Update on Lake Sturgeon

in New York State Waters

Jan. 2000

Abstracts and Meeting Summary

Lake Sturgeon Research Meeting
January 27, 2000
Wyndham Syracuse Hotel
Syracuse, NY

Edited by:
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Agenda

Update on Lake Sturgeon in New York State Waters 2000

Lake Sturgeon Research Meeting
January 27, 2000
Wyndham Syracuse Hotel
Syracuse, NY

10:00 - 10:30 Coffee and doughnuts

10:30 - 10:40 Overview of Lake Sturgeon in New York –Carlson, Brooking

10:40 - 10:50 Overview of sturgeon in the Niagara River and Lower Great Lakes – Lowie, Hughes

10:50 - 11:00 Sturgeon in the Canadian waters of Lake Ontario - Mathers

11:00 - 11:10 Lake sturgeon spawning on artificial habitat in the St. Lawrence River – LaPan

11:10 - 11:20 Sturgeon in Lake St. Lawrence and the Grass River - Hayes

11:20 - 11:30 Sturgeon restoration in the Genesee River - Dittman

11:30 - 11:40 Sturgeon research in the Oswegatchie River – Schlueter, Lowie

11:40 - 11:50 Lampricide effects on sturgeon – Weisser

11:50 - 12:00 Sturgeon in Cayuga Lake – Chiotti

12:00 - 12:10 Summary of sturgeon recaptures in Oneida Lake – Brooking

12:10 – 12:30 Summary and Discussion

Lunch on your own

A RECOVERY PLAN FOR THE LAKE STURGEON IN NEW YORK STATE

Prepared as an updated version by:

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from the original plan by Dean Bouton Nov. 1994

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Abstract. Lake sturgeon has been classified as threatened in New York State since 1983 and has been ranked a priority species for recovery since 1994. Lake sturgeon inhabited all of New York's border waters on the west, north, and northeast and provided huge commercial landings. Prior to 1904, these catches were larger than any other Great Lakes state. Also there were isolated populations (by dams) in the Grasse River, Oswegatchie Rivers and Black Lake, and records of occasional sightings in the Oswego basin, including Oneida and Cayuga Lakes. Today, there are remnants of populations in all areas but the last two. Among these, we can see the full range of changes, from decline toward extirpation, to recovery, to having apparently maintained themselves at a sustained level. The populations maintaining themselves today are recognized as being in five separate geographic units, contrasted to more than 12 units historically. The two populations in the Oswegatchie basin that are at the brink of extirpation are isolated by dams and have been supplemented with hatchery stocking.

This Recovery Plan, first developed in 1994, has the goal of maintaining these five units in border waters and restoring populations in three other areas. Once these eight populations show successful reproduction and recruitment, the species will be eligible for this project to down list it from Threatened to Special Concern. In recognition of the arbitrary choice of this target number of eight populations, we also advocate recovery activities in other waters. To that end, this document includes brief descriptions of plans for other management waters, including Oneida and Cayuga Lakes, the lower Genesee River near Lake Ontario, and the Allegheny River. It may later be decided that some of these proposals are not outside of the goals of

this project to downlist the lake sturgeon from Threatened. Alternatively, efforts in these waters may serve a different goal of restoring lake sturgeon to the important role they had in their respective historic fish communities.

Table 1. New York waters with sustained sturgeon populations.

Waters	*Year of relative abundance/ population estimate*	*Years of known spawning*	*Authority*
Niagara R. (upper) & eastern L. Erie		1993	incidental rpts
Niagara R. (lower)			incidental rpts
St. Lawrence R., Middle Corridor (29mi)		1994-96	LaPan
St. Lawrence R., Lake St Francis (8 mi)	1970=1/200'net 1997=460 adults	1996	Hayes, Jolliff
Grasse R. (21 mi)	1998=.4/150'net	1995-99	Hayes, Carlson

Table 2. Lake sturgeon waters and major tributaries, in New York State, and the activities relating to their recovery.
(Waters that are numbered share an intermixed and substantial population (now distinct due to barriers). Waters with populations that are designated with bold/underlined are sustained or developing, and spawn at historic sites. Historic fisheries are marked with the same letter when connected and different letters or bold when considered separate.)

Waters	*Catches in 1990-98*		*Documented spawn/recruit.*		*Historic fisheries*	*Relative abundance*		*Hatchery stocking (yrs)*
	no. reports	**no. fish**	**(hist.)**	**(recent)**	**(letters are connected waters)**	**all ages**	**juvenile (hatch.)**	
(1) Lake Erie (Buffalo)	7	16	**y**	?	**A**			
Cattaraugus Ck.			**?**		A			
(1) Niagara R. (upper)	94	**94**	**y**	**y**	A	some	some	
(2) Niagara R. (lower)	20		**y**	**y**	**B**	some	rare	
(2) Lake Ontario	12			-	B	very rare		
Genesee R.(mouth)			**y**					
Oswego R.(mouth)			**y**					
Oneida Lake	3	57		-			(many)	1995-6,8-9
Seneca R.				-				
Cayuga Lake	6	8		-			(some)	1995, 8

(2) Black R./Chaumont Bay		3	**y**	?	**B**		rare	
St. Lawr., Thous Isl.	1	1		-	**B**	very rare		
(2) St. Lawr., Middle Corridor	9	84	**y**	**y**	**B**	some	rare	
(2) St Law. R., Lake St. Lawrence	4	12		-	**B**	rare	rare	
Oswegatchie R. (rm 11-59)	3	363	**y**		**C**	very rare	(many)	1995-99
Oswegatchie R. (rm 5-11)	1	1	**y**		**D**	very rare		1994
Black Lake	3	3		-	**D**	very rare	(some)	1995, 8, 9
(3) St. Law. R., Lake St Francis	7	1067	**y**	**y**	**E**	many	some	
(4) Grasse R.	11	74	**y**	**y**	**E**	many	some	
Raquette R. (rm 1-19)	1		**?**			-		
St. Regis R. (above Hogansburg)						-	(some)	1998, 9
St. Regis R. (below Hogansburg)			**y**			-		
Lake Champlain	2	2			**F**	very rare		
Allegheny R. (possible)								
No. waters - 5 bold			**12**	**5**	15 (**12 units**)			

USFWS LAKE STURGEON PROGRAM SUMMARY

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Niagara River

Since the summer of 1998, we have been researching the population of lake sturgeon in the lower Niagara River. The overall

goal of our study is to identify key spawning and feeding habitats in the river in order to better manage, protect, and enhance the lake sturgeon population. The objectives of our study are to: (1) compare the daily, seasonal, and diel movement patterns of juvenile and adult lake sturgeon and (2) compare the utilization of macro- (e.g., river, main lake) and microhabitats (e.g., high flow, back eddy) between juvenile and adult lake sturgeon. As of November 1999, 32 lake sturgeon have been captured in the lower river by SCUBA diver and traditional fish sampling (e.g., gill net, setline) methods. A sub-sample (n = 20) of these fish were fitted with ultrasonic transmitters so that we could monitor long-term fish movements in the river and its confluence to Lake Ontario. All fish were collected in eddy environments, with slower currents, often upstream. Total CPUE to date, for all methods is 0.27 fish per night. Not knowing the age at maturity of the Niagara River population, we feel we have been catching and tracking primarily juvenile (<1000 mm TL) and sub-adult (1000-1200 mm TL) fish, with at least five fish assured to be adults (>1200 mm TL). Two ripe males were captured in 1999. Several sonic tags have become ‘idle’ as indicated by prolonged stationary fixes, while other tags/fish have not been located since shortly after tagging. For example, two adult fish have not been located since mid-June, the end of the suspected spawning period. Currently, we are actively tracking seven fish, with four fish absent and nine ‘idle’ tags. All ‘idle’ tags provided an average of three months of tracking information. In general, our tagged lake sturgeon inhabit both the Niagara River and Lake Ontario at its confluence with the river. Juveniles seem to prefer nearshore, slow water currents (mean bottom velocity 0.18 m/s) in the river, primarily remaining where they were collected. Adults seem to prefer the faster currents (mean bottom velocity 0.37 m/s) of the river and its confluence with the lake. Juveniles (mean depth 9.5 m) and adults (mean depth 10.8 m) occupy similar depths. Substrate samples collected in all areas where fish were located were primarily silt/sand with some small gravel. Finally, locations have been identified in the river that were occupied exclusively by adults (particularly during May and early June).

In 2000, we plan to focus on monitoring adult individuals by deploying 6 more sonic tags on fish caught in March-May. Additional individuals will continue to be collected to support ongoing collaborative work comparing the age, growth, status, and genetics of Great Lakes lake sturgeon populations. Habitat parameters will also continue to be collected throughout the study.

Lake Sturgeon Sighting Program

Anecdotal information of lake sturgeon sightings has been reported by recreationalists and commercial fishermen since 1994. In 1998, public outreach efforts were significantly increased by distributing information via posters in dive shops, web pages, distributing ‘Sighting Alert’ cards to marinas, bait shops, and boat launches, and posting a ‘Sighting Alert’ notice in State Fishing Regulations Guides. In each sighting report participants record the date, time, location, number, size, depth, water temperature, substrate composition, and vegetation abundance. This initiative has been implemented in all lower Great Lakes waters and continues to be a substantial contribution to population assessment in the Great Lakes. As a result of the increased educational effort, 86 reports of 120 lake sturgeon (7 water bodies) were filed by our office in 1998. In 1999, 77 reports of 119 lake sturgeon (16 water bodies) were recorded. Previously, the most reports ever submitted in one year to the LGLFRO was 12. Also, we conducted two mass diving events in the upper Niagara River, with eight boats and a total of 26 divers in each dive. The purpose of the "mass dive" is to better identify lake sturgeon distribution and abundance in the river. The "mass dive" provided an excellent educational opportunity for the diving community to interact with LGLFRO biologists and learn more about the lake sturgeon. It also allowed LGLFRO biologists to further explore the potential for diver sightings to be used as a method of lake sturgeon population and habitat assessment.

Genesee River

In a cooperative effort with NYSDEC (Region 8 - Avon and Endangered Species) and with USGS Tunison Fish Lab we are determining the habitat suitability for and the present utilization of lake sturgeon in the Genesee River below Rochester. Our office sampled the river for adult sturgeon migrating during the suspected spawning period. Eighteen gillnet nights caught no lake sturgeon. During the summer, experimental gillnets were fished for the presence of younger lake sturgeon. Very little effort was given due to (intentional) gear destruction. Tunison implemented the habitat suitability component, which found suitable spawning habitat below the lower falls. Sub-optimum juvenile habitat was found in the downstream areas of the river. No chemical analysis was included in 1999. In 2000, we plan to again survey for adult, migrating lake sturgeon. If none are found, we likely will implement a cooperative stocking initiative in the fall.

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UPDATE ON LAKE STURGEON IN CANADIAN WATERS OF LAKE ONTARIO AND THE ST. LAWRENCE RIVER, JANUARY 2000

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Protection Status

- Not listed as a Vulnerable, Threatened or Endangered Species in the Province of Ontario (sturgeon populations are considered healthy in some areas of the province)
- Harvest of Lake Sturgeon by commercial and recreational fisheries is not permitted in Canadian waters of Lake Ontario and the upper St. Lawrence River

Monitoring Programs

- OMNR fish community indexing programs in Eastern Lake Ontario and the St. Lawrence River provide an indicator of Lake Sturgeon abundance
- Index gillnetting conducted in the Bay of Quinte and Eastern Outlet Basin of Lake Ontario since 1972 provides a quantitative measure of sturgeon abundance. No sturgeon were captured in this program prior to 1997, since that time a total of 11 young fish (50 to 74 cm in length) have been captured. Fish have been captured throughout this area and at a wide variety of water depths (5 to 30 m) and water temperatures (10.6 to 22.2 C).
- Index gillnetting has been conducted every second year in the Thousand Islands portion of the St. Lawrence River since 1987. No sturgeon were captured in this program prior to 1999, when one fish (75 cm in length) was captured.
- Commercial fishermen capture Lake Sturgeon incidentally in their nets in Lake Ontario and often report these sightings with their 'Daily Catch Reports'. These data provide a qualitative measure of sturgeon abundance.
- Starting in 1996 commercial fishermen observed small sturgeon in gillnets set for yellow perch in the Eastern Basin of Lake Ontario. Reports of up to 29 fish per year have been received.

Rehabilitation Initiatives

- Lake Sturgeon were observed 'spawning' (no eggs or young collected) in the Trent River, the site of historical spawning activity. Dates of observation – May 3 to 10 at water temperatures of 17 to 18 C.
- Efforts to identify and protect spawning sites in Canadian waters of Lake Ontario and the upper St. Lawrence River will continue in the future.

LAKE STURGEON SPAWNING ON ARTIFICIAL HABITAT IN THE ST. LAWRENCE RIVER

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Abstract. In 1996, lake sturgeon (*Acipenser fulvescens*) spawning was documented on an artificially placed gravel bed in the St. Lawrence River for the third consecutive year. Two distinct spawning periods were observed in 1996. Spawning initially commenced on June 17, when water temperature reached 15ºC. A second spawning event was documented from June 28 to July 1 (16ºC). Sturgeon egg densities were monitored in three transects on egg trays, on the gravel surface, and within interstitial spaces in the gravel. Counts of developing eggs in the gravel bed during both spawning periods were used to estimate a total of 275,000 eggs on the study area (0.075 ha). Actual egg numbers were higher prior to confirmed predation by silver redhorse (*Moxostoma anisurum)*, log perch (*Percina caprodes*), and lake sturgeon. Average egg density was highest in the transect with the highest water velocities. Lake sturgeon fry were first observed in the gravel on June 24 (15.5ºC), and first emergence from the gravel was documented on June 28. Hatching following the second spawning event commenced on July 3. Based on assessment of average embryo viability (61.6%), potential fry production from the site was approximately 169,000 fry. Current velocity, substrate particle size, depth of substrate, and maintenance of sediment-free interstitial spaces are important considerations in planning future spawning habitat enhancement projects.

Reference:

LaPan, S.R., Klindt, R.M., Schaivone, A. and J.H. Johnson. 1997. Lake sturgeon spawning on artificial habitat in the St. Lawrence River. Annual Report, St. Lawrence River Subcommittee to the Lake Ontario Committee, Great Lakes Fishery Commission, March 1997. pp 13-1 to 13-9.

SUMMARY OF LAKE STURGEON RESEARCH EFFORTS IN THE ST. LAWRENCE AND GRASSE RIVER SYSTEMS

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St. Lawrence River Studies

Identification of spawning sites below the FDR Power Project
During a 1995-98 study ripe male (n=22) and female (n=18) sturgeon were released with ultrasonic transmitters and tracked

to identify spawning areas and post-spawning movements. Telemetry results indicate that pre-spawning sturgeon congregate within the lower reaches of a bypass channel known as the south channel prior to entering high velocity tailrace waters. Artificial substrate trays and blocks deployed in tailrace waters resulted in the collection of 34 fertilized lake sturgeon eggs at five adjacent stations located within the Canadian tailrace (near dam) during the 1998 spawning period. Average bottom velocities and depths at the five stations ranged from 0.50 m/s to 1.20 m/s and from 6.52 m to 6.98 m.

Lake sturgeon distribution, movements and habitat preference below the FDR Power Project
Post-spawning sturgeon (n=33) moved rapidly downstream through the main shipping channels into the deepwater channels that braid Lake St. Francis or returned to the bypass channel (n=7). The maximum downstream migration recorded was 80 km. Telemetry results indicate sturgeon exhibit site fidelity and generally remain localized in their movements after entering these areas. Fall upstream migration and over-wintering within the south channel was observed.

Capture data (CPUE) and telemetry results indicate habitat partitioning between juvenile and adult sturgeon. Juveniles released with sonic transmitters (n=22) within the study site exhibited high levels of site fidelity to a few areas of uninterrupted deepwater expanses of silt. Macrobenthos samples collected within these juvenile microhabitats indicate that chironimidae and brachycentridae were the two most abundant prey types. An examination of the juvenile diet samples (n=45) indicate that chironomids were the most abundant prey item. Adult sturgeon within this study area did not exhibit this microhabitat selection but were observed over heterogenous substrates which contain silt, cobble, and boulders which support zebra mussel concentrations. Evidence of large scale zebra mussel predation within these areas, personal observations of mussel predation by sturgeon and the examination of adult diet samples (n=40) suggests that the zebra mussel comprises a significant component of the adult diet. Zebra mussels were the most abundant prey type in 84% of adult diets. Bivalves were not found in specimens smaller than 650mm suggesting this approaches the threshold body size at which sturgeon begin to feed upon these bivalves.

Population dynamics of lake sturgeon stocks below the Power Project
Biological information was recorded for a total of 1149 sturgeon captures during 1995-98 field efforts. Sturgeon captures consisted of n=50 known females, n=130 ripe males, n=240 juveniles and n=729 sex unknown. Total lengths and age of resident stock captures ranged from 354 mm to 1895 mm and 2 years to 76 years respectively. Age 0-1 resident stock were not captured during juvenile assessments suggesting that age 0-1 fish remain in unidentified downstream nursery areas. Age 0-2 hatchery stock fish were re-captured with regularity (n=20) indicating survivorship of introduced stock. The combined 1995-98 data set is currently being utilized to determine the population size, age structure, survivorship, age and weight length relationships, growth, condition factor and fecundity for this stock.

Lake sturgeon distribution above the FDR Power Project
A total of nine juveniles (456 mm TL – 650 mm TL) were captured over a period of 116 experimental gillnet sets (1996-98) extending from the FDR Power Project to Nevins Point above Ogdensburg. Sturgeon captures were limited to four areas that each exhibited a flat sand/silt substrate, low to moderate velocities (0.1 m/s – 0.2 m/s) and depths ranging from 15m – 18m.

Grasse River Studies

Distribution and movement patterns of spawning lake sturgeon captured below the Village of Madrid dam.
Four ripe male and two juvenile lake sturgeon were captured over a period of seven nights 7 during April 1998 (temps: 12.5 ^{o}C – 14.5^{o}C). Each of the four ripe males were released with ultrasonic transmitters to determine the origin of the spawning stock. Telemetry results indicated that two of the tagged fish exhibited active movements between pools located below the dam and the first set of downstream rapids through the summer and fall. One tagged male traversed one set of rapids and exhibits localized movements within a deep pool below Chamberlain Corners. The other male continued its post-spawning downstream migration through three sets of large rapids and remains active in deep water pools between Chase Mills and Louisville.

Population dynamics, abundance and distribution of lake sturgeon stocks between Massena and Madrid.
A total of 100 net sets were accomplished between Madrid and the Massena Dams resulting in the capture of 45 sturgeon

ranging in size from 611 mm TL to 1342 mm TL. Areas exhibiting the highest catch per unit effort were in pools below the Madrid Dam, immediately above the Chamberlain Corner rapids and immediately below the Massena Rod and Gun Club. This data set is currently being utilized to determine the age structure, survivorship, age and weight length relationships, growth and condition factor for this Grasse River stock.

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LAKE STURGEON RESTORATION RESEARCH PROJECT IN THE GENESEE RIVER

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Lake sturgeon (*Acipenser fulvescens*) is one of a group of valuable species whose populations are generally imperiled worldwide. Historically abundant in Lake Ontario, they have virtually disappeared due to overfishing and habitat degradation. Lake sturgeon has been identified as a target species for the restoration and enhancement of self-sustaining populations in Lake Ontario by the U.S. Fish and Wildlife Service (USFWS) and the New York Department of Environmental Conservation (NYSDEC). Historically, lake sturgeon were present in the Genesee River and were sufficiently abundant in nearby areas of Lake Ontario to support a commercial fishery. In 1999 the NYDEC, the USFWS, and the USGS initiated a collaborative project to determine the feasibility of restoring a sturgeon population in the Genesee River. Steps in this project include: the evaluation of possible habitat based on a Lake Sturgeon Habitat Suitability model, evaluation of any present population, and stocking of juveniles with evaluation of their habitat use. In the first year of this project an evaluation of spawning and summer foraging habitat was conducted and habitats were mapped. Gill nets were set for adults. Plans for the second year of this project include: collection of second year habitat (water flow) data, further efforts to capture any extant adults, and rearing juveniles, fall stocking, and evaluation of habitat use by the stocked fish.

OSWEGATCHIE RIVER LAKE STURGEON RESTORATION PROJECT

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NYSDEC Lake Sturgeon Stocking Summary - Oswegatchie River

Date	Number	Total Length (mm)
07 July 93	10,000	25-55
12 August 93	7,000	40-90
26 Sept. 94	3,100	19-55
08 Sept. 95	2,250	178-307
27 Sept. 96	2,520	180
7 October 97	2,987	197
01 October 98	1,500	196
23 Sept. 99	1,500	----

Total Stocked 30,857

1998 Field Summary

The sampling to determine downstream distribution of stocked lake sturgeon was completed with a total of 88 river kilometers covered. Gillnetting was conducted on 48 nights consisting of 244 individual gillnet sets. This yielded 362 lake sturgeon comprised of 4 year classes. A total of 144 lake sturgeon were captured from the 1997 stocking year class, 175 lake sturgeon from the 1996 stocking year class, 39 from the 1995 stocking year class, and 1 lake sturgeon from the 1994 stocking year class. In addition, one native lake sturgeon was captured with an interpreted age of 12. The mean total length and weight for age class 1, 2, and 3 are 271.5mm and 78.7g (N=145), 456.5mm and 386.7g (N=159), and 560.9mm and 679.6g (N=28), respectively.

Diet analysis was conducted on 141 juvenile lake sturgeon captured in the Oswegatchie River. Of the 141 lake sturgeon stomachs pumped, 82 contained at least one prey item. In total, 1,401 prey items were consumed by the 82 juvenile lake sturgeon. Major food items in the diet of lake sturgeon were Ephemeropterans, Dipterans (*Chironimidae*), and Trichopterans with a frequency of occurrence of 57.4%, 45.4%, and 24.1%, respectively. The next most abundant food items were ostracods (7.8%) and Oligochaetes (5.0%). Benthic samples were also collected to determine prey availability and to characterize habitat (analysis is not yet complete).

After three consecutive years of stocking, the lake sturgeon show a unique distribution pattern. From the mouth at the St. Lawrence River upstream to Natural Dam, 88 kilometers were sampled. The 1997 stocking year class was distributed in roughly the upper 40 kilometers of river (rkm 88-43), with the exception of two 1997 sturgeon occurring in the remaining 40 kilometers of river downstream. The 1996 stocking year class distribution overlaps the 1997 year class and continues downstream to the mouth of the river (rkm 88-0). The 1995 stocking year class was distributed in the lower reaches of the river from river kilometer 18 to the mouth (rkm 18-0).

Radio telemetry was used to describe movements and habitat utilization of stocked juvenile sturgeon. A total of 20 juvenile sturgeon were radio tagged and tracked bi-weekly. The radio tagged fish were composed of 10 newly released hatchery lake sturgeon and 10 naturalized lake sturgeon. The newly released sturgeon were obtained from the NYSDEC Oneida Lake Fish Hatchery in Constantia, NY and the naturalized sturgeon were obtained through gillnetting in the Oswegatchie River. Habitat analysis will be conducted for high use areas of both the newly released sturgeon and the naturalized sturgeon.

Movements of radio tagged juvenile lake sturgeon were monitored and show an interesting pattern. The radio tagged lake sturgeon were released in pairs for comparison purposes, one naturalized fish and one newly released hatchery fish. The newly released hatchery lake sturgeon were held in a holding pen in the river until naturalized sturgeon could be obtained. At that point, a pair would be released at the capture site of the naturalized sturgeon and movements monitored. The general pattern displayed by ten naturalized sturgeon is localized movements (approx. 200 - 300 m) with some exceptions. The ten newly released hatchery lake sturgeon show a general pattern of downstream movement, in some cases in excess of 70 kilometers. All ten newly released hatchery lake sturgeon moved downstream an average of 32 kilometers.

1999 Field Summary

Analysis of data collected during the 1999 field season is not complete and the following is a brief overview. Sampling continued to determine downstream distribution of stocked juvenile lake sturgeon at selected sites. Gillnetting was conducted on 15 nights consisting of 50 individual gillnet sets (4 sampling periods, May - Oct.). This yielded 264 lake sturgeon comprised of 5 year classes (24 specimens age not determined). A total of 23 lake sturgeon were captured from the 1999 stocking year class, 45 lake sturgeon from the 1998 stocking year class, 127 lake sturgeon from the 1997 stocking year class, 44 lake sturgeon from the 1996 stocking year class, and 1 lake sturgeon from the 1995 stocking year class. The 23 lake sturgeon from the 1999 stocking year class were captured during the October sampling period and were released from the hatchery less than one month prior. The following table is a summary for mean total length for stocking year classes for 1999 field data.

1999 Field Data	Stocking Year Class	Mean Total Length (mm)
	1995	535mm (N=1)
	1996	483.4mm (N=44)
	1997	372.1mm (N=127)
	1998	306.5mm (N=45)
	1999	252.2mm (N=23)

Movements of 1998 radio tagged lake sturgeon were monitored in 1999 and continue to show a downstream movement pattern. The tagged naturalized lake sturgeon eventually displayed the same pattern as the newly stocked hatchery sturgeon but moved downstream at a much slower rate. A shift in dominant year class composition was detected at the four standardized sampling sites. This supports the telemetry data showing the same overall downstream movement of stocked juvenile lake sturgeon.

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SEA LAMPREY MANAGEMENT PROGRAM AND LAKE STURGEON

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Purpose Of Presentation:

- to describe the Sea Lamprey Management Program and the relationship to lake sturgeon.
- to present the findings of lampricide toxicity tests on lake sturgeons and sea lampreys.
- to confirm that the Program operates within the spirit of the Great Lakes Fishery Commission Strategic Vision.

Introduction:

Since the 1950's, the U.S. Fish and Wildlife Service and Department of Fisheries and Oceans Canada have been contracted by the Great Lakes Fishery Commission to conduct operational activities of the Sea Lamprey Management Program (Program) throughout the Great Lakes basin. The Program continues to work with fisheries management agencies to achieve consensus on sea lamprey control and priority fisheries management projects in streams of the Great Lakes basin, apply the ecosystem approach, use adaptive management strategies, address risk management issues, and take action to minimize the risk to nontarget organisms. The Program has reduced populations of sea lampreys by 90% in the basin and is a key fishery management activity that contributes to the success of the Great Lakes fishery, an estimated benefit of about $4 billion/year to the region.

The Program uses several techniques to attack sea lampreys during different stages of the life cycle. Currently, the primary method to control sea lampreys utilizes the lampricide 3-trifluoromethyl-4-nitrophenol (TFM) that kills sea lamprey larvae in streams with little or no impact on other fishes. Other methods of control include barriers to block the upstream migration of spawning sea lampreys, sea lamprey traps to capture and remove adult lampreys, and the sterile-male-release-technique to reduce the success of sea lamprey spawning. Lampricide treatment and low head sea lamprey barrier dam construction in a stream occur only with the support and the approval of regulatory and management agencies.

The lake sturgeon is among the nontarget fishes most sensitive to TFM exposure. Since 1989, the Program established partnerships with agencies in the basin to identify lake sturgeon streams and conducted extensive TFM toxicity tests to determine the LC 99.9 for larval sea lampreys and also to minimize the effect on lake sturgeons. State, provincial, and tribal agencies determine lake sturgeon streams where annual production occurs. In streams where sea lampreys and lake sturgeon co-exist, a specialized protocol is used to minimize the potential risk to lake sturgeons.

TFM Toxicity Tests On Lake Sturgeons And Larval Sea Lampreys

TFM toxicity tests on lake sturgeons ($\geq$ 100 mm) and larval sea lampreys were conducted in the field and laboratory during 1989-1996. The following is a summary of the findings (Johnson et al. 1999):

ABSTRACT. The Sturgeon River - a tributary of Lake Superior in Houghton and Baraga Counties, MI - is a major producer of sea lampreys (*Petromyzon marinus*) and is a prime nursery area for juvenile lake sturgeons (*Acipenser fulvescens*). Prior to

the application of the lampricide 3-trifluoromethyl-4-nitrophenol (TFM) in 1989, we ran on-site toxicity tests to determine the sensitivity of the lake sturgeon to TFM. Concentrations of TFM approximately 1.3 times the LC99.9 of sea lamprey larvae were not lethal to juvenile lake sturgeons. This difference in sensitivity to TFM between sea lamprey larvae and juvenile lake sturgeons would allow stream treatment without significant mortality of lake sturgeons. Follow-up laboratory flow-through toxicity tests showed that juvenile lake sturgeons were more sensitive than northern pike (*Esox lucius*), muskellunge (*Esox masquinongy*), and rainbow trout (*Oncorhynchus mykiss*). Toxicity tests showed that pH significantly affected the toxicity of TFM to lake sturgeons, but changes in total alkalinity had little effect. Lampricide was applied to the Sturgeon River to kill larval sea lampreys in 1989 and 1994 at concentrations of TFM determined by on-site toxicity tests. Extensive post-treatment surveys found many dead sea lamprey larvae but almost no dead nontarget species and no dead lake sturgeons.

In a separate research project, additional lampricide toxicity tests on young-of-year lake sturgeons are in progress. The findings will be reported after peer review is completed.

Great Lakes Fishery Commission Strategic Vision

The Commission will provide an integrated sea lamprey management program that supports the Fish Community Objectives for each of the Great Lakes and that is ecologically and economically sound and socially acceptable. The close relationship between sea lamprey management efforts and other fishery management activities will require cooperation and coordination among all partners concerned with Great Lakes fishery management.

Literature Cited

Johnson, D.A., T.D. Bills, and J.W. Weisser. 1999. Sensitivity of lake sturgeon (*Acipenser fulvescens*) to the lampricide 3-trifluoromethyl-4-nitrophenol (TFM) in field and laboratory exposures. Great Lakes Fishery Commission, Ann Arbor, MI. Technical Report 62. 23 p.

STOCKED STURGEON IN CAYUGA LAKE

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St. Lawrence river strain lake sturgeon were stocked in Cayuga Lake on September 14, 1995 and August 24, 1998. The 1995 stocking consisted of 2800 individuals (age 0) which averaged 250 mm and the 1998 stocking consisted of 370 individuals (age 1) which averaged 345 mm. A total of 2400 fish from the 1995 year class were stocked from shore at Long Pt. State Park which is on the east side of the lake approximately 20 miles north of Ithaca. An additional 400 fish from this year class were stocked in the Fall Creek estuary at Stewart Park in Ithaca.

The first recaptures of these fish were at the Milliken Power Station which is on the east side of the lake approximately 10 miles north of Ithaca. Two fish from the 1995 year class were killed in January 1996 by being impinged by the plant's

cooling water intake screening system. These fish were both males and were 274 and 280 mm in total length. Stomach analysis of these fish revealed they had consumed *Mysis* and burrowing mayfly larvae.

Three additional fish from the 1995 year class were also impinged by the cooling water system. These fish were captured on 6/26, 7/30, and 11/18, 1996. We were not able to examine their stomach contents due to the deteriorated condition of the fish.

N.Y.S.D.E.C. Region 7 lake trout egg take netting from November 3-6, 1998 resulted in recapture of three fish from the 1995 year class which averaged 666 mm (26.2 in.) and one age 1 fish from the 1997 year class that was 359 mm (14.1 in.) in total length.

During summer lake trout netting in August, 1999 graded mesh gill nets captured nine age 2 sturgeon from the 1997 year class. These fish were caught on the east side of the lake approximately one mile from the south end. All of these fish were from the group which had been stocked in the Fall Creek estuary the previous August. Mean length of these age 2 fish was 415 mm (16.3 in.).

There have been reports from anglers who have caught or seen sturgeon in or near Cayuga Lake. Two fish were reported in 1998 by a fisherman fishing in the estuary of Fall Creek. He indicated he caught one of these fish and estimated they were 16-18 inches long. Two fish of similar size were reported seen by an angler in the same general area in 1999. All of these sightings occurred in late May or early June. An additional fish was caught just below Cayuga Lake in the Seneca River in early May, 1999. The angler reported the fish was approximately 25 inches long. This fish was probably one of those from the 1995 year class stocked in Cayuga lake.

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GROWTH, HABITAT USE AND DIET OF RE-INTRODUCED LAKE STURGEON IN ONEIDA LAKE, NY

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Since 1995, the Oneida Fish Cultural Station has stocked lake sturgeon in an effort to restore a spawning population in Oneida Lake. About 40,000 sturgeon larvae were stocked on May 26, 1995, though survival was likely low since many larvae had not commenced feeding. An additional 5,000 fingerlings were stocked that fall at approximately 254 mm, and this group most likely provided the majority of sturgeon in the lake. Lesser numbers of fish have been stocked from 1996-99.

To date, minimal effort has been expended on Oneida Lake to determine growth, diet, habitat use and movements of these stocked fish. However, standard sampling by the Cornell Warmwater Fisheries Unit has indicated that stocking of sturgeon appears to have been highly successful. A total of 109 sturgeon have been recaptured from stocking, 73 of which were caught in standard gillnetting surveys and 26 caught in gillnet effort directed at sturgeon. In over 500 bottom trawl hauls from 1996-1999, only 4 sturgeon have been caught. Four additional fish have been caught in trapnets and two by electrofishing. The oldest group of sturgeon (age-IV+) reached nearly 900 mm by the fall of 1999. Sampling in 1999 recaptured at least one fish from every year class of stocking. All fish stocked or recaptured since 1998 have been tagged with Carlin dangler tags, with a single tag return to date.

A small section of the pectoral fin spine (+/-1 cm) was removed from near the base of the fin for aging on 22 fish. The bone was sectioned and aged under a microscope, and age rings on most fish were readily visible. Ages from fin spines were used to verify ages estimated from length distributions and generally agreed quite well.

Distribution of the sturgeon catch indicates that of the 73 sturgeon caught at the 15 standard gillnet sites, over 60% were captured at 4 sites (Dutchman's Island Shoal, Damon's Point, Buoy 133, and Buoy 113), however sturgeon have been recaptured at all 15 gillnet sites. This suggests that there are habitat preferences, however fish are also widely distributed throughout the lake. Sturgeon appear to show a preference for sites on a dropoff and near shoals, but further investigation is needed.

Diets of 54 fish were determined by gastric lavage. Of these, food was found in 40 fish or 74% of stomachs, 78% of which contained amphipods. The next most common item was snails. Other items, which were found in less than 10% of fish that had fed, were: isopods, caddis larvae, larval fish, zebra mussels, oligochaetes, and chironomids. One heartily feeding fish had eaten amphipods, oligochaetes, caddis nymphs, and 9 age-0 tessellated darters.

Sturgeon stocking appears to be quite successful in Oneida Lake. We have recaptured at least one fish from every year class stocked, which seems very unlikely considering in some years less than 500 fish were stocked in this 20,000 ha lake, or 0.03/ha. Sturgeon appear highly vulnerable to gillnets and are quite hardy; little or no mortality has been observed. Monitoring will continue in the form of our standard sampling surveys, and additional effort may be expended towards sturgeon as time permits. Future studies should concentrate on identifying key sturgeon habitats, and movement of sturgeon within or out of this open lake system. We recommend continued stocking in Oneida Lake to diversify age classes and the gene pool.

NYS ONEIDA FISH HATCHERY
LAKE STURGEON STOCKING HISTORY

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Date	Water	# Fish	Size	Yearclass	Mark/Tag
8/3/93	Oswego R.	35	3-4"	1993	
9/26/94	Oswegatchie R.	500	7-9"	1994	
5/26/95	Oneida L.*	40,000	fry*	1995	*starving
9/14/95	Grasse R.	5000	9"	1995	
9/12/95	Oneida L.	5000	10"	1995	
9/14/95	Cayuga L.	2800	10"	1995	
9/27/96	Oswegatchie R.	2528	7"	1996	
9/27/96	Oswegatchie R.	50	20-24"	1995	
9/27/96	St. Lawrence R.	250	7"	1996	

9/27/96	St. Lawrence R.	250	7"	1996	
9/25/96	Oneida L.	500	7"	1996	
9/25/96	Oneida L.	50	20-24"	1995	
10/7/97	Oswegatchie R.	2987	6.5"	1997	scute
10/7/97	St. Lawrence R.	250	6.5"	1997	scute
10/7/97	St. Lawrence R.	250	6.5"	1997	scute
7/8/98	Oneida L.	287	8.5"	1997	
8/24/98	Cayuga L.	370	14"	1997	
8/31/98	Oneida L.	100	14"	1997	dangler tag
9/30/98	St. Regis R.	750	7.5"	1998	
9/30/98	Black L.	1500	7.5"	1998	scute
9/30/98	St. Lawrence R.	300	7.5"	1998	scute
9/30/98	St. Lawrence R.	350	7.5"	1998	
9/30/98	Oswegatchie R.	1500	7.5"	1998	scute
9/23/99	Black L.	1200	9.5"	1999	scute
9/30/99	Oneida L.	300	9.5"	1999	dangler tag
9/29/99	Oneida L.	20	36"	1995	

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Great Lakes Lake Sturgeon Web Site