Targeted sampling for Black Redhorse (*Moxostoma duquesnei*) in the Sauble River, Ontario, 2022

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ABSTRACT

Barnucz, J., White, C.J., Gáspárdy, R.C., Colm, J.E., and Drake, D.A.R. 2026. Targeted sampling for Black Redhorse (*Moxostoma duquesnei*) in the Sauble River, Ontario, 2022. Can. Data Rep. Fish. Aquat. Sci. 1469: vii + 22 p.

Targeted sampling for Black Redhorse (*Moxostoma duquesnei*), a species listed as Threatened under Canada's *Species at Risk Act*, was conducted on the Sauble River, Bruce Country, Ontario between 31 May and 16 June 2022. Sampling for Black Redhorse occurred upstream of Sauble Falls in wadeable habitats between the hamlets of Tara and Tolmie. A total of 15 sites were sampled (backpack electrofishing, nine sites; bag seine, six sites), focusing on areas suspected to contain catostomids. A total of 360 catostomids were captured including 347 White Sucker (*Catostomus commersonii*), 11 young-of-year suckers (*Catostomus* sp.), and two Greater Redhorse (*Moxostoma valenciennesi*); Black Redhorse was not detected. Incidentally, 125 Northern Sunfish (*Lepomis peltastes*), SARA-listed as Special Concern, were captured and ranged from 57–112 mm total length. Detailed habitat results are presented for all sites. Future targeted sampling for Black Redhorse may be warranted at wadeable and non-wadeable sites between Tolmie and Sauble Falls.

RÉSUMÉ

Barnucz, J., White, C.J., Gáspárdy, R.C., Colm, J.E., and Drake, D.A.R. 2026. Targeted sampling for Black Redhorse (*Moxostoma duquesnei*) in the Sauble River, Ontario, 2022. Can. Data Rep. Fish. Aquat. Sci. 1469: vii + 22 p.

Un échantillonnage ciblé du chevalier noir (*Moxostoma duquesnei*), inscrit en tant qu'espèce menacée à la liste de la *Loi sur les espèces en péril* du Canada, a été effectué dans la rivière Sauble, dans le comté de Bruce (Ontario), entre le 31 mai et le 16 juin 2022. L'échantillonnage a été réalisé en amont des chutes Sauble, dans des habitats accessibles à gué entre les hameaux de Tara et de Tolmie. Au total, 15 sites ont été échantillonnés (pêche électrique avec dispositif portatif dans neuf sites; pêche à la senne dans six sites), et on s'est concentré sur les zones où l'on soupçonne la présence de catostomidés. Au total, 360 catostomidés ont été capturés, dont 347 meuniers noirs (*Catostomus commersonii*), 11 jeunes de l'année de diverses espèces de meuniers (*Catostomus* sp.) et deux chevaliers jaunes (*Moxostoma valenciennesi*); aucun chevalier noir n'a été détecté. Par ailleurs, 125 crapets du Nord (*Lepomis peltastes*), une espèce préoccupante inscrite sur la liste de la LEP, ont été capturés et mesuraient de 57 à 112 mm de longueur totale. Les résultats détaillés sur l'habitat sont présentés pour tous les sites. De futurs échantillonnages ciblés du chevalier noir pourraient être justifiés et avoir lieu dans des sites accessibles à gué, ou non, entre Tolmie et les chutes Sauble.

INTRODUCTION

Fisheries and Oceans Canada (DFO) has the responsibility to provide for the protection and recovery of fishes listed under the *Species at Risk Act* (SARA). To inform scientific aspects of the recovery process, DFO regularly conducts field sampling to satisfy several research objectives for SARA-listed fishes, such as evaluating the distribution and abundance of species, determining species–habitat relationships, and better understanding the influence of threats and recovery actions. DFO data reports are published to support the Species at Risk Program by providing an overview of field activities and to provide a medium for archiving data associated with the sampling of SARA-listed fishes and their habitat.

This data report summarizes targeted field sampling by DFO in 2022 to evaluate the distribution of Black Redhorse (*Moxostoma duquesnei*) in the Sauble River, Bruce County, Ontario. Black Redhorse is a large sucker species (family: Catostomidae) listed as Threatened under SARA. Within Canada, Black Redhorse is found in the Lake St. Clair, Lake Erie, and Lake Huron drainages with extant populations in the Sauble River, Saugeen River, Maitland River, Bayfield River, Ausable River, Grand River, Conestogo River, Nith River, North Thames River, and South Thames River (COSEWIC 2015). The earliest record of Black Redhorse collected in the Sauble River was from 1958 (COSEWIC 2015), with two Black Redhorse specimens identified but released (and therefore unconfirmed) on 28 July 1958 near Park Head Road and Sideroad 5, close to the confluence of Park Head Creek (E. Holm, ROM, pers. comm.). Black Redhorse was later detected in the Sauble River below Sauble Falls in 2014, 2016, and 2017 by the DFO Invasive Carp Program (formerly Asian Carp Program; Marson et. al 2016, Colm et. al. 2018, 2019).

In 2022, targeted sampling for Black Redhorse was undertaken by DFO to determine the distribution of this species in the Sauble River upstream of Sauble Falls.

METHODS

STUDY SYSTEM AND SITE SELECTION

Black Redhorse is known to undertake spawning migrations in the spring and to aggregate in pools downstream of the riffles where spawning occurs (COSEWIC 2015, Reid 2006). To focus sampling efforts and maximize the likelihood of detection, sampling for Black Redhorse occurred in the spring of 2022, targeting pool–riffle habitats that might support spawning aggregations of suckers, based on Reid (2006). Candidate sampling locations were preidentified using Google Earth satellite imagery dated May 2021 and included all road crossings from Sauble Falls upstream to Tara, as well as river segments between road crossings where riffle–pool habitats were visible on satellite imagery (Appendix 1). Field crews then scouted these 27 candidate locations on 30 May, 8 June, and 14 June to assess: 1) physical accessibility via public or private land and to obtain permission to access where required, 2) the presence of target habitat features, and 3) whether stream depth was suitable for wadeable sampling.

The majority of the land in the Sauble River watershed is privately owned and, due to time constraints, access via private land was not sought for the majority of candidate sites on private property. Therefore, DFO field crews primarily used public access points within municipal road allowances, conservation areas, and parks to access candidate locations. Five candidate sites were located within a 12 km stretch of the Sauble River from Sauble Falls upstream to Sideroad 15. This stretch was accessed by a downstream canoe float and scouted on 8 June by launching canoes via the road allowance at Sideroad 15 and taking out at the

Sauble Falls Conservation Area canoe launch. No wadeable target habitat was identified in this stretch under the high flow conditions encountered during scouting. The remaining 22 candidate sites were located upstream of Sideroad 15 and were scouted 30 May and 14 June. Eight candidate locations met all three selection criteria and sampling effort was focused in these locations with the exception of candidate location CL-12 where field crews determined that, though wadeable, sampling could not be conducted efficiently. DFO sampled 15 sites across the seven candidate locations (Figure 1).

FISH SAMPLING

In wadeable sites where water depth was less than 0.6 m, a dual backpack electrofishing (BPEF) approach similar to Reid (2006) was used with a Smith-Root® LR-24 unit. The dual BPEF approach used two BPEF units in tandem with three netters spread across the river moving in an upstream direction to herd and stun catostomids while minimizing the chance of escapement. An electrofishing site included all pool–riffle habitat that could be sampled continuously while moving upstream. Site dimensions and number of pool–riffle sequences per site was variable depending on site conditions. Electrofishing effort (seconds) and settings were recorded from both BPEF units at the end of each site and the total site area was approximated from the length and midpoint width of the total sampled habitat, measured using a measuring tape and/or laser rangefinder following fish collection. The BPEF site location was marked using a handheld GPS unit at the start (downstream) and stop (upstream) boundaries of the electrofished area. Where possible, only stunned suckers were netted for identification and enumeration. However, other fishes were netted where visibility was poor or netters were not confident in their immediate visual identification, and also where stunned fishes needed to be removed from the electrical field to recover where flow was not sufficient to move them away. Fishes were held in buckets of fresh river water carried by the BPEF operators until electrofishing efforts concluded and all captured fishes were placed in larger holding bins of river water for processing.

In wadeable sites where water depth exceeded BPEF requirements (0.6–1.1 m depth), a multi-pass seining approach was used, similar to Barnucz and Drake (2021), with three successive seine hauls fished over the same area using a 9.2 m x 1.8 m bag seine with 3 mm mesh. Seining effort was recorded in total hauls per site, where the site was defined as the area of target habitat sampled continuously by all three seine hauls. The total sampled area was approximated from the seining site dimensions (length and midpoint width) measured following fish sampling using a measuring tape and/or laser rangefinder. The seine site location was marked using a handheld GPS unit at the start (upstream) and stop (downstream) boundaries of the seined area. All fishes captured in the seine net were placed into large holding bins of fresh river water on shore, separated by seine haul, until seining was completed at the site.

ENUMERATION OF FISHES

Only fishes in the sucker family (Catostomidae) were intended to be processed while all other bycaught fishes were immediately released back into the sampling site (or immediately downstream if sampling was not yet concluded). However, field crews noticed that Northern Sunfish (*Lepomis peltastes*), SARA-listed as Special Concern, was also captured incidentally and therefore was also retained for processing. Suckers were identified to the lowest practical taxonomic resolution (typically species), enumerated, and the minimum and maximum total length (mm) was recorded at each site. Digital photo and/or physical specimen vouchers were taken for a subset of enumerated species at each site for species identification verification in the laboratory. Individual total length (mm) was measured for all Northern Sunfish.

HABITAT SAMPLING

Habitat sampling methods followed Barnucz and Drake (2021). Habitat sampling consisted of measuring several physical site and water quality parameters after fishes were processed and released. Stream width (m) (measured from bank to bank, perpendicular to the stream channel), site width (m), and site length (m) were measured with a Nikon™ Laser 1200S laser range finder. Sampling area (m^2) was approximated by multiplying sampling site width and sampling site length. Three representative stream depth (m) and water velocity (m/s) measurements were taken within the site using an OTT MF Pro™ water velocity meter. Surface water temperature (°C), conductivity (µS/cm), turbidity (NTU), pH, and dissolved oxygen (mg/L) were measured using a YSI™ EXO2 multiparameter sonde at the midpoint of the site. Water clarity (m) was measured using a 120 cm Fieldmaster™ turbidity tube. Air temperature (°C) was measured using a Kestrel™ 3000 wind meter. Substrate composition was assessed visually and by obtaining handfuls of bed material, and was classified approximately by median particle diameters based on the Bain (1999) modified Wentworth substrate classification: clay (< 0.004 mm), silt (0.004–0.06 mm), sand (0.06–2 mm), gravel (2–64 mm), cobble (64–256 mm), boulder (> 256 mm excluding bedrock), rubble (broken concrete or rip rap), and concrete (river or lake bottom consisting of a uniform human-made concrete surface). Bedrock and organic substrates were also assessed visually when present. Substrate was assessed over the entire sampled area of the site. Substrate was recorded as percent composition of each particle class. Site location (latitude, longitude) was determined using a Garmin™ Montana 600 handheld GPS unit. Aquatic macrophytes and riparian vegetation were described using a visual assessment within the area sampled. The coverage of four aquatic macrophyte classes (submerged, emergent, floating, or open water) were recorded as a percentage for each site. Similarly, the percent coverage was recorded for each riparian vegetation class (herbaceous, coniferous, deciduous, shrubs, or none) at each site.

SAMPLING PERMITS AND DATA ARCHIVING

Sampling was conducted under SARA Permit Number 22-PCAA-00016. Seining and backpack electrofishing were conducted under Standard Operating Protocols GWACC-116 and GWACC-111, approved by the DFO and Environment and Climate Change Canada Animal Care Committee (operated under approval of the Canadian Council on Animal Care). Data associated with the collections in this report are housed under the project code “2022-BRH-SR” in the Biodiversity Science database within the Great Lakes Laboratory for Fisheries and Aquatic Sciences. Every effort has been made to ensure the accuracy of data contained in this report; however, results may be updated as part of ongoing data verification procedures. Data associated with this report may be obtained by contacting the Great Lakes Laboratory for Fisheries and Aquatic Sciences.

RESULTS

FISH SAMPLING

A total of 15 sites were sampled across the seven candidate locations (Table 1, Appendix 1). Of these, nine were sampled using backpack electrofishing and six with seining (Figures 2–4). Total backpack electrofishing effort was 29,574 seconds across nine sites with a mean effort of 3,286 seconds per site (Table 2). Backpack electrofishing settings for each sampling site are summarized in Table 2. An example of sampling with dual electrofishing backpacks is shown in Figure 5. Total seining effort was 16 seine hauls across six sites (Table 3); sites 13 and 14 were limited to only two seine hauls each due to limited wadeable sampling area. Total sampling area for all backpack electrofishing sites was 16,380 m^2 with a mean sampling area of 1,820 m^2 per

site (Table 4). Total sampling area for seining sites was 2,165 m^2 with a mean sampling area of 361 m^2 per site (Table 4). The site of the 1958 (unconfirmed) detection of Black Redhorse was not sampled in 2022 due to water depth (candidate location CL-14; Appendix 1).

Pooled catch data across all sites and both gears totaled 360 catostomids, including 347 White Sucker (*Catostomus commersonii*), 11 young-of-year suckers (Catostomidae), and two Greater Redhorse (*Moxostoma valenciennesi*) (Table 5, Appendix 2). The two Greater Redhorse were captured at Site 14 with a seine net (Figure 6, Figure 7). Additionally, a total of 125 Northern Sunfish were captured at six of the 15 sampling sites: 57 by backpack electrofishing at four sites and 68 by seining at two sites (Table 6, Figure 8, Figure 9). Northern Sunfish total length ranged from 57–112 mm (mean: 79.9 mm) (Figure 10, Appendix 3).

HABITAT SAMPLING

Habitat measurements by sampling site are summarized in Tables 7–9. Across all sites, air temperature ranged from 12.6–33.5 °C (mean: 22.93 °C), water temperature ranged from 17.45–25.96 °C (mean: 21.64 °C), conductivity ranged from 346.7–517 µS/cm (mean: 472.81 µS/cm), dissolved oxygen ranged from 7.60–13.83 mg/L (mean: 10.05 mg/L), pH ranged from 7.97–8.24 (mean: 8.14), water clarity ranged from 0.61–1.15 m (mean: 0.84 m), and turbidity ranged from 0.96–10.35 NTU (mean: 3.72 NTU). Dissolved oxygen, pH, and turbidity were not recorded at Sites 12 and 13 due to equipment limitations with the YSI™ EXO2 multiparameter sonde. The mean depth ranged from 0.23–0.76 m with a grand mean of 0.47 m. The mean water velocity ranged from 0.04–0.39 m/s with a grand mean of 0.20 m/s. The dominant substrate class across all sites was cobble (11 sites) followed by bedrock (two sites) and silt (one site): cobble ranged from 5–70% (mean: 40.3%); boulder ranged from 5–40% (mean: 18.3%); gravel ranged from 5–25% (mean: 13.7%); sand ranged from 0–10% (mean: 5.3%); silt ranged from 0–75% (mean: 11%); bedrock ranged from 0–60% (mean: 10%); and organic ranged from 0–5% (mean: 1.3%). The dominant aquatic vegetation class was open water across all sites: open water ranged from 50–95% (mean: 74.7%); submerged vegetation ranged from 5–30% (mean: 14%); emergent vegetation ranged from 0–20% (mean: 9.3%); and floating vegetation ranged from 0–10% (mean: 2%). The dominant riparian vegetation class was herbaceous (14 sites) followed by shrubs (one site): herbaceous vegetation ranged from 40–95% (mean: 72.3%); deciduous vegetation ranged from 0–40% (mean: 13.7%); shrubs ranged from 0–45% (mean: 7.7%); coniferous vegetation ranged from 0–30% (mean: 4.7%); and, no vegetation ranged from 0–10% (mean: 1.7%).

Future targeted sampling for Black Redhorse may be warranted at sites between Tolmie and Sauble Falls, including the site of the 1958 (unconfirmed) detection that was not sampled in 2022 due to water depth.

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Table 1. *Sampling site locations and sampling gear (BPEF: backpack electrofishing, SN: seine net) for Black Redhorse in the Sauble River, Ontario (2022).*

Site ID	Field number	Sampling gear	Date	Latitude	Longitude	Narrative locality description
1	2022-BRH-SR-310522-001A	BPEF	31-May-22	44.48118	-81.14217	Tara Conservation Area, parkette off River Street
2	2022-BRH-SR-310522-002A	BPEF	31-May-22	44.47069	-81.14406	Tara Rotary Park
3	2022-BRH-SR-010622-001A	BPEF	01-Jun-22	44.53030	-81.18643	Sideroad 25N u/s of Allenford Bridge
4	2022-BRH-SR-010622-002A	BPEF	01-Jun-22	44.53161	-81.18579	Sideroad 25N u/s of Allenford Bridge
5	2022-BRH-SR-020622-001A	BPEF	02-Jun-22	44.53558	-81.18013	Allenford, d/s of Thomas Street Bridge. Access via historical plaque
6	2022-BRH-SR-070622-001A	SN	07-Jun-22	44.63057	-81.17704	Upstream of County Road 8 - Pools
7	2022-BRH-SR-070622-002A	BPEF	07-Jun-22	44.63161	-81.17734	Upstream of County Road 8 - Braid closest to road
8	2022-BRH-SR-070622-003A	BPEF	07-Jun-22	44.63391	-81.18587	Long stepwise riffle, d/s of Allenford Road, N of City Road 8
9	2022-BRH-SR-140622-001A	BPEF	14-Jun-22	44.63179	-81.17599	Upstream of County Road 8 - Braided channel
10	2022-BRH-SR-150622-001A	BPEF	15-Jun-22	44.63725	-81.19530	Everest Nursery - Braided channel
11	2022-BRH-SR-150622-002A	SN	15-Jun-22	44.63748	-81.19427	Everest Nursery - d/s-most deep side braid
12	2022-BRH-SR-150622-003A	SN	15-Jun-22	44.63715	-81.19348	Everest Nursery - Pool along east bank
13	2022-BRH-SR-160622-001A	SN	16-Jun-22	44.53550	-81.18033	Allenford, along Highway 21, u/s Thomas Street ~225m
14	2022-BRH-SR-160622-002A	SN	16-Jun-22	44.53038	-81.18647	Immediately u/s of Sideroad 25N - Pool on right bank
15	2022-BRH-SR-160622-003A	SN	16-Jun-22	44.53000	-81.18696	Immediately d/s of Sideroad 25N - Run and side pool on left bank

Table 2. *Summary of backpack electrofishing (BPEF) sampling effort and settings for Black Redhorse in the Sauble River, Ontario (2022).*

Site ID	BPEF1 effort (s)	BPEF2 effort (s)	Total effort (s)	Amps (A)	Voltage (V)	Pulse/sec (Hz)	Watts (W)
1	746	817	1563	0.29	134	60	40
2	621	659	1280	0.47	150	60	73
3	1286	1402	2688	0.44	152	60	74
4	3005	3132	6137	0.56	158	60	90
5	2026	1903	3929	0.48	172	60	85
7	1117	990	2107	0.32	165	60	57
8	1234	1315	2549	0.40	172	60	74
9	1333	1399	2732	0.50	172	60	89
10	3466	3123	6589	0.50	172	60	93

Table 3. *Summary of seining (SN) effort for Black Redhorse in the Sauble River, Ontario (2022).*

Site ID	Sampling gear	Effort (hauls)
6	SN	3
11	SN	3
12	SN	3
13	SN	2
14	SN	2
15	SN	3

Table 4. *Summary of sampling area for backpack electrofishing (BPEF) and seining (SN) for Black Redhorse in the Sauble River, Ontario (2022). Sampling width, length, and area rounded to nearest whole number.*

Site ID	Sampling gear	Sampling area width (m)	Sampling area length (m)	Total sampling area (m^2)
1	BPEF	11	70	735
2	BPEF	20	29	582
3	BPEF	15	65	982
4	BPEF	16	150	2430
5	BPEF	14	155	2217
6	SN	10	17	167
7	BPEF	10	85	850
8	BPEF	40	100	3980
9	BPEF	9	65	605
10	BPEF	20	200	4000
11	SN	15	44	660
12	SN	10	52	518
13	SN	6	70	420
14	SN	10	20	200
15	SN	10.0	20.0	200

Table 5. *Species identified and enumerated during sampling in the Sauble River, Ontario (2022). Target species included any member of the Catostomidae (sucker) family, with other SARA-listed species (Northern Sunfish) enumerated upon discovery. All non-target fishes were released without enumeration.*

Scientific name	Common name	Total
Catostomus commersonii	White Sucker	347
Catostomidae	Sucker sp. (juvenile)	11
Lepomis peltastes	Northern Sunfish	125
Moxostoma valenciennesi	Greater Redhorse	2
	Total fishes	**485**

Table 6. *Summary of Northern Sunfish (SARA: Special Concern) captured in the Sauble River, Ontario (2022) using backpack electrofishing (BPEF) and seining (SN).*

			Total length (mm)		
Site ID	Sampling gear	Total captured	Mean	Min	Max
3	BPEF	8	75.25	57	112
4	BPEF	18	78.72	60	108
5	BPEF	30	78.33	57	102
10	BPEF	1	100	100	100
14	SN	66	80.95	61	111
14	SN	2	85.5	67	104
Total		**125**	**79.9**	**57**	**112**

Table 7. *Summary of abiotic habitat conditions at each site sampled for Black Redhorse in the Sauble River, Ontario (2022). An asterisk (*) indicates a parameter was not measured.*

Site ID	Air temp. (°C)	Water temp. (°C)	Conductivity (µS/cm)	Dissolved oxygen (mg/L)	pH	Water clarity (m)	Turbidity (NTU)	Mean depth (m)	Mean water velocity (m/sec)
1	27.1	23.69	481.4	12.74	8.24	*	1.19	0.44	0.27
2	31.5	24.46	491.2	13.83	8.24	*	2.05	0.38	0.25
3	24.1	24.11	495.7	7.76	7.99	1.15	0.96	0.44	0.15
4	33.5	25.96	503.0	11.81	8.24	0.76	1.30	0.33	0.19
5	19.1	21.56	461.9	8.69	7.99	1.10	2.76	0.34	0.29
6	12.6	17.45	376.7	9.05	8.19	0.61	10.35	0.60	0.12
7	13.5	17.49	379.9	9.80	8.20	0.77	5.82	0.27	0.34
8	14.0	17.50	388.8	7.60	7.99	0.66	3.58	0.23	0.38
9	20.5	19.33	483.3	9.84	8.17	*	5.80	0.33	0.39
10	20.1	20.13	491.0	9.23	8.17	*	1.77	0.59	0.22
11	27.0	21.04	496.5	10.96	8.23	*	9.14	0.76	0.12
12	32.9	21.30	498.7	10.94	8.21	*	1.63	0.41	0.04
13	21.5	22.50	514.0	8.42	7.97	*	1.99	0.58	0.09
14	22.4	24.90	517.0	*	*	*	*	0.72	0.05
15	24.2	23.20	513.0	*	*	*	*	0.59	0.16
Min.	**12.6**	**17.45**	**376.7**	**7.60**	**7.97**	**0.61**	**0.96**	**0.23**	**0.04**
Mean	**22.9**	**21.64**	**472.8**	**10.05**	**8.14**	**0.84**	**3.72**	**0.47**	**0.20**
Max.	**33.5**	**25.96**	**517.0**	**13.83**	**8.24**	**1.15**	**10.35**	**0.76**	**0.39**

***Table 8**. Summary of substrate composition by percent type at each site sampled for Black Redhorse in the Sauble River, Ontario (2022).*

Site ID	Dominant substrate type	Organic	Clay	Silt	Sand	Gravel	Cobble	Boulder	Bedrock	Rubble	Concrete
1	Cobble	0	0	5	5	20	40	30	0	0	0
2	Cobble	0	0	5	5	20	40	30	0	0	0
3	Cobble	0	0	5	10	20	35	30	0	0	0
4	Cobble	0	0	5	5	20	50	20	0	0	0
5	Cobble	0	0	5	0	10	55	30	0	0	0
6	Cobble	0	0	10	10	5	60	15	0	0	0
7	Cobble	0	0	5	5	10	60	20	0	0	0
8	Bedrock	0	0	0	5	5	10	20	60	0	0
9	Cobble	0	0	5	0	15	70	10	0	0	0
10	Cobble	5	0	5	10	15	30	5	30	0	0
11	Cobble	5	0	15	10	10	50	10	0	0	0
12	Bedrock	0	0	5	5	5	20	5	60	0	0
13	Cobble	5	0	10	5	25	50	5	0	0	0
14	Silt	5	0	75	5	5	5	5	0	0	0
15	Boulder	0	0	10	0	20	30	40	0	0	0
Min.	**-**	**0**	**0**	**0**	**0**	**5**	**5**	**5**	**0**	**0**	**0**
Mean	**Cobble**	**1.3**	**0.0**	**11.0**	**5.3**	**13.7**	**40.3**	**18.3**	**10.0**	**0.0**	**0.0**
Max.	**-**	**5**	**0**	**75**	**10**	**25**	**70**	**40**	**60**	**0**	**0**

***Table 9.** Summary of aquatic and riparian vegetation by percent of each vegetation type present within areas sampled for Black Redhorse in the Sauble River, Ontario (2022).*

Site ID	Dominant aquatic vegetation type	Emergent	Floating	Submerged	Open water	Dominant riparian vegetation type	Deciduous	Coniferous	Herbaceous	Shrubs	None
1	Open water	5	0	20	75	Shrubs	10	5	40	45	0
2	Open water	10	0	20	70	Herbaceous	30	0	60	10	0
3	Open water	5	0	20	75	Herbaceous	15	0	70	15	0
4	Open water	10	0	20	70	Herbaceous	5	0	90	5	0
5	Open water	15	5	30	50	Herbaceous	20	0	65	15	0
6	Open water	5	0	5	90	Herbaceous	40	5	55	0	0
7	Open water	0	0	10	90	Herbaceous	20	5	75	0	0
8	Open water	15	0	20	65	Herbaceous	30	30	40	0	0
9	Open water	0	0	5	95	Herbaceous	20	20	55	0	5
10	Open water	20	5	15	60	Herbaceous	0	0	95	0	5
11	Open water	5	0	10	85	Herbaceous	5	0	85	5	5
12	Open water	5	0	10	85	Herbaceous	5	5	85	5	0
13	Open water	10	5	10	75	Herbaceous	0	0	95	5	0
14	Open water	20	10	10	60	Herbaceous	5	0	85	10	0
15	Open water	15	5	5	75	Herbaceous	0	0	90	0	10
Min.	**-**	**0**	**0**	**5**	**50**	**-**	**0**	**0**	**40**	**0**	**0**
Mean	**Open water**	**9.3**	**2.0**	**14.0**	**74.7**	**Herbaceous**	**13.7**	**4.7**	**72.3**	**7.7**	**1.7**
Max.	**-**	**20**	**10**	**30**	**95**	**-**	**40**	**30**	**95**	**45**	**10**

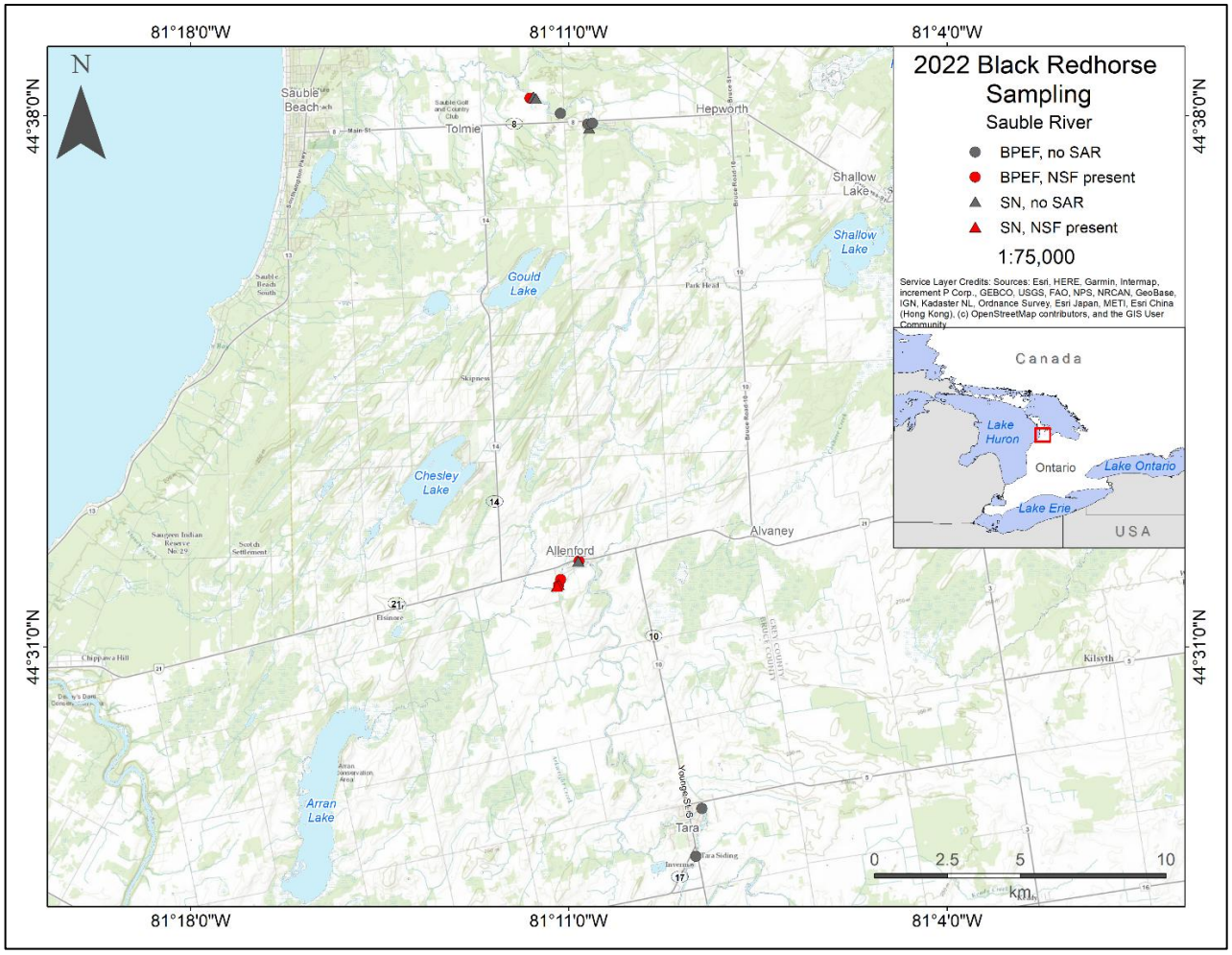


Figure 1. *Locations of Black Redhorse sampling (BPEF: backpack electrofishing, SN: seining) and Northern Sunfish (NSF) detections in the Sauble River, Ontario (2022).*

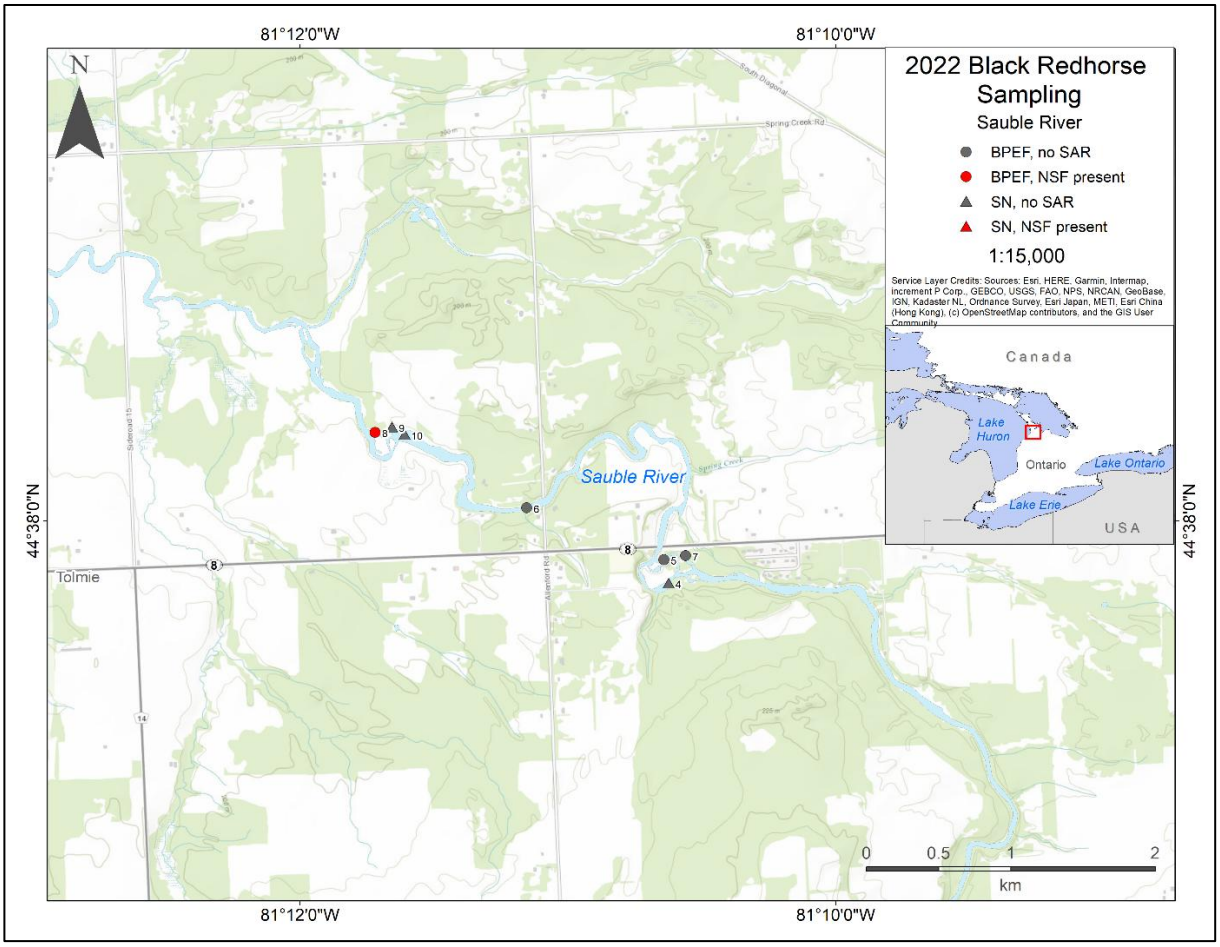


***Figure 2**. Locations of backpack electrofishing (BPEF) and seining (SN) sites for Black Redhorse in the Sauble River including incidental Northern Sunfish (NSF) detections within Reach 1 near Tolmie, Ontario (2022).*

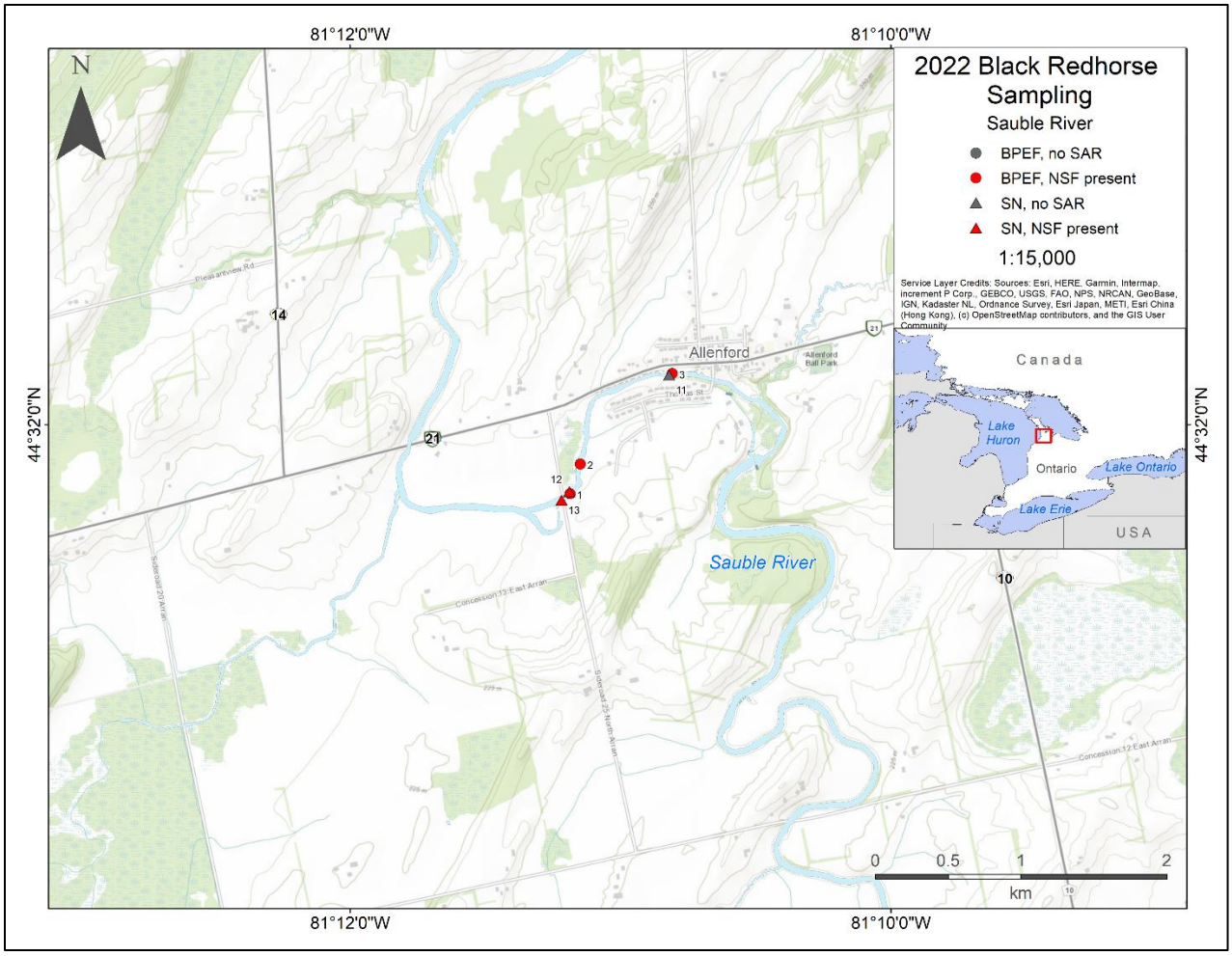


Figure 3. *Locations of backpack electrofishing (BPEF) and seining (SN) sites for Black Redhorse in the Sauble River including incidental Northern Sunfish (NSF) detections within Reach 2 near Allenford, Ontario (2022).*

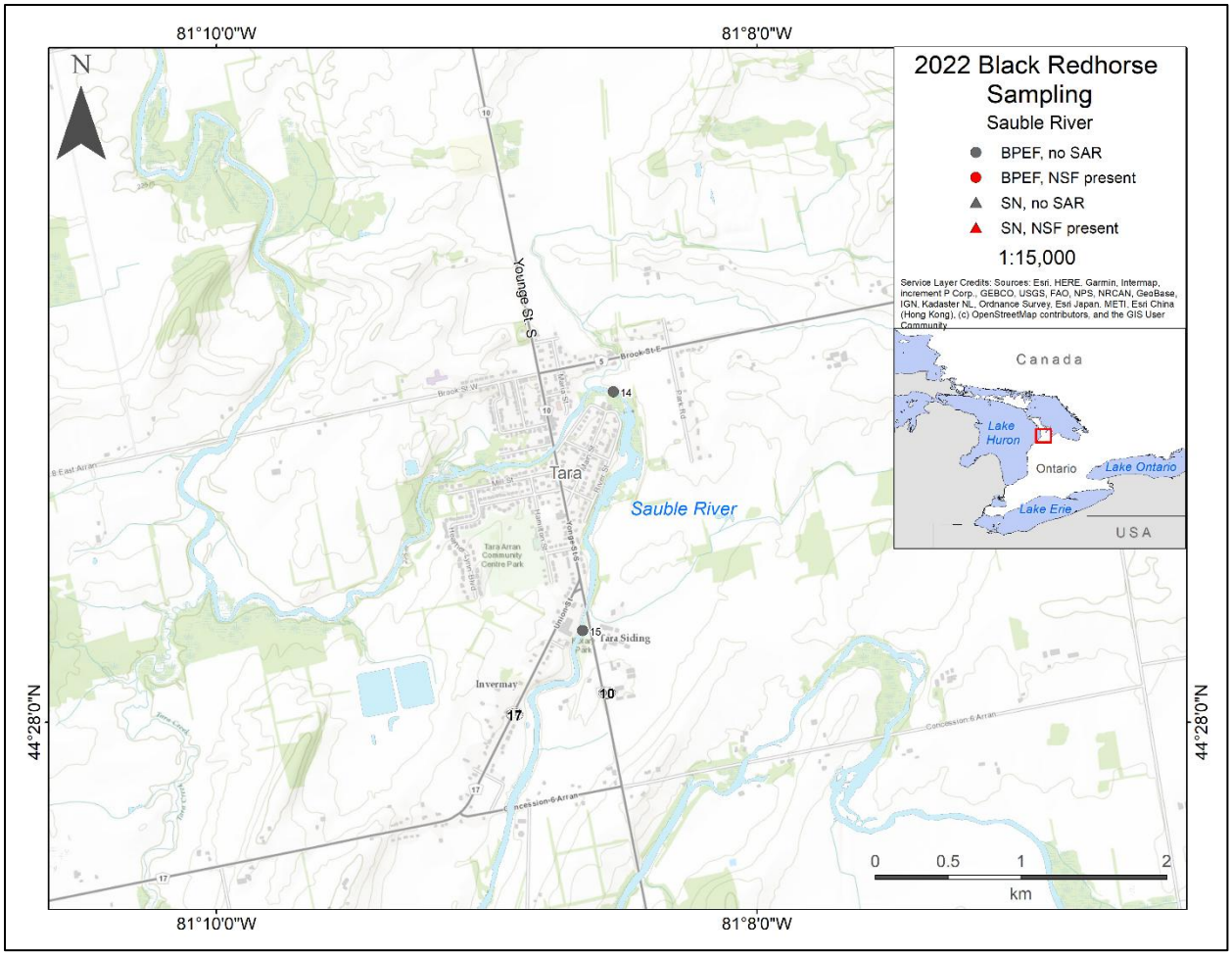


Figure 4. *Locations of backpack electrofishing (BPEF) and seining (SN) sites for Black Redhorse in the Sauble River including incidental Northern Sunfish (NSF) detections within Reach 3 near Tara, Ontario (2022).*



Figure 5. *Dual backpack electrofishing method showing two backpack electrofishers and three netters spread across the river width to herd and stun catostomids (Sauble River, Ontario, 2022).*



Figure 6. *Digital voucher photo of Greater Redhorse (92 mm and 101 mm total length) captured at Site 14 in the Sauble River, Ontario (2022).*



Figure 7. *Photo of Site 14 (2022-BRH-SR-160622-002A) in the Sauble River, Ontario (2022).*

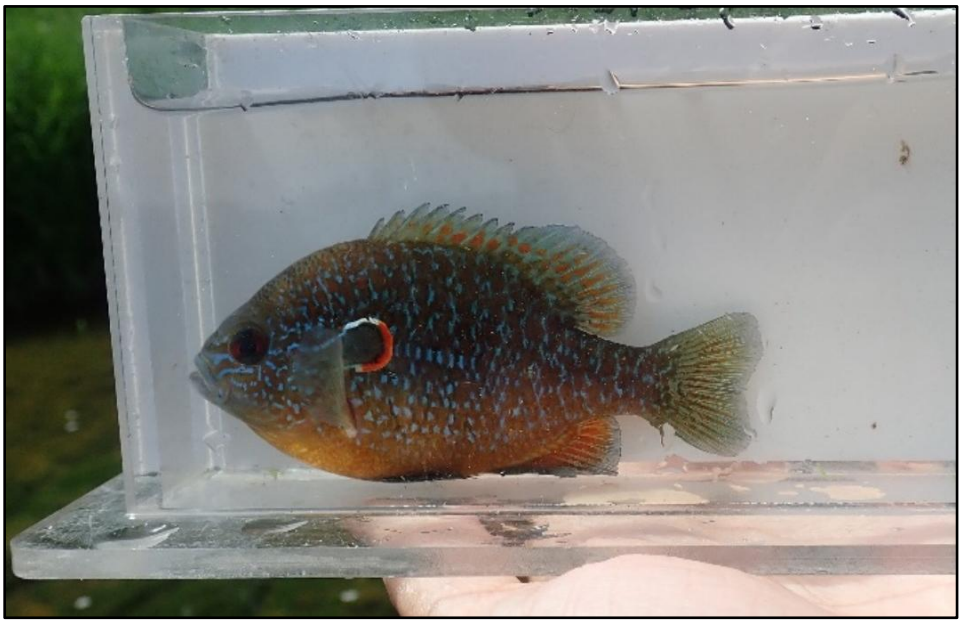


Figure 8. *Digital voucher photo of a Northern Sunfish (60 mm total length) captured at Site 5 (2022-BRH-SR-020622-001A) in the Sauble River, Ontario (2022).*



Figure 9. *Photo of Site 5 (2022-BRH-SR-020622-001A) in the Sauble River, Ontario (2022).*

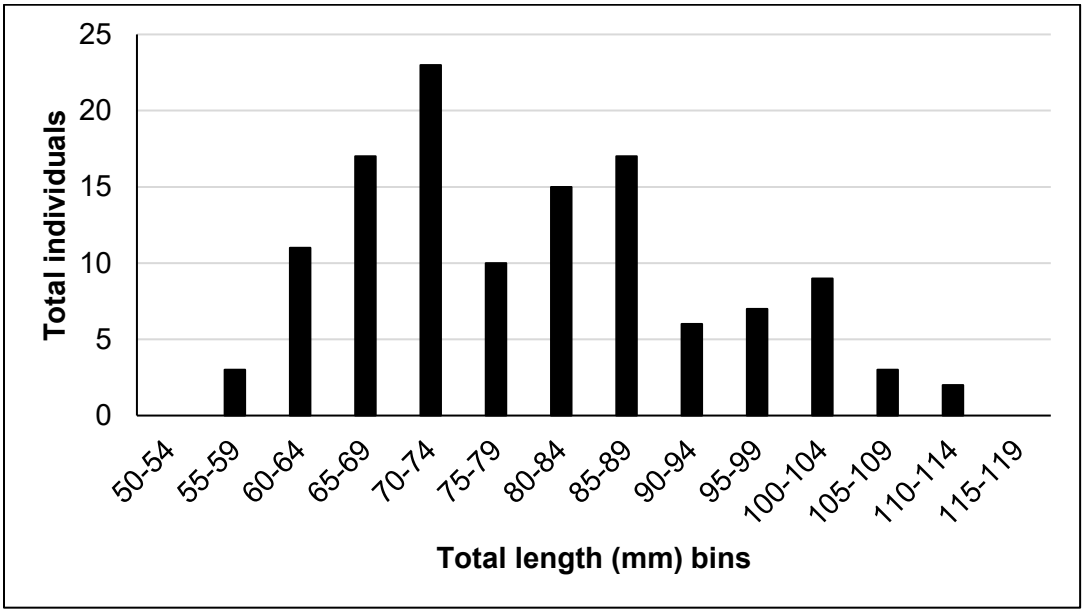


Figure 10. *Length–frequency distribution of Northern Sunfish captured in the Sauble River, Ontario (2022) (n=125).*

Appendix 1. *Description of preidentified candidate locations for Black Redhorse sampling in the Sauble River, Ontario, 2022. Scouting occurred on 30 May, 8 June, and 14 June to determine accessibility (public or private and whether landowner permission could be obtained if private), whether target habitat (riffle–pool habitat) was present, and whether the target habitat was wadeable.*

Candidate location (CL)	Candidate site type, description	Latitude	Longitude	Access	Accessible	Target habitat	Wadeable
CL-01	Road crossing: Sauble Falls canoe access	44.67733	-81.25621	Public (canoe launch)	YES	NO	-
CL-02	Riffle: ~2.3 km d/s Jewel Bridge Rd	44.65972	-81.25267	Public (canoe)	YES	NO	-
CL-03	Riffle: at Jewel Bridge	44.65248	-81.24590	Public (road allowance)	YES	YES	NO
CL-04	Riffle: ~3.2 km d/s Sideroad 15	44.64342	-81.23732	Public (canoe)	YES	NO	-
CL-05	Riffle: ~1.1 km d/s Sideroad 15	44.64134	-81.21711	Public (canoe)	YES	NO	-
CL-06	Road crossing: Sideroad 15	44.64522	-81.21102	Public (road allowance)	YES	NO	-
CL-07	Riffle: ~670 m u/s Sideroad 15	44.64291	-81.20621	Private (not requested)	NO	-	-
CL-08	Riffle: Everest Nurseries	44.63629	-81.19196	Private (requested)	YES	YES	YES
CL-09	Road crossing: Allenford Rd N	44.63417	-81.18493	Public (road allowance)	YES	YES	YES
CL-10	Road crossing: Bruce Rd 8	44.63222	-81.17762	Public (road allowance)	YES	YES	YES
CL-11	Riffle: behind Crescent St, Hepworth	44.63041	-81.17051	Private (not requested)	NO	-	-
CL-12	Road crossing: Silver Lake Rd	44.61429	-81.16002	Public (road allowance)	YES	YES	YES
CL-13	Riffle: ~560 m u/s Silver Lake Rd	44.61058	-81.16202	Private (not requested)	NO	-	-
CL-14	Road crossing: Park Head Rd	44.59594	-81.15997	Public (road allowance)	YES	YES	NO
CL-15	Riffle: ~1.3 km u/s of Park Head Rd	44.58656	-81.16812	Private (not requested)	NO	-	-
CL-16	Riffle: end of Salem Rd (dead end)	44.57734	-81.16899	Private (not requested)	NO	-	-
CL-17	Riffle: ~2.1 km u/s Allenford Rd (S)	44.56754	-81.17038	Private (not requested)	NO	-	-
CL-18	Road crossing: Allenford Rd (S)	44.55173	-81.17951	Public (road allowance)	YES	NO	-
CL-19	Road crossing: Hwy 21	44.53249	-81.19642	Public (road allowance)	YES	NO	-
CL-20	Road crossing: Sideroad 25N	44.53029	-81.18657	Public (road allowance)	YES	YES	YES
CL-21	Road crossing: Thomas St, Allenford	44.53547	-81.17900	Public (park d/s)	YES	YES	YES
CL-22	Riffle: dam u/s of Allenford	44.65186	-81.17504	Private (not requested)	NO	-	-
CL-23	Road crossing: Concession 12E	44.51598	-81.17289	Public (road allowance)	YES	NO	-
CL-24	Road crossing: Concession Rd 10	44.49714	-81.17103	Public (road allowance)	YES	NO	-
CL-25	Road crossing: Concession 8E	44.47919	-81.16567	Public (road allowance)	YES	NO	-
CL-26	Road crossing: Bruce Rd 10/Yonge St, Tara (N)	44.47868	-81.14586	Public (CA u/s)	YES	YES	YES
CL-27	Road crossing: Bruce Rd 10/Yonge St, Tara (S)	44.47166	-81.14387	Public (park u/s)	YES	YES	YES

Appendix 2. *Cumulative catch of fishes by sampling site (n=15) for Black Redhorse in the Sauble River, Ontario (2022).*

Site ID	Field number	*Catostomus commersonii*	Catostomidae	*Lepomis peltastes*	*Moxostoma valenciennesi*
1	2022-BRH-SR-310522-001A	0	0	0	0
2	2022-BRH-SR-310522-002A	0	0	0	0
3	2022-BRH-SR-010622-001A	1	0	8	0
4	2022-BRH-SR-010622-002A	23	0	18	0
5	2022-BRH-SR-020622-001A	32	0	30	0
6	2022-BRH-SR-070622-001A	0	0	0	0
7	2022-BRH-SR-070622-002A	0	0	0	0
8	2022-BRH-SR-070622-003A	0	11	0	0
9	2022-BRH-SR-140622-001A	1	0	0	0
10	2022-BRH-SR-150622-001A	1	0	1	0
11	2022-BRH-SR-150622-002A	23	0	0	0
12	2022-BRH-SR-150622-003A	250	0	0	0
13	2022-BRH-SR-160622-001A	5	0	0	0
14	2022-BRH-SR-160622-002A	11	0	66	2
15	2022-BRH-SR-160622-003A	0	0	2	0

Appendix 3. *Site-specific total length (mm) measurements for Northern Sunfish captured in the Sauble River, Ontario (2022).*

Site ID	Field number	Total length (mm)
3	2022-BRH-SR-010622-001A	100
3	2022-BRH-SR-010622-001A	61
3	2022-BRH-SR-010622-001A	112
3	2022-BRH-SR-010622-001A	58
3	2022-BRH-SR-010622-001A	97
3	2022-BRH-SR-010622-001A	57
3	2022-BRH-SR-010622-001A	57
3	2022-BRH-SR-010622-001A	60
4	2022-BRH-SR-010622-002A	95
4	2022-BRH-SR-010622-002A	69
4	2022-BRH-SR-010622-002A	60
4	2022-BRH-SR-010622-002A	108
4	2022-BRH-SR-010622-002A	87
4	2022-BRH-SR-010622-002A	81
4	2022-BRH-SR-010622-002A	98
4	2022-BRH-SR-010622-002A	69
4	2022-BRH-SR-010622-002A	71
4	2022-BRH-SR-010622-002A	65
4	2022-BRH-SR-010622-002A	83
4	2022-BRH-SR-010622-002A	76
4	2022-BRH-SR-010622-002A	82
4	2022-BRH-SR-010622-002A	71
4	2022-BRH-SR-010622-002A	73
4	2022-BRH-SR-010622-002A	101
4	2022-BRH-SR-010622-002A	68
4	2022-BRH-SR-010622-002A	60
5	2022-BRH-SR-020622-001A	81
5	2022-BRH-SR-020622-001A	71
5	2022-BRH-SR-020622-001A	84
5	2022-BRH-SR-020622-001A	76
5	2022-BRH-SR-020622-001A	84
5	2022-BRH-SR-020622-001A	83
5	2022-BRH-SR-020622-001A	69
5	2022-BRH-SR-020622-001A	75
5	2022-BRH-SR-020622-001A	100
5	2022-BRH-SR-020622-001A	83
5	2022-BRH-SR-020622-001A	84
5	2022-BRH-SR-020622-001A	62
5	2022-BRH-SR-020622-001A	71
5	2022-BRH-SR-020622-001A	70
5	2022-BRH-SR-020622-001A	63
5	2022-BRH-SR-020622-001A	85
5	2022-BRH-SR-020622-001A	96
5	2022-BRH-SR-020622-001A	83
5	2022-BRH-SR-020622-001A	91
5	2022-BRH-SR-020622-001A	64

Site ID	Field number	Total length (mm)
5	2022-BRH-SR-020622-001A	85
5	2022-BRH-SR-020622-001A	85
5	2022-BRH-SR-020622-001A	64
5	2022-BRH-SR-020622-001A	71
5	2022-BRH-SR-020622-001A	83
5	2022-BRH-SR-020622-001A	57
5	2022-BRH-SR-020622-001A	102
5	2022-BRH-SR-020622-001A	68
5	2022-BRH-SR-020622-001A	89
5	2022-BRH-SR-020622-001A	71
10	2022-BRH-SR-150622-001A	100
14	2022-BRH-SR-160622-002A	106
14	2022-BRH-SR-160622-002A	87
14	2022-BRH-SR-160622-002A	84
14	2022-BRH-SR-160622-002A	74
14	2022-BRH-SR-160622-002A	90
14	2022-BRH-SR-160622-002A	101
14	2022-BRH-SR-160622-002A	69
14	2022-BRH-SR-160622-002A	71
14	2022-BRH-SR-160622-002A	89
14	2022-BRH-SR-160622-002A	76
14	2022-BRH-SR-160622-002A	109
14	2022-BRH-SR-160622-002A	89
14	2022-BRH-SR-160622-002A	91
14	2022-BRH-SR-160622-002A	86
14	2022-BRH-SR-160622-002A	73
14	2022-BRH-SR-160622-002A	73
14	2022-BRH-SR-160622-002A	102
14	2022-BRH-SR-160622-002A	89
14	2022-BRH-SR-160622-002A	70
14	2022-BRH-SR-160622-002A	81
14	2022-BRH-SR-160622-002A	66
14	2022-BRH-SR-160622-002A	76
14	2022-BRH-SR-160622-002A	81
14	2022-BRH-SR-160622-002A	74
14	2022-BRH-SR-160622-002A	74
14	2022-BRH-SR-160622-002A	87
14	2022-BRH-SR-160622-002A	66
14	2022-BRH-SR-160622-002A	68
14	2022-BRH-SR-160622-002A	97
14	2022-BRH-SR-160622-002A	87
14	2022-BRH-SR-160622-002A	77
14	2022-BRH-SR-160622-002A	85
14	2022-BRH-SR-160622-002A	69
14	2022-BRH-SR-160622-002A	111
14	2022-BRH-SR-160622-002A	77
14	2022-BRH-SR-160622-002A	96
14	2022-BRH-SR-160622-002A	90
14	2022-BRH-SR-160622-002A	78

Site ID	Field number	Total length (mm)
14	2022-BRH-SR-160622-002A	70
14	2022-BRH-SR-160622-002A	71
14	2022-BRH-SR-160622-002A	77
14	2022-BRH-SR-160622-002A	109
14	2022-BRH-SR-160622-002A	99
14	2022-BRH-SR-160622-002A	89
14	2022-BRH-SR-160622-002A	73
14	2022-BRH-SR-160622-002A	65
14	2022-BRH-SR-160622-002A	92
14	2022-BRH-SR-160622-002A	77
14	2022-BRH-SR-160622-002A	69
14	2022-BRH-SR-160622-002A	72
14	2022-BRH-SR-160622-002A	71
14	2022-BRH-SR-160622-002A	100
14	2022-BRH-SR-160622-002A	69
14	2022-BRH-SR-160622-002A	61
14	2022-BRH-SR-160622-002A	91
14	2022-BRH-SR-160622-002A	87
14	2022-BRH-SR-160622-002A	70
14	2022-BRH-SR-160622-002A	86
14	2022-BRH-SR-160622-002A	67
14	2022-BRH-SR-160622-002A	63
14	2022-BRH-SR-160622-002A	61
14	2022-BRH-SR-160622-002A	71
14	2022-BRH-SR-160622-002A	84
14	2022-BRH-SR-160622-002A	74
14	2022-BRH-SR-160622-002A	68
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