DRAFT ENVIRONMENTAL STATEMENT
HARBOR OF REFUGE

PORT ONTARIO
OSWEGO COUNTY, NEW YORK

U.S. ARMY CORPS OF ENGINEERS
BUFFALO DISTRICT

MARCH 1978

SUMMARY
HARBOR OF REFUGE
PORT ONTARIO
OSWEGO COUNTY, NEW YORK

(X) Draft Environmental Statement ( ) Final Environmental Statement

Responsible Office: U.S. Army Engineer District, Buffalo
1776 Niagara Street
Buffalo, NY 14207
Telephone (716) 876-5454

1. Name of Action: (X) Administrative ( ) Legislative

2. Description of Action: The proposed Harbor of Refuge plan hereafter referred to as Plan 4 recommended for Port Ontario, NY, would provide adequate refuge harbor facilities in the Mexico Bay region of eastern Lake Ontario. Anchorage space (within the anchorage basin) would be provided for about 20 boats in need of refuge during adverse weather conditions. Additionally, 30 more boats could be accommodated in the river entrance channel if the basin was filled to capacity. Two rubblemound breakwaters would be constructed at the mouth of the Salmon River to provide optimum entrance conditions. The south breakwater would be about 1,450 feet long and the north breakwater about 350 feet in length. Where necessary, the lake approach channel will be dredged to eight feet below LWD. The river channel and anchorage basin will be dredged to six feet below LWD. Recreational facilities include parking and breakwater access for sportsfishermen. Boating facilities include a wood open-pile public dock, and pumpout facilities.

3. Environmental Impacts: The proposed harbor of refuge improvements will provide protection and refuge harbor facilities for recreational boaters in the Mexico Bay region of eastern Lake Ontario during adverse weather conditions. Recreational sportfishing from the proposed breakwaters would be encouraged. The social well-being of the community and region would also be improved by the stimulation of the local economy.

Adverse Environmental Effects: During construction, noise, dust, odors, turbidity, and traffic created would have a short term effect on the surrounding environment. Recreational activities would be disrupted by construction activities. Approximately 9.62 acres of benthic habitat would be disturbed by navigation channel dredging activities, and an additional 2.18 acres of bottom habitat would be eliminated under the proposed harbor struction. About 5.7 acres of wetland would be dredged to provide channels and an anchorage basin.

4. Alternatives:

Plan 1: The Project Document Plan
Plan 2: The Definite Project Report Plan

Legislative (Cont'd)

Honorable John R. Zagame
Mr. Arthur Ospelt - Oswego County Legislator
Mr. Bruce Soule - Oswego County Legislator

Other

American Fisheries Society
Mr. J. Gordon Bentley
Central New York Regional Planning and Development Board
Ms. Betty J. Duxbury
Dr. John I. Green, St. Lawrence University
Mr. J.W. Harris, PE
Ms. Margherita E. Hull
Izaak Walton League of America
Mayor, Village of Pulaski
National Wildlife Federation
Niagara Mohawk Power Corporation
Onondaga Audubon Society
Oswego County Environmental Management Council
Oswego County Federation of Sportsmen's Clubs
Oswego County Health Department
Oswego County Planning Board
Oswego County Recreation Commission
Oswego Valley League of Women Voters
Pine Grove Beach Association
Pulaski Chamber of Commerce
Pulaski Village Planning Board
Richland Town Planning Board
Salmon River News
Sierra Club
Sport Fishing Institute
Supervisor, Town of Mexico
Vera Cruz Yacht Club

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1. PROJECT DESCRIPTION

1.01 Location - Port Ontario Harbor is located in Oswego County, New York at the mouth of the Salmon River. The harbor itself has direct access to the Mexico Bay region of the eastern end of Lake Ontario. The mouth of the Salmon River is about 19 miles northeast of Oswego Harbor and about 20 miles south of the entrance to Henderson Bay, the two nearest harbors of refuge for small craft. By road, Port Ontario is about 40 miles from Syracuse, New York and about 36 miles from Watertown, New York the two nearest metropolitan areas. A map of the Port Ontario region is shown on Plate 2.12.

1.02 Existing Harbor - At the present time Port Ontario is not operated or maintained as a Federal Harbor. The harbor is essentially natural and boater access from Lake Ontario into the harbor is at times severely hampered by formation of a sand and gravel bar at the mouth of the Salmon River. There are no public navigation facilities at Port Ontario Harbor. All docks and facilities used for recreational craft are privately owned. Local commercial facilities include several launching ramps, boat rentals, fuel, ice, parking, refuse collection, bait and tackle, mail service, a bar, sleeping accommodations, and berthing docks for about 50 boats. One launch ramp is State-owned and is located on Selkirk Shores State Park on the south bank of the Salmon River. The ramp is unimproved but considerable parking space is provided.

1.03 The Lighthouse Marina, located near the Salmon River outlet has berthing slips for 16 boats and rents 18 boats without motors. There are 17 docks on the north bank of the Salmon River, between the Lighthouse Marina and the Route 3 bridge, and 11 berthing slips on the south side of the Salmon River opposite the Lighthouse Marina. Public parking areas are inadequate and limited.

1.04 Current Difficulties Attending Navigation - Current difficulties attending navigation apply in general to both the regional eastern Lake Ontario and local Port Ontario Harbor situations. These difficulties include:

a. The lack of a suitable harbor of refuge for small craft cruising the Mexico Bay region between the Federally maintained project at Oswego Harbor and Henderson Bay, an open water distance of approximately 41 miles.

b. Lack of suitable public recreational navigation facilities at Port Ontario.

c. Shoaling at the mouth of the Salmon River.

a. Technical Criteria - The plan should be engineeringly feasible to build and maintain using conventional floating and land-based construction equipment. The plan when implemented should provide a safe entrance channel and harbor of refuge at Port Ontario Harbor. The harbor should remain open for the duration of the navigation season which in the Mexico Bay area usually extends from late spring to early fall of each year. Channel depths and widths should be adequate for most recreational boats currently operating and which are expected to operate on Lake Ontario in the future.

b. Economic Criteria - As Port Ontario Harbor is authorized as and considered a Harbor of Refuge, economic criteria are not required for justification of the project but are considered as part of the overall evaluation.

c. Environmental Criteria - The plan should avoid adverse effects on the natural environment, such as damage to wetlands and other wildlife habitat, and minimize water pollution. The plan should also avoid adverse effects on the human environment, such as presenting aesthetically objectionable features and the destruction of cultural resources, and should promote increased recreational opportunities and income stability.

1.07 Authorization - Authorization for the construction of a Harbor of Refuge at Port Ontario, New York was given in Section 2 of the River and Harbor Act (P.L. 14, 79th Congress, 1st Session), approved 2 March 1945, in accordance with plans and conditions set forth in House Document No. 446, 78th Congress, 2nd Session.

1.08 Authorized Plan of Improvement - The authorized plan of improvement, as described in the authorizing document and illustrated on Plate 6.2 provided for:

a. Two parallel jetties 200 feet apart, the north and south jetties 915 feet and 735 feet long, respectively, with pile wall connections to shore 280 feet and 470 feet long, respectively;

b. An entrance channel 100 feet wide and 10 feet deep, from deep water in the lake to a point about 400 feet upstream from the inner end of the north jetty;

c. An inner channel, 100 feet wide and 8 feet deep, from the inner end of the entrance channel to a point about 1,800 feet upstream; and

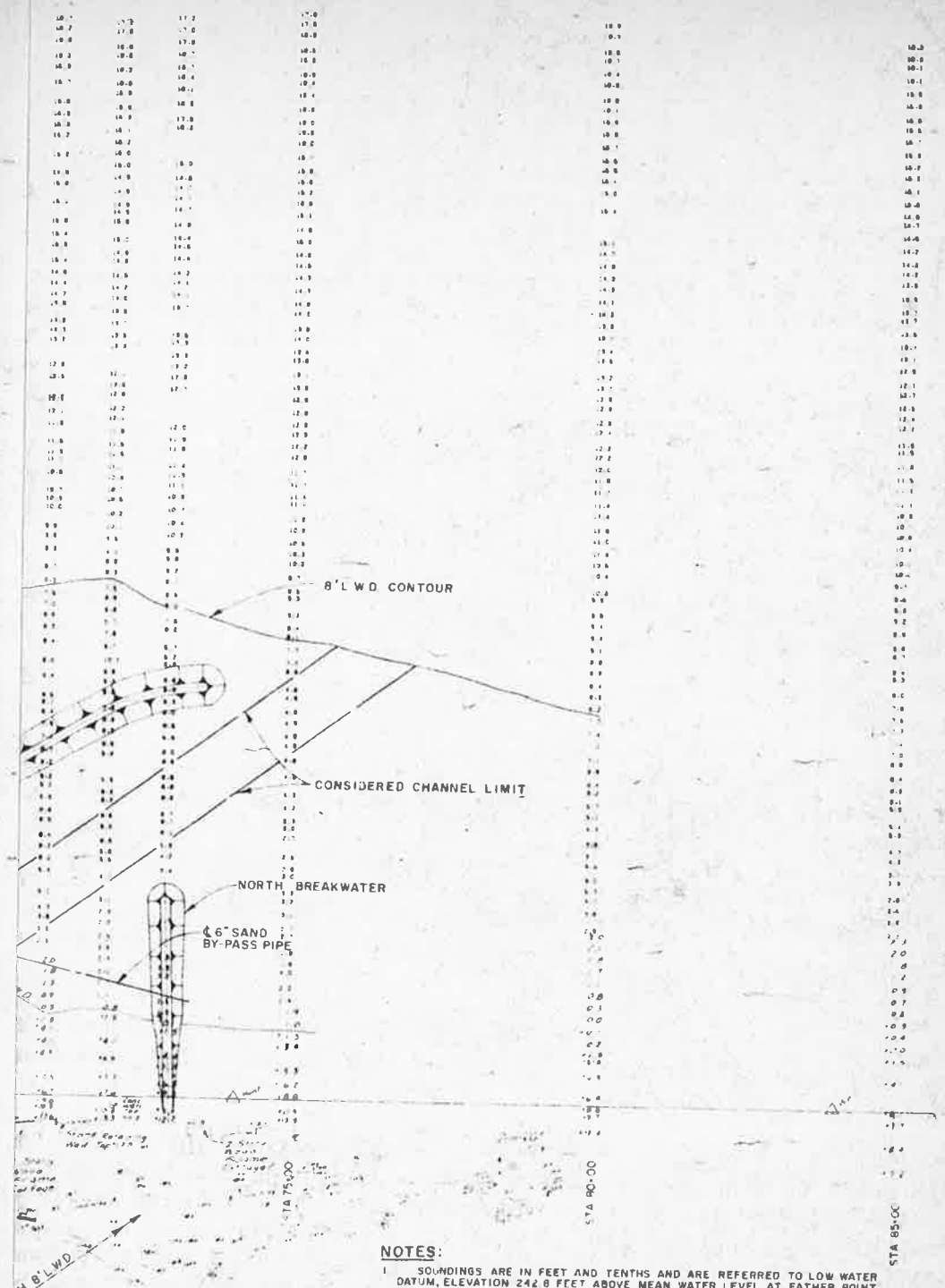
d. A harbor basin generally 400 feet wide; ranging in length from 900 feet to 600 feet, and eight feet deep, upstream from the inner channel; and

Permanent installation of the pipe is considered advisable to provide a convenient use of a portable pump that could be quickly mobilized and transported to the site for pumping the material when appropriate. The tops of the breakwaters would be smooth capped with concrete and provided with guard rails for safety of fishermen and other users.

1.13 The dimensions of the entrance channel, river channel, and anchorage basin are based upon several factors. The depths are based on the type and characteristics of recreational craft now cruising the lake and upon the desire of the U.S. Environmental Protection Agency that excessive dredging be avoided. EPA recommended depths of six feet in the river channel and eight feet in the entrance channel (see letter of 19 May 1976). Due to lack of sufficient data on vessel drafts of Lake Ontario craft no analysis was made. However, existing levels of Lake Ontario average one to two feet or more above LWD (Low Water Datum) effectively creating channel depths of 9+ feet in the entrance channel and 7+ feet in the river channel. Such depths are considered more than adequate for almost all vessels currently cruising Lake Ontario. Channel width in the entrance channel and river are the minimum required to carry the amount and frequency of traffic expected after the onset of a lake storm when craft seek convenient, safe, and easy access to a refuge basin. The size of the anchorage basin is based upon the number of cruising and transient craft that would seek refuge during a lake storm. A local marina operator furnished information on the maximum size and number of cruising and transient craft that could be expected to seek refuge and estimated from his observations that 20 boats ranging in size from 26 to 40 feet in length could be expected. Additionally the river channel could also be used for temporary anchorage and refuge should more boats seek refuge. The alignment of the river channel was carefully selected to avoid excessive dredging, particularly of any wetlands, and to avoid disturbing the stability of shore structures.

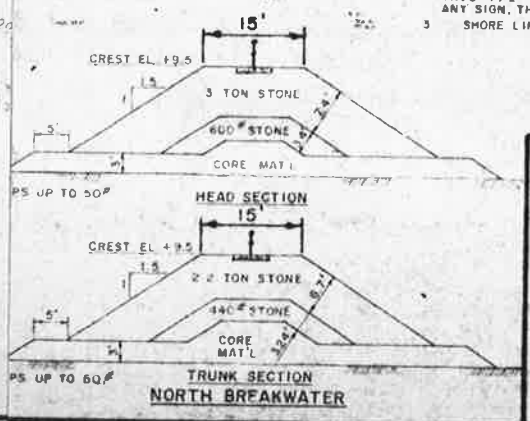
1.14 The effect of the hydroelectric power plant, about 14.5 miles upstream of the mouth, was tested in the harbor model at WES. Various flows were simulated to develop a clear understanding of how the normal daily flow of 1,500 cfs would affect navigation and how greater flows up to 15,000 cfs would affect shoaling and pass through the opening between breakwaters. The regulated flows serve to mitigate stagnation that might otherwise result from construction of solid fill, shore connected breakwaters. Thus, the influence of the power plant is part of the basis for design of the project plan.

1.15 Selected Plan, Introduction - Alternative 4, the selected plan, would consist of two shore connected rubblemound breakwaters at the mouth of the Salmon River; an entrance channel through the breakwaters; and an inner channel leading to a turning and anchorage basin in the lower river. Included as part of the plan would be north and



NOTES:

1. SOUNDINGS ARE IN FEET AND TENTHS AND ARE REFERRED TO LOW WATER DATUM, ELEVATION 242.8 FEET ABOVE MEAN WATER LEVEL AT FATHER POINT, QUEBEC (1GLD 1955).
2. HEIGHTS ABOVE LOW WATER DATUM ARE INDICATED WITH A PLUS SIGN, THUS +12. DEPTHS BELOW LOW WATER DATUM ARE INDICATED WITHOUT ANY SIGN, THUS 2.3.
3. SHORE LINE, WHERE SHOWN ON DRAWING, IS AT L W D.



NORTH BREAKWATER

PORT ONTARIO HARBOR, NEW YORK
HARBOR OF REFUGE
CONSIDERED IMPROVEMENTS
ALTERNATIVE 4
U.S. ARMY ENGINEER DISTRICT, BUFFALO

PLATE 1.1

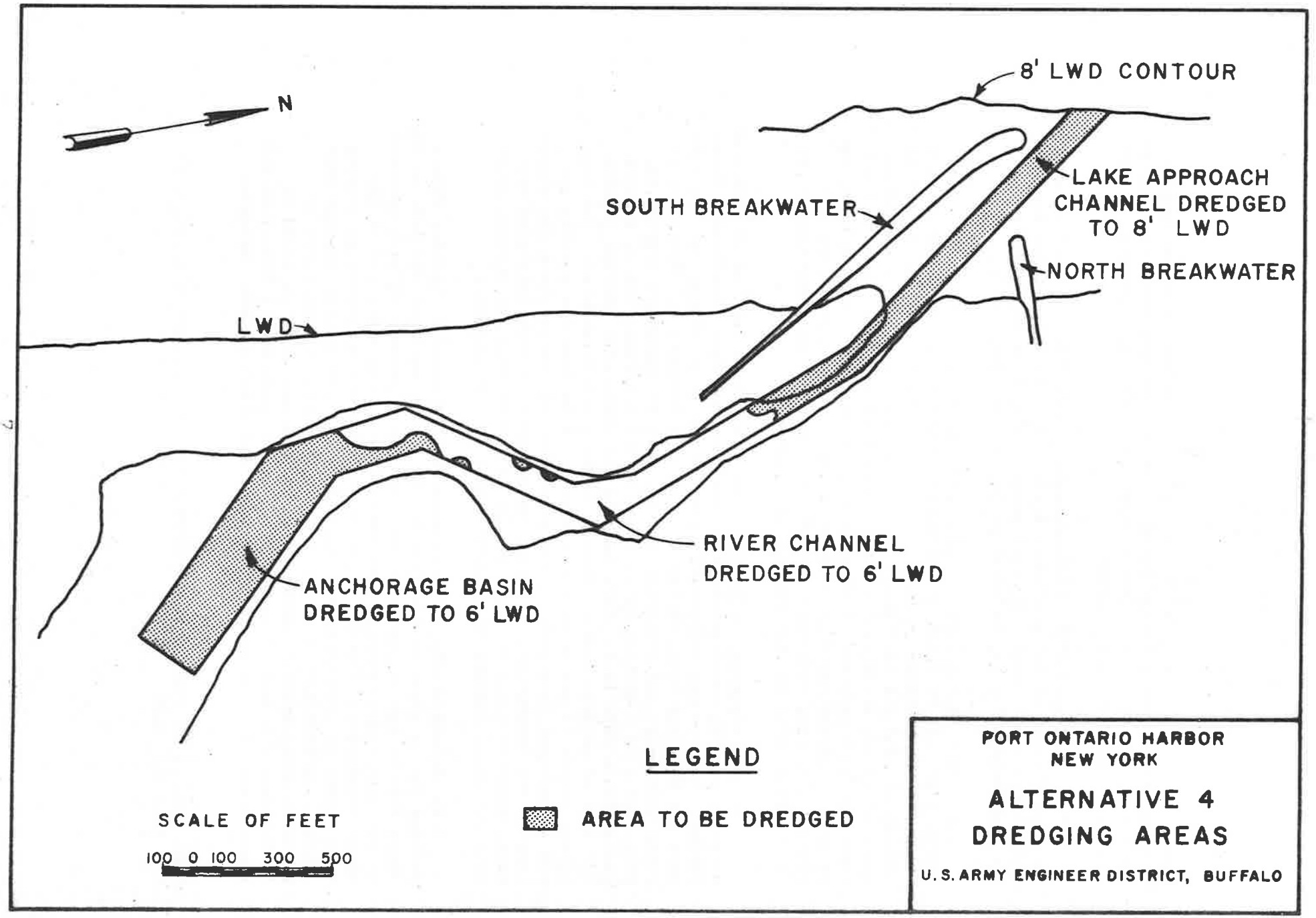

8' LWD CONTOUR
N
SOUTH BREAKWATER
LAKE APPROACH CHANNEL DREDGED TO 8' LWD
NORTH BREAKWATER
LWD
RIVER CHANNEL DREDGED TO 6' LWD
ANCHORAGE BASIN DREDGED TO 6' LWD
LEGEND
AREA TO BE DREDGED
SCALE OF FEET
100 0 100 300 500
PORT ONTARIO HARBOR
NEW YORK
ALTERNATIVE 4
DREDGING AREAS
U.S. ARMY ENGINEER DISTRICT, BUFFALO

PLATE 1.2

pumpout and toilet facilities would also be provided as part of the overall project.

1.24 Project Construction - Construction of the proposed project will take approximately two years. In accordance with the recommendations of the New York State Department of Environmental Conservation in a letter dated 15 November 1977, construction will be restricted to the periods between the months of July and December. Assuming no delays to current schedules, plans and specifications should be completed for the project by October 1979. Construction should begin sometime in 1980 and be completed by October 1981.

1.25 Environmental Protection and Mitigation - To help mitigate environmental impacts on soil and vegetation in the proposed project area, beautification improvements will be included in the proposed plan where necessary. Such disturbed terrain will be planted with a herbaceous seed mixture, and/or trees and shrubs adaptable to growing conditions in the area, as needed, to help minimize soil loss on disturbed lands. During construction, the Contractor will be required to minimize temporary environmental impacts such as noise, dust, and water turbidity, in accordance with the procedures and regulations outlined in the Civil Works Construction Guide Specification for Environmental Protection (CE-1300, June 1973). In order to insure that these procedures and regulations are properly implemented, after construction has been completed, annual inspections will be conducted by the Corps to check on the operation and maintenance of the project.

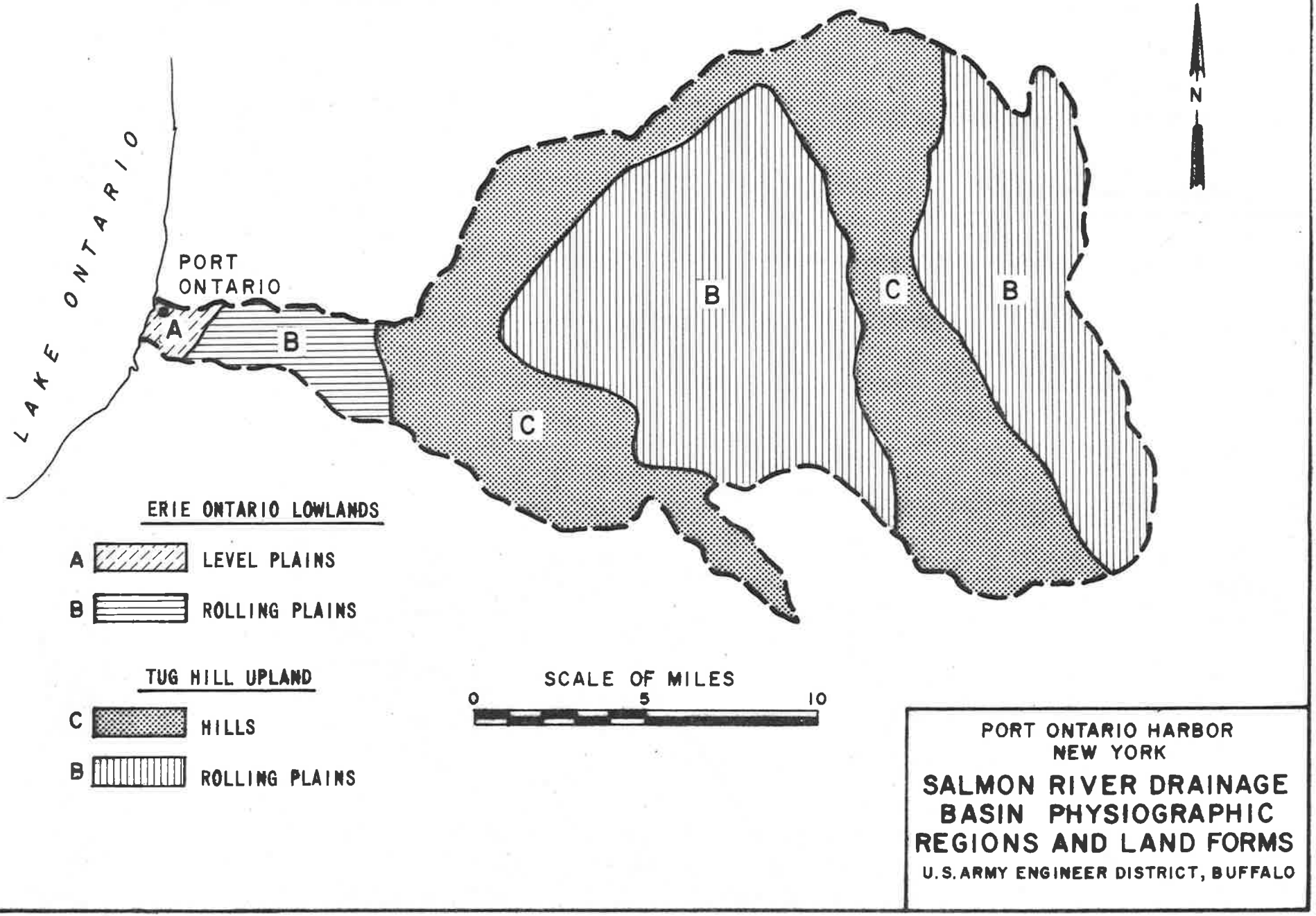
1.26 The Contractor will be required to have water-tight equipment, including coamings, which must be maintained in order to prevent spillage of oils and excavated materials. In addition, the Contractor will be required to prevent or control siltation, air pollution, erosion, spillage (including accidental), disposal, turbidity and maintenance of any pollution control facilities deemed necessary for the duration of the project.

1.27 Project Maintenance and Monitoring - Maintenance of the navigation facilities, including breakwaters, channels and aids to navigation will be the responsibility of the Federal Government. Maintenance of recreational features of the project, including breakwater fishing facilities, parking lots, the public wharf and associated sanitary facilities will be the responsibility of the local cooperator.

1.28 Local Assurances - The items of local cooperation required for construction of a harbor of refuge at Port Ontario, NY, are defined in House Document No. 446, 78th Congress, 2nd Session. The items of local cooperation are based upon plans and conditions of the authorized plan of improvement. The plan selected in this reformulation study, Plan 4, is somewhat different than the authorized plan and requires

Recreation, will be required to furnish a lump sum apportionment of $211,300 based upon the original authorization in addition to costs for lands and damages currently estimated at $42,000 and costs for the public wharf, currently estimated at $137,000. As Port Ontario is authorized as a harbor of refuge, benefit/cost (B/C) ratios are not required in the overall justification of a plan. However, B/C ratios have been provided for the selected plan (B/C = 2.08) and the other alternatives considered (see Section 6), to demonstrate the overall benefit potential for each plan considered.

1.31 Total annual maintenance costs based on October 1977 price levels are estimated at $44,300. The Federal Government will be required to pay annual costs of repairs and maintenance of breakwaters and channels ($37,000 annually), and aids to navigation ($800 annually). The local cooperator will be required to pay costs of maintenance of recreational facilities estimated to be $6,500 annually.



PORT ONTARIO HARBOR
NEW YORK

SALMON RIVER DRAINAGE BASIN PHYSIOGRAPHIC REGIONS AND LAND FORMS

U.S. ARMY ENGINEER DISTRICT, BUFFALO

PLATE 2.1

2.05 The Salmon River (Stillwater) Reservoir dams the Salmon River in northeastern Oswego County. The Reservoir is used primarily for hydro-electric power generation by the Niagara Mohawk Power Corporation. Its level fluctuates between 910 and 935 feet and storage is over 17,000 million gallons of water. The lower reservoir, known as the Lighthouse Hill Reservoir, has a spillway elevation of 651 feet. Between the upper reservoir and the lower reservoir, the river drops 286 feet in about one-half mile. Plate 2.3 illustrates the entire Salmon River Watershed. (1,2)

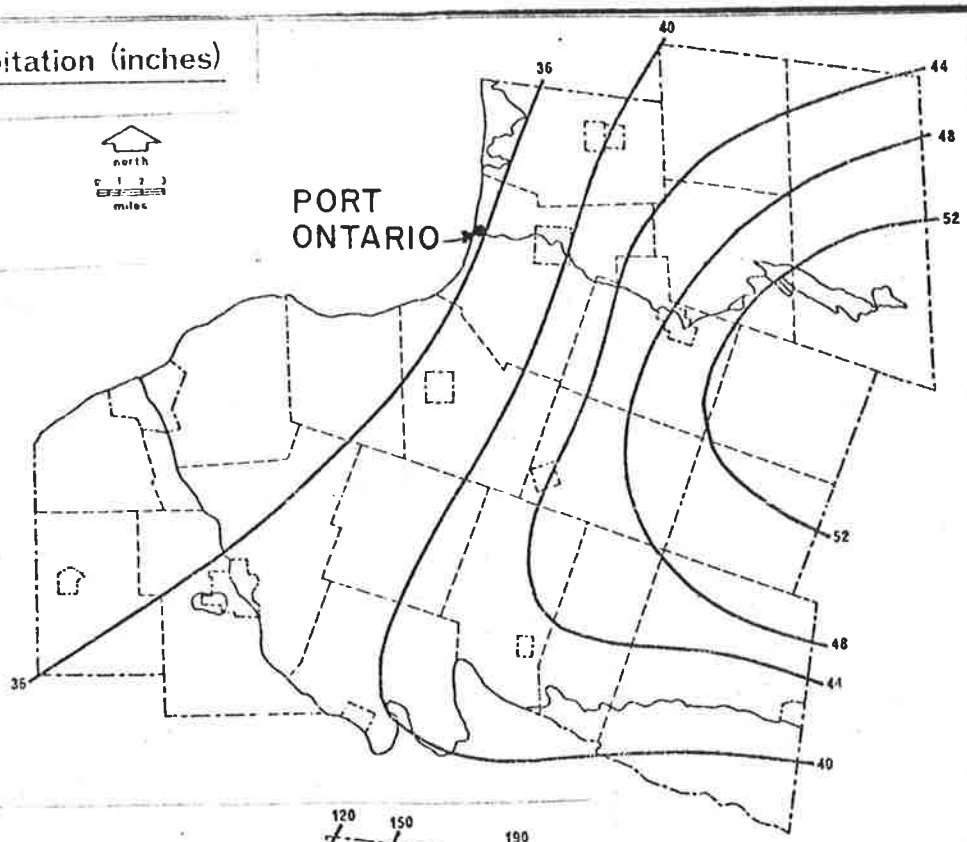
2.06 Climate - Port Ontario, located in Oswego County, NY experiences rather rigorous variable weather conditions, but its climate is generally considered to be humid continental in nature. A variety of air masses including: continental polar and continental arctic masses (originating in Canada), maritime tropical air masses (originating in the southeast Atlantic and Gulf of Mexico), and maritime polar masses (originating in the north Pacific and north Atlantic Oceans), dominate the climate and weather of the Port Ontario area at different times of the year. Port Ontario's close proximity to Lake Ontario has additional effects on the local climate particularly during the cold half-year when the Lake serves as a source of heat and moisture for the cold, dry polar continental air masses. Oswego County lies in the eastern Lake Ontario snowbelt where the lake, terrain and prevailing air flows tend to concentrate snowfall.

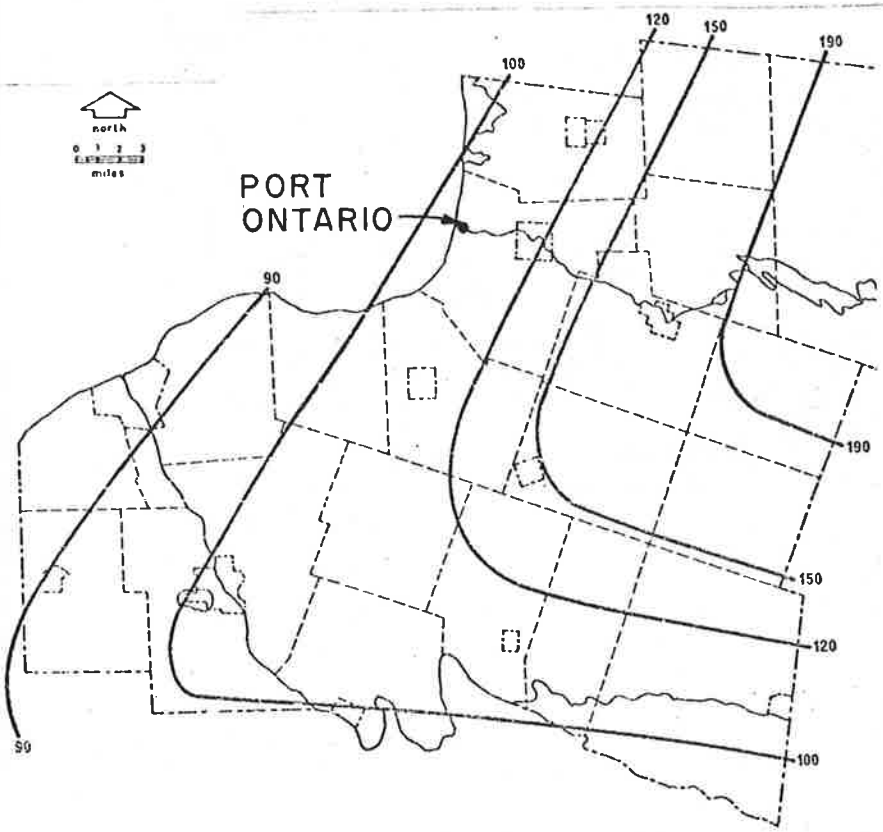
2.07 Mean annual precipitation at Port Ontario is about 35 inches while average annual snowfall is about 100 inches. At Highmarket on the Tug Hill Plateau, average annual precipitation is about 51 inches while average annual snowfall is close to 200 inches. Refer to plate 2.4, General Climatic Information for Oswego County.

2.08 The Mexico Bay region is an area of quite variable weather conditions. Lake storms can arise quickly in the warmer months and snow squalls occur frequently during the winter. Although climatic conditions are generally less severe than in the nearby Tug Hill region, cold, snowy winters prevail at Port Ontario while the summer is generally warm and dry. (1,2)

2.09 Geology - The primary bedrock underlying Oswego County is sedimentary in origin. This bedrock was formed in the shallow marine seas that covered the region from 570 million to 345 million years ago. This span of time covers the Cambrian, Ordivician, Silurian, and Devonian Periods. The rocks formed during these depositional periods were sandstones, dolostones, limestones, shales, and siltstones. Plate 2.5 illustrates the bedrock geology of Oswego County.

Mean Annual Precipitation (inches)





Average Seasonal Snowfall (inches)

PORT ONTARIO HARBOR
NEW YORK

OSWEGO COUNTY
GENERAL CLIMATIC INFORMATION

U. S. ARMY ENGINEER DISTRICT, BUFFALO

PLATE 2.4

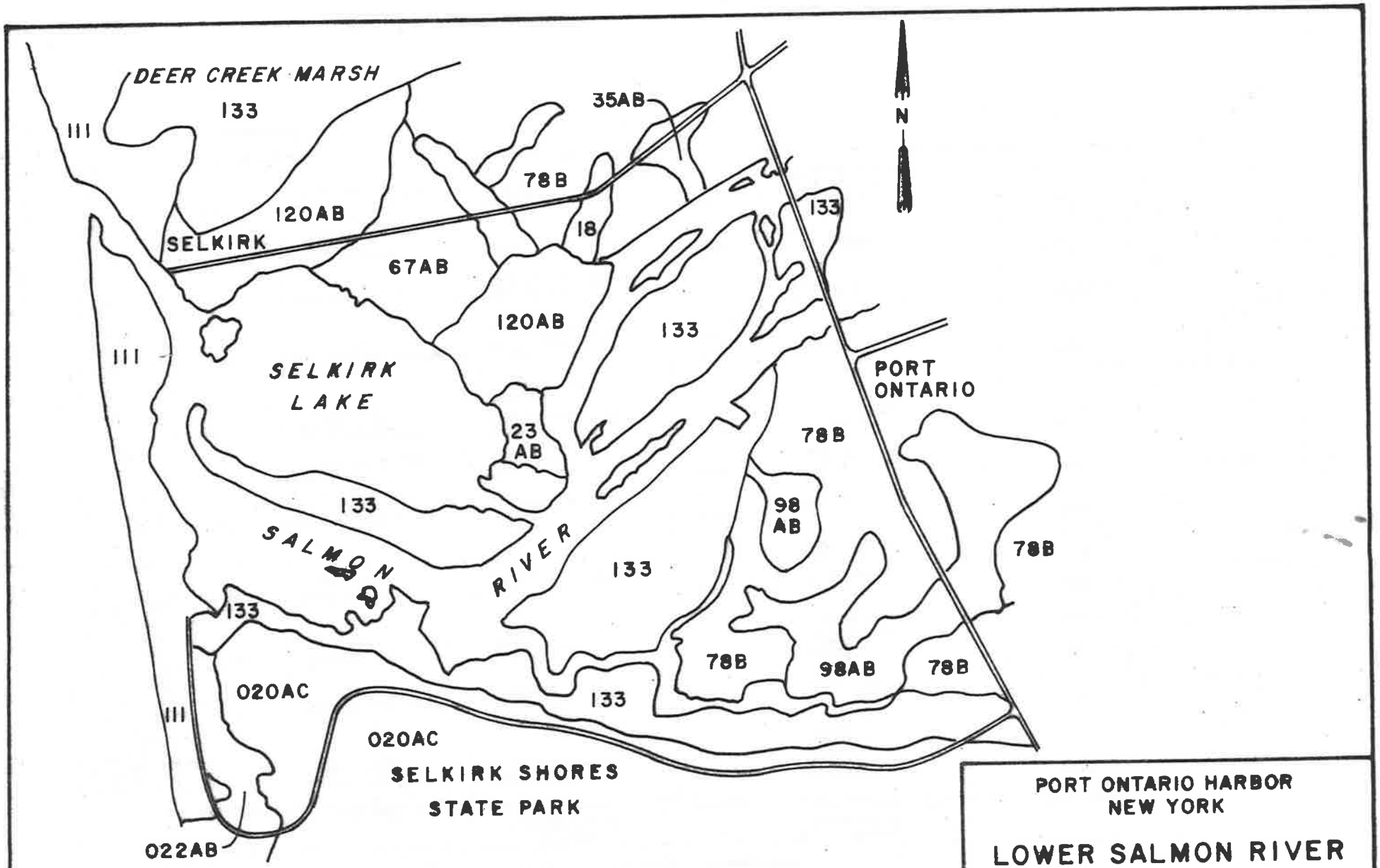
2.10 The formation of the Upper Ordovician is the Lorraine group, consisting primarily of siltstones and shales, and the Oswego sandstone. The Queenston formation and Medina group are considered as one formation spanning both Upper Ordovician and Lower Silurian time. They consist of red and green shales, red siltstones, and red sandstone. The Middle Silurian bedrock in the most southerly portion of Oswego County is the Clinton formation, consisting primarily of sandstones and shales. Dolostones outcrop at the very tip of the town of Schroeppel. In later geologic time, New York State and much of the Eastern United States slowly rose above the level of the sea, subjecting the sedimentary rocks to weathering and erosional forces. This, along with the scouring action of the glaciers during the Pleistocene, stripped away overlying rocks until the layers left exposed in Oswego County were of the Ordovician and Silurian Periods.

2.11 During glacial times, an ice sheet at least one mile thick moved over Northern New York State. Millions of tons of ice scoured the bedrock, plowing up debris, quarrying out blocks of rock and grinding the mass into fine fragments. When the ice melted, lakes and rivers were formed that further modified the landscape. Masses of glacial drift were deposited upon the land. These deposits include till, outwash and lacustrine materials. In places, the character of the till was changed as it was flushed out and resorted by melt water. Outwash deposits were left in river beds when rivers ceased flowing. Lacustrine deposits were left at the bottom of glacial lakes when the ice dams melted and lakes drained. (2,4)

2.12 Soils - The soils of the Port Ontario area were formed and deposited as the last Pleistocene glacier receded nearly 10,000 years ago. Subsequent plant growth and decay have further modified the parent materials creating the existing soil conditions. The soils of the Port Ontario locality generally belong to the Ira-Sodus association. Ira-Sodus soils are predominately composed of material from the underlying red and gray sandstones, but also contain some limestone and shale. The resulting till composition is moderately coarse textured and medium to low in lime content. The Ira-Sodus association is made of about 40% Sodus soils, 30% Ira soils, 15% Scriba soils, and 15% of various minor soils.

2.13 The deep, well drained Sodus soils occur on the tops of drumlins and on gently to moderately sloping areas of till plains. They have 1-1/2 to 2-1/2 feet of moderately permeable, gravelly or stony loam or sandy loam over a dense, firm, slowly permeable, gravelly to stony fine sandy loam or loam over a fragipan that is 2 to 3-1/2 feet thick; under this is firm, gravelly or stony sandy loam or loam glacial till.

2.14 The deep, moderately well drained Ira soils occupy nearly level to steep parts of drumlins and till plains in positions where they may receive small amounts of runoff water from Sodus soils. Ira soils have



PORT ONTARIO HARBOR
NEW YORK

LOWER SALMON RIVER SOILS MAP

U. S. ARMY ENGINEER DISTRICT, BUFFALO

PLATE 2.6

Table 2.2 – Water Quality Data – Salmon River Station 04250504
at Port Ontario Bridge on State Highway 3

	5/6/75	3/4/75	12/9/74	10/8/74	8/6/74	6/18/74	5/21/74	4/23/74	12/19/73	10/18/73	Mean
Total Nitrate (mg/l)	.76	.59	.30	.13	.16	.21	.44	.72	.64	.12	.41
Total Nitrite (mg/l)	.01	.00	.00	.00	.01	.01	.01	.00	.01	.00	.005
Total Nitrite & Nitrate (mg/l)	.77	.59	.30	.13	.17	.22	.45	.72	.65	.12	.41
Total Kjeldahl Nitrogen (mg/l)	.25	.16	.29	.23	.32	.33	.26	.18	.13	.27	.24
Total Nitrogen (mg/l)	1.02	.75	.59	.36	.49	.55	.71	.90	.78	.40	.66
Total Phosphorus (mg/l)	.01	.01	.02	.02	.02	.02	.01	.01	.00	.00	.01
Specific Conductance (micromhos)	43	78	56	80	59	73	63	42	62	138	69
Ph	6.7	7.2	7.9	8.4	8.1	7.7	7.8	8.1	6.6	7.3	7.6
Temperature (C^{O})	8.0	0.5	3.0	10.0	22.0	19.0	13.5	6.0	.0	8.0	9.0
Turbidity (JTU)	1	3	4	1	3	2	2	1	1	4	2
Dissolved Oxygen (DO)	9.0	12.6	10.4	8.8	7.8	6.7	9.6	10.6	16.4	10.5	10.2
Percent Saturation	77	88	78	78	90	71	93	86	114	90	87
Chlorophyll A (ug/l)	.0	43	3.0	14	5.0	2.4	7.3	3.2	.0	1.1	7.9
Chlorophyll B (ug/l)	.0	140.0	1.0	18.0	3.0	9.6	12	8.8	–	–	24.1
Fecal Coliform (per 100 ml)	89	82	210	820	170	140	840	180	–	8940	1275
Total Organic Carbon (mg/l)	2.9	2.4	13	6.3	6.2	–	3.7	–	4.5	16	6.9
Total Arsenic (ug/l)	0	0	0	0	1	2	0	1	3	0	1
Total Cadmium (ug/l)	0	0	0	4	0	0	0	0	–	–	1
Total Chromium (ug/l)	0	0	0	0	10	20	10	20	–	–	10
Total Copper (ug/l)	0	0	0	20	40	0	0	10	–	–	8.8
Total Lead (ug/l)	2	1	3	86	81	1	1	3	15	3	20
Total Mercury (ug/l)	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5	.5
Total Zinc (ug/l)	10	0	10	70	–	–	–	–	–	–	23

2.19 Air Quality - Four levels of air quality classifications based upon general levels of social and economic development and pollution potentials exist in New York State. Assigned to each classification level are generalized land uses. The Port Ontario - Pulaski area is classified as Level I (the highest classification), with associated general land uses predominantly for timber, agricultural crops, dairy farming, or recreation. Habitation and industry are relatively spare in Level I regions. No significant air pollution problems appear to exist in the Port Ontario region. (8)

2.20 Sediment Quality - Region V of the United States Environmental Protection Agency collected bottom sediments along the lower Salmon River on 27 July 1976. Four stations were sampled as indicated on Plate 2.7. At one station, PON 76-3, no sample was collected as the bottom consisted of hard rocky materials. In general, hard and rocky substrates were found lakeward of PON 76-3. Sediments inland of that area were dark brown sand and silt containing aquatic vegetation and detritus. Bulk sediment analysis results show light to moderate levels of organic pollution at Station PON 76-4 and some metals pollution at PON 76-2, probably resulting from the clay content of the sediment which tends to bind up metals. Results of the field observations, bulk sediment analysis, and sediment size analysis are presented in Table 2.4.

2.21 The most appropriate method of determining the chemical-biological effects of the discharge of dredged material on the water column of the receiving water is called the elutriate test. The most obvious effects include temporary increases in turbidity and suspended solids levels. Reduced light penetration might also have a temporary adverse effect on phytoplankton communities. Other physical effects include covering part of the benthic community and possible disruptions in its structure and function. Results of the elutriate test of Port Ontario sediments are presented in Table 2.5. The elutriate test for Station PON 76-4 shows some releases of TKN, ammonia nitrogen, iron, manganese, and mercury. Due to the difficulty of obtaining samples from that hard bottom at other stations, insufficient sample volumes were collected to perform the elutriate test at Stations PON 76-1, PON 76-2 and PON 76-3.

2.22 The bulk sediment PCB and pesticides analysis, Table 2.6, for the sample from Station PON 76-4 shows that all measured organic compounds are well below quantifiable detection limits of laboratory analysis.

2.23 Considering all of the above mentioned survey data, Region V of the USEPA, has classified the entire dredging area at Port Ontario Harbor as unpolluted and suitable for unrestricted disposal.

2.24 Littoral Drift - The formation of the large sand and cobble bar at the mouth of the Salmon River is caused primarily by the strong

Table 2.4 - Bulk Sediment Test Results
Port Ontario, New York 1976

	Sediment Standards (1)			Stations			
	Non-Polluted	Moderately Polluted	Highly Polluted	PON76-1	PON76-2	PON76-3	PON76-4
1. Field Observations							
Depth (Meters)	-	-	-	5	3	5	3
Color	-	-	-	Brown	Brown Over Grey	-	Dark Brown
Sample Description	-	-	-	Sand	Sand Over Clay	Rocks	Sand and Silt
Odor	-	-	-	Beach	None	-	None
Oil	-	-	-	None	None	-	None
General Remarks	-	-	-	Hard Bottom	Hard Bottom	Hard Bottom, No Sample	Heavy Aquatic Weeds, Detritis
2. Bulk Sediment Analysis Results							
Total Solids %	-	-	-	56.5	36.6	-	41.9
Volatile Solids %	5	5-8	8	< 1	2.2	-	7.1*
Chem. Oxy. Demand mg/kg	40,000	40,000 - 80,000	80,000	< 1,000	11,000	-	85,000**
Tot. Kjel. Nitrogen mg/kg	1,000	1,000 - 2,000	2,000	< 14	170	-	490
Oil-Grease mg/kg	1,000	1,000 - 2,000	2,000	< 250	< 250	-	< 250
Mercury mg/kg	1		1	< 0.1	< 0.1	-	0.6
Lead mg/kg	40	40 - 60	60	< 5	< 5	-	20
Zinc mg/kg	90	90 - 200	200	13	81	-	115*
Total Phosphorus mg/kg	420	420 - 650	650	72	510*	-	93
Ammonia Nitrogen mg/kg	75	75 - 200	200	< 10	20	-	72
Manganese mg/kg	300	300 - 500	500	180	840**	-	370*
Nickel mg/kg	20	20 - 50	50	< 10	55**	-	25*
Arsenic mg/kg	3	3 - 8	8	< 2	3*	-	2
Cadmium mg/kg	-	-	6	< 1	< 1	-	< 1
Chromium mg/kg	25	25 - 75	75	3	30*	-	9
Magnesium mg/kg	-	-	-	3,300	14,900	-	3,100
Copper mg/kg	25	25 - 50	50	< 2	26*	-	14
Iron mg/kg	17,000	17,000 - 25,000	25,000	4,300	31,000**	-	12,000
3. Sediment Size Analysis %							
Medium Gravel & Larger	Retained on #10 Sieve			< 1	< 1	-	3
Fine Gravel %	Retained on #20 Sieve			< 1	< 1	-	2
Medium and Coarse Sand %	Retained on #60 Sieve			70	< 1	-	15
Fine Sand %	Retained on #200 Sieve			9	< 1	-	26
Silts and Clays %	Passing #200 Sieve			21	100	-	54

(1) From USEPA, Region V, Chicago, IL, 15 March 1976.
* Moderately Polluted
** Highly Polluted

Table 2.6 - Bulk Sediment Chemistry PCB and Pesticides Analysis
(All values are mg/kg dry weight)
Port Ontario, New York 1976

Compound	Sample Site
	PON76-4
Hexachlorobenzene	<5
beta Benzenehexachloride	<1
Lindane	<5
Treflan	<5
Aldrin	<5
Zytron	-
Isodrin	<1
Heptachlor Epoxide	<1
gamma Chlordane	<1
o,p -DDE	<2
p,p'-DDE	<2
o,p -DDD	<1
o,p -DDT	<2
p,p' -DDD	<1
p,p' -DDT	<1
Methoxychlor	<2
Mirex	<2
2,4-D, Isopropyl Ester	<1
Di-n-Butyl Phthalate	<5
Endosulfan I	<1
Dieldrin	<1
Di (Ethylhexyl) Phthalate	<10
Endrin	<2
Endosulfan II	<1
DCPA	<1
Tetradifon	<10
Aroclor 1016 (1242)	<1
Aroclor 1248	<1
Aroclor 1254	<1
Aroclor 1260	<1
Total PCB	<1

2.28 The town of Port Ontario lies about 3/4 of a mile east of the project area. Terrestrial vegetation near the town consists of active and abandoned agricultural fields. Plants typical of old field succession such as aspen (Populus sp.), sumac (Rhus sp.) willows (Salix spp.), dogwood (Cornus sp.) goldenrods (Solidago spp.) and asters (Aster spp.) are commonly found in these areas. (11)

2.29 Wetlands - Seven major coastal wetlands occur in the Salmon River vicinity of Eastern Lake Ontario (Table 2.7 and Plate 2.8). Wetlands are generally referred to as lowland areas covered with shallow and sometimes temporary or intermittent waters, and other wet shallow areas along lakes, ponds, and rivers. They are referred to by various names including swamps, marshes, and bogs. Along Lake Ontario the most common wetland is a marsh often separated from the lake by a sand bar usually with a single outlet into the lake. Marshes are generally characterized as late fill in stages of lake succession. The substrate is soft muck, rich in decaying organic matter and mixed with the mineral soil. Marshes are extremely productive of waterfowl, particularly ducks. Muskrats are the most common mammal of the marsh. The more open, permanent waters of the marsh provide excellent breeding and nursery areas for many warm water game and forage fish species.

2.30 The Salmon River Marsh comprising about a 320-acre area upstream from the mouth of the Salmon River is owned partly by the State as part of Selkirk Shores State Park and is partly under private ownership. The marsh is comprised primarily of open water and shallow waterlogged islands. Its value to waterfowl is rather limited due to the heavy human disturbance in the area. The river and marsh complex itself is extremely valuable to the fishery resources of the area. Salmon have been successfully stocked and imprinted in the lower reaches of the Salmon River.

2.31 Table 2.7 describes the primary wetlands along the Mexico Bay shoreline. All are typical coastal fresh water marshes but vary in the type and degree of vegetative cover. Compared to several other marshes in the area, the Salmon River Marsh does not seem quite as valuable to fish and wildlife production as several of the other marshes described. Defined below are the wetland types, wildlife value and vulnerability classifications. (12,13,14)

a. Wetland Type Classification and Description - The wetland type classification used is that of the Fish and Wildlife Service as published in Circular 39, Wetlands of the United States by Shaw and Fredine in 1956.

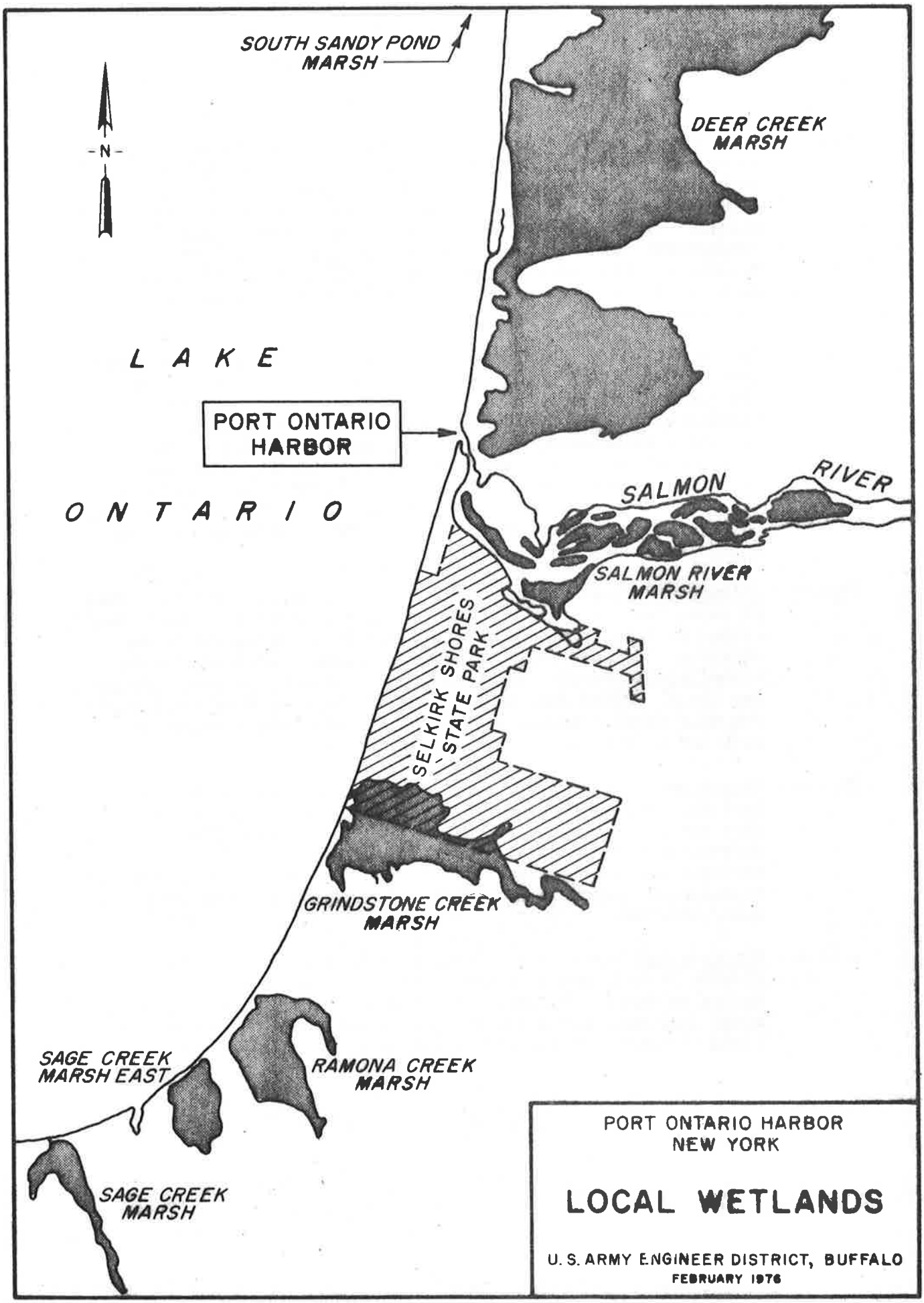

SOUTH SANDY POND MARSH
N
DEER CREEK MARSH
L A K E
PORT ONTARIO HARBOR
O N T A R I O
SALMON RIVER
SALMON RIVER MARSH
SELKIRK SHORES STATE PARK
GRINDSTONE CREEK MARSH
SAGE CREEK MARSH EAST
RAMONA CREEK MARSH
SAGE CREEK MARSH
PORT ONTARIO HARBOR
NEW YORK
LOCAL WETLANDS
U. S. ARMY ENGINEER DISTRICT, BUFFALO
FEBRUARY 1976

PLATE 2.8

Type 7 - Wooded swamps - The soil is waterlogged at least to within a few inches of its surface during the growing season, and is often covered with as much as one foot of water. Wooded swamps occur mostly along sluggish streams, on flood plains, on flat uplands, and in very shallow lake basins. In the north, trees include tamarack, arborvitae, black spruce, balsam, red maple, and black ash. Northern evergreen swamps usually have a thick ground covering of mosses. Deciduous swamps frequently support beds of duckweeds, smartweeds, and other herbs.

b. Wildlife Value - The wildlife rating system that follows is based upon the type of cover available in the various wetland types, as described previously, and from the vulnerability ratings defined in subparagraph c that follows:

Low: Habitat receiving relatively low use and production. Usually with at least one or a combination of limiting habitat factors such as poor interspersion, lack of open water, cover, etc.

Medium: Significant use of and production in the area. Usually has good interspersion, food and cover availability, lack of disturbance.

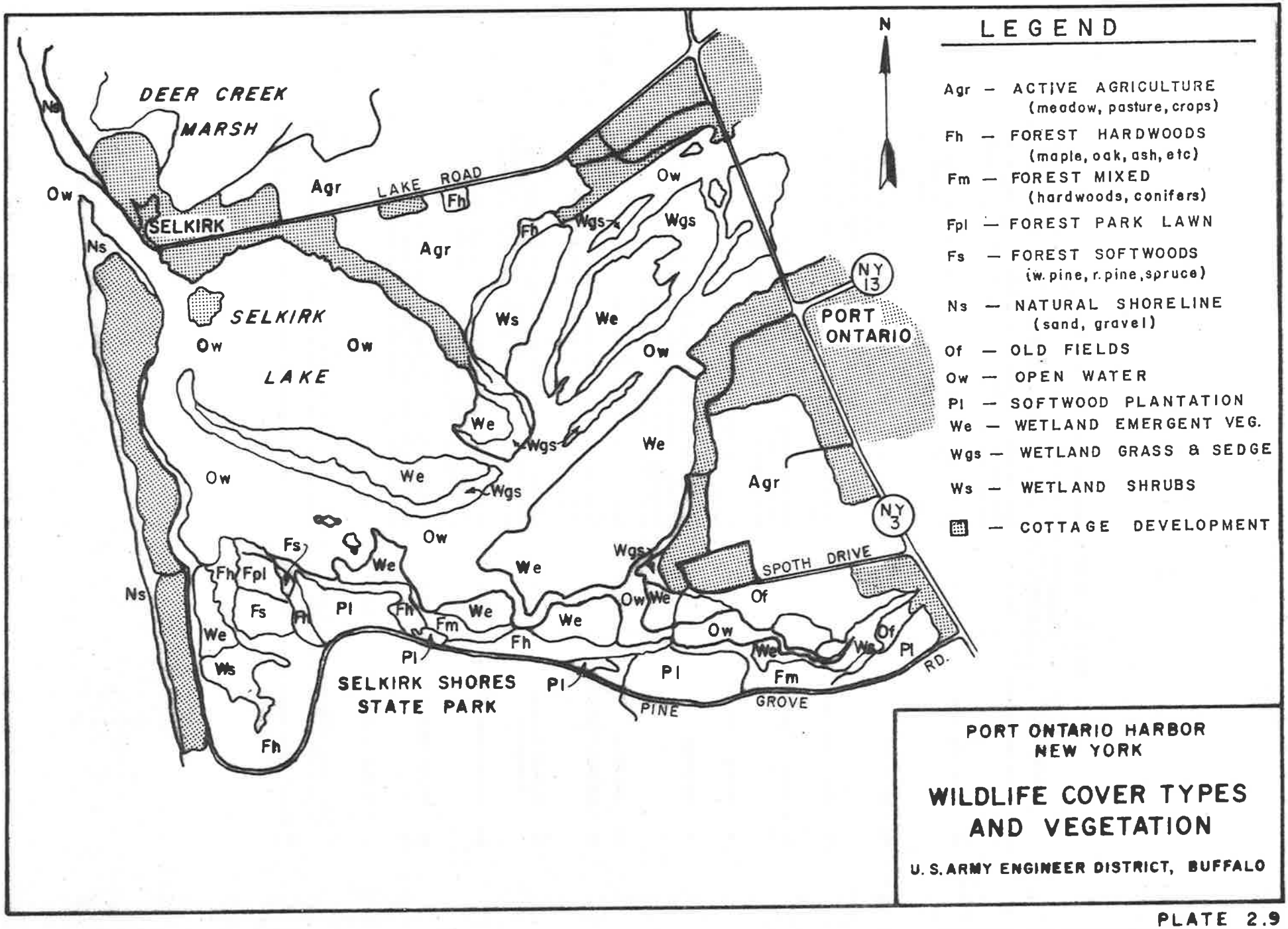
High: The highest levels of use and production for the area as a whole. Usually reflects the highest biological productivity, interspersion, food and cover, and a very low degree of disturbance.

c. Vulnerability - The vulnerability of wetlands to destruction by filling, ownership, access, or intrusion of development either for agriculture or of urban type uses such as seasonal residences is described below.

Low: Degradation very low or nonexistent. Accessibility difficult and human activities generally compatible with nature of area.

Medium: Degradation of area is actively occurring at a slow pace or the potential for very active damage is real due to increased accessibility, drainage, fill or human interests not compatible with the natural area.

High: Active degradation of area presently occurring at a fast rate including fill, dredging, drainage, high degree of human presence and activity and a high degree of accessibility. Chances of complete degradation for fish and wildlife use is imminent.



PORT ONTARIO HARBOR
NEW YORK

WILDLIFE COVER TYPES AND VEGETATION

U. S. ARMY ENGINEER DISTRICT, BUFFALO

PLATE 2.9

2.37 Table 2.9 presents a list of the species of reptiles, amphibians, and mammals observed, recorded and collected during the Terrestrial Vertebrate Study at Port Ontario. No active surveys were made of the bird populations at Port Ontario. More than 270 bird species have been recorded in the eastern Lake Ontario area and undoubtedly any of these could be seen at various times of the year. The wetland and estuary area of the lower Salmon River provides excellent habitat for many species of waterfowl, shorebirds and many passerine species. For the complete list of species see reference (11).

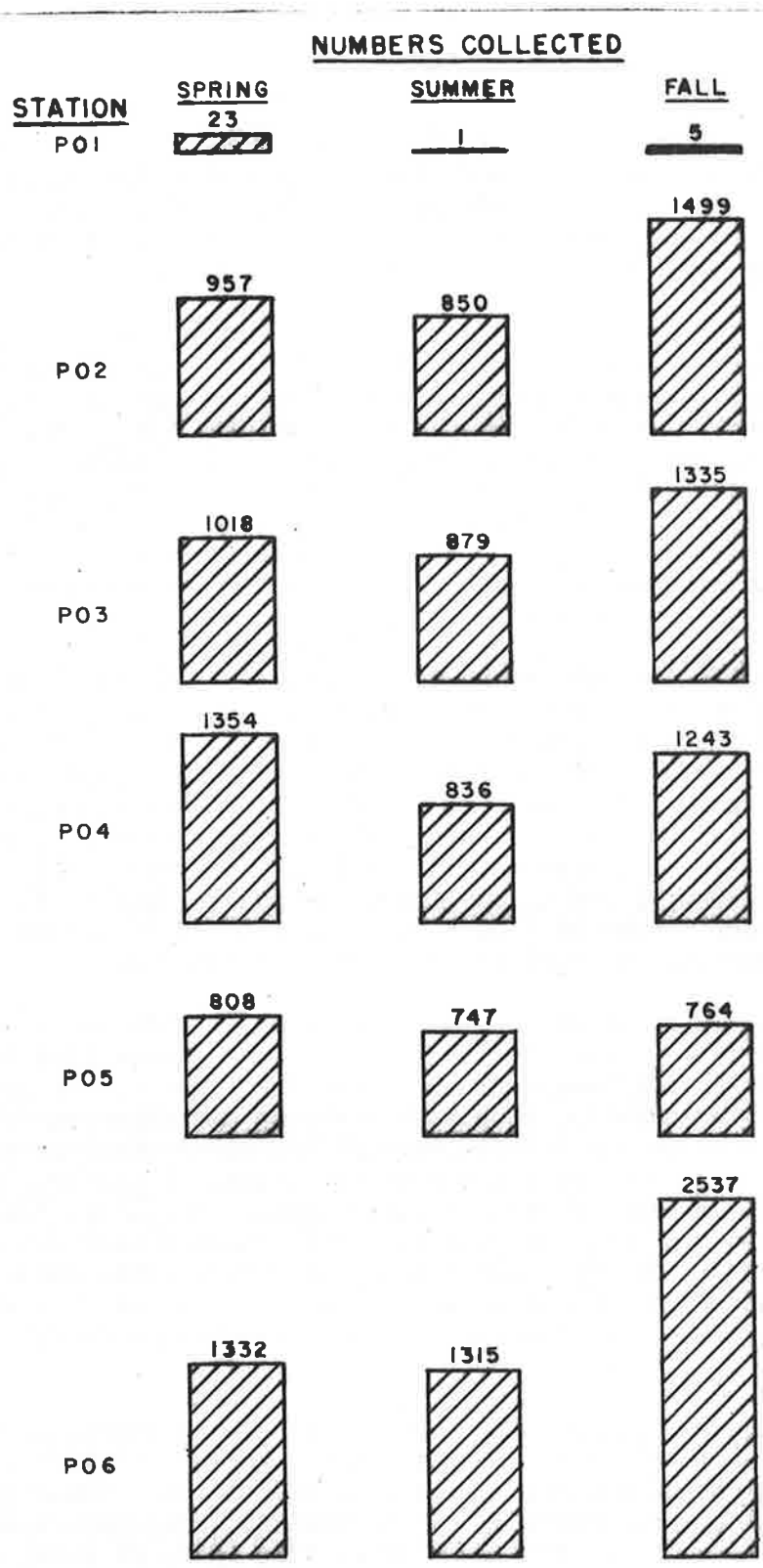
2.38 Macrobenthos - Macrobenthos were collected at Port Ontario on 24 August 1976 (summer sampling); 3 November 1976 (fall sampling); and 19 April 1977 (spring sampling) at six stations as indicated on Plate 2.7. Samples were collected using an unweighted (24.5 kg) nine by nine inch Ponar grab sampler. Samples were washed, preserved and stained in the field and subsequently sorted, identified and enumerated by staff personnel of the New York State Department of Environmental Conservation, Avon Pollution Investigations Laboratory at Avon, NY.

2.39 Nineteen major taxa of benthic invertebrates were collected during the Port Ontario study. Table 2.10 lists and enumerates on the major taxa collected at each station. Only small variations exist between the total number of benthic macroinvertebrates collected at each station during the various seasons (see Plate 2.10). The percentage of the total number collected summed for all stations, during each season were 31.38 percent (summer), 26.44 percent (fall), and 42.18 percent (spring). The predominate invertebrates collected were Dipteria, Oligochaeta, Gastropoda, and Turbellaria representing together 77.53 percent of all the organisms collected. Considerable variation does exist between stations and taxa with respect to numbers captured which can be seen by carefully observing Table 2.10. Station P01, the only site located in Lake Ontario, consistently yielded the lowest number of individuals. This undoubtedly results from its location at the mouth of the Salmon River where varying conditions of flow and a constantly moving sand and cobble substrate prevent the formation of any large stable benthic community. In contrast, station P06 located within Selkirk Lake is characterized by rather calm waters and a silty substrate allowing the establishment of a large stable benthic community dominated by Amphipoda, Diptera, Gastropods and Oligochaetes.

2.40 The study as a whole indicates that rather large, stable benthic communities exist in the Port Ontario Harbor area. Good water quality and sediment quality conditions as well as the presence of various substrates in the harbor are the most relevant factors in the stability of the benthic community at Port Ontario. Benthic invertebrates are primary detritus feeders and in turn provide an excellent food source for fish in the area. The benthos feed to a large extent on dead and decaying organic vegetative matter such as the abundant

Table 2.9 - Reptiles, Amphibians and Mammals (Cont'd)

Starnose Mole (Condylura cristata) - Common
Hairy-tail Mole (Parascalops breweri) - Common
White-footed Mouse (Peromyscus leucopus) - Common, collected
Deer Mouse (Peromyscus maniculatus) - Abundant, collected
Meadow Vole (Microtus pennsylvanicus) - Very common, collected
Meadow-jumping Mouse (Zapus hudsonius) - Common, collected
Woodland-jumping Mouse (Napaeozapus insignis) - Common



PORT ONTARIO, HARBOR
NEW YORK

BENTHOS VARIATIONS
BY STATION

U.S. ARMY ENGINEER DISTRICT BUFFALO

PLATE 2.10

Table 2.11 - Fish Survey - Port Ontario, NY (1976-1977)
Study Summary

	Electrofishing	Shore Seining	Trap Netting	Gill Netting
Sampling Methods	4 sampling sites, sampling done from a 16 foot boat in littoral areas.	13 sampling sites, sampling done in littoral areas no more than 50 feet from shore using 6' x 36' x 1/4" mesh bag seine.	5 trap net sites, 1 additional site during summer, sampling done for larger game and non-game species.	6 netting sites, nets 175 feet long x 6 feet deep of 7 mesh panels (1.0, 1.5, 2.0, 2.5, 3.0, 4.0 and 5.0 inches). Two sampling sites in Lake Ontario.
Summer 1976 Sampling	15 Species, 303 Individuals Station EF1 yielded highest CE. Most abundant species - Creek Chubsucker - Golden Shiner - Bullhead - Pumpkinseed - Largemouth Bass	20 Species, 253 Individuals Station 10 yielded most individuals. Predominant species - Golden Shiner - Bridle Shiner - Largemouth Bass - Pumpkinseed - Rock Bass - Tesselated Darter	16 Species, 1,118 Individuals Station T4 yielded highest catches. Predominant species - Bullhead - Pumpkinseed	18 Species, 297 Individuals Station G4 yielded largest catches. Predominant species - Bullhead - Yellow Perch - Golden Shiner - Alewife - Salmonids
Fall 1976 Sampling	17 Species, 248 Individuals Station EF4 yielded highest CE. Prominant Species - Northern Pike - Golden Shiner - Creek Chubsucker - Bullhead - Pumpkinseed	15 Species Station 11 yielded most individuals. Predominant Species - Northern Hog Sucker - Bullhead - Pumpkinseed - Various Cyprinids - Smallmouth Bass - Some Salmonids	11 Species Station T3 yielded largest catch. Predominant Species - Bullhead - Northern Pike - White Sucker - Bluegill	7 Species Station G6 yielded largest catch, all white suckers. Predominant Species - White Sucker
Spring 1977 Sampling	15 Species, 347 Individuals Station EF2 yielded highest CE. Commonest Species - Bullheads - Golden Shiner - Creek Chubsucker - Pumpkinseed - Rock Bass	19 Species Station 10 yielded highest total catch. Predominant Species - Golden Shiner - Coho Salmon - Common Shiner - Pumpkinseed - Bullhead - Tesselated Darter	14 Species Station T3 yielded largest catch. Predominant Species - Bullhead - Bowfin - Northern Pike - White Sucker - Pumpkinseed - Rock Bass	20 Species Station G2 yielded largest total catch. Predominant Species - Rainbow Smelt - White Perch - Bullhead - White Sucker - Rock Bass - Yellow Perch
Total Survey	25 Species, 898 Individuals 5 species made up 81% of the total catch. Station EF2 yielded highest CE among all stations.	32 Species, 665 Individuals Highest numbers collected during spring. Significant variances in catch between stations and seasons. Station 10 yielded highest catch. Four species made up 60% of catch.	20 Species, 2,829 Individuals Highest numbers collected during spring. Small uniform variances in catch between stations and seasons. Bullheads predominant species.	24 Species Generally species distribution by site uniform. Some seasonal and site differences in catches. Large catch of Rainbow Smelt in spring at Station G2.

except under permit, to enhance the propagation or survival of the species. Threatened species are considered to be in less peril of survival but could possibly become endangered in the forseeable future in a portion or all of their range and regulations on their taking are less rigorous. The Federal Register of 14 July 1977, Vol. 42, No. 135, p. 36420-36431, gives the most recent list of species protected by the Act. Table 2.13 lists all endangered vertebrate species protected by Federal and State law that presently or previously occurred in the Port Ontario region. Of the eight endangered species listed in Table 2.13 only five: the Osprey, Bald Eagle, Peregrine Falcon, Indiana Bat and possibly the Bog Turtle have much possibility of occurring at Port Ontario. No recent known sightings of any of these species have been recorded for the area. No plants protected by State law are known to occur in the immediate project area. Additionally, no plants native to New York State are currently protected by the Endangered Species Act. (11,15,16,17,18,19)

HUMAN ENVIRONMENT

2.45 History, Cultural Resources and Aesthetics - The prehistory of the Port Ontario area is not well known and there have been no previous professional archeological surveys in the vicinity of the mouth of the Salmon River. Past studies have concentrated in the Oswego and Pt. Peninsula areas and Port Ontario appears to be a cultural boundary region between the St. Lawrence and central New York. It is reasonable to assume that the area has been utilized by man for at least 6,000 years. The mouth of the Salmon River provided attractive habitat for hunters and gatherers, especially for people heavily dependent on fish for subsistence. The area of Selkirk Park bordering the Salmon River would probably have been more attractive for habitation than the beach at the mouth of the River.

2.46 The Selkirk lighthouse dates to about 1838 and appears to be potentially eligible for the National Register of Historic Places. It is included in the New York State inventory of historic places and the Historic American Building Survey files.

2.47 There are no sites in the project area currently listed in the National Register of Historic Places or the Historic American Engineering Record. There are no other sites on the State list.

2.48 A combination intensive and reconnaissance cultural resource survey of the project area is being done under contract. Those areas where the proposed breakwaters tie into land are being intensively surveyed. In other areas a reconnaissance level survey is being conducted in those areas of Selkirk Park which might experience developmental pressure as a consequence of harbor improvement. Both reports will be fully coordinated with the State Historic Preservation Officer, the National Park Service and any other appropriate agencies or individuals. Comments

or recommendations from any of the above reviewers will be considered in the preparation of the Final Environmental Statement for the Port Ontario Harbor Project. Because the annual reports of the Chief of Engineers between 1844 and 1893 mention numerous shipwrecks in the vicinity of the Salmon River, the Contractor will make an effort to document any wrecks which might be affected by the proposed dredging.

2.49 The Contractor has reported that there is one reported site in the vicinity of Selkirk Park but has not yet acquired enough data to locate the site in relation to the project. The two areas where the breakwaters will directly impact land have been tested and no prehistoric material was recovered. The dune area where the northern breakwater ties into shore appears to have been disturbed by bulldozer recently and some recent garbage was found during testing.

2.50 There are no areas in the project vicinity on the National Registry of Natural Landmarks, although this region will probably be surveyed in the next two years. There is a possibility that portions of the sand dune region to the north of the Salmon River may be eligible for this registry.

2.51 Several unique natural areas providing aesthetic and scenic viewpoints exist in the Port Ontario vicinity, (2). These areas are described individually below:

a. Coastal Wetlands - Several major fresh water wetlands occur along the Lake Ontario shoreline in the Port Ontario vicinity including the Salmon River Marsh. These areas are discussed in paragraphs 2.29 through 2.31.

b. Lake Ontario Dunes - Along Lake Ontario, located primarily in the town of Sandy Creek, are well developed bay-bar dune areas. The most notable dunes are located along the lakeward boundary of North Pond. The beach bar dune complex is a deposition feature of the longshore littoral currents of the area. North Pond is a lagoon with two narrow variable openings to Lake Ontario. The dunes have unique natural vegetation specialized to the dune-ecosystem.

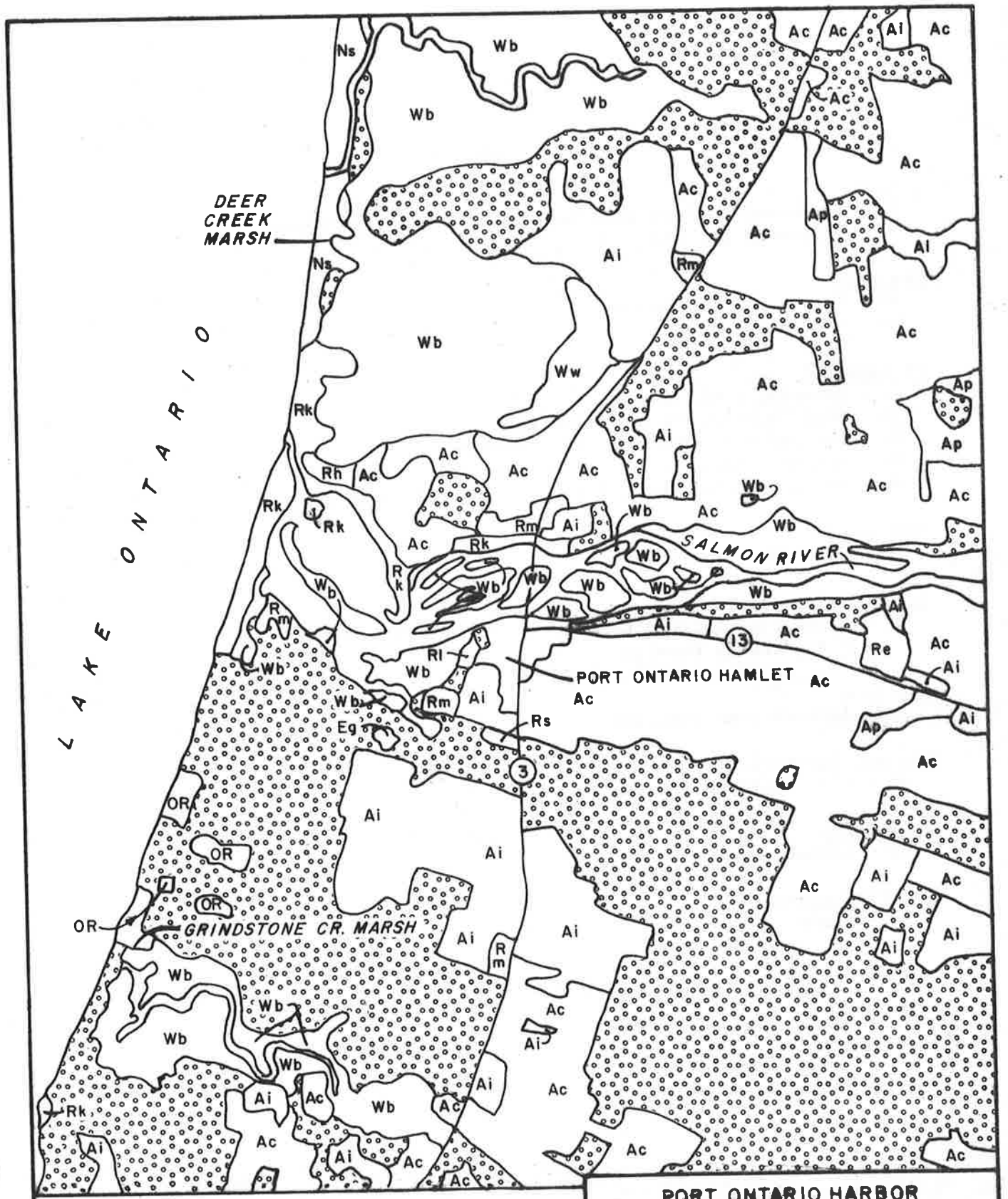
c. Salmon River Falls - The Salmon River Falls, located in the town of Orwell about one mile downstream from the Salmon River Reservoir, drop about 110 feet to a small pool at the bottom. Access to the falls is by unpaved road, the nearest village being Altmar about six miles away. Volume of the falls is controlled by releases from the Salmon River Reservoir and during spring runoff the flow is often four times its summer and fall lows. From the falls to the lower reservoir the falls winds for about 1,200 feet through a 200-foot gorge.

from the mouth of the Salmon River through the towns of Richland and Albion to Williamstown, a distance of 17 miles, where it intersected the plank road between Rome and Oswego. In 1850 the Rome and Watertown Railroad was built through Richland Station, and in May 1851, trains were running to Watertown. As late as 1857, a line of daily stages was operated from Pulaski to Oswego, from Pulaski to Syracuse, and from Richland Station to Oswego. In the fall of 1865 the railroad between Richland Station and Oswego was completed, giving Pulaski a station. In the autumn of 1871 the Syracuse Northern Railroad began operations. At a later date one of the depots at Pulaski was abandoned. The track through the village to Lacona was taken up, and a junction with a single station established, leaving one track to Richland, where it intersected the road from Rome. In 1872 the construction of a railroad from Boonville to Port Ontario was initiated and a company was organized, but the project was abandoned. All of these events had a marked influence upon the development of the town.

2.56 Port Ontario, a "city of unrealized possibilities," situated at the mouth of the Salmon River, has an early history which almost rivals that of Oswego, to which it became an active rival for shipping and other lake interests. It was the site of the first permanent settlement in Richland, and from an early day was regarded as a natural harbor. Some time prior to 1836, a number of settlers organized the Port Ontario Company and immediately surveyed a large tract of land into building lots. The new city was announced with "a flourish of trumpets," and lots sold at exhorbitant prices. On 24 April 1837, the village was incorporated, and on 16 May the Legislature chartered the Salmon River Harbor Canal Company, which was organized for the purpose of constructing a canal "from the original lake to the village of Port Ontario." In 1838, a lighthouse (Selkirk Lighthouse) was built and in 1855 it was refitted.

2.57 In 1836 Congress authorized a commercial harbor at the mouth of the Salmon River and construction was begun on the breakwaters. Because of the difficulty of maneuvering a sailing vessel in a storm the original plan for parallel piers 200 feet apart was changed in favor of a long southern pier angling to the northwest and a short northern pier perpendicular to shore. These piers were of timber crib construction and it was hoped that the river would be confined sufficiently to maintain a deep channel. The dangers of the area were described as follows:

> "Vessels driven into it (Mexico Bay) in a west or northwest gale are past all hope of safety; they must inevitably be driven ashore, and that, too, on a beach so shallow that they ground and go to pieces some two or three hundred yards from the shore, and the crews almost inevitably perish."



LEGEND

FORESTLANDS

FOR KEY TO OTHER SYMBOLS, SEE TABLE 2.14

PORT ONTARIO HARBOR
NEW YORK

LAND USE MAP

U S ARMY ENGINEER DISTRICT, BUFFALO

PLATE 2.11

2.63 The shoreline area of the lower Salmon River area, is generally a unique area consisting naturally of a highly erodible beach of sand and cobbles protecting large wetland areas surrounded by forestland. Where they have not been destroyed, active sand dunes may be found along the shoreline in this area and to the north. (11)

2.64 Demographics - As of 1970, the population of the town of Richland, including Port Ontario, was 5,324. The largest village within the town of Richland is Pulaski, with a population of 2,480. The nonwhite population of the town of Richland is less than one percent, which closely aligns with that of the rest of Oswego County and compares with a Statewide nonwhite population of 13.2 percent. Population density, as of 1970, was 620 per square mile in the village of Pulaski, 98 in the town of Richland, and 104 for the entire county of Oswego. Table 2.15 presents some recent population data.

2.65 Census figures since 1930 reveal a steady but relatively modest growth pattern for the area. The town of Richland experienced a net gain of 1,508 persons over the 40 year period from 1930 to 1970. As illustrated in Table 2.16, this represents an overall increase in population for the 40 year period of 39.5 percent, compared with a net increase of 44.9 percent in Oswego County and an identical increase of 44.9 percent for New York State from 1930 to 1970.

2.66 Age distribution is presented in Table 2.17. Median age for the town of Richland, at 27.4 as of 1970, was approximately three years younger than that of New York State as a whole, although it exceeded that of Oswego County by nearly 2-1/2 years. As of 1970, 53 percent of the population of the town of Richland was 25 years old or older, as compared with a 57.1 percent figure for New York State.

2.67 Almost 14 percent of Oswego County's population is either foreign born, or native born of parents at least one of whom is foreign born (Table 2.18). Among persons in this category, the largest numbers are of Italian (24.3%) and Canadian (20.8%) heritage. As stated above, the town of Richland and Oswego County both have nonwhite populations consisting of less than one percent.

2.68 As of 1970, approximately 47.5 percent of persons 25 years of age or older had at least four years of high school, compared with the three-county Syracuse area (Madison, Onondaga, and Oswego counties) with 57.7 percent and New York State with 52.6 percent. As shown in Table 2.19, the median number of school years completed for persons 25 years and older in Oswego County was 11.7, as compared to 12.1 for New York State. A lower percentage of Oswego County residents 25 years and older are college graduates (7.8%) than for the Syracuse area (13.1%) or for New York State as a whole (11.8%). (21,22,29)

Table 2.19

Education, Place of Work, 1970

	Persons 25 Years and Older, 1970					Employed Persons, 1970					
		% Completing				Place of Work			Transport to Work		
						Residents		Non-	Percent of Employed Persons by		
	Median School Years Completed	Four Years High School	1-3 Years College	Four Years College	Five or More Years College	Working in Own County	Working in Other County	Residents Working in County	Automobile	Public Transportation	Walking or Work at Home
New York State	12.1	31.2	9.6	6.2	5.6	4,135,452	2,218,310	-	54.4	32.2	11.2
Upstate New York	12.1	32.8	10.4	6.0	4.8	1,963,917	308,923	-	79.7	5.3	12.7
Syracuse SMSA	12.2	34.1	10.5	7.3	5.8	195,798	23,462	-	80.5	6.5	11.1
Oswego County	11.7	31.9	7.8	4.1	3.7	21,306	9,221	1,553	83.2	0.4	13.7

Table 2.20

Housing, 1970

	Housing Units										
		Occupied			Percent of All Year-round Units						
					Year Structure Built			All	With More	With Central	
	Total Number	Number	Percent Owner-Occupied	Seasonally Vacant	1960-Mar. 1970	1940-1959	1939 or Earlier	Plumbing Facilities	Than One Bathroom	Heating or Built-in Electrical Units	
New York State	6,299,582	5,913,861	47.3	144,537	16.8	27.7	55.6	96.8	24.1	93.8	
Upstate New York	2,253,654	2,021,363	67.1	107,937	17.3	23.7	59.1	95.6	24.8	87.8	
Syracuse SMSA	206,952	192,242	65.8	5,192	20.7	26.3	53.1	96.0	27.4	92.8	
Oswego County	32,857	29,179	76.1	1,975	19.1	16.7	64.2	92.0	18.1	86.8	
Richland (T)	1,973	1,628	75.1	214	19.6	12.0	68.4	89.7	18.8	79.0	

2.73 Communities in the project area are linked with other villages, towns and cities by U. S., State and county highways. Major U. S. and State highways serving the project area are Routes 3 and 11, running generally north and south, and Route 13, running generally east and west. In addition, county roads 62 and 41, running north and south, and 5, 2, and 2A, running east and west, supplement the system. Interstate Highway 81, from the New York State Thruway and Syracuse to the south, runs north from the village of Pulaski through Watertown to the Canadian border. Plate 2.12 provides an overview of major highways and roads in the project vicinity.

2.74 Daily bus service from the village of Pulaski to Syracuse and Watertown is provided by Greyhound Bus Lines, facilitating access to air and rail transportation. In addition, the Penn Central Railroad maintains a line north and south through Pulaski, providing freight service to local industry. (21,24,25)

2.75 Utilities - Water service in the immediate project area is provided by the Pulaski Water and Sewer Commission. Water is drawn from ground wells and springs and is normally untreated; however, water quality is regularly tested and a standby chlorination system is available when needed. The system serves approximately 1,000 households and a population of about 2,700. Average daily water production is 300,000 gallons and distribution storage capacity, defined as gallons of water ready to enter the mains by pumping or gravity, is 325,000 gallons.

2.76 A complete sanitary and storm sewer system is operative within the village of Pulaski and a sewage treatment plant is operated by the New York State Environmental Facilities Corporation. Treated effluent is discharged into the Salmon River. Septic and holding tanks account for the remainder of sewage disposal in the immediate project vicinity.

2.77 Both gas and electric service are provided by the Niagara Mohawk Power Corporation. Telephone service for the area is provided by the General Telephone Company of Upstate New York. Table 2.22 lists percentages of heating fuels and appliances used in Oswego County as compared with nearby regions in New York State. (25,26)

2.78 Community Services and Facilities - Residents of the project area are served by both the New York State Police, which maintains a substation in the village of Pulaski, and the Oswego County Sheriff's Department, both of which maintain daily automobile patrols in and around the immediate project area. In addition, the village of Pulaski maintains its own police force consisting of one patrol car with three full-time and four part-time officers. The Oswego County Sheriff's Department maintains two rescue patrol boats in the hamlet of Port Ontario, near the mouth of the Salmon River, and the U. S. Coast Guard

Table 2.22

FUEL AND APPLIANCES, 1970

	HEATING FUEL USED				APPLIANCES - Percentage of Occupied Housing Units						
	Percentage of Occupied Housing Units							Air Conditioning			
	Utility Gas	Liquid Fuel	Electricity	Other	Washing Maching	Clothes Dryer	Dish-Washer	Room Unit	Central System	Two Television Sets or More	Freezer
New York State	37.8	56.8	1.8	3.6	57.2	29.6	18.1	28.2	3.2	33.5	16.2
Upstate New York	55.7	38.2	2.4	3.6	77.4	47.0	19.3	14.1	2.1	31.5	27.1
Syracuse SMSA	70.0	23.5	3.2	3.3	75.8	46.3	21.4	16.6	2.8	38.3	26.8
Oswego County	49.1	42.5	2.8	5.7	78.8	45.1	12.5	9.8	1.4	30.3	35.2

2.84 Industry groups of employed persons are classified by the business of their principle employer. Industrial groupings for the residents of the town of Richland, as illustrated in the 1974 edition of the New York State Commerce Department's Business Fact Book for the Syracuse area, are presented in Table 2.23. Although the manufacturing category of durable and non-durable goods for the town of Richland (22.9%) falls below that of New York State, it accounts for the highest single category of employment, followed closely by the retail trade and professional services categories. Persons employed in both farming and construction trades in the town of Richland account for significantly higher percentages of the total than do these categories in either the Syracuse S.M.S.A. or the State as a whole. (21,25,26,28)

2.85 Employment and Income - As of 1970, there were approximately 1,719 employed workers in the town of Richland, out of a possible labor force, defined as population 16 years and over, of 3,497. Of these, 53.6 percent, or approximately 1,874 persons, were actually in the labor force, either as employed or unemployed workers, or as members of the Armed Forces. Private wage and salary workers accounted for the largest compensation group (68.7%), followed by Government workers (17.6%), self-employed workers (12.9%) and unpaid family workers (less than 1%). Females in the work force numbered 616, or about 33 percent of the total.

2.86 Table 2.24 illustrates the percentages of employed persons in various occupational groups in the town of Richland as compared with other statistical subdivisions in New York State. As of 1970, the largest single group under this heading in the town of Richland consisted of operatives, accounting for 16.9 percent of the total, followed by clerical workers (15.6%), craftsmen and foremen (14.5%), and professional and technical workers (13.1%). Owing to the rural character of the town of Richland, farmers and farm managers (including tenant farmers and share croppers) accounted for about 4 percent of employed persons, or four times that of the three-county Syracuse SMSA.

2.87 Persons commuting from the town of Richland to places of work outside Oswego County constitute a substantial percentage of the total work force and deserve mentioning. About 28 percent of employed workers, or almost 31 percent of those commuting to work, held jobs outside of Oswego County. Of these, about 90 percent worked either in the city of Syracuse or in surrounding Onondaga County, indicating the importance of the Syracuse metropolitan area to the local economy.

2.88 The median income for families in the town of Richland, as of 1969, was $9,043. As illustrated in Table 2.25, the greatest single percentage of families in the town of Richland (almost 30%) fell into

Table 2.24

Income, 1969

	Median Income, Families and Unrelated Individuals	Median Income	Number of Families	Income of Families — Income Groups - Percentage of Families							
				Under $3,000	$3,000 -4,999	$5,000 -6,999	$7,000 -9,999	$10,000 -14,999	$15,000 -24,999	$25,000 -49,999	$50,000 or More
	$	$									
New York State	8,510	10,617	4,584,616	8.2	8.3	10.6	18.9	27.5	19.7	5.6	1.2
Upstate New York	8,167	10,216	1,618,448	7.4	8.1	11.2	21.8	30.1	17.3	3.5	0.6
Syracuse SMSA	8,124	10,450	153,424	7.1	7.6	10.4	21.5	30.8	17.8	3.9	0.8
Oswego County	7,220	9,254	24,057	9.4	8.8	12.6	25.2	28.4	13.5	1.9	0.1
Richland (T)	7,575	9,043	1,330	15.1	10.8	9.6	19.4	29.7	12.3	3.0	0.0

the $10,000 to $15,000 income range, comparing closely to that of the Syracuse SMSA. However, about 15 percent, or more than twice the percentage of families in the Syracuse SMSA, had incomes of under $3,000. (21,30)

2.89 Recreational Resources - Recreational facilities abound in the Port Ontario area. Selkirk Shores State Park, operated by the Central New York Division of Parks and Recreation, is the major recreational facility in the area. Located on the shores of Lake Ontario, it is an all-purpose park providing 980 acres of fine facilities for overnight camping, fishing, picnicing, boating, hiking and other outdoor activities. A natural sand beach, protected by two jetties, provides an excellent swimming area within the park. Fishing is good during the summer for perch and smallmouth bass. In addition, there are many miles of streams in the Tug Hill area east of Pulaski to which the State has acquired public fishing rights. A wide range of facilities for outdoor recreation are also available in the project area on a commercial basis, including hunting and fishing lodges, cottages, motels, marine facilities and camping grounds. Other recreational facilities in the area include the Len-Mar Greens golf course, located 1/2 mile south of Selkirk State Park on Route 3, the Elms golf course, also on Route 3 about seven miles to the north of the project site, plus a bowling center and movie theater, both located in the village of Pulaski.

2.90 Existing recreational areas within the village of Pulaski appear to be deficient with respect to both size and facilities. Typical standards developed by the National Recreational Association, and similar agencies, include a recommendation of one acre of gross recreational land for each 100 persons. This includes space for all kinds of active, as well as passive, recreation. According to this standard, the village of Pulaski should provide approximately 25 acres of recreational land. It should be recognized, however, that this standard was developed primarily for large urban concentrations that are almost devoid of any nearby open space and from which regional recreational facilities are difficult to reach. The village has a total of approximately 7.7 acres devoted to some type of park or recreational use. Additionally, playgrounds and play equipment on the grounds of the Pulaski Central School are available for children during non-school hours. School facilities are also used for the summer youth program. The Ringgold Volunteer Fire Department owns approximately four acres of land along the Salmon River, but the little use this area receives is mainly confined to annual "field days". (3,11,24,25)

2.91 Sportfishing - During 1968 the New York State Department of Environmental Conservation began stocking Coho Salmon in tributary streams of Lake Ontario patterned after similar, successful salmon

Table 2.26 Lake Ontario and Tributary Salmonid Stocking 1968-1977

Species	1977	1976	1975	1974	1973	1972	1971	1970	1969	1968
Coho Salmon	38,640	177,575	813,000	147,000	215,000	230,000	122,000	294,000	125,000	25,000
Chinook Salmon	0	593,400	920,000	975,000	650,000	426,000	100,000	140,000	70,000	0
Brown Trout	162,508	310,571	371,000	80,000	60,000	0	0	0	0	0
Steelhead	26,768	28,800	0	200,000	0	0	0	0	0	0
Rainbow Trout	49,910	157,587	252,000	15,000	0	0	0	0	0	0
Lake Trout	0	336,920	514,000	630,000	65,000	0	0	0	0	0
Total	277,826	1,605,033	2,870,000	2,047,000	990,000	656,000	222,000	434,000	195,000	25,000

Wood, Field and Stream

Upstate Salmon River Is Outstanding As a Newly Developed Sport Fishery

By NELSON BRYANT
Special to The New York Times

PULASKI, N.Y.—Tumbling into Lake Ontario from its headwaters in the remote Tug Hill plateau, the Salmon River has become the focal point of a newly developed and remarkable sport fishery for two species of Pacific salmon, the coho and chinook, and steelhead trout.

It is remarkable because nowhere else in the northeast can an angler catch all three of these hard fighting and highly prized fish in one spot.

Sadly, however, there is little rejoicing in Pulaski and other lakeside communities because just as a booming sport fishing industry seemed about to be born, the discovery of contaminants in the trout and salmon—including Mirex and PCB's—resulted in a state ban in 1976 on keeping certain sizes of the fish.

Between now and spring, those willing to brave cold, snow and icy waters stand an excellent chance of catching steelhead trout weighing up to 10 pounds or more, for these fish already have begun their spawning runs up the Salmon and other streams that empty into the eastern end of the Lake. Although they can be taken with a fly and a sinking line, the most successful cold-weather technique is with a spinning rod and lure or salmon and steelhead eggs.

The chinooks, which grow to 30 pounds, enter the streams in late summer, and the cohos, which run as large as the steelheads (a steelhead is a rainbow trout with a wanderlust) begin their migration in early fall.

In spring and early summer the coho fishery moves into the lake where the deep-trolling downrigger technique developed for Lake Michigan's cohos has proved effective. One should also mention the March and April angling along the shore for huge brown trout.

The lake trout—which need no populations of two salmonoids, lake trout and landlocked salmon. The salmon were nearly all gone by the beginning of this century, largely as a result

Historically, Lake Ontario held good of power dams that blocked access to spawning areas and tributaries.

spawning streams—hung on until the 1950's when they, too, disappeared, victims of over-exploitation by commercial fishermen and the predations of the lamprey eel, an anadromous fish that under normal conditions grows to maturity in salt water but spawns in high quality fresh water streams. At some point, perhaps the 19th century, lampreys made their way into the Great Lakes and managed, as do many anadromous species including the striped bass, to work out their life cycle in fresh water, substituting a lake for the ocean.

A leader in the development of Lake Ontario's salmonoids sport fishery is William A. Pearce, supervisor of the Great Lakes Fisheries section of the New York State Department of Environmental Conservation (D.E.C.) at Cape Vincent, N. Y.

New York Experiment

In a recent interview, Pearce observed that in the last half of the 1950's, the Great Lakes Fishery Commission, a Canadian-American agency, was formed with its first goal to find a way to control the lamprey eels and restore the lake trout population. All during this period and thereafter there was also a continuing and successful effort to abate conventional industrial and domestic sewage entering the lakes.

Following Michigan's successful introduction of coho salmon into Lake Michigan in 1966, New York State tried planting a small number of cohos in Lake Ontario at Pulaski, and for the next three years this effort was continued. It met with little success, however, because of lamprey predation. All of the salmon which came back to the streams in which they were stocked showed lamprey scars, an average of 12 or 14 a fish.

The lamprey fastens its disk-shaped mouth to a fish and feeds on its blood. Eventually a chemical was found that was both biodegradable and, in proper quantities, toxic to lampreys only, and they and the eels were attacked in their spawning streams.

Within two years after the start of the intensive Lake Ontario lamprey control program, the numbers of fish returning increased tremendously, and, says Pearce, "we were on our way to developing what is now the largest and finest salmonoid (trout and salmon) fishery in the East and probably second only to Michigan in the entire country."

Although the salmon and steelhead fishery was enough to set an angler's head spinning, the state, feeling that the potential of the lake had not been fully exploited, began to stock it with brown trout in 1973. And, to put it in Pearce's words, "the results were phenomenal. It is by far the greatest brown trout fishery in the Northeast."

In March and April, huge schools of brown trout ranging from 3 to 15 pounds move in close to shore in quest of alewives and smelt that may be taken on flies or spinning lures. Work also has begun on stocking lake trout in Ontario. 500,000 fingerlings will be planted this spring.

Even as the trout and salmon multiply and grow in Lake Ontario, the aforementioned ban has hurt many people. Among them is Pearce, who left a better-paying job with the D.E.C. to direct the Ontario operation. Also hurt were those who invested time and money in preparing for the anticipated sport fishery. Pearce is particularly sensitive about this because he spent many hours convincing people of the region that the fishery would develop and that they should get ready for it.

William Pearce fishing for steelhead in the Salmon River, lavishly decorated with ice and snow

The regulations involving Lake Ontario fish—including smallmouth bass—are complicated, but, in general, the smaller sizes with lesser amounts of contamination are the ones anglers may keep. There is also a provision for taking three trophy sized salmonoids a year.

When concentrations of Mirex and PCB's above the levels considered safe for human consumption by the United States Food and Drug Administration were found in Lake Ontario fish, the D.E.C. moved swiftly to impose the ban.

Some observers feel that the state acted too precipitously, and note that Canada—which shares the lake with the United States—dealt with the problem by issuing a warning spelling out the dangers, as far as they are known, of eating the fish.

Still others feel that there should be a distinct on between F.D.A. restrictions involving commercial traffic and food and fish gathered by the individual for his own consumption.

Assuming that the levels of Mirex and PCB's have been properly assessed, there is still the question of how much and how often such fish may be safely eaten.

A.A. Berle, the D.E.C. commissioner, said that he was currently seeking Federal assistance toward this end. He also said that the major source of the Mirex had been located and eliminated, but added that the ubiquitous PCB's, which can come from the atmosphere, posed stiffer problems. How long the substances already in the lake will remain viable is another matter, but the experience with DDT leads one to believe that fairly rapid improvement could take place.

An outdoorsman, skier and ex-paratrooper, Berle is aware that his department's decision to impose the ban is most unpopular in many quarters, but, he observed, "The time is over when all a fish and game conservation department has to do is stock fish and game and manage them."

Meanwhile, efforts to keep the Lake Ontario fishery going will continue although stocking of the highly prized chinook, because they are the most heavily contaminated, has ended. There will be a fairly good run of large chinook this coming fall, but by the fall of 1979 their numbers will have dwindled noticeably.

2.94 Recreational Boating and Boat Harbors - Considerable amounts of small craft navigation occur along the eastern shores of Lake Ontario and in the Mexico Bay area. The primary difficulties and dangers encountered by recreational boaters on Lake Ontario are the highly variable weather conditions and quickly developing violent storms that often occur. When these storms develop boaters must reach port quickly or suffer the dangerous circumstances of riding out a severe storm and its associated high winds and rough waves.

2.95 Currently on Lake Ontario no suitable harbors of refuge or suitably developed harbors for small vessels exist between Oswego Harbor and the Henderson Bay area, an open water distance of approximately 41 miles. From Little Sodus Bay to Cape Vincent, a shoreline distance of about 75 miles, only four Federally maintained harbors exist. In addition, seven non-Federal developed and undeveloped harbors exist in this stretch. Table 2.27 and Plate 2.13 illustrate existing harbors in Eastern Lake Ontario. (33,34,35,36) Descriptions of the harbors follow:

a. Little Sodus Bay - Located along the southerly shore of Lake Ontario about 15 miles west of Oswego Harbor, Little Sodus provides suitably deep draft of 15.5 feet for any recreational craft on Lake Ontario. The entrance channel is protected for most of its length by parallel piers.

b. Oswego Harbor - Located at the mouth of the Oswego River about 59 miles northwest of Rochester, NY and about 20 miles southeast of Port Ontario, Oswego Harbor is a deep draft commercial harbor. The existing Federal Project provides a system of breakwaters which form a large protected outer harbor area off the mouth of the Oswego River with a smaller basin along shore to the west. The channels and basins have various controlling depths of 27, 25, 24 and 21 feet. Oswego Harbor provides suitable refuge capabilities for small recreational boats navigating the area.

c. Mexico Point (Little Salmon River) Harbor - The Little Salmon Harbor is located at the mouth of the Little Salmon River in Mexico Bay about 14 miles east of Oswego Harbor. No Federal project exists at Mexico Point. Most of the property along the east side of the river mouth is owned by the State of New York and has been developed as a boat launching site. Riprap stone has been placed along the lake shore to the east of the mouth as shore protection. The harbor does not provide adequate refuge capabilities as littoral processes frequently form a sand and gravel bar at the river mouth making navigation difficult and often dangerous.

d. Port Ontario Harbor - Chapter 1 outlines the existing features of Port Ontario the harbor under consideration for development in this study.

Table 2.27 - Eastern Lake Ontario Boat Harbors
Recreational Boating Facilities

Harbor	Responsibility	Entrance conditions, limiting depths	Primary Uses	Number of Recreational Craft Based (approximately)	Boating Facilities Present
Little Sodus Bay	Federal	15.5 ft.	Recreational boating and launch sites	100-125	5 marinas, 5 launch ramps, 120 pier moorings, some private docks
Oswego Harbor	Federal	21 to 27 ft.	Commercial Harbor and recreational boating	66	2 marinas, 1 launch site
Little Salmon - Mexico Point	State	Varies dependent upon shoaling conditions	Launch ramps	13	2 launch ramps, 13 boats moored at private docks
Port Ontario	None	Varies dependent upon shoaling conditions often 2 ft.	Launch ramps, berthing spaces, recreational boating	Unknown	52 berthing docks, 18 rental boats, 1 launch ramp, many private docks
Sandy Pond	None	Varies dependent upon shoaling conditions often 3 ft.	Recreational boating	Unknown	9 marina and launching facilities, many private docks
Henderson Bay and Harbor	None	Variable from 20 to 40 feet	Recreational boating	380	6 marina facilities and 3 launch facilities
Sacket's Harbor	Federal	8 to 12 ft.	Recreational boating	160	2 marinas, 1 launch site
Chamont Bay	None	Variable from 18 to 30 ft.	Recreational boating	Unknown	9 marinas, 8 launch sites
Cape Vincent	Federal	8 to 12 ft.	Recreational boating	270	10 marinas, 1 launch site
Galloo Island	None	Up to 7 ft.	Harbor of Refuge	None	None

e. North Sandy Pond - North Sandy Pond located about 23 miles northeast of Oswego and 28 miles south of Sacket's Harbor is a lagoon about three miles long and 1-1/2 to 2 miles wide. It is separated from Lake Ontario by a barrier beach and sand dunes. The location of the pond outlet varies due to erosion, sediment movement and littoral drift along the barrier beach. Depths up to 15 feet in the pond are adequate for boaters but depths in the constantly shifting outlet are generally 3 feet or less.

f. Henderson Bay and Harbor - Located about 41 miles northeast of Oswego is a broad recession of the Lake Ontario shoreline about 7 miles in maximum length and 2 miles in maximum width known as Henderson Bay. Located at the extreme southwesterly limits of this bay is Henderson Harbor. The bay and harbor areas provide suitable deep waters and sheltered harbor conditions for recreational boaters of the area.

g. Sacket's Harbor - This harbor is located in the southwest section of Black River Bay about 54 miles by water northeast of Oswego Harbor. This Federal Harbor provides adequate refuge facilities for small boats with depths ranging from 8 to 12 feet in an 8 acre anchorage basin. In addition a seasonally operated Coast Guard station is located at Sacket's Harbor.

h. Chaumont Bay - Chaumont Bay is a large, well protected area about 73 miles by water northeast of Oswego Harbor. Considerable deep water (18 to 30 feet) anchorage exists within the confines of Chaumont Bay as well as many commercial marinas.

i. Cape Vincent Harbor - This harbor is situated at the head of the St. Lawrence River about 2-1/2 miles from Lake Ontario. Cape Vincent, a Federally maintained harbor provides adequate anchorage and mooring for vessels entering or leaving the St. Lawrence River with depths ranging from 16 to 20 feet.

j. Galloo Island - Galloo Island is located about 2-3/8 miles westerly of Stony Island in the open waters of Lake Ontario near the head of the St. Lawrence River. Natural embayments provide undeveloped refuge capabilities at Galloo Island for boats of up to 7 foot draft.

2.96 Future Environments - Future regional and community environments for Oswego County and the town of Richland have been projected by State and local agencies. In general, agency projections and plans are based upon the assumption that both population and economic factors will continue to exhibit positive growth trends throughout north-central New York State during the next fifty years. Population projections for the town of Richland and Oswego County generally indicate that more people can be expected to live in the area by the beginning of the twenty-first century. Increases in population will consequently affect

Table 2.28 - Projected Characteristics of the Human Environment

Year	Population Projections		Recreational Projections			
			Recreational Boating Population		Sportfishing Population	
	Town of Richland	Oswego County	Oswego County	Jefferson County	Oswego County	Jefferson County
1970	5,324	100,897	2,318	10,148	1,667	2,041
1975	5,873	109,389	n.p.	n.p.	n.p.	n.p.
% Change	+10.3	+8.4	-	-	-	-
1980	6,374	117,089	n.p.	n.p.	n.p.	n.p.
% Change	+8.5	+7.0	-	-	-	-
1985	6,950	126,112	n.p.	n.p.	n.p.	n.p.
% Change	+9.0	+7.7	-	-	-	-
1990	7,556	135,459	3,064	12,259	5,272	5,907
% Change	+8.7	+7.4	+32.2	+20.8	+216.3	+189.4
1995	8,269	144,590	n.p.	n.p.	n.p.	n.p.
% Change	+9.4	+6.7	-	-	-	-
2000	8,975	153,166	n.p.	n.p.	n.p.	n.p.
% Change	+8.5	+5.9	-	-	-	-

n.p. - not projected

public dock; breakwater fishing access; land acquisitions; land-side access for construction; impact mitigation; and preservation of the dune-barrier beach complex to the north of the Salmon River outlet.

3.05 The Niagara Mohawk Power Company in a letter dated 15 November 1977 indicated that the proposed project did not adversely impact on their current land use patterns. Mr. Bruce Soule, Oswego County Legislator, responded favorably to the plan in a letter dated 18 November 1977.

3.06 The Oswego County Planning Board in a letter dated 18 November 1977 responded in favor of the proposed project at Port Ontario. They noted that the project was in conformance with the Oswego County Land Use Plan (1977, Reference 4), and that it is compatible with the town of Richland Zoning Ordinance. In addition, no conflicts were forseen between the proposed project and a Regional Water Quality Management Program currently being conducted by the County Planning Board.

3.07 The New York State Department of Environmental Conservation, in a letter dated 25 November 1977, responded favorably to the proposed project. The DEC recognized the need for development of a harbor of refuge at Port Ontario particularly in light of the development of the Lake Ontario-Salmon River sportfishery. DEC also noted the importance of the Salmon River estuary as a fish spawning and breeding area and indicated that construction should be timed to least interfere with fish spawning runs. DEC in conclusion noted the need to provide parking facilities and breakwater access for sportfishermen thereby optimizing the potential uses of the project.

3.08 The U.S. Department of Housing and Urban Development, in a letter dated 29 November 1977, noted that the proposed project does not conflict with their plans and policies. They also suggested contacting two local agencies; the Oswego County Planning Board and the Central New York Regional Planning and Development Board. As the Oswego County Planning Board had already been contacted no further, correspondence was necessary. The Central New York Regional Planning Board was notified of the proposed project in a letter dated 2 December 1977.

3.09 The Central New York Regional Planning and Development Board, in a letter dated 12 December 1977, responded favorably to the proposed project. No unresolved conflicts with any existing land use plans, policies, or proposals were identified by the Board.

capital, time, labor and natural resources used in the planning, design and construction of a project. Actions include such physical measures as construction of breakwaters and dredging of harbor channels. Outputs of an action are the ultimate future happenings that result from project actions. Outputs include such occurrences as provision of a safe refuge harbor, increased human activity and increased stimuli for new development in the project area. Plate 4.1 outlines the major inputs, actions and outputs that will create impacts from the implementation of the proposed Harbor of Refuge Project at Port Ontario, NY.

4.07 Impact Analysis - Impacts of the proposed Harbor of Refuge Project have been analyzed as specifically as possible according to the effect on specific components of the natural and human environments. Impacts resulting from input stages of project implementation are usually direct and of short-term duration although they most often involve irretrievable commitments of human and natural resources. Impacts resulting from action stages of project implementation may be direct or indirect, and vary in duration and commitment of resources. Impacts resulting from output stages of project implementation are usually of an indirect nature, a long-term duration, and involve varying degrees of commitments of both natural and human resources.

IMPACTS AT THE INPUT STAGE

4.08 Inputs - Inputs into the Port Ontario project include natural resources such as stone, concrete, steel, fossil fuels, and asphalt. Human resources used as inputs in the project include capital, time and labor.

4.09 Natural Resources - Certain project aspects will require the commitment of natural resources at the input stage including: (1) stone - will be quarried from a nearby quarry that can provide the proper materials at the most economical cost. This stone will be used for breakwater construction; (2) steel, concrete and asphalt will be used in construction of recreational fishing facilities including the breakwater walkway, safety guard rail, and navigational aids (buoys and lights); (3) wood will be used in the construction of the open pile wharf and foot bridges; (4) oil and gasoline will be used in all phases of the construction project by vehicles and machinery.

4.10 Inputs of these materials will be committed during initial construction and any operations and maintenance of the project that may be required in the future. As such, they are committed for the entire project lifetime and thus are irretrievably lost. The magnitude of impact can be considered low comparing the amounts of materials used in this project to the total amount of these materials available in this country. In the case of stone and concrete, impacts will probably be local or regional. It is unlikely that a quarry outside the north-

central New York area could supply stone economically. Wharf, foot bridge, guard rail and navigational-aid materials originate and can be obtained from various parts of the country, thus impacts of a low magnitude can be expected nationally.

4.11 Capital - Monetary resources from public revenues have been, and will be, expended during the planning, design, construction, and maintenance of the project. Total capital expenditures for this project are estimated to be about .725 million for preconstruction planning and design, and about 3.52 million for construction. Postconstruction maintenance costs of approximately $44,300 annually will be a function of the project's long-term physical integrity, continuing need for the project, and other factors. The magnitude of the capital expenditure impact is low through the construction phase, since 100 percent of the preconstruction costs and 85 percent of the construction costs are borne by the Federal Government. The remaining 15 percent of the construction costs will be furnished by non-Federal entities (State, county, town). The magnitude of the impact during the operation and maintenance phase over the 100-year effective life of the project will be a function of the extent of required maintenance, the size of the funding agency's tax base, and other factors. Monies spent on labor and other unrecoverable resources will be irreversibly and irretrievably committed. Indirect effects of capital expenditures will include employment and business activity for those firms that supply equipment, materials, and construction workers during the construction and maintenance of the project.

4.12 Time and Labor - The labor committed by all persons working on this project, is irreversibly and irretrievably expended, since all labor used for the project cannot be used for any other activity, nor can it be regained. Inasmuch as labor is accomplished over time, the time spent in project-related labor is also an expended resource. The types of labor committed to the project are generally in "blue collar" occupations (equipment operatives, construction laborers, etc.) during construction and maintenance activities. "White collar" labor is committed to the project during its planning, engineering and funding phases. The initial geographic level of the project's impact on time and labor is national as project participants (researchers, reviewers, prospective Contractors, etc.) are located throughout the country. The impact's duration is both temporary, in that time and labor are expended only when people are actively working on the project, and long-term since the need for project-related labor will extend into the twenty-first century. Assuming that about 50 percent of the preconstruction costs and 30 percent of the construction costs are for labor, then about 111 man-years of labor will be committed to the planning and construction of this project (also assuming a cost of $12,800 per man-year). Using the same assumptions about one man year of labor annually will be expended towards the maintenance of this project. Considering the number of persons in the nation, the time and labor expended on this project represent only a

4.17 Soils, Geology - Only minor effects will occur to soils of the project area as a result of project construction. The operation of heavy construction equipment will produce some unavoidable compaction of soils. Some vegetation will have to be removed for access of construction equipment to the project site. This will create some minor erosion and sedimentation problems. The duration of impacts on soils are largely short term and confined to the immediate project areas. These impacts are basically irreversible as one could not expect the rebuilding of lost soils within the foreseeable future.

4.18 A considerable quantity of rock will be quarried and used in breakwater construction. The commitment of rock to this project is basically long-term and irreversible as the rock will be committed to the project for its effective lifetime. Rock will be used from the nearest quarry that can provide suitable material at the most economical cost.

4.19 Air Quality - Air quality in the proposed project area will be temporarily affected by dust, noise, odors and vehicle emissions from the operation of construction equipment. The construction Contractor will be required to control such emissions and effects where practical. During the preparation of final project design and specifications the New York State Department of Environmental Conservation's Bureau of Noise will be consulted in developing applicable noise control measures for construction of the proposed project.

4.20 Littoral Drift - Construction of breakwaters at the mouth of the Salmon River will have some long-term impacts on the littoral transport system present along the lakeshore at the mouth of the river. Although the breakwaters have been model tested to provide for optimum entrance channel conditions with minimal effects on littoral transport some trapping of sediments will probably occur to the south of the south breakwater and some erosion or sediment starvation could occur directly to the north of the north breakwater. A sand bypass pipe has been incorporated into the proposed project. It will pass from the north to south breakwater underneath the bottom of the entrance channel. This will allow for the pumping of trapped sediments from one breakwater under the entrance channel and to the lakeward side of the opposite breakwater mitigating for any starvation or erosion that might occur. Pumping will be possible in either direction as a truck mounted pump could be operated at outlets of either the north or south terminus of the sand bypass pipe. Thus the essentially long term effects of littoral drift interruption can be mitigated when necessary creating essentially short-term littoral drift interruptions.

4.21 Water Quality - Some short-term reversible impacts on water quality will occur during project construction. There will be some unavoidable spilling of fuels, oil and grease into the river waters

located in Selkirk Shores State Park directly south of the project and Deer Creek Marsh to the north.

4.26 The disposal of dredged material is not expected to have any appreciable impact on wildlife. Material will be deposited at the interface between Lake Ontario and the lake shore, north of the mouth of the Salmon River. Wave action will quickly redistribute most of this material. The only impact that may occur is the temporary disruption of the feeding behavior of shorebirds in the immediate vicinity.

4.27 Wetlands and Aquatic Vegetation - Aquatic vegetation throughout most of the Salmon River Marsh is well developed and extensive. Within the specific project area itself, the vegetation is more restricted. Aquatic vegetation in the river channel is negligible and adverse impacts from dredging are not expected. The turning basin area and its immediate surroundings is the only place where harmful impacts to the aquatic vegetation are expected to occur. Dredging operations will remove approximately 5.7 acres of this wetland. The impacts would be irreversible and of long term duration. Although vegetation would be expected to reestablish itself in the disturbed area over time, periodic maintenance dredging to keep the channel and turning basin open will prohibit any extensive regrowth. Other aquatic vegetation adjacent to the dredged area may also be lost as a result of siltation from project construction and future maintenance.

4.28 The wetland within the turning basin dredging zone is classified as a Type 5 area according to U.S. Fish and Wildlife Service standards (13). Water levels of this type are fairly deep in comparison to the other categories of the wetland classification system. Vegetation in Type 5 wetlands usually occurs at depths of less than six feet. Emergent vegetation is limited and occurs only as a fringe at the border of the water.

4.29 Dredging plans have been formulated with respect to the low water datum for Lake Ontario, being 242.8 feet above mean water level at Father Point, Quebec (IGLD, 1955). Figures 1.1 and 1.2 show the depths in the project area at low water datum and the sites where dredging will take place respectively. However, current water depths (not shown in figures) average between two to three feet more than the low water value. Thus, approximately half of the area to be dredged in the turning basin is already at or below the six foot limit of usual vegetation growth as described in Sections 2.29 to 2.34. As a result, the aquatic vegetation in this area is limited and considered to be only marginally productive. Eelgrass makes up most of the vegetation in the turning basin. This is a significant mitigating factor with respect to the loss of this section of wetland. The other mitigating factor to this loss is the presence of abundant aquatic vegetation further upstream from the project. About 320 acres of wetland make up the Salmon River Marsh.

This diversity is largely a result of the habitat differences which make up the project area and its adjacent surroundings. The close proximity of Lake Ontario's cold and warm water fisheries and the warm water fishery of the Salmon River are the main components in this diverse habitat.

4.35 Impacts on the fishery will be reversible and of short duration, but are expected to be of some significance. Immediate fish kills will result from mechanical damage by equipment used in dredging and breakwater construction. Increased turbidity in the river's water could cause gill damage and kill fish. Construction activities will also produce disturbances which would force fish near the project area to move to other locations in the river or lake. Removal of large quantities of bottom material will destroy some spawning habitat as well as fish eggs and juveniles.

4.36 Noise, Aesthetics, and Recreational Resources - High noise levels will be generated by construction equipment during initial construction of the project and any operations and maintenance thereafter. The presence of construction equipment, temporary quarters, etc., will be of negative aesthetic value compared to the present project site environment. These impacts will be of short term, low magnitude, occurring only during construction, and operations and maintenance activities. Long term adverse aesthetic impacts will result from the permanent presence of the two breakwaters and excavation and dredging which will include sections of land at the mouth of Salmon River and wetlands in the proposed turning basin. Recreational activities, especially those associated with navigation, will necessarily be interrupted during construction operations and maintenance activities. Long term recreational opportunities, however, will be enhanced upon project completion with respect to both recreational boating, by virtue of improved harbor access facilities and docking and turning basin facilities, and increased sport fishing opportunities provided by the two breakwaters. Items of local cooperation, including provisions for a public wharf, lands, easements, rights-of-way, and additional parking facilities, will serve to complement these recreational opportunities.

4.37 Community Cohesion - The influx of workers during construction may result in some disruptions of personal and organizational interactions in the project area community. In addition, the presence of construction equipment, access roads, other supportive facilities and workers at the project site will result in disruptions and barriers to normal activities and social interaction among resident cottage owners in the immediate project vicinity. These impacts, however, should be of relatively low magnitude and of short duration (essentially lasting only as long as construction and subsequent maintenance, including dredging operations). Construction activities by the local cooperator (New York State), such as the construction of public docking facilities,

basin will also result in a negative aesthetic impact. Increased traffic noises will occur due to the additional number of small boats and motor vehicles that will be attracted to the area. In addition, discarded refuse left by increased numbers of boaters and sport fishermen along public and private property will result in further negative aesthetic impacts.

4.44 Community Cohesion - The implacement of permanent public facilities such as access roads, walkways, fencing along private property, parking facilities, and improved docking and fishing facilities will result in significant alterations, interruptions, and barriers to existing social interactions and relationships among private residential property dwellers in the immediate project area. Specifically, these will result in physical barriers to social interaction (e.g., fencing), loss of privacy, loss of a sense of community, increased noise levels, and pollution caused by the expected influx of "outside" recreators.

4.45 Business and Industrial Activity - Local commercial enterprises, particularly those retail and service establishments that provide goods and services to the boating and sportfishing populations, can be expected to experience an increase in business activities and revenues in relation to the number of additional recreators attracted by the improved harbor facilities. Increased trade accruing to existing business enterprises may increase both employment levels and personal incomes in the community.

4.46 Increased demands for recreation-related goods and services will increase the potential for improvement of existing commercial facilities and the development of new commercial facilities. Commercial developments would benefit local economic activities by stimulating business investments, creating employment opportunities, and increasing aggregate business and personal income in the community.

4.47 Community Growth - The project is not expected to have a significant, positive effect on population growth in the area. However, there may be an increased demand for short-term housing by recreators attracted to the improved harbor facilities during the summer season. This demand could increase the potential for the improvement of existing seasonal residences and the construction of new residences. Since the project area is in a state of less than full employment, no significant increases in the labor force are expected to result from increased demand for recreational goods and related services. Regional growth is not expected to be significantly affected by the project.

4.48 Tax Revenues - Improvements made to existing commercial and residential facilites, and the development of new facilities, would increase both the market and taxable value of affected properties. In addition, increased commercial activity, including retail trade, housing, rentals, restaurants, and fuel purchases will result in additional sales

5. ANY PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

5.01 Short-Term Adverse Impacts of Construction - Air quality in the proposed project area will be adversely affected, to some degree, by dust, noise, odors, and vehicle emissions from the operation of construction equipment. Accidental spillages of oil and greases from the construction floating plant will adversely affect project area water quality if spillages occur. Vehicular traffic on local streets will be inconvenienced by the periodic presence of construction vehicles. The aesthetic characteristics of the project area will be disrupted by the sights, sounds, and odors associated with construction equipment and activities. Construction equipment and activities will create potential safety hazards to small boaters and residents in the community.

5.02 Turbidity, caused by construction activities in project area waters, will adversely affect water quality. Short-term decreases in light penetration and biological productivity will occur in turbid waters. Siltation in the project channels and peripheral water areas will destroy some benthic flora and fauna. Some nektonic, planktonic, and benthic organisms will be destroyed or displaced by the operation of construction equipment. Dredging will release some nutrients and pollutants into solution or suspension, which will affect water quality and could result in the uptake of toxic constituents by aquatic organisms. About 9.62 acres of existing benthic habitat will be severely disrupted by dredging. Increased suspension of bottom materials in project area waters may damage gill filaments of some fish causing some local and limited mortality. Most fish are expected to migrate from the project area during construction. Some project area wildlife will be displaced due to construction disturbance.

5.03 Small boat activity for transportation and recreation purposes will be disrupted by the presence of the floating plant. To a certain degree, sales at marine-related businesses will decline due to the disruption of recreational activity in the harbor. Sportfishing will be disrupted by the displacement of fish from project waters.

5.04 Long-Term Adverse Impacts of the Completed Proposed Project - Fuel leaks, accidental spillages, accumulations of debris, vehicle exhaust emissions, and other pollutant sources will increase in relation to the number of small craft and vehicles that will be attracted to the harbor. Such impacts will be attenuated if the success of the NYSDEC salmonid stocking program is realized. Many more boats will be operating in the Port Ontario region due to the fishery, than would be expected under normal conditions. Erosion or accretion of materials may occur to the lakeward side of either breakwater.

5.05 Local fish and wildlife populations will be periodically disturbed by the increased number of small craft in the harbor. Vessel traffic tie-ups will occur during peak periods of harbor use by small boats.

6. ALTERNATIVES TO THE PROPOSED ACTION

6.01 Introduction - Various criteria and objectives for the provision of safe, suitable refuge harbor facilities at Port Ontario, New York, were developed during the planning of this project. Structural and nonstructural measures were then developed that could possibly satisfy the criteria and objectives. Measures that were not considered appropriate from engineering, economic, and/or environmental criteria were then eliminated from further consideration. The measures considered appropriate were then combined in various ways to formulate plans. The plans were then evaluated based upon the original criteria and objectives of providing a safe, adequate refuge harbor and assessed for environmental impacts and finally evaluated against each other. The results of the above planning and evaluating process led to the selection of Alternative 4 as the recommended plan of improvement at Port Ontario, New York. In addition, three other structural plans as described in the following sections met the planning objectives and criteria and were considered in detail. The No Action Plan implying no change to existing conditions was also considered in detail. The Phase I GDM document for this project describes in detail the objectives, criteria, measures and evaluation factors considered during the planning of the Port Ontario Harbor of Refuge Project.

6.02 The following paragraphs describe the various alternative plans considered in addition to Plan 4. Each alternative carried into the Phase I stage of planning is described and the environmental effects of the plans are illustrated. After careful consideration of all planning criteria and objectives, Plan 3, the Lake Plan, has been designated the EQ (Environmental Quality Plan). Plan 4, the Optimum River Plan, has been designated the NED (National Economic Development Plan), as it has the least cost of any considered plan and returns the greatest benefits.

ALTERNATIVE 3 - THE LAKE PLAN

6.03 Introduction - Alternative 3 would involve the construction of a harbor of refuge along the open shoreline of Lake Ontario at the northwest corner of Selkirk Shores State Park. All the navigation and recreation improvements considered would border or be on State park lands and would be adjacent to the bathing beach immediately to the south.

6.04 The Lake Plan, Plate 6.1, would provide for:

a. Two stone breakwaters in Lake Ontario fronting Selkirk Shores State Park land to form a protected mooring area for small craft; the southerly breakwater 850 feet long with a 150-foot long, 20-foot wide foot bridge to shore and the northerly breakwater 600 feet long with a 150-foot long, 20-foot wide foot bridge to shore;

b. Two stone breakwaters each 110 feet long, parallel to and 130 feet from shore 80 feet south of the south breakwater and 80 feet north of the north breakwater;

c. An entrance channel between the outer ends of the north and south breakwaters 100 feet wide and 8 feet deep, from deep water in the lake to within the protection of the breakwaters;

d. An access channel to the mooring area and public dock 100 feet wide aggregating 900 feet in length and 6 feet deep; and

e. A mooring area for transient craft 350 feet wide, 550 feet long and 6 feet deep.

6.05 Safe adequate anchorage would be provided within the confines of the refuge harbor for about 20 boats ranging in length from 26 to 40 feet.

6.06 Foot bridges would be constructed from shore to both the north and south breakwaters for fishermen access. In addition, the foot bridges would allow long-shore circulation and allow for the continuance of littoral movements of sand and cobbles alongshore. The breakwaters would be capped with a smooth concrete walkway and guard rails would be provided for safety. The large protective breakwaters would rise about 17 feet above low water datum.

6.07 The nearshore breakwaters are situated and designed to help reduce wave action in the anchorage area that could otherwise result from openings at the foot bridges. They would rise about 8.0 feet above low water datum.

6.08 The approach channel would be dredged to a depth of 8 feet below low water datum. The inner channel and anchorage area would be dredged to a depth of 6 feet below low water datum. A total of 25,066 cubic yards of sandy and gravelly material representing an area of 6.69 acres of lake bottom would be dredged. Dredged materials would be disposed of by littoral nourishment along the beach to the north of the Salmon River outlet.

6.09 Adverse Environmental Impacts - Inputs of capital, time, and labor would be irreversible commitments of human resources used during the implementation of Alternative 3. During construction, unavoidable impacts such as dust, noise, adverse esthetics, possible water pollution and other effects associated with construction activities would be encountered. Such effects would be temporary in nature, probably of low magnitude and confined to the immediate project area.

6.16 Plan 3 would have little impact in the future on the local biological and human setting. An inherent part of the river plans are the stimuli they would induce for the development of more recreational boating facilities in the lower Salmon River and pressure for development in the associated wetland areas. The only means to enlarge Plan 3 would be the costly construction of additional breakwaters. In the case of the river plans, considerable private land abuts the river front and with the construction of adequate navigation improvements (breakwaters and channels) it is probable that considerable interest would be developed among the public towards construction of marina and private docking facilities further degrading the existing biological environment of the riverine ecosystem.

6.17 Local Cooperation - The local cooperator and items of local cooperation would be the same for the Lake Plan as for the selected plan, Alternative 4, although costs would be different. See sections 1.27 through 1.28 for the local cooperation items.

6.18 Costs - The total first cost of Alternative 3 based on October 1977, price levels is $7,060,000. The benefit/cost (B/C) ratio for Plan 3 is 0.47. Table 6.1 breaks down the total costs into various activities and Federal or non-Federal responsibility.

6.19 Estimated annual maintenace costs would be accrued for Alternative 3 as indicated in table 6.2 below:

Table 6.2 - Annual Maintenance Costs, Alternative 3

Item	Federal	Non-Federal	Cost
	$	$	$
Channels and Breakwaters	110,000		110,000
Aids to Navigation	3,000		3,000
Recreational Facilities		7,000	7,000
Total	113,000	7,000	120,000

6.20 The Lake Plan, Alternative 3, was rejected from further consideration due to its high initial cost and due to the fact that the New York State Office of Parks and Recreation, the local cooperator, does not approve of the plan. In a letter dated 7 November 1977, the Office of Parks and Recreation indicated that the plan was untenable because of its close location to the bathing beach at Selkirk Shores State Park, its high cost, and other aesthetic and environmental considerations.

ALTERNATIVE 1 - THE PROJECT DOCUMENT PLAN

6.21 Introduction - Alternative 1 would involve the construction of a harbor of refuge at the mouth of the Salmon River. Various parts of the navigational improvements would be on State and private lands.

6.22 The Project Document Plan, Plate 6.2, would provide for:

a. Two parallel jetties 200 feet apart, the north and south jetties 915 feet and 735 feet long, respectively, with pile wall connections to shore 280 feet and 470 feet long, respectively;

b. An entrance channel 100 feet wide and 10 feet deep, from deep water in the lake to a point about 400 feet upstream from the inner end of the north jetty;

c. An inner channel 100 feet wide and eight feet deep from the inner end of the entrance channel to a point about 1,800 feet upstream; and

d. A harbor basin generally 400 feet wide; ranging in length from 900 feet to 600 feet, and eight feet deep, upstream from the inner channel.

6.23 Safe adequate refuge would be provided within the confines of the refuge harbor for 20+ boats ranging in length from 26 to 40 feet. Access to the anchorage basin is suggested to be by an open pile wood wharf that connects to shore in the area of Selkirk Shores State Park near an existing parking lot and small launching ramp.

6.24 Due to the fact that the jetties would be connected to shore by sheet pile walls, no jetty access would be provided for recreational fishing.

6.25 The lake approach channel would be dredged to a depth of 10 feet below low water datum. The inner, river channel and anchorage area would be dredged to a depth of eight feet below low water datum. A total of 144,000 cubic yards of sandy, gravelly, and silty material representing an area of 11.14 acres of lake and river bottom would be dredged. Dredged materials would be disposed of by littoral nourishment along the beach to the north of the Salmon River outlet.

6.26 Adverse Environmental Impacts - Inputs of capital, time, and labor would be irreversible commitments of human resources used during the implementation of Alternative 1. During construction, unavoidable impacts such as dust, noise, adverse esthetics, possible water pollution and other effects associated with construction activities would be encountered. Such effects would be temporary in nature, probably of low magnitude and confined to the immediate project area.

6.27 Construction of jetties and steel sheet pile shore connections would cause the loss of about 0.75 acre of lakeshore and riverine benthic habitat. An additional 11.14 acres of lake and river benthic habitat would be disturbed by dredging. Considerable destruction of macrobenthos will occur but recolonization should restore macrobenthic populations in the dredged areas shortly after dredging ceases. Wildlife and fish would be disturbed and would probably avoid the project area during construction. Some outright destruction of wildlife and fish will occur during project construction.

6.28 Littoral sediment disposal is expected to have little impact except for increased turbidity created in the area during disposal operations.

6.29 Dredging in the lower Salmon River for Alternative 1 would have some impact on wetlands. Using as a reference point six feet below low water datum for the maximum depth of rooted aquatic plant growth and associated wetland development, about 8.35 acres of Type 5 open fresh water wetland would be lost through channel and basin dredging. An additional small area of Type 5 wetland would be disturbed during construction of the public wharf.

Table 6.3 - Total Costs, Alternative 1

Item	Federal	Non-Federal	Cost
			$
Breakwaters		1/	2,817,400
Channels		1/	1,159,300
Subtotal	3,765,400	211,300 1/	3,976,700
Engineering & Design			2/
Supervision & Administration			2/
Aids to Navigation	16,900		16,900
Lands and Damages		9,400	9,400
Public Wharf		517,000	517,000
Pier Fishing Facilities	None Provided		
Total	3,782,300	737,700	4,520,000

1/ The local sponsor is responsible for a cash contribution of $211,300 towards the costs of breakwaters and channels under the conditions of the original authorization.

2/ No estimates provided for engineering and design or supervision and administration.

6.36 Annual maintenance costs would be accrued for Alternative 1 as indicated in Table 6.4 below.

Table 6.4 - Annual Maintenance Costs, Alternative 1

Item	Federal	Non-Federal	Cost
	$	$	$
Channels and Jetties	47,100		47,100
Aids to Navigation	900		900
Public Wharf		23,500	23,500
Total	48,000	23,500	71,500

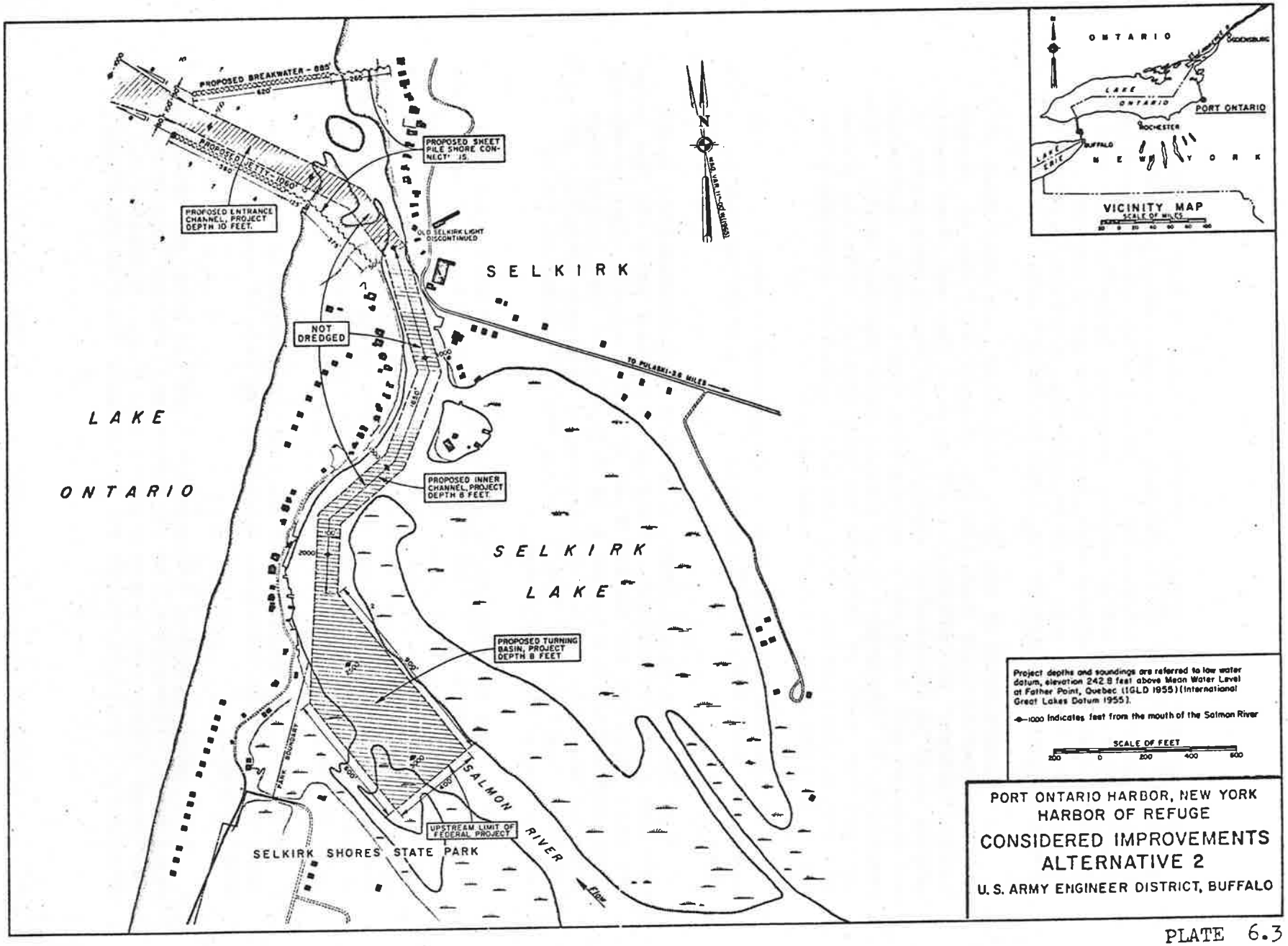

PROPOSED BREAKWATER - 885'
PROPOSED JETTY - 1060'
PROPOSED ENTRANCE CHANNEL, PROJECT DEPTH 10 FEET.
PROPOSED SHEET PILE SHORE CONNECT'N.
OLD SELKIRK LIGHT DISCONTINUED
SELKIRK
NOT DREDGED
TO PULASKI-26 MILES
LAKE ONTARIO
PROPOSED INNER CHANNEL, PROJECT DEPTH 8 FEET.
SELKIRK LAKE
PROPOSED TURNING BASIN, PROJECT DEPTH 8 FEET
PARK BOUNDARY
SALMON RIVER
Flow
UPSTREAM LIMIT OF FEDERAL PROJECT
SELKIRK SHORES STATE PARK
ONTARIO
LAKE ONTARIO
PORT ONTARIO
ROCHESTER
BUFFALO
LAKE ERIE
N E W Y O R K
VICINITY MAP
Project depths and soundings are referred to low water datum, elevation 242.8 feet above Mean Water Level at Father Point, Quebec (1GLD 1955) (International Great Lakes Datum 1955).
1000 Indicates feet from the mouth of the Salmon River
SCALE OF FEET
200 0 200 400 600
PORT ONTARIO HARBOR, NEW YORK
HARBOR OF REFUGE
CONSIDERED IMPROVEMENTS
ALTERNATIVE 2
U.S. ARMY ENGINEER DISTRICT, BUFFALO

PLATE 6.3

River and would require the dredging of some existing and potential wetland areas. The Lake Plan, in contrast, does not require the dredging of any wetlands.

6.50 Implementation of Alternative 2 would generate considerable interest in the development of additional boating facilities in the lower Salmon River including marinas, private docks and associated facilities. Development of these boating facilities would cause further degradation of the existing natural environment, particularly the 320-acre Salmon River wetland complex. Future development of private marina and dock facilities in the lower Salmon River would be considered under the Department of the Army permit system and be subject to review by the Fish and Wildlife Service and the New York State Department of Environmental Conservation.

6.51 Local Cooperation - The local cooperator and items of local cooperation would be the same for Alternative 2 as for the selected plan, Alternative 4, although costs would be different.

6.52 Costs - The total cost of Alternative 2 based on October 1977 price levels is $5,810,000. The benefit/cost (B/C) ratio for Plan 2 is 1.08. Table 6.5 breaks down the total costs into various activities and Federal or non-Federal responsibility.

6.54 Alternative 2 was rejected for several reasons including higher costs than Plan 4, uncertainty about the design and adequacy of the navigational structures, the greater amounts of sediments dredged and wetlands disrupted, and because no breakwater fishing facilities are provided.

ALTERNATIVE 5 - NO ACTION

6.55 Introduction - The No Action Alternative as its title implies would mean that no Federal actions would be taken to construct a Harbor of Refuge at Port Ontario. Due to the high costs involved in construction of such navigational facilities, it is improbable that the State of New York or any local Governments would build such a harbor without the aid of the Federal Government.

6.56 Environmental Impacts of No Action - The No Action Alternative would mean that little additional recreational navigation facilities would be developed in the lower Salmon River. Without the provision of adequate breakwaters and channels it is unlikely that local interests would expand the number of marinas and docks currently existing in the area.

6.57 The dangers of sudden storms causing injury or loss of life of recreational boaters cruising the Mexico Bay area will remain with the No Action Alternative. It is unlikely that adequate refuge harbors will be developed in any other suitable localities along the Mexico Bay shoreline.

6.58 No breakwater fishing facilities or opportunities will be provided with the No Action Alternative. Thus, no additional economic stimuli provided by increased sales of fishing equipment, bait, and associated sales of food, sleeping quarters, etc., would occur.

6.59 The No Action Alternative means that no breakwater structures would be built at the mouth of the Salmon River. Littoral processes and movements would remain and the existing natural channel would periodically experience shoaling.

6.60 In general, the No Action Alternative would mean that little additional economic stimuli would occur in the region. No additional employment opportunities would be provided in the service and construction trades if the no action alternative is selected.

6.61 The No Action Alternative was rejected as the dangers of navigating in Mexico Bay and the lack of any suitable harbors of refuge in the area would still exist.

8. ANY IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH WOULD BE INVOLVED IN THE PROPOSED ACTION SHOULD IT BE IMPLEMENTED

8.01 Implementation of the proposed project would result in the expenditure or elimination of various natural and human resources. In order to evaluate resource commitments that can be expected to occur from implementation of the proposed project at Port Ontario, the time frame for an irreversible or irretrievable commitment is defined as a minimum of 50 years, which is the estimated effective lifetime of the proposed project.

8.02 Labor, capital, energy, and time expended during the planning, design, construction, and maintenance phases of the proposed project will be permanently lost. Structural materials will be committed for the project's lifetime.

8.03 Approximately 2.18 acres of lake bottom habitat will be covered by harbor structures until such time, if ever, when the structures are removed.

8.04 Approximately 9.62 acres of benthic habitat will be committed to future maintenace dredging when channel conditions warrant such activities.

8.05 Individuals of floral and faunal species located in the project area will be destroyed by construction activities and will be irreversibly and irretrievably lost.

8.06 The aesthetic environments of the harbor will be permanently altered.

9.05 Model Study - The Corps invited State, county, and local officials and a marina operator from Port Ontario to see and discuss the hydraulic model of Port Ontario at the Waterways Experiment Station (WES) on 21 June 1977.

9.06 Agency Coordination - Various Federal, State, and local officials and agencies were contacted by phone, personal visit, and by correspondence during this study. Copies of their responses are provided in Appendix A of this report. Considerable coordination has been conducted within the Cortland Area office of the U. S. Fish and Wildlife Service. The Final Fish and Wildlife Coordination Act Report on the Port Ontario Harbor Project was received by the Buffalo District on 17 February 1978. Copies of the report are available from the Buffalo District on request. It has not been included here due to its length.

9.07 News Releases - Prior to the public meeting, a news release was sent to various news media announcing the purpose of the meeting. Throughout the study, news releases have been made to announce the most recent and significant findings of the study.

9.08 Land Use Plans - Federal, State, and local land use planning agencies were contacted to determine the relationship of the proposed action to land use plans or proposals. Comments from coordinating agencies are discussed in Chapter 3 of this Environmental Statement.

9.09 Cultural Resources - The Buffalo District has contracted for a cultural resources reconnaissance level study of the proposed project area. This report when completed will be sent to the National Park Service, the State Historic Preservation Officer, and the State Archeologist for review and comment. If it appears sites eligible for the National Register of Historic Places will be affected, coordination with the Advisory Council on Historic Preservation will be initiated.

9.10 Statement Coordination - To ensure full coordination, this Environmental Statement has been sent to Federal, State, and local Government agencies, private industry, citizen groups and concerned individuals for review and comment. A list of entities that received this document is presented as Item 5 of the Summary page.

APPENDIX A

LETTERS OF COORDINATION

APPENDIX A

LETTERS OF COORDINATION

Abbreviations Used in Index

BD	- U.S. Army Engineer District, Buffalo, NY
CG	- Ninth Coast Guard District
CNYRPDB	- Central New York Regional Planning and Development Board
EPA	- United States Environmental Protection Agency
FWS	- U.S. Fish and Wildlife Service
HUD	- U.S. Department of Housing and Urban Development
NMPC	- Niagara Mohawk Power Corporation
NYSDEC	- New York State Department of Environmental Conservation
NYSDS	- New York State Department of State
NYSOPR	- New York State Parks and Recreation
OCPB	- Oswego County Planning Board
PGBA	- Pine Grove Beach Association
SLEOC	- St. Lawrence-Eastern Ontario Commission
USDI:NPS	- National Park Service

NCBED-PA 29 May 1975

Honorable Robert C. McEwen
House of Representatives
Washington, DC 20515

Dear Mr. McEwen:

This letter is in response to both your 13 May 1975 letter concerning a small-boat harbor at Little Salmon River and a 20 May telephone request by Mr. Malon of your office concerning actions the Corps can take in Oswego County in the interest of recreational boating and fishing.

There is one authorized Corps of Engineers navigation project in Oswego County that has been constructed to date. This is the Oswego deep draft harbor. Current Corps activities at Oswego Harbor consist of maintenance of completed structures and channels. The project was designed and built as a commercial harbor.

Another authorized Corps of Engineers navigation project in Oswego County is at Port Ontario and has not yet been constructed. The project at Port Ontario is authorized for construction as a small-boat harbor. There are no funds in the FY 76 budget to initiate the design of the Port Ontario small-boat harbor. I have indicated a capability to accomplish a $50,000 design effort for this project in FY 76 if these funds are provided.

I have been authorized by Congress to make a study to determine the feasibility of constructing a small-boat harbor at the mouth of the Little Salmon River but to date no funding has been provided for this study. I will consider including this study in my recommended FY 77 program.

I can assure you that I am aware of the interest of area residents in development of boating access to Lake Ontario. I also share the concern about safety of fishermen attempting to utilize the lake waters for any without adequate harbors of refuge. If I can be of further assistance in this matter or provide further information, I will be happy to do so.

Sincerely yours,

RICHARD C. REEVES
Colonel, Corps of Engineers
District Engineer

Goodno _____
Kelly _____
Gilbert _____
Maloney _____
Liddell _____

STATE OF NEW YORK
PARKS AND RECREATION
ALBANY

LEHMAN
ISSIONER

December 19, 1975

Dear Colonel Hughes:

RE: NCBED-DG

I was very pleased with the progress your office has made with the Cattaraugus Creek, Dunkirk, and Port Ontario Harbors of Refuge Projects.

Assurances from New York State will be given when called for, subject to appropriations by the Legislature and municipalities. Chautauqua County has already budgeted a small amount of monies. Port Ontario does not have a municipal fiscal sponsor, which will require additional funds from the State.

In the matter of land easements, Port Ontario will present the greatest problem and very well may take a year for resolution. We are awaiting a firm siting design. Numerous pieces of property are involved, and their distance from State Park lands creates a facet which must be given serious scrutiny.

There seems to be no land acquisition difficulties at Dunkirk, since the upland area is owned by the City.

The Town of Hanover has indicated it would be responsible for obtaining easements from Mr. Benjamin Wadja at the mouth of Cattaraugus Creek. Adjacent lands further south are owned by the Town.

At the north shore of Cattaraugus Creek, the Seneca Nation of Indians will undoubtedly prefer to negotiate with a Federal agency regarding their lands.

Thank you for your sincere efforts at advancing the Harbors of Refuge Program.

Sincerely,

Colonel Bernard C. Hughes
District Engineer
Department of the Army
1776 Niagara Street
Buffalo, NY 14207

This is, of course, dependent on there being access, be it privately or publicly sponsored. As a result of the size of Lake Ontario, the weather systems and wind and wave action coupled with the allure of catching big fish, it is also obvious that such access should be available in type and locations so as to afford a reasonable level of safety to boaters. The development of such access must be viewed as necessary to the development of the lake fishery, and Port Ontario can be a significant step in that direction.

The Office of Parks and Recreation acts as New York States "lead agency" in developments such as Port Ontario. Therefore, we will be cooperating with that Office, as well as the Corps, making direct recommendations concerning what we believe to be requirements for acquisition, development and maintenance of this public use facility.

At present, those recommendations include the following:

1) Acquisition should provide the greatest amount of safe public access to the physical facility and its component parts such as the use of jetty walls for fishing piers. Problems which could arise from public use conflict with adjacent owners should be realistically appraised now in selecting alternatives for acquisition and planned layout.

2) Docks constructed with pilings would be preferable to permanent fill in the method of construction. Open piling systems will allow for better water circulation patterns and would lessen turbidity problems during and following construction.

3) Permanent bulkheading should be of hard durable material such as rock rip-rap, concrete or sheet pile to eliminate erosion vulnerability.

4) Design of the facility, turning basin and channel should utilize natural flow characteristics to minimize needs for maintenance dredging.

Sincerely,

B. L. Griffin
Regional Supervisor
of Fish & Wildlife

nh

cc: Col. B. C. Hughes (Attn: Bill Berkeley)
Roy Roberts
Sam Perry
W. Hicks
A. Petty
J. Proud (Attn: W. Stiles)
W. Pearce
R. Brewer

1. Construct slightly smaller breakwaters and jetties of riprap rather than less environmentally acceptable steel sheet pile.

2. Construct an 8 foot deep entrance channel in the immediate vicinity of the jetties.

3. Construct a 5 foot deep, plus 1 foot extra depth for errors, equals six foot anchorage area just within the mouth of the Salmon River for storm refuge.

4. The Corps and/or the state should purchase the area's high quality wetlands or in lieu of this conduct an intensive publicity campaign which would notify area land owners that permit applications for dredging and filling in vegetated wetlands or spawning and nursery areas will be almost certainly denied.

Thank you for the opportunity to comment.

Sincerely yours,

Conrad Simon
Director
Environmental Programs Division

For assistance in the probability determination of the existence of significant archeological resources that could be affected by the project work and for advice on necessary follow-up measures to mitigate harm, we recommend consultation very soon with such qualified archeologists as New York Archeological Council (4242 Ridge Lea Road, Buffalo, New York 14226) and with Mr. Patrick Wilder (Sackets Harbor State Park, Sackets Harbor, New York 13685). The draft environmental statement should display and discuss the results of these professional and official consultations.

The schedule for the Plan of Study, Environmental Impact Statement and General Design Memorandum accomplishment looks good--the open seasons being available for necessary resource investigations. We look forward to reviewing a most commendable draft environmental statement next spring.

You should understand that these comments are being offered as technical assistance from concerns and expertise of the National Park Service only. You may wish to secure similar assistance from the Bureau of Outdoor Recreation, U. S. Fish and Wildlife Service or other Bureaus of this Department. Our comments at this time do not predispose of any Departmental position that may be taken later upon review of the draft environmental statement or otherwise.

Sincerely yours,

L. J. Hovig
Acting Regional Director

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OR
HENDERSON, N Y 13650

September 1, 1977

Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Attention: Lt. Col. Thomas R. Braun
Corps of Engineers
Acting District Engineer

Dear Lt. Col. Braun:

Thank you very much for your letter of August 25, 1977 which answered several questions brought up by the Pine Grove Beach Association members. I will make this letter part of our file for future reference. There is, however, one point which I think I should make, that being it was never the intent of the property owners to have access to a Federal structure if the public did not also have it. I understand that it is totally unacceptable and our members fully appreciate this.

Our position, as you know, is that the Association is basically in favor of the project to the extent that the Salmon River becomes a safe boat harbor with marina facilities but with no access to the piers for fishing by anyone.

Very truly yours,

C. W. Wittenburg (mo)

C. H. Wittenburg, President
Pine Grove Beach Association

CHW:mo

STATE OF NEW YORK
PARKS AND RECREATION
ALBANY

ORIN LEHMAN
COMMISSIONER

October 4, 1977

Dear Colonel Ludwig:

I would like to clarify the State of New York's position in the development of a Harbor of Refuge at Port Ontario, New York.

It is still, at this time, the intention of the State of New York to provide only what is called for in the project document for upland development, namely, access to the site.

I am very pleased with the continued progress toward utilizing the recreational opportunities offered by Lake Ontario.

Sincerely,

Orin Lehman

Colonel Daniel D. Ludwig
District Engineer
Department of the Army
U.S. Corps of Engineers
Buffalo District
1776 Niagara Street
Buffalo, New York 14207

completion of a Phase I GDM for Port Ontario which is a project that could be constructed in a few years and would help alleviate the need for a suitable harbor-of-refuge in the Mexico Bay area. The current schedule for completion of a Phase I GDM report and a Draft Environmental Impact Statement for the Port Ontario project is 30 November 1977.

Four plans are being considered in our final plan formulation stages for Port Ontario. These include the project document authorized plan, the definite project report plan, the lake plan and an optimum river plan which we have identified as plan 4. The results of our preliminary analyses and coordination efforts indicate that Plan 4 will be the District's selected plan. It will also be the National Economic Development (NED) Plan. The Lake Plan is being considered the Environmental Quality (EQ) Plan. Plan 4 was model studied at our Waterways Experiment Station (WES) in Vicksburg, Mississippi, and the breakwater alignment was proved to be the most appropriate for maintaining the hydrologic regime of the Salmon River and has the least interruption of littoral drift along the shoreline. As indicated on the drawing for Plan 4, a pipeline will be placed from the south breakwater to the north breakwater to make it feasible for periodic pumping of trapped littoral material from the south breakwater to the lakeward side of the north breakwater, or vice versa. This will provide for beach replenishment in the event downdrift erosion occurs at either the north or south breakwaters.

Region II of the United States Environmental Protection Agency has classified the sediments from the lower Salmon River as unpolluted and suitable for open lake disposal. EPA also recommends, in order of preference, disposal methods consisting of littoral nourishment, upland disposal in a suitable area and, lastly, open lake disposal. The District will not select a disposal method until there is agreement between EPA, USFWS, the State of New York DEC, and the State Office of Parks and Recreation.

Diagrams are included for each of the plans under consideration. Attachment 1 compares the major features, costs, and dredging quantities for each plan. Each plan is designed as a harbor-of-refuge only. The New York State Parks and Recreation Commission, the non-Federal sponsor, has no plans at this time to construct a marina at Port Ontario. The State, however, would be required to provide a public dock adjacent to any anchorage area. A preliminary indication of such a public dock is shown on the drawing for Plan 4. An anchorage area is a necessary part of any harbor-of-refuge and is designed for the anchorage of transient craft seeking refuge from lake storms. The public dock is a Federal project authorization requirement for the purpose of providing for the sale of motor fuel, lubricants, and potable water available to all on equal terms.

Attachment 1
Features and Costs

	Optimum River Plan (Plan 4) (1)	Lake Plan (2)	Project Document Plan	Definite Project Report Plan
PROJECT FEATURES				
Protective Structures Type	Stone Rubblemound	Stone Rubble-mound	Steel sheet pile, diaphragm cell and cantilever wall construction	Steel sheet pile, diaphragm cell and cantilever wall construction
Width (feet)	See Cross Section	See Cross Section		20.24 to 17.30 circular cells 9.58 cantilever
Jetty length (feet)				
South jetty	350	850	1,205	1,060
North jetty	1,450	600	1,195	885
Entrance channel				
width (feet)	100	100	100	100
length (feet)	1,200	400		1,100
depth (feet)	8	8	10 below LWD	10 below LWD
dredging required(c.y.)	33,000	*		
Inner channel				
width (feet)	100	100	100	100
length (feet)	2,200	900		1,700
depth (feet)	6	6	8 below LWD	8 below LWD
dredging required(c.y.)*		*		
Turning Basin				
width (feet)	250	350	400 generally	400 generally
length (feet)	900	550	northerly limit 900 southerly limit 600	northly limit 900 southerly limit 600
depth	6	6	8 below LWD	8 below LWD
dredging required(c.y.)*		21,400		
*combine (c.y.)	31,600	3,700		

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

NCBED-PR

17 October 1977

Mr. Ivan P. Vamos
Assistant Commissioner for
Environmental Affairs
New York State Parks and Recreation
Empire State Plaza
Albany, NY 12238

Dear Mr. Vamos:

Our office was contacted by telephone on 29 September 1977 by Mr. Joe Hudek and Ms. Grace Klipper of Region II of the United States Environmental Protection Agency, New York, concerning sediments of the lower Salmon River at Port Ontario Harbor. A letter will be sent to the District Office stating that the sediments in question are unpolluted and suitable for open lake disposal. In addition, recommendations will be made concerning favored disposal methods. In order of preference, EPA would prefer littoral nourishment, upland disposal at a suitable site, and open lake disposal.

In the past, the District has been unable to gain approval from the New York State Department of Environmental Conservation for littoral nourishment projects. We would appreciate your contacting the appropriate personnel in DEC concerning the idea of littoral nourishment at Port Ontario and would also appreciate receiving your views on the subject.

Sincerely yours,

DANIEL D. LUDWIG
Colonel, Corps of Engineers
District Engineer

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10007

OCT 21 1977

Colonel Daniel D. Ludwig
District Engineer
Buffalo District
Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Re: Sediment quality of Port Ontario Harbor, New York

Dear Colonel Ludwig:

We have reviewed the sediment quality reports for Port Ontario Harbor prepared by our Region V Great Lakes Surveillance Branch. Based on their sampling data, we have determined that these sediments are unpolluted.

We have the following preference for the method of dredged material disposal:

1. Beach nourishment
2. Upland disposal
3. Open lake disposal

We are looking forward to further coordination with you on this sensitive project.

Sincerely yours,

Barbara Metzger for

Conrad Simon
Director
Environmental Programs Division

LETTER SENT TO THE FOLLOWING:

Mr. Richard Garrabrant
Environmental Clearance Officer
U. S. Department of Housing and
Urban Development
Buffalo Area Office
560 Main Street
Buffalo, NY 14202

K. W. Shiatte, Director
Development Division
New York State Department of Transportation
1220 Washington Avenue
State Campus
Albany, NY 12226

D. David Brandon, A.I.P.
Director of Program Development
New York State Urban Development
Corporation
41 State Street
Albany, NY 12207

Mr. Robert E. Hansen
New York State Office of Planning Services
State Tower Building
Syracuse, NY 13202

Mr. E. Wilson Cambell
Acting Assistant Commissioner
Office of Planning and Development
Administrative and Engineering Bldg.
State Campus
Albany, NY 12226

Orin Lehman, Commissioner
New York State Office of
Parks and Recreation
Agency Building 1
Empire State Plaza
Albany, NY 12223

Mr. Alman J. Hawkins
Oswego County Planner
County Office Building
Fulton, NY 13069

Thomas P. Eichler, Director
Office of Program Development
New York State Department of
Environmental Conservation
50 Wolf Road
Albany, NY 12233

Mr. William Tyson
Executive Director
St. Lawrence - Eastern Ontario Commission
317 Washington Street
Watertown, NY 13601

Honorable Floyd Carpenter
Mayor, Village of Pulaski
7685 View Road
Pulaski, NY 13142

Mr. James Bartlett
Executive Vice President
Niagara Mohawk Corporation
300 Erie Blvd.
W. Syracuse, NY 13202

VILLAGE OF PULASKI

7633 JEFFERSON STREET • PULASKI, NEW YORK 13142

INCORPORATED 1832

October 27, 1977

Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Attn: Daniel D. Ludwig, Col.

Dear Sir:

The proposed Harbor of Refuge improvements at Port Ontario, Oswego County, New York will not conflict with the objectives or policies of the Village of Pulaski.

This is a plan long awaited by the residents of this area.

Sincerely yours,

Floyd T. Carpenter

Floyd T. Carpenter
Mayor

FTC/eec

sk/2175

2 November 1977

NCBED-PR

Mr. William A. Pierce
New York State Dept. of
Environmental Conservation
Cape Vincent Fisheries Station
P.O. Box 292
Cape Vincent, NY 13618

Dear Mr. Pierce:

The Buffalo District is currently working on a Phase I GDM (General Design Memorandum) and Draft Environmental Impact Statement for the Port Ontario Harbor of Refuge Project. Although we are considering several alternatives, Plan 4 as shown on the enclosed plate, appears to be the most favorable alternative from results of our preliminary analysis. Outlined in red on the enclosed plate are areas that will be dredged if this plan is accepted. We are aware of the value of the lower Salmon River wetlands for fish spawning and migratory movements and are concerned about the possible impacts of breakwater construction and dredging on spawning and migratory activities.

If the project is approved for construction, it would be possible for construction and dredging to occur roughly between the months of April and early December, depending on weather conditions. I would very much appreciate your advice as to which months of the year are most appropriate to schedule construction and dredging that would least interfere with fish spawning and migratory movements in the Salmon River. If you could provide us this information by 20 November 1977, we will incorporate it into our planning report for this project. If you have any questions, please contact Mr. Philip Berkeley of our Environmental Resources Section at 876-5454, extension 2175.

I appreciate your past interest and involvement in our study.

Sincerely yours,

KENNETH R. HALLOCK, P.E.
Acting Chief, Engineering Division

1 Incl
as stated

CF:
NCBED-PR

30TH DISTRICT, NEW YORK

Congress of the United States
House of Representatives
Washington, D.C. 20515

November 3, 1977

Colonel Daniel D. Ludwig
District Engineer
Buffalo District, Corps of Engineers
Department of the Army
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

The enclosed letter from Ms. Gail Lowenstein is self-explanatory, and I am forwarding it to you so that you are aware of her concerns and also to ask if there is anything which you can write to me which may serve to reassure her.

Thank you for your attention to this matter.

Sincerely,

Robert C. McEwen

RCM:rgc
Enclosure

CENTRAL NEW YORK STATE PARK AND RECREATION COMMISSION Jamesville, New York 13078 315-473-8400

Laurence D. Martel, Chairman
Charles T. Mitchell, Regional Administrator

November 7, 1977

Department of the Army
Buffalo District, Corps. of Engineers
1776 Niagara Street
Buffalo, NY 14207

Re: Port Ontario
Harbor of Refuge

Attention Col. Daniel D. Ludwig
District Engineer

Dear Col. Ludwig:

I am writing in response to your October 25th letter asking for comments as to how the above project may affect our proposed land-use plans.

We, of course, support the Salmon River as a harbor or refuge along with our Albany office and therefore are somewhat open-minded as to our exact land-use plans. The following comments are general in nature, but are intended to summarize our present thinking of the proposed harbor of refuge development.

(1) We have absolutely no desire to get into any type of full scale marina development in the Pine Grove area of Selkirk Shores State Park. We recognize the need for a public dock extending from shore out to the anchorage basin and support the idea of a small launch ramp in this area (ramp was not mentioned in your letter). We do not wish to sell fuel, lubricants or other supplies that may compete with private enterprise.

(2) We are concerned about problems encountered with providing public access to the two breakwaters extending into Lake Ontario, particularly along the lake by the private cottages south of the Salmon River mouth.

(3) Interested parties such as the U. S. Fish and Wildlife Service, The Audubon Society and the Sierra Club should be well informed of the proposed development.

NEW YORK STATE PARKS & RECREATION Agency Building 1, Empire State Plaza, Albany, New York 12238 Information 518 474-0456
Orin Lehman, Commissioner

November 7, 1977

Colonel Daniel D. Ludwig
District Engineer
U. S. Army Corps of Engineers
Buffalo District
1776 Niagara Street
Buffalo, NY

Dear Colonel Ludwig:

RE: NCBED-PR, PORT ONTARIO HARBOR OF REFUGE

Commissioner Lehman has asked me to respond to your letter of October 25th regarding the correlation of New York State Parks and Recreation plans and programs with the proposed Harbor of Refuge at Port Ontario.

The Port Ontario Harbor of Refuge project provides for the needed protection of boaters using the increasingly popular Eastern end of Lake Ontario. The project provides for improved access to meet the needs of recreationists and sportsmen as well as considerable economic benefits for this region.

We find no conflict between our anticipated users of this area and the plan you have proposed. I have asked the Central New York State Park Region to prepare a schematic plan for providing public access to the harbor. This plan will be forwarded to you for your comments and recommendations as soon as possible. While we anticipate no major environmental concerns, we are prepared to work on appropriate assessments and any necessary mitigating actions. I have asked Dr. Peter Buttner, Director of Environmental Management Bureau, to follow up on these aspects of the project.

In response to Mr. Hassey's telephone inquiries of October 28th with Alex Gronvall and myself regarding the various breakwater designs under consideration we offer the following for our record:

1. The State of New York supports the River Plan #4.

2. The Plan for a Harbor of Refuge on the lakefront near the present bathing beach is not tenable because of cost, aesthetic and environmental considerations (littoral drift and erosion problems). We believe that a structure of this magnitude would have significant negative impacts on the shoreline of Selkirk Shores State Park.

NEW YORK STATE PARKS & RECREATION Agency Building 1, Empire State Plaza, Albany, New York 12238 Information 518 474-0456
Orin Lehman, Commissioner

November 10, 1977

Col. Daniel D. Ludwig
District Engineer
U.S. Army Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Col. Ludwig:

We have completed our review of the project description forthe harbor of refuge proposed for Port Ontario, Ontario County and wish to comment as follows.

We have been largely guided by the Corps' recommendations relative to the design and location of the offshore protective structures, and of the dredged channel and anchorage mooring area. We agree that alternative 4 provides the optimum plan.

Subject to further study we do, however, wish to relocate the proposed launching ramp 500' to 800' to the east because of a lesser adverse impact upon the wetland area, and to provide greater distance between the site and the existing pine grove area.

We also desire to eliminate the provision of a refueling facility as this service is available from another source in the harbor. It is our further expectation that other commercial facilities will be developed in this harbor once it is completed.

The elimination of this feature is wholly in accordance with the state's policy of encouraging commercial development, and enhancing boating benefits through not introducing competition to commercial interests.

Sincerely,

Roy Roberts
Sr. Marine Services Representative

RR/an

2) Specific questions --

Is the "public dock," south-west of the anchorage basin, intended as the key water-side element of a marina? If so, is there adequate depth alongside, and how is that depth to be maintained?

Have necessary land-side facilities (access, parking, launching, pump-out and other sanitary facilities, etc.) been laid out so as to prevent adverse affects on the scenic and botanically valuable Pine Grove section of the state park?

For which breakwater is fishing access proposed? For both? What land acquisitions will be needed for such public access?

What land acquisitions will be required for siting the breakwaters, inland from L.W.D.?

Will land-side access be required for construction purposes, and if so how is it to be provided, and how will needed road improvement and maintenance be managed?

What means will be used for traffic control and other impact mitigation along access routes to the breakwaters, past private shorefront properties not directly within the project work area: (1) during construction, and (2) subsequently, for breakwater fishermen? Where will parking for such fishermen be located?

The proposed improvements will have the effects of increasing both the accessibility and commercial attractiveness of the barrier dune formation, especially northwards from the River mouth. Have resulting adverse environmental impacts been identified, and preventive or remedial policies or measures been proposed and evaluated in the project DEIS? Have other concerned state and local agencies been consulted in this regard?

We cannot comment on technical aspects of the proposed breakwater design, and assume that the DEIS will reflect COE assessment of their effects on local littoral transport processes. Protection of the down-drift shoreline will be of utmost concern to us, of course.

These questions are illustrative of matters we will have in mind in reviewing the DEIS. Thank you again for the opportunity for initial comment on the proposed improvements at Port Ontario.

Sincerely,

G. L. Harder
Deputy Executive Director

ab
cc Ivan Vamos

to be an unsatisfactory solution because without breakwaters the channel could be filled in very quickly by a single storm. This was one of many alternatives considered in the selection of the recommended plan of improvement.

In developing the plan of improvement for Port Ontario Harbor, possible impacts on the environment were fully considered and the design of the breakwaters and alinement of the channel in the Salmon River was very carefully selected to minimize any adverse effects on the environment. It is true that any plan of action will have an impact that will be adverse to some extent, but the Port Ontario Harbor project will favorably benefit a large number of people outside the Selkirk Beach area as well as many in the area who wish to enjoy safe recreational boating.

I would like Ms. Lowenstein to know that I share her concern about the importance of preserving our heritage of natural beauty. For that reason, I have instructed my staff to work closely with State and local interests to insure that the harbor development has the least practicable adverse effect on the environment.

If I can be of further help, please let me know. I will bring this matter to Colonel Ludwig's attention upon his return.

Sincerely yours,

THOMAS R. BRAUN
Lt Col, Corps of Engineers
Deputy District Engineer

Hassey_____
Kelly_____
Gilbert_____
Ballock_____
PAO _____
Braun_____

CF:
HQDA (DAEN-CWA-D) w/incmg corresp
NCDED "
Exec. Ofc. "
PAO "
NCDED-PN

Honorable Robert C. McEwen
Representative in Congress
307 Federal Building
Watertown, NY 13601

NIAGARA MOHAWK POWER CORPORATION

NIAGARA MOHAWK

300 ERIE BOULEVARD, WEST
SYRACUSE, N. Y. 13202

November 15, 1977

Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, NY 14207

Attn: Mr. Philip Berkeley

Re: Proposed Harbor of Refuge Improvements
at Port Ontario, Oswego County, New York

Dear Mr. Berkeley:

As I indicated to your Mr. Tim Daily today on the phone, Niagara Mohawk has no objection to the proposed Harbor of Refuge improvements at Port Ontario, Oswego, New York. The project should not adversely impact on our land use.

Very truly yours,

John P. Clinton
Attorney

JPC/mel

OSWEGO COUNTY PLANNING BOARD

November 18, 1977

Daniel D. Ludwig
Colonel, Corps of Engineers
District Engineer
Department of the Army
Buffalo District
Corps of Engineers
1776 Niagara Street
Buffalo, New York

Re: Harbor of Refuge, Port Ontario, Oswego County, New York

Dear Col. Ludwig:

In response to your inquiry as to the compatibility of the above project to local plans and development regulations, I have again reviewed the project description along with local plans and zoning regulations.

The only zoning regulations which are applicable are those enacted by the Town of Richland. Although the Town ordinance does not specify "Harbors of Refuge" as a possible use, a broad zone bordering Lake Ontario is designated for recreational uses. The proposed Harbor of Refuge would stimulate the actual development of some of the land uses permitted in the coastal zone. Based on my discussions with the Town Planning Board and others during the development of the zoning ordinance in 1972, I believe that the Town intended to encourage outdoor recreational uses in the coastal zone.

The Oswego County Land Use Plan, published in 1977, is a general one and detailed uses were not addressed. However, specific recreational facilities were identified as desirable future developments. Among these recreational facilities was the Harbor of Refuge at Port Ontario.

In my judgement the Port Ontario project is in conformance with the County Plan and is compatible with the Town of Richland Zoning Ordinance.

A region-wide Water Quality Management Program, including Oswego County, is still in progress. The Oswego County portion of the plan is being participated in and coordinated by my office. I foresee no unusual conflicts between the effects of a Harbor of Refuge and water quality management plans which will emerge from this effort.

COUNTY OFFICES: 200 NORTH SECOND STREET • FULTON, NEW YORK 13069 • TELEPHONE (315) 593-2168

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233

Peter A. A. Berle,
Commissioner

November 25, 1977

Daniel D. Ludwig
Colonel, Corps of Engineers
District Engineer, Dept. of the Army
1776 Niagara Street
Buffalo, New York, 14207

Dear Mr. Ludwig:

Re: Port of Ontario Harbor of Refuge - Oswego County
DEC 738-19

This response to your October 25, 1977 letter confirms and summarizes prior comments of this Department concerning the subject project.

There has been and continues to be an urgent need to provide a harbor of refuge on Lake Ontario between Henderson Harbor and Oswego to provide for boating safety. Alternative 4 as described in your October 25 transmittal contains all the necessary elements to provide an acceptable harbor of refuge at that location, and is consistent with our Bureau of Fisheries goal to provide and maintain safe access to the Lake Ontario sport fishery in that area.

The Salmon River estuary is critically important as a spawning and nursery area for many of the Lake Ontario fish species. It is conceivable that imprudent timing of construction could have an unnecessary adverse impact on that ecosystem. July and August are probably the two best months with respect to minimal impact on the fishery. The months of September through December would also be acceptable. There does exist the possibility of interference with spawning runs of steelheads (rainbow trout) and salmon during the fall months, but since these fish move mostly at night, it is doubtful if these spawning runs will be affected. We request that the Department be kept informed as plans develop and be given the opportunity to participate, especially in those aspects potentially affecting fish and their habitat.

Thank you for the opportunity for review and we look forward to review of more detailed project plans when available.

Very truly yours,

for Allen F. Davis
Terence P. Curran, Director
Office of Environmental Analysis

EM:nd

cc: William A. Pierce, Supervisor, Great Lakes Fisheries Section
Allen Coburn, Region 7, DEC
Thomas P. Eichler
File DEC 738-19

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
REGIONAL OFFICE
26 FEDERAL PLAZA, NEW YORK, NEW YORK 10007

REGION II

NOV 29 1977

IN REPLY REFER TO:

Mr. Daniel D. Ludwig
Colonel, Corps of Engineers
District Engineer
Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

Subject: Draft Environmental Impact Statement
Port Ontario Harbor of Refuge

We are responding to your letter of October 25, 1977, addressed to Mr. Richard Garrabrant, regarding the relationship between the subject project and the plans of other agencies.

This Department has no projects within the Port Ontario, New York area and therefore we will not be impacted by the harbor improvements proposed by the Corps of Engineers.

In order to determine the impact on local and regional plans and policies including zoning ordinances, we suggest you contact the regional and county planning agencies if you have not done so. The contact person for each agency is as follows:

Mr. Gary Hayes
Executive Director
Central New York Regional Planning
and Development Board
Mid-Town Plaza
700 E. Water Street
Syracuse, N. Y. 13210

Tel. # 315-422-8276

Mr. Alman Hawkins, Director
Oswego County Planning Board
County Office Building
200 North Second Street
Fulton, New York 13069

Tel. # 315-593-2168

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Insuring Office
Albany, New York

bb/2175

2 December 1977

NCBED-PR

Mr. Gary Hayes
Executive Director
Central New York Regional Planning
and Development Board
Mid-Town Plaza
700 E. Water Street
Syracuse, NY 13210

Dear Mr. Hayes:

We are currently preparing a draft environmental impact statement for the proposed Harbor of Refuge improvements at Port Ontario, Oswego County, NY. The major features of the proposed project include construction of north and south breakwalls at the mouth of the Salmon River and dredging an entrance channel and anchorage basin in the lower Salmon River. Other project features include provisions for breakwater fishing and a public dock. This project also provides for sand bypass facilities to move material from behind either breakwater.

In order to fully assess the relationship between the proposed project and the plans of other agencies, we would appreciate knowing whether or not the subject project will conform or conflict with the objectives and specific terms of existing or proposed land use plans, policies and controls, if any, that your agency may have reviewed or formulated for the project area. An evaluation of master plans, zoning regulations, plans developed in response to the Clean Air Act and the Federal Water Pollution Act Amendments of 1972, or other related land use proposals of your agency would be helpful in this respect. A brief project description and location maps are enclosed for your reference.

I would appreciate your response by 21 December 1977. If you have any questions concerning the proposed Port Ontario Harbor of Refuge, please call Mr. Philip Berkeley, (716) 876-5454.

Sincerely yours,

2 Incl
as stated

DANIEL D. LUDWIG
Colonel, Corps of Engineers
District Engineer

CF:
✓NCBED-PF

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
100 Grange Place
Room 202
Cortland, New York 13045

February 17, 1978

Colonel Daniel D. Ludwig
District Engineer
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

Enclosed are two copies of our final fish and wildlife report on the proposed Port Ontario Project, Oswego County, New York.

Your pertinent comments on the preliminary draft have been incorporated into the final report.

Sincerely yours,

Paul P. Hamilton

Paul P. Hamilton
Field Supervisor

Enclosures: 2

APPENDIX B

ECONOMIC DATA EXTRACTED FROM U.S. ARMY CORPS OF ENGINEERS GENERAL DESIGN MEMORANDUM NO. 1, PORT ONTARIO HARBOR OF REFUGE, NY. COMPLETE DOCUMENT IS AVAILABLE AT U.S. ARMY ENGINEER DISTRICT, BUFFALO.

B1. Cost estimates for the selected plan, summarized below, are of sufficient detail to support the conclusions drawn during the formulation stage of planning. More detailed cost estimates will be developed for the Phase II General Design Memorandum. Cost estimates are generally based upon preliminary quantity estimates made during August of 1977.

B2. The estimated first cost of the project based upon October 1977 price levels is $3,520,000. A breakdown of costs and responsibilities is presented in table B-1.

B3. The recommended plan, plan 4, is quite similar in nature to the authorized plan of improvement with the exception of breakwater alignment, channel depths, and the size of the anchorage basin.

B4. Estimated annual costs and responsibilities is presented in table B-2. Annual costs are based on October 1977 price levels.

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SHUPP

A Symposium on Selected Coolwater Fishes of North America

St. Paul-Minneapolis, Minn.

March 7-8-9 1978

A SYMPOSIUM ON SELECTED COOLWATER FISHES OF NORTH AMERICA

ST. PAUL - MINNEAPOLIS

March 7 - 8 - 9, 1978

STEERING COMMITTEE

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Thunder Bay, Ontario, Canada

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N.D. State Game & Fish Department
Bismarck, N.D.

PROGRAM AGENDA

urban recreation task force & Wild & Scenic River Task force
17- major cities = bring up to standards 10 yrs. -Smile,

Tuesday, March 7, 8:30 - 10:00 a.m.

Minnesota Room

SYMPOSIUM INTRODUCTION

8:30 Welcome - Arden Trandahl, US FWS, Steering Committee Chairman
- Minnesota Governor, Rudy Perpich

Introduction - Henry Regier, President-Elect-AFS, University of Toronto

Keynote Address - Robert Herbst, Assistant Secretary of Interior

GENERAL CONSIDERATIONS

9:20 1. A management-oriented review of the biology of yellow perch and walleye.

John J. Ney, Virginia Polytechnic Institute and State University, Blacksburg

9:40 2. Taxonomy and distribution of North American esocids.

E. J. Crossman, Royal Ontario Museum
University of Toronto

10:00 Coffee Break

ECOLOGICAL CONSIDERATIONS IN COOLWATER FISHES

Tuesday, March 7 10:20 - 12:00 N

Minnesota Room East

Convener - J. S. Campbell, Department of Fisheries and Environment, Winnipeg, Canada

10:20 1. Inventory of percid and esocid habitat in North America.

K. D. Carlander, Iowa State University, Ames
J. S. Campbell, Department of Fisheries & Environment Winnipeg, Canada
R. J. Muncy, Iowa State University, Ames

10:40 2. An hypothesis of homing behavior in walleyes as related to observed patterns of passive and active movement.

Donald E. Olson, Minnesota DNR, Detroit Lakes
Dennis H. Schupp, Minnesota DNR, Brainerd
Val Macins, Ontario MNR, Kenora

11:00 3. The adult walleye (Stizostedion v. vitreum) in the percid community - a niche definition based on feeding behavior and food specificity.

R. A. Ryder, Ontario MNR, Thunder Bay
Steve Kerr, Bedford Institute of Oceanography, Dartmouth, NS

11:20 4. Walleye abundance, growth, movement and yield in disparate environments within a Minnesota lake.

D. H. Schupp, Minnesota DNR, Brainerd

11:40 5. Structure of fish communities in lakes that contain yellow perch, sauger and walleye populations.

Michael D. Clady, Oklahoma Cooperative Fishery Research Unit, Stillwater

ECOLOGICAL CONSIDERATIONS IN COOLWATER FISHES

Tuesday, March 7 1:30 - 5:00 p.m.

Minnesota Room East

Convener - Robert Carline, Ohio Cooperative Fishery Research Unit, Columbus

1:30 1. Sauger, walleye and yellow perch in the southeastern United States.

P. A. Hackney, TVA, Norris, TN
J. A. Holbrook II, TVA, Norris, TN

1:50 2. Reproduction, growth and standing crops of yellow perch in southern reservoirs.

James P. Clugston, US Fish and Wildlife Service, Clemson, SC
James L. Oliver, US Fish and Wildlife Service, Clemson, SC
Richard Ruelle, US Fish and Wildlife Service, Clemson, SC

2:10 3. Spawning and nursery areas of coolwater fishes in Lake Oahe.

William R. Nelson, US Fish and Wildlife Service, Pierre, SD

2:30 4. Effects of temperature on production and yield of juvenile walleye in experimental ecosystems.

William Wrenn, TVA, Decatur, AL
T. D. Forsythe, TVA, Decatur, AL

2:50 5. Diversity of a community of small fishes as related to abundance of the dominant percid fishes.

Michael Clady, Oklahoma Cooperative Fishery Research Unit, Stillwater
Larry Nielsen, Cornell University, Ithaca, NY

3:10 Coffee Break

ECOLOGICAL CONSIDERATIONS IN COOLWATER FISHES

Tuesday, March 7 1:30 - 5:00 p.m.

Minnesota Room East

3:40 6. Sauger and walleye in Norris Reservoir, Tennessee.

Richard B. Fitz, TVA, Norris, TN
John A. Holbrook II, TVA, Norris, TN

4:00 7. Effects of the environment on growth, survival and exploitation of northern pike, Esox lucius.

19°C optimum growth

John Casselman, Ontario MNR, Maple

4:20 8. Ecological separation of sympatric muskellunge and northern pike.

E. J. Harrison, State University of New York, Buffalo
W. F. Hadley, State University of New York, Buffalo

4:40 9. Feeding interrelationships of coolwater fish: yellow perch, walleye, sauger and northern pike.

William A. Swenson, University of Wisconsin, Superior

3-4% body weight daily gives optimum growth – Question: Are we feeding dry food heavy enough at 3% if waste is considered?

CULTURE

Tuesday, March 7 10:20 - 12:00 N

Minnesota Room West

Convener - Roger Herman, US Fish and Wildlife Service, Wellsboro, PA

10:20 1. The geographical and numerical scope of propagation of selected coolwater fishes in the United States.

Joseph Webster, US Fish and Wildlife Service, Twin Cities, MN
Arden Trandahl, US Fish and Wildlife Service, Washington, DC

10:40 2. Culture of yellow perch.

Graden R. West, US Fish and Wildlife Service, Senecaville, OH

11:00 3. Preliminary observations on the sperm of yellow perch (Perca flavescens).

Steven D. Koenig, University of Wisconsin, Madison
T. B. Kayes, University of Wisconsin, Madison
H. E. Calbert, University of Wisconsin, Madison

11:20 4. Comparative growth of male versus female yellow perch (Perca flavescens) fingerlings under controlled environmental conditions.

E. F. Schott, University of Wisconsin, Madison
T. B. Kayes, University of Wisconsin, Madison
H. E. Calbert, University of Wisconsin, Madison

11:40 5. Intensive culture of walleyes: The state of the art.

John G. Nickum, New York Cooperative Fishery Research Unit, Cornell University, Ithaca

CULTURE

Tuesday, March 7 1:30 - 4:45 p.m.

Minnesota Room West

Convener - Charles Hicks, Missouri Department of Conservation, Jefferson City

1:30 1. Intensive culture of esocids - the current state of the art.

Delano R. Graff, Pennsylvania Fish Commission, Bellefonte

1:50 2. Intensive culture of tiger muskellunge in Michigan during 1976 and 1977.

Charles H. Pecor, Michigan DNR, Mattawan

2:10 3. Reviewing the esocid hybrids.

Keen Buss, Boalsburg, PA
James Meade III, Pennsylvania Fish Commission, Bellefonte
Delano Graff, Pennsylvania Fish Commission, Bellefonte

2:30 4. Control of reproduction in northern pike (Esox lucius).

G. de Montalembert, Laboratory of Fish Physiology, Jouy en Josas, France
C. Bry, Laboratory of Fish Physiology, Jouy en Josas, France
R. Billard, Laboratory of Fish Physiology, Jouy en Josas, France

2:50 Coffee Break

3:20 5. The status of coolwater fish diets.

Leo E. Orme, US Fish and Wildlife Service, Spearfish, SD

3:40 6. A review of disease problems in propagation of coolwater fishes.

Ken Wolf, US Fish and Wildlife Service, Leetown, WV

4:00 7. A muscular dystrophy-like anomaly of walleye (Stizostedion vitreum vitreum).

Philip P. Economon, Minnesota DNR, St. Paul

4:20 8. Lymphosarcoma in esocids.

R. A. Sonstegard, University of Guelph

Tuesday, March 7 7:30

Minnesota Room East

ALLOCATING PERCID RESOURCES IN THE GREAT LAKES: BIOLOGICAL, INSTITUTIONAL, POLITICAL, SOCIAL AND ECONOMIC RAMIFICATIONS - A PANEL

Carlos Fetterolf - Great Lakes Fisheries Commission, Ann Arbor, MI
Moderator

Kenneth Muth - US Fish and Wildlife Service, Sandusky, OH
Rapporteur

Robert C. Haas - Michigan DNR, Mt. Clemens
Sport approach

Russell Scholl - Ohio DNR, Sandusky
Balanced approach

Art Holder - Ontario MNR, London
Commercial approach

Dennis M. Cauvin - Department of Fisheries & Environment, Winnipeg, Canada
Resource allocation: An economic perspective

Barney Dowdle - College of Forest Resources, University of Washington, Seattle
Use of economics in resource allocation

Minnesota Room West

THE ROLE OF PRIVATE ORGANIZATIONS IN MANAGEMENT OF COOLWATER FISHERIES RESOURCES - A PANEL

Gilbert Radonski - Sport Fishing Institute, Washington, DC
Moderator

Lawrence Belusz - Missouri Department of Conservation, Sedalia
Rapporteur

Charles Shaw - President, In'Fisherman Society, Bloomington, MN

Lawrence Ramsell - Muskies, Inc., Galesburg, IL

Gene Harbage - Past President, Ohio Huskie Muskie Club, Summit Station, OH

Duane Shodeen - Minnesota DNR, St. Paul

Dale Henegar - North Dakota Game and Fish Department, Bismarck

ECOLOGICAL CONSIDERATIONS IN COOLWATER FISHES

Wednesday, March 8 8:00 - 11:45 a.m.

Minnesota Room

Convener - Kenneth Muth, US Fish and Wildlife Service, Sandusky, OH

8:00 1. Survival, growth and vulnerability to angling of northern pike and walleyes stocked as fingerlings in small lakes with bluegills or minnows.

George B. Beyerle, Michigan DNR, Mattawan

8:20 2. A life history study of the muskellunge (Esox masquinongy) in West Virginia.

Robert Miles, West Virginia DNR, Belleville

8:40 3. Seasonal movements and home range activities of Esox masquinongy as determined by radiotelemetry.

John Minor, University of Toronto

9:00 4. Some physiological consequences of angling stress in muskellunge (Esox masquinongy Mitchell).

G. L. Beggs, University of Toronto
G. F. Holeton, University of Toronto

9:20 5. Management of endangered coolwater fishes.

James Engel, US Fish and Wildlife Service,
Twin Cities, MN

9:45 Coffee Break

MANAGEMENT OF COOLWATER FISHES

Considerations in Percid Management

Convener - James Addis, Wisconsin DNR, Madison

10:00 1. Case histories of stocking walleyes, Stizostedion vitreum vitreum, in inland lakes, impoundments, and the Great Lakes - 100 years with walleyes.

Percy W. Laarman, Michigan DNR, Ann Arbor

10:20 2. Food, growth and exploitation of percids in Ohio's upground reservoirs.

Kenneth Paxton, Ohio DNR, Findlay
Fred Stevenson, Ohio DNR, Findlay

MANAGEMENT OF COOLWATER FISHES (cont'd)

10:40 3. An old fish - an old lake.

Michael Rawson, Ohio DNR, Sandusky
Russell Scholl, Ohio DNR, Sandusky

11:00 4. Management for walleye or sauger, South Basin, Lake Winnipeg.

R. O. Schlick, Manitoba Department of Renewable Resources and Transportation Services, Winnipeg

11:20 5. Effects of water level management on walleye and other coolwater fishes in Kansas reservoirs.

Calvin Groen, Kansas Fish and Game Commission, Pratt
Troy Schroeder, Kansas Fish and Game Commission, Council Grove

Wednesday, March 8 1:00 - 2:45 p.m.

Minnesota Room

MANAGEMENT OF COOLWATER FISHES (cont'd)

Development of Esocid Fisheries

Convener - E. J. Crossman, Royal Ontario Museum, University of Toronto

1:00 1. Management evaluation of stocked northern pike in Colorado's small irrigation reservoirs.

Stephen A. Flickinger, Colorado State University, Ft. Collins
John H. Clark, Alaska Fish and Game Department, Anchorage

1:20 2. An evaluation of the muskellunge (Esox masquinongy) fishery of Lake Pomme de Terre and efforts to improve stocking success.

Lawrence C. Belusz, Missouri Department of Conservation, Sedalia

1:40 3. Evaluation of esocid stocking in Wisconsin.

Leon Johnson, Wisconsin DNR, Spooner

2:00 4. Use of fin clips in the evaluation of muskellunge stocking programs.

Fergus McNeil, University of Toronto

2:20 5. Management implications of hybrid esocids in Pennsylvania.

Robert B. Hesser, Pennsylvania Fish Commission, Bellefonte

2:45 Coffee Break

Wednesday, March 8 3:00 - 4:45 p.m.

Minnesota Room East

MANAGEMENT OF COOLWATER FISHES (cont'd)

Management of Coolwater Fisheries - Case Histories

Convener - Joseph Scidmore, Minnesota DNR, St. Paul

3:00 1. The Matheson Island sauger fishery of Lake Winnipeg, 1972 - 1976.

E. B. Davidoff, Manitoba Department of Renewable Resources and Transportation Services, Winnipeg

3:20 2. Northern pike, tiger muskie and walleye populations in Stockton Lake, Missouri - a management evaluation.

John Goddard, Missouri Department of Conservation, Sparta
Lee C. Redmond, Missouri Department of Conservation, Jefferson City

3:40 3. An evaluation of the muskellunge fishery in Cave Run Lake, Kentucky.

James Axon, Kentucky Department of Fish and Wildlife Resources, Frankfort

4:00 4. Responses of northern pike to exploitation in Murphy Flowage, Wisconsin.

Howard E. Snow, Wisconsin DNR, Spooner

4:20 5. The Great Lakes muskellunge population of Lake St. Clair.

Robert Haas, Michigan DNR, Mt. Clemens

HAPPY HOUR 6:30

BANQUET 7:30

Wednesday, March 8 3:00 p.m.

Minnesota Room West

HATCHERY DESIGN FOR COOLWATER SPECIES - A PANEL

Jack Hammond - Michigan DNR, Lansing

Moderator

John Nickum - New York Cooperative Fishery Research Unit, Cornell University, Ithaca

Rapporteur

Cecil Fox - Kramer, Chin and Mayo, Seattle, WA

The hatchery development process

Edward Miller - Pennsylvania Fish Commission, Bellefonte

Facilities design of Pennsylvania coolwater hatcheries from an engineering standpoint

Maurice Moore - Michael Baker, Jr., Inc., Beaver, PA

Details of the design of the Linesville Fish Culture Station.

Harry Westers - Michigan DNR, Lansing

Hatchery design principles for the intensive culture of coolwater fishes.

Thursday, March 9 8:30 a.m. - 12 N

Minnesota Room

MANAGEMENT OF COOLWATER FISHES (cont'd)

General Management Concepts for Coolwater Fishes

Convener - Peter Colby, Ontario MNR, Thunder Bay

8:30 1. The incremental method of assessing habitat potential for coolwater species: With management implications.

Ken D. Bovee, US Fish and Wildlife Service, Ft. Collins, CO

8:50 2. Management implications for the boreal lakes of Central Canada: A case study of the development of commercial fishing.

George F. Adams, Manitoba Department of Renewable Resources and Transportation Services, Winnipeg

9:10 3. The concept of balance for coolwater fish populations.

Richard Anderson, Missouri Cooperative Fishery Research Unit, Columbia
A. Stephen Weithman, Missouri Cooperative Fishery Research Unit, Columbia

9:30 4. Effects of a minimum size limit on the walleye population of a northern Wisconsin lake.

Steven L. Serns, Wisconsin DNR, Woodruff

9:50 5. Dynamics of the northern pike population and changes that occurred with a minimum size limit in Escanaba Lake, Wisconsin.

James J. Kempinger, Wisconsin DNR, Woodruff
Robert F. Carline, Ohio Cooperative Fishery Research Unit, Columbus

10:10 Coffee Break

MANAGEMENT OF COOLWATER FISHES (cont'd)

10:30 6. Fisheries management theory.

Robert T. Lackey, Virginia Polytechnic Institute and State University, Blacksburg

10:50 7. Selection of minimum size limits for walleye (Stizostedion v. vitreum) in Michigan.

James C. Schneider, Michigan DNR, Ann Arbor

11:10 8. Walleye fishery management program in Texas.

John Prentice, Texas Parks and Wildlife, Ingram
Richard Clark, Jr., Texas Parks and Wildlife, Austin

A SYMPOSIUM SUMMARY AND A LOOK AHEAD

11:30 Canadian View

Herbert Lawler, Department of Fisheries and Environment, Winnipeg, Canada

11:45 U.S.A. View

Charles Burrows, Minnesota DNR, St. Paul

GENERAL CONSIDERATIONS

A MANAGEMENT-ORIENTED REVIEW OF THE BIOLOGY OF YELLOW PERCH AND WALLEYE

John J. Ney

Department of Fisheries and Wildlife Sciences
Virginia Polytechnic Institute and State University
Blacksburg, Virginia 24061

Abstract

Yellow perch and walleye systematics, reproduction, early life history, growth, food habits, mortality, annual recruitment behavior and interspecific relationships are briefly reviewed and compared. The species possess similar fecundity, patterns of growth and mortality, and initial food habits but differ in other major respects. Substrate preferences and disjunctive spawning periods promote reproductive segregation. Food habits diverge during the first summer as walleye become piscivorous and yellow perch continue to consume a wide variety of planktonic and benthic invertebrates. Opportunistic feeding may partially account for the higher incidence of stunting in yellow perch populations. In cohabited waters, synchronous fluctuations in year class strength and inverse relations of first-year growth suggest the dependence of walleye on y-o-y yellow perch production. Year class strength in each species may be controlled by environmental factors during the reproductive period where spawning habitat is limited, but complex biotic relationships probably influence recruitment in more stable systems. Scattered information indicates that yellow perch and walleye populations can be limited or displaced by certain competing species and can control the success of others.

Management of indigenous and introduced percid populations can be improved by biological research to identify stocks and ecological adaptations, analyze and predict variations in year class strength, and document species interrelationships.

TAXONOMY AND DISTRIBUTION OF NORTH AMERICAN ESOCIDS

E. J .Crossman

Department of Ichthyology and Herpetology
Royal Ontario Museum
and Department of Zoology
University of Toronto
Toronto, Ontario

Abstract

Presently there are four species of native esocids, Esox

masquinongy, E. lucius, E. niger, and E. americanus, and one exotic species E. reicherti, at large in North America. The four native species now include five named forms, intergrades, and natural hybrids. Taxonomic divisions within species are under study. Post-Wisconsin, natural distribution patterns have been changed by man, and man is again adjusting the distributional limits of some species by extensive introductions.

Changes in taxonomic concepts of the family and species are traced. The present distribution of each species is given in detail, and suggestions made concerning their distributions in the past and future.

ECOLOGICAL CONSIDERATIONS IN COOLWATER FISHES

INVENTORY OF PERCID AND ESOCID HABITAT IN NORTH AMERICAN

K. D. Carlander[1], J. S. Campbell[2] and R. J. Muncy[1]

[1]Iowa Cooperative Fishery Research Unit, Iowa State University, Ames, Iowa
[2]Freshwater Institute, Fisheries and Marine Service, Winnipeg, Manitoba

Abstract

Questionnaires sent to the chief fishery staff member of U.S. states and Canadian provinces provided the basic data for estimated habitat occupied by walleye, sauger, yellow perch, northern pike and muskellunge in North American. Species habitat areas, grouped by size categories within lakes, impoundments and streams, were listed by major drainage patterns in north to south regional groupings. Detailed state and provincial data, as well as authors' estimates for non-reporting agencies, are available from three reference libraries.

Distributional patterns as the result of introductions as well as native populations of each species revealed major concentrations of cool water habitat around the Great Lakes. Habitats reported as a percentage of total freshwater area in North America were 54% for northern pike, 1% for muskellunge, 32% for walleye, 10% for sauger, and 26% for yellow perch. Habitat areas occupied by the five species, as percentage of total freshwater areas, varied widely between regional groupings.

AN HYPOTHESIS OF HOMING BEHAVIOR IN WALLEYES AS RELATED TO OBSERVED PATTERNS OF PASSIVE AND ACTIVE MOVEMENT

Donald E. Olson and Dennis H. Schupp

Minnesota Department of Natural Resources

Val Macins

Ontario Ministry of Natural Resources

Abstract

An hypothesis that walleye homing is an adult-learned behavior rather than a natal-imprinted response is presented.

A tendency for marked adult walleyes to home to spawning areas is frequently reported in a review of fisheries literature. A tendency for individual walleyes to return to the same openwater

feeding areas in successive years is also suggested by investigators. Movement of immature walleyes is often shown to differ from that of adults in the same waters.

Intensity of walleye homing varies in separate waters and appears to be influenced by physical characteristics of the environment and strengthened by repeated migrations.

River and wind current commonly move walleye eggs and fry great distances from the site of egg deposition before fry are sufficiently developed to commence feeding. In view of the early larval stage of walleyes at which the imprinting of spawning area characteristics must occur, natal conditioning to home to spawning areas is considered unlikely.

THE ADULT WALLEYE (STIZOSTEDION V. VITREUM) IN THE PERCID COMMUNITY - A NICHE DEFINITION BASED ON FEEDING BEHAVIOR AND FOOD SPECIFICITY

R. A. Ryder

Ontario Ministry of Natural Resources
Thunder Bay, Ontario

S. R. Kerr

Marine Ecology Laboratory
Bedford Institute of Oceanography
Dartmouth, Nova Scotia

Abstract

A methodology is proposed for niche contouring of a single species, the walleye (Stizostedion v. vitreum), as well as the percid community according to the Hutchinson - Fry niche concepts. A percid "harmonic" community is defined as one consisting of four basic species components which contribute to both persistence of the community and continuing identity. Mesotrophy provides fundamental environmental conditions for harmonic percid communities which are aggregated about a median of central tendency representing an optimum combination of abiotic factors. Astatic fish aggregations occur remote from the optimum in either direction, and lack continuing identity and persistence. The walleye niche is described on the basis of its food habits, feeding behavior and interspecific ethology within the percid community. The walleye is an opportunistic piscivore, which partitions the available food resources in time with other piscivores by feeding during twilight periods or nocturnally. Therefore, species niche is characterized in terms of individual metabolic capacities while community niche is defined on the basis of emergent properties.

WALLEYE ABUNDANCE, GROWTH, MOVEMENT, AND YIELD IN DISPARATE ENVIRONMENTS WITHIN A MINNESOTA LAKE

D. H. Schupp

Minnesota Department of Natural Resources
Division of Fish and Wildlife
Brainerd, Minnesota 56401

Abstract

Walleye, Stizostedion vitreum, abundance and yield was highest and growth was most rapid in mesotrophic areas of a large lake with disparate environments ranging from eutrophic to morphometrically oligotrophic. Movement of tagged walleyes varied among the different environments. The following factors appeared to influence these parameters most: (1) basin morphometry and its effect on turbidity, temperature, and productivity; (2) availability of spawning habitat; and (3) abundance and growth of young yellow perch, Perca flavescens, the principle prey of walleyes.

STRUCTURE OF FISH COMMUNITIES IN LAKES THAT CONTAIN YELLOW PERCH, SAUGER, AND WALLEYE POPULATIONS

Michael D. Clady

Department of Natural Resources
Cornell University
Ithaca, New York 14853

Abstract

Yellow perch (Perca flavescens) and walleye (Stizostedion vitreum) populations appear to thrive in the same lakes most often, and the presence of sauger (Stizostedion canadense) usually indicates that the portion of the community made up of yellow perch and walleyes is less. Species diversity is correlated negatively with the relative importance of yellow perch in the fish community and positively with the proportion of the community made up of sauger, but apparently not related to relative abundance of walleye. Fish communities containing different combinations of large percids tend to be characterized by non-percid species belonging to different reproductive guilds.

SAUGER, WALLEYE, AND YELLOW PERCH IN THE SOUTHEASTERN UNITED STATES

P. A. Hackney and J. A. Holbrook II

Tennessee Valley Authority
Norris, Tennessee 37828

Abstract

Sauger, walleye, and yellow perch are all native to the southeastern United States, the southerly limit of their natural range. Important fisheries exist only for sauger in low-gradient mainstream reservoirs and walleye in upland tributary reservoirs.

Mortality of sauger is very high and year-class strength quite variable. Growth is rapid for both sauger and walleye, and fisheries for trophy walleye formerly existed in many reservoirs for several years following impoundment. Walleye fisheries declined in all reservoirs, but were restored from stockings of northern strains. Self-sustaining populations of walleye now exist although trophy fish are no longer taken.

The factors limiting percid abundance and distribution in the southeastern United States are unclear. Water temperature does not appear to be the limiting factor in most instances.

REPRODUCTION, GROWTH, AND STANDING CROPS OF YELLOW PERCH IN SOUTHERN RESERVOIRS

James P. Clugston, James. L. Oliver and Richard Ruelle

U. S. Fish and Wildlife Service
Southeast Reservoir Investigations
Clemson, South Carolina 29631

Abstract

Although water temperatures required for spawning of yellow perch (Perca flavescens) were met in 17 southern reservoirs, pre-spawning water temperatures were in the range considered to impair reproductive success (during most years, 8-10 C was the lowest temperature measured). Yellow perch spawned about 2 months earlier in South Carolina than in northern states, but at about the same water temperature (10 C). Maturity indexes for gravid females, the number of eggs produced by a female of a given length, and the age at maturity were similar at northern and southern latitudes. Although yellow perch in the South appeared to have a longer growing season than

fish in the North, southern fish did not grow significantly faster. Young-of-the-year grew from a length of 7 mm in early March to about 40 mm in early June. Average lengths of yellow perch at the end of each of the first 6 years of life in Keowee Reservoir, South Carolina, were 77, 132, 184, 217, 250, and 252 mm.

SPAWNING AND NURSERY AREAS OF COOLWATER FISHES IN LAKE OAHE

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Abstract

Lake Oahe is one of six main stem Missouri River reservoirs. As the reservoir filled, prairie grasslands were gradually inundated, but at full pool the reservoir normally fluctuates within a relatively narrow range. These water-level fluctuations and wave action hinder the development of aquatic vegetation in littoral areas or terrestrial vegetation on the shores.

Species that require vegetation for spawning such as northern pike (Esox lucius), carp (Cyprinus carpio), and bigmouth buffalo (Ictiobus bubalus), developed large populations during the filling of Lake Oahe, but because of the lack of a suitable spawning substrate under full pool conditions, their reproductive success and populations have declined substantially. Yellow perch (Perca flavescens) reproductive success was also exceptionally high during the filling stage, but even without vegetation on which to extrude their egg masses, hatching success remains adequate in areas where turbidity is reduced. Sauger (Stizostedion canadense) and walleye (S. vitreum vitreum) spawn in the major tributaries -- the Missouri, Cheyenne, Moreau, and Grand Rivers. These rivers are also utilized for spawning by channel catfish (Ictalurus punctatus), white bass (Morone chrysops), and goldeye (Hiodon alosodies). Spring runoff is the major factor affecting the reproductive success of these species. The reservoir fish population is now dominated by river spawning rather than reservoir spawning species.

SAUGER AND WALLEYE IN NORRIS RESERVOIR, TENNESSEE

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Abstract

Norris Reservoir, Tennessee, contains populations of both walleye and sauger. Following impoundment in 1936 sauger were an important member of the sport fishery but have since declined to <1 percent of the catch, although they are still fairly abundant.

Since 1938 first year growth of sauger has declined but growth of older age classes has increased. Walleye growth in the first four age classes has shown no trends.

In both species, heaviest, longest, oldest and fastest growing specimens are typically females. Norris populations also grow faster than more northern populations. In contrast to walleye, sauger are seldom caught in vertical gill nets, apparently spawn over large distances of tributary rivers, and do not appear to spawn in the reservoir proper.

Walleye caught in vertical gill nets appear to stay close to the thermocline when summer stratification is most intense even if it means occupying water with oxygen concentration of 1-2 mg/liter. In cooler months walleye also apparently move toward the surface at night.

EFFECTS OF ENVIRONMENTAL FACTORS ON GROWTH, SURVIVAL, ACTIVITY, AND EXPLOITATION OF NORTHERN PIKE, ESOX LUCIUS

J. M. Casselman

Ontario MNR Maple

Abstract

Studies on northern pike, Esox lucius, were conducted under controlled laboratory conditions and in the natural environment. The effects of such environmental factors as temperature, photoperiod, and dissolved oxygen concentration on growth, survival, activity, and catch per unit effort are described.

The optimum temperature for growth is 19 C for weight and 21 C for length. Growth rate is low at low temperatures (≈4 C),

but increases rapidly at temperatures of $\geq$ 10 C. At temperatures above optimum, growth decreases rapidly and ceases at approximately 28 C. Laboratory experiments indicate that growth rate in length and weight may be stimulated slightly by long periods of daylight (16L-8D). Continuous light, however, results in negative growth rate.

The upper incipient lethal temperature for northern pike is 29 C. The lower incipient lethal oxygen concentration is directly related to temperature. Northern pike are extremely tolerant of low oxygen concentration and in shallow lakes, where oxygen reduction during winter is common, they can survive minimum winter oxygen concentrations of 0.3 mg/1 (2% air saturation).

Spontaneous swimming activity of northern pike fed ad libitum in the laboratory was maximal at approximately 20 C, a temperature that is close to the optimum for growth. Pike were significantly less active at 6 C than at temperatures $\geq$ 9 C. Catch per unit effort of gill nets set in shallow lakes at temperatures ranging from 13 to 24 C was high from 14 to 19 C, and peaked for both northern pike and its primary prey, yellow perch, Perca flavescens, at 15 to 17 C. Activity in relation to temperature was comparable in the laboratory and natural environment when all variables were considered.

During winter oxygen depletion northern pike can detect and avoid low oxygen concentrations. Vertical distribution, or depth from the ice-water interface, at which both northern pike and yellow perch are captured in gill nets is highly significantly correlated with oxygen concentration. Catch per unit effort of such stationary gear as gill nets is highly correlated with the dissolved oxygen concentration in the immediate vicinity of the net. In later winter when much of the lake was devoid of oxygen, fish congregated in areas where the oxygen concentration ranged from 0.7 (5% air saturation) to 4.0 mg/1 (30% air saturation), resulting in extremely high catches per unit effort. Activity in oxygen concentrations of <0.7 mg/1 was extremely low. Northern pike were captured alive in stationary gear in late winter at oxygen concentrations of 0.04 mg/1 (0.3% air saturation). Although northern pike can tolerate an extremely wide range of environmental conditions, they are mesothermal or "coolwater" fish which are best adapted to the mesotrophiceutrophic environment.

ECOLOGICAL SEPARATION OF SYMPATRIC MUSKELLUNGE AND NORTHERN PIKE

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Abstract

Sympatric populations of northern pike and muskellunge in the upper Niagara River and its local watershed were studied during 1975, 1976 and early 1977. Collections began as early as February and extended into November. Trap nets, seines, electrofishing and creel surveys were used to sample 312 muskellunge and 623 northern pike. With the exception of a few one-year-old fish, no muskellunge were found in tributaries. In contrast, nearly all (97%) northern pike were collected in tributaries despite extensive river sampling. These data showed that the species are spatially segregated throughout much of their life cycles. Current velocity data suggest that differential adaptation to river current may be the most important factor permitting coexistence of the two species.

The geologic history of the Niagara River suggests that the muskellunge population may have been established rather recently (since 5500 BP). However the present distribution of northern pike indicates that this population was probably established much earlier (12,300-10,400 BP).

FEEDING INTERRELATIONSHIPS OF COOLWATER FISH: PERCH, WALLEYE, SAUGER AND NORTHERN PIKE

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Abstract

Predation and food competition of coolwater fish were studied to identify their influence on walleye (Stizostedion vitreum vitreum), sauger (S. canadense), yellow perch (Perca flavescens) and northern pike (Esox lucius) populations.

Relatively small size of young perch, their abundance and pelagic distribution were identified as important factors resulting in their

role as walleye prey. Small size of perch at hatch results in their dependence on small prey, slow growth and extended period of pelagic development. Age 0 perch became suitable prey for walleye when their length was less than 45% of walleye length. Walleye predation represents the primary source of perch mortality where perch and walleye dominate the community. Cannibalism by walleye increases when prey availability is low and represents a mechanism for maximizing prey production and transfer of energy to walleye.

Age 0 sauger are generally too small to feed on age 0 perch and too large to be preyed upon by age 0 walleye. When age 0 trout-perch are available and of suitable size, sauger growth and survival increases. Sensitivity to light and related depth distribution of sauger results in continuation of the feeding relationship with trout-perch throughout life in lakes where both species are abundant. Evidence suggests limited occurrence, slow growth and low production of sauger results from relatively low attach success in the habitat for which they are light adapted.

Adaptation of northern pike for cover in inshore areas segregates them from sauger but promotes feeding interactions which may reduce walleye abundance. Limited evidence suggests northern pike predation on walleye, walleye cannibalism and reduced walleye food availability occur in lakes where inshore cover and northern pike are abundant. Because available energy in clear water lakes does not result in high density populations of small pelagic prey which walleye are dependent upon they should be managed for northern pike which are adapted to accumulate energy from the low density populations of large size prey characteristic of these waters.

Surplus production accumulated by abundant young yellow perch represents an important adaptation to intensive predation. The success of this mechanism is indicated by the success of yellow perch in coolwater communities.

SURVIVAL, GROWTH, AND VULNERABILITY TO ANGLING OF NORTHERN PIKE AND WALLEYES STOCKED AS FINGERLINGS IN SMALL LAKES WITH BLUEGILLS OR MINNOWS

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Abstract

For northern pike stocked as fingerlings in small lakes with bluegills, survival was high after 3 years for the initial plant but

very low for the succeeding two plants. Growth was moderate through age I but slow thereafter, despite an abundance of edible size bluegills. Survival and growth were generally better when pike were stocked in lakes with minnows. In one lake supplementary stocking of young salmonids was necessary to stimulate rapid growth of age II pike.

In a lake with bluegills survival of walleyes was surprisingly high but growth was slow. In a lake with minnows survival of all three year classes of walleyes was consistently higher and growth was considerably faster than in the lake with bluegills.

As anticipated, northern pike were more vulnerable to angling than walleyes. However both species were relatively easy to catch. It is suggested that small lakes offer an excellent opportunity to optimize survival, growth, and return to the angler of predator fishes stocked as fingerlings.

A LIFE HISTORY STUDY OF THE MUSKELLUNGE, ESOX MASQUINONGY, IN WEST VIRGINIA

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Abstract

The native range of the muskellunge, Esox masquinongy ohioensis, in West Virginia is restricted to streams of the Ohio River drainage. Native muskellunge populations are currently present in 41 streams which comprise 1,100 km and 2,935 hectares of muskellunge habitat.

A life history study of the muskellunge in Middle Island Creek was conducted from 1966 to 1974. A 28.7-hectare study area had a minimum muskellunge population of 1.5 fish/hectare and 4.4 kg/hectare. An intensively sampled 6.2-hectare pool contained a minimum muskellunge population of 4.4 fish/hectare and 9.1 kg/hectare. Adult muskellunge in Middle Island Creek were heavily exploited by anglers and showed a great deal of upstream and downstream movement. Males matured at age III or IV and at lengths of 61-64 cm. Females matured at age IV or V and at lengths of 66-71 cm. Spawning occurred during April when daily water temperatures averaged 10 C or higher for 4-8 days. Spawning sites were located at the lower or upper ends of pools in slack-water areas near riffles. The time period between egg fertilization and fry swim-up ranged from 17-30 days.

SEASONAL MOVEMENTS AND HOME RANGE ACTIVITIES OF MUSKELLUNGE, *ESOX MASQUINONGY*, AS DETERMINED BY RADIOTELEMETRY

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Abstract

This radiotelemetry study of muskellunge, *Esox masquinongy*, begun in June 1975, was conducted in one small (85 hectare) and one larger (3725 hectare) lake within the Kawartha Lakes region of central Ontario. The movements of six male and ten female muskellunge (650 mm to 1015 mm total length) were monitered over an eighteen month time period. The establishment of summer and winter home ranges, and movements within and about these areas are described with regard to size and sex of the fish. The effects of environmental factors, such as temperature, dissolved oxygen concentration, photoperiod, available depth and habitat vegetation, upon time of home range establishment and movements are described.

All male fish returned to summer home ranges, 0.48 to 0.92 hectare, immediately after spawning. Summer home ranges were abandoned in fall at water temperatures below 18.5 C. Maximum movements (435 m/day) occurred at temperatures between 9.5 C to 17 C. Winter home ranges, (0.18 to 0.4 hectare) were established at temperatures less than 6.5 C. Minimum movements occurred in January and February (0.5 C). Upstream spawning movements (4.5 km) occurred after ice melt, at a temperature of 6 C.

Most female fish wandered about immediately after spawning. Summer home ranges (0.4 to 1.2 hectare) were established late in July and August (Temp: 24.5 C). Most female fish established two or three home range areas. Much movement between areas (78 m/day) occurred during late summer and early fall. Home ranges were abandoned at temperatures less than 25.5 C. Maximum movements (151 m/day) occurred at 10.5 C. Winter home ranges, 0.2 to 0.3 hectare, were established after freeze over. Spawning movements (675 m/day) occurred after ice melt in water temperatures above 5.5 C.

Some home range areas overlapped, however there was never more than one fish in each area at any one time. Fish displaced up to 4.5 km from their well established home range areas usually returned by the most direct path within 24 hours of time.

The establishment of home range areas and varied use of these areas imply that sexual and size oriented differences exist. These differences, as influenced by other environmental factors, may be important when discussing muskellunge management procedures for specific bodies of water.

SOME PHYSIOLOGICAL CONSEQUENCES OF ANGLING STRESS IN MUSKELLUNGE (*ESOX MASQUINONGY*)

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Abstract

Capture of muskellunge by angling resulted in a reduction of blood pH, elevated lactic acid concentrations, and a drop in total carbon dioxide and bicarbonate concentrations. Lactic acid levels were not as high as those characterizing fatigue in other species. Adequate oxygen reversed this state of metabolic acidosis in surviving muskellunge. Hemoglobin and hematocrit levels declined by 22% and 40%, respectively, during recovery. Plasma sodium and potassium ion concentrations fluctuated but displayed no trends during recovery, indicating severe ionoregulatory dysfunction did not occur. 30% of all angled muskellunge died. Death was physiologically characterized by declining blood pH. Increased mortality was related to midsummer conditions of high water temperatures and low oxygen levels. The significant mortality of angled muskellunge suggests an alternative to a minimum size restriction may be a more effective means of conservation.

MANAGEMENT OF ENDANGERED COOLWATER FISHES

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Abstract

Management of eleven coolwater fish species presently on the United States Endangered Species List is discussed.

CULTURE

HISTORICAL PERSPECTIVE OF PROPAGATION AND MANAGEMENT OF THE COOLWATER FISHES IN THE UNITED STATES

Joseph Webster and Arden Trandahl

Abstract

Propagation for expanding coolwater fish ranges began in the late 1800's in the western states. Reservoir construction throughout the United States has resulted in intensive propagation and management of coolwater species outside their natural ranges since 1940. Many states report an inability to establish naturally reproducing populations, but they have established continuing supplemental stocking programs because the demand has been high. Most coolwater species are top predators and are useful in managing overabundant forage populations.

More than half the states are involved in coolwater fish production, and others are planning coolwater fish production programs. National utilization of coolwater fishes seems imminent.

Historical Federal production figures are presented.

CULTURE OF YELLOW PERCH (*Perca flavescens*)

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Abstract

Yellow perch (*Perca flavescens*, Mitchell) averaging 13.6 g and 108 mm for males and 38.6 g and 157.7 mm for females were held in a metal stock tank containing 937 liters of water for spawning purposes in late April and early May of 1975.

Two sacrificed females averaged 113.4 eggs per gram of body weight. The 46 spawns collected from the remaining 147 females averaged 4377 eggs. Eggs were incubated on trout hatching trays in troughs and a Heath Incubator.

At or near hatching eggs were placed on floating screened trays in a 0.2 ha pond for completion of hatching and for rearing. From an estimated 102,860 fertile eggs stocked 35,880 fingerlings were harvested for a return of 35%. Part of these fingerlings were held

and fed dry feed and grew from 0.38 g each to 1.36 g with a survival of 38% to distribution.

Observations on characteristics of culture and life history are included.

PRELIMINARY OBSERVATIONS ON THE SPERM OF YELLOW PERCH (Perca flavescens)

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Abstract

Observations were made on the morphology and physical-chemical characteristics of yellow perch spermatozoa. Spermatozoa resembled the primitive type described for other teleosts. Counts for 10 fish ranged from 1.14×10^{10} to 3.02×10^{10} sperm/ml. The seminal plasma of 10 fish had an average pH of 8.50, osmotic pressure of 316.7 milliosmols, and contained 2.64, 0.46, 0.128 and 0.145 mg of Na^{+}, K^{+}, Ca^{++} and Mg^{++}/g, respectively. Corresponding ion concentrations for spermatozoa were 1.81, 1.65, 0.073 and 0.228 mg/g.

COMPARATIVE GROWTH OF MALE VERSUS FEMALE YELLOW PERCH (PERCA FLAVESCENS) FINGERLINGS UNDER CONTROLLED ENVIRONMENTAL CONDITIONS

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Abstract

Female yellow perch (Perca flavescens) fingerlings outgrew males when raised under controlled environmental conditions. Six groups of 102 fish each were grown in 110-liter aquaria using two different formulated feeds, a constant temperature of 21 to 22°C, and a 16 hr light/8 hr dark photoperiod. On both feeds, females became significantly larger than males at about 110-mm total length and about 15 g total weight. It is

postulated that body size, rather than environmental cues or chronological age, may control the onset of sex-related size dimorphism in perch and that reproductive hormones are involved in this process.

INTENSIVE CULTURE OF WALLEYES: THE STATE OF THE ART

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Abstract

Intensive culture of walleyes has developed considerably during the past ten years; however, it is still an incomplete art and a very incomplete science. Pond-reared walleye fingerlings have been reared under intensive conditions to lengths of 100 - 125 mm over a 10 - 15 week growing period with survival rates in excess of 60 percent. Several forms of pelleted dry diets have been used, with W-7 the diet of choice at this time. Temperatures of 20 - 22 C, and water exchange rates of at least two per hour, have produced the most rapid growth and minimized disease problems. A variety of tanks, troughs and raceways have been used successfully for intensive walleye culture.

Walleye fry have accepted dry feeds; however, very few have survived to fingerling size. Better diets, improved control of diseases, and different designs for rearing units hold promise for bringing intensive culture of walleye fry to satisfactory levels. Post-fingerling walleyes have been reared successfully under intensive conditions, thus indicating that culture of walleyes to larger sizes (i.e. 175 mm and larger) is technically feasible.

Full development of intensive walleye culture to a level comparable to that of channel catfish or rainbow trout may occur during the next ten years, if the problems of fry culture are solved and economically feasible sources of 20 - 22 C water are obtained.

INTENSIVE CULTURE OF ESOCIDS THE CURRENT STATE OF THE ART

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Abstract

The intensive culture of esocids has been profoundly influenced

by the use of artificial diets. Adequate diets have been developed and automatic mechanical feeders have come into wide use. Most culture programs are emphasizing the production of tiger muskellunge (Esox lucius x Esox masquinongy). Hatchery design has changed to reflect increased knowledge of requirements of esocid fishes and to accommodate techniques developed to feed artificial diets. Trends in Michigan and Pennsylvania are to incorporate esocid culture and salmonid culture into an integrated or combination hatchery design. Fiberglass tanks, concrete raceways and silos are being used to rear esocids. Techniques and hatchery design have changed dramatically over the past decade; fisheries pathology as related to intensive culture of esocids has not kept pace with this change and basic information is still being developed. Achievements in the art of intensive culture of esocids should serve as an inspiration to culturists working with other difficult-to-rear fishes.

INTENSIVE CULTURE OF TIGER MUSKELLUNGE IN MICHIGAN DURING 1976 AND 1977

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Fisheries Division

Abstract

The hybrid tiger muskellunge (male northern pike, Esox lucius x female northern muskellunge Esox masquinongy) was reared intensively using artificial diets during 1976 and 1977. Egg incubation, early rearing phases and developmental work with fingerlings were undertaken at Wolf Lake State Fish Hatchery. Production fingerling rearing was undertaken at Platte River State Fish Hatchery. The total numbers of 15 to 23 cm fingerling produced during 1976 and 1977 were 88,000 and 109,000 hybrids, respectively. Survival from eggs ranged from 11 to 15% for 1976 and 22% for 1977. The improved survival during 1977 was attributed to better egg quality and modifications of feeding techniques which resulted in a lower incidence of cannibalism. Growth rate averages ranged between 0.140 and 0.175 cm/day during 1976 and averaged 0.180 cm/day during 1977. Improved feeding techniques again were responsible for the better growth rates. Columnaris and bacterial gill disease did cause mortalities but these mortalities were low in comparison to the total loss due to cannibalism.

REVIEWING THE ESOCID HYBRIDS

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Abstract

A review of the crosses and reciprocal crosses of all six species which comprise the family Esocidae is presented as a summary of the knowledge of these unique man-created varieties. The excitement initiated by this family of fishes and their hybrids and the inhibitions which have delayed earlier production of the hybrids for management and sport purposes are discussed.

As a background, natural and immunological barriers to hybridization are reviewed. These include distribution, habitat, size, behavior, spawning time, spawning sites, and other biological peculiarities which can be considered isolating factors. In contrast, the occasional occurrence of natural hybrids is also reviewed.

Included in tabular form in the presentation is the fertility and sterility of most all of the progeny of the crosses and reciprocal crosses of the six species of esocids.

A summary comparison and evaluation of esocid hybrids is presented which includes ease of culture, disease resistance, growth rate in hatcheries, value as predators, vulnerability to angling, maximum growth, and potential as a sport fish.

CONTROL OF REPRODUCTION IN NORTHERN PIKE (Esox lucius)

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Abstract

Several methods to control gametes availability in northern pike (Esox lucius) were investigated:

1. Precocious induction of ovulation was achieved with a single injection of partially purified salmon gonadotropin, but the treatment should be administered soon after the capture in order to avoid ovarian atresia.

2. Ovulated oocytes should be inseminated within 24 hours after ovulation. Loss of fertility due to aging occured 1 - 3 days after ovulation.

3. High doses of progesterone exhibited a threefold increase of sperm release.

4. Cryopreservation of diluted sperm at -196°C led to variable fertilizing capacities after thawing, depending on the donor male.

5. A diluent originally tested in the trout was used successfully for artificial insemination.

THE STATUS OF COOLWATER FISH DIETS

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Abstract

There is an increasing demand for more and larger coolwater fish. Intensive culture using a formulated feed only feasible method to meet the demand. Trout feeds are not satisfactory for coolwater fish. Seven diets were formulated specifically for coolwater fish and tested. The W-7 feed has been the most satisfactory. Cultural techniques and disease control have advanced with the development of the feeds. Success achieved with fingerlings but not fry. Results vary with the different fish. Feeding formulated feeds to tiger muskie on a production scale. Economics comparable to that for trout. Many improvements still needed and basic nutritional information is sorely lacking.

A REVIEW OF THE DISEASE PROBLEMS IN PROPAGATION OF COOLWATER FISHES

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Abstract

A review of the diseases of coolwater fishes is presented.

A MUSCULAR DYSTROPHY-LIKE ANOMALY OF WALLEYE, *STIZOSTEDION VITREUM VITREUM*

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Abstract

A skeletal muscle abnormality is described from 32 walleyes obtained from widely distributed Minnesota lakes between 1959 and 1974. Discrete to diffuse, yellow-brown, coarsely fibrous and fatty muscle tissue changes occur more frequently in adult male walleyes caught from small fertile lakes that are managed almost exclusively by stocking. The most common and distinguishing histologic features of muscular dystrophy in man and the dystrophy-like myopathies in animals were found in this myopathy of walleyes. Characteristic alteration of muscle fibers shown in transverse sections included marked variation in diameter size with numerous atrophic fibers, abnormal rounding, decreased eosinophilia, extensive infiltration of endomysium with fatty connective tissue, hyaline or "waxy" degeneration in which cross striations are no longer recognizable and the fiber appears uniformly eosinophilic and translucent, and floccular disintegration indicative of necrotic-like changes. Hyperplasia is not associated with this abnormality, and regeneration appears absent. More advanced lesions show concentric laminations of hyalinized material that appears to be derived from the involution and consolidations of myofibrils, recognized in less severely affected fibers as "ringbinden" or striated annulets. This anomaly, known in Minnesota as myofibrogranuloma (MFG), has basic histopathologic similarities with genetically induced dystrophic processes found in several domestic species of birds and mammals. MFG remains in a class of dystrophic myopathies in which the pathogenesis is not yet clear. Until MFG has been explained more fully, it may be more accurate to refer to it as a muscular dystrophy-*like* anomaly.

LYMPHOSARCOMA IN MUSKELLUNGE (ESOX MASQUINONGY) AND NORTHERN PIKE (ESOX LUCIUS): PARAMETERS FOR DISEASE CONTROL

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Abstract

Epizootics of a malignant blood cancer (lymphosarcoma) affect feral populations of northern pike (Esox lucius) and muskellunge (Esox masquinongy). An overall frequency of occurrence of the disease in pike and muskellunge as high as 20.9% and 16% respectively were found. The disease in feral muskellunge causes high mortalities while in pike spontaneous regressions are common. Field epizootiological studies suggest that the disease is horizontally transmitted percutaneously during the act of spawning. Parameters for control of the disease are presented based on epizootiological studies.

* Research Scholar of the National Cancer Institute of Canada. This work was supported by grants from the National Cancer Institute of Canada.

MANAGEMENT OF COOLWATER FISHES

CASE HISTORIES OF STOCKING WALLEYES, *STIZOSTEDION VITREUM VITREUM*, IN INLAND LAKES, IMPOUNDMENTS, AND THE GREAT LAKES -- 100 YEARS WITH WALLEYES

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Abstract

Evaluations on stocking walleyes, *Stizostedion vitreum vitreum*, in 125 bodies of water during the last 100 years were reviewed. Walleye stockings were separated into three categories: (1) introductory plants where walleyes were absent, (2) maintenance plants where natural reproduction was absent or very limited, and (3) supplemental plants where efforts were made to augment natural reproducing walleye populations. About 48% of the introductory plants were successful. Approximately 32% of maintenance plants were successful. Only about 5% of the supplemental plants were considered to be successful. Success or failure of walleye stocking appeared to depend more on environmental and biological conditions of individual bodies of water than on the number and size of walleyes that were stocked.

FOOD, GROWTH AND EXPLOITATION OF PERCIDS IN OHIO'S UPGROUND RESERVOIRS

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Abstract

Yellow perch growth was rapid, with perch attaining mean total lengths in excess of 200 mm as I+ or II+ fish. Growth abruptly declined in years after attaining 200 mm, and was related to the absence of piscivorous forage for older and larger perch. Perch fed throughout life on zooplankton and aquatic insects, primarily chironomid larvae and pupae.

No predator-prey relationship existed between young-of-the-year walleye and yellow perch, as young perch grew too rapidly to be utilized by slower growing 0+ walleye. Perch were also unimportant as forage for Age I and older walleye, and growth of walleye was poor. Walleye forage was primarily zooplankton and aquatic

insects through Age II, with fish and crayfish important at Ages III and IV. Though growth was slow, walleye were readily harvested and along with perch accounted for 44% of the total angler harvest from 1972-77.

AN OLD FISH - AN OLD LAKE

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Abstract

The sauger, Stizostedion canadense, was re-introduced into western Lake Erie by stocking 882,000 fry and fingerling sauger into lower Sandusky Bay between 1974 and 1976. Recaptures in research and commercial fishing gear have indicated good survival from each of these annual stockings. Their distribution ranged from Maumee Bay east to Cleveland, Ohio, and north to the Canadian shoreline. Areas of concentration occurred in Sandusky Bay and along the southern shore of western Lake Erie.

Growth has exceeded by far the historical growth of native sauger. Back calculated lengths at the end of years of life 1 through 3 were 200, 381, and 433 mm. Condition factor K(TL) for sauger averaged 1.078. All of the males and most females were mature as 2-year olds. Fecundity estimates for 2-year old females averaged 65,000 eggs per fish. Mature sauger migrated up the Sandusky and Maumee Rivers to spawning areas during March and April. Natural recruitment has occurred. Sauger fed primarily on freshwater drum (Aplodinotus grunniens) and emerald shiners (Notropis atherinoides).

Sport catches of sauger have occurred at their spawning areas in tributary rivers and along the southern shoreline of Lake Erie.

MANAGEMENT FOR WALLEYE OR SAUGER, SOUTH BASIN, LAKE WINNIPEG

R. O. Schlick

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Abstract

The South Basin of Lake Winnipeg just prior to 1970, when the

lake was closed due to mercury contamination in fish, produced mainly sauger. From 1972 unwards, the fall fishery, which is the main seasonal fishery, produced predominately walleye. The question then arose, "Should we manage the South Basin for walleye or sauger?" In 42 seasons sauger and walleye production has been almost equal (only 3.2% difference). Dominance of either sauger over walleye production or vise versa has varied not only from year to year but sometimes from season to season within the same year. These shifts in dominance do not appear related to market conditions but are probably the result of environmental factors or migrations. This indicates that both species are very important to the South Basin fishery. Maturity studies indicate a change to a larger gill net mesh size would be desirable. Economically fishermen would suffer by an increased mesh size, although a continuing price differential in favour of walleye over sauger would lessen the economic implications of a larger mesh gill net fishery. Environmental factors are likely to favour the sauger over the walleye, in the future.

EFFECTS OF WATER LEVEL MANAGEMENT ON WALLEYE AND OTHER COOLWATER FISHES IN KANSAS RESERVOIRS

Calvin L. Groen and Troy A. Schroeder

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Abstract

The environmental and biological effects of water level management are monitored on certain Kansas reservoirs. The basic water level management plan consists of a rising water level in the spring to improve fish spawning and nursery conditions, followed by a mid-summer drawdown for revegetation of the fluctuation zone and to increase forage vulnerability for piscivorous fishes. An improved forage base, increased walleye growth, increased walleye recruitment and harvest, enhanced survival of stocked walleye fry and northern pike fingerlings, an improved fish population structure, and improved water quality are attributed to water level management. No documented sustained natural northern pike recruitment has occurred. Manipulation of water levels has proven to be a valuable tool for the fisheries manager.

MANAGEMENT EVALUATION OF STOCKED NORTHERN PIKE IN COLORADO'S SMALL IRRIGATION RESERVOIRS

Stephen A. Flickinger[1] and John H. Clark[2]

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Abstract

Northern pike (Esox lucius) of two size groups were stocked into several small irrigation reservoirs in Colorado. Small northern pike approximately 50 mm total length were stocked at an approximate rate of 62/ha, whereas large northern pike averaging 377 mm total length were stocked at an approximate rate of 25/ha. Out of 18 introductions of 50 mm northern pike, 9 (50%) resulted in no observable northern pike populations, 7 (39%) resulted in northern pike populations of too low a density to interest fishermen, and 2 (11%) resulted in northern pike populations of a density which would attract fishermen. Survival of 50 mm stocked northern pike was dependent upon large numbers of small sized forage fishes. In the two instances when 50 mm fingerlings established in sufficient numbers to interest fishermen, cost per surviving catchable sized northern pike average $0.16. Out of 4 introductions of 377 mm northern pike, all (100%) resulted in northern pike populations of a density which would interest fishermen. Survival of stocked 377 mm northern pike averaged 35% and cost per surviving fish averaged $4.62. Few statistical differences in average size and number of resident fish populations were found within a year after northern pike were introduced into study reservoirs; although, the general trend was an increase in average total length and a decrease in number of resident fishes following introduction of northern pike.

AN EVALUATION OF THE MUSKELLUNGE (ESOX MASQUINONGY) FISHERY OF LAKE POMME DE TERRE AND EFFORTS TO IMPROVE STOCKING SUCCESS

Lawrence C. Belusz

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Abstract

Two independent creel census methods (roving and probability) were used to measure fishing pressure and angler success for muskellunge

at Lake Pomme de Terre. The two methods provided wide variations in estimated harvest of muskellunge because of differences in calculating angling pressure. However, the probability method was believed to provide more reliable estimates due to narrower confidence limits and higher levels of probability. Angler acceptance of muskellunge as a trophy fish has increased since they were first stocked in 1966 with fishing pressure for muskellunge increasing each year. Heavy exploitation of initial plantings of muskellunge by anglers in 1972 has resulted in a limited adult population providing an annual harvest of 100 to 200 muskellunge per year.

Studies to determine the magnitude of fingerling muskellunge stocking mortality have indicated that a wide range of success is possible. Delayed releases of muskellunge held in isolation coves showed that the period of greatest mortality occurred within 48 hours. Bacterial studies indicated that delayed mortality may be caused by typically non-pathogenic strains under stress conditions.

EVALUATION OF ESOCID STOCKING IN WISCONSIN

Leon D. Johnson

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Spooner, Wisconsin 54801

Abstract

There was great variability in the range of survival for stocked esocids in Wisconsin waters. Generally, muskellunge (Esox masquinongy) and northern pike (Esox lucius) survived in the range of 0-60% over short-term intervals. Despite high variations, the stocked fingerlings added to the lake populations. There was an overall tendency for hybrids of these two species to survive at higher rates, up to 85%. Hybrids fed dry diets, however, tended toward lower survival than those fed minnows.

USE OF FIN CLIPS IN THE EVALUATION OF MUSKELLUNGE STOCKING PROGRAMS

Fergus I. McNeil

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Toronto, Ontario

Abstract

The survival and growth of fin-clipped muskellunge fingerlings and the regeneration of the clipped fins was studied at

Nogies Creek, Ontario. Analyses of the data from this study indicated that:

1. Removal of a pectoral fin was no more detrimental to survival or growth than the removal of a pelvic fin.
2. Removal of one of the paired fins without anesthesia was no more detrimental to survival or growth than removal with anesthesia.
3. Removal of two pelvic fins resulted in significantly lower growth in the first 50 days after marking than the removal of a single pelvic fin when reared in colder water.
4. Growth of marked hatchery fingerlings does not differ from that of wild fingerlings.
5. Survival of marked hatchery fingerlings is similar to that of wild fingerlings after an initial period of high mortality.
6. Incidents of regeneration of removed fins is significant within one year of marking.
7. Extent of regeneration is significant within one year of marking.

MANAGEMENT IMPLICATIONS OF HYBRID ESOCIDS IN PENNSYLVANIA

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Abstract

The purpose for using hybrid esocids in Pennsylvania's fishery management programs has historically been ill-defined. It has been complicated by introducing one hybrid in significant numbers before its poststocking advantages were determined. Use of hybrids should be based on hatchery benefits, and superiority over parents and other hybrids after stocking.

In Pennsylvania, only the sterile tiger muskellunge (Esox lucius x Esox Masquinongy) has been utilized to any great extent and has proven superior to both parents and other hybrids in many hatchery categories.

Tiger muskellunge have been planted in 109 waters in Pennsylvania, reaching a maximum of 50 in 1975. All new impoundments over 28 hectares are stocked with tiger fry at the rate of approximately 250/ha unless they occur in a parent species natural range. Following initial introductions, fingerlings only, averaging 18 cm to 20 cm are stocked at the rate of 1 to 2/ha, usually biennially. Stream stocking rates are

625 fry/km or 20 fingerlings/km for streams less than 100 meters wide and 1000 fry/km or 30 fingerlings for wider streams. Fry are stocked in streams only as introductions to rehabilitated waters. Fingerlings are stocked thereafter usually on a biennial basis.

Available information indicates the tiger is difficult to sample, grows rapidly, particularly in new impoundments, returns better to the angler than the purebred muskellunge and is readily accepted by a growing segment of anglers as a valued trophy.

THE MATHESON ISLAND SAUGER FISHERY OF LAKE WINNIPEG, 1972-1976

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Abstract

Excess fishing pressure and the use of small-mesh nets have caused severe problems for populations of whitefish, sauger, and walleye in Lake Winnipeg, and resulted in declining catches prior to 1970. Following the introduction of a quota system during 1971 in the Matheson Island fishery of Lake Winnipeg, sauger and walleye catches have improved. In 1972, when this fishery reopened following a two-year closure due to mercury pollution, the sauger catch consisted of three main age groups, III-V. In 1973, the modal age of sauger decreased to III, and continued at this age through 1976. Age III sauger became the mainstay of the fishery in 1974 and subsequent years. The contributions of age IV and older sauger to the fishery have decreased since 1972. Age II sauger comprised only 1% of the total catch in 1972, increased to 27% in 1974, and comprised 15% and 17% of the total catch in 1975 and 1976, respectively. Since 1973, the commercial fishery has relied increasingly upon immature sauger, mainly females, for the bulk of its catch. There is evidence that the continued good catches of sauger at Matheson Island have been supported by stocks of fish from other areas that contain mature individuals. The sauger fishery also is aided by fishing regulations and the presence of other species, mainly walleye, that lower fishing pressure. There is need for further study of the delineation of sauger stocks and their relationship to one another. The capture of immature sauger must be curtailed to increase the number of spawners.

NORTHERN PIKE, TIGER MUSKIE, AND WALLEYE POPULATIONS IN STOCKTON LAKE, MISSOURI - A MANAGEMENT EVALUATION

John A. Goddard and Lee C. Redmond

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Abstract

Walleye and northern pike played an important role in the development of a quality fishery, a diverse fishery and a trophy fishery in Stockton Lake. A three-stage filling of 10,072 ha Stockton Lake coupled with spring releases of walleye and northern pike fry and fingerlings into the flooded terrestrial vegetation in 1970, 1971, and 1972 resulted in good survival, exceptional growth, and a quality fishery.

Angler interest in these species was high accounting for 20% of the fishing trips in 1972.

With a minimum size limit of 457 mm (18 in) and 762 mm (30 in) on walleye and northern pike, harvest reached a high of 1.9 and 1.2 fish/ha (2.4 and 4.5 kg/ha) in 1972 and averaged 1.0 and 0.4 fish/ha (1.5 and 1.5 kg/ha). The size limits provided many additional hours of quality angling; in 1971 nearly 31,000 sublegal walleye and northern pike were caught and released to be caught again (10.3/ha). While remaining in the lake, they provided effective predation on the forage fishes, primarily gizzard shad. In addition the size limits permitted a very respectable harvest of quality size fish, averaging 1.4/ha weighing 3 kg/ha. Tiger muskies were released in 1975 to replace the northern pike, many of which succumbed to natural mortality.

AN EVALUATION OF THE MUSKELLUNGE FISHERY IN CAVE RUN LAKE, KENTUCKY

James R. Axon

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Department of Fish and Wildlife Resources
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Abstract

Cave Run Lake, 3,347 hectares, was impounded in 1974 on the Licking River. The river had a native population of muskellunge (Esox masquinongy), but an additional 0.3 fish/hectare were stocked

above the dam in 1973. Since then, annual stockings of the lake have occurred at the rates of 1.1-3.1 fish/hectare; lengths of stocked fish have been 102-356 mm. The largest planting was in 1974: 10,445 fish of 102-305 mm length. Yearly standing crops of muskellunge in coves have ranged between 0 and 0.7 fish (0.04-0.73 kg)/hectare. In 1975, anglers took 56 muskellunge (214 kg) of legal size (762 mm minimum length) at a rate of 1 fish/58 h. In 1976, these statistics improved to 1,029 fish, 4,140 kg, and 1 fish/48 h. Muskellunge provided 21% by weight of the total angler harvest that year. The 1977 muskellunge take was 478 fish (2,300 kg). The 1974 year class provided 68% and 78% of the muskellunge harvest in 1976 and 1977, respectively. Muskellunge reach legal length between ages II and IV in Cave Run Lake, compared with ages III-VI in Kentucky streams. Carp and gizzard shad were the only food items identified in stomachs of muskellunge.

RESPONSES OF NORTHERN PIKE TO EXPLOITATION IN MURPHY FLOWAGE, WISCONSIN

Howard E. Snow

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Spooner, Wisconsin

Abstract

The harvest and population dynamics of the fish populations in Murphy Flowage were studied for 15 years. A complete creel census and annual population estimates were utilized to describe the relationship between exploitation and other selected statistics of the northern pike (Esox lucius) which was the major predator species present. The entire study was conducted under liberalized fishing conditions (no bag, season or size limits).

Annual densities of native northern pike over 356 mm ranged from 5.8 to 40.6/hectare (mean = 20.8) and the biomass averaged 14.7 kg/hectare. The addition of stocked northern pike (117.2/hectare) in December of the ninth year of the study, temporarily increased the standing stock to 121.6/hectare the following spring. The annual harvest of northern pike averaged 6.9 fish/hectare (6.7 kg/hectare) and they were caught at an average annual rate of 3.8/100 hours of angling. Annual exploitation rate (u) averaged 26%, natural mortality rate (v) 40%, and total mortality rate (A) 66%. Total mortality was not density dependent within the range of population density observed for native northern pike but became density dependent only when the numbers of fish were increased to high levels by stocking. I concluded that except when their densities were artificially high that the most important determinant of northern

pike population density in Murphy Flowage was the availability of suitable forage (small bluegills). The results suggest that forage may contribute to predator abundance only above some threshold density of prey. Conversely, at lower forage levels predators may control the abundance of forage species.

THE MUSKELLUNGE, ESOX MASQUINONGY MITCHELL, IN LAKE ST. CLAIR

Robert C. Haas

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Lake St. Clair Great Lakes Station
Mt. Clemens, Michigan 48045

Abstract

The population of muskellunge, Esox masquinongy Mitchell, in Lake St. Clair has been exploited by intensive sport fishing for many years. Data collected since 1968, in conjunction with studies on other species, have been used to reassess the condition of the Lake St. Clair muskellunge.

Trap nets have taken 357 adult muskellunge during spring spawning which were tagged and released. Age and growth data show that they are very similar to the St. Lawrence River muskellunge. Mean total lengths of females were greater than males after age V. Females did not reach maturity until about 914 mm total length which is well beyond the traditional minimum size of 762 mm.

Data were collected on the seasonal and areal distribution of angler caught muskellunge. This information and recaptures of trap net and angler tagged fish demonstrated substantial movements of about 40 km.

THE INCREMENTAL METHOD OF ASSESSING HABITAT POTENTIAL FOR COOLWATER SPECIES: WITH MANAGEMENT IMPLICATIONS

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Abstract

The IFG incremental method was designed to assess the effects of stream flow regimes on fish communities. It can also be used for

other fisheries related problems such as channelization impact studies, cost-benefit analysis of stream rehabilitation projects, stream classification and stocking programs, and negotiation of flow releases from hydroelectric projects.

The method utilizes one or more hydraulic simulation procedures to determine the distribution of depth, velocity, and substrate within the channel at difference discharges. A composite probability of use for each combination of depth, velocity, and substrate is determined for each life stage of each species under study. A weighted usable area, roughly equivalent to the physical carrying capacity of the stream reach is then determined for each month of the year, based on different flow regimes, such as the median flow year or 1-in-10 low flow year. The weighted usable area may then be used to interpret changes in both standing crop and species composition due to changes in the hydraulic features of the stream. An example is given showing how the method could be used to assess the impact of a channelization project and the subsequent design of a rehabilitation project applied to the channelized reach.

MANAGEMENT IMPLICATIONS FOR THE BOREAL LAKES OF CENTRAL CANADA: A CASE STUDY OF THE DEVELOPMENT OF COMMERCIAL FISHING

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Transportation Services
Winnipeg, Manitoba R3H 0W9

Abstract

The fisheries resource of the numerous boreal lakes on the Laurentian Shield of central Canada traditionally have been important, both economically and socially, to the people in this region. These lakes continue to be valuable producers of highly preferred sport and commercial fish. Historically, the commercial fisheries have sought the dominate species, primarily walleye (*Stizostedion vitreum vitreum*), lake whitefish (*Coregonus clupeaformis*), and northern pike (*Esox lucius*). A synoptic review of management trends and the development of commercial fishing in northern Ontario is presented as representative of fisheries development in this region.

Serious declines in commercial fishing in this region point to a need for more comprehensive fisheries policies and management strategies. Implications for the management of these fisheries should be drawn first from a clearer understanding of past schemes

and their reasons for failure. Effective fisheries development programs, and fisheries management in general, require: a recognition and respect for the socio-economic framework of fisheries and fishing communities; sincere efforts by fisheries institutions to eliminate the fragmented approach to new initiatives; a willingness to learn from the adaptive or experimental approach; and an immediate transfer of insights and information directly to planning and policy-making.

THE CONCEPT OF BALANCE FOR COOLWATER FISH POPULATIONS

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Columbia, Missouri

Abstract

We propose a new approach to evaluate the state of balance or structure of coolwater fish populations and communities. Balanced fish communities have been defined by H. S. Swingle as those which have the capacity to provide yields of fish of satisfactory size in proportion to the productivity of the system. A new index of structure has been termed the Proportional Stock Density (PSD). This index is calculated as the percentage of fish of a quality size (length) in the stocks $\left(\frac{\text{NO.} \geq \text{QUALITY SIZE}}{\text{NO.} \geq \text{STOCK SIZE}} \times 100\right)$ All that is needed to calculate the index is a length-frequency distribution of individual stocks. Minimum stock size and quality size for a species are defined as a percentage of the world record length. The proposed minimum stock and quality size for some coolwater fishes are: yellow perch, 13 and 20 cm (5 and 8 inches); smallmouth bass, 18 and 26 cm (7 and 11 inches); walleye 25 and 41 cm (10 and 16 inches); northern pike, 33 and 53 cm (13 and 21 inches); and muskellunge, 41 and 66 cm (16 and 26 inches). These minimum stock sizes range from 23 to 26% of the record length; minimum quality sizes range from 37 to 41% of the record length. An analysis of model stocks based on representative growth and mortality rates indicates that the PSD for balanced yellow perch populations may range from 20 to 40%; balanced top predator populations may have PSD values that range from 40 to 60%. Length limits have the potential to change the PSD of coolwater species from high or low values to within target ranges.

EFFECTS OF A MINIMUM SIZE LIMIT ON THE WALLEYE POPULATION OF A NORTHERN WISCONSIN LAKE

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Abstract

After the establishment of a minimum length limit on walleyes in Big Crooked Lake, Wisconsin, the angler catch and yield of walleyes 381 mm and larger decreased four-fold, while there was approximately a three-fold decline in the number of walleyes of this size in the lake. Mean length and weight of angler-caught walleyes declined as did growth and condition. The number of walleyes less than 381 mm increased during the study period, mainly due to two large consecutive year-classes. The total annual mortality rate of walleyes 381 mm and greater was directly related to their density but was not correlated with the density of walleyes less than 381 mm. There was a positive relationship between the population density of walleyes 381 mm and larger and angler catch. The exploitation rate ranged from 11.1 to 20.5% and was not related to walleye density.

DYNAMICS OF THE NORTHERN PIKE POPULATION AND CHANGES THAT OCCURRED WITH A MINIMUM SIZE LIMIT IN ESCANABA LAKE, WISCONSIN

James J. Kempinger and Robert F. Carline

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Abstract

A 56 cm minimum length limit on catches of northern pike (*Esox lucius*) was applied to Escanaba Lake in 1964 and removed 9 years later. While the regulation was in effect, the density of northern pike shorter than 56 cm (sublegal size) doubled, and that of larger (legal) fish increased by 47%; total biomass increased by 43% to 7.9 kg/hectare. Growth rates decreased. Prior to 1964, northern pike reached 56 cm at age IV, but by 1972 they did not attain this size until age VIII. Total mortality rates rose from 60% to 82% during 1964-1972, but fishing mortality decreased from 46% to 6% and annual harvest of northern pike fell from 3.6 to 1.2 kg/hectare. Numbers of legal northern pike in the harvest remained about the same after the size limit was imposed, and angling success increased from 0.4 to 0.8 legal fish/100 hours (because of lower

Department of Fisheries and Wildlife Sciences
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Abstract

This paper places general management theory in a fisheries management framework. Fisheries management is the practice of analyzing, making, and implementing decisions to maintain or alter the structure, dynamics, and interactions of habitat, aquatic biota, and man to achieve specified human goals and objectives through the aquatic resource. Managers usually predict the consequences of a proposed fisheries management decision in a number of ways, including rules of thumb, past experience, formal models, experimentation, trial and error, and of course, pure guess. A key and obvious problem in making accurate predictions of the consequences of a proposed management decision is the complexity of most fisheries. Numerical analysis or lack of data have often been identified as the major problems with using formal models in fisheries management, but lack of basic management theory is even more critical. A fundamental premise in all fisheries management is that all benefits derivable from fisheries management are accurable solely to man. Given this premise, a simple general theory of fisheries management can be developed in which most of the controversy surrounding fisheries management decisions revolves around which goals and objectives are selected and who selects them. In such a "general theory of fisheries management" biological factors are largely constraints and are only rarely major decision variables.

SELECTION OF MINIMUM SIZE LIMITS FOR WALLEYE (*STIZOSTEDION V. VITREUM*) FISHING IN MICHIGAN[1]

James C. Schneider

Michigan Department of Natural Resources
Ann Arbor, Michigan 48109

Abstract

Typical walleye stocks and fisheries are simulated mathematically to predict tradeoffs among yield in weight, catch in numbers, stock size, and egg production. Under the most likely conditions of growth, natural mortality, and fishing, maximum yield in weight took place when walleye were recruited to the fishery during Age III, but near-maximum yields were obtained over a broad range of minimum fish age and harvest size limits. This allows the manager flexibility in managing for alternative goals such as recreational values or stock size. For the average

sport fishery in Michigan, the recent change from 330 mm to a 381 mm minimum size limit is expected to: 1) have no significant effect on yield, 2) increase walleye egg production by 20-30%, 3) increase the total numbers of walleye caught (legal plus sublegal) and the biomass of the population by 15-20%, and 4) cause a similar decrease in the numbers of legal-sized walleyes taken home.

[1]Contribution of D-J F-35-R

WALLEYE FISHERY MANAGEMENT PROGRAM IN TEXAS

John A. Prentice[1] and Richard D. Clark, Jr.[2]

[1]Texas Parks and Wildlife Department
Ingram, Texas 78025
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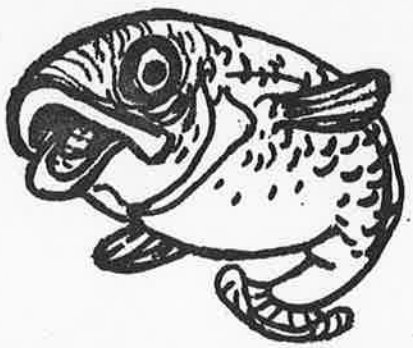
Abstract

This report accounts progress made in Texas walleye (Stizostedion vitreum vitreum) fishery management, results of walleye research and use of a systems approach to walleye management. Seventeen reservoirs of varying features were stocked with walleye and sampled to determine water quality, standing crops of fishes, and survival, spawning success and age and growth of walleye. Results indicated three major factors affected success of walleye introductions: 1) water temperature during their spawning time, 2) amount of potential walleye spawning area, and 3) standing crops of potential walleye predators. These factors were used to develop a walleye population dynamics similator model, WALLEYE. WALLEYE was used to devise a decision making system for walleye management. Rapid assimilation of data and a general systems approach to aid in fishery management decisions were the main contributions of WALLEYE.

NEW YORK CHAPTER

SUPPLEMENT TO MEMBERSHIP DIRECTORY

-1978-



AMERICAN FISHERIES SOCIETY

Membership Directory Supplement - 1978 (Sept., 1978)

Names and other information for 71 new members are added to the April publication of 167 names.

Changes in addresses, employers and telephone numbers for members are included at the end of this supplement.

Dr. John C. Baiardi — 516-668-5145
c/o N.Y. Ocean Science Lab.
Montauk, NY 11954

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Employer (School): Texas Inst., Inc. — 914-737-3081
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Interest: Fisheries Biology, Population Dynamics

****

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Robert E. Foley
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Interest: Fish Propagation

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Richard Fox
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Interest: Population Studies

Charles T. Hamilton (cont.)

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Interest: Marine & Freshwater Fisheries

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Interest: Freshwater Fisheries Biology and Aquatic Ecology

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Dept. of Biological Sciences

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Interest: Population & Aquatic Ecology, Fisheries, Biotelemetry

****

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****

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225 Montgomery St.
Newburgh, NY 12550
914-561-9073

Employer (School): Texas Inst., Inc.
P.O. Box 237
Buchanan, NY 10511
914-737-3081

Job Title: Technical Directory-Hudson River Ecological Study

Interest: Fish Behavior - Power Plant Studies

****

Terrence Kloss
Schroon River Road
Warrensburg, NY 12885
518-494-3615

Employer (School): NYS Fish Hatchery
Warrensburg, NY 12885
518-623-3361

Job Title: Fish & Wildlife Technician

Interest: Fish Propagation

****

John J. Long
1953 Balmer Rd.
Ransomville, NY 14131
716-791-3711

Employer (School): NYS DEC
Fish & Wildlife Mgmt. Board (Reg. 9)
716-285-7313

Job Title: Chairman

Interest: Fish and Wildlife - General

Arthur J. Newell
RD 1, Box 71
Westerlo, NY 12193
518-797-5150

Employer (School): Ichthyological Associates
P.O. Box 2
Stamford, NY 12167
607-652-3563

Job Title: Senior Aquatic Biologist

Interest: Freshwater Fisheries

****

Kenneth B. Nichols
114 Seaman Avenue
Castle on Hudson, NY 12033
518-732-7000

Employer (School): Retired

Interest: Fish Propagation

****

Joel S. O'Connor
139 Wilderness Rd.
St. James, NY 11780
516-584-5088

Employer (School): US Dept. of Commerce, NOAA
MESA Project Office, SUNY
Stony Brook, NY 11794
516-751-7002

Job Title: Senior Ecologist

Interest: Estuarine and Coastal Ecology - Pollution Impacts

****

Timothy M. O'Keefe
RFD 3 Jack Road
Peekskill, NY 10566
914-737-8335

Employer (School): Union Carbide Corporation
914-345-3458

Job Title: Biologist

Interest: Fish Nutrition

John Reed
106 Old Mamarneck Rd.
White Plains, NY 10605

914-946-2259

Employer (School): Malcolm Pirnie Inc.
White Plains, NY 10602

914-694-2100

Job Title: Environmental Analyst

Interest: Environmental Impacts, Water Resources

****

F. Paul Richards
411 Tree Rd., North
S. Setauket, NY 11720

516-981-5483

Employer (School): Ecological Analysts Inc.
275 Broad Hollow Rd.
Melville, NY 11746

516-752-1122

Job Title: Aquatic Ecology Program Manager

Interest: Ecology of Fish

****

Katheleen S. Roos
Apt. 2A
80 Justice St.
W. Babylon, NY 11704

516-884-6388

Employer (School): Equitable Environmental Health
333 Crossways Park Dr.
Woodbury, NY 11797

516-364-8500

Job Title: Assistant Director of Biological Sciences

Interest: Ichthyology - Fisheries Management

****

George A. Roth
RD #2 Dunderberg Road
Putnam Valley, NY 10579

914-526-2927

Employer (School): Texas Inst., Inc.
P.O. Box 237
Buchanan, NY 10511

914-737-3081
Ext. 38

Job Title: Quality Supervisor

Interest: Application of Quality Assurance/Control to Fisheries Science

Martin A. Smith, Jr. 518-585-6981
Lakeshore Apts., Eagle Lake
Ticonderoga, NY 12883

Employer (School): NYS DEC 518-597-3430

Job Title: Fish & Wildlife Technician

Interest: Fish Culture

****

Michael T. Sobczak 914-738-5426
50 Second St.
North Pelham, NY 10803

Employer (School): T.A.M.S. 212-755-2000
345 Park Ave.
New York, NY 10022

Job Title: Senior Ecologist

Interest: Fishery Biology - Aquatic Ecology

****

John J. Spagnoli 518-677-2621
RD #2
Cambridge, NY 12816

Employer (School): NYS DEC 518-457-6178
50 Wolf Rd.
Albany, NY 12233

Job Title: Bureau Chief, Fish & Wildlife Ecologist

Interest: Organic Contaminants

****

Selden J. Spencer 914-255-5077
55 DuBois Rd.
New Paltz, NY 12561

Employer (School): State University College 914-257-2541
New Paltz, NY 12562

Job Title: Professor of Biology

Interest: Aquatic Bilogy - Marine & Fresh Water

Dwight A. Webster (cont.)

Job Title: Professor of Fishery Science

Interest: Salmonid Biology, Population Dynamics, Acid-resistant Brook Trout

****

Philip R. Welsch
29 East 7th St.
Oswego, NY 13126

315-342-2785

Employer (School): Texas Inst., Inc.
Ecological Services Branch

315-342-3041

Job Title: Manager - Oswego Field Station

Interest: Aquatic Ecology

****

Robert G. Werner
RD #3 Tracy Dr.
Skaneateles, NY 13152

315-673-4272

Employer (School): SUNY CESF
Syracuse, NY 13210

315-473-8849

Job Title: Professor

Interest: Larval Fish Ecology

****

Edward V. White
260 Mill Creek Dr.
Southold, NY 11971

516-765-9224

Employer (School): retired

****

T. H. Wohnsiedler
Samsonville, NY 12476

914-657-8479

Employer (School): Ulster Commun. College

914-687-7621

Job Title: Division Chairman - Biology

Interest: Trout Stream Ecology

Membership Directory Changes (1978)

Jim Johnson
Columbia Gardens, Apt. 117
Cohoes, NY 12047
518-235-7231

Employer: NYS DEC
50 Wolf Rd.
Albany, NY 12233
518-457-6178

Job Title: Senior Aquatic and Terrestrial Ecologist

Interest: Salmonid ecology

****

Robert J. Kurtz

Employer: Passaic River Basin Study Group
New York District, Corps of Engineers
26 Federal Plaza
New York, NY 10007
212-264-3615

Job Title: Biologist

Interest: Fish life histories, environmental impact statements

****

Edward J. Kuzia
Lily Lake Rd.
Bleecker Stage
Gloversville, NY 12078
518-725-3532

Employer: NYS DEC
Hale Creek Field Station
RT 29A
Gloversville, NY 12078
518-773-7318

****

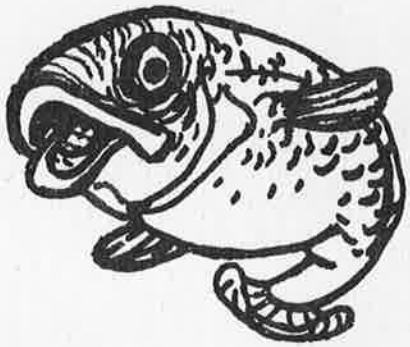
Charles McCarthy, Jr.
20-5 Pond Way
Manorville, NY 11949
516-878-8736

Employer: Suffolk County Community College
Speonk Riverhead Rd.
Riverhead, NY 11901
516-369-2600

NEW YORK CHAPTER

MEMBERSHIP DIRECTORY

-1978-



AMERICAN FISHERIES SOCIETY

1978 OFFICERS

President

Bruce D. Shupp

Vice-President

Philip T. Briggs

Secretary-Treasurer

Joseph W. Gorsuch

Secretary-Treasurer-Elect

Lawrence C. Skinner

January 18, 1979

William J. Abraham
8913 Strutt Street
Wayland, NY 14572

716-728-5067

Employer (School): NYS DEC

716-226-2466

Job Title: Sr. Aquatic Biologist

Interest: Fisheries management

****

Larry G. Arvidson
Rd #1 Box 2446
23 James Street
Rosendale, NY 12472

914-658-9823

Employer (School): Lawler, Matusky and Skelly, Engineers

Job Title: Benthos Department Coordinator

Interest: Fish larvae

****

James W. Atz
106 Bayview Avenue
Port Washington, NY 11050

516-767-3367

Employer (School): American Museum of Natural History

212-TR3-1300

Job Title: Curator

Interest: Genetics, comparative physiology

****

Dr. John C. Baiardi
c/o N.Y. Ocean Science Lab.
Montauk, NY 11954

516-668-5145

Employer (School): N.Y. Ocean Science Lab.

516-668-5800

Job Title: Director

Interest: Physiology & Marine Bio-Medicine

****

Howard C. Baker
Star Route
Clintondale, NY 12515
914-883-6461

Employer (School): Texas Inst., Inc.
P.O. Box 237
Buchanan, NY 10511
914-737-3081

Job Title: Biologist - Technical Staff

Interest: Aquatic ecology

****

C. Allen Beebe, Jr.
23 LaGrange Avenue
Poughkeepsie, NY 12603
914-471-0496

Employer (School): Texas Instruments
P.O. Box 237
Buchanan, NY 10511
914-737-3081

Job Title: Biologist

Interest: Aquatic ecology of lower Hudson River fishes and macrophytes.

****

Michael Billy
54 Grant St.
Sloatsburg, NY 10974
914-753-2206

Employer (School): Texas Inst., Inc.
P.O. Box 287
Buchanan, NY 10511
914-737-3081

Job Title: Environmental Technician

Interest: Fisheries science

****

David L. Bimber
126 Eagle Street
Fredonia, NY 14063
716-672-5720

Employer (School): Dept. Biology
S.U.C. at Fredonia, NY 14063
716-673-3375

Job Title: Graduate Student

Interest: Aquatic ecology

****

Matthew C. Kelly — 914-266-5697
RD #2 Sunset Trail
Clinton Corners, NY 12514

Employer (School): Texas Instruments Ecological Services
Buchanan, NY

Job Title: Fisheries Technician

Interest: Estuarine & anadromous fishes

****

Erik Kiviat — 914-297-6129
Smithtown Rd.
Fishkill, NY 12524

Employer (School): Bard College — Same as above
Annandale, NY 12504

Job Title: Research Associate in Ecology

Interest: Conservation-wetland ecology

****

Ronald J. Klauda — 914-561-9073
225 Montgomery St.
Newburgh, NY 12550

Employer (School): Texas Inst., Inc. — 914-737-3081
P.O. Box 237
Buchanan, NY 10511

Job Title: Technical Directory-Hudson River Ecological Study

Interest: Fish behavior power plant studies

****

Terrence Kloss — 518-494-3615
Schroon River Road
Warrensburg, NY 12885

Employer (School): NYS Fish Hatchery — 518-623-3361
Warrensburg, NY 12885

Job Title: Fish & Wildlife Technician

Interest: Fish propagation

****

Richard K. Keiser, Jr. 914-534-8526
RD #1 Long Hill Road
Highland Falls, NY 10930

Employer (School): Texas Instruments 914-737-7031
Box 237
Buchanan, NY 10511

Job Title: Data Operations Manager

Interest: Estuarine ecology (Penaeid shrimp biology), commercial fisheries assessment

****

Alfred T. Kellar 516-751-4980
16 Mills Rd.
Stony Brook, NY 11790

Employer (School): NYS DEC 516-751-7900
SUNY, Bldg. 40
Stony Brook, NY 11794

Job Title: Associate Aquatic Biologist - Regional Fisheries Manager

Interest: Freshwater fisheries management

****

Robert L. Kellogg 914-565-2374
30 Memorial Drive - Warden Hts.
Newburgh, NY 12550

Employer (School): Ecological Analysts, Inc. 914-692-6706
RD 2, Goshen Turnpike

Job Title: Scientist

Interest: Thermal biology

****

Bill Kelly 914-266-5697
Sunset Trail
Clinton Corners, NY 12514

Employer (School): NYS DEC 914-255-5453
Region 3 - Fisheries

Job Title: Senior Aquatic Biologist

Interest: Fisheries mgmt.

****

John H. Judd
3006 Sequoia Pkwy.
Ann Arbor, Michigan 48100

Interest: Limnology - benthos

****

Robert Juffras 516-785-6374
3134 Riverside Drive
Wantagh, NY 11293

Employer (School): SUNY @ Syracuse 315-478-3449
124 Lambreth LN.
Syracuse, NY 13210

Job Title: Student

Interest: Fisheries & wildlife biology & management

****

Jeffrey Kassner 516-475-1494
75 Swan Lake Drive
Patchogue, NY 11772

Employer (School): Town of Brookhaven 516-475-5500
Dept. Environmental Protection Ext. 381
475 E. Main Street
Patchogue, NY 11772

Job Title: Marine Biologist

Interest: Shellfish mariculture, fisheries management

****

Dean Katsila 315-474-4775
733-735 Maryland Avenue
Syracuse, NY 13210

Employer (School): SUNY, Dept. of Forest Biology
@ Syracuse

Job Title: Graduate Student

Interest: Fisheries ecology

****

Dave Johnson
Box 12
Rainbow Lake, NY 12976

518-327-3653

Employer (School): Adirondack Park Agency

518-891-4050

Job Title: Aquatic Ecologist

Interest: General

****

Jim Johnson
Columbia Gardens, Apt. 117
Cohoes, NY 12047

518-235-7231

Employer (School): NYS DEC
50 Wolf Rd.
Albany, NY 12233

518-457-6178

Job Title: Senior Aquatic and Terrestrial Ecologist

Interest: Salmonid ecology

****

Thomas Jolliff
Bedford Corners Road
Cape Vincent, NY 13618

315-654-3156

Employer (School): NYS DEC, Bureau Fisheries
Fisheries Station
Cape Vincent, NY 13618

315-654-2147

Job Title: Associate Aquatic Biologist

Interest: Lake Ontario salmonid fisheries

****

Fred G. Joost
Star Route
Paul Smiths, NY 12970

518-327-3532

Employer (School): Cornell University

518-327-3534

Job Title: Fisheries Technician

Interest: Coldwater fishes

****

Sam Insalaco 716-865-3438
3000 Lake Avenue, Apt. 2
Rochester, NY 14612

Employer (School): Dept. of Biological Sciences 716-395-2193
S.U.C. Brockport, NY 14420

Job Title: Graduate Student

Interest: Chlorinated organics & fish

****

Peter A. Isaacson 518-797-5196
50 Fleming Road
Rensselaerville, NY 12147

Employer (School): Office of Environmental Planning 518-474-5363
NYS Public Service Comm.
Empire State Plaza
Albany, NY 12223

Job Title: Principal Aquatic & Terrestrial Ecologist

Interest: Aquatic ecological relationships

****

Gerald R. Iwan 914-666-7448
Crow Hill Rd.
Mt. Kisco, NY 10549

Employer (School): Environmental Services 914-345-2414 or
Union Carbide Corp. 345-2574
Tarrytown, NY 10591

Job Title: Section Leader, Field Studies Aquatic Toxicology

Interest: Aquatic toxicology/biology, Largemouth Black Bass productivity

****

Daryl L. Jenks 607-962-6548
349 N. Hamilton St.
Painted Post, NY 14870

Employer (School): NYS DEC 607-776-7087
Bath Fish Hatchery, RD #2
Bath, NY 14810

Job Title: Fish and Wildlife Technician

Interest: Fisheries propagation and management

****

Philip J. Hulbert
RD #1 Box 69
East Meredith, NY 13757
607-278-5490

Employer (School): NYS DEC - Region 4
Stamford, NY
607-652-7364

Job Title: Conservation Biologist

Interest: Trout stream ecology/sub-lethal effects of pesticides on aquatic life

****

Carol Hutchings
449 Closter Park Road
Closter, NJ 07624
201-768-1442

Employer (School): American Museum of National History
Central Park West at 79th Street
New York, NY 10024
212-TR3-1300
Ext. 388

Job Title: Scientific Assistant

Interest: Illustrator

****

Brendan Hutchinson
Cornell Fish Station RD #1
Bridgeport, NY 13030

Employer (School): As Above
315-633-9243

Interest: Fish biology

****

Jay B. Hutchison Jr.
Angola Road
Cornwall, NY 12518
914-534-4350

Employer (School): Orange & Rockland Utilities Inc.
One Blue Hill Plaza
Pearl River, NY 10965
914-627-2581

Job Title: Aquatic Biologist

Interest: Biological impact of power generating facilities on aquatic & terrestrial ecosystems

****

Ned Holmes
High Acres
Hemlock, NY 14466

716-346-5761

Employer (School): DEC
Box 57
Avon, NY 14414

716-226-2466

Job Title: Regional Supervisor Fish and Wildlife

Interest: Fisheries management

****

Clayton L. Hopper
2582 Four Rod Road
East Aurora, NY 14052

716-652-7740

Employer (School): Frey Concrete Inc.
Lancaster, NY

716-683-1432

Job Title: Truck Driver

Interest: Rainbows and walleye

****

Gregory Huba
18-5 Woodlake Road
Albany, NY 12203

518-456-5864

Employer (School): B.S., Marine Science
Presently - a Fisherman (offshore trawling)

Job Title: Deckhand - Skipper

Interest: Mariculture, especially saltwater finfish in the northern latitudes

****

Thomas Huggins
South Quaker Lane
Hyde Park, NY 12538

914-454-0869

Employer (School): Central Hudson Gas & Electric Corp.
284 S. Avenue
Poughkeepsie, NY 12602

914-452-2000

Job Title: Manager, Ecological Studies

Interest: Impingement, entrainment & thermal impacts

****

J.B. Heiser 607-256-4007
Stimson Hall
Cornell University
Ithaca, NY 14853

Employer (School); Cornell University 607-256-4007

Job Title: Student

Interest: Ichthyology

****

Lloyd Herman 716-688-7386
1049 S. Campbell Blvd.
N. Tonawanda, NY 14120

Employer (School): Cornell University

Job Title: Student

Interest: Fishery science

****

Thomas B. Hoff 914-565-6779
12 St. Anne Drive
New Windsor, NY 12550

Employer (School): Texas Inst., Inc. 914-737-3081
P.O. Box 237
Buchanan, NY 10551

Job Title; Aquatic Ecologist

Interest: Salmonids, striped bass and sturgeon

****

Timothy E. Holden 716-625-9324
5532 Irish Road
North Tonawanda, NY 14120

Employer (School): SUNY at Buffalo

Job Title: Student

****

Peter J. Hart
5 Grenville Ct.
East Rockaway, NY 11518

516-LY-9-1159

Employer (School): C.W. Post - LIU
Greenvale, L.I.

516-832-2445

Interest: Regulation

****

Tom Hart
1051 Colvin
Buffalo, NY 14223

716-877-7170

Employer (School): SUNY Buffalo

Job Title: Student

****

Jack Hasse

Employer (School): NYS DEC
207 Genesee Street
Utica, NY 13501

315-797-6120
Ext. 417

Job Title: Conservation Biologist

Interest: Fish mgmt., tropical fish & exotic species

****

James M. Haynes
44 Winston Woods
Brockport, NY 14420

716-637-6376

Employer (School): State University College
Dept. of Biological Sciences

716-395-2476

Job Title: Asst. Professor of Biology

Interest: Population & aquatic ecology, fisheries, biotelemetry

****

Cecil E. Heacox
R.D. Box 194
Wassaic, NY 12592

914-677-5659

Employer (School): Self-Employed

914-677-5659

Job Title: Natural Resources Consultant

Interest: Administration: advise staffs and board's of directors of industrial firms and public utilities; Writing: summarize technical reports for administrators, book and magazine writing.

****

Roy Haje
33 Tulip Hill Lane
S. Setauket, NY 11720

Employer (School): NYS DEC 516-751-7900
Environmental Analysis, Room 219
SUNY, Bldg. 40
Stony Brook, NY 11794

Job Title: Tidal Wetlands Permit Agent

Interest: Environmental analysis

****

Albert G. Hall 607-652-7860
15 South Delaware Street
Stamford, NY 12167

Employer (School): Self Employed - Consultant Same as above

Job Title: Natural Resource Consultant

Interest: Environmental impact studies

****

Charles T. Hamilton
86 Oakview Hwy.
Easthampton, NY 11937

Employer (School): NYS DEC 516-751-7900
SUNY, Bldg. 40
Stony Brook, NY 11794

Job Title: Conservation Biologist

Interest: Marine & freshwater fisheries

****

Judith Ann Hansen 914-331-6924
169 Pine St.
Kingston, NY 12401

Employer (School): State University College at Oneonta
Oneonta, NY 13820

Job Title: Graduate Student

Interest: Freshwater fisheries biology and aquatic ecology

****

A. Cristopher Gross 516-757-0241
12 Harbor Ridge Drive
Centerport, NY 11721

Employer (School): Long Island Lighting Co. 516-733-4103
175 E. Old Country Road
Hicksville, NY 11801

Job Title: Senior Biologist

Interest: Power plants and fish/tidal marshes

****

Richard Grosvenor
c/o Envirosphere Company
19 Rector Street
New York, NY 10006

Employer (School): Envirosphere Company 212-785-5766

Job Title: Environmental Project Leader (Aquatic Biologist)

Interest: Toxicity, freshwater fisheries

****

Kathleen Hadley 716-694-2990
7417 Bear Ridge Road
N. Towanda, NY 14120

Employer (School): Bio Systems Research Inc. 716-835-9277
1376 Kensington Avenue
Buffalo, NY 14215

Job Title: Senior Aquatic Biologist - Lab. Director

Interest: Larval fish

****

Wayne F. Hadley 716-694-2990

Employer (School): Dept. of Biology, SUNY 716-636-2881
Buffalo, NY 14260

Job Title: Assistant Professor

Interest: Ichthyology - fisheries management

****

David M. Green — 315-858-0301
Box 1865
Richfield Springs, NY 13439

Employer (School): Cornell University Department of Natural Resources — 315-858-1527

Job Title: Research Associate and Project Leader

Interest: Warmwater fish population dynamics

****

Bradley L. Griffin — 607-533-7296
838 Buck Rd., RD #1
Groton, NY 13073

Employer (School): NYS DEC Division of Fisheries — 607-753-3095

Job Title: Regional Supervisor of Fish and Wildlife (Reg. 7)

****

Robert H. Griffiths — 518-765-2005
RR #2
Voorheesville, NY 12186

Employer (School): Dept. of Env. Conservation
50 Wolf Road
Albany, NY 12233 — 518-457-5430

Job Title: Principal Aquatic Biologist

Interest: Fish propagation

****

John S. Grim — 914-876-3983
Kerr Road - RD #3 — or-4786
Rhinebeck, NY 12572

Employer (School): Northeastern Biologists Inc. — Same as above

Job Title: Aquatic Biologist

Interest: Fish culture

****

James J. Gift
14 W. Spring Hollow Road
Centerport, NY 11721
516-261-3050

Employer (School): Ecological Associates
275 Broad Hollow Rd.
Melville, NY 11747
516-752-1122

Job Title: Director of Operations

Interest: Behavioral and physiological responses of fish to physical-chemical parameters

****

Dr. John C. Godfrey
215 Manor Drive
Syracuse, NY 13214
315-446-4910

Employer: Bristol Laboratories
315-432-2271

Job Title: Manager of New Ventures

Interest: Medicinal chemistry; organic and analytical chemistry

****

Joseph W. Gorsuch
132 Wyndham Road
Rochester, NY 14612
716-621-7678

Employer: Eastman Kodak Company
Toxicology Section, B-306
HS&HFL
Rochester, NY 14650
716-458-1000
Ext. 84528

Job Title: Aquatic Biologist

Interest: Phycology, culture, aquatic toxicology

****

Stephen Grabe
95 Ash Street
Piermont, NY 10968
914-359-0978

Employer (School): Fordham University

Job Title: Trophic interactions/plankton

****

Thomas C. Gardinier
4 Yankee Maid Lane
Goshen, NY 10924

914-294-7015

Employer (School): Texas Inst., Inc.
Ecological Services Division

914-737-3081

Job Title: Environmental Technician

Interest: Population studies

****

Gary M. Genga
57 Marco Lane
Rochester, NY 14622

716-338-2395

Employer (School): SUNY At Buffalo Consultant for
Rochester Gas & Electric Corp.

716-546-2700
Ask for Gina Plant

Job Title: Biologist

Interest: Phycology

****

Carl George

Employer (School): Dept. Biol. Science
Union College
Schenectady, NY 12308

518-370-6243

Job Title: Assoc. Professor - Biology

Interest: Aquatic ecology

****

Ellie George
860 B Robin Road
W. Amherst, NY 14228

716-689-8122

Employer (School): SUNY at Buffalo

716-636-2881

****

Charles Fontana
State Fish Hatchery
DeBruce, NY 12758

Employer (School): NYS DEC

Job Title: Principal Fish & Wildlife Technician

Interest: Fish Propagation

****

John L. Forney 315-633-2948
RD #1
Bridgeport, NY 13030
Employer (School): Cornell University 315-633-9243

Job Title: Research Association

Interest: Population dynamics

****

Richard Fox

Employer (School): NYS DEC 516-751-7900
SUNY, Bldg. 40
Stony Brook, NY 11794

Job Title: Marine Biologist

****

Douglas F. Fraser 518-872-2024
Suto Road
Voorheesville, NY 12186

Employer (School): Siena College 518-783-2451
Dept. of Biology
Londonville, NY 12211

Job Title: Assistant Prof.

Interest: Ecology

****

Michael C. Gann 914-658-8704
RD #1, Box 153
Rosendale, NY 12472

Employer (School): NYS DEC 914-255-5453
21 South Putt Cors. Rd.
New Paltz, NY 12561

Job Title: Regional Fisheries Manager - Region 3

Interest: Inland fisheries management

Patrick J. Festa
Mt. View Terrace Apts.
Latham, NY 12110

518-783-8954

Employer (School): NY DEC Bureau of Fisheries

518-457-6937

Job Title: Aquatic Biologist

Interest: Habitat development

****

Thomas C. Field
RD #1
Gansevoort, NY 12831

518-793-1282

Employer (School): Self, Fernwood Trout Hatchery, Inc.

Same as above

Interest: Fish culture, limnology

****

Samuel L. Finkelstein
7 Aspen Court
Coram, NY 11727

516-928-4453

Employer (School): NYS DEC
SUNY, Bldg. 40
Stony Brook, NY 11794

516-751-7900

Job Title: Associate Aquatic Biologist (Marine)

Interest: Marine fisheries

****

William Flick
Paul Smiths, NY 12970

518-327-3529

Employer (School): Cornell University

518-327-3534

Job Title: Research Specialist

Interest: Trout-Salmon

****

Robert E. Foley
3 Frasier Ave.
Johnstown, NY 12095

Employer (School): NYS DEC

518-773-7319

Job Title: Asst. Research Scientist

Interest: Aquatic toxicology, physiological ecology

****

Robert P. Fairchild 315-446-1388
319 Hurlburt Road
Syracuse, NY 13224

Employer (School): William Nottingham High School 315-425-4380
3100 E. Genesee Street
Syracuse, NY 13224

Job Title: Science teacher

Interest: Nature appreciation for students

****

James Fava 516-261-3015
8 Selden Drive
East Northport, NY 11731

Employer (School): Ecological Analysts 516-752-1122
275 Broad Hollow Rd.
Melville, NY 11746

Job Title: Scientist

Interest: Behavior and ecology

****

David J. Fallon 516-928-2099
4 Pueblo Ct.
Coram, NY 11727

Employer (School): NYS DEC 516-751-7900
Stony Brook Univ.
Bldg. 40
Stony Brook, NY 11794

Job Title: Senior Aquatic Ecologist

Interest: Power plants - environmental impact statements

****

David L. Febinger 607-257-2752
514 B Etna Rd.
Ithaca, NY 14850

Employer (School): Cornell University 607-256-3013
Ithaca, NY 14853

Job Title: Graduate Student

Interest: Adaptations to cold water - ecophysiology of fish

****

William E. Eustance 914-292-5745
7 Oakcrest Drive
Goshen, NY 10924

Employer (School): Eustance & Horowitz, PC 914-361-4541
Circleville, NY 10919

Job Title: Environmental Engineer

Interest: Water-protection of quality

****

Mark A. Evanko 716-839-0362
116 Washington Hwy.
Snyder, NY 14226

Employer (School): Medaille College
12 Agassiz Cir.
Buffalo, NY

Job Title: Faculty

Interest: Aquatic biology

****

W. Harry Everhart 607-272-0074
3 Snyder Heights
Ithaca, NY 14850

Employer (School): Cornell University
Ithaca, NY 14853

Job Title: Professor and Chairman - Department of Natural Resources

Interest: Fisheries management

****

William S. Ewell 716-247-3083
296 Cross Gates Road
Rochester, NY 14606

Employer (School): Eastman Kodak Company 716-458-1000
Rochester, NY 14650 Ext. 84528

Job Title: Aquatic Toxicologist

Interest: Aquatic toxicology

****

Michael W. Duttweiler 607-277-0006
345 Coddington Road
Ithaca, NY 14850

Employer (School): New York Sea Grant Extension Program 607-256-2162
Fernow Hall
Cornell University
Ithaca, NY 14850

Job Title: Assistant Program Leader

Interest: Fish contaminants, educational aspects of fishery management

****

Neil F. Ehlinger 315-337-1238
6747 Williams Road
Rome, NY 13440

Employer: Retired from NYS DEC as Associate Fish Pathologist

Interest: General

****

Ralph Elston 607-272-2304
401 Snyder Hill Rd.
Ithaca, NY 14850

Employer (School): Dept. Avian and Aquatic 607-256-5449
Animal Medicine
Vet. College
Cornell Univ.
Ithaca, NY 14853

Job Title: Ph.D. Candidate

Interest: Aquatic animal disease - Shellfish

****

Ron Engle 315-343-9678
Brown Drive RD #3
Oswego, NY 13126

Employer (School): State University N.Y. 315-341-3088
Dept. Zoology
Oswego, NY 13126

Job Title: Professor

Interest: Fish larvae

****

Wallace Dominey
148 German Cross Road
Ithaca, NY 14850
607-273-5209

Employer (School): Cornell University
Ithaca, NY 14853
607-256-3397

Job Title: Graduate Student

Interest: Mating systems, behavior

****

Gary E. Drucker
Country Squire Apts. Bldg. 2, Apt. 12
Middletown, NY 10940
914-692-5343

Employer (School): Ecological Analysts Inc.
RD 2 Goshen Tpke.
Middletown, NY 10940
914-692-6706
Ext. 526

Job Title: Environmental Specialist #2

Interest: Larval fish identification

****

George E. Duckwall
NYS Fish Hatchery
Crown Point, NY 12928
518-597-3430

Employer (School): NYS DEC
518-597-3430

Job Title: Sr. Fish & Wildlife Tech.

Interest: Fish Propagation

****

Dennis Dunning
Colonial Manor G-2
Watertown, NY 13601
315-788-0291

Employer (School): SUNY College of Environ, Sci & Forestry
Syracuse, NY 13210
315-782-0100
Ext. 311 or 313

****

Russell DePace 914-277-5421
8813 Heritage Hills
Somers, NY 10689

Employer (School): SUNY College Environ. Sci. and Forestry
Syracuse, NY 13210

Interest: Fisheries biology, water quality analyses.

****

Dr. Joseph V. DePinto 315-265-9361
RD #2
Potsdam, NY 13676

Employer (School): Clarkson College of Technology 315-268-6532
Civil and Envir. Engr. Dept.

Job Title: Asst. Prof.

Interest: Applied limnology; eutrophication; acid precipitation

****

Gerald Desko 814-456-1900
1128 W. 5th Street
Apt. #4
Erie, PA 16507

Employer (School): Aquatic Ecology Associates 814-868-0996
1616 W. Grandview Blvd.
Erie, PA 16509

Job Title: Aquatic Biologist

Interest: Fish ecology (streams)

****

C. Braxton Dew 914-358-8269
30 Sierra Vista Lane
Valley Cottage, NY 10989

Employer: LMS Engineers 914-735-8300
Pearl River, NY 10965
School: City University of NY (Ph.D. Candidate)

Job Title: Aquatic Biologist

Interest: Fisheries biology, population dynamics

****

Robert W. Davis
29 Farley Drive
Stony Point, NY 10980

914-942-2184

Employer (School): LMS Engineers
2 Burd Street
Ngack, NY 10960

914-735-8300 Ext. 395

Job Title: Fisheries Coordinator

Interest: Fisheries biology (anadromous & estuarine)

****

Howard J. Dean
9241 Main Street
Westernville, NY 13486

315-827-4606

Employer (School): N.Y.S. Dept. Env. Cons.
Bur. Env. Protection
Rome, NY 13440

315-337-0910

Job Title: Assoc. Aquatic Biologist

Interest: Field pesticide research

****

Antoinette DeFazio
13715 SW 90 Avenue
Miami, Florida 33176

305-235-1834

Employer (School): Stunter College
695 Park Avenue

Job Title: Student

Interest: Sensory systems in fish

****

J. Eddy Demers
15 Sunset Road
Newburgh, NY 12550

914-565-6167

Employer (School): Lawler, Matusky & Skelly Engineers
1 Blue Hill Plaza
Pearl River, NY 10965

914-565-2444

Job Title: Field/Laboratory Supervisor

Interest: Aquatic ecology w/fisheries emphasis

****

William J. Culligan
RD #1
510 Peru Rd.
Groton, NY 13073

607-898-3331

Employer (School): NYS DEC Region 7
Cortland, NY

607-753-3095

Job Title: Principal Fish & Wildlife Tech.

Interest: Fisheries Mgt.

****

Terry R. Culp
P.O. Box 2
Stamford, NY 12167

Employer (School): Ichthyological Associates
111 Main Street
P.O. Box 2
Stamford, NY 12167

607-652-3563

Job Title: Aquatic Ecologist

****

Martin W. Daley
Pawling Manor
Staatsburg, NY 12580

914-889-4696

Employer (School): Central Hudson Gas & Electric Corp.

914-452-2000
X461

Job Title: Biologist

Interest: Power plant impacts on fisheries

****

Donald J. Davis
112 G. Kings Park Drive
Liverpool, NY 13088

315-652-7436

Employer (School): NALCO Environmental Sciences

Job Title: Associate Biologist

Interest: Fisheries biology (field and report prep.)

****

Alexander L. Cooper 716-288-6860
1011 Garson Ave.
Rochester, NY 14609

Employer (School): Retired from NYS Dept. Environ. Conservation

Job Title: Retired as Head Director, Avon Water Pollution Unit

Interest: Water pollution investigations

****

D. James Coutu 315-782-7418
322 Teneyck Street
Watertown, NY 13601

Employer (School): NYS DEC 315-782-0100

Job Title: Sr. Aquatic Biologist

****

Cliff Creech 607-898-3965
648 Old Stage Road
Groton, NY 13073

Employer (School): NYS DEC 607-753-3095
Cortland, NY 13045

Job Title: Regional Fisheries Mgr.

Interest: Lake salmonids

****

Joseph Cullen
RD-1 Western Avenue
Marlboro, NY 12542

Employer (School): Lawler, Matusky & Skelly Engineers

Job Title: Fisheries Field/Lab Technician

Interest: Freshwater fisheries investigations

****

Jeffrey Clock
257 Springtown Rd.
New Paltz, NY 12561

914-255-6280

Employer (School): Ecological Analysis, Inc.
Middletown, NY 10940

914-562-3950

Job Title: Assoc. Scientist

Interest: Icthyoplankton ecology

****

Barbara A. Cogan
6160 Delafield Avenue
Bronx, NY 10471

212-549-0911

Employer (School): City University of NY
Herbert H. Lehman College
Bedford Park Blvd West
Bronx, NY 10468

212-960-8239

Job Title: Research Asst./Graduate Student

Interest: Fish cytogenetics

****

Richard T. Colesante
118 Mill Street
Constantia, NY 13044

315-623-9475

Employer (School): NYS DEC

315-623-7311

Job Title: Senior Aquatic Biologist

Interest: Propagation of coolwater fishes

****

James R. Colquhoun
33 Pillmore Drive
Rome, NY 13440

315-336-0234

Employer (School): NYS DEC - Rome Lab
Bureau of Environmental Protection

315-337-0910

Job Title: Senior Aquatic Biologist

Interest: Effects of toxicants on
the aquatic ecosystem

****

Bart Chezar
30 5th Avenue
New York, NY 10011
212-674-7147

Employer (School): NYS Energy Research and Development Authority
212-986-5090

Job Title: Project Mgr. for Env. Research

Interest: Energy/environment

****

Thomas Chiotti
Box 201 Stevens Road
McLean, NY 13102
607-838-3733

Employer (School): NYS DEC
607-753-3095

Job Title: Conservation Biologist

Interest: Lakes fisheries, community ecology

****

Michael Christy
64 1/2 State St.
Canton, NY 13617
315-386-8335

Employer (School): Cornell University

Job Title: Student

Interest: Fishery science

****

Dr. L.N. Clesceri
Lake Shore Dr.
Bolton Landing, NY 12814
518-644-9443

Employer (School): Rensselaer Polytechnic Institute
Troy, NY 12181
518-270-6541

Job Title: Director of the Fresh Water Inst. and Professor of Environmental Engineering

Interest: Water chemistry

****

Phyllis H. Cahn
260 Prince Avenue
Freeport, NY 11520

516-233-1475

Employer (School): Long Island University
P.O. Greenvale, NY 11548

516-299-2427

Job Title: Professor and Chairman, Dept. Marine and Environ. Science

Interest: Fish physiology, behavior and environ. biology

****

John J. Cambalik
Dogwood Hill Road
Wappingers Falls, NY 12590

914-297-7601

Employer (School): SUNY @ Syracuse
Box 79 Sadler
1000 Irving Avenue
Syracuse, NY 13210

Job Title: Student

Interest: Fisheries biology, limnology, entomology, management or research

****

Rostyslaw Caryk
1376 Kensington
Buffalo, NY 14215

716-836-6867

Employer (School): Biosystems Res. Inc.

716-835-9277

Job Title: Senior Fisheries Biologist

Interest: Freshwater fisheries

****

David M. Chase
64 Pinehurst Blvd.
Calverton, NY 11933

516-727-8503

Employer (School): Cooperative Extension/Sea Grant
Cornell University

516-727-7850

Job Title: Sea Grant Extension Specialist

Interest: Commercial fisheries; aquaculture

****

David F. Brodowski
R.D. #1 Paradise Hill Road
Deruyter, NY 13052

Employer (School): N.Y.S. College of Forestry @ Syracuse — 315-473-8849

Job Title: Aquatic Tech. Assistant

Interest: Fisheries biology

****

Edwards B. Brothers — 607-347-4203
3 Sunset West, R.D. 7
Ithaca, NY 14850

Employer (School): Sect. Ecology and Systematics, Langmuir Lab. Cornell University Ithaca, NY 14853 — 607-256-4703

Job Title: Assist. Professor; Curator Ichthyology

Interest: Ichthyology

****

Jerry Brown — 716-322-7322
Route 362
Bliss, NY 14024

Employer (School): Brown's Trout Hatchery — Same as above

Job Title: Owner-operator

Interest: Fish culture - water quality

****

David S. Bundy — 315-472-3657
185 Robineau Road
Syracuse, NY 13207

Employer (School): Onondaga Community College Biology Dept. Syracuse, NY 13215 — 315-469-7741

Job Title: Assoc. Prof.

Interest: Ecology - aquatic system

****

James S. Brand
NYS Fish Hatchery
Chateaugay, NY 12920

518-497-6151

Employer (School): NYS DEC
Bureau of Fisheries

518-497-6151

Job Title: Principal Fish & Wildlife Tech.

Interest: Fish propagation

****

Edward P. Brauer
131 Amberlands
Croton, NY 10520

914-271-3305

Employer (School): Union Carbide Corp., Chem 159
Tarrytown, NY 10591

914-345-2567

Job Title: Biologist

Interest: Salmonid osmoregulation and disease

****

Robert C. Brewer
Friends Lake
Chestertown, NY 12817

518-494-2830

Employer (School): NYS DEC
Bureau of Fisheries

518-457-5698

Job Title: Assistant Chief, Fisheries

Interest: Management & administration

****

Philip T. Briggs

Employer (School): N.Y.S. Dept. Env. Cons.
Bldg. 40 - SUNY
Stony Brook, NY 11794

516-751-7900

Job Title: Associate Aquatic Biologist (Marine)

Interest: Finfish and crustaceans

****

Leigh M. Blake 315-773-5811
Boot Jack Hill
Felts Mills, NY 13638

Employer (School): NYS Dept. of Environmental Conservation 315-782-0100 Ext. 311
Watertown, NY 13601

Job Title: Regional Fisheries Manager

****

Robert W. Boenig 716-673-1164
7 University Park
Fredonia, NY 14063

Employer (School): State University of New York 716-673-3375
Fredonia, NY 14063

Job Title: Professor of Biology

Interest: Getting good students interested in good science

****

Diane M. Bohmhauer 716-692-6691
766 Fletcher Street
Tonawanda, NY 14150

Employer (School): SUNY Buffalo - Student

Interest: Fisheries biology

****

Martin Borko 914-888-2371
P.O. Box 511
Wurtsboro, NY 12790

Employer (School): Orange Co. Com. College 914-343-1121 Ext 211
South St.
Middletown, NY 10940

Job Title: Professor of Biology

Interest: Freshwater fishes

****

David H. Kosowski
P.O. Box 652
Saranac Lake, NY 12983

Employer (School): NYS Dept. Env. Conservation 518-891-1370
Raybrook, NY 12977

Job Title: Fish & Wildlife Tech.

Interest: Fisheries - general

****

Robert J. Kurtz 516-LO. 1-6429
27 Smith Street
Valley Stream, NY 11580

Employer (School): Passaic River Basin Study Group 212-264-3615
New York District, Corps of Engineers
26 Federal Plaza
New York, NY 10007

Job Title: Biologist

Interest: Fish life histories, environmental impact statements

****

Edward J. Kuzia 518-725-3532
Lily Lake Rd.
Bleecker Stage
Gloversville, NY 12078

Employer (School): NYS DEC 518-773-7318
Hale Creek Field Station
RT 29A
Gloversville, NY 12078

Job Title: Senior Fish Pathologist

Interest: Fish toxicology

****

Vincent R. Lander 914-473-9213
34 Bart Dr.
Poughkeepsie, NY 12603

Employer (School): Consolidated Edison Co. of NY 914-737-8528
4 Irving Place
New York, NY

Job Title: Associate Biologist

Interest: Impingement & entrainment

****

Robert E. Lange
12 Riverhead Road
Sound Beach, NY 11789

Employer (School): New York DEC
SUNY Bldg. 40
Stony Brook, NY

516-751-7900
Ext. 265

Job Title: Conservation Biologist

Interest: Urban fisheries, warmwater fisheries management

****

Ernie Lantiegne
240 Virgil Road
Dryden, NY 13053

315-844-8792

Employer (School): N.Y.S. DEC
Cortland, NY

315-753-3095

Job Title: Sr. Aquatic Biologist

Interest: Fish management

****

W. Mason Lawrence
40 Albin Road
Delmar, NY 12054

518-439-1964

Employer (School): Same

Same as above

Job Title: Consultant on Natural Resources Management

Interest: Administration & management

****

Louis Leibovitz
940 E. State Street
Ithaca, NY 14850

607-273-1328

Employer (School): N.Y.S. College of Veterinary Medicine
Cornell University
Ithaca, NY 14853

607-256-5440

Job Title: Associate Professor

Interest: Aquatic animal diseases

****

Bruce L. Lippincott
Four Corners Rd., RD 3
Warwick, NY 10990
914-986-6658

Employer (School): Lawler, Matusky & Skelly Engineers
One Blue Hill Plaza
Pearl River, NY 10965
914-735-8300

Job Title: Director of quality assurance, environmental measurements division

Interest: Aquatic biology

****

Howard A. Loeb
184 Georgetown Ct.
Voorheesville, NY 12186
518-765-4935

Employer (School): NYS DEC
50 Wolf Road
Albany, NY 12233
518-457-5420

Job Title: Supervising Aquatic Biol., Chief, Cold Water Unit

Interest: Coldwater fisheries

****

Mark D. London
427 Mt. Hope Rd.
Wharton, NJ 07885
201-625-1367

Employer (School): Public Service Electric & Gas Company
80 Park Place
Newark, NJ 07101

Job Title: Lead Biologist

Interest: Assessments of environmental impact

****

John J. Long
1953 Balmer Rd.
Ransomville, NY 14131
716-791-3711

Job Title: Chairman, NY Fish & Wildlife Mgmt. Board (Reg. 9)
716-285-7313

Interest: Coldwater fisheries

****

Charles McCarthy, Jr. 516-878-8736
20-5 Pond Way
Manorville, NY 11949

Employer (School): Suffolk County Community College 516-369-2600
Speonk Riverhead Rd.
Riverhead, NY 11901

Job Title: Instructor, Marine Sciences

Interest: Marine biology, fisheries biology, mariculture

****

Zachary S. Macy 516-676-2826
9 Millford Drive
Locust Valley, NY 11560

Employer (School): SUNY @ Syracuse, NY 315-472-1724

Job Title: Student

Interest: Fisheries biology, freshwater biology & stream ecology

****

Joseph L. Mangiardi, II 518-532-7984
Box 63
Schroon Lake, NY 12870

Employer (School): South Dakota State University
Dept. Wildlife & Fishery Sciences

Job Title: Grad. Res. Asst. in Fish Genetics - M.S.

Interest: Fish genetics/aquaculture

****

James B. Marean 315-638-8283
24 Grove Street
Baldwinsville, NY 13027

Employer (School): NALCO Environmental Sciences 315-437-6658
6720 Thompson Road Ext. 16
Syracuse, NY 13211

Job Title: Associate Fisheries Biologist

Interest: Adult & larval fish - distribution

****

Samuel J. Markello
4049 N. Boston Rd.
Eden, NY 14057

Employer (School): Bio Systems Research, Inc. 716-839-5277
1376 Kensington Avenue
Buffalo, NY 14215

Job Title: President

Interest: Ecology, limnology, fisheries biology

****

William R. Marscher 315-797-0626
7 Knollwood Road
New Hartford, NY 13413

Employer (School): Liberty Mutual Ins. Co. 315-797-2900

Job Title: Manager

Interest: Fishing

****

James B. McLaren 914-561-9073
7 Paul Avenue
Newburgh, NY 12550

Employer (School): Texas Instruments Incorporated 914-737-3081
Box 237
Buchanan, NY 10511

Job Title: Fisheries Biologist

Interest: Fish ecology & behavior

****

Lawrence R. McManus 315-853-8793
40 College Hill Road
Clinton, NY 13323

Employer (School): Hamilton College 315-859-4221
Clinton, NY 13323

Job Title: Professor of Biology

Interest: Freshwater ecology

****

Gerald Mikol
Colonial Manor Apts. G2
Black River Road
Watertown, NY 13601

315-782-0291

Employer (School): SUNY, College Env. Sci. & Forestry
@ Syracuse

315-788-0100
Ext. 311

Job Title: Research Associate

Interest: St. Lawrence River project

****

Jeffrey S. Miller
Prentiss Drug & Chemical Co., Inc.
363 7th Avenue
New York, NY 10001

212-736-6766

Employer (School): Same

Job Title: Sales Representative

Interest: Sale of fish toxicants

****

William W. Miller, Jr.
RD #1 Box 35A
Brant Lake, NY 12815

518-494-4097

Employer (School): NYS DEC Region Five
Inland Fisheries Management
Warrensburg, NY 12885

518-623-3671

Job Title: Conservation Biologist

Interest: Lake George salmonid mgt.

****

Edward L. Mills
RD #3
Canastota, NY 13032

315-655-8569

Employer (School): Cornell University
Biological Field Sta.
RD #1
Bridgeport, NY 13030

315-633-9243

Interest: Limnology, food chain, aquatic ecology

****

Andrew C. F. Mirchel — 516-363-2288
24 Bergen Lane
Blue Point, NY 11715

Employer (School): Marine Sciences Research Center — 516-246-3449
SUNY at Stony Brook
Stony Brook, NY 11794

Job Title: Graduate Student/Research Assistant

Interest: Marine fisheries management

****

Lawrence J. Nashett — 607-257-0414
Apt. N1D Lansing West III
Ithaca, NY 14850

Employer (School): Cornell University — 607-256-2151
Ithaca, NY 14853

Job Title: Graduate Research Assistant

Interest: Fish population dynamics

****

Russell John Nemecek — 716-372-0043
108 Coleman Street
Olean, NY 14760

Employer (School): St. Bonaventure University
Biology Dept.

Job Title: Graduate Student - Lab Instructor

Interest: Ecology of Etheostoma sp., fish distribution, marine sector management

****

Paul C. Neth — 518-885-7792
RD #5 Juniper Drive
Ballston Spa, NY 12020

Employer (School): NYS DEC — 518-457-5698
50 Wolf Road
Albany, NY 12233

Job Title: Principal Aquatic Biologist, Supervisor of Inland Fisheries

Interest: Fisheries management; fisheries program administration

****

Gary Neuderfer 716-424-4926
45 Norman Rd.
Rochester, NY 14623

Employer (School): NYS DEC 716-226-2466
Avon, NY 14414

Job Title: Associate Aquatic Biologist

Interest: Aquatic toxicology

****

Arthur J. Newell 518-797-5150
RD #1, Box 71
Westerlo, NY 12193

Employer (School): Ichthyological Associates 607-652-3563
P.O. Box 2
Stamford, NY 12167

Job Title: Senior Aquatic Biologist

Interest: Freshwater fisheries

****

Kenneth B. Nichols 518-732-7000
114 Seaman Avenue
Castle on Hudson, NY 12033

Employer (School): Retired

Interest: Fish propagation

****

John G. Nickum 607-844-5557
2 Top Forty Road
Freeville, NY 13068

Employer (School): New York Cooperative Fishery Res. Unit 607-256-2151
118 Fernow Hall
Cornell University
Ithaca, NY 14853

Job Title: Leader

Interest: Aquaculture - warmwater/coolwater management

****

Joel S. O'Connor 516-584-5088
139 Wilderness Rd.
St. James, NY 11780

Employer (School): US Dept. of Commerce, NOAA 516-751-7002
MESA Project Office, SUNY
Stony Brook, NY 11794

Job Title: Senior Ecologist

Interest: Estuarine and coastal ecology, pollution impacts

****

Susan G. O'Connor, Ph.D. 914-986-6161
Box 461
Jones Road
Warwick, NY 10990

Employer (School): Lawler, Matusky & Skelly Engineers 914-735-8300
One Blue Hill Plaza
Pearl River, NY 10965

Job Title: Manager, Environmental Measurements Division

****

Timothy M. O'Keefe 914-737-8335
RFD 3 Jack Road
Peekskill, NY 10566

Employer (School): Union Carbide Corporation 914-345-3458

Job Title: Biologist

Interest: Fish nutrition

****

Louis G. Olney 315-684-3448
Rocks Road
Morrisville, NY 13408

Employer (School): Morrisville Agriculture 315-684-7987
and Technical School

Job Title: Professor

Interest: Ichthyology

****

Timothy Burke O'Mara
62 Inwood Place
Buffalo, NY 14209

716-881-1666

Employer (School): University of Buffalo
Research Foundation

Job Title: Research Associate

****

William P. O'Riley
614 Boyde Street
Watertown, NY 13601

315-788-6908

Employer (School): Morrisville Agriculture and
Technical School

315-684-7987

Job Title: Student

Interest: Fisheries management

****

Maurice B. Otis
P.O. Box 243
Saranac Lake, NY 12983

518-891-1009

Employer (School): NYS DEC
Ray Brook, NY 12977

518-891-1370

Job Title: Regional Supervisor of Fish & Wildlife

Interest: Fish habitat improvement
conservation engineering related to fisheries

****

Miguel Padilla
15 Marble Hill Ave.
Bronx, NY 10463

212-562-5394

Employer (School): Manhattan College

Job Title: Student

Interest: Aquatic biology and fish culture

****

Carl E. Parker
51 Delmar Place
Delmar, NY 12054

518-439-5207

Employer (School): NYS DEC
50 Wolf Road
Albany, NY 12233

518-457-5420

Job Title: Chief, Bureau of Fisheries

Interest: Administration, contaminants, legislation

****

Bill Pearce
615 Bevary, Box 316
Cape Vincent, NY 13612

315-654-2833

Employer (School): NYS DEC
Cape Vincent, Box 292

315-654-2147

Job Title: Sup'v. Great Lakes Fisheries Section

Interest: Fisheries, aquatic environment

****

Thomas H. Peck
33 Old Town Road
Beacon, NY 12508

914-831-6553

Employer (School): Texas Inst., Inc.
P.O. Box 237
Buchanan, NY 10511

914-737-3081

Job Title: Biologist

Interest: Mortality, fecundity, age composition, essentially basic biology of fish

****

William T. Perrotte, Jr.
Box 293 (Old Post Road)
Staatsburg, NY 12580

914-889-4048

Employer (School): Marist College
Poughkeepsie, NY 12601

914-471-3240
Ext. 285

Job Title: Asst. Prof., Biology

Interest: Limnology-ecology-inv. zoology-botony

****

Arch Petty
5 Miller Drive
Homer, NY 13077

607-749-4670

Employer (School): Retired

Interest: Fishery biology

****

Martin Pfeiffer
Box 141
Bloomingdale, NY 12913

518-891-4468

Employer (School): DEC
Ray Brook, NY 12977

518-891-1370

Job Title: Aquatic Biologist

Interest: Coldwater fish mgt.

****

Joseph F. Pickett, Sr.
RD 3, Burden Lake Road
Averill Park, NY 12018

518-647-2532

Employer (School): N.Y.S. Education Dept.
State Library - Albany, NY

518-474-5954

Job Title: Principal Clerk

Interest: Centrarchidae and crayfish

****

Jerry L. Platt
Old King Estate
Highland Mills, NY 10930

914-928-9384

Employer (School): Museum of the Hudson Highlands
Cornwall on the Hudson, NY

914-534-7781

Job Title: Curator

Interest: Fish Communities

****

James R. Plautz
249 Cheshire Ct.
Voorheesville, NY 12186
518-765-4116

Employer (School): Junior College of Albany
Albany, NY 12208
518-445-1713

Job Title: Biology Instructor

Interest: Water quality, chemical limnology

****

Edward W. Radle
RD #9 Plank Road
Clifton Park, NY 12065
518-371-7519

Employer (School): NYS DEC
50 Wolf Road
Albany, NY 12233
518-457-6178

Job Title: Sr. Aquatic & Terrestrial Ecologist

Interest: Entrainment and impingement at Power Plants

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Edward C. Raney
301 Forest Drive
Ithaca, NY 14850
607-257-7121

Employer (School): Ichthyological Associates, Inc.
607-257-4757

Job Title: President

Interest: Ichthyology

****

John Reed
106 Old Mamarneck Rd.
White Plains, NY 10605
914-946-2259

Employer (School): Malcolm Pirnie Inc.
White Plains, NY 10602
914-694-2100

Job Title: Environmental Analyst

Interest: Environmental impacts, water resources

****

F. Paul Richards
411 Tree Rd., North
S. Setauket, NY 11720

516-981-5483

Employer (School): Ecological Analysts, Inc.
275 Broad Hollow Rd.
Melville, NY 11746

516-752-1122

Job Title: Aquatic Ecology Program Manager

Interest: Ecology of fish

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Daniel Richardson
641 Greenleaf Meadows
Rochester, NY 14612

716-621-2794

Employer (School): Commercial Aquaculture
641 Greenleaf Meadows
Rochester, NY 14612

Same as above

Job Title: Manager-Operator

Interest: Fish culture, water quality

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Michael Riner
P.O. Box 22
Glenham, NY 12527

914-831-6420

Employer (School): Texas Instruments
P.O. Box 237
Buchanan, NY 10511

914-737-3081

Job Title: Biologist

Interest: Submerged aquatics and ichthyoplankton

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Neil H. Ringler
18 Getman Drive
Baldwinsville, NY 13027

315-638-8128

Employer (School): SUNY, 207 Illick Hall
College of Envir. Sci. & Forestry
@ Syracuse, NY 13210

315-473-8619

Job Title: Asst. Prof. Zoology

Interest: Aquatic biology

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Wm. Ellis Ripley
35-24 - 164th Street
Flushing, NY 11358

212-961-4068

Employer (School): Wm. Ellis Ripley
United Nations Development Programme
United Nations, NY 10017

212-754-4805

Job Title: Fisheries Advisor

Interest: International fisheries development

****

Ron Roberts
P.O. Box 371
Staatsburg, NY 12580

914-889-4947

Employer (School): Ecological Analysts Inc.

914-737-3081

Job Title: Biologist

Interest: Power plant impact, entrainment

****

Mike Roche
8574 Sumac Drive, Apt. 1F
Baldwinsville, NY 13027

315-638-8174

Employer (School): Nalco Environmental Sciences
6720 Thompson Road
Syracuse, NY 13211

315-437-6658

Job Title: Fisheries Technician

Interest: Fisheries biology field sampling

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Kathleen S. Roos
Apt. 2A
80 Justice St.
W. Babylon, NY 11704

516-884-6388

Employer (School): Equitable Environmental Health
333 Crossways Park Dr.
Woodbury, NY 11797

516-364-8500

Job Title: Assistant Director of Biological Sciences

Interest: Ichthyology - fisheries management

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George A. Roth 914-526-2927
RD #2 Dunderberg Road
Putnam Valley, NY 10579

Employer (School): Texas Inst., Inc. 914-737-3081
P.O. Box 237 Ext. 38
Buchanan, NY 10511

Job Title: Quality Supervisor

Interest: Application of quality assurance/control to fisheries science

****

Gaylord E. Rough 607-587-5761
88 S. Main Street
Alfred, NY 14802

Employer (School): Alfred University 607-871-2205

Job Title: Prof. of Biology

Interest: Aquatic ecology-especially fishes

****

Kenneth J. Salamon 914-223-5981
RD #1, Baker Road
Hopewell Junction, NY 12533

Employer (School): Fordham University 914-273-3078
Bronx, NY

Job Title: Ph.D. Candidate - Energy requirements of overwintering
Largemouth Bass

Interest: Fish physiology

****

Jack Saltes 315-472-1724
459 Westcott Street
Syracuse, NY 13210

Employer (School) SUNY @ Syracuse

Job Title: Student

Interest: Fisheries biology

****

Robert Sampson
516 Shore Drive
Newburgh, NY 12550
914-496-4025

Employer (School): LMS Engineers

Job Title: Fisheries Coordinator

Interest: Naturalist fisheries

****

Robert V. SanTapaga
150 Acacia Avenue
Staten Island, NY 10308
212-984-7499

Employer (School): Environmental Science & Forestry
at Syracuse

Interest: Wildlife biology

****

Dr. John H. Schachte, Jr.
706 Floyd Avenue
Rome, NY 13440
315-339-2518

Employer (School): NYS DEC
Bureau of Fisheries
315-337-0910

Job Title: Associate Fish Pathologist

Interest: Diagnosis and control of viral, bacterial and parasitic diseases of cultured fish

****

Robert I. Shearer
RD #2 County Home Road
Mexico, NY 13114
315-963-8904

Employer (School): Rice Creek Biological Station
SUNY At Oswego
Oswego, NY 13126
315-341-2343

Job Title: Assistant Director

Interest: Stream ecology/benthos

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963-8904

788-4308

782-0100
311

273-9183

233-2233
552

271-6562

237-6658