# Stream Ecological Integrity

LONG-TERM MONITORING PROJECT SUMMARY

## Introduction

Streams and rivers are fundamental components of nearly every park in the Rocky Mountain Network (ROMN). Their ecology is both intimately linked with and reflective of the watersheds they drain; streams integrate ecosystems within a landscape and are dependent on it for inputs of energy and nutrients. Streams support a broad spectrum of ecological services, including wildlife habitat, nutrient processing, hydrologic cycling, and multiple socioeconomic functions for humans (e.g., water sources, fisheries, recreation). Because streams are typically sensitive to stressors at both local and landscape scales, they are one of the most useful types of ecosystems for long-term ecological monitoring in the network. At least 5 of ROMN's 12 high priority vital signs are integrated into the Stream Ecological Integrity (SEI) protocol, which is currently in development. The protocol will be implemented in all six parks, with initial pilot efforts at Glacier National Park.

## Objectives

The core monitoring objectives of the SEI protocol are to:

1. *Determine the episodic (5 to 10 year) status and trend in stream condition at the park scale using benthos and periphyton assemblages, physical habitat, and select physiochemical measures*

2. *Determine the seasonal, annual, and/or episodic status and trend in stream condition at select "sentinel" sites*

3. *Determine the long-term status and trend in the proportion of total stream length in a park where select invasive plant, invasive aquatic taxa, or beavers are present*

NPS

SEI monitoring in Glacier NP by the Flathead Lake Biological Station field crew.

NPS

SEI monitoring on Hudson Bay Creek in Glacier NP, 2008.

## Basic Approach and Status of Protocol Development

The ROMN SEI protocol details the long-term monitoring and assessment of ROMN streams and rivers via an integrated, comprehensive approach. To monitor condition in streams, the ROMN will collect and synthesize multiple response and stressor measures and compare them to thresholds in park-specific, reference condition distributions using bioassessment models. Stream condition estimates must include the scale of the entire sampleable stream resource within a park. Finally, given the importance of temporal dynamics in streams, select locations must be monitored more intensively such that site-scale long-term trend in the loading of core water quality measures and other hydrologically driven processes can be tracked, particularly in how these change relative to climate dynamics and nutrient deposition.

SEI methods are based on protocols from the Environmental Protection Agency's (EPA) Environmental Monitoring and As-

**Network park units with ongoing SEI monitoring**

| | |
|---|---|
| Florissant Fossil Beds NM | Great Sand Dunes NP and Pr |
| **Glacier NP** | **Little Bighorn Battlefield NM** |
| **Grant-Kohrs Ranch NHS** | Rocky Mountain NP |

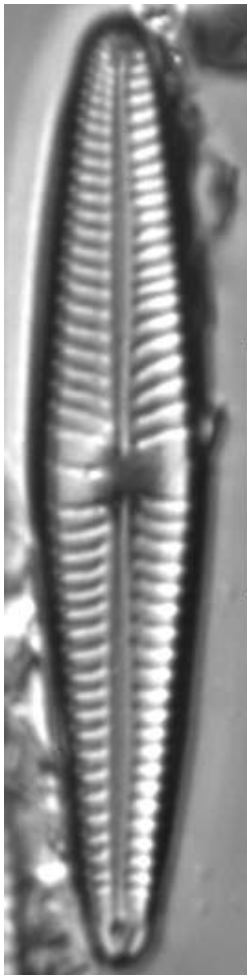
**bold** indicates current monitoring; gray indicates future monitoring plans
NHS = National Historic Site; NM = National Monument;
NP = National Park; Pr = Preserve

sessment Program, extensive research by the Flathead Lake Biological Station (FLBS) of the University of Montana, and methods from the U.S. Geological Survey (USGS) and USDA Forest Service. The network completed a draft protocol for stream monitoring in August 2008 and is nearing completion of pilot monitoring in Glacier.

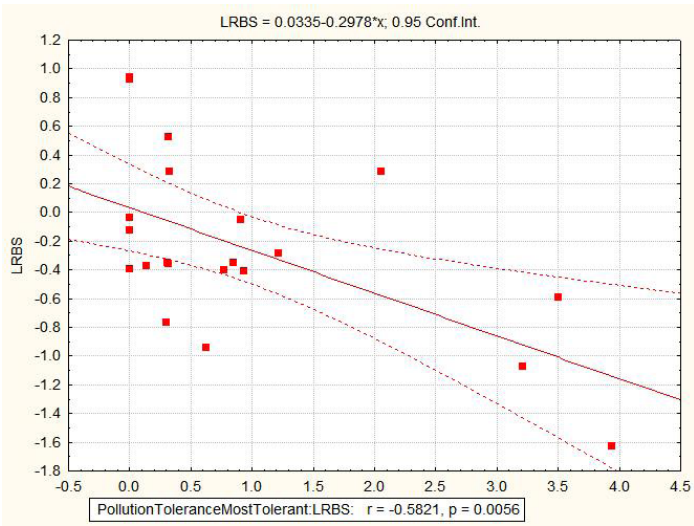
## Preliminary Results

In 2007 and 2008, crews from the FLBS and ROMN, augmented by Glacier staff and volunteers, conducted 86 sampling events of 45 unique sites in Glacier. The Glacier sample events include four in non wadeable rivers where new methods were successfully used, a new high altitude sentinel site on Reynolds Creek at Logan Pass and multiple revisits to survey sites to develop estimates of method precision. Additional sample events were conducted at Little Bighorn Battlefield National Monument and Grant-Kohrs Ranch National Historic Site. The Clark Fork River at Grant-Kohrs Ranch is a Superfund site and ROMN SEI monitoring will eventually contribute to the ongoing restoration of this system.

The ROMN and FLBS are currently analyzing all samples. Preliminary data from 2007 have been used to create over 70 periphyton metrics and 35 physical habitat metrics. Modeling is ongoing to relate these results to natural and anthropogenic disturbance in the park (fig. 1). These analyses will eventually develop into bioassessment tools for Glacier. The ROMN will also assess water quality data relative to state and EPA standards. The network continues to work with Loren Bahls, an expert on Montana diatoms and algae. To date, we have provisionally added up to 15 new taxa to science from ROMN SEI samples (photo, top left). We are also tracking *Didymosphenia geminata*, or "rock snot", an invasive (but native) diatom that may be reflective of climate driven shifts in the condition of Glacier's streams (photo, bottom right).



Example of possible new-to-science diatom taxa from 2007 Glacier NP samples. *Gomphonema aff. Longilineare* (L. Bahls, provisional identification).




NPS

Figure 1. Diatom pollution tolerance relationship to relative bed stability at sampled sites in Glacier NP, 2007. Diatoms with higher tolerance to organic nutrients and other anthropogenic disturbances are more common in streams with channels with a sediment load that exceeds the channels natural expectation.

NPS

Rock snot infestation on the Red Eagle Creek floodplain near the Camas road, July 2008.

## Future Plans

In 2009, the ROMN will sample sentinel sites in Glacier and Grant-Kohrs Ranch, revisit four survey sites in Glacier, sample one site each on North and Middle Fork of the Flathead and one site on the Little Bighorn River. The Flathead and Little Bighorn river sites were selected by the EPA and state of Montana as national reference sites for large rivers and the ROMN will partner with these groups on these efforts. All sentinel sites in will be sampled on a recurring basis starting in 2009. The ROMN will submit the draft SEI protocol for peer review in December of 2009.

## Contacts

Billy Schweiger, ROMN protocol lead and Ecologist,
billy_schweiger@nps.gov
Mike Britten, ROMN Program Manager,
mike_britten@nps.gov