



SOUTH NATION
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McKinnon's Creek Catchment Study

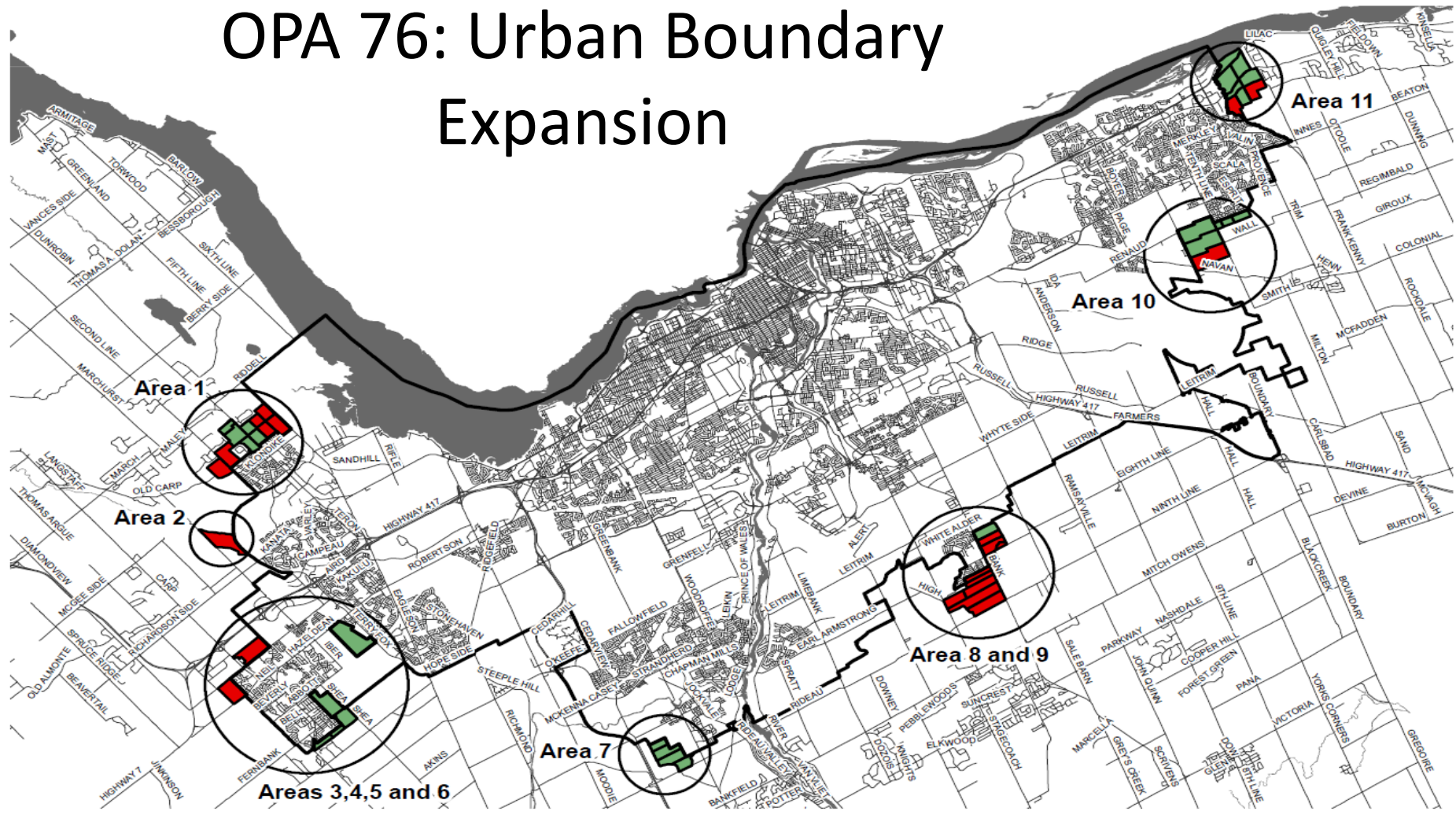
2016-2017

Clean Water Committee

November 26, 2018



OPA 76: Urban Boundary Expansion



Legend

- Areas recommended for inclusion in urban area
- Areas not recommended

0 1 2 4 6 8 10 Kilometers

I:\CO2008\Misc\Potential_urban_expansion_areas\Overall_Map.mxd





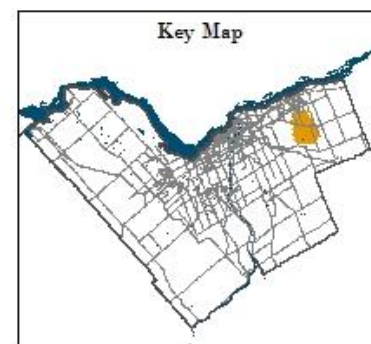
MCKINNON'S CREEK CATCHMENT REPORT

Sample Locations

Sampling Points

- 2016
- 2016 and 2017
- 2017

- McKinnon's Creek
- Tributary of McKinnon's Creek
- McKinnon's Subwatershed



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Scale 1:50,000

2018





Baseflow monitoring, McKinnon's Creek

- Headwater Drainage Feature (HDF) sampling
- Baseflow monitoring
- Floodplain mapping

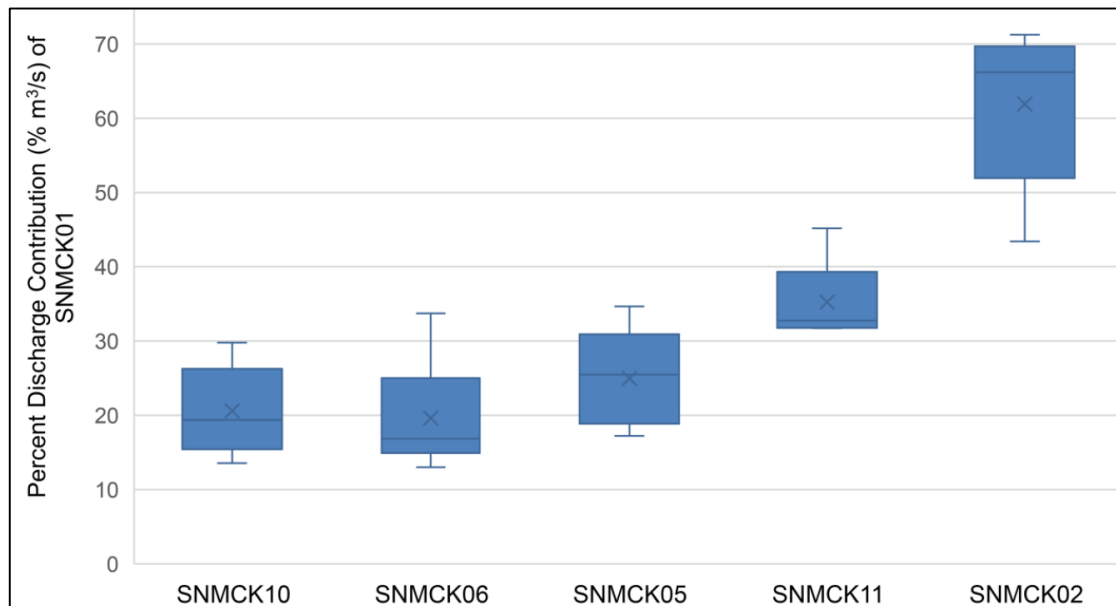
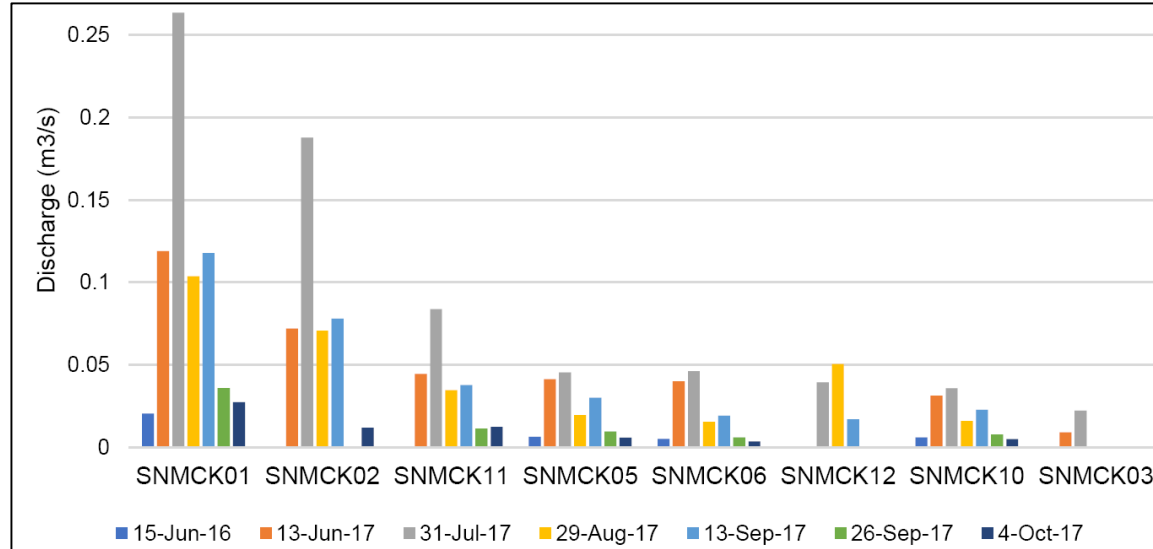


Headwater Drainage Feature Recommendations

| Drainage Feature (Site-Feature #) | Step 1 | Step 2 | Step 3 | Step 4 | Management Recommendation |
|-----------------------------------|------------------------------------|------------------------|------------------------|------------------------|---------------------------|
| | Hydrology | Riparian | Fish Habitat | Terrestrial Habitat | |
| SNMCKA-1 | Contributing Functions (Ephemeral) | Limited Functions | Contributing Functions | Limited Functions | Mitigation |
| SNMCKA-2 | Contributing Functions (Ephemeral) | Limited Functions | Contributing Functions | Limited Functions | Mitigation |
| SNMCKB-1 | N/A | N/A | N/A | N/A | No Summer Data |
| SNMCKC-1 | Contributing Functions (Ephemeral) | Contributing Functions | Contributing Functions | Limited Functions | Mitigation |
| SNMCKC-2 | Contributing Functions (Ephemeral) | Important Functions | Contributing Functions | Contributing Functions | Conservation |
| SNMCKC-3 | Contributing Functions (Ephemeral) | Important Functions | Contributing Functions | Contributing Functions | Conservation |
| SNMCKD-1 | Contributing Functions (Ephemeral) | Contributing Functions | Contributing Functions | Limited Functions | Mitigation |
| SNMCKD-2 | Contributing Functions (Ephemeral) | Contributing Functions | Contributing Functions | Limited Functions | Mitigation |
| SNMCKE-1 | Valued Functions (Intermittent) | Contributing Functions | Valued Functions | Limited Functions | Conservation |
| SNMCKF-1 | Contributing Functions (Ephemeral) | Important Functions | Contributing Functions | Contributing Functions | Mitigation |
| SNMCKF-2 | Contributing Functions (Ephemeral) | Contributing Functions | Contributing Functions | Limited Functions | Mitigation |
| SNMCKG-1 | Contributing Functions (Ephemeral) | Contributing Functions | Contributing Functions | Limited Functions | Mitigation |
| SNMCKH-1 | Important Functions (Perennial) | Important Functions | Contributing Functions | Contributing Functions | Protection |



Baseflow Monitoring





Water Quality and Habitat



YSI data download



Electrofishing, McKinnon's Creek

- Water chemistry
- Long-term continuous data collection
- Temperature surveys
- Biological surveys



Water Chemistry Results 2010-2017:

| CK74-050 | 75th Percentile | Guideline Value | Number of Observations | Number of Exceedances | Percentage of Exceedances |
|-----------------------------|-----------------|-----------------|------------------------|-----------------------|---------------------------|
| TP (mg/L) | 0.13 | 0.03 | 72 | 72 | 100% |
| Nitrate (mg/L) | 0.52 | 3 | 71 | 1 | 1% |
| TKN (mg/L) | 1.73 | 1 | 72 | 46 | 64% |
| Chloride (mg/L) | 188 | 120 | 72 | 37 | 51% |
| Sulphate (mg/L) | 128 | 100 | 72 | 42 | 58% |
| Iron (mg/L) | 1.58 | 0.3 | 71 | 70 | 99% |
| Zinc (mg/L) | 0.01 | 0.02 | 71 | 3 | 4% |
| <i>E. coli</i> (CFU/100 mL) | 255 | 100 | 71 | 32 | 45% |

Percentage of dissolved oxygen results that do not meet water quality guidelines for **fish** in 2017:

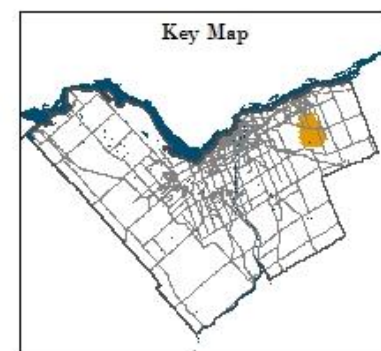
| Year | % of time < 5.5 mg/L DO (other life stages) | % of time < 6.0 mg/L DO (early life stages) |
|------|---|---|
| 2017 | 24% | 36% |

MCKINNON'S CREEK CATCHMENT REPORT

Benthic Invertebrate Assessment

Benthic Invertebrate Assessment

- Impaired
- Not Impaired
- Possibly Impaired
- McKinnon's Creek
- Tributary of McKinnon's Creek
- McKinnon's Subwatershed



Scale 1 : 50,000

2018



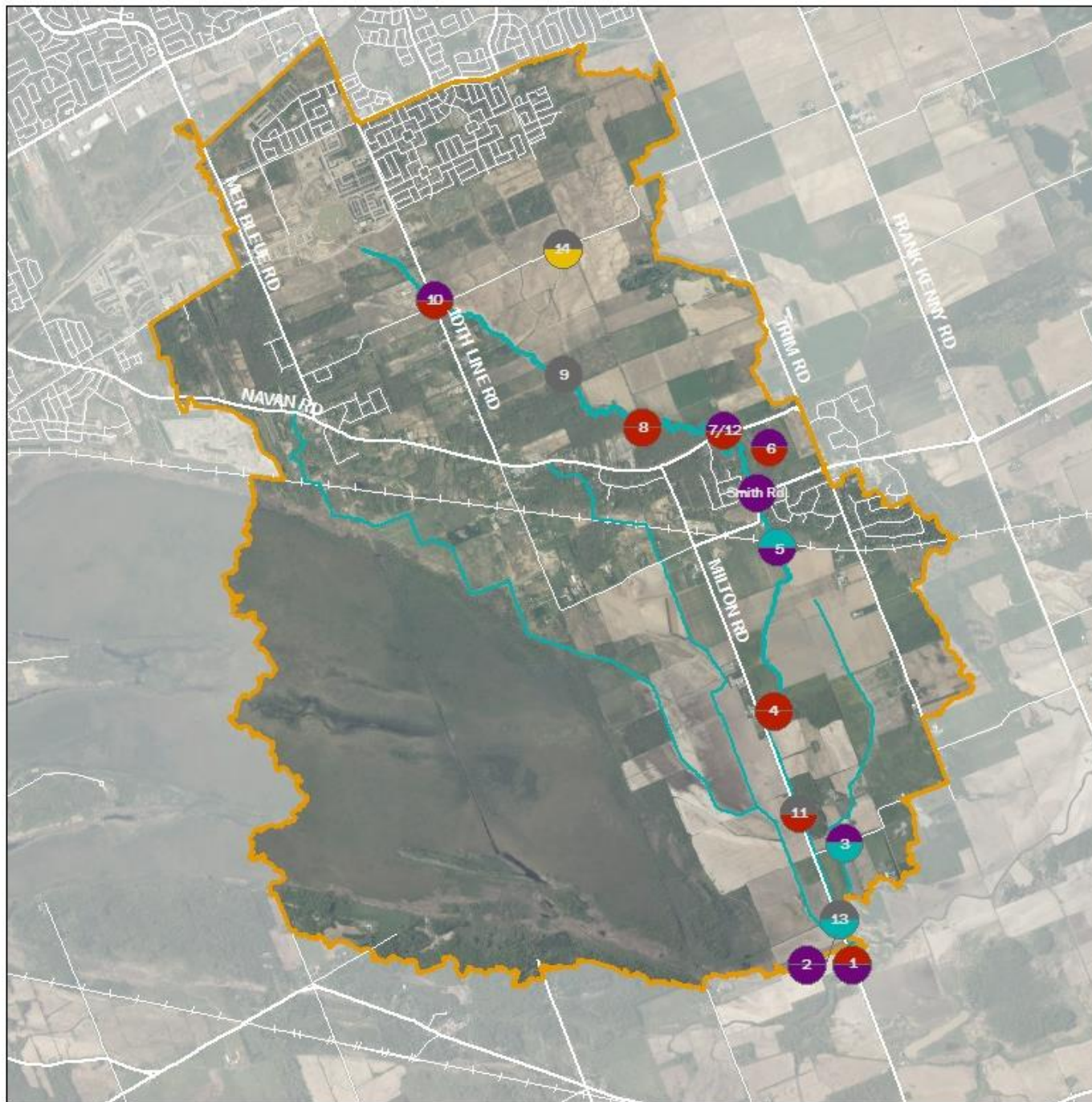
MCKINNON'S CREEK CATCHMENT REPORT

Temperature Profiles (Summer Average)



Scale 1:50,000

2018



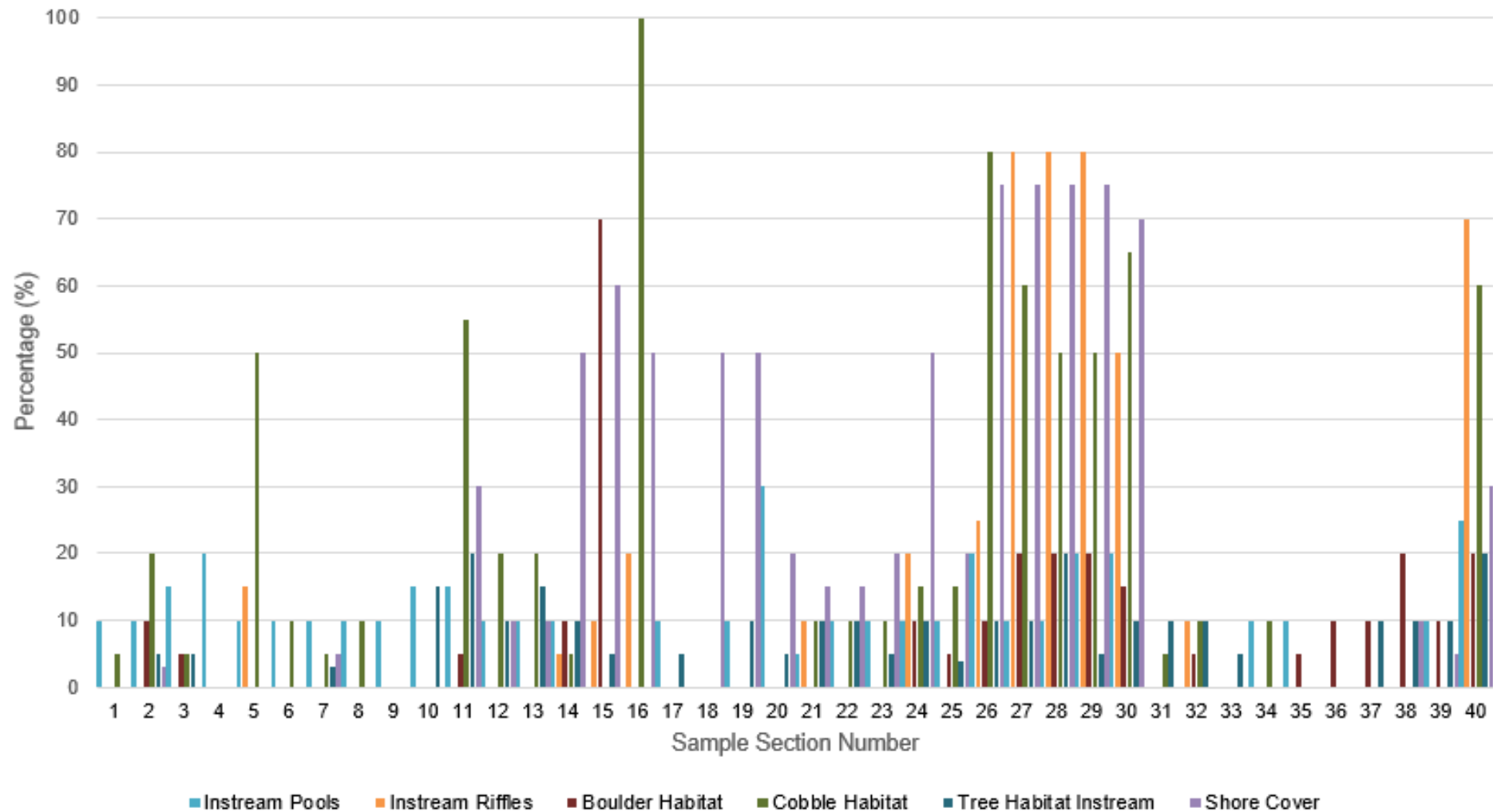


Fish Communities

| Fish Species | Thermal Preference | SNMCK 01 | SNMCK 02 | SNMCK 03 | SNMCK 04 | SNMCK 05 | SNMCK 06 | SNMCK 07 | SNMCK 08 | SNMCK 09 | SNMCK 10 |
|--|------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| Trout Perch (<i>Percopsis omiscomaycus</i>) | Cold water | | | | | 1.09% | | 0.84% | | | |
| Banded Killifish (<i>Fundulus diaphanous</i>) | Cool water | 5.00% | | | 3.41% | | | | 1.82% | 12.98% | |
| Brassy Minnow (<i>Hybognathus hankinsoni</i>) | Cool water | | 10.32% | | 2.05% | 0.82% | | | 1.82% | | 9.92% |
| Brook Stickleback (<i>Culaea inconstans</i>) | Cool water | | 1.29% | 85.71% | 1.37% | | | | | 0.76% | 3.05% |
| Central Mudminnow (<i>Umbra limi</i>) | Cool water | 5.00% | 30.32% | 9.52% | 1.02% | | | 1.68% | 0.91% | 1.53% | 4.58% |
| Common Shiner (<i>Luxilus cornutus</i>) | Cool water | | 10.32% | | 1.02% | 19.13% | 9.04% | 5.04% | 23.64% | 0.76% | |
| White Sucker (<i>Castostomus commersonii</i>) | Cool water | 5.00% | 3.23% | | 3.07% | 15.30% | 14.46% | 13.45% | 8.18% | | 2.29% |
| Creek Chub (<i>Semotilus atromaculatus</i>) | Cool water | 10.00% | 14.19% | 4.76% | 37.20% | 31.69% | 40.36% | 12.61% | 25.45% | 1.53% | 11.45% |
| Etheostoma Spp. | Cool water | 40.00% | 12.26% | | 11.95% | 8.47% | 4.22% | 15.13% | 10.00% | 5.34% | 2.29% |
| Golden Shiner (<i>Notemigonus crysoleucas</i>) | Cool water | | 4.52% | | | | | 9.24% | 15.45% | 7.63% | 42.75% |
| Longnose Dace (<i>Rhinichthys cataractae</i>) | Cool water | | | | 4.44% | 12.57% | 5.42% | 6.72% | 1.82% | 1.53% | |
| Rock Bass (<i>Ambloplites rupestris</i>) | Cool water | 20.00% | 0.65% | | 1.02% | | 10.24% | 14.29% | 2.27% | | |
| Logperch (<i>Percina caprodes</i>) | Cool-warm water | | | | 0.68% | | 4.22% | | | | |
| Northern Redbelly Dace (<i>Chrosomus eos</i>) | Cool-warm water | | 10.97% | | 6.48% | | | | | | 0.76% |
| Bluntnose Minnow (<i>Pimephales notatus</i>) | Warm water | 10.00% | 0.65% | | 24.91% | 10.11% | 12.05% | 12.61% | 7.27% | 67.94% | 20.61% |
| Fathead Minnow (<i>Pimephales promelas</i>) | Warm water | | | | 1.37% | | | 0.84% | | | 1.53% |
| Pumpkinseed (<i>Lepomis gibbosus</i>) | Warm water | 5.00% | 1.29% | | | | | 7.56% | | | 0.76% |
| | % Warm water Spp. | 15.00% | 1.94% | | 26.28% | 10.11% | 12.05% | 21.01% | 7.27% | 67.94% | 22.90% |
| | % Cool-warm water Spp. | | 10.97% | | 7.17% | | 4.22% | | | | 0.76% |
| | % Cool water Spp. | 85.00% | 87.10% | 100.00% | 66.55% | 87.98% | 83.73% | 78.15% | 91.36% | 32.06% | 76.34% |
| | % Cold water Spp. | | | | | 1.09% | | 0.84% | | | |

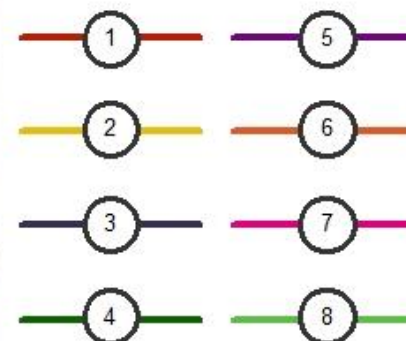


Habitat Hotspots



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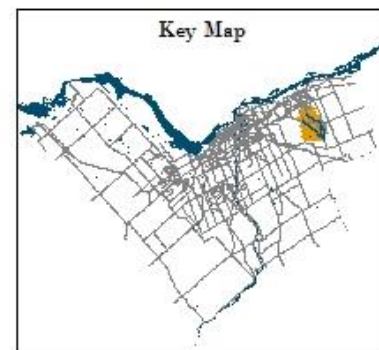
Restoration Opportunities



— Tributary of McKinnon's Creek

— McKinnon's Subwatershed

Key Map



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Acknowledgements



Eastern Ontario Water Resources Program

