2022 West and Clyde River
Long Term Electrofishing Report

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Introduction

The Central Queens Branch of the PEI Wildlife Federation (CQWF) has been carrying out electrofishing surveys since 2004. The surveys target native juvenile species Atlantic salmon (Salmo salar), brook trout (Salvelinus fontinalis), and rainbow trout (Oncorhynchus mykiss), which are considered non-native or invasive on Prince Edward Island. In total, there have been twenty-nine sites that have been surveyed since 2004. However many of these have not been surveyed each year therefore determining population trends is difficult. There are some sites, however, that have been surveyed for many years, some since 2004, which present valuable, and usable data for the salmonid populations within them.

Surveys targeted juvenile habitats to determine spawning success and recruitment from year to year at long-term index sites. These index sites were established to help monitor long-term population trends in salmonid communities and are assessed on an annual basis. Index sites are located on major tributaries (2nd and 3rd order streams) and also include sites along the main river (3rd and 4th order streams). Sites were strategically chosen to be representative of stream habitat and cover areas where there have been historic records of salmon or brook trout spawning efforts. In some instances, sites were established to monitor the survival success from hatchery-stocked fry. Typically juvenile habitat contains shallow waters (<60cm) with a lack of deep pools (>60cm) and coarse stream bottom substrate.

The main objectives for electrofishing surveys were to determine local juvenile abundances for salmonid species and to determine which sections of river habitat are currently being utilized by Atlantic salmon.

Methods

A battery-powered Smith-Root LR-24 electrofisher was used to conduct surveys. An electrical current is produced to immobilize fish and a crew is nearby to capture the stunned fish using dip nets. Captured fish are placed in a bucket to be held until processed.

To measure density, a site is enclosed with barrier nets to prevent any immigration or emigration of fish during surveys. Normally 3 sweeps, (sometimes 4) are carried out through the entire site to establish a diminishing return of captured fish. Captured fish are identified by species and then measured to fork length to determine age class. Once all the captured fish are processed they are released back to the stream. Measurements are taken at the site to determine the total area of stream surveys which will be used with the Zippin Three Sample method to determine a population estimate within the site surveyed. The population estimate

is then used to determine the number of fish per 100m^2 and will be presented in that format for this report. Other measurements also taken at each site include water temperature and GPS location.

Electrofishing index sites are typically surveyed in late summer, early autumn to avoid unfavorable survey conditions (warm water temperatures, low water, etc). Each year the surveys are conducted between late August to mid-September. Conducting surveys at roughly the same time each year also provides more consistent time frames for measuring the growth of fish.

Results and Discussion

This report will describe all the available data from individual index electrofishing sites on the West and Clyde River. In total there are sixteen index sites, fourteen of which are on the West River and the remaining two are on the Clyde River. Sites were prioritized in certain years due to time constraints therefore there are data gaps at certain sites. Some sites have also been relocated for various reasons. In certain instances, the in-stream habitat changes, and in order to have better representation of the local habitat sites are relocated. In 2018 several sites were either created or relocated to target juvenile Atlantic salmon populations (ie- downstream of identified Atlantic salmon redds).

Of the fourteen sites on the West River, six sites are along the main branch. Many of these index sites have recently been established and serve an important role in indicating Atlantic salmon population trends as the bulk of the spawning occurs along the main West River in comparison to tributaries. Index sites have been established on major tributaries to help gauge restoration success. Three sites have been established in the Brookvale area, four on Howell's Brook, and one on Quinn's Brook (Table 1).

Table 1. Description of index electrofishing sites on the West and Clyde Rivers

Location Description	Site
Main branch at Howells Brook Junction	W-Main1
Below Bolger Park rd 150m	W-Main2
200m above Bolger Park Bridge	W-Main3
Off Elliot River rd	W-Main4
Main river immediately upstream of Skye Brook entrance	W-Main5
Site 200m below Hatchery	W-Main6
Skye Brook just above entrance to main river, below Kingston Rd	W-Bvale1
Main river in Brookvale above Curley's bypass pond	W-Bvale2

Main river headwaters, Brookvale above P Arsenaults	W-Bvale3
Quinn's Brook in Emyvale below Westwood Hills Estates	W-Quinns1
Howell's Brook just downstream of Riverdale Rd culvert	W-Howells1
Site adjacent to Jeremy MacDonalds field	W-Howells2
Howell's Brook just downstream of Wynn Rd culvert	W-Howells3
Howell's Brook below Quinn Rd culvert	W-Howells4
Clyde River at head-of-tide, near remnants of mill	C-Main
Clyde River north branch along Bannockburn Rd	C-Main2

It should be noted that salmon fry have been stocked in the West River since 2016. There have been varying amounts year to year as CQWF gets the surplus fry from the Morell stocking program. Salmon were originally stocked in the headwaters areas so CQWF could closely monitor and gauge the survival of the stocked fish and also with the hopes of having adult salmon return to such areas. It is important to note where and how many salmon fry have been stocked as this will influence the juvenile Atlantic salmon densities noted at sites nearby stocked areas

Table 2. Atlantic salmon fry stocked on the West River from 2015 to 2022.

Location	2015	2016	2017	2018	2019	2020	2021	2022
Patty A Tributary (Brookvale)	10 000	10 000	5 000	1 500	8 000	10 000	12 000	10 000
Ross Rd (Brookvale)	5 000	2 000	2 500		5 000			10 000
Curleys (Brookvale)	5 000	3 000	5 000	1 500	7 000			
Below Hatchery (Brookvale)							12 000	10 000
Riverdale Rd. to Peters Rd (Howell's)					10 000			
Above Peters Rd (Howell's)					1 000		12 000	10 000
Below Riverdale Rd (Howell's)			2 500			5 000		
Total	**20 000**	**15 000**	**15 000**	**3 000**	**31 000**	**15 000**	**36 000**	**40 000**

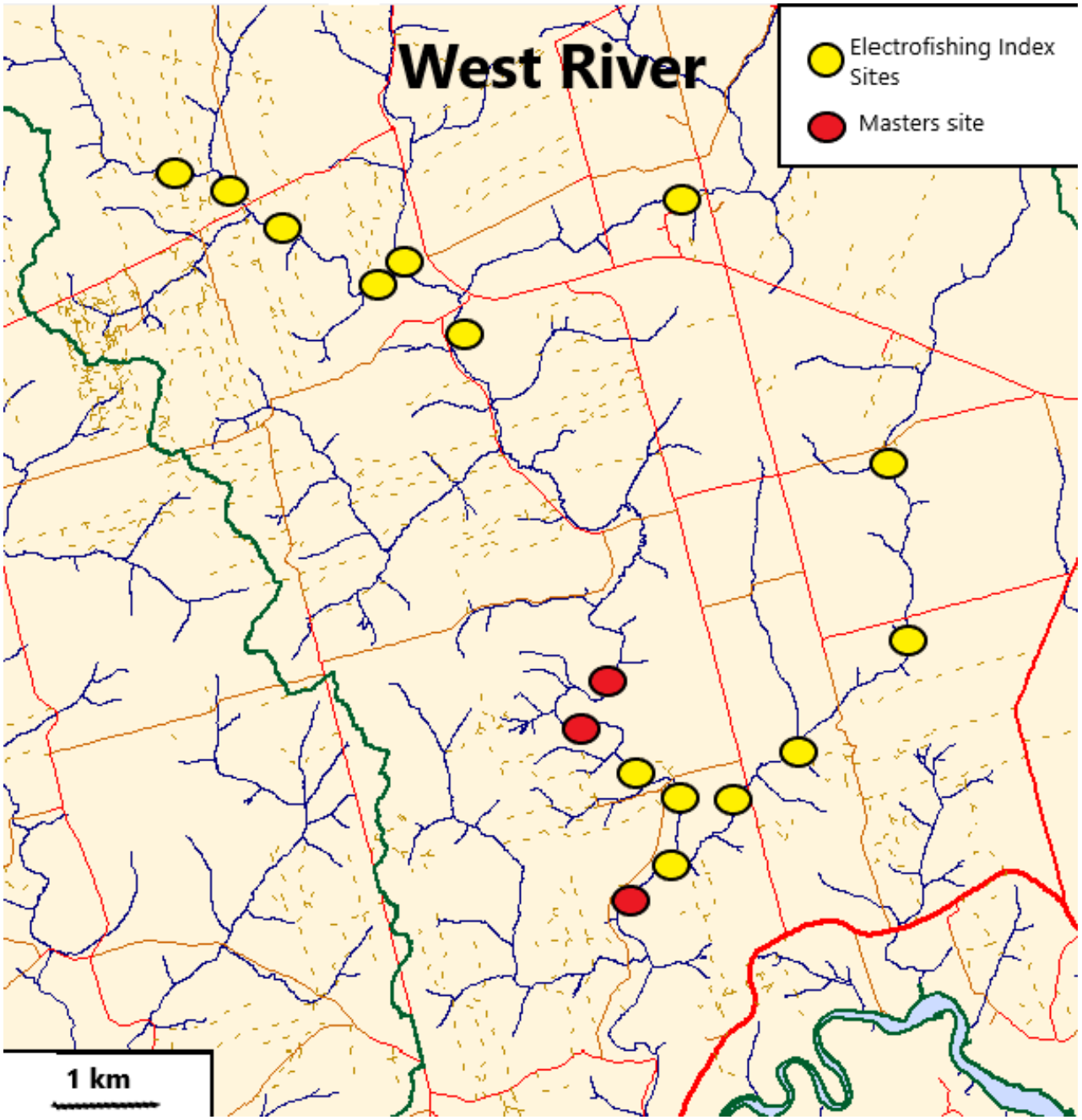

Figure 1. Map of electrofishing site locations on the West River.

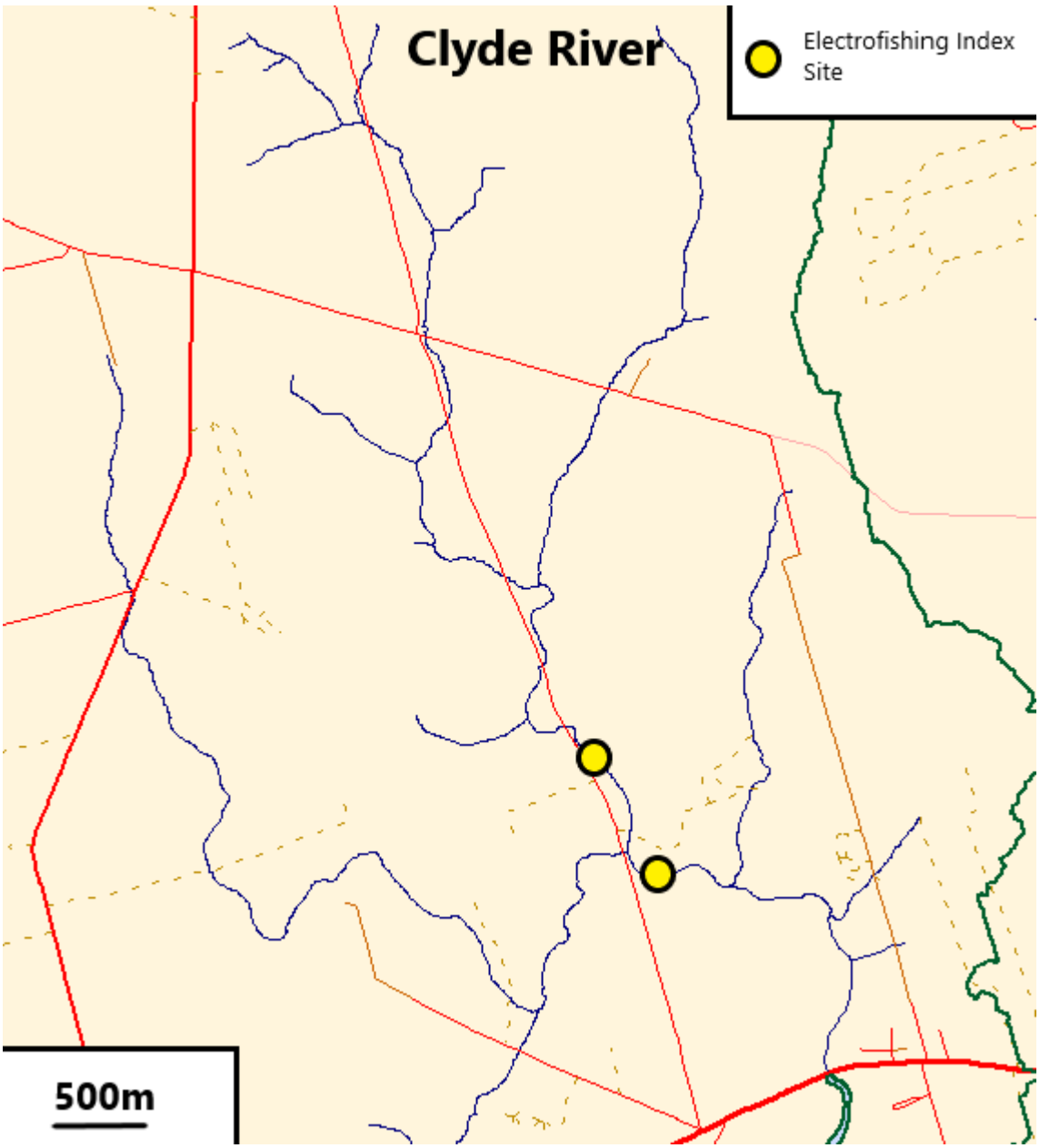

Figure 2. Map of electrofishing index site locations on the Clyde River.

W-Main 1: Howell's Brook Junction

This site is located on the main branch at the Howell's Brook junction. This site was established in 2019 for a UPEI Graduate study. CQWF decided this site will continue to be monitored since it is an ideal index for monitoring local native juvenile Atlantic salmon populations. This site was surveyed without the use of barrier nets due to the river's width and associated difficulties. Salmonid densities increased drastically in 2020. This is opposite to the other Masters' study sites. There are many factors that could contribute to an increase in densities, however the exact reason is unknown and assumptions will not be made. Densities in this site were 51.2 fish per $100m^2$ in 2019 and over doubled in 2020 at 109.4 fish per $100m^2$. In 2021 densities went back down to 44.37 fish per $100m^2$.

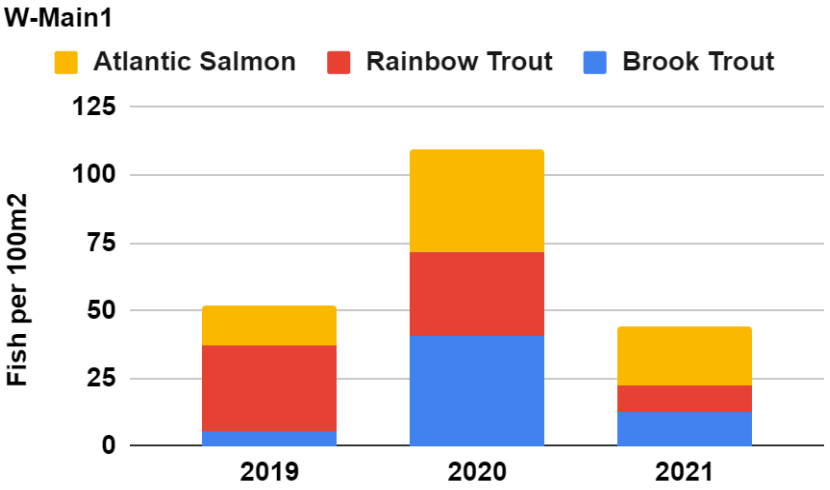

Figure 3. Electrofishing site located at mouth of Howell's Brook on the main branch of the West River which indicates the fish per $100m^2$ captured during time of surveying from 2019 to 2021.

W-Main 2: Below Bolger Park Rd

Surveying began in 2018, this site was established for providing a better representation of native juvenile Atlantic salmon populations on the main branch of the West River. Below Bolger Park rd is not affected by stocking. The site gives a better representation of natural populations due to the bulk of the salmon spawning population occurring on the main branch. The data from 2020 may be inaccurate due to electrofisher issues. It looks to be rather evenly shared by all salmonids but it does appear that rainbow trout are slightly more abundant. This site contains swift riffle habitat with abundant coarse substrate making it preferred by Atlantic salmon and rainbow trout juveniles. Total salmonid densities here span

from 70.8 to 174.4 fish per 100m^2. There were no significant changes in fish densities from 2021 to 2022 at this site.

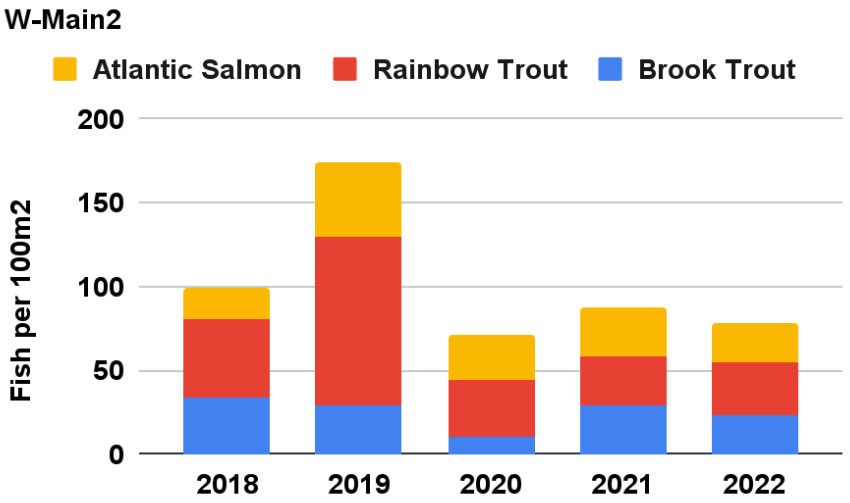

Figure 4. Electrofishing site located 200m below Bolger Park Rd bridge on the main branch of the West River which indicates the fish per 100m^2 captured during time of surveying from 2018 to 2022.

W-Main 3: Above Bolger Park

Above Bolger Park Rd was surveyed in 2019 and 2020 for UPEI Masters research, since it is a good representation of native juvenile Atlantic salmon populations, CQWF will continue surveys at this location. The area is dominated by juvenile Atlantic salmon while brook trout populations are low due to habitat and rainbow trout populations are moderate. The drop in Atlantic salmon densities in 2021 could be due to the lack of redds upstream in 2020. Salmonid densities in the site were 215.9 fish per 100m^2 in 2019 and 154.7 in 2020.

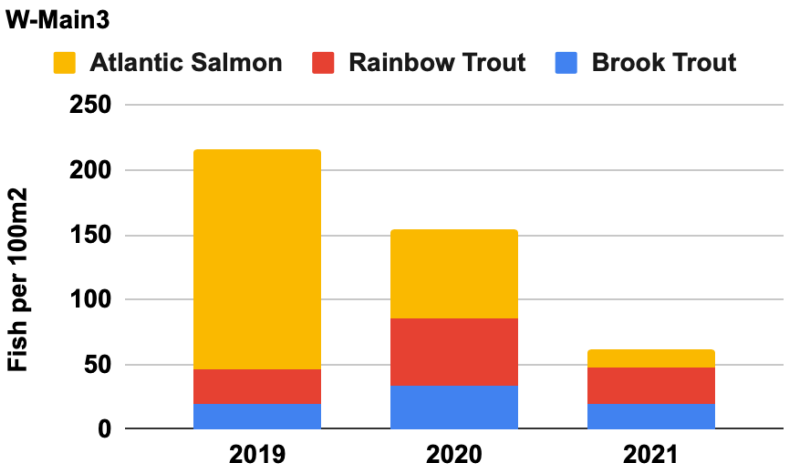

Figure 5. Electrofishing site located above Bolger Park Rd Bridge on the main branch of the West River which indicates the fish per 100m^2 captured during time of surveying from 2019 to 2021.

W-Main4: Cudmores

Electrofishing surveys began on the Cudmores section of the West River in 2018. Since then, it has been surveyed every year. Brook trout and rainbow trout densities appear to be relatively constant. Atlantic salmon populations have been consistently very low in this section, this likely has to do with poor juvenile rearing habitat, low redd numbers in the area, and unfavorable spawning substrate. Total salmonid densities in the area range from 55 to 118 fish per 100m^2. Fish densities were at their highest in 2022 since the site was surveyed in 2018.

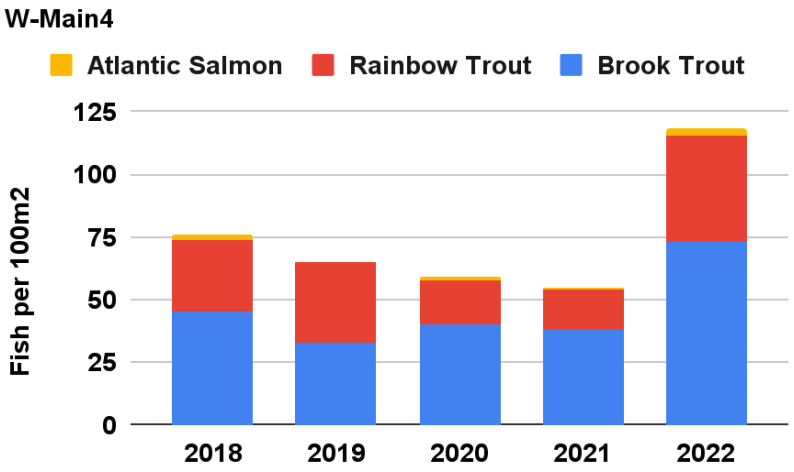

Figure 6. Electrofishing site located below the Mckenna Rd on the Cudmore's property on the main branch of the West River which indicates the fish per 100m^2 captured during time of surveying from 2018 to 2022.

W-Main5: Above Skye Brook Main Branch

Immediately upstream of Skye Brook entrance, the area has been surveyed since 2010. Atlantic salmon fry detected are naturally recurring, parr detected may have migrated from upstream sections that have been stocked since 2015. Brook trout densities have remained constant, rainbow trout have varied over the years. Total salmonid densities at this site span from 23.8 to 93.62 fish per 100m^2. Fish densities were at their lowest since 2015 in 2022. This is likely related to the frequent runoff events from the Canada Games construction site at the Brookvale Ski Park in the fall of 2021 and spring of 2022. This resulted in a

massive amount of sediment put into the streams during the spawning season and was assumed to significantly impact the spawning success in fall of 2021/spring 2022.

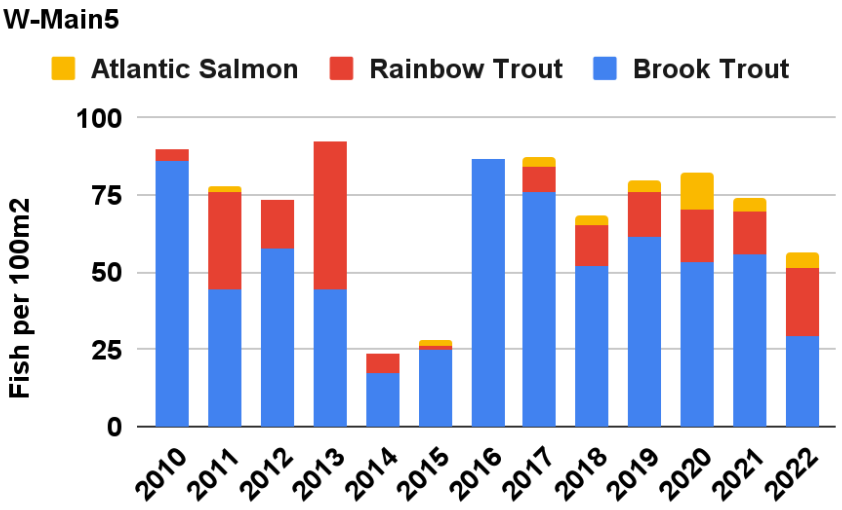

Figure 7. Electrofishing site located above the junction of Skye Brook on the main branch of the West River which indicates the fish per 100m^2 captured during time of surveying from 2010 to 2022.

W-Main6: Below Brookvale Hatchery

This site is located 200m below Ocean Trout Farms hatchery. The hatchery is an environmental concern for CQWF so it has been monitored since 2019. Brook and rainbow trout populations have been relatively constant since 2019, however, Atlantic salmon juveniles have been declining. The site has been influenced by stocking and the decline of Atlantic salmon could be the result of redd placement in past years. Total salmonid densities at this site range from 47.9 to 98.08 fish per 100m^2. Fish densities were at their lowest since 2022 since the site was began being surveyed since 2019. This is likely related to the frequent runoff events from the Canada Games construction site at the Brookvale Ski Park in the fall of 2021 and spring of 2022. This resulted in a massive amount of sediment put into the streams during the spawning season and was assumed to have significantly impact the spawning success in fall of 2021/spring 2022.

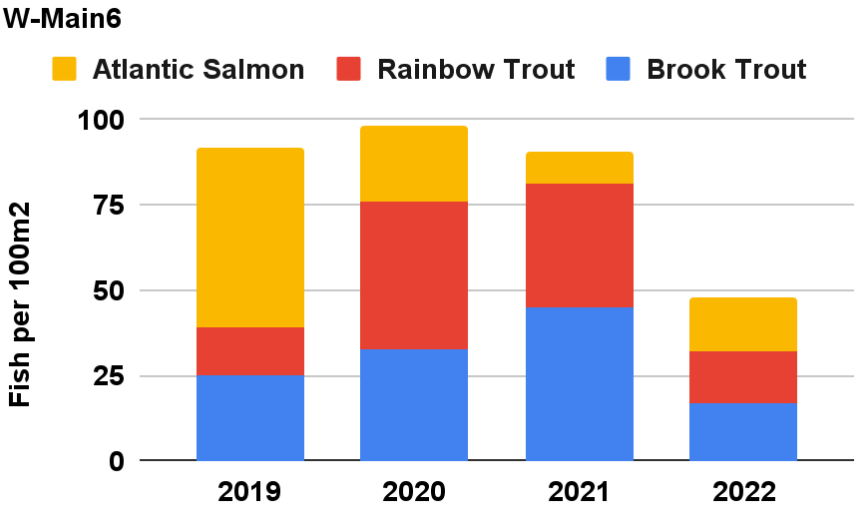

Figure 8. Electrofishing site located below the hatchery in Brookvale on the main branch of the West River which indicates the fish per 100m^2 captured during time of surveying from 2019-2022.

W-Bvale1: Skye Brook

This site is located just above the entrance to the main river, below the Kingston Rd culvert. Atlantic salmon have been only detected in 2021 and in very low densities. Brook trout dominate the area, this is credited to habitat as it contains slower flows and abundant woody debris. Rainbow trout populations do appear to be on the rise as recent years have shown. Total salmonid densities range from 29.4 to 97.94 fish per 100m^2. Although the total fish density was lower than 2021 the rainbow trout densities were at the highest since the site was began being surveyed in 2012.

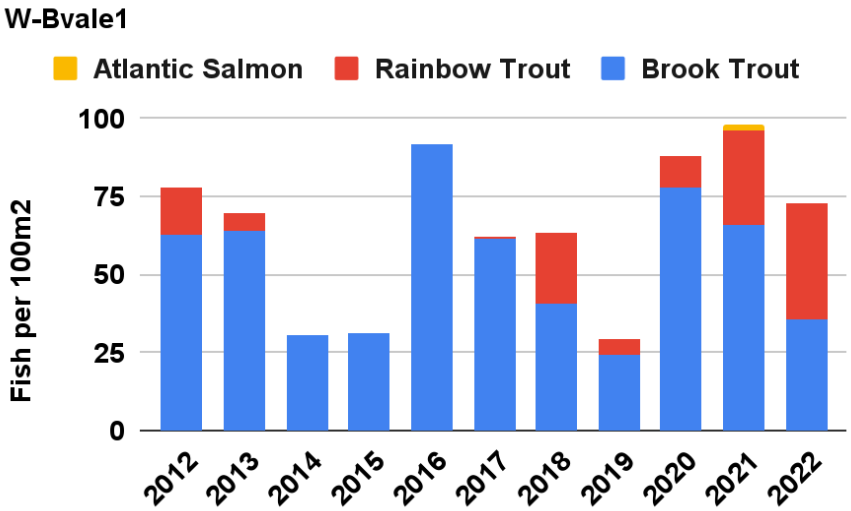

Figure 9. Electrofishing site located on Skye Brook which indicates the fish per 100m^2 captured during time of surveying from 2012-2022.

W-Bvale2: Curley's Property

The main branch of the West River in Brookvale above Curley's bypass pond has been surveyed since 2012. CQWF began restoration efforts along this section in 2010, the seven-year stream restoration cycle is apparent. The site was moved once due to the formation of a pool for accuracy reasons in 2018. The section is very heavily influenced by stocking, but the significant increase in 2020 is due to redds found in the year prior. Overall, the increasing trend of salmonid densities at this site can be attributed to the intensive restoration efforts carried out by CQWF which started in 2010. Since 2010 the total fish per 100m^2 have ranged from 37.5 to 231.4. There were no significant difference in 2022 and 2021 in fish densities.

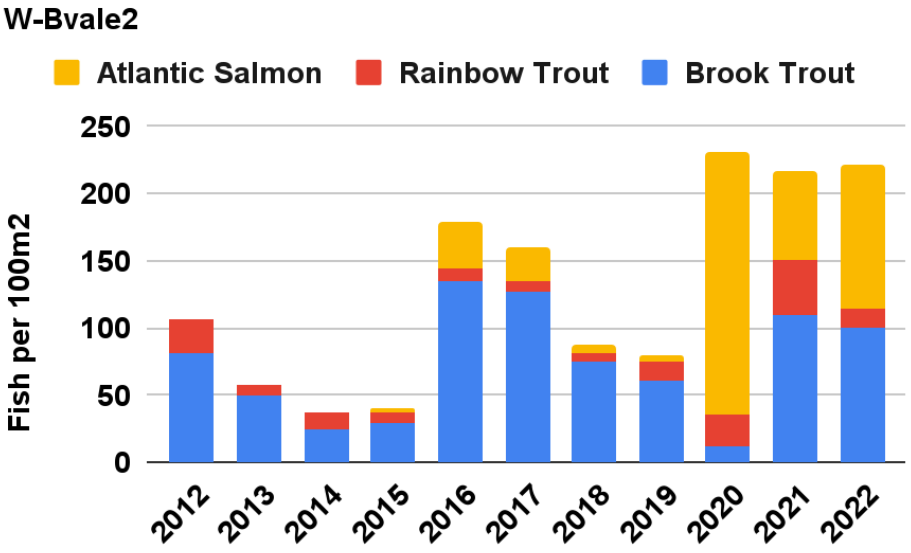

Figure 10. Electrofishing site located at the Curley's property in Brookvale which indicates the fish per 100m^2 captured during time of surveying from 2012 to 2022.

W-Bvale3: Patty Arsenaults

Main river headwaters in Brookvale above Patty Aresenaults. The site has been surveyed since 2015. The area was not surveyed in 2018 due to time constraints. The Atlantic salmon populations present are very heavily influenced by stocking. Brook trout populations have been rather constant with Atlantic salmon. Rainbow trout are present but in varying amounts. Total salmonid densities range from 59.1 to 192.9 fish per 100m^2. Overall fish

densities in this site were lower than recent years, most similar to 2015. Reasons for this is unknown.

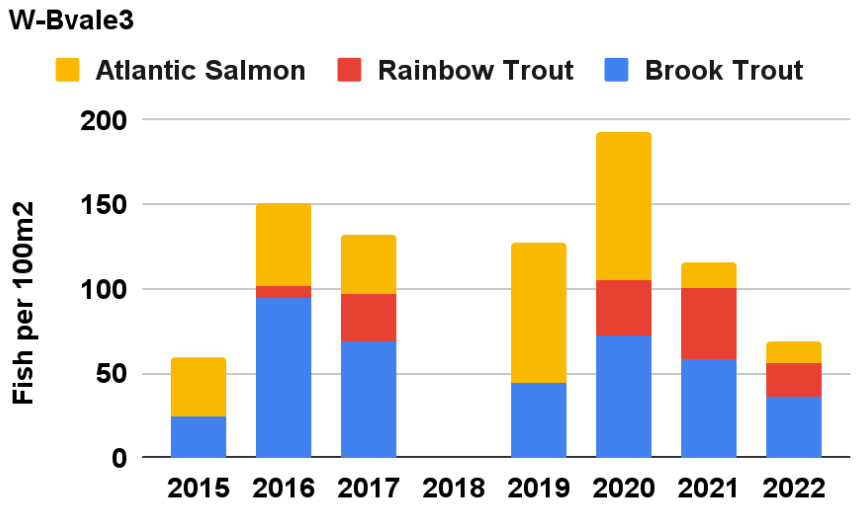

Figure 11. Electrofishing site located at Patty A. property in Brookvale which indicates the fish per 100m^2 captured during time of surveying from 2015 to 2022 (2018 data is missing).

W-Quinns1: Quinn's Brook Below Carragher's Pond

The Carragher's site has been being surveyed since 2004 and is on Quinn's brook below Westwood Hills Estates. Rainbow trout densities have been increasing as brook trout populations decline. Salmon appeared in 2011 for the first time since being surveyed, it is assumed that there were redds in 2010. The increase of salmon in 2020 is stocked fish from the Abegweit Fish Friends program. Total salmonid densities at this site have ranged from 81.2 to 230.6 fish per 100m^2.

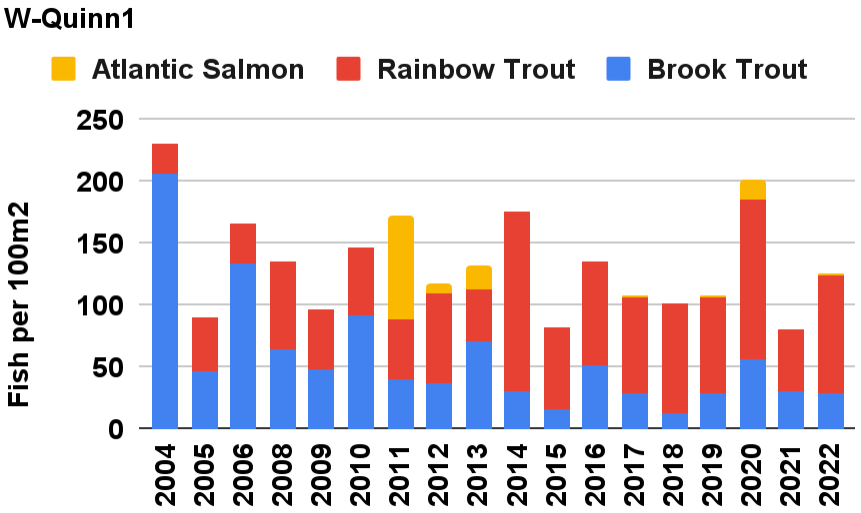

Figure 12. Electrofishing site located below Carragher's Pond on Quinn's Brook which indicates the fish per 100m^2 captured during time of surveying from 2004 to 2022.

W-Howells1: Howell's Brook Below Riverdale Rd

Just downstream of the culvert on the Riverdale Rd. This area has been surveyed since 2004. The site has moderately low salmon densities but they remain consistent. Atlantic salmon populations are heavily influenced by fry stocking. Brook trout populations appear to be declining slowly as rainbow trout densities have been on the rise. This site was relocated downstream 100m in 2020 to better represent local habitat features. Salmonid densities range from 30.2 to 168.9 fish per 100m^2 in the area.

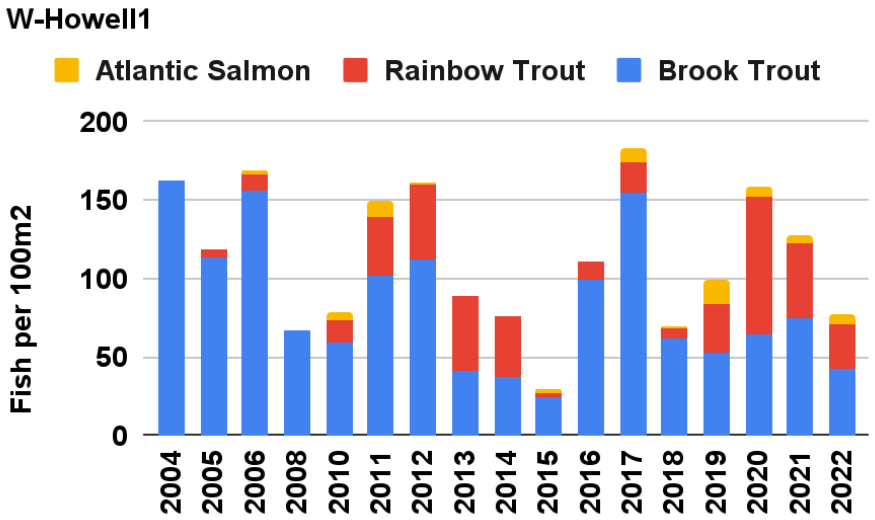

Figure 13. Electrofishing site located below Riverdale Rd on Howell's Brook which indicates the fish per 100m^2 captured during time of surveying from 2004 to 2022.

W-Howells2: Howell's Brook at MacDonald's Property

The site is adjacent to Jeremy McDonalds field and has been surveyed since 2018. This reach of the stream was stocked with salmon in 2019 and also had an abundant number of Atlantic salmon redds recorded along this reach in fall of 2019. Salmonid densities have been rising over the years, this likely has to do intensive restoration efforts. Brook trout are in the most abundance followed by rainbow trout, then Atlantic salmon. Densities at this site range from 81.5 to 169.7 fish per 100m^2.

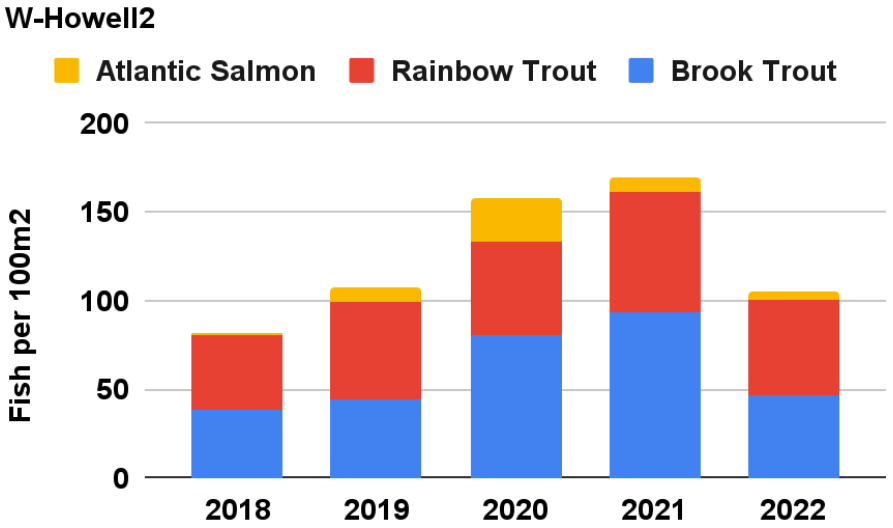

Figure 14. Electrofishing site located on Jeremy Macdonald's property on Howell's Brook which indicates the fish per 100m^2 captured during time of surveying from 2018 to 2022.

W-Howells3: Howell's Brook at Wynn Road

This site can be found just downstream of Wynn rd culvert, it has been surveyed since 2013 however no surveys were done in 2019 and 2020. Densities seem to vary over the years with brook trout being more abundant than rainbow trout other than in 2017. In comparison to the Quinn rd site upstream, trends seem to be very similar by year with a significant drop in densities in 2014 and 2015. Densities at the Wynn Rd site span from 18.5 to 156.1 fish per 100m^2.

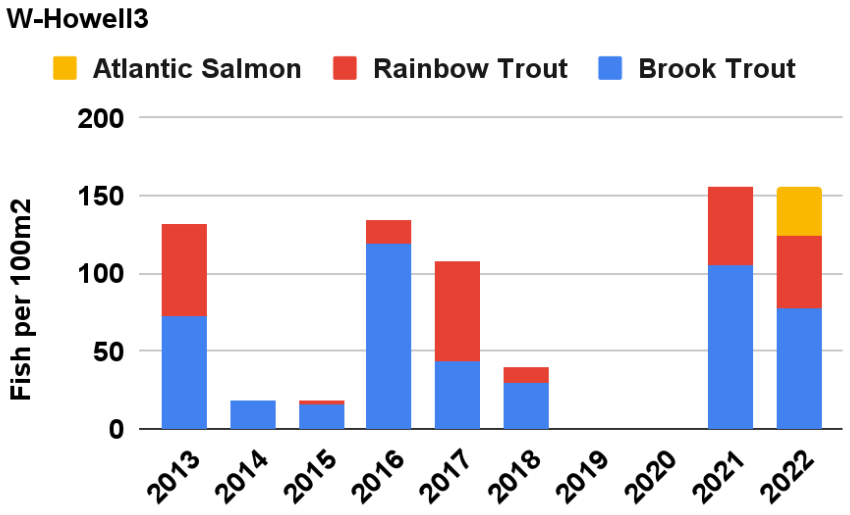

Figure 15. Electrofishing site located below the Wynn Rd on Howell's Brook which indicates the fish per 100m^2 captured during time of surveying from 2013 to 2022 (data missing from 2019 and 2020).

W-Howells4: Howells Brook at Quinn Road

Downstream of Quinn rd culvert, has been surveyed since 2015, however was not surveyed in 2019 or 2020. Density trends are very similar to those in the Wynn rd section downstream (as mentioned above). Brook trout are dominant at this site because the habitat is more suitable. There have not been any Atlantic salmon detected at this site. Population densities range from 37.2 to 120.2 fish per 100m^2.

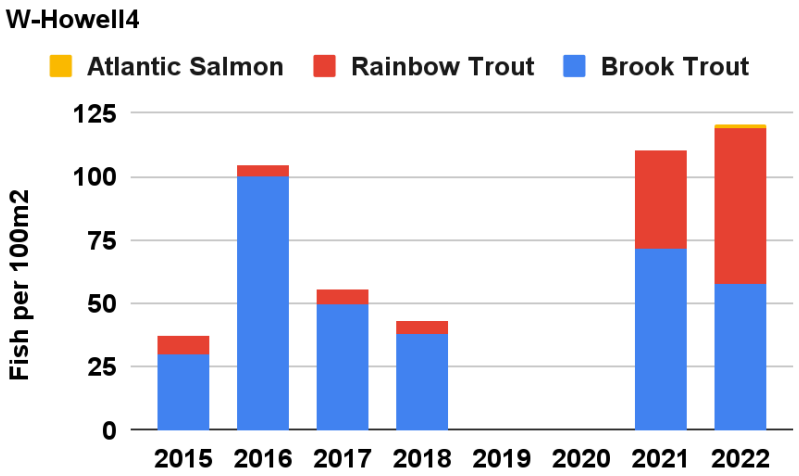

Figure 16. Electrofishing site located below the Quinn Rd on Howell's Brook which indicates the fish per 100m^2 captured during time of surveying from 2013 to 2022 (data missing from 2019 and 2020).

C-Main1: Dixons Dam at Clyde River

Located on the Clyde River, near the head of tide and remnants of the mill. Not monitored in 2018 and 2019 due to a major dam removal project. This also very much altered the site so data 2020 and later is not constant with earlier data. Brook trout dominate the area. Fish densities range from 19.5 to 123.9 fish per 100m^2. It can be noted that the highest densities were in 2021 so we cannot relate that with data older than 2020 due to major habitat alterations from the dam removal project.

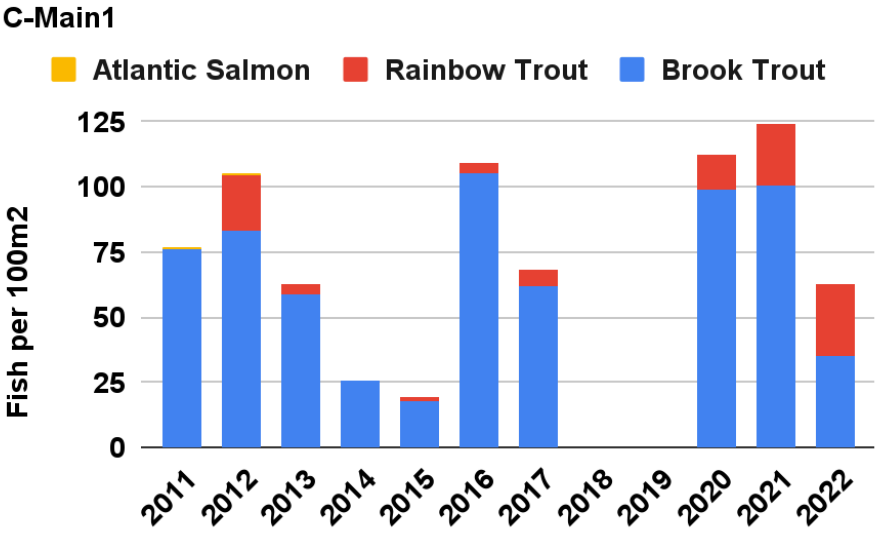

Figure 17. Electrofishing site located at the Dixon's property which indicates the fish per 100m^2 captured during time of surveying from 2011 to 2022 (data missing from 2018 and 2019).

C-Main2: Alex Dixon's at Clyde River

This site is located along the main branch of the Clyde River off the Bannockburn road, the site has been constant since 2011. The last Atlantic salmon detected was in 2012, this is the last evidence of salmon on the Clyde River. There was a major decline in densities from 2014 to 2015 for unknown reasons. Overall brook trout have been slightly more abundant than rainbow trout. The salmonid densities for the site range from 14 to 206.5 fish per 100m^2.

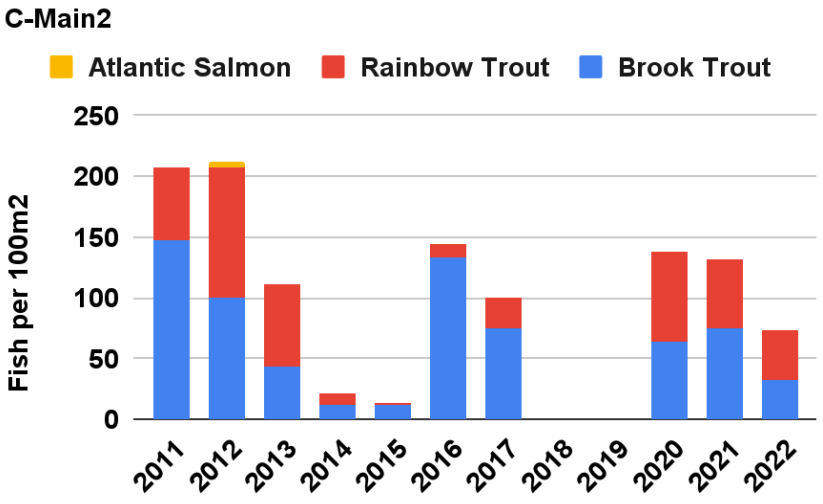

Figure 18. Electrofishing site located at the upper north end of the Dixon's property which indicates the fish per 100m^2 captured during time of surveying from 2011 to 2022 (data missing from 2018 and 2019).

UPEI Masters Study Sites

The following sites were surveyed in 2019-2020 for the purpose of a UPEI Master's study. These sites were identified as ideal Atlantic salmon habitat and originally six were surveyed. Since then three of those sites were continued to be monitored for index sites as they provide useful insight to monitoring Atlantic salmon juvenile populations that are not influenced by stocking efforts. The following Master's sites were chosen not to be contoured to be monitored due to poor access issues and/or poor habitat selection.

Masters-1: Riverdale Horseshoe

Data collected in 2019 and 2020 for UPEI Masters' research. This site has more rainbow trout than Atlantic salmon. Brook trout densities are low in comparison because the habitat is more suitable for salmon and rainbow trout. Salmon densities were lower slightly in 2020 than they were in 2019. Densities for both species of trout in the site remained rather constant. Salmonid densities in 2019 were 94.76 fish per 100m^{2}and 86.8 fish per 100m^2 in 2020. Due to difficult access, this site may not be surveyed on an annual basis.

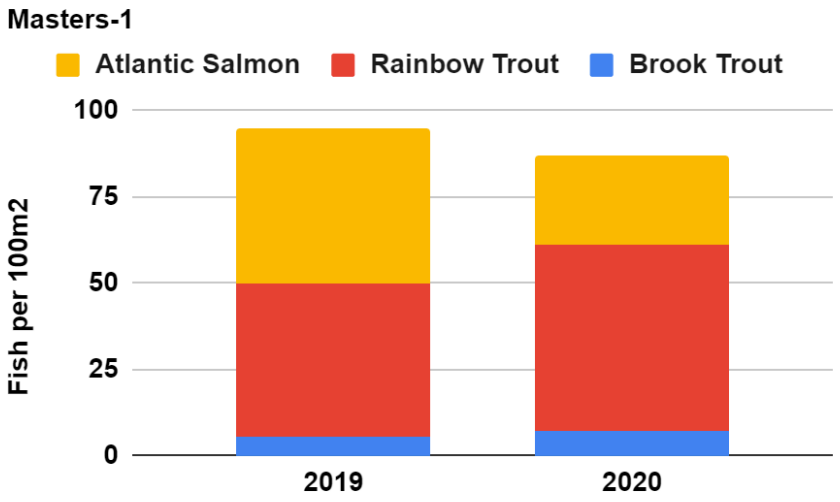

Figure 19. Electrofishing site located in the midst of the Riverdale "Horseshoe" which indicates the fish per 100m^2 captured during time of surveying from 2019 and 2020. This site was surveyed for the purpose of an UPEI Graduate study.

Masters-2: Above Clearcut

The site was surveyed in 2019 and 2020 for a UPEI Masters' study. The site is along the main branch of the West River, so it is a good indication of returning, native Atlantic salmon. Site densities remained fairly constant in both years. Atlantic salmon and rainbow trout decreased in 2020, however, brook trout densities increased. Densities in 2019 were 65.9 fish per 100m^2 and in 2020 densities were 69.1 fish per 100m^2.

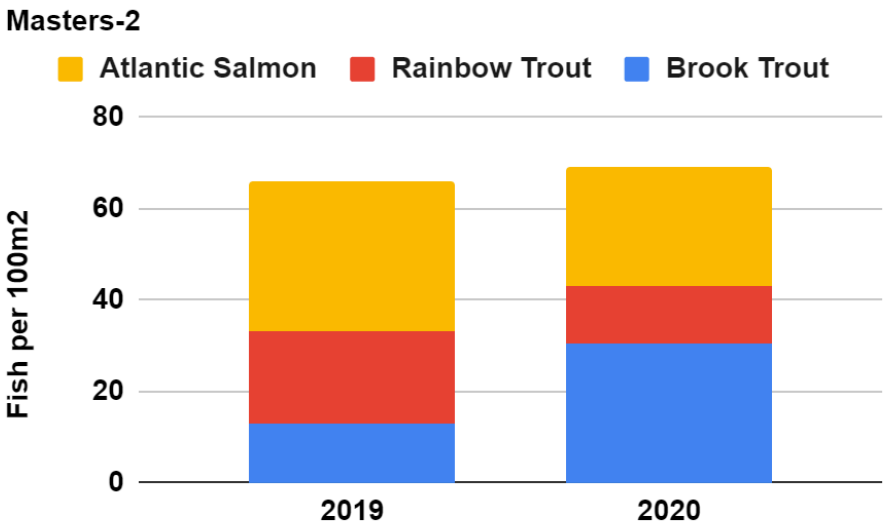

Figure 19. Electrofishing site located 200m above the "Clearcut" on the main West River which indicates the fish per 100m^2 captured during time of surveying from 2019 and 2020. This site was surveyed for the purpose of an UPEI Graduate study.

MASTERS Horseshoe

This site was surveyed during a UPEI Graduate study once in 2019 and not again in 2020 due to poor site selection. The main goal of surveying this site was to assess native juvenile Atlantic salmon populations. Salmonid densities were 30.4 fish per 100m^2 in 2019.

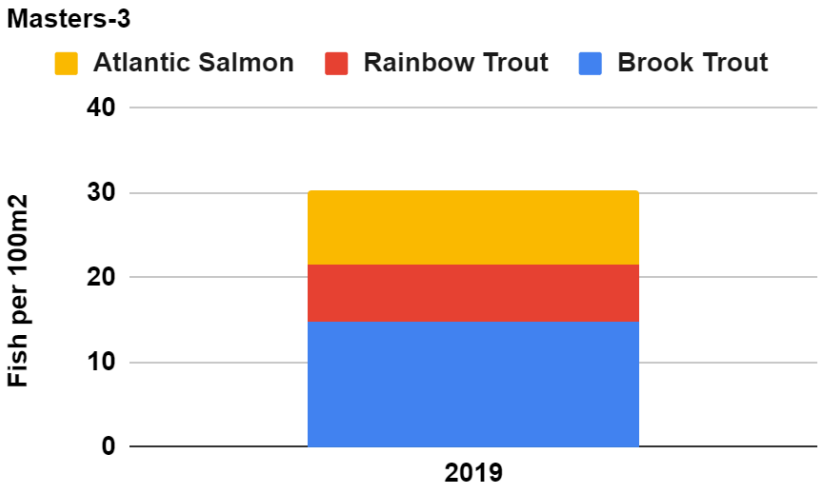

Figure 20. Electrofishing site located in the lower reaches of the Riverdale "Horseshoe' on the main West River which indicates the fish per 100m^2 captured during time of surveying in 2019. This site was surveyed for the purpose of an UPEI Graduate study.

Additional Sites

The additional sites is a section where sites that are rather insignificant are listed. Quality trend analysis is not possible for these sites. This is either due to the data being old and irrelevant; the sites not being surveyed for long enough, or the location of the site is unknown.

Table 3. The description and reasoning of old, additional electrofishing sites that are no longer visited.

Site Name	Description and Reasoning
Ross Rd Tributary (Brookvale)	The site was surveyed in 2019, it will not be surveyed again for the foreseeable future. Was monitored to analyze the population of stocked salmon.
Old Cudmores (main West River)	The site was surveyed in 2007, 2008, and 2009. Has since been replaced by a new cudmores site.
Baltic Rd (Clyde River West branch)	The area was surveyed in 2015 and 2016. Was collected as baseline data in the early stages of restoration. Site may be revisited in coming years.
Beer site (Clyde River West branch)	This site was surveyed once in 2014 and could possibly be revisited in the future to gauge the success of restoration. The site is on the West branch of the Clyde River.
Waller Site (Clyde River West branch)	Surveys were done once in 2016 to gauge restoration success. The site is on the west branch of the Clyde. Possibly to be revisited in the future.

Vermunts (Clyde River West branch)	The site is on the west branch of the Clyde River. Was surveyed once in 2016, possibly to be revisited.
Black Brook (West River tributary)	The site surveyed in 2014, has not been surveyed since. Is on the West River but the exact location of the site is unknown.
Gass Brook (West River tributary)	This site is found below Mckenna rd. Surveyed in 2014 and not since. Site will not be revisited for the foreseeable future.
McCardles (West River main branch)	The site is in the Green Bay region of the West River, surveyed in 2010 not since. It is unknown exactly where the site is.
Below Rte 13 (West River main branch)	Site in brookvale and was surveyed in 2016, the exact location of the site is unknown so it will not be revisited.

Recommendations

In the future when collecting and analyzing electrofishing data, some things should be considered. It is important that the index sites along the main branch of the West River continue to be surveyed (above and below Bolger Park rd and Howell's Junction). Data from these sites is essential in monitoring the natural spawning success of native Atlantic Salmon. The data collected can also be used in order to confirm the accuracy of redd counts in years prior. Sites should remain as constant as possible, however, sometimes they need to be changed. When a site is changed, it should be clearly noted so that in future reports, this can be acknowledged and the accuracy of the data presented is not compromised. It would also be productive to establish more sites on the Clyde River to better understand that system. The pond basin area of the Clyde would be a good starting point.