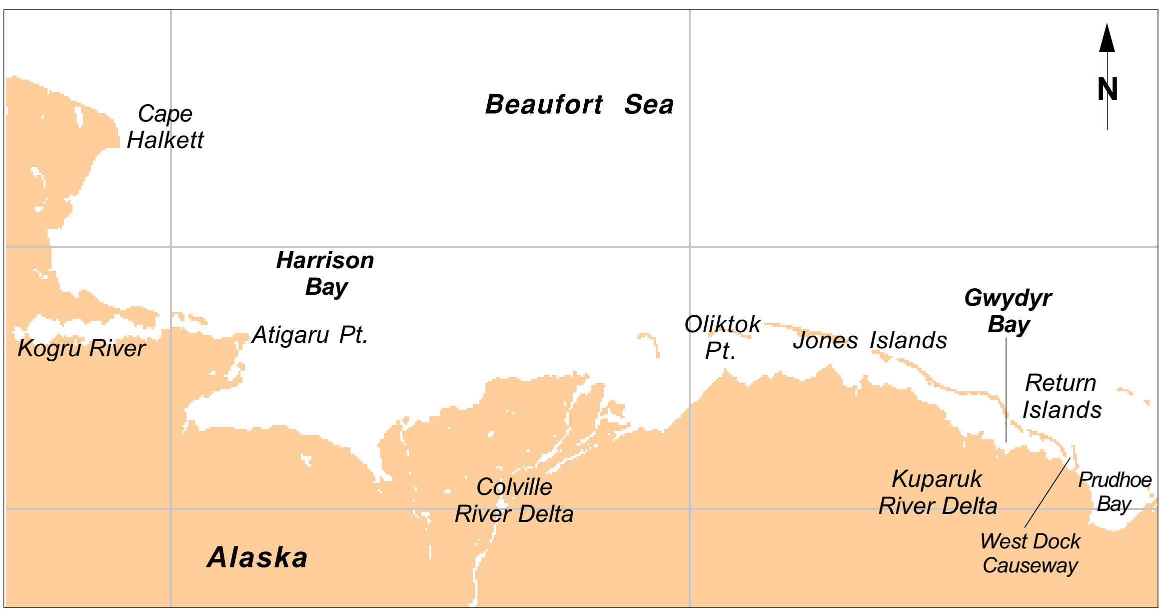
User's Guide

Welcome to the Location File for Harrison and Gwydyr Bays, Alaska! Gwydyr Bay is a lagoon area west of Prudhoe Bay, between the Return Islands and the mainland in northeastern Alaska. Harrison Bay is a large inlet north and west of the Colville River Delta. Both of these bays are part of Alaska's beautiful and fragile tundra. Tundra is a flat, treeless plain that supports shrubby or matlike vegetation, such as low shrubs, sedges, grasses, mosses, and lichens. The climatic conditions of this area include an extremely short growing season (6 to 10 weeks), long, cold, dark winters (6 to 10 months with mean monthly temperatures below 32° F or 0° C), and low precipitation (less than five inches [12.7 centimeters] per year), coupled with strong, drying winds. Animal species that have adapted to these conditions and reside year-round on the tundra include ptarmigan, arctic hare, arctic fox, and musk ox.

In the U.S., tundra known as the "North Slope" extends north from the foothills of the Brooks Range to the Arctic Ocean, and west from the Canadian border to the Chukchi Sea. Significant oil development occurs on the North Slope; hence, the Harrison and Gwydyr Bays Location File is the second in a series for this area, and replaces the Gwydyr Bay Location File.



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 Harrison and Gwydyr Bays, GNOME will prompt you to:

1. Choose the model settings (start date and time, and run duration).
2. Set the flow rates for the Colville and Kuparuk Rivers.
3. Input the wind conditions.

GNOME will guide you through each of these choices. 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. For example, when you are prompted to set the river flow rates, you can either (1) choose a climatological estimate of the flow rate (High, Mean/Medium, or Low), or for the Kuparuk River, (2) enter your own value. To learn how to obtain Kuparuk River flow rates, click the button, “Finding River Flow Data”, or check the “Finding River Flow Data” Help topic. Similarly, 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

The Harrison and Gwydyr Bays Location File is designed to simulate climatological open water conditions within the region. Open water season is generally mid-July through mid-September. The Location File contains circulation patterns that simulate the wind-driven coastal circulation and the flows of the Colville and Kuparuk Rivers. Because the tidal currents are generally less than 5 cm/sec (Endicott 1992), tides have not been included in the simulation.

Circulation (Wind-driven and River)

The coastal circulation in the coastal Beaufort Sea is driven by the wind and is constrained along the shoreline in either direction. Summer winds are primarily from the east to northeast, and secondarily from the west to northwest. Winds with an easterly component drive coastal circulation toward the west and offshore, while winds with a westerly component drive the coastal currents toward the east and onshore (Aagaard 1979, Barnes and Reimnitz 1974, Cannon and Hachmeister 1987, Hachmeister et al. 1987, Hale et al. 1989, Savoie and Wilson 1986). Changes in wind direction are generally reflected in the coastal circulation within a few hours (Savoie and Wilson 1986).

Wind-driven Ekman transport can alter the across-shelf surface pressure gradient. Upwelling situations tend to increase the water column stratification while downwelling situations tend to make the water column more homogeneous (Hale et al. 1989). When the wind relaxes or reverses, the forcing sustaining this pressure gradient is released and water tends to move on- or off-shore (Savoie and Wilson 1986). Large river discharges also create a surface plume with significant offshore velocities that move the fresher surface water offshore, creating an estuary-like circulation with colder, more saline water moving to the surface in response (Hale et al. 1989). These effects are not simulated in this Location File.

West Dock Break

We have been careful to simulate the cut through West Dock causeway to allow the coastal circulation to pass through. The surface circulation in this Location File flows both through the West Dock and as a jet around the margin of the causeway, returning shoreward on the other side, as seen in the field (Hachmeister et al. 1987, Savoie and Wilson 1986, Short et al. 1988a).

Current Patterns

This Location File has four current patterns: two components of the wind-driven currents in the lagoon systems, the Colville River, and the Kuparuk River. All were created with the NOAA Current Analysis for Trajectory Simulations (CATS) hydrodynamic model.

Wind-driven currents were simulated in the NOAA Current Analysis for Trajectory Simulation (CATS) hydrodynamic model, using the Wind-Driven Analysis Currents model. The model was used with linear physics so that the wind-driven currents could be related to the wind time series data entered by the user. Both northerly and easterly winds were simulated in the CATS model, so the wind direction that the user enters is decomposed into those two components. The current velocity is then related to the wind stress calculated from the wind time series. The wind-driven circulation patterns were scaled from fieldwork conducted during August, 2001.

Colville River Flow

The Colville River flows into Harrison Bay and is simulated with user interaction in this Location File. The user can choose one of three flow values as estimates of the flow rate.

The three flow rates (20,000 cfs, 10,000 cfs, and 3,000 cfs) are estimates of high, medium, and low flow rates for river flow after the extremes of the spring freshet have passed. The 1996 Colville River Delta Channel Assessment by Shannon & Wilson, Inc. was used for flow estimates.

Kuparuk River Flow

The Kuparuk River flows into Gwydyr Bay and is also simulated with user interaction in this Location File. The user can choose one of three flow values as estimates of the flow rate, or can enter a flow rate based on real-time or historical flow values.

The three flow values available in the pulldown menu are the mean flow rate (2250 cfs) plus/minus the standard deviation (1550) calculated from historical flow data from 1971-1999. The historical measurements were taken between July 1 and August 31, with flow rates greater than 10,000 cfs discarded, as we did not simulate these flooding conditions in this Location File.

To obtain real-time or historical flow values for the Kuparuk River, see the **USGS Water Resources of the United States** web page at http://water.usgs.gov/ . Under the heading, **Water Data**, select “Real-Time.” On the interactive map, click Alaska (AK). Finally (at http://waterdata.usgs.gov/ak/nwis/current/?type=flow), under the heading, **Arctic Slope**, select station number "15896000" for the station Kuparuk River near Deadhorse, Alaska.

References

You can get more information about Harrison and Gwydyr Bays from these publications and web sites.

Oceanographic

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Hale, D.A., M.J. Hameedi, L.E. Hachmeister, and W.J. Stringer. 1989. Effects of the West Dock Causeway on Nearshore Oceanographic Processes in the Vicinity of Prudhoe Bay, Alaska. Technical Report. Anchorage: NOAA, Ocean Assessments Division. 50 pp.

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Savoie, M.A. and D.E. Wilson. 1986. Physical Processes Monitoring Program - 1984, final report. In: Prudhoe Bay Waterflood Environmental Monitoring Program - 1984. Prepared by Kinnetic Laboratories, Inc. for U.S. Army Corps of Engineers, Alaska District, Anchorage, Alaska. 195 pp + appendices.

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Hydrographic

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Shannon & Wilson, Inc. 1996. 1996 Colville River Delta Channel Assessment, Colville River Delta, North Slope, Alaska. Fairbanks, AK: Shannon & Wilson, Inc. 9 pp. + appendices.

Wind and Weather

National Weather Service Forecast Office (NWSFO), Fairbanks, Alaska
http://pafg.arh.noaa.gov/forecasts/AKZ/AKZ202/
A zone forecast for the northern Arctic coast. Includes links to other forecasts, satellite pictures, weather history, and related information.

Interactive Weather Information Network--National Weather Service (NWS)
http://iwin.nws.noaa.gov/iwin/iwdspg1.html
To obtain weather reports and forecasts for this region, click AK on the U.S. map, then click Deadhorse or Barrow on the Alaska map.

NOAA/NOS Center for Operational Oceanographic Products and Services (CO-OPS)
http://co-ops.nos.noaa.gov/data_options.shtml?stn=9497645+Prudhoe+Bay,+AK
Retrieve environmental data recently collected at National Ocean Service data collection platforms and stored in the CO-OPS databases. Click the link "Weather/Ocean Data" to view the form you can use to retrieve data. Follow these steps to view current wind observations for station 9497645, Prudhoe Bay, AK:

(1) Check that "9497645 Prudhoe Bay, AK" is shown in the Station box.

(2) Choose "C1 - Wind Speed, Dir, Gusts" from the Sensor menu.

(3) Enter beginning and ending dates for the data you'd like to view.

(4) Select a date/time format from the Output Format menu, then select a Time Zone (UTC [coordinated universal time; formerly known as Greenwich Mean Time] or LST [Local Standard Time]).

(5) Click the "View Data" button to see the data in tabular form, or click the "View Plot" button to see the data in graphical form. Wind speed is provided in meters per second (m/s) and wind direction in degrees true.

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.

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