Division of Geological & Geophysical Surveys

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

SAVOONGA, 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 Savoonga, 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 Savoonga maps were created in 2004 and 1980 based on land surveys 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."

Blier, Warren, Stanley Keefe, Wilson A. Shaffer, and Sung C. Kim, December 1997, Storm surges in the region of western Alaska: Monthly Weather Review, vol. 125 p. 3094–3108.

The authors describe the relationship between storm surges in Alaska and extratropical cyclones. They have identified Norton Sound and the Bering Sea as the two regions most vulnerable to cyclone-linked coastal flooding. A statistical storm surge model was developed to provide advanced warning to coastal villages; however, the author highlights that a more accurate model would be necessary to utilize this warning system as a hazard mitigation strategy. The installation of storm-surge gauges would also be required for this warning system to be used successfully.

Brigham-Grette, Julie, and David M. Hopkins, 1995, Emergent marine record and paleoclimate of the last interglaciation along the northwest Alaskan coast: Quaternary Research, vol. 43, p. 159–173.

This paper describes the stratigraphy of deposits from the last interglaciation in the Beringian region of Alaska and summarizes biostratigraphic information used to infer past water-mass and sea-ice conditions in the Bering Strait and southern Arctic Ocean.

Burke, Jill, January 2011, Savoonga power outages blamed on lack of sea ice [electronic]: Alaska Dispatch.

http://www.alaskadispatch.com/article/savoonga-power-outages-blamed-lack-sea-ice

This popular press article describes the circumstances surrounding a power outage in Savoonga during a 2011 winter storm. In an interview, Meera Kohler, CEO for Alaska Village Electric Cooperative Inc., explained that AVEC had never seen a problem like the one in Savoonga, and attributed abnormal sea spray buildup to the lack of protective sea ice.

Danielson, Seth, and Zygmunt Kowalik, October 2005, Tidal currents in the St. Lawrence Island region: Journal of Geophysical Research, vol. 110, no. C10004, 18 p.

Historical and newly available nearshore and offshore current meter data from the vicinity of St. Lawrence Island are used to more fully describe the spatial and temporal variability associated with tidal currents around the island.

Hopkins, David M., C.H. Nelson, R.B. Perry, and Tau Rho Alpha, *of* U.S. Geological Survey (USGS), National Ocean Survey, and National Oceanographic and Atmospheric Administration (NOAA), March 1976, Physiographic subdivisions of the Chirikov Basin, northern Bering Sea: U.S. Government Printing Office, Washington, D.C., Professional Paper no. 759-B, 12 p.

This northern Bering Sea study is the result of a collaboration between the U.S. Geological Survey and the National Oceanic and Atmospheric Administration. Bathymetric complexities are compared to extensive sedimentological and geophysical studies to provide critical insights into the Cenozoic history of the Chirikov Basin. Includes description of physiographic units resulting from a discussion of the Quaternary tectonic, erosional, and depositional history of the northern Bering Sea.

Hopkins, David M., Robert W. Rowland, and William W. Patton, Jr., 1972, Middle Pleistocene mollusks from St. Lawrence Island and their significance for the paleo-oceanography of the Bering Sea: Quaternary Research, vol. 2, p. 119–134.

This report discusses how the fossiliferous marine beds of St. Lawrence Island provide insight into former ocean current circulation patterns in the northern Bering Sea region and how the glacial drift that covers these beds provides evidence of former glaciations in the vicinity of Anadyr Strait. To develop an understanding of the patterns mentioned above, the species of molluscan fauna observed from each profile on St. Lawrence Island were characterized and compared to documented collections from the region.

Johnson, Walter R., and Zygmunt Kowalik, April 1986, Modeling of storm surges in the Bering Sea and Norton Sound: Journal of Geophysical Research, vol. 91, no. C4, p. 5119–5128.

Based on the results of a numerical model used to examine sea level, currents, and ice distribution during Bering Sea storm events, the authors suggest that the presence of land-fast ice in Norton Sound has a measurable effect on the size and onshore arrival time of storm-surge events. Both land-fast and pack ice are included as parameters in the model runs. The model is validated using observations and measurements from the February 1982, March 1982, and November 1974 storm events, and reproduces observations of sea ice redistribution during these storm events.

Kapsch, Marie-Luise, Hajo Eicken, and Martin Robards, 2010, Chapter 5, Sea ice distribution and ice use by indigenous walrus hunters on St. Lawrence Island, Alaska, *of* SIKU—Knowing Our Ice: Springer, p. 115–144.

In this chapter from the Sea Ice Knowledge and Use (SIKU) project, the authors correlate reported weather and ice conditions with favorable walrus hunting conditions in the vicinity of Gambell and Savoonga, Alaska. Since walrus are dependent upon sea ice distribution and abundance, the ability of indigenous people to hunt the animal reflects surface climatology locally and regionally. The study focus is 2006–2008, during a significantly low minimum summer ice extent in the Pacific.

Krupnik, Igor, Leonard Apangalook, Sr., and Paul Apangalook, 2010, Chapter 4, "It's cold, but not cold enough": observing ice and climate change in Gambell, Alaska, in IPY 2007–2008 and Beyond *of* SIKU: Knowing Our Ice: Springer Science Business Media B.V., p. 81–114.

In this chapter from the Sea Ice Knowledge and Use (SIKU) project, the authors discuss the outcome of an observational study of ice and weather conditions in Gambell, Alaska. In an effort to develop a systematic way of recording daily ice and weather patterns, indigenous community members were recruited to collect data for incorporation into scientific studies. This chapter describes the history and scope of documented observations in Gambell over a 33-month period from 2006–2009. Observations include descriptions of seasonal ice and weather variation, as well as a record of subsistence hunting activities.

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.

Mikulski, Pearl, *of* Kawerak, Inc., *for* the Community of Savoonga and the Bering Strait Development Council, June 2009, Savoonga local economic development plan, 2009–2013: Kawerak, Inc., Nome, Alaska, 84 p.

AS 29.40.030 requires Savoonga to adopt a comprehensive plan to define policy statements, goals, and standards for the physical, social, and economic development of the community.

This plan provides the community with a complete inventory of existing demographics, social conditions and services, economic conditions and activities, public services, and public and private facilities. This inventory was compiled in an effort to equip the community with basic informational tools for local planning.

One of the top 12 economic development priorities of this plan is to develop a Hazard Mitigation Plan for the community. Savoonga is subject to coastal erosion and flooding during the storm season. Beaches have historically been susceptible to damage and erosion due to storm conditions, tidal surges, and sea ice conditions. The coastal erosion from storms in 2003, 2004 and 2005 caused elevated concern in the community.

Other economic development priorities directly impacting the coastal zone include buying new search and rescue vehicles, building storage facilities for those vehicles, and constructing a new harbor, dock, and causeway.

Mofjeld, Harold O., February 1986, Observed tides on the northeastern Bering Sea Shelf: Journal of Geophysical Research, vol. 91, no. C2, p. 2593–2606

The author uses measurements from a bottom-pressure gauge array, deployed between 1981 and 1982, on the Bering Sea shelf to examine the relationship between observed and modeled tidal fluctuations. The presented results include an improved identification of amphidromic node locations and a discussion of the influence of sea ice on tidal predictions in this region. The author emphasizes that considerable work is still necessary to account for spatial and seasonal departures of tidal observations from modeled predictions in this sparsely instrumented region.

Nakao, Kinshiro, Kazuhisa Chikita, Shyu Nakaya, Koichi Urakami, and Yoshiyuki Ishii, February 1986, Palaeoenvironment in St. Lawrence Island, Alaska: Journal of the Faculty of Science, Hokkaido University, ser. 7, vol. 8, no. 1, p. 15–27.

To validate hypotheses about ice sheet expansion in the northern hemisphere during Ice Ages, the authors collected quantitative paleorecords of precipitation and atmospheric temperatures from the sedimentary record on St. Lawrence Island. The objective of this study was to investigate the climatic effects of ocean-derived moisture during the construction of ice sheets. Sedimentary structures and permafrost base depths were

inferred from electrical depth soundings at six sites and from two lake-sediment cores (core logs are included in text). A chemical analysis of inland water and core sediments revealed the quantity and extent of salts derived from marine sources, showing spikes during the most recent marine transgressions.

Oozeva, Conrad, Chester Noongwook, George Noongwook, Christina Alowa, and Igor Krupnik , 2004, Watching ice and weather our way—Sikumengllu eslamengllu esghapalleghput: Washington, D.C., Arctic Studies Center, National Museum of Natural History, Smithsonian Institution, and Savoonga Whaling Captains Association, 207 p.

This book was the result of a four-year partnership between Alaska Native hunters from two Yupik Eskimo communities on St. Lawrence Island, and sea ice experts. The authors documented and evaluated the changes noted by residents in order to observe environmental change using traditional ecological knowledge.

Included in the book are translations for 99 different types of sea ice with illustrated examples. There are also specific observations/stories of weather-related phenomena that include ice formation, hunting practices, and storms.

Overland, J.E., and A.T. Roach, June 1987, Northward flow in the Bering and Chukchi seas: Journal of Geophysical Research, vol. 92, no. C7, p. 7097–7105.

The Bering Strait is the only avenue for the exchange of ice, water, heat, and nutrients between the Pacific and Arctic Oceans. The authors use a two-dimensional, barotropic numerical model for the Bering Sea and Chukchi Sea shelves to investigate the relationship between sea levels and regional transport patterns. This provides additional evidence that Bering Strait transport and regional circulation patterns are driven by Pacific Ocean–Arctic Ocean sea level difference. The authors also use the model to qualitatively critique previous subregional observation-based studies.

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. Savoonga has no floods recorded on this site, and is not participating in the National Flood Insurance Program.

U.S. Army Corps of Engineers, March 2009, Study findings and technical report: Alaska baseline erosion assessment: Elmendorf Air Force Base, AK, US 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 throughout Alaska. The report has recognized Savoonga as being subject to erosion issues; Savoonga was identified as one of 69 communities where the monitoring of erosion conditions is actively ongoing.

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 (see "Highlights" section).*

The recommendations provide alternatives to current actions taken during flooding and erosion responses by 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. Savoonga was recognized as one of the 184 Alaska Native Villages affected by flooding and erosion.

Waller, Roger M., October 1958, Water-resources reconnaissance of Gambell and Savoonga villages, St. Lawrence Island, Alaska: U.S. Geological Survey, 14 p.

This is part of a three-part report on groundwater conditions for rural Alaska villages. Gambell and Savoonga were visited in July and August 1957 to determine the possibility of securing a reliable groundwater supply.

Savoonga is on the north shore of St. Lawrence Island, on a low, broad point, exposed almost continuously to winds from the Bering Sea. The Savoonga area is described as being underlain by olivine basalt lava flows from the Kookooligit Mountains. The presence of marine mud overlying the basalt is provided as evidence of sea-level regression in the area. Permafrost was reportedly encountered at a depth of 5 feet. Detailed chemical analysis of water samples taken from Savoonga wells, Troutman Lake, and Savoonga Creek are included in the report.

Walton, F.W., R.B. Perry, and H.G. Greene, 1969, Seismic reflection profiles, northern Bering Sea: U.S. Department of Commerce, Environmental Science Services Administration, operational data report C&GS DR-8, 17 p.

As part of a general continental shelf survey for Norton Sound, a series of seismic reflection profiles were collected aboard the USC&GSS SURVEYOR. The survey included bathymetric, gravity, and magnetic data at a 1 mile trackline spacing. This report contains the seismic trackline graphs along with the operations log for the cruise.
