Hooper Bay, 2013

BUILDING OUR TOOLBOX: COMMUNITY-BASED MONITORING OF COASTAL HAZARDS

LEO Webinar - April 21, 2015
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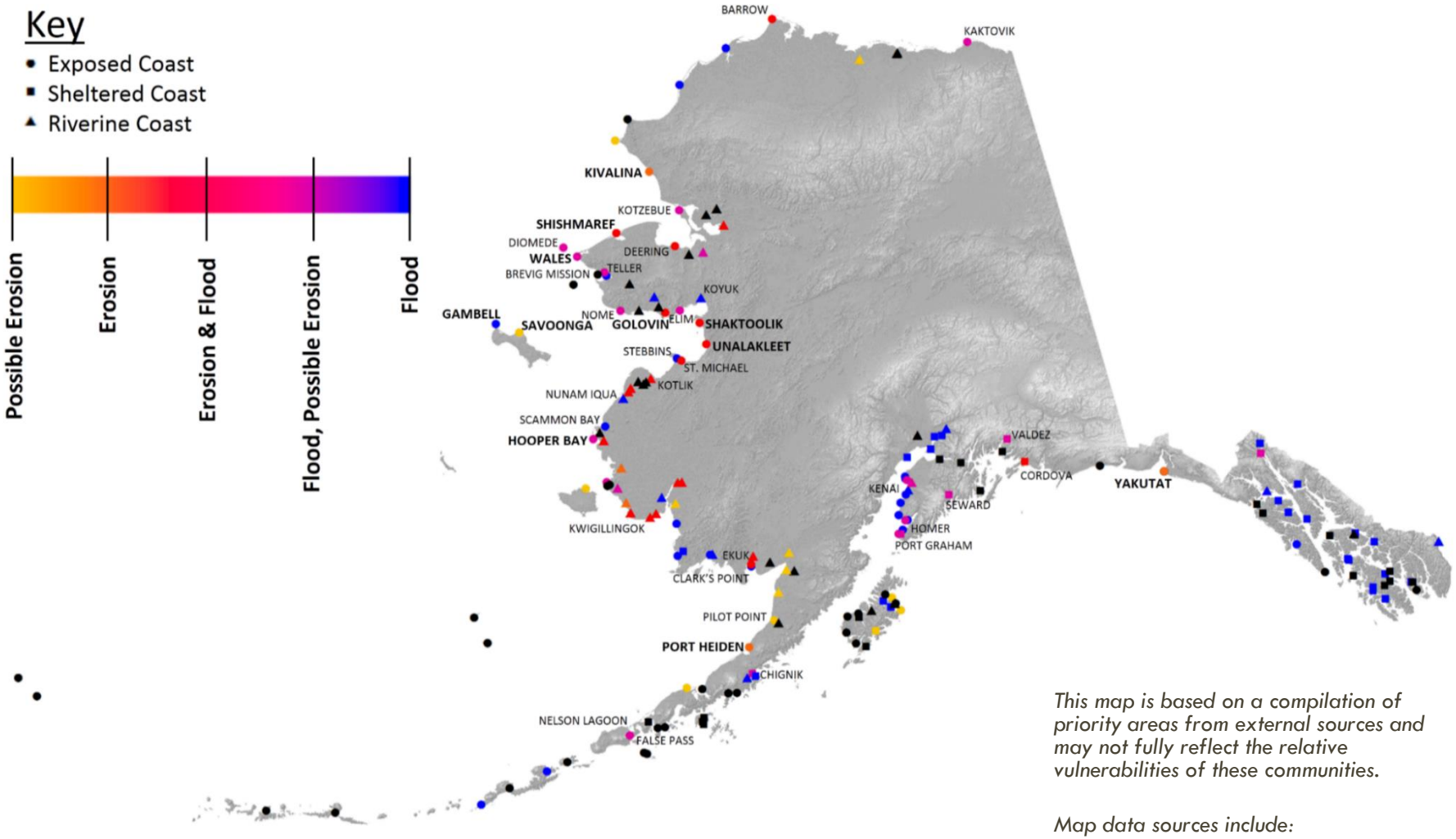
Coastal Geologist
www.dggs.alaska.gov/coast

Special thanks to: Lauren Southerland, Alex Gould, John Henry Jr, Ms. Kotongan, Mike Brubaker

DGGS COASTAL HAZARDS PROGRAM

- Active Since 2011 (Coastal Impact Assistance Program)
- Available to field questions from residents and stakeholders
- Program Objectives:
  - Increase quality/quantity of coastal baseline data
  - Provide shoreline change and coastal inundation tools
  - Encourage/develop coastal management resources for an Alaskan audience



ALASKA POPULATIONS VULNERABLE TO COASTAL FLOODING AND EROSION

This map is based on a compilation of priority areas from external sources and may not fully reflect the relative vulnerabilities of these communities.

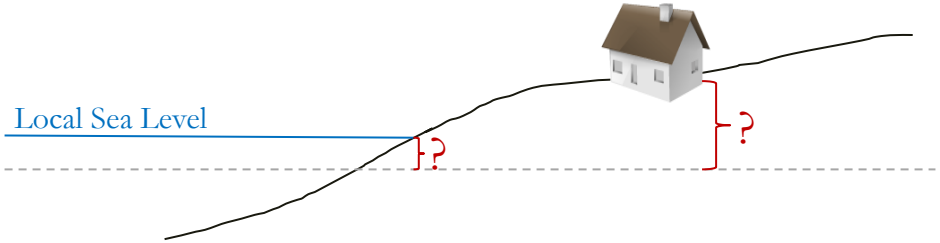
Map data sources include:

- *US Army Corps of Engineers Baseline Erosion Assessment*
- *US Army Corps of Engineers Floodplain Database*
- *Government Accountability Office report on Alaska villages at-risk to flooding and erosion*
- *Federal and State Disaster Declarations (1978-2013)*
- *Recommendations to the Governor's Subcabinet on Climate Change*

THE COASTAL BASICS: FLOOD AND EROSION DATA

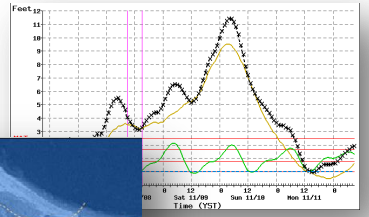
Shape of the Ground

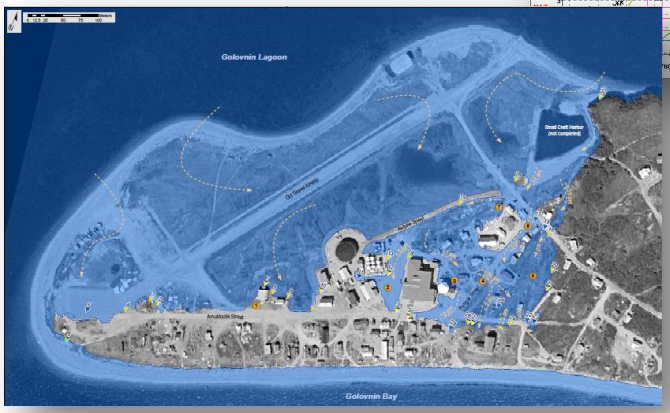
How High Things Are

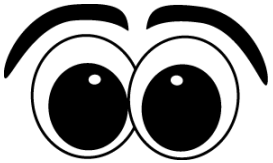


Location of the Coast

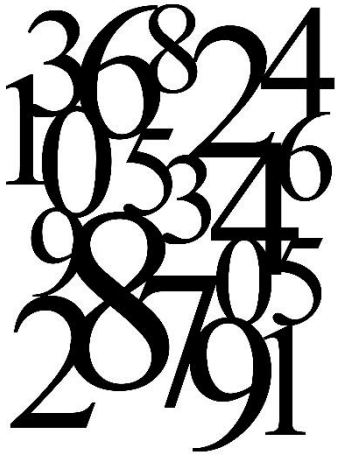
What happens in a Storm







EYEBALLS → NUMBERS



PORT HEIDEN, 2006 (SHOREZONE)

PORT HEIDEN, 2013

"Rapid Erosion is occurring"

"38.2 ft/year of Erosion is occuring"

QUALITATIVE → QUANTITATIVE DATA

- Record of change that will reveal acceleration or deceleration
- Values that can be fed into models to make better predictions
- Documentation of damages to qualify for disaster mitigation funds

QUANTITATIVE OBSERVATIONS

A useful number:

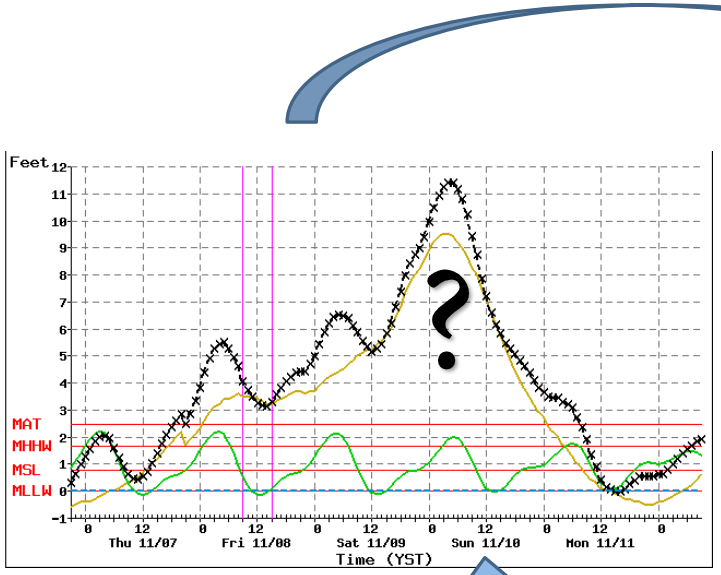
- Is characteristic of the event/conditions
- Is collected by a knowledgeable observer
- Has a scientific application

Requirements:

- Time
- Conditions
- Name of collector
- Documentation
- Level of uncertainty
- A calibration or reference frame

Unalakleet Dock

NUMERICAL OBSERVATIONS IMPROVE PREDICTIONS EXAMPLE: STORM SURGE FORECASTING



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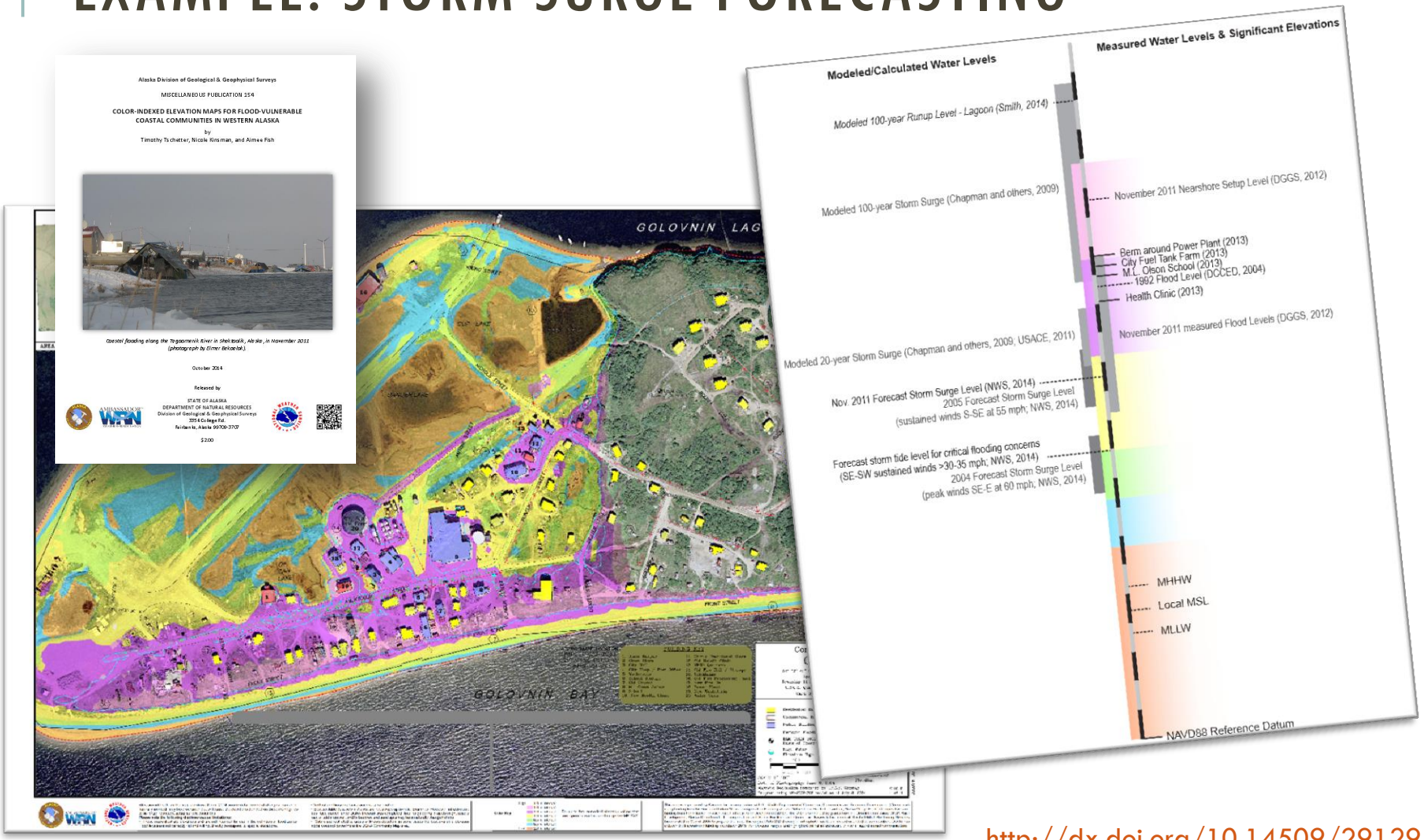


http://dx.doi.org/10.14509/29129

CRITICAL ROLE OF RESIDENT OBSERVERS

Coastal flooding in Golovin, Alaska (Photo by Toby Anungazuk, November 2011)

- On site
- Frequent re-measurement opportunities
- Knowledge of threshold for 'significant change'
- Customized data collection

RESIDENT-LED OBSERVATIONS

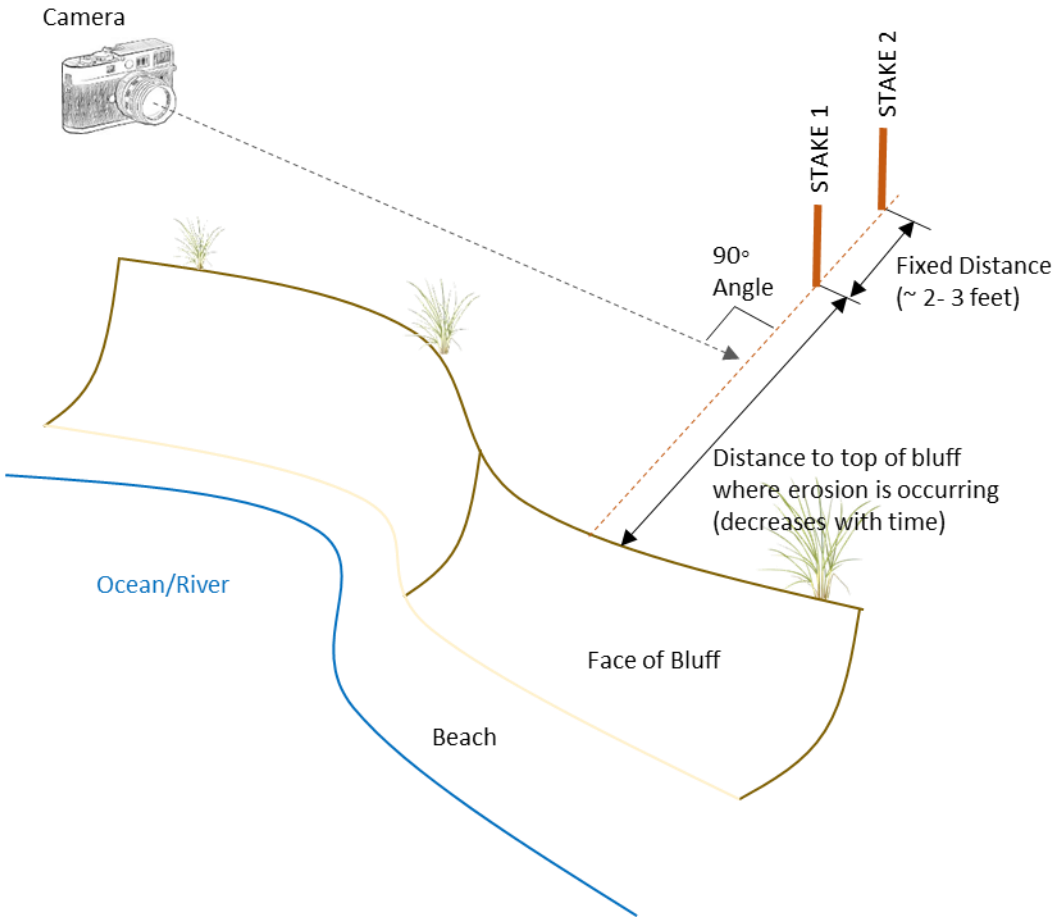
DGGS has partnered with residents in coastal AK to experiment with ways to put numbers to observations

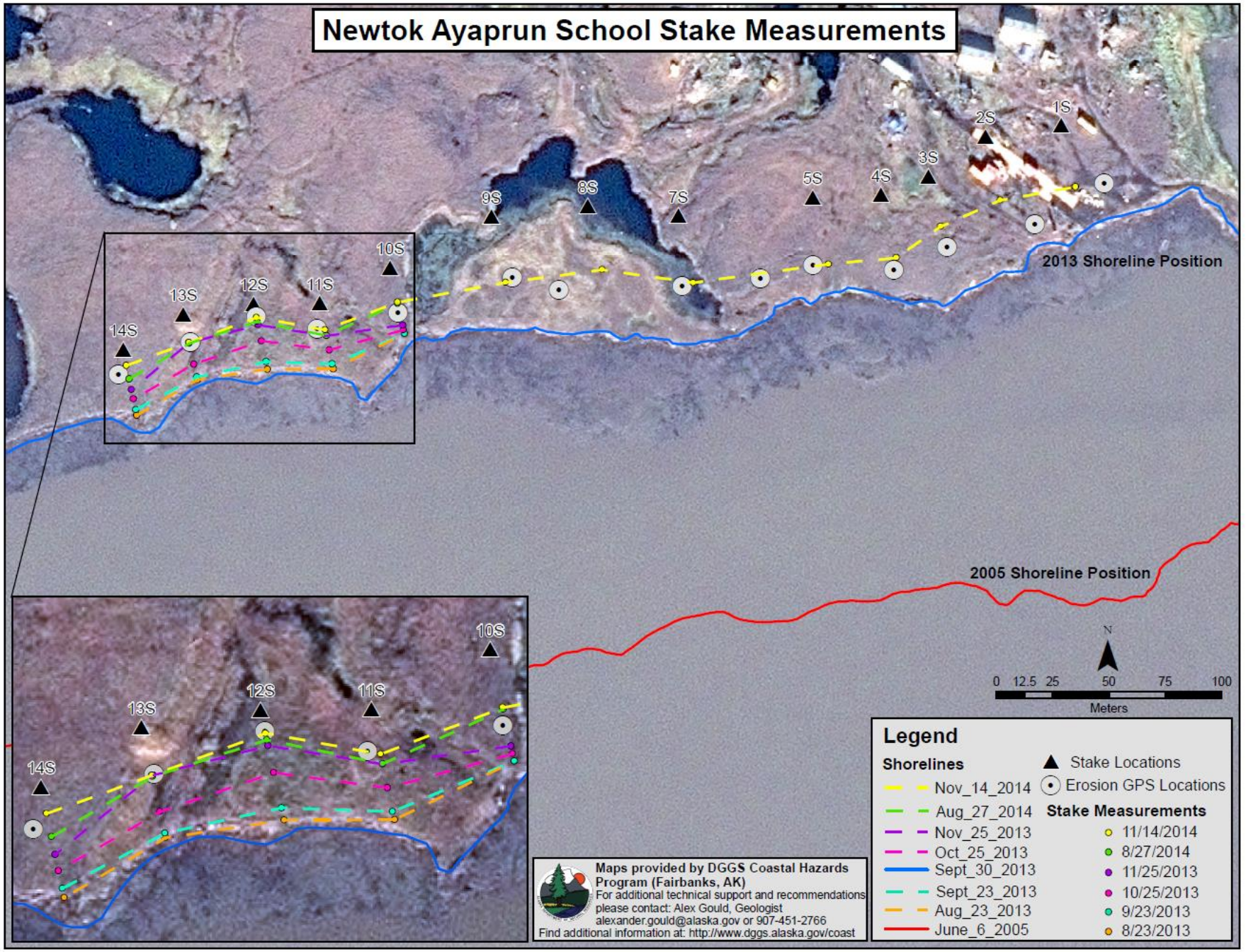
TIME LAPSE CAMERAS: EROSION MONITORING

- Calibration requirements:
  - Stake location
  - Camera positioning

- May also be completed with a measuring tape and regular site visits

- Pursuing a pilot project with Bristol Bay Native Assn., Sea Grant, and UAF Bristol Bay Campus



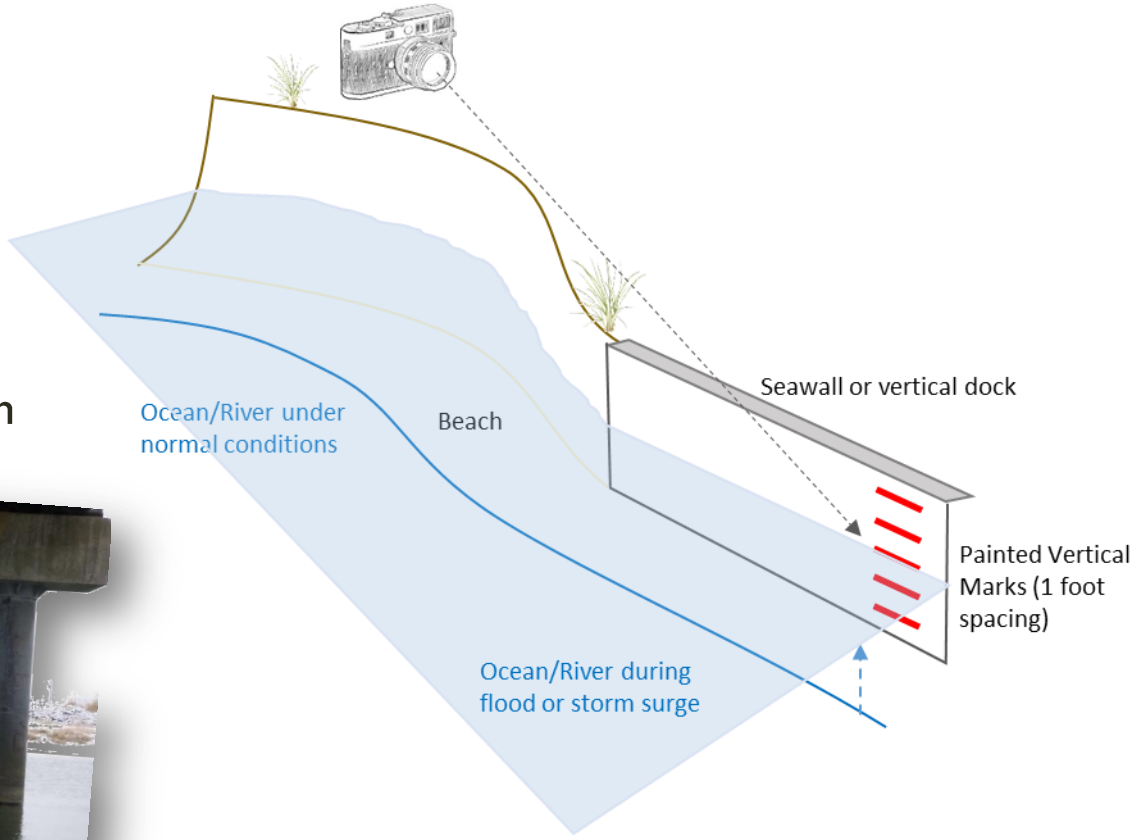


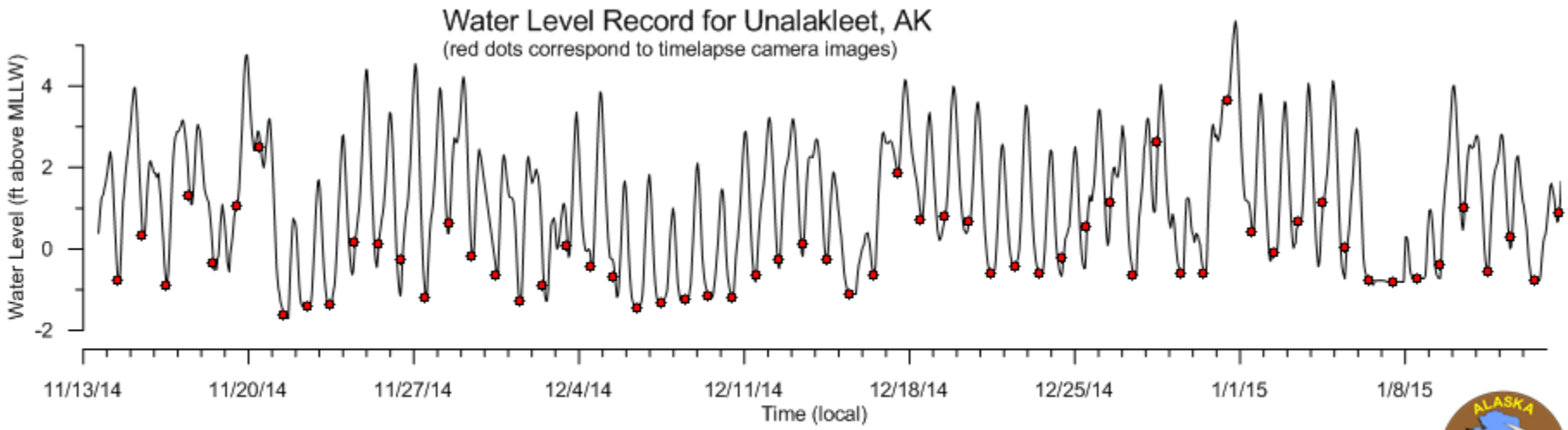
Data provided to DGGS by Alaska Division of Community and Rural Affairs

TIME LAPSE CAMERAS: WATER LEVEL MONITORING

- Calibration requirements:
  - Height of vertical marker(s)
  - Camera positioning

- May also be completed in conjunction with an instrument in the water



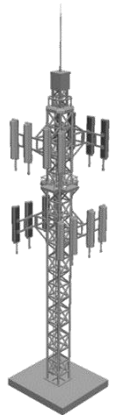


Video by Ms. Kotongan

MOBILE PHONES: CAMERA, GPS, AND COMMUNICATION

Upcoming LEO Smart phone App

The Eyes, Ears & Voice of LEO Our Changing Environment



Approximate Positioning Accuracy

< 1 inch

~ 5-16 feet

~ 10-30 feet… and decreasing

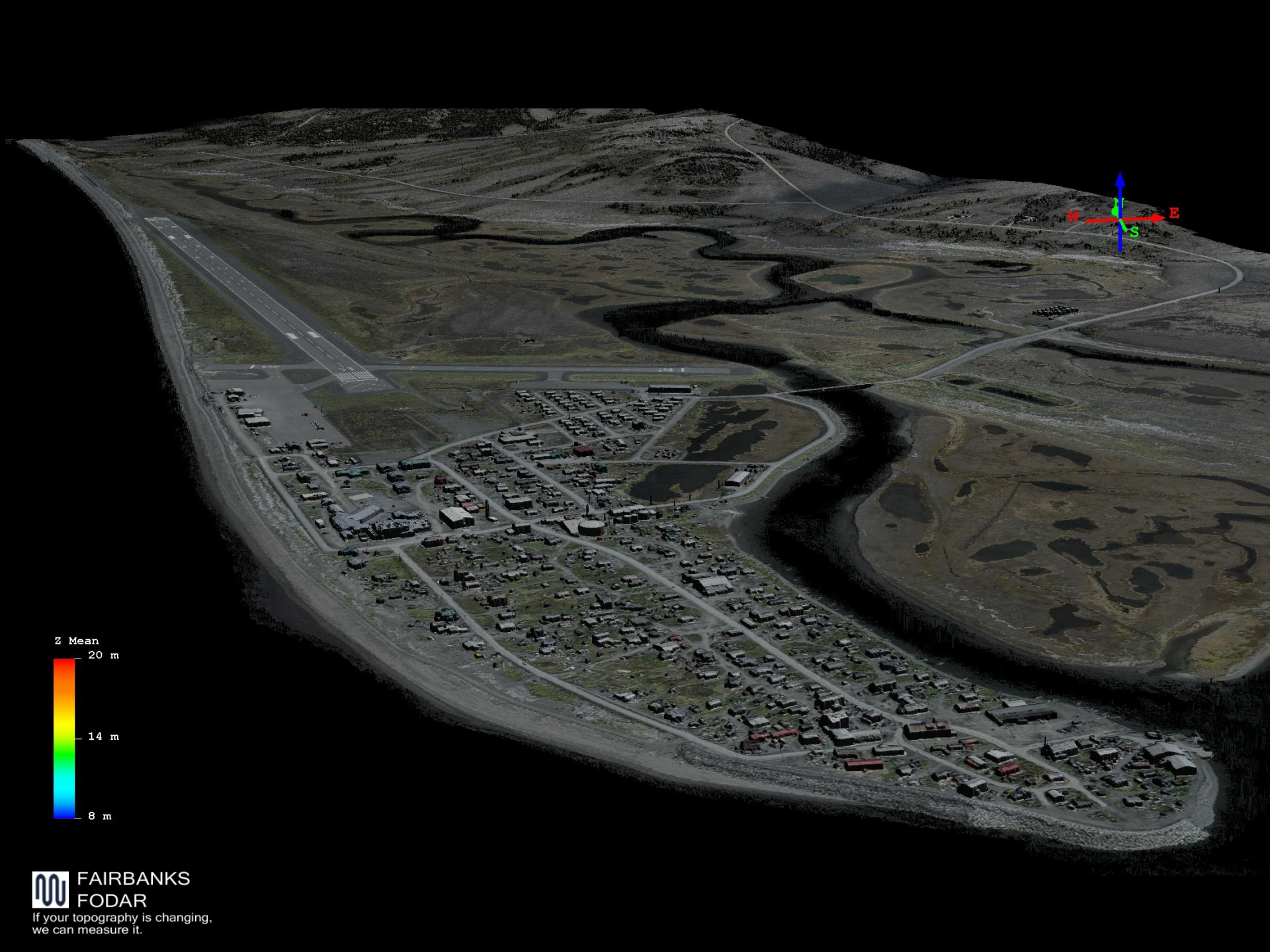
UNK DATA COLLECTION EXPERIMENTS: PART 1 – ELEVATION OF A LINE

- Data need:
  - Elevation of a water level on the beach
  - Elevation of a river
  - Elevation of the peak water level after a storm surge (where the debris is)

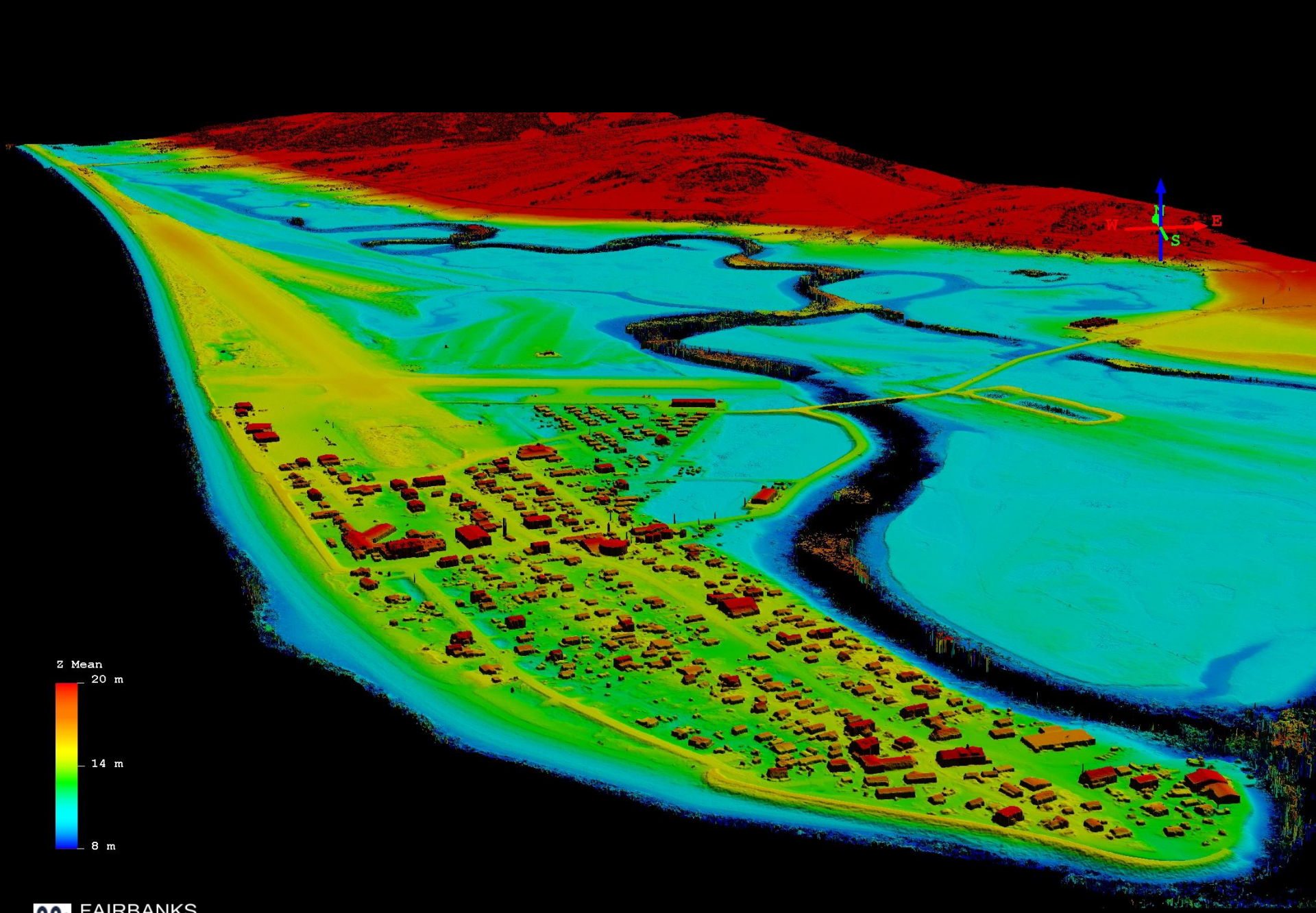
- Assumption:
  - GPS in phone is not very good, but the error is random
  - GPS in phone is more accurate horizontally than vertically
  - The feature being measured is at a constant elevation
  - There is a very good Digital Elevation model available

DGGS scientist: Alex Gould

Community Partner: John Henry Jr, IGAP Coordinator, Native Village of Unalakleet



FAIRBANKS
FODAR
If your topography is changing,
we can measure it.



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ELEVATION OF FEATURE FROM MODEL

Wood line on the beach is approximately 5.7 ft above Local Mean Sea Level

Standard deviation of vertical values was 3.5 inches (n =17)

This is a good approximate measure of the water level at the beach during the most recent storm

UNK DATA COLLECTION EXPERIMENTS: PART 2 – 3-D "SNAP SHOTS"

- Data need:

  Shape and size of an object/feature

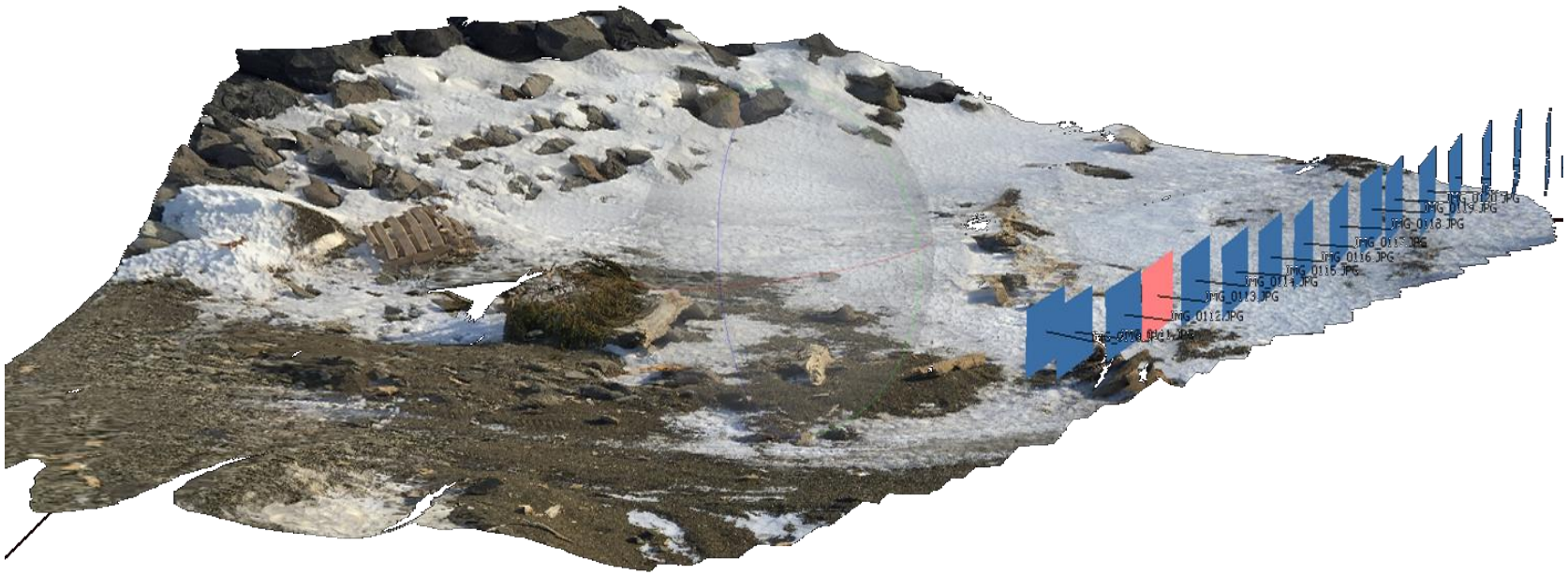
  For example:
  - Erosion areas or damaged revetments/seawalls
  - Biological monitoring (whales, seals, plant life)
  - Glacial monitoring
  - Sea level trends
  - Permafrost degradation

- The method:
  - Lots of pictures from slightly different angles are taken of the area/object of interest
  - An object with a known size (box, for example) is placed in the images for scale
  - Computer software at DGGS is used to build a 3-D model that can be emailed

DGGS intern scientist: Lauren Southerland

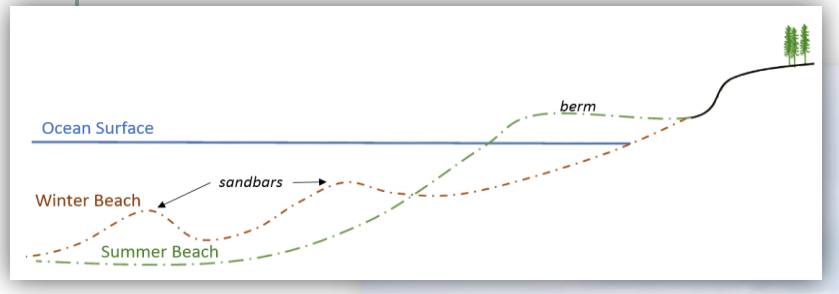
Community Partner: John Henry Jr, IGAP Coordinator, Native Village of Unalakleet

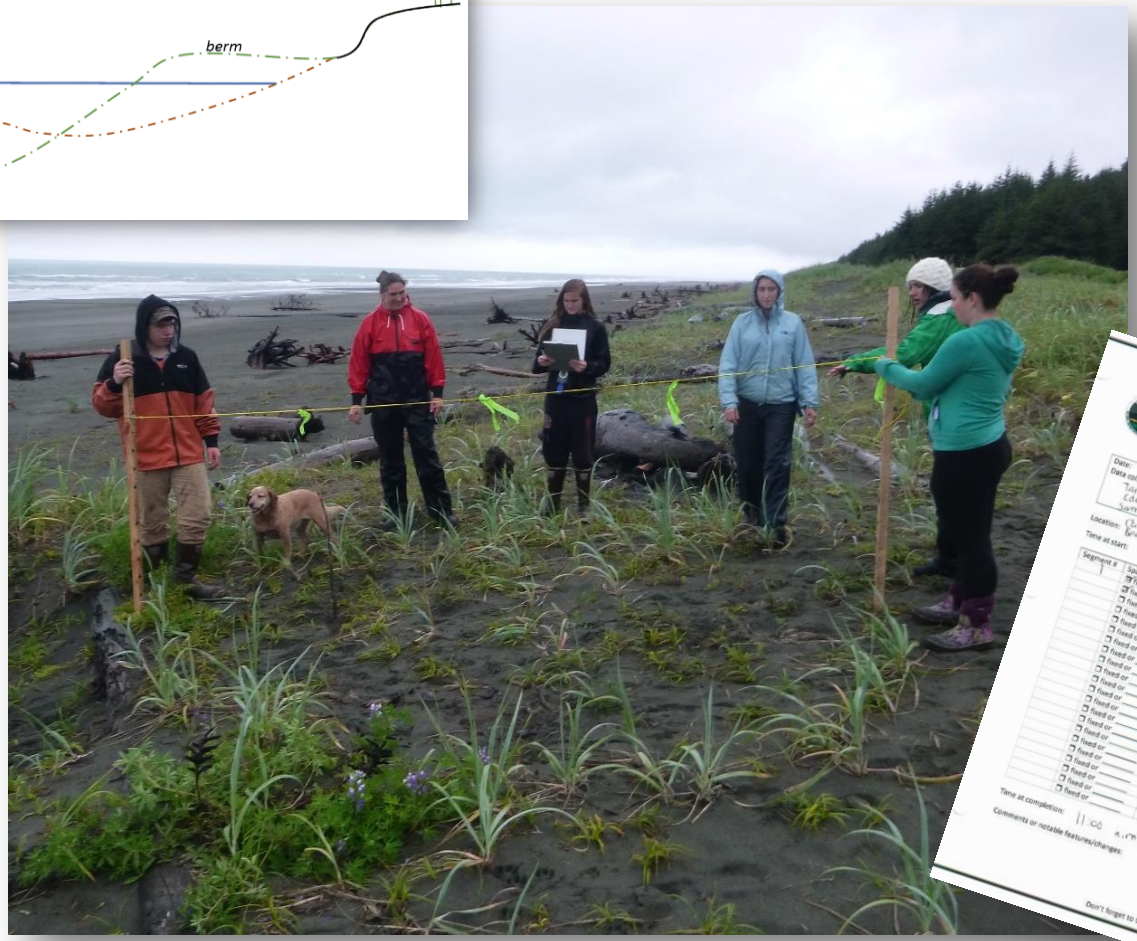
UNK DATA COLLECTION EXPERIMENTS: PART 2 – 3-D "SNAP SHOTS"

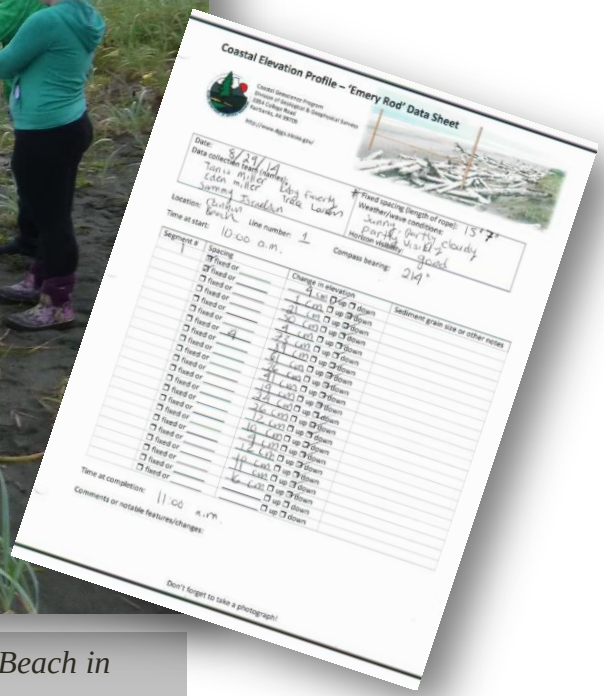


- Ongoing experiments to test best photo distance, spacing, etc.
- Lots of possible applications
- Can calculate volume change with repeat imaging

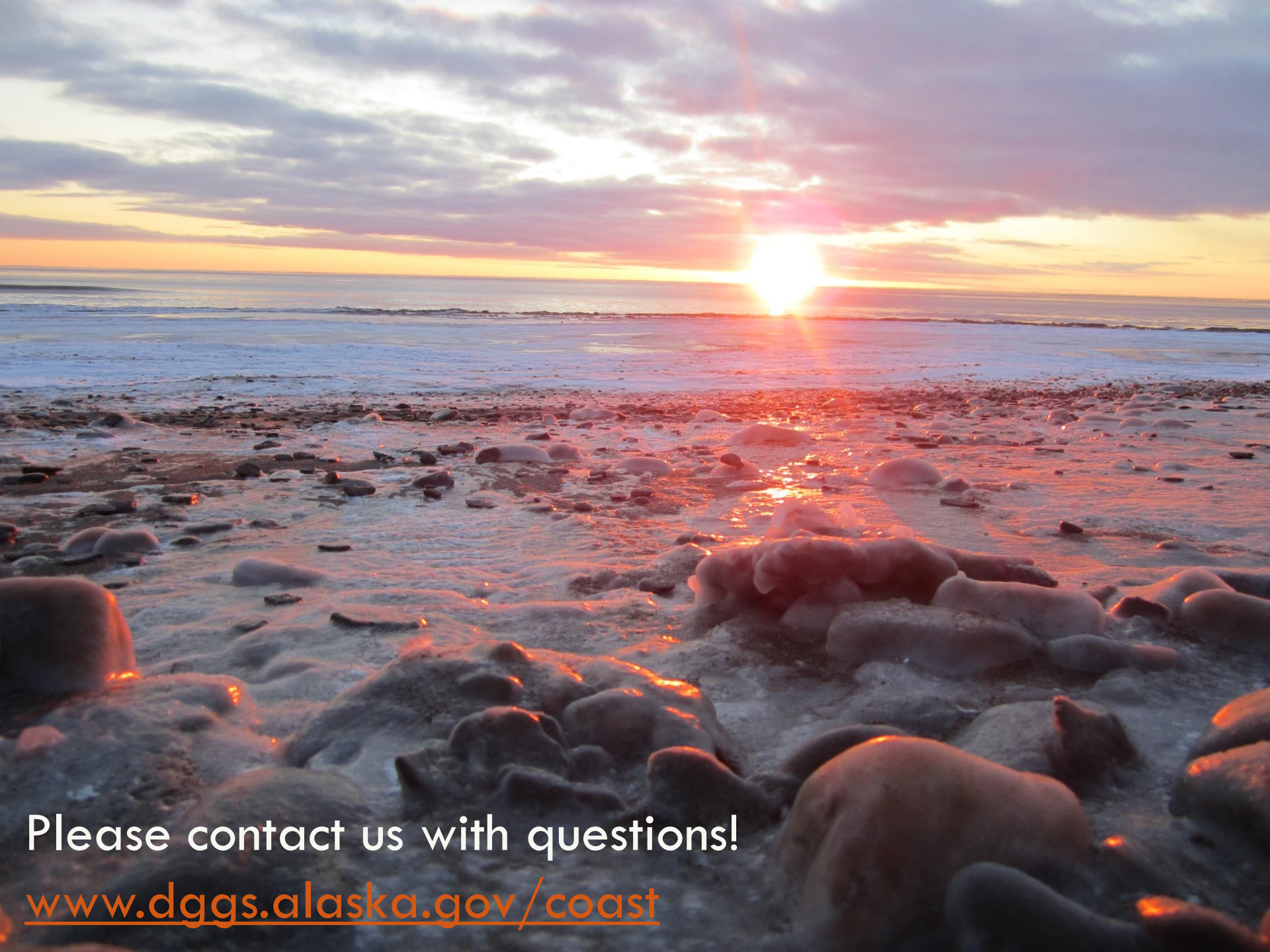
OTHER COMMUNITY-BASED MEASUREMENTS: BEACH SHAPE IN YAKUTAT







High School students collecting coastal elevation data on Cannon Beach in Yakutat, Alaska (2014)


Please contact us with questions!
www.dggs.alaska.gov/coast