Alberta Conservation Association
2017/18 Project Summary Report

Project Name: Owl River Walleye

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Partnerships

Alberta Environment and Parks
Syncrude Canada Ltd.

Key Findings

- Confirmed the use of the upper 10 km section of the Owl River study area by spawning fish.
- Dissolved oxygen and temperature remained within optimal ranges for walleye during spawning in May.
- Total phosphorus and nitrogen levels were high throughout the system; levels were higher at downstream sites than at upstream sites.
- Total coliform counts exceeded established limits for agricultural use (>1,000 mpn/100 mL) at all sites.
- Aquatic habitat condition and macroinvertebrate community composition were similar to 2011 baseline conditions, with no obvious temporal or spatial trends.

Introduction

In 2005, the Government of Alberta began the Lac La Biche Fisheries Restoration Program, including an intensive stocking program that stocked over 200 million walleye fry and fingerlings in the lake to restore populations (McGregor 2014). The Owl River is considered the primary spawning habitat for Lac La Biche walleye, with historical walleye spawning habitat located approximately 30 km upstream from Lac La Biche (Chris Davis, Alberta Environment and Parks[AEP], pers. comm.). In 2011, ACA began a long-term initiative to protect and restore riparian habitat along the Owl River to aid the walleye restoration. We collected baseline data on riparian health, water quality, aquatic habitat, and the distribution of walleye spawning habitat. In 2017, we reassessed these characteristics as part of a three-year interval monitoring protocol; results of the riparian component of the study are presented under Land Management (Riparian Conservation Program).

Methods

In 2017, we conducted night-time visual observations during peak walleye spawning season to determine spawning activity within spawning locations identified in 2011 and 2014. We actively searched for walleye using hand-held spotlights from shore and recorded locations with a GPS unit. We conducted monthly water quality analyses from May to August at five locations. Where applicable, we interpreted water quality data using the Canadian Council of Ministers of the Environment Canadian Water Quality Guidelines (Canadian Council of Ministers of the Environment 2007) for a) Protection of Aquatic Life and b) Protection of Agricultural Water Uses, as well as the AEP environmental quality guidelines for Alberta surface waters (Alberta Environment and Sustainable Resource Development 2014). In August, we conducted macroinvertebrate analyses at five locations following the United States Environmental Protection Agency multi-habitat protocol (Barbour et al. 1999), and we assessed aquatic habitat along cross-sectional transects at 1-km intervals in the upper section (upper 10 km) and at 5-km intervals in the lower section (lower 30 km) of the river. Data collected included wetted and bankfull widths, riparian width, vegetation cover and composition, soil exposure, and human-related disturbance along banks. In August, the Owl River experienced flood conditions, which prevented the collection of some habitat variables.

Results

Water temperature ranged from 12.7 to 20.6°C and dissolved oxygen (DO) from 6.5 to 10.9 mg/L from May to August. Total phosphorus (TP) concentrations were high throughout the system. Summer average total TP ranged between 68 to 140 µg/L, with higher concentrations at downstream sites (Sites 12-W and 16-W) (Table 1). Total nitrogen concentrations from May to August ranged from 0.8 to 1.6 mg/L, averaging above the AEP limit (1.0 mg/L) at three sites. Turbidity ranged from a high of 8.9 NTU in May to a low of 1.6 NTU in August, with summer averages ranging from 4.4 to 5.8 NTU (Table 1). As expected, turbidity was higher in spring than summer, and summer averages were higher at downstream sites than at upstream sites. Total coliform counts were high and summer averages exceeded the CCME (2007) limit for agriculture use (>1,000 mpn/100mL) at all sites (Table 1). *E-coli* counts exceeded CCME limits (≥100 mpn/100 mL) at site 9-W in May; however, summer averages remained below limits at all sites. We collected a total of 7,260 macroinvertebrates belonging to 71 families. Diversity ranged from 2.1 to 2.3 and richness ranged from 36 to 56; there were no clear spatial distributional patterns. The most common family was *Baetidae* (Order: *Ephemeroptera*).

Table 1. Key water quality variable averages (May to August 2017) at five water quality sites in the Owl River system.

Site	Temp (°C)	DO (mg/L)	TP (µg/L)	TN (mg/L)	Chl*a* (µg/L)	Turbidity (NTU)	*E-coli* (mpn/ 100mL)	Total coliform (mpn/100)
1-W	16.8	8.1	114.0	0.9	3.0	4.5	15.1	1,892.5
9-W	16.1	9.5	113.0	0.5	5.7	5.8	85.5	2,200.0
12-W	16.7	8.0	119.3	1.1	3.9	5.3	22.3	1,602.5
16-W	17.3	7.7	140.0	1.0	4.6	5.2	23.3	1,777.5
2-W[1]	16.7	9.8	68.5	1.2	6.1	4.4	23.5	1,585.0

Temp = temperature, DO = dissolved oxygen, TP = total phosphorus, TN = total nitrogen, Chl*a* = chlorophyll-*a*
[1]Site located on Piche River, approximately 200 m upstream of confluence with Owl River.

Grasses and woody shrubs made up a majority of the streamside vegetation. In general, human disturbance was low throughout the study sites and only observed in the lower section of the river where agricultural practices have removed the larger woody vegetative species. High levels of erosion were observed along the banks in September of 2017 after August flooding had subsided (Photo 3).

Conclusion

In 2017, we monitored aquatic habitat, water quality, and walleye spawning along the Owl River as part of a long-term initiative to protect and restore the riparian vegetation. We reaffirmed the use of the upper reaches of the Owl River as the primary spawning site in the Owl River system. Total coliform counts remained high and exceeded the CCME limit for agriculture use at all sites. Dissolved oxygen concentrations were high throughout the river system and above CCME limits for supporting aquatic life. Total phosphorus concentrations were high throughout the system, indicating the Owl River is a nutrient-rich system, with a trend of increasing concentration farther downstream toward the lake. Despite enhancements to the riparian area in 2012, significant changes to water quality have not been observed, emphasizing the need for continued conservation efforts along the length of the river, complemented by further long-term monitoring.

Communications

- Submitted final report to Syncrude Canada Ltd.

Literature Cited

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Upstream view of monitoring site 2-W. Photo: Britt Schmidt

Alberta Conservation Association biologist Tyler Johns kayaking along the Owl River to access aquatic habitat monitoring sites. Photo: Britt Schmidt

Erosion along the bank of the Owl River following August flooding.
Photo: Britt Schmidt