

Hurricane Florence

Role of GIS in Operations, Response and Recovery

November 7, 2018

On September 14th 2018, Florence made landfall and proved to be one of the most devastating hurricanes in North Carolina's history



90 mph

Top wind speed



10 ft

Storm surge



8 trillion

Gallons of rainfall



6

Days in length



994,000

Households
in affected area



40

North Carolina
fatalities



“Florence is the worst flood
in East Coast history.”



Hurricane Florence ranks among top
10 costliest US storms, expert says

– *Major news outlets*





Post Hurricane Florence, North Carolina faces significant challenges

28

Counties declared Federal disaster zones¹

2.6M

Total impacted population

>900k

People without power at peak of storm

>1,000

Out-of-state first responders

36

States have provided NC assistance

¹ 13 counties currently under review by FEMA as of 10/8/18



Image result for man in boat with cat hurricane florence

HAZARD RISK AND RESPONSE MANAGEMENT FRAMEWORK KEY COMPONENT UTILIZED DURING HURRICANE FLORENCE

Hurricane Florence and Michael

REAL-TIME, SCENARIO and FORECASTED

REAL-TIME IMPACT AND WARNING

DAMAGE HOTSPOTS

SERA - Dam Inundation

STORM-DERIVED IMPACT ANALYSIS

Gage Manager

Repeater

Real-Time Sensors

PLANNING, PREPAREDNESS, PREVENTION, MITIGATION

POINT & CLICK FLOOD HAZARD ZONE AND BFE

STRUCTURE SPECIFIC FLOOD RISK ASSESSMENT

STRUCTURE SPECIFIC FLOOD RISK MITIGATION

STRUCTURE SPECIFIC FLOOD RISK RATED INSURANCE

FLOODPLAIN MANAGEMENT

MILLENNIAL FLOOD RISK SITE

IRISK - MULTI-HAZARD RISK ASSESSMENT

DYNAMIC, DATABASE-QUERY, DIGITAL DISPLAY



STRUCTURE-SPECIFIC RISK ASSESSMENT

STRUCTURE-SPECIFIC RISK MITIGATION

STRUCTURE SPECIFIC HAZARD ID & BFE

STRUCTURE SPECIFIC INSURANCE RATING / PROFILE

TOPOGRAPHY

STRUCTURES / PARCEL

FIRST FLOOR ELEVATION

FLOOD HAZARD AND BFE

NFIP DATA

CURVES / METHODOLOGIES

Parcel / Socio-Demographics

Florence – Structure and Financial Impact

	Wind		Surge		Riverine		Hazard Total	
COUNTY	Damages	Building Count	Damages	Building Count	Damages	Building Count	Damages	Building Count
TOTALS	\$90,963,997	491,669	\$2,214,209,513	35,204	\$1,244,952,591	44,689	\$3,550,126,101	571,562

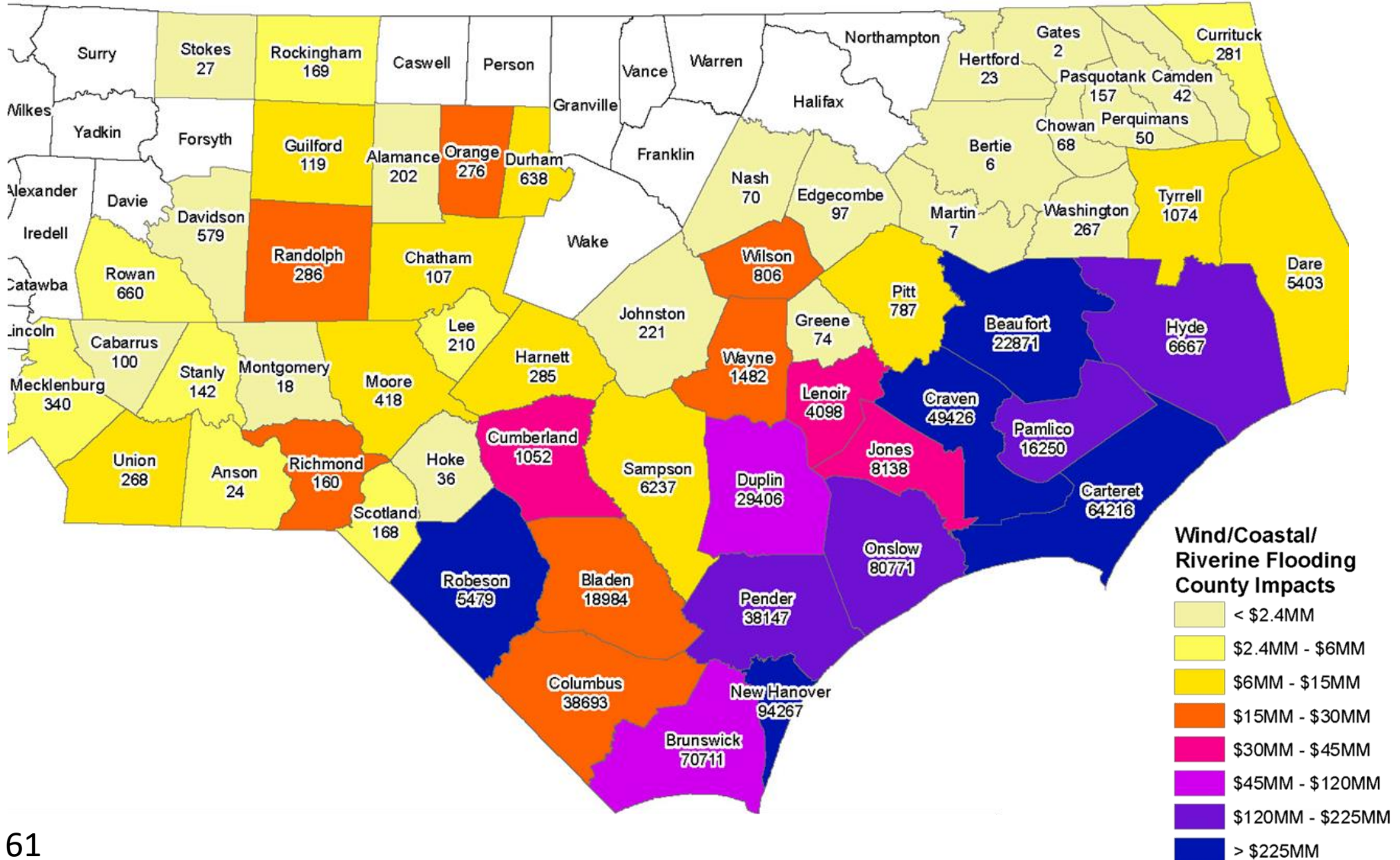
County	Number of Flood Impacted Buildings in Hurricane Florence	Impacted Repetitive Loss Buildings	Impacted Buildings Damaged in Matthew	Impacted HMGP Gap Properties
58 Counties	79,894	3,506	35,793	674

SUMMARY OF ESTIMATED DAMAGES TO RESIDENTIAL PROPERTIES

FLOOD DEPTH	DAMAGE LEVEL	All Hazards		Surge Flooding		Riverine Flooding		Wind	
		Estimated Damages (M)	Building Count	Estimated Damages (M)	Building Count	Estimated Damages (M)	Building Count	Estimated Damages (M)	Building Count
Substructure	Minor	\$142.2	37,391	\$51.5	8,900	\$90.7	28,491		
0 - 2 ft	Minor	\$562.9	15,474	\$340.7	8,552	\$222.2	6,922		
2 - 4 ft	Moderate	\$765.8	10,712	\$550.4	7,617	\$215.4	3,095		
4 - 6 ft	Major	\$624.0	6,711	\$466.7	4,880	\$157.3	1,831		
6+ ft	Destroyed	\$435.0	4,275	\$321.1	2,938	\$113.8	1,337		
Total		\$2,611.1	509,067	\$1,730.4	32,887	\$799.4	41,676	\$81.2	434,504



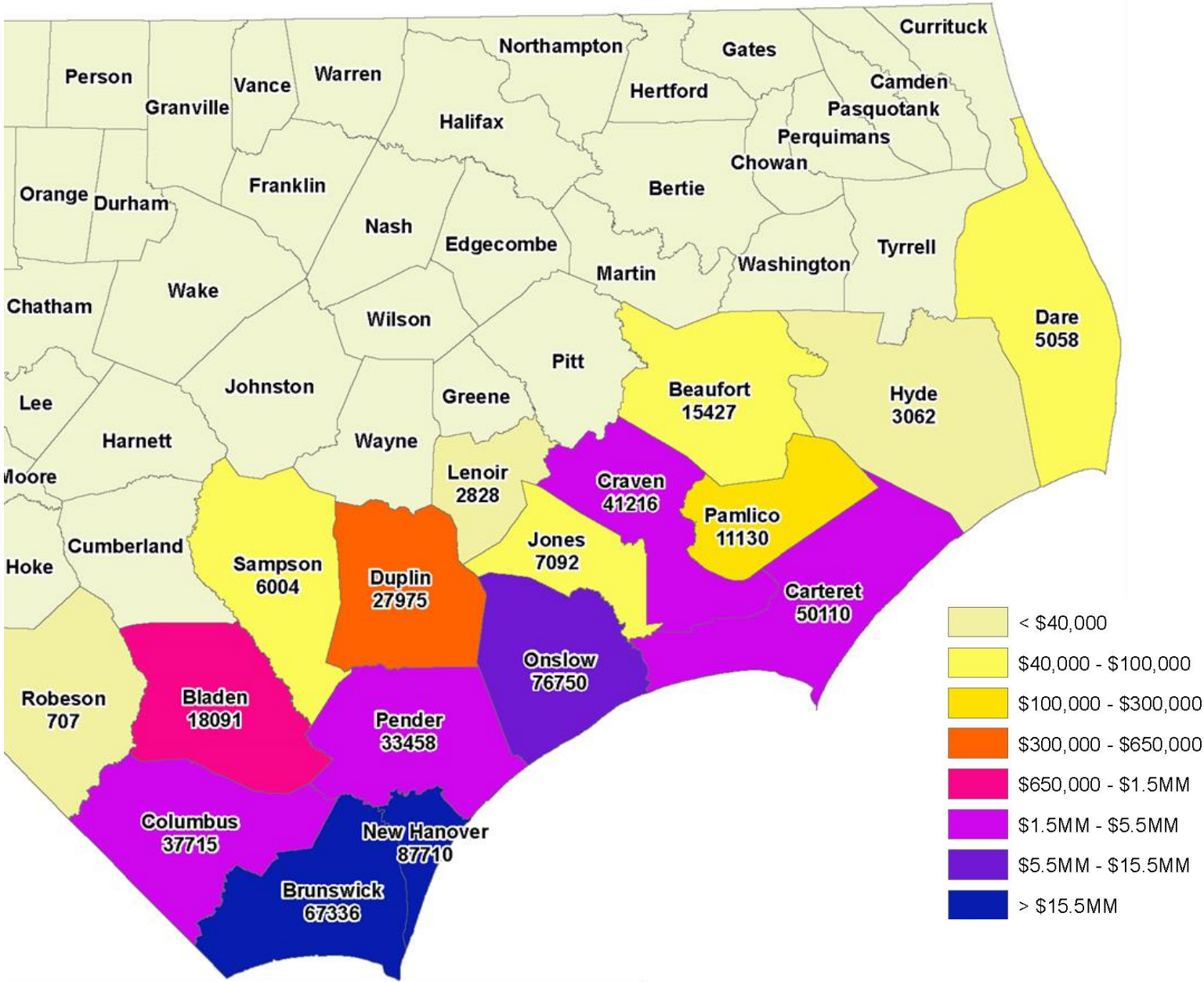
Florence – Structure and Financial Impact



Florence – Structure and Financial Impact from Wind

County	All Occupancy Types		Non-Residential		Public		Residential	
	Estimated Wind Damage	Building Count	Estimated Wind Damage	Building Count	Estimated Wind Damage	Building Count	Estimated Wind Damage	Building Count
Beaufort	\$91,298	15,427	\$12,007	1481	\$14,169	344	\$65,122	13602
Bladen	\$653,514	18,091	\$34,670	2690	\$44,981	441	\$573,863	14960
Brunswick	\$15,661,069	67,336	\$1,174,850	3283	\$198,657	782	\$14,287,562	63271
Carteret	\$3,776,385	50,110	\$88,475	3163	\$190,022	905	\$3,497,888	46042
Columbus	\$5,087,914	37,715	\$468,238	3218	\$200,542	761	\$4,419,135	33736
Craven	\$1,548,626	41,216	\$112,104	3097	\$805,590	776	\$630,932	37343
Dare	\$78,750	5,058	\$5,435	283	\$5,278	90	\$68,037	4685
Duplin	\$603,825	27,975	\$72,218	8532	\$35,592	546	\$496,015	18897
Hyde	\$39,710	3,062	\$1,332	481	\$2,263	99	\$36,115	2482
Jones	\$66,051	7,092	\$1,825	1655	\$11,279	193	\$52,947	5244
Lenoir	\$6,857	2,828	\$1,227	764	\$865	42	\$4,765	2022
New Hanover	\$52,339,159	87,710	\$2,649,793	4935	\$337,653	1108	\$49,351,712	81667
Onslow	\$5,580,938	76,750	\$235,558	3949	\$2,723,575	5288	\$2,621,804	67513
Pamlico	\$299,134	11,130	\$3,639	1026	\$5,700	215	\$289,794	9889
Pender	\$5,043,140	33,458	\$234,868	3891	\$85,995	437	\$4,722,277	29130
Robeson	\$3,452	707	\$357	110	\$374	11	\$2,721	586
Sampson	\$84,177	6,004	\$2,989	2451	\$8,909	118	\$72,279	3435
Totals	\$90,963,997	491,669	\$5,099,584	45,009	\$4,671,444	12,156	\$81,192,970	434,504

Florence – Structure and Financial Impact from Wind



Florence – Estimated Coastal Surge Return Periods

Location	County	Hurricane Florence (2018)	
		Flood Elevation (NAVD88 ft)	Estimated Recurrence Interval (years)
Pungo River at Belhaven	Beaufort	5.7	150-yr
Pamlico River at Washington	Beaufort	7.6	35-yr
Tranters Cr. At SR1403 Near Washington	Beaufort	7.5	500-yr
Cashie River at Windsor At S. King St	Bertie	3.5	10-yr
Cashie River at SR1257 Near Windsor	Bertie	8.0	10-yr
Causeway Drive Bridge at Ocean Isle Beach	Brunswick	4.4	10-yr
Middleton Blvd Bridge, 1500 To Oak Island	Brunswick	5.0	10-yr
Wilmington - Cape Fear R Nr US 17/76	Brunswick	6.0	10-yr
Joyce Creek at Old Swamp Rd	Camden	2.6	10-yr
Bogue Sound at Beaufort, NC - Pivers Island	Carteret	5.1	15-yr
Pamlico Sound at Cedar Island Ferry Terminal	Carteret	4.8	80-yr
Chowan River at Edenton Waterfront Park	Chowan	2.4	25-yr
Neuse River at NW Craven Middle School	Craven	8.6	20-yr
Currituck Sound at US 158 Nr Point Harbor	Currituck	2.0	12-yr
Roanoke Sound at US Highway 64/264 Pond Island	Dare	1.8	10-yr
Atlantic Coast at Duck	Dare	3.5	10-yr
Pamlico Sound at Cape Hatteras Coast Guard Station	Dare	2.0	20-yr
Pamlico Sound at Ocracoke - NCCAT Campus	Hyde	3.0	45-yr
Roanoke River at Williamston	Martin	3.9	<10-yr
Wrightsville Beach - Johnny Mercer Pier	New Hanover	6.0	15-yr
New River at Old Bridge St. in Jacksonville	Onslow	7.3	35-yr
Neuse R. at Oriental Town Pier	Pamlico	9.2	400-yr
Little River at SR 1367 At Woodville	Pasquotank	2.3	10-yr
Pasquotank River at Elizabeth City Mariners Wharf Park	Pasquotank	2.5	17-yr
Scuppernong River at Columbia Town Hall	Tyrrell	2.3	20-yr

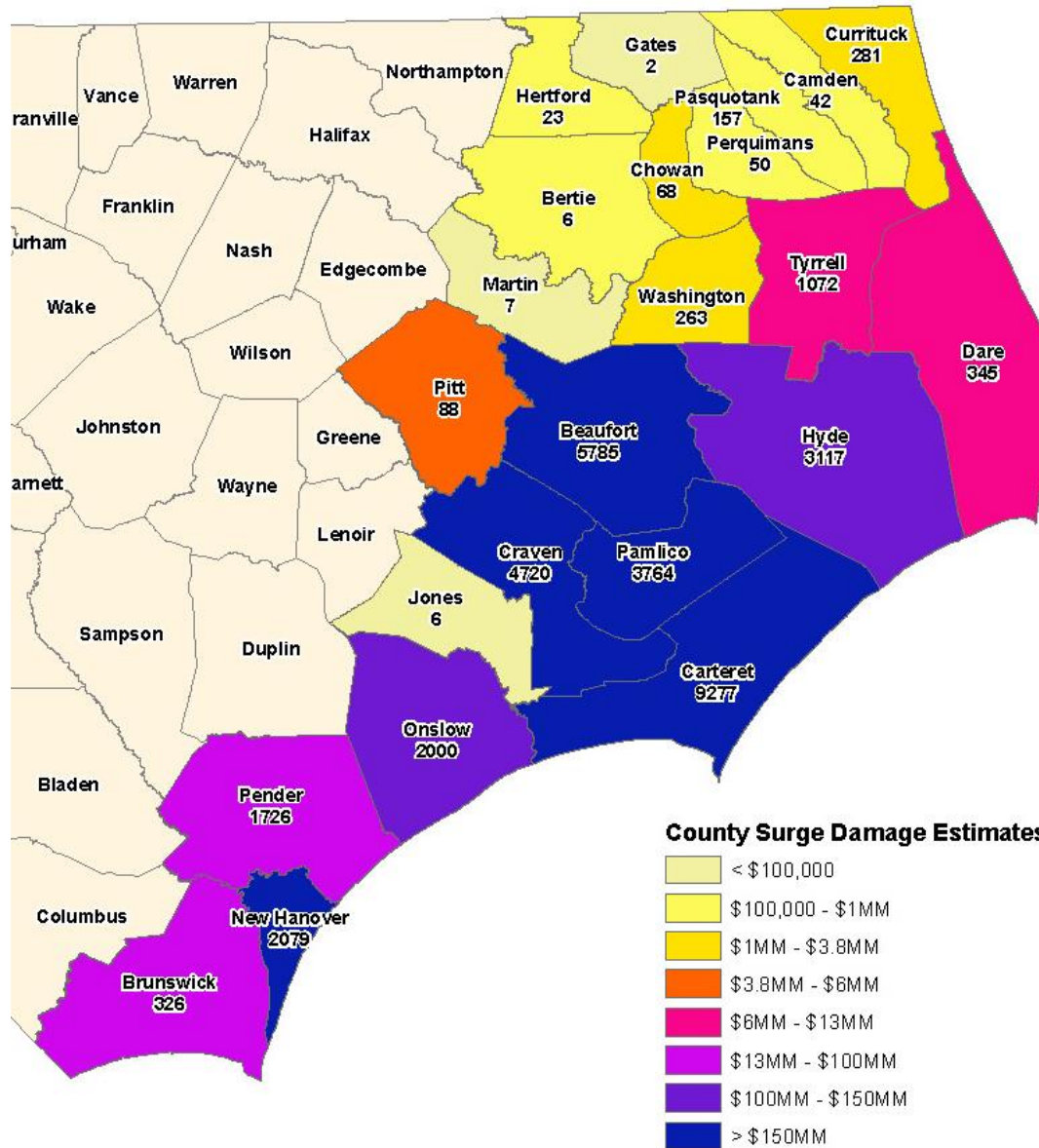
Florence – Structure and Financial Impact from Surge Flooding

Coastal Surge Impacts - Maximum Inundation

Geographic Area	Estimated Flood Depth	Damage Category	All Occupancy Types		Non Residential		Public		Residential	
			Estimated Structure Damages	Building Count	Estimated Structure Damages	Building Count	Estimated Structure Damages	Building Count	Estimated Structure Damages	Building Count
Eventwide Totals	Substructure	Minor	\$ 53,258,248	9,115	\$ 1,713,625	215	\$ -	0	\$ 51,544,623	8,900
Eventwide Totals	0 - 2 ft	Minor	\$ 442,068,037	9,387	\$ 52,461,821	686	\$ 48,928,875	149	\$ 340,677,341	8,552
Eventwide Totals	2 - 4 ft	Moderate	\$ 721,803,169	8,284	\$ 107,545,819	559	\$ 63,848,748	108	\$ 550,408,602	7,617
Eventwide Totals	4 - 6 ft	Major	\$ 589,677,986	5,279	\$ 76,169,838	350	\$ 46,836,932	49	\$ 466,671,216	4,880
Eventwide Totals	6+ ft	Destroyed	\$ 407,402,073	3,139	\$ 31,125,576	178	\$ 55,139,561	23	\$ 321,136,936	2,938
	Total		\$ 2,214,209,513	35,204	\$ 269,016,679	1,988	\$214,754,116	329	\$ 1,730,438,718	32,887

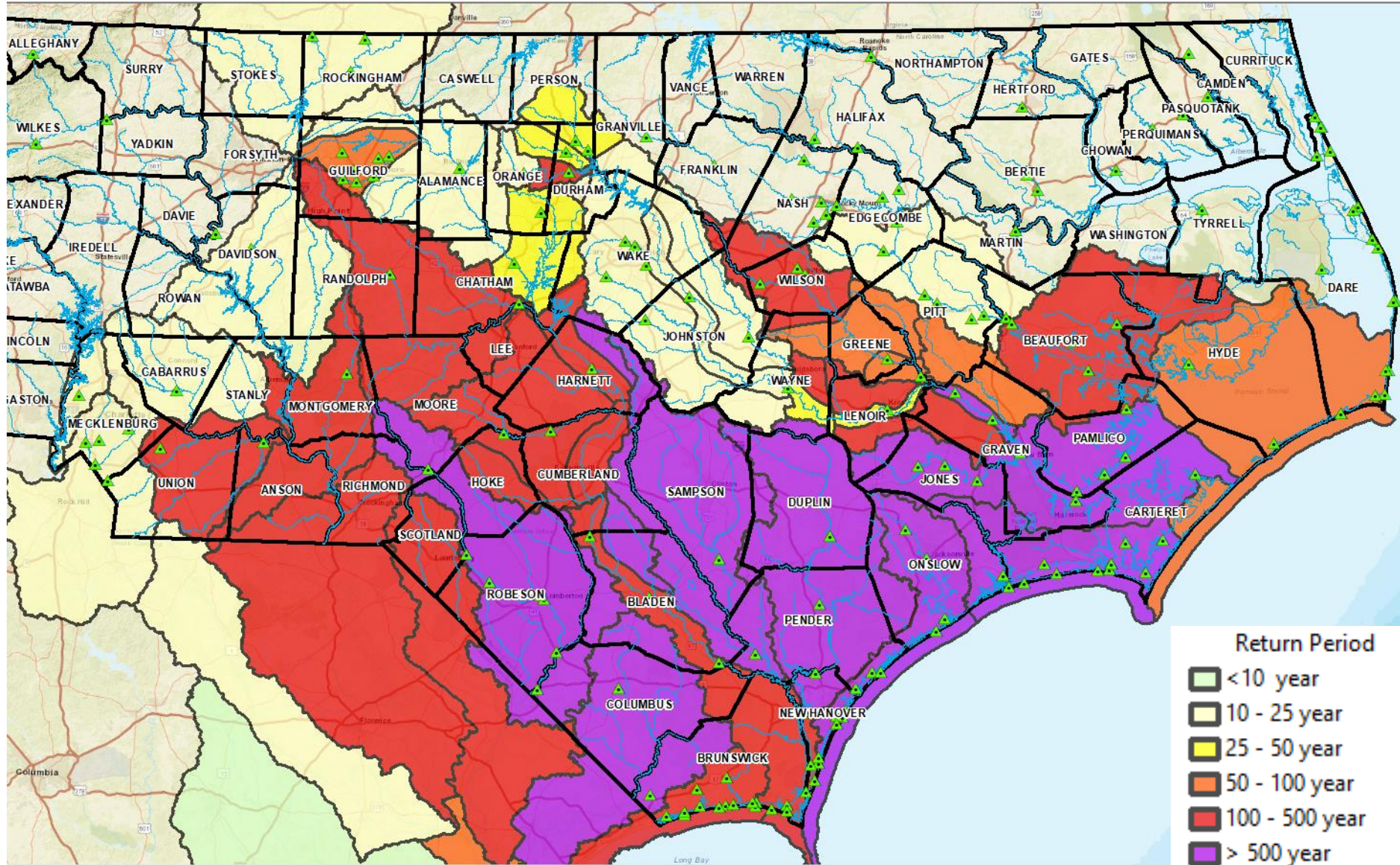
Total Buildings	35,204	Total Damages	\$ 2,214,209,513
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Florence – Structure and Financial Impact from Surge Flooding



The number under the county name is the number of buildings impacted by flooding.

Gaging Station Event Return Periods



Florence – Estimated Riverine Return Periods

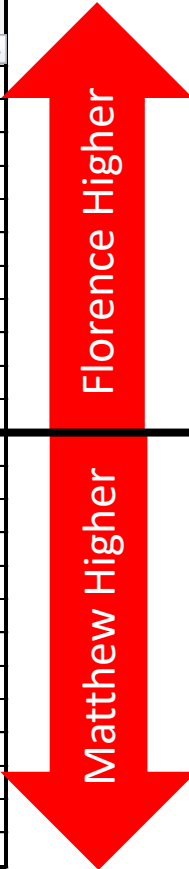
				Hurricane Florence (2018)	
SITE_ID	Type (Riverine or	NAME	County	Flood Elevation (NAVD88 ft)	Est. Recurrent Interval (years)
	Coastal)				
02105544	Riverine	CAPE FEAR RIVER AT LOCK 2 NEAR ELIZABETHTOWN, NC	Bladen	51.1	>500-yr
30001	Riverine	Lockwoods Folly River - Southport-Supply Rd SE	Brunswick	15.8	>500-yr
WHSN7	Riverine	Soules Swamp at S. Madison St in Whiteville	Columbus	60.6	>500-yr
FBLN7	Riverine	Lumber River at NC904 in Fair Bluff	Columbus	67.0	>500-yr
02103000	Riverine	Little River at Manchester	Cumberland	158.3	>500-yr
02108000	Riverine	NE Cape Fear River near Chinquapin	Duplin	40.6	>500-yr
TOWN7	Riverine	Town Creek at Us 258 near Pinetops	Edgecombe	61.6	>500-yr
TRTN7	Riverine	Trent R. at Trenton at N. Weber St	Jones	28.8	>500-yr
02092500	Riverine	Trent River near Trenton	Jones	42.0	>500-yr
02093000	Riverine	New River near Gum Branch	Onslow	27.2	>500-yr
02108619	Riverine	NE Cape Fear River at Castle Hayne	Pender	11.8	>500-yr
02108566	Riverine	Northeast Cape Fear River near Burgaw	Pender	24.6	>500-yr
02134500	Riverine	Lumber River at Boardman	Robeson	85.5	>500-yr
02133624	Riverine	Lumber River near Maxton	Robeson	191.8	>500-yr
02106500	Riverine	Black River near Tomahawk	Sampson	53.0	>500-yr
02092554	Riverine	Trent R. at Pollocksville	Jones	16.5	500-yr
02087359	Riverine	Walnut Ck at Sunnybrook Dr, Raleigh	Wake	199.3	500-yr
02128000	Riverine	Little River near Star	Montgomery	430.9	400-yr
CHBN7	Riverine	Booker Creek at E. Franklin St	Orange	265.6	350-yr
02102908	Riverine	Flat Creek near Inverness	Hoke	199.7	300-yr
02102000	Riverine	Deep River at Moncure	Lee	199.5	300-yr
02105769	Riverine	Cape Fear River at Lock #1 near Kelly	Bladen	26.7	200-yr
BCUN7	Riverine	Black River at NC 210	Pender	20.3	175-yr
02126000	Riverine	Rocky River near Norwood	Stanly	248.4	175-yr
02146750	Riverine	Mcalpine Cr Blw McMullen Cr near Pineville	Mecklenburg	534.2	105-yr
0212467595	Riverine	Goose Ck at SR1525 near Indian Trail	Union	559.7	100-yr
WSNN7	Riverine	Hominy Swamp at Forest Hills Rd near Wilson	Wilson	119.7	100-yr

Florence – Estimated Riverine Return Periods *(cont'd)*

SITE_ID	Type (Riverine or		NAME	County	Flood Elevation (NAVD88 ft)	Est. Recurrent Interval (years)
	Coastal)					
02085070	Riverine		Eno River near Durham	Durham	292.9	99-yr
02100500	Riverine		Deep River at Ramseur	Randolph	444.3	90-yr
02134170	Riverine		Lumber River at Lumberton	Robeson	119.7	90-yr
02092576	Riverine		Trent River at US Highway 70 at New Bern, NC	Craven	10.4	80-yr
02104000	Riverine		Cape Fear River at Fayetteville	Cumberland	81.2	80-yr
0209399200	Riverine		Horsepen Cr at Us 220 near Greensboro	Guilford	751.8	60-yr
02105500	Riverine		Cape Fear River Lock near Tarheel	Bladen	66.6	50-yr
30003	Riverine		Cawcaw Swamp - No 5 School Rd NW	Brunswick	27.9	50-yr
02091500	Riverine		Contentnea Creek at Hookerton	Greene	33.5	50-yr
0209553650	Riverine		Buffalo Ck at SR2819 near Mcleansville	Guilford	668.9	50-yr
02095000	Riverine		S Buffalo Cr near Greensboro	Guilford	706.0	50-yr
02094659	Riverine		S Buffalo Cr near Pomona	Guilford	785.7	50-yr
02102500	Riverine		Cape Fear River at Lillington	Harnett	124.9	50-yr
02133500	Riverine		Drowning Creek near Hoffman	Moore	280.6	50-yr
PMBN7	Riverine		Lumber River at St Hwy 710 near Pembroke	Robeson	158.8	50-yr
02081500	Riverine		Tar River near Tar River	Granville	306.5	40-yr
02070500	Riverine		Mayo River near Price	Rockingham	700.4	47-yr
30002	Riverine		Shalotte River - Main St US17 BUS	Brunswick	8.8	45-yr
JCKN7	Riverine		New River at Old Bridge St. in Jacksonville	Onslow	7.3	35-yr
02086500	Riverine		Flat River at Dam near Bahama	Durham	275.0	34-yr
0208521324	Riverine		Little River at SR1461 near Orange Factory	Durham	393.8	25-yr
25530	Riverine		N Fork Catawba River/Us 221 N	Mcdowell	1730.2	25-yr
0214685800	Riverine		Six Mile Creek near Pineville	Union	571.5	25-yr
02089000	Riverine		Neuse River near Goldsboro	Wayne	69.5	25-yr

Florence - Comparison to Matthew (Riverine)

SITE NAME	County	Hurricane Florence (2018)		Hurricane Matthew (2016)		Difference (ft) Florence vs Matthew
		Flood Elevation (NAVD88 ft)	Est. Recurrent Interval (years)	Flood Elevation (NAVD88 ft)	Est. Recurrent Interval (years)	
Trent River at US Highway 70 at New Bern, NC	Craven	10.4	80-yr	3.3	<10 -yr	7.1
Lumber River near Maxton	Robeson	191.8	>500-yr	186.5	100-yr	5.3
New River at Old Bridge St. in Jacksonville	Onslow	7.3	35-yr	3	<10 -yr	4.3
NE Cape Fear River near Chinquapin	Duplin	40.6	>500-yr	36.3	500-yr	4.3
Little River at Manchester	Cumberland	158.3	>500-yr	155	>500-yr	3.3
Cape Fear River at Fayetteville	Cumberland	81.2	80-yr	78.6	100-yr	2.6
Cape Fear River at Lock #1 near Kelly	Bladen	26.7	200	24.8	100	1.9
Cape Fear River at Lillington	Harnett	124.9	50-yr	123.2	<10 -yr	1.7
Lumber River at NC904 in Fair Bluff	Columbus	67.0	>500-yr	66.23	>500-yr	0.8
Lumber River at Lumberton	Robeson	119.7	90	119.3	75	0.4
Lumber River at Boardman	Robeson	85.5	>500-yr	85.5	500	0.0
Neuse River near Goldsboro	Wayne	69.5	25-yr	71.6	90-yr	-2.1
Tar River at Us 401 at Louisburg	Franklin	196.7	12-yr	199	35-yr	-2.3
Neuse River at Kinston	Lenoir	35.5	20-yr	38.1	75-yr	-2.6
Hominy Swamp at Forest Hills Rd near Wilson	Wilson	119.7	100-yr	122.8	<10 -yr	-3.1
Contentnea Creek at Hookerton	Greene	33.5	50-yr	37.9	<10 -yr	-4.4
Crabtree Cr at Old Wake Forest Rd Rah	Wake	197.1	10-yr	205.8	100-yr	-8.7
Crabtree Ck at Hwy 70, Raleigh	Wake	215.9	10-yr	225.5	35-yr	-9.6
Neuse River near Clayton	Johnston	138.1	10-yr	148	45-yr	-9.9
Neuse River at Smithfield	Johnston	117.2	10-yr	127.4	200-yr	-10.2
Cashie River at SR1257 near Windsor	Bertie	8.0	10-yr	19.8	250-yr	-11.8
Tar River at Greenville	Pitt	8.7	10-yr	21	45-yr	-12.3
Tar River at 97 at Rocky Mount	Edgecombe	69.0	10-yr	81.5	65-yr	-12.5
Tar River at Tarboro	Edgecombe	24.2	10-yr	45.6	200-yr	-21.4



Florence – Structure and Financial Impact from Riverine Flooding

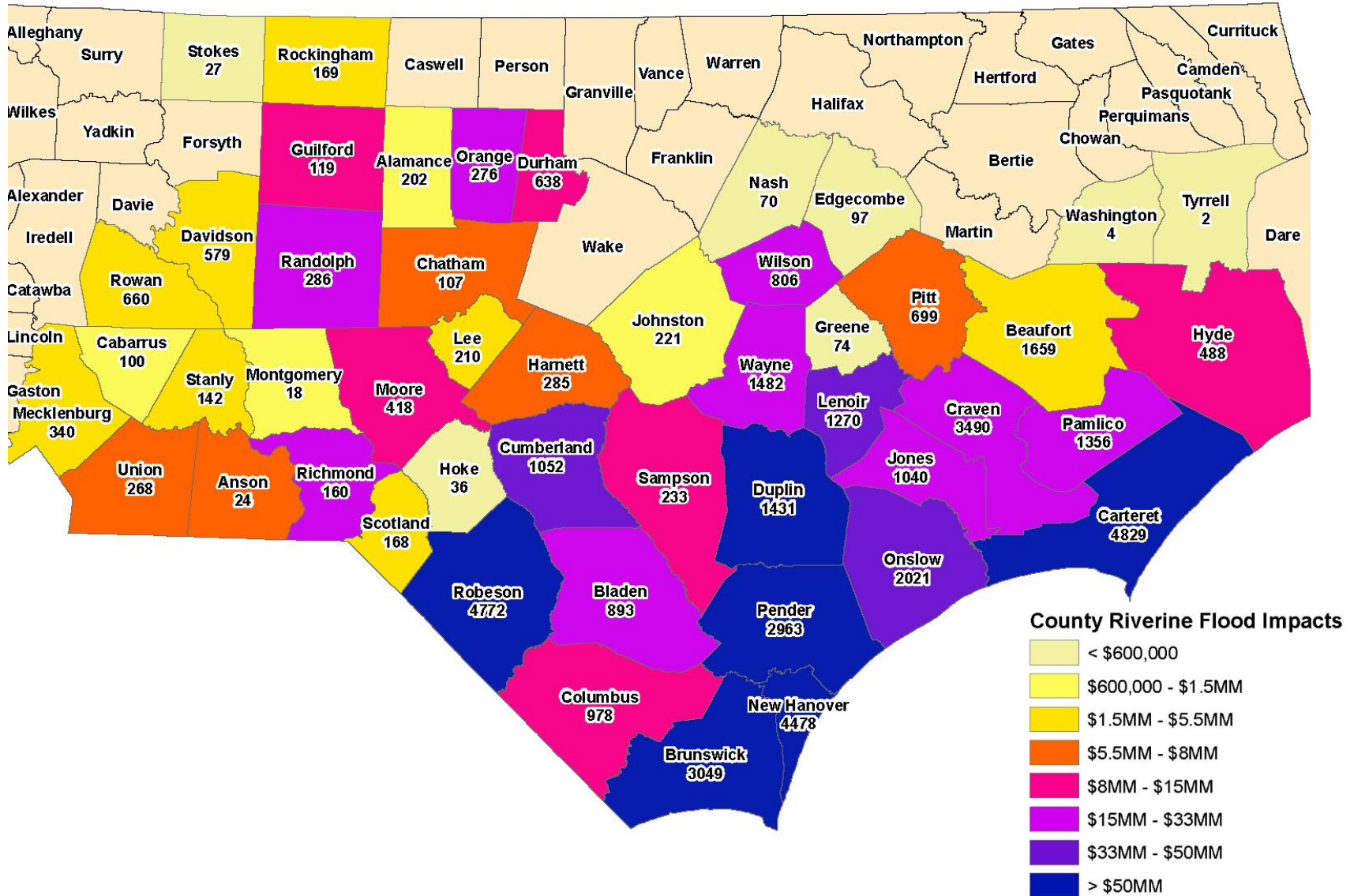
Riverine Impacts - 10/01/18 Analysis

All Structures		All Occupancy Types		Non Residential		Public		Residential	
Geographic Area	Estimated Flood Depth	Structure /		Estimated		Structure /		Estimated	
		Content Damages	Building Count	Structure / Content Damages	Building Count	Content Damages	Building Count	Content Damages	Building Count
Eventwide Totals	Minor	\$ 95,080,473	28,965	\$ 4,399,951	474	\$ -	0	\$ 90,680,522	28,491
Eventwide Totals	Minor	\$ 352,380,368	8,203	\$ 107,093,371	1,118	\$ 23,071,616	163	\$ 222,215,382	6,922
Eventwide Totals	Moderate	\$ 358,794,610	3,733	\$ 109,132,538	550	\$ 34,255,205	88	\$ 215,406,867	3,095
Eventwide Totals	Major	\$ 254,911,916	2,179	\$ 70,858,509	293	\$ 26,759,193	55	\$ 157,294,214	1,831
Eventwide Totals	Destroyed	\$ 183,785,224	1,609	\$ 46,595,670	215	\$ 23,358,023	57	\$ 113,831,530	1,337
	Totals	\$ 1,244,952,591	44,689	\$ 338,080,038	2,650	\$ 107,444,037	363	\$ 799,428,516	41,676

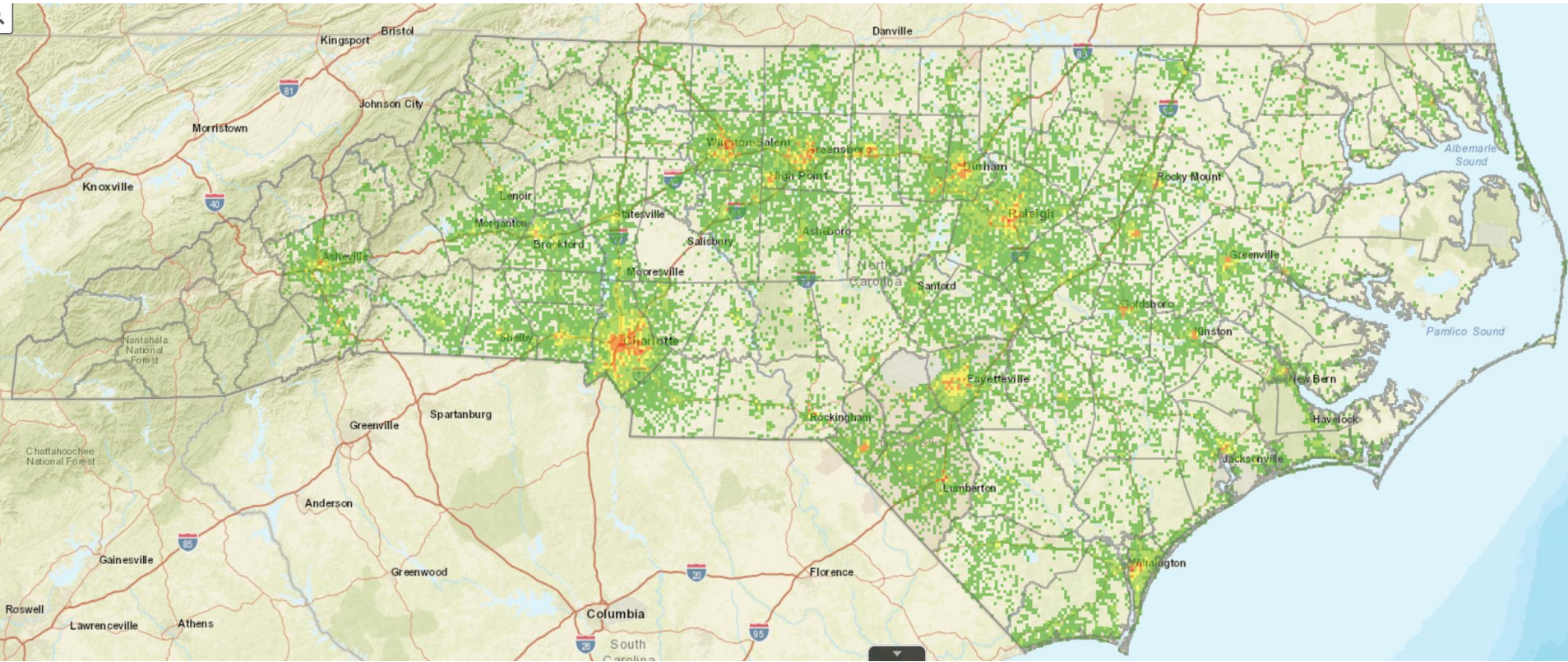
Total Buildings	44,689	Total Damages	\$ 1,244,952,591
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Structural/Content Damages

Florence – Structure and Financial Impact from Riverine Flooding



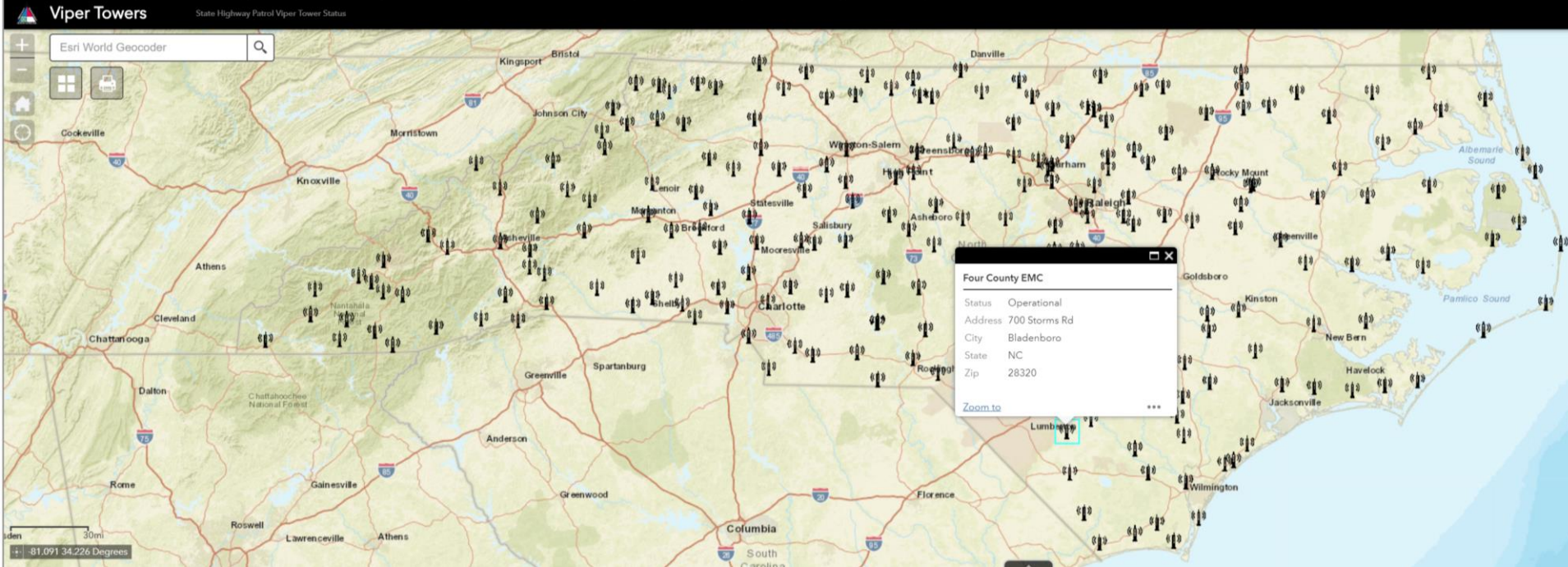
Florence - 911 Hot Spots



Florence – VIPER Towers

Situational Map Viewer - Hurricane Florence

Post Flore Activities | Florence Advisory | COP | Asset Tracking | 911 Hot Spots | Citizen Assistance Requests | Florence Imagery | Road Conditions | Viper Towers



Florence – Advisory Damage Assessments

Situational Map Viewer - Hurricane Florence

Post Florence Activities | Florence Advisory | COP | Asset Tracking | 911 Hot Spots | Citizen Assistance Requests | Florence Imagery | Road Conditions | Viper Towers

NCEM Hurricane Florence Advisory Map

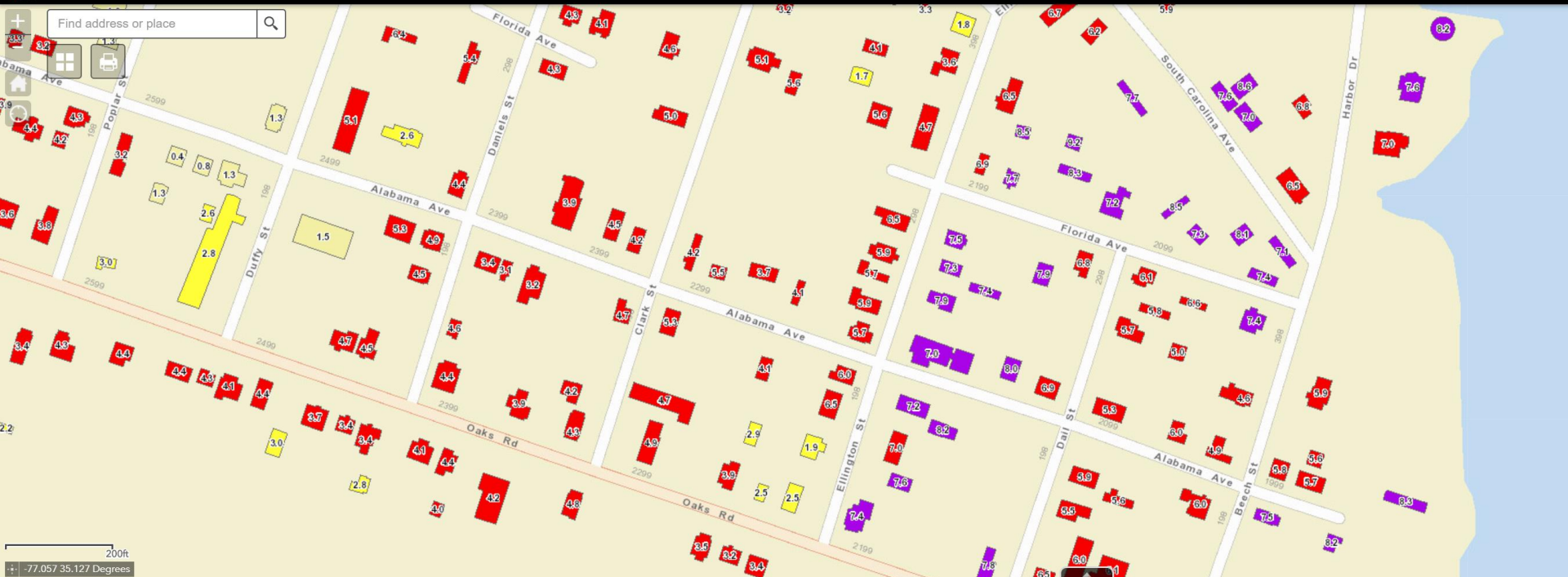


Florence – Structure Level Damage

Situational Map Viewer - Hurricane Florence

Post Florence Activities | **Florence Advisory** | COP | Asset Tracking | 911 Hot Spots | Citizen Assistance Requests | Florence Imagery | Road Conditions | Viper Towers

NCEM Hurricane Florence Advisory Map

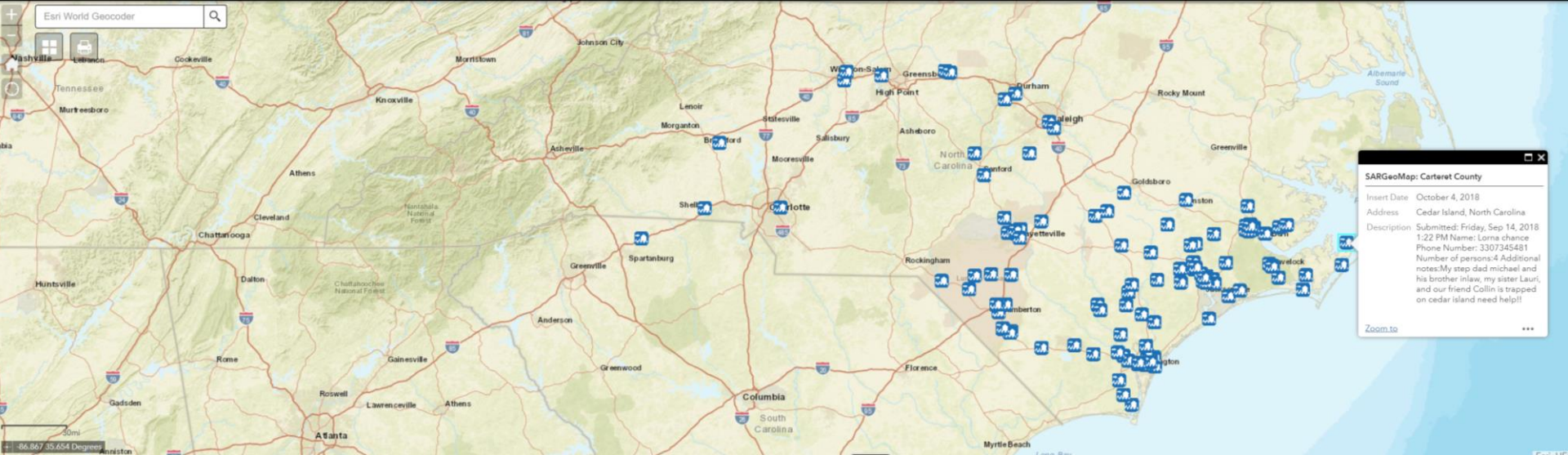


Florence – Citizen Assistance Requests

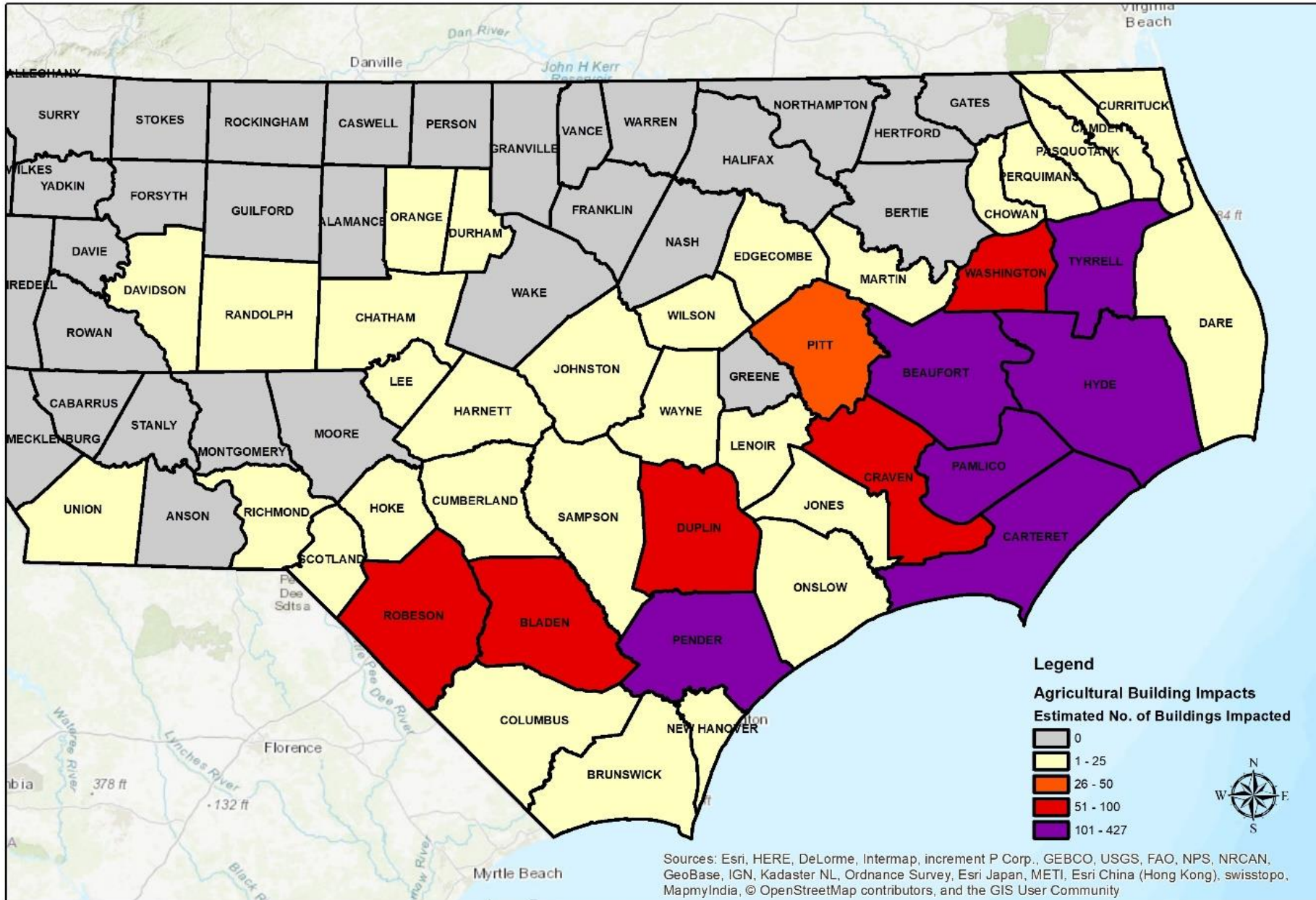
Situational Map Viewer - Hurricane Florence

Post Florence Activities | Florence Advisory | COP | Asset Tracking | 911 Hot Spots | Citizen Assistance Requests | Florence Imagery | Road Conditions | Viper Towers

Citizen Assistance Requests

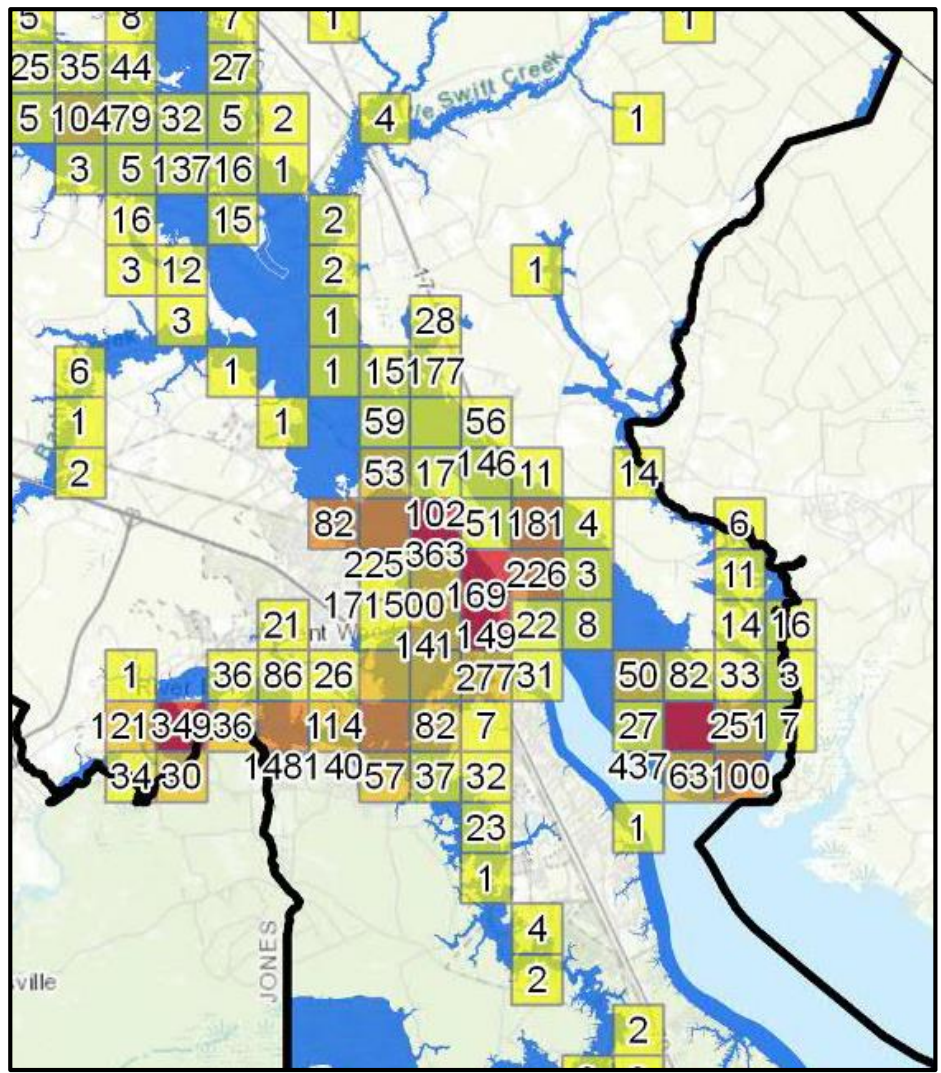
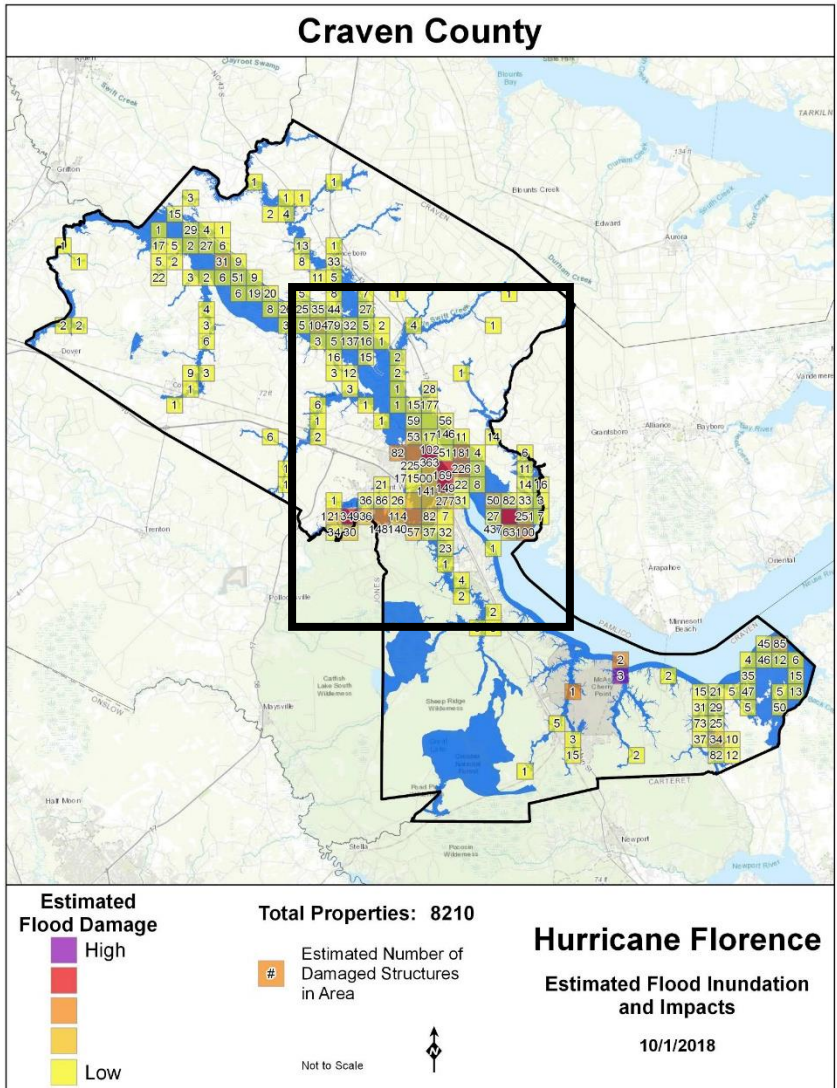


HURRICANE FLORENCE AGRICULTURAL BUILDING IMPACTS

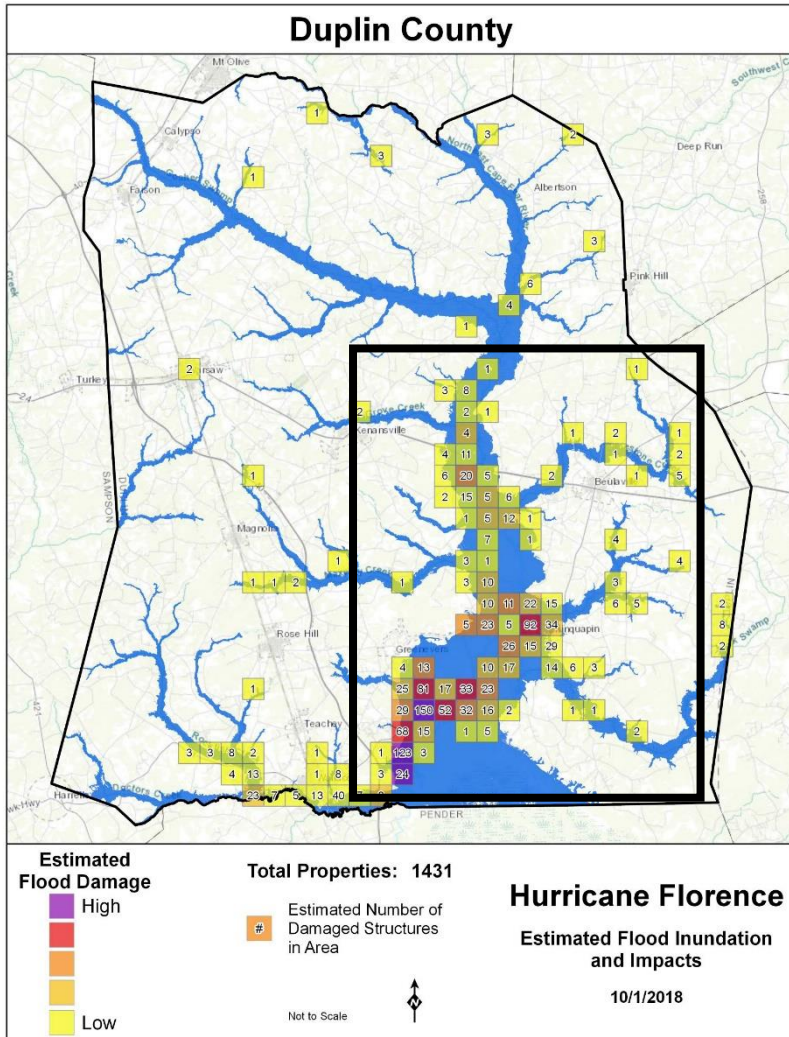


Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Countywide Damage Hot Spot Maps

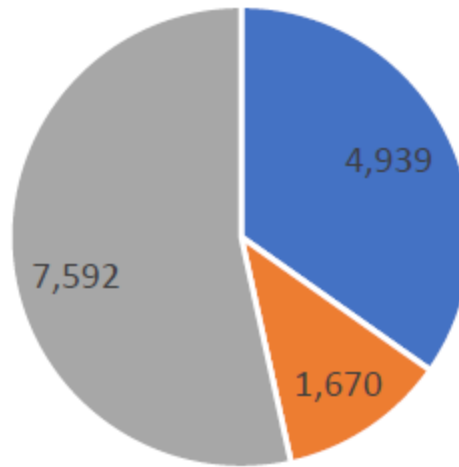


Countywide Damage Hot Spot Maps



Florence – NFIP Claims (10/17/18)

NFIP Claims



■ Closed W/ Payment ■ Closed W/out Payment ■ Open Claims

National Floodplain Insurance Program

- Total # of Claims: 14,201
- Percent Closed: 47%
- Total Amount Paid on All Claims: \$184,308,842

Insurance Deficit Calculations

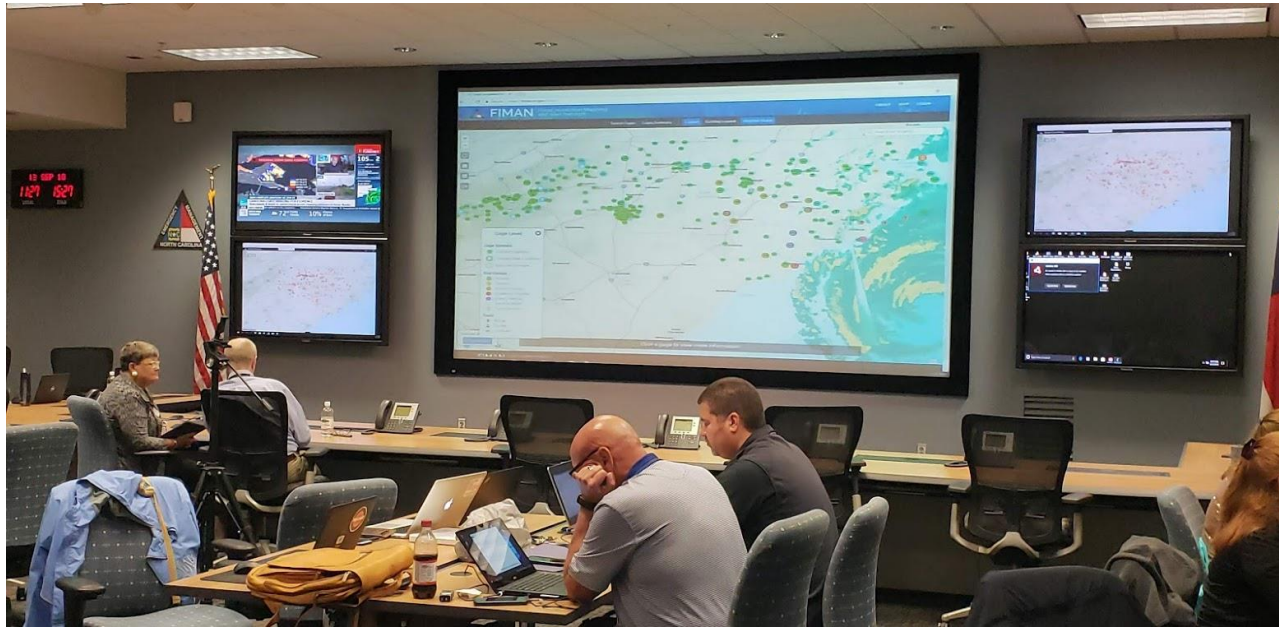
Hurricane Florence					10/1/2018
Flood Damage Impact vs NFIP Insurance Coverage					
NCEM Risk Management					
County	Total Impacted Buildings (Floor)	Total Flood Damage Estima	NFIP Insurance Deficit (Individual	Un/Underinsured Properties	Percent Properties Un/Underinsured
Camden	42	\$423,673	\$192,147	18	43%
Mecklenburg	340	\$4,932,515	\$1,933,602	147	43%
Beaufort	7,444	\$402,979,745	\$189,837,952	3,673	49%
Currituck	281	\$2,410,907	\$1,048,601	176	63%
Chowan	68	\$1,099,538	\$860,283	44	65%
Durham	638	\$11,048,529	\$9,046,675	427	67%
Edgecombe	97	\$419,001	\$221,105	65	67%
Brunswick	3,375	\$63,818,207	\$31,268,330	2,271	67%
New Hanover	6,557	\$533,858,561	\$276,197,986	4,471	68%
Dare	345	\$6,014,942	\$3,355,811	236	68%
Moore	418	\$8,336,556	\$6,993,484	290	69%
Wilson	806	\$25,972,495	\$21,093,753	563	70%
Carteret	14,106	\$648,862,097	\$398,644,194	9,911	70%
Pender	4,689	\$204,598,612	\$126,216,006	3,348	71%
Craven	8,210	\$404,685,748	\$271,800,524	5,969	73%
Pamlico	5,120	\$181,361,838	\$122,060,338	3,732	73%
Union	268	\$7,908,252	\$7,716,494	203	76%
Guilford	119	\$14,634,289	\$12,578,752	91	76%
Onslow	4,021	\$163,555,664	\$101,422,810	3,093	77%
Perquimans	50	\$465,421	\$339,214	39	78%
Harnett	285	\$7,582,871	\$6,765,475	224	79%
Alamance	202	\$1,070,647	\$861,923	160	79%
Pasquotank	157	\$608,519	\$491,035	125	80%
Orange	276	\$26,403,599	\$19,191,489	222	80%
Lee	210	\$5,423,579	\$4,818,484	170	81%
Nash	70	\$412,376	\$399,790	57	81%
Cumberland	1,052	\$35,310,813	\$29,816,137	867	82%
Bertie	6	\$102,057	\$100,986	5	83%
Lenoir	1,270	\$43,239,823	\$35,636,237	1,067	84%
Tyrrell	1,074	\$11,707,291	\$9,513,153	904	84%

County	Total Impacted Buildings (Floor)	Total Flood Damage Estima	NFIP Insurance Deficit (Individual	Un/Underinsured Properties	Percent Properties Un/Underinsured
Hyde	3,605	\$121,595,409	\$100,290,363	3,060	85%
Wayne	1,482	\$20,931,515	\$16,553,203	1,271	86%
Pitt	787	\$10,153,879	\$8,954,879	683	87%
Chatham	107	\$6,327,806	\$5,964,624	93	87%
Hertford	23	\$427,276	\$398,003	20	87%
Duplin	1,431	\$98,259,502	\$80,086,056	1,269	89%
Randolph	286	\$21,070,684	\$20,375,707	256	90%
Johnston	221	\$1,304,649	\$1,277,502	198	90%
Columbus	978	\$14,547,844	\$13,238,848	879	90%
Greene	74	\$200,344	\$147,801	67	91%
Washington	267	\$2,191,562	\$1,957,236	245	92%
Jones	1,046	\$32,841,744	\$26,976,735	972	93%
Robeson	4,772	\$225,155,451	\$209,200,671	4,446	93%
Sampson	233	\$8,178,891	\$6,922,885	218	94%
Hoke	36	\$574,879	\$551,687	34	94%
Montgomery	18	\$617,178	\$614,058	17	94%
Rockingham	169	\$4,976,496	\$4,238,315	161	95%
Stanly	142	\$3,630,158	\$3,580,145	136	96%
Scotland	168	\$5,405,158	\$5,309,893	161	96%
Stokes	27	\$66,127	\$65,988	26	96%
Richmond	160	\$21,810,477	\$21,646,129	155	97%
Bladen	893	\$27,087,505	\$26,441,492	867	97%
Cabarrus	100	\$1,115,799	\$1,114,338	99	99%
Davidson	579	\$1,513,308	\$1,497,589	575	99%
Rowan	660	\$4,238,318	\$4,232,562	659	100%
Anson	24	\$5,626,928	\$5,626,927	24	100%
Gates	2	\$24,121	\$24,121	2	100%
Martin	7	\$40,932	\$40,932	7	100%
Totals	79,893	\$3,459,162,104	\$2,257,751,457	59,168	74%

	Florence	Matthew	Floyd
Date	Sept. 14, 2018	Oct. 8, 2016	Sept. 15, 1999
Power outages	Over 1 million people	Approximately 800,000 people	Over 500,000
Displaced in shelters	18,000 people	3,750 people	
Roads closed or impassable	Over 1,100	635	
School systems closed	58	34	
Deaths	40	28	51
Major Dis. Dec. (counties)	28	49	66
Homes damaged, value, severity	74,000, \$2.53 billion, 4,269 destroyed	88,000, \$967 million, 4,424 destroyed	56,000, 7,000 destroyed
Employment in floodplain	77,000 employees	50,000 employees	
Business disruptions	25,000 businesses, 400,000 employees	30,000 businesses, 400,000 employees	60,000 businesses
Value of physical damage to businesses (current dollars)	\$600 million	\$745 million	\$1 billion
Direct economic losses to non-ag. businesses (current dollars)	\$1.86 billion	Over \$2 billion	\$4 billion
Agriculture losses (current dollars)	Over \$1.1 billion	\$400 million	\$1 billion
Total economic losses (current dollars)	\$5.29 billion		



Vital Component of EOC Operations



Media = Web Traffic

Florence flooding: Monitoring potential flooding in your area with FIMAN

Monday, September 17, 2018

RALEIGH, N.C. (WTVD) -- The aftermath of Florence has left many communities largely underwater.

Luckily, the NC Flood Inundation Mapping and Alert Network has created an amazing piece of software that allows users to hone in on a specific river in their area and see where the water is predicted to flood out to.

RELATED: Florence flooding: Storm 'has never been more

As inland waters rise, state keeps wary eye on 167 high-risk dams

Tags: Hurricane Florence, flooding

Posted September 15
Updated September 16

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Track flooding in your neighborhood in real time

Try Kraft Mozzarella & Parmesan Expertly Paired for pizza

Maps & Driving Directions

Enter Your Address & Go! Quick Maps and Directions

By: FOX 46 Web Staff

POSTED: SEP 12 2018 10:54PM EDT
VIDEO POSTED: SEP 12 2018 10:13PM EDT

Jim Cantore Retweeted

Jen Carfagno @JenCarfagno · 30m

See where North Carolina flooding is at a glance with flood inundation map. Arrows show is water levels at the location are going up or down. #Florence #Flooding #TurnAroundDontDrown

FIMAN Flood Inundation Mapping and Alert Network

Search Gages Gages Summary Legend Building Legend Weather Radar

Showing 377 Gages Show All Gages

4 14

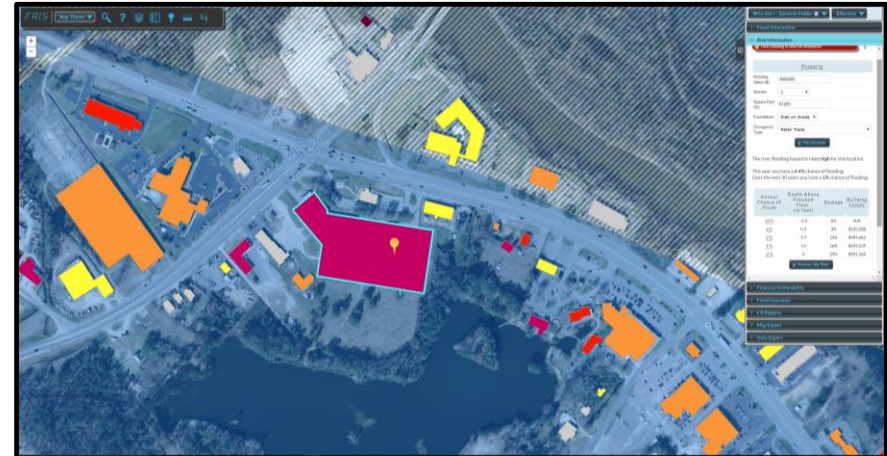
Media = Web Traffic



FIMAN and FRIS – Usage During Florence

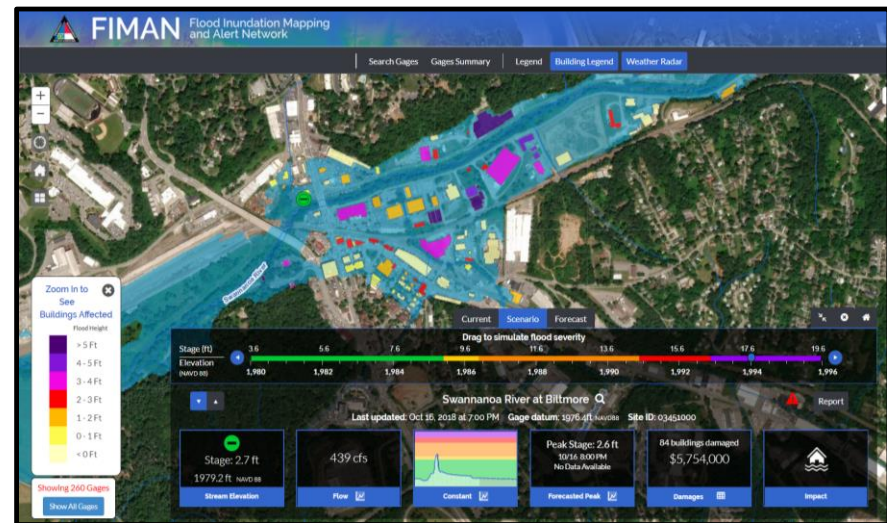
From September 6th – September 20th the Flood Risk Information System – **FRIS** experienced:

- 198,811,131 Page Views
- 255,414,441 Hits
- Busiest Day – September 11th
 - 66.15M Views / 77.35M Hits



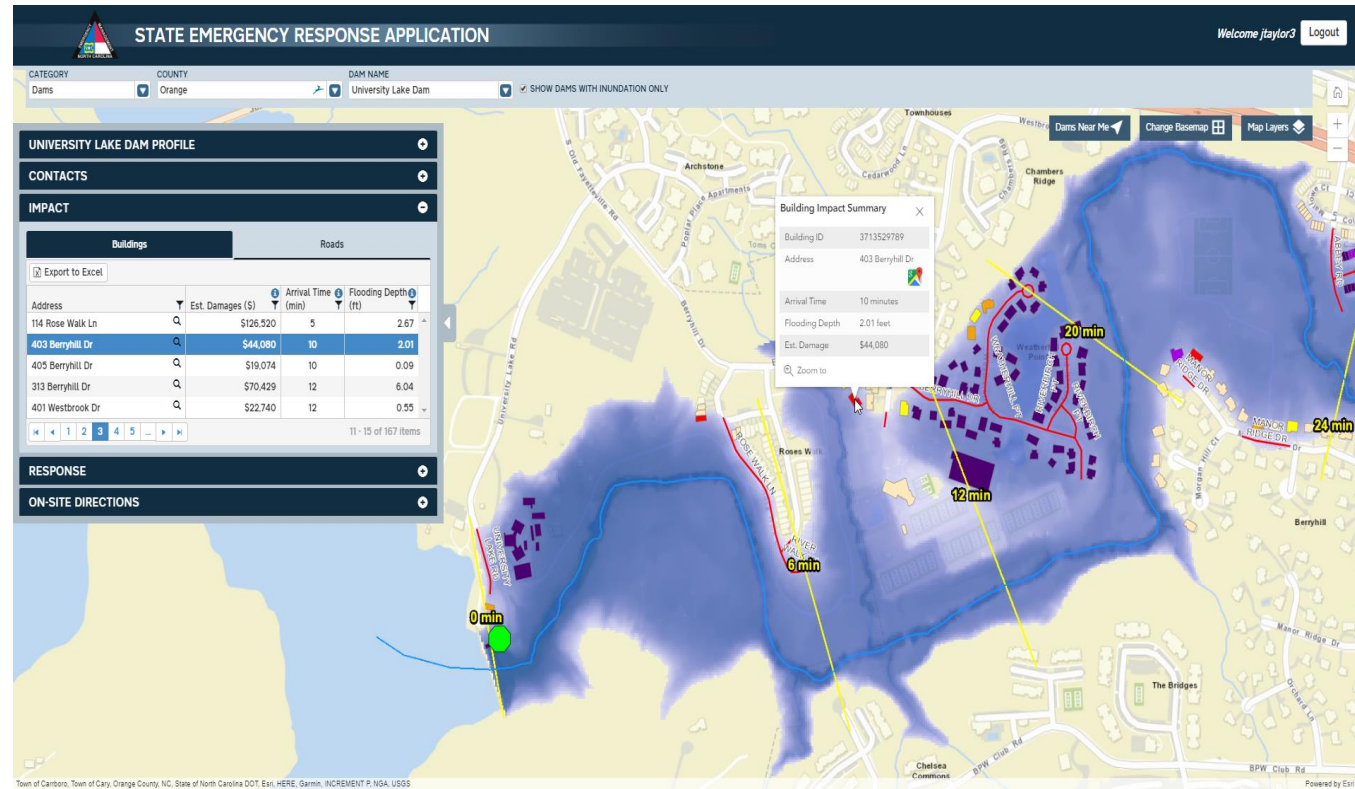
From September 6th – September 26th the Flood Risk Information System – **FIMAN** experienced:

- 7,155,182 Page Views
- 59,193,296 Hits
- Busiest Days – September 15th and 16th
 - 1.58M Views / 12.88M Hits



Florence - Dam Inundation Modeling, Mapping and Risk

- Through DRA-2018, NCEM-RM is in the process of constructing breach analysis / inundation models, inundation map rasters and impact analyses for 1,505 High and Intermediate Hazard Dams.
- This information will be incorporated into the State Emergency Response Application (SERA) and NC SPARTA.
- During Hurricane Florence, NCEM-RM utilized the existing dam inundation modeling, inundation rasters, and risk impact analysis to instruct first responders on which properties should be evacuated.



*With Great Challenge Comes
Great Opportunity for Innovation*



QUESTIONS?

John.Dorman@ncdps.gov
919-825-2310