Climate Change Issues at the State Level:

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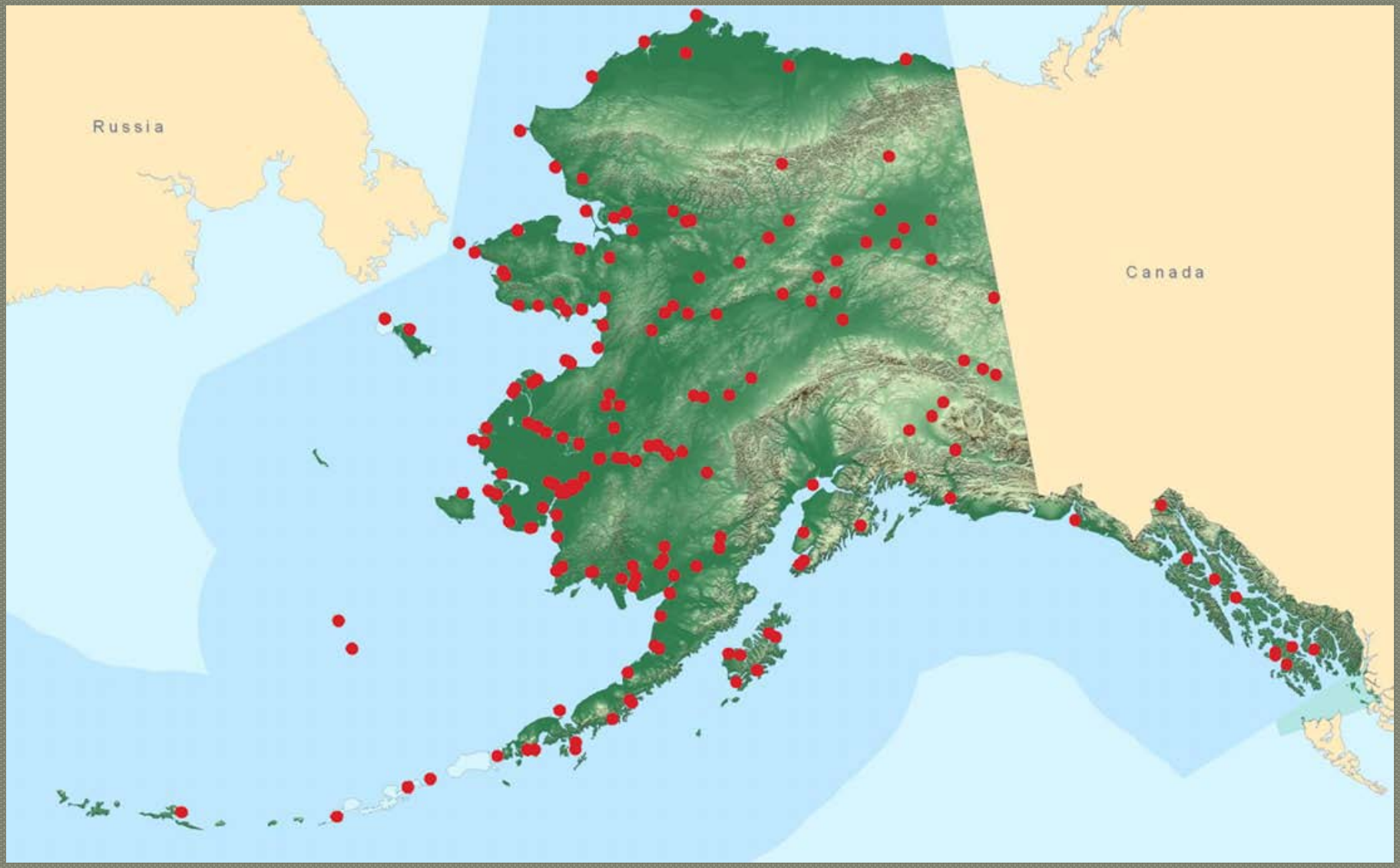
Photo: Kawerak

The Takeaway Message

In the face of the media hype and politics surrounding the issue of climate change, it is critical that the State make decisions based on solid, sound science and be mindful of ongoing physical processes that would proceed regardless of changing climate.

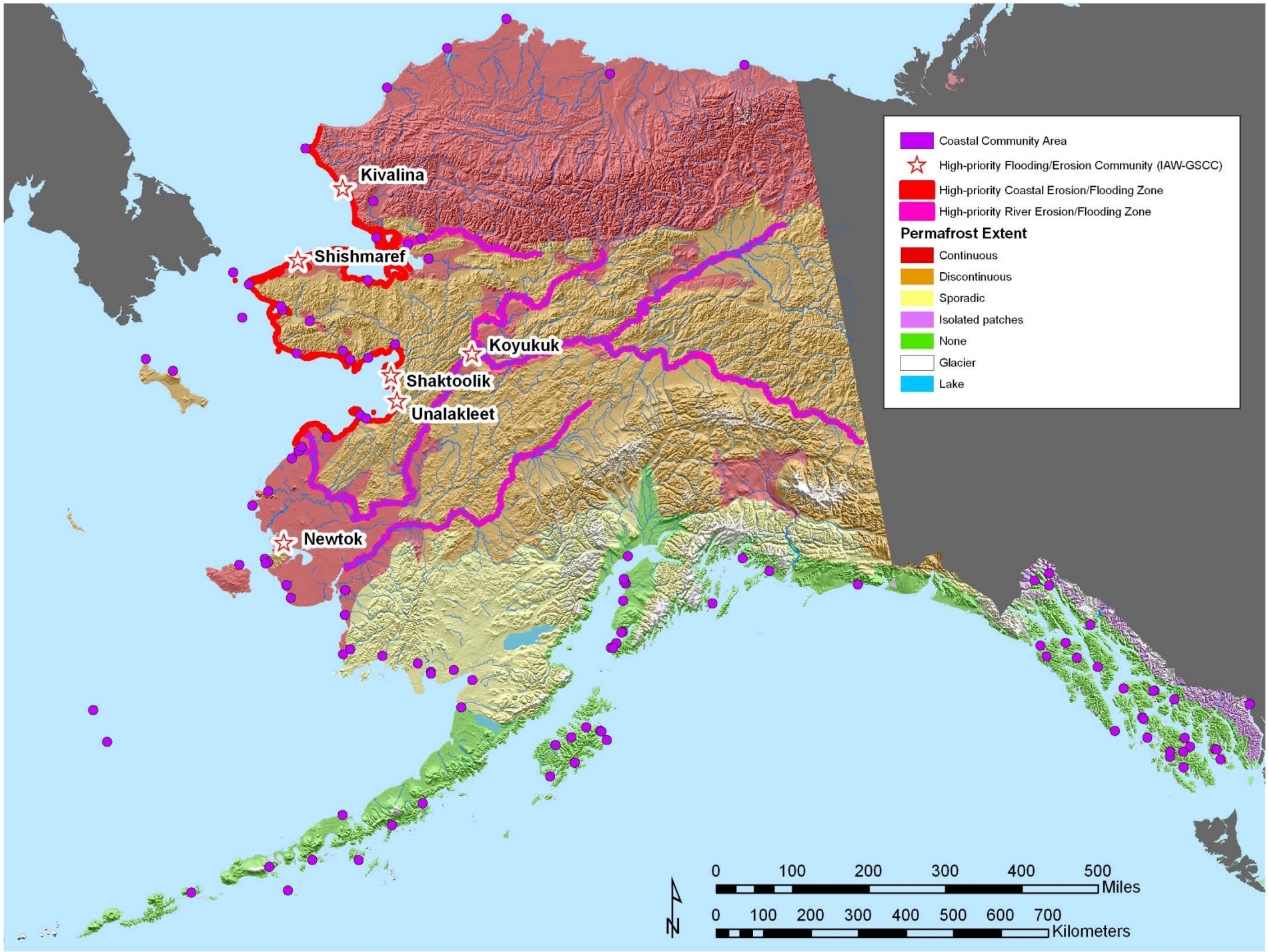
Why is the State Concerned about Submerged Lands in a Changing Climate?

It's something of a no-brainer…



•Flooding and erosion affects 184 out of 213, or 86 percent, of Alaska Native villages to some extent (US Government Accounting Office Report GAO-04-895T).

•71 percent of Alaska coastal communities, or 80 out of 112, sit at or below 10 meters elevation.


Kivalina
Shishmaref
Koyukuk
Shaktoolik
Unalakleet
Newtok
Coastal Community Area
High-priority Flooding/Erosion Community (IAW-GSCC)
High-priority Coastal Erosion/Flooding Zone
High-priority River Erosion/Flooding Zone
Permafrost Extent
Continuous
Discontinuous
Sporadic
Isolated patches
None
Glacier
Lake
0 100 200 300 400 500 Miles
0 100 200 300 400 500 600 700 Kilometers
N

Climate Change and Coastal Processes: Exacerbation by Warming Climate

- Decreased sea ice extent and duration
  - Reduced shore protection
  - Increased fetch
  - Storm surges
- Increased sea surface temperatures
  - Thermal abrasion
  - Increased sediment load
- Accelerated thermokarst development
  - Increased lagoon and tidal prism volumes
  - Erosion
- Sea level rise
  - Inundation of low-lying areas

Changes in Alaska's Northernmost Regions

- Coastal erosion may have doubled since 1955
- Inland expansion of channel networks and increased river bank erosion have been attributed to warming
- Lakes, ponds, and wetlands appear to be more dynamic, growing in some areas, shrinking in others, and changing distribution across lowland regions
- Permafrost degradation on the Arctic coastal plain suggests 10-30 percent of lowland and tundra landscapes may be affected by even modest warming
- Slope instability in headwater regions is increasing and leading to increased sedimentation rates

Alaska's Glaciers

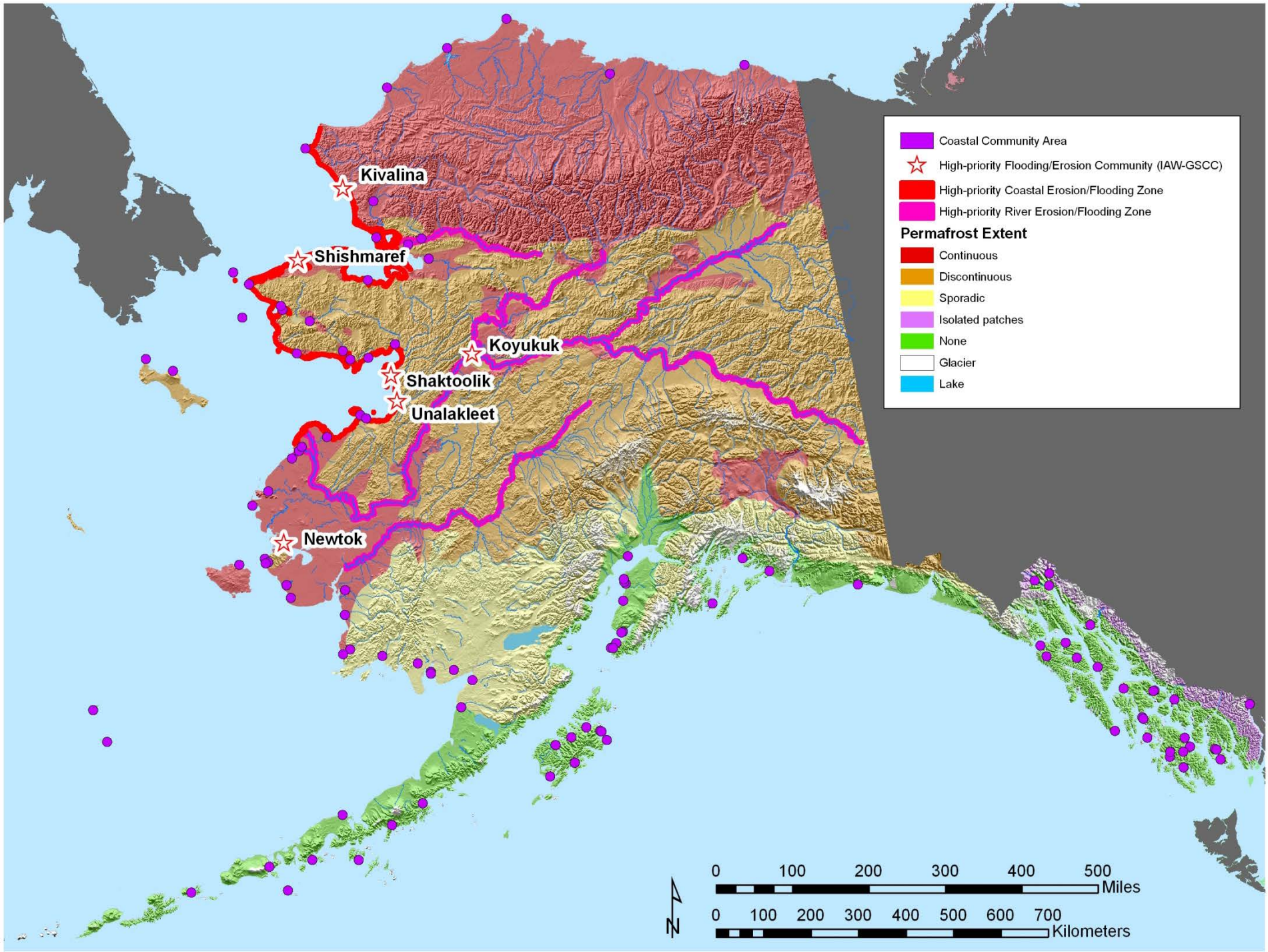
- During the 20th and 21st centuries, most land-terminating glaciers in Alaska retreated extensively from their Little Ice Age maximum extent
- Since 1980, nearly all glaciers in Alaska have been in a state of retreat
- Isostatic uplift
  - 4-30 mm/yr
- Changes in sedimentation rates will impact:
  - Water supplies
  - Water quality
  - Hydroelectric power generation potential
  - Flood hazards
  - Freshwater, estuarine and coastal habitats

Primary Anticipated Effects of Climate Change to Submerged Lands in Alaska

- Increased suspended sediment loads and sedimentation rates in lagoons and offshore
- Changes to lagoon, estuary and deltaic systems:
  - Salination
  - Water levels
  - Morphology
  - Sedimentation

Known vs. Unknown: Where's the Data?

- We know what types of effects changes in various parameters (storm frequency, ice extent, sea level) will have on natural ongoing coastal processes.
- Whether or not, and to what extent, these changes are occurring will require more observation:
  - Difficult to separate accelerated signals of coastal erosion in Alaska because rates in the absence of climate change are virtually unknown.
- Understanding processes is therefore key, as is observing ongoing coastal processes especially in sensitive low-lying environments such as lagoons and marshes.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DGGS is Gathering Critical Data So Alaskans Can Benefit From Informed Decision-Making by State and Local Governments

- Coastal Hazards Program
  - Kivalina - 2010
  - Shaktoolik - 2011
  - Unalakleet - 2011
- Climate Change Hazards Program
  - Koyukuk - 2010
  - Whittier - 2011
  - Seward - 2011

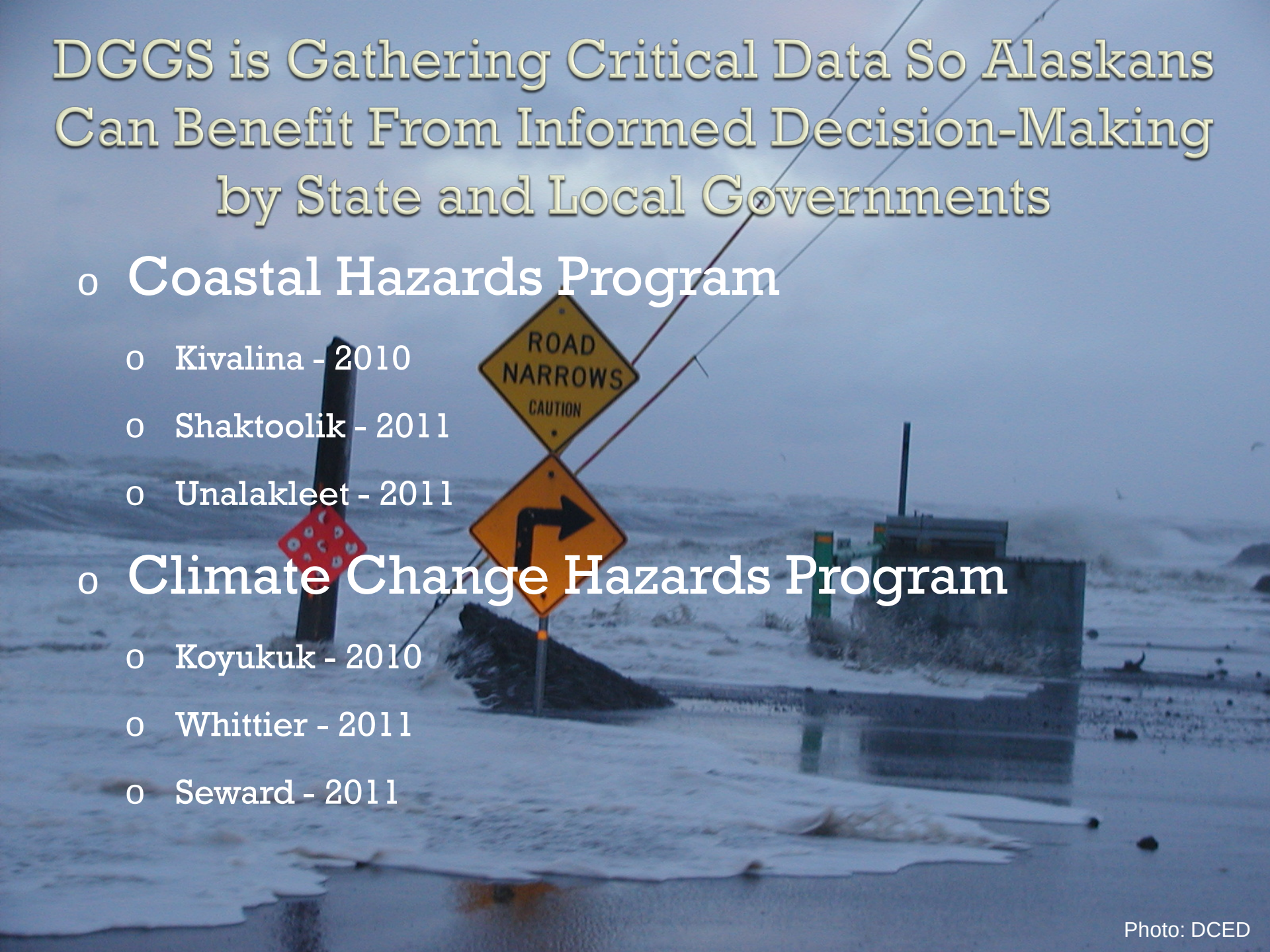

Photo: DCED