

## Truax Dam Removal Monitoring on the Saugeen River - 2020 Update Report -

In a partnership between Bruce Power, the Lake Huron Fishing Club and the Municipality of Brockton, and with expert direction from GSS Engineering Consultants Ltd., the century-old Truax Dam in the Town of Walkerton, ON was successfully removed in 2019, thereby reducing safety concerns with the ageing structure and eliminating a major barrier to fish passage in the Saugeen River (Figure 1). Although the dam had a fishway that allowed some migrating salmonids to pass under specific flow conditions, the large concrete structure was impassible by other community fish species. Opening up the Saugeen River at Walkerton will provide fish the opportunity to access high-quality upstream habitat. For trout and salmon species that migrate up the Saugeen each fall and spring, they will not be delayed or blocked any longer by the dam and they will not suffer physical stress and injury from repeatedly trying to jump over the tall concrete barrier.

Scientists from Bruce Power and Biotactic Inc. teamed up with support from Golder Associates to design a Before-After-Control-Impact (BACI) study of the Truax Dam removal to monitor the effects of this dam removal and to quantify the environmental benefits to the Saugeen River fishery. Twenty-two sampling locations were established throughout the Saugeen River watershed (Figure 2), and two years of baseline data were collected in 2018 & 2019 before the dam was removed. A high-level summary of these data is shown here in the following pages.

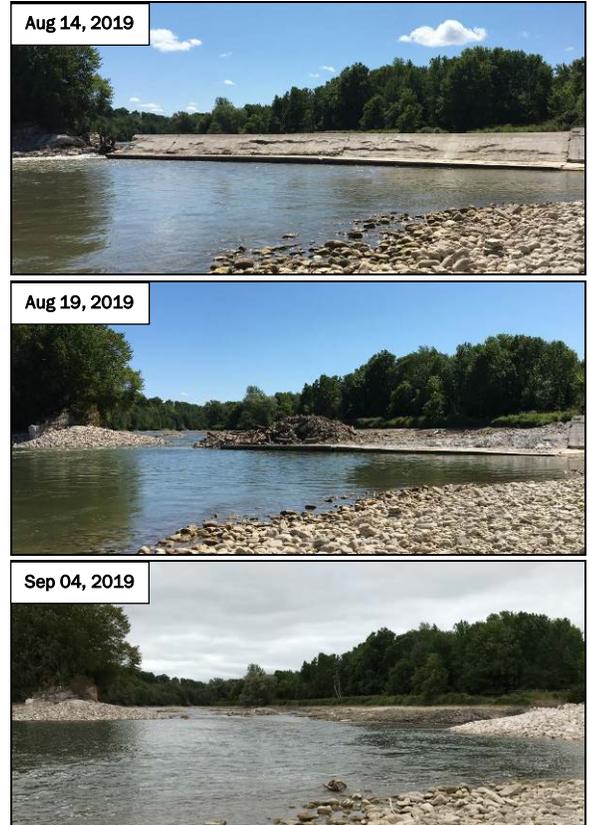
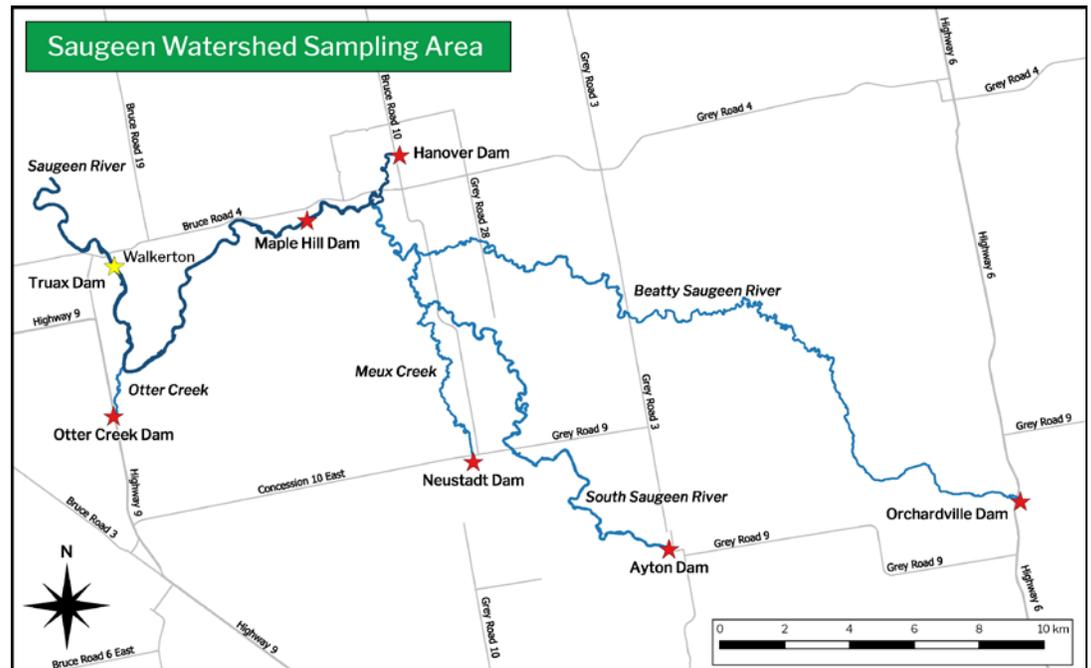
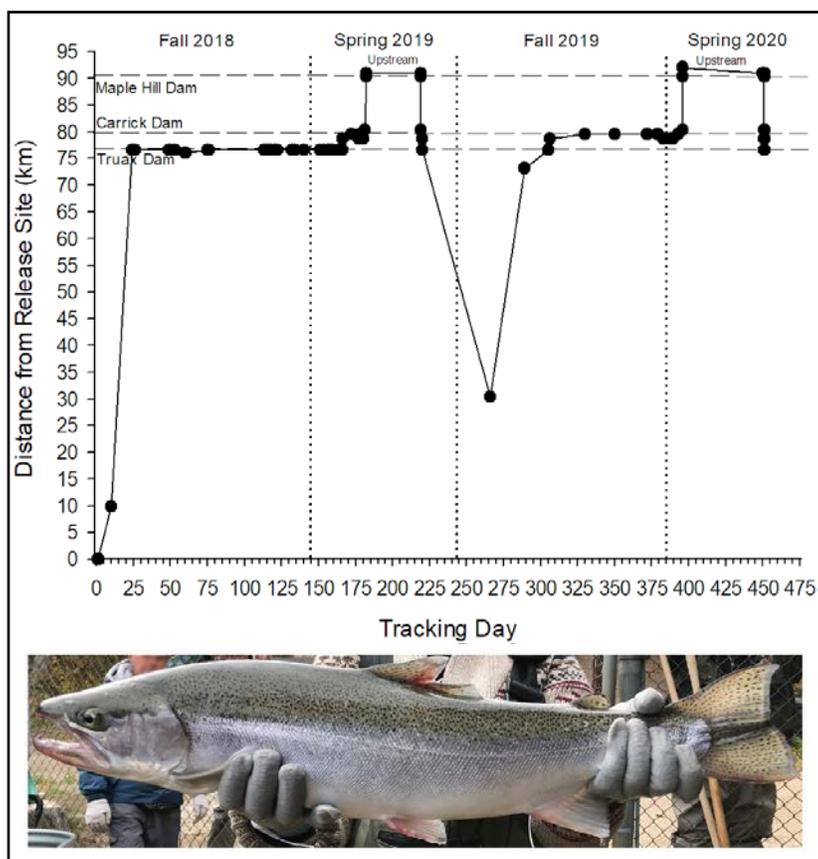


Figure 1 – Truax Dam, Walkerton, ON. The original wooden dam was built in 1852 and later replaced by the concrete structure shown above in 1919. The dam posed a significant barrier to fish passage for more than a century before it was removed in the summer of 2019 over the course of 3 weeks.

Figure 2 – Twenty-two long-term monitoring sites are located in the Saugeen (upstream & downstream of the former Truax Dam) and within the South Saugeen & Beatty Saugeen Rivers and Otter and Meux Creeks. Dams (red stars) are natural end-points of the study area as fish cannot pass upstream of these structures. Control sites with independent fish communities are located outside of the study area, upstream of the Hanover and Otter Creek dams. Monitoring is occurring over several years and includes electrofishing surveys to measure changes in fish biomass and production, habitat assessments, redd surveys to monitor changes in fish spawning, and underwater video and radio-telemetry studies to track fish passage throughout the watershed.



## Radiotelemetry – tracking the movement of Rainbow Trout in the Saugeen



Telemetry is an innovative way to track migration patterns of fish. It uses implanted radio transmitters and a series of receivers that pick up unique signals so that individual fish can be precisely geo-located. Biotactic Inc. specializes in these fish tracking techniques and partnered up with Bruce Power to better understand Rainbow Trout movement in the Saugeen River watershed as they migrate inland from Lake Huron each spring and fall. With the help of volunteers from the Ontario Steelheaders and the Lake Huron Fishing Club, 200 fish have been tagged and tracked to-date using fixed (stationary) receivers placed near the Truax, Carrick and Maple Hill dams and by mobile methods (airplane, automobile and by foot). These advanced techniques have revealed unprecedented information on the magnitude of passage and delay at the Truax Dam and upstream structures (Table 1).

The life history of Rainbow Trout is fascinating and wonderfully illustrated by Fish #99 that was tagged in fall 2018 and tracked for close to two years (Figure 3). This telemetry work is uncovering interconnections between hydrology and biology that drive successful migration of Rainbow Trout into tributaries of the upper Saugeen River watershed. Both river flow and temperature conditions vary throughout the year, and contribute to successful dam passage. Tracking results from the post-dam removal period combined with visual observations of fish during the migration windows show they are less fatigued migrating upstream now that they are able to pass freely through the former Truax Dam.

Figure 3 – Fish #99, a wild adult male Rainbow Trout was captured on Oct 16, 2018 at Denny’s Dam (km zero) and implanted with a radiotag before being released upstream to the Saugeen River. This fish travelled 77 km over 23 days to Walkerton’s Truax Dam, where it did not (or could not) pass any further until the following spring when it travelled upstream of the Truax, Carrick, and Maple Hill Dams and continued onward to spawning locations before migrating back downstream in late spring 2019. This fish was relocated in fall 2019 after the Truax Dam was removed and was observed to pass upstream of the former dam footprint but not upstream of Carrick Dam. In spring 2020 Fish #99 travelled upstream of Carrick and Maple Hill Dams and continued onward to spawning locations before migrating back downstream.

Table 1 – Radiotelemetry results collected in the spring & fall of 2018–2020. Tracking devices were implanted in adult Rainbow Trout captured at Denny’s Dam on Apr 22 & Oct 15-16, 2018 and Apr 26 & Oct 28, 2019. Fifty fish were implanted with radio-transmitters by Biotactic Inc., and followed over time using stationary, overland mobile, and aerial techniques. No fish were tagged in spring 2020 due to COVID-19 restrictions placed on field work.

Monitoring period		S'18	F'18		S'19		F'19				S'20	
Fish tracking group		S'18	S'18	F'18	S'18 & F'18	S'19	S'18, F'18, S'19	F'19	S'18, F'18, S'19	F'19	F'19	
Sample size (n)	(# fish tagged or remaining)	50	49	50	96	50	128	50	117	49		
	(# relocated)	43	14	43	54	44	25	46	8	37		
Denny's Dam	(# not migrating upstream)	10	6	4	9	12	15	21	4	4		
Truax Dam	(# arrived at Truax)	27	1	17	31	28	1	10	2	28		
	(# passed upstream)	17	0	3	22	17	1	7	1	26		
	(% passage)	63	0	18	71	61	100	70	50	93		
	(average delay, hrs)	23	-	193	186	31	1	5	12	1.5		
Carrick	(# arrived at Carrick)	17	-	2	22	17	1	7	2	29		
	(# passed upstream)	14	-	0	17	17	0	0	2	25		
	(% passage)	82	-	0	77	100	0	0	100	86		
Maple Hill Dam	(# arrived at Maple Hill)	13	-	-	13	12	-	-	2	20		
	(# passed upstream)	5	-	-	12	8	-	-	2	15		
	(% passage)	38	-	-	92	67	-	-	100	75		
Tributaries	(# relocated)	T-2, OC-2 BS-2	-	-	OC-3, BS-3 MC-1	OC-4, BS-1	-	T-1	-	OC-4, BS-3		
Harvested	(#)	1	-	3	1	4	3	1	1	1		

Abbreviations: S–spring; F–fall; T–Teeswater River; OC–Otter Creek; BS–Beatty Saugeen River; MC–Meux Creek.

## Fish Biomass – measuring changes in fish production after dam removal

Using well-established multi-pass electrofishing methods, Bruce Power and Biotactic Inc. are collecting key information about all fish species inhabiting the study area (Figure 2). Fish are collected each summer at 22 sampling locations and identified to the lowest taxon possible. Each one has its length and weight recorded and is then returned safely to the river after it is taxonomically identified. This information is used to calculate the total fish biomass present in the fish community. Changes in fish productivity from year to year will be used to assess the impact of the Truax Dam removal on the Saugeen River watershed. The net gain in fish biomass is being credited to Bruce Power as an Offset within its Fisheries Act Authorization.

Table 2 - Summary of baseline electrofishing surveys for each long-term monitoring site within the Saugeen River, including fish distribution and abundance for 2018 and 2019. Shading denotes species presence with dark grey indicating species presence in the site both years, light grey denotes presence in 2019 only, and black denotes presence in 2018 only.

Family	Species	Downstream Site			Upstream Sites			Sites		Control Sites	
		1	2	3	1	2	3	4	5	1	2
<b>Catostomidae</b>	Northern Hog Sucker										
	Redhorse Sp.										
	Shorthead Redhorse										
	White Sucker										
<b>Centrarchidae</b>	Largemouth Bass										
	Rock Bass										
	Smallmouth Bass										
<b>Cottidae</b>	Mottled Sculpin										
<b>Cyprinidae</b>	Blackchin Shiner										
	Blacknose Dace										
	Blacknose Shiner										
	Bluntnose Minnow										
	Brassy Minnow										
	Central Stoneroller										
	Common Carp										
	Common Shiner										
	Creek Chub										
	Finescale Dace										
	Hornyhead Chub										
	Longnose Dace										
	River Chub										
	Rosyface Shiner										
	Spottail Shiner										
	Unidentified Sp.										
<b>Gasterosteidae</b>	Brook Stickleback										
<b>Ictaluridae</b>	Stonecat										
<b>Percidae</b>	Blackside Darter										
	Fantail Darter										
	Iowa Darter										
	Johnny Darter										
	Rainbow Darter										
	Unidentified Darters										
<b>Petromyzontidae</b>	N. Brook Lamprey										
<b>Salmonidae</b>	Brown Trout										
	Rainbow Trout										
<b>Umbridae</b>	Central Mudminnow										
<b>Total # of fish</b>											
	2018	188	330	464	235	143	541	51	120	557	195
	2019	113	198	291	55	36	219	38	147	243	159

Table 3 – Summary of baseline electrofishing surveys for each long-term monitoring site within Saugeen River tributaries, including fish distribution and abundance for 2018 and 2019. Shading denotes species presence with dark grey indicating species presence in the site both years, light grey denotes presence in 2019 only, and black denotes presence in 2018 only.

Family	Species	Otter C.		Cont.	South Saugeen R.			Meux C.		Beatty Saugeen R.			Styx R. Cont.
		Sites 1	Sites 2		Sites 1	Sites 2	Sites 3	Sites 1	Sites 2	Sites 1	Sites 2	Sites 3	
<b>Catostomidae</b>	Northern Hog Sucker												
	White Sucker												
<b>Centrarchidae</b>	Largemouth Bass												
	Pumpkinseed												
	Rock Bass												
	Smallmouth Bass												
<b>Cottidae</b>	Mottled Sculpin												
<b>Cyprinidae</b>	Blackchin Shiner												
	Blacknose Dace												
	Blacknose Shiner												
	Bluntnose Minnow												
	Central Stoneroller												
	Common Shiner												
	Creek Chub												
	Hornyhead Chub												
	Longnose Dace												
	Mimic Shiner												
	N. Pearl Dace												
	N. Redbelly Dace												
	River Chub												
	Rosyface Shiner												
	Unidentified Sp.												
<b>Esocidae</b>	Northern Pike												
<b>Gasterosteidae</b>	Brook Stickleback												
<b>Ictaluridae</b>	Brown Bullhead												
	Stoneyhead												
<b>Percidae</b>	Blackside Darter												
	Fantail Darter												
	Iowa Darter												
	Johnny Darter												
	Rainbow Darter												
<b>Petromyzontidae</b>	N. Brook Lamprey												
<b>Salmonidae</b>	Brook Trout												
	Brown Trout												
	Chinook Salmon												
	Rainbow Trout												
	Trout Sp.												
<b>Umbridae</b>	Central Mudminnow												
<b>Total # of fish</b>	2018	651	307	283	367	204	267	227	586	164	300	654	280
	2019	539	592	313	216	258	282	165	540	74	181	512	174

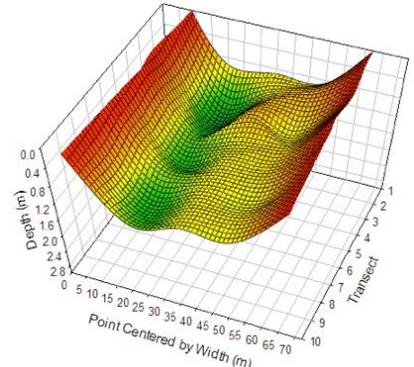
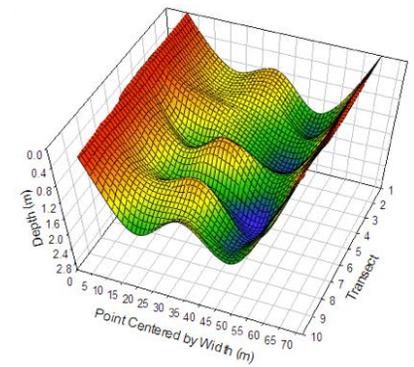
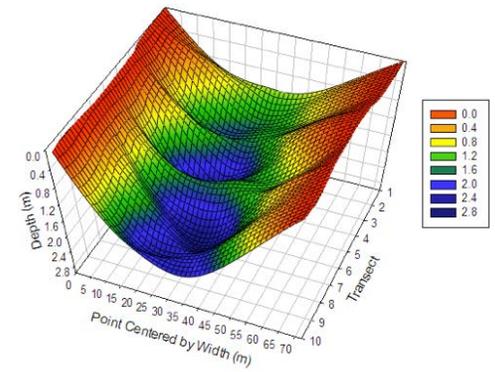


Figure 4 – Habitat assessments are done at each location to characterize the type and quality of fish habitat present and to link that information to the presence and abundance of fish inhabiting the area. Assessments at locations near the former Truax Dam location are on-going to document changes in habitat that have occurred from the dam removal. Shown here are three-dimensional profiles of one location in the Saugeen River, which forms a part of the overall assessment of habitat.

## Underwater Video & Spawning Surveys

Underwater solar-powered motion-activated infrared cameras were installed to monitor fish movement at Otter Creek and the Maple Hill Dam (Table 4). This supporting information will help to monitor fish health, activity and habitat use at key times in the spring and fall, and it will be used along with telemetry data, redd surveys (Table 5), and quantitative measurements of fish production to understand the impacts of the Truax Dam removal.

Table 4 – Summary of underwater videography data collected 2018 to 2020 in the study area.

	Fall 2018		Spring 2019		Truax Dam Removed	Fall 2019	Spring 2020
	Otter Creek	Maple Hill Dam	Otter Creek	Maple Hill Dam		Otter Creek	Maple Hill Dam
Days of video captured (#)	9	14	18	9		9	15
Date range	Oct 24–Nov 12	Oct 16–29	May 8–28	May 8–31		Oct 29–Nov 14	Apr 24–May 8
Adult salmonids (#)	5	24	272	94		0	273
Juvenile salmonids (#)	29	0	186	16		39	17
Non-salmonids (#)	7	0	251	2		21	0
Unidentified fish (#)	0	0	78	12		4	0
Total (#)	41	24	787	124		64	290



Figure 5 – Adult Rainbow Trout moving upstream past the Maple Hill Dam camera as it exits the fishway on Oct 19, 2018 (left); Two healthy Rainbow Trout smolts entering Otter Creek from the Saugeen River on Nov 11, 2018 (right).

Table 5 – Summary of redd count data collected in 2018 and 2019 in the study area. Rainbow Trout redds were counted in the spring and Chinook Salmon redds were counted in the fall.

	Spring 2018			Fall 2018		Spring 2019			Truax Dam Removed	Fall 2019			Spring 2020	
	Otter Creek	Meux Creek	Beatty Saugeen	Otter Creek	Meux Creek	Otter Creek	Meux Creek	Beatty Saugeen		Saugeen River	Otter Creek	Meux Creek	Saugeen River	Otter Creek
Surveys completed (#)	4	3	–	5	4	7	3	–		2	4	3	4	5
Date range	May 1–May 23	Apr 30–May 25	Apr 6–May 25	Oct 12–Nov 30	Oct 5–Nov 12	Apr 24–Jun 7	Apr 8–May 14	Apr 8–May 24		Oct 15–Oct 29	Oct 15–Nov 26	Oct 21–Nov 15	Apr 24–May 21	Apr 24–Jun 1
Redds observed (#)	45	10	62	8	3	21	14	119		3	10	3	31	46
Avg size (m <sup>2</sup> )	2.3	2.3	–	1.8	1.0	1.1	0.8	–		2.3	1.7	0.4	12.4	1.6
Fish observed (on redds) (#)	79 (51)	4	19	31 (13)	1	46 (10)	5 (5)	18		11 (1)	7 (5)	0	33(24)	47(10)