



Losses Avoided from Hurricane Matthew in North Carolina

This study examines losses avoided in the State of North Carolina as a result of previous hazard mitigation projects. A large number of the projects were property acquisition and demolition in this analysis. The data clearly show that substantially more damage would have occurred if these properties had not been acquired.

Hurricane Matthew hit North Carolina in early October 2016. A Federal Disaster was declared on October 4, 2016. According to the latest estimate from the North Carolina Department of Public Safety, Hurricane Matthew-related flooding has impacted more than 100,000 structures in the State valued at \$1.5 billion. To date, there have been 2,336 water rescues and 26 storm-related deaths in the State of North Carolina.

In eastern North Carolina, local governments issued mandatory evacuations, and as of October 16, 2016, there were 2,179 State residents in 32 shelters run by the State. In Lenoir County, 200 people were in the two County shelters, and County officials are working to find temporary homes for residents. National Guard reservists, State Highway Patrol, and Coast Guard members are standing ready throughout the County to assist residents. In the City of Kinston, NC (located in Lenoir County), approximately 1,000 structures have been affected by flooding from Hurricane Matthew. Preliminary estimates indicate that flooding in Kinston has impacted over 800 homes and 170 commercial properties with an estimated value of \$125 million.

Unfortunately, North Carolina has extensive experience with hurricanes and the damage they can inflict. Although there is significant damage in the State, things could have been much worse. After Hurricane Fran in 1996, North Carolina received FEMA Hazard Mitigation Assistance (HMA) funding for 478 projects. The State received \$323 million for implementing activities such as property acquisition/relocation, elevation, stormwater management, utility protective measures, retrofitting of public structures, public awareness and education, and



Kinston, North Carolina, on October 14, 2016.
FEMA News Photos

water and sanitary sewer system protective measures. Included in these projects is the acquisition or elevation above the 100-year flood elevation of approximately 6,000 properties.

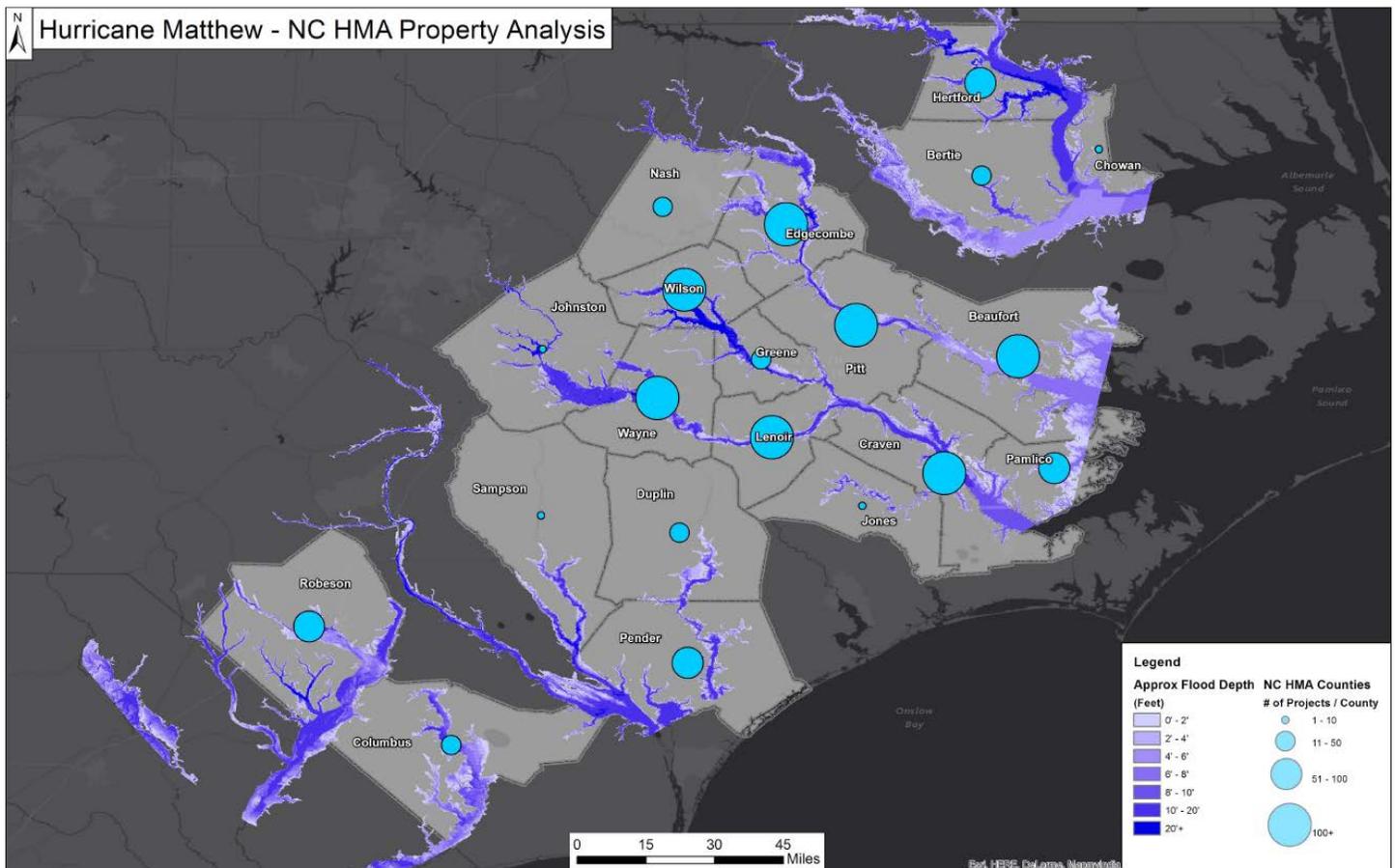
Lenoir County and the City of Kinston, both hit heavily by Hurricane Fran, worked with the State of North Carolina and FEMA, using HMA funds, to acquire 420 structures, 3 mobile home parks, and 68 vacant lots that were located in the most flood-prone areas of the City and County. The goal of these acquisitions was to move people and structures out of areas that would likely be impacted by flooding in the future. By removing these structures and maintaining the areas as open space, the City managed to decrease the losses experienced during Hurricane Matthew.

According to the Mayor of Kinston, *“Having experienced two floods of the century in less than two decades is pretty phenomenal in and of itself, but actually, because of that,*

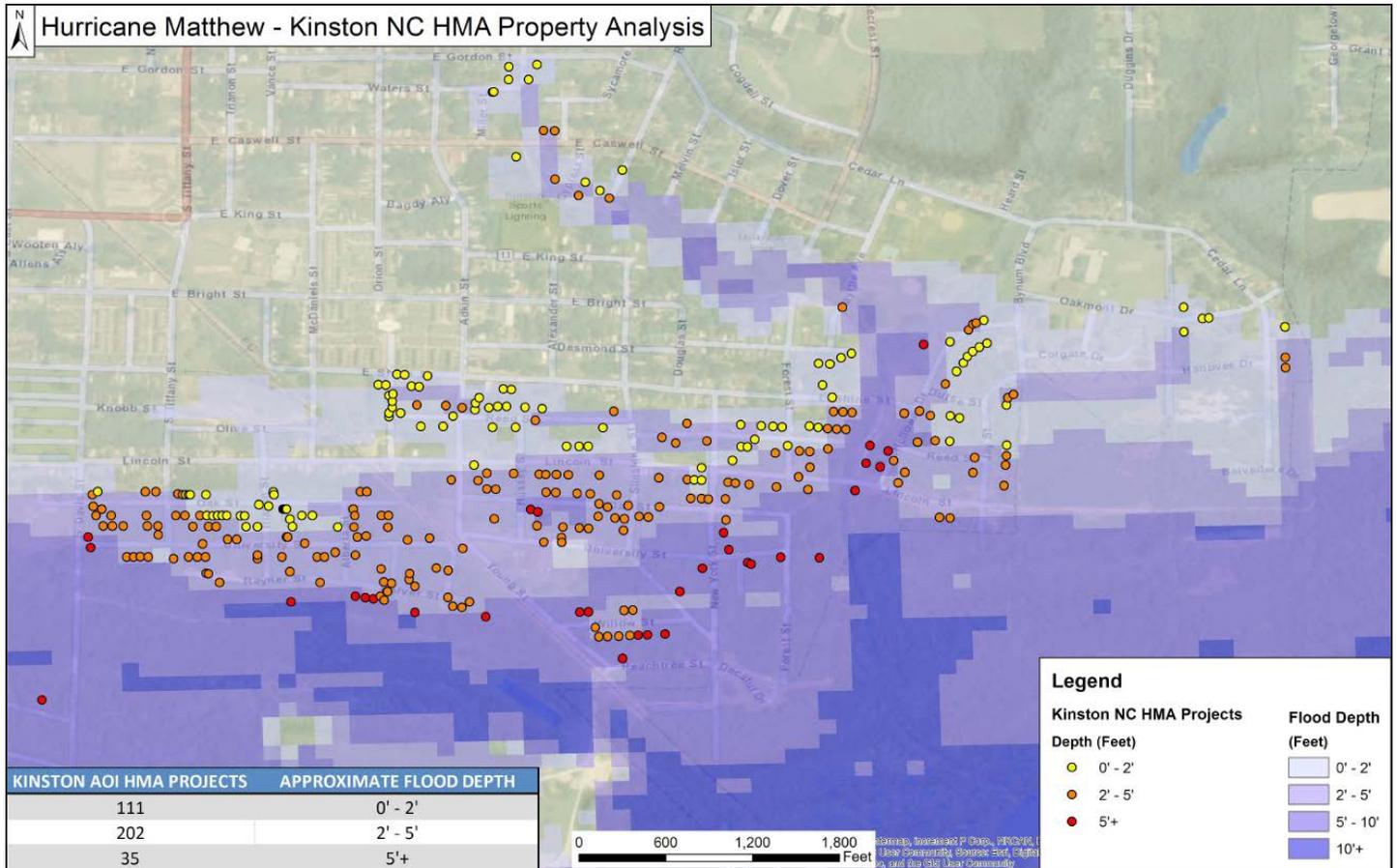
90 percent of the residential areas that would be impacted today, they’ve already been moved out because FEMA bought those houses years ago,” said Kinston Mayor B.J. Murphy.

Maps 1 and 2 and Tables 1 and 2 illustrate areas in North Carolina where flood-prone properties were acquired using FEMA grant funds, and the losses avoided as a result of these acquisitions. These data are based on geographic information system (GIS) information from FEMA. Of the 6,000 properties mitigated throughout the State, 2,249 properties located in the Hurricane Matthew flood-impacted areas were considered in this study. For a conservative (lower bound) analysis, 488 properties that had less than 2 feet of floodwater were not included.

This study did not take into account other losses avoided, such as emergency response costs, insurance payments, debris removal, and others, so the actual losses avoided are likely substantially higher than what the GIS data show.



MAP 1. Hurricane Matthew – North Carolina HMA Property Analysis. This map shows locations of flood-prone properties that were acquired in eastern North Carolina using FEMA HMA grant funds.



MAP 2. Hurricane Matthew – Kinston, NC HMA Property Analysis. This map shows locations of flood-prone properties that were acquired in Kinston, NC before Hurricane Matthew hit. All of the dots indicate structures that would have been damaged during Hurricane Matthew if they had not been previously acquired.

The upper bound estimate accounts for 2,249 structures that were acquired or elevated at a total project cost of \$271,061,352. This equals a Return on Investment (ROI) of 0.87 and a total losses avoided amount of **\$234,814,741**.

Table 1. Estimate of Losses Avoided from Hurricane Matthew in North Carolina – Upper Bound Estimate

Depth of Flooding	Number of Structures	Losses Avoided			Total
		Building	Contents	Displacement	
Less than 2 ft.	1,034	\$38,547,520	\$11,001,760	\$10,119,344	\$59,668,624
Between 2 and 5 ft.	612	\$39,265,920	\$10,771,200	\$17,968,198	\$68,005,318
Greater than 5 ft.	603	\$56,537,280	\$15,195,600	\$35,407,919	\$107,140,799
Total	2,249	\$134,350,720	\$36,968,560	\$63,495,461	\$234,814,741

Upper Bound Analysis Assumptions: 1-story house without basement; 1,600 sq. ft.; average quality of construction; building replacement value of \$100/sq. ft.

The lower bound estimate accounts for 1,761 structures that were acquired or elevated at a total project cost of \$266,222,172. This equals a Return on Investment (ROI) for the grant funds of 0.77 and a total losses avoided amount of **\$206,653,920**.

Table 2. Estimate of Losses Avoided from Hurricane Matthew in North Carolina – Lower Bound Estimate

Depth of Flooding	Number of Structures	Losses Avoided			Total
		Building	Contents	Displacement	
Less than 2 ft.	546	\$20,354,880	\$5,809,440	\$5,343,484	\$31,507,804
Between 2 and 5 ft.	612	\$39,265,920	\$10,771,200	\$17,968,198	\$68,005,318
Greater than 5 ft.	603	\$56,537,280	\$15,195,600	\$35,407,919	\$107,140,799
Total	1,761	\$116,158,080	\$31,776,240	\$58,719,600	\$206,653,920

Lower Bound Analysis Assumptions: 1-story house without basement; 1,600 sq. ft.; 2 ft. of ground clearance; average quality of construction; building replacement value of \$100/sq. ft.

Conclusion

This study shows that even with a conservative, lower bound estimate of damages avoided, there is still a significant benefit to the State, communities, and residents as a direct result of their determination and commitment to hazard mitigation. In short, mitigation works; it saves lives and properties and reduces the financial impact of hazards on the community.

Sources

1. [Washington Post](#)
2. [North Carolina Department of Public Safety](#)
3. Kinston, NC local news:
 - <http://abc11.com/weather/neuse-river-crests-in-kinston-flooding-could-last-days/1554068/>
 - <https://www2.ncdps.gov/NewsRelease.cfm?id=2513>
4. [FEMA photo library](#)
5. [FEMA website](#)
6. FEMA GIS data