

Development of a Comprehensive Geospatial Tool for Assessing Watershed Integrity and Aquatic Ecosystem Health

Geospatial modeling can be an insightful tool to assess aquatic ecosystem health (AEH) in unmonitored basins as comprehensive and frequent field monitoring can be difficult and expensive. However, geospatial models often rely on untested relationships between field monitoring data and watershed-scale stressor data (e.g. urbanization), which limit their ability to characterize AEH across diverse ecosystems in Alberta. Within this context, the aim of the project is to use available geospatial stressor data to develop a model of watershed integrity (capacity of a watershed to maintain its processes and functions essential for its sustainability) that can accurately assess AEH in Alberta. The model will be developed and calibrated using field data from intensively monitored tributaries in the North Saskatchewan River (NSR) basin and related geospatial data from their connected catchments. This novel paired monitoring and modeling approach will help assess AEH across unmonitored regions of the NSR basin and evaluate the performance of geospatial modeling within an Alberta context.



RECIPIENT:

**University of Alberta,
Dr. Rolf Vinebrook**



PARTNERS:

**Alberta Environment and Protected Areas,
EPCOR, NSWA**



TOTAL BUDGET:

\$3,130,962



AI FUNDING:

\$750,000



PROJECT DATES:

**MAY 2019 –
JUL 2023**



PROJECT TRL:

N/A

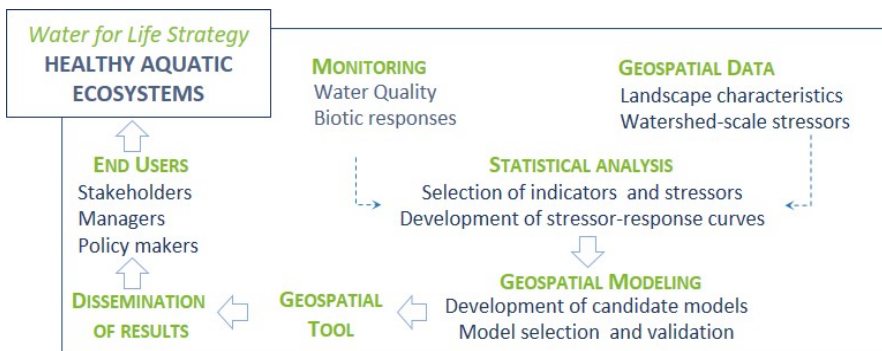


Figure 1. Proposed workflow for developing a geospatial tool to assess aquatic ecosystem health of the NSR basin.

APPLICATION

The development of a geospatial model of watershed integrity will provide a robust tool for the rapid assessment of the condition of watersheds and aquatic ecosystems across the NSR basin and identify potential areas and drivers of aquatic ecosystem impairment. The outcomes of the project will help managers and stakeholders to make informed decisions regarding watershed management and will provide crucial information for fulfilling the objectives of Alberta's Water for Life strategy.



ALBERTA INNOVATES CLEAN RESOURCES

ENVIRONMENTAL INNOVATION

WATER INNOVATION

PROJECT GOALS

- Review published geospatial models of watershed integrity and indices of AEH.
- Assess AEH of representative tributaries of the NSR using field -based approaches and traditionally used indices.
- Develop and test the performance of relationships between new and traditional indices of AEH with spatial metrics of watershed condition (i.e. stressor -response curves).
- Select, implement and validate the best performing geospatial model of watershed integrity
- Disseminate the results to the scientific community and the broader public.

BENEFITS TO ALBERTA

- The geospatial modeling tool will improve the efficiency of aquatic monitoring programs in Alberta and save significant time and resources
- Data gathered during the project will update knowledge on the condition of tributaries and the effects of catchment activities and tributary inputs ecosystem health in the NSR.
- The project will improve the scientific understanding of non-point pollution sources and the effects of watershed dynamics and change on source water quality for drinking water
- Support the ongoing provision of key services that rely on healthy aquatic ecosystems and underpin social and economic needs
- HQP training



**4 Papers
Published or in
Draft**



**1 New Model
Developed**



**25 Students and
Technicians
Trained**

CURRENT STATUS

MAR 2023

The project completion date was extended until July 2023 to account for lost time in the field due to the pandemic and related challenges. A preliminary geospatial model has been developed and field surveys completed. Data analyses are currently ongoing.