

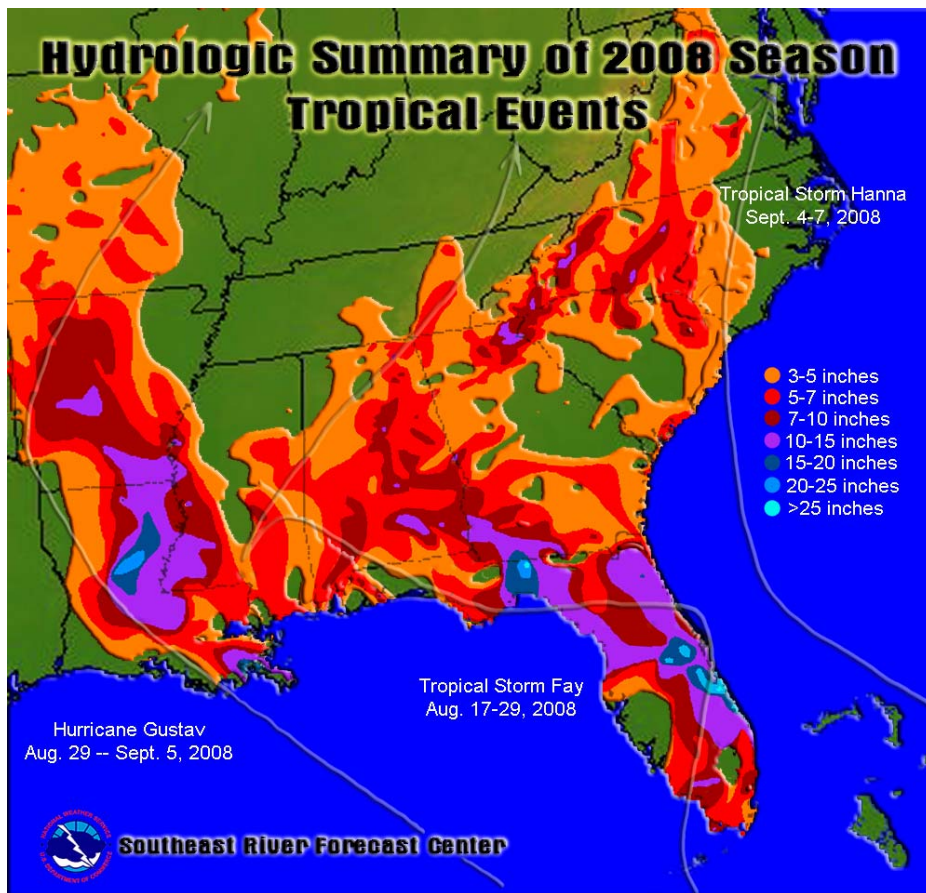


**Critical Issue: Tropical Season Review 2008
Impact on Southeast U.S. Water Resources**

Issued: December 18, 2008

Summary:

- A normal number of inland-moving tropical systems impacted the region.
- T.S. Fay brought record rain and floods to parts of Florida.
- Tropical rainfall resulted in significant hydrologic recharge over much of Florida, Alabama, southern Georgia, and central sections of North and South Carolina.
- Some severely drought-impacted areas, including North Georgia, western North and South Carolina, and west central Florida, near Tampa, saw limited or no significant hydrologic recharge this season.



There are several distinct times of the year when “typical” rainfall patterns provide an opportunity for the recharge of key water resources.

The primary climatologically-based recharge period (with the exception of the Florida peninsula) is the winter and early spring months. Secondary periods include the tropical season and a small secondary window of severe weather in the fall.

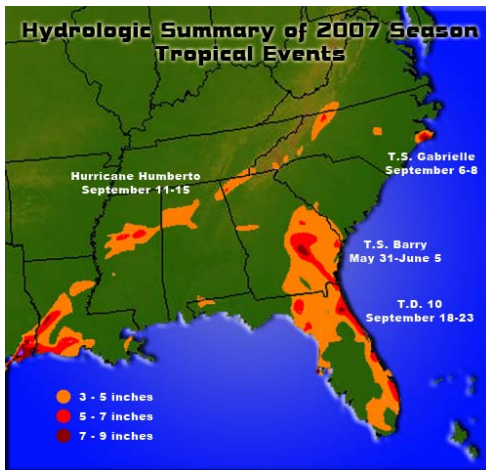
Tropical season, from June 1st through November 30th, is potentially a time for soil and reservoir recharge. Most tropical systems arrive in the late summer and early fall, which otherwise tends to be a relatively dry time of the year.

Recharge from tropical systems can be “hit or miss.” While some areas may receive extensive rainfall, other nearby areas can remain completely dry. Rainfall will also vary between tropical seasons. Some seasons have been extremely wet (2004 and 2005), while other seasons had little if any tropical activity moving across the Southeast U.S. (2006 and 2007). This reduction of inland-moving tropical activity in 2006 and 2007 aggravated overall drought conditions.

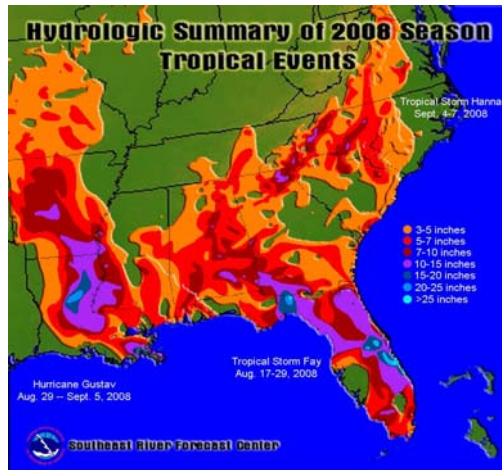
Tropical rainfall is generally more reliable over Florida, Southeast Georgia, and the eastern Carolinas than areas north, including North Georgia and the western Carolinas.

It is also important to note that very weak tropical storms or even “tropical-like” systems can play just as important a role as strong hurricanes. Plumes of tropical moisture, often not even associated with a formally-established tropical system, can produce as much or more rain than a strong hurricane.

Tropical Season 2007



Tropical Season 2008

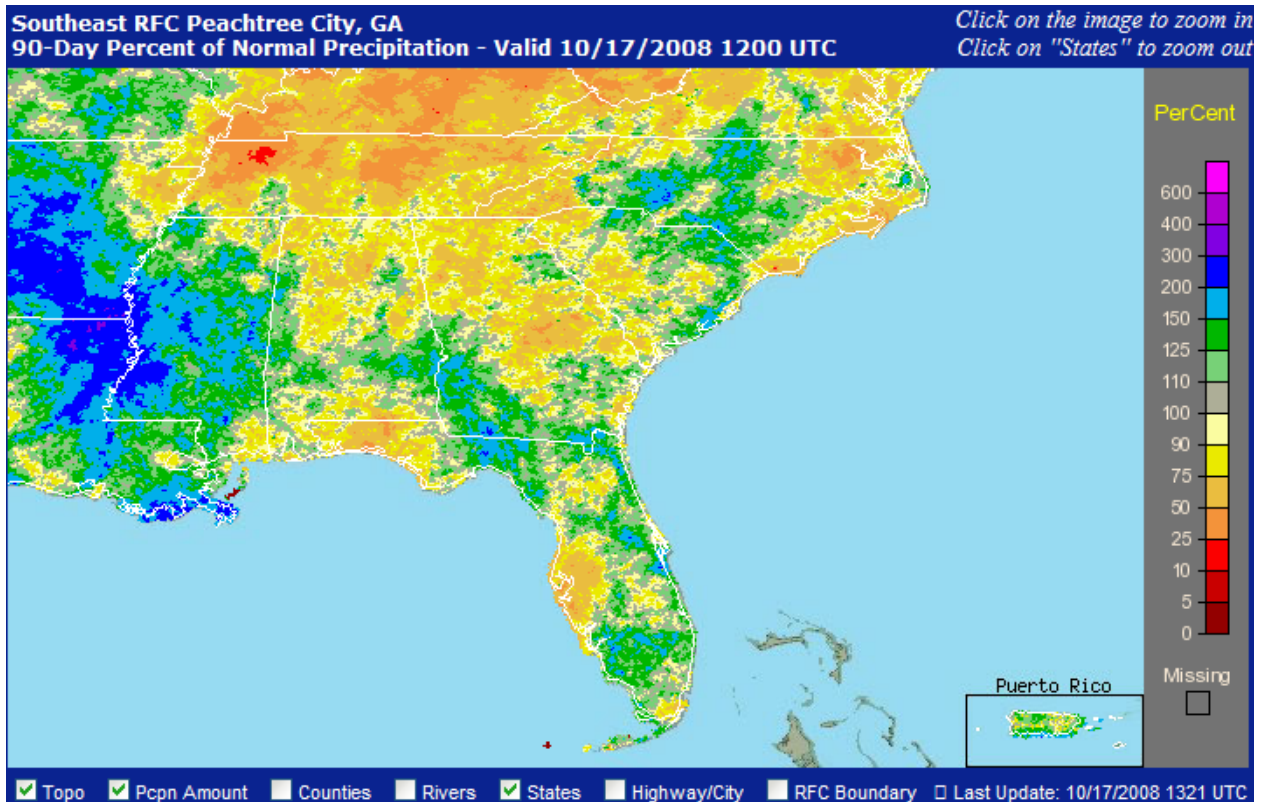


Let’s take a look at hydrologic aspects of the 2008 tropical season.

Nine tropical systems made landfall in or within 100 miles of the U.S. this past season. Four of these systems impacted the SERFC’s area of concern, the same number as in 2007.

While the Southeast U.S. saw the same number of inland-moving systems in 2008 as in 2007, there were significant differences. The areal coverage of tropical rainfall in 2008 was significantly greater than 2007. In fact, significant tropical rainfall (of three inches or more) impacted about four times more area in 2008 than in 2007.

The well-below-normal 2007 tropical season (at least as measured by areal precipitation coverage) did not play a significant role in drought relief, with the exception of T.S. Barry. In 2008, tropical rainfall did play a significant role in the recharge of water resources and drought relief over extensive areas of the Southeast U.S.



The above image shows the percent of normal rainfall during the tropical season. Areas of green and blue show above-normal rainfall, while red and yellow areas indicate below-normal rainfall. The areas in green and blue generally received rainfall that helped recharge water resources.

2008 Tropical Events Making U.S. Landfall (Within 100 Miles)

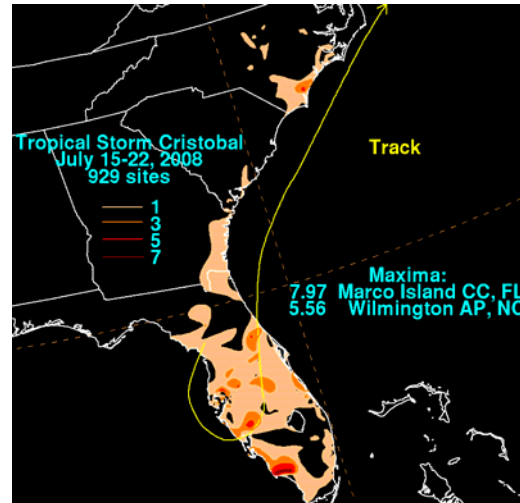
Event	Date	Primary Hydrologic Impact (SERFC Only)	Maximum Rainfall
T.S. Cristobal	July 19 – 23	Florida, coastal Georgia and N.C.	7.97 Marco Island, Fla. 5.56 Wilmington, N.C.
Hurricane Dolly	July 20 – 24	n/a	15.00 Harligen, Tex.
T.S. Edouard	August 3 – 5	n/a	6.11 Hamilton, Tex.
T.S. Fay	August 15 – 24	Major and record flooding Florida	27.65 Melbourne, Fla.
Hurricane Gustav	August 25 – Sept. 2	n/a	21.00 Larto Lake, La.
Tropical Storm Hanna	August 28 – September 7	Flash flooding Puerto Rico, Flooding North Carolina	16.19 Adjuntas, P.R. 9.55 Woodbridge, Va.
Hurricane Ike	September 1 – 14	n/a	15.75 Houston, Tex.
Hurricane Kyle	September 25 – 29	Flash Flooding Puerto Rico	30.47 Patillis, P.R.
Hurricane Omar	October 13 – 18	n/a	

2008 Tropical Events Making U.S. Landfall (Within 100 Miles)

Area Storms	RFC HSA	Events	Total Percent
Southeast	SERFC	4	44.5%
West Gulf	WGRFC	3	33.3%
Central Gulf	LMRFC	1	11.1%
Northeast	NERFC	1	11.1%

T.S. Cristobal

Cristobal was the third named storm of the season and formed off the Southeast U.S. Coast along a trough of low pressure. Cristobal remained offshore, passing just east of Cape Hatteras. Parts of central Florida and coastal areas of Georgia and North Carolina received moderate rainfall in the 1- to 3-inch range. A small area near Wilmington, North Carolina, received heavier rainfall amounts. Wilmington reported 5.56 inches of rain.



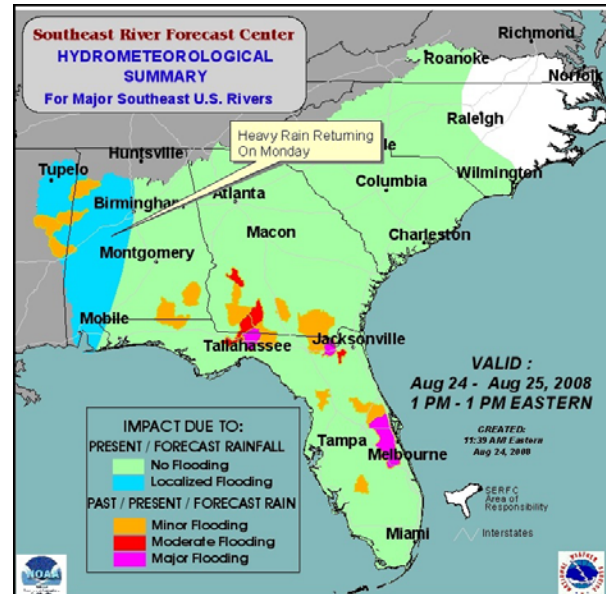
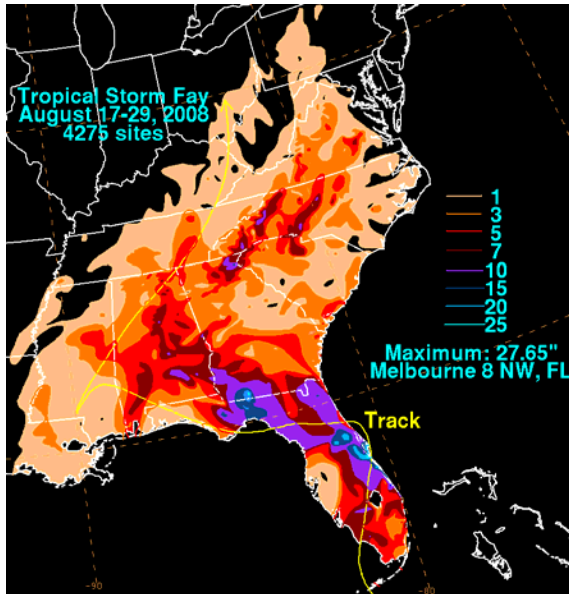
T.S. Christobal Hydrologic Impacts:

- Moderate coastal rainfall with pooling of water and temporary flooding of poorly-drained locations
- No mainstem river flooding

T.S. Fay

Tropical Storm Fay was, by far, the most extensive and most severe flood event over the SERFC's area during the 2008 tropical season. Fay was the sixth named storm and zigzagged across the state of Florida four times, a record.

Fay produced copious amounts of rain from east central Florida near Melbourne (Kennedy Space Center region) into the Florida Panhandle. Major-to-record flooding was reported over the St. Johns River basin, northeast of Orlando, and again over the Florida Panhandle near Tallahassee.



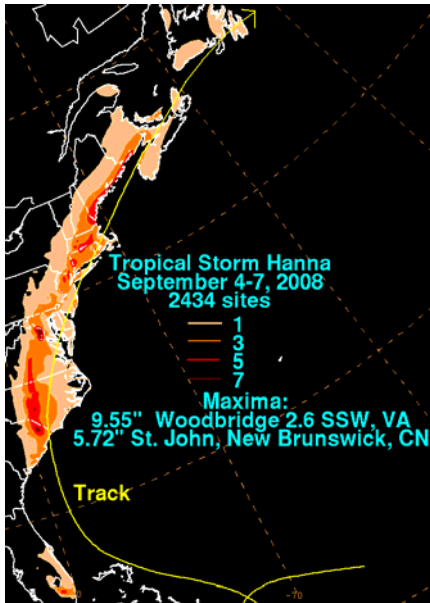
Melbourne received the most rainfall, reporting an amazing 27.65 inches. The areas indicated in purple near Melbourne, Jacksonville, and Tallahassee, experienced the most severe flooding.

T.S. Fay Hydrologic Impacts:

- Major-to-record flooding along the St. Johns River.
- Moderate-to-major flooding on Black Creek and along the St. Marks and St. Marys Rivers.

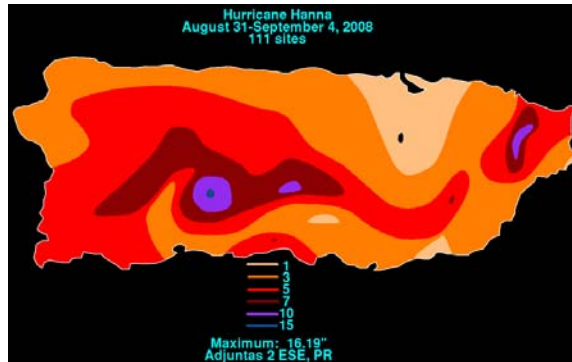
Tropical Storm Hanna

Hanna impacted two parts of the SERFC's area, Puerto Rico and parts of the Carolinas. At least 536 deaths were reported, mostly due to flooding in the northern part of Haiti, making it the deadliest tropical cyclone in the Atlantic basin since Hurricane Stan in 2005 and the deadliest storm of the 2008 season.



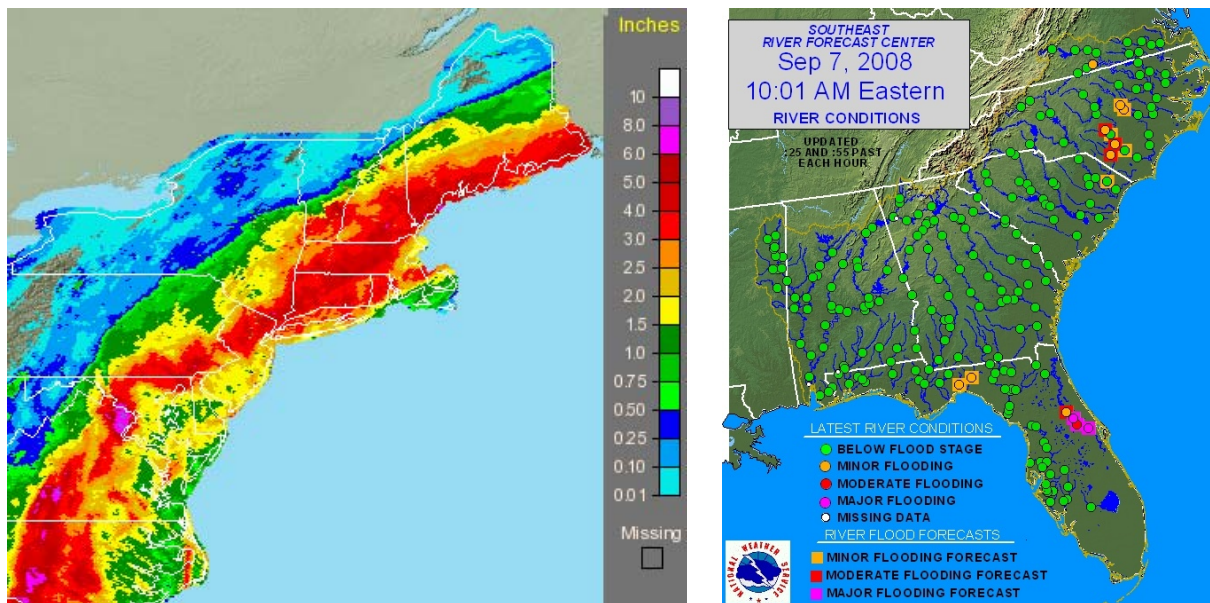
The image to the left shows the track of heavy rainfall associated with Hanna. Heavy rain extended from the central portion of North Carolina into New England.

Heavy rainfall from T.S. Hanna produced minor-to-moderate flooding along the Neuse and Cape Fear River basins.

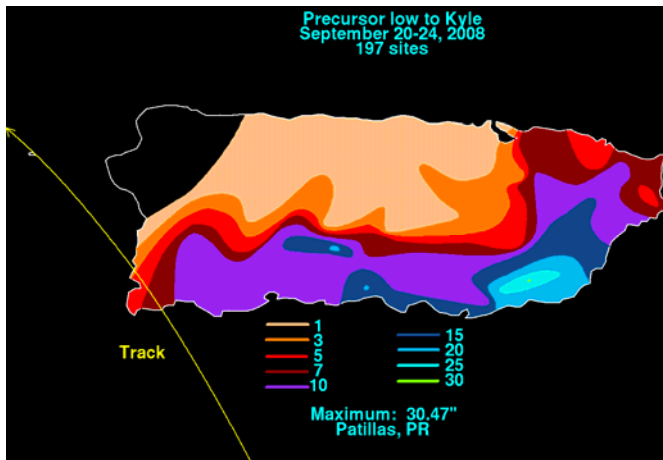


T.S. Hannah Hydrologic Impacts:

- Minor-to-moderate mainstem river flooding along portions of the Neuse and Cape Fear River basins of central North Carolina.



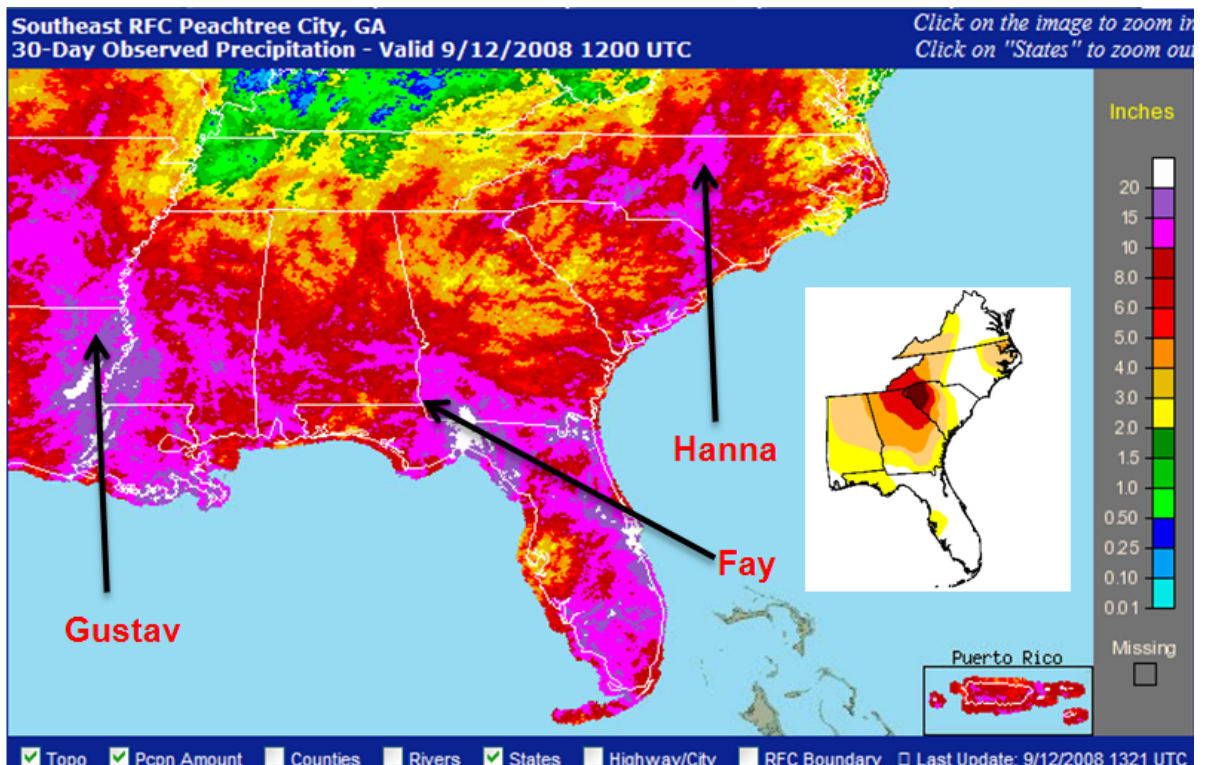
Precursor to Tropical Storm Kyle



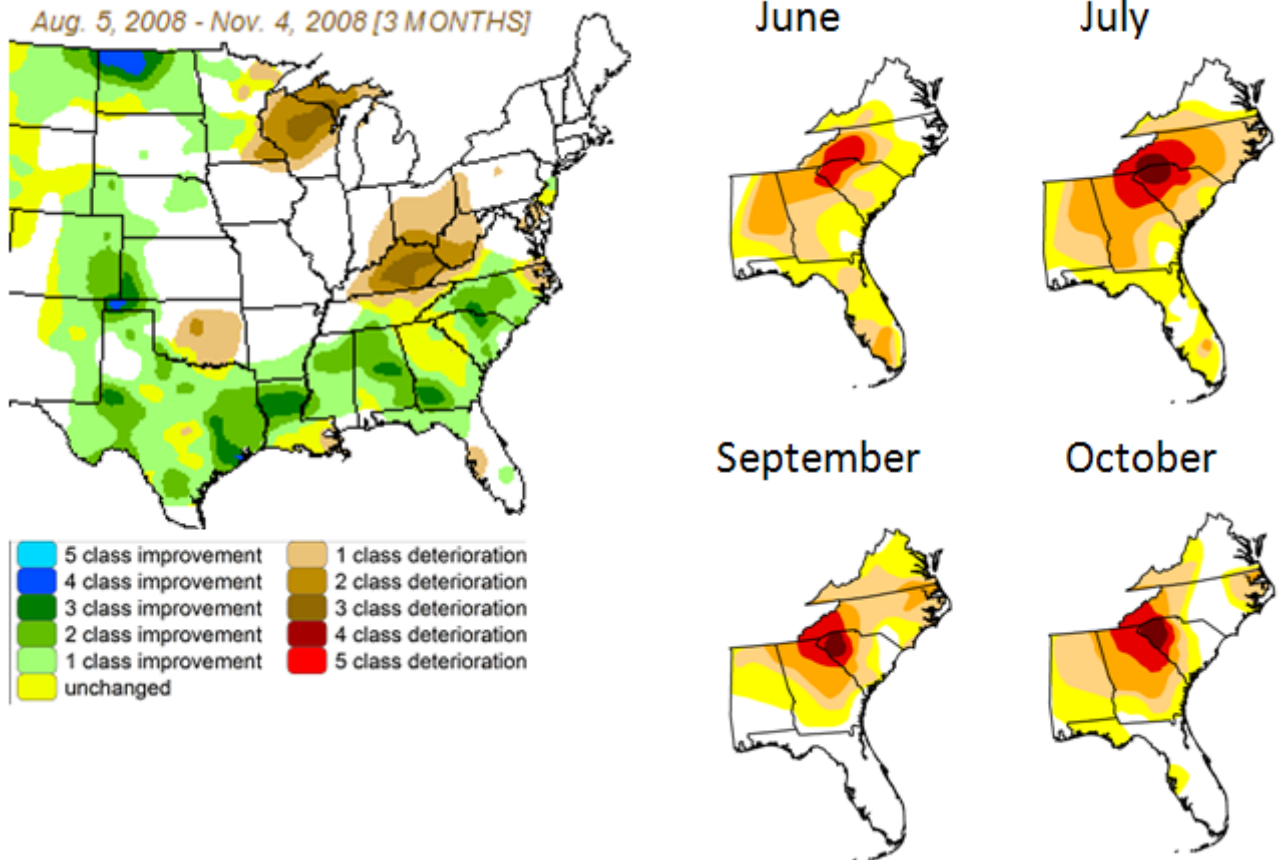
Overall Impact on Water Resources

Much of the Southeast U.S. had been in the midst of a severe multi-year drought prior to the 2008 hurricane season.

The following chart captures the majority of the rainfall for Gustav, Hannah, and Fay. Areas in red and purple indicate significant rainfall and overall water resources recharge. Unfortunately, as depicted by the U.S. Drought Monitor, the majority of rainfall moved south, east, and west of the hardest-hit drought areas.



The following images show changes to the U.S. Drought Monitor throughout the tropical season. The summary graph indicates improvement or deterioration over the 3-month period. Areas of green indicate improvement, while yellow shows unchanged conditions.



Summary: A normal number of inland-moving tropical rainfall systems brought floods and hydrologic recharge to portions of the Southeast U.S. Tropical rainfall significantly improved rainfall deficits over much of Florida (except around Tampa), a large part of Alabama, and central parts of North and South Carolina and Virginia. T.S. Fay resulted in major and record floods across parts of Florida. Unfortunately, most of this tropical rainfall skirted around the hardest-hit drought areas of Northeast Alabama, North Georgia, and Western North and South Carolina.

SERFC Water Watch Team