



The Development of the North Carolina Disaster Spray Maps

Jeff Brown



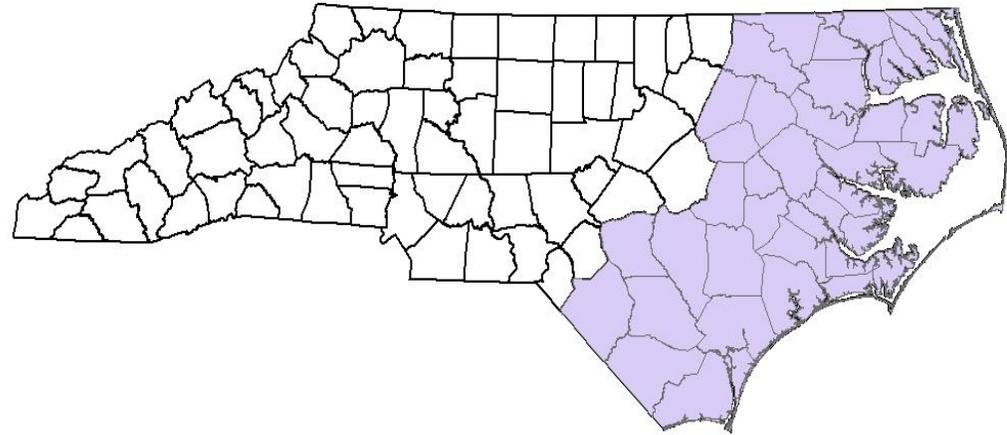


Hurricane Floyd 1999

- Aerial spray maps were made during the disaster response in Raleigh using the 1990 census data.



Hurricane Floyd Counties





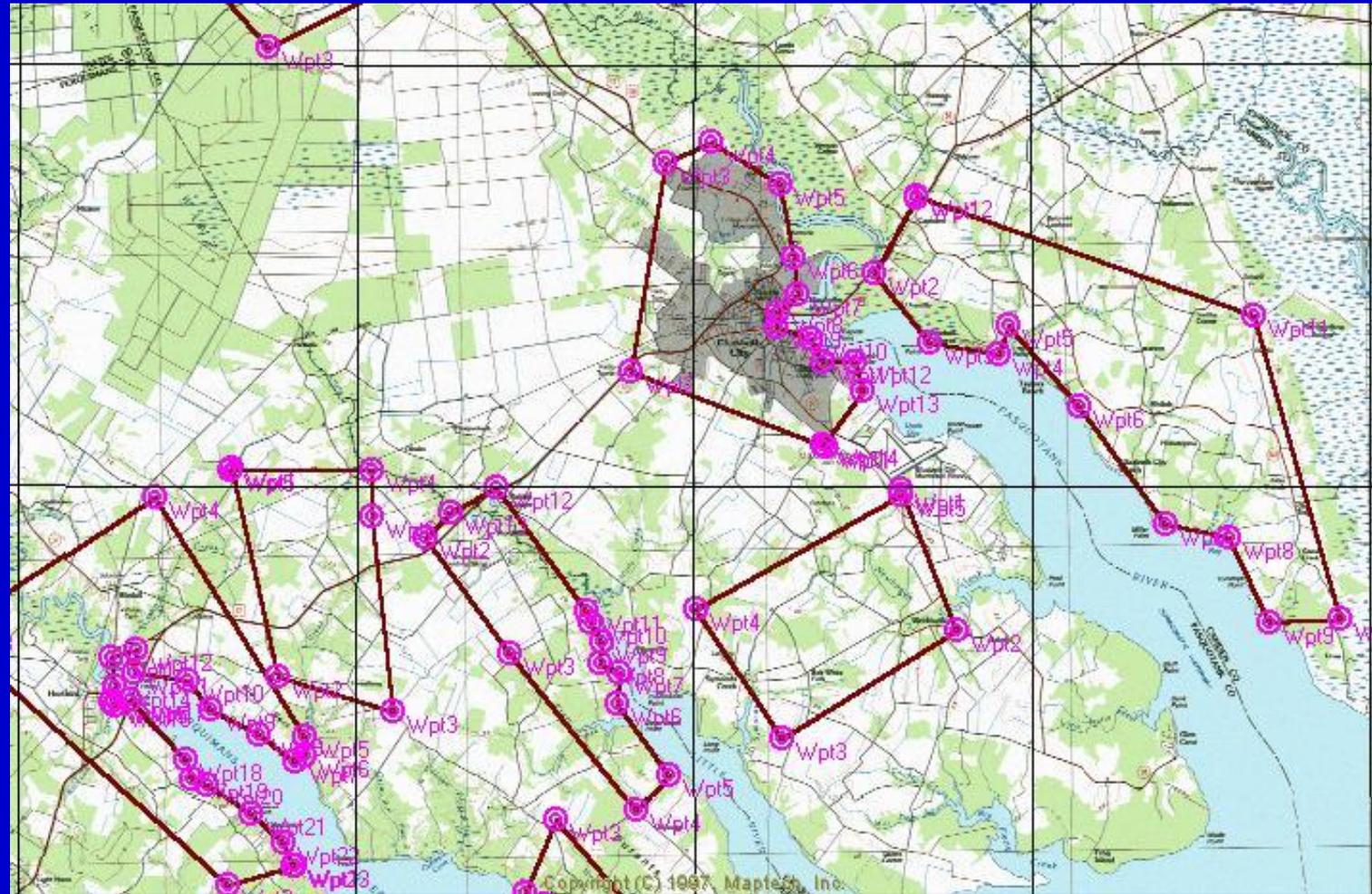
2000



- MapTech was used to computerize the spray blocks from the paper Floyd maps.
- Each vertex (point) in a spray block was assigned a GPS coordinate.
- 1,734 points were assigned to 188 polygons in the 37 Floyd Counties
- Polygons are based on population and potential mosquito production.



Map Tech Polygons





2001



- Met with USFWLS to address federally listed endangered species concerns
- There is no way that existing software can handle the complexities of this project.
- State of NC has no \$\$ to purchase the software for this project.
- Brunswick and New Hanover Counties agree to help.
- Nicholas School of Environment Duke University GIS training



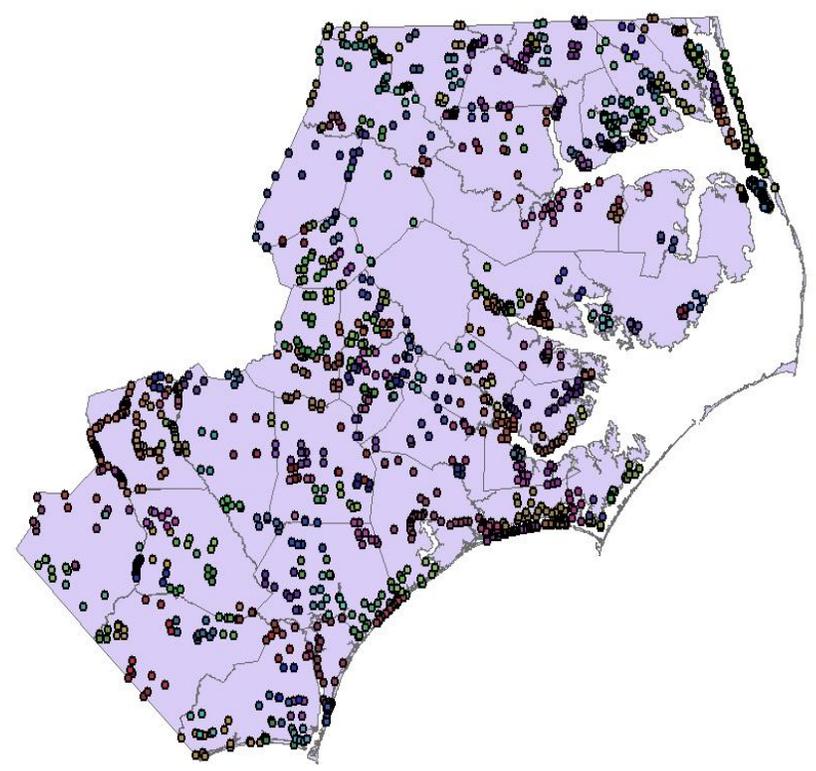
2002



- New Hanover County agrees to provide computer resources
- Spray polygons are converted from MapTech to ArcView 3.2 using NHC's software.
- Brunswick County builds their mosquito control GIS capabilities - ArcGIS 8.2
- Nicholas School of Environment Duke University for more GIS training
- Develop West Nile polygons (entire state)

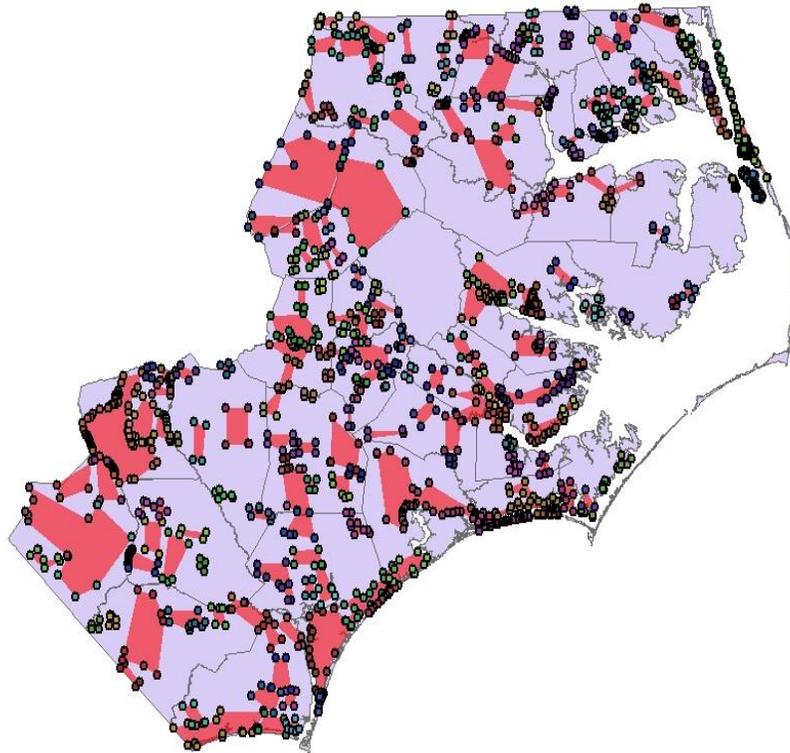


Hurricane Floyd Maptech points imported to Arc Map





Original Polygons





Data Considerations

- Discover the North Carolina Center for Geographic information Analysis....
 - Update polygons to reflect 2000 census data
 - Include municipal boundaries
 - Exclude state, federal parks and military bases
 - Exclude endangered species
 - Buffer major hydrography
 - County polygons should be mapped individually
 - Add major roads to map



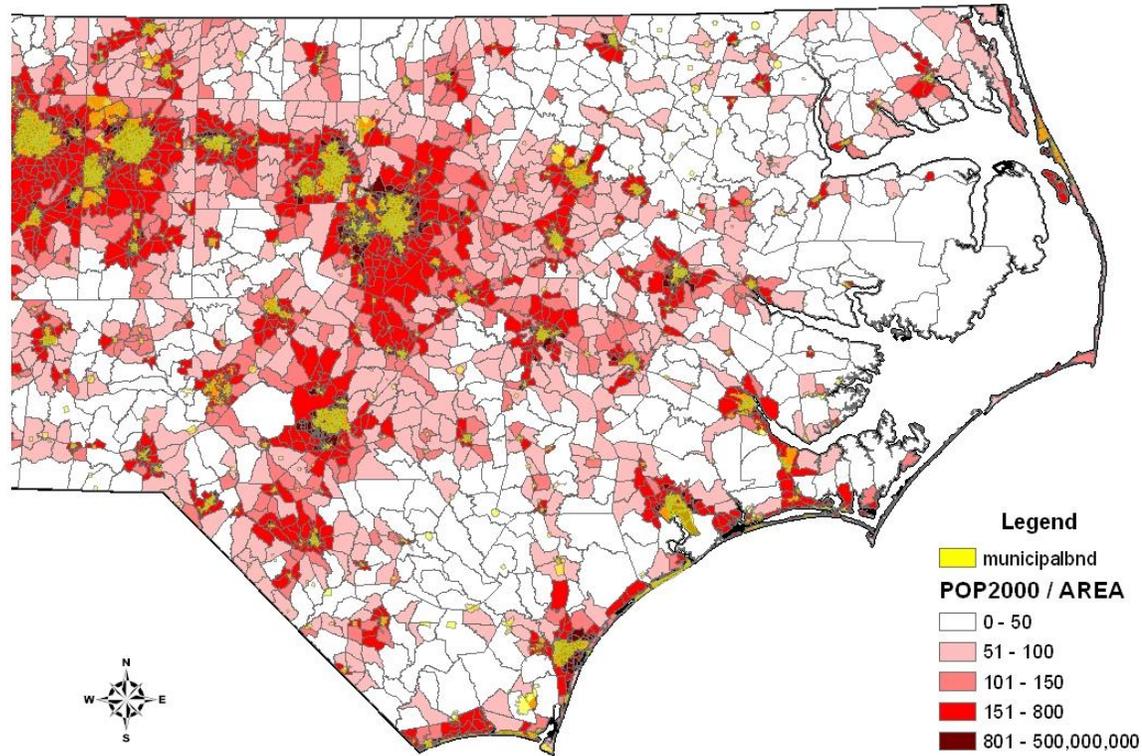
2003



- Continue working with USFWLS
- Contact aerial applicator about capabilities
- Meet with Brunswick, Craven and ARHS about local concerns
- Scramble to finalize spray maps for Isabel implementation

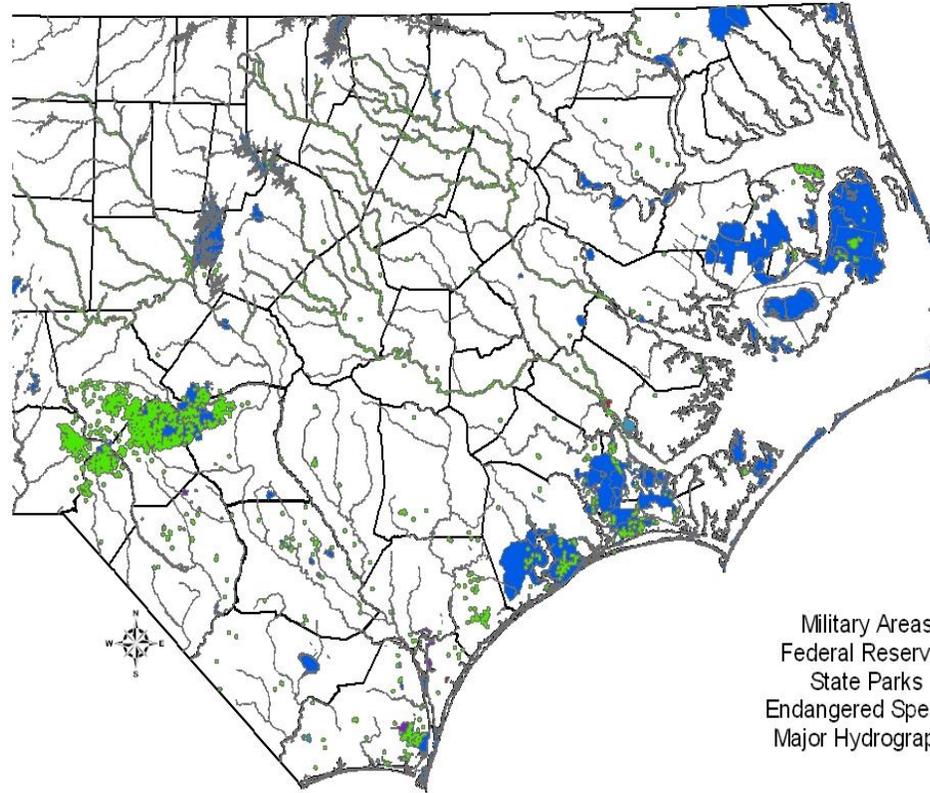


2000 Census Data





Areas to Avoid



Military Areas
Federal Reserves
State Parks
Endangered Species
Major Hydrography

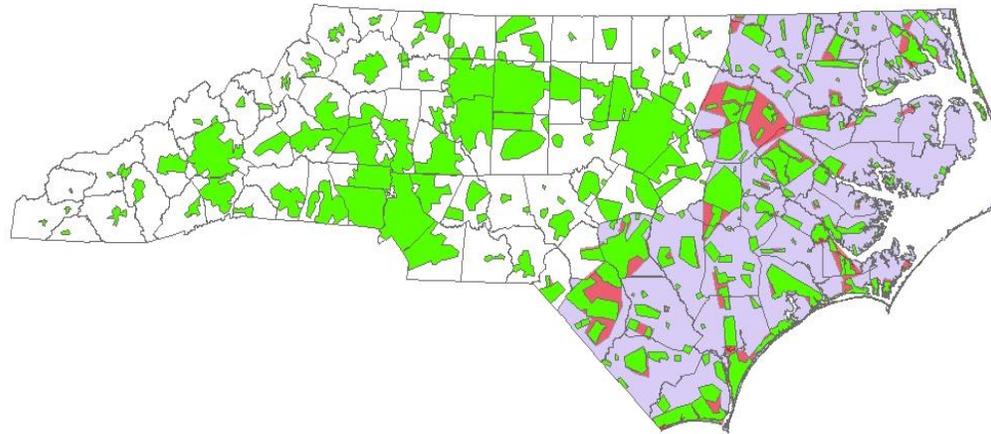


Agencies Participating

- NC PHPM
- USFWLS, NCHP (endangered species)
- County Health Department (local input)
- Aerial applicators (capabilities)
- NCCGIA geographic data, expertise
- Duke University hours of training



Buffered Spray Blocks



Reshaped by County
Buffered major hydrography



Project Summary

- 100 Counties mapped by population
- 297 polygons state wide
- 9,212,446.2 acres
- 37 separate project counties completed
- 187 polygons from Floyd counties
- 111 polygons in 22 counties approved for Hurricane Isabel
- Hurricane Isabel tests the GIS Project



Brunswick County Aerial Spray Polygons Hurricane Florence 2018

Anthony Thomas

Brunswick County GIS Administrator



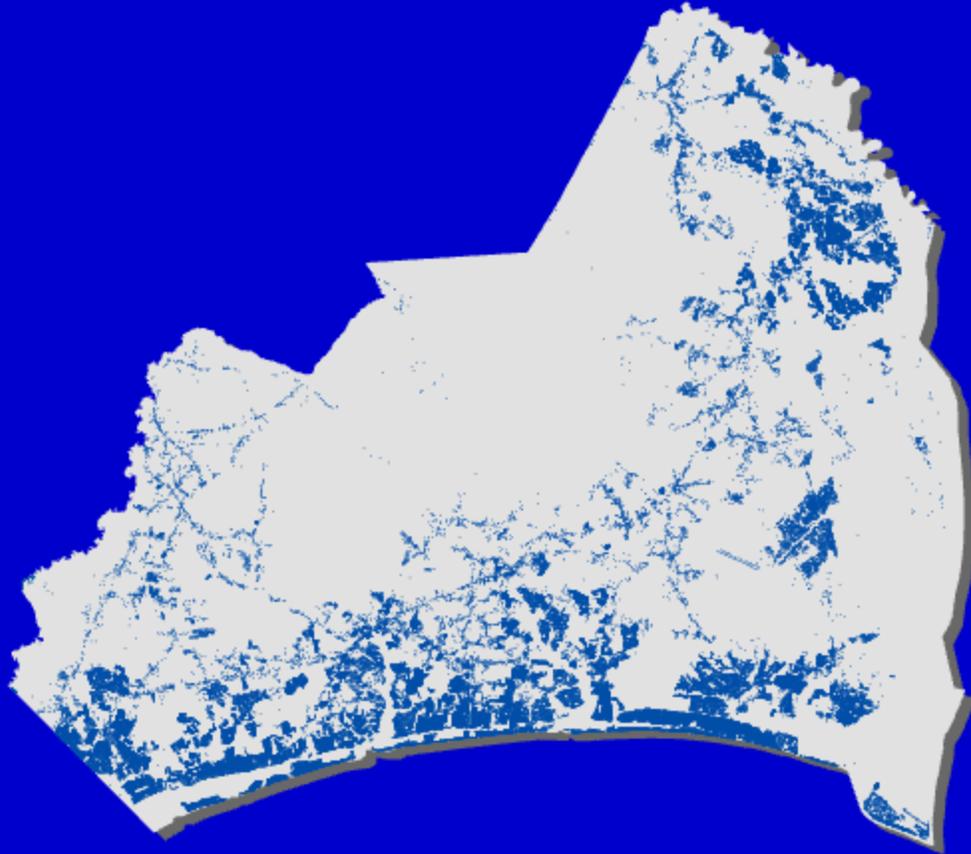
Understanding the Need



- Initial request came in as a phone conversation
- Takeaways from that conversation:
 - Understood the need to delineate areas of concentrated populations
 - Recognized there may be areas that should be protected from aerial spray application per US Fish and Wildlife
 - Aware that this process had been implemented before (15 years prior; much has changed since)
 - **Ask more questions**
- Let's get started looking at the data!



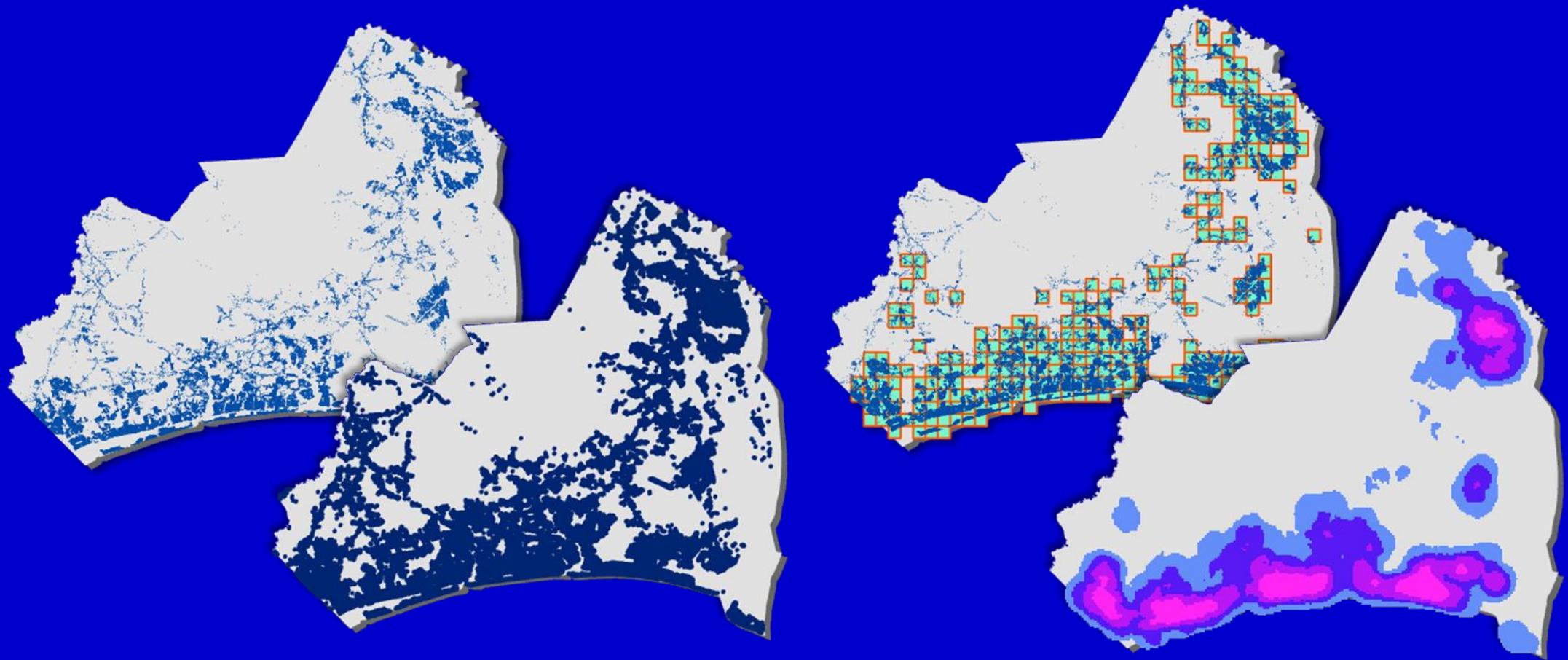
Defining the Area in Need



- Where are the people?
- Brunswick County address points typically represent built structures; majority of points represent residential structures
- Analyzing address density:
 - Attempted buffering points to create polygons based on density of addresses
 - Created grids to determine address density per square mile
 - Created raster products that identified areas of greatest concentration



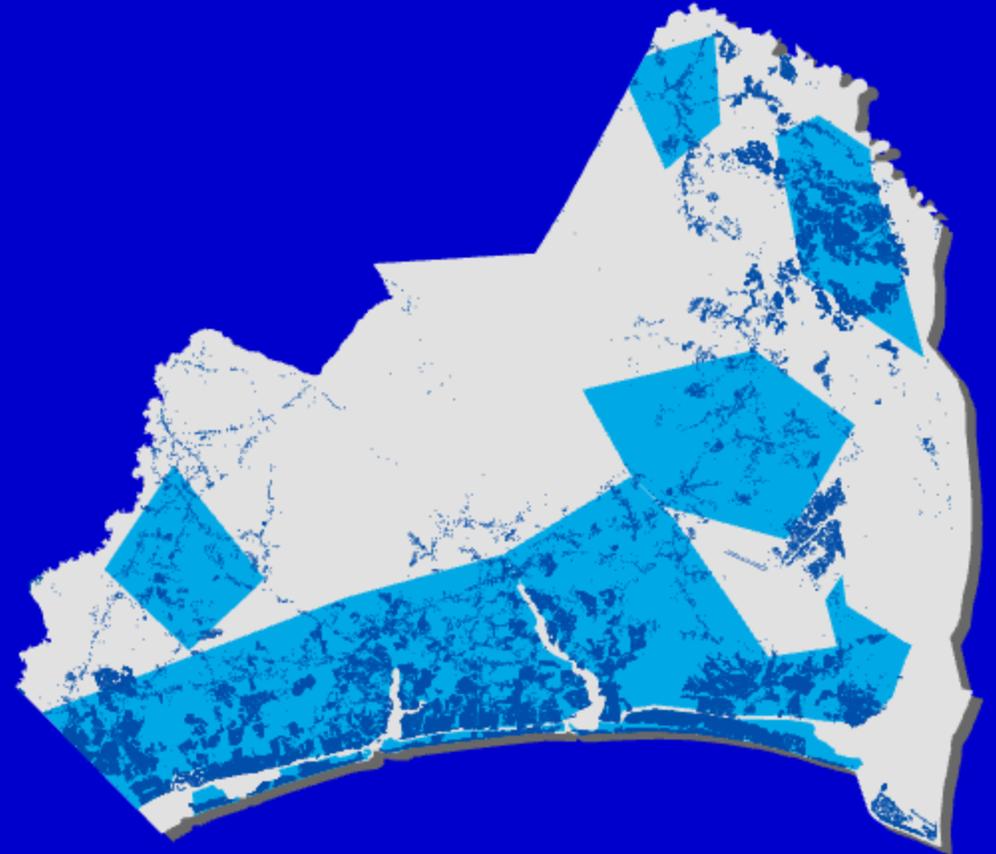
Defining the Area in Need





Revisiting History

- Brunswick County had experienced this process in the past
- Much of the necessary work had been done to create spray polygons; there would be no need to create new spray polygons from scratch
- Base polygons were created in 2003; these would form the foundation for Hurricane Florence response polygons for 2018
- File geodatabase feature classes were created from original spray polygon shapefiles (make copies - protect the original data)

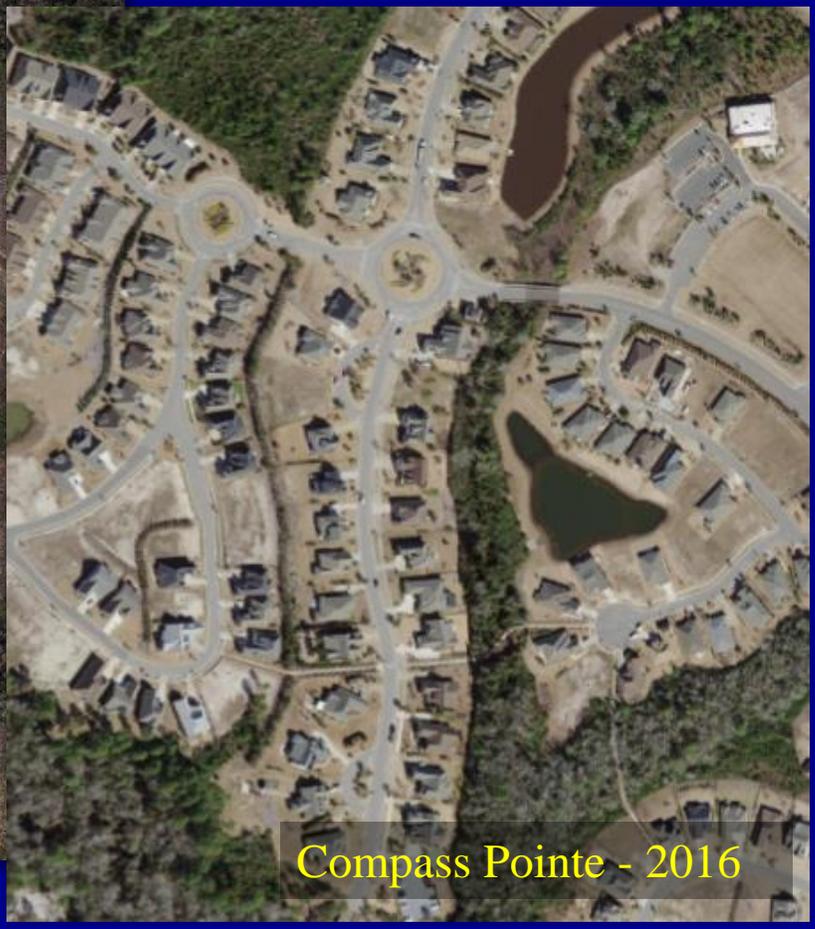




Capturing Change



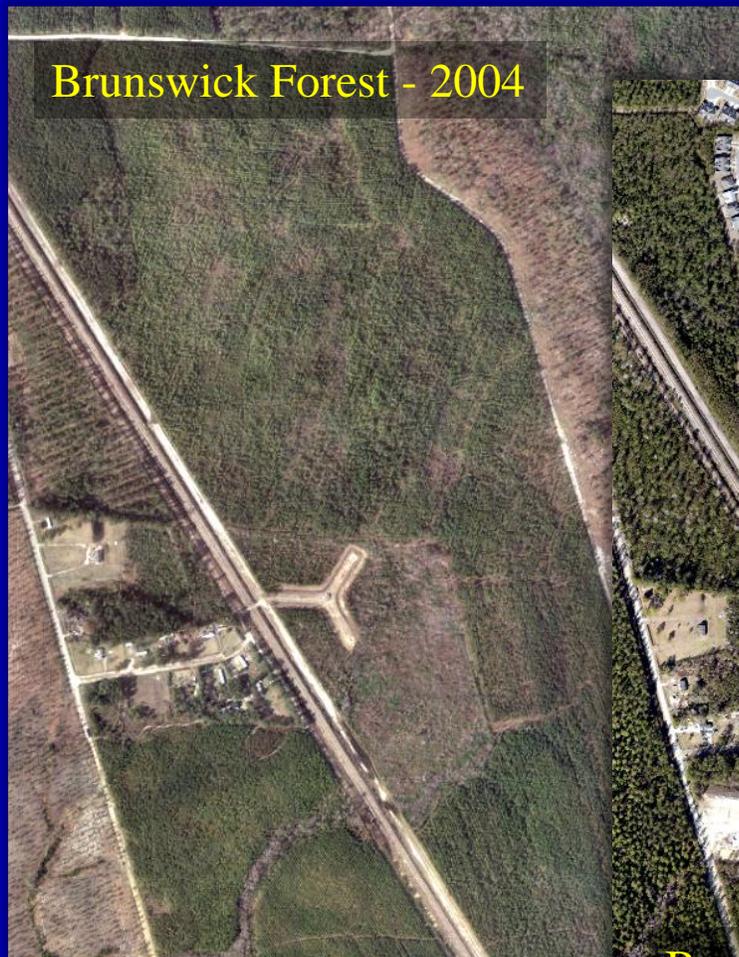
Compass Pointe - 2004



Compass Pointe - 2016



Capturing Change



Brunswick Forest - 2004

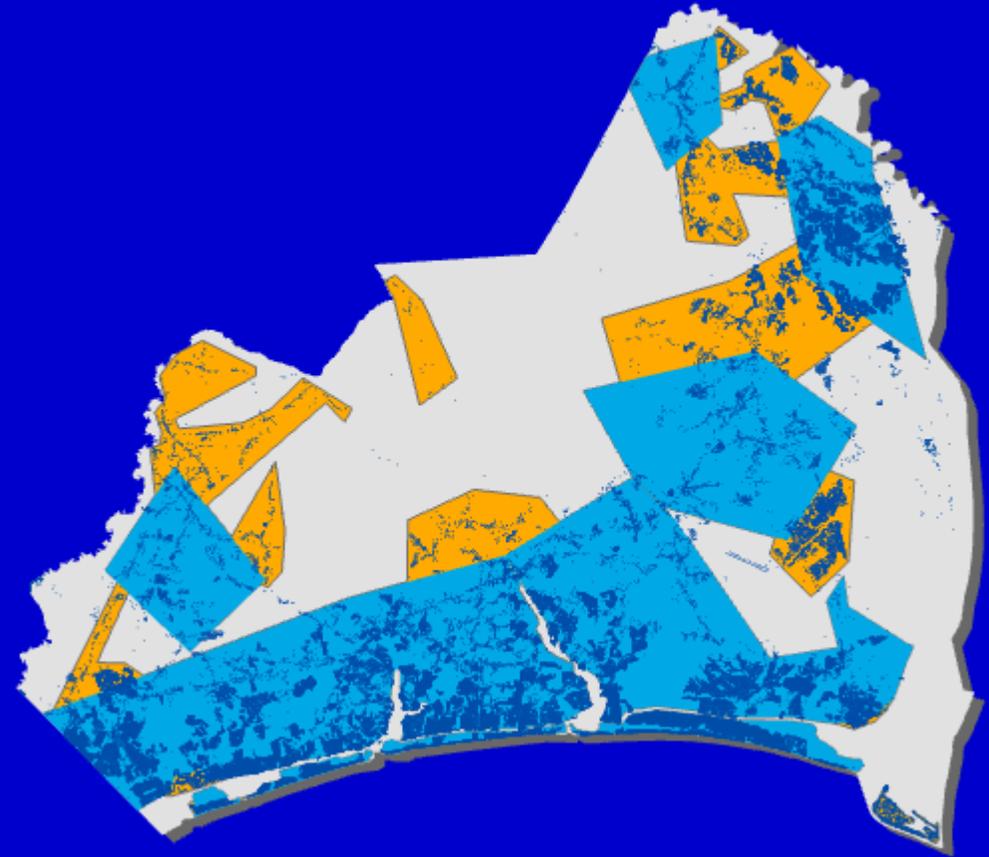


Brunswick Forest - 2019



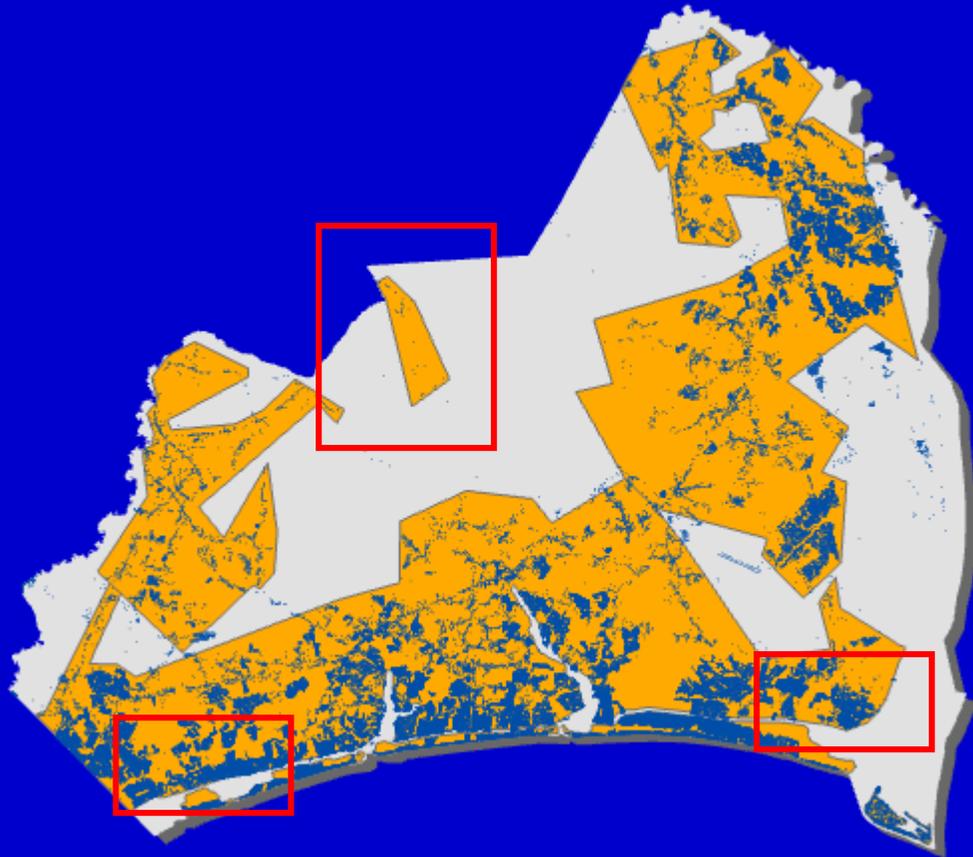
Capturing Change

- Brunswick County has experienced tremendous growth since 2003
- Additional polygons were required to capture large pockets of population growth that occurred since original spray polygons were created





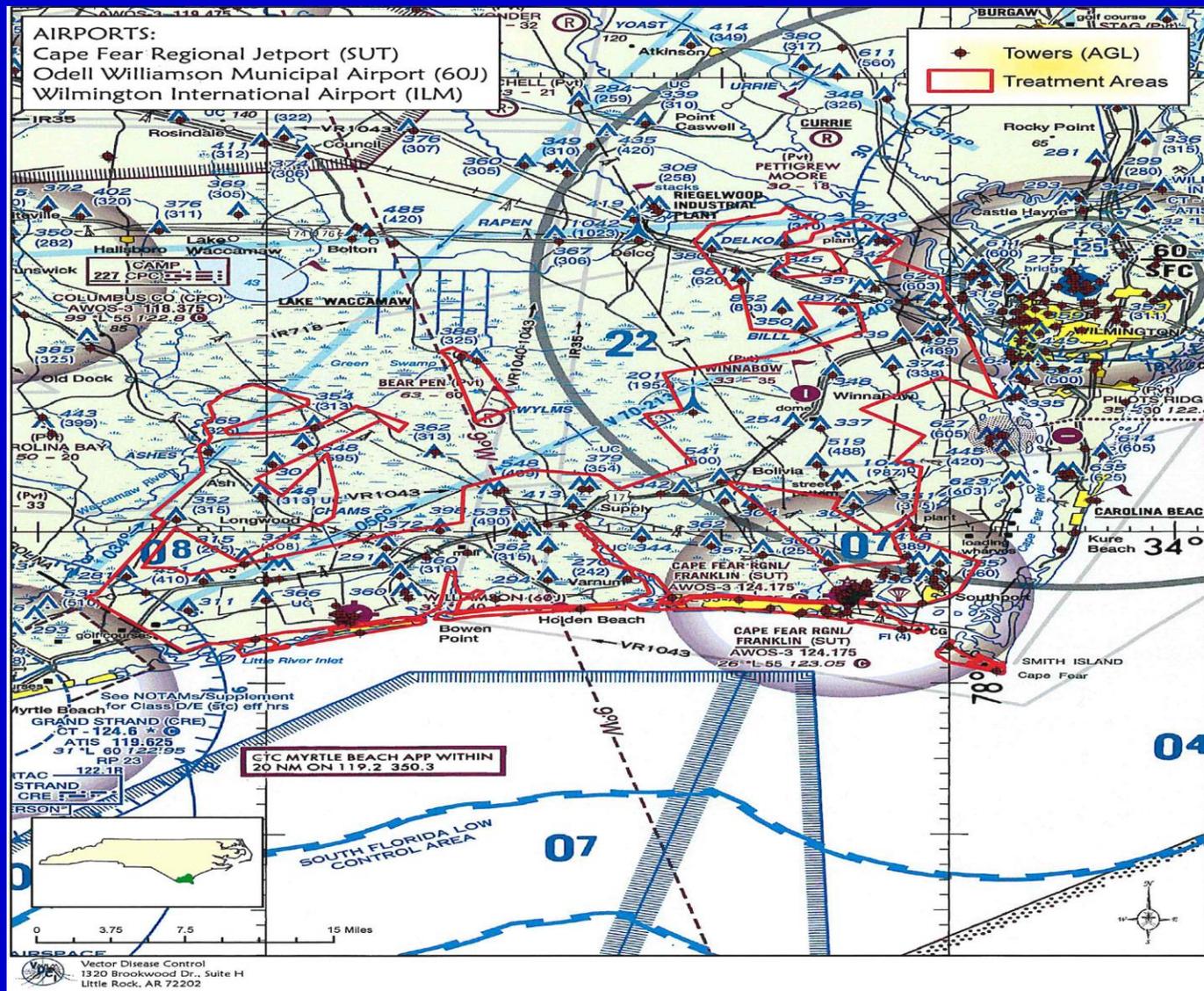
Finalizing the Area in Need



- Ongoing review of the spray polygons led to additional changes that incorporated areas possibly susceptible to increasing mosquito populations



Initial Mapping Provided by VDCI





Sharing the Data

- An ArcGIS map package was created to provide map and data to state agencies
- Polygon data was exported to ESRI shapefile format for sharing with county staff, state agencies and US Fish and Wildlife
- Brunswick County and VDCI exchanged shapefiles for review and assessment



USFWLS REVIEW



- **9/28/2018** Sara, Please find attached a zip archive containing the shapefile Jeff referenced below. Please let me know if you have any questions.
- **9/30/2018** Hey Sara, just doing my due diligence with respect to Brunswick's Aerial application for mosquitoes starting Monday evening Oct 1,2018. Thanks Jeff
- **10/1/2018** Brunswick will start aerial spraying for mosquitoes this evening. Our contractor will be using 3 planes, one for all the barrier islands, 1 for the northern part of the county and one starting on the west end of the county. It should take 3 evening applications to complete the 325,000 acres of the county.

I would like to introduce to a few key folks you may need to communicate with over the next couple of weeks. Michael Doyle is the medical entomologist for North Carolina and is facilitating county mosquito response efforts through local Health Departments. Dr. Jim Burnette is the Director of the NCDA&CS Structural Pest Control and Pesticide Division and Dr. Mike Waldvogel serves as Director of the Structural Pest Management Training & Research Facility with NC State. Jim and Mike put the link below together. It includes a list of counties that have applied for an aerial exemption through NCDA. I think this may be a good way to prioritize your fish and wildlife review as additional counties submit their spray maps for USFWLS review.



USFWLS Response

- Sorry I was unable to load your proposed spray polygons sooner. I've reviewed them and there are several that overlap with areas where avoidance was recommended. As you suggested last week, ground spray would be preferable in the vicinity of the listed species elements near Boiling Springs Lakes (corresponding to object id 33 in the layer your staff provided). There are other suggested avoidance areas in several other polygons (but not as extensive as the overlap in ID33). If it is possible to use alternatives to aerial spray in this area, that would be helpful, but not required by FWS. I have looped in our FEMA contact as well.
-
- Thanks for advance coordination - feel free to call my cell if you need anything before the planes go today (919-812-xxxx)
-
- Sara
- *****
Sara E. Ward
U.S. Fish and Wildlife Service
- Eastern North Carolina Ecological Services Sub-Office
- 100 Conservation Way
- Manteo, NC 27954
- (252) 473-1132 ext. 243
- sara_ward@fws.gov



Communicating Information

Brunswick County Media Release



For immediate release: 4/10/2019
Contact: Amanda Hutcheson, (910) 253-2995
Amanda.hutcheson@brunswickcountync.gov

Brunswick County Aerial Mosquito Spraying

Bolivia, NC – Aerial spraying for mosquitoes in Brunswick County will begin Monday, Oct. 1, weather-permitting, to assist with mosquito populations following Hurricane Florence and the storm-related flooding.

The spraying will be County-wide, including all towns or cities and all islands. The planes will fly at approximately the same time of day that the trucks spray (during the evening hours). Additional information about the aerial spraying, including a spraying schedule, will be shared as soon as it is available.

Heavy rains and flooding can lead to large populations of mosquitoes. Some mosquitoes carry viruses that may cause illnesses such as La Crosse encephalitis, West Nile virus and eastern equine encephalitis.

Brunswick County began spraying for mosquitoes with trucks on Sept. 24, while also submitting a request for an emergency aerial response for mosquito control. That aerial spraying is set to begin Monday.

Citizens can also take precautions to prevent mosquito bites, including wearing light-colored, long-sleeved shirts and long pants, avoid being outside at dusk and dawn when mosquitoes are most active, and apply mosquito repellent. If using repellent with DEET, make sure to follow label instructions, and keep DEET out of the eyes, mouth and nose.

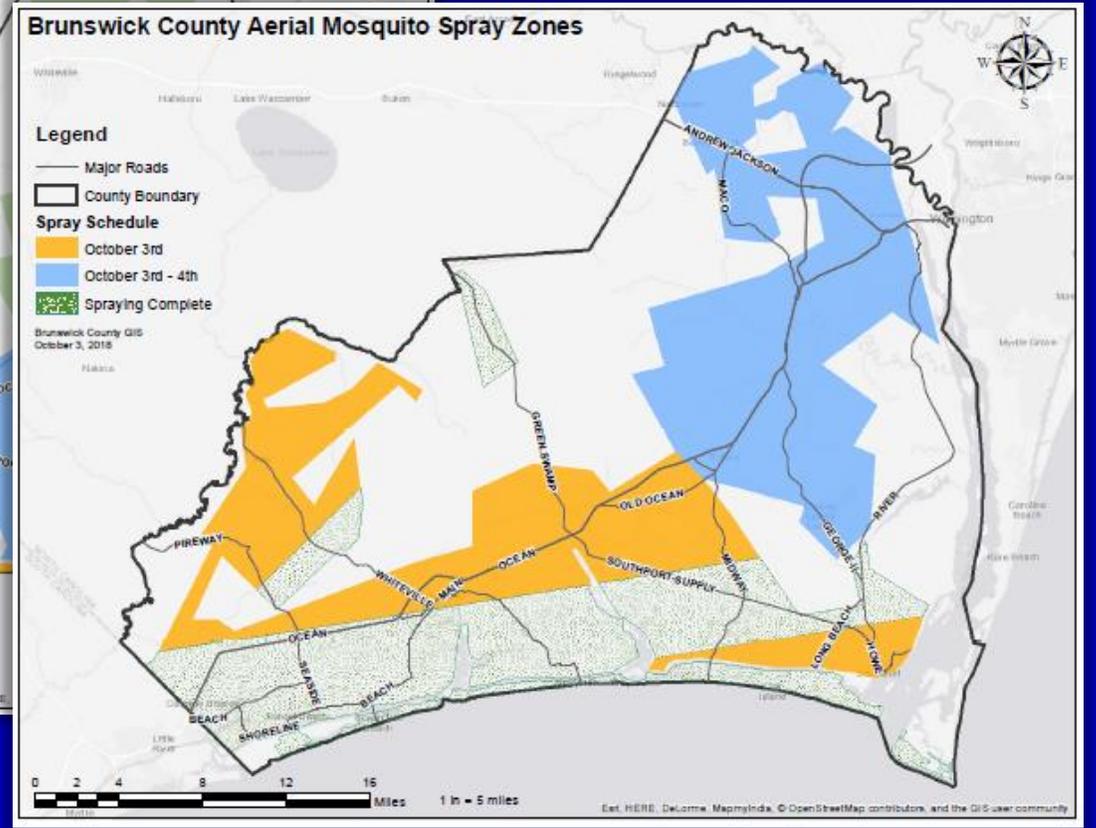
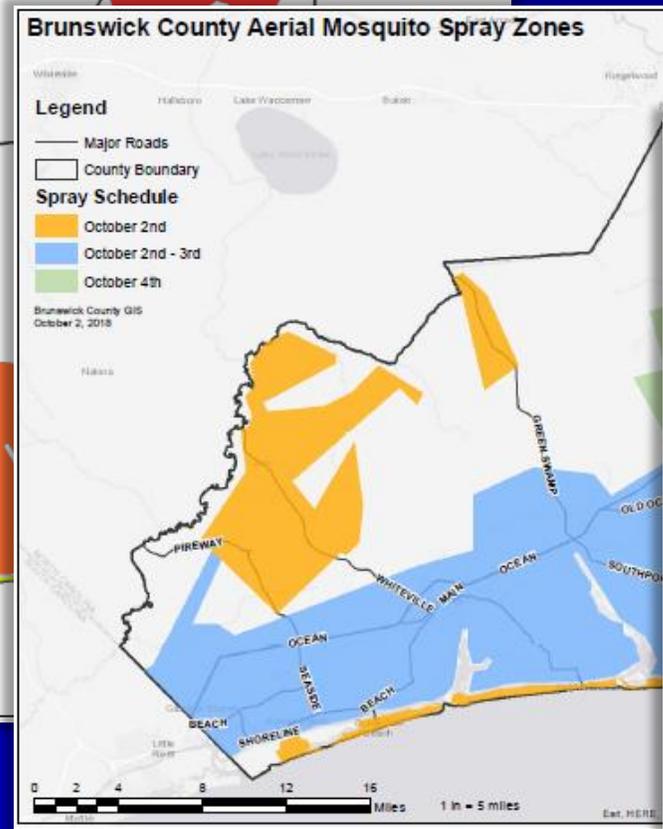
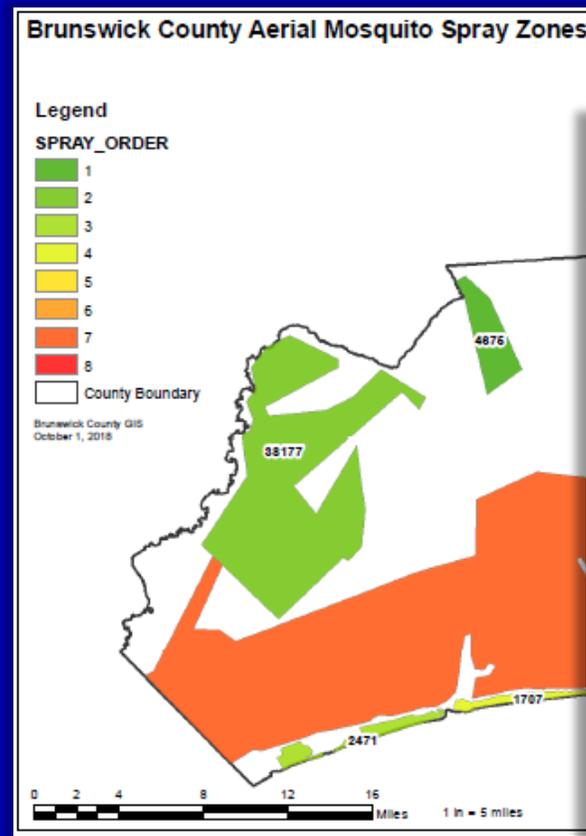
Brunswick County Mosquito Control will reach out to all registered bee-keepers. Any bee-keepers who are not registered and have questions should call Cooperative Extension at 910-253-2610 for information.

– End –

- Maps were created to complement text-based media releases communicating project initiation
- VDCI delivered daily status reports following each mission
- Multiple maps were created to convey spraying progress, as well as upcoming spray schedule, to county stakeholders and to the public

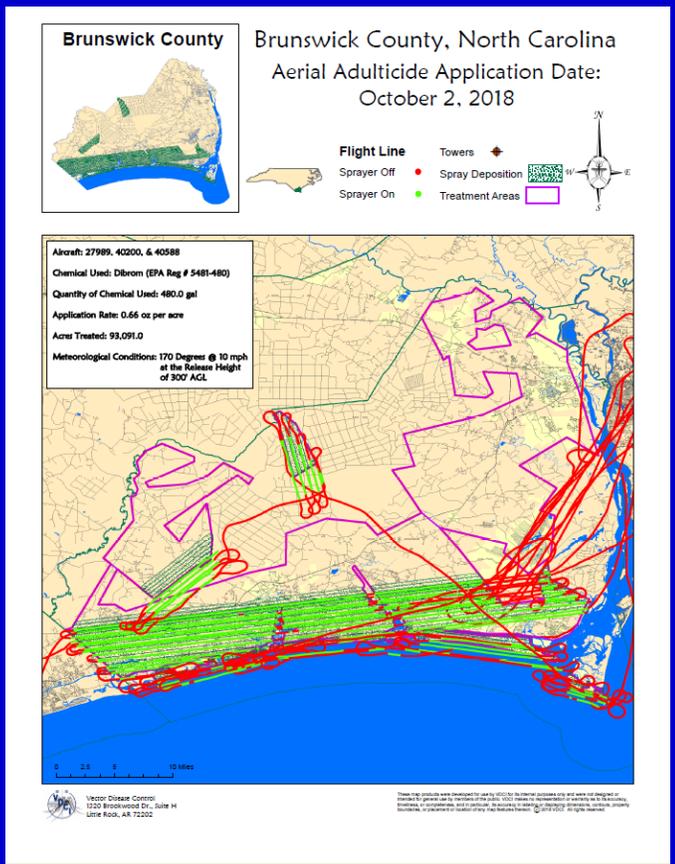


Communicating Information





10/2/2018 Application

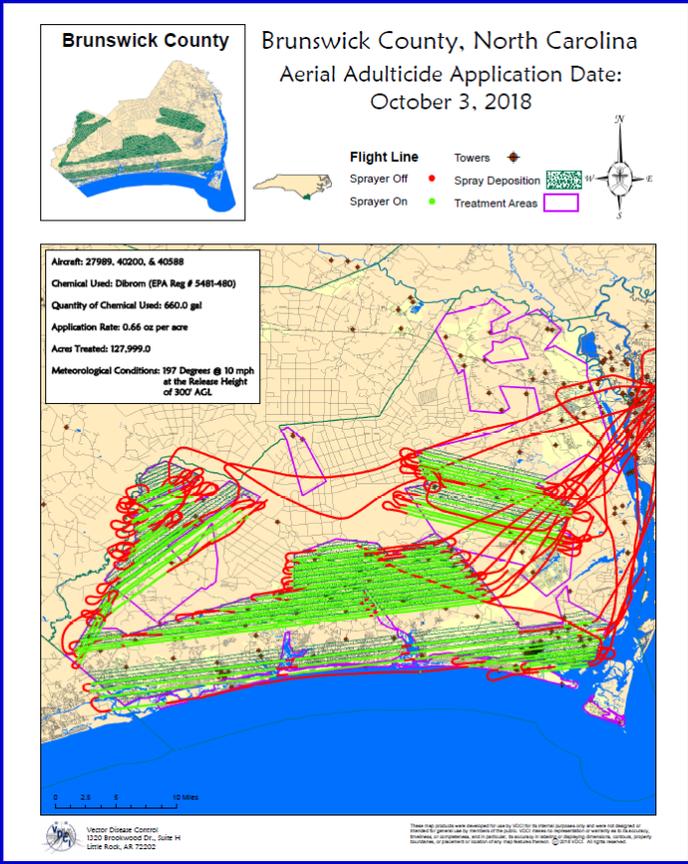


Vector Disease Control
Post-Application Report

	Vector Disease Control			
	Post-Application Report			
				TOTALS
Customer	Brunswick County, NC	Brunswick County, NC	Brunswick County, NC	Brunswick County, NC
Date	10/2/2018	10/2/2018	10/2/2018	10/2/2018
Type of Aircraft	Piper Cheftain	Piper Aztec	Piper Aztec	Piper Cheftain & Piper Aztec
Registration # of Aircraft	27989	40200	40588	27989, 40200, & 40588
Type of Application	Adulticide	Adulticide	Adulticide	Adulticide
Spray Swath Width	1000	1000	1000	1000
Pilot	Paul Heideman (#027-804)	Ragan Ellington (#027-892)	Chris Hoyles (#027-893)	Heideman, Ellington, & Hoyles
Co-pilot	Chris Jones	Buddy Hollis	Allison Gerstner	Jones, Hollis, & Gerstner
Spray Zone treated	Brunswick	Brunswick	Brunswick	Brunswick
Chemical Used	Dibrom (EPA Reg #5481-480)	Dibrom (EPA Reg #5481-480)	Dibrom (EPA Reg #5481-480)	Dibrom (EPA Reg #5481-480)
Chemical Supplied By	Customer	Customer	Customer	Customer
Quantity (gallons)	120.00	240.00	120.00	480.00
Oz/Ac	0.66	0.66	0.66	0.66
Acres treated	23,273.0	46,545.0	23,273.0	93,091.0
Time of Application Start	19:10	19:00	18:47	18:47
Time of Application End	22:45	22:45	22:45	22:45
Aircraft Indicated Speed	150 kts	130 kts	130 kts	150/130 kts
Release Altitude	300'	300'	300'	300'
Wind speed	10 mph	10 mph	10 mph	10 mph
Wind direction	170	170	170	170
Temperature/Dew Pt	80F/66F	80F/66F	80F/66F	80F/66F
Sunset	18:54	18:54	18:54	18:54
Sunrise	7:07	7:07	7:07	7:07
Sky Condition	Clear	Clear	Clear	Clear



10/3/2018 Application

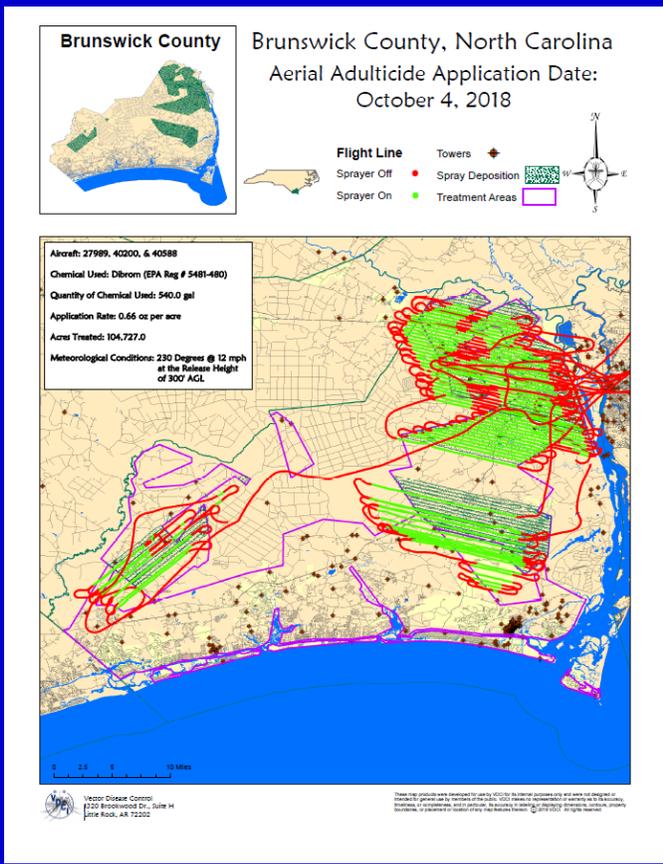


Vector Disease Control
Post-Application Report

	Vector Disease Control			
	Post-Application Report			
				TOTALS
Customer	Brunswick County, NC	Brunswick County, NC	Brunswick County, NC	Brunswick County, NC
Date	10/3/2018	10/3/2018	10/3/2018	10/3/2018
Type of Aircraft	Piper Cheiftain	Piper Aztec	Piper Aztec	Piper Cheiftain & Piper Aztec
Registration # of Aircraft	27989	40200	40588	27989, 40200, & 40588
Type of Application	Adulticide	Adulticide	Adulticide	Adulticide
Spray Swath Width	1000	1000	1000	1000
Pilot	Paul Heideman (#027-804)	Ragan Ellington (#027-892)	Chris Hovles (#027-893)	Heideman, Ellington, & Hovles
Co-pilot	Chris Jones	Zane Dear	Allison Gerstner	Jones, Dear, & Gerstner
Spray Zone treated	Brunswick	Brunswick	Brunswick	Brunswick
Chemical Used	Dibrom (EPA Reg #5481-480)	Dibrom (EPA Reg #5481-480)	Dibrom (EPA Reg #5481-480)	Dibrom (EPA Reg #5481-480)
Chemical Supplied By	Customer	Customer	Customer	Customer
Quantity (gallons)	240.00	240.00	180.00	660.00
Oz/Ac	0.66	0.66	0.66	0.66
Acres treated	46,545.0	46,545.0	34,909.0	127,999.0
Time of Application Start	18:55	19:00	18:50	18:50
Time of Application End	22:50	23:00	22:35	23:00
Aircraft Indicated Speed	150 kts	130 kts	130 kts	150/130 kts
Release Altitude	300'	300'	300'	300'
Wind speed	10 mph	10 mph	10 mph	10 mph
Wind direction	197	197	197	197
Temperature/Dew Pt	82F/66F	82F/66F	82F/66F	82F/66F
Sunset	18:53	18:53	18:53	18:53
Sunrise	7:08	7:08	7:08	7:08
Sky Condition	Clear	Clear	Clear	Clear



10/4/2018 Application

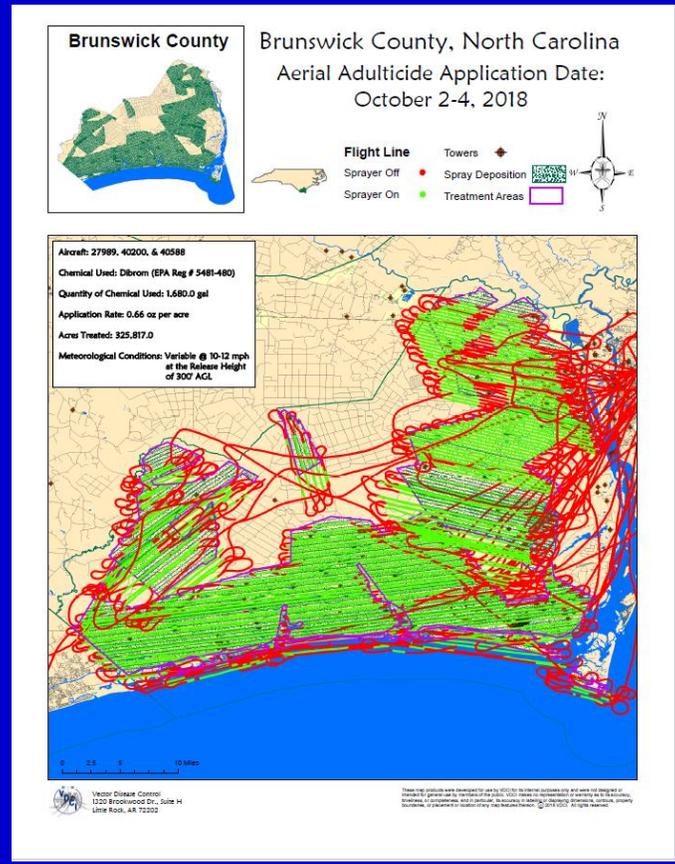


Vector Disease Control
Post-Application Report

	Vector Disease Control			
	Post-Application Report			
				TOTALS
Customer	Brunswick County, NC	Brunswick County, NC	Brunswick County, NC	Brunswick County, NC
Date	10/4/2018	10/4/2018	10/4/2018	10/4/2018
Type of Aircraft	Piper Cheftain	Piper Aztec	Piper Aztec	Piper Cheftain & Piper Aztec
Registration # of Aircraft	27989	40200	40588	27989, 40200, & 40588
Type of Application	Adulticide	Adulticide	Adulticide	Adulticide
Spray Swath Width	1000	1000	1000	1000
Pilot	Paul Heideman (#027-804)	Ragan Ellington (#027-892)	Chris Hoyles (#027-893)	Heideman, Ellington, & Hoyles
Co-pilot	Chris Jones	Zane Dear	Allison Gerstner	Jones, Dear, & Gerstner
Spray Zone treated	Brunswick	Brunswick	Brunswick	Brunswick
Chemical Used	Dibrom (EPA Reg #5481-480)			
Chemical Supplied By	Customer	Customer	Customer	Customer
Quantity (gallons)	240.00	120.00	180.00	540.00
Oz/Ac	0.66	0.66	0.66	0.66
Acres treated	46,545.0	23,273.0	34,909.0	104,727.0
Time of Application Start	19:00	19:00	18:50	18:50
Time of Application End	22:22	21:00	22:35	22:35
Aircraft Indicated Speed	150 kts	130 kts	130 kts	150/130 kts
Release Altitude	300'	300'	300'	300'
Wind speed	12 mph	12 mph	12 mph	12 mph
Wind direction	230	230	230	230
Temperature/Dew Pt	88F/66F	88F/66F	88F/66F	88F/66F
Sunset	18:52	18:52	18:52	18:52
Sunrise	7:08	7:08	7:08	7:08
Sky Condition	Clear	Clear	Clear	Clear



Complete Application





Florence Ends