



RECREATIONAL FISHING SURVEY OF THE UPPER NIAGARA RIVER

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UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

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ABBREVIATIONS AND COMMON TERMS

angler hour	basic unit of angler effort
angler trip	a measure of angling effort, calculated by dividing angler hours (also a measure of effort) by mean trip length in hours
B.A.S.S.	Bass Anglers Sportsman Society
black bass	fishes within genus <i>Micropterus</i> ; herein, largemouth bass and smallmouth bass
catch	all fish caught by an angler
cfs	cubic feet per second
CPUE	acronym for catch-per-unit-of-effort; catch rate. Herein, fish caught per angler-hour; a measure of angler success
directed fishery	effort by anglers targeting a specific species (e.g., striped bass) or group of fishes (black bass, catfishes)
ESPN	Entertainment and Sports Programming Network, owner of B.A.S.S.
h	hours
harvest	fish caught that are kept by the angler
HPUE	acronym for harvest-per-unit-of-effort; harvest rate. Herein, fish harvested per angler-hour; a measure of angler success
mm	millimeter
NYSDEC	New York State Department o Environmental Conservation

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QA	quality assurance
SE	standard error, a precision measure of an estimate
retention rate	the proportion of fish caught that were harvested by an angler

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EXECUTIVE SUMMARY

A sport fishing survey was conducted on the upper Niagara River from April 5 through November 30, 2003. The objectives were to estimate the number of hours fished, the number of fish caught and harvested, catch rates, and harvest rates for both shore and boat anglers. Data on fishing from boats were collected from 35 weekly aerial counts and from interviews with 379 boat angling parties at a combination of eight boat ramps and marinas. Data on fishing from shore were collected from counts of anglers and 5,124 anglers interviewed representing 3,072 fishing parties at 15 public access sites along the river.

Boat anglers made an estimated 16,741 trips to the upper Niagara River and spent an estimated 65,050 hours fishing. Seasonally, the greatest number of the trips (54%) and hours spent fishing (56%) occurred during the summer. More boat trips were made to the Tonawanda Channel (6,880) than to the Chippewa Channel (4,219) or mainstem of the Niagara River (5,642). Among boat anglers who fished for a particular species rather than anything they could catch, smallmouth bass was most frequently sought, followed by muskellunge and northern pike. Boat anglers fished for smallmouth bass and muskellunge primarily during the summer and fall and for northern pike primarily during the spring.

Shore anglers made an estimated 44,854 trips to the upper Niagara River and spent an estimated 91,530 hours fishing. Seasonally, the estimated greatest number of the trips (47%) and hours spent fishing (47%) occurred during the summer. Most of their trips were to Ferry Street (Broderick Park), Squaw Island, and Ontario Street; 71% of the trips were to Buffalo waterfront sites. Unlike boat anglers, most shore anglers (70%) fished for whatever they could catch rather than a particular species. Among shore anglers who fished for a particular species, black bass (primarily smallmouth bass) was most frequently sought, followed by yellow perch and northern pike. Shore anglers fished for black bass (primarily for smallmouth bass) during all seasons and for yellow perch and northern pike primarily during the spring and fall.

The catch rate of yellow perch by boat anglers seeking yellow perch during 2003 was 4.68 fish/hour for the period April 5 through November 30 and 4.02 fish/hour for the period May 18 through

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November 30, i.e., the period when boat anglers were interviewed during a 1999 survey. The catch rate during the 1999 survey, based on anglers interviewed in New York only, was 5.20 fish/hour. The catch rate of yellow perch by shore anglers seeking yellow perch during 2003 was 4.11 fish/hour for the period April 5 through November 30 and 3.20 fish/hour for the period July 23 through November 30, i.e., the period when shore anglers were interviewed during the 1999 survey. The catch rate of yellow perch during the 1999 survey was 5.11 fish/hour.

The catch rate of smallmouth bass by boat anglers seeking smallmouth bass during 2003 was 0.84 fish/hour for the period April 5 through November 30 and 0.79 fish/hour for the period May 18 through November 30, i.e., the period when boat anglers were interviewed during a 1999 survey. The catch rate during the 1999 survey, based on anglers interviewed in New York only, was 0.90 fish/hour. The catch rate of smallmouth bass by shore anglers seeking smallmouth bass during 2003 was 0.55 fish/hour for the period April 5 through November 30 and 0.49 fish/hour for the period July 23 through November 30, i.e., the period when shore anglers were interviewed during the 1999 survey. The catch rate of smallmouth bass during the 1999 shore survey was 1.64 fish/hour.

The catch rate of northern pike by boat anglers seeking northern pike during 2003 was 0.45 fish/hour for the period April 5 through November 30 and 0.45 fish/hour for the period May 18 through November 30, i.e., the period when boat anglers were interviewed during a 1999 survey. The catch rate during the 1999 survey, based on anglers interviewed in New York only, was 0.25 fish/hour. The catch rate of muskellunge by boat anglers seeking muskellunge during 2003 was 0.07 fish/hour for the period April 5 through November 30 and 0.07 fish/hour for the period May 18 through November 30, i.e., the period when boat anglers were interviewed during the 1999 survey. The catch rate of muskellunge during the 1999 survey was 0.08 fish/hour.

Overall CPUE for the boat fishery was 1.08 fish/h, with angler success higher during spring than during other seasons. The overall HPUE was 0.13 fish/h as boat anglers released a high proportion of fish caught. Overall CPUE and HPUE for the shore fishery was 2.10 and 0.90 fish/h, with angler success and harvest higher in the fall than in other seasons. The largest components of total CPUE and HPUE by shore anglers resulted from success catching yellow perch, round goby, smallmouth bass, and rock bass.

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Boat anglers caught an estimated 71,126 fish, 85% of which were smallmouth bass, largemouth bass, yellow perch, and northern pike, and harvested an estimated at 9,457 fish, 78% of which were smallmouth bass and yellow perch. Catch and harvest of smallmouth bass peaked during summer while catch and harvest of yellow perch peaked in the fall.

Shore anglers caught an estimated 185,637 fish, of which most were yellow perch, round goby, rock bass, and smallmouth bass, and harvested an estimated 79,040 fish, with more than half the harvest consisting of round goby that were typically discarded by the anglers. Yellow perch and rock bass formed the bulk of the remaining fish harvested for personal use. Although 24,353 smallmouth bass were caught, only 1,617 were harvested. Catch and harvest of round goby and smallmouth bass peaked in summer, while catch and harvest of yellow perch peaked in spring and fall. Catch and harvest rock bass was highest in spring and summer.

About 95% of all anglers interviewed resided locally, i.e., in Erie County, Niagara County, or nearby portions of the five adjacent counties; most of the others were from out-of-state.

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1.0 INTRODUCTION AND BACKGROUND

The New York Power Authority (NYPA) is engaged in the relicensing of the Niagara Power Project in Lewiston, Niagara County, New York. The present operating license of the plant expires in August 2007. As part of its preparation for the relicensing of the Niagara Project, NYPA is developing background information related to the ecological, engineering, recreational, cultural, and socioeconomic aspects of the Project.

The 1,880-MW (firm capacity) Niagara Power Project is one of the largest non-federal hydroelectric facilities in North America. The Project was licensed to the newly created Power Authority of the State of New York (now the New York Power Authority) in 1957. Construction of the Project began in 1958, and first electricity was produced in 1961.

The Project has several components. Twin intakes are located approximately 2.6 miles above Niagara Falls. Water entering these intakes is routed around the Falls via two large low-head conduits to a 1.8-billion-gallon forebay, lying on an east-west axis about 4 miles downstream of the Falls. The forebay is located on the east bank of the Niagara River. At the west end of the forebay, between the forebay itself and the river, is the Robert Moses Niagara Power Plant, NYPA's main generating plant at Niagara. This plant has 13 turbines that generate electricity from water stored in the forebay. Head is approximately 300 feet. At the east end of the forebay is the Lewiston Pump Generating Plant. Under non-peak-usage conditions (i.e., at night and on weekends), water is pumped from the forebay via the plant's 12 pumps into the 22-billion-gallon Lewiston Reservoir, which lies east of the plant. During peak usage conditions (i.e., daytime Monday through Friday), the pumps are reversed for use as generators, and water is allowed to flow back through the plant, producing electricity. The forebay therefore serves as headwater for the Robert Moses plant and receptor of tailwater from the Lewiston Plant. South of the forebay is a switchyard, which serves as the electrical interface between the Project and its service area.

For purposes of generating electricity from Niagara Falls, two seasons are recognized: tourist season and non-tourist season. By law, at least 100,000 cfs must be allowed to flow over Niagara Falls during tourist season (April 1 – October 31) daytime and evening hours, and at least 50,000 cfs at all

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other times. Canada and the United States are entitled by international treaty to produce hydroelectric power with the remainder, sharing equally.

One of the studies NYPA agreed to conduct as part of the relicensing process was a sport fishing survey conducted on the upper Niagara River from April through November 2003. The objectives of the survey were to estimate:

1. shore and boat fishing effort on the upper Niagara River,
2. the numbers of fish caught and harvested, and
3. catch and harvest rates.

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2.0 METHODS

2.1 Study Area

The upper Niagara River flows north past Buffalo, New York, a major urban center of more than 292 thousand residents (2000 U.S. census; <http://quickfacts.census.gov/qfd/states/36000.html>), and further north creates Niagara Falls, a prime, international tourist attraction. The combined population of adjacent Erie County, which includes Buffalo, and less densely populated Niagara County to the north is approximately 1.16 million people (2000 U.S. census; <http://quickfacts.census.gov/qfd/states/36000.html>). Previous estimates suggested that more than a quarter-million angler days of fishing effort may be spent on the upper Niagara River ([Connelly et al. 1997](#)). Recreational angling is enhanced by the quality and variety of fish species readily available to both shore and boat anglers, including game fish such as smallmouth bass, steelhead, walleye, northern pike, and muskellunge, plus numerous panfish species ([NYSDEC 2002](#)). Scientific names of fishes corresponding to the common names used throughout this report are listed in [Appendix A](#).

The sport fishery assessment was conducted on the entire upper Niagara River, bordered on the south by the Peace Bridge and on the north by the navigation-restriction boundary about 2.5 miles above Niagara Falls ([Figure 2.1-1](#)). The Peace Bridge was considered the boundary between Lake Erie and the upper Niagara River. The Niagara River represents the international boundary between the United States (US) and Canada. The actual border roughly bisects the mainstem river for several miles north of the Peace Bridge, but further north follows the western shore of Grand Island about 100 m offshore. Grand Island splits the river for much of the study area into the East Channel (Tonawanda Channel) and the West Channel (Chippewa Channel). Thus, the East Channel is entirely within US (New York) waters, whereas the West Channel is primarily Canadian (Ontario province) waters. Physical and habitat characteristics of the upper Niagara River are provided in [NYSDEC 2002](#).

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2.2 General Survey Design Characteristics

The 2003 upper Niagara River sport fishery assessment consisted of two concurrent study designs that extended from 5 April through 30 November. The individual study designs were developed to independently assess the shore and boat-based fisheries. The shore fishery design was conducted entirely within New York State, and survey data represent only New York-based sport fisheries. The boat fishery design yielded data judged to be representative of the entire river (US and Canada) sport fishery ([NYSDEC 2002](#)), although interviews were conducted only at selected New York public access points. See [Section 4.2](#) for a discussion of the underlying survey assumptions.

The eight-month time frame was stratified into three seasons. The seasons, which were of unequal length and were developed to reflect New York State fishing regulations, were defined as follows:

- Spring = 5 April - 20 June;
- Summer = 21 June - 1 September (Labor Day); and
- Fall = 2 September - 30 November.

Weekdays and weekend days/holidays represented additional temporal strata. Each weekend day and designated federal (US) holiday was sampled, as well as three weekdays per week throughout the survey. The Friday after Thanksgiving was substituted for the federal Thanksgiving Day holiday. Throughout the survey period, a fishing day was defined as 0730 to approximately 1-h after sunset.

A total of 17 public access sites were included in the overall study design ([Table 2.2-1](#); [Figure 2.1-1](#)). The shore survey included 15 sites divided into two geographic areas. Seven shore fishing sites (100-numbered series in [Table 2.2-1](#)) bordered the Buffalo waterfront. Eight additional shore sites (200-numbered series in [Table 2.2-1](#)) were located north of Buffalo in the Town or City of Tonawanda, North Tonawanda, Niagara Falls, or on Grand Island (see [Figure 2.1-1](#)). The shoreline sites ranged in size from smaller parks (e.g., Towpath Park, Griffon Park) to extensive shoreline areas within linear river parks, particularly in the Tonawandas (e.g., Isle View, Niawanda, and Gratwick Riverside Parks). Three shore

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fishing sites were further partitioned as shown in [Table 2.2-1](#) (e.g., West River Parkway on Grand Island) to better describe angler usage.

Several shore fishing sites such as Isle View and Niawanda Parks or Broderick Park at the foot of Ferry Street were extensive. Further, angler movement among or within such sites was enhanced by the biking/hiking path that parallels the upper Niagara River throughout this reach. In these instances, site boundaries (not listed in [Table 2.2-1](#) but provided in the SOP, [Appendix B](#)) were established to facilitate angler count consistency among survey technicians, and to meet survey time requirements, especially during peak angler use periods such as weekends during good weather. In addition, anglers counted and interviewed in Beaver Island State Park were limited to those fishing from structures associated with the marina.

Eight public boat ramps were sampled for the boat fishing survey ([Table 2.2-1](#); [Figure 2.1-1](#)). Six boat ramps were located within sites that also offered shore fishing access. The two boat-only sites also offered seasonal dockage facilities that were sampled along with ramp retrievals. Locally abundant private marinas were not sampled.

2.3 Boat Fishery Sampling Methods

The upper Niagara River boat fishery was assessed with a complemented survey ([Pollock et al. 1994](#)) that combined aerial counts of fishing boats with information obtained from ground interviews at boat ramps. Field data collection effort totaled 178 technician days. Weekly flights were made by helicopter flown at about 500 ft above ground level that facilitated separate counts of active fishing boats, fishing boats in transit (visible wake), and other recreational craft. Fishing boats were identified by location, activity, or visible gear, occasionally with assistance of binoculars. An approximately equal number of weekday and weekend/holiday flights was achieved by alternating flight days between daytypes throughout the survey. The specific flight day was chosen at random. Fishing and non-fishing boat counts were recorded separately for the East Channel, West Channel, and river mainstem on standardized boat count forms ([Figure 2.3-1](#)).

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Flights occurred mid-day (between 1100-1500 h) to coincide with the expected period of maximum boat use, as demonstrated by Lockwood et al. (2001) for another Great Lakes boat fishery. The rationale for non-random scheduling of count flight times is provided principally in Lockwood et al. (2001) but also in Dauk and Schwarz (2001). Counting fishing boats during times of expected maximum use results in fishing pressure estimates based on the maximum amount of data and the minimum amount of data expansion to represent effort for the respective stratum, while reducing any error (variability) associated with count expansion (Lockwood et al. 2001).

Boat angler count flights originated at Niagara Falls International Airport. Each flight proceeded south over the east or west channel, over the river mainstem to the Peace Bridge, and returned via the uncounted channel (Figure 2.1-1). Count times were short, typically lasting 20-35 minutes, and only rarely longer.

The time and location of on-site boat angler interviews were each selected randomly from among a series of potential starting times (0730 h -1430 h, depending upon day length) and the eight boat ramps included in the design (Table 2.2-1). The design specified three boat ramps each surveyed for two hours per day, thus surveys could begin as late as 1430 h during summer (but no later than 1130 h in November) and be completed by dark. New York State-owned Big Sixmile Marina on Grand Island was surveyed only when open between May 10 and November 1. Technicians interviewed all returning anglers during the 2-h interval. Ramps were never sufficiently busy to require a formal subsample of returning anglers (see Section 2.4 below). The exceptions occurred when anglers refused to be interviewed which happened infrequently. Technicians also tallied the number of non-fishing boats returning to the ramp during the interval. Personal water craft (jet-skis) and recreational boats retrieved from in-water dockage at the end of boating season were not tallied. The number of boat anglers returning and the number interviewed were recorded on the standard count form (Figure 2.3-2).

Completed trip interview data were recorded on standardized survey forms (Figure 2.3-3). Interrupted fishing trips that returned to the ramp for food, fuel, or mechanical problems were considered completed trips. All boat anglers were asked where they fished. Upper Niagara River anglers were classified into four groups: East Channel only, West Channel only, mainstem only, or multiple river locations. Anglers fishing only in Lake Erie or that fished in both Lake Erie and the Niagara River were

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interviewed but identified separately. Generally, such an interview proceeded until the angler mentioned Lake Erie. As a result, characteristics of Lake Erie anglers were consistently gathered but accurate catch data sometimes were not. Further, attempts during interviews to separate time spent in the lake or the river as well as any associated catch during a fishing trip that included both locations proved fruitless. All data from anglers that fished all or part of their trip in Lake Erie were omitted from any upper Niagara River analyses.

2.4 Shore Fishery Sampling Methods

The shore fishery was assessed with a roving-roving angler survey design that combined pressure counts with on-site interviews ([Pollock et al. 1994](#)). Technicians traveled site to site along specific routes on a precise time schedule. The time schedule provided “check points” to assure continued movement during the count-while-interviewing procedure. Each shore site was visited each survey day. Due to the large number of access sites in the design, two independent but concurrent sampling events were scheduled daily, termed the Buffalo Route and the Northern Route. Morning and afternoon survey periods scheduled on alternate days provided additional temporal stratification. The duration of each survey period equaled one-half of the hours available monthly from 0730 to approximately 1-h post-sunset. Field data collection for the shore fishery totaled 356 technician days.

The Buffalo Route always consisted of seven sites. The Northern Route consisted of eight sites during April through 23 May, and from 18 October through the survey conclusion, and seven sites during 24 May through 17 October. The Beaver Island State Park site on Grand Island was dropped from the Northern Route for approximately five months because shore anglers were denied marina access to avoid conflicts with boaters. Daily routes of travel were selected at random from among three site-order options to avoid repeated sampling at a site at the same time of day.

Equal time intervals were spent at each site on a route and included a count of all anglers upon arrival, interview time, and travel time to the next site on the route. Several sites were small enough to also permit a departure angler count. These sites included Towpath Park, Sheridan Drive, Fisherman’s Park, Griffon Park, Woods Creek mouth, and Beaver Island State Park. Departure counts were initiated

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on April 22 when technicians observed frequent angler arrivals and departures following their initial angler count. All angler counts were recorded on standardized survey count forms ([Figure 2.3-2](#)).

Angler interviews occurred after the arrival count. Technicians moved through the site and interviewed all or a subsample of angler parties actively fishing. As a result, most interviews consisted of incomplete trips. At busy sites it frequently was necessary to interview every 2nd or 3rd party to accommodate the time schedule. Interview data were recorded on standardized survey forms ([Figure 2.3-3](#)).

2.5 Biological Data

Selected harvested species were measured (total length, TL, in mm) and checked for marks and tags (as made available by anglers) according to the protocol in [Table 2.5-1](#). Marks and tags included fin clips, passive integrated transponder (PIT) tags, or coded wire tags (CWT) used by NYPA contractors during companion relicensing studies, dorsal tags applied by the Niagara Musky Association, or fin clips and tags utilized by various resource agencies. Interviewed anglers who caught and released muskellunge were asked to estimate TL in inches.

2.6 Tournaments

Fishing tournaments were identified and catalogued prior to and during the survey. Tournaments sponsored by national, statewide, or regional groups were usually well publicized in the local media or over the Internet. Bait and tackle stores were checked regularly for news of upcoming events, local or otherwise. However, many locally-sponsored events were encountered only by chance. Tournament participants encountered during interviews were noted on the standard interview form ([Figure 2.3-3](#)).

2.7 Computational Methods

Field data quality control began with a review of each day's data sheets for accuracy and completeness by the survey technician prior to delivery to the field coordinator. The field coordinator and

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project manager each completed subsequent data sheet reviews before submittal for electronic processing. All questionable entries were resolved prior to data entry.

Shore angler count data were double-keyed into a Microsoft Excel database. Database listings were produced and compared to original data sheets, and any corrections made as necessary. Following these QA steps, the shore count data were loaded to a SAS Version 8.0 database for further processing and analysis. Similarly, all aerial count and ground interview data were double-keyed to separate Excel databases and, following the QA process, were loaded into a SAS Version 8.0 database for all calculations.

2.7.1 Boat Angler Survey

Effort estimates for the boat fishery were based on the weekly helicopter flights that counted active fishing boats. Effort estimates in angler hours were developed as described in Lockwood et al. (2001). The number of anglers per fishing boat was obtained from the ground interviews. The expansion from boat counts to angler hours of effort depends upon development of “boat angler use profiles” based on ground interview data. These profiles were developed for each of the six boat angler strata (season = 3; daytype = 2) from all the boat interviews in the stratum. Each profile describes the hourly distribution of boat anglers on the water throughout a fishing day in the respective stratum. Factors e_{pt} for expanding counts for $i = 1-24$ hours are

$$e_{pt} = \frac{1}{b_{pt}} \sum_{i=1}^{24} b_{pi}$$

where b_{pt} = number of boating parties each hour of the day during the period.

Since it represented a minimal portion of the overall effort variance, the variance attributable to the expansion factors derived from the “boat angler use profiles” was not included in the overall effort variance calculations (Roger Lockwood, Michigan Department of Natural Resources, personal

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communication to John Magee, Gomez and Sullivan Engineers). Each individual count B_{pt} was then expanded by e_{pt} and the number of days in the period D_p to estimate effort E_{pt} .

$$E_{pt} = B_{pt} D_p e_{pt}$$

Mean effort for the period was estimated by averaging over n counts in the period.

Estimated variance for \bar{E}_p is

$$\hat{V}ar(E_p) = 1 - \frac{n_p}{D_p} \left(\frac{\sum_{i=1}^{n_p} (\bar{E}_p - E_{pi})^2}{n_p(n_p - 1)} \right)$$

Estimated boat anglers hours \hat{E}_{ap} for the period was derived by multiplying \bar{E}_p by the mean number of anglers per boat A_p in the period. Variance of the estimated boat angler hours is

$$\hat{V}ar(\hat{E}_{ap}) = \bar{E}_p^2 \hat{v}ar(A_p) + A_p^2 \hat{v}ar(\bar{E}_p) - \hat{V}ar(A_p) \hat{v}ar(\bar{E}_p)$$

Estimated effort in angler hours was calculated for targeted species. Species -specific effort was the product of the amount of boat angler effort in a primary stratum (e.g., summer) and the proportion of anglers targeting a species in the respective stratum. This method is simplified in that it does not account for variations in trip length among anglers targeting different species.

Effort in angler trips was also estimated as described in Malvestuto (1983). The estimate of angler effort in angler hours for a stratum was divided by the mean length of a completed fishing trip in the stratum. Total effort in trips was the aggregate of individual strata.

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Catch and harvest rates were developed from completed trip interviews. A ratio-of-means estimator ([Jones et al. 1995](#); [Lockwood 1997](#); [Pollock et al. 1997](#)) was used to calculate catch and harvest rates within each stratum. All rates are expressed as fish per angler-hour (fish/h). Overall rates (all anglers) as well as directed (targeted fishing) rates were calculated. Overall rates were used to calculate catch and effort, whereas directed rates were used for various comparisons of angler success. Catch rates and harvest rates for boat anglers were determined using a ratio-of-means estimator, which is recommended when using completed trip interviews ([Jones et al. 1995](#)). The ratio-of-means estimator is calculated by dividing the total catch by the total effort of all the interviewed anglers within the stratum. This estimator was defined as:

$$\hat{R}_1 = \left(\frac{\sum_{i=1}^n x_i}{\sum_{i=1}^n c_i} \right)$$

where \hat{R}_1 = mean boat catch rate or harvest rate for the stratum,

n = the number of party interviews in the stratum,

x_i = the catch or harvest of the i th party $i=1, \dots, n$,

c_i = the total angler hours expended by the i th party.

The estimates of variance of the mean catch or harvest rate were calculated by using the single cluster sampling with replacement formula described by Jones et al. ([1995](#)):

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$$\hat{\text{Var}}(\hat{R}_1) = \frac{1}{N(\bar{x})^2} \left(\frac{\sum_{i=1}^n (x_i - R_1 c_i)^2}{n} \right)$$

where $\hat{\text{Var}}(\hat{R}_1)$ = estimated variance of the mean catch or harvest rate for boat anglers,

\hat{R}_1 = mean catch or harvest rate for boat anglers,

n = the number of party interviews in the stratum,

x_i = the catch or harvest rate for the i th party $i=1, \dots, n$,

c_i = the total angler hours expended by the i th party,

N = number of anglers in the stratum or given day,

\bar{x} = mean angler effort.

Using the variance of the means, the standard error of estimation was calculated:

$$\sqrt{\hat{\text{Var}}(\hat{R}_1)} .$$

Catch and harvest for each species by season were the products of effort and overall catch/harvest rates for that species for each day type (weekday, weekend) in a season. Seasonal estimates were the sum of the two day type estimates per season.

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Similar calculations of catch and harvest estimates for geographic areas were not done because boat anglers were generally unable to identify the number and species of fish caught and the amount of time spent in each geographic area when they moved between or among geographic areas during a trip.

2.7.2 Shore Angler Survey

Daily stratum (AM or PM) effort in angler hours was the product of the summed angler counts (including any averages of an arrival and departure count) and the survey period length for each day type (weekday, weekend). Survey period length was one-half the length of the defined fishing day (0730 h to approximately 1-h past sunset). The mean of the daily estimates for an AM or PM stratum was multiplied by the number of days in the respective day type each month or season and then summed to estimate total effort for the month or season. Monthly and seasonal effort was summed for the April-November period and expressed in angler hours. Angler counts were expanded to estimate effort of the i th fishing day by:

$$\hat{e}_i = I_i \times T$$

where I_i = count of anglers at time i ,

T = length of the fishing period.

Monthly and seasonal strata effort was summed for the April-November period and expressed in angler hours. The estimated effort for the stratum is:

$$\hat{E} = \sum_{i=1}^n (\hat{e}_i / \pi_i)$$

where $\pi_i = n_k / N_k$ for all of the sampling units in the i th stratum.

Total effort is the sum of the effort of each stratum.

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The variance for each stratum and standard error is:

$$\hat{\text{Var}}(E_a^n) = \frac{N_a^2}{n_a^2 - n_a} \sum_{i=1}^{n_a} (e_{i_a} - \bar{e}_a)^2$$

$$\hat{\text{SE}}(\hat{E}_a) = \sqrt{\text{Var}(\hat{E}_a)}$$

where n_a = number of units sampled in stratum,

N_a = total number of units in stratum.

The sum of the variances for each stratum is the variance for total effort.

Estimated effort in angler hours was calculated for targeted species. Species-specific effort was the product of the amount of shore angler effort in a primary stratum (e.g., summer) and the proportion of anglers targeting a species in the respective stratum. This method is simplified in that it does not account for variations in trip length among anglers targeting different species.

Effort in angler trips was estimated by dividing the angler hour estimates by the appropriate mean trip length (h). Angler trips were calculated for seasons to increase the number of completed trips available for the mean trip length calculation. Catch and harvest rates were estimated using the mean-of-ratios estimator as recommended by Pollock et al. (1994) and Jones et al. (1995) for incomplete trips. The mean-of-ratios estimator averages the catch and harvest rates for individual anglers/parties in a stratum. Incomplete fishing trips <0.5 h were omitted from catch and harvest rate calculations to avoid extreme catch rates (Pollock et al. 1994). Overall and targeted catch and harvest rates were calculated. This estimator was defined as:

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$$\hat{R}_2 = \frac{\sum_{i=1}^n \frac{y_i}{x_i}}{n}$$

where \hat{R}_2 = mean catch or harvest rate for shore anglers,

y_i = catch of the i th shore angler,

x_i = trip length of the i th angler,

n = number of interviews in a stratum.

The variance and standard error for this estimator are:

$$\hat{\text{Var}}(\hat{R}_2) = \frac{\sum_{i=1}^N \left(\frac{y_i}{x_i} \right) - (R_2)^2}{nN}$$

$$\text{SE}(\hat{R}_2) = \sqrt{\text{Var}(\hat{R}_2)} .$$

Catch \hat{C} and harvest \hat{H} were estimated as the product of effort \hat{E} for each stratum and the overall catch and harvest rates for each species of that stratum. Strata totals were summed to estimate total catch and harvest for each month and each season. Monthly or seasonal totals were summed to yield total catch and harvest.

$$\hat{C} = \hat{E} \times \hat{R}_c$$

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$$\hat{H} = \hat{E} \times \hat{R}_h .$$

The variance for catch and harvest was calculated as in Pollock et al. (1994).

$$\hat{Var}\hat{C} = N^2 \left(\frac{\sum_{i_1}^{n_1} (C_{i_2} \bar{C}_1)^2}{n_2(n_2 - 1)} \right)$$

where C_i = daily catch estimates for stratum 1,

n_i = number of days sampled in stratum 1,

N = number of days in stratum.

The variances were summed across strata to estimate the variance of total catch and harvest. Standard error of the total was estimated by

$$\hat{SE}(\hat{C}) = \sqrt{Var(\hat{C})} .$$

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TABLE 2.2-1

ACCESS SITES (ALL U.S.) SAMPLED DURING 2003 UPPER NIAGARA RIVER SPORT FISHERY ASSESSMENT

Access site	Survey*	Code**	Sub-site	Sampled Area
Bird Island Pier	S	101	river side	Pier proper south to Peace Bridge
	S	102	canal side	Pier proper south to Peace Bridge
Ferry Street (Broderick Park)	S	110		Includes shoreline fronting Broderick Park and Bird Island Pier parking lots
Squaw Island	S	121	canal entrance	Entire bulkhead area and adjacent river bank at Black Rock Canal entrance
	S	122	railroad bridge	River shoreline south of international railroad bridge
Towpath Park	S	130		Entire park
Ontario Street	S&B	140		Shoreline fronting parking lots north and south of boat ramp
Riverside Park	S	150		Shoreline from foot bridge overpass south to Ontario St. parking lot
Foot of Sheridan Drive	S&B	160		Vicinity of boat ramp and Aqua Lane Park shoreline south of ramp
Isle View Park	S&B	200		Shoreline accessible from motor vehicle
Niawanda Park	S&B	210		Shoreline accessible from motor vehicle
Fisherman's Park	S	220		Includes wooden pier, pavilion area, and park shoreline south to boat davit
Gratwick Riverside Park	S&B	230		Shoreline accessible from motor vehicle, including riprap breakwaters
Griffon Park	S&B	240		Docks and immediate shoreline
Mouth of Wood's Creek	S	250		Area in the bridge vicinity at creek mouth and shoreline along access road
Big Sixmile Marina	B	260		Public ramp and long-term slips
West River Parkway	S	271	north pull-off	Shoreline accessible from parking lot (including wading anglers)
	S	272	middle pull-off	Shoreline accessible from parking lot (including wading anglers)
	S	273	south pull-off	Shoreline accessible from parking lot (including wading anglers)

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TABLE 2.2-1 (CONT.)

ACCESS SITES (ALL U.S.) SAMPLED DURING 2003 UPPER NIAGARA RIVER SPORT FISHERY ASSESSMENT

Access site	Survey*	Code**	Sub-site	Sampled Area
Blue Water Marina	B	280		Public ramp and long-term slips
Beaver Island State Park Marina	S	290		Bulkheads and dock fingers in immediate marina area only

* S = shore survey; B= boat survey

** Site codes refer to information in [Appendix B](#).

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**TABLE 2.5-1
PROTOCOL FOR CHECKING TOTAL LENGTH (TL), MARKS AND TAGS AMONG HARVESTED OR RELEASED NIAGARA
RIVER FISHES**

Species	Harvested TL-mm	Released TL-in	Released TL Legal/sublegal	Harvested Fish				
				PIT tag	CWT	Fin clips	Dorsal tags	Agency tags
Smallmouth bass	yes		yes					yes
Largemouth bass	yes			yes	yes	yes		
Walleye	yes							yes
Lake trout	yes					yes		
Rainbow trout/steelhead	yes					yes		
Yellow perch	yes			yes	yes	yes		
Northern pike	yes			yes	yes	yes		
Muskellunge	yes	yes					yes	

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SPORT FISH UTILIZATION (CREEL SURVEY)
IN THE UPPER NIAGARA RIVER
AND ITS TRIBUTARIES**

**Sampled Access Sites in the
Upper Niagara River in 2003**

LEGEND:

- ▲ Sampled Access Sites
- Geographic Partition
- Water Bodies
- Streams
- Municipal Boundary
- Roads

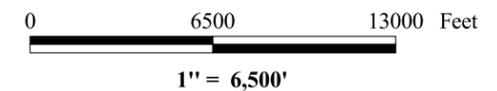
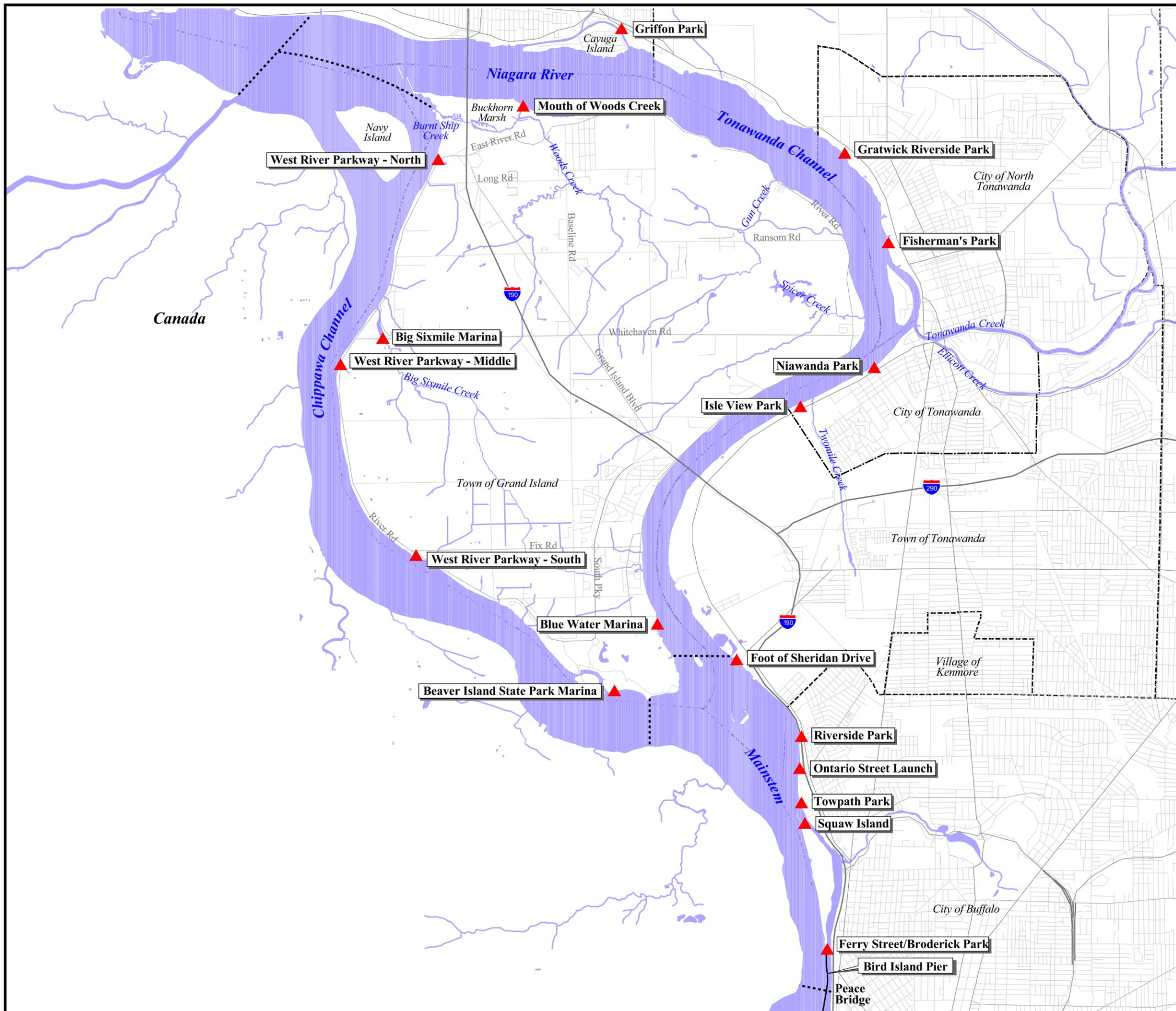


FIGURE 2.1-1



Upper Niagara River Recreational Fishery Survey

Investigator Initials

--	--	--

Client Code: 9656

Aerial Survey Form ASF.01

Sample Date

--	--	--	--

month day year

Day Type

--

1 - Weekday
2 - Weekend

Count Time

--	--	--	--

Start

Stop

Wind

--

1 - calm
2 - light
3 - moderate
4 - strong

Wind Direction

--	--

1 - N
2 - NE
3 - E
4 - SE
5 - S
6 - SW
7 - W
8 - NW

Weather Code

--

1 - Sunny
2 - Partly Cloudy
3 - Overcast
4 - Raining
5 - Windy
6 - Foggy
7 - Snow

River Segment	Total	Tally and Notes Section	
Mainstem			Actively Fishing Count
			In Transit Fishing Count
			Recreational Boat Count
Tonawanda (East)			Actively Fishing Count
			In Transit Fishing Count
			Recreational Boat Count
Chippewa (west)			Actively Fishing Count
			In Transit Fishing Count
			Recreational Boat Count

Remarks:

UPPER NIAGARA RIVER DAILY COUNT SUMMARY
SITE COUNT FORM
DCS.01

Investigator Initials

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Client Code: 9656

Route: A B C D (circle 1)

month	day	year			

Sample Date

Mode

1 - Shore 2 - Boat

Day Type

1 - weekend/holiday 2 - weekday

Survey type

1 - Buffalo Route 2 - Tonawanda / Grand Island Route 3 - Boat Survey

Site Code	Site Arrival Time	Site Departure Time	Angler Count	Anglers Interviewed	Recreational Boats
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Site Description: _____					
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Site Description: _____					
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Site Description: _____					
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Site Description: _____					
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Site Description: _____					
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Site Description: _____					

Comments: (continue comments on back if needed)

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3.0 RESULTS

3.1 Observed Data

3.1.1 Boat Survey- Aerial Count Flights

A total of 35 boat count flights occurred during the April through November period ([Table 3.1.1-1](#)). The initial flight (April 26) occurred three weeks after the start of ground data acquisition due to delays in obtaining security clearance for overflights and aircraft mechanical problems. Postponed early April flights were made up by May 14 and proceeded weekly thereafter. The number of flights was equal among survey temporal stratum (season and daytype) except for summer weekdays. All count start times occurred between 1100-1450 h, with the majority (71.4%) of counts starting between 1100-1259 h ([Table 3.1.1-1](#)).

Active fishing boats favored the mainstem river during spring and fall, but were most abundant in the East Channel during summer when most fishing occurred ([Table 3.1.1-2](#)). The proportion of anglers fishing in the West Channel was highest during fall, although overall it was the least utilized location among the three river sections.

Boat angling occurred throughout the entire upper Niagara River, but anglers were consistently noted at certain locations or features (see [Figure 2.1-1](#)). Favored mainstem locations included: Motor Island and Strawberry Island (both southeast of Grand Island), southern tip of Grand Island, offshore of Riverside Park, and a back eddy along the Canadian shore near the Peace Bridge. East Channel sites included: the general area near the mouth of Wood's Creek (northern Grand Island), offshore of Gratwick Park, offshore of Isle View and Niawanda Parks, a nearshore drift at Bluewater Marina (southeast Grand Island), and near the Huntley Station (east bank, just north of Sheridan Drive access). West Channel anglers favored locations associated with channel edges (drop-offs) just off either shore rather than specific reaches.

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Angling associated with the Huntley Station discharge (noted during at least 14 of 35 flights) was recorded at survey inception and continued throughout summer and fall. Typically, anglers would orient approximately 100 ft north (downriver) of the discharge structure. As many as three boats actively fished the discharge area during a flight.

Count flights recorded 292 fishing boats “in transit” (visible wake) in addition to 576 “actively fishing” boats, or 33.6% of all identified fishing boats. Fishing boats “in transit” could have been 1) heading toward the initial fishing location of the day, including Lake Erie; 2) returning to the boat ramp or marina after completing a fishing trip in the upper Niagara River or Lake Erie; or 3) changing fishing locations during the “actively fishing” portion of their trip. As identified above, boats in transit before or after a fishing trip were not actively fishing. However, changing locations was a normal activity during many fishing trips. Such anglers may merely have been returning upriver to repeat a drift, or simply moving from one shoal or island or other feature to another. The proportion of boats counted while changing fishing locations (relative to the other listed possibilities) is unknown, but if substantial may lead to an underestimate of boat fishing effort since fishing boats “in transit” were omitted from estimated effort calculations (see [Section 2.7.1](#)).

3.1.2 Boat Survey-Ground Interview Data

Boat angler counts (all fishing boats returning, including those that spent time in Lake Erie) were highest at Sheridan Drive during each month, and anglers using the Sheridan Drive ramp exceeded 50% of all boat anglers counted during April, June, October, and November ([Table 3.1.2-1](#)). Overall boat ramp usage peaked in summer, particularly in August ([Table 3.1.2-2](#)). No fishing boats were counted at the ramp in Gratwick Park during April, October, and November. The boat ramp at Big Sixmile Marina on Grand Island did not open until May 10, and closed for the season on November 1.

Relative boat ramp usage was examined by accounting for the overall number of actual surveys conducted at each ramp ([Table 3.1.2-3](#)). Based on the number of boat anglers counted per survey, the Sheridan Drive ramp supported nearly one-third of all boat fishing documented. The ramp at Griffon

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Park ranked second in angler use. The least amount of boat angling use occurred at Niawanda Park, a site heavily used by personal watercraft.

The temporal and spatial distribution of ground interviews generally mimicked boat ramp usage as determined by fishing boat arrival counts. Any differences between the two samples resulted from angler refusals to participate in the survey or anglers returning from a trip that involved Lake Erie. The various distributions of interview data are provided to characterize the angler sample by season, by river section, and overall. Interview data were also used to compare spatial distribution of fishing boats in the upper Niagara River as determined by aerial counts to fishing locations reported by anglers returning to surveyed boat ramps.

The upper Niagara River sample totaled 773 interviewed boat anglers from 379 angling parties ([Table 3.1.2-4](#)). Most interviews occurred at Sheridan Drive (34.4%) on the mainstem river in Buffalo, and at Griffon Park (15.4%) in Niagara Falls at the north end of the East Channel ([Figure 2.1-1](#)). The fewest interviews occurred at Niawanda Park, Bluewater Marina, and Gratwick Park. The largest proportion of interviews occurred during summer (53.7%), specifically during the month of August (21.6%) ([Table 3.1.2-5](#)). Isle View Park was the only access site with fewer interviews during summer than another season (spring).

Survey technicians also interviewed 144 boat anglers that represented 73 boats (15.7 % of all boat angler interviews) returning from trips that included all or a portion of the time spent fishing in Lake Erie. All but four anglers were interviewed during summer. The observed data from these interviews are provided separately at the end of [Appendix C](#) but are not discussed otherwise herein.

Based on interviews at eight US access sites, the East Channel was the favored fishing location during each season, and the West Channel was the least utilized ([Table 3.1.2-6](#)). Nearly 20% of boat anglers fished in more than one river location during their trip, suggesting that many of the fishing boats observed “in transit” from the air may have merely been changing fishing locations during a trip entirely within the Niagara River.

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The average number of anglers per boat was highest during spring, and declined thereafter ([Table 3.1.2-7](#)). The overall average was 2.0 anglers per boat for 383 fishing parties returning from the upper Niagara River.

The average length of a completed boat fishing trip was 3.9 h ([Table 3.1.2-8](#)). Trip length was greatest during the fall (4.3 h), and exceeded the mean trip length in spring by 1 h.

Anglers from four upper Niagara River charter boat trips were interviewed ([Table 3.1.2-9](#)). Three targeted smallmouth bass and originated from Bluewater Marina on Grand Island. One trip targeted muskellunge and originated at the Sheridan Drive ramp in November. One trip (not shown in [Table 3.1.2-9](#)) to Lake Erie for smallmouth bass was also noted.

Boat angler use profiles developed from all the upper Niagara River interview data within each of six strata (spring-weekend, summer-weekday, etc.) depicted the aggregated number of boat fishing parties on the water throughout the sampled fishing days ([Figures 3.1.2-1](#), [3.1.2-2](#), and [3.1.2-3](#)). All profiles were unimodal and suggested that peak boat fishing activity was achieved by or before mid-morning regardless of season or daytype. Peak usage typically extended to 1200 or 1300 h, then declined steadily throughout the afternoon and evening. The data fail to show evidence of increased evening fishing such as might occur after work on weekdays. However, we commonly saw boats launched during evening surveys that may have been retrieved after dark following departure of the angler survey technician. Each profile was used in combination with the corresponding aerial boat counts to estimate boat fishing pressure.

3.1.3 Species Sought by Boat Anglers

Seven fish species or species groups were targeted by the upper Niagara River boat fishery ([Table 3.1.3-1](#)). Boat anglers seeking black bass (smallmouth bass and largemouth bass as a group) formed 48.6% of those interviewed. Most bass anglers interviewed sought smallmouth bass, but more than 21% of all black bass anglers sought largemouth bass or were not specific ([Table 3.1.3-2](#)). Among other boat anglers with a species preference, muskellunge (10.1%) and northern pike anglers (9.4%) ranked second

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and third. Approximately one-quarter of all boat anglers interviewed did not express a species preference (“Anything”). Comparatively few boat anglers sought yellow perch, walleye, or trout (primarily rainbow trout/steelhead, but also brown trout).

Seasonally, black bass were the most sought during summer and fall ([Table 3.1.3-1](#)). Smallmouth bass were mentioned most frequently, although some anglers also targeted largemouth bass, and other mentioned only “bass”. Pre-season (before June 21) black bass anglers comprised 16.3% of those interviewed in the spring. Northern pike anglers were most prevalent during spring, whereas muskellunge anglers were most numerous during summer and, especially, fall.

The pursuit of black bass peaked during August and September when three of four boat anglers sought bass ([Table 3.1.3-3](#)). Northern pike were targeted primarily in May and June, whereas muskellunge were targeted by the highest proportion of anglers during November. The few boat anglers seeking yellow perch and trout did so primarily in October and November. The proportion of anglers without a species preference was highest at survey onset and generally declined throughout the fishing season.

Black bass were also targeted by the most boat anglers in each river section ([Table 3.1.3-4](#)). The northern pike angler proportion was highest (14.0%) among boat anglers fishing the mainstem river. The highest proportion of muskellunge anglers (18.8%) occurred among those that fished in more than one river location. Seasonally, northern pike were sought in each section in spring, whereas black bass dominated fishing in each section in summer and fall. Muskellunge anglers in each section were most abundant in fall.

3.1.4 Shore Survey-Count and Interview Data

Daily counts by location summarized by survey week are provided in [Appendix Table C-1](#). A total of 6,037 anglers was counted during 178 daily survey periods ([Table 3.1.4-1](#)). Peak shore angler usage occurred in June, followed by August, July, and May. The fewest anglers occurred in November. Seasonally, angler counts in summer formed 43.5% of the total ([Table 3.1.4-2](#)). Anglers in spring were

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approximately twice as numerous as in fall. The seven shore access sites in Buffalo accounted for 71.3% of all shore anglers counted.

Shore anglers in Buffalo at Ferry Street (Broderick Park), Squaw Island, and Ontario Street accounted for 54.5% of the total counted ([Table 3.1.4-2](#)). Fisherman's Park in North Tonawanda and Niawanda Park in Tonawanda combined supported an additional 15.3% of total anglers. Two of the three shore access sites located on Grand Island were the least utilized. Pull-offs along West River Parkway and the area at mouth of Wood's Creek accounted for 0.5% and 1.6%, respectively, of angler use.

Monthly access site usage was highest at 11 of 15 shore locations in either May or June, including Squaw Island and Ontario Street, two of the three most heavily fished sites ([Table 3.1.4-1](#)). Ferry Street, Fisherman's Park, and the Bird Island Pier received the most use in August. Most angling at Beaver Island State Park marina occurred in April, when only the Squaw Island site supported more use. However, angling at Beaver Island in spring was terminated May 18, otherwise May use may have been higher.

The Squaw Island site was the most heavily utilized during April, May, and November ([Table 3.1.4-1](#)). Ontario Street supported the most anglers in June, and Ferry Street was the most utilized site during July through October. The mouth of Woods Creek and, especially, the West River Parkway pull-offs received comparatively little use during any month.

Seasonally, Squaw Island supported 22.0% of all shore anglers in spring ([Table 3.1.4-2](#)). Ferry Street accounted for 21.2% and 25.3% of all shore anglers counted in summer and fall, respectively. Other than at Beaver Island State Park marina, where angling was prohibited during summer, shore fishing at Griffon Park declined the most from spring to summer. Technicians noted that the small size of the Griffon Park site and heavy fishing and recreational boat use of the launch ramp likely interfered with shore fishing. In contrast, Niawanda Park use nearly tripled from spring to summer, possibly due, in part, to weekly fishing excursions for children sponsored by the local Boys/Girls Club.

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Three access areas were further partitioned into sub-sites since anglers had clear choices where to fish at each (Table 3.1.4-3). At Bird Island Pier, anglers elected to fish either in the Niagara River or the Black Rock Canal. On the pier section in the study area north of the Peace Bridge, slightly more anglers were counted fishing in the Black Rock Canal than in the Niagara River. However, technicians noted that anglers commonly fished both sides of the pier during a fishing trip. Additionally, technicians estimated that 75% of the anglers that fished the Bird Island Pier did so south of the Peace Bridge, outside the study area (designated Lake Erie). It is unknown whether anglers also utilized the Black Rock Canal as extensively south of the Peace Bridge.

More than 93% of Squaw Island anglers were counted near the lock entrance to the Black Rock Canal or on the associated breakwall that effectively creates a large backwater. Although relatively few anglers fished at the alternate Squaw Island site along the river shoreline near the international railroad bridge, occasionally anglers noted near the railroad bridge were later observed at the more heavily used lock entrance area, or elsewhere (e.g., Ferry Street/Broderick Park). Movement among these proximal sites (and also among other sites surveyed) was facilitated by the bike path that parallels the upper Niagara River.

Few anglers were counted at the three parking areas (pull-offs) along West River Parkway on Grand Island. The south pull-off received the most use. Particularly noteworthy was use of the north and south pull-offs by wading anglers, especially the south pull-off by fly fishers. The mouth of Woods Creek was the only other site amenable to wading anglers.

The temporal and spatial distribution of ground interviews generally mimicked shore access site usage as determined by instantaneous counts. A substantial portion of the differences between the “count” and “interviewed” samples resulted from angler refusals to participate in the survey. Shore anglers frequently refused to participate and at a substantially higher (though not quantified) rate than for boat anglers. The various distributions of interview data are provided to characterize the angler sample by season, by access point, and overall.

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The sample of shore anglers interviewed totaled 5,124 among 3,072 parties ([Table 3.1.4-4](#)). Most interviews occurred at Ferry Street/Broderick Park (17.7%), followed by Squaw Island (16.7%) and Ontario Street (16.0%), all on the mainstem river in Buffalo. Fisherman's Park and Niawanda Park on the East Channel provided the most interviews at the northern end of the study reach ([Figure 2.1-1](#)). The fewest interviews occurred at West River Parkway and at the mouth of Wood's Creek, both on Grand Island. The largest proportion of interviews occurred during summer (42.2%), followed closely by spring (39.8%) ([Table 3.1.4-5](#)). Monthly, interviews peaked during June which spanned both seasons ([Table 3.1.4-4](#)). The period May through July accounted for 57.8% of all shore angler interviews.

The average shore fishing completed trip lasted 2.0 h ([Table 3.1.2-8](#)). Trips were somewhat longer in the fall, similar to the boat fishery.

3.1.5 Species Sought by Shore Anglers

Upper Niagara shore anglers targeted 15 fish species, plus the categories "sunfish", "catfish", and "bait/minnows" ([Table 3.1.5-1](#)). However, more than 70% of all shore anglers interviewed did not target a particular fish species during a trip. The proportion of such "casual" anglers was nearly 80% during summer. Shore anglers seeking black bass (smallmouth bass and largemouth bass as a group) or yellow perch comprised most of those that expressed a preference. Most yellow perch angling occurred during spring and fall, and although the proportion seeking yellow perch during spring (16.6%) and fall (16.4%) was similar, more than twice as many anglers participated in the spring fishery. Black bass fishing from shore was most prevalent in summer. Among other species, the largest proportion of northern pike, rock bass, trout, and white bass anglers occurred in spring. Few shore anglers specifically targeted walleye, although walleye were more often mentioned as a secondary species by shore anglers seeking bass or trout, particularly at the Ferry Street location.

Whereas boat black bass anglers favored smallmouth bass (see [Section 3.1.3](#)), 68.5% of shore black bass anglers were less specific and simply targeted "black bass" ([Table 3.1.3-2](#)). Smallmouth bass were targeted by 24.1% of black bass shore anglers, compared to 7.5% of shore black bass anglers that

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targeted largemouth bass. The “generalist” nature of shore bass anglers conformed to that of most other shore anglers.

Examined monthly, yellow perch dominated targeted angling during April, May, October, and November ([Table 3.1.5-2](#)). Black bass were the main species sought during June through September. The largest proportion of northern pike anglers occurred in May. Anglers without a species preference were fewest in November when most shore fishing focused on yellow perch.

Yellow perch alone among the six major species or groups was targeted by shore anglers at each access site ([Table 3.1.5-3](#)). Most yellow perch angling occurred at Squaw Island followed by Ontario Street, Beaver Island State Park marina, and Ferry Street (Broderick Park). Northern pike anglers were nearly as ubiquitous, occurring at 14 sites. The only site where northern pike were not targeted was Ferry Street, the most heavily used shore site. Northern pike fishing was most prevalent at Squaw Island followed by Fisherman’s Park and Niawanda and Gratwick Parks. In general, northern pike anglers were more evenly distributed among sites than other angler types.

Black bass were sought at all access sites except Griffon Park and Beaver Island State Park marina ([Table 3.1.5-3](#)). Bass anglers were most abundant at Ferry Street followed by Fisherman’s Park and Niawanda Park, and fewest at Riverside Park and along West River Parkway on Grand Island. Bass anglers along West River Parkway, however, represented 50% of all anglers interviewed at this site, many of them fly fishers. Rock bass angling occurred at 12 sites, with the exceptions of all three sites on Grand Island. Squaw Island and Griffon Park supported the most rock bass anglers.

Trout and, especially, white bass represented upper Niagara River species with a more focused spatial component to their respective fisheries. Trout were sought at eight access sites, but relatively few trout anglers were interviewed at locations other than Ferry Street, Squaw Island, and Bird Island Pier ([Table 3.1.5-3](#)). All three sites are just downstream from the Niagara River transition from Lake Erie. The focus of white bass angling also was at Ferry Street, the location where 82% of all white bass anglers were interviewed ([Table 3.1.5-3](#)).

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Brown bullhead, included among the “other species” in [Table 3.1.5-3](#), was sought by few anglers. However, all brown bullhead anglers interviewed fished at the Beaver Island State Park marina in spring.

3.2 Angling Effort Estimates

3.2.1 Boat Survey

Estimated total boat angling effort on the upper Niagara River during 2003 was 65,050 angler hours or 16,741 trips ([Table 3.2.1-1](#)). Effort during summer accounted for 55.9% of angler hours and 54.3% of trips. More angler hours were expended during fall on fewer trips than occurred in spring due to the additional length of fall fishing trips ([Table 3.1.2-8](#)).

More boat fishing trips (6,880) occurred in the East Channel than in other river sections ([Table 3.2.1-1](#)), based on the fishing locations of boats counted during overflights ([Table 3.1.1-2](#)). However, boat anglers were mobile and nearly 20% of the US anglers interviewed said they fished in more than one river section during a trip ([Table 3.1.2-6](#)).

Boat anglers expended more effort targeting black bass than any other species ([Table 3.2.1-2](#)). Total effort for black bass was nearly five times that of muskellunge, the next most targeted species. The amount of effort targeting northern pike was highest in spring.

3.2.2 Shore Survey

Shore anglers expended 91,530 angler hours fishing the upper Niagara River in 2003 ([Table 3.2.2-1](#)). Calculated SE was 9.4% of the total estimate indicating good precision. The sum of seasonal angler-hours was slightly less than the sum of monthly angler hours due to calculation methods. The estimated number of angler trips, based on seasonally estimated hours, was 44,854. Angler trips were calculated only by season to enhance the sample size of completed trips (see [Table 3.1.2-8](#)).

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Angler effort in hours and trips was highest in the summer ([Table 3.2.2-1](#)). However, effort in angler hours was highest during the period May through August. These four months accounted for 78.0% of the total angler-hour estimate, and monthly effort during May through August ranged from 16,067-19,820 angler hours. Shore effort was substantially less during October and November, combined accounting for 5.1% of the total.

Total targeted effort for black bass was higher than for all other species pursued from shore, but most of the effort occurred in summer ([Table 3.2.2-2](#)). During spring and fall, the targeted effort was greatest for yellow perch, but anglers in spring also expended effort for northern pike, rock bass, and trout as well as black bass.

3.3 Catch and Harvest Estimates

The observed (raw) total fish catch and harvest for the interviewed boat and shore fisheries are listed separately in [Appendix Table C-2](#). The various temporal catch and harvest estimates for all fish were based on the raw data summarized in [Appendix Table C-2](#). Additionally, interviewed shore anglers caught 14 mudpuppies not listed in [Appendix Table C-2](#) that were omitted from catch and harvest estimates. Most mudpuppies were caught at the Squaw Island site near the Black Rock Canal entrance.

3.3.1 Boat Survey

Boat anglers caught an estimated 71,126 fish of at least 20 species ([Table 3.3.1-1](#)). Smallmouth bass and largemouth bass combined accounted for 63.4% of the total catch. Yellow perch and northern pike ranked next in the boat angler catch, and these four species totaled more than 85% of all fish caught. Yellow perch and smallmouth bass dominated the harvest of 9,457 fish, with yellow perch contributing 51.2% of all fish harvested by boat anglers. Most of the remainder of fish harvested were black crappie and round goby. However, most round goby not returned to the water were intentionally killed due to their status as an invasive species, and not kept for personal use.

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Estimated muskellunge catch totaled 1,191 but no harvest was documented ([Table 3.3.1-1](#)). Similarly, the harvest of northern pike, sunfish, rock bass, and freshwater drum was small compared to the number caught. In contrast, yellow perch, walleye, and lake trout represented the only species where anglers retained the majority of fish caught. Overall, boat anglers kept 13.3% of their catch.

The largest seasonal catch total occurred in summer and was comprised mostly (65.3%) of smallmouth bass ([Table 3.3.1-2](#)). The largest total harvest occurred in fall. The 3,898 yellow perch harvested in fall represented 80.5% of the total boat angler harvest of yellow perch, and 72.9% of the total fish harvest in fall. Among other fisheries, the catch of black crappie and brown bullhead was entirely in the spring. Most northern pike were caught in the spring and very few in the fall. More muskellunge were caught in summer than other seasons. However, the muskellunge fishery yielded as many fish pre-season (muskellunge season opened June 21, the same day as black bass) in spring as during the fall ([Table 3.3.1-1](#)) although the fall supported most of the targeted muskellunge angling ([Table 3.1.3-1](#)). In addition to yellow perch, largemouth bass represented another species where the largest catch occurred in the fall.

The spring fisheries for smallmouth bass and largemouth bass were substantial ([Table 3.3.1-2](#)). Although New York State Fishing Regulations state that harvest of any black bass pre-season was prohibited in the upper Niagara River, the catch of each species in spring ranked second relative to the season when the largest catch occurred.

3.3.2 Shore Survey

The total catch by shore anglers was 185,637 fish of at least 24 species ([Tables 3.3.2-1](#) and [3.3.2-2](#)), plus at least five species of baitfish (see [Section 3.7.2](#)). Yellow perch, round goby, rock bass, and smallmouth bass dominated and formed 84.5% of all fish caught. The harvest comprised 21 species plus baitfish. The non-native round goby formed 51.7% of 79,040 fish harvested. However, to our knowledge round goby were never harvested for consumption, but uniformly discarded on land at the fishing site, or, rarely, used for bait. Yellow perch (18,645) and rock bass (9,429) combined equaled 35.5% of fish harvested, and ranked first and second among fish harvested by shore anglers for personal use.

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Muskellunge, adult golden shiner, and bowfin were the only species caught but not harvested by shore anglers, although smaller golden shiners were included among harvested baitfish. Additional fish caught but rarely kept included freshwater drum, largemouth bass, and walleye.

The “catfish” group ([Table 3.3.2-2](#)) included some identified channel catfish but anglers were reluctant to permit examination of some fish, and also were usually not specific about channel catfish or brown bullheads released. The sunfish caught ([Table 3.3.2-1](#)) included bluegill and pumpkinseed. Among harvested sunfish identified to species by the technicians, the proportion was 77% pumpkinseed and 23% bluegill.

Shore anglers caught and harvested three species of trout ([Table 3.3.2-2](#)). Rainbow trout/steelhead was the most commonly caught. In addition, one interviewed angler reported the catch of an “unidentified salmonid” that may have been a coho salmon ([Table 3.3.2-2](#)). The angler reported catching a “silver” (coho) but would not permit examination of the angler harvested fish. Stray coho in the upper Niagara River are possibly the result of Lake Erie stocking by the State of Pennsylvania, as they are common in the Lake Erie-New York open water fishery ([Culligan et al. 2003](#)).

The largest catch and/or harvest of yellow perch, rock bass, freshwater drum (catch only), white bass, northern pike, and brown bullhead occurred in the spring ([Table 3.3.2-3](#)). Although a few more drum may have been harvested in summer, drum were harvested overall at a very low rate compared to most other fish. Among the six species with the highest catches in spring, yellow perch uniquely contributed the second highest catch and harvest in the fall. Among other species, the largest catches of round goby, smallmouth bass, minnows/baitfish, sunfish, largemouth bass and white perch occurred in the summer. Most “minor” species were also caught primarily during spring or summer ([Table 3.3.2-4](#)). The exceptions were walleye and adult golden shiner that contributed most of their total catch in the fall.

Monthly catch and harvest patterns revealed that for most species peak catches and/or harvest occurred during the period of maximum shore effort from May through August ([Table 3.3.2-5](#)). Within this period yellow perch, white bass, northern pike, brown bullhead, and baitfish catches were highest in

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May, rock bass and freshwater drum catches peaked in June, smallmouth bass, largemouth bass, and white perch catches peaked in July, and round goby and sunfish catches were highest in August.

The baitfish catches were somewhat unusual and temporally reflected shore anglers' pursuit of northern pike in May and black bass during August and September. Shore anglers frequently fished one rod for bait while another rod was baited for either pike or bass. This practice was especially prevalent at Fisherman's Park in North Tonawanda.

Yellow perch, brown bullhead, and largemouth bass represented species with high catches and/or harvest during months when overall effort was low or declining. Yellow perch and brown bullhead harvest was each higher in April than any month other than May although effort was substantially less. Following the April through June period of maximum yellow perch catch and harvest, the July catch and harvest declined sharply, then recovered to a relatively consistent level that was maintained from August through November. Brown bullhead catches subsided after May. The largemouth bass catch in September was equivalent to July although effort had begun to decline during the fall.

Among fishes less common in the shore angler catch, rainbow trout/steelhead catches were highest in May and June and brown trout in April ([Table 3.3.2-6](#)). Lake trout were only caught in April and June. Muskellunge were infrequently caught by shore anglers, occurring primarily during April through July. Walleye were caught during each month except November, but the catch in September was substantially higher than in other months.

3.4 Catch and Harvest Rates

Both general and targeted rates are discussed in this section. General catch and harvest rates are calculated for all anglers and are those utilized in catch and harvest calculations. General catch and harvest rates are also particularly useful when describing the overall upper Niagara River shore fishery since the majority of shore anglers were generalists and less than 30% of shore anglers interviewed targeted a particular species. By comparison, approximately 75% of boat anglers targeted a species during their trips, so targeted catch and harvest rates are the most useful when discussing the boat fishery.

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In addition, we noted proportional differences in angler preference for either black bass species among participants in the boat or shore fisheries, including numerous anglers classified only as “black bass” anglers (see [Section 3.1](#)). Although more anglers targeted smallmouth bass than largemouth bass, there were sufficient anglers who targeted “black bass” to warrant calculating targeted CPUE and HPUE for each species and also for these species among “all black bass anglers” as a group. Particularly for the boat fishery, few anglers specifically targeted largemouth bass but we estimated more than 11,000 were caught. Thus, most largemouth bass were likely caught by anglers not targeting largemouth bass. Calculating CPUE and HPUE for largemouth bass by enlarging the sample to “all bass anglers” presents a more realistic catch rate estimate (larger sample size) as well as a better comparison to smallmouth bass catch rates. As a result, we calculated catch and harvest rates for smallmouth bass and largemouth bass separately for any angler seeking black bass, in addition to calculating targeted rates for only that species by anglers targeting that species (i.e., the traditional directed rate). These comparisons are reported separately in [Section 3.4.5](#). Further, several anglers were unable to provide the species of black bass caught and released. Their catch data were recorded as “black bass” but were not included in any directed rates calculations.

Most shore fishing data represented incomplete trips. Since only incomplete trips ≥ 0.5 h were used in catch and harvest rate calculations ([Section 2.7.2](#)), 600 party interviews with trip lengths < 0.5 h were omitted from rate calculations.

3.4.1 Overall Rates for Boat Anglers

Boat angler total (entire survey) CPUE and HPUE were 1.08 and 0.13 fish/h, respectively ([Table 3.4.1-1](#)). Spring CPUE for all boat anglers (1.78 fish/h) was highest overall, and was especially high in April (2.86 fish/h), but also more variable as shown by the high SE. Boat CPUE was lower during June through September but relatively consistent among months as well as within months (low SE). The boat angler HPUE was highest in November when comparatively few anglers fished due to frequently poor weather.

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The CPUE and HPUE values by species for all anglers seasonally and monthly are listed in [Appendix Tables C-3](#) and [C-4](#) but are not discussed herein. The highly focused nature of most boat anglers makes directed rates the most appropriate for discussion.

3.4.2 Targeted Rates for Boat Anglers

Smallmouth bass was the species most targeted by boat anglers, and the targeted CPUE for smallmouth bass for the entire survey was 0.84 fish/h ([Table 3.4.2-1](#)). The total smallmouth bass HPUE was 0.07 fish/h as most anglers released their fish. The targeted CPUE for largemouth bass was 1.52 fish/h, and HPUE was 0.0 fish/h, although these data are based on a small sample of nine anglers. Seasonally, smallmouth bass CPUE was highest during the spring (2.20 fish/h), although comparatively few anglers who targeted smallmouth bass pursued them in spring ([Table 3.1.3-1](#)). The targeted CPUE and HPUE for smallmouth bass during the primary fishery (in terms of targeted effort and catch) in summer was 0.81 and 0.09 fish/h.

Boat anglers seeking yellow perch and black crappie exhibited the highest targeted CPUE and HPUE among targeted species ([Table 3.4.2-1](#)), although the sample size for each species was small (for black crappie, a single party of three anglers). The CPUE for each species exceeded 4.0 fish/h and HPUE exceeded 2.0 fish/h. The targeted CPUE for each species was highest in the spring, whereas the HPUE for yellow perch was higher in the fall. Neither species was targeted during the summer, nor was black crappie targeted in fall.

Comparatively few boat anglers also sought trout or walleye. Total directed CPUE for trout and walleye was 0.29 and 0.11 fish/h ([Table 3.4.2-1](#)). Anglers kept most trout and all walleye caught, and the targeted HPUE was 0.15 and 0.11 fish/h, respectively. Boat anglers targeting walleye and trout were only successful during the summer and fall, respectively.

Sample sizes were deemed too small (see [Table 3.1.3-3](#)) to calculate meaningful monthly directed CPUE and HPUE for species other than northern pike, muskellunge, and smallmouth bass ([Table 3.4.2-2](#)). Northern pike were sought each month but boat anglers were successful during only five of eight

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months. The highest northern pike CPUE occurred in June (0.64 fish/h). The northern pike CPUE for May, July, and October ranged from 0.38-0.40 fish/h. Northern pike were only harvested in May at 0.01 fish/h.

Boat anglers targeted muskellunge beginning in May, and were most successful in September (CPUE = 0.11 fish/h), followed by June and July (CPUE = 0.10 fish/h each month; [Table 3.4.2-2](#)). The CPUE was lower in October and November when most boat anglers targeted muskellunge (see [Section 3.1](#)). No muskellunge were harvested by interviewed anglers, consequently the HPUE was zero.

Monthly smallmouth bass CPUE was highest pre-bass season during May (2.80 fish/h). During June through August CPUE ranged from 0.75-0.88 fish/h, then declined to 0.46 fish/h in September. The highest monthly HPUE of 0.14 fish/h was attained in August.

The success (CPUE) of boat anglers targeting smallmouth bass, muskellunge, and northern pike was examined by general fishing location ([Table 3.4.2-3](#)). Smallmouth bass and muskellunge anglers were each more successful in the East Channel. Northern pike anglers were substantially more successful in the mainstem river than elsewhere. Success of all angler types was lowest in the West Channel.

3.4.3 Overall Rates for Shore Anglers

The total CPUE and HPUE for the upper Niagara River shore fishery were 2.10 and 0.90 fish/h ([Table 3.4.3-1](#)). The CPUE and HPUE were highest in the fall, particularly during October and November. Total CPUE was also 2.20 fish/h or higher during May and June.

The general catch and harvest rates for all species caught by all shore anglers are listed by season and month in [Appendix Tables C-5](#) and [C-6](#). Since so many (>70%) of the upper Niagara River shore anglers did not specifically target a species, especially in summer when most angling occurred ([Table 3.1.5-1](#)), general catch and harvest rates were largely representative of the overall shore angler population. As a result, the general CPUE and HPUE for the four species prominent in the harvest are shown by season and month in [Tables 3.4.3-2](#) and [3.4.3-3](#). Smallmouth bass and yellow perch were each sought by

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about 10% of the shore anglers, whereas rock bass and round goby represent species caught commonly by shore anglers but targeted by few (rock bass) or not at all. Round goby were widely regarded as a nuisance by shore anglers.

The overall CPUE of yellow perch (0.65 fish/h) was highest among all species caught from shore ([Table 3.4.3-2](#)). The round goby overall CPUE of 0.46 fish/h ranked second, but the HPUE (0.42 fish/h) was higher than for any other species. Virtually all “harvested” round goby were allowed to suffocate on the bank at the fishing site, as most anglers were aware that gobies are regarded as an invasive species not to be returned to the water alive. Seasonally, the CPUE for smallmouth bass and yellow perch was highest in the fall, and rock bass CPUE was highest in the spring ([Table 3.4.3-2](#)). Round goby CPUE was similar during summer and fall, and in summer was higher than for any other species.

Monthly, round goby CPUE ranged between 0.52 and 0.69 fish/h from July through November ([Table 3.4.3-3](#)). Yellow perch CPUE and HPUE were highest in October, November, and April, and lowest in July. Rock bass CPUE and HPUE peaked during May and June. Smallmouth bass CPUE was highest in September. The monthly succession of good fishing (high CPUE) for yellow perch in early spring, rock bass in late spring, smallmouth bass in summer, and yellow perch again in the fall assure largely unselective shore anglers of relatively high success throughout most of the good weather season.

3.4.4 Targeted Rates for Shore Anglers

Targeted CPUE and HPUE for the species most often targeted by shore anglers ([Table 3.1.5-1](#)) is shown in [Table 3.4.4-1](#). Targeted rates for all other species, pursued overall by 25 or fewer shore anglers, are listed in [Appendix Tables C-7](#) and [C-8](#).

The total CPUE and HPUE of shore anglers targeting yellow perch were 3.16 and 1.29 fish/h ([Table 3.4.4-1](#)). Seasonally, both CPUE and HPUE were highest in the fall at 4.30 and 2.00 fish/h. Shore angler CPUE for yellow perch increased to a peak in June (3.67 fish/h), declined sharply in July, and increased steadily thereafter to the highest monthly CPUE in November (4.84 fish/h) ([Table 3.4.4-2](#)). The

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monthly HPUE was also highest in November (2.37 fish/h), and ranged from 1.12 to 1.77 fish/h during May, September, and October.

Targeted smallmouth bass CPUE for shore anglers was 0.55 fish/h ([Table 3.4.4-1](#)). The targeted smallmouth bass HPUE was 0.03 fish/h, less than one-half the HPUE by boat anglers. The seasonal smallmouth bass CPUE was highest during spring (pre-season), but during bass season was higher in fall (0.57 fish/h) than in summer (0.42 fish/h). Monthly, angler success (CPUE) during the open bass season was highest in September (0.60 fish/h; [Table 3.4.4-2](#)). However, anglers targeting smallmouth bass in May were more than twice as successful (CPUE=1.25 fish/h).

The directed CPUE for northern pike was 0.16 fish/h, and shore anglers harvested pike at a rate of 0.03 fish/h ([Table 3.4.4-1](#)). Northern pike CPUE was comparable in spring and fall although the most consistent effort for pike occurred during spring. The highest monthly CPUE for northern pike anglers (0.44 fish/h) occurred when pike harvest was prohibited in April ([Table 3.4.4-2](#)). Northern pike anglers harvested pike from shore only in May (0.07 fish/h).

The number of shore anglers targeting yellow perch was sufficient to examine entire survey directed catch and harvest rates at five shore fishing sites ([Table 3.4.4-3](#)). At all other sites six or fewer anglers targeted yellow perch, too few for meaningful analysis. Most yellow perch fishing occurred at Squaw Island (canal entrance) or at Ontario Street, where CPUE and HPUE were highest and virtually identical. The lowest angler success for yellow perch among these sites was estimated at Beaver Island State Park marina. However, the rates at Beaver Island largely reflect spring angling. Few anglers fished at Beaver Island in the fall when yellow perch directed CPUE tended to be highest ([Table 3.4.4-1](#)).

3.4.5 Targeted Rates for Bass Species by Black Bass Anglers

The total targeted boat catch rate for the limited number (9) of largemouth bass anglers was substantially higher than that for the larger sample (295) of smallmouth bass anglers ([Table 3.4.5-1](#)). No doubt good catches of largemouth bass are possible by knowledgeable anglers, but the high CPUE likely does not accurately reflect the relationship between their respective catch rates. However, when

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calculated for all black bass anglers, the CPUE for smallmouth bass (0.85 fish/h) was more than three times that of largemouth bass (0.27 fish/h), yielding a more realistic comparison.

More largemouth bass anglers (39) were interviewed during shore surveys. The targeted CPUE (0.36 fish/h) was higher than the CPUE calculated for all bass anglers (0.14 fish/h). However, both catch rates reflected the greater likelihood of catching a smallmouth bass from shore.

3.5 Angler Demographics

Residents of Erie and Niagara counties, plus small portions of five immediately adjacent counties (collectively “local residents”), formed more than 95% of anglers interviewed in either sport fishery ([Tables 3.5-1](#) and [3.5-2](#)). Further, there was little seasonal variation in residence patterns for either fishery. Non-local residents were primarily from out-of-state, as opposed to other New York counties. Non-NY residents from 24 states and Puerto Rico participated in the shore fishery, compared to 10 states recorded from the boat fishery (see listings in tables). Canadian anglers were few.

3.6 Biological Data

3.6.1 Fish Total Lengths

Total length (TL) data for harvested species are shown in [Tables 3.6.1-1](#) (boat fishery) and [3.6.1-2](#) (shore fishery). Most length data were obtained from smallmouth bass and yellow perch. No anglers indicated they harvested legal muskellunge. However, a technician observed a single eviscerated muskellunge along shore at Fisherman’s Park that exceeded 50 inches on June 23 following the opening weekend for legal harvest.

The mean lengths of harvested smallmouth bass by boat and shore anglers were 386.4 mm and 357.1 mm, respectively. The modal length group of smallmouth bass harvested by boat anglers was 356-381 mm. In comparison, the modal length group harvested by shore anglers was 280-304 mm. Shore anglers also harvested large, legal smallmouth bass up to 545 mm TL.

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Anglers that were queried whether smallmouth bass they released were legal or sub-legal reported contrasting ratios between the shore and boat fisheries. Boat anglers released predominantly legal fish (64.2% of 260 released smallmouth bass), whereas shore anglers released mostly sub-legal fish (65.8% of 584 released smallmouth bass).

The mean TL of harvested yellow perch by shore anglers was 203.2 mm, with a range of 130-341 mm. The modal TL group harvested in the yellow perch shore fishery was 178-203 mm. The mean length of yellow perch harvested by boat anglers (242.7 mm) was larger than for shore anglers, although the sample size was comparatively small.

Little variation was evident in the sizes of yellow perch harvested monthly except during November ([Table 3.6.1-3](#)). The modal TL group in November was 204-228 mm, larger than in any other month.

Northern pike harvested by shore anglers averaged 620.3 mm, and ranged from 455-775 mm. Northern pike < 559 mm (22 inches) formed 22.7% of those measured. Only one northern pike (795 mm) harvested by boat anglers was available for measurement.

Although harvested muskellunge were not encountered during interviews, upper Niagara River anglers released a broad size range of muskellunge, including legal-size fish ([Table 3.6.1-4](#)). Angler-estimated TL of 48 released muskellunge (shore and boat fisheries combined) ranged 4-52 inches. The mean lengths of released muskellunge were 31 inches and 35 inches for the boat and shore fisheries, respectively. Four muskellunge were estimated to be legal length (≥ 48 inches). The largest muskellunge reported (52 inches) was caught and released by a shore angler, whereas a boat angler reported releasing a 4-inch juvenile muskellunge.

Three anglers each reported releasing a tiger muskellunge. Tiger muskellunge are hybrids of muskellunge and northern pike that are typically stocked as top predators by fisheries management agencies. However, none are known to be stocked in the upper Niagara River or Lake Erie based on stocking data available on NYSDEC's website.

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Occasionally, anglers also provided estimated lengths of other fish species released. These data are provided in [Appendix Tables C-9](#) (boat) and [C-10](#) (shore).

3.6.2 Fish Tags and Fin Clips

Tags from five fish were detected during the angler survey, four from associated Niagara Project relicensing studies and one from a Lake Erie multi-agency cooperative program. All tag data were reported to NYPA for appropriate follow up.

Two yellow perch marked with coded wire tags (CWT) as part of a separate Niagara Power Project relicensing issue (Determine the effectiveness of Buckhorn Marsh Restoration Project for enhancing northern pike reproduction) ([NYPA and Gomez and Sullivan 2005](#)) were detected. One 223-mm perch was harvested April 14 at the Squaw Island site, and the other (221 mm) was harvested at the Ontario Street site on June 13. The latter perch was also marked with a right pectoral fin clip.

Passive integrated transponder (PIT) tags were detected in two largemouth bass caught at the mouth of Wood's Creek on Grand Island. One largemouth bass 375 mm TL was harvested June 29, the other (414 mm TL) was caught and released on August 16.

A 470 mm TL walleye tagged (metal jaw tag) in Lake Erie near Dunkirk, NY by NYSDEC was harvested from the mainstem upper Niagara River on July 16. The walleye had been at-large for 77 days.

Additionally, a 545 mm TL steelhead marked with a right pectoral clip was caught in the mainstem upper Niagara River on September 6.

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3.7 Ancillary Data and Observations

3.7.1 Fishing Tournaments

At least 20 fishing tournaments associated with the upper Niagara River were identified during 2003 ([Table 3.7.1-1](#)). Most events were held at or emanated from upper Niagara River access sites. However, at least four tournaments that included upper Niagara River fishing utilized launch sites outside the investigation area (e.g., Buffalo Small Boat Harbor just south of the Peace Bridge on Lake Erie). Eight events involved “river-only” fishing. Most of these were small shore-only tournaments held at either Niawanda Park, Ontario Street access, or Sheridan Drive access (Aqua Lane Park). However, two were boat fishing events held by local clubs.

Most of the tournaments identified during 2003 permitted fishing in either the upper Niagara River or Lake Erie. These events ranged in scope from those sponsored by a single local business attracting local anglers (e.g., Big Catch Bait and Tackle, Buffalo) to the CITGO Bassmasters Northern Open that was supported by a national fishing organization (ESPN/B.A.S.S.) and attracted 350 entrants, including many professional anglers from outside the region. Another large event was the NY Bass Federation state tournament with 115 anglers.

A unique local event held annually in mid-summer is The Greater Niagara Fish Odyssey (NYPA is one of multiple sponsors). Fishing was permitted from shore and by boat in all waterways of Erie and Niagara counties, including the upper Niagara River. Cash and merchandise prizes were awarded for fish in six categories, including black bass, walleye, rainbow trout, salmon, lake trout, and “sheepshead” (freshwater drum). In addition to prizes for competitors, proceeds were distributed to charitable organizations. A 2-day team bass fishing tournament associated with the Fish Odyssey that incorporated one day each on the upper and Lower Niagara River was cancelled by organizers.

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3.7.2 Bait Collection

Collection of baitfish for commercial sale and personal use occurred throughout the upper Niagara River. Commercial bait operations utilized square dip nets and favored, in particular, a site along the bulkhead at Ferry Street access (Broderick Park). However, commercial netting was observed within Beaver Island State Park marina, Griffon Park, and Fisherman’s Park. Smaller nets and traps were also used to collect baitfish for personal use.

Upper Niagara River anglers also caught baitfish by hook-and-line. This practice was especially prevalent at Fisherman’s Park, where anglers baited very small hooks with bread to catch a variety of baitfish when seeking primarily black bass or northern pike. Identified species caught for bait by this method included emerald shiner, spottail shiner, common shiner, golden shiner, and bluntnose minnow. Local anglers referred to such baitfish variously during interviews as either “shiners”, “chubs”, or “stonerollers”.

3.7.3 Angling Outside the Study Design

Although the study design included 15 defined shore fishing sites that, in aggregate, likely represented all aspects of Niagara River shore fishing, other fishing sites were used and noted by creel technicians. An annotated list of such sites follows, including the seasons when angling was observed.

- Black Rock Canal—Angling was noted at two locations: within Broderick Park at the foot of Ferry St. (summer and fall), and at the railroad bridge crossing to Squaw Island (fall).
- Squaw Island mitigation ponds—Both ponds proximal to the Black Rock Canal entrance lock at the main Squaw Island fishing site were utilized in summer.
- Private marina between Fisherman’s Park and Gratwick Park, North Tonawanda—Anglers were noted here during early spring and fall, likely seeking yellow perch among the dock pilings.

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- Breakwall and south bank of Big Sixmile Creek (Grand Island)—The short breakwall at the creek mouth on the West Channel, and the south creek bank from the breakwall to the public boat ramp, was frequently utilized for shore fishing during spring, summer, and fall, and also pre-survey in March.
- Rock riprap north of Fisherman’s Park—only occasional use noted in summer.

The most consistent use occurred near the mouth of Big Sixmile Creek on Grand Island, a West Channel tributary. Instantaneous counts of up to 15-20 anglers were seen during scheduled shore and/or boat surveys. Although some sites such as the Black Rock Canal and the Squaw Island mitigation ponds were not located directly on the upper Niagara River, anglers moved among fishing sites so commonly that fishing at one of these “alternate” sites could easily be (and was often) accommodated during a trip to a nearby Niagara River location within the survey design.

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TABLE 3.1.1-1

**DISTRIBUTION OF BOAT ANGLER COUNT FLIGHTS BETWEEN DAYTYPES AND TIME
OF DAY, UPPER NIAGARA RIVER ANGLER SURVEY, 2003**

Daytype/Time (h)*	Spring	Summer	Fall	Total
Weekend/holiday	6	6	6	18
Weekday	6	5	6	17
1100-1259	10	7	8	25
1300-1459	2	4	4	10
Total flights	12	11	12	35

* Allocation to time category based on flight start time.

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**TABLE 3.1.1-2
SEASONAL DISTRIBUTION OF ACTIVE FISHING BOATS IN THE UPPER NIAGARA
RIVER DURING 2003**

	Percent of active fishing boats			Total boats
	Mainstem river	East Channel	West Channel	
Spring	40.9	38.0	21.3	150
Summer	25.9	51.0	23.1	259
Fall	39.5	28.8	31.7	167
Total	33.7	41.1	25.2	576

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TABLE 3.1.2-1

MONTHLY COUNTS OF BOAT ANGLERS AT SURVEYED BOAT RAMPS, UPPER NIAGARA RIVER ANGLER SURVEY, 2003

	April		May		June		July		August		September		October		November		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Ontario Street	1	4.0	4	4.0	28	14.8	38	20.5	11	4.8	16	15	3	5.7	4	9.5	105	11.3
Sheridan Drive	13	52.0	30	30.0	101	53.4	59	31.9	66	29.1	29	27.1	31	58.5	22	52.4	351	37.8
Isle View Park	1	4.0	26	26.0	9	4.8	0	0	48	21.1	3	2.8	1	1.9	10	23.8	98	10.6
Niawanda Park	4	16.0	9	9.0	4	2.1	13	7.0	11	4.8	2	1.9	3	5.7	0	0	46	5.0
Gratwick Riverside Park	0	0.0	8	8.0	8	4.2	7	3.8	23	10.1	10	9.3	0	0.0	0	0	56	6.0
Griffon Park	6	24.0	10	10.0	13	6.9	38	20.5	23	10.1	24	22.4	12	22.6	2	4.8	128	13.8
Big Sixmile Marina	closed		7	7.0	13	6.9	15	8.1	26	11.5	18	16.8	2	3.8	close d		81	8.7
Blue Water Marina	0	0.0	6	6.0	13	6.9	15	8.1	19	8.4	5	4.7	1	1.9	4	9.5	63	6.8
Total	25		100		189		185		227		107		53		42		928	

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TABLE 3.1.2-2

**SEASONAL COUNTS OF BOAT ANGLERS AT SURVEYED BOAT RAMPS, UPPER
NIAGARA RIVER ANGLER SURVEY, 2003**

	Spring		Summer		Fall		Site totals	
	# Anglers	%	# Anglers	%	# Anglers	%	# Anglers	%
Ontario Street	20	11.2	62	11.1	23	12.0	105	11.3
Sheridan Drive	52	29.2	221	39.6	78	40.6	351	37.8
Isle View Park	29	16.3	55	9.9	14	7.3	98	10.6
Niawanda Park	14	7.9	27	4.8	5	2.6	46	5.0
Gratwick Riverside Park	8	4.5	38	6.8	10	5.2	56	6.0
Griffon Park	25	14.0	71	12.7	32	16.7	128	13.8
Big Sixmile Marina	16	9.0	45	8.1	20	10.4	81	8.7
Blue Water Marina	14	7.9	39	7.0	10	5.2	63	6.8
Seasonal totals	178		558		192		928	
Seasonal %	19.2		60.1		20.7			

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**TABLE 3.1.2-3
BOAT ANGLER USAGE AMONG SURVEYED BOAT RAMPS, UPPER NIAGARA RIVER
ANGLER SURVEY, 2003**

Boat Access Site	Boat anglers	Total surveys	Anglers per survey	Proportional usage (%)
Ontario Street	105	67	1.57	11.7
Sheridan Drive	351	80	4.39	32.8
Isle View Park	98	70	1.40	10.5
Niawanda Park	46	64	0.72	5.4
Gratwick Riverside Park	56	64	0.88	6.5
Griffon Park	128	64	2.00	14.9
Big Sixmile Marina	81	51	1.59	11.9
Blue Water Marina	63	74	0.85	6.4
Total	928	534		100.0

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TABLE 3.1.2-4

SEASONAL DISTRIBUTION OF BOAT ANGLERS INTERVIEWED AT EACH ACCESS SITE, UPPER NIAGARA RIVER ANGLER SURVEY, 2003

	Ontario Street	Sheridan Drive	Isle View Park	Niawanda Park	Gratwick Riverside Park	Griffon Park	Big Sixmile Marina	Bluewater Marina	Season	
									Total	%
Spring	20	51	29	14	9	25	16	14	178	23.0
Summer	49	140	22	26	36	71	43	28	415	53.7
Fall	20	75	12	5	11	23	24	10	180	23.3
Site Total	89	266	63	45	56	119	83	52	773	
%	11.5	34.4	8.2	5.8	7.2	15.4	10.7	6.7		

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TABLE 3.1.2-5

NUMBER OF BOAT ANGLERS INTERVIEWED MONTHLY AT EACH LAUNCH RAMP, UPPER NIAGARA RIVER ANGLER SURVEY, 2003

Month	Ontario Street	Sheridan Drive	Isle View Park	Niawanda Park	Gratwick Riverside Park	Griffon Park	Big Sixmile Marina	Blue Water Marina	Total	%
April	1	13	1	4	0	6	0	0	25	3.2
May	4	30	26	9	8	10	7	6	100	12.9
June	24	63	9	4	9	13	13	13	148	19.1
July	34	33	0	12	7	38	13	9	146	18.9
August	6	51	15	11	21	23	26	14	167	21.6
September	16	25	3	3	11	20	22	5	105	13.6
October	2	31	1	2	0	7	2	1	46	6.0
November	2	20	8	0	0	2	0	4	36	4.7
Total interviewed	89	266	63	45	56	119	83	52	773	
Percent of total	11.5	34.4	8.2	5.8	7.2	15.4	10.7	6.7		

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TABLE 3.1.2-6

**SEASONAL DISTRIBUTION OF BOAT ANGLERS AS DETERMINED FROM INTERVIEWS,
UPPER NIAGARA RIVER ANGLER SURVEY, 2003**

Fishing site	Spring		Summer		Fall		Total	
	N	%	N	%	N	%	N	%
East Channel	100	56.2	170	41.0	86	47.8	356	46.0
West Channel	11	6.2	55	13.3	11	6.1	77	10.0
Mainstem river	24	13.5	113	27.2	49	27.2	186	24.1
Multiple river locations	43	24.2	77	18.6	34	18.9	154	19.9
Season totals	178		415		180		773	
%	23.0		53.7		23.3			

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**TABLE 3.1.2-7
MEAN NUMBER OF ANGLERS PER BOAT, UPPER NIAGARA RIVER ANGLER SURVEY,
2003**

Season	Weekday		Weekend/holiday		Overall	
	No. parties	Anglers per boat (SE)	No. parties	Anglers per boat (SE)	No. parties	Anglers per boat (SE)
Spring	36	2.1 (0.18)	44	2.4 (0.13)	80	2.2 (0.11)
Summer	76	1.9 (0.10)	120	2.2 (0.08)	196	2.1 (0.06)
Fall	29	1.5 (0.12)	78	1.7 (0.08)	107	1.7 (0.04)
Overall	141	1.9 (0.08)	242	2.1 (0.05)	383	2.0 (0.04)

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**TABLE 3.1.2-8
MEAN COMPLETED FISHING TRIP LENGTH, UPPER NIAGARA RIVER ANGLER
SURVEY, 2003**

	Spring		Summer		Fall		Total	
	No. trips	Mean trip length (h) (SE)	No. trips	Mean trip length (h) (SE)	No. trips	Mean trip length (h) (SE)	No. trips	Mean trip length (h) (SE)
Boat	80	3.3 (0.20)	196	4.0 (0.14)	107	4.3 (0.19)	383	3.9 (0.10)
Shore	89	2.0 (0.20)	55	2.0 (0.20)	32	2.2 (0.26)	176	2.0 (0.12)

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**TABLE 3.1.2-9
UPPER NIAGARA RIVER CHARTER BOAT TRIPS INCLUDED IN ANGLER SURVEY DATA,
2003**

Date	Boat ramp	Species targeted
31 May	Bluewater Marina	Smallmouth bass
31 May	Bluewater Marina	Smallmouth bass
9 August	Bluewater Marina	Smallmouth bass
22 November	Sheridan Drive	Muskellunge

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UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

**TABLE 3.1.3-1
SPECIES AND SPECIES GROUPS SOUGHT BY BOAT ANGLERS, UPPER NIAGARA RIVER
ANGLER SURVEY, 2003**

	Spring		Summer		Fall		Grand total	
	No. anglers	%						
Trout	3	1.7	0	0.0	7	3.9	10	1.3
Northern pike	51	28.7	17	4.1	5	2.8	73	9.4
Muskellunge	2	1.1	34	8.2	42	23.3	78	10.1
Black bass	29	16.3	248	59.8	99	55.0	376	48.6
Black crappie	3	1.7	0	0.0	0	0.0	3	0.4
Yellow perch	8	4.5	0	0.0	13	7.2	21	2.7
Walleye	4	2.2	11	2.7	1	0.6	16	2.1
Anything	78	43.8	105	25.3	13	7.2	196	25.4
Totals	178		415		180		773	

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**TABLE 3.1.3-2
SPECIES PREFERENCES AMONG BLACK BASS ANGLERS, UPPER NIAGARA RIVER
ANGLER SURVEY, 2003**

Species	Boat Anglers		Shore Anglers	
	No. interviewed	%	No. interviewed	%
Smallmouth bass	295	78.5	126	24.1
Largemouth bass	9	2.4	39	7.5
Black bass	72	19.1	358	68.5
Totals	376		523	

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.1.3-3

SPECIES SOUGHT MONTHLY (PERCENT) BY BOAT ANGLERS, UPPER NIAGARA RIVER ANGLER SURVEY, 2003

Species	April	May	June	July	August	September	October	November	Total	
									Interviewed	%
Trout	0.0	3.0	0	0	0	1.9	4.3	8.3	10	1.3
Northern pike	12.0	26.0	18.9	6.8	0.6	1.9	4.3	2.8	73	9.4
Muskellunge	0.0	2.0	10.1	5.5	6.6	6.7	21.7	69.4	78	10.1
Black bass	8.0	17.0	39.9	46.6	74.9	80.0	41.3	5.6	376	48.6
Black crappie	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	3	0.4
Yellow perch	12.0	4.0	0.7	0.0	0.0	0.0	17.4	13.9	21	2.7
Walleye	0.0	4.0	0.0	6.8	0.6	1.0	0.0	0.0	16	2.1
Anything	68.0	41.0	30.4	34.2	17.4	8.6	10.9	0.0	196	25.4
Total interviewed	25	100	148	146	167	105	46	36	773	

**NIAGARA POWER PROJECT (FERC NO. 2216)
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**TABLE 3.1.3-4
SPECIES SOUGHT SEASONALLY BY BOAT ANGLERS BY FISHING LOCATION, UPPER
NIAGARA RIVER ANGLER SURVEY, 2003**

Fishing site	Target species	Spring	Summer	Fall	Total
		%	%	%	%
East channel	Rainbow trout	3.0		3.5	1.7
	Northern pike	23.0			6.5
	Muskellunge	2.0	7.1	15.1	7.6
	Black bass	21.0	61.8	68.6	52.0
	Black crappie	3.0			0.8
	Yellow perch	3.0		4.7	2.0
	Walleye	4.0			1.1
	Anything	41.0	31.2	8.1	28.4
Number of interviews		100	170	86	356
West channel	Rainbow trout				
	Northern pike	27.3			3.9
	Muskellunge		5.5	27.3	7.8
	Black bass	27.3	65.5	72.7	61.0
	Black crappie				
	Yellow perch	18.2			2.6
	Walleye				
	Anything	27.3	29.1		24.7
Number of interviews		11	55	11	77
Mainstem river	Rainbow trout			8.2	2.2
	Northern pike	58.3	6.2	10.2	14.0
	Muskellunge		6.2	18.4	8.6
	Black bass		60.2	34.7	45.7
	Black crappie				
	Yellow perch	8.3		18.4	5.9
	Walleye		9.7	2.0	6.5
	Anything	33.3	17.7	8.2	17.2
Number of interviews		24	113	49	186

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

**TABLE 3.1.3-4 (CONT.)
SPECIES SOUGHT SEASONALLY BY BOAT ANGLERS BY FISHING LOCATION, UPPER
NIAGARA RIVER ANGLER SURVEY, 2003**

Fishing site	Target species	Spring	Summer	Fall	Total
		%	%	%	%
Multiple river locations	Rainbow trout				
	Northern pike	25.6	13.0		13.6
	Muskellunge		15.6	50.0	18.8
	Black bass	11.6	50.6	44.1	38.3
	Black crappie				
	Yellow perch	2.3			0.6
	Walleye				
	Anything	60.5	20.8	5.9	28.6
Number of interviews		43	77	34	154

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

**TABLE 3.1.4-1
MONTHLY COUNTS OF SHORE ANGLERS AT SURVEYED ACCESS POINTS, UPPER NIAGARA RIVER ANGLER SURVEY,
2003**

	April		May		June		July		August		September		October		November		Site Usage	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Bird Is	20	4.6	32	3.1	51	3.9	41	3.9	62	5.9	49	7.2	16	4.8	2	1.2	273	4.5
Ferry St	54	12.3	156	15.3	231	17.6	220	21.1	251	24.0	143	21.1	105	31.4	45	26.6	1,205	20.0
Squaw Is	129	29.5	227	22.3	193	14.7	121	11.6	146	13.9	81	12.0	96	28.7	66	39.1	1,059	17.5
Towpath Pk	9	2.1	71	7.0	75	5.7	44	4.2	47.5	4.5	29.5	4.4	20	6.0	4	2.4	300	5.0
Ontario St	39	8.9	154	15.2	239	18.2	214	20.5	197	18.8	121	17.9	43	12.9	21	12.4	1,028	17.0
Riverside Pk	27	6.2	52	5.1	62	4.7	46	4.4	26	2.5	7	1.0	8	2.4	12	7.1	240	4.0
Sheridan Dr	7	1.6	28	2.8	66.5	5.1	45	4.3	32	3.1	20.5	3.0	2.5	0.7	0	0.0	201.5	3.3
Buffalo sites subtotal	285		720		917.5		731		761.5		451		290.5		150		4,306.5	71.3
Isle View Pk	2	0.5	43	4.2	36	2.7	43	4.1	31	3.0	19	2.8	4	1.2	1	0.6	179	3.0
Niawanda Pk	16	3.7	23	2.3	117	8.9	98	9.4	84	8.0	77	11.4	11	3.3	4	2.4	430	7.1
Fisherman's Pk	9.5	2.2	49	4.8	104	7.9	100.5	9.6	124.5	11.9	88	13.0	19.5	5.8	2.5	1.5	497.5	8.2
Gratwick Rvrsd Pk	15	3.4	28	2.8	67	5.1	32	3.1	21	2.0	20	3.0	0	0.0	0	0.0	183	3.0
Griffon Pk	6	1.4	36	3.5	34.5	2.6	7.5	0.7	7.5	0.7	9.5	1.4	3	0.9	0	0.0	104	1.7
Wood's Crk	3	0.7	16	1.6	31.5	2.4	23.5	2.3	10	1.0	10.5	1.6	2	0.6	0	0.0	96.5	1.6
West Rvr Prkwy	2	0.5	8	0.8	6	0.5	6	0.6	8	0.8	2	0.3	0	0.0	0	0.0	32	0.5

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.1.4-1 (CONT.)

**MONTHLY COUNTS OF SHORE ANGLERS AT SURVEYED ACCESS POINTS, UPPER NIAGARA RIVER ANGLER SURVEY,
2003**

	April		May		June		July		August		September		October		November		Site Usage	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Beaver Is St Pk	99	22.6	93.5	9.2	closed to all angling							0.0	4.5	1.3	11.5	6.8	208.5	3.5
Northern sites subtotal	152.5		296.5		396		310.5		286		226		44		19		1,730.5	28.7
Monthly totals	437.5		1,016.5		1,313.5		1,041.5		1,047.5		677		334.5		169		6,037	
Monthly usage (%)	7.2		16.8		21.8		17.3		17.4		11.2		5.5		2.8			

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.1.4-2

**SEASONAL COUNTS OF SHORE ANGLERS FISHING AT SURVEYED ACCESS POINTS,
UPPER NIAGARA RIVER ANGLER SURVEY, 2003**

	Spring		Summer		Fall		Site Usage	
	# Anglers	%	# Anglers	%	# Anglers	%	# Anglers	%
Bird Island	81	3.5	131	5.0	61	5.4	273	4.5
Ferry Street	363	15.9	557	21.2	285	25.3	1,205	20.0
Squaw Island	503	22.0	321	12.2	235	20.8	1,059	17.5
Towpath Park	122.5	5.4	125	4.8	52.5	4.7	300	5.0
Ontario Street	340	14.9	512	19.5	176	15.6	1,028	17.0
Riverside Park	118	5.2	95	3.6	27	2.4	240	4.0
Sheridan Drive	81.5	3.6	97	3.7	23	2.0	201.5	3.3
Buffalo sites subtotal	1,609		1,838		859.5		4,306.5	71.3
Isle View Park	67	2.9	89	3.4	23	2.0	179	3.0
Niawanda Park	90	3.9	252	9.6	88	7.8	430	7.1
Fisherman's Park	112.5	4.9	289	11.0	96	8.5	497.5	8.2
Gratwick Riverside Park	89	3.9	76	2.9	18	1.6	183	3.0
Griffon Park	70.5	3.1	21	0.8	12.5	1.1	104	1.7
Mouth of Wood's Creek	39	1.7	45	1.7	12.5	1.1	96.5	1.6
West River Parkway	14	0.6	16	0.6	2	0.2	32	0.5
Beaver Island State Park	192.5	8.4	closed to angling		16	1.4	208.5	3.5
Northern sites subtotal	674.5		788		268		1,730.5	28.7
Seasonal totals	2,283.5		2,626		1,127.5		6,037	
Seasonal usage (%)	37.8		43.5		18.7			

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.1.4-3

ANGLER USE OF SUB-SITES AT THREE SHORE ACCESS SITES, UPPER NIAGARA RIVER ANGLER SURVEY, 2003

Shore anglers	Bird Island Pier			Squaw Island			West River Parkway			
	River side	Canal side	Total	Canal entrance	RR bridge	Total	North	Middle	South	Total
Counted	125	141	266	975	70	1,045	8	3	21	32
% each sub-site	47.0	53.0		93.3	6.7		25.0	9.4	65.6	
Interviewed	98	112	210	824	31	855	0	3	19	22
% each sub-site	46.7	53.3		96.4	3.6		0	13.6	86.4	

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.1.4-4

NUMBER OF SHORE ANGLERS INTERVIEWED MONTHLY AT EACH ACCESS SITE, UPPER NIAGARA RIVER ANGLER SURVEY, 2003

	April	May	June	July	August	September	October	November	Total interviewed	Percent of total
Bird Island Pier	16	29	47	33	34	39	11	1	210	4.1
Ferry Street	43	135	174	187	175	101	61	31	907	17.7
Squaw Island	116	185	154	92	107	67	76	58	855	16.7
Towpath Park	18	52	78	51	39	33	6	3	280	5.5
Ontario Street	33	142	186	159	148	98	34	18	818	16.0
Riverside Park	29	50	55	41	16	7	6	9	213	4.2
Sheridan Drive	0	28	69	53	31	22	2	0	205	4.0
Isle View Park	1	39	33	47	27	16	4	1	168	3.3
Niawanda Park	9	21	98	74	72	65	9	4	352	6.9
Fisherman's Park	12	56	101	111	116	93	18	2	509	9.9
Gratwick Park	15	36	64	31	19	19	0	0	184	3.6
Griffon Park	6	37	42	8	8	14	4	0	119	2.3
Mouth of Wood's Creek	5	18	37	28	11	14	1	0	114	2.2
West River Parkway	2	10	1	3	4	2	0	0	22	0.4
Beaver Island State Park	83	66	Closed to all angling				7	12	168	3.3
Total	388	904	1,139	918	807	590	239	139	5,124	100.0
Percent	7.6	17.6	22.2	17.9	15.7	11.5	4.7	2.7	100.0	

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.1.4-5

**SEASONAL DISTRIBUTION OF SHORE ANGLER INTERVIEWS AMONG ACCESS POINTS
AND SUB-SITES, UPPER NIAGARA RIVER ANGLER SURVEY, 2003**

	Spring		Summer		Fall		Total	
	N	%	N	%	N	%	N	%
Bird Island Pier-river	29	1.4	44	2.0	25	2.7	98	1.9
Bird Island Pier-canal	44	2.2	48	2.2	20	2.2	112	2.2
Ferry St.	303	14.9	414	19.2	190	20.5	907	17.7
Squaw Island-canal	417	20.5	219	10.1	188	20.3	824	16.1
Squaw Island-RR bridge	6	0.3	19	0.9	6	0.6	31	0.6
Towpath Park	117	5.7	123	5.7	40	4.3	280	5.5
Ontario St.	292	14.3	379	17.5	147	15.9	818	16.0
Riverside Park	114	5.6	77	3.6	22	2.4	213	4.2
Sheridan Drive	77	3.8	104	4.8	24	2.6	205	4.0
Isle View Park	60	2.9	87	4.0	21	2.3	168	3.3
Niawanda Park	76	3.7	202	9.3	74	8.0	352	6.9
Fisherman's Park	123	6.0	288	13.3	98	10.6	509	9.9
Gratwick Park	93	4.6	74	3.4	17	1.8	184	3.6
Griffon Park	77	3.8	24	1.1	18	1.9	119	2.3
Wood's Creek Mouth	47	2.3	52	2.4	15	1.6	114	2.2
West River Parkway-north	0	0.0	0	0.0	0	0.0	0	0.0
West River Parkway-middle	2	0.1	1	0.0	0	0.0	3	0.1
West River Parkway-south	11	0.5	6	0.3	2	0.2	19	0.4
Beaver Island State Park	149	7.3	closed to angling		19	2.1	168	3.3
Seasonal totals	2,037		2,161		926		5,124	
Percent	39.8		42.2		18.1			

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

**TABLE 3.1.5-1
SPECIES AND SPECIES GROUPS SOUGHT BY SHORE ANGLERS, UPPER NIAGARA
RIVER ANGLER SURVEY, 2003**

	Spring		Summer		Fall		Grand total	
	No. anglers	%						
Anything	1,288	63.2	1,716	79.4	604	65.2	3,608	70.4
Black bass	84	4.1	335	15.5	104	11.2	523	10.2
Yellow perch	339	16.6	22	1.0	152	16.4	513	10.0
Northern pike	105	5.2	32	1.5	9	1.0	146	2.8
Rock bass	58	2.8	30	1.4	5	0.5	93	1.8
Trout	62	3.0	1	0.0	24	2.6	87	1.7
White bass	48	2.4	8	0.4	1	0.1	57	1.1
Other species*	53	2.6	17	0.8	27	2.9	97	1.9
Totals	2,037		2,161		926		5,124	

* Other species include: muskellunge, minnows/bait, common carp, brown bullhead, catfish, white perch, black crappie, sunfish, walleye, freshwater drum.

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.1.5-2

SPECIES OR SPECIES GROUPS SOUGHT MONTHLY BY SHORE ANGLERS, UPPER NIAGARA RIVER ANGLER SURVEY, 2003

Species	April	May	June	July	August	September	October	November	Total.	
	%	%	%	%	%	%	%	%	Interviewed	%
Trout	7.8	3.2	0.4	0.1	0	0	6.5	6.6	87	1.7
Northern pike	1.8	8.0	3.4	1.4	1.1	0.2	3.0	0.7	146	2.8
White bass	0.0	2.9	2.1	0.9	0.0	0.2	0.0	0.0	57	1.1
Rock bass	1.8	3.4	2.5	1.2	1.5	0.9	0.0	0.0	93	1.8
Black bass	0.3	4.8	9.8	12.9	18.3	15.9	5.6	1.5	523	10.2
Yellow perch	31.3	17.1	6.7	0.9	1.0	2.8	19.5	67.2	513	10.0
Anything	56.9	60.5	75.2	82.6	78.1	80.1	65.4	24.1	3,608	70.4
Other species*	1.3	3.9	1.6	0.5	1.0	3.0	3.5	1.5	97	1.9
Total interviewed	383	870	1,121	913	799	573	231	137	5,124	

* Other species include: muskellunge, minnows/bait, common carp, brown bullhead, catfish, white perch, black crappie, sunfish, walleye, freshwater drum.

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.1.5-3

SPECIES SOUGHT BY SHORE ANGLERS AT FIFTEEN ACCESS SITES, UPPER NIAGARA RIVER ANGLER SURVEY, 2003

		Trout	Northern pike	White bass	Rock bass	Black bass	Yellow perch	Other species	Anything	Total interviewed
Bird Island Pier	N	17	4	0	4	20	7	6	152	210
	%	8.1	1.9	0.0	1.9	9.5	3.3	2.9	72.4	
Ferry Street	N	28	0	47	8	119	68	16	621	907
	%	3.1	0.0	5.2	0.9	13.1	7.5	1.8	68.5	
Squaw Island	N	26	27	8	23	44	204	26	497	855
	%	3.0	3.2	0.9	2.7	5.1	23.9	3.0	58.1	
Towpath Park	N	2	5	0	7	23	10	2	231	280
	%	0.7	1.8	0.0	2.5	8.2	3.6	0.7	82.5	
Ontario Street	N	0	10	1	10	53	93	5	646	818
	%	0	1.2	0.1	1.2	6.5	11.4	0.6	79.0	
Riverside Park	N	2	13	0	2	8	26	2	160	213
	%	0.9	6.1	0.0	0.9	3.8	12.2	0.9	75.1	
Sheridan Drive	N	0	12	0	3	27	8	2	153	205
	%	0	5.9	0.0	1.5	13.2	3.9	1.0	74.6	
Isle View Park	N	8	3	0	1	23	2	4	127	168
	%	4.8	1.8	0.0	0.6	13.7	1.2	2.4	75.6	

N equals the number of anglers interviewed.

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.1.5-3 (CONT.)

SPECIES SOUGHT BY SHORE ANGLERS AT FIFTEEN ACCESS SITES, UPPER NIAGARA RIVER ANGLER SURVEY, 2003

		Trout	Northern pike	White bass	Rock bass	Black bass	Yellow perch	Other species	Anything	Total interviewed
Niawanda Park	N	1	16	0	10	63	4	1	257	352
	%	0.3	4.5	0.0	2.8	17.9	1.1	0.3	73.0	
Fisherman's Park	N	0	17	1	1	71	5	13	401	509
	%	0	3.3	0.2	0.2	13.9	1.0	2.6	78.8	
Gratwick Park	N	0	16	0	10	35	4	0	119	184
	%	0	9	0	5	19	2	0	65	
Griffon Park	N	3	2	0	14	0	6	4	90	119
	%	2.5	1.7	0.0	11.8	0.0	5.0	3.4	75.6	
Wood's Creek	N	0	11	0	0	26	2	1	74	114
	%	0	9.6	0.0	0.0	22.8	1.8	0.9	64.9	
West River Parkway	N	0	1	0	0	11	2	0	8	22
	%	0	4.5	0.0	0.0	50.0	9.1	0.0	36.4	
Beaver Island State Park	N	0	9	0	0	0	72	15	72	168
	%	0	5.4	0.0	0.0	0.0	42.9	8.9	42.9	

N equals the number of anglers interviewed.

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.2.1-1

ESTIMATED BOAT ANGLER EFFORT, UPPER NIAGARA RIVER ANGLER SURVEY, 2003

	Total angler hours			Total trips		Trips by fishing location	
	Number	SE	%	Number	%	Site	No. trips
Spring	13,889	4,402	21.4	4,209	25.1	East Channel	6,880
Summer	36,358	11,100	55.9	9,090	54.3	West Channel	4,219
Fall	14,802	4,552	22.8	3,442	20.6	Mainstem river	5,642
Total	65,050*	12,779**		16,741			16,741

*The value for the total angler hours is the sum of the angler hours for all seasons.

**The SE value for the total angler hours is not the sum of the SE values for all seasons, but is calculated as the sum of the variances of the seasonal angler hours.

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

**TABLE 3.2.1-2
SPECIES-SPECIFIC EFFORT BY BOAT ANGLERS, UPPER NIAGARA RIVER ANGLER
SURVEY, 2003**

Target Species	Effort in Angler-hours			
	Spring	Summer	Fall	Total
Black bass*	2,263	21,727	8,141	32,131
Muskellunge	156	2,979	3,454	6,589
Northern pike	3,979	1,489	411	5,880
Yellow perch	624	0	1,069	1,693
Walleye	312	964	82	1,358
Trout	234	0	576	810
Black crappie	234	0	0	234

* Includes smallmouth bass and largemouth bass.

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.2.2-1

**ESTIMATED SHORE FISHING EFFORT BY SEASON AND MONTH DURING THE UPPER
NIAGARA RIVER ANGLER SURVEY, 2003**

Season/ Month	Shore Angler Effort			
	Hours	%	SE	Trips
Spring	36,199	39.9	10,874	18,100
Summer	42,443	46.7	9,383	21,222
Fall	12,171	13.4	5,841	5,532
April	7,548	8.2	2,841	
May	16,067	17.6	3,633	
June	19,820	21.7	4,274	
July	18,490	20.2	4,085	
August	17,033	18.6	3,184	
September	7,883	8.6	2,147	
October	3,485	3.8	1,557	
November	1,205	1.3	797	
Totals	91,530		8,604	44,854

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

**TABLE 3.2.2-2
SPECIES-SPECIFIC EFFORT BY SHORE ANGLERS, UPPER NIAGARA RIVER ANGLER
SURVEY, 2003**

Target Species	Effort in Angler-hours			
	Spring	Summer	Fall	Total
Black bass*	1,493	6,580	1,367	9,439
Yellow perch	6,024	432	1,998	8,454
Northern pike	1,866	628	118	2,613
Rock bass	1,031	589	66	1,686
Trout	1,102	20	315	1,437
White bass	853	157	13	1,023
Walleye	284	157	13	455

* Includes smallmouth bass and largemouth bass

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.3.1-1

TOTAL ESTIMATED CATCH AND HARVEST BY BOAT ANGLERS, UPPER NIAGARA RIVER ANGLER SURVEY, 2003

	Total Catch	SE	Percent of total catch	Total Harvest	SE	Percent of total harvest
Smallmouth bass	33,980	9,232	47.8	2,537	1,558	26.8
Largemouth bass	11,132	5,259	15.7	182	207	1.9
Yellow perch	9,430	6,380	13.3	4,843	5,553	51.2
Northern pike	5,965	2,262	8.4	41	46	0.4
Black crappie	2,344	1,919	3.3	685	897	7.2
Sunfish*	1,570	1,984	2.2	46	106	0.5
Rock bass	1,448	734	2.0	22	55	0.2
Round goby	1,343	1,306	1.9	638	1,104	6.7
Freshwater drum	1,252	755	1.8	16	30	0.2
Muskellunge	1,191	467	1.7	0	0	0.0
Brown bullhead	499	561	0.7	131	143	1.4
Walleye	316	232	0.4	262	224	2.8
Black bass	203	168	0.3	0	0	0.0
Common carp	123	123	0.2	0	0	0.0
Rainbow trout	116	172	0.2	33	82	0.4
Rudd	68	74	0.1	0	0	0.0
White perch	56	136	0.1	0	0	0.0
Catfish	46	104	0.1	0	0	0.0
Brown trout	25	36	0.0	0	0	0.0
Lake trout	21	28	0.0	21	28	0.2
Total	71,126	13,033		9,457	5,952	

* Includes bluegill and pumpkinseed

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.3.1-2

SEASONAL ESTIMATED CATCH AND HARVEST BY BOAT ANGLERS, UPPER NIAGARA RIVER ANGLER SURVEY, 2003

	Spring				Summer				Fall			
	Catch	SE	Harvest	SE	Catch	SE	Harvest	SE	Catch	SE	Harvest	SE
Smallmouth bass	8,920	5,067	0	0	19,224	7,037	1,832	1,020	5,835	3,169	705	1,178
Largemouth bass	3,999	3,281	0	0	3,014	1,585	160	200	4,120	3,792	22	55
Yellow perch	3,142	2,573	752	923	1,654	1,394	192	353	4,634	5,669	3,898	5,464
Northern pike	4,187	1,952	25	36	1,622	1,132	16	29	156	158	0	0
Black crappie	2,344	1,919	685	897								
Sunfish*	85	111	0	0	490	603	0	0	995	1,887	46	106
Rock bass	428	359	0	0	941	631	0	0	78	108	22	55
Round goby					539	600	16	30	804	1,160	622	1,103
Freshwater drum	124	121	0	0	890	660	16	30	238	347	0	0
Muskellunge	255	145	0	0	679	384	0	0	257	221	0	0
Brown bullhead	499	561	131	143								
Walleye					294	229	262	224	22	39	0	0
Black bass	170	147	0	0					33	83	0	0
Common carp	46	45	0	0	66	112	0	0	11	27	0	0
Rainbow trout	50	51	0	0					67	164	33	82
Rudd	25	36	0	0	32	59	0	0	11	27	0	0
White perch									56	136	0	0
Catfish									46	104	0	0

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.3.1-2 (CONT.)

SEASONAL ESTIMATED CATCH AND HARVEST BY BOAT ANGLERS, UPPER NIAGARA RIVER ANGLER SURVEY, 2003

	Spring				Summer				Fall			
	Catch	SE	Harvest	SE	Catch	SE	Harvest	SE	Catch	SE	Harvest	SE
Brown trout	25	36	0	0								
Lake trout	21	28	21	28								
Total	24,320	7,147	1,615	1,296	29,445	7,552	2,494	1,122	17,361	7,857	5,349	5,700

* Includes bluegill and pumpkinseed

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

**TABLE 3.3.2-1
TOTAL ESTIMATED CATCH AND HARVEST BY SHORE ANGLERS, UPPER NIAGARA
RIVER ANGLER SURVEY, 2003**

Species	Catch			Harvest		
	Number	SE	%	Number	SE	%
Yellow perch	51,430	26,852	27.7	18,645	12,063	23.6
Round goby	45,904	32,116	24.7	40,850	31,172	51.7
Rock bass	35,208	25,280	19.0	9,429	12,246	11.9
Smallmouth bass	24,353	14,464	13.1	1,617	1,944	2.0
Freshwater drum	6,288	6,054	3.4	119	411	0.2
Sunfish*	5,104	4,165	2.7	1,414	2,685	1.8
Minnows/baitfish	4,970	6,302	2.7	3,758	5,017	4.8
Largemouth bass	4,461	3,556	2.4	153	302	0.2
White perch	2,655	14,800	1.4	1,339	4,556	1.7
White bass	1,257	2,420	0.7	406	932	0.5
Northern pike	1,058	1,382	0.6	196	570	0.2
Brown bullhead	645	1,024	0.3	518	977	0.7
Other fishes**	2,305	-	1.2	595	-	0.8
Totals	185,637	54,229		79,040	35,082	

* Bluegill and pumpkinseed.

** See [Table 3.3.2-2](#).

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.3.2-2

**TOTAL ESTIMATED CATCH AND HARVEST OF "OTHER FISHES" BY SHORE ANGLERS,
UPPER NIAGARA RIVER ANGLER SURVEY, 2003**

Other Species	Catch		Harvest	
	Number	SE	Number	SE
Black bass	412	1,289	0	0
Common carp	332	950	203	901
Walleye	314	1,295	13	74
Rainbow trout	293	762	91	203
Catfish*	267	630	121	429
Black crappie	142	427	32	220
White sucker	125	294	14	78
Muskellunge	101	259	0	0
Brown trout	100	281	89	275
Redhorse sucker	72	406	21	195
Golden shiner	67	133	0	0
Bowfin	39	159	0	0
Lake trout	37	285	5	28
Unidentified salmonid	6	31	6	31
Totals	2,305		595	

* Includes channel catfish.

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.3.2-3

**SEASONAL ESTIMATED CATCH AND HARVEST OF THE 12 MOST NUMEROUS FISH CAUGHT BY SHORE ANGLERS,
UPPER NIAGARA RIVER ANGLER SURVEY, 2003**

	Spring				Summer				Fall			
	Catch	SE	Harvest	SE	Catch	SE	Harvest	SE	Catch	SE	Harvest	SE
Yellow perch	30,606	38,294	10,490	15,773	6,848	12,414	1,725	4,949	14,610	17,202	6,190	7,817
Round goby	12,334	23,941	10,459	23,122	25,045	37,781	22,483	36,642	7,737	13,231	7,592	13,235
Rock bass	18,376	31,550	5,477	14,548	15,638	17,971	3,766	9,313	1,170	2,497	134	417
Smallmouth bass	6,732	14,954	115	564	12,011	13,347	1,323	2,941	5,927	9,562	179	386
Freshwater drum	3,793	7,502	45	352	2,467	4,946	74	496	131	399	0	0
Minnnows/baitfish	1,942	7,004	623	3,808	2,203	6,996	2,196	6,996	1,497	4,542	1,487	4,541
Sunfish*	1,485	3,555	196	1,650	2,874	5,090	934	3,454	1,045	1,751	262	859
Largemouth bass	1,133	2,498	19	125	2,161	3,594	86	349	1,221	2,336	14	54
White perch	382	2,205	379	2,204	2,028	24,896	692	7,195	296	875	245	748
White bass	1,110	3,607	356	1,277	106	592	42	327	79	348	15	128
Northern pike	749	2,060	137	718	199	745	33	232	180	452	15	91
Brown bullhead	462	1,589	403	1,565	166	942	102	873	13	65	8	52
Other fishes	892	-	414	-	763	-	91	-	641	-	49	0
Total	79,996	58,402	29,112	32,000	72,509	53,112	33,546	39,708	34,547	24,568	16,191	16,081

* Includes bluegill and pumpkinseed

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.3.2-4

SEASONAL ESTIMATED CATCH AND HARVEST OF "OTHER FISHES" CAUGHT BY SHORE ANGLERS, UPPER NIAGARA RIVER ANGLER SURVEY, 2003

	Spring				Summer				Fall			
	Catch	SE	Harvest	SE	Catch	SE	Harvest	SE	Catch	SE	Harvest	SE
Black bass	20	241	0	0	153	1,493	0	0	218	1,297	0	0
Walleye	36	229	6	81	67	593	0	0	212	1,540	7	47
Common carp	184	937	144	920	113	503	32	287	7	46	0	0
Rainbow trout	201	951	51	284	28	216	0	0	46	224	43	223
Catfish*	210	920	98	647	7	88	7	88	50	301	0	0
White sucker	53	230	12	100	88	600	0	0	3	31	0	0
Black crappie	15	113	0	0	125	603	31	340	0	0	0	0
Muskellunge	56	284	0	0	36	303	0	0	12	84	0	0
Brown trout	103	640	92	624	0	0	0	0	0	0	0	0
Golden shiner	0	0	0	0	0	0	0	0	93	578	0	0
Redhorse sucker	0	0	0	0	75	669	21	296	0	0	0	0
Lake trout	9	92	6	84	38	472	0	0	0	0	0	0
Bowfin	0	0	0	0	34	241	0	0	0	0	0	0
Unidentified salmonid	7	94	7	94	0	0	0	0	0	0	0	0

* Includes channel catfish

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

**TABLE 3.3.2-5
MONTHLY ESTIMATED CATCH AND HARVEST OF THE 12 MOST NUMEROUS FISH CAUGHT BY SHORE ANGLERS,
UPPER NIAGARA RIVER ANGLER SURVEY, 2003**

	April				May				June				July			
	Catch	SE	Harvest	SE	Catch	SE	Harvest	SE	Catch	SE	Harvest	SE	Catch	SE	Harvest	SE
Yellow perch	8,659	10,847	3,666	3,501	13,074	13,829	4,782	7,756	9,955	15,424	2,729	6,440	1,476	1,934	224	706
Round goby	29	161	29	161	7,026	11,352	5,191	10,524	8,546	16,015	8,086	16,002	9,906	15,569	8,548	14,711
Rock bass	89	343	73	340	7,973	15,394	2,806	8,917	14,769	17,692	4,063	7,070	7,743	7,222	1,362	3,373
Smallmouth bass	0	0	0	0	2,906	8,470	59	305	4,238	4,663	204	523	6,005	6,050	542	1,383
Freshwater drum	0	0	0	0	862	2,169	7	58	3,181	4,709	41	268	1,292	2,572	55	270
Sunfishes	0	0	0	0	449	1,380	0	0	1,161	2,250	227	1,345	882	1,851	329	1,335
Minnows/baitfish	9	28	0	0	1,607	4,360	542	2,205	128	622	0	0	117	472	117	472
Largemouth bass	4	23	4	23	466	1,125	0	0	921	1,414	34	121	1,151	2,062	57	209
White perch	0	0	0	0	315	1,368	311	1,367	100	652	100	652	1,835	14,702	594	4,239
White bass	0	0	0	0	818	2,231	174	535	264	848	183	735	77	333	14	109
Northern pike	92	234	0	0	407	1,093	139	529	289	705	20	156	37	131	10	63
Brown bullhead	188	535	178	534	221	528	197	508	126	629	95	615	35	174	16	127

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.3.2-5 (CONT.)

**MONTHLY ESTIMATED CATCH AND HARVEST OF THE 12 MOST NUMEROUS FISH CAUGHT BY SHORE ANGLERS,
UPPER NIAGARA RIVER ANGLER SURVEY, 2003**

	August				September				October				November			
	Catch	SE	Harvest	SE	Catch	SE	Harvest	SE	Catch	SE	Harvest	SE	Catch	SE	Harvest	SE
Yellow perch	4,569	8,387	1,449	3,186	4,797	7,587	2,040	3,555	4,972	5,592	2,038	2,219	3,929	3,364	1,717	1,851
Round goby	12,652	17,800	11,434	17,365	4,640	8,587	4,506	8,589	2,293	3,481	2,251	3,480	812	993	806	992
Rock bass	3,494	5,931	994	2,986	421	757	26	88	620	989	92	220	100	237	14	73
Smallmouth bass	5,139	5,667	613	1,185	5,429	6,732	170	300	618	1,291	30	61	19	29	0	0
Freshwater drum	808	1,753	16	144	107	245	0	0	31	119	0	0	8	34	0	0
Sunfishes	1,555	2,372	596	1,868	732	1,071	84	209	325	424	179	297	0	0	0	0
Minnnows/baitfish	1,497	3,023	1,497	3,023	1,223	3,178	1,223	3,178	391	925	379	922	0	0	0	0
Largemouth bass	700	1,069	31	178	1,142	1,993	6	24	77	113	21	14	0	0	0	0
White perch	103	460	85	429	190	528	190	528	105	327	51	178	8	14	8	14
White bass	36	187	23	165	11	55	0	0	6	28	4	26	45	91	8	54
Northern pike	55	278	12	109	94	199	13	69	53	168	0	0	31	52	2	12
Brown bullhead	60	231	21	116	15	63	10	54	0	0	0	0	0	0	0	0

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

**TABLE 3.3.2-6
MONTHLY ESTIMATED CATCH AND HARVEST OF THE "OTHER FISHES" CAUGHT BY SHORE ANGLERS, UPPER
NIAGARA RIVER ANGLER SURVEY, 2003**

	April				May				June				July			
	Catch	SE	Harvest	SE												
Black bass	0	0	0	0	19	158	0	0	57	408	0	0	121	929	0	0
Common carp	0	0	0	0	22	79	0	0	199	890	172	880	80	282	16	127
Walleye	15	80	0	0	17	91	6	68	12	84	0	0	47	361	0	0
Rainbow trout	35	89	25	80	90	469	22	130	97	566	0	0	0	0	0	0
Catfish*	35	192	35	192	142	518	79	379	32	169	0	0	0	0	0	0
Black crappie	0	0	0	0	0	0	0	0	50	259	0	0	66	283	32	220
White sucker	0	0	0	0	35	156	10	71	24	89	5	33	25	128	0	0
Muskellunge	7	38	0	0	14	80	0	0	33	162	0	0	33	175	0	0
Brown trout	85	264	74	258	15	95	15	95	0	0	0	0	0	0	0	0
Redhorse sucker	0	0	0	0	0	0	0	0	0	0	0	0	46	353	0	0
Golden shiner	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bowfin	0	0	0	0	0	0	0	0	0	0	0	0	39	159	0	0
Lake trout	5	28	5	28	0	0	0	0	32	284	0	0	0	0	0	0
Unidentified salmonid	6	31	6	31	0	0	0	0	0	0	0	0	0	0	0	0

* Includes channel catfish

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.3.2-6 (CONT.)

**MONTHLY ESTIMATED CATCH AND HARVEST OF THE "OTHER FISHES" CAUGHT BY SHORE ANGLERS, UPPER
NIAGARA RIVER ANGLER SURVEY, 2003**

	August				September				October				November			
	Catch	SE	Harvest	SE	Catch	SE	Harvest	SE	Catch	SE	Harvest	SE	Catch	SE	Harvest	SE
Black bass	0	0	0	0	116	442	0	0	99	641	0	0	0	0	0	0
Common carp	16	144	16	144	16	63	0	0	0	0	0	0	0	0	0	0
Walleye	16	115	0	0	187	1,227	0	0	19	81	7	30	0	0	0	0
Rainbow trout	24	120	0	0	4	21	0	0	37	131	37	131	6	28	6	28
Catfish*	8	55	8	55	52	245	0	0	0	0	0	0	0	0	0	0
Black crappie	26	187	0	0	0	0	0	0	0	0	0	0	0	0	0	0
White sucker	7	42	0	0	33	189	0	0	0	0	0	0	0	0	0	0
Muskellunge	0	0	0	0	0	0	0	0	14	46	0	0	0	0	0	0
Brown trout	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Redhorse sucker	26	199	21	195	0	0	0	0	0	0	0	0	0	0	0	0
Golden shiner	0	0	0	0	0	0	0	0	0	0	0	0	67	133	0	0
Bowfin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lake trout	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified salmonid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Includes channel catfish

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.4.1-1

SEASONAL AND MONTHLY OVERALL CATCH AND HARVEST RATES FOR BOAT ANGLERS, UPPER NIAGARA RIVER ANGLER SURVEY, 2003

	CPUE	SE	HPUE	SE
Spring	1.78	0.56	0.11	0.09
Summer	0.79	0.10	0.08	0.03
Fall	1.19	0.29	0.23	0.12
April	2.86	2.90	0.06	0.08
May	1.96	0.68	0.17	0.16
June	0.89	0.19	0.06	0.04
July	0.65	0.13	0.03	0.01
August	0.85	0.18	0.11	0.07
September	0.84	0.16	0.08	0.04
October	1.92	0.76	0.23	0.17
November	1.46	0.96	0.67	0.50
Total	1.08	0.15	0.13	0.04

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.4.2-1

TARGETED CATCH AND HARVEST RATES FOR BOAT ANGLERS, UPPER NIAGARA RIVER ANGLER SURVEY, 2003

	Spring				Summer				Fall				Entire Survey Total			
	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE
Trout	0.00		0.00						0.34	0.26	0.17	0.13	0.29	0.25	0.15	0.13
Northern pike	0.45	0.22	0.00	0.01	0.52	0.34	0.00		0.21	0.14	0.00		0.45	0.17	0.00	0.00
Muskellunge	0.00		0.00		0.08	0.04	0.00		0.07	0.03	0.00		0.07	0.03	0.00	0.00
Smallmouth bass	2.20	2.10	0.00	0.00	0.81	0.14	0.09	0.04	0.45	0.12	0.03	0.04	0.84	0.17	0.07	0.03
Largemouth bass	4.00		0.00		1.17	0.54	0.00	0.00	0.99	0.56	0.00	0.00	1.52	0.54	0.00	0.00
Black crappie	4.29		2.38										4.29	0.00	2.38	0.00
Yellow perch	6.32	2.84	1.61	1.23					4.02	0.98	2.90	0.96	4.68	1.16	2.53	0.79
Walleye	0.00	0.00	0.00	0.00	0.13	0.06	0.13	0.06	0.00		0.00		0.11	0.05	0.11	0.05

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

**TABLE 3.4.2-2
TARGETED CPUE AND HPUE BY MONTH FOR BOAT ANGLERS, UPPER NIAGARA
RIVER ANGLER SURVEY, 2003**

Month	Parameter	Northern Pike			Muskellunge			Smallmouth Bass		
		Rate	SE	N*	Rate	SE	N	Rate	SE	N
April	CPUE	0.00	0.00	3			0			
	HPUE	0.00	0.00							
May	CPUE	0.38	0.23	26	0.00	0.00	2	2.80	1.08	16
	HPUE	0.01	0.01		0.00	0.00		0.00	0.00	
June	CPUE	0.64	0.31	28	0.10	0.08	15	0.88	0.40	43
	HPUE	0.00	0.00		0.00	0.00		0.03	0.04	
July	CPUE	0.39	0.37	10	0.10	0.07	8	0.75	0.20	62
	HPUE	0.00	0.00		0.00	0.00		0.02	0.02	
August	CPUE	0.14		1	0.03	0.04	11	0.80	0.19	103
	HPUE	0.00			0.00	0.00		0.14	0.07	
September	CPUE	0.00	0.00	2	0.11	0.12	7	0.46	0.12	67
	HPUE	0.00	0.00		0.00	0.00		0.03	0.04	
October	CPUE	0.40		2	0.02	0.03	10	0.00		4
	HPUE	0.00			0.00	0.00		0.00		
November	CPUE	0.00		1	0.07	0.04	25			
	HPUE	0.00			0.00	0.00				

*N is the number of anglers seeking that species.

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.4.2-3

TARGETED CATCH AND HARVEST RATES OF BOAT ANGLERS BY RIVER SECTION, UPPER NIAGARA RIVER ANGLER SURVEY, 2003

Targeted Species	East Channel				West Channel				Mainstem River				Multiple River Locations			
	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE
Smallmouth bass	0.96	0.29	0.08	0.05	0.53	0.23	0.07	0.10	0.80	0.18	0.06	0.05	0.71	0.37	0.03	0.05
Muskellunge	0.10	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.04	0.00	0.00	0.06	0.03	0.00	0.00
Northern pike	0.28	0.19	0.01	0.02	0.08	0.05	0.00	0.00	0.72	0.30	0.00	0.00	0.38	0.28	0.00	0.00

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.4.3-1

SEASONAL AND MONTHLY OVERALL CATCH AND HARVEST RATES FOR SHORE ANGLERS, UPPER NIAGARA RIVER ANGLER SURVEY, 2003

	CPUE	SE	HPUE	SE
Spring	2.15	0.15	0.79	0.08
Summer	1.70	0.11	0.78	0.08
Fall	2.73	0.22	1.32	0.14
April	1.23	0.23	0.55	0.10
May	2.28	0.25	0.89	0.15
June	2.20	0.17	0.74	0.09
July	1.68	0.22	0.64	0.13
August	1.79	0.15	0.97	0.12
September	2.22	0.23	0.98	0.16
October	2.99	0.50	1.52	0.32
November	3.92	0.65	2.09	0.38
Total	2.10	0.09	0.90	0.05

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.4.3-2

**SEASONAL GENERAL CATCH AND HARVEST RATES FOR SELECTED SPECIES CAUGHT BY SHORE ANGLERS, UPPER
NIAGARA RIVER ANGLER SURVEY, 2003**

	Spring				Summer				Fall				Total			
	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE
Round goby	0.31	0.04	0.26	0.04	0.55	0.06	0.50	0.06	0.56	0.10	0.55	0.10	0.46	0.04	0.42	0.04
Rock bass	0.50	0.10	0.16	0.05	0.38	0.04	0.09	0.02	0.11	0.03	0.01	0.00	0.37	0.04	0.10	0.02
Smallmouth bass	0.18	0.03	0.00	0.00	0.28	0.02	0.03	0.00	0.41	0.07	0.01	0.00	0.27	0.02	0.02	0.00
Yellow perch	0.84	0.08	0.28	0.04	0.16	0.03	0.04	0.01	1.23	0.16	0.55	0.07	0.65	0.05	0.24	0.02

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.4.3-3

**MONTHLY GENERAL CATCH AND HARVEST RATES FOR SELECTED SPECIES CAUGHT
BY SHORE ANGLERS, UPPER NIAGARA RIVER ANGLER SURVEY, 2003**

		Round goby	Rock bass	Smallmouth bass	Yellow perch
April	CPUE	0.00	0.01		1.13
	SE	0.00	0.01		0.23
	HPUE	0.00	0.01		0.48
	SE	0.00	0.01		0.10
May	CPUE	0.37	0.55	0.20	0.82
	SE	0.07	0.19	0.07	0.12
	HPUE	0.29	0.22	0.00	0.28
	SE	0.06	0.12	0.00	0.06
June	CPUE	0.39	0.72	0.22	0.52
	SE	0.07	0.12	0.03	0.08
	HPUE	0.37	0.19	0.01	0.12
	SE	0.07	0.04	0.00	0.03
July	CPUE	0.52	0.41	0.33	0.09
	SE	0.10	0.05	0.04	0.02
	HPUE	0.47	0.07	0.03	0.01
	SE	0.10	0.02	0.01	0.01
August	CPUE	0.65	0.21	0.30	0.23
	SE	0.10	0.05	0.04	0.06
	HPUE	0.59	0.06	0.03	0.07
	SE	0.10	0.03	0.01	0.02
September	CPUE	0.52	0.06	0.60	0.54
	SE	0.12	0.02	0.10	0.12
	HPUE	0.50	0.00	0.02	0.24
	SE	0.12	0.00	0.01	0.06
October	CPUE	0.69	0.21	0.18	1.49
	SE	0.22	0.12	0.08	0.34
	HPUE	0.67	0.03	0.01	0.56
	SE	0.22	0.01	0.00	0.12

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.4.3-3 (CONT.)

**MONTHLY GENERAL CATCH AND HARVEST RATES FOR SELECTED SPECIES CAUGHT
BY SHORE ANGLERS, UPPER NIAGARA RIVER ANGLER SURVEY, 2003**

		Round goby	Rock bass	Smallmouth bass	Yellow perch
November	CPUE	0.49	0.09	0.02	3.20
	SE	0.16	0.04	0.01	0.60
	HPUE	0.49	0.02	0.00	1.56
	SE	0.16	0.01	0.00	0.33

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.4.4-1

TARGETED CATCH AND HARVEST RATES FOR SHORE ANGLERS, UPPER NIAGARA RIVER ANGLER SURVEY, 2003

	Spring				Summer				Fall				Total			
	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE
Trout	0.09	0.04	0.09	0.04	0.00		0.00		0.10	0.05	0.10	0.05	0.09	0.03	0.09	0.03
Northern pike	0.18	0.09	0.04	0.02	0.08	0.04	0.00	0.00	0.19	0.14	0.00	0.00	0.16	0.06	0.03	0.02
Smallmouth bass	1.08	0.45	0.00	0.00	0.42	0.12	0.03	0.03	0.57	0.21	0.08	0.08	0.55	0.12	0.03	0.02
Largemouth bass	0.00		0.00		0.40	0.17	0.00	0.00	0.00		0.00		0.36	0.16	0.00	0.00
Yellow perch	2.71	0.34	0.97	0.15	1.19	0.51	0.53	0.30	4.30	0.60	2.00	0.30	3.16	0.29	1.29	0.14
White bass	0.26	0.07	0.24	0.07	0.00	0.00	0.00	0.00	0.00		0.00		0.24	0.06	0.23	0.06
Rock bass	4.91	1.56	1.09	0.34	0.84	0.35	0.61	0.35	0.38		0.38		3.76	1.16	0.95	0.26

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.4.4-2

TARGETED CPUE AND HPUE BY MONTH FOR SHORE ANGLERS, UPPER NIAGARA RIVER ANGLER SURVEY, 2003

Month	Parameter	Northern Pike			Yellow Perch			Smallmouth Bass			Largemouth Bass		
		Rate	SE	N	Rate	SE	N	Rate	SE	N	Rate	SE	N
April	CPUE	0.44	0.35	7	2.06	0.49	120	0.00		1			
	HPUE	0.00	0.00		0.87	0.20		0.00					
May	CPUE	0.23	0.14	70	2.84	0.52	149	1.25	0.56	9	0.00		2
	HPUE	0.07	0.05		1.12	0.28		0.00	0.00		0.00		
June	CPUE	0.05	0.03	38	3.67	0.82	75	0.50	0.29	25	0.27	0.18	8
	HPUE	0.00	0.00		0.82	0.22		0.00	0.00		0.00	0.00	
July	CPUE	0.02	0.02	13	0.30	0.30	8	0.57	0.30	16	0.35	0.26	23
	HPUE	0.00	0.00		0.30	0.30		0.10	0.10		0.00	0.00	
August	CPUE	0.08	0.08	9	1.20	0.57	8	0.36	0.14	35	0.86	0.60	4
	HPUE	0.00	0.00		0.90	0.59		0.00	0.00		0.00	0.00	
September	CPUE	0.00		1	3.21	0.77	16	0.60	0.23	10	0.00		1
	HPUE	0.00			1.77	0.74		0.09	0.09		0.00		
October	CPUE	0.27	0.19	7	3.67	1.16	45	0.35		1	0.00		1
	HPUE	0.00	0.00		1.37	0.24		0.00			0.00		
November	CPUE	0.00		1	4.84	0.83	92						
	HPUE	0.00			2.37	0.47							

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.4.4-2 (CONT.)

TARGETED CPUE AND HPUE BY MONTH FOR SHORE ANGLERS, UPPER NIAGARA RIVER ANGLER SURVEY, 2003

Month	Parameter	Trout			Rock bass			White Bass		
		Rate	SE	N	Rate	SE	N	Rate	SE	N
April	CPUE	0.13	0.07	30	0.12	0.12	7			0
	HPUE	0.13	0.07		0.12	0.12				
May	CPUE	0.04	0.02	28	4.42	1.02	30	0.26	0.08	25
	HPUE	0.04	0.02		1.65	0.59		0.25	0.08	
June	CPUE			4	5.34	2.88	28	0.27	0.12	23
	HPUE				0.66	0.28		0.23	0.12	
July	CPUE	0.00		1	0.57	0.47	11	0.00	0.00	8
	HPUE	0.00			0.33	0.33		0.00	0.00	
August	CPUE			0	0.83	0.60	12			0
	HPUE				0.67	0.67				
September	CPUE			0	0.38		5	0.00		1
	HPUE				0.38			0.00		
October	CPUE	0.14	0.08	15			0			0
	HPUE	0.14	0.08							
November	CPUE	0.05	0.05	9			0			0
	HPUE	0.05	0.05							

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.4.4-3

**TARGETED ENTIRE SURVEY CATCH AND HARVEST RATES FOR YELLOW PERCH BY
PRIMARY SHORE FISHING SITE, UPPER NIAGARA RIVER ANGLER SURVEY, 2003**

Fishing Location	Yellow Perch				Number of anglers
	CPUE	SE	HPUE	SE	
Ferry Street	2.42	0.59	1.26	0.25	54
Squaw Island, canal entrance	3.96	0.48	1.51	0.23	185
Ontario Street	3.96	0.85	1.48	0.38	75
Riverside Park	2.57	0.83	0.47	0.23	24
Beaver Island State Park	1.86	0.70	1.03	0.35	53

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.4.5-1

**COMPARISONS OF BLACK BASS SPECIES CATCH AND HARVEST RATES BETWEEN BASS ANGLER TYPES, UPPER
NIAGARA RIVER ANGLER SURVEY, 2003**

Target species or group	Spring				Summer				Fall				Total			
	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE
BOAT ANGLERS																
Smallmouth bass																
Smallmouth bass anglers	2.20	1.04	0.00	0.00	0.81	0.14	0.09	0.04	0.45	0.12	0.03	0.04	0.84	0.17	0.06	0.03
All black bass anglers	2.30		0.00		0.82		0.09		0.54		0.04		0.85		0.07	
Largemouth bass																
Largemouth bass anglers	4.00		0.00		1.17	0.54	0.00	0.00	0.99	0.56	0.00	0.00	1.52	0.54	0.00	0.00
All black bass anglers	0.17		0.00		0.12		0.01		0.62		0.00		0.27		0.01	
SHORE ANGLERS																
Smallmouth bass																
Smallmouth bass anglers	1.08	0.45	0.00	0.00	0.41	0.12	0.03	0.03	0.57	0.21	0.08	0.08	0.55	0.12	0.03	0.02
All black bass anglers	0.92	0.26	0.01	0.01	0.55	0.09	0.05	0.02	0.74	0.11	0.05	0.02	0.65	0.07	0.05	0.01
Largemouth bass																
Largemouth bass anglers	0.00		0.00		0.40	0.17	0.00	0.00	0.00		0.00		0.36	0.16	0.00	0.00
All black bass anglers	0.10	0.08	0.00	0.00	0.16	0.05	0.01	0.01	0.11	0.09	0.00	0.00	0.14	0.04	0.01	0.00

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.5-1

RESIDENCE OF BOAT ANGLERS INTERVIEWED IN THE UPPER NIAGARA RIVER, 2003

Season	Origin	Number Interviewed	%
Spring	Erie Co., Niagara Co., parts of adjacent counties ^a	167	93.8
	Other NY counties	0	0.0
	Other States	11	6.2
	Canada	0	0.0
		178	
Summer	Erie Co., Niagara Co., parts of adjacent counties ^a	402	96.9
	Other NY counties	1	0.2
	Other States	10	2.4
	Canada	2	0.5
		415	
Fall	Erie Co., Niagara Co., parts of adjacent counties ^a	165	92.7
	Other NY counties	7	3.9
	Other States	5	2.8
	Canada	1	0.6
		178	
Total	Erie Co., Niagara Co., parts of adjacent counties ^a	734	95.2
	Other NY counties	8	1.0
	Other States ^b	26	3.4
	Canada	3	0.4
		771	

^a Zip codes 14001-14305 includes proximal portions of Cattaraugus, Chautauqua, Genesee, Orleans, Wyoming counties.

^b Florida, Illinois, Michigan, Massachusetts, Montana, Ohio, Pennsylvania, Rhode Island, Tennessee, West Virginia.

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.5-2

RESIDENCE OF SHORE ANGLERS INTERVIEWED IN THE UPPER NIAGARA RIVER, 2003

Season	Origin	Number Interviewed	%
Spring	Erie Co., Niagara Co., parts of adjacent counties ^a	1,991	97.7
	Other NY counties	33	1.6
	Other States	13	0.6
	Canada	0	0.0
		2,037	
Summer	Erie Co., Niagara Co., parts of adjacent counties ^a	2,092	97.1
	Other NY counties	28	1.3
	Other States	34	1.6
	Canada	0	0.0
		2,154	
Fall	Erie Co., Niagara Co., parts of adjacent counties ^a	917	99.0
	Other NY counties	7	0.8
	Other States	1	0.1
	Canada	1	0.1
		926	
Total	Erie Co., Niagara Co., parts of adjacent counties ^a	5,000	97.7
	Other NY counties	68	1.3
	Other States ^b	48	0.9
	Canada	1	0.0
		5,117	

^a Zip codes 14001-14305 includes proximal portions of Cattaraugus, Chautauqua, Genesee, Orleans, Wyoming counties.

^b Alabama, Alaska, Arizona, California, Connecticut, Florida, Georgia, Illinois, Indiana, Kansas, Michigan, Massachusetts, Montana, New Mexico, North Carolina, Ohio, Oklahoma, Pennsylvania, Puerto Rico, Rhode Island, South Carolina, Tennessee, Texas, Virginia, West Virginia.

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.6.1-1

LENGTH FREQUENCY BY 1 INCH TOTAL LENGTH GROUPS (MEASURED IN MM) FOR FISH HARVESTED BY BOAT ANGLERS, UPPER NIAGARA RIVER ANGLER SURVEY, 2003

Total Length		Rainbow trout	Northern pike	Smallmouth bass	Largemouth bass	Black crappie	Yellow perch	Walleye	Freshwater drum	Lake trout
mm	inches									
178-203	7-8						3			
204-228	8-9						3			
229-254	9-10						2			
255-279	10-11					1	3			
280-304	11-12					2	2			
305-330	12-13			4		1	1			
331-355	13-14			4						
356-381	14-15			11	2					
382-406	15-16			3						
407-432	16-17			6	2			2		1
433-457	17-18			2						
458-483	18-19			3	2			1		
509-533	20-21							2		
534-559	21-22	2						2		
560-584	22-23								1	
585-609	23-24	1								
788-812	31-32		1							
	Total	3	1	33	6	4	14	7	1	1

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.6.1-2

LENGTH FREQUENCY BY 1 INCH TOTAL LENGTH GROUPS (MEASURED IN MM) FOR FISH HARVESTED BY SHORE ANGLERS, UPPER NIAGARA RIVER ANGLER SURVEY, 2003

Total Length		Rnbw trout	Brwn trout	Nrthrn pike	Wht sucker	Brwn bullhead	Wht perch	Wht bass	Rock bass	Smllmth bass	Lrgmth bass	Blek crappie	Yllw perch	Walleye	Lake trout
mm	in.														
102-127	4-5								4						
128-152	5-6												18		
153-177	6-7									1			82		
178-203	7-8								2			1	122		
204-228	8-9								1			1	97		
229-254	9-10						1	1	1	2			63		
255-279	10-11									5	2		19		
280-304	11-12				1	1		1		12			5		
305-330	12-13					1		2		11	1		1		
331-355	13-14							1		8	2		2		
356-381	14-15					1				11	3				
382-406	15-16					1				7	2				
407-432	16-17	2	2							5					
433-457	17-18	1	1	1						3					
458-483	18-19	2	1							4					
484-508	19-20			1						2					1
509-533	20-21	1		1						2					
534-559	21-22			2						1					

**NIAGARA POWER PROJECT (FERC NO. 2216)
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TABLE 3.6.1-2 (CONT.)

LENGTH FREQUENCY BY 1 INCH TOTAL LENGTH GROUPS (MEASURED IN MM) FOR FISH HARVESTED BY SHORE ANGLERS, UPPER NIAGARA RIVER ANGLER SURVEY, 2003

Total Length		Rnbw trout	Brwn trout	Nrthrn pike	Wht sucker	Brwn bullhead	Wht perch	Wht bass	Rock bass	Smllmth bass	Lrgmth bass	Bck crappie	Yllw perch	Walleye	Lake trout
mm	in.														
560-584	22-23	1		3											
585-609	23-24			3											
610-635	23-24			3											
636-660	24-25	1		2											
661-685	25-26			1											
686-711	26-27													1	
712-736	27-28			2											
737-762	28-29			1										1	
762-787	30-31			2											
	Total	8	4	22	1	4	1	5	8	74	10	2	409	2	1

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

TABLE 3.6.1-3

MONTHLY LENGTH FREQUENCY BY 1-INCH TOTAL LENGTH GROUPS (MEASURED IN MM) FOR HARVESTED YELLOW PERCH CAUGHT BY SHORE ANGLERS, UPPER NIAGARA RIVER ANGLER SURVEY, 2003

mm	Total Length Range									Total
	128-152	153-177	178-203	204-228	229-254	255-279	280-304	305-330	331-355	
inches	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	
April	3	10	16	14	6	3	1			53
May	1	7	24	14	11	3	1		1	62
June	5	17	16	10	9	1	2			60
July		5	5	1		2				13
August	4	8	5	2	2			1		22
September		14	24	15	10	3	1		1	68
October	2	16	19	16	11	3				67
November	3	5	13	25	14	4				64
Total	18	82	122	97	63	19	5	1	2	409

**NIAGARA POWER PROJECT (FERC NO. 2216)
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**TABLE 3.6.1-4
ANGLER-ESTIMATED TOTAL LENGTHS (IN INCHES) OF RELEASED MUSKELLUNGE,
UPPER NIAGARA RIVER ANGLER SURVEY, 2003**

Inch Group	Boat Anglers	Shore Anglers
4	1	
10		
12		
13	1	
14		
15		1
16		
17		
18	1	
19		
20	2	1
21		
22	2	
23	1	
24	3	
25		
26	1	
27	1	
28	3	
29		1
30	5	
31	1	
32		
33	1	
34	1	
35	2	
36	4	1
38	2	
40	2	
41	1	
42	3	
44		1
45	1	
48	2	1
52		1
Total	41	7

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**TABLE 3.7.1-1
FISHING TOURNAMENTS DURING 2003 ASSOCIATED WITH THE UPPER NIAGARA RIVER**

Date	Location held (if specified)	Event name	Shore (S)/ Boat (B)	Area(s) fished*	Sponsor
24-May	Ontario St. access	Towpath Fishing Festival	S	river	unknown
7-Jun	Sheridan Dr. access	Children's Derby	S	river	unknown
8-Jun	Buffalo SBH**	Niagara Frontier Bassmasters	B	river/lake	Niagara Frontier Bassmasters
21-Jun	weigh-in at restaurant	Annual Bass Tournament	S/B	river/lake	Wagon Wheel Restaurant, Niagara Falls
21-Jun	Niawanda Park	Children's Derby	S	river	unknown
28-Jun	Sheridan Dr. access	"Pause for the Day" Bass Tournament	S/B	river/lake	unknown
5-Jul	Ontario St./Riverside access	Riverside Business Tournament	S	river	local businesses
17-Jul	Erie Basin Marina	BassEye Celebrity Challenge	B	river/lake	Cystic Fibrosis Foundation
20-Jul	weigh-in at bait shop	"Big Catch" Tournament	S/B	river	Big Catch Bait & Tackle, Buffalo
Jul 26- Aug 3	multiple weigh-in sites	Greater Niagara 2003: A Fish Odyssey	S/B	river/lake	multiple area sponsors
27-Jul	Niawanda Park	Boy Scout Derby	S	river	Boy Scout Troop 413
2-Aug	Buffalo SBH** (event cancelled)	Greater Niagara Team Bass Challenge	B	river/lake	event part of "2003: A Fish Odyssey"
9-Aug	Bluewater Marina	Grand Island Rod & Gun Club Tournament	B	river	Grand Island Rod & Gun Club
23-Aug	Isle View Park	Upper Niagara River-Lake Erie Tournament	B	river/lake	Southern Tier Bassmasters
24-Aug	weigh-in at tavern	KC's Fishing Contest	B	river/lake	KC's Tavern, Niagara Falls

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TABLE 3.7.1-1 (CONT.)

FISHING TOURNAMENTS DURING 2003 ASSOCIATED WITH THE UPPER NIAGARA RIVER

Date	Location held (if specified)	Event name	Shore (S)/ Boat (B)	Area(s) fished*	Sponsor
7-Sep	Buffalo SBH**	Lake Erie-Niagara Tournament	B	river/lake	NY Bass Federation
11-13 Sep	Erie Basin Marina	CITGO Bassmasters Northern Open	B	river/lake	ESPN/B.A.S.S.
14-Sep	Big Sixmile Marina	Upper Niagara River Tournament	B	river	Western NY Bassmasters
9-Nov	Sheridan Dr. access	Club Tagging Tournament	B	river/lake	Niagara Musky Association
15-Nov	Sheridan Dr. access	Club Cash Tournament	B	river/lake	Niagara Musky Association

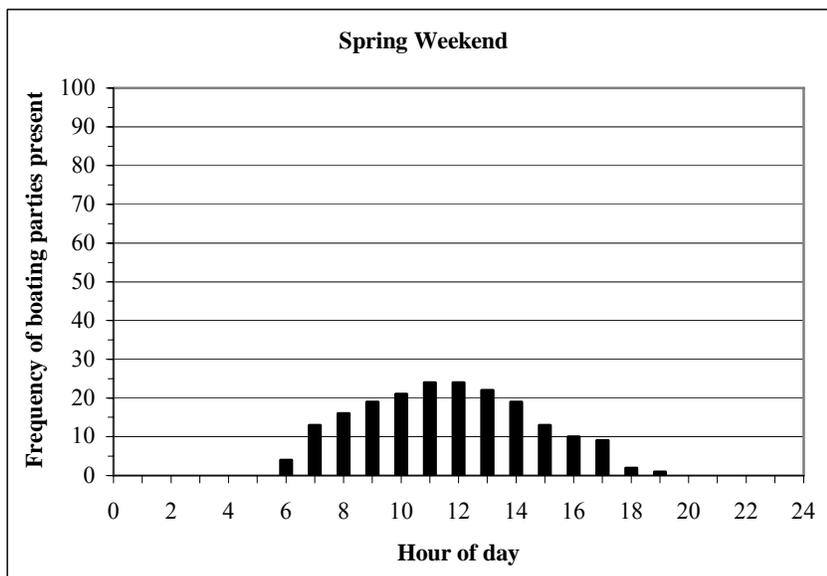
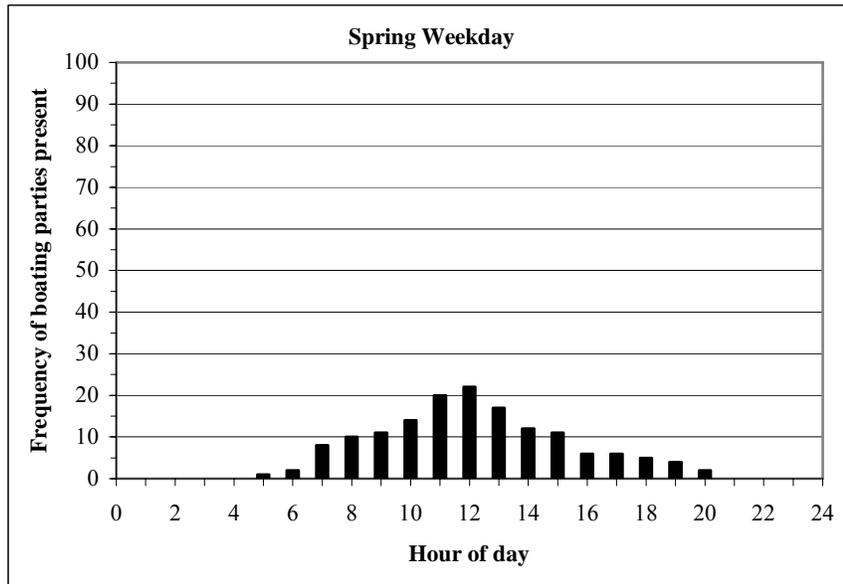
* river = upper Niagara River; river/lake = upper Niagara River and Lake Erie.

** SBH = Small Boat Harbor (Lake Erie).

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FIGURE 3.1.2-1

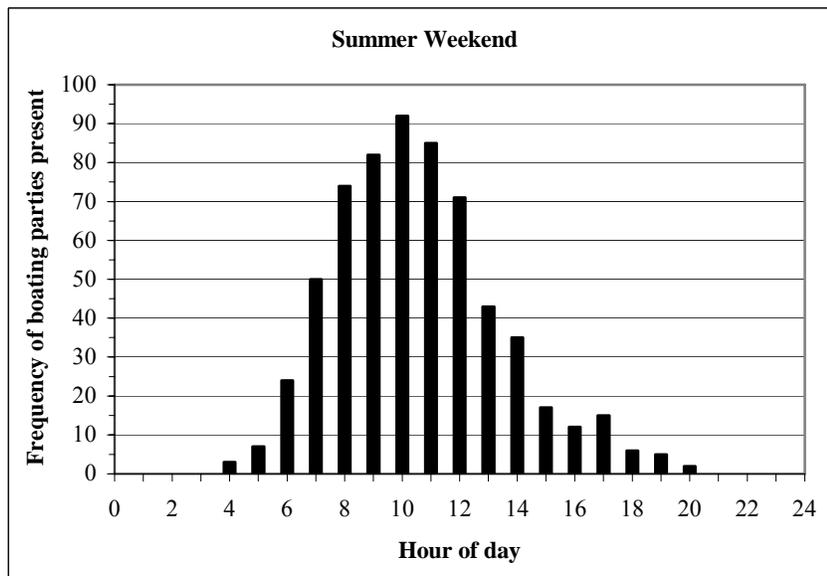
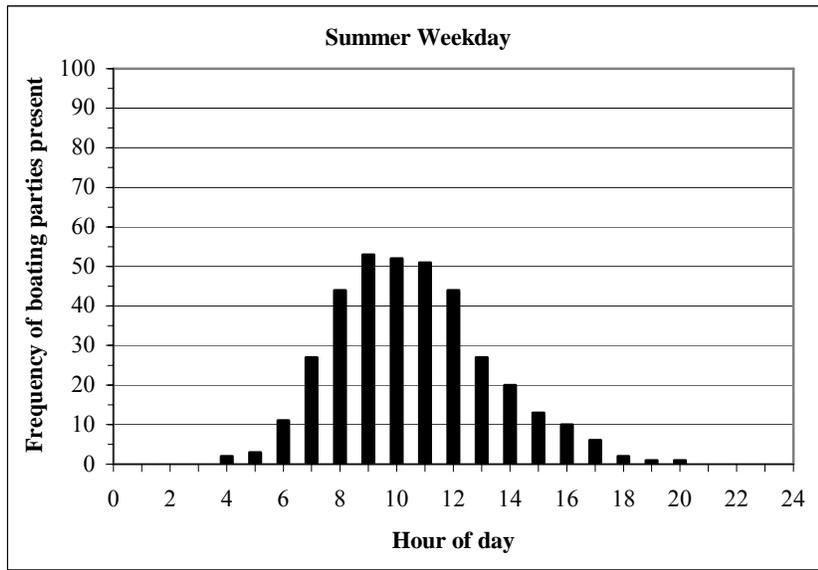
HOURLY DISTRIBUTION OF BOAT FISHING PARTY INTERVIEWS DURING WEEKDAYS AND WEEKEND/HOLIDAYS IN SPRING 2003, UPPER NIAGARA RIVER ANGLER SURVEY



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FIGURE 3.1.2-2

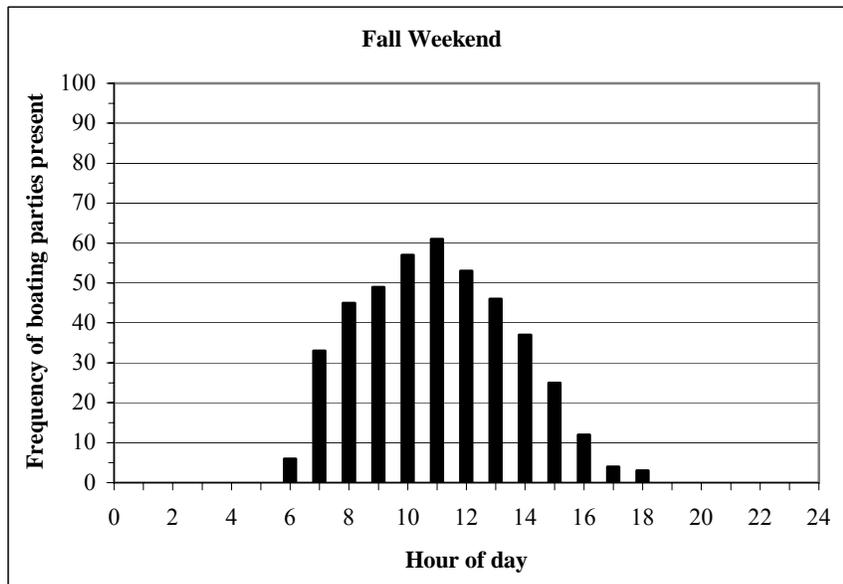
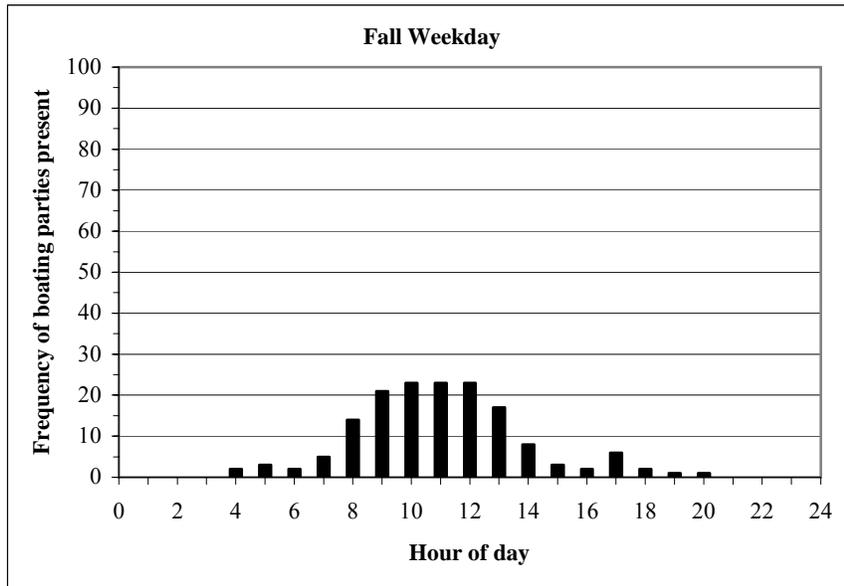
HOURLY DISTRIBUTION OF BOAT FISHING PARTY INTERVIEWS DURING WEEKDAYS
AND WEEKEND/HOLIDAYS IN SUMMER 2003, UPPER NIAGARA RIVER ANGLER



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FIGURE 3.1.2-3

HOURLY DISTRIBUTION OF BOAT FISHING PARTY INTERVIEWS DURING WEEKDAYS AND WEEKEND/HOLIDAYS IN FALL 2003, UPPER NIAGARA RIVER ANGLER SURVEY)



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4.0 DISCUSSION

Summaries of 1999 and 2003 boat angler effort, catch and harvest, and catch rate data are provided in [Appendix E](#) for reference and to facilitate direct comparisons between years. The 1999 catch and harvest estimates were recalculated using only NY-based boat anglers to conform to the 2003 boat angler survey. Additionally, the original 2003 boat angler catch and harvest data were modified to provide estimates that conformed to the shorter 1999 survey time frame (15 May to 31 October).

4.1 Comparisons with Historical Surveys

In the upper Niagara River, the yellow perch and smallmouth bass boat and shore fisheries were the most important based both on catch and the species most frequently targeted by recreational anglers during 2003. The catch rate of yellow perch by boat anglers seeking yellow perch during 2003 was 4.68 fish/hour for the period April 5 through November 30 and 4.02 fish/hour for the period May 18 through November 30, i.e., the period when boat anglers were interviewed during a 1999 survey ([Table 4.0-1](#)). The catch rate during the 1999 survey, based on anglers interviewed in New York only, was 5.20 fish/hour. The catch rate of yellow perch by shore anglers seeking yellow perch during 2003 was 4.11 fish/hour for the period April 5 through November 30 and 3.20 fish/hour for the period July 23 through November 30, i.e., the period when shore anglers were interviewed during the 1999 survey ([Table 4.0-1](#)). The catch rate of yellow perch during the 1999 survey was 5.11 fish/hour.

The catch rate of smallmouth bass by boat anglers seeking smallmouth bass during 2003 was 0.84 fish/hour for the period April 5 through November 30 and 0.79 fish/hour for the period May 18 through November 30, i.e., the period when boat anglers were interviewed during a 1999 survey ([Table 4.0-1](#)). The catch rate during the 1999 survey, based on anglers interviewed in New York only, was 0.90 fish/hour. The catch rate of smallmouth bass by shore anglers seeking smallmouth bass during 2003 was 0.55 fish/hour for the period April 5 through November 30 and 0.49 fish/hour for the period July 23 through November 30, i.e., the period when shore anglers were interviewed during the 1999 survey ([Table 4.0-1](#)). The catch rate of smallmouth bass during the 1999 shore survey was 1.64 fish/hour.

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The catch rate of northern pike by boat anglers seeking northern pike during 2003 was 0.45 fish/hour for the period April 5 through November 30 and 0.45 fish/hour for the period May 18 through November 30, i.e., the period when boat anglers were interviewed during a 1999 survey ([Table 4.0-2](#)). The catch rate during the 1999 survey, based on anglers interviewed in New York only, was 0.25 fish/hour. The catch rate of muskellunge by boat anglers seeking muskellunge during 2003 was 0.07 fish/hour for the period April 5 through November 30 and 0.07 fish/hour for the period May 18 through November 30, i.e., the period when boat anglers were interviewed during the 1999 survey ([Table 4.0-2](#)). The catch rate of muskellunge during the 1999 survey was 0.08 fish/hour.

The species composition of fish caught by shore and boat anglers in 2003 relative to 1999 was generally similar ([Appendix Table E-1](#)). However, the relative catch of some species differed between years. Foremost was the catch of round goby, primarily by shore anglers but also on a limited basis by boat anglers. Round gobies formed nearly one-quarter of the shore angler catch, exhibited catch rates second only to yellow perch among shore anglers, and were caught at shore access sites throughout the upper Niagara River. Round gobies were not observed in upper Niagara River shore or boat angler catches in 1999 ([NYSDEC 2002](#)), although high densities were first achieved in Lake Erie just one year later ([Culligan et al. 2003](#)). However, round gobies were initially reported in the Lake Ontario sport fishing survey during 2001 by open-water boat anglers returning to lower Niagara River access sites ([Eckert 2001](#)). Estimated Lake Ontario catch in 2001 was fewer than 1,000 individuals. Subsequently, the estimated round goby catch in Lewiston Reservoir within the Niagara Power Project was 179 during 2002, and more than 30,000 in the lower Niagara River during May 2002 to June 2003 ([Stantec 2005a](#); [Stantec 2005b](#)). In comparison, the estimated 2002 catch of round goby by Lake Erie boat anglers was 36,228 ([Culligan et al. 2003](#)). During April to November 2003, the estimated catch of round goby by upper Niagara River shore anglers was 45,904.

Secondly, the estimated largemouth bass catch by boat anglers was considerably higher during the 2003 survey. We estimated that more than 11,000 largemouth bass were caught in April to November 2003 ([Table 3.3.1-1](#)), more than five times the full-season estimate (2,127 bass) by boat anglers in 1999 ([Appendix Table E-1](#)). The 2003 largemouth bass catch, adjusted for direct comparison to the shorter season surveyed in 1999 (6,884 bass) remained more than three times higher ([Appendix Table E-1](#)). In addition, the 2003 shore fishery estimated more than 4,400 largemouth bass caught. We believe the

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longer 2003 survey time frame was partly responsible for the size of the boat angler largemouth bass catch, but also note the apparently higher numbers of largemouth bass available. Numerous 2003 reported largemouth bass catches were greater than the largest reported catch of 14 bass in 1999 ([NYSDEC 2002](#)). Further, we noted a pattern of several large catches of largemouth bass by boat anglers from locations along the east bank of the East Channel, primarily the reach from the Sheridan Drive boat ramp down to the Isle View boat ramp. During a trip in early November a single boat angler estimated he caught and released 110 largemouth bass from this reach, an estimate refined by careful questioning by the survey technician. Other boat anglers also reported substantial catches (up to 99 bass per party) of largemouth bass associated with the same shoreline, including the Huntley Station, located just downriver from the Sheridan Drive access. Angling near the Huntley Station was noted during 40% of boat angling count flights.

Full-season effort estimates across years were different likely due to a number of factors, foremost among them the length of the survey time frame. Our estimate of 2003 boat fishing effort (65,050 angler hours) was more than the estimate of boat fishing effort by NYSDEC in 1999 of 55,120 angler hours ([Appendix Table E-2](#)). However, the 2003 survey encompassed 41% more days (most of April, half of May, and November) than the 1999 survey. For an identical time frame equivalent to 1999, the amount of effort estimated in 2003 was 58,902 angler hours, within 7% of the 1999 estimate ([Appendix Table E-2](#)). Further, a partial-year (23 July-30 November) effort estimate for the 1999 shore fishery was 24,814 angler hours. During the comparable August-November period in 2003, shore anglers fished 29,606 angler hours, an equivalent estimate given the inclusion of additional access points in the present survey. Thus, estimated shore and boat fishery effort for comparable-length periods in 1999 and 2003 was similar.

The estimated number of hours that boat anglers spent fishing on the upper Niagara River during 2003 (65,050) was lower than the estimate (212,419 angler hours) for 1984 ([NYSDEC 1989](#)). However, the estimates are not directly comparable because the 2003 data only included fishing by boat anglers on the upper Niagara River whereas the 1984 data included fishing on Lake Erie as well as the upper Niagara River. Nevertheless, this discrepancy alone does not appear to account for the higher 1984 effort estimate. Although not determined in 1984, both the 1999 survey (25%: [NYSDEC 2002](#)) and the present survey (16%) estimated comparable proportional use of upper Niagara River boat ramps by Lake Erie

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anglers. If the proportion of Lake Erie anglers using Niagara River access sites was similar in 1984 to the two most recent surveys, much of the difference in estimated effort may have been the result of different design and analytical methods.

Similarly, the upper Niagara River shore fishery in 2003 supported less than one-half the amount of angler effort (216,579 vs 91,530 angler hours) estimated for 1984 by NYSDEC ([1989](#)), although the estimated number of trips was similar (44,854 in 2003 vs 48,074 in 1984). Differences in effort were likely attributable to the different methods used. Specifically, the 1984 survey was designed to develop a precise estimate of effort for a very large geographic area (New York Great Lakes), but not for a small, relatively discrete fishery such as the upper Niagara River. Further, fewer shore sites were included in the 1984 design and different field and analytical methods were employed ([NYSDEC 1989](#); [Robson and Jones 1989](#)).

4.2 Survey Precision and Assumptions for Future Surveys

The survey methods employed during 2003 generated relatively precise estimates of angler effort, particularly for the shore fishery. Proportional standard error was 9.4% of the shore fishing effort estimate. Shore angler counts occurred each survey day, which amounted to five of seven days weekly. The precision of the full season boat fishery effort estimate, also expressed as proportional standard error, was 19.6%, and was achieved by counting boat anglers once per week. The desired precision for angler survey estimates is 20% or better ([Malvestuto 1983](#)). For the most part weekly count flights occurred during the period of peak boat angler use as determined from interviews. Most (71%) count flights occurred between 1100-1259 h, which generally corresponded to when most fishing boats were on the water. More so in summer than in other seasons, several flights occurred in the afternoon, after daily fishing pressure had begun to decline. Our boat angler use profile data showed that the peak in the number of summer boat angler parties occurred by 0900 h and was sustained for several hours thereafter. Counting boats during peak usage is desirable so that subsequent extrapolations to total effort estimates based on these data utilize the most information ([Lockwood et al. 2001](#)). Counting at other times increases the variability and decreases the precision of the estimates. Future surveys of upper Niagara River boat fishing using similar methodology to estimate effort should strive to make all fishing boat counts between 1000-1200 h regardless of season or daytype.

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Future surveys of the upper Niagara River boat fishery utilizing this relatively efficient design also must reconcile several important assumptions.

1. Interviews of anglers at selected public ramps in New York accurately represent boat angling throughout the upper Niagara River.

Upper Niagara River boat anglers can trailer their boats and use public access, or slip their boats and fish out of numerous private marinas. Several very large marinas exist in Buffalo and the Tonawandas, as well as on Grand Island. Although it is likely most of the larger marinas cater to primarily non-fishing boaters, since recreational boating in this reach is substantial, some marinas may be used by private fishing boats, and likely also by charter fishing operations. We also noted chartered fishing trips originating from public ramps at Sheridan Drive and Bluewater Marina. Anglers may also fish out of small private clubs, as we observed next to Bluewater Marina (Niagara River Station Fishing Club) on Grand Island. No anglers were interviewed at any of these private sites in 2003. However, we consider it unlikely that boat anglers using local public facilities would be that much different in either angling habits or catch rates from those preferring private sites.

Further, Ontario boat anglers included in the aerial counts used to develop fishing pressure estimates also fish out of numerous public and private sites in Canada, none of which were included in our survey. NYSDEC investigated the effects of including data from two jurisdictions on catch rates for their 1999 survey and found that any differences in catch rates that occurred were statistically non-significant ([NYSDEC 2002](#)). Their assumption was that NY-based catch rates, as obtained in 2003, “reasonably characterized” all upper Niagara River anglers.

2. Fishing boats were readily distinguishable from pleasure boats.

During the 35 aerial counts fishing boats were readily distinguished from pleasure craft except on two occasions. In one instance during summer an extremely high number of recreational boats were observed near the northern end of Grand Island. Such high numbers could occur as the result of a planned event such as a regatta (as in this case), or, in a second instance, on the first nice weekend

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day after an unusually long stretch of bad summer weather. Additionally, late in the fishing season several boats underway had their canvas tops up and it was not possible to ascertain fishing gear in use or onboard. These latter boats were characterized as recreational boats.

3. Rescheduling of count flights cancelled due to inclement weather did not bias high the effort estimates for that stratum.

Only one flight was cancelled due to inclement weather (poor visibility) during the 2003 survey. It occurred during the fall when fishing pressure was lower and was immediately rescheduled. Other flights were cancelled due to mechanical problems, which tend to occur randomly and are unlikely to induce bias in estimating effort. Bias problems may be foreseen, however, and may be introduced if numerous flights are cancelled due to poor flight weather (heavy rain, thunderstorms) and made up on fair weather days with comparatively higher boat angler use. The likelihood of this scenario was minimized during 2003 for several reasons. Count flights were typically short, and originated near the river. Thus, weather problems could usually be avoided by knowledge of the prevailing weather and shifting flight times as needed within the preferred time window. Because of survey design flexibility, a 30-minute count flight could be inserted between passing storms and remain within the desired count time window. Use of a helicopter also permitted flights at relatively low altitude which avoided higher wind speeds and low cloud ceilings that might have greater impact on fixed-wing aircraft. The helicopter also permitted better scrutiny of boats to discern the purpose of their day on the water.

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TABLE 4.0-1

HISTORICAL TARGETED CATCH RATE (CPUE) AND HARVEST RATE (HPUE) COMPARISONS (FISH/H) OF SMALLMOUTH BASS AND YELLOW PERCH AMONG UPPER NIAGARA RIVER ANGLER SURVEYS

Sport Fishery Location	Year(s)	Smallmouth Bass				Yellow Perch				Reference
		Boat		Shore		Boat		Shore		
		CPUE (2SE)	HPUE (2SE)	CPUE (2SE)	HPUE (2SE)	CPUE (2SE)	HPUE (2SE)	CPUE (2SE)	HPUE (2SE)	
Upper Niagara River ¹	2003 18 May-30 Nov	0.79 (0.27)	0.07 (0.05)			4.02 (1.85)	2.81 (1.82)			present study
	2003 5 Apr-30 Nov	0.84 (0.34)	0.07 (0.06)			4.68 (2.23)	2.53 (1.58)			
	2003 23 Jul-30 Nov			0.49 (0.19)	0.03 (0.03)			3.20 (1.80)	1.76 (0.77)	
	2003 5 Apr-30 Nov			0.55 (0.24)	0.03 (0.04)			3.16 (0.58)	1.29 (0.28)	
Upper Niagara River ²	1999 18 May-30 Nov	0.90 (0.28)	0.14 (0.08)			5.20 (5.20)	2.51 (1.48)			NYSDEC 2002
	1999 23 July-30 Nov			1.64 (0.65)	0.05 (0.06)			5.11 (1.62)	2.73 (0.94)	
Upper Niagara River ^{3,4}	1984	0.36	0.17	0.39	0.04	1.93	1.12	0.76	0.43	NYSDEC 1989

Data modification notes:

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1) Boat fishery: original study included April through November; table data modified to conform to shorter NYSDEC 1999 boat fishery survey. Shore fishery: original April through November study length modified to conform to shorter NYSDEC 1999 shore fishery survey; shore fishing sites not surveyed in 1999 eliminated from 2003 CPUE/HPUE calculations.

2) Boat fishery: survey length 18 May through November; data modified by removal of OMNR angler data set and using Lockwood et al. ([2001](#)) to conform to 2003 design. Shore fishery: survey length 23 July-30 November.

3) May through October;

4) Rates include boat anglers returning from Lake Erie;

Precision shown as 2 SE (approximates 95% confidence intervals) where available.

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TABLE 4.0-2

HISTORICAL TARGETED CATCH RATE (CPUE) AND HARVEST RATE (HPUE) COMPARISONS (FISH/H) OF NORTHERN PIKE AND MUSKELLUNGE AMONG UPPER NIAGARA RIVER ANGLER SURVEYS

Sport Fishery Location	Year(s)	Northern Pike				Muskellunge				Reference
		Boat		Shore		Boat		Shore		
		CPUE (2SE)	HPUE (2SE)	CPUE (2SE)	HPUE (2SE)	CPUE (2SE)	HPUE (2SE)	CPUE (2SE)	HPUE (2SE)	
Upper Niagara River ¹	2003 18 May-Nov 30	0.49 (0.37)	<0.01 (0.01)			0.07 (0.05)	0.00 (0.00)			present study
	2003 5 Apr-Nov 30	0.45 (0.34)	0.00 (0.00)			0.07 (0.06)	0.00 (0.00)			
	2003 23 Jul-Nov 30			0.11 (0.21)	0.00 (0.00)			0.00 (0.00)	0.00 (0.00)	
	5 Apr-30 Nov			0.16 (0.12)	0.03 (0.04)			0.00 (0.00)	0.00 (0.00)	
Upper Niagara River ²	1999 18 May-30 Nov	0.25 (0.36)	0.01 (0.04)			0.08 (0.09)	0.00 (0.00)			NYSDEC 2002
	1999 23 July-30 Nov			none	targeted			0.00 (0.00)	0.00 (0.00)	
Upper Niagara River ³	1984	No	data	available	-	-	-	-	-	NYSDEC 1989

Data modification notes:

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1) Boat fishery: original study included April through November; table data modified to conform to shorter NYSDEC 1999 boat fishery survey. Shore fishery: original April through November study length modified to conform to shorter NYSDEC 1999 shore fishery survey; shore fishing sites not surveyed in 1999 eliminated from 2003 CPUE/HPUE calculations.

2) Boat fishery: survey length 18 May through November; data modified by removal of OMNR angler data set and using Lockwood et al. ([2001](#)) to conform to 2003 design. Shore fishery: survey length 23 July-30 November.

3) May through October.

Precision shown as 2 SE (approximates 95% confidence intervals) where available.

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APPENDICES

**NIAGARA POWER PROJECT (FERC NO. 2216)
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APPENDIX A – NYSDEC FISH SPECIES CODES

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NYSDEC FISH SPECIES CODES

Common name (by family)	Scientific Name		NYS species code
	Genus	Species	
<u>Petromyzontidae</u>			
Ohio Lamprey	<i>Ichthyomyzon</i>	<i>bdellium</i>	201
Chestnut Lamprey	<i>Ichthyomyzon</i>	<i>castaneus</i>	202
Northern Brook Lamprey	<i>Ichthyomyzon</i>	<i>fossor</i>	203
Mountain Brook Lamprey	<i>Ichthyomyzon</i>	<i>greeleyi</i>	204
Silver Lamprey	<i>Ichthyomyzon</i>	<i>unicuspis</i>	205
American Brook Lamprey	<i>Lampetra</i>	<i>appendix</i>	206
Sea Lamprey	<i>Petromyzon</i>	<i>marinus</i>	207
<u>Acipenseridae</u>			
Shortnose Sturgeon	<i>Acipenser</i>	<i>brevirostrum</i>	260
Lake Sturgeon	<i>Acipenser</i>	<i>fulvescens</i>	261
Atlantic Sturgeon	<i>Acipenser</i>	<i>oxyrinchus</i>	262
Pallid Sturgeon	<i>Scaphirhynchus</i>	<i>albus</i>	263
Shovelnose Sturgeon	<i>Scaphirhynchus</i>	<i>platorynchus</i>	264
<u>Polyodontidae</u>			
Paddlefish	<i>Polyodon</i>	<i>spathula</i>	266
<u>Lepisosteidae</u>			
Spotted Gar	<i>Lepisosteus</i>	<i>oculatus</i>	267
Longnose Gar	<i>Lepisosteus</i>	<i>osseus</i>	268
Shortnose Gar	<i>Lepisosteus</i>	<i>platostomus</i>	269
Alligator Gar	<i>Lepisosteus</i>	<i>spatula</i>	270
<u>Amiidae</u>			
Bowfin	<i>Amia</i>	<i>calva</i>	271
<u>Anguillidae</u>			
American Eel	<i>Anguilla</i>	<i>rostrata</i>	276
<u>Clupeidae</u>			
Blueback Herring	<i>Alosa</i>	<i>aestivalis</i>	285
Alabama Shad	<i>Alosa</i>	<i>alabamae</i>	286
Skipjack Herring	<i>Alosa</i>	<i>chrysochloris</i>	287
Hickory Shad	<i>Alosa</i>	<i>mediocris</i>	288
Alewife	<i>Alosa</i>	<i>pseudoharengus</i>	289
American Shad	<i>Alosa</i>	<i>sapidissima</i>	290

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NYSDEC FISH SPECIES CODES (CONT.)

Common name (by family)	Scientific Name		NYS species code
	Genus	Species	
Gizzard Shad	<i>Dorosoma</i>	<i>cepedianum</i>	294
<u>Engraulidae</u>			
Bay Anchovy	<i>Anchoa</i>	<i>mitchilli</i>	301
<u>Hiodontidae</u>			
Goldeye	<i>Hiodon</i>	<i>alosoides</i>	305
Mooneye	<i>Hiodon</i>	<i>tergisus</i>	306
<u>Salmonidae</u>			
Longjaw Cisco	<i>Coregonus</i>	<i>alpenae</i>	310
Cisco or Lake Herring	<i>Coregonus</i>	<i>artedii</i>	311
Lake Whitefish	<i>Coregonus</i>	<i>clupeaformis</i>	312
Bloater	<i>Coregonus</i>	<i>hoyi</i>	313
Kiyi	<i>Coregonus</i>	<i>kiyi</i>	315
Shortnose Cisco	<i>Coregonus</i>	<i>reighardi</i>	317
Shortnose Cisco	<i>Coregonus</i>	<i>reighardi</i>	318
Splake	<i>Hybrid</i>	<i>J15 & J16</i>	332
Pink Salmon	<i>Oncorhynchus</i>	<i>gorbuscha</i>	319
Coho Salmon	<i>Oncorhynchus</i>	<i>kisutch</i>	320
Rainbow Trout	<i>Oncorhynchus</i>	<i>mykiss</i>	326
Sockeye Salmon/Kokanee	<i>Oncorhynchus</i>	<i>nerka</i>	321
Chinook Salmon	<i>Oncorhynchus</i>	<i>tshawytscha</i>	322
Round Whitefish	<i>Prosopium</i>	<i>cylindraceum</i>	324
Atlantic Salmon	<i>Salmo</i>	<i>salar</i>	327
Brown Trout	<i>Salmo</i>	<i>trutta</i>	328
Brook Trout	<i>Salvelinus</i>	<i>fontinalis</i>	329
Lake Trout	<i>Salvelinus</i>	<i>namaycush</i>	330
<u>Esocidae</u>			
Redfin Pickerel	<i>Esox</i>	<i>americanus americanus</i>	345
Grass Pickerel	<i>Esox</i>	<i>americanus vermiculatus</i>	346
Northern Pike	<i>Esox</i>	<i>lucius</i>	347
Muskellunge	<i>Esox</i>	<i>masquinongy</i>	348
Chain Pickerel	<i>Esox</i>	<i>niger</i>	349
Tiger Musky	<i>Hybrid</i>	<i>K04 & K06</i>	350

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NYSDEC FISH SPECIES CODES (CONT.)

Common name (by family)	Scientific Name		NYS species code
	Genus	Species	
Cyprinidae			
Central Stoneroller	<i>Campostoma</i>	<i>anomalum</i>	360
Goldfish	<i>Carassius</i>	<i>auratus</i>	361
Redside Dace	<i>Clinostomus</i>	<i>elongatus</i>	362
Lake Chub	<i>Couesius</i>	<i>plumbeus</i>	363
Grass Carp	<i>Ctenopharyngodon</i>	<i>idella</i>	364
Spotfin Shiner	<i>Cyprinella</i>	<i>spiloptera</i>	394
Common Carp	<i>Cyprinus</i>	<i>carpio</i>	365
Streamline Chub	<i>Erimystax</i>	<i>dissimilis</i>	371
Cutlips Minnow	<i>Exoglassum</i>	<i>maxillingua</i>	367
Tonguetied Minnow	<i>Exoglassum</i>	<i>laurae</i>	366
Brassy Minnow	<i>Hybognathus</i>	<i>hankinsoni</i>	368
Mississippi Silvery Minnow	<i>Hybognathus</i>	<i>nuchalis</i>	369
Gravel Chub	<i>Hybopsis</i>	<i>x-punctata</i>	374
Striped Shiner	<i>Luxilus</i>	<i>chrysocephalus</i>	384
Common Shiner	<i>Luxilus</i>	<i>cornutus</i>	385
Redfin Shiner	<i>Lythrurus</i>	<i>umbratilis</i>	396
Silver Chub	<i>Macrohybopsis</i>	<i>storeriana</i>	373
Hornyhead Chub	<i>Nocomis</i>	<i>biguttatus</i>	375
River Chub	<i>Nocomis</i>	<i>micropogon</i>	376
Golden Shiner	<i>Notemigonus</i>	<i>crysoleucas</i>	377
Bigeye Chub	<i>Notropis</i>	<i>amblops</i>	370
Comely Shiner	<i>Notropis</i>	<i>amoenus</i>	378
Satinfin Shiner	<i>Notropis</i>	<i>analostanus</i>	379
Pugnose Shiner	<i>Notropis</i>	<i>anogenus</i>	380
Emerald Shiner	<i>Notropis</i>	<i>atherinoides</i>	381
Bridle Shiner	<i>Notropis</i>	<i>bifrenatus</i>	382
Silverjaw minnow	<i>Notropis</i>	<i>buccatus</i>	409
Ironcolor Shiner	<i>Notropis</i>	<i>chalybaeus</i>	383
Bigmouth Shiner	<i>Notropis</i>	<i>dorsalis</i>	386
Blackchin Shiner	<i>Notropis</i>	<i>heterodon</i>	388
Blacknose Shiner	<i>Notropis</i>	<i>heterolepis</i>	389

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NYSDEC FISH SPECIES CODES (CONT.)

Common name (by family)	Scientific Name		NYS species code
	Genus	Species	
Spottail Shiner	<i>Notropis</i>	<i>hudsonius</i>	390
Silver Shiner	<i>Notropis</i>	<i>photogenis</i>	391
Swallowtail Shiner	<i>Notropis</i>	<i>procne</i>	392
Rosyface Shiner	<i>Notropis</i>	<i>rubellus</i>	393
Sand Shiner	<i>Notropis</i>	<i>stramineus</i>	395
Mimic Shiner	<i>Notropis</i>	<i>volucellus</i>	397
Northern Redbelly Dace	<i>Phoxinus</i>	<i>eos</i>	398
Finescale Dace	<i>Phoxinus</i>	<i>neogaeus</i>	399
Bluntnose Minnow	<i>Pimephales</i>	<i>notatus</i>	400
Fathead Minnow	<i>Pimephales</i>	<i>promelas</i>	401
Western Blacknose Dace	<i>Rhinichthys</i>	<i>atratus meleagris</i>	402
Longnose Dace	<i>Rhinichthys</i>	<i>cataractae</i>	403
Bitterling	<i>Rhodeus</i>	<i>sericeus</i>	404
Rudd	<i>Scardinius</i>	<i>erythrophthalmus</i>	405
Creek Chub	<i>Semotilus</i>	<i>atromaculatus</i>	406
Fallfish	<i>Semotilus</i>	<i>corporalis</i>	407
Pearl Dace	<i>Semotilus</i>	<i>margarita margarita</i>	408
Catostomidae			
River Carpsucker	<i>Carpionodes</i>	<i>carpio</i>	415
Quillback	<i>Carpionodes</i>	<i>cyprinus</i>	416
Highfin Carpsucker	<i>Carpionodes</i>	<i>velifer</i>	417
Longnose Sucker	<i>Catostomus</i>	<i>catostomus</i>	418
White Sucker	<i>Catostomus</i>	<i>commersoni</i>	419
Blue Sucker	<i>Cycleptus</i>	<i>elongatus</i>	420
Creek Chubsucker	<i>Erimyzon</i>	<i>oblongus</i>	421
Lake Chubsucker	<i>Erimyzon</i>	<i>sucetta</i>	422
Northern Hog Sucker	<i>Hypentelium</i>	<i>nigricans</i>	423
Smallmouth Buffalo	<i>Ictiobus</i>	<i>bubalus</i>	424
Bigmouth Buffalo	<i>Ictiobus</i>	<i>cyprinella</i>	425
Black Buffalo	<i>Ictiobus</i>	<i>niger</i>	426
Spotted Sucker	<i>Minytrema</i>	<i>melanops</i>	427
Silver Redhorse	<i>Moxostoma</i>	<i>anisurum</i>	428

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NYSDEC FISH SPECIES CODES (CONT.)

Common name (by family)	Scientific Name		NYS species code
	Genus	Species	
River Redhorse	<i>Moxostoma</i>	<i>carinatum</i>	429
Black Redhorse	<i>Moxostoma</i>	<i>duquesnei</i>	430
Golden Redhorse	<i>Moxostoma</i>	<i>erythrurum</i>	431
Shorthead Redhorse	<i>Moxostoma</i>	<i>macrolepidotum</i>	432
Greater Redhorse	<i>Moxostoma</i>	<i>valenciennesi</i>	433
<u>Ictaluridae</u>			
Black Bullhead	<i>Ameiurus</i>	<i>melas</i>	442
Yellow Bullhead	<i>Ameiurus</i>	<i>natalis</i>	443
Brown Bullhead	<i>Ameiurus</i>	<i>nebulosus</i>	444
White Catfish	<i>Ictalurus</i>	<i>catus</i>	440
Blue Catfish	<i>Ictalurus</i>	<i>furcatus</i>	441
Channel Catfish	<i>Ictalurus</i>	<i>punctatus</i>	445
Stonecat	<i>Noturus</i>	<i>flavus</i>	446
Tadpole Madtom	<i>Noturus</i>	<i>gyrinus</i>	447
Margined Madtom	<i>Noturus</i>	<i>insignis</i>	448
Brindled Madtom	<i>Noturus</i>	<i>miurus</i>	449
Flathead Catfish	<i>Pylodictis</i>	<i>olivaris</i>	450
<u>Aphredoderidae</u>			
Pirate Perch	<i>Aphredoderus</i>	<i>sayanus</i>	460
<u>Belonidae</u>			
Atlantic Needlefish	<i>Strongylura</i>	<i>marina</i>	521
<u>Cyprinodontidae</u>			
Sheepshead Minnow	<i>Cyprinodon</i>	<i>variegatus</i>	530
Banded Killifish	<i>Fundulus</i>	<i>diaphanus</i>	531
Mummichog	<i>Fundulus</i>	<i>heteroclitus</i>	532
Rainwater Killifish	<i>Lucania</i>	<i>parva</i>	535
<u>Poeciliidae</u>			
Western Mosquitofish	<i>Gambusia</i>	<i>affinis</i>	540
<u>Antherinidae</u>			
Brook Silverside	<i>Labidesthes</i>	<i>sicculus</i>	545
Inland Silverside	<i>Menidia</i>	<i>beryllina</i>	547

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NYSDEC FISH SPECIES CODES (CONT.)

Common name (by family)	Scientific Name		NYS species code
	Genus	Species	
<u>Moronidae</u>			
White Bass	<i>Morone</i>	<i>chrysops</i>	576
Striped Bass	<i>Morone</i>	<i>saxatilis</i>	577
White Perch	<i>Morone</i>	<i>americana</i>	575
<u>Centrarchidae</u>			
Mud Sunfish	<i>Acantharchus</i>	<i>promotis</i>	590
Rock Bass	<i>Ambloplites</i>	<i>rupestris</i>	591
Bluespotted Sunfish	<i>Enneacanthus</i>	<i>gloriosus</i>	592
Banded Sunfish	<i>Enneacanthus</i>	<i>obesus</i>	593
Redbreast Sunfish	<i>Lepomis</i>	<i>auritus</i>	594
Green Sunfish	<i>Lepomis</i>	<i>cyanellus</i>	595
Pumpkinseed	<i>Lepomis</i>	<i>gibbosus</i>	596
Warmouth	<i>Lepomis</i>	<i>gulosus</i>	597
Bluegill	<i>Lepomis</i>	<i>macrochirus</i>	598
Longear Sunfish	<i>Lepomis</i>	<i>megalotis</i>	599
Smallmouth Bass	<i>Micropterus</i>	<i>dolomieu</i>	600
Largemouth Bass	<i>Micropterus</i>	<i>salmoides</i>	601
White Crappie	<i>Pomoxis</i>	<i>annularis</i>	602
Black Crappie	<i>Pomoxis</i>	<i>nigromaculatus</i>	603
<u>Percidae</u>			
Eastern Sand Darter	<i>Ammocrypta</i>	<i>pellucida</i>	605
Greenside Darter	<i>Etheostoma</i>	<i>blennioides</i>	606
Rainbow Darter	<i>Etheostoma</i>	<i>caeruleum</i>	607
Bluebreast Darter	<i>Etheostoma</i>	<i>camurum</i>	628
Iowa Darter	<i>Etheostoma</i>	<i>exile</i>	608
Fantail Darter	<i>Etheostoma</i>	<i>flabellare</i>	609
Swamp Darter	<i>Etheostoma</i>	<i>fusiforme</i>	610
Spotted Darter	<i>Etheostoma</i>	<i>maculatum</i>	611
Johnny Darter	<i>Etheostoma</i>	<i>nigrum</i>	613
Tesselated Darter	<i>Etheostoma</i>	<i>olmsted</i>	614
Variagate Darter	<i>Etheostoma</i>	<i>variatum</i>	615
Banded Darter	<i>Etheostoma</i>	<i>zonale</i>	616

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NYSDEC FISH SPECIES CODES (CONT.)

Common name (by family)	Scientific Name		NYS species code
	Genus	Species	
Yellow Perch	<i>Perca</i>	<i>flavescens</i>	617
Logperch	<i>Percina</i>	<i>caprodes</i>	618
Channel Darter	<i>Percina</i>	<i>copelandi</i>	619
Gilt Darter	<i>Percina</i>	<i>evides</i>	620
Longhead Darter	<i>Percina</i>	<i>macrocephala</i>	621
Blackside Darter	<i>Percina</i>	<i>maculata</i>	622
Shield Darter	<i>Percina</i>	<i>peltata</i>	623
River Darter	<i>Percina</i>	<i>shumardi</i>	624
Sauger	<i>Stizostedion</i>	<i>canadense</i>	625
Walleye	<i>Sander</i>	<i>vitreus</i>	626
<u>Sciaenidae</u>			
Freshwater Drum	<i>Aplodinotus</i>	<i>grunniens</i>	700
Silver Perch	<i>Bairdiella</i>	<i>chrysur</i>	701
<u>Mugilidae</u>			
Striped Mullet	<i>Mugil</i>	<i>cephalus</i>	735
<u>Cottidae</u>			
Mottled Sculpin	<i>Cottus</i>	<i>bairdi</i>	865
Slimy Sculpin	<i>Cottus</i>	<i>cognatus</i>	866
Spoonhead Sculpin	<i>Cottus</i>	<i>ricei</i>	867
<u>Osmeridae</u>			
Rainbow Smelt	<i>Osmerus</i>	<i>mordax</i>	335
<u>Umbridae</u>			
Central Mudminnow	<i>Umbra</i>	<i>limi</i>	340
Eastern Mudminnow	<i>Umbra</i>	<i>pygmaea</i>	341
<u>Percopsidae</u>			
Trout-perch	<i>Percopsis</i>	<i>omiscomaycus</i>	461
<u>Gadidae</u>			
Atlantic Cod	<i>Gadus</i>	<i>morhua</i>	492
Burbot	<i>Lota</i>	<i>lota</i>	493
Atlantic Tomcod	<i>Microgadus</i>	<i>tomcod</i>	496

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NYSDEC FISH SPECIES CODES (CONT.)

Common name (by family)	Scientific Name		NYS species code
	Genus	Species	
<u>Gasterosteidae</u>			
Fourspine Stickleback	<i>Apeltes</i>	<i>quadracus</i>	560
Brook Stickleback	<i>Culaea</i>	<i>inconstans</i>	561
Threespine Stickleback	<i>Gasterosteus</i>	<i>aculeatus</i>	562
Blackspotted Stickleback	<i>Gasterosteus</i>	<i>wheatlandi</i>	563
Ninespine Stickleback	<i>Pungitius</i>	<i>pungitius</i>	564
<u>Congridae</u>			
Conger Eel	<i>Conger</i>	<i>oceanicus</i>	280
<u>Soleidae</u>			
Hogchoker	<i>Trinectes</i>	<i>maculatus</i>	910

ADDITIONAL SPECIES NOT INCLUDED IN NYSDEC CODE LIST

Common name (by family)	Scientific Name		NYS species code
	Genus	Species	
<u>Gobiidae</u>			
Round goby	<i>Neogobius</i>	<i>melanostomus</i>	
<u>Cyprinidae</u>			
Rudd	<i>Scardinius</i>	<i>erythrophthalmus</i>	
<u>AMPHIBIA</u>			
<u>Proteidae</u>			
Mudpuppy	<i>Necturus</i>	<i>maculosus</i>	

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**APPENDIX B – STANDARD OPERATING PROCEDURES FOR THE NYPA UPPER NIAGARA
RIVER ANGLER SURVEY, 2003**

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Standard Operating Procedures for the NYPA Upper Niagara River Angler Survey, 2003

1.0 INTRODUCTION

1.1 General Approach

The data forms associated with this standard operating procedure (SOP) are designed to document the fisheries and recreational use of the resources associated with the Niagara Power Project in the upper Niagara River. The upper Niagara River is upriver of Niagara Falls and defined in this study as extending from the boating limit above the Falls upriver to the Peace Bridge, including both east and west river channels around Grand Island. Normandeau personnel will collect angler data and supporting information (e.g., weather) which will assist the New York Power Authority (NYPA) in their re-licensing of the Power Project.

This SOP was prepared to provide field personnel general criteria for making on-site decisions related to data collection and as a guide to completing data forms. The data forms provide a script, via data-fields, to prompt technicians to the questions to be asked of anglers, and to document angler responses. The SOP also describes the objectives of the angler study. Understanding study objectives will assist field personnel in the appropriate application of the procedures outlined below.

This SOP includes the following attached data forms and related materials:

- Form [DCS.01](#), upper Niagara River Angler Survey Count Form;
- Form [NCS.01](#), (a single sided, 1 page form), upper Niagara River Angler Survey Interview Data Sheet; and
- Form [ASF.01](#) upper Niagara River Aerial Boat Survey.
- The coding instructions specific to these forms.
- Information on access sites in the survey.

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Note that it is possible data forms or coding instructions will be revised as the project progresses to reflect collection of more appropriate data. Coding manuals are typically "living documents" and designed to accommodate flexible survey needs. Angler technicians will be informed as soon as possible about changes in data collection or recording. Unused, older data forms should be properly discarded upon receipt of revised forms. Technicians will be notified promptly if any there have been any revisions to the survey forms. Revision numbers (e.g., Form NCS.02, ...03, etc.) appear in the title of the form. Depending on the type of revision to a form the SOP may or may not be revised.

It is intended that personnel working on this project, through training, will be familiar with the forms and data fields prior to reviewing the SOP. Normandeau personnel must understand the type of data to be entered, specific to each data-field, in a form prior to data collection.

Although all study personnel work for Normandeau, they indirectly represent URS Corporation and NYPA. Angler technicians should always be courteous, and in the event an angler declines an interview or is belligerent in any way, thank them for their time and move to the next angler/boat. An example of a verbal introduction an angler technician can use when approaching an angler is presented in [Section 7.0](#). If anglers request details of the study beyond those found in this SOP the technician can direct them to contact NYPA.

Recreational and angler data will be obtained at several sites on the upper Niagara River (see [Figure 2.1-1](#), main report). At shore fishing sites angler data will be collected from individual shore anglers or shore fishing parties while they are fishing, known as a roving angler survey. A roving survey yields mostly incomplete-trip interviews. It is also possible to interview shore anglers who have finished fishing. Completed trip interviews will occur as anglers exit a site. Interviews will be obtained from each individual or party that is shore fishing or exiting a site as time permits. When there is a lack of shore anglers, technicians should wait at a site after completing all interviews to remain on the prescribed time schedule. The type of interview, complete or incomplete, will be noted on the data sheet ([NCS.01](#)).

For boat anglers the angler technician will collect data from an individual who represents all persons aboard (e.g., a charter-boat captain, or party spokesman) and presents the boats' catch data

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collectively. The boat interviews will typically occur when a boat has returned from a fishing trip (a completed trip survey). Interruptions in boat fishing to return for gas or lunch, or to pick up additional passengers, should be treated as break in fishing and recorded as a completed trip.

The Angler Form [NCS.01](#) is universal for conducting boat or shore angler interviews. However, not all fields are used at each site or in every type of interview. When no anglers are present during the period of a site visit only the appropriate space on the Angler Summary Form ([DCS.01](#)) needs to be completed for that site.

The boat and shoreline angler surveys will be completed a minimum of five days per week from April 5, 2003 through November 30, 2003. Surveys will also occur on Federal holidays. A fishing day is defined to start at 0730 and extend until 1-h past sunset. Different methodologies characterize each survey type. Specific shift times for boat surveys will vary depending upon random selection of an initial start time for the day. Since three 2-h interview periods comprise each boat survey, plus travel time between sites, the daily start time selected must accommodate all interview periods and required travel time. Thus, a daily start time cannot occur later than approximately 7-h before the time of sundown plus 1-h. A monthly schedule will specify boat survey start times.

Two shifts of equal length within the defined fishing day (above) will be recognized for shore surveys, and designated as morning (AM) or afternoon (PM) shifts. Technicians must move along a prescribed route on a time schedule to visit the required number of sites within a shift. There are sufficient shore sites that two technicians will work the same shift time (AM or PM) simultaneously on a given survey day. The time schedules developed each month reflect varying day length throughout the survey period.

Aerial (helicopter) surveys to count fishing and recreational boats will be completed once per week on alternating weekend/holiday and weekday daytypes. Due to design considerations all flights will occur during mid-day (e.g., 1100-1500 h), considered to represent the time of maximum boating activity. The upper Niagara River will be partitioned for counts into three reaches termed east channel, west

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channel, and mainstem ([Figure 2.1-1](#), main report). The number of fishing and recreational boats will be identified and summed separately for each count area.

1.2 Fisheries Objectives and General Procedure for Selecting Anglers for Interview

The main objective of the field angler survey is to obtain the most accurate and precise angler catch data as possible. These data will be used along with fishing effort data to estimate catch and harvest. To accomplish these objectives NYPA needs angler personnel at shore and boat ramp sites to obtain instantaneous counts and interviews of anglers at a shore site, or interview boat anglers returning from a fishing trip. The time spent fishing and the number and species of fish caught and harvested (i.e., number of fish kept and not returned to the water) by the angler(s) are the most important data for the angler study and are to be documented on survey-specific data forms. These data are used to, among other things, estimate the catch-per-unit-effort (CPUE) and ultimately the estimated fish harvest from the upper Niagara River.

For shore fishing surveys, obtain an instantaneous count of all anglers upon arrival at a shore fishing site. For selected sites with limited angler dispersal, a second angler count when departing for the next site will also be made (see [Section 2.0](#)). Instantaneous count and related data are entered as appropriate on the Site Count Form [DCS.01](#). A second data sheet, Form [NCS.01](#) (one form per shore party) will be completed only when an interview is attempted or completed (i.e., if there are no anglers at a site during a shift, Form [NCS.01](#) will NOT be filled in for that site). The type of fisheries and related data to be placed in data fields on Forms [DCS.01](#) and [NCS.01](#) are relatively straightforward as scripted. Some data will be provided by the angler technician (e.g., place and time of interview) other data will be obtained from the angler (e.g., number and species of fish caught, length of time fished and biological data).

For boat fishing surveys, record the total number of anglers that completed their fishing trips at that site during the 2-h wait period. All or a subsample will be interviewed. Record both the total number counted and total number interviewed on the [DCS.01](#) Form. Record all boat angler interview data on Form [NCS.01](#).

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Interviews will be completed for all anglers at a site or a subset of these anglers as time permits. When the interview period (approximately one hour or less for each shoreline site, two hours for each boat interview site) will not permit effective interviews of all anglers at a site the angler technician will systematically select which anglers to interview. For example, if the technician estimates it will take 10 minutes for an interview to obtain catch data and there are 13 anglers at the site, interviewing every other angler will allow them to interview close to half the anglers in an hour. If there are more anglers present the technician might elect to interview every third or fourth angler and so on. When time is limiting it is not necessary to interview all anglers. It is more important to get an accurate instantaneous count, and a complete, accurate set of data from each angler interviewed. The fishing success of anglers will also extend the time needed per interview as will any collection of biological data (see [Section 3.0](#)).

NOTE: if the angler technician determines that an angler's statements seem purposely misleading or unrealistic, it should be noted on the comments line as suspicious data and/or field voided in consultation with the project manager. For purposes of safety and data integrity technicians will avoid contact with persons who are obviously intoxicated or belligerent.

Biological data collection (e.g., fish lengths) is important, but it is not necessary to obtain this information from the fish of all anglers (boat or shore) interviewed except as time permits. Collection of biological data should be minimized (2-3 anglers/site will be adequate if angler sub-sampling is necessary) or eliminated when it will prevent interviews of anglers who are about to leave.

2.0 ANGLER SURVEY DATA COLLECTION SITES

Angler survey data (boat counts and boat angler interviews) are to be collected from boat anglers returning to the public boat launch sites and marinas at:

- Ontario Street,
- Foot of Sheridan Drive,
- Isle View Park,
- Niawanda Park,

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- Gratwick Riverside Park,
- Griffon Park,
- Big Sixmile Marina, and
- Blue Water Marina.

The first six listed sites are along the East (Tonawanda) Channel (see [Figure 2.1-1](#), main report); the last two sites are on Grand Island.

Angler counts and angler interviews will also be collected from anglers fishing from shore at these 15 sites. Arrival angler counts only are taken at each shore fishing site except as noted below:

- Bird Island Pier (pier proper south to Peace Bridge),
- Ferry Street (formally Broderick Park),
- Squaw Island ,
- Towpath Park (departure count also),
- Ontario Street,
- Riverside Park,
- Foot of Sheridan Drive (departure count also),
- Isle View Park,
- Niawanda Park,
- Fisherman's Park (departure count also),
- Gratwick Riverside Park,
- Griffon Park (departure count also),
- Woods Creek mouth (departure count also),
- West River Parkway, and

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- Beaver Island State Park Marina (departure count also).

All shore fishing sites are arrayed along the east river bank except the last three sites that are located on Grand Island.

Section 9, [Attachment C](#) provides directions to each boat ramp and shore angling site. The sites are grouped geographically into two routes for shoreline surveys, and all shore sites will be visited on a survey day. Although eight boat ramps are listed, only three boat access sites will be visited on any survey day. [Attachment C](#) also provides all site data codes, and information that describes the sampling approach for each site. Beaver Island State Park Marina will be surveyed only when fishing is permitted (April through May 18; October 18 through November 30).

3.0 BASICS OF ANGLER SURVEY DATA COLLECTION

3.1 Shore Angler Surveys

Data related to angler surveys are to be collected by the technician and recorded as appropriate on survey-specific forms listed in [Section 1](#). The headings for data fields on the forms typically provide direction relative to the type of information that will be placed in a field. For all angler interviews, as scripted on the angler data forms, questions will be asked such as what fish species they sought (targeted), duration of the fishing trip, whether the trip is a complete or incomplete, total number by species of fish kept, and the number by species of fish released.

Survey form [DCS.01](#) will be filled out each day for a shore or boat survey. The form is intended to record information such as survey type, site name, time the site is visited, and the count of anglers (count of all anglers observed, whether single or dual, plus total of anglers interviewed) at each site visited as the survey progresses. Survey form [NCS.01](#) will be completed only when an interview is attempted. The coding manual provided as [Attachment B](#) describes how each data field should be completed in the field.

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Form [DCS.01](#) will be reviewed at the end of each site visit and at the end of a shift to ensure that all applicable fields on that form are completed as appropriate. When interview form [NCS.01](#) has been used, it will be reviewed at the end of EACH interview to immediately ensure that all applicable fields on that form are completed as appropriate. Pencils will be used to record data. If errors are found, the technician will strike through the error and write the correction and date beside the strike. Do not erase errors.

Shore fishing surveys will yield mostly incomplete-trip interviews (anglers remain actively fishing), but can also intercept anglers that are quitting. After an angler provides the primary information (e.g., target species, time spent fishing, catch), with permission the total length (TL) of any harvested fish will be recorded. When time permits, length data from all fish harvested will be collected. When anglers are numerous and the measuring process impacts collection of fish catch data from other anglers, the technician will randomly sub-sample anglers to interview and/or the anglers from which to obtain fish lengths and other biological data. Alternatively, the technician may randomly subsample (i.e., avoid intentional selection of the largest or smallest individuals) a portion of the retained catch. See [Sections 1.1](#) and [3.3](#) for detailed biological data collection information.

3.2 Boat Angler Surveys

The summary and interview data forms for boat surveys are identical to those used for shore anglers (review [Section 3.1](#)), although there are differences in interview procedures. The form [NCS.01](#) was designed to accommodate these differences. Foremost is the need to determine from the angler or party spokesman where the party fished. A map of the survey area will be used to help the angler identify river locations (mainstem, east or west channel) where he fished. If the boat anglers have fished all or a portion of their trip in Lake Erie, the party should be interviewed and noted appropriately on the interview sheet.

Boat fishing is often completed by a group of anglers (an angling party) and catch data such as targeted species, number caught and kept, etc. are to be reported for the party. Although the data will be

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normally obtained from one individual on the boat who represents all persons aboard as a spokesman the total number of anglers in the boat party is to be recorded.

Boat interviews will typically occur when a boat has returned from a fishing trip (a completed trip survey). In addition, for most boat fishing surveys an interruption in fishing for fuel or food that involves a return to the launch ramp or marina is a significant break in fishing and thus the trip can be considered complete to that point. The type of trip (complete or, infrequently, incomplete) will always be noted in the appropriate field on the data form. The residence of the angler(s), (e.g., zip code for NY residents, state/province for others) will be obtained. However, a charter boat captain's residence is not to be included on the data form, except where it is the same as one or more of his clients.

Launch conditions and traffic at the time of the interview can dictate where and how an interview is conducted. If there are few or no other boats waiting to use the dock facilities the technician will interview the boat angler(s) as the opportunity is presented at the launch. If the launch is busy, the technician will try to record the interview data after the boat has been loaded on the trailer and pulled to a convenient and safe location. At no time shall the technician's activities impede the use of the launch facilities by other parties or endanger themselves or others.

If a boat party indicates they have fished the Niagara River and also in Lake Erie but they cannot determine the length of time at each site and/or which fish were caught where, the data they could provide cannot be used. The technician should complete the interview, indicate the trip involved Lake Erie, and thank the anglers. If, in the technician's opinion, a group of anglers are providing a reasonable estimate of the species and number of fish caught, kept, and returned for each location, their information can be included in the data form and will be considered valid.

3.3 Additional Biological Data and Method of Coding Samples

Biological samples (i.e., in addition to total length, TL) will be collected opportunistically for the following species as listed below. Samples will be obtained from harvested fish except as noted. PIT tags

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and coded wire (CW) tags are small internal tags each detected by use of special tag-specific gear. Each angler technician will carry tag detection gear.

- Smallmouth bass--TL plus number legal and number sub-legal released.
- Largemouth bass--TL plus PIT tag, CW tag.
- Walleye--TL only
- Lake trout--TL only
- Rainbow trout--TL plus fin clips
- Yellow perch--TL plus PIT tag, CW tag.
- Northern Pike--TL plus PIT tag, CW tag
- Muskellunge--TL plus measured TL of released fish; dorsal tag; cleithrum.

Data codes specific to each tag type are listed on the bottom of Form [NCS.01](#). Instructions for coding are included in the [NCS.01](#) coding manual ([Attachment B](#)). Additionally, a space on [NCS.01](#) is available to record the number of any tags encountered, including dorsal tags or PIT tags. Additional information to facilitate biological data collection is provided in the Coding Manual ([Attachment B](#)).

Fish with PIT and/or coded wire tags may also have fin clips to secondarily identify marked fish. Clips may involve pectoral, pelvic, or caudal fins. Most fish fin-clipped are young-of-year and unlikely to be harvested. If fin-clipped fish are observed note the appropriate clip on the interview sheet.

A data code is also provided on Form [NCS.01](#) to identify muskellunge sampled for cleithra (see [Attachment A](#)). Cleithra from legally caught (48 inches in Niagara River, 54 inches in Lake Erie, open season only) individual muskellunge will be placed in separate and specifically labeled ziplock-type plastic sample bags. Samples are to be identified with a unique sample number using a Date:Place:Time alphanumeric code that will be written on a waterproof form inserted into the sample bag (use sharpie). A representative sample number is: 5-9-03/140/14:23.

The method to produce a sample number is:

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1. Begin all sample numbers with the current date (e.g., 5-9-03)
2. Following the date, add the site-code for where the sample is collected. Site codes are found in the attachments to the SOP. e.g., 140 for Ontario Street.
3. Determine military time to the nearest minute (e.g., 14:23 hours) and place the time after the site code.
4. Write the code on the bag insert; and
5. Return the samples to the Field Crew Leader for storage. The Crew Leader will freeze the cleithra samples to avoid rapid decomposition.

3.4 Aerial Survey of Boats Used for Fishing

Instantaneous aerial counts will be conducted on one randomly chosen day each week. A 50/50 split between weekday and weekend/holiday strata will be obtained by alternating daytypes throughout the season. Weather permitting these counts should occur on the same day that interviews are to be conducted. All boats in the upper Niagara River (U.S. and Canadian waters) will be counted and designated as either "fishing" or "other recreational" (e.g., water skiing, swimming, kayak groups, etc.). Exceptions would be commercial boat traffic or tour boats.

Two categories of fishing boat will be recognized: (1) boats actively engaged in fishing, and (2) fishing boats underway (in transit). A vessel will be considered a fishing boat actively engaged in fishing if any of its occupants are observed holding a fishing rod, landing net, or a fish. A slowly moving boat without a visible wake will also be considered actively fishing if downriggers are deployed, or occupants are drift fishing but not holding equipment or fish. A vessel will be considered a fishing boat underway if none of its occupants are observed holding a fishing rod, landing net, or fish, but if the boat is observed to have downriggers or fishing rods on board and is producing an obvious, visible wake. All other vessels will be considered non-fishing boats.

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Boat counts will be recorded separately on form ASF.01 for three river sections ([Figure 2.1-1](#), main report): the mainstem (Peace Bridge north to north end of Motor Island in the East Channel and north end of Beaver Island in the West Channel); East Channel (Tonawanda channel, extending from north end of Motor Island to the navigation limit above Niagara Falls); and West Channel (Chippawa channel, extending from Beaver Island to the north end of Navy Island. A laminated map will aid counters during flights.

3.5 Angler Survey Journals

Field technicians will maintain a daily log of their activity in a journal. The purpose is to provide information that will assist interpretation of the formal survey data. For each shore or boat survey the date, time, and type of survey will be noted. Anecdotal information and observations by the angler technician that augment the formal data recorded on survey forms should be recorded. Such information may include weather conditions that affect fishing activity, favored fishing locations, angler remarks about river conditions and fishing, etc.

4.0 SCHEDULES AND ANGLER ROUTES

The schedule for the angler survey is a separate document that identifies the personnel, dates, shift times, and randomly selected starting locations for the roving shoreline and boat angler surveys. The aerial count survey schedule is found in the same document. Count flight dates have been pre-selected to provide the FAA and the flight sub-contractor the information needed to fly over the Niagara River during periods of Temporary Flight Restrictions (TFR) related to national security concerns. Flight schedules may be modified either due to bad weather and/or equipment malfunctions. Ground survey schedules will be developed monthly. The schedules will provide information on sites to be visited, routes of travel, time intervals for each site on a route (shore) or survey, etc. Directions to sites are provided in Section 9, [Attachment C](#). All angler technicians will consult the schedules to determine their daily responsibilities.

The shoreline angler survey will be conducted at each site on a route for approximately one hour or less per site per day. Sites will be visited beginning at either 07:30 hours (AM shift) or at an afternoon

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time (PM shift) specified by the monthly schedule. The PM shift start time will vary throughout the year as day length varies. Route information including: specific route (order of sites), starting time, arrival time for each site, etc., is provided in [Attachment C](#).

The boat angler survey sites are those listed in [Section 2.0](#). Three sites will be visited for two hours each scheduled day. Selection of the survey start time, sites to visit, and order of visitation will be scheduled monthly.

Interviews will not be initiated if they cannot be completed prior to darkness. For safety, all interviews and site visits will end and the technicians will be at their vehicle prior to darkness.

5.0 DATA CUSTODY

Data sheets will be retained by the technician until delivered to the Field Crew Leader (FCL), the locked private storage facility, or picked up in the field by the FCL. The number and kinds of sheets delivered or transferred will be documented, dated and all parties involved will initial the transfer(s). Each daily summary form (three generated per day, minimum of 15 per week) will be sent (typically by fax) to a permanent Normandeau office for data entry and weekly production of a progress report. Following review by the FCL, all original data forms and a data custody cover sheet will be sent to a permanent Normandeau office for data entry and storage.

6.0 SAFETY

Technicians will be cognizant of surroundings, suspicious people in the area, weather and footing (ice/snow/mud) conditions. Technicians are not to place themselves in situations where their safety is in undue jeopardy. Be aware of cell phone usage. [Section 8](#) of the SOP provides lists of phone numbers for local police, Border Patrol and NYPA security. Use them in an emergency or if in danger. Survey field personnel should call the FCL or communicate with each other at the end of each shift.

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7.0 EXAMPLE ANGLER SURVEY INTERVIEW INTRODUCTION TO ANGLERS

An example approach for initiating a boat or shore interview is:

“Hello, I work for Normandeau Associates and I’m conducting a fisheries survey on behalf of the New York Power Authority (NYPA). If you have a few minutes I’d like to ask some general questions about your fishing trip today.” Proceed with the interview only if permission is granted. If, during the interview, anglers ask for more specifics on the NYPA Power Project or the reasons for the survey, direct them to call NYPA.

If an individual is not interested, thank them and move to the next. The approach is to always be courteous, even if the angler is not. If the angler agrees to the interview, ask the questions listed on the angler forms as appropriate. **NOTE:** When conducting an interview, do not delay anglers or boats if there are other boats waiting to use the launch.

When finished with the main portion of the interview, and the angler has kept some fish, ask:

“Do you mind if I take length measurements of your fish, and check for various tags?” Always request permission to remove cleithra from harvested muskellunge (note: do not collect cleithra of musky to be released or caught out of season). Cleithrum removal involves mutilation and additional time on the part of the angler or angling party. Respect their decision to decline. Also, if the angler technician observes that the angler has misidentified a fish, or harvested a species during a closed season, note this on the data sheet and correct it after the interview. It is not necessary and may even be detrimental to “correct” the angler. Use discretion.

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8.0 PHONE NUMBERS

8.1 Police, NYPA Security, and Related Phone Numbers

8.2 Angler Personnel Phone Numbers

9.0 ROUTE AND SITE DIRECTIONS, SITE LIMITS

See [Attachment C](#)

ATTACHMENT A - CLEITHRUM REMOVAL

From: <http://www.trentu.ca/muskie/biology/biol06.html>

Instructions for removing cleithral bones

Cleithra (singular=cleithrum) are paired, crescent-shaped, flat bones that are the main supports of the shoulder (pectoral girdle). They are just visible under the skin on either side of the head immediately behind the gill covers (see above [figure](#)). The basic points for removing the left cleithrum by hand are as follows:

- Hold the dead fish facing left, and grasp the fish behind the pectoral fins with the right hand. Hook the fingers of the left hand over the top of the head.
- Use the thumb of the left hand to lift the opercular flap, exposing the cleithrum just posterior to the gills.
- Push the thumb between the posterior edge of the cleithrum and the connective tissue and muscle.
- Move the thumb towards the top, and then towards the bottom, to separate most of the inner surface of the bone from the underlying soft tissue.
- Push the thumb or index finger of the left hand through the soft connective tissue in the middle anterior of the cleithrum ([Figure 2](#)).
- Hook the index finger from the outside through this hole and firmly pull the cleithrum away from its dorsal connection, exposing the dorsal spine.
- When the dorsal tip has been released (in very large fish some of the heavy connective tissue may have to be cut away to ease the separation), grasp it between the thumb and index finger.

- Pull the cleithrum out from the body and towards the anterior. This will expose the anterior tip. It is important during this process to pull the cleithrum strongly away from the body to avoid breaking or tearing the extreme anterior tip and growing edge.
- Push the cleithrum over the thumb of the same hand or the index finger of the other hand to hold back the adhering soft tissue. This peels away the muscle and connective tissue from the outer surface of the cleithrum.

With this method of removal, the cleithrum comes away virtually free of soft tissue. In very large fish or if age is to be determined immediately some dissection with a knife or scissors may be required.

Cleaning of cleithral bones

After one or both cleithral bones are removed from the fish, they should be kept damp until they can be cleaned. If this is to be more than a day, they should be kept frozen. Be sure that the appropriate

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information remains associated with each cleithrum during this intermediate step.

- Pour boiling water into a Pyrex or heat-resistant container.
- Hold the bone with a pair of tongs or forceps, dip the bone into the boiling or near-boiling water, and hold it there for approximately 15 seconds. Remove the bone and dip in cool, clean water. Rub off the muscle and other soft tissue with a cloth, paper towel or toothbrush. If some soft tissue still remains firmly attached, repeat the process until all of the soft tissue is removed. Twice is usually adequate except for very large bones, or those on which a lot of connective tissue has been attached.
- Rinse the bone with clean water and wipe dry with a cloth or paper towel.
- These bones can be placed directly into a perforated ziploc bag with the completed biological information form, or a Cleithrum Project envelope, if available.

CAUTION: Do not leave the bones in boiling water for a prolonged time or the zones used to determine age and growth will become completely obscured. If processing several fish at one time, be careful to make sure that the bones, scales, and information from one fish from one fish are not mixed with those of another. If there is any possibility a mix-up has occurred, inform us.

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ATTACHMENT B – DATA FORMS AND CODING MANUAL

Proprietary material.

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**ATTACHMENT C - SITE DESCRIPTIONS, SAMPLING APPROACH,
ROUTES, AND DIRECTIONS**

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UPPER NIAGARA RIVER ANGLER SURVEY

Shore Survey- access site descriptions and directions. Data recorded separately for sub-sites as listed.				
Site	Use	Code	Directions	Sampling Approach
Bird Island Pier	S	100	Off Niagara St., Route 266. Turn right (if driving from north) on Robert Rich Way, under bridge, over canal, turn left to pier parking lot	No bicycles allowed. Walk pier as far as Peace Bridge to get angler count; return while interviewing angler parties. Sub-sites: river side = 101; canal side = 102.
sub-site	S	101	River side of pier	
sub-site	S	102	Canal side of pier	
Ferry Street	S	110	Off Niagara St., Route 266. Turn right (if driving from north) on Robert Rich Way, under bridge, over canal. Site is named Broderick Park.	Site consists of bulkhead railing extending along Bird Island Pier and Broderick Park parking lots. Site ends at concrete barriers on bike path.
Squaw Island	S	120	From north on Niagara St., Rt. 266, turn right immediately after RR underpass. Cross canal on RR bridge, drive toward river, turn under RR tracks and follow road to parking lots at north end of island. Proceed to Black Rock Canal entrance.	Main focus is anglers on north tip of island at canal entrance, and anglers on riprap along river accessed from canal site. Also get counts and interviews from shoreline accessed by new parking lot by RR bridge out to river on rip rap. Subsites: canal area = 121; new parking lot = 122.
sub-site	S	121	Canal entrance area	
sub-site	S	122	Parking lot/shore by RR bridge	
Towpath Park	S	130	Off Niagara St., Rt. 266, turn toward river at W. Hertel Ave. (Riverwalk sign); drive under I-190 to parking lot adjacent to Rich Marina	Small, discrete shore-only site along bulkhead railing.
Ontario Street	S/B	140	From north, use I-190 to Ontario St. exit. Turn left at Rt. 266, Niagara St, then immediate left under I-190 to parking lot.	Boat ramp-in small parking lot near I-190. Shore site-along bulkhead railing near boat ramp, and along yellow bulkhead railing north along long parking area.
Riverside Park	S	150	Access via Ontario St boat ramp. Drive to far (north) end of parking lot.	Site consists of bulkhead railing extending from end of Ontario St. parking lot. Site ends at pedestrian walkway on bike path.

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UPPER NIAGARA RIVER ANGLER SURVEY (CONT.)

Shore Survey- access site descriptions and directions. Data recorded separately for sub-sites as listed.				
Site	Use	Code	Directions	Sampling Approach
Sheridan Drive	S/B	160	Off River Rd./Niagara St. at Sheridan Drive intersection, in Town of Tonawanda Park	Boat ramp-in main parking lot. Shore site-includes shore near ramp, along bulkhead railing south of boat ramp, and along shore in Aqua Lane Park parking area (to south).
Isle View Park	S/B	200	Off Rt. 266, Niagara St., just north of S. Gr. Island Bridge, Tonawanda.	Long linear park. Boat ramp-in north end of park. Shore site- equivalent to vehicle road extent. Drive roads, or bike along path near river. Multiple entrances.
Niawanda Park	S/B	210	Off Rt. 266, Niagara St., north of S. Gr. Island Bridge and north of Isle View Park, Tonawanda.	Long linear park. Boat ramp-in north end of park. Shore site- equivalent to vehicle road extent. Drive roads, or bike along path near river. Multiple entrances.
Fisherman's Park	S	220	Off Rt. 265/384-River Rd.-Seaway Trail, North Tonawanda.	Site consists of riprap shoreline to north, wooden pier, and bulkhead to south. Ends at boat davit at end of aqua-colored fence.
Gratwick Riverside Park	S/B	230	Off Rt. 265/384-River Rd.-Seaway Trail, North Tonawanda.	Linear Park. Central boat ramp. Drive along to count and interview shore anglers; check for anglers on small rock breakwalls near shore.
Griffon Park	S/B	240	Off Rt. 265/384-Buffalo Ave, Niagara Falls-Seaway Trail. Small park behind Cayuga Island.	Boat ramp- at parking lot. Shore anglers- on nearby bulkheads and courtesy dock fingers.
Mouth of Wood's Creek	S	250	Grand Island. Off East River Rd., Buckhorn Island State Park. Park by locked gate.	Walk access road past locked gate to creek mouth. Site consists of shore along access road and area adjacent to bridge over creek.
Big Sixmile Marina	B	260	Grand Island, off West River Parkway at Whitehaven Rd. Enter off Whitehaven Rd.	Boat ramp-at river end of marina; also many dockfingers/slips.
West River Parkway	S	270	Grand Island. Site consists of three overlooks/parking areas along West River Parkway.	Treat overlooks as one site timewise, but keep individual overlook counts separate. North = 271; Middle = 272; South = 273.
sub-site	S	271	North overlook	
sub-site	S	272	Middle overlook	
sub-site	S	273	South overlook	

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UPPER NIAGARA RIVER ANGLER SURVEY (CONT.)

Shore Survey- access site descriptions and directions. Data recorded separately for sub-sites as listed.				
Site	Use	Code	Directions	Sampling Approach
Blue Water Marina	B	280	Grand Island. South end of island near intersection of East River Rd. and Ferry Rd.	Private marina with \$3 launch charge.
Beaver Island State Park	S	290	Grand Island, south end. Enter park and proceed to marina parking lot.	Shore site consists of concrete bulkheads and dock fingers in marina area only; not shoreline on either side of marina area.

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

UPPER NIAGARA RIVER ANGLER SURVEY – SHORE ROUTES

Buffalo Sites-comprised of seven shore fishing sites. Three routes of travel.	
Route	Order of travel to sites
Route A	Start at Bird Island Pier; to Ferry Street; to Squaw Island; to Towpath Park; to Ontario Street; to Riverside Park; to Foot of Sheridan Drive (finish).
Route B	Start at Foot of Sheridan Drive; to Riverside Park; to Ontario Street; to Towpath Park; to Squaw Island; to Ferry Street; to Bird Island Pier (finish).
Route C	Start at Squaw Island; to Ferry Street; to Bird Island Pier; to Towpath Park; To Riverside park; to Ontario Street; to Sheridan Drive (finish).
Grand Island-Tonawanda Sites-comprised of eight shore fishing sites. Three routes of travel.	
Route A	Start at Isle View Park; to Niawanda Park; to Fisherman's Park; to Gratwick Riverside Park; to Griffon Park; cross to Grand Island; to West River Parkway; to Beaver Island S.P.; to Wood's Creek (finish).
Route B	Start at Wood's Creek (Grand Island); to West River Parkway; to Beaver Island S.P.; cross South Grand Island Bridge; to Isle View park; to Niawanda Park; to Fisherman's Park; to Gratwick Riverside Park; to Griffon Park (finish).
Route C	Start at Griffon Park; to Gratwick Riverside Park; to Fisherman's Park; to Niawanda Park; to Isle View Park; cross South Grand Island Bridge; to Wood's Creek; to West River Parkway; to Beaver Island S.P. (finish).

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

NIAGARA RIVER ANGLER SURVEY - SHORE ROUTES - AM—REVISED

Sites correspond to order of sites specified in route descriptions (listed separately).										
Month	Route	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Finish
April	Buffalo	730	828	926	1024	1122	1220	1318		1416
	Gr.Is.-Ton.	730	821	912	1003	1054	1145	1236	1327	1418
May	Buffalo	730	730	930	1030	1130	1230	1330		1430
	Gr.Is.-Ton.	730	822	914	1006	1058	1150	1242	1334	1426
June	Buffalo	730	831	932	1033	1134	1235	1336		1437
	Gr.Is.-Ton.	730	823	916	1009	1102	1155	1248	1341	1434
July	Buffalo	730	831	932	1033	1134	1235	1336		1437
	Gr.Is.-Ton.	730	823	916	1009	1102	1155	1248	1341	1434
August	Buffalo	730	829	928	1027	1126	1225	1324		1423
	Gr.Is.-Ton.	730	822	914	1006	1058	1150	1242	1334	1426
TIMES THROUGH AUGUST WILL CONTINUE AS ORIGINALLY PUBLISHED TIMES FROM SEPTEMBER THROUGH NOVEMBER HAVE CHANGED-PLEASE NOTE										
Sept.	Buffalo	730	824	918	1012	1106	1200	1254		1348
	Gr.Is.-Ton.	730	824	918	1012	1106	1200	1254		1348
Oct. (see below)	Buffalo	730	820	910	1000	1050	1140	1230		1320
	Gr.Is.-Ton.	730	814	858	942	1026	1110	1154	1238	1322
Oct 26 to Nov 30	Buffalo	730	813	856	939	1022	1105	1148		1231
	Gr.Is.-Ton.	730	808	846	924	1002	1040	1118	1156	1234

Notes to new schedule times:

- 1) Continue using Buffalo Rt. times for both routes through October 17. Begin using separate routes times on October 18 with re-opening of Beaver Island Park marina to shore angling.
- 2) Daylight Savings Time ends October 25. Thus, October Grand Island times will be used for about one week only.
- 3) Beginning October 26, use individual route times for last 5 weeks of the survey to 11/30.
- 4) Schedule changes made to avoid sampling last site on route in the dark. Arrival times for late in a month will still occur after sunset for a few days.

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

NIAGARA RIVER ANGLER SURVEY - SHORE ROUTES - PM--REVISED

Sites correspond to order of sites specified in route descriptions (listed separately).										
Month	Route	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Finish
April	Buffalo	1416	1514	1612	1710	1808	1906	2004		2102
	Gr.Is.-Ton.	1418	1509	1600	1651	1742	1833	1924	2015	2106
May	Buffalo	1430	1530	1630	1730	1830	1930	2030		2130
	Gr.Is.-Ton.	1426	1518	1610	1702	1754	1846	1938	2030	2122
June	Buffalo	1437	1538	1639	1740	1841	1942	2043		2144
	Gr.Is.-Ton.	1434	1527	1620	1713	1806	1859	1952	2045	2138
July	Buffalo	1437	1538	1639	1740	1841	1942	2043		2144
	Gr.Is.-Ton.	1434	1527	1620	1713	1806	1859	1952	2045	2138
August	Buffalo	1423	1522	1621	1720	1819	1918	2017		2116
	Gr.Is.-Ton.	1426	1518	1610	1702	1754	1846	1938	2030	2122
TIMES THROUGH AUGUST WILL CONTINUE AS ORIGINALLY PUBLISHED TIMES FROM SEPTEMBER THROUGH NOVEMBER HAVE CHANGED-PLEASE NOTE										
Sept.	Buffalo	1348	1442	1536	1630	1724	1818	1912		2006
	Gr.Is.-Ton.	1348	1442	1536	1630	1724	1818	1912		2006
Oct. (see below)	Buffalo	1320	1410	1500	1550	1640	1730	1820		1910
	Gr.Is.-Ton.	1322	1406	1450	1534	1618	1702	1746	1830	1914
Oct 26 to Nov 30	Buffalo	1231	1314	1357	1440	1523	1606	1649		1732
	Gr.Is.-Ton.	1234	1312	1350	1428	1506	1544	1622	1700	1738

Notes to new schedule times:

- 1) Continue using Buffalo Rt. times for both routes through October 17. Begin using separate routes times on October 18 with re-opening of Beaver Island Park marina to shore angling.
- 2) Daylight Savings Time ends October 25. Thus, October Grand Island times will be used for about one week only.
- 3) Beginning October 26, use individual route times for last 5 weeks of the survey to 11/30.
- 4) Schedule changes made to avoid sampling last site on route in the dark. Arrival times for late in a month will still occur after sunset for a few days.

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX C – DATA APPENDIX

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX TABLE C-1

**WEEKLY SHORE ANGLER COUNTS BY ACCESS SITE, UPPER NIAGARA RIVER ANGLER SURVEY, 2003. SURVEY STARTED
APRIL 5. DATE SHOWN IS FIRST DAY OF COUNT WEEK**

Shore Access Site	5-Apr	7-Apr	14-Apr	21-Apr	28-Apr	5-May	12-May	19-May	26-May	2-Jun
Bird Island Pier			7							
Bird Island Pier-river side	0	2	0	2	4	3	3	2	4	4
Bird Island Pier-canal side	0	8	1	0	2	4	3	3	8	7
Ferry Street	0	13	20	17	27	26	39	30	49	76
Squaw Island			14							
Squaw Island-canal entrance	7	47	39	19	16	23	68	54	90	63
Squaw Island-RR bridge	0	0	1	0	0	0	0	11	4	1
Towpath Park	0	0	3	8	10	22	41	39	38	36
Ontario Street	0	5	22	7	21	7	22	53	60	64
Riverside Park	0	2	15	8	12	5	15	7	18	15
Sheridan Drive	0	0	7	0	8	6	17	5	26	19
Isle View Park	0	0	2	0	0	5	7	19	12	13
Niawanda Park	0	4	1	11	0	3	3	8	11	9
Fisherman's Park	0	1	3	11	6	10	9	38	45	50
Gratwick Riverside Park	0	2	3	10	1	3	5	11	12	13
Griffon Park	0	0	1	10	8	7	0	32	47	9
Mouth of Wood's Creek	0	0	0	6	0	4	18	0	16	17
West River Pkwy, north overlook	0	0	0	0	0	0	0	1	0	0
West River Pkwy, middle overlook	0	0	2	0	0	0	0	0	0	0

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX TABLE C-1 (CONT.)

**WEEKLY SHORE ANGLER COUNTS BY ACCESS SITE, UPPER NIAGARA RIVER ANGLER SURVEY, 2003. SURVEY STARTED
APRIL 5. DATE SHOWN IS FIRST DAY OF COUNT WEEK.**

Shore Access Site	5-Apr	7-Apr	14-Apr	21-Apr	28-Apr	5-May	12-May	19-May	26-May	2-Jun
West River Pkwy, south overlook	0	0	0	0	0	0	2	2	3	3
Beaver Island State Park	7	15	42	67	87	62	41	0	no fishing allowed	
Weekly Total	14	99	183	176	202	190	293	315	443	399

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX TABLE C-1 (CONT.)

**WEEKLY SHORE ANGLER COUNTS BY ACCESS SITE, UPPER NIAGARA RIVER ANGLER SURVEY, 2003. SURVEY STARTED
APRIL 5. DATE SHOWN IS FIRST DAY OF COUNT WEEK.**

Shore Access Site	9-Jun	16-Jun	23-Jun	30-Jun	7-Jul	14-Jul	21-Jul	28-Jul	4-Aug
Bird Island Pier									
Bird Island Pier-river side	4	5	5	10	0	5	5	2	7
Bird Island Pier-canal side	8	5	2	9	1	4	3	7	4
Ferry Street	45	47	44	61	37	69	42	48	66
Squaw Island									
Squaw Island-canal entrance	36	26	20	37	19	19	28	28	21
Squaw Island-RR bridge	5	0	5	8	2	2	1	5	0
Towpath Park	17	42	49	49	5	15	17	17	21
Ontario Street	52	53	53	110	37	33	28	47	34
Riverside Park	14	16	6	17	22	3	2	4	6
Sheridan Drive	55	29	16	46	15	20	3	15	17
Isle View Park	7	5	9	17	4	15	3	8	7
Niawanda Park	20	45	35	31	13	11	39	30	10
Fisherman's Park	19	65	57	77	27	28	52	59	50
Gratwick Riverside Park	15	27	7	6	3	14	10	6	8
Griffon Park	13	16	9	0	0	10	5	2	7
Mouth of Wood's Creek	17	4	17	25	14	6	4	1	0
West River Pkwy, north overlook	0	2	0	0	0	1	0	0	0
West River Pkwy, middle overlook	0	0	0	0	0	0	0	0	0

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX TABLE C-1 (CONT.)

**WEEKLY SHORE ANGLER COUNTS BY ACCESS SITE, UPPER NIAGARA RIVER ANGLER SURVEY, 2003. SURVEY STARTED
APRIL 5. DATE SHOWN IS FIRST DAY OF COUNT WEEK.**

Shore Access Site	9-Jun	16-Jun	23-Jun	30-Jun	7-Jul	14-Jul	21-Jul	28-Jul	4-Aug
West River Pkwy, south overlook	1	0	0	5	0	0	0	0	3
Beaver Island State Park	no fishing allowed								
Weekly Total	328	387	334	508	199	255	242	279	261

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX TABLE C-1 (CONT.)

**WEEKLY SHORE ANGLER COUNTS BY ACCESS SITE, UPPER NIAGARA RIVER ANGLER SURVEY, 2003. SURVEY STARTED
APRIL 5. DATE SHOWN IS FIRST DAY OF COUNT WEEK.**

Shore Access Site	11-Aug	18-Aug	25-Aug	1-Sep	8-Sep	15-Sep	22-Sep	29-Sep	6-Oct
Bird Island Pier									
Bird Island Pier-river side	5	10	3	7	13	6	0	0	2
Bird Island Pier-canal side	8	15	5	4	5	11	3	2	4
Ferry Street	32	70	54	47	39	40	17	12	34
Squaw Island									
Squaw Island-canal entrance	20	43	22	23	15	22	12	4	29
Squaw Island-RR bridge	4	7	1	3	0	6	0	0	1
Towpath Park	28	13	20	14	27	12	6	4	12
Ontario Street	41	44	45	40	38	24	19	1	20
Riverside Park	3	5	10	0	6	1	0	0	5
Sheridan Drive	16	10	12	11	15	13	2	0	3
Isle View Park	6	5	11	7	4	7	1	0	2
Niawanda Park	17	19	18	21	25	21	10	0	9
Fisherman's Park	50	49	57	61	40	50	25	8	17
Gratwick Riverside Park	4	2	1	9	1	8	2	0	0
Griffon Park	3	3	0	4	8	2	5	0	1
Mouth of Wood's Creek	4	4	11	16	1	4	0	0	2
West River Pkwy, north overlook	0	4	0	0	0	0	0	0	0
West River Pkwy, middle overlook	0	1	0	0	0	0	0	0	0

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX TABLE C-1 (CONT.)

**WEEKLY SHORE ANGLER COUNTS BY ACCESS SITE, UPPER NIAGARA RIVER ANGLER SURVEY, 2003. SURVEY STARTED
APRIL 5. DATE SHOWN IS FIRST DAY OF COUNT WEEK.**

Shore Access Site	11-Aug	18-Aug	25-Aug	1-Sep	8-Sep	15-Sep	22-Sep	29-Sep	6-Oct
West River Pkwy, south overlook	0	0	0	2	0	0	0	0	0
Beaver Island State Park	no fishing allowed								
Weekly Total	241	304	270	269	237	227	102	31	141

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX TABLE C-1 (CONT.)

**WEEKLY SHORE ANGLER COUNTS BY ACCESS SITE, UPPER NIAGARA RIVER ANGLER SURVEY, 2003. SURVEY STARTED
APRIL 5. DATE SHOWN IS FIRST DAY OF COUNT WEEK.**

Shore Access Site	13-Oct	20-Oct	27-Oct	3-Nov	10-Nov	17-Nov	24-Nov
Bird Island Pier							
Bird Island Pier-river side	8	0	0	0	0	2	0
Bird Island Pier-canal side	0	0	0	0	0	0	0
Ferry Street	31	15	20	7	7	22	2
Squaw Island							
Squaw Island-canal entrance	33	18	21	15	10	26	2
Squaw Island-RR bridge	3	0	0	0	0	0	0
Towpath Park	17	4	6	0	0	5	0
Ontario Street	15	3	8	2	1	14	0
Riverside Park	1	2	0	2	0	10	0
Sheridan Drive	2	0	0	0	0	0	0
Isle View Park	0	2	0	0	0	1	0
Niawanda Park	2	0	2	2	0	0	0
Fisherman's Park	7	5	4	0	2	0	1
Gratwick Riverside Park	0	0	0	0	0	0	0
Griffon Park	5	0	0	0	0	0	0
Mouth of Wood's Creek	0	0	2	0	0	0	0
West River Pkwy, north overlook	0	0	0	0	0	0	0
West River Pkwy, middle overlook	0	0	0	0	0	0	0

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX TABLE C-1 (CONT.)

**WEEKLY SHORE ANGLER COUNTS BY ACCESS SITE, UPPER NIAGARA RIVER ANGLER SURVEY, 2003. SURVEY STARTED
APRIL 5. DATE SHOWN IS FIRST DAY OF COUNT WEEK.**

Shore Access Site	13-Oct	20-Oct	27-Oct	3-Nov	10-Nov	17-Nov	24-Nov
West River Pkwy, south overlook	0	0	0	0	0	0	0
Beaver Island State Park	0	7	4	7	4	10	0
Weekly Total	124	56	67	35	24	90	5

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX TABLE C-2

**OBSERVED SPECIES CATCH AND HARVEST BY BOAT AND SHORE ANGLERS, UPPER
NIAGARA RIVER ANGLER SURVEY, 2003**

Common name	Boat Anglers		Shore Anglers	
	Caught	Kept	Caught	Kept
Yellow perch	405	177	4,560	1,785
Round goby	49	26	3,275	3,018
Rock bass	69	2	2,245	686
Smallmouth bass	1,527	121	1,669	145
Freshwater drum	57	1	482	8
Minnnows/baitfish			360	271
Sunfish*	29	0	344	40
Largemouth bass	642	12	333	21
White perch	5	0	116	81
Pumpkinseed	2	1	103	37
Northern pike	263	2	98	34
White bass			87	39
Bluegill	65	0	82	11
Brown bullhead	23	6	72	51
Golden shiner			30	0
Common carp	5	0	22	8
White sucker			20	3
Rainbow trout	8	3	19	11
<i>Black bass</i>	11	0	18	0
Catfish**	1	0	15	4
Walleye	13	9	13	3
Black crappie	102	28	9	3
Brown trout	1	0	8	7
Muskellunge	65	0	7	0
Channel catfish			7	6
Redhorse sucker			5	2
Lake trout	1	1	4	1
Bowfin			2	0

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX TABLE C-2 (CONT.)

**OBSERVED SPECIES CATCH AND HARVEST BY BOAT AND SHORE ANGLERS, UPPER
NIAGARA RIVER ANGLER SURVEY, 2003**

Common name	Boat Anglers		Shore Anglers	
	Caught	Kept	Caught	Kept
Unidentified salmonid			1	1
Unidentified fish			1	0
Rudd	4	0		

* Includes bluegill and pumpkinseed

** Includes channel catfish

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX TABLE C-3

**SEASONAL CATCH AND HARVEST RATES (ALL ANGLERS) FOR ALL SPECIES CAUGHT BY BOAT ANGLERS, UPPER
NIAGARA RIVER ANGLER SURVEY, 2003**

	Spring				Summer				Fall				Total			
	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE
Black crappie	0.173	0.140	0.048	0.063									0.033	0.036	0.009	0.016
Brown bullhead	0.039	0.051	0.010	0.013									0.007	0.013	0.002	0.003
Brown trout	0.002	0.003	0.000	0.000									0.000	0.001	0.000	0.000
Common carp	0.003	0.004	0.000	0.000	0.001	0.002	0.000	0.000	0.001	0.003	0.000	0.000	0.002	0.002	0.000	0.000
Freshwater drum	0.009	0.008	0.000	0.000	0.025	0.021	0.001	0.001	0.011	0.015	0.000	0.000	0.018	0.012	0.000	0.001
Round goby					0.012	0.013	0.001	0.001	0.036	0.050	0.031	0.049	0.016	0.012	0.008	0.010
Catfishes									0.001	0.003	0.000	0.000	0.000	0.000	0.000	0.001
Lake trout	0.002	0.003	0.002	0.003									0.000	0.001	0.000	0.001
Largemouth bass	0.312	0.265	0.000	0.000	0.082	0.044	0.006	0.008	0.398	0.408	0.003	0.007	0.207	0.107	0.004	0.004
<i>Black bass</i>	0.014	0.012	0.000	0.000					0.004	0.010	0.000	0.000	0.004	0.004	0.000	0.000
Muskellunge	0.019	0.010	0.000	0.000	0.020	0.011	0.000	0.000	0.025	0.022	0.000	0.000	0.021	0.008	0.000	0.000
Northern pike	0.299	0.109	0.002	0.003	0.043	0.026	0.001	0.001	0.018	0.018	0.000	0.000	0.085	0.036	0.001	0.001
Rainbow trout	0.003	0.004	0.000	0.000					0.008	0.020	0.004	0.010	0.003	0.004	0.001	0.002
Rock bass	0.034	0.028	0.000	0.000	0.025	0.017	0.000	0.000	0.009	0.013	0.003	0.007	0.022	0.012	0.001	0.001
Rudd	0.002	0.003	0.000	0.000	0.001	0.002	0.000	0.000	0.001	0.003	0.000	0.000	0.001	0.002	0.000	0.000
Smallmouth bass	0.633	0.318	0.000	0.000	0.519	0.103	0.061	0.031	0.336	0.132	0.021	0.037	0.493	0.105	0.039	0.019

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX TABLE C-3 (CONT.)

**SEASONAL CATCH AND HARVEST RATES FOR ALL SPECIES CAUGHT BY BOAT ANGLERS, UPPER NIAGARA RIVER
ANGLER SURVEY, 2003**

	Spring				Summer				Fall				Total			
	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE
Sunfishes	0.007	0.010	0.000	0.000	0.011	0.013	0.000	0.000	0.093	0.223	0.001	0.003	0.031	0.044	0.000	0.001
Walleye					0.006	0.005	0.005	0.004	0.003	0.005	0.000	0.000	0.004	0.003	0.003	0.002
White perch									0.006	0.016	0.000	0.000	0.002	0.003	0.000	0.000
Yellow perch	0.231	0.194	0.053	0.065	0.044	0.042	0.007	0.014	0.243	0.266	0.168	0.204	0.131	0.075	0.057	0.043

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX TABLE C-4

MONTHLY CATCH AND HARVEST RATES (ALL ANGLERS) FOR BOAT ANGLERS, UPPER NIAGARA RIVER ANGLER SURVEY, 2003

	April				May				June				July			
	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE
Black crappie	0.06	0.05	0.04	0.05	0.29	0.24	0.07	0.11								
Brown bullhead					0.07	0.09	0.02	0.02								
Brown trout					0.00	0.00	0.00	0.00								
Common carp									0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
Freshwater drum					0.01	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.02	0.01	0.00	0.00
Round goby													0.00	0.01	0.00	0.00
Catfishes																
Lake trout	0.01	0.02	0.01	0.02												
Largemouth bass	1.94	1.79	0.00	0.00	0.08	0.09	0.00	0.00	0.07	0.04	0.01	0.02	0.04	0.02	0.00	0.00
<i>Black bass</i>					0.02	0.02	0.00	0.00								
Muskellunge					0.02	0.01	0.00	0.00	0.04	0.03	0.00	0.00	0.02	0.01	0.00	0.00
Northern pike					0.29	0.13	0.00	0.00	0.20	0.13	0.00	0.00	0.05	0.04	0.00	0.00
Rainbow trout					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
Rock bass	0.06	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.03	0.00	0.00	0.04	0.03	0.00	0.00
Rudd					0.00	0.00	0.00	0.00								
Smallmouth bass	0.09	0.10	0.00	0.00	0.93	0.52	0.00	0.00	0.44	0.16	0.05	0.04	0.44	0.13	0.01	0.01
Sunfishes									0.01	0.01	0.00	0.00	0.02	0.03	0.00	0.00
Walleye													0.02	0.01	0.01	0.01
White perch																
Yellow perch	0.71	0.89	0.00	0.00	0.23	0.26	0.08	0.11	0.09	0.10	0.01	0.02	0.01	0.02	0.00	0.00

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX TABLE C-4 (CONT.)

MONTHLY CATCH AND HARVEST RATES FOR BOAT ANGLERS, UPPER NIAGARA RIVER ANGLER SURVEY, 2003

	August				September				October				November			
	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE
Black crappie																
Brown bullhead																
Brown trout																
Common carp													0.01	0.02	0.00	0.00
Freshwater drum	0.04	0.05	0.00	0.00	0.02	0.02	0.00	0.00	0.01	0.01	0.00	0.00				
Round goby	0.02	0.03	0.00	0.00	0.02	0.05	0.02	0.05	0.05	0.08	0.03	0.07	0.06	0.17	0.06	0.17
Catfishes									0.01	0.01	0.00	0.00				
Lake trout																
Largemouth bass	0.10	0.07	0.01	0.01	0.31	0.28	0.00	0.01	0.45	0.42	0.00	0.00	0.70	1.90	0.00	0.00
<i>Black bass</i>									0.02	0.04	0.00	0.00				
Muskellunge	0.01	0.01	0.00	0.00	0.02	0.03	0.00	0.00	0.01	0.02	0.00	0.00	0.05	0.06	0.00	0.00
Northern pike	0.01	0.01	0.00	0.00	0.01	0.02	0.00	0.00	0.03	0.06	0.00	0.00	0.02	0.04	0.00	0.00
Rainbow trout					0.01	0.03	0.01	0.02								
Rock bass	0.02	0.03	0.00	0.00	0.00	0.01	0.00	0.00	0.02	0.04	0.00	0.00	0.01	0.03	0.01	0.03
Rudd	0.00	0.01	0.00	0.00					0.01	0.01	0.00	0.00				
Smallmouth bass	0.60	0.18	0.09	0.07	0.42	0.17	0.04	0.07	0.40	0.30	0.00	0.00	0.01	0.02	0.01	0.02
Sunfishes	0.01	0.02	0.00	0.00	0.01	0.02	0.00	0.00	0.40	0.92	0.00	0.00	0.01	0.03	0.01	0.02
Walleye	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00					0.01	0.02	0.00	0.00
White perch									0.03	0.07	0.00	0.00				
Yellow perch	0.03	0.04	0.02	0.03	0.02	0.02	0.00	0.00	0.50	0.08	0.20	0.29	0.60	0.98	0.59	0.98

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX TABLE C-5

**SEASONAL CATCH AND HARVEST RATES FOR ALL SPECIES CAUGHT BY SHORE ANGLERS, UPPER NIAGARA RIVER
ANGLER SURVEY, 2003**

	Spring				Summer				Fall				Total			
	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE
Black crappie	0.000	0.000	0.000	0.000	0.003	0.001	0.001	0.000					0.001	0.001	0.000	0.000
Bowfin					0.001	0.001	0.000	0.000					0.000	0.000	0.000	0.000
Brown bullhead	0.014	0.005	0.012	0.005	0.004	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.007	0.002	0.006	0.002
Brown trout	0.003	0.002	0.003	0.001									0.001	0.001	0.001	0.001
Baitfish/minnows	0.051	0.023	0.014	0.009	0.075	0.025	0.074	0.025	0.146	0.054	0.145	0.054	0.081	0.018	0.067	0.016
Common carp	0.007	0.004	0.006	0.004	0.003	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.004	0.002	0.002	0.002
Freshwater drum	0.105	0.018	0.001	0.001	0.054	0.008	0.002	0.001	0.012	0.003	0.000	0.000	0.064	0.008	0.001	0.000
Round goby	0.307	0.042	0.262	0.040	0.547	0.064	0.498	0.063	0.562	0.097	0.550	0.097	0.460	0.037	0.420	0.036
Golden shiner									0.009	0.009	0.000	0.000	0.002	0.002	0.000	0.000
Catfishes	0.005	0.002	0.003	0.002	0.000	0.000	0.000	0.000	0.004	0.002	0.000	0.000	0.003	0.001	0.001	0.001
Lake trout	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000					0.001	0.000	0.000	0.000
Largemouth bass	0.032	0.008	0.000	0.000	0.059	0.010	0.003	0.001	0.086	0.022	0.001	0.001	0.054	0.007	0.001	0.000
<i>Black bass</i>	0.000	0.000	0.000	0.000	0.003	0.002	0.000	0.000	0.021	0.012	0.000	0.000	0.006	0.003	0.000	0.000
<i>Moxostoma</i> sp					0.002	0.001	0.001	0.001					0.001	0.001	0.000	0.000
Muskellunge	0.001	0.001	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.001	0.000	0.000	0.001	0.000	0.000	0.000
Northern pike	0.019	0.005	0.004	0.002	0.004	0.002	0.001	0.000	0.014	0.004	0.002	0.001	0.012	0.002	0.002	0.001
<i>Notropis</i> sp	0.000	0.000	0.000	0.000									0.000	0.000	0.000	0.000
Rainbow trout	0.007	0.003	0.002	0.001	0.001	0.001	0.000	0.000	0.004	0.002	0.004	0.002	0.004	0.001	0.002	0.001
Rock bass	0.499	0.101	0.162	0.055	0.378	0.039	0.091	0.019	0.105	0.034	0.012	0.004	0.365	0.042	0.101	0.022

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX TABLE C-5 (CONT.)

**SEASONAL CATCH AND HARVEST RATES FOR ALL SPECIES CAUGHT BY SHORE ANGLERS, UPPER NIAGARA RIVER
ANGLER SURVEY, 2003**

	Spring				Summer				Fall				Total			
	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE
Smallmouth bass	0.180	0.034	0.003	0.001	0.281	0.023	0.028	0.005	0.412	0.067	0.013	0.004	0.271	0.021	0.015	0.002
Sunfishes	0.037	0.009	0.004	0.003	0.074	0.012	0.020	0.006	0.087	0.024	0.024	0.013	0.063	0.008	0.015	0.004
Trout	0.000	0.000	0.000	0.000									0.000	0.000	0.000	0.000
Walleye	0.001	0.001	0.000	0.000	0.002	0.001	0.000	0.000	0.011	0.009	0.001	0.000	0.003	0.002	0.000	0.000
White bass	0.028	0.007	0.011	0.003	0.002	0.001	0.001	0.001	0.007	0.005	0.002	0.002	0.013	0.003	0.005	0.001
White perch	0.011	0.005	0.011	0.005	0.047	0.042	0.016	0.012	0.021	0.007	0.017	0.006	0.028	0.017	0.014	0.005
White sucker	0.002	0.001	0.000	0.000	0.003	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.001	0.000	0.000
Yellow perch	0.838	0.083	0.282	0.035	0.162	0.026	0.040	0.009	1.233	0.155	0.547	0.075	0.648	0.048	0.241	0.022

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX TABLE C-6

MONTHLY CATCH AND HARVEST RATES FOR SHORE ANGLERS, UPPER NIAGARA RIVER ANGLER SURVEY, 2003

	April				May				June				July			
	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE
Black crappie									0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bowfin													0.00	0.00	0.00	0.00
Brown bullhead	0.04	0.02	0.04	0.02	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Brown trout	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00								
Baitfish/minnows	0.00	0.00	0.00	0.00	0.11	0.05	0.03	0.02	0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.00
Common carp					0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
Freshwater drum					0.04	0.01	0.00	0.00	0.17	0.03	0.00	0.00	0.07	0.02	0.00	0.00
Round goby	0.00	0.00	0.00	0.00	0.37	0.07	0.29	0.06	0.39	0.07	0.37	0.07	0.52	0.10	0.47	0.10
Golden shiner																
Catfishes	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00				
Lake trout	0.00	0.00	0.00	0.00					0.00	0.00	0.00	0.00				
Largemouth bass	0.00	0.00	0.00	0.00	0.03	0.01	0.00	0.00	0.05	0.01	0.00	0.00	0.07	0.02	0.00	0.00
<i>Black bass</i>					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<i>Moxostoma</i> sp													0.00	0.00	0.00	0.00
Muskellunge	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Northern pike	0.02	0.01	0.00	0.00	0.02	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<i>Notropis</i> sp	0.00	0.00	0.00	0.00												
Rainbow trout	0.01	0.00	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00				
Rock bass	0.01	0.01	0.01	0.01	0.55	0.19	0.22	0.12	0.72	0.12	0.19	0.04	0.41	0.05	0.07	0.02
Smallmouth bass					0.20	0.07	0.00	0.00	0.22	0.03	0.01	0.00	0.33	0.04	0.03	0.01
Sunfishes					0.02	0.01	0.00	0.00	0.06	0.01	0.01	0.00	0.05	0.01	0.02	0.01
Trout	0.00	0.00	0.00	0.00												
Walleye	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX TABLE C-6 (CONT.)

MONTHLY CATCH AND HARVEST RATES FOR SHORE ANGLERS, UPPER NIAGARA RIVER ANGLER SURVEY, 2003

	April				May				June				July			
	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE
White bass					0.05	0.01	0.01	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00
White perch					0.02	0.01	0.02	0.01	0.01	0.00	0.01	0.00	0.11	0.11	0.04	0.03
White sucker					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Yellow perch	1.13	0.23	0.48	0.10	0.82	0.12	0.28	0.06	0.52	0.08	0.12	0.03	0.09	0.02	0.01	0.01

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX TABLE C-6 (CONT.)

MONTHLY CATCH AND HARVEST RATES FOR SHORE ANGLERS, UPPER NIAGARA RIVER ANGLER SURVEY, 2003

	August				September				October				November			
	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE
Black crappie	0.00	0.00	0.00	0.00												
Bowfin																
Brown bullhead	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00								
Brown trout																
Baitfish/minnows	0.18	0.06	0.18	0.06	0.17	0.07	0.17	0.07	0.15	0.14	0.15	0.14				
Common carp	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00								
Freshwater drum	0.04	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.01	0.00	0.00
Round goby	0.65	0.10	0.59	0.10	0.52	0.12	0.50	0.12	0.69	0.22	0.67	0.22	0.49	0.16	0.49	0.16
Golden shiner													0.05	0.05	0.00	0.00
Catfishes	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00								
Lake trout																
Largemouth bass	0.06	0.01	0.00	0.00	0.14	0.03	0.00	0.00	0.03	0.01	0.00	0.00				
<i>Black bass</i>					0.02	0.01	0.00	0.00	0.04	0.04	0.00	0.00				
<i>Moxostoma</i> sp	0.00	0.00	0.00	0.00												
Muskellunge									0.00	0.00	0.00	0.00				
Northern pike	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.02	0.01	0.00	0.00	0.01	0.01	0.00	0.00
<i>Notropis</i> sp																
Rainbow trout	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Rock bass	0.21	0.05	0.06	0.03	0.06	0.02	0.00	0.00	0.21	0.12	0.03	0.01	0.09	0.04	0.02	0.01
Smallmouth bass	0.30	0.04	0.03	0.01	0.60	0.10	0.02	0.01	0.18	0.08	0.01	0.00	0.02	0.01	0.00	0.00
Sunfishes	0.12	0.03	0.03	0.01	0.10	0.02	0.01	0.01	0.13	0.07	0.07	0.05				
Trout																
Walleye	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00				

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX TABLE C-6 (CONT.)

MONTHLY CATCH AND HARVEST RATES FOR SHORE ANGLERS, UPPER NIAGARA RIVER ANGLER SURVEY, 2003

	August				September				October				November			
	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE
White bass	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.03	0.01	0.01
White perch	0.00	0.00	0.00	0.00	0.02	0.01	0.02	0.01	0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.00
White sucker	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00								
Yellow perch	0.23	0.06	0.07	0.02	0.54	0.12	0.24	0.06	1.49	0.34	0.56	0.12	3.20	0.60	1.56	0.33

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX TABLE C-7

**MONTHLY TARGETED CATCH AND HARVEST RATES FOR ALL SPECIES TARGETED BY SHORE ANGLERS, UPPER
NIAGARA RIVER ANGLER SURVEY, 2003**

	April				May				June				July			
	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE
Northern pike	0.44	0.35	0.00	0.00	0.23	0.14	0.07	0.05	0.05	0.03	0.00	0.00	0.02	0.02	0.00	0.00
<i>Black bass</i>	0.00		0.00		0.74	0.29	0.01	0.01	0.38	0.11	0.03	0.02	0.71	0.16	0.04	0.03
Yellow perch	2.06	0.49	0.87	0.20	2.84	0.52	1.12	0.28	3.67	0.82	0.82	0.22	0.30	0.30	0.30	0.30
Trout	0.13	0.07	0.13	0.07	0.04	0.02	0.04	0.02					0.00		0.00	
Muskellunge					0.00		0.00		0.00		0.00					
Black crappie	0.00		0.00										0.00		0.00	
Walleye					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	
Brown bullhead	1.99	1.11	1.99	1.11	0.96	0.32	0.96	0.32								
Rock bass	0.12	0.12	0.12	0.12	4.42	1.02	1.65	0.59	5.34	2.88	0.66	0.28	0.57	0.47	0.33	0.33
Catfish					0.00	0.00	0.00	0.00								
White perch					0.00	0.00	0.00	0.00	0.17	0.17	0.17	0.17				
White bass					0.26	0.08	0.25	0.08	0.27	0.12	0.23	0.12	0.00	0.00	0.00	0.00
Common carp									0.00		0.00		0.65		0.00	
Freshwater drum									0.40		0.40					
Minnnows/baifish																
Sunfish																

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX TABLE C-7 (CONT.)

**MONTHLY TARGETED CATCH AND HARVEST RATES FOR ALL SPECIES TARGETED BY SHORE ANGLERS, UPPER
NIAGARA RIVER ANGLER SURVEY, 2003**

	August				September				October				November			
	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE
Northern pike	0.08	0.08	0.00	0.00	0.00		0.00		0.27	0.19	0.00	0.00	0.00		0.00	
<i>Black bass</i>	0.41	0.09	0.04	0.02	0.67	0.11	0.03	0.02	0.67	0.39	0.00	0.00	0.00		0.00	
Yellow perch	1.20	0.57	0.90	0.59	3.21	0.77	1.77	0.74	3.67	1.16	1.37	0.24	4.84	0.83	2.37	0.47
Trout									0.14	0.08	0.14	0.08	0.05	0.05	0.05	0.05
Muskellunge					0.00	0.00	0.00	0.00	0.00		0.00		0.00	0.00	0.00	0.00
Black crappie																
Walleye	0.00	0.00	0.00	0.00												
Brown bullhead																
Rock bass	0.83	0.60	0.67	0.67	0.38		0.38									
Catfish																
White perch																
White bass					0.00		0.00									
Common carp					0.00		0.00									
Freshwater drum																
Minnows/baifish	4.00		4.00		6.29	5.79	6.29	5.79	10.19	9.16	10.19	9.16				
Sunfish					0.06	0.06	0.00	0.00	0.00	0.00	0.00	0.00				

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX TABLE C-8

**SEASONAL TARGETED CATCH AND HARVEST RATES FOR ALL SPECIES TARGETED BY SHORE ANGLERS, UPPER
NIAGARA RIVER ANGLER SURVEY, 2003**

	Spring				Summer				Fall				Total			
	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE	CPUE	SE	HPUE	SE
Trout	0.09	0.04	0.09	0.04	0.00		0.00		0.10	0.05	0.10	0.05	0.09	0.03	0.09	0.03
Northern pike	0.18	0.09	0.04	0.02	0.08	0.04	0.00	0.00	0.19	0.14	0.00	0.00	0.16	0.06	0.03	0.02
Muskellunge	0.00		0.00		0.00		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Smallmouth bass	1.08	0.45	0.00	0.00	0.42	0.12	0.03	0.03	0.57	0.21	0.08	0.08	0.55	0.12	0.03	0.02
Largemouth bass	0.00		0.00		0.40	0.17	0.00	0.00	0.00		0.00		0.36	0.16	0.00	0.00
Black crappie	0.00		0.00		0.00		0.00						0.00	0.00	0.00	0.00
Yellow perch	2.71	0.34	0.97	0.15	1.19	0.51	0.53	0.30	4.30	0.60	2.00	0.30	3.16	0.29	1.29	0.14
Walleye	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					0.00	0.00	0.00	0.00
Brown bullhead	1.48	0.56	1.48	0.56									1.48	0.56	1.48	0.56
Catfish	0.00	0.00	0.00	0.00									0.00	0.00	0.00	0.00
White perch	0.06	0.06	0.06	0.06									0.06	0.06	0.06	0.06
White bass	0.26	0.07	0.24	0.07	0.00	0.00	0.00	0.00	0.00		0.00		0.24	0.06	0.23	0.06
Rock bass	4.91	1.56	1.09	0.34	0.84	0.35	0.61	0.35	0.38		0.38		3.76	1.16	0.95	0.26
Freshwater drum	0.40		0.40										0.40		0.40	
Minnows/baitfish					4.00		4.00		8.24	4.57	8.24	4.57	7.39	3.64	7.39	3.64
Common carp					0.33	0.33	0.00	0.00	0.00		0.00		0.22	0.22	0.00	0.00
Sunfish									0.03	0.03	0.00	0.00	0.03	0.03	0.00	0.00

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX TABLE C-9

**LENGTH FREQUENCY BY 1 INCH TOTAL LENGTH GROUPS (ESTIMATED IN INCHES)
FOR RELEASED FISH BY BOAT ANGLERS, UPPER NIAGARA RIVER ANGLER SURVEY,
2003**

Inches	Northern pike	Muskellunge	Rock bass	Smallmouth bass	Largemouth bass
4		1			
10			1	3	1
12				1	
13		1			
14				6	
15				5	
16				2	1
17				8	1
18	1	1		10	1
19				1	
20		2		1	
21				1	
22		2			
23		1			
24	6	3			
25	3				
26	1	1			
27	1	1			
28	1	3			
30	3	5			
31		1			
32	1				
33		1			
34		1			
35	2	2			
36		4			
38		2			
40		2			
41		1			
42		3			
45		1			
48		2			
Total	19	41	1	38	4

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX TABLE C-10

**LENGTH FREQUENCY BY 1 INCH TOTAL LENGTH GROUPS (ESTIMATED IN INCHES)
FOR RELEASED FISH BY SHORE ANGLERS, UPPER NIAGARA RIVER ANGLER SURVEY,
2003**

Inches	Northern pike	Muskellunge	White sucker	Smallmouth bass	Largemouth bass	Yellow perch	Bowfin
6						2	
8						1	
9	1						
10				2		1	
11						1	
14			1				
15		1		1	3		
16					3		
18	3			1			
20	1	1					
21				1			
22	1						
23	1						
24	1						
25	1						
27	1						
29		1					1
30	1						
36		1					
44		1					
48		1					
52		1					
Total	11	7	1	5	6	5	1

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX TABLE C-11

**SPECIES SOUGHT SEASONALLY BY BOAT ANGLERS THAT FISHED ALL OR PART OF
THEIR TRIP IN LAKE ERIE**

Targeted species	Spring	Summer	Fall	Total	%
Rainbow trout			1	1	0.7
Northern pike		2		2	1.4
Muskellunge		1		1	0.7
Black bass	1	87		88	61.1
Walleye		27		27	18.8
Lake trout			2	2	1.4
Anything		23		23	16.0
Totals	1	140	3	144	

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX D – SITE ACCESS PHOTOS

**APPENDIX FIGURE D-1
BEAVER ISLAND STATE PARK MARINA**



**APPENDIX FIGURE D-2
BEAVER ISLAND STATE PARK MARINA (1)**



**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

**APPENDIX FIGURE D-3
BEAVER ISLAND STATE PARK MARINA (2)**



APPENDIX FIGURE D-4
BIG SIXMILE MARINA -RAMP



APPENDIX FIGURE D-5
BIG SIXMILE MARINA - SLIPS



**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

**APPENDIX FIGURE D-6
BIRD ISLAND PIER (1)**



**APPENDIX FIGURE D-7
BIRD ISLAND PIER (2)**



**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

**APPENDIX FIGURE D-8
FERRY STREET, BRODERICK PARK**



**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

**APPENDIX FIGURE D-9
FERRY STREET - SUNSET**



**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

**APPENDIX FIGURE D-10
FISHERMAN'S PARK (1)**



**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

**APPENDIX FIGURE D-11
FISHERMAN'S PARK (2)**



**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

**APPENDIX FIGURE D-12
FISHERMAN'S PARK - BACKWATER**



**APPENDIX FIGURE D-13
GRATWICK PARK (1)**



**APPENDIX FIGURE D-14
GRATWICK PARK (2)**



**APPENDIX FIGURE D-15
GRATWICK PARK (3) - LAUNCH**



**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

**APPENDIX FIGURE D-16
GRATWICK PARK – INTERVIEW ON BREAKWATER**



APPENDIX FIGURE D-17
GRIFFON PARK



APPENDIX FIGURE D-18
ISLE VIEW RAMP



**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

**APPENDIX FIGURE D-19
ISLE VIEW SHORELINE**



**APPENDIX FIGURE D-20
MOTOR ISLAND FROM SHERIDAN DRIVE**



**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

**APPENDIX FIGURE D-21
NIAWANDA LAUNCH**



**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

**APPENDIX FIGURE D-22
NIAWANDA PLATFORM**



**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

**APPENDIX FIGURE D-23
NIAWANDA SHORE - NORTH**



APPENDIX FIGURE D-24
NIAWANDA SHORE - SOUTH



**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

**APPENDIX FIGURE D-25
ONTARIO STREET RAMP, BULKHEAD**



**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

**APPENDIX FIGURE D-26
ONTARIO STREET RAMP, SHORELINE INCLUDING RIVERSIDE**



**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

**APPENDIX FIGURE D-27
SHERIDAN DRIVE LAUNCH**



**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

**APPENDIX FIGURE D-28
SHERIDAN DRIVE – HUNTLEY STATION**



**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

**APPENDIX FIGURE D-29
SHERIDAN DRIVE – SHORE BULKHEAD**



**APPENDIX FIGURE D-30
SQUAW ISLAND – CANAL ENTRANCE**



APPENDIX FIGURE D-31
SQUAW ISLAND – LOCK WALL



**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

**APPENDIX FIGURE D-32
TOWPATH PARK - BULKHEAD**



APPENDIX FIGURE D-33
WOODS CREEK MOUTH - BRIDGE



**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

**APPENDIX E - TABULAR SUMMARIES OF 1999 AND 2003 BOAT ANGLER CATCH AND
HARVEST, EFFORT, AND CATCH RATE INFORMATION**

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX TABLE E-1

**ESTIMATED CATCH AND HARVEST OF ALL SPECIES FOR UPPER NIAGARA RIVER
BOAT ANGLERS, MAY 15 TO OCTOBER 31, 1999 AND 2003. INTERVIEWS CONDUCTED
AT NEW YORK BOAT RAMPS ONLY.**

Species	May 15-October 31, 1999		May 15-October 31, 2003	
	Number Caught (standard error)	Number Harvested (standard error)	Number Caught (standard error)	Number Harvested (standard error)
Smallmouth bass	33,775 (11,111)	5,453 (2,755)	33,358 (9,167)	2,515 (1,491)
Yellow perch	5,539 (4,792)	1,796 (2,672)	3,126 (2,096)	680 (668)
Rock bass	4,428 (2,081)	198 (301)	1,319 (723)	0
Largemouth bass	2,127 (1,143)	0	6,884 (2,689)	182 (207)
Northern pike	1,818 (1,811)	76 (80)	5,704 (2,205)	45 (50)
Freshwater drum	1,676 (957)	0	1,177 (735)	16 (30)
Pumpkinseed	920 (1,255)	0	included as sunfish	
White bass	542 (1,217)	0	0	0
Bluegill	432 (515)	0	included as sunfish	
Sunfishes ^a	496 (536)	0	1,450 (N/A)	0
Muskellunge	253 (175)	0	1,065 (444)	0
Carp	62 (79)	0	113 (121)	0
Black crappie	52 (96)	0	1,078 (1,067)	0
Walleye	31 (56)	0	305 (230)	262 (224)

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX TABLE E-1 (CONT.)

ESTIMATED CATCH AND HARVEST OF ALL SPECIES FOR UPPER NIAGARA RIVER BOAT ANGLERS, MAY 15 TO OCTOBER 31, 1999 AND 2003. INTERVIEWS CONDUCTED AT NY BOAT RAMPS ONLY.

Species	May 15-October 31, 1999		May 15-October 31, 2003	
	Number Caught	Number Harvested	Number Caught	Number Harvested
	(standard error)	(standard error)	(standard error)	(standard error)
Minnow spp. ^b	31 (56)	0	0	0
Other species ^c not caught in 1999	-	-	1,862 (N/A)	332 (N/A)
Species totals	52,182 (12,646)	7,523 (3,850)	57,441 (10,340)	4,032 (1,697)

^aPumpkinseed and bluegill combined in 2003. Standard error not available.

^bListed in NYSDEC ([2002](#)) as minnow but known to be creek chub.

^cIncludes (catch/harvest): round goby (880/178), brown bullhead (477/121), black bass spp. (191/0), rainbow trout (119/32), rudd (70/0), white perch (54/0), catfish spp. (45/0), brown trout (27/0). Standard error not available.

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX TABLE E-2

**COMPARISONS OF TOTAL AND SEASONAL UPPER NIAGARA RIVER BOAT ANGLING
EFFORT ESTIMATES, 1999 AND 2003. SE = STANDARD ERROR.**

Season	Effort Estimate					
	May 15-October 31, 1999		May 15-October 31, 2003		April 5-November 30, 2003	
	Angler hours	SE	Angler hours	SE	Angler hours	SE
Spring	9,549	3,226	10,271	3,543	13,889	4,402
Summer	39,413	11,816	36,358	11,100	36,358	11,100
Fall	6,158	5,730	12,273	4,206	14,802	4,552
Total	55,120	13,522	58,902	12,388	65,050	12,779

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX TABLE E-3

ESTIMATED CATCH AND HARVEST OF THE FOUR MOST PROMINENT SPECIES ENCOUNTERED BY BOAT ANGLERS INTERVIEWED AT NEW YORK BOAT RAMPS ON THE UPPER NIAGARA RIVER BETWEEN MAY 15 AND OCTOBER 31, 1999 AND 2003. SE = STANDARD ERROR.

Season	Area		Smallmouth bass		Muskellunge		Northern pike		Yellow perch	
			Number	SE	Number	SE	Number	SE	Number	SE
Spring	All areas-1999	Catch	811	651	23	40	647	739	0	0
		Harvest	0	0	0	0	45	57	0	0
	All areas-2003	Catch	8,422	5,009	234	147	3,962	1,888	397	349
		Harvest	0	0	0	0	29	40	121	143
Summer	All areas-1999	Catch	28,061	10,872	155	154	1,081	1,650	1,569	1,684
		Harvest	4,964	2,704	0	0	31	56	66	100
	All areas-2003	Catch	19,224	7,037	679	384	1,622	1,132	1,654	1,394
		Harvest	1,832	1,020	0	0	16	29	192	353
Fall	All areas-1999	Catch	4,903	2,198	75	73	90	118	3,970	4,487
		Harvest	489	526	0	0	0	0	1,730	2,670
	All areas-2003	Catch	5,712	3,070	153	168	119	138	1,074	1,525
		Harvest	683	1,087	0	0	0	0	368	549

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX TABLE E-3 (CONT.)

ESTIMATED CATCH AND HARVEST OF THE FOUR MOST PROMINENT SPECIES ENCOUNTERED BY BOAT ANGLERS INTERVIEWED AT NEW YORK BOAT RAMPS ON THE UPPER NIAGARA RIVER BETWEEN MAY 15 TO OCTOBER 31, 1999 AND 2003. SE = STANDARD ERROR

Season	Area		Smallmouth bass		Muskellunge		Northern pike		Yellow perch	
			Number	SE	Number	SE	Number	SE	Number	SE
Grand total	All areas-1999	Catch	33,775	11,111	253	175	1,818	1,811	5,539	4,792
		Harvest	5,453	2,755	0	0	76	80	1,796	2,672
	All areas-2003	Catch	33,358	9,167	1,065	444	5,704	2,205	3,126	2,096
		Harvest	2,515	1,491	0	0	45	50	680	668

Note: The original Table 6 from NYSDEC (2002) also provided a spatial breakdown (e.g., East Channel, etc.) of catch and harvest. Since spatially explicit effort for 1999 could not be estimated using Lockwood et al. (2001), spatial estimates of catch could not be calculated as was done for the original 1999 dataset.

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX TABLE E-4

MONTHLY TARGETED CATCH AND HARVEST RATES OF THE FOUR MOST PROMINENT SPECIES ENCOUNTERED BY BOAT ANGLERS ON THE UPPER NIAGARA RIVER, MAY 18 THROUGH NOVEMBER 30, 1999 AND 2003. SE = STANDARD ERROR. N = NUMBER OF PARTIES INTERVIEWED AT NEW YORK BOAT RAMPS.

Month		Smallmouth bass			Muskellunge			Northern pike			Yellow perch		
		Rate	SE	N	Rate	SE	N	Rate	SE	N	Rate	SE	N
May 1999	Catch rate	0.00	-	1			0	0.19	0.04	4	0.00	-	2
	Harvest rate	0.00	-					0.05	0.05		0.00	-	
May 2003	Catch rate	2.68	1.06	8	0.000	0.000	1	0.38	0.25	8	4.00	0.00	1
	Harvest rate	0.00	0.00		0.000	0.000		0.02	0.02		0.00	0.00	
June 1999	Catch rate	0.78	0.49	18	0.083	0.060	6	0.40	0.09	3	0.00	-	1
	Harvest rate	0.19	0.12		0.000	-		0.00	-		0.00	-	
June 2003	Catch rate	0.77	0.26	28	0.101	0.079	7	0.64	0.31	12	4.00	0.00	1
	Harvest rate	0.07	0.06		0.000	0.000		0.00	0.00		4.00	0.00	
July 1999	Catch rate	0.82	0.26	31			0			0			0
	Harvest rate	0.18	0.10										
July 2003	Catch rate	0.76	0.18	37	0.100	0.067	4	0.39	0.37	3			0
	Harvest rate	0.02	0.02		0.000	0.000		0.00	0.00				
August 1999	Catch rate	1.05	0.31	30	0.000	-	2			0			0
	Harvest rate	0.15	0.09		0.000	-							
August 2003	Catch rate	0.76	0.17	55	0.032	0.038	4	0.14	0.00	1			0
	Harvest rate	0.11	0.06		0.000	0.000		0.00	0.00				

**NIAGARA POWER PROJECT (FERC NO. 2216)
UPPER NIAGARA RIVER RECREATIONAL FISHING STUDY, 2003**

APPENDIX TABLE E-4 (CONT.)

MONTHLY TARGETED CATCH AND HARVEST RATES OF THE FOUR MOST PROMINENT SPECIES ENCOUNTERED BY BOAT ANGLERS ON THE UPPER NIAGARA RIVER, MAY 18 THROUGH NOVEMBER 30, 1999 AND 2003. SE = STANDARD ERROR. N = NUMBER OF PARTIES INTERVIEWED AT NEW YORK BOAT RAMPS.

Month		Smallmouth bass			Muskellunge			Northern pike			Yellow perch		
		Rate	SE	N	Rate	SE	N	Rate	SE	N	Rate	SE	N
September 1999	Catch rate	1.01	0.29	38	0.064	0.051	4	0.00	-	1			0
	Harvest rate	0.13	0.07		0.000	-		0.00	-				
September 2003	Catch rate	0.49	0.11	44	0.110	0.120	4	0.00	0.00	2			0
	Harvest rate	0.05	0.04		0.000	0.000		0.00	0.00				
October 1999	Catch rate	0.69	0.28	11	0.048	0.066	6			0	4.38	2.23	6
	Harvest rate	0.00	-		0.000	-					2.45	1.45	
October 2003	Catch rate	0.59	0.21	12	0.024	0.033	7	0.40	0.00	1	3.40	1.62	5
	Harvest rate	0.00	0.00		0.000	0.000		0.00	0.00		1.36	0.76	
November 1999	Catch rate	0.65	0.57	3	0.145	0.092	8	0.00	-	1	11.47	4.66	4
	Harvest rate	0.09	-		0.000	-		0.00	-		4.97	1.62	
November 2003	Catch rate	0.00	0.00	1	0.068	0.037	14	0.00	0.00	1	4.75	0.85	4
	Harvest rate	0	0		0.000	0.000		0.00	0.00		4.71	0.88	
Total 1999	Catch rate	0.90	0.14	132	0.085	0.043	26	0.25	0.18	9	5.20	2.60	13
	Harvest rate	0.14	0.04		0.000	0.000		0.01	0.02		2.51	1.24	
Total 2003	Catch rate	0.79	0.13	185	0.070	0.025	41	0.49	0.18	28	4.02	0.92	11
	Harvest rate	0.07	0.03		0.000	0.000		0.004	0.006		2.81	0.91	