

## MAP ACTIVITY: The Blizzard of '93

name: \_\_\_\_\_

Organized storm systems, called **mid-latitude cyclones**, or **low pressure systems**, move across the United States several times each year. Although many are weak disturbances that draw little attention, some, such as the March 1993 system, become legendary. This Blizzard of '93 brought the Eastern United States to a standstill, dumping several inches of snow throughout the region from Mississippi to Maine, halting transportation, and denying electricity to thousands of homes and businesses. The storm also generated tornadoes and record amounts of lightning in the southeastern United States. By some estimates, the death toll related to the storm was over 270. **IMPORTANT:** If you missed class this day, go to Benson's website and watch the PenCast and PowerPoint presentation.

**Procedures ...** You will need colored pencils: blue, red, green, orange, purple

1. **SNOW . . .** The map in this handout shows snowfall accumulations at various locations from March 12-14. On the map draw lines connecting places where the total snowfall was probably 20 inches. Do the same for 30 and 10 inches.
2. **PRESSURE & PATH of the STORM . . .** Use the list of locations of the storm's center that follows. On the map of snowfall totals, plot the center of the storm by placing a bright red "L" with the date/time for each position within the period. For example the fourth "L" would be labeled 13-1p because that is where the center of the storm was on March 13th at 1 p.m. The first position, located below the map, is done for you (12-7p).

Day & Time	Latitude	Longitude	Pressure
March 12 at 7 pm	28.2 N	89.0 W	989 mb
March 12 at 11 pm	30.0 N	86.2 W	983 mb
March 13 at 7 am	32.0 N	83.0 W	973 mb
March 13 at 1 pm	35.5 N	78.5 W	966 mb
March 13 at 7 pm	38.7 N	75.8 W	960 mb
March 13 at 11 pm	40.9 N	74.3 W	962 mb
March 14 at 7 am	45.0 N	68.1 W	965 mb

3. **FRONTS & STORM CENTER:** Place an "L" in the middle of the South Carolina/Georgia border. Put a penny-sized circle around it. Draw a blue cold front extending southward through Florida to the "Z" beneath the map. Draw a red warm front from the "L" that you drew on the SC/GA border to the "X" that is located to the right of the map. The cold front should be headed eastward, and the warm front headed northward.
4. **SQUALL LINE:** A "squall line" is a line of thunderstorms that forms in front of advancing cold air. Make a heavy purple dashed line on the map to indicate the probable location of the squall line based on the position of the fronts that you just drew onto the map.
5. **COLD & WARM AIR:** Use a blue pencil to shade the area where there was cold air at the surface, and a red one to shade the area where air at the surface was warm. The entire map will be colored in.
6. **WIND:** Use a green pencil to color in ALL of the arrows on the map to show wind directions at the time the storm was centered over the GA/SC border.
7. **STORM SURGE:** A storm surge is caused by strong steady winds pushing water toward the coast. Surges can cause beach erosion, flooding, and damage to boats and docks. Use an orange pencil to highlight the coastline that would have been experiencing the strongest storm surge as the storm was centered over the GA/SC border.
8. Answer the questions on back of this sheet.

\*Use sentences.

1. According to the data table on page one of this handout, at what time and date was the pressure in the storm's center lowest?

2. What was happening along the two fronts? Circle one.

The cold air was forced up and over the warm air.

The warm air was forced up and over the cold air.

3. Which front forced the air upward more abruptly? (See diagrams on pages 556-557 for help.)

4. How does the upward movement of air contribute to cloud formation? Circle one.

It compresses the air.

It allows the air to expand.

5. The storm caused numerous tornadoes in Florida, and established new records for lightning strikes, causing **5,100 flashes during one hour** on March 13. Which front was responsible for the tornadoes and lightning . . . the warm front, or the cold front?

6. Which front was responsible for the snowfall?

7. The death toll related to this storm was over 250. List three ways that a storm system such as this may cause people to die. NOTE: You won't starve to death in 3 days.

8. Use page 430 of your text to locate the position of the warm ocean current called the Gulf Stream. What did this warm current add to the storm system to increase snowfall amounts?

9. \*Why do low-pressure systems near coastal areas typically cause more precipitation than those centered over states such as Montana?

10. Compare your snowfall map to a map of the USA. What landform is located in the area of heavy snowfall?

11. \*How would this landform have contributed to the formation of clouds and snow? Hint: What do mountains force air to do?

12. At the time the system was centered over the GA/SC border, what was the wind direction at each of the following locations? **Winds are named by where they are coming from.**

Northern Florida

Northern Alabama

North Carolina

13. Look at the locations of the storm center that you plotted on your map (the "L's"). Which of these had the most influence on the path of the storm? Circle one.

the Gulf Stream

the Jet Stream

the Trade Winds

Read the section in your book titled, "Mid-Latitude Cyclones". (starts on p. 558).

14. \* Look at the maps and diagrams on page 558. In diagram C, it says "Cyclonic Circulation Established". Explain what "cyclonic" means IN YOUR OWN WORDS.

15. \*Look at the diagrams on page 558. Explain what happens to the relationship between the cold front and warm front as the storm moves from the middle of the country to the east coast.

16. \*Look at the map on page 559. Notice lines G-F and E-A, which correspond to diagrams above and below the map. What is the weather like at point C?

17. \*What would be the forecast for point C?

18. Which location on the map is most likely experiencing thunderstorms? Circle one, and then explain why.

A      B      C      D      E      F      G

19. \*Explain what an "occlusion" is.

20. Read the section titled "Occlusion: The beginning of the End" on page 559. Think about what you've read and explain what is meant by the next-to-last sentence, which states, "At this point, the cyclone has exhausted its source of energy." You must use the word moisture in your answer. (No help from your teacher on this one!)

