

# Communities on the Edge

## Connecting Observations and Community Health

Arctic Observing Summit, Davos Switzerland June 25, 2018

Michael Y. Brubaker, MS

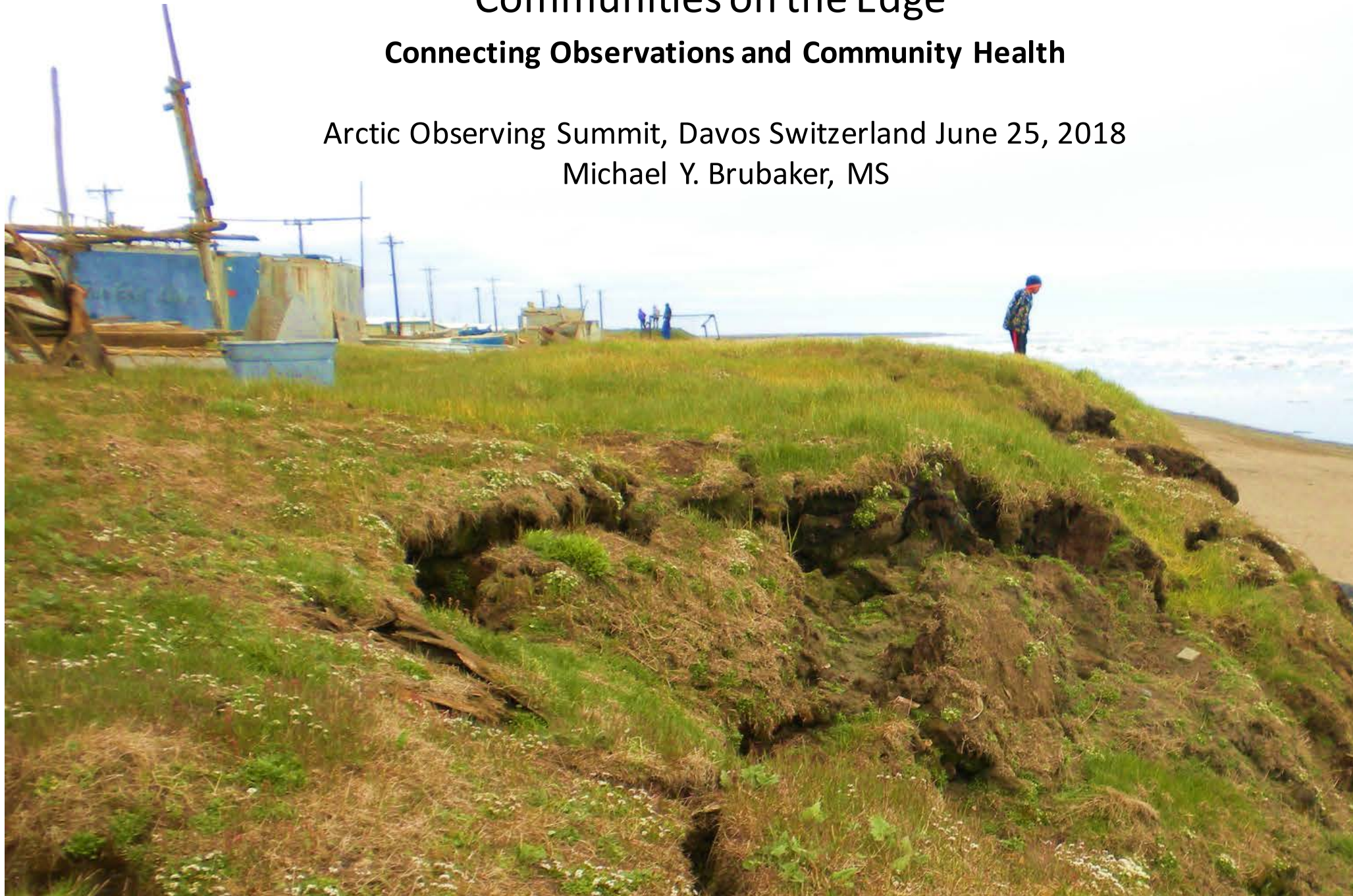










Photo: NASA



Courtesy: Aleutian Pribilof Islands Association





Photo: ShoreZone









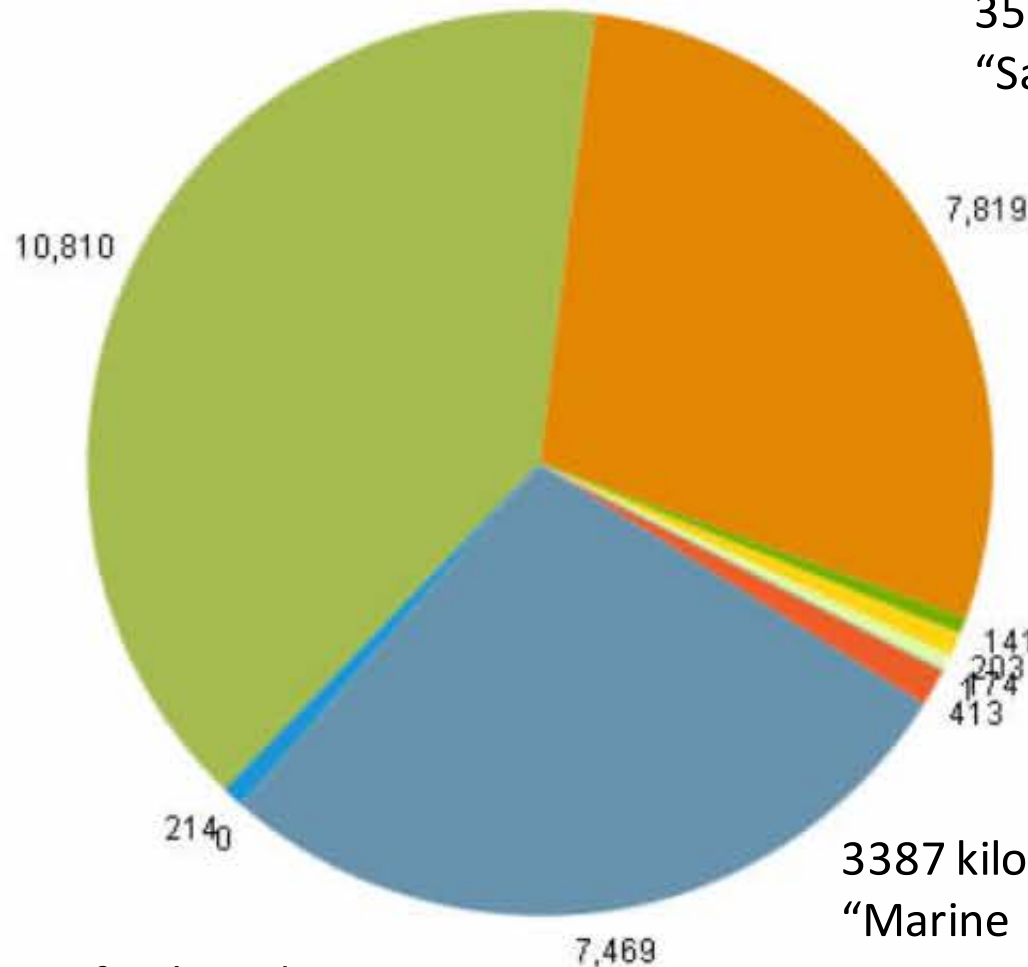
# Project Name: Aleutian Survey 1990 Baseline Harvest Profile

## Pounds Harvested

- Salmon
- Non-Salmon Fish
- Large Land Mammals
- Small Land Mammals
- Marine Mammals
- Migratory Birds
- Other Birds
- Bird Eggs
- Marine Invertebrates
- Plants and Berries

4903 kilograms of  
"Non-salmon Fish".

3542 kilograms of  
"Salmon".



3387 kilograms of  
"Marine Mammal".







# Alaska Native Tribal Health Consortium



Alaska Native Medical Center



Environmental Health  
and Engineering

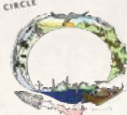


Community Health



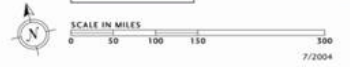
**Alaska Tribal Health System**  
**Regional Health Consortia**  
**Area Map Key by Region**

| REGION NUMBER                              | ORGANIZATION   |
|--|--|
| Alaska Native Tribal Health Consortium     |  |
| 1  | Arctic Slope Native Association  |
| 2  | Maniilaq Association   |
| 3  | Norton Sound Health Corporation  |
| 4  | Yukon-Kuskokwim Health Corporation   |
| 5  | Bristol Bay Area Health Corporation  |
| 6  | Aleutian/Pribilof Islands Association  |
| 7  | Eastern Aleutian Tribes  |
| 8  | Kodiak Area Native Association   |
| 9  | Southcentral Alaska<br>Alaska Native Medical Center<br>(jointly managed by ANTHC & SCA)<br>Southcentral Foundation   |
| 10   | Chugachmiut  |
| 11   | Copper River Native Association  |
| 12   | Mt. Sanford Tribal Consortium  |
| 13   | SouthEast Alaska Regional Health Consortium  |
| 16   | Tanana Chiefs Conference   |
| <b>Tribal and/or Local Health Programs</b> |  |
| REGION NUMBER                              | ORGANIZATION   |
| 1  | UJC (Barrow)   |
| 3  | Diomedea, Native Village of  |
| 4  | Kwinhagak, Native Village of<br>Akiachak Native Community  |
| 6  | St. George Traditional Council   |
| 8  | Karluk, Native Village of  |
| 9  | Southcentral Alaska<br>• Eklutna, Native Village of<br>• Ninilchik Village Traditional Council<br>• Selkovia Village Tribe<br>• Chickaloon Village Traditional Council<br>• Knik Tribal Council<br>• Tyonek, Native Village of<br>• Kenaitze Indian Tribe, IRA |
| 10   | Valdez Native Tribe<br>Eyak, Native Village of   |
| 11   | Chitina Traditional Council  |
| 13   | Hoonah Indian Association<br>Yakutat Tlingit Tribe   |
| 14   | Ketchikan Indian Corporation   |
| 15   | Metlakatla Indian Community  |
| 17   | Council of Athabaskan Tribal Governments   |



**Legend**

- Village
- Village with Clinic
- Subregional Clinic
- Regional Hospital
- Alaska Native Medical Center (jointly managed by ANTHC & SCA)
- ▭ Tribal or Local Health Program
- ▭ Regional Area Border
- Road











Courtesy: LEO Network





Photo Courtesy: LEO Network





Courtesy: LEO Network





Photo courtesy LEO Network





Photo courtesy LEO Network



# Center for Climate and Health



***Disease***



***Behavioral Health***



***Food Security***



***Injury***



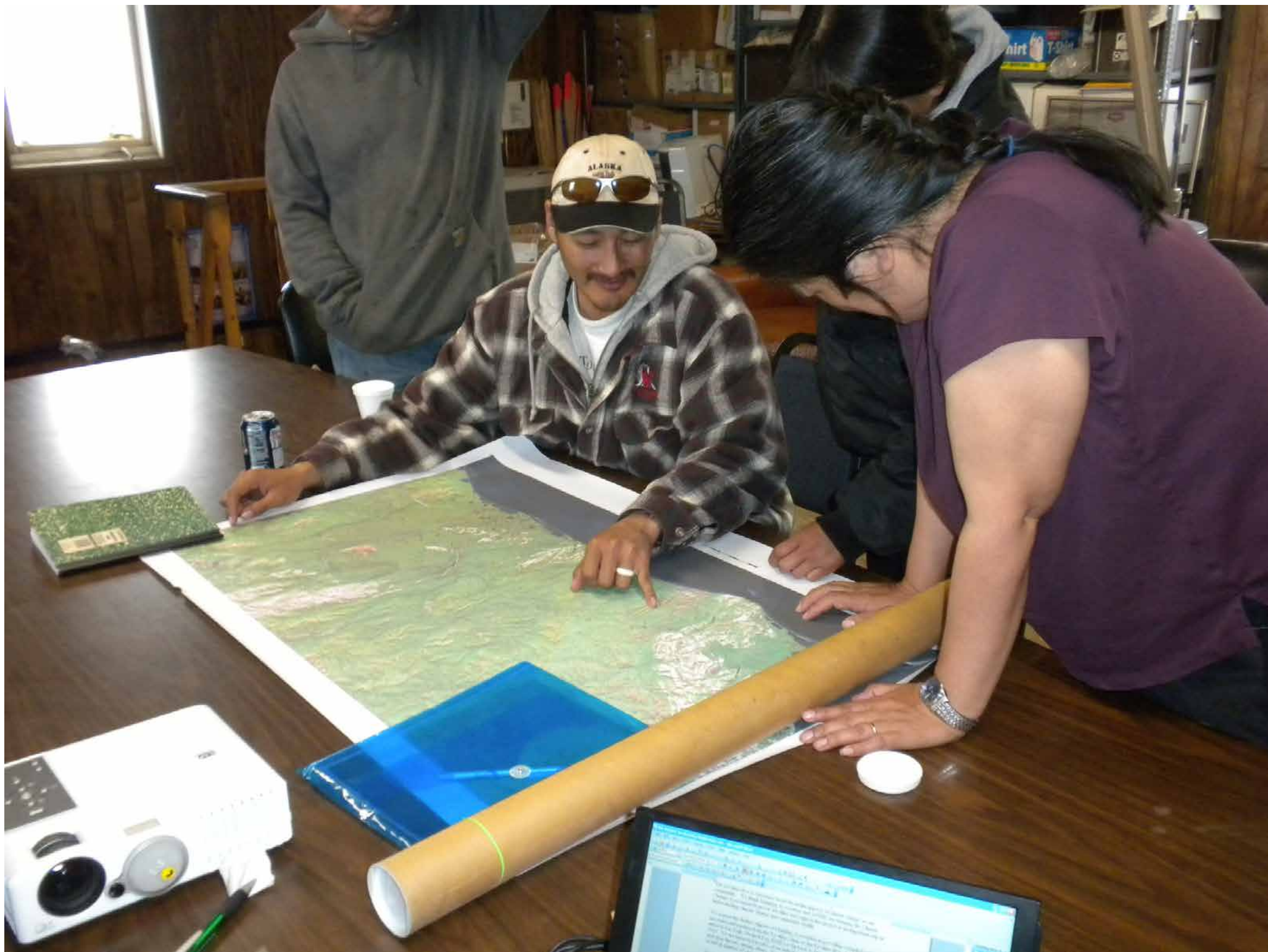
***Water Security***

In 2009 ANTHC established for first center in the nation with a focus on understanding the connections between climate change, environmental impacts and health effects.

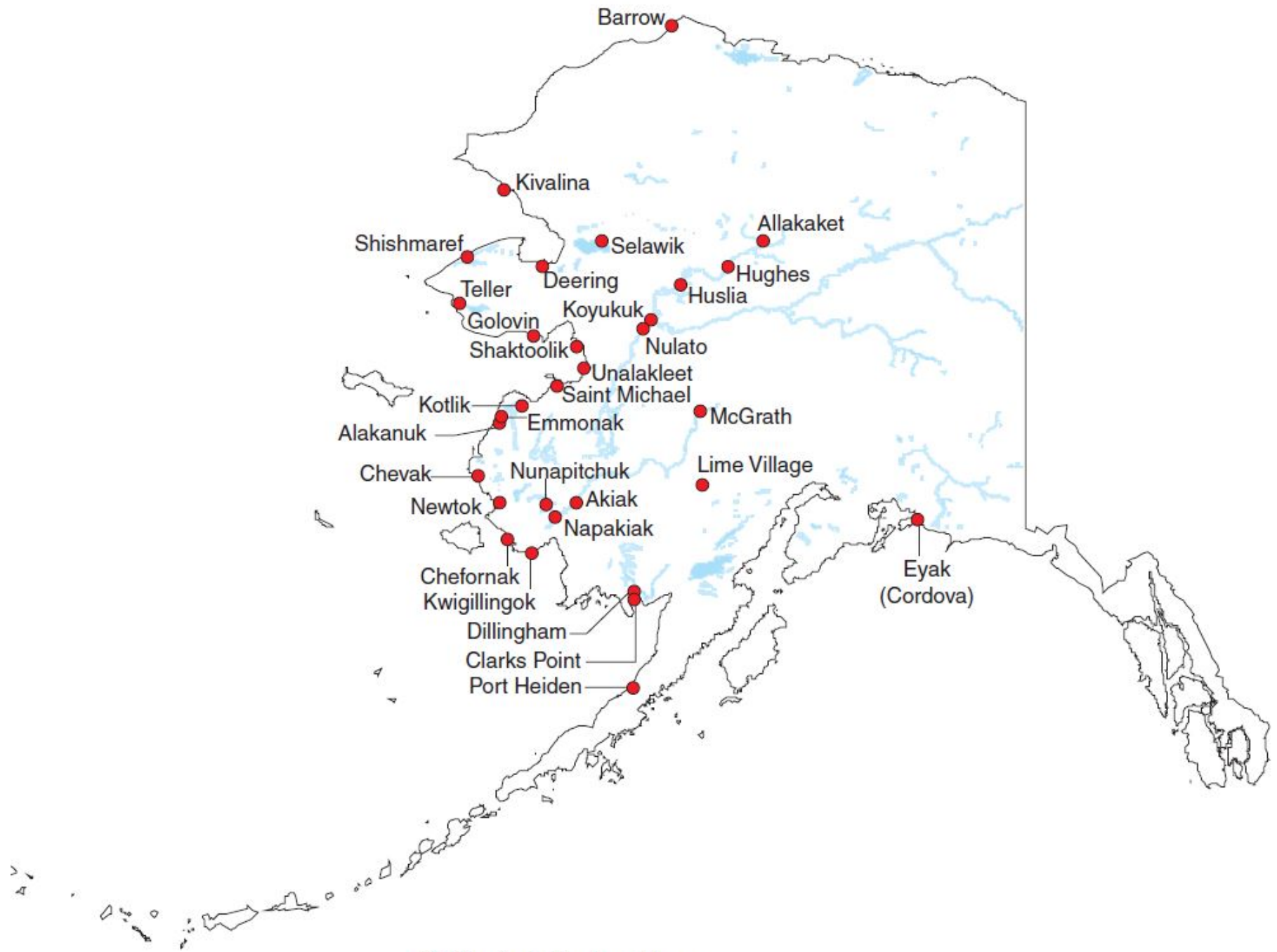


ALASKA NATIVE  
TRIBAL HEALTH  
CONSORTIUM









● 31 imminently threatened villages





Photo: NASA





Photo Tim Matsui





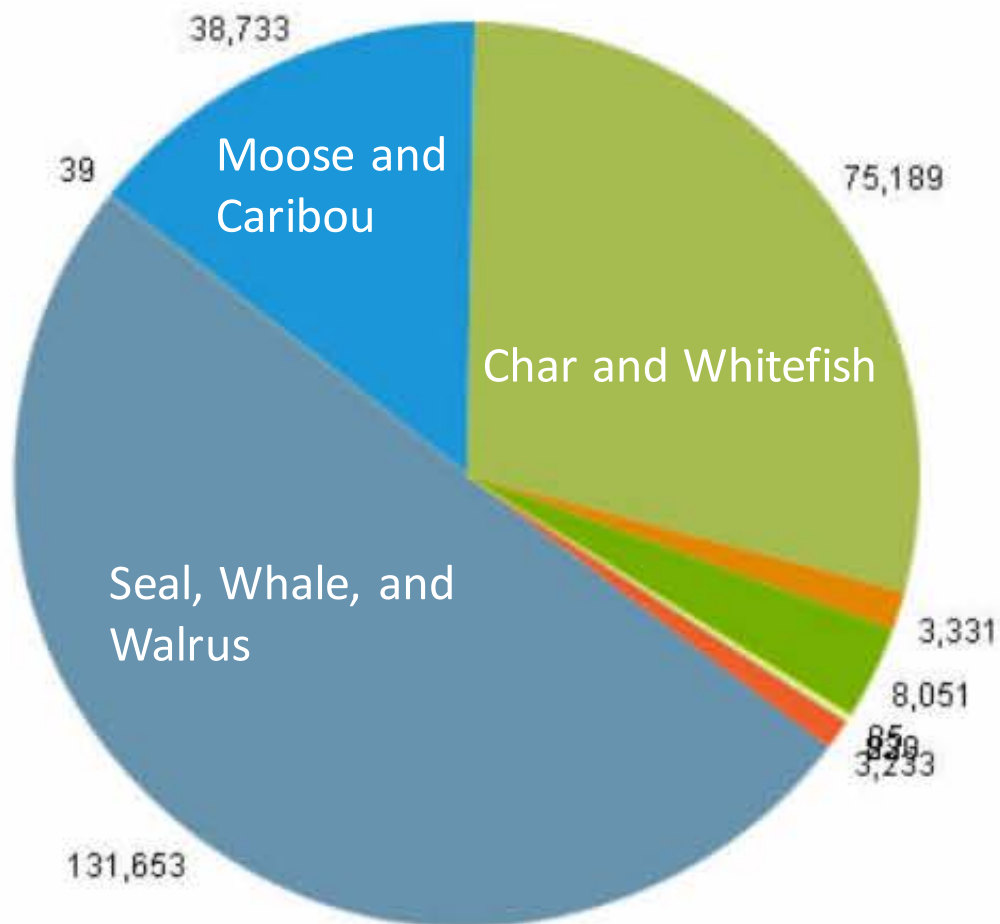


# Project Name: Noatak & Kivalina Baseline Update

## Baseline Harvest Profile

### Pounds Harvested

- Salmon
- Non-Salmon Fish
- Large Land Mammals
- Small Land Mammals
- Marine Mammals
- Migratory Birds
- Other Birds
- Bird Eggs
- Marine Invertebrates
- Plants and Berries



Source: Alaska Department of Fish and Game





Photo by Millie Hawley



Please  
do not  
spill  
in  
sink







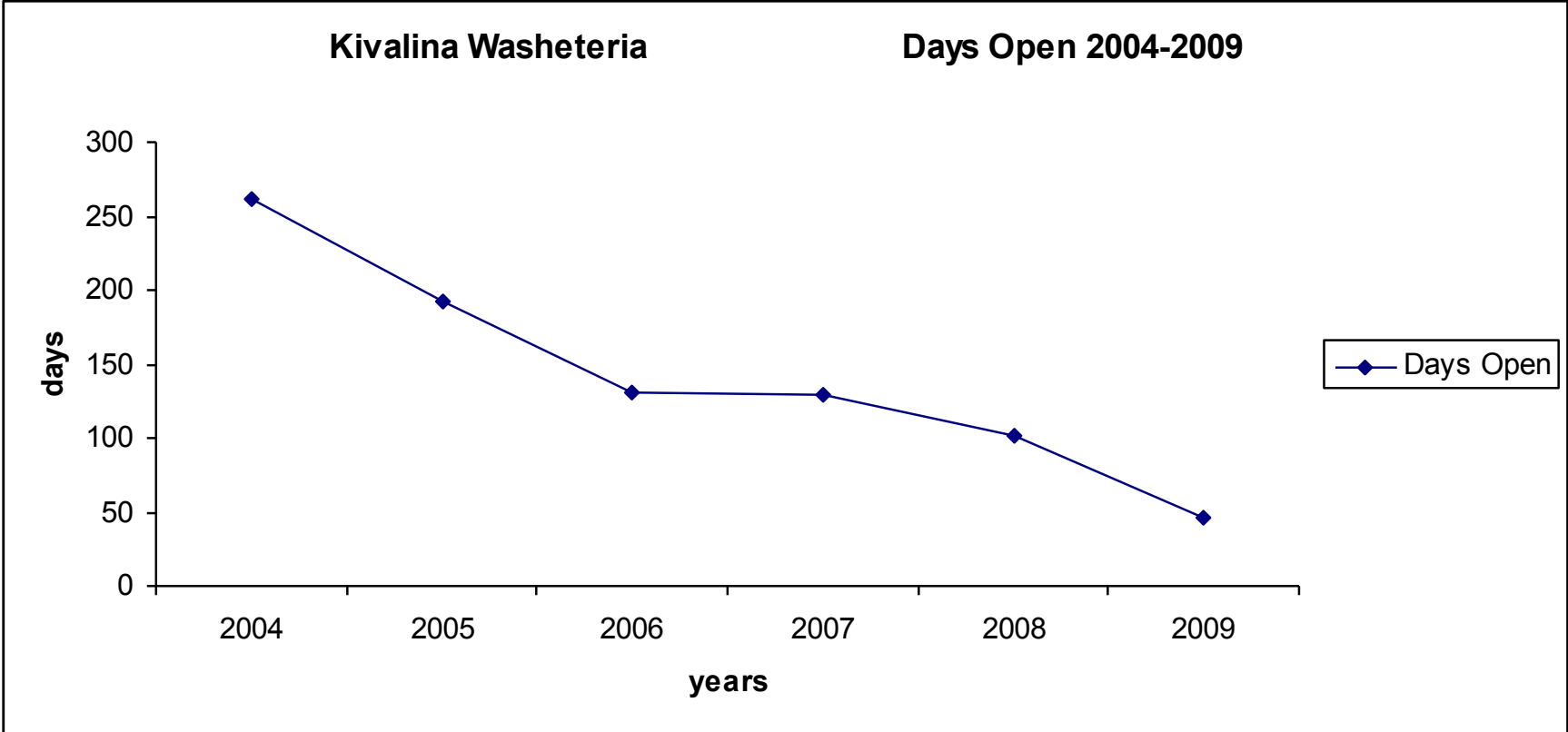








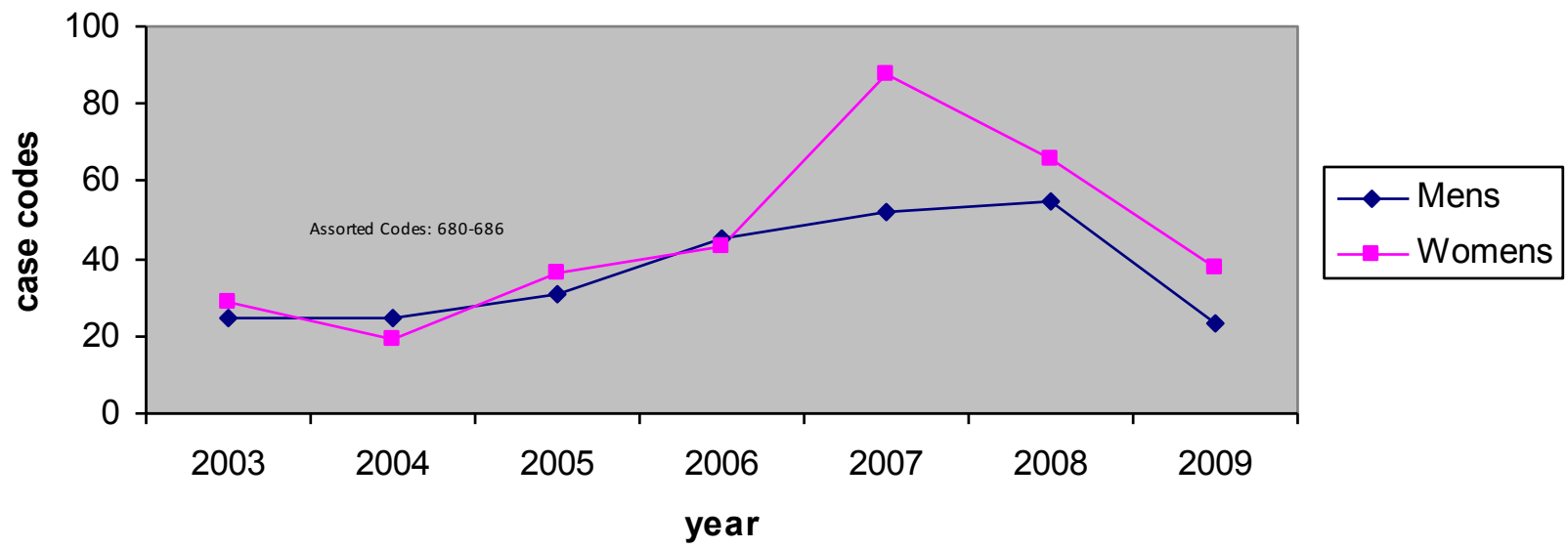




Source: City of Kivalina Washeteria Logbook



### Skin Diseases 2003-2009











Int J Circumpolar Health. 2013; 72: 10.3402/ijch.v72i0.21233.

Published online 2013 Aug 5. doi: [10.3402/ijch.v72i0.21233](https://doi.org/10.3402/ijch.v72i0.21233)

PMCID: PMC3754545

PMID: [23986890](https://pubmed.ncbi.nlm.nih.gov/23986890/)

## Washeteria closures, infectious disease and community health in rural Alaska: a review of clinical data in Kivalina, Alaska

[Timothy K. Thomas](#),<sup>1,\*</sup> [Jake Bell](#),<sup>1</sup> [Dana Bruden](#),<sup>2</sup> [Millie Hawley](#),<sup>3</sup> and [Michael Brubaker](#)<sup>1</sup>

[Author information](#) ▶ [Copyright and License information](#) ▶ [Disclaimer](#)

This article has been [cited by](#) other articles in PMC.

### Abstract

Go to:

### Background

Go to:

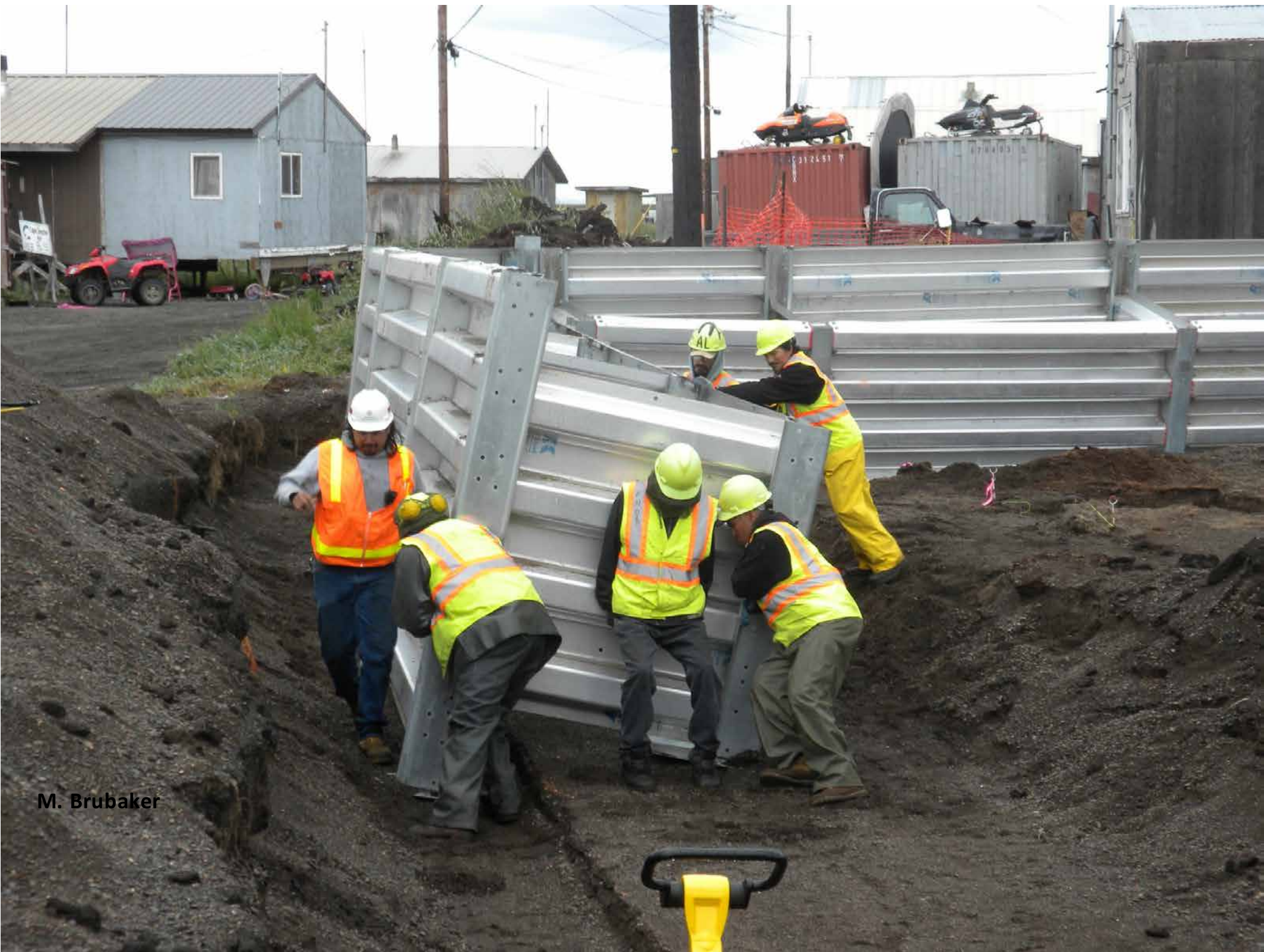
Kivalina is a northwest Alaska barrier island village of 400 people vulnerable to storm surges exacerbated recently by delayed winter sea and shore ice formation. The village has no in-home piped water or sewage; the “washeteria” is the only structure providing public showers, laundry facilities and flush toilets. In October 2004, a storm damaged the washeteria septic system resulting in prolonged facility closures. We assessed rates of gastrointestinal, respiratory and skin infections potentially impacted by prolonged washeteria closures.

### Methods

Go to:

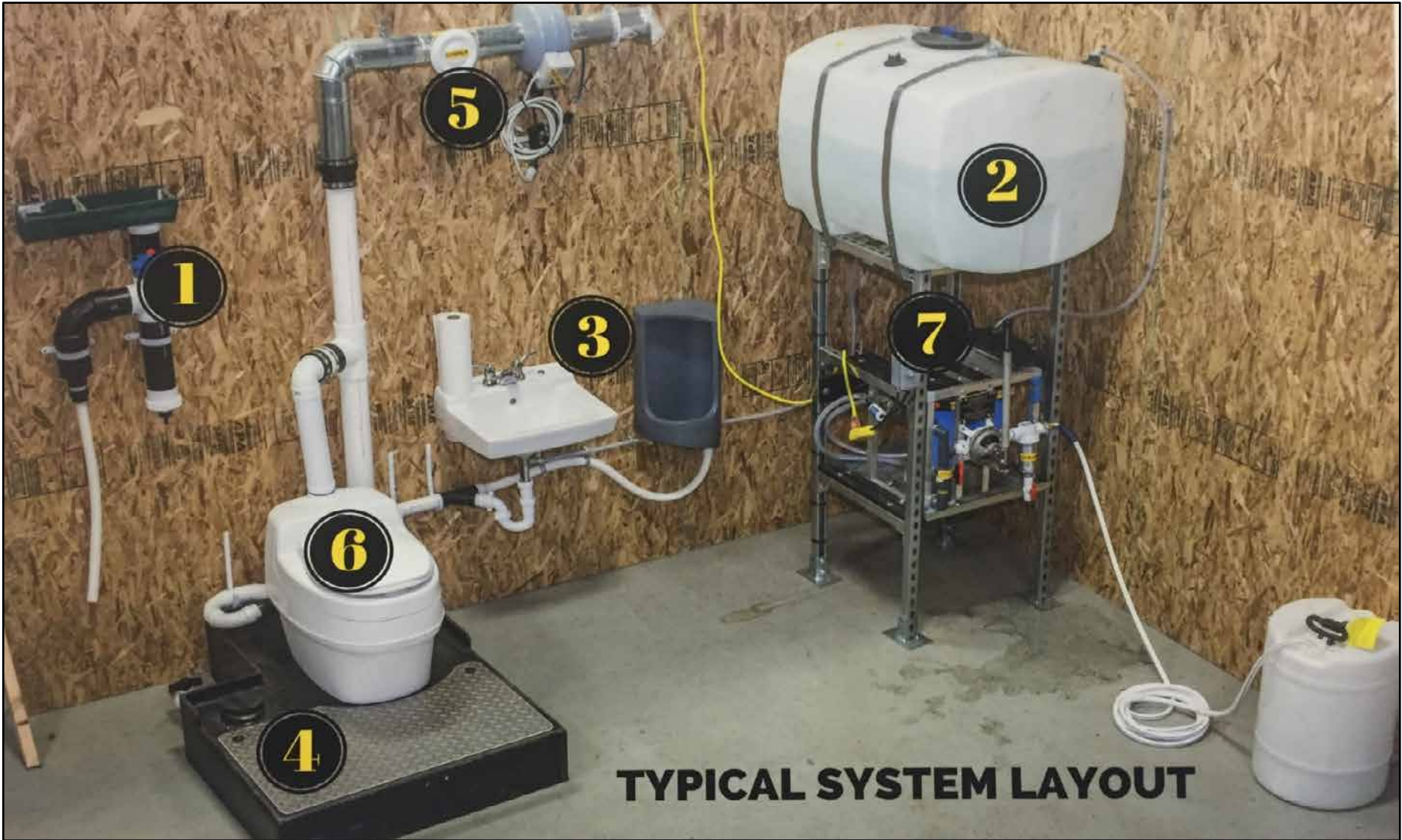
We obtained washeteria closure dates from 2003 to July 2009 and defined >7 day closure as prolonged. We received de-identified data on all Kivalina clinic visits from 2003 to 2009 and selected visits with ICD-9 diagnosis codes for respiratory, skin, or gastrointestinal infection; subsequent same patient/same illness-category visits within 14 days were excluded. We compared annual visit rates, for all ages combined, before (2003–2004) and after (2005–2009) the “2004” storm.





M. Brubaker





**TYPICAL SYSTEM LAYOUT**









Climate Change in **Kivalina**, Alaska  
Strategies for Community Health



ANTHC Center for Climate and Health

Funded by



Brubaker M., Berner J., Bell J., Warren J., Climate Change in Kivalina, Alaska, Strategies for Community Health. ANTHC, 2010.

<http://www.anthc.org/chs/ces/climate/climateandhealthreports.cfm> \

Funded by United States Indian Health Service Cooperative Agreement No. AN 08-X59



# Health Effects of Climate Change Impacts in Kivalina

*Allergic Reactions*



*Mental Health*



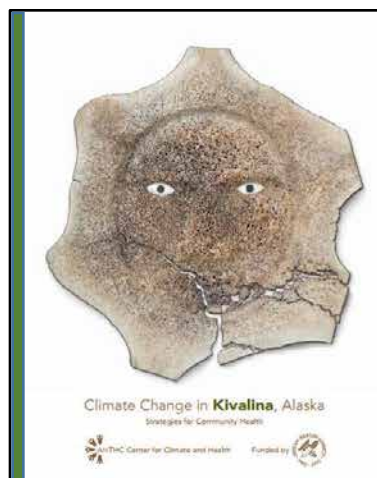
*Travel Safety*

*Food Spoilage*



*Waterborne Disease*

*Food Confidence*



*Respiratory Health*

*Injury*



*Ice Hazards*

*Nutrition*



*Water Quality*



*Infrastructure Damage*



*Infection*

# Health Effects of Climate Change Impacts in Kivalina

**Allergic Reactions**  
**Invasive Insects**



**Travel Safety**  
**River and Trail Conditions**

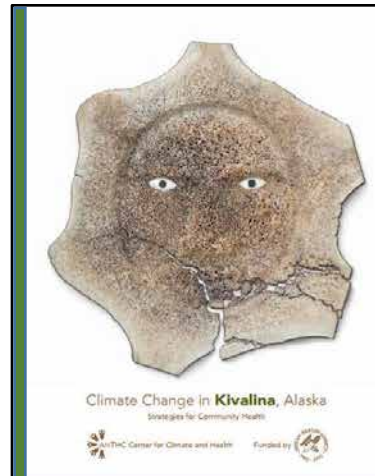
**Food Spoilage**  
**Permafrost Temperatures**



**Mental Health**  
**Event / Seasonal Stress**



**Waterborne Disease**  
**Smoke and Pollen Levels**



**Respiratory Health**  
**Smoke and Pollen Levels**

**Food Confidence**  
**Marine Mammals**



**Ice Hazards**  
**Sea ice conditions**

**Injury**  
**Marine Mammals**



**Infection**  
**Emerging Health Threats**

**Nutrition**  
**Harvest Levels**



**Water Quality**   **Infrastructure Damage**  
**Streams and Lakes**   **Environmental Design Parameters**



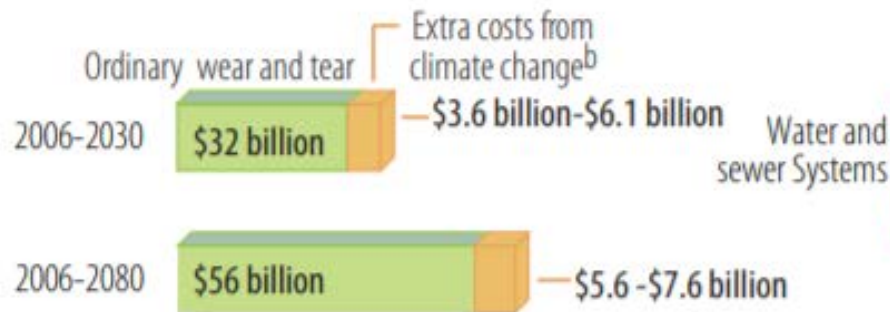


**Figure 1. How Much Might Climate Change Add to Future Costs for Public Infrastructure in Alaska?**

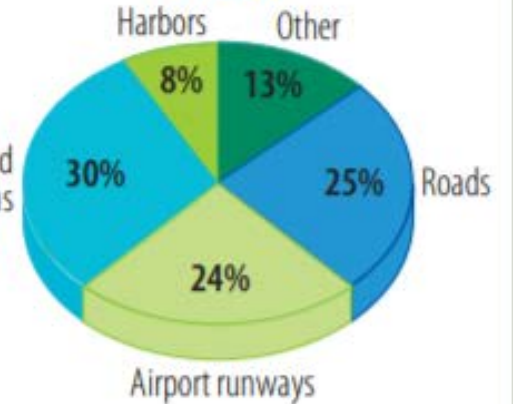
**Examples of Public Infrastructure (Federal, State, and Local)**

- Roads: 9,564 miles
- Airports: 253
- Bridges and harbors: 954
- Schools: 520
- Water and sewer systems: 366
- Railroad tracks: 819 miles
- Law enforcement, defense, emergency services, and health-care facilities: 841

**Estimated Cost of Replacing Infrastructure as It Wears Out<sup>a</sup>**



**Likely Share of Extra Costs (By 2030)<sup>c</sup>**



<sup>a</sup>These estimates are in *net present value*, which is a standard way of summarizing potential costs over long periods. Think of it as the amount that would need to be deposited in a bank today, earning interest, to cover all the costs for a project (or some other purpose) over a specified future period. <sup>b</sup>Depends on the level of climate warming and takes likely design adaptations into account. <sup>c</sup>Assumes moderate climate warming

**Estimated Cost of Replacing Infrastructure as It Wears Out<sup>a</sup>**



**Total 7.6 billion  
Water 2.1 billion**

## **Kivalina Storm – Septic System Damage Impacts**

### **Infrastructure Costs:**

New septic drainfield: \$200,000.00

Revetment Wall Cost: \$13,428,774

### **Patient Treatment Costs:**

Disruption of community access to showers, flush toilets and washing machines. Increased cases of skin infections. Cost – undetermined.

### **Relocation of Village ~ \$400 million**

Health Component\* (Water): \$13 million

Health Component\* (Waste Water System): \$11 million

Health Component\* (Landfill): \$750,000\*

Health Component\* (Clinic): \$3.5 million

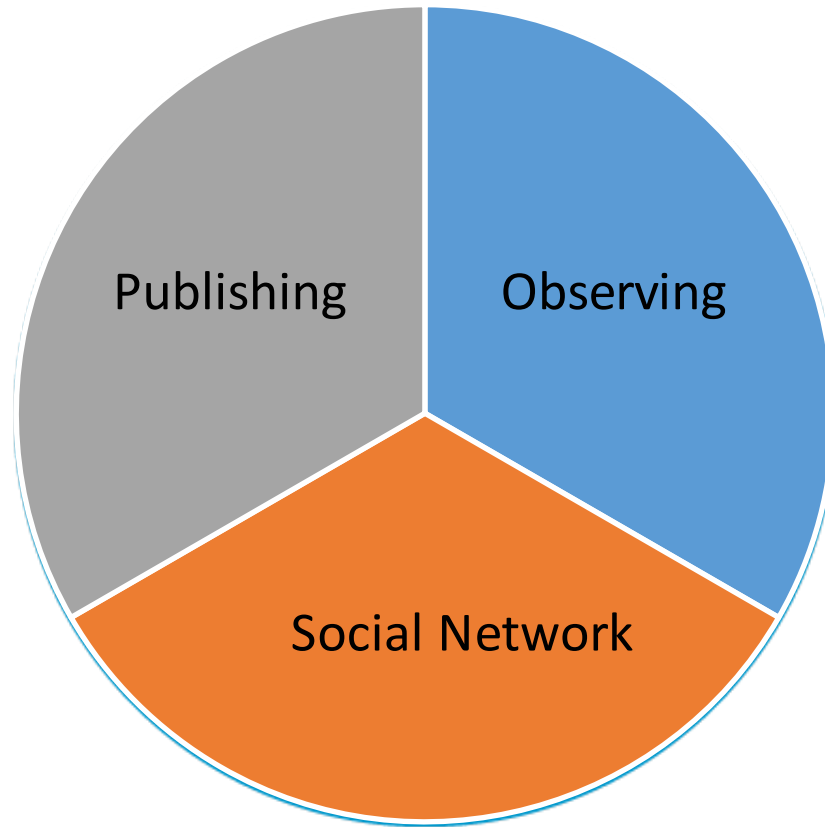
*\*Estimated*





M. Brubaker

# Three Platforms





A person wearing a green wetsuit and a dark cap with a fur-lined hood is sitting on a boat. The background shows a body of water and a cloudy sky. A semi-transparent text box is overlaid on the left side of the image.

To respect and acknowledge the contributions of all members.

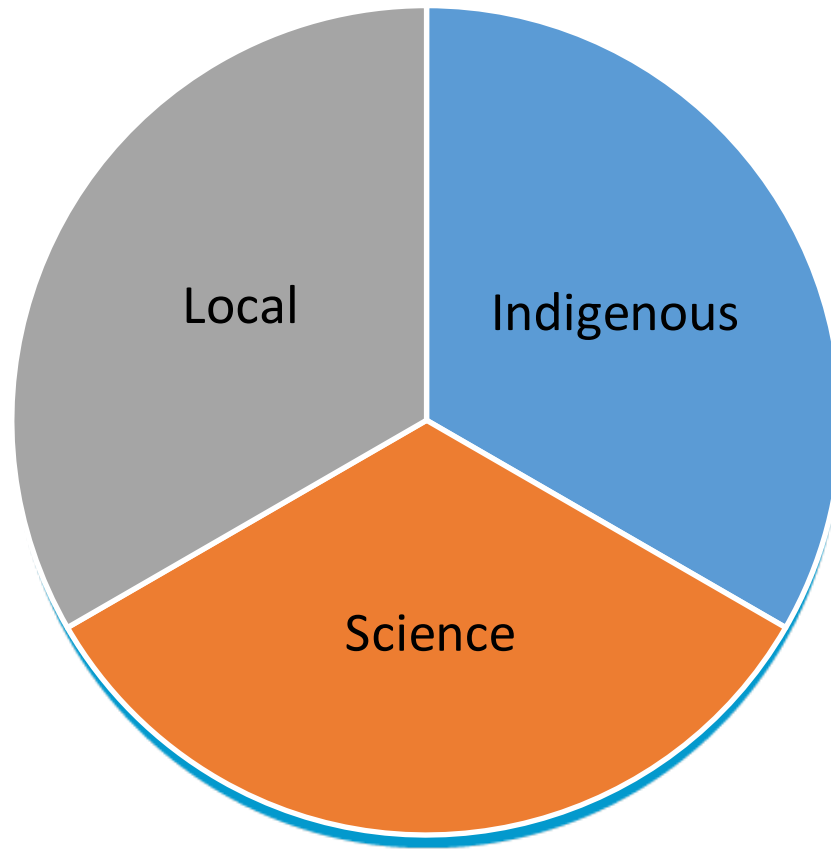
To help guide members to the resources they need.

To make the information accessible for all.

To respect privacy and create a safe, professional space for information sharing.

And to make the system inclusive of different knowledge systems.

# Three Knowledge System







Observation



Extreme or Unusual Event – time and location specific



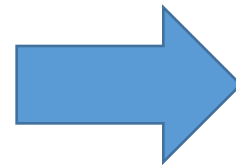
Member applies their knowledge (local, traditional, scientific) to evaluate relevance of event for LEO Network.



Member decides observation is significant and appropriate for sharing.



Observer takes pictures and submits observation using website or LEO Reporter App (field).



Observation Submitted



Observer is notified and accepted observations are published to LEO Network.



Observer



Sharon Nayokpuk  
Shishmaref Alaska, United States

Environmental  
Department  
**Native Village of  
Shishmaref**

Consultant



Jennifer Demir  
Nome Alaska, United States

Environmental Health  
**Norton Sound  
Health Corporation**

Consultant



Vladimir  
Romanovsky  
Fairbanks Alaska, United States

Professor of  
Geophysics  
**Permafrost  
Laboratory**

Consultant



Michael Opheim  
Seldovia Alaska, United States

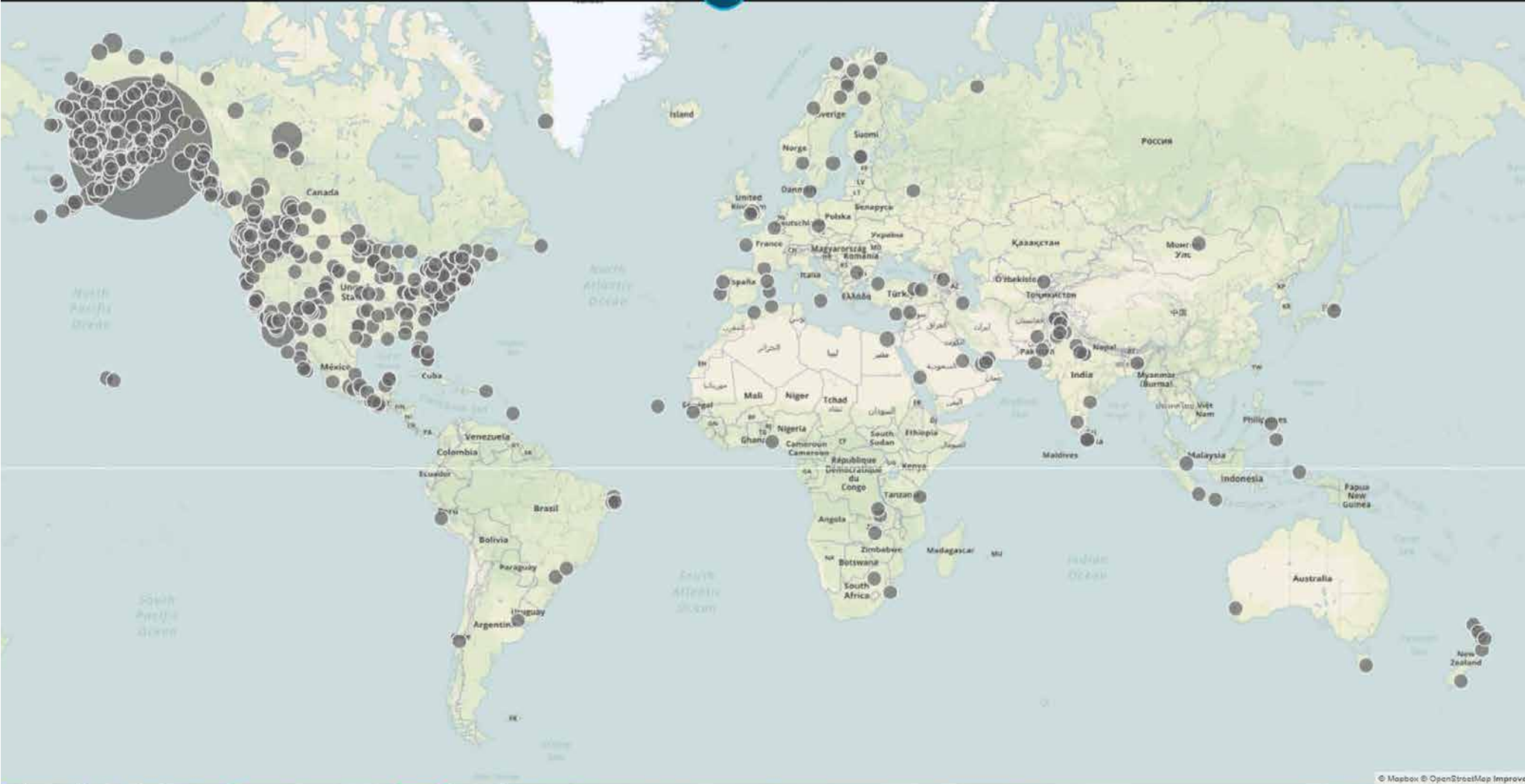
Environmental  
Coordinator  
**Seldovia Village  
Tribe**

Consultant



Richard L. Thoman  
Jr  
Fairbanks Alaska, United States

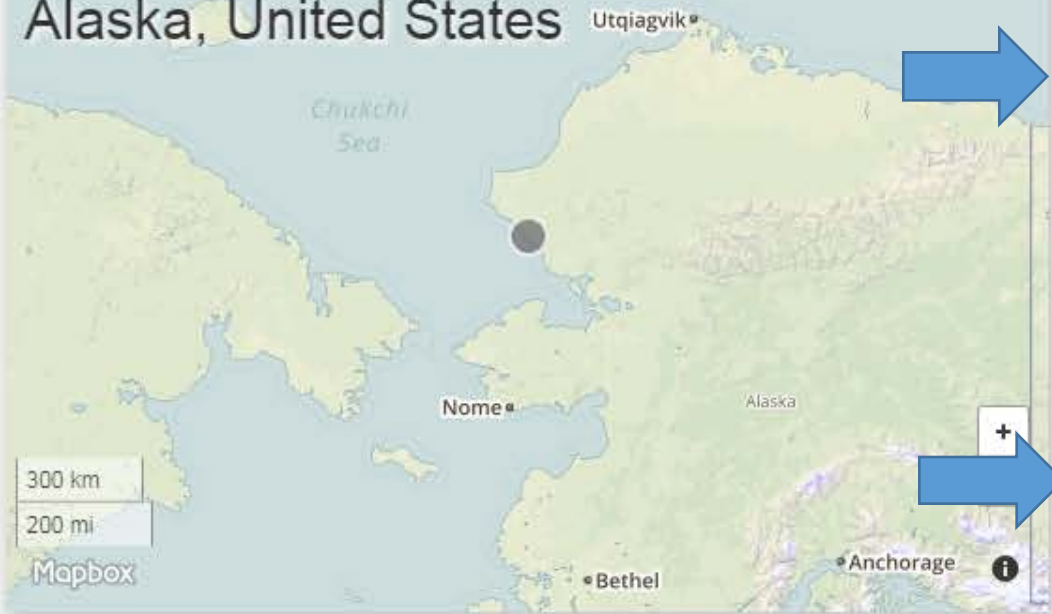
Alaska Region  
Climate Science and  
Services Manager  
**National Weather**





# Kivalina

## Alaska, United States



☆ Follow

### Weather

Current and historical weather in Kivalina. Powered by [Dark Sky](#).

### ShoreZone Photos

Aerial photography near Kivalina from [ShoreZone](#).

### Climate Projections

Climate projections for Kivalina from [SNAP](#).

### Community Maps

Maps of Kivalina from [State of Alaska DCRA](#).

## 5 LEO Members [View All >](#)



**Millie Hawley**

President

Native Village of Kivalina



**Janet Mitchell**



**Janet Mitchell**

Administrator

Kivalina City Council



**mida swan**



**Replogle Swan**

Observer

Kivalina Search and Rescue

## 12 Nearby Posts within 50 km [View All >](#)



### Report out on Kivalina evacuation route and school site

Kivalina, Alaska, United States

24 NOV 2017

The school site is about six miles northeast of town. If constructed, it would serve as the terminus of the evacuation route and as a modern shelter capable of housing the entire community.

The Arctic Sounder



### Second storm batters western coastline

Kivalina, Alaska, United States

24 NOV 2017

The recent storm brought water levels up to the lagoon bank by



## Second storm batters western coastline

Kivalina, Alaska, United States

24 NOV 2017

The recent storm brought water levels up to the lagoon bank by town. Along the Chukchi Coast, storm surge and tides were expected to raise sea levels four to six feet above the normal high tide line, the weather service noted.

 Arctic Sounder



## Unidentified Marine Mammal

Kivalina, Alaska, United States

29 JUN 2017

We could not figure out the what type of sea mammal it is.

 LEO Network



## Too Much Rain

Kivalina, Alaska, United States

18 JUN 2017

Summer rain affecting subsistence food preservation.

 LEO Network



## Ushak Lake Wildfire

Kivalina, Alaska, United States


15 AUG 2016

Residents puzzled about origins of underground fire.





-  Weather **5**
-  Ocean/Sea **3**
-  Sea Mammals **3**
-  Fish **2**
-  Ice and Snow **2**
-  Air **1**
-  Birds **1**
-  Seasons **1**
-  Other **1**
-  Plants **1**
-  Infrastructure **1**
-  Health **1**
-  Land Mammals **1**



Arctic Char (*Salvelinus alpinus*) with Saprolegnia Mold

3 Nov 2015

JUNE 18, 2017

# Too Much Rain

Kivalina, Alaska, United States



☆ Follow + My Maps Share Edit

## Contributors



**Janet Mitchell** Observer

Kivalina Alaska, United States

Send Message



**Anna Godduhn** Consultant

Fairbanks Alaska, United States

Send Message

**Observation:** With the summer season coming sooner and sooner, we are hunting the bearded seals earlier as well but why do we have to have rain in June? It has wreaked havoc on the preservation process. Many of the foods were molding because of the moisture in the air. I had to hang our drying meat inside my house and clean the mold after bringing them in.

**LEO says:** The impact to subsistence food is important to note here. This observation has been shared with the Alaska Department of Fish and Game, Division of Subsistence.

The UAF Scenarios Network for Alaska + Arctic Planning (SNAP) historical precipitation chart compares daily precipitation for locations around Alaska. The circles indicate daily precipitation frequency, and circle size and color indicate relative intensity. To the right of the chart, opposing bars indicate precipitation levels 6 months prior to the represented month, as well as the precipitation in the 6 months following.

For the Kotzebue area, one larger circle appears slightly after mid-June. According to precipitation data collected in previous years, it appears that precipitation in June does occur, but the June 2017 event may have been more intense.

Also available from the SNAP website are temperature and precipitation histories and projections. These graphs compare average monthly totals rather than the daily data shown in the historical precipitation chart. For Kivalina, there has been an increase in average monthly precipitation amounts from between 1961-1990 and 2010-2019 (estimated future projection). That chart can be found [here](#). There has also



Bearded seal drying inside the houses (Photo courtesy of Janet Mitchell)

Latitude 67.72694  
Longitude -164.53333  
Nearby

## Reference

Mitchell, Janet and Anna Godduhn. 2017. Too Much Rain. LEO Network (leonetwork.org). Accessed 18 June 2018.



MEMBERS JANET MITCHELL



## Janet Mitchell


Kivalina Alaska, United States  
Member since 2017

[✉ Send a Message to Janet Mitchell](#)


☆ Follow


### Contributions [View on Map](#)

- Observer**




Unidentified Marine Mammal  
Kivalina, Alaska, Un...  
JUN 29, 2017



- Observer**




Too Much Rain  
Kivalina, Alaska, Un...  
JUN 18, 2017




### Collaborators

- 

Kathy Burek  
Huntington  
Eagle River Alaska, Un...
- 

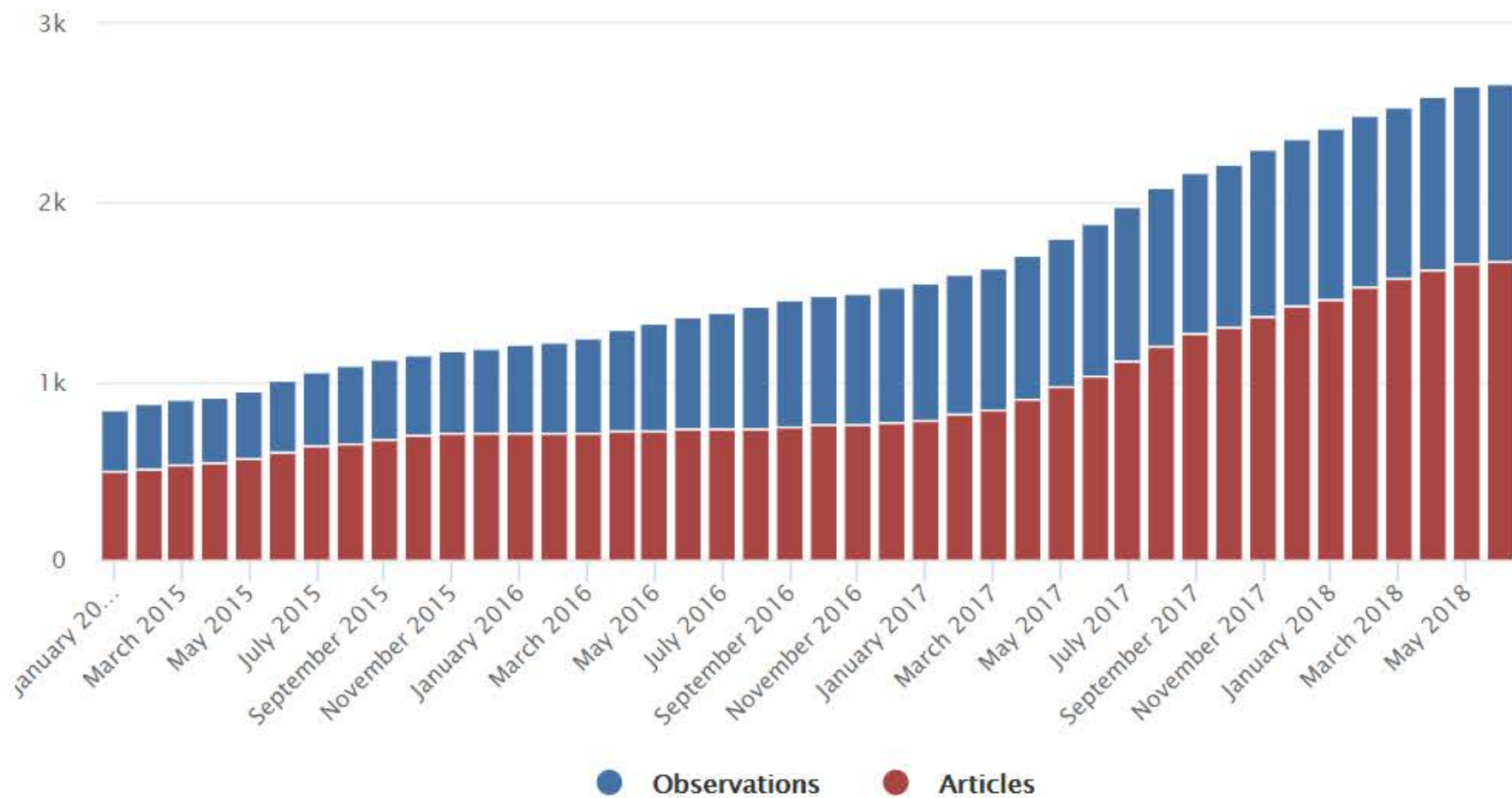
Gay Sheffield  
Nome Alaska, United St...

Marine Advisory Program Bering Strait  
UAF Sea Grant
- 

Anna Godduhn  
Fairbanks Alaska, Unit...

Alaska Department of Fish and Game

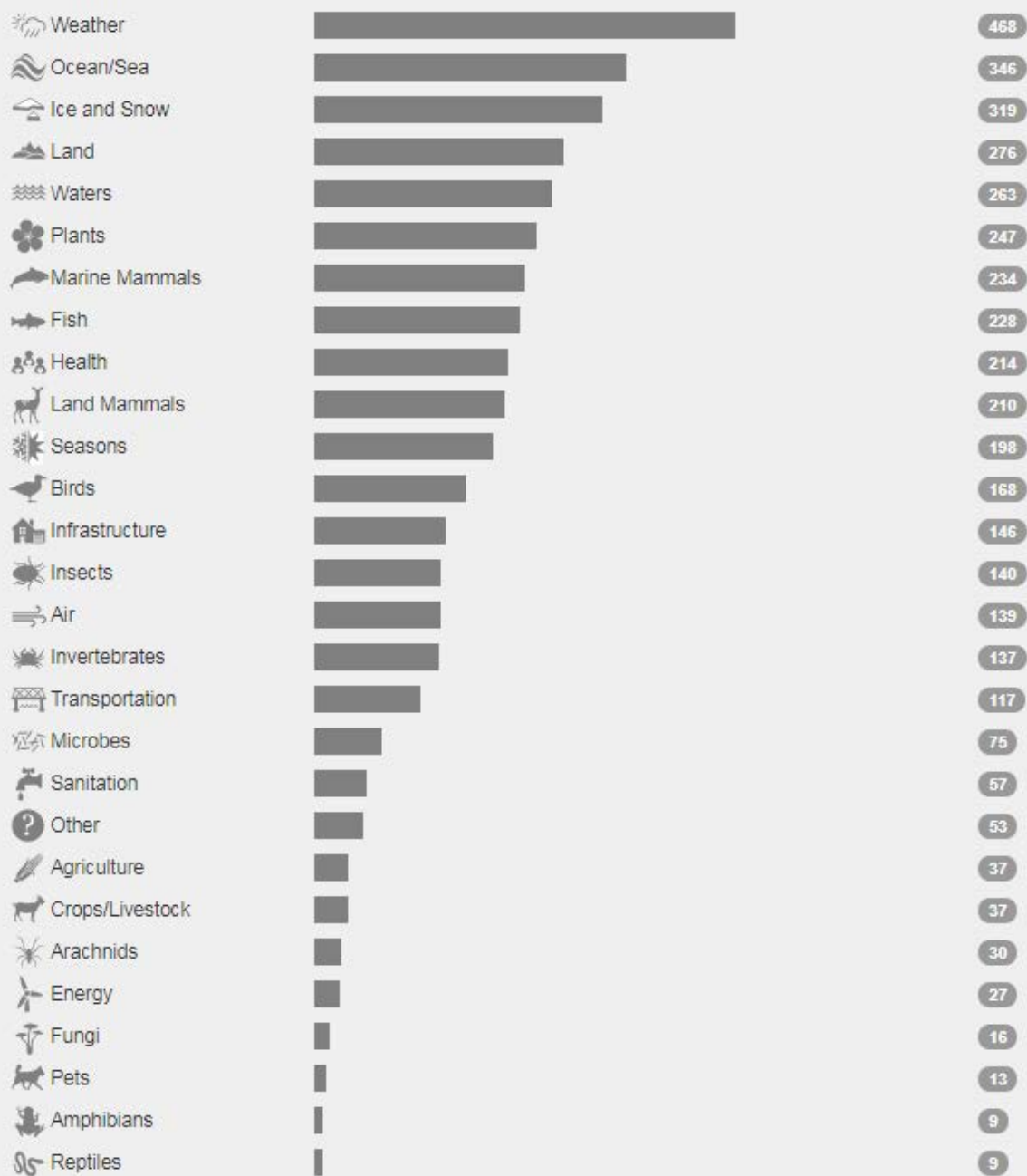
## Observations/Articles by Month

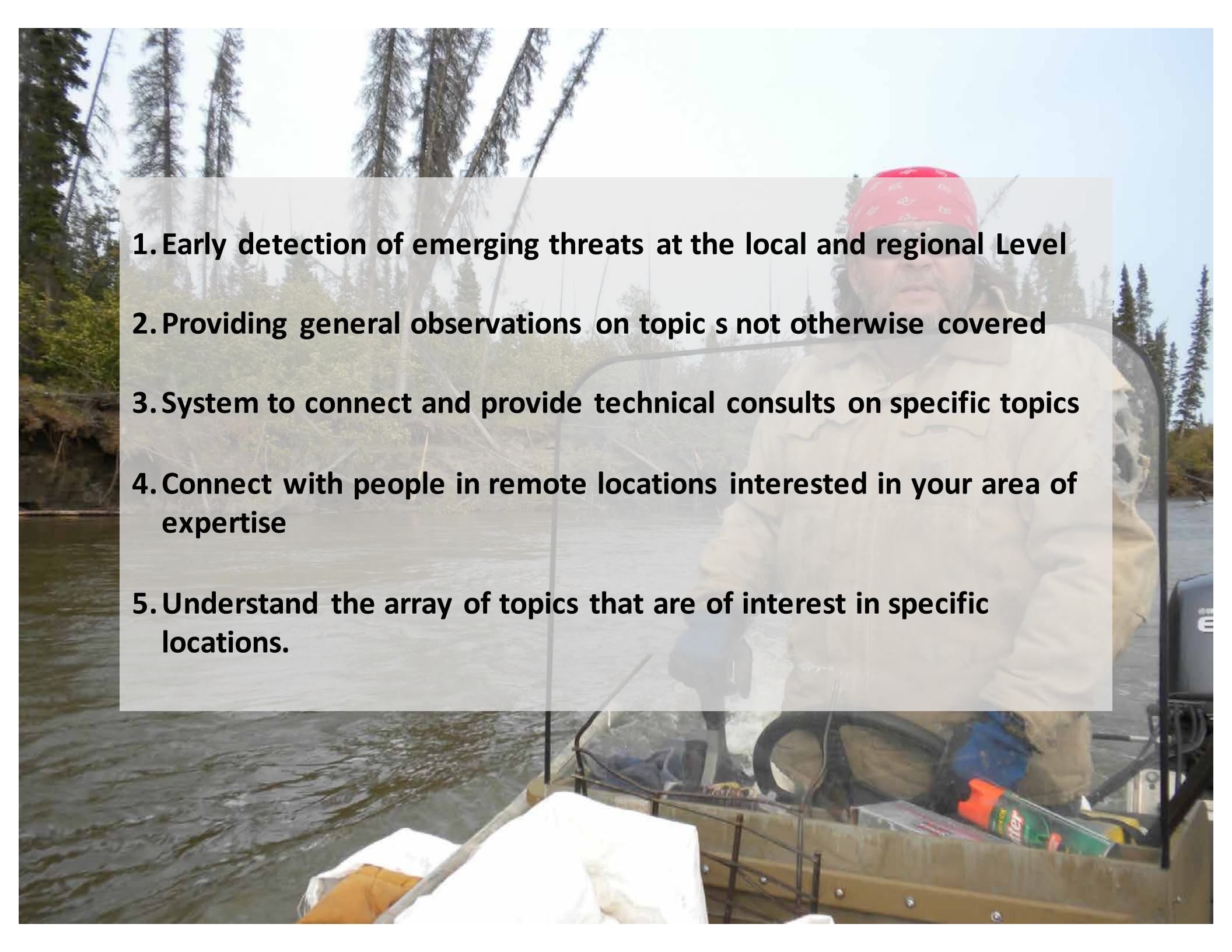




# 1997 Observations

## Topic



- 
- A man with a beard, wearing a red bandana and a tan jacket, is standing on a boat in a river. The boat is filled with gear, including a white bag and a green container. The background shows a dense forest of tall evergreen trees under a clear sky.
- 1. Early detection of emerging threats at the local and regional Level**
  - 2. Providing general observations on topics not otherwise covered**
  - 3. System to connect and provide technical consults on specific topics**
  - 4. Connect with people in remote locations interested in your area of expertise**
  - 5. Understand the array of topics that are of interest in specific locations.**



The logo features the text "LEO NETWORK" in white, bold, sans-serif font. "LEO" is on the top line and "NETWORK" is on the bottom line. The text is centered within a dark blue circle, which is itself surrounded by a lighter blue ring. The entire graphic is set against a solid blue background.

**LEO**  
NETWORK

[mbrubaker@anthc.org](mailto:mbrubaker@anthc.org)