

**Bosworth Creek Monitoring Project**  
March 31, 2010

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**Introduction:**

The Bosworth Creek Monitoring Project (BCMP) is a multi-disciplinary, long-term study of a local watershed by high school students from Mackenzie Mountain School, Norman Wells, NT, local residents, and researchers from universities and government agencies. The seasonal phases of the creek (open water, freeze-up, frozen and break-up) are sampled for biological and chemical baseline inventories that help monitor potential impacts resulting from industrial activities and climate change. A close working relationship with scientists from southern universities, government agencies and industry provides northern high school students with exceptional scientific career opportunities.

The Bosworth Creek Monitoring Project (BCMP) was initiated in 2006 following concerns raised by local residents about fish stocks following the removal of a weir. The weir was constructed in 1960 to create a pond needed to run a power generation station for an oil refinery. Closure of the refinery resulted in dismantling the weir in 2005 by Imperial Oil Resources NWT Limited under a Reclamation and Restoration Plan. The Sahtu Renewable Resources Board (SRRB) contacted the Department of Fisheries and Oceans (DFO) about the logistics involved in restocking the creek. It was decided that fish would likely re-inhabit the creek on their own and the project was created to allow local youth an opportunity to track these changes over time. The BCMP is looking at most aspects of the 125 square kilometre watershed including flora, fauna, geology, geography, climatology, and chemistry. The BCMP is aimed at local youth comprised of approximately 55% Dene and Métis and 45 % of other ethnic origins. The project includes approximately equal participation by both genders and encourages and supports young women to pursue careers in the sciences.

The BCMP fully compliments the objectives outlined by INAC NWT CIMP. This project supports both Monitoring and Research AND Capacity Building and Training. Monitoring is a major component of this study and includes water and soil quality monitoring for contaminants due to industrial activities and natural sources, as well as observing changes and interactions between local flora and fauna over time. The collection and evaluation of these data, along with the biological investigations will encompass the Research aspect of this category. The close association between the investigators and professionals are ensuring that all data and methods are valid.

Education is the underlying principle of this investigation. Students are becoming proficient in freshwater aquatic sampling, identification, data recording and presentation of results. Skills include a wide range of standardized sampling methods for vertebrates, invertebrates and soil and water chemistries.

This project addresses the following Value Components:

- Water and Sediment Quality
- Water Quality
- Fish Quality
- Fish Habitat, Populations, and Harvest
- Birds
- Vegetation

The final result of this project will be a comprehensive understanding of the habitat associated with Bosworth Creek and the wildlife that resides in this watershed. Documents detailing the state of chemical and biological inventories and health will be provided to the Norman Wells Renewable Resources Council. These resources will assist the RRC with monitoring areas of special interest and habitat stewardship.

The investigators are utilizing every opportunity to identify new water sources and assess the quality of water, soil, permafrost and active layer within the watershed. Fish health and habitat identification and monitoring will incorporate a number of related biological communities and components including bird and vegetation studies. In addition, baseline information for benthic organisms and amphibians will compliment the project's contributions towards Value Components.

The project is teaching local residents about the effects of cumulative impacts due to industry and environment. The nature of physical cumulative effects is becoming the focus of scrutiny by the NWRRC who understand the issues regarding cumulative effects on people by toxins in meat and fish. The BCMP took this understanding and projected it beyond biological systems to include geography. This has enabled the NWRRC to look at ranges of potential impacts to the physical environment that will affect the biological components that feed them.

Local stewards will have the ability to monitor on-going sources of concern and identify new or perpetual impacts to local habitat. The BCMP utilizes every opportunity to educate local residents about cumulative effects and the natural sciences. Reports are published at the SRRB website: [www.srrb.nt.ca](http://www.srrb.nt.ca) and Aurora Research Institute website: [www.nwtresearch.com](http://www.nwtresearch.com).

### **Discussion / Conclusions:**

The benthic macroinvertebrate baseline study was completed and provides an inventory of 39 families (Table 1). This baseline study was invaluable for two reasons. First, it provides a means to monitor the occurrence of non-endemic species that are expanding their ranges due to changing weather patterns. The baseline inventory will be used to create a benthic key for northern species by a graduate student from the University of Prince Edward Island over the next two years. This will enable local stewards to assess biotic health without requiring expensive field and lab facilities and unnecessary statistical models that will never be used by northern communities.

Second, specimens were collected at different times of the year over the last three years. These collections clearly demonstrate that northern benthic communities undergo rapid development due to a number of factors including changing water volumes, the timing of emergence and location. This has significance as the standard method for collecting benthic invertebrates relies on a very narrow collection window that does not provide a realistic biotic interpretation. The benthic atlas and other tools will allow on-going monitoring by high school students through the

GNWT Experiential Science Program and members of the Norman Wells Renewable Resource Council.

Water chemistry also reflects an annually changing environment. For example, there is a large introduction of aluminum and lithium between May and the middle of August that is probably a result of runoff. Moreover, two forms of overflow ice (blue-green and yellow-brown) have complicated the baseline study because neither reflects soil chemistry and the latter contains several elements in concentrations that may pose a threat to human and wildlife health. Further baseline collections are required as this issue could potentially become the biggest cumulative impact in the north.

Table 1: Known occurrences of benthic macroinvertebrates in Bosworth Creek

|                  |                 |
|------------------|-----------------|
| Aeshnidae        | Leptophlebiidae |
| Ameletidae       | Libellulidae    |
| Amphipoda        | Limniphilidae   |
| Amphizoidae      | Metretopodidae  |
| Ashnidae         | Nemouridae      |
| Baetidae         | Notonectidae    |
| Brachycentridae  | Orthocladiinae  |
| Chironomidae     | Ostracoda       |
| Chloroperlidae   | Perlodidae      |
| Coenagrionidae   | Phryganeidae    |
| Corixidae        | Prostigamta     |
| Dytiscidae       | Pteronarcydae   |
| Ephemerellidae   | Rhyacophilidae  |
| Glossosomatidae  | Simuliidae      |
| Haliplidae       | Siphonuridae    |
| Heptageniidae    | Sphaeriidae     |
| Hydropsychidae   | Stratiomyidae   |
| Hydroptilidae    | Tanyderidae     |
| Lepidostomatidae | Tipulidae       |
| Leptoceridae     |                 |

**Budget:**

Table 2: Breakdown of proposed project cost, including activities funded by NWT CIMP

| Project Activities       | Total Activity Cost | NWT CIMP Funded Activities |
|--------------------------|---------------------|----------------------------|
| Training                 | 21,800.00           | 5,000.00                   |
| Analyses                 | 17,500.00           | 5,000.00                   |
| Field Transportation     | 14,300.00           | 5,000.00                   |
| Facilitation/Development | 14,000.00           | 0.00                       |
| Materials and Supplies   | 9,589.00            | 0.00                       |
| Student Wages            | 8,600.00            | 0.00                       |
| Implementation           | 5,000.00            | 5,000.00                   |
| Public Education         | 3,000.00            | 0.00                       |
| Freight                  | 1,200.00            | 0.00                       |
| Total                    | \$94,989.00         | \$20,000.00                |