Alberta Conservation Association
2007/08 Project Summary Report

Project name: *Battle River Index of Biological Integrity*

Project leader: Trevor Council

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Partnerships:

Alberta Environment
Alberta Sustainable Resource Development
ATCO Power Ltd., Battle River Generating Station, Forestburg
Battle River Watershed Alliance
Department of National Defense, Canadian Forces Base Wainwright

Key findings

- A total of 3,473 fish representing 14 species were captured. White sucker represented 49% of the catch, whereas walleye and pike combined represented only 12% of the catch.
- Geographic information system (GIS) analysis was used to create metrics measuring various human land activities at multiple scales.
- Preliminary results indicate that the multi-metric IBI comprising percent omnivores, percent carnivores, and species richness, is highly sensitive to human disturbance.

Introduction

Resource managers require an assessment of the integrity of the fish community in the Battle River to support the management of aquatic resources in the drainage. Given the lack of established tools for bioassessments of rivers in Alberta, the primary objective of our work was to develop an Index of Biological Integrity (IBI) for the Battle River. An IBI is a multi-metric approach that is useful when examining the influence of humans on aquatic systems. Specifically, an IBI approach allows for a description of the health of a river through assessment and description of the structure of its fish community. IBI can be used to detect effects (e.g., point and non-point pollution, physical habitat alteration, flow alteration, and complex cumulative impacts) of diverse human actions (e.g., agriculture, livestock grazing, logging, recreation, and urbanization) on water resources. An IBI can also be used to define spatial and temporal patterns in water resource conditions and to evaluate the effects of management efforts (Karr 1999, 1997).

Methods

We selected study sites along the Battle River from Battle Lake to the Saskatchewan border in an effort to represent the full spatial extent of the river and its various habitats. At each of our 84 sites, we collected fish assemblage, riparian, and water quality data. Fish were captured using boat electrofishing gear.

We used a GIS to conduct spatial analyses of a suite of metrics. Metrics were designed to measure a variety of human land-use activities at multiple scales. We also conducted a survey to assess historical fish assemblage and habitat conditions along the Battle River. We used methods established in similar IBI studies (e.g., Stevens et al. 2006; Bramblett et al. 2005) and published species habitat requirement information to develop and validate the metrics used in the Battle River IBI.

Results

We captured a total of 3,473 fish representing 14 species from 84 sites along the Battle River in 2006 and 2007. White sucker represented 49% of the catch, whereas walleye and pike combined represented only 12% of the catch (Table 1). Longnose dace and lake chub represented 27% of the catch.

Table 1.   Combined boat electrofishing catch from 84 sites along the Battle River, 2006 and 2007.

Species	Total number captured	Percent of catch
Burbot	9	0.26
Fathead minnow	31	0.89
Goldeye	7	0.20
Iowa darter	2	0.06
Lake chub	398	11.5
Longnose dace	547	15.8
Longnose sucker	1	0.03
Mooneye	2	0.06
Northern pike	341	9.8
Shorthead redhorse sucker	229	6.6
Spottail shiner	8	0.23

Trout-perch	115	3.3
Walleye	84	2.4
White sucker	1,699	48.9
Total	**3,473**	**100**

Initially we created 12 candidate metrics using our fish assemblage data, some of which were subsequently deemed redundant as determined by correlation analysis (Stevens 2008; in draft). Preliminary results suggest that the metrics: percent omnivores, percent carnivores, and species richness are highly sensitive to human disturbance (Stevens 2008).

Conclusion

We sampled a total of 84 sites on the Battle River and collected fish assemblage, riparian, and water quality data. All data was used in the development of a multi-metric IBI for the Battle River. Preliminary analysis indicates that the metrics: percent omnivores, percent carnivores, and species richness are highly sensitive to human disturbance.

Communications

- Preliminary results were discussed at a Fish Community Index Seminar and Workshop in Nisku, Alberta.
- Results were presented to the Fisheries Standards Committee at a Lotic Monitoring Workshop.
- The project was profiled in the Fall 2006 edition of *Conservation* magazine.

Literature cited

Bramblett, R.G., T.R. Johnson, A.V. Zale, and D.G. Heggem. 2005. Development and evaluation of a fish assemblage index of biotic integrity for northwestern Great Plains streams. Transactions of the American Fisheries Society 134: 624-640.

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Stevens, C., G. Scrimgeour, W. Tonn, C. Paszkowski, M. Sullivan, and S. Millar. 2006. Developing and testing of a fished-based index of biological integrity to quantify the health of grassland streams in Alberta. Technical Report, T-2006-001, produced by Alberta Conservation Association, Edmonton, Alberta, Canada. 50 pp + App.

Stevens, C. 2008. Fished-based index of biological integrity for the Battle River, Alberta. Technical Report (draft), produced by Golder Associates Ltd., for the Alberta Conservation Association, Edmonton, Alberta, Canada.

Alberta Conservation Association staff sampling the fish assemblage on the Battle River. (Photo: Jason Blackburn)

Cattle on the Battle River. (Photo: Jason Blackburn)

Sample site on the Battle River. (Photo: Brad Hurkett)