Division of Geological & Geophysical Surveys

MISCELLANEOUS PUBLICATION 147S

ANNOTATED BIBLIOGRAPHY SERIES IN SUPPORT OF COASTAL COMMUNITY HAZARD PLANNING—NORTHWEST ALASKA

SHISHMAREF, ALASKA

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This annotated bibliography is part of a series created to facilitate access to documents useful for coastal geohazard evaluation and community planning in Northwest Alaska. Below is a comprehensive list of community-specific information sources, each with full bibliographic information and an informative-style annotation that highlights content pertaining to the community of Shishmaref, Alaska. For a detailed description of the preparation and scope of this resource, please refer to this bibliography series' foreword. Any notable errors and/or omissions may be reported to the Coastal Hazards Program manager at the Alaska Division of Geological & Geophysical Surveys (DGGS).

Alaska Department of Commerce, Community & Economic Development (DCCED), accessed 2011, Division of Community & Regional Affairs (DCRA) Community Profiles [website]: State of Alaska Department of Commerce, Community & Economic Development.

http://www.commerce.state.ak.us/dca/profiles/profile-maps.htm

This website provides access to community profile maps for community-based planning. The maps are available in 24" by 36" and 30" by 42" formats. The Shishmaref maps were created in 2004, 1996, and 1980 based on land survey and/or interpretation of aerial imagery. Subsistence hunting grounds, habitat areas, community buildings and public facilities are delineated. Shoreline position and potential erosion zones are included in the map content. All maps have been sponsored by the Alaska Division of Community & Regional Affairs and contracted to local agencies for production.

Alaska Department of Natural Resources Division of Coastal and Ocean Management (DCOM), accessed February 2011, Alaska Coastal Management program [website]: Alaska Department of Natural Resources Division of Coastal and Ocean Management.

http://alaskacoast.state.ak.us/Explore/Tour.html

This website outlines the Alaska Coastal Management Plans for each coastal district. It provides stewardship plans "to ensure a healthy and vibrant Alaskan coast that efficiently sustains long-term economic and environmental productivity."

Alaska Department of Transportation & Public Facilities (DOT&PF), January 2009, Infrastructure and erosion control: An overview of the Alaska Department of Transportation & Public Facilities projects in the northern region: Alaska Department of Transportation & Public Facilities, 58 p.

This powerpoint contains an overview of Alaska Department of Transportation & Public Facilities projects concerning erosion control in their northern region. The projects in Shishmaref include changes to the airport master plan and reconnaissance study for a relocation road.

Becker, Steven, Lori W. Richter, Robert W. Sampson, and Joe D. White *for* Shishmaref Erosion Control and Relocation Coalition, October 2002, Preliminary natural resources assessment of relocation and emergency evacuation sites discussion paper: Natural Resource Conservation Service, U.S. Department of Agriculture, 10 p.

This is a brief report of a field reconnaissance trip taken by the NRCS to analyze environmental conditions of potential relocation sites for the village of Shishmaref. The locations evaluated were based on the Shishmaref Erosion Control and Relocation Coalition's priorities, which were voted on by the community. This assessment favors relocation to the southwestern side of Shishmaref Inlet, and offers further exploratory analysis to be completed by the NRCS.

Bristol Environmental & Engineering Services Corporation *for* Shishmaref Erosion and Relocation Coalition and Kawerak, Inc., June 2010, Shishmaref relocation plan update final, Shishmaref, Alaska: Anchorage, Alaska, Bristol Environmental & Engineering Services Corporation, 43 p.

This report is an update to the Shishmaref Erosion and Relocation Coalition on previously evaluated relocation sites and necessary steps for future relocation planning. Relocation to the mainland has been identified as the popular choice of Shishmaref citizens, compared to collocation or not moving. Although the Tin Creek and West Tin Creek sites have been favored during certain public meetings, there is concern as to the site viability because of the ice-rich soils at both sites. Further examination of sites along the Ear Mountain access road are necessary as well as the West Nunatuq site before a decision is made. Collocation for both Nome and Kotzebue has been considered by the U.S. Army Corps of Engineers, as well as the feasibility of no action. Cost analyses are available for each of the potential options, as well as planning steps/requirements.

Chapman, Raymond S., Sung-Chan Kim, and David J. Mark, *for* U.S. Army Corps of Engineers, Alaska District, 2009, Storm damage and flooding evaluation, storm-induced water level prediction study for the western coast of Alaska: Vicksburg, MS, U.S. Army Engineer Research and Development Center, Coastal & Hydraulics Laboratory, 92 p.

The U.S. Army Engineer Research and Development Center, Coastal & Hydraulics Laboratory provided technical assistance assessing storm-generated regional water levels and currents at selected sites of ongoing and potential COE projects along Alaska's western coast. The purpose was to develop frequency-of-occurrence relationships for storm-generated water levels at 17 communities along the western coast of Alaska. Storm wind, pressure, ice, and surge data were generated for each of the areas, and the bathymetry was updated. Fifty-two storm event simulations were performed and a database of water levels versus return period was developed for each site.

Elswick, Virginia L., 2003, Seismic interpretation and structural evaluation of the Hope Basin, Alaska [MS Thesis]: Morgantown, West Virginia, West Virginia University Department of Geology and Geography, 21 p.

This MS thesis was submitted to the Eberly College of Arts and Sciences at West Virginia University. The content outlines the geologic setting and history for the Hope Basin, in the Chukchi Sea off the northwestern coast of Alaska. The lithology of Hope Basin was inferred from data collected in two wells drilled at Nimiuk Point on the Seward Peninsula and Cape Espenberg in the Selawik Basin, as well as from seismic data collected by the U.S. Geological Survey in 1977–1980. Four stratigraphic units are described for the area and a structural hypothesis for basin development is presented.

Eningowuk, Luci, *of* Shishmaref Erosion and Relocation Coalition, June 2004, Testimony of the Shishmaref erosion and relocation coalition before the Committee on Appropriations of the United States Senate [testimony]: Shishmaref Erosion and Relocation Coalition, 12 p.

This is the testimony of Luci Eningowuk, a Shishmaref Erosion and Relocation Coalition chairperson. In her testimony to the United States Senate Committee on Appropriations she addresses erosion issues for Shishmaref. The four points in this testimony include the relocation of the existing community to the mainland, ongoing beach erosion and efforts to minimize its impact, lack of funding for immediate infrastructure needs, and the demand for state and federal multi-agency coordination. Photographs and documentation of the ongoing process of home relocation in the community are also presented.

Fair, Susan, W., 1997, Inupiat naming and community history, the Tapqaq and Saniniq Coasts near Shishmaref, Alaska: Professional Geographer, vol. 49, no. 4, p. 466–480.

This publication focuses on the geography and traditional place names in the Shishmaref and Deering area. Included in this work is a description of the regional context with extensive documentation of local knowledge and Inupiat words for common coastal terms such as 'tapqaq' (sandy strand) and 'undani' (downcoast).

Hartig, Larry, *of* Alaska Department of Environmental Conservation & Governor's Climate Change Sub-Cabinet, October 2010, State of Alaska and State/Federal Executive Roundtable Activities Regarding the Arctic [presentation]: Anchorage, Alaska, Northern Waters Task Force, 53 p.

http://housemajority.org/coms/anw/pdfs/26/NWTF_Powerpoint_Hartig_01Oct10.pdf

This is a powerpoint presentation about the state and federal executive roundtable activities regarding the Arctic. The discussion includes hazards associated with declining Arctic sea ice extent, melting of permafrost, storm surges, and coastal erosion. Thirty-one villages are identified as imminently threatened: Barrow, Kivalina, Selawik, Allakaket, Hughes, Huslia, Shishmaref, Deering, Teller, Koyukuk, Nulato, Golovin, Shaktoolik, Unalakleet, Saint Michael, Kotlik, McGrath, Emmonak, Alakanuk, Chevak, Newtok, Nunapitchuk, Lime Village, Eyak (Cordova), Napakiak, Akiak, Chefornak, Kwigillingok, Dillingham, Clark's Point, and Port Heiden. Specific photos and engineering initiatives for 4 communitites are discussed, including: Kivalina, Shishmaref, Unalakleet, and Newtok.

Hufford, Gary, and Pertain, James, 2004, Climate change and short-term forecasting for Alaskan northern coasts: Anchorage, Alaska, National Weather Service, 5 p.

Summary: "Records of increasing temperatures, thawing permafrost, rising sea level, and reduction in sea ice extent and thickness are all physical evidence of warming in Alaska. In the north these rising temperatures are causing the protective nearshore ice to form later in the year and melt sooner, leaving the coastal villages vulnerable to greater impacts from the waves and surges associated with Fall storms.

In order to provide sufficient time for villages to take disaster mitigation prior to storms there is a greater need than ever for high quality, consistent numerical model guidance such as that which was provided to forecasters during the storm of 18–19 October, 2004. Since these numerical models rely on observational data, there is also a need for increased number and quality of arctic atmospheric and oceanic observations, both in situ and remotely sensed. The challenge for the forecaster will be to recognize the increasing number of extreme events under changing climatic conditions so that he/she can issue accurate forecasts and warnings with sufficient lead time to arctic coastal communities."

Immediate Action Workgroup (IAWG), Michael Black and Patricia Opheen, eds., March 2009, Recommendations to the Governor's Subcabinet on Climate Change: Immediate Action Workgroup, 162 p.

The Immediate Action Workgroup was established to address known threats to Alaskan communities caused by coastal erosion, thawing permafrost, flooding, and fires. This report is a follow-up to the recommendations made in April 2008, and provides recommendations for actions and policies to be implemented in 2009 and 2010. Shishmaref is identified as needing a community plan to coordinate the various organizations involved in the responses and mitigation of flooding and erosion hazards. Flooding and erosion projects are outlined from 2009 to 2010, and additional projects necessary to mitigate these hazards are suggested.

Immediate Action Workgroup (IAWG), Michael Black and Patricia Opheen, eds., 2008, Recommendations report to the Governor's Subcabinet on Climate Change: Immediate Action Workgroup, 86 p.

This report includes the recommendations provided by the Immediate Action Work Group (IAWG) regarding the actions and policies that should be taken in the next 12–18 months to prevent loss of life and property in Alaska's communities that are most vulnerable to the effects of climate change. Shishmaref was one of six communities addressed in this report as needing immediate action from the state regarding threats to erosion and flooding.

To protect the washeteria and lagoon in Shishmaref, the subcabinet recommends the construction of an extension on the Army Corps revetment already under contract. The cost for this project, estimated at $25 million, would be shared between the Corps and the State. The contents of this report also advise Shishmaref residents to begin planning and training for a suite of emergency operations that will prepare the community for emergency evacuation.

According to this report, a local planning committee has formed with the intent of developing a relocation plan. Relocation siting and reconnaissance assessments need to be conducted for a relocation road, new airport, and new community location. At the time of publication, the Corps of Engineers had been approved to begin a relocation feasibility study but funds were not yet appropriated.

Jordan, J.W., and O.K. Mason, 1999, A 5,000 year record of intertidal peat stratigraphy and sea level change from Northwest Alaska: Quaternary International, vol. 60 p. 37–47.

http://www.sciencedirect.com/science/article/B6VGS-3Y9X895-3/2/b00fc06641a513a07ae93d8ed1afec33

This study presents data to suggest a regional sequence of sea-level variation in the Chukchi Sea. Radiocarbon dates from marsh peat sequences along the northwest portion of the Seward Peninsula provide information about the timing of eustatic and storm-controlled changes in sea level during the late Holocene. The location under investigation included areas adjacent to Shishmaref, along the barrier island system of the peninsula.

Kawerak, Inc., Kelly Eningowuk, *of* Shishmaref IRA and Shishmaref Erosion and Relocation Coalition, and Tony Weyiouanna *of* Kawerak Transportation Planning, eds., *for* the Native Village of Shishmaref and the Bering Strait Development Council, October 2003, Shishmaref local economic development plan 2004–2009: Nome, Alaska, Kawerak, Inc., , 55 p.

This plan is a collection of strategies that are meant to increase cultural heritage and local employment opportunities, decrease dependency, and reduce duplication of efforts in various projects and programs for Shishmaref, Alaska. Among the top 11 priorities, two are related to coastal hazard planning and include working together as a community through relocation plans and building roads in the new location.

Lynn, Kathy, and Ellen Donoghue, April 2011, Climate change—Realities for Alaska Native villages: Eugene, Oregon, Tribal Climate Change Project, University of Oregon, 5 p.

This summary was produced as part of the Tribal Climate Change Profile Project to increase knowledge among tribal and non-tribal organizations through the illustration of innovative approaches to addressing climate change challenges. Included is a brief summary of the issues involved with village relocation in Alaska and the history behind village dependence on federal funding. The residents of Shishmaref began exploring relocation in 2001. There are worldwide research efforts focused on collecting perspectives on relocation and resettlement in the circumpolar north including Kivalina, Shishmaref, and Koyukuk. This document contains a useful table of publications, websites, video resources, and news articles on the topic of village relocation.

Manley, W.F., Jordan, J.W., Lestak, L.R., Mason, O.K., Parrish, E.G., and Sanzone, D.M., 2007, Coastal erosion since 1950 along the southeast Chukchi Sea, Alaska, based on both GIS and field measurements: Boulder, Colorado, 38th International Arctic Workshop, University of Colorado at Boulder, p. 90–92.

This is an abstract for a poster presentation on the measured changes in the nearshore coastal environment in northwestern Alaska. Field measurements of the region include repeat photography, mapping of sediments and landforms, and ground-truth measurements of coastal profiles. Erosion rates were determined using the USGS DSAS extension to ArcGIS, and attributed to coastal sensitivity to increased "frequency and intensity of storm events, increasing temperatures, permafrost melting, sea-level rise, and the increasing length of summer ice-free season." The erosion rates were found to change temporally and spatially throughout the region, but an average of 0–3 m/yr of erosion was experienced from Wales to Kivalina over the last five decades.

Mason, Owen K., 1996, Geological and anthropological considerations in relocating Shishmaref, Alaska: Alaska Division of Geological & Geophysical Surveys Report of Investigations no. 96-7, 18 p.

This is a reconnaissance study of the surficial geology and engineering properties of geologic materials at possible relocation sites suggested by the City of Shishmaref. The sites include Ear Mountain, Tin Creek, and Nunatak Bluff. The report provides a background on the threats the community faces due to erosion at its current location, and also contains a geologic map of the area.

Mason, Owen K., and James W. Jordan, 2002, Minimal late Holocene sea level rise in the Chukchi Sea—Arctic insensitivity to global change?: Global and Planetary Changes, vol. 32, p. 13–23.

In this article, Mason and Jordan outline the apparent disconnect between late Holocene global sea-level rise and the moderate sea-level rise observed in Northwest Alaska. Radiocarbon ages taken from peat and storm deposits in Seward Peninsula lagoons allowed for the reconstruction of a sea level curve spanning the last 6,000 years. The results indicate that sea level in northwestern Alaska has risen an average 0.3 mm per year compared to the global average of 1–2 mm per year. The authors suggest several hypotheses for these differing rates including cold sea-surface temperatures (limited steric expansion), geoid variation and/or the development of permafrost. Although

observed rates of sea-level rise are moderate for the Chukchi Sea, the article cautions that the response of northern Alaska's coasts to future global climate change remains uncertain and requires continued investigation.

Natural Resources Conservation Service (NRCS) and the Shishmaref Erosion and Relocation Coalition, January 2004, Site comparison of Tin Creek and West Tin Creek Hills for potential emergency evacuation and permanent relocation sites: Natural Resources Conservation Service, 16 p.

This report consists of the evaluation of two potential relocation sites for the community of Shishmaref. Analysis of the geology, vegetation, hydrology, and engineering properties of the Tin Creek and the West Tin Creek Hills sites were conducted over a four day field excursion. The sites were found to be very similar, except one site is 2 miles farther inland and has more area available for development. Potential infrastructure development was considered for each site based on the move from Sarichef Island and rock/gravel resources on Ear Mountain. No recommendations were made on the preference of one site over the other.

Péwé, Troy L., David M. Hopkins, and Arthur H. Lachenbruch, *of* U.S. Geological Survey *for* U.S. Atomic Energy Commission, April 1958, Engineering geology bearing on harbor site selection along the northwestern coast of Alaska from Nome to Point Barrow, U.S. Geological Survey Trace Elements Investigations report no. 678, 57 p.

This report provides geologic and oceanographic information from previous investigations, aerial imagery, and reconnaissance fieldwork regarding the optimal location of a deepwater harbor. The harbor was to be constructed using modern nuclear explosives and located at a point along the northwestern coast of Alaska between Nome and Point Barrow. The project was not undertaken.

Rowland, Julie, Steve Masterman, and Leo J. Woster, eds., December 2009, Geotechnical data report, Shishmaref relocation road: Alaska Department of Transportation & Public Facilities, no. AKSAS: 76776, 111 p.

This geotechnical report is the result of three data collection visits to the areas surrounding Shishmaref, Alaska. This report is meant to aid in development of either of two coastal materials sites, a potential access road to Ear Mountain, and a village relocation site for Shishmaref. Samples consisted of drilled core of 26–39 foot depths across the areas of interest. Detailed sieve analysis, Los Angeles abrasion testing, degradation, sodium sulfate soundness, and other analyses were completed by the Northern Region Materials Laboratory and included in this report.

Russell Cox, Sally, *of* Alaska Division of Community & Regional Affairs, 2011, Alaska climate change impact mitigation program [powerpoint]: Anchorage, Alaska Division of Community & Regional Affairs, 28 p.

This is a powerpoint presentation about the Alaska Climate Change Impact Mitigation Program (ACCIMP) presented by Sally Cox, a planner with the Alaska Department of Commerce, Community & Economic Development. Communities that have been identified for community planning grants under this program are Kivalina, Shishmaref, Koyukuk, Unalakleet, Shaktoolik, and Newtok.

Simpson, J.J., January 1984, Final report, Task Force on Erosion Control: Alaska Department of Transportation & Public Facilities, project no. R-30023, 101 p.

The Erosion Control Task Force was appointed to investigate and inventory potential erosion problems on a statewide basis, to prioritize the erosion problem sites by severity and need, and to provide preliminary design plans where immediate remedial action is required. Sites were rated based on public safety, public property, private property, time of projected loss, ability to move, approximate replacement value, and economic value. Projected costs of erosion protection measures were analyzed and total $16,802,300 for all projects. This report outlines specific engineering projects to reduce the effects of coastal and riverine erosion for communities throughout Alaska.

The report describes erosion at Shishmaref as being driven by storms from the Chukchi Sea. Increased water levels and wave run-up during these storm events actively undercut the banks of the island. The authors of this report suggested erosion protection in the form of 1,000 feet of rip rap or grout-filled fabric bags on the seaward side of the island.

Strain, Daniel, July 2011, Collapsing coastlines—How Arctic shores are pulled a-sea: Science News, p. 18–21.

This is a popular press article that describes rates of bluff erosion and mechanisms of coastal erosion in the Kaktovik area. The author highlights some of the issues associated with community responses to elevated rates

of erosion, including challenges and costs associated with relocation solutions. Shishmaref is also highlighted as a community imperiled by accelerated erosion.

Stevenson, Terril, *of* Natural Resource Conservation Service Idaho, October 2003, Trip report, Shishmaref relocation study, Shishmaref, Alaska, September 8–12, 2003: Boise, Idaho, Natural Resource Conservation Service, U.S. Department of Agriculture, 6 p.

This is a memorandum to Rob Sampson of SCE regarding the geology of a potential relocation site at Shishmaref, Alaska. The NRCS conducted a reconnaissance field excursion to observe the geological, river, and groundwater processes around the Tin Creek relocation site. This memorandum summarizes results from the trip and provides potential construction uses of materials found on Ear Mountain. Materials mining procedures are suggested for large and small rocks as well as groundwater as a drinking water source.

Tetra Tech, Inc., *for* U.S. Army Corps of Engineers, Alaska District, December 2004, Shishmaref relocation and collocation study, Shishmaref, Alaska—Preliminary costs of alternatives: Seattle, Washington, Tetra Tech, Inc., 75 p.

This report is an evaluation of the projected costs of four alternative courses of action being considered in response to the ongoing erosion of Sarichef Island. The first alternative would be for the community of Shishmaref to remain in its present location on Sarichef Island, requiring the installation and periodic maintenance of engineered coastal structures to slow erosion rates (total preliminary cost $42,277,500+). The second alternative would include relocating south across the saltwater lagoon to an area on the mainland called the Tin Creek site (total cost $179,320,500). For the third alternative, the residents of Shishmaref would move to the City of Nome (total cost $93,208,350). For the fourth alternative, the residents of Shishmaref would move to the City of Kotzebue (total cost $140,626,350). The calculation of each of these preliminary cost projections is described in detail in the report.

U.S. Army Corps of Engineers, accessed 2011, Civil works floodplain management services [website]: U.S. Army Corps of Engineers, Alaska District.

http://www.poa.usace.army.mil/en/cw/fld_haz/floodplain_index.htm

This website provides flood-hazard data for communities throughout Alaska. A link is provided to a flood-hazard-specific bibliography, maintained by the U.S. Army Corps of Engineers. The last Shishmaref flood event was documented during 1989, with the largest flood on record, in 1973, caused by coastal flooding of the Bering Strait. Notes about the 1973 flood event are provided, with relative storm-surge elevations.

U.S. Army Corps of Engineers, March 2009, Study findings and technical report: Alaska baseline erosion assessment: Elmendorf Air Force Base, AK, U.S. Army Corps of Engineers, Alaska District, 68 p.

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

This statewide assessment was conducted by the U.S. Army Corps of Engineers to coordinate, plan, and prioritize responses to erosion for Alaska. The report designated 26 communities, including Shishmaref, as priority action communities. A history of erosion projects in Shishmaref from 1992 to 2009 includes emergency tank relocation, erosion control, and shoreline protection projects.

U.S. Army Corps of Engineers, Timothy J. Gallagher, ed., April 2006, Alaska Village Erosion Technical Assistance Program—An examination of erosion issues in the communities of Bethel, Dillingham, Kaktovik, Kivalina, Newtok, Shishmaref, and Unalakleet: U.S. Army Corps of Engineers, Alaska District, 44 p.

This report documents an investigation of issues surrounding erosion at several Alaska Native villages. It includes an examination of erosion rates and controls, potential relocation sites, and impacts to Alaska Native culture and tradition. Erosion protection of Shishmaref, estimated at a cost of $16 million, is projected to provide 10–15 years of community site stability. This report includes different options for project locations with cost and benefit analyses.

U.S. Government Accountability Office (GAO), June 2009, Report to congressional requestors—Alaska Native villages, limited progress has been made on relocating villages threatened by flooding and erosion: U.S. General Accountability Office Report GAO-040895T, 53 p.

http://www.gao.gov/products/GAO-09-551

This report is a follow-up to the 2003 GAO report on flooding and erosion in Alaska Native villages, and was completed to identify concerns due to climate change that have increased the urgency of federal and state efforts. The GAO developed recommendations for Congress that include:

1. *A flooding assessment to augment the erosion assessment completed by the Army Corps of Engineers.*
2. *An amendment to federal legislation so that 64 more villages may be eligible for grants.*
3. *Designating a federal entity to oversee and coordinate village relocation efforts.*

This report recognizes Shishmaref as one of 31 villages facing imminent threats from flooding and erosion. Shishmaref was declared a state flood disaster area in 2004 and 2005. The 2005 event forced villagers living on the coastline to seek shelter at the center of the village, with the eventual relocation of their homes after the storm season. A new community location has been chosen at the Tin Creek site; relocation is estimated by the U.S. Army Corps of Engineers to cost $100–200 million.

U.S. Government Accounting Office (GAO), 2003 [2004], Alaska Native villages—Most are affected by flooding and erosion, but few qualify for federal assistance: U.S. General Accounting Office Report GAO-04-142, 82 p.

http://www.gao.gov/products/GAO-04-142

This study was conducted to provide recommendations to Congress that would improve how state and federal agencies respond to flooding and erosion in Alaska. This was done by:

1. *Determining the extent to which these villages were affected.*
2. *Identifying federal and state flooding and erosion programs.*
3. *Determining the current status of efforts to respond to flooding and erosion in nine villages.*
4. *Identifying alternatives that Congress may wish to consider when providing assistance for flooding and erosion (from "Highlights" section).*

The recommendations provide alternatives to current actions taken during flooding and erosion responses by including federal agencies and the Denali Commission. The adoption of policies by the Denali Commission would guide investments in infrastructure for Alaska Native villages affected by flooding and erosion. Shishmaref was one of four communities discussed as an example of a community in imminent danger due to flooding and erosion and considering relocation. The average erosion rates in Shishmaref are reported as 20–50 feet per year, and in October 1997, a storm was responsible for 125 feet of erosion. The community of Shishmaref voted to relocate in 1973, and is still making plans to do so.

Weyiouanna, Tony, October 2007, Coastal erosion and storm damage in Alaska [testimony]: U.S. Committee on Senate Homeland Security and Governmental Affairs, Subcommittee on Disaster Recovery, 5 p.

This is the testimony of Tony Weyiouanna, Shishmaref Village Transportation Planner to the United States Congress. The testimony includes three main components that describe the current situation in Shishmaref.

1. *Details of the relocation of the community to the mainland.*
2. *Projects completed to date and effectiveness.*
3. *Recommended projects to help move relocation forward.*

Mr. Weyiouanna, on behalf of the Shishmaref Erosion and Relocation Coalition, requested appropriation of funds from the State of Alaska and Congress to the Coalition in the amount of $950,818 for the first year of funding and $1,100,000 per year after that until the completed relocation of the community.

Wise, James L., Albert L. Comiskey, and Richard Becker, 1981, Storm surge climatology and forecasting in Alaska: Anchorage, Alaska, Arctic Environmental Information and Data Center, University of Alaska, 26 p.

The objective of this study was to improve the quality of life and the security of property in coastal areas susceptible to flooding by enhancing the decision-making process for human activities and development. This study compiles historical climate data to develop a surge forecast regression equation.

The Seward Peninsula, Norton Sound, and Lower Yukon area are identified as having the greatest frequency of reported storms. Storm profiles specific to Shishmaref are recorded for 1973, 1974, and 1979.
