Targeted Sampling for Silver Shiner (*Notropis photogenis*) in Sixteen Mile Creek, Ontario, 2016-2018

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Silver Shiner (*Notropis photogenis*), listed as Threatened under Canada's *Species at Risk Act*, is known to occur in only five drainages in Canada (Sixteen Mile Creek, Bronte Creek, Grand River, Thames River, and Saugeen River, Ontario). Fisheries and Oceans Canada conducted five targeted sampling events at six reaches in Sixteen Mile Creek: July 2016, July and September 2017, and March and August 2018. Eighty-eight sites were sampled with a bag seine to assess Silver Shiner habitat use, feeding and thermal ecology, reproduction, and life history. In total, 13,925 fishes representing 32 species were captured. Common Shiner (*Luxilus cornutus*) and Silver Shiner were the most abundant species captured, representing 62.7% of all fishes captured (31.5% and 31.3% respectively).1,571 Silver Shiner were detected at 90.9% of sampled sites in 2016, 1,941 individuals were detected at 55.6% of sites in 2017, and 844 individuals were detected at 60% of sites in 2018. These results provide data to assess species ecology and will be useful for planning future sampling efforts in occupied watersheds.

RÉSUMÉ

White, C.J., Gáspárdy, R.C., Barnucz, J., Colm, J.E., Burbank, J., and Drake, D.A.R., 2024. Targeted Sampling for Silver Shiner (*Notropis photogenis*) in Sixteen Mile Creek, Ontario, 2016-2018. Can. Data Rep. Fish. Aquat. Sci. 1396: vi + 45 p.

Le méné miroir (*Notropis photogenis*), une espèce de poisson inscrite comme étant menacée en vertu de la *Loi sur les espèces en péril,* n'est présent que dans cinq bassins hydrographiques au Canada (crique Sixteen Mile, crique Bronte, rivière Grand, rivière Thames et rivière Saugeen, en Ontario). Pêches et Océans Canada a réalisé cinq activités d'échantillonnage ciblées dans six tronçons de la crique Sixteen Mile : en juillet 2016, en juillet et septembre 2017 et en mars et août 2018. On a échantillonné quatre-vingt-huit sites à l'aide d'une senne afin d'évaluer l'utilisation de l'habitat par le méné miroir, son écologie alimentaire et thermique, sa reproduction et son cycle de vie. Au total, 13 925 poissons représentant 32 espèces ont été capturés. Le méné à nageoires rouges (*Luxilus cornutus*) et le méné *miroir* ont été les espèces les plus abondantes capturées, représentant 62,7 % de tous les poissons capturés (31,5 % et 31,3 % respectivement). On a détecté 1 571 ménés miroirs dans 90,9 % des sites échantillonnés en 2016, 1 941 individus ont été détectés dans 55,6 % des sites en 2017, et 844 individus ont été détectés dans 60 % des sites en 2018. Ces résultats fournissent des données qui permettent d'évaluer l'écologie de l'espèce et seront utiles pour planifier les futurs efforts d'échantillonnage dans les bassins versants où l'espèce est présente.

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* (2002) (SARA). To inform scientific aspects of the recovery process, DFO regularly conducts field sampling to satisfy various 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 sampling SARA-listed fishes and their habitat.

Silver Shiner (*Notropis photogenis*) is a long, silvery leuciscid with a pointed oblique mouth extending almost to the front of its large eye (COSEWIC 2011, Glass et al. 2016). This species was assessed as Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in April 1983 and re-examined and confirmed in April 1987. Silver Shiner was re-examined by COSEWIC in May 2011, with a re-assessment of Threatened owing to a limited area of occupancy and less than 10 locations (DFO 2013). Silver Shiner was subsequently listed as Threatened on Schedule 1 of SARA in August 2019 (COSEWIC 2011).

In Canada, Silver Shiner is at the edge of its northern range (Glass et al. 2016) and is found in only five drainages (Sixteen Mile Creek, Bronte Creek, Grand River, Thames River, and Saugeen River, Ontario; [DFO 2022]). Prior to the 2011 COSEWIC assessment, there was uncertainty about the status of Silver Shiner in Sixteen Mile Creek (Halton region), which was resolved by targeted field work to better understand the distribution and habitat use of the species in that drainage (described in Glass et al. 2016). Owing to the discovery of a relatively abundant population of Silver Shiner in Sixteen Mile Creek, several studies were subsequently undertaken there between 2016 and 2018 to assess Silver Shiner feeding ecology (Burbank et al. 2022a), thermal occupancy (Burbank et al. 2020), reproduction (Burbank et al. 2022b), and life history (Burbank et al. 2021, 2022c). This data report summarizes the underlying field work and targeted sampling by DFO for 2016-2018 associated with the Burbank et al. 2020, 2021, and 2022 a,b,c publications.

METHODS

SITE SELECTION

Sampling occurred within Sixteen Mile Creek, which flows from northwest of Milton to its confluence with Lake Ontario in Oakville. The section of Sixteen Mile Creek between Lower Base Line W and Upper Middle Rd. was the focal area of sampling during the 2016-2018 period encompassed in this data report (Figure 1, Figure 2, Figure 3).

Sampling in 2016 was conducted to resample sites from the 2011 systematic survey for Silver Shiner and to assess the electivity model developed by Glass et al. (2016). Sampling reaches in 2016 were selected as those that were: a) in close proximity to Silver Shiner detections in 2011, or b) previously unsampled reaches that filled spatial gaps between previous sampling locations (Figure 1). Following the same methods as Glass et al. (2016), sampling reaches (n=6) were defined as up to ten times the wetted width within which three to four sites were sampled in visibly distinct habitat types: riffle, run, or pool. Sites within each reach were visited in a downstream-to-upstream order to minimize disturbance of the other sites within the reach. In

2016, a total of 22 sites were sampled (four sites at four reaches and three sites at two reaches). All sampling was conducted in July 2016 (Table 1, Appendix 1).

In 2017 and 2018, sampling occurred within the same six sampling reaches from 2016 (Figure 2, Figure 3). Reaches were labelled as Reach 1 through 6 from the upstream-most reach (upstream of Lower Base Line W) to the downstream-most reach (upstream of Upper Middle Road). For simplicity, a site is defined here as a unique spatial-temporal sampling event. In some cases, similar locations were sampled at different times in a year but are referred to as different sites as sampling coordinates often varied slightly. In 2017, 36 sites were sampled; a riffle, a run, and a pool site were sampled within each of the six reaches during two sampling events: 18 sites were sampled in July, and the same 18 sites were re-sampled in September 2017. In 2018, 30 sites were sampled across two sampling events: 12 sites in March across four reaches due to restricted winter access at Lyon's Valley Park at Dundas St. W. and 18 sites in August across all six reaches (Table 1, Appendix 1).

FISH ASSEMBLAGE SAMPLING

In all years, fishes were collected using a 9.14 m long x 1.8 m tall bag seine with 3 mm mesh. Seining occurred within wadable habitat, moving in a downstream direction within the site (Figure 4). Two to three field personnel made every effort to seine the entire habitat type, to a maximum area of 10 m wide and 20 m long. Three successive hauls were conducted over the same area at each site during each sampling event. All fishes captured were placed in bins of fresh oxygenated water for sorting.

Fishes were processed separately by seine haul in 2016 and as cumulative catch among the three hauls per site in 2017 and 2018 immediately after seining concluded at the site. All captured fishes were identified to species level, where possible, and enumerated. In 2016, a minimum and maximum total length (TL) was measured for each species, and at least one representative specimen for each species from each site was retained as a voucher (either digital photo or physical specimen) for species verification in the laboratory. All remaining fishes were released alive back into the area from which they were captured. A maximum of 40 individuals of each species per site in 2017 and March 2018 and a maximum of 11 individuals per species per site in August 2018 were kept on dry ice after euthanasia via overdose of clove oil for stable isotope analyses (described in Burbank et al. 2020, 2021, 2022a, 2022b, 2022c). These individuals were measured and weighed in the lab once thawed.

Total length was measured for all Silver Shiner captured in 2016 and weight was measured for a subset of individuals to weigh up to 50 individuals per site in the field. However, weight measurements were obtained inconsistently due to scale malfunctions on site. No live lengths or weights of Silver Shiner were measured in 2017 or 2018.

HABITAT SAMPLING

Habitat sampling occurred at every sampling site after fishes were processed and released. The following variables were measured: air temperature (°C), water temperature (°C), pH, conductivity (µS/cm), dissolved oxygen (mg/L), water clarity (via turbidity tube; m), turbidity (NTU), stream depth (m), stream velocity (m/s), stream width (m), distance from shore (m), sampling width (m), and sampling length (m). Air temperature was measured using a Kestrel 3000 Wind Meter.

Water temperature, pH, conductivity, dissolved oxygen, and turbidity were measured using a YSI EXO2 multiparameter sonde just below the water surface. Water clarity was measured

using a 120 cm Fieldmaster turbidity tube. Site location (latitude, longitude) was determined using a Garmin Montana 600 handheld GPS unit. Three representative depth and flow measurements were taken in each site using a meter stick and a Swoffer 2100 current velocity meter at 50% stream depth, held at a 90-degree angle to the stream. Stream width was measured along the midpoint of the site, perpendicular to the stream bank, with a Nikon Laser 1200S waterproof laser range finder, measuring only the wetted width. Sampling length and width were measured as the length and width of the riffle, run, or pool physically encompassed by the seine.

Substrate, aquatic vegetation, and riparian vegetation composition were assessed using visual classification. The substrate was described using percent composition by substrate type, where substrate type was classified by median particle diameters based on a modified Wentworth substrate classification (Bain 1999) using median particle diameters: clay (<0.005 mm), silt (0.005-0.05 mm), sand (0.05-2 mm), gravel (2-65 mm), cobble (65-250 mm), boulder (250-4000 mm), bedrock (>4000 mm, solid un-weathered rock), hardpan (compacted layer of soil), rubble (broken man-made material), and organic (plant material).

Aquatic macrophyte composition was based on the following vegetation classes within the sampling location to a total of 100%: open water, submerged vegetation, floating vegetation, and emergent vegetation. Riparian vegetation was determined using the same method for the following vegetation classes: deciduous, coniferous, herbaceous, shrubs, and none. Dominant aquatic macrophyte type and riparian vegetation type were recorded. Six HOBO PRO V2 temperature loggers were installed near shore in a permanently wetted area, one in each sampling reach, on March 29th, 2017, and were subsequently retrieved on November 28th, 2017 (Figure 2, Appendix 2).

SAMPLING PERMITS AND DATA ARCHIVING

Seining and fish euthanasia were conducted following animal use Standard Operating Protocols GWACC-116 and GWACC-107 and Animal Use Protocol 1846, approved by the DFO and Environment and Climate Change Canada Animal Care Committee (operated under the approval of the Canadian Council on Animal Care). Data associated with these collections is housed under the project codes “2016-SSSU”, “2017-SSFE”, and “2018-SSFE” 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 or accessed via the Open Government portal (Government of Canada 2024).

RESULTS

Overall, 13,924 fishes representing 32 species (not including fishes identified only to genus or family level) were captured in Sixteen Mile Creek during five sampling events at 88 total sites, including 4,356 Silver Shiner across 58 sites (Table 2, Figure 1, Figure 2, Figure 3). Common Shiner (*Luxilus cornutus*) and Silver Shiner were the two most abundant species captured overall (Figure 5a, Figure 6). Captured Silver Shiner ranged from 23 – 135 mm TL (mean 58.9 mm TL) and from 0.20 – 13.43 g (mean 2.74g) (Table 3, Figure 7a, Figure 8a, Appendix 4). Results are summarized by sampling year and sampling event below. Site-specific catch data are provided in Appendix 3, and site -specific habitat data are provided in Appendix 5 (water

chemistry), Appendix 6 (substrate composition), and Appendix 7 (aquatic and riparian vegetation).

2016 SAMPLING

Sampling event 1 – July 2016

Twenty-two sites were sampled in 2016, capturing 7,092 fishes representing 24 species (Table 2, Figure 1). The three most abundant species detected were Common Shiner, Silver Shiner, and Longnose Dace (*Rhinichthys cataractae*), representing 75.0% of the total catch (45.2%, 22.2%, and 7.6%, respectively) (Figure 5b). Silver Shiner and Common Shiner were the two most frequently occurring species, each detected at 90.9% of the 22 sites sampled. Smallmouth Bass (*Micropterus dolomieu*) was the next most frequently occurring species detected at 81.8% of sites but represented only 1.4% of the total catch.

A total of 1,571 Silver Shiner were captured in 2016 across all but two sites sampled (Table 2, Appendix 3a). Mean site-level relative abundance (RA) was 30.9%, ranging from 0 to 95%. The most Silver Shiner detected at a single site was 281 individuals at the run in Reach 5 (75.1% site-level RA). Silver Shiner made up 95% of the catch at the pool in Reach 1 (170 individuals). The total length of all 1,571 Silver Shiner were measured, but only 321 individuals were weighed. Silver Shiner ranged in total length from 26 to 130 mm with a mean total length of 54.8 mm. Silver Shiner weight ranged from 0 to 12.8 g, with a mean weight of 3.1 g (Table 3). It was presumed that at least two age classes, including juveniles, of Silver Shiner were detected in 2016 based on length-frequency and length-weight relationships (Figure 7b, Figure 8b).

Across all sites sampled in 2016, the mean air temperature was 24.7°C (range: 19.6 – 31.6°C), mean water temperature was 23.7°C (19.7°C – 27.2°C), mean conductivity was 1917.3 µS/cm (1327.1 – 2188.6 µS/cm), mean dissolved oxygen was 10.7 mg/L (7.8 – 12.3 mg/L), mean pH was 9.1 (8.7 – 9.8), mean water clarity was 0.8 m (0.4 – 1.1 m) and mean turbidity was 4.6 NTU (1.2 – 9.2 NTU). The mean water velocity was 0.2 m/sec (0.0 – 0.6 m/sec) and the mean water depth was 0.5 m (0.1 – 0.9 m) (Table 4). The dominant substrate type was cobble at 54.5% of sites. The mean substrate composition across sites was cobble: 43.6%, bedrock: 16.6%, gravel: 16.4%, silt: 7.5%, boulder: 4.5%, organic: 4.3%, sand: 4.1%, hardpan: 2.6%, rubble: 0.5% (Table 5). The dominant aquatic vegetation type was open water at 86.4% of sites sampled. The mean aquatic vegetation composition across sites was open water: 78.9%, submerged: 19.1%, and emergent: 2.0%. The dominant riparian vegetation type was herbaceous at 72.7% of sites. The mean riparian vegetation composition across sites was herbaceous: 69.5%, none: 25.9%, deciduous: 3.4%, and shrubs: 1.1% (Table 6).

2017 SAMPLING

Thirty-six sites were sampled across two sampling events in 2017, capturing 4,749 fishes representing 27 species (Table 2, Figure 2, Appendix 3b). The three most abundant species detected were Silver Shiner, Common Shiner, and Rainbow Darter (*Etheostoma caeruleum*) representing 66.2% of the total catch (40.9%, 16.5%, and 8.8%, respectively) (Figure 5c). Rainbow Darter was the most frequently occurring species detected at 91.7% of sites sampled. Silver Shiner was the next most frequently occurring species detected at 55.6% of the thirty-six sites sampled and represented 40.9% of the total catch.

Sampling event 2 – July 2017

Eighteen sites were sampled in July, capturing 2,896 fishes representing 24 species (Table 2). The three most abundant species detected were Silver Shiner, Common Shiner, and Johnny Darter (*Etheostoma nigrum*), representing 66.3% of the total catch (38.6%, 19.2%, and 8.5%, respectively) (Figure 5c). Rainbow Darter and Silver Shiner were the two most frequently occurring species, detected at 88.9% and 72.2% of the sites sampled. Smallmouth Bass and Common Shiner were the next most frequently occurring species, each detected at 61.1% of sites. Smallmouth Bass represented only 1.4% of the total catch.

A total of 1,117 Silver Shiner were captured in July across 72% of the 18 sites sampled (Table 2, Appendix 3b). Mean site-level RA was 34.5%, ranging from 0 to 90.3%. The most Silver Shiner detected at a single site was 355 individuals in July at the run in Reach 6 (78.4% site-level RA). Silver Shiner made up 90.3% of the catch at the run in Reach 1 (130 individuals). Of the 1,117 Silver Shiner captured, 435 had total length and weight measured (Appendix 4). Silver Shiner ranged in total length from 23 to 125 mm with a mean total length of 56.7 mm. Silver Shiner weight ranged from 0.08 to 12.43 g, with a mean weight of 1.91 g (Table 3). It was presumed that at least two age classes, including primarily juveniles, of Silver Shiner were detected in July based on length-frequency and length-weight relationships (Figure 7c, Figure 8c).

Across all sites sampled in July, the mean air temperature was 23.5°C (18.6 – 30.4°C), mean water temperature was 22.1°C (19.2 – 25.4°C), mean conductivity was 734.5 µS/cm (206.7 – 888.2 µS/cm), mean dissolved oxygen was 10.3 mg/L (8.0 – 12.5 mg/L), mean pH was 8.4 (7.9 – 8.8), mean water clarity was 0.7 m (0.2 – 1.1 m) and mean turbidity was 6.8 NTU (1.0 – 23.2 NTU). The mean water velocity was 0.3 m/sec (0.0 – 1.0 m/sec) and the mean water depth was 0.4 m (0.2 – 0.8 m) (Table 4). The dominant substrate type was cobble at 38.8% of sites. The mean substrate composition across sites was cobble: 33.3%, gravel: 17.8%, bedrock: 16.9%, silt: 13.1%, sand: 9.4%, boulder: 8.6%, and organic: 0.6% (Table 5). The dominant aquatic vegetation type was open water at 100% of sites sampled. The mean aquatic vegetation composition across sites was open water: 70.0%, submerged: 28.3%, and emergent: 1.7%. The dominant riparian vegetation type was herbaceous at 61.1% of sites. The mean riparian vegetation composition across sites was herbaceous: 67.8%, none: 27.8%, deciduous: 4.2%, and shrubs: 0.3% (Table 6).

Sampling event 3 – September 2017

Eighteen sites were sampled in September, capturing 1,853 fishes representing 22 species (Table 2). The three most abundant species detected were Silver Shiner, Common Shiner, and Rainbow Darter, representing 66.4% of the total catch (44.5%, 12.4%, and 9.5%, respectively) (Figure 5c). Rainbow Darter and Silver Shiner were the two most frequently occurring species, detected at 94.4% and 55.6% of the sites sampled. Striped Shiner (*Luxilus chrysocephalus*) was the next most frequently occurring species, detected at 50% of sites but representing only 6.7% of the total catch.

A total of 824 Silver Shiner were captured in September across 39% of the 18 sites sampled (Table 2, Appendix 2b). Mean site-level RA was 24.0%, ranging from 0 to 87.5%. The most Silver Shiner detected at a single site was 300 individuals at the run in Reach 3 (86.2% site-level RA). Silver Shiner made up 87.5% of the catch at the pool in Reach 1 (42 individuals). Of

the 824 Silver Shiner captured, 252 individuals had total length measures, and 250 were weighed (Appendix 4). Silver Shiner ranged in total length from 59 to 121 mm with a mean total length of 77.8 mm. Silver Shiner weight ranged from 1.31 to 11.89 g, with a mean weight of 3.30 g (Table 3). It was presumed that at least two age classes of Silver Shiner were detected in September based on length-frequency and length-weight relationships (Figure 7c, Figure 8 c).

Across all sites sampled in September, the mean air temperature was 24.1°C (18.7 – 29.0°C), mean water temperature was 20.1°C (18.2 – 23.3°C), mean conductivity was 686.6 µS/cm (258.0 – 901.3 µS/cm), mean dissolved oxygen was 9.8 mg/L (5.7 – 12.9 mg/L), mean pH was 8.5 (8.0 – 8.9), and mean turbidity was 3.9 NTU (0.7 – 19.1 NTU). The mean water velocity was 0.2 m/sec (0.0 – 0.9 m/sec) and the mean water depth was 0.4 m (0.1 – 1.0 m) (Table 4). The dominant substrate type was cobble at 38.8% of sites. The mean substrate composition across sites was cobble: 33.1%, gravel: 19.2%, bedrock: 16.9%, boulder: 12.2%, silt: 11.9%, sand: 4.2%, and organic: 2.5% (Table 5). The dominant aquatic vegetation type was open water at 100% of sites sampled. The mean aquatic vegetation composition across sites was open water: 83.3%, submerged: 15.3%, and emergent: 1.4%. The dominant riparian vegetation type was herbaceous at 66.7% of sites. The mean riparian vegetation composition across sites was herbaceous: 64.2%, none: 31.7%, deciduous: 2.8%, and shrubs: 1.4% (Table 6).

2018 SAMPLING

Thirty sites were sampled across two sampling events in 2018, capturing 2,083 fishes and representing 22 species within Sixteen Mile Creek (Table 2, Figure 3, Appendix 3c). The three most abundant species detected were Silver Shiner, Common Shiner, and Bluntnose Minnow (*Pimephales notatus*), representing 67.9% of the total catch (40.5%, 18.8%, and 8.6%, respectively) (Figure 5d). Silver Shiner and Rainbow Darter were the two most frequently occurring species, each detected at 60% of the 30 sites sampled. Common Shiner was the next-most frequently occurring species detected at 53.3% of the sites but representing only 18.8% of the total catch.

Sampling event 4 – March 2018

Twelve sites were sampled in March, capturing 394 fishes representing 16 species (Table 2). The three most abundant species detected were Silver Shiner, Common Shiner, and Johnny Darter, representing 79.2% of the total catch (55.1%, 15.7%, and 8.4%, respectively) (Figure 5d). Silver Shiner, Rainbow Darter, and Johnny Darter were the three most frequently occurring species, each detected at 33.3% of the sites sampled. Fathead Minnow (*Pimephales promelas*), Bluntnose Minnow, Common Shiner, and Brook Stickleback (*Culaea inconstans*) were the next most frequently occurring species, each detected at 16.7% of sites.

A total of 217 Silver Shiner were captured in March across 33.3% of the 12 sites sampled (Table 2, Appendix 2c). Mean site-level RA was 12.2%, ranging from 0 to 59.4%. The most Silver Shiner detected at a single site was 212 individuals at the pool in Reach 2 (59.4% site-level RA). Of the 217 Silver Shiner captured, 45 individuals had total length measured, and 44 individuals were weighed (Appendix 4). Silver Shiner ranged in total length from 55 to 135 mm with a mean total length of 81.2 mm. Silver Shiner weight ranged from 0.90 to 13.43 g, with a mean weight of 3.32 g (Table 3). It was presumed that at least two age classes of Silver Shiner

were detected in March based on length-frequency and length-weight relationships (Figure 7d, Figure 8d).

Across all sites sampled in March, the mean air temperature was 4.8°C (1.8 – 9.9°C), mean water temperature was 4.4°C (1.1 – 9.8°C), mean conductivity was 732.7 µS/cm (575.9 – 975.0 µS/cm), mean dissolved oxygen was 15.3 mg/L (14.5 – 15.9 mg/L), mean pH was 8.5 (8.4 – 8.5), mean water clarity was 0.8 m (0.4 – 1.1 m), and mean turbidity was 4.4 NTU (2.5 – 11.2 NTU). The mean water velocity was 0.4 m/sec (0.0 – 0.9 m/sec) and the mean water depth was 0.5 m (0.2 – 0.9 m) (Table 4). The dominant substrate type was cobble at 50.0% of sites. The mean substrate composition across sites was cobble: 33.3%, bedrock: 25.6%, sand: 12.5%, gravel: 10.4%, boulder: 7.1%, silt: 7.8%, and rubble: 5.0% (Table 5). The dominant aquatic vegetation type was open water at 100% of sites sampled. The mean aquatic vegetation composition across sites was open water: 100%. The dominant riparian vegetation type was none at 91.7% of sites. The mean riparian vegetation composition across sites was none: 84.2%, herbaceous: 12.9%, and deciduous: 2.9% (Table 6).

Sampling event 5 – August 2018

Eighteen sites were sampled in August, capturing 1,689 fishes representing 20 species (Table 2). The three most abundant species detected were Silver Shiner, Common Shiner, and Bluntnose Minnow, representing 66.7% of the total catch (37.1%, 19.5%, and 10.1%, respectively) (Figure 5d). Silver Shiner, Common Shiner, and Rainbow Darter were the three most frequently occurring species, each detected at 77.8% of the sites sampled. White Sucker (*Catostomus commersonii*) was the next most frequently occurring species, detected at 55.6% of sites but representing only 2% of the total catch (Appendix 2c).

A total of 627 Silver Shiner were captured in August across 77.7% of the 18 sites sampled (Table 2, Appendix 2c). Mean site-level RA was 29.5%, ranging from 0 to 87.8%. The most Silver Shiner detected at a single site was 151 individuals at the run in Reach 1 (87.3% site-level RA). Silver Shiner made up 87.8% of the catch at the run in Reach 3 (36 individuals). Of the 627 Silver Shiner captured, 85 individuals had total length measured, and 84 were weighed (Appendix 4). Silver Shiner ranged in total length from 51 to 126 mm with a mean total length of 78.3 mm. Silver Shiner weight ranged from 0.73 to 11.78 g, with a mean weight of 3.43 g (Table 3). It was presumed that at least two age classes of Silver Shiner were detected in August based on length-frequency and length-weight relationships (Figure 7d, Figure 8d).

Across all sites sampled in August, the mean air temperature was 25.4°C (20.9 – 29.7°C), mean water temperature was 22.6°C (20.5 – 23.7°C), mean conductivity was 644.3 µS/cm (18.1 – 804.8 µS/cm), mean dissolved oxygen was 10.9 mg/L (7.6 – 11.9 mg/L), mean pH was 9.1 (8.4 – 9.7), mean water clarity was 0.3 m (0.1 – 0.6 m), and mean turbidity was 32.0 NTU (8.9 – 262.3 NTU). The mean water velocity was 0.4 m/sec (0.0 – 1.0 m/sec) and the mean water depth was 0.4 m (0.2 – 0.8 m) (Table 4). The dominant substrate type was cobble at 38.9% of sites. The mean substrate composition across sites was cobble: 31.1%, gravel: 19.7%, boulder: 15.6%, bedrock: 15.0%, sand: 6.7%, silt: 6.7%, and organic: 4.4% (Table 5). The dominant aquatic vegetation type was open water at 100% of sites sampled. The mean aquatic vegetation composition across sites was open water: 91.4%, emergent: 4.7%, submerged: 3.3%, and floating: 0.6%. The dominant riparian vegetation type was none at 91.7% of sites. The mean

riparian vegetation composition across sites was herbaceous: 83.6%, shrubs: 13.1%, and deciduous: 3.3% (Table 6).

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TABLES

Table 1. *Summary of Silver Shiner sampling events across six stream reaches in Sixteen Mile Creek, Ontario, 2016-2018. A double-X represents reaches where two sites of the same habitat type were sampled in 2016, and a dash (-) indicates no site sampled. Exact site locations are provided in Appendix 1.*

		Year	2016	2017		2018	
Reach	General location	Habitat	July	July	September	March	August
1	Lower Base Line W. (upstream)	Pool	XX	X	X	X	X
		Riffle	X	X	X	X	X
		Run	XX	X	X	X	X
2	Lower Base Line W. (downstream)	Pool	-	X	X	X	X
		Riffle	X	X	X	X	X
		Run	X	X	X	X	X
3	Fourth Line (upstream)	Pool	X	X	X	X	X
		Riffle	XX	X	X	X	X
		Run	X	X	X	X	X
4	Dundas St W. (upstream)	Pool	X	X	X	-	X
		Riffle	X	X	X	-	X
		Run	X	X	X	-	X
5	Dundas St W. (downstream)	Pool	X	X	X	-	X
		Riffle	X	X	X	-	X
		Run	XX	X	X	-	X
6	Upper Middle Rd. (upstream)	Pool	XX	X	X	X	X
		Riffle	X	X	X	X	X
		Run	X	X	X	X	X

Table 2. *Summary of cumulative catch of fishes across five sampling events at six reaches in Sixteen Mile Creek, Ontario (2016-2018).*

Scientific name	Common name	Jul-16	Jul-17	Sep-17	2017 Total	Mar-18	Aug-18	2018 Total	Grand total
Ambloplites rupestris	Rock Bass	**92**	16	15	**31**	14	10	**24**	**147**
Ameiurus melas	Black Bullhead	**1**	-	-	**-**	-	1	**1**	**2**
Ameiurus natalis	Yellow Bullhead	**-**	-	-	**-**	-	2	**2**	**2**
Campostoma anomalum	Central Stoneroller	**-**	1	-	**1**	-	-	**-**	**1**
Catostomus commersonii	White Sucker	**55**	30	23	**53**	2	33	**35**	**143**
Culaea inconstans	Brook Stickleback	**125**	15	27	**42**	4	-	**4**	**171**
Cyprinella spiloptera	Spotfin Shiner	**2**	-	-	**-**	-	-	**-**	**2**
Cyprinus carpio	Common Carp	**-**	1	-	**1**	-	-	**-**	**1**
Esox lucius	Northern Pike	**-**	-	1	**1**	-	-	**-**	**1**
Etheostoma caeruleum	Rainbow Darter	**216**	244	176	**420**	8	159	**167**	**803**
Etheostoma exile	Iowa Darter	**-**	2	-	**2**	-	-	**-**	**2**
Etheostoma flabellare	Fantail Darter	**8**	7	22	**29**	-	-	**-**	**37**
Etheostoma nigrum	Johnny Darter	**107**	246	122	**368**	33	70	**103**	**578**
Hypentelium nigricans	Northern Hogsucker	**13**	9	4	**13**	1	8	**9**	**35**
Labidesthes sicculus	Brook Silverside	**-**	-	1	**1**	-	-	**-**	**1**
Lepomis gibbosus	Pumpkinseed	**3**	19	8	**27**	-	13	**13**	**43**
Lepomis macrochirus	Bluegill	**1**	8	1	**9**	1	-	**1**	**11**
Leuciscidae	Juvenile Minnow (*Leuciscidae*)	**-**	110	-	**110**	-	-	**-**	**110**
Luxilus chrysocephalus	Striped Shiner	**255**	172	145	**317**	17	117	**134**	**706**
Luxilus cornutus	Common Shiner	**3205**	556	229	**785**	62	329	**391**	**4381**
Luxilus sp.	juvenile shiner (*Luxilus* sp.)	**1**	-	-	**-**	-	25	**25**	**26**
Micropterus dolomieu	Smallmouth Bass	**98**	43	23	**66**	-	6	**6**	**170**
Micropterus nigricans	Largemouth Bass	**-**	10	7	**17**	-	2	**2**	**19**
Nocomis biguttatus	Hornyhead Chub	**16**	-	-	**-**	-	-	**-**	**16**
Nocomis micropogon	River Chub	**155**	31	85	**116**	1	32	**33**	**304**
Nocomis sp.	juvenile chub (*Nocomis* sp.)	**1**	-	-	**-**	-	-	**-**	**1**
Notropis atherinoides	Emerald Shiner	**25**	-	-	**-**	-	-	**-**	**25**
Notropis photogenis	**Silver Shiner**	**1571**	1117	824	**1941**	217	627	**844**	**4357**
Notropis rubellus	Rosyface Shiner	**268**	12	8	**20**	7	45	**52**	**340**
Noturus flavus	Stonecat	**-**	1	-	**1**	-	2	**2**	**3**
Pimephales notatus	Bluntnose Minnow	**244**	135	60	**195**	9	170	**179**	**618**
Pimephales promelas	Fathead Minnow	**12**	-	1	**1**	14	1	**15**	**28**
Pomoxis nigromaculatus	Black Crappie	**4**	1	-	**1**	-	-	**-**	**5**
Rhinichthys cataractae	Longnose Dace	**539**	77	65	**142**	1	20	**21**	**702**
Semotilus atromaculatus	Creek Chub	**75**	33	6	**39**	3	17	**20**	**134**
	Total fishes	**7092**	2896	1853	**4749**	394	1689	**2083**	**13924**
	Species detected	**24**	24	22	**27**	16	20	**22**	**32**

Table 3. *Summary of Silver Shiner total length (TL) and weight across five sampling events in Sixteen Mile Creek, Ontario, 2016-2018.*

Sampling event	Total captured	TL (mm)				Weight (g)			
		Count	Min.	Mean	Max.	Count	Min.	Mean	Max.
Jul-16	**1571**	**1571**	**26**	**54.8**	**130**	**320**	**0.2**	**3.1**	**12.8**
Jul-17	1117	435	23	56.7	125	435	0.08	1.91	12.43
Sep-17	824	252	59	77.8	121	250	1.31	3.30	11.89
2017	**1941**	**689**	**23**	**64.5**	**125**	**685**	**0.08**	**2.42**	**12.43**
Mar-18	217	45	55	81.2	135	44	0.90	3.32	13.43
Aug-18	627	85	51	78.3	126	84	0.73	3.48	11.78
2018	**844**	**130**	**51**	**79.3**	**135**	**128**	**0.73**	**3.43**	**13.43**
Overall	**4356**	**2390**	**23**	**58.9**	**135**	**1134**	**0.20**	**2.74**	**13.43**

***Table 4**. Summary of abiotic habitat conditions presented as mean values (min - max) across five sampling events in Sixteen Mile Creek, Ontario, 2016-2018.*

Sampling event	Air temp. (°C)	Water temp. (°C)	Conductivity (µS/cm)	Dissolved oxygen (mg/L)	pH	Water clarity (m)	Turbidity (NTU)	Depth (m)	Water velocity (m/s)
16-Jul	**24.7** (19.6 - 31.6)	**23.7** (19.7 - 27.2)	**1917.3** (1327.1 - 2188.6)	**10.7** (7.8 - 12.3)	**9.1** (8.7 - 9.8)	**0.8** (0.4 - 1.1)	**4.6** (1.2 - 9.2)	**0.5** (0.1 - 0.9)	**0.2** (0.0 - 0.6)
Jul-17	23.5 (18.6 - 30.4)	22.1 (19.2 - 25.4)	734.5 (206.7 - 888.2)	10.3 (8.0 - 12.5)	8.4 (7.9 -8.8)	0.7 (0.2 - 1.1)	6.8 (1.0 - 23.2)	0.4 (0.2 - 0.8)	0.3 (0.0 - 1.0)
Sep-17	24.1 (18.7 – 29.0)	20.1 (18.2 - 23.3)	686.6 (258.0 - 901.3)	9.8 (5.7 - 12.9)	8.5 (8.0 - 8.9)	- -	3.9 (0.7 - 19.1)	0.4 (0.1 – 1.0)	0.2 (0.0 - 0.9)
2017	**24.0** (18.6 - 30.4)	**21.1** (18.2 - 25.4)	**707.2** (206.7 - 901.3)	**10.1** (5.7 - 12.9)	**8.5** (7.9 - 8.9)	**0.7** (0.2 - 1.1)	**5.4** (0.7 - 23.2)	**0.4** (0.1 – 1.0)	**0.3** (0.0 - 1.0)
Mar-18	4.8 (1.8 - 9.9)	4.4 (1.1 - 9.8)	732.7 (575.9 - 975.0)	15.3 (14.5 - 15.9)	8.5 (8.4 - 8.5)	0.8 (0.4 - 1.1)	4.4 (2.5 - 11.2)	0.5 (0.2 - 0.9)	0.4 (0.0 - 0.9)
Aug-18	25.4 (20.9 - 29.7)	22.6 (20.5 - 23.7)	644.3 (18.1 - 804.8)	10.9 (7.6 - 11.9)	9.1 (8.4 - 9.7)	0.3 (0.1 - 0.6)	32.0 (8.9 - 262.3)	0.4 (0.2 - 0.8)	0.4 (0 - 1.0)
2018	**17.2** (1.8 - 29.7)	**15.1** (1.1 - 23.7)	**679.6** (18.1 – 975.0)	**11.5** (7.6 - 15.9)	**8.9** (8.4 - 9.7)	**0.6** (0.1 - 1.1)	**25.1** (2.5 - 262.3)	**0.5** (0.2 - 0.9)	**0.4** (0 - 1.0)
Overall	**21.8** (1.8 – 31.6)	**19.7** (1.07 – 27.2)	**1000.4** (18.1 – 2188.6)	**10.7** (5.7 – 15.9)	**8.8** (7.9 – 9.8)	**0.7** (0.1 – 1.1)	**10.9** (0.7	**0.5** (0.1 – 1.0)	**0.3** (0.0 - 1.0)

Table 5. *Summary of substrate composition by percent type presented as mean values (min - max) across five sampling events in Sixteen Mile Creek, Ontario, 2016-2018.*

Sampling event	Organic	Clay	Silt	Sand	Gravel	Cobble	Boulder	Bedrock	Hardpan	Rubble	Concrete	Dominate substrate
16-Jul	**4.3**	**0.0**	**7.5**	**4.1**	**16.4**	**43.6**	**4.5**	**16.6**	**2.6**	**0.5**	**0.0**	**Cobble**
	(0 - 70)	(0 - 0)	(0 - 30)	(0 - 20)	(0 - 60)	(0 - 100)	(0 - 10)	(0 - 90)	(0-55)	(0-10)	-	-
Jul-17	0.6	0.3	13.1	9.4	17.8	33.3	8.6	16.9	0.0	0.0	0.0	Cobble
	(0-10)	(0 - 5)	(0 - 90)	(0 - 75)	(0 - 65)	(0- 90)	(0 - 30)	(0 - 85)	-	-	-	-
Sep-17	2.5	0.0	11.9	4.2	19.2	33.1	12.2	16.9	0.0	0.0	0.0	Cobble
	(0 - 35)	-	(0 - 90)	(0 - 40)	(0 - 40)	(5 - 85)	(0 - 40)	(0 - 80)	-	-	-	-
2017	**1.5**	**0.1**	**12.5**	**6.8**	**18.5**	**33.2**	**10.4**	**16.9**	**0.0**	**0.0**	**0.0**	**Cobble**
	(0 - 35)	(0 - 5)	(0 - 90)	(0 - 75)	(0 - 65)	(0 - 90)	(0 - 40)	(0 - 85)	-	-	-	-
Mar-18	0.0	0.0	7.8	12.5	10.4	33.3	7.1	25.6	0.0	5.0	0.0	Cobble
	-	-	(0 - 40)	(0 - 55)	(0 - 30)	(0 - 75)	(0 - 25)	(0 - 100)	-	(0 - 40)	-	-
Aug-18	4.4	0.0	6.7	6.7	19.7	31.1	15.6	15.0	0.0	0.0	0.0	Cobble
	(0 - 50)	-	(0 - 40)	(0 - 35)	(0 - 50)	(0 - 70)	(0 - 50)	(0 - 90)	-	-	-	-
2018	**2.7**	**0.0**	**6.8**	**9.2**	**16**	**32**	**12.2**	**18.8**	**0.0**	**2.0**	**0.0**	**Cobble**
	(0 - 50)	-	(0 - 40)	(0 - 55)	(0 - 50)	(0 - 75)	(0 - 50)	(0 - 100)	-	(0 - 40)	-	-
Overall	**2.0**	**0.0**	**9.0**	**7.0**	**17.0**	**35.0**	**10.0**	**18.0**	**1.0**	**1.0**	**0.0**	**Cobble**
	(0 - 70)	(0 - 5)	(0 - 90)	(0 - 75)	(0 - 65)	(0 - 100)	(0 - 50)	(0 - 100)	(0 - 55)	(0 - 40)	-	-

Table 6. *Summary of aquatic and riparian vegetation presented as mean values (min - max) across five sampling events in Sixteen Mile Creek, Ontario, 2016-2018.*

Sampling event	Emergent	Floating	Submerged	Open Water	Dominant aquatic vegetation	Deciduous	Coniferous	Herbaceous	Shrubs	None	Dominant riparian vegetation
16-Jul	**2.0**	**0.0**	**19.1**	**78.9**	**Open water**	**3.4**	**0.0**	**69.5**	**1.1**	**25.9**	**Herbaceous**
	(0 - 20)	-	(0 - 90)	(10 - 100)	-	(0 - 25)	-	(0 - 100)	(0 - 20)	(0 - 100)	-
Jul-17	1.7	0.0	28.3	70.0	Open water	4.2	0.0	67.8	0.3	27.8	Herbaceous
	(0 - 15)	-	(5 - 90)	(15 - 90)	-	(0 - 20)	-	(10 - 100)	(0 - 5)	(0 - 90)	-
Sep-17	1.4	0.0	15.3	83.3	Open water	2.8	0.0	64.2	1.4	31.7	Herbaceous
	(0 - 20)	-	(5 - 50)	(50 - 95)	-	(0 - 20)	-	(25 - 100)	(0 - 10)	(0 - 70)	
2017	**1.5**	**0.0**	**21.8**	**76.7**	**Open water**	**3.5**	**0.0**	**66**	**0.8**	**29.7**	**Herbaceous**
	(0 - 20)	-	(5 - 90)	(10 - 95)	-	(0 - 20)	-	(10 - 100)	(0 - 10)	(0 - 90)	-
Mar-18	0.0	0.0	0.0	100.0	Open water	2.9	0.0	12.9	0.0	84.2	None
	-	-	-	-		(0 - 10)	-	(0 - 55)	-	(40 - 100)	-
Aug-18	4.7	0.6	3.3	91.4	Open water	3.3	0.0	83.6	13.1	0.0	Herbaceous
	(0 - 20)	(0 - 10)	(0 - 20)	(70 - 100)	-	(0 - 50)	-	(50 - 100)	(0 - 50)	-	-
2018	**2.8**	**0.3**	**2.0**	**94.8**	**Open water**	**3.2**	**0.0**	**55.3**	**7.8**	**33.7**	**Herbaceous**
	(0 - 20)	(0 - 10)	(0 - 20)	(70 - 100)	-	(0 - 50)	-	(0 - 100)	(0 - 50)	(0 - 100)	-
Overall	**2.0**	**0.0**	**14.0**	**83.0**	**Open water**	**3.0**	**0.0**	**63.0**	**3.0**	**31.0**	**Herbaceous**
	(0 – 20)	(0 – 10)	(0 – 90)	(10 – 100)	-	(0 – 50)	-	(0 – 100)	(0 – 50)	(0 – 100)	-

FIGURES

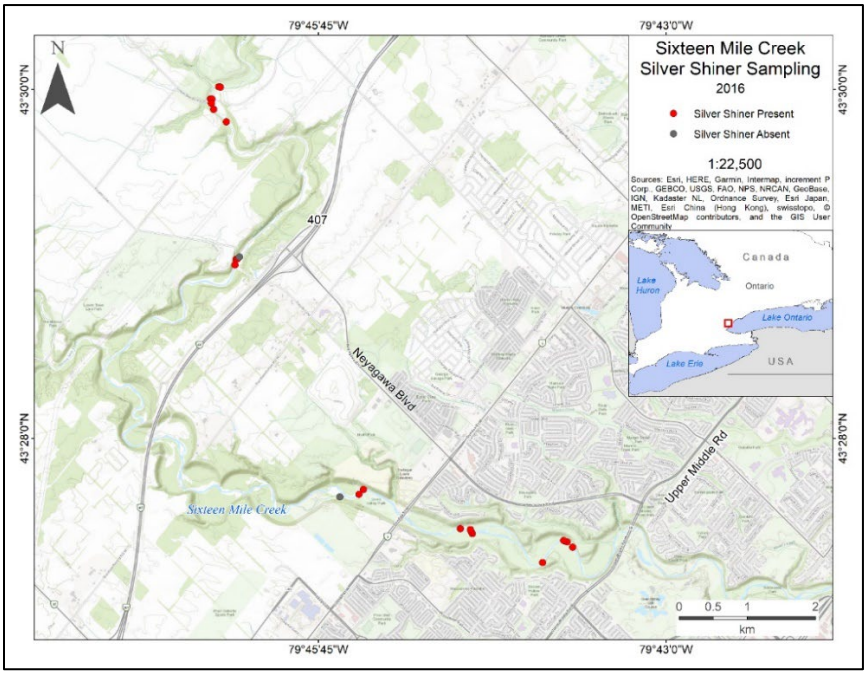

Figure 1. *Locations of Silver Shiner sampling in Sixteen Mile Creek, Ontario, 2016.*

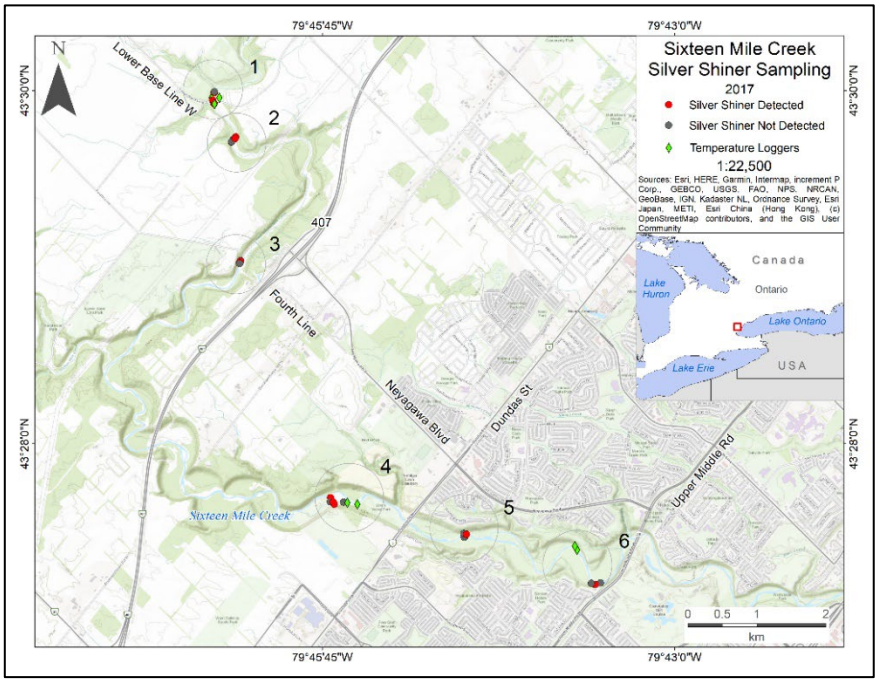

Figure 2. *Location of six reaches sampled for Silver Shiner in Sixteen Mile Creek, Ontario, across two sampling events in 2017.*

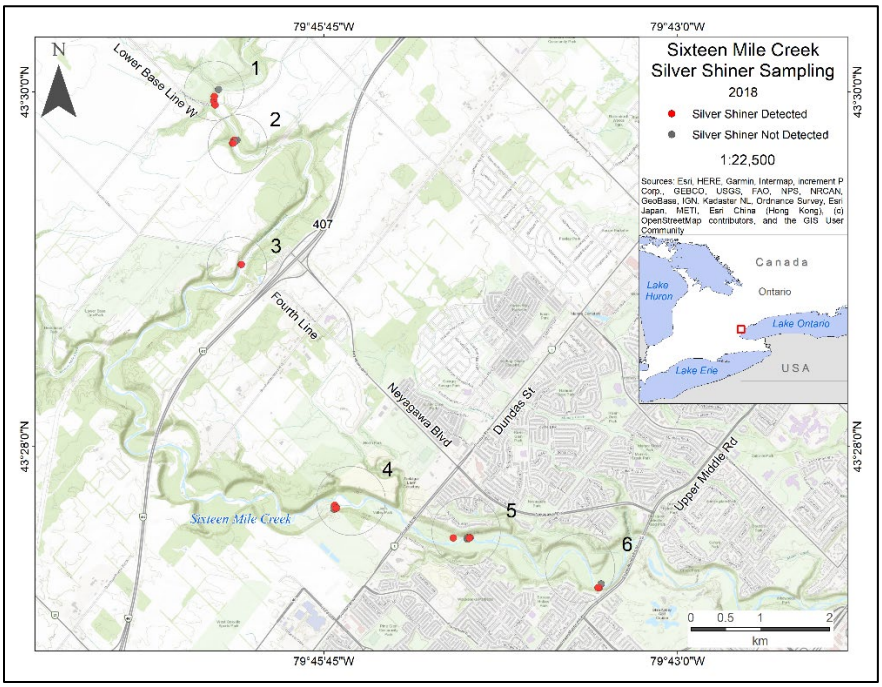

Figure 3. *Location of six reaches sampled for Silver Shiner in Sixteen Mile Creek, Ontario, across two sampling events in 2018.*

Figure 4. *Seining was conducted in a downstream direction, as shown in the site photograph facing downstream of the riffle site in Reach 6 (2017-SSFE-260717-601A), Sixteen Mile Creek, taken during the July 2017 sampling event.*

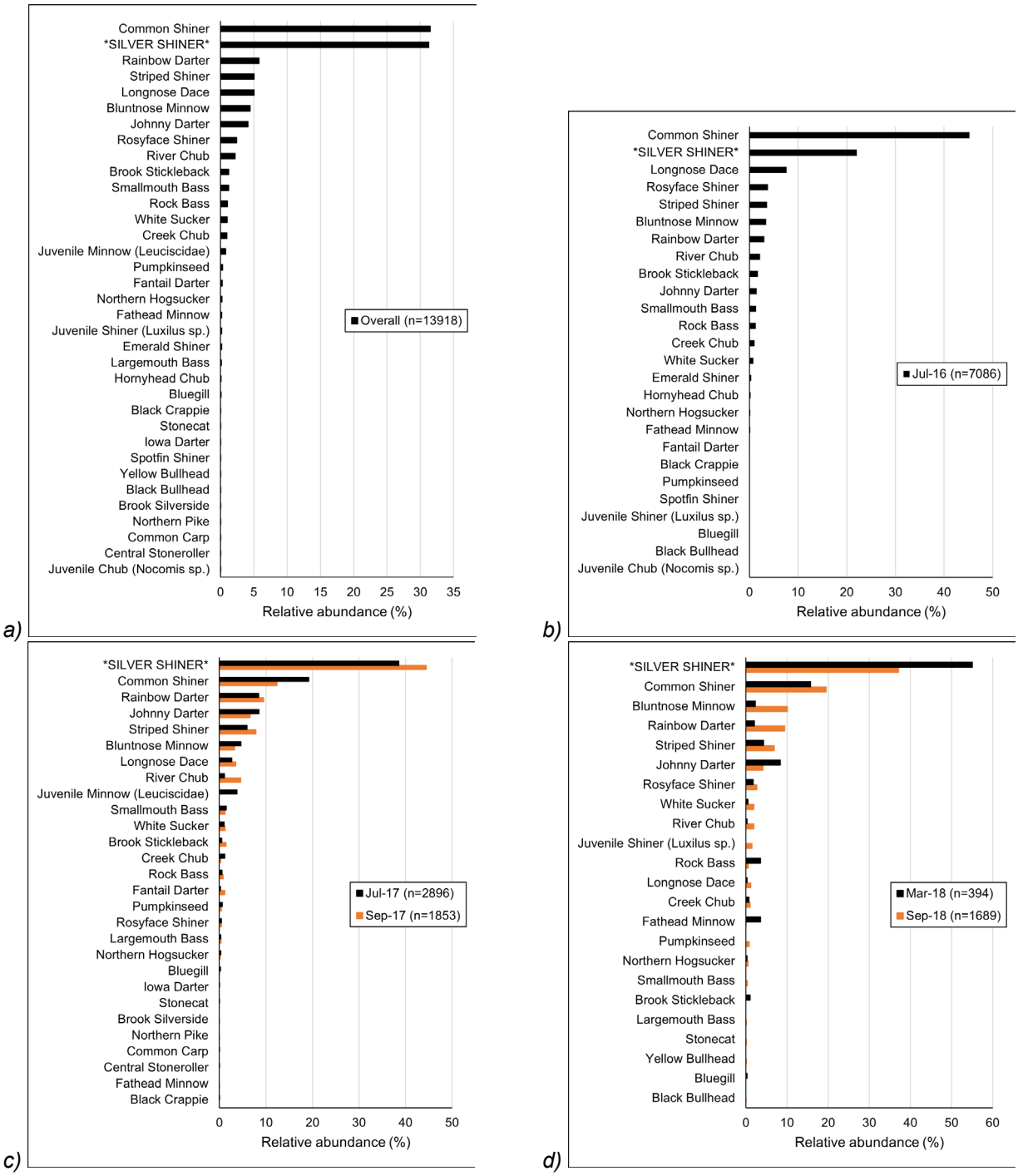

Figure 5. *Rank-abundance of fishes captured during a) all sampling events, b) in 2016, c) in 2017, and d) in 2018 in Sixteen Mile Creek, Ontario.*

Figure 6. *Photograph of an adult Silver Shiner captured in Sixteen Mile Creek, Ontario taken during the July 2017 sampling event.*

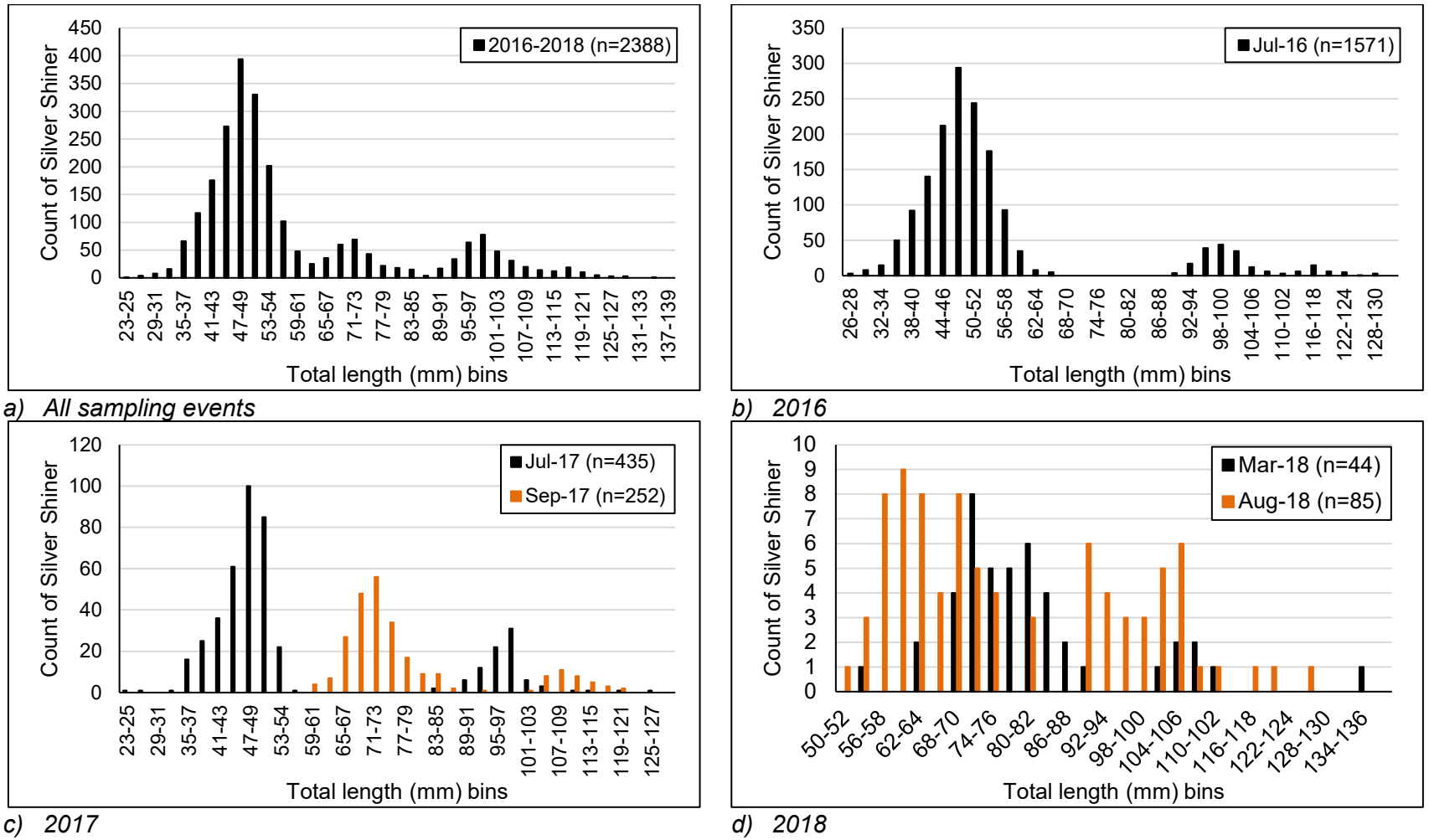

Figure 7. *Length-frequency of Silver Shiner captured across five sampling events in Sixteen Mile Creek in a) all sampling events, b) 2016, c) 2017, and d) 2018.*

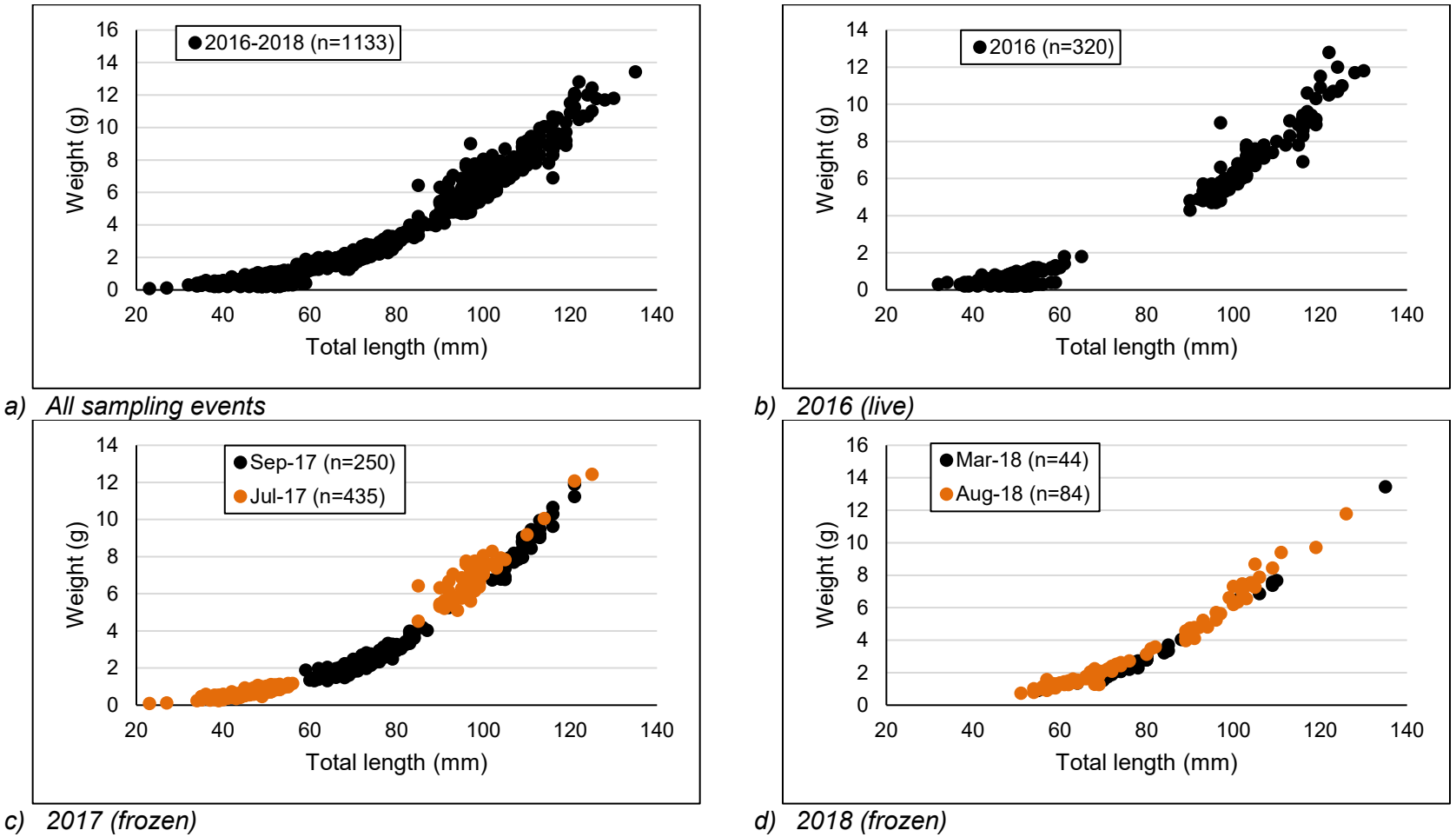

Figure 8. *Length-weight relationship for Silver Shiner captured across five sampling events in Sixteen Mile Creek in a) all sampling events b) 2016, c) 2017, d) 2018. Live measurements were taken in 2016, preserved (frozen) measurements were taken in 2016, preserved (frozen) measurements were taken in 2017 and 2018.*

APPENDICES

Appendix 1. *Location details for all sites and all sampling events for Silver Shiner in Sixteen Mile Creek, 2016-2018.*

Year	Month	Reach	Habitat	Field number	Date	Latitude	Longitude	Narrative locality description
2016	July	1	Pool	2016-SSSU200716-102A	20-Jul-16	43.49909	-79.77648	Pool immediately u/s of Lower Baseline W
2016	July	1	Pool	2016-SSSU260716-103A	26-Jul-16	43.49868	-79.77659	Pool under willow immediately d/s of Lower Base Line W
2016	July	1	Riffle	2016-SSSU200716-103A	20-Jul-16	43.50027	-79.77562	-
2016	July	1	Run	2016-SSSU200716-104A	20-Jul-16	43.50023	-79.77538	~ 170 m u/s of Lower Baseline W
2016	July	1	Run	2016-SSSU200716-101A	20-Jul-16	43.49911	-79.77670	Run along riprap bank immediately u/s of Lower Base Line W
2016	July	2	Riffle	2016-SSSU260716-101A	26-Jul-16	43.49692	-79.77460	~ 320 m d/s of Lower Base Line W
2016	July	2	Run	2016-SSSU260716-102A	26-Jul-16	43.49811	-79.77628	~ 88 m d/s of Lower Base Line W, just d/s of low-head dam
2016	July	3	Pool	2016-SSSU190716-104A	19-Jul-16	43.48324	-79.77346	Deep pool immediately u/s of 4th Line walking bridge
2016	July	3	Riffle	2016-SSSU190716-102A	19-Jul-16	43.48385	-79.77313	~ 100 m u/s of 4th Line walking bridge, riffle
2016	July	3	Riffle	2016-SSSU190716-103A	19-Jul-16	43.48401	-79.77288	~ 150 m u/s of 4th Line walking bridge
2016	July	3	Run	2016-SSSU190716-101A	19-Jul-16	43.48376	-79.77333	Run behind boulders ~95m u/s of 4th Line walking bridge
2016	July	4	Pool	2016-SSSU210716-103A	21-Jul-16	43.46110	-79.75965	Pool ~200m u/s of end of Lyons Valley Park trail
2016	July	4	Riffle	2016-SSSU210716-102A	21-Jul-16	43.46134	-79.75713	~ 620 m u/s Dundas St W Riffle, Lyons Valley Park
2016	July	4	Run	2016-SSSU210716-101A	21-Jul-16	43.46181	-79.75653	~ 550 m u/s Dundas St W, outside bend Run
2016	July	5	Pool	2016-SSSU120716-101A	12-Jul-16	43.45758	-79.74220	~ 870 m d/s Dundas St W
2016	July	5	Riffle	2016-SSSU120716-102A	12-Jul-16	43.45773	-79.74228	~ 850 m d/s of Dundas St W
2016	July	5	Run	2016-SSSU120716-104A	12-Jul-16	43.45806	-79.74375	710 m d/s of Dundas St W
2016	July	5	Run	2016-SSSU120716-103A	12-Jul-16	43.45796	-79.74245	820 m d/s Dundas St W
2016	July	6	Pool	2016-SSSU110716-102A	11-Jul-16	43.45679	-79.72968	~ 160 m u/s of walking bridge - Upper Middle Rd
2016	July	6	Pool	2016-SSSU110716-104A	11-Jul-16	43.45482	-79.73292	~ 500 m u/s of walking bridge - Upper Middle Rd
2016	July	6	Riffle	2016-SSSU110716-103A	11-Jul-16	43.45693	-79.73015	~ 170 m u/s of walking bridge - Upper Middle Rd
2016	July	6	Run	2016-SSSU110716-101A	11-Jul-16	43.45629	-79.72897	~ 150 m u/s of walking bridge - Upper Middle Rd
2017	July	1	Pool	2017-SSFE-170717-103A	17-Jul-17	43.49876	-79.77659	Under willow immediately d/s of Lower Baseline Rd
2017	July	1	Riffle	2017-SSFE-170717-102A	17-Jul-17	43.49980	-79.77654	~ 90 m u/s of Lower Baseline Rd
2017	July	1	Run	2017-SSFE-170717-101A	17-Jul-17	43.49910	-79.77673	immediately u/s of Lower Baseline Rd
2017	July	2	Pool	2017-SSFE-180717-202A	18-Jul-17	43.49514	-79.77432	~ 520 m d/s of Lower Baseline Rd
2017	July	2	Riffle	2017-SSFE-180717-201A	18-Jul-17	43.49538	-79.77406	~ 500 m d/s of Lower Baseline Rd
2017	July	2	Run	2017-SSFE-180717-203A	18-Jul-17	43.49564	-79.77374	~ 475 m d/s of Lower Base Line

Year	Month	Reach	Habitat	Field number	Date	Latitude	Longitude	Narrative locality description
2017	July	3	Pool	2017-SSFE-190717-303A	19-Jul-17	43.48369	-79.77328	~ 75 m u/s of old 4th Line bridge
2017	July	3	Riffle	2017-SSFE-190717-301A	19-Jul-17	43.48385	-79.77318	~ 100 m u/s of old 4th Line bridge
2017	July	3	Run	2017-SSFE-190717-302A	19-Jul-17	43.48378	-79.77325	~ 80 m u/s of old 4th Line bridge
2017	July	4	Pool	2017-SSFE-200717-401A	20-Jul-17	43.46116	-79.75971	~ 710 m u/s of Dundas St W
2017	July	4	Riffle	2017-SSFE-240717-402A	24-Jul-17	43.46159	-79.76142	~ 900 m u/s of Lions Valley Park (Dundas)
2017	July	4	Run	2017-SSFE-240717-403A	24-Jul-17	43.46094	-79.76092	~ 850 m u/s of Dundas St W
2017	July	5	Pool	2017-SSFE-250717-502A	25-Jul-17	43.45808	-79.74402	~ 600 m d/s of Dundas St W
2017	July	5	Riffle	2017-SSFE-250717-501A	25-Jul-17	43.45789	-79.74397	~ 600 m d/s of Dundas St W
2017	July	5	Run	2017-SSFE-250717-503A	25-Jul-17	43.45815	-79.74381	~ 625 m d/s of Dundas St W
2017	July	6	Pool	2017-SSFE-260717-603A	26-Jul-17	43.45350	-79.72748	~ 120 m d/s Sixteen Mile Creek Trail bridge, ~ 680 m u/s of Upper Middle Rd
2017	July	6	Riffle	2017-SSFE-260717-601A	26-Jul-17	43.45353	-79.72629	~ 200 m d/s Sixteen Mile Creek Trail bridge, ~ 600 m u/s Upper Middle Rd
2017	July	6	Run	2017-SSFE-260717-602A	26-Jul-17	43.45339	-79.72700	~ 150 m d/s Sixteen Mile Creek Trail bridge, ~ 650 m u/s of Upper Middle Rd
2017	Sept.	1	Pool	2017-SSFE-190917-103A	19-Sep-17	43.49880	-79.77657	-
2017	Sept.	1	Riffle	2017-SSFE-190917-102A	19-Sep-17	43.49989	-79.77654	not flowing enough to riffle
2017	Sept.	1	Run	2017-SSFE-190917-101A	19-Sep-17	43.49908	-79.77673	-
2017	Sept.	2	Pool	2017-SSFE-190917-202A	19-Sep-17	43.49517	-79.77431	-
2017	Sept.	2	Riffle	2017-SSFE-190917-201A	19-Sep-17	43.49540	-79.77398	-
2017	Sept.	2	Run	2017-SSFE-190917-203A	19-Sep-17	43.49548	-79.77383	-
2017	Sept.	3	Pool	2017-SSFE-180917-303A	18-Sep-17	43.48369	-79.77321	-
2017	Sept.	3	Riffle	2017-SSFE-180917-301A	18-Sep-17	43.48395	-79.77310	-
2017	Sept.	3	Run	2017-SSFE-180917-302A	18-Sep-17	43.48388	-79.77312	-
2017	Sept.	4	Pool	2017-SSFE-200917-401A	20-Sep-17	43.46116	-79.75971	-
2017	Sept.	4	Riffle	2017-SSFE-200917-402A	20-Sep-17	43.46120	-79.76143	-
2017	Sept.	4	Run	2017-SSFE-200917-403A	20-Sep-17	43.46117	-79.76108	-
2017	Sept.	5	Pool	2017-SSFE-210917-502A	21-Sep-17	43.45820	-79.74407	-
2017	Sept.	5	Riffle	2017-SSFE-210917-501A	21-Sep-17	43.45786	-79.74401	-
2017	Sept.	5	Run	2017-SSFE-210917-503A	21-Sep-17	43.45812	-79.74372	-
2017	Sept.	6	Pool	2017-SSFE-220917-603A	22-Sep-17	43.45350	-79.72748	-
2017	Sept.	6	Riffle	2017-SSFE-220917-601A	22-Sep-17	43.45353	-79.72629	-
2017	Sept.	6	Run	2017-SSFE-220917-602A	22-Sep-17	43.45339	-79.72700	-
2018	March	1	Pool	2018-SSFE-090318-103A	09-Mar-18	43.49881	-79.77661	under willow immediately d/s of Lower Base Line
2018	March	1	Riffle	2018-SSFE-090318-102A	09-Mar-18	43.50023	-79.77612	~ 130 m u/s of Lower Base Line
2018	March	1	Run	2018-SSFE-090318-101A	09-Mar-18	43.49915	-79.77675	-

Year	Month	Reach	Habitat	Field number	Date	Latitude	Longitude	Narrative locality description
2018	March	2	Pool	2018-SSFE-140318-203A	14-Mar-18	43.49518	-79.77429	-
2018	March	2	Riffle	2018-SSFE-140318-202A	14-Mar-18	43.49537	-79.77399	-
2018	March	2	Run	2018-SSFE-140318-201A	14-Mar-18	43.49548	-79.77374	-
2018	March	4	Pool	2018-SSFE-150318-403A	15-Mar-18	43.46080	-79.76116	-
2018	March	4	Riffle	2018-SSFE-150318-402A	15-Mar-18	43.46103	-79.76118	-
2018	March	4	Run	2018-SSFE-150318-401A	15-Mar-18	43.46097	-79.76088	-
2018	March	5	Pool	2018-SSFE-150318-502A	15-Mar-18	43.45810	-79.74571	-
2018	March	5	Riffle	2018-SSFE-150318-501A	15-Mar-18	43.45797	-79.74391	-
2018	March	5	Run	2018-SSFE-150318-503A	15-Mar-18	43.45812	-79.74352	-
2018	August	1	Pool	2018-SSFE-220818-103A	22-Aug-18	43.49878	-79.77656	-
2018	August	1	Riffle	2018-SSFE-220818-102A	22-Aug-18	43.49957	-79.77666	~ 100 m u/s of Lower Baseline Rd W
2018	August	1	Run	2018-SSFE-220818-101A	22-Aug-18	43.49911	-79.77671	-
2018	August	2	Pool	2018-SSFE-220818-202A	22-Aug-18	43.49519	-79.77425	-
2018	August	2	Riffle	2018-SSFE-220818-201A	22-Aug-18	43.49532	-79.77404	-
2018	August	2	Run	2018-SSFE-220818-203A	22-Aug-18	43.49549	-79.77409	-
2018	August	3	Pool	2018-SSFE-200818-303A	20-Aug-18	43.48379	-79.77316	~ 75 m u/S of old 4th Line bridge
2018	August	3	Riffle	2018-SSFE-200818-301A	20-Aug-18	43.48379	-79.77316	100 m u/s of old 4th Line bridge
2018	August	3	Run	2018-SSFE-200818-302A	20-Aug-18	43.48379	-79.77316	~ 8 m u/s of old 4th Line bridge
2018	August	4	Pool	2018-SSFE-230818-401A	23-Aug-18	43.46085	-79.76096	~ 75 m u/s of Dundas St W
2018	August	4	Riffle	2018-SSFE-230818-402A	23-Aug-18	43.46117	-79.76105	~ 900 m u/s of Dundas St W
2018	August	4	Run	2018-SSFE-230818-403A	23-Aug-18	43.46090	-79.76086	~ 850 m u/s of Dundas St W
2018	August	5	Pool	2018-SSFE-230818-502A	23-Aug-18	43.45811	-79.74389	~ 600 m d/s of Dundas St W
2018	August	5	Riffle	2018-SSFE-230818-501A	23-Aug-18	43.45807	-79.74387	~ 600 m u/s of Dundas St W
2018	August	5	Run	2018-SSFE-230818-503A	23-Aug-18	43.45808	-79.74364	~ 650 m u/s of Dundas St W
2018	August	6	Pool	2018-SSFE-240818-603A	24-Aug-18	43.45343	-79.72697	~ 120 m d/s of Sixteen Mile Creek bridge
2018	August	6	Riffle	2018-SSFE-240818-601A	24-Aug-18	43.45377	-79.72655	~ 200 m d/s of Sixteen Mile Creek bridge
2018	August	6	Run	2018-SSFE-240818-602A	24-Aug-18	43.45343	-79.72680	~ 150 m d/s of Sixteen Mile Creek bridge

Appendix 2. *Site-specific locations for all temperature loggers deployed.*

Field Number	Date	Latitude	Longitude	Gear Type
2017-SSFE-290317-001A	29-Mar-17	43.46095	-79.75793	Temp Logger - Deploy (HOBO PRO V2)
2017-SSFE-290317-002A	29-Mar-17	43.46109	-79.75923	Temp Logger - Deploy (HOBO PRO V2)
2017-SSFE-290317-003A	29-Mar-17	43.49932	-79.77686	Temp Logger - Deploy (HOBO PRO V2)
2017-SSFE-290317-004A	29-Mar-17	43.49872	-79.77651	Temp Logger - Deploy (HOBO PRO V2)
2017-SSFE-290317-005A	29-Mar-17	43.45700	-79.72962	Temp Logger - Deploy (HOBO PRO V2)
2017-SSFE-290317-006A	29-Mar-17	43.45665	-79.72933	Temp Logger - Deploy (HOBO PRO V2)

***Appendix 3**. Cumulative catch of fishes at each site sampled for Silver Shiner in a) 2016, b) 2017, and c) 2018 in Sixteen Mile Creek.*

a) 2016 – Sampling Event 1 (n=22 sites)

i. 2016 Part 1. Ambloplites rupestris – Luxilus chrysocephalus

Field Number	*Ambloplites rupestris*	*Ameiurus melas*	*Ameiurus natalis*	*Campostoma anomalum*	*Catostomus commersonii*	*Culaea inconstans*	*Cyprinella spiloptera*	*Cyprinus carpio*	*Esox lucius*	*Etheostoma caeruleum*	*Etheostoma exile*	*Etheostoma flabellare*	*Etheostoma nigrum*	*Hypentelium nigricans*	*Labidesthes sicculus*	*Lepomis gibbosus*	*Lepomis macrochirus*	*Leuciscidae*	*Luxilus chrysocephalus*
2016-SSSU110716-101A	3	0	0	0	0	1	0	0	0	7	0	0	2	0	0	0	0	0	33
2016-SSSU110716-102A	0	0	0	0	0	0	0	0	0	1	0	0	9	0	0	1	0	0	7
2016-SSSU110716-103A	0	0	0	0	1	0	0	0	0	1	0	2	2	1	0	0	0	0	9
2016-SSSU110716-104A	0	0	0	0	0	0	0	0	0	12	0	0	4	0	0	0	0	0	0
2016-SSSU120716-101A	67	0	0	0	1	107	0	0	0	53	0	2	17	0	0	2	0	0	2
2016-SSSU120716-102A	1	0	0	0	0	0	0	0	0	38	0	0	0	2	0	0	0	0	0
2016-SSSU120716-103A	0	0	0	0	1	0	0	0	0	7	0	0	38	0	0	0	0	0	1
2016-SSSU120716-104A	1	0	0	0	0	0	2	0	0	2	0	0	3	0	0	0	0	0	84
2016-SSSU190716-101A	0	0	0	0	0	0	0	0	0	1	0	0	2	1	0	0	0	0	0
2016-SSSU190716-102A	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	6
2016-SSSU190716-103A	0	0	0	0	0	0	0	0	0	9	0	1	0	0	0	0	0	0	0
2016-SSSU190716-104A	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
2016-SSSU200716-101A	0	1	0	0	0	0	0	0	0	0	0	0	6	2	0	0	0	0	0
2016-SSSU200716-102A	1	0	0	0	7	0	0	0	0	0	0	0	2	0	0	0	1	0	0
2016-SSSU200716-103A	0	0	0	0	0	0	0	0	0	3	0	1	0	0	0	0	0	0	1
2016-SSSU200716-104A	0	0	0	0	1	0	0	0	0	6	0	0	0	0	0	0	0	0	6
2016-SSSU210716-101A	0	0	0	0	1	0	0	0	0	11	0	1	0	2	0	0	0	0	11
2016-SSSU210716-102A	1	0	0	0	1	0	0	0	0	48	0	1	1	4	0	0	0	0	1
2016-SSSU210716-103A	12	0	0	0	34	17	0	0	0	16	0	0	15	0	0	0	0	0	7
2016-SSSU260716-101A	5	0	0	0	7	0	0	0	0	1	0	0	0	1	0	0	0	0	86
2016-SSSU260716-102A	0	0	0	0	1	0	0	0	0	0	0	0	4	0	0	0	0	0	0
2016-SSSU260716-103A	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total captured	**92**	**1**	**0**	**0**	**55**	**125**	**2**	**0**	**0**	**216**	**0**	**8**	**107**	**13**	**0**	**3**	**1**	**0**	**255**
Relative abundance (%)	**1.3**	**0.0**	**0.0**	**0.0**	**0.8**	**1.8**	**0.0**	**0.0**	**0.0**	**3.0**	**0.0**	**0.1**	**1.5**	**0.2**	**0.0**	**0.0**	**0.0**	**0.0**	**3.6**
Freq. of occurrence (%)	**40.9**	**4.5**	**0.0**	**0.0**	**45.5**	**13.6**	**4.5**	**0.0**	**0.0**	**72.7**	**0.0**	**27.3**	**68.2**	**31.8**	**0.0**	**9.09**	**4.5**	**0.0**	**63.6**

ii. *2016 Part 2.* Luxilus cornutus – *Silver Shiner (SS) relative abundance (RA) %*

Field number	*Luxilus cornutus*	*Luxilus* sp.	*Micropterus dolomieu*	*Micropterus nigricans*	*Nocomis biguttatus*	*Nocomis micropogon*	*Nocomis* sp.	*Notropis atherinoides*	*Notropis photogenis*	*Notropis rubellus*	*Noturus flavus*	*Pimephales notatus*	*Pimephales promelas*	*Pomoxis nigromaculatus*	*Rhinichthys cataractae*	*Semotilus atromaculatus*	Total fishes	Species detected	SS RA (%)
2016-SSSU110716-101A	132	0	4	0	0	8	0	0	161	0	0	2	0	0	0	0	**353**	**10**	**45.6**
2016-SSSU110716-102A	81	0	1	0	0	5	0	0	63	0	0	23	0	0	0	0	**191**	**9**	**33.0**
2016-SSSU110716-103A	66	0	0	0	0	33	0	0	14	33	0	42	0	0	91	0	**295**	**12**	**4.75**
2016-SSSU110716-104A	304	1	2	0	0	0	0	0	150	114	0	0	0	0	0	0	**587**	**6**	**25.6**
2016-SSSU120716-101A	750	0	7	0	0	0	0	0	8	0	0	12	0	0	1	0	**1029**	**13**	**0.78**
2016-SSSU120716-102A	193	0	1	0	0	19	0	0	10	66	0	12	0	0	173	1	**516**	**11**	**1.94**
2016-SSSU120716-103A	33	0	4	0	0	0	0	3	281	0	0	4	0	0	2	0	**374**	**10**	**75.1**
2016-SSSU120716-104A	533	0	1	0	0	2	1	0	96	3	0	1	0	0	6	0	**735**	**12**	**13.1**
2016-SSSU190716-101A	116	0	12	0	0	0	0	0	28	2	0	0	0	0	0	0	**162**	**7**	**17.3**
2016-SSSU190716-102A	30	0	1	0	0	1	0	0	41	0	0	0	0	0	0	0	**80**	**6**	**51.3**
2016-SSSU190716-103A	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	**15**	**3**	**0.00**
2016-SSSU190716-104A	6	0	0	0	0	0	0	20	258	6	0	0	0	0	0	0	**292**	**6**	**88.4**
2016-SSSU200716-101A	0	0	3	0	0	0	0	0	156	0	0	10	0	0	0	0	**178**	**6**	**87.6**
2016-SSSU200716-102A	1	0	4	0	0	0	0	0	1	0	0	100	0	4	0	0	**121**	**9**	**0.83**
2016-SSSU200716-103A	1	0	0	0	0	0	0	0	13	0	0	0	0	0	11	0	**30**	**6**	**43.3**
2016-SSSU200716-104A	4	0	15	0	0	1	0	0	18	0	0	3	0	0	13	4	**71**	**10**	**25.4**
2016-SSSU210716-101A	247	0	0	0	12	24	0	0	24	44	0	0	0	0	42	0	**419**	**11**	**5.73**
2016-SSSU210716-102A	139	0	2	0	1	56	0	0	1	0	0	0	0	0	199	2	**457**	**14**	**0.22**
2016-SSSU210716-103A	407	0	4	0	3	3	0	0	0	0	0	28	12	0	1	41	**600**	**14**	**0.00**
2016-SSSU260716-101A	152	0	7	0	0	3	0	0	23	0	0	2	0	0	0	26	**313**	**11**	**7.35**
2016-SSSU260716-102A	5	0	24	0	0	0	0	0	57	0	0	5	0	0	0	1	**97**	**7**	**58.8**
2016-SSSU260716-103A	5	0	1	0	0	0	0	2	170	0	0	0	0	0	0	0	**179**	**5**	**95.0**
Total captured	**3205**	**1**	**98**	**0**	**16**	**155**	**1**	**25**	**1571**	**268**	**0**	**244**	**12**	**4**	**539**	**75**	**7092**	**32**	**22.2**
Relative abundance (%)	**45.1**	**0**	**1.4**	**0**	**0.2**	**2.2**	**0**	**0.4**	**22.2**	**3.8**	**0**	**3.4**	**0.2**	**0.1**	**7.6**	**1.1**	**-**	**-**	
Freq. of occurrence (%)	**90.9**	**4.5**	**81.8**	**0**	**13.6**	**50**	**4.5**	**13.6**	**90.9**	**31.8**	**0**	**59.1**	**4.5**	**4.5**	**45.5**	**27.3**	**-**	**-**	

b) 2017 – Sampling events 2 and 3 (n=36 sites)

i. 2017 Part 1. Ambloplites rupestris – Luxilus chrysocephalus

Field number	*Ambloplites rupestris*	*Ameiurus melas*	*Ameiurus natalis*	*Campostoma anomalum*	*Catostomus commersonii*	*Culaea inconstans*	*Cyprinella spiloptera*	*Cyprinus carpio*	*Esox lucius*	*Etheostoma caeruleum*	*Etheostoma exile*	*Etheostoma flabellare*	*Etheostoma nigrum*	*Hypentelium nigricans*	*Labidesthes sicculus*	*Lepomis gibbosus*	*Lepomis macrochirus*	*Leuciscidae*	*Luxilus chrysocephalus*
2017-SSFE-170717-101A	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
2017-SSFE-170717-102A	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
2017-SSFE-170717-103A	3	0	0	0	0	0	0	0	0	4	0	0	8	0	0	0	1	0	0
2017-SSFE-180717-201A	0	0	0	0	0	0	0	0	0	14	0	1	0	0	0	0	0	0	0
2017-SSFE-180717-202A	8	0	0	1	0	1	0	0	0	31	0	0	61	0	0	1	0	0	0
2017-SSFE-180717-203A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
2017-SSFE-180917-301A	0	0	0	0	0	0	0	0	0	9	0	2	0	0	0	0	0	0	0
2017-SSFE-180917-302A	0	0	0	0	3	0	0	0	0	19	0	1	1	0	0	0	0	0	5
2017-SSFE-180917-303A	0	0	0	0	0	0	0	0	0	7	0	2	0	0	0	0	0	0	0
2017-SSFE-190717-301A	0	0	0	0	0	0	0	0	0	9	0	0	1	0	0	0	0	0	11
2017-SSFE-190717-302A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
2017-SSFE-190717-303A	1	0	0	0	3	0	0	0	0	68	0	2	2	0	0	0	0	0	0
2017-SSFE-190917-101A	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	6
2017-SSFE-190917-102A	0	0	0	0	0	0	0	0	0	14	0	0	0	2	0	0	0	0	0
2017-SSFE-190917-103A	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2017-SSFE-190917-201A	0	0	0	0	0	0	0	0	0	14	0	1	0	0	0	0	0	0	0
2017-SSFE-190917-202A	4	0	0	0	1	0	0	0	0	58	0	0	53	0	1	0	0	0	0
2017-SSFE-190917-203A	7	0	0	0	1	0	0	0	1	3	0	1	0	0	0	0	0	0	19
2017-SSFE-200717-401A	2	0	0	0	9	14	0	1	0	50	2	0	74	0	0	18	7	110	28
2017-SSFE-200917-401A	0	0	0	0	15	27	0	0	0	14	0	0	18	0	0	8	1	0	3
2017-SSFE-200917-402A	0	0	0	0	2	0	0	0	0	9	0	8	0	0	0	0	0	0	5
2017-SSFE-200917-403A	0	0	0	0	1	0	0	0	0	8	0	0	1	2	0	0	0	0	63
2017-SSFE-210917-501A	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
2017-SSFE-210917-502A	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
2017-SSFE-210917-503A	0	0	0	0	0	0	0	0	0	6	0	0	6	0	0	0	0	0	18
2017-SSFE-220917-601A	0	0	0	0	0	0	0	0	0	6	0	5	0	0	0	0	0	0	3
2017-SSFE-220917-602A	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	23
2017-SSFE-220917-603A	1	0	0	0	0	0	0	0	0	4	0	2	42	0	0	0	0	0	0
2017-SSFE-240717-402A	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	12
2017-SSFE-240717-403A	0	0	0	0	1	0	0	0	0	7	0	0	1	0	0	0	0	0	53
2017-SSFE-250717-501A	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
2017-SSFE-250717-502A	1	0	0	0	1	0	0	0	0	14	0	1	3	0	0	0	0	0	1

Field number	*Ambloplites rupestris*	*Ameiurus melas*	*Ameiurus natalis*	*Campostoma anomalum*	*Catostomus commersonii*	*Culaea inconstans*	*Cyprinella spiloptera*	*Cyprinus carpio*	*Esox lucius*	*Etheostoma caeruleum*	*Etheostoma exile*	*Etheostoma flabellare*	*Etheostoma nigrum*	*Hypentelium nigricans*	*Labidesthes sicculus*	*Lepomis gibbosus*	*Lepomis macrochirus*	*Leuciscidae*	*Luxilus chrysocephalus*
2017-SSFE-250717-503A	0	0	0	0	0	0	0	0	0	11	0	0	0	1	0	0	0	0	13
2017-SSFE-260717-601A	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
2017-SSFE-260717-602A	0	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	38
2017-SSFE-260717-603A	0	0	0	0	16	0	0	0	0	27	0	2	95	8	0	0	0	0	0
Total captured	**31**	**0**	**0**	**1**	**53**	**42**	**0**	**1**	**1**	**420**	**2**	**29**	**368**	**13**	**1**	**27**	**9**	**110**	**317**
Relative abundance (%)	**0.7**	**0.0**	**0.0**	**0.0**	**1.1**	**0.9**	**0.0**	**0.0**	**0.0**	**8.8**	**0.0**	**0.6**	**7.8**	**0.3**	**0.0**	**0.6**	**0.2**	**2.3**	**6.7**
Freq. of occurrence (%)	**30.6**	**0.0**	**0.0**	**2.8**	**30.6**	**8.3**	**0**	**2.8**	**2.8**	**91.7**	**2.8**	**36.1**	**44.4**	**11.1**	**2.8**	**8.3**	**8.3**	**2.8**	**52.8**

ii. 2017 Part 2. Luxilus cornutus – *Silver Shiner (SS) relative abundance (RA) %*

Field number	*Luxilus cornutus*	*Luxilus* sp.	*Micropterus dolomieu*	*Micropterus nigricans*	*Nocomis biguttatus*	*Nocomis micropogon*	*Nocomis* sp.	*Notropis atherinoides*	*Notropis photogenis*	*Notropis rubellus*	*Noturus flavus*	*Pimephales notatus*	*Pimephales promelas*	*Pomoxis nigromaculatus*	*Rhinichthys cataractae*	*Semotilus atromaculatus*	**Total fishes**	**Species detected**	**SS RA (%)**
2017-SSFE-170717-101A	2	0	1	0	0	0	0	0	130	0	0	9	0	0	0	0	**144**	**7**	**90.3**
2017-SSFE-170717-102A	4	0	0	0	0	0	0	0	17	0	0	0	0	0	2	0	**26**	**7**	**65.4**
2017-SSFE-170717-103A	0	0	4	0	0	0	0	0	42	0	0	0	0	1	1	7	**71**	**10**	**59.2**
2017-SSFE-180717-201A	0	0	1	0	0	0	0	0	0	0	0	0	0	0	12	0	**28**	**5**	**0.00**
2017-SSFE-180717-202A	0	0	7	8	0	0	0	0	55	0	0	22	0	0	0	7	**202**	**12**	**27.2**
2017-SSFE-180717-203A	0	0	3	0	0	0	0	0	35	0	0	0	0	0	0	1	**42**	**5**	**83.3**
2017-SSFE-180917-301A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	**12**	**4**	**0.00**
2017-SSFE-180917-302A	6	0	3	0	0	6	0	0	300	0	0	4	0	0	0	0	**348**	**11**	**86.2**
2017-SSFE-180917-303A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**9**	**2**	**0.00**
2017-SSFE-190717-301A	32	0	1	0	0	3	0	0	25	0	0	2	0	0	0	0	**84**	**9**	**29.8**
2017-SSFE-190717-302A	28	0	8	0	0	3	0	0	216	0	0	0	0	0	0	0	**267**	**6**	**80.9**
2017-SSFE-190717-303A	0	0	5	0	0	0	0	0	0	0	0	3	0	0	0	0	**84**	**8**	**0.00**
2017-SSFE-190917-101A	1	0	5	0	0	1	0	0	9	0	0	0	0	0	0	0	**25**	**8**	**36.0**
2017-SSFE-190917-102A	0	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	**20**	**4**	**0.00**
2017-SSFE-190917-103A	0	0	0	0	0	0	0	0	42	5	0	0	0	0	0	0	**48**	**4**	**87.5**
2017-SSFE-190917-201A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	0	**39**	**3**	**0.00**
2017-SSFE-190917-202A	0	0	0	0	0	0	0	0	0	0	0	48	0	0	0	1	**166**	**7**	**0.00**
2017-SSFE-190917-203A	1	0	11	0	0	4	0	0	152	0	0	0	0	0	0	1	**201**	**12**	**75.6**
2017-SSFE-200717-401A	35	0	6	2	0	0	0	0	35	0	0	8	0	0	2	16	**419**	**19**	**8.35**

Field number	*Luxilus cornutus*	*Luxilus* sp.	*Micropterus dolomieu*	*Micropterus nigricans*	*Nocomis biguttatus*	*Nocomis micropogon*	*Nocomis* sp.	*Notropis atherinoides*	*Notropis photogenis*	*Notropis rubellus*	*Noturus flavus*	*Pimephales notatus*	*Pimephales promelas*	*Pomoxis nigromaculatus*	*Rhinichthys cataractae*	*Semotilus atromaculatus*	Total fishes	Species detected	SS RA (%)
2017-SSFE-200917-401A	0	0	0	6	0	0	0	0	0	0	0	0	1	0	0	3	**96**	**10**	**0.00**
2017-SSFE-200917-402A	23	0	0	0	0	8	0	0	0	0	0	0	0	0	6	0	**61**	**7**	**0.00**
2017-SSFE-200917-403A	180	0	1	0	0	49	0	0	59	3	0	7	0	0	1	0	**375**	**13**	**15.7**
2017-SSFE-210917-501A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	**11**	**2**	**0.00**
2017-SSFE-210917-502A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	**3**	**3**	**0.00**
2017-SSFE-210917-503A	14	0	0	0	0	5	0	0	43	0	0	0	0	0	0	0	**92**	**6**	**46.7**
2017-SSFE-220917-601A	0	0	0	0	0	2	0	0	0	0	0	0	0	0	23	0	**39**	**5**	**0.00**
2017-SSFE-220917-602A	4	0	0	0	0	10	0	0	219	0	0	0	0	0	0	0	**258**	**5**	**84.9**
2017-SSFE-220917-603A	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	**50**	**6**	**0.00**
2017-SSFE-240717-402A	22	0	0	0	0	7	0	0	3	0	0	0	0	0	33	0	**78**	**7**	**3.85**
2017-SSFE-240717-403A	299	0	0	0	0	11	0	0	106	1	1	6	0	0	0	0	**486**	**11**	**21.8**
2017-SSFE-250717-501A	0	0	0	0	0	5	0	0	0	0	0	0	0	0	9	0	**15**	**4**	**0.00**
2017-SSFE-250717-502A	13	0	6	0	0	1	0	0	0	0	0	0	0	0	11	0	**52**	**11**	**0.00**
2017-SSFE-250717-503A	0	0	0	0	0	0	0	0	54	11	0	0	0	0	1	0	**91**	**7**	**59.3**
2017-SSFE-260717-601A	18	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	**27**	**4**	**0.00**
2017-SSFE-260717-602A	44	0	0	0	0	1	0	0	355	0	0	12	0	0	0	0	**453**	**7**	**78.4**
2017-SSFE-260717-603A	59	0	1	0	0	0	0	0	44	0	0	73	0	0	0	2	**327**	**11**	**13.5**
Total captured	**785**	**0**	**66**	**17**	**0**	**116**	**0**	**0**	**1941**	**20**	**1**	**195**	**1**	**1**	**142**	**39**	**4749**	**32**	**40.9**
Relative abundance (%)	**16.5**	**0.0**	**1.4**	**0.4**	**0.0**	**2.4**	**0.0**	**0.0**	**40.9**	**0.4**	**0.0**	**4.1**	**0.0**	**0.0**	**3.0**	**0.8**	**-**	**-**	**-**
Freq. of occurrence (%)	**50.0**	**0.0**	**44.4**	**11.1**	**0.0**	**41.7**	**0.0**	**0.0**	**55.6**	**11.1**	**2.8**	**33.3**	**2.8**	**2.8**	**41.7**	**25.0**	**-**	**-**	**-**

c) *2018 Sampling events 4 and 5 (n=30 sites)*

i. *2018 Part 1.* Ambloplites rupestris – Luxilus chrysocephalus

Field number	*Ambloplites rupestris*	*Ameiurus melas*	*Ameiurus natalis*	*Campostoma anomalum*	*Catostomus commersonii*	*Culaea inconstans*	*Cyprinella spiloptera*	*Cyprinus carpio*	*Esox lucius*	*Etheostoma caeruleum*	*Etheostoma exile*	*Etheostoma flabellare*	*Etheostoma nigrum*	*Hypentelium nigricans*	*Labidesthes sicculus*	*Lepomis gibbosus*	*Lepomis macrochirus*	*Leuciscidae*	*Luxilus chrysocephalus*
2018-SSFE-090318-101A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2018-SSFE-090318-102A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2018-SSFE-090318-103A	0	0	0	0	2	1	0	0	0	5	0	0	10	0	0	0	1	0	0
2018-SSFE-140318-201A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2018-SSFE-140318-202A	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0

Field number	*Ambloplites rupestris*	*Ameiurus melas*	*Ameiurus natalis*	*Campostoma anomalum*	*Catostomus commersonii*	*Culaea inconstans*	*Cyprinella spiloptera*	*Cyprinus carpio*	*Esox lucius*	*Etheostoma caeruleum*	*Etheostoma exile*	*Etheostoma flabellare*	*Etheostoma nigrum*	*Hypentelium nigricans*	*Labidesthes sicculus*	*Lepomis gibbosus*	*Lepomis macrochirus*	*Leuciscidae*	*Luxilus chrysocephalus*
2018-SSFE-140318-203A	14	0	0	0	0	3	0	0	0	1	0	0	21	0	0	0	0	0	17
2018-SSFE-150318-401A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2018-SSFE-150318-402A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2018-SSFE-150318-403A	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
2018-SSFE-150318-501A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2018-SSFE-150318-502A	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
2018-SSFE-150318-503A	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
2018-SSFE-200818-301A	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0
2018-SSFE-200818-302A	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
2018-SSFE-200818-303A	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	6	0	0	0
2018-SSFE-220818-101A	1	1	0	0	0	0	0	0	0	0	0	0	3	0	0	1	0	0	10
2018-SSFE-220818-102A	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	1	0	0	0
2018-SSFE-220818-103A	4	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0
2018-SSFE-220818-201A	0	0	0	0	1	0	0	0	0	15	0	0	0	0	0	0	0	0	0
2018-SSFE-220818-202A	3	0	1	0	13	0	0	0	0	74	0	0	14	0	0	1	0	0	0
2018-SSFE-220818-203A	0	0	0	0	3	0	0	0	0	12	0	0	0	0	0	0	0	0	2
2018-SSFE-230818-401A	0	0	0	0	3	0	0	0	0	1	0	0	8	0	0	4	0	0	5
2018-SSFE-230818-402A	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	8
2018-SSFE-230818-403A	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	47
2018-SSFE-230818-501A	0	0	1	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
2018-SSFE-230818-502A	0	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0
2018-SSFE-230818-503A	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	11
2018-SSFE-240818-601A	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	8
2018-SSFE-240818-602A	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	15
2018-SSFE-240818-603A	0	0	0	0	7	0	0	0	0	41	0	0	41	6	0	0	0	0	11
Total captured	**24**	**1**	**2**	**0**	**35**	**4**	**0**	**0**	**0**	**167**	**0**	**0**	**103**	**9**	**0**	**13**	**1**	**0**	**134**
Relative abundance (%)	**1.2**	**0.1**	**0.1**	**0.0**	**1.7**	**0.2**	**0.0**	**0.0**	**0.0**	**8.0**	**0.0**	**0.0**	**5.0**	**0.4**	**0.0**	**0.6**	**0.1**	**0.0**	**6.40**
Freq. of occurrence (%)	**16.7**	**3.3**	**6.7**	**0.0**	**36.7**	**6.7**	**0.0**	**0.0**	**0.0**	**60.0**	**0.0**	**0.0**	**36.7**	**13.3**	**0.0**	**16.7**	**3.3**	**0.0**	**33.3**

ii. 2018 Part 2. Luxilus cornutus – *Silver Shiner (SS) relative abundance (RA) %*

Field number	*Luxilus cornutus*	*Luxilus* sp.	*Micropterus dolomieu*	*Micropterus nigricans*	*Nocomis biguttatus*	*Nocomis micropogon*	*Nocomis* sp.	*Notropis atherinoides*	*Notropis photogenis*	*Notropis rubellus*	*Noturus flavus*	*Pimephales notatus*	*Pimephales promelas*	*Pomoxis nigromaculatus*	*Rhinichthys cataractae*	*Semotilus atromaculatus*	Total fishes	Species detected	SS RA (%)
2018-SSFE-090318-101A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**	**0.00**
2018-SSFE-090318-102A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**	**0.00**
2018-SSFE-090318-103A	1	0	0	0	0	0	0	0	1	0	0	1	0	0	0	3	**25**	**9**	**4.00**
2018-SSFE-140318-201A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**	**0.00**
2018-SSFE-140318-202A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	**1**	**0.00**
2018-SSFE-140318-203A	61	0	0	0	0	0	0	0	212	7	0	8	13	0	0	0	**357**	**10**	**59.4**
2018-SSFE-150318-401A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**	**0.00**
2018-SSFE-150318-402A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**	**0.00**
2018-SSFE-150318-403A	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	**2**	**2**	**0.00**
2018-SSFE-150318-501A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**	**0.00**
2018-SSFE-150318-502A	0	0	0	0	0	0	0	0	3	0	0	0	0	0	1	0	**6**	**4**	**50.0**
2018-SSFE-150318-503A	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	**3**	**3**	**33.3**
2018-SSFE-200818-301A	20	0	0	0	0	0	0	0	64	13	0	0	0	0	0	0	**100**	**5**	**64.0**
2018-SSFE-200818-302A	3	0	0	0	0	0	0	0	36	1	0	0	0	0	0	0	**41**	**4**	**87.8**
2018-SSFE-200818-303A	0	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	**12**	**5**	**16.7**
2018-SSFE-220818-101A	3	0	0	0	0	0	0	0	151	0	0	3	0	0	0	0	**173**	**8**	**87.3**
2018-SSFE-220818-102A	11	0	0	0	0	0	0	0	102	1	0	4	0	0	0	0	**122**	**7**	**82.9**
2018-SSFE-220818-103A	1	0	1	0	0	0	0	0	9	0	0	1	0	0	1	4	**24**	**10**	**37.5**
2018-SSFE-220818-201A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	**22**	**3**	**0.00**
2018-SSFE-220818-202A	0	0	2	0	0	0	0	0	5	0	1	4	1	0	0	8	**127**	**12**	**3.94**
2018-SSFE-220818-203A	2	0	1	0	0	0	0	0	2	0	1	0	0	0	0	1	**24**	**8**	**8.33**
2018-SSFE-230818-401A	18	22	1	2	0	0	0	0	1	0	0	1	0	0	0	2	**68**	**11**	**1.47**
2018-SSFE-230818-402A	8	0	0	0	0	12	0	0	1	0	0	0	0	0	5	0	**38**	**6**	**2.63**
2018-SSFE-230818-403A	116	3	0	0	0	0	0	0	33	0	0	3	0	0	2	2	**209**	**8**	**15.8**
2018-SSFE-230818-501A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	**6**	**3**	**0.00**
2018-SSFE-230818-502A	7	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	**11**	**4**	**0.00**
2018-SSFE-230818-503A	47	0	0	0	0	10	0	0	76	5	0	0	0	0	1	0	**152**	**8**	**50.0**
2018-SSFE-240818-601A	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	**15**	**4**	**0.00**
2018-SSFE-240818-602A	25	0	0	0	0	0	0	0	139	19	0	0	0	0	0	0	**199**	**5**	**69.8**
2018-SSFE-240818-603A	65	0	0	0	0	9	0	0	6	6	0	154	0	0	0	0	**346**	**10**	**1.73**
Total captured	**391**	**25**	**6**	**2**	**0**	**33**	**0**	**0**	**844**	**52**	**2**	**179**	**15**	**0**	**21**	**20**	**2083**	**32**	**40.5**
Relative abundance (%)	**18.8**	**1.2**	**0.3**	**0.1**	**0.0**	**1.6**	**0.0**	**0.0**	**40.5**	**2.5**	**0.1**	**8.6**	**0.7**	**0.0**	**1.0**	**1.0**	**-**	**-**	
Freq. of occurrence (%)	**53.3**	**6.7**	**16.7**	**3.3**	**0.0**	**16.7**	**0.0**	**0.0**	**60.0**	**23.3**	**6.7**	**30.0**	**10.0**	**0.0**	**26.7**	**20.0**	**-**	**-**	

***Appendix 4**. Site specific total length (TL, mm) and weight (W, g) measurements for Silver Shiner. A dash (-) indicates a measurement not recorded (n=2392).*

Field Number	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W
2016-SSSU110716-101A	49	-	52	0.7	41	0.5	48	-	46	-	44	-	42	0.4	43	-	42	-	45	-
2016-SSSU110716-101A	48	-	44	0.6	50	0.8	49	-	51	-	43	-	44	0.6	43	-	41	-	50	-
2016-SSSU110716-101A	54	-	47	-	38	0.2	45	-	48	-	51	-	47	0.6	44	-	43	-	49	-
2016-SSSU110716-101A	49	-	48	0.6	42	0.8	44	-	48	-	51	-	46	0.5	42	-	44	-	45	-
2016-SSSU110716-101A	51	-	49	0.7	50	0.7	44	-	48	-	47	-	49	0.7	37	-	43	-	37	-
2016-SSSU110716-101A	50	-	46	0.5	39	-	37	-	46	-	49	-	51	0.6	41	-	40	-	45	-
2016-SSSU110716-101A	48	-	43	0.5	44	0.4	42	-	41	-	55	-	44	0.4	38	-	47	-	43	-
2016-SSSU110716-101A	49	-	48	0.8	50	0.7	47	-	48	-	49	-	45	0.7	39	-	36	-	48	0.7
2016-SSSU110716-101A	46	-	51	0.8	46	0.5	34	-	45	-	49	-	45	0.6	51	-	47	0.6	45	0.7
2016-SSSU110716-101A	52	-	49	0.6	46	0.5	38	-	43	-	48	-	44	0.6	41	-	49	-	46	0.6
2016-SSSU110716-101A	52	-	45	-	45	0.6	39	-	45	-	48	-	46	0.7	44	-	49	0.7	47	-
2016-SSSU110716-101A	50	-	42	-	42	-	42	-	42	-	52	-	45	0.8	44	0.6	46	0.6	46	0.7
2016-SSSU110716-101A	51	-	52	0.9	45	0.6	43	-	46	-	49	-	40	-	50	0.8	46	0.6	46	0.6
2016-SSSU110716-101A	49	-	47	0.7	42	0.5	44	-	42	-	46	-	48	-	44	-	41	-	48	-
2016-SSSU110716-101A	50	-	45	0.6	47	0.6	43	-	47	-	46	-	-	-	-	-	-	-	-	-
2016-SSSU110716-101A	48	-	47	-	49	-	47	-	42	-	53	-	47	0.6	48	-	43	-	46	-
2016-SSSU110716-101A	47	-	49	0.8	44	-	37	-	40	-	-	-	-	-	-	-	-	-	-	-
2016-SSSU110716-102A	45	0.4	47	-	47	0.6	46	0.6	44	-	46	0.6	35	-	38	-	42	-	47	-
2016-SSSU110716-102A	53	0.5	38	-	45	-	45	0.6	45	-	52	1	44	-	40	-	46	-	42	-
2016-SSSU110716-102A	44	0.3	45	-	43	-	43	0.5	49	-	49	0.7	45	-	42	-	40	-	47	-
2016-SSSU110716-102A	51	0.8	34	-	32	-	47	0.6	40	-	45	0.5	49	-	35	-	47	0.6	50	-
2016-SSSU110716-102A	52	0.9	27	-	52	-	47	0.7	46	-	45	0.5	40	-	43	0.4	-	-	53	-
2016-SSSU110716-102A	32	0.3	49	-	47	-	49	0.7	40	-	45	0.4	32	-	49	0.7	39	-	48	-
2016-SSSU110716-102A	51	0.8	40	-	42	-	47	-	47	0.6	53	0.5	35	-	47	0.6	40	-	38	-
2016-SSSU110716-102A	39	0.3	28	-	47	-	32	-	43	0.4	44	0.3	38	-	45	-	38	-	43	0.5
2016-SSSU110716-102A	46	0.5	39	-	50	-	35	-	46	0.6	51	0.8	50	-	43	-	35	-	47	0.6
2016-SSSU110716-102A	45	0.6	40	-	53	-	38	-	45	0.6	52	0.9	42	-	32	-	49	0.9	27	-
2016-SSSU110716-102A	49	0.9	38	-	48	-	50	-	47	-	32	0.3	47	-	52	-	46	0.6	49	-
2016-SSSU110716-102A	51	0.8	38	-	45	0.5	52	1	40	-	46	0.5	34	-	47	0.7	45	0.5	40	-
2016-SSSU110716-102A	39	0.3	45	-	35	-	49	0.7	28	-	45	0.6	42	-	-	-	-	-	-	-
2016-SSSU110716-103A	51	-	46	-	48	-	47	-	52	-	51	-	48	-	42	-	53	-	-	-
2016-SSSU110716-103A	45	-	52	-	49	-	46	-	48	-	-	-	-	-	-	-	-	-	-	-
2016-SSSU110716-104A	49	-	41	-	47	0.7	43	-	42	-	40	-	40	-	44	-	40	-	38	-
2016-SSSU110716-104A	42	-	49	-	44	0.2	35	-	43	0.5	40	-	46	-	35	-	35	-	37	-
2016-SSSU110716-104A	39	-	51	-	47	0.4	37	-	47	0.6	48	-	47	-	34	-	39	-	35	-
2016-SSSU110716-104A	52	-	37	-	39	0.3	42	-	43	0.4	36	-	44	-	42	-	35	-	33	-
2016-SSSU110716-104A	38	-	42	-	44	0.6	44	-	47	0.5	42	-	44	-	37	-	37	-	49	-

Field Number	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W
2016-SSSU110716-104A	46	-	36	-	45	0.5	54	-	46	0.6	42	-	47	-	52	-	36	-	40	-
2016-SSSU110716-104A	47	-	36	-	48	0.8	35	-	52	0.9	44	-	40	-	44	-	35	-	50	-
2016-SSSU110716-104A	38	-	40	-	41	0.2	38	-	44	0.6	41	-	45	-	43	-	38	-	38	-
2016-SSSU110716-104A	34	-	41	-	42	0.4	34	-	49	0.8	48	-	38	-	37	-	39	-	39	-
2016-SSSU110716-104A	47	-	38	-	49	0.8	41	-	43	-	51	-	37	-	48	-	40	-	36	-
2016-SSSU110716-104A	55	-	50	-	49	0.6	42	-	50	0.6	39	-	47	-	35	-	42	-	42	-
2016-SSSU110716-104A	38	-	39	-	49	0.7	36	-	37	-	43	-	45	-	35	-	37	-	37	-
2016-SSSU110716-104A	34	-	47	-	34	0.4	33	-	49	-	51	-	33	-	36	-	43	-	36	-
2016-SSSU110716-104A	47	-	38	-	42	-	37	-	36	-	44	-	37	-	37	0.3	36	-	35	-
2016-SSSU110716-104A	45	-	44	-	49	0.8	39	-	38	-	37	-	38	-	48	0.8	42	-	38	-
2016-SSSU120716-101A	43	0.5	47	0.6	43	0.5	44	0.6	42	0.4	38	0.4	39	0.4	45	0.7	-	-	-	-
2016-SSSU120716-102A	50	0.9	45	0.5	49	0.7	47	-	46	0.6	52	0.9	44	0.5	49	0.7	47	0.7	50	0.8
2016-SSSU120716-103A	97	5.2	43	-	44	-	42	-	44	-	46	-	47	-	46	-	47	-	44	-
2016-SSSU120716-103A	98	5.7	48	-	43	-	43	-	47	-	44	-	40	-	37	-	37	-	40	-
2016-SSSU120716-103A	100	6.1	44	-	39	-	38	-	48	-	46	-	48	-	39	-	43	-	44	-
2016-SSSU120716-103A	52	0.9	47	-	45	-	43	-	37	-	43	-	47	-	49	-	42	-	43	-
2016-SSSU120716-103A	44	0.5	53	-	40	-	43	-	47	-	54	-	40	-	42	-	46	-	39	-
2016-SSSU120716-103A	56	1.1	48	-	45	-	40	-	46	-	49	-	48	-	38	-	47	-	46	-
2016-SSSU120716-103A	47	0.6	48	-	38	-	39	-	48	-	45	-	45	-	47	-	48	-	42	-
2016-SSSU120716-103A	43	0.5	49	-	41	-	42	-	43	-	42	-	49	-	43	-	39	-	44	-
2016-SSSU120716-103A	49	0.8	46	-	56	-	45	-	42	-	47	-	50	-	47	-	44	-	38	-
2016-SSSU120716-103A	47	0.7	49	-	40	-	42	-	40	-	53	-	49	-	54	-	46	-	30	-
2016-SSSU120716-103A	50	1	46	-	45	-	43	-	47	-	-1	-	51	-	57	-	49	-	43	-
2016-SSSU120716-103A	52	0.7	42	-	41	-	39	-	47	-	47	-	50	-	51	-	47	-	46	-
2016-SSSU120716-103A	54	1.2	47	-	43	-	45	-	36	-	47	-	50	-	47	-	42	-	37	-
2016-SSSU120716-103A	52	0.9	45	-	46	-	48	-	47	-	44	-	50	-	48	-	48	-	42	-
2016-SSSU120716-103A	51	0.9	48	-	45	-	47	-	39	-	52	-	45	-	52	-	49	-	43	-
2016-SSSU120716-103A	53	1.1	47	-	43	-	51	-	40	-	47	-	48	-	52	-	44	-	42	-
2016-SSSU120716-103A	54	1.2	49	-	46	-	52	-	38	-	45	-	47	-	46	-	38	-	42	-
2016-SSSU120716-103A	49	0.9	56	-	49	-	44	-	45	-	48	-	54	-	52	-	43	-	41	-
2016-SSSU120716-103A	52	0.9	44	-	43	-	47	-	46	-	44	-	48	-	47	-	41	-	42	-
2016-SSSU120716-103A	52	0.9	40	-	52	-	46	-	47	-	44	-	50	-	43	-	40	-	30	-
2016-SSSU120716-103A	51	-	42	-	42	-	48	-	39	-	52	-	48	-	49	-	45	-	39	-
2016-SSSU120716-103A	54	-	50	-	43	-	44	-	45	-	48	-	45	-	42	-	43	-	39	-
2016-SSSU120716-103A	47	-	44	-	45	-	47	-	46	-	49	-	47	-	47	-	40	-	45	-
2016-SSSU120716-103A	43	-	51	-	53	-	49	-	45	-	53	-	52	-	45	-	41	-	44	-
2016-SSSU120716-103A	49	-	48	-	51	-	42	-	51	-	53	-	52	-	44	-	48	-	54	-
2016-SSSU120716-103A	45	-	44	-	43	-	35	-	46	-	51	-	48	-	47	-	43	-	49	-
2016-SSSU120716-103A	53	-	47	-	43	-	43	-	48	-	49	-	47	-	44	-	37	-	50	-
2016-SSSU120716-103A	42	-	39	-	46	-	103	7.2	51	-	57	-	52	-	49	-	44	-	47	-

Field Number	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W
2016-SSSU120716-103A	48	-	51	-	45	-	37	-	47	-	-	-	-	-	-	-	-	-	-	-
2016-SSSU120716-104A	52	-	55	-	52	-	113	9.1	51	-	44	-	29	-	50	-	42	-	45	-
2016-SSSU120716-104A	39	-	49	-	50	-	116	9.4	57	-	46	-	55	-	52	-	39	-	45	-
2016-SSSU120716-104A	49	-	50	-	51	-	122	10.5	55	-	51	-	39	-	45	-	47	-	46	-
2016-SSSU120716-104A	53	-	53	-	55	-	103	7.6	49	-	48	-	56	-	52	-	56	-	120	10.9
2016-SSSU120716-104A	52	-	39	-	47	-	120	11.5	48	-	31	-	45	-	32	-	57	-	122	12.8
2016-SSSU120716-104A	52	-	31	-	51	-	47	-	56	-	52	-	50	-	46	-	43	-	124	12
2016-SSSU120716-104A	54	-	54	-	45	-	49	-	54	-	50	-	42	-	44	-	51	-	123	10.7
2016-SSSU120716-104A	46	-	29	-	50	-	49	-	45	-	55	-	55	-	49	-	48	-	117	10.6
2016-SSSU120716-104A	26	-	44	-	46	-	44	-	51	-	51	-	52	-	46	-	47	-	119	9.2
2016-SSSU120716-104A	52	-	44	-	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016-SSSU190716-101A	49	0.2	59	0.4	53	0.2	56	0.3	53	0.3	52	0.2	50	0.2	55	0.3	58	0.4	52	0.3
2016-SSSU190716-101A	54	0.3	53	0.3	54	0.3	52	0.2	54	0.3	49	0.2	53	0.3	49	0.2	53	0.3	51	0.3
2016-SSSU190716-101A	52	0.3	52	0.2	48	0.2	52	0.3	50	0.3	54	0.3	46	0.2	53	0.4	-	-	-	-
2016-SSSU190716-102A	58	-	93	5.3	52	-	54	-	47	-	52	-	95	5.1	103	6.8	57	-	55	-
2016-SSSU190716-102A	54	-	97	5.8	55	-	45	-	50	-	49	-	103	6.9	100	6.3	101	6.8	104	7.1
2016-SSSU190716-102A	58	-	58	-	54	-	48	-	56	-	52	-	101	6.2	103	7	107	7.8	106	7.6
2016-SSSU190716-102A	53	-	105	7.6	100	5.9	48	-	56	-	52	-	124	10.7	104	6.9	47	-	54	-
2016-SSSU190716-102A	43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016-SSSU190716-104A	55	-	56	-	50	-	56	-	46	-	53	-	57	-	50	-	46	-	128	11.7
2016-SSSU190716-104A	49	-	58	-	50	-	49	-	53	-	58	-	52	-	51	-	49	-	97	5.5
2016-SSSU190716-104A	51	-	54	-	51	-	57	-	46	-	47	-	49	-	54	-	52	-	90	4.8
2016-SSSU190716-104A	62	-	49	-	52	-	50	-	54	-	46	-	49	-	55	-	48	-	100	6.2
2016-SSSU190716-104A	56	-	50	-	50	-	49	-	42	-	52	-	48	-	51	-	52	-	101	-
2016-SSSU190716-104A	51	-	45	-	54	-	54	-	49	-	54	-	53	-	48	-	41	-	54	-
2016-SSSU190716-104A	56	-	50	-	47	-	49	-	46	-	54	-	42	-	54	-	50	-	52	-
2016-SSSU190716-104A	55	-	53	-	52	-	50	-	30	-	54	-	52	-	55	-	47	-	54	-
2016-SSSU190716-104A	45	-	41	-	56	-	47	-	95	4.7	45	-	53	-	59	-	47	-	54	-
2016-SSSU190716-104A	53	-	47	-	46	-	47	-	103	6.7	44	-	55	-	53	-	51	-	53	-
2016-SSSU190716-104A	50	-	52	-	54	-	52	-	95	5.3	47	-	57	-	47	-	48	-	57	-
2016-SSSU190716-104A	54	-	46	-	50	-	47	-	98	5.7	47	-	55	-	49	-	49	-	46	-
2016-SSSU190716-104A	47	-	50	-	50	-	53	-	101	6.1	52	-	55	-	55	-	50	-	53	-
2016-SSSU190716-104A	51	-	45	-	43	-	57	-	97	6.6	55	-	47	-	51	-	48	-	47	-
2016-SSSU190716-104A	58	-	43	-	50	-	55	-	101	6.1	49	-	53	-	52	-	43	-	47	-
2016-SSSU190716-104A	47	-	47	-	60	-	48	-	100	6.3	48	-	55	-	49	-	47	-	59	-
2016-SSSU190716-104A	52	-	47	-	52	-	52	-	107	7.1	59	-	44	-	54	-	54	-	48	-
2016-SSSU190716-104A	53	-	57	-	46	-	56	-	103	6.9	45	-	55	-	46	-	48	-	57	-
2016-SSSU190716-104A	51	-	55	-	47	-	55	-	107	7.3	51	-	47	-	48	-	43	-	49	-
2016-SSSU190716-104A	57	-	56	-	52	-	56	-	97	4.8	55	-	57	-	49	-	42	-	46	-
2016-SSSU190716-104A	52	-	50	-	47	-	48	-	102	6.2	50	-	54	-	52	-	50	-	55	-

Field Number	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W
2016-SSSU190716-104A	45	-	58	-	55	-	55	-	100	5.7	59	-	49	-	47	-	49	-	56	-
2016-SSSU190716-104A	59	-	45	-	47	-	50	-	46	-	52	-	52	-	39	-	44	-	47	-
2016-SSSU190716-104A	49	-	51	-	45	-	42	-	52	-	60	-	49	-	55	-	46	-	44	-
2016-SSSU190716-104A	54	-	45	-	40	-	48	-	55	-	54	-	52	-	57	-	47	-	45	-
2016-SSSU190716-104A	47	-	52	-	47	-	47	-	44	-	49	-	48	-	57	-	-	-	-	-
2016-SSSU200716-101A	116	9.3	47	-	60	-	95	-	51	-	100	6	52	-	41	-	51	-	50	-
2016-SSSU200716-101A	113	8.3	43	-	55	-	95	-	47	-	58	1.2	48	-	52	-	44	-	53	-
2016-SSSU200716-101A	96	5.5	57	-	52	-	52	-	45	-	90	4.3	48	-	54	-	43	-	48	-
2016-SSSU200716-101A	103	7.8	45	-	43	-	92	-	51	-	112	7.8	52	-	53	-	47	-	95	-
2016-SSSU200716-101A	99	5.8	48	-	51	-	54	-	52	-	115	8.9	50	-	48	-	48	-	53	-
2016-SSSU200716-101A	118	9.3	55	-	55	-	52	-	55	-	105	6.7	40	-	53	-	45	-	51	-
2016-SSSU200716-101A	117	9	54	-	50	-	98	-	101	-	60	1.2	46	-	47	-	58	-	50	-
2016-SSSU200716-101A	98	5.9	51	-	42	-	96	-	55	-	119	10	48	-	95	-	46	-	44	-
2016-SSSU200716-101A	55	1.2	47	-	49	-	42	-	58	-	95	5.3	45	-	52	-	56	-	48	-
2016-SSSU200716-101A	61	1.4	41	-	52	-	57	-	52	-	55	1	47	-	52	-	42	-	49	-
2016-SSSU200716-101A	97	9	100	-	55	-	52	-	97	-	95	5.6	52	-	45	-	50	-	52	-
2016-SSSU200716-101A	115	7.8	91	-	49	-	51	-	55	-	100	5.8	45	-	52	-	52	-	51	-
2016-SSSU200716-101A	118	9.4	52	-	48	-	98	-	98	-	116	8.6	51	-	49	-	115	-	40	-
2016-SSSU200716-101A	92	-	55	-	51	-	52	-	100	-	54	0.9	48	-	50	-	98	-	47	-
2016-SSSU200716-101A	119	8.9	49	-	45	-	50	-	98	-	59	1.1	43	-	50	-	44	-	52	-
2016-SSSU200716-101A	100	6.1	39	-	52	-	46	-	45	-	50	-	-	-	-	-	-	-	-	-
2016-SSSU200716-102A	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016-SSSU200716-103A	62	-	53	-	54	-	57	-	52	-	56	-	53	-	51	-	-	-	-	-
2016-SSSU200716-103A	58	-	52	-	55	-	55	-	59	-	-	-	-	-	-	-	-	-	-	-
2016-SSSU200716-104A	52	-	56	-	63	-	105	-	54	-	56	-	58	-	98	-	55	-	52	-
2016-SSSU200716-104A	92	-	53	-	65	-	96	-	55	-	52	-	52	-	118	-	-	-	-	-
2016-SSSU210716-101A	52	0.8	51	0.7	48	0.8	53	1.1	54	1.1	51	0.9	43	0.6	46	0.7	53	1.1	65	1.8
2016-SSSU210716-101A	58	1.1	53	0.9	39	0.2	40	0.3	53	1	46	0.6	39	0.4	48	0.7	59	1.3	61	1.8
2016-SSSU210716-101A	55	1.1	34	-	47	0.6	56	1	-	-	-	-	-	-	-	-	-	-	-	-
2016-SSSU210716-102A	55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016-SSSU260716-101A	59	-	58	-	56	-	54	-	61	-	54	-	59	-	55	-	60	-	57	-
2016-SSSU260716-101A	55	-	54	-	56	-	57	-	56	-	55	-	53	-	54	-	63	-	62	-
2016-SSSU260716-101A	54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016-SSSU260716-102A	53	-	49	-	50	-	51	-	58	-	103	6.1	60	-	50	-	54	-	55	-
2016-SSSU260716-102A	57	-	58	-	57	-	59	-	57	-	58	-	63	-	58	-	57	-	59	-
2016-SSSU260716-102A	42	-	53	-	55	-	61	-	52	-	48	-	57	-	51	-	58	-	51	-
2016-SSSU260716-102A	55	-	57	-	50	-	61	-	55	-	48	-	57	-	52	-	48	-	49	-
2016-SSSU260716-102A	44	-	53	-	51	-	53	-	54	-	60	-	56	-	59	-	55	-	98	5.9
2016-SSSU260716-102A	57	-	48	-	60	-	53	-	54	-	58	-	53	-	-	-	-	-	-	-
2016-SSSU260716-103A	65	-	94	-	58	-	98	6	100	6	52	-	99	-	50	-	100	6.3	93	4.8

Field Number	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W
2016-SSSU260716-103A	51	-	102	-	51	-	103	6.6	110	8	40	-	107	-	55	-	102	6	98	5.3
2016-SSSU260716-103A	50	-	95	-	59	-	103	6.2	99	5.7	52	-	90	-	55	-	95	5.2	96	5.3
2016-SSSU260716-103A	52	-	108	-	55	-	98	5.7	115	8.9	65	-	102	-	94	-	117	9.6	100	6
2016-SSSU260716-103A	59	-	103	-	55	-	95	5.2	97	5.4	66	-	106	-	93	-	100	6.2	95	5.2
2016-SSSU260716-103A	59	-	102	-	56	-	97	5.4	116	6.9	55	-	103	-	92	-	103	6.2	116	8.3
2016-SSSU260716-103A	55	-	93	-	55	-	100	5.7	117	9.1	57	-	54	-	97	-	106	7.1	97	5.8
2016-SSSU260716-103A	50	-	94	-	56	-	95	4.9	102	6.6	44	-	103	-	106	-	100	6	102	6.1
2016-SSSU260716-103A	51	-	94	-	57	-	101	6.4	96	4.7	52	-	99	-	120	-	101	6	99	5.4
2016-SSSU260716-103A	52	-	49	-	58	-	105	6.8	96	5.6	51	-	94	-	100	-	96	5.3	125	11
2016-SSSU260716-103A	55	-	51	-	57	-	101	5.7	95	5.1	55	-	97	-	98	-	105	-	100	5.7
2016-SSSU260716-103A	41	-	111	-	58	-	93	5.7	130	11.8	52	-	100	-	103	-	95	-	109	7.4
2016-SSSU260716-103A	51	-	128	-	59	-	96	5.3	95	5.7	59	-	63	-	94	-	100	-	104	7.1
2016-SSSU260716-103A	56	-	98	-	59	-	92	4.9	100	6.1	53	-	116	-	94	-	99	-	95	5.4
2016-SSSU260716-103A	52	-	116	-	49	-	61	-	47	-	55	-	101	-	99	-	95	-	53	-
2016-SSSU260716-103A	50	-	52	-	47	-	58	-	103	6.9	58	-	118	-	57	-	60	-	55	-
2016-SSSU260716-103A	54	-	49	-	54	-	56	-	62	-	54	-	56	-	58	-	58	-	101	6.3
2017-SSFE-170717-101A	41	0.49	46	0.57	39	0.45	45	0.59	98	7.09	44	0.5	98	7.11	98	7.02	47	0.71	96	6.71
2017-SSFE-170717-101A	42	0.61	46	0.73	51	0.85	35	0.42	92	6.67	37	0.4	97	6.73	99	7.09	43	0.54	37	0.33
2017-SSFE-170717-101A	43	0.37	41	0.5	43	0.35	44	0.62	96	7.76	48	0.9	92	5.53	36	0.47	98	6.71	97	6.7
2017-SSFE-170717-101A	40	0.4	98	7.21	39	0.41	42	0.59	93	5.41	46	0.6	99	7.24	50	0.85	85	6.43	52	1.05
2017-SSFE-170717-102A	52	0.82	50	0.94	49	0.822	49	0.79	50	0.68	49	0.8	48	0.77	49	0.79	48	0.71	53	0.85
2017-SSFE-170717-102A	55	1.09	51	0.89	48	0.822	53	1.05	51	0.81	49	0.8	50	0.85	-	-	-	-	-	-
2017-SSFE-170717-103A	50	0.83	49	0.78	52	1.04	50	0.81	51	0.93	48	0.7	55	0.98	40	0.48	48	0.8	51	0.88
2017-SSFE-170717-103A	49	0.8	50	0.88	46	0.59	45	0.61	50	0.99	49	0.8	45	0.58	46	0.62	46	0.63	47	0.65
2017-SSFE-170717-103A	53	1.04	45	0.64	49	0.86	46	0.63	49	0.81	45	0.5	49	0.83	46	0.75	47	0.61	49	0.85
2017-SSFE-170717-103A	51	0.94	52	0.96	51	0.91	48	0.76	49	0.86	48	0.8	51	0.9	48	0.74	49	0.81	42	0.42
2017-SSFE-180717-202A	49	0.82	50	0.97	45	0.93	53	0.85	43	0.6	48	0.7	51	0.87	46	0.61	46	0.76	50	0.8
2017-SSFE-180717-202A	48	0.73	50	0.7	50	0.81	52	0.97	48	0.71	48	1	53	1.06	51	0.81	49	0.79	50	0.84
2017-SSFE-180717-202A	50	0.87	41	0.52	49	0.98	49	0.78	51	0.79	50	0.8	48	1.06	50	0.89	50	1.02	48	0.72
2017-SSFE-180717-202A	49	0.83	40	0.29	52	0.85	44	0.53	48	0.83	48	1	49	0.76	53	1.09	47	0.87	-	-
2017-SSFE-180717-203A	51	0.95	49	0.87	46	0.71	51	0.94	46	0.55	47	0.8	104	7.92	51	0.81	46	0.74	51	0.73
2017-SSFE-180717-203A	47	0.58	97	7.28	47	0.77	49	0.71	35	0.28	42	0.5	102	8.28	49	0.85	51	1	46	0.7
2017-SSFE-180717-203A	50	0.74	96	6.8	51	0.95	50	0.69	53	0.84	44	0.6	51	0.79	49	0.89	46	0.79	50	0.76
2017-SSFE-180717-203A	49	0.87	45	0.53	48	0.62	46	0.58	39	0.26	-	-	-	-	-	-	-	-	-	-
2017-SSFE-180917-302A	69	2.14	69	2.11	72	2.26	71	2.08	70	2	84	3.6	80	3.26	66	1.7	75	2.42	116	10.7
2017-SSFE-180917-302A	76	2.95	80	3.25	79	2.9	79	2.97	71	2.18	77	2.8	87	4.02	73	2.47	82	3.34	76	2.54
2017-SSFE-180917-302A	71	2.09	73	2.38	82	3.26	77	2.78	74	2.56	70	2	84	3.93	83	3.32	73	2.3	70	1.93
2017-SSFE-180917-302A	76	2.33	79	3.21	72	2.37	72	2.19	75	2.6	73	2.3	86	4.18	72	2.27	75	2.58	71	2.18
2017-SSFE-180917-302A	73	2.26	72	2.28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2017-SSFE-190717-301A	45	0.57	48	0.81	56	1.16	50	0.81	50	0.89	48	0.8	50	0.78	49	0.85	50	0.79	49	0.92

Field Number	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W
2017-SSFE-190717-301A	53	1.02	45	0.75	52	1.05	50	0.86	51	0.88	114	10	55	1.17	48	0.78	48	0.78	102	7.61
2017-SSFE-190717-301A	44	0.46	47	0.74	50	0.91	98	7.1	-	-	-	-	-	-	-	-	-	-	-	-
2017-SSFE-190717-302A	48	0.61	49	0.71	48	0.74	47	0.93	53	0.97	50	0.8	49	0.75	46	0.83	50	0.98	98	6.54
2017-SSFE-190717-302A	53	0.99	49	0.83	48	0.84	48	0.83	49	0.88	50	0.8	46	0.72	53	0.94	51	0.93	93	5.84
2017-SSFE-190717-302A	52	0.84	51	0.98	53	0.91	46	0.71	49	0.71	52	1	52	0.93	48	0.67	98	7.76	50	0.91
2017-SSFE-190717-302A	39	0.43	49	0.74	51	0.92	49	0.94	50	0.96	51	0.7	50	0.82	52	0.87	54	0.96	51	0.81
2017-SSFE-190917-101A	59	1.88	109	8.42	80	3.04	71	2.15	66	1.96	64	1.4	105	7.36	83	3.72	-	-	-	-
2017-SSFE-190917-103A	108	8.02	74	2.25	71	2.22	76	2.61	72	2.3	71	1.8	104	6.78	67	1.76	77	2.56	78	3.32
2017-SSFE-190917-103A	72	2.69	84	3.64	74	2.37	68	1.82	71	2.08	70	2	105	6.91	71	2.1	74	2.32	73	2.21
2017-SSFE-190917-103A	76	2.61	80	2.94	62	1.98	65	1.6	72	2.22	66	1.7	121	11.24	74	2.46	73	2.54	109	8.73
2017-SSFE-190917-103A	71	2.17	80	3.2	67	1.84	68	1.89	69	1.98	69	1.8	106	7.77	69	1.91	72	2.21	77	2.72
2017-SSFE-190917-203A	70	2.18	106	7.93	69	1.94	71	2.09	105	6.77	65	1.6	66	1.75	75	2.3	67	1.7	113	9.2
2017-SSFE-190917-203A	70	1.88	110	9.03	68	2	67	2.03	116	10.3	71	2.2	79	3.15	76	2.75	75	2.64	113	9.03
2017-SSFE-190917-203A	73	2.27	67	1.86	72	2.22	74	2.14	111	8.45	68	1.8	74	2.42	72	2.13	72	2.26	112	9.06
2017-SSFE-190917-203A	69	2	68	2	68	2.23	73	2.14	110	9	73	2.3	79	3.17	74	2.52	73	2.44	78	2.87
2017-SSFE-200717-401A	46	0.76	47	0.84	35	0.28	40	0.52	42	0.54	39	0.4	44	0.42	36	0.58	36	0.47	35	0.32
2017-SSFE-200717-401A	40	0.55	38	0.41	37	0.32	42	0.6	35	0.46	42	0.5	48	0.6	45	0.54	35	0.31	45	0.52
2017-SSFE-200717-401A	39	0.34	49	0.46	42	0.56	39	0.34	40	0.44	39	0.4	40	0.37	41	0.38	45	0.85	38	0.54
2017-SSFE-200717-401A	42	0.44	35	0.45	38	0.3	44	0.59	42	0.54	-	-	-	-	-	-	-	-	-	-
2017-SSFE-200917-403A	66	1.85	61	1.31	84	3.91	71	2.29	64	1.32	71	2.2	75	2.6	74	2.75	76	2.69	70	2.47
2017-SSFE-200917-403A	71	2.4	77	3.12	70	2.16	68	1.99	76	2.82	75	2.7	67	1.7	73	2.61	72	2.22	79	3.28
2017-SSFE-200917-403A	70	1.98	74	2.19	65	1.85	71	2.16	68	1.89	68	2	72	2.5	69	1.98	68	1.85	83	3.9
2017-SSFE-200917-403A	76	2.54	71	2.2	68	2.07	71	2.17	74	2.64	71	2.2	76	2.77	84	3.8	82	3.41	71	2.31
2017-SSFE-210917-503A	81	3.04	109	8.81	92	5.26	67	1.9	73	2.36	83	4	107	8.18	113	9.07	73	2.24	116	9.63
2017-SSFE-210917-503A	64	2.04	113	9.48	107	7.7	79	3.18	79	2.48	61	1.5	109	9.05	121	11.9	76	2.75	113	9.94
2017-SSFE-210917-503A	67	1.73	102	6.74	107	8.09	70	2.2	68	1.82	63	1.7	111	9.01	109	7.95	73	2.23	111	9.45
2017-SSFE-210917-503A	79	3.25	110	8.65	108	7.85	62	1.39	73	2.81	67	1.7	112	9.18	105	7.78	76	2.81	73	2.66
2017-SSFE-220917-602A	64	1.58	72	2.27	69	1.62	70	2.01	68	1.75	67	1.8	72	2.13	67	1.84	76	2.7	70	1.86
2017-SSFE-220917-602A	70	2.02	75	2.49	66	1.96	66	1.63	70	1.98	75	2.6	75	2.56	70	1.81	68	1.7	73	2.67
2017-SSFE-220917-602A	66	1.49	73	1.97	70	1.94	68	1.93	73	2.23	66	-	68	2.14	69	1.82	109	8.83	68	1.48
2017-SSFE-220917-602A	68	-	66	1.73	78	2.82	69	2.01	67	1.6	60	1.4	68	1.8	67	1.79	105	7.63	66	1.9
2017-SSFE-220917-602A	69	1.74	68	2.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2017-SSFE-240717-402A	53	0.99	54	1.02	48	0.79	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2017-SSFE-240717-403A	44	0.65	27	0.11	51	0.81	43	0.49	40	0.54	37	0.4	43	0.58	42	0.6	53	1.12	53	0.96
2017-SSFE-240717-403A	46	0.7	41	0.48	42	0.48	48	0.84	48	0.64	43	0.5	49	0.83	47	0.77	51	0.94	50	0.87
2017-SSFE-240717-403A	48	0.85	39	0.53	45	0.59	51	1.11	46	0.7	44	0.6	43	0.56	51	0.75	42	0.44	45	0.6
2017-SSFE-240717-403A	43	0.61	46	0.56	48	0.8	52	1.09	43	0.5	49	0.8	48	0.78	52	1.03	51	0.71	50	0.83
2017-SSFE-250717-503A	92	6.12	121	12.1	99	6.79	99	6.57	93	7.06	95	6.9	103	7.54	103	7.39	96	6.23	85	4.52
2017-SSFE-250717-503A	96	6.24	95	5.77	99	6.75	125	12.4	99	7.13	92	5.6	103	7.47	94	5.8	99	6.65	99	7.31
2017-SSFE-250717-503A	105	7.83	99	6.77	96	6.55	91	5.21	99	7.27	98	7.1	90	5.45	96	5.95	99	7.55	90	6.32

Field Number	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W	TL	W
2017-SSFE-250717-503A	110	9.18	91	5.63	93	5.71	96	7.59	95	5.83	98	6.3	104	7.9	101	7.55	99	6.84	97	6.1
2017-SSFE-260717-602A	47	0.64	97	6.13	95	6.28	47	0.7	47	0.64	50	0.8	96	6.04	100	8.05	48	0.76	39	0.24
2017-SSFE-260717-602A	40	0.31	95	5.86	93	5.37	44	0.57	53	0.93	52	0.9	99	6.51	92	5.51	23	0.08	98	6.97
2017-SSFE-260717-602A	45	0.54	97	6.52	98	6.15	49	0.96	47	0.71	46	0.6	99	6.38	100	7.04	96	6.66	90	5.41
2017-SSFE-260717-602A	49	0.68	99	6.67	99	6.37	50	0.8	43	0.51	37	0.4	97	5.6	100	7.19	49	0.69	94	5.11
2017-SSFE-260717-602A	51	0.81	90	5.31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2017-SSFE-260717-603A	52	0.97	40	0.46	44	0.57	42	0.47	41	0.39	41	0.4	47	0.62	51	0.8	45	0.7	47	0.68
2017-SSFE-260717-603A	54	1.04	46	0.56	46	0.58	50	0.83	46	0.76	49	0.9	47	0.62	44	0.53	49	0.93	45	0.72
2017-SSFE-260717-603A	50	0.9	48	0.74	49	0.92	42	0.52	42	0.47	45	0.5	48	0.67	34	0.24	37	0.26	40	0.36
2017-SSFE-260717-603A	42	0.72	44	0.56	48	0.61	43	0.44	45	0.68	44	0.5	40	0.58	50	0.97	45	0.5	47	0.62
2018-SSFE-090318-103A	135	13.43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018-SSFE-140318-202A	71	2.07	80	2.78	71	1.93	110	7.67	80	3.10	101	6.51	89	4.22	73	2.10	76	2.20	80	3.00
2018-SSFE-140318-202A	78	2.72	80	2.96	69	1.91	77	2.61	74	2.08	74	2.06	109	7.56	106	6.87	80	2.78	77	2.61
2018-SSFE-140318-202A	84	3.22	88	4.03	72	1.94	78	2.49	76	2.31	73	2.08	70	1.52	71	1.74	75	2.23	78	2.29
2018-SSFE-140318-202A	85	3.69	85	3.36	72	2.15	80	2.78	109	7.37	84	3.27	86	-	68	1.55	72	1.88	70	1.96
2018-SSFE-150318-502A	55	0.90	64	1.34	64	1.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018-SSFE-150318-503A	104	7.52	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018-SSFE-200818-301A	62	1.48	119	9.71	101	6.34	80	3.13	61	1.43	70	2.09	126	11.78	104	7.53	74	2.42	71	2.22
2018-SSFE-200818-302A	69	1.26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018-SSFE-220818-101A	56	1.12	93	4.99	90	4.74	91	4.78	56	1.07	55	0.96	64	1.37	93	5.21	96	5.70	59	1.28
2018-SSFE-220818-102A	72	2.08	92	4.77	94	4.80	58	1.12	97	5.63	64	1.53	117	-	89	4.23	91	4.11	54	0.78
2018-SSFE-220818-102A	63	1.41	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018-SSFE-220818-103A	69	1.81	54	1.01	62	1.26	64	1.37	56	0.98	59	1.14	74	2.49	51	0.73	58	1.05	-	-
2018-SSFE-220818-201A	104	7.39	68	1.28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018-SSFE-220818-202A	59	1.30	69	2.08	63	1.54	96	5.23	61	1.36	-	-	-	-	-	-	-	-	-	-
2018-SSFE-230818-402A	67	2.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018-SSFE-230818-403A	68	2.24	111	9.40	102	6.96	89	4.56	58	1.34	61	1.31	72	2.39	99	6.60	104	7.42	59	1.06
2018-SSFE-230818-403A	74	2.62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018-SSFE-230818-503A	67	1.94	105	8.68	102	7.03	100	7.31	61	1.26	66	1.76	76	2.71	102	7.46	100	6.19	69	1.99
2018-SSFE-240818-602A	68	1.92	106	7.88	82	3.58	60	1.36	105	7.26	57	1.57	109	8.44	89	3.96	103	6.56	73	2.42
2018-SSFE-240818-602A	57	0.91	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018-SSFE-240818-603A	63	1.61	66	1.62	81	3.47	73	2.51	-	-	-	-	-	-	-	-	-	-	-	-

Appendix 5. *Abiotic habitat conditions at each site sampled for Silver Shiner in Sixteen Mile Creek, Ontario, 2016-2018.*

Field number	Air temp. (°C)	Water temp. (°C)	Conductivity (µS/cm)	Dissolved oxygen (mg/L)	pH	Water clarity (m)	Turbidity (NTU)	Average stream depth (m)	Average water velocity (m/sec)
2016-SSSU110716-101A	19.60	22.06	1948.1	10.65	9.27	-	5.93	0.36	0.20
2016-SSSU110716-102A	20.30	25.01	2065.1	11.77	8.93	0.85	3.93	0.43	0.10
2016-SSSU110716-103A	19.50	27.23	2138.0	12.31	8.99	0.44	1.78	0.65	0.64
2016-SSSU110716-104A	25.70	26.74	2112.4	11.78	8.99	1.14	1.56	0.90	0.04
2016-SSSU120716-101A	19.30	21.29	1889.9	7.78	8.73	0.48	7.64	0.68	0.02
2016-SSSU120716-102A	20.20	21.95	1920.5	9.39	8.84	0.94	2.87	0.19	0.59
2016-SSSU120716-103A	20.50	23.80	1985.7	10.34	8.91	1.07	7.52	0.93	0.07
2016-SSSU120716-104A	21.50	26.27	2068.6	11.30	9.15	0.45	5.10	0.68	0.16
2016-SSSU190716-101A	25.50	23.44	2005.0	11.18	8.88	0.94	4.54	0.47	0.21
2016-SSSU190716-102A	25.50	23.47	2006.1	11.18	8.98	1.03	4.23	0.37	0.31
2016-SSSU190716-103A	25.50	23.52	2007.2	11.31	9.01	1.00	4.16	0.16	0.26
2016-SSSU190716-104A	25.50	26.55	2111.2	11.25	9.10	0.60	3.85	0.85	0.05
2016-SSSU200716-101A	25.60	20.24	1840.0	11.06	8.88	0.78	3.54	0.70	0.03
2016-SSSU200716-102A	26.20	19.65	1831.7	10.12	8.90	0.50	5.48	0.36	0.01
2016-SSSU200716-103A	26.90	22.60	1904.7	11.60	9.14	0.90	4.74	0.12	0.54
2016-SSSU200716-104A	26.90	22.81	1913.3	11.06	9.09	0.81	4.21	0.36	0.31
2016-SSSU210716-101A	31.50	23.28	2099.3	11.43	9.81	0.95	2.39	0.40	0.56
2016-SSSU210716-102A	31.60	23.40	2104.7	12.03	9.30	0.83	3.66	0.14	0.43
2016-SSSU210716-103A	31.00	25.57	2188.6	10.70	9.05	0.85	1.20	0.75	0.01
2016-SSSU260716-101A	25.40	23.10	1340.8	8.73	9.70	0.65	9.15	0.51	0.22
2016-SSSU260716-102A	28.90	23.24	1327.1	8.80	9.06	0.53	6.63	0.35	0.17
2016-SSSU260716-103A	19.80	26.09	1373.2	9.92	8.84	0.60	6.22	0.68	0.03
2017-SSFE-170717-101A	23.30	21.66	671.3	8.04	8.04	0.60	11.97	0.73	0.13
2017-SSFE-170717-102A	23.60	22.14	676.8	8.99	8.32	0.63	11.19	0.26	0.58
2017-SSFE-170717-103A	23.90	23.62	696.4	10.27	8.48	0.29	23.20	0.77	0.01
2017-SSFE-180717-201A	22.20	21.12	708.0	8.93	8.24	0.50	9.14	0.21	0.46
2017-SSFE-180717-202A	25.30	23.67	736.8	10.65	8.45	0.20	20.12	0.26	0.01
2017-SSFE-180717-203A	26.20	24.82	753.2	11.19	8.51	0.73	6.99	0.45	0.08
2017-SSFE-180917-301A	21.40	18.24	258.0	10.33	8.56	-	1.33	0.16	0.68
2017-SSFE-180917-302A	24.30	19.50	532.0	11.43	8.73	-	2.41	0.39	0.14
2017-SSFE-180917-303A	29.00	21.50	544.3	12.12	8.85	-	4.61	0.24	0.00
2017-SSFE-190717-301A	26.10	22.39	206.7	11.24	8.50	0.73	4.85	0.28	0.72
2017-SSFE-190717-302A	30.40	24.05	736.0	12.53	8.69	0.99	4.32	0.44	0.32
2017-SSFE-190717-303A	30.40	25.41	742.2	12.45	8.77	0.69	11.17	0.25	0.01
2017-SSFE-190917-101A	25.90	23.32	603.0	12.90	8.74	-	1.87	0.80	0.00
2017-SSFE-190917-102A	27.80	22.38	600.3	12.53	8.73	-	4.21	0.31	0.09
2017-SSFE-190917-103A	26.60	21.51	595.1	10.63	8.60	-	3.80	0.96	0.00
2017-SSFE-190917-201A	21.20	19.83	562.5	7.62	8.34	-	3.05	0.12	0.30
2017-SSFE-190917-202A	28.20	21.27	583.2	10.35	8.60	-	2.86	0.20	0.00
2017-SSFE-190917-203A	23.40	20.20	568.1	8.81	8.42	-	2.58	0.73	0.03
2017-SSFE-200717-401A	18.70	21.61	806.1	8.19	8.24	-	3.17	0.51	0.01
2017-SSFE-200917-401A	24.90	19.01	816.4	5.65	7.99	-	16.96	0.44	0.00
2017-SSFE-200917-402A	21.80	19.19	816.7	8.91	8.44	-	1.15	0.23	0.59
2017-SSFE-200917-403A	27.70	19.65	827.0	9.76	8.52	-	0.74	0.53	0.24
2017-SSFE-210917-501A	19.70	18.72	790.2	9.63	8.63	-	1.43	0.18	0.87
2017-SSFE-210917-502A	25.00	18.85	901.3	6.56	8.10	-	19.12	0.26	0.00
2017-SSFE-210917-503A	26.30	19.40	798.8	10.38	8.47	-	1.61	0.67	0.26

Field number	Air temp. (°C)	Water temp. (°C)	Conductivity (µS/cm)	Dissolved oxygen (mg/L)	pH	Water clarity (m)	Turbidity (NTU)	Average stream depth (m)	Average water velocity (m/sec)
2016-SSSU110716-101A	19.60	22.06	1948.1	10.65	9.27	-	5.93	0.36	0.20
2017-SSFE-220917-601A	-	18.44	809.2	9.34	8.45	-	1.09	0.13	0.49
2017-SSFE-220917-602A	20.90	19.11	817.7	9.92	8.54	-	1.05	0.52	0.18
2017-SSFE-220917-603A	21.70	19.13	816.0	10.16	8.59	-	0.96	0.32	0.02
2017-SSFE-240717-402A	21.30	21.04	818.2	9.00	8.31	-	1.34	0.21	0.60
2017-SSFE-240717-403A	21.30	21.13	819.1	9.16	8.35	-	1.78	0.73	0.27
2017-SSFE-250717-501A	18.60	19.17	786.3	9.97	8.30	-	1.35	0.23	0.98
2017-SSFE-250717-502A	20.20	21.95	888.2	9.18	7.87	1.09	4.68	0.29	0.00
2017-SSFE-250717-503A	22.30	21.88	825.1	12.11	8.60	-	2.49	0.80	0.24
2017-SSFE-260717-601A	23.20	19.76	738.8	10.38	8.41	-	1.19	0.16	0.70
2017-SSFE-260717-602A	23.30	20.72	793.6	11.38	8.58	-	1.75	0.66	0.13
2017-SSFE-260717-603A	23.60	22.35	817.3	12.36	8.68	-	1.03	0.21	0.02
2018-SSFE-090318-101A	7.60	8.80	922.0	-	-	0.55	-	0.73	-
2018-SSFE-090318-102A	9.90	9.80	674.0	-	-	0.95	-	0.25	-
2018-SSFE-090318-103A	7.60	8.80	922.0	-	-	0.42	-	0.91	-
2018-SSFE-140318-201A	4.00	7.00	876.0	-	-	0.92	-	0.57	0.11
2018-SSFE-140318-202A	4.00	5.20	923.0	-	-	-	-	0.17	0.60
2018-SSFE-140318-203A	1.80	3.90	975.0	-	-	0.54	-	0.25	0.01
2018-SSFE-150318-401A	2.50	1.10	575.9	15.18	8.39	0.86	2.62	0.81	0.34
2018-SSFE-150318-402A	2.50	1.12	576.4	15.08	8.40	0.86	2.53	0.26	0.92
2018-SSFE-150318-403A	2.50	1.07	578.8	14.46	8.38	0.86	11.15	0.63	0.00
2018-SSFE-150318-501A	5.20	1.78	588.9	15.91	8.53	1.05	2.76	0.30	0.78
2018-SSFE-150318-502A	5.20	1.81	590.0	15.73	8.53	1.05	3.77	0.42	0.11
2018-SSFE-150318-503A	5.20	1.82	589.8	15.66	8.53	1.05	3.72	0.59	0.40
2018-SSFE-200818-301A	26.80	23.19	752.3	11.78	9.29	-	14.64	0.47	-
2018-SSFE-200818-302A	26.80	23.35	754.3	11.88	9.24	-	10.76	0.46	-
2018-SSFE-200818-303A	26.80	23.26	753.3	11.67	9.25	0.57	26.56	0.45	-
2018-SSFE-220818-101A	26.50	22.53	748.3	8.95	8.82	0.34	28.24	0.84	0.40
2018-SSFE-220818-102A	20.90	22.66	758.9	8.94	8.72	0.26	29.01	0.52	0.64
2018-SSFE-220818-103A	22.40	22.64	749.6	8.94	8.75	0.27	33.73	0.68	0.00
2018-SSFE-220818-201A	21.00	21.59	491.8	8.34	8.56	0.29	29.83	0.19	0.91
2018-SSFE-220818-202A	21.00	21.59	688.5	7.62	8.41	0.12	262.27	0.33	0.01
2018-SSFE-220818-203A	21.00	21.59	690.4	8.36	8.57	0.30	31.77	0.28	0.43
2018-SSFE-230818-401A	26.40	20.47	764.2	10.02	9.12	0.49	13.58	0.36	0.00
2018-SSFE-230818-402A	26.40	20.60	659.6	10.03	9.37	-	13.81	0.45	0.82
2018-SSFE-230818-403A	26.40	20.62	762.9	9.96	9.08	-	13.53	0.73	0.25
2018-SSFE-230818-501A	29.70	23.45	577.3	11.04	9.57	-	14.24	0.36	0.97
2018-SSFE-230818-502A	29.70	23.72	804.8	10.67	9.28	-	11.86	0.26	0.06
2018-SSFE-230818-503A	29.70	23.42	799.7	10.93	9.37	-	12.28	0.48	0.29
2018-SSFE-240818-601A	24.20	21.78	40.1	11.37	9.73	-	10.81	0.15	0.86
2018-SSFE-240818-602A	26.90	20.90	18.1	11.56	9.38	-	8.92	0.63	0.41
2018-SSFE-240818-603A	24.20	21.54	783.4	11.40	9.29	-	10.45	0.32	0.08
Min.	**1.80**	**1.07**	**18.1**	**5.65**	**7.87**	**0.12**	**0.74**	**0.12**	**0.01**
Mean	**21.80**	**19.66**	**1000.4**	**10.66**	**8.77**	**0.69**	**10.92**	**0.45**	**0.29**
Max.	**31.60**	**27.23**	**2188.6**	**15.91**	**9.81**	**1.14**	**262.27**	**0.96**	**0.98**

Appendix 6. *Substrate composition by percent type at each site sampled for Silver Shiner within Sixteen Mile Creek, Ontario, 2016-2018.*

Field number	Organic	Clay	Silt	Sand	Gravel	Cobble	Boulder	Bedrock	Hardpan	Rubble	Concrete	Dominant Substrate
2016-SSSU110716-101A	0	0	0	0	5	5	0	90	0	0	0	Bedrock
2016-SSSU110716-102A	0	0	5	0	10	15	10	60	0	0	0	Bedrock
2016-SSSU110716-103A	0	0	5	5	10	75	5	0	0	0	0	Cobble
2016-SSSU110716-104A	0	0	20	10	35	30	5	0	0	0	0	Gravel
2016-SSSU120716-101A	70	0	10	0	0	10	0	0	0	10	0	Organic
2016-SSSU120716-102A	0	0	0	10	20	70	0	0	0	0	0	Cobble
2016-SSSU120716-103A	0	0	10	20	10	0	5	0	55	0	0	Hardpan
2016-SSSU120716-104A	0	0	10	10	40	20	10	10	0	0	0	Gravel
2016-SSSU190716-101A	0	0	5	5	5	45	10	30	0	0	0	Cobble
2016-SSSU190716-102A	0	0	0	5	25	40	5	25	0	0	0	Cobble
2016-SSSU190716-103A	0	0	0	0	0	90	10	0	0	0	0	Cobble
2016-SSSU190716-104A	5	0	30	5	40	10	5	5	0	0	0	Gravel
2016-SSSU200716-101A	0	0	5	0	0	5	10	80	0	0	0	Bedrock
2016-SSSU200716-102A	5	0	25	0	60	10	0	0	0	0	0	Gravel
2016-SSSU200716-103A	0	0	0	0	5	90	5	0	0	0	0	Cobble
2016-SSSU200716-104A	0	0	0	0	0	100	0	0	0	0	0	Cobble
2016-SSSU210716-101A	0	0	0	0	10	60	5	25	0	0	0	Cobble
2016-SSSU210716-102A	0	0	0	0	0	100	0	0	0	0	0	Cobble
2016-SSSU210716-103A	15	0	20	0	25	40	0	0	0	0	0	Cobble
2016-SSSU260716-101A	0	0	10	0	15	70	5	0	0	0	0	Cobble
2016-SSSU260716-102A	0	0	0	0	5	50	5	40	0	0	0	Cobble
2016-SSSU260716-103A	0	0	10	20	40	25	5	0	0	0	0	Gravel
2017-SSFE-170717-101A	0	0	5	0	0	0	10	85	0	0	0	Bedrock
2017-SSFE-170717-102A	0	0	0	10	15	75	0	0	0	0	0	Cobble
2017-SSFE-170717-103A	0	5	90	5	0	0	0	0	0	0	0	Silt
2017-SSFE-180717-201A	0	0	0	20	30	50	0	0	0	0	0	Cobble
2017-SSFE-180717-202A	10	0	80	0	5	5	0	0	0	0	0	Silt
2017-SSFE-180717-203A	0	0	0	0	30	40	30	0	0	0	0	Cobble
2017-SSFE-180917-301A	0	0	0	0	20	70	10	0	0	0	0	Cobble
2017-SSFE-180917-302A	0	0	0	0	20	20	10	50	0	0	0	Bedrock
2017-SSFE-180917-303A	5	0	15	0	30	40	10	0	0	0	0	Cobble
2017-SSFE-190717-301A	0	0	0	0	40	45	15	0	0	0	0	Cobble
2017-SSFE-190717-302A	0	0	0	5	20	20	15	40	0	0	0	Bedrock
2017-SSFE-190717-303A	0	0	20	20	30	20	5	5	0	0	0	Gravel
2017-SSFE-190917-101A	0	0	5	0	5	5	25	60	0	0	0	Bedrock
2017-SSFE-190917-102A	0	0	10	0	20	50	10	10	0	0	0	Cobble
2017-SSFE-190917-103A	0	0	10	40	40	5	5	0	0	0	0	Sand
2017-SSFE-190917-201A	0	0	5	0	35	60	0	0	0	0	0	Cobble
2017-SSFE-190917-202A	0	0	90	0	10	0	0	0	0	0	0	Silt
2017-SSFE-190917-203A	0	0	10	0	20	40	30	0	0	0	0	Cobble
2017-SSFE-200717-401A	0	0	30	20	25	25	0	0	0	0	0	Silt
2017-SSFE-200917-401A	35	0	20	10	25	10	0	0	0	0	0	Organic
2017-SSFE-200917-402A	0	0	0	0	20	75	5	0	0	0	0	Cobble
2017-SSFE-200917-403A	0	0	0	10	20	30	0	40	0	0	0	Bedrock
2017-SSFE-210917-501A	0	0	0	0	5	85	10	0	0	0	0	Cobble
2017-SSFE-210917-502A	0	0	10	10	30	10	40	0	0	0	0	Boulder
2017-SSFE-210917-503A	0	0	0	0	10	10	30	50	0	0	0	Bedrock
2017-SSFE-220917-601A	0	0	0	0	5	75	20	0	0	0	0	Cobble

Field number	Organic	Clay	Silt	Sand	Gravel	Cobble	Boulder	Bedrock	Hardpan	Rubble	Concrete	Dominant Substrate
2017-SSFE-220917-602A	0	0	5	0	0	5	10	80	0	0	0	Bedrock
2017-SSFE-220917-603A	5	0	35	5	30	5	5	15	0	0	0	Silt
2017-SSFE-240717-402A	0	0	0	0	5	90	5	0	0	0	0	Cobble
2017-SSFE-240717-403A	0	0	0	0	5	10	15	70	0	0	0	Bedrock
2017-SSFE-250717-501A	0	0	0	0	5	90	5	0	0	0	0	Cobble
2017-SSFE-250717-502A	0	0	5	10	65	10	10	0	0	0	0	Gravel
2017-SSFE-250717-503A	0	0	0	5	10	10	30	45	0	0	0	Bedrock
2017-SSFE-260717-601A	0	0	0	0	5	90	5	0	0	0	0	Cobble
2017-SSFE-260717-602A	0	0	0	0	15	15	10	60	0	0	0	Bedrock
2017-SSFE-260717-603A	0	0	5	75	15	5	0	0	0	0	0	Sand
2018-SSFE-090318-101A	0	0	0	0	0	0	10	90	0	0	0	Bedrock
2018-SSFE-090318-102A	0	0	0	0	0	5	0	95	0	0	0	Bedrock
2018-SSFE-090318-103A	0	0	0	20	30	50	0	0	0	0	0	Cobble
2018-SSFE-140318-201A	0	0	0	0	0	70	20	10	0	0	0	Cobble
2018-SSFE-140318-202A	0	0	0	10	10	75	5	0	0	0	0	Cobble
2018-SSFE-140318-203A	0	0	35	10	20	30	5	0	0	0	0	Silt
2018-SSFE-150318-401A	0	0	0	0	0	0	0	100	0	0	0	Bedrock
2018-SSFE-150318-402A	0	0	0	0	0	70	10	0	0	20	0	Cobble
2018-SSFE-150318-403A	0	0	40	50	10	0	0	0	0	0	0	Sand
2018-SSFE-150318-501A	0	0	0	0	5	50	5	0	0	40	0	Cobble
2018-SSFE-150318-502A	0	0	10	55	20	10	5	0	0	0	0	Sand
2018-SSFE-150318-503A	0	0	0	5	30	40	25	0	0	0	0	Cobble
2018-SSFE-200818-301A	0	0	0	0	20	70	10	0	0	0	0	Cobble
2018-SSFE-200818-302A	0	0	0	0	20	50	30	0	0	0	0	Cobble
2018-SSFE-200818-303A	0	0	0	35	40	25	0	0	0	0	0	Gravel
2018-SSFE-220818-101A	0	0	0	0	5	0	5	90	0	0	0	Bedrock
2018-SSFE-220818-102A	0	0	0	0	0	30	10	60	0	0	0	Bedrock
2018-SSFE-220818-103A	50	0	20	0	20	0	10	0	0	0	0	Organic
2018-SSFE-220818-201A	0	0	0	0	40	30	30	0	0	0	0	Gravel
2018-SSFE-220818-202A	0	0	10	10	50	20	10	0	0	0	0	Gravel
2018-SSFE-220818-203A	0	0	0	0	20	50	30	0	0	0	0	Cobble
2018-SSFE-230818-401A	20	0	40	10	10	10	10	0	0	0	0	Silt
2018-SSFE-230818-402A	0	0	0	0	0	50	50	0	0	0	0	Boulder
2018-SSFE-230818-403A	0	0	0	0	0	0	10	80	0	0	0	Bedrock
2018-SSFE-230818-501A	0	0	0	0	20	70	10	0	0	0	0	Cobble
2018-SSFE-230818-502A	0	0	10	30	20	35	5	0	0	0	0	Cobble
2018-SSFE-230818-503A	0	0	10	10	20	40	20	0	0	0	0	Cobble
2018-SSFE-240818-601A	0	0	0	0	20	60	20	0	0	0	0	Cobble
2018-SSFE-240818-602A	0	0	10	20	0	10	20	40	0	0	0	Bedrock
2018-SSFE-240818-603A	10	0	20	10	50	10	0	0	0	0	0	Gravel
Min.	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**-**
Mean	**2**	**0**	**9**	**7**	**17**	**35**	**10**	**18**	**1**	**1**	**0**	**Cobble**
Max.	**70**	**5**	**90**	**75**	**65**	**100**	**50**	**100**	**55**	**40**	**0**	**-**

Appendix 7. *Aquatic and riparian vegetation by percent of each vegetation type present within habitat sampled for Silver Shiner in Sixteen Mile Creek, Ontario, 2016-2018.*

Field number	Emergent	Floating	Submerged	Open water	Dominant aquatic vegetation	Deciduous	Coniferous	Herbaceous	Shrubs	None	Dominant riparian vegetation
2016-SSSU110716-101A	0	0	0	100	Open Water	20	0	60	20	0	Herbaceous
2016-SSSU110716-102A	0	0	10	90	Open Water	0	0	100	0	0	Herbaceous
2016-SSSU110716-103A	0	0	15	85	Open Water	0	0	40	0	60	None
2016-SSSU110716-104A	0	0	25	75	Open Water	0	0	25	0	75	None
2016-SSSU120716-101A	0	0	90	10	Submerged	0	0	85	0	15	Herbaceous
2016-SSSU120716-102A	0	0	10	90	Open Water	10	0	90	0	0	Herbaceous
2016-SSSU120716-103A	0	0	0	100	Open Water	5	0	95	0	0	Herbaceous
2016-SSSU120716-104A	0	0	60	40	Submerged	0	0	10	5	85	None
2016-SSSU190716-101A	0	0	10	90	Open Water	0	0	10	0	90	None
2016-SSSU190716-102A	0	0	5	95	Open Water	0	0	95	0	5	Herbaceous
2016-SSSU190716-103A	0	0	10	90	Open Water	0	0	95	0	5	Herbaceous
2016-SSSU190716-104A	5	0	10	85	Open Water	0	0	100	0	0	Herbaceous
2016-SSSU200716-101A	0	0	5	95	Open Water	0	0	0	0	100	None
2016-SSSU200716-102A	20	0	60	20	Submerged	5	0	95	0	0	Herbaceous
2016-SSSU200716-103A	0	0	20	80	Open Water	0	0	100	0	0	Herbaceous
2016-SSSU200716-104A	0	0	5	95	Open Water	0	0	100	0	0	Herbaceous
2016-SSSU210716-101A	0	0	0	100	Open Water	0	0	60	0	40	Herbaceous
2016-SSSU210716-102A	0	0	30	70	Open Water	5	0	5	0	90	None
2016-SSSU210716-103A	0	0	35	65	Open Water	0	0	100	0	0	Herbaceous
2016-SSSU260716-101A	20	0	10	70	Open Water	0	0	100	0	0	Herbaceous
2016-SSSU260716-102A	0	0	5	95	Open Water	5	0	90	0	5	Herbaceous
2016-SSSU260716-103A	0	0	5	95	Open Water	25	0	75	0	0	Herbaceous
2017-SSFE-170717-101A	0	0	5	95	Open Water	0	0	75	0	25	Herbaceous
2017-SSFE-170717-102A	0	0	50	50	Open Water	0	0	40	0	60	None
2017-SSFE-170717-103A	0	0	5	95	Open Water	10	0	90	0	0	Herbaceous
2017-SSFE-180717-201A	0	0	10	90	Open Water	0	0	100	0	0	Herbaceous
2017-SSFE-180717-202A	15	0	70	15	Submerged	5	0	95	0	0	Herbaceous
2017-SSFE-180717-203A	0	0	10	90	Open Water	5	0	85	5	5	Herbaceous
2017-SSFE-180917-301A	0	0	10	90	Open Water	0	0	100	0	0	Herbaceous
2017-SSFE-180917-302A	0	0	5	95	Open Water	0	0	85	10	5	Herbaceous
2017-SSFE-180917-303A	0	0	20	80	Open Water	0	0	95	5	0	Herbaceous
2017-SSFE-190717-301A	0	0	5	95	Open Water	0	0	95	0	5	Herbaceous
2017-SSFE-190717-302A	0	0	5	95	Open Water	0	0	10	0	90	None
2017-SSFE-190717-303A	0	0	5	95	Open Water	5	0	90	0	5	Herbaceous
2017-SSFE-190917-101A	0	0	5	95	Open Water	0	0	40	0	60	None
2017-SSFE-190917-102A	0	0	50	50	Open Water	0	0	55	5	40	Herbaceous
2017-SSFE-190917-103A	0	0	5	95	Open Water	20	0	80	0	0	Herbaceous
2017-SSFE-190917-201A	0	0	5	95	Open Water	0	0	50	0	50	Herbaceous
2017-SSFE-190917-202A	20	0	30	50	Open Water	5	0	95	0	0	Herbaceous
2017-SSFE-190917-203A	0	0	5	95	Open Water	0	0	30	0	70	None
2017-SSFE-200717-401A	10	0	50	40	Submerged	10	0	60	0	30	Herbaceous
2017-SSFE-200917-401A	0	0	40	60	Open Water	10	0	85	0	5	Herbaceous
2017-SSFE-200917-402A	0	0	25	75	Open Water	0	0	50	0	50	Herbaceous
2017-SSFE-200917-403A	0	0	5	95	Open Water	0	0	40	0	60	None
2017-SSFE-210917-501A	0	0	5	95	Open Water	5	0	70	5	20	Herbaceous
2017-SSFE-210917-502A	0	0	20	80	Open Water	0	0	25	0	75	None

Field number	Emergent	Floating	Submerged	Open water	Dominant aquatic vegetation	Deciduous	Coniferous	Herbaceous	Shrubs	None	Dominant riparian vegetation
2017-SSFE-210917-503A	0	0	5	95	Open Water	5	0	35	0	60	None
2017-SSFE-220917-601A	0	0	25	75	Open Water	0	0	80	0	20	Herbaceous
2017-SSFE-220917-602A	0	0	10	90	Open Water	5	0	45	0	50	None
2017-SSFE-220917-603A	5	0	5	90	Open Water	0	0	95	0	5	Herbaceous
2017-SSFE-240717-402A	0	0	90	10	Submerged	0	0	70	0	30	Herbaceous
2017-SSFE-240717-403A	0	0	30	70	Open Water	20	0	50	0	30	Herbaceous
2017-SSFE-250717-501A	0	0	90	10	Submerged	5	0	85	0	10	Herbaceous
2017-SSFE-250717-502A	0	0	20	80	Open Water	0	0	30	0	70	None
2017-SSFE-250717-503A	0	0	15	85	Open Water	10	0	40	0	50	None
2017-SSFE-260717-601A	0	0	20	80	Open Water	0	0	95	0	5	Herbaceous
2017-SSFE-260717-602A	0	0	10	90	Open Water	5	0	10	0	85	None
2017-SSFE-260717-603A	5	0	20	75	Open Water	0	0	100	0	0	Herbaceous
2018-SSFE-090318-101A	0	0	0	100	Open Water	0	0	0	0	100	None
2018-SSFE-090318-102A	0	0	0	100	Open Water	5	0	5	0	90	None
2018-SSFE-090318-103A	0	0	0	100	Open Water	5	0	55	0	40	Herbaceous
2018-SSFE-140318-201A	0	0	0	100	Open Water	0	0	0	0	100	None
2018-SSFE-140318-202A	0	0	0	100	Open Water	0	0	20	0	80	None
2018-SSFE-140318-203A	0	0	0	100	Open Water	0	0	40	0	60	None
2018-SSFE-150318-401A	0	0	0	100	Open Water	0	0	20	0	80	None
2018-SSFE-150318-402A	0	0	0	100	Open Water	0	0	5	0	95	None
2018-SSFE-150318-403A	0	0	0	100	Open Water	0	0	0	0	100	None
2018-SSFE-150318-501A	0	0	0	100	Open Water	5	0	10	0	85	None
2018-SSFE-150318-502A	0	0	0	100	Open Water	10	0	0	0	90	None
2018-SSFE-150318-503A	0	0	0	100	Open Water	10	0	0	0	90	None
2018-SSFE-200818-301A	0	0	0	100	Open Water	0	0	70	30	0	Herbaceous
2018-SSFE-200818-302A	0	0	0	100	Open Water	0	0	70	30	0	Herbaceous
2018-SSFE-200818-303A	10	0	0	90	Open Water	0	0	70	30	0	Herbaceous
2018-SSFE-220818-101A	0	0	0	100	Open Water	0	0	100	0	0	Herbaceous
2018-SSFE-220818-102A	0	0	0	100	Open Water	50	0	50	0	0	Herbaceous
2018-SSFE-220818-103A	20	0	0	80	Open Water	10	0	50	40	0	Herbaceous
2018-SSFE-220818-201A	5	0	0	95	Open Water	0	0	100	0	0	Herbaceous
2018-SSFE-220818-202A	20	0	0	80	Open Water	0	0	100	0	0	Herbaceous
2018-SSFE-220818-203A	0	0	0	100	Open Water	0	0	100	0	0	Herbaceous
2018-SSFE-230818-401A	10	10	10	70	Open Water	0	0	100	0	0	Herbaceous
2018-SSFE-230818-402A	0	0	10	90	Open Water	0	0	100	0	0	Herbaceous
2018-SSFE-230818-403A	0	0	10	90	Open Water	0	0	100	0	0	Herbaceous
2018-SSFE-230818-501A	0	0	0	100	Open Water	0	0	100	0	0	Herbaceous
2018-SSFE-230818-502A	0	0	0	100	Open Water	0	0	90	10	0	Herbaceous
2018-SSFE-230818-503A	0	0	0	100	Open Water	0	0	50	50	0	Herbaceous
2018-SSFE-240818-601A	0	0	0	100	Open Water	0	0	80	20	0	Herbaceous
2018-SSFE-240818-602A	10	0	10	80	Open Water	0	0	95	5	0	Herbaceous
2018-SSFE-240818-603A	10	0	20	70	Open Water	0	0	80	20	0	Herbaceous
Min.	**0**	**0**	**0**	**10**	**-**	**0**	**0**	**0**	**0**	**0**	**-**
Mean	**2**	**0**	**14**	**83**	**Open Water**	**3**	**0**	**63**	**3**	**31**	**Herbaceous**
Max.	**20**	**10**	**90**	**100**	**-**	**50**	**0**	**100**	**50**	**100**	**-**