

GNOME™

GENERAL NOAA OIL MODELING ENVIRONMENT

User's Manual

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NATIONAL OCEANIC
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AND RESTORATION

HAZARDOUS MATERIALS
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Chapter 1

Welcome to GNOME

Welcome to **GNOME**, the General NOAA Oil Modeling Environment! This chapter contains an overview of GNOME, a description of how to download and install GNOME from our Web site, and an explanation of how GNOME's online Help and this manual can guide you as you use GNOME.

About GNOME

GNOME is a publicly available oil spill trajectory model that simulates oil movement due to winds, currents, tides, and spreading. GNOME was developed by the Hazardous Materials Response Division (HAZMAT) of the National Oceanic and Atmospheric Administration Office of Response and Restoration (NOAA OR&R). HAZMAT will use this model during spill response to calculate a "best guess" of a spill's trajectory and the associated uncertainty in that trajectory. **You can use GNOME to ...**

- Predict how winds, currents, and other processes might move and spread oil spilled on the water.
- Learn how predicted oil trajectories are affected by inexactness ("uncertainty") in current and wind observations and forecasts.
- See how spilled oil is predicted to change chemically and physically ("weather") during the time that it remains on the water surface.

To use GNOME, you describe a spill scenario by entering information into the program; GNOME then creates and displays an oil spill "movie" showing the predicted trajectory of the oil spilled in your scenario. Along with GNOME, most users also will want to use the GNOME **Location Files** for their regions of interest; these files contain prepackaged tide and current data, and make it easier to work with GNOME. Each Location File prompts you for environmental conditions needed to define the circulation, then sets up GNOME accordingly. The Location Files also contain references (both print publications

and Internet sites) to help you find detailed information for the location you are simulating.

The Location Files are not complete enough for use in spill response. (In the event of an actual oil or chemical spill in U.S. waters, call the U.S. Coast Guard National Response Center at 1-800-424-8802.) The Location Files are, however, an excellent tool for creating scenarios and building intuition regarding oil spill trajectories at a particular location.

What GNOME Can Do

GNOME is a trajectory model that can ...

- Estimate the trajectory of spills by processing information that you provide about wind and weather conditions, circulation patterns, river flow, and the oil spill(s) you wish to simulate.
- Predict the trajectories that can result from the inexactness (uncertainty) in current and wind observations and forecasts.
- Use weathering algorithms to make simple predictions about the changes the oil will undergo while it is exposed to the environment.
- Quickly be updated, re-run, and saved with new information.
- Provide trajectory output (including uncertainty estimates) in a geo-referenced format that can be used as input to GIS (geographic information system) programs.

Because GNOME was created as a tool for several kinds of users, we created it with three **model modes**:

- Standard Mode
- GIS Output Mode
- Diagnostic Mode

In **Standard Mode**, GNOME's most automated mode, a Location File loads pre-developed location data, such as an area map and dominant current patterns, into GNOME. GNOME's rule-based expert system (wizard) then prompts you for information it needs to run your model. In Standard Mode, you can save your model setup for later use, or you can print a picture or create a "movie" of your model run. GNOME's Standard Mode isn't flexible enough to use for spill response, but it is an

excellent tool for simulating spills in spill planning and drills, and for building intuition regarding oil spill trajectories at specific locations.

In **GIS Output Mode**, you also use a Location File to set up your model. In this mode, however, you can export your model output in GIS-compatible format. GNOME can output your trajectory in an ASCII, public domain, multi-file format (NOAA Standard Splot Files) that can be read into a number of different GIS programs. (An extension for ArcView GIS users is available in the Toolkit section of our Web site, <http://response.restoration.noaa.gov/software/gnome/tools.html>.) The point data from GNOME can also be read into a companion program, GNOME Analyst (formerly known as TAT), where it can be converted into a standard NOAA vector format, printed as a trajectory forecast, or saved in digital format for input into GIS programs for additional analysis. GIS Output Mode is primarily used for spatial or GIS analysis for emergency spill response.

In the tactical response mode of GNOME, **Diagnostic Mode**, you can use a Location File to help set up the model, or you can set up the model entirely on your own. (Without a Location File, GNOME requires input of shoreline and hydrodynamic information.) In Diagnostic Mode you have these additional capabilities:

- You have full access to all model parameters and scaling options.
- You can tailor the model to represent real-time data.
- With advanced training and hydrodynamic modeling experience, you can develop your own Location Files.
- You can set coefficients that control the size and distribution of the uncertainty used in the “Minimum Regret” estimates. (In Standard and GIS Output Modes, the values are set in the Location Files by the Location File builders and are not accessible to you.)

Diagnostic Mode is designed primarily for expert modelers, such as contingency planners and the modelers who provide full tactical support for spill response teams. This manual does not cover the features of GNOME’s Diagnostic Mode. **For training in the use of this mode, contact NOAA HAZMAT at ORR.GNOME@noaa.gov or at (206) 526-6317.**

What GNOME Can't Do

Do not use a Location File if you are responding to a real spill. Instead, report any oil or chemical spills in U.S. waters to the U.S. Coast Guard National Response Center at 1-800-424-8802.

Each GNOME Location File contains generalized information about the tides, currents, and shorelines in the region it covers. GNOME uses this information to make trajectory predictions for spills in that region. Because Location Files contain only climatological information, rather than information about the specific conditions at a particular date and time, they aren't designed to accurately model real spills. During real spills, NOAA's response team uses GNOME in its advanced Diagnostic Mode, and all of the data entered into the model is carefully examined to determine if it applies to the scenario at hand. The team can also enter more exact, "real-time" current and tide information, and can track the movement of the oil to fine-tune their trajectory predictions.

Similarly, a Location File won't accurately recreate a real spill, such as the Exxon Valdez spill in Prince William Sound. The currents in GNOME's Location Files are created from climatological data; however, real currents vary from the mean and are not steady in time. Using a Location File in Standard or GIS Output Mode, you can't change currents part way through a spill simulation. Consequently, recreating such a complex spill is limited by the Location File's climatological environmental information.

If you'd like assistance with trajectory analysis and spill-related issues, contact your local NOAA Scientific Support Coordinator (SSC). You can find out how to contact your local SSC from the NOAA HAZMAT main office at (206) 526-6317.

Getting and Installing GNOME

GNOME is publicly available via the Internet in both Macintosh and Microsoft Windows formats. GNOME and its Location Files may be freely used and distributed.

GNOME is a 32-bit application, so it runs in Windows 95/98/NT, but not in Windows 3.1. The Windows version requires 1.6 MB of RAM. The screen resolution in Windows

must be set to a minimum of 640 x 480 pixels in order for the dialog boxes to display properly. The Macintosh version of GNOME requires a Power PC running System 7 or higher, and requires 740K of RAM.

To download and install GNOME, use your browser to go to the **Downloading, Installing, and Running GNOME** section of the NOAA HAZMAT Web site, located at <http://response.restoration.noaa.gov/software/gnome/gnomeinfo.html>. This web page outlines the steps you should follow to download, install, and run GNOME for Macintosh or Windows computers.

If your browser does not support FTP downloading, you can use an FTP client application. You can get more information from this section of our Web site: <http://response.restoration.noaa.gov/software/gnome/gnomeftp.html>.

If you want to view your saved GNOME files in the mapping software, ArcView, you will need the GNOME ArcView extension, `gnome.avx`. Instructions for downloading and using this extension file are provided in the Toolkit section of our Web site, <http://response.restoration.noaa.gov/software/gnome/tools.html>.

How to Get What You Want From GNOME

As you begin working with GNOME, you should experiment with the model to improve your skill and intuition in trajectory analysis. To learn how oceanographic and atmospheric conditions influence oil spill trajectories, we recommend that you try running the model with different tides, different wind speeds and directions, and with different current patterns or different river flow rates (if applicable). To run the model with different tides, adjust the start and stop times to set the scenario during different phases of the tide cycle. Strong winds can control the oil spill trajectory, so try a variety of speeds and directions. (GNOME does provide some error checking for realistic values, but you should try to check that your values are realistic for the location you are modeling.) Because each Location File includes only the commonest conditions found in an area, you won't be able to simulate all aspects of a region's circulation and wind patterns, or transitions from one pattern to another.

To create a specific scenario for a training exercise or demonstration, choose the current pattern (if applicable) or river flow (if applicable) that best directs the oil spill in the direction you would like it to go. Adjust your trajectory by changing the speed and

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direction of the winds as the spill develops. As you are developing your model, be sure that your winds are realistic for the location you've selected.

We also recommend that you include the “**minimum regret**” (**uncertainty**) **solution** in your model runs. GNOME can compensate for typical errors in the wind and current input data. (For example, the weather forecast may be inaccurate in the timing of a frontal passage, in the speed or direction of the winds, or in the strength of the currents.) By taking these uncertainties into account, GNOME can predict many possible trajectories for your spill. This information allows responders to create more comprehensive response plans in which the value of a resource can be balanced against the probability that it may be impacted by a spill. The tutorial in the next chapter describes the “minimum regret” solution in more detail. The additional calculations required to run the “minimum regret” solution slows the model somewhat, so you may want to run this solution after you have fine-tuned the “best guess” trajectory.

To further build your skills at using GNOME, try some of the **example problem sets** available at <http://response.restoration.noaa.gov/software/gnome/examples.html>.

If you want to run a spill trajectory in which you specify conditions other than those included in GNOME (for example, you need to modify the current patterns developed by NOAA or import current patterns from other sources), you'll need to learn to operate GNOME in Diagnostic Mode. For training in the use of Diagnostic Mode, contact NOAA HAZMAT at ORR.GNOME@noaa.gov or at (206) 526-6317.

Getting Help

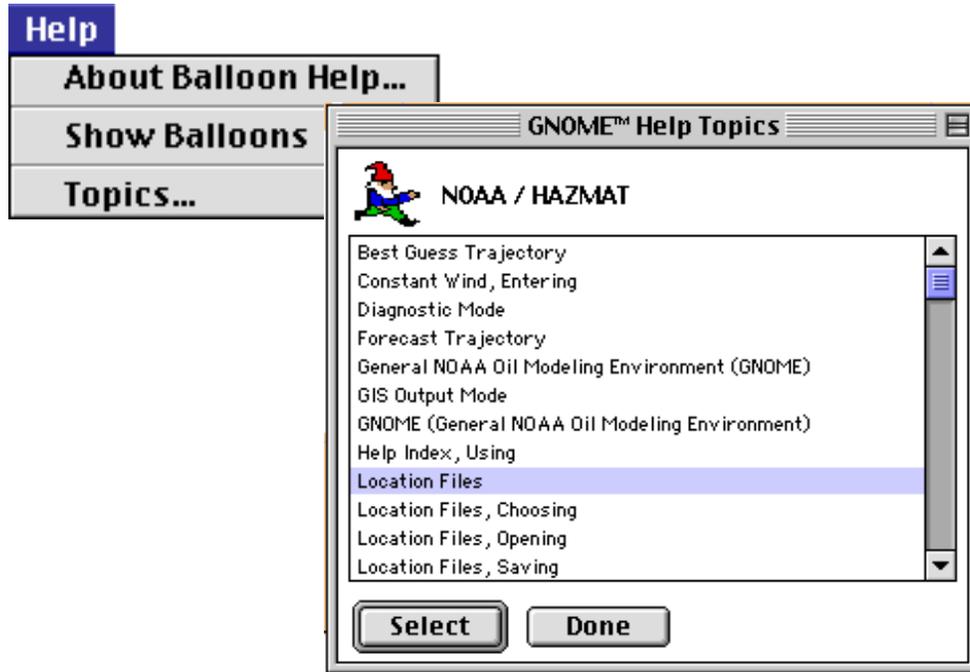
You can get online help at any time when you are running GNOME.

The Help Menu

Use GNOME's Help menu to view explanations of GNOME's main functions and features. The Help menu differs between the Macintosh and Windows operating systems.

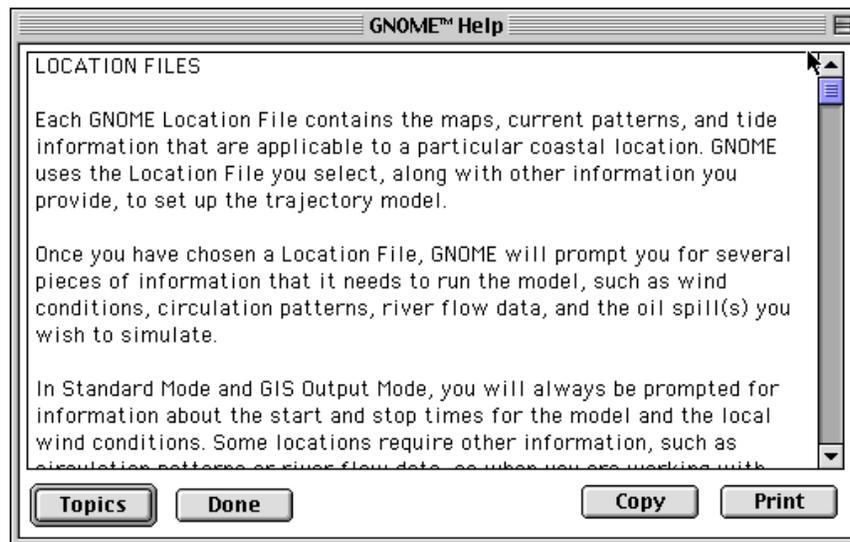
On a Macintosh

If you're using GNOME on a Macintosh, select **Topics...** from the **Help** menu to display an alphabetical listing of GNOME Help Topics.



Select the **Topics...** menu item (background) to view the **GNOME Help Topics** (foreground) on a Macintosh.

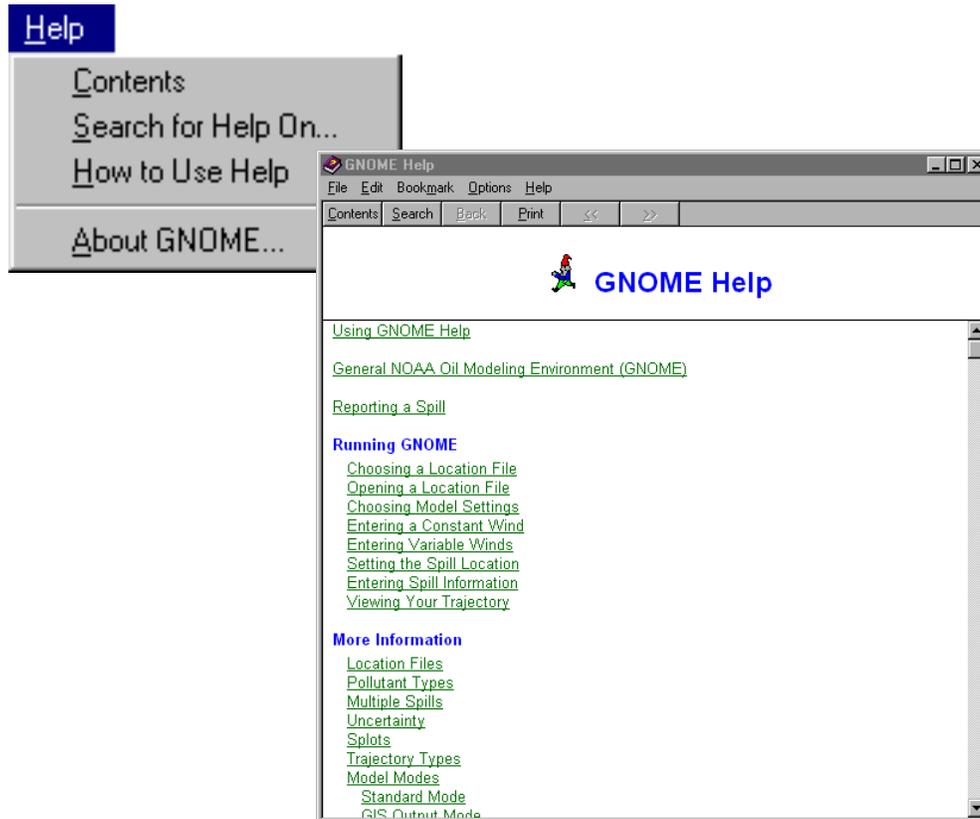
Highlight a topic name, then click **Select** to view a discussion of that topic:



Sample **GNOME Help** topic on a Macintosh

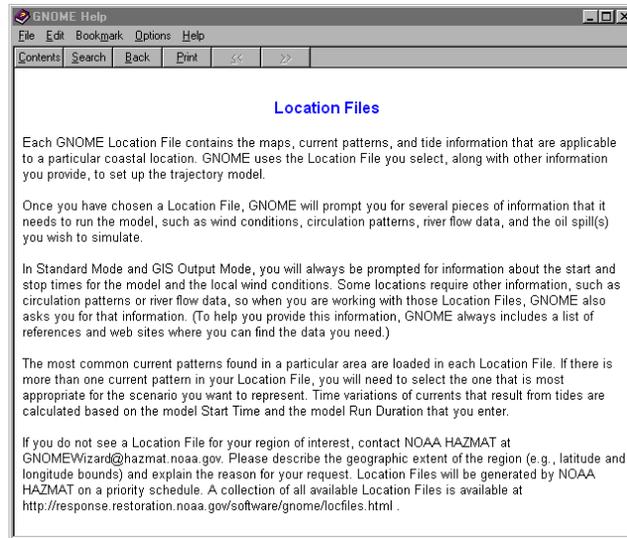
In Windows

If you're using Windows, select **C**ontents from the **H**elp menu.



Select the **C**ontents menu item (background) to view the **G**NOME **H**elp contents (foreground) in Windows.

The Contents menu item displays the Help topics that are available to help you as you use GNOME. Click any of the underlined topics to view the discussion of that topic:

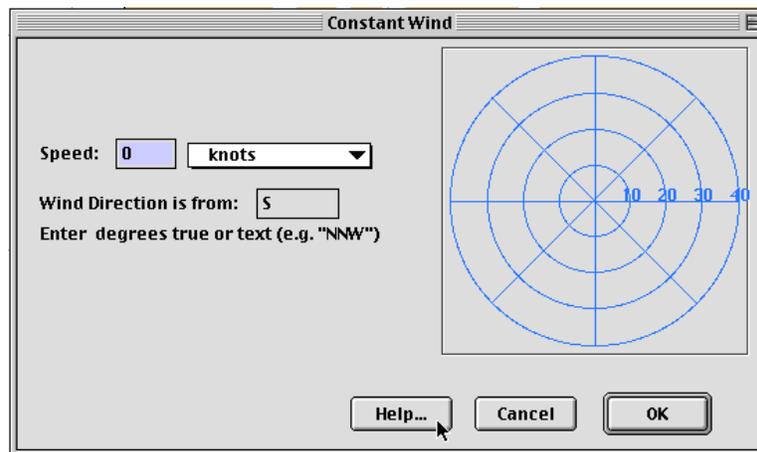


Sample GNOME Help topic in Windows

For more information about the Help menu choices, see the Reference chapter of this manual.

Help Buttons

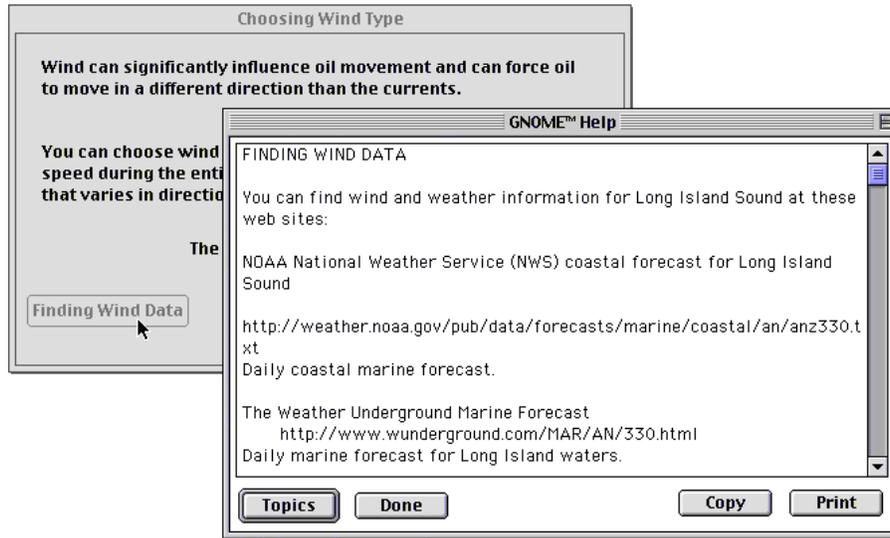
You can also click **Help** buttons on GNOME windows and dialog boxes to view information about particular features or required model inputs.



Click **Help** in GNOME dialog boxes to get more information.

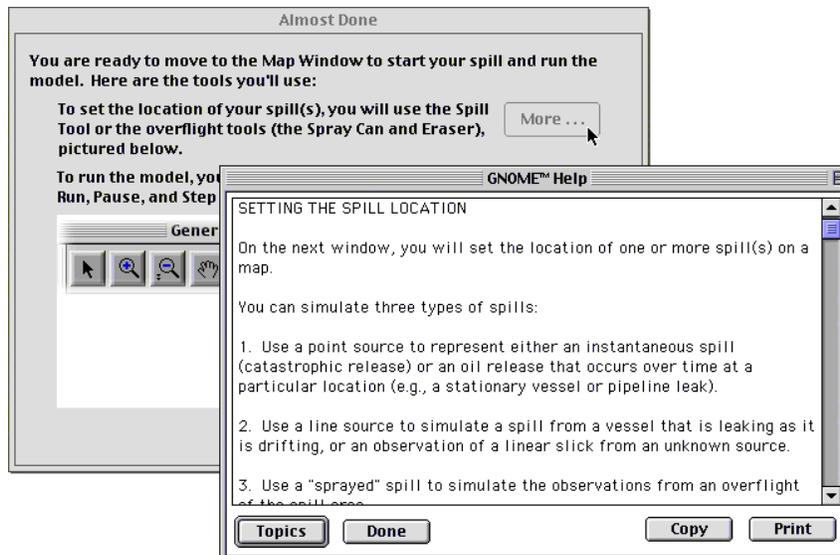
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GNOME also provides references for data relating to wind, river flow, and current patterns to help you enter appropriate information into the model. As you work in GNOME, you will see buttons, such as **Finding Wind Data**, **Finding Flow Data**, and **How to Select a Current Pattern**. Click the appropriate button to get help with the weather and oceanographic conditions for your region of interest.



Click **Finding Wind Data** (background) to learn more about wind conditions for your region of interest (foreground).

In some GNOME windows, you can get more information by clicking a **More...** button.



Click **More...** (background) to learn more about a topic (foreground).

How to Use This Manual

This manual includes five chapters to help you learn to use GNOME. After reviewing this chapter, turn to **Chapter 2** for a step-by-step GNOME tutorial. **Chapter 3** contains information you will need if you plan to work in GNOME's GIS Output Mode. Refer to **Chapter 4** for descriptions of the main features of GNOME. Sections of this chapter include explanations of GNOME's Location Files, the Map Window, and GNOME's toolbar and menus. In **Chapter 5** you can find some trouble-shooting advice and, at the end of the manual, you'll find a **glossary** of terms and an **index**.

Chapter 2

Learning the Basics

This chapter guides you, step-by-step, through a GNOME scenario describing a hypothetical crude oil spill into Long Island Sound. Follow along, using your own copy of GNOME, to familiarize yourself with GNOME's features and capabilities. For more information about any aspect of GNOME, refer to the **Reference** chapter (Chapter 4) of this manual.

Introduction

It's just after 3:30 a.m., Pacific Standard Time. Your day began when your pager went off a few minutes ago. Now you're arriving in the main "warroom" of NOAA HAZMAT's oil spill response team in Seattle, where other team members are assembling. The amplified voice of NOAA's New York-based Scientific Support Coordinator (SSC) is coming in over the speaker phone. He's reporting a "no-notice" drill, based on a tanker that has collided with a cargo barge, spilling crude oil into Long Island Sound. Local Coast Guard officers are collecting more details about the spill from on-scene observers and the tanker's manifest. NOAA's job during the next hours or days is to provide scientific information and support to the Coast Guard and other members of the Unified Command (representatives of the "spiller" and the local, State and Federal agencies in charge of the spill response).

Your NOAA colleagues have begun to compile the basic information that's needed for an actual oil spill response:

- Marking the **spill location** (reported to be roughly 10 miles, or 6 km, southeast of New Haven) on a navigation chart of the area,
- Collecting **weather reports and forecasts** from the NOAA National Weather Service, and

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- Checking for “**sensitive sites**”—locations or resources especially vulnerable to harm from oiling—in the general area that could be affected by the spill (for example, shellfish beds, seabird rookeries, marine mammal haul-out grounds, marinas, historical sites, and public beaches).

Your job as a trajectory modeler is to provide **trajectory estimates** of the spilled oil, to identify which areas of Long Island Sound could be affected by the moving, spreading oil slick, and to determine whether the oil might beach along any sections of the coast.

To perform this task, you’ll use the GNOME model by:

- First entering information that describes the drill **scenario**. A scenario is a representation of the oil spill (where, when, how, how much, and what type of oil has spilled) within the current environmental setting (prevailing winds and currents, type of shoreline, etc.).
- Then viewing an “**oil spill movie,**” or **animation** of the trajectory of the oil spilled in your scenario.

You’ll use GNOME to create an animated depiction of the predicted trajectory of the oil spilled from the leaking tanker into Long Island Sound and then update that trajectory based on observations of the spill from actual overflights.

NOTE: In this exercise, you’ll actually be using the **GNOME Location File** for Central Long Island Sound, which contains “canned,” or generalized, information about the currents and tides in that region. During a response to an actual oil spill, NOAA’s response team uses more advanced features of GNOME along with more exact, “real-time” weather, current, and tide information. The team members also track the movement of the oil in order to fine-tune their trajectory predictions. Using a Location File for a real spill response can be dangerous!

Gearing Up

You’ll need both GNOME and the “Central Long Island Sound” Location File. You can download both from the Internet, as follows:

1 To download **GNOME**, open the following web page in your browser, then follow the instructions you'll see on that page to download and install GNOME on your computer.

<http://response.restoration.noaa.gov/software/gnome/gnomeinfo.html>

2 The **Central Long Island Sound** Location File accompanies GNOME. Later, if you want to download a different Location File, open the following web page, then follow the instructions you'll see on that page to download the file to your computer:

<http://response.restoration.noaa.gov/software/gnome/locfiles.html>

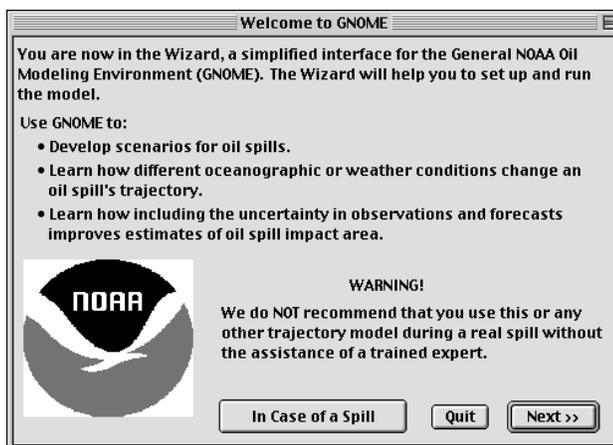
Setting Up Your Scenario

1 Start **GNOME**.

In Windows 95, 98, or NT: From the **Start** menu, select the **GNOME** submenu, then choose **GNOME**.

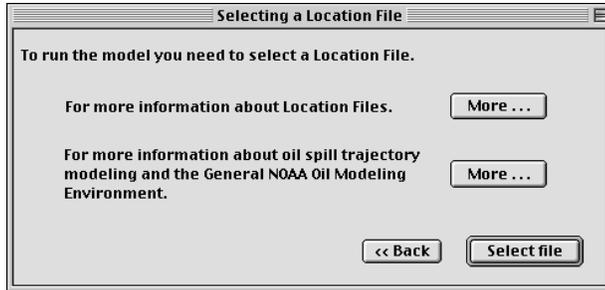
On a Macintosh computer: Open the GNOME folder, then **double-click** the GNOME program icon,  .

You'll then see the **Welcome to GNOME** dialog box via its Wizard interface:



Click **Next**.

2 You'll see the **Selecting a Location File** dialog box below:



You're about to open the GNOME **Location File** for **Central Long Island Sound**. Each GNOME Location File contains generalized information about the tides, currents, and shorelines in its specific region. GNOME uses this information to make trajectory predictions for spills in that region. Although using a Location File is the easiest way to use GNOME, Location Files contain *only* generalized information (rather than information about specific conditions at a specific date and time) and thus are not designed for accurately modeling real spills. To model a real spill, you will need to receive either training or expert help to use GNOME in its advanced Diagnostic mode.

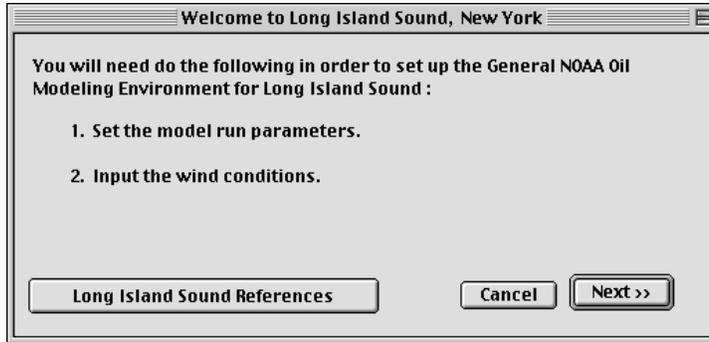
Click **Select file**.

3 You'll see the **Open a File** dialog box below. Find and click the file named **Central Long Island Sound**.



Then click **Open**.

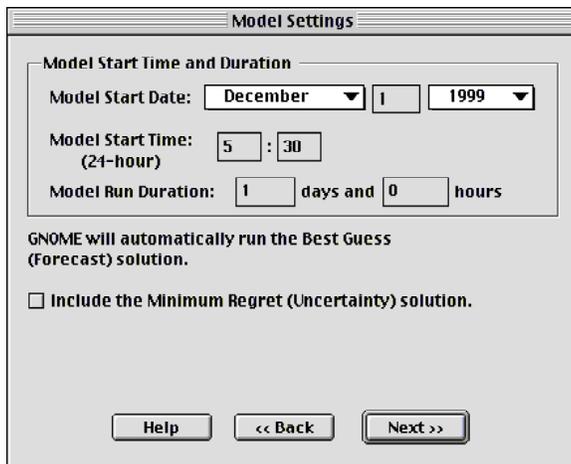
4 Read the information on the next dialog box, **Welcome to Long Island Sound, New York**.



This dialog box simply tells you what steps are coming up. Click **Long Island Sound References** if you'd like to see a list of print and online references helpful for oil trajectory modeling in this region.

Then click **Next**.

5 You'll see the **Model Settings** dialog box below. Enter the **Model Start Date** and the **Model Start Time** when you'd like the spill movie to begin and the **Model Run Duration** for the movie.



Both the **Model Start Date** and **Start Time** must be set at or before the beginning date and time of the oil spill. We said earlier that it's December 1, 1999, and the tanker crew has reported that the spill began at about 5:30 a.m.,

Eastern Standard Time. Set the model (movie) to start at that date and time (using the 24-hour time system and omitting the time zone).

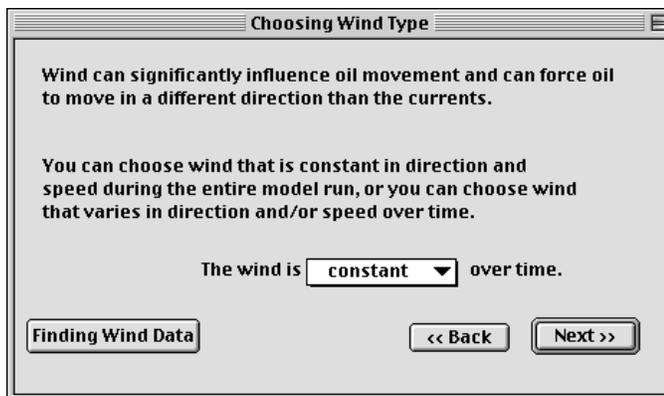
We'll talk about **Best Guess** and **Minimum Regret** solutions later, in the section "Dealing with Uncertainty." For now, leave the **Include Minimum Regret (Uncertainty) solution** box unchecked.

When you've finished entering the start date and time and the model (movie) run duration, your screen should look like the one above.

Now click **Next**.

6 You'll now see the **Choosing Wind Type** dialog box. Here, you'll need to indicate whether the wind is:

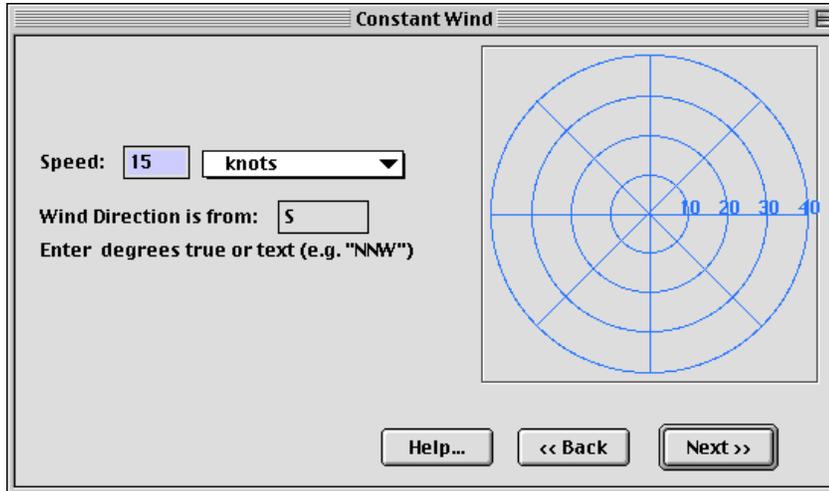
- blowing steadily at a particular speed from a particular direction (**constant** wind) or
- changing speed and direction frequently (**variable** wind)



The National Weather Service has reported that winds in the vicinity of the spill have been blowing quite steadily at 15 knots from the south, and are forecast to continue for the rest of the day. Thus, because the winds are expected to remain steady, **constant** wind is the best choice here.

Select **constant** wind, then click **Next**.

7 You are now looking at the **Constant Wind** dialog box.



Enter **15** in the wind **Speed** box, check that **knots** is the selected unit of speed, and that **S** (south) is the direction the wind is blowing from.

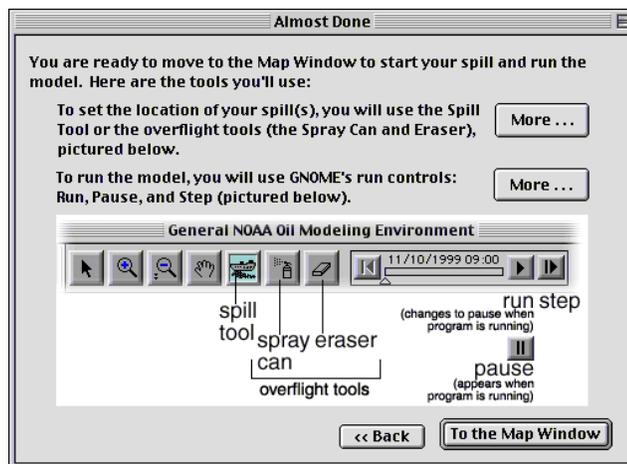
You can also use the blue **Wind Target** (right side of the dialog box) to enter wind speed and direction. To learn how to use this, click **Help**—or just experiment.

Then click **Next**.

8 You will now see the **Almost Done** dialog box.

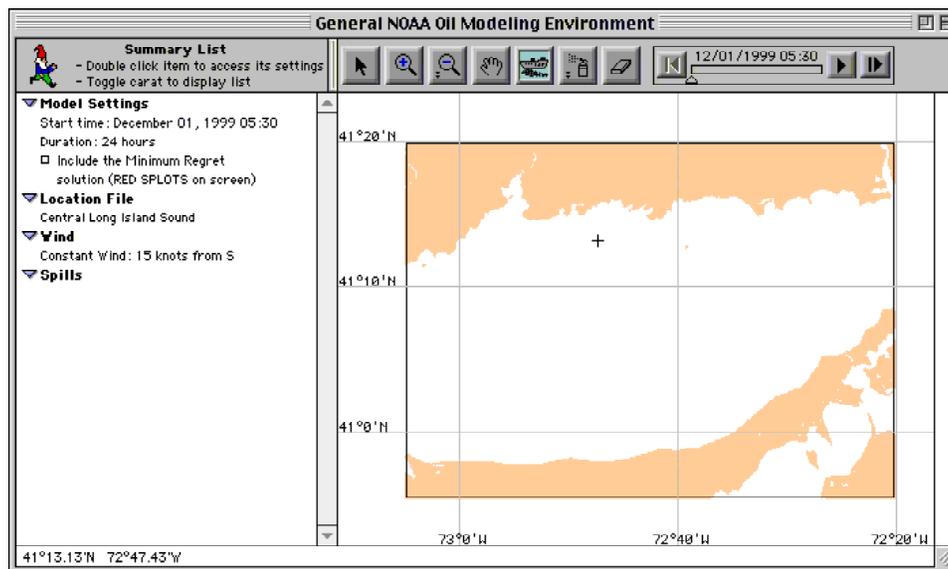
You're about to view the Map Window. This dialog box tells you what tools and controls you'll be using there.

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Click **To the Map Window**.

9 You will now see the **Map Window: General NOAA Oil Modeling Environment**.



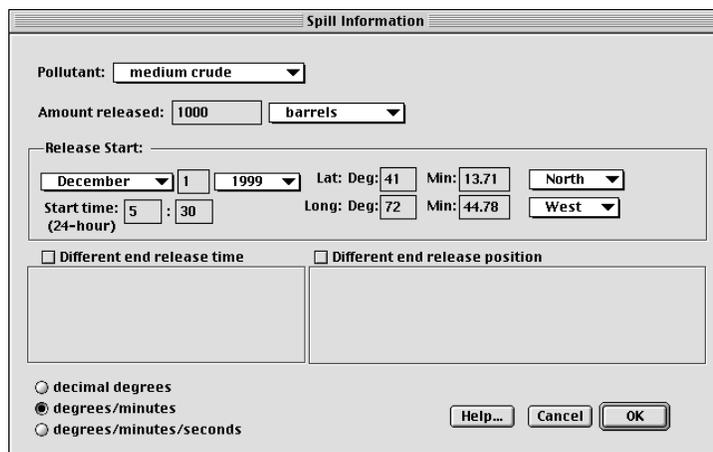
Check that the **Spill tool**  is selected in the toolbar.

Now click anywhere within the water area of the map to set the location of the spill. You will discover that if you try clicking on the tan-colored land areas (or on certain water areas where GNOME's data are not adequate), you will be

alerted, by the symbol , that GNOME cannot predict the trajectory of oil spilled from that area.

By clicking on the map, you are setting an *approximate* location of the spill, indicated by a small +. In a moment, the next dialog box pops up, where you can adjust that setting to match the exact latitude and longitude of the spill (41 deg., 13.71 min. North; 72 deg., 44.78 min. West), as reported by the New York SSC.

10 You are now at the **Spill Information** dialog box.



Enter the remaining details about this scenario:

(1) From the **Pollutant** menu, select **medium crude**.

You can use GNOME to predict the trajectories of a range of oils by simply choosing the pollutant category closest to the one that has spilled. In this case, it's "medium crude," since the drill scenario specifies that the tanker spilled a medium crude oil. GNOME automatically factors in the weathering characteristics of any type of spilled oil during its exposure to the elements UNLESS you select **non-weathering** in the pollutant menu. The weathering behaviors of different oils are critical to predicting their trajectories. With time, part of the oil evaporates and part of it disperses into the water, so that less and less of the oil remains on the surface, and this remaining surface oil also changes physically over time.

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(2) For **Amount released**, enter **1,000**, and check that **barrels** is the selected unit of volume.

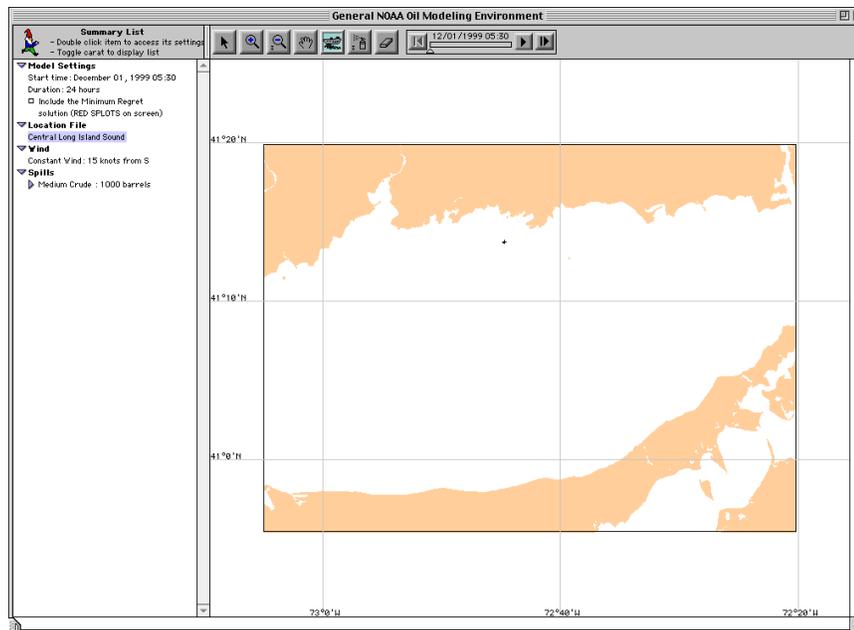
(3) Make sure that the **Release Start** date and time are **December 1, 1999** and **5:30 a.m.** This is the date and time that the spill begins and NOT the **Model Start** date and time, which you already entered in the **Model Settings** dialog box, **Step 5**.

(4) Adjust the latitude (**Lat**) of the spill to **41 deg., 13.71 min. North**, and the longitude (**Long**) to **72 deg., 44.78 min. West**.

This is the location of the spill, as reported to you by the New York SSC. If the spill had continued for a period of time, or had continued as the tanker moved across the water, you also would need to enter a **Different End Release Time** or **Position**. But in this Long Island Sound incident, the Coast Guard officers have reported that the tanker spilled oil over a period of just several minutes, through a hole in a single tank: this spill was brief, and happened in just one place.

Once your screen looks like the one above, click **OK**.

11 The map of central Long Island Sound will now be redrawn before your eyes, with the location of the spill indicated by a small +.

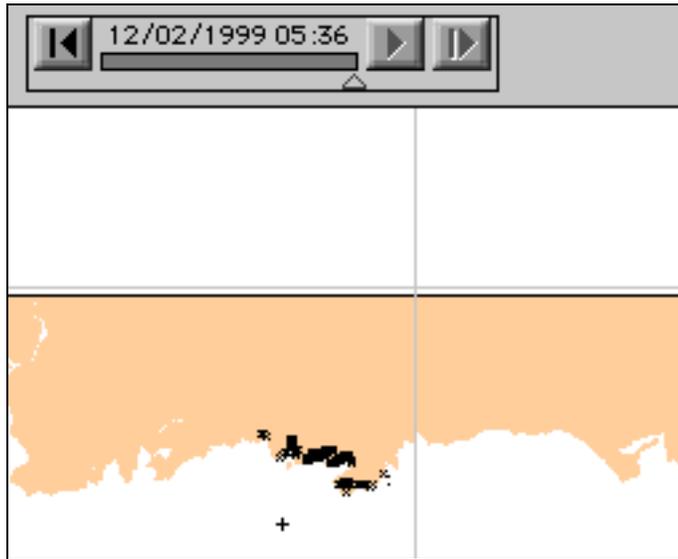


Running the Spill Movie

You're now ready to run the trajectory animation, or spill movie.

- 1 To run the movie, press the **Run** control (▶).

You should see an animation of the predicted oil spill trajectory. When it has finished, your map should look like this:



In GNOME, a volume of spilled oil is represented in your **Map Window** as a set of small dots that we call **splots** (mathematicians would call them Lagrangian elements, or LEs.). Each splot represents part of the spilled oil. During the spill movie, you watched as the splots moved across your screen like a swarm of bees. They represent GNOME's prediction of how the oil that spilled from the tanker would be moved across the water surface by winds, currents, and turbulent processes.

The movie showed how the spilled oil is predicted to move during the first 24 hours after the start of the spill (since, back in **Step 5**, you set the **Model Run Duration** to 1 day). Now that the movie has stopped, you can see that all the splots are arranged along the coastline, indicating GNOME's prediction that, by the end of day 1, nearly all the oil will have beached (washed ashore) along the Connecticut coast just north of the spill location.

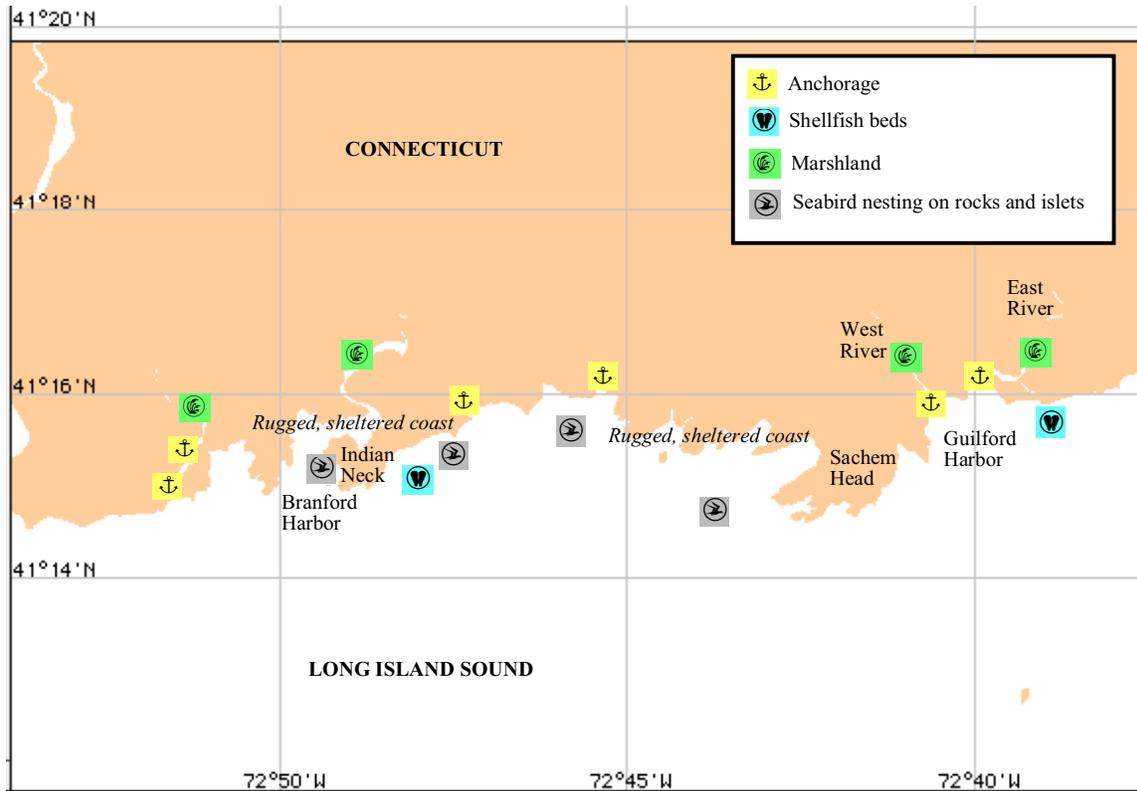
Now that you've viewed the spill movie once, there are some other things to try:

- To rewind the movie and view it again, press the **Reset** control () , then press **Run** () again. As you watch the movie, you can pause at any point by pressing the **Pause** control () , which appears only while the movie is running). You also can drag the **Time Marker** (the small triangle just below the **Movie Progress Bar**, ) left or right to view particular moments during the spill.
- To zoom-in for a closer look of the spill area, click on the **Zoom-In** tool () in the toolbar. Then outline the area you want to zoom-into by holding down your mouse button, dragging diagonally across the part of the map that you wish to see up-close, then releasing your mouse button. To zoom back out, click the **Zoom-Out** tool () , then click on the map (which will be redrawn centered on the point where you clicked).
- To adjust the position of the map in the **Map Window**, click the **Hand** tool () , then drag the map into a new position.

Dealing With Uncertainty

Now that you've completed your initial trajectory prediction, you and your colleagues will gather to review your findings. In a few minutes, you'll need to pass along what you've learned to the New York SSC, who is now on-scene on the Connecticut coast, working with the spill responders there.

You've learned where GNOME has predicted the spilled oil will go. Meanwhile, the team's marine biologist has prepared a map (below) showing the environmentally sensitive areas in the vicinity of the spill:



She refers to this map of sensitive areas as she looks over your GNOME output. She notes that:

- If the spilled oil goes where GNOME has predicted, state shellfish beds to the east and west of the oiled coastline will not be oiled in the first 24 hours.
- Likewise, marshlands along the West and East Rivers are predicted to be unaffected.
- Areas predicted to be threatened by this spill include (1) offshore islets and rocks used as nesting sites by seabirds and (2) the rugged, sheltered coastline west of Sachem Head.

Another of your NOAA colleagues scrutinizes your trajectory map and the biologist’s findings, and asks, *“How accurate is your trajectory prediction? How sure are you that the shellfish beds and riverside marshes will not be oiled?”*

To answer this question, you need to consider the effects of **uncertainty** in the information you entered into GNOME. When you ran your spill movie, what you saw

was GNOME's **best guess** of the trajectory of the oil. But in trajectory modeling, even the best-available information on forecast winds and currents can often contain errors, because winds and currents aren't entirely predictable. It's rare for wind speed and direction forecasts to be precisely accurate, and it's even less possible to precisely predict current patterns.

This inherent uncertainty explains why the NOAA oil spill response team does not rely solely on trajectory modeling, but also observes and tracks spilled oil to check the accuracy of their models and make adjustments as needed.

In the particular case of this Long Island Sound drill,

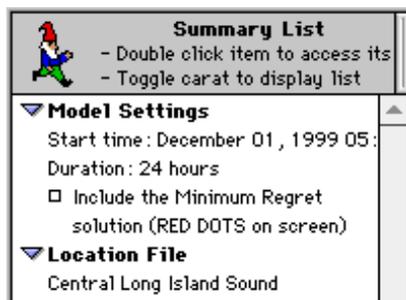
- the wind may change speed and/or direction somewhat from the National Weather Service forecast, and
- current patterns in the Sound at the time of the spill are unlikely to match the generalized information in the Location File.

We know that our wind and current information is, to a degree, uncertain. What this means is that we must not only obtain the **best guess** trajectory, but must also be able to predict what the errors caused by this uncertainty will mean.

The following section will explain how to accomplish this using GNOME.

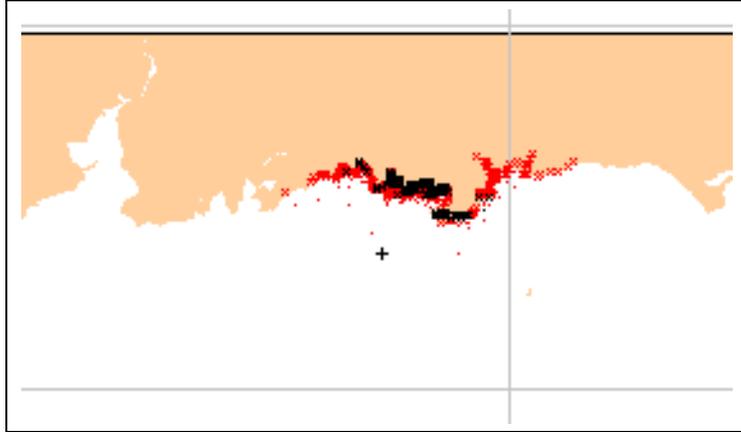
Best Guess & Minimum Regret Trajectories

1 In the menu to the left of the map, under the **Model Settings** heading, click on the box labeled **Include the Minimum Regret solution**.



2 Press the **Run** control (▶) to rerun the spill movie.

This time, you'll see both **black** and **red** spots on the map. By the time the spill movie stops, you'll notice that the two kinds of spots are arranged like this:



The black spots have accumulated along the coast between the shellfish beds, just as they had before. The red spots, however, have accumulated along a much longer stretch of the coastline, and some still remain out in the water. Unlike the black spots, some of the red spots have reached the shellfish beds, and some have accumulated at the mouths of the West and East Rivers, where oil could potentially penetrate into the riverside marshlands during high tides or storm surges. Red spots appear within a larger area, encompassing the rocks and islets important to nesting seabirds and along additional sections of rugged, sheltered shorelines that may be difficult to clean if oiled.

To understand what GNOME is showing you here, there are two things to consider.

- the **black spots** represent GNOME's **best guess** trajectory estimate of the oil spilled from the tanker. To make this best guess, GNOME assumes that (1) the winds continue to blow steadily at the speed and from the direction you entered into GNOME, and that (2) the data in the Location File accurately represent the current patterns during the time of the spill. When making a best guess, GNOME accounts for the turbulence that is inherent in natural processes, such as winds and currents, but **NOT** for errors in wind forecasts or current patterns.

- the **red spots** represent GNOME’s larger **minimum regret** trajectory estimate for the same spill. To predict this trajectory, GNOME accounts for uncertainty in the wind and current information that you entered. As a very rough rule of thumb—assuming a “typical” degree of uncertainty in the wind and current information you use in modeling a spill scenario—the chance that the spilled oil will remain within the area covered by the **red spots** is on the order of 90%. It is impossible to assign a more precise probability, because little is yet known about uncertainties in wind and current forecasts, although NOAA is actively researching this topic.

Predicting a **minimum regret** trajectory allows you to consider spill outcomes that are *less probable than the **best guess** outcome, but that are potentially either more harmful or more costly.*

3 Your next task is to **brief the New York SSC** on your trajectory estimates using GNOME, so that he can inform the Unified Command where the spilled oil will most likely go. The Unified Command will use your trajectory prediction, along with information from other experts and their own observations and expertise, in deciding where to implement protective countermeasures, such as placing booms and skimmers.

What should you tell the New York SSC?

You should show him both the **best guess** and **minimum regret** trajectories, explaining that:

- The oil will most likely follow the smaller **best guess** trajectory (within the **black spots**).
- There is a roughly 90% probability that the spilled oil will **NOT** extend beyond the minimum regret trajectory (the larger area covered by the **red spots**).

The response team needs to consider protection measures for **biologically sensitive** locations anywhere in the area encompassed by the **minimum regret** trajectory—and **NOT** just within the smaller **best guess** area covered by the black spots.

This is where the concept of “minimum regret” enters the scenario:

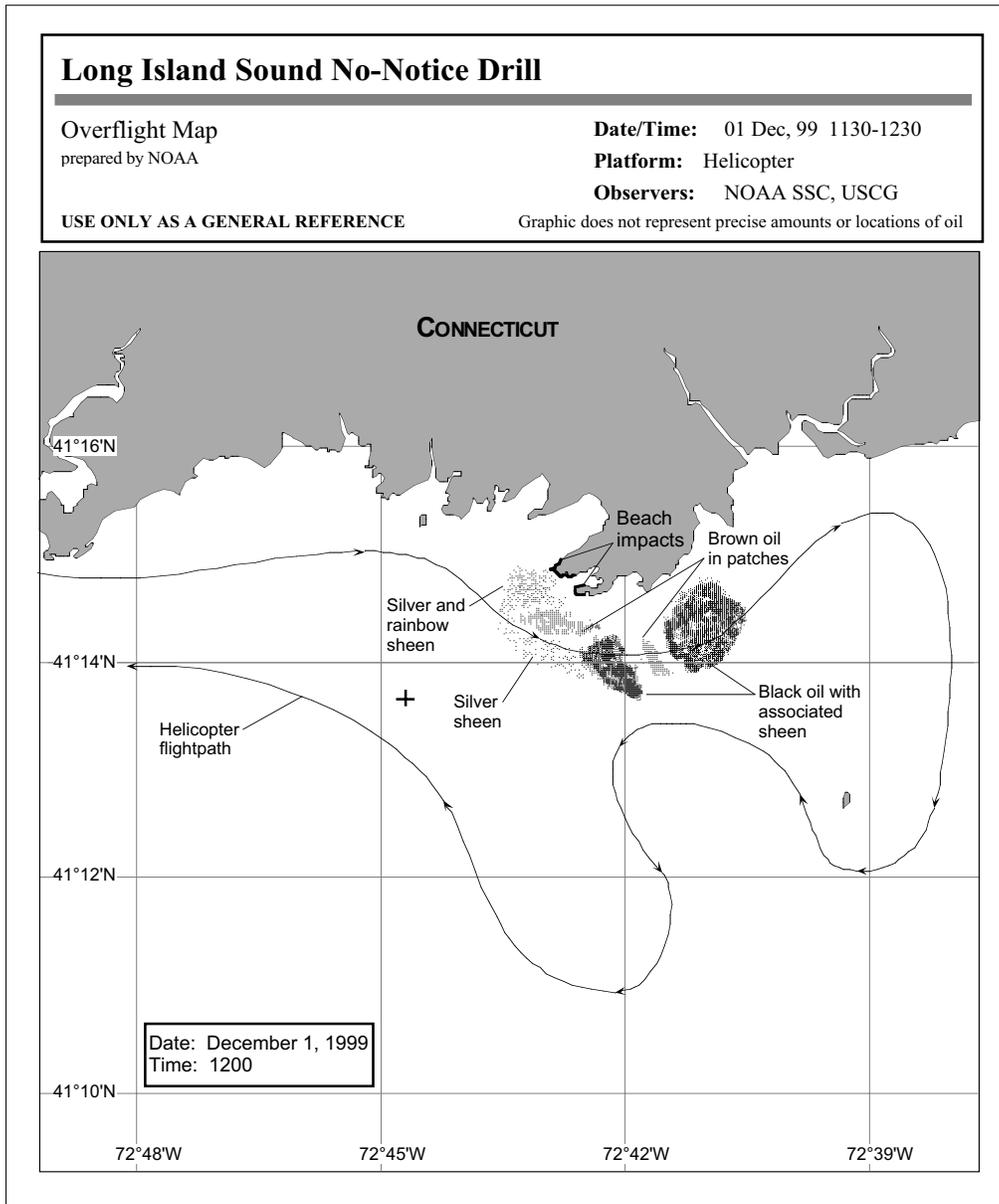
A response team will be least likely to regret their response choices if they develop a protection strategy for the area encompassed in the **minimum regret** trajectory, rather than just the smaller **best guess** area.

In the case of this drill scenario,

- The Unified Command might select protection strategies (such as placing boom across the river mouths) to minimize the amount of oil penetrating into the marshes.
- They also might develop strategies (such as placing boom or using skimmers) to help prevent oil from reaching the shellfish beds.

Reinitializing your GNOME Trajectory relative to Overflight Observations

Later in the day, the response team is able to conduct an overflight of the spill area to visually locate slicks and sheens of oil on the water. The NOAA SSC made aerial observations from a helicopter to spot oil on the water in the vicinity of Sachem Head. Two large areas of black oil and two smaller areas of brown oil were spotted, with silver-to-rainbow sheens trailing them to the west and south, something like this:



Overflight information is very important for trajectory modelers because it helps you calibrate your trajectory. Using the SSC's observations, you can create a **hindcast trajectory** to see how well your modeled spill trajectory matches the actual overflight observations of the spill. The response team plans to conduct additional overflights at 1700 today (December 1, 1999) and another tomorrow morning at 0800 (December 2, 1999).

In the meantime, the Coast Guard officers now need updated trajectory materials as they continue to plan for the spill. First, you need to create a **hindcast** trajectory to update your scenario to more closely match the overflight results.

1 Before you start, you'll want to uncheck the **Include Minimum Regret solution** box in the **Summary List** to the left of the map.

2 You will need updated wind observations, which you can find at weather-related Internet sites. (Check the GNOME Help topic **Wind Data, Finding** for wind and weather sources.)

These are the observed winds until noon December 1, 1999.

12/01/99	0500	15 knots S
12/01/99	0600	10 knots S
12/01/99	0700	18 knots S
12/01/99	0800	10 knots S
12/01/99	0900	18 knots S
12/01/99	1000	05 knots S
12/01/99	1100	06 knots S
12/01/99	1200	09 knots S

3 Double-click the name **Central Long Island Sound** in the **Summary List**. Click **Next** until you see the **Choosing Wind Type** dialog box. Choose **variable** wind, then click **Next**.

4 Enter the observed winds in the **Variable Winds** dialog box:

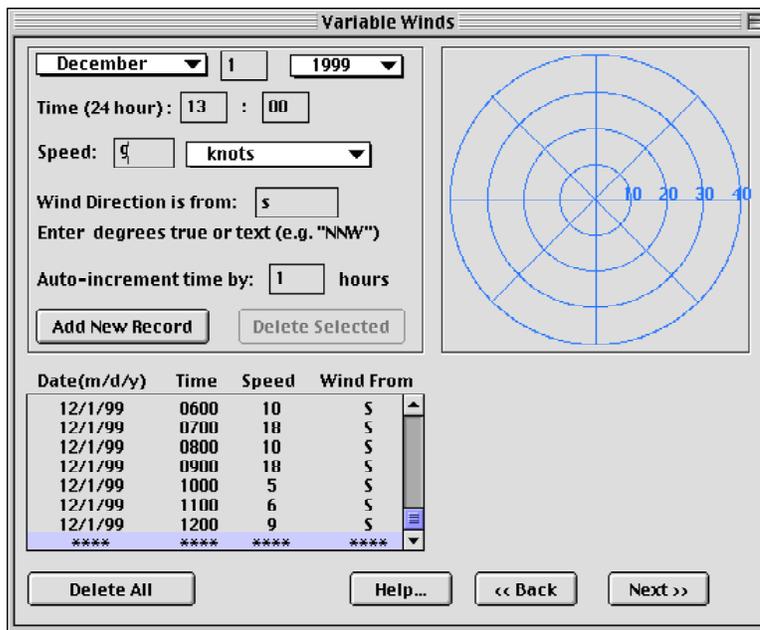
(1) Be sure the date is **December 1, 1999**, the date of the first wind record.

(2) Enter the first wind time (**0500**).

(3) Enter the first wind speed and direction (**15 knots** from the **S**)

- (4) Because the winds observations are 1 hour apart, enter an auto-increment time of **1 hour**.
- (5) Click **Add New Record**.

Your first wind record, including wind date, time, speed, and direction, will appear in the **Wind Records** table in the lower left section of the window.



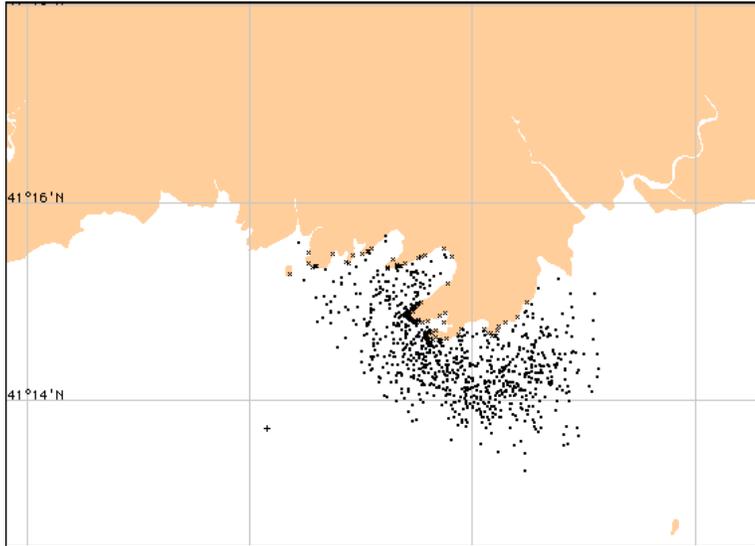
- (6) Enter the remaining wind records by repeating steps 1 – 5 above, or by using the blue **Wind Target**. Click within the target on the point that represents the wind speed and direction you want to enter (for example, the intersection of the S axis and the 10-knot circle). If necessary, you can hold down your mouse button and drag to adjust the wind speed and direction to the combination you want. Then release the mouse button.

Once your screen looks like the one above, click **Next**.

Next, you will run the model until noon to see how well you simulated the spill.

5 Select the **Run Until** item from the **Model** menu, and change the **Stop Time** to 1200.

Your trajectory should look like this:



Not bad for a first try! (Trajectory modelers can adjust the parameters in GNOME to make the modeled scenario and the actual spill agree more closely, although that involves advanced training. For our learning purposes, we have an excellent simulation.)

Now that you've tested your trajectory, you can make your next forecasts. This will involve two steps:

- (1) Updating the wind with a new forecast, and
- (2) Reinitializing the spill relative to the overflight map.

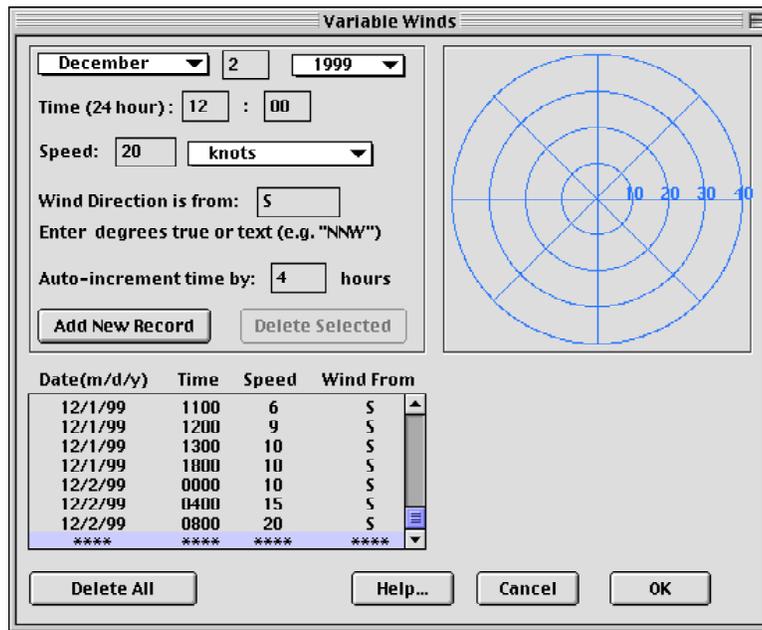
The **new forecast** is for winds from the S at 10 knots through midnight, increasing to S at 20 knots by morning.

6 Add the observed winds in the **Variable Winds** dialog box.

Here is an example of how to create that file:

12/01/99	1300	10 knots S
12/01/99	1800	10 knots S
12/02/99	0000	10 knots S
12/02/99	0400	15 knots S
12/02/99	0800	20 knots S

These records are not hourly (or of any consistent increment). To enter them easily, go to the **Wind Records** table and select the last row, which contains only asterisks (****). Enter the new record information in the **Date**, **Time**, **Speed**, and **Wind from** boxes. Click **Add New Record**.



Once your screen looks like the one above, click **Next**.

7 Next, you will use the overflight tools to spray spots to match the overflight map. To add the overflight observations to GNOME, you will use the **Spray Can** tool to "spray" the spill on the map to show its current location and extent.

Before you add your overflight results to GNOME, you may want to delete your original spill so that you can easily see the overflight results.

(1) First, save your original spill as a **Location File Save**. To do this, select **Save** from the GNOME **File** menu, then click **OK**. Choose a file name and folder, then click **Save**.

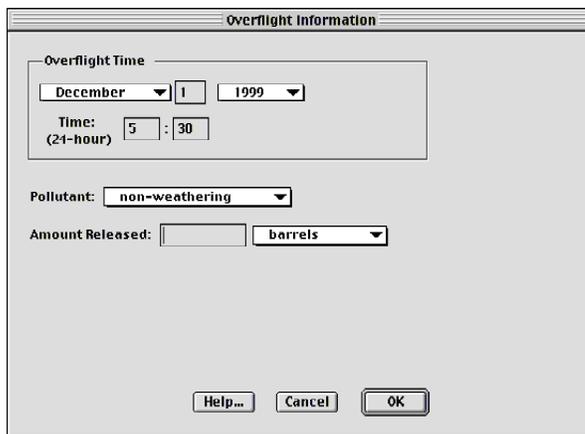
(2) Next, to delete the original spill from your map, select the description of the spill, **Medium Crude: 1000 barrels**, listed under **Spills** in the Summary List. From the GNOME **Item** menu, select **Delete**, then click **OK**.

Now, before you spray spots on the map, you need to provide more information about the overflight and pollutant.

8 Enter the details about the overflight.

(1) Click the **Spray Can** tool, , on the GNOME toolbar.

You'll see the **Overflight Information** dialog box, where you'll enter information about the overflight and the pollutant that was released.



(2) Enter the date and time of the overflight.

The overflight was conducted at noon (**1200**) on **December 1**, so you'll need to adjust the time shown in the dialog box.

(3) Select a pollutant type from the menu.

The response team confirms that the pollutant released in the Sound is a medium crude. When you select **medium crude** from the **Pollutant** menu, you'll notice that the information boxes change. (In this dialog box, the information that you must enter varies, depending on the information that you have already entered. For instance, you must enter different information if you select a pollutant that weathers than if you choose a non-weathering pollutant.)

Overflight Information

Overflight Time

December 1 1999

Time: (24-hour) 12 : 00

Pollutant: medium crude

Amount Released: [] barrels at Overflight Time

Pollutant Age: [] hrs
(Overflight Time - Time of Spill)

Help... Cancel OK

- (4) Enter the amount of the release, select the appropriate units from the menu, then select the time when the release amount was estimated.

Here, you can enter the **Amount Released** estimated at the **Time of Spill** or at the **Overflight Time**. At this time, the New York SSC advises that a more accurate estimate of the amount *originally* released is **2500 barrels**. Enter that amount and select **Time of Spill**.

You should be aware that estimates of pollutant volume from overflights are highly inaccurate. An observer may see black oil on the surface of the water and think that it's very thick; however, the oil could actually be as thin as .001 inch (thinner than a layer of paint on a wall)!

- (5) Enter the date and time of the spill.

Check that the **Time of Spill** boxes show **December 1, 1999** and 5:30 a.m. (**0530**)

Once your screen looks like the one below, click **OK**.

9 Change the **Model Start Time**.

Once you've clicked **OK**, GNOME will prompt you to change the **Model Start Time** (your "movie" start time) to coincide with the **Overflight Time**.

Click **Change**.

10 Choose the size of the **spray can** diameter.

You can choose a small, medium, or large diameter of spray to use when you "draw" the overflight observations on the map. Click **Medium**, then click **OK**. Your cursor will change to a "medium-size" circle over the water areas of the map. Later, you can change the spray diameter by double-clicking the **Spray Can** tool.

11 Spray the **overflight observations** on the map.

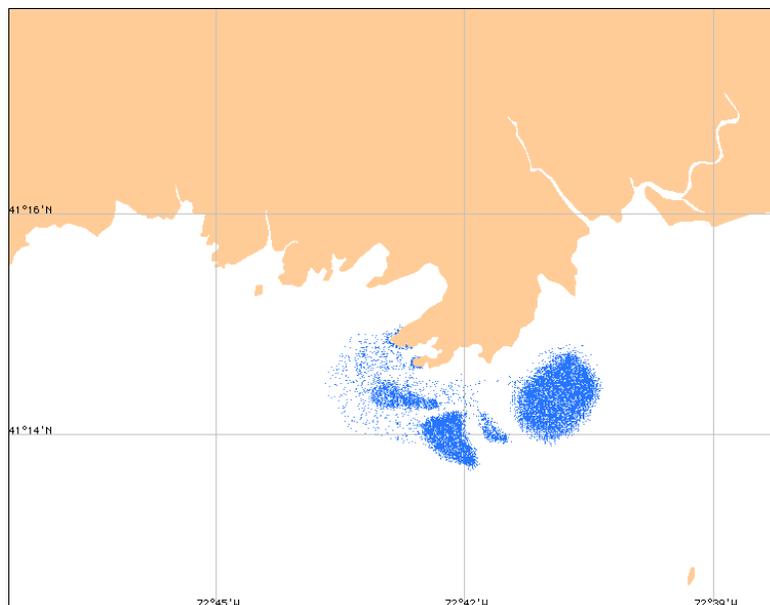
Before you "spray" the spill on the map, use the **zoom-in** tool () and **hand** tool () to get a better view of the area of the spill. To "spray" the spill on the

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map, click an appropriate water region of the map, hold down your mouse button, then drag the cursor to spray pollutant particles.

If you spray an area in error, you can remove the particles with the **Eraser** tool. To do this, click the **Eraser** tool, , on the GNOME toolbar. (Your cursor will change to a square.) Drag the cursor over the area of pollutant to be removed, then release your mouse button. Any land areas or lines of latitude or longitude that you "erase" from the map will be immediately redrawn.

Your reinitialized scenario should look something like this:

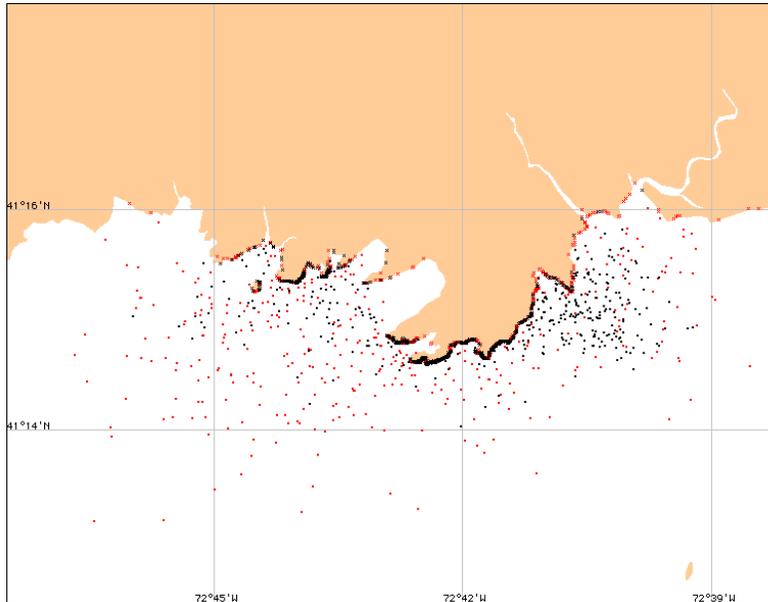


12 Click the **Arrow** tool, , on the GNOME toolbar to leave the editing mode.

13 Because the New York SSC and the Coast Guard will want to see both the **Minimum Regret** and **Best Guess** trajectories, click on the box labeled **Include the Minimum Regret solution** in the left section of the Map Window.

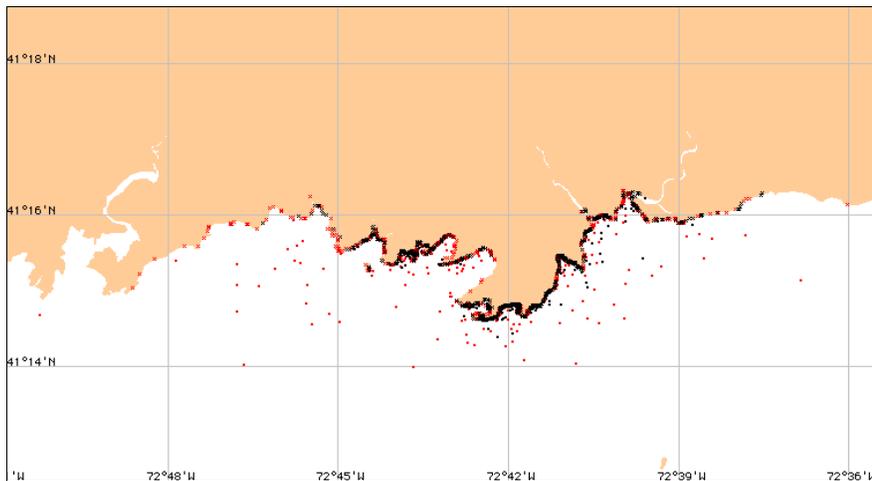
14 Try running this scenario until **1700 December 1, 1999**. Use the **Run Until** item from the **Model** menu.

Your trajectory should look something like this:



15 Try running this scenario until **0800 December 2, 1999**.

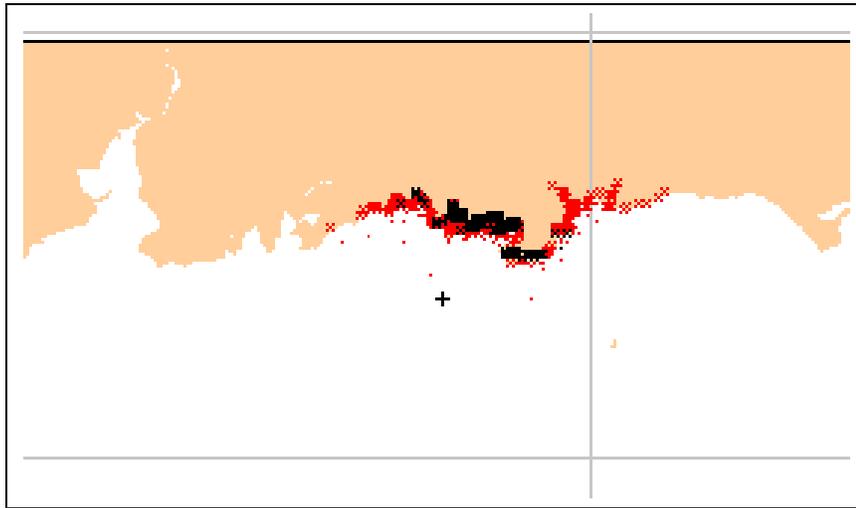
Your trajectory should look something like this:



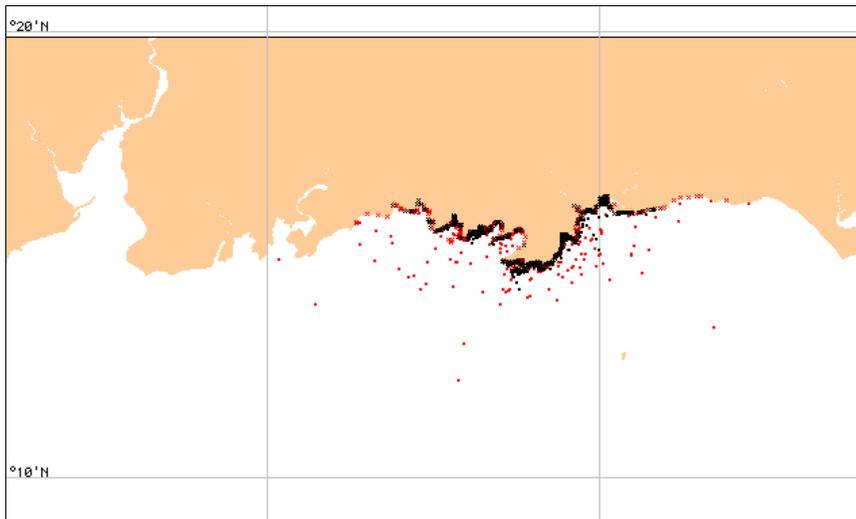
The spill response team will now disregard the earlier trajectories created in GNOME. But let's take a look at the trajectory we originally expected the oil to follow and compare it with our reinitialized trajectory.

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This was our modeled trajectory for **0530** on **December 2nd**.



This is the same view of our reinitialized trajectory for **0800 December 2nd**.



You can see that the reinitialized oil-spill trajectory covers the shoreline quite differently than the first trajectory predicted. The reinitialized trajectory—incorporating the actual distribution of oil, actual observed winds, and a more recent wind forecast—provides a more reliable forecast of the spill trajectory.

This process of looking at the overflight map, hindcasting the spill to check the model, and creating new predictions continues twice each day throughout the spill response. In working through the process, both the weather forecaster and the HAZMAT modeler become more familiar with the region and gain skill in their forecasting. By reviewing the observations of oil movement and wind conditions, they can refine their predictions and enable the response team to more successfully respond to the spill.

Exiting (Quitting) GNOME

When you've completed your work with GNOME, just choose

Quit from the **File** menu if you're using a Macintosh, or

Exit from the **File** menu if you're using Windows.

You can also first save any GNOME trajectory as a file that you can reopen later in GNOME, or as a "movie" that you can view in QuickTime™. To do this, click **Save** under the **File** menu, select a file type, then click **OK**.

What Now?

You've just completed an initial guided tour of GNOME. At this point, you should be able to create and model simple oil spill scenarios, and you should be aware of important trajectory modeling concepts, including the effect of uncertainty on modeling outcomes.

To further build your skills at using GNOME, we invite you to try some of the GNOME example problem sets available at

<http://response.restoration.noaa.gov/software/gnome/examples.html>.

You also might prefer to start using GNOME in your own work. GNOME is an appropriate tool for a variety of purposes. Here are just a few:

- conducting tabletop exercises to train spill responders.
- improving your understanding of how oil spills might affect a coastal region for which you have planning responsibilities, or where you are a spill responder.
- preparing classroom demonstrations, exercises, or science projects.

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You can find other materials to help you to understand and use GNOME at **<http://response.restoration.noaa.gov/software/gnome/gnome.html>**.

Good luck with your work, and remember that you can contact us with questions and concerns about GNOME at **ORR.GNOME@noaa.gov**.

Chapter 3

Working with GIS

Geographic Information System (GIS) users can obtain GIS-compatible output in GNOME's **GIS Output Mode**. This mode lets you save geo-referenced files of oil locations at specific times. This information can then be used by various GIS programs or post-processed to provide contours of oil distribution. In GIS Output Mode, as in Standard Mode, GNOME uses the generalized information contained in its Location Files; however, this mode offers these additional output options for GIS users:

- GNOME can generate an ASCII, multi-file oil distribution output. The file format adheres to NOAA's published standard trajectory output.¹ One file (or two, if you include uncertainty splots in your trajectory) is a geo-referenced file provided in **MOSS (Map Overlay Statistical System)**, a public domain GIS format. The MOSS file can be read into a number of different GIS programs for additional geo-spatial analysis.
- The point data from GNOME can be read into a companion program, **GNOME Analyst (formerly known as TAT)**, which can derive oil concentration contours through Thiessen analysis. These oil concentration contours can also be exported in a GIS-compatible format.

File Formats

In GIS Output Mode, as in Standard Mode, you can save a trajectory as a picture or a movie:

- **Location File Save (.LFS)** – An output file format that saves all the information you have entered into GNOME using a Location File.
- **QuickTime Movie (.mov)** – A “movie” animation of a modeled spill, produced hourly, which will run as a stand-alone file that can be viewed with QuickTime™.

¹ J.A. Galt, D.L. Payton, H. Norris, and C. Friel, Digital Distribution Standard for NOAA Trajectory Analysis Information, HAZMAT Report 96-4, January 1996.

To view QuickTime files, you will need the free **QuickTime player** available for download at <http://www.apple.com/quicktime/download/>.

NOAA Standard Splot Files

You can also export your GNOME trajectories as NOAA Standard Splot Files. GNOME offers two formats:

- **NOAA Standard Splot Files (for GIS)** – A single snapshot output that saves only a single view of the spill at a single time and day.
- **NOAA Standard Splot File Series (for GIS)** – An output of NOAA Standard Splot Files throughout the animation of the spill model. Saves a series of successive views of the spill, at 1-hour intervals.

To work with NOAA Standard Splot Files, you will need a mapping program that can directly import MOSS formatted files (such as MOSS or ARC/INFO). For **ArcView** users, HAZMAT has created an extension (gnome.avx) that allows import of the splot files, as well as contour information from GNOME Analyst. This extension is available in the GNOME Toolkit section of our Web site. Instructions for downloading and using the extension are provided at

<http://response.restoration.noaa.gov/software/gnome/tools.html>.

The number of files that GNOME creates will vary, depending on the duration of your model and whether or not you have chosen to include the minimum regret trajectory. GNOME outputs files 3 through 7, which contain the following information:

- File 3 (.ms3) Header information, such as scenario information and any caveats.
- File 4 (.ms4) Position data for the “best guess” (forecast) splots.
- File 5 (.ms5) Attributes of each of the “best guess” splots.
- File 6 (.ms6) Position data for the “minimum regret” (uncertainty) splots (if included in the trajectory).
- File 7 (.ms7) Attributes of each of the “minimum regret” splots (if included).

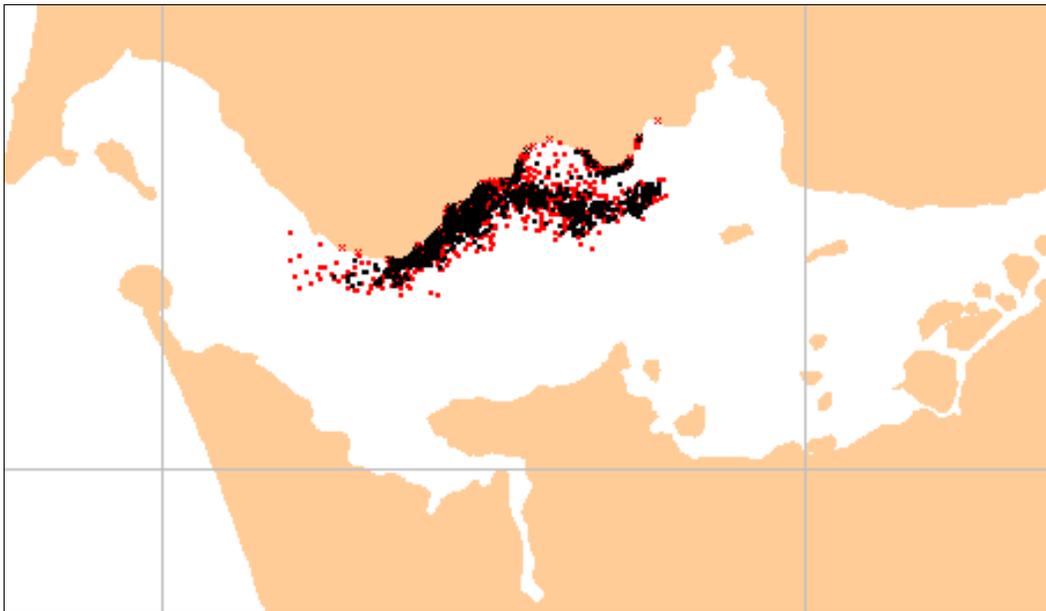
Sample files are shown in the Appendix.

GNOME Splot Files

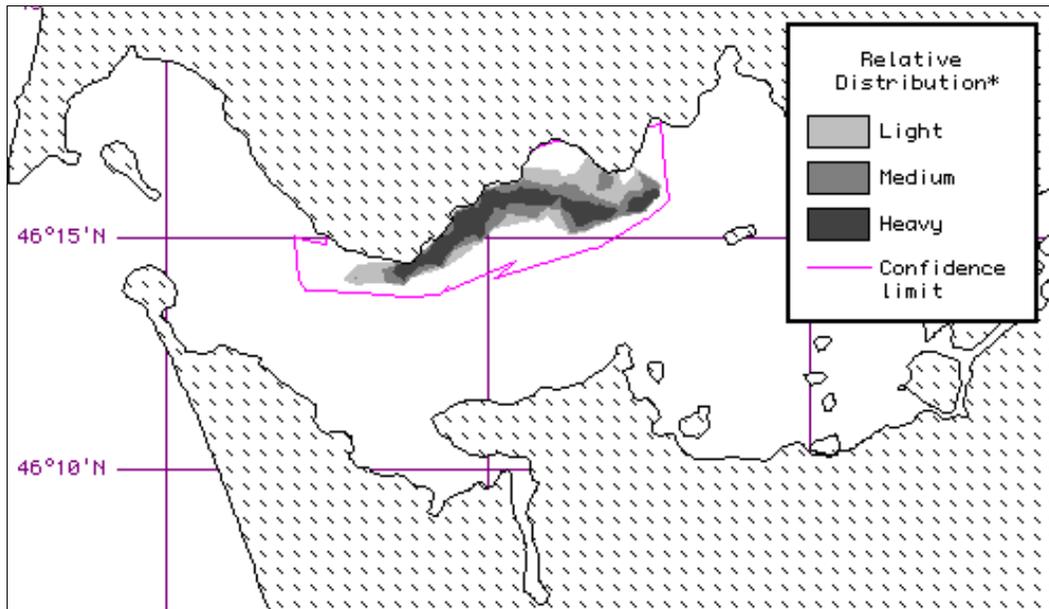
You can also save your GNOME trajectory in a file format that can be further processed in **GNOME Analyst** to create contours of oil distribution. To process GNOME Analyst files, choose either of these formats:

- **GNOME Splot File (for GNOME Analyst)** – A single snapshot of the spill for GNOME Analyst.
- **GNOME Splot File Series (for GNOME Analyst)** – An hourly file output throughout the spill animation for GNOME Analyst.

GNOME Analyst converts the "best guess" splots displayed in GNOME to oil concentration contours, and the "minimum regret" splots to a bounding contour. Here are some example outputs.



Splots generated in **GNOME**.



Oil concentration contours and uncertainty boundary generated in **GNOME Analyst**.

BNA Map Files

To create oil concentration contours in GNOME Analyst, you will need a map file on which to display the contours. You can open your own vector map in GNOME Analyst, or you can export the map from the GNOME Location File and open it in GNOME Analyst. To save the Location File map as a file, choose the file type **BNA Map File (for GNOME Analyst)**.

To learn more about GNOME Analyst or to obtain training, contact NOAA HAZMAT at ORR.GNOME@noaa.gov or at (206) 526-6317.

Wind Data Files

Spill responders use NOAA HAZMAT's oil weathering program, ADIOS®, which allows time-dependent winds. If you create a time-dependent wind in GNOME, you can save that wind as a text file in GIS Output Mode, then read it into ADIOS without having

to re-enter the winds. To save your winds as a file for ADIOS, choose the file type **Wind Data File**.

Help with GIS Terminology

An online dictionary of GIS terms is available to GIS users by the Association for Geographic Information and the University of Edinburgh Department of Geography at this Web site: <http://www.geo.ed.ac.uk/agidict/welcome.html>. The dictionary includes definitions for 980 terms compiled from a variety of sources, which either relate directly to GIS or which GIS users may come across in the course of their work. The dictionary is supplemented by 52 diagrams.

Chapter 4

Reference

Here are explanations of the main components of GNOME: Location Files, the Map Window, and the GNOME toolbar and menus.

Location Files

GNOME's Location Files were created to guide you through the model setup for a specific region. A Location File is a mini-expert system (wizard) that contains all the components used in setting up GNOME. Each Location File contains generalized information about the tides, currents, and shorelines in the region it covers. In addition, the Location File contains error checking and extensive user Help topics, designed to guide you through running the model. GNOME uses the Location File information, along with other information you provide, to set up the trajectory model.

Once you have chosen a Location File, GNOME will prompt you for several pieces of information that it needs to run the model, such as wind conditions, circulation patterns, river flow rate, and the oil spill(s) you wish to simulate. GNOME's Help topics provide some sources of real-time and historical data about the region to answer these questions. When you have selected your answers, the mini-expert system converts your answers into model parameters.

In Standard Mode and GIS Output Mode, you will always be prompted for information about the start and stop times for the model, and the local wind conditions. Some locations require other information, such as circulation patterns or river flow data, so when you are working with those Location Files, GNOME also asks you for that information. (Try the **Columbia River Estuary** Location File for an example of **river flow choices**. To help you provide this information, GNOME always includes a list of references and Web sites where you can find the data you need.)

The most common current patterns found in a particular area are loaded in each Location File. If there is more than one current pattern in your Location File, you will need to select the one that is most appropriate for the scenario you want to represent. (See the

Santa Barbara Channel Location File for an example of **current pattern choices**.) Time variations of currents that result from tides are calculated based on the model start time and the run duration that you enter.

For more technical information about GNOME's Location Files, see the **Technical Documentation** section of the **User's Guide** for the Location File of interest. User's Guides are available at this section of our Web site:

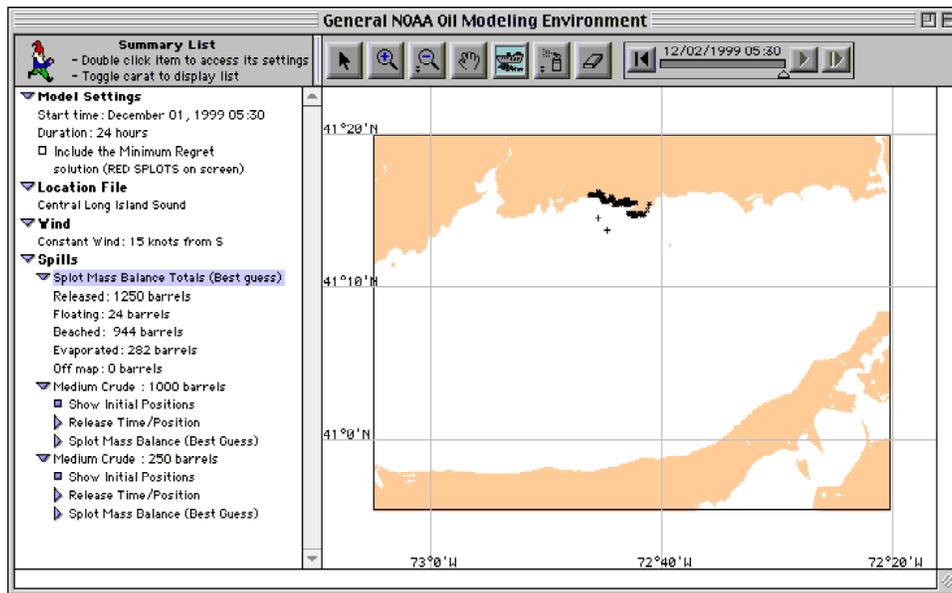
<http://response.restoration.noaa.gov/software/gnome/locfiles.html>.

A collection of all available Location Files is available at **<http://response.restoration.noaa.gov/software/gnome/locfiles.html>**. NOAA HAZMAT is initially creating Location Files following a Coast Guard priority list of 32 Marine Safety Offices. Other Location Files will be created as resources allow. If you have questions about the Location File list, contact NOAA HAZMAT at ORR.GNOME@noaa.gov.

The Map Window

When you are ready to set your spill(s) in GNOME, a map of a Location File area is displayed in the Map Window. The Map Window has two sections. The right side displays a map of the location you selected (including latitude and longitude bounds) and the GNOME toolbar. As you move your cursor across the map, GNOME displays in the lower left section of the window your cursor's geographical location. (In Diagnostic Mode, GNOME displays current velocity information in the lower left section.)

The left side of the Map Window, the **Summary List**, details the information about your model: your Model Settings, the Location File you have chosen, the Wind conditions you have specified, and the Spill(s) that you will enter. **To see detailed information for each topic, click the triangle (carat) to the left of the topic.**



After you have run the model, you may want to change some of its conditions. **You can change your model conditions by double-clicking the items in the Summary List.**

Double-click **Model Settings** to change your Model Start Date, Start Time, Run Duration, or to include the Minimum Regret (Uncertainty) solution in your model. (Some Model Settings changes, such as changes to the Start Time, or adding the Minimum Regret solution, will cause the spill model to “rewind” to the beginning.)

Double-click **Location File** to change to a new Location File. (You may want to save your model results before you open a new file. To do this, click Save under the File menu, select a file type, then click OK.)

Double-click the name of your Location File to change the wind conditions, flow rate, or circulation pattern for your region.

Double-click **Wind** to change the speed or direction of the constant or variable wind. (If you have chosen a constant wind and want to change it to a variable wind, double-click **Location File**. The Location File Welcome window will appear with all the settings you have chosen. You only have to enter information that you are changing, so in the Choosing Wind Type window, choose “variable” from the pull-down menu.)

Double-click **Spills** to add a new spill to the model. You can add a point or line source spill (Point/Line Source Splots) or you can spray a spill on the map to represent observations made during an overflight of the spill area (Sprayed Splots).

Double-click the description of your spill to change the spill date and time or pollutant information. (A point or line source spill is shown as "[pollutant type]: [amount released]". An overflight spill is shown as "[pollutant type]: overflight".)

In the **Spills** item of the Summary List, GNOME calculates a mass balance of the “best guess,” or forecast, solution for each spill. The mass balance is the fate of different portions of the spill due to the trajectory, the pollutant type, and the weathering that the pollutant has undergone. GNOME shows the proportion of your spill that is released, floating, beached, evaporated and dispersed, and off the map. If you model more than one spill, you will also see a summary mass balance, **Spot Mass Balance Totals**, listed first (in the units of the first spill).

GNOME Tools

GNOME’s tools help you set your spill(s) and view your trajectory in the Map Window.



The Arrow Tool. Use this tool to de-select other GNOME tools (such as the Spray Can tool) and to navigate through the Summary List.



The “Zoom-In” Tool. The scale and coverage of the GNOME maps are fixed; however, with this tool selected, you can zoom in to see a particular region more closely. When you click this tool, your cursor changes to a “plus” magnifying glass (⊕). Click on the map to “zoom in.” The map will be re-centered on the point you clicked. You can also click this tool, then drag on the map to draw a square. The square will be zoomed to fit the window.



The “Zoom-Out” Tool. With this tool selected, you can “zoom out” on the map. When you click this tool, your cursor changes to a “minus” magnifying glass (⊖). Click on the map to “zoom out.” The map will be re-centered on the point you clicked. You can also double-click this tool to fit the map to the window.



The Hand Tool. With this tool selected, you can move the map within the window. When you click this tool, your cursor changes to a “hand” (☞). Click and drag to move the map around within the window.



The Spill Tool. With this tool selected, you show the location of your spill(s). When you click this tool, your cursor changes to a cross hair (+). Click on the water area of the map to indicate the location of a **point source**, or click and drag on the water area to indicate the location of a **line source**. (Note that the latitude and longitude of your cursor will be shown in the lower left corner as you move it across the map.)

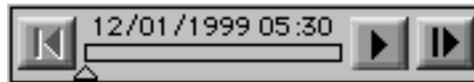


The Spray Can Tool. With this tool selected, you can "spray" a spill on the map to represent the observations made during an overflight of the spill area. When you click this tool, you first need to enter information about the overflight and pollutant, then you choose the diameter of spray you want to use on the map. Your cursor then changes to a small, medium, or large circle ○, ○, ○. To spray the spill, click an appropriate water region of the map, then drag the cursor to spray blue pollutant particles. (When you run the model, these spots will not be visible until the model time reaches the overflight time.) If you want to change the diameter of your spray, double-click the Spray Can tool, then select a new size.



The Eraser Tool. With this tool selected, you can remove spill particles that you have sprayed in error. When you click this tool, your cursor changes to a square (□). Drag the cursor over the area of pollutant to be removed, then release your mouse button. (Any land areas or lines of latitude or longitude that you "erase" from the map will be immediately redrawn.)

The Map Window also includes controls in the Movie Progress Bar that help you run your trajectory, or spill movie.



Movie Progress Bar



Run. To start the model, click the Run control. The model will run for the duration period that you chose. (This control changes into the Pause control whenever the model is running.)



Pause. To pause the model while it is running, click the Pause control, which appears only while the model is running. To resume running, click Run.



Step. To start and stop the model one step at a time, click Pause, then click Step. The model will advance the oil spill in small, pre-set time increments.



Reset. To “rewind” the model, click Reset.

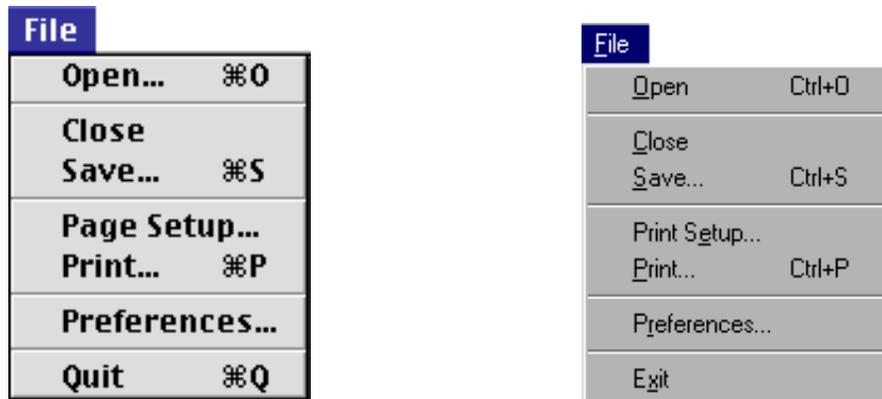
If you want to run your trajectory until a particular time, drag the time marker, , below the Movie Progress Bar, to the time when you'd like the model to stop. You can also use this control to view earlier pictures of your trajectory. To do this, just drag the time marker forwards or backwards (in 1-hour increments) to the time you would like to view.

GNOME Menus

GNOME's menu bar contains five menus: **File**, **Edit**, **Item**, **Model**, and **Help**. Here are explanations of how you can use these menus in GNOME.

The File Menu

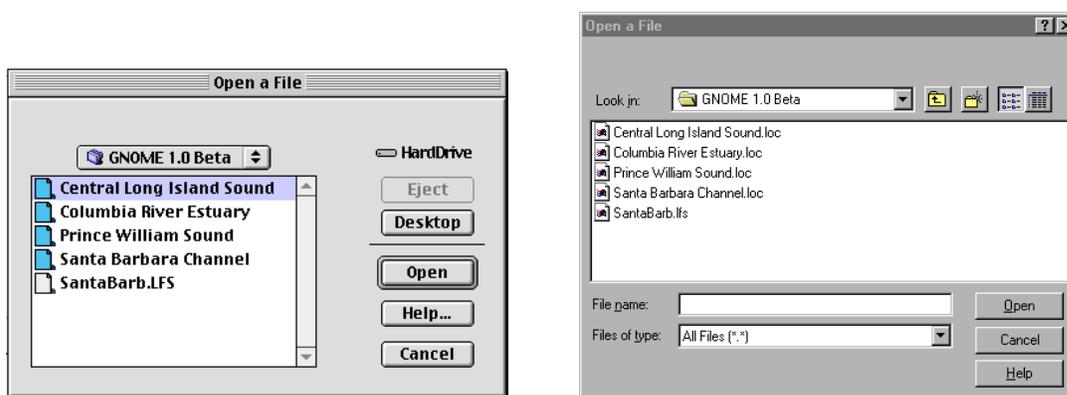
GNOME's File menu works in much the same way as other applications.



The **File** menu on a Macintosh (left) and in Windows (right)

Open...

Click **Open...** to open a Location File or other file type. The following window will display, showing the Location Files you have downloaded and any files you have saved.



The **Open a File** window on a Macintosh (left) and in Windows (right)

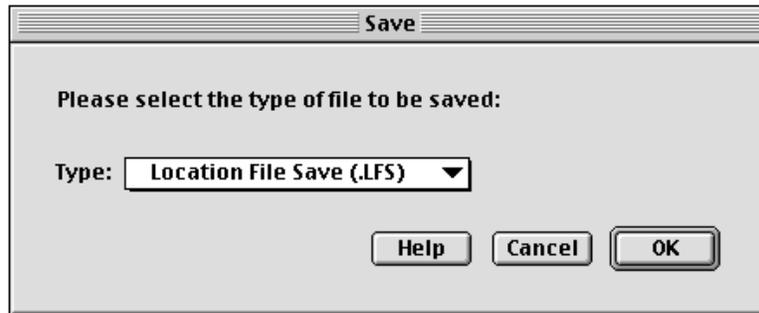
You can also choose **Open...** to work with model information you have previously saved as a Location File Save (.LFS). See the **Save...** topic later in this section for more information about saving files in GNOME.

Close

Click **Close** to close the Location File you are working with. (If you wish to save a trajectory you have created, be sure to save your trajectory as a Location File Save or QuickTime Movie before you close the Location File.)

Save...

Click **Save...** from GNOME's File menu when you wish to save the results of your work in a file.



The **Save** window in GNOME

You can save in several formats, depending on the model mode you are working in.

In **Standard Mode**, you can save a file in either of two formats:

- Location File Save (.LFS)
- QuickTime Movie

In **GIS Output Mode**, you can save a file in these formats:

- Location File Save (.LFS)
- QuickTime Movie
- NOAA Standard Splot Files (for GIS)
- NOAA Standard Splot File Series (for GIS)
- GNOME Splot File (for GNOME Analyst)
- GNOME Splot File Series (for GNOME Analyst)
- BNA Map File (for GNOME Analyst)
- Wind Data File

In **Diagnostic Mode**, you can save a file in these formats:

- Diagnostic File Save (.SAV)
- QuickTime Movie
- NOAA Standard Splot Files (for GIS)
- NOAA Standard Splot File Series (for GIS)

- GNOME Splot File (for GNOME Analyst)
- GNOME Splot File Series (for GNOME Analyst)
- BNA Map File (for GNOME Analyst)
- Wind Data File

A **Location File Save** is a file format that saves all the information you have entered into GNOME using a Location File. In Standard and GIS Output Modes, GNOME must have access to the Location File in order to properly open and run your Location File Save.

A **QuickTime Movie** is a “movie” animation of a modeled spill, produced hourly, that will run as a stand-alone file. To view QuickTime™ files, you will need the free

QuickTime player available for download at <http://www.apple.com/quicktime/download/>.

NOAA Standard Splot File output is useful for Geographical Information Systems (GIS) users. The **NOAA Standard Splot Files** format produces a single view of the spill, whereas the **NOAA Standard Splot File Series** produces hourly files throughout the animation of the spill model. Part of these file outputs is a geo-referenced point file in MOSS (Map Overlay Statistical System) file format. MOSS is an ASCII, public domain format that can be imported by many GIS systems. Using a GIS, you can integrate this output with other geo-referenced data. You can then view diverse data sets together, or generate spatial queries to determine potential areas of impact and resources at risk. NOAA HAZMAT has created an extension for use with **ArcView**, one popular GIS package. This extension allows easy access to the Standard Splot Files and allows the import of spill contours generated by GNOME Analyst.

GNOME Splot Files are an output format that can be processed further in the NOAA application, **GNOME Analyst** (formerly known as TAT). GNOME Analyst converts the "best guess" splots displayed in GNOME to oil concentration contours, and the "minimum regret" splots to a bounding contour. The **GNOME Splot Files** format outputs a single time snapshot of the spill model; whereas the **GNOME Splot File Series** format produces hourly files throughout the animation of the spill model.

The file output **BNA Map File** is useful for GNOME Analyst users. To create oil concentration contours in GNOME Analyst, you need a map file on which to display the contours. You can open your own vector map in GNOME Analyst, or you can save the map from the GNOME Location File, and open it in GNOME Analyst.

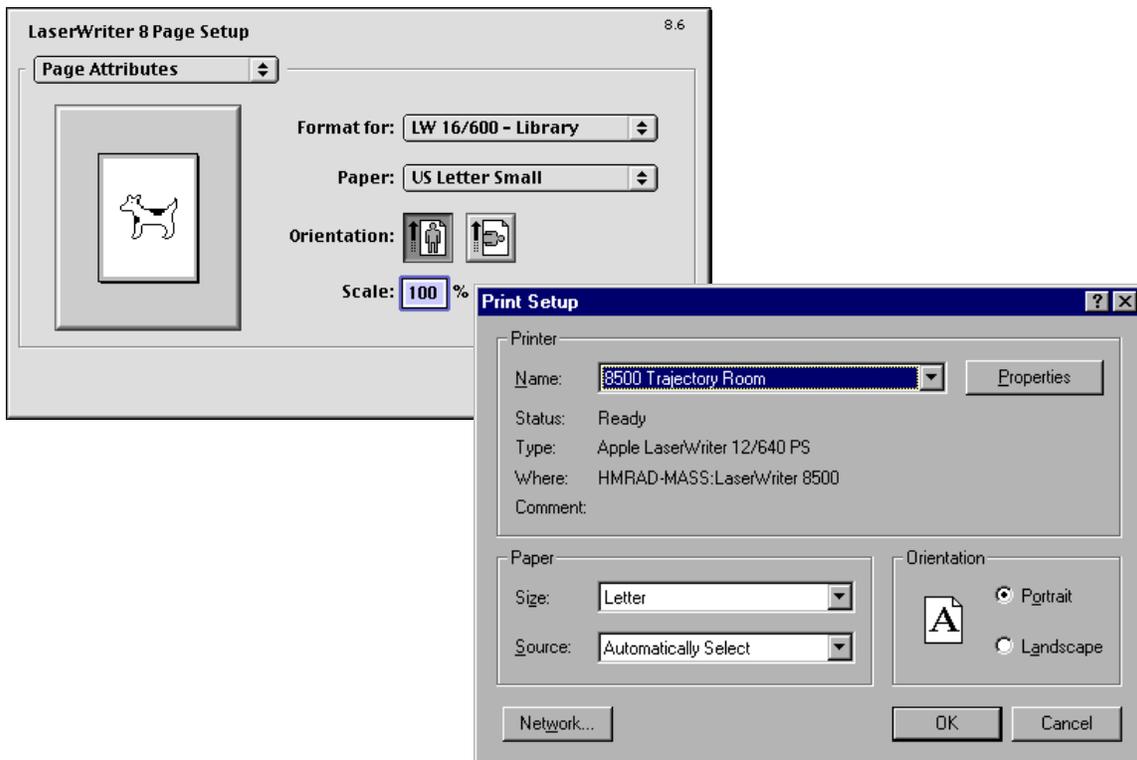
The file format **Wind Data File** is useful for those who use NOAA HAZMAT's oil weathering program, **ADIOS**. If you create a time-dependent wind in GNOME, you can save that wind as a text file and read it into ADIOS without having to re-enter the winds.

For more information about NOAA Standard Splot Files, GNOME Splot Files, BNA Map Files, and Wind Data Files, see the **Working With GIS** chapter (chapter 3) of this manual.

A **Diagnostic File Save (.SAV)** is an output file format that saves all model settings and files used to produce a trajectory in Diagnostic Mode. It is not available in Standard or GIS Output Modes.

Page Setup... or Print Setup...

Click **Page Setup...** on a Macintosh, or **Print Setup...** in Windows, to adjust the standard printing options, such as the printer to be used, the size and orientation of the paper, and the scale you wish to use when you print your results.

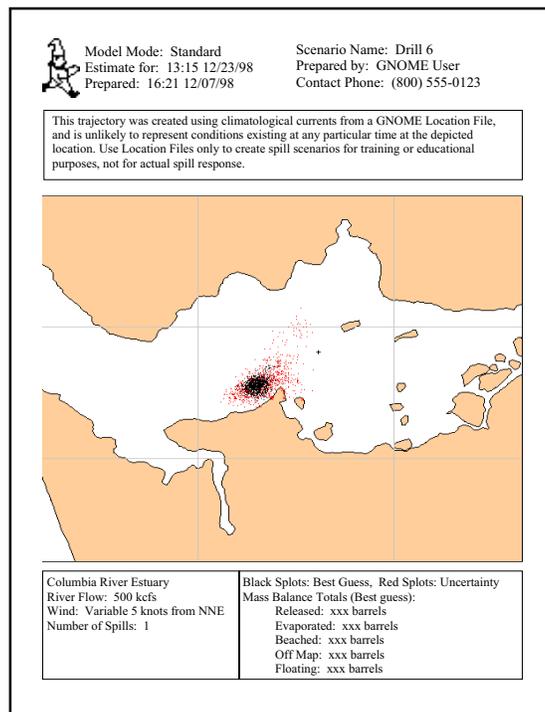


The **Page Setup** (Macintosh) and **Print Setup** (Windows) dialog boxes

Because the map prints at a constant aspect ratio, the scale that you choose affects the size of the text that is printed. For example, a page setup that includes a scale of 60% will produce smaller text and a larger map.

Print...

You can print a GNOME trajectory in a form similar to this.



Your printout will include the spill trajectory that you are displaying in the Map Window. The top section of your printout includes this information:

- the model mode used to create the trajectory.
- the time and date of the trajectory “picture.”
- the time and date the trajectory was printed.
- your scenario name.
- your name and contact phone number.
- an optional caveat.

In the bottom section of the printout, the following information is provided:

- the Location File used (if applicable).
- river flow, current pattern, or other settings unique to the Location File.
- wind type (variable or constant), speed, and direction at the time the trajectory “picture” was taken.
- the number of spills.
- legend information (Black Spots: Best Guess; Red Spots: Uncertainty).
- mass balance totals of all “Best Guess” solutions.

To print your spill trajectory, click **Print** in the File menu. The following window will display.

The screenshot shows a dialog box titled "Output Header". It contains the following elements:

- Print Mode:** Two radio buttons, "black & white" (selected) and "color".
- Scenario Name:** A text input field.
- Estimate for:** Two text input fields, "Time:" (containing "19:00") and "Date:" (containing "4/22/99").
- Prepared by:** A text input field.
- Prepared:** Two text input fields, "Time:" (containing "19:23") and "Date:" (containing "4/22/99").
- Contact Phone:** A text input field.
- Buttons:** "Edit Caveat...", "Help...", "Cancel", and "OK".

In the Output Header window, you view or add the information that will appear on the printed copy of your trajectory.

1. Under **Print Mode**, choose to print your trajectory in either “black & white” or “color”. (The “black & white” print option creates a faxable copy.)
2. In the next section, **Estimate for:**, GNOME shows the time and date when your trajectory “picture” was taken (i.e., the end of your run duration, or the time and date when you stopped the model).
3. The section **Prepared:** shows the current time and date (taken from your computer’s internal clock).
4. In the section, **Scenario Name:**, type a name to identify your trajectory.

5. Enter your name in the section, **Prepared by:**.
6. Enter an appropriate phone number in the section, **Contact Phone:**.
7. If your trajectory was created with a GNOME Location File, this standard caveat will be displayed on your printed copy:

“This trajectory was created using climatological currents from a GNOME Location File and is unlikely to represent conditions existing at any particular time at the depicted location. Use Location Files only to create spill scenarios for training and educational purposes, not for actual spill response.”

To change this text, click the **Edit Caveat...** button, then type the text you want to include.

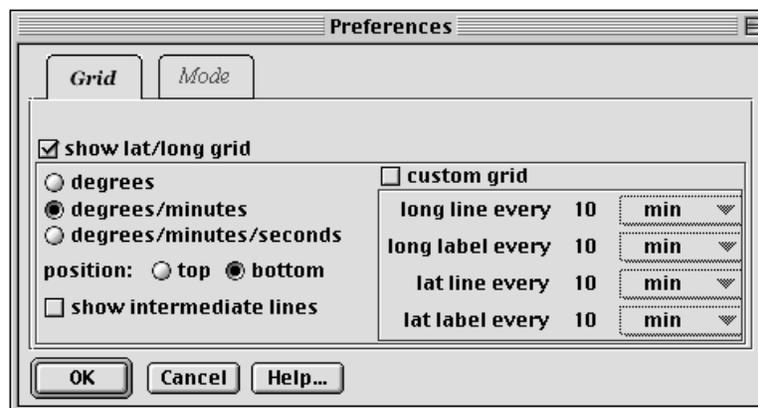
8. Click **OK**.

A standard Print dialog box will open, where you can specify the printer and number of copies you want to print.

Preferences...

Click the **Preferences...** item in the File menu to (1) change the appearance of the grid in the Map Window, or (2) change the model mode of GNOME.

To change the grid settings, click the **Grid** tab,  .



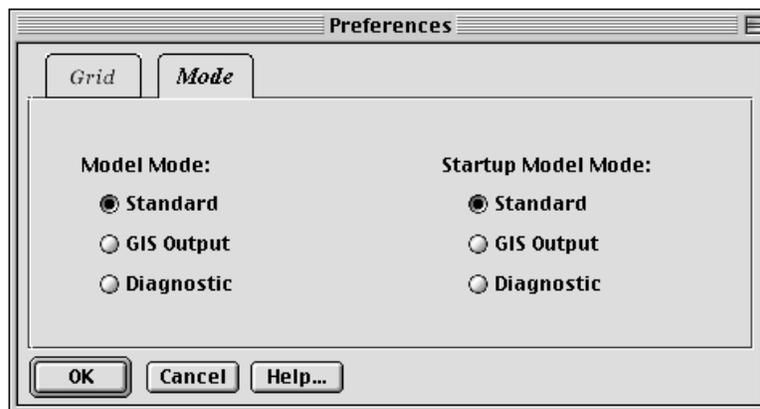
Click the **show lat/long grid** box to show the latitude and longitude lines in the Map Window. (Click the box again to hide the latitude and longitude lines.)

Next, you can change the units in which you'll see and enter position data in GNOME. Choose one of the radio buttons to select "degrees", "degrees/minutes", or "degrees/minutes/seconds". In the lower left corner of the Map Window, GNOME will show the position of your cursor in the format you've chosen.

To show the grid on top of the map, click "top" in the **position:** section. If you prefer to view the grid beneath the map, click "bottom".

Click the **show intermediate lines** box if you'd like the lines of longitude and latitude shown in smaller increments. If you want the lines shown in specific increments, click the **custom grid** box, then enter the increments in which you want the lines shown and labeled.

To change the GNOME Model Mode, click the Mode tab,



Under **Model Mode**, choose the mode in which you'd like to work: Standard, GIS Output, or Diagnostic.

If you work predominantly in one mode of GNOME, you can instruct GNOME to open in that mode each time it starts up. Under **Startup Model Mode**, choose Standard, GIS Output, or Diagnostic.

Note: When you change from Standard Mode to GIS Output Mode while you're working on a trajectory scenario, the information you've entered will be saved, but the model will reset to its Start Time.

If you change from GIS Output Mode to Standard Mode, GNOME will again retain your settings; however, you will only be able to output your trajectory in the output formats of Standard Mode.

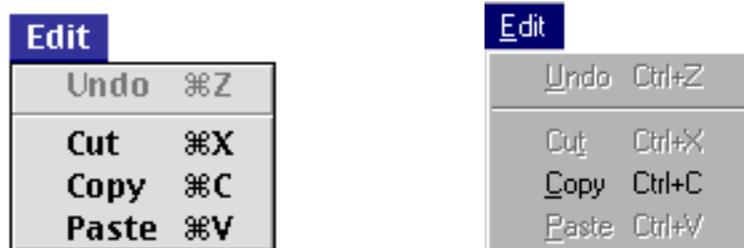
If you change to Diagnostic Mode, GNOME will alert you that you are changing to a mode that requires detailed knowledge of trajectory modeling, and will suggest that you first save your Location File settings. You won't be able to change from Diagnostic Mode to another mode without losing all your model information.

Quit or Exit

In the File menu, click **Quit** on a Macintosh or **Exit** in Windows to close GNOME. (If you want to save a trajectory you have created, be sure to save it as a Location File Save or QuickTime Movie before you close GNOME.)

The Edit Menu

You'll probably recognize the items in the Edit menu in GNOME. They work the same way as in other computer applications; however, the **Undo** menu item is not currently implemented in GNOME. The Macintosh version of GNOME includes three items in the Edit menu: **Cut**, **Copy**, and **Paste**, and their keyboard shortcuts. The Windows Edit menu includes only the **Copy** item; however, the standard Windows shortcuts for Cut (Ctrl+X) and Paste (Ctrl+V) work the same way in GNOME as in other computer applications.



The **Edit** menu on a Macintosh (left) and in Windows (right)

Cut

Click **Cut** in the Edit menu to delete any selected text you've entered in a GNOME dialog box.

Copy

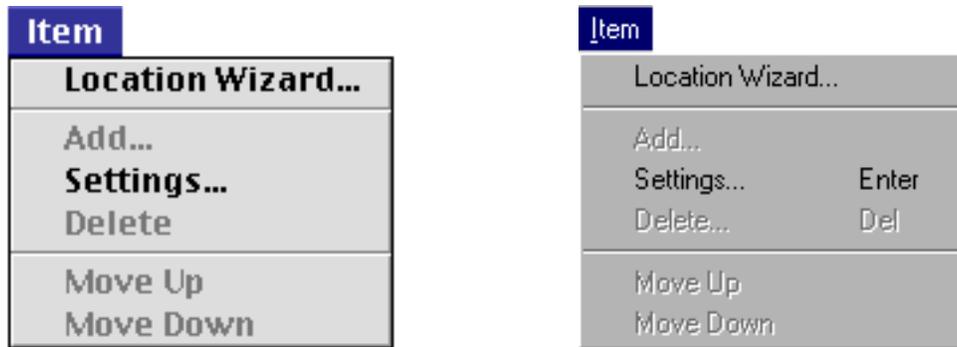
In the Map Window, click **Copy** to copy your model result to the clipboard. You can then paste your copied item into a word processing or graphics application. In a dialog box, you can click **Copy** to copy any selected text. You can then paste the text in a text box of another dialog box.

Paste

Select a text box in a dialog box, then click **Paste** to add data you have cut or copied.

The Item Menu

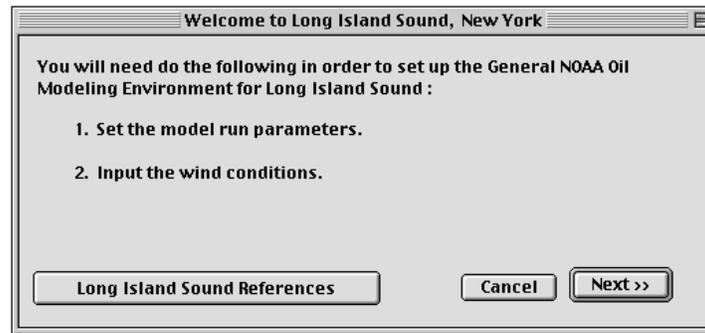
The Item menu contains four items in Standard and GIS Output modes. (The **Move Up** and **Move Down** menu items are used only in GNOME's Diagnostic Mode.) Some of the Item menu items are available only when appropriate items in the Summary List are highlighted. For example, the **Add...** item is available only when you have highlighted **Spills** in the Summary List.



The **Item** menu on a Macintosh (left) and in Windows (right)

Location Wizard...

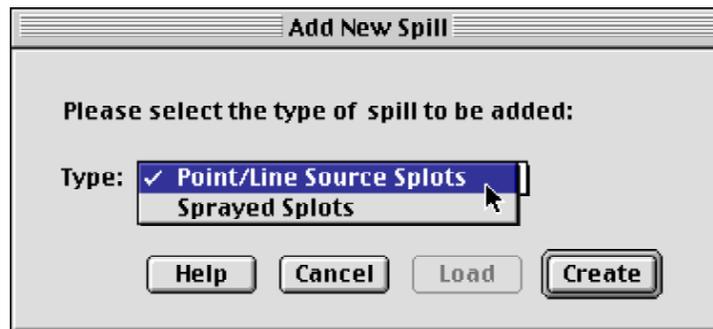
Click **Location Wizard...** in the Item menu to change any of the information you entered in GNOME. A series of windows will open, beginning with the Location File Welcome window, to allow you to adjust your model settings and other conditions.



You will soon learn a quicker way to make these changes: double-click an item listed in the Summary List of the Map Window to open the dialog box applicable to that item.

Add...

To add a new spill to your scenario, highlight **Spills** in the Summary List, then click **Add...** in the Item menu. (Double-clicking the **Spills** item will produce the same result.) The following window will display.



You can simulate three types of spills in GNOME:

1. Use point source spots to represent either an instantaneous spill (catastrophic release) or an oil release that occurs over time at a particular location (e.g., a stationary vessel or pipeline leak).
2. Use line source spots to simulate a spill from a vessel that is leaking as it is drifting, or an observation of a linear slick from an unknown source.
3. Use sprayed spots to simulate the observations reported from an overflight of the spill area.

Chapter 4: Reference

To set a point or line source, select **Point/Line Source Spots**, then click Create. On the next window, you will provide more information about the spill, including:

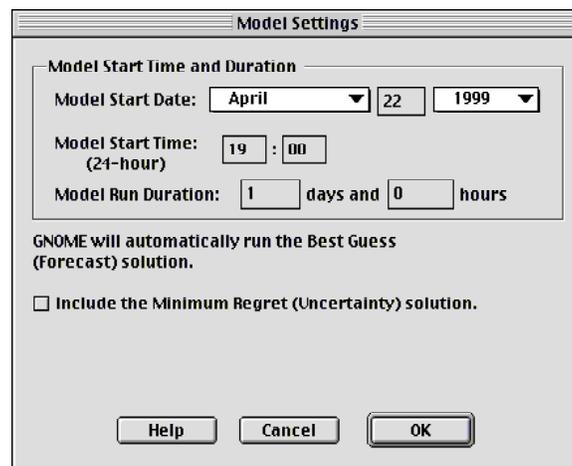
- Pollutant type
- Amount released
- Release start and stop dates and times

To "spray" overflight spots on the map, select **Sprayed Spots**, then click Create. On the next two windows, you need to provide more information, including:

- Overflight date and time
- Pollutant type
- Amount released
- Time that the amount was estimated (if the pollutant is a type that weathers)
- Pollutant age (if the amount was estimated during the overflight)
- Time of spill (if the amount was estimated at the time the spill occurred)
- Diameter of "spray" you want to use on the map

Settings...

Click **Settings...** to change any of the information you entered in the Model Settings window, shown below.



The screenshot shows a dialog box titled "Model Settings". It contains the following fields and options:

- Model Start Time and Duration** (grouped title)
- Model Start Date:** April (dropdown), 22 (text), 1999 (dropdown)
- Model Start Time:** 19 (text), : 00 (text), (24-hour)
- Model Run Duration:** 1 (text) days and 0 (text) hours
- GNOME will automatically run the Best Guess (Forecast) solution.
- Include the Minimum Regret (Uncertainty) solution.
- Buttons: Help, Cancel, OK

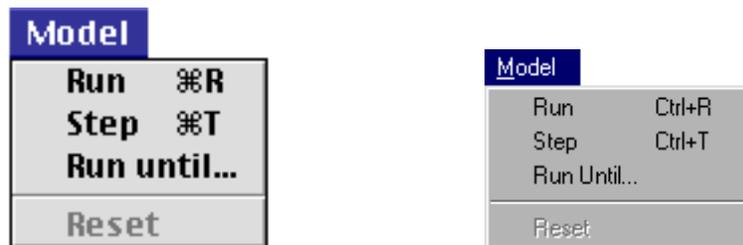
You can also double-click the **Model Settings** item in the Summary List of the Map Window to change the settings you have entered.

Delete

To delete a spill from your scenario, first highlight the name of the spill in the Summary List. A point or line source spill is shown as "[pollutant type] : [amount released]" in the Summary List. An overflight spill (sprayed plots) is shown as "[pollutant type] : overflight". To delete the spill, click **Delete** in the Item menu. GNOME will prompt you to confirm that you want to delete the selected spill. Click **OK**.

The Model Menu

The Model menu items operate in a similar way to GNOME's run controls:



The **Model** menu on a Macintosh (left) and in Windows (right)

Run

Click **Run** in the Model menu to see your spill trajectory. (You can also run your trajectory by pressing the Run control, , on the GNOME toolbar.)

Step

Click **Step** to run your trajectory in small, pre-set time increments. (Another way to run your trajectory incrementally is to use the Step control, , on the toolbar.)

Run until...

If you want to stop your trajectory at a particular time during its Run Duration, you can set GNOME to run until that time. Click **Run Until...** in the Model menu, then enter your stop date and time in the Run Until dialog box, shown below.



(You can also use the toolbar to run your trajectory until a particular time. Drag the time marker, , below the movie progress bar to the time when you'd like the model to stop.)

Reset

Click **Reset** in the Model menu to rewind your spill movie. (You can also rewind the movie by clicking the Reset control, , on the GNOME toolbar.)

The Help Menu

From the Help menu, you can view explanations of GNOME's main functions and features. The GNOME Help menu differs between the Macintosh and Windows operating systems.

On a Macintosh



The **Help** menu on a Macintosh

About Balloon Help...

Click **About Balloon Help...** to learn more about the Macintosh Balloon Help.

Show Balloons

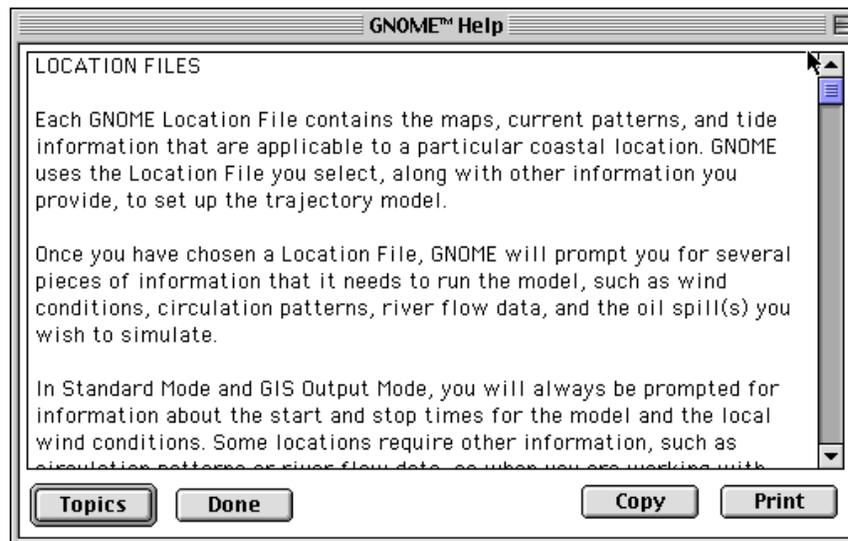
Click **Show Balloons** to turn Balloon Help on.

Hide Balloons (appears only when Balloon Help is turned on)

Click **Hide Balloons** to turn Balloon Help off.

Topics...

Click **Topics...** from the Help menu to see the list of GNOME Help Topics. Select the topic you'd like to see, then click **Select**.

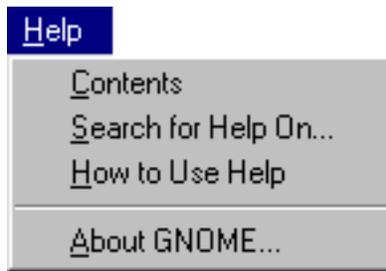


Sample **GNOME Help** topic on a Macintosh

When you've finished reading the topic discussion...

- click **Topics** to return to the Help index to select another topic.
- click **Done** to return to GNOME.
- click **Copy** to copy the discussion text to the clipboard.
- click **Print** to print the Help topic.

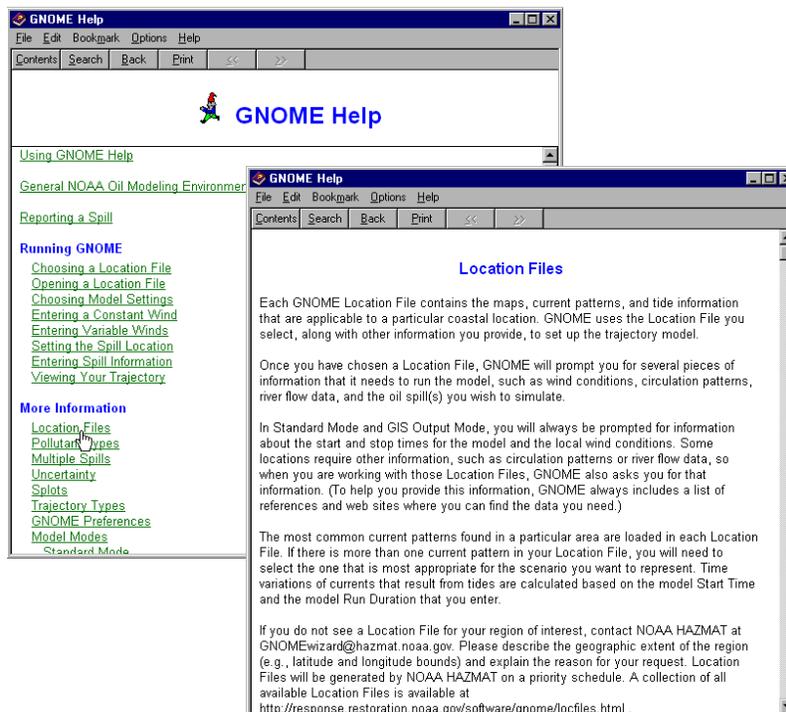
In Windows



The **Help** menu in Windows

Contents

In Windows, select **Contents** from the **Help** menu to view the GNOME Help contents.



Click any of the underlined topics in **GNOME Help** (background) to view the discussion of that topic (foreground).

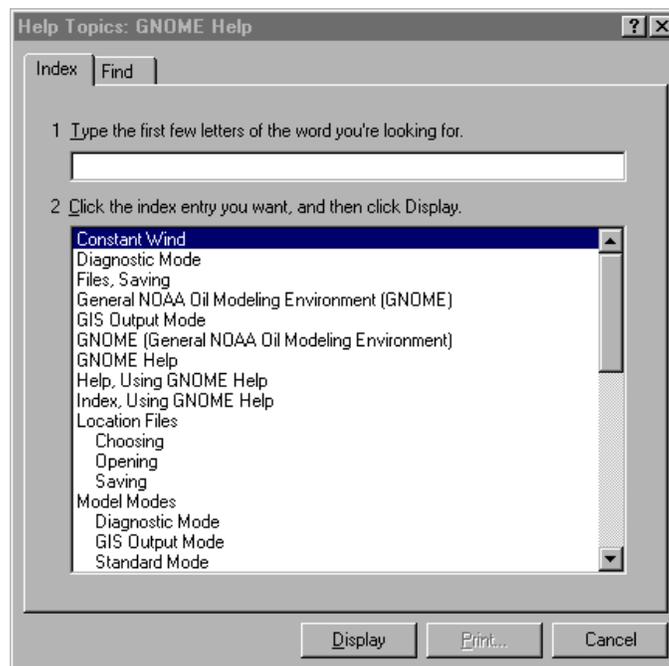
When you've finished reading the topic discussion...

- click **Contents** to return to the GNOME Help Contents.
- click **Search** to go to the GNOME Help Index.
- click **Back** to view the previous Help topic.

- click **Print** to print the Help topic.
- click the **Close** button, , in the upper right corner of the window to return to GNOME.

Search for Help On...

Click **Search for Help On...** to display an alphabetical index of GNOME Help topics in Windows. You can type the first few letters of the word you're looking for, or you can highlight a topic from the list, then click **Display**, to view the discussion of that topic.



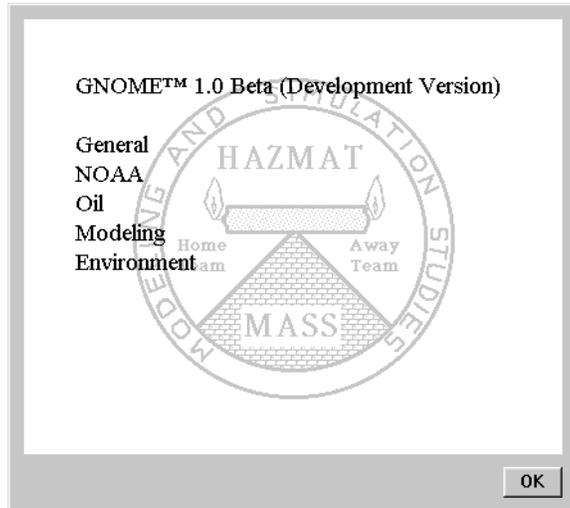
The **GNOME Help Index** in Windows

How to Use Help

Click **How to Use Help** to learn more about **Windows Help**. Windows provides three sections of help: a Contents, an alphabetical Index, and a Find capability.

About GNOME...

Click **About GNOME...** to see the version of GNOME in which you are working.



The GNOME Splash Screen

Chapter 5

Troubleshooting

Often, when you encounter difficulties while running GNOME, it will alert you to the problem. At other times, you may encounter a problem and be unsure of how to solve it. Here are some cases you might encounter:

I don't see a Location File for an area I'd like to model.

We are currently preparing Location Files to support the work of the U.S. Coast Guard's Marine Safety Offices. To see what locations are currently available, check our Web site at <http://response.restoration.noaa.gov/software/gnome/locfiles.html> . To learn what Location Files will be available soon, check this section of our site: <http://response.restoration.noaa.gov/software/gnome/news.html> . If you have questions about the list of Location Files, contact NOAA HAZMAT at ORR.GNOME@noaa.gov.

I'm a GIS user, and I don't see the GIS-compatible file formats when I try to save a file. What's wrong?

You've opened GNOME in Standard Mode instead of GIS Output Mode. To change to GIS Output Mode, from the File menu, choose Preferences, click the Mode tab, then click GIS Output.

I am using a CD version of GNOME. When I try to quit GNOME, I get this message: "Error saving settings."

When you run GNOME from a CD, GNOME cannot write the settings file (settings.osm) to the CD when you exit the application, so it displays the error message. To solve this problem, copy GNOME and the Location Files to a directory on your hard drive and run GNOME from there.

Other troubleshooting issues are discussed in the FAQ section of our Web site at <http://response.restoration.noaa.gov/software/gnome/gnomefaq.html>.

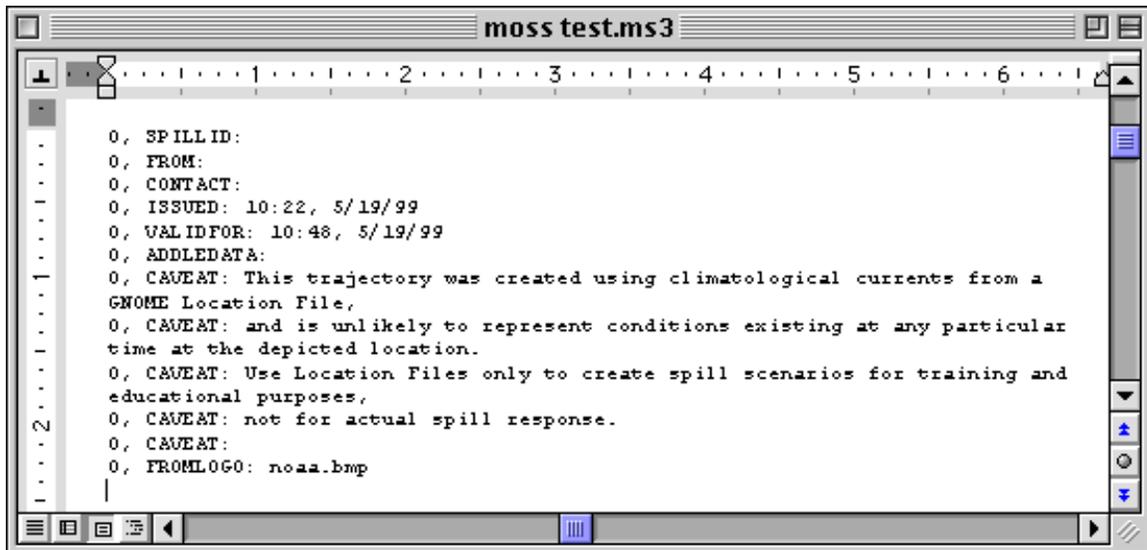
Appendix

Example NOAA Standard Splot File Output

Following are examples of the file formats for GNOME's NOAA Standard Splot File output. These files are the same as files three through seven of the Standard NOAA Trajectory Output.

.ms3 File

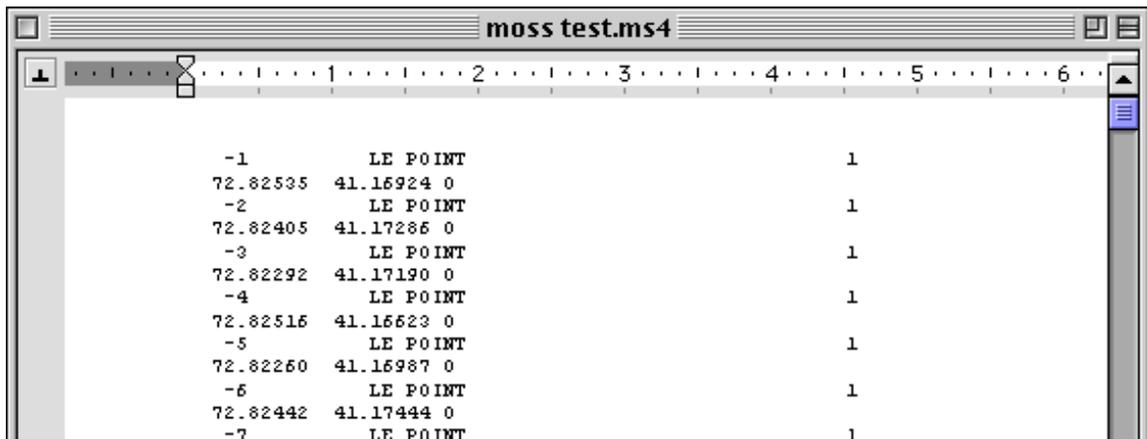
The .ms3 file contains caveat and spill-specific information.



```
moss test.ms3
0, SPILL ID:
0, FROM:
0, CONTACT:
0, ISSUED: 10:22, 5/19/99
0, VALIDFOR: 10:48, 5/19/99
0, ADDEDATA:
0, CAVEAT: This trajectory was created using climatological currents from a
GNOME Location File,
0, CAVEAT: and is unlikely to represent conditions existing at any particular
time at the depicted location.
0, CAVEAT: Use Location Files only to create spill scenarios for training and
educational purposes,
0, CAVEAT: not for actual spill response.
0, CAVEAT:
0, FROMLOGO: noaa.bmp
```

.ms4 File

The .ms4 file is a MOSS point file with the position data of the forecast splots.



```
moss test.ms4
-1 LE POINT 1
72.82535 41.16924 0
-2 LE POINT 1
72.82405 41.17286 0
-3 LE POINT 1
72.82292 41.17190 0
-4 LE POINT 1
72.82516 41.16623 0
-5 LE POINT 1
72.82260 41.16987 0
-6 LE POINT 1
72.82442 41.17444 0
-7 LE POINT 1
```

.ms5 File

The .ms5 file links by the index field to the forecast MOSS file. It provides information applicable to individual plots, such as oil type, age of the plot, and whether it is beached or floating.

```

-1, ABSOLUTEMASS, CONSERVATIVE, 0.000000, 0.158987, 1.000000, 0.800000, INWATER
-2, ABSOLUTEMASS, CONSERVATIVE, 0.000000, 0.158987, 1.000000, 0.800000, INWATER
-3, ABSOLUTEMASS, CONSERVATIVE, 0.000000, 0.158987, 1.000000, 0.800000, INWATER
-4, ABSOLUTEMASS, CONSERVATIVE, 0.000000, 0.158987, 1.000000, 0.800000, INWATER
-5, ABSOLUTEMASS, CONSERVATIVE, 0.000000, 0.158987, 1.000000, 0.800000, INWATER
-6, ABSOLUTEMASS, CONSERVATIVE, 0.000000, 0.158987, 1.000000, 0.800000, INWATER
-7, ABSOLUTEMASS, CONSERVATIVE, 0.000000, 0.158987, 1.000000, 0.800000, INWATER
-8, ABSOLUTEMASS, CONSERVATIVE, 0.000000, 0.158987, 1.000000, 0.800000, INWATER
-9, ABSOLUTEMASS, CONSERVATIVE, 0.000000, 0.158987, 1.000000, 0.800000, INWATER
-10, ABSOLUTEMASS, CONSERVATIVE, 0.000000, 0.158987, 1.000000, 0.800000, INWATER
-11, ABSOLUTEMASS, CONSERVATIVE, 0.000000, 0.158987, 1.000000, 0.800000, INWATER
    
```

.ms6 File

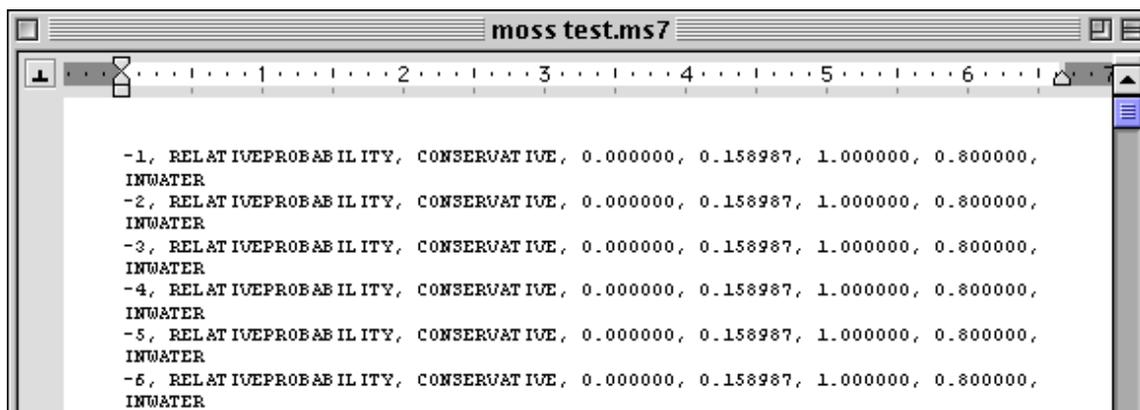
The .ms6 file provides the position data for the “minimum regret” (uncertainty) plots (if they are included in the trajectory).

```

-1          LE POINT          1
72.82147  41.17150  0
-2          LE POINT          1
72.82070  41.17184  0
-3          LE POINT          1
72.82775  41.17504  0
-4          LE POINT          1
72.82058  41.17075  0
-5          LE POINT          1
72.82319  41.17462  0
-6          LE POINT          1
72.82168  41.16727  0
    
```

.ms7 File

The .ms7 file provides attributes of each of the “minimum regret” spots (if they were included in the trajectory).



```
moss test.ms7
-1, RELATIVE PROBABILITY, CONSERVATIVE, 0.000000, 0.158987, 1.000000, 0.800000,
INWATER
-2, RELATIVE PROBABILITY, CONSERVATIVE, 0.000000, 0.158987, 1.000000, 0.800000,
INWATER
-3, RELATIVE PROBABILITY, CONSERVATIVE, 0.000000, 0.158987, 1.000000, 0.800000,
INWATER
-4, RELATIVE PROBABILITY, CONSERVATIVE, 0.000000, 0.158987, 1.000000, 0.800000,
INWATER
-5, RELATIVE PROBABILITY, CONSERVATIVE, 0.000000, 0.158987, 1.000000, 0.800000,
INWATER
-6, RELATIVE PROBABILITY, CONSERVATIVE, 0.000000, 0.158987, 1.000000, 0.800000,
INWATER
```

For more information on the Standard NOAA Trajectory Output, see HAZMAT Report 96-4, Digital Distribution Standard for NOAA Trajectory Analysis Information, J.A. Galt, D.L. Payton, H. Norris, and C. Friel, January 1996.

Glossary

24-hour time

The system of expressing time in which the time of day is indicated by four digits. The first two digits indicate the hour (00 to 23) and the last two indicate the number of minutes past that hour (00 to 59). Each day begins at midnight, 0000, and the last minute of each day is 2359. Under this system, 6:00 a.m. is 0600, and 2:30 p.m. is 1430.

Best guess trajectory

A trajectory that assumes that all of the information that is input into the model (winds, currents, tides, etc.) is exactly correct. Also known as the forecast trajectory, this trajectory represents our best guess of where spilled oil will go.

BNA Map File (for GNOME Analyst)

An output file that saves the map from a GNOME Location File for use in the NOAA HAZMAT program, GNOME Analyst. Available only in GIS Output and Diagnostic modes.

Constant wind

Wind that is blowing steadily at a particular speed from a particular direction.

Diagnostic File Save (.SAV)

An output file format that saves all model settings and files used to produce a trajectory in Diagnostic Mode. Available only in Diagnostic Mode.

Diagnostic Mode

The most advanced mode of GNOME. In Diagnostic Mode, you can use a Location File to load information into GNOME, or you can set up the model entirely on your own. Diagnostic Mode was designed for use by experts during tactical support for spill response teams. Use of this mode requires training from NOAA HAZMAT.

Glossary

Dialog box	A window that GNOME presents to you, in which you enter information or choose options.
Forecast trajectory	A trajectory that assumes that all of the information that is input into the model (winds, currents, tides, etc.) is exactly correct. Also known as the “best guess” trajectory because it represents our best guess of where the spilled oil will go.
GIS	Geographic Information System. A computer-based tool for mapping and analyzing things that exist and events that happen on earth. GIS technology integrates common database operations, such as query and statistical analysis, with the unique visualization and geographic analysis benefits offered by maps.
GIS Output Mode	A GNOME mode in which you can export model output in GIS- (geographic information system) compatible format. GIS Output Mode is primarily used for spatial or GIS analysis. Use of this mode requires training from NOAA HAZMAT.
GNOME	The General NOAA Oil Modeling Environment. The oil spill trajectory model described in this manual.
GNOME Analyst	A NOAA application, formerly known as TAT, that converts “best guess” plot number and position data into oil density contours, and converts “minimum regret” plot location data into an uncertainty bounding contour.
GNOME Splot File (for GNOME Analyst)	An output file format available in GIS Output and Diagnostic modes that provides a single time snapshot of the spill model for GNOME Analyst.

GNOME Splot File Series (for GNOME Analyst)	An output file format available in GIS Output and Diagnostic modes that produces hourly files throughout the animation of the spill model for GNOME Analyst.
HAZMAT	Hazardous Materials Response Division of NOAA Office of Response and Restoration (OR&R).
Hindcast	In spill modeling, a model run for some time in the future is called a forecast. When you know the actual spill situation and want to create model conditions to represent that situation for a time in the past, you are creating a hindcast. Modelers use hindcasts to test how changes to the model conditions affect the results. HAZMAT modelers use hindcasts to test their simulation of the most recent events, with the goal of making their next forecast more accurate.
Line source	In GNOME, a line source simulates a spill from a vessel that is leaking as it is drifting, or an observation of a slick from an unknown source.
Location File	Files containing generalized information about the tides, currents, and shorelines of a given region. GNOME uses this information and the information that you provide to set up the trajectory model.
Location File Save (.LFS)	An output file format that saves all the information you have entered into GNOME using a Location File. In Standard and GIS Output modes, GNOME must have access to the Location File in order to properly open and run the Location File Save.
Mass balance	The fate of different portions of a spill due to the trajectory, the pollutant type, and the weathering that the pollutant has undergone.

Minimum regret trajectory	A trajectory that incorporates uncertainties in the model. It shows areas of the map that could be impacted if, for example, the wind blows from a somewhat different direction than you have specified, or if the currents in the area flow somewhat faster or slower than expected. It represents other possibilities of where the spill might go.
Model modes	Levels in which GNOME can be run. GNOME was designed with three model modes: Standard Mode, GIS Output Mode, and Diagnostic Mode. Standard and GIS Output Modes must use Location Files to run. Diagnostic Mode can use Location Files or user files. GIS Output Mode and Diagnostic Mode require training from NOAA HAZMAT.
Model settings	Details about your model, or “spill movie.” You need to enter a Start Date and Start Time when you would like your spill movie to begin, and a Run Duration for the movie. You can also indicate whether you would like the model to compensate for uncertainty in the input data.
MOSS	Map Overlay Statistical System, a public domain GIS format.
NOAA	National Oceanic and Atmospheric Administration. An organization of the Department of Commerce, NOAA is composed of the National Ocean Service (NOS); National Weather Service; National Marine Fisheries Service; National Environmental Satellite, Data, and Information Service; and Office of Oceanic and Atmospheric Research. HAZMAT is a portion of the Office of Response and Restoration under NOS.

NOAA Standard Splot Files (for GIS)	An output file format available in GIS Output and Diagnostic modes that produces a single view of the spill that can be viewed in ArcView, using the ArcView extension.
NOAA Standard Splot File Series (for GIS)	An output file format available in GIS Output and Diagnostic modes that produces hourly files throughout the animation of the spill model. These files can be viewed in ArcView, using the ArcView extension.
"No-Notice" Drill	A response drill in which no advance notice is given to the responding parties (government, industry, and/or contractors) to exercise and test spill preparations and readiness.
Non-weathering pollutant	A pollutant type that does not change chemically or physically over time in the marine environment.
OR&R	Office of Response and Restoration. Includes the Hazardous Materials Response Division (HAZMAT), the Coastal Resource Protection and Restoration Division, and the Damage Assessment Center.
Overflight	An airplane or helicopter flight over a spill area to determine the location and extent of the spill. Overflights are critical for making good forecasts.
Point/Line Source Splots	A type of spill that can be modeled in GNOME to represent a point or line source. <i>See</i> Point source <i>and</i> Line source.
Point source	In GNOME, a point source represents either an instantaneous spill (catastrophic release) or an oil release that occurs over time at a particular location (e.g., a stationary vessel or pipeline leak).

Glossary

Pollutant age	The number of hours the pollutant has been in the water. When you are using GNOME's overflight tools, the pollutant age is the time of the overflight minus the time of the spill.
Pollutant types	The oil and oil products for which GNOME can calculate weathering information.
QuickTime Movie (.mov)	A "movie" animation of a modeled spill, produced hourly. Will run as a stand-alone file that can be viewed with the QuickTime player.
Reinitialize	To reset or restart GNOME with different initial conditions.
Reinitialized trajectory	A trajectory that incorporates the observations made during an overflight of the spill area. Spill particles are sprayed on the map to represent the last observed location and extent of the spill.
Run duration	The amount of time that you would like the model, or "spill movie," to run. The minimum time for a run duration is 1 hour; the maximum time is 3 days.
Scenario	A description of where, how, how much, and what type of oil has spilled, and the current environmental conditions.
Splots	Tiny, representative pieces of spilled oil in a GNOME spill trajectory. They appear as small "pollutant particles" on the map when you run your spill; however, different types of splots are represented in different ways. In any trajectory that includes a "minimum regret" solution, black splots represent GNOME's best guess of where spilled oil will go. (For all black splots, wind and model data are assumed to be correct.) Red splots represent the "minimum regret" area for the same spill. When splots beach, they change to tiny "x"s

Splots (<i>continued</i>)	on land regions of the map. Beached “best guess” splots are shown as black "x"s; beached “minimum regret” splots are shown as red "x"s. In a trajectory that has been sprayed with GNOME's Spray Can tool, blue splots represent the area where oil has been observed in an overflight of the spill.
Sprayed Splots	A type of spill that can be modeled in GNOME to represent the observations made during an overflight of the spill area. Tiny pollutant particles (splots) are added to the spill scenario with the GNOME Spray Can tool. These particles appear blue on the map until the trajectory is run.
SSC	Scientific Support Coordinator.
Standard Mode	The most automated mode of GNOME. In Standard Mode, a Location File loads information into GNOME, then GNOME prompts you for information it needs to run your model. In this mode, you can print a picture or create a "movie" of your trajectory. Standard Mode is not flexible enough to be used for spill response; however, it is an excellent tool for simulating spills and building intuition regarding oil spill trajectories at specific locations.
TAT	A NOAA application, now known as GNOME Analyst , that converts “best guess” spot number and position data into oil density contours, and converts “minimum regret” spot location data into an uncertainty bounding contour.
Trajectory	The direction and pattern of movement of spilled oil over time.

Glossary

Uncertainty	Our knowledge that observations and forecasts are not perfect. GNOME always produces a "best guess" trajectory, but will also include the possibility of inaccuracies in a "minimum regret" trajectory if you request it in your Model Settings.
Uncertainty trajectory	A trajectory that incorporates uncertainties in the model. It shows areas of the map that could be impacted if, for example, the wind blows from a somewhat different direction than you have specified, or if the currents in the area flow somewhat faster or slower than expected. It represents other possibilities of where the spill might go.
Weathering	Physical and chemical changes that a pollutant undergoes while it is exposed to the environment. In the marine environment, a pollutant can change in its density, viscosity (resistance to flow), rate of evaporation and dispersion into the water column, and the rate at which an oil-in-water mixture may form. The weathering behaviors of different pollutants are critical to predicting their trajectories. GNOME uses a simple weathering model; NOAA HAZMAT's oil weathering program, ADIOS, provides more detailed estimates of the expected characteristics and behavior of oil spilled into the marine environment.
Unified Command	Representatives of the party responsible for an oil spill, and the State and Federal governments who are in charge of the spill response.
Variable wind	Wind that is changing speed and direction frequently.

Wind Data File

An output file format available in GIS Output and Diagnostic modes that saves wind records as a text file for use in NOAA HAZMAT's oil weathering program, ADIOS.

Wind direction

The direction from which the wind is blowing.

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