

## Addendum to the Embro Dam and Conservation Area – Existing Environmental Conditions (2016), Upper Thames River Conservation Authority

---

### Introduction

The Upper Thames River Conservation Authority (UTRCA) has engaged with its consultant Matrix Solutions Inc. for the continuation of the Class Environmental Assessment for the Embro Dam. The study was initiated in 2015, completed by Ecosystems Recovery Inc., which later merged with Matrix Solutions Inc. The final study report was submitted to the UTRCA in 2017.

This document serves as an addendum to the Existing Environmental Conditions report (2016), completed by the UTRCA staff. The document contains updates (if any) to streamflow, surface water quality, aquatic and terrestrial biology, and cultural evaluation.

### Flow characteristics

There is no update on the flow characteristics.

### Hydrogeology

A map of well records from well records map of the Ontario Ministry of Environment, Conservation and Park (MECP) was retrieved and reviewed for any updates. No changes to the well records were noticed.

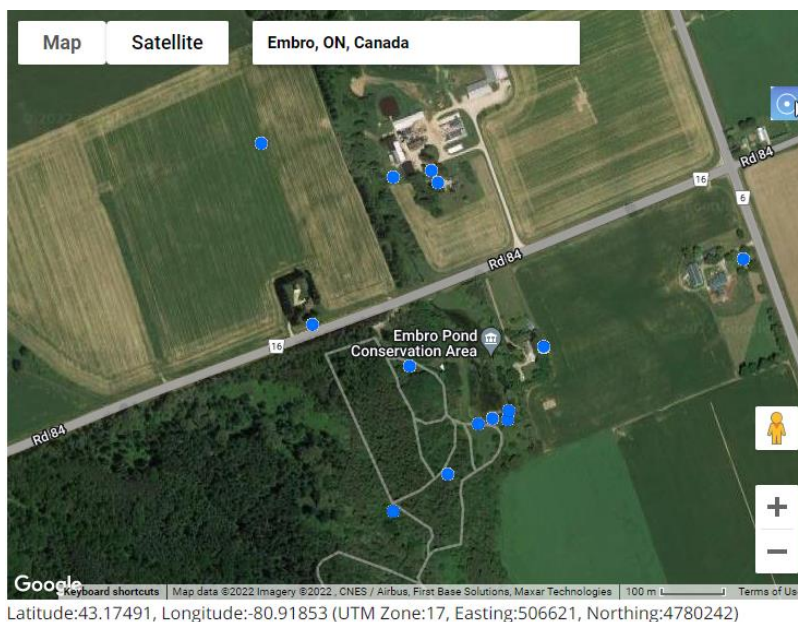


Image 1: MECP Well records (<https://www.ontario.ca/page/map-well-records>)

### Surface Water Quality

No surface water sampling has been conducted on the site since October, 2016.

### **Fisheries and Benthic**

Additional sampling for fish and benthic at and near the subject area has been conducted since 2015. Please refer to Appendix A for the information.

### **Terrestrial Ecology**

No further data has been acquired since 2016.

### **Cultural**

In 2021, the UTRCA engaged with TMHC Inc. to conduct cultural heritage evaluation that considers the potential heritage value or interest of the site. The final report was submitted in 2022.

# **Appendix A**

Update on Fisheries and Benthic data since 2016

### 1.1.1 Aquatic Ecology

This section of the Addendum Report summarizes recent aquatic surveys completed since the original 2016 Embro Dam Existing Conditions Report. Electrofishing and benthic survey data from November 2015 to July 2022 were reviewed in order to update the existing conditions at the sampling sites shown on Figure 1. *A list of recorded fish and benthic species, separated into sampling location, is provided in Appendix C: Embro Dam area Fish and Benthic Records 2015 to 2022.*

#### 1.1.1.1 Fisheries Resources

Youngsville Drain has been sampled extensively in the past, both upstream and downstream of pond, and found to support a fairly stable Brook Trout dominated community. Since the last report, upstream reaches were sampled on twelve (12) occasions and downstream of the dam was sampled six (6) times (Table 1). Brook Trout was detected at every sample event both upstream and downstream of the Embro pond from 1999 to present.

All fish were identified to species, recorded, and released. Sample records, including *historic records*, are tracked in a WISKI database and are provided in **Appendix C**.

Site Name	Former Site Name	UTM	Dates Sampled	Site Description
<i>Upstream of Embro Dam</i>				
UT.MU119	MU41	x: 505996 y: 4781291	Nov. 19, 2015 Nov. 16, 2016 Nov. 22, 2016	East of 35th Line 1.4 km North of Road 84
UT.MU118	MU24	x: 505741 Y: 4781834	Nov. 11, 2015 Nov. 17, 2015 Nov. 19, 2015 Nov. 14, 2016 Nov. 16, 2016 Nov. 25, 2016	East of 35th Line 2 km North of Road 84
UT.MU117	837-UT	x: 506759 y:4780111	Nov. 17, 2016 Aug. 13, 2019 Jun. 17, 2022	Youngsville Drain Oxford Rd 84
<i>Embro Pond</i>				
UT.MU133	MU25	x: 506858 y: 4779995	Not sampled since last report	Embro CA, Rd 84
<i>Downstream of Embro Dam</i>				
UT.MU116	MU40	x: 506879 y: 4779791	Nov. 19, 2015 Nov. 16, 2016 Nov. 22, 2016 Aug. 23, 2018 Aug. 13, 2019 Jun. 17, 2022	Rd 84, Embro C.A., Downstream of Pond

**Table 1. Recent Fish Sampling Dates and Locations**

In the 2016 Existing Conditions report it was noted that Brook Trout were recorded in large numbers upstream of the Embro Dam. The continued to abundance of Brook Trout above the dam suggests that Youngsville Drain provides good quality cold water habitat. Brook Trout presence below the dam indicates that the numerous seeps and extensive aquatic vegetation that develops throughout the summer months (limiting sunlight penetration) counteract the warming effect of the pond and allow the cool water habitat to persist. The decreased presence of young- of- the- year trout in the downstream samples indicate that the cool water habitat is somewhat marginal, not ideal for trout recruitment. Trout that were recorded likely passed over the dam, and became trapped, downstream.

Based on all available data from historic and recent fish surveys spanning from 1999 to 2022, there is a large discrepancy in species diversity between upstream and downstream of the pond (i.e., nine (9) species recorded upstream and twenty-seven (27) species downstream). The low species diversity is fairly typical of trout dominated systems, but likely also reflects the impact of the barrier to fish movement that is due to the Embro Dam and Pond. The diverse downstream community includes cold water species and both permanent, and seasonally present, warm water species.

Six (6) of the eight (8) species historically found upstream of the Embro Dam were located during recent sampling (conducted in 2016, 2019, and 2022). One additional species; the Bluntnose Minnow was detected. Two species: Creek Chub and Northern Redbelly Dace, were previously found upstream, but not detected in the most recent sampling events. As species recently detected were primarily the most commonly encountered fish in previous surveys, this is considered to be a fairly stable fish community.

<b>Detected in 2016 – 2022 Samples and Historically Detected in Upstream Reaches</b>	<b>New Upstream Species Detection</b>	<b>Absent from 2016 – 2022 Sampling, but Previously Detected in Upstream reaches</b>
Blacknose Dace	Bluntnose Minnow	Creek Chub
Brook Stickleback		Northern Redbelly Dace
Brook Trout		
Fathead Minnow		
Johnny Darter		
White Sucker		

**Table 2. Fish Species Sampled Upstream of Embro Pond 2016-2022**

Twenty (20) of the twenty-seven (27) species sampled downstream of the Embro Pond were found during the November 2015 to July 2022 sampling. Of the 20 species, five were new species detections. Of note, Northern Sunfish, a Species at Risk of Special Concern was detected at the downstream site on August 13, 2019. Prior to 2016 Northern Sunfish did not have Special Concern status. The Northern Sunfish status was assessed to be of Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) May 2016. The Committee on the Status of Species at Risk in Ontario (COSSARO) assessed Northern Sunfish status to be Special Concern December 2016. The main threat to Northern Sunfish is declining habitat quality. This species likes slow-moving, clean water with plenty of aquatic vegetation and is not tolerant of muddy or polluted waters. Seven (7) species; Bluegill, Golden Shiner, Greenside Darter, Rock Bass, Rosyface Shiner, Smallmouth Bass, and Striped Shiner were previously found downstream, but not detected in the most recent sampling events. Results of the recent fish sampling indicate that Embro Dam continues to be an effective barrier to fish movement and it limits the upstream fish community diversity.

<b>Detected in 2015 – 2022 Samples and Historically Detected in Downstream Reaches</b>	<b>New Downstream Species Detections</b>	<b>Absent from 2015 – 2022 sampling, Historically detected in Downstream Reaches</b>
Blacknose Dace	Black Bullhead	Bluegill
Bluntnose Minnow	Largemouth Bass	Golden Shiner
Brook Stickleback	Northern Sunfish	Greenside Darter
Brook Trout	Rainbow Darter	Rock Bass
Central Stoneroller	Spotfin Shiner	Rosyface Shiner
Common Shiner		Smallmouth Bass
Creek Chub		Striped Shiner
Fantail Darter		

Fathead Minnow		
Hornyhead Chub		
Johnny Darter		
Northern Hog Sucker		
Northern Redbelly Dace		
Pumpkinseed		
White Sucker		

**Table 3. Fish Species Sampled Upstream of Embro Pond 2016-2022**



**Figure 1: Embro Dam area benthic and fish sampling (Source: UTRCA; Appendix C)**

#### 1.1.1.2 Benthic Resources

Benthic invertebrates are organisms that live on the bottom or in the sediment of a water body. Because they are diverse, generally sedentary, and responsive to environmental alterations, benthic invertebrates are often sampled to study water quality (Jones, N.E. 2011).

To determine water quality, a value from 0 to 10, called a biotic index, is assigned to benthic invertebrate taxa. This value indicates their sensitivity and tolerance to pollution. Lower numbers indicate pollution

sensitivity and high numbers indicate tolerance. A weighted average of the biotic index and the number of invertebrates in each taxa in the sample gives a value called a Family Biotic Index (FBI). The water quality ranges for the FBI values can be found in Table 1.

FBI Value	Water Quality
< 4.25	Excellent
4.25 – 5.00	Good
5.00 – 5.75	Fair
5.75 – 6.50	Fairly Poor
6.50 – 7.25	Poor
> 7.25	Very Poor

**Table 4: Water quality ranges for FBI values**

Sampling for benthic macroinvertebrates to update the existing conditions upstream and downstream the Embro Dam was conducted in May 2016 and September 2017, September 2019, and September 2021. Sampling was conducted using a traveling kick and sweep method, and samples handled and analyzed using methods consistent with Provincial (OBBN) and Federal (CABIN) protocols. Samples were preserved in the field, randomly subsampled in the lab and identified to the Family taxonomic level. Resulting data were entered into the WISKI database and analyzed. *Sample records (including historic records) with calculated Family Biotic Index (FBI) are provided in Appendix C. The water quality ranges for the FBI values can be seen in Table 6.*

Site Name	Former Site Name	Date Sampled
<i>Upstream of Embro Dam</i>		
<i>UT.MU117</i>	<i>MU26</i>	<i>May 3, 2016 Sept. 13, 2017 Sept. 9, 2019 Sept. 2, 2021</i>
<i>UT.MU119</i>	<i>MU24</i>	<i>Not sampled since last report</i>
<i>Downstream of Embro Dam</i>		
<i>UT.MU116</i>	<i>MU40</i>	<i>May 3, 2016 Sept. 13, 2017 Sept. 9, 2019 Sept. 2, 2021</i>

**Table 5. Recent Benthic Sampling Dates and Locations**

Fall sampling conducted in 2017, 2019 and 2021 showed better water quality downstream of the Embro Dam compared to upstream. Conversely, the spring 2016 sample showed better water quality upstream. The average FBI for the upstream and downstream sites shows little difference in FBI score (6.00 upstream compared to 6.13 downstream). Overall, there was little difference between upstream and downstream results. Both sites are considered Fairly Poor overall. Benthic family biotic index score could indicate that the upstream site is suffering somewhat from nutrient enrichment and the negative pond effects are counteracted by some nutrient filtering and assimilation.

**Table 7** ~~Error! Reference source not found.~~ below compares the FBI values reported in the 2016 Embro Dam Existing Conditions Report (2015 values) and recent 2016 - 2021 values from Youngsville Drain to average FBI values for the Mud Creek and Upper Thames watersheds. The Embro values indicate slightly poorer water quality than the average value for all samples of the Upper Thames 2017 watershed



report card (FBI = 5.97). Youngsville Drain values are similar to the value for the most recent (2012) Mud Creek Watershed Report Card (FBI = 6.05). All values are within the same water quality range of “fair” to “fairly poor”, which is below the provincial guideline target of “good” water quality (FBI < 5.00).

**Table 6: Water quality ranges for FBI values**

FBI Value	Water Quality
< 4.25	Excellent
4.25 – 5.00	Good
5.00 – 5.75	Fair
5.75 – 6.50	Fairly Poor
6.50 – 7.25	Poor
> 7.25	Very Poor

**Table 7: Comparison of FBI values for Embro Conservation Area, Mud Creek and UTRCA watershed (Source: UTRCA)**

Benthic Sample Location	2016 Existing Conditions Report Sample Dates		2022 Addendum Report Benthic Sampling Dates				Average FBI From 2017 EA	Average 2015 - 2021	Water Quality
	Spring 2015 FBI	Fall 2015 FBI	Spring 2016	Fall 2017	Fall 2019	Fall 2021			
Youngsville Drain upstream of Embro Pond	5.82	6.06	6.09	6.07	6.02	5.84	5.94	6.00	Fairly poor
Youngsville Drain downstream of Embro Dam	5.84	6.37	7.17	5.82	5.6	5.75	6.12	6.13	Fairly poor
Mud Creek watershed 2017 report Card (2011-2015 data)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6.05	Fairly poor
UTRCA watershed 2017 report Card (2011-2015 data)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	5.97	Fairly poor
Provincial Guideline (target only)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	< 5.00	Good

**References:**

COSEWIC. 2016. COSEWIC assessment and status report on the Northern Sunfish *Lepomis peltastes*, Saskatchewan - Nelson River populations and the Great Lakes - Upper St. Lawrence populations, in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xv + 51 pp. (<https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/cosewic-assessments-status-reports/northern-sunfish-2016.html>).

COSSARO. 2016. Ontario Species at Risk Evaluation Report for Northern Sunfish (*Lepomis peltastes*)  
[http://cossaroagency.ca/wp-content/uploads/2017/06/Accessible\\_Final\\_COSSAROEvaluation\\_NorthernSunfish\\_Dec2016.pdf](http://cossaroagency.ca/wp-content/uploads/2017/06/Accessible_Final_COSSAROEvaluation_NorthernSunfish_Dec2016.pdf)