

## User's Guide

Welcome to the Location File for Glacier Bay, Alaska! Glacier Bay is a recently (300 years ago) deglaciated fjord located along the northern end of the Alaska panhandle (about 50 miles [80 km] west of Juneau) in southeast Alaska. The Y-shaped bay is approximately 65 miles [105 km] long and has several finger-like inlets extending from it. Two of the inlets, Muir and Tarr, extend to within miles of British Columbia, Canada. To the east and west of the bay are the steep mountain summits of the Chilkat and Fairweather ranges. Glacier Bay offers spectacular scenery and is one of the most popular destinations for cruise ships visiting Alaska.

Glacier Bay is an oceanographically and biologically complex area in a small package. Large amounts of freshwater runoff from calving glaciers and rain, combined with large tidal exchange in the estuary, can make Glacier Bay change dramatically over a few hours. Anything living in the water must adapt to these sudden changes in temperature and salinity. The glaciers of this area also produce large amounts of sediment, which can drastically change the water clarity. Much of the sediment collects within the bay; in some places, more than one centimeter [0.4 inches] is laid down each day!



NOAA has created Location Files for different U.S. coastal regions to help you use the General NOAA Oil Modeling Environment, GNOME. In addition, on a case-by-case basis, NOAA develops international Location Files when working with specific partners. Each Location File contains information about local

oceanographic conditions that GNOME uses to model oil spills in the area covered by that Location File. Each Location File also contains references (both print publications and Internet sites) to help you learn more about the location you are simulating.

As you work with the Location File for Glacier Bay, GNOME will prompt you to:

1. Choose the model settings (start date and time, and run duration).
2. Input the wind conditions.

GNOME will guide you through choosing the model settings and entering the wind conditions. Each window has a button that leads you to helpful information and the general Help topic list. Click the Help button anytime you need help setting up the model. When you need to input the wind conditions in GNOME, you can click the “Finding Wind Data” button to see a list of web sites that publish wind data for this region.

More information about GNOME and Location Files is available at <http://response.restoration.noaa.gov/software/gnome/gnome.html> .

## **Technical Documentation**

### ***Background***

As a recently deglaciated fjord, tides and freshwater outflow dominate the currents in Glacier Bay. The seasonal cycle of freshwater outflow is accounted for in the tidal coefficients, although on any day the actual runoff could be quite different. Without real-time monitoring of freshwater flows from glaciers or rain, climatology was the only option to use in the Glacier Bay Location File.

### ***Current Patterns***

The tidal current pattern was simulated in the NOAA Circulation Analysis for Trajectory Simulations (CATS) hydrodynamic model using the WAC submodel with shallow water wave dynamics. The tidal time dependence is simulated using the tidal coefficients from the tidal station west of Beardslee Island (58° 28' N, 136° 02' W).

### ***References***

You can get more information about Glacier Bay from these publications and web sites.

## Oceanography

Coast and Geodetic Survey. 1962. Surface water temperature and salinity, Pacific coast, North America and South America and Pacific Ocean islands. Washington, DC: C&GS.

Carlson, P.R., R.D. Powell, and D.M. Rearic. 1989. Turbidity-current channels in Queen Inlet, Glacier Bay, Alaska. *Canadian Journal of Earth Science*. 26: 807-820.

Cowan, E.A. 1992. Meltwater and tidal currents: controls on circulation in a small glacial fjord. *Estuarine, Coastal and Shelf Science*. 34: 381-392.

Hooge, P.N. and E.R. Hooge. 2002. Fjord oceanographic patterns in Glacier Bay, Alaska. Report to the National Park Service, U.S. Geological Survey, Alaska Science Center, Gustavus, Alaska. 144 pp.

Martin, J.W. 1967. Sea Surface Current Studies in Southeastern Alaska, spring and summer, 1967. U.S. Bureau of Commercial Fisheries.

Matthews, J.B. 1981. Seasonal circulation of the Glacier Bay, Alaska fjord system. *Estuarine Coastal and Shelf Science*. New York. 12(6): 679-700.

Matthews, J.B. and A.V. Quinlan. 1975. Seasonal characteristics of water masses in Muir Inlet, a fjord with tidewater glaciers. *Journal of the Fisheries Research Board of Canada*. 32: 1693-1703.

McLain, D. 1969. Miscellaneous Observations of Surface Temperature, Salinity, and Currents in Lynn Canal, U.S. Fish and Wildlife Service. Auke Bay, AK.

Muench, R.D. and J.D. Schumacher. 1980. Physical oceanographic and meteorological conditions in the Northwest Gulf of Alaska. NOAA Technical Memorandum ERL PMEL-22. Seattle: Pacific Marine Environmental Laboratory, National Oceanic and Atmospheric Administration.

Powell, R.D. and A. Elverhoi. 1989. Introduction. *Marine Geology*. 85: III-IV.

Reyer, T.C. 1993. High-latitude oceanic variability associated with the 18.6-year nodal tide. *Journal of Geophysical Research*. 98: 4639-4644.

Sharman, L.C. 1982. Wachusett Inlet intertidal surveys, August, 1982, second minus tide series. U.S. National Park Service, Glacier Bay National Park and Preserve.

Sundberg, K.A. 1981. Marine Biology and Circulation Investigations in Sitka Sound, Alaska. Alaska Dept. of Fish and Game, Habitat Section. Anchorage, AK.

Tabata, S. 1982. The anticyclonic, baroclinic eddy off Sitka, Alaska, in the Northeast Pacific Ocean. *Journal of Physical Oceanography*. 12: 1260-1282.

Washburne, R. 1989. *Southeast Alaska Current Atlas*. Bellevue, WA: Weatherly Press (206-881-5212).

## **Hydrography**

Bryant, M.D., P.E. Porter, and S.J. Paustian. 1990. Evaluation of a stream channel-type system for southeast Alaska. U.S. Forest Service, Forestry Sciences Laboratory, Juneau.

Cebula, J.J. 1963. Glacier Bay National Monument stream survey. U.S. National Park Service, Glacier Bay National Park and Preserve.

Cowan, E.A., R.D. Powell, and N.D. Smith. 1986. Effects of meltwater stream discharges and fjord water masses on sedimentary deposits at temperate tidewater glaciers. Canberra, Australia.

Huneke, E. and M. Owens. 1966. Glacier Bay National Monument stream survey. U.S. National Park Service, Glacier Bay National Park and Preserve.

Johnston, D.P. 1965. Glacier Bay National Monument stream survey. U.S. National Park Service, Glacier Bay National Park and Preserve.

Letarte, J. and R. Stottlemeyer. 1984. Baseline streamwater chemistry for watersheds of Glacier Bay National Park, Alaska. Michigan Technical University, Department of Biological Science, Houghton.

Sidle, R.C. 1986. Transport of sediment and organic material in streams of coastal Alaska. In: *Iceland Coastal and River Symposium*. Sigbjarnarson, G. (ed). Reykjavik: University of Iceland. pp. 305-326.

Sidle, R.C. and A.M. Milner. 1990. Physical facts influencing stream development in Glacier Bay National Park, Alaska. In: *Second Glacier Bay Science Symposium, 1988*. Milner, A.M. and J.D. Wood, Jr. (eds). Glacier Bay National Park & Preserve, AK, U.S. National Park Service. pp. 19-25.

Soiseth, C.R. 1995. Summary of stream surveys in Glacier Bay National Park and Preserve: 1952-1994. U.S. National Park Service, Glacier Bay National Park & Preserve. Unpublished report.

Stottlemeyer, R. and D. Rutkowski. 1987. Baseline stream water chemistry for watersheds of Glacier Bay National Park and Preserve, Alaska. Great Lakes Area Resource Studies Unit (GLARSU) Technical Report 22. Final report submitted to the National Park Service, Alaska Regional Office, Anchorage, AK. 118 pp.

U.S. National Park Service. Undated. Glacier Bay National Park stream catalog. USNPS, Glacier Bay National Park and Preserve.

## **Wind and Weather**

Alaska Regional Headquarters of the NOAA National Weather Service

<http://www.arh.noaa.gov/>

To obtain observations, under "Weather Data", click "Observations" (<http://www.arh.noaa.gov/observations/>). On the clickable imagemap, click "Juneau" for current weather conditions at Juneau, AK.

Alaska Marine Weather

<http://panc.arh.noaa.gov/>

Marine zone forecasts provided by the National Weather Service Forecast Office (NWSFO), Anchorage, AK. Click "Marine Weather" in the navigation bar on the left. On the clickable imagemap, click "1A1" to get the marine forecast for Area 1A1, Lynn Canal and Glacier Bay.

National Weather Service: Juneau, Alaska

<http://pajk.arh.noaa.gov>

To view the short-term weather forecast for Glacier Bay, click "Zone 21" on the clickable imagemap.

National Weather Service Internet Weather Source

<http://weather.noaa.gov/weather/current/PAGS.html>

Current weather conditions for Gustavus, AK.

Forecasts from Alaska

<http://iwin.nws.noaa.gov/iwin/textversion/state/ak.html>

Interactive Weather Information Network (IWIN) (text only version) forecasts from Alaska.

(1) To obtain a regional forecast, click "Zone Forecast", then scroll down or search for AKZ021, the zone for Glacier Bay, including Gustavus.

(2) To obtain current conditions, click "Short Term (NOWCASTS)", then scroll down or search for AKZ021, the zone for Glacier Bay, including Gustavus.

## **General Information**

Alaska Biological Science Center: Glacier Bay Projects

[http://abscweb.wr.usgs.gov/glba/glba\\_prog.htm](http://abscweb.wr.usgs.gov/glba/glba_prog.htm)

The Alaska Biological Science Center provides scientific information on Alaska's wildlife and habitats to federal land management agencies to assist in their resource management decisions. The Glacier Bay Field Station focuses its research on the effects of anthropogenic disturbance on and the natural variation within the Glacier Bay ecosystem, with emphasis on the marine environment.

Glacier Bay, Alaska, from the Ground, Air and Space

<http://sdcd.gsfc.nasa.gov/GLACIER.BAY/glacierbay.story.html>

A web site based on the NASA/Goddard Space Flight Center (GSFC) video, "Glacier Bay, Alaska, from the Ground, Air and Space." Provides a lively, historical perspective of glacier changes at Glacier Bay by bringing glaciers to life with spectacular "fly-bys" of scenic rides over 3-dimensional glaciers, live video footage of ice fronts calving into the sea, and dramatic picture sequences of historic and satellite data. The video was produced by GSFC's Earth and Space Data Computing Division.

Alaska Science Center - Biological Science Office: Research Programs

<http://www.absc.usgs.gov>

Part of the Biological Resources Division of the U.S. Geological Survey, the Alaska Science Center - Biological Science Office conducts research on wildlife and their vast habitats in Alaska, providing scientific information essential for resource management decisions.

Alaska Cooperative Fish & Wildlife Research Unit

[http://mercury.bio.uaf.edu/akcfwru/unit\\_index.html](http://mercury.bio.uaf.edu/akcfwru/unit_index.html)

Part of a nation-wide cooperative program, the Alaska Cooperative Fish and Wildlife Research Unit promotes research and graduate student training in the ecology and management of fish, wildlife and their habitats.

Alaska State Geo-Spatial Data Clearinghouse

<http://www.asgdc.state.ak.us/>

Provides electronic access to a wide variety of information in the form of maps, images, and descriptions about Alaska geo-spatial data.

USGS Water Resources of Alaska

<http://www-water-ak.usgs.gov/>

USGS reports on water resources in Alaska.

## **Oil Spill Response**

NOAA Hazardous Materials Response Division (HAZMAT)

<http://response.restoration.noaa.gov>

Tools and information for emergency responders and planners, and others concerned about the effects of oil and hazardous chemicals in our waters and along our coasts.

Molnia, B.F. and M.C. Wheeler. 1978. Report on the beach dynamics, geology, and oil spill susceptibility of the Gulf of Alaska coastline in Glacier Bay National Monument, Sea Otter Creek to Icy Point. U.S. Geological Survey Open-File Report, 78-0284.