Examples

Try out these examples to learn the basics of modeling oil spills in Tampa Bay. Explore how the changing tides affect the trajectories of oil slicks, how wind can move an oil slick in a different direction from the currents, and how model and observation limitations can be overcome by considering both the "Best Guess" and the "Minimum Regret" (Uncertainty) solutions. This knowledge will help you in designing your own GNOME model runs.

The following conditions hold for each of the examples:
Wind: Constant wind at 0 knot (kn), unless otherwise specified in a particular example.
Spill size: 1000 gallons.
Pollutant type: Non-weathering, unless specified.

Use GNOME's Standard Mode and the Tampa Bay Location File to answer the following questions:

1. To see how changing winds affect an oil slick's trajectory, set up the model for a spill to occur on December 15, 1999 at 2100 located at 27° 34' N, 82° 53' W. Run the model for 6 hours and watch how the spill moves. Next, add a 20-knot (kn) wind from the SW and rerun the model.

What is the difference between the oil slick trajectory with and without the wind?

> **Hint:** To easily set a spill at a particular location, simply double-click the Spill Tool on the GNOME toolbar. You can then enter the *exact* latitude and longitude of the spill in the Spill Information window. (This method is much easier than moving your mouse around the map and watching its location in the lower left corner of the window!)
>
> To add wind to your model, double-click **Wind** in the left section of the Map Window (the Summary List), then change the wind speed and direction in the Constant Wind window.
>
> **Answer:** Offshore of Tampa Bay, the north-south component of the wind sets up a current running north or south. The wind also moves the oil on the surface of the water. As a result, the slick does not move very much without wind, and begins to move more as the wind increases.

2. To see how the changing monthly (spring to neap) and daily tides can affect the movement of a spill, change the spill location to the mouth of Tampa Bay at 27° 34.81' N, 82° 40.34' W. Change the model duration to 24 hours to see more of the tidal transport. Start the spill and see how far the spill moves in 24 hours.

Hint: To move a spill, simply double-click the description of the spill in the Spills section of the Summary List. (In this case, the spill description is "Non-Weathering: 1000 gallons".) In the Spill Information window, change the position data to that shown above.

To change the model duration, double-click the item "Duration: 6 hours" in the Summary List. In the Model Settings window, change the Run Duration to 24 hours.

Next, change the start date and time to December 22, 1999 at 0030 and rerun the model for 24 hours.

Hint: You will need to change the start date and time for both the *model* and the *spill*. You can make these changes from the Summary List.

How did the spill trajectory of the second spill compare with the first? Note the differences in the tidal currents in the information below:

Date	Time	Tidal Current
12/15/99	2058	slack before ebb
12/15/99	2347	0.7-kn ebb
12/16/99	0252	slack before flood
12/16/99	0536	0.6-kn flood
12/22/99	0029	slack before ebb
12/22/99	0417	2.7-kn ebb
12/22/99	0835	slack before flood
12/22/99	1104	2.0-kn flood

Answer: The first spill starts during neap tides, when the tidal exchange is minimal, whereas the second spill starts during spring tides, when the tidal currents are maximal. The stronger the tidal currents, the farther the oil slick will travel and spread.

3. To see how uncertainty in model input (such as the uncertainty in weather forecasts) is modeled in GNOME, you will create a new spill with same model start time as the last spill on December 22, 1999. Change the model duration to 12 hours, and the spill location to 27° 46' 0.3" N and 82° 32' 22.2" W, and include the Minimum Regret solution. Run the three cases below and compare how the extent and amount of beached pollutant changes as the wind increases.

Case 1: 0-kn wind
Case 2: 5-kn wind from S
Case 3: 20-kn wind from S

Answer: As the wind increases, larger amounts of oil beach on the shorelines. Although the overall length of impacted shoreline is less with increased wind, the shoreline that is oiled has a higher density of oil.

	Wind	Amount Beached (%)
Case 1	0-kn wind	< 5
Case 2	5-kn wind from S	15 – 25
Case 3	20-kn wind from S	> 30

Note that the Minimum Regret solution (red splots) indicates how the beach impacts and oil location could change with different inputs (e.g., the weather forecast was not correct). This allows people using GNOME to alert decision-makers of potential impacts beyond the "Best Guess" of the spill location.

4. Rerun the last scenario (20-kn wind from S) twice more with new spill products: **gasoline** and **medium crude oil**.

How does the extent of the oil slick and the mass balance change with each product?

Hint: To change the pollutant type, double-click the description of the spill ("Non-Weathering: 1000 gallons") in the Summary List.

Answer: The extent of the oil slick does not change from one product to another, but the mass balance does change dramatically. Gasoline is a light, refined product that evaporates quickly. Medium crude is a much heavier product that persists much longer. Your answers may differ slightly from the ones shown below:

	Gasoline	Medium Crude
floating (%)	2	29
beached (%)	7	58
evaporated and dispersed (%)	91	13