

# Profound Changes in Alaska's Coastline

## "Our Homes, Our Way of Life"

Coastlines provide Alaska's most life-filled environments. From shallow near shore waters, to tidelands, beaches, bluffs, bays, lagoons, estuaries and deltas, this thin slice of Alaska supports a disproportionately large share of our state's fish and wildlife as well as most of our communities. These fantastically rich coastal environments – the places where the land meets the ocean – are particularly vulnerable to climate change.

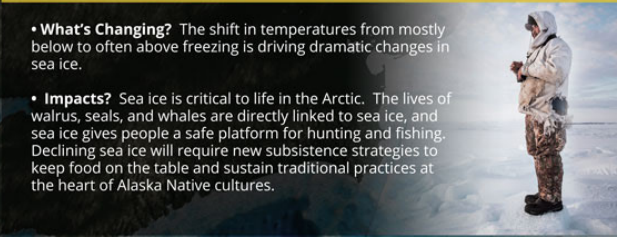


### PHASE CHANGE: Welcome to a New World

- From 1970–2015, northwestern Alaska warmed two and a half times faster than the global average (+7.3 °F/ vs. +3.0 °F / century).
- Future average regional temperature is likely to increase by +7° F by the 2040s and +13° F by the 2080s.
- These changes are enormous, equal to or greater than the magnitude of change from the ice ages to our current climate.
- **The Bottom Line:** These changes mean a transition from an environment with average temperature 10°F below freezing, no trees, where humans and wildlife rely on predictable sea ice, to one where the average annual temperature is above freezing, trees can grow, and spring and fall sea ice is rare, if it exists at all.

### MELTING SEA ICE

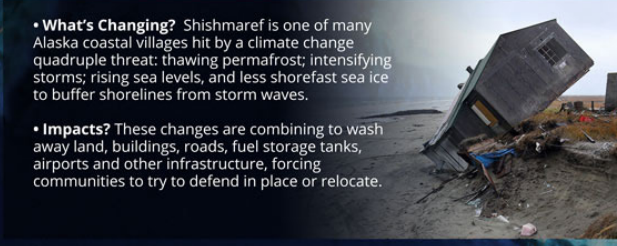
*"If I can't hunt for walrus I lose the heart of what I teach my grandchildren"*  
Nome Participant



- **What's Changing?** The shift in temperatures from mostly below to often above freezing is driving dramatic changes in sea ice.
- **Impacts?** Sea ice is critical to life in the Arctic. The lives of walrus, seals, and whales are directly linked to sea ice, and sea ice gives people a safe platform for hunting and fishing. Declining sea ice will require new subsistence strategies to keep food on the table and sustain traditional practices at the heart of Alaska Native cultures.

### COMMUNITY LIFE AT THE MELTING EDGE OF CLIMATE CHANGE

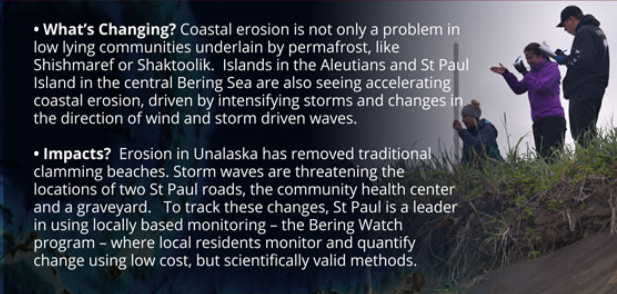
*"Shishmaref is our home, it's where our heart is"* (Shishmaref resident quoted in New York Times)



- **What's Changing?** Shishmaref is one of many Alaska coastal villages hit by a climate change quadruple threat: thawing permafrost; intensifying storms; rising sea levels, and less shorefast sea ice to buffer shorelines from storm waves.
- **Impacts?** These changes are combining to wash away land, buildings, roads, fuel storage tanks, airports and other infrastructure, forcing communities to try to defend in place or relocate.

### ROCKY ISLANDS

*"Animals are migrating different and we need to change the hunting seasons and practices so that we can get our fish & game"* King Salmon



- **What's Changing?** Coastal erosion is not only a problem in low lying communities underlain by permafrost, like Shishmaref or Shaktoolik. Islands in the Aleutians and St Paul Island in the central Bering Sea are also seeing accelerating coastal erosion, driven by intensifying storms and changes in the direction of wind and storm driven waves.
- **Impacts?** Erosion in Unalaska has removed traditional clamming beaches. Storm waves are threatening the locations of two St Paul roads, the community health center and a graveyard. To track these changes, St Paul is a leader in using locally based monitoring – the Bering Watch program – where local residents monitor and quantify change using low cost, but scientifically valid methods.



*"We're seeing more deaths every year as people risk travel for food and fall through the ice"* Nome participant

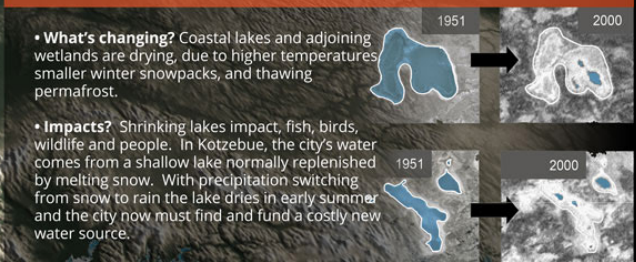
*"For the first time ever we have beavers, and they're polluting our village water supply"* Kotzebue participant

*"Most of our communities are based on edge of highly productive estuaries – and they're really changing"* Nome participant

*"Historic and archaeological sites are being eroded; barrier islands and spits are being eroded"* Unalaska participant

### SHRINKING LAKES, DRYING WETLANDS

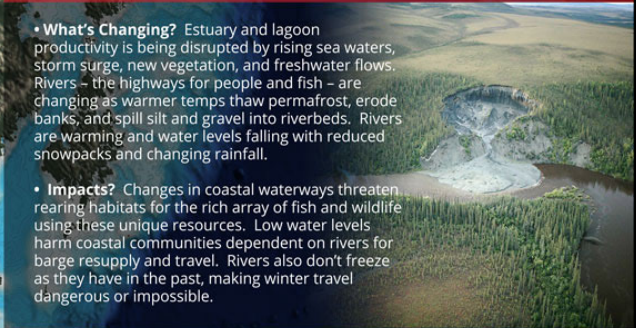
*"The tundra is so dry - now it crunches when you walk"* Kotzebue Participant



- **What's changing?** Coastal lakes and adjoining wetlands are drying, due to higher temperatures smaller winter snowpacks, and thawing permafrost.
- **Impacts?** Shrinking lakes impact, fish, birds, wildlife and people. In Kotzebue, the city's water comes from a shallow lake normally replenished by melting snow. With precipitation switching from snow to rain the lake dries in early summer and the city now must find and fund a costly new water source.

### CHANGING RIVERS, COASTAL LAGOONS, & ESTUARIES

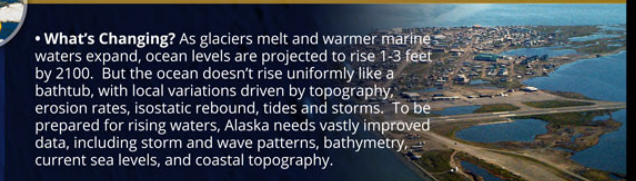
*"Lagoons, coastal rivers are incredibly rich and productive – and they're being hammered by climate change"* Kotzebue participant



- **What's Changing?** Estuary and lagoon productivity is being disrupted by rising sea waters, storm surge, new vegetation, and freshwater flows. Rivers – the highways for people and fish – are changing as warmer temps thaw permafrost, erode banks, and spill silt and gravel into riverbeds. Rivers are warming and water levels falling with reduced snowpacks and changing rainfall.
- **Impacts?** Changes in coastal waterways threaten rearing habitats for the rich array of fish and wildlife using these unique resources. Low water levels harm coastal communities dependent on rivers for barge resupply and travel. Rivers also don't freeze as they have in the past, making winter travel dangerous or impossible.

### RISING WATERS & FLOODING COASTLINES: WE NEED BETTER DATA!

*"There are more tidal data stations in Chesapeake Bay than all of Alaska"* King Salmon Participant



- **What's Changing?** As glaciers melt and warmer marine waters expand, ocean levels are projected to rise 1-3 feet by 2100. But the ocean doesn't rise uniformly like a bathtub, with local variations driven by topography, erosion rates, isostatic rebound, tides and storms. To be prepared for rising waters, Alaska needs vastly improved data, including storm and wave patterns, bathymetry, current sea levels, and coastal topography.

