

Name: \_\_\_\_\_

Class Period: \_\_\_\_\_

Date: \_\_\_\_\_

## Tropical Storm Frances Analysis

### OBJECTIVE

Tropical Storm Frances struck the southeast (upper) Texas coast September 7 through 13, 1998, and caused extensive beach and dune erosion and damage to structures. The storm surge peaked at only 1.4 m above mean sea level, but extreme water levels ( $> 0.78$  m) lasted for 64 hours. Although peak wave height was 4.09 m during the storm, extreme wave heights ( $>2.30$  m) lasted for 73 hours.

You are a coastal scientist hired by the Texas General Land Office to document the effects of Tropical Storm Frances. To do so you will need to construct beach profiles before and after the storm at different locations along the Texas coast. You will use data that have been collected by students at Ball High School and scientists at the Bureau of Economic Geology (BEG) at The University of Texas at Austin.

One of the goals of this section is to help you understand the importance of the Texas High School Coastal Monitoring Program. Through data collection conducted by schools in the program, BEG scientists are able to better comprehend coastal processes, beach morphology, and shoreline change along the Texas coast.

### PROCEDURE

Plot data you have downloaded from the Texas High School Coastal Monitoring Program Website (<http://txcoast.beg.utexas.edu/thscmp/>). You will need the following profile information to answer the questions in Part A: BEG02-980428-1020 and BEG02-980916-0830. For Part B, you will need BEG02-981022-0852 and another BEG02 profile from 2003 or 2004 (your choice).

To calculate the volume, you will need to plot your profiles by hand on graph paper. Remember to make 1 block=1 meter on the X-axis but 1block=0.1 meter on the Y-axis. Plot all the XZ points for one of the dates then draw a line connecting them. Use a different colored pencil for each different profile. Be sure to add a legend so you can identify the different profiles. Label the significant profile features using the notes provided and answer the questions below.

**CRITICAL THINKING QUESTIONS**Part A

1. Dune: What volume of sand has been lost in the dunes? How was the dune system affected following Tropical Storm Frances?

Volume of Sand lost \_\_\_\_\_

BEG02-980428-1020 \_\_\_\_\_

\_\_\_\_\_ BEG02-

980916-0830 \_\_\_\_\_

\_\_\_\_\_

2. Beach: What volume of sand has been lost on the beach? Approximately how far landward has the beach moved?

Volume of Sand lost \_\_\_\_\_

Distance landward \_\_\_\_\_

3. What is the total (dune + beach) volume of sand lost during Tropical Storm Francis?

Volume of Sand lost \_\_\_\_\_

Part B

1. Add the BEG02-981022-0852 profile to your plot. After Tropical Storm Frances, *washover* sand in the picnic area at Galveston Island State Park (BEG02) was bulldozed seaward to form an artificial *foredune* (BEG02-981022-0852 plot). Without considering the new dune system—consider the beach portion of the profile—how much has BEG02 recovered in 1 month (September to October)?

Volume of Sand recovered in 1 month \_\_\_\_\_

2. Add the final BEG02 profile. How much recovery (beach and dune system) has occurred since October 1998? In other words, what volume of sand has been returned to the beach and dune system?

Volume of Sand recovered \_\_\_\_\_

Part C (optional)

Repeat Part A for BEG08 on Follets Island (BEG08-980428-0850 and BEG08-980915-1141). After answering those questions, add BEG08-981022-1104 and a 2003 or 2004 BEG08 profile of your choice.

1. BEG08 on Follets Island is in a natural setting. After Tropical Storm Frances, this area was not manipulated to return *washover* sand to the beach and dune system. How much did the beach and dune recover in 1 month? At the end of your monitoring period?

Volume of Sand recovered in 1 month \_\_\_\_\_

Volume of Sand recovered by time you choose \_\_\_\_\_

2. Excluding the artificial dune at BEG02, how do these two sites compare with one another during this recovery period?

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\*Remember, Frances was only a Tropical Storm. Imagine what would occur during a Category 3 Hurricane (wind speeds from 111 to 130 mph)!