Land, Sea and Homes: Connecting Climate and Communities in western Alaska

Robin Bronen and Denise Pollock
Alaska Institute for Justice

Jaci Overbeck
Alaska Department of Geological and Geophysical Surveys

Mary-Beth Schreck and Rick Thoman
NWS Alaska Region
What’s the Problem

- Alaska Native communities facing many challenges, including rapidly changing environment
- Need to monitor ongoing environmental change at multiple levels
- Extensive traditional knowledge of environmental threats: little to no western science data to predict rate of change
- Native communities are resilient, but can’t do it by themselves in the modern age
- Societal structures (e.g. laws, government organization, limited comms and infrastructure) create roadblocks to adaptation

Working together
- Communities
- NGOs
- State and Federal Agencies
Example: NOAA (and other agency) Tide and Water Level Gauges

More than 900 miles of coastline with no standard water level measurements

Source: National Buoy Data Center
Environmental Threats

- Coastal Storm Flooding
- Extreme weather events producing high winds
- Erosion
- Sea and River Ice Changes
- Permafrost Thawing
  - Infrastructure and food security

Shishmaref: May 17, 2018
Curtis Nayopuk
What’s Threatened

• Safety
• Infrastructure
  • Buildings, utilities, airstrip and docking facilities
• Economy
  • Subsistence activities
• Food Security

Derek Kusiak via KYUK
Kotlik, Alaska

Above: Photos of flooding in front of Harold Okitkun’s house on November 12, 2017. Below: Floodwaters reach AC store on November 22 (Harold Oktikun)

Ice piling up after high water event in Kotlik on November 11, 2017 (Tanya Hunt)
Coastal Erosion

Shishmaref erosion in November 2017 (Ralph Sinnok)

Port Heiden erosion, November 17, 2017 (Melissa O’domin)

Port Heiden erosion, November 22, 2017 (Melissa O’domin)
Alaska Institute for Justice

- NGO dedicated to working with tribal, state and federal agencies to design and implement community-led adaptation and relocation process based on human rights.
- Imminently threatened communities project started 2015.
- Workshops, telecons, alerts, documentation, policy analysis and change at state, national and international level
AIJ Communities
AIJ hosts community meetings to ensure that strong community engagement occurs with all environmental monitoring.
AIJ Compiles Environmental Impacts Narratives

November 2017 Storm and Weather Narratives

National Weather Service (NWS) storm alerts impacting Alaska Native coastal communities in November 2017

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov. 11, 2017</td>
<td>The NWS issued an alert that a long fetch of moderate west to northwest winds would affect Port Heiden and Nelson Lagoon.</td>
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<tr>
<td>Nov. 18-19, 2017</td>
<td>The NWS issued a high surf advisory was issued for the Yukon Delta, a forecast of strong winds in the Alaska Peninsula, and a forecast of rain north of Chevak and south of Bethel.</td>
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<tr>
<td>Nov. 22, 2017</td>
<td>The NWS issued a coastal flood advisory was also issued for Shishmaref, Kivalina, Golovin, and Kotlik.</td>
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This storm narrative report provides these 5 NWS forecasts and storm observations for communities in Golovin, Kotlik, Unalakleet, Kivalina, Shishmaref, Nelson Lagoon, and Port Heiden. Also included are weather updates, ground failure events, and wind storm events for communities of Atmautluak, Eyak, Elim, Chevak, and Kwigillingok. As a result of the coastal flood advisories, high surf advisories, strong wind alerts, and minimal to no sea ice formation many of these communities experienced erosion and flooding impacts.

November 20, 2017

Forecast: The National Weather Service issued a coastal flooding alert November 22 through November 23 in Golovin.

Observed Storm Details: In the evening of November 19, Golovin experienced waters a little higher than high tide. Wind gusts stayed under 50mph. On November 20, southeast winds occurred during the day and died down at 5pm. When the wind switched to south winds until 2am. The tide was way out and the beach tripled in width. There was a bunch of slush and young ice in Golovin Bay and in the lagoon, and heavy snow for most of the morning. On November 21, south winds at 20mph shifted to northwest winds. Flooding does not usually occur with southeast winds. The wind died down after 11:30pm and stars became visible in the SE part of the sky, and as it calmed later, most stars were visible in the sky.

At 5pm on November 22, west winds brought the tide into Golovin fast until the wind got stronger and switched more from the northwest direction. By 7pm the wind was coming from the west. Before 11:30pm, the snow squalls stopped and wind subsided until there was no wind. There was little wave action on the beaches because of the slush ice and thin ice formed on the Golovin Bay side.

Observed Storm Impacts: On November 22, the surge went up and covered 3/4 or more of the old airport. The water reached almost the same height as the October 11-13 event (Toby Anungazuk Jr. AIJ personal communication, November 22, 2017).
Alaska DGGS

Helping to fill water level and erosion monitoring gaps by:

Installing and maintaining low cost sensors

Contract with JOA, LLC. Station deployed and retrieved by a teacher in Nunam Iqua.

NWS staff helping to install a remote water level sensor with DGGS along with water level time series available in real-time.
Alaska DGGS

Helping to fill water level and erosion monitoring gaps by:

Providing local individuals with scientific protocols and training for collecting data

Tide staff at installation and during flood event, surveyed to vertical reference frame.

Denise Pollock (AIJ), Lewis Amik (Kwigillingok), and Emmett Matthias (Kotlik) working to install and monitoring flooding and erosion.
Alaska DGGS

Helping to fill water level and erosion monitoring gaps by:

And converting data to standard reference systems for mapping.

Converting flood and erosion data into the same vertical or horizontal reference systems allows DGGS to map potential or observed hazards and store for comparison to past or future events.

Past erosion at Port Heiden, Alaska, combined with current time-lapse camera monitoring. (work funded by Alaska Sea Grant).
NWS Alaska Region

• Weather to seasonal scale forecasts (coastal flooding, accelerated erosion and ice of highest concern)

• Climate and historical trends
  – Sea and river Ice (freeze-up, melt-out, stability)
  – Storminess and flooding
  – Winds
From Annie Weyiouanna in Shishmaref: “Here are pictures from yesterday, as you can see there is open water on the horizon. Were you able to see pics to confirm?”

From the NWS Alaska Sea Ice Program: “The polynya is expanding a little each day as the southerly to easterly winds continue.”
Future

• Support and Strengthen Local Environmental Monitoring
  – Erosion, Storm Surge, Permafrost degradation

• Continued Production of Environmental Impacts Narratives
  – Building a climatology of events that matter to communities

• Community Weather & Climate App
  – Community customized and designed for low bandwidth
  – Prototype functional, needs funding for production

Quyanaqpak!