



Sturgeon Mobile Tracking for the New NY Bridge at Tappan Zee

2015 Final Report

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for

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A. INTRODUCTION

PERMIT CONDITIONS AND ENDANGERED AND THREATENED SPECIES PLAN

In addition to the compensatory mitigation projects required to offset potential environmental impacts from construction of The New NY Bridge, the New York State Department of Environmental Conservation (DEC) has required in its Permit the preparation of an Endangered and Threatened Species Mitigation Plan. This Plan details a series of studies that, when completed, would result in a Net Conservation Benefit for endangered shortnose and Atlantic sturgeon. These studies were designed to provide new ecological information and to promote conservation measures for Hudson River sturgeon. While previous studies have already provided information on the movement patterns, foraging habits, and benthic habitat associations of shortnose and Atlantic sturgeon within the Hudson River, DEC has indicated that additional information would improve management and conservation efforts.

This Incidental Take ECL Article 11 permit (Permit ID 3-9903-00043/00014) requires adherence to the approved Net Conservation Benefit Plan as outlined in the permit. The permit states:

F. Tracking of acoustically marked fish from the vicinity of the bridge construction site and other locations to contribute knowledge of species distribution and habitat use with the Hudson River Estuary. Two techniques will be used: Stationary Gateway receivers, described in Permit Condition 40, below; and Mobile tracking.

ii. Mobile tracking will be designed to provide a more precise location to determine the bottom and habitat type the tagged fish utilizes. The 50 km stretch of river centered on the Tappan Zee Bridge will be monitored by mobile tracking for tagged fish two days per week on a schedule to be determined and approved by the Department as part of the final Endangered and Threatened Species Mitigation Plan. Tracking procedures will be consistent with NYSDEC procedures.

Progress reports will be submitted to the Department on a schedule to be developed, with data files, numbers of fish caught, tagged or lavaged, and a summary of work to present, including progress in stomach content analyses and/or fish tracking data¹.

Mobile tracking of sturgeon was approved as one portion of the Plan, with the goal of increasing our understanding of the spatial distribution, movement, and habitat use of Atlantic and shortnose sturgeon within the Hudson River. As part of the mobile tracking effort, three quarterly reports and one final report have been prepared. This is the final report, which summarizes the results of mobile tracking during the 12-week tracking effort conducted in 2015. This final report also summarizes the combined 40 weeks of mobile tracking conducted by the Authority in 2014 (28 weeks) and 2015 (12 weeks). The 2014 data were presented in last year's quarterly reports for the project, but are also included here for summary purposes and to compare the locations and movement of acoustic-tagged sturgeon between 2014 and 2015.

¹ Reporting on sturgeon capture, lavage, and stomach content analysis will be submitted as part of a separate but related Net Conservation Benefit project.

B. MOBILE TRACKING

DESCRIPTION OF STUDY AREA

Mobile tracking during the course of the project was conducted from the George Washington Bridge (GW Bridge) at River Mile 12 to Buchanan, NY at RM 42. This 31-mile study area was divided into three river segments (see Figure 1). At DEC's request, the northern extent of the 2015 study area was Stony Point at RM 39. The three river segments are as follows:

- GW Bridge - this segment is the area between the GW Bridge (RM 12) and the Tappan Zee Bridge (TZB) (RM 27);
- Tappan Zee – this segment is the area between the TZB (RM 27) and the southern terminus of Haverstraw Bay (adjacent to the tip of Croton Point Park on the west side of the park), including all of Croton Bay (RM 33); and
- Haverstraw Bay – this segment is the area between the southern terminus of Haverstraw Bay (RM 33) and Buchanan, NY (RM 42).

METHODS

Acoustic-tagged sturgeon were tracked within the 31-mile study area using a Lotek dual-hydrophone and receiver tracking system (Lotek Wireless, Inc., Newmarket, Ontario). By determining the locations of tagged sturgeon, it is possible to investigate the fine-scale movement patterns and habitat associations of these fish. Tracking methods were consistent with the tracking protocol developed and used by DEC's Hudson River Fisheries Unit, Hudson River Estuary Program.

Forty weeks of mobile tracking were conducted in the study area over the course of 2014 and 2015. Mobile tracking during the first season was conducted two days per week between April 28 and November 7, 2014 (weeks 1 through 28). Tracking resumed the following spring and was conducted two days per week between May 7 and July 22, 2015 (weeks 29 through 40).

Tracking was conducted aboard a 21-foot research vessel equipped with two hydrophones, located on the fore port and starboard sides of the boat. The hydrophones were directly connected to an onboard laptop computer running the Lotek MAP software, which was actively monitored by a crew member during tracking.

The general approach to tracking consisted of “searching” a series of fixed stations located in one of the three river segments with the goal being to “find” tagged sturgeon. Based on previous work by DEC, and using an estimated minimum signal range of approximately 500 m, it was determined that a spacing of approximately 1 km between search points was adequate to allow full coverage of each river segment. In the narrow portion of the river from the GW Bridge (RM 12) to Dobbs Ferry (RM 22) (see Figure 1), the minimum detection range is sufficient to detect all tagged fish between the shores of the river from the center of the channel. In these areas, “searching” was conducted from the center of the river channel at 1-km increments. In the wider portion of the study area between Dobbs Ferry (RM 22) and Stony Point (RM 39), the river is too wide to search the entire area in one pass. Therefore, search points located on 1-km grids were used. This grid design was adapted to allow the tracking crew to cover each river segment quickly, while minimizing the risk of allowing any tagged fish to go undetected. The location of

the grid points were rotated sequentially between three different sets of grids to avoid a detection bias.

Tracking each day began by “searching” at the first search point, which consisted of driving the boat in a tight circle for a period of at least two minutes with both hydrophones submerged. The rear 65° of the hydrophones were covered with a baffle to provide directionality by preventing detection of tag signals from the stern. The location of each search point and all tag IDs detected at that location were recorded at the “search” point (search) in a database using a 4G data-enabled iPad tablet with an average GPS accuracy of 7 feet and equipped with the Fulcrum GPS application. If the signal strength for any of the detected sturgeon indicated that one of the sturgeon was relatively close to the search point, the boat was moved in the direction of the strongest signal until three consecutive signals with a strength of 90 or higher were received, at which point, the tagged fish was considered “found” at that precise location. Tagged fish that were tracked but not “found” were determined to be “close” if three consecutive powers of 80 or higher are received by the hydrophones. At this time, a waypoint was recorded as a “found” point (found), or a “close” point (close). If the tracked sturgeon was not located as “close” or “found”, the crew moved on to the next search point. Throughout the tracking day, data on all search, close, and found points were backed up by uploading data to the Fulcrum server.

C. RESULTS

SEARCH EFFORT BY RIVER SEGMENT (2015)

In 2015, sturgeon tracking occurred on 24 days between May 7 and July 22, 2015 (weeks 29 through 40; Table 1). Over the course of these 24 days, 9 days were spent tracking in Haverstraw Bay, 8 days were spent tracking in the Tappan Zee region, and 7 days were spent tracking in the GW Bridge region. The full search grid was completed on all but two tracking days (i.e., June 2 and July 7), which had to be abbreviated due to poor weather conditions.

DETECTED STURGEON (2015)

During the 24 tracking days, a total of 870 search points were sampled, with an average of 36 search points each tracking day. Over this time, 261 detections of 32 uniquely tagged sturgeon (15 Atlantic sturgeon and 17 shortnose sturgeon) were made at search points, which included sturgeon classified as “detected”, “close”, and “found”¹. The number of uniquely tagged sturgeon detected in each the three regions was the same; however, the average number of sturgeon detected per day was highest in the Haverstraw Bay and GW Bridge regions and slightly lower in the Tappan Zee region (Table 2). The number of uniquely tagged sturgeon detected among the three regions was similar for both Atlantic and shortnose sturgeon (Table 3)².

All sturgeon detected during mobile tracking were tagged by either the Thruway Authority or by DEC. See Appendix A for a summary of sturgeon that were “detected” or “found” in 2014 and 2015.

¹ Sturgeon classified as “close” and “found” are considered a subset of all “detected” sturgeon.

² Individual tag IDs were often detected in more than one river segment so the numbers of detections are greater than the number of individual tags.

Table 1 2015 Tracking Schedule		
Tracking Date	River Segment	Complete or Partial Tracking Day
5/7/15	Haverstraw Bay	Complete
5/8/15	Tappan Zee Bridge	Complete
5/15/15	Haverstraw Bay	Complete
5/18/15	George Washington Bridge	Complete
5/21/15	George Washington Bridge	Complete
5/22/15	Tappan Zee Bridge	Complete
5/27/15	Tappan Zee Bridge	Complete
5/28/15	Haverstraw Bay	Complete
6/1/15	Haverstraw Bay	Complete
6/2/15	George Washington Bridge	Partial
6/9/15	Tappan Zee Bridge	Complete
6/12/15	George Washington Bridge	Complete
6/15/15	Haverstraw Bay	Complete
6/18/15	Tappan Zee Bridge	Complete
6/22/15	George Washington Bridge	Complete
6/23/15	Haverstraw Bay	Complete
6/29/15	Haverstraw Bay	Complete
6/30/15	Tappan Zee Bridge	Complete
7/7/15	Tappan Zee Bridge	Partial
7/9/15	George Washington Bridge	Complete
7/14/15	George Washington Bridge	Complete
7/16/15	Haverstraw Bay	Complete
7/21/15	Tappan Zee Bridge	Complete
7/22/15	Haverstraw Bay	Complete

Table 2 Summary of Sturgeon Detected during 2015 Tracking			
River Segment	# Detected	# of Unique Tags	Average Detected per Day
Haverstraw Bay	110	17	12
Tappan Zee	73	17	9
GW Bridge	78	17	11
Total	261		

Table 3 Number of Individual Tagged Sturgeon Detected in each River Segment during 2015 Tracking		
River Segment	Atlantic	Shortnose
Haverstraw Bay	6	11
Tappan Zee	7	10
GW Bridge	6	11

FOUND STURGEON (2015)

During the 24 days of tracking, a total of 61 “found fish” points were recorded (Table 4, Appendix B). These points corresponded with 23 uniquely tagged sturgeon, of which 8 were Atlantic sturgeon and 15 were shortnose sturgeon (Table 5, Appendix A). The number of “found” sturgeon was highest in the Haverstraw Bay region and only slightly less in the GW Bridge region. Similarly, the number of uniquely tagged sturgeon and the average number of “found sturgeon” per day were both comparatively higher in the Haverstraw Bay and GW Bridge regions and lower in the Tappan Zee region. The majority of Atlantic sturgeon were found in Haverstraw Bay, while the majority of shortnose sturgeon were found in the GW Bridge region (Table 6).

Table 4 Summary of “Found” Sturgeon by River Segment (2015)			
River Segment	# Found	# of Unique Tags	Average Found per Day
Haverstraw Bay	25	13	2.7
Tappan Zee	14	9	1.8
GW Bridge	22	13	3.1
Total	61		

In 2015, there were 13 sturgeon (2 Atlantic sturgeon and 11 shortnose sturgeon) that were “found” more than once. A map showing the locations of these fish is provided in Appendix C, as are individual maps for each sturgeon with annotated dates on which each sturgeon was found. Both of the Atlantic sturgeon were found in the deeper waters of the river channel, while the shortnose sturgeon were more commonly found in the shallower waters of eastern Haverstraw Bay, Croton Bay, and the western shallows of the Tappan Zee region. Shortnose sturgeon were occasionally found along the edge of the channel but infrequently occurred in the deepest areas of the channel.

Table 5 Tagged Sturgeon “Found” during 2015 Tracking					
Species	Tag ID	Life Stage	Species	Tag ID	Life Stage
Atlantic Sturgeon*	11155	Juvenile	Shortnose Sturgeon*	11191	Adult
Atlantic Sturgeon*	11161	Juvenile	Shortnose Sturgeon*	11192	Adult
Atlantic Sturgeon	11184	Juvenile	Shortnose Sturgeon*	11193	Adult
Atlantic Sturgeon	11207	Subadult	Shortnose Sturgeon*	11194	Adult
Atlantic Sturgeon*	11213	Subadult	Shortnose Sturgeon*	11195	Adult
Atlantic Sturgeon	11217	Subadult	Shortnose Sturgeon*	11196	Adult
Atlantic Sturgeon*	11219	Juvenile	Shortnose Sturgeon*	11197	Adult
Atlantic Sturgeon	11220	Juvenile	Shortnose Sturgeon*	11202	Adult
Shortnose Sturgeon*	11166	Adult	Shortnose Sturgeon*	11205	Adult
Shortnose Sturgeon*	11171	Adult	Shortnose Sturgeon*	11206	Adult
Shortnose Sturgeon*	11188	Adult	Shortnose Sturgeon*	11228	Adult
Shortnose Sturgeon*	11190	Adult			

* "Found" during both tracking years.

Table 6 Number of Individual Tagged Sturgeon “Found” in each River Segment (2015)		
River Segment	Atlantic	Shortnose
Haverstraw Bay	5	8
Tappan Zee	2	7
GW Bridge	3	10

FOUND STURGEON (2014-2015)

During the entire 40-week tracking effort in 2014 and 2015, a total of 331 sturgeon were “found.” In general, Atlantic sturgeon were concentrated in the northern portion of the study area and in the deeper waters of the navigation channel, while shortnose sturgeon were more evenly distributed throughout the study area and were more frequently found in shallower water and near the shoreline (Table 7, Appendix D).

Location maps for individual sturgeon were prepared for all sturgeon that were “found” more than once during the 40-week tracking effort (Appendix D). Atlantic sturgeon (n=9 individuals) were found almost exclusively in the channel and nearly always upstream of the Tappan Zee Bridge. Shortnose sturgeon (n=29 individuals) moved throughout the study area, but were most commonly “found” in the shallower areas. Many of the shortnose sturgeon were “found” within a specific area (e.g., eastern Haverstraw Bay, Croton Bay) on numerous occasions over the course of several months and were often in the same area over consecutive years. Fourteen of the 29 shortnose sturgeon “found” on multiple days during mobile tracking were found within the same area in both 2014 and 2015. This may indicate some level of site fidelity, although it’s not possible to determine from the tracking data where sturgeon were located on days between tracking events or how widely they ranged during that time.

Table 7 Percentage of “Found” Sturgeon by Region (2014-2015)				
River Segment	Atlantic		Shortnose	
Haverstraw Bay	61	77%	101	40%
Tappan Zee	8	10%	94	37%
GW Bridge	10	13%	57	23%

INTERANNUAL TRENDS FOR FOUND STURGEON (2014-2015)

To provide a fair comparison for interannual analysis, the 2014 tracking data were subset to include only the May 1 through July 25 time period. The resulting 2014 and 2015 datasets covered the same time period and contained the same number of tracking events per region in both years (i.e., annual effort for Haverstraw = 9, Tappan Zee = 8, GW Bridge = 7).

The number of sturgeon “found” during 2014 was approximately twice that “found” in 2015 (Table 8). The observed decline in the number of sturgeon is likely a result of expired tag batteries for juvenile Atlantic sturgeon tagged by the Authority in 2014 and shortnose sturgeon tagged by the DEC in prior years. There were also fewer subadult Atlantic sturgeon “found” in 2015 (i.e., only 8 of 30 subadults tagged in 2014 were “found” in 2015).

Abundances of both species, in terms of the numbers “found”, were highest in Haverstraw Bay during both years (Table 8). Atlantic sturgeon specifically were “found” more frequently in Haverstraw Bay and less frequently in the downstream regions during both years.

Shortnose sturgeon were fairly evenly distributed among the three regions, but in both years the highest number of shortnose sturgeon occurred in the Haverstraw Bay region. In 2015, fewer shortnose sturgeon were “found” in the Tappan Zee region compared to the other regions.

Table 8 Interannual Comparison of "Found" Sturgeon during May - July 2014 and 2015				
		2014	2015	Total
Atlantic Sturgeon	Haverstraw Bay	20	5	25
	Tappan Zee	4	2	6
	GW Bridge	2	4	6
	Total	26	11	37
Shortnose Sturgeon	Haverstraw Bay	37	20	57
	Tappan Zee	32	12	44
	GW Bridge	27	18	45
	Total	96	50	146
Total		129	61	190

FOUND STURGEON BY WATER DEPTH

The average depths searched during 2015 ranged from approximately 6 to 8 meters (see Table 9). Atlantic sturgeon were found at depths averaging 12 to 18 meters and were found at depths that exceeded the average depths searched in all three river segments. In contrast, shortnose sturgeon were found at depths that were comparable to the average surveyed depths (i.e., 6 to 8 meters). Shortnose sturgeon in the GW Bridge segment were found at slightly shallower depths than the average depths searched (i.e., 6 meters vs. 8 meters).

Table 9 Search Depths vs. Depths of "Found" Sturgeon 2015 Tracking				
		Depths searched (mean and range, m)	Depths of found fish (mean and range, m)	Sturgeon found
Atlantic Sturgeon	Haverstraw Bay	6.4 (2-29)	18.4 (10-22)	5
	Tappan Zee	6.2 (1-14)	11.5 (10-13)	2
	GW Bridge	8.0 (1-19)	13.8 (12-16)	4
Shortnose Sturgeon	Haverstraw Bay	6.4 (2-29)	7.0 (2-24)	20
	Tappan Zee	6.2 (1-14)	7.8 (2-13)	12
	GW Bridge	8.0 (1-19)	5.9 (2-10)	18

In both the 2015 tracking effort and the combined 2014-2015 tracking effort (see Table 10), sturgeon were found at the greatest depths in Haverstraw Bay (Atlantic sturgeon down to 30 meters and shortnose sturgeon down to 24 meters). However, across the entire 40-week tracking period, shortnose sturgeon were consistently found at depths that were similar to, or shallower,

than those searched, while Atlantic sturgeon were consistently found at greater depths than the average surveyed.

Table 10 Search Depths vs. Depths of “Found” Sturgeon (2014-2015)				
		Depths searched (mean and range, m)	Depths of found fish (mean and range, m)	Sturgeon found
Atlantic Sturgeon	Haverstraw Bay	7.4 (2-30)	13.0 (2-30)	61
	Tappan Zee	6.0 (1-14)	8.8 (4-13)	8
	GW Bridge	8.4 (1-21)	12.0 (3-16)	10
Shortnose Sturgeon	Haverstraw Bay	7.4 (2-30)	7.3 (1-24)	101
	Tappan Zee	6.0 (1-14)	5.2 (1-13)	94
	GW Bridge	8.4 (1-21)	5.7 (1-15)	57

D. APPENDICES

- A. List of Tagged Sturgeon Detected or Found during 40 Weeks of Mobile Tracking in the Haverstraw, Tappan Zee, and GW Bridge Segments of the Hudson River (2014-2015)
- B. Summary of Tagged Sturgeon Found during 2015 Mobile Tracking
- C. Maps of Found Sturgeon (2015), including a Summary Map of Found Sturgeon
- D. Maps of Found Sturgeon (2014-2015) during 40 Weeks of Mobile Tracking

Appendix A

List of Tagged Sturgeon Detected or Found during 40 Weeks of Mobile Tracking in the Haverstraw, Tappan Zee, and GW Bridge Segments of the Hudson River (2014-2015)

Appendix A

List of Tagged Sturgeon Detected (D) or Found (F) during 40 Weeks of Mobile Tracking in the Haverstraw, Tappan Zee, and GW Bridge regions of the Hudson River (2014-2015)

Species – Tag ID	Tagging Organization	2014	2015
Atlantic Sturgeon – 11123	NYSTA	D	
Atlantic Sturgeon – 11124	NYSTA	F	
Atlantic Sturgeon – 11125	NYSTA	D	
Atlantic Sturgeon – 11126	NYSTA	F	
Atlantic Sturgeon – 11127	NYSTA	D	
Atlantic Sturgeon – 11128	NYSTA	F	
Atlantic Sturgeon – 11129	NYSTA	F	
Atlantic Sturgeon – 11130	NYSTA	F	
Atlantic Sturgeon – 11131	NYSTA	F	
Atlantic Sturgeon – 11132	NYSTA	F	
Atlantic Sturgeon – 11133	NYSTA	F	
Atlantic Sturgeon – 11135	NYSTA	F	
Atlantic Sturgeon – 11136	NYSTA	F	
Atlantic Sturgeon – 11139	NYSTA	D	
Atlantic Sturgeon – 11153	NYSTA	F	
Atlantic Sturgeon – 11154	NYSTA	F	D
Atlantic Sturgeon – 11155	NYSTA	F	F
Atlantic Sturgeon – 11156	NYSTA	F	
Atlantic Sturgeon – 11157	NYSTA	F	
Atlantic Sturgeon – 11158	NYSTA	F	
Atlantic Sturgeon – 11159	NYSTA	F	D
Atlantic Sturgeon – 11160	NYSTA	F	
Atlantic Sturgeon – 11161	NYSTA	F	F
Atlantic Sturgeon – 11162	NYSTA	D	D
Atlantic Sturgeon – 11165	NYSTA	F	
Atlantic Sturgeon – 11182	NYSTA	D	
Atlantic Sturgeon – 11184	NYSTA		F
Atlantic Sturgeon – 11187	NYSTA	F	D
Atlantic Sturgeon – 11199	NYSTA	F	
Atlantic Sturgeon – 11207	NYSTA		F
Atlantic Sturgeon – 11208	NYSTA	D	
Atlantic Sturgeon – 11209	NYSTA	F	
Atlantic Sturgeon – 11210	NYSTA	F	
Atlantic Sturgeon – 11212	NYSTA	D	
Atlantic Sturgeon – 11213	NYSTA	F	F

Species – Tag ID	Tagging Organization	2014	2015
Atlantic Sturgeon – 11214	NYSTA	D	
Atlantic Sturgeon – 11216	NYSTA	F	
Atlantic Sturgeon – 11217	NYSTA	D	F
Atlantic Sturgeon – 11218	NYSTA		D
Atlantic Sturgeon – 11219	NYSTA	F	F
Atlantic Sturgeon – 11220	NYSTA		F
Atlantic Sturgeon – 11221	NYSTA	F	
Atlantic Sturgeon – 11222	NYSTA	D	
Atlantic Sturgeon – 11224	NYSTA	F	
Atlantic Sturgeon – 11225	NYSTA	D	D
Atlantic Sturgeon – 11226	NYSTA	F	
Atlantic Sturgeon – 11229	NYSTA	F	
Atlantic Sturgeon – 11230	NYSTA		D
Shortnose Sturgeon – 10469	NYSDEC	F	
Shortnose Sturgeon – 10773	NYSDEC	F	
Shortnose Sturgeon – 10774	NYSDEC	F	
Shortnose Sturgeon – 10779	NYSDEC	F	
Shortnose Sturgeon – 10780	NYSDEC	F	
Shortnose Sturgeon – 10782	NYSDEC	F	
Shortnose Sturgeon – 10784	NYSDEC	F	
Shortnose Sturgeon – 10787	NYSDEC	F	
Shortnose Sturgeon – 10793	NYSDEC	F	
Shortnose Sturgeon – 10794	NYSDEC	F	
Shortnose Sturgeon – 10795	NYSDEC	F	
Shortnose Sturgeon – 10798	NYSDEC	F	
Shortnose Sturgeon – 10800	NYSDEC	D	
Shortnose Sturgeon – 10801	NYSDEC	F	
Shortnose Sturgeon – 10802	NYSDEC	D	
Shortnose Sturgeon – 10805	NYSDEC	D	
Shortnose Sturgeon – 10807	NYSDEC	D	
Shortnose Sturgeon – 10809	NYSDEC	D	
Shortnose Sturgeon – 10810	NYSDEC	F	
Shortnose Sturgeon – 10812	NYSDEC	F	
Shortnose Sturgeon – 10814	NYSDEC	F	
Shortnose Sturgeon – 10815	NYSDEC	F	
Shortnose Sturgeon – 10817	NYSDEC	F	
Shortnose Sturgeon – 11116	NYSTA	D	
Shortnose Sturgeon – 11134	NYSTA	D	

Species – Tag ID	Tagging Organization	2014	2015
Shortnose Sturgeon – 11137	NYSTA	F	
Shortnose Sturgeon – 11138	NYSTA	F	
Shortnose Sturgeon – 11139	NYSTA	F	
Shortnose Sturgeon – 11140	NYSTA	D	
Shortnose Sturgeon – 11142	NYSTA	D	
Shortnose Sturgeon – 11150	NYSTA	F	
Shortnose Sturgeon – 11163	NYSTA	F	D
Shortnose Sturgeon – 11164	NYSTA	F	
Shortnose Sturgeon – 11166	NYSTA	F	F
Shortnose Sturgeon – 11167	NYSTA	F	
Shortnose Sturgeon – 11168	NYSTA	F	D
Shortnose Sturgeon – 11170	NYSTA	F	
Shortnose Sturgeon – 11171	NYSTA	F	F
Shortnose Sturgeon – 11186	NYSTA	F	
Shortnose Sturgeon – 11188	NYSTA	F	F
Shortnose Sturgeon – 11189	NYSTA	F	
Shortnose Sturgeon – 11190	NYSTA	F	F
Shortnose Sturgeon – 11191	NYSTA	F	F
Shortnose Sturgeon – 11192	NYSTA	F	F
Shortnose Sturgeon – 11193	NYSTA	F	F
Shortnose Sturgeon – 11194	NYSTA	F	F
Shortnose Sturgeon – 11195	NYSTA	F	F
Shortnose Sturgeon – 11196	NYSTA	F	F
Shortnose Sturgeon – 11197	NYSTA	F	F
Shortnose Sturgeon – 11198	NYSTA	F	
Shortnose Sturgeon – 11202	NYSTA	F	F
Shortnose Sturgeon – 11205	NYSTA	F	F
Shortnose Sturgeon – 11206	NYSTA	F	F
Shortnose Sturgeon – 11228	NYSTA	F	F

Appendix B

Summary of Tagged Sturgeon Found During 2015 Mobile Tracking

Summary of Tagged Sturgeon Found during 2015 Mobile Tracking

TAGS FOUND BY DATE

Species – Tag ID	07-May	8-May	15-May	18-May	21-May	22-May	27-May	28-May	1-Jun	9-Jun	12-Jun	15-Jun
Atlantic Sturgeon – 11155		1										
Atlantic Sturgeon – 11161	1											
Atlantic Sturgeon – 11184												
Atlantic Sturgeon – 11207												
Atlantic Sturgeon – 11213												
Atlantic Sturgeon – 11217												
Atlantic Sturgeon – 11219											1	
Atlantic Sturgeon – 11220					1							
Shortnose Sturgeon – 11166							1			1		
Shortnose Sturgeon – 11171												
Shortnose Sturgeon – 11188			1			1			1			1
Shortnose Sturgeon – 11190	1				1	1			1			1
Shortnose Sturgeon – 11191				1	1						1	
Shortnose Sturgeon – 11192						1			2		1	1
Shortnose Sturgeon – 11193							1					
Shortnose Sturgeon – 11194												
Shortnose Sturgeon – 11195												1
Shortnose Sturgeon – 11196				1	2							
Shortnose Sturgeon – 11197												
Shortnose Sturgeon – 11202											1	
Shortnose Sturgeon – 11205											1	
Shortnose Sturgeon – 11206											1	
Shortnose Sturgeon – 11228					1			1	1			
Grand Total	2	1	1	2	6	3	2	1	5	1	6	4

Appendix B
Found Tags – 2015 continued

TAGS FOUND BY DATE												
Species – Tag ID	18-Jun	22-Jun	23-Jun	29-Jun	30-Jun	7-Jul	9-Jul	14-Jul	16-Jul	21-Jul	22-Jul	Total
Atlantic Sturgeon – 11155												1
Atlantic Sturgeon – 11161												1
Atlantic Sturgeon – 11184		1										1
Atlantic Sturgeon – 11207				1								1
Atlantic Sturgeon – 11213			1									1
Atlantic Sturgeon – 11217	1		1									2
Atlantic Sturgeon – 11219				1			1					3
Atlantic Sturgeon – 11220												1
Shortnose Sturgeon – 11166						1				1		4
Shortnose Sturgeon – 11171									1			1
Shortnose Sturgeon – 11188			1	1							1	7
Shortnose Sturgeon – 11190												6
Shortnose Sturgeon – 11191		1						1				5
Shortnose Sturgeon – 11192					1						1	7
Shortnose Sturgeon – 11193										1	1	3
Shortnose Sturgeon – 11194		1										1
Shortnose Sturgeon – 11195			1									2
Shortnose Sturgeon – 11196		1										4
Shortnose Sturgeon – 11197		1						1				2
Shortnose Sturgeon – 11202												1
Shortnose Sturgeon – 11205	1		1									3
Shortnose Sturgeon – 11206												1
Shortnose Sturgeon – 11228										1		4
Grand Total	2	5	5	3	1	1	1	2	1	3	3	61

Appendix C

**Maps of Found Sturgeon (2015)
including a Summary Map of all Found Sturgeon**

Sturgeon locations during weekly
mobile tracking in 2015 (May-July)

Sturgeon locations

Species

- Atlanticsturgeon
- Shortnose sturgeon

0 1 2 4 6 8 Miles



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNR/Airbus DS, USDA, USGS, AeroX, Getmapping, Aerogrid, IGN, IGP, Swisstopo, and the GIS User Community

Sturgeon locations during weekly mobile tracking from May 7 - July 22, 2015

6/23/2015

6/18/2015

Sturgeon locations

tag_id, status



Atlantic Sturgeon - 11217, Found

0 1 2 4 6 8 Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Sturgeon locations during weekly mobile tracking from May 7 - July 22, 2015

6/29/2015

6/12/2015

7/9/2015

Sturgeon locations

tag_id, status

Atlantic Sturgeon - 11219, Found

0 1 2 4 6 8 Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Sturgeon locations during weekly mobile tracking from May 7 - July 22, 2015

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Sturgeon locations

tag_id, status



Shortnose Sturgeon - 11166, Found

7/21/2015

7/7/2015

5/27/2015

6/9/2015

0 1 2 4 6 8 Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Sturgeon locations during weekly mobile tracking from May 7 - July 22, 2015

6/15/2015
5/15/2015 6/29/2015 6/1/2015
6/23/2015 7/22/2015
5/22/2015

Sturgeon locations

tag_id, status



Shortnose Sturgeon - 11188, Found

0 1 2 4 6 8 Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, IGP, swisstopo, and the GIS User Community



Sturgeon locations during weekly mobile tracking from May 7 - July 22, 2015

5/7/2015

6/15/2015 6/1/2015

5/22/2015

5/21/2015

Sturgeon locations

tag_id, status



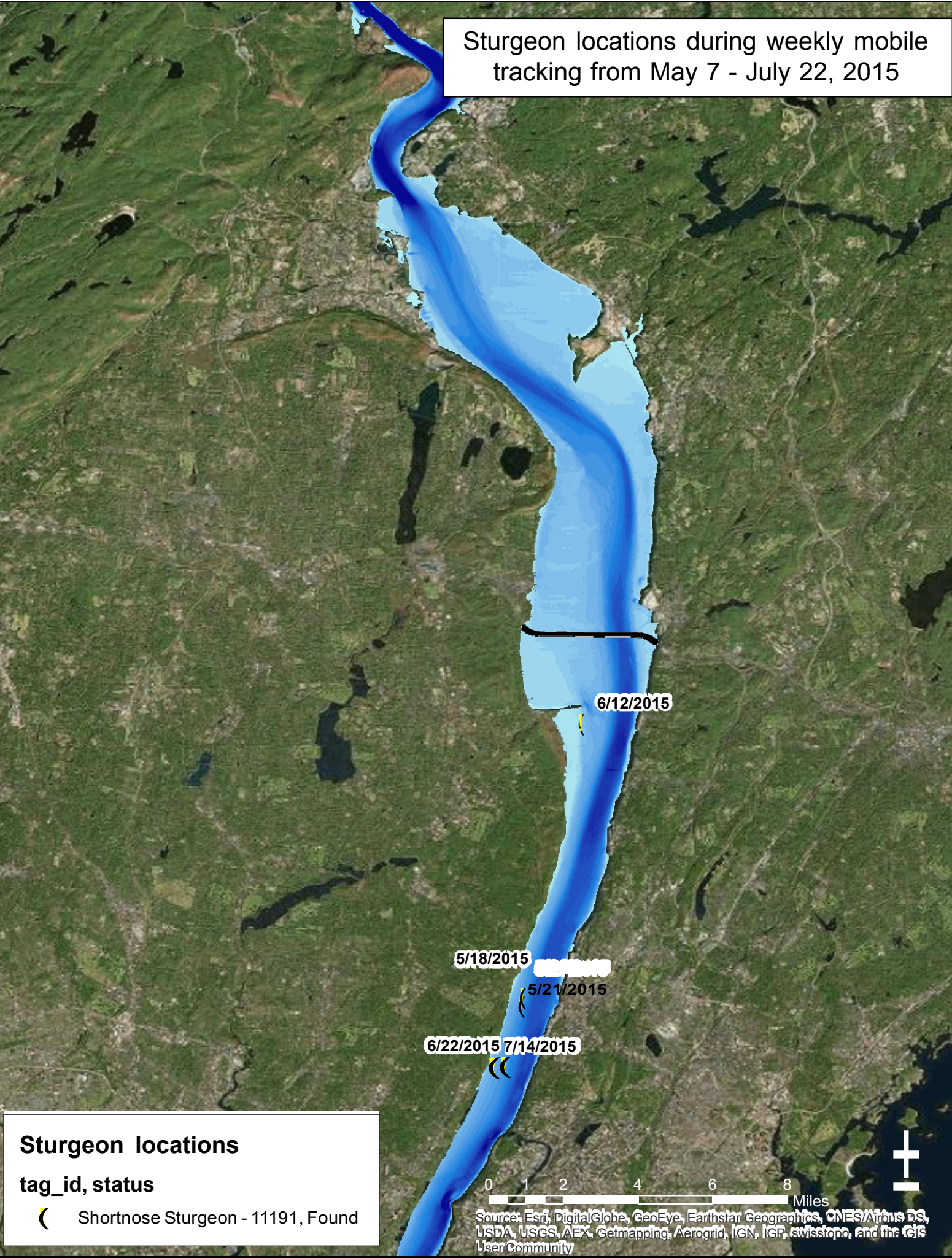
Shortnose Sturgeon - 11190, Found

0 1 2 4 6 8 Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Sturgeon locations during weekly mobile tracking from May 7 - July 22, 2015



Sturgeon locations

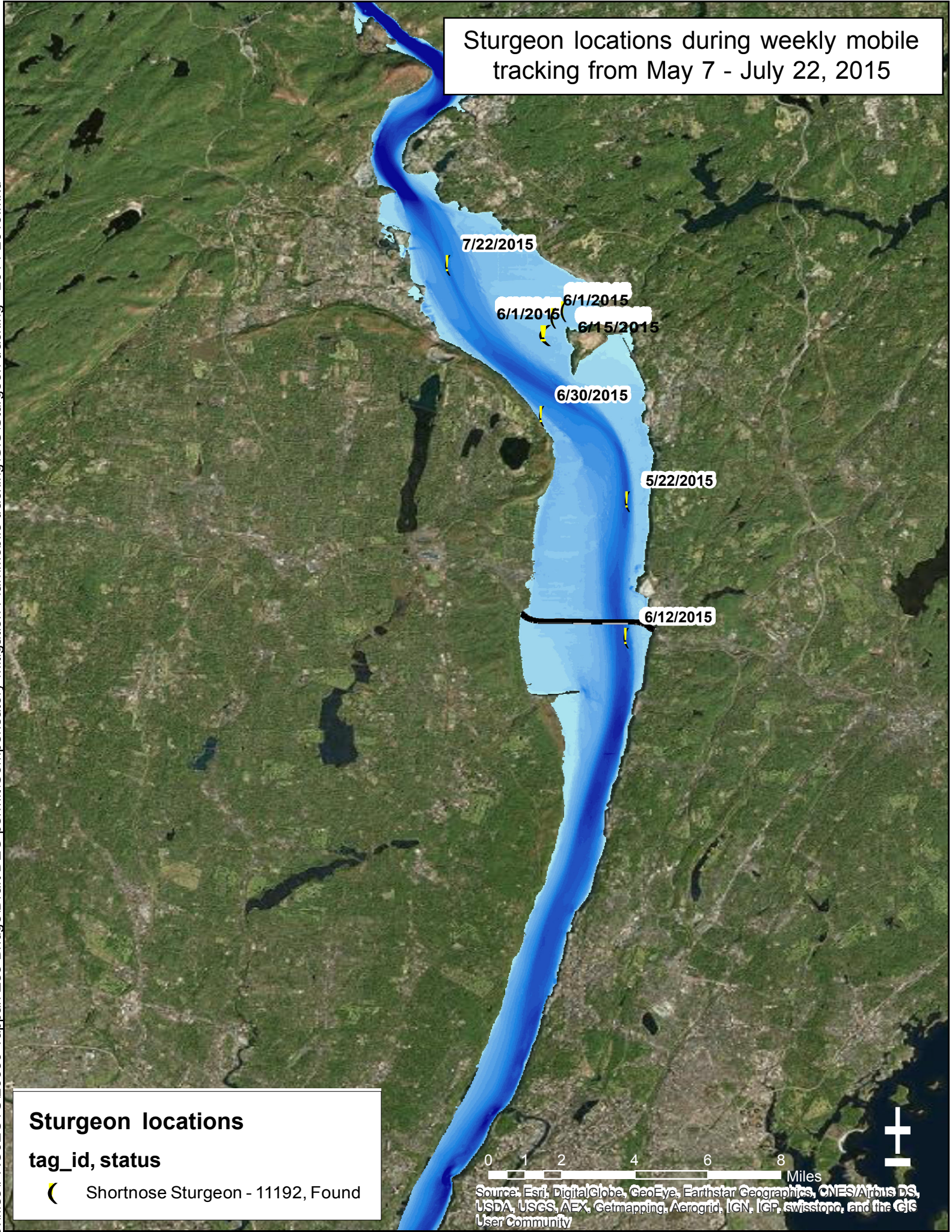
tag_id, status

(Shortnose Sturgeon - 11191, Found

0 1 2 4 6 8 Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Sturgeon locations during weekly mobile tracking from May 7 - July 22, 2015



Sturgeon locations

tag_id, status

(Shortnose Sturgeon - 11192, Found

0 1 2 4 6 8 Miles
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

C:\files\PROJECTS\20389 Tappan Zee Bridge\Draft DEC permit\Compensatory Mitigation Plan\Mobile tracking\GIS\Sturgeon tracking - 2014-2015.mxd

Sturgeon locations during weekly mobile tracking from May 7 - July 22, 2015

7/22/2015

7/21/2015

5/27/2015

Sturgeon locations

tag_id, status

(Shortnose Sturgeon - 11193, Found

0 1 2 4 6 8 Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, IGP, swisstopo, and the GIS User Community

Sturgeon locations during weekly mobile tracking from May 7 - July 22, 2015

6/15/2015 6/23/2015

Sturgeon locations

tag_id, status



Shortnose Sturgeon - 11195, Found

0 1 2 4 6 8 Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, IGP, swisstopo, and the GIS User Community



Sturgeon locations during weekly mobile tracking from May 7 - July 22, 2015

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Sturgeon locations

tag_id, status

(Shortnose Sturgeon - 11196, Found

5/18/2015

5/21/2015

5/21/2015

6/22/2015

0 1 2 4 6 8 Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community




Sturgeon locations during weekly mobile tracking from May 7 - July 22, 2015

C:\files\PROJECTS\20389 Tappan Zee Bridge\Draft DEC permit\Compensatory Mitigation Plan\Mobile tracking\GIS\Sturgeon tracking - 2014-2015.mxd

Sturgeon locations

tag_id, status

 Shortnose Sturgeon - 11197, Found

7/14/2015

6/22/2015



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Sturgeon locations during weekly mobile tracking from May 7 - July 22, 2015

6/23/2015

6/18/2015

6/12/2015

Sturgeon locations

tag_id, status



Shortnose Sturgeon - 11205, Found

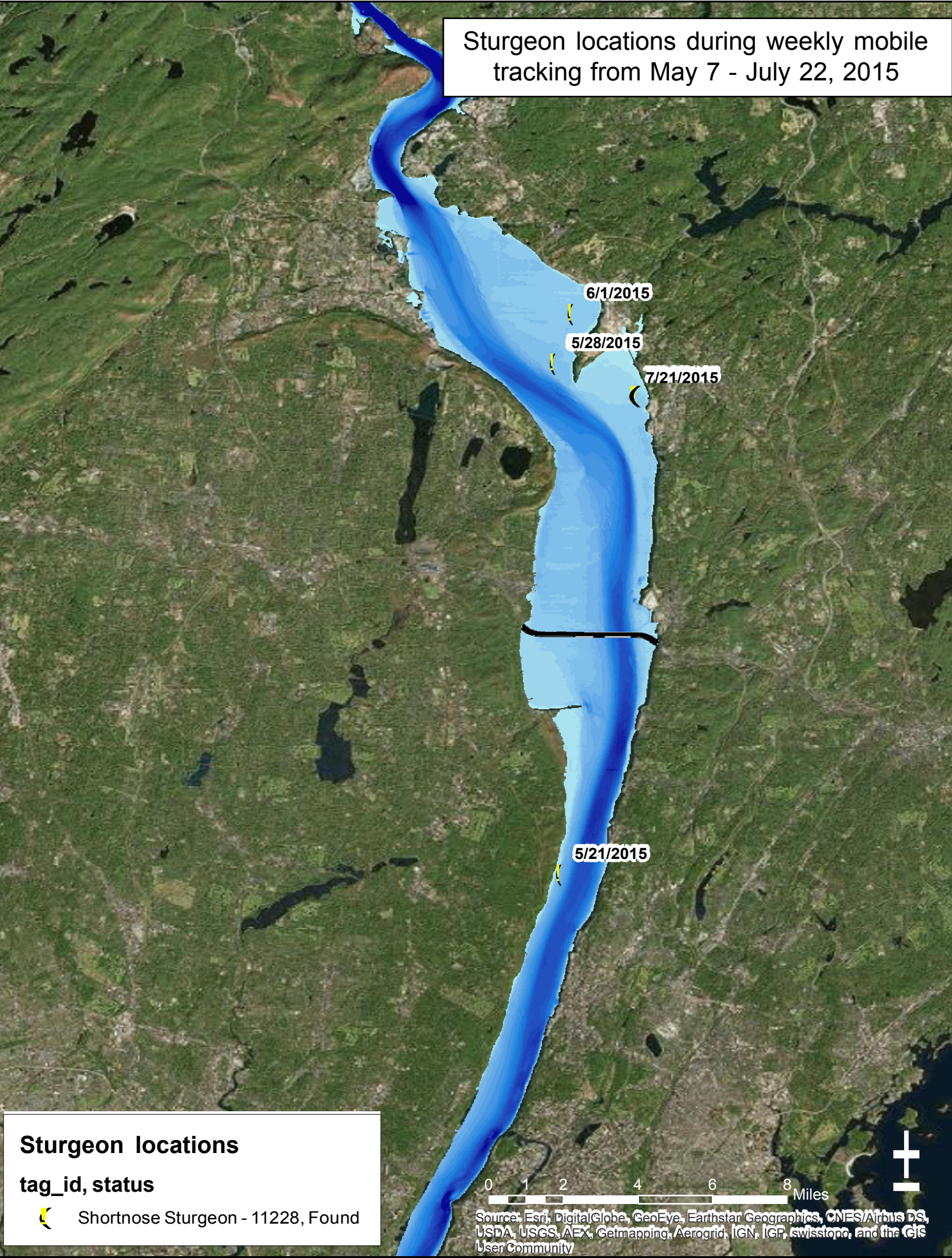
0 1 2 4 6 8 Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Sturgeon locations during weekly mobile tracking from May 7 - July 22, 2015

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Sturgeon locations

tag_id, status



Shortnose Sturgeon - 11228, Found

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Appendix D

Maps of Found Sturgeon (2014-2015) during 40 Weeks of Mobile Tracking

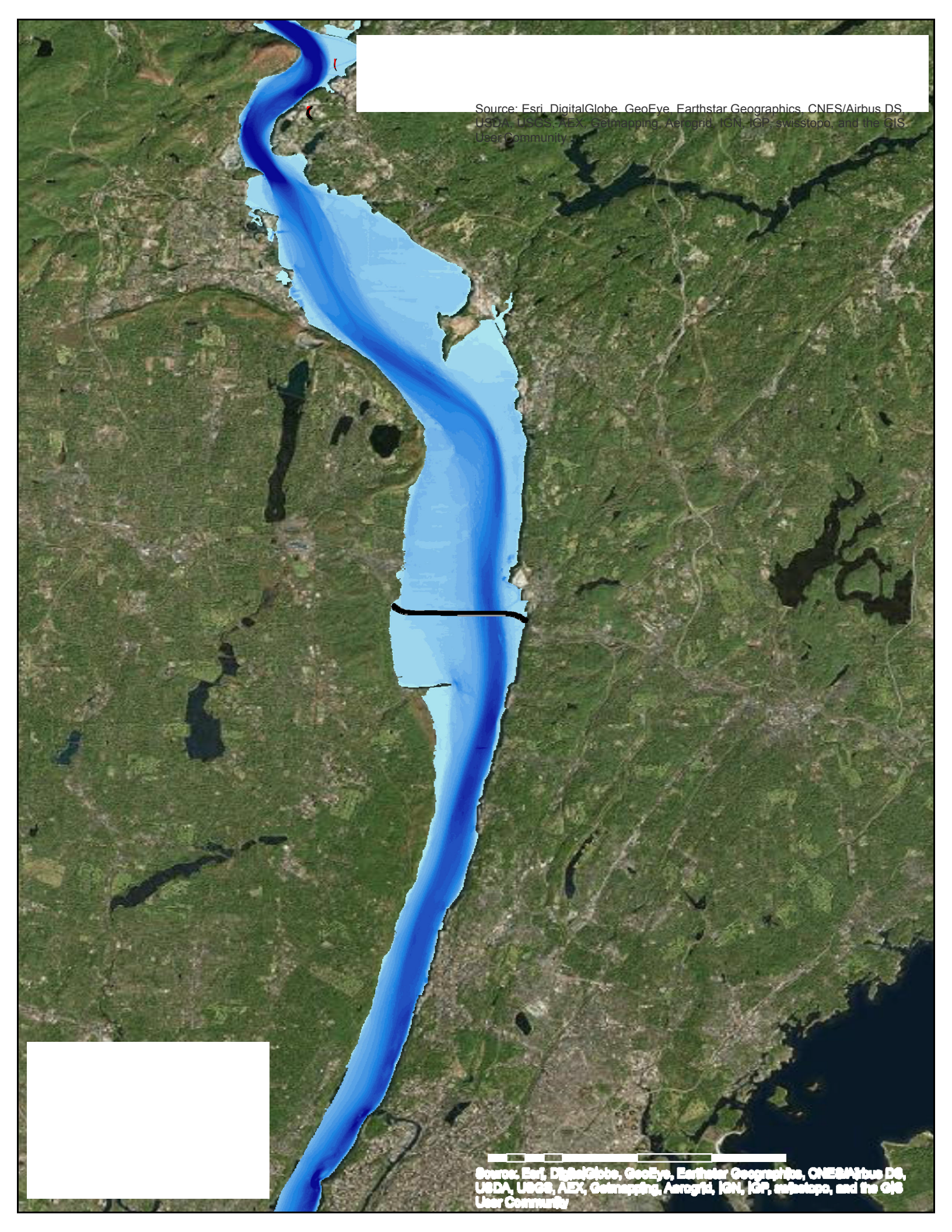
Sturgeon locations during weekly mobile tracking
in 2014 (April-November) and 2015 (May-July)



Sturgeon locations

Species

Atlanticsturgeon

A satellite map showing a river flowing from the top left towards the bottom right. A semi-transparent blue overlay follows the course of the river, indicating a specific area of interest or a model. The surrounding landscape is green with some brown patches, suggesting a mix of vegetation and bare ground. There are several small black lines and a red line on the map, possibly indicating specific points or boundaries. Two white rectangular boxes are present: one in the top right and one in the bottom left.

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS,
USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS
User Community

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS,
USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS
User Community

Sturgeon locations during weekly mobile tracking from April 2014 - July 2015

(5/14/2014
(9/2/2014
(9/23/2014
9/17/2014 (10/9/2014
7/8/2014 (7/14/2014
7/30/2014

Sturgeon locations

tag_id, status

(Atlantic Sturgeon - 11135, Found

0 1 2 4 6 8 Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Sturgeon locations during weekly mobile tracking from April 2014 - July 2015

(7/30/2014
(6/6/2014
8/11/2014 (5/14/2014
(5/23/2014
(6/23/2014

Sturgeon locations

tag_id, status

(Atlantic Sturgeon - 11136, Found

0 1 2 4 6 8 Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Sturgeon locations during weekly mobile tracking from April 2014 - July 2015

(5/23/2014

(5/8/2015

(8/14/2014

Sturgeon locations

tag_id, status



Atlantic Sturgeon - 11155, Found

0 1 2 4 6 8 Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, Aero, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



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Sturgeon locations during weekly mobile tracking from April 2014 - July 2015

6/11/2014
7/30/2014

5/20/2014

Sturgeon locations

tag_id, status



Atlantic Sturgeon - 11156, Found

0 1 2 4 6 8 Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



C:\files\PROJECTS\20389 Tappan Zee Bridge\Draft DEC permit\Compensatory Mitigation Plan\Mobile tracking\GIS\Sturgeon tracking - 2014-2015.mxd

Sturgeon locations during weekly mobile tracking from April 2014 - July 2015

(9/23/2014

6/12/2014

(6/24/2014

Sturgeon locations

tag_id, status



Atlantic Sturgeon - 11158, Found

0 1 2 4 6 8 Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Sturgeon locations during weekly mobile tracking from April 2014 - July 2015

(5/7/2015)

(8/20/2014)

tag_id, status
Sturgeon locations

(Atlantic Sturgeon - 11161, Found

0 1 2 4 6 8 miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Sturgeon locations during weekly mobile tracking from April 2014 - July 2015

6/23/2015
6/20/2014

Sturgeon locations

tag_id, status

(Atlantic Sturgeon - 11213, Found

0 1 2 4 6 8 Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Sturgeon locations during weekly mobile tracking from April 2014 - July 2015

(6/20/2014

(6/29/2015

(6/12/2015

(7/9/2015

Sturgeon locations

tag_id, status



Atlantic Sturgeon - 11219, Found

0 1 2 4 6 8 Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Sturgeon locations during weekly mobile tracking from April 2014 - July 2015

7/30/2014

8/11/2014

7/14/2014

6/6/2014

5/23/2014

6/23/2014

Sturgeon locations

tag_id, status

(Atlantic Sturgeon - 11229, Found

0 1 2 4 6 8 Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, ICG, Swisstopo, and the GIS User Community

Sturgeon locations during weekly mobile tracking from April 2014 - July 2015



Sturgeon locations

tag_id, status

(Shortnose Sturgeon - 10773, Found

0 1 2 4 6 8 Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Sturgeon locations during weekly mobile tracking from April 2014 - July 2015

(5/23/2014

(8/14/2014
8/18/2014

(7/25/2014

Sturgeon locations

tag_id, status



Shortnose Sturgeon - 10774, Found

0 1 2 4 6 8 Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroX, Getmapping, Aerogrid, IGN, IGP, Swisstopo, and the GIS User Community



Sturgeon locations during weekly mobile tracking from April 2014 - July 2015

Sturgeon locations

tag_id, status

(Shortnose Sturgeon - 10780, Found

0 1 2 4 6 8 Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroX, Getmapping, Aerogrid, IGN, IGP, Swisstopo, and the GIS User Community



Sturgeon locations during weekly mobile tracking from April 2014 - July 2015

7/30/2014
8/11/2014
6/6/2014
7/14/2014

Sturgeon locations

tag_id, status



Shortnose Sturgeon - 10782, Found

0 1 2 4 6 8 Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Sturgeon locations during weekly mobile tracking from April 2014 - July 2015

(5/14/2014

(9/23/2014

(5/23/2014

(5/23/2014

(8/18/2014

(9/3/2014

(7/23/2014

(5/30/2014

Sturgeon locations

tag_id, status



Shortnose Sturgeon - 10787, Found

0 1 2 4 6 8 Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Sturgeon locations during weekly mobile tracking from April 2014 - July 2015

(8/14/2014

(8/20/2014

(7/25/2014

(7/15/2014

(10/31/2014

(10/10/2014

tag_id, status
Sturgeon locations

(Shortnose Sturgeon - 10794, Found

0 1 2 4 6 8
Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, NPS/Air Force, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, GPR, Swisstopo, and the GIS User Community

Sturgeon locations during weekly mobile tracking from April 2014 - July 2015

6/6/2014
5/23/2014

7/29/2014
6/24/2014

tag_id, status
Sturgeon locations

(Shortnose Sturgeon - 10795, Found

0 1 2 4 6 8

Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, NCS/Airbus, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Sturgeon locations during weekly mobile tracking from April 2014 - July 2015

7/7/2014

5/20/2014

8/18/2014

6/12/2014

Sturgeon locations

tag_id, status



Shortnose Sturgeon - 10815, Found

0 1 2 4 6 8 miles



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, NLS/Airphoto, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, GPR, swisstopo, and the GIS User Community

Sturgeon locations during weekly mobile tracking from April 2014 - July 2015

6/19/2014 (5/30/2014)
(5/15/2014)
7/15/2014

Sturgeon locations

tag_id, status



Shortnose Sturgeon - 10817, Found



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, NCS/Airbus, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Sturgeon locations during weekly mobile tracking from April 2014 - July 2015

(5/23/2014)

(9/17/2014)

(7/30/2014)

(8/20/2014)

Sturgeon locations

tag_id, status



S hornnose Sturgeon - 11139, Found

0 1 2 4 6 8 miles



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, INES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Sturgeon locations during weekly mobile tracking from April 2014 - July 2015

(10/22/2014

(5/15/2014

(7/15/2014

(8/20/2014

(7/25/2014

(8/27/2014

tag_id, status
Sturgeon locations

(Shortnose Sturgeon - 11163, Found

0 1 2 4 6 8
Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, INES/Airbus CS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, not for US User Community

Sturgeon locations during weekly mobile tracking from April 2014 - July 2015

(10/9/2014

(8/4/2014

(9/23/2014

(10/21/2014

(6/4/2014

(6/12/2014

(6/24/2014

tag_id, status
Sturgeon locations

(Shortnose Sturgeon - 11164, Found

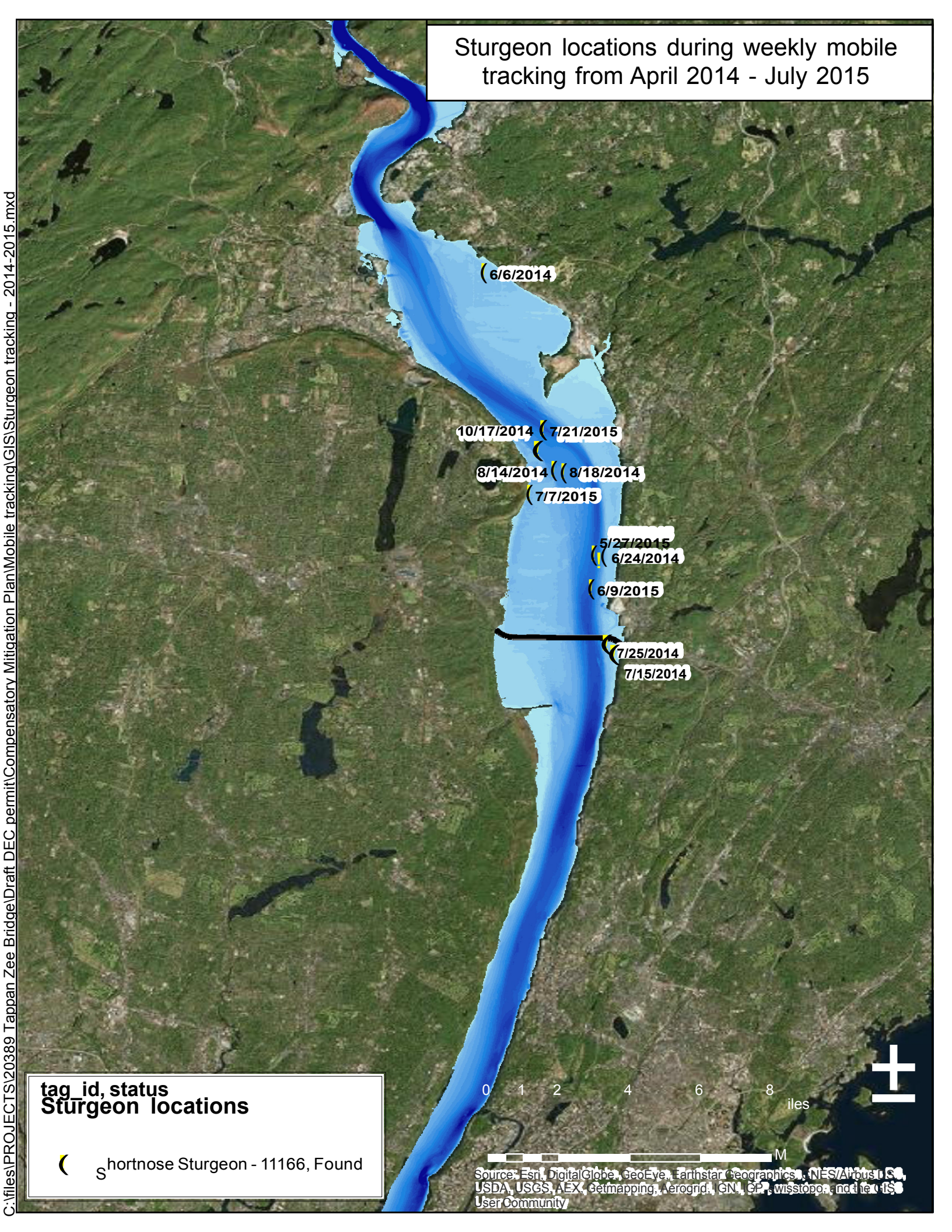
0 1 2 4 6 8

Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, INES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Sturgeon locations during weekly mobile tracking from April 2014 - July 2015

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tag_id, status
Sturgeon locations

(Shortnose Sturgeon - 11166, Found

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, INES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Sturgeon locations during weekly mobile tracking from April 2014 - July 2015

(8/18/2014

(8/14/2014

(9/3/2014

(6/24/2014

Sturgeon locations

tag_id, status



Shortnose Sturgeon - 11170, Found

0 1 2 4 6 8 miles



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, INES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Sturgeon locations during weekly mobile tracking from April 2014 - July 2015

7/16/2015
7/30/2014
9/17/2014
7/14/2014

tag_id, status
Sturgeon locations



Shortnose Sturgeon - 11171, Found

0 1 2 4 6 8

Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, NCS/Airbus, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Sturgeon locations during weekly mobile tracking from April 2014 - July 2015

11/7/2014
8/11/2014 6/23/2014
10/9/2014
6/15/2015
6/29/2015 6/1/2015
5/15/2015 7/30/2014
7/22/2015 5/27/2014
7/8/2014 5/23/2014
5/2/2014 5/22/2015
10/17/2014
7/23/2014

tag_id, status
Sturgeon locations

Shortnose Sturgeon - 11188, Found

0 1 2 4 6 8

Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Geomapping, AeroGRID, IGN, IGP, swisstopo, and the GIS User Community

Sturgeon locations during weekly mobile tracking from April 2014 - July 2015

(9/17/2014

(5/1/2014

(9/23/2014

(9/24/2014

tag_id, status
Sturgeon locations

(Shortnose Sturgeon - 11189, Found

0 1 2 4 6 8

Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, INES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Sturgeon locations during weekly mobile tracking from April 2014 - July 2015



tag_id, status
Sturgeon locations

(Shortnose Sturgeon - 11190, Found

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Geomapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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Sturgeon locations during weekly mobile tracking from April 2014 - July 2015

(7/30/2014
(7/22/2015
5/20/2014
(7/21/2015
(5/27/2015
(5/2/2014

tag_id, status
Sturgeon locations

(Shortnose Sturgeon - 11193, Found

0 1 2 4 6 8

Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, INES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Sturgeon locations during weekly mobile tracking from April 2014 - July 2015

(7/14/2014

(6/19/2014

(6/22/2015

ag_id, status
Sturgeon locations

t

Shortnose Sturgeon - 11194, Found

0 1 2 4 6 8 miles

M

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Sturgeon locations during weekly mobile tracking from April 2014 - July 2015

5/1/2014 (6/23/2014
(6/23/2015
(5/27/2014 6/15/2015
7/7/2014 8/18/2014
(9/3/2014
(7/29/2014

tag_id, status
Sturgeon locations

Shortnose Sturgeon - 11195, Found

0 1 2 4 6 8 miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Sturgeon locations during weekly mobile tracking from April 2014 - July 2015

(5/30/2014
(6/12/2014
10/10/2014 (5/21/2015
(5/21/2015
5/18/2015
(6/22/2015

tag_id, status
Sturgeon locations

Shortnose Sturgeon - 11196, Found

0 1 2 4 6 8 miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Geomapping, AeroGRID, IGN, GP, wistop, and the US User Community

Sturgeon locations during weekly mobile tracking from April 2014 - July 2015

(5/14/2014

(9/23/2014

(9/17/2014

(6/4/2014

(7/29/2014

7/7/2014

7/23/2014

(7/14/2015

6/19/2014

(6/22/2015

6/11/2014

ag_id, status
Sturgeon locations

t



Shortnose Sturgeon - 11197, Found

0 1 2 4 6 8 miles

0 1 2 4 6 8 miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS,
USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the
User Community



Sturgeon locations during weekly mobile tracking from April 2014 - July 2015

(5/14/2014

(9/3/2014

8/14/2014

(8/18/2014

(7/15/2014

(7/25/2014

(6/12/2015

Sturgeon locations

tag_id, status

(Shortnose Sturgeon - 11202, Found

0 1 2 4 6 8 Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, INES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Sturgeon locations during weekly mobile tracking from April 2014 - July 2015

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(6/23/2015

(6/18/2015

(8/14/2014

8/18/2014

(5/9/2014

(7/23/2014

014

5/9/2014

tag_id, status
Sturgeon locations

(Shortnose Sturgeon - 11205, Found

(6/12/2015

1

2

4

6

8

Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, NCS/Airbus, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

C:\files\PROJECTS\20389 Tappan Zee Bridge\Draft DEC permit\Compensatory Mitigation Plan\Mobile tracking\GIS\Sturgeon tracking - 2014-2015.mxd

(6/12/2015

0 1 2 4 6 8 miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS,
USDA, USGS, AeroGRID, IGN, GE, CNES/Airbus, and the U.S.
User Community



Sturgeon locations during weekly mobile tracking from April 2014 - July 2015

(6/1/2015)
(5/28/2015)
(7/21/2015)
(7/29/2014)
(8/18/2014)
(5/21/2015)

tag_id, status
Sturgeon locations

(Shortnose Sturgeon - 11228, Found

0 1 2 4 6 8
Miles

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, INES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

