Miramichi Salmon Restoration
Stocking 2024

Prepared by:
Lyndsay Jay-Keating
Biologist
Miramichi Salmon Association

Holly Labadie
Hatchery Manager
Miramichi Fisheries Management

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Introduction

Stocking Atlantic salmon (*Salmo salar*) first-feeding fry can improve the juvenile production capacity of the Miramichi River by targeting areas that are under-seeded or inaccessible to wild spawning adults. An electrofishing survey is carried out each year by the Miramichi Salmon Association (MSA) to assess areas of the river that are lacking adequate numbers of fry or parr. Low fry or parr numbers could be the result of multiple factors including poor adult returns, barriers to adult movement into upper stream reaches (i.e.: beaver dams), environmental events such as ice scouring that could destroy a redd, or suboptimal water conditions. Areas with zero/minimal fry present were targeted to stock and efforts were made to identify and remove any impediments to natural spawning. Most of these areas were in small tributaries in the headwaters of the Miramichi River. Small brooks and streams often have good quality habitat and lower numbers of predators than larger downstream locations (NASCO, 2010). These narrow waterways may be inaccessible however, because of barriers or decreased water levels in low flow years.

Juvenile abundance electrofishing surveys and smolt estimates are used to aid in determining specific tributaries that may need additional stocking. To increase efficiency and successful establishment, salmon fry that have incubated at the Miramichi Salmon Conservation Centre (MSCC) are placed strategically in streams that will benefit most from their introduction. Stocking salmon fry into a tributary with high salmon fry abundance could negatively impact those fish by increasing the level of competition for food resources. To avoid this, sites with less than 50 fry/100m^2 are considered candidates for stocking. The absence of fry at a previously stocked site may indicate that the site does not contain the appropriate habitat, or it may have too many predators.

Prior to 2010, the MSA stocked fall fingerlings that were marked by an adipose clip (removal of the adipose fin). In 2010 the focus shifted to stocking first-feeding salmon fry in the late spring/early summer. These fry were incubated as eggs on brook water to ensure the rate of egg development is similar in timing to that of wild eggs. The stocking of fry over fingerlings has several benefits, including the reduced risk of fish contracting a pathogen while in artificially high densities at the MSCC, and the improved capacity to develop wild behaviour tendencies at a younger age (Berejikian and Ford, 2004). First-feeding fry are stocked in June at an average size of 0.2-0.5g.

With the declining numbers in adult returns to the Miramichi (DFO, 2023) it has become more difficult to collect adults for broodstock to fulfill fry stocking enhancement programs. The MSA supports leaving the few remaining adults in the river to spawn naturally and moved to an alternative method for fry stocking, called Smolt to Adult Supplementation (SAS). Smolts are

collected from individual tributaries and reared to maturation at the MSCC after 2.5-3.5 years, the adults are spawned, eggs are incubated over the winter, and fry are released in the spring with the same protocol as the traditional stocking program. Collecting a small number of smolts in the spring allows for higher survival to maturation at the MSCC than would occur in the wild (Chaput *et.al.*, 2019). With higher adult survival at the hatchery, more fry are available to help bolster salmon populations on the Miramichi River.

The objective of this fry stocking program was to improve Atlantic salmon production in the upper reaches of the Southwest Miramichi watershed using the offspring of adults collected from the traditional broodstock program and from a new SAS program operated at the MSCC.

Methods

Wild adult salmon were collected in October 2023 for broodstock from the Southwest Miramichi River in Juniper as part of the traditional broodstock program. Despite angler efforts, only one female was caught from the Cains River on the Southwest Miramichi and released. Mature SAS adults were already onsite at the MSCC from a smolt collection in 2021 from the Southwest Miramichi River in Ludlow. Adults were kept separated based on their river of origin.

Once ripe, female salmon were stripped of their eggs, which were then fertilized by a male salmon from the same river. Immediately following spawning, the wild adults were released back into the wild via Stewart Brook, which runs beside the MSCC. SAS adults were held at the MSCC.

Eggs from both groups were incubated on brook water in trays until the eyed stage, then the eggs were shocked, and mortality removal occurred daily. Eyed eggs were transferred to upwelling incubation boxes in preparation for hatching. After hatching, fry were fed a formulated salmonid diet (Skretting Nutra Sprint 0.5mm/0.7mm) for approximately 2-3 weeks until stocking. All salmon fry were stocked into their native river of origin

Stocking sites in Juniper were selected based on low juvenile densities found at the exact or nearby locations from the previous year's electrofishing results and in tributaries that typically have low juvenile production. As stocking sites for the Ludlow fry were new in 2024, there was no historical electrofishing site-specific data. Stocking sites were selected based on access upriver of the smolt collection location, mapping data, and visual observation of the mapped sites to ground-truth habitat supportive of salmon fry. Historical Department of Fisheries and Oceans (DFO) baseline electrofishing sites were not stocked.

Permits

Scientific Permits from the Department of Fisheries and Oceans (SG-RHQ-21-032, SG-RHQ-24-029 and NB 2024-049, NB 2024-050) were obtained prior to starting this project. A small sub-sample of fish from each stock were sent for disease testing at the Gulf Fisheries Centre Aquatic Animal Health Laboratory in Moncton prior stocking.

Results and Discussion

Approximately 55,150 first-feeding wild Atlantic salmon fry were stocked into 16 sites of the Southwest Miramichi River system in Juniper (Figure 1; Table 1). Approximately 89,850 first-feeding SAS Atlantic salmon fry were stocked into 21 sites of the Southwest Miramichi River and tributaries (Figure 2; Table 2). The water levels were high in June 2024, so some larger sites had additional buckets of fry added due to a lack of available and accessible habitat elsewhere.

Our traditional stocking program has become harder to complete with the decline in returning adult salmon to the Miramichi. By introducing a stocking program derived from SAS-reared adults, MSA can utilize the MSCC in a greater capacity to support conservation efforts.

This program allows a higher proportion of salmon eggs to be produced and fry to be released back into the wild. This program also connects anglers to the Miramichi Salmon Conservation Centre and provides wild and SAS fry back to the Miramichi River system, with the goal to help sustain and enhance Atlantic salmon populations during this critical period.

Acknowledgements

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References

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Appendix

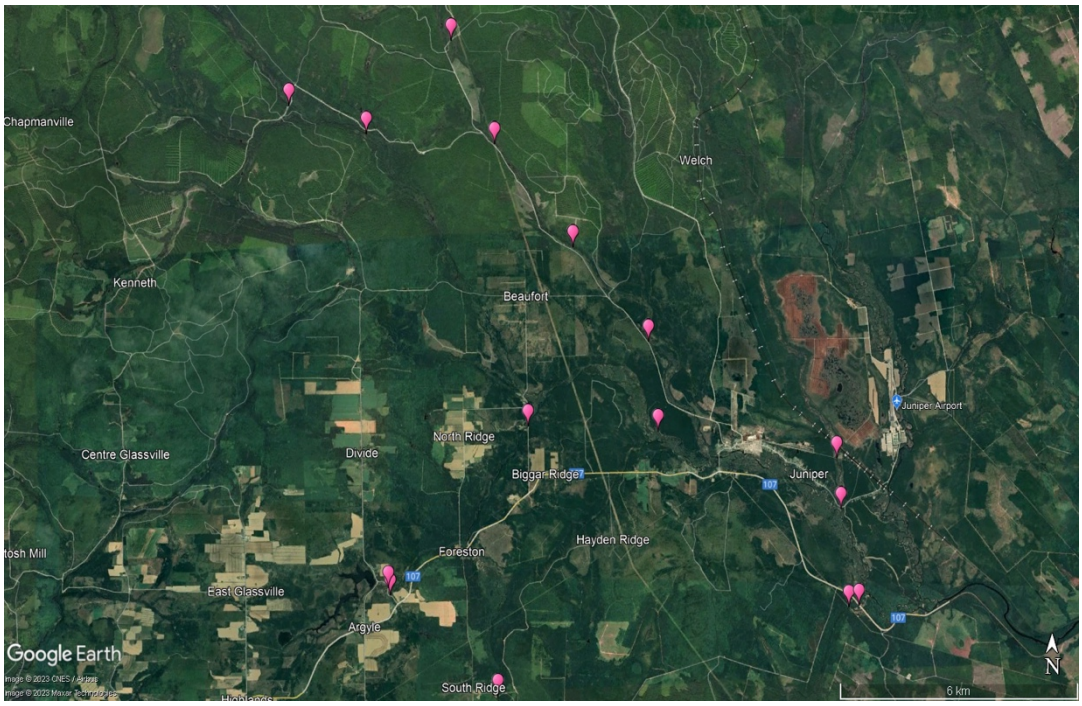

Figure 1. Stocking sites of wild Atlantic salmon fry distributed to the Southwest Miramichi River in Juniper in 2024.

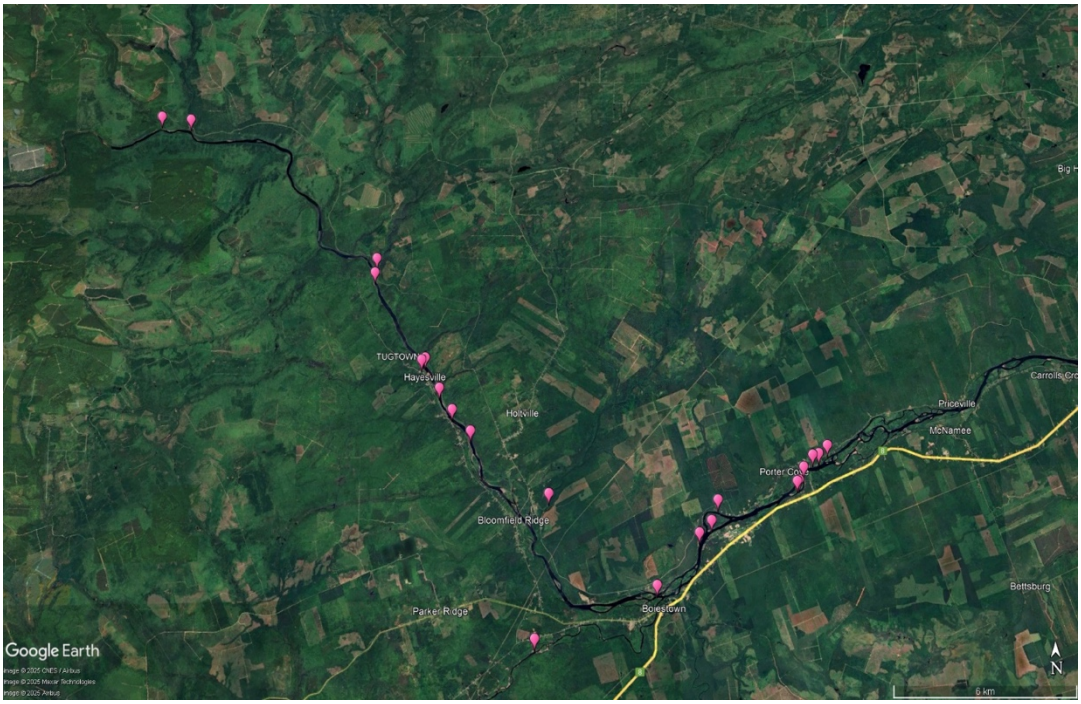

Figure 2. Stocking sites of SAS Atlantic salmon fry distributed to the Southwest Miramichi River above Ludlow in 2024.

Table 1. Distribution of wild Atlantic salmon fry from the Miramichi Salmon Conservation Centre to the Southwest Miramichi River system in Juniper in 2024.

Strain	Site	# of fish	Latitude	Longitude
SWM	Clearwater Bk 1	3050	46.518420	-67.178280
SWM	Clearwater Bk 2	6025	46.518120	-67.181610
SWM	Juniper Bk 1	3025	46.539160	-67.184563
SWM	Juniper Bk 2	3000	46.549300	-67.186270
SWM	SWM S. Branch 1	6075	46.554360	-67.245090
SWM	SWM S. Branch 1a	3025	46.554890	-67.287830
SWM	SWM S. Branch 2	6100	46.511923	-67.299595
SWM	Lake Bk 3	1500	46.518970	-67.332080
SWM	Lake Bk 4	1500	46.520550	-67.332790
SWM	Big Teague Bk 3	3100	46.573100	-67.248730
SWM	Little Teague Bk 1a	3050	46.592580	-67.274000
SWM	Little Teague Bk 2a	3075	46.613760	-67.300210
SWM	Little Teague Bk 3	3325	46.635150	-67.314940
SWM	Elliott Bk 1	3175	46.621070	-67.367780
SWM	Elliott Bk 2	3125	46.615480	-67.342290
SWM	Elliott Bk 3	3000	46.582541	-67.306948

Table 2. Distribution of SAS Atlantic salmon fry from the Miramichi Salmon Conservation Centre to the Southwest Miramichi River system above Ludlow in 2024.

Strain	Site	# of fish	Latitude	Longitude
SWM	LUD 1	4065	46.497453	-66.345316
SWM	LUD 1a	4136	46.495145	-66.349276
SWM	LUD 2	4089	46.494758	-66.352021
SWM	LUD 3	3000	46.491335	-66.356269
SWM	LUD 3a	3075	46.487600	-66.358570
SWM	LUD 3b	2525	46.487970	-66.359459
SWM	LUD 5	8644	46.482414	-66.394582
SWM	LUD 6	6100	46.476609	-66.397707
SWM	LUD 7	3902	46.473196	-66.403227
SWM	LUD 8	5413	46.458690	-66.422390
SWM	LUD 11	2717	46.503510	-66.502570
SWM	LUD 13	3200	46.509850	-66.510660
SWM	LUD 15	6025	46.516250	-66.516300
SWM	LUD 17a	3184	46.524641	-66.524236
SWM	LUD 17b	3316	46.525252	-66.522591
SWM	LUD 20	6037	46.551250	-66.545470
SWM	LUD 21	2638	46.555564	-66.544691
SWM	LUD 23	6894	46.600184	-66.631945
SWM	LUD 24	2511	46.601267	-66.645482
SWM	LUD PB3	3158	46.485054	-66.468467
SWM	LUD T3	5217	46.444517	-66.475618