



Alaska CIAP State Tier 1-10:

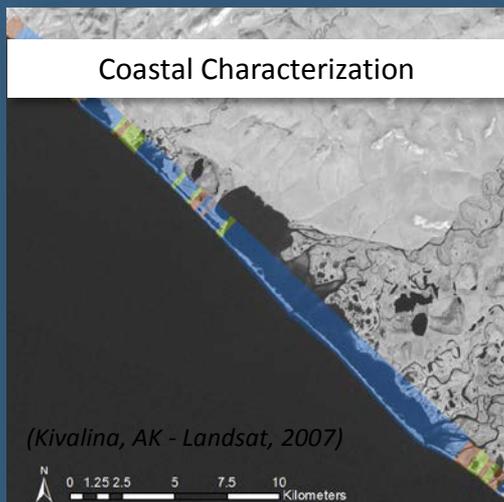
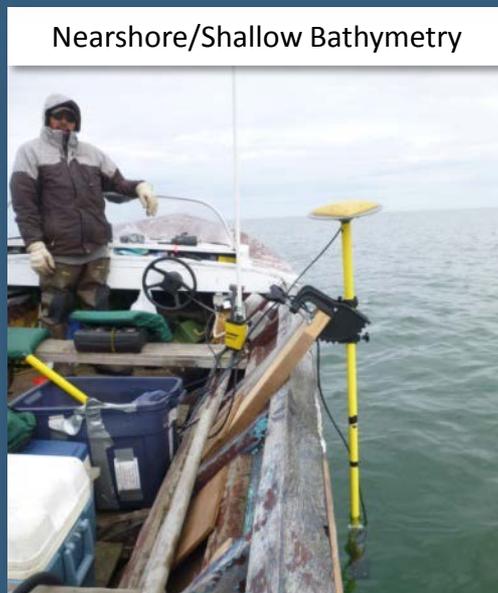
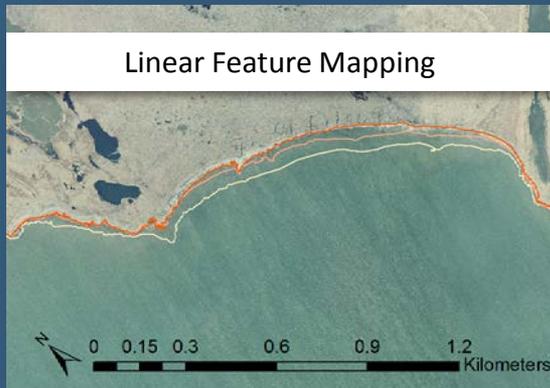
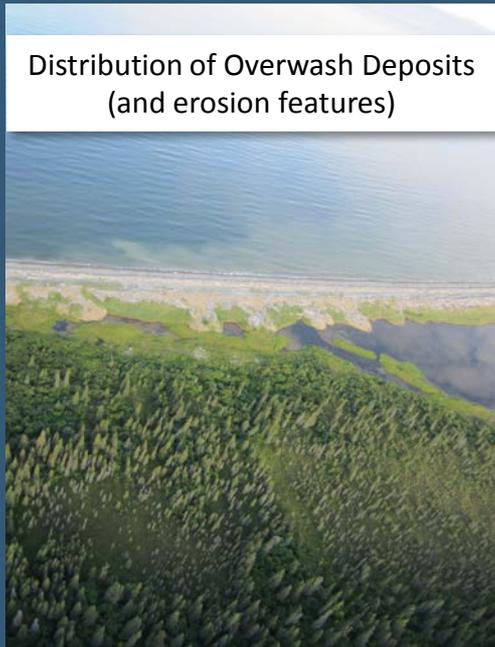
Geohazard Evaluation & Geologic Mapping for Coastal Communities



CIAP Administrative Meeting

November 28, 2012

DGGS Coastal Fieldwork & Baseline Data Collection



DGGS Approach to Coastal Geohazard Mapping



U.S. Army Corps
of Engineers
Alaska District

Study Findings and Technical Report

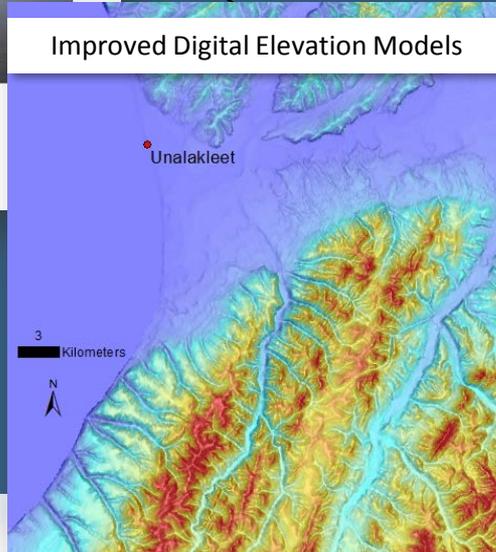
Alaska Baseline Erosion Assessment



Division of the community of Kenai

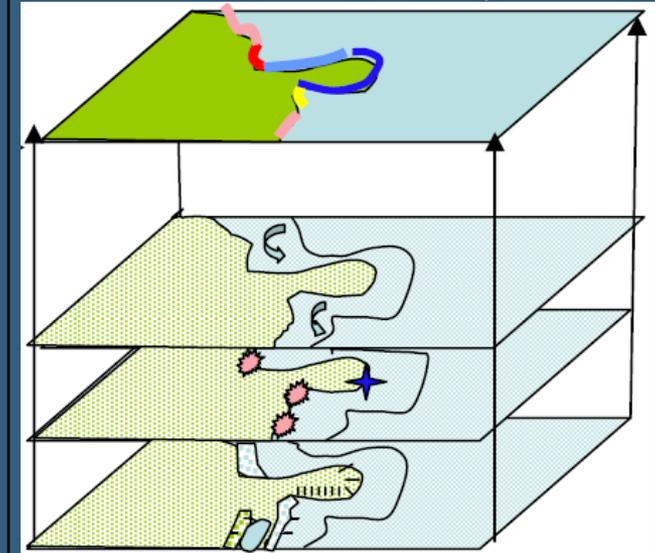
Outside reports, maps, model results, expert and resident knowledge

Improved Digital Elevation Models



Synthesis

Coastal Classification and Vulnerability Bands/Ribbons/Lines/Strips



(RESPONSE & BRGM, 2006)

Composite Coastal Hazard Maps for Alaskan Communities

Included Information:

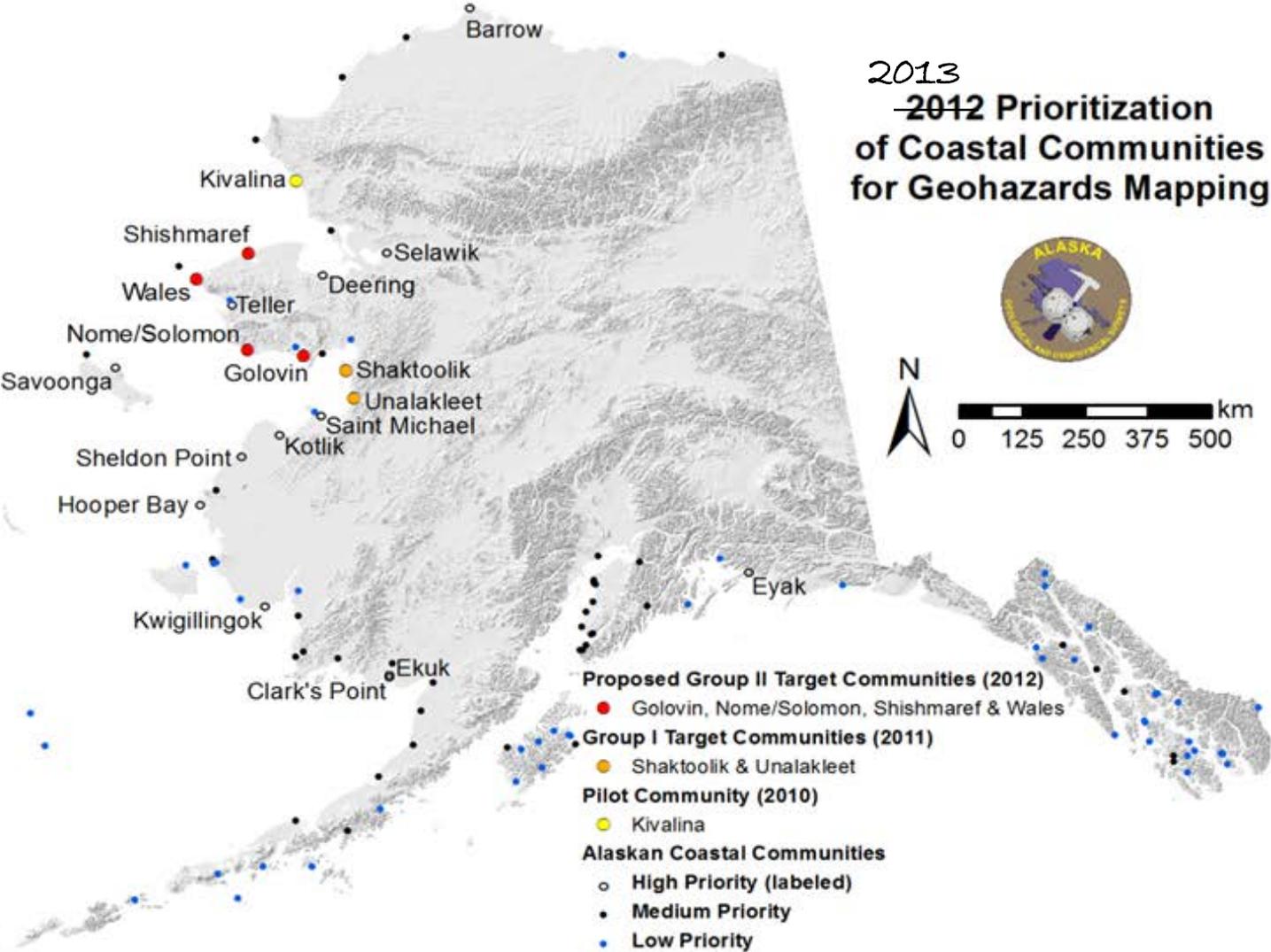
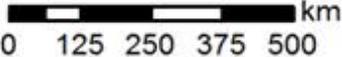
- Geomorphology & Coastal Processes
- Historically Recorded Hazards
- Existing Defenses
- Local Knowledge

Field investigations including baseline data collection & ground truthing



Project Field Areas

2013 -2012 Prioritization of Coastal Communities for Geohazards Mapping



DGGS Winter 2011 Activities

Rapid Response to November Bering Sea Storm

- On site less than 24 hours after storm surge
 - 2 days in Unalakleet
 - 2 days in Shaktoolik
 - 1 day in Nome
 - 1 day in Golovin
- Used precision GPS equipment to document
 - 20 post-storm coastal profiles
 - >50 storm-induced water levels
- Used a range of techniques to document various ocean surface heights such as storm surge and wave run-up elevations
- Collected photographs, video and eyewitness accounts from community residents



DGGS Summer 2012 Activities

Coastal Mapping

- Seward Peninsula:
 - Golovin
 - Nome
 - Wales
 - Shishmaref
- 40 days of field work
 - 15 helicopter supported days
 - 10 boat supported days
- ~300 km of coast investigated for geohazard mapping
- ~900 km² of surficial geology mapped
- Concurrent collection of water level measurements



Timeline

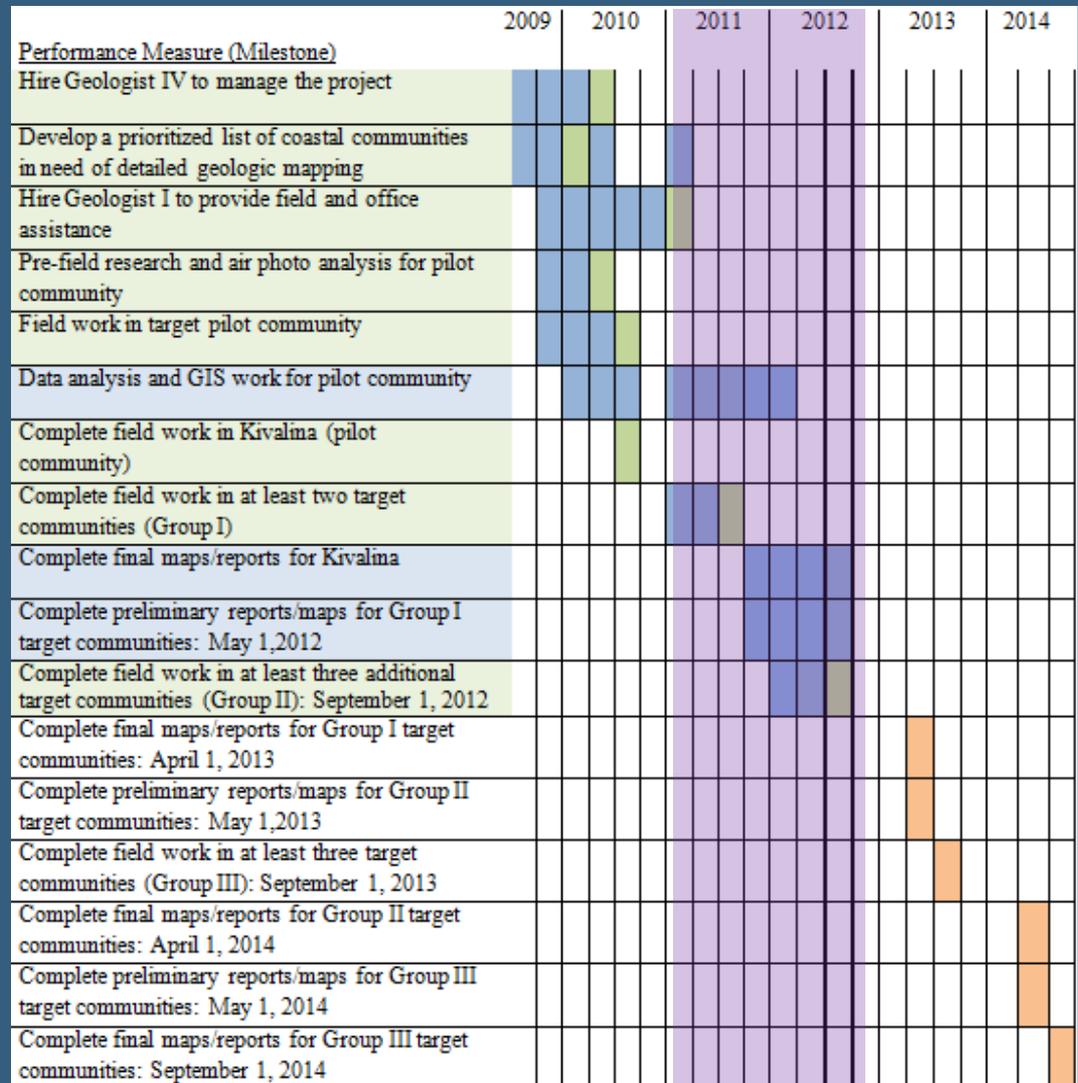
- In 4th year of project
- Dedicated Program Manager (<2 years)
- Field -> Publication process = ~2.5 years

Delay/reschedule causes:

- Rolling start
- Unknown existing data
- New Equipment

Expedited by:

- Alaska familiarity
- Outside CIAP products
- Collaborations
- New contractors



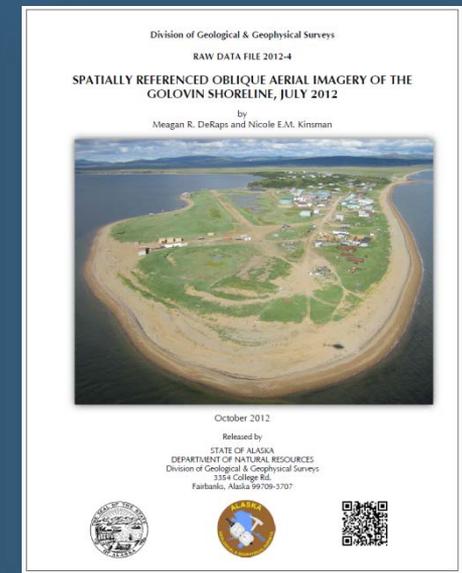
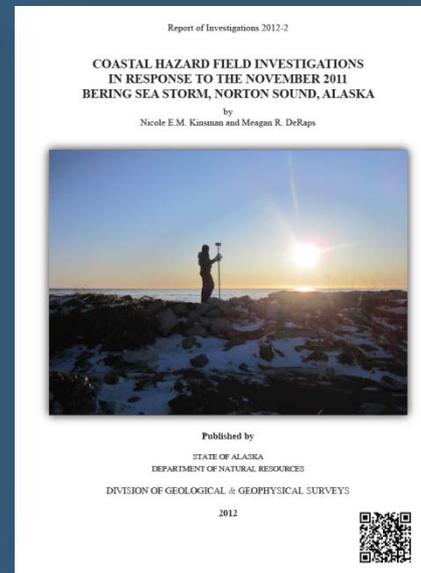
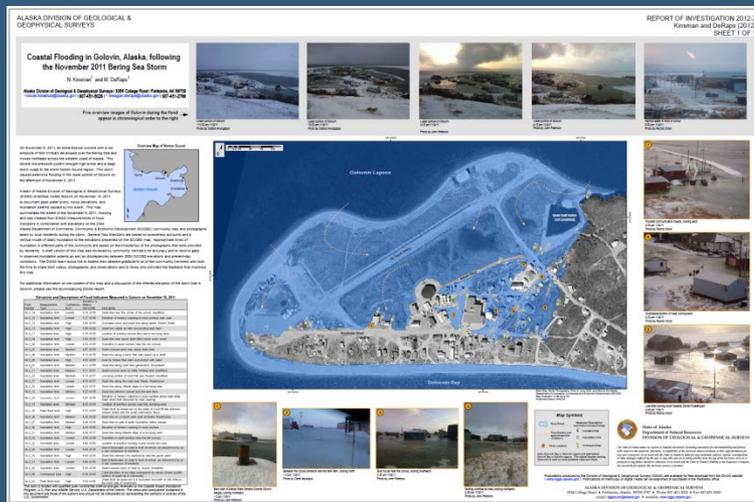
Recent DGGS Coastal Publications

Coastal Hazard Field Investigations in Response to the November 2011 Bering Sea Storm, Norton Sound, Alaska ([RI 2012-2](#))

Spatially Referenced Oblique Aerial Photography of the Golovin Shoreline, July 2012 ([RDF 2012-4](#))

Annotated Bibliography Series in Support of Coastal Community Hazard Planning – Northwest Alaska ([MP 147](#))

Spatially Referenced Oblique Aerial Photography of the Eastern Norton Sound Shoreline, July 2011 ([RDF 2011-5](#))



In Preparation:

Preliminary Evaluation of Coastal Geohazards on the Island to the Northeast of Shishmaref, Alaska (PIR)

Surficial Geologic Map of Shaktoolik, Alaska (RI)

Surficial Geologic Map of Kivalina, Alaska (RI)

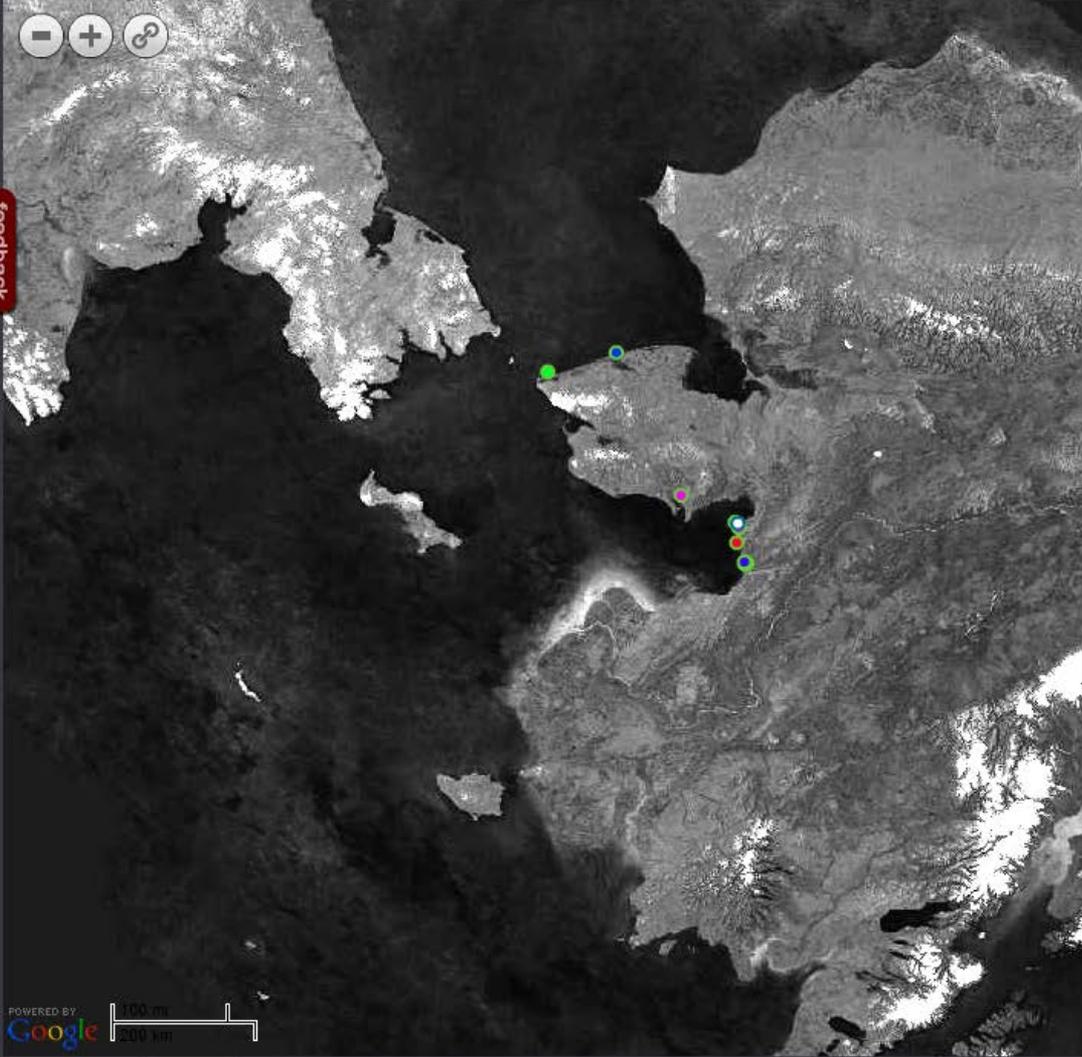
Bathymetric measurements in shallow coastal areas near Wales, Golovin and Shishmaref, Alaska (RDF)

Characterization of coastal geomorphology and geohazards: Kivalina, Alaska (RI)

New Collaborative Developments



Arctic Monitoring Efforts ? Search all layers



Map navigation: - + ↻

Feedback

Arctic Assets

Studies Sensors Sources and white

Check all | Uncheck all

-  Alaska DNR, DGGs
-  Bedford Institute of Oceanography
-  Bigelow Laboratory for Ocean Sciences
-  BOEM
-  BOEM/NOAA/ADFG/Alaska Beluga Whale Committee/ North Slope Borough
-  Center for Coastal & Ocean Mapping - Univ. of NH
- Department of Fisheries and Oceans Canada
-  Hokkaido University
- Institute of Ocean Sciences, Department of Fisheries and Oceans Canada, University of Maryland, JAMSTEC, University of Victoria
-  NMFS, AFSC, National Marine Mammal Laboratory
-  NOAA
-  NOAA/BOEM
-  North Slope Borough

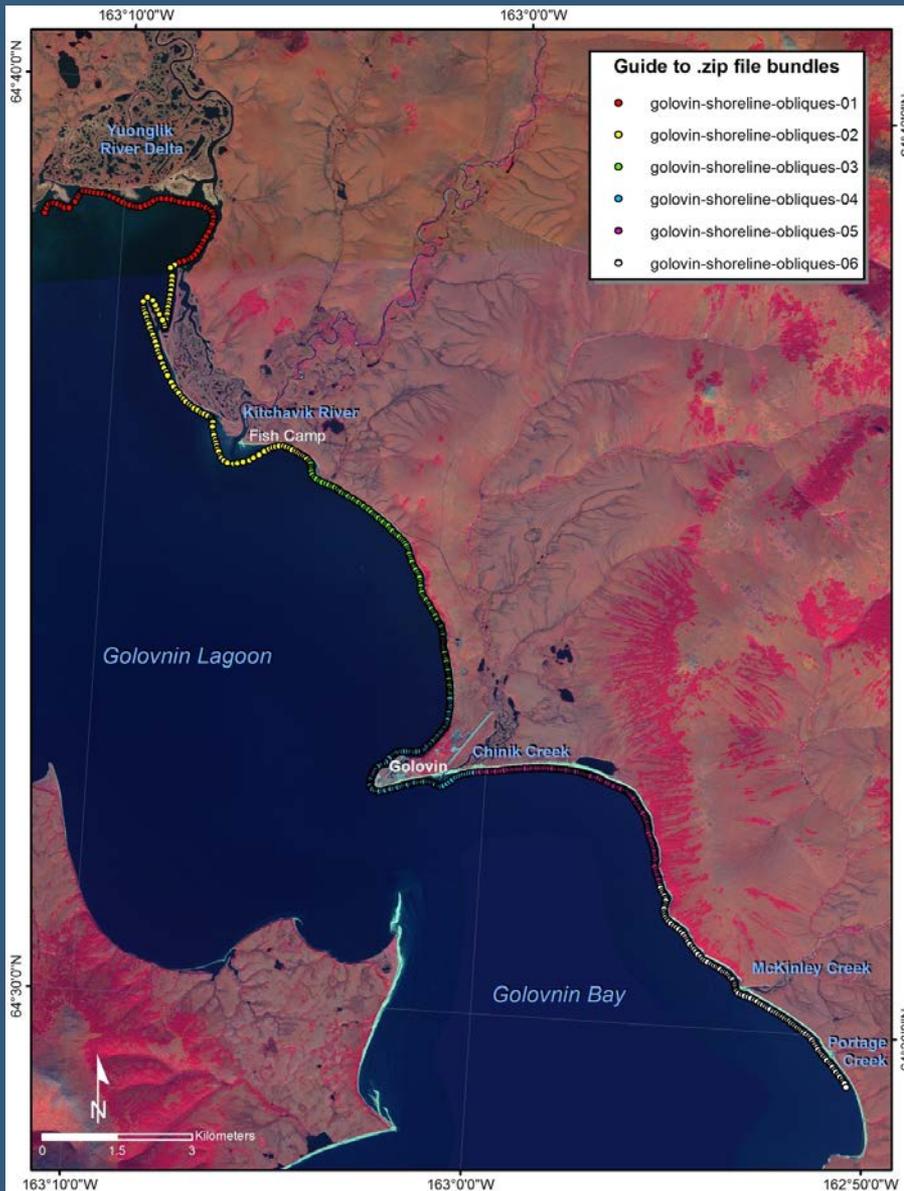
POWERED BY Google

100 km 200 km

04/27/1981 Time control 01/02/2013

Vector < >

Alaska ShoreZone



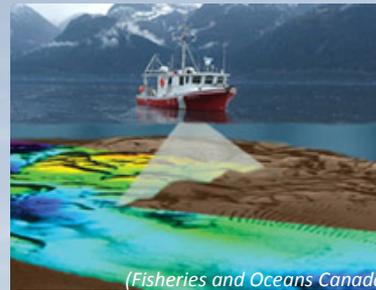
Involvement with ShoreZone

- \$11,000 towards 2012 imaging
- Providing feedback on new Coastal Vulnerability Module
- Partnering for additional image collection in western AK (2013)

Western Alaska Landscape Conservation Cooperative

Motivation

- To support the development of high resolution topobathy in rural Alaska
- Uses:
 - Assess wave exposure
 - Inundation modeling
 - Coastal development
 - Change detection



Summary

- Nearshore bathymetric measurements for critical coastal areas
- Utilizes locally-owned boats of convenience
- 60+ hours of boat time and 5 weeks of concurrent tidal measurements in Summer 2012



Boats used during the 2012 field season.

From left to right:

Shishmaref - 20' wooden skiff

Golovin - 25' salmon boat

Wales - 18' Lund

10/16/2012



Graduate Research

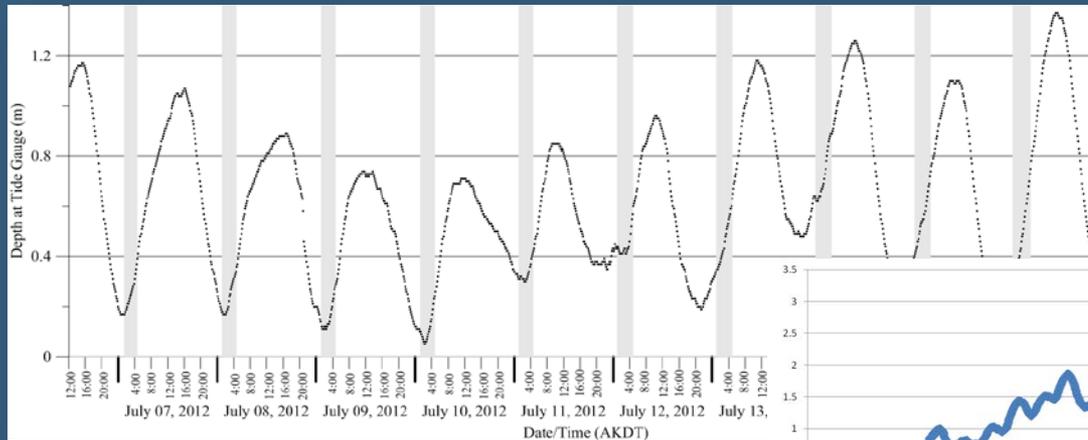


*Jacquelyn Smith (co-advised w/ Dr. Debu Misra)
MS Geological Engineering
Modeling Storm Surge Vulnerability in Golovin, Alaska*

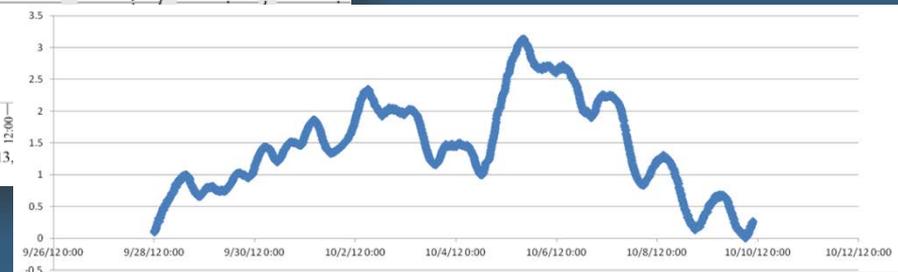


*Kimber DeGrandpre (co-advised w/ Dr. Jeff Freymueller)
MS Geology & Geophysics
Quantifying Relative Sea Level Change in Western Alaska*

Water Level Monitoring
Network



July, 2012 Water Depths in Golovin, AK



October, 2012 Surge in Golovin, AK

Storm surge flooding and erosion on the northwest coast of Alaska

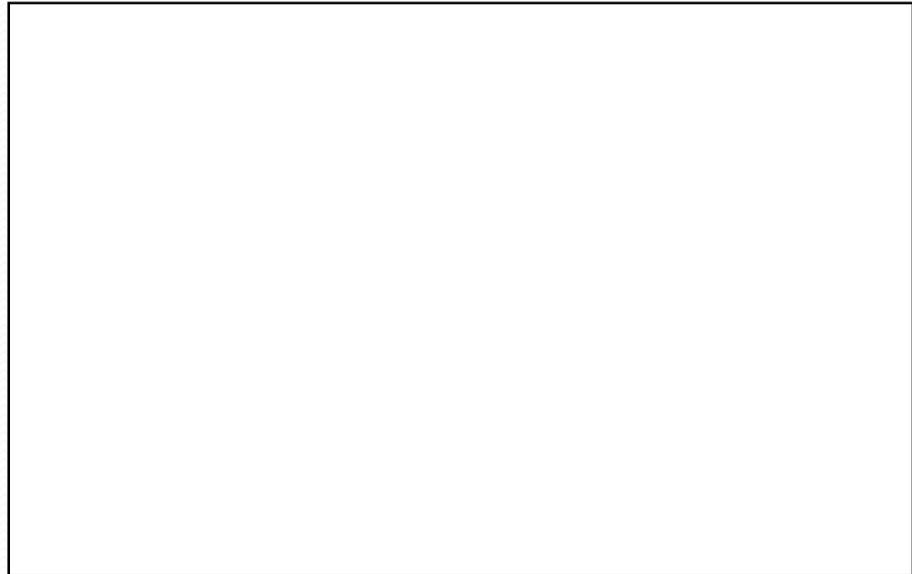
Jacquelyn Smith

University of Alaska Fairbanks Geological Engineering

Masters Candidate

Objective

- Develop methodology to analyze effects of storm surge on flooding and erosion at Golovin, Alaska.
- Provide necessary hydraulic analysis for engineering solution design.



Storm Surge



- Storm water levels compared to normal conditions at Golovin, Alaska
October 5th, 2012
(FAA, 2012)

Hydrodynamic Modeling

- Geologic Environment
- Topological Environment
- Atmospheric Environment
- Hydraulic Environment

Grain Size

- Image autocorrelation vs. sieving
 - USGS developed Matlab grain size auto detection program.
 - Standard sieve procedure.



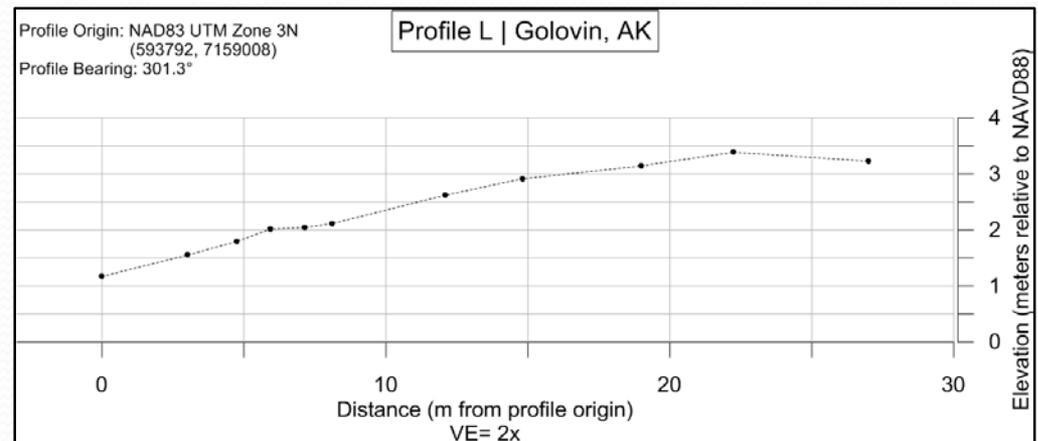
WorldView2 Bathymetry

- Coastal band.
- Test for Arctic conditions.
- Develop workflow for future uses.



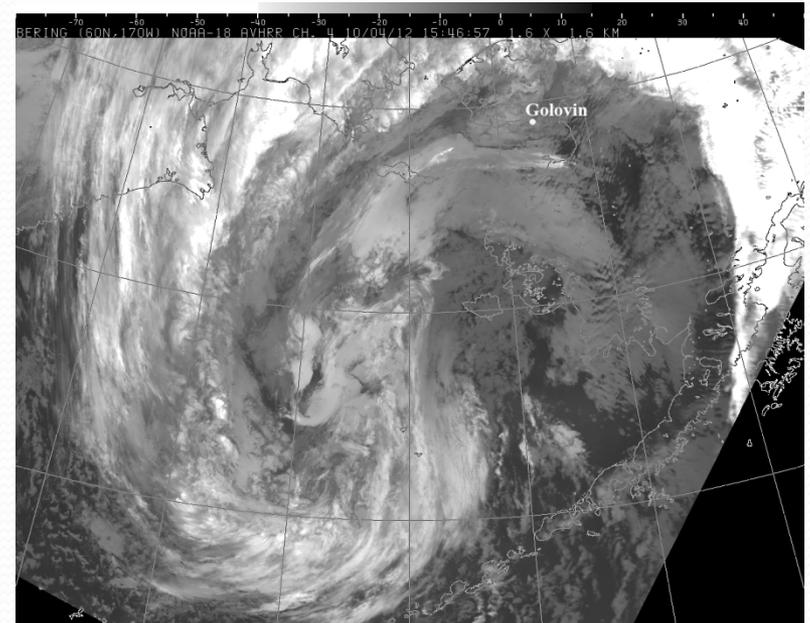
Coastal Survey

- Smooth transition from bathymetry to land surface.
- Allows for specific calculations
 - Runup
 - Dune overtopping



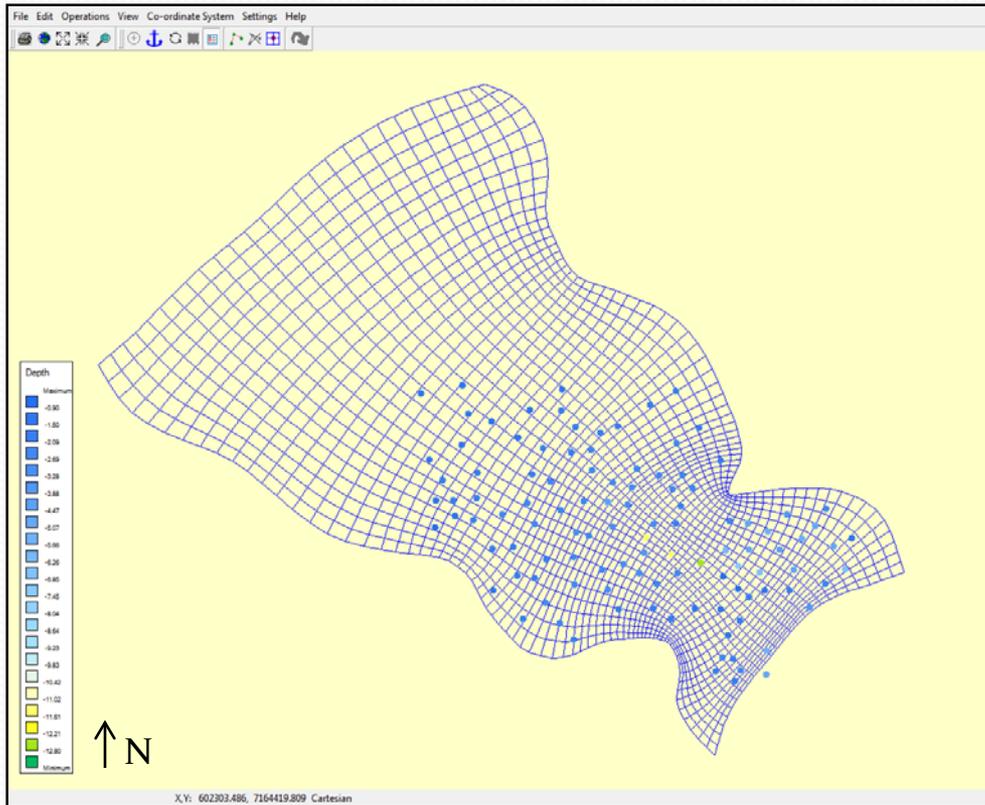
Atmospheric Conditions

- Consider previous storm conditions.
- Projected storm conditions.
- Variations in storm attributes.
 - Direction
 - Intensity



Thermal infrared image of October 5, 2012
Bering Sea Storm off coast of Alaska (NOAA,
2012)

Integration into DELFT3D



- Hydraulic wave and flow model.
- Calculates water height during storm conditions.

End Product

- Assessment of potential erosion and inundation elevations along Golovin coast.
- Initial hydraulic analysis required for engineering design.
- Repeatable methodology of storm surge hazard quantification.
- Dissemination of Information:
 - American Society of Photogrammetry and Remote Sensing 2013 Conference.
 - 2013 Alaska Space grant and NASA EPSCoR Research Symposium.
 - American Geophysical Union 2014 Oceans Conference.

Planned Conferences and Meetings (thru Spring 2013)



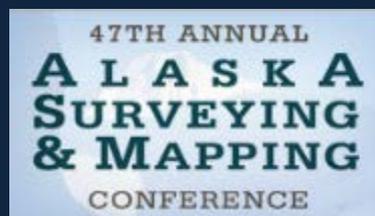
November 2012

Annual ShoreZone Partners Meeting



January 2013

Alaska Marine Science Symposium



February 2013

Conference highlighting geospatial projects and research across Alaska



February 2013

Alaska Forum on the Environment



March 2013

5th National NOAA Coastal Services Conference

A focus on the technical information needs of the nation's coastal programs



April 2013

American Water Resources Association, Northern-Region
Fairbanks Seminar Series

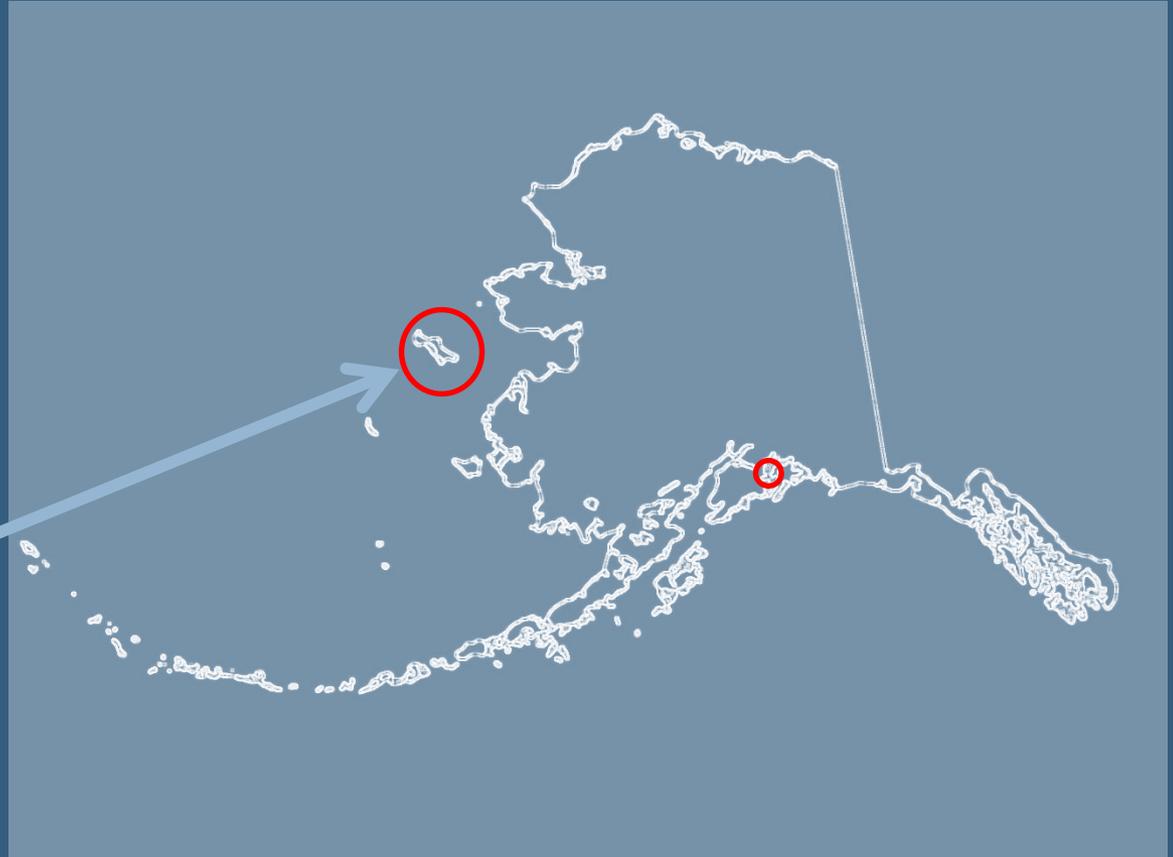
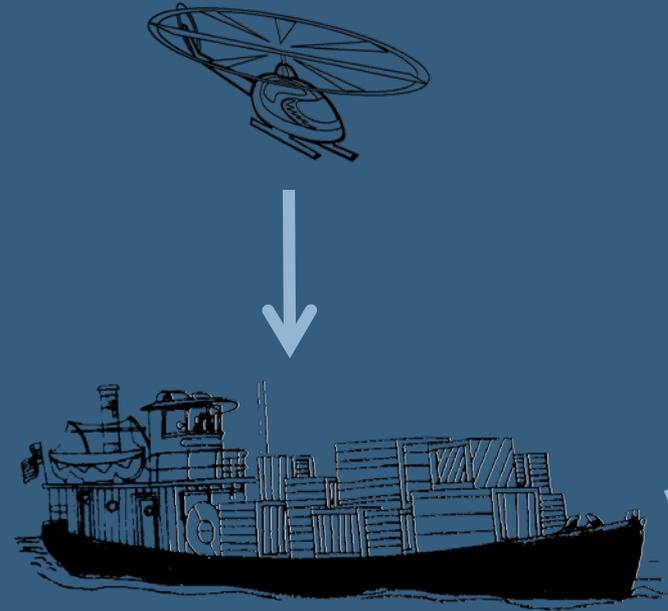


June 2013

11th International Symposium for GIS and Computer Cartography for Coastal Zone Management

Theme: Monitoring and Adapting to Change on the Coast

2013 – Savoonga and Gambell



2013

**St. Lawrence Island
Savoonga
Gambell**

Whittier