ELOKA Workshop

Data Management and Local Knowledge: Building a Network to Support Community-Based Research and Monitoring

November 15, 16, 17, 2011
University of Colorado at Boulder
Boulder, Colorado, U.S.A.

Hosted by the National Snow and Ice Data Center, University of Colorado
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Welcome

Welcome to the Data Management and Local Knowledge: Building a Network to Support Community-Based Research and Monitoring workshop hosted by the Exchange for Observations and Knowledge of the Arctic (ELOKA). Boulder has much to offer and we hope that you have an opportunity to explore and experience the city and the University of Colorado campus. This document contains information that may be helpful during your stay as well as the workshop agenda and abstracts. We look forward to three informative and productive days.

The ELOKA Workshop Team,

Peter Pulsifer, Shari Gearheard, Henry Huntington, Mark Parson, Heidi McCann, Chris McNeave, Betsy Sheffield, Linda Pendergrass (CiRES), Lornay Hansen (CiRES), Julia Collins, Allaina Wallace, and Amy FitzGerrell

Workshop Logistics

How to Access Wireless Internet

1. Select UCB Guest as your wireless network.
2. Open a web browser and go to www.colorado.edu. You will be automatically redirected to a registration page.
3. Review the Terms and Conditions of Use.
4. Click on the Accept button.
5. You are now free to use UCB Guest Wireless for basic internet activity.

*Please note the maximum Internet access is 5 hours. After 5 hours, please follow the same steps as above.*

University Memorial Center (UMC) umc.colorado.edu

Building Hours
Sunday: 11am - Midnight
Monday - Thursday: 7am - Midnight
Friday: 7am - 1am
Saturday: 7am - 1am
303.492.6161

The UMC is at the heart of campus providing an exciting gathering place to celebrate diversity, explore individuality, build community, and pursue big ideas. It offers much to the student as well as the visitor.

Dining establishments:
- Celestial Seasonings
- Domino’s Pizza
- Jamba Juice
- Games Area
- Subway
- Wok & Roll
- Alfred Packer Restaurant & Grill
- Baby Doe’s Coffee & Bakery

Services & Shops:
- Ink Spot Copy Center
  Winter Hours: 8:00am-5:00pm M-F
  UMC 130C (In Food Court)
  207 UCB
  Phone: 303-492-7878
  Fax: 303-492-1060
  inkspot@colorado.edu
• CU BookStore
  Offers Apparel, Gifts, Technology and supplies
  Store Hours: Sun – Closed, Mon – 8AM-6PM, Tues – 8AM-6PM, Wed – 8AM-6PM,
  Thurs – 8AM-6PM, Fri – 8AM-5PM, Sat – 9AM-4PM

Campus Map

The map below indicates the workshop location at the University Memorial Center.

How to Get Around Boulder

With its well-developed infrastructure of multi-purpose paths, bike lanes, and an impressive transit system, getting around Boulder is easy. For detailed information about ‘Go Boulder’ go to these websites:

Boulder Yellow Cab

Boulder is a fairly easy town to get around by taxi or public transportation. If you choose to use taxi services, Boulder Yellow Cab is available and an easy number to remember – 303.777.7777. In the experience of the organizers, they provide great service.

Regional Transportation District (RTD)

In addition to city buses, the Regional Transportation District (RTD) service is useful. Local fare is $2.25 for one way and you can ask for a transfer (if needed) for no cost. Below are the RTD routes that provide the closest access to the Boulder Inn.

- The 203/225 runs East/West along Baseline Road. If you feel the need to venture out to downtown Boulder, this is the bus you will want to take. Catch the West Bound bus and it will take you directly to the downtown area and to the main bus terminal. You will want to catch the Eastbound 203 or 225 to get back to the Boulder Inn.
- The BOUND runs North/South along 30th Street and runs until 12AM. This bus will take you along 30th Street and near the 29th Street Mall, which offers various restaurants and to the Basemar Shopping Center, which also offers restaurants such as East Indian and Chinese as well as fast food choices.

* See route maps below for the Bound and 203/225

Local Boulder maps and restaurants

The Boulder Inn provides maps, brochures, and menus of local restaurants in their main lobby.

Route 203/225 Boulder/Lafayette Via Baseline

Effective: 9 January 2011
Map Revised: 9 January 2011

Go Boulder:  http://www.bouldercolorado.gov/goboulder/

Go Boulder:  http://www.bouldercolorado.gov/goboulder/
Workshop Agenda

Data Management and Local Knowledge: Building a Network to Support Community-Based Research and Monitoring

Day 1  November 15th, 2011

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Speaker (Moderator)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 AM</td>
<td>First shuttle leaves Boulder Inn for CU (approx. 13 min ride)</td>
<td></td>
</tr>
<tr>
<td>8:30 AM</td>
<td>Last shuttle leaves Boulder Inn for CU</td>
<td></td>
</tr>
<tr>
<td>8:00 - 9:00 AM</td>
<td>Continental breakfast at UMC Aspen Room</td>
<td></td>
</tr>
<tr>
<td>9:00 AM</td>
<td>Welcome. Welcome the Elders and travelers and officially open the workshop</td>
<td>Shari Gearheard, Peter Pulsifer, Hilary Waukau</td>
</tr>
<tr>
<td>9:15 AM</td>
<td>Meeting logistics [shuttles, meals, bathrooms, Internet, questions, etc]</td>
<td>Heidi McCann</td>
</tr>
<tr>
<td>9:30 AM</td>
<td>Why we are here, overall workshop layout, our purpose</td>
<td>Henry Huntington</td>
</tr>
<tr>
<td>9:50 AM</td>
<td>An overview of ELOKA and summary of afternoon workshop activities</td>
<td>Peter Pulsifer</td>
</tr>
<tr>
<td>10:00 AM</td>
<td>Introduction to Session 1: ELOKA and other LTK and Community Based Monitoring and LTK projects in North American Arctic, and Siberia</td>
<td>Shari Gearheard</td>
</tr>
<tr>
<td>10:00 AM</td>
<td>The Arctic Borderlands Ecological Knowledge Co-op: Issues of data management and data access in an arctic long-term community-based monitoring systems</td>
<td>Michael Svoboda</td>
</tr>
<tr>
<td>10:10 AM</td>
<td>Climate Change and Health: from Knowledge to Action</td>
<td>Erin Myers</td>
</tr>
<tr>
<td>10:20 AM</td>
<td>Yup'iik Environmental Knowledge Project: The Natural and Cultural History of the Bering Sea Coast</td>
<td>Ann Riordan</td>
</tr>
<tr>
<td>10:30 AM</td>
<td>Questions</td>
<td>All</td>
</tr>
<tr>
<td>Time</td>
<td>Event</td>
<td>Presenter(s)</td>
</tr>
<tr>
<td>--------</td>
<td>----------------------------------------------------------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>10:40 AM</td>
<td><strong>Break</strong></td>
<td>All</td>
</tr>
<tr>
<td>10:55 AM</td>
<td>Monitoring and Managing Local Knowledge as it Relates to Indigenous Arctic Games</td>
<td>John Kilbourne</td>
</tr>
<tr>
<td>11:05 AM</td>
<td>Comparison of Local Perceptions on Brown Bear Management and Key Factors Influencing Human-Bear Encounters Across the Pacific</td>
<td>Kim Jochum</td>
</tr>
<tr>
<td>11:05 AM</td>
<td>Contemplating the Translation of Qualitative Local Knowledge Data into Community Databases</td>
<td>Susan Crate</td>
</tr>
<tr>
<td>11:35 AM</td>
<td><strong>Questions</strong></td>
<td>All</td>
</tr>
<tr>
<td>11:45 AM</td>
<td>Role of Bering Sea Sub-Network (BSSN) to map subsistence use and explore climate change impacts and adaptations</td>
<td>Maryann Smith, Olia Sutton, Uliana Fleener</td>
</tr>
<tr>
<td>12:05 PM</td>
<td>Peoples of the White Crane – Investigation of Impacts of Climate Change in the Indigenous and Local Societies of the Eurasian North</td>
<td>Tero Mustonen</td>
</tr>
<tr>
<td>12:25 PM</td>
<td><strong>Questions/Transition</strong></td>
<td>All</td>
</tr>
<tr>
<td>12:35 PM</td>
<td>Lunch</td>
<td>All</td>
</tr>
<tr>
<td>1:15 PM</td>
<td>Connection Café</td>
<td>All</td>
</tr>
<tr>
<td>2:00 PM</td>
<td>Welcome, facilitated discussion, break out groups, group presentations, and other workshop activities.</td>
<td>Mark Serreze, All</td>
</tr>
<tr>
<td>2:10 PM</td>
<td>Workshop activites</td>
<td>All</td>
</tr>
<tr>
<td>3:30 PM</td>
<td>Break</td>
<td>All</td>
</tr>
<tr>
<td>3:45 PM</td>
<td>Workshop activities</td>
<td>All</td>
</tr>
<tr>
<td>5:00 PM</td>
<td>Adjourn</td>
<td>All</td>
</tr>
<tr>
<td>5:20 PM</td>
<td>First shuttle leaves CU for Boulder Inn</td>
<td>All</td>
</tr>
<tr>
<td>5:50 PM</td>
<td>Last shuttle leaves Boulder Inn for CU Dinner on your own</td>
<td>All</td>
</tr>
</tbody>
</table>

# Day 2  
**Wednesday, November 16th, 2011**

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Speaker (Moderator)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 AM</td>
<td>First shuttle leaves Boulder Inn for CU (approx. 13 min ride)</td>
<td></td>
</tr>
<tr>
<td>8:30 AM</td>
<td>Last shuttle leaves Boulder Inn for CU</td>
<td></td>
</tr>
<tr>
<td>8:00 - 9:00 AM</td>
<td>Continental breakfast at UMC Aspen Room</td>
<td></td>
</tr>
<tr>
<td>9:00 AM</td>
<td>Welcome and review of yesterday, goals for today</td>
<td>Henry Huntington</td>
</tr>
</tbody>
</table>

**Introduction to first set of presentations: LTK and Community Based Monitoring and LTK projects in North American Arctic (Session 1 continued)**

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Speaker (Moderator)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:15 AM</td>
<td>Local Observations and Scientific Perspectives in Dialogue: Efforts to preserve and access the record</td>
<td>William Schneider</td>
</tr>
<tr>
<td>9:15 AM</td>
<td>Introduction to first set of presentations: LTK and Community Based Monitoring and LTK projects in North American Arctic (Session 1 continued)</td>
<td>Peter Pulsifer</td>
</tr>
<tr>
<td>9:25 AM</td>
<td>Community-based Archaeology: What to Do When the Community Has Limited Facilities</td>
<td>Anne M. Jensen</td>
</tr>
<tr>
<td>9:35 AM</td>
<td>Data management in a project combining local and traditional knowledge and “western” science to identify Important Ecological Areas in U.S. Arctic waters</td>
<td>Christopher Krenz</td>
</tr>
<tr>
<td>9:45 AM</td>
<td>Sharing research findings in Nunavut: A tool to track the use and integration of community-based knowledge about food (in)security</td>
<td>Rachel Hirsch</td>
</tr>
<tr>
<td>9:55 AM</td>
<td>Questions and introduction to Session 2: Focus on methods and technology</td>
<td>All, Peter Pulsifer</td>
</tr>
<tr>
<td>10:05 AM</td>
<td>Community-Based Monitoring in the Inuvialuit Settlement Region</td>
<td>Vernan Amos</td>
</tr>
<tr>
<td>10:15 AM</td>
<td>Images of the Arctic (IOTA): Involving Northern Residents in Repeat Photography</td>
<td>David Cairns</td>
</tr>
<tr>
<td>10:25 AM</td>
<td>Break</td>
<td>All</td>
</tr>
<tr>
<td>10:40 AM</td>
<td>Building a Distributed Community Data Management Network for Local and Traditional Knowledge</td>
<td>Amos Hayes</td>
</tr>
</tbody>
</table>

**Day 2 Cont.**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Presenter(s)</th>
</tr>
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<tbody>
<tr>
<td>10:50 AM</td>
<td>Sea Ice for Walrus Outlook (SIWO) data collection and community feedback methods</td>
<td>Tiffany Vance</td>
</tr>
<tr>
<td>11:00 AM</td>
<td>Community-based sea-ice observations in Alaska: From the ice into the computer and back</td>
<td>Mette Kaufman</td>
</tr>
<tr>
<td>11:10 AM</td>
<td>Developing a Geocollaboratory for Indigenous Tourism Research</td>
<td>Sylvie Blangy (Donohoe, H., Mitchell, S.)</td>
</tr>
<tr>
<td>11:20 AM</td>
<td>Participatory Photo-Mapping of Environmental Conditions in the Inuvialuit Settlement Region</td>
<td>Trevor D. Bennett</td>
</tr>
<tr>
<td>11:30 AM</td>
<td>The Art and Science of Multi-Scale Citizen Science Support</td>
<td>Greg Newman</td>
</tr>
<tr>
<td>11:40 AM</td>
<td><strong>Questions</strong></td>
<td>All</td>
</tr>
<tr>
<td>11:45 AM</td>
<td>Alaska Native Knowledge Network</td>
<td>Sean Topkok, Ray Barnhardt</td>
</tr>
<tr>
<td>12:05 PM</td>
<td>Lessons from community-based documentation and management of living resources in North West Greenland</td>
<td>Finn Danielson</td>
</tr>
<tr>
<td>12:25 PM</td>
<td>Pathways, Considerations and Collaborations of Traditional Knowledge and Science to Describe Narwhal Tusk Function</td>
<td>Martin Nweeia, David Angnatsiak</td>
</tr>
<tr>
<td>12:45 PM</td>
<td>Lunch</td>
<td></td>
</tr>
<tr>
<td>1:15 PM</td>
<td><strong>Poster session UMC Rm 235</strong></td>
<td></td>
</tr>
<tr>
<td>1:15 PM</td>
<td>Bridging Knowledge Across Scales For Adaptation Planning in Denali National Park</td>
<td>Corrie Knapp</td>
</tr>
<tr>
<td>1:15 PM</td>
<td>Defining and developing useable sea ice information for Alaska's North Slope coastal communities</td>
<td>Matthew Druckenmiller</td>
</tr>
<tr>
<td>1:15 PM</td>
<td>The Polar Data Catalogue: Data and Information Portal for Northern Research and Monitoring</td>
<td>Julie Frieddell</td>
</tr>
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### Day 2 Cont.

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:15 PM</td>
<td><strong>Break</strong></td>
<td>All</td>
</tr>
<tr>
<td></td>
<td>Facilitated discussion, break out groups, group presentations, and other workshop activities.</td>
<td>All</td>
</tr>
<tr>
<td>2:30 PM</td>
<td></td>
<td>All</td>
</tr>
<tr>
<td>4:30 PM</td>
<td>Adjourn early. Additional time to prepare for group dinner</td>
<td></td>
</tr>
<tr>
<td>4:45 PM</td>
<td>First shuttle leaves CU for Boulder Inn</td>
<td></td>
</tr>
<tr>
<td>5:15 PM</td>
<td>Last shuttle leaves CU for Boulder Inn</td>
<td></td>
</tr>
<tr>
<td>6:15 PM</td>
<td>First shuttle leaves Boulder Inn for Laudisio’s</td>
<td></td>
</tr>
<tr>
<td>6:45 PM</td>
<td>Last shuttle leaves Boulder Inn for Laudisio’s</td>
<td></td>
</tr>
<tr>
<td>9:30 PM</td>
<td>First shuttle leaves Laudisio’s for Boulder Inn</td>
<td></td>
</tr>
<tr>
<td>10:00 PM</td>
<td>Last shuttle leaves Laudisio’s for Boulder Inn</td>
<td></td>
</tr>
</tbody>
</table>
### Day 3  
**Thursday, November 17th, 2011**

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Speaker (Moderator)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 AM</td>
<td>First shuttle leaves Boulder Inn for CU (approx. 13 min ride)</td>
<td></td>
</tr>
<tr>
<td>8:30 AM</td>
<td>Last shuttle leaves Boulder Inn for CU</td>
<td></td>
</tr>
<tr>
<td>8:00-9:00 AM</td>
<td>Continental breakfast at UMC Aspen Room</td>
<td></td>
</tr>
<tr>
<td>9:00 AM</td>
<td>Welcome and review of yesterday, goals for today</td>
<td>Henry Huntington</td>
</tr>
<tr>
<td>9:15 AM</td>
<td><strong>Introduction to Session 3: International projects and Network Building</strong></td>
<td>Henry Huntington</td>
</tr>
<tr>
<td></td>
<td>Redmap: Citizen science as a research tool for monitoring ecological change in the marine environment</td>
<td>Gretta Pecl</td>
</tr>
<tr>
<td>9:25 AM</td>
<td>Indigenous Peoples of Russia's Adaptation Strategies to Climate Change Challenges</td>
<td>Vyacheslav Shadrin and Pyotr Kaurgin</td>
</tr>
<tr>
<td>9:45 AM</td>
<td>The Natural History of the 2010 West Indian Herpetofauna REU through Avila University</td>
<td>Hayden Hedman</td>
</tr>
<tr>
<td>9:55 AM</td>
<td>Indigenous Knowledge Governance System: A holistic model for indigenous knowledge management</td>
<td>Tariq Zaman</td>
</tr>
<tr>
<td>10:05 AM</td>
<td><strong>Questions</strong></td>
<td>All</td>
</tr>
<tr>
<td>10:15 AM</td>
<td><strong>Break</strong></td>
<td>All</td>
</tr>
<tr>
<td>10:30 AM</td>
<td>Engaging with Communities, Applying Technology, and Facilitating Network Building:  Experiences from the Exchange for Local Observations and Knowledge of the Arctic Project</td>
<td>Peter Pulsifer</td>
</tr>
<tr>
<td>10:40 AM</td>
<td>Inuit Qaujisarvingat: The Inuit Knowledge Centre – Emerging Opportunities in Knowledge Stewardship from a National Inuit-Specific Lens</td>
<td>Rebecca Mearns</td>
</tr>
<tr>
<td>Time</td>
<td>Event</td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>----------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>10:50 AM</td>
<td>Data Management and Local Knowledge: Building Networks to Support Community-based Ecosystemic and Socio-Economic Monitoring in Nunavut Canada</td>
<td>Seth Reinhart</td>
</tr>
<tr>
<td>11:00 AM</td>
<td>Community-Based Monitoring in the Context of the Sustaining Arctic Observing Networks (SAON) Process</td>
<td>Eva Krummel</td>
</tr>
<tr>
<td>11:10 AM</td>
<td>Questions</td>
<td>All</td>
</tr>
<tr>
<td>11:20 AM</td>
<td>The Yukon River Basin Indigenous Observation Network: Enhancing long-term data with traditional knowledge</td>
<td>Leah Mackey, Jay Hootch</td>
</tr>
<tr>
<td>11:40 AM</td>
<td>Questions</td>
<td>All</td>
</tr>
<tr>
<td>11:50 AM</td>
<td>Lunch</td>
<td>All</td>
</tr>
<tr>
<td>1:05 PM</td>
<td>Facilitated discussion, break out groups, group presentations, and other workshop activities.</td>
<td>All</td>
</tr>
<tr>
<td>3:00 PM</td>
<td>Break</td>
<td>All</td>
</tr>
<tr>
<td>3:15 PM</td>
<td>Workshop activities</td>
<td>All</td>
</tr>
<tr>
<td>4:15 PM</td>
<td>Workshop summary and closing</td>
<td>All</td>
</tr>
<tr>
<td>5:00 PM</td>
<td>Adjourn</td>
<td>All</td>
</tr>
<tr>
<td>5:20 PM</td>
<td>First shuttle leaves CU for Boulder Inn</td>
<td>All</td>
</tr>
<tr>
<td>5:50 PM</td>
<td>Last shuttle leaves Boulder Inn for CU</td>
<td>All</td>
</tr>
<tr>
<td></td>
<td>Dinner on your own</td>
<td></td>
</tr>
</tbody>
</table>
Workshop Overview

The purpose of the ELOKA workshop is to bring together researchers, community members, organizations, and projects working on issues surrounding data management for both Local and Traditional Knowledge (LTK) and information from community-based research and monitoring with a focus on the Arctic region.

Workshop objectives

Review projects working on LTK and community-based research and monitoring, with an emphasis on identifying and discussing data management (examples, successes, challenges, issues, questions, systems, etc.);

• Discuss as a group key topics on the theme of data management, local knowledge, and community-based research; and
• Discuss development of a LTK/Community Based Monitoring (CBM) network through collaboration and partnership.

Notes for presenters

A broad range of topics will be covered over the course of the workshop. To facilitate discussion presenters are asked to, where appropriate, address a set of key points in their presentation. This will assist in providing some consistency across talks.

1. Overview of the project
   a. purpose, vision/goals
   b. participants, and stakeholders
   c. location, duration
   d. summary of data collected, methods, and data management approaches

2. Lessons learned
   a. Successes
   b. Challenges
   c. Issues
   d. questions raised

Presenters can consider providing responses to these guiding questions in relation to 'Lessons learned':

i. Has the project reached its initial purposes;
ii. how has it been evaluated; how should it be evaluated?
iii. who uses the results of the program;
iv. how have results impacted stewardship decisions in the region/management impact?

Please note that to ensure that all presenters have time to speak, we will be firmly enforcing the 10 minute speaking time. This does not include questions as time for questions has been scheduled at regular intervals throughout the sessions. We suggest a presentation of 6-8 slides and ask that you rehearse beforehand to ensure that you can present in the time allotted.

Active listening by audience

To support and expedite our discussions during the afternoon sessions, we are asking that the audience consider a number of questions:
From your perspective, what are the most notable elements of the project vision or goals? Here, notable implies that you see the element as very important, highly interesting, applicable to other regions, or relevant to your interests.

What did you find most interesting about the data management approaches discussed? Do you know of other approaches that could be appropriate for the project?

What presented aspects should be considered/are applicable throughout the North?

Using brief points or keywords, can you suggest how challenges/issues/questions could be addressed? Ideas can be elaborated on during the afternoon session.

**Overview of goals, objectives and desired outcomes by day**

The following sections present an overview of the goals, objectives, general process, and outcomes envisioned for the ELOKA workshop. We are attempting to focus the afternoon discussion on Day 1 on general data management topics that may include community engagement, data collection methodology, consent issues, funding or others. On Day 2 the focus of discussion is on the details of the technological aspects of data management. We recognize that all of these topics are highly interrelated and that such a thematic separation is imperfect. However, the aim is to provide some structure to help organize our discussions on this complex set of topics. Day 3 will focus on establishing how participants might collaborate in the future in relation to addressing the opportunities and issues identified during the first two days.

**Day 1**

**Goal**

To gain a detailed knowledge and understanding of the broad topics of data management, local knowledge, and community-based research.

**Objectives**

I. Using the morning talks as a starting point for discussion compile (a) a list of visions or goals of LTK/CBM practitioners in relation to data management (b) identify successes, challenges, issues, and questions (items) set or faced by community members, researchers, and other practitioners with respect to LTK/CBM data management.

II. Create a list of proposed ideas on how to address items raised (e.g. achieve vision, mitigate challenges). Solutions proposed can range from pragmatic or short-term, to 'blue sky' or long-term.

**General Process**

- Short presentations (10 minutes maximum) in the morning are followed by facilitated discussion in the afternoon.
- Where Indigenous community members have traveled to the workshop, 20 minutes will be allotted for the project presentation. These presentations are scheduled just before the lunch break.
- During the afternoon sessions groups of 6-7 participants will work to generate a list of items (Objectives i). They will then be asked to brainstorm to propose solutions in keeping with Objective ii.
- To encourage 'cross-fertilization', groups will be structured in a way that members will need to periodically mix. For example, members from one group could be asked to present their items to another group who will in turn need to propose ideas on how to address the items. There are two objectives here: i) encourage people to think about new problems (i.e. those brought from another group). ii) facilitate personal interaction to encourage constructive network building discussions on Day 3.
- Additionally, we will attempt to assign people from different regions evenly across groups.
- Detailed items related to technology will be recorded and identified, if appropriate, for Day 2 discussion.
- Groups will work to develop materials in support of achieving the outlined objectives. A representative from each group will present results to the larger group at the end of each of the two activity periods.

Outcomes

I. The primary 'hard' outcome of Day 1 will be an outline of a report chapter documenting the list of items raised and the possible solutions proposed.  
II. The primary 'soft' outcome will be start of new associations between participants.

Day 2

Goals

• To continue building on the outcomes of Day 1 through consideration of the first set of Day 2 talks (Session 1 from Agenda, continued from Day 1)
• To develop knowledge and understanding of key topics related to the technological aspects of data management, local knowledge, and community-based research (building on Session 2 talks). A particular focus will be placed on how available technologies may address end user requirements and issues identified on Day 1 and early on Day 2.

Objectives

I. Compile an inventory of specific technical issues, challenges, and questions (items) facing workshop attendees. This may include items carried over from discussions during Day 1, and will include additional items identified through consideration of Day 2 talks and afternoon discussions.
II. Create an annotated list of existing technical solutions currently available through, or known to, participants.
III. Identify potential future opportunities related to technologies and a 'wish list' of features, services, data resources etc.. Wherever possible opportunities and 'wish list' will aim to address items identified on Day 1.

General Process

• Short presentations in the morning
• For the afternoon, the general breakout group process used on Day 1 one will be used on Day 2.
• We may ask that a person with technology expertise be divided among the groups so that discussion can benefit from their expertise.
• If there is interest, time can be allocated for those participants interested to discuss the details of technology (e.g. development platforms used, hardware issues etc.)

Outcomes

I. The primary hard outcome of Day 2 will be an outline of a report chapter documenting technological items, available solutions, opportunities and the wish list established.
II. The primary soft outcome of Day 2 will be participants' expanded knowledge of relevant technologies and those who develop or apply them.

Day 3

Goal

• A vision for how interested workshop attendees and others may chose to collaborate into the future.

Objectives

I. Discuss perceived benefits of establishing a collaborative network. Also, identify perceived costs, drawbacks, and concerns.
II. Start to answer key network purpose and development questions. How can a network assist with addressing items identified in Day 1 and Day 2? What would a useful network look like? How would
information move through the network? What would the points of connection be (e.g. virtual site, meetings, social networking)? How can existing network initiatives be improved or expanded?

III. Work to develop a statement or declaration of shared values, objectives, areas of interest, etc.

General Process

- These sessions will include significant periods of discussion as an entire group.
- Breakout groups may be established for short periods of time to address particular questions with the results of these discussions being fed back to the larger group.
- Sessions will be documented in real-time so that the group can review draft versions of lists and statements.

Outcomes

I. A list of perceived benefits, costs, drawback and concerns in relation to establishing a collaborative network.
II. A list of preliminary questions and (where possible) answers related to establishing some form of collaborative network.
III. A draft statement or declaration of shared values, objectives, areas of interest etc.
IV. A clear plan for moving forward on ideas developed.

Special Issue of Polar Geography

An important outcome of the workshop will be a special journal issue of Polar Geography on community-based research and data management. Selected abstracts for the workshop have been invited to develop full papers for the journal issue. Draft papers are due starting November 17th, 2011 and must be submitted to the guest editors no later than the end of 2011 (Dec 30th) with publication expected at the end of 2012. This collection of papers will provide detailed accounts of participants’ projects and address issues surrounding data management for both Local and Traditional Knowledge (LTK) and information from community-based research and monitoring. Wherever possible, we will encourage authors to link their papers to the discussion and outcomes of the workshop. The guest editors (Peter Pulsifer, Henry Huntington, and Gretta Pecl) will be writing an introductory article for the special issue that will identify consistent themes, make connections between projects, and highlight the outcomes of the workshop. More information can be found here:


Although the special issue will be an important workshop outcome, we recognize that the primary audience of the issue will be members of the academic community. The intention is to also share the results of the workshop beyond academia. To this end, the aforementioned post-workshop publication will complement the special issue. During the workshop the format and methods for distributing this publication will be discussed.
The Arctic Borderlands Ecological Knowledge Co-op: Issues of data management and data access in an arctic long-term community-based monitoring systems.

Catherine A Gagnon and Michael Svoboda

The Arctic Borderlands Ecological Knowledge Co-op (ABEKC) was created in 1994 when representatives from First Nations, Inuvialuit, government agencies, scientists and co-management groups met in Dawson city to start an ecological monitoring program within the range of the Porcupine Caribou Herd, which roams in parts of Alaska, the Yukon and Northwest Territories. Three main issues were identified in 1994 as being central to the program: climate change, contaminants, and regional development. Formally, the goals of the ABEKC are to: a) monitor and assess ecosystem changes in the range of the Porcupine Caribou Herd and adjacent areas; b) encourage the use of both science-based studies and studies based on local and traditional knowledge in ecological monitoring and ecosystem management; c) improve communications and understanding among governments, aboriginal and non-aboriginal communities and scientists with regard to ecosystem knowledge and management; and d) foster capacity-building and training opportunities in northern communities in the context of the above-listed goals.

The ecological monitoring program of the ABEKC includes two aspects. First, it developed a database of 65 scientific indicators, updated annually, that cover a wide range of topics including weather, bird abundance, etc. Second, the ABEKC, via community researchers, runs an annual community-based monitoring program during which an average of 17 local experts per community are interviewed each year on topics including: weather, caribou, fish, etc. At the beginning of the ABEKC, four communities participated to this monitoring program, and included Aklavik, Old Crow, Fort McPherson and Arctic Village. Since 2003, the ABEKC expanded to include: Inuvik, Kaktovik, Tuktoyaktuk and Tsiigehtchic.

As of 2008, 1190 interviews have been conducted by the ABEKC. Dealing with this amount of information has raised several challenges and questions related to data management and access. Some of these challenges include the fact that numerous people are/have been involved in the ABEKC process of data collection, storage and organization over the years, so that very few people are knowledgeable about the overall process. The consequence is that few people are actually knowledgeable enough to easily extract information from the database, which may impede data interpretation and access. Changes in questionnaires and codification of data over the years have also challenged the capacity of the ABEKC to analyse time series information. Moreover, the creation of a large database have raised the question of how to capture the information from multiple interviews without running the risk of compartmentalizing the information to the point that the subtleties and context of LTK are lost in the process. These challenges and questions, as well as others, will be discussed in this presentation.

Today, the Coop has just completed a survey redesign in collaboration with program partners and decision making bodies. The new questionnaire plays the strengths of both community based monitoring capacity (simple and repeatable) and are linked to decision making information needs (wildlife status and trends). This improved model aims to demonstrate a viable local based knowledge framework/operation that informs decision maker needs once collected, while still providing the long term context and information for communities and land users to learn more about their environments.

Environment Canada
Arctic Borderlands Ecological Knowledge Coop
Circumpolar Biodiversity Monitoring Program (CBMP)

Climate Change and Health: from knowledge to action

Erin Myers

Over the last decade, Northern communities as well as climate change researchers have begun to understand the degree to which climate change is impacting the health of Northern peoples in Canada. Climate change is not
just an environmental issue but it is becoming very much a human health issue. The health implications resulting from a warmer and more unpredictable climate are not distributed evenly: current health status, age, gender, genetics, geography, and economics, are some of the key variables affecting the ability of individuals and communities to adapt to and reduce the effects of climate change.

To help address these issues, it is important to support First Nations and Inuit communities in conducting their own research and in developing adaptation plans/tools. Health Canada, as a part of the federal government’s overall climate change strategy, has implemented a community-based program since 2008 that aims to build capacity in climate change and health research as well as to develop adaptation plans and relevant communication materials at the community, regional, and national levels.

Since the launch of the Climate Change and Health Adaptation Program, Health Canada has funded 37 community-based projects across the Canadian North. Research topics that link climate change and health issues include food security, water quality, health awareness/education, traditional medicine, land erosion and land use, and ice safety and monitoring.

A significant component of the Program has been data management and best practices. The federal government funds community-based projects and, once all the documentation for successful application for funding has been received, requires only final activity and financial reports. The research findings and results are owned by the communities who generate the information. The Program does realize, however, the importance of community-based participatory research and is working with communities on data management so that research findings and results can be compiled and disseminated (final reports, etc.) in a way that can affect evidence-based policy decisions within the federal and other levels of government.

Overview of results from these projects as well as the approach that the Program has taken to address community-based participatory research and data management will be discussed in the presentation.

Health Canada
Ottawa, Canada

Yup'ik Environmental Knowledge Project: The Natural and Cultural History of the Bering Sea Coast

Ann Fienup-Riordan, Calista Elders Council

The Yup'ik Environmental Knowledge Project is conceived as a major effort in indigenous observation and knowledge documentation in four Yup'ik communities on the Bering Sea coast. We hope to fill a major gap in what is known about Bering Sea coastal adaptations, as well as integrate and compare this new knowledge with existing Yup'ik environmental knowledge. The project was initiated by Bering Sea coastal communities in collaboration with the Calista Elders Council (CEC) and long-time consulting anthropologist Ann Fienup-Riordan. The CEC is a non-profit organization representing the 1,300 Yup'ik tradition bearers of the Yukon-Kuskokwim delta in southwest Alaska. It is the major research organization for the region and is active in documenting the traditional knowledge of the Yup'ik people.

Since 2000, these documentation efforts have been supported in part by grants from NSF's Arctic Social Science Program as well as NSF's BEST (Bering Ecosystem Study) Program. The Yup'ik Environmental Knowledge Project builds directly on this work, especially the Nelson Island Project supported by BEST.

The Yup'ik Environmental Knowledge Project has two closely-related goals: 1) Work with elder experts in four Yukon Delta communities--Kotlik, Emmonak, Alakanuk, and Nunam Iqua--in collaboration with non-Native scientists and younger community members to produce a holistic documentation of their unique natural history and cultural geography, including traditional place names, weather and ice conditions, harvesting patterns, animal and plant communities, and related oral traditions.

2) Integrate and compare documentation of Yukon Delta natural and cultural history with existing documentation for Yup'ik coastal communities to the south, including the villages of Hooper Bay and Chevak, Nelson Island communities, and Canineq (lower Kuskokwim coastal) communities.

Residents express an urgent need to document their environmental knowledge. During the workshop we hope to share ways we have worked together over the last decade to accomplish our goals. We also look forward to learning from other participants about community concerns in other parts of the Arctic.

Calista Elders Council, Anchorage, Alaska
Monitoring and Managing Local Knowledge as it Relates to Indigenous Arctic Games

John Kilbourne

Throughout history the games we have played have been a testament about who we were, and are. From early Inuit bone and hunting games, to the gladiator contests of Ancient Rome, to the modern American game of baseball, the games we play have served as a statement of and a rehearsal for the life-world of that period and place. By reconnecting with and understanding the games of our past, we can build meaningful bridges between our past and present, and hopefully gain a better understanding of the meaning and importance of the modern games we play. Both of the aforesaid are timely and important, especially as they relate to indigenous Arctic people who are trying to build networks to monitor and preserve their traditions in our modern world.

The games of indigenous Arctic people (Inuit of the Eastern Arctic of Canada, and the Sámi of Scandinavia) provide a myriad of lessons and rewards. These lessons and rewards furnished the sustenance that secured the Inuit's and Sámi's continued progress and evolution. By learning about and practicing the games of the Inuit and Sámi, we can affirm many important lessons about living in our modern world. These lessons include a heightened respect for indigenous people throughout the world; an enlightened understanding about fairness and reciprocity; greater awareness of the importance of our environmental playground; and a greater awareness of the importance of intercultural and international education. Most important, by reconnecting with and understanding indigenous Arctic games, we can build meaningful and important bridges between our past and present.

The presentation will focus on and about research into the games of indigenous Arctic people, i.e., the Inuit of the Eastern Arctic of Canada, and the Sámi of the Arctic of Norway. Using lecture, photography, and video the presentation will share the importance of monitoring and preserving game activities of indigenous Arctic people. Included in the presentation will be an overview of the partnerships being established that include Inuit and Sámi community members, university researchers, and educators, who are dedicated to the preservation, management, and distribution of the aforesaid local knowledge on and about indigenous games. The preservation, management, and distribution includes a new web site (Resource Base) dedicated to indigenous Arctic games.

Grand Valley State University

Towards a suitable open access database and metadata standard for international qualitative and interdisciplinary wildlife data: An example from human perceptions on bear management across the Pacific Rim

Kim Jochum¹,², Lilian Alessa¹, Andrew Kliskey¹, Falk Huettmann², Susan Todd³

People's perceptions of, and understanding about, environmental decision making are widely recognized as key for effectively implementing wildlife management. This study examines local people's perceptions with respect to identifying short-comings with the communication between managers and local people, and which also seeks to improve management approaches while identifying local people's knowledge gaps. In addition this study presents a unique approach across the Pacific Rim, comparing the Russian Far East with Alaska, while focusing on the urban-wildland interface regions: South Sakhalin Island and Southern Alaska. Such comparison is relevant due to varying prerequisites in each region, and similar increases in human-bear encounters over the last years across regions. In Alaska, considerable funding for brown bear management and educational purposes exists, which is not the case for Sakhalin Island. Data was collected via semi-structured interviews based on nonprobability sampling. Interview participants were chosen based on their work related to wildlife. Analyses focused on the classification of interview content and examination of complex relationships (grounded theory). How local people describe problems and their positive associations with brown bear management are important factors that contribute to resilient bear conservation while managing for an increasing human footprint in Northern regions.

Due to a strong believe in the importance of data sharing and open access to data for such work, we intend to make all data available. However, authors need to recognize it as worthwhile to put effort and time into sharing and metadata writing. Thus open access to data needs to happen in an understandable, for the public logical fashion, in overseable (online) data bases, and cannot just be stored anymore in small databases where search engines only discover it by chance.

Data management of this project is an important part, but not truly implemented yet, majorly due to structural reasons, which are critically discussed. A suitable metadata format as well as storage database for the qualitative data was not identified yet due to existing standards. Of additional difficulty is the multidisciplinarity of the large international project in which this qualitative wildlife study is embedded. Components include additionally quantitative social science data (survey data), as well as quantitative remote sensing layers and predictive modelling data (geospatial data as raster and shape files in GIS). Due to the geospatial components, the metadata format suggested as overall standard is FGDC ISO up to now. However we hope for more input on these issues. We further make suggestion for and discuss how to deal with complexities in social science projects, how to address them, and what structure is needed to make open data sharing in interdisciplinary sciences a reality. The Polar Information Commons (PIC, www.polarcommons.org) is recognized as a good example, but does not fit our data either really due to the missing linkage to truly polar research.

1 RAM Group, Biological Sciences, University of Alaska Anchorage 2 EWHALE lab, Institute of Arctic Biology, Biology and Wildlife Department, University of Alaska Fairbanks 3 School of Natural Resources and Agricultural Sciences, University of Alaska Fairbanks

Contemplating the Translation of Qualitative Local Knowledge Data into Community Databases

Susan Crate

This presentation will focus on the data management issues of an evolving community-based monitoring system with Viliui Sakha communities of northeastern Siberia, Russia (and potentially in the near-future in the project’s other site, Labrador, Canada). This NE Siberia community-based monitoring system has evolved out of a 2008-2011 NSF-funded Arctic Social Science project to gauge local perceptions, understandings and responses to the regional effects of global climate change. Findings revealed that one of the nine main changes observed was a change in the timing of the seasons. In response, Crate worked with her colleague and historical climatologist, Astrid Ogilvie, to develop a collaborative proposal, Understanding Climate-Driven Phenological Change - Observations, Adaptations and Cultural Implications in Northeastern Siberia and Labrador/Nunatsiavut (PHENARC), in response to NSF’s Arctic Systems Science call for interdisciplinary projects on changing seasonality. Ogilvie brings her expertise and also the inclusion of one of her field sites, Labrador, Canada, that gives the project a strong comparative aspect. Although only in its formative stages, Viliui Sakha communities envision creating what is known in US culture as a ‘citizen science’ network, possibly coordinated through local schools in which case it will have the added benefit of being both an education experience and of being guided by the next generation(s). To date, project PI Crate has been working with a dozen residents of the four research villages who she has contracted to record daily weather conditions, climate observations, and phenological (seasonal) changes. The qualitative ethnographic analysis of journals is ongoing and the individual journals bear a wealth of rich data related to how individuals perceive their world and the changes therein. However quantitatively there is the need to find ways to bring these data into a common ‘language’ in order to input them into a common village-level data base. How can communities develop village-level knowledge databases and use them?

Brief Overview of PHENARC: The primary research objective of PHENARC is to understand present and potential future linkages between Arctic system climate change, altered phenological processes, and adaptations and responses of human societies to these changes. Broad research questions are: i) What are the key seasonal events that form an integral part of the ecosystems in PHENARC’s two main study areas of northeastern Siberia and Labrador?; ii) How are these seasonal events changing, and what specific phenological shifts are occurring in these study areas?; iii) What are the drivers of these seasonal events, and how do they cascade through and affect the entire system?; iv) How are phenological changes and their resulting ecosystem impacts affecting the timing of people’s subsistence and other activities?; v) How are these societal changes in turn affecting the larger cultural system?

Igor Krupnik, and Claudio Aporta

The paper overviews various sets of records created by the international SIKU-ISIUOP project (IPY #166) during its operational period in 2006–2010. Like many IPY 2007–2008 projects, SIKU-ISIUOP was designed and implemented as a consortium of several national initiatives and individual/small group efforts by scientists and local partners from five nations: Canada, U.S., Russia, Greenland and France. Data were collected in four national languages (English, Russian, French, Kalaallit) and several indigenous languages and dialects (Inuïktikut – several dialects, Tunumiisut/East Greenlandic, Inupiaq, Yup’ik, Siberian/St Lawrence Island Yupik, Chukchi). The original sets of records collected by almost two dozen individual initiatives are currently dispersed among the participating scientists and communities in five nations, though copies may be secured for the common depository and sharing.

The first step in addressing the SIKU-ISIUOP data legacy would be to make a full inventory of collected materials, with links and full attribution (metadata). The largest regional depositories of SIKU-ISIUOP records are currently at Carleton University (Ottawa), University of Alaska (Fairbanks), Smithsonian Institution (Washington, DC), Russian Heritage Institute (Moscow, Russia) and Research and Sustainable Development, ICC Greenland (Nuuk). The most extensive types of accumulated records include: 1) materials for the Sea Ice Cybertagographic Atlas (Carleton University), mostly in electronic format; 2) observational logs of 4 local monitors in Alaskan communities of Barrow, Gambell, Shaktoolik and Wales (2006-ongoing), organized as a searchable EXCEL database at the Geophysical Institute, University of Alaska Fairbanks; 3) materials for illustrated indigenous ‘sea ice dictionaries’ (most of the original and copied sets are at the Smithsonian Institution in Washington, DC); 4) observational logs and other contributions by four Russian indigenous monitors – at the Russian Heritage Institute in Moscow (with full copies at the Smithsonian); and 5) SIKU-ISIUOP project correspondence, origination and implementation records – major collections at the Smithsonian and at Carleton University.

Further activities in processing and organizing SIKU-ISIUOP database will depend on additional funding (none available at the moment) and continuing publication efforts (Russian SIKU volume; Wales Sea Ice Dictionary; individual project-related papers and theses, etc.). It makes perfect sense for the former SIKU-ISIUOP team to forge partnership with ELOKA to develop a concise strategy on processing, preservation and sharing of the many unique datasets accumulated by the project team in 2006–2010.

1Smithsonian Institution, 2Carleton University

Role of Bering Sea Sub-Network (BSSN) to map subsistence use and explore climate change impacts and adaptations

Maryann Smith1, Victoria Gofman2, Andrew Kliskey3, Lilian Na’ia Alessa4 and Patricia Cochran5

Subsistence activity in the Bering Sea is facing many challenges as a result of climate change. Changing environmental conditions can affect subsistence by disrupting food webs and increasing weather variability. Melting sea ice and warming ocean waters have increased interests in development including marine transport, offshore oil and gas exploration and commercial fishing. Development can have both positive and negative impacts to the indigenous groups who occupy the area. Although development can potentially bring economic activity to depressed rural areas, development that disrupts subsistence activity has the potential to affect food security, cultural continuation and well-being of indigenous groups. In order to understand impacts of development, maps of subsistence use locations are needed. Subsistence mapping is commonly done using focus groups of experts who draw lines around areas they use to hunt and gather food. This process may lead to an incomplete picture of community harvest areas. Phase two of the Bering Sea Sub-Network, community-based research, endeavours to address this issue by sampling a consensus of ‘high harvesters’ within a community. In order to deal with the abundant mapped data an innovative technique of density mapping is being used. Density mapping using Geographic Information Systems displays, on an interval scale, areas from high density subsistence use to low. The power of these maps lies in their ability to allow decision makers to rate a project’s desirability based on its potential to disrupt subsistence activity. During year three of this seven year project 1706 interviews were conducted with 546 people in 6 indigenous Alaskan and Russian villages bordering the Bering Sea. Communities included Sand Point (Eastern Aleut/Unangas), Togiak (Central Yup’ik), Gambell (Siberian Yupik), Kanchalan (Chukchi), Tymlat (Koryak) and Nikolskoye (Western Aleut/Unangas). Respondents circled
locations where they harvest and answered questions about those locations. Questions focused on observed changes in the environment, challenges faced while harvesting and general questions about the species harvested. These data can not only facilitate the mapping of harvest locations, but allow researchers to spatially explore the effects of climate change to subsistence activity and resulting adaptations.

1Aleut International Association, Survey Manager and presenter, 2Aleut International Association, Principal Investigator, 3University of Alaska Anchorage, Resilience and Adaptive Management Group, Senior Researcher, 4University of Alaska Anchorage, Resilience and Adaptive Management Group, Co-Principal Investigator, 5Alaska Native Science Commission, Anchorage, AK, Co-Principal Investigator

Peoples of the White Crane – Investigation of Impacts of Climate Change in the Indigenous and Local Societies of the Eurasian North

Tero Mustonen1 and Vyacheslav Shadrin2

Peoples of the White Crane – Investigation of Impacts of Climate Change in the Indigenous and Local Societies of the Eurasian North investigates the impact of Arctic climate change and weather-related events in the lives and cultures of the Indigenous and local communities along the Eurasian North in the Arctic Russian Federation – more specifically in the Northeastern Republic of Sakha-Yakutia – the lower Kolyma region. This is the home region of the two nomadic Chukchi communities – Turvaurgin and Nutendli.

Very little is still known regarding both the contemporary lives of these peoples and climate change impacts in the region. The Indigenous societies of Eurasian include the Chukchi, Even, Evenk and Yukaghir peoples among many others.

The non-profit pan-Arctic Snowchange Cooperative based in Finland has been cooperating with the Nutendli and Turvaurgin communities since 2004 on questions of nomadic schooling, sustainable energy solutions, oral histories, traditional knowledge revitalisation, Indigenous land use and rights just to name a few topics.

These societies consider the endangered Siberian white crane (Grus leucogeranus) to be a sacred bird – it has been mentioned that these are peoples of the white crane. Therefore our project is named after this Red Book-listed animal as a symbol of the fragile survival and knowledge of these Indigenous societies of the region.

At the same time this region is experiencing the melting of the continuous permafrost which will further accelerate global climate change as the billions of tons of carbon dioxide will be released to the atmosphere in the current melting process.

The paper will address rebuilding healthy ecosystems through a model of re-traditionalization - rebuilding of core subsistence and cultural activities in the face of rapid weather and cultural changes in the Eurasian North. Special attention will be paid to the community of Turvaurgin that has in the past two years engaged in a rigorous and ambitious attempt to revitalize Chukchi nomadic reindeer herding, implemented Maori-style language nests, and in January 2011 received land use rights to their home region. The community is in cooperation with the Barefoot College in India in the process of solar electrifying the nomadic camps. In the current context in the Arctic Turvaurgin is a shining beacon of model development for the northern Indigenous communities.

1Snowchange Cooperative, 2Institute of the Indigenous Peoples of the North

END OF DAY 1 PRESENTATIONS
Day 2 Presentations

Community–Based Research and Monitoring

William Schneider

Local Observations and Scientific Perspectives in Dialogue: Efforts to preserve and access the record

This paper reports on two projects in the Interior Alaskan village of Tanana. The first combines local observations and scientific investigations of river ice conditions. The second identifies perceptions of climate change impact on subsistence livelihood. Both are archived on the University of Alaska Jukebox Program.

The projects began with community members who identified key environmental issues on videotaped interviews that have been preserved in some cases in their entirety on Jukebox, a web based program that allows us to update information and compare observations over time. The observations of community members are based on livelihood concerns such as safe travel, health of the fish, availability of firewood. Their concerns became the starting point for engaging scientists and scientific literature to help explain the processes at work and to create a dialogue between community members and scientists, one that informs both groups.

In this paper we will describe how we attempt to create and preserve the dialogue through aspects of the research such as: village monitoring and recording of travel conditions, site visits to dangerous river conditions, hydrological instrumentation, and a workshop that provided opportunity for scientists and local experts to discuss specific conditions together. Jukebox provides the archive for an expanding record of first person observations.

Professor Emeritus
Rasmuson Library
University of Alaska

Community-based Archaeology: What to Do When the Community Has Limited Facilities

Anne M. Jensen

Most archaeology in the Arctic takes place in an area used by residents of a particular community. Even if the site is quite remote, hunters and travelers may use the area, or there may be a displaced descendant community in a nearby settlement. These people are often involved in projects as advisors, field participants and resource persons. They are interested in the project and its results, as well as in the data and artifacts gathered during the project.

Yet, it is often not practical to house that data and those artifacts in the nearest community. Suitable curation facilities are often lacking, forcing a choice to be made between caring for the archaeological materials and making them accessible. In some cases, legal constraints make use of an approved curation facility hundreds of miles away the only possibility. Even preliminary lab work may take place in laboratories remote from the community, either due to class schedules or issues with finding space and using hazardous chemicals. There is often a huge amount of digital data associated with the archaeology. Such projects often generate a considerable amount of ethnographic or traditional knowledge documentation as well, in the form of audio and video recordings and maps. Again, there is often no suitable space to store this material in the community, either the physical originals or as digital copies. Some of this material is definitely not something that community members would feel comfortable sharing with the public at large.

A variety of solutions are developing to deal with large quantities of digital archaeological data (e.g. tDAR), but they are designed for research use, and may not meet the needs of community members. They are also not ideal for use with TK data of other types.

These issues are problematic enough for well-funded long-term research projects run from academic institutions or agencies. They are far more severe for compliance projects, where the environment is profit-driven, and sustainable long-term support for community information dissemination is not likely to be available.

I will compare archaeological projects which have encountered these issues. One is based in Barrow, which does have lab and museum facilities, the other in Point Hope, which does not have such facilities. We have found solutions to some of the issues for the Barrow project (in part due to experience with and facilities developed by the North Slope Borough for TK data, but they are not totally satisfactory. I look forward to discussing the issues with others trying to deal with similar problems.

UIC Science, LLC

Data management in a project combining local and traditional knowledge and “western” science to identify Important Ecological Areas in U.S. Arctic waters.

Christopher Krenz, Caleb Pungowiyi, Jeff Short, Debra Fischman, and Susan Murray

Oceana is working with regional entities and local communities in the Arctic to identify Important Ecological Areas (IEAs) in U.S. Arctic waters. IEAs are geographically delineated areas which by themselves or in a network have distinguishing ecological characteristics, are important for maintaining habitat heterogeneity or the viability of a species, or contribute disproportionately to an ecosystem’s health, including its productivity, biodiversity, functioning, structure, or resilience. The identification of IEAs will be based upon the best available information, which encompasses both local and traditional knowledge (LTK) and “western” science. Although the International Polar Year and research associated with potential expansion of industrial activities in the U.S. Arctic has recently expanded the “western” science available for the region, that science remains patchy in space, time, and topical coverage. Incorporating LTK into the identification of IEAs is critical in the Arctic. This project combines different types of knowledge into a common platform for analyses. Combining LTK and “western” science present methodological and data management challenges to ensure analyses and other products are both respectful of LTK holders and scientifically credible.

Local and traditional knowledge is incorporated into the spatial information used to identify IEAs in four ways. (1) Previously documented LTK, including documentation of subsistence use areas and spatial information about species, is gathered and included with “western” science in a GIS database. (2) Targeted LTK is documented and included in the GIS database to fill large information gaps. (3) Peer reviews of “western” scientific spatial information are conducted by local community experts (e.g., to correct the size and location of walrus haul outs). And (4) semi-directed interviews of local community experts are conducted to identify IEAs and help validate and determine the robustness of analyses.

Data management of LTK in this project addresses several traditional issues as well as more novel issues that arise from combining and analyzing information from multiple sources. Similar to many other projects LTK data management in this project includes taking and organizing appropriate metadata, following informed consent agreements, ensuring accurate representation of information, and protecting the cultural integrity and rights of participants. In addition through review of “western” information by local community experts and analyses containing both LTK and “western” science, this project combines LTK with “western” science into new products. Data management is complicated by the need to keep track of and organize information in such a way that combined products and meta-analyses include appropriate source data information. As the use of LTK in research and management continues to expand, data management systems should take into consideration the potential for LTK information to be combined with other information and used in meta-analysis. This forethought will help ensure that LTK information continues to be used respectfully and appropriately long after it is documented.

Oceana is an international, non-profit ocean conservation organization, dedicated to protecting the world’s oceans. We have an Arctic program focused on addressing the rapidly changing conditions in the Arctic, of which the IEA project is a critical component of our work.

Oceana

Sharing research findings in Nunavut: A tool to track the use and integration of community-based knowledge about food (in)security

Rachel Hirsch¹, Jodi Durdle², Sharon Edmunds-Potvin³, Gwen Healey⁴, Jennifer Noah⁴, Jamal Shirley⁵, and Mary Ellen Thomas⁵

Northern residents have had a long history of having to deal with and adapt to issues of food (in)security. Climate change, in addition to – for example, issues such as the inflated cost of store bought foods, high levels of suicide, low levels of health status, and the presence of contaminants in country foods, are some of the many problems that exacerbate an already difficult situation. In 2007, The Government of Canada issued a mandate to assess “key vulnerabilities and health impacts related to climate change in Northern / Inuit populations”. In response, from 2008-2011, Health Canada funded Northern First Nations and Inuit communities to conduct community-based research on climate change and health adaptation. Increasingly, academics and policy-makers

are seeking out local sources of knowledge from indigenous and non-indigenous peoples about what adaptation strategies are best suited to their local land and environment. What is relatively understudied is how findings based on northerner-led projects are being integrated into government programs that deal with the root issue of food (in)security.

This is a very new project initiated only this year and our research team has just recently developed and applied a new set of protocols. Our data management interests pertain to issues of knowledge translation as science (research) is moved forward into policy outcomes (action). The main objective of this project is to better understand communications between climate change and health policy stakeholders operating at local, territorial and national levels in Canada. We are interested in understanding how information about food (in)security is being exchanged from community-based researchers to various policy actors who are concerned with climate change and food security in Nunavut. In particular, how might intended messages from the community level be transformed, leading to possible misinterpretations, as research findings are shared?

We aim to support community-research groups or those interested in disseminating and using community-based research from the Canadian Arctic. We are doing this by describing what happens to results from northerner-led projects and by developing a way to track, using techniques from social network analysis, the exchange of different types of knowledge such as local (e.g., observations of changing environments and migratory patterns), traditional (e.g., lessons from elders), or scientific (e.g., changes in the population dynamics and ecology of harvested wildlife). Currently, we are co-producing a knowledge tracking guidebook, scheduled for completion in early 2012, outlining our procedure and other protocols related to the validation, storage and dissemination of our data. This technique was recently applied for the first time August to October 2011, in collaboration with the Qaujigiartiit Health Research Centre, by tracking a core message and corresponding interpretation of an image from their photovoice project on climate change and health in Nunavut.

Community-Based Monitoring in the Inuvialuit Settlement Region

Vernon Amos and Kayla Hansen-Craik

The six communities in the Inuvialuit Settlement Region (ISR) of the Northwest Territories, Canada, are involved in a variety of monitoring programs. To better coordinate these activities, and to better incorporate traditional knowledge into these efforts, the ISR has begun to develop a community-based monitoring (CBM) program for the region. The program will also serve as a mechanism for bottom-up driven research programs and priorities for the region. This program is expected to provide full-time monitors in each community, to determine how best to address community interests and needs and to work with scientists visiting the region who share similar interests and a willingness to work in partnership with ISR communities. Effective and secure data management is a critical component of the program. Community members want to share information, but they are also wary of how unrestricted access to community information may lead to using that information in ways that do not help the community. They also recognize that access restrictions may vary depending on the kind of information being considered. Furthermore, they are eager to get scientific data back in ways they can understand and use. The development of the data management system will take time and effort. By participating in the ELOKA workshop, we hope to learn from the experiences of others around the Arctic.

Images of the Arctic (IOTA): Involving Northern Residents in Repeat Photography

David Cairns

During the coming century the Earth’s climate is expected to warm and precipitation patterns are expected to change. These changes are expected to be particularly pronounced in the Arctic. Repeat photography is a powerful tool for identifying changes that are occurring in the terrestrial Arctic system and then conveying that
information to both the scientific community and the public. The most challenging aspects of repeat photography studies are associated with finding sources of historic photographs that have been well preserved and also locating the exact location where the photographs were taken. This project seeks to build capacity for future studies of environmental change in the Arctic by establishing an archival database where in georeferenced photographs of the Arctic could be stored for future repeat photography studies. In populating the database, existing georeferenced photographs from the scientific community will be acquired but emphasis will be placed on capturing images of the contemporary Arctic conditions by northern residents.

GPS-enabled digital cameras are provided to three communities on the North Slope of Alaska to enable students and adults to photograph their contemporary environment and to learn about the process of repeat photography. This project integrates with the curriculum adopted by the North Slope Borough School District and provides an entrée into science for northern residents. Photographs acquired under this program will be archived within the IOTA database to be developed in collaboration with the ELOKA program.

Archival photographs will also be acquired and compared to the contemporary photographs to address questions of the type and rates of environmental change that have occurred on Alaska’s North Slope in the last several decades. I also propose to create web-based GIS tools that can be used to quantitatively analyzed repeat photo pairs for this project.

This project will contribute to our ability to answer pressing questions about changes in the Arctic environment over the historic period up and through the project period. Questions regarding the change in location (or stability) of vegetation communities on the landscape, rates of change in fluvial systems, and the prevalence of mass wasting activities such as coastal erosion can be addressed using this methodology. This project provides an important resource for monitoring change into the future. By providing a centralized, well publicized data archive for georeferenced photographs from all over the Arctic, future researchers will have less difficulty in locating photographs or the Arctic that can easily be relocated and rephotographed.

This project provides a simple yet innovative mechanism by which northern communities can become involved in climate change science. There are specific educational benefits to this project related to the collaboration of the scientific team with the local teachers and principals at the North Slope Borough School District. The project dovetails well with the Iñupiaq Learning Framework that has been adopted by the NSBSD.

Texas A & M University

Building a Distributed Community Data Management Network for Local and Traditional Knowledge

Amos Hayes and Jean-Pierre Fiset

For more than a decade, the Geomatics and Cartographic Research Centre (GCRC) at Carleton University has been developing theory and practical technologies to support data management and dissemination with a strong focus on cultural context. Recent work on a number of community-led interactive atlases and International Polar Year projects have highlighted challenges in organizing, representing, and ensuring the preservation of knowledge in digital form without affecting the control and possession of the information by communities themselves. Communities have expressed a desire to be able to host and grow these digital collections within the community while recognizing that longer term preservation may be better achieved by partnering with regional or territorial governments, knowledge centres, or even other communities with sufficient technical capacity.

To attempt to address these concerns, the GCRC has designed and is part-way through the deployment of a pilot distributed data management system where each participant community, region, or organization hosts a node comprised of flexible data storage, an interactive atlas-based front-end for discovery, input, and management, and robust data replication among selected trusted peers in the network. In conjunction with Inuit Tapiriit Kanatami (ITK) researchers and community representatives, a consent model is being built to guide the access control capabilities of the system.

GCRC and ITK are also working with Arctic College in Nunavut to develop a for-credit course focused on community research theory and practise. The learning resources attached to the course are being created with an open license and in an open community wiki that includes support from ELOKA members. This paper will provide an overview of the system being built, the supporting consent and education work, the community content already housed in the system, and future directions for the project.

Geomatics and Cartographic Research Centre
Carleton University, Ottawa, Canada

Sea Ice for Walrus Outlook (SIWO) data collection and community feedback methods

Tiffany C. Vance

The Sea Ice for Walrus Outlook (SIWO), an activity of the SEARCH (http://www.arcus.org/search/siwo), is a resource for Alaska Native subsistence hunters, coastal communities, and others interested in sea ice, weather, and walrus. From April through June, SIWO provides information on local-scale weather and sea ice conditions in the Northern Bering Sea and southern Chukchi Sea regions of Alaska via a web page that is updated weekly. As a part of 2011 SIWO efforts, we are seeking ways to improve communication with hunters and local residents on weather and ice conditions, the accuracy of the SIWO maps, and general conditions in the region.

Because of the technical challenges of communicating with remote communities, including low bandwidth Internet connections, limited computing resources, and the need of the hunters to concentrate on hunting, we seek to make communication options as straightforward as possible. After considering a variety of data transmission techniques, we decided to create a simple grid overlay on SIWO maps to allow text messages and brief emails to be used to gather information. We also have explored using a Facebook page created as a part of SIWO as another feedback mechanism. We plan to display the feedback on a Google map as a way to integrate the environmental data with geolocated information received from the communities. While we do not currently have an extensive archive of feedback, we anticipate needing to store and manage the data we are gathering.

In the future we hope to use social media harvesting techniques to extract information and geographic locations from resources such as Facebook posting and Tweets made by residents in coastal communities. We envision integrating this information with the more traditional data resources, e.g., satellite imagery and wind analyses, that are created for SIWO.

In participating in the workshop, I (and the project) hope to share our experiences, but more importantly to learn from the experiences of other participants. We welcome the opportunity to understand how we might better develop and support a two-way data exchange and collaboration with the communities and how we might best store, display, and manage our data.

NOAA/NMFS and San Francisco State University

Other team members: Sue E. Moore - NOAA/NMFS S&T, Vera Metcalf - Eskimo Walrus Commission, James E. Overland and Nancy N. Soreide, NOAA/OAR/PMEL, Hajo Eicken - UAF, Gary Hufford - NOAA/NWS, Lisa Guy and Nazila Merati, UW/JISAO

Community-based sea-ice observations in Alaska: From the ice into the computer and back

Mette Kaufman and Hajo Eicken

Since fall of 2006, we have worked with Iñupiaq and Yupik sea-ice experts to gather community-based ice observations as part of the emerging Arctic Observing Network. Key advisors and contributors include Winton Weyapuk, Jr. (Wales, AK), Joe Leavitt (Barrow, AK), Leonard and Paul Apanaglook (Gambell, AK) and a number of others from different coastal villages in Alaska. Guidance by Igor Krupnik with the Smithsonian Institution and support by the Exchange for Local Observations and Knowledge of the Arctic (ELOKA) project have been instrumental to our efforts as well. We are exploring different approaches to building a cooperative sea-ice observing network that improves understanding of ice use by coastal communities while providing them with better ice information (Druckenmiller et al., 2009; Eicken, 2010). Hence, format and breadth of observations have been mostly defined by the observers themselves and the broader community of hunters they confer with. Daily logs of ice conditions are kept by the observers and passed on to our team at the University of Alaska Fairbanks (UAF) for data entry and archival. During the first phase of our project, we defined different (and evolving) categories of ice and environmental information related, e.g., to the seasonal cycle of sea ice, hazardous ice events, ice use by animals and people. These observations have been gathered in a commercial database (Microsoft Outlook), along with additional insights obtained from phone conversations and community visits by UAF team members and contributions by experts from other villages. Such observations are complemented by data from our geophysical sea-ice observatory and field trips (seaice.alaska.edu/gi/observatories), with the aim (where possible) to complement local and indigenous knowledge. Information flows back into the communities through personal communication, our website, cooperative efforts involving native organizations and agencies, such as the Sea Ice for Walrus Outlook (www.arcus.org/search/siwo), and community presentations and school visits. Graduate student Matthew Druckenmiller worked with the Barrow Whaling Captains Association to
generate a seasonal ice trails map used widely in the community and disseminated as hardcopy and online. We are now entering the next phase of data archival and dissemination in collaboration with the ELOKA project to develop a more sophisticated database that can serve both as an evolving and adaptive archive and a tool for communities to safe-keep and make available community-based ice observations. We welcome feedback on this draft product so as to make it potentially useful to other researchers and communities as well.

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Developing A Geocollaboratory For Indigenous Tourism Research

**Blangy, Sylvie**¹, Holly Donohoe², Scott Mitchell³

Collaboratories have been defined as centers without walls, virtual places where research teams can undertake collaborative research. As part of the Aboriginal Tourism Network (ABORINET) project, we have been developing a geocollaboratory to support research on Indigenous tourism around the world. Indigenous communities are culturally distinct and remotely located and these conditions present significant geographic constraints and a set of socio-cultural challenges when conducting research on issues affecting these communities. Therefore, the geocollaboratory development and implementation focused on: (1) the specific goal of enabling collaboration between non-Indigenous researchers and Indigenous peoples on issues related to Indigenous tourism planning and management, and (2) the general issue of enabling the sharing of differing knowledge and management approaches (i.e. traditional ecological knowledge) amongst research and Indigenous communities. The primary goal of ABORINET is to develop a multi-scale and multi-method data collection and analysis protocol for better understanding Indigenous tourism in a way that supports multi-site and longitudinal comparisons, for connecting Indigenous communities across the world, and for sharing the results in ways that are meaningful to tourism stakeholders within and beyond Indigenous communities. This paper introduces the research effort, describes the conceptual framework within which the geocollaboratory is being developed, it outlines the process and the lessons learned in the development stages with specific attention afforded the geographical nature of the collaboratory, and the limitations of Internet-based collaboratory research are identified. Recommendations for mitigating potential limitations and challenges are proposed and future research opportunities are identified.

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Participatory Photo-mapping of Environmental Conditions in the Inuvialuit Settlement Region

**Trevor D. Bennett** and Trevor C. Lantz

The Mackenzie Delta region (MDR), of Northwestern Canada is a dynamic environment that is ecologically and culturally significant. This region is experiencing rapid environmental change that is expected to worsen with continued climate warming and additional anthropogenic stressors. In northern regions, conventional environmental monitoring strategies can be hindered by complex and cost prohibitive logistics. In some areas changes in land cover are occurring so rapidly that maintaining an accurate inventory is problematic. Knowledgeable land users are in a unique position to assess changes in regional environmental conditions and inventory cumulative impacts. In this context of environmental change and uncertainty, there is a critical need to draw on local knowledge and observations to inform decision-making.

In this project we developed and field-tested a community-based monitoring program that used participatory photography. Our objective was to create a monitoring program consistent with community goals and Inuvialuit culture that documented local observations in an accessible format. Working with the Hunter and Trapper Committees of Aklavik, Inuvik, and Tuktoyaktuk, and the Inuvialuit Joint Secretariat, we adapted a participatory photo-mapping (PPM) method to record Inuvialuit observations of environmental conditions.

In the summer of 2010, we tested the PPM protocol by organizing field trips with groups of knowledgeable Inuvialuit hunters and land users. Inuvialuit observations of environmental conditions were recorded using digital cameras and hand held GPS units. Subsequently, digital photographs and video became the focus of photo elicitation interviews, which added a detailed narrative to each geo-referenced observation. Following fieldwork
and interviews, geo-referenced photos, video, audio recordings, and associated text files were entered into web-based map. Approximately 150 observations were mapped and grouped into 50 themes.

Interviews with monitors and a range of potential map users suggest that web-based mapping is an effective way to record and share observations and concerns related to the regional environment. Slow internet connection speeds, a complex web-based mapping interface, and technical demands of managing and organizing geo-referenced multi-media observations are key challenges that will need to be overcome before the PPM protocol can be implemented widely.

Overall, this research highlights the effectiveness of using visual methods to document and share Inuvialuit observations. A monitoring program built around local observations that are linked to geo-referenced images (and other media) will significantly improve our capacity to detect the impacts of environmental change. By providing a record of the location and magnitude of anomalous environmental conditions, this monitoring initiative will also contribute to northern planning and decision-making.

University of Victoria

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**Data Management and Local Knowledge: Building a Network to Support The Art and Science of Multi-Scale Citizen Science Support**

**Greg Newman¹, Jim Graham¹, Alycia Crall², and Melinda Laituri³**

Citizen science and community-based monitoring programs are increasing in number and breadth, generating volumes of scientific data. Many programs are ill-equipped to effectively manage these data. We examined the art and science of multi-scale citizen science support, focusing on issues of integration and flexibility that arise for data management when programs span multiple spatial, temporal, and social scales across many domains. Our objectives were to: (1) briefly review existing citizen science approaches and data management needs; (2) propose a framework for multi-scale citizen science support; (3) develop a cyber-infrastructure designed to support citizen science program needs; and (4) describe lessons learned. We find that approaches differ in scope, scale, and activities and that the proposed framework situates programs while guiding cyber-infrastructure development. We built a cyber-infrastructure support system for citizen science programs (www.citsci.org) and show that carefully designed systems can be adept enough to support programs at multiple spatial and temporal scales across many domains when built with a standards-based flexible architecture. The advantage of a flexible, yet controlled, cyber-infrastructure system lies in the ability of users with different levels of permission to easily customize features themselves, while adhering to controlled vocabularies necessary for cross-discipline comparisons and meta-analyses. Program evaluation tied to this framework and integrated into cyber-infrastructure support systems will improve our ability to track effectiveness. We compare existing systems and discuss the importance of standards for interoperability and the challenges associated with system maintenance and long-term support. We conclude by offering a vision of the future of citizen science data management and cyber-infrastructure support.

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**Alaska Native Knowledge Network**

Ray Barnhardt, Sean Topkok

In 1995 the University of Alaska Fairbanks in collaboration with the Alaska Federation of Natives established the Alaska Native Knowledge Network to share and promote the exchange of cultural resources and knowledge among indigenous communities throughout Alaska and beyond. One of the major ANKN initiatives in promoting the use of indigenous knowledge has been the creation of a clearinghouse and database to identify, review and catalog appropriate national and Alaska-based cultural and curricular resources suitable for indigenous settings, and make them available throughout the state via the ANKN web site (http://www.ankn.uaf.edu). In selecting culturally relevant materials for the database and CD-ROM collections, we have sought to reach beyond the surface features of indigenous cultural practices and illustrate the potential for comparative study of deep knowledge drawn from both the Native and Western knowledge streams.

The knowledge and skills derived from thousands of years of careful observation, scrutiny and survival in a complex ecosystem readily lends itself to the in-depth study of basic principles of biology, chemistry, physics and mathematics, particularly as they relate to areas such as botany, geology, hydrology, meteorology, astronomy, physiology, anatomy, pharmacology, technology, engineering, ecology, topography, ornithology, fisheries and other applied fields. Requests for the cultural resources listed in the ANKN database has grown steadily, with over 1.5 million “hits” recorded on the web site each month.

One of the vehicles for bringing coherence to the ideas imbedded in the ANKN has been the development of a culturally-based curriculum framework for purposes of organizing all the curricular and cultural resources that are merging as Native people bring their knowledge to the forefront in the educational and research arenas. The “Spiral Pathway for Integrating Rural Alaska Learning” (SPIRAL), is structured around 12 indigenous themes and grade levels, so that the compilation of cultural and curricular resources can be accessed by clicking on the appropriate segment, which will then produce a codified list of available materials, many of which can be downloaded directly from the ANKN web site.

For those communities and schools that have full technology access, we have been providing training in implementing “cultural atlases”—a CD-ROM/web site development process in which students research any aspect of their culture/community/region and assemble the information in a multimedia format through the use of technology. Cultural atlases engage students in information gathering and compiling processes that simultaneously enhance learning of subject matter, technology applications and cultural knowledge, with the results often of direct interest and service to their communities. Areas in which cultural atlases have been developed by students in various schools around the state include life histories, genealogies, place names, language documentation, uses of local flora and fauna, subsistence practices, community histories, traditional arts and crafts, mapping projects and weather knowledge. Sean Topok, the Inupiaq ANKN staff member responsible for the cultural atlas initiative will attend and present at the ELOKA workshop.

Alaska Native Knowledge Network
University of Alaska Fairbanks

Lessons from community-based documentation and management of living resources in North West Greenland

Finn Danielsen

Monitoring of changes in the environment is necessary to ensure that resources are sustainably used. The scientific knowledge of populations and trends in Greenland’s living resources is incomplete. Local knowledge abounds but has rarely been quantified or used for government decision-making.

The Greenland Government would like to a) increase local capacity to quantify, document and manage the living resources, b) enhance local engagement in natural resource management, c) encourage improved ability to adapt management to changes in the populations and distribution of species, and d) strengthen the dialogue between fishers, hunters, scientists and managers.

In response to these challenges, we are testing how community-based documentation and management of living resources can be undertaken in Greenland in practice. We have established a simple, community-based monitoring scheme, led by the Department of Fisheries, Hunting and Agriculture and Qaasuitsup Municipality. The scheme is being implemented by the three villages of Akunnaaq, Qaarsut and Ilulissat.

As part of this scheme, the village committees of the three villages each established a local Natural Resource Council (NRC). These councils consist of some of the most experienced and interested local hunters, fishers and other people interested in the environment. When members of these councils are in the field, they collect data on the living resources and their usage. At quarterly meetings of each council, data are summarized, discussed, interpreted and possible management initiatives emanating from the results are considered. The proposed management decisions and the supporting data and analysis are forwarded to the Village Committee for its endorsement, before being forwarded to the municipality and government authorities.

The following are examples of how the data are used. First, in Akunnaaq, the NRC recorded trawlers operating in a shallow sea area adjacent to their village. There were 4-5 vessels every day throughout April and May 2010. This number was the same as in 2009 but higher than in previous years. Moreover, the vessels were using heavier fishing gear. The NRC was worried that potential degradation of the seafloor might affect the production of Atlantic Wolf Fish and so they proposed that the municipality should restrict the size of vessels in the area.

Second, one of the attributes recorded by the NRC in Qaarsut is their catch of Greenland Halibut in the fiord. On the basis of their catch-and-effort estimates from long-line fishery, they assessed that the population was the same in May 2010 but higher in June-September 2010 than in the same months of 2009. Nevertheless, the NRC
was concerned that many nets were being set over their longlines and that some nets were left at sea when the sea was covered by ice, given that rotting fish attracts sharks. They proposed that the municipality should restrict net fishing in the area.

Third, in Qaarsut, the Council observed that the population of Canada Goose had increased substantially. Canada Goose may outcompete the threatened Greenland White-fronted Goose. They proposed that the autumn hunting period for Canada Goose should be expanded by two weeks.

As shown above, the principal data managers are the NRCs. The basic raw data comprise field forms, filled in by hand, with observations of species/resource use, quantity, place and time. The municipal office in each village provides a meeting room, stamps, access to photocopying etc. The community members participate as volunteers because of their interest. It is also an opportunity for their insights and knowledge to be used and their voices heard. The scheme can be sustained at very low cost.

Some of the challenges we have recognized are: (i) How can we locally manage populations that are shared between several villages or countries? and (ii) How can we locally make management decisions when there are disagreements within the sector (e.g. local versus foreign fishers)?

In conclusion, community-based documentation cannot replace scientist monitoring of the living resources in Greenland but the two approaches can supplement each other. Local monitoring can, for instance, help pinpoint particular species or areas that are in need of more attention. The municipality is now integrating the scheme into its mainstream activities and scaling it up to more villages. The government is keen on a better differentiation of fishing and hunting periods and quotas geographically within the large country, and we hope that our new scheme can help this process.

By community members and government/NGO facilitators involved in “Opening Doors to Native Knowledge” (“Piniakkanik sumiiffinni nalunaarsuineq”; www.PiSuNa.org)

Pathways, Considerations and Collaborations of Traditional Knowledge and Science to Describe Narwhal Tusk Function

Martin T. Nweeia, Cornelius Nutarak, Frederick C. Eichmiller, David Angnatsiak, Pavia Nielsen, Peter V. Hauschka

Traditional knowledge on the narwhal has been collected through video interviews, map renderings, written records and audio recordings in the High Arctic communities of Nunavut and Greenland where narwhal hunting is prevalent. Observations of migration, anatomy, population and behavior have been useful at various points along the line of scientific inquiry about narwhal tusk function. Since the writings of Albertus Magnus over 500 years ago, the function of the narwhal tusk has eluded scientific discovery. The 2-3 meter, straight, spiraled tooth, horizontally erupting outward through the upper lip of most males, is one of two formed tusks, the other remaining impacted in the upper jaw. Such anatomy, morphology, asymmetry and dimorphic attributes are unprecedented among mammals. Likewise, the evolutionary link to Artiodactyl origins, and the embryologic loss of four pairs of potential teeth provide few clues to understand tusk function. Despite eating large fish, there are no teeth in a narwhal’s mouth for functional considerations of biting and chewing.

Inuit and Inughuit elders and hunters have assisted on scientific field expeditions, in the collection of specimens, and by sharing knowledge. Field expedition teams in Nunavut have included at least four Inuit hunters each field season to help capture and restrain narwhal that are tested for tusk sensitivity. Hunters have also been trained and enlisted to prepare specimens for laboratory analysis that are shipped from these established scientific High Arctic outposts. Knowledge and observations from hunters has been offered and shared for the tusk research, and in prepared publications, workshops and conferences. Full inclusion of elders and hunters as collaborators, authors and presenters is held as a model for information exchange and presentation. Participation, preservation, and presentation of this knowledge have been completed and continue to be sought in an effort to extend outreach and bring these collected insights to a wider audience. Collaboration which utilizes different methodologies from scientists, elders and hunters, though useful and important, may also present difficulties. Each group has identified issues with the acceptance and appreciation of the other’s methods. Discussion of the different ways of thinking, sharing and holding knowledge within scientific and indigenous cultures is useful for future investigations seeking to combine such different approaches and participant views. Difficult questions in organismal biology can benefit from such collaborative models which seek different perspectives. Sensitivity to the methodologies and values of each contributing group by the other is needed to reinforce successful outcomes and ongoing positive collaborations.

END OF DAY 2 PRESENTATIONS
Day 2 Poster Session

Bridging Knowledge Across Scales For Adaptation Planning in Denali National Park

Corrine Noel Knapp\(^1\) and F. S. Chapin III\(^2\)

Climate change impacts local places in surprising ways: by creating uncertainty for decision-makers who are nested at different organizational levels and spatial scales. The speed and complexity of the projected changes require that communities, agencies and government entities develop new methods to collect information, decipher trends and implications, and respond to change. In Denali National Park managers and rural subsistence communities make decisions at different scales that have cross-scale impacts and influence the natural resources and ecosystem services of the boreal forest. This project aims to document, assess and then facilitate the translation of current science, agency observations and data and local knowledge of rural community members between levels. We will use interviews and focus groups to understand how long-term residents of rural communities and National Park Service (NPS) employees understand the social-ecological system of Denali, what knowledge and data they possess about system function, what questions they have about the systems response to change, and whether available information could be scaled up or down to answer these questions. We propose that managers and rural community members will have different perceptions of change and understandings of system dynamics resulting in different questions and sets of data/information that they collect. We believe that cross-scale sharing of knowledge and data may provide complementary information and lead to more sustainable management and informed adaptation planning.

\(^1\)University of Alaska, Fairbanks. PhD Student. Resilience and Adaptation Program IGERT fellow.  
\(^2\)University of Alaska, Fairbanks. Professor of Ecology.

Defining and developing usable sea ice information for Alaska’s North Slope coastal communities

Matthew L. Druckenmiller

The climate, sea ice, and coastal regime of Alaska’s North Slope have substantially changed over the last few decades. Consequently, local coastal communities increasingly face difficulty in assessing the significance of such change to their decision making environment, which includes issues relating to subsistence hunting of marine mammals, sea ice related hazards, coastal erosion, and offshore oil and gas development. Local planners and users of sea ice stand to benefit from improved access to relevant science-based sea ice information, especially sources capable of interfacing with local and traditional knowledge and observations. This presentation will outline a project that is working between the National Snow and Ice Data Center (NSIDC) and Alaska’s North Slope Borough (NSB) to develop sea ice information tailored to the unique decisions facing coastal communities on Alaska’s North Slope and their local ways of understanding and observing the environment. This project will work with local community decision makers and ice-users to define their broader information needs, preferred types of data products, and the technological, educational, or epistemological challenges they face in using science-based information. In close collaboration with the NSB’s Department of Wildlife Management, a data and information management strategy will be developed to track how ice retreat is impacting community activities and the marine mammals they depend on. This strategy will ideally incorporate scientific research data, tailored sea ice information products, and local knowledge and observations. Lastly, a training program will be developed for NSB staff that summarizes the outcomes of this project and ultimately improves local access to relevant planning information. While this two-year collaborative project officially began in fall 2011, it is building from research, data management efforts, and lessons-learned by the Seasonal Ice Zone Observing Network – an affiliated project with ELOKA and integral partner in this effort.

National Snow and Ice Data Center, University of Colorado at Boulder

The Polar Data Catalogue:
Data and Information Portal for Northern Research and Monitoring

Julie E. Friddell and Ellsworth F. LeDrew

Since 2007, the Polar Data Catalogue (PDC, http://www.polardata.ca) has served as Canada’s primary on-line source for data and information on the cryosphere and the polar regions. The PDC was developed as a collaborative project between the Canadian Cryospheric Information Network (CCIN, http://www.ccin.ca), the ArcticNet Network of Centres of Excellence, the Government of Canada Program for the International Polar Year 2007-2008, and the Department of Fisheries and Oceans Canada. Additional partners who have been instrumental in providing direction and support include Environment Canada, Inuit Tapiriit Kanatami, the Inuit Circumpolar Council, the Northern Contaminants Program, the ArcticNet Student Association, and the Centre for Northern Studies. The PDC has been adopted as the metadata and data portal and archive for the Circumpolar Biodiversity Monitoring Programme, the Canadian Ice Service, and the Beaufort Regional Environmental Assessment, among others.

To contribute to the PDC, researchers across Canada upload data files and metadata which describe their projects. By searching the on-line Catalogue, Indigenous people, Arctic residents, and other researchers can learn about projects and access data from studies taking place in northern communities and across the polar regions. To facilitate exchange of knowledge and data, we have been working with users in Canada’s North to create a PDC Lite Search which functions at low bandwidth. This new web tool, which complements the full-featured Catalogue, will allow “off-line” searching of PDC metadata records and include new features to accommodate northern geographies. To improve sharing of information between the PDC and other polar data portals in Canada and around the world, emerging web sharing protocols are being investigated and tested to allow increased national and international access to the PDC records.

Additionally, the CCIN website is undergoing a complete redesign. The CCIN site, which has contained the State of the Canadian Cryosphere website since the 1990’s, receives thousands of hits per month. The site’s scientific content is being updated, and new data visualizations are being created which allow the user to graphically view and investigate PDC datasets. Social media tools are being integrated into the site: Newly available PDC metadata and data are announced via Twitter, and a blog section provides opportunities for users to share stories about the cryosphere or changes they are experiencing; post images and videos; link to news articles or other websites; and generate, share, and coordinate information on pertinent research and monitoring projects. Social media has proven its ability to bring people together in times of political and other crisis; As a new avenue of interaction, it can also advance collaboration as well as our understanding of and response to polar environmental and socio-economic change.

We welcome feedback on our on-line tools and encourage inquiries regarding new opportunities and partnerships to better serve the needs of polar research, community-based initiatives, and northern monitoring programs.

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University of Waterloo, Waterloo, Ontario, Canada

Bering Sea Ecosystem Study (BEST) Nelson Island Natural and Cultural Heritage Project

Janet Scannell¹, Ann Fienup-Riordan², Alice Rearden²

The Bering Sea Ecosystem Study (BEST) is a multi-year study of the Bering Sea ecosystem funded by the National Science Foundation (NSF). One component of BEST is the study of human communities along the Bering Sea coastline. The primary goal of the BEST Nelson Island Natural and Cultural Heritage project is to create and preserve a holistic documentation of the unique natural history and cultural geography of Nelson Island. This documentation was created with the help of elder experts in five Bering Sea communities, in collaboration with non-Native scientists and younger community members, and includes traditional place names, weather and ice conditions, harvesting patterns, animal and plant communities, and related oral traditions. Nelson Island, the traditional homeland of the Yupiit, or Yup’ik Eskimos, has a population of 1,200 and is located on the Bering Sea coast between the mouths of the Yukon and Kuskokwim rivers.

A three-week circumnavigation of Nelson Island occurred in July 2007 with twenty elders, students and village helpers, along with Calista Elders Council staff and three additional scientists. During the circumnavigation and at community gatherings after the trip, elders shared close to one thousand names. These names include historic...
sites and landscape features of all shapes and sizes, from tiny sloughs to deep ocean channels and many names were shared as part of stories.

NCAR EOL has developed web sites for use in other Arctic data applications using the Geographic Information System (GIS) Mapserver software package. The unique aspect of this project was to modify this software to display the human dimensions information gathered during the circumnavigation. The web site displays a map of Nelson Island and the many Yup’ik place names that were collected. These place names include all village types, spring and fall hunting camps, summer fish camps, reindeer stations, and permanent winter villages, as well as many historic and prehistoric sites. The web site also documents the stories that the elders shared with the group as they remembered information about a particular place, along with photos taken during the trip. The poster describes how this information is displayed and will show examples from the web site. All this information will be preserved for future generations at http://mapserver.eol.ucar.edu/best and in the book “Our Nelson Island Stories”. The hope is that both Yup’ik and non-Yup’ik readers will learn from the elders’ rich subsistence lifestyle experiences and live better and safer lives.

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Collecting and preserving local and traditional climate knowledge

Julia Collins, Peter Pulsifer, Shari Gearheard

The Exchange for Local Observations and Knowledge of the Arctic (ELOKA) provides data management services and support to Arctic communities and others who are working with local and traditional knowledge (LTK) or who are gathering data from community-based monitoring systems. These data are at high risk of loss or, when preserved, may be difficult to access for a variety of reasons, including concerns regarding the distribution of sensitive or culturally important information and the difficulty of initiating or maintaining community-based research without an established data management infrastructure. LTK data are often presented in formats quite different from satellite or model data sources (e.g., interviews, maps, and photographs), which adds to the challenge of using LTK in concert with other climate data sets. The ELOKA team works together with local experts, Indigenous organizations and researchers to design systems for responsibly curating these data, making them available to the contributing Arctic communities, and where possible, available to the climate research community in formats suitable for linking to satellite or model data. Where interest exists, we are helping our partners develop local data management programs. We will present examples of data management strategies used to date, lessons learned, and ideas for the future.

National Snow and Ice Data Center, University of Colorado at Boulder, corresponding author pulsifer@nsidc.org

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Connecting Inuit Observations With Fine-Scale Meteorological Model: Informatics And The Silalirijiit Project

Peter L. Pulsifer1, Shari Gearheard1, Glen Liston2, Julia Collins1, Kelly Elder3, Henry Huntington4

Climate change affects many aspects of the environment, including weather patterns and the frequencies of various weather events and phenomena. Inuit in Clyde River, Nunavut, are concerned about the changes that may be in store, noting that they have already observed changes in wind patterns and other weather features. Arctic indigenous peoples are careful observers of their environment, and the documentation of their observations has provided a wealth of information about, among other things, specific ecological and climatological changes. Concurrently, numerical models simulate past climates on regional and global scales and make projections into the future, providing crucial insight into climatological trends and processes. The Silalirijiit project attempts to connect Inuit observations with fine-scale meteorological models. Part of this effort involves the development of new information systems.

Through partnership with the Exchange for Local Observations and Knowledge of the Arctic project (ELOKA) (http://eloka-arctic.org), a web-based system has been developed to allow Inuit from Clyde River and other communities to access near real-time meteorological data from four local weather stations in the language of their choice, Inuktitut or English* (http://clyderiverweather.org). These data are also available to interested scientists, recreationalists, or search and rescue personnel, for example.
Here we provide a high level discussion of the technical architecture, related components, and resulting system that supports data dissemination and stewardship. Data are presented in numerical form and are presented using visualization techniques. In addition to an easy to use Web interface, future iterations of the system will provide machine-to-machine interfaces using open standards common to data intensive science methods. We conclude with a discussion of our approach to long term

* Multilingual support being released summer 2011

1 National Snow and Ice Data Center, University of Colorado at Boulder, 2 Cooperative Institute for Research in the Atmosphere (CIRA), Colorado State University, 3 Rocky Mountain Research Station, U.S. Forest Service 4 Huntington Consulting

END OF DAY 2 POSTERS

Day 3 Presentations

Redmap: Citizen science as a research tool for monitoring ecological change in the marine environment

Gretta Pecl1, Melissa Nursey-Bray2, Fiona Brodribb1, Peter Walsh1, Stewart Frusher1, Graham Edgar1, Peter Last3, Jeremy Lyle1 and Rick Stuart-Smith1

A major challenge in establishing how climate change may be impacting on our marine ecosystems, particularly in Australia, is the scarcity of longer-term and larger-scale monitoring programs that inform us of such changes. We have developed a web-based on-line database and mapping facility (Redmap – Range Extension Database and Mapping project) where members of the public submit data and photos on catches or observations of marine species that are observed outside their known distribution (e.g. species that may be undergoing range shifts). The east coast of Tasmania, Australia is situated within a climate change ‘hotspot’ with recorded rates of ocean warming over the last 6-7 decades of 3.8 times the global average. Evidence suggests almost 100 marine species have shifted in response with range extensions recently recorded in barnacles, sea urchins and dozens of fish species. Since the launch of the website 16 months ago we have had an overwhelming response from the marine community including commercial and recreational fishers, divers and boaters. In addition to engaging the Tasmanian marine community, the site has received over 22,000 hits from 135 countries and the success of REDMAP has resulted in proposals to extend the concept nationwide and adapt Redmap for Alaska. Community participation in REDMAP can create for individuals the sense (and in this case, the reality) that they are actively and constructively helping with a major issue currently facing the global community – people can log on and literally see how their information has helped generate a picture of how our marine ecosystems are changing, they can see ‘their’ data point on the map. REDMAP is raising awareness and engaging participants in our fishing industries, improving industry and community understanding of the impacts of climate change on marine biodiversity and resources. We believe Redmap is a successful concept as it is engaging the community on the issue of climate change through an activity they enjoy (fishing and diving) and is also a mechanism to provide clear acknowledgement of the valuable knowledge held within our marine industries and general community. We report on a formal project evaluation currently underway for Redmap to assess how the program is perceived by Tasmanian fishers, divers, resource managers and scientists. This is critical to understand as ensuring community-based research or monitoring programs are on-going and sustainable involves achieving legitimacy and credibility from both community and scientific perspectives.

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The majestic Himalaya is a treasurer of floral, faunal and bioresource diversity. Among all the Himalayan states of India, Uttarakhand is well known for its floral and faunal diversity including traditional knowledge of medicinal plants due to its distinct geography and ecological marginal conditions. The state is known as green state comprises natural forest and alpine pastures. Among the floral diversity, more than 1700 species have high medicinal properties. Communities of the region have familiar with the healing properties of available plant species. Rural areas inhabitants depend on bioresources viz. fuel; fodder and non timber forest produce (NTFP) collection. They have small scale traditional agriculture system and have other strong tradition of protecting biodiversity of the region. Medicinal and aromatic plants are the integral parts of the rural communities. Rural people have indigenous knowledge for curing diseases by utilizing these various natural resources from generations. The acquired indigenous knowledge of medicinal plants have less documented by any institution in the area. More than 95% of medicinal plants used in preparing medicine by various industries are harvested from wild populations in India. Medicinal plants tolerance to harvest varies with climatic conditions as the temperate herbs become highly vulnerable to harvest of individuals. Furthermore, rising demand with shrinking habitats may lead to the local extinction of many medicinal plant species. The residents of Garhwal have a vital role in environmental management and propagation of medicinal plants due to traditional knowledge and its use as medicine. It is a valuable and sustainable knowledge system developed over generations by local communities of the area. The local healers have their traditional system for curing of various diseases with undocumented knowledge. It has been observed as one of the best option of sustainable livelihoods for the residents of the area. Studies on use of traditional knowledge of medicinal plants in different areas of Garhwal have been conducted and observed the continuous exploitation of several medicinal plant species from the wild and substantial loss of their habitats and decline of many high value medicinal plant species over the years. Use of harvesting technology of medicinal plants would be valuable to recover the traditional knowledge and generate sustainable livelihoods for the community. Medicinal plants and bioresources are an integral part of their life system. Inhabitants including local healers and rural women have well developed indigenous knowledge on medicinal plants with strong healing capacities. About 150 medicinal plant species were documented with healing properties, which are generally used by the community for various purposes.

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Community Based Sustainable Development Biodiversity Monitoring Programme in Nanda Devi Biosphere Reserve, World Heritage Site, Western Himalaya: Climate Change Perspective

V.P. Uniyal* and Shazia Quasin

Mountains are early indicators of climate change. They play major roles in influencing regional and global climates. In recent times it is believed that the changes occurring in the fragile mountain ecosystems will be providing an early warning of the changes to the environment, so it is vital that the biological and physical components of mountains are strictly monitored and studied. Climate change will also mean changes in the hydrological cycle with less snow and more rain, as well as extreme and more frequent events such as fires, floods, droughts and storms. Such changes could occur even with relatively small increases in temperature and could have serious impacts on agriculture-based livelihoods, infrastructure and health. These threats are also prevailing and quite visible in the Himalayan regions in recent times. Nanda Devi Biosphere Reserve (NDBR), located within the high mountainous ranges of Uttarakhand state of the northern parts of the western Himalayas. The NDBR includes the Nanda Devi and Valley of Flowers National Park (5860.69 sq km. Latitude N30°08' - 31°02' and Longitude E 79°12' - 80°19' with large altitudinal range 1,800 to 7,817 amsl). The area with unique topography, climate and soil supporting diverse ecosystem, habitats, communities, richness and species is one of the important site of wilderness and hot spot of biodiversity. This region harbours rich diversity and distribution of high altitude floral and faunal species, which is characterized by high endemism, rarity and existence of numerous local geographical subspecies. The knowledge of Himalayan biodiversity is sparse as compared to other region, because of its difficult terrain and climatic condition. Realizing the importance of its biological diversity and...
occurrence of several rare and endangered floral and faunal species the NDBR was listed as World Heritage Site. The high percentages of endemic species richness itself identify the conservation value of the reserve. The reserve supports over 1,000 species of plants and about 520 species of fauna including mammals, birds, reptiles, amphibians, fishes, insects and molluscs and annelids.

A total of 47 villages fall within the buffer zone of the reserve. People living in these villages have two ethnic groups viz., Indo-Mongoloid and Indo-Aryan with indigenous culture, tradition and religious beliefs. They reside in the higher mountains close to the area of the park with very small land holdings, inaccessibility and remoteness coupled with short working season makes any development initiatives difficult in this area. The main occupation is agriculture, sheep rearing and small tourism based economy. They solely depend on forests for fuel, fodder and NTFP collection. They have traditional knowledge system of medicinal plants and natural resources for sustainable livelihood. For the first time, long term ecological monitoring programme for the conservation of biodiversity has been designed with the residents, their traditional knowledge and involvement of scientific institutions using modern scientific tools. The need of research and monitoring for the conservation of biodiversity needed in this fragile biodiversity area of the Western Himalayas is vital for assessing future changes and shift of climatic condition of the region.

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The Natural History of the 2010 West Indian Herpetofauna REU through
Avila University engaged in collecting fieldwork pertinent to the local inhabitants of Union Island in St. Vincent & The Grenadines (SVG).

Hayden Hedman

We are currently working on a collaborative intervention in sharing the ecological knowledge gained from the research experience for education and conservation. The research produced four publications and more still in press that will be implemented into local schools and regional NGOs to support educational and conservation efforts.

We met with local educators and administrators while on Union Island and agreed to exchange information obtained from the island. We will develop an electronic curriculum accessible for the Union Island education system based on Quinn et al. publication (cited below). IUCN Red List assessments have been submitted for three species: Gonatodes daudini, Typhlops tasymicris, and Sphaerodactylus kirbyi. The recommended conservation status of the first two species is critically endangered and that of the third vulnerable. We were confronted daily with the complexity of working on a small island that local inhabitants comprise of only a small percentage of the overall population (approx. 20%). The immigration of citizens from throughout the Caribbean and an influx of seasonal and annual tourism has diluted much of the island’s original autonomy. Based largely on recommendations in Bentz et al. (cited below), we continue to work closely with the SVG Department of Forestry and local NGOs (Environmental Attackers, Sustainable Grenadines, SVG National Trust) to develop and implement a conservation plan for the slopes above Chatham Bay on Union Island. This is the most important watershed on the island and provides the only known habitat for the three species listed above. It is threatened by development plans that include a road construction project that would bisect the habitat and fragment the populations of the species, as well as a plan to expand a resort currently catering to yachts that anchor in the bay. As another means of preservation, we have been in contact with an international NGO (Conservation International) in regard to controlling feral mammals (goats that threaten the integrity of the habitat and cats that prey on small reptiles). This research conducted in conjunction with these endeavors is situated within the long-term goals that seek to: (1) re-route the road to minimize impact on the critical habitat, (2) restrict the development of the resort to the beach, and (3) establish the slopes as a protected area. The ecological research obtained instills a crucial element in conserving the biota of the island and also maintaining the natural landscape. The environment is an and ecological and cultural facet engrained in the livelihoods and autonomous culture of Union Islanders.

Publications:

Indigenous Knowledge Governance System: A holistic model for indigenous knowledge management.

**Tariq Zaman**¹, **Alvin W. Yeo**¹, **Narayanan Kulathuramaiyer**²

There are more than 30 million people living in South East Asia who can be classified as indigenous minorities. For indigenous communities their knowledge is the main resource not merely for economic gains but also for their survival. The scientific community and organisations focuses on Indigenous Knowledge (IK) management as management of corpus of facts rather than management of and by a living system. IK as a living system has a much broader understanding of indigenous people and system as the community places themselves in relation to the environment in which they live. It is well acknowledged that use of ICTs for indigenous cultural preservation and revitalization can lead to several challenges. The Open Data movement is an example. This study will adapted the use of current knowledge management tools in the realization of a holistic approach to model Indigenous Knowledge Governance System (IKGS). The research methodology comprises two components first an intensive process of knowledge management system audit where the current community knowledge management practices and processes would discover while in second phase a generic framework of IKGS would propose. In this paper we present KM assessment tool for indigenous communities which has been tested in remote community in Bario, Sarawak. On the bases of our assessment of IKM of Bario, community capacity and resources, we have developed a IKGS framework and strategy map for Bario community. The framework developed has been instrumental in delivering strategies to best address the particular needs for effectively empowering indigenous communities. The newly formulated Malaysia National ICT R & D framework emphasizes on the provision of info-structures via tools, technologies and methodologies to support knowledge management (ranging from acquisition, through organization to application) as well as develop creative content with core competency in providing various media content, access, services and products. Our proposed research will support the second layer of the National ICT R & D framework that is generic processors for multilingual, multimedia, multimodal, knowledge management technology. This paper will highlight some of the lessons learnt during our replication and deployment process of the project using the eBario Project as an initial guide.

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²Faculty of Computer Sciences and Information Technology.

Engaging with Communities, Applying Technology, and Facilitating Network Building: Experiences from the Exchange for Local Observations and Knowledge of the Arctic Project

**Peter L. Pulsifer**, Shari Gearheard, Henry Huntington, Mark Parsons, Chris McNeave, Heidi McCann

The Exchange for Local Observations and Knowledge of the Arctic project (ELOKA) facilitates the collection, preservation, exchange, and use of local observations and knowledge of the Arctic. Additionally ELOKA is collaborating with other researchers and organizations around the world who are engaged in addressing data management issues for community-based research. We are working to build a community that facilitates international knowledge exchange, development of resources, and collaboration focused on local communities and stewardship of their data, information, and knowledge.

This paper presents a review and critical evaluation of our experiences to date in three areas: i) engaging with communities, including Northern communities and communities of practice from the North and other regions ii) applying technologies to the acquisition, documentation, representation and long-term stewardship of local and traditional knowledge iii) working with other international partners to facilitate the development of a network in support of the exchange and stewardship of community knowledge. We conclude the presentation with an analysis of successes and ongoing challenges. An overview of best practices is provided and areas of future research are identified.

National Snow and Ice Data Center, University of Colorado at Boulder

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Inuit Qaujisarvingat: The Inuit Knowledge Centre – Emerging Opportunities in Knowledge Stewardship from a National Inuit-Specific Lens

Rebecca Mearns, Carrie Grable

Issues of Arctic sovereignty, resource development, climate change and militarization have magnified interest in northern research. These issues have influence on Arctic science through increasing demands for timely scientific information as well as the engagement of Arctic Indigenous peoples. Much emphasis has been placed on the inclusion of local Inuit knowledge in science, research and policy development in northern Canada. The challenge still remains on how to build sustainable Inuit communities that can fully participate in finding innovative ways to connect Inuit knowledge with science, research and policy development.

This presentation will discuss Inuit Qaujisarvingat: The Inuit Knowledge Centre (IKC), an initiative launched by Inuit Tapiriit Kanatami to work towards addressing these challenges and opportunities. The IKC is in a unique position to provide a National Inuit-specific lens on Arctic science and research. We will explain how the Centre focuses its efforts to ensure an increasingly active role for Inuit in research that leads to the generation of innovative knowledge for improved research, science and policy decision making within a Canadian and global context. Data management and knowledge stewardship are an integral part of IKC’s mandate and some of the activities in this area will be discussed.

Inuit Qaujisarvingat, Inuit Tapiriit Kanatami, Ottawa, Canada

Data Management and Local Knowledge: Building Networks to Support Community-based Ecosystemic and Socio-Economic Monitoring in Nunavut Canada

Seth Reinhart

Article 12.7.6 of the Nunavut Land Claims Agreement (NLCA) requires that government and the Nunavut Planning Commission cooperate to develop and implement a plan for monitoring the current and cumulative long-term environmental impacts of development in Nunavut. This plan is referred to as the Nunavut General Monitoring Plan (NGMP).

NGMP will provide for the collection, analysis and dissemination of information regarding the state and health of the eco-systemic and socio-economic environment in the Nunavut Settlement Area. NGMP will contribute towards the establishment of baseline data and the continued collection of data required to monitor environmental changes over time.

NGMP is a partnership governed by the NGMP Steering Committee which is composed of Nunavut Tunngavik Incorporated (NTI), the Government of Nunavut (GN), the Nunavut Planning Commission (NPC) and Indian and Northern Affairs Canada/Government of Canada (INAC/GoC). The NGMP Steering Committee is supported by the NGMP Secretariat, Partner Advisory and Expert Advisory Groups.

Nunavut general monitoring information will be managed and shared via the NGMP Information Management System (IMS) and periodic reports. The NGMP IMS/Portal will provide a one-window, web-based portal to qualitative and quantitative information on Nunavut's environment at a local, regional and territorial level. The IMS will include a searchable metadata/repository for data. Outreach/engagement and reporting functions will acknowledge user skills and have a multi-lingual user interface. Key information will need to be available in a variety of formats, and in all Nunavut official languages.

NGMP will take a creative and coordinated partnership approach to monitoring in Nunavut. General monitoring should have regard for community, regional, territorial, national and international contexts, including both qualitative (i.e. Inuit Qaujimajatuqangit) and quantitative information. Information that is collected must be accurate, reliable and available in formats that are useful and culturally appropriate for the full range of users. The NGMP will be part of the decision-support system to inform sound decisions, policies, and to take effective action in realizing the Territory’s goals. NGMP participants (users and information providers) include:

- Inuit
- Institutions of Public Government

Nunavut General Monitoring Plan

- Government
- Inuit organizations
- Regional wildlife organizations/local Hunter and Trapper Organizations
- Communities/municipalities
- Non-governmental organizations

As the NGMP IMIT system is currently in the early stages of development, NGMP is interested in learning and sharing information regarding data management; particularly as it relates to local and IQ/traditional knowledge given the significance of this data in the Nunavut context. In Nunavut, IQ/traditional knowledge is frequently held and transmitted orally, and there are various efforts initiatives to capture and digitize this information in various forms. Currently, a great deal of traditional knowledge is held closely by community members and not widely accessible to inform and support development decisions. At the same time, community credibility of data collected and made accessible through NGMP is paramount to meaningful monitoring. To be credible, Nunavummiut will need to be able to “see themselves” in the data.

As NGMP is a collaborative initiative, the NGMP IMIT system will be dependent upon the input and coordination of multiple parties. The NGMP Secretariat and Steering Committee will play key functions in fulfilling the role of establishing these networks for sharing information. These networks, from the ground up, will be vital to ensuring the credibility and transmission of the monitoring information to inform and support Nunavut’s development over time.

Eva Kruemmel

Community-Based Monitoring in the Context of the Sustaining Arctic Observing Networks (SAON) Process

The Inuit Circumpolar Council (ICC) is a circumpolar Inuit organization which represents the around 155,000 Inuit from Alaska (U.S.), Canada, Greenland and Chukotka (Russia). ICC works at international venues such as the United Nations and Arctic Council, to ensure Inuit priorities are being addressed.

In their 2006 Salekhard Declaration, the Arctic Council urged “all Member countries to maintain and extend long term monitoring of change in all part of the Arctic, and request the Arctic Monitoring and Assessment Programme to cooperate with other Arctic Council Working Groups, the International Arctic Science Committee and other partners in efforts to create a coordinated Arctic observing network, that meets identified societal needs.” This started a process to develop the “Sustaining the Arctic Observing Networks” (SAON).

SAON wants to further multinational engagement for the development of sustained and coordinated observing and data sharing systems across the Arctic. The focus is on systems that serve societal needs and are related to environmental, social, economic and cultural issues. ICC’s interest within SAON is particularly to strengthen community-based monitoring activities and to ensure that they are recognized and represented in the process.

The presentation will give the background on SAON, where it is headed, and the initiatives taken by ICC and its partners (which include ELOKA) to advance community-based monitoring in the process.

Inuit Circumpolar Council (Canada)
Ottawa, Canada

L.M. Mackey, C. Thomas, and Indigenous Observation Network Technicians.

The Yukon River Inter-Tribal Watershed Council (YRITWC) Science Department has partnered with the United States Geological Survey (USGS) and the Yukon River Basin (YRB) Tribes and First Nations in Alaska and Canada to create the largest Indigenous Observation Network (ION) in the world. This partnership is generating a long-term baseline dataset of water quality and water chemistry looking specifically at parameters that are sensitive to climate change. The Science Department was developed in an effort to address increasing concerns voiced by the Indigenous Peoples living in the YRB about the health of the Yukon River due to changes they had observed. In an effort to provide one of the first long-term water quality datasets of the Yukon River and its
tributaries, the YRITWC began working with USGS in 2005 to develop a water quality study with the goal of seamless continuation from the USGS 5-year Yukon River study that had began in 2001. Long-term datasets have proven to be indispensable in documenting trends in systems and identifying conditions that may be causing noticeable shifts from the documented baseline order. Combining these datasets with corresponding Local Traditional Knowledge (LTK) provides a powerful combination of information that specifically addresses changes in environmental trends over time. These datasets are becoming increasingly important as changing climate events begin to dictate the livelihoods of people around the world, particularly in the Arctic.

The foundation of the YRITWC is the participation and support of Tribes and First Nations within the YRB in Alaska and Canada. Interested participants from the Tribes and First Nations were trained to collect water samples and follow protocols in accordance to USGS method standards and have become the largest Indigenous Observation Network. Through this collaborative partnership water quality parameters including, pH, alkalinity, major ions, dissolved organic carbon, greenhouse gases and water isotopes, have been collected from 45 sites during 2001-2010. The ION was able to expand sampling efforts to simultaneous bi-weekly collections (May-September) from widely distributed sites on the Yukon River and tributaries. The success and strong relationships developed in the execution of the water quality study spurred the collaborative Active Layer Network (ALN) project in 2009 to begin long-term observation of systematic changes in active layer thickness with correlating soil temperature and moisture analysis. Over the course of two years 20 ALN sites were installed in locations across the YRB. ION technicians, and/or USGS/YRITWC staff complete annual active layer measurements and soil moisture/temperature data retrieval. Active Layer grid measurement and accompanying data have been added to the online international Circumpolar Active Layer Monitoring (CALM) database. Preliminary results are proving to be valuable components to the project’s long-term strength and sustainability.

The natural movement of LTK dialogue is enhanced by the participation of the ION with YRITWC projects. By narrowing the gap between scientific data collection and LTK, we are able to pursue a more holistic approach to our environmental research.

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END OF DAY 3 PRESENTATIONS