

Buffalo State

State University of New York

Stephen M. Schoenwiesner

Licensing Manager

New York Power Authority

123 Main Street

White Plains, NY 10601

1300 Elmwood Avenue
Buffalo, NY 14222-1095
www.buffalostate.edu

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Dear Mr. Schoenwiesner:

Please find attached five copies of our Conceptual Pre-Proposal: "Status of the Niagara River benthic community: effects of water fluctuations, contamination, and long-term trends" that we would like to submit to the Habitat Enhancement and Restoration Fund. We are also sending a copy of the pdf file on the CD.

Please let me know if you have any questions,

Sincerely,



Lyubov E. Burlakova, PhD
Research Scientist, Adjunct Associate Professor
Great Lakes Center
Classroom Building C215A
Buffalo State College
1300 Elmwood Ave. Buffalo, NY 14222
Phone: Office (716) 878-4504
Lab (716) 878-5232
Fax: (716) 878-6644
E-mail: burlakle@buffalostate.edu
Web page: <http://www.buffalostate.edu/greatlakescenter/x732.xml>

Conceptual Pre-Proposal

STATUS OF THE NIAGARA RIVER BENTHIC COMMUNITY: EFFECTS OF WATER FLUCTUATIONS, CONTAMINATION, AND LONG-TERM TRENDS

PROJECT SPONSOR IDENTIFICATION

Name: Lyubov E. Burlakova, and Alexander Y. Karatayev
Affiliation: Great Lakes Center, Buffalo State College
Mailing Address: 1300 Elmwood Ave., Buffalo, New York 14222
Phone: (716) 878-4504, (716)-878-5423
Fax: (716) 878-6644
E-mail: burlakle@buffalostate.edu; karataay@buffalostate.edu

COLLABORATORS: Dimitry Gorsky, US FWS, Amherst, NY; Don W. Schloesser, USGS, Great Lakes Science Center, Ann Arbor, MI; Buffalo-Niagara Riverkeepers, Buffalo, NY.

PROJECT LOCATION: Niagara River (excluding the Falls).

SUMMARY

Traditional chemical water quality monitoring can be minimally informative for the overall stress of ecosystems. Meanwhile, biological communities often reflect the overall ecological integrity (i.e., chemical, physical, and biological) by assimilating stresses over time and thus providing an ecological measure of fluctuating environmental conditions¹. Biological monitoring using benthic macroinvertebrates is one of the most reliable and cost-effective approaches for assessing ecosystem health because benthic communities are very sensitive to environmental disturbances. Furthermore, benthic communities include species which constitute a broad range of trophic levels and pollution tolerances, thus providing ideal information for interpreting cumulative effects of multiple stressors¹⁻⁴.

The Niagara River Area of Concern (NRAOC) was established due to past commercial and industrial activity that polluted the basin, and the Niagara River Remedial Action Plan (NYS DEC, 1994) concluded that the degradation of fish and wildlife populations and the loss of fish and wildlife habitat were "impaired" beneficial uses. Although identified as "impaired", the structure and functioning of the Niagara River aquatic ecosystem are currently poorly understood. This is particularly true for the benthic community that, despite being directly impacted by toxic contamination of water and sediments^{5,6} and water fluctuations, has been sampled sporadically and only at selected locations. As a result, the community has not been comprehensively surveyed or evaluated for over 40 years⁷. We propose a project to assess the current status of the benthic macroinvertebrate community, evaluate the effects of water fluctuations and contamination on the community, estimate the historical and recent changes in community integrity, and to develop a long-term benthic monitoring program to address the effects of Power Project and Degradation of Fish and Wildlife Populations Beneficial Use Impairments for Niagara River AOC.

In this project we will survey the benthic community of the Upper and Lower Niagara River and some of the tributaries to describe the current diversity and community structure. We will use historical data^{5,8} and substrate composition maps created using side scan sonar (USFWS)¹ to develop sampling design and define different types of sediments and areas with similar habitats. Our sampling protocol will target several goals: (1) to assess the effect of water level fluctuation we will sample and compare benthic communities at similar sites with different degrees of water fluctuations; (2) to assess the effect of contamination we will sample polluted and non-impaired sites within the basin; (3) to assess changes in

benthic diversity and abundance we will repeat the designs of previous samplings^{5,6,9}; (4) to determine benthic species diversity and community structure in various river habitats, we will conduct a random sampling within each identified habitat type in the Upper Niagara Riverⁱⁱ; (5) to assess the current diversity of important bioindicators (e.g. freshwater molluscs^{10,11}) we will survey their historical locations¹²⁻¹⁶ and other suitable habitats in the Niagara River and tributaries. We will employ existing and develop new effective benthic biological indices to contrast the current status of affected and non-impaired sites; compare the current status of benthic community and selected indicator benthic groups with historical data to determine existing trends. We will assess the current status of molluscs in the Niagara River and develop classification criteria for using mollusc diversity as an indicator of the viability of the river ecosystem. Based on the results of this study we will: (1) develop recommendations to diminish effects of water fluctuations on benthic communities; (2) produce habitat maps for benthic communities of the Upper Niagara River; (3) select and prioritize valuable habitats for conservation and monitoring (e.g. species-rich areas or sites with rare species), and (4) identify habitats of importance as feeding grounds for valuable fish species (e.g. sturgeon). We will form a knowledge database that will make historical and current data available to recognize short- and long-term changes and trends in the benthic community of the Niagara River. Finally, we will develop monitoring procedures to address the effects of Power Project and Degradation of Fish and Wildlife Populations Beneficial Use Impairments for Niagara River AOC.

The anticipated **benefits from this project to the Niagara Basin** will be to enhance the scientific understanding of the structure and function of the Niagara River benthic community, providing essential information for management decisions, conservation actions, and recovery plans while helping support the sustainable recreational use of the Niagara River. The magnitude of the anticipated benefits will be **basin-wide** and will meet several *eligibility criteria*. This project will directly address the **Power Project impact** on aquatic (benthic) community, and large amount of data collected in this comprehensive study will provide **strong scientific foundation** for developing recommendations for monitoring, management, long-term protection and enhancement of **rare, threatened, and endangered** benthic (and particularly mollusc) species and their habitat in the Niagara Basin. It will help in resolving **Niagara River RAP Delisting Targets and Management Actions for fish and wildlife related Beneficial Use Impairments** by determining the actual status of aquatic communities and habitats, evaluate historical and current status of benthic invertebrate species in the Niagara River AOC, identify the priority habitats, and develop monitoring scheme for selected habitats and sentinel species. Our proposal will focus on development of management plans for conservation of wildlife resources in the Niagara River Basin, and is consistent with the goals of the **Great Lakes Fish and Wildlife Restoration Act of 2006** in protecting and restoring threatened and endangered species. The proposed research is consistent with the recommendations in the **Great Lakes Regional Collaboration's "Strategy to Restore and Protect the Great Lakes"**: our proposal will work to "Maintain widely distributed, self-sustaining populations where the species occurred historically basinwide". The project is consistent with the **NYS Comprehensive Wildlife Conservation Strategy** that recommends "Continuing and expanding benthic habitat mapping and indexing efforts and develop analogous mapping procedures in larger freshwater systems of the state", "developing monitoring programs and monitoring protocols for species of greater conservation need (SGCN)", "understanding the abundance and distribution of SGCN". The goals of this study are consistent with the foundations of **Haudenosaunee culture** to ensure the cycles of creation continue for all future generations, as improvement of understanding of biological resources is the first critical step in promoting long-term sustainability of the Niagara River ecosystem.

Fish and Wildlife Habitat Enhancement and Restoration Fund

Conceptual Pre-Proposal

Estimate of Project Cost and Funding Requested

Name of Proposed Project: Status of the Niagara River benthic community: effects of water fluctuations, contamination, and long-term trends

	Design/Build/Execute	Operate/Maintain
Total Project Cost:	\$ <u>1,008,043</u>	\$ _____
Cost Sharing:	\$ <u>264,029</u>	\$ _____
Funding Requested: (Total cost minus co-funding)	\$ <u>737,355</u>	\$ _____

The budget categories include salaries and support for students, fringe benefits, travel, supplies, contractual work, and indirect cost. The total combined match from the Buffalo State College and the US Fish and Wildlife Service will be \$264,029 (36% from the requested funding) and will include salary, fringe benefits, boat time, and indirect costs. The total match from the US Fish and Wildlife Service will include side scan sonar (\$120,000) purchased with the Great Lakes Restoration Initiative funds.

REFERENCES

- 1 Barbour, M. T., Gerritsen, J., Snyder, B. D. & Stribling, J. B. Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates and Fish. Second Edition. Report No. EPA 841-B-99-002, (U.S. Environmental Protection Agency, Washington, D.C., 1999).
- 2 Rosenberg, D. M. & Resh, V. H. in *Freshwater monitoring and benthic macroinvertebrates*. (eds D. M. Rosenberg & V. H. Resh) (Chapman and Hall, Inc., London, New York, 1993).
- 3 Resh, V. H. & Jackson, J. K. in *Freshwater monitoring and benthic macroinvertebrates*. (eds D. M. Rosenberg & V. H. Resh) (Chapman and Hall, Inc, London, New York, 1993).
- 4 Uzarski, D. G., Burton, T. M. & Genet, J. A. Validation and performance of an invertebrate index of biotic integrity for Lakes Huron and Michigan fringing wetlands during a period of lake level decline. *Aquatic Ecosystem Health & Management* **7**, 269-288 (2004).
- 5 Veal, D. M. A Biological Evaluation of the Niagara River. (Ontario Ministry of Environment, 1968).
- 6 Simpson, K. W. Macroinvertebrate Survey of the Niagara River - 1976. (New York State Department of Health, Albany, NY, 1980).
- 7 Wooster, M. & Matthies, L. Buffalo and Niagara Rivers habitat assessment and conservation framework. (Buffalo Niagara Riverkeeper, 2008).
- 8 Murdoch, A. & Williams, D. Suspended sediments and the distribution of bottom sediments in the Niagara River. *Journal of Great Lakes Research* **15**, 427-436 (1989).
- 9 Nasca, J. A. A survey of the adult and larval trichoptera of the upper Niagara River, State University of New York College at Buffalo, (1979).
- 10 Aldridge, D. C., Fayle, T. M. & Jackson, N. Freshwater mussel abundance predicts biodiversity in UK lowland rivers. *Aquatic Conservation: Marine and Freshwater Ecosystems* **17**, 554-564 (2007).
- 11 Grabarkiewicz, J. & Davis, W. An introduction to freshwater mussels as biological indicators. Report No. EPA-260-R-08-015, (U.S. Environmental Protection Agency, Washington, D.C., 2008).
- 12 Letson, E. J. Check list of the Mollusca of New York. *Bulletin of the New York State Museum* **88** (1905).
- 13 Strayer, D. L. & Jirka, K. J. The Pearly Mussels of New York State. *New York State Museum Memoir [N. Y. State Mus. Mem.]* **26**, 133 pp. + 127 plates (1997).
- 14 Strayer, D. L., Jirka, K. J. & Schneider, K. J. Recent collections of freshwater mussels (Bivalvia:Unionidae) from western New York. *Walkerana* **5**, 63-72 (1991).
- 15 Riveredge Associates. Occurrences of Rare, Threatened, and Endangered Mussel Species in the Vicinity of the Niagara Power Project. (New York Power Authority, 2003).
- 16 Robertson, I. C. S. & Blakeslee, C. L. The Mollusca of the Niagara Frontier Region and Adjacent Territory. *Bulletin of the Buffalo Society of Natural Sciences* **19**, 160 pp. (1948).

ⁱ The ongoing US Fish and Wildlife Service survey is funded by the Great Lakes Restoration Initiative funds.

ⁱⁱ The Lower Niagara River habitat survey is currently proposed within the "Niagara River Observatory" proposal to be submitted in 2012 to the Niagara River Greenway Commission.