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North Carolina Water Science Center

Podcast

Water Science for a changing world

NCWSC-001: Hurricane Floyd, and the Floods of 1999

The following podcast is a product of the U.S. Geological Survey and the North Carolina Water Science Center.

[Intro audio]: Hurricane audio mix: wind; 1955 news reel; 1999 news monologue and weather alerts. **Dr. Jerad Bales:** "It's important to not become complacent when we don't see those storms because they will occur again."

Ray Douglas: Hurricanes are often associated with high winds and storm-surge. However when they stall, tremendous amounts of rainfall can produce floods of enormous proportion.

Today on our program, Hurricane Floyd, and the floods of 1999. I am Ray Douglas, and this is "Water Science for a changing world".

Dr. Jerad Bales is the current Director of the USGS North Carolina Water Science Center in Raleigh, soon he will be moving to Reston, Virginia to assume the position as USGS Chief Scientist for Hydrology. Dr. Bales thank you for joining us today. Can you provide a little background on the events and conditions leading up to Hurricane Floyd.

Dr. Jerad Bales: Well, ten years ago September sixteenth, eastern North Carolina was effected severely by Hurricane Floyd. After we made sure that our staff were safe and we gathered them in our office in Raleigh, and our staff from Charlotte and Asheville came over to help out. We sent crews out to measure these floods and to collect water-quality samples. But it wasn't just Hurricane Floyd that caused the impacts, it was really three sequential Hurricanes, Dennis, Floyd and Irene. Dennis occurred early in the month, on the fourth and fifth, and Irene was later in October, on about the seventeenth. Before Hurricane Dennis arrived in North Carolina, the State was in a drought, rainfall was about seven inches below normal in Raleigh, it was about thirteen inches below further east in Kinston, which is in the Neuse River Basin. Dennis was kind of an odd hurricane, it circled around in the Atlantic off the outer banks for several days. Eventually it made landfall and it brought quite a bit of rain. It relieved the drought and it brought the rivers up to flood-stage in some cases. Then shortly after that, Hurricane Floyd came to North Carolina, at one time Hurricane Floyd was one of the strongest hurricanes that had been observed in the Atlantic, fortunately it lost some strength before it made landfall, but it was still very devastating to the State.

Douglas: How much rainfall did these storms actually produce, and has North Carolina ever experienced this much storm activity so close together?

Bales: The total rainfall in September and October in eastern North Carolina, in some places as much as three feet of rain fell, that's about eighty-five percent of what we normally get in an entire year and we got that in the months of September and October. There have been a number of other occasions in the past when North Carolina has been effected by three hurricanes close together. In 1955, in September and October, we had three hurricanes in North Carolina and during one of those storms, Onslow county, which is on the coast got fifty inches of rain much

more than we got with Floyd. But the difference between the 1955 and the 1999 storms were that most of the rain in 1955 was right along the coast, but in 1999 the rain covered much of eastern North Carolina from the head of the estuaries into Raleigh or so.

Douglas: Well, which rivers in North Carolina experienced the most flooding and what were some of the measurements from them?

Bales: All of the river basins in eastern North Carolina, everything east of Raleigh, the Tar, the Roanoke, the Neuse, the Cape Fear, they all experienced record flooding from Hurricane Floyd. The floods were, at what we call, the two-tenths of a percent exceedance level. And what that means is that there is a one in five-hundred chance that we will get a flood of that size or bigger in any given year. For example, a one percent exceedance level means that there is a one percent chance in any given year that we have a flood of this magnitude. We used to call that the hundred-year flood but we have tried to move away from that terminology because people have misinterpreted it to mean that once we have flood of that size then we are not going to have another one for a hundred years, but that's really not what we are trying to say. We are just saying that there is a one in one-hundredth chance that we will have that flood in any given year. If we have one this year, there is still a one in one-hundred chance we will have one next year.

Douglas: Well just how long did some of those rivers remain above flood-stage?

Bales: The Neuse river at Goldsboro was above flood-stage for almost the entire months of September and October. The Neuse river at Goldsboro went above flood stage on September fifth, which is when began being effected by Hurricane Dennis, and it didn't go below flood-stage until the end of October.

Douglas: How did that effect your water-quality sampling, and what were some of the results?

Bales: In some cases the high amount of water diluted what we found in the rivers. Pesticide levels in most cases were lower than what we would typically find in normal conditions and that's primarily because there was so much water that it diluted the pesticides.

Douglas: Can you give us some specifics on what was found?

Bales: The amount of Nitrogen that was delivered from the Pamlico Sound from the Neuse river from these floods was about four thousand tons, that's about half of what would get delivered in an entire year and it was delivered in only two months. The amount of water that came down the rivers that flow into Pamlico Sound was of such a volume that it displaced about three quarters of the total volume of Pamlico Sound. So another way to look at that is that by the end of October as much as three quarters of the water in Pamlico Sound was flood water. And these floods did have some effects on the water quality of Pamlico Sound, but it appears that those effects were relatively short lived and were no longer seen after three or four years.

Douglas: Well that's always good to hear. I understand that there were a few other USGS developments during this event. Could you share with us a little about that?

Bales: After these floods USGS recalculated for all of the river basins in eastern North Carolina we recalculated what the one in one hundred chance flood was, or what the one percent flood level was, and there was a big difference in what we thought the one in one hundred chance flood was before the storm and after the storm. Another thing that USGS has done following Hurricane Floyd was to develop flood inundation maps. We worked with the North Carolina Flood Plan Mapping Program and with the National Weather Service to develop maps for portions of the Tar River Basin. And these maps show in great detail what areas would be inundated at a given

river level and at one foot intervals. So at flood-stage we map what's flooded, and at one foot above flood-stage we show what is flooded and so on. And so this information is very useful to local governments, local emergency managers and others in responding to floods. The technology that USGS developed for this flood inundation mapping is now being used statewide across North Carolina and is being implemented by the Weather Service across the country.

Douglas: Dr. Bales, thanks for speaking with us today, any final comments on the current hurricane season for North Carolina?

Bales: Well, the 1990s in North Carolina was marked by a number of hurricanes, some major like Floyd and Fran, and some not so major like Dennis and Bonnie, Bonnie only effected the outer banks primarily. It's important to measure the floods, it's important to document them for several reasons. One is just for scientific information, another reason to document these floods is to provide information that helps in future management decisions. Recently, in the last six or eight years, North Carolina has been spared the impact of hurricanes, and that's a good thing, but it's important to not become complacent when we don't see those storms because they will occur again.

Douglas: We've been speaking with Dr. Jared Bales, current Director of the USGS North Carolina Water Science Center. For more information on Hurricane Floyd and USGS Inundation maps, visit us on the web at nc.water.usgs.gov.

[Close Audio]: Hurricane audio mix.

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