOTAL NUMBER OF FISH CAUGHT BY 60' BAG SEINE IN THE GRASSE RIVER IN 1979 AT STATION S03.

SPECIES	SAMPLING PERIOD 5/7	5/29	6/18	7/6*	7/23*	8/6*	8/20*	9/5*	9/17*	9/27*	10/15*	11/6*	11/27*	TOTAL	# HAULS PRESENT	AVG. = PER HAUL PRESENT	RANK BY =
Golden shiner	3	11	1	--	--	--	--	--	--	--	--	--	--	15	3	5.0	1
Emerald shiner	3	0	0	--	--	--	--	--	--	--	--	--	--	3	1	3.0	5
Spottail shiner	10	0	0	--	--	--	--	--	--	--	--	--	--	10	1	10.0	2
White sucker	0	1	0	--	--	--	--	--	--	--	--	--	--	1	1	1.0	6
Pumpkinseed	1	0	0	--	--	--	--	--	--	--	--	--	--	1	1	1.0	6
Johnny darter	6	0	2	--	--	--	--	--	--	--	--	--	--	8	2	4.0	3
Yellow perch	2	1	2	--	--	--	--	--	--	--	--	--	--	5	3	1.7	4
Logperch	0	0	1	--	--	--	--	--	--	--	--	--	--	1	1	1.0	6
# Specimens	25	13	6	--	--	--	--	--	--	--	--	--	--	44	3	14.7	--
# Species	6	3	4	--	--	--	--	--	--	--	--	--	--	8	--	--	--

* Not sampled

TABLE: 21. TOTAL NUMBER OF FISH CAUGHT BY 60' BAG SEINE IN THE GRASSE RIVER IN 1979 AT STATION S04.

SPECIES	SAMPLING PERIOD													TOTAL	# HAULS PRESENT	AVG. # PER HAUL PRESENT	RANK BY #
	5/7	5/29	6/18	7/6	7/23	8/6	8/20	9/5	9/17	9/27	10/15	11/6	11/27				
American eel	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1.0	20
Gizzard shad	0	0	0	0	0	0	0	0	3	0	0	0	0	3	1	3.0	18
Carp	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1.0	20
Silvery minnow	7	0	11	0	0	0	0	0	0	0	0	0	0	18	2	9.0	14
Golden shiner	12	0	31	0	13	0	1	4	26	24	2	0	2	115	9	12.8	4
Emerald shiner	19	0	0	0	1	0	0	11	0	4	1	0	0	36	5	7.2	10
Spottail shiner	202	3	12	0	16	5	0	1	15	11	4	4	112	385	11	35.0	1
Rosyface shiner	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1.0	20
Common shiner	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1.0	20
Bluntnose minnow	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1.0	20
Fathead minnow	5	0	0	0	0	0	0	0	0	0	0	0	0	5	1	5.0	17
Fallfish	0	0	14	7	32	1	3	2	1	0	1	0	1	62	9	6.9	5
White sucker	17	0	4	7	12	0	9	1	0	0	2	0	0	52	7	7.4	6
Greater redhorse	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1.0	20
Brown bullhead	0	0	1	0	0	9	8	0	0	0	0	0	1	19	4	4.8	13
White perch	0	0	0	0	10	3	7	1	9	7	2	0	0	39	7	5.6	8
Rockbass	0	0	0	0	0	1	0	0	1	0	0	0	0	2	2	1.0	19
Pumpkinseed	0	7	6	1	4	2	1	3	0	1	0	0	0	25	8	3.1	12
Bluegill	0	0	1	0	1	0	3	100	12	100	7	24	0	248	8	31.0	2
Smallmouth bass	0	0	1	1	1	1	2	2	1	0	0	0	0	9	7	1.3	16
Largemouth bass	0	0	0	0	0	3	4	4	1	3	0	0	0	15	5	3.0	15
Black crappie	0	0	0	0	0	0	1	12	2	4	10	7	2	38	7	5.4	9
Johnny darter	2	1	3	5	2	1	0	2	4	3	2	8	1	34	12	2.8	11

TABLE: 21 continued

SPECIES	SAMPLING PERIOD 5/7	5/29	6/18	7/6	7/23	8/6	8/20	9/5	9/17	9/27	10/15	11/6	11/27	TOTAL	# HAULS PRESENT	AVG. # PER HAUL PRESENT	RANK BY #
Yellow perch	8	1	4	2	1	1	4	2	8	8	1	0	0	40	11	3.6	7
Logperch	1	0	12	52	111	12	19	1	11	1	0	0	0	220	9	24.4	3
# Specimens	275	13	100	76	206	39	62	146	94	[illegible]	[illegible]	43	119	1371	13	105.5	---
# Species	11	5	12	8	14	11	12	14	13	11	[illegible]	[illegible]	6	25	---	---	---

TABLE: 22. TOTAL NUMBER OF FISH CAUGHT BY 60" BAG SEINE IN THE GRASSE RIVER IN 1979 AT STATION S05.

SPECIES	SAMPLING PERIOD													TOTAL	# HAULS PRESENT	AVG. # PER HAUL PRESENT	RANK BY #
	5/7	5/29	6/18	7/6	7/23	8/6	8/20	9/5	9/17	9/27	10/15	11/6	11/27				
Alewife	0	0	0	0	0	0	0	0	4	0	0	0	0	4	1	4.0	16
Gizzard shad	0	0	0	0	0	0	0	0	2	0	0	0	0	2	1	2.0	18
Cyprinidae	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1.0	20
Silvery minnow	5	0	1	0	0	0	0	0	1	0	0	0	1	8	4	2.0	14
Golden shiner	2	9	0	1	0	0	0	2	9	4	0	0	3	30	7	4.3	11
Emerald shiner	1	0	0	0	0	0	0	15	13	0	1	0	1	31	5	6.2	10
Spottail shiner	55	5	3	1	0	0	0	1	7	3	15	2	165	257	10	25.7	1
Pugnose shiner	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1.0	20
Fathead minnow	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1.0	20
Fallfish	0	0	3	44	0	2	7	0	12	9	0	1	6	84	8	10.5	7
White sucker	4	4	42	9	1	0	5	5	10	8	0	0	5	93	10	9.3	5
Greater redhorse	0	3	0	0	0	0	0	0	0	0	0	0	0	3	1	3.0	17
Brown bullhead	2	1	1	0	0	0	0	0	0	1	0	0	21	26	5	5.2	12
White perch	43	3	0	0	0	0	7	13	51	34	28	3	9	191	9	21.2	3
Rockbass	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	1.0	20
Pumpkinseed	1	0	2	0	0	1	0	4	1	0	0	0	0	9	5	1.8	13
Bluegill	0	1	1	0	0	0	32	69	14	4	1	0	1	123	8	15.4	4
Smallmouth bass	0	0	2	0	1	0	0	2	1	0	0	0	0	6	4	1.5	15
Largemouth bass	0	0	0	0	0	0	0	1	1	0	0	0	0	2	2	1.0	18
Black crappie	0	0	1	3	0	0	5	55	13	10	2	0	2	91	8	11.4	6
Johnny darter	5	15	6	2	4	0	5	6	4	5	0	2	1	55	11	5.0	9
Yellow perch	2	3	28	3	9	0	3	5	5	1	2	0	2	63	11	5.7	8
Logperch	0	0	28	116	5	5	8	12	22	1	1	0	0	198	9	22.0	2

TABLE: 22 continued.

SPECIES	SAMPLING PERIOD 5/7	5/29	6/18	7/6	7/23	8/6	8/20	9/5	9/17	9/27	10/15	11/6	11/27	TOTAL	# HAULS PRESENT	AVG. # PER HAUL PRESENT	RANK BY #
Mottled sculpin	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1.0	20
# Specimens	120	44	118	179	21	8	73	191	172	80	50	8	217	1281	13	98.5	--
# Species	10	9	12	8	6	3	9	14	19	11	7	4	12	24	--	--	--

TABLE: 23. TOTAL NUMBER OF FISH CAUGHT BY 60' BAG SEINE IN THE GRASSE RIVER IN 1979 AT STATION S06.

SPECIES	SAMPLING PERIOD													TOTAL	# HAULS PRESENT	AVG. # PER HAUL PRESENT	RANI BY #
	5/7*	5/29*	6/18*	7/6	7/23	8/6	8/20*	9/5*	9/17*	9/27*	10/15*	11/6*	11/27*				
Pumpkinseed	--	--	--	1	0	1	--	--	--	--	--	--	--	2	2	1.0	1
Smallmouth bass	--	--	--	1	0	0	--	--	--	--	--	--	--	1	1	1.0	2
Yellow perch	--	--	--	1	0	0	--	--	--	--	--	--	--	1	1	1.0	2
# Specimens	--	--	--	3	0	1	--	--	--	--	--	--	--	4	2	2.0	--
# Species	--	--	--	3	0	1	--	--	--	--	--	--	--	3	--	--	--

* Not Sampled

TABLE: 24. TOTAL NUMBER OF FISH CAUGHT BY SEINE IN THE GRASSE RIVER AT ALL STATIONS.

SPECIES	SAMPLING PERIOD													TOTAL	# HAULS PRESENT	AVG. # PER HAUL PRESENT	RANK BY =
	5/7	5/29	6/18	7/6	7/23	8/6	8/20	9/5	9/17	9/27	10/15	11/6	11/27				
Bowfin	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1.0	28
American eel	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1.0	28
Alewife	0	0	0	0	0	0	0	0	4	0	0	0	0	4	1	4.0	21
Gizzard shad	0	0	0	0	0	0	0	0	5	0	0	0	0	5	2	2.5	20
Cyprinidae	0	0	0	0	6	0	0	0	1	0	0	0	0	7	3	2.3	18
Carp	0	0	1	0	1	0	0	0	0	0	0	1	1	4	4	1.0	21
Silvery minnow	14	5	15	0	0	0	0	0	1	0	0	0	1	36	10	3.6	14
Golden shiner	79	32	46	1	15	0	3	8	82	28	2	380	16	692	34	20.4	2
Emerald shiner	40	2	0	0	1	0	0	36	13	5	2	0	1	100	19	5.3	11
Spottail shiner	310	12	15	1	18	5	0	2	22	14	19	41	277	736	33	22.3	1
Rosyface shiner	2	0	0	0	0	0	0	0	0	0	0	0	0	2	2	1.0	26
Bridle shiner	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1.0	28
Pugnose shiner	2	5	0	0	0	0	1	0	0	0	0	0	0	8	6	1.3	17
Common shiner	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1.0	28
Bluntnose minnow	0	1	1	1	0	0	0	0	0	0	0	0	1	4	4	1.0	21
Fathead minnow	5	0	0	0	0	0	0	0	1	0	0	0	0	6	2	3.0	19
Fallfish	0	0	17	53	32	3	10	2	13	9	1	1	8	149	19	7.8	7
White sucker	25	7	50	16	14	0	14	6	10	8	2	7	7	166	25	6.6	6
Greater redhorse	0	4	0	0	0	0	0	0	0	0	0	0	0	4	2	2.0	21
Brown bullhead	4	6	7	0	0	9	8	0	1	12	0	3	26	76	19	4.0	12
Brook silverside	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1.0	28
White perch	43	3	0	0	10	3	14	14	60	41	30	3	9	230	16	14.4	5
Centrarchidae	0	0	0	0	2	0	0	0	0	0	0	0	0	2	1	2.0	26
Rockbass	0	0	0	0	0	1	0	1	1	0	0	0	0	3	3	1.0	25
Pumpkinseed	7	20	19	3	4	4	1	7	1	1	0	2	0	69	25	2.8	13

TABLE: 24 continued.

SPECIES	SAMPLING PERIOD													TOTAL	# HAULS PRESENT	AVG # PER HAUL PRESENT	RANK BY #
	5/7	5/29	6/18	7/6	7/23	8/6	8/20	9/5	9/17	9/27	10/15	11/6	11/27				
Bluegill	5	5	2	0	1	1	35	182	30	120	8	83	6	478	27	17.7	3
Smallmouth bass	0	0	4	2	2	1	2	4	3	0	0	0	0	18	14	1.3	16
Largemouth bass	0	0	0	0	0	6	4	6	3	4	0	0	0	23	14	1.6	15
Micropterus sp.	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1.0	28
Black crappie	0	0	1	3	0	0	6	67	16	14	12	9	4	132	14	9.4	10
Johnny darter	19	32	33	7	6	1	5	8	8	8	2	10	2	141	36	3.9	8
Yellow perch	26	10	36	8	10	1	7	7	13	10	3	7	2	140	34	4.1	9
Logperch	1	3	44	168	116	17	27	13	33	2	1	0	0	425	21	20.2	4
Mottled sculpin	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1.0	28
#Specimens	584	148	291	263	240	53	137	363	322	276	82	547	361	3667	59	62.2	---
# Species	17	16	15	11	17	13	14	15	22	14	11	12	14	34	---	----	----

TABLE: 25. TOTAL NUMBER OF FISH CAUGHT BY SEINE IN THE GRASSE RIVER IN 1979 AT STATION S01.

SPECIES	SAMPLING PERIOD													TOTAL	# HAULS PRESENT	AVG. # PER HAUL PRESENT	RANK BY =
	5/7	5/29	6/18	7/6	7/23	8/6	8/20	9/5	9/17	9/27	10/15	11/6	11/27				
Bowfin	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1.0	20
Cyprinidae	0	0	0	0	5	0	0	0	1	0	0	0	0	6	2	3.0	9
Carp	0	0	1	0	0	0	0	0	0	0	0	1	1	3	3	1.0	13
Silvery minnow	0	0	3	0	0	0	0	0	0	0	0	0	0	3	1	3.0	13
Golden shiner	52	10	14	0	2	0	2	2	47	0	0	380	11	520	10	52.0	1
Emerald shiner	3	2	0	0	0	0	0	10	0	1	0	0	0	16	6	2.7	7
Spottail shiner	13	1	0	0	2	0	0	0	0	0	0	35	0	51	5	10.2	3
Rosyface shiner	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1.0	20
Bridle shiner	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1.0	20
Pugnose shiner	1	4	0	0	0	0	0	0	0	0	0	0	0	5	3	1.7	11
Bluntnose minnow	0	0	1	0	0	0	0	0	0	0	0	0	1	2	2	1.0	17
Fallfish	0	0	0	2	0	0	0	0	0	0	0	0	1	3	2	1.5	13
White sucker	4	0	1	0	1	0	0	0	0	0	0	7	2	15	5	3.0	8
Brown bullhead	1	4	5	0	0	0	0	0	1	11	0	3	4	29	8	3.6	4
Centrarchidae	0	0	0	0	2	0	0	0	0	0	0	0	0	2	1	2.0	17
Pumpkinseed	5	3	8	1	0	0	0	0	0	0	0	2	0	19	6	3.2	6
Bluegill	4	4	0	0	0	1	0	13	4	16	0	59	5	106	9	11.8	2
Smallmouth bass	0	0	1	0	0	0	0	0	1	0	0	0	0	2	2	1.0	17
Largemouth bass	0	0	0	0	0	3	0	1	1	1	0	0	0	6	4	1.5	9
Micropterus sp.	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1.0	20
Black crappie	0	0	0	0	0	0	0	0	1	0	0	2	0	3	2	1.5	13
Johnny darter	0	4	0	0	0	0	0	0	0	0	0	0	0	4	2	2.0	12
Yellow perch	10	2	2	2	0	0	0	0	0	1	0	7	0	24	6	4.0	5
#Specimens	95	34	36	5	13	5	2	26	56	30	0	496	25	823	15	54.9	-
#Species	11	9	9	3	6	3	1	4	7	5	0	9	7	23	--	----	--

TABLE: 26 . TOTAL NUMBER OF FISH CAUGHT BY SEINE IN THE GRASSE RIVER IN 1979 AT STATION SO2.

SPECIES	* SAMPLING * PERIOD													TOTAL	# HAULS PRESENT	AVG. # PER HAUL PRESENT	RANK BY #
	5/7	5/29	6/18	7/6*	7/23	8/6*	8/20	9/5*	9/17*	9/27*	10/15*	11/6*	11/27*				
Silvery minnow	1	5	0	--	--	--	--	--	--	--	--	--	--	6	2	3.0	4
Golden shiner	5	2	0	--	--	--	--	--	--	--	--	--	--	7	3	2.3	2
Emerald shiner	6	0	0	--	--	--	--	--	--	--	--	--	--	6	1	6.0	4
Spottail shiner	3	2	0	--	--	--	--	--	--	--	--	--	--	5	3	1.7	7
Pugnose shiner	0	1	0	--	--	--	--	--	--	--	--	--	--	1	1	1.0	10
Bluntnose minnow	0	1	0	--	--	--	--	--	--	--	--	--	--	1	1	1.0	10
White sucker	0	2	3	--	--	--	--	--	--	--	--	--	--	5	2	2.5	7
Brown bullhead	1	0	0	--	--	--	--	--	--	--	--	--	--	1	1	1.0	10
Brook silverside	0	1	0	--	--	--	--	--	--	--	--	--	--	1	1	1.0	10
Pumpkinseed	0	10	3	--	--	--	--	--	--	--	--	--	--	13	3	4.3	1
Bluegill	1	0	0	--	--	--	--	--	--	--	--	--	--	1	1	1.0	10
Johnny darter	1	1	0	--	--	--	--	--	--	--	--	--	--	2	2	1.0	9
Yellow perch	4	3	0	--	--	--	--	--	--	--	--	--	--	7	2	3.5	2
Logperch	0	3	3	--	--	--	--	--	--	--	--	--	--	6	2	3.0	4
#Specimens	22	31	9	--	--	--	--	--	--	--	--	--	--	62	5	12.4	---
#Species	8	11	3	--	--	--	--	--	--	--	--	--	--	14	--	---	--

* Not Sampled

TABLE: 27. TOTAL NUMBER OF FISH CAUGHT BY SEINE IN THE GRASSE RIVER IN 1979 AT STATION S03.

SPECIES	* SAMPLING* PERIOD													TOTAL	# HAULS PRESENT	AVG. # PER HAUL PRESENT	RANK BY #
	5/7	5/29	6/18	7/6*	7/23	8/6*	8/20	9/5*	9/17*	9/27*	10/15*	11/6*	11/27*				
Golden shiner	3	11	1	--	--	--	--	--	--	--	--	--	--	15	3	5.0	1
Emerald shiner	3	0	0	--	--	--	--	--	--	--	--	--	--	3	1	3.0	5
Spottail shiner	10	0	0	--	--	--	--	--	--	--	--	--	--	10	1	10.0	3
White sucker	0	1	0	--	--	--	--	--	--	--	--	--	--	1	1	1.0	6
Brown bullhead	0	1	0	--	--	--	--	--	--	--	--	--	--	1	1	1.0	6
Pumpkinseed	1	0	0	--	--	--	--	--	--	--	--	--	--	1	1	1.0	6
Johnny darter	10	3	2	--	--	--	--	--	--	--	--	--	--	15	4	3.8	1
Yellow perch	2	1	2	--	--	--	--	--	--	--	--	--	--	5	3	1.7	4
Logperch	0	0	1	--	--	--	--	--	--	--	--	--	--	1	1	1.0	6
#Specimens	29	17	6	--	--	--	--	--	--	--	--	--	--	52	5	10.4	--
#Species	6	5	4	--	--	--	--	--	--	--	--	--	--	9	--	---	--

* Not sampled

TABLE: 28 . TOTAL NUMBER OF FISH CAUGHT BY SEINE IN THE GRASSE RIVER IN 1979 AT STATION S04.

SPECIES	SAMPLING PERIOD													TOTAL	# HAULS PRESENT	AVG. # PER HAUL PRESENT	RANK BY #
	5/7	5/29	6/18	7/6	7/23	8/6	8/20	9/5	9/17	9/27	10/15	11/6	11/27				
American eel	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1.0	20
Gizzard shad	0	0	0	0	0	0	0	0	3	0	0	0	0	3	1	3.0	18
Carp	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1.0	20
Silvery minnow	7	0	11	0	0	0	0	0	0	0	0	0	0	18	2	9.0	14
Golden shiner	16	0	31	0	13	0	1	4	26	24	2	0	2	119	10	11.9	4
Emerald shiner	27	0	0	0	1	0	0	11	0	4	1	0	0	44	6	7.3	7
Spottail shiner	225	3	12	0	16	5	0	1	15	11	4	4	112	408	12	34.0	1
Rosyface shiner	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1.0	20
Pugnose shiner	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1.0	20
Common shiner	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1.0	20
Bluntnose minnow	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1.0	20
Fathead minnow	5	0	0	0	0	0	0	0	0	0	0	0	0	5	1	5.0	17
Fallfish	0	0	14	7	32	1	3	2	1	0	1	0	1	62	9	6.9	5
White sucker	17	0	4	7	12	0	9	1	0	0	2	0	0	52	7	7.4	6
Greater redhorse	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1.0	20
Brown bullhead	0	0	1	0	0	9	8	0	0	0	0	0	1	19	4	4.8	13
White perch	0	0	0	0	10	3	7	1	9	7	2	0	0	39	7	5.6	10
Rockbass	0	0	0	0	0	1	0	0	1	0	0	0	0	2	2	1.0	19
Pumpkinseed	0	7	6	1	4	2	1	3	0	1	0	0	0	25	8	3.1	12
Bluegill	0	0	1	0	1	0	3	100	12	100	7	24	0	248	8	31.0	2
Smallmouth bass	0	0	1	1	1	1	2	2	1	0	0	0	0	9	7	1.3	16
Largemouth bass	0	0	0	0	0	3	4	4	1	3	0	0	0	15	5	3.0	15
Black crappie	0	0	0	0	0	0	1	12	2	4	10	7	2	38	7	5.4	11
Johnny darter	3	5	7	5	2	1	0	2	4	3	2	8	1	43	15	2.9	8

TABLE: 28. (continued)

SPECIES	SAMPLING PERIOD 5/7	5/29	6/18	7/6	7/23	8/6	8/20	9/5	9/17	9/27	10/15	11/6	11/27	TOTAL	# HAULS PRESENT	AVG. # PER HAUL PRESENT	RANK BY #
Yellow perch	8	1	4	2	1	1	4	2	8	8	1	0	0	40	11	3.6	9
Logperch	1	0	12	52	111	12	19	1	11	1	0	0	0	220	9	24.4	3
#Specimens	312	17	104	76	206	39	62	146	94	166	32	43	119	1416	16	88.5	--
#Species	12	5	12	8	14	11	12	14	13	11	10	4	6	26	--	----	--

TABLE: 29. TOTAL NUMBER OF FISH CAUGHT BY SEINE IN THE GRASSE RIVER IN 1979 AT STATION S05.

SPECIES	SAMPLING PERIOD													TOTAL	# HAULS PRESENT	AVG. # PER HAUL PRESENT	RANK BY #
	5/7	5/29	6/18	7/6	7/23	8/6	8/20	9/5	9/17	9/27	10/15	11/6	11/27				
Alewife	0	0	0	0	0	0	0	0	4	0	0	0	0	4	1	4.0	16
Gizzard shad	0	0	0	0	0	0	0	0	2	0	0	0	0	2	1	2.0	18
Cyprinidae	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1.0	20
Silvery minnow	6	0	1	0	0	0	0	0	1	0	0	0	1	9	5	1.8	13
Golden shiner	3	9	0	1	0	0	0	2	9	4	0	0	3	31	8	3.9	10
Emerald shiner	1	0	0	0	0	0	0	15	13	0	1	0	1	31	5	6.2	10
Spottail shiner	59	6	3	1	0	0	0	1	7	3	15	2	165	262	12	21.8	1
Pugnose shiner	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1.0	20
Fathead minnow	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1.0	20
Fallfish	0	0	3	44	0	2	7	0	12	9	0	1	6	84	8	10.5	7
White sucker	4	4	42	9	1	0	5	5	10	8	0	0	5	93	10	9.3	5
Greater redhorse	0	3	0	0	0	0	0	0	0	0	0	0	0	3	1	3.0	17
Brown bullhead	2	1	1	0	0	0	0	0	0	1	0	0	21	26	5	5.2	12
White perch	43	3	0	0	0	0	7	13	51	34	28	3	9	191	9	21.2	3
Rockbass	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	1.0	20
Pumpkinseed	1	0	2	0	0	1	0	4	1	0	0	0	0	9	5	1.8	13
Bluegill	0	1	1	0	0	0	32	69	14	4	1	0	1	123	8	15.4	4
Smallmouth bass	0	0	2	0	1	0	0	2	1	0	0	0	0	6	4	1.5	15
Largemouth bass	0	0	0	0	0	0	0	1	1	0	0	0	0	2	2	1.0	18
Black crappie	0	0	1	3	0	0	5	55	13	10	2	0	2	91	8	11.4	6
Johnny darter	5	19	24	2	4	0	5	6	4	5	0	2	1	77	13	5.9	8
Yellow perch	2	3	28	3	9	0	3	5	5	1	2	0	2	63	11	5.7	9
Logperch	0	0	28	116	5	5	8	12	22	1	1	0	0	198	9	22.0	2
Mottled sculpin	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1.0	20
#Specimens	126	49	136	179	21	8	73	191	172	80	50	8	217	1310	16	81.9	---
#Species	10	9	12	8	6	3	9	14	19	11	7	4	12	24	----	-----	---

TABLE: 30. TOTAL NUMBER OF FISH CAUGHT BY SEINE IN THE GRASSE RIVER IN 1979 AT STATION S06.

SPECIES	SAMPLING* PERIOD													TOTAL	# HAULS PRESENT	AVG. # PER HAUL PRESENT	RANK BY #
	5/7*	5/29*	6/18*	7/6	7/23	8/6	8/20	9/5*	9/17*	9/27*	10/15*	11/6*	11/27*				
Pumpkinseed	--	--	--	1	0	1	--	--	--	--	--	--	--	2	2	1.0	1
Smallmouth bass	--	--	--	1	0	0	--	--	--	--	--	--	--	1	1	1.0	2
Yellow perch	--	--	--	1	0	0	--	--	--	--	--	--	--	1	1	1.0	2
#Specimens	--	--	--	3	0	1	--	--	--	--	--	--	--	4	3	1.3	--
#Species	--	--	--	3	0	0	--	--	--	--	--	--	--	3	---	---	--

* Not Sampled

TABLE: 31. LENGTH/FREQUENCY OF GOLDEN SHINERS CAUGHT IN SEINES IN THE GRASSE RIVER IN 1979.

SIZE RANGE (mm)	NUMBER OF SPECIMENS PER SAMPLING PERIOD													TOTAL	PERCENT
	5/7	5/29	6/18	7/6	7/23	8/6	8/20	9/5	9/17	9/27	10/15	11/6	11/27		
31-40	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0.2
41-50	4	0	0	0	0	0	1	0	4	2	0	50	2	63	11.2
51-60	8	5	0	0	0	0	1	7	62	19	1	154	6	263	46.9
61-70	14	8	3	0	0	0	0	0	12	7	1	40	5	90	16.0
71-80	1	3	8	0	6	0	0	1	2	0	0	1	1	23	4.1
81-90	6	3	7	0	6	0	1	0	0	0	0	1	0	24	4.3
91-100	21	4	16	1	3	0	0	0	1	0	0	0	0	46	8.2
101-110	16	5	9	0	0	0	0	0	0	0	0	2	0	32	5.7
111-120	3	2	2	0	0	0	0	0	0	0	0	1	1	9	1.6
121-130	2	1	1	0	0	0	0	0	0	0	0	0	0	4	0.7
131-140	2	1	0	0	0	0	0	0	0	0	0	0	1	4	0.7
141-150	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0.4
Total	79	32	46	1	15	0	3	8	81	28	2	250	16	561	100.0

TABLE: 32 . LENGTH/FREQUENCY OF SPOTTAIL SHINERS CAUGHT IN SEINES IN THE GRASSE RIVER IN 1979.

SIZE RANGE (mm)	NUMBER OF SPECIMENS PER SAMPLING PERIOD													TOTAL	PERCENT
	5/7	5/29	6/18	7/6	7/23	8/6	8/20	9/5	9/17	9/27	10/15	11/6	11/27		
11-20	0	0	0	0	2	1	0	0	0	0	0	0	0	3	0.5
21-30	0	0	0	0	5	0	0	0	0	0	0	0	0	5	0.8
31-40	0	1	0	0	1	4	0	0	0	0	1	1	0	8	1.2
41-50	32	2	0	0	0	0	0	0	2	1	8	9	27	81	12.4
51-60	63	5	4	0	1	0	0	2	16	13	9	27	192	332	50.7
61-70	35	1	1	1	5	0	0	0	2	0	0	1	10	56	8.5
71-80	58	1	3	0	4	0	0	0	1	0	1	2	16	86	13.1
81-90	40	2	7	0	0	0	0	0	1	0	0	1	31	82	12.5
91-100	1	0	0	0	0	0	0	0	0	0	0	0	1	2	0.3
Total	229	12	15	1	18	5	0	2	22	14	19	41	277	655	100.0

TABLE: 33. LENGTH/FREQUENCY OF FALLFISH CAUGHT IN SEINES IN THE GRASSE RIVER IN 1979.

	NUMBER OF SPECIMENS PER SAMPLING PERIOD														
SIZE RANGE (mm)	5/7	5/29	6/18	7/6	7/23	8/6	8/20	9/5	9/17	9/27	10/15	11/6	11/27	TOTAL	PERCENT
51-60	0	0	1	0	0	0	6	0	0	0	0	0	0	7	4.7
61-70	0	0	2	0	0	0	1	0	0	2	0	0	0	5	3.4
71-80	0	0	8	8	11	0	0	0	0	5	0	0	1	33	22.1
81-90	0	0	5	19	17	1	0	0	0	0	0	0	2	44	29.5
91-100	0	0	1	19	4	0	3	1	2	0	1	0	1	32	21.5
101-110	0	0	0	6	0	1	0	1	6	1	0	0	2	17	11.4
111-120	0	0	0	0	0	1	0	0	2	1	0	0	1	5	3.4
121-130	0	0	0	0	0	0	0	0	2	0	0	0	1	3	2.0
131-140	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0.7
141-150	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
151-160	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0.7
161-170	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
171-180	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
181-190	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
191-200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
201-210	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
211-220	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0.7
Total	0	0	17	53	32	3	10	2	13	9	1	1	8	149	100.1

TABLE: 34. LENGTH/FREQUENCY OF WHITE SUCKERS CAUGHT IN SEINES IN THE GRASSE RIVER IN 1979.

SIZE RANGE (mm)	NUMBER OF SPECIMENS PER SAMPLING PERIOD													TOTAL	PERCENT
	5/7	5/29	6/18	7/6	7/23	8/6	8/20	9/5	9/17	9/27	10/15	11/6	11/27		
41-50	0	0	0	0	1	0	0	0	1	0	0	0	0	2	1.3
51-60	0	0	0	0	10	0	4	0	3	3	0	0	0	20	12.5
61-70	0	0	0	0	2	0	1	0	6	2	0	0	0	11	6.9
71-80	3	1	0	0	0	0	0	0	0	3	0	0	1	8	5.0
81-90	7	3	1	0	0	0	0	0	0	0	0	2	0	13	8.1
91-100	9	2	19	2	0	0	0	0	0	0	0	0	0	32	20.0
101-110	4	1	9	6	0	0	0	0	0	0	0	0	0	20	12.5
111-120	1	0	15	4	1	0	2	0	0	0	1	0	1	25	15.6
121-130	1	0	5	4	0	0	1	0	0	0	0	0	0	11	6.9
131-140	0	0	1	0	0	0	0	0	0	0	1	0	0	2	1.3
141-150	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0.6
151-160	0	0	0	0	0	0	3	0	0	0	0	2	0	5	3.1
161-170	0	0	0	0	0	0	1	0	0	0	0	1	0	2	1.3
171-180	0	0	0	0	0	0	1	0	0	0	0	0	1	2	1.3
181-190	0	0	0	0	0	0	0	0	0	0	0	0	2	2	1.3
191-200	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.6
201-210	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.6

241-250	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0.6

471-480	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0.6
Total	25	7	50	16	14	0	14	0	10	8	2	7	7	160	100.1

TABLE: 35 . LENGTH/FREQUENCY OF WHITE PERCH CAUGHT IN SIENES IN THE GRASSE RIVER IN 1979.

SIZE RANGE (mm)	NUMBER OF SPECIMENS PER SAMPLING PERIOD													TOTAL	PERCENT
	5/7	5/29	6/18	7/6	7/23	8/6	8/20	9/5	9/17	9/27	10/15	11/6	11/27		
21-30	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0.4
31-40	0	0	0	0	0	0	3	1	6	6	5	0	0	21	9.1
41-50	0	0	0	0	0	1	5	4	23	21	20	3	0	77	33.5
51-60	0	0	0	0	0	0	2	7	15	9	1	0	3	37	16.1
61-70	0	0	0	0	0	0	3	2	8	4	2	0	3	22	9.6
71-80	0	0	0	0	2	0	1	0	6	1	1	0	2	13	5.7
81-90	0	1	0	0	1	0	0	0	1	0	1	0	0	4	1.7
91-100	0	2	0	0	4	0	0	0	0	0	0	0	0	6	2.6
101-110	0	0	0	0	2	2	0	0	0	0	0	0	0	4	1.7
111-120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
121-130	1	0	0	0	1	0	0	0	0	0	0	0	0	2	0.9
131-140	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0.4
141-150	3	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
151-160	3	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
161-170	5	0	0	0	0	0	0	0	0	0	0	0	0	5	2.2
171-180	7	0	0	0	0	0	0	0	0	0	0	0	1	8	3.5
181-190	7	0	0	0	0	0	0	0	0	0	0	0	0	7	3.0
191-200	5	0	0	0	0	0	0	0	0	0	0	0	0	5	2.2
201-210	7	0	0	0	0	0	0	0	0	0	0	0	0	7	3.0
211-220	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0.9
221-230	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0.4
231-240	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0.4
Total	43	3	0	0	10	3	14	14	60	41	30	3	9	230	99.9

TABLE: 36. LENGTH/FREQUENCY OF YELLOW PERCH CAUGHT IN SEINES IN THE GRASSE RIVER IN 1979.

SIZE RANGE (mm)	NUMBER OF SPECIMENS PER SAMPLING PERIOD													TOTAL	PERCENT
	5/7	5/29	6/18	7/6	7/23	8/6	8/20	9/5	9/17	9/27	10/15	11/6	11/27		
21-30	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0.7
31-40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
41-50	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0.7
51-60	1	1	0	0	1	0	0	0	0	0	0	0	0	3	2.1
61-70	1	2	3	0	0	0	1	2	0	0	0	1	0	10	7.1
71-80	3	1	9	0	0	1	1	2	2	2	0	0	0	21	15.0
81-90	4	1	6	4	1	0	1	2	5	1	0	0	0	25	17.9
91-100	2	0	2	0	2	0	0	0	0	4	2	0	0	12	8.6
101-110	0	0	2	0	2	0	2	0	0	0	0	0	0	6	4.3
111-120	1	0	2	0	1	0	0	0	0	0	0	0	0	4	2.9
121-130	1	1	5	0	1	0	0	0	0	0	0	1	0	9	6.4
131-140	1	1	0	0	1	0	0	0	1	0	0	1	0	5	3.6
141-150	7	2	1	1	1	0	0	0	1	1	0	0	0	14	10.0
151-160	0	0	2	3	0	0	0	1	0	0	0	0	1	7	5.0
161-170	2	0	0	0	0	0	0	0	2	1	0	2	0	7	5.0
171-180	2	1	2	0	0	0	1	0	1	0	0	1	0	8	5.7
181-190	1	0	1	0	0	0	0	0	0	1	0	1	0	4	2.9
191-200	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0.7
201-210	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
211-220	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.7
221-230	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0.7
Total	26	10	36	8	10	1	7	7	13	10	3	7	2	140	100.0

TABLE: 37. LENGTH/FREQUENCY OF LOGPERCH CAUGHT IN SEINES IN THE GRASSE RIVER IN 1979.

	NUMBER OF SPECIMENS PER SAMPLING PERIOD														
SIZE RANGE (mm)	5/7	5/29	6/18	7/6	7/23	8/6	8/20	9/5	9/17	9/27	10/15	11/6	11/27	TOTAL	PERCENT
41-50	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0.2
51-60	0	0	6	9	0	0	0	0	0	0	0	0	0	15	3.6
61-70	0	3	27	135	39	1	2	2	2	0	0	0	0	211	50.1
71-80	1	0	7	17	65	12	9	3	7	0	0	0	0	121	28.7
81-90	0	0	4	5	11	3	14	7	17	1	1	0	0	63	15.0
91-100	0	0	0	0	1	0	1	1	4	1	0	0	0	8	1.9
101-110	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0.2
111-120	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0.2
Total	1	3	44	166	116	16	27	13	32	2	1	0	0	421	99.9

TABLE: 38. LENGTH/FREQUENCY OF BLUEGILLS CAUGHT IN THE GRASSE RIVER IN 1979.

SIZE RANGE (mm)	NUMBER OF SPECIMENS PER SAMPLING PERIOD													TOTAL	PERCENT
	5/7	5/29	6/18	7/6	7/23	8/6	8/20	9/5	9/17	9/27	10/15	11/6	11/27		
21-30	0	0	0	0	0	1	9	4	1	9	2	19	1	46	9.7
31-40	1	2	0	0	0	0	25	154	26	89	5	59	5	366	77.1
41-50	3	3	1	0	0	0	1	24	2	17	0	5	0	56	11.8
51-60	1	0	1	0	0	0	0	0	1	2	1	0	0	6	1.3
61-70	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0.2
Totals	5	5	2	0	1	1	35	182	30	117	8	83	6	475	100.1

Appendix A. Summary of Fish Species Captured in the St. Lawrence River During Various Studies Between 1930 and 1979. (Taxonomy according to Bailey, et al. 1970).

Genus and Species	Common Name	Year Captured					
		1930[1]	1958[2]	1973[3]	1976[4]	1978[5]	1979[6]
Ichthyomyzon fossor	Northern brook lamprey		X	X			
Ichthyomyzon unicuspis	Silver lamprey	X	X	X	X		
Lampetra lamottei	American brook lamprey		X	X			
Petromyzon marinus	Sea lamprey	X	X	X	X		
Acipenser fulvescens	Lake sturgeon	X	X	X	X	X	
Lepisosteus osseus	Longnose gar	X	X	X	X	X	
Amia calva	Bowfin	X	X	X	X	X	X
Anguilla rostrata	American eel	X	X	X	X	X	X
Alosa pseudoharengus	Alewife	X	X	X	X		X
Dorosoma cepedianum	Gizzard shad		X	X	X	X	X
Hiodon tergisus	Mooneye	X	X	X	X		
Coregonus artedii	Cisco	X	X	X			
Coregonus clupeaformis	Lake whitefish			X			
Prosopium cylindraceum	Round whitefish		X	X			
Salmo gairdneri	Rainbow trout		X	X	X		
Salmo salar	Atlantic salmon	X	X	X			
Salmo trutta	Brown trout		X	X	X		
Salvelinus namaycush	Lake trout		X	X			
Osmerus mordax	Rainbow smelt		X	X	X	X	
Umbra limi	Central mudminnow	X	X	X	X		
Esox americanus	Grass pickerel		X	X	X		
Esox lucius	Northern pike	X	X	X	X	X	X
Esox masquinongy	Muskellunge	X	X	X	X	X	
Esox niger	Chain pickerel		X	X			
Carassius auratus	Goldfish		X			X	
Clinostomus elongatus	Redside dace		X				
Couesius plumbeus	Lake chub		X	X			
Cyprinus carpio	Carp	X	X	X	X	X	X
Exoglossum maxillingua	Cutlips minnow	X	X	X	X		
Hybognathus hankinsoni	Brassy minnow		X	X	X		
Hybognathus nuchalis	Silvery minnow			X	X		X
Nocomis micropogon	River chub			X			
Notemigonus crysoleucus	Golden shiner	X	X	X	X	X	X
Notropis anogenus	Pugnose shiner		X	X	X		X
Notropis atherinoides	Emerald shiner	X	X	X	X	X	X
Notropis bifrenatus	Bridle shiner	X	X	X	X		X
Notropis cornutus	Common shiner	X	X	X	X		X
Notropis heterodon	Blackchin shiner	X	X	X	X		
Notropis heterolepis	Blacknose shiner	X	X	X	X		
Notropis hudsonius	Spottail shiner	X	X	X	X	X	X
Notropis rubellus	Rosyface shiner	X	X	X	X		X

Appendix A. (continued)

Genus and Species	Common Name	1930	1958	1973	1976	1978	1979
Notropis spilopterus	Spotfin shiner	X	X	X	X	X	
Notropis stramineus	Sand shiner	X	X	X	X		
Notropis volucellus	Mimic shiner	X		X	X		
Phoxinus eos	Northern redbelly dace		X	X			
Phoxinus neogaeus	Finescale dace		X	X			
Pimephales notatus	Bluntnose minnow	X	X	X	X	X	X
Pimephales promelas	Fathead minnow	X	X	X	X		X
Rhinichthys atratulus	Blacknose dace		X	X			
Rhinichthys cataractae	Longnose dace	X	X	X	X		
Semotilus atromaculatus	Creek chub	X	X	X	X		
Semotilus corporalis	Fallfish	X	X	X	X	X	X
Semotilus margarita	Pearl dace		X	X			
Carpiodes cyprinus	Quillback		X	X		X	
Catostomus catostomus	Longnose sucker		X	X			
Catostomus commersoni	White sucker	X	X	X	X	X	X
Erimyzon oblongus	Creek chubsucker		X				
Moxostoma anisurum	Silver redhorse	X	X	X	X	X	
Moxostoma carinatum	River redhorse		X	X			
Moxostoma duquesnei	Black redhorse		X	X			
Moxostoma hubbsi	Copper redhorse		X				
Moxostoma macrolepidotum	Shorthead redhorse	X	X	X	X		X
Moxostoma valenciennesi	Greater redhorse	X	X	X	X	X	X
Ictalurus melas	Black bullhead		X	X			
Ictalurus natalis	Yellow bullhead		X	X	X	X	
Ictalurus nebulosus	Brown bullhead	X	X	X	X	X	X
Ictalurus punctatus	Channel catfish	X	X	X	X	X	X
Noturus flavus	Stonecat	X	X	X		X	
Noturus gyrinus	Tadpole madtom		X	X	X		
Percopsis omiscomaycus	Trout-perch	X	X	X	X	X	
Lota lota	Burbot	X	X	X	X	X	
Fundulus diaphanus	Banded killifish	X	X	X	X	X	
Labidesthes sicculus	Brook silverside	X	X	X	X	X	X
Culaea inconstans	Brook stickleback	X	X	X	X	X	
Gasterosteus aculeatus	Threespine stickleback	X	X	X	X	X	
Pungitius pungitius	Ninespine stickleback			X			
Morone americana	White perch		X	X	X	X	X
Morone chrysops	White bass		X	X	X	X	
Ambloplites rupestris	Rockbass	X	X	X	X	X	X
Lepomis gibbosus	Pumpkinseed	X	X	X	X	X	X
Lepomis macrochirus	Bluegill		X	X	X	X	X
Lepomis megalotis	Longear sunfish		X				

Appendix A. (continued)

Genus and Species	Common Name	1930	1958	1973	1976	1978	1979
Micropterus dolomieu	Smallmouth bass	X	X	X	X	X	X
Micropterus salmoides	Largemouth bass	X	X	X	X	X	X
Pomoxis nigromaculatus	Black crappie		X	X	X	X	X
Ammocrypta pellucida	Eastern sand darter		X	X			
Etheostoma caeruleum	Rainbow darter		X				
Etheostoma exile	Iowa darter	X	X	X	X		
Etheostoma flabellare	Fantail darter		X	X			
Etheostoma nigrum	Johnny darter	X	X	X	X	X	X
Perca flavescens	Yellow perch	X	X	X	X	X	X
Percina caprodes	Logperch	X	X	X	X	X	X
Percina copelandi	Channel darter	X	X	X			
Stizostedion canadense	Sauger	X	X	X			
Stizostedion vitreum vitreum	Walleye	X	X	X	X	X	X
Aplodinotus grunniens	Freshwater drum		X	X	X		
Cottus bairdi	Mottled sculpin	X	X	X	X	X	X
Cottus cognatus	Slimy sculpin		X	X	X		
TOTAL NUMBER OF SPECIES		56	93	92	67	43	35

[1]Greeley, Moore, and Sibley (1930)
[2]Hubbs and Lagler (1958)
[3]Scott and Crossman (1973)
[4]U. S. Dept. of Interior (1976 A,B)
[5]Dunning, Tarby, and Evans (1978); Dunning, Evans, and Tarby (1978)
[6]This study

SECTION:C

BIRDS

TABLE OF CONTENTS

	Page
List of Figures	C-III
List of Tables	C-V
Introduction	C-1
Materials and Methods	C-1
Results and Discussion	C-3
Bird Survey Areas in Massena	C-3
1. Polly's Gut to Massena International Bridge	C-3
2. Hawkins Point-Moses-Saunders Dam	C-4
3. Barnhart Island Marina	C-6
4. Long Sault Lookout	C-6
5. Eisenhower Lock	C-7
6. North Shore of Wiley-Dondero Canal	C-7
7. Snell Lock	C-8
8. Horton Road to Kinne Road	C-8
9. Haverstock Road-South Grasse River Road	C-9
Bird Transects Conducted During Breeding Season	C-10
Bird Survey Areas Upriver from Massena	C-14
Hopson's Bay Corridor	C-14
Massena Town Beach Corridor	C-14
Massena Country Club Corridor	C-15
Wilson Hill Game Management Area	C-15
Canada Island-Murphy Island Corridor	C-17
Lakeshore Drive Corridor	C-17

Table of Contents (continued)

	Page
Iroquois Dam Corridor	C-18
Galop Island Corridor	C-18
Jacques Cartier State Park Corridor	C-19
American Island Corridor	C-19
Oak Point Corridor	C-19
Blind Bay Corridor	C-20
Eagle Wing Island Group	C-21
Summary and Conclusions	C-22
Literature Cited	C-24
Figures	C-25
Tables	C-72
Appendix A1	C-252
Appendix A2	C-255

LIST OF FIGURES

Figure Number		Page
1	Location of part of bird survey site 1.	C-25
2	Locations of bird survey sites 2-4, 6-8, 10-13, and parts of sites 1, 5, 9, 14, 16, 55, 56, and 57.	C-26
3	Locations of bird survey sites 23-31 and parts of sites 5, 9, 14, 16, and 22.	C-27
4	Locations of bird survey site 15 and parts of sites 1 and 17.	C-28
5	Locations of bird survey sites 18-21 and parts of sites 17 and 22.	C-29
6	Locations of bird survey sites 32-34 and part of site 35.	C-30
7	Locations of bird survey sites 36-39 and part of site 35.	C-31
8	Locations of bird survey sites 40, 41, and 43, and parts of sites 42 and 45.	C-32
9	Locations of bird survey sites 44 and 46 and parts of sites 42 and 45.	C-33
10	Locations of bird survey sites 47-49, 51, and part of site 45.	C-34
11	Locations of bird survey sites 50, 52, and 54, and parts of sites 55, 56, and 57.	C-35
12	Locations of parts of bird survey sites 55, 59, and 60.	C-36
13	Locations of parts of bird survey sites 56 and 57.	C-37
14	Locations of bird survey sites 58 and 61 and parts of sites 59 and 60.	C-38
15	Locations of bird survey sites 53, 62, and part of site 59.	C-39
16	Locations of bird survey sites 63 and 66.	C-40
17	Locations of bird survey sites 64, 65, and 67.	C-41
18	Location of bird survey site 68.	C-42
19	Location of part of bird survey site 69.	C-43
20	Locations of bird survey sites 70-73 and parts of sites 69 and 74.	C-44
21	Locations of bird survey site 75 and part of site 74.	C-45
22	Locations of bird survey sites 76-80.	C-46
23	Locations of bird survey sites 81-83.	C-47
24	Locations of bird survey sites 84-91 and part of site 92.	C-48
25	Locations of bird survey sites 93-94 and part of site 92.	C-49
26	Locations of bird survey sites 95-101 and part of site 92.	C-50
27	Locations of bird survey sites 102-108 and part of site 109.	C-51
28	Locations of bird survey sites 110-118, 121-125, 171-172, and part of site 109.	C-52
29	Locations of bird survey sites 119-120 and 127-129.	C-53
30	Locations of bird survey sites 126, 130-132, and 170.	C-54

List of Figures (continued)

Figure Number		Page
31	Locations of bird survey sites 133-137, 140-145, and parts of sites 138 and 146.	C-55
32	Locations of bird survey sites 139, 150, and part of site 138.	C-56
33	Locations of bird survey sites 147, 149, and parts of sites 146 and 148.	C-57
34	Locations of parts of bird survey sites 148, 151, 155, and 169.	C-58
35	Locations of bird survey sites 153-154 and parts of sites 151, 152, and 155.	C-59
36	Locations of bird survey sites 156-157 and parts of sites 155 and 163.	C-60
37	Location of bird survey site 158 and parts of sites 159 and 164.	C-61
38	Locations of bird survey sites 160-162 and parts of sites 163 and 164.	C-62
39	Locations of parts of bird survey sites 152, 163, and 164.	C-63
40	Location of part of bird survey site 159.	C-64
41	Location of bird survey site 165.	C-65
42	Location of bird survey site 166.	C-66
43	Location of bird survey site 167.	C-67
44	Location of bird survey site 168.	C-68
45	Locations of bird transects BT1 and BT5-BT10 during breeding season.	C-69
46	Locations of bird transects BT4, BT11-BT14, and parts of transects BT2 and BT3 during breeding season.	C-70
47	Locations of parts of bird transects BT2 and BT3 during breeding season.	C-71

LIST OF TABLES

Table Number		Page
1	Bird Transects in the Massena Sampling Area on the St. Lawrence River in 1979.	C-72
2	General Habitats of Birds in the Vicinity of Eisenhower and Snell Locks Along the St. Lawrence River in 1979.	C-77
3	Checklist of the Birds of the St. Lawrence River-1976-1979.	C-81
4	Number of Birds Sighted on the St. Lawrence River in 1979 at Station 1.	C-91
5	Number of Birds Sighted on the St. Lawrence River in 1979 at Station 2.	C-100
6	Number of Birds Sighted on the St. Lawrence River in 1979 at Station 3.	C-106
7	Number of Birds Sighted on the St. Lawrence River in 1979 at Station 4.	C-107
8	Number of Birds Sighted on the St. Lawrence River in 1979 at Station 5.	C-111
9	Number of Birds Sighted on the St. Lawrence River in 1979 at Station 6.	C-115
10	Number of Birds Sighted on the St. Lawrence River in 1979 at Station 7.	C-116
11	Number of Birds Sighted on the St. Lawrence River in 1979 at Station 8.	C-117
12	Number of Birds Sighted on the St. Lawrence River in 1979 at Station 9.	C-121
13	Number of Birds Sighted on the St. Lawrence River in 1979 at Station 11.	C-123
14	Number of Birds Sighted on the St. Lawrence River in 1979 at Station 12.	C-127
15	Number of Birds Sighted on the St. Lawrence River in 1979 at Station 13.	C-133
16	Number of Birds Sighted on the St. Lawrence River in 1979 at Station 14.	C-139
17	Number of Birds Sighted on the St. Lawrence River in 1979 at Station 15.	C-143
18	Number of Birds Sighted on the St. Lawrence River in 1979 at Station 16.	C-147
19	Number of Birds Sighted on the St. Lawrence River in 1979 at Station 17.	C-148
20	Number of Birds Sighted on the St. Lawrence River in 1979 at Station 18.	C-149

List of Tables (continued)

Table Number		Page
21	Number of Birds Sighted on the St. Lawrence River in 1979 at Station 19.	C-150
22	Number of Birds Sighted on the St. Lawrence River in 1979 at Station 20.	C-151
23	Number of Birds Sighted on the St. Lawrence River in 1979 at Station 21.	C-152
24	Number of Birds Sighted on the St. Lawrence River in 1979 at Station 22.	C-153
25	Number of Birds Sighted on the St. Lawrence River in 1979 at Station 23.	C-157
26	Number of Birds Sighted on the St. Lawrence River in 1979 at Station 24.	C-158
27	Number of Birds Sighted on the St. Lawrence River in 1979 at Station 25.	C-159
28	Number of Birds Sighted on the St. Lawrence River in 1979 at Station 26.	C-161
29	Number of Birds Sighted on the St. Lawrence River in 1979 at Station 27.	C-165
30	Number of Birds Sighted on the St. Lawrence River in 1979 at Station 28.	C-169
31	Number of Birds Sighted on the St. Lawrence River in 1979 at Station 29.	C-171
32	Number of Birds Sighted on the St. Lawrence River in 1979 at Station 30.	C-175
33	Number of Birds Sighted on the St. Lawrence River in 1979 at Station 31.	C-177
34	Number of Birds Sighted on the St. Lawrence River in 1979 in the Hopson's Bay Corridor.	C-181
35	Number of Birds Sighted on the St. Lawrence River in 1979 in the Massena Town Beach Corridor.	C-187
36	Number of Birds Sighted on the St. Lawrence River in 1979 in the Massena Country Club Corridor.	C-193
37	Number of Birds Sighted on the St. Lawrence River in 1979 in the Wilson Hill Game Management Area.	C-195
38	Number of Birds Sighted on the St. Lawrence River in 1979 in the Canada Island-Murphy Island Corridor.	C-207
39	Number of Birds Sighted on the St. Lawrence River in 1979 in the Lakeshore Drive Corridor.	C-213
40	Number of Birds Sighted on the St. Lawrence River in 1979 in the Iroquois Dam Corridor.	C-214

List of Tables (continued)

Table Number		Page
41	Number of Birds Sighted on the St. Lawrence River in 1979 in the Galop Island Corridor.	C-220
42	Number of Birds Sighted on the St. Lawrence River in 1979 in the Jacques Cartier State Park Corridor.	C-222
43	Number of Birds Sighted on the St. Lawrence River in 1979 in the American Island Corridor.	C-226
44	Number of Birds Sighted on the St. Lawrence River in 1979 in the Oak Point Corridor.	C-230
45	Number of Birds Sighted on the St. Lawrence River in 1979 in the Blind Bay Corridor.	C-242
46	Number of Birds Sighted on the St. Lawrence River in 1979 in the Eagle Wing Island Group.	C-251

INTRODUCTION

The primary goal of this study is to characterize the avian populations of the St. Lawrence River in the Massena area and to determine the potential effects of the Additional Locks project on these populations. A determination of species richness and relative abundance is necessary to help assess these potential impacts.

MATERIALS AND METHODS

Bird studies were conducted along the international section of the St. Lawrence River in 1979 from June through November. The primary effort was concentrated in the Massena area.

Several methods were utilized to survey the bird populations. One method consisted of setting up fourteen transects in the locks area, where most of the construction for additional locks would be likely to occur. The locations of these transects were chosen to allow coverage of the entire locks area and to sample all types of habitat found in the area. Each transect was approximately one kilometer in length and was surveyed three times during the breeding season in June and early July. All adult birds observed or identified by song along each transect during each survey were counted. The three surveys were then averaged for each transect to provide an estimate of the potential breeding bird population in a given area.

Colonial waterbird surveys were also conducted. Several known colonies were visited during late June and July. Counts of adults and juveniles were conducted at all colonies.

The majority of the observation time was spent on surveys of roadside fringes, waterbird and waterfowl counts, and surveys of specific habitat types such as marshes and woodlots. Waterbird and waterfowl counts were conducted from overlooks along the St. Lawrence River. All birds sighted or identified by song in a ten minute observation period were counted. These data were tabulated to determine species richness and relative abundance. These surveys were concentrated during the fall migration period in October and November.

The roadside fringes were surveyed in conjunction with other activities, such as while en route to waterfowl observation points. These surveys tend to underestimate the totals of inconspicuous species such as bitterns.

The marshes, woodlots, and other specific habitat types were visited several times during the year. Counts were made to determine the species occupying these habitats and their relative abundance.

Bird species were also recorded during mammal trapping surveys. All species observed while walking the trap-line were recorded. This information, which is included as an appendix to this report, provides a species list and the richness value for several specific habitat types in the Massena area, and for selected islands and mainland areas in the upriver portion of the St. Lawrence River.

A major portion of the study effort was devoted to the Massena area, where the primary impacts of additional locks construction would be felt. However, due to the motile nature of birds, as well as the potential for upriver dredging and other impacts such as increased ship traffic, several important upriver areas were also surveyed. These data will be presented in the final report.

RESULTS AND DISCUSSION

Bird Survey Areas in Massena

Thirty sites were surveyed in the Massena area in 1979 (Figs. 1-5). These sites have been grouped into nine general areas for discussion.

1. Polly's Gut to Massena International Bridge.

The first area, consisting of survey site 1 (Table 4), covers the river area from Polly's Gut to the Massena International Bridge. This site was surveyed 26 times from June 8 through November 20. A total of 62 species, more than at any other site in the Massena area, was observed here. The peak species richness occurred in early July, followed by a sharp decline in October.

The predominant species at this site was Ring-billed Gull, which was present throughout the year and averaged 623.3 individuals per occurrence. Tree Swallows ranked second with 226.5 individuals per occurrence, although they were absent after August. During the early breeding season (through mid-July) many adult Ring-billed Gulls and Black-crowned Night Herons were seen feeding in this area. Many swallows fed in this area during the summer.

This area of the river appears to be important primarily as a feeding area for birds from nearby colonies.

2. Hawkins Point - Moses-Saunders Dam.

Area 2 includes the area around Hawkins Point and the Moses-Saunders Dam, as well as the fringes along the access roads to Hawkins Point. Survey sites 12-16 are included in this area (Tables 14-18). The habitat of this area is primarily open fields and scattered shrublands, with small patches of deciduous forest (see habitat map in vegetation section of this report). It also includes the open water around the Moses-Saunders Dam.

Site 12 was essentially open fields and was surveyed 22 times between June 5 and November 13. A total of 52 species was observed, with species richness peaking in June and declining in late July. Swallows and Starlings were abundant in early summer in this area.

Site 13 is an open field and shrubland ecotone overlooking the river at the Moses-Saunders Dam. This site was surveyed 25 times from June 5 through November 20. A total of 42 species was observed here, with the peak occurring in late October and early November during the fall migration period. Waterfowl and waterbirds dominated this site in the fall. The most abundant species were Common Merganser (840.6/occurrence), Ring-billed Gull (337.1/occurrence), and Canada Goose (155.0/occurrence).

Site 14 was a roadside fringe area of open fields and shrublands. Twelve surveys were conducted along this area from August through November. A total of 36 species was observed, with Tree Swallow and Canada Goose being most prevalent.

Site 15 consisted of open water areas visible from the top of the dam. This area was surveyed 11 times between late July and November. A total of 38 species was observed, including 12 species of ducks, most of which were present in low numbers. Common Merganser, Canada Goose, and Ring-billed Gull were abundant in the fall.

A total of 27 species was sighted along the roadside fringe of site 16 du ng six fall surveys.

The Hawkins Point area was valuable as a feeding area for swallows, and some of the lawns were used by Canada Geese. The open water areas around the dam were important concentration areas for feeding gulls and waterfowl. Several species of gulls, including Little Gull, Parasitic Jaeger, and Bonaparte's Gull utilized the area in late summer and fall. In November, huge flocks of Common Mergansers and a variety of other ducks used the area.

3. Barnhart Island Marina.

The third area consisted of the Barnhart Island Marina overlook and the islands visible from this area (Bergin, Sheek, and Strachan). Sites 17-22 were included in this area (Tables 19-24). Each of the islands was visited once or twice by boat in June. Strachan Island held a colony of over 13,000 Ring-billed Gulls, while Commern Terns were relatively abundant on East and West Sheek Islands.

The overlook was visited 12 times from July 30 through November 20. A total of 35 species was noted here. Ring-billed Gull was the most abundant and frequent species, occurring throughout the sampling period and averaging 359.9 per occurrence. Small numbers of several species of ducks utilized the area in October.

In general, this area is important because of the waterbird colonies present on the islands. Strachan Island had the largest Ring-billed Gull colony found along the river, and West Sheek Island had one of the largest Common Tern colonies found in 1979.

4. Long Sault Lookout.

The fourth area consisted of the campground area on Long Sault peninsula. This area is a blend of deciduous forest, shrubland, and open fields, and overlooks Lake St. Lawrence. Survey sites 26 and 27 were included in this area (Tables 28 and 29).

Site 26 overlooks Lake St. Lawrence. A total of 42 species was observed during 14 surveys between June and November. Species richness peaked in June and July and then declined rapidly. Ring-billed Gull was the most abundant species through August, averaging 145.6 per occurrence. Canada Geese were abundant in November.

Site 27 was essentially a deciduous forest. Seventeen surveys were conducted in this area between June and November. A total of 49 species was sighted, although no birds were observed in November. American Robins were found throughout the sampling period. Dark-eyed Juncos were relatively abundant in October.

5. Eisenhower Lock.

The fifth area is the area around Eisenhower Lock. This area consists mostly of open fields. Sites 25 and 28 were included in this area (Tables 27 and 30). Only four surveys were conducted at station 25. Thirty species were observed, but none were abundant. Twenty species were observed during 12 visits to site 28 from June through November. Ring-billed Gulls were present throughout the sampling period.

6. North Shore of Wiley-Dondero Canal.

Area 6 includes the north shore of the Wiley-Dondero Canal. Sites 11, 23, and 24 are included in this area (Tables 13, 25, and 26). Site 11 overlooks two pools which were concentration areas for waterfowl. Eighteen species of ducks were present between August and November. The flocks were dominated

by Redheads, Ring-necked Ducks, and Black Ducks. Common Crows were also abundant in November. A large flock of Common Mergansers was observed in Robinson Bay in November.

7. Snell Lock.

The seventh area is the Snell Lock area (site 4 - Table 7). Nine surveys were conducted here in June and July. A total of 41 species was observed. Swallows and Starlings were the most abundant species in the open fields surrounding the lock.

8. Horton Road to Kinne Road.

Area 8 encompasses the area between the Grasse River and the Wiley-Dondero Canal, from Horton Road to Kinne Road. Included in this area are sites 5, 8, 9, 29, 30, and 31 (Tables 8, 11, 12, and 31-33). The habitat is a patchwork of open fields, shrublands, and deciduous forests.

Site 5 consists of the open fields along Kinne Road leading to Snell Lock. Forty species were observed here, with Red-winged Blackbirds and Starlings being predominant. Site 8 included the roadside fringe of Kinne Road from North Grasse River Road to the canal. Fourteen surveys between June and November yielded 48 species, none of which were very abundant. The habitat at this site consists of ecotones between forest, shrubland, and fields.

Site 9 is a powerline right-of-way. Five surveys were done here between July and October. A total of 32 species, including six species of sparrows, was observed. Red-winged Blackbird and Song Sparrow were the most abundant species noted.

Site 29, surveyed nine times from July through November, was a patchwork of habitats where Red-winged Blackbird was the dominant species. A total of 39 species was observed here. Site 30, a roadside fringe surveyed in June and July, yielded observations of 35 species, of which Starlings were the most abundant.

Site 31 was sampled 15 times from June through November. A total of 45 species was identified in the open fields along Horton Road. The species richness declined in mid-July. Ring-billed Gulls were abundant in June and July, and Purple Martins were abundant through mid-August. Red-winged Blackbirds were relatively abundant through August and again in October.

Red-winged Blackbirds and Starlings were the most prevalent species in area 8. The many ecotones in this area produced a variety of bird species.

9. Haverstock Road-South Grasse River Road.

The last area consists of the roadside fringes of Haverstock Road and South Grasse River Road, and includes two small marsh areas along the Grasse River.

Sites 2, 3, 6, and 7 are included in this area (Tables 5, 6, 9, and 10). A total of 47 species was observed in 23 samples along Haverstock Road (site 2). As was typical of other open field areas, species richness declined in late July, after the breeding season had ended. Red-winged Blackbirds, Starlings, and Tree Swallows were the most abundant species at this station. Red-winged Blackbird was also the most abundant species in the marsh areas.

Bird Transects Conducted During Breeding Season.

Fourteen transects were surveyed during breeding season prior to July 10 (Table 1). A total of 95 species of birds was sighted. Species richness ranged from 35 for transect BT3 (open field) to 61 for transect BT6 (shrubland).

Transect BT1 was located in a shrubland in Robert Moses State Park. A total of 57 species was observed here. The most abundant species was American Robin (9/day), followed by American Redstart (6/day). Woodpeckers, flycatchers, warblers, and blackbirds were frequently encountered.

Transect BT2 passed through an open field and a shrubland near Polly's Gut. A total of 52 species was observed here. The most abundant species were Ring-billed Gull (15/day), American Robin (12/day), and American Redstart (10/day). Vireos and blackbirds were noted frequently.

Transect BT3, located in an open field near Polly's Gut, had the lowest species richness value (35). Ring-billed Gull was predominant (40/day), followed by Common Grackle (30/day) and Red-winged Blackbird (20/day). Most of the species sighted had low numbers.

Transect BT4 was located in an open field north of Snell Lock. A total of 43 species was observed here. The most abundant species were Ring-billed Gull (10/day) and Red-winged Blackbird (7/day).

Transect BT5 passed through a deciduous forest north of Eisenhower Lock. A total of 41 species was observed here, with Red-winged Blackbird (18/day), Common Grackle (6/day), and American Robin (6/day) being most abundant. Blackbirds were frequently observed.

A total of 61 species was sighted along transect BT6, which passed through shrubland north of Eisenhower Lock. The most abundant species were American Redstart (12/day), Red-winged Blackbird (10/day), Veery (9/day), Song Sparrow (9/day), and American Robin (9/day). Blackbirds, as a group, were quite common.

Transect BT7 passed through a deciduous forest near Robinson Creek. A total of 53 species was observed here, with Red-winged Blackbird (12/day) and Purple Martin (10/day) predominating.

A shrubland and open field along Horton Road provided the habitat for transect BT8, which has a species richness value of only 36. Red-winged Blackbird (22/day), Ring-billed Gull (14/day), and Song Sparrow (7/day) were the most abundant species.

Transect BT9 passed through a deciduous forest and shrubland near Donahue Road. A total of 46 species was observed here, with flycatchers and woodpeckers occurring frequently. Red-winged Blackbird (8/day), Yellow Warbler (7/day), and American Redstart (7/day) were the most abundant species.

A total of 48 species was found in the shrublands around Kinne Road (BT10). The most abundant species were Veery (8/day) and American Robin (6/day). Most species occurred in low numbers.

Transect BT11 had a habitat consisting of open fields, shrubland, and deciduous forest. It was located near Kinne Road. A total of 42 species was observed here. The most abundant species were Gray Catbird, Yellow Warbler, and Common Yellowthroat, all with an average of six per day.

The habitat of transect BT12, located south of Snell Lock, was open fields. Ring-billed Gulls were the most abundant of the 42 species sighted here, averaging ten per day. Blackbirds were frequently sighted, with Red-winged Blackbirds averaging nine per day.

Transect BT13, located south of the Grasse River in an open field, ranked second in species richness with 60. Several species were very abundant, with Ring-billed Gull averaging 50 per day and Red-winged Blackbird averaging 18 per day. Tree Swallows (10/day) and Starlings (10/day) were also abundant.

A total of 56 species was observed along transect BT14, which passed through shrublands and open fields near Reynolds Metal. Ring-billed Gulls were overwhelmingly dominant here (1000/day). Other abundant species were Starling (22/day) and Red-winged Blackbird (10/day).

Overall, Ring-billed Gulls and Red-winged Blackbirds were the most abundant species in the open fields and in the transects which crossed both fields and shrubland. American Robin, Veery, and American Redstart were most prevalent in shrublands, while Red-winged Blackbirds were the most abundant species in the deciduous forest areas.

Eleven species occurred along all 14 transects. Among the species in this group which were also relatively abundant (an average of four or more per day per transect) were Red-winged Blackbird, American Robin, Starling, Yellow Warbler, Common Yellowthroat, and Song Sparrow. A total of 13 other species occurred along 11 or more transects.

Several species were found along only one transect, and averaged one or less individuals sighted per day. Among these species, which can be considered rare in the Massena area during the 1979 breeding season, were Black Duck, Sharp-shinned Hawk, Virginia Rail, Commom Gallinule, Eastern Bluebird, Yellow-throated Vireo, and Mourning Warblers.

Bird Survey Areas Upriver from Massena

A total of 140 sites was surveyed along the St. Lawrence River between Massena and Tibbets Point. These sites have been grouped into 13 corridors for discussion. The corridors were selected for their proximity to potential dredging areas.

Hopson's Bay Corridor

The first corridor consists of survey sites 33 and 34 and is located near Hopson's Bay (Table 34). Extensive dredging could occur in the channel from Richards Point to Eisenhower Lock. Siltation could settle in the bays along this area.

Surveys were conducted on 25 sampling dates in this corridor (both sites were sampled on nine of these dates) between June 6, 1979 and November 20, 1979. A total of 49 species was observed here. Species richness was highest in June and July. A few species of waterfowl and gulls were sighted here, but open field species predominated. Red-winged Blackbirds were relatively abundant in June and July, and Killdeer were regularly encountered in June, July, and October.

Massena Town Beach Corridor

The Massena Town Beach corridor includes survey site 35 (Table 35). Extensive dredging and siltation could occur in this area.

Surveys were conducted in this corridor on 19 sampling dates between June and November. A total of 42 species was observed here. Species richness was high only in June. Ring-billed Gulls were observed in low numbers on most dates, while swallows, robins, blackbirds, and sparrows were frequently observed in June. Forty Snow Buntings were sighted on November 8.

Massena Country Club Corridor

Survey site 36 comprised the Massena Country Club corridor (Table 36). Some dredging could occur around this site.

This area was surveyed six times - three each in June and November. Starling was the most abundant of the 39 species sighted here, averaging 51.5 per occurrence. Ring-billed Gull ranked second in abundance and was the dominant species in November. Killdeer and Purple Martin were also relatively abundant, averaging 16.0 and 11.7 per occurrence, respectively.

Wilson Hill Game Management Area

This corridor, encompassing the area around Wilson Hill Island, was represented by five survey sites (40-43 and 47). Surveys were conducted on 26 dates from June through November (Table 37), with anywhere from one to five locations being surveyed on each date. A total of 105 species-far more than was found anywhere else along the river-was observed in this area. Species richness was very high in June, and high in July

and again in late October and early November, during the fall migration period.

Waterfowl were plentiful in late July and August, and throughout October and November. A total of 21 species of ducks was observed at these sites. The most abundant of these species were American Wigeon (209.5/occurrence), Redhead (137.5/occurrence), Greater Scaup (118.6/occurrence), Hooded Merganser (104.5/occurrence), and Ring-necked Duck (101.1/occurrence). Three species of ducks were observed in concentrations exceeding 500 (Gadwall, American Wigeon, and Ring-necked Duck). Hooded Mergansers were present in numbers exceeding 200 between November 6 and November 13. Canada Geese were also abundant, averaging 439.4 per occurrence, and exceeding 500 on ten sampling dates (over 1000 on four of these dates). On October 25, 75 American Coots were sighted. This species was rarely seen elsewhere on the river.

A large flock of Evening Grosbeaks (numbering around 230) was observed on November 13. This was by far the largest concentration of this species found anywhere along the river. Several species were frequently sighted from June through August. Among these were Eastern Kingbird, Starling, Red-winged Blackbird, Common Grackle, and Song Sparrow. Species frequently occurring throughout the sampling period were Ring-billed Gull, Common Flicker, Common Crow, Black-capped Chickadee, and American Robin.

This area is important for a variety of activities of many species. It is a prime breeding area for several species, and is heavily utilized as a waterfowl staging area. Very little dredging is projected for the Wilson Hill Island Area, but the birds in this area also utilize other areas near potential dredging sites.

Canada Island-Murphy Island Corridor

Survey sites 52 and 55-58 were included in the Canada Island-Murphy Island Corridor (Table 38). Surveys were conducted on 22 dates from June through November. A total of 33 species was observed in this area. Species richness was low, with a maximum of 11 species on one date. Ring-billed Gull was the most frequently observed species here.

The islands in this corridor are relatively undisturbed and provide important avian habitat. However, a turning basin for larger ships could potentially be located in this area, cutting off part of Canada Island. In addition, extensive dredging would be needed along this stretch of the river to expand the capacity to a 36-foot depth.

Lakeshore Drive Corridor

The Lakeshore Drive corridor extends along the Canadian side of the St. Lawrence River near Ogden Island, and includes survey site 59.

Extensive dredging could occur in this area of the river. This corridor was sampled twice on August 9 and 29. Eleven species, none of which were very abundant, were observed along this corridor (Table 39).

Iroquois Dam Corridor

Survey site 62, comprising the Iroquois Dam corridor, was sampled on 15 dates between June and November (Table 40). There are extensive areas of potential dredging in this corridor.

Species richness was quite high along this corridor (64 species), with the peak occurring in August. The most abundant species were Rock Dove (55.0/occurrence) and Starling (48.8/occurrence), while Barn Swallow and Red-winged Blackbird were also quite common. Eight Double-crested Cormorants were sighted on October 5. Cliff swallows were observed nesting on the dam.

Galop Island Corridor

The Galop Island corridor was located in an area where extensive dredging is likely to occur. Survey sites 64-69 were included in this corridor. Surveys were conducted on ten dates from August through November (Table 41). A total of 25 species was noted; August 29 was the only survey date when more than four species were sighted (16 were observed). Most of the birds observed in this area were sighted on August 29, when Red-winged Blackbird was the most abundant species (300).

Jacques Cartier State Park Corridor

Survey sites 92-94 are included in the Jacques Cartier State Park corridor. Some dredging may occur near the islands and shoals in this area. Surveys were taken on 14 dates between June and November (Table 42). A total of 48 species was seen, with richness being highest in June and lowest in July.

Ring-billed Gull was the dominant species at this site in July, October, and November, averaging 83.3 per occurrence. Seven species of ducks utilized the area in October and November, with the largest flock containing 350 Black Scoters on November 9.

American Island Corridor

The American Island Corridor consisted of sites 97 and 98. Some dredging may occur in this area. Surveys were conducted between July and November on 14 dates (Table 43). A total of 43 species, including eight species of ducks, was noted in this corridor. Ring-billed Gull was the most abundant species, averaging 70.5 per occurrence.

Oak Point Corridor

Oak Point corridor included several overlooks, roadside fringes, and numerous islands and shoals near Oak Point. Dredging is potentially

extensive in this area. Survey sites 100-111 are included in this corridor. These 12 sites were surveyed on a total of 32 dates between June and November (Table 44). The richness value of 83 for this corridor was second only to the Wilson Hill Game Management Area.

Waterfowl were common in this area from September through November. Fifteen species of ducks were observed, with the most abundant being Black Scoter (127.0/occurrence), Common Merganser (69.3/occurrence), and Red-breasted Merganser (42.5/occurrence). A flock of 120 Canvasbacks was observed on November 11. A variety of waterfowl broods were seen between June and September. Common Loons were relatively frequent, averaging 12.6 per occurrence and exceeding 17 on four occasions.

Waterbirds were also abundant along this corridor. Ring-billed Gulls averaged 69.3 per occurrence, and, along with Herring Gulls, were observed on all survey dates. Common Terns were observed feeding in fairly large numbers (42.5/occurrence) until their departure in October.

Other fairly abundant species which were frequently observed were Blue Jay, Purple Martin, Tree Swallow, and Bank Swallow. Several species of blackbirds were abundant in June and July in the roadside fringe areas.

Blind Bay Corridor

The Blind Bay corridor, which encompasses several potential dredging

areas, includes sites 114-118 and 171. These sites were surveyed on 24 dates between June and November (Table 45). A total of 64 species was observed, with peak richness occurring in July.

Waterfowl were common from July through October, with eight species of ducks being observed. The most abundant duck species were Blue-winged Teal (69.7/occurrence), Mallard (42.5/occurrence), and American Wigeon (34.7/occurrence). Canada Geese were relatively abundant in October.

Several species of gulls were common from July through October. The shoals west of Indian Chief Islands were inhabited by one of the largest Common Tern colonies found on the river in 1979. Great Blue Herons were frequently seen feeding in the area throughout the survey and Common Loons were relatively abundant in October.

Eagle Wing Island Group

The Eagle Wing Island Group, consisting of site 159, is located near a potential dredging site. This site was sampled three times between June 26 and July 21 (Table 46). Only five species were counted, with Ring-billed Gull (281.7/occurrence) and Common Tern (212.0/occurrence) being the only abundant species. This island represented one of the largest Common Tern colonies seen on the river in 1979.

SUMMARY AND CONCLUSIONS

Bird studies were conducted along the international section of the St. Lawrence River from June through November 1979. The primary effort was concentrated in the Massena area.

One-kilometer transects were surveyed during the breeding season and all adult birds observed were recorded. Colonial waterbird populations were surveyed later in the breeding season.

Waterbird and waterfowl counts were conducted from overlooks, and surveys were conducted for roadside fringe areas and specific habitats such as marshes and woodlots.

Bird species were also recorded during mammal trapping surveys.

The locks area around Massena is a patchwork of deciduous forest, open fields, and shrublands. Red-winged Blackbird was the most abundant species, but sparrows, Starlings, and American Robins also occurred frequently. The islands in the area were occupied by gulls and terns. Some of these islands are important nesting sites. The open water areas are important staging areas for Canada Geese and migratory ducks, particularly large flocks of Common Mergansers, Redheads, Ring-necked Ducks, and Black Ducks. They are also used as feeding areas for the many gulls and Tree Swallows found in the area.

Ring-billed Gull and Red-winged Blackbird were the most abundant species in the open fields during the breeding season. American Robin, Veery, and American Redstart were the most prevalent species in shrublands, and Red-winged Blackbird was the most abundant species in the deciduous forest areas during breeding season.

A variety of upriver areas where dredging may occur were surveyed throughout the sampling season. Several areas were important as waterfowl migration staging areas. Among these were the Wilson Hill Game Management Area, islands and shoals near Jacques Cartier State Park, the American Island corridor, the Oak Point corridor, and the Blind Bay corridor. Several species of gulls were prevalent along the river, many being concentrated near potential dredging sites. Common Terns utilized several of the islands in the area. Common Loons were frequently observed in October in the Oak Point and Blind Bay corridors.

LITERATURE CITED

Maxwell, G.R. II and G.A. Smith. 1978. Bird studies along the St. Lawrence River during late spring and summer 1978. Rice Creek Biological Field Station. SUNY College at Oswego, Oswego, New York. 105pp.

168

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

24th Ed., Aug. 31/74

14761

(formerly LS 11)

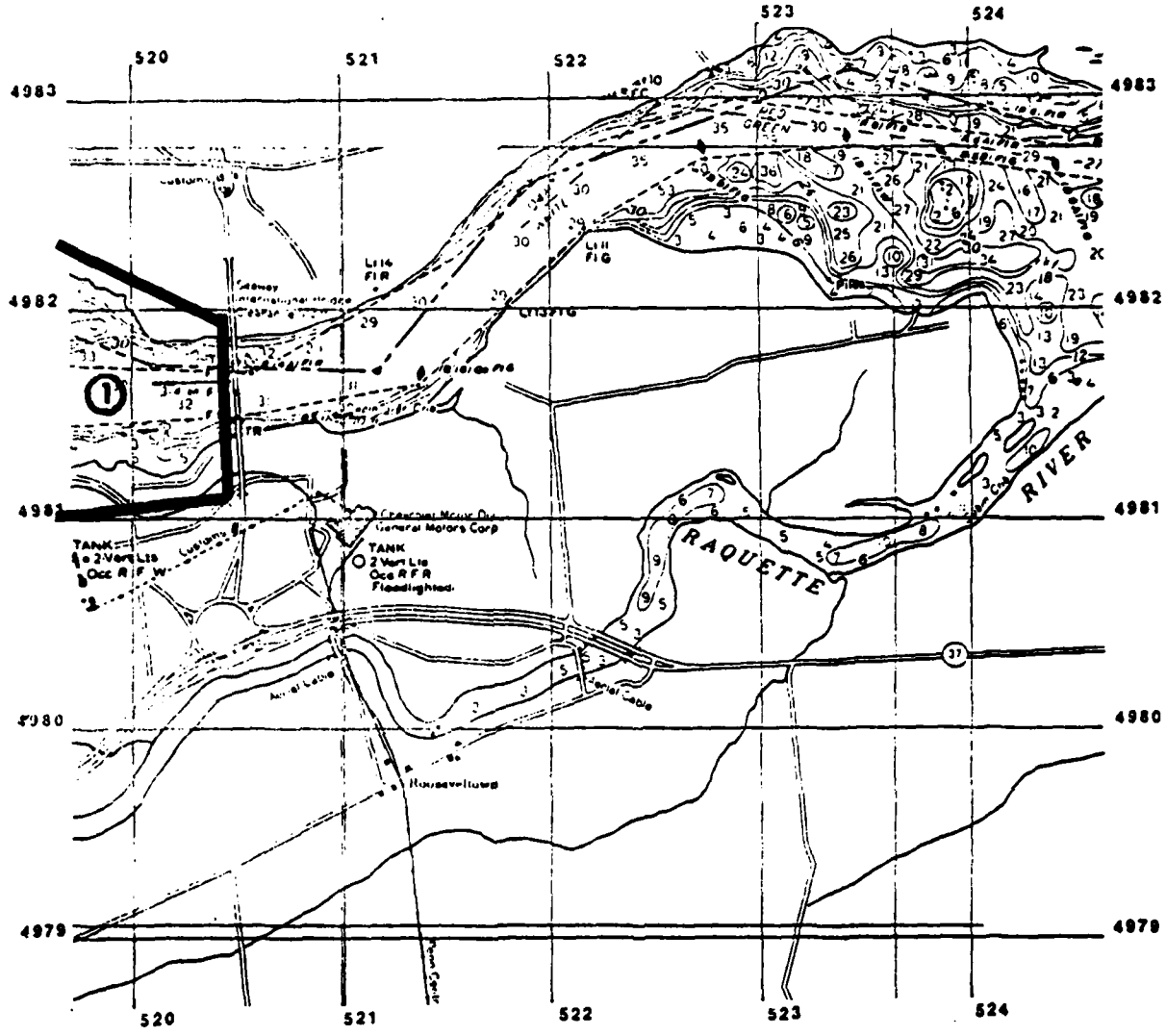


Fig. 1. Location of part of bird survey site 1.

A

COUNTERPART TO
HOGANSBURG

SOUNDINGS IN FEET

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

24th Ed., Aug. 31/74

14761

(formerly LS 11)

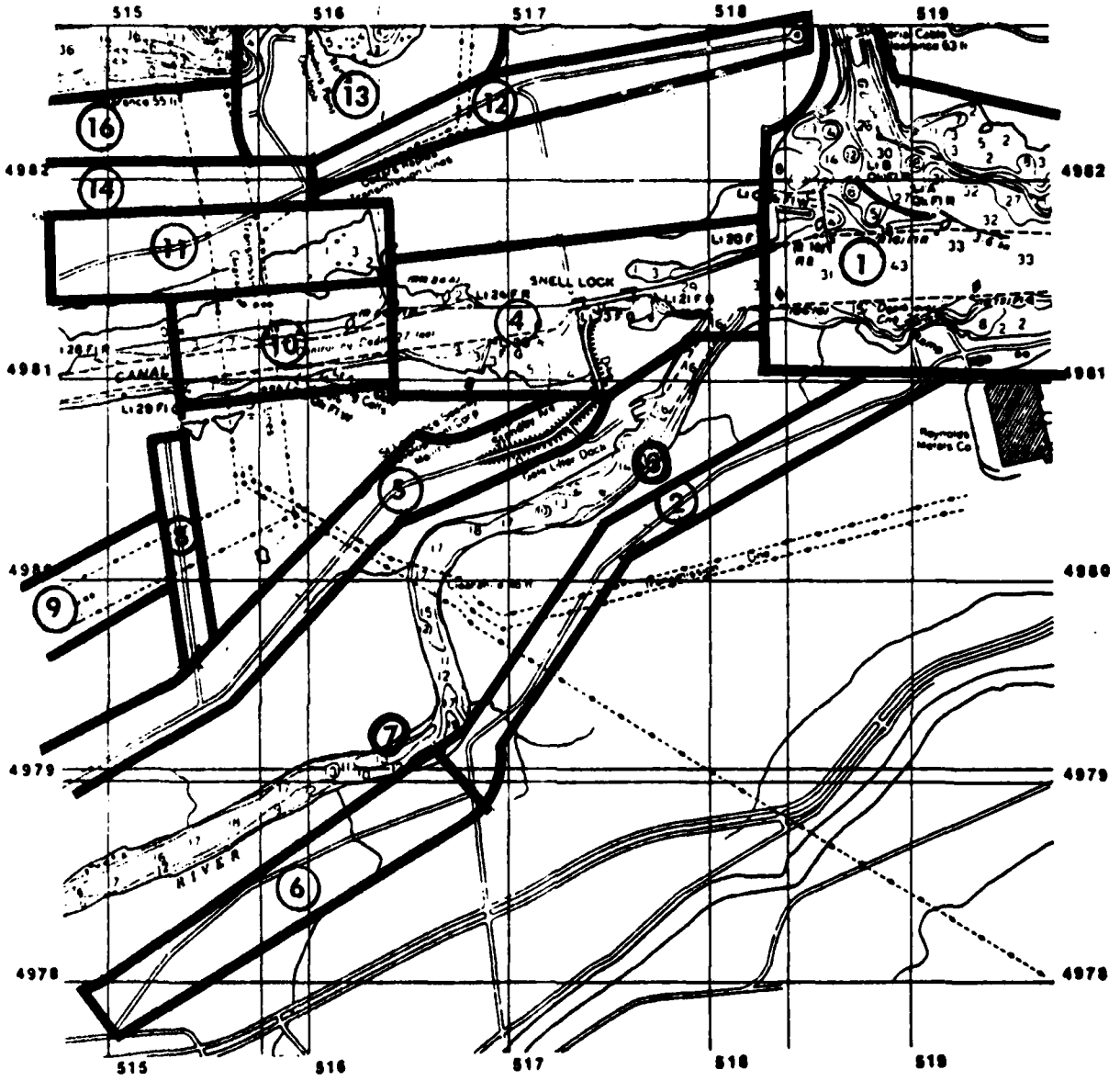


Fig. 2. Locations of bird survey sites 2-4, 6-8, 10-13, and parts of sites 1, 5, 9, 14, and 16.

B

COUNTERPART TO
RAQUETTE RIVER

SOUNDINGS IN FEET

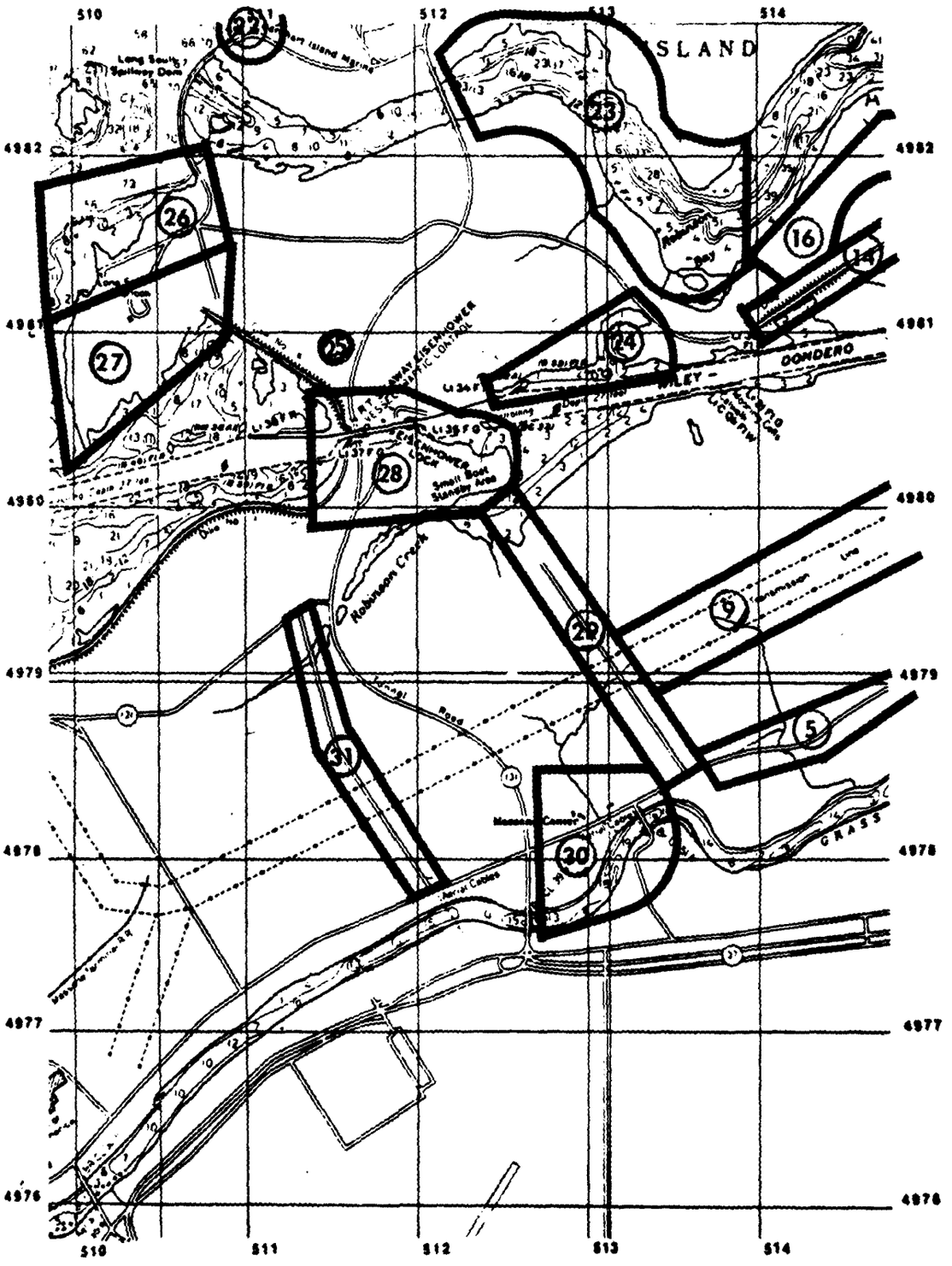
160

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

24th Ed., Aug. 31/74

14761

(formerly LS 11)



A

COUNTERPART TO
RAQUETTE RIVER

SOUNDINGS IN FEET

Fig. 3. Locations of bird survey sites 23-31 and parts of sites 5, 9, 14, 16, and 22.

180

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

14761
(formerly LS 11)

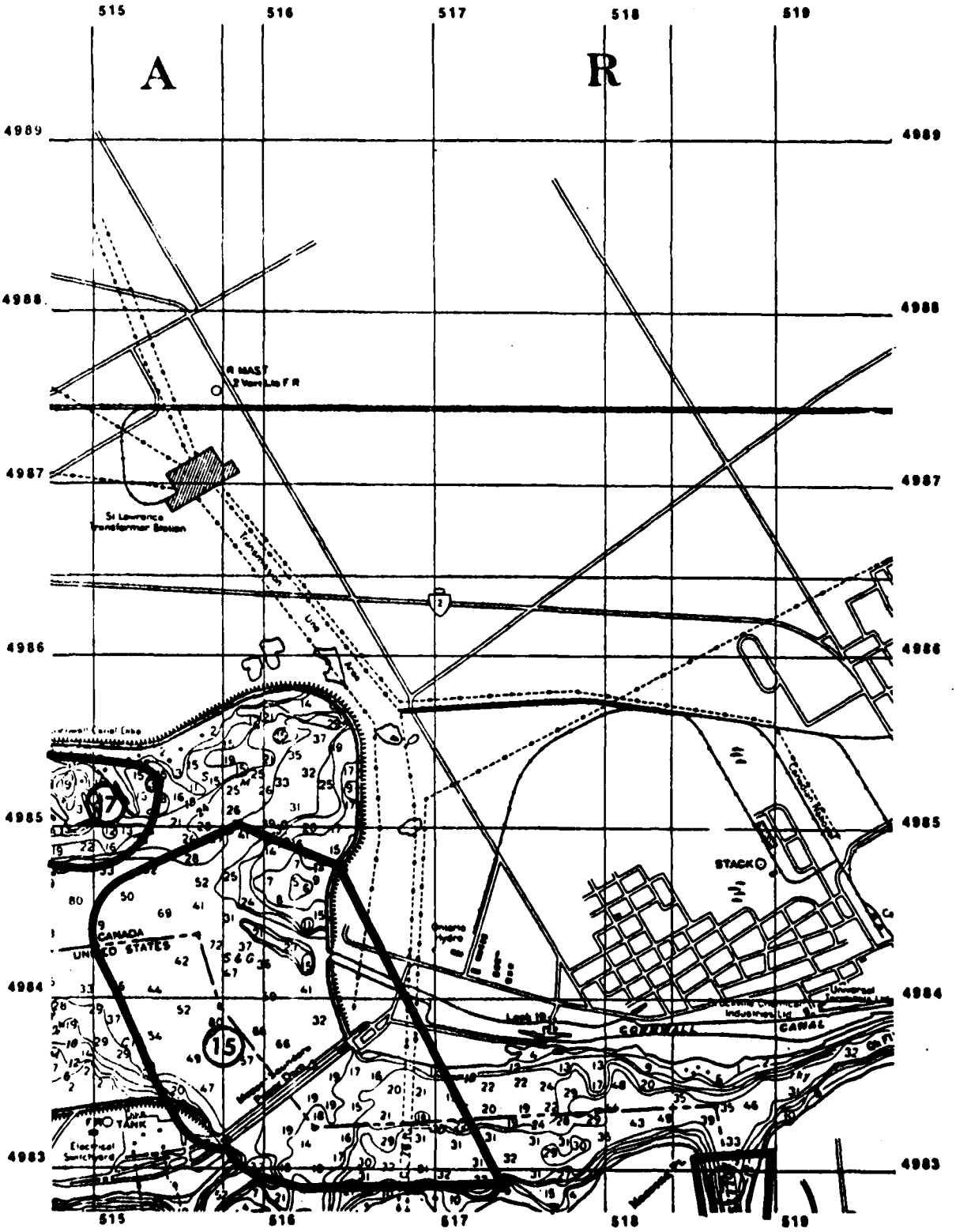


Fig. 4. Locations of bird survey site 15 and parts of sites 1 and 17.

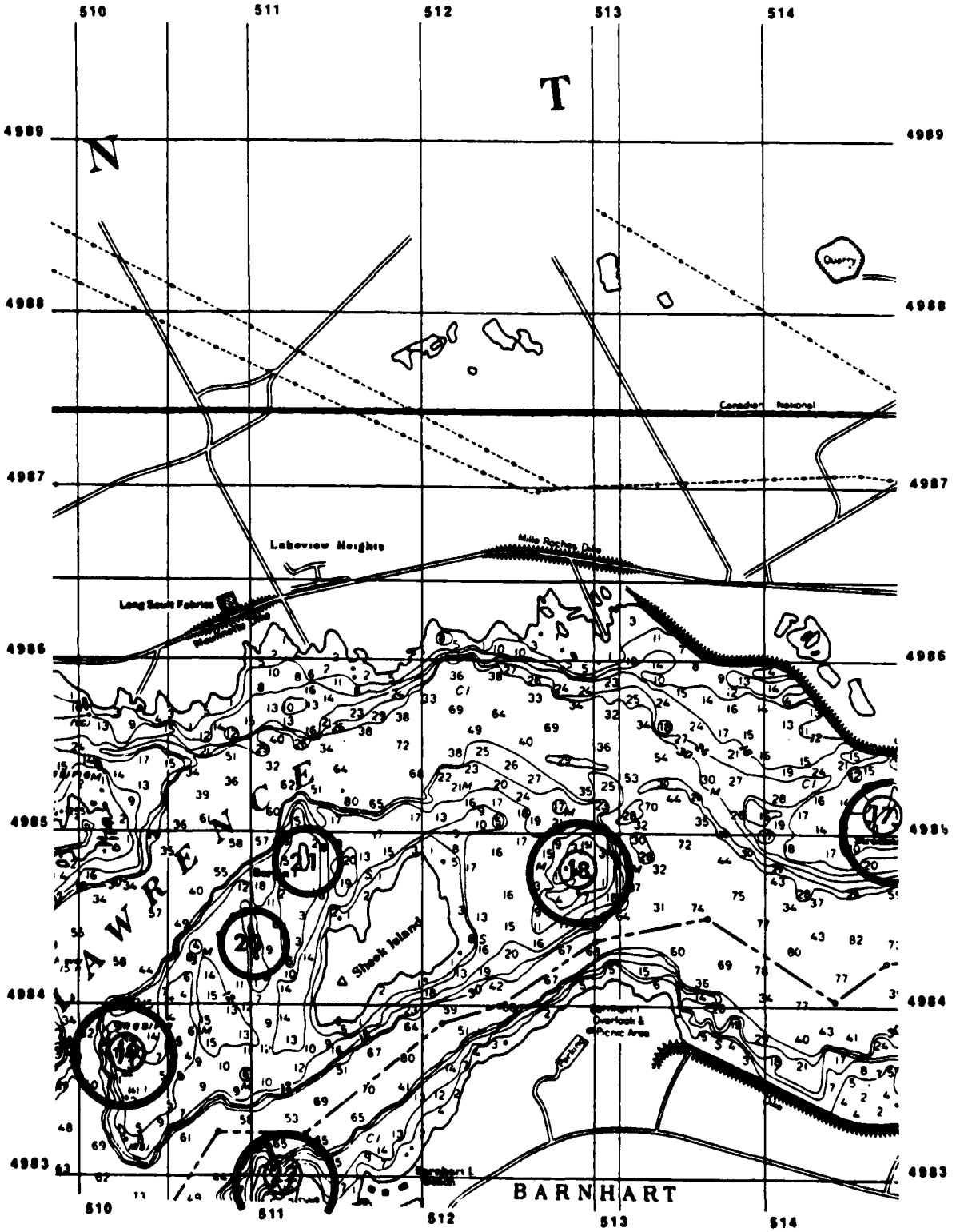
178

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

24th Ed., Aug. 31/74

14761

(formerly LS 11)



NOT FOR NAVIGATIONAL USE

COUNTERPART TO
CORNWALL WEST

SOUNDINGS IN FEET

C

Fig. 5. Locations of bird survey sites 18-21 and parts of sites 17 and 22.

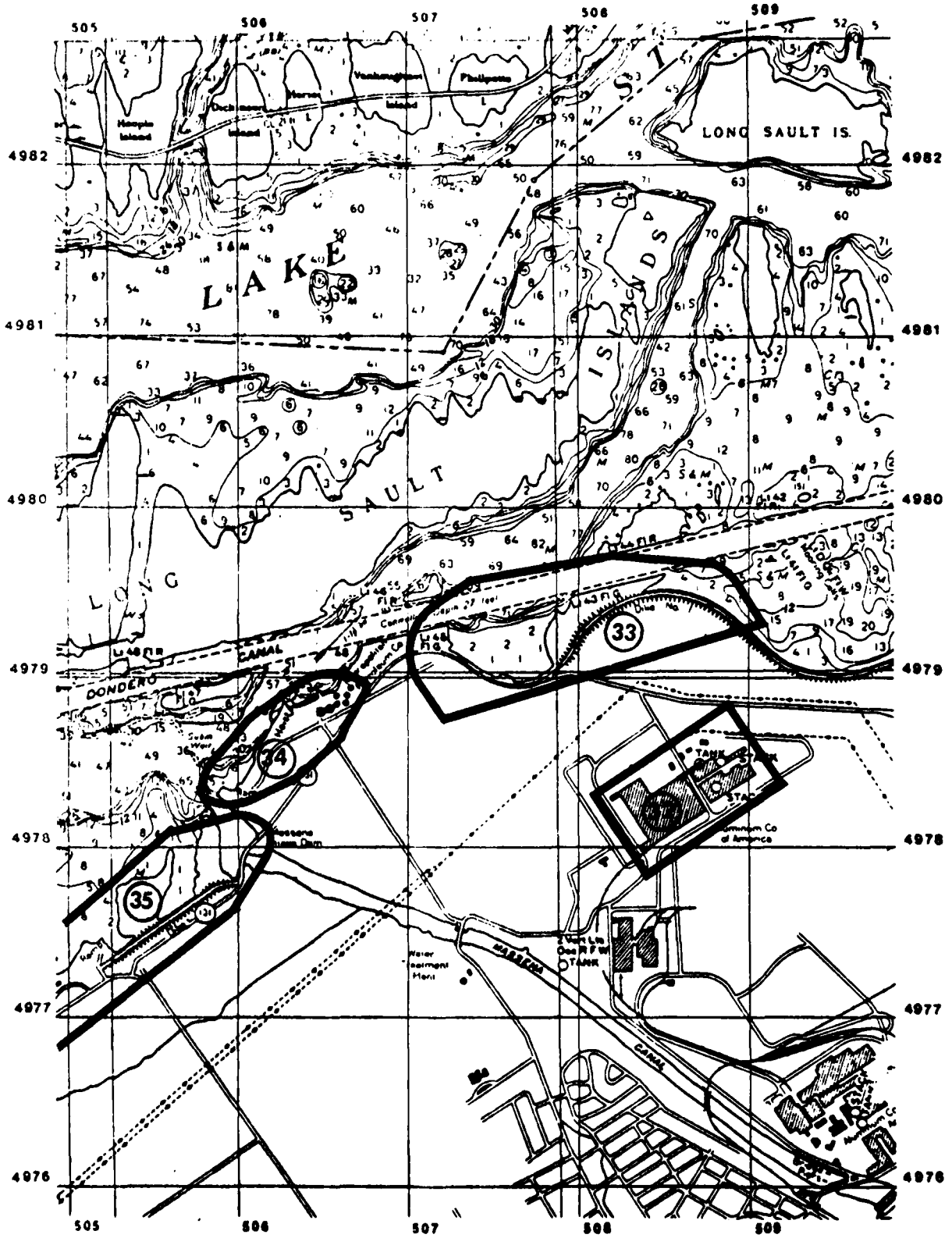
154

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

24th Ed., Aug. 31/74

14761

(formerly LS 11)



B

COUNTERPART TO MASSENA

SOUNDINGS IN FEET

Fig. 6. Locations of bird survey sites 32-34 and part of site 35.

152

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

24th Ed., Aug. 31/74 23rd Ed., Aug. 31/74

14761 (formerly LS 11) **14762** (formerly LS 12)

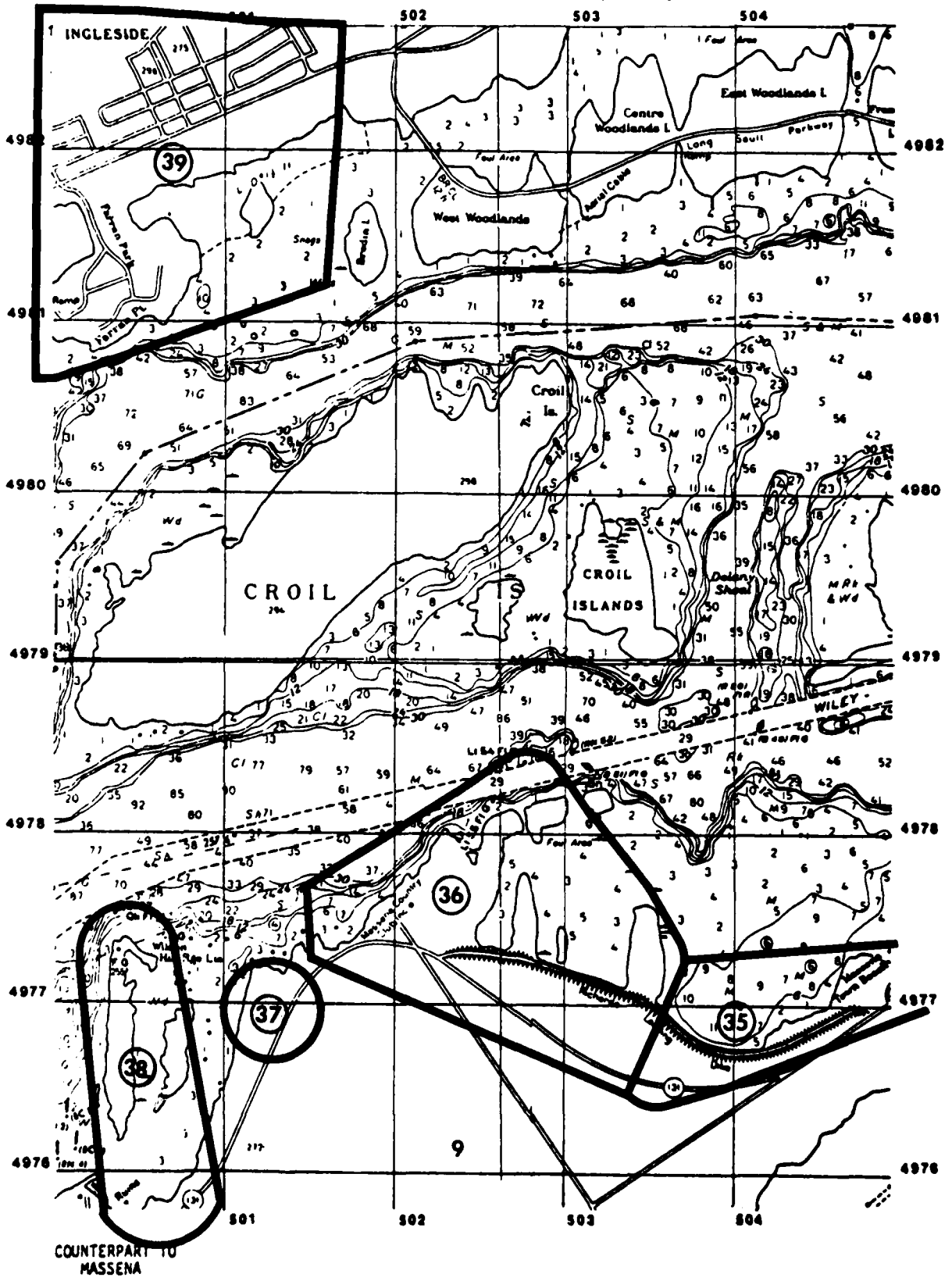


Fig. 7. Locations of bird survey sites 36-39 and part of site 35.

U. S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

23rd Ed., Aug. 31/74
14762
(formerly LS 12)

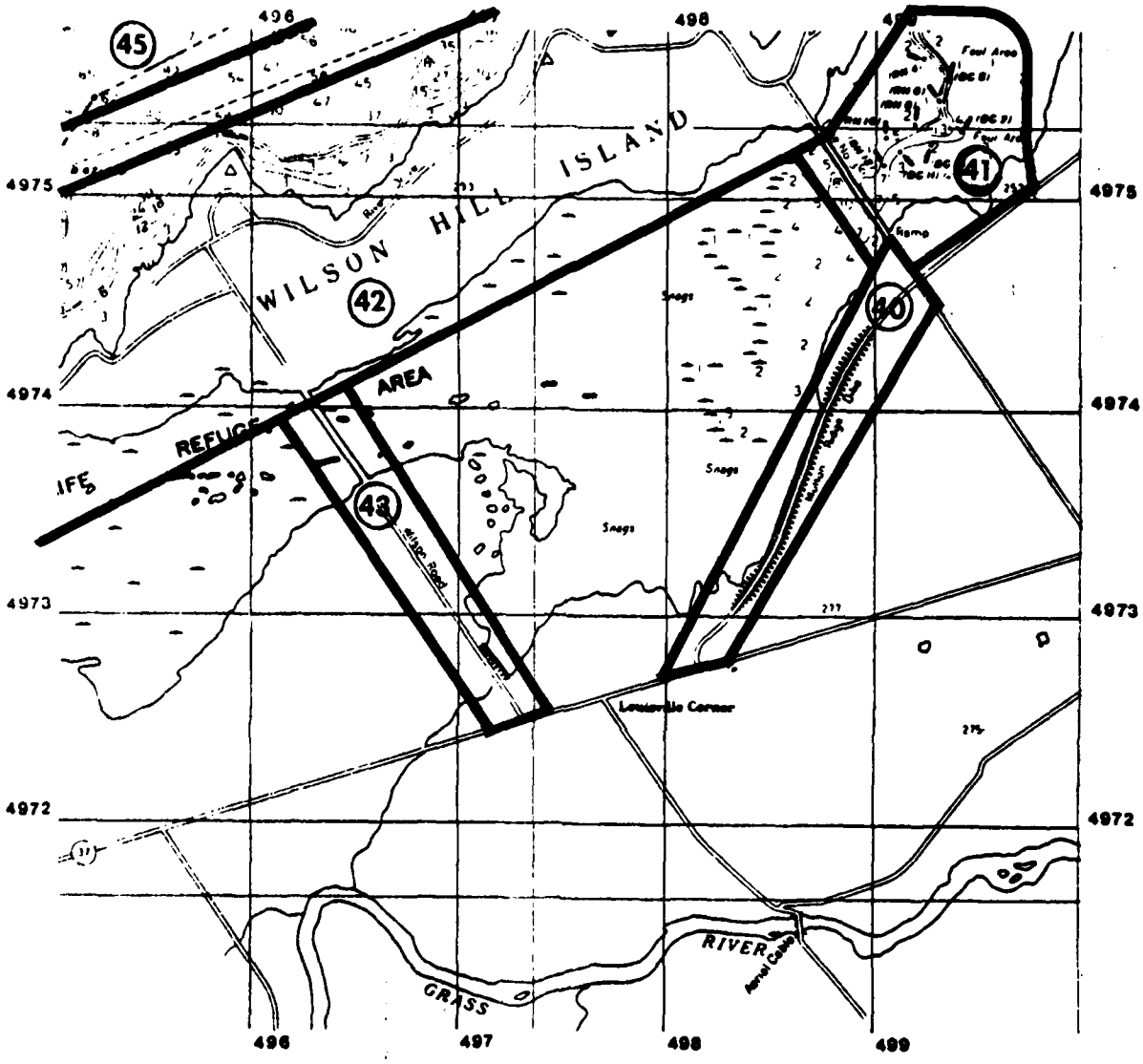


Fig. 8. Locations of bird survey sites 40, 41, and 43, and parts of sites 42 and 45.

D

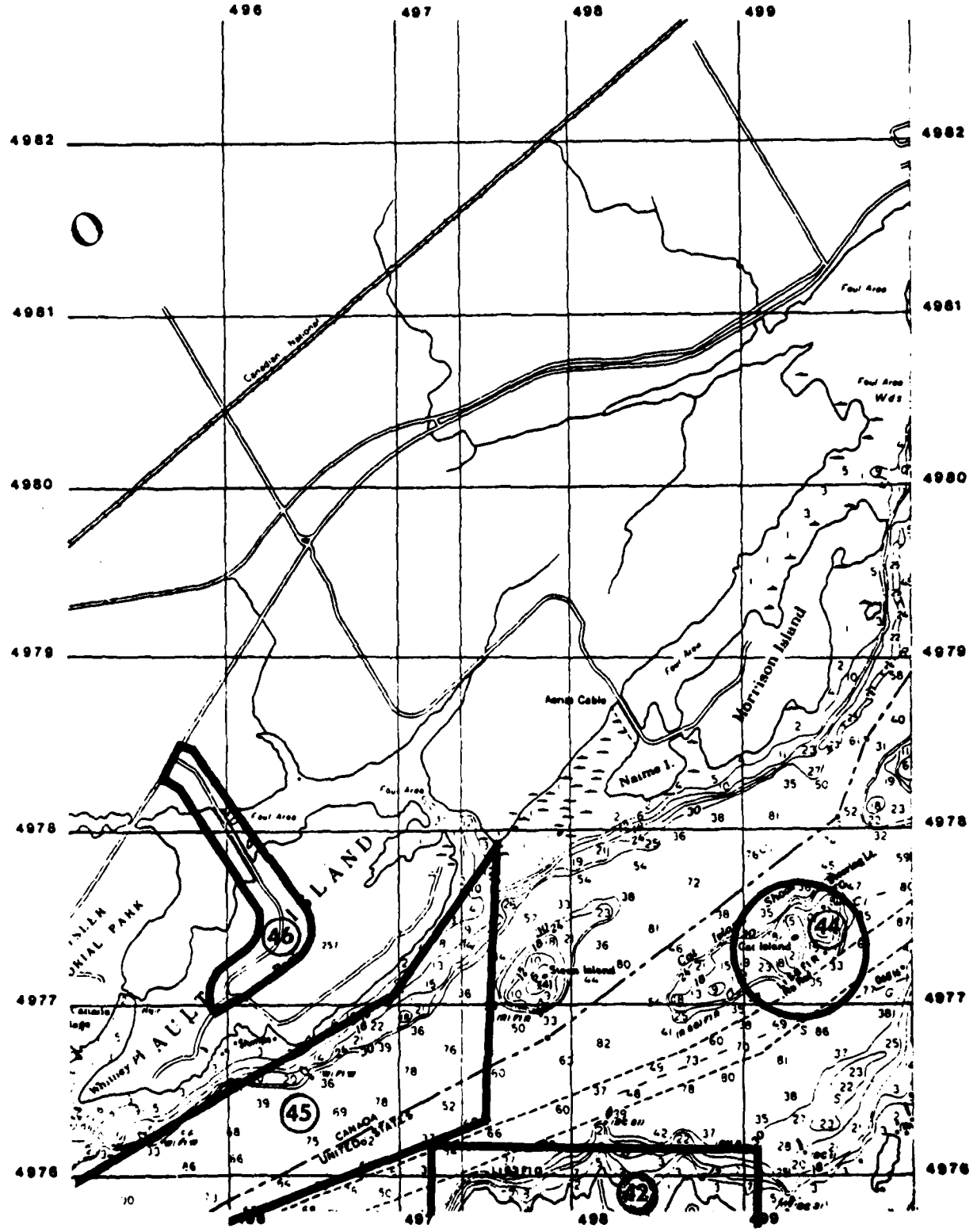
COUNTERPART TO
LOUISVILLE

SOUNDINGS IN FEET

146

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

23rd Ed., Aug. 31/74
14762
(formerly LS 12)



B

COUNTERPART TO
LOUISVILLE

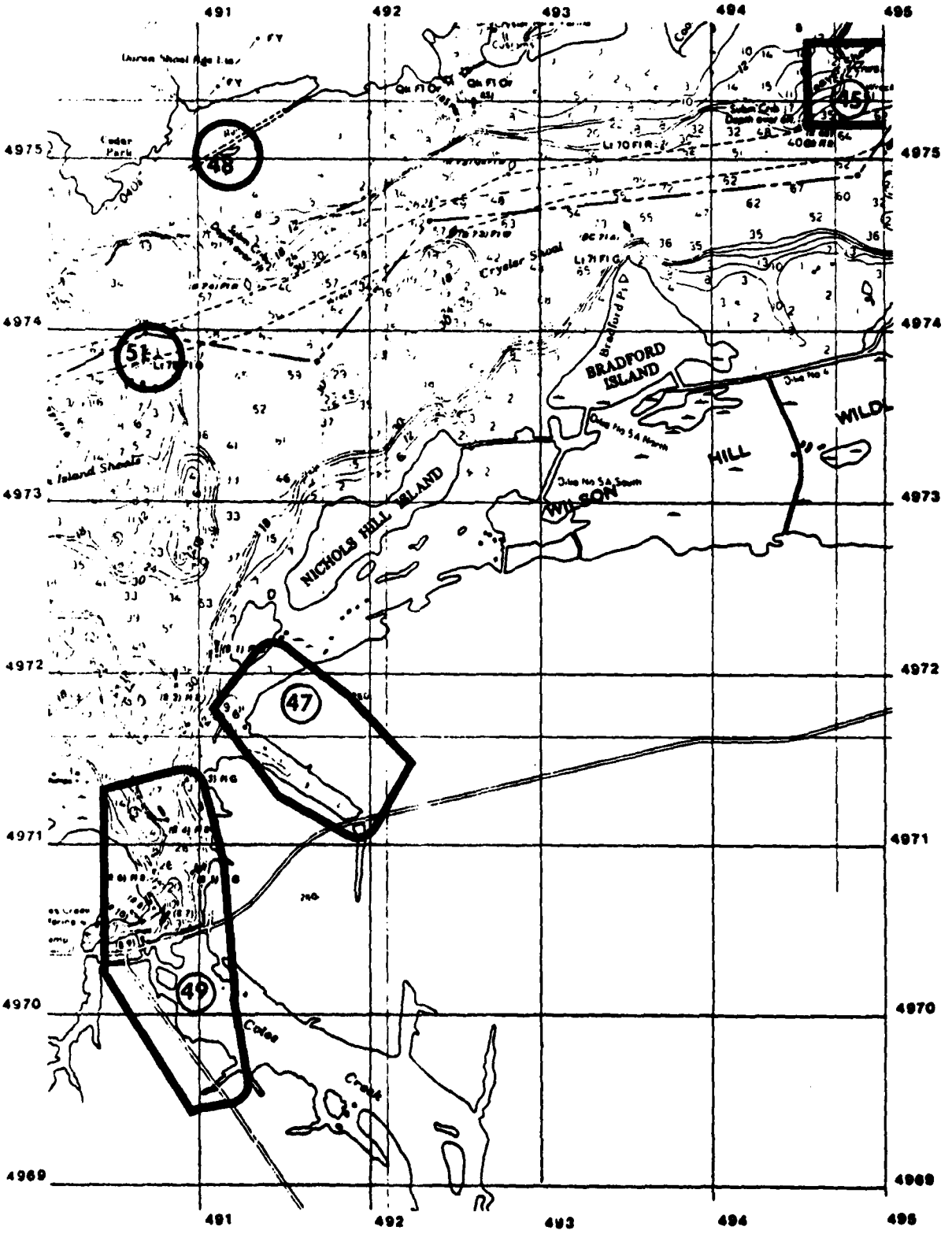
SOUNDINGS IN FEET

Fig. 9. Locations of bird survey sites 44 and 46 and parts of sites 42 and 45.

148

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

23rd Ed., Aug. 31/74
14762
(formerly LS 12)



C

COUNTERPART TO
LOUISVILLE

SOUNDINGS IN FEET

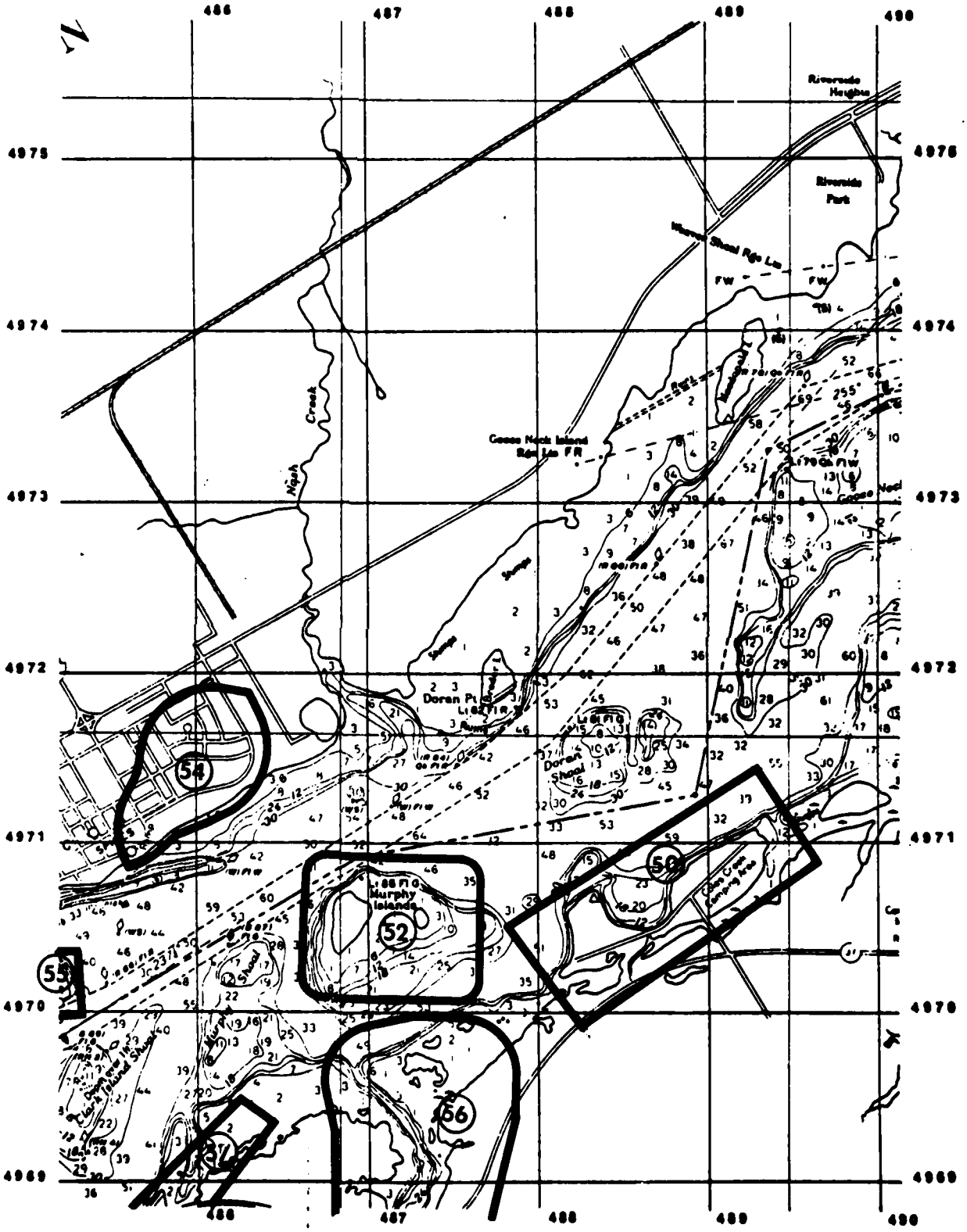
Fig. 10. Locations of bird survey sites 47-49, 51, and part of site 45.

142

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

23rd Ed., Aug. 31/74

14762
(formerly LS 12)



D

COUNTERPART TO MORRISBURG

SOUNDINGS IN FEET

Fig. 11. Locations of bird survey sites 50, 52, and 54, and parts of sites 55, 56, and 57.

U. S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

23rd Ed., Aug. 31/74
14762
(formerly LS 12)

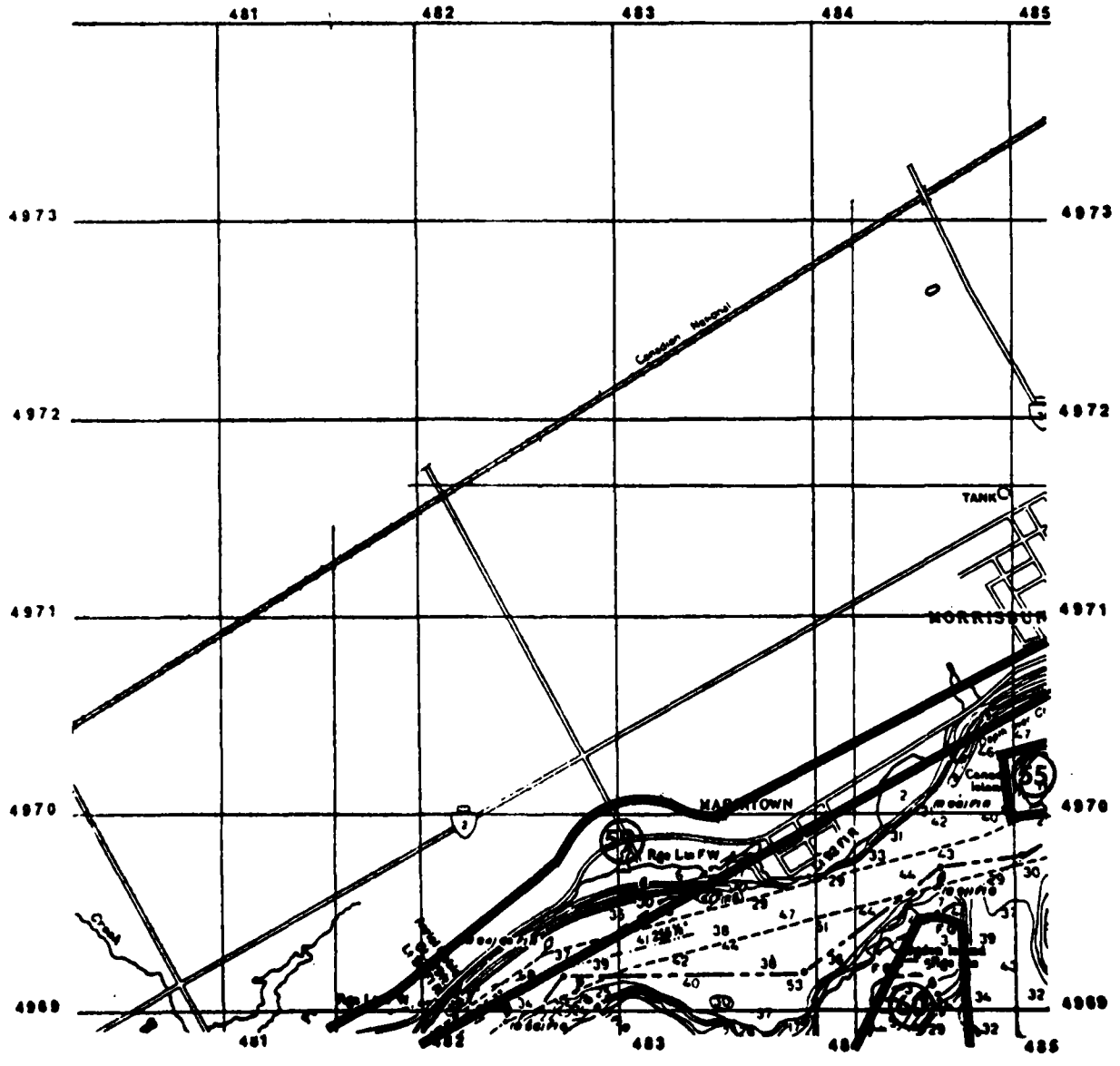


Fig. 12. Locations of parts of bird survey sites 55, 59, and 60.

136

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

23rd Ed., Aug. 31/74
14762
(formerly LS 12)

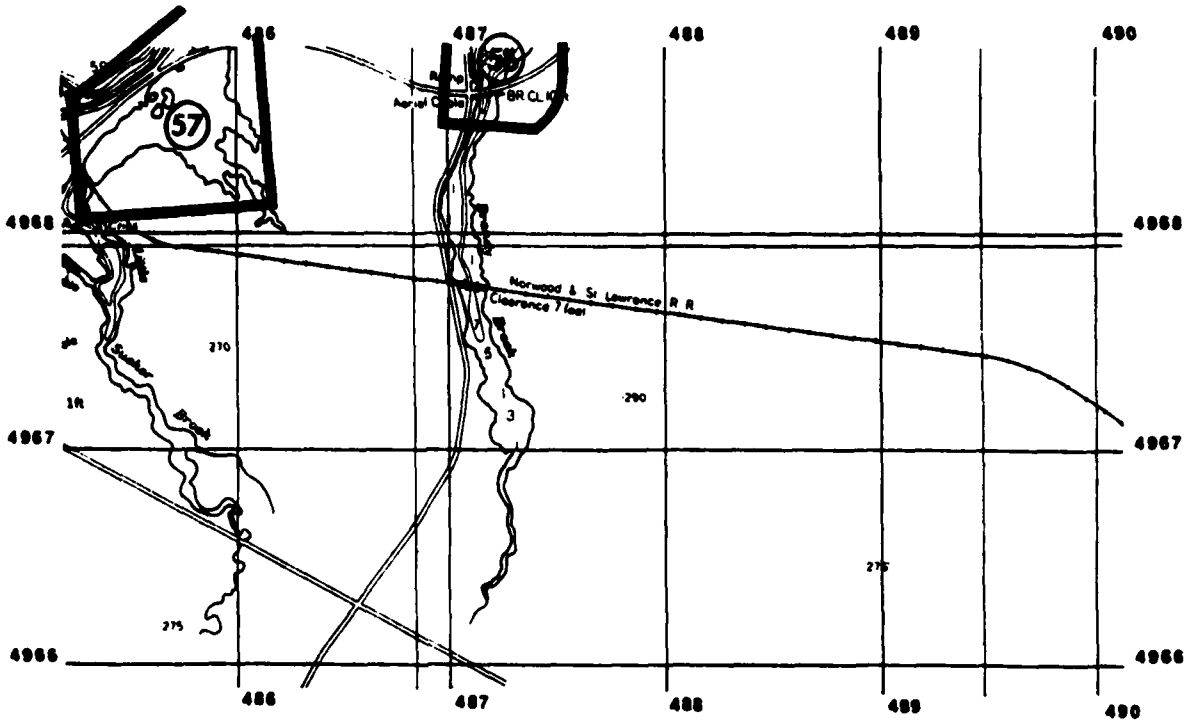


Fig. 13. Locations of parts of bird survey sites 56 and 57.

NOT FOR NAVIGATIONAL USE

B

COUNTERPART TO
MADDINGTON

SOUNDINGS IN FEET

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

23rd Ed., Aug. 31/74
14762
(formerly LS 12)

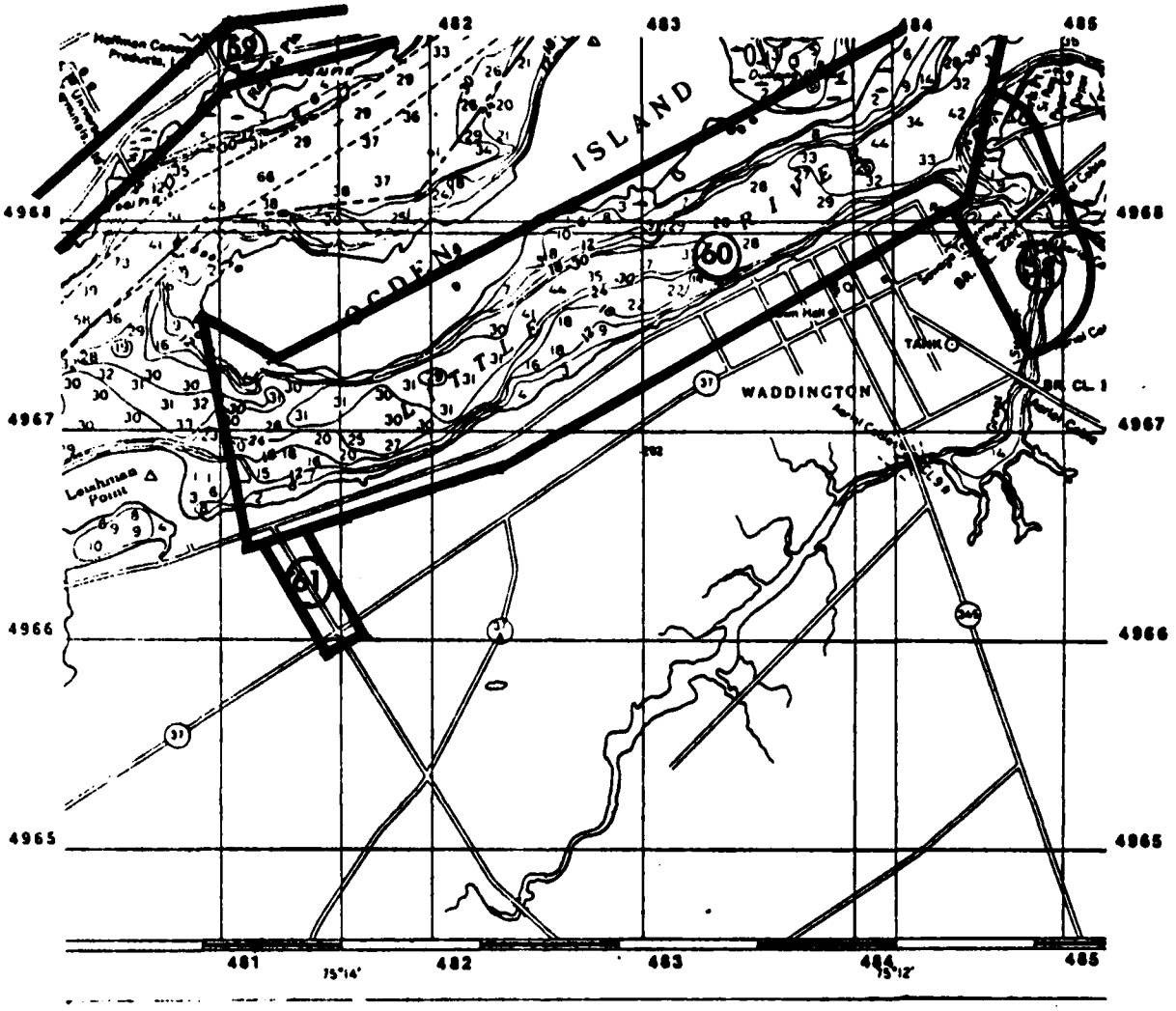


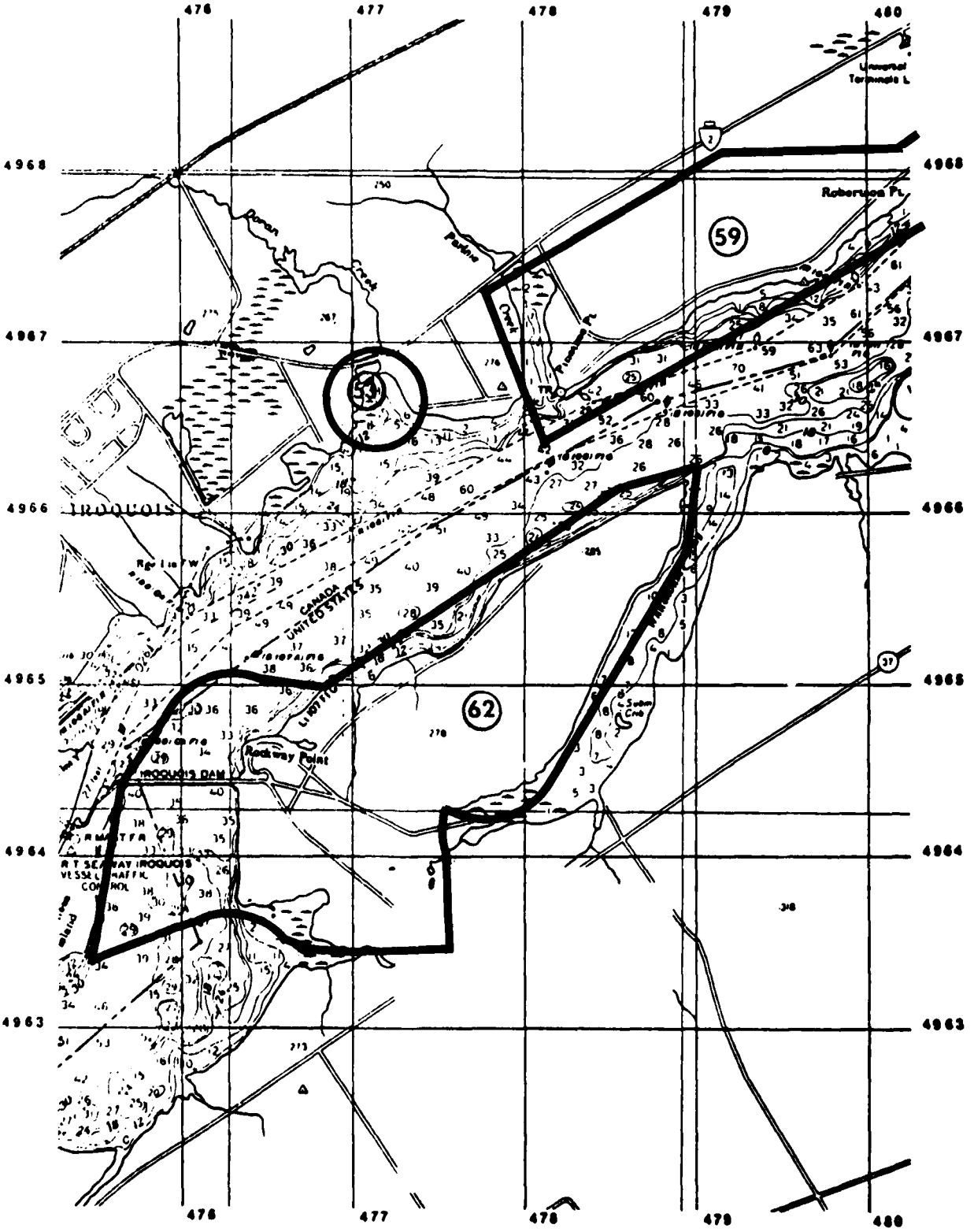
Fig. 14. Locations of bird survey sites 58 and 61 and parts of sites 59 and 60.

A

COUNTERPART TO WADDINGTON

SOUNDINGS IN FEET

U. S. DEPARTMENT OF COMMERCE
NOAA–NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226



B

COUNTERPART TO
SPARROWHAWK POINT

SOUNDINGS IN FEET

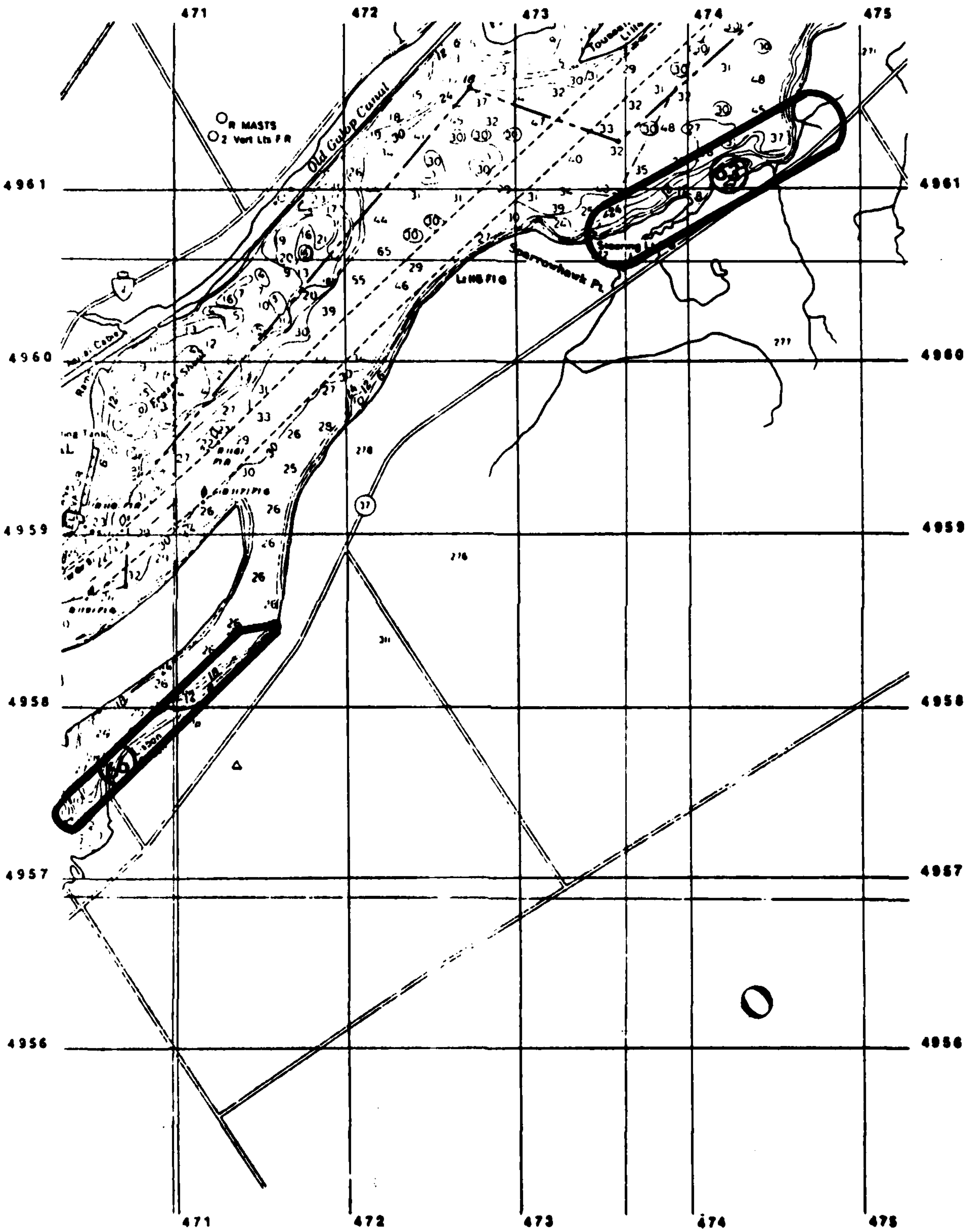
Fig. 15. Locations of bird survey sites 53, 62, and part of site 59.

130

U. S. DEPARTMENT OF COMMERCE
NOAA–NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226

25th Ed., April 12/74

13



C

COUNTERPART TO
SPARROWHAWK POINT

SOUNDINGS IN FEET

Fig. 16. Locations of bird survey sites 63 and 66.

U. S. DEPARTMENT OF COMMERCE
NOAA–NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226

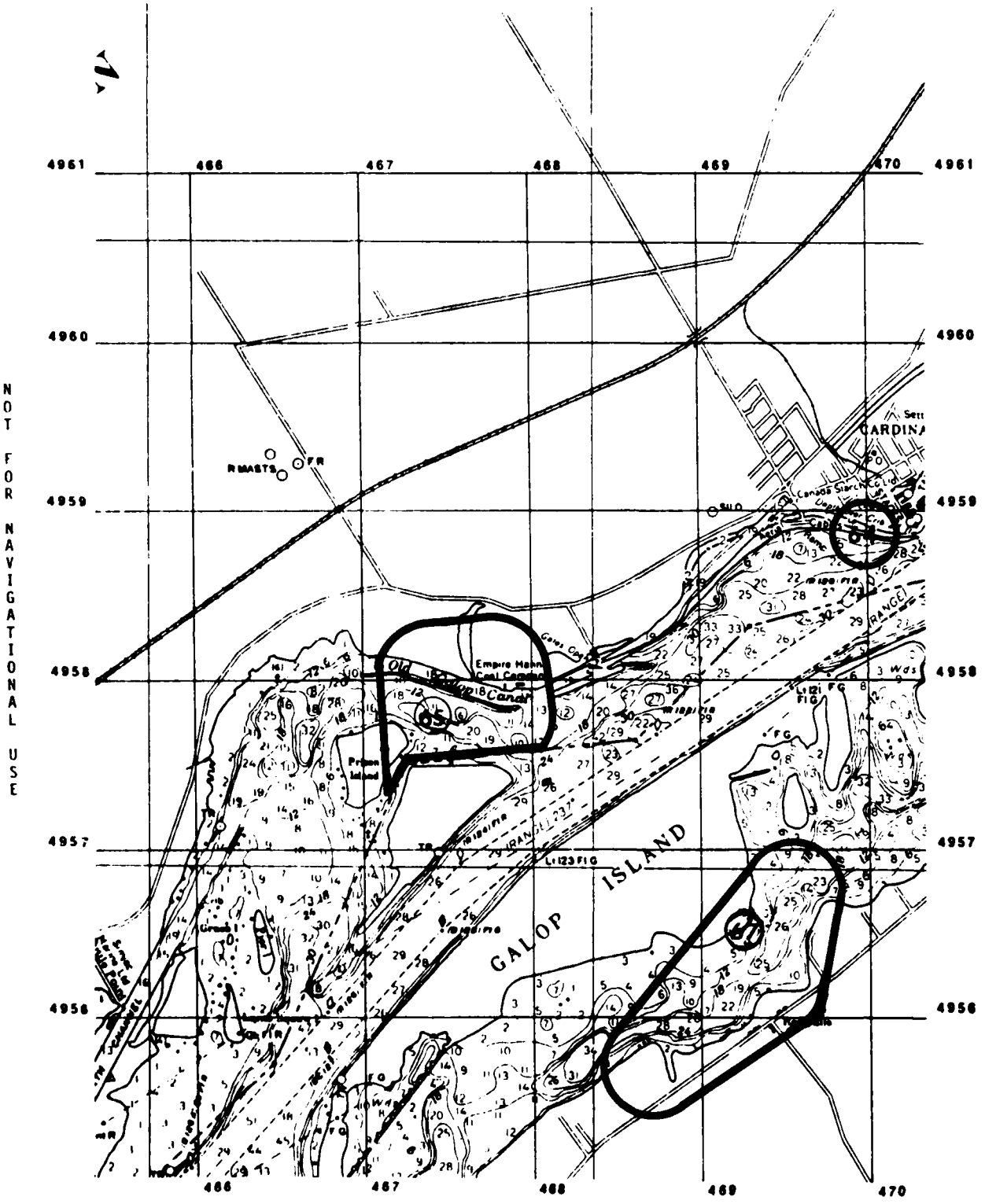


Fig. 17. Locations of bird survey sites 64, 65, and 67.

U. S. DEPARTMENT OF COMMERCE
NOAA–NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226

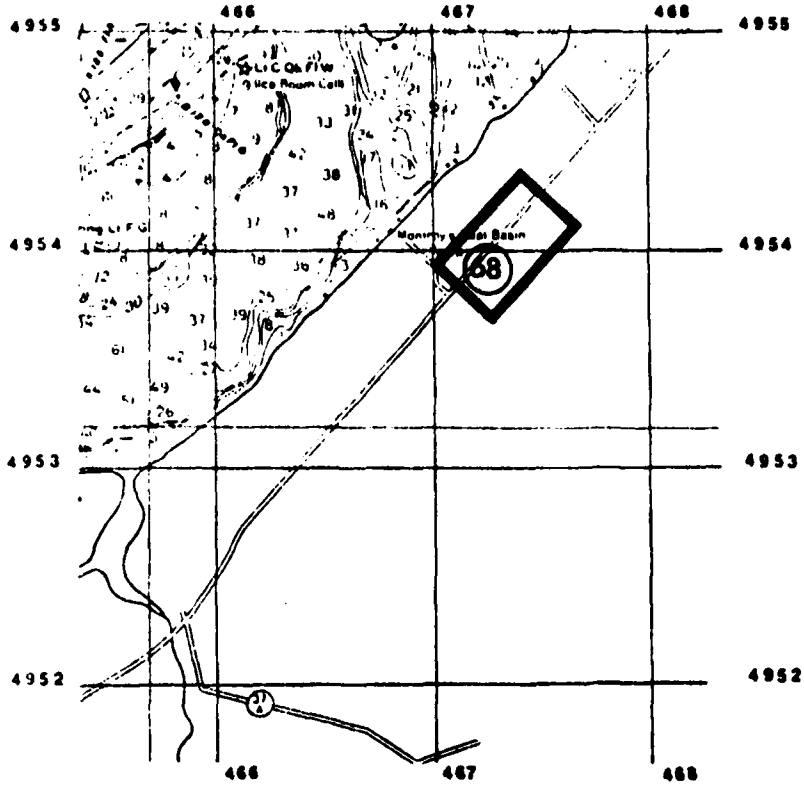


Fig. 18. Location of bird survey site 68.

B

COUNTERPART TO
OGDENSBURG EAST

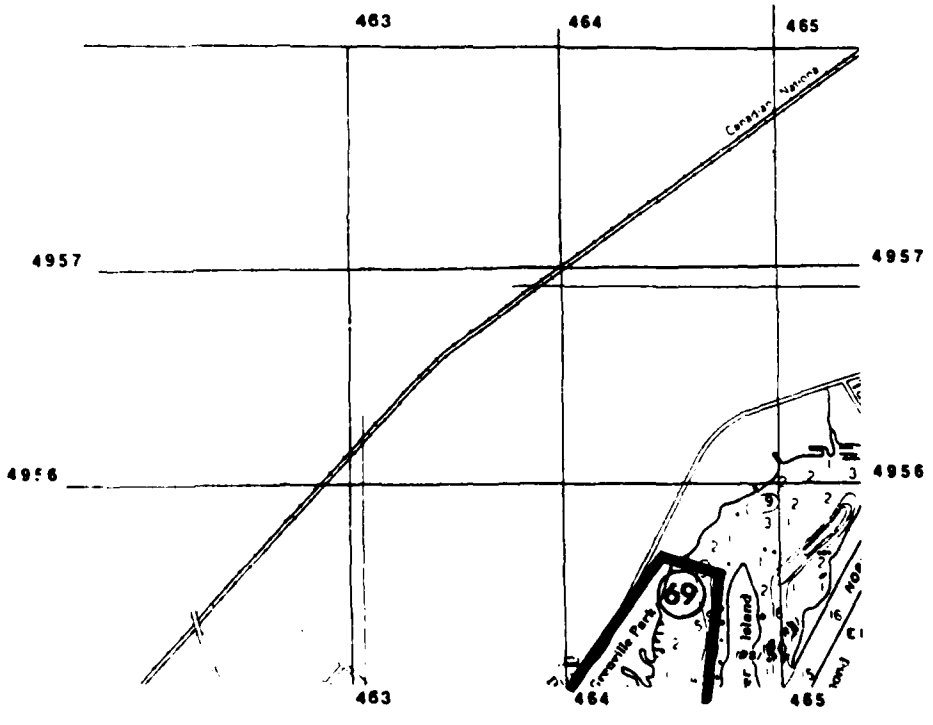
SOUNDINGS IN FEET

122

U. S. DEPARTMENT OF COMMERCE
NOAA–NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U.S. Courthouse, Detroit, Michigan 48226

25th Ed., April 12/74
13

NOT FOR NAVIGATIONAL USE



C

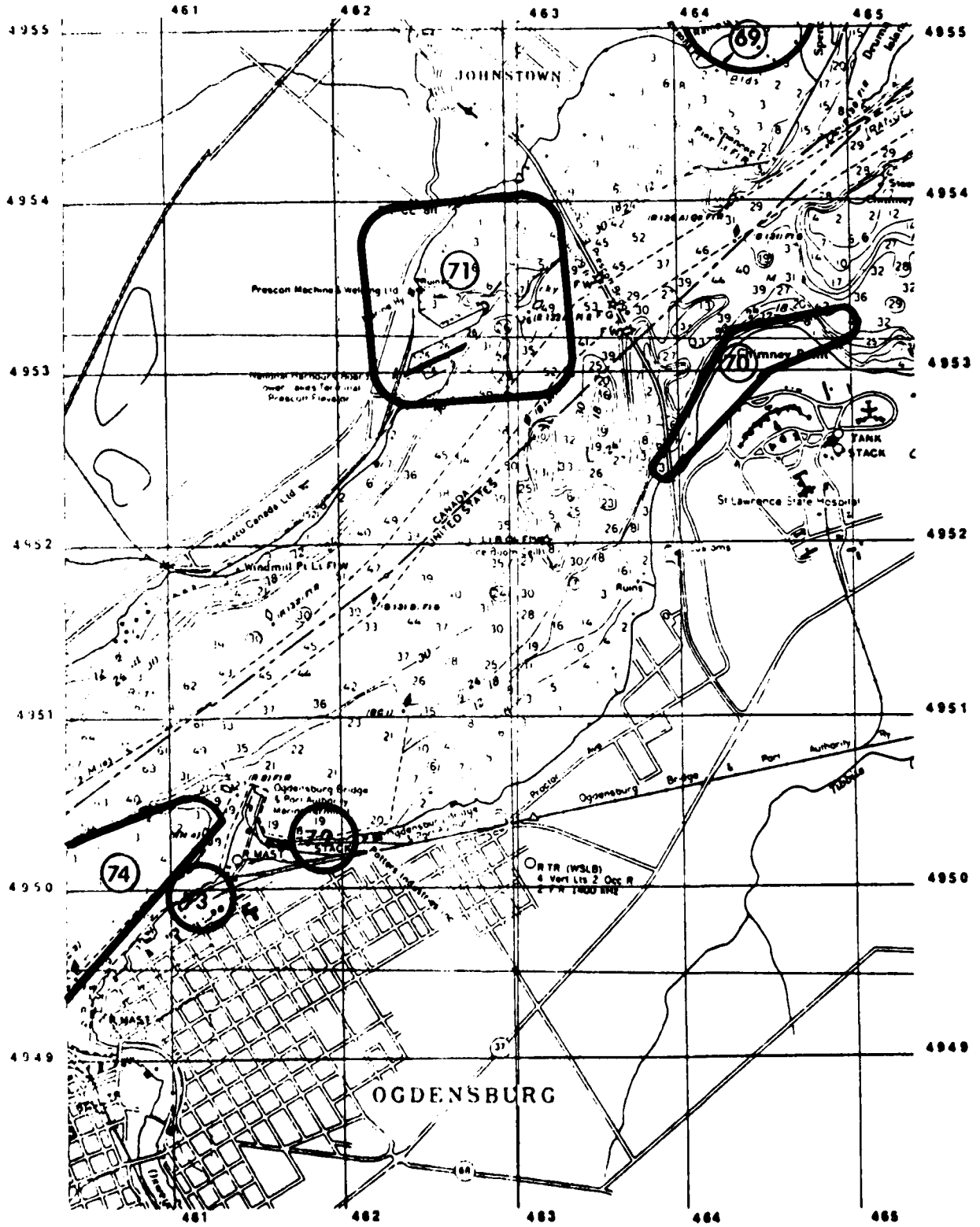
COUNTERPART TO
RED MILLS

SOUNDINGS IN FEET

Fig. 19. Location of part of bird survey site 69.

U. S. DEPARTMENT OF COMMERCE
NOAA - NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226

25th Ed., April 12/74
13



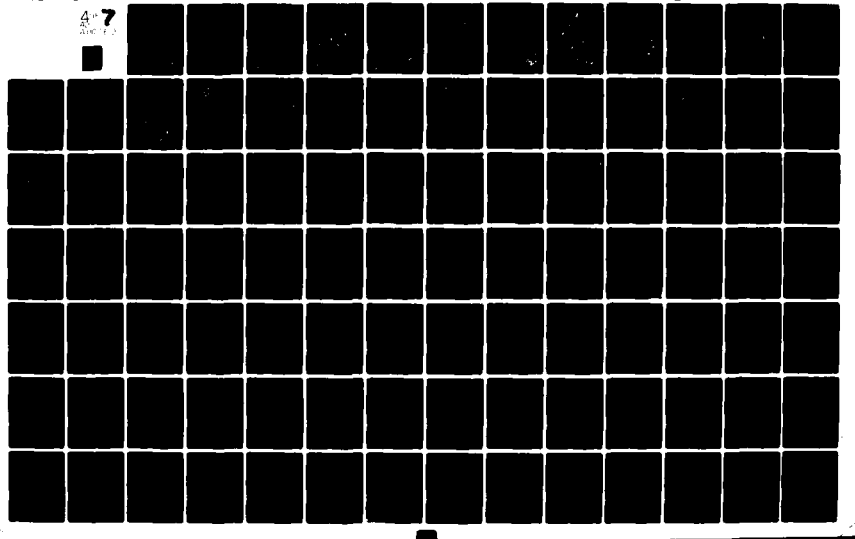
COUNTERPART TO
OGDENSBURG EAST

SOUNDINGS IN FEET

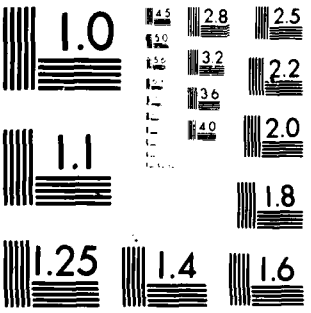
Fig. 20. Locations of bird survey sites 70-73 and parts of sites 69 and 74.

AD-A110 760 FISH AND WILDLIFE SERVICE CORTLAND NY F/G 6/3
BIOLOGICAL SURVEY ALONG THE ST. LAWRENCE RIVER FOR THE ST. LAWR--ETC(U)
1979

UNCLASSIFIED NL

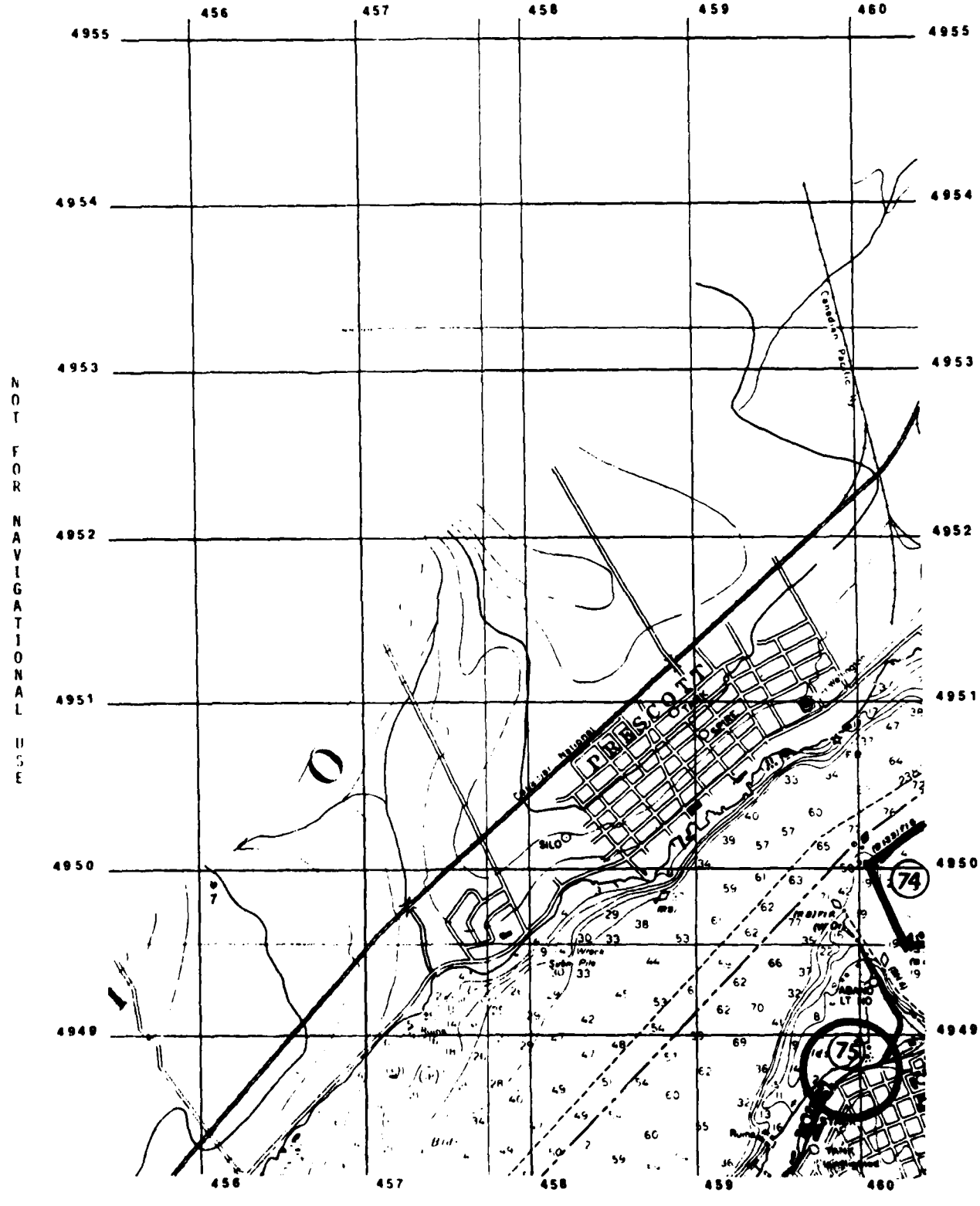


A110 76



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

U. S. DEPARTMENT OF COMMERCE
NOAA-NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226



NOT FOR NAVIGATIONAL USE

B

COUNTERPART TO
OGDENSBURG WEST

SOUNDINGS IN FEET

Fig. 21. Locations of bird survey site 75 and part of site 74.

U. S. DEPARTMENT OF COMMERCE
NOAA-NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226

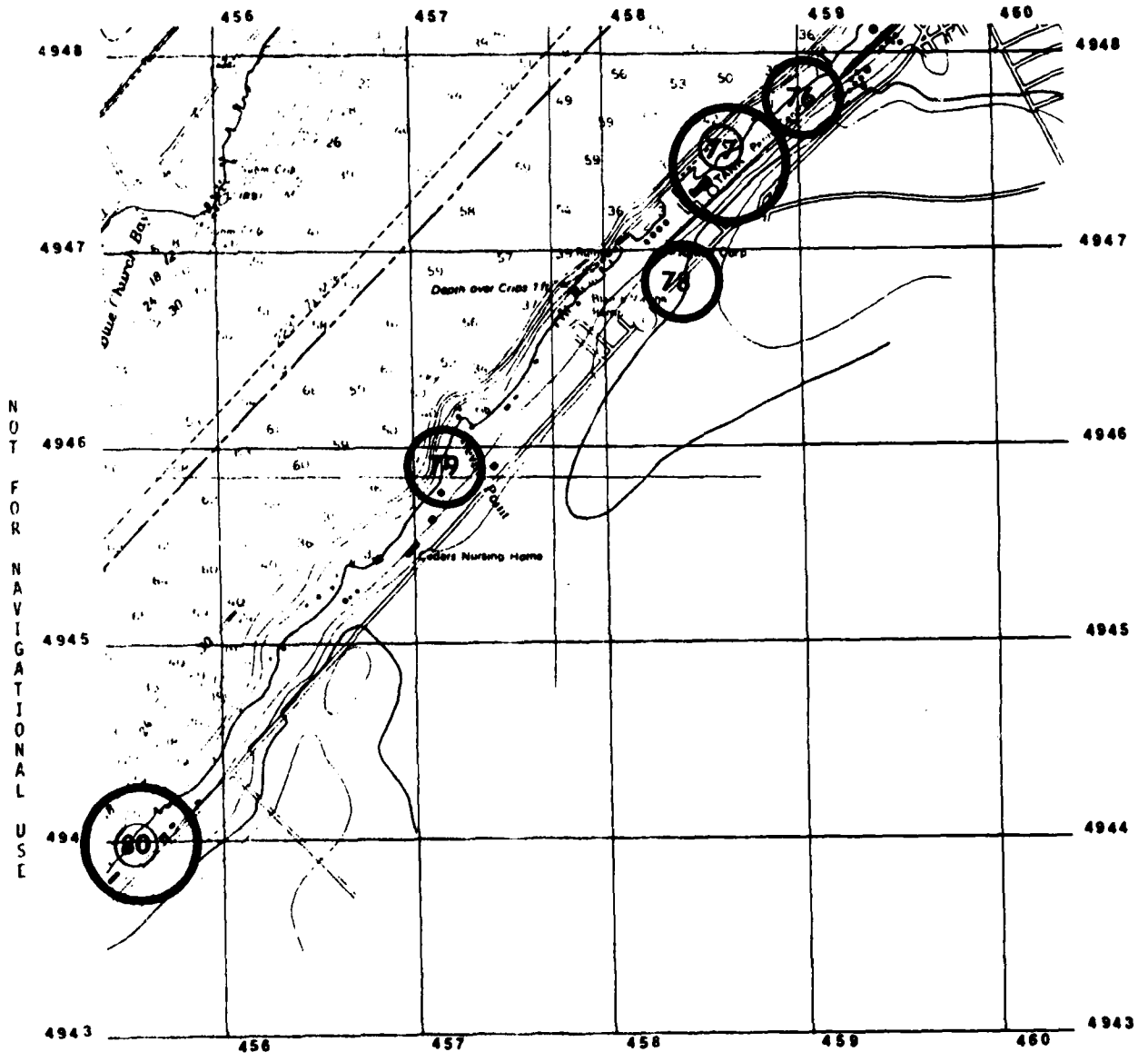


Fig. 22. Locations of bird survey sites 76-80.

D

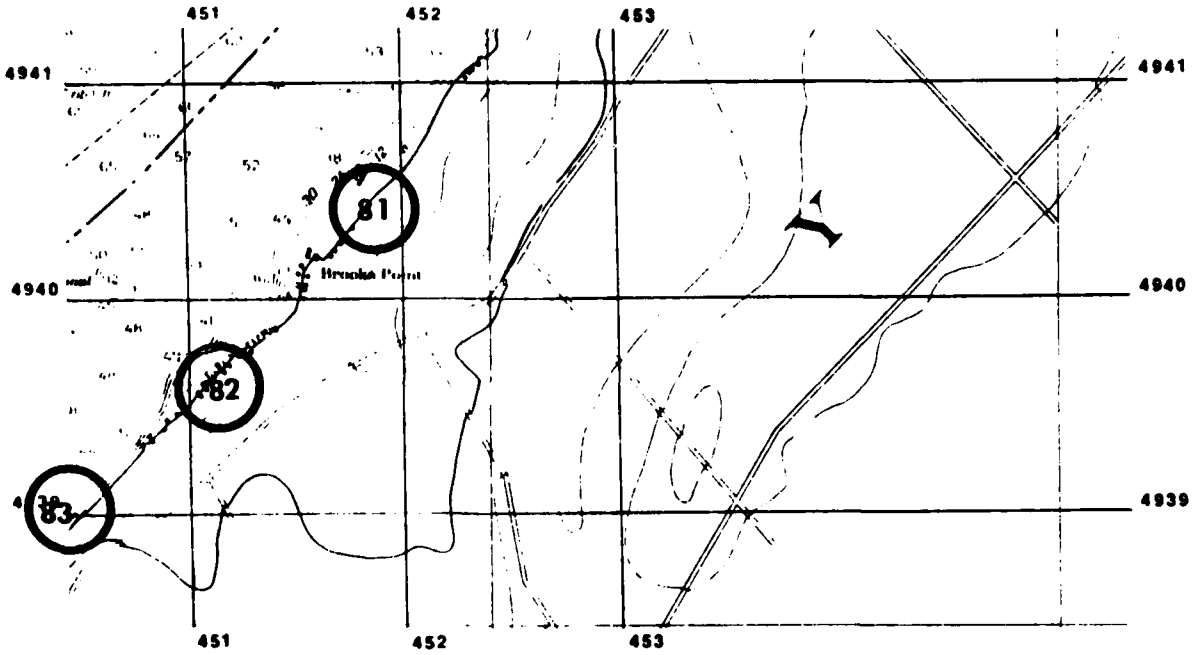
COUNTERPART TO
OGDENSBURG WEST

SOUNDINGS IN FEET

106

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

24th Ed., Aug. 31/74
14761
(formerly LS 11)



NOT FOR NAVIGATIONAL USE

Fig. 23. Locations of bird survey sites 81-83.

A

COUNTERPART TO
EDWARDSVILLE

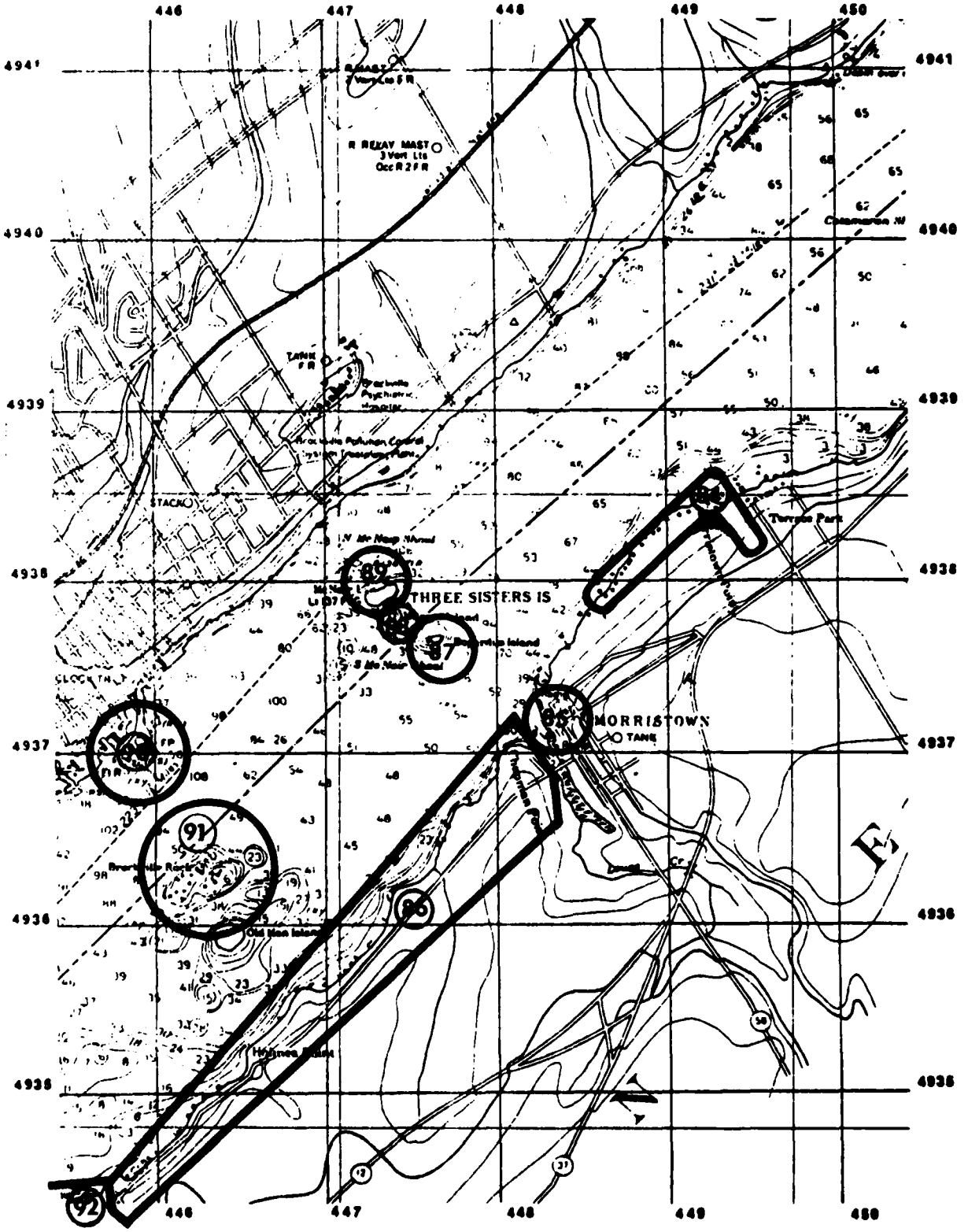
SOUNDINGS IN FEET

98

U. S. DEPARTMENT OF COMMERCE
NOAA–NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226

23rd ed., April 12/14

14



COUNTERPART TO MORRISTOWN

SOUNDINGS IN FEET

B

1

Fig. 24. Locations of bird survey sites 84-91 and part of site 92.

96

U. S. DEPARTMENT OF COMMERCE
NOAA–NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U S Courthouse, Detroit Michigan 48226

23rd Ed., April 12/74
14

NOT FOR NAVIGATIONAL USE

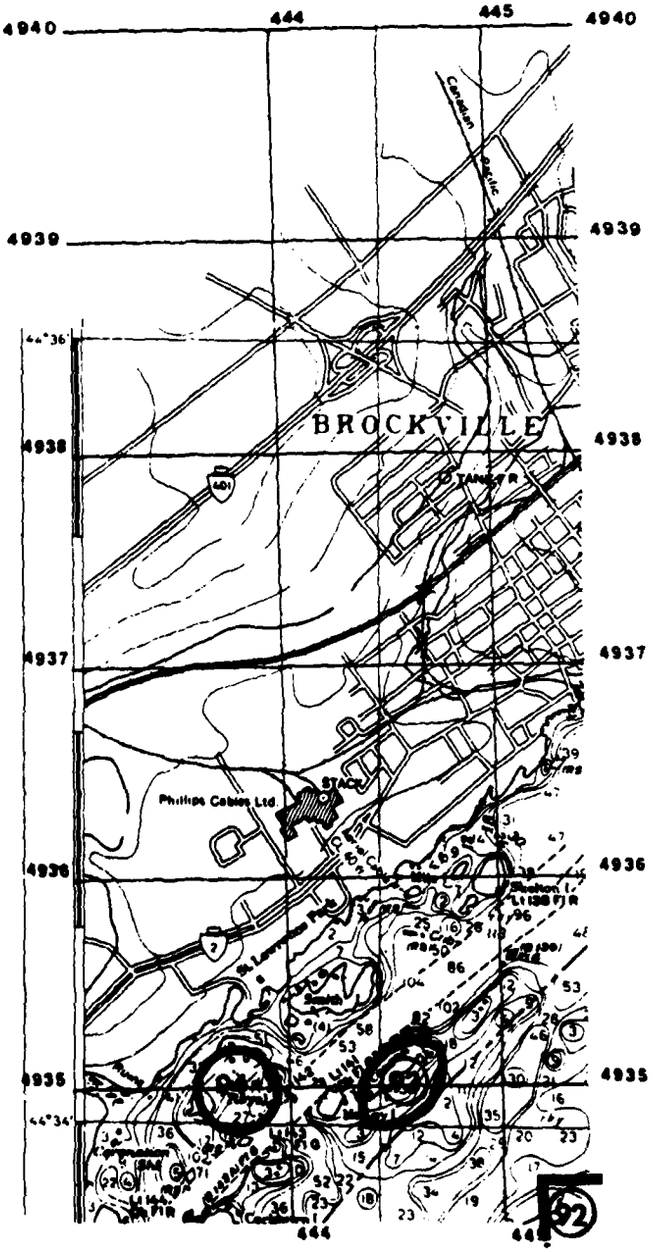


Fig. 25. Locations of bird survey sites 93-94 and part of site 92.

A

COUNTERPART TO MORRISTOWN

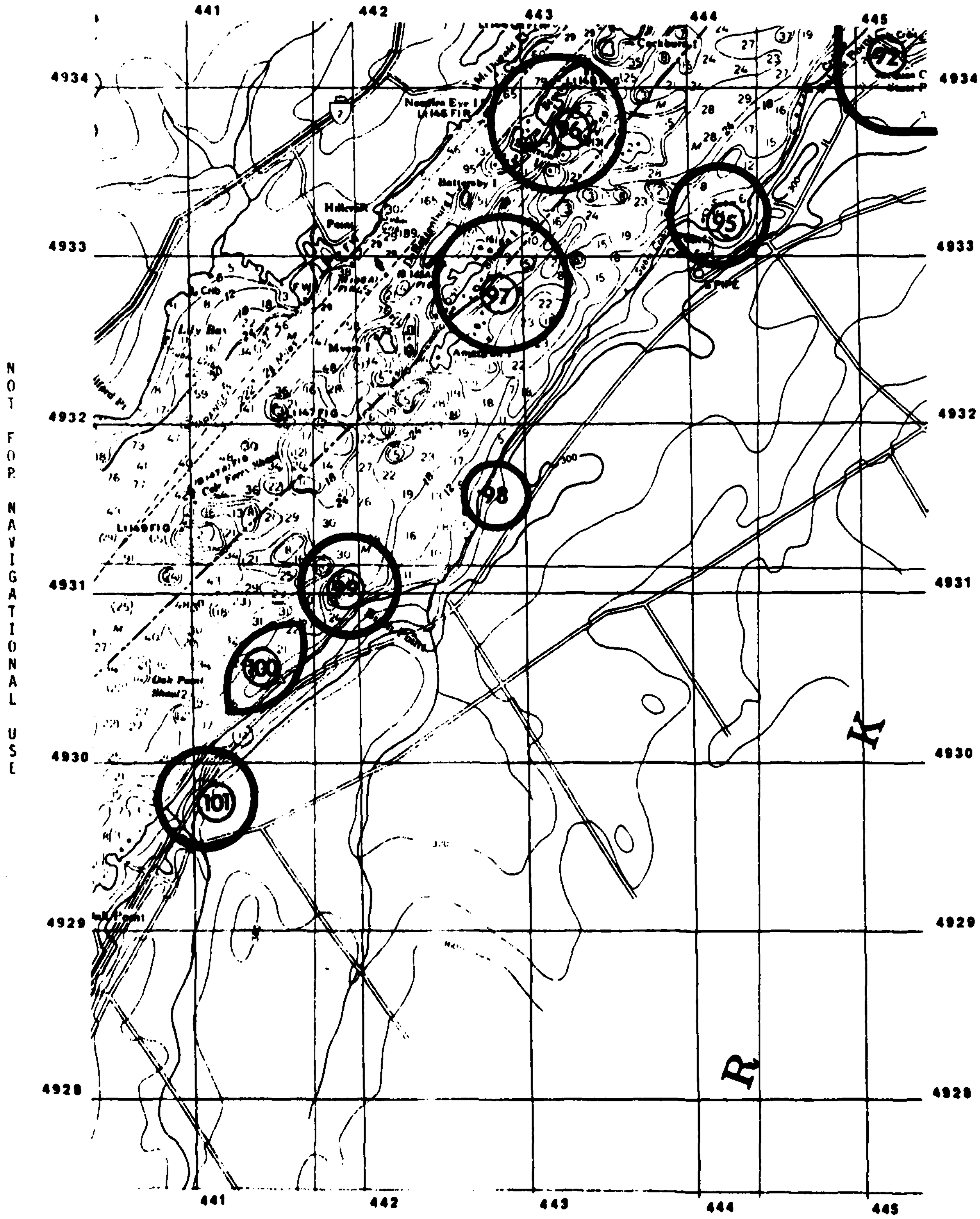
SOUNDINGS IN FEET

100

U. S. DEPARTMENT OF COMMERCE
NOAA–NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U.S. Courthouse, Detroit, Michigan 48226

25th Ed., June 12/74

15



C

COUNTERPART TO
MORRISTOWN

SOUNDINGS IN FEET

Fig. 26. Locations of bird survey sites 95-101 and part of site 92.

104

U. S. DEPARTMENT OF COMMERCE
NOAA–NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226

25th Ed., June 12/74

15

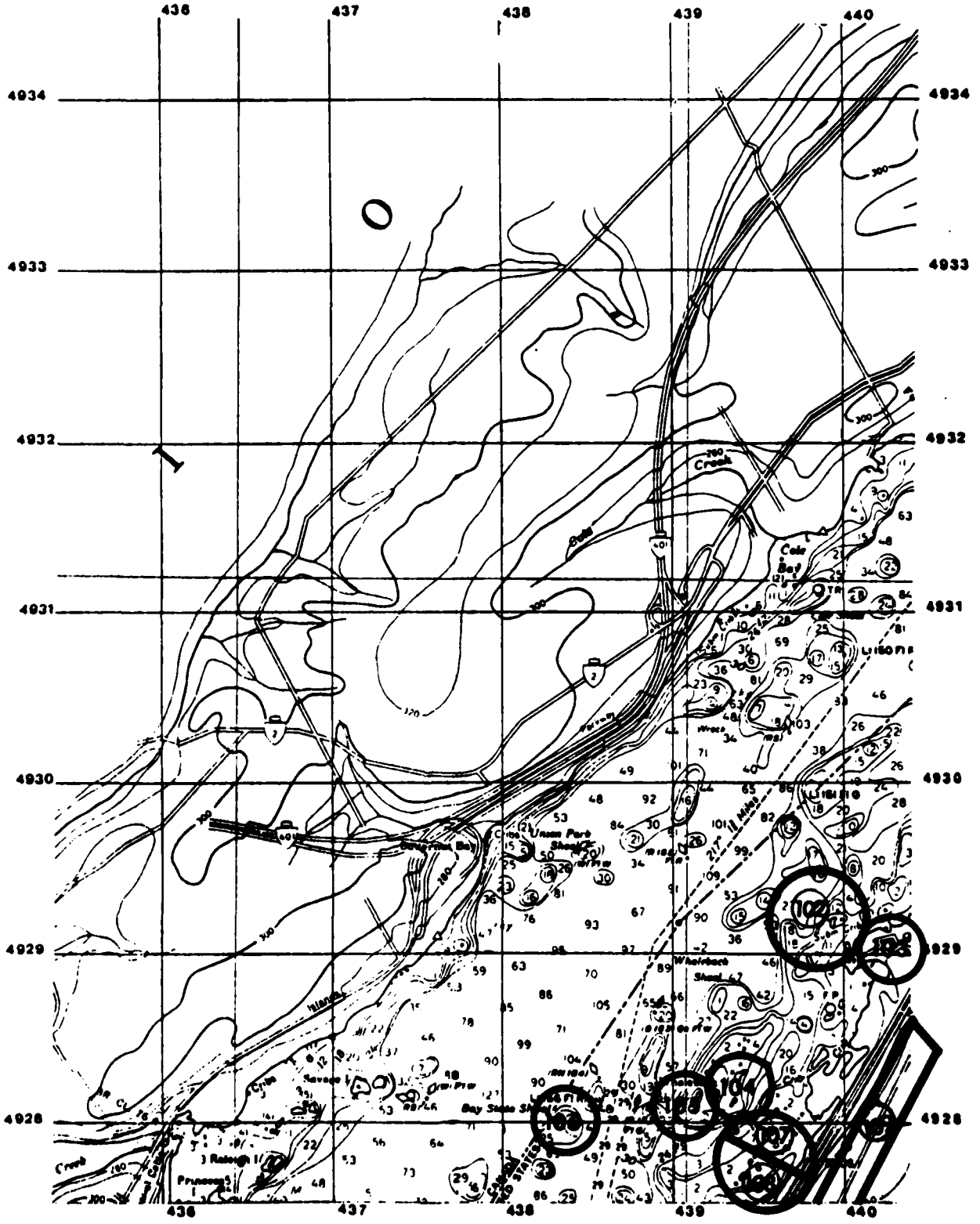
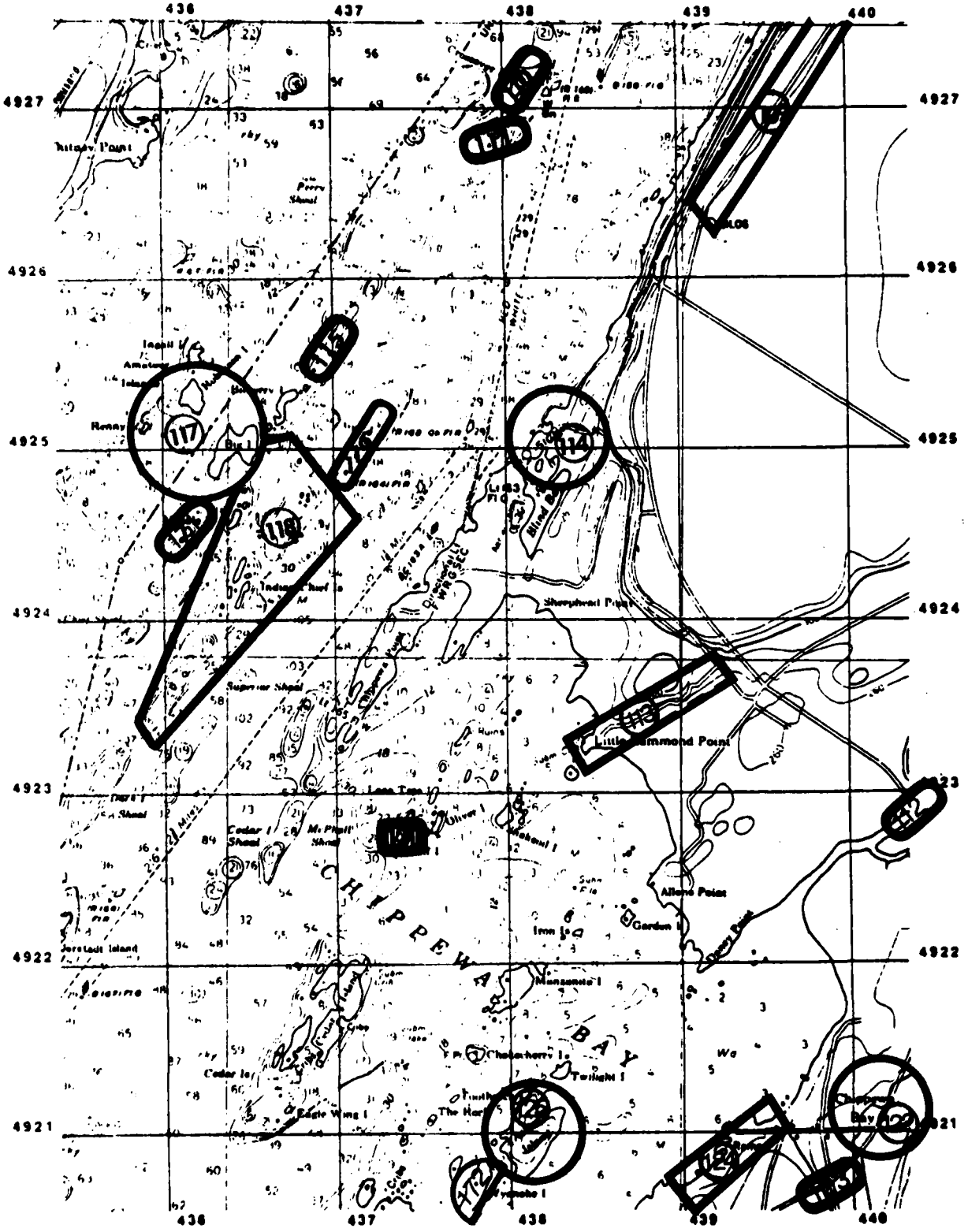


Fig. 27. Locations of bird survey sites 102-108 and part of site 109.

U. S. DEPARTMENT OF COMMERCE
NOAA–NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U.S. Courthouse, Detroit, Michigan 48226

25th Ed., June 12/74

15



B

COUNTERPART TO CHIPPEWA BAY

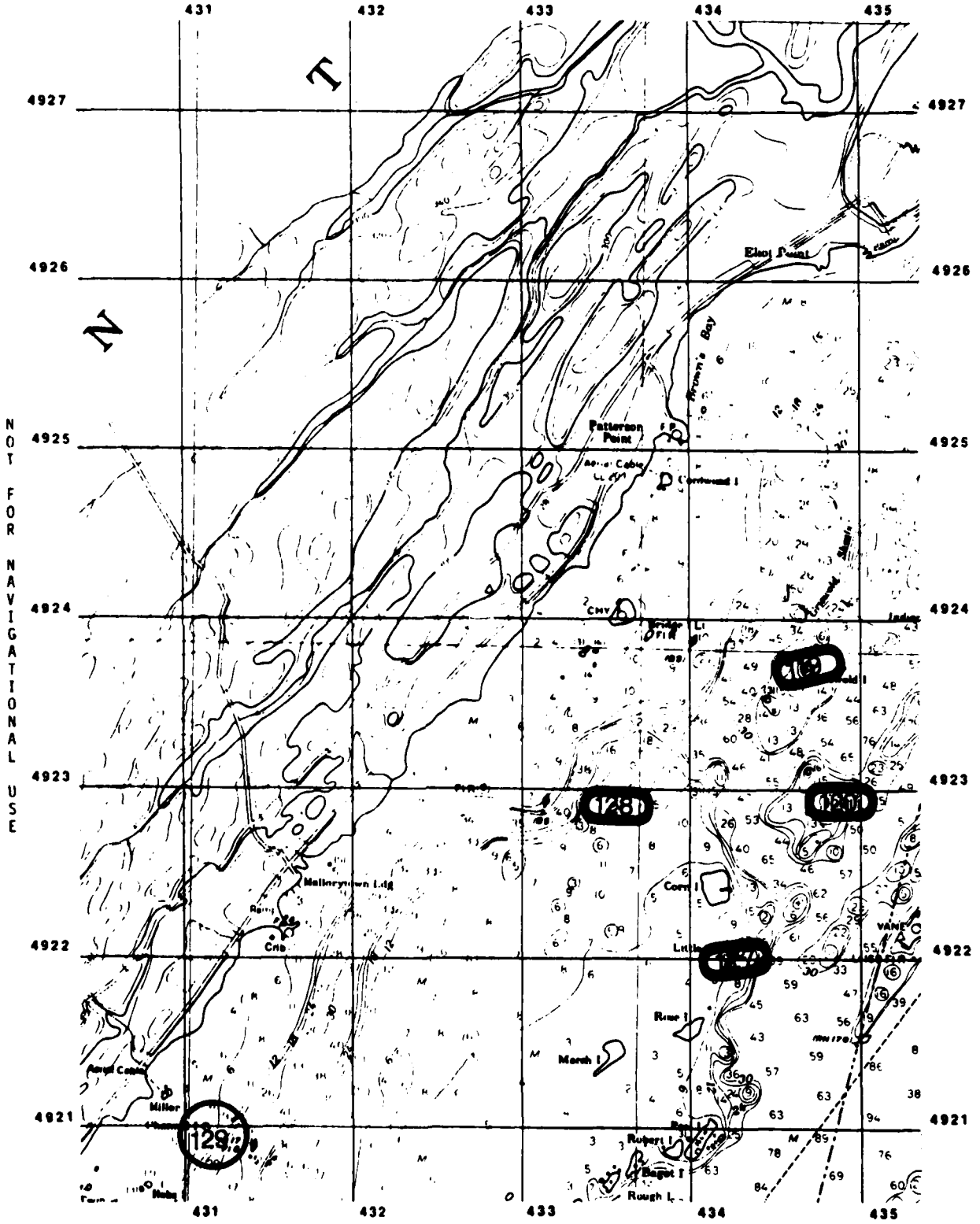
SOUNDINGS IN FEET

Fig. 28. Locations of bird survey sites 110-118, 121-125, 171-172, and part of site 109.

84

U. S. DEPARTMENT OF COMMERCE
NOAA–NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226

25th Ed., June 12/74
15



NOT FOR NAVIGATIONAL USE

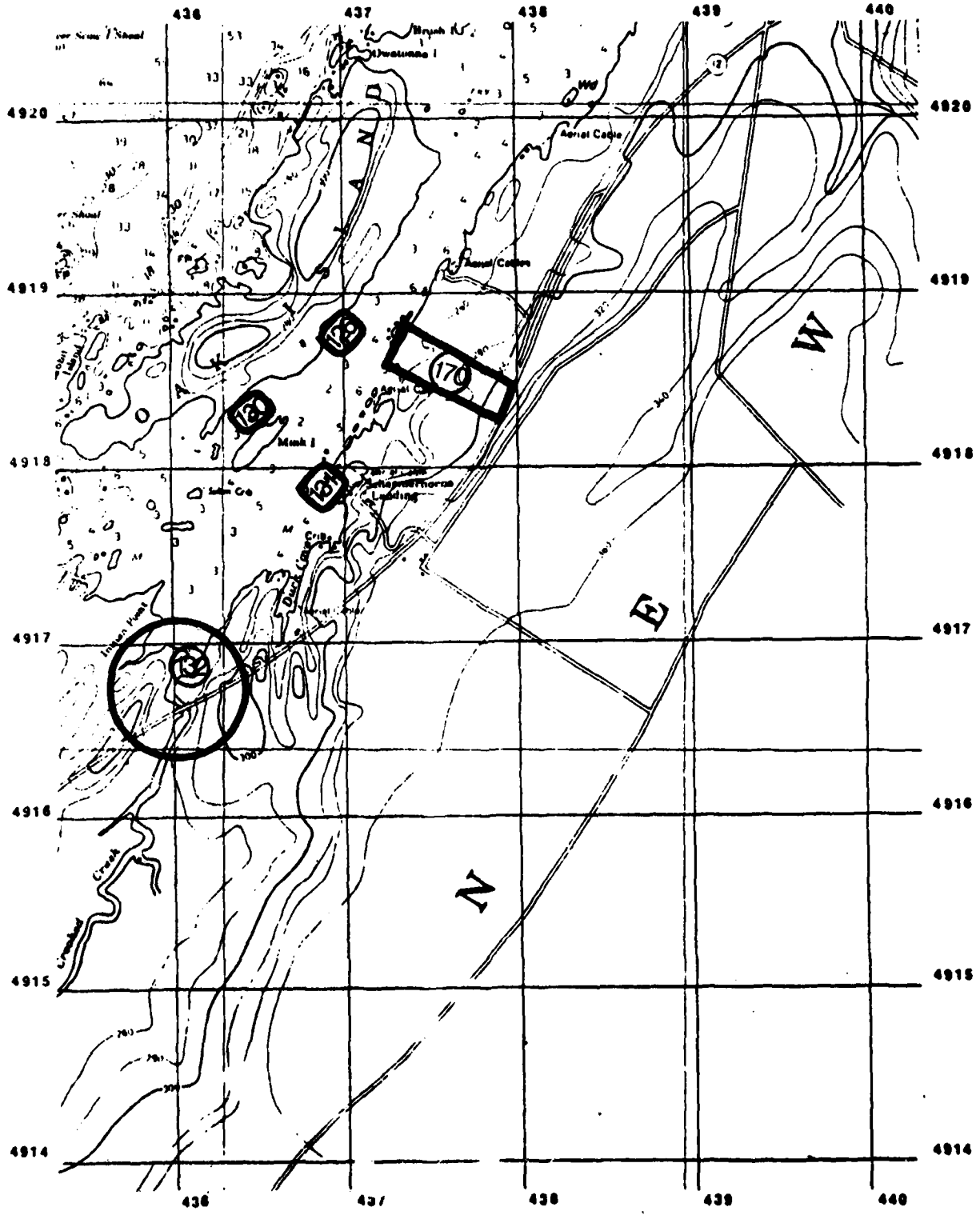
A

COUNTERPART TO CHIPPEWA BAY

SOUNDINGS IN FEET

Fig. 29. Locations of bird survey sites 119-120 and 127-129.

U. S. DEPARTMENT OF COMMERCE
NOAA–NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U.S. Courthouse, Detroit, Michigan 48226

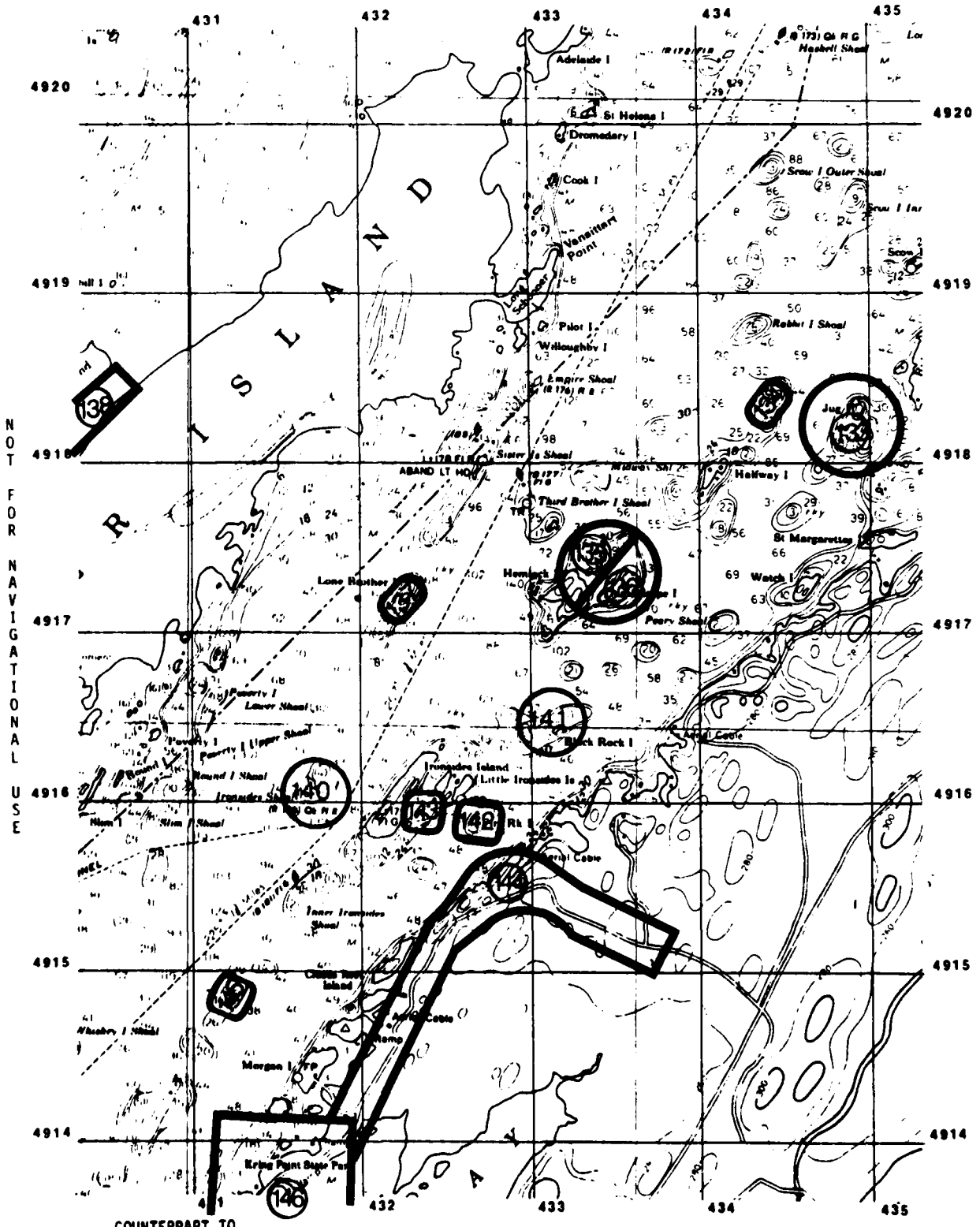


COUNTERPART TO CHIPPEWA BAY

SOUNDINGS IN FEET

Fig. 30. Locations of bird survey sites 126, 130-132, and 170.

U. S. DEPARTMENT OF COMMERCE
NOAA - NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226



C

Fig. 31. Locations of bird survey sites 133-137, 140-145, and parts of sites 138 and 146.

Published at Washington, D. C.
U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

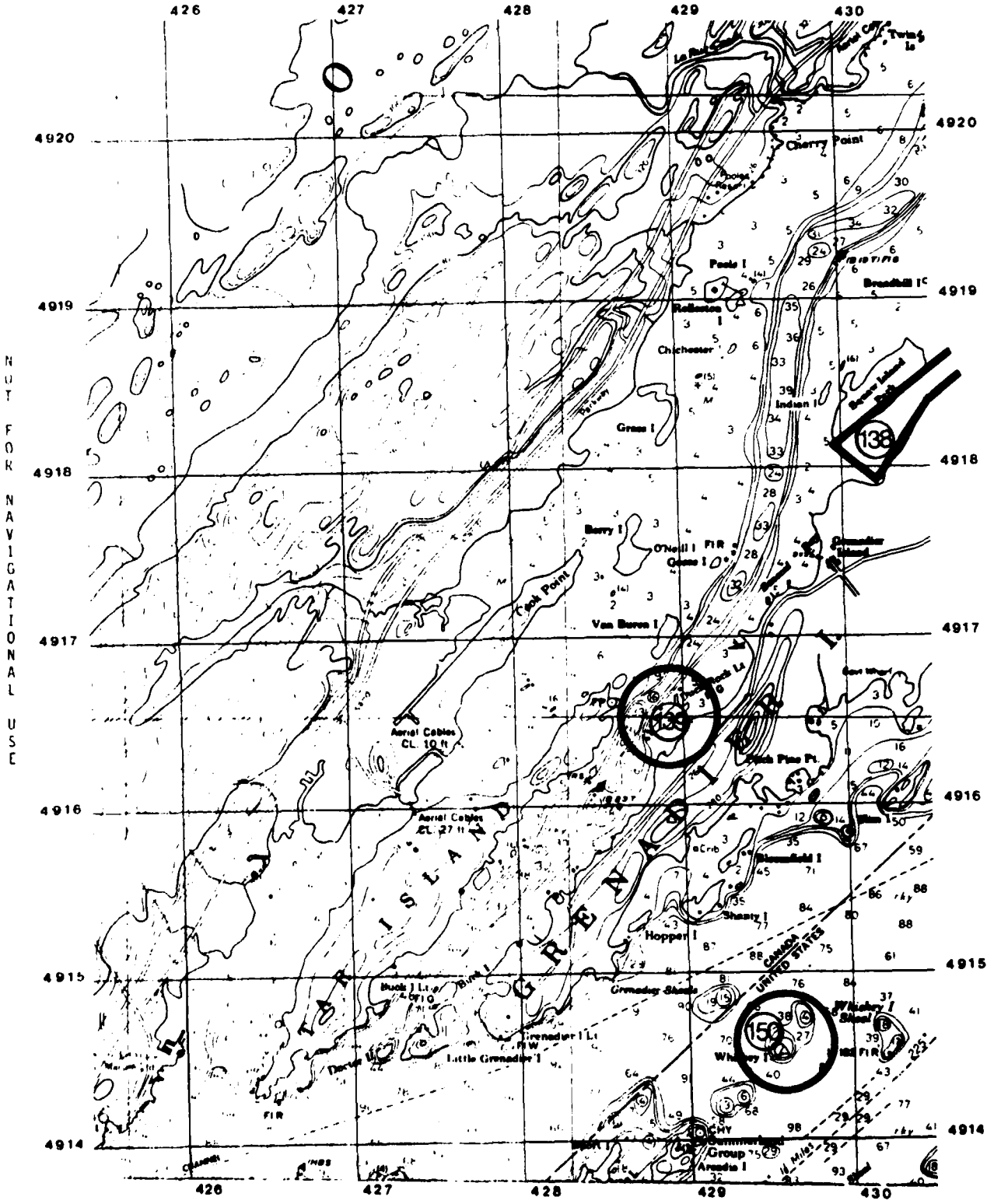


Chart Location

West of Chippewa Bay - Section "C"
North of Alexandria Bay - Section "B"

Fig. 32. Locations of bird survey sites 139, 150, and part of site 138.

U. S. DEPARTMENT OF COMMERCE
NOAA–NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226

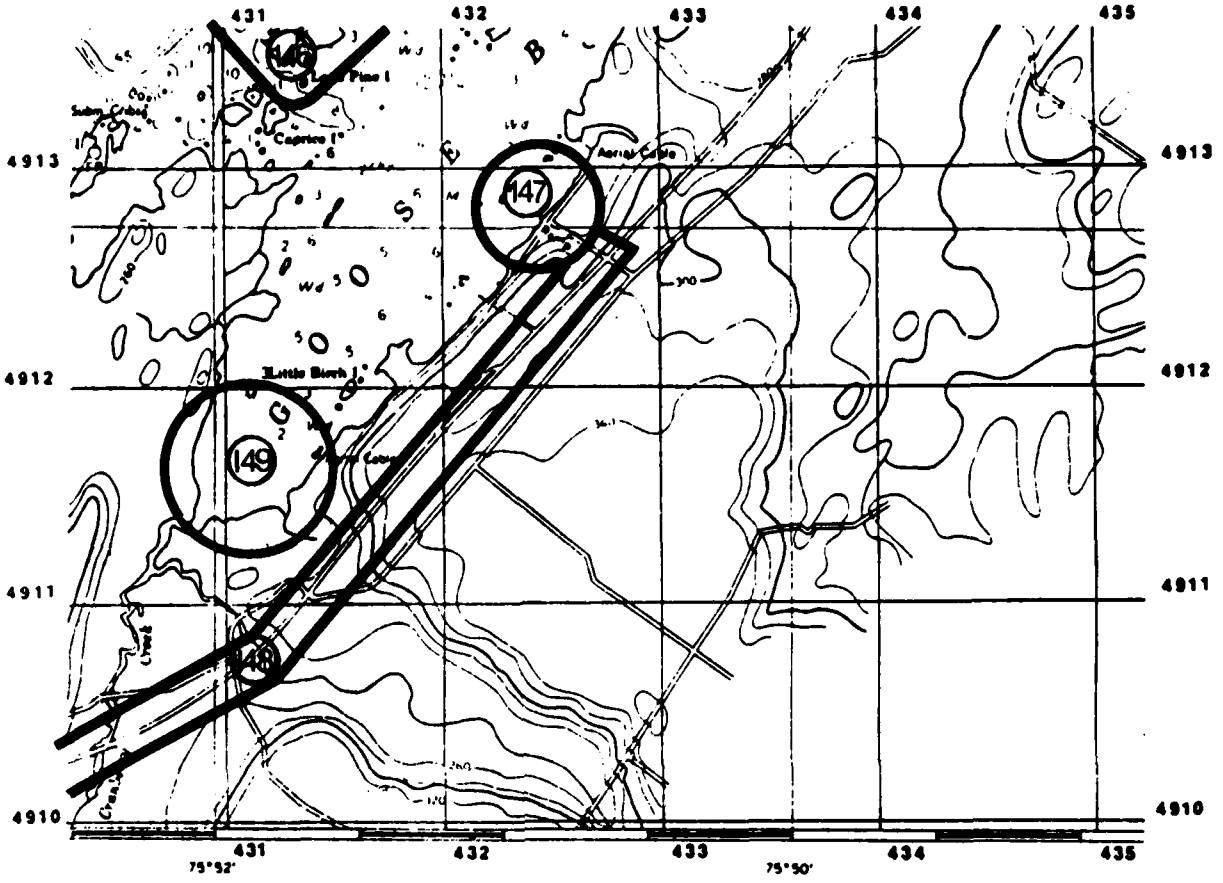


Fig. 33. Locations of bird survey sites 147, 149, and parts of sites 146 and 148.

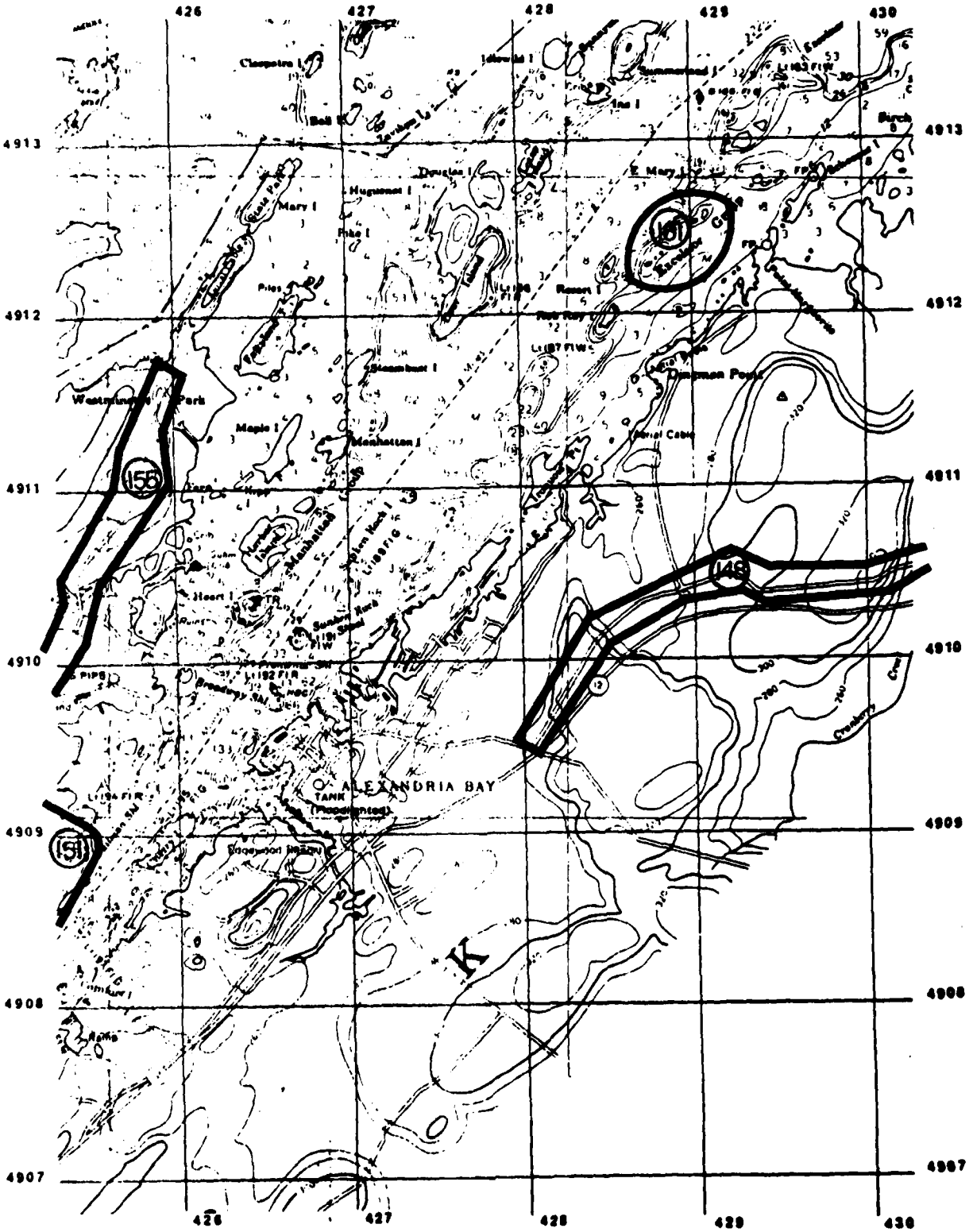
A

COUNTERPART TO REDWOOD

SOUNDINGS IN FEET

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

29th Ed., Aug. 31/74
14766
(formerly LS 16)



B

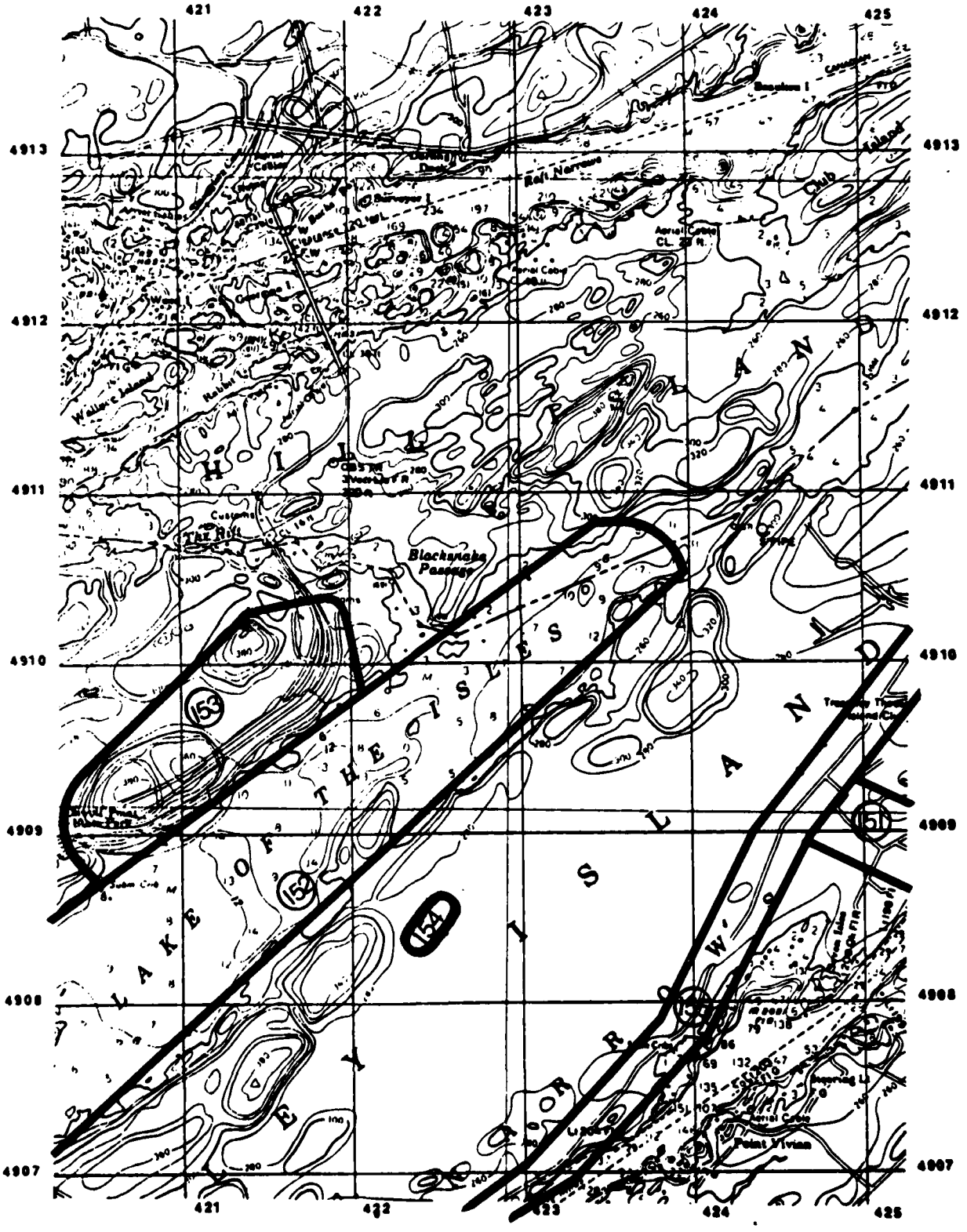
COUNTERPART TO
ALEXANDRIA BAY

SOUNDINGS IN FEET

Fig. 34. Locations of parts of bird survey sites 148, 151, 155, and 169.

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

25th Ed., Aug. 31/74
14766
(formerly LS 16)



A

COUNTERPART TO
ALEXANDRIA BAY

SOUNDINGS IN FEET

Fig. 35. Locations of bird survey sites 153-154 and parts of sites 151, 152, and 155.

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

25th Ed., Aug. 31/74
14766
(formerly LS 16)

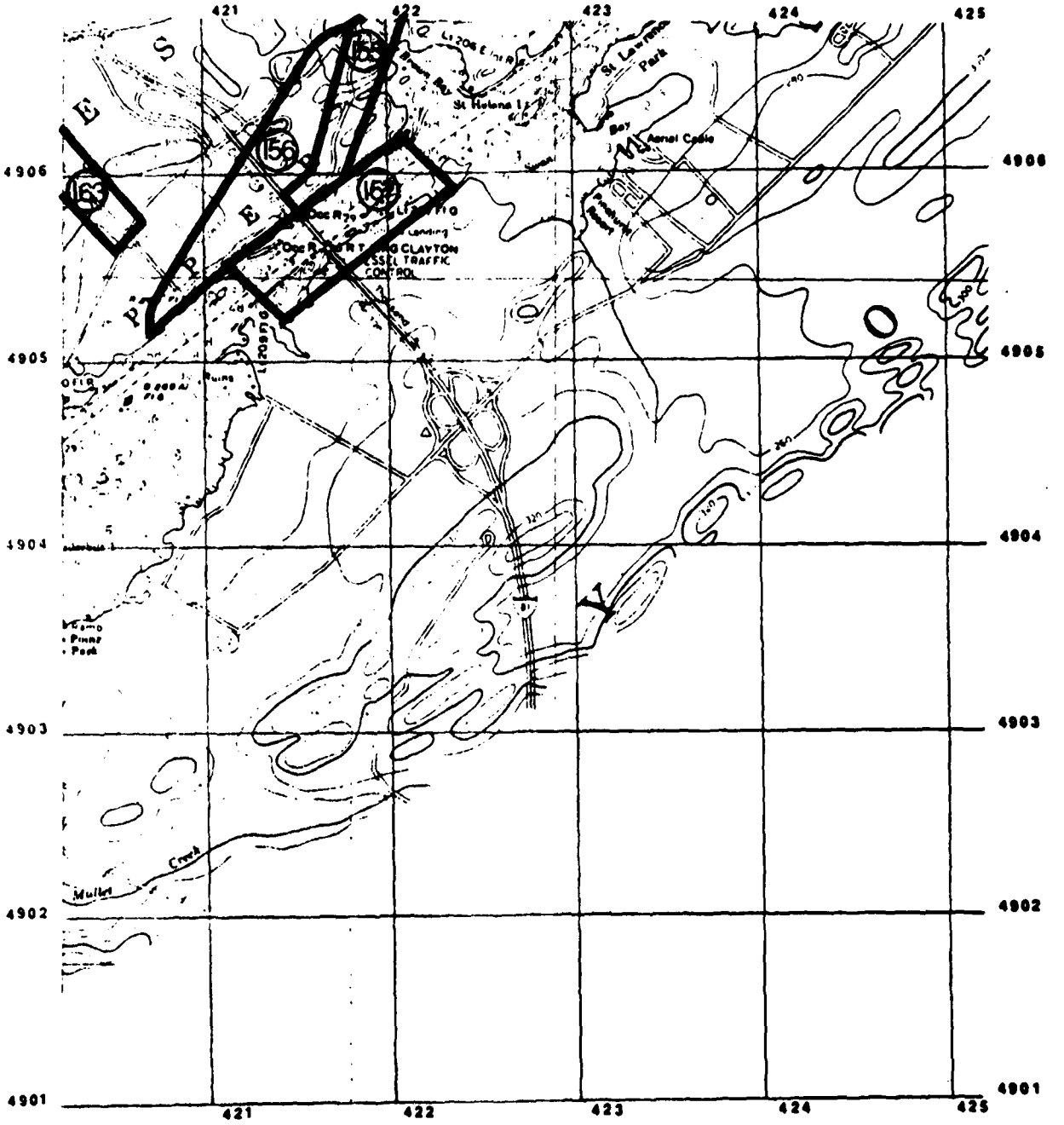


Fig. 36. Locations of bird survey sites 156-157 and parts of sites 155 and 163.

C

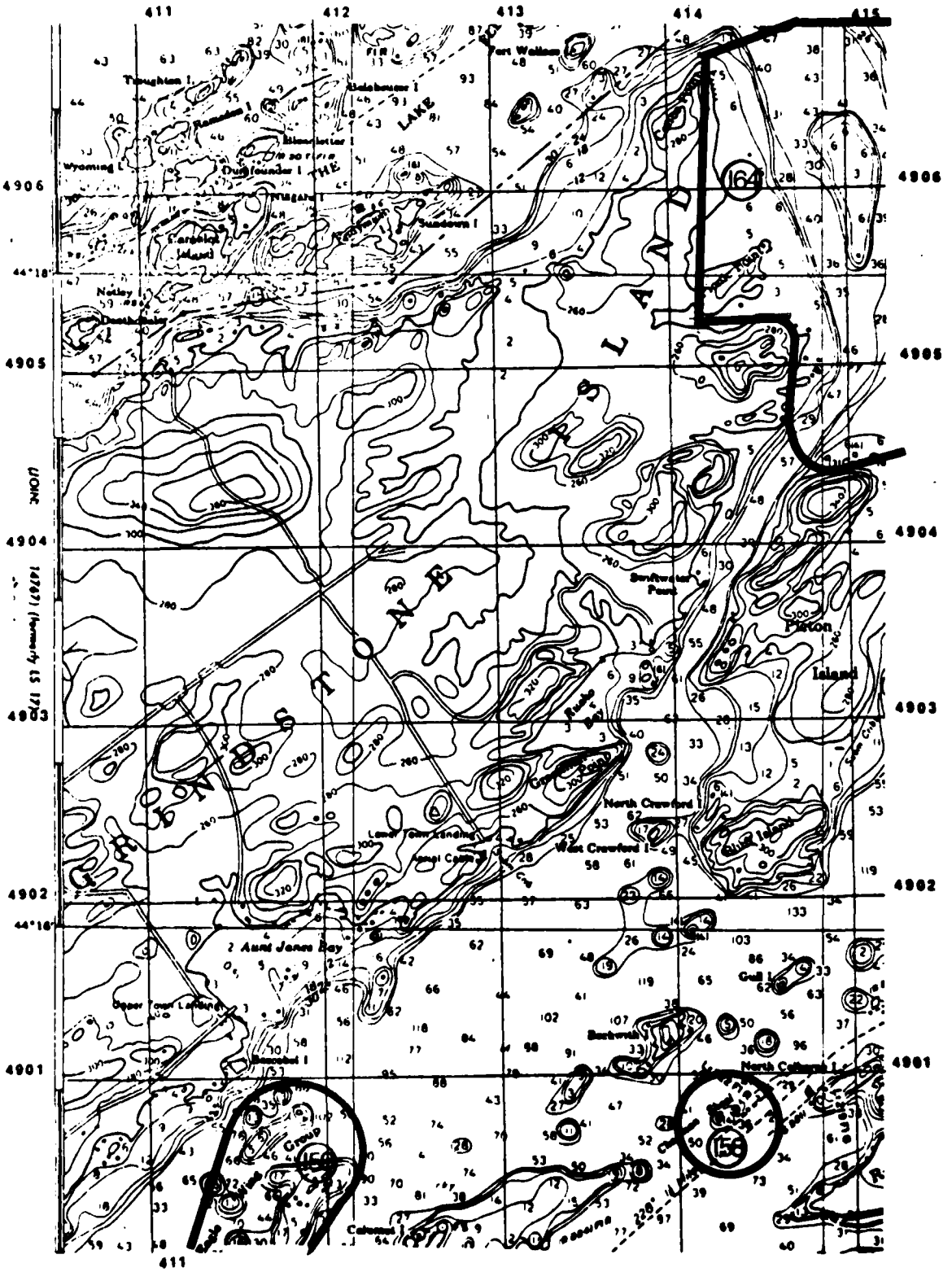
COUNTERPART TO
ALEXANDRIA BAY

SOUNDINGS IN FEET

62

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

25th Ed., Aug. 31/74
14766
(formerly LS 16)



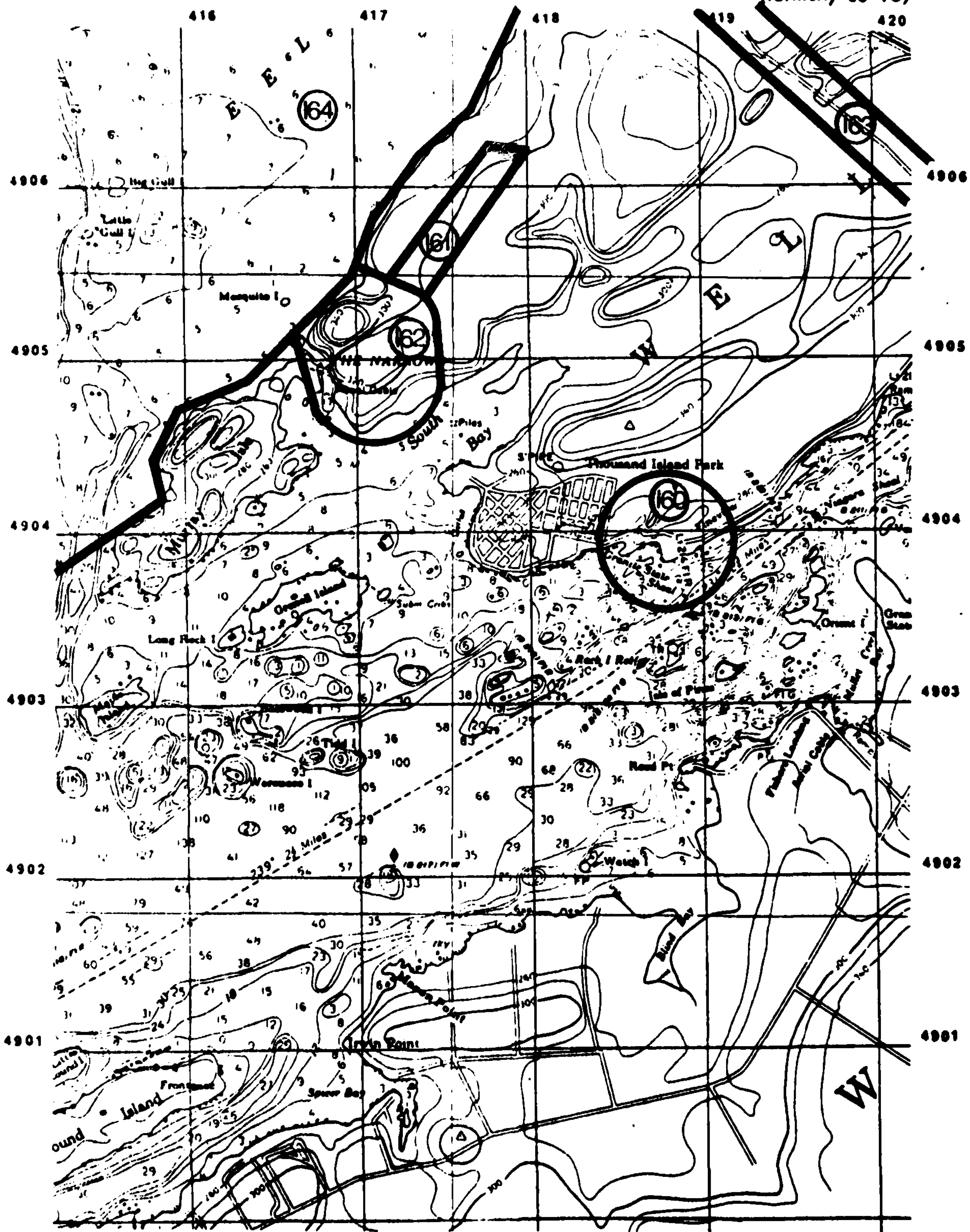
COUNTERPART TO
THOUSAND ISLAND
PARK

SOUNDINGS IN FEET

Fig. 37. Location of bird survey site 158 and parts of sites 159 and 164.

64 U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

25th Ed., Aug. 31/74
14766
(formerly LS 16)



D

COUNTERPART TO
THOUSAND ISLAND
PARK

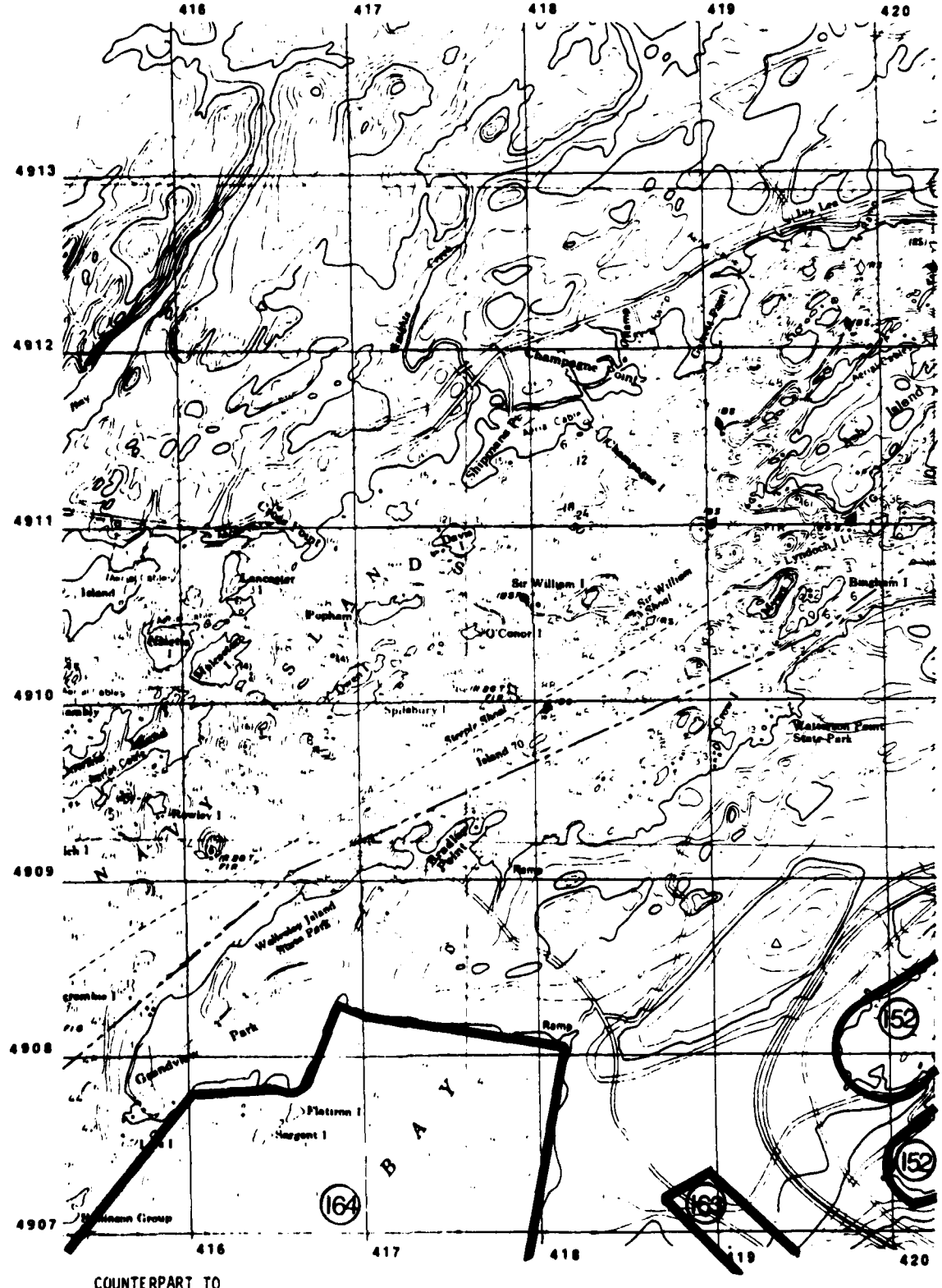
SOUNDINGS IN FEET

Fig. 38. Locations of bird survey sites 160-162 and parts of sites 163 and 164.

60

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

25th Ed., Aug 31/74
14766
(formerly LS 16)



B

COUNTERPART TO
THOUSAND ISLAND
PARK

SOUNDINGS IN FEET

Fig. 39. Locations of parts of bird survey sites 152, 163, and 164.

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

25th Ed., Aug. 31/74
14766
(formerly LS 16)

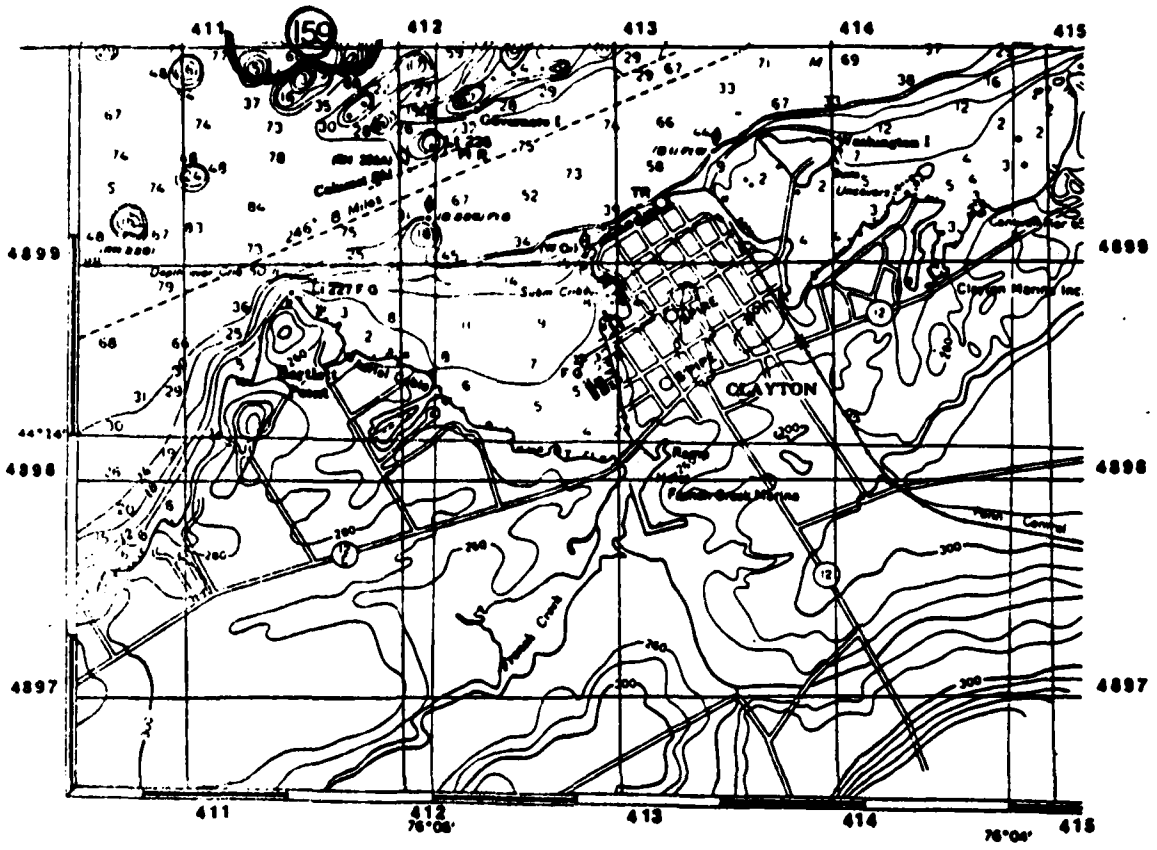


Fig. 40. Location of part of bird survey site 159.

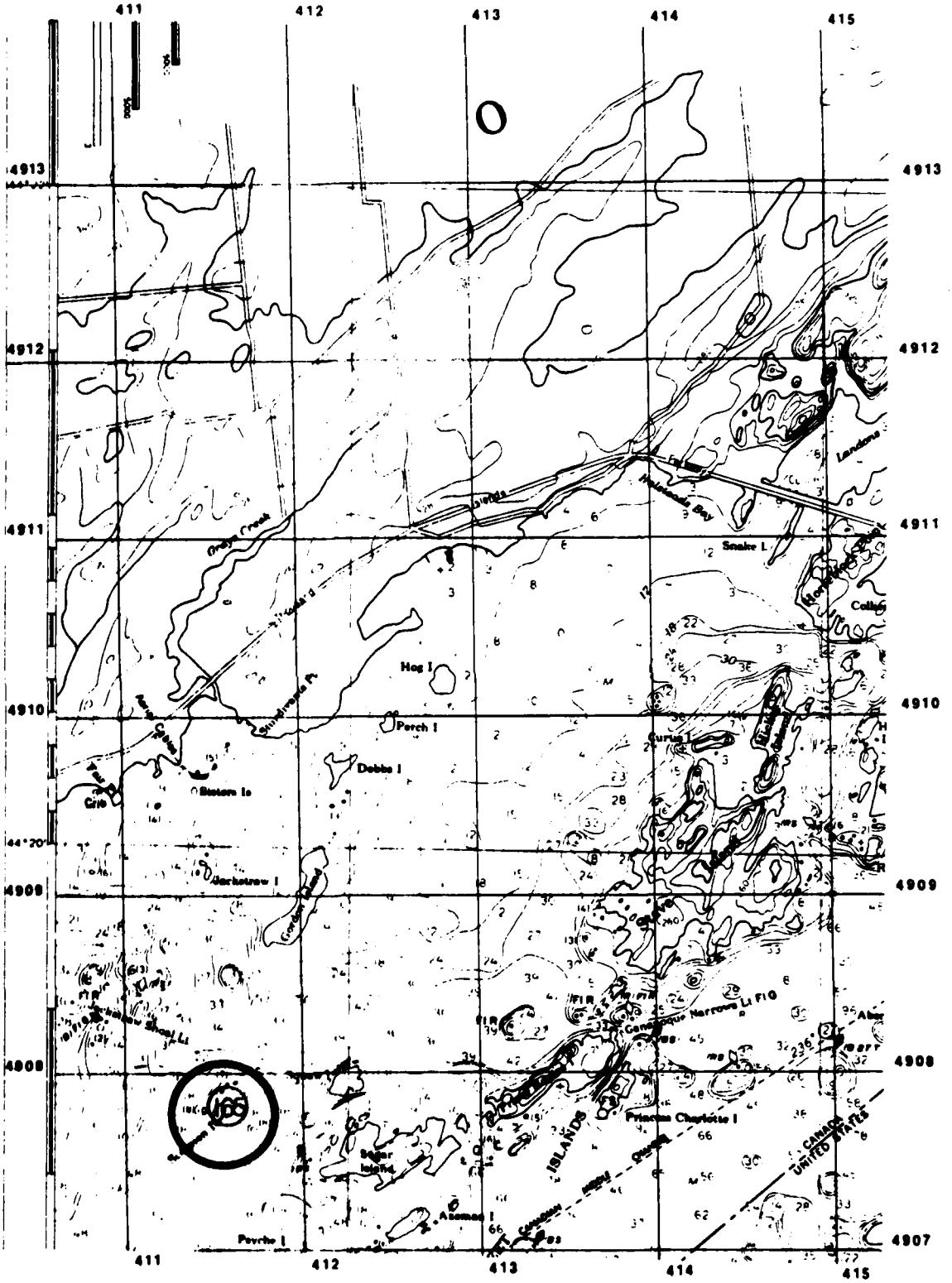
A

COUNTERPART TO CLAYTON

SOUNDINGS IN FEET

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

25th Ed., Aug 31/74
14766
(formerly LS 16)



NOT FOR NAVIGATIONAL USE

A

COUNTERPART TO THOUSAND ISLAND PARK

SOUNDINGS IN FEET

Fig. 41. Location of bird survey site 165.

32

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

14th Ed., Apr. 5/75
14767
(formerly LS 17)

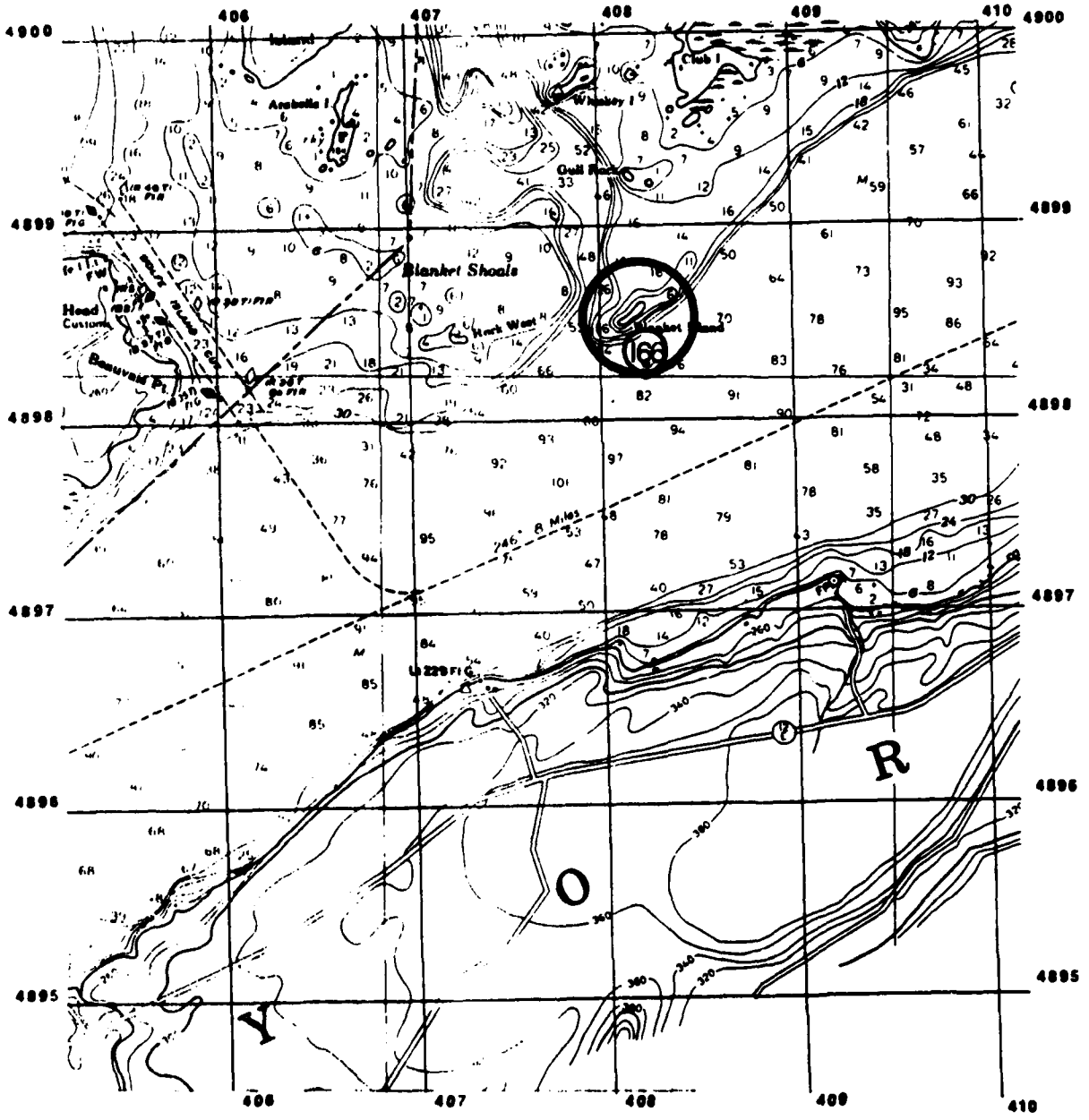


Fig. 42. Location of bird survey site 166.

NOT FOR NAVIGATIONAL USE

B

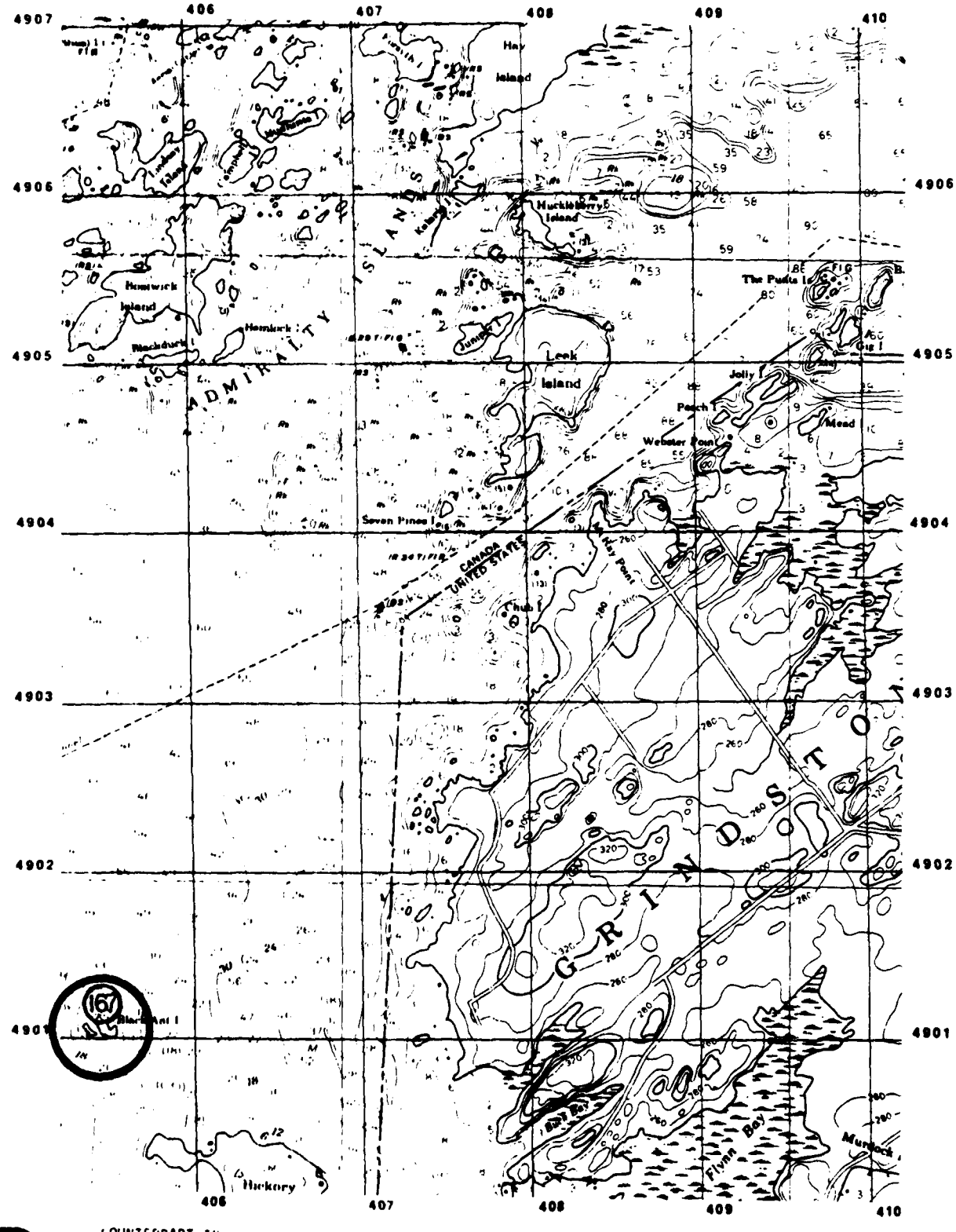
COUNTERPART TO
SAINT LAWRENCE

SOUNDINGS IN FEET

56

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

14th Ed., Apr. 5/75
14767
(formerly LS 17)



D

COUNTERPART TO GANANOQUE

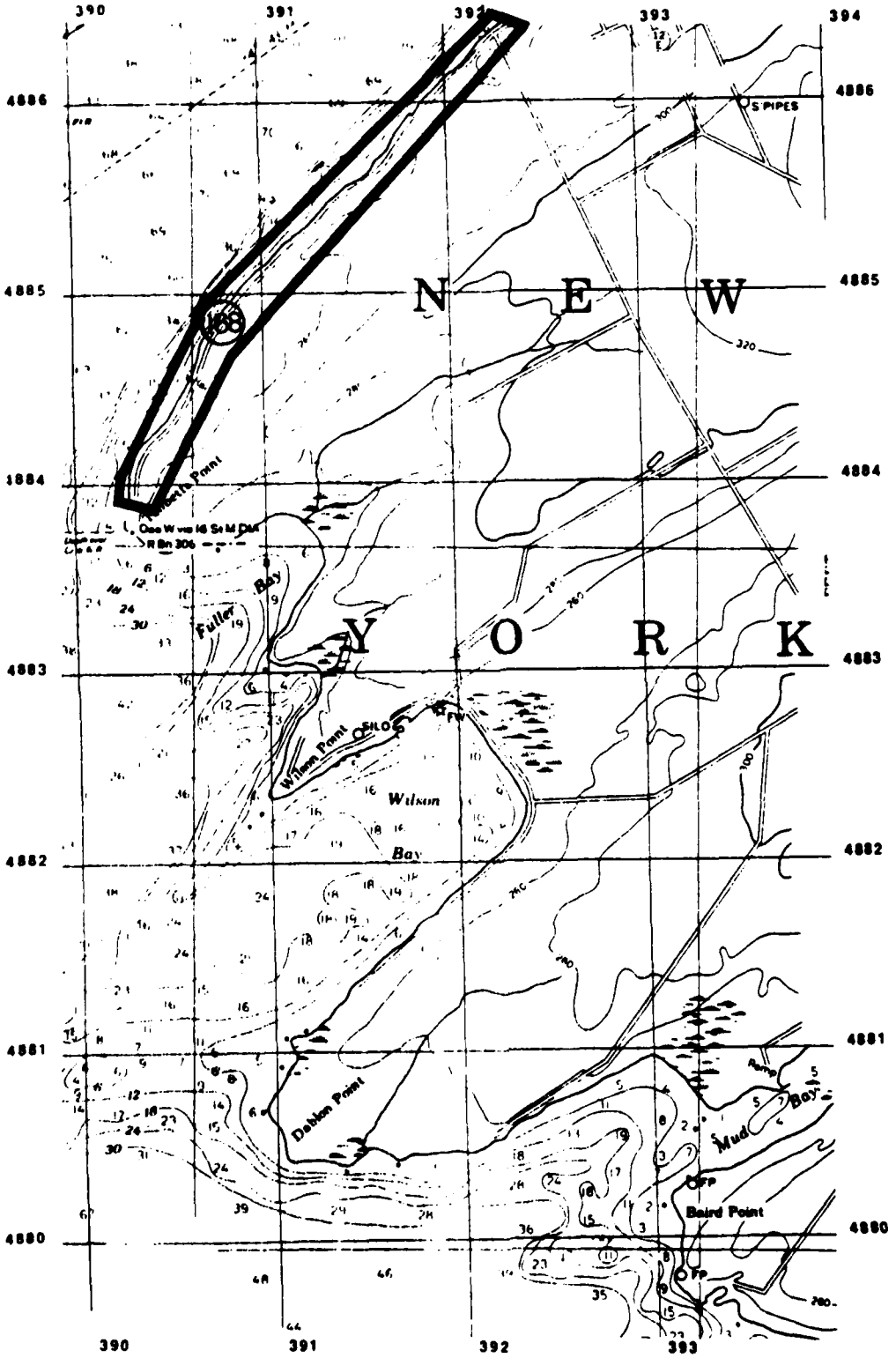
SOUNDINGS IN FEET

Fig. 43. Location of bird survey site 167.

8

U S DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

14th Ed., Mar. 22/75
14768
(formerly LS 18)



NOT FOR NAVIGATIONAL USE

COUNTERPART TO CAPE VINCENT SOUTH

SOUNDINGS IN FEET

A

Fig. 44. Location of bird survey site 168.

160

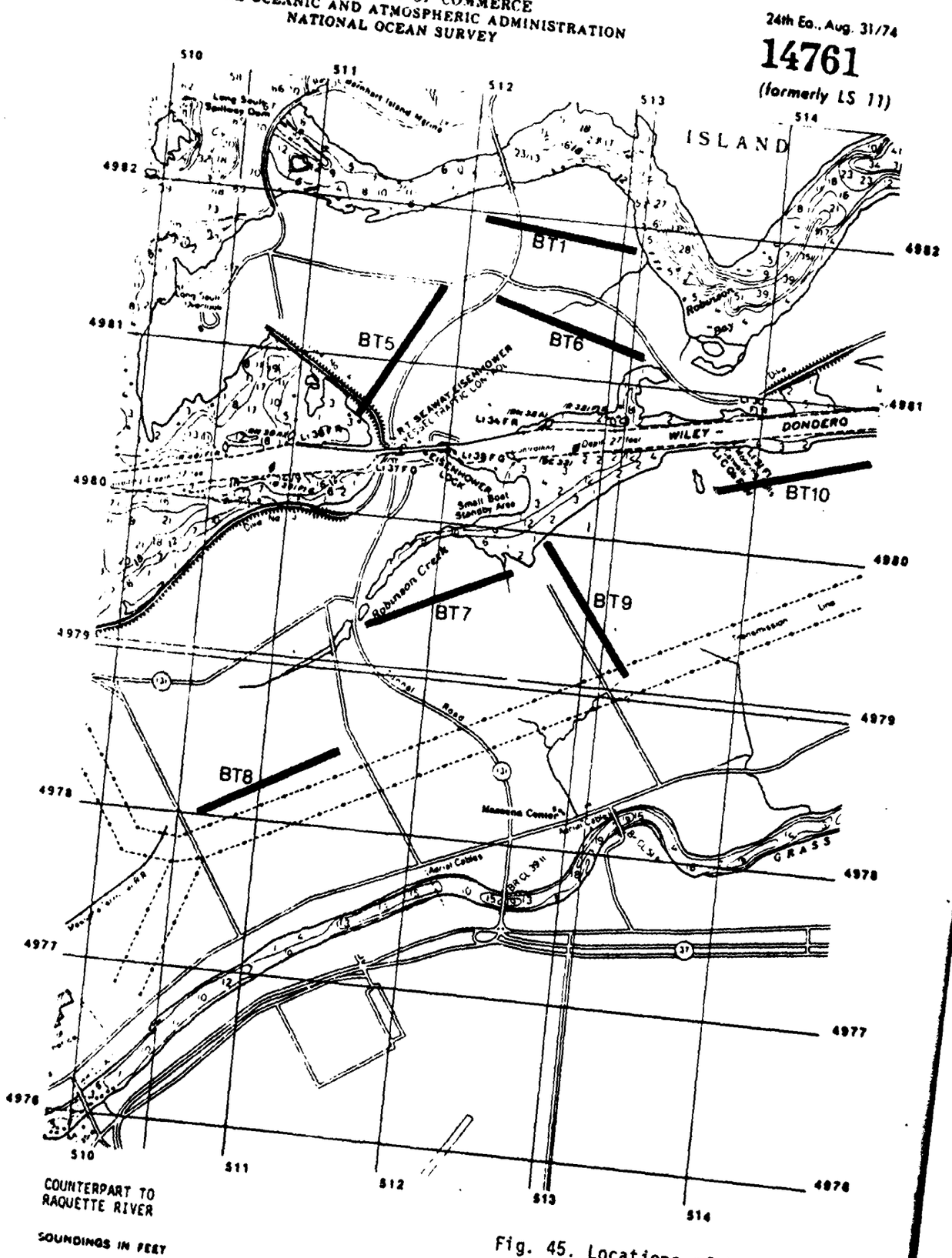


Fig. 45. Locations of bird transects BT1 and BT5-B10 during breeding season.

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

24th Ed., Aug. 31/74
14761
(formerly LS 11)

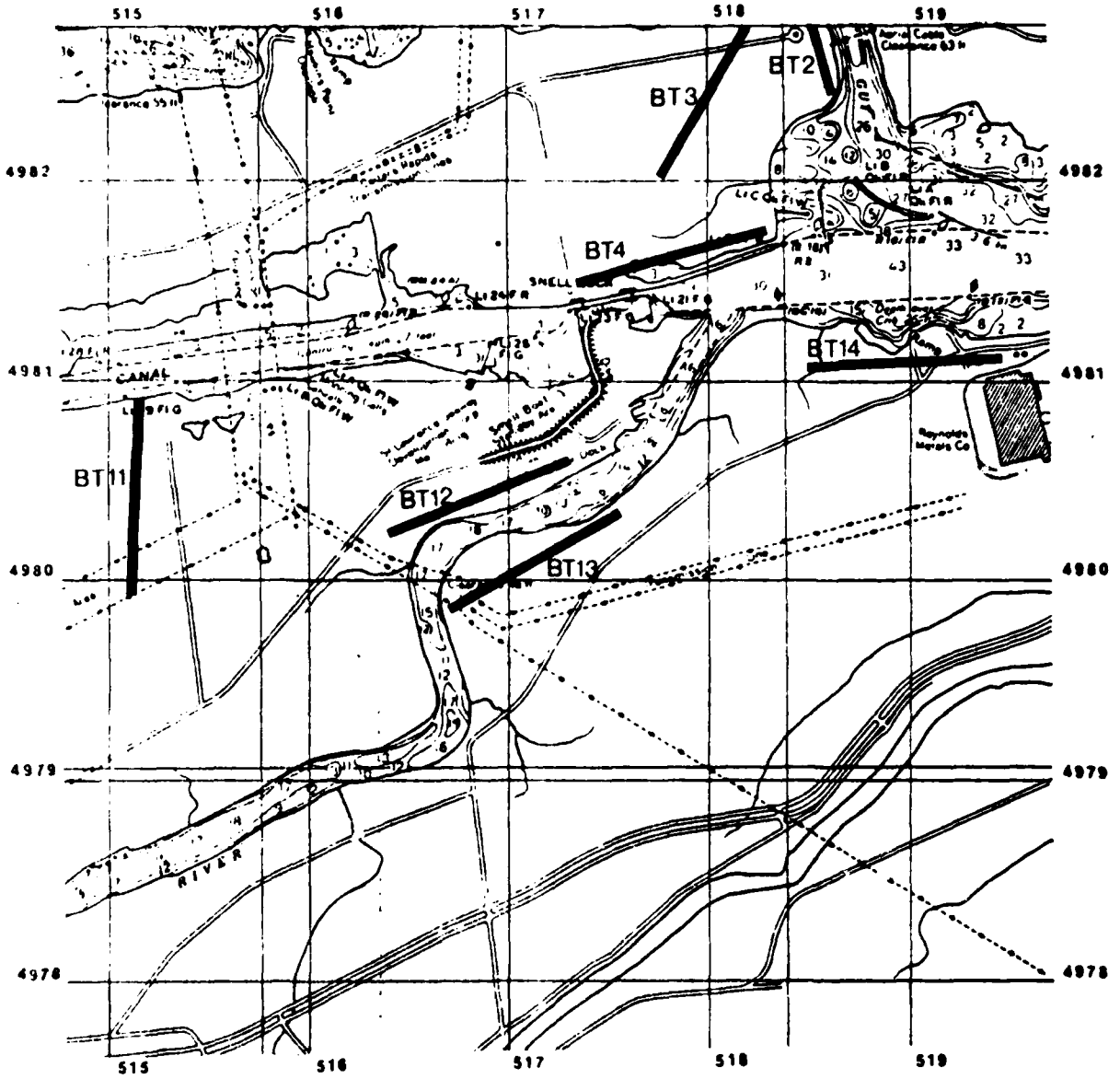


Fig. 46. Locations of bird transects BT4, BT11-BT14, and parts of BT2 and BT3 during breeding season.

B

COUNTERPART TO
RAQUETTE RIVER

SOUNDINGS IN FEET

180

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

24th Ed., Aug. 31/74

14761

(formerly LS 11)

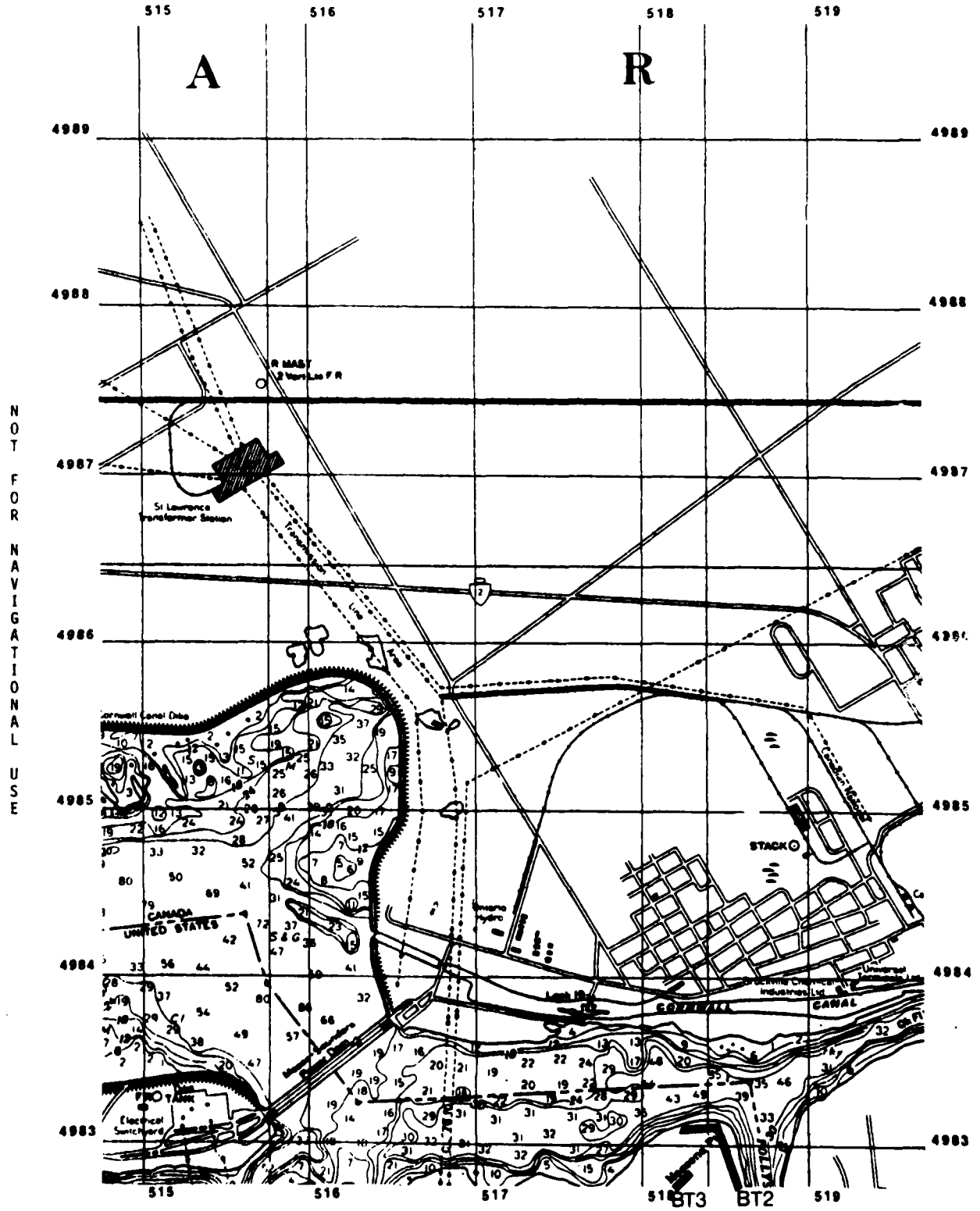


Fig. 47. Locations of parts of bird transects BT2 and BT3 during breeding season.

Table 1. Bird transects in the Massena sampling area on the St. Lawrence River in 1979.*

TRANSECTS

Number	Name
BT1	Robert Moses Park
BT2	Polly's Gut Woods
BT3	Polly's Gut Field
BT4	Snell Lock North
BT5	Eisenhower Lock North
BT6	Eisenhower Woods
BT7	Robinson Creek Area
BT8	Route 131 - Horton Road
BT9	Donahue Road
BT10	Kinne Road West
BT11	Kinne Road North
BT12	Snell Lock South
BT13	Grasse River
BT14	Reynolds Metals Area

* Each transect was approximately one kilometer (0.6 miles) in length and was surveyed three times during the breeding season, prior to July 10, 1979. A survey usually required about two hours to complete. The three surveys of each route were averaged to provide a basic figure for comparative purposes. This figure is used in the table. All birds noted were recorded. The numbers and name of each transect are listed above.
+ = < 1

Table 1 (continued)

Species [1/]	TRANSECTS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	Number of Transects Present
Common Loon	0	+	0	0	0	0	0	0	0	0	0	0	+	0	2
Great Blue Heron	+	1	+	0	0	0	+	0	0	+	0	0	+	1	7
Green Heron	+	0	0	+	0	0	1	0	0	1	0	0	+	0	5
Black-crowned Night Heron	0	1	0	0	0	0	0	0	0	0	0	0	+	4	3
American Bittern	0	0	0	0	0	0	0	0	0	0	0	0	1	+	2
Canada Goose	0	0	0	+	0	1	+	0	0	0	0	0	+	+	5
Mallard	0	0	0	+	0	1	1	0	0	0	0	0	1	3	5
Black Duck	0	0	0	0	0	0	0	0	0	0	0	0	0	+	1
Gadwall	0	0	0	0	0	0	0	0	0	0	0	0	+	2	2
Blue-winged Teal	0	0	0	0	0	0	+	0	0	0	0	0	1	0	2
American Wigeon	0	0	0	0	0	+	0	0	0	0	0	+	1	6	4
Sharp-shinned Hawk	0	+	0	0	0	0	0	0	0	0	0	0	0	0	1
Red-tailed Hawk	0	+	+	0	0	1	0	+	1	0	+	0	1	+	8
Northern Harrier	0	0	+	0	0	0	0	0	+	0	+	0	1	+	5
American Kestrel	1	0	1	+	0	1	1	1	0	0	+	0	+	0	8
Ruffed Grouse	0	+	0	0	0	1	0	0	0	+	0	0	0	0	3
Virginia Rail	0	0	0	0	+	0	0	0	0	0	0	0	0	0	1
Common Gallinule	0	0	0	0	0	0	0	0	0	0	0	0	+	0	1
Killdeer	2	0	2	1	0	2	2	+	0	0	0	2	2	4	9
American Woodcock	0	0	+	0	0	+	0	0	0	0	0	+	0	0	3
Common Snipe	+	0	0	0	1	+	0	0	0	0	+	0	0	0	4
Upland Sandpiper	0	0	1	0	0	0	0	0	0	0	0	+	2	1	4
Spotted Sandpiper	0	0	0	+	0	0	+	0	0	0	0	+	1	1	5
Herring Gull	0	0	+	0	0	0	0	0	0	0	0	0	0	2	2
Ring-billed Gull	3	15	40	10	0	+	6	14	8	2	5	10	50	1000	13

1/ Transects 1 through 14 are the same as transects BT1 through BT14.

Table 1 (continued)

Species	TRANSECTS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	Number of Transects Present
Common Tern	0	0	+	0	0	0	0	0	0	0	0	0	+	3	3
Rock Dove	0	0	0	2	0	+	0	3	0	0	0	4	+	4	6
Mourning Dove	2	0	1	0	0	+	2	0	0	+	0	0	2	+	7
Yellow-billed Cuckoo	0	+	0	0	0	0	0	+	0	+	0	0	0	0	3
Black-billed Cuckoo	+	1	0	+	0	0	0	+	2	1	0	0	0	+	7
Great Horned Owl	+	+	0	0	0	0	0	0	0	0	0	0	0	0	2
Chimney Swift	2	0	+	+	1	0	0	2	0	0	0	0	2	1	7
Ruby-throated Hummingbird	+	+	0	0	0	0	0	0	+	0	0	0	0	0	3
Belted Kingfisher	+	1	0	0	0	1	+	0	0	0	0	0	1	+	6
Common Flicker	2	1	0	+	+	2	+	0	1	2	+	0	1	+	11
Pileated Woodpecker	1	+	0	0	0	1	0	0	+	0	0	0	0	0	4
Hairy Woodpecker	0	+	0	0	+	1	0	0	+	+	0	0	0	0	5
Downy Woodpecker	1	1	0	0	1	1	0	0	1	+	+	0	0	+	8
Eastern Kingbird	3	1	5	2	1	3	6	4	2	1	3	2	6	4	14
Great-crested Flycatcher	1	1	0	0	+	1	1	+	2	1	0	0	0	0	8
Eastern Phoebe	+	0	0	0	0	0	1	0	+	0	0	0	0	+	4
Willow Flycatcher	1	0	1	2	1	2	+	3	2	1	5	1	2	1	13
Alder Flycatcher	2	0	0	1	1	+	+	1	2	1	4	2	1	2	12
Least Flycatcher	1	1	0	0	+	1	+	0	1	+	0	0	0	0	7
Eastern Wood Pewee	2	2	0	0	1	2	0	0	1	+	0	+	0	0	7
Tree Swallow	3	0	1	0	+	6	2	2	+	1	2	2	10	1	12
Bank Swallow	0	0	0	+	0	0	+	0	2	+	0	1	2	4	7

Table 1 - (continued)

Species	TRANSECTS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	Number of Transects Present
Barn Swallow	2	2	6	2	4	4	2	+	0	4	+	4	6	8	13
Cliff Swallow	0	0	0	0	0	0	+	0	0	0	0	+	2	6	4
Purple Martin	0	2	2	+	+	0	10	3	+	0	0	6	8	4	10
Blue Jay	1	+	0	0	0	1	+	2	0	0	0	+	+	0	7
Common Crow	1	2	3	+	2	4	2	1	+	3	5	+	1	2	14
Black-capped Chickadee	1	+	0	0	0	2	0	0	+	+	1	0	0	0	6
White-breasted Nuthatch	0	1	0	0	0	1	0	0	1	+	+	0	0	0	5
Brown Creeper	0	+	0	0	0	+	0	0	0	0	0	0	0	0	2
House Wren	4	4	+	1	2	5	2	1	1	+	3	1	2	1	14
Gray Catbird	3	1	2	1	2	4	2	1	4	3	6	2	4	2	14
Brown Thrasher	0	+	0	+	1	1	+	0	0	+	1	0	1	+	9
American Robin	9	12	+	3	6	9	6	5	4	6	5	4	6	3	14
Wood Thrush	2	2	0	0	+	4	1	0	1	2	2	0	+	0	9
Veery	3	5	0	+	+	9	1	0	3	8	5	3	+	1	12
Eastern Bluebird	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Cedar Waxwing	1	0	+	1	2	2	2	2	+	4	2	2	+	0	12
Loggerhead Shrike	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Starling	4	+	4	3	2	4	6	2	+	4	2	2	10	22	14
Yellow-throated Vireo	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Red-eyed Vireo	4	8	0	+	3	4	+	0	5	2	3	0	0	0	9
Warbling Vireo	1	1	0	1	+	2	1	1	2	1	1	+	1	2	13
Black and White Warbler	1	0	0	0	0	+	0	0	0	0	1	0	0	0	3
Nashville Warbler	0	0	0	0	0	+	0	0	+	1	0	0	0	0	3

Table 1 - (continued)

Species	TRANSECTS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	Number of Transects Presen
Yellow Warbler	5	8	2	2	2	8	8	5	7	5	6	5	6	6	14
Chestnut-sided Warbler	0	+	0	0	0	+	1	0	0	+	0	0	0	0	4
Ovenbird	1	1	0	0	0	1	0	0	0	+	1	0	0	0	5
Northern Waterthrush	1	0	0	0	0	+	0	0	0	0	0	0	0	0	2
Mourning Warbler	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Common Yellowthroat	4	3	1	1	2	4	4	4	5	5	6	5	4	5	14
American Redstart	6	10	0	1	3	12	0	0	7	4	2	0	0	0	8
House Sparrow	0	0	0	2	0	0	0	0	0	0	0	0	0	4	2
Bobolink	0	0	4	1	0	+	2	2	1	0	1	2	5	4	9
Eastern Meadowlark	+	0	3	+	2	0	2	3	1	0	2	3	4	3	11
Red-winged Blackbird	4	8	20	7	8	10	12	22	4	2	4	9	18	10	14
Northern Oriole	2	4	1	1	1	5	2	1	3	3	1	1	1	1	14
Common Grackle	3	3	30	+	6	2	5	2	0	+	1	2	8	4	13
Brown-headed Cowbird	4	2	3	+	2	1	4	0	2	+	4	4	3	2	13
Scarlet Tanager	1	1	0	0	+	1	0	0	+	1	+	0	0	0	7
Rose-breasted Grosbeak	4	5	0	0	2	2	2	0	2	4	2	3	1	0	10
Indigo Bunting	0	0	+	+	0	+	1	1	+	0	0	1	2	1	9
American Goldfinch	+	1	5	4	2	2	2	3	2	+	+	1	6	2	14
Rufous-sided Towhee	+	1	0	+	1	4	1	1	1	2	1	+	1	+	13
Savannah Sparrow	0	0	4	2	0	0	2	5	0	0	0	2	4	3	7
Chipping Sparrow	+	1	0	1	2	0	1	2	0	+	0	1	+	1	10
Field Sparrow	0	0	0	0	0	1	1	0	0	0	1	0	+	+	5
White-throated Sparrow	2	0	0	0	+	1	1	0	0	0	0	1	0	0	5
Swamp Sparrow	1	0	0	0	0	0	0	0	0	0	0	+	0	0	2
Song Sparrow	6	4	2	3	4	9	6	7	2	3	1	5	4	6	14
Species Richness	57	52	35	43	41	61	53	36	46	48	42	42	60	56	

Table 2 - General Habitats of Birds Along the International Section of the St. Lawrence River in 1979.

Species	Woodlands	Brushlands	Mixed Brush Fields	Fields	Developed Areas	Shorelines and Open Islands	Water Areas, Marshes
Common Loon						X	X
Pied-billed Grebe						X	X
Great Blue Heron						X	X
Green Heron						X	X
Black-crowned Night Heron						X	X
Least Bittern						X	X
American Bittern						X	X
Canada Goose				X		X	X
Mallard						X	X
Black Duck						X	X
Gadwall						X	X
Blue-winged Teal						X	X
American Wigeon						X	X
Wood Duck	X					X	X
Redhead						X	X
Turkey Vulture	X		X	X		X	X
Goshawk	X	X					
Sharp-shinned Hawk	X	X					
Coopers Hawk	X	X					
Red-tailed Hawk	X	X	X	X			
Northern Harrier		X	X	X			X
American Kestrel		X	X	X	X		
Ruffed Grouse	X						
Gray Partridge			X	X			
Turkey	X	X	X	X			
Virginia Rail							X
Common Gallinule							X
Killdeer				X	X	X	X
American Woodcock		X	X				
Common Snipe		X	X			X	X
Upland Sandpiper				X			
Herring Gull						X	X
Ring-billed Gull				X		X	X

Table 2 - (continued)

Species	Woodlands	Brushlands	Mixed Brush Fields	Fields	Developed Areas	Shorelines and Open Islands	Water Areas, Marshes
Common Tern						X	X
Black Tern						X	X
Rock Dove				X	X		
Mourning Dove	X	X	X	X	X		
Yellow-billed Cuckoo	X	X	X				
Black-billed Cuckoo	X	X	X				
Screech Owl	X						
Great Horned Owl	X	X	X	X			
Barred Owl	X						
Whip-poorwill		X	X	X			
Common Nighthawk						X	
Chimney Swift	X	X	X	X	X		
Ruby-throated Hummingbird		X	X				
Belted Kingfisher						X	X
Common Flicker	X	X	X	X	X	X	
Pileated Woodpecker	X	X					
Hairy Woodpecker	X	X					
Downy Woodpecker	X	X					
Eastern Kingbird		X	X	X	X		
Great Crested Flycatcher	X						
Eastern Pheobe		X	X		X		
Willow Flycatcher		X	X				
Alder Flycatcher		X	X				
Eastern Wood Pewee	X						
Horned Lark				X			
Tree Swallow			X	X	X	X	X
Bank Swallow				X		X	X
Rough-winged Swallow						X	X
Barn Swallow			X	X	X	X	X
Cliff Swallow				X	X	X	X
Purple Martin				X	X	X	X
Blue Jay	X	X	X		X	X	

Table 2 - (continued)

Species	Woodlands	Brushlands	Mixed Brush Fields	Fields	Developed Areas	Shorelines and Open Islands	Water Areas, Marshes
Common Crow	X	X	X	X	X	X	
Black-capped Chickadee	X	X	X		X		
White-breasted Nuthatch	X	X					
Red-breasted Nuthatch	X[3]						
Brown Creeper	X						
House Wren	X[2]	X	X		X		
Long-billed Marsh Wren							X
Gray Catbird	X[2]	X	X		X		
Brown Thrasher	X[2]	X	X				
American Robin	X	X	X		X		
Wood Thrush	X						
Veery	X	X					
Cedar Waxwing		X	X		X		
Loggerhead Shrike			X				
Starling	X	X	X	X	X	X	
Yellow-throated Vireo	X						
Red-eyed Vireo	X						
Warbling Vireo	X				X		
Black & White Warbler	X						
Nashville Warbler	X	X					
Yellow Warbler	X[2]	X	X		X		
Yellow-rumped Warbler	X[3]						
Chestnut-sided Warbler	X	X					
Pine Warbler	X[3]						
Ovenbird	X						
Mourning Warbler	X	X					
Common Yellowthroat	X[2]	X	X		X		
Canada Warbler	X						
American Redstart	X	X					
House Sparrow					X		
Bobolink				X			
Eastern Meadowlark				X			
Red-winged Blackbird		X	X	X	X	X	

Table 2 - (continued)

Species	Woodlands	Brushlands	Mixed Brush Fields	Fields	Developed Areas	Shorelines and Open Islands	Water Areas, Marshes
Northern Oriole	X	X			X		
Common Grackle	X	X	X	X	X		
Brown-headed Cowbird	X	X	X	X	X		
Scarlet Tanager	X						
Rose-breasted Grosbeak	X						
Indigo Bunting		X	X				
American Goldfinch		X	X	X	X		
Rufous-sided Towhee	X[2]	X	X				
Savannah Sparrow				X			
Henslows Sparrow				X			
Vesper Sparrow				X			
Chipping Sparrow		X	X	X	X		
Field Sparrow		X	X	X			
White-throated Sparrow	X	X					
Swamp Sparrow							X
Song Sparrow		X	X	X	X		

1 = Found on dams

2 = Found in openings

3 = Found in conifers

Table 3 - Checklist of the Birds of the St. Lawrence River

KEY

Season Definitions:

Spring - March 20 to May 31
Summer - June 1 to August 10
Fall - August 11 to December 10
Winter - December 11 to March 19

Occurrence Codes:

X = recorded in the literature or in unpublished field notes of observers in the area, but not found during the 1979 study.
XS = recorded by personnel during the course of the 1979 study.

SPECIES		SEASONAL OCCURRENCE				
		Spring	Summer	Fall	Winter	Breeds
Gavia immer	Common Loon	X	XS	XS	X	Yes
Gavia stellata	Red-throated Loon	X	X	XS	X	No
Podiceps grisegena	Red-necked Grebe	X	X	XS	X	No
Podiceps auritus	Horned Grebe	X		XS	X	No
Podilymbus podiceps	Pied-billed Grebe	X	XS	XS	X	Yes
Oceanodroma leucorhoa	Leach's Petrel		X			No
Pelecanus erythrorhynchos	White Pelican	X				No
Phalacrocopax auritus	Double-crested Cormorant	X	XS	XS		No
Ardea herodias	Great Blue Heron	X	XS	XS	X	Yes
Butorides striatus	Green Heron	X	XS	XS		Yes
Bubulcus ibis	Cattle Egret	X	X	X		Yes
Casmerodius albus	Great Egret	X	X	X		No
Egretta thula	Snowy Egret			X		No
Nycticorax nycticorax	Black-crowned Night Heron	X	XS	XS		Yes (probable)
Ixobrychus exilis	Least Bittern	X	X	X		Yes
Botaurus lentiginosus	American Bittern	X	XS	XS		Yes
Plegadis falcinellus	Glossy Ibis	X				No

Table 3. (continued).

SPECIES		SEASONAL OCCURRENCE				
		Spring	Summer	Fall	Winter	Breeds
Cygnus olor	Mute Swan				X	No
Olor columbianus	Whistling Swan			X	X	No
Branta canadensis	Canada Goose	X	XS	XS	X	Yes
Branta bernicla	Brant	X	XS	XS		No
Chen caerulescens	Snow Goose	X		XS	X	No
Alopochen aegyptiacus	Egyptian Goose*		XS			No
Anas platyrhynchos	Mallard	X	XS	XS	X	Yes
Anas rubripes	Black Duck	X	XS	XS	X	Yes
Anas strepera	Gadwall	X	XS	XS	X	Yes
Anas acuta	Pintail	X	XS	XS	X	Yes
Anas crecca	Green-winged Teal	X	XS	XS	X	Yes
Anas discors	Blue-winged Teal	X	XS	XS	X	Yes
Anas americana	American Wigeon	X	XS	XS	X	Yes
Anas clypeata	Northern Shovellor	X	X	XS	X	Yes
Aix sponsa	Wood Duck	X	XS	XS	X	Yes
Aythya americana	Redhead	X	XS	XS	X	Yes
Aythya collaris	Ring-necked Duck	X	XS	XS	X	No
Aythya valisineria	Canvasback	X	X	XS	X	No
Aythya marila	Greater Scaup	X	XS	XS	X	No
Aythya affinis	Lesser Scaup	X	XS	XS	X	No
Bucephala clangula	Common Goldeneye	X	XS	XS	X	No
Bucephala islandica	Barrow's Goldeneye	X			X	No
Bucephala albeola	Bufflehead	X	X	XS	X	No
Clangula hyemalis	Oldsquaw	X	X	XS	X	No
Somateria mollissima	Common Eider			X		No
Somateria spectabilis	King Eider			X	X	No
Melanitta deglandi	White-winged Scoter	X	X	XS	X	No
Melanitta perspicillata	Surf Scoter			XS		No
Melanitta nigra	Black Scoter	X		XS	X	No

* Probably escaped from aviary.

Table 3. (continued).

SPECIES		SEASONAL OCCURRENCE				
		Spring	Summer	Fall	Winter	Breeds
Oxyura jamaicensis	Ruddy Duck	X		XS	X	No
Lophodytes cucullatus	Hooded Merganser	X	XS	XS	X	Yes
Mergus merganser	Common Merganser	X	XS	XS	X	?
Mergus serrator	Red-breasted Merganser	X	X	XS	X	No
Cathartes aura	Turkey Vulture	X	XS	XS		Yes
Accipiter gentilis	Goshawk	X	X	X	X	Yes
Accipiter striatus	Sharp-shinned Hawk	X	XS	XS	X	Yes
Accipiter cooperii	Cooper's Hawk	X	XS	XS	X	Yes
Buteo jamaicensis	Red-tailed Hawk	X	XS	XS	X	Yes
Buteo lineatus	Red-shouldered Hawk	X	X	X		No
Buteo platypterus	Broad-winged Hawk	X	XS	XS		Yes
Buteo lagopus	Rough-legged Hawk	X	X	X	X	No
Haliaeetus leucocephalus	Bald Eagle	X	X	X	X	No
Circus cyaneus	Northern Marsh Harrier	X	XS	XS	X	Yes
Pandion haliaetus	Osprey	X	XS	XS		?
Falco rusticolus	Gyrfalcon				X	No
Falco peregrinus	Peregrine Falcon	X		X		No
Falco columbarius	Merlin	X		X		No
Falco sparverius	American Kestrel	X	XS	XS	X	Yes
Bonasa umbellus	Ruffed Grouse	X	XS	XS	X	Yes
Phasianus colchicus	Ring-necked Pheasant	X	XS	XS	X	Yes
Perdix perdix	Gray Partridge	X	XS	XS	X	Yes
Meleagris gallopavo	Turkey	X	X	XS	X	Yes
Rallus limicola	Virginia Rail	X	XS	X		Yes
Porzana carolina	Sora	X	X	X		Yes
Gallinula chloropus	Common Gallinule	X	XS	XS		Yes
Fulica americana	American Coot	X	X	XS	X	No
Charadrius semipalmatus	Semipalmated Plover	X	XS	XS		No

Table 3. (continued).

SPECIES		SEASONAL OCCURRENCE				
		Spring	Summer	Fall	Winter	Breeds
Charadrius vociferus	Killdeer	X	XS	XS	X	Yes
Pluvialis dominica	American Golden Plover			X		No
Pluvialis squatarola	Black-bellied Plover	X		XS		No
Arenaria interpres	Ruddy Turnstone	X	XS	XS		No
Philohela minor	American Woodcock	X	XS	XS		Yes
Capella gallinago	Common Snipe	X	XS	XS		Yes
Numenius phaeopus	Whimbrel		X	X		No
Bartramia longicauda	Upland Sandpiper	X	XS	XS		Yes
Actitis macularia	Spotted Sandpiper	X	XS	XS		Yes
Tringa solitaria	Solitary Sandpiper	X	X	X		No
Tringa melanoleuca	Greater Yellowlegs	X	XS	XS		No
Tringa flavipes	Lesser Yellowlegs	X	XS	XS		No
Calidris canutus	Red Knot		X	X		No
Calidris maritima	Purple Sandpiper	X		X	X	No
Calidris melanotos	Pectoral Sandpiper	X	X	X		No
Calidris fuscicollis	White-rumped Sandpiper			XS		No
Calidris bairdii	Baird's Sandpiper			XS		No
Calidris minutilla	Least Sandpiper	X	XS	XS		No
Calidris alpina	Dunlin	X	X	XS		No
Calidris mauri	Western Sandpiper			X		No
Calidris pusilla	Semipalmated Sandpiper	X	XS	XS		No
Calidris alba	Sanderling	X	XS	XS		No
Limnodromus griseus	Short-billed Dowitcher	X	XS	XS		No
Limnodromus scolopaceus	Long-billed Dowitcher	X				No
Micropalama himantopus	Stilt Sandpiper			X		No
Tryngites subruficollis	Buff-breasted Sandpiper			X		No
Limosa haemastica	Hudsonian Godwit			X		No
Phalaropus fulicarius	Red Phalarope	X	X	X		No
Steganopus tricolor	Wilson's Phalarope		X	X		No

Table 3. (continued).

SPECIES		SEASONAL OCCURRENCE				
		Spring	Summer	Fall	Winter	Breeds
Lobipes lobatus	Northern Phalarope		X	XS		No
Stercorarius parasiticus	Parasitic Jaeger			XS		No
Larus hyperboreus	Glaucous Gull	X		X	X	No
Larus glaucoides	Iceland Gull			X	X	No
Larus marinus	Great Black-backed Gull	X	XS	XS	X	No
Larus argentatus	Herring Gull	X	XS	XS	X	Yes
Larus delawarensis	Ring-billed Gull	X	XS	XS	X	Yes
Larus philadelphia	Bonaparte's Gull	X	XS	XS	X	No
Larus minutus	Little Gull			XS		No
Rissa tridactyla	Black-legged Kittiwake			X	X	No
Xema sabini	Sabine's Gull			X		No
Sterna forsteri	Forester's Tern		X			No
Sterna hirundo	Common Tern	X	XS	XS		Yes
Sterna caspia	Caspian Tern	X	XS	XS		Yes
Chlidonias niger	Black Tern	X	XS	XS		Yes
Uria lomvia	Thick-billed Murre			X		No
Columba livia	Rock Dove	X	XS	XS	X	Yes
Zenaida macroura	Mourning Dove	X	XS	XS	X	Yes
Coccyzus americanus	Yellow-billed Cuckoo	X	XS			Yes
Coccyzus erythropthalmus	Black-billed Cuckoo	X	XS	X		Yes
Tyto alba	Barn Owl		X	X	X	Yes
Otus asio	Screech Owl	X	XS	XS	X	Yes
Bubo virginianus	Great Horned Owl	X	XS	XS	X	Yes
Nyctea scandiaca	Snowy Owl	X		X	X	No
Surnia ulula	Hawk Owl				X	No
Strix varia	Barred Owl	X	XS	XS	X	Yes
Asio otus	Long-eared Owl	X	X	X	X	Yes
Asio flammeus	Short-eared Owl	X	X		X	Yes
Aegolius funereus	Boreal Owl	X			X	No
Aegolius acadicus	Saw-whet Owl	X			X	?
Caprimulgus vociferus	Whip-poor-will	X	XS	XS		Yes
Chordeiles minor	Common Nighthawk	X	XS	XS		Yes

Table 3. (continued).

SPECIES		SEASONAL OCCURRENCE				
		Spring	Summer	Fall	Winter	Breeds
Chaetura pelagica	Chimney Swift	X	XS	XS		Yes
Archilochus colubris	Ruby-throated Hummingbird	X	XS	XS		Yes
Megaceryle alcyon	Belted Kingfisher	X	XS	XS	X	Yes
Colaptes auratus	Common Flicker	X	XS	XS		Yes
Dryocopus pileatus	Pileated Woodpecker	X	XS	XS	X	Yes
Melanerpes carolinus	Red-bellied Woodpecker	X	X	X	X	No
Melanerpes erythrocephalus	Red-headed Woodpecker	X	XS	XS	X	Yes
Sphyrapicus varius	Yellow-bellied Sapsucker	X	XS	X		?
Picoides villosus	Hairy Woodpecker	X	XS	XS	X	Yes
Picoides pubescens	Downy Woodpecker	X	XS	XS	X	Yes
Picoides arcticus	Black-backed Three-toed Woodpecker				X	No
Picoides tridactylus	Northern Three-toed Woodpecker	X			X	No
Tyrannus tyrannus	Eastern Kingbird	X	XS	XS		Yes
Myiarchus crinitus	Great-crested Flycatcher	X	XS	XS		Yes
Sayornis phoebe	Eastern Phoebe	X	XS	XS		Yes
Empidonax flaviventris	Yellow-bellied Flycatcher	X		X		No
Empidonax traillii	Willow Flycatcher	X	XS	XS		Yes
Empidonax alnorum	Alder Flycatcher	X	XS	XS		Yes
Empidonax minimus	Least Flycatcher	X	XS	XS		Yes
Contopus virens	Eastern Wood Pewee	X	XS	XS		Yes
Nuttallornis borealis	Olive-sided Flycatcher		X	X		No
Eremophila alpestris	Horned Lark	X	X	XS	X	Yes
Iridoprocne bicolor	Tree Swallow	X	XS	XS		Yes
Riparia riparia	Bank Swallow	X	XS	XS		Yes
Stelgidopteryx ruficollis	Rough-winged Swallow	X	XS	XS		Yes
Hirundo rustica	Barn Swallow	X	XS	XS		Yes
Petrochelidon pyrrhonota	Cliff Swallow	X	XS	XS		Yes
Progne subis	Purple Martin	X	XS	XS		Yes

Table 3. (continued).

SPECIES		SEASONAL OCCURRENCE				
		Spring	Summer	Fall	Winter	Breeds
Perisoreus canadensis	Gray Jay	X		X	X	No
Cyanocitta cristata	Blue Jay	X	XS	XS	X	Yes
Corvus corax	Common Raven				X	No
Corvus brachyrhynchos	Common Crow	X	XS	XS	X	Yes
Parus atricapillus	Black-capped Chickadee	X	XS	XS	X	Yes
Parus hudsonicus	Boreal Chickadee				X	No
Sitta carolinensis	White-breasted Nuthatch	X	XS	XS	X	Yes
Sitta canadensis	Red-breasted Nuthatch	X	XS	XS	X	Yes
Certhia familiaris	Brown Creeper	X	XS	XS	X	Yes
Troglodytes aedon	House Wren	X	XS	XS		Yes
Troglodytes troglodytes	Winter Wren	X	X	XS	X	Yes
Thryothorus ludovicianus	Carolina Wren		X	X	X	No
Cistothorus palustris	Long-billed Marsh Wren	X	XS	XS		Yes
Cistothorus platensis	Short-billed Marsh Wren	X	X			Yes
Mimus polyglottos	Mockingbird	X	X	X	X	No
Dumetella carolinensis	Gray Catbird	X	XS	XS		Yes
Toxostoma rufum	Brown Thrasher	X	XS	XS		Yes
Oreoscoptes montanus	Sage Thrasher				X	No
Turdus migratorius	American Robin	X	XS	XS	X	Yes
Hylocichla mustelina	Wood Thrush	X	XS	XS		Yes
Catharus guttatus	Hermit Thrush	X	X	XS		?
Catharus ustulatus	Swainson's Thrush	X		XS		No
Catharus minimus	Gray-cheeked Thrush	X		X		No
Catharus fuscescens	Veery	X	XS	XS		Yes
Sialia sialis	Eastern Bluebird	X	X	X	X	Yes
Polioptila caerulea	Blue-gray Gnatcatcher	X	X			No
Regulus satrapa	Golden-crowned Kinglet	X	X	XS	X	?
Regulus calendula	Ruby-crowned Kinglet	X		XS		No
Anthus spinoletta	Water Pipit	X		XS		No

Table 3. (continued)

SPECIES		SEASONAL OCCURRENCE				
		Spring	Summer	Fall	Winter	Breeds
Bombycilla garrulus	Bohemian Waxwing	X			X	No
Bombycilla cedrorum	Cedar Waxwing	X	XS	XS	X	Yes
Lanius excubitor	Northern Shrike	X		X	X	No
Lanius ludovicianus	Loggerhead Shrike	X	XS			No
Sturnus vulgaris	Starling	X	XS	XS	X	Yes
Vireo griseus	White-eyed Vireo		X			No
Vireo flavifrons	Yellow-throated Vireo	X	XS	XS		Yes
Vireo solitarius	Solitary Vireo	X	X	X		?
Vireo olivaceus	Red-eyed Vireo	X	XS	XS		Yes
Vireo philadelphicus	Philadelphia Vireo	X		XS		No
Vireo gilvus	Warbling Vireo	X	X	X		Yes
Mniotilta varia	Black-and-white Warbler	X	XS	XS		Yes
Vermivora chrysoptera	Golden-winged Warbler	X	X			Yes
Vermivora peregrina	Tennessee Warbler	X	X	XS		No
Vermivora celata	Orange-crowned Warbler	X		X		No
Vermivora ruficapilla	Nashville Warbler	X	XS	XS		Yes
Parula americana	Northern Parula	X		X		No
Dendroica petechia	Yellow Warbler	X	XS	XS		Yes
Dendroica magnolia	Magnolia Warbler	X	X	XS		?
Dendroica tigrina	Cape May Warbler	X		XS		No
Dendroica caerulescens	Black-throated Blue Warbler	X	X	XS		Yes
Dendroica coronata	Yellow-rumped Warbler	X	XS	XS		Yes
Dendroica virens	Black-throated Green Warbler	X	X	X		Yes
Dendroica cerulea	Cerulean Warbler	X	X			?
Dendroica fusca	Blackburnian Warbler	X	X	X		Yes
Dendroica pensylvanica	Chestnut-sided Warbler	X	XS	XS		Yes
Dendroica castanea	Bay-breasted Warbler	X		XS		No
Dendroica striata	Blackpoll Warbler	X	X	XS		No
Dendroica pinus	Pine Warbler	X	XS	XS		Yes

Table 3. (continued).

SPECIES		SEASONAL OCCURRENCE				
		Spring	Summer	Fall	Winter	Breeds
Dendroica palmarum	Palm Warbler	X		X		No
Seiurus aurocapillus	Ovenbird	X	XS	XS		Yes
Seiurus noveboracensis	Northern Waterthrush	X	XS	XS		Yes
Oporornis agilis	Connecticut Warbler			X		No
Oporornis philadelphia	Mourning Warbler	X	X	X		Yes
Geothylpis trichas	Common Yellowthroat	X	XS	XS		Yes
Wilsonia pusilla	Wilson's Warbler	X		XS		No
Wilsonia canadensis	Canada Warbler	X	X	XS		Yes
Setophaaga ruticilla	American Redstart	X	XS	XS		Yes
Passer domesticus	House Sparrow	X	XS	XS	X	Yes
Dolichonyx oryzivorus	Bobolink	X	XS	XS		Yes
Sturnella magna	Eastern Meadowlark	X	XS	XS	X	Yes
Sturnella neglecta	Western Meadowlark	X				No
Agelaius phoeniceus	Red-winged Blackbird	X	XS	XS	X	Yes
Icterus spurius	Orchard Oriole		X			No
Icterus galbula	Northern Oriole	X	XS	XS	X	Yes
Euphagus carolinus	Rusty Blackbird	X	X	XS		No
Quiscalus quiscula	Common Grackle	X	XS	XS	X	Yes
Molothrus ater	Brown-headed Cowbird	X	XS	XS	X	Yes
Piranga olivacea	Scarlet Tanager	X	XS	XS		Yes
Cardinalis cardinalis	Cardinal	X	XS	XS	X	Yes
Pheucticus ludovicianus	Rose-breasted Grosbeak	X	XS	XS		Yes
Passerina cyanea	Indigo Bunting	X	XS	XS		Yes
Spiza americana	Dickcissel		X	X		No
Hesperiphona vespertina	Evening Grosbeak	X	X	X	X	?
Carpodacus purpureus	Purple Finch	X	X	X	X	Yes
Pinicola enucleator	Pine Grosbeak	X		X	X	No
Carduelis hornemanni	Hoary Redpoll				X	No
Carduelis flammea	Common Redpoll	X		X	X	No
Carduelis pinus	Pine Siskin	X		X	X	No

Table 3. (continued).

SPECIES		SEASONAL OCCURRENCE				
		Spring	Summer	Fall	Winter	Breeds
Carduelis tristis	American Goldfinch	X	XS	XS	X	Yes
Loxia curvirostra	Red Crossbill	X		X	X	No
Loxia leucoptera	White-winged Crossbill				X	No
Pipilo erythrophtalmus	Rufous-sided Towhee	X	XS	XS		Yes
Passerculus sandwichensis	Savannah Sparrow	X	XS	XS		Yes
Ammodramus savannarum	Grasshopper Sparrow		X			?
Ammodramus henslowii	Henslow's Sparrow	X	XS	X		Yes
Pooecetes gramineus	Vesper Sparrow	X	XS	XS		Yes
Junco hyemalis	Dark-eyed Junco	X	Y	X	X	Yes
Spizella arborea	Tree Sparrow	X		XS	X	No
Spizella passerina	Chipping Sparrow	X	XS	XS		Yes
Spizella pusilla	Field Sparrow	X	XS	XS		Yes
Zonotrichia leucophrys	White-crowned Sparrow	X		XS		No
Zonotrichia albicollis	White-throated Sparrow	X	XS	XS	X	Yes
Passerella iliaca	Fox Sparrow	X		X		No
Melospiza lincolnii	Lincoln's Sparrow			XS		No
Melospiza georgiana	Swamp Sparrow	X	XS	XS		Yes
Melospiza melodia	Song Sparrow	X	XS	XS	X	Yes
Calcarius lapponicus	Lapland Longspur	X		X	X	No
Plectrophenax nivalis	Snow Bunting	X		XS	X	No

Table: 4 . Number of birds sighted on the St. Lawrence River in 1979 at station 1 .

SPECIES	6/8	6/13	6/21	6/23	6/26	7/2	7/3	7/5	7/11	7/12
Common Loon										
Double-crested Cormorant										
Great Blue Heron	3	1	1	1	1	1	1	1		
Black-crowned Night Heron	7	10	6	5	5	6	6	8	10	10
Canada Goose										
Mallard		11	3	4			4	5	2	4
Black Duck		1								
Gadwall		2		2			2	1		
Blue-winged Teal										
American Wigeon	2		12	5	4	35	30	4	75	3
Wood Duck					1	1				
Redhead										
Common Goldeneye										
White-winged Scoter										
Surf Scoter										
Black Scoter										
Common Merganser									1	
Red-tailed Hawk										
Killdeer	2	4	4	5	4	2	5	4	3	4
Upland Sandpiper	1	1			1		1			
Spotted Sandpiper	1	1					1			
Great Black-backed Gull										
Herring Gull										
Ring-billed Gull	4000	4000	3000	2000	1500	200	400	100	15	18
Bonaparte's Gull										
Common Tern			1			2	2	4	5	5
Rock Dove		6				6	4			
Mourning Dove										

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table 4 (continued)

SPECIES	6/8	6/13	6/21	6/23	6/26	7/2	7/3	7/5	7/11	7/12
Belted Kingfisher										
Common Flicker										
Downy Woodpecker										
Eastern Kingbird	4	2	1		1		1			
Tree Swallow	14	40	5	8	4	6	12	15	14	10
Bank Swallow		2	1			5	1		4	15
Barn Swallow	5	8	10	12	15	16	14	3	8	9
Unidentified Swallows										
Purple Martin		3	2		4		5	2		1
Blue Jay										
Common Crow	3	2	5			6	2			
Gray Catbird										
Brown Thrasher		1		1			1			
American Robin		8	3		2	4				
Cedar Waxwing										
Starling	10	18	15	30	40	50	40	50	60	110
Yellow Warbler	3	1	4	3	6	1	1	2		1
Yellow-rumped Warbler										
Common Yellowthroat										
House Sparrow										
Eastern Meadowlark										
Red-winged Blackbird	15	2	10	5	6	14	5	4	6	2
Brown-headed Cowbird										
Evening Grosbeak										
American Goldfinch						3				2
Rufous-sided Towhee				1				1		
Savannah Sparrow										
Tree Sparrow										

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 4 (continued)

SPECIES	6/8	6/13	6/21	6/23	6/26	7/2	7/3	7/5	7/11	7/12
Field Sparrow					1					
White-crowned Sparrow										
White-throated Sparrow										
Swamp Sparrow				1			1			
Song Sparrow	1	1				1	4		2	1
Snow Bunting										
Species Richness	15	22	17	15	16	18	23	15	13	15

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 4 (continued)

SPECIES	7/18	7/30	8/1	8/6	8/9	8/29	9/24	10/5	10/15	10/17
Common Loon										
Double-crested Cormorant							1			
Great Blue Heron										
Black-crowned Night Heron	2	2	10							
Canada Goose		40								
Mallard	5	47	6		1					4
Black Duck		2		1			1			
Gadwall	1	2	54	34	41			5		
Blue-winged Teal		1								
American Wigeon	17	117	17	10	10	6				10
Wood Duck										
Redhead		2			32					1
Common Goldeneye										
White-winged Scoter										
Surf Scoter										1
Black Scoter										
Common Merganser										
Red-tailed Hawk										
Killdeer	8		5	2			3	1		
Upland Sandpiper										
Spotted Sandpiper	2			1	3					
Great Black-backed Gull				1	1	12	1			1
Herring Gull				18	5	30	50	1		
Ring-billed Gull	16	17	12	137	80	70	60	5	2	10
Bonaparte's Gull						20	15			
Common Tern	4					4				
Rock Dove	10							2	30	
Mourning Dove		2								

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table 4 (continued)

SPECIES	7/18	7/30	8/1	8/6	8/9	8/29	9/24	10/5	10/15	10/17
Belted Kingfisher							1			
Common Flicker					4				2	
Downy Woodpecker									1	
Eastern Kingbird	4		7	4		2				
Tree Swallow	35		8	24	1400	2000			155	100
Bank Swallow	8									
Barn Swallow	12	2	5	8	15	100				
Unidentified Swallows				300						
Purple Martin	4									
Blue Jay									2	
Common Crow	4			2	3		5		8	2
Gray Catbird				1						
Brown Thrasher										
American Robin	2			4				100	130	75
Cedar Waxwing				5	3		10	15		
Starling	180				10		20			10
Yellow Warbler	3			2	9					
Yellow-rumped Warbler							60	20		
Common Yellowthroat					1					
House Sparrow					1					
Eastern Meadowlark					2					
Red-winged Blackbird	15							15		2
Brown-headed Cowbird								10		
Evening Grosbeak										
American Goldfinch	5			3	3					
Rufous-sided Towhee										
Savannah Sparrow				1			45	5		
Tree Sparrow										

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 4 (continued)

SPECIES	7/18	7/30	8/1	8/6	8/9	8/29	9/24	10/5	10/15	10/17
Field Sparrow	1						1	1		
White-crowned Sparrow									4	
White-throated Sparrow							5			2
Swamp Sparrow										
Song Sparrow	2			16	10		60	5	10	5
Snow Bunting										
Species Richness	22	11	9	20	20	9	16	13	10	13

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 4 (continued)

SPECIES	10/22	10/30	11/8	11/10	11/13	11/20		Total	Avg./ Occ.	
Common Loon			1					1	1.0	
Double-crested Cormorant								1	1.0	
Great Blue Heron								10	1.3	
Black-crowned Night Heron								87	6.7	
Canada Goose						130		170	85.0	
Mallard								96	8.0	
Black Duck								5	1.3	
Gadwall								144	14.4	
Blue-winged Teal								1	1.0	
American Wigeon								357	22.3	
Wood Duck								2	1.0	
Redhead								35	11.7	
Common Goldeneye		1			5			6	3.0	
White-winged Scoter			1					1	1.0	
Surf Scoter								1	1.0	
Black Scoter		1			1			2	1.0	
Common Merganser								1	1.0	
Red-tailed Hawk						1		1	1.0	
Killdeer								56	3.7	
Upland Sandpiper								4	1.0	
Spotted Sandpiper								9	1.5	
Great Black-backed Gull								16	3.2	
Herring Gull			1	5	30	2		142	15.8	
Ring-billed Gull	5		4	80	250	10		15582	623.3	
Bonaparte's Gull								35	17.5	
Common Tern								27	3.4	
Rock Dove								58	9.7	
Mourning Dove								2	2.0	

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 4 (continued)

Species	10/22	10/30	11/8	11/10	11/13	11/20		Total	Avg./ Occ.	+
Belted Kingfisher								1	1.0	
Common Flicker								6	3.0	
Downy Woodpecker								1	1.0	
Eastern Kingbird								26	2.9	
Tree Swallow								3850	226.5	
Bank Swallow								36	5.1	
Barn Swallow								242	15.1	
Unidentified Swallows								300	300.0	
Purple Martin								21	3.0	
Blue Jay								2	2.0	
Common Crow								42	3.8	
Gray Catbird								1	1.0	
Brown Thrasher								3	1.0	
American Robin				15				343	34.3	
Cedar Waxwing								33	8.3	
Starling								643	45.9	
Yellow Warbler								36	3.0	
Yellow-rumped Warbler								80	40.0	
Common Yellowthroat								1	1.0	
House Sparrow								1	1.0	
Eastern Meadowlark								2	2.0	
Red-winged Blackbird								101	7.8	
Brown-headed Cowbird								10	10.0	
Evening Grosbeak						2		2	2.0	
American Goldfinch								16	3.2	
Rufous-sided Towhee								2	1.0	
Savannah Sparrow								51	17.0	
Tree Sparrow				3	3			6	3.0	

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 4 (continued)

SPECIES	10/22	10/30	11/8	11/10	11/13	11/20		Total	Avg./ Occ.+	
Field Sparrow								4	1.0	
White-crowned Sparrow								4	4.0	
White-throated Sparrow								7	3.5	
Swamp Sparrow								2	1.0	
Song Sparrow								118	9.1	
Snow Bunting		1						1	1.0	
Species Richness	1	3	4	4	5	5		62		

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 5 . Number of birds sighted on the St. Lawrence River in 1979 at station 2 .

SPECIES	6/11	6/13	6/21	6/27	7/2	7/5	7/11	7/18	7/19	7/30
Mallard										
Red-tailed Hawk		1					2			
Northern Marsh Harrier	1		1	1	1	1	2	3	1	
American Kestrel	1		1	1	1	1		1	5	4
Killdeer									5	5
Upland Sandpiper	1	2		1	2	3	2	1		1
Rign-billed Gull	3	5	5	4	10	5	4	6	5	
Rock Dove			8	4			5		8	
Mourning Dove										
Great Horned Owl										
Belted Kingfisher										
Common Flicker	1		1		2	4	2	1	5	
Downy Woodpecker			1				1			
Eastern Kingbird	2	3		5	3	5	4	8	22	
Great-crested Flycatcher			1			1				
Tree Swallow	5	3	5	4	20	50	4	3	8	200
Bank Swallow										10
Barn Swallow	4	6	10	2	10	10	2	2	18	250
Cliff Swallow									30	
Purple Martin	3		4	1	2	4	1	2	3	30
Blue Jay										
Common Crow	1		3	4	1	1	2	6	5	5
White-breasted Nuthatch										
American Robin		2	3		1	4			4	2
Cedar Waxwing					2		1		8	
Loggerhead Shrike	1	1	1	2	2	1	3			3
Starling	5	10	15	40	60	45	70	50	300	40
Tennessee Warbler										

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 5 (continued)

SPECIES	6/11	6/13	6/21	6/27	7/2	7/5	7/11	7/18	7/19	7/30
Yellow Warbler	3	2	2	3	3	3	4	5	4	
Yellow-rumped Warbler										
Palm Warbler										
Common Yellowthroat	2	3	2	1	6	4	3	2	3	
American Redstart					1					
House Sparrow										
Bobolink	3	2	6	4	2	15	10	40	126	3
Eastern Meadowlark	5	6	4	5	5	5	4	8	6	
Red-winged Blackbird	15	26	24	50	40	60	60	80	80	20
Northern Oriole				2	1		4			
Common Grackle	2	4	5	6	15	8	3	14	20	
Brown-headed Cowbird	1	5	4	2	2	5	4	2	5	
Indigo Bunting										
Evening Grosbeak										
American Goldfinch										
Savannah Sparrow	4	3	6	4	5	5	6	7	14	2
White-crowned Sparrow										
White-throated Sparrow										
Song Sparrow	6	8	6	6	3	3	4	4	3	3
Species Richness	21	18	23	22	25	23	25	20	24	15

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 5 (continued)

Species	8/1	8/6	8/9	8/29	9/24	10/5	10/15	10/17	10/22	10/30
Mallard						11				
Red-tailed Hawk					2	2	1		1	2
Northern Marsh Harrier	1									
American Kestrel	1	1	1	4				1		
Killdeer						2				
Upland Sandpiper										
Ring-billed Gull	3		5							
Rock Dove			10			50	5	150		
Mourning Dove		2								1
Great Horned Owl						1				
Belted Kingfisher					1					
Common Flicker	2				2	2				
Downy Woodpecker			1			1				
Eastern Kingbird		1	6							
Great-crested Flycatcher	1									
Tree Swallow	42	30	400	30			10			
Bank Swallow										
Barn Swallow	34	15	15	10						
Cliff Swallow										
Purple Martin		5	16							
Blue Jay						10	3			
Common Crow	11	3	6	5	6	15		105		
White-breasted Nuthatch						1				
American Robin						100	100	100	10	
Cedar Waxwing										
Loggerhead Shrike										
Starling	100	100		50			30	150		
Tennessee Warbler						1				

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table 5 (continued)

SPECIES	8/1	8/6	8/9	8/29	9/24	10/5	10/15	10/17	10/22	10/30
Yellow Warbler			5							
Yellow-rumped Warbler						45				
Palm Warbler						3				
Common Yellowthroat										
American Redstart										
House Sparrow								30		
Bobolink	2									
Eastern Meadowlark		9	40	3						
Red-winged Blackbird	15			500				40		
Northern Oriole	2									
Common Grackle						5		17		
Brown-headed Cowbird								15		
Indigo Bunting	1									
Evening Grosbeak										
American Goldfinch	2	8	3			5				
Savannah Sparrow				5				6		
White-crowned Sparrow							3			
White-throated Sparrow						10			5	
Song Sparrow						45		10		
Species Richness	14	10	12	8	4	18	7	11	3	2

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table 5 (continued)

SPECIES	11/6	11/10	11/13		Total	Avg./+ Occ.				
Mallard					11	11.0				
Red-tailed Hawk		2			13	1.6				
Northern Marsh Harrier					12	1.3				
American Kestrel					23	1.8				
Killdeer					12	4.0				
Upland Sandpiper					13	1.6				
Ring-billed Gull		10			65	5.4				
Rock Dove	5		50		295	29.5				
Mourning Dove					3	1.5				
Great Horned Owl					1	1.0				
Belted Kingfisher					1	1.0				
Common Flicker					22	2.2				
Downy Woodpecker					4	1.0				
Eastern Kingbird					59	5.9				
Great-crested Flycatcher					3	1.0				
Tree Swallow					814	54.3				
Bank Swallow					10	10.0				
Barn Swallow					388	27.7				
Cliff Swallow					30	30.0				
Purple Martin					71	6.5				
Blue Jay					13	6.5				
Common Crow					179	11.2				
White-breasted Nuthatch					1	1.0				
American Robin					326	32.6				
Cedar Waxwing	2				13	3.3				
Loggerhead Shrike					14	1.8				
Starling	5				1070	66.9				
Tennessee Warbler					1	1.0				

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table 5 (continued)

SPECIES	11/6	11/10	11/13		Total	Avg./* Occ.				
Yellow Warbler					34	3.4				
Yellow-rumped Warbler					45	45.0				
Palm Warbler					3	1.0				
Common Yellowthroat					26	2.9				
American Redstart					1	1.0				
House Sparrow					30	30.0				
Bobolink					213	19.4				
Eastern Meadowlark					100	8.3				
Red-winged Blackbird					1010	77.7				
Northern Oriole					9	2.3				
Common Grackle					99	9.0				
Brown-headed Cowbird					45	4.5				
Indigo Bunting					1	1.0				
Evening Grosbeak	30				30	30.0				
American Goldfinch					18	4.5				
Savannah Sparrow					67	5.6				
White-crowned Sparrow					3	3.0				
White-throated Sparrow					15	7.5				
Song Sparrow					101	8.4				
Species Richness	4	2	1		47					

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 6 . Number of birds sighted on the St. Lawrence River in 1979 at station 3 .

SPECIES	6/11	6/12	6/21	6/26	7/2	7/5	7/30		Total	Avg./* Occ.
Great Blue Heron							1		1	1.0
American Bittern	1	1		1			3		6	1.5
Mallard	2	3	2	1		1	8		17	2.8
American Wigeon							2		2	2.0
Northern Marsh Harrier	1				2				3	1.5
Blue-winged Teal	1	1				1	1		4	1.0
Long-billed Marsh Wren	2	2	1		1	1			7	1.4
Common Yellowthroat	1		2	2	4	2			11	2.2
Bobolink		1	3		3	2			9	2.3
Red-winged Blackbird	8	10	20	22	50	60			170	28.3
Swamp Sparrow	1	2	1		1	2	2		9	1.5
Song Sparrow		2	2	4	4	2			14	2.8
Species Richness	8	8	7	5	7	8	6		12	

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 7 . Number of birds sighted on the St. Lawrence River in 1979 at station 4 .

SPECIES	6/5	6/7	6/11	6/14	6/21	6/26	7/2	7/5	7/19	
Great Blue Heron			1				1			
Mallard				1			2			
Northern Marsh Harrier								1		
American Kestrel						1	1			
American Woodcock	1		1							
Common Snipe	1					2	1			
Herring Gull	1									
Ring-billed Gull	30	18	39	41	15	7	18	6	5	
Black-billed Cuckoo							1			
Common Flicker				1	2	2	3	1		
Eastern Kingbird	4	4	5	4	3	2		7	14	
Great-crested Flycatcher		1		1	1			1		
Tree Swallow	4	6	6	5	40	36	50	250	150	
Bank Swallow	2	1	4	18	32	50	120	400	300	
Barn Swallow	3	8	20	12	15	26	30	50	75	
Cliff Swallow	20	40	30	8	150	250	400	350	200	
Purple Martin	2			3	5	8	14	7	4	
Black-capped Chickadee			2	1	2	1				
House Wren	1	1	1		1			1	1	
Gray Catbird				2	1	2	1			
Brown Thrasher				1			1			
American Robin		4	5	10	8	7	6	5	4	
Starling	8	12	15	30	50	40	80	120	200	
Warbling Vireo			1	1		1				
Yellow Warbler	7	9	4	6	5	6	8	14	6	
Common Yellowthroat	2	3	4	3	3	2	1	2	1	
American Redstart	1			1	5		1	1	1	
Bobolink	4	5	6	6	4	5	4	4	2	

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 7 (continued)

SPECIES	6/5	6/7	6/11	6/14	6/21	6/26	7/2	7/5	7/19	
Eastern Meadowlark	4	4	5	4	3	3	7	2	1	
Red-winged Blackbird	6	10	15	8	7	4	10	15	20	
Northern Oriole	1	1		3	1	2		1		
Common Grackle	4	7	9	15	16	8	13	7	15	
Brown-headed Cowbird		4	3	2			8	6	1	
Scarlet Tanager	1									
Rose-breasted Grosbeak	2	1	1		1	1		1		
American Goldfinch	4	3	2	2	2	1	2	1	6	
Rufous-sided Towhee		2	1	1			1			
Savannah Sparrow	1	3	4		3	1	1	1	1	
Chipping Sparrow	1	1		1	1			1		
Field Sparrow	1				1				1	
Song Sparrow	5	3	4	8	7	5	1	1	3	
Species Richness	27	24	25	29	28	26	28	27	22	

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 7 (continued)

SPECIES	Total	Avg./† Occ.
Great Blue Heron	2	1.0
Mallard	3	1.5
Northern Marsh Harrier	1	1.0
American Kestrel	2	1.0
American Woodcock	2	1.0
Common Snipe	4	1.3
Herring Gull	1	1.0
Ring-billed Gull	179	19.9
Black-billed Cuckoo	1	1.0
Common Flicker	9	1.8
Eastern Kingbird	43	5.4
Great-crested Flycatcher	4	1.0
Tree Swallow	547	60.8
Bank Swallow	927	103.0
Barn Swallow	239	26.6
Cliff Swallow	1448	160.9
Purple Martin	43	6.1
Black-capped Chickadee	6	1.5
House Wren	6	1.0
Gray Catbird	6	1.5
Brown Thrasher	2	1.0
American Robin	49	6.1
Starling	555	61.7
Warbling Vireo	3	1.0
Yellow Warbler	65	7.2
Common Yellowthroat	21	2.3
American Redstart	10	1.7
Bobolink	40	4.4

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table 7 (continued)

SPECIES	Total	Avg./ Occ.
Eastern Meadowlark	33	3.7
Red-winged Blackbird	95	10.6
Northern Oriole	9	1.5
Common Grackle	94	10.4
Brown-headed Cowbird	24	4.0
Scarlet Tanager	1	1.0
Rose-breasted Grosbeak	7	1.2
American Goldfinch	23	2.6
Rufous-sided Towhee	5	1.3
Savannah Sparrow	15	1.9
Chipping Sparrow	5	1.0
Field Sparrow	3	1.0
Song Sparrow	37	4.1
Species Richness	41	

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 8 . Number of birds sighted on the St. Lawrence River in 1979 at station 5 .

SPECIES	7/30	8/1	8/6	8/9	8/29	9/24*	10/5	10/15	10/17	10/22
Great Blue Heron									1	
Canada Goose									61	
Mallard			2						2	
Black Duck									1	
Red-tailed Hawk										
American Kestrel			1	3	6					1
Gray Partridge									18	
Killdeer		2							2	
Rock Dove										
Mourning Dove			1							
Belted Kingfisher			1							
Common Flicker		2	5							
Downy Woodpecker									1	1
Eastern Kingbird		9	9	4	4					
Horned Lark										
Tree Swallow		10	4	10				3	7	
Bank Swallow		3								
Barn Swallow		30	50	40						
Purple Martin				2						
Blue Jay							3		25	
Common Crow	5	8	8				20		3	5
Black-capped Chickadee							4		5	
Brown Thrasher		1								
American Robin		3		15			30		15	5
Water Pipit									1	
Cedar Waxwing				1						
Starling	200	20	20	110	150		140	500	50	200
Yellow Warbler			1				5			

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 8 continued

SPECIES	7/30	8/1	8/6	8/9	8/29	9/24*	10/5	10/15	10/17	10/22
House Sparrow		10		50					15	
Bobolink		3	50							
Eastern Meadowlark		4					5			
Red-winged Blackbird			1800	20	500		10		42	
Unidentified Blackbirds			200							
Common Grackle				3					5	5
Brown-headed Cowbird									25	
American Goldfinch			5							
Savannah Sparrow		3	3							
Rufous-sided Towhee							1			
White-throated Sparrow							4			
Song Sparrow		4		20			15		4	
Species Richness	2	15	15	13	4	0	11	2	19	6

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 8 continued

SPECIES	10/30*	11/8	11/10	11/20		Total	Avg./+ Occ.			
Great Blue Heron						1	1.0			
Canada Goose						61	61.0			
Mallard						4	2.0			
Black Duck						1	1.0			
Red-tailed Hawk		1		1		2	1.0			
American Kestrel						11	2.8			
Gray Partridge						18	18.0			
Killdeer			1			5	1.7			
Rock Dove		15	50			65	32.5			
Mourning Dove						1	1.0			
Belted Kingfisher						1	1.0			
Common Flicker						7	3.5			
Downy Woodpecker						2	1.0			
Eastern Kingbird						26	6.5			
Horned Lark			12			12	12.0			
Tree Swallow						34	6.8			
Bank Swallow						3	3.0			
Barn Swallow						120	40.0			
Purple Martin						2	2.0			
Blue Jay		2				30	10.0			
Common Crow						49	8.2			
Black-capped Chickadee		3				12	4.0			
Brown Thrasher						1	1.0			
American Robin						68	13.6			
Water Pipit						1	1.0			
Cedar Waxwing						1	1.0			
Starling						1390	154.4			
Yellow Warbler						6	3.0			

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 8 continued

SPECIES	10/30*	11/8	11/10	11/20		Total	Avg./+ Occ.			
House Sparrow		10				85	21.3			
Bobolink						53	26.5			
Eastern Meadowlark						9	4.5			
Red-winged Blackbird						2372	474.4			
Unidentified Blackbirds						200	200.0			
Common Grackle						13	4.3			
Brown-headed Cowbird						25	25.0			
American Goldfinch						5	5.0			
Savannah Sparrow						6	3.0			
Rufous-sided Towhee						1	1.0			
White-throated Sparrow						4	4.0			
Song Sparrow						43	10.8			
Species Richness	0	5	3	1		40				

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 9 . Number of birds sighted on the St. Lawrence River in 1979 at station 6 .

SPECIES	10/5	10/17	10/22*	11/6		Total	Avg./† Occ.			
Killdeer		1				1	1.0			
Rock Dove	10					10	10.0			
Eastern Phoebe	1					1	1.0			
Blue Jay	3	8		2		13	4.3			
Common Crow		5				5	5.0			
Black-capped Chickadee	4					4	4.0			
American Robin	55	30		2		87	29.0			
Cedar Waxwing	6					6	6.0			
Starling	25	20		2		47	15.7			
Yellow Warbler	16					16	16.0			
House Sparrow	10	30				40	20.0			
Eastern Meadowlark	3					3	3.0			
Red-winged Blackbird	50					50	50.0			
Dark-eyed Junco	4					4	4.0			
White-throated Sparrow	10	2				12	6.0			
Song Sparrow	35	10				45	22.5			
Species Richness	14	8	0	3		16				

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 10 . Number of birds sighted on the St. Lawrence River in 1979 at station 7 .

SPECIES	6/11	6/12	6/26	7/30		Total	Avg./* Occ.			
Great Blue Heron		1				1	1.0			
Canada Goose	1					1	1.0			
Mallard	2		1	2		5	1.7			
Killdeer	2		1			3	1.5			
Swamp Sparrow	1	1	1	1		4	1.0			
Species Richness	4	2	3	2		5				

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 11 . Number of birds sighted on the St. Lawrence River in 1979 at station 8 .

SPECIES	6/5	6/6	6/8	6/12	6/21	6/29	7/5	8/1	8/6	8/9
Green Heron	1					1				
Mallard		1								
Red-tailed Hawk	1			1						
Northern Marsh Harrier								1		
American Kestrel	1	2		1	2		2			
Ruffed Grouse	1									
Killdeer								3	3	
Upland Sandpiper	1	1	1			1				
Ring-billed Gull	8	4	1				5			
Mourning Dove	1				1		1			
Belted Kingfisher			1							
Common Flicker	1			2	1		3		2	
Hairy Woodpecker		1							3	
Downy Woodpecker	1			1						
Eastern Kingbird	8	4	5	5	3	4	5	2	4	
Great-crested Flycatcher	2	2	1	3	1	2	2	1		
Eastern Phoebe	1		1	1						
Willow Flycatcher	2	2	1	3	1					
Alder Flycatcher	3	2	2	3	1	1		1		
Eastern Wood Pewee									1	
Bank Swallow								5		
Barn Swallow	4		3	6		4	20	5	4	5
Purple Martin	2				1					
Blue Jay										
Common Crow			1	1		1	4		3	
Black-capped Chickadee			4			2				
House Wren			1		1	2				
American Robin	6	5	8	4	4	5	4		20	

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table 11 continued

SPECIES	6/5	6/6	6/8	6/12	6/21	6/29	7/5	8/1	8/6	8/9
Woodthrush			1	2		1	1			
Veery			1	1		1				
Cedar Waxwing		2	1	2		1	2			
Starling	2	5	4	4	10	15	30			
Red-eyed Vireo	2	2	1	2		2	1			
Warbling Vireo	1		1	1		1				
Yellow Warbler	8	5	2	5	3	5	3			
Common Yellowthroat	4	3	3	3	2	4	1			
American Redstart	2	2	1	1	1		1	50		
Bobolink	1	1	1	2	1	1				
Eastern Meadowlark	2	2	1	3	2	1			4	
Red-winged Blackbird	10	15	7	8	8	4	15			10
Northern Oriole	4	3	3	2		1	2			
Brown-headed Cowbird	2		1	1	2		1			
Rose-breasted Grosbeak	2	1	3	2	2	1	1			
American Goldfinch									6	
Rufous-sided Towhee		1			1					1
Savannah Sparrow	2	1	2	1	1		1		4	
Field Sparrow		1	1		1					
Song Sparrow	11	8	7	4	5	6	5	10	4	
Species Richness	31	25	31	29	23	24	22	9	12	3

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 11 continued

SPECIES	10/17	10/22	11/8	11/10		Total	Avg./+ Occ.			
Green Heron						2	1.0			
Mallard						1	1.0			
Red-tailed Hawk		1				3	1.0			
Northern Marsh Harrier				1		2	1.0			
American Kestrel						8	1.6			
Ruffed Grouse						1	1.0			
Killdeer						6	3.0			
Upland Sandpiper						4	1.0			
Ring-billed Gull						18	4.5			
Mourning Dove						3	1.0			
Belted Kingfisher						1	1.0			
Common Flicker						9	1.8			
Hairy Woodpecker						4	2.0			
Downy Woodpecker						2	1.0			
Eastern Kingbird						40	4.4			
Great-crested Flycatcher						14	1.8			
Eastern Phoebe						3	1.0			
Willow Flycatcher						9	1.8			
Alder Flycatcher						13	1.9			
Eastern Wood Pewee						1	1.0			
Bank Swallow						5	5.0			
Barn Swallow						51	6.4			
Purple Martin						3	1.5			
Blue Jay	4		2			6	3.0			
Common Crow		10				20	3.3			
Black-capped Chickadee			5			11	3.7			
House Wren						4	1.3			
American Robin						56	7.0			

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table 11 continued

SPECIES	10/17	10/22	11/8	11/10		Total	Avg./+ Occ.			
Woodthrush						5	1.3			
Veery						3	1.0			
Cedar Waxwing						8	1.6			
Starling	20	50				140	15.6			
Red-eyed Vireo						10	1.7			
Warbling Vireo						4	1.0			
Yellow Warbler						31	4.4			
Common Yellowthroat						20	2.9			
American Redstart						58	8.3			
Bobolink						7	1.2			
Eastern Meadowlark						15	2.1			
Red-winged Blackbird						77	9.6			
Northern Oriole						15	2.5			
Brown-headed Cowbird						7	1.4			
Rose-breasted Grosbeak						12	1.7			
American Goldfinch						6	6.0			
Rufous-sided Towhee						3	1.0			
Savannah Sparrow						12	1.7			
Field Sparrow						3	1.0			
Song Sparrow						60	6.7			
Species Richness	2	3	2	1		48				

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 12 . Number of birds sighted on the St. Lawrence River in 1979 at station 9 .

SPECIES	7/30	8/1	8/6	9/24	10/5		Total	Avg./+ Occ.		
Green Heron			1				1	1.0		
Common Flicker	1	8	22	5			36	9.0		
Hairy Woodpecker			1				1	1.0		
Downy Woodpecker			2	2			4	2.0		
Eastern Kingbird	3	4	10				17	5.7		
Eastern Wood Pewee			1				1	1.0		
Tree Swallow	60						60	60.0		
Blue Jay		2					2	2.0		
Common Crow		5	5				10	5.0		
Black-capped Chickadee			2				2	2.0		
Gray Catbird				1			1	1.0		
American Robin	5	3	15				23	7.7		
Veery	1		1				2	1.0		
Ruby-crowned Kinglet				2			2	2.0		
Cedar Waxwing	3	4					7	3.5		
Starling			50		50		100	50.0		
Yellow Warbler		2	3				5	2.5		
Common Yellowthroat	1		8	5			14	4.7		
Eastern Meadowlark			1				1	1.0		
Red-winged Blackbird	15	600	20		10		645	161.3		
Northern Oriole			5				5	5.0		
Common Grackle			2				2	2.0		
Rose-breasted Grosbeak		2	15				17	8.5		
American Goldfinch		8	15				23	11.5		
Rufous-sided Towhee		1					1	1.0		
Dark-eyed Junco			5				5	5.0		
Field Sparrow					2		2	2.0		
White-crowned Sparrow				25	30		55	27.5		

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 12 (continued)

SPECIES	7/30	8/1	8/6	9/24	10/5		Total	Avg./+ Occ.		
White-throated Sparrow			2	40	20		62	20.7		
Lincoln's Sparrow				5			5	5.0		
Swamp Sparrow			4	20	2		26	8.7		
Song Sparrow	3	10	140	225	40		418	83.6		
Species Richness	9	12	22	11	7		32			

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 13 . Number of birds sighted on the St. Lawrence River in 1979 at station 11 .

SPECIES	7/26	7/30	8/29	9/8	9/24	10/5	10/17	10/23	10/30	11/8
Great Blue Heron			2		3	2	3	1		
Canada Goose		32	8	200	5		4	50	1	1
Mallard			35	34	90	262	25	80	20	21
Black Duck			36	58	210	266	110	240	135	80
Gadwall				2	60	17	36	65	115	16
Pintail						3				
Green-winged Teal					2					
Blue-winged Teal			4	3						
American Wigeon			19	8	80	10	35	25	10	
Northern Shoveler						41	4			30
Redhead					5		205	345	850	800
Canvasback					2	1			2	29
Ring-necked Duck					70		210	775	650	550
Greater Scaup							320	100	10	
Lesser Scaup							6			
Unidentified Scaup										30
Common Goldeneye									2	
Hooded Merganser								2	2	1
Common Merganser						2	18		6	10
Red-breasted Merganser							4			
Red-tailed Hawk					1		2			2
Northern Marsh Harrier	1	1	1						1	2
American Kestrel		1		1		1				
American Coot							1			
Killdeer						2				
Great Black-backed Gull								2		1
Herring Gull		1	5					2	1	
Ring-billed Gull		10	60					8	61	20

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table 13 continued

SPECIES	7/26	7/30	8/29	9/8	9/24	10/5	10/17	10/23	10/30	11/8
Albino Ring-billed Gull										
Common Tern	3									
Belted Kingfisher			1							
Common Flicker				2						
Eastern Kingbird	5	4								
Common Crow				50	5				2	2
Starling		30		50						
Bobolink		2								
Red-winged Blackbird		55								
White-crowned Sparrow									5	
Swamp Sparrow						1				
Song Sparrow		6	5							
Species Richness	3	10	11	10	12	12	15	13	17	16

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table 13 continued

SPECIES	11/10	11/13	11/20		Total	Avg./+ Occ.				
Great Blue Heron					11	2.2				
Canada Goose			4		305	33.9				
Mallard	26	31	11		635	57.7				
Black Duck	145	100	104		1484	134.9				
Gadwall	17	22	10		360	36.0				
Pintail					3	3.0				
Green-winged Teal					2	2.0				
Blue-winged Teal					7	3.5				
American Wigeon					187	26.7				
Northern Shoveler	1	41			117	23.4				
Redhead	850	840	800		4695	586.9				
Canvasback	2	3			39	6.5				
Ring-necked Duck	700	450	200		3605	450.6				
Greater Scaup	3		10		443	88.6				
Lesser Scaup					6	6.0				
Unidentified Scaup		10			40	20.0				
Common Goldeneye					2	2.0				
Hooded Merganser			15		20	5.0				
Common Merganser	10	5	14		65	9.3				
Red-breasted Merganser		4			8	4.0				
Red-tailed Hawk		2	1		8	1.6				
Northern Marsh Harrier		1			7	1.2				
American Kestrel					3	1.0				
American Coot					1	1.0				
Killdeer					2	2.0				
Great Black-backed Gull		2			5	1.7				
Herring Gull					9	2.3				
Ring-billed Gull		200	100		459	65.6				

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 13 continued

SPECIES	11/10	11/13	11/20	Total	Avg./+ Occ.
Albino Ring-billed Gull		1		1	1.0
Common Tern				3	3.0
Belted Kingfisher				1	1.0
Common Flicker				2	2.0
Eastern Kingbird				9	4.5
Common Crow	470			529	105.8
Starling				80	40.0
Bobolink				2	2.0
Red-winged Blackbird				55	55.0
White-crowned Sparrow				5	5.0
Swamp Sparrow				1	1.0
Song Sparrow				11	5.5
Species Richness	10	14	11	39	

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 14 . Number of birds sighted on the St. Lawrence River in 1979 at station 12 .

SPECIES	6/5	6/6	6/11	6/13	6/21	6/26	6/27	7/3	7/11	7/19
Great Blue Heron										
Green Heron		1							1	
Canada Goose										
Black Duck										
American Wigeon										
Common Goldeneye										
Red-breasted Merganser										
Red-tailed Hawk	1			1	1	1		1	1	
Northern Marsh Harrier										
American Kestrel	1		1	1	1	1		1	1	1
Killdeer	1	4	2	1			3	2	1	4
Ring-billed Gull										
Mourning Dove					1	1		1		1
Black-billed Cuckoo			1	1	1					
Belted Kingfisher				1						
Common Flicker										
Hairy Woodpecker										
Downy Woodpecker				1	1		1			
Eastern Kingbird	3	1	2	4	2	3	2	2	12	8
Willow Flycatcher			3	2	2	1	2	2	2	
Alder Flycatcher			2	1	1	1	1	1	1	
Tree Swallow	2	4	2	4	4	3	5	4	12	8
Bank Swallow				31						
Barn Swallow	40	52	20		18	6	5	9	7	8
Cliff Swallow	150	120	70	50	160	8	14	20	18	10
Unidentified Swallow										
Purple Martin	4	2	3	4	3	2	2	1	5	2
Blue Jay										

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 14 continued

SPECIES	6/5	6/6	6/11	6/13	6/21	6/26	6/27	7/3	7/11	7/19
Common Crow	1	4		4	3	3	2		2	
Black-capped Chickadee				2	2	1		1		
American Robin	2	10	14	7	6	5	4	3	2	2
Veery		1	2		1					
Cedar Waxwing	2			1	5	4	5	4		4
Starling	5	18	30	17	16	5	20	130	40	140
Yellow Warbler	9	8	9	6	7	5	5	4	4	6
Common Yellowthroat	5	6	4	5	5	3	5	4	3	2
American Redstart	2	1		1		1				
Bobolink	4	3	4	4	4	4	3	3	3	4
Eastern Meadowlark	4	5	4	3	4	6	1	4	4	2
Red-winged Blackbird	15	22	18	24	21	26	23	36	21	15
Northern Oriole		2	2	3	1	3	2		5	
Common Grackle	4	6	4	2	3	4	5	5	4	1
American Goldfinch	2	1		2	3	4	2	6	4	6
Rufous-sided Towhee		1	1	2	1	2		1	1	1
Savannah Sparrow	3	3	2	4	5	6	5	6	3	3
Vesper Sparrow										
Dark-eyed Junco										
Chipping Sparrow		1	2	1			1			1
White-crowned Sparrow										
White-throated Sparrow										
Swamp Sparrow	1			1						
Song Sparrow	9	8	10	8	7	8	5	5	4	3
Species Richness	23	24	24	32	29	27	24	25	25	22

*No Birds sighted +Mean number per sampling period present (Average per occurrence)

Table 14 continued

SPECIES	7/26	7/30	8/9	8/29	9/8	10/15	10/17	10/23	10/30	11/8
Great Blue Heron					3			1		
Green Heron										
Canada Goose						35				
Black Duck						3	4			
American Wigeon						1	1			
Common Goldeneye										
Red-breasted Merganser								1		
Red-tailed Hawk				1	1	2	2	2	4	2
Northern Marsh Harrier										
American Kestrel	6	3	5	6	6	1				
Killdeer										
Ring-billed Gull										
Mourning Dove										
Black-billed Cuckoo										
Belted Kingfisher										
Common Flicker			9		35	4				
Hairy Woodpecker										1
Downy Woodpecker										
Eastern Kingbird	14	8								
Willow Flycatcher										
Alder Flycatcher										
Tree Swallow			1800	500						
Bank Swallow										
Barn Swallow			10							
Cliff Swallow										
Unidentified Swallow	100									
Purple Martin										
Blue Jay					6					

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 14 continued

SPECIES	7/26	7/30	8/9	8/29	9/8	10/15	10/17	10/23	10/30	11/8
Common Crow	15			10	10		5	4		2
Black-capped Chickadee							5			
American Robin			30			30	25	10		
Veery										
Cedar Waxwing	2		5					30		
Starling	100	10							100	
Yellow Warbler	2									
Common Yellowthroat	1									
American Redstart										
Bobolink										
Eastern Meadowlark	8				8					
Red-winged Blackbird	25	20								
Northern Oriole										
Common Grackle										
American Goldfinch					60					
Rufous-sided Towhee										
Savannah Sparrow			5							
Vesper Sparrow									1	
Dark-eyed Junco						20		20		
Chipping Sparrow										
White-crowned Sparrow						2				
White-throated Sparrow						5				
Swamp Sparrow										
Song Sparrow	6					30	5			
Species Richness	11	4	7	4	8	11	7	7	3	3

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 14 continued

SPECIES	11/10	11/13		Total	Avg./+ Occ.					
Great Blue Heron	1			5	1.7					
Green Heron				2	1.0					
Canada Goose				35	35.0					
Black Duck	10			17	5.7					
American Wigeon				2	1.0					
Common Goldeneye	15			15	15.0					
Red-breasted Merganser				1	1.0					
Red-tailed Hawk	1	2		23	1.5					
Northern Marsh Harrier	1			1	1.0					
American Kestrel				35	2.5					
Killdeer				18	2.3					
Ring-billed Gull	150			150	150.0					
Mourning Dove				4	1.0					
Black-billed Cuckoo				3	1.0					
Belted Kingfisher				1	1.0					
Common Flicker				48	16.0					
Hairy Woodpecker				1	1.0					
Downy Woodpecker				3	1.0					
Eastern Kingbird				61	5.1					
Willow Flycatcher				14	2.0					
Alder Flycatcher				8	1.1					
Tree Swallow				2348	195.7					
Bank Swallow				31	31.0					
Barn Swallow				175	17.5					
Cliff Swallow				620	62.0					
Unidentified Swallow				100	100.0					
Purple Martin				28	2.8					
Blue Jay				6	6.0					

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 14 continued

SPECIES	11/10	11/13	Total	Avg./+ Occ.
Common Crow	5		70	5.0
Black-capped Chickadee	5		16	2.7
American Robin			150	10.7
Veery			4	1.3
Cedar Waxwing			62	6.2
Starling	100	200	931	62.1
Yellow Warbler			65	5.9
Common Yellowthroat			43	3.9
American Redstart			5	1.3
Bobolink			36	3.6
Eastern Meadowlark			53	4.4
Red-winged Blackbird			266	22.2
Northern Oriole			18	2.6
Common Grackle			38	3.8
American Goldfinch			90	9.0
Rufous-sided Towhee			10	1.3
Savannah Sparrow			45	4.1
Vesper Sparrow			1	1.0
Dark-eyed Junco			40	20.0
Chipping Sparrow			6	1.2
White-crowned Sparrow			2	2.0
White-throated Sparrow			5	5.0
Swamp Sparrow			2	1.0
Song Sparrow			108	8.3
Species Richness	9	2	52	

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 15. Number of birds sighted on the St. Lawrence River in 1979 at station 13.

SPECIES	6/5	6/6	6/11	6/13	6/21	6/26	6/27	7/3	7/11	7/19
Pied-billed Grebe										1
Great Blue Heron	1			2		2	1			
Canada Goose	2			3						
Mallard	1				2	2	1	1		
Black Duck										
Canvasback										
Common Goldeneye										
Bufflehead										
Oldsquaw										
Common Merganser										
Red-breasted Merganser										
Red-tailed Hawk										
Northern Marsh Harrier										
American Kestrel										
Killdeer										
Spotted Sandpiper										3
Solitary Sandpiper										
Parasitic Jaeger										
Great Black-backed Gull									3	
Herring Gull									3	
Ring-billed Gull	1000	500	300	400	300	400	200	350	300	60
Bonaparte's Gull										
Little Gull										
Common Tern	4		5	2	1					60
Black Tern										
Rock Dove										
Common Flicker										
Tree Swallow										

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 15 continued

SPECIES	6/5	6/6	6/11	6/13	6/21	6/26	6/27	7/3	7/11	7/19
Barn Swallow										
Blue Jay										
Common Crow										
Black-capped Chickadee										
American Robin										
Starling										
Eastern Meadowlark										
Red-winged Blackbird										
Rusty Blackbird										
Evening Grosbeak										
Dark-eyed Junco										
Tree Sparrow										
Song Sparrow										
Snow Bunting										
Species Richness	5	1	2	4	3	3	3	2	3	4

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 15 continued

SPECIES	8/1	8/3	8/9	8/29	9/8	9/24	10/5	10/15	10/17	10/23
Pied-billed Grebe										
Great Blue Heron										
Canada Goose	30							300	300	
Mallard						3				
Black Duck										
Canvasback										
Common Goldeneye										
Bufflehead										
Oldsquaw										
Common Merganser								2	2	
Red-breasted Merganser								1		
Red-tailed Hawk						1				1
Northern Marsh Harrier										
American Kestrel		12		1	1		1			
Killdeer							2			
Spotted Sandpiper										
Solitary Sandpiper			1							
Parasitic Jaeger										
Great Black-backed Gull	8		6	2	2	2	1	10		3
Herring Gull	20		25	3	40	3	5	150	5	25
Ring-billed Gull	600		500	10	750	30	35	800	100	200
Bonaparte's Gull	22		43		45	1	34	20	102	50
Little Gull					1					
Common Tern	10		20	4	25					
Black Tern					3					
Rock Dove							50			
Common Flicker		10		3						
Tree Swallow				100						

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table 15 continued

SPECIES	8/1	8/3	8/9	8/29	9/8	9/24	10/5	10/15	10/17	10/23
Barn Swallow				12						
Blue Jay										
Common Crow				5						
Black-capped Chickadee								3		
American Robin								35		
Starling							20			
Eastern Meadowlark				6				2		
Red-winged Blackbird		3								
Rusty Blackbird										
Evening Grosbeak										
Dark-eyed Junco								25		
Tree Sparrow										
Song Sparrow										
Snow Bunting										
Species Richness	6	3	6	10	8	6	8	11	5	5

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 15 continued

SPECIES	10/30	11/8	11/10	11/13	11/20		Total	Avg./ Occ.+		
Pied-billed Grebe				1			2	1.0		
Great Blue Heron							6	1.5		
Canada Goose	50	400					1085	155.0		
Mallard		4	2				16	2.0		
Black Duck		15	2	20	3		40	10.0		
Canvasback				100			100	100.0		
Common Goldeneye		15	35	40	125		215	53.8		
Bufflehead		8					8	8.0		
Oldsquaw	1		12				13	6.5		
Common Merganser	130	500	400	3450	1400		5884	840.6		
Red-breasted Merganser	5						6	3.0		
Red-tailed Hawk		1	1	1	5		10	1.7		
Northern Marsh Harrier	1						1	1.0		
American Kestrel							15	3.8		
Killdeer							2	2.0		
Spotted Sandpiper							3	3.0		
Solitary Sandpiper							1	1.0		
Parasitic Jaeger	1						1	1.0		
Great Black-backed Gull	1	5	10		13		66	5.1		
Herring Gull	30	30	40	10	110		499	33.3		
Ring-billed Gull	230	200	350	250	225		3090	337.1		
Bonaparte's Gull	15	11	35				378	34.4		
Little Gull							1	1.0		
Common Tern							131	14.6		
Black Tern							3	3.0		
Rock Dove					10		60	30.0		
Common Flicker							13	6.5		
Tree Swallow							100	100.0		

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 15 continued

SPECIES	10/30	11/8	11/10	11/13	11/20		Total	Avg./+ Occ.		
Barn Swallow							12	12.0		
Blue Jay	1						1	1.0		
Common Crow	5	2					12	4.0		
Black-capped Chickadee	23						26	13.0		
American Robin	70						105	52.5		
Starling	150						170	85.0		
Eastern Meadowlark							8	4.0		
Red-winged Blackbird							3	3.0		
Rusty Blackbird					2		2	2.0		
Evening Grosbeak					10		10	10.0		
Dark-eyed Junco							25	25.0		
Tree Sparrow	5				5		10	5.0		
Song Sparrow	5						5	5.0		
Snow Bunting					10		10	10.0		
Species Richness	17	12	10	8	12		42			

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table 16 . Number of birds sighted on the St. Lawrence River in 1979 at station 14.

SPECIES	8/7	9/8	9/17	9/24	10/5	10/15	10/17	10/30	11/8	11/10
Great Blue Heron			1		1					
Canada Goose	40	150			25	500	430	50		
Egyptian Goose						1				
Mallard	15				2				6	7
Black Duck					2				2	3
Mallard X Black Duck										1
Common Merganser									1	
Cooper's Hawk										1
Red-tailed Hawk			2	1	3	1			3	2
Northern Marsh Harrier								1		
American Kestrel	8	1	1							
Ruffed Grouse			1						1	
Killdeer					5		5		1	
Herring Gull					2					2
Ring-billed Gull	115				6		2	5	10	
Common Flicker	2	6							1	
Downy Woodpecker										
Eastern Kingbird	5	4								
Tree Swallow	2500									
Bank Swallow	5									
Barn Swallow	15									
Cliff Swallow	5									
Blue Jay								1		
Common Crow	5	14	20		15			5	5	
Black-capped Chickadee								3		
American Robin					40			20		
Starling					100			50	150	
Yellow-rumped Warbler					5					

*No birds sighted +Mea number per sampling period present (Average per occurrence)

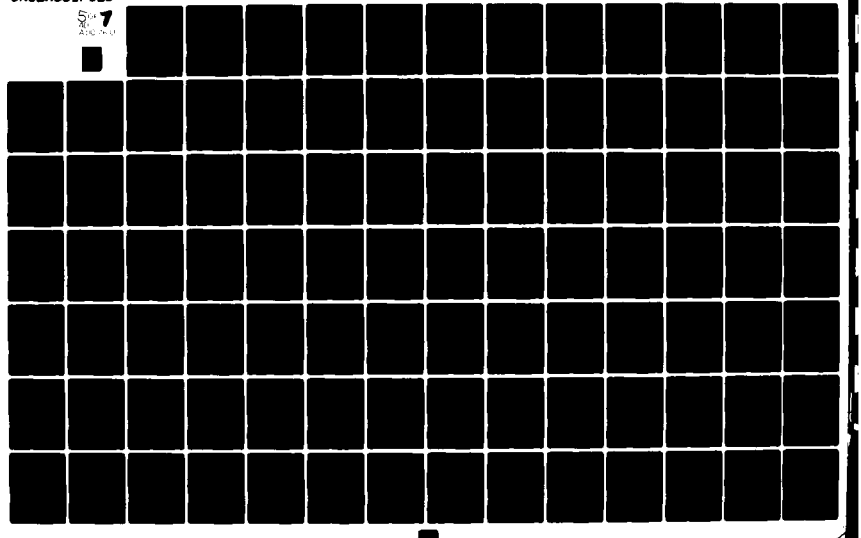
Table: 16 continued

SPECIES	8/7	9/8	9/17	9/24	10/5	10/15	10/17	10/30	11/8	11/10
Eastern Meadowlark				60	10					
Common Grackle	3									
Savannah Sparrow			4							
Dark-eyed Junco						100				
Tree Sparrow								5		
White-crowned Sparrow					5					
White-throated Sparrow					15					
Song Sparrow					40		5	5		
Species Richness	12	5	6	2	16	4	4	10	10	6

*No birds sighted +Mean number per sampling period present (Average per occurrence)

AD-A110 760 FISH AND WILDLIFE SERVICE CORTLAND NY F/G 6/3
BIOLOGICAL SURVEY ALONG THE ST. LAWRENCE RIVER FOR THE ST. LAWR--ETC(U)
1979

UNCLASSIFIED NL



A110 7

1.0
1.1
1.25
1.4
1.6
2.8
3.2
3.6
4.0
2.5
2.2
2.0
1.8

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963 A

Table: 16 continued

SPECIES	11/13	11/20		Total	Avg./* Occ.					
Great Blue Heron				2	1.0					
Canada Goose				1195	199.2					
Egyptian Goose				1	1.0					
Mallard		7		37	7.4					
Black Duck	3	3		13	2.6					
Mallard X Black Duck		1		2	1.0					
Common Merganser	1			2	1.0					
Cooper's Hawk				1	1.0					
Red-tailed Hawk		1		13	1.9					
Northern Marsh Harrier				1	1.0					
American Kestrel				10	3.3					
Ruffed Grouse				2	1.0					
Killdeer		1		12	3.0					
Herring Gull				4	2.0					
Ring-billed Gull		4		142	23.7					
Common Flicker				9	3.0					
Downy Woodpecker		1		1	1.0					
Eastern Kingbird				9	4.5					
Tree Swallow				2500	2500.0					
Bank Swallow				5	5.0					
Barn Swallow				15	15.0					
Cliff Swallow				5	5.0					
Blue Jay				1	1.0					
Common Crow				64	10.7					
Black-capped Chickadee		5		8	4.0					
American Robin				60	30.0					
Starling		30		330	82.5					
Yellow-rumped Warbler				5	5.0					

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 16 continued

SPECIES	11/13	11/20		Total	Avg./+ Occ.					
Eastern Meadowlark				70	35.0					
Common Grackle				3	3.0					
Savannah Sparrow				4	4.0					
Dark-eyed Junco				100	100.0					
Tree Sparrow				5	5.0					
White-crowned Sparrow				5	5.0					
White-throated Sparrow				15	15.0					
Song Sparrow				50	16.7					
Species Richness	2	9		36						

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 17 . Number of birds sighted on the St. Lawrence River in 1979 at station 15.

SPECIES	7/26	7/29	8/3	8/7	9/17	9/24	10/5	10/30	11/8	11/13
Common Loon								1		
Double-crested Cormorant					1					
Canada Goose				116	150		25	175	125	500
Mallard									6	
Black Duck								3		
Gadwall				10						3
American Wigeon				12						
Redhead										
Ring-necked Duck									1	
Greater Scaup							5			1
Bufflehead									14	
Oldsquaw										2
Surf Scoter								1		
Black Scoter								1	100	
Common Merganser								200		225
Red-tailed Hawk						1	3		1	
American Coot									5	1
Spotted Sandpiper				3						
Semipalmated Sandpiper				2						
Parasitic Jaeger								1		
Great Black-backed Gull	1	1	15	3				1		
Herring Gull	5			6	5		10		30	
Ring-billed Gull	250	50	300	130	120		40	150	200	
Bonaparte's Gull			71	92	30	35	88	87	26	24
Little Gull								1		
Common Tern	55	5		33	140	50				
Black Tern					2					
Rock Dove				40				40	10	25

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 17 continued

SPECIES	7/26	7/29	8/3	8/7	9/17	9/24	10/5	10/30	11/8	11/13
Hairy Woodpecker						1				
Tree Swallow	350									
Bank Swallow	100									
Barn Swallow	150									
Common Crow									3	
Brown Thrasher						1				
American Robin								10		
Cedar Waxwing								5		
Starling									20	
Yellow-rumped Warbler					1					
Species Richness	7	4	3	11	8	5	6	14	13	8

*No birds sighted +Mean number per sampling period present (Average per occurrence).

Table: 17 continued

SPECIES	11/20		Total	Avg./* Occ.						
Common Loon			1	1.0						
Double-crested Cormorant			1	1.0						
Canada Goose	250		1341	191.6						
Mallard			6	6.0						
Black Duck			3	3.0						
Gadwall	1		14	4.7						
American Wigeon			12	12.0						
Redhead	1		1	1.0						
Ring-necked Duck			1	1.0						
Greater Scaup			6	3.0						
Bufflehead			14	14.0						
Oldsquaw			2	2.0						
Surf Scoter			1	1.0						
Black Scoter			101	50.5						
Common Merganser			425	212.5						
Red-tailed Hawk			5	1.7						
American Coot	1		7	2.3						
Spotted Sandpiper			3	3.0						
Semipalmated Sandpiper			2	2.0						
Parasitic Jaeger			1	1.0						
Great Black-backed Gull	16		37	6.2						
Herring Gull			60	10.0						
Ring-billed Gull			1240	155.0						
Bonaparte's Gull	3		456	50.7						
Little Gull			1	1.0						
Common Tern			283	56.6						
Black Tern			2	2.0						
Rock Dove	20		135	27.0						

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 17 continued

SPECIES	11/20		Total	Avg./+ Occ.						
Hairy Woodpecker			1	1.0						
Tree Swallow			350	350.0						
Bank Swallow			100	100.0						
Barn Swallow			150	150.0						
Common Crow			3	3.0						
Brown Thrasher			1	1.0						
American Robin			10	10.0						
Cedar Waxwing			5	5.0						
Starling			20	20.0						
Yellow-rumped Warbler			1	1.0						
Species Richness	7		38							

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 18. Number of birds sighted on the St. Lawrence River in 1979 at station 16 .

SPECIES	8/7	10/5	10/17	10/23	10/30	11/20		Total	Avg./† Occ.	
Great Blue Heron			1					1	1.0	
Canada Goose			250					250	250.0	
Egyptian Goose			1					1	1.0	
Mallard		2						2	2.0	
Red-tailed Hawk					5			5	5.0	
American Kestrel	3							3	3.0	
Ruffed Grouse		1						1	1.0	
Herring Gull		1	20			1		22	7.3	
Ring-billed Gull			200					200	200.0	
Common Flicker	2	3						5	2.5	
Hairy Woodpecker		1						1	1.0	
Downy Woodpecker		1						1	1.0	
Eastern Kingbird	6							6	6.0	
Barn Swallow	15							15	15.0	
Blue Jay	5	2						7	3.5	
Common Crow		10	2					12	6.0	
Black-capped Chickadee			2	5		3		10	3.3	
White-breasted Nuthatch						1		1	1.0	
Gray Catbird	2							2	2.0	
Brown Thrasher	3							3	3.0	
American Robin	3	30	10	5	30			78	15.6	
Cedar Waxwing	23							23	23.0	
Starling		50	5	30				85	28.3	
Yellow-rumped Warbler		5						5	5.0	
Red-winged Blackbird	45							45	45.0	
White-throated Sparrow		5						5	5.0	
Song Sparrow	2							2	2.0	
Species Richness	11	12	9	3	2	3		27		

*No birds sighted †Mean number per sampling period present (Average per occurrence)

Table: 19 . Number of birds sighted on the St. Lawrence River in 1979 at station 17 .

SPECIES	6/18-6/19		Total	Avg./+ Occ.						
Ring-billed Gull	13200		13200	13200.0						
Species Richness	1		1							

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 20. Number of birds sighted on the St. Lawrence River in 1979 at station 18.

SPECIES	6/19		Total	Avg./+ Occ.						
Common Tern	61		61	61.0						
Species Richness	1		1							

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 21 . Number of birds sighted on the St. Lawrence River in 1979 at station 19 .

SPECIES	6/5	6/19		Total	Avg./+ Occ.					
Common Tern	80	122		202	101.0					
Bank Swallow		100		100	100.0					
Species Richness	1	2		2						

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 22. Number of birds sighted on the St. Lawrence River in 1979 at station 20.

SPECIES	6/19		Total	Avg./+ Occ.						
Mallard	2		2	2.0						
Ring-billed Gull	8		8	8.0						
Common Tern	6		6	6.0						
Species Richness	3		3							

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 23 . Number of birds sighted on the St. Lawrence River in 1979 at station 21

SPECIES	6/19		Total	Avg./+ Occ.						
Canada Goose	28		28	28.0						
Spotted Sandpiper	4		4	4.0						
Herring Gull	2		2	2.0						
Ring-billed Gull	19		19	19.0						
Common Tern	5		5	5.0						
Species Richness	5		5							

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 24. Number of birds sighted on the St. Lawrence River in 1979 at station 22.

SPECIES	7/30	8/7	9/8	9/17	10/5	10/17	10/23	10/30	11/8	11/10
Common Loon						2				
Horned Grebe						3				
Canada Goose	350	6	20					140	100	
Mallard						30				
Black Duck						15				
Gadwall						17				
American Wigeon		5				10				
Surf Scoter						1				
Common Merganser						10				
Unidentified Ducks								50		
Red-tailed Hawk					1				1	1
Greater Yellowlegs					1					
Great Black-backed Gull	5		5			20			1	10
Herring Gull			50		2	100			3	30
Ring-billed Gull		100	2300	5	1	400			8	250
Bonaparte's Gull										
Unidentified Gulls								300		
Common Tern	50	15								
Belted Kingfisher								1		
Common Flicker		3		6					1	
Downy Woodpecker		1								
Eastern Kingbird		7								
Great-crested Flycatcher	1									
Bank Swallow	20									
Rough-winged Swallow	1									
Barn Swallow	60	5								
Blue Jay								4		
Common Crow		8							5	

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 24 continued

SPECIES	7/30	8/7	9/8	9/17	10/5	10/17	10/23*	10/30	11/8	11/10
White-breasted Nuthatch		1								
American Robin		5				10				
Cedar Waxwing	3									
Yellow Warbler	5									
Yellow-rumped Warbler			1							
Dark-eyed Junco						5		25		
Song Sparrow	2									
Species Richness	10	11	5	2	4	13	0	6	7	4

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 24 continued

SPECIES	11/13	11/20		Total	Avg./ Occ.+					
Common Loon				2	2.0					
Horned Grebe				3	3.0					
Canada Goose				616	123.2					
Mallard				30	30.3					
Black Duck				15	15.0					
Gadwall				17	17.0					
American Wigeon				15	7.5					
Surf Scoter				1	1.0					
Common Merganser	100	80		190	63.3					
Unidentified Ducks				50	50.0					
Red-tailed Hawk		2		5	1.3					
Greater Yellowlegs				1	1.0					
Great Black-backed Gull		4		45	7.5					
Herring Gull	5	15		205	29.3					
Ring-billed Gull	100	75		3239	359.9					
Bonaparte's Gull	2			2	2.0					
Unidentified Gulls				300	300.0					
Common Tern				65	32.5					
Belted Kingfisher				1	1.0					
Common Flicker				10	3.3					
Downy Woodpecker				1	1.0					
Eastern Kingbird				7	7.0					
Great-crested Flycatcher				1	1.0					
Bank Swallow				20	20.0					
Rough-winged Swallow				1	1.0					
Barn Swallow				65	32.5					
Blue Jay				4	4.0					
Common Crow	2			15	5.0					

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 24 continued

SPECIES	11/13	11/20		Total	Avg./+ Occ.					
White-breasted Nuthatch				1	1.0					
American Robin				15	7.5					
Cedar Waxwing				3	3.0					
Yellow Warbler				5	5.0					
Yellow-rumped Warbler				1	1.0					
Dark-eyed Junco				30	15.0					
Song Sparrow				2	2.0					
Species Richness	5	5		35						

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 25 . Number of birds sighted on the St. Lawrence River in 1979 at station 23.

SPECIES	11/10	11/20		Total	Avg./* Occ.					
Common Merganser	1600	3500		5100	2550.0					
Species Richness	1	1		1						

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 26 . Number of birds sighted on the St. Lawrence River in 1979 at station 24 .

SPECIES	6/26	7/2	7/5	7/19		Total	Avg./* Occ.			
Green Heron	1		1			2	1.0			
American Bittern				1		1	1.0			
Canada Goose	8	18	35	15		76	19.0			
American Wigeon	2					2	2.0			
Red-tailed Hawk	1					1	1.0			
American Kestrel	1					1	1.0			
Killdeer	5	1	1	1		8	2.0			
Eastern Kingbird	4	5	9	4		22	5.5			
Willow Flycatcher	5	4	2	1		12	3.0			
Alder Flycatcher	3	2	2			7	2.3			
Barn Swallow		20	30	20		70	23.3			
Purple Martin	2	4	5	3		14	3.5			
Common Crow	5	6	5	5		21	5.3			
House Wren	2	1	1	2		6	1.5			
American Robin	5	4	6	5		20	5.0			
Starling	20	76	110	15		226	56.5			
Yellow Warbler	7	9	6	8		30	7.5			
Common Yellowthroat	3	2	1	2		8	2.0			
Red-winged Blackbird	20	15	35	15		85	21.3			
Common Grackle	3		2	4		9	3.0			
American Goldfinch	2		3	4		9	3.0			
Swamp Sparrow	1	1	1			3	1.0			
Song Sparrow	8	4	7	3		22	5.5			
Species Richness	21	16	19	17		23				

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 27 . Number of birds sighted on the St. Lawrence River in 1979 at station 25 .

SPECIES	6/11	6/18	6/27	7/5		Total	Avg./* Occ.			
Great Blue Heron			1			1	1.0			
Green Heron	2	1	1			4	1.3			
Mallard			1	1		2	1.0			
American Kestrel		1				1	1.0			
Virginia Rail	1	1	1			3	1.0			
Killdeer	2	4	5			11	3.7			
Common Snipe	2	2	2			6	2.0			
Upland Sandpiper			1			1	1.0			
Ring-billed Gull			4			4	4.0			
Common Tern			1	2		3	1.5			
Mourning Dove	1					1	1.0			
Yellow-billed Cuckoo		1				1	1.0			
Common Flicker			1	2		3	1.5			
Downy Woodpecker	1		1			2	1.0			
Alder Flycatcher	1	1	1			3	1.0			
Common Crow			6			6	6.0			
House Wren			1			1	1.0			
Long-billed Marsh Wren			1	1		2	1.0			
American Robin			4			4	4.0			
Starling	5	4	12			21	7.0			
Yellow Warbler	2	3	3			8	2.7			
Common Yellowthroat	1	3	4	2		10	2.5			
American Redstart	1					1	1.0			
Red-winged Blackbird	10	10	12			32	10.7			
Northern Oriole	2	1				3	1.5			
Common Grackle	1	5				6	3.0			
Brown-headed Cowbird	1	2	2			5	1.7			
Field Sparrow	1	1	1			3	1.0			

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 27 continued

SPECIES	6/11	6/18	6/27	7/5		Total	Avg./# Occ.			
Swamp Sparrow			3	2		5	2.5			
Song Sparrow			3	4		7	3.5			
Species Richness	16	15	24	7		30				

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 28. Number of birds sighted on the St. Lawrence River in 1979 at station 26.

SPECIES	6/18	6/23	6/27	7/2	7/11	7/30	8/21	10/5	10/17	10/30
Double-crested Cormorant			1							
Great Blue Heron			1		1					
Canada Goose	1	3	15	3	6	5			30	
Black Duck										
Common Merganser									4	1
Goshawk										
Red-tailed Hawk	1		1							
American Kestrel		1								
Killdeer								24		2
Lesser Yellowlegs						1				
Great Black-backed Gull									1	9
Herring Gull	1			2		1				1
Ring-billed Gull	50	20	500	150	110	4	400		1	75
Belted Kingfisher		1		1	1					
Common Flicker					1		4			
Downy Woodpecker	1		1							
Bank Swallow				50	110					
Barn Swallow	4	6	8	10	14					
Cliff Swallow	4	3		2	4					
Purple Martin						3				
Blue Jay			1	1	2					
Common Crow	2	4	4	3	4				4	
Black-capped Chickadee		4	3	8	5					
American Robin	6	4	6	3	9	5		10	10	10
Wood Thrush	1	1	1	1						
Veery	1	1	1	1	1					
Cedar Waxwing										
Starling										40

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 28 continued

SPECIES	6/18	6/23	6/27	7/2	7/11	7/30	8/21	10/5	10/17	10/30
Yellow Warbler	5	2	5	3	5	2		5		
Common Yellowthroat	2	1	2	2	4					
American Redstart	1	1		1	3					
Northern Oriole	2	3	3	2	1					
Common Grackle	2		5	7	12					
Rose-breasted Grosbeak	1	1		1	4					
Indigo Bunting	1	1	1		2					
Evening Grosbeak										
American Goldfinch			4	2	3					3
Dark-eyed Junco									10	
Tree Sparrow										
Chipping Sparrow	1	3	3	5	5					
White-throated Sparrow								10		
Song Sparrow	4	3	6	5	6	2		5		
Species Richness	20	19	21	22	23	8	2	5	7	8

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 28 continued

SPECIES	11/8	11/10	11/13	11/20		Total	Avg/+ Occ.			
Double-crested Cormorant						1	1.0			
Great Blue Heron						2	1.0			
Canada Goose	140	300	215	275		993	90.3			
Black Duck				2		2	2.0			
Common Merganser						5	2.5			
Goshawk			1			1	1.0			
Red-tailed Hawk			1	1		4	1.0			
American Kestrel						1	1.0			
Killdeer						26	13.0			
Lesser Yellowlegs						1	1.0			
Great Black-backed Gull			2			12	4.0			
Herring Gull	2			1		8	1.3			
Ring-billed Gull						1310	145.6			
Belted Kingfisher						3	1.0			
Common Flicker						5	2.5			
Downy Woodpecker						2	1.0			
Bank Swallow						160	80.0			
Barn Swallow						42	8.4			
Cliff Swallow						13	3.3			
Purple Martin						3	3.0			
Blue Jay	2					6	1.5			
Common Crow	2					23	3.3			
Black-capped Chickadee						20	5.0			
American Robin						63	7.0			
Wood Thrush						4	1.0			
Veery						5	1.0			
Cedar Waxwing					1	1	1.0			
Starling	50				75	165	55.0			

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 28 continued

SPECIES	11/8	11/10	11/13	11/20		Total	Avg./† Occ.			
Yellow Warbler						27	3.9			
Common Yellowthroat						11	2.2			
American Redstart						6	1.5			
Northern Oriole						11	2.2			
Common Grackle						26	6.5			
Rose-breasted Grosbeak						7	1.8			
Indigo Bunting						5	1.3			
Evening Grosbeak				2		2	2.0			
American Goldfinch						12	3.0			
Dark-eyed Junco						10	10.0			
Tree Sparrow	10					10	10.0			
Chipping Sparrow						17	3.4			
White-throated Sparrow						10	10.0			
Song Sparrow						31	4.4			
Species Richness	6	1	4	7		42				

*No birds sighted †Mean number per sampling period present (Average per occurrence)

Table: 29. Number of birds sighted on the St. Lawrence River in 1979 at station 27.

SPECIES	6/7	6/12	6/21	6/23	6/26	6/27	7/2	7/11	7/19	7/30
Canada Goose										
Mallard										3
Common Merganser										3
Cooper's Hawk					1					
Northern Marsh Harrier	1			1						
American Kestrel	1				1					
Ruffed Grouse	1	1								
Killdeer	2	1	1	1	2	2	5	2	5	3
Great Black-backed Gull										
Herring Gull										
Ring-billed Gull	10	12	14	18	12	8	10	22	30	75
Mourning Dove	1	2	1	1						
Belted Kingfisher			1			1			1	
Common Flicker	1	1	1	1	1	1	1	1	1	
Pileated Woodpecker										
Yellow-bellied Sapsucker										
Downy Woodpecker					1		1			
Eastern Kingbird		1				1	4	2	5	
Great-crested Flycatcher	1	2	1	2	2	1	1	1	2	
Eastern Phoebe				4	2	1	4			
Least Flycatcher	1		1	1		1		1	1	
Tree Swallow				3			1		3	
Barn Swallow		5	4	2		+	2			
Purple Martin			3	2	1		4	2	2	
Blue Jay				1	2	4	1	4	6	
Common Crow	2	4	6	3	5	4	5	2	1	
Black-capped Chickadee	2		2	4			1	2	6	
White-breasted Nuthatch				1			1		1	

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 29 continued

SPECIES	6/7	6/12	6/21	6/23	6/26	6/27	7/2	7/11	7/19	7/30
House Wren	4	2	1	3	2	4	5	2		
American Robin	5	9	4	8	10	15	7	8	15	5
Wood Thrush	2	2	1	2	2	1	1	2	2	
Veery	1	2	2	1	1		1	1		
Ruby-crowned Kinglet										
Cedar Waxwing										
Starling										
Red-eyed Vireo	3	4	3	3	4	6	4	3	4	
Yellow Warbler	4	5	4	3	4	3	2	4	6	
Common Yellowthroat	3	2	1	1	2	2	1	2	2	
American Redstart	3	4	6	2	5		2	1	2	
House Sparrow						15	1	5		
Red-winged Blackbird			6	10	4	16	24	13	18	
Northern Oriole	2	1	2	1	4	2	3	5	2	
Brown-headed Cowbird								10		
Common Redpoll						3				
American Goldfinch										
Rufous-sided Towhee	1	2		1				1		
Dark-eyed Junco										
White-throated Sparrow										
Song Sparrow	10	9	6	5	8	7	4	9	8	
Species Richness	22	20	22	27	22	22	26	24	22	5

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 29 continued

SPECIES	10/5	10/17	10/23	10/30	11/8*	11/10*	11/20*		Total	Avg./+ Occ.
Canada Goose				12					12	12.0
Mallard									3	3.0
Common Merganser									3	3.0
Cooper's Hawk									1	1.0
Northern Marsh Harrier									2	1.0
American Kestrel									2	1.0
Ruffed Grouse									2	1.0
Killdeer				1					25	2.3
Great Black-backed Gull			1						1	1.0
Herring Gull			1						1	1.0
Ring-billed Gull									211	21.1
Mourning Dove									5	1.3
Belted Kingfisher									3	1.0
Common Flicker	5								14	1.4
Pileated Woodpecker			1						1	1.0
Yellow-bellied Sapsucker	1								1	1.0
Downy Woodpecker									2	1.0
Eastern Kingbird									13	2.6
Great-crested Flycatcher									13	1.4
Eastern Phoebe									11	2.8
Least Flycatcher									6	1.0
Tree Swallow									7	2.3
Barn Swallow									17	3.4
Purple Martin									14	2.3
Blue Jay	5								23	3.3
Common Crow	5								37	3.7
Black-capped Chickadee			10						27	3.9
White-breasted Nuthatch									3	1.0

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 29 continued

SPECIES	10/5	10/17	10/23	10/30	11/8*	11/10*	11/20*		Total	Avg./+ Occ.
House Wren									23	2.9
American Robin	20	60	15	40					221	15.8
Wood Thrush									15	1.7
Veery									9	1.3
Ruby-crowned Kinglet	2								2	2.0
Cedar Waxwing				3					3	3.0
Starling			20	25					45	22.5
Red-eyed Vireo									34	3.8
Yellow Warbler									35	3.9
Common Yellowthroat									16	1.8
American Redstart									25	3.1
House Sparrow									21	7.0
Red-winged Blackbird									91	13.0
Northern Oriole									22	2.4
Brown-headed Cowbird									10	10.0
Common Redpoll									3	3.0
American Goldfinch	5								5	5.0
Rufous-sided Towhee									5	1.3
Dark-eyed Junco		15	50	25					90	30.3
White-throated Sparrow	10	5							15	7.5
Song Sparrow	15	5							85	7.7
Species Richness	9	4	7	6	0	0	0		49	

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 30 . Number of birds sighted on the St. Lawrence River in 1979 at station 28 .

SPECIES	6/5	6/27	7/30	8/1	8/9	8/21	10/5	10/17	11/8	11/10
Green Heron					1					
Canada Goose			70			100	190			
Egyptian Goose							1			
Northern Marsh Harrier				1			1			
Killdeer						2				
Herring Gull						1	2	1		
Ring-billed Gull	15	20		33	5		30	20	22	200
Great Horned Owl				1						
Common Flikcer						7				
Eastern Kingbird			4	15						
Tree Swallow	5									
Blue Jay						2				
Common Crow										2
American Robin						6				
Starling					50	10	50			
Red-winged Blackbird				150						
Northern Oriole						3				
Common Grackle	3					3				
Savannah Sparrow		2								
Song Sparrow		3	3							
Species Richness	3	3	3	5	3	9	6	2	1	2

*No birds sighted +Mean number per sampling period present (Average per occurrence)

SPECIES	11/13	11/20		Total	Avg./+ Occ.					
Green Heron				1	1.0					
Canada Goose				260	86.7					
Egyptian Goose				1	1.0					
Northern Marsh Harrier				2	1.0					
Killdeer				2	2.0					
Herring Gull		2		6	1.5					
Ring-billed Gull	200	20		565	56.5					
Great Horned Owl				1	1.0					
Common Flicker				7	7.0					
Eastern Kingbird				19	9.5					
Tree Swallow				5	5.0					
Blue Jay	5			7	3.5					
American Robin				6	6.0					
Starling		50		160	40.0					
Red-winged Blackbird				150	150.0					
Northern Oriole				3	3.0					
Common Grackle				6	3.0					
Savannah Sparrow				2	2.0					
Song Sparrow				6	3.0					
Species Richness	2	3		20						

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 31 . Number of birds sighted on the St. Lawrence River in 1979 at station 29 .

SPECIES	7/30	8/1	8/6	10/5	10/17	11/8	11/10*	11/13	11/20	
Common Merganser						10			2	
American Kestrel	1									
Ruffed Grouse					1					
Spotted Sandpiper		1								
Herring Gull						1				
Ring-billed Gull						2		14	10	
Rock Dove									30	
Common Flicker	2	8	2		3					
Downy Woodpecker	2									
Eastern Kingbird	11	12	3							
Eastern Pewee	15									
Barn Swallow			6							
Blue Jay	8							5	2	
Common Crow				5						
Black-capped Chickadee				20	4	10			10	
House Wren					1					
Gray Catbird		3	2							
American Robin	10	3			40					
Wood Thrush	1									
Veery	1									
Ruby-crowned Kinglet				40						
Cedar Waxwing								20		
Starling	30									
Red-eyed Vireo	1									
Yellow Warbler			2							
Yellow-rumped Warbler				30	2					
Common Yellowthroat	41									
Bobolink	10									

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 31 continued

SPECIES	7/30	8/1	8/6	10/5	10/17	11/8	11/10*	11/13	11/20	
Red-winged Blackbird	2		6		500					
Northern Oriole	2									
Common Grackle	2									
Evening Grosbeak									10	
American Goldfinch			2							
Dark-eyed Junco				25	5					
Tree Sparrow			4			15				
White-crowned Sparrow				10						
White-throated Sparrow				5	5					
Swamp Sparrow	1	1	1							
Song Sparrow	5	4	4	40	10					
Species Richness	18	7	10	8	10	5		3	6	

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 31 continued

SPECIES	Total	Avg./+ Occ.
Common Merganser	12	6.0
American Kestrel	1	1.0
Ruffed Grouse	1	1.0
Spotted Sandpiper	1	1.0
Herring Gull	1	1.0
Ring-billed Gull	26	8.7
Rock Dove	30	30.0
Common Flicker	15	3.8
Downy Woodpecker	2	2.0
Eastern Kingbird	26	8.7
Eastern Pewee	15	15.0
Barn Swallow	6	6.0
Blue Jay	15	5.0
Common Crow	5	5.0
Black-capped Chickadee	44	11.0
House Wren	1	1.0
Gray Catbird	5	2.5
American Robin	53	17.7
Wood Thrush	1	1.0
Veery	1	1.0
Ruby-crowned Kinglet	40	40.0
Cedar Waxwing	20	20.0
Starling	30	30.0
Red-eyed Vireo	1	1.0
Yellow Warbler	2	2.0
Yellow-rumped Warbler	32	16.0
Common Yellowthroat	41	41.0
Bobolink	10	10.0

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 31 continued

SPECIES	Total	Avg./† Occ.
Red-winged Blackbird	508	169.3
Northern Oriole	2	2.0
Common Grackle	2	2.0
Evening Grosbeak	10	10.0
American Goldfinch	2	2.0
Dark-eyed Junco	30	15.0
Tree Sparrow	19	9.5
White-crowned Sparrow	10	10.0
White-throated Sparrow	10	5.0
Swamp Sparrow	3	1.0
Song Sparrow	63	12.6
Species Richness	39	

*No birds sighted †Mean number per sampling period present (Average per occurrence)

Table: 32 . Number of birds sighted on the St. Lawrence River in 1979 at station 30 .

SPECIES	6/5	6/7	6/12	6/18	6/23	7/3		Total	Avg./ Occ.	
American Kestrel		1			1			2	1.0	
Ring-billed Gull	1	10	5			4		20	5.0	
Rock Dove		2		8	1	4		15	3.8	
Chimney Swift						4		4	4.0	
Common Flicker		1	1					2	1.0	
Hairy Woodpecker			1					1	1.0	
Downy Woodpecker			1		1			2	1.0	
Eastern Kingbird	2	1		2	1	4		10	2.0	
Great-crested Flycatcher	1							1	1.0	
Tree Swallow	4	6	2	1	5	9		27	4.5	
Barn Swallow	8	6	15	10	4	8		51	8.5	
Purple Martin	10	8	6	8	7	14		53	8.8	
Common Crow				4				4	4.0	
Black-capped Chickadee		2		1				3	1.5	
White-breasted Nuthatch			1	1	1			3	1.0	
House Wren	1	1		1	2	1		6	1.2	
American Robin		8	9	8	15	14		54	10.5	
Cedar Waxwing			2	2		2		6	2.0	
Starling	7	15	14	16	42	86		180	30.0	
Warbling Vireo	1	1	1	1	1	1		6	1.0	
Yellow Warbler	2	5	3	2	1	2		15	2.5	
Common Yellowthroat	2	3	2	2	1			10	2.0	
House Sparrow	10	18	21	10	8	8		75	12.5	
Bobolink	2	2	1			1		6	1.5	
Eastern Meadowlark	1	2	2	1		1		7	1.4	
Red-winged Blackbird	4	6	5	10	8	14		47	7.8	
Northern Oriole	5	4	4	2	1	1		17	2.8	
Common Grackle	5	3	4	10	12	15		49	8.2	

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 32 continued

SPECIES	6/5	6/7	6/12	6/18	6/23	7/3		Total	Avg./ Occ.+	
Brown-headed Cowbird	2		1	2		1		6	1.5	
Rose-breasted Grosbeak	1	1		1	1			4	1.0	
American Goldfinch	4	1			2	1		8	2.0	
Rufous-sided Towhee	1	1			1			3	1.0	
Savannah Sparrow	1		1	1	1	1		5	1.0	
Chipping Sparrow	1		1					2	1.0	
Song Sparrow	4	5	3	2	1			15	3.0	
Species Richness	24	25	24	24	23	22		35		

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 33 . Number of birds sighted on the St. Lawrence River in 1979 at station 31 .

SPECIES	6/11	6/18	6/26	6/27	7/19	7/26	7/30	8/1	8/9	9/24
Canada Goose					70			40	45	
Mallard			3	2	2					
Hooded Merganser										
Common Merganser										
Red-tailed Hawk										
Northern Marsh Harrier				1						
American Kestrel									1	
Ring-billed Gull	35	48	14	12	14	230				
Common Tern			1	3						
Belted Kingfisher	1			1				1	1	2
Common Flicker		1		1	2					
Hairy Woodpecker			1							
Downy Woodpecker	1	1	1	1						
Eastern Kingbird								12	6	
Great-crested Flycatcher	1	1	1	1						
Tree Swallow	12	14	18	26	38		15	10		
Barn Swallow							20	5		
Cliff Swallow				4			1			
Purple Martin	40	48	46	46	29	80	60	20	15	
Blue Jay									2	
Black-capped Chickadee	5									
House Wren	2	3	3	3	4					
Gray Catbird	1	2	4	1	3					
Brown Thrasher		1	1	1						
American Robin	20	31	24	34	39			5	7	
Veery	1	1		1						
Cedar Waxwing	2	4	4	9	15		4		4	
Starling	8	3	16	38	89		5			

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 33 continued.

SPECIES	6/11	6/18	6/26	6/27	7/19	7/26	7/30	8/1	8/9	9/24
Red-eyed Vireo		1								
Warbling Vireo	1	1	1							
Yellow Warbler	16	12	10	8	12			2		
Common Yellowthroat	8	5	7	6	3					
American Redstart		1	1							
Bobolink	6	8	5	8	4					
Eastern Meadowlark	6	5	6	4	3					
Red-winged Blackbird	25	22	31	18	86	50	5	20		
Northern Oriole	3	3	4	1						
Common Grackle	6	12	5	9	15					
Brown-headed Cowbird		5	1	3	2					
Evening Grosbeak										
Rufous-sided Towhee	1	2	2	2	2	1				
Savannah Sparrow	11	9	2	8	6					
Chipping Sparrow	2	4	1	1	1					
Swamp Sparrow	1	1	1	3						
Song Sparrow	8	6	5	6	5					10
Species Richness	26	29	29	31	22	4	7	8		2

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 33 continued

SPECIES	10/17	10/30	11/8	11/10	11/13		Total	Avg./ Occ.		
Canada Goose							155	51.7		
Mallard							7	2.3		
Hooded Merganser				2			2	2.0		
Common Merganser					1		1	1.0		
Red-tailed Hawk		1	1				2	1.0		
Northern Marsh Harrier							1	1.0		
American Kestrel							1	1.0		
Ring-billed Gull							353	58.8		
Common Tern							4	2.0		
Belted Kingfisher							6	1.2		
Common Flicker							4	1.3		
Hairy Woodpecker							1	1.0		
Downy Woodpecker							4	1.0		
Eastern Kingbird							18	9.0		
Great-crested Flycatcher							4	1.0		
Tree Swallow							133	19.0		
Barn Swallow							24	12.5		
Cliff Swallow							5	2.5		
Purple Martin							384	42.7		
Blue Jay							2	2.0		
Black-capped Chickadee							5	5.0		
House Wren							15	3.0		
Gray Catbird							11	2.2		
Brown Thrasher							3	1.0		
American Robin		15					175	21.9		
Veery							3	1.0		
Cedar Waxwing							42	6.0		
Starling	50	100					309	38.6		

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 33 continued

SPECIES	10/17	10/30	11/8	11/10	11/13		Total	Avg./ Occ.		
Red-eyed Vireo							1	1.0		
Warbling Vireo							3	1.0		
Yellow Warbler							60	10.0		
Common Yellowthroat							29	5.8		
American Redstart							2	1.0		
Bobolink							31	6.2		
Eastern Meadowlark							24	4.8		
Red-winged Blackbird	100						357	40.0		
Northern Oriole							11	2.8		
Common Grackle							47	9.4		
Brown-headed Cowbird							11	2.8		
Evening Grosbeak			30				30	30.0		
Rufous-sided Towhee							10	1.7		
Savannah Sparrow							36	7.2		
Chipping Sparrow							9	1.8		
Swamp Sparrow							6	1.5		
Song Sparrow							40	6.7		
Species Richness	2	3	2		1		45			

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 34 . Number of birds sighted on the St. Lawrence River in 1979 in the Hopson's Bay Corridor.

SPECIES	6/6	6/7	6/11	6/14	6/18	6/26	6/27	7/3	7/11	7/26
Common Loon										
Great Blue Heron	1		1					1		
Canada Goose	29	15	18	31			16	26		20
Mallard	2	3		1		2		2	6	
Black Duck										
Gadwall									3	
American Wigeon	1									
Red-tailed Hawk		1		1						
American Kestrel	1									
Killdeer	1		3		2	4		1	8	2
Spotted Sandpiper				1		2	4	7	3	
Northern Phalarope										
Great Black-backed Gull										
Herring Gull										
Ring-billed Gull	2			2			1	4		
Common Tern				1			4			2
Rock Dove				2						
Black-billed Cuckoo						1				
Common Flicker							1	2		
Eastern Kingbird				1			4	5	5	4
Tree Swallow			1				2	2		
Bank Swallow					2				15	
Barn Swallow	2	4	6	4			10	10		
Common Crow					2	3	2	4	5	
Black-capped Chickadee						4			5	
House Wren					2	3			5	
Gray Catbird					4	5			3	
Brown Thrasher					1	1			1	

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 34 (continued).

SPECIES	6/6	6/7	6/11	6/14	6/18	6/26	6/27	7/3	7/11	7/26
American Robin					5	8			7	
Veery					1				1	
Cedar Waxwing					5	4			6	
Starling			5	9	6	10	15	26	12	
Red-eyed Vireo					1	4			1	
Yellow Warbler	1				5	4	1		6	
Common Yellowthroat					1	1			2	
American Redstart					1	1			1	
Eastern Meadowlark	4	2	1	2			5	1		
Red-winged Blackbird	4	5	3	8	5	12	14	29	18	
Northern Oriole					2	1			3	
Common Grackle	1		1		2	4	3	1	5	
Brown-headed Cowbird					5	4			15	
American Goldfinch					2	2			2	
Rufous-sided Towhee					1	1				
Savannah Sparrow	1			1						
Dark-eyed Junco										
Tree Sparrow										
Chipping Sparrow										
White-throated Sparrow										
Song Sparrow	1		2	1	4	5		1	10	
Snow Bunting										
Species Richness	14	6	10	15	21	23	14	16	25	4

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 34 (continued)

SPECIES	7/30	8/3	8/7	8/9*	10/5	10/17*	10/18	10/22*	10/23	10/25 *
Common Loon										
Great Blue Heron										
Canada Goose	30									
Mallard					3					
Black Duck					8					
Gadwall										
American Wigeon					1					
Red-tailed Hawk										
American Kestrel			1							
Killdeer	20				10				8	
Spotted Sandpiper		1	4							
Northern Phalarope					1					
Great Black-backed Gull										
Herring Gull							3		6	
Ring-billed Gull		1	3				5		70	
Common Tern			2							
Rock Dove										
Black-billed Cuckoo										
Common Flicker					3					
Eastern Kingbird										
Tree Swallow										
Bank Swallow										
Barn Swallow			50							
Common Crow							5		2	
Black-capped Chickadee										
House Wren										
Gray Catbird										
Brown Thrasher										

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 34 (continued)

SPECIES	7/30	8/3	8/7	8/9*	10/5	10/17*	10/18	10/22*	10/23	10/25*
American Robin			3						30	
Veery										
Cedar Waxwing			2							
Starling										
Red-eyed Vireo										
Yellow Warbler										
Common Yellowthroat										
American Redstart										
Eastern Meadowlark										
Red-winged Blackbird					5				20	
Northern Oriole										
Common Grackle										
Brown-headed Cowbird										
American Goldfinch									4	
Rufous-sided Towhee										
Savannah Sparrow										
Dark-eyed Junco							5			
Tree Sparrow										
Chipping Sparrow			4							
White-throated Sparrow					2					
Song Sparrow			15				10			
Snow Bunting										
Species Richness	2	2	10	0	8	0	5	0	7	0

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 34 (continued)

SPECIES	10/30	11/8	11/10	11/13	11/20		Total	Avg/+ Occ.		
Common Loon				1			1	1.0		
Great Blue Heron							3	1.0		
Canada Goose							185	23.1		
Mallard							19	2.7		
Black Duck							8	8.0		
Gadwall							3	3.0		
American Wigeon							2	1.0		
Red-tailed Hawk			1				3	1.0		
American Kestrel							2	1.0		
Killdeer							59	5.9		
Spotted Sandpiper							22	3.1		
Northern Phalarope							1	1.0		
Great Black-backed Gull				7			7	7.0		
Herring Gull					13		22	7.3		
Ring-billed Gull	15	30	5	31	120		289	22.2		
Common Tern							9	2.3		
Rock Dove			10				12	6.0		
Black-billed Cuckoo							1	1.0		
Common Flicker							6	2.0		
Eastern Kingbird							19	3.8		
Tree Swallow							5	1.7		
Bank Swallow							17	8.5		
Barn Swallow							86	12.3		
Common Crow			1	2	1		27	2.7		
Black-capped Chickadee							9	4.5		
House Wren							10	3.3		
Gray Catbird							12	4.0		
Brown Thrasher							3	1.0		

*No birds sighted + Mean number per sampling period present (Average per occurrence)

...le 34 (continued)

SPECIES	10/30	11/8	11/10	11/13	11/20		Total	Avg./ Occ.		
American Robin							53	10.6		
Veery							2	1.0		
Cedar Waxwing							17	4.3		
Starling							83	11.9		
Red-eyed Vireo							6	2.0		
Yellow Warbler							17	3.4		
Common Yellowthroat							4	1.3		
American Redstart							3	1.0		
Eastern Meadowlark							15	2.5		
Red-winged Blackbird							123	11.2		
Northern Oriole							6	2.0		
Common Grackle							17	2.4		
Brown-headed Cowbird							24	8.0		
American Goldfinch							10	2.5		
Rufous-sided Towhee							2	1.0		
Savannah Sparrow							2	1.0		
Dark-eyed Junco							5	5.0		
Tree Sparrow		10			10		20	10.0		
Chipping Sparrow							4	4.0		
White-throated Sparrow							2	2.0		
Song Sparrow							49	5.4		
Snow Bunting										
Species Richness	1	2	4	4	4		49			

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 35 . Number of birds sighted on the St. Lawrence River in 1979 in the Massena Town Beach Corridor.

SPECIES	6/5	6/8	6/12	6/21	6/27	7/26	7/30	8/3	8/7	8/21
Common Loon										
Green Heron	1		1							
Mallard	1				1	18	8			
Gadwall							1	16	17	
Common Merganser										
Red-tailed Hawk										
Killdeer	1	1	3	2	5					
American Woodcock	1									
Spotted Sandpiper	8	3	2	4	4	2			2	
Great Black-backed Gull									1	
Herring Gull										
Ring-billed Gull	5	11	4	6	4	6	5		5	
Common Tern									6	
Chimney Swift				1	1					
Common Flicker					1					
Eastern Kingbird	1	2	1	1						
Eastern Phoebe	1	1	1	4	4					
Willow Flycatcher	2	1	2	1						
Horned Lark										
Bank Swallow	4	2	4	4	8					
Barn Swallow	10	8	10	12	15					30
Cliff Swallow	10	3	6	4	5					
Purple Martin	4	5	1		2					
Common Crow		3		2	1	2			2	
Gray Catbird		1	1	2	1					
American Robin	10	8	8	10	4	20				
Starling						30				
Yellow Warbler	2	3	3	3	3					

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 35 (continued)

SPECIES	6/5	6/8	6/12	6/21	6/27	7/26	7/30	8/3	8/7	8/21
Common Yellowthroat	4	5	4	4	3					
American Redstart	1	1								
Bobolink	6	4	5	5	5	2				
Eastern Meadowlark	3	3	4	3	3	4				
Red-winged Blackbird	10	12	8	6	14	70				
Northern Oriole	1	2	1	1	1					
Common Grackle		5	4	4	4	5				
Brown-headed Cowbird						2				
Rufous-sided Towhee	1	1	1	1	1					
Savannah Sparrow	5	4	6	5	5	4				
Chipping Sparrow		1			1					
Swamp Sparrow						1				
Song Sparrow		5	5	6	5	15			3	
Snow Bunting										
Species Richness	23	25	23	23	25	14	3	1	7	1

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 35 (continued)

SPECIES	9/8	10/18	10/23	10/25	10/30	11/8	11/10	11/13		
Common Loon			1					2		
Green Heron										
Mallard										
Gadwall										
Common Merganser							3	11		
Red-tailed Hawk										
Killdeer			2							
American Woodcock										
Spotted Sandpiper										
Great Black-backed Gull										
Herring Gull		1	5							
Ring-billed Gull	15	40	70		110		5			
Common Tern										
Chimney Swift										
Common Flicker										
Eastern Kingbird										
Eastern Phoebe										
Willow Flycatcher										
Horned Lark						1				
Bank Swallow										
Barn Swallow										
Cliff Swallow										
Purple Martin										
Common Crow	8	3	5		2	1				
Gray Catbird										
American Robin		5		10	2					
Starling				5						
Yellow Warbler										

*No Birds Sighted +Mean number per sampling period present (Average per occurrence)

Table C-5 (continued)

SPECIES	9/8	10/18	10/23	10/25	10/30	11/8	11/10	11/13		
Common Yellowthroat										
American Redstart										
Bobolink										
Eastern Meadowlark		2								
Red-winged Blackbird			10							
Northern Oriole										
Common Grackle										
Brown-headed Cowbird										
Rufous-sided Towhee										
Savannah Sparrow										
Chipping Sparrow										
Swamp Sparrow										
Song Sparrow										
Snow Bunting						40				
Species Richness	2	5	6	2	3	3	2	2		

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 35 (continued)

SPECIES	11/20		Total	Avg./+ Occ.						
Common Loon			3	1.5						
Green Heron			2	1.0						
Mallard			28	7.0						
Gadwall			34	11.3						
Common Merganser			14	7.0						
Red-tailed Hawk	1		1	1.0						
Killdeer			14	2.3						
American Woodcock			1	1.0						
Spotted Sandpiper			25	3.6						
Great Black-backed Gull			1	1.0						
Herring Gull			6	3.0						
Ring-billed Gull			286	22.0						
Common Tern			6	6.0						
Chimney Swift			2	1.0						
Common Flicker			1	1.0						
Eastern Kingbird			5	1.3						
Eastern Phoebe			11	2.2						
Willow Flycatcher			6	1.5						
Horned Lark			1	1.0						
Bank Swallow			22	4.4						
Barn Swallow			85	14.2						
Cliff Swallow			28	5.6						
Purple Martin			12	3.0						
Common Crow	1		29	2.6						
Gray Catbird			5	1.3						
American Robin			77	8.6						
Starling			35	17.5						
Yellow Warbler			14	2.8						

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 35 (continued)

SPECIES	11/20		Total	Avg./+ Occ.						
Common Yellowthroat			20	4.0						
American Redstart			2	1.0						
Bobolink			27	4.5						
Eastern Meadowlark			22	3.1						
Red-winged Blackbird			130	18.6						
Northern Oriole			6	1.2						
Common Grackle			22	4.4						
Brown-headed Cowbird			2	2.0						
Rufous-sided Towhee			5	1.0						
Savannah Sparrow			29	4.8						
Chipping Sparrow			2	1.0						
Swamp Sparrow			1	1.0						
Song Sparrow			39	6.5						
Snow Bunting			40	40.0						
Species Richness	2		42							

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 36. Number of birds sighted on the St. Lawrence River in 1979 in the Massena Country Club Corridor.

SPECIES	6/18	6/23	6/29	11/10	11/13	11/20		Total	Avg./+ Occ.	
Green Heron	1							1	1.0	
Canada Goose	6	5	4		80	10		105	21.0	
Black Duck						3		3	3.0	
American Wigeon	4	3						7	3.5	
Hooded Merganser				5				5	5.0	
American Kestrel			1					1	1.0	
Killdeer	8	14	26					48	16.0	
Spotted Sandpiper	2	1	2					5	1.7	
Great Black-backed Gull					2			2	2.0	
Herring Gull				10	2			12	6.0	
Ring-billed Gull	4	3	5	110	122			244	48.8	
Rock Dove	4	3	2		25			34	8.5	
Mourning Dove		4	2					6	3.0	
Black-billed Cuckoo			1					1	1.0	
Common Flicker	1		2					3	1.5	
Downy Woodpecker	1		1					2	1.0	
Willow Flycatcher	1	1	1					3	1.0	
Barn Swallow	6	7	8					21	7.0	
Purple Martin	14	9	12					35	11.7	
Blue Jay					2			2	2.0	
Common Crow					2	2		4	2.0	
House Wren		1	?					3	1.5	
Gray Catbird	2	1	1					4	1.3	
American Robin	4	5	4					13	4.3	
Cedar Waxwing	2	1	1					4	1.3	
Starling	26	58	112		10			206	51.5	
Yellow Warbler	3	5	4					12	4.0	
Common Yellowthroat	6	4	5					15	5.0	

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 36 (continued)

SPECIES	6/18	6/23	6/29	11/10	11/13	11/20		Total	Avg./+ Occ.
House Sparrow	6	4	2					12	4.0
Bobolink	3	4	3					10	3.3
Eastern Meadowlark	4	4	3					11	3.7
Red-winged Blackbird	11	8	12					31	10.3
Northern Oriole		2	1					3	1.5
Common Grackle	8	15	7					30	10.0
Brown-headed Cowbird	6	3	4					13	4.3
American Goldfinch	2	1	2					5	1.7
Savannah Sparrow	2	3	4					9	3.0
Chipping Sparrow	1		1					2	1.0
Song Sparrow	4	5	7					16	5.3
Species Richness	28	27	31	3	8	3		39	

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 37. Number of birds sighted on the St. Lawrence River in 1979 in the Wilson Hill Game Management Area.

SPECIES	6/5	6/11	6/13	6/18	6/23	6/29	7/2	7/3	7/26	8/3
Common Loon									2	
Horned Grebe										
Pied-billed Grebe									1	3
Great Blue Heron	2		5	5		3		4	9	5
Green Heron									1	
American Bittern										1
Canada Goose			2	21	12	14	10	8	35	20
Blue Goose										
Mallard									34	1
Mallard X Black Duck									1	
Black Duck									10	
Gadwall	2			1					78	1
Pintail									1	
Green-winged Teal									2	
Blue-winged Teal										
American Wigeon	1		1		2				11	
Wood Duck	15		3							
Redhead									8	
Canvasback										
Ring-necked Duck									5	
Greater Scaup									1	
Lesser Scaup										
Unidentified Scaup										
Common Goldeneye	1									
Bufflehead										
White-winged Scoter										
Ruddy Duck										
Hooded Merganser										

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 37 (continued)

SPECIES	6/5	6/11	6/13	6/18	6/23	6/29	7/2	7/3	7/26	8/3
Common Merganser										
Turkey Vulture										
Goshawk										1
Red-tailed Hawk										
Osprey										
American Kestrel									1	
Ruffed Grouse	1	1								
American Coot										
Killdeer			1			2				6
Common Snipe										
Spotted Sandpiper			1		1	1				
Solitary Sandpiper										
Greater Yellowlegs									1	
Lesser Yellowlegs									1	6
Dunlin										
Great Black-backed Gull					::					
Herring Gull										
Ring-billed Gull	6		3	7	4	47			7	7
Bonaparte's Gull										
Common Tern	1				1		2		13	12
Belted Kingfisher										
Common Flicker	3	2	3	3	1	7		3		
Hairy Woodpecker										
Downy Woodpecker	1	1	1	1	1	2		1		
Eastern Kingbird	1	2	2	1	1	9	3	3	10	11
Great Crested Flycatcher	2	1	2	3		1		1		
Eastern Wood Pewee										1
Tree Swallow	2	4	3	2	3	4		6	10	7

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table 37 (continued)

SPECIES	6/5	6/11	6/13	6/18	6/23	6/29	7/2	7/3	7/26	8/3
Rough-winged Swallow										2
Barn Swallow			12	6	8	12	6	14		35
Cliff Swallow										4
Purple Martin				2		4				15
Blue Jay	2	1		2		4				4
Common Crow	2	1	5	3	1	1		4	10	5
Black-capped Chickadee			1	2		10				5
White-breasted Nuthatch										1
Gray Catbird	1	4	5	6	5	6		2		
Brown Thrasher			1	2	1					
American Robin	4	6	9	12	5	7		6	5	22
Wood Thrush				1	1	1		1		
Veery	4	3	12	16	4	10		1		2
Golden-crowned Kinglet										
Ruby-crowned Kinglet										
Water Pipit										
Cedar Waxwing			2	1	2	2		2		3
Starling	2		4	14	8	6	50	12		10
Red-eyed Vireo	2	4	8	8	1	7		1		
Warbling Vireo	1	1	1	1	1	1		1		
Black and White Warbler	2	1	1							
Orange-crowned Warbler										
Nashville Warbler			1	1						
Yellow Warbler	6	4	8	8	5	8		2	2	
Yellow-rumped Warbler										
Ovenbird			1	1						
Common Yellowthroat	2	3	2	4	1	1		2		
American Redstart	2	5	6	5	4	7		1		

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 37 (continued)

SPECIES	6/5	6/11	6/13	6/18	6/23	6/29	7/2	7/3	7/26	8/3
House Sparrow										
Bobolink									2	
Red-winged Blackbird	4	12	20	20	10	19	20	4	50	20
Northern Oriole	2	1	5	4	3	3		2		
Common Grackle	3	5	4	4	3	4		10		
Brown-headed Cowbird	1		2	2	1	3				
Scarlet Tanager	1		3	2						
Rose-breasted Grosbeak			2	4	1	3				1
Indigo Bunting	1		1	1	1					
Evening Grosbeak										
Purple Finch										2
American Goldfinch				2		1		1		2
Rufous-sided Towhee			1	1		1				
Savannah Sparrow	1	1	2		1	2		1	1	
Dark-eyed Junco										
Chipping Sparrow			1	1						
Field Sparrow			1	1		1				
White-crowned Sparrow										
White-throated Sparrow	1	1	4	3		6		1		1
Swamp Sparrow									1	
Song Sparrow	6	5	6	4	4	4		3	21	1
Snow Bunting										
Species Richness	34	23	42	41	31	37	6	27	31	32

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 37· (continued)

SPECIES	8/7	8/21	9/8	9/17	10/6	10/15	10/18	10/22	10/23	10/25
Common Loon										2
Horned Grebe										
Pied-billed Grebe	3	5								
Great Blue Heron	1	3	4						1	1
Green Heron										
American Bittern		1								
Canada Goose	25		55		550	700	820	1075		725
Blue Goose									5	
Mallard		28	4		5		11	1	10	35
Mallard X Black Duck										
Black Duck			4		6		15	8	4	10
Gadwall		525	8	1	100		22	30		16
Pintail								27		
Green-winged Teal	3		1							1
Blue-winged Teal	8	4								
American Wigeon			3	3	77		415	701		145
Wood Duck										
Redhead			5		200		145	160		230
Canvasback										
Ring-necked Duck		1			105		2			3
Greater Scaup			1		20	60	110	180		77
Lesser Scaup			26		5		40	60		40
Unidentified Scaup										
Common Goldeneye							5			
Bufflehead							4			
White-winged Scoter										
Ruddy Duck										
Hooded Merganser							65	35		9

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 37 (continued)

SPECIES	8/7	8/21	9/8	9/17	10/6	10/15	10/18	10/22	10/23	10/25
Common Merganser							2			
Turkey Vulture	1									
Goshawk										
Red-tailed Hawk	1						1			
Osprey	1	1								
American Kestrel	1	1								
Ruffed Grouse										
American Coot										78
Killdeer		3	6		40					
Common Snipe			3							
Spotted Sandpiper	2					1				
Solitary Sandpiper		1								
Greater Yellowlegs						2	4			
Lesser Yellowlegs										
Dunlin									8	
Great Black-backed Gull			1							
Herring Gull					3				12	3
Ring-billed Gull		3	62	3			12		35	1
Bonaparte's Gull										
Common Tern	6	5								
Belted Kingfisher	1	1	2		1					
Common Flicker	2	8	12	4						
Hairy Woodpecker								1		
Downy Woodpecker		2								
Eastern Kingbird	5	14	6							
Great Crested Flycatcher										
Eastern Wood Pewee		3								
Tree Swallow		5				5				

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 37 (continued)

SPECIES	8/7	8/21	9/8	9/17	10/6	10/15	10/18	10/22	10/23	10/25
Rough-winged Swallow										
Barn Swallow	6	50								
Cliff Swallow										
Purple Martin	3	2								
Blue Jay		2	12					1		
Common Crow	15	7	4				4	3		2
Black-capped Chickadee	5	46	20	15		8	10	20	40	15
White-breasted Nuthatch		1								
Gray Catbird		2								
Brown Thrasher										
American Robin		20	10				30		30	
Wood Thrush										
Veery	1									
Golden-crowned Kinglet									2	
Ruby-crowned Kinglet									1	
Water Pipit								2		
Cedar Waxwing	7	11								
Starling		50								
Red-eyed Vireo	1									
Warbling Vireo										
Black and White Warbler										
Orange-crowned Warbler						1				
Nashville Warbler										
Yellow Warbler		3								
Yellow-rumped Warbler						8			1	
Ovenbird										
Common Yellowthroat				1						
American Redstart										

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 37 (continued)

SPECIES	8/7	8/21	9/8	9/17	10/6	10/15	10/18	10/22	10/23	10/25
House Sparrow		10								
Bobolink	3	9								
Red-winged Blackbird	125	350							2	
Northern Oriole										
Common Grackle	8	17								
Brown-headed Cowbird										
Scarlet Tanager										
Rose-breasted Grosbeak		1	3							
Indigo Bunting										
Evening Grosbeak										
Purple Finch										
American Goldfinch			2						6	
Rufous-sided Towhee		1								
Savannah Sparrow										
Dark-eyed Junco			10			75	10	20	30	10
Chipping Sparrow										
Field Sparrow										
White-crowned Sparrow							2			
White-throated Sparrow						1				
Swamp Sparrow										
Song Sparrow	5	27	2						5	
Snow Bunting										15
Species Richness	25	37	25	6	12	10	21	16	16	20

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 37. (continued)

SPECIES	10/29	11/6	11/10	11/13	11/19	11/20		Total	Avg/+ Occ.	
Common Loon		5		7	2	1		19	3.2	
Horned Grebe						1		1	1.0	
Pied-billed Grebe								12	3.0	
Great Blue Heron								43	3.6	
Green Heron								1	1.0	
American Bittern								2	1.0	
Canada Goose	635	1185	850	1020		1025		8787	439.4	
Blue Goose								5	5.0	
Mallard	5	9	14	11		3		171	12.2	
Mallard X Black Duck								1	1.0	
Black Duck	10	4	14	27		4		116	9.7	
Gadwall	34	75	65	104		5		1067	66.7	
Pintail		2		15				45	11.3	
Green-winged Teal								7	1.8	
Blue-winged Teal								12	6.0	
American Wigeon	120	540	159	855		110		3143	209.5	
Wood Duck								18	9.0	
Redhead	52	270	190	113		140		1513	137.5	
Canvasback			2	1				3	1.5	
Ring-necked Duck	185	685	10	10		5		1011	101.1	
Greater Scaup	110	360	170	270		65		1424	118.6	
Lesser Scaup	20		70	4				265	33.1	
Unidentified Scaup	10							10	10.0	
Common Goldeneye		25	5	14		20		70	11.7	
Bufflehead	1	2	2					9	2.3	
White-winged Scoter		10						10	10.0	
Ruddy Duck		7	1	4		3		15	3.8	
Hooded Merganser	110	252	240	230		55		996	124.5	

*No birds sighted +Mean number per sampling period present (Average per occurrence)

SPECIES	10/29	11/6	11/10	11/13	11/19	11/20		Total	Avg/+ Occ.	
Common Merganser		5						7	3.5	
Turkey Vulture								1	1.0	
Goshawk								1	1.0	
Red-tailed Hawk								2	1.0	
Osprey								2	1.0	
American Kestrel								3	1.0	
Ruffed Grouse								2	1.0	
American Coot				25				103	51.5	
Killdeer	2			1				61	7.6	
Common Snipe								3	3.0	
Spotted Sandpiper								6	1.2	
Solitary Sandpiper								1	1.0	
Greater Yellowlegs								7	2.3	
Lesser Yellowlegs								7	3.5	
Dunlin								8	8.0	
Great Black-backed Gull		2				1		4	1.3	
Herring Gull		5	1			2		26	4.3	
Ring-billed Gull	2	32	3	17		15		266	14.8	
Bonaparte's Gull		35	10					45	22.5	
Common Tern								40	5.7	
Belted Kingfisher				1				8	1.3	
Common Flicker								48	4.4	
Hairy Woodpecker								1	1.0	
Downy Woodpecker								10	1.3	
Eastern Kingbird								68	5.2	
Great Crested Flycatcher								10	1.7	
Eastern Wood Pewee								4	2.0	
Tree Swallow								51	4.6	

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table 37 (continued)

SPECIES	10/29	11/6	11/10	11/13	11/19	11/20		Total	Avg/+ Occ.
Rough-winged Swallow								2	2.0
Barn Swallow								149	16.6
Cliff Swallow								4	4.0
Purple Martin								26	5.2
Blue Jay	1		3	2				34	3.1
Common Crow		3		4				74	4.4
Black-capped Chickadee	25	10		10				242	15.1
White-breasted Nuthatch								2	1.0
Gray Catbird								31	3.9
Brown Thrasher								4	1.3
American Robin			5					171	12.2
Wood Thrush								4	1.0
Veery								53	5.9
Golden-crowned Kinglet								2	2.0
Ruby-crowned Kinglet								1	1.0
Water Pipit								2	2.0
Cedar Waxwing								30	3.8
Starling								156	17.3
Red-eyed Vireo								32	4.0
Warbling Vireo								7	1.0
Black and White Warbler								4	1.3
Orange-crowned Warbler								1	1.0
Nashville Warbler								2	1.0
Yellow Warbler								46	5.1
Yellow-rumped Warbler								9	4.5
Ovenbird								2	1.0
Common Yellowthroat								16	2.0
American Redstart								30	4.3

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table 37 (continued)

SPECIES	10/29	11/6	11/10	11/13	11/19	11/20		Total	Avg/+ Occ.
House Sparrow								10	10.0
Bobolink								14	4.7
Red winged Blackbird								656	50.5
Northern Oriole								21	3.0
Common Grackle								58	6.4
Brown-headed Cowbird								9	1.8
Scarlet Tanager								6	2.0
Rose-breasted Grosbeak								15	2.1
Indigo Bunting								4	1.0
Evening Grosbeak				230				230	230.0
Purple Finch								2	2.0
American Goldfinch								14	2.3
Rufous-sided Towhee								4	1.0
Savannah Sparrow								9	1.3
Dark-eyed Junco	2							157	22.4
Chipping Sparrow								2	1.0
Field Sparrow								3	1.0
White-crowned Sparrow								2	2.0
White-throated Sparrow								18	2.3
Swamp Sparrow								1	1.0
Song Sparrow								93	7.2
Snow Bunting								15	15.0
Species Richness	17	22	19	23	1	16		106	

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table 38. Number of birds sighted on the St. Lawrence River in 1979 in the Canada Island - Murphy Island Corridor.

SPECIES	6/25	6/29	7/1	7/26	8/3	8/7	8/9	8/21	8/29	9/8
Great Blue Heron	2		1	2		3		1	1	
Canada Goose										
Brant										
Mallard						40		4		
Black Duck								2		
Gadwall						25		2		
Pintail						2				
American Wigeon	8					12				
Wood Duck										1
Surf Scoter										
Common Merganser										
Red-breasted Merganser										
Turkey Vulture						3				
Killdeer	1		1				2	2		4
Spotted Sandpiper	3		5		1					
Solitary Sandpiper	2									2
Greater Yellowlegs										
Dunlin										
Great Black-backed Gull										3
Herring Gull						1		3		9
Ring-billed Gull		6		5	3	20	21	129		33
Common Tern	55	2	55				2	14		3
Rock Dove										5
Belted Kingfisher	1									1
Common Flicker	1		1							3
Eastern Kingbird					5					
Tree Swallow						5				
Barn Swallow						12				

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 38 (continued)

SPECIES	6/25	6/29	7/1	7/26	8/3	8/7	8/9	8/21	8/29	9/8
Purple Martin	1		2							
Common Crow										6
American Robin					5					
Cedar Waxwing						3				
Song Sparrow			4	2	3					
Species Richness	9	2	7	3	5	11	3	8	1	11

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 38 (continued)

SPECIES	9/17	10/6	10/16	10/22	10/23	10/29	11/6	11/8	11/10	11/13
Great Blue Heron						1				1
Canada Goose									40	
Brant							30	3		
Mallard							4			14
Black Duck							2			
Gadwall										
Pintail										
American Wigeon			1							
Wood Duck										
Surf Scoter			1							
Common Merganser							14	2		
Red-breasted Merganser									8	
Turkey Vulture										
Killdeer										
Spotted Sandpiper										
Solitary Sandpiper										
Greater Yellowlegs						2				
Dunlin						6				
Great Black-backed Gull	1									3
Herring Gull		1	5	1	23	1	1	2	2	2
Ring-billed Gull	10	26	25	10	19	6	6	8	10	7
Common Tern										
Rock Dove	5		15							
Belted Kingfisher	1									
Common Flicker										
Eastern Kingbird										
Tree Swallow										
Barn Swallow										

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 38 (continued)

SPECIES	9/17	10/6	10/16	10/22	10/23	10/29	11/6	11/8	11/10	11/13
Purple Martin										
Common Crow										
American Robin										
Cedar Waxwing										
Song Sparrow										
Species Richness	4	2	5	2	2	5	6	4	4	5

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 38 (continued)

SPECIES	11/19*	11/20		Total	Avg/+ occ.					
Great Blue Heron				12	1.5					
Canada Goose				40	40.0					
Brant				33	16.5					
Mallard				64	16.0					
Black Duck				4	2.0					
Gadwall				27	13.5					
Pintail				2	2.0					
American Wigeon				21	7.0					
Wood Duck				1	1.0					
Surf Scoter				1	1.0					
Common Merganser		10		26	8.7					
Red-breasted Merganser				8	8.0					
Turkey Vulture				3	3.0					
Killdeer				10	2.0					
Spotted Sandpiper				9	3.0					
Solitary Sandpiper				4	2.0					
Greater Yellowlegs				2	2.0					
Dunlin				6	6.0					
Great Black-backed Gull				7	2.3					
Herring Gull		1		52	4.0					
Ring-billed Gull		40		384	21.3					
Common Tern				131	21.8					
Rock Dove				25	8.3					
Belted Kingfisher				3	1.0					
Common Flicker				5	1.7					
Eastern Kingbird				5	5.0					
Tree Swallow				5	5.0					
Barn Swallow				12	12.0					

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 38 (continued)

SPECIES	11/19*	11/20		Total	Avg/+ occ.					
Purple Martin				3	1.5					
Common Crow				6	6.0					
American Robin				5	5.0					
Cedar Waxwing				3	3.0					
Song Sparrow				9	3.0					
Species Richness	0	3		33						

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 39. Number of birds sighted on the St. Lawrence River in 1979 in the Lakeshore Drive Corridor.

SPECIES	8/9	8/29		Total	Avg/ occ.+					
Mallard		6		6	6.0					
Northern Marsh Harrier		1		1	1.0					
American Kestrel		1		1	1.0					
Killdeer		6		6	6.0					
Great Black-backed Gull		1		1	1.0					
Herring Gull		1		1	1.0					
Ring-billed Gull	25	12		37	18.5					
Rock Dove		20		20	20.0					
Barn Swallow		16		16	16.0					
Blue Jay		2		2	2.0					
Common Crow		5		5	5.0					
Species Richness	1	11		11						

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 40. Number of birds sighted on the St. Lawrence River in 1979 in the Iroquois Dam Corridor.

SPECIES	6/29	6/30	7/3	8/1	8/3	8/6	8/7	9/8	10/5	10/23
Common Loon										
Double-crested Cormorant		1							8	
Great Blue Heron	1	3	2	2	2	1	1	1		
Green Heron							1			
Canada Goose					14					
Mallard							2	4		
Gadwall									4	
Pintail										
Redhead									1	
Common Goldeneye										
Bufflehead										
Oldsquaw										
Surf Scoter										
Hooded Merganser										
Common Merganser										
Red-breasted Merganser										
Red-tailed Hawk								1		1
Northern Marsh Harrier				7	2		2			
American Kestrel				5		2	9		1	
Spotted Sandpiper				1		2				
Lesser Yellowlegs						1				
Great Black-backed Gull									2	
Herring Gull							1		5	
Ring-billed Gull	30	40	15	4	8	4	3	10	155	
Common Tern					2		9			
Rock Dove				20	10	20	20		40	
Belted Kingfisher				1			1			
Common Flicker					3		5	5		

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 40. (continued)

SPECIES	6/29	6/30	7/3	8/1	8/3	8/6	8/7	9/8	10/5	10/23
Red-headed Woodpecker					1					
Downy Woodpecker								1		
Eastern Kingbird				2	5	3	7			
Great Crested Flycatcher				1	4					
Bank Swallow	10	20	100	3						
Barn Swallow	15	40	70	11	6	6	10			
Cliff Swallow	10	15	50							
Purple Martin					6					
Blue Jay									5	
Common Crow				16	18	5	2			5
Black-capped Chickadee				2						
White-breasted Nuthatch				1						
American Robin					2	6	5			
Cedar Waxwing					5		2			
Starling						5	20		70	
Red-eyed Vireo					5					
Yellow Warbler				3						
Common Yellowthroat					1					
House Sparrow							5			
Bobolink							2			
Eastern Meadowlark				3		4	6			
Red-winged Blackbird				5	10	40	75			
Northern Oriole							1			
Rusty Blackbird										
Common Grackle						2				
Rose-breasted Grosbeak					1					
Indigo Bunting				1						
American Goldfinch				5	10	2	8	2		

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 40. (continued)

SPECIES	6/29	6/30	7/3	8/1	8/3	8/6	8/7	9/8	10/5	10/23
Savannah Sparrow				3			3	3	15	
Vesper Sparrow										
Dark-eyed Junco									1	
Tree Sparrow										
Chipping Sparrow					1					
Swamp Sparrow				2			1			
Song Sparrow				5	8	6	5	2		
Snow Bunting										
Species Richness	5	6	5	22	22	16	26	10	12	2

*No birds sighted

+Mean number per sampling period present (Average per occurrence)

Table: 40. (continued)

SPECIES	10/29	11/8	11/10	11/13	11/20		Total	Avg/+ Occ.		
Common Loon	1			1			2	1.0		
Double-crested Cormorant							9	4.5		
Great Blue Heron							13	1.6		
Green Heron							1	1.0		
Canada Goose							14	14.0		
Mallard							6	3.0		
Gadwall							4	4.0		
Pintail		18					18	18.0		
Redhead							1	1.0		
Common Goldeneye		10					10	10.0		
Bufflehead			5				5	5.0		
Oldsquaw	14						14	14.0		
Surf Scoter	1						1	1.0		
Hooded Merganser	1						1	1.0		
Common Merganser		3	3				6	3.0		
Red-breasted Merganser	31	3	13				47	15.7		
Red-tailed Hawk		1					3	1.0		
Northern Marsh Harrier					1		12	3.0		
American Kestrel					1		18	3.6		
Spotted Sandpiper							3	1.5		
Lesser Yellowlegs							1	1.0		
Great Black-backed Gull							2	2.0		
Herring Gull	4			3			13	3.2		
Ring-billed Gull	7						276	27.6		
Common Tern							11	5.5		
Rock Dove	25	250					385	55.0		
Belted Kingfisher							2	1.0		
Common Flicker							13	4.3		

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 40. (continued)

SPECIES	10/29	11/8	11/10	11/13	11/20		Total	Avg/+ Occ.		
Red-headed Woodpecker							1	1.0		
Downy Woodpecker							1	1.0		
Eastern Kingbird							17	4.2		
Great Crested Flycatcher							5	2.5		
Bank Swallow							133	33.2		
Barn Swallow							158	22.6		
Cliff Swallow							75	25.0		
Purple Martin							6	6.0		
Blue Jay							5	5.0		
Common Crow	2				5		55	6.9		
Black-capped Chickadee	10						12	6.0		
White-breasted Nuthatch							1	1.0		
American Robin	10						23	5.8		
Cedar Waxwing							7	3.5		
Starling	100						195	48.8		
Red-eyed Vireo							5	5.0		
Yellow Warbler							3	3.0		
Common Yellowthroat							1	1.0		
House Sparrow							5	5.0		
Bobolink							2	2.0		
Eastern Meadowlark							13	4.3		
Red-winged Blackbird							130	32.5		
Northern Oriole							1	1.0		
Rusty Blackbird	2						2	2.0		
Common Grackle	1						3	1.5		
Rose-breasted Grosbeak							1	1.0		
Indigo Bunting							1	1.0		
American Goldfinch							27	5.4		

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 40. (continued)

SPECIES	10/29	11/8	11/10	11/13	11/20		Total	Avg/+ Occ.		
Savannah Sparrow	1						25	5.0		
Vesper Sparrow	3						3	3.0		
Dark-eyed Junco	3						4	2.0		
Tree Sparrow	2	10					12	6.0		
Chipping Sparrow							1	1.0		
Swamp Sparrow							3	1.5		
Song Sparrow							26	5.2		
Snow Bunting	25						25	25.0		
Species Richness	19	7	3	2	3		64			

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 41 . Number of birds sighted on the St. Lawrence River in 1979 in the Galop Island Corridor.

SPECIES	8/7	8/9	8/29	10/25	10/29	11/8	11/9	11/11	11/13*	
Mallard		6	25							
Black Duck			1							
Gadwall			16							
Blue-winged Teal			3							
Common Goldeneye						10				
Red-tailed Hawk					1					
Common Gallinule			8							
Killdeer		3	7							
Upland Sandpiper	1									
Greater Yellowlegs			3							
Lesser Yellowlegs			10							
Herring Gull				2	2	3				
Ring-billed Gull		2		90	5	75		2		
Common Tern		3								
Mourning Dove			6							
Barn Swallow		5								
Purple Martin			15							
Common Crow					2					
American Robin			35							
Starling			100							
House Sparrow			50							
Red-winged Blackbird			300							
Tree Sparrow							20			
Chipping Sparrow			2							
Song Sparrow			10							
Species Richness	1	5	16	2	4	3	1	1	0	

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 41. (Continued)

SPECIES	11/19*		Total	Avg/+ Occ.						
Mallard			31	15.5						
Black Duck			1	1.0						
Gadwall			16	16.0						
Blue-winged Teal			3	3.0						
Common Goldeneye			10	10.0						
Red-tailed Hawk			1	1.0						
Common Gallinule			1	1.0						
Killdeer			10	5.0						
Upland Sandpiper			1	1.0						
Greater Yellowlegs			3	3.0						
Lesser Yellowlegs			10	10.0						
Herring Gull			7	2.3						
Ring-billed Gull			174	34.8						
Common Tern			3	3.0						
Mourning Dove			6	6.0						
Barn Swallow			5	5.0	::					
Purple Martin			15	15.0						
Common Crow			2	2.0						
American Robin			35	35.0						
Starling			100	100.0						
House Sparrow			50	50.0						
Red-winged Blackbird			300	300.0						
Tree Sparrow			20	20.0						
Chipping Sparrow			2	2.0						
Song Sparrow			10	10.0						
Species Richness	0		25							

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 42 . Number of birds sighted on the St. Lawrence River in 1979 in the Jacques Cartier State Park Corridor.

SPECIES	6/18	7/21	7/23*	7/27	7/29	9/8	9/9	10/4	10/16	10/19
Common Loon										1
Red-necked Grebe										
Great Blue Heron										1
Mallard							5			
Common Goldeneye										40
Oldsquaw										
White-winged Scoter										
Surf Scoter									2	
Black Scoter										
Common Merganser										
Ruffed Grouse									2	
Semipalmated Plover							2			
Killdeer									2	
Sanderling							1			
Great Black-backed Gull									2	2
Herring Gull		2							31	2
Ring-billed Gull		220		110	45	10	1		405	6
Mourning Dove										
Belted Kingfisher								1		
Common Flicker						4				
Pileated Woodpecker	3					1				
Hairy Woodpecker	1									
Downy Woodpecker										
Least Flycatcher	6									
Eastern Wood Pewee	8									
Tree Swallow									50	
Blue Jay	3					10		25		3
Common Crow	1	4			3					

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 42. (continued)

SPECIES	6/18	7/21	7/23*	7/27	7/29	9/8	9/9	10/4	10/16	10/19
Black-capped Chickadee	4					8		15	15	
American Robin	16							5	50	
Wood Thrush	7									
Veery	5									
Golden-crowned Kinglet								2		
Cedar Waxwing	2									
Red-eyed Vireo	6					4				
Philadelphia Vireo						1				
Warbling Vireo	2									
Black and White Warbler	2									
Yellow Warbler	3									
Bay-breasted Warbler						2				
Pine Warbler	3									
Ovenbird	1									
American Redstart	16					2				
Northern Oriole	5									
Rose-breasted Grosbeak	4									
Dark-eyed Junco								2		
Chipping Sparrow						24				
White-throated Sparrow								10		
Species Richness	20	3	0	1	2	10	4	7	9	7

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 42. (continued)

SPECIES	10/25	11/9	11/11	11/20		Total	Avg/+ occ.			
Common Loon	3	6	4			14	3.5			
Red-necked Grebe			1			1	1.0			
Great Blue Heron	1					2	1.0			
Mallard						5	5.0			
Common Goldeneye			48	30		118	39.3			
Oldsquaw			5			5	5.0			
White-winged Scoter			6			6	6.0			
Surf Scoter						2	2.0			
Black Scoter			350			350	350.0			
Common Merganser		8				8	8.0			
Ruffed Grouse						2	2.0			
Semipalmated Plover						2	2.0			
Killdeer						2	2.0			
Sanderling						1	1.0			
Great Black-backed Gull	2	1	2			9	1.8			
Herring Gull	2	21	10	2		70	10.0			
Ring-billed Gull	5	40	70	5		917	83.3			
Mourning Dove		1				1	1.0			
Belted Kingfisher						1	1.0			
Common Flicker						4	4.0			
Pileated Woodpecker						4	2.0			
Hairy Woodpecker						1	1.0			
Downy Woodpecker			1			1	1.0			
Least Flycatcher						6	6.0			
Eastern Wood Pewee						8	8.0			
Tree Swallow						50	50.0			
Blue Jay	3					44	8.8			
Common Crow						8	2.7			

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 42. (continued)

SPECIES	10/25	11/9	11/11	11/20		Total	Avg/+ Occ.			
Black-capped Chickadee		20	4			66	11.0			
American Robin						71	23.7			
Wood Thrush						7	7.0			
Veery						5	5.0			
Golden-crowned Kinglet						2	2.0			
Cedar Waxwing						2	2.0			
Red-eyed Vireo						10	5.0			
Philadelphia Vireo						1	1.0			
Warbling Vireo						2	2.0			
Black and White Warbler						2	2.0			
Yellow Warbler						3	3.0			
Bay-breasted Warbler						2	2.0			
Pine Warbler						3	3.0			
Ovenbird						1	1.0			
American Redstart						18	9.0			
Northern Oriole						5	5.0			
Rose-breasted Grosbeak						4	4.0			
Dark-eyed Junco						2	2.0			
Chipping Sparrow						24	24.0			
White-throated Sparrow						10	10.0			
Species Richness	6	7	11	3		48				

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 43 . Number of birds sighted on the St. Lawrence River in 1979 in the American Island Corridor.

SPECIES	7/21	7/23	7/24	7/27	7/29	8/3	9/8	9/9	10/4	10/16
Common Loon										
Double-crested Cormorant		1								
Great Blue Heron		5		1	2			2		
Mallard		9		11	12			45		
Black Duck										
Gadwall								6		
Green-winged Teal								3		
Blue-winged Teal								165		
American Wigeon								2		
Common Goldeneye										
Black Scoter										
Cooper's Hawk										
Killdeer				19						
Spotted Sandpiper		2		5	3					
Solitary Sandpiper				2	1					
Least Sandpiper				1	1					
Herring Gull		7	1	8	6		6	10	2	18
Ring-billed Gull		119	132	244	91	10	20	78	10	60
Bonaparte's Gull		3								1
Common Tern	1		8	5	1			6		
Mourning Dove	2									
Belted Kingfisher										
Pileated Woodpecker										
Hairy Woodpecker										
Downy Woodpecker										
Tree Swallow	4					17				
Bank Swallow	4									
Barn Swallow						10				

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table 43. (continued)

SPECIES	7/21	7/23	7/24	7/27	7/29	8/3	9/8	9/9	10/4	10/16
Purple Martin						15				
Blue Jay	10								5	
Common Crow	1								8	
Black-capped Chickadee					4					
White-breasted Nuthatch										
Brown Creeper										
American Robin										
Ruby-crowned Kinglet										
Starling				20						
House Sparrow									5	
Red-winged Blackbird						10				
Northern Oriole	2									
Cardinal						2				
Dark-eyed Junco										
Song Sparrow	2				2					
Species Richness	8	7	3	10	10	6	2	9	5	3

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table 43. (continued)

SPECIES	10/18	10/25	11/9	11/11		Total	Avg/+ Occ.			
Common Loon			2			2	2.0			
Double-crested Cormorant						1	1.0			
Great Blue Heron	1		1			12	2.0			
Mallard						77	19.3			
Black Duck			4			4	4.0			
Gadwall						6	6.0			
Green-winged Teal						3	3.0			
Blue-winged Teal						165	165.0			
American Wigeon						2	2.0			
Common Goldeneye			45	20		65	32.5			
Black Scoter				350		350	350.0			
Cooper's Hawk	1					1	1.0			
Killdeer						19	19.0			
Spotted Sandpiper						10	3.3			
Solitary Sandpiper						3	1.5			
Least Sandpiper						2	1.0			
Herring Gull						58	7.3			
Ring-billed Gull		2	10			776	70.5			
Bonaparte's Gull						4	2.0			
Common Tern						21	4.2			
Mourning Dove						2	2.0			
Belted Kingfisher		1				1	1.0			
Pileated Woodpecker			1			1	1.0			
Hairy Woodpecker		1				1	1.0			
Downy Woodpecker		1				1	1.0			
Tree Swallow						21	10.5			
Bank Swallow						4	4.0			
Barn Swallow						10	10.0			

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 43. (continued)

SPECIES	10/18	10/25	11/9	11/11		Total	Avg/+ Occ.			
Purple Martin						15	15.0			
Blue Jay						15	7.5			
Common Crow						9	4.5			
Black-capped Chickadee	15	20				39	13.0			
White-breasted Nuthatch	1					1	1.0			
Brown Creeper	1	2				3	1.5			
American Robin		20				20	20.0			
Ruby-crowned Kinglet		2				2	2.0			
Starling						20	20.0			
House Sparrow						5	5.0			
Red-winged Blackbird						10	10.0			
Northern Oriole						2	2.0			
Cardinal						2	2.0			
Dark-eyed Junco		10				10	10.0			
Song Sparrow						4	2.0			
Species Richness	2	10	7	2		43				

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 44 . Number of birds sighted on the St. Lawrence River in 1979 in the Oak Point Corridor.

SPECIES	6/5	6/19	6/23	6/25	7/3	7/5	7/12	7/18	7/20	7/21
Common Loon										
Double-crested Cormorant										7
Great Blue Heron			1			1				2
Canada Goose										
Brant										
Mallard			4		2	1				
Black Duck										
Gadwall										
Pintail										
Blue-winged Teal										
American Wigeon										
Canvasback										
Greater Scaup										
Common Goldeneye										
Oldsquaw										
White-winged Scoter										
Surf Scoter										
Black Scoter										
Common Merganser										
Red-breasted Merganser										
American Kestrel						1				
Killdeer	1		6		2	3	1			
Black-bellied Plover										
Upland Sandpiper										
Spotted Sandpiper										2
Solitary Sandpiper										
Lesser Yellowlegs										
Least Sandpiper										1

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 44. (continued)

SPECIES	6/5	6/19	6/23	6/25	7/3	7/5	7/12	7/18	7/20	7/21
Sanderling										1
Great Black-backed Gull										2
Herring Gull	22	15	3	52	42		30	44	47	57
Ring-billed Gull	22	8	15		4	2	3	56		20
Bonaparte's Gull										
Common Tern	24		32	8	32	1	35	19		39
Black Tern								2		
Rock Dove					6	3	5			
Mourning Dove	1	2	5		2	1	2			
Belted Kingfisher										
Common Flicker		1	2		1		2			
Hairy Woodpecker					2	1				
Downy Woodpecker					1					
Eastern Kingbird	2	5	4		3	8	8	2		
Great Crested Flycatcher	1	1				1	1			
Eastern Phoebe	1		1		1		1			
Least Flycatcher	2	3	1			2	1			
Eastern Wood Pewee	1		1							
Tree Swallow	14	6	5		4	30	15			
Bank Swallow										
Barn Swallow	3	10	8		2	5	10			
Purple Martin		10	15		12	16	25	10		
Blue Jay			2		1	2	1			
Common Crow	2		6		2		5			
Black-capped Chickadee			2		1	3	3			
White-breasted Nuthatch							1			
House Wren	6	4	3		2	2	2			
Gray Catbird	2	2	1		2	4	2			

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 44 (continued)

SPECIES	6/5	6/19	6/23	6/25	7/3	7/5	7/12	7/18	7/20	7/21
American Robin	4	7	4		8	7	6			
Water Pipit										
Cedar Waxwing										
Starling	2		10		15	37	12			
Yellow Warbler	6	12	14		13	8	4			
Yellow-rumped Warbler										
Ovenbird			1							
Common Yellowthroat	1	3	2		4	4	1			
American Redstart	4	3	4		6	2	1			
House Sparrow										
Bobolink										
Eastern Meadowlark	4	4	3		5	2	2			
Red-winged Blackbird	16	10	15		14	10	15			
Northern Oriole	2	5	2		4	2	1			
Common Grackle	3	4			2	3	15			
Brown-headed Cowbird			10		8	6	5			
Cardinal	1		2		1					
Rose-breasted Grosbeak	2	1	1		2	3	1			
Indigo Bunting							6			
American Goldfinch			3			4	4			
Rufous-sided Towhee			1		1	1	2			
Savannah Sparrow										
Dark-eyed Junco		1								
Chipping Sparrow		2	1		1	1				
White-throated Sparrow										
Song Sparrow	8	10	8		8	9	6			
Snow Bunting										
Species Richness	27	24	36	2	35	34	35	6	1	9

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 44 (continued)

SPECIES	7/23	7/24	7/27	7/29	8/1	8/3	8/21	9/8	9/9	9/17
Common Loon										
Double-crested Cormorant										
Great Blue Heron							1		3	
Canada Goose										
Brant										
Mallard	12	7	1				25	14	27	
Black Duck				1			5	1	2	
Gadwall			3	1			20	8	27	
Pintail										
Blue-winged Teal							3	2	63	
American Wigeon								6	31	
Canvasback										
Greater Scaup										
Common Goldeneye										
Oldsquaw										
White-winged Scoter										
Surf Scoter										
Black Scoter										
Common Merganser										
Red-breasted Merganser										
American Kestrel										
Killdeer		24	35	1				3		
Black-bellied Plover							1			
Upland Sandpiper						8	1			
Spotted Sandpiper	5	9	4	8	3		4	1		
Solitary Sandpiper	10	4	18	8	10				3	
Lesser Yellowlegs							3			
Least Sandpiper	9			2						

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table 44. (continued)

SPECIES	7/23	7/24	7/27	7/29	8/1	8/3	8/21	9/8	9/9	9/17
Sanderling	1		2	5					1	
Great Black-backed Gull				4	1		4	1	6	3
Herring Gull	34	54	72	55	45	34	39	4	23	6
Ring-billed Gull	100	53	228	70	3	60	93	121	60	35
Bonaparte's Gull								4		
Common Tern	76	60	43	51	26	30	35	66	90	110
Black Tern										
Rock Dove										
Mourning Dove										
Belted Kingfisher			1	1						
Common Flicker							5	4		
Hairy Woodpecker										
Downy Woodpecker										
Eastern Kingbird					14	6	15			
Great Crested Flycatcher					1					
Eastern Phoebe										
Least Flycatcher										
Eastern Wood Pewee						1				
Tree Swallow		10		40	10		135			
Bank Swallow							20			
Barn Swallow	15			2	4	4	80			
Purple Martin					3		85			
Blue Jay							10			2
Common Crow						5	4	4		2
Black-capped Chickadee						3	12	10		
White-breasted Nuthatch						1				
House Wren										
Gray Catbird							1			

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 44 (continued)

SPECIES	7/23	7/24	7/27	7/29	8/1	8/3	8/21	9/8	9/9	9/17
American Robin						6				
Water Pipit										
Cedar Waxwing							10			
Starling					10		25	2		
Yellow Warbler					2	1	2			
Yellow-rumped Warbler										
Ovenbird										
Common Yellowthroat										
American Redstart										
House Sparrow					6	5	5			
Bobolink							3			
Eastern Meadowlark					1		2			2
Red-winged Blackbird				1	5	7	5	25		
Northern Oriole							4			
Common Grackle					3		6			
Brown-headed Cowbird							1			
Cardinal					1					
Rose-breasted Grosbeak										
Indigo Bunting							1			
American Goldfinch					2	5	13	2		
Rufous-sided Towhee							1			
Savannah Sparrow							3			
Dark-eyed Junco										
Chipping Sparrow										
White-throated Sparrow										
Song Sparrow	1				6	8	7			
Snow Bunting										
Species Richness	10	8	10	15	20	15	39	18	12	7

*No birds sighted +Mean number per sampling period present (Average per occurrence)

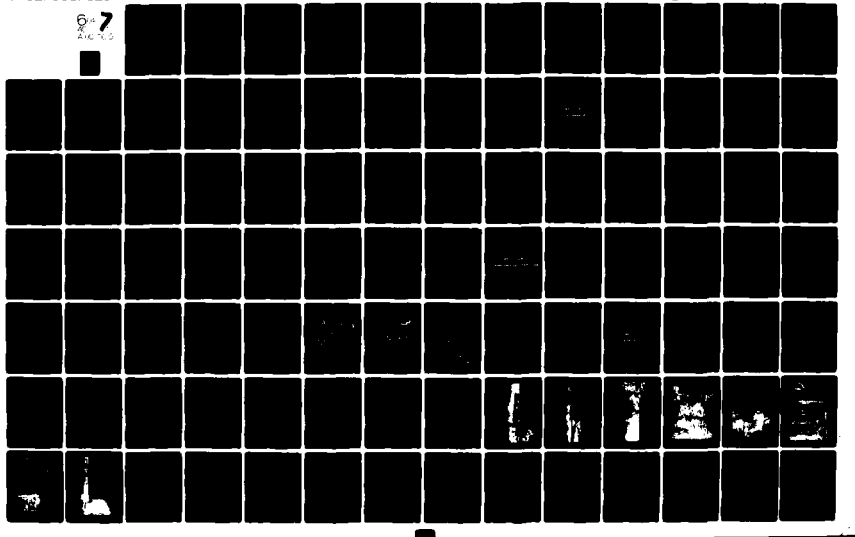
Table: 44 (continued)

SPECIES	9/18	9/25	10/4	10/16	10/24	10/25	10/29	11/9	11/11	11/12
Common Loon			17	22		2		7	19	20
Double-crested Cormorant										
Great Blue Heron	1			1					1	
Canada Goose			81	36		125			85	120
Brant						17				
Mallard			12	1				6	20	22
Black Duck			4	13				28	16	36
Gadwall								10	2	7
Pintail		3								
Blue-winged Teal										
American Wigeon										
Canvasback										120
Greater Scaup				2						
Common Goldeneye									4	2
Oldsquaw								5		
White-winged Scoter									12	
Surf Scoter				1						1
Black Scoter								4	250	
Common Merganser				2				200	6	
Red-breasted Merganser				5					75	50
American Kestrel										
Killdeer		3	10							
Black-bellied Plover										
Upland Sandpiper										
Spotted Sandpiper										
Solitary Sandpiper										
Lesser Yellowlegs										
Least Sandpiper										

*No birds sighted +Mean number per sampling period present (Average per occurrence)

AD-A110 760 FISH AND WILDLIFE SERVICE CORTLAND NY F/G 6/3
BIOLOGICAL SURVEY ALONG THE ST. LAWRENCE RIVER FOR THE ST. LAWR--ETC(U)
1979

UNCLASSIFIED NL



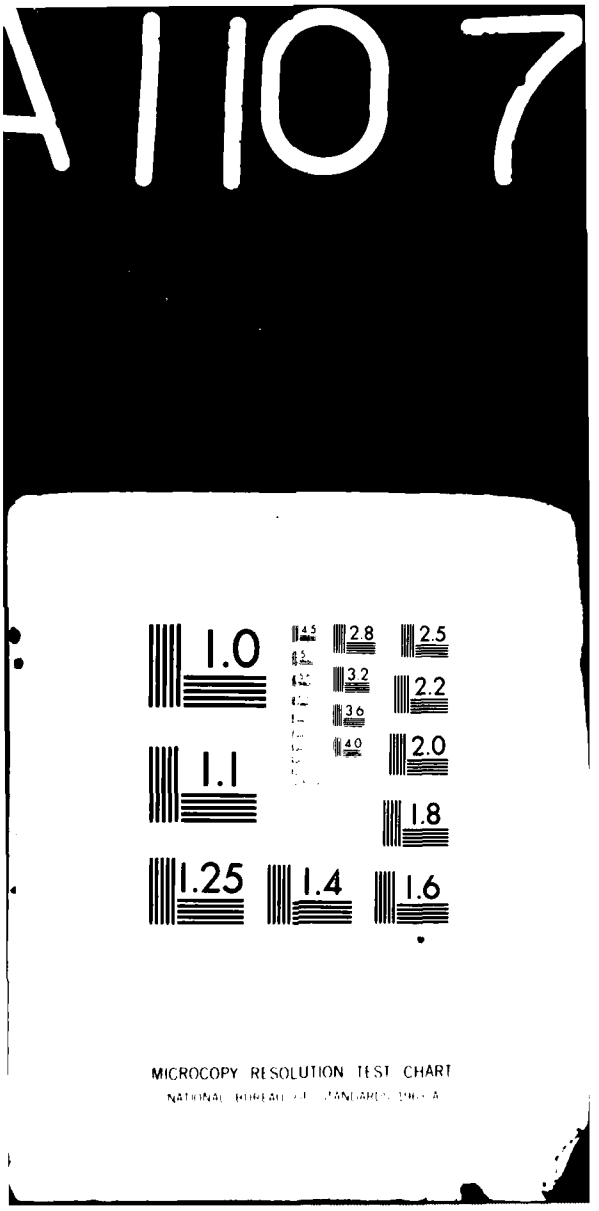

A110 7
1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
MICROCOPY RESOLUTION TEST CHART

Table 44. (continued)

SPECIES	9/18	9/25	10/4	10/16	10/24	10/25	10/29	11/9	11/11	11/12
Sanderling										
Great Black-backed Gull	1		16	1	1	13		23	11	15
Herring Gull		1	28	11	5	26	3	25	65	24
Ring-billed Gull	60	20	152	140		200	9	125	26	105
Bonaparte's Gull	2			5						
Common Tern	110		4	1						
Black Tern										
Rock Dove										
Mourning Dove	5									
Belted Kingfisher	1									
Common Flicker										
Hairy Woodpecker										
Downy Woodpecker	2						1		1	
Eastern Kingbird										
Great Crested Flycatcher										
Eastern Phoebe										
Least Flycatcher										
Eastern Wood Pewee										
Tree Swallow			10							
Bank Swallow										
Barn Swallow	1									
Purple Martin										
Blue Jay	240		25		6	12		7		
Common Crow	5	10	10			12	4			
Black-capped Chickadee	15				5	33	5	15	12	
White-breasted Nuthatch										
House Wren										
Gray Catbird										

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 44 (continued)

SPECIES	9/18	9/25	10/4	10/16	10/24	10/25	10/29	11/9	11/11	11/23
American Robin			5							
Water Pipit				1						
Cedar Waxwing										
Starling						50	10			
Yellow Warbler										
Yellow-rumped Warbler			5							
Ovenbird										
Common Yellowthroat										
American Redstart										
House Sparrow										
Bobolink										
Eastern Meadowlark					1	7				
Red-winged Blackbird										
Northern Oriole										
Common Grackle										
Brown-headed Cowbird										
Cardinal			3		1		1		2	
Rose-breasted Grosbeak										
Indigo Bunting										
American Goldfinch	4									
Rufous-sided Towhee										
Savannah Sparrow	5									
Dark-eyed Junco						10	10			
Chipping Sparrow										
White-throated Sparrow			20			2	3			
Song Sparrow						4				
Snow Bunting				12				5		
Species Richness	14	5	16	16	6	14	9	13	17	12

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 44 (continued)

SPECIES	11/13	11/19		Total	Avg./+ Occ.					
Common Loon	1			88	12.6					
Double-crested Cormorant				7	7.0					
Great Blue Heron				11	1.4					
Canada Goose				447	89.4					
Brant				17	17.0					
Mallard				154	11.0					
Black Duck		2		108	10.8					
Gadwall				78	9.8					
Pintail				3	3.0					
Blue-winged Teal				68	22.7					
American Wigeon				37	18.5					
Canvasback				120	120.0					
Greater Scaup				2	2.0					
Common Goldeneye				6	3.0					
Oldsquaw				5	5.0					
White-winged Scoter				12	12.0					
Surf Scoter				2	1.0					
Black Scoter				254	127.0					
Common Merganser				208	69.3					
Red-breasted Merganser	40			170	42.5					
American Kestrel				1	1.0					
Killdeer				89	8.1					
Black-bellied Plover				1	1.0					
Upland Sandpiper				9	4.5					
Spotted Sandpiper				36	4.5					
Solitary Sandpiper				53	8.8					
Lesser Yellowlegs				3	3.0					
Least Sandpiper				12	4.0					

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 44. (continued)

SPECIES	11/13	11/19		Total	Avg./ Occ.					
Sanderling				10	2.0					
Great Black-backed Gull	1	10		113	6.6					
Herring Gull		21		887	30.6					
Ring-billed Gull	1	150		1941	69.3					
Bonaparte's Gull				11	3.7					
Common Tern				892	42.5					
Black Tern				2	2.0					
Rock Dove				14	4.7					
Mourning Dove				18	2.6					
Belted Kingfisher				3	1.0					
Common Flicker				15	2.5					
Hairy Woodpecker				3	1.5					
Downy Woodpecker				5	1.3					
Eastern Kingbird				67	6.7					
Great Crested Flycatcher				5	1.0					
Eastern Phoebe				4	1.0					
Least Flycatcher				9	1.8					
Eastern Wood Pewee				3	1.0					
Tree Swallow				279	25.4					
Bank Swallow				20	20.0					
Barn Swallow				144	12.0					
Purple Martin				176	22.0					
Blue Jay		2		310	25.8					
Common Crow				71	5.5					
Black-capped Chickadee				119	9.2					
White-breasted Nuthatch				2	1.0					
House Wren				19	3.2					
Gray Catbird				14	2.0					

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 44 (continued)

SPECIES	11/13	11/19		Total	Avg./ Occ.					
American Robin				47	5.9					
Water Pipit				1	1.0					
Cedar Waxwing				10	10.0					
Starling				173	17.3					
Yellow Warbler				72	8.0					
Yellow-rumped Warbler				5	5.0					
Ovenbird				1	1.0					
Common Yellowthroat				15	2.5					
American Redstart				20	3.3					
House Sparrow				16	5.3					
Bobolink				3	3.0					
Eastern Meadowlark				33	3.0					
Red-winged Blackbird				123	11.2					
Northern Oriole				20	2.9					
Common Grackle				36	5.1					
Brown-headed Cowbird				30	6.0					
Cardinal				12	1.5					
Rose-breasted Grosbeak				10	1.7					
Indigo Bunting				7	3.5					
American Goldfinch				37	4.6					
Rufous-sided Towhee				6	1.2					
Savannah Sparrow				8	4.0					
Dark-eyed Junco				21	7.0					
Chipping Sparrow				5	1.3					
White-throated Sparrow				25	8.3					
Song Sparrow				75	6.8					
Snow Bunting				17	8.5					
Species Richness	4	4		83						

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 45 . Number of birds sighted on the St. Lawrence River in 1979 in the Blind Bay Corridor.

SPECIES	6/5	6/13	6/18	6/23	7/3	7/20	7/21	7/23	7/24	7/25
Common Loon								9	1	2
Double-crested Cormorant									2	
Great Blue Heron	2		1	1	2	1	4	6	9	11
Canada Goose										
Mallard							12	7	24	48
Mallard X Black Duck										
Black Duck							1	1	1	2
Gadwall							4	7		
Green-winged Teal										3
Blue-winged Teal										
American Wigeon										
Common Merganser										
Turkey Vulture					3					
Red-tailed Hawk										
American Kestrel	1									
Killdeer										
Ruddy Turnstone										
Spotted Sandpiper							8	3	1	8
Solitary Sandpiper								7		6
Lesser Yellowlegs										4
Least Sandpiper								5		
Dunlin										
Sanderling								3		3
Great Black-backed Gull							4	14	6	10
Herring Gull							11	30	17	16
Ring-billed Gull					3		30	53	36	78
Bonaparte's Gull										
Common Tern					4		102	166		97

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table:45. (continued)

SPECIES	6/5	6/13	6/18	6/23	7/3	7/20	7/21	7/23	7/24	7/25
Black Tern								3		
Rock Dove										
Belted Kingfisher				1						
Common Flicker				1				1		
Hairy Woodpecker										
Downy Woodpecker										
Eastern Kingbird								8		5
Eastern Wood Pewee										
Tree Swallow					2		4	16		
Bank Swallow							4			
Barn Swallow			2		8			90		
Purple Martin						5	4	10		50
Blue Jay										
Common Crow		1	2	1	2		3	2		
Black-capped Chickadee										
White-breasted Nuthatch					1					
House Wren	1	1								
Gray Catbird			1							
American Robin	5		10		10					
Wood Thrush	1		1							
Starling	4					20		2		
Red-eyed Vireo					1					
Warbling Vireo					1					
Yellow Warbler			1	1						
Yellow-rumped Warbler										
Common Yellowthroat			1							
Bobolink										
Eastern Meadowlark						2				

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 45 (continued)

SPECIES	6/5	6/13	6/18	6/23	7/3	7/20	7/21	7/23	7/24	7/25
Red-winged Blackbird	2	5	4	1	4	5	4	26		
Northern Oriole		1								
Common Grackle	3	3	2	1	5			7		
Brown-headed Cowbird		1		1		20				
Rose-breasted Grosbeak										
American Goldfinch				2		2				
Rufous-sided Towhee			1							
Song Sparrow							2	7		
Species Richness	8	6	11	9	13	7	15	24	9	15

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 45 (continued)

SPECIES	7/27	8/3	8/21	9/8	9/9	9/18	10/4	10/16	10/24	10/29
Common Loon	1							40		
Double-crested Cormorant					2					
Great Blue Heron	3		1		3		1	3		
Canada Goose							140	15		
Mallard	81	2	20	22	22		245	24		3
Mallard X Black Duck	1									
Black Duck	1		10	4	6		36	4		
Gadwall	11		3	48			17	8		
Green-winged Teal							3			
Blue-winged Teal				115	78		16			
American Wigeon	1			3			100			
Common Merganser										
Turkey Vulture										
Red-tailed Hawk										
American Kestrel										
Killdeer			2							
Ruddy Turnstone	1									
Spotted Sandpiper	15				1					
Solitary Sandpiper	27			2	5					
Lesser Yellowlegs										
Least Sandpiper	3									
Dunlin							8	3		
Sanderling	6				3		5	1		
Great Black-backed Gull	15		2		13		54	8		3
Herring Gull	57	3	1	3	14		10	28		1
Ring-billed Gull	206	30	10	100	26		55	53	5	
Bonaparte's Gull				1			2			
Common Tern	201		2		26			2		

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table 45. (continued)

SPECIES	7/27	8/3	8/21	9/8	9/9	9/18	10/4	10/16	10/24	10/29
Black Tern	1									
Rock Dove	2									
Belted Kingfisher										
Common Flicker		1								
Hairy Woodpecker										1
Downy Woodpecker			1							
Eastern Kingbird		2	3							
Eastern Wood Pewee			2							
Tree Swallow	60	4			5					
Bank Swallow	5									
Barn Swallow		10								
Purple Martin	25									
Blue Jay									2	2
Common Crow						5	5			12
Black-capped Chickadee			2							
White-breasted Nuthatch										
House Wren			1							
Gray Catbird			2							
American Robin		2	1							
Wood Thrush										
Starling			5			30				
Red-eyed Vireo		1	1							
Warbling Vireo										
Yellow Warbler			2							
Yellow-rumped Warbler							5			
Common Yellowthroat										
Bobolink			2							
Eastern Meadowlark										

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table 25 (continued)

BIRDS	7/27	8/3	8/21	9/8	9/9	9/18	10/4	10/16	10/24	10/29
Red-winged Blackbird	4	15	2							
Northern Oriole			2							
Common Grackle										
Brown-headed Cowbird										
Rose-breasted Grosbeak		1								
American Goldfinch			2							
Rufous-sided Towhee										
Song Sparrow	1									
Species Richness	22	11	23	9	13	2	16	12	2	6

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table 45 (continued)

SPECIES	11/9	11/11	11/12*	11/19		Total	Avg/+ Occ.			
Common Loon						53	10.6			
Double-crested Cormorant						4	2.0			
Great Blue Heron						48	3.4			
Canada Goose						155	77.5			
Mallard						510	42.5			
Mallard X Black Duck						1	1.0			
Black Duck						66	6.6			
Gadwall						98	14.0			
Green-winged Teal						6	3.0			
Blue-winged Teal						209	69.7			
American Wigeon						104	34.7			
Common Merganser	2					2	2.0			
Turkey Vulture						3	3.0			
Red-tailed Hawk	1	1				2	1.0			
American Kestrel						1	1.0			
Killdeer						2	2.0			
Ruddy Turnstone						1	1.0			
Spotted Sandpiper						36	6.0			
Solitary Sandpiper						47	9.4			
Lesser Yellowlegs						4	4.0			
Least Sandpiper						8	4.0			
Dunlin						11	5.5			
Sanderling						21	3.5			
Great Black-backed Gull	2					131	11.9			
Herring Gull				3		194	14.9			
Ring-billed Gull	10			8		703	46.9			
Bonaparte's Gull						3	1.5			
Common Tern						600	75.0			

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table 3.5. (continued)

SPECIES	11/9	11/11	11/12*	11/19		Total	Avg/+ Occ.			
Black Tern						4	2.0			
Rock Dove						2	1.0			
Belted Kingfisher						1	1.0			
Common Flicker						3	1.0			
Hairy Woodpecker						1	1.0			
Downy Woodpecker						1	1.0			
Eastern Kingbird						18	4.5			
Eastern Wood Pewee						2	2.0			
Tree Swallow						91	15.2			
Bank Swallow						9	4.5			
Barn Swallow						110	27.5			
Purple Martin						94	18.8			
Blue Jay						4	2.0			
Common Crow						33	3.7			
Black-capped Chickadee						2	2.0			
White-breasted Nuthatch						1	1.0			
House Wren						3	1.0			
Gray Catbird						3	1.5			
American Robin						28	5.6			
Wood Thrush						2	1.0			
Starling						61	12.2			
Red-eyed Vireo						3	1.0			
Warbling Vireo						1	1.0			
Yellow Warbler						4	1.3			
Yellow-rumped Warbler						5	5.0			
Common Yellowthroat						1	1.0			
Bobolink						2	2.0			
Eastern Meadowlark						2	2.0			

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table C-9 (Continued)

Species	11/9	11/11	11/12	11/19		Total	Avg/* Occ			
Red-winged Blackbird						72	6.5			
Northern Oriole						3	1.5			
Common Grackle						21	3.5			
Brown-headed Cowbird						22	7.3			
Rose-breasted Grosbeak						1	1.0			
American Goldfinch						6	2.0			
Rufous-sided Towhee						1	1.0			
Song Sparrow						10	3.3			
Species Richness	4	1	0	2		64				

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Table: 46 . Number of birds sighted on the St. Lawrence River in 1979 in the Eagle Wing Island Group.

SPECIES	6/26	7/13	7/21		Total	Avg/+ Occ.				
Mallard	3	7			10	5.0				
Great Black-backed Gull			5		5	5.0				
Herring Gull			3		3	3.0				
Ring-billed Gull	80	585	180		845	281.7				
Common Tern	260	226	150		636	212.0				
Species Richness	3	3	4		5					

*No birds sighted +Mean number per sampling period present (Average per occurrence)

Appendix A1. Avian species occurrence and richness recorded at 14 mainland sites during summer, 1979.

	Song Sparrow	American Robin	Starling	Common Crow	Eastern Kingbird	Red-winged Blackbird	Common Flicker	Eastern Meadowlark	Bobolink	Common Yellowthroat	Common Grackle	Gray Catbird	Rose-breasted Grosbeak	Veery	American Goldfinch	Belted Kingfisher
Donahue II	x	x	x	x	x	x	x	x		x	x	x	x	x	x	
Snell Lock	x	x	x	x	x	x	x	x	x							x
Grasse River NE II	x	x	x	x	x	x		x	x	x	x					
Dredge Hill		x	x			x	x	x	x	x						x
Eisenhower Lock	x	x	x	x	x		x	x	x							
Oak Island Mainland							x				x	x	x			
Eisenhower Upland	x	x	x	x			x					x	x	x		
Rt 12 Upland					x							x	x		x	
Hemlock Mainland																x
Grasse River SW	x		x	x	x	x		x	x					x		
Kinnie Rd	x	x	x	x	x						x				x	
Donahue I	x	x				x				x	x	x				
Kring Point																
Grasse River NE I						x			x	x						
Total Number of Sites Observed	8	8	8	7	7	7	6	6	6	5	5	5	4	3	3	3

Appendix A1. (continued)

	Ruffed Grouse	Blue Jay	Black-capped Chickadee	American Woodcock	Killdeer	Yellow Warbler	American Kestrel	Northern Marsh Harrier	Cedar Waxwing	Wood Thrush	Great Blue Heron	Spotted Sandpiper	Downy Woodpecker	American Wigeon	Common Snipe	Brown Thrasher
Donahue II	x	x				x	x			x						
Snell Lock					x		x	x						x		x
Grasse River NE II								x	x							
Dredge Hill											x					
Eisenhower Lock					x										x	
Oak Island Mainland		x	x								x	x	x			
Eisenhower Upland																
Rt 12 Upland	x	x	x	x												
Hemlock Mainland	x		x	x								x	x			
Grasse River SW																
Kinnie Rd																
Donahue I																
Kring Point		x		x					x	x						
Grasse River NE I						x										
Total Number of Sites Observed	3	4	3	3	2	2	2	2	2	2	2	2	2	1	1	1

Appendix A1. (continued)

	American Redstart	Northern Oriole	Indigo Bunting	Loggerhead Shrike	Upland Sandpiper	Ring-billed Gull	Yellow-billed Cuckoo	Barn Swallow	Pileated Woodpecker	House Wren	Canada Goose	White-breasted Nuthatch	Mallard	Ruby-throated Hummingbird	Semipalmated Sandpiper	Richness
Donahue II		x	x													21
Snell Lock											x					16
Grasse River NE II				x	x											14
Dredge Hill						x		x								11
Eisenhower Lock																10
Oak Island Mainland										x						10
Eisenhower Upland	x															9
Rt 12 Upland												x				9
Hemlock Mainland													x	x	x	9
Grasse River SW																8
Kinnie Rd																7
Donahue I																6
Kring Point							x	x								6
Grasse River NE I																4
Total Number of Sites Observed	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	

Appendix A2. Avian species occurrence and richness recorded on 10 islands during summer, 1979.

	Song Sparrow	Common Grackle	Red-winged Blackbird	Yellow Warbler	Great Blue Heron	American Robin	Common Crow	Tree Swallow	Common Flicker	Black Duck	Barn Swallow	Spotted Sandpiper	Belted Kingfisher	Starling	Ruffed Grouse	Hairy Woodpecker	White-breasted Nuthatch
Oak			x	x	x	x	x		x	x			x			x	
Ironsides	x	x	x	x	x				x		x		x	x			
Bluff	x	x			x			x	x		x	x	x		x		x
Yeo	x	x	x	x		x	x			x							
Club	x		x	x		x	x							x	x		
Arcadia	x	x		x		x			x	x						x	
Hemlock	x		x	x	x		x	x									
Whiskey	x	x			x			x				x					
Whale	x	x	x	x													
N. Colborne		x	x		x							x					
Total number of sites observed	8	7	7	7	6	4	4	3	4	3	2	3	3	2	2	2	1

Appendix A2. (Continued)

	Cedar Waxwing	Bluejay	Downy Woodpecker	Northern Oriole	American Goldfinch	Great Horned Owl	Gray Catbird	Blackcapped Chickadee	Eastern Kingbird	Mallard	Magnolia Warbler	Loggerhead Shrike	Common Yellowthroat	American Woodcock	Wood Thrush	Turkey Vulture
Oak	x	x			x	x	x	x						x	x	x
Ironsides		x	x	x		x						x	x			
Bluff			x					x								
Yeo											x					
Club					x											
Arcadia																
Hemlock				x			x									
Whiskey																
Whale									x	x						
N. Colborne									x	x						
Total number of sites observed	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1

Appendix A2. (Continued)

	House Wren	Red-eyed Vireo	Mourning Dove	Richness
Oak	x	x		20
Ironsides				15
Bluff			x	13
Yeo				8
Club				8
Arcadia				7
Hemlock				8
Whiskey				5
Whale				6
N. Colborne				6
Total number of sites observed	1	1	1	

SECTION:D

MAMMALS

TABLE OF CONTENTS

	Page
List of Figures	D-II
List of Tables	D-III
Introduction	D-1
Materials and Methods	D-1
Results and Discussion	D-2
Summary and Conclusions	D-7
Literature Cited	D-8
Figures	D-9
Tables	D-11

LIST OF FIGURES

Figure Number		Page
1	Map of the St. Lawrence Region along the international border.	D-9
2	Location of Survey Sites	D-10

LIST OF TABLES

Table Number		Page
1	Comparison of Trapping Success at Massena, New York (1979)	D-11
2	Species of Mammals Detected During Winter Track Surveys in Four Habitat Types in the Massena Area, 1980.	D-12
3	Special Occurrence and General Abundance of Mammals in the Massena Area.	D-13
4	Species Occurrence at the Four Major Habitat Types in the Massena Area as Indicated by Summer Trapping Surveys (s) and Winter Track Surveys (w).	D-15
5	Comparison of Habitat Parameters Recorded at Snell and Eisenhower (a Dredge-spoil area) Trapping Sites During Late June, 1979.	D-16
6	Comparison of Trapping Success at Dredge Hill (Red Mills) with that at Mainland Sites Surveyed During 1978.	D-17
7	Island Area, Isolation, and Species Richness of Mammals for 13 Islands Surveyed During the Summer of 1979 in the Thousand Islands Region.	D-18
8	Comparison of Trapping Success (%) on Insular and Mainland Sites in the Thousand Islands Region (1979).	D-19
9	Maximum Cross-Ice Distance and Frequency of Occurrence of Mammals Tracked on the River's Ice at Chippewa Bay During Winter, 1980.	D-21
10	Habitat Parameters Recorded at Mammalian Trapping Sites (June-July 1979).	D-22
11	Types of Traps and Baits Used for Mammal Trapping	D-23

INTRODUCTION

The purpose of this study was to characterize the mammalian fauna in the Massena area and predict the impact of a proposed Additional Locks Program upon mammalian communities. This requires a description of species composition and relative densities of mammals at major habitat sites in the vicinity of Massena, as well as at other pertinent sites, including dredge-disposal areas and islands.

MATERIALS AND METHODS

Trapping surveys were conducted during the summer of 1979 to estimate mammalian occurrence and relative densities at nine sites in the vicinity of Massena, one dredge-disposal site near Red Mills, and 13 islands in the Thousand Islands Region (Figures 1 and 2). These surveys were conducted using a system of live-trap stations spaced approximately 50 m apart. Each station consisted of a variety of live-traps which were baited (Table 11) and set for maximum trapability and variety of mammals. Each trap was checked and rebaited (when necessary) daily throughout a seven-day trapping period at each site. Captured individuals were identified, weighed, temporarily marked, and then released at the site (see VanDruff and Lomolino, 1978). In addition, surveys for mammalian signs were conducted concurrent with trapping surveys.

After each trapping survey, general habitat characteristics were recorded for each station at each of the sites surveyed (Table 10). Habitat parameters recorded were soil hardness, moisture, and organic content, canopy closure, and percent ground cover of rock, soil, litter, grass, lichen, herbs, saplings, shrubs, ferns, and trees.

Snow track surveys were conducted during the winter of 1980 to detect the occurrence and general activity of mammals not usually encountered during trapping surveys (e.g., fox, coyote, or flying squirrels). Three tracking surveys were conducted at each of the sites surveyed during summer trapping studies. All tracks encountered were identified and recorded.

Cross-ice movements of mammals were also investigated during the winter of 1980. Seven track surveys were conducted on the ice at Chippewa Bay, New York (Figure 1). The location, direction and identification of all tracks encountered were recorded on field-maps. A summary of the results of these surveys is presented in Table 9.

RESULTS AND DISCUSSION

Eleven species of mammals were encountered during trapping surveys in 1979 (Table 1). The meadow vole (Microtus pennsylvanicus) was the most frequently encountered species, occurring at five of the nine sites surveyed. Meadow voles were also the most abundant mammalian species, with trapping success values of 25.5% and 12.0% at Snell and Riparian SE sites, respectively.

At the community level, mammalian abundance (as inferred from trapping success for all mammals) was highest at the Snell old-field site, whereas species richness of mammals was highest at the Donahue II hardwood site. The lowest abundance and richness of mammals were encountered in grassland and Riparian East sites.

During winter track surveys, 12 mammalian species were detected at the sites surveyed during the summer (Table 2). Again, species richness was maximum at the hardwood sites and lowest at grassland sites. The additional species detected during winter surveys (i.e., those not encountered during trap surveys) include the southern flying squirrel (Glaucomys volans), weasel (Mustela erminea or M. frenata), red fox (Vulpes vulpes), eastern coyote (Canis latrans), and white-tailed deer (Odocoileus virginianus).

The results of trapping and tracking surveys, along with pertinent information in the literature, have enabled the compilation of a list of species occurring in the Massena area, along with their general abundances (Table 3). There are 18 species of mammals that are either common or abundant in the Massena area. In addition, five species are considered common-to-rare, 11 rare, and three (the bats) seasonal. None of the 37 species of mammals occurring in the vicinity of Massena is officially listed as an endangered species by the federal or state government.

One of the most direct effects of additional locks construction will be that incurred through destruction or disturbance of mammalian habitats. Since mammalian species richness and composition differ according to habitat (Table 4), the nature and intensity of potential impacts will also differ according to which habitats are affected. The species potentially impacted at each of the four major habitat types studied (grassland, old-field, hardwood, and riparian)

are listed in Table 4. As this table indicates, destruction of hardwoods and old-field sites will affect the greatest number of species since richness is greatest in these habitats. In terms of individual numbers, destruction of old-field sites will impact the greatest number of individuals since mammalian abundance is highest in these habitats (Table 1). Disturbances of mammalian communities should be minimal if grasslands are impacted since species richness (Table 4), as well as overall abundance (Table 1), is lowest in these habitats.

Along with the terrestrial species discussed above, additional locks operations or construction may also impact aquatic mammals if disturbances of wetlands occur. In the Massena area, the species most likely to be affected by such disturbances include muskrats (Ondatra zibethicus), mink (Mustela vison), otter (Lutra canadensis), beaver (Castor canadensis) and raccoons (Procyon lotor).

Construction of an additional locks system in the Massena area will involve disposal of considerable quantities of dredge material, which is also likely to have a demonstrable impact upon mammalian communities through habitat destruction. These immediate effects of dredge-disposal may be inferred from the previous discussion and Table 4. However, through alteration of edaphic (soil) characteristics, dredge-disposal is also likely to have long-term impacts on mammalian communities.

Important insights into these long-term effects are provided by comparisons of the results of surveys at dredge-disposal and non-disposal sites. The two old-field sites were selected such that their general characteristics (situation, exposure, surrounding habitat, etc.) were similar, with the exception that the Eisenhower site was completely situated within a dredge-disposal area. The most marked difference between these two sites (Table 1) was that the density of the meadow vole at Eisenhower was only seven percent of that at Snell. In addition, overall abundance of mammals at Eisenhower was approximately one-fifth of that at the Snell old-field site.

These differences in mammalian communities can be directly linked to characteristics of the substrate, or dredge material. As Table 5 indicates, the only significant differences among habitat parameters at these two sites were edaphic characteristics - soil hardness, moisture, and organic content, and percent of cover of rocks.

Other insights into the effects of dredge-disposal on mammalian communities are provided by comparison of a dredge-disposal site at Red Mills (Dredge Hill) and three other, less altered sites along the St. Lawrence River. Overall abundance and richness of mammals at these four sites were similar (Table 6). This may be attributed to some soil management techniques apparently applied at Dredge Hill (e.g., drainage divergence and selective planting). However, there is a definite and consistent difference between species composition at Dredge Hill and the three non-disposal sites included in Table 6. The mammalian community at Dredge Hill is characteristically early successional with typical pioneer species such

as meadow voles, meadow jumping mice (Zapus hudsonius) and woodchucks (Marmota monax). In contrast, mammalian communities at the less altered sites consist of later successional species including woodland jumping mice (Napaeozapus insignis), gray squirrels (Sciurus carolinensis), red squirrels (Tamiasciurus hudsonicus), chipmunks (Tamias striatus), and southern flying squirrels (Glaucomys volans).

Potential impacts of additional locks construction and operation also include those incurred indirectly and at regions outside the Massena area. Mammalian communities may be indirectly, but nonetheless, substantially impacted if Additional Locks activities result in water level fluctuation and siltation of aquatic habitats.

Water fluctuation is one of the most severe mortality factors for muskrat populations (Errington, 1963). Flooding, local drought, and siltation may also reduce both primary and secondary productivity of aquatic ecosystems, and, in turn, reduce resources important to aquatic and semi-aquatic mammals including mink, otter, muskrats, and raccoons.

Other potential impacts associated with construction and operation of additional locks include those resulting from destruction and disturbances of island ecosystems. Species richness and composition of insular communities vary with island size and isolation (Tables 7 and 8). Therefore, fewer mammalian species will be affected if relatively small and distant islands are disturbed. However, even the small [2.025 ha (5 a)] and/or isolated [0.6 km (.36 mi) from the mainland] islands harbor dense populations of typically one species, the meadow vole. Consequently, destruction of even these small islands may impact a substantial number (albeit limited in richness) of mammals.

SUMMARY AND CONCLUSIONS

Of the 37 species of mammals believed to occur in the vicinity of Massena, 18 are considered common or abundant, five common to rare, 11 rare, and three seasonal. Hardwood and old field sites harbored the highest species richness and abundance of mammals. Grassland sites had few species with generally low abundance.

Large and near islands had a greater variety of mammals than small and distant islands, which typically harbor dense populations of one species, the meadow vole.

LITERATURE CITED

Errington, P.L. 1963. Muskrat populations. Iowa State University Press, Ames. 665 pp.

Lackey, J.A. 1977. Small mammals of the St. Lawrence River system. pp. 189-216 In Geis (ed.), Preliminary report: Biological characteristics of the St. Lawrence River, SUNY College of Environmental Science and Forestry, Syracuse. 231 pp.

Sainola, P. 1979. (Personal Communication) Thousand Islands Park Commission, Robert Moses State Park.

Wright, M.I. 1978. Mammals of the St. Lawrence Region: Baseline studies and proposals for impact assessment of winter navigation. M.S. Thesis, SUNY College of Environmental Science and Forestry, Syracuse. 116pp.

Wrigley, R.E. 1969. Ecological notes on the mammals of Southern Quebec. Can. Field Nat. 83(3):201-211.

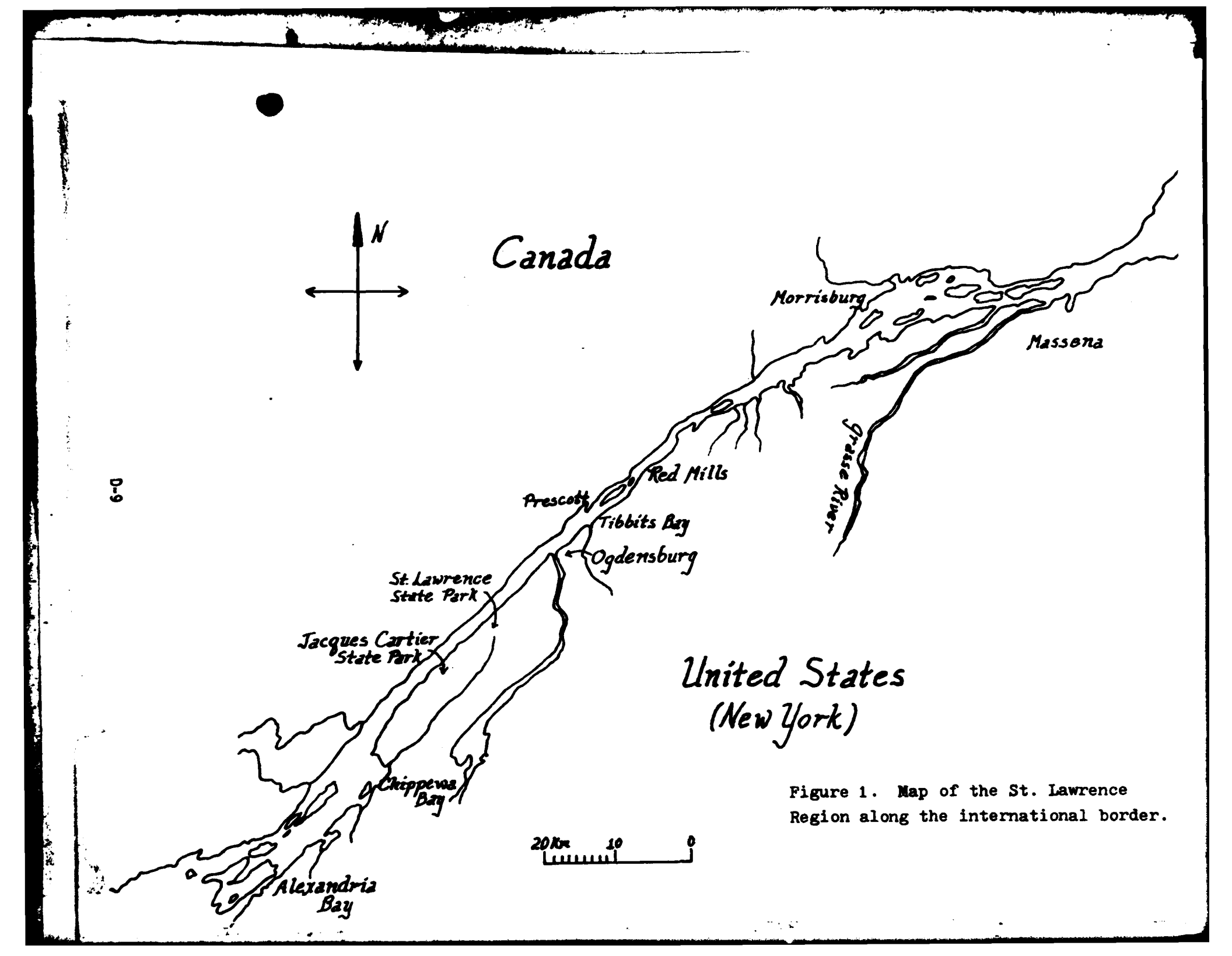


Figure 1. Map of the St. Lawrence Region along the international border.

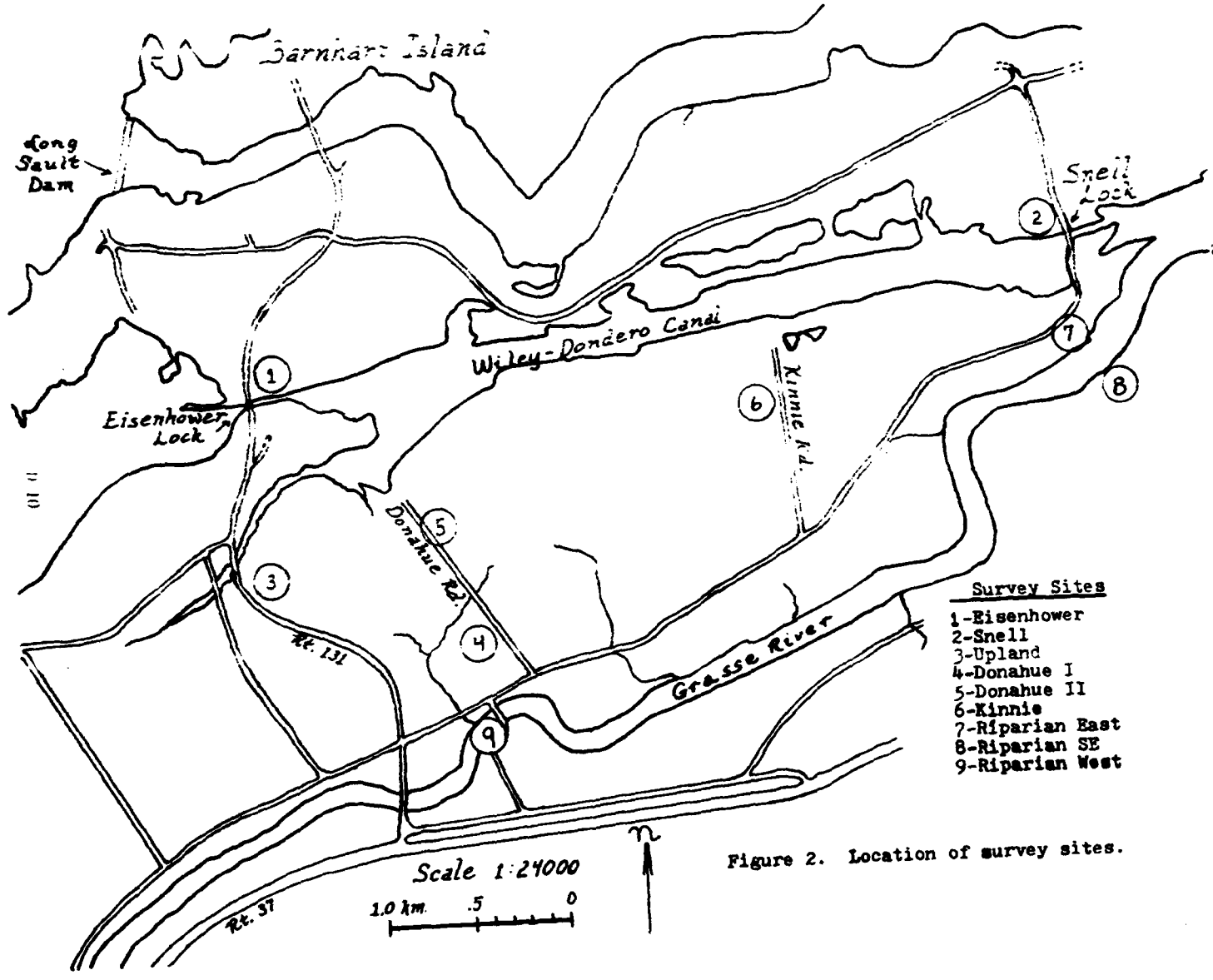


Figure 2. Location of survey sites.

Table 1. Comparison of trapping success at Massena, New York (1979). *

Species	Grassland		Riparian			Old Field		Hardwood	
	Donahue I	Kinnie Rd.	E	W	SE	Snell	Eisenhower	Upland	Donahue II
Masked or Pygmy Shrew	0	0	1.0	0	0	2.0	0	0	0.6
Short-tailed Shrew	0	0	0	1.1	0.9	0	0	0	2.3
Meadow vole	1.9	0	0	2.1	12.0	25.5	1.9	0	0
Meadow jumping mouse	0	0	0	0	3.7	2.9	2.9	0	0
Chipmunk	0	0	0	17.8	0	0	0	1.9	4.2
Deer mouse	0	0	0	0	0	0	0	1.5	5.8
Woodchuck	0	0	0	0	0	2.8	2.4	0	2.7
Snowshoe hare	2.4	0	0	0	0	0	2.4	0	0
Domestic cat	0	2.9	0	0	0	0	0	2.7	0
Striped skunk	0	5.0	0	0	0	0	0	0	0
Red squirrel	0	0	0	0	1.9	0	0	0	1.0
All Mammals	1.5	2.1	0.5	6.1	9.4	16.5	3.5	1.9	5.8
Richness	2	2	1	3	4	4	4	3	5

*Data collected from 9 sites; 3,210 trapdays during summer, 1979.

Table 2. Species of mammals detected during winter track surveys in four habitat types in the Massena area, 1980.

Species	Habitat Type			
	Grassland	Riparian	Old-Field	Hardwoods
Short-tailed shrew	x		x	x
Meadow vole	x		x	
Deer mouse		x	x	x
Red squirrel		x		x
Gray squirrel		x		x
S. flying squirrel				x
Cottontail rabbit			x	x
Snowshoe hare			x	x
Weasel			x	x
Red fox	x	x	x	x
Eastern coyote				x
White-tailed deer			x	x
Richness	3	4	8	11

Table 3. Species occurrence and general abundance of mammals in the Massena area.

Species (latin name)	Abundance category*
Shrews and Moles (Insectivora)	
Masked shrew (*Sorex cinereus*)	C
Smokey shrew (*Sorex fumeus*)[1]	R
Pygmy shrew (*Microsorex hoyi*)	C
Short-tailed shrew (*Blarina brevicauda*)	A
Hairy-tailed mole (*Parascalops breweri*)[2]	R
Eastern mole (*Scalopus aquaticus*)[2]	R
Star-nosed mole (*Condylura cristata*)	C
Bats (Chiroptera)[3,4]	
Little brown bat (*Myotis lucifugus*)	S
Big brown bat (*Eptesicus fuscus*)	S
Silver-haired bat (*Lasionycteris noctivagans*)	S
Rabbits and Hares (Lagomorpha)	
Eastern cottontail (*Sylvilagus floridanus*)	C
Snowshoe hare (*Lepus americanus*)	C
Rodents (Rodentia)	
Eastern chipmunk (*Tamias striatus*)	A
Woodchuck (*Marmota monax*)	A
Gray squirrel (*Sciurus carolinensis*)	C
Red squirrel (*Tamiasciurus hudsonicus*)	C
S. flying squirrel (*Glaucomys volans*)	C-R
N. flying squirrel (*Glaucomys sabrinus*)	R
American beaver (*Castor canadensis*)	R
Deer mouse (*Peromyscus* spp.)	A
Meadow vole (*Microtus pennsylvanicus*)	A
Muskrat (*Ondatra zibethica*)	C
Norway rat (*Rattus norvegicus*)	R
House mouse (*Mus musculus*)	R
Meadow jumping mouse (*Zapus hudsonius*)	C
Woodland jumping mouse (*Napaeozapus insignis*)	R

Table 3. (continued).

Carnivores (Carnivora)	
Coyote (*Canis latrans*)	C-R
Red fox (*Vulpes vulpes*)	C
Gray fox (*Urocyon cinereoargenteus*)	R
Raccoon (*Procyon lotor*)	C
Fisher (*Martes pennanti*)[5]	R
Ermine (*Mustela erminea*)	C-R
Long-tailed Weasel (*Mustela frenata*)	C-R
American mink (*Mustela vison*)	C-R
River otter (*Lutra canadensis*)	R
Striped skunk (*Mephitis mephitis*)	C
Ungulates (Artiodactyla)	
White-tailed deer (*Odocoileus virginianus*)	C

---

* Abundance category symbols; A = Abundant, C = Common, R = Rare, and S = Seasonal.

[1]Wright, 1978.

[2]VanDruff and Lomolino, 1978.

[3]Lackey, 1977.

[4]Wrigley, 1969.

[5]Sainola, 1979.

Table 4. Species occurrence at the four major habitat types in the Massena area as indicated by summer trapping surveys (s) and winter track surveys (w).

Species	Habitat Type			
	Grassland	Riparian	Old-Field	Hardwoods
Masked or Pygmy Shrew		s	s	s
Short-tailed shrew	w	s	w	s,w
Meadow vole	s,w	s	s,w	
Deer mouse		w	w	s,w
Meadow jumping mouse		s	s	
Chipmunk		s		s
Red squirrel		s,w		s,w
Gray squirrel		w		w
S. flying squirrel				w
Woodchuck			s	s
Cottontail rabbit			w	w
Snowshoe hare	s		s,w	w
Weasel			w	w
Skunk	s			
Red fox	w	w	w	w
Eastern coyote				w
White-tailed deer			w	w
Richness	5	9	11	14

Table 5. Comparison of habitat parameters recorded at Snell and Eisenhower (a dredge-spoil area) trapping sites during late June, 1979. Standard deviations are included in parentheses (n = 20).

Habitat Parameter	Snell	Eisenhower	t[a]
Soil Character[b]			
- Hardness	2.0(.00)	2.8(.43)	2.63*
- Moisture	2.5(.50)	1.3(.43)	2.57*
- Organic	2.0(.00)	1.3(.43)	2.30*
Percent Cover			
- Rock	0.0(0.0)	5.0(3.5)	2.02*
- Soil	2.5(2.5)	17.5(18.9)	1.11
- Litter	0.0(0.0)	0.0(0.0)	0.00
- Grass	38.8(17.8)	43.8(26.5)	0.22
- Lichen	8.8(7.4)	6.3(2.2)	0.46
- Herbs	46.3(24.3)	23.8(21.3)	1.09
- Saplings & shrubs	2.5(4.3)	1.3(2.2)	0.35
- Ferns	0.0(0.0)	0.0(0.0)	0.00
- Trees	3.8(4.1)	2.5(4.3)	0.31
Canopy Closure (%)	3.8(4.1)	0.0(0.0)	1.31

[a] t values representing a significant difference ($P < .05$) between sites are indicated by an asterisk.

[b] Soil character parameters were rated as 1, 2, or 3 for the particular characteristic with 3 being the maximum for that qualitative parameter.

Table 6. Comparison of trapping success at Dredge Hill (Red Mills) with that at Mainland sites surveyed during 1978.

Species	Dredge Hill	St. Lawrence State Park	Tibbits Bay	Coles Creek State Park
Masked or Pygmy shrew	2.6	0	0.9	2.1
Short-tailed shrew	0	1.7	0.6	1.8
Deer mouse	2.2	3.2	2.2	0
Meadow vole	2.2	0	0.9	0
Meadow jumping mouse	1.1	0.9	0	0.5
Woodland jumping mouse	0	0	0	0.5
Norway rat	0.4	0	0	0
Chipmunk	0	0.8	2.0	3.7
Gray squirrel	0	0	0.6	0
Red squirrel	0	2.3	1.5	0
S. flying squirrel	0	1.3	0	0
Woodchuck	5.1	0	0	0
Raccoon	2.6	2.5	5.1	0
Skunk	1.4	0	1.3	0
Snowshoe hare	0	0	0	0
Cottontail rabbit	0	0	0.4	0.8
All Mammals	5.4	5.9	6.0	6.5
Richness	8	7	10	6

* These data are based on 521, 799, 798, and 696 functional trapdays at Dredge Hill, St. Lawrence State Park, Tibbit's Bay, and Coles Creek State Park, respectively (see VanDruff and Lomolino, 1978).

Table 7. Island area, isolation, and species richness of mammals for 13 islands surveyed during the summer of 1979 in the Thousand Islands Region.

Island	Area (km^2)	Isolation (km)	Richness
Grenadier	5.9085	0.98	11
Oak	1.7572	0.31	9
Club	0.6336	0.24	6
Bluff	0.2481	0.65	5
Ironsides	0.0878	0.55	3
Hemlock	0.0437	0.83	1
Yeo	0.0352	0.97	1
Whale	0.0028	0.98	1
N. Colborne I	0.0013	1.01	1
N. Colborne II	0.0016	1.03	1
N. Colborne III	0.0008	1.04	1
Whiskey	0.0028	1.03	1
Arcadia	0.0295	1.03	1

Table 8 Comparison of trapping success (%) on Insular and Mainland Sites in the Thousand Islands Region (1979).*

	Mainland			Island Sites				
	Chippewa Creek	Kring Point	N. Hammond	N. Colborne I	N. Colborne II	N. Colborne III	Whiskey	Arcadia
Blarina	3.2	0.8	2.8					
Peromyscus	8.0	7.1	11.4					
Microtus	0.4		0.8	11.2	28.6	18.2	22.4	
Zapus		0.4						
Sciurus	s		5.3					
Tamiasciurus	s	3.0	1.5					s
Tamias		8.2	1.5					
Glaucomys			1.5					
Marmota	s	s	s					
Mustela e.								
Mustela f.	0.6							
Procyon	5.2	s	5.3					
Erethizon	s							
Mephitis		1.0						
Vulpes	s		s					
Canis l.			s					
Odocoileus	s	s						
Sylvilagus		s						
Richness	11	10	11	1	1	1	1	1

* s indicates species sighted or detected by a definite sign

Table 8. continued *

	Island Sites							
	Grenedier	Oak	Club	Bluff	Ironsides	Hemlock	Yeo	Whale
Blarina	0.7	2.2		0.7	0.9			
Peromyscus	11.3	2.9	0.2					
Microtus	0.5		0.2	0.2	12.0	36.5	1.0	38.5
Zapus					0.3			
Sciurus	s	s	s	s				
Tamiasciurus	s		2.3					
Tamias	4.2	2.2						
Glaucomys								
Marmota								
Mustela e.	0.2							
Mustela f.		0.4						
Procyon	2.5	s	2.6	1.8				
Erethizon				3.6				
Mephitis		1.1						
Vulpes	s	s						
Canis l.								
Odocoileus	s	s						
Sylvilagus	s		s					
Richness	11	9	6	5	3	1	1	1

* s indicates species sighted or detected by a definite sign

Table 9. Maximum cross-ice distance and frequency of occurrence of mammals tracked on the river's ice at Chippewa Bay during winter, 1980.*

Species	Maximum cross-ice distance (m)	Frequency (of 7 surveys)
Eastern coyote	2,275	5
Red fox	1,490	7
Star-nosed mole	1,065	3
Red squirrel	105	2
Mink	90	1
Deer mouse	35	3
Muskrat	30	1
Meadow vole	20	1
Skunk	20	1

* Total distance of all tracks encountered = 74,480 meters.

Table 10. Habitat Parameters Recorded at Mammalian Trapping Sites (June-July 1979) *

Habitat Parameter	Donahue I	Kinnie Rd.	Upland	Donahue II	Riparian (Grasse River) E	Riparian (Grasse River) W	Riparian (Grasse River) SE
Canopy Closure %	0(0)	0(0)	69.4(22.7)	65(22.5)	1.3(2.2)	63.8(20.7)	20(18.4)
Soil - hardness	2.0(0)	2.0(0)	2.0(0)	2.0(0)	2.0(0)	2.0(0)	2.0(0)
- moisture	2.8(0.4)	2.0(0)	2.0(0)	2.1(0.3)	2.3(0.4)	2.5(0.5)	2.5(0.5)
- organics	2.0(0)	2.0(0)	2.4(4.8)	2.1(0.3)	2.0(0)	2.8(0.4)	2.0(0)
Percent Cover							
- rock	0(0)	7.5(2.5)	14.4(6.3)	3.8(4.1)	6.3(5.4)	2.5(4.3)	3.8(6.5)
- soil	3.8(6.5)	35.0(3.5)	5.0(3.5)	10.6(5.3)	7.0(4.7)	16.3(13.9)	15.0(8.7)
- litter	8.8(2.2)	5.0(0)	33.1(17.3)	13.8(9.3)	8.8(2.2)	11.3(2.2)	11.3(4.1)
- grass	38.8(7.4)	22.5(5.6)	8.1(6.1)	4.4(4.6)	51.3(22.7)	16.7(16.5)	10.0(5.0)
- lichen & moss	2.5(4.3)	1.3(2.2)	4.4(3.0)	8.8(9.9)	1.3(2.2)	6.3(2.2)	18.8(23.8)
- herbs	40.0(12.7)	22.5(7.5)	10.6(8.1)	33.8(21.5)	17.5(10.3)	21.3(9.6)	27.5(20.8)
- saplings & shrubs	3.8(4.1)	11.3(2.2)	10.0(3.5)	11.9(6.1)	7.5(5.6)	6.3(2.2)	6.3(2.2)
- ferns	0(0)	0(0)	4.0(3.2)	0(0)	0(0)	0(0)	0(0)
- trees	0(0)	2.5(2.5)	11.9(2.4)	9.4(6.3)	1.3(2.2)	15.0(5.0)	7.5(2.5)

* Numbers in parentheses are standard deviations.

Table 11. Types of Traps and Baits Used for Mammal Trapping.

Type	Bait
Pitfall trap (oil can or taller in size) buried flush with surface	None
Snap traps (mouse)	Peanut butter/rolled oats mix
Snap traps (rat)	Peanut butter/rolled oats mix
Chipmunk size wire cage trap	Peanut butter/rolled oats mix and corn
Squirrel size wire cage trap	Peanut butter/rolled oats mix and corn
Squirrel size wire cage trap	Chunky dog food and fish
Raccoon size wire cage trap	Fish, meat, carrots and apple

SECTION:E

AMPHIBIANS & REPTILES

TABLE OF CONTENTS

	Page
List of Figures and Tables	E-II
Introduction	E-1
Materials and Methods	E-2
Results and Discussion	E-3
Amphibians	E-3
Reptiles	E-5
Summary and Conclusions	E-6
Amphibians	E-6
Reptiles	E-7
Literature Cited	E-8
Figures	E-9
Tables	E-12

LIST OF FIGURES AND TABLES

Number		Page
Figure 1	General area surveyed for amphibians and reptiles, vicinity of Eisenhower and Snell Locks, Jefferson County, New York.	E-9
Table 1	Amphibian and Reptile Species Determined to be Present in the Vicinity of the Eisenhower and Snell Locks, Massena, New York.	E-12
Table 2	Common and Scientific Names of Amphibians and Reptiles Discussed in the Text.	E-13

INTRODUCTION

Amphibians and reptiles are two vertebrate groups that are usually ignored or given only cursory examination during studies of vertebrate communities. As a group, they are more difficult to study than are fish, birds, or mammals. Because of their seasonal movements between aquatic and terrestrial habitats and their long periods of inactivity (often encompassing nine months of each year in north temperate areas), the population dynamics of these groups are virtually unstudied. Estimates of abundance are especially difficult to obtain for the broad-ranging snakes, and the explosive - breeding frogs and toads. Turtles are perhaps the easiest of all reptiles to study, but an examination of their population ecology and abundance in a given area would require considerable effort on the part of any researcher. Studies of amphibian and reptile communities have therefore been restricted to surveys that generally report on the observed presence or the presumed absence of a given species. Such information along with estimates of general abundance are usually the best data available for use in environmental impact assessments.

To provide completeness, amphibians and reptiles were studied as a part of a descriptive study of the fish and wildlife resources in the Eisenhower and Snell locks area of the St. Lawrence Seaway, Jefferson County, New York. This report: (1) details information obtained through limited trapping and cursory field reconnaissance conducted in 1979; (2) reviews existing literature concerning the amphibian and reptile resource in the St. Lawrence River - northern New York area; and (3) discusses possible impacts on amphibians and reptiles from perturbations to the existing ecosystem.

MATERIALS AND METHODS

Field investigations of amphibians and reptiles were restricted to an area that included all of the St. Lawrence Seaway Development Corporation lands and waterways in the vicinity of the Eisenhower and Snell locks, all of Robert Moses State Park (exclusive of Barnhart Island), the lower Grasse River below Massena Center, and all lands northeast of N.Y. Route 131 lying between the Grasse River and the St. Lawrence Seaway channel. Because of time restrictions and lack of suitable quantitative methodologies for studying field populations of amphibians and reptiles, field sampling and reconnaissance were conducted at irregular intervals. However, field work was planned so that most sampling and reconnaissance fell within the breeding season of amphibians and the nesting season of reptiles. Specific dates of field work included: April 17 and 24-26, May 1-3 and 29-31, June 12-14, and August 8, 14-15, and 20-21, 1979.

Field sampling techniques included hand capture, use of dip-nets, hoop-traps, Tomahawk live-traps, basking traps, and pit-fall traps. The pit-fall traps proved unsucessful and this method was abandoned early in the study. General field reconnaissance included the turning over of logs, stones, and other debris, sifting through piles of dead leaves and duff, muddling in the muddy bottom of wetlands and waterways, and casual observations of individuals both with and without binoculars. Special effort was made to identify all frogs and toads present by listening to the mating calls of the males during the spring breeding season. No systematic or quantitative sampling was conducted, but notes were made as to the relative abundance of each species. Additional records were

made of the habitat preferences of each species and of specific localities where they were found. Little difficulty was encountered in identifying the species captured or observed; Conant (1975) was used to verify species and subspecies identification. All captured individuals were identified and released where taken.

RESULTS AND DISCUSSION

Amphibians

In general, and as a group, amphibians are well represented in the area of concern (Table 1) and are quite abundant. The salamanders were represented by only one species, but this group is generally quite secretive and could be more diverse than is indicated by the available information. The shallow, hard-packed soils in the area most favor the presence of frogs and toads, which are generally aquatic, terrestrial, and arboreal, but likely limit the presence of salamanders, which are generally fossorial in habit. Seasonal ponds, emergent marshes, shrub swamps, and forested wetlands are used by all of these species for their spring breeding activities. Green frogs and bullfrogs spend both their larval and adult life stages in these aquatic habitats, whereas wood frogs, gray treefrogs, spring peepers, American toads, and the blue-spotted salamanders spend their adult life in shrubby and wooded areas. Adult western chorus frogs and northern leopard frogs spend the summer months in grassy fields and wet meadows. The more aquatic amphibians, including the green frog, bullfrog, and northern leopard frog, overwinter in the mud at the bottom of aquatic habitats, whereas the more terrestrial species tunnel in the soil of upland habitats.

Whereas most upland, wetland, and pond habitats had some frogs or toads, the Wiley-Dondero Canal - Robinson Creek area had no significant amphibian resource. A few pickerel frogs were found in grassy upland areas adjacent to the canal and the creek; however, conditions at the shoreline were generally unsuitable for most amphibian species. Rapid water-level fluctuations resulting from operation of the locks likely explain the paucity of amphibians in littoral areas. Amphibian breeding does not occur in the canal or creek area, nor could amphibian eggs or larvae tolerate the excessive turbidity that accompanies the rapid water-level changes. Frogs are much more common in the lower Grasse River where water-level fluctuations are less severe. However, even the moderate fluctuations that occur in the river seem to force the frogs to higher, drier habitats where they are more susceptible to predation. More severe water-level fluctuations in the lower Grasse River could adversely impact frog populations there, perhaps causing some species to abandon the area.

Aside from the general secretive habits of the group, other possible reasons for so few salamander species having been found may be due to a lack of suitable habitat. Spring seeps and cold, well-shaded streams are non-existent, explaining the lack of stream salamanders (Eurycea). The paucity of mature forests in the area may be limiting for the woodland salamanders (Plethodon and Ambystoma), while hard-packed, non-porous soils, and lack of ground cover may lessen the suitability of existing habitat. The loss of any woodland cover could be detrimental to existing populations.

Reptiles

Reptiles are represented by at least four turtles and two snakes (Table 1), but the latter group is quite secretive and could be more diverse than is indicated by the available information. Snakes are wide-ranging and utilize most of the various habitats available to them in the study area. Three of the turtle species are primarily aquatic; the painted turtles and snapping turtles being most common in ponds, marshes, and swamps, whereas the map turtles are restricted to riverine environments. Blanding's turtles are semi-aquatic, living in shallow marsh and swamp habitats that may go dry in summer.

Snapping turtles and painted turtles were found to occur in all aquatic areas having standing water year-round, including ponds and marshes, but excluding the Wiley-Dondero Canal - Robinson Creek area. Rapid water-level fluctuations, high turbidity levels, and a shortage of food in the littoral zone and adjacent shoreline likely explain the general absence of reptiles in the canal and creek area. Similarly, these conditions would seem to explain the absence of snakes that rely on habitats comprised of wetland-upland interface (e.g. Nerodia and Thamnophis). Painted turtles were found in the lower Grasse River where more moderate water-level fluctuations occur, but densities appeared to be quite low, possibly indicative of poor quality turtle habitat. The map turtle was found to occur in the lower Grasse River, but its abundance was also low, likely due to poor food resources and a general lack of suitable basking sites needed by this species.

Under a rating system devised by State biologists (Landry et al., 1979), the Blanding's turtle is considered to be "threatened." Threatened species are those whose "populations in New York are subject to a significant threat from known or unknown causes, but which face little danger of extirpation within the foreseeable future if certain actions are taken and maintained." The Blanding's turtle is semi-aquatic, inhabiting shallow wetlands, and is especially sensitive to disturbances resulting from man's development activities. In northern New York, the Blanding's turtle is at the far eastern limits of its primary contiguous range (McCoy, 1973), density levels appear to be lower than elsewhere throughout its range, and the stability of these populations is uncertain (Petokas and Alexander, In press). Development activities in northern New York should be avoided where they could impact the habitat of this species.

Garter snakes were found to be the most common reptile in the study area. The relatively abundant old field and shrubland habitat provided nearly ideal conditions for this species. The red-bellied snake was also present, but it is more secretive, having specialized habitat requirements. The general lack of ground cover, especially fallen logs, bark, and other debris, may effectively limit the abundance of this species.

SUMMARY AND CONCLUSIONS

Amphibians

Seven frog, one toad, and one salamander species were found in the area under study. Eight additional amphibians (one frog and seven salamanders) may

possibly occur in the area, but suitable habitat is generally lacking. Both permanent and seasonal ponds are important to the survival of these species. Rapid water-level fluctuations in the Wiley-Dondero Canal - Robinson Creek area likely explain the general absence of amphibians in that area. Frogs are more common in the lower Grasse River where conditions are more hospitable, but moderate water-level fluctuations force the frogs to utilize higher, drier habitat where they are more susceptible to predation. Areas of mature deciduous forest provide important cover for the more terrestrial amphibians.

Reptiles

Two snake and four turtle species were found in the area under study. Seven additional reptiles (one turtle and six snakes) may possibly occur in the area, but existing environmental conditions may limit reptile diversity. Rapid water-level fluctuations in the Wiley-Dondero Canal - Robinson Creek area, accompanied by a shortage of food in the littoral zone and adjacent shoreline, likely explains the general absence of reptiles in that area. Similarly, these conditions would seem to explain the absence of snakes that rely on habitats comprised of wetland-upland interface.

The garter snake is the most common reptile in the area of concern. Snapping turtles and painted turtles occur in most aquatic areas having standing water year-round, whereas map turtles were found exclusively in the lower Grasse River. The Blanding's turtle, a semi-aquatic species, was found to occur in the Robert Moses State Park - Wiley-Dondero Canal area; this species is especially sensitive to environmental perturbations and has been proposed for "threatened" status based on published standards.

LITERATURE CITED

Alexander, M.M. 1977. Amphibians and reptiles of the St. Lawrence River. Pages 217-231 in Preliminary Report: Biological Characteristics of the St. Lawrence River. J. W. Geis (ed.). State Univ. New York, Coll. Environ. Sci. and Forestry, Syracuse.

Bishop, S.C. 1941. The salamanders of New York. New York State Mus. Bull. No. 324. 365pp.

Collings, J.T., J.E. Huheey, J. L. Knight, and H.M. Smith. 1978. Standard common and scientific names for North American amphibians and reptiles. Soc. Study Amphib. and Rept., Herpetol. Circ. No.7. 36pp.

Conant, R. 1975. A field guide to reptiles and amphibians of eastern and central North America. Houghton-Mifflin Co., Boston. 429pp.

Landry, J.L., L.P. Hirsch, and E.R. McCaffrey. 1979. A rating system for threatened and endangered species of wildlife. New York Fish and Game J. 26(1): 11-21.

McCoy, C.J. 1973. Emydoidea, E. blandingii. Cat. Am. Amphib. and Rept. 136:1-4.

Petokas, P.J., and M.M. Alexander. In press. Occurrence of the Blanding's turtle in northern New York. New York Fish and Game J.

Schaaf, R.T., Jr. and P.W. Smith. 1971. Rana palustris. Cat. Am. Amphib. and Rept. 117:1-3.

Uzzell, T. 1967. Ambystoma tremblayi. Cat. Am. Amphib. and Rept. 50:1-2.

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

24th Ed., Aug. 31/74
14761
(formerly LS 11)

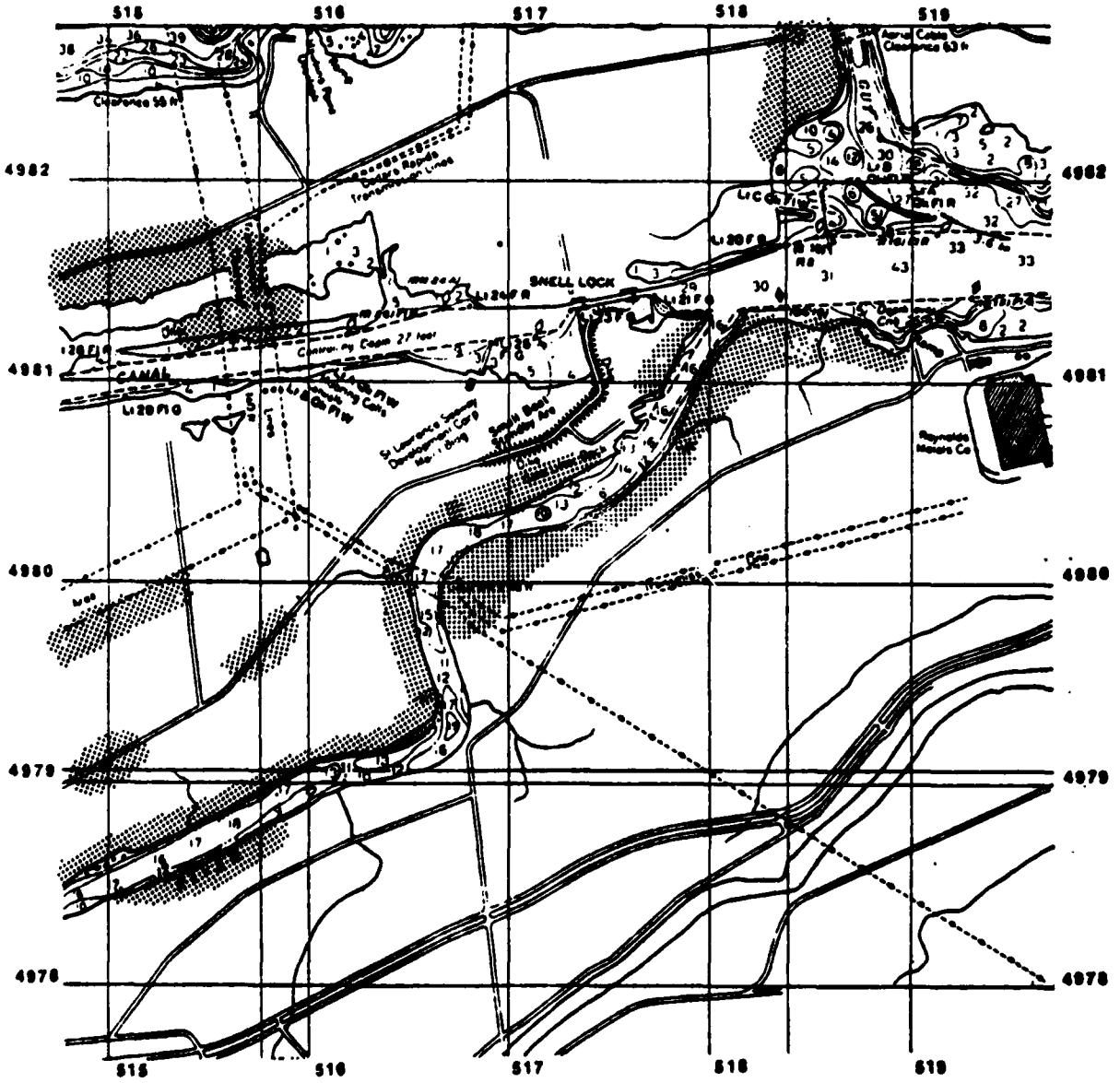


Fig. 1. General area surveyed for amphibians and reptiles, vicinity of Eisenhower and Snell Locks, Jefferson County, New York. Stippling indicates areas where field reconnaissance and trapping were concentrated.

B

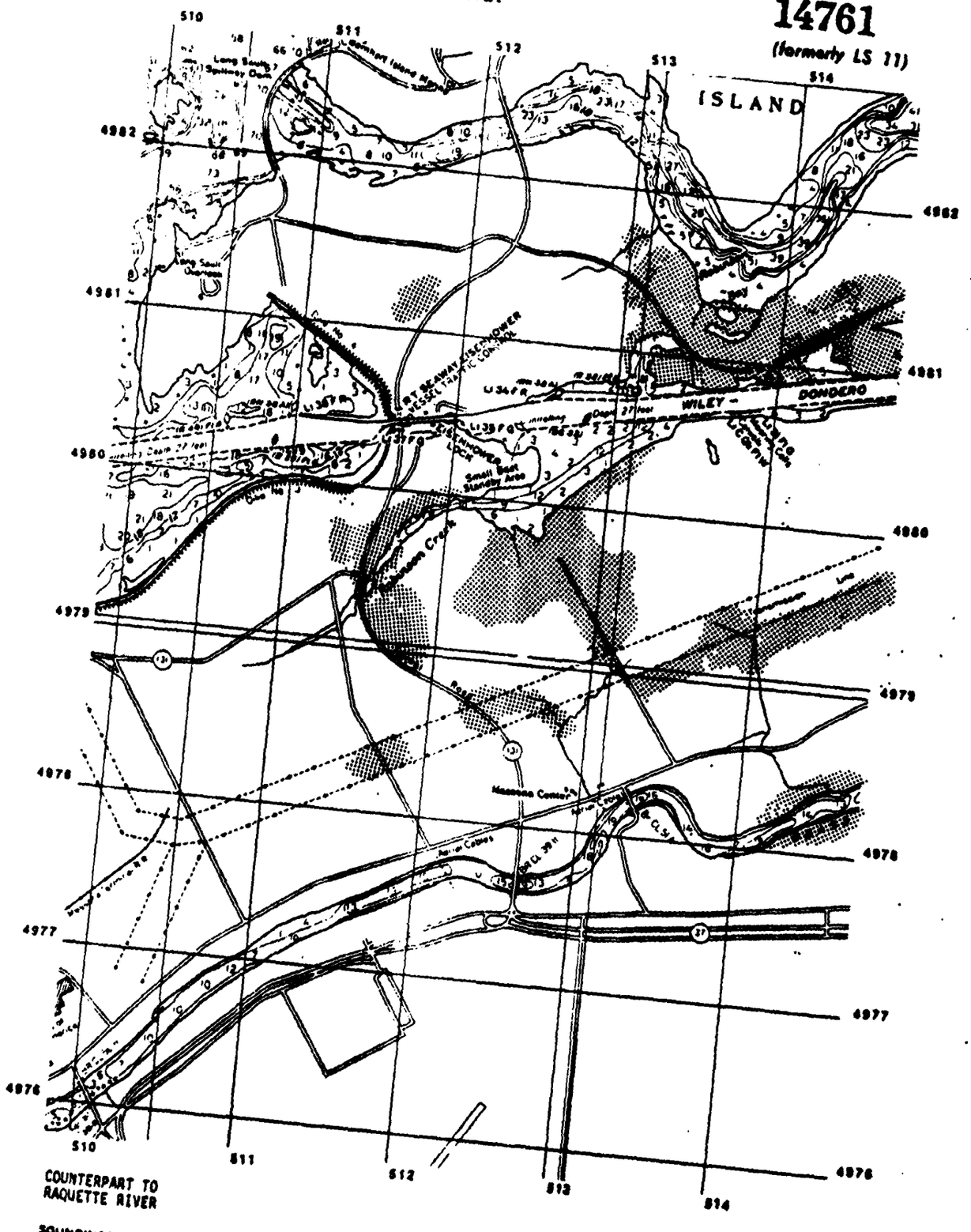
COUNTERPART TO
RAQUETTE RIVER

SOUNDINGS IN FEET

160

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

14761
(formerly LS 11)



A

COUNTERPART TO
RAQUETTE RIVER

SOUNDINGS IN FEET

Fig. 1. (continued).

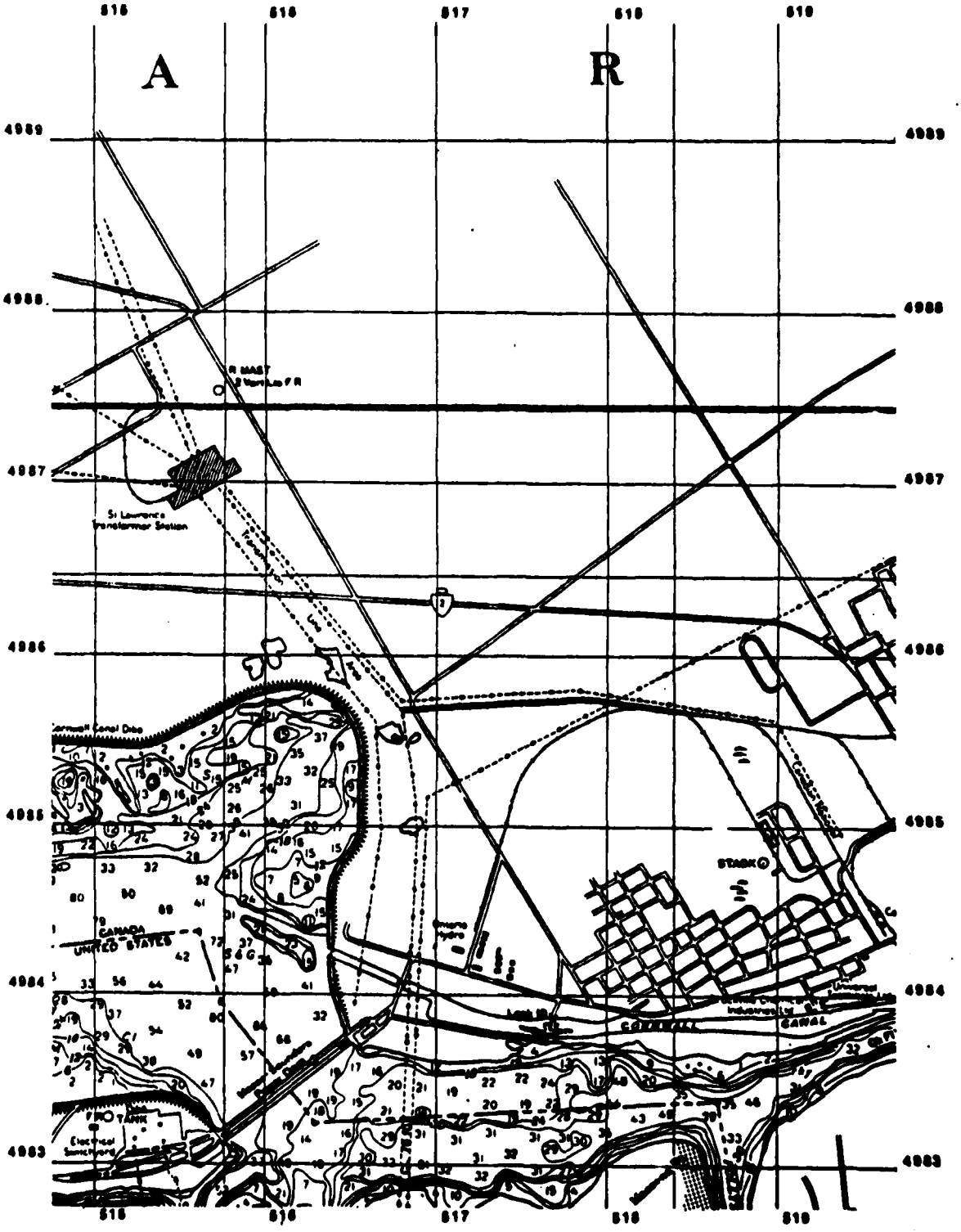
180

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

24th Ed., Aug. 31/74

14761

(formerly LS 11)



NOT FOR NAVIGATIONAL USE

D

COUNTERPART TO CORNWALL WEST

SOUNDINGS IN FEET

Fig. 1. (continued).

Table 1. -- Amphibian and reptile species determined to be present in the vicinity of the Eisenhower and Snell Locks, Massena, New York. A plus sign (+) denotes the observed presence of a species in a particular area or habitat type. Data are summarized from field reconnaissance conducted between April 17 and August 21, 1979.

SPECIES	Habitat												
	Emergent Marsh	Wet Meadow	Shrub Swamp	Forested Wetland	Upland Shrub	Mature Decid Hdwd	Second Growth Hdwd	Robinson Creek	Wiley-Dondero Canal	Powerline Row	Grass Field	Pond	Grasse River
Amphibians													
Blue-spotted Salamander							+						
American Toad						+					+	+	
Spring Peeper		+		+									
Gray Treefrog										+			
Western Chorus Frog	+	+	+	+						+		+	
Bullfrog	+									+		+	+
Green Frog	+									+		+	+
Northern Leopard Frog	+	+	+	+				+	+	+	+	+	+
Wood Frog				+	+							+	
Reptiles													
Snapping Turtle	+											+	+
Painted Turtle	+											+	+
Blanding's Turtle	+							+	+				
Map Turtle													+
Eastern Garter Snake			+	+	+						+	+	
Red-bellied Snake											+		

Table 2. -- Common and scientific names of amphibians and reptiles discussed in the text. Nomenclature follows Collins et al. (1978).

Common Name	Scientific Name
Amphibians	
Mudpuppy	*Necturus maculosus*
Red-spotted Newt	*Notophthalmus viridescens*
Spotted Salamander	*Ambystoma maculatum*
Blue-spotted Salamander	*Ambystoma laterale*
Tremblay's Salamander	*Ambystoma tremblayi*
Red-backed Salamander	*Plethodon cinereus*
Four-toed Salamander	*Hemidactylium scutatum*
Northern Two-lined Salamander	*Eurycea bislineata bislineata*
American Toad	*Bufo americanus*
Spring Peeper	*Hyla crucifer*
Gray Treefrog	*Hyla versicolor*
Western Chorus Frog	*Pseudacris triseriata triseriata*
Bullfrog	*Rana catesbeiana*
Green Frog	*Rana clamitans melanota*
Northern Leopard Frog	*Rana pipiens*
Pickerel Frog	*Rana palustris*
Wood Frog	*Rana sylvatica*
Reptiles	
Common Snapping Turtle	*Chelydra serpentina serpentina*
Stinkpot	*Sternotherus odoratus*
Painted Turtle	*Chrysemys picta X marginata*
Blanding's Turtle	*Emydoidea blandingi*
Map Turtle	*Graptemys geographica*
Northern Watersnake	*Nerodia sipedon sipedon*
Eastern Garter Snake	*Thamnophis sirtalis sirtalis*
Northern Ribbon Snake	*Thamnophis sauritus sauritus*
Northern Brown Snake	*Storeria dekayi dekayi*
Red-bellied Snake	*Storeria occipitomaculata*
Northern Ringneck Snake	*Diadophis punctatus edwardsi*
Smooth Green Snake	*Opheodrys vernalis*
Eastern Milk Snake	*Lampropeltis triangulum triangulum*

SECTION: F

VEGETATION

TABLE OF CONTENTS

	Page
List of Figures and Tables	F-II
Introduction	F-1
Materials and Methods	F-4
Results	F-5
Open Areas	F-5
Shrublands	F-6
Deciduous Forest	F-6
Coniferous Forest	F-7
Wetlands	F-7
Urban-Industrial Areas	F-8
Summary and Conclusions	F-8
Literature Cited	F-9
Figures	F-10
Table	F-18

LIST OF FIGURES AND TABLES

Number		Page
Figure 1	An open grassy field.	F-10
Figure 2	A late succession stage in the "open area" cover type.	F-11
Figure 3	A dense shrubland.	F-12
Figure 4	A relatively open shrubland.	F-13
Figure 5	Small aspens in an early successional hardwood stand.	F-14
Figure 6	A relatively mature deciduous forest stand.	F-15
Figure 7	The white pine stand near the mouth of Robinson Creek.	F-16
Figure 8	A small cattail marsh.	F-17
Figure 9	Vegetation map for vicinity of Eisenhower and Snell Locks near Massena, New York, 1979.	Attached
Table 1	Preliminary Plant Species List of Additional Locks Study Site on the St. Lawrence River in Spring and Summer of 1979.	F-18

INTRODUCTION

Due to man's activities and influence, the vegetation in the Massena study area is very complex. Agricultural, industrial, and urban use of the land has resulted in a patchwork pattern of fields, wasteland, home sites, and urban-industrial complexes. In some cases, this patchwork condition is favorable to wildlife as it offers habitat diversity and abundant edges between habitat types. On the other hand, the complexity and variability of the vegetation presents problems to the vegetation mapper. In order to realistically represent the cover and the variability of that cover, one must delineate cover types on a very large scale. At the same time, however, the scale must not be so large as to, for example, delineate two trees as a deciduous forest.

There is a successional sequence common in this area; starting with bare or sparsely vegetated soil, this sequence progresses through an open field dominated by perennial plants and grasses, a shrubby yet essentially open field, a shrubland, a successional forest, and, finally, a deciduous forest.

Unfortunately, vegetation maps must be in terms of discrete boundaries between cover types. When these discrete boundaries do not exist, arbitrary decisions must be made concerning the demarcation between continuous zones. This problem can be dealt with by lumping several continuous zones, such as shrubland-successional forest-hardwood forest, or by making many (often inaccurate) arbitrary decisions. In other words, there is a trade-off between accuracy and precision.

Six cover types for the Massena study area were recognized and delineated: shrubland, deciduous forest, coniferous forest, open field, urban-industrial areas, and wetlands. This classification in some cases required arbitrary decisions to be made between deciduous forest and shrubland, and between open fields and shrubland.

Geis and Luscomb (1972) prepared a vegetative cover map for all of the United States portion of the St. Lawrence River and eastern Lake Ontario. They used 10 cover types in their classification: agricultural lands, developed lands, herbaceous fields, open shrubby fields, shrublands, deciduous forests, mixed forests, successional forests, Typha marshes, and shrubby marshes. Their level of precision is higher than that used for this study, but since their classification requires many more arbitrary decisions on the part of the cover type mapper, and because they were dealing with a much larger area requiring extensive field checking, their accuracy level is lower.

Most of the discrepancies between the cover typing of Geis and Luscomb (1972) and that used here are due to the different cover type classifications used. A few discrepancies can also be attributed to the greater intensity of field checking in the Massena area made possible by the smaller area treated.

Geis and Hyduke (1978) carried out habitat mapping and critical habitat studies for a limited portion of the St. Lawrence River, upstream of the present study area. For terrestrial vegetation mapping, they made use of information gathered by Geis and Luscomb (1972). They also utilized the New York State Department of Environmental Conservation (NYSDEC) wetland inventory presented by Hardy and Johnston (1975). In addition to terrestrial and wetland mapping, Geis and Hyduke (1978) identified zones of potential rooted aquatic vegetation. These zones were arrived at by following the 18 foot (5.5 m) contour line on the National Oceanic and Atmospheric Administration (NOAA) navigation charts. This zone can easily be found in the Massena study area by following the 18 foot (5.5 m) depth, although this zone has not been delineated on our map.

In fact, this 18 foot (5.5 m) limit is a preliminary determination of the extent of the littoral zone in the St. Lawrence River. The actual extent of the zone will be dependent on many factors, the most important of which is the transparency of the water. This transparency varies from site to site along the river (see benthic studies, this report). The 18 foot (5.5 m) cut-off point for littoral vegetation, therefore, needs to be field checked and verified (James W. Geis, personal communication).

MATERIALS AND METHODS

The vegetation was mapped preliminarily using stereo pairs of black and white aerial photographs, taken in May 1978, on a scale of 1:24,000. This map was field checked during the spring and summer of 1979. The cover types and delineations were modified as a result of field checking and the information was transferred from the aerial photographs to United States Geological Survey (U.S.G.S.) topographical maps of the same scale.

Black and white photographs were taken of representative cover types using a Canon 35 mm single lens reflex camera with a 50 mm Canon lens. All photographs were taken in July, 1979 using Kodak Tri-X film.

A preliminary plant species list was compiled during the field checking process. This list is largely a record of plant species seen and identified in the field. Many unknown specimens were also collected and preserved, and were identified at a later date. These collections do not, however, represent the extensive work necessary for the compilation of an exhaustive species list.

The use of scientific names follows Fernald (1950), Crum, Steere, and Anderson (1973), and Conrad (1956).

RESULTS

Vegetation Mapping

The accompanying vegetation map (Figure 9) is a summarization of the vegetation patterns in the Massena study area. Descriptions of each cover type are given below.

Open areas. Powerline rights-of-way and open fields are considered under the same category, because they are vegetationally similar and provide the same type of wildlife habitat. Fields under active cultivation or under agricultural use are also considered in this category because, in most cases, agricultural land is indistinguishable from open abandoned fields on the air photos. It was not feasible to field check all of these areas.

All of these areas are characterized by their open condition, with few or no woody shrubs. Grasses (Phleum pratense, Dactylis glomerata, Bromus inermis) (Geis, Hyduke, Gilman, Ruta, and Faust 1976) are dominant in the agricultural lands and recently abandoned farmlands (Figure 1). In older open fields and powerline rights-of-way, perennial plants such as goldenrod (Solidago spp.) and milkweed (Asclepias syriaca) predominate (Figure 2). This classification corresponds to Geis and Luscomb's (1972) "agricultural lands", "herbaceous fields", and in part what they considered as "developed lands" (they included powerline rights-of-way under this category).

Shrublands. This category corresponds with Geis and Luscomb's (1972) "open shrubby fields" and "shrublands". Shrublands represent a successional intermediary between open fields and deciduous forests. The shrublands are dominated by hawthorn (Crataegus spp.), buckthorn (Rhamnus cathartica), staghorn sumac (Rhus typhina), and dogwood (Cornus spp.), between 3 and 13 feet (1 and 4 m) in height. Occasional tree species, usually not more than 16 feet (5 m) in height, are present within the shrubland. These tree species include American elm (Ulmus americana), willows (Salix spp.), and poplars (Populus spp.).

The shrublands vary from dense, impenetrable thickets (Figure 3) to relatively open areas, with shrubs interspersed with open field vegetation (Figure 4).

Deciduous forest. This category includes Geis and Luscomb's (1972) "deciduous forest" and "successional forest". It was not practicable to differentiate between these types from air photos or in the field. Again, this category actually represents a continuum, and includes stands of early successional species such as aspens (Populus tremuloides and P. grandidentata), American elm, and white ash (Fraxinus americana), 7 to 23 feet (2 to 7 m) tall and up to 6 in (15.2 cm) diameter at breast height (DBH). These stands (Figure 5) have an understory of small saplings of the dominant species, or in many cases a dense shrub understory. Often, however, the forest is open, with a grassy ground cover.

The deciduous forest as a whole, however, can by typified as a relatively mature stand consisting of mixtures of sugar maple (Acer saccharum), white ash, shagbark hickory (Carya ovata), basswood (Tilia americana), and oak (Quercus rubra and Q. alba). These dominant species are from 5 to 15 in (13 to 38 cm) DBH and form a solid canopy cover (Figure 6). The subcanopy and shrub layers are composed of hop hornbeam (Ostrya virginiana) and saplings of the dominant species. The sparse ground cover is made up of grasses and other herbaceous species, including wood aster (Aster acuminatus), Solomon's seal (Polygonatum biflorum), false Solomon's seal (Smilacina racemosa), and wild lily-of-the-valley (Maianthemum canadense). Sugar maple and American beech (Fagus grandifolia) reproduction are often evident, and indicate that these deciduous forests are still undergoing successional development.

Coniferous forest. There is one small white pine (Pinus Strobus) stand near the mouth of Robinson Creek (Figure 7). This stand is dominated by widely spaced, 10 to 20 in. (25 to 50 cm.) DBH white pines, with a dense shrub layer of raspberry (Rubus idaeus), staghorn sumac, and saplings of American elm.

Wetlands. Although there are many important and interesting wetlands in the upriver portions of the St. Lawrence River, the only wetlands in the Massena study area are small, riverine cattail (Typha spp.) marshes (Figure 8).

Urban-industrial areas. Urban-industrial areas include factories, concentrations of dwellings, Seaway maintenance and support function areas, and other developed areas.

SUMMARY AND CONCLUSIONS

Habitat mapping was completed for the Eisenhower and Snell locks area of the St. Lawrence River in 1979. Six cover types were represented. Among these were open areas (powerline rights-of-way and open fields), shrublands, deciduous forests (stands of early successional species and mature stands of maple, ash, hickory, basswood, and oak), coniferous forest, wetlands (riverine cattail marshes), and urban-industrial areas (factories, dwellings, Seaway maintenance and support function areas, and other developed areas).

LITERATURE CITED

Conrad, H.S. 1956. How to know the mosses and liverworts.

Crum, H.A., W.C. Steere, and L.E. Anderson. 1973. A new list of mosses of North America north of Mexico. The Bryologist 76: 85-130.

Dept. of the Army. 1974. Review of reports on St. Lawrence Seaway-Long Sault Canal additional or duplicate locks. Buffalo District, Corps of Engineers. Buffalo, New York. pp.27-32.

Fernald, M.L. 1950. Gray's manual of botany, eighth ed. American Book Co., NY.

Geis, J.W. and N.P. Hyduke. 1978. Habitat mapping and critical habitat studies. Tech. Rpt. N, Environmental Assessment of the FY 1979 Winter Navigation Demonstration on the St. Lawrence River. SUNY College of Envir. Sci. and Forestry. Syracuse.

Geis, J.W., N.P. Hyduke, B.A. Gilman, P. Ruta and M.E. Faust. 1976. Plant communities along the St. Lawrence River Shoreline in New York State. SUNY College of Envir. Sci. and Forestry, Syracuse.

Geis, J.W., and S. Luscomb. 1972. Technical report on natural vegetation. St. Lawrence-Eastern Ontario Shoreline Study. SUNY College of Envir. Sci. and Forestry. Syracuse.

Hardy, E.E. and E.A. Johnston, 1965. New York State wetlands inventory; Technical report. Resources Inform. Lab., College Agr. Life Sci., Cornell Univ., Ithaca, N.Y.

Figure 1. An open grassy field.

Figure 2. A late successional stage in the "open area" cover type. This field is dominated by perennial plants, with shrubs beginning to become established.

Figure 3. A dense shrubland.

Figure 4. A relatively open shrubland.

Figure 5. Small aspens in an early successional hardwood stand.

Figure 6. A relatively mature deciduous forest stand.

Figure 7. The white pine stand near the mouth of Robinson Creek.

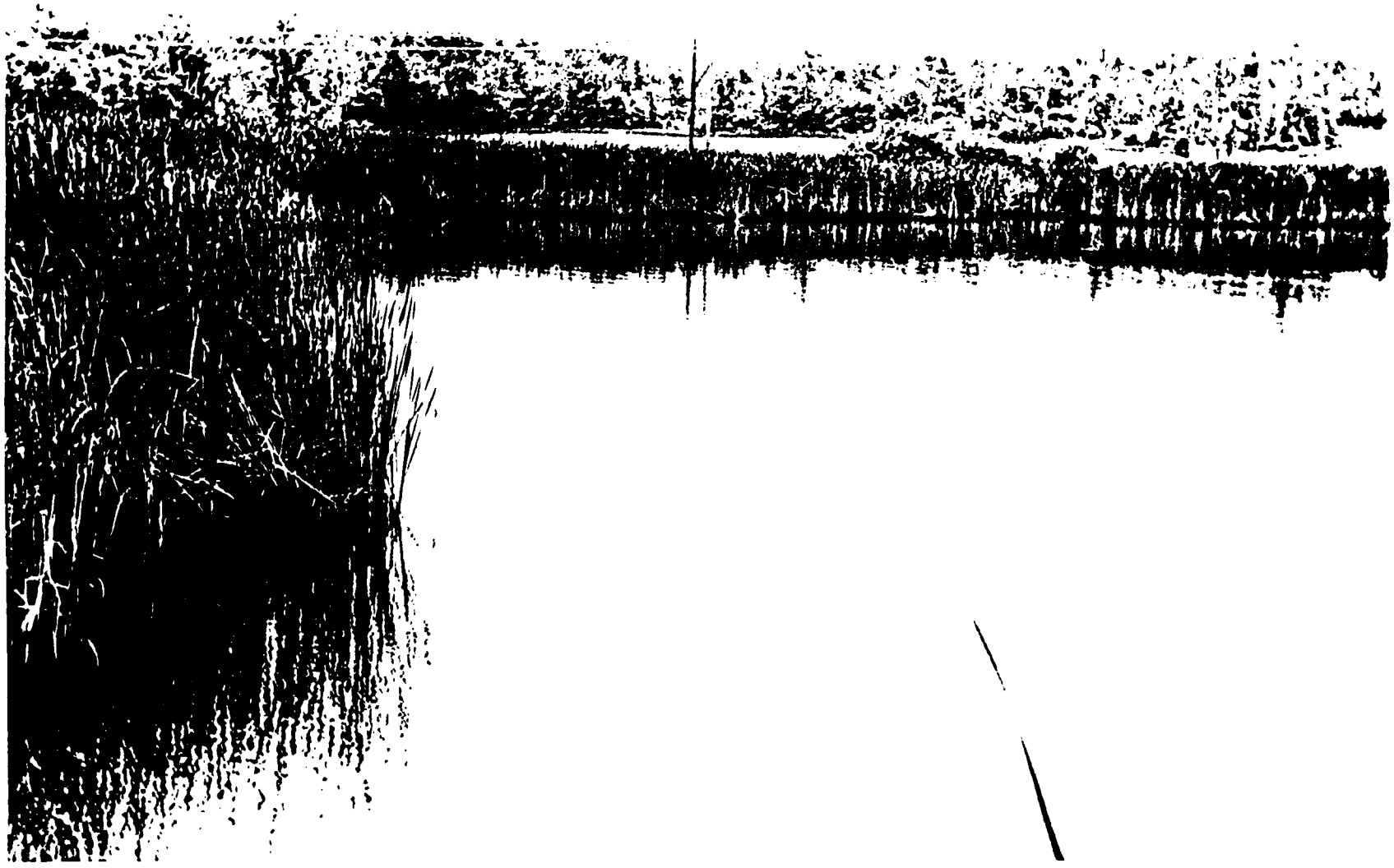


Figure 8. A small cattail marsh.

Table 1. Preliminary plant species list for Additional Locks Study site on the St. Lawrence River in spring and summer of 1979.
*Not found during this study; from Dept. of the Army (1974).

Bryophyta, Musci (mosses)

Atrichum hausknichtii

Brachythecium spp.

Bryum argentium

Callicladium haldanianum

Ceratodon purpureus

Climacium dendroides

Dicranum fuscescens

D. montanum

D. scoparium

Drepanocladus uncinatus

Fontinalis sp.

Funaria hygrometrica

Herzogiella striatella

Hypnum pallescens

Leptodictyum riparium

Leucobryum glaucum

Plagiothecium cavifolium

Pohlia nutans

Polytrichum juniperinum

P. ohioense

Rhacomitrium spp.

Tetraphis pellucida

Thuidium delicatulum

T. recognitum

Table 1. (continued)

Trachaeophyta (vascular plants

Polypodiaceae (fern family)

Onoclea sensibilis	sensitive fern
Dryopteris noveboracensis	New York fern
D. spinulosa	spinulose wood fern
Polystichum acrostichoides	Christmas fern
Pteridium aquilinum	bracken fern

Pinaceae (pine family)

Tsuga canadensis	hemlock
Picea glauca	white spruce
Larix laricina	tamarack
Pinus Strobus	white pine
P. sylvestris	Scotch pine

Typhaceae (cattail family)

Typha spp.	cattail

Sparganiaceae (burreed family)

Sparganium spp.	burreed

Zosteraceae (pondweed family)

Potamogeton spp.	pondweed

Table 1. (continued)

Alismataceae (water plantain family)	
Sagittaria sp.	arrowhead
Hydrocharitaceae (frog's bit family)	
Vallisneria americana	wild celery
Gramineae (grass family)	
**Festuca* sp.	fescue-grass
**Poa* sp.	meadow-grass
**Phalaris arundinacea*	reed canarygrass
Phleum pratense	timothy
Cyperaceae (sedge family)	
**Scirpus* sp.	bulrush
Araceae (arum family)	
Arisaema atrorubens	Jack in the pulpit
Juncaceae (rush family)	
**Juncus* sp.	rush
Liliaceae (lily family)	
Erythronium americanum	dog-toothed violet
Smilacina racemosa	false Solomon's seal
Maianthemum canadense	wild lily-of-the-valley

Table 1. (continued)

Streptopus roseus	rose twisted stalk
Polygonatum biflorum	Solomon's seal
Trillium grandiflorum	white trillium

Iridaceae (iris family)

Iris versicolor	blue flag
I. Pseudacorus	yellow iris

Salicaceae (willow family)

Salix spp.	willow
Populus tremuloides	quaking aspen
P. grandidentata	bigtoothed aspen
P. deltoides	cottonwood
P. balsamifera	balsam poplar

Juglandaceae (walnut family)

Juglans cinerea	butternut
**Carya cordiformis*	bitternut hickory
Carya ovata	shagbark hickory

Corylaceae (hazel family)

Ostrya virginiana	hop hornbeam
Betula populifolia	grey birch
B. papyrifera	white birch
Alnus rugosa	speckled alder

Table 1. (continued)

Fagaceae (beech family)	
Quercus alba	white oak
Q. rubra	red oak
Fagus grandifolia	American beech
Ulmaceae (elm family)	
Ulmus americana	American elm
Urticaceae (nettle family)	
Urtica dioica	stinging nettle
Polygonaceae (buckwheat family)	
*Rumex crispus	curled dock
Caryophyllaceae (pink family)	
Cerastium vulgatum	common mouse-eared chickweed
Silene Cucubalus	bladder campion
Ceratophyllaceae (coontail family)	
Ceratophyllum demersum	coontail
Nymphaeceae (water lily family)	
Nuphar variegatum	spatterdock
Nymphaea odorata	white water lily

Table 1. (continued)

Ranunculaceae (buttercup family)	
Ranunculus septentrionalis	swamp buttercup
R. acris	common buttercup
Thalictrum polygamum	meadow rue
Caltha palustris	marsh marigold
Aquilegia canadensis	columbine
Actaea rubra	red baneberry
A. pachypoda	white baneberry
Cruciferae (mustard family)	
Barbarea vulgaris	winter cress
Arabis canadensis	sicklepod
Saxifragaceae (saxifrage family)	
Ribes spp.	gooseberry
Rosaceae (rose family)	
Amelanchier spp.	June berry
Crataegus spp.	hawthorn
Fragaria virginiana	strawberry
Rubus idaeus	raspberry
R. allegheniensis	blackberry
Prunus pensylvanica	pin cherry
P. serotina	black cherry
P. virginiana	choke cherry

Table 1. (continued)

Leguminosae (pea family)	
Trifolium pratense	red clover
*Melilotus officinalis	yellow sweet clover
*Melilotus alba	white sweet clover
Robinia Pseudo-Acacia	black locust
Vicia Cracca	tufted vetch
Anacardiaceae (cashew family)	
Rhus typhina	staghorn sumac
R. radicans	poison ivy
Aceraceae (maple family)	
Acer saccharum	sugar maple
A. rubrum	red maple
A. Negundo	box elder
Balsaminaceae (touch-me-not family)	
Impatiens capensis	touch-me-not
Rhamnaceae (buckthorn family)	
Rhamnus cathartica	buckthorn
Vitaceae (grape family)	
Parthenocissus quinquefolia	woodbine
Vitis sp.	wild grape

Table 1. (continued)

Tiliaceae (linden family)	
Tilia americana	basswood
Violaceae (violet family)	
Viola papilionacea	violet
Lythraceae (loosestrife family)	
**Lythrum* sp.	loosestrife
Onagraceae (evening primrose family)	
**Oenothera biennis*	common evening-primrose
Epilobium angustifolium	fireweed
Haloragaceae (water milfoil family)	
Myriophyllum sp.	water milfoil
Umbelliferae (parsley family)	
Heracleum maximum	cow parsnip
Daucus Carota	Queen Anne's lace
Cornaceae (dogwood family)	
Cornus spp.	dogwood
Oleaceae (olive family)	
Fraxinus spp.	ash
F. americana	white ash

Table 1. (continued)

Apocynaceae (dogbane family)	
Vinca minor	periwinkle
Asclepiadaceae (milkweed family)	
Asclepias syriaca	milkweed
Convolvulaceae (morning glory family)	
Ipomoea sp.	morning glory
Labiatae (mint family)	
**Glechoma hederaceae*	Gill-over-the-ground
Splanaceae (nightshade family)	
**Solanum Dulcamara*	bittersweet nightshade
Rubiaceae (madder family)	
**Galium* sp.	bedstraw
Caprifoliaceae (honeysuckle family)	
Lonicera spp.	honeysuckle
**Viburnum alnifolium*	hobblebush
Sambucus canadensis	white elderberry
S. pubens	red elderberry
Compositae (composite family)	
Solidago spp.	goldenrod
**Aster novae-angliae*	New England aster
Aster acuminatus	wood aster

Table 1. (continued)

*Tanacetum vulgare	common tansy
*Arctium minus	burdock
Taraxacum sp.	dandelion

SECTION:G

EXISTING CONDITIONS

PROFILE

Introduction

The St. Lawrence River, which is the only natural outlet for the Great Lakes, is the longest east-west river on the North American continent, coursing a distance of 557 miles. The United States bounds approximately the upper 125 miles of the river. The river flow is fairly uniform, with a maximum daily average discharge of 350,000 cubic feet per second at Massena, New York.

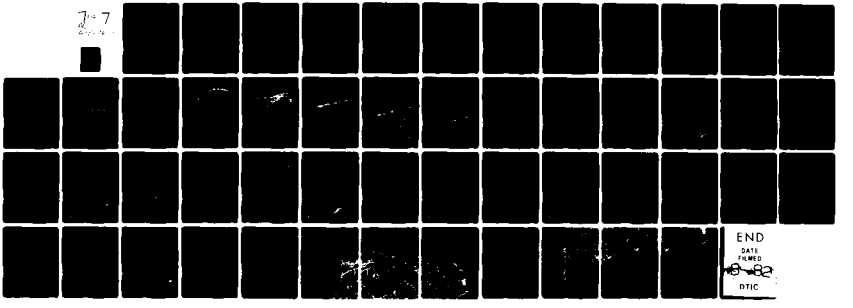
Benthos

Benthic invertebrates are an important component of the ecosystem due to their role in the food web and because many are sensitive to environmental conditions and may be indicative of changes resulting from activities altering current patterns and transport of organic material (Mills, Smith, and Forney. 1978b). Several studies have been conducted on the benthic components of the St. Lawrence River ecosystem since 1976. Among these studies are Kurczewski et al. (1976), Mills and Forney (1976), and Mills, Smith, and Forney (1978a, b, c, and 1979).

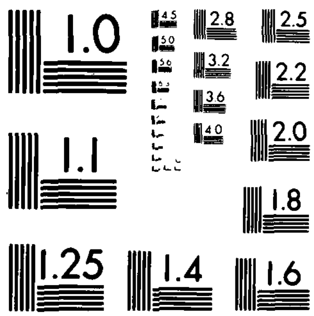
The patchy non-random distribution of benthic invertebrates makes quantitative sampling difficult. Within similar depths, substrates, and habitats, population and biomass are highly variable. Currents, inflowing streams, aquatic macrophytes, and cultural effluents also influence the type and abundance of benthic invertebrates.

AD-A110 760 FISH AND WILDLIFE SERVICE CORTLAND NY F/G 6/3
BIOLOGICAL SURVEY ALONG THE ST. LAWRENCE RIVER FOR THE ST. LAWR--ETC(U)
1979

UNCLASSIFIED NL



END
DATE FILMED
8-82
DTIC



MICROCOPY RESOLUTION TEST CHART

NATIONAL BUREAU OF STANDARDS 1963-A

In general, fine-particle feeding molluscs dominate the upriver areas of the St. Lawrence, while the community shifts to coarse particle feeders in the downriver areas due to the prevalence of sand, clay, and gravel. The standing crop is greatest near Lake Ontario where molluscs dominate, while the non-shelled biomass increases downriver and is dominated by chironomids, oligochaetes, and amphipods. Other important taxa are isopods, nematodes, and caddisfly larvae. Nematodes and oligochaetes are particularly abundant near sewage treatment outflows.

The seasonal trends show increses in abundance, biomass, and diversity from May to October, followed by a decline during the winter months. The highest diversity and abundance are associated with aquatic macrophytes such as Vallisneria americana, Myriophyllum exalbescens, Heteranthra dubia, and Ceratophyllum demersum. The island and shoal areas throughout the river are very productive, due mainly to the abundance of these macrophytes.

In the Massena area, the abundance, biomass, and diversity are considerably lower in the Wiley-Dondero Canal than in the rest of the river. Few differences in species composition are apparent between channel and non-channel sites, and these are usually due to substrate differences.

Many benthic invertebrates are utilized as food by many species of fish. Amphipods are the most common prey, but isopods and molluscs are also heavily utilized.

Fish

The St. Lawrence-Eastern Lake Ontario region harbors a major portion of the fisheries of New York (U.S. Dept. of Interior 1976a). Sport fishing supports a multimillion dollar industry in the area. Werner and Ford (1972) identified 11 warmwater species as major contributors to the economy - smallmouth bass, northern pike, yellow perch, brown bullhead, muskellunge, rock bass, white perch, white bass, pumpkinseed, largemouth bass, and walleye. Smallmouth bass is the most important warmwater species from the viewpoint of angler preference, economics, and catch. Northern pike and yellow perch rank second and third, respectively.

Several fisheries studies have been conducted on the St. Lawrence River since 1972. Among these studies are Werner and Ford (1972); Werner (1976); Ringler (1976); U.S. Department of the Interior (1976a, b, c); Dunning and Evans (1978); Dunning, Evans, and Tarby (1978); Dunning, Tarby, and Evans (1978); NALCO Environmental Sciences (1978); Cooley (1978); and Panek (1979). Most of these studies concentrated on the upriver areas, with little work being done around Massena.

These studies showed significant differences in fish distribution between winter and spring. They also indicated that the Thousand Islands area was more productive than the Lake St. Lawrence Area. In the Massena area, the Raquette and Grasse Rivers are important to the fisheries resources as spawning, nursery, and feeding areas. Seining in the Grasse River in 1979 yielded 35 species, of which spottail shiner, golden shiner, logperch, and bluegill were the most abundant.

Food habits studies of fish in the St. Lawrence River have shown that smallmouth and largemouth bass and northern pike are piscivores, while brown bullhead, yellow perch, rock bass, black crappie, pumpkinseed, and white perch are generalists. Aquatic insect larvae and pupae represented only a small fraction of the diet of all species taken, particularly in specimens larger than 100 mm, where molluscs and amphipods were the major components of the diet. Larval fish were rarely found in fish stomachs.

Birds

Birds are the most abundant vertebrates on the St. Lawrence River in terms of species richness (260+). The majority of these species are migrants, although many species breed along the river. Most of the studies conducted on birds of the St. Lawrence River region were done by Maxwell and Smith (1976, 1978a, 1978b).

Waterfowl are important from an economic viewpoint. Over 20 percent of the New York State migrating waterfowl population uses the St. Lawrence River. The lowlands and marshes are important for the production and harvest of dabbling and diving ducks. During the winter, concentrations of waterfowl, particularly Common Goldeneyes and Common [illegible]sers, are found around open water pools.

Previous studies on the St. Lawrence River have emphasized colonial waterbird concentrations, due to their sensitivity to environmental disruptions, which places them among the species most likely to be impacted by alterations to the river ecosystem. Most colonial waterbird colonies are restricted to low-lying, sparsely vegetated islands which are rarely visited by humans. Common Terns are stressed due to their poor nesting sites which are subjected to flooding and cold weather. The best nesting sites have been unavailable to this species due to competition from humans and Ring-billed Gulls. Herring Gulls are stressed by chemical contaminants (Maxwell and Smith 1978a).

Few species found along the St. Lawrence River occur in all seasons. The spring migration begins March 15 and the peak occurs in May. The post-breeding migration, which lasts from July to December, is much longer than the spring migration. By early December most migrants have left and winter populations are well established. A total of 59 species was detected by Maxwell and Smith during the winter of 1978; 18 of these species were fairly common.

Between Clayton and Oak Point, woodland species such as thrushes, vireos, and warblers predominate. Diving ducks, Great Blue Herons, and Accipiter hawks are also fairly common, particularly around the marshes. Open country species are more prevalent along the rest of the river, and gull concentrations occur on many of the shoals.

Species inhabiting the Massena sector are among those most likely to be affected by water level changes. Shorebirds are more numerous at the Massena end of the river due to the numerous shallow embayments and creek outlets. Common Tern and Ring-billed Gull colonies are frequent near Massena. The open water areas are important staging areas for Canada Geese and migratory ducks, particularly large flocks of Common Mergansers, Redheads, Ring-necked Ducks, and Black Ducks. These areas are also used as feeding areas for gulls and Tree Swallows. The most common upland species in the locks area are Red-winged Blackbirds, sparrows, Starlings, and American Robins. During breeding season, the open field areas are dominated by Ring-billed Gulls and Red-winged Blackbirds, while the deciduous forests are dominated by Red-winged Blackbirds and the shrublands contain predominantly American Robins, Veeries, and American Redstarts.

Several of the potential upriver dredging areas are important as waterfowl staging areas; among these are the islands and shoals near Jacques Cartier State Park, American Island, Oak Point, and Blind Bay (near Hammond). Gulls are frequently concentrated near these areas, and Common Loons were frequent near Oak Point and Blind Bay.

Mammals

A total of 34 large mammal species have been listed for the St. Lawrence River region; six of these are abundant (cottontail rabbit, chipmunk, woodchuck, beaver, muskrat, and raccoon) and ten others (wolf, gray fox, black bear, American marten, wolverine, mountain lion, lynx, bobcat,

moose, and elk) are probably rare or extirpated (VanDruff and Wright 1976). Thirty-one species of small mammals have also been noted in the area. Mammal studies in the St. Lawrence River area include Lackey (1976), VanDruff and Wright (1976), and VanDruff and Lomolino (1978a, b).

The marshes of the St. Lawrence River and its tributaries produce large numbers of valuable furbearers such as muskrat, beaver, mink and raccoon. Significant acreages of undeveloped privately-owned wetlands with high wildlife potential are present in the region.

The muskrat is the most economically important species. Water fluctuation is one of the most severe mortality factors for muskrat populations, and they are also affected by siltation and shifting bottom sediments. Other species likely to be affected by wetland disturbances are mink, otter, beaver, and raccoon.

The coyote is the most common large carnivore while the meadow vole is the most common small mammal. The meadow vole is found in high densities on many islands.

Most of the species found on islands are active in winter and cross the ice. The number of tracks and species richness was found to increase from the ice to the upland areas. Island colonization is a significant aspect in the maintenance of isolated mammal populations.

In the Massena area, 18 species of mammals are common, 5 common to rare, 11 rare, and 3 seasonal. None of these species are endangered. The species richness is greatest in the hardwood areas and lowest at the grassland sites.

Amphibians and Reptiles

Amphibians and reptiles are sensitive to environmental changes involving the land-water interface. Among the potentially disruptive changes are those involving vegetation, temperature, water levels, water fluctuations, drainage, filling of shallows, and pollution. Previous studies of amphibians and reptiles on the St. Lawrence River were done by Alexander in 1976 and 1978.

A total of 18 species of amphibians and 17 species of reptiles are believed to be present along the St. Lawrence River. Alexander found 22 of these species in 1976. All of them spend the winter in a dormant state, and many are found near marshes. Frogs and toads are the most common species. The most common turtles are the snapping turtle and the midland painted turtle, while the most abundant snakes are the northern water snake and the garter snake.

In the Massena area, most upland, wetland, and pond habitats have some frogs or toads. The Wiley-Dondero Canal-Robinson Creek area, however, has no significant amphibian and reptile resources due to the rapid water-level fluctuations from the locks operations. Areas of mature deciduous forest provide important cover for the more terrestrial amphibians.

At least four turtle species and two species of snakes are found in the Massena area. The garter snake is the most common reptile. The Blanding's turtle has been proposed as a "threatened" species and is especially sensitive to environmental perturbations.

Vegetation

Undisturbed forest areas are rare in the St. Lawrence River area. Successional fields occupy 22 percent of the shoreline areas along Lake Ontario and the St. Lawrence River in Jefferson and St. Lawrence Counties. Much of the upland area has been converted to seasonal residences, marinas, businesses, and agriculture. Among the vegetational studies done along the St. Lawrence River are Geis and Hyduke (1976, 1978), Geis and Kee (1977), and Raynal and Geis (1978).

Six cover types have been delineated for the Massena area - shrubland, deciduous forest, coniferous forest, open areas, wetlands, and urban-industrial areas. Open areas include open fields, agricultural fields, and powerline rights-of-way, and are characterized by grasses, goldenrod, and milkweed. Shrublands are a successional intermediary between open fields and deciduous forests. The common species of this cover type are hawthorn, buckthorn, staghorn sumac, dogwood, American elm, willows, and poplars. The deciduous forest category includes both early successional forests, characterized by aspen, American elm, and white ash, and mature forests, characterized by sugar maple, white ash, shagbark hickory, basswood, and oak, with sugar maple and American beech

reproduction. The coniferous forests are predominantly white pine, with a shrub layer of raspberry, staghorn sumac, and American elm saplings. The wetlands in the area are small, riverine cattail marshes. The Urban-industrial areas include factories, concentrations of dwellings, Seaway maintenance and support facilities, and other developed areas.

Literature Cited

Alexander, M.M. 1976. The amphibians and reptiles of the St. Lawrence River and vicinity. SUNY College of Environmental Science and Forestry, Syracuse, New York. 37 pp.

_____. 1978. Environmental assessment of the FY 1979 winter navigation demonstration on the St. Lawrence River. Vol. II. Tech. Rep. I. Spring census of larval fishes. SUNY College of Environmental Science and Foresty, Syracuse, New York. 10 pp.

Cooley, J.L. 1978. Environmental assessment of the FY 1979 winter navigation demonstration on the St. Lawrence River. Vol II. Tech. Rep. L. Aquatic food web characterization studies. SUNY College of Environmental Science and Forestry, Syracuse, New York. 17 pp.

Dunning, D.J. and J.T. Evans. 1978. Baseline biological studies preparatory to the assessment of winter navigation: refinement of winter fish sampling techniques. New York State Department of Environmental Conservation, Watertown, New York. 19 pp.

Dunning, D.J., J.T. Evans, and M.J. Tarby. 1978. Baseline biological studies preparatory to the assessment of winter navigation: fisheries data base on the St. Lawrence River. New York State Department of Environmental Conservation, Watertown, New York. 144 pp.

Dunning, D.J., M.J. Tarby, and J.T. Evans. 1978. Environmental assessment of the FY 1979 winter navigation demonstration on the St. Lawrence River. Vol. I. Tech. Rep. D. Adult fisheries study. SUNY College of Environmental Science and Forestry, Syracuse, New York. 77 pp.

Geis, J.W. and N.P. Hyduke. 1976. Plant communities along the St. Lawrence River shoreline in New York State. SUNY College of Environmental Science and Forestry, Syracuse, New York. 32 pp.

_____. 1978. Environmental assessment of the FY 1979 winter navigation demonstration on the St. Lawrence River. Vol. II. Tech. Rep. N. Habitat mapping and critical habitat studies. SUNY College of Environmental Science and Forestry, Syracuse, New York. 27 pp.

Geis, J.W. and J.L. Kee. 1977. Coastal wetlands along Lake Ontario and the St. Lawrence River in Jefferson County, New York. SUNY College of Environmental Science and Forestry, Syracuse, New York. 130 pp.

Kurczewski, F.E., S.R. Alm, and R.J. Mungari. 1976. Insects of the St. Lawrence River. SUNY College of Environmental Science and Forestry, Syracuse, New York. 15 pp.

Lackey, J.A. 1976. Preliminary report on small mammal studies in the St. Lawrence River system. Rice Creek Biological Field Station. SUNY at Oswego, Oswego, New York. 32 pp.

Maxwell, G.R. II and G.A. Smith. 1976. Preliminary bird studies for navigation season extension on the St. Lawrence River. Rice Creek Biological Field Station. SUNY at Oswego, Oswego, New York. 183 pp.

_____. 1978a. Bird studies along the St. Lawrence River during late spring and summer 1978. Rice Creek Biological Field Station. SUNY at Oswego, Oswego, New York. 105 pp.

_____. 1978b. Environmental assessment of the FY 1979 winter navigation demonstration on the St. Lawrence River. Vol. I. Tech. Rep. F. Bird studies during the winter of 1978. SUNY College of Environmental Science and Forestry, Syracuse, New York. 52 pp.

Mills, E.L. and J.L. Forney. 1976. Preliminary report on primary and secondary production of the St. Lawrence River system, summer 1976. Cornell University, Ithaca, New York. 99 pp.

Mills, E.L., S.B. Smith, and J.L. Forney. 1978a. Characterization of the primary and secondary components of the St. Lawrence River food web during summer 1978. Cornell University, Ithaca, New York. 159 pp.

_____. 1978b. Environmental assessment of the FY 1979 winter navigation demonstration on the St. Lawrence River. Vol. I. Tech. Rep. B. Benthic sampling and substrate analysis at ice boom sites I. Benthic invertebrate populations. SUNY College of Environmental Science and Forestry, Syracuse, New York. 41 pp.

_____. 1978c. Environmental assessment of the FY 1979 winter navigation deomonstration on the St. Lawrence River. Vol. II. Tech. Rep. K. Primary producers, secondary consumers, and water quality in the St. Lawrence River. SUNY College of Environmental Science and Forestry, Syracuse, New York. 96 pp.

_____. 1979. The St. Lawrence River in winter: population structure, biomass, and pattern of its primary and secondary food web components. Cornell University, Ithaca, New York. 27 pp.

NALCO Environmental Sciences. 1978. Environmental assessment of the FY 1979 winter navigation demonstration on the St. Lawrence River. Vol. II. Tech. Rep. I. Spring census of larval fishes. SUNY College of Environmental Science and Forestry, Syracuse, New York. 21 pp.

New York State Department of Environmental Conservation and SUNY College of Environmental Science and Forestry. 1978. Environmental assessment of the FY 1979 winter navigation demonstration on the St. Lawrence River. Summary Volume. SUNY College of Environmental Science and Forestry, Syracuse, New York. 56 pp.

Panek, F.M. 1979. St. Lawrence River warmwater fish stock assessment. New York State Department of Environmental Conservation, Watertown, New York.

Raynal, D.J. and J.W. Geis. 1978. Environmental assessment of the FY 1979 winter navigation demonstration on the St. Lawrence River. Vol. I. Tech. Rep. G. Winter studies of littoral vegetation. SUNY College of Environmental Science and Forestry, Syracuse, New York. 21 pp.

Ringler, N.H. 1976. Feeding ecology of fishes in the St. Lawrence River. SUNY College of Environmental Science and Forestry, Syracuse, New York. 43 pp.

U.S. Department of the Interior. 1976a. Ecological studies for navigation season extension on the St. Lawrence River. U.S. Fish and Wildlife Service, Cortland, New York. 166 pp.

_____. 1976b. St. Lawrence River ecological study: comprehensive study requirements; ecological impact assessments; coordination. U.S. Fish and Wildlife Service, Cortland, New York.

_____. 1976c. St. Lawrence River ecological study: fisheries studies. U.S. Fish and Wildlife Service, Cortland, New York. 372 pp.

VanDruff, L.W. and M.V. Lomolino. 1978a. Environmental assessment of the FY 1979 winter navigation demonstration on the St. Lawrence River. Vol. II. Tech. Rep. M. Mammal and furbearer studies during the winter of 1978. SUNY College of Environmental Science and Forestry, Syracuse, New York. 35 pp.

_____. 1978b. Studies of riverine mammals along the St. Lawrence River, summer 1978. SUNY College of Environmental Science and Forestry, Syracuse, New York. 14 pp.

VanDruff, L.W. and M.I. Wright. 1976. The large mammals of the St. Lawrence River region: an environmental planning study. SUNY College of Environmental Science and Forestry, Syracuse, New York. 35 pp.

Werner, R.G. 1976. St. Lawrence River study report. Ichthyoplankton and inshore larval fish communities. SUNY College of Environmental Science and Forestry, Syracuse, New York. 166 pp.

Werner, R.G. and D. Ford. 1972. St. Lawrence-Eastern Ontario Shoreline Study. Technical report on fishery resources. St. Lawrence-Eastern Ontario Commission, Watertown, New York. 63 pp.

APPENDIX

170

U. S. DEPARTMENT OF COMMERCE
NOAA–NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226

24th Ed., Aug. 31/74
14761
(formerly LS 11)

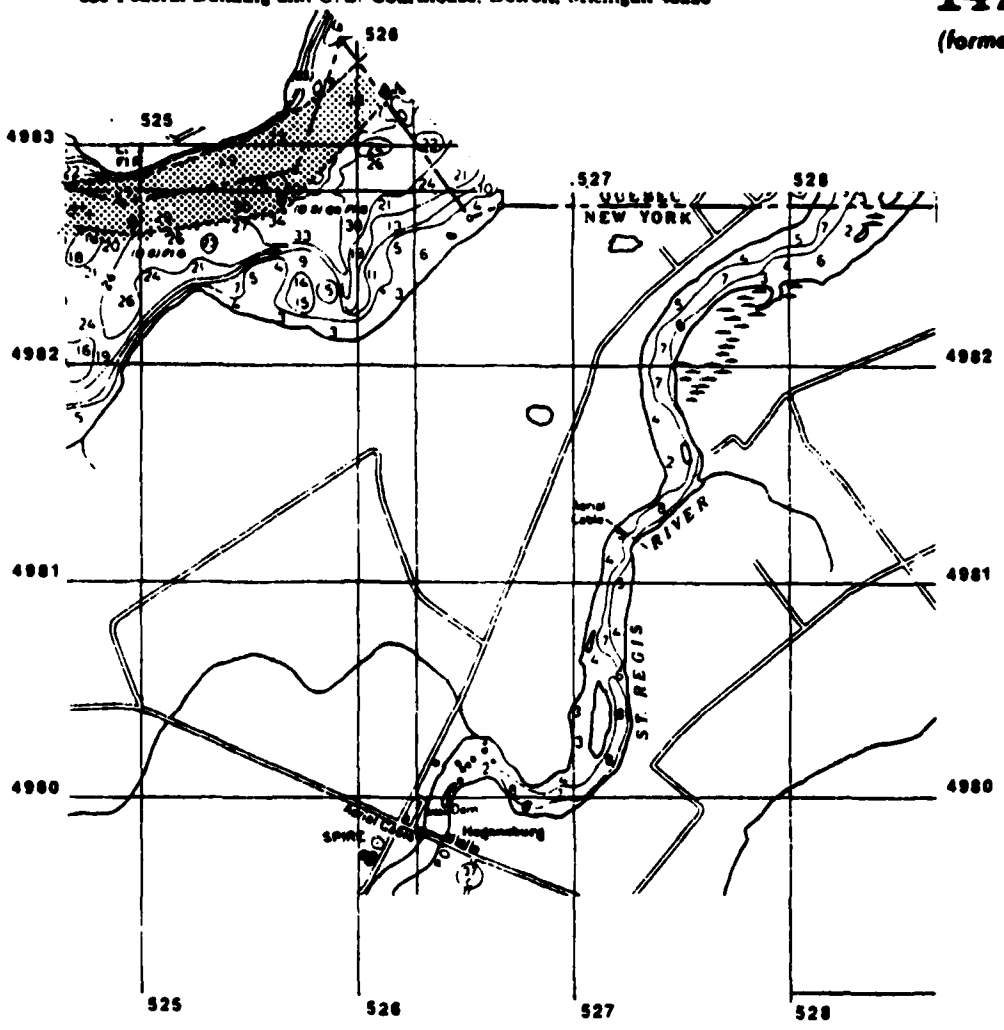


Fig. 1. Potential dredging sites for the Additional Locks and other Navigation Improvements Project. Stippling indicates areas of dredging. Circles indicate turning basins (possible island removal).

B

COUNTERPART TO HOGANSBURG

SOUNDINGS IN FEET

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

24th Ed., Aug. 31/74

14761

(formerly LS 11)

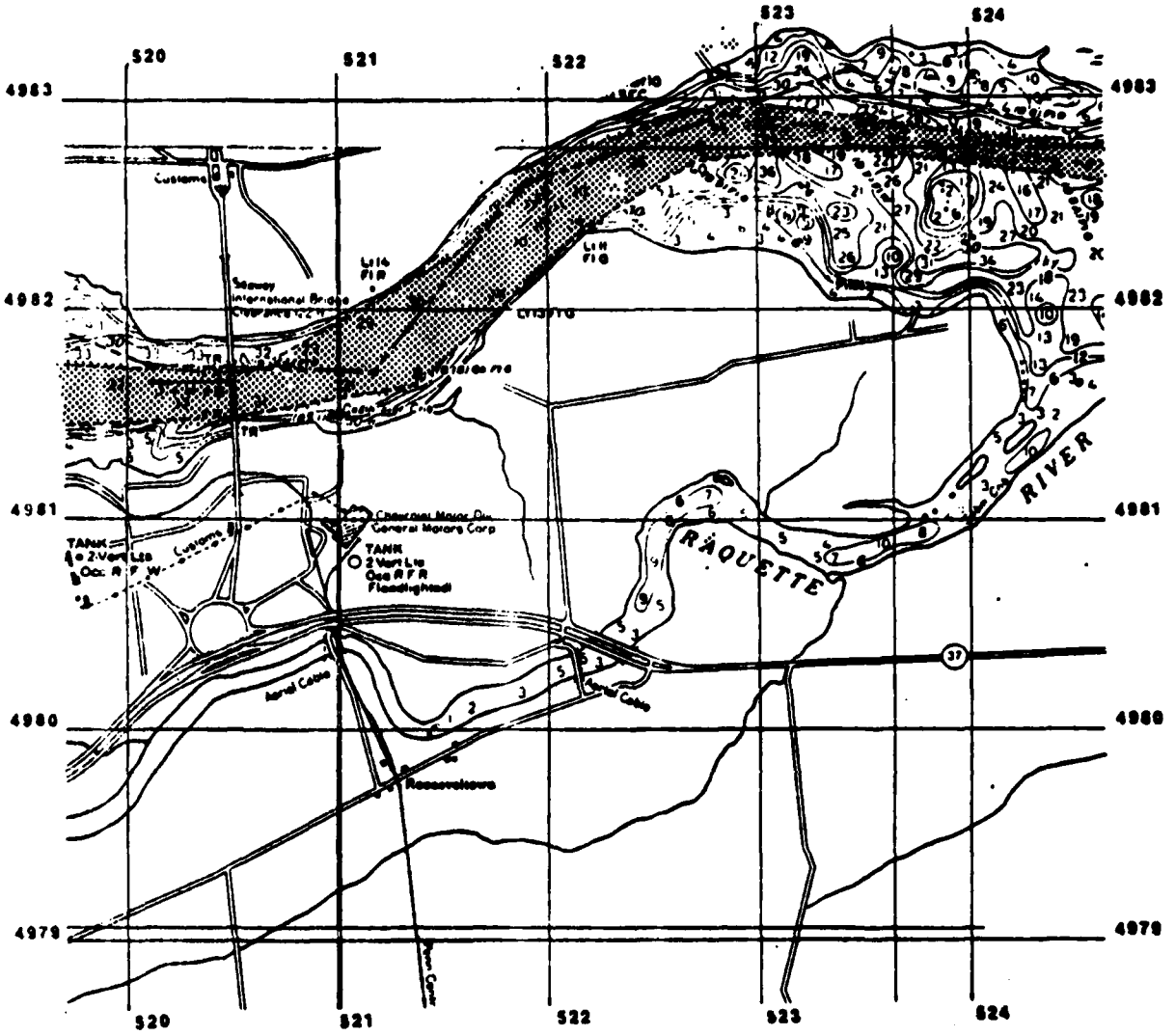


Fig. 1. (continued)

A

COUNTERPART TO
HOGANSBURG

SOUNDINGS IN FEET

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

24th Ed., Aug. 31/74
14761
(formerly LS 11)

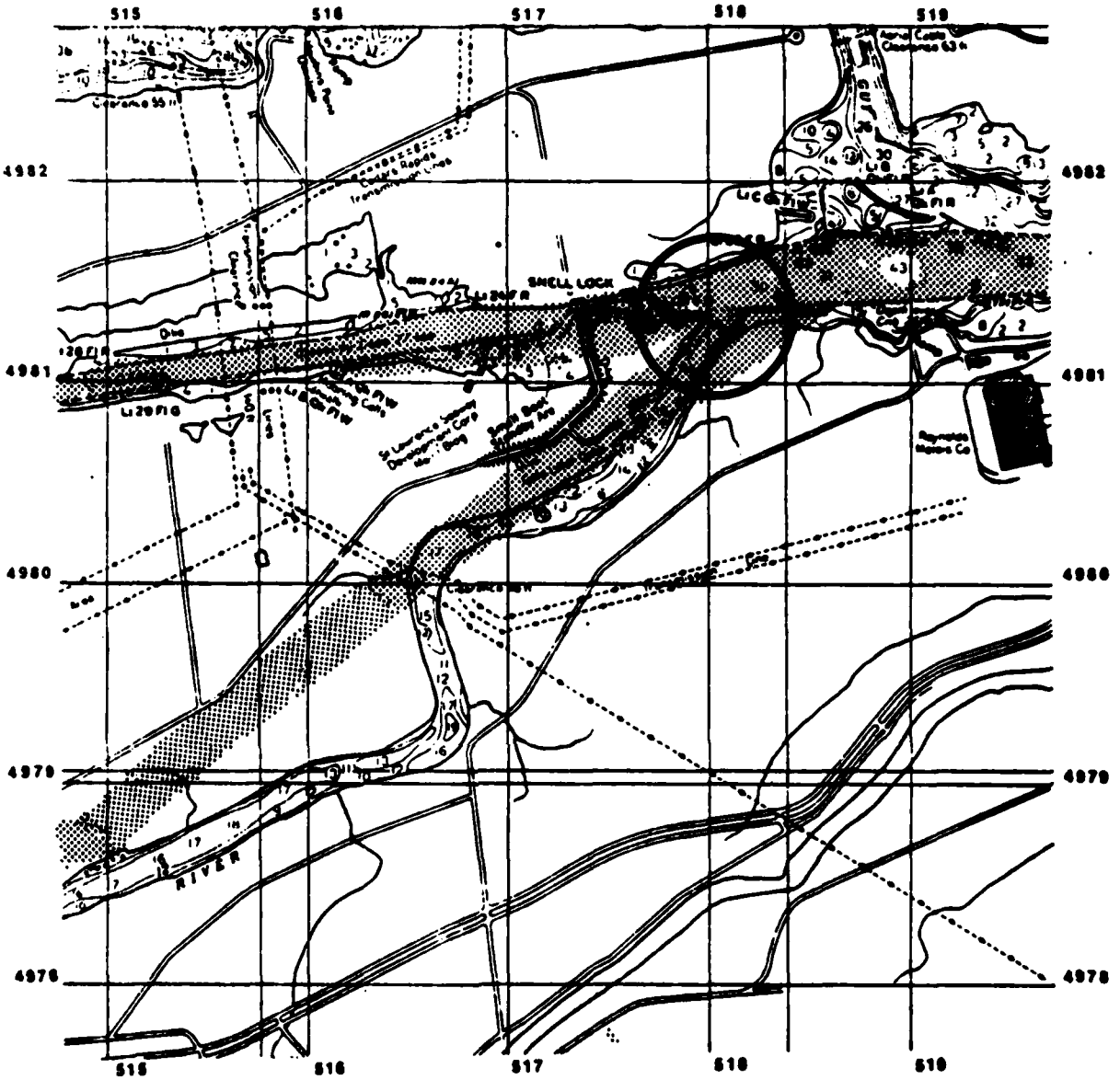


Fig. 1. (continued)

B

COUNTERPART TO
RAQUETTE RIVER

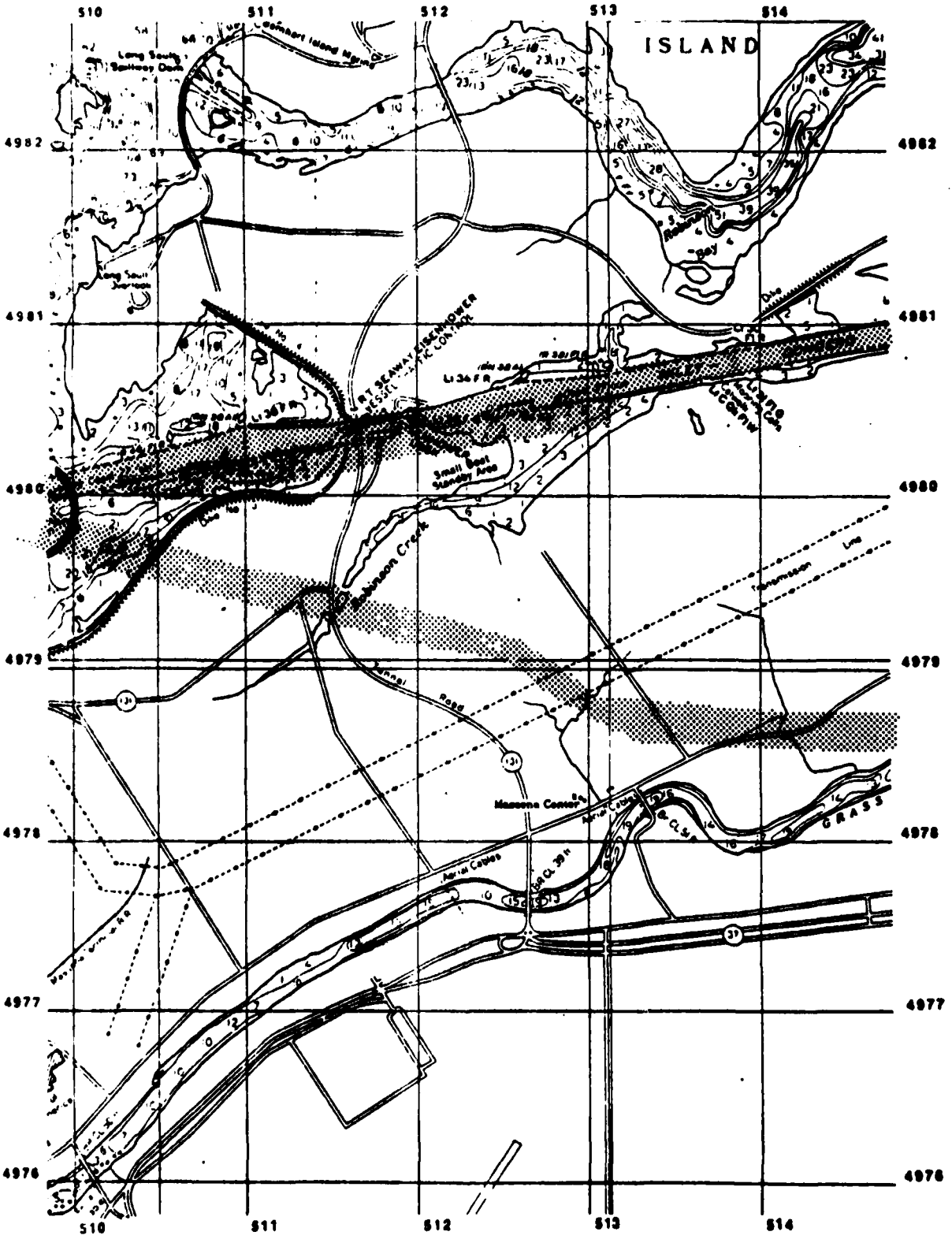
SOUNDINGS IN FEET

U S DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

24th Ed., Aug. 31/74

14761

(formerly LS 11)



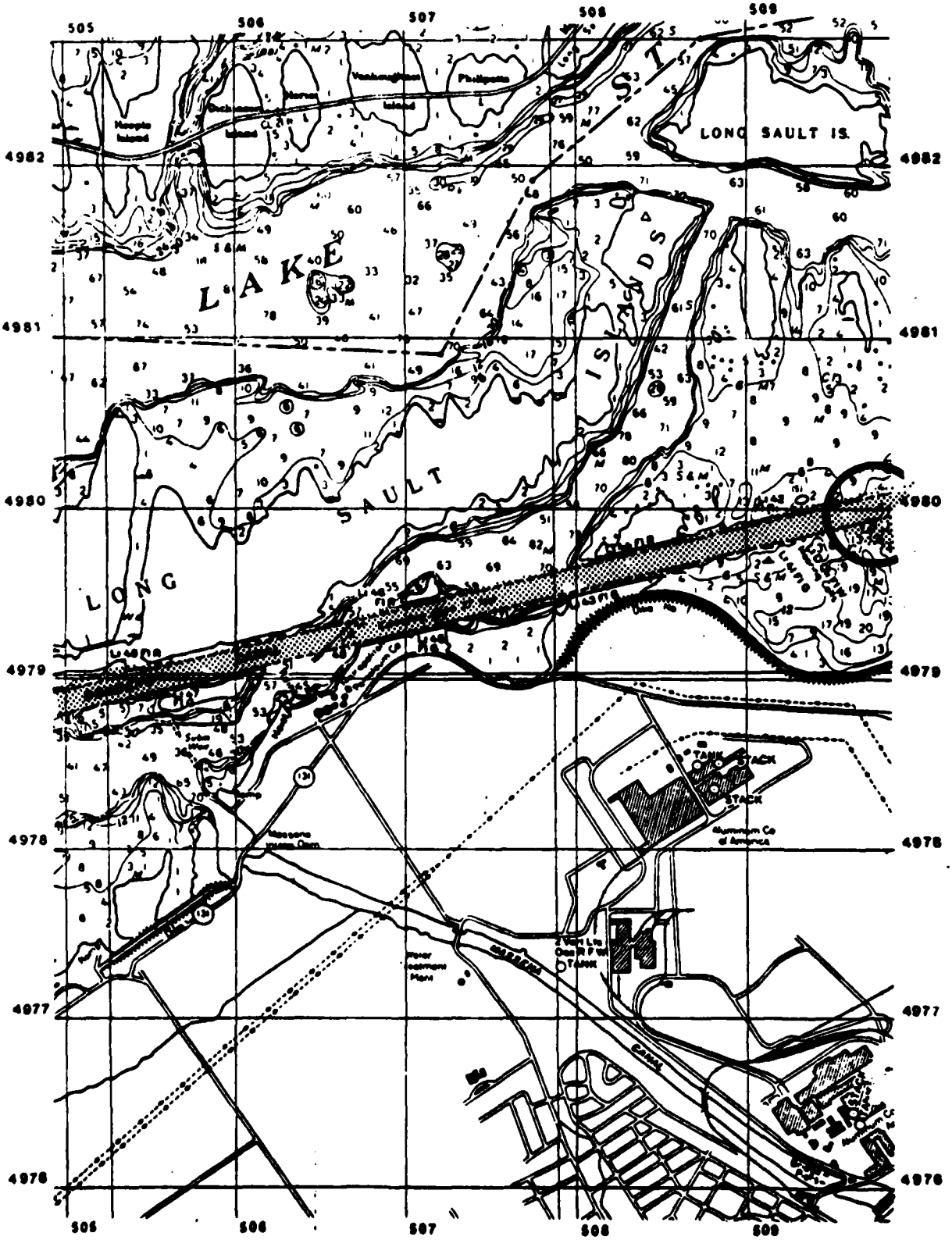
COUNTERPART TO
RAQUETTE RIVER

SOUNDINGS IN FEET

Fig. 1. (continued)

U. S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

24th Ed., Aug. 31/74
14761
(formerly LS 11)



B

COUNTERPART TO MASSENA

SOUNDINGS IN FEET

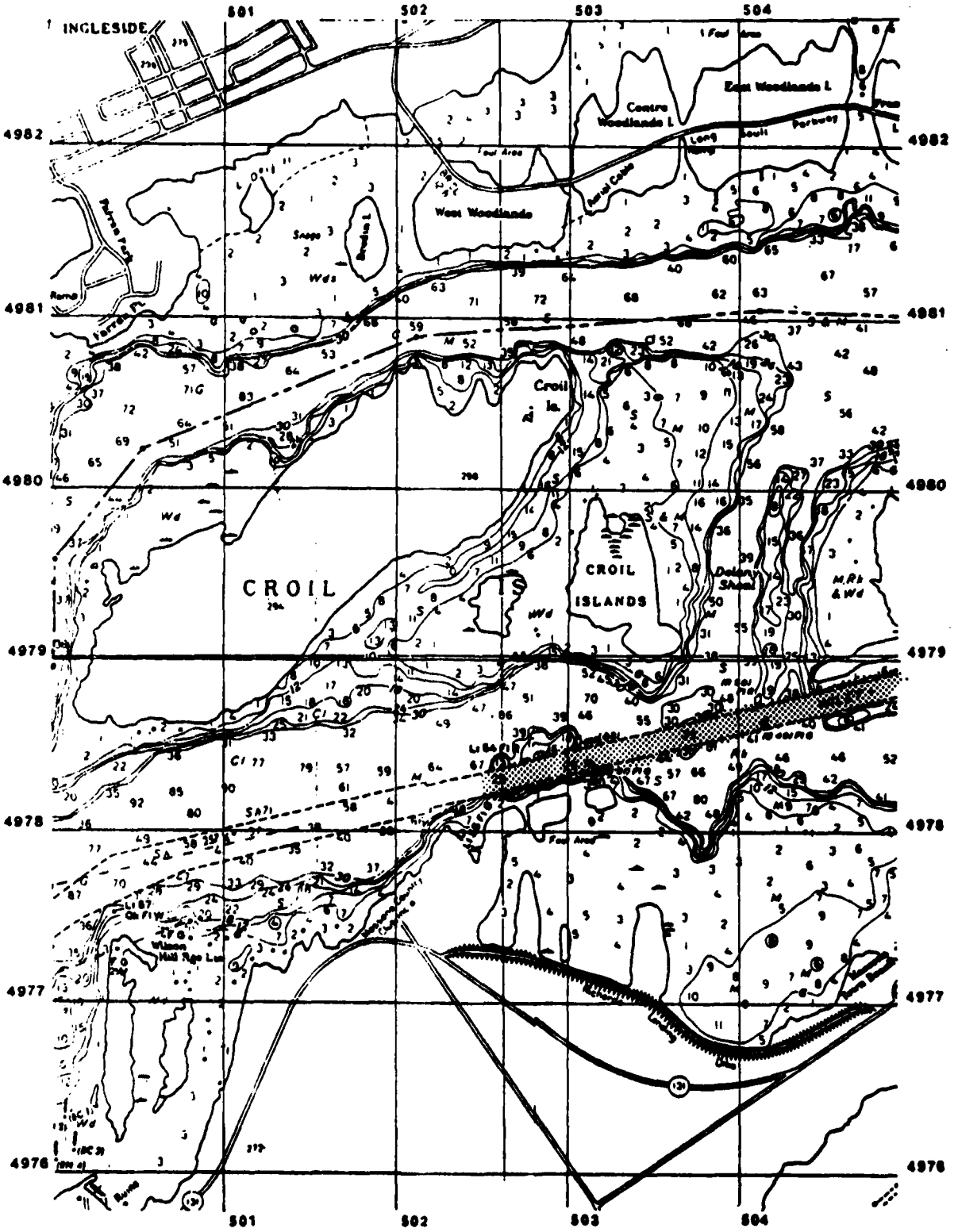
Fig. 1. (continued)

152

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

24th Ed., Aug. 31/74 23rd Ed., Aug. 31/74

14761 (formerly LS 11) **14762** (formerly LS 12)



COUNTERPART TO MASSENA

SOUNDINGS IN FEET

Fig. 1. (continued)

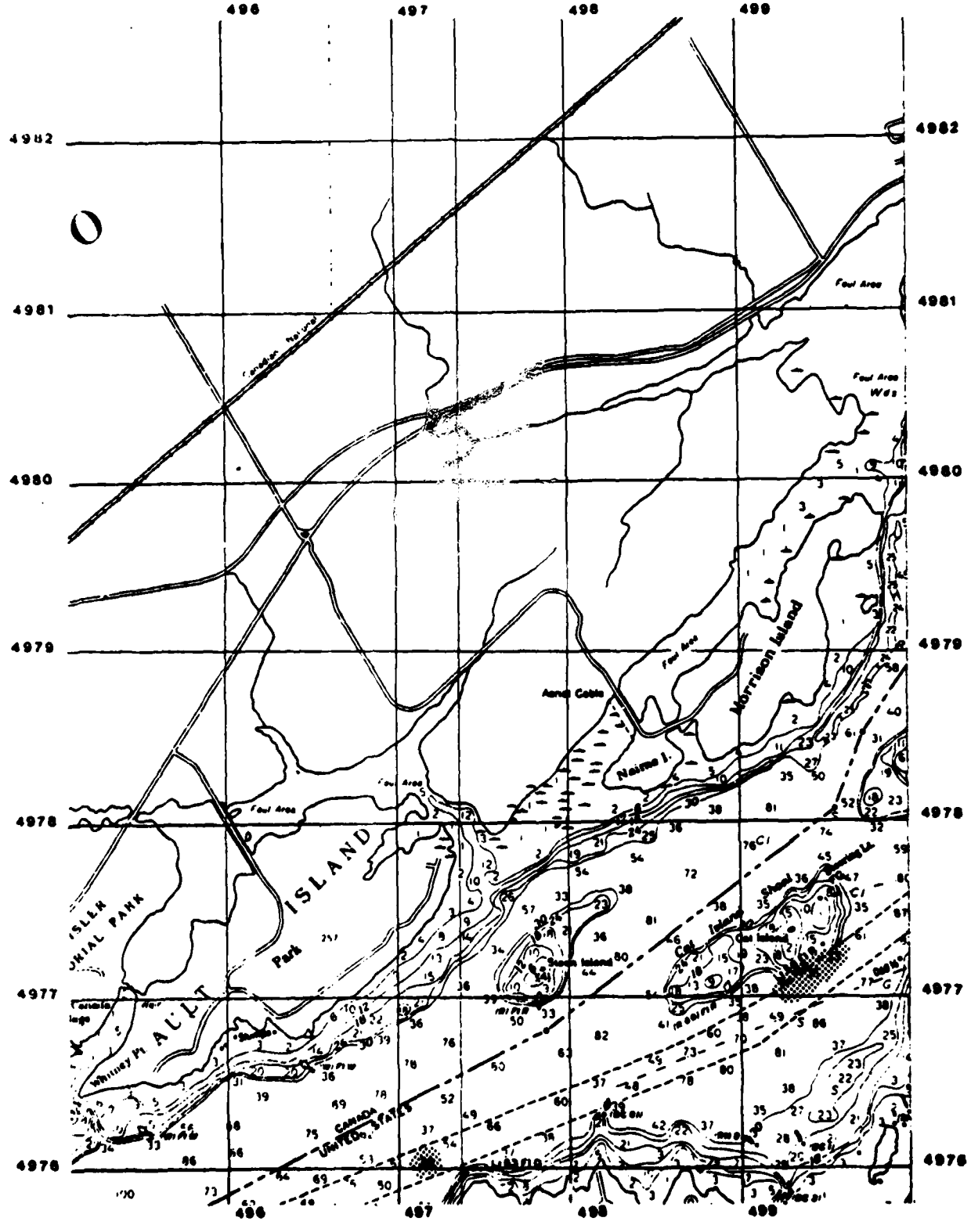
146

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

23rd Ed., Aug. 31/74

14762

(formerly LS 12)



B

COUNTERPART TO
LOUISVILLE

SOUNDINGS IN FEET

Fig. 1. (continued)

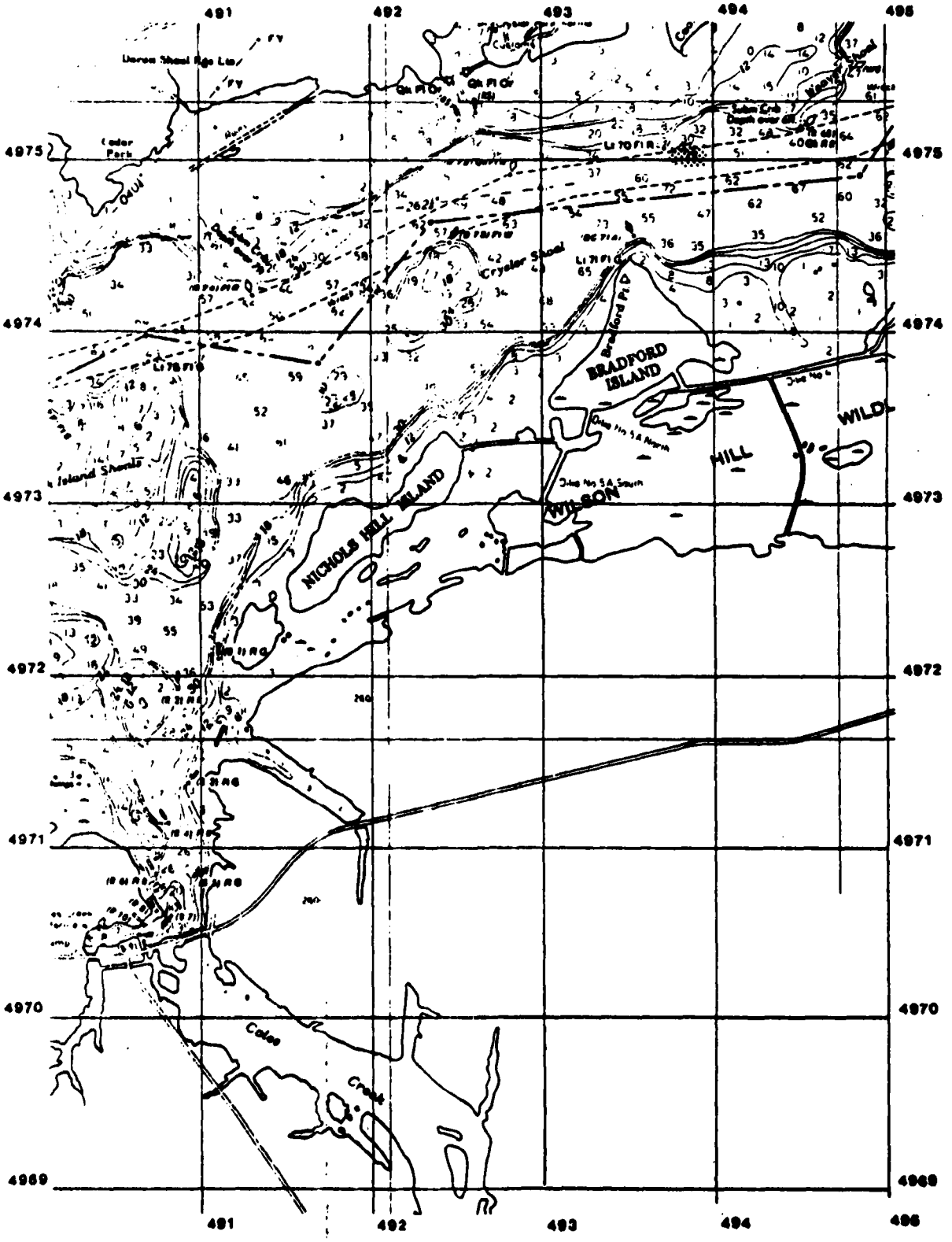
148

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

23rd Ed., Aug. 31/74

14762

(formerly LS 12)



C

COUNTERPART TO
LOUISVILLE

SOUNDINGS IN FEET

Fig. 1. (continued)

134

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

23rd Ed., Aug. 31/74
14762
(formerly LS 12)

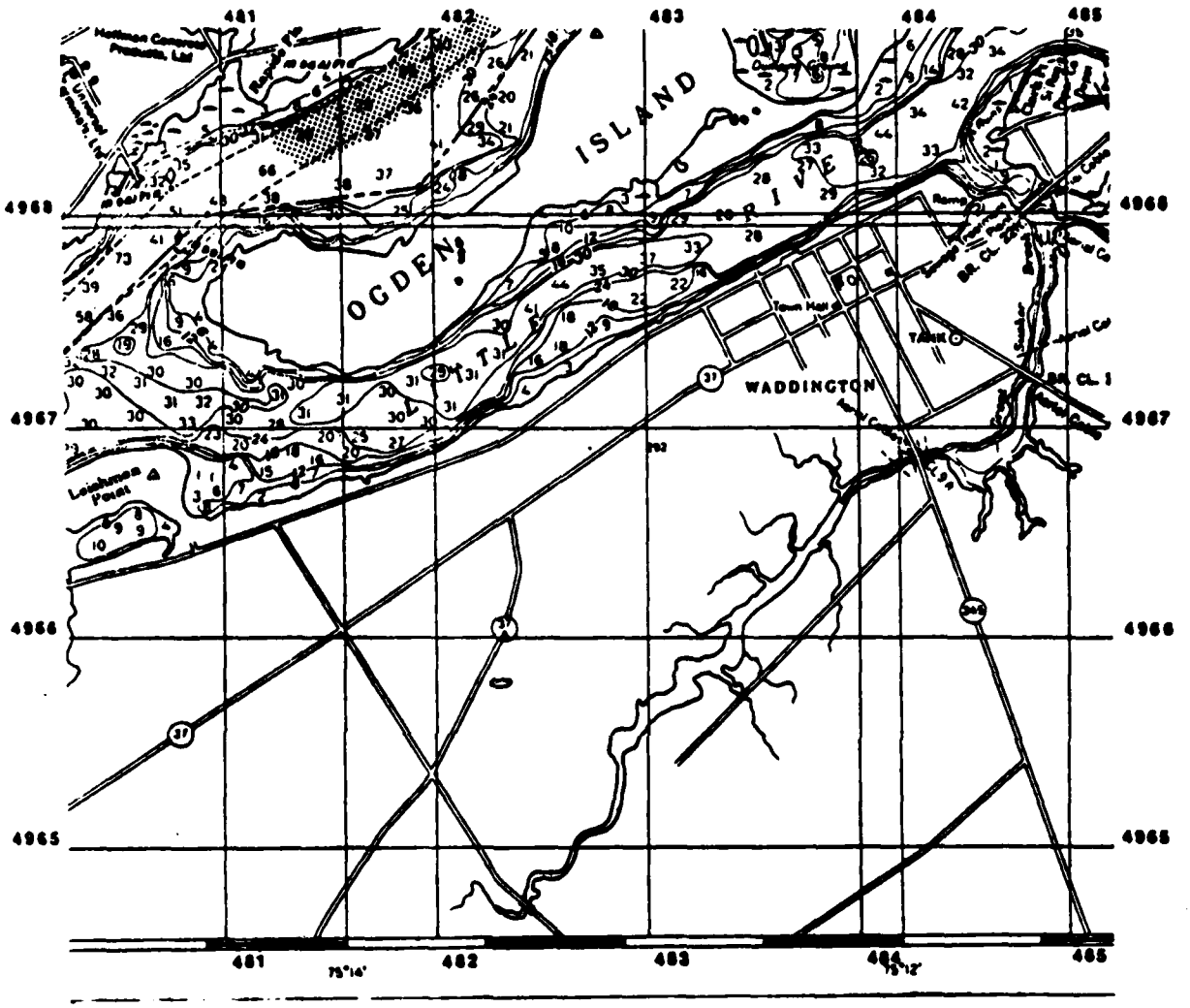


Fig. 1. (continued)

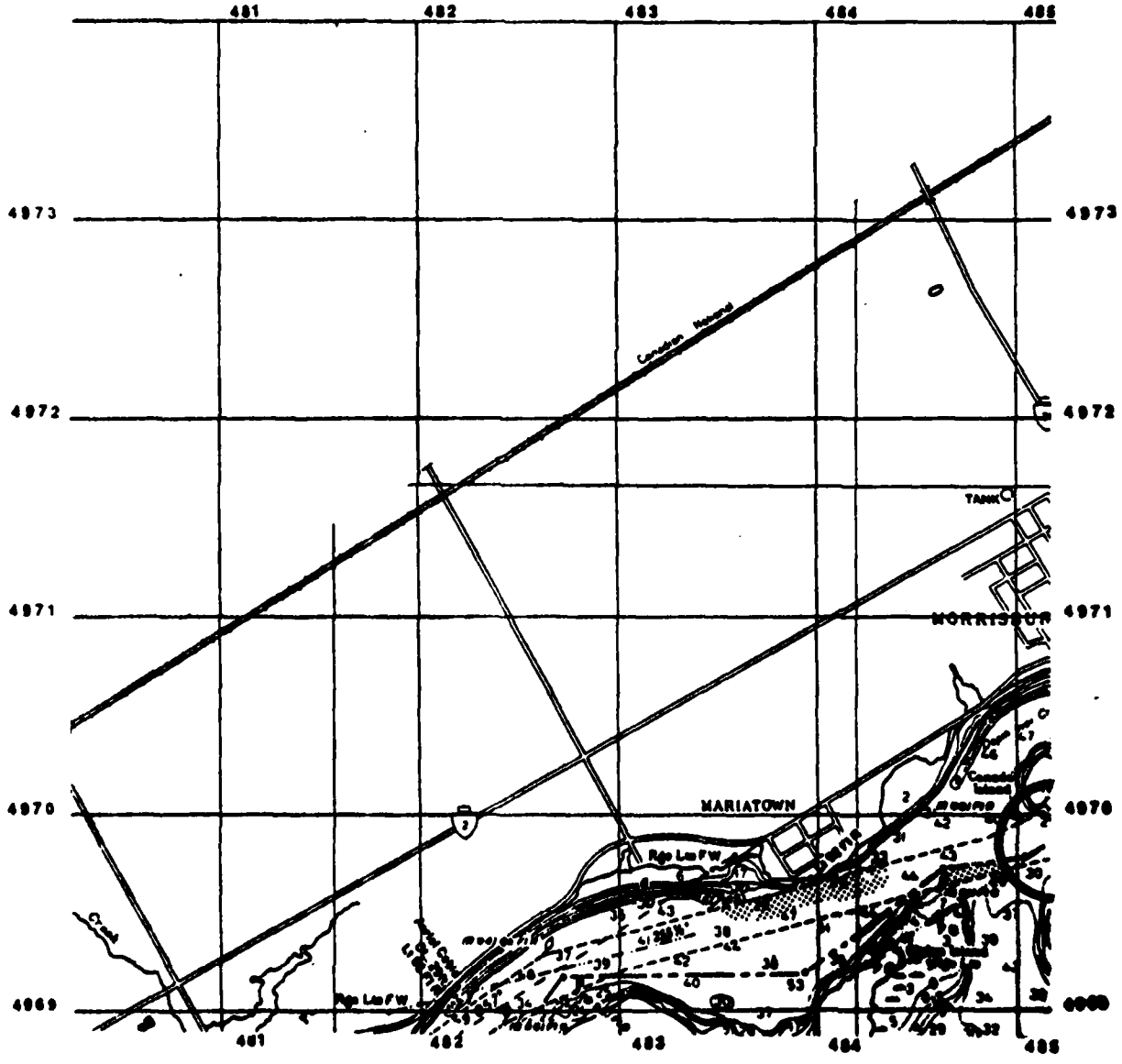
A

COUNTERPART TO
WADDINGTON

SOUNDINGS IN FEET

140 U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

23rd Ed., Aug. 31/74
14762
(formerly LS 12)



C

COUNTERPART TO
MORRISBURG

SOUNDINGS IN FEET

Fig. 1. (continued)

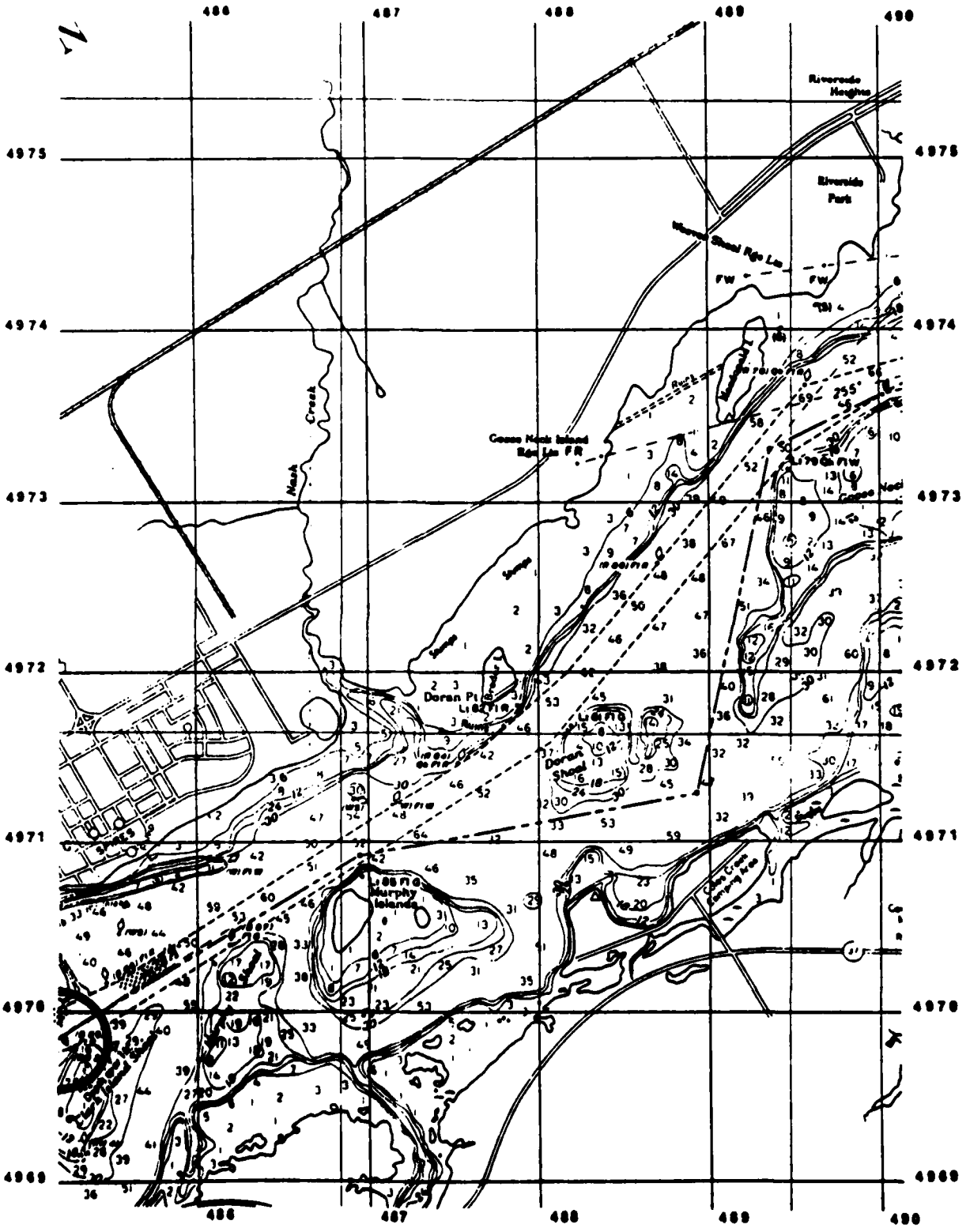
142

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

23rd Ed., Aug. 31/74

14762

(formerly LS 12)



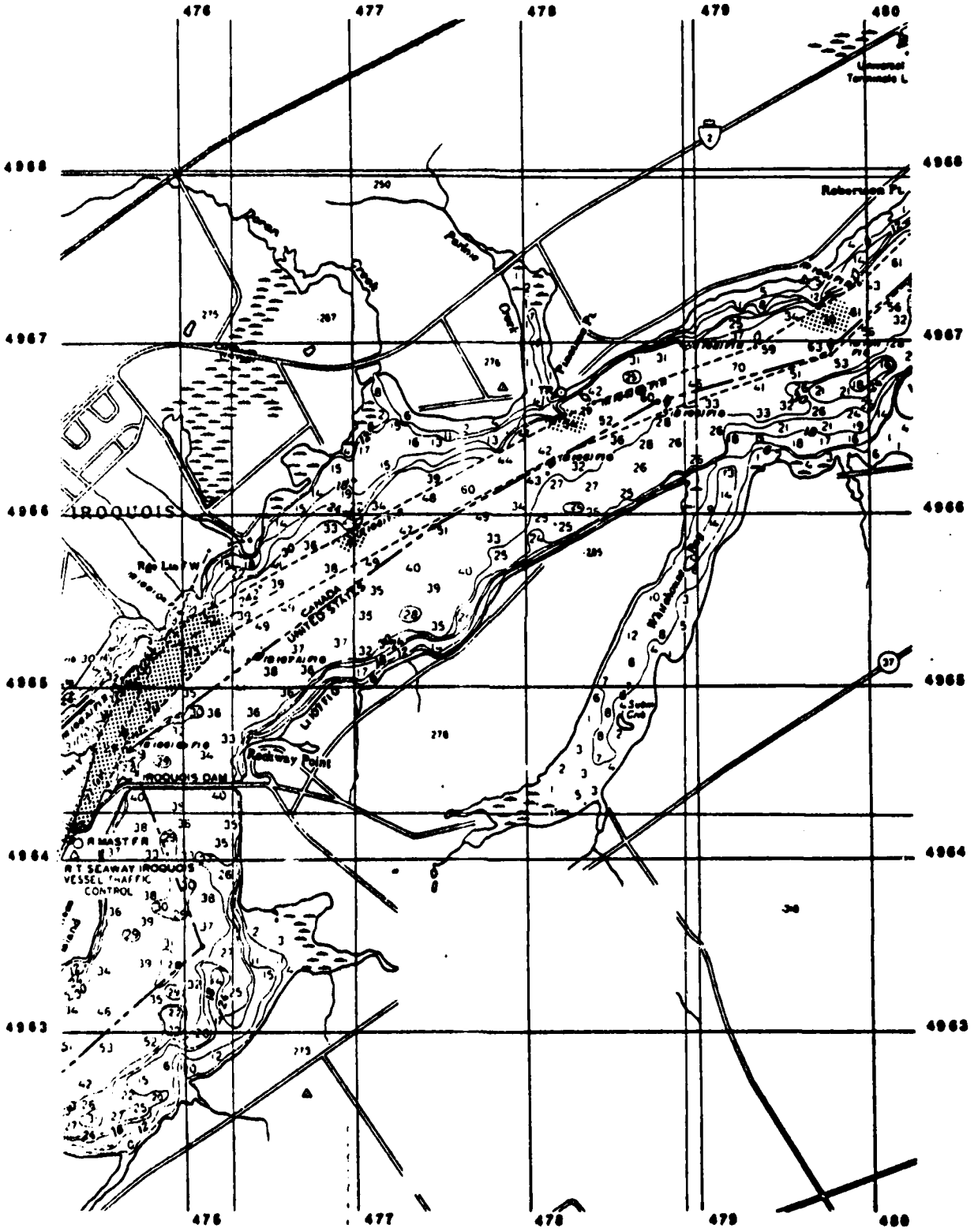
D

COUNTERPART TO
MORRISBURG

SOUNDINGS IN FEET

Fig. 1. (continued)

U. S. DEPARTMENT OF COMMERCE
NOAA–NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226



B

COUNTERPART TO
SPARROWHAWK POINT

SOUNDINGS IN FEET

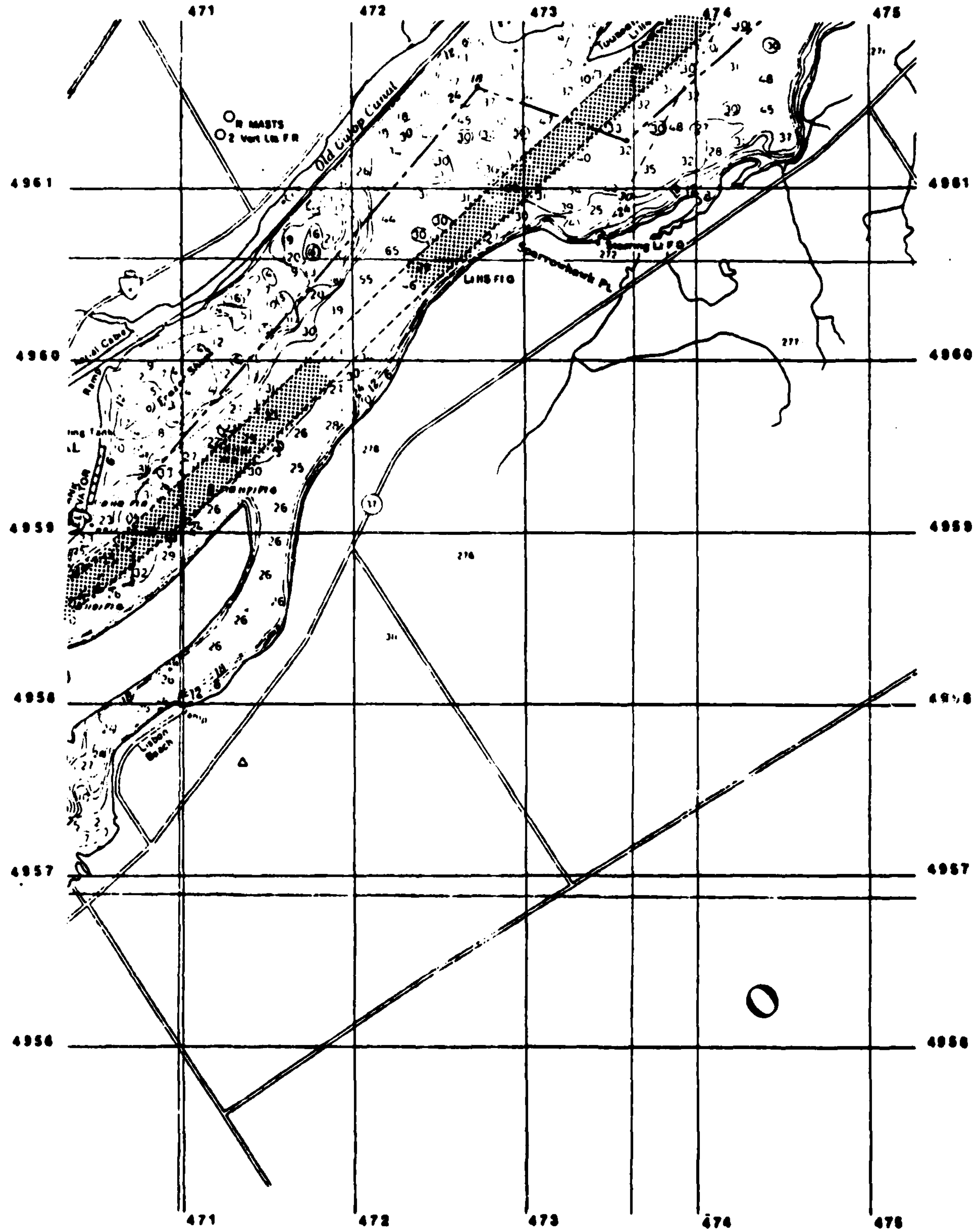
Fig. 1. (continued)

130

U. S. DEPARTMENT OF COMMERCE
NOAA–NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226

25th Ed., April 12/74

13



C

COUNTERPART TO
SPARROWHAWK POINT

SOUNDINGS IN FEET

Fig. 1. (continued)

U. S. DEPARTMENT OF COMMERCE
NOAA–NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226

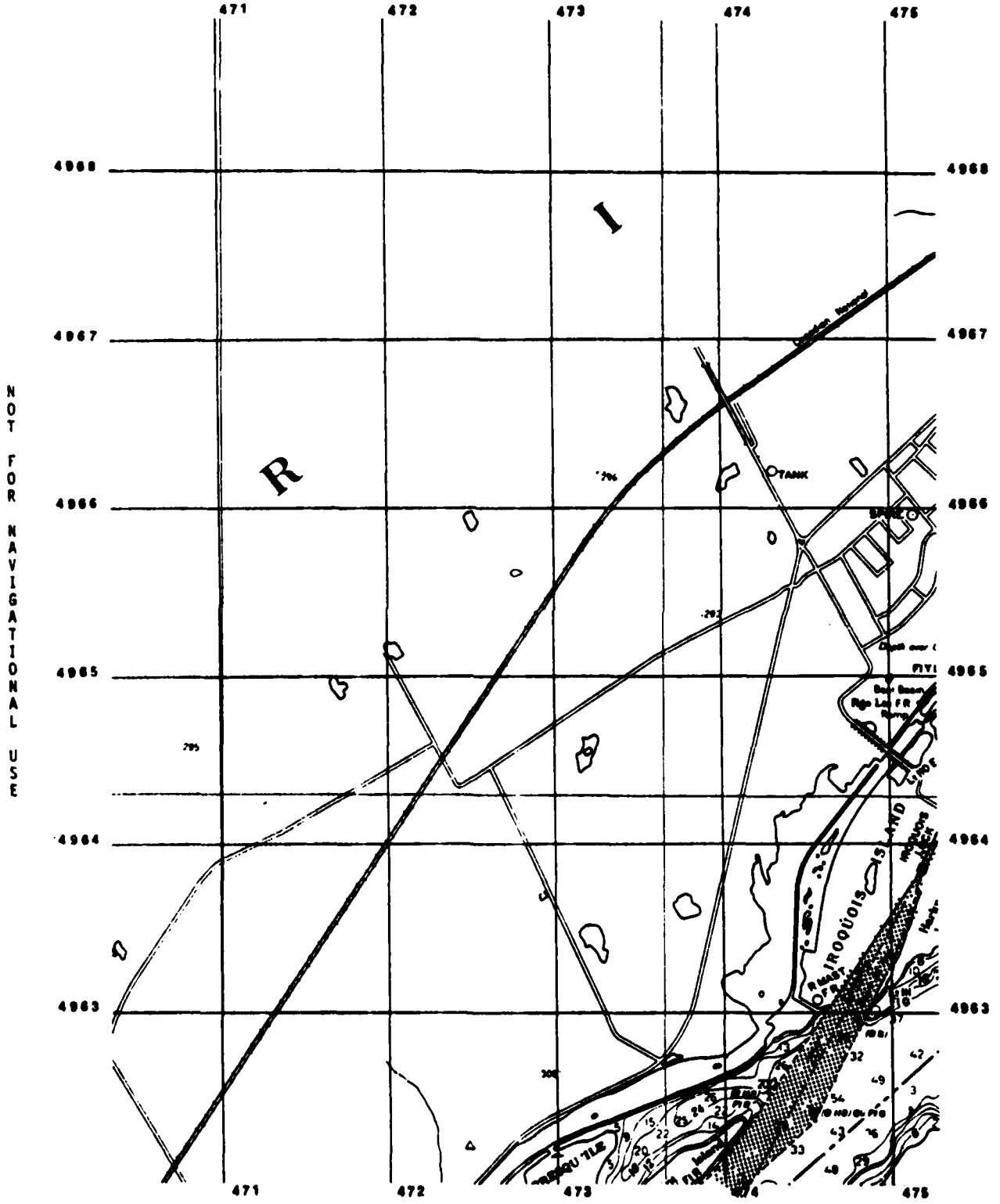
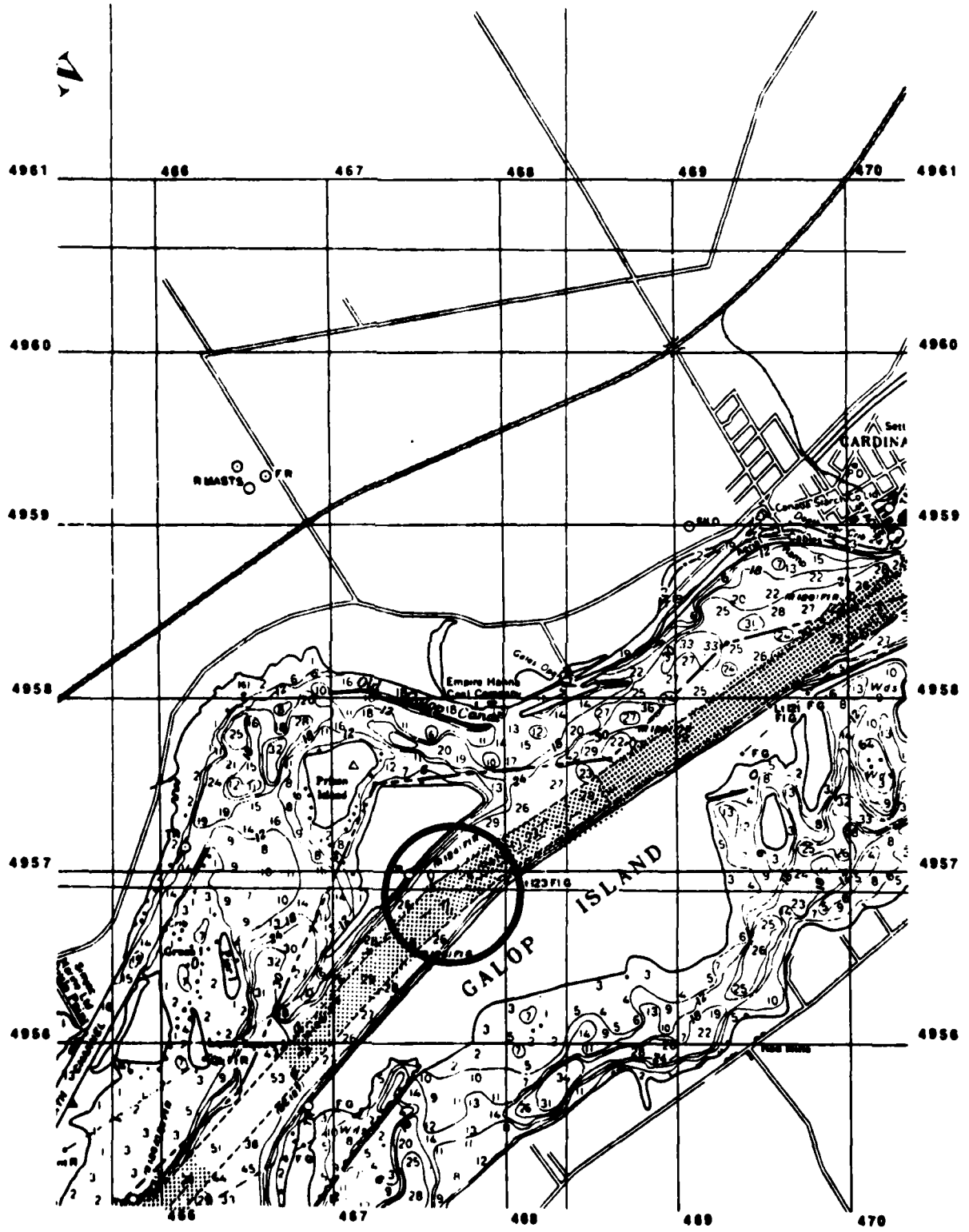


Fig. 1. (continued)

U. S. DEPARTMENT OF COMMERCE
NOAA–NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226



NOT FOR NAVIGATIONAL USE

D

COUNTERPART TO RED MILLS

SOUNDINGS IN FEET

Fig. 1. (continued)

NOAA–NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226

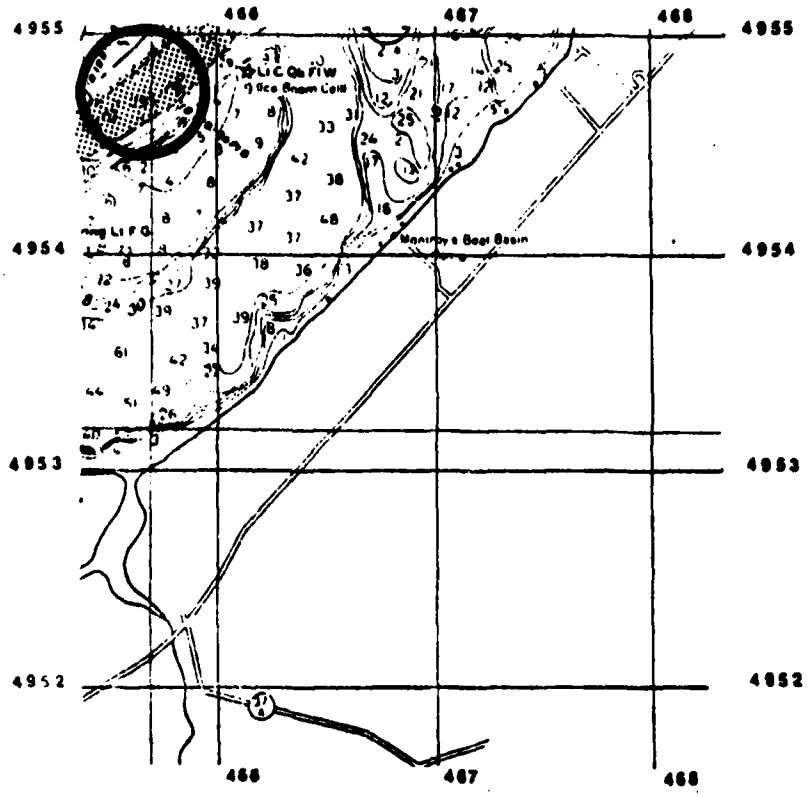


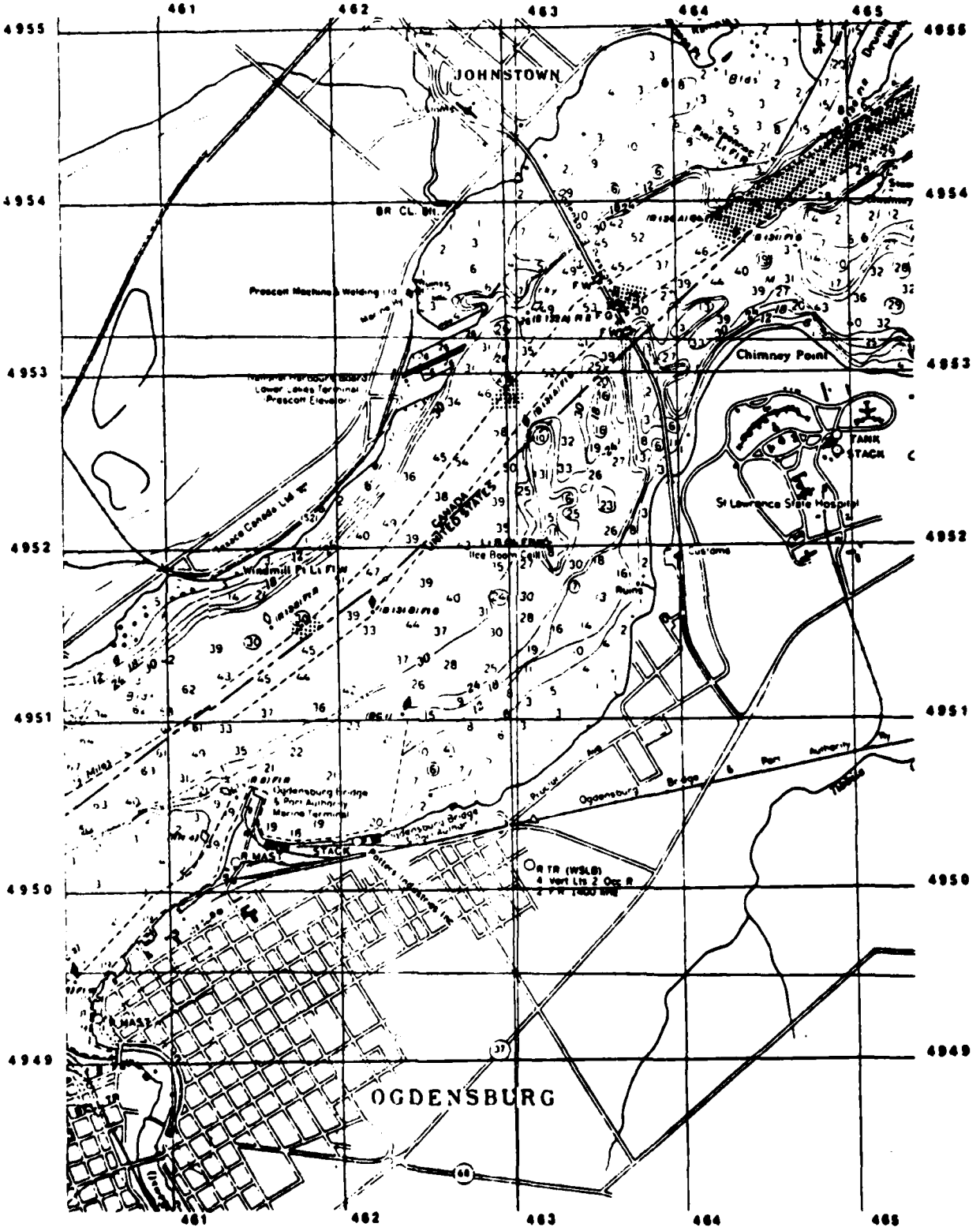
Fig. 1. (continued)

B

COUNTERPART TO
OGDENSBURG EAST

SOUNDINGS IN FEET

U. S. DEPARTMENT OF COMMERCE
NOAA–NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226



A

COUNTERPART TO
OGDENSBURG EAST

SOUNDINGS IN FEET

Fig. 1. (continued)

U. S. DEPARTMENT OF COMMERCE
NOAA - NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226

23rd Ed., April 12/74
14

NOT FOR NAVIGATIONAL USE

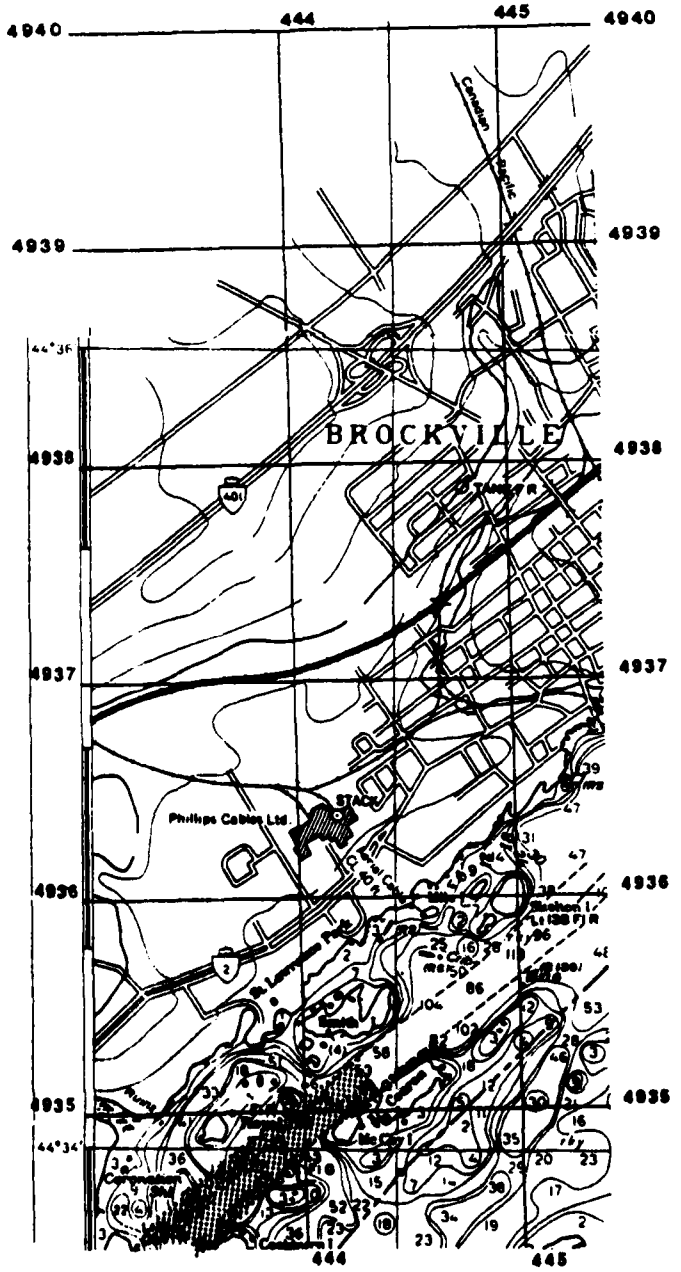


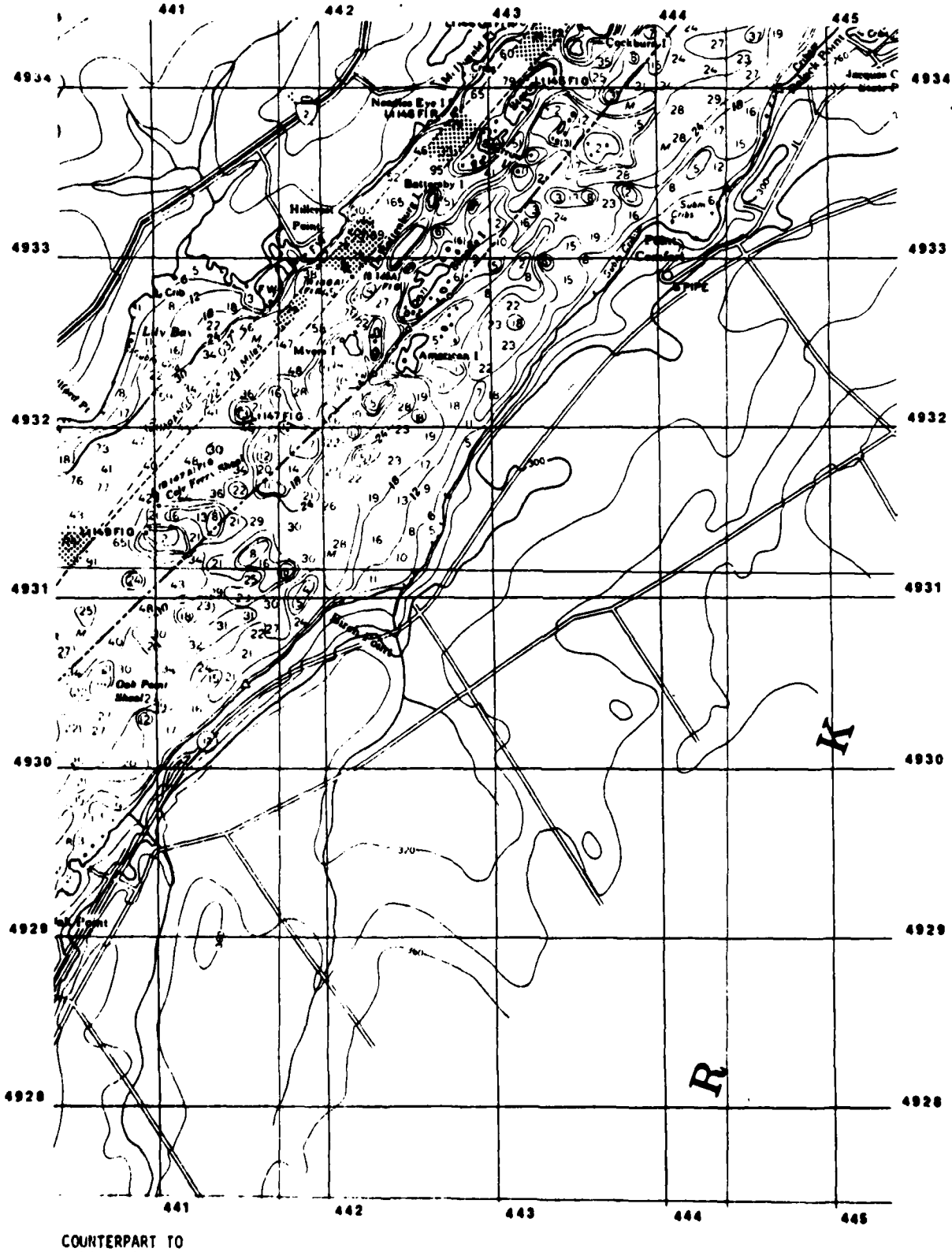
Fig. 1. (continued)

A

COUNTERPART TO MORRISTOWN

SOUNDINGS IN FEET

U. S. DEPARTMENT OF COMMERCE
NOAA–NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U.S. Courthouse, Detroit, Michigan 48226



C

COUNTERPART TO MORRISTOWN

SOUNDINGS IN FEET

Fig. 1. (continued)

104

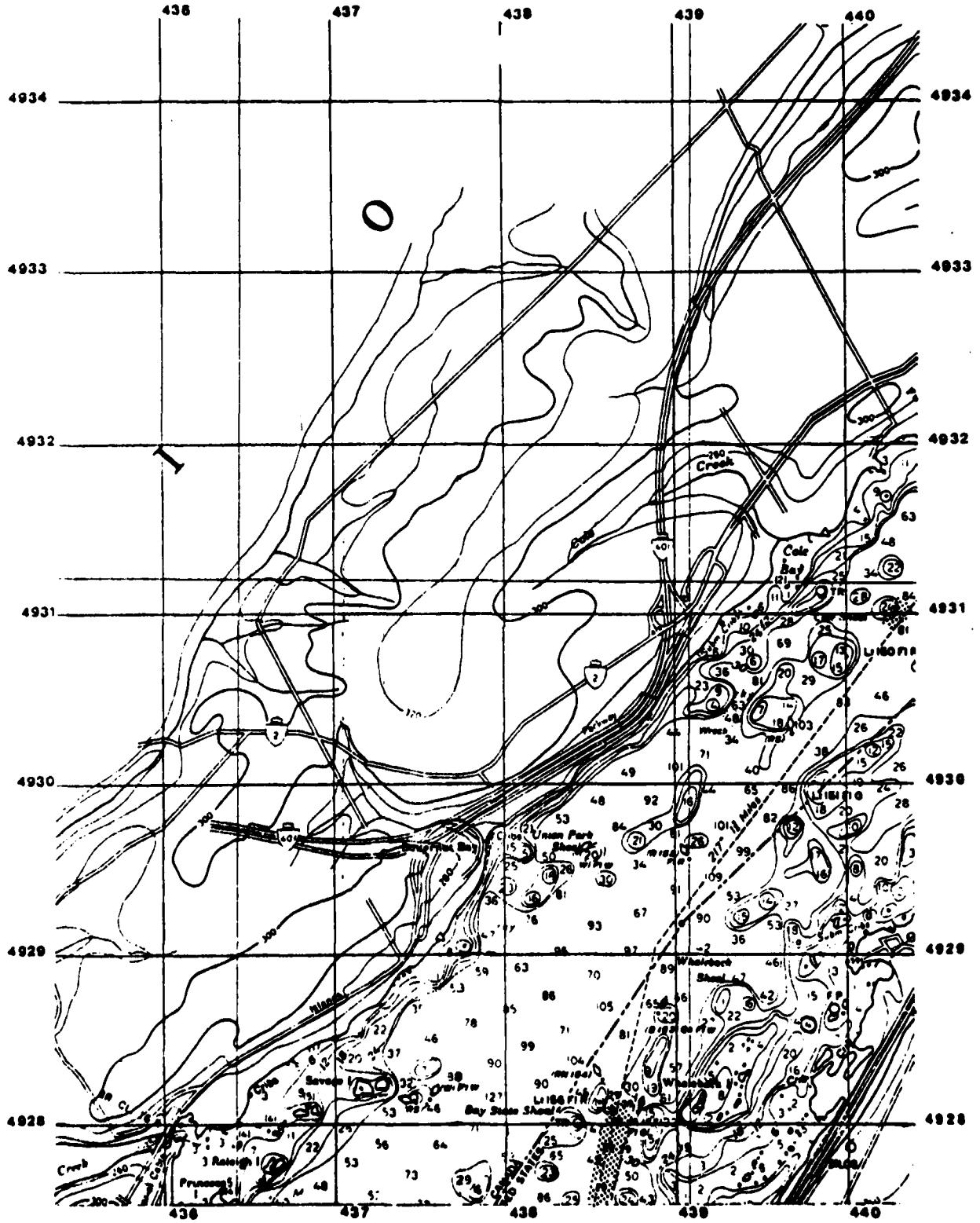
U. S. DEPARTMENT OF COMMERCE

NOAA-NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER

630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226

25th Ed., June 12/74

15



E

COUNTERPART TO MORRISTOWN

SOUNDINGS IN FEET

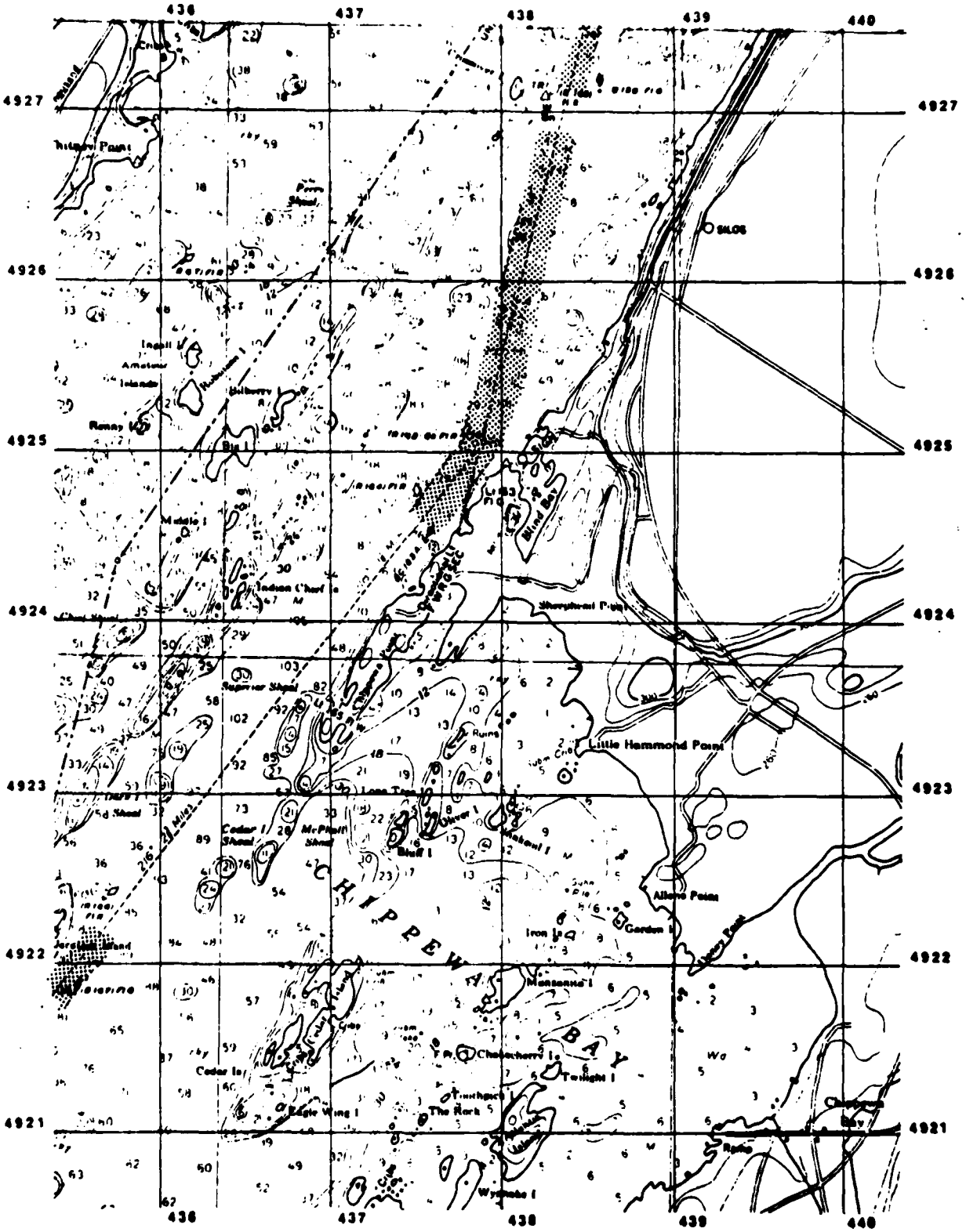
Fig. 1. (continued)

86

U. S. DEPARTMENT OF COMMERCE
NOAA-NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226

25th Ed., June 12/74

15



B

COUNTERPART TO CHIPPEWA BAY

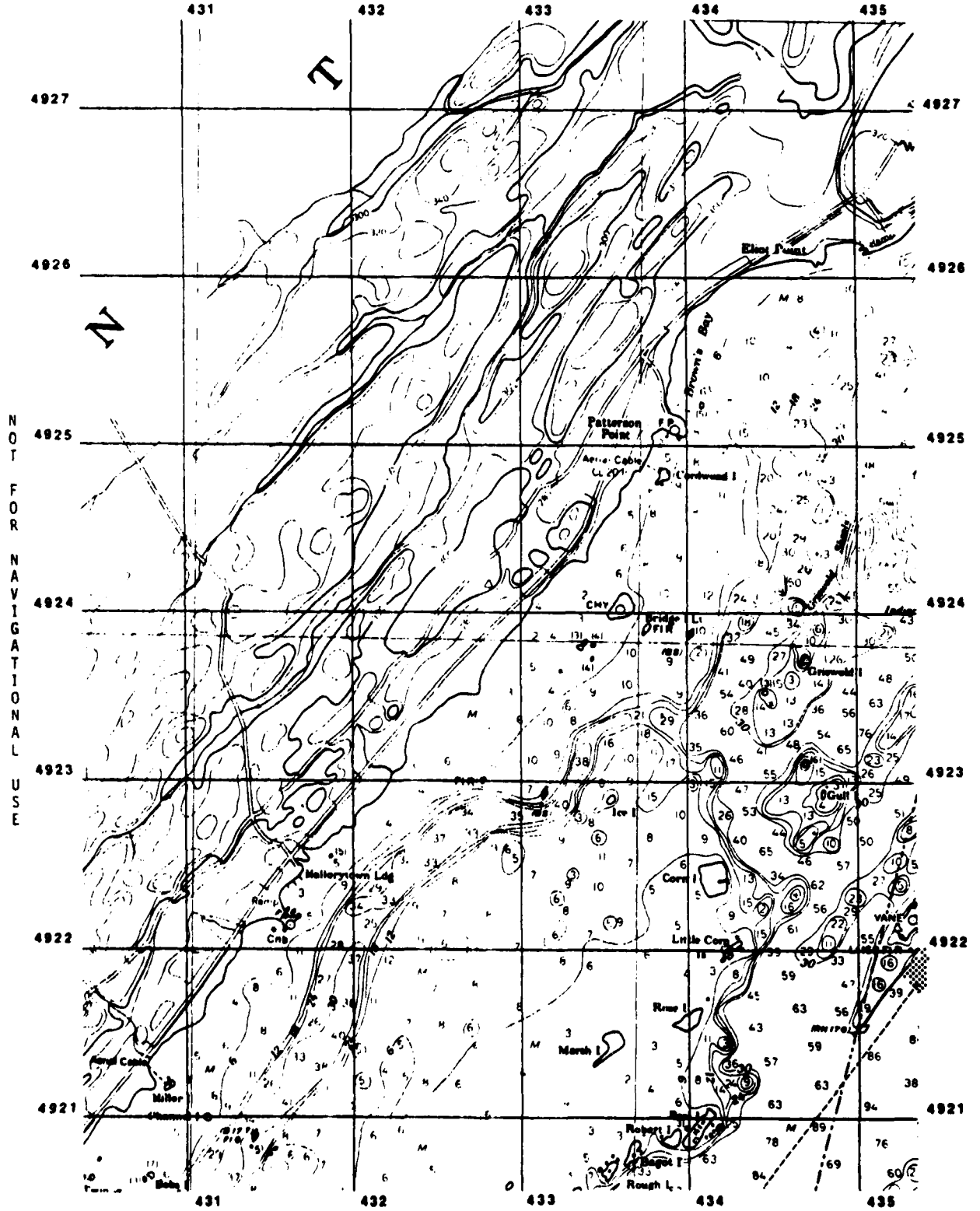
SOUNDINGS IN FEET

Fig. 1. (continued)

84

U. S. DEPARTMENT OF COMMERCE
NOAA–NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226

28th Ed., June 12/74
15



A

COUNTERPART TO CHIPPEWA BAY

SOUNDINGS IN FEET

Fig. 1. (continued)

U. S. DEPARTMENT OF COMMERCE
NOAA–NATIONAL OCEAN SURVEY, LAKE SURVEY CENTER
630 Federal Building and U. S. Courthouse, Detroit, Michigan 48226

25th Ed., June 12/74
15

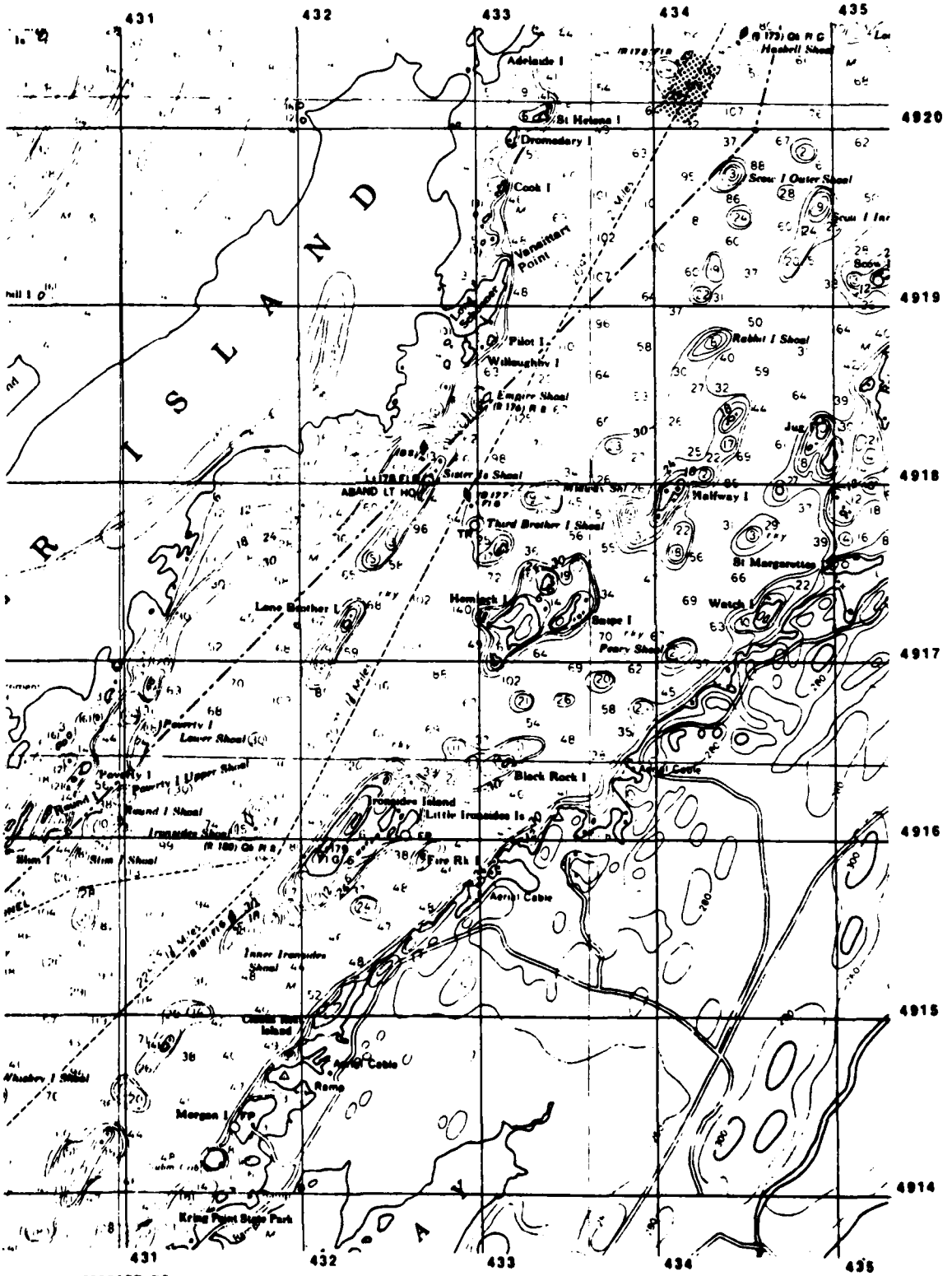


Fig. 1. (continued)

Published at Washington, D. C.
U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

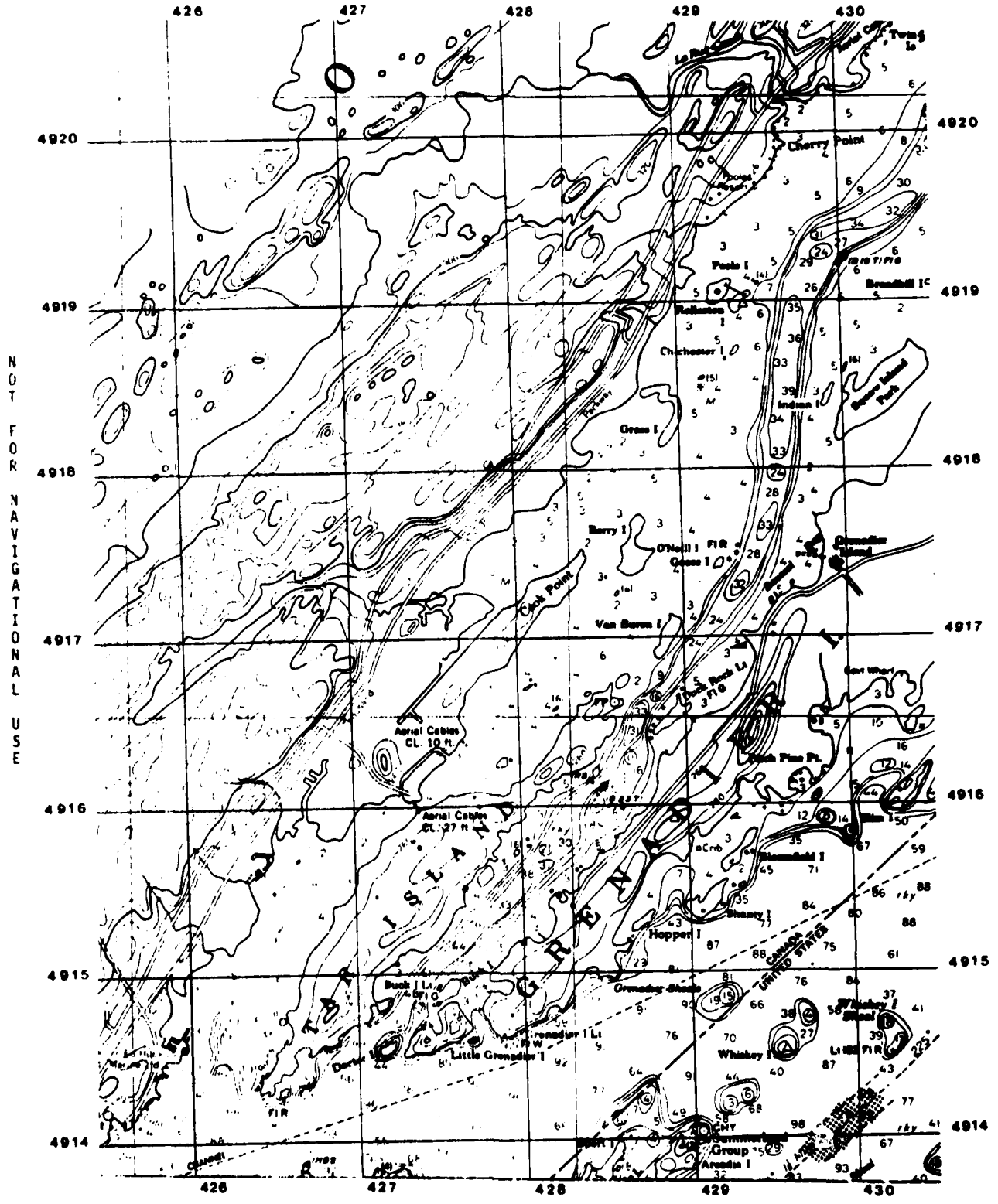


Chart Location

West of Chippewa Bay - Section "C"
North of Alexandria Bay - Section "B"

Fig. 1. (continued)

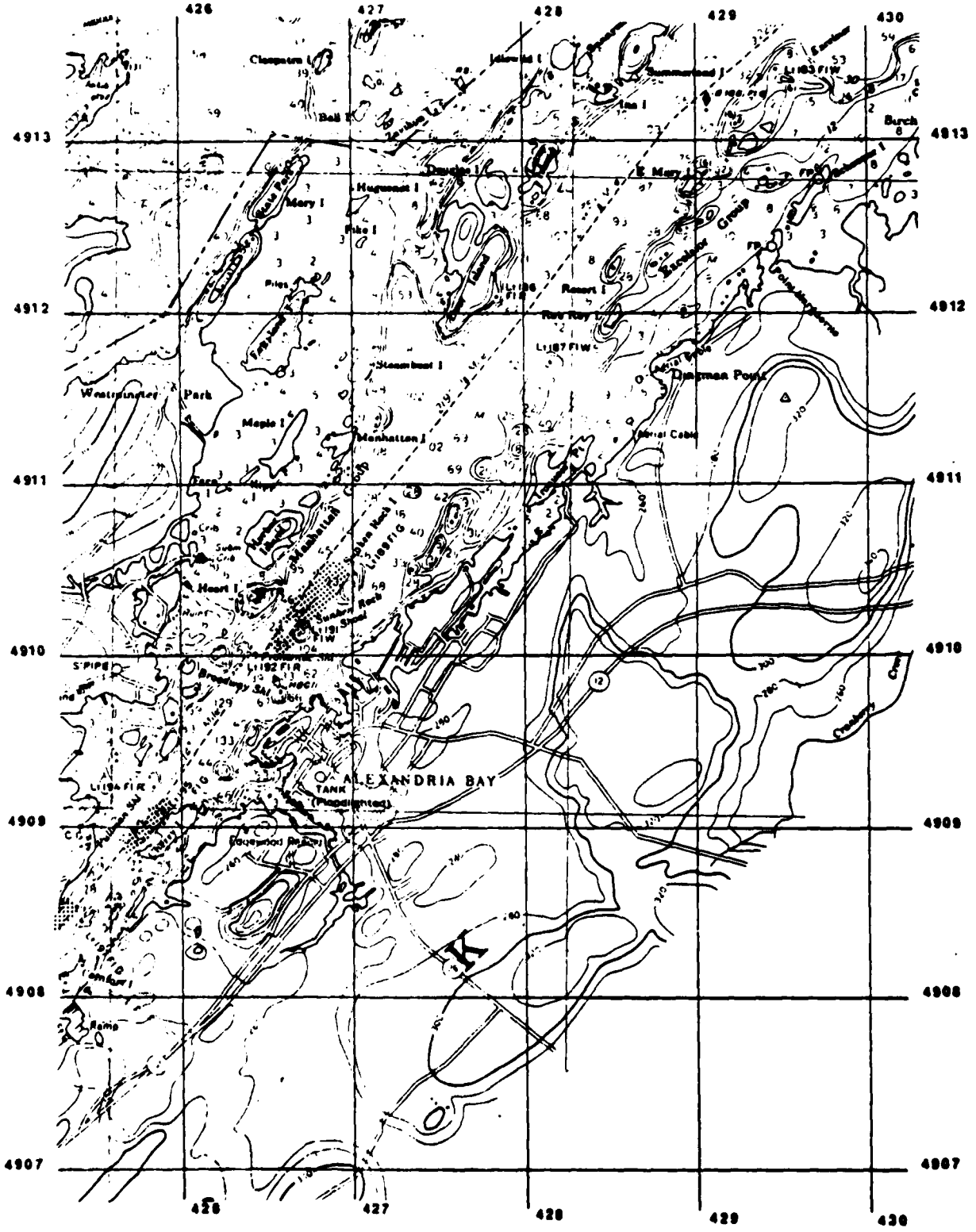
68

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

25th Ed., Aug 31/74

14766

(formerly LS 16)



B

COUNTERPART TO
ALEXANDRIA BAY

SOUNDINGS IN FEET

Fig. 1. (continued)

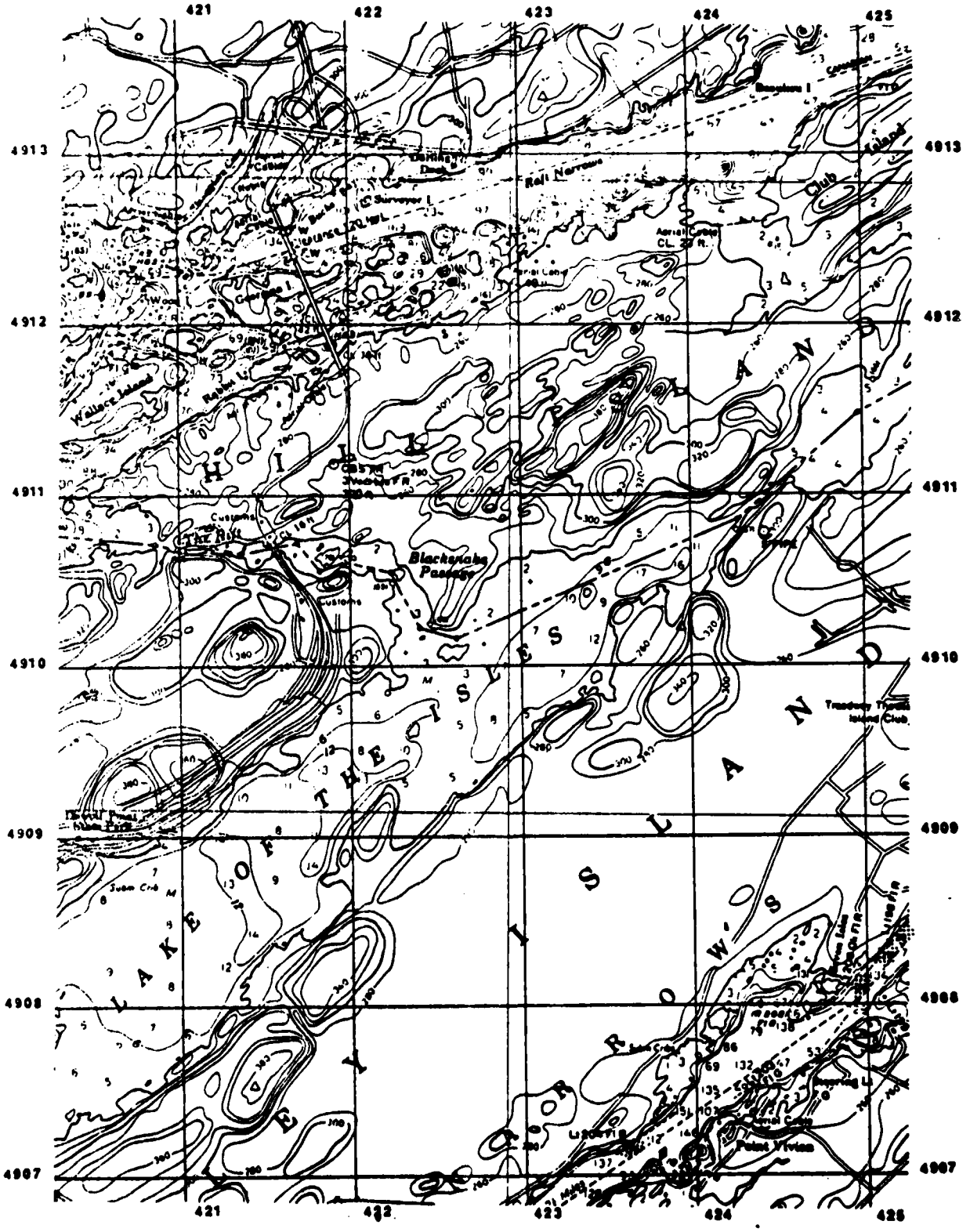
66

U. S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

25th Ed., Aug. 31/74

14766

(formerly LS 16)



A

COUNTERPART TO
ALEXANDRIA BAY

SOUNDINGS IN FEET

Fig. 1. (continued)

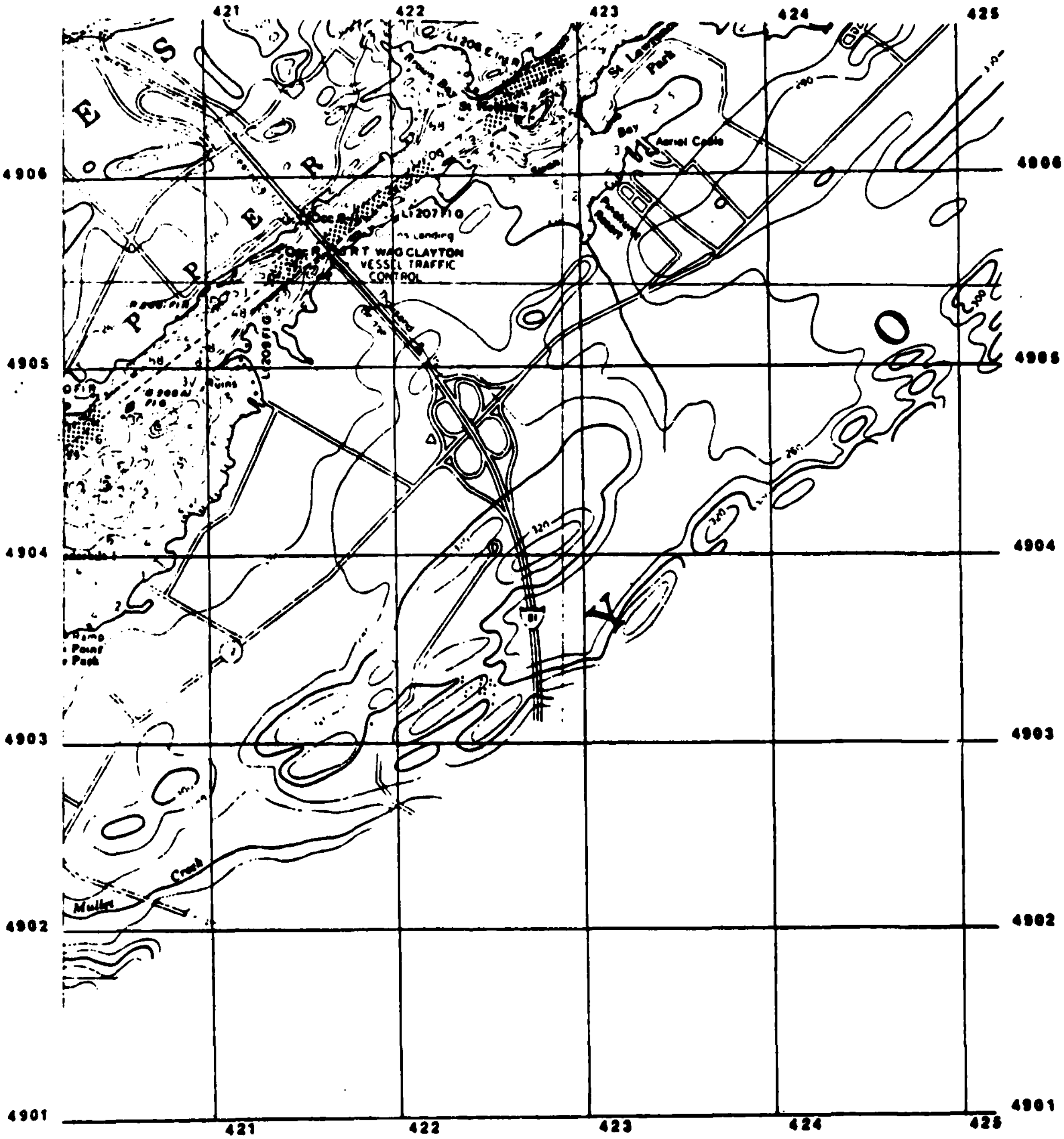
70

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

25th Ed., Aug. 31/74

14766

(formerly LS 16)



C

COUNTERPART TO
ALEXANDRIA BAY

SOUNDINGS IN FEET

Fig. 1. (continued)

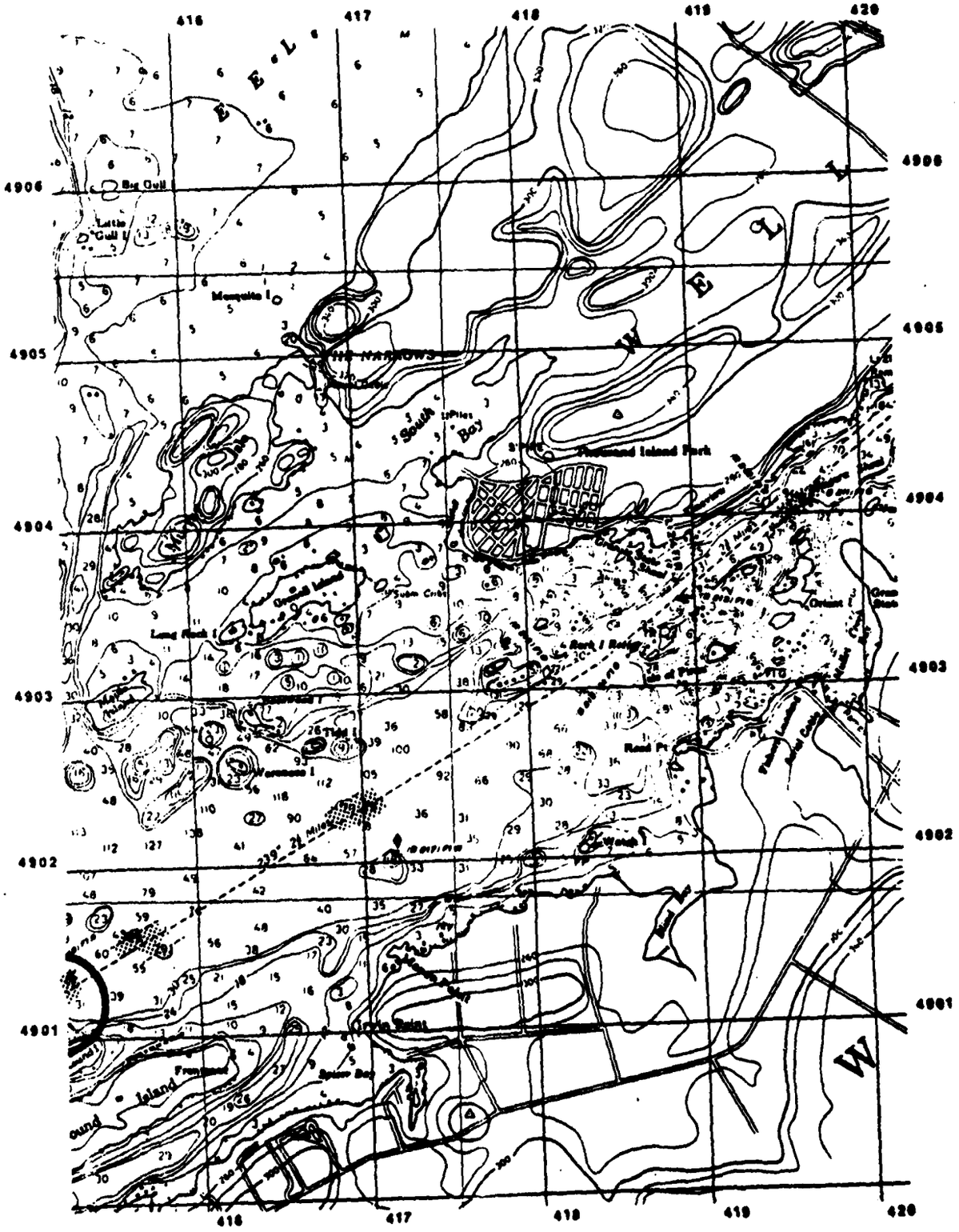
64

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

25th Ed., Aug. 31/74

14766

(formerly LS 16)



D

COUNTERPART TO THOUSAND ISLAND PARK

SOUNDINGS IN FEET

Fig. 1. (continued)

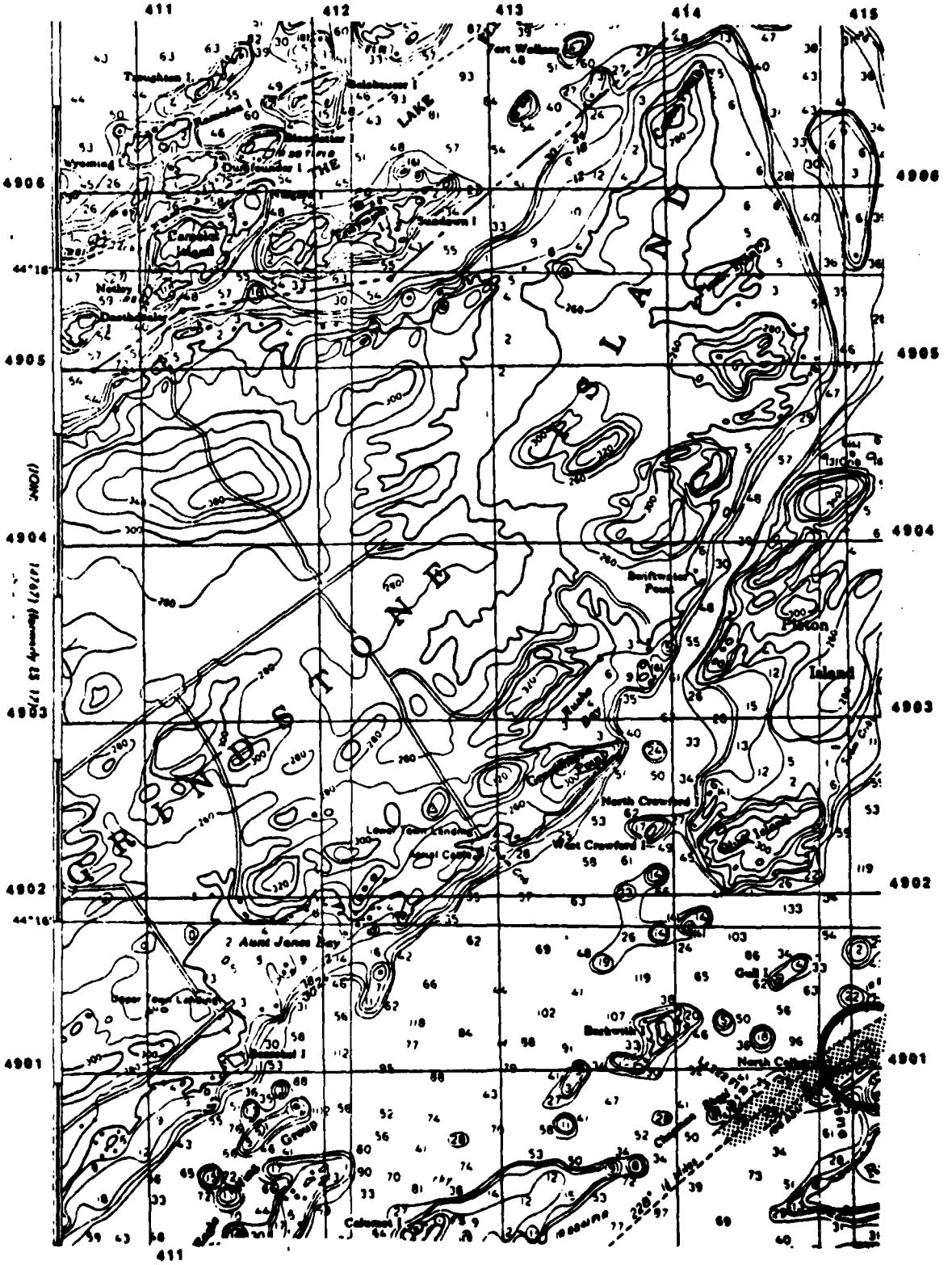
62

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

25th Ed., Aug. 31/74

14766

(formerly LS 16)



C

COUNTERPART TO
THOUSAND ISLAND
PARK

SOUNDINGS IN FEET

Fig. 1. (continued)

38

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

28th Ed., Aug. 31/74

14766

(formerly LS 16)

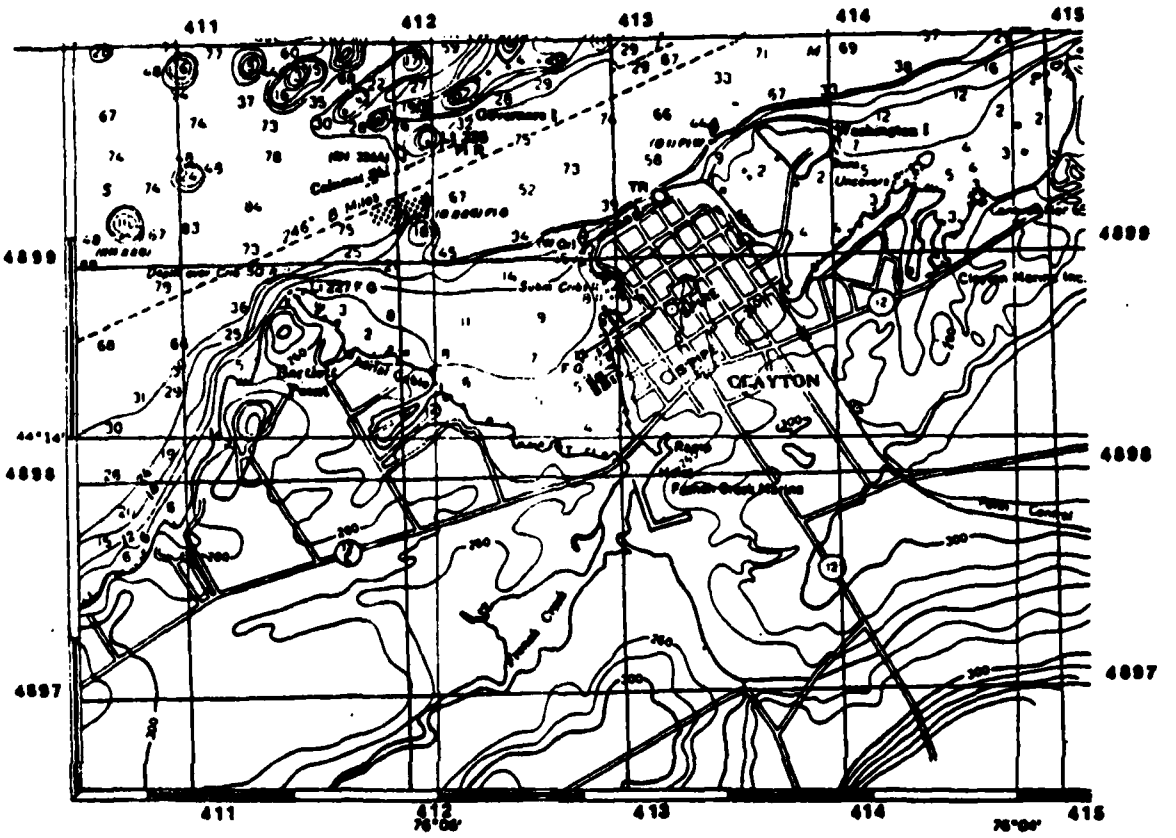
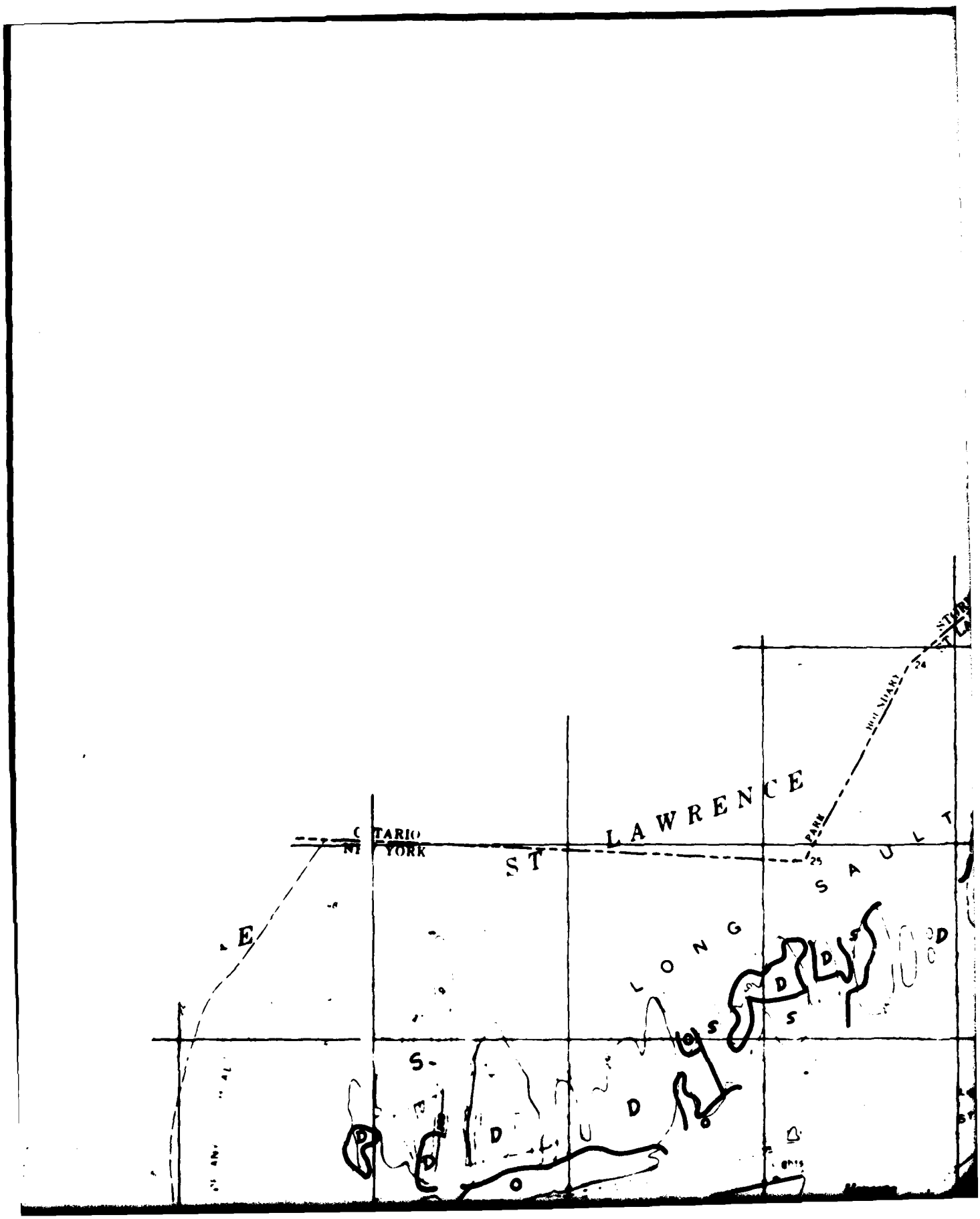


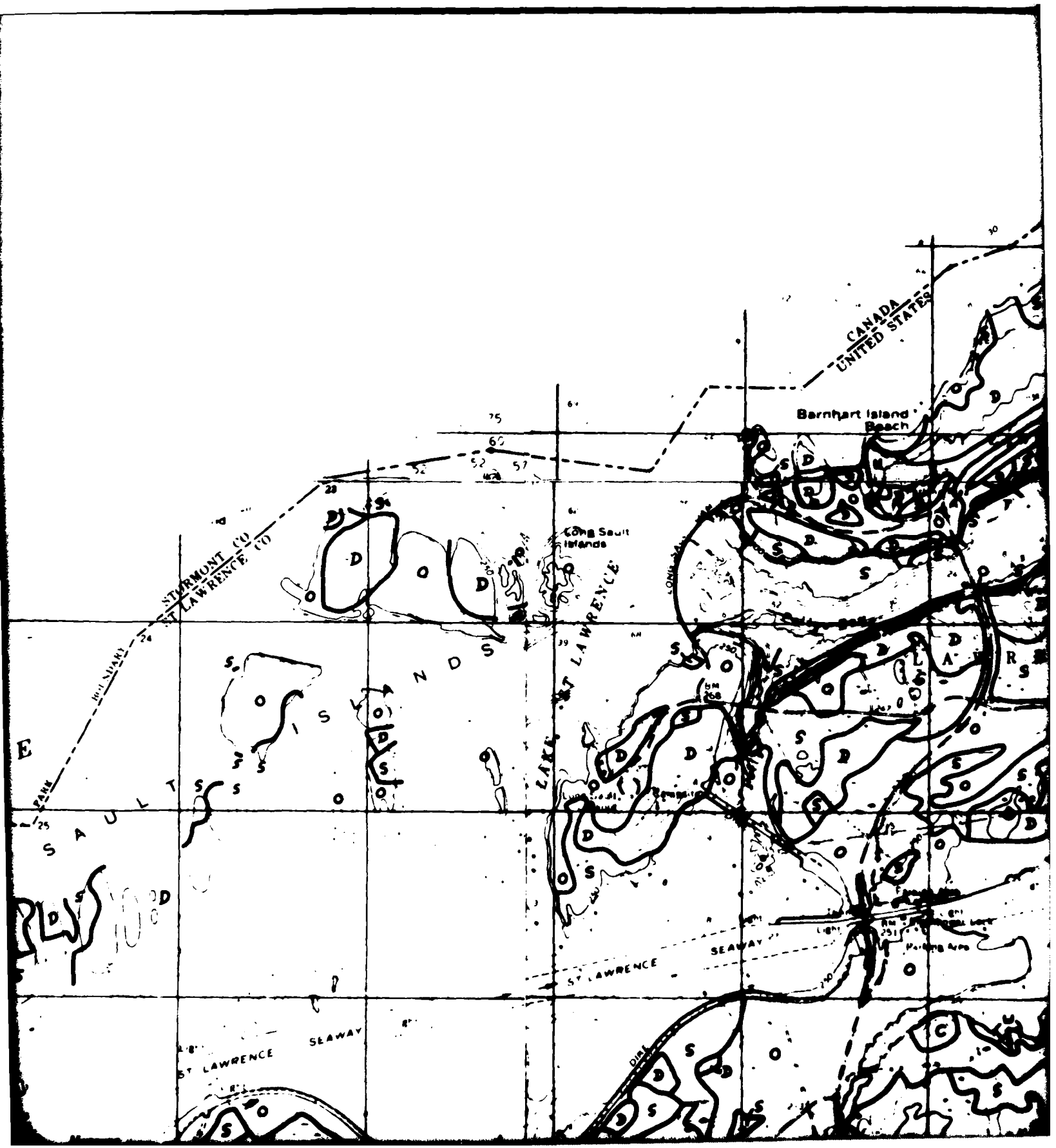
Fig. 1. (continued)

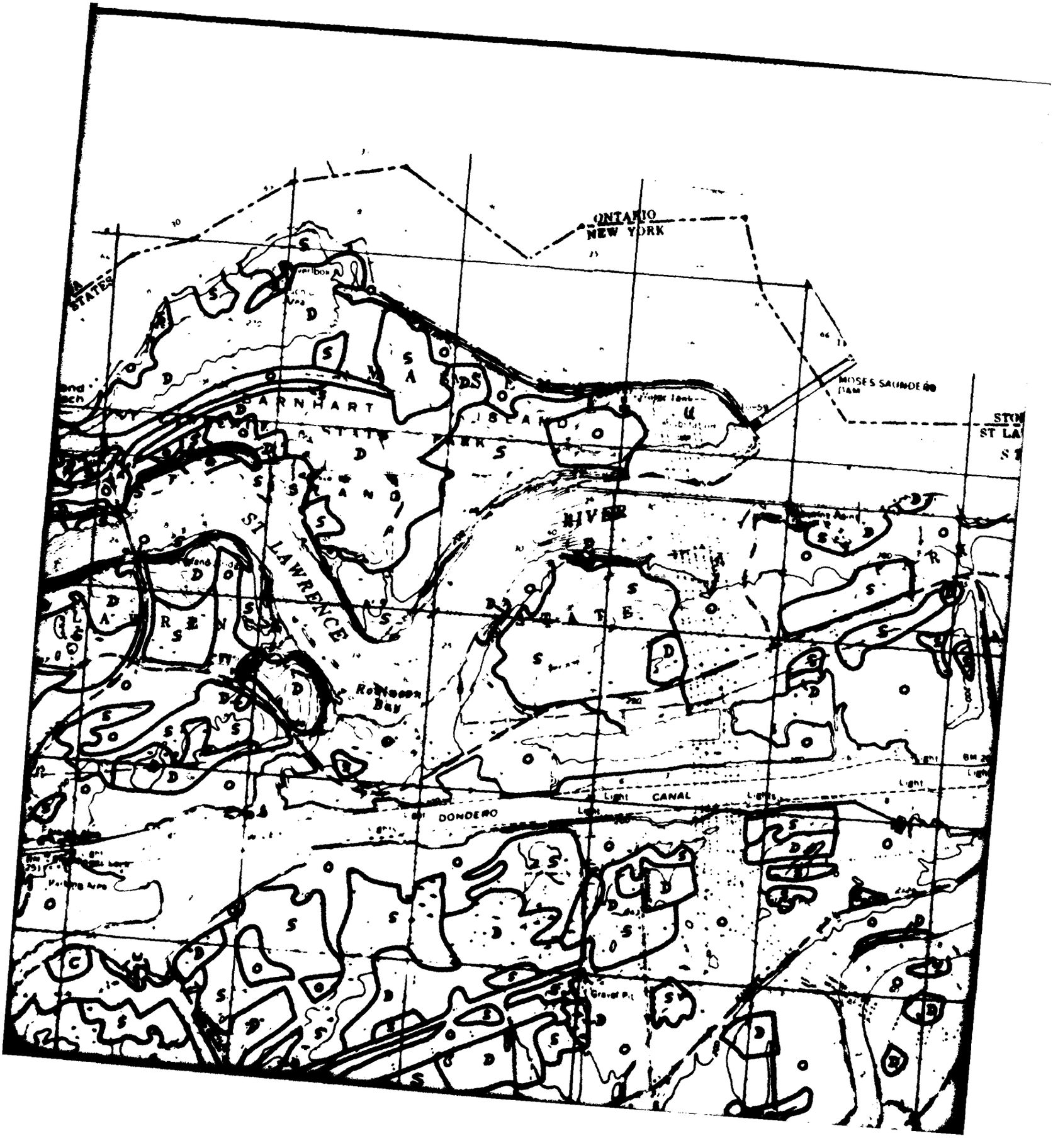
A

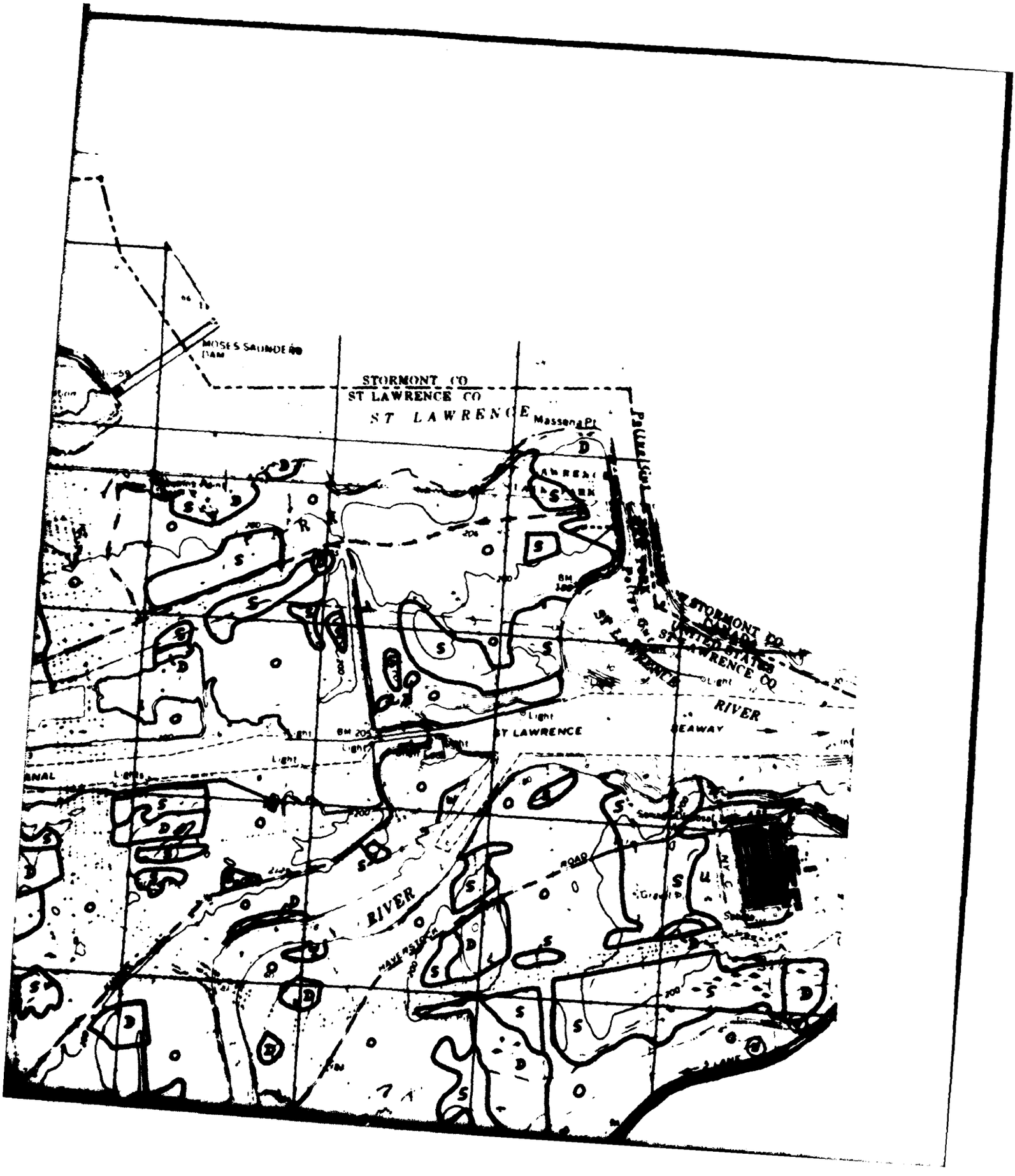
COUNTERPART TO CLAYTON

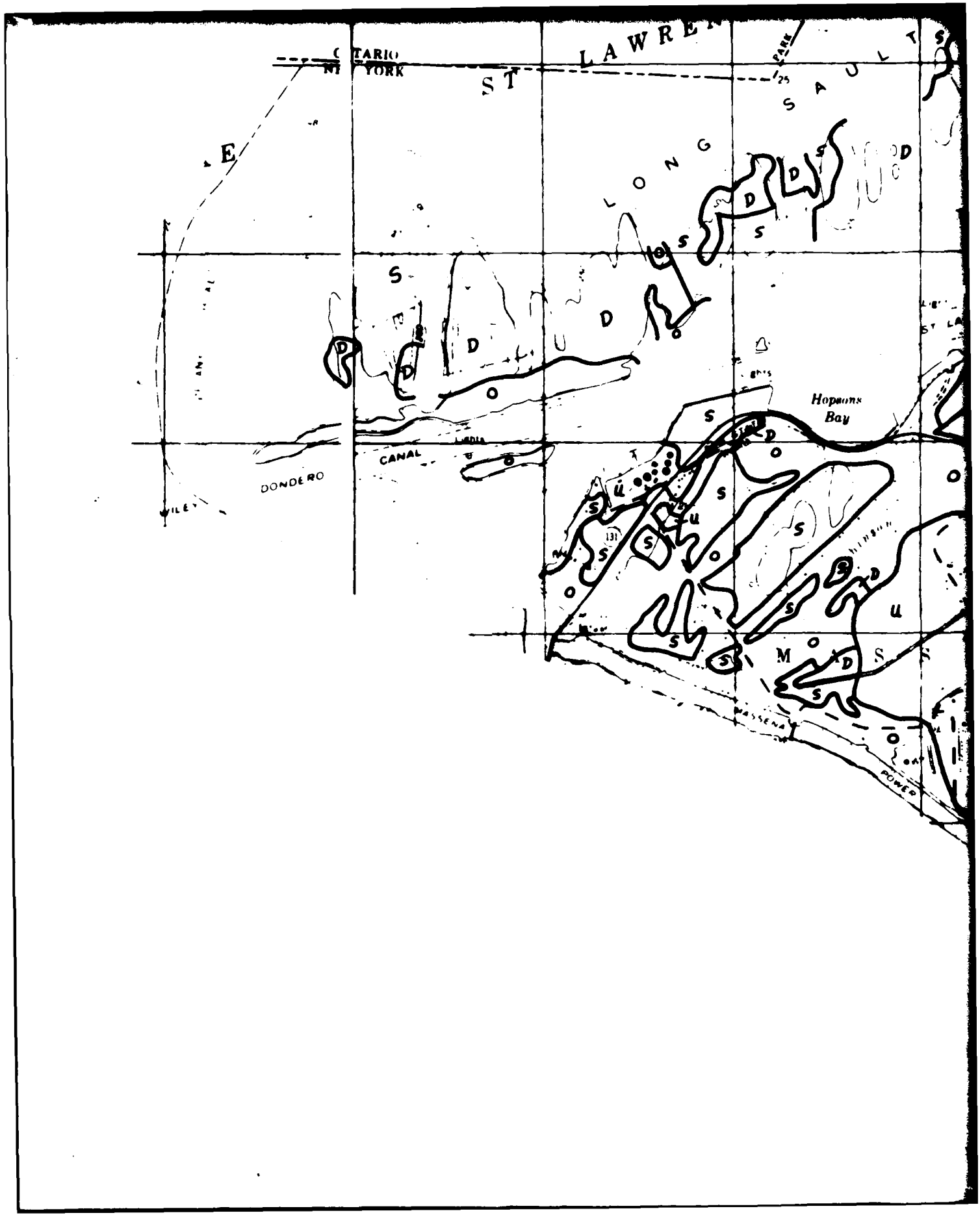
SOUNDINGS IN FEET

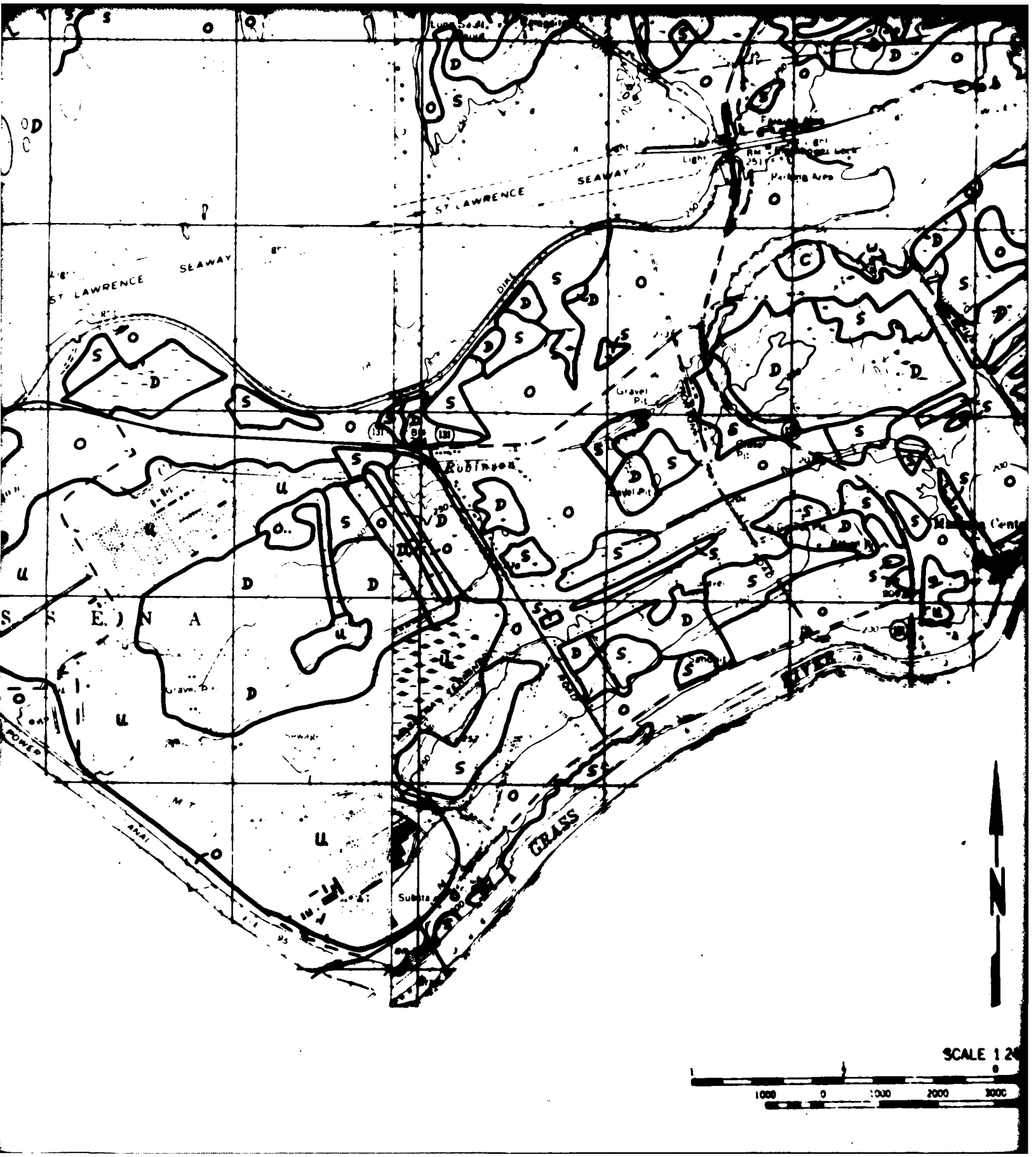

ONTARIO
NEW YORK
ST LAWRENCE
SAULT
LONG


CANADA
UNITED STATES
Barnhart Island
Beach
Long Sault
Islands
LAKE ST LAWRENCE
SEAWAY
ST LAWRENCE
SEAWAY
ST LAWRENCE


ONTARIO
NEW YORK
BARNHART ISLAND
ST LAWRENCE
RIVER
CANAL
DONDERO


MOSES SAUNDERS DAM
STORMONT CO
ST LAWRENCE CO
ST LAWRENCE
Massena Pt
UNITED STATES
RIVER
SEAWAY
ST LAWRENCE
RIVER
ROAD


ST LAWRENCE
SAULT
LONG
Hopkins Bay
CANAL
DONDERO
131
POWER


ST LAWRENCE SEAWAY
ST LAWRENCE SEAWAY
Robinson
Gravel Pit
Gravel Pit
S E N A
GRASS
RIVER
N
SCALE 1 2
1000 0 1000 2000 3000

LEGEND

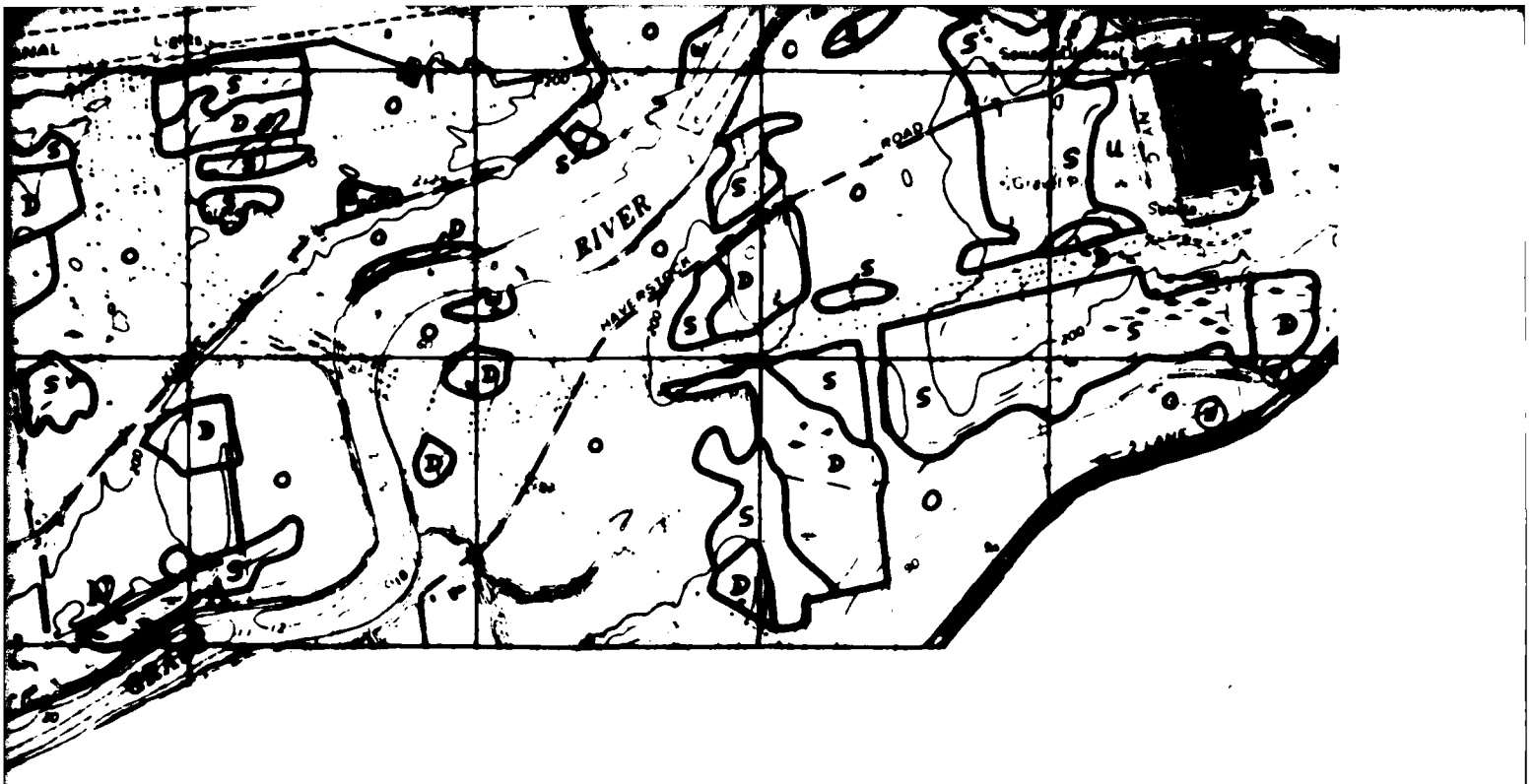
S --- Shrubland
D --- Deciduous forest
O --- Open field
C --- Coniferous forest
U --- Urban-Industrial
W --- Wetlands

N

SCALE 1 24000

0 1 MILE

1000 2000 3000 4000 5000 6000 7000 FEET



LEGEND

S --- Shrubland
D --- Deciduous forest
O --- Open field
C --- Coniferous forest
U --- Urban-Industrial area
W --- Wetlands

Figure 9 - Vegetation Map for the vicinity of the Eisenhower and Snell locks near Massena, N.Y. 1979.

DATE
FILMED
8