

# Floyd in Retrospect

John H. Tibbetts

*The text below is comprised of sections from the article “Floyd Follies: What We’ve Learned” published in Coastal Heritage Magazine, Volume 17, number 1, in 2002. It highlights improvements made to South Carolina’s emergency preparedness after Hurricane Floyd exposed serious flaws in the former evacuation plan. Given the similar revelation of recent failures in the evacuation plans of New Orleans and Houston, the editors felt this piece warranted a second look. New research is being done on best practices in emergency evacuation management (see Lessons from Katrina and Rita—<http://www.vtpi.org/katrina.pdf>), and planners may want to fit some of the recommendations described in this article into the context of 2005. In addition, the article highlights the behavior tendencies of key targets for emergency response planners. This information can help shape the way in which evacuation plans address the issues and concerns of these varied stakeholders. Words in brackets have been added by the author for clarification purposes.*

Emergency officials are always searching for glitches in their disaster plans. Drills are rarely sufficient. Sooner or later, planners must experience the real thing—the major disaster—to find the inevitable kinks in their systems. And that’s what [Hurricane] Floyd did [in September 1999]: it exposed some flaws in hurricane preparedness that the state is working to fix.

For many evacuees, the most glaring flaw was a lack of reversed lanes on major highways. Since Floyd, the S.C. Department of Public Safety has developed workable lane reversals for I-26 between Charleston and Columbia, U.S. 17 south in Georgetown County, and U.S. 278 in Beaufort County. If a giant storm threatens South Carolina anytime soon, the governor would probably reverse lanes of I-26 and perhaps other highways, experts say. Each state from Texas to North Carolina, moreover, plans to reverse at least one road in case of a major storm.

South Carolina emergency personnel and law-enforcement agencies also now have better communications tools, with improved two-way radio equipment and

coordination among agencies. “We’ll be able to talk to who we need to, when we need to,” says [Lt. Col.] Stubblefield [of the South Carolina Highway Patrol].

The state has expanded its traffic-monitoring capabilities with 34 closed-circuit television cameras on hurricane routes, aircraft, and automated speed detectors. Traffic information will be relayed to the state emergency operations center. From there, emergency managers can send messages via cell phone to solar-powered highway signs, which guide evacuees to less congested routes, according to Dick Jenkins, an engineer with the S.C. Department of Transportation. The state will roll out portable roadside radio transmitters that provide detailed traffic information.

The idea is “to keep people moving,” says Stubblefield, “so they are able to get on and off the interstate at will, to find food and refuge, rather than being stacked up.”

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Next time, federal traffic experts will monitor any multi-state evacuation. A special team led by federal highway officials will gather at FEMA's Atlanta regional headquarters to coordinate information during a major storm that sends people scurrying across multiple state lines. In the past, "federal highway officials were not major players in hurricane evacuation planning, but that situation has improved dramatically," says [Jay] Baker, [a Florida State University geographer who studies evacuations].

The team will employ a Web-based program called the Evacuation Traffic Information System (ETIS), which relies on built-in data from hurricane evacuation studies and real-time information from states and counties on tourism occupancy, traffic counts, evacuation participation rates, and other data. The program, displaying information on an interactive map, predicts traffic volumes across a multi-state region. Hurricane program managers at state emergency-operations centers will view the map at the same time. Thus, if there is a huge northward movement of people from Florida and Georgia next time, South Carolina will have early warning.

Southeastern states have conducted two major exercises to test the ETIS program. The system, says Lewis, seemed to work well, though "we've not had a major hurricane requiring a big evacuation during the past two years, so it hasn't been tested in real time."

When each hurricane season begins on June 1, the S.C. Emergency Management Division disseminates 500,000 evacuation maps, offering route guidance for each coastal region. In a voluntary evacuation, travelers can take any road they wish. But once the governor announces a mandatory evacuation, law enforcement will likely guide many travelers to pre-determined routes. "We put a lot of effort into making sure that we can maintain traffic flow, as much as we possibly can, on the routes we've determined to be evacuation routes," says Stubblefield. "If people deviate from those routes—if

they know short cuts or they think have a better way—they'll run into a (traffic) problem. Please use the routes that we've designated unless you're told otherwise through public information that we provide."

Not every state vulnerable to hurricanes learned lessons from Floyd. "There are states where evacuees are on their own," where people receive little guidance from government about the best routes to take, says Lewis. "Then there are other states that are really getting their acts together." South Carolina is one of the latter. Lewis says, "There is no state that has better preparation for hurricane evacuations."

For an evacuation to work smoothly, emergency managers must do their jobs efficiently, citizens must heed evacuation orders promptly, and the hurricane must stay offshore long enough to allow people to escape.

Government, however, can't evacuate the entire South Carolina coastline as quickly as many would like. An estimated 64 percent of South Carolina's coastal residents—591,000 to 673,000 people—left their homes during Floyd over two days, according to a study by the University of South Carolina Hazards Research Lab. "When you're trying to move as many people as we're trying to move, there will be some delays," says William Winn, emergency manager for Beaufort County. "If people want to avoid those delays, they need to leave earlier. If everybody tries to get on the road at the same time, we're going to have problems."

Too many people squeezing onto too few roads—there's the rub. Each year, thousands of new residents migrate to the South Carolina coast, but our highway systems can't keep pace. Horry County's population swelled by 37 percent in the 1990s, Beaufort County by 40 percent, and the Charleston metropolitan area by eight percent. And tourism in the coastal plain is flourishing. The Grand Strand alone routinely attracts 400,000 tourists on summer weekends and up to a half-million on Labor Day weekend.

“Coastal population growth is outstripping the transportation network’s capacity to efficiently handle all the traffic,” says [Jon] Boettcher [of the S.C. Emergency Management Division]. “Traffic engineers are constantly looking for new routes, better ways to do things, better ways to gather evacuation information. But the road infrastructure just isn’t there.”

The number of vehicles on the road during evacuations has grown even faster than the coastal population. During Floyd, about 25 percent of households from the Charleston area evacuated in more than one vehicle. “One of the reasons that the roads were so clogged was because people were taking more than one car,” says Susan L. Cutter, a geographer at the University of South Carolina who studies evacuation behavior. Many families also hauled boats or recreational vehicles, adding to congestion. “People were evacuating as a household unit, but they were traveling in separate cars and communicating by cell phone, doing it in a caravan.”

### **Leave Early!**

The best evacuation plan in the world, experts say, won’t work if citizens fail to leave dangerous places early.

If you’re thinking about escaping the coast during the next hurricane, remember one thing: leave before you’re ordered to go. That is, leave early—at least 36 to 48 hours before a major storm’s expected landfall—if you live in a flood-prone house or a mobile home in a coastal area. Leave early if you think your house can’t bear up to hurricane-force winds. Leave early if you have special needs—an elderly relative, for example, who can’t cope with hours stuck in traffic.

It’s important to leave early because tropical cyclones are unpredictable. Hurricane forecasts have become more accurate over the past 30 years due to improved computer models and satellite information. But when the National Hurricane Center forecasters estimate that

a hurricane would strike 24 hours before landfall, they still have an average error of nearly 70 miles. At 48 hours before landfall, they have an average error of almost 130 miles. At 72 hours, they have an error of 200 miles. A hurricane expected to strike a couple hundred miles from your house three days hence could turn and hit you instead.

Forecasting inaccuracies are inevitable, given tropical cyclones’ erratic temperaments. Hurricanes can turn on a dime, loop crazily, and abruptly speed up or slow down. Tropical cyclones can intensify dramatically and suddenly, but scientists still have the greatest difficulty in forecasting storm intensity, says Stacy R. Stewart, a hurricane specialist with the National Hurricane Center. Andrew and Hugo each grew from a category 2 to a category 4 storm in less than 12 hours.

Twenty-four hours before landfall, a hurricane could be a dawdling category 2. Just before it comes ashore, however, it could speed up and intensify to a category 4, driving floodwaters much farther inland than anticipated. People who stay home expecting a relatively mild hurricane could face a massive storm—and then it’d be too late to leave.

An evacuation order must be issued far in advance of a storm eye coming ashore. That way, residents have enough time to travel to a safe location before the arrival of gale-force winds (39 miles per hour). To ensure public safety, emergency planners want everyone off the road 15 to 24 hours before the storm’s eye makes landfall, depending on the storm’s forward speed.

Emergency planners must also factor in a community’s clearance time—the time needed to move all residents and tourists who want to leave to higher ground or safe shelter. During a major hurricane threat, Horry County, for example, requires a clearance time of about 24 hours to evacuate its peak coastal population.

All told, a mandatory evacuation might have to start 48 hours before a major storm strikes a community. Yet vulnerable residents and tourists should leave the coastline during the voluntary evacuation, which precedes the governor's mandatory order.

"If people who are in harm's way wait for a governor's mandatory order to evacuate, then they're missing the boat, it's too late," says Dennis Clark, emergency manager for Charleston County.

Waiting for a mandatory order heightens your risks of getting stuck on the highway network. When Floyd roared up the coastline, thousands of cars heading west and north from Jacksonville, Florida, were still stuck in traffic jams. Floyd, a category 4 hurricane at that time, could have made landfall in northeastern Florida, catching them on the road. At 100 miles per hour—the wind speed of a category 2 hurricane—wind pressures can begin lifting cars, says Baker.

That's the nightmare of every emergency manager in a hurricane-prone area: thousands of evacuees trapped in cars thrown around like toys by high winds.

But leaving early isn't easy. One-third of Charleston-area residents polled by Florida State University researchers reported that someone in their household had to work during the Floyd evacuation, and many said it delayed their departure.

"A lot of employers, during both Hugo and Floyd, told their workers to come in to work that morning, during the voluntary evacuation," says Clark. "They said they would let workers go at mid-day. So you had a lot of folks who were hitting the road when they got off work," and they drove immediately into the worst of the congestion. "Plenty of those people would've already left home ten hours earlier if they'd had the chance."

## Who Should Go?

The largest evacuation in American history was also the largest "over-evacuation," some experts say. Many who ran from Floyd probably did not need to. Meanwhile, many vulnerable people who should have evacuated did not leave.

About one-half of the 3.5 million evacuees in the four-state region were actually ordered to leave, [William] Massey [hurricane program manager for the Federal Emergency Management Agency] points out. Only a narrow strip of Florida's eastern coastline was evacuated under mandatory orders, yet frightened inland dwellers from places like Orlando, a hundred miles from the sea, also fled north. Many upland dwellers in South Carolina left town, although the governor evacuated primarily low-lying areas under a mandatory order.

People who live in solidly built homes on high ground but who relocate anyway are called "shadow" evacuees, in the parlance of emergency managers. Shadow evacuees greatly exacerbated the massive multi-state traffic jam during Floyd, making it more difficult for the most vulnerable people to get out of harm's way.

Yet emergency officials "are not very aggressive about telling people (who live in upland areas in well-built homes) not to evacuate," says Baker. "Maybe they're afraid of being sued." Or maybe they're afraid to have deaths and injuries on their conscience. "What if you tell someone 'Don't leave' and then a tree falls through their house and kills them?" asks Massey.

The South Carolina coast, with its many creeks and rivers, complicates individual evacuation decisions. Under a worst-case scenario during a category 4 storm, some Charleston-area neighborhoods along the rivers 20 miles inland from the coast can face a dangerous storm surge, according to a Jan. 2001 study by the U.S. Army Corps of Engineers. As a storm surge is driven

into a river basin, it can pile up higher and higher as the basin narrows. “A lot of people aren’t aware of how far surge can go inland,” says [Stacy R.] Stewart [a hurricane specialist with the National Hurricane Center]. To learn if you live in a flood-hazard area, contact your insurer or local planning and zoning department.

For now, the Palmetto State has enough roadways to evacuate all coastal residents and tourists, regardless of whether they live or play along the beachfront or in a well-built structure on high ground 30 miles from the shoreline. But can South Carolina’s transportation network keep pace with an ever-growing coastal population? Can the regional transportation highway network cope with population increases along the coast from South Florida to North Carolina?

Floyd’s track, after all, was not so unusual. Hurricanes Bertha and Fran also traveled north up the coast, threatening Florida, then Georgia, then South Carolina, before striking North Carolina. “The only difference is that Bertha and Fran were not very strong storms when they made the pass” up the coast, says Massey. “The Floyd track was a pretty common track if you look at history and climatology.” We should expect and plan for another multi-state evacuation like the one for Floyd, he says.

But the effectiveness of the next major hurricane response will “depend on how quickly people follow the recommendations by state government to evacuate early and along designated routes,” says Stubblefield. “If people wait until the last minute to get on the road network and we have a tremendous number doing that at one time, it’ll be difficult.”

Vacationers with children evacuate earliest of all. “Family vacationers will be gone from the area quickly,” says Paul Whitten, director of public safety for Horry County. “They’ll say, ‘I don’t need this.’” During summer months, hurricane-evacuation routes fill up rapidly with

family tourists heading out of town.

It’s the old-timers, people who have lived on the coast for 10 or more years, who are most resistant to leaving for a hurricane, says Whitten. “You have people on the front beach who will not evacuate.”

Some homeowners in floodprone areas remain stubbornly blind to the risks they face. “Some people want to stay with their homes,” says Stacy R. Stewart, a hurricane specialist with the National Hurricane Center. “They say, ‘I put my life into it.’ Yes, but they may literally put their lives into it.”

## Resources

Visit the Coastal Heritage Magazine web site at [http://www.scseagrant.org/library/library\\_pubs\\_ch.htm](http://www.scseagrant.org/library/library_pubs_ch.htm).