2023 & 2024

LAHAVE RIVER
SMALLMOUTH BASS TAGGING STUDY

NOVA SCOTIA FRESHWATER FISHERIES RESEARCH COOPERATIVE

LAHAVE RIVER ATLANTIC SALMON ASSOC.

NOVA SCOTIA

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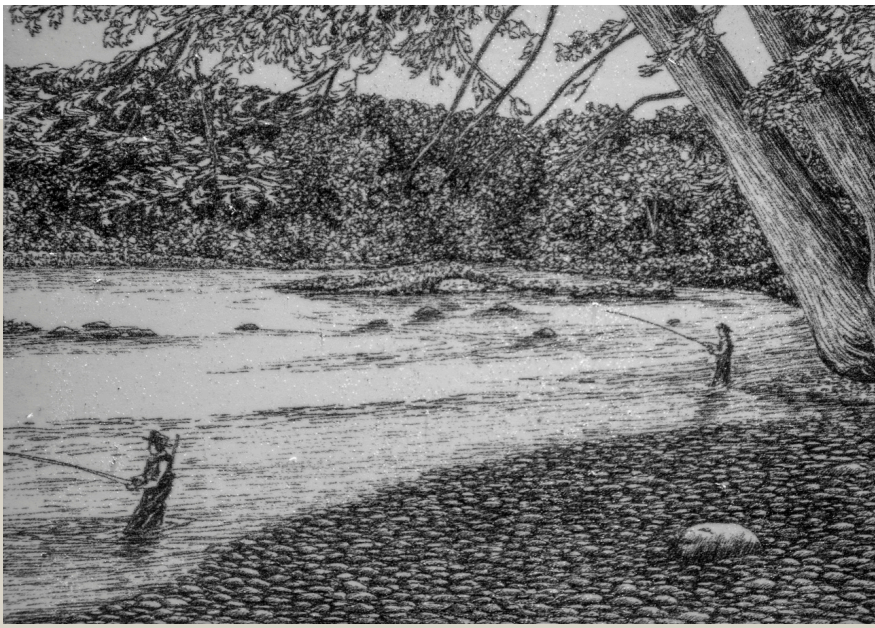
EXECUTIVE SUMMARY

The goal of this project is to determine if Smallmouth Bass (Micropterus dolomieu), an Aquatic Invasive Species (AIS) present in the LaHave River, follow seasonal migration patterns between lake and river habitat within the watershed. Additionally, if movement is found to occur, does it correspond with the availability of migratory prey such as juvenile Atlantic Salmon (Salmo salar), Brook Trout (Salvenlinus fontinalis), and Alewife (Alosa pseudoharengus), or environmental ques and variables, within the LaHave River Watershed.



INTRODUCTION

The LaHave River Watershed in Lunenburg County was historically a thriving fishery for native Atlantic Salmon and Brook Trout. However, these populations have declined due to multiple factors, including acidification, warming waters, habitat loss, and the introduction of aquatic invasive species. Organizations such as the LaHave River Salmon Association (LRSA), the Nova Scotia Salmon Association (NSSA), and Coastal Action (CA) are working to improve water quality in the watershed through habitat enhancement and restoration programs like Adopt-A-Stream. The LRSA, in particular, is focused on understanding the biological threats to the watershed, especially the impact of invasive species.

Smallmouth Bass and Chain Pickerel were illegally introduced into the watershed in the 1990s, and new occurrences of these species continue to rise at an alarming rate. If left unmanaged, these invasions will further threaten native species throughout the watershed (Mitchell et al., 2011). Effectively controlling these aquatic invasive species requires a deeper understanding of their behavior. Coastal Action has documented that Chain Pickerel are aggressive predators that heavily prey on downstream-migrating Atlantic Salmon smolt (Feener & MacLeod, 2019). Additionally, research by the Department of Fisheries and Aquaculture has shown declines in Brook Trout populations following the introduction of Smallmouth Bass (LeBlanc, 2010). The combined presence of both invasive species is likely to have a substantial impact on native salmonids and other aquatic life.

Given limited resources, managing Smallmouth Bass effectively requires insight into their behavior to ensure efforts are targeted efficiently. In larger systems with lakes and major rivers, it remains unclear how native and invasive species overlap in habitat use, making it difficult to determine where control measures will yield the greatest benefits.

Stomach content analysis by Coastal Action (Feener & MacLeod, 2019) suggests that during the spring Atlantic Salmon smolt migration, Smallmouth Bass are not actively feeding, with few individuals preying on juvenile salmon or Brook Trout. By the time Smallmouth Bass begin actively foraging, salmonid species may have already migrated out of the lake in search of better food sources, more suitable water conditions, or to avoid predation. This raises the possibility that Smallmouth Bass primarily impact native salmonids through competition for food and habitat rather than direct predation.

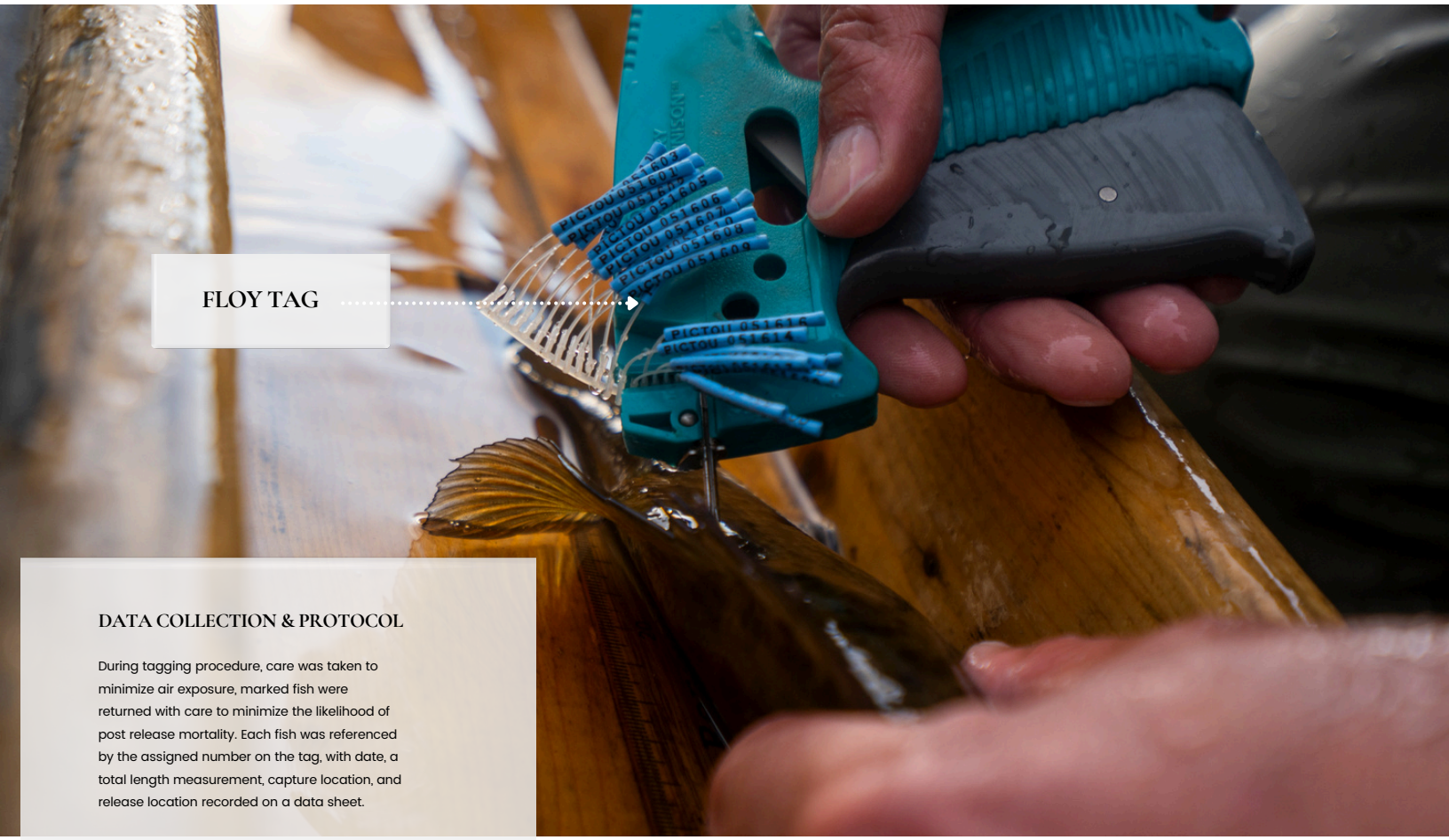
A key question remains: do most Smallmouth Bass in lake environments stay there, or do they migrate into river systems, where they may prey on and compete with native species? Answering this question is critical for informing future management strategies in the LaHave River watershed and other regions affected by illegal introductions of invasive species.

METHODOLOGY

Methods - This project was designed around the use of Citizen science, which is the practice where members of the public (LRSA), often without formal scientific training, contribute to scientific research and data collection. This can involve tasks like observing wildlife, collecting environmental data, identifying patterns, or even analyzing large sets of data. The LaHave River Salmon Association members were trained by the Nova Scotia Department of Fisheries & Aquaculture staff in FLOY tagging and sampling methods. It's important to note, only trained individuals applied the tags during the project.

TAGGING

This tagging project occurred between the months of May and October 2023 & 2024 to coincide with the general angling season. The LaHave River Salmon Association obtained a Section 52 Scientific Collectors Permit allowing members, volunteers, and students to use recreational angling practices & gear to capture Smallmouth Bass for a “mark/recapture” study. During the study a variety of spinning and fly tackle was used while angling from shore and from boats throughout the fish collections.



DATA COLLECTION & PROTOCOL

During tagging procedure, care was taken to minimize air exposure, marked fish were returned with care to minimize the likelihood of post release mortality. Each fish was referenced by the assigned number on the tag, with date, a total length measurement, capture location, and release location recorded on a data sheet.

Figure 1. Image showing the position of Floy tag insertion on Smallmouth Bass.

SAMPLE AREA

Wentzells Lake is one of the largest lakes within the LaHave River system, it acts as the confluence of the Main Stem and North Branch & is located approx. 12 Km from the head of tide. The lake is approx. 2km in length, and 700m wide, with a maximum depth of 12m. The shoreline consists of a mix of wild vegetation, grass, ferns, large hemlock stands hardwoods, & manicured residential properties along the western shore. Aquatic vegetation includes Lilypad's, and native weed found mostly in coves, bays and shallows. There is a relatively consistent channel or thalweg that runs from the inflow of the mainstem and North Branch to the outflow at the foot of the lake averaging 10m.

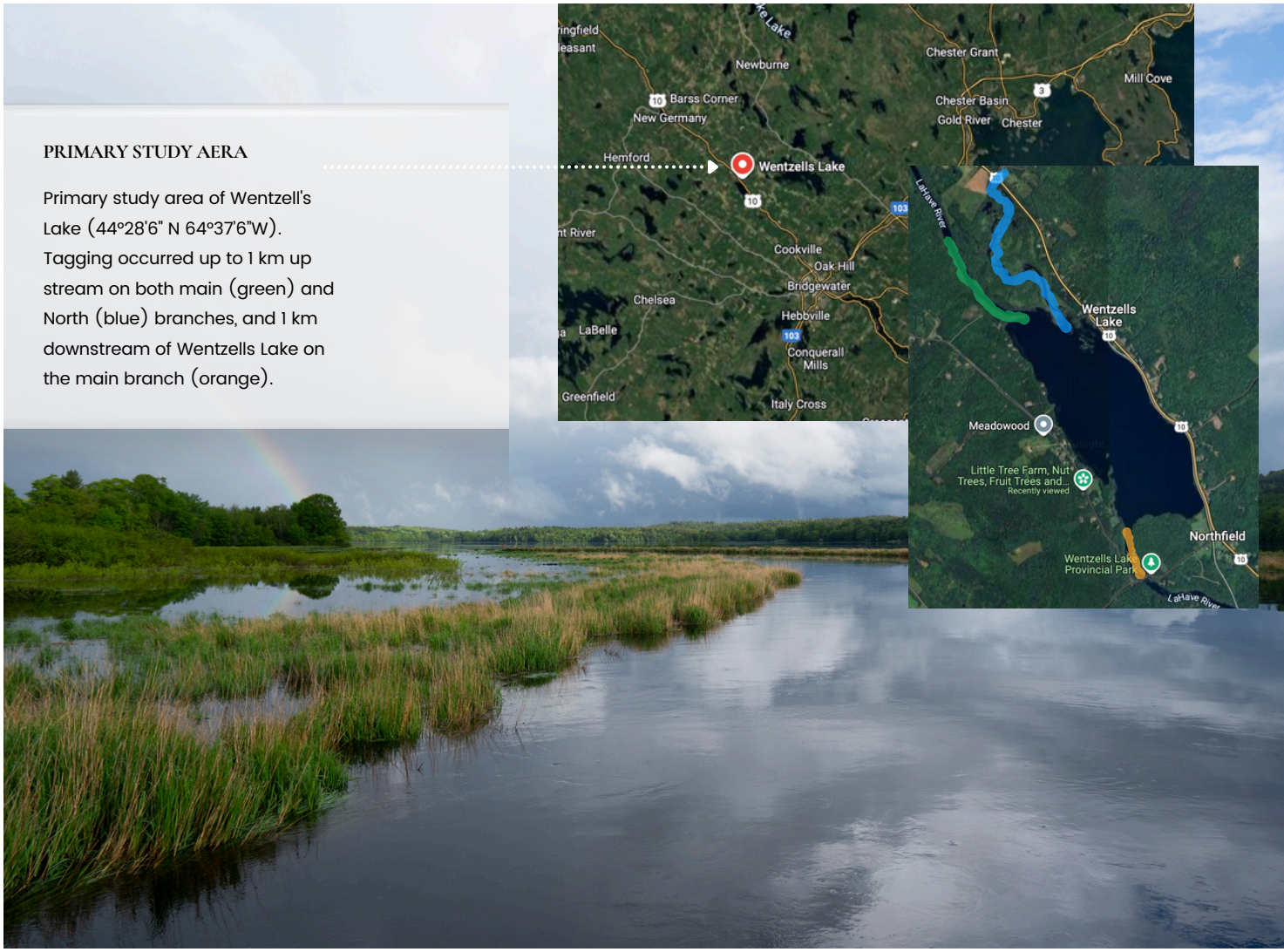


Figure 2. Primary study area of Wentzell's Lake (44°28'6" N 64°37'6"W). Tagging occurred up to 1 km up stream on both main (green) and North (blue) branches, and 1 km downstream of Wentzells Lake on the main branch (orange).

RESULTS

Results – After two drastically different field seasons, 2023 being wet with numerous high-water events, & 2024 being incredibly hot and dry with low water, a summary of our efforts are as follows. 2023 saw 25 field days tagging effort 570 volunteer hours leading to 161 fish tagged, & 2 recaptures. In 2024 the LRSA was able to increase total field days to 48, contributing 1200 volunteer hours to the study, & leading to 253 fish tagged, & 7 recaptures. Combined efforts, 2023-2024 for this project include 73 field days, 1770 volunteer hours, 414 fish tagged, & 9 recaptures.

2023 Summary

FIELD DAYS	25
TAGGING EFFORT HOURS	570
FISH TAGGED	161
2023 RECAPTURES	2

2024 Summary

FIELD DAYS	48
TAGGING EFFORT HOURS	1200
FISH TAGGED	253
2024 RECAPTURES	7

Combined

FIELD DAYS	73
TAGGING EFFORT HOURS	1770
FISH TAGGED	414
TOTAL RECAPTURES	9

Figure 3. Summary of results for 2023, 2025, & combined.

RECAPTURE DATA

Figure 4. Recapture data for 2023 & 2024

The data from the 9 recaptures shows minimal movement, and a fidelity to the areas where the fish were tagged and then recaptured. 6 of the nine fish tagged were recaptured less than 500m from their original tagging location. The largest movement was observed by one individual (Tag # 92772) captured on August 1st, 2023 in the North Branch. This individual moved 3510m before being recaptured downstream of Wentzells Lake in the Main Stem on June 1 2024. This fish was 142mm when it was tagged and 256mm upon recapture in June of 2024, a gain in total length of 114mm. It can be hypothesized this juvenile fish was likely trying to find suitable habitat to feed and grow into sexual maturity.

The LRSA as an attempt to gain a better understanding of larger migration would like to expand the recapture efforts upstream and downstream of the primary study area.

DISTRIBUTION OF TAGGED FISH IN THE SAMPLE AREA

Proportion of Tagged Fish – The below figure 5, illustrates the proportion of tagged fish released in each primary location within the LaHave River sampling area for both 2023 & 2024. It's noteworthy that in 2023 most captures and releases, 55% occurred in Wentzells Lake, where in 2024 our efforts and tagged fish releases are more evenly represented though out the sample area, roughly 30% each for the lake, mainstem downstream, and the North Branch.

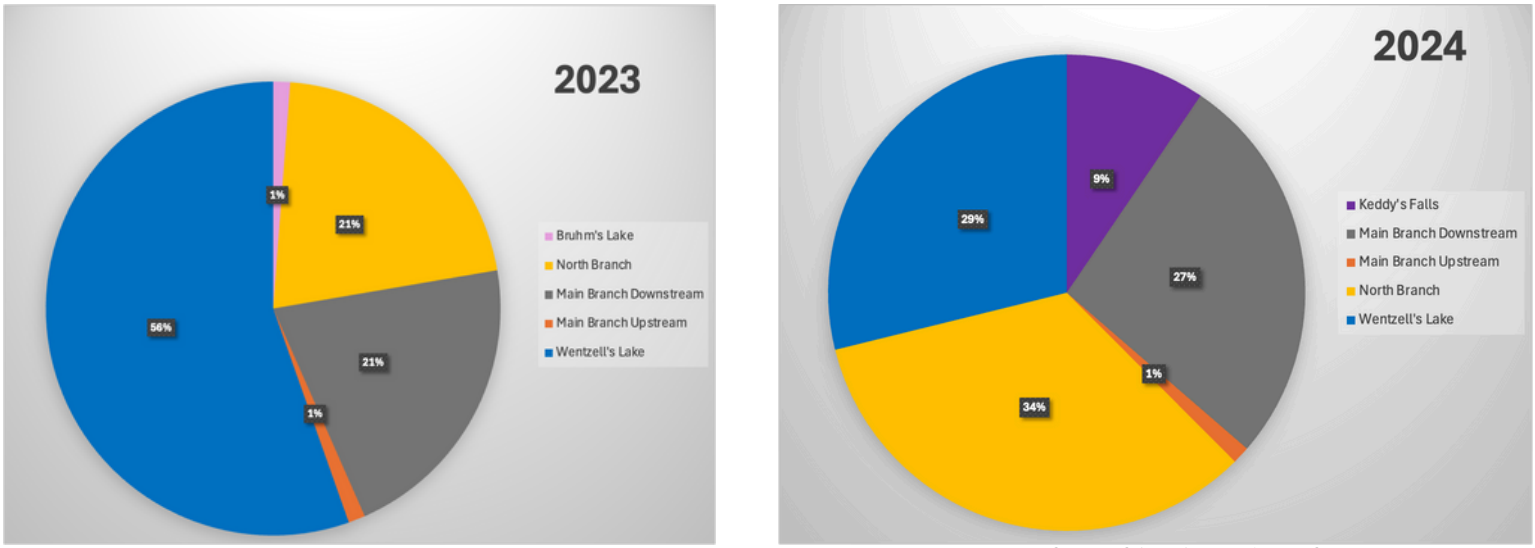


Figure 5. Distribution of tagged fish in the sample area for 2023 & 2024

LENGTH FREQUENCY DISTRIBUTION OF SMALLMOUTH BASS CAPTURED FOR STUDY

Length Frequency of Tagged Fish Within the Study Aera – A total of 161 fish were tagged in 2023 between May 1- Oct 31. The total length ranged from 142-522mm with a mean fish length of 295mm. Of the tagged fish, 95% of all Smallmouth Bass were between 200-400mm. In 2024 the LRSA managed to tag 253 fish, an interesting trend in size structure for the population is beginning to emerge, where most captured bass were between 200-400mm. For 2025 LRSA will be scaling up recapture efforts, more data will not only give insights to seasonal movements, but will also help in an estimation of growth rate for the LaHave watershed.

Figure 6. Length frequency distribution of Smallmouth Bass captured for study for 2023 & 2024

DISCUSSION

1

CONTINUE TAGGING

- Increase public awareness towards study.
- Electro fishing to increase efficiency.

2

RECAPTURE DATA

- Increase public participation for data reporting.
- Increase in person communication with angers in study area.
- Telemetry tags or PIT tags

3

STAY INFORMED

- Continue to stay updated with past and present studies and techniques.

4

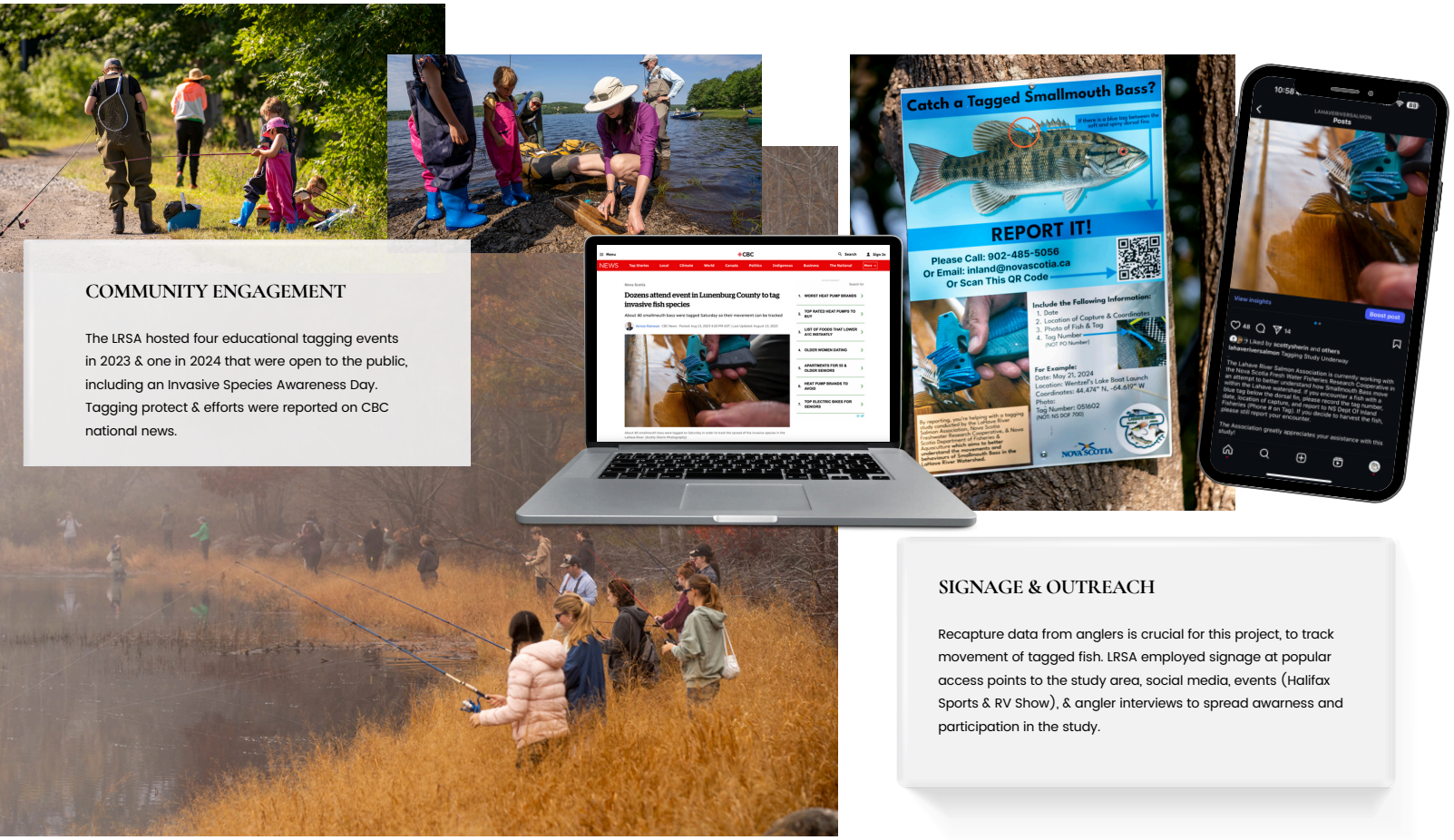
CITIZEN SCIENCE

- Increases public engagement and volunteers
- Effective tool for building knowledge and experience.

In 2023, early season angling for Smallmouth Bass is typically very productive, however, an exceptionally cold & wet spring made for tough conditions. It was anticipated that mature, spawning fish would be targeted in the shallows while they were guarding the nests. This is typically a very productive time to be angling large Smallmouth Bass. Instead, high water appears to have displaced spawning fish, making early season angling unusually difficult. Angling success didn't increase until later in the season when water returned to seasonal levels and fish could be found in their expected locations. It is difficult to know if mature fish returned to spawn, or if spawning was abandoned entirely in 2023. In 2024, lake and water levels were low, this combined with an increase in tagging and volunteer effort resulted in a larger number of fish being tagged. Although sampling through rec angling is possible, greater tagging yields might be possible with methods like electrofishing.

The importance of public participation in a mark and recapture study cannot be overstated. The LRSA identified short comings in their signage and public outreach in 2023. In 2024 the LRSA built and strategically installed 14 large metal signs, employed social media outreach, and held a public tagging event & AIS Awareness Day to promote and explain the study, tags, and how to report a tagged fish. To date, no tag data has been reported to the NS Department of Fisheries & Aquaculture.. All recapture data has been collected by members and volunteers of the LRSA. In person conversations with the pubic and anglers in the study area yielded one recaptured from an anger who provided a picture of a recaptured tag, but they had not reported the fish to NSDFA. In conversation with the angler, it appeared that they had intended to report the tag but eventually forgot. Further outreach to anglers showed a willingness to assist with the project, but the failure to record the tag number correctly, or at all in some instances. Future considerations to ensure the recapture of data might include the use of telemetry tags, or pit tags & arrays. More tagging data would provide a better understanding of annual movement. For example, it may be hypothesized that juvenile Smallmouth Bass are reared in the lake until they reach a certain length before moving out to feed, thus adding a complex level of competition for food and resources for native species, before returning in the fall as mature adults over winter & spawn in Wentzells Lake in the spring.

COMMUNITY ENGAGMENT



The LRSA hosted four educational tagging events in 2023 & one in 2024 that were open to the public, including an Invasive Species Awareness Day where volunteers from the public captured Smallmouth Bass that were tagged by trained LRSA members. Other events included educational lake side sessions with Parkview Education Centers biology class to discuss the impacts of aquatic invasive species and fish anatomy lessons. Students from the Nova Scotia Community College (NSCC) attended a similar successful lakeside session. In total, 120 students were educated on the impacts of aquatic invasive species and participated in sportfishing for the day. We were fortunate to have our Tagging Study & 2023 AIS awareness day covered by CBC on August 13th 2023.

Signage - Recapture data from anglers is crucial for this project to track movement of tagged fish. LRSA designed & installed large metal signs at popular access points/fishing sites in the study area. Signs included a brief description of the study, pictures describing our tags and tag number, contact information, as well as a QR code. Along with signs, LRSA used social media, events (Halifax Sports & RV Show), & angler interviews to spread awareness and participation in the study.

ACKNOWLEDGEMENTS

The opportunity to participate in an FFRC project has been an amazing learning experience and, in many ways, helped the LRSA grow and transition from that of an angling club, to a science-based conservation association. The importance of citizen science cannot be overstated as a tool, empowering those who care deeply about a watershed to engage in meaningful research and put boots on the ground. This project has had a meaningful impact on helping to educate the public on the impacts of aquatic invasive species. This FFRC tagging project has created an amazing experience for our summer interns, working towards careers in the science and conservation fields.

The LaHave River Salmon Association would like to thank the many volunteers who contributed to fish collections and helped educate the community of the impacts of AIS. We would like to thank Andrew Lowles from Inland Fisheries for his help with this project training and educating our staff & volunteers in tagging protocols, and for being a invaluable resource of knowledge throughout the study. We would like to thank John MacMillan, and them members of the Freshwater Fisheries Research Cooperative for providing valuable scientific knowledge, training, and financial support for this project. This project was also made possible by the Clean Foundation & their Clean leadership summer internship Program which allowed the LRSA to hire a “Summer Project Coordinator, & a Summer Field Technician”. Thanks to our working partners, The Nova Scotia Salmon Association, Coastal Action, Nova Scotia Invasive Species Council, and to the Nova Scotia Guides Service and the MicMac Rod and gun club for assisting with events, gear, and the use of their grounds.

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Feener, S., and K. MacLeod. 2019. LaHave River Invasive Species Project 2019 Final Report. Freshwater Fisheries Research Cooperative. novascotia.ca/fish/documents/2020-FFRC-Invasive-species-in-LaHave-River.pdf

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APPENDIX A. SMALLMOUTH BASS TAGGING DATA

Date	Tag #	Length (TL) (mm)	Release location
2023-06-06	51618	222	44°22'54" N 64°37'49"W
2023-06-06	51619	250	44°22'54" N 64°37'49"W
2023-06-06	51620	228	44°22'54" N 64°37'49"W
2023-06-06	51621	331	44°22'54" N 64°37'49"W
2023-06-07	51604	308	44°28'6" N 64°37'6"W
2023-06-07	51605	270	44°28'6" N 64°37'6"W
2023-06-07	51606	307	44°28'6" N 64°37'6"W
2023-06-07	51607	237	44°28'6" N 64°37'6"W
2023-06-07	51608	281	44°28'6" N 64°37'6"W
2023-06-07	51609	367	44°28'6" N 64°37'6"W
2023-06-07	51610	371	44°28'6" N 64°37'6"W
2023-06-07	51611	232	44°28'6" N 64°37'6"W
2023-06-07	51612	267	44°28'6" N 64°37'6"W
2023-06-07	51613	309	44°28'6" N 64°37'6"W
2023-06-07	51614	304	44°28'6" N 64°37'6"W
2023-06-07	51615	234	44°28'6" N 64°37'6"W
2023-06-07	51616	415	44°28'6" N 64°37'6"W
2023-07-04	51602	345	44°28'27" N 64°37'80"W
2023-07-12	92277	262	44°28'27" N 64°37'80"W
2023-07-12	92278	378	44°28'27" N 64°37'80"W
2023-07-12	92279	370	44°28'27" N 64°37'80"W
2023-07-12	92280	310	44°28'27" N 64°37'80"W
2023-07-12	92281	305	44°28'27" N 64°37'80"W
2023-07-12	92282	329	44°28'27" N 64°37'80"W
2023-07-12	92283	321	44°28'27" N 64°37'80"W
2023-07-13	92284	270	44°28'27" N 64°37'80"W
2023-07-13	92285	261	44°28'27" N 64°37'80"W
2023-07-19	92287	305	44°28'6" N 64°37'6"W
2023-07-19	92288	316	44°28'6" N 64°37'6"W
2023-07-19	92289	352	44°28'6" N 64°37'6"W
2023-07-19	92291	249	44°28'6" N 64°37'6"W
2023-07-19	92292	411	44°28'6" N 64°37'6"W
2023-07-19	92293	282	44°28'6" N 64°37'6"W
2023-07-19	92294	279	44°28'6" N 64°37'6"W
2023-07-19	92295	286	44°28'6" N 64°37'6"W
2023-07-19	92296	283	44°28'6" N 64°37'6"W
2023-07-19	92297	394	44°28'6" N 64°37'6"W
2023-07-19	92298	317	44°28'6" N 64°37'6"W
2023-07-20	92269	229	44°30'36" N 64° 38'25"W
2023-07-20	92270	276	44°30'36" N 64° 38'25"W

2023-07-20	92271	238	44°30'36" N 64° 38'25"W
2023-07-20	92272	210	44°30'36" N 64° 38'25"W
2023-07-20	*92274	217	44°30'36" N 64° 38'25"W
2023-07-20	92275	219	44°28'6" N 64°37'6"W
2023-07-20	92299	236	44°28'6" N 64°37'6"W
2023-07-26	51603	203	44°29'37" N 64°38'66" W
2023-07-26	92259	361	44°30'36" N 64° 38'25"W
2023-07-26	92260	337	44°30'36" N 64° 38'25"W
2023-07-26	92261	235	44°30'36" N 64° 38'25"W
2023-07-26	92263	241	44°30'36" N 64° 38'25"W
2023-07-26	92264	330	44°30'36" N 64° 38'25"W
2023-07-26	92265	300	44°30'36" N 64° 38'25"W
2023-07-26	92266	319	44°30'36" N 64° 38'25"W
2023-07-26	92267	325	44°30'36" N 64° 38'25"W
2023-07-26	92268	380	44°30'36" N 64° 38'25"W
2023-07-26	92752	260	44°30'36" N 64° 38'25"W
2023-08-01	92771	351	44°30'36" N 64° 38'25"W
2023-08-01	92772	142	44°30'36" N 64° 38'25"W
2023-08-01	92773	190	44°30'36" N 64° 38'25"W
2023-08-01	92774	212	44°30'36" N 64° 38'25"W
2023-08-03	*92251	300	44°27'24" N 64°36'37" W
2023-08-03	92252	335	44°27'24" N 64°36'37" W
2023-08-03	92253	264	44°27'24" N 64°36'37" W
2023-08-03	92254	265	44°27'24" N 64°36'37" W
2023-08-03	92255	251	44°27'24" N 64°36'37" W
2023-08-03	92401	305	44°27'24" N 64°36'37" W
2023-08-03	92402	385	44°27'24" N 64°36'37" W
2023-08-03	92405	305	44°27'24" N 64°36'37" W
2023-08-03	92407	311	44°27'24" N 64°36'37" W
2023-08-03	92408	333	44°27'24" N 64°36'37" W
2023-08-04	92226	390	44°27'48"N 64°37'27"W
2023-08-04	92227	300	44°27'48"N 64°37'27"W
2023-08-04	92228	290	44°27'48"N 64°37'27"W
2023-08-04	92229	260	44°27'48"N 64°37'27"W
2023-08-04	92230	241	44°27'48"N 64°37'27"W
2023-08-04	92231	241	44°27'48"N 64°37'27"W
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2023-08-04	92233	270	44°27'48"N 64°37'27"W
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2023-08-04	92757	290	44°27'48"N 64°37'27"W
2023-08-04	92759	270	44°27'48"N 64°37'27"W
2023-08-04	92761	260	44°27'48"N 64°37'27"W
2023-08-04	92762	280	44°27'48"N 64°37'27"W
2023-08-04	92763	240	44°27'48"N 64°37'27"W
2023-08-04	92764	273	44°27'48"N 64°37'27"W
2023-08-04	92765	260	44°27'48"N 64°37'27"W
2023-08-10	92413	349	44°29'40" N 64°38'30" W
2023-08-10	92414	304	44°29'40" N 64°38'30" W
2023-08-10	92415	251	44°29'40" N 64°38'30" W
2023-08-10	92416	302	44°29'40" N 64°38'30" W
2023-08-10	92417	411	44°29'40" N 64°38'30" W
2023-08-12	49270	357	44°29'01"N 64°37'58"W
2023-08-12	49271	315	44°29'01"N 64°37'58"W
2023-08-12	49272	350	44°29'01"N 64°38'12"W
2023-08-12	49273	265	44°28'6" N 64°37'6"W
2023-08-12	49274	245	44°28'6" N 64°37'6"W
2023-08-12	49275	365	44°28'6" N 64°37'6"W
2023-08-12	49526	390	44°28'6" N 64°37'6"W
2023-08-12	49527	341	44°28'6" N 64°37'6"W
2023-08-12	49528	255	44°28'6" N 64°37'6"W
2023-08-12	49529	265	44°28'6" N 64°37'6"W
2023-08-12	49530	252	44°28'6" N 64°37'6"W
2023-08-12	49531	298	44°28'6" N 64°37'6"W
2023-08-12	49532	278	44°28'6" N 64°37'6"W
2023-08-12	49533	233	44°28'6" N 64°37'6"W
2023-08-12	49534	232	44°28'6" N 64°37'6"W
2023-08-12	49535	264	44°28'6" N 64°37'6"W
2023-08-12	49536	165	44°28'6" N 64°37'6"W
2023-08-12	49537	423	44°28'6" N 64°37'6"W
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2023-08-12	49544	275	44°28'6" N 64°37'6"W

2023-08-12	49545	370	44°28'6" N 64°37'6"W
2023-08-12	49546	355	44°28'6" N 64°37'6"W
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2023-08-12	49548	345	44°28'6" N 64°37'6"W
2023-08-12	49549	355	44°28'6" N 64°37'6"W
2023-08-12	49550	245	44°28'6" N 64°37'6"W
2023-08-12	58398	261	44°28'55"N 64°38'14" W
2023-08-12	58399	260	44°28'55"N 64°38'14" W
2023-08-12	58400	255	44°28'55"N 64°38'14" W
2023-08-12	92237	280	44°28'27" N 64°37'80"W
2023-08-12	92238	315	44°28'27" N 64°37'80"W
2023-08-12	92239	320	44°28'27" N 64°37'80"W
2023-08-12	92240	220	44°28'27" N 64°37'80"W
2023-08-12	92420	254	44°28'55"N 64°38'14" W
2023-08-12	92421	361	44°28'55"N 64°38'14" W
2023-08-12	92423	240	44°28'55"N 64°38'14" W
2023-08-15	58393	309	44°29'14"N 64°38'10"W
2023-08-15	58394	247	44°29'14"N 64°38'10"W
2023-08-15	58395	230	44°29'13"N 64°38'19"W
2023-08-15	58396	230	44°29'13"N 64°38'19"W
2023-08-15	58397	285	44°29'13"N 64°38'19"W
2023-08-15	92241	220	44°27'48"N 64°37'27"W
2023-08-24	92242	522	44°28'6" N 64°37'6"W
2023-08-24	92243	390	44°28'6" N 64°37'6"W
2023-08-24	92244	335	44°28'6" N 64°37'6"W
2023-08-24	92245	305	44°28'6" N 64°37'6"W
2023-08-24	92246	254	44°28'6" N 64°37'6"W
2023-08-24	92247	230	44°28'6" N 64°37'6"W
2023-10-09	58385	345	44° 29' 23.34" N, 64° 38' 24.72" W
2023-10-10	58384	224	44° 29' 23.34" N, 64° 38' 24.72" W
2023-10-11	58383	320	44° 29' 23.34" N, 64° 38' 24.72" W
2023-10-12	58382	365	44° 29' 18.41" N, 64° 38' 26.93" W
2023-10-13	58381	389	44° 29' 18.41" N, 64° 38' 26.93" W
2023-10-14	58380	375	44° 29' 15.30" N, 64° 38' 25.95" W
2023-10-15	58379	330	44° 29' 15.30" N, 64° 38' 25.95" W
2023-10-16	58378	325	44° 29' 14.39" N, 64° 38' 23.34" W
2023-10-17	58377	383	44° 29' 12.73" N, 64° 38' 7.19" W
2023-10-18	58376	377	44° 29' 14.08" N, 64° 38' 10.58" W
2023-10-19	49225	344	44° 29' 2.43" N, 64° 38' 1.51" W

May 29 2024	49214	240	44° 29' 34.24" N, 64° 38' 19.78" W
May 29 2024	49213	320	44° 29' 34.24" N, 64° 38' 19.78" W
May 29 2024	49212	215	44° 29' 34.24" N, 64° 38' 19.78" W
May 29 2024	49211	265	44° 29' 34.24" N, 64° 38' 19.78" W
June 1 2024	49903	275	44° 27' 59.54" N, 64° 37' 31.00" W
June 1 2024	49904	356	44° 27' 59.54" N, 64° 37' 31.00" W
June 1 2024	49905	210	44° 27' 54.89" N, 64° 37' 30.25" W
June 1 2024	49906	251	44° 27' 47.60" N, 64° 37' 29.45" W
June 1 2024	49907	245	44° 27' 47.60" N, 64° 37' 29.45" W
June 1 2024	49908	300	44° 27' 44.88" N, 64° 37' 23.26" W
June 1 2024	49909	333	44° 27' 44.88" N, 64° 37' 23.26" W
June 1 2024	49910	335	44° 27' 44.88" N, 64° 37' 23.26" W
June 4 2024	49210	325	44°27' 44.47" N, 64°37' 64.624" W
June 4 2024	49209	257	44°27' 44.48" N, 64°37' 64.657" W
June 6 2024	49208	300	44° 28' 10.35" N, 64° 37' 26.00" W
June 6 2024	49263	300	44° 28' 25.44" N, 64° 37' 8.12" W
June 11 2023	49207	264	44° 28' 1.79" N, 64° 37' 30.60" W
June 13 2024	49206	280	44° 29' 26.95" N, 64° 38' 23.71" W
June 13 2024	49276	264	44° 29' 25.76" N, 64° 38' 24.65" W
June 13 2024	49277	255	44° 29' 25.76" N, 64° 38' 24.65" W
June 13 2024	49278	350	44° 29' 25.76" N, 64° 38' 24.65" W
June 13 2024	49279	365	44° 29' 25.04" N, 64° 38' 24.43" W
June 13 2024	49280	255	44° 29' 25.04" N, 64° 38' 24.43" W
June 13 2024	49281	260	44° 29' 25.04" N, 64° 38' 24.43" W
June 13 2024	49282	320	44° 29' 28.36" N, 64° 38' 20.69" W
June 13 2024	49283	260	44° 29' 31.2" N, 64° 38' 20.22" W
June 13 2024	49262	255	44° 29' 25.8324" N, 64° 38' 24.29844" W
June 13 2024	49261	339	44° 29' 25.8324" N, 64° 38' 24.29844" W
June 17 2024	49911	345	44° 29' 2.50" N, 64° 38' 0.83" W
June 17 2024	49912	314	44° 29' 2.50" N, 64° 38' 0.83" W
June 17 2024	49913	257	44° 29' 14.50" N, 64° 38' 7.04" W
June 17 2024	49914	273	44° 29' 14.50" N, 64° 38' 7.04" W
June 17 2024	49915	385	44° 29' 15.60" N, 64° 38' 22.24" W
June 17 2024	49916	223	44° 29' 15.20" N, 64° 38' 25.25" W
June 17 2024	49917	196	44° 29' 15.20" N, 64° 38' 25.25" W
June 17 2024	49918	227	44° 29' 16.50" N, 64° 38' 26.41" W
June 17 2024	49919	230	44° 29' 16.50" N, 64° 38' 26.41" W
June 20 2024	49284	289	44° 27' 45.86" N, 64° 37' 25.68" W
June 20 2024	49285	310	44° 27' 45.94" N, 64° 37' 24.06" W
June 20 2024	49286	230	44° 27' 45.94" N, 64° 37' 24.06" W

June 20 2024	49287	304	44° 27' 43.06" N, 64° 37' 19.06" W
June 20 2024	49288	280	44° 27' 43.85" N, 64° 37' 20.60" W
June 27 2024	49289	270	44° 29' 32.93" N, 64° 38' 18.02" W
June 27 2024	49290	231	44° 29' 26.92" N, 64° 38' 23.57" W
June 27 2024	49291	235	44° 29' 26.92" N, 64° 38' 23.57" W
June 27 2024	49292	240	44° 29' 25.80" N, 64° 38' 24.68" W
June 27 2024	49293	350	44° 29' 25.80" N, 64° 38' 24.68" W
July 2 2024	49294	260	44.47680 N 64.63294 W
July 2 2024	49295	240	44°28'36.2"N 64°37'59.3"W
July 2 2024	49296	240	44°28'36.2"N 64°37'59.3"W
July 4 2024	49259	345	44° 27' 42.92" N, 64° 37' 19.08" W
July 4 2024	49258	279	44° 27' 42.92" N, 64° 37' 19.08" W
July 4 2024	49257	434	44° 27' 42.92" N, 64° 37' 19.08" W
July 4 2024	49256	273	44° 27' 42.92" N, 64° 37' 19.08" W
July 4 2024	49255	425	44° 27' 42.92" N, 64° 37' 19.08" W
July 4 2024	49260	260	44° 27' 42.92" N, 64° 37' 19.08" W
July 4 2024	49297	290	44.46187 N 64.62049 W
July 4 2024	49298	260	44.46187 N 64.62049 W
July 8 2024	49299	290	44° 28.604 N, 64° 37.989" W
July 8 2024	49300	350	44° 28.604 N, 64° 37.989" W
July 8 2024	49800	320	44° 28.604 N, 64° 37.989" W
July 8 2024	49751	380	44° 28.915 N, 64° 37.847" W
July 8 2024	49774	335	44° 28.915 N, 64° 37.847" W
July 8 2024	49752	270	44° 28.915 N, 64° 37.847" W
July 9 2024	49798	290	44° 28.604 N, 64° 37.989" W
July 9 2024	49285	380	44° 28.915 N, 64° 37.847" W
July 9 2024	49773	380	44° 28.915 N, 64° 37.847" W
July 10 2024	49796	355	44° 28.115 N, 64° 37.479" W
July 12 2024	49771	260	44° 28.021 N, 64° 38.326" W
July 15 2024	49770	350	44° 28.021 N, 64° 38.326" W
July 15 2024	49769	330	44° 28.021 N, 64° 38.326" W
July 15 2024	49772	285	44° 28.021 N, 64° 38.326" W
July 16 2024	49766	460	44.4413 N 64.6360
July 16 2024	49764	290	44.4413 N 64.6360
July 16 2024	49763	360	44°29'13.2"N 64°38'12.2"W
July 16 2024	49762	440	44°29'13.2"N 64°38'12.2"W
July 16 2024	49761	330	44°29'12.2"N 64°38'19.4"W
July 16 2024	49760	410	44°29'12.2"N 64°38'19.4"W
July 16 2024	49759	225	44.888 N 64.6401

July 16 2024	49758	310	44°29'12.2"N 64°38'19.4"W
July 18 2024	49757	350	44° 28.600 N, 64° 37.975" W
July 18 2024	49765	305	44° 29.005 N, 64° 37.9495" W
July 18 2024	49756	495	44° 29.220 N, 64° 38.203" W
July 18 2024	49755	320	44° 29.220 N, 64° 38.203" W
July 18 2024	49754	300	44° 29.220 N, 64° 38.203" W
July 18 2024	49602	190	44° 29.204 N, 64° 38.323" W
July 18 2024	49603	310	44° 29.252 N, 64° 38.402" W
July 18 2024	49604	290	44° 29.252 N, 64° 38.402" W
July 18 2024	49601	330	44° 29.252 N, 64° 38.402" W
July 18 2024	49605	400	44° 29.268 N, 64° 38.432" W
July 18 2024	49795	260	44° 29.204 N, 64° 38.105" W
July 18 2024	49794	290	44° 29.204 N, 64° 38.105" W
July 18 2024	49793	300	44° 28.955 N, 64° 37.939" W
July 18 2024	49920	275	44° 28' 29.172" N, 64° 37' 12.36" W
July 20 2024	49789	300	44° 29.301 N, 64° 38.442" W
July 20 2024	49788	330	44° 29.447 N, 64° 38.418" W
July 20 2024	49787	350	44° 29.447 N, 64° 38.418" W
July 20 2024	49786	350	44°28'57.3"N 64°37'56.3"W
July 22 2024	49785	310	44° 29.322 N, 64° 38.430" W
July 22 2024	49784	310	44° 29.322 N, 64° 38.430" W
July 22 2024	49783	300	44° 29.239 N, 64° 38.069" W
July 23 2024	49782	240	44° 28.604 N, 64° 37.989" W
July 23 2024	49781	340	44° 28.955 N, 64° 37.939" W
July 23 2024	49921	320	44.4833035 N 64.632551 W
July 23 2024	49922	375	44.486955 N 64.636490 W
July 23 2024	49923	380	44° 29.233 N, 64° 38.337" W
July 23 2024	49924	340	44° 29.233 N, 64° 38.337" W
July 25 2024	49778	260	44.47474 -64.63305
July 25 2024	49624	250	44° 29.036 N, 64° 38.358" W
July 25 2024	49623	300	44° 28.920 N, 64° 37.780" W
July 25 2024	49622	335	44° 28.920 N, 64° 37.780" W
July 25 2024	49621	270	44° 28.920 N, 64° 37.780" W
July 25 2024	49620	400	44° 28.920 N, 64° 37.780" W
July 25 2024	49619	310	44° 29.030 N, 64° 37.975" W
July 26 2024	49618	360	44° 29.209 N, 64° 38.229 W
July 27 2024	49617	320	44° 28.111 N, 64° 37.098 W
July 27 2024	49925	275	44° 47.169 N, 64° 62.853 W
July 27 2024	49924	315	44° 47.889 N, 64° 63.128 W

July 27 2024	49925	350	44° 28.920 N, 64° 37.780" W
July 27 2024	59651	355	44° 28.579 N, 64° 37.756" W
July 27 2024	59176	400	44.47425 N 64.62135 W
July 27 2024	59177	295	44.47425 N 64.62135 W
July 27 2024	59178	210	44.47425 N 64.62135 W
July 30 2024	59179	272	44° 27' 45.41801" N, 64° 37' 21.82468" W
July 30 2024	59180	220	44° 27' 45.41801" N, 64° 37' 21.82468" W
July 30 2024	59181	240	44° 27' 45.41801" N, 64° 37' 21.82468" W
July 30 2024	59182	220	44° 27' 45.41801" N, 64° 37' 21.82468" W
July 30 2024	59183	265	44° 27' 45.41801" N, 64° 37' 21.82468" W
July 30 2024	59184	340	44°27'45.4"N 64°37'21.8"W
July 30 2024	59185	220	44°27'45.4"N 64°37'21.8"W
July 30 2024	59186	260	44°27'45.4"N 64°37'21.8"W
July 30 2024	59187	320	44°27'45.4"N 64°37'21.8"W
July 30 2024	59188	250	44° 27' 45.41801" N, 64° 37' 21.82468" W
July 30 2024	49616	400	44° 28.920 N, 64° 37.780" W
July 30 2024	49615	250	44° 28.089 N, 64° 37.157" W
August 2 2024	49614	280	44° 28.555 N, 64° 37.907" W
August 2 2024	49613	270	44° 28.920 N, 64° 37.780" W
August 2 2024	49612	280	44° 28.920 N, 64° 37.780" W
August 2 2024	49611	320	44° 28.881 N, 64° 37.885" W
August 2 2024	49610	250	44° 28.881 N, 64° 37.885" W
August 4 2024	49609	310	44.47474 -64.63305
August 4 2024	49608	300	44.47474 -64.63305
August 5 2024	49607	230	44° 29.322 N, 64° 38.430" W
August 5 2024	49606	400	44° 29.322 N, 64° 38.430" W
August 5 2024	59201	250	44° 29.036 N, 64° 38.358" W
August 5 2024	59202	320	44° 29.036 N, 64° 38.358" W
August 5 2024	59203	385	44° 28.920 N, 64° 37.780" W
August 5 2024	59204	420	44° 28.920 N, 64° 37.780" W
August 6 2024	59205	270	44.46219 N 64.62206 W
August 6 2024	59206	230	44.46219 N 64.62206 W
August 6 2024	59207	260	44.46219 N 64.62206 W
August 6 2024	59208	220	44.46147 N 64.61990 W
August 6 2024	59209	220	44.46147 N 64.61990 W
August 6 2024	59210	290	44.46147 N 64.61990 W

August 6 2024	59211	305	44.46147 N 64.61990 W
August 6 2024	59212	430	44.46147 N 64.61990 W
August 6 2024	59213	380	44.46147 N 64.61990 W
August 6 2024	59214	310	44.46147 N 64.61990 W
August 6 2024	59189	333	44° 27' 42.44" N, 64° 37' 17.04" W
August 6 2024	59190	305	44° 27' 41.83" N, 64° 37' 13.12" W
August 6 2024	59191	355	44° 27' 41.98" N, 64° 37' 5.52" W
August 7 2024	59215	240	44° 28.920 N, 64° 37.780" W
August 7 2024	59216	260	44° 28.920 N, 64° 37.780" W
August 7 2024	59217	300	44° 29.322 N, 64° 38.430" W
August 8 2024	59193	280	44° 29' 45.15577" N, 64° 38' 34.29873" W
August 8 2024	59195	258	44° 29' 24.97208" N, 64° 38' 25.11951" W
August 8 2024	59194	210	44° 29' 25.73" N, 64° 38' 24.86" W
August 8 2024	59198	211	44° 29' 27.53" N, 64° 38' 21.23" W
August 10 2024	52199	320	44°27'56.0"N 64°37'29.9"W
August 10 2024	59200	241	44°27'56.0"N 64°37'29.9"W
August 10 2024	59301	281	44°27'56.1"N 64°37'30.4"W
August 10 2024	59302	275	44°27'48.1"N 64°37'27.7"W
August 10 2024	59303	282	44°27'48.1"N 64°37'27.7"W
August 10 2024	59304	265	44°27'48.1"N 64°37'27.7"W
August 10 2024	59305	341	44°27'41.4"N 64°37'12.2"W
August 13 2024	59308	295	44° 30' 4.39" N, 64° 38' 58.99" W
August 13 2024	59325	295	44° 29' 28.50" N, 64° 38' 24.30" W
August 13 2024	59324	210	44° 29' 28.15" N, 64° 38' 23.52" W
August 15 2024	59322	310	44° 27' 45.67" N, 64° 37' 17.76" W
August 15 2024	59321	310	44° 27' 44.84" N, 64° 37' 16.38" W
August 15 2024	59320	263	44° 27' 44.84" N, 64° 37' 16.38" W
August 16 2024	59218	240	44.47474 -64.63305
August 16 2024	59219	320	44° 28.604 N, 64° 37.989" W
August 16 2024	59220	250	44° 28.920 N, 64° 37.780" W
August 16 2024	59221	300	44° 29.229 N, 64° 38.133" W
August 16 2024	59222	300	44° 29.206 N, 64° 38.231" W
August 16 2024	59223	380	44° 29.206 N, 64° 38.231" W
August 16 2024	59224	350	44° 29.206 N, 64° 38.231" W
August 16 2024	59225	250	44° 29.206 N, 64° 38.231" W
August 16 2024	59276	300	44° 29.206 N, 64° 38.231" W
August 16 2024	59277	410	44° 29.228 N, 64° 38.332" W
August 16 2024	59278	260	44° 29.228 N, 64° 38.332" W

August 16 2024	59279	290	44° 29.228 N, 64° 38.332" W
August 16 2024	59280	300	44° 28.920 N, 64° 37.780" W
August 16 2024	59281	270	44° 28.920 N, 64° 37.780" W
August 17 2024	59282	260	44° 28.301 N, 64° 37.684" W
August 17 2024	59283	280	44° 28.301 N, 64° 37.684" W
August 17 2024	59285	250	44° 28.301 N, 64° 37.684" W
August 17 2024	59284	350	44° 28.092 N, 64° 37.465" W
August 17 2024	59286	250	44° 28.301 N, 64° 37.684" W
August 18 2024	59287	450	44° 28.841 N, 64° 37.851" W
August 20 2024	59288	320	44.46206 N 64.62192 W
August 20 2024	59289	220	44.46206 N 64.62192 W
August 20 2024	59290	230	44.46206 N 64.62192 W
August 20 2024	59291	260	44.46206 N 64.62192 W
August 20 2024	59292	290	44.46206 N 64.62192 W
August 20 2024	59293	410	44.46213 N 64.61821 W
August 20 2024	59294	360	44.46213 N 64.61821 W
August 20 2024	59295	380	44.46213 N 64.61821 W
August 21 2024	59296	340	44.45624 N 64.61031 W
August 21 2024	59297	280	44.45624 N 64.61031 W
August 21 2024	59298	350	44.45624 N 64.61031 W
August 21 2024	59299	210	44.45624 N 64.61031 W
August 21 2024	59300	320	44.45624 N 64.61031 W
August 22 2024	59026	240	44.45702 N 64.61066 W
August 22 2024	59027	315	44.45702 N 64.61066 W
August 22 2024	59028	240	44.45702 N 64.61066 W
August 22 2024	59029	230	44.45702 N 64.61066 W
August 22 2024	59030	340	44.45702 N 64.61066 W
August 22 2024	59317	340	44° 27' 28.97" N, 64° 36' 41.70" W
August 22 2024	59316	260	44° 25' 49.89" N, 64° 35' 9.57" W
August 22 2024	59314	253	44° 27' 27.11" N, 64° 36' 38.76" W
August 22 2024	59318	220	44° 27' 17.27619" N, 64° 36' 24.87544" W
August 25 2024	59032	330	44.48150 N 64.63071 W
August 25 2024	59033	340	44.48150 N 64.63071 W
August 25 2024	59034	250	44.48150 N 64.63071 W
August 25 2024	59035	340	44.48150 N 64.63071 W
August 26 2024	59036	440	44.46222 N 64.61844 W
August 26 2024	59037	430	44.46222 N 64.61844 W
August 26 2024	59049	380	44.46222 N 64.61844 W

September 18 2024	59047	300	44.45624 N 64.61031 W
September 18 2024	59048	290	44.45624 N 64.61031 W
September 18 2024	59046	305	44.45624 N 64.61031 W
September 18 2024	59044	320	44.45624 N 64.61031 W
September 18 2024	59043	380	44.45624 N 64.61031 W
September 18 2024	59042	270	44.45624 N 64.61031 W
September 18 2024	59041	330	44.45624 N 64.61031 W
September 18 2024	59040	350	44.45624 N 64.61031 W
September 18 2024	59039	300	44.45624 N 64.61031 W
September 18 2024	59038	310	44.45624 N 64.61031 W
September 19 2024	59701	330	44 29.149W 64 38.069W
September 19 2024	59702	310	44°29'08.9"N 64°38'04.1"W
October 3 2024	59703	200	44°29'13.2"N 64°38'12.2"W
October 3 2024	59704	180	44°29'13.2"N 64°38'12.2"W
October 3 2024	59705	410	44 28.366N 64 37.633W
October 10 2024	59706	380	44.47474 -64.63305
October 10 2024	59707	305	44 29.194 64 38.310
October 17 2024	59708	410	44.47474 -64.63305
October 20 2024	59709	345	44.47474 -64.63305
October 20 2024	59710	355	44.48773,-64.63987
October 20 2024	59711	365	44.48768,-64.64037
October 20 2024	59712	374	44.48807,-64.64073
October 20 2024	59713	350	44° 29' 36.39" N, 64° 38' 26.15" W

APPENDIX B. SMALLMOUTH BASS RECAPTURE DATA

Tagging Date	Tag #	Tagging Location	Length A	B	Recapture Date	Recapture Location	Length B
June 6 2023	51619 (A)	44.4720812, -64.6240431	250	51619 (B)	June 12 2023	44.4751034, -64.6222855	NA
June 7 2023	51609 (A)	44.4681918, -64.6197516	367	51609 (B)	June 25 2023	44.4738785, -64.6199251	NA
August 4 2023	92226 (A)	44°27'48"N 64°37'27.0"W	390	92226 (B)	June 1 2024	44°27'59.5"N 64°37'31.0"W	390
August 1 2023	92772 (A)	44° 29' 28.1224" N 64° 38' 23.4546" W	142	92772 (B)	June 1 2024	44°27'47.6"N 64°37'29.5"W	265
May 29 2024	49213 (A)	44°29'34.24" N 64°38'19.78" W	320	49213 (B)	June 18 2024	44°29'31.7"N 64°38'17.9"W	NA
July 23 2024	49781 (A)	44° 28' 57.2999" N 64° 37' 56.3002" W	340	49781 (B)	August 5 2024	44°29'02.2"N 64°38'21.5"W	355
July 4 2024	49256 (A)	44° 27' 42.92" N, 64° 37' 19.08" W	273	49256 (B)	August 15 2024	44°27'44.8"N 64°37'16.4"W	300
July 30 2024	59185 (A)	44° 27' 45.4" N 64° 37' 21.7999" W	220	59185 (B)	August 20 2024	44°27'43.7"N 64°37'05.6"W	230
August 16 2024	59219 (A)	44° 28' 36.0455" N 64° 37' 58.3208" W	320	59219 (B)	Oct 20 2024	44°28'29.1"N 64°37'59.0"W	340