



# Collaborative Community Planning for Resilient Alaska Communities

Sally Russell Cox, Alaska Division of Community and Regional Affairs ♦ Northwest Interagency Partnership for Sustainable Communities Leadership Meeting ♦ February 19, 2015



# Outline

## I. Brief Background

- a. Impacts of climate change on Alaska
- b. Timeline of state efforts on climate change

## II. State Programs and Projects

- a. Alaska Climate Change Impact Mitigation Program
- b. Mertarvik Strategic Management Plan
- c. Alaska Community Coastal Protection Project

## III. Critical Community Decision-Making Points throughout Process



# Impacts of Climate Change on Alaska

Alaska is often referred to as the “*canary in the coal mine*” for climate change. As the only state in the nation with an Arctic region, the impacts of a changing climate are already evident.



# Impacts of Climate Change on Alaska

Over the past 60 years, Alaska has warmed *more than twice as rapidly* as the rest of the United States, with state-wide average annual air temperature increasing by nearly 3°F and average winter temperature by 5.5°F, with substantial year-to-year and regional variability.

**Total Change in Mean Seasonal and Annual Temperature (°F), 1949 - 2013**

<i>Region</i>	<i>Location</i>	<b>Winter</b>	<b>Spring</b>	<b>Summer</b>	<b>Autumn</b>	<b>Annual</b>
<i>Arctic</i>	Barrow	7.0	4.8	3.7	5.3	5.2
<i>Interior</i>	Bettles	6.4	3.6	1.8	1.5	3.3
	Fairbanks	6.6	3.0	2.5	0.1	3.0
	Delta Junction	8.8	2.7	1.3	0.1	3.1
	McGrath	7.0	3.9	2.6	1.3	3.7
<i>West Coast</i>	Kotzebue	6.0	1.1	2.8	1.9	3.0
	Nome	3.6	2.4	2.4	0.5	2.2
	Bethel	6.0	3.2	1.8	0.0	2.8
	King Salmon	7.6	3.3	1.2	0.5	3.2
	St Paul	-0.2	0.6	2.1	1.0	0.9
	Cold Bay	1.2	0.7	1.5	0.9	1.1
<i>Southcentral</i>	Talkeetna	8.9	4.7	2.9	2.5	4.7
	Gulkana	7.8	1.8	1.0	0.0	2.6
	Anchorage	5.2	3.0	1.1	1.3	2.7
	Homer	6.0	2.9	2.8	1.6	3.3
<i>Southeast</i>	Kodiak	1.1	1.6	1.2	-0.4	0.8
	Yakutat	5.5	2.6	2.1	0.6	2.6
	Juneau	6.7	2.5	2.0	1.1	3.0
	Annette	3.8	2.1	1.7	0.3	1.9
<b>Average</b>		<b>5.5</b>	2.7	2.0	1.1	<b>2.8</b>

# Reduction in Arctic Sea Ice

The extent and thickness of arctic sea ice has decreased significantly since 1979.

In the past, this ice has provided a “buffer” to the impacts of sea storms on coastal communities.

Declining Sea Ice Extent

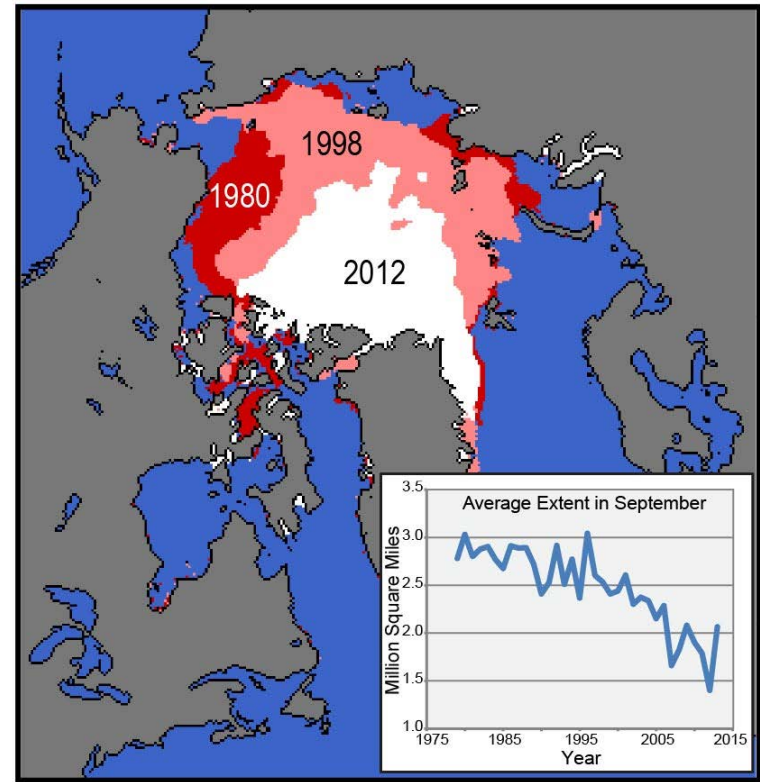


Figure source: NSIDC 2012; Data from Fetterer et al. 2013



# Reduction in Arctic Sea Ice

As a result, coastal communities are much more vulnerable to the impacts of coastal sea storms and related storm surges, flooding and erosion.

Kivalina



Shishmaref



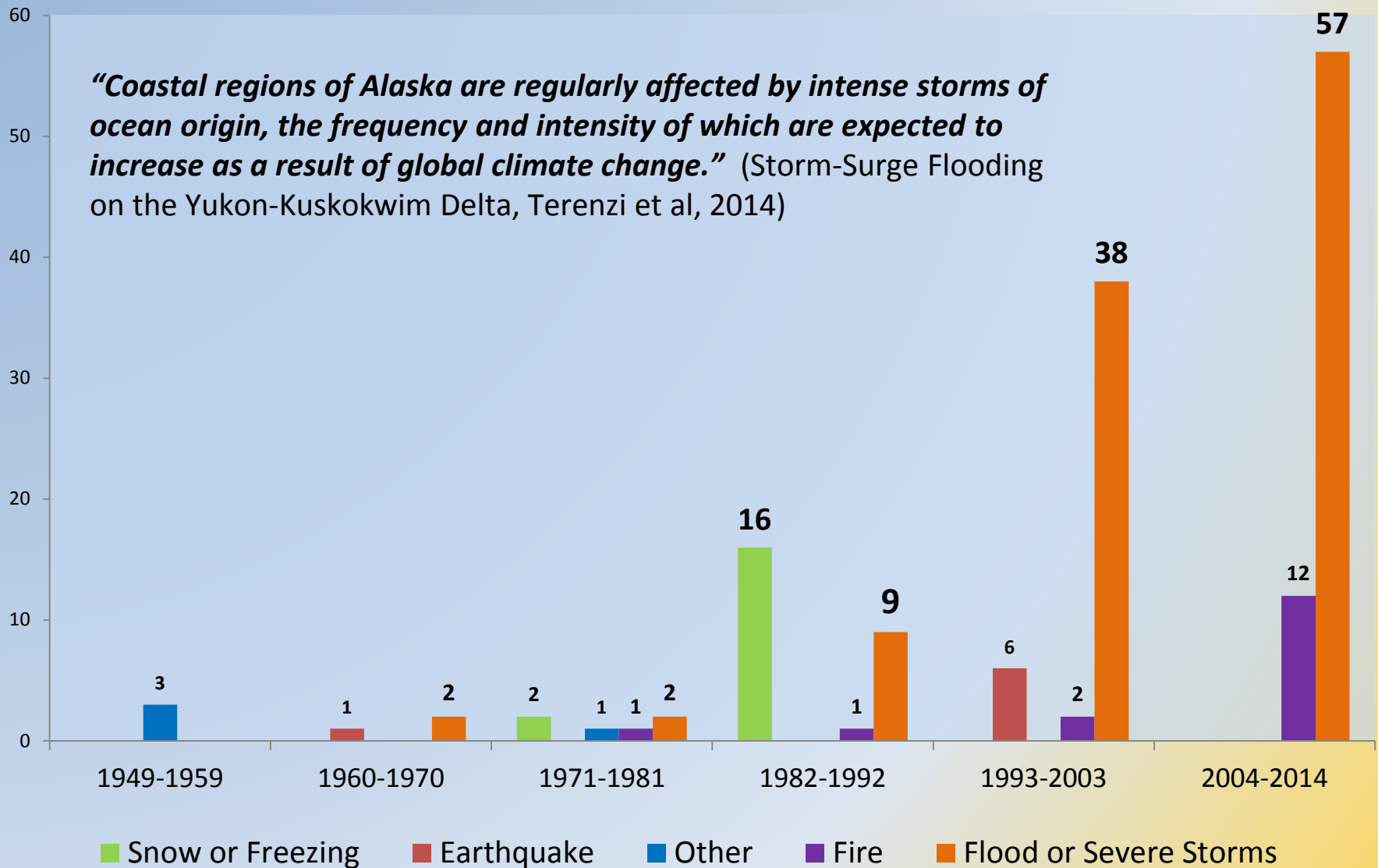
# Alaska Federally-Declared Disasters, 1953-2014

Date	Disaster #	Incident Description
1/23/2014	4162	Severe Storms, Straight-line Winds, and Flooding
1/16/2014	4161	Flooding
6/25/2013	4122	Flooding
11/27/2012	4094	Severe Storm, Straight-line winds, Flooding, and Landslides
2/2/2012	4054	Severe Storm
12/22/2011	4050	Severe Winter Storms and Flooding
6/10/2011	1992	Ice Jam and Flooding
12/18/2009	1865	Severe Storms, Flooding, Mudslides, and Rockslides
6/11/2009	1843	Flooding and Ice Jams
9/26/2008	1796	Severe Storms, Flooding, Landslides, and Mudslides
12/8/2006	1669	Severe Storms, Flooding, Landslides, and Mudslides
10/27/2006	1666	Fire
10/16/2006	1663	Severe Storms, Flooding, Landslides, and Mudslides
8/4/2006	1657	Snow Melt and Ice Jam Flooding
12/9/2005	1618	Severe Fall Storm, Tidal Surges, and Flooding
3/14/2005	1584	Severe Winter Storm
11/15/2004	1571	Severe Winter Storm, Tidal Surges and Flooding
4/26/2003	1461	Winter Storm
12/4/2002	1445	Winter Storms
11/8/2002	1440	Earthquake
6/26/2002	1423	Flooding
2/17/2000	1316	Winter Storms and Avalanches

Date	Disaster #	Incident Description
6/7/1996	1119	Wildfires
10/13/1995	1072	Severe Storm, Flooding
9/13/1994	1039	Severe Storm, Flooding
5/30/1991	909	Heavy Snow, Ice Jams, Flooding
6/10/1989	832	Flooding
5/10/1989	826	Severe Freezing
3/11/1988	813	Fire
10/27/1986	781	Coastal Storm, High Winds, Waves
10/27/1986	782	Severe Storms, Flooding
12/18/1975	493	Fire, Freezing
11/14/1974	452	Severe Storms, Flooding
6/24/1974	444	Freeze in Spawning Areas of Red Salmon
11/7/1973	408	Heavy Rains, Flooding
12/19/1969	281	Heavy Rains, Landslide
8/17/1967	230	Severe Storms, Flooding
3/28/1964	168	Earthquake
12/22/1955	46	Severe Hardship to Salmon Industry
11/10/1954	31	Severe Hardship to Salmon Industry
10/30/1953	13	Severe Hardship to Salmon Industry

Source: [https://www.fema.gov/disasters/grid/state-tribal-government/86?field disaster type term tid 1=All&order=field disaster declaration date&sort=desc](https://www.fema.gov/disasters/grid/state-tribal-government/86?field%20disaster%20type%20term%20tid%201=All&order=field%20disaster%20declaration%20date&sort=desc)

# Alaska Federally-Declared Disasters, 1953-2014

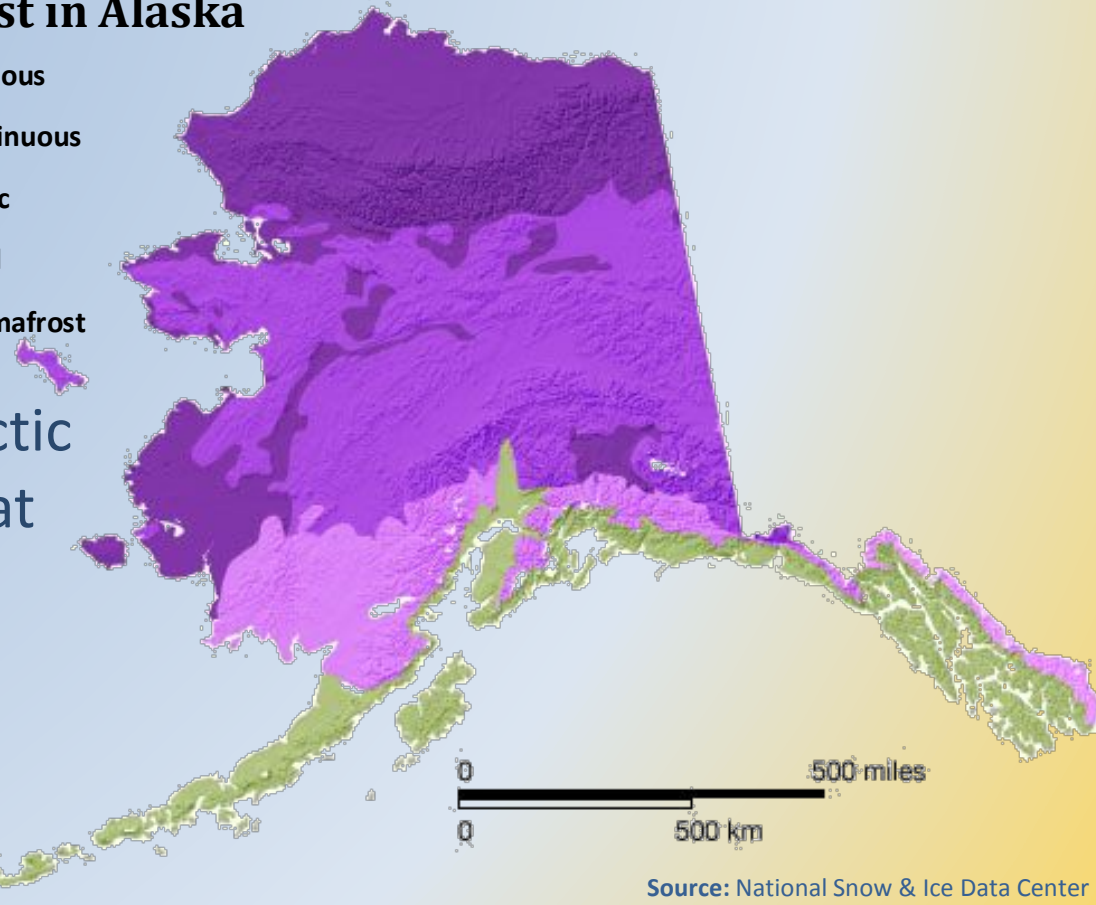
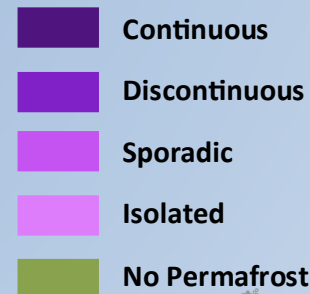


Source: <http://www.fema.gov/api/open/v1/DisasterDeclarationsSummaries>



# Thawing Permafrost

## Permafrost in Alaska



Source: National Snow & Ice Data Center

- 80% of land in Alaska is underlain by permafrost.
- Permafrost near Alaska's Arctic coast has warmed 4°F - 5°F at 65 foot depth since the late 1970s and 6°F to 8°F at 3.3 foot depth since the mid-1980s.
- Thaw is already occurring in interior and southern Alaska, where permafrost temperatures are near the thaw point.

# Thawing Permafrost

Ice - rich permafrost layer thaws when exposed to warmer river/sea water, leaving a “shelf” with no support.





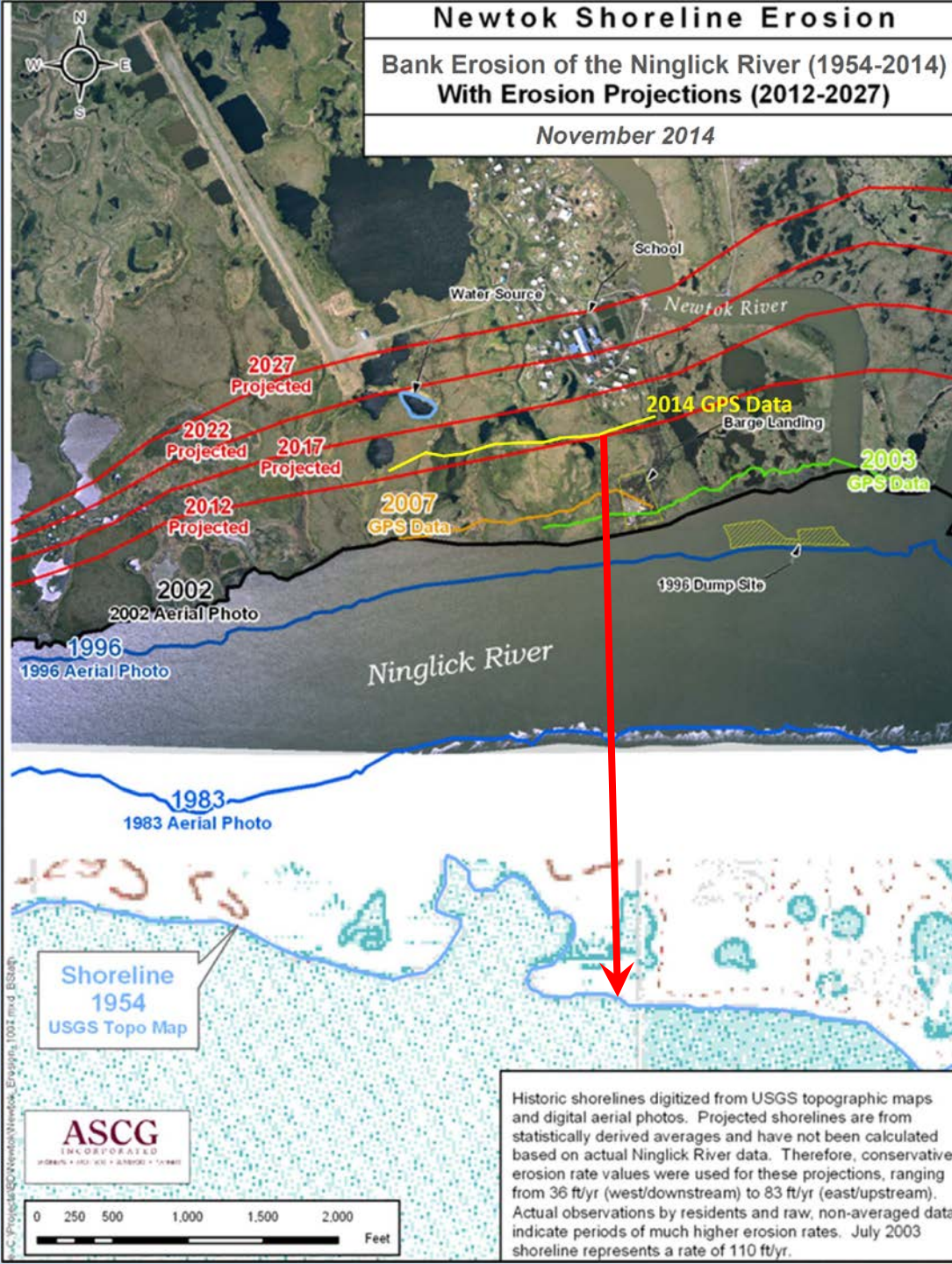




# Newtok Shoreline Erosion

Bank Erosion of the Ninglick River (1954-2014)  
With Erosion Projections (2012-2027)

November 2014



*“Not that long ago the water was far from our village and could not be easily seen from our homes. Today the weather is changing and is slowly taking away our village. Our boardwalks are warped, some of our buildings tilt, the land is sinking and falling away, and the water is close to our homes. The infrastructure that supports our village is compromised and affecting the health and well-being of our community members, especially our children.”*

**Newtok Traditional Council, Mertarvik Strategic Management Plan**

# Newtok Shoreline Retreat, 2006 to 2014



*“The Ninglick River is eroding toward Newtok at an average rate of 72 feet per year. The maximum yearly observed rate of erosion is 300 feet per year. At that rate, the Ninglick River would reach the community school by about 2017. The school is the largest and most important structure in the community. Its loss would severely impact the function and continued existence of the community.”*

# Flooding

- Increased snowpack or rapid temperature increases can cause excessive glacial and snow melt at higher elevations, resulting in flooding
- Lack of sea ice leaves coastal communities vulnerable to storm-surge resulting in flooding
- Ice jams on rivers lead to flooding in riverine communities





Golovin



Source: Anchorage Daily News

Newtok



# Cumulative Impacts to Villages

- Loss of land buffers due to erosion
- Increased vulnerability to coastal storms due to loss of sea-ice; land to erosion
  - Storm surge flooding
  - Increased thawing of permafrost in river banks; coast leading to increased erosion;
- Public health impacts from toxic/human waste in flood waters
- Reduced food security – thawing of ice cellars, etc.



# Impacts of Climate Change on Alaska

## GAO Report 2003:

- Flooding and erosion affect 184 of 213 (or about 86%) Alaska Native villages to some extent
- Villages of Kivalina, Koyukuk, Newtok, and Shishmaref in imminent danger from flooding and erosion and planning to relocate.

## GAO Report 2009:

- 31 villages imminently threatened by flooding and erosion.
- At least 12 of 31 imminently threatened villages have decided to relocate—in part or entirely—or to explore relocation options.



# Impacts of Climate Change on Alaska



# Timeline of Events - Alaska

Dec. 2003	<i>GAO-04-142 Report on Alaska Native Villages, Erosion &amp; Flooding</i>
May 2006	<i>Newtok Planning Group</i> organized
Nov. 29, 2006	AO 231 establishes DCCED “to act as the state coordinating agency”
Jul. 10, 2006	Legislature establishes <i>AK Climate Impact Assessment Commission</i>
Aug. 1, 2007	<i>First Alaska Climate Change Sub-Cabinet meeting held</i>
Sep. 12-13, 2007	<i>Village of Kivalina self-evacuates during severe fall storm</i>
Sep. 14, 2007	<i>Governor signs AO 238 for AK Climate Change Sub-Cabinet</i>
Oct. 11, 2007	<i>Senate Coastal Erosion Field Hearing</i> (Stevens and Landrieu)
Nov. 6, 2007	<i>Immediate Action Working Group</i> established.
Nov. 19-20, 2007	Sen. Stevens holds <i>Roundtable on Coastal Erosion/Village Relocation</i> . <i>Alaska Climate Change Impact Mitigation Program</i> proposed as one of State’s responses to issues
Jul. 1, 2008	<i>Alaska Climate Change Impact Mitigation Program</i> funded
2008 - 2009	Development of <i>Alaska Climate Change Strategy – Adaptation, Mitigation, Immediate Action, and Research Need Reports</i>
Jun. 2009	<i>GAO-09-551 Report on Relocation of Alaska Native Villages</i>
Jan. 11, 2010	<i>Mertarvik Strategic Management Plan</i> funded
May 9, 2012	<i>Alaska Community Coastal Protection Project</i> funded

# Alaska Climate Change Impact Mitigation Program

- Established to provide funding and technical assistance to communities imminently threatened by climate-related natural hazards.
- Intended to assist impacted communities develop planned approach to shoreline protection, building relocation and/or eventual relocation of the village.
- Also intended to address Alaska Congressional Delegation's request that State of Alaska participate with federal government in addressing climate-change impacts on Alaska's communities.



# Implemented through technical assistance and two funding sources

## Hazard Impact Assessments:

- Identify and document climate change-related hazards
- Analyze hazard trends and future impacts to community
- Recommend solutions to mitigate impacts of local natural hazards, taking into account financial considerations

## Community Adaptation Planning Grants:

- Based on recommendations of Hazard Impact Assessment
- Brings community to next stage in addressing hazards



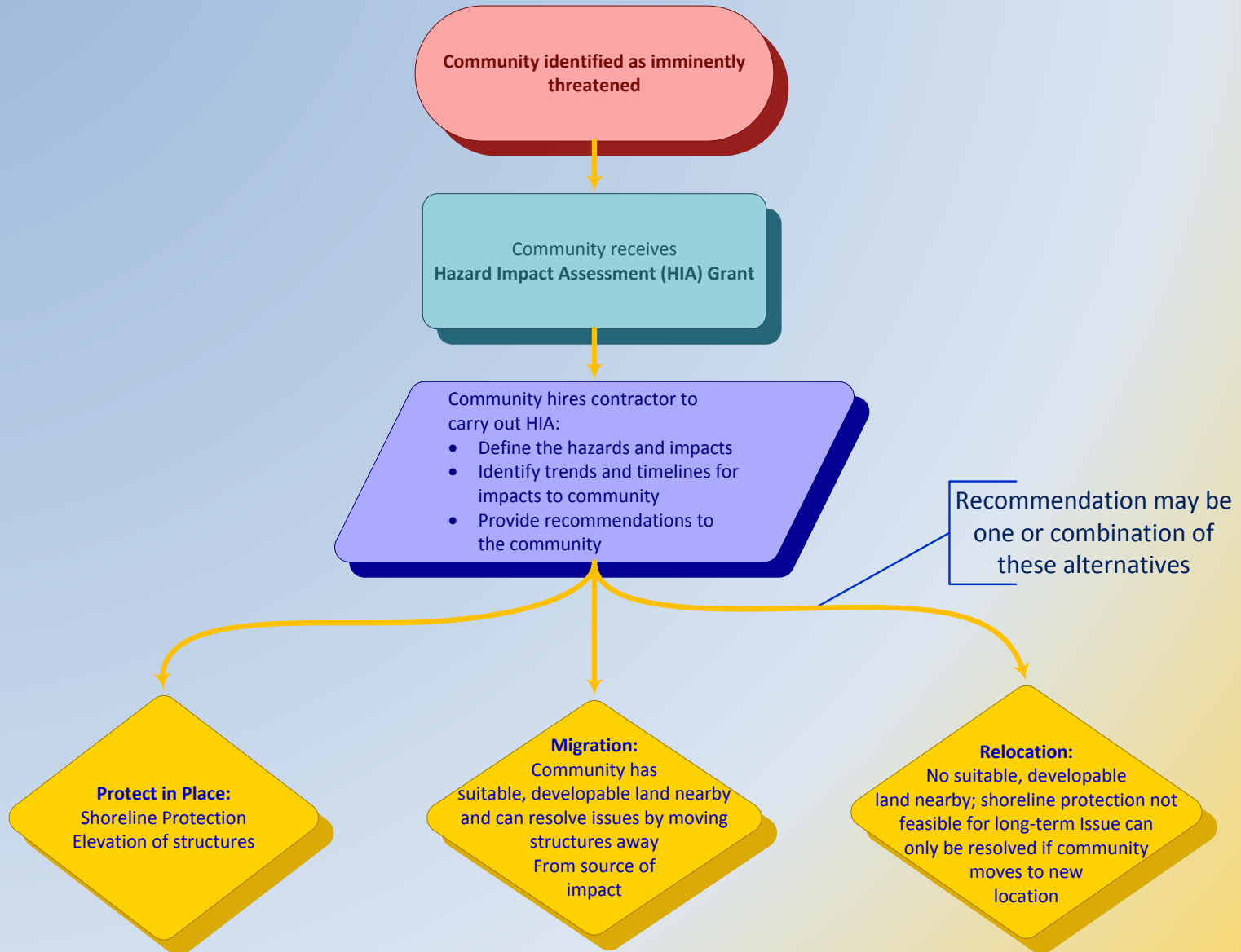


# Hazard Impact Assessments

- Identify and document climate change-related hazards
- Analyze hazard trends and future impacts to community
- Recommend solutions to mitigate impacts of local natural hazards, taking into account financial considerations



# Community Decision-Making Process: Phase 1



# Communities receiving Hazard Impact Assessment Grants



# Kipnuk

- Erosion of Kiguklik River, mostly during fall storms
- Seasonal flooding and storm surges causing over-topping of sewage lagoon, dispersal of fuel
- Thawing permafrost causing subsidence - loss of foundation support, threatening structures



Photo: Golder & Associates



Photo: Golder & Associates

# Kipnuk Hazard Impact Assessment

*Recommendations will provide basis for Community Planning Grant*

- Shoreline protection to reduce rate of riverbank erosion, such as sheet piles, rip-rap, seawall, and river course modification
- Elevate structures above flood levels. Use of appropriate foundations such as pile or triodetic foundations to address permafrost degradation
- Adopt building code setting minimum floor height for new structures
- Install flood warning system including monitoring component to collect data for forecasting severity of storm surges
- Construct levee system to protect village from flooding
- Insulated pads to elevate the relative ground surface



# Atmautluak

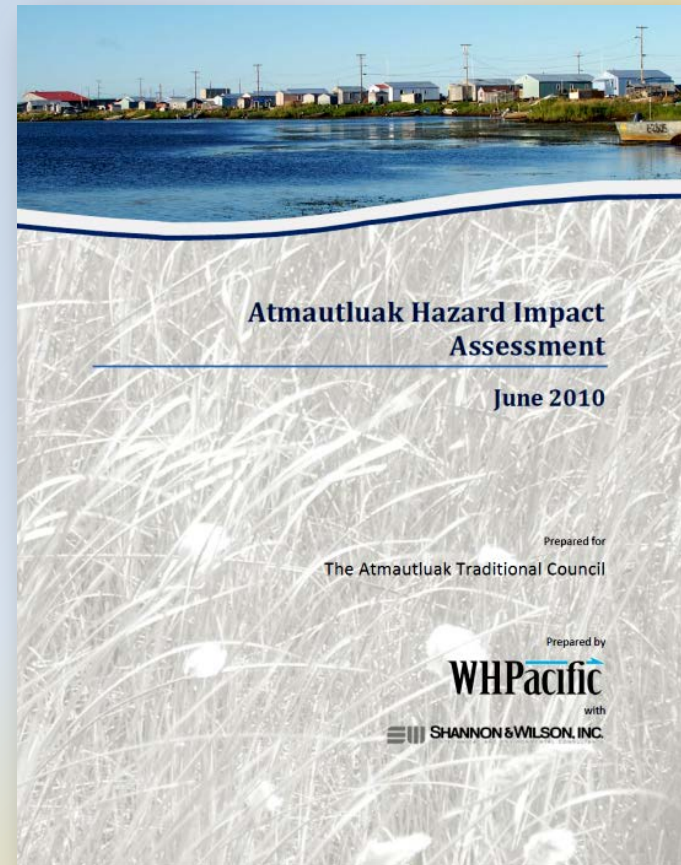
- Erosion caused by thawing permafrost and ice jams
- Flooding caused by ice jamming of local river
- Thawing permafrost impacting village roads, utility infrastructure (telephone, electrical and fuel lines)



# Atmautluak Hazard Impact Assessment

Recommendations will provide basis for Community Planning Grant

- Conduct hydrological study to quantify recurrence intervals of floods and to evaluate alternatives to reduce bank erosion
- Require that future projects install thermistors to document changes in the active layer
- Monitor erosion through bank migration study (aerial photographs and physical measurements)
- Raise fuel lines off ground to reduce susceptibility to subsidence and subsequent corrosion
- Prepare community land use plan to identify preferred locations for new housing or other community facilities or infrastructure
- Prepare community surface drainage plan to drain surface water into nearby lakes and rivers
- Move or replace structures in danger from riverine erosion

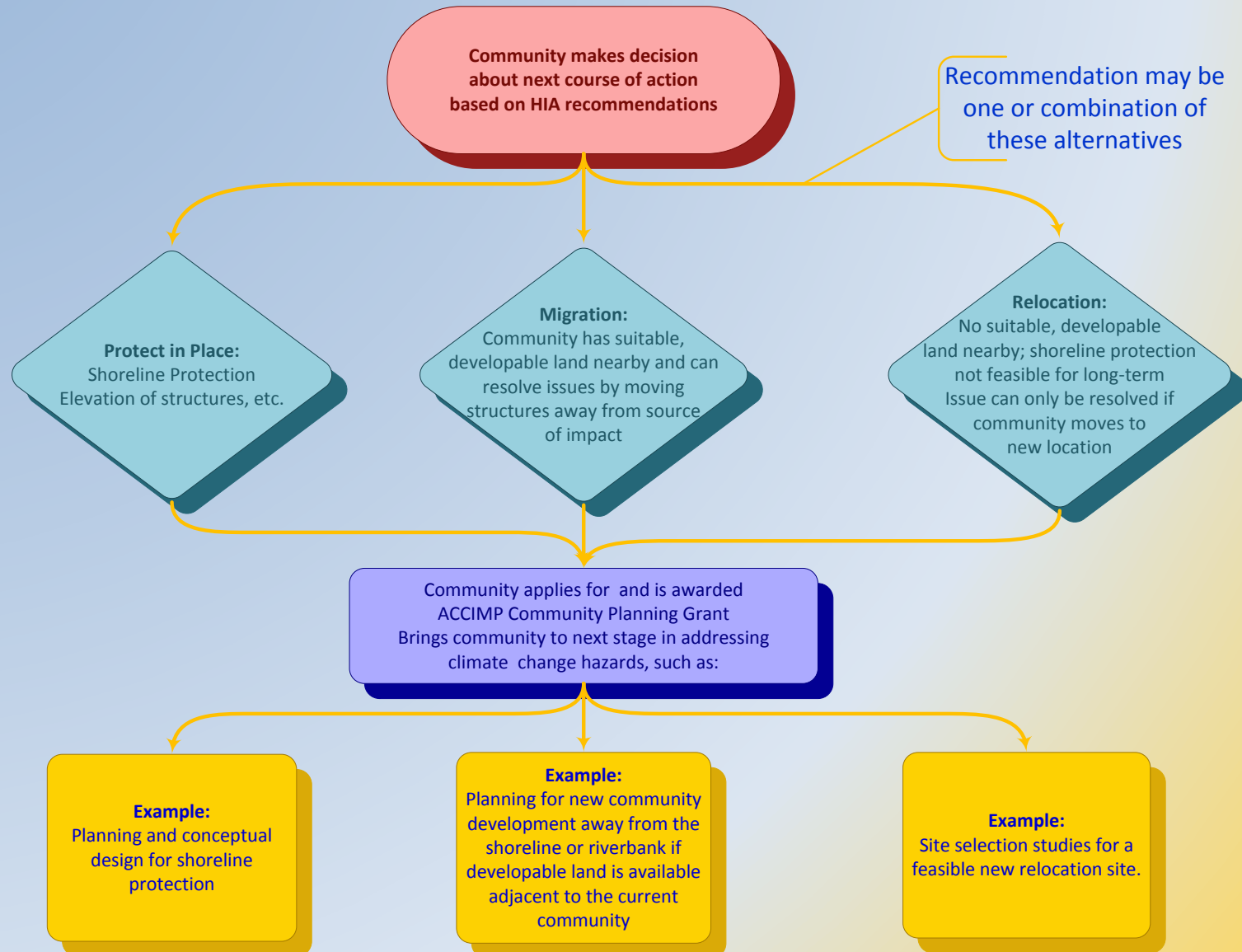


# Communities receiving Adaptation Planning Grants





# Community Decision-Making Process: Phase 2



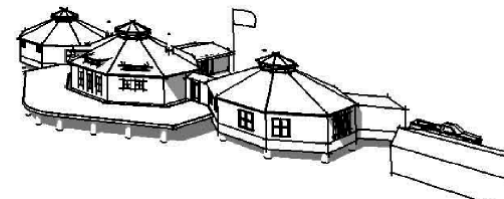
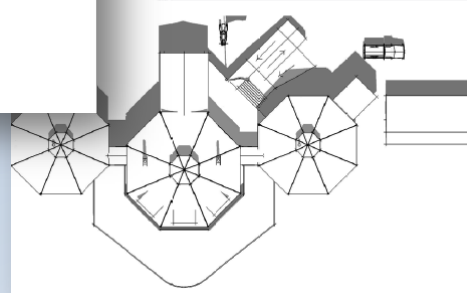
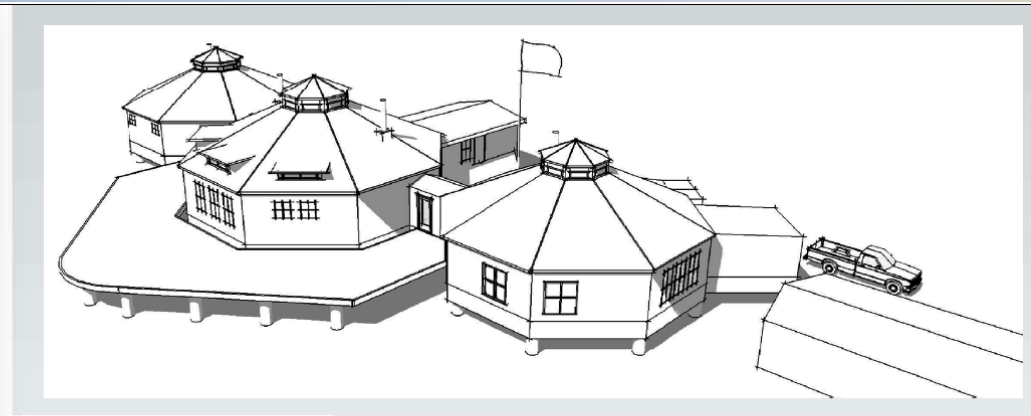
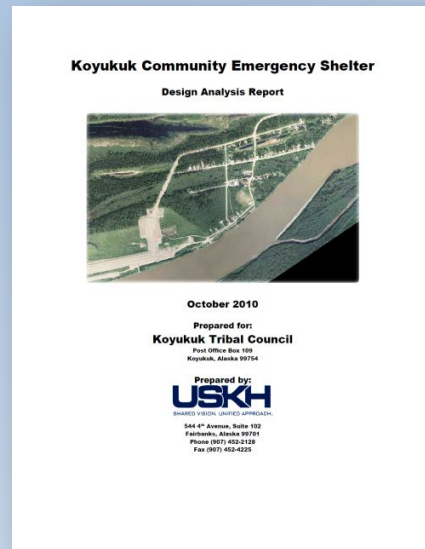
# Koyukuk

- Entire village is built within floodplain of Koyukuk River
- Threatened seasonally by wildfire, ice dams, and flooding/erosion resulting from ice dams
- Community eventually plans to move to higher ground at nearby Koyukuk Mountain



# Koyukuk Community Emergency Shelter

- Proposed to provide shelter for community during flood events
- Will serve as command post and “safe house” accessible to community
- Facilitates evacuations, provides temporary housing, and enables return of residents to their homes in safe manner



# Shishmaref

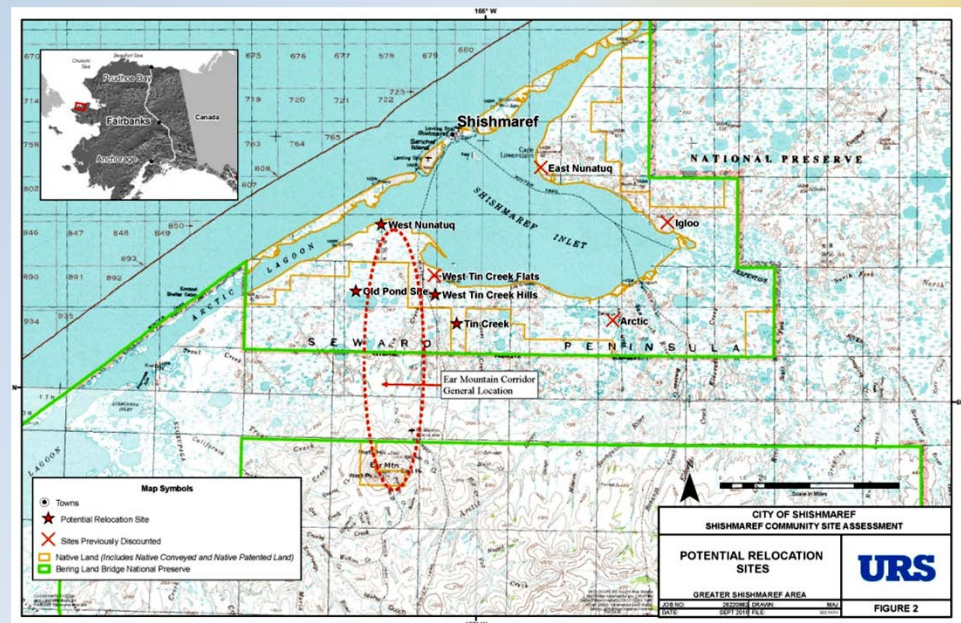
- Seawall has been built to protect community as a temporary measure
- Community looking at relocation as long-term solution



Photo: Shishmaref Relocation Coalition

# Shishmaref Community Relocation Site Selection Feasibility Study

- Community has hired consulting firm (URS Corporation) to:
  - work with community to organize and review prior relocation studies
  - reconfirm community values and technical considerations for site selection criteria
  - evaluate remaining candidate sites and need for any new sites
  - identify at least one relocation site with broad community support and reasonable constructability
  - identify initial next steps for pioneer development.



# Shaktoolik

- Berm between village and the beach is composed largely of naturally deposited driftwood logs
- Village becomes an island during storm surges, and then it is additionally threatened by ocean waves throwing these logs into town



# Shaktoolik Evacuation Shelter Design Analysis Report

Shaktoolik hired a contractor to develop a concept-level design for an elevated structure which will provide shelter for the community during emergencies, principally during storm surges, but also in other extreme weather events and serve other non-emergency functions.



# Unalakleet

Community has developable land nearby and can resolve issues by moving infrastructure/facilities away from source of impact





# Foothills Master Plan and Subdivision Design Project

Directs new development to higher ground, away from impacts of erosion, flooding, and storm surge.

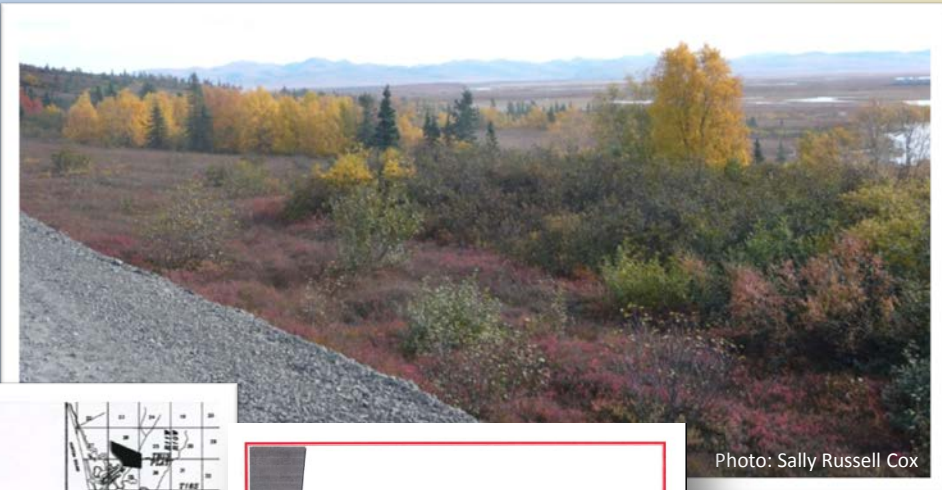


Photo: Sally Russell Cox




City of Unalakleet  
Foothills Subdivision  
Master Plan

Unalakleet Alaska  
January 31, 2011

# Mertarvik Strategic Management Plan


Sets a common vision for relocating the village of Newtok to relocation site on Nelson Island.



**MERTARVIK**

**Nunaullemteggun ikayuqulluta tamamta,  
assirluta aknirtenritellerkamtenun,  
nugtarlemtenun ciunerkamteni**

*a community that builds together  
for the safe and healthy future of Newtok*



**Preliminary Relocation Report :: Newtok to Mertarvik**


ISSUED FOR REVIEW by the Community of Newtok and the Newtok Planning Group, June 2011  
Developed by Agnew:Beck Consulting with PDC Engineers and USKH Inc. in collaboration with NPG members Sally Russell Cox and Greg Magee.

Strategic Management Plan

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Newtok to Mertarvik

March 2012



**MERTARVIK**

**Nunaullemteggun ikayuqulluta tamamta,  
assirluta aknirtenritellerkamtenun,  
nugtarlemtenun ciunerkamteni**

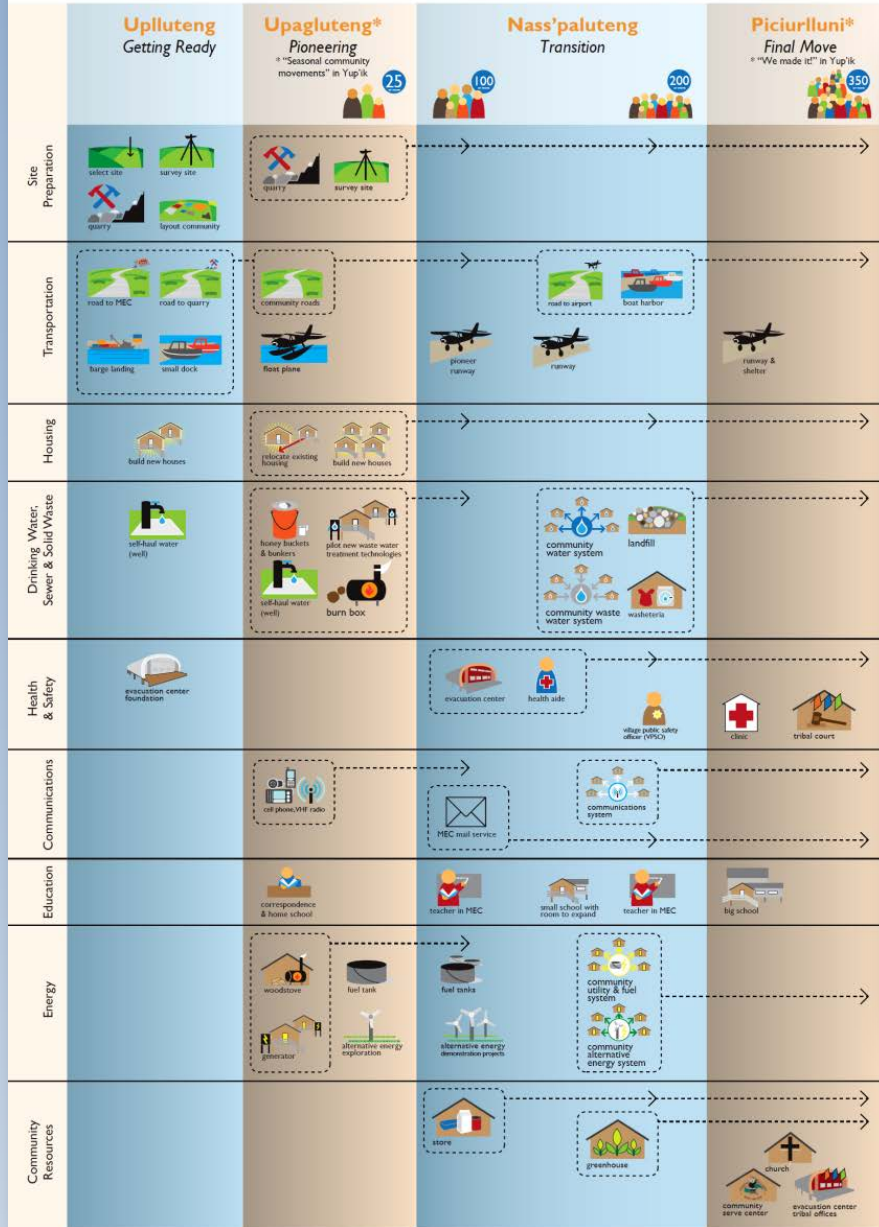
*a community that builds together  
for the safe and healthy future of Newtok*

- **Develops a Collective Vision:** focuses the resources of the community and supporting partnerships behind a common vision and common set of priorities.
- **Establishes a Framework for Other Plans:** serves as an “umbrella document” for relocation activities. All other plans, policies and strategies will support the strategic management plan and take direction from it.
- **Communicates the Relocation Strategy:** establishes and communicates the “blueprint” for relocation in a positive and practical way to everyone in the community, government agencies, and other organizations.
- **Facilitates Effective Partnerships:** strengthens existing and builds new partnerships with different levels of government, as well as other partners and funders. These partnerships are essential to achieving the strategic actions of the plan.

# Mertarvik Relocation Plan



**MERTARVIK**  
 Huskieringimigun Bayyapuluha, taavarrivis, saavirata  
 akkieerivillerkavarrimun, naggeeriverrivunne cuvavarrivunne  
 a community that builds together for the safe and healthy future of Newtok



Strategic Focus Areas	2012		2013		2014	
	winter/spring	summer/fall	winter/spring	summer/fall	winter/spring	summer/fall
<b>Site Preparation</b> <ol style="list-style-type: none"> <li>1. Fund, develop townsite plan</li> <li>2. Fund, carry out survey</li> <li>3. Resolve land ownership questions</li> <li>4. Determine lot allocation strategy</li> <li>5. Construct pioneer roads</li> <li>6. Establish basic housing development rules</li> <li>7. Develop quarry resource</li> </ol>						
<b>Building Capacity</b> <ol style="list-style-type: none"> <li>1. Identify partnership team</li> <li>2. Define MCDCC role, strengthen functions</li> <li>3. Assess needed skills, create training plan</li> <li>4. Assess regional demand for rock/gravel</li> <li>5. Build relationships with foundations</li> </ol>						
<b>Emergency Response + Public Health</b> <ol style="list-style-type: none"> <li>1. Redesign MEC if necessary</li> <li>2. Hire MEC construction manager and crew</li> <li>3. Develop, implement MEC funding strategy</li> <li>4. Identify health professional pioneer</li> <li>5. Complete MEC vertical construction</li> <li>6. Develop long-term plan for clinic</li> </ol>						
<b>Housing</b> <ol style="list-style-type: none"> <li>1. Complete site preparation tasks</li> <li>2. Conduct housing survey</li> <li>3. Develop a housing strategy</li> <li>4. Relocate houses</li> <li>5. Implement housing programs</li> <li>6. Research housing energy technologies</li> </ol>						
<b>Drinking Water + Sanitation</b> <ol style="list-style-type: none"> <li>1. Identify practical system alternatives</li> <li>2. Evaluate + select alternatives</li> <li>3. Develop business plan</li> <li>4. Pursue funding for design + construction</li> </ol>						

■ = project initiation   ■ = project maintenance

# Community Decision-Making Process: Phase 3

Direct assistance to community on navigating governmental processes and resources available to achieve goals and projects needed to mitigate climate change impacts

## **Establishment of Interagency Working Group:**

- Coordinated assistance to community to achieve recommendations
- Benefits: leveraging of resources, better coordination of work and reduced conflicts in project timelines and construction windows

## **Hiring Local Project Coordinator (Community Resident):**

- Full-time local project coordinator to work with project staff, agencies, and community planning grant contractors
- Serve as advocate for funding through grants and other means to implement needed evaluations and action plans.
- Represent community at interagency meetings

## **Development of Comprehensive Strategic Management Plan:**

- Contractor hired to develop strategic management plan which provides "blueprint" for how community and agencies will proceed to accomplish recommended actions.
- Contractor will work with community, local project coordinator, agencies and attend inter-agency meetings to develop strategic management plan, which will include:
  - Projected timelines/costs associated with projected relocation/shoreline protection
  - Sequence of tasks and subtasks that must take place
  - Entities responsible for specific tasks or activities
  - Best construction windows to reduce environmental impacts
  - Resources required

# Alaska Community Coastal Protection Project



# Objective

- To increase community sustainability and resilience to the impacts of natural hazards.



# Essential Components

- Strong community leadership
- Agency support and collaboration
- Careful, effective planning





# Strong Community Leadership

Community grant for full-time Community Coordinator to:

- Represent community at interagency working group meetings
- Work with project staff, inter-agency group, and planning contractor on resiliency plan
- Advocate for funding to carry out resiliency plan

DCRA provides training, technical assistance and other support to Community Coordinator



# Agency Support and Collaboration

Organization of interagency working group (state/federal agencies and regional organizations):

- To coordinate resources and technical assistance to help community implement resiliency plan.



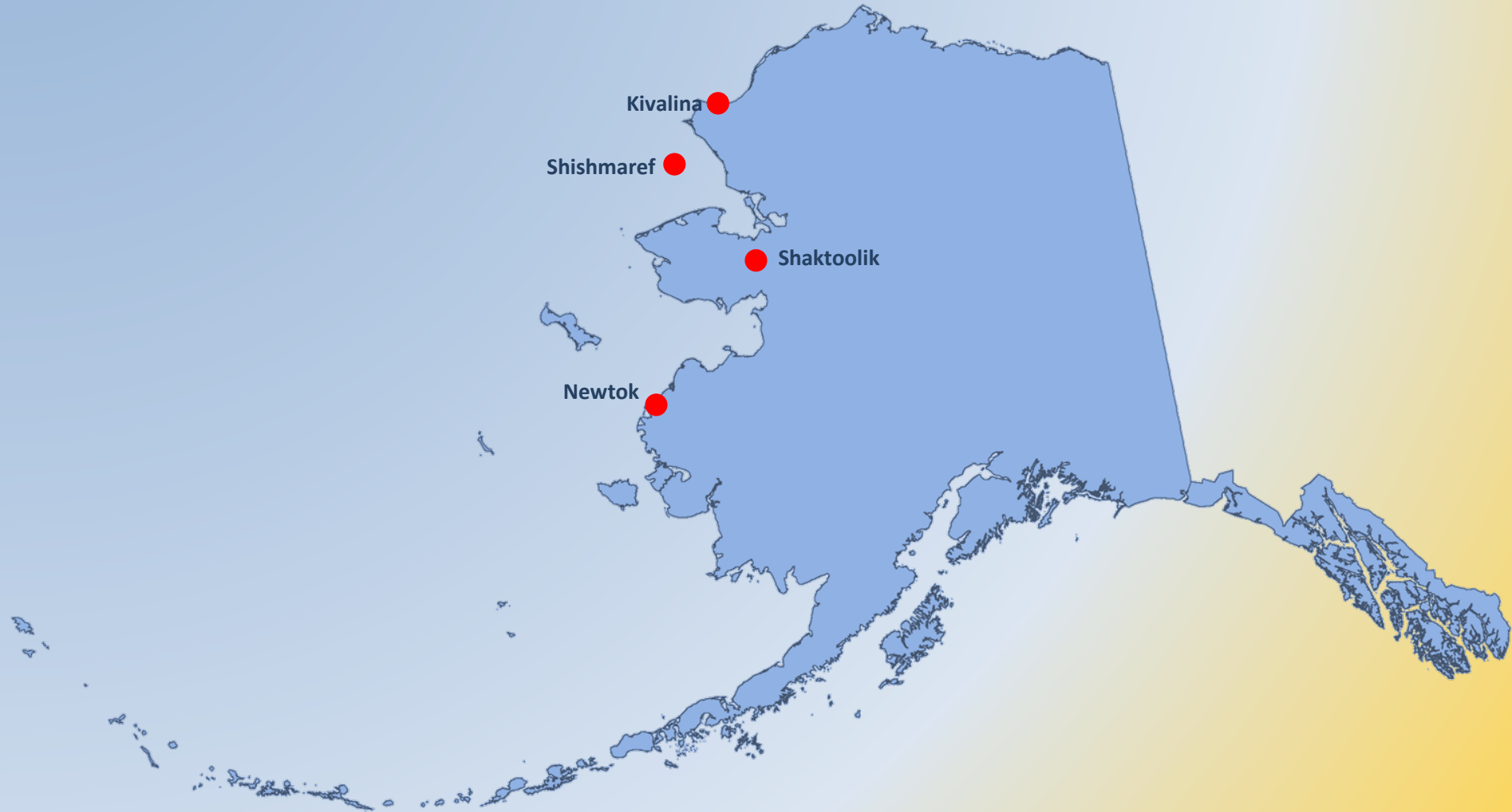
# Careful, Effective Planning

## Comprehensive Strategic Management Plan:

- Contractor hired to work with community and inter-agency working group to develop strategic management plan -- “blueprint” for how the community and agencies will proceed over the next 10 – 20 years to accomplish the community’s recommended actions.
- Plan is **community-driven**, with technical support provided by agencies:
  - Sequencing of activities and projects to implement plan
  - Potential funding sources; identification of critical funding cycles and opportunities
  - Identification of potential resource-leveraging opportunities among agencies
  - Identification of construction windows



# 2015 - Top Imminently Threatened Communities

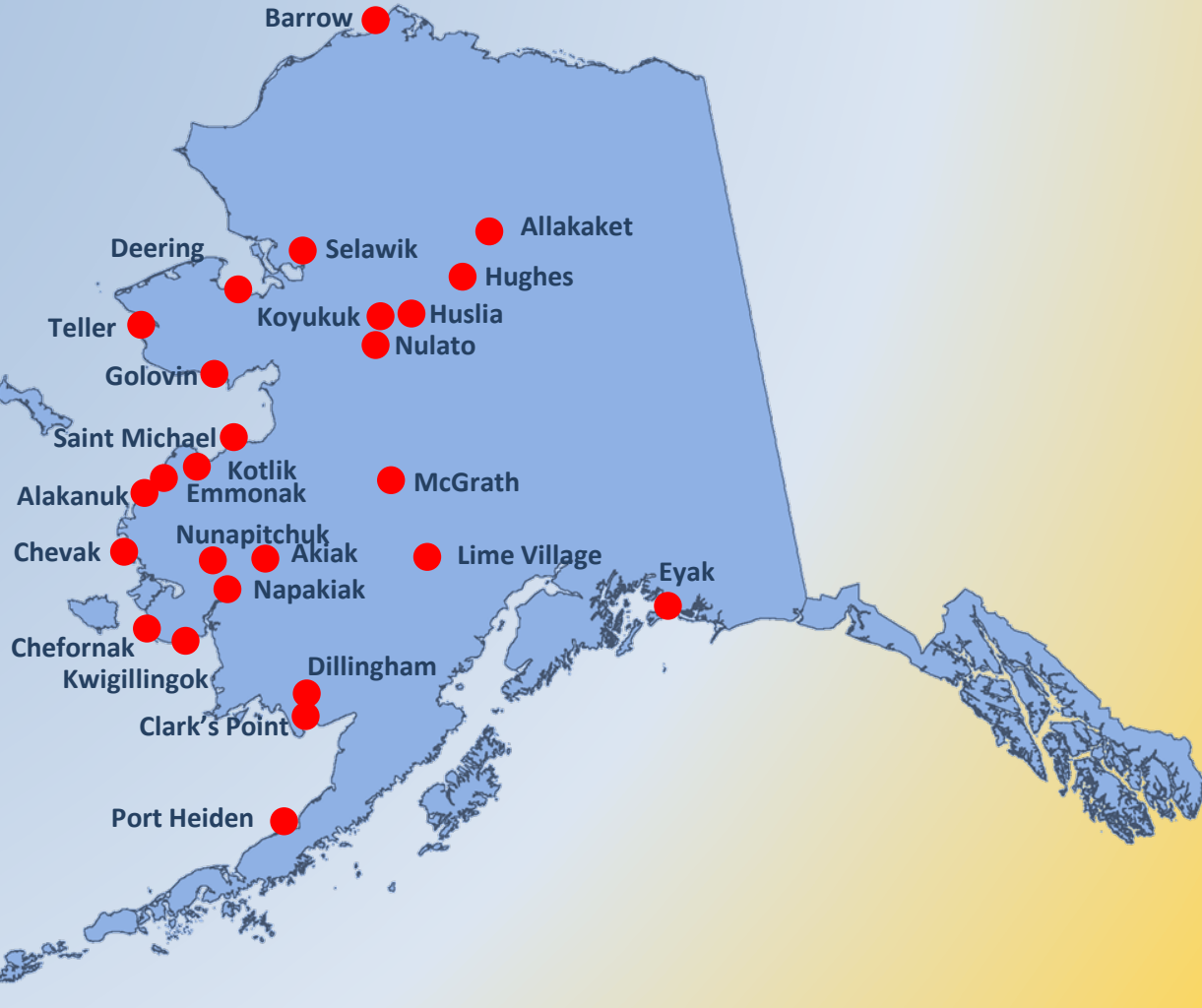


# Hazard Impact Assessments Completed 2012-2015

## Request Future Funding for Adaptation Planning



# Communities Requiring Assistance





Sally Russell Cox  
State of Alaska

Department of Commerce, Community, and Economic Development  
Division of Community and Regional Affairs

Email: [sally.cox@alaska.gov](mailto:sally.cox@alaska.gov)

Phone: 907.269.4588

Web: <http://commerce.state.ak.us/dnn/dcra/PlanningLandManagement/ACCIMP.aspx>  
<http://commerce.state.ak.us/dnn/dcra/PlanningLandManagement/AlaskaCommunityCoastalProtectionProject.aspx>  
<http://commerce.state.ak.us/dnn/dcra/PlanningLandManagement/NewtokPlanningGroup/MertarvikStrategicManagementPlan.aspx>

