

Monitoring culturally-significant trout streams



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Introduction

Keweenaw Bay Indian Community (KBIC)

- Federally-recognized Ojibwa (Chippewa) tribe
- Home territory: much of the western Upper Peninsula of Michigan; centered on Keweenaw Bay region
- Treaty of 1842: Ceded much of home territory but reserved many rights on ceded land
- Treaty of 1854: Established L'Anse Indian Reservation

Introduction

Treaties

- Made between sovereign nations only
- “The supreme law of the land”
- Signees not under jurisdiction of lesser levels of government; relationship is directly with the U.S. federal government

Sovereignty

- The ability of an organized group of people (i.e., a nation) to govern itself

These are very important words in my community

Introduction

- **Tribal fishing:** A very important exercising of treaty rights (in addition to cultural traditions, sustenance, and economic importance)
- **Tribal fisheries management:** A very important expression of sovereignty
- The KBIC has its own fish hatchery, stocking Lake Superior and many streams across the reservation and in ceded territory outside the reservation
- A huge investment for the Tribe

Introduction

Tribal natural resource management: Many additional layers of complexity

- Fisheries example: Traditional values regarding taking only what is needed, thinking seven generations into the future
- Forestry example: Harvesting for economic purposes is not a traditional role or responsibility (e.g., deciding what to take)
- Additional concerns: sacredness of water, conserving medicinal plants, serving needs of community (e.g., elders)

There's a lot more involved than typical "science"

Introduction

Keweenaw Bay Ojibwa Community College (KBOCC)

- Established 1975
- Fully accredited by HLC in 2012
- Recent average: ~100 students enrolled
- Five Associate Degree programs

Tribal Colleges: traditionally focused on teaching, not research

Introduction

Environmental Science Department Research

Peer-reviewed pubs:

- Climate change and sacredness of water (interview-based)
- Climate change adaptation policy preferences (survey-based)
- Successional pathways of NIPF hardwood/hemlock stand after selective harvest (gap analysis)

In progress:

- Arsenic groundwater study
- This project

Introduction

Departmental goals

- Foster an awareness of the interconnectedness between humans and the natural world
- Illustrate relationships between the biotic and abiotic components of ecosystems
- Provide students with foundational knowledge needed to understand environmental issues
- Emphasize the unique features of the local and regional environment
- Integrate culture-specific values with scientific principles

Introduction

Objectives of our scholarly research

- Community leaders (KBIC Tribal Council) must approve
- Community members must be welcome to engage
- Outcomes must include clear benefits to the community
- Cultural values must be recognized and followed
- Students must gain important co-curricular learning opportunities (assistantship salaries, internship credits, links to students' capstone projects, presentation opportunities, co-authoring credits, etc.)

Monitoring stream temps

Rationale for this project

- Fish are an important cultural, recreational, economic, and sustenance resource for the community
- Treaty rights, sovereignty, environmental justice
- Informing all relevant natural resource management efforts, but especially our stocking program
- KBIC previously had limited resources for monitoring

Monitoring stream temps

Rationale for this project

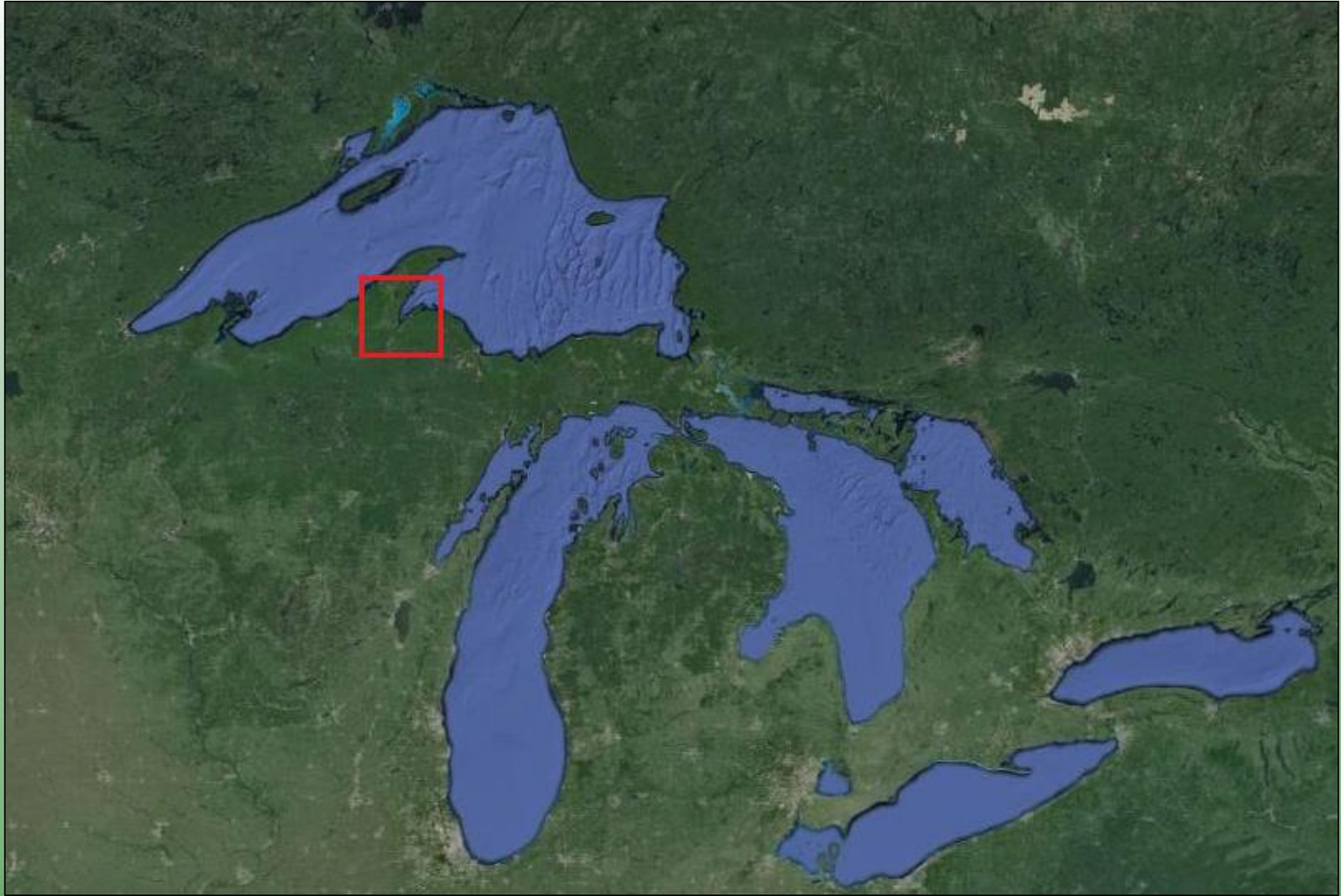
- Coldwater species are very sensitive to temperature increases
- Brook trout critical temp: 70°F
- Baseline data
 - Climate change
 - Upstream land-use activities

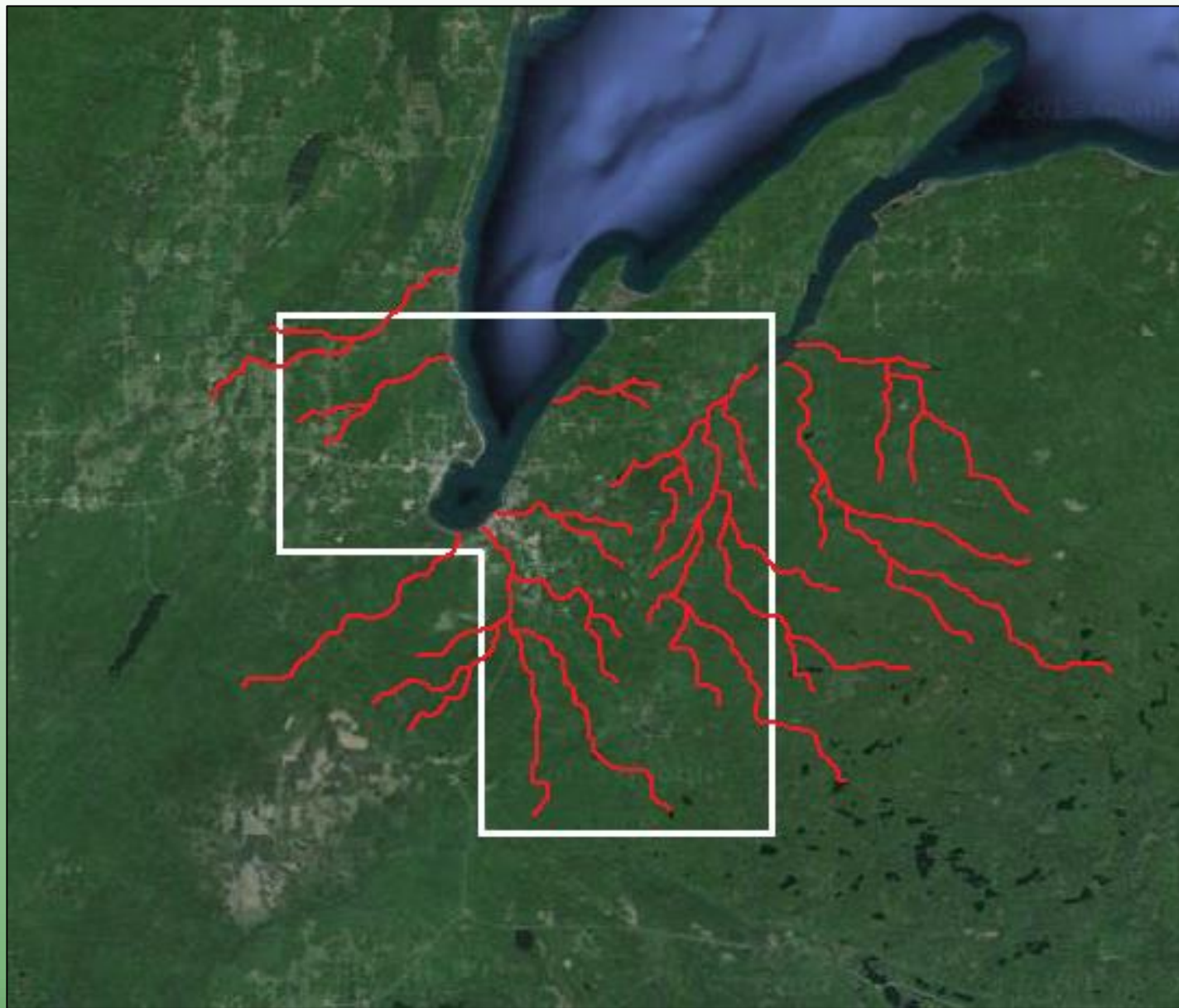
Environmental changes  cultural impacts

Monitoring stream temps

Objective: Deploy long-term continuous water temp profiling devices throughout the KBIC Home Territory

- Baseline data
- Collaborate with relevant agency partners (FWS, DNR, GLIFWC)
- Potentially improve KBIC stocking program
- Contribute to scholarly literature
- Meet departmental research goals



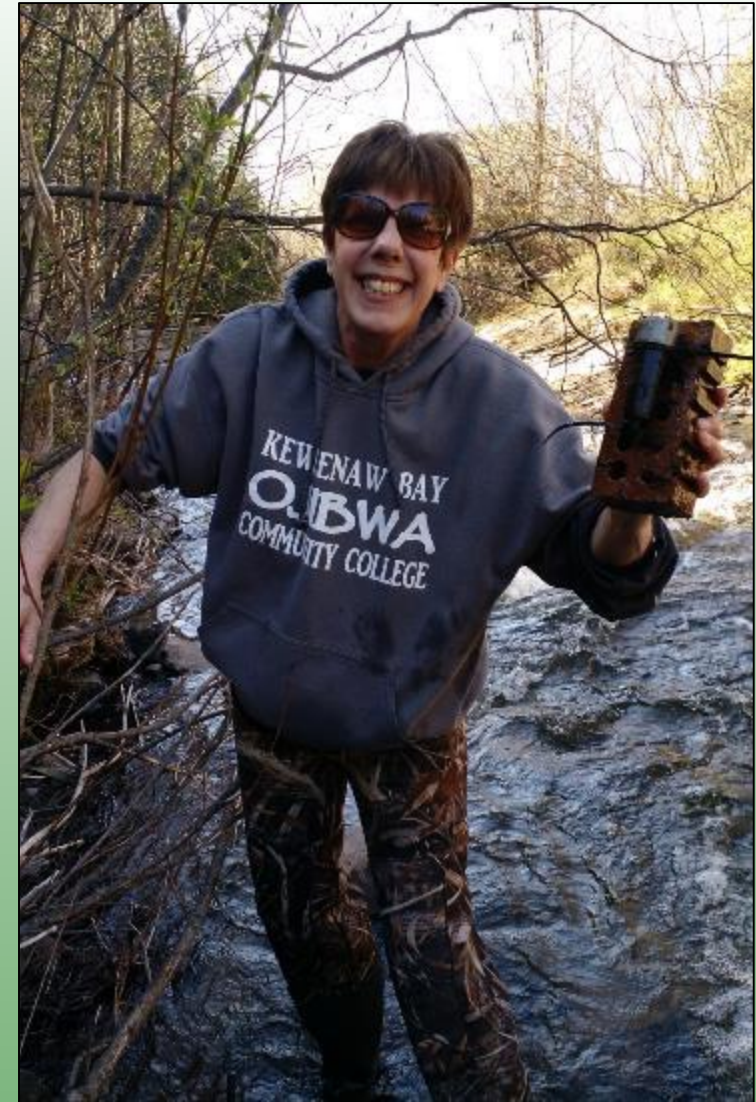




Data logger

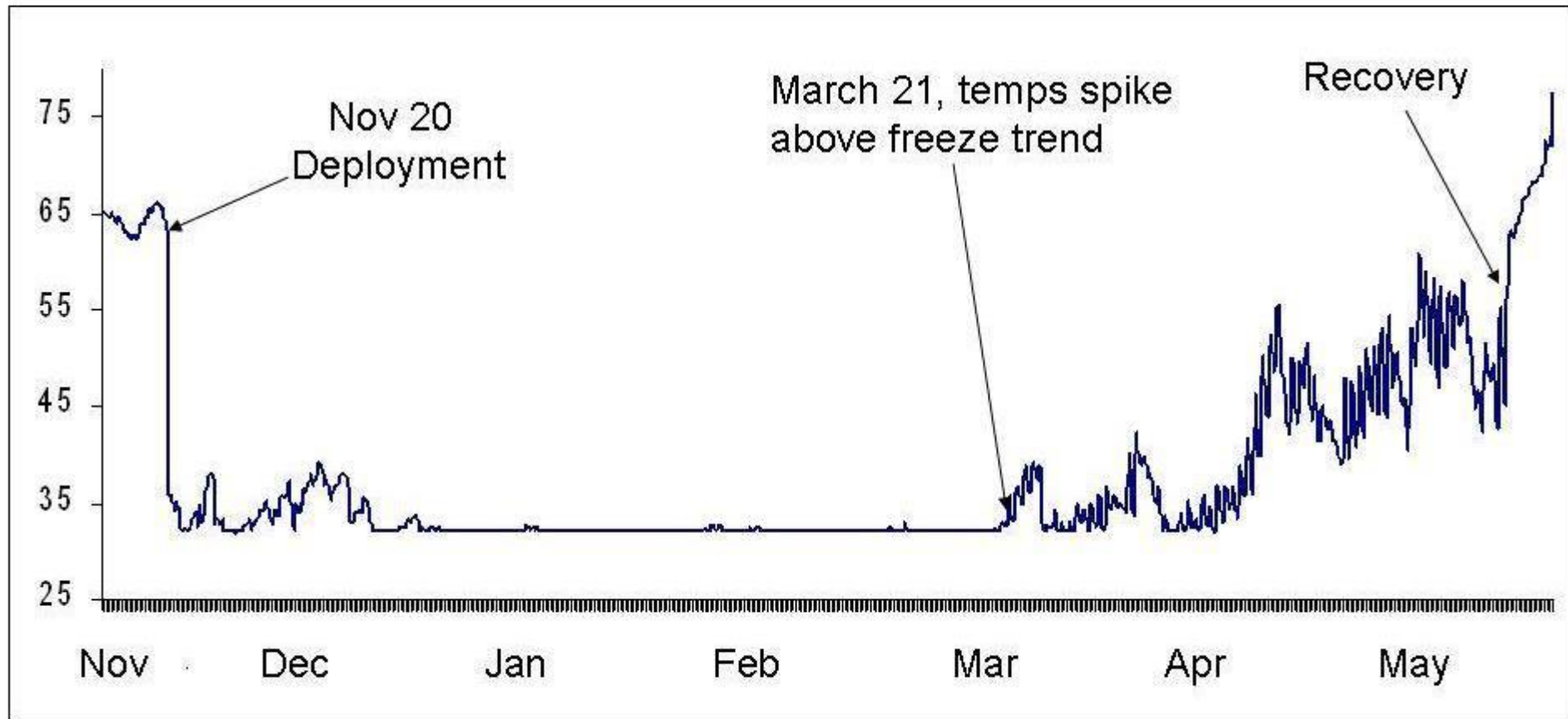


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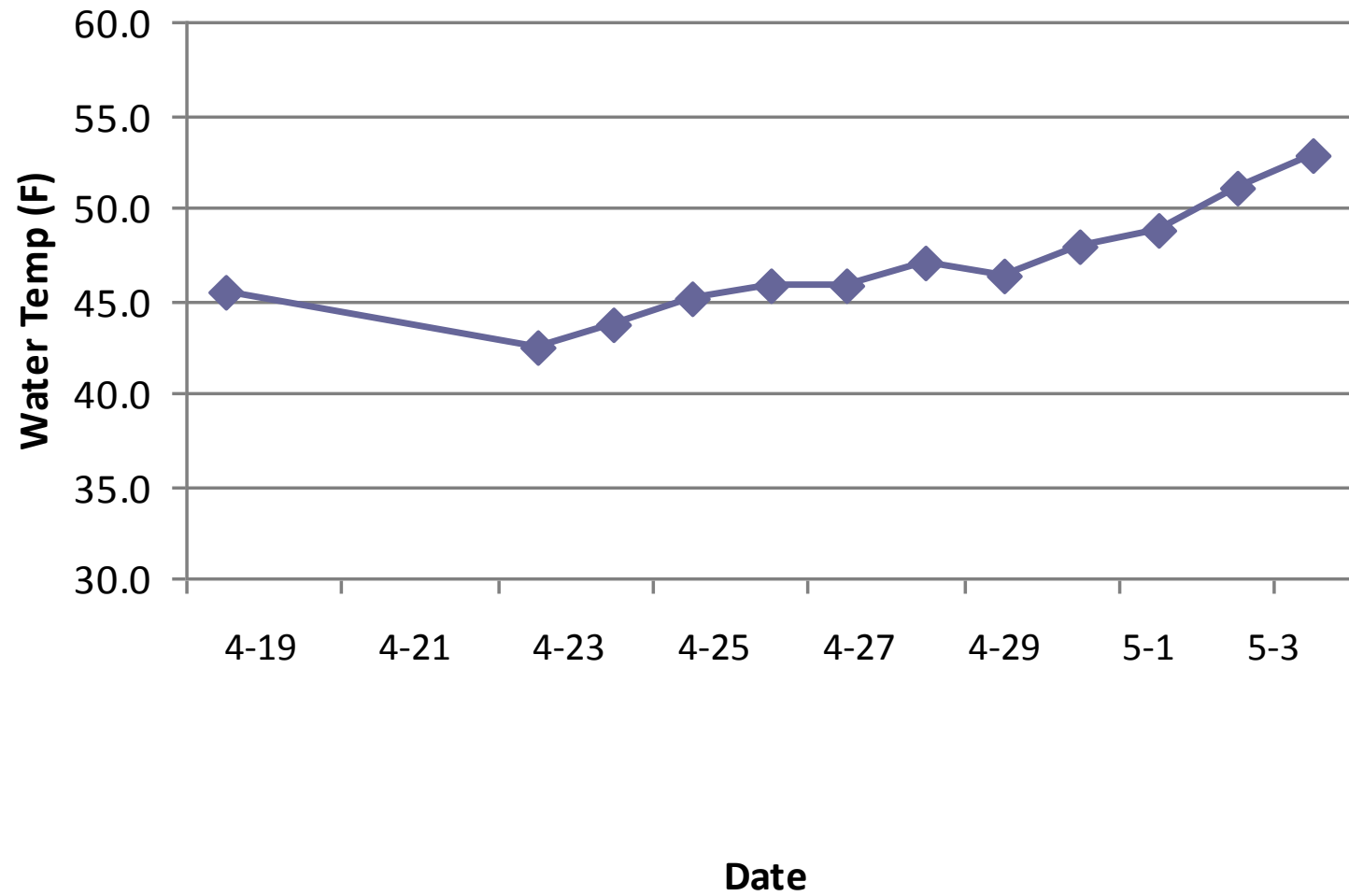


Jane Kahkonen

Dakota Creek LOGGER 15-30



Mean Water Temperature Portage Lake



Preliminary outcomes

- Trial run: fall 2015 to spring 2016
 - 43 loggers successfully deployed and retrieved
 - Many lessons learned
- First critical data-collection period: Summer 2016
 - 53 loggers deployed and retrieved
 - Sitting on oodles of data to analyze
- Re-funded through 2017
- Much work about to begin!

Preliminary outcomes

Student engagement

- Seven students have earned stipends for their contributions
- Five have earned Internship credits (required for graduation)
- Two are in the process of developing their (required) Capstone projects around this work
- Three student conference presentations

Monitoring critical fish habitat in coldwater streams of the L'Anse Indian Reservation
Michael C. Rodriguez
Andrew T. Koach (Faculty mentor)
Keweenaw Bay Ojibwa Community College

Abstract
Michigan's Keweenaw Bay Indian Community (KBIC) is fortunate to be surrounded by abundant water resources, including coldwater streams that provide suitable habitat to fish species of cultural, recreational, and commercial significance. However, changing environmental conditions pose a threat to the sustainability of certain species, and make fish stocking programs less effective. Through an EPA Tribal Co-Management grant, students of Keweenaw Bay Ojibwa Community College in 2015 began a long-term water temperature monitoring program in streams across the reservation. This poster summarizes the progress of the research and identifies objectives for the upcoming spring and summer.

Introduction
The Keweenaw Bay Indian Community (KBIC) is a sovereign nation as a signatory to the Treaty of 1842 and the Treaty of 1854 (KBC, 2015), with its land base in the L'Anse Indian Reservation in the western Upper Peninsula of Michigan along the shores of the Keweenaw Bay of Lake Superior (Figure 1). The KBC Natural Resources Department (NRD) enforces standards of the Treaty about natural resources, including aquatic ecosystems. The purpose is to protect and manage a sustainable fishery and manage a strategic rehabilitation and post-rain stock of brook trout (*Salvelinus fontinalis*), a species of commercial, recreational, and cultural significance to the community (Figure 2).

Methods
We acquired 50 Inno Water Temp Pro V2 submersible temperature logging units to install in target streams across reservation territory (Figure 3). The logging units perform continuous water temperature monitoring, with self-contained data storage in each unit. At the end of the data collection period (summer 2016), logging units will be retrieved from streams. Data will be collected using USB reader U-GTM-1 data sticks and stored and analyzed with proprietary NRD data recovery software.

Results
Since the project is in its early stages, there is no data to report at this time. However, through fall 2015 we met our goal of deploying temperature loggers in 30 target streams. In early spring 2016 we will deploy 20 more loggers, and by summer we will be collecting and analyzing data before releasing loggers for fall.

Discussion
This research will provide a wide range of benefit to the community. The NRD will gain critical data on stream conditions to help guide fisheries management decisions in light of environmental change. Equipment will allow the monitoring program to continue well into the future. KBIC students are gaining valuable research experience, increasing interest in the field of Environmental Science, and are being rewarded with stipends for their work. The project will result in spring 2016 and data will be collected in August 2016 final report.

References
Keweenaw Bay Indian Community (KBIC). (2015). Keweenaw Bay Indian Community. Retrieved from www.keweenawbay.com

Conclusion
The Keweenaw Bay Indian Community (KBIC) is a sovereign nation as a signatory to the Treaty of 1842 and the Treaty of 1854 (KBC, 2015), with its land base in the L'Anse Indian Reservation in the western Upper Peninsula of Michigan along the shores of the Keweenaw Bay of Lake Superior (Figure 1). The KBC Natural Resources Department (NRD) enforces standards of the Treaty about natural resources, including aquatic ecosystems. The purpose is to protect and manage a sustainable fishery and manage a strategic rehabilitation and post-rain stock of brook trout (*Salvelinus fontinalis*), a species of commercial, recreational, and cultural significance to the community (Figure 2).

Figure 1: Map of the L'Anse Indian Reservation, in the Upper Peninsula of Michigan.

Figure 2: Brook trout (*Salvelinus fontinalis*).

Figure 3: Inno Water Temp Pro V2 submersible temperature logging unit.

Figure 4: Students in the field monitoring water temperature.

Figure 5: Students in the field monitoring water temperature.

Figure 6: Students in the field monitoring water temperature.

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Figure 100: Students in the field monitoring water temperature.

Preliminary outcomes

Engaging historically under-represented students in scholarly STEM research: This is a big deal

Our 2016 roster of student assistants featured:

- Five tribal members (including one elder)
- Two students of Hispanic descent
- Four women (including three grandmothers)
- One veteran

Preliminary outcomes

Curriculum development

- *Introduction to Environmental Science (ES110)*
- *Introduction to Earth Science (GS105)*
- *Introduction to Conservation Biology (BI130)*
- *Wildlife Biology (BI203)*
- *Fisheries Biology and Management (BI205)*
- *Principles of Ecology (BI206)*



Preliminary outcomes

Community benefits

- Engagement
- Fishing is an extremely important tradition to KBIC families
- Many rely on productive fisheries for their income or for sustenance



Preliminary outcomes

Proposed outcomes exceeded for 2015-2016:

- 9 student assistants hired (proposed 3-5); 6 already contributed enough hours for required internship credit
- 53 datasets from loggers (proposed 45)
- 1000 total labor hours to complete work (proposed 1250)
- 3 KBIC-NRD field technicians contributed (not proposed)
- 4 conference presentations delivered (proposed 1)
- Nearshore Lake Superior data being collected in walleye habitat (not proposed)
- Students engaged in a variety of volunteer community service activities (not proposed)



Left: KBIC Kids' Fishing Derby, June 2016 (all 7 participated)



Right: Annual Lake Superior Day clean-up event, July 2016 (4 participated)



Above: KBOCC campus beautification project, July 2016 (6 participated)

Not pictured: KBOCC "Adopt-a-highway" clean-up event, July 2016 (6 participated)

Looking ahead

- Much data ready for analysis
- Another 50 loggers purchased for 2017
- Expansion of geographic scope for stream component
- Expansion of near-shore component to include “the big lake” (tethering loggers to existing gillnets)
- 4 new student recruits, in addition to 4 returning students

That's it! Any questions?