

Pribilof Islands/Bering Sea GIS: Historic Preservation and Environmental Restoration

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Introduction

The Pribilof Islands, Alaska are a five-island archipelago volcanic in origin and remotely located in the Bering Sea north of the Aleutian Island chain. They are home to Aleut native Alaskans and the breeding grounds for 70% of the world's northern fur seal (*Callorhinus ursinus*) population and numerous seabird species. Two of the previously uninhabited islands, St. Paul and St. George Islands, were colonized by the Russians in 1786 and later controlled by the U.S. Government. First Russia and then the U.S. relied on the labor of Aleuts relocated to the Pribilof Islands from the Aleutian Islands chain to harvest fur seals, sea otters, and arctic fox. From their first arrival and through much of the 20th century, the Aleuts relied on the islands' and Bering Sea's natural resources, including fur seals, sea lions, whales, arctic fox, walrus, numerous sea bird species, and a variety of plants for customary traditional (subsistence) purposes. Still today, as home to the world's single largest ethnic Aleut community, the Pribilof Islands natural resources are vital to the survival of the Aleut community. Fur seal, endangered Steller sea lion, imported reindeer,

Abstract

Following decades of government controlled northern fur seal harvesting, the accumulation of solid waste and petroleum fuel releases created a governmental liability on the Pribilof Islands, Alaska. The National Oceanic and Atmospheric Administration's (NOAA) Ocean Service through its Office of Response and Restoration (OR&R) is responsible for site restoration activities and the transfer of lands to local entities. As part of the restoration and transfer of NOAA property, NOAA is generating a comprehensive Geographic Information Systems (GIS) project to preserve historical, ecological, cultural, and environmental restoration information in compliance with an agreement under the National Historic Preservation Act. This project strives to include all forms of digital spatial data available for the Pribilof Islands and the surrounding Bering Sea ecosystem in an interactive, multimedia DVD-ROM format. The final product will serve as the historical legacy of the federal agencies that managed the Pribilof Islands and an important tool for future island management by the Aleut community.

halibut and crab species, and plants, such as salmon and moss berries, continue to play a significant role in customary traditional practices, economic development, and the maintenance of cultural and ecological harmony. Certain species, such as sea urchins and clams that have documented use, apparently no longer have subsistence value although the potential still exists.

NOAA, as the most recent of the former federal administrators of the Pribilof Islands, is responsible for restoring the islands' environmental integrity and transferring more than 95% of government lands to the local people following decades of government control. During its management of the islands and the commercial fur seal harvest, the U.S. Government was responsible for the islands' energy supply and waste disposal. By the 1980s, household waste landfills, construction and demolition debris dumps, vehicle boneyards, and releases of petroleum fuel products associated with spills, dumping of used oil, corrosion of pipelines, tanks, and barrels dotted the islands.

More than 90 sites on St. George and St. Paul Islands required evaluation and potential restoration in order to complete the land transfer (Lindsay *et al.* 2004).

Seal Islands National Historic Landmark Preservation

Due to the important role that the Pribilof Islands played in Alaskan history and the fur seal industry, significant portions of both St. Paul and St. George Islands are included within the Seal Islands National Historic Landmark and District (<http://www.nationalregisterofhistoricplaces.com/AK/Aleutian+Islands/state.html>). To fulfill the compliance requirements of the National Historic Preservation Act and preserve the legacy of the Pribilof Islands, NOAA is entering into a Memorandum of Agreement (MOA) with the Alaska State Historic Preservation Office. A portion of the MOA would require NOAA to build an interpretive GIS project that includes traditional cultural and natural resource features of the Pribilof Islands, as well as contaminated site restoration data (National Historic Preservation

Act of 1966, as amended (16 U.S.C. 470 et seq.)). The interpretive GIS project includes data from a multitude of sources, and delivers documentation in a variety of media such as GIS data files, narrative text, historic maps and drawings, site closure documents, photographs, and videos. The project will be distributed in a two-disc DVD-ROM format, with disc one containing the narrative, documents, and map and image gallery, leaving disc two for the GIS project and data. Now in its middle stages of completion, the project is slated for release before the end of the year 2005.

Telling the Story of the Seal Islands

A robust HTML-based project viewed much like a website, but run locally from the DVD, comprises the first component of the project (disc one). It includes chapters on Pribilof Islands history, cultural resources, natural resources, and cleanup and restoration efforts. Links to photographs, maps, videos, and site closure documents provide users with a variety of supporting documentation. Screen captures as illustrations in the narrative text enable viewers to realize the capabilities of the GIS component of the project. A key feature in the HTML-based project is a map and image gallery that contains a vast collection of historical and modern maps, master title plats, paintings, sketches, and photographs of the Pribilof Islands. A final step in the project will be posting this component to the Internet, to allow universal access to interested parties without the necessity of the DVD-ROM.

Exploring the Islands through GIS

A GIS project in the form of an ArcGIS 9 document (.mxd) and supporting data comprises the

second component (disc two) of the project. A user must have ESRI ArcGIS 9 software in order to view the GIS project. However, users will be directed to free ESRI ArcExplorer software, which will allow them to add shapefiles to a blank project for viewing. The GIS project is divided into data frames corresponding to the chapters in disc one, including Regional Overview, Physical and Natural Resources, Boundary and Infrastructure, Seal Islands History, and Remediation and Restoration. Hyperlinks to site closure documents, historical maps and photos, and contaminated site cleanup videos and photos are included wherever possible.

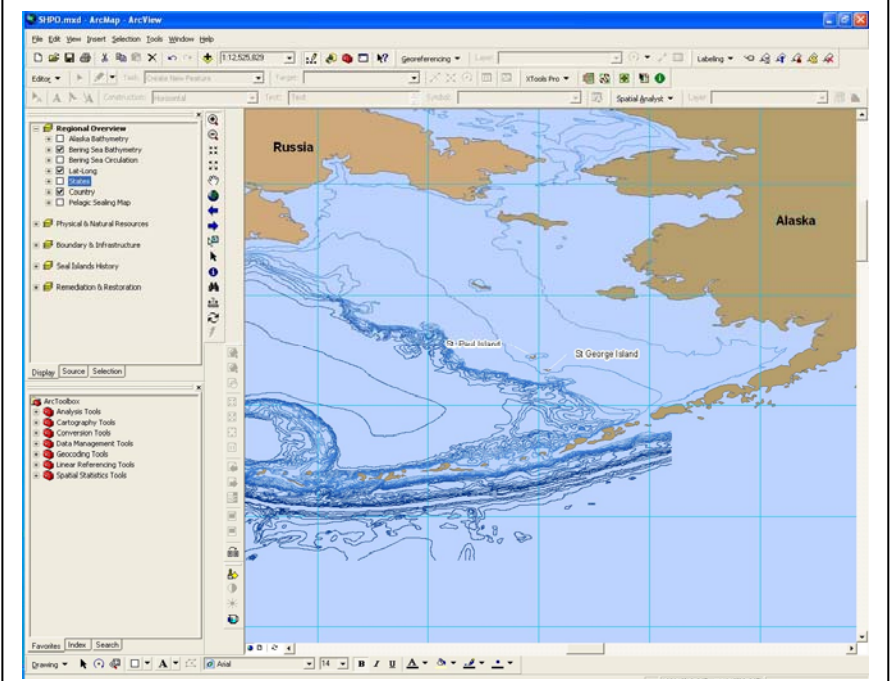
The Regional Overview shows the general location of the Pribilof Islands and their place in the world, and important Bering Sea and fishery data (Figure 1). Bathymetry, areas of longline fishing practices, and circulation patterns are highlighted, along with foraging and migration patterns of the northern fur seals. This data set provides a geographic introduction to the unique Bering Sea ecosystem that surrounds the Pribilof Islands.

The Physical and Natural Resources data frame are specific for each of the inhabited islands of St. Paul and St. George. They include features such as geologic information, seal rookery haul-outs, and subsistence foraging areas. Data from Douglas and Mary Veltre's research on subsistence resource utilization on St. Paul and St. George Islands are a major point of interest in this chapter (Veltre and Veltre 1981). Numerous maps and drawings by Henry W. Elliott, an artist and naturalist, thoroughly document the sealing activities in the late nineteenth and early twentieth centuries and the resulting decline in northern fur seal population.

The Boundary and Infrastructure data frame displays island property ownership, subdivisions and tracts, roads, utilities, and easements. Rectified Bureau of Land Management (BLM) master title plats of St. Paul and St. George Islands are a point of interest in this section as well as surveys conducted by third party organizations under

Figure 1

The Regional Overview data frame allows users to interactively work with Bering Sea data framing the surrounding environment of the Pribilof Islands.



contract by the local entities. Together, this chapter portrays an accurate and comprehensive picture of past and present land use on the two main islands.

The Seal Islands History data frame covers a breadth of information collected throughout the U.S. Government's management of the islands. This particular chapter includes rectified images and maps, plus hyperlinks to historic photographs and hand-drawn maps, collected from archived government reports. The Historic American Buildings Survey (HABS), a program within the National Park Service, is generating documentation of buildings used in commercial sealing on the Pribilof Islands, including architectural descriptions, photographs of the buildings' settings, major elevations, and any noteworthy interior or exterior architectural details. These components are hyperlinked to the corresponding building locations in the GIS.

The final data frame of the project, titled Remediation and Restoration, documents NOAA's cleanup of contaminated and debris sites on the Pribilof Islands (Figure 2). Site and sub-site locations are shown along with a synopsis of the latest data available for each location. Photos and videos documenting site remediation and restoration are included to the extent possible, and closure documents are hyperlinked for all sites where cleanup is complete. Because the restoration efforts are not entirely complete at this time, this portion of the project will require updating when the remaining sites are restored.

As a final phase of the GIS portion of the project, interactive maps may be served over the Internet using ESRI ArcIMS software. This activity would be a part of a larger effort to bring the HTML narrative live on the Internet including links to pared down versions of the overall GIS project. The IMS sites for the chapters described

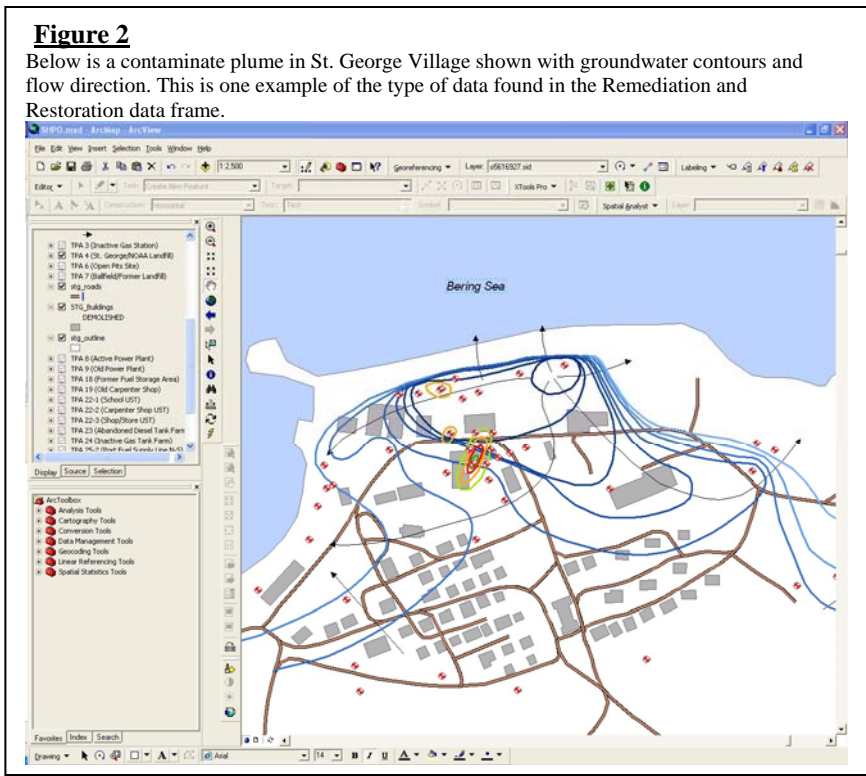
previously would be in a streamlined version for easy and quick interaction over various speeds of Internet connections, providing the public with a robust experience and learning tool about the U.S. Government's unique relationship with these remote islands, and the importance of the islands' conservation.

Conclusion

The project's intent is to provide data and documentation above and beyond the minimum requirements of the National Historic Preservation Act, and to present it in a manner that is informative, accessible, and visually appealing to a variety of users. This project provides a valuable tool for the Aleut community and the Pribilof Islands School District for use in effectively teaching history, resource management, and environmental stewardship. The Aleut community, scientists, researchers, government and local entities will all benefit from having a cohesive collection of Pribilof Islands data spanning more than a century available in a multimedia, interactive format. This project as a whole will be a noteworthy part of the U.S. Government's legacy on these remote and unique islands of immense biological and cultural significance to the Aleut community, the State of Alaska, and the Nation.

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The information in this paper reflects the views of the authors, and does not necessarily reflect the official positions or policies of NOAA or the Department of Commerce.