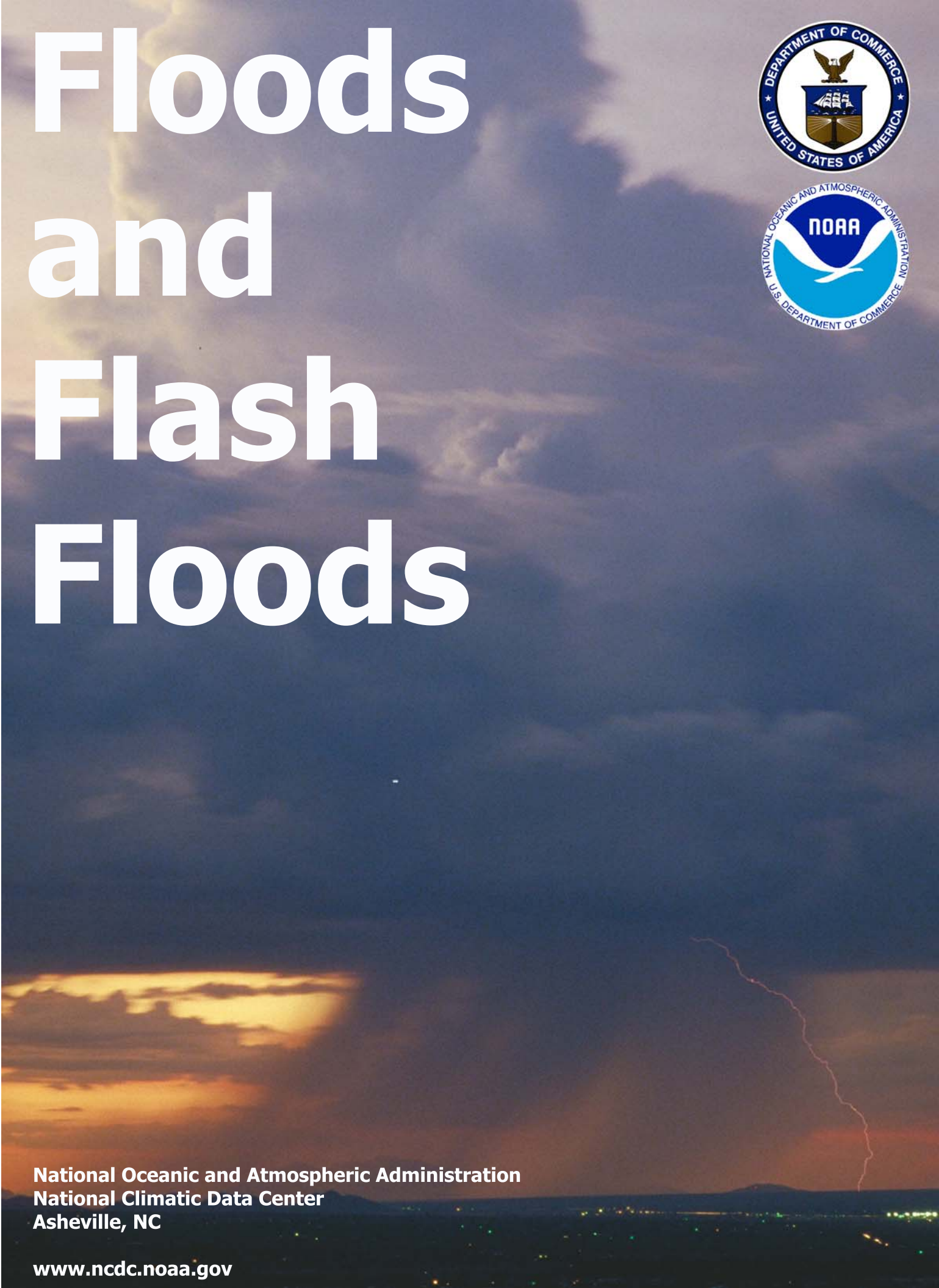
Floods and Flash Floods

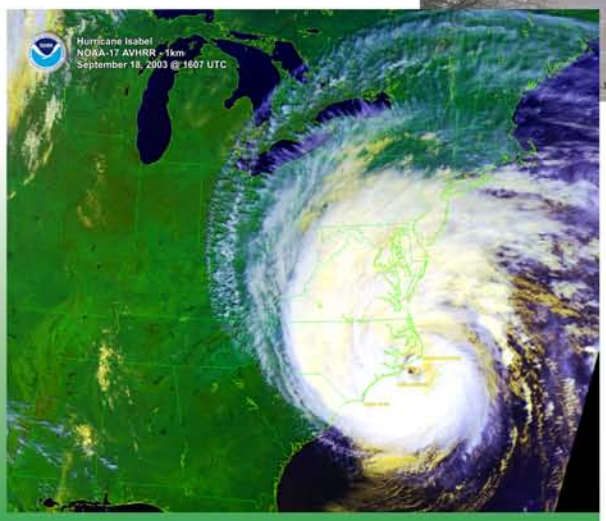


National Oceanic and Atmospheric Administration
National Climatic Data Center
Asheville, NC

www.ncdc.noaa.gov

NORTH CAROLINA FLOODS

Hurricane Isabel made landfall early in the afternoon on September 18, 2003 as a category two hurricane across Core Banks in extreme eastern Carteret county. Isabel moved north northwest near 20 mph across eastern North Carolina during the afternoon. Areas mainly near and east of the storm center experienced significant wind and storm surge effects. Major ocean overwash and beach erosion occurred along the North Carolina Outer Banks where waves up to 20 feet accompanied a 6 to 8 foot storm surge. Almost 350 million dollars in damage occurred in Dare county alone where several thousand homes and businesses, several piers, and sections of Highway 12 were damaged or washed away. Eastern Carteret, eastern Pamlico, southern Craven, Beaufort, and Hyde counties experienced significant storm surge damage with hundreds of homes flooded in most of these counties. The highest storm surges were experienced in the lower reaches of the Neuse River where water levels rose to as high as 10.5 feet at the mouth of Adams Creek. Storm surge values ranged from 6 to 10 feet across eastern Pamlico county with the highest water levels recorded near Oriental. A 4 to 7 foot storm surge occurred across Core Sound in eastern Carteret county, except water levels rose between 8 and 10 feet along the South River and Big Creek. Storm surge values were around 7 feet in portions of Beaufort county in Washington, and Belhaven. Virtually every business on Main Street in Belhaven was flooded with 2 to 3 feet of water. Storm surges from 2 to 6 feet occurred across Hyde county with the highest water levels recorded in Swan Quarter in the southwest part of the county where hundreds of homes and businesses flooded. Wind damage was more significant across Hyde, Washington, Tyrell, Martin, and the Outer Banks counties where wind gusts of around 100 mph occurred. Hurricane force winds resulted in structural damage to homes. Numerous trees and power lines were downed across these areas resulting in a loss of electricity for several weeks in some locations. Hurricane force winds were also experienced in parts of the inland counties of Jones, Craven, and Pitt counties during the afternoon of September 18th where inland hurricane wind warnings had been in effect for 11 hours. Other counties west of the center of the storm experienced wind gusts between 60 and 65 mph.



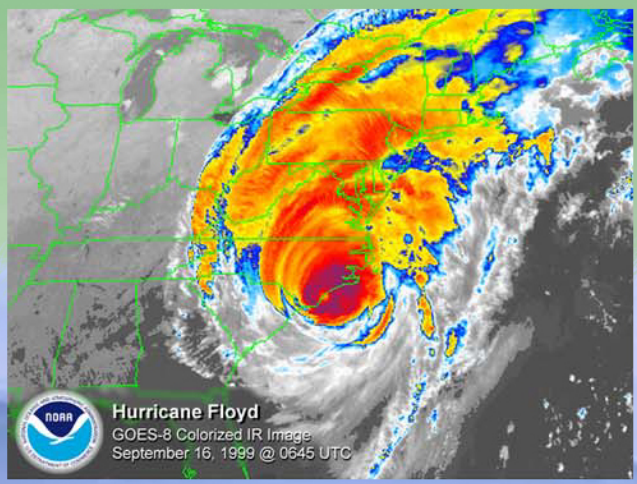
A classic severe urban flash flood caused extensive damage in Hickory, NC, late on a Saturday afternoon in August. Four to six inches of rain fell in little more than an hour in the midst of one of the worst droughts known in the region. Another form of classic flash flooding occurs in mountainous or hilly terrain. Excessive rainfall causes rapidly moving crests of water to flow quickly downhill. When the wall of water is high, just about everything in its path can be taken away. In recent years, flash flooding of this type has affected parts of North Carolina in the Laurel Creek area of Madison county, the Hickory Nut Gorge area near Bat Cave and Lake Lure, and streams flowing out of the mountains in Caldwell county.

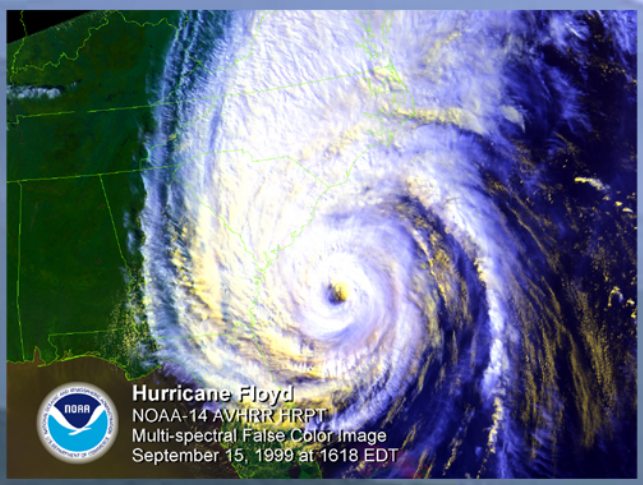
Severe damage can also result from general flooding. In January 1998, the North Carolina mountains suffered widespread damage from flooding of many mountain streams when an exceptionally heavy and prolonged rain storm combined with snow melt. The flooding was so severe in parts of Avery and Mitchell counties, that the North Carolina Division of Emergency Management operated a command post for several weeks.

Flooding and flash flooding is most often associated with thunderstorms, both non-severe and severe. Even in cases when the rainfall is prolonged, thunderstorms are usually embedded in the general rain.

There are several key points to remember...

Do not drive into flooded roadways or across flooded bridges. Most flood fatalities are associated with vehicles. Do not allow children to play near flooded streams or drainage ditches. Many deaths happen for that reason. Take a weather radio when camping. Many camp sites near streams, especially in high terrain are prone to rapid water rises. If you hear persistent thunder, even when it is not raining where you are, the stream can rise quickly to flash flood.





Activity:

Flood Numbers

Content Area/Course:

Earth/Environmental Science

Grade Level:

6-8

COMPETENCY GOAL

Indicators:

To study the earth including the introduction of such concepts as temperature, the water cycle, gravitation, states of matter, chemical concentration, and energy transfer.

Project 2061 Benchmarks:

The cycling of water in and out of the atmosphere plays an important role in determining climatic patterns. Water evaporates from the surface of the earth, rises and cools, condenses into rain or snow, and falls again to the surface. The water falling on land collects in rivers and lakes, soil, and porous layers of rock, and much of it flows back into the ocean.

Upon completing this investigation, the student should be able to:

(1) Set up and solve problems involving area, volume, and speed.
(2) Convert quantities to their equivalent in different units.
(3) Describe in familiar terms large quantities such as billion gallons of water.

Introduction:

Although technically not severe weather, flooding and flash flooding are weather hazards deserving of special preparedness. That is because flooding often kills more people than lightning, tornadoes, and severe thunderstorms.

Flash flooding happens quickly when excessive rainfall results from high rainfall rates over a short amount of time. Flash flooding affects any part of the state, and urban areas are especially prone to severe urban flooding, when slow moving or repeating thunderstorms dump large amounts of rain quickly.

Activity:

1. At Davenport, Iowa, the Mississippi River was 2,200 feet wide during the flood and the cross section of the river was 40,000 square feet. What was the average depth of the river there at flood time?
2. Knowing the width and average depth of the river from the previous question, construct on paper a scaled drawing of the river's cross section. Use the same scale for both horizontal and vertical dimensions. Do this by setting the average depth as being equal to one inch.
3. The water was flowing past Davenport at 3.25 feet per second. How many cubic feet of water were flowing past Davenport every second?
4. How many cubic feet passed by in one day?
5. Given that one cubic foot of water equals approximately 7.5 gallons, how many gallons of water were flowing past Davenport per second?
6. How many gallons passed by in one day?
7. River flow is often measured in billions of gallons per day (BGD). What was the BGD flow at Davenport?
8. Imagine you are a graphic artist for a newspaper illustrating a story about the flood. You are told to come up with some way to show how much water is flowing past Davenport each day. One way to do it is to think in terms of football fields, since the football field is a "standard" measurement of area for many. How many football fields would the water cover 10 feet deep? (A football field is about one acre, and one acre is 43,560 square feet.) Can you come up with some other commonly used measure? How many times would the water fill your classroom? The whole school (obtaining the volume of the entire school would be a good class project)?

Answer Key:

1. 18.18 feet
2. Cross-section dimensions: 1" high by 121" wide
3. 130,000 cubic feet per second
4. 11,232,000,000 cubic feet per day
5. 975,000 gallons per second
6. 84,240,000,000 gallons per day
7. 84.24 BGD
8. 25,785 football fields