"Working Together to Keep Communities & Cultures Intact in the Face of Climate Change"

COP-15

Copenhagen, Denmark

15 December 2009

Larry Hartig

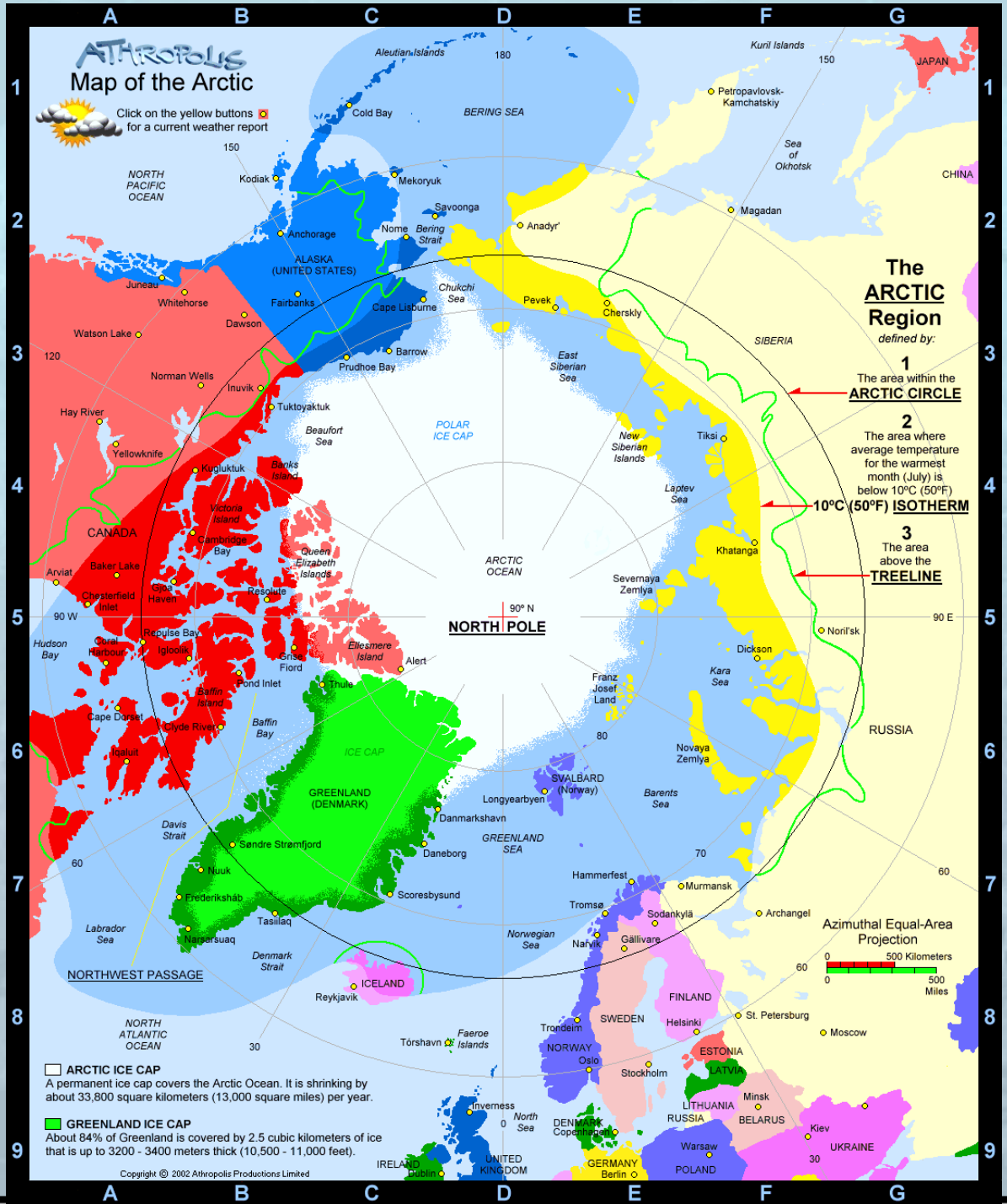
Commissioner, Alaska Department of Environmental Conservation

Chair, Governor's Climate Change Sub-Cabinet

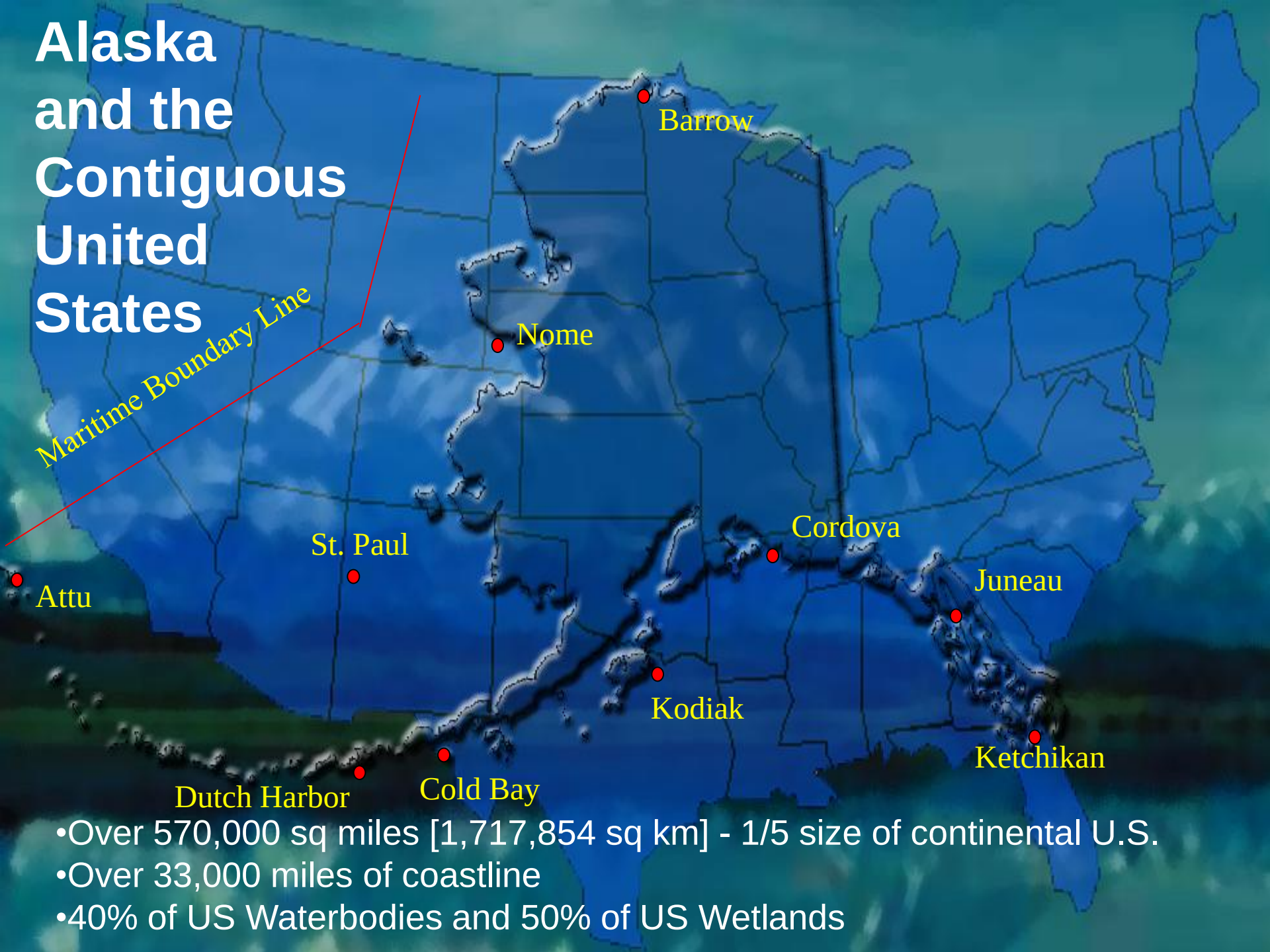
Presentation

- Alaska's Climate, Communities, and People
- Evidence of warming and thawing in Alaska
- Impacts on rural Arctic communities
- Actions being taken to address these impacts
  - Collaboration
  - Community involvement
  - Sustainable solutions

Alaska and the Circumpolar North



Alaska and the Contiguous United States



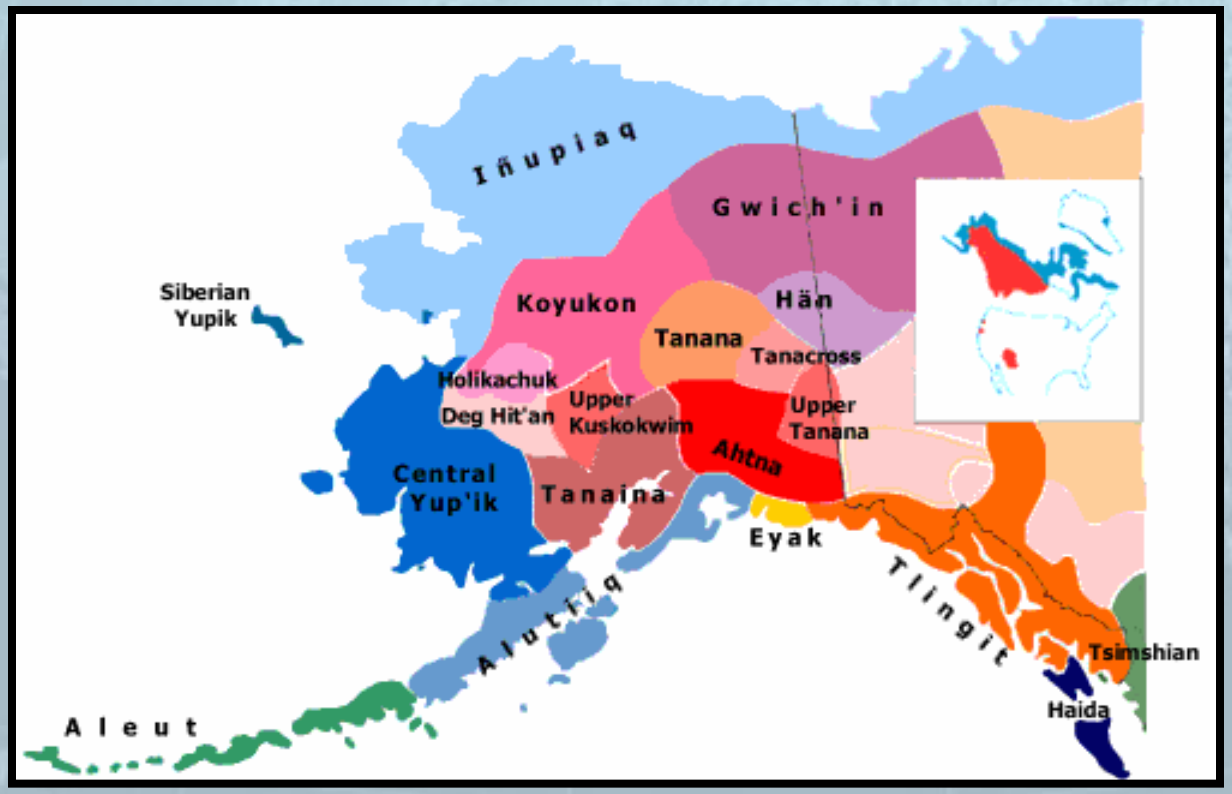
- Over 570,000 sq miles [1,717,854 sq km] - 1/5 size of continental U.S.
- Over 33,000 miles of coastline
- 40% of US Waterbodies and 50% of US Wetlands

Alaska – Her People

Total Population of State - ~686,000

Native population - ~ 90,000

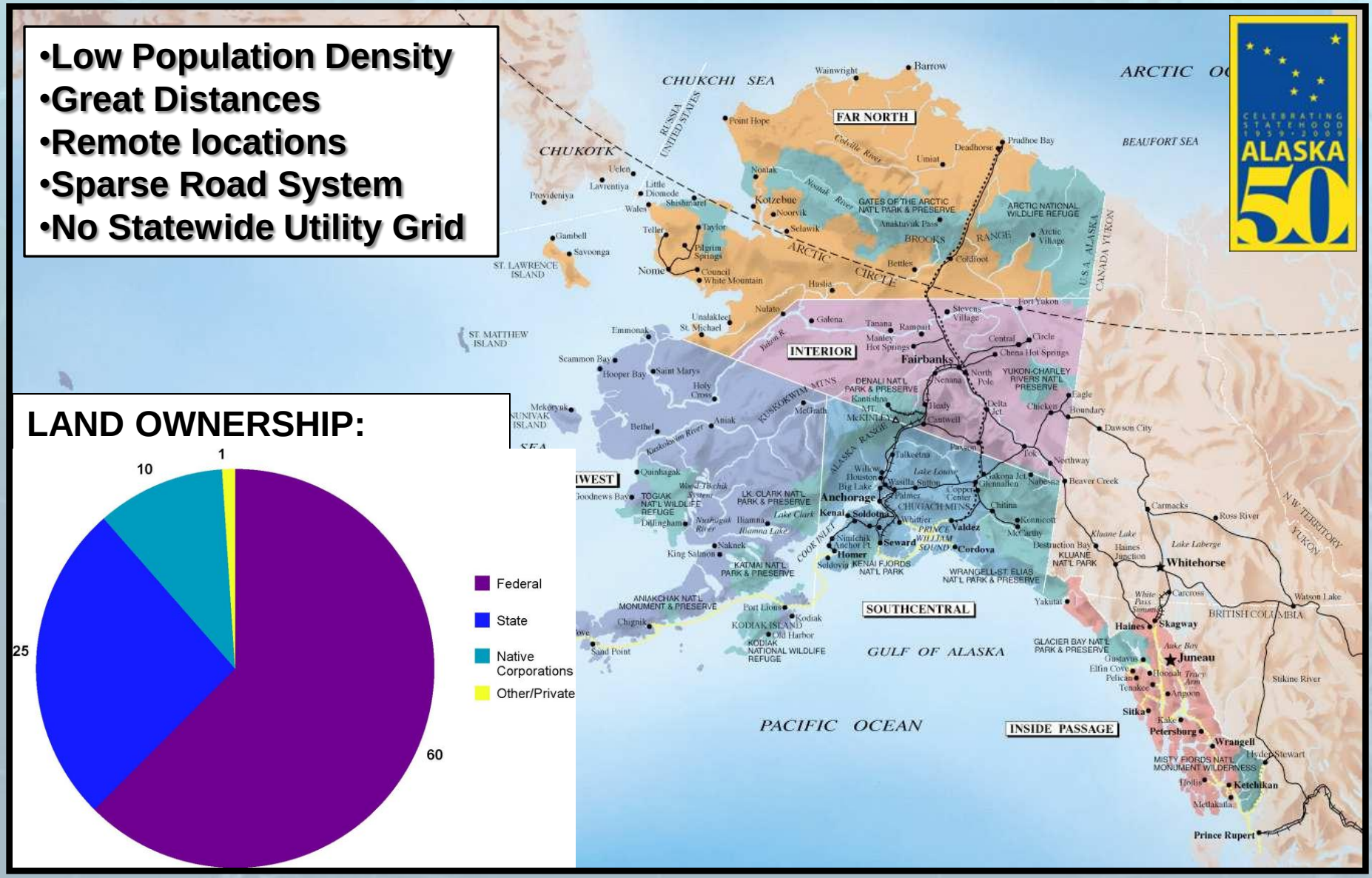
Subsistence way of life important



Alaska - "The Last Frontier"

- Low Population Density
- Great Distances
- Remote locations
- Sparse Road System
- No Statewide Utility Grid

LAND OWNERSHIP:


CHUKCHI SEA
ARCTIC OCEAN
BEAUFORT SEA
FAR NORTH
INTERIOR
SOUTHCENTRAL
GULF OF ALASKA
PACIFIC OCEAN
INSIDE PASSAGE
ARCTIC CIRCLE
Barrow
Wainwright
Point Hope
Deadhorse
Pradhoe Bay
Umiat
Kotzebue
Noorvik
Nome
Fairbanks
Anchorage
Kenai
Soldotna
Homer
Seward
Valdez
Cordova
Whittier
Palmer
Wasilla
Talkeetna
Delta Jct
Tok
Dawson City
Whitehorse
Skagway
Haines
Juneau
Sitka
Petersburg
Ketchikan
Wrangell
Prince Rupert
Yakutat
Kodiak
Dillingham
King Salmon
Bethel
Aniak
Galena
Nulato
Unalakleet
St. Michael
Emmonak
Scammon Bay
Hooper Bay
Saint Marys
Holy Cross
McGrath
Takotna
Nenana
North Pole
Eagle
Chicken
Boundary
Northway
Beaver Creek
Carmacks
Ross River
Watson Lake
Carcross
Atka
Adak
Unalaska
Dutch Harbor
Sand Point
Chignik
Naknek
Iliamna
Lake Clark
Nushagak River
Kuskokwim River
Yukon R.
Tanana
Rampart
Manley Hot Springs
Stevens Village
Fort Yukon
Central
Circle
Chena Hot Springs
Arctic Village
Coldfoot
Bettles
Huslia
Ruby
Galena
Teller
Taylor
Pilgrim Springs
Council
White Mountain
Wales
Shishmaref
Little Diomede
Lavrentiya
Provideniya
Uelen
Gambell
Savoonga
Point Hope
Wainwright
Barrow
Umiat
Deadhorse
Pradhoe Bay
Nuiqsut
Nuiqsut
Colville River
Noatak River
Anaktuvuk Pass
Arctic Village
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Juneau
Sitka
Petersburg
Ketchikan
Wrangell
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Yakutat
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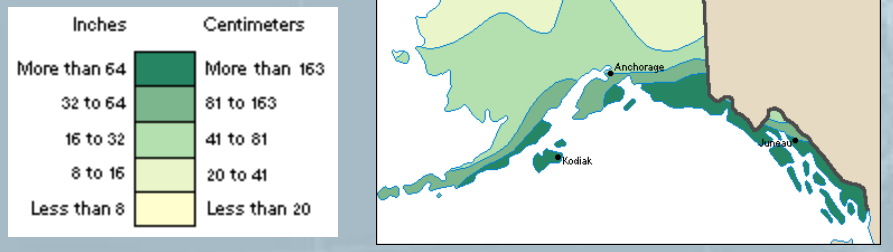
Aniak
Galena
Nulato
Unalakleet
St. Michael
Emmonak
Scammon Bay
Hooper Bay
Saint Marys
Holy Cross
McGrath
Takotna
Nenana
North Pole

Climate Regions & Precipitation in Alaska

Source: UAF: Alaska Climate Research Center

Precipitation:

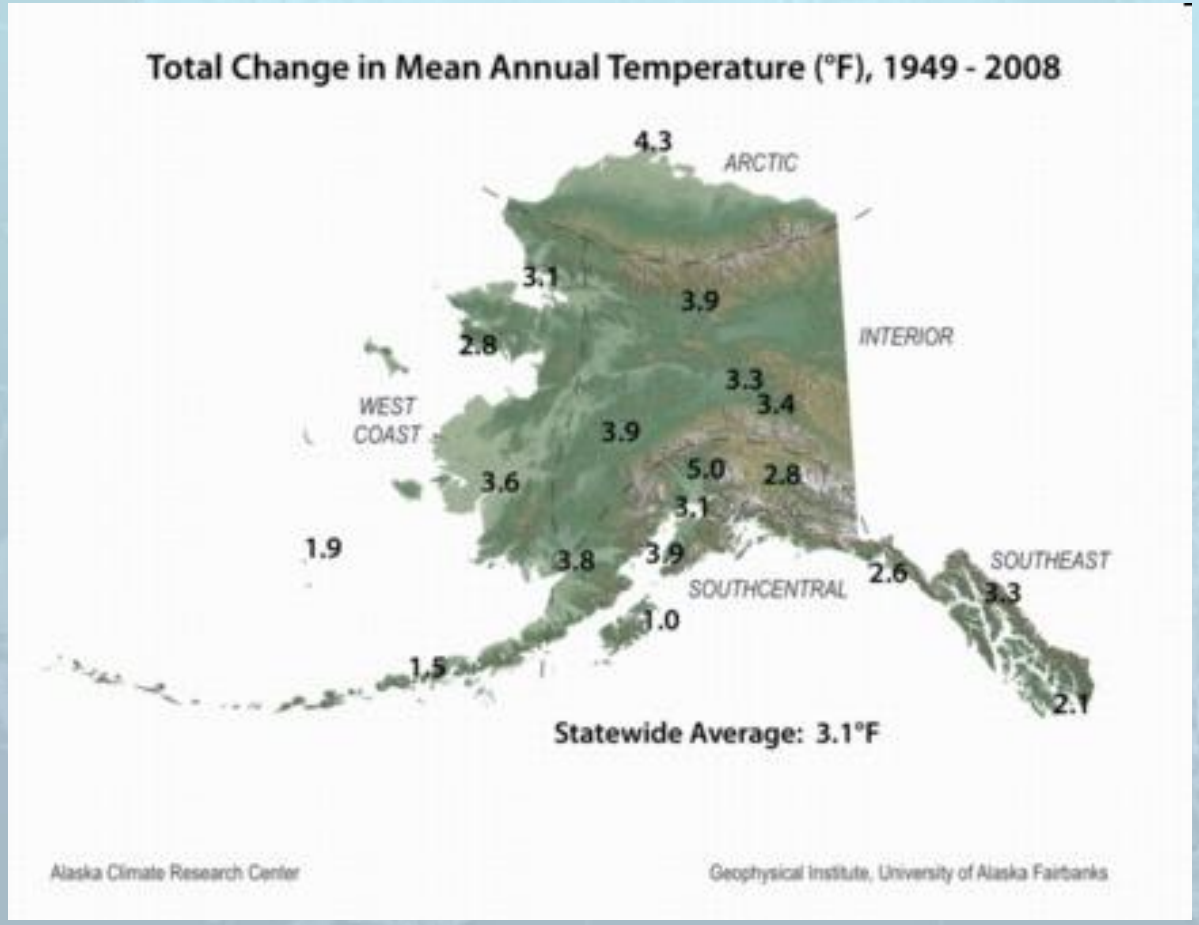


The Climate is Changing

"Arctic average temperature has risen at almost twice the rate as the rest of the world in the past few decades. Widespread melting of glaciers and sea ice and rising permafrost temperatures present additional evidence of strong arctic warming. These changes in the Arctic provide an early indication of the environmental and societal significance of global warming."

[Executive Summary, "Impacts of a Warming Arctic," Arctic Climate Impact Assessment, Cambridge University Press 2004]

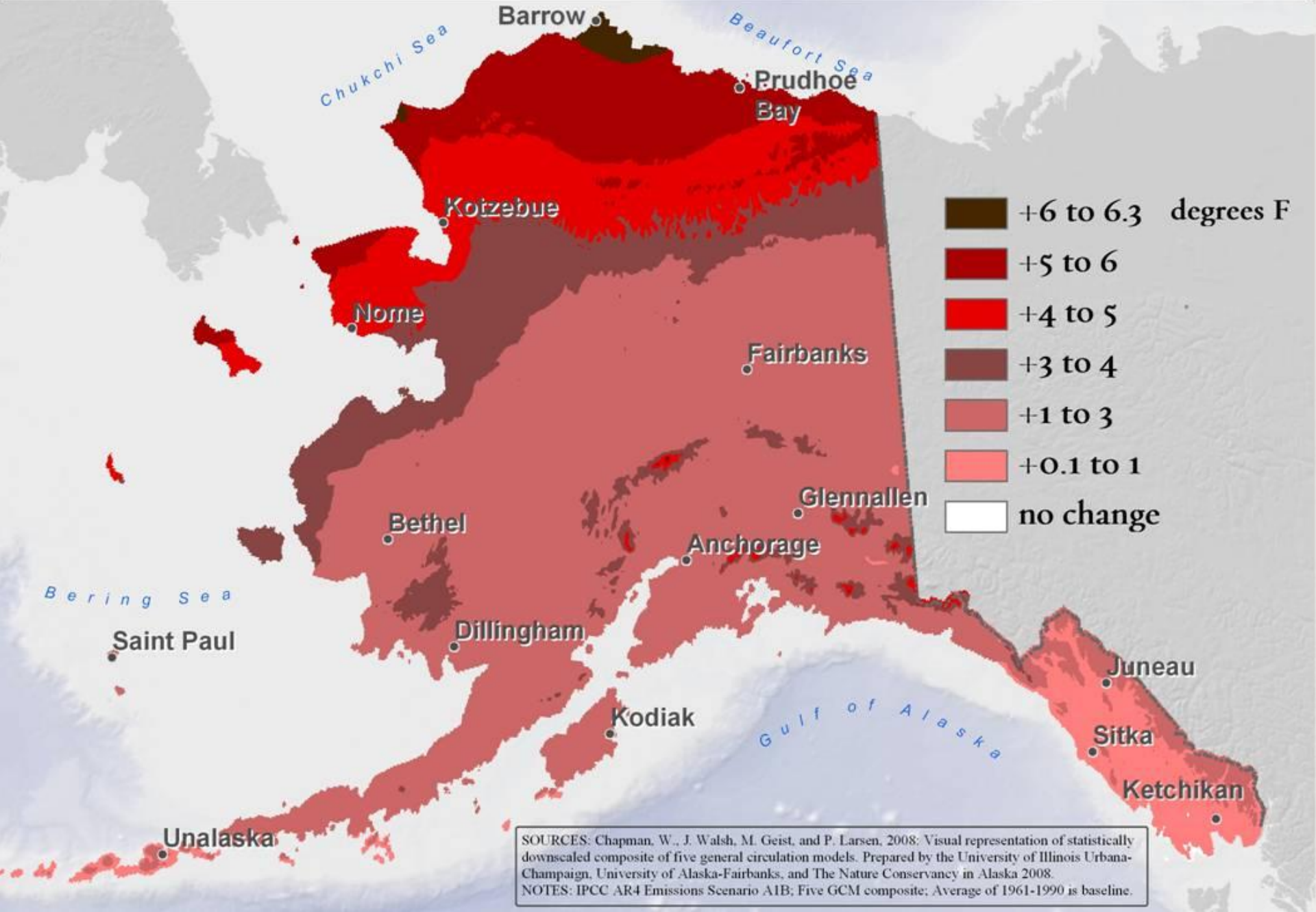
Rising Air Temperatures



Temperature change in Alaska, 1949-2008

[from Alaska Climate Research Center]

Projected Annual Temperature Change 1961-90 to 2051-60

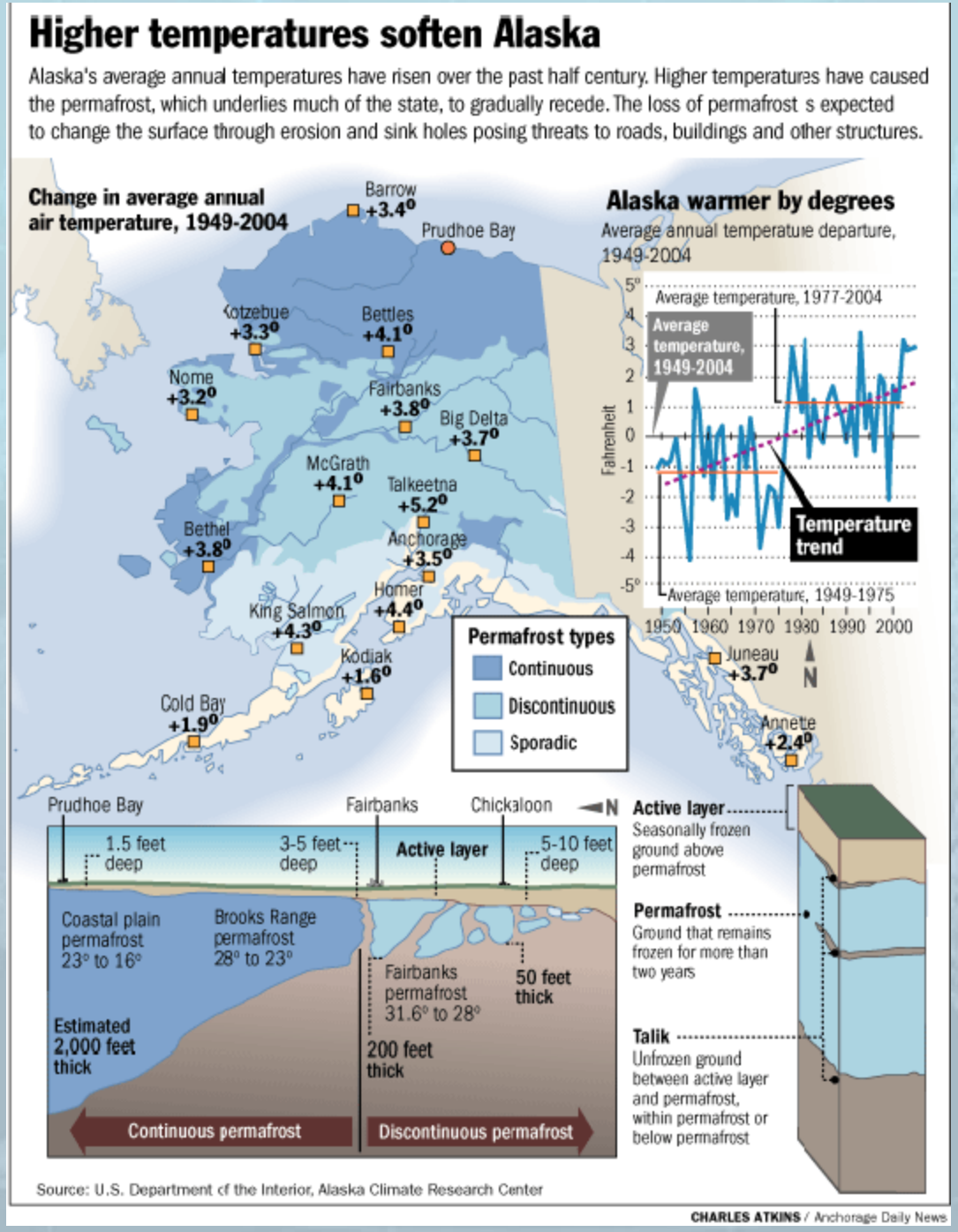


SOURCES: Chapman, W., J. Walsh, M. Geist, and P. Larsen, 2008: Visual representation of statistically downscaled composite of five general circulation models. Prepared by the University of Illinois Urbana-Champaign, University of Alaska-Fairbanks, and The Nature Conservancy in Alaska 2008.
NOTES: IPCC AR4 Emissions Scenario A1B; Five GCM composite; Average of 1961-1990 is baseline.

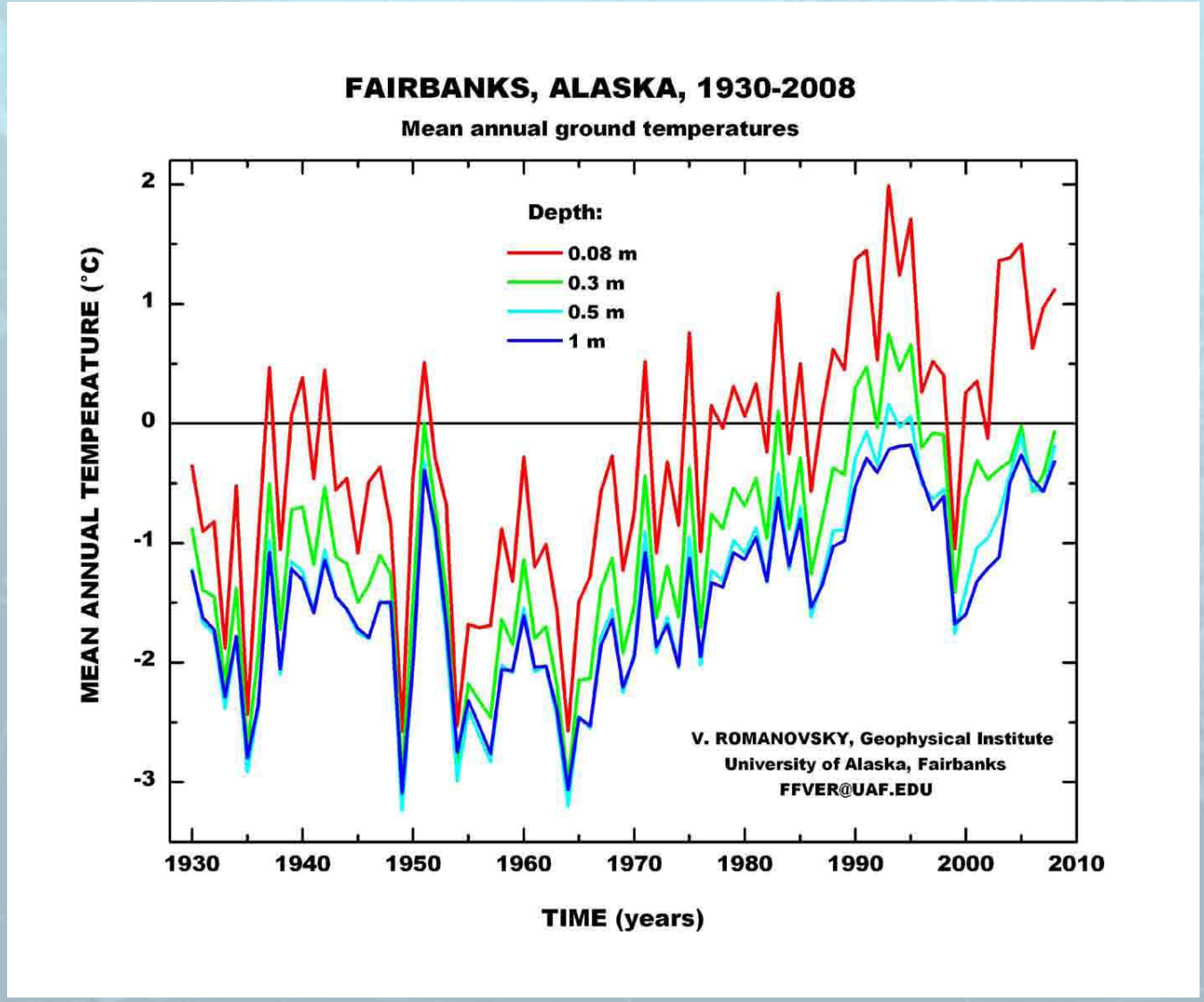
Glaciers Melting

Shown here are Austin Post's 1958 photo of the McCall Glacier terminus, alongside of a 2003 photo by Matt Nolan taken at almost the same spot.

Climate Change Impacts to Permafrost:



Rising Ground Temperatures Affect Permafrost



Selawik River
Retrogressive Thaw Slump

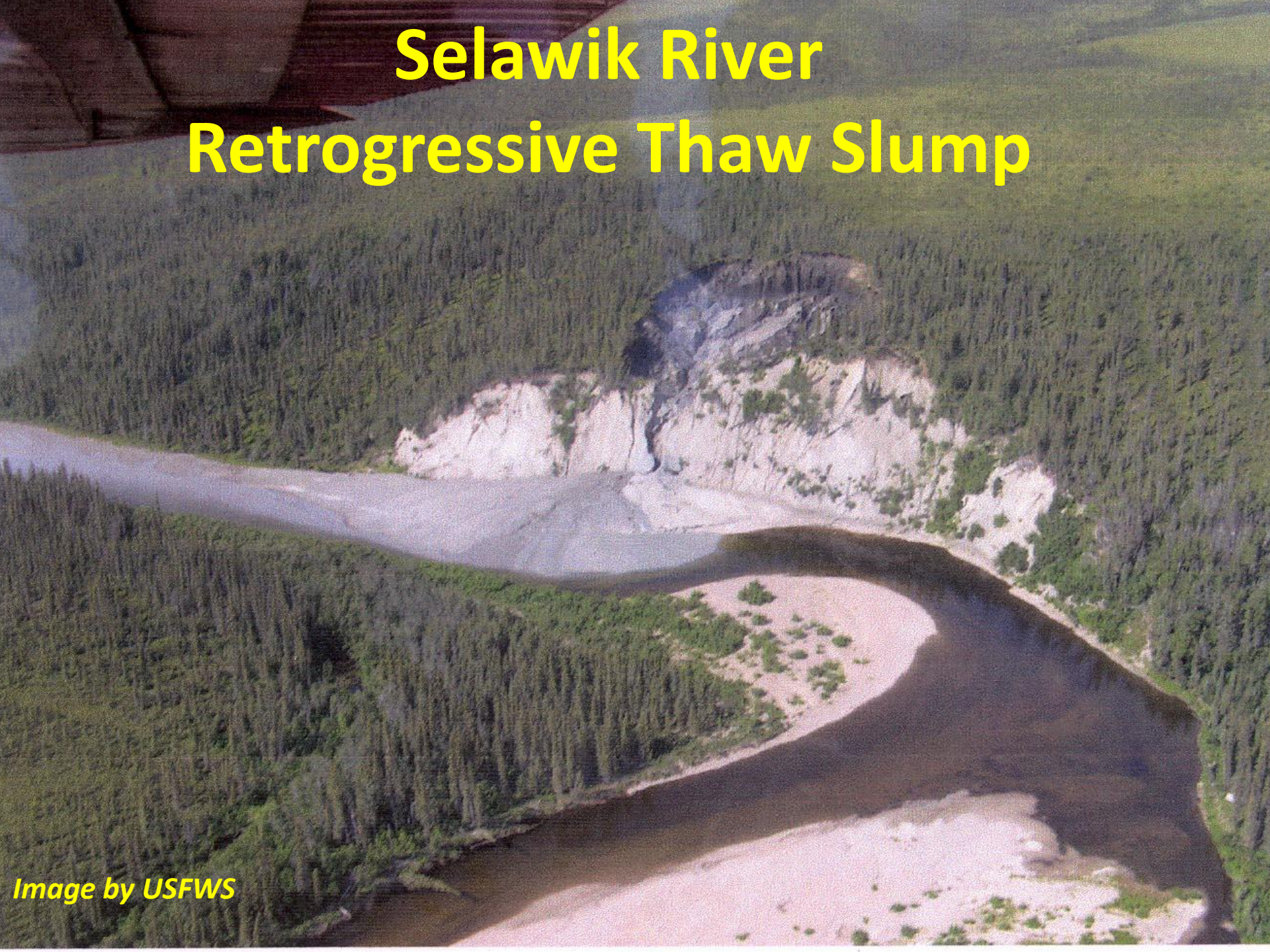


Image by USFWS

Selawik Retrogressive Thaw Slump

Changing Water Resources – Ponds Drying up

- Precipitation during growing season
- Air Temperatures
- Thawing of Permafrost

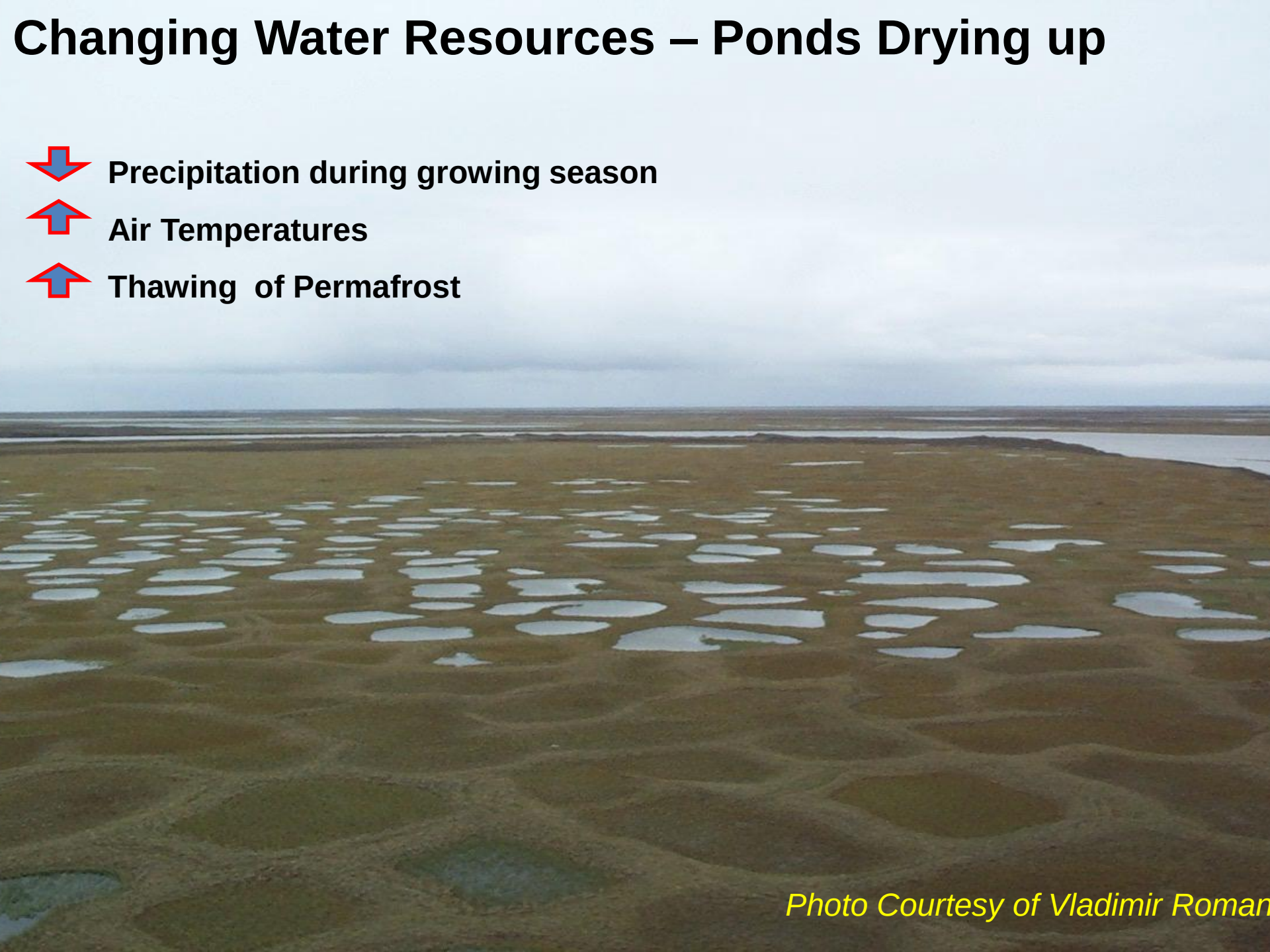
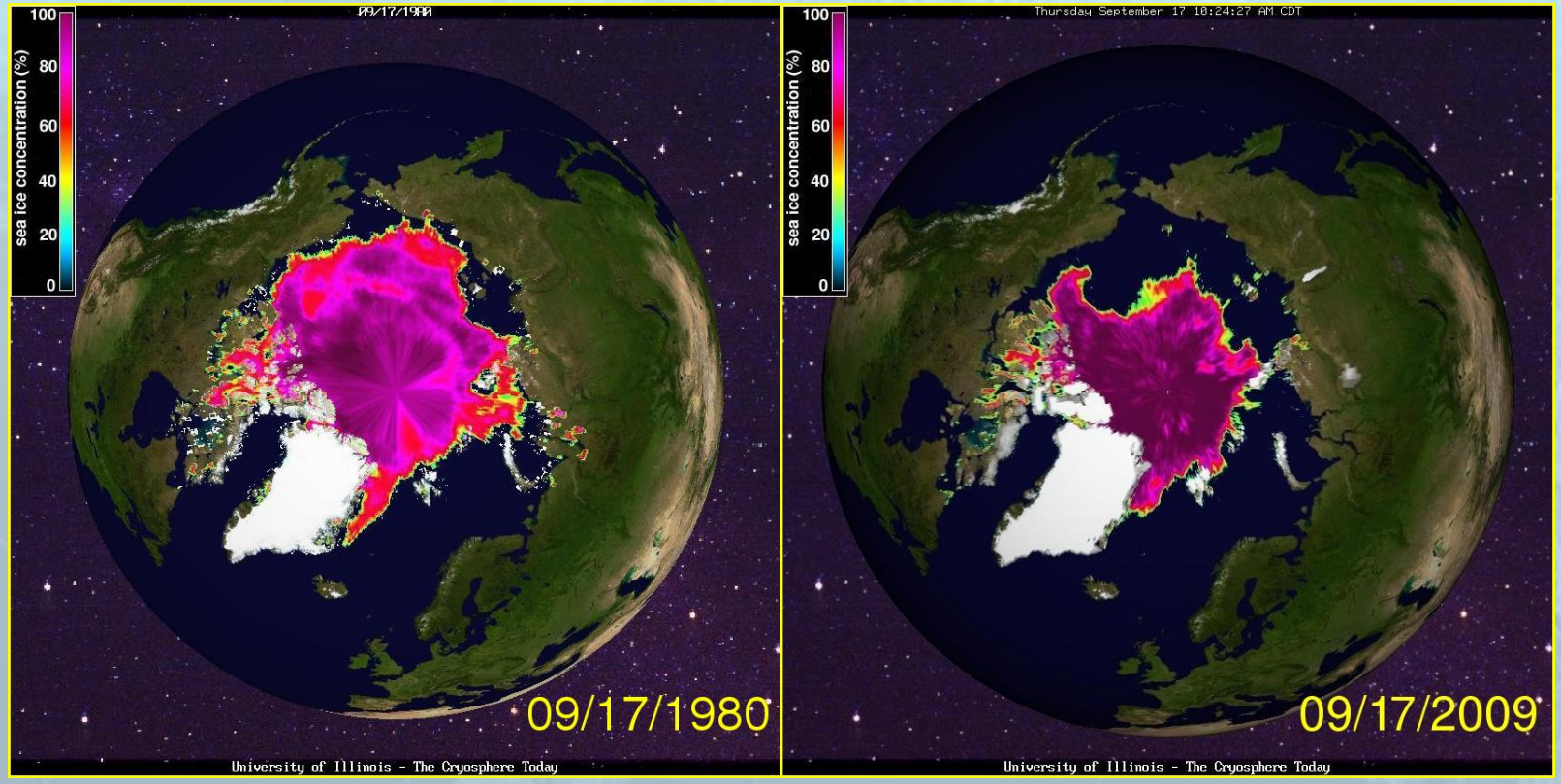


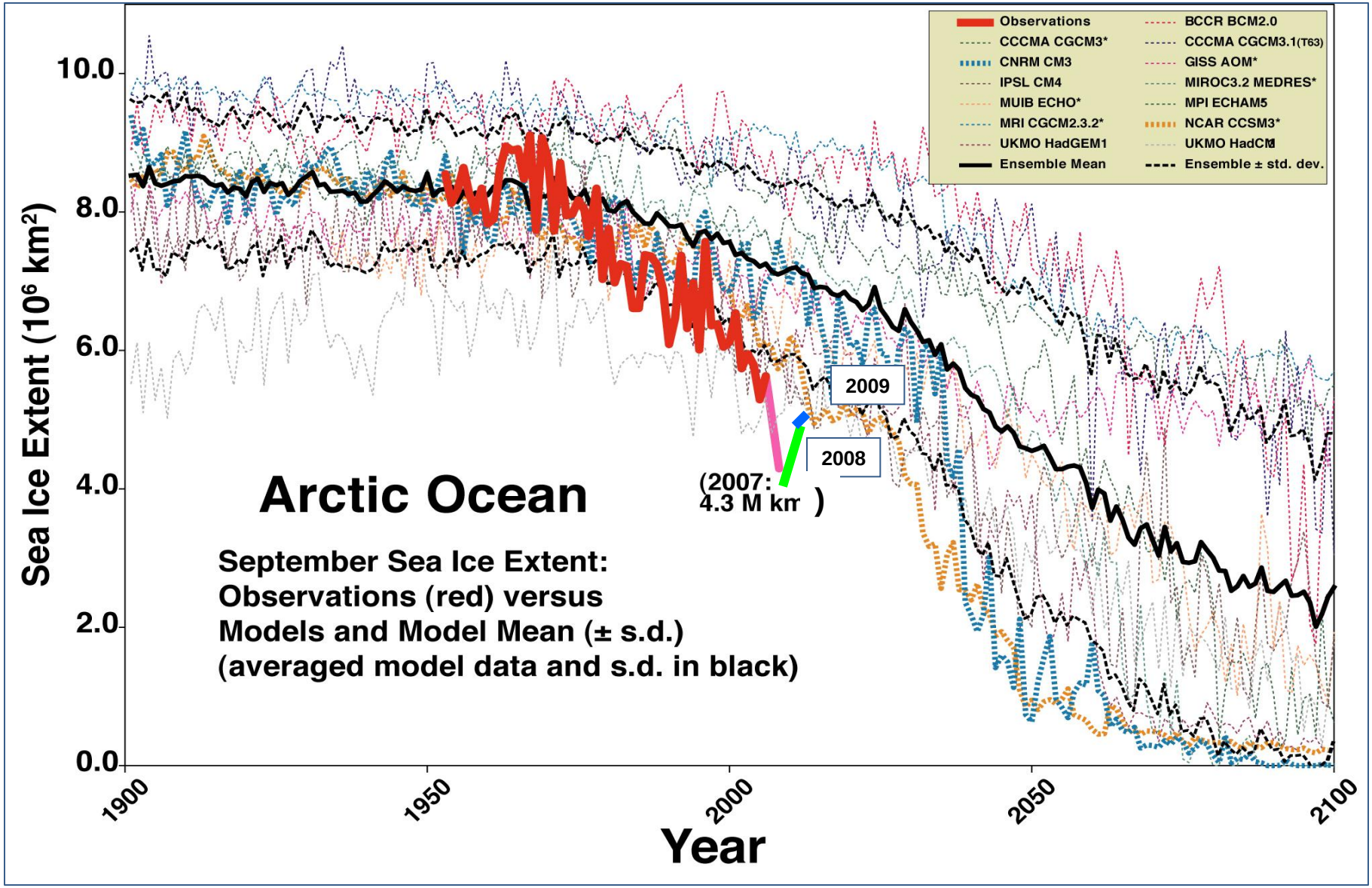
Photo Courtesy of Vladimir Roman

Declining Arctic Sea Ice Extent



University of Illinois

Observed sea ice declining faster than forecast



Stroeve, Holland et al., 2007

Marine Ice

Important Erosion control

- landfast ice acts as seawall

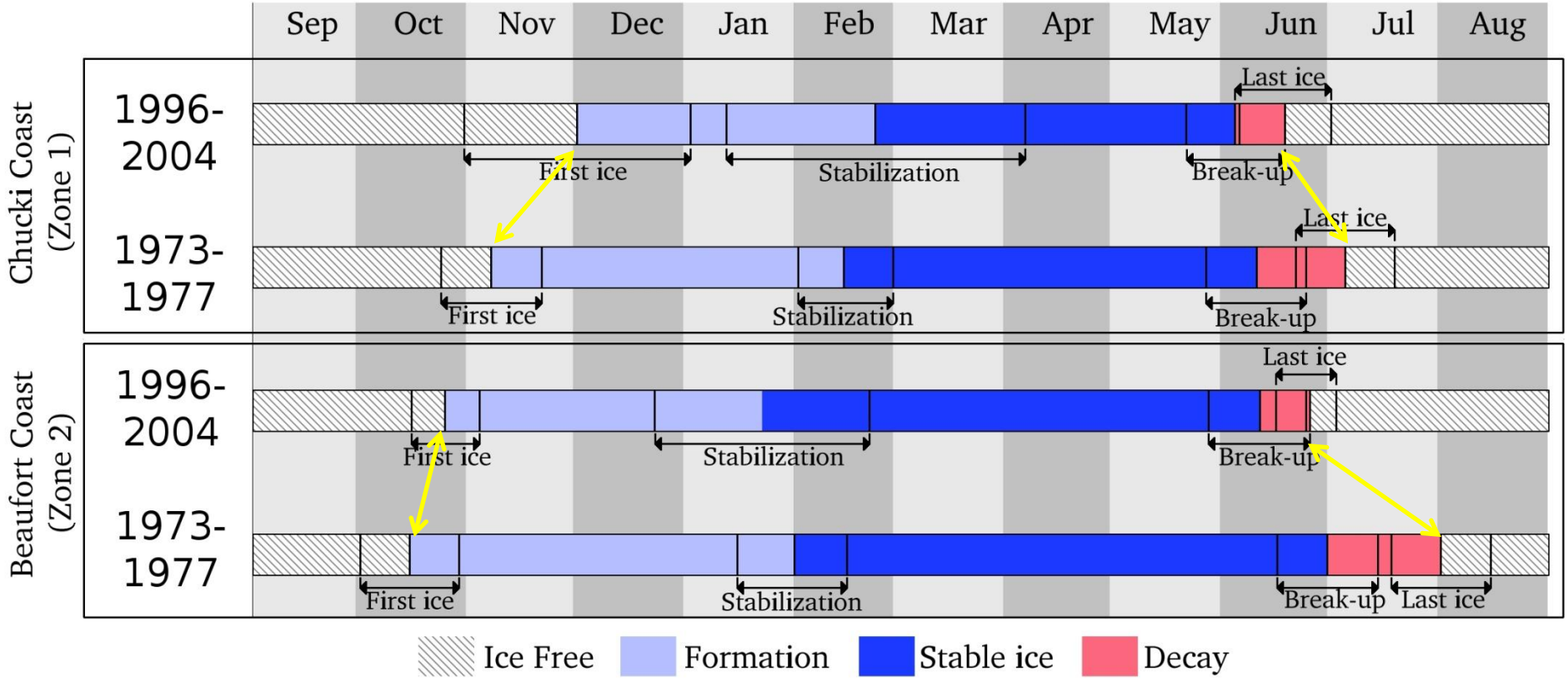
- floating ice dampens waves

- distance to ice edge - open water fetch control

- slush ice can also act as defense

Reduction in duration of Landfast Ice

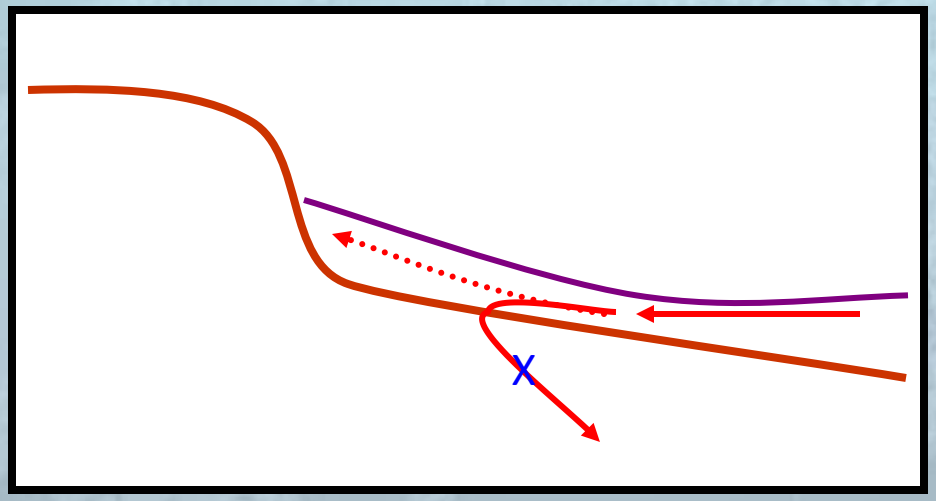
Forming Later, Breaking Up Earlier



Andy Mahoney, U. Otago/UAF

Storm Surges along Alaska's Coastline

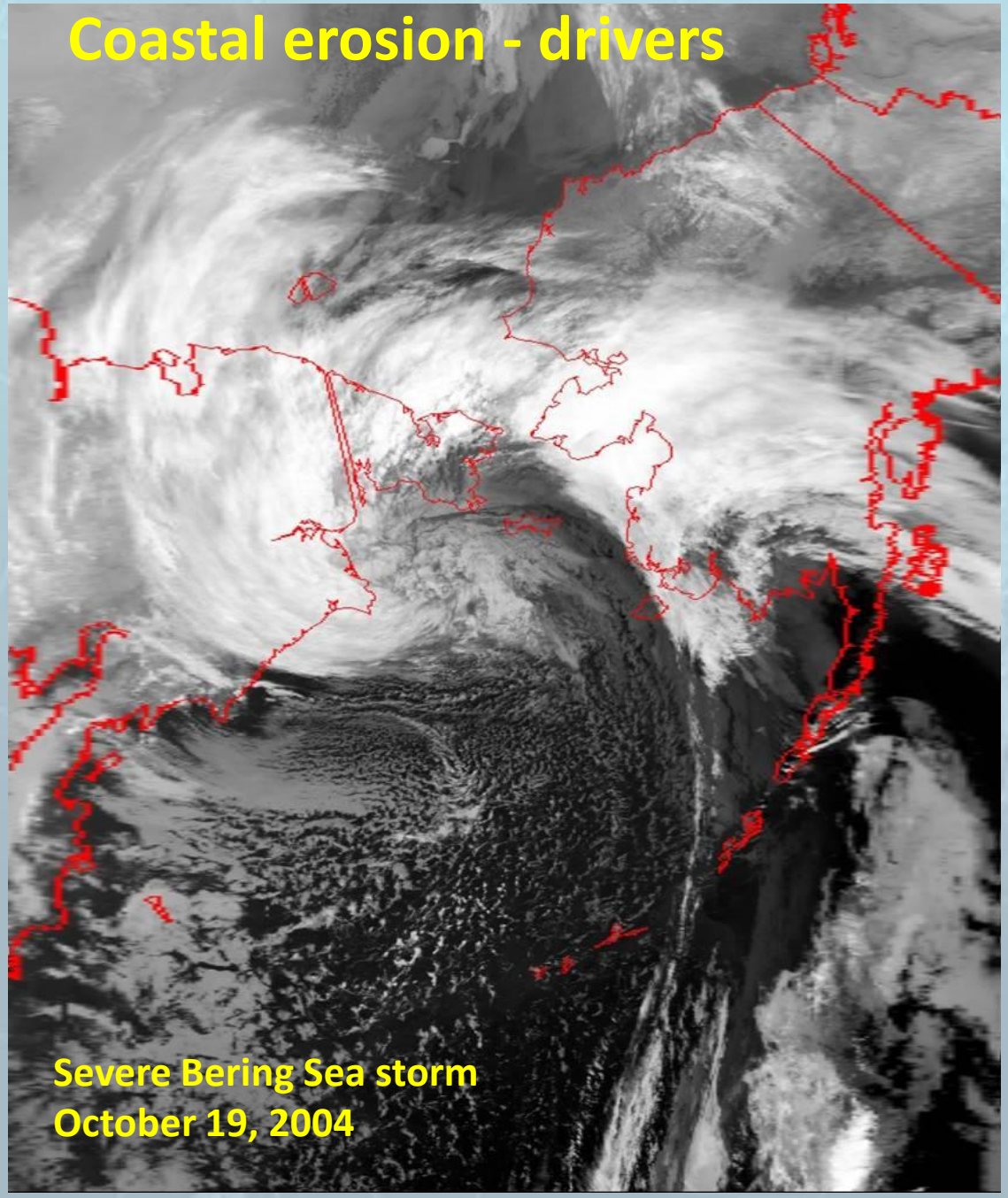
When storm winds drive water toward the shore, if the near shore bottom is not deep, water has nowhere to go but to pile up on the coast in a surge, or "positive set up."



Very important point for much of the Alaska coast

David Atkinson, International Arctic Research Center, UAF

Coastal erosion - drivers



Severe Bering Sea storm
October 19, 2004

Damage caused by Lows which Linger Along Coast in Alaska

Some drivers responsible for damage include:
DURATION of STORM EVENT
DIRECTION OF WIND
SPEED OF WIND

➢And Nome (Oct. 2004)

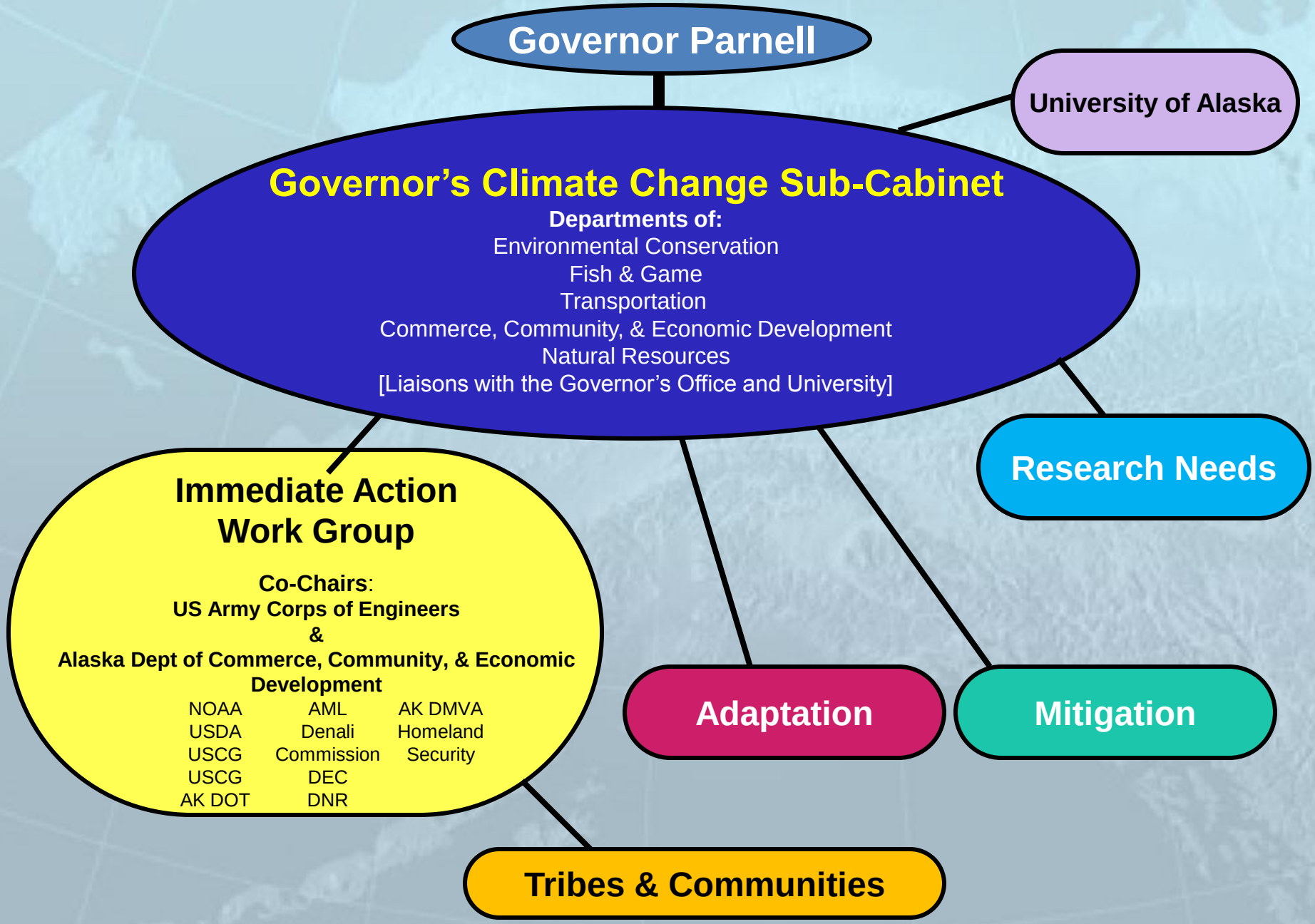
Nome, AK – During October 2004 Storm

Cause over $20M Damage along the Coast of Alaska

Nome, AK – Front Street (where the Iditarod finishes)

Photos: David Atkinson

State of Alaska Climate Change Sub-Cabinet & Coordinating Bodies

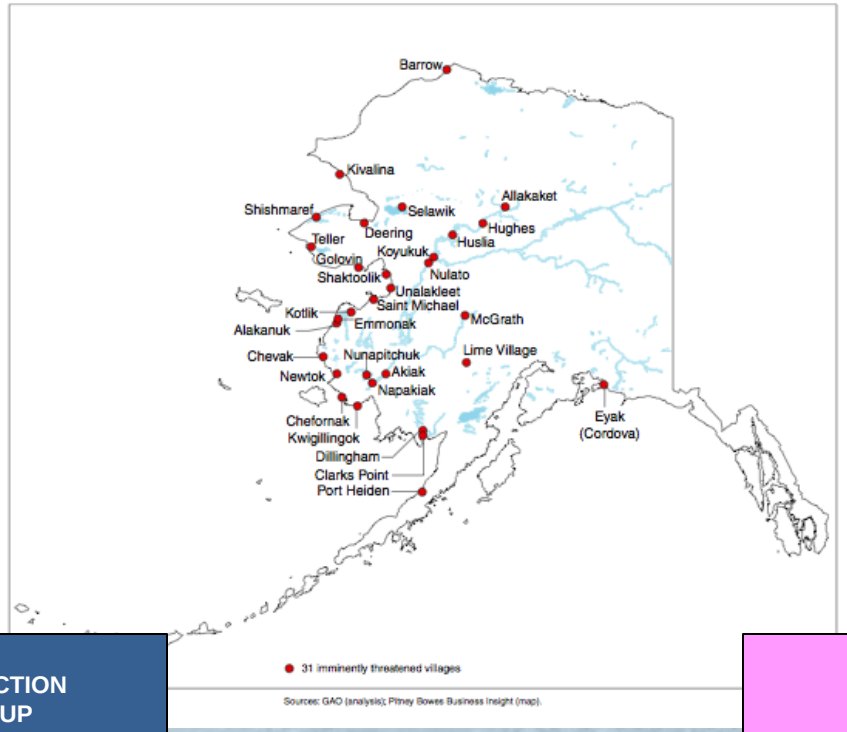


31 Villages Imminently Threatened [GAO 2009]

Alaska Communities in Peril

RECOMMENDATIONS REPORT TO THE GOVERNOR'S SUBCABINET ON CHANGE CLIMATE

FINAL REPORT FROM THE IMMEDIATE ACTION WORKGROUP APRIL 17, 2008



Requesters
United States Government Accountability Office

GAO

June 2009

ALASKA NATIVE VILLAGES
Limited Progress Has Been Made on Relocating Villages Threatened by Flooding and Erosion

GAO-09-551

IMMEDIATE ACTION WORKGROUP RECOMMENDATIONS TO THE GOVERNOR'S SUBCABINET ON CLIMATE CHANGE MARCH 2009

GAO Reports ('03 '09)

IAWG Reports ('08 & '09)

USACE Assessment ('09)

Alaska Baseline Erosion Assessments

http://www.poa.usace.army.mil/AKE/Home.html

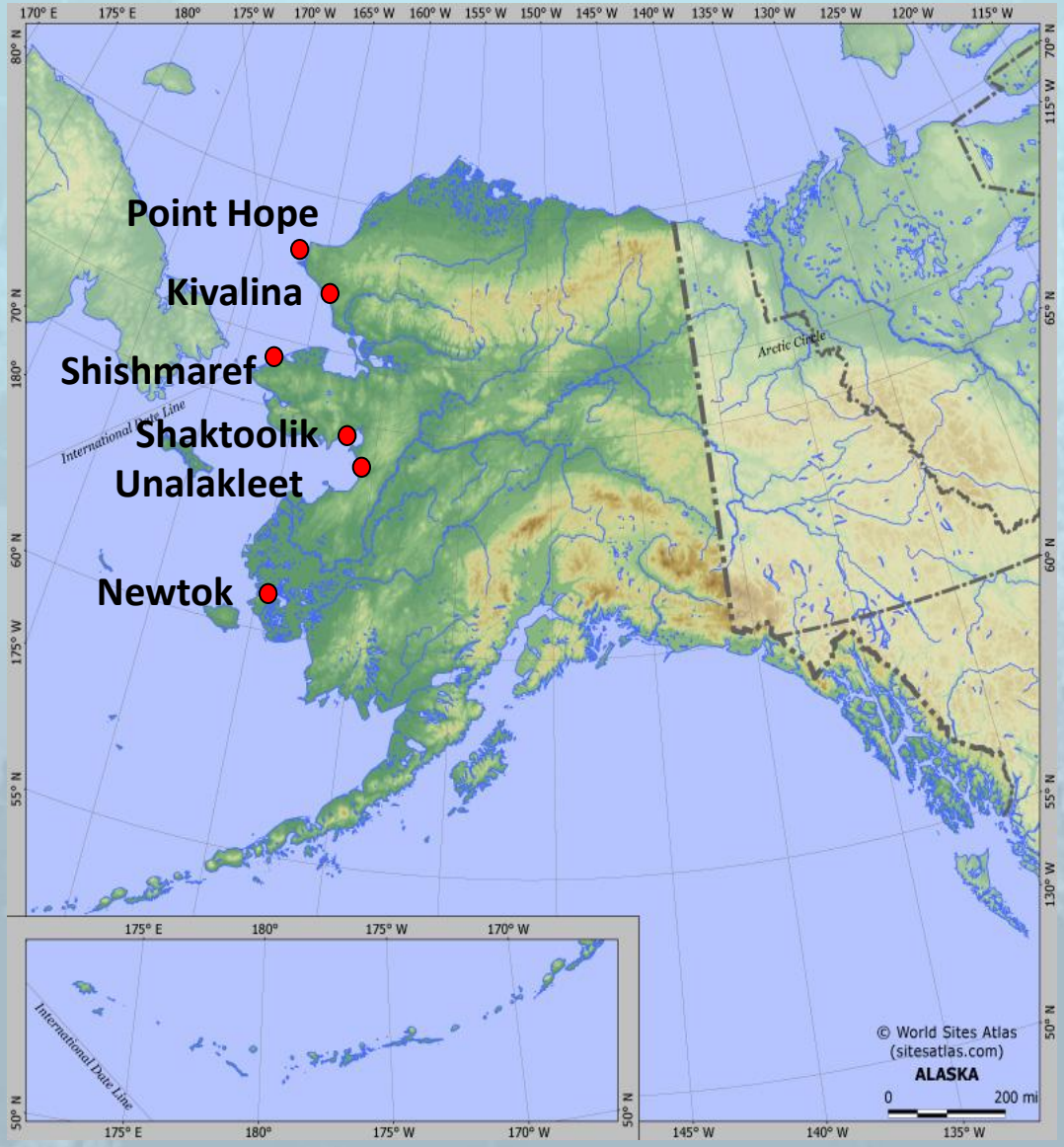
U.S. Army Corps of Engineers 2009

Protecting People & Communities – Short & Long-term Actions …

Emergency Preparedness [DMVA] •Evacuation Planning Assistance •Training •Construction of Evacuation Routes & Shelters •Identification of Safe Havens	**Temporary Protection** [DOT/Corps of Engineers] •Shoreline Protection, Rock Revetments & similar structures •Mobile Structures
Long Term Solutions [Newtok Planning Group] •Relocation Guidance & Coordination •Technical Assistance •Water, Sanitation, Utilities •Project-Specific Grants •Partnership w/DOD Innovative Readiness Training Shelter	**Community Planning** [DCCED, DCRA, et. Al.] •Hazard Impact Analysis •Technical Assistance & Small Grants •Community Planning Grants •Coordinating with others for community wellness, i.e. sustainability

Photos: AK Photo Library, Kawerak, B. Molnia, FEMA

Map of Selected Alaska Communities



Kivalina

Coastal Community Faced with Flooding & Erosion

Kivalina

September 2006 Sea Wall Completed

B. Molnia

Kivalina

October 2006 Sea Wall Damaged

Photos: DMVA Homeland Security & Emergency Mgmt

Kivalina

October 2007 Storm Threatens Tank Farm

Photos: DMVA HS&EM

Kivalina

October 2007 Storm Threatens Tank Farm

Photos: DMVA HS&EM

2009 FALL SEA STORM PREPARATION GUIDE

Emergency Preparedness – Technical Assistance and Training in Communities

State of Alaska
Department of Military and Veterans Affairs
Homeland Security & Emergency Management

Homeland Security

Sector Anchorage
Guardians of The Last Frontier

NOAA Tide Studies Aligned with IAWG Priorities

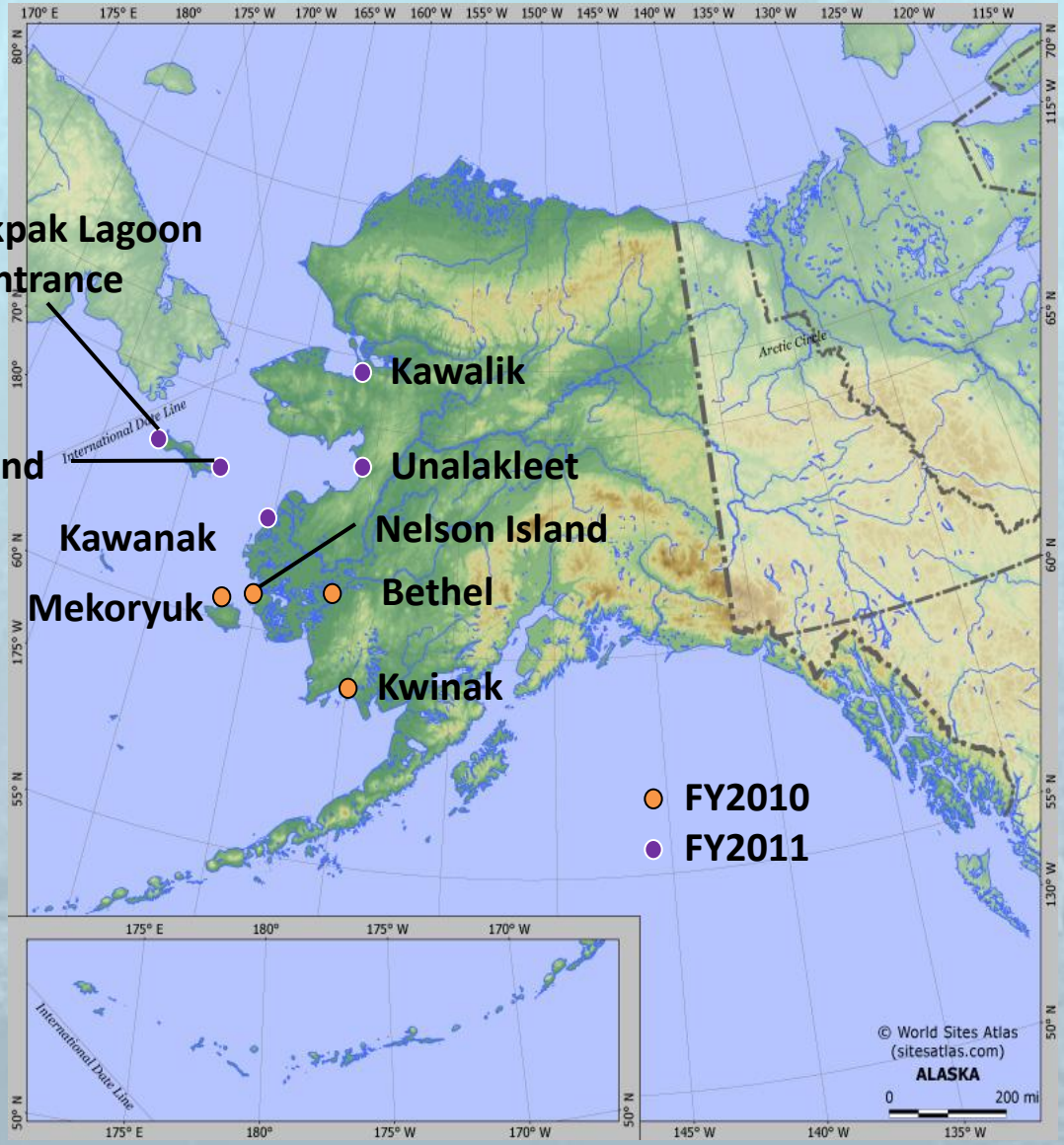


Photo: NOAA

Kivalina – 2009 Extension of Shoreline Protection

Photos: B. Molnia

Shismaref – Protecting in Place While Planning a Relocation

Shismaref – Storm Damage

Coastal erosion…. October 2004

Coastal erosion…. October 2005

Shismaref – Working Together

Photo: USACE

Photo: G. Magee

Shismaref – Progress on Shoreline Protection Project

<Buying Time to Plan Relocation >

Photo: D. Pope

Photo: USACE

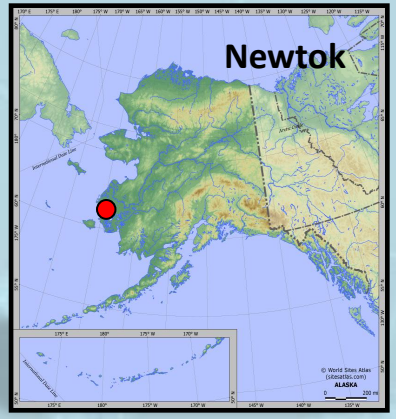
Unalakleet - Migrating to higher ground

Unalakleet - Storm Damage

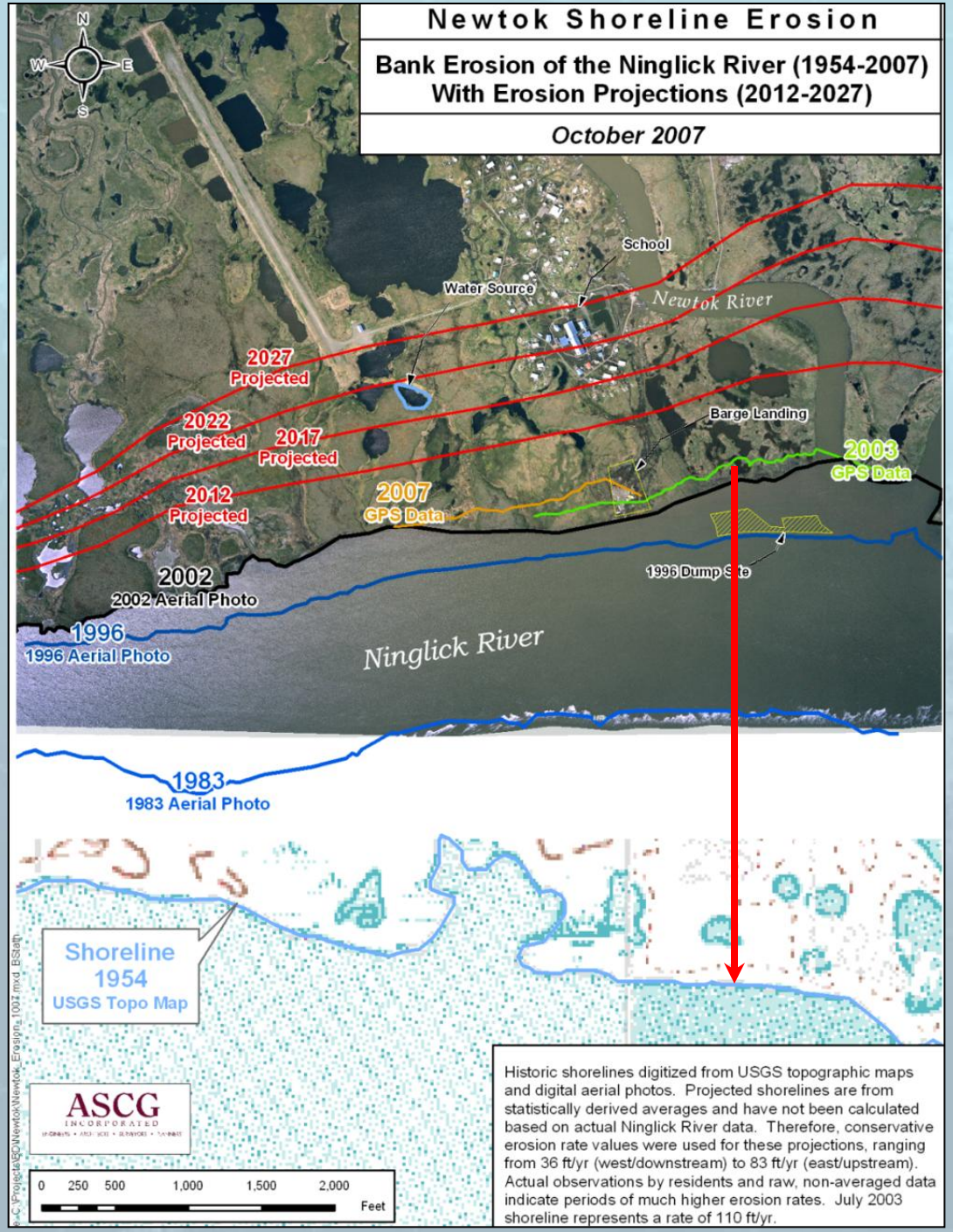
Photos courtesy Steve Ivanoff

Unalakleet – Developing New Subdivisions on Higher Ground

Lower Photos courtesy Steve Ivanoff



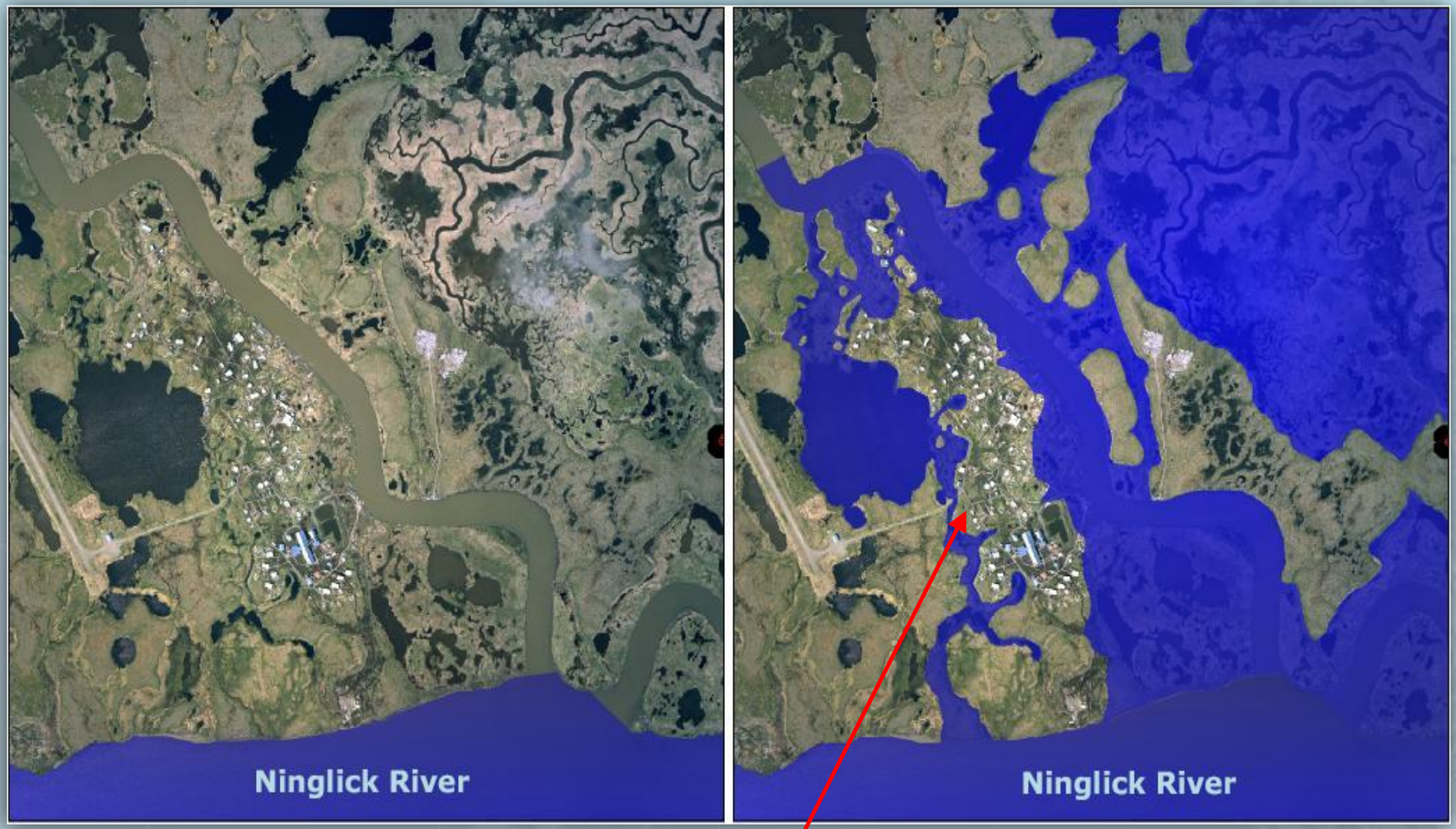
Newtok – Relocating entire community



Historical and Projected Erosion in Newtok:

- Ninglick River is eroding toward Newtok at average rate of 72 feet per year.
- Maximum yearly observed rate of erosion is 300 feet per year.
- Red arrow points to the shoreline in 1954
- Landfill and barge landing have already eroded away.

Newtok – Significant Impacts



Depiction of flooding from the September 22, 2005 fall storm

Newtok – Bank Erosion

Photos: Stanley Tom

Newtok – Bank Erosion

Some houses were only connected to the village by boardwalks floating in the water

Photo: Stanley Tom

Participants in Newtok Planning Group

Native Village of Newtok

- Newtok Traditional Council
- Newtok Native Corporation

State of Alaska

- Alaska Department of Commerce, Community, and Economic Development– ***group coordinator***
- Alaska Department of Environmental Conservation (DEC)/Village Safe Water Program
- Alaska Department of Transportation and Public Facilities
- Alaska Department of Military and Veterans Affairs/Division of Homeland Security and Emergency Management
- Alaska Department of Education and Early Development
- Alaska Department of Health and Social Services
- Alaska Industrial Development and Export Authority/Alaska Energy Authority
- Alaska Governor's Office
- Senator Lyman Hoffman's Office

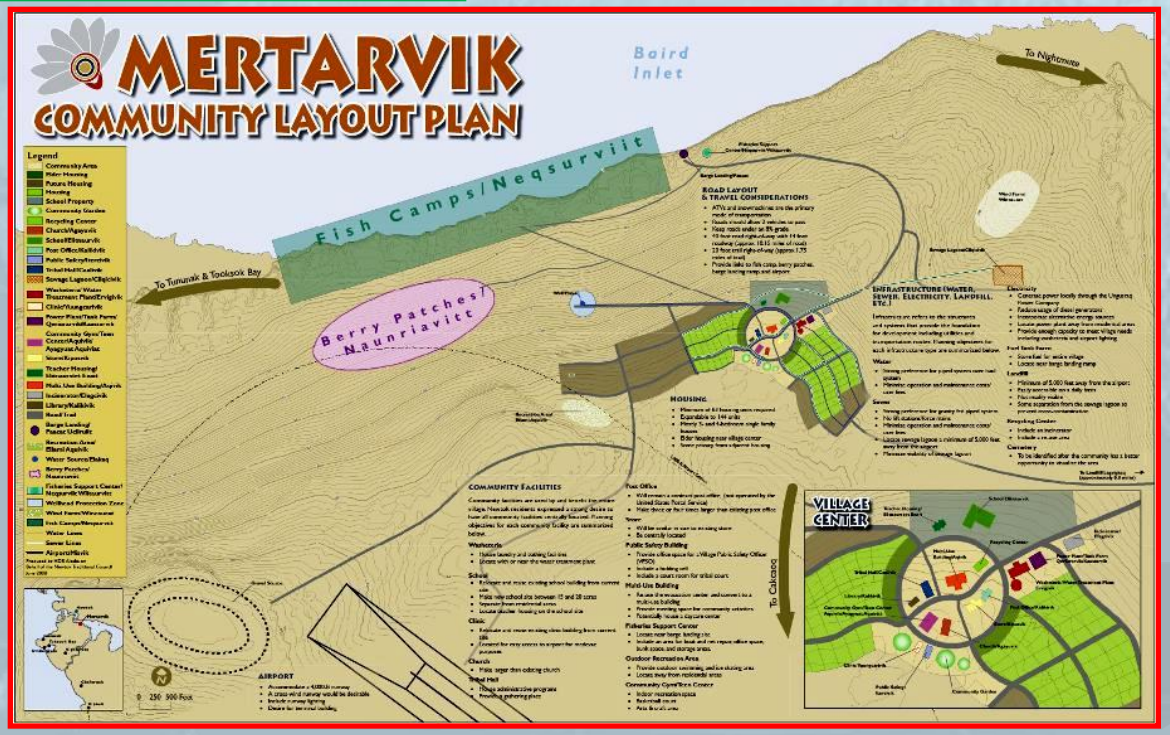
Federal

- U.S. Army Corps of Engineers, Alaska District
- U.S. Department of Commerce, Economic Development Administration
- U.S. Department of Commerce, National Oceanic and Atmospheric Administration
- U.S. Department of Defense, Innovative Readiness Training Program
- U.S. Department of Agriculture, Rural Development
- U.S. Department of Agriculture, Natural Resources Conservation Services
- U.S Department of Housing and Urban Development
- U.S. Department of the Interior, Bureau of Indian Affairs
- U.S Department of Transportation, Federal Aviation Administration
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- Denali Commission
- Senator Lisa Murkowski's Office
- Senator Mark Begich's Office

Regional Organizations

- Association of Village Council Presidents, Regional Housing Authority
- Coastal Villages Region Fund
- Lower Kuskokwim School District
- Rural Alaska Community Action Program
- Yukon-Kuskokwim Health Corporation

Newtok Planning & Construction of Adaptation Measures



Innovative Readiness Training Program

Providing Services to American communities in need alongside military training to the Armed Forces

IRT Base Camp at Mertarvik Barge Landing and Staging Area

Point Hope – A Confluence of Climate Issues

In early 1970's village moved inland 3 miles

Potentially Submerged Areas Due to Sea Level Rise at Pt. Hope

Submerged Areas
.33 m (1.08 ft) scenario
.5 m (1.64 ft) scenario
1 m (3.28 ft) scenario

Berm along upper coastline

Airstrip

Point Hope

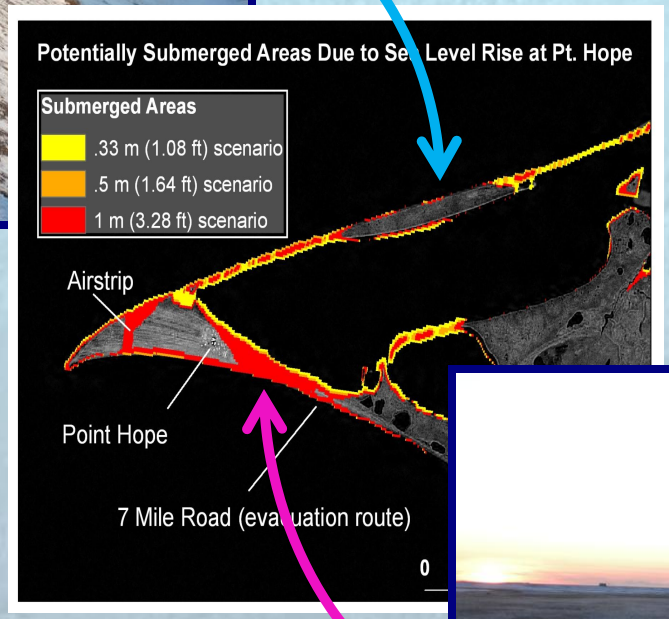
Water Supply

7 Mile Road (evacuation route)

0 1 2 Miles

D. Dugan

Berm – Provides protection from Chuckchi Sea storms

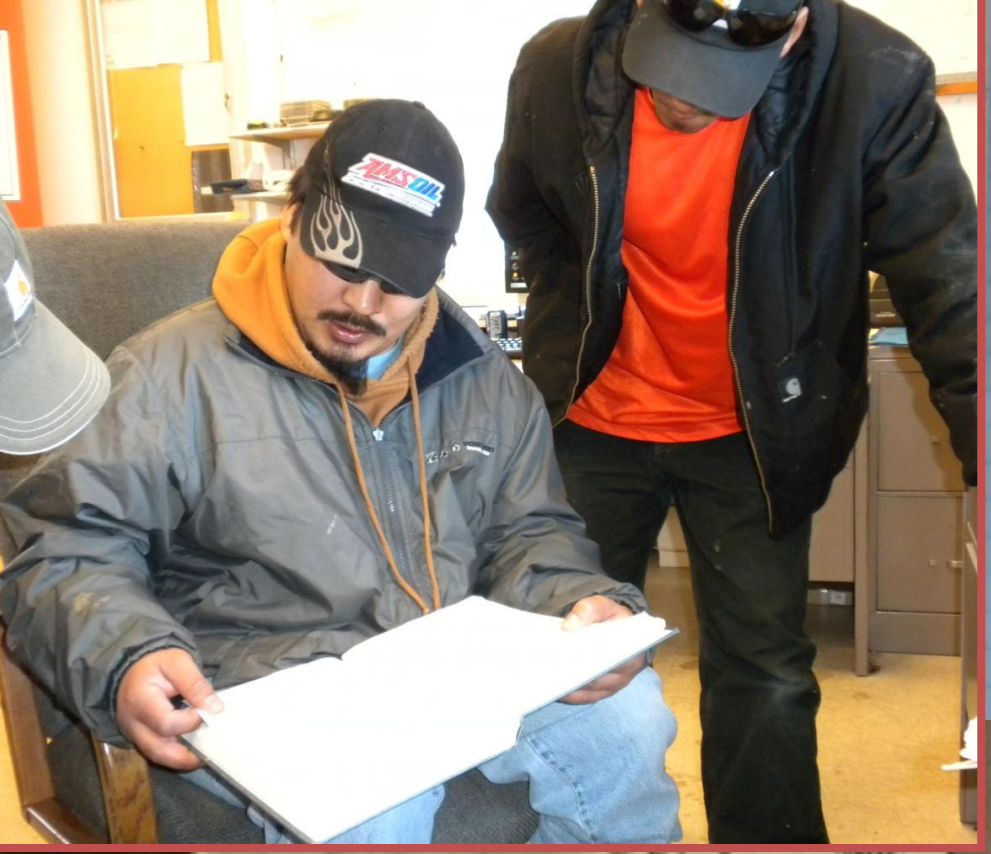


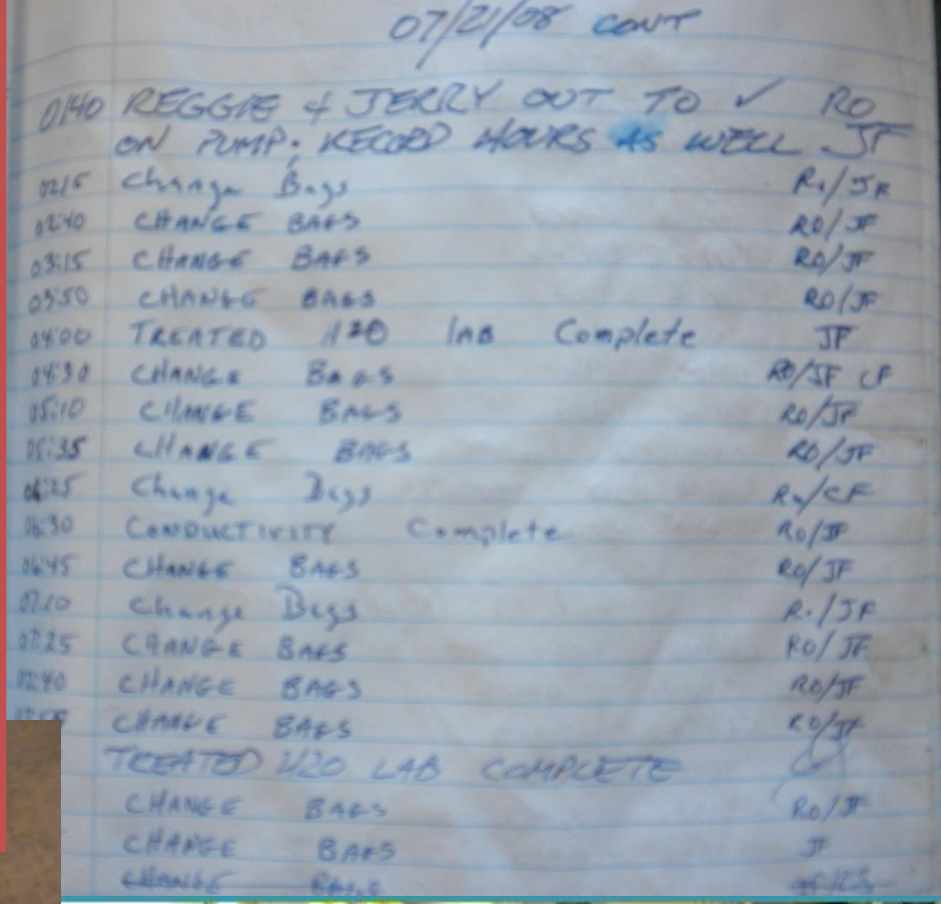
Evacuation Road

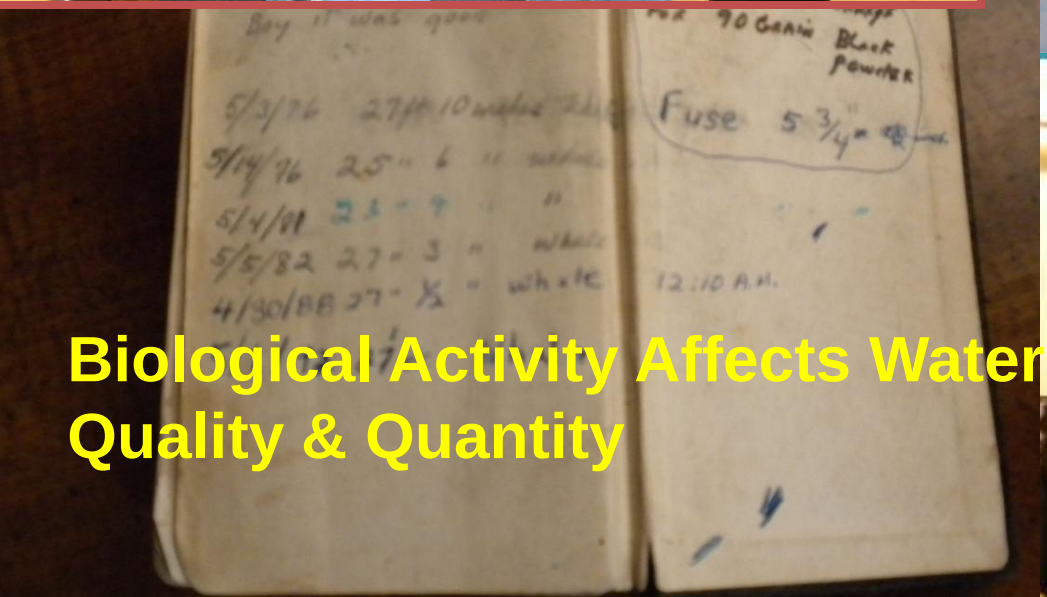
Climate Change & Health Impact Assessments
(Alaska Native Tribal Health Consortium- ANTHC)

- Extreme Weather Events
- Snow and Ice Conditions
- Permafrost
- Erosion
- Sea Level Rise
- Water & Sanitation
- Food Safety and Security & Subsistence
- Plants & Wildlife

ANTHC Center for Climate & Health Reports & Bulletins at:
http://www.anthc.org/chs/ces/climate/cchbulletins.cfm







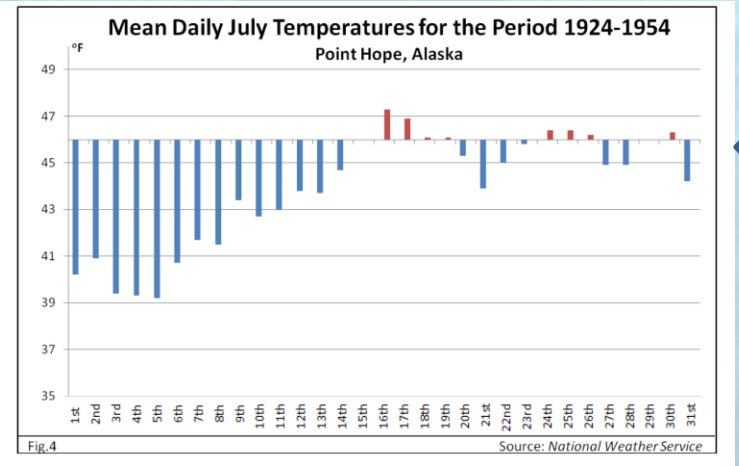
Biological Activity Affects Water Quality & Quantity

Photos: Mike Brubaker

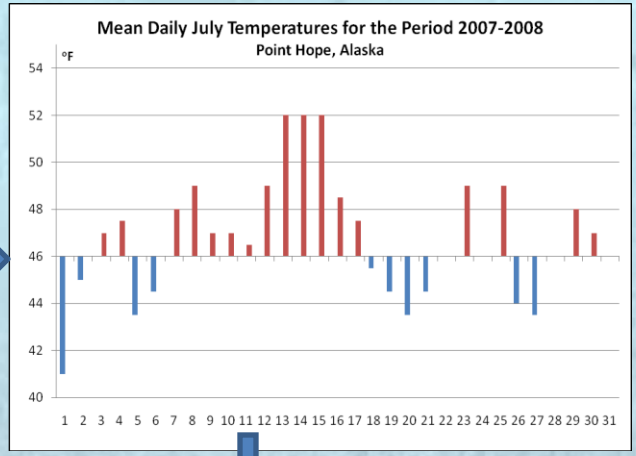
Impacts to Arctic Tundra Lakes:

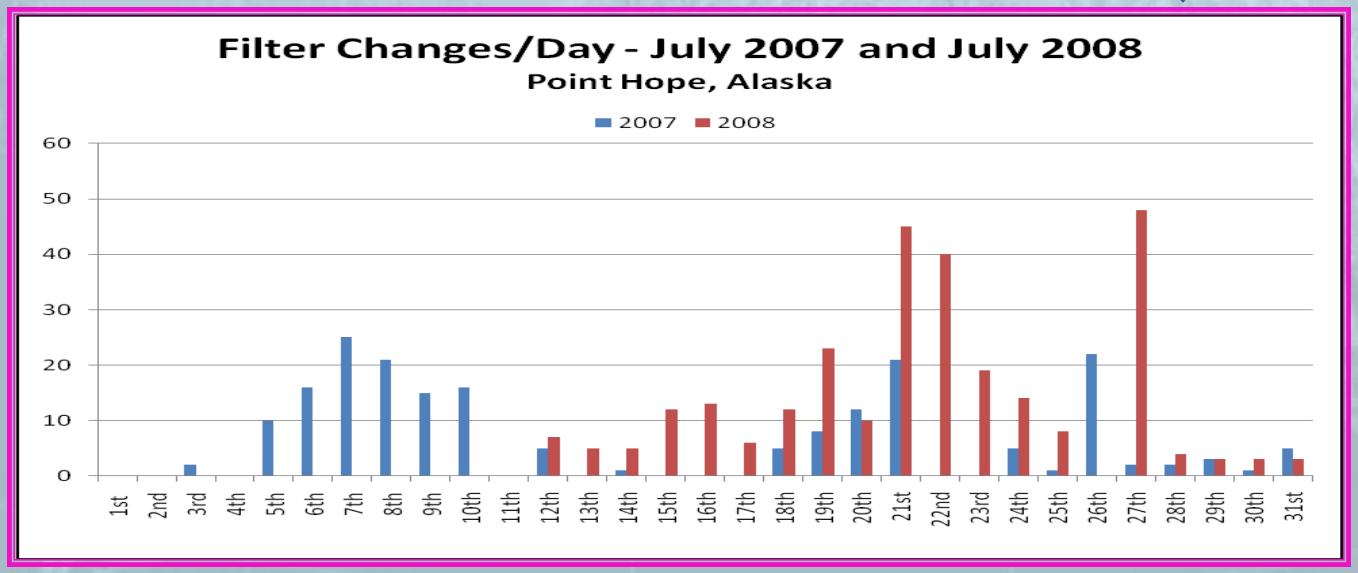
Warmer Temperatures Correspond with Increased Filter Changes at Water Plant

Mean Daily Temps for July (1924-54) compared to 2007-08



46 Degrees F Line





Assessing Threats to Food Safety and Security

Photo: Mike Brubaker

Threats to Food Safety and Security

Failed Ice Cellar used for Food Storage in Point Hope

Ice Cellar

Photos: Mike Brubaker

Sample of Partners Working Together towards Adaptation Planning at the Local Level

Local Traditional Knowledge

Community Planning, Coordination, & Infrastructure

Research

Shoreline Protection & Evacuation Shelter

Tidal Stations & Observations

Design & Construction of Structures

Rural Infrastructure

Health Assessments

Climate Projections

Adaptation Support

Landscape Conservation Collaboratives

Alaska The Last Frontier

http://www.climatechange.alaska.gov/

ALASKA Department of Environmental Conservation

Photo of Mount Redoubt by Dennis Josefczyk