TEACHER MASTER

How to Read the Graphs

Use the following to explain key features of the three graphs used by students in this exercise.

1. Project the August 25th graph on a board, wall or Smart Board.
2. The graph title is the first thing you should look at. The title at the top of the page tells you the name of the monitoring station (Bon Secour), the types of data that are shown on the graph, and the date (August 25, 2011).
3. The title says that the graph is displaying three types of data for August 25, 2011: 1) dissolved oxygen; 2) tide height; and 3) wind direction. Most of the time, you might only see a graph with one type of data displayed over time. On these graphs, you will see three types of data displayed over time.
4. What is the horizontal axis of the graph? All three data types are displayed over time. So the horizontal axis of this graph is time. The 24 hour day is divided into half hour units and displayed along the horizontal axis, running from midnight to midnight.
5. The vertical axis along the left side of the graph is for dissolved oxygen, which is measured in parts per million (ppm). The thick graph line is labeled as dissolved oxygen.
6. There is an additional graph feature to allow you to interpret the significance of the dissolved oxygen levels. There are three horizontal shaded bands running across the graph. These zones display the impact of different dissolved oxygen levels on the health of aquatic organisms that live in the water:

   Healthy Range: 4-5 ppm
   Marginal Range: 2-4 ppm
   Danger Range: 0-2 ppm

   If the dissolved oxygen line is within the danger range, then water at Bon Secour would not be healthy for aquatic organisms at that time on that day.
7. The vertical axis along the right side of the graph is for tide height, which is measured in feet. The thin graph line is labeled as tide height.
8. Below the graph are wind direction icons. The sample interval is every two hours during the day. The arrow points in the direction the wind is blowing. An easterly wind is defined as blowing from the east toward the west. So the wind direction icon for an easterly wind should point toward the left.

STUDENT MASTER

When Did a Jubilee Occur?

Scott Phipps and Mike Dardeau with a datalogger at Bon Secour monitoring station

Tidal datum station, Weeks Bay Reserve

Weather station, Weeks bay Reserve

Scientists Mike Dardeau, of Dauphin Island Sea Lab and Scott Phipps, Research Coordinator for Weeks Bay Reserve, want you to think about the following: "If you weren't there along the shores of Mobile Bay to see the fish and crabs coming onshore during a jubilee, what kind of data would you need to examine to identify when jubilee event occurred?"

What do you think? If you understand the conditions that cause a jubilee and if you have data about those conditions on a specific date, you should be able to say whether or not a jubilee occurred. Let's see if that's true!

Procedure

1. Mike and Scott have provided you with Mobile Bay datalogger data for three days in the summer of 2011. The graphs, one for each day, show dissolved oxygen, tide height, and wind direction.
2. Look at each graph. What does the dissolved oxygen level graph show happening on that day? When was the tide rising and falling on that day? In which direction was the wind blowing?
3. As you examine the three graphs, keep a record of your findings in the Data Log. You will need the data you record to either support or disprove which dates met the conditions for the occurrence of a jubilee event.
4. Once you have examined all three graphs and filled in the Data Log, use the Jubilee Conditions Checklist to help you draw your conclusions about which day or days jubilees occurred. Remember, a jubilee should only occur when all of the conditions on the checklist were present in Mobile Bay.

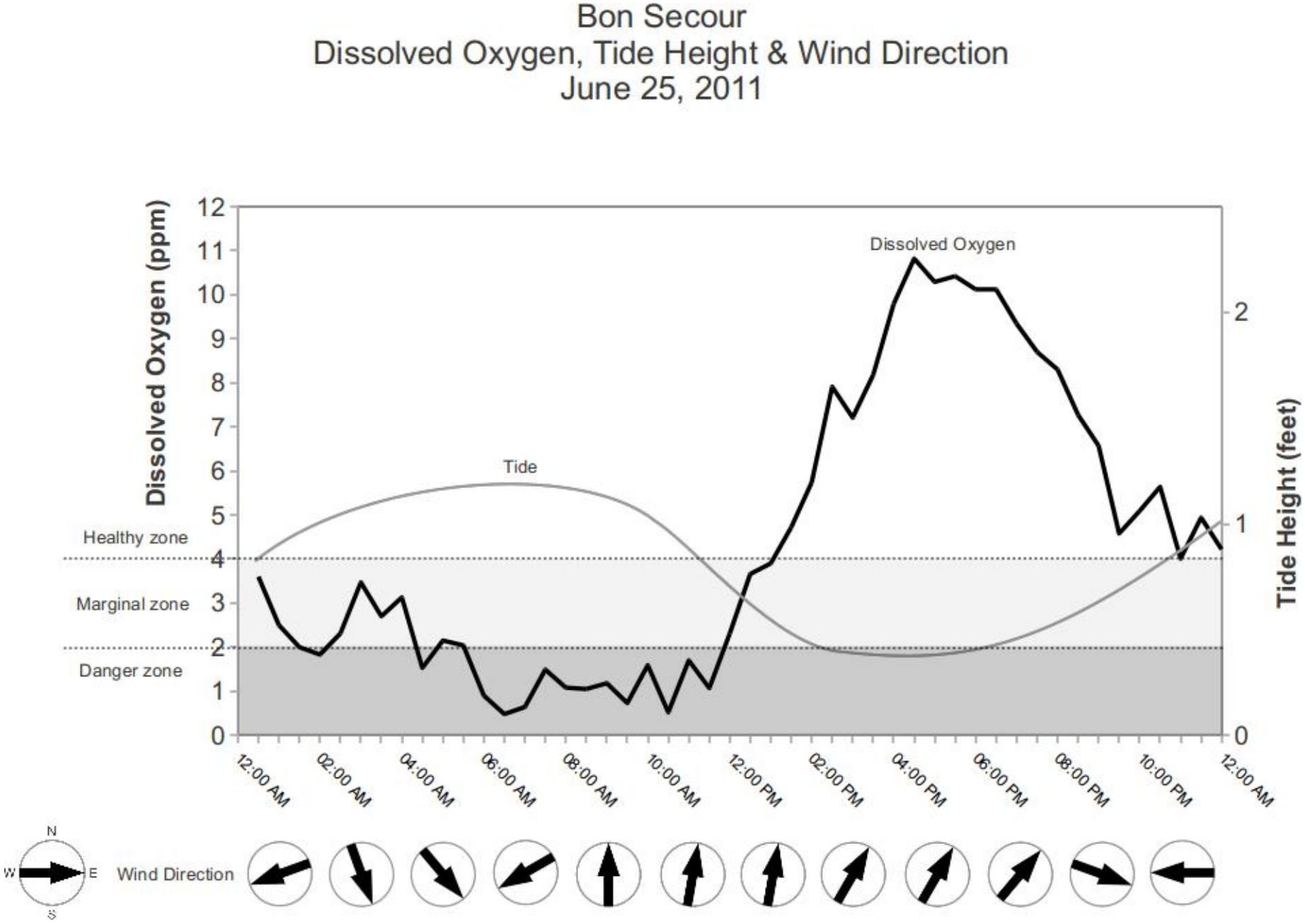
Jubilee Conditions Checklist

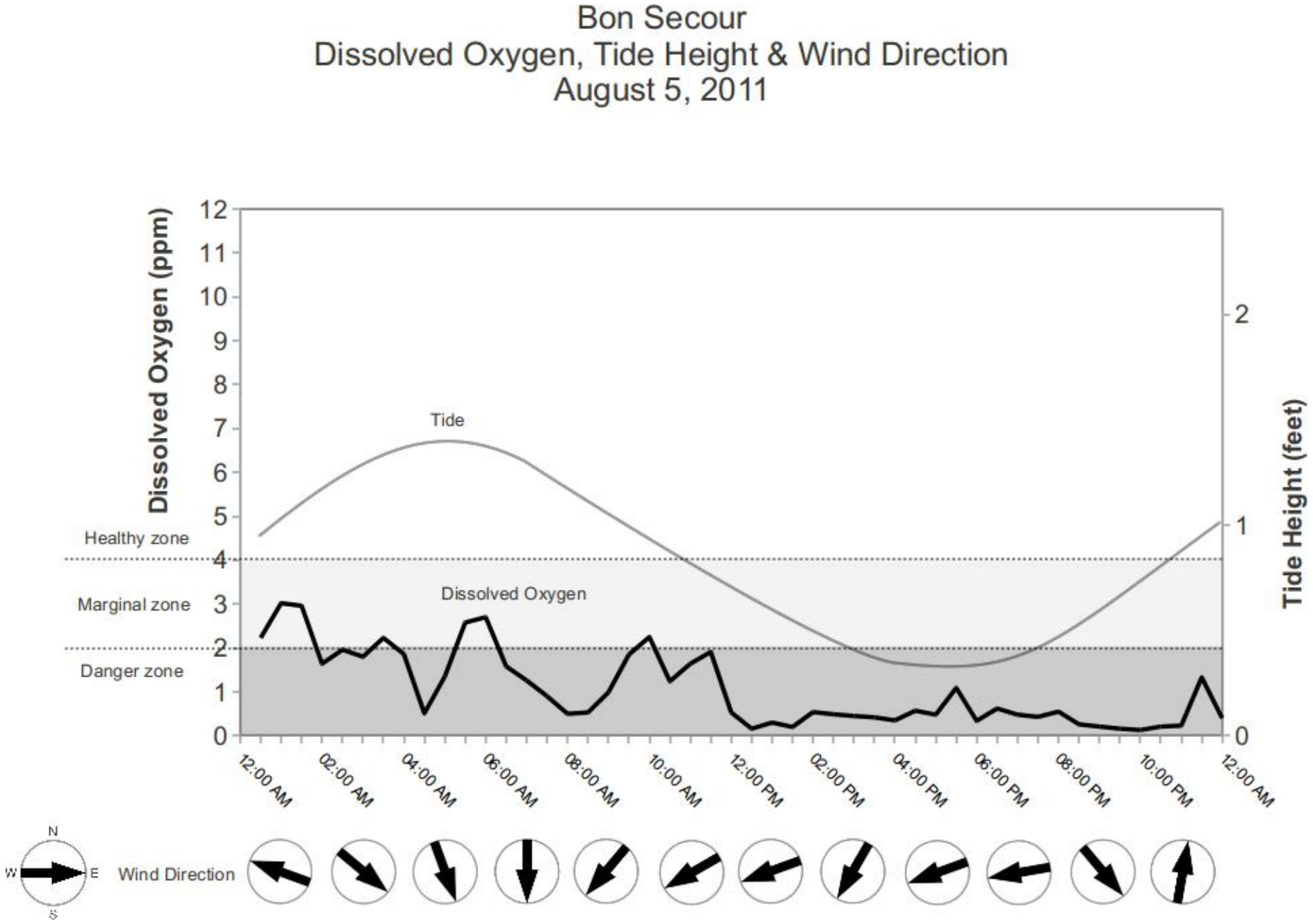
- ✔ It is summer. The water temperature in summer is very warm.
- ✔ It is very early morning and the sun is still down or just rising.
- ✔ Because of the warm water and the time of day, dissolved oxygen levels in the water are very low.
- ✔ The wind is easterly. The wind is blowing gently from the east and moving the fresher surface water away from the shore and into the middle of the bay.
- ✔ The tide is rising. Water is coming in from the Gulf of Mexico, but has very little tidal movement.

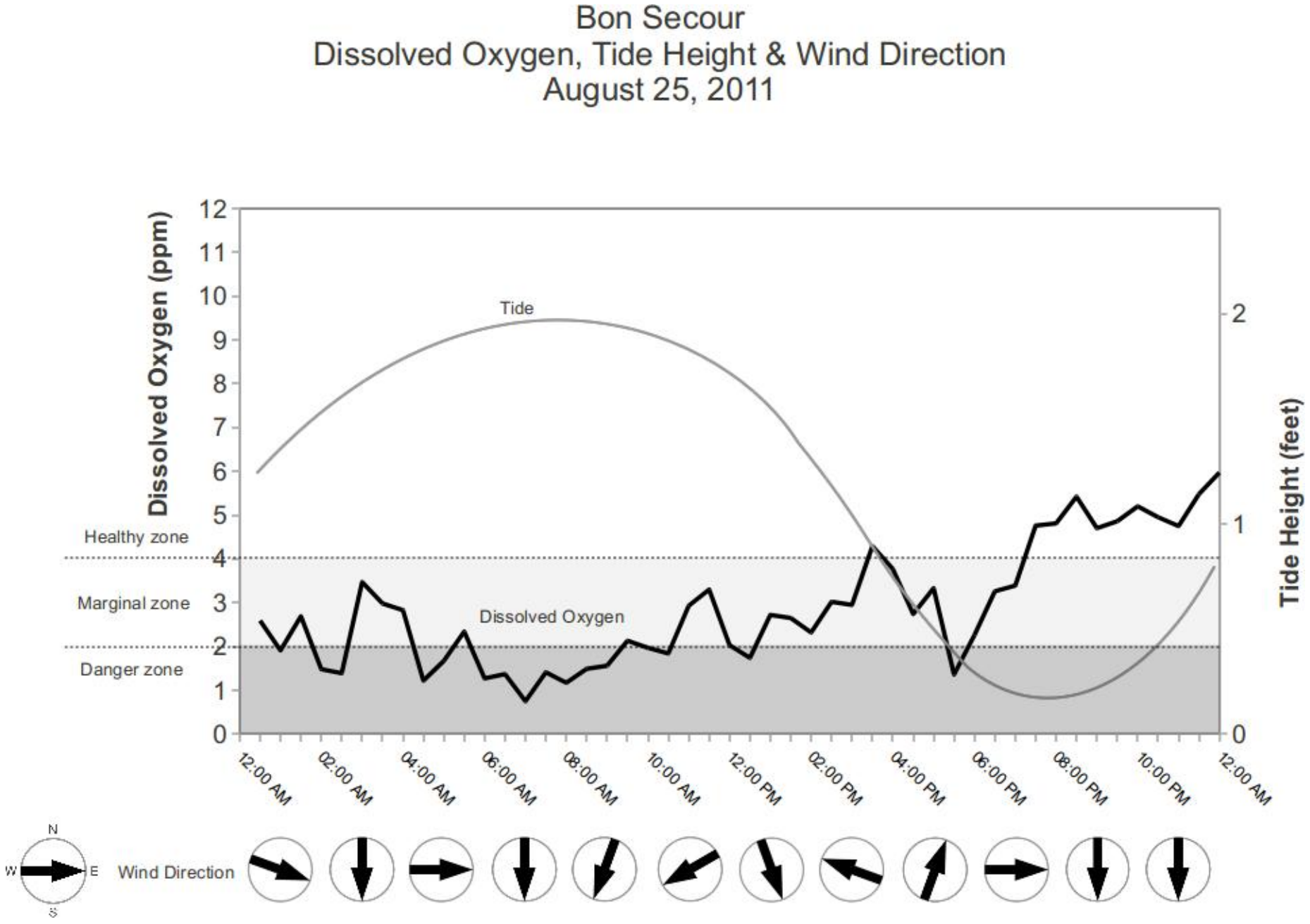
5. Share your conclusions with the class. Were all conditions for a jubilee event present on June 25, August 5, or August 25, 2011? Provide evidence to support your findings. Do you think researchers could predict a jubilee before it happened? Why or why not?

Data Log

Date	What was the time range of the lowest dissolved oxygen levels on this day?	Was the dissolved oxygen (DO) level near or below 2 ppm on this day?	Was the tide rising (water entering the bay) or falling (water leaving the bay) near dawn on this day?	Was the wind easterly (blowing from the east) near dawn on this day?
June 25, 2011				
August 5, 2011				
August 25, 2011				


Bon Secour
Dissolved Oxygen, Tide Height & Wind Direction
June 25, 2011
Dissolved Oxygen (ppm)
Tide Height (feet)
Dissolved Oxygen
Tide
Healthy zone
Marginal zone
Danger zone
12:00 AM
02:00 AM
04:00 AM
06:00 AM
08:00 AM
10:00 AM
12:00 PM
02:00 PM
04:00 PM
06:00 PM
08:00 PM
10:00 PM
12:00 AM
N
W
E
S
Wind Direction


Bon Secour
Dissolved Oxygen, Tide Height & Wind Direction
August 5, 2011
Dissolved Oxygen (ppm)
Tide Height (feet)
Tide
Dissolved Oxygen
Healthy zone
Marginal zone
Danger zone
12:00 AM
02:00 AM
04:00 AM
06:00 AM
08:00 AM
10:00 AM
12:00 PM
02:00 PM
04:00 PM
06:00 PM
08:00 PM
10:00 PM
12:00 AM
N
W
E
S
Wind Direction


Bon Secour
Dissolved Oxygen, Tide Height & Wind Direction
August 25, 2011
Dissolved Oxygen (ppm)
Tide Height (feet)
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Dissolved Oxygen
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08:00 AM
10:00 AM
12:00 PM
02:00 PM
04:00 PM
06:00 PM
08:00 PM
10:00 PM
12:00 AM
N
W
E
S
Wind Direction