



*Preparing for, Responding to, and  
Mitigating Compound Water Hazards for  
Resilient Rural Communities*

# Compound Flooding in Eastern North Carolina: Understanding Stakeholder Perceptions and Needs

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<https://tinyurl.com/yyzzzz2t>



THE CITADEL

# Study Area

## Tyrrell County (2018)

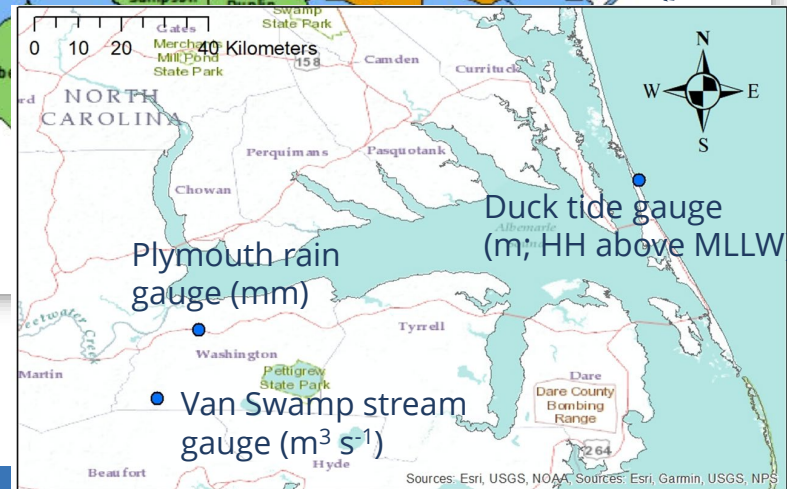
Pop	4,131
% people living in poverty	25.2 (5 <sup>th</sup> highest)
Median household income	\$35,472 (5 <sup>th</sup> lowest)
Per capita income	\$18,682 (5 <sup>th</sup> lowest)

Tyrrell County is one of the most at-risk counties to climate change in the nation



### County Population

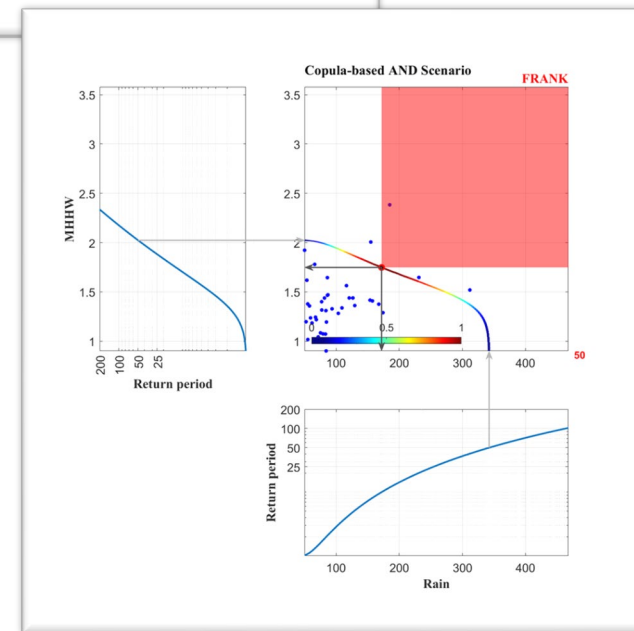
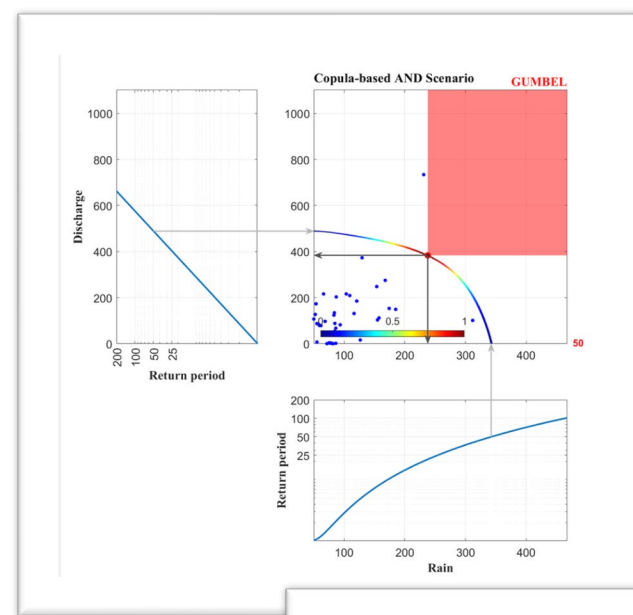
- Green: Rural (50 - 99.9%)
- Orange: Rural (100%)
- Blue: Urban (More than 50.1%)



# Goals of NOAA Project

Related to compound flood events:

1. **assessing the perceived risks and needs of the hazard management and planning community in eastern North Carolina through two way communication**
2. examining the physical nature and economic and health impacts from 2010 to present
3. using this information to co-produce knowledge and tools for better preparation, response and mitigation plans.



# February 26, 2020 Compound Flood Workshop



- 41 Emergency managers, planners, and elected officials
- Director, Tyrrell Soil & Water Conservation District
- County Manager, Tyrrell County
- Emergency Management Coordinator, Tyrrell County

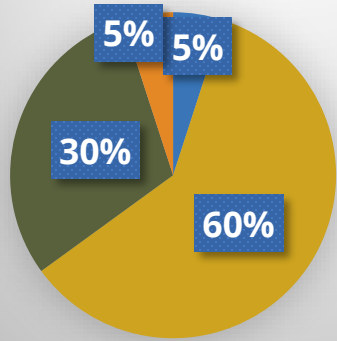


## Rain

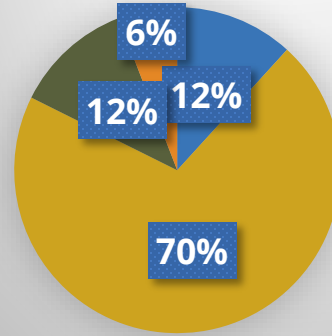
### FREQUENCY

## River

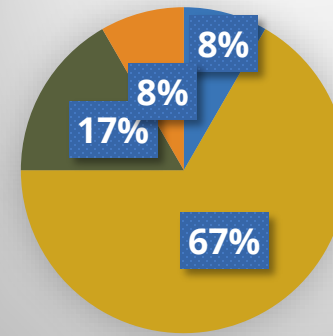
## Ocean/Sound



- Almost never
- Somewhat frequent
- Very frequent
- Constant



- Almost never
- Somewhat frequent
- Very frequent
- Constant



- Almost never
- Somewhat frequent
- Very frequent
- Constant

80% saw this type of flooding as becoming **more frequent**

58% saw this type of flooding as becoming **more frequent**

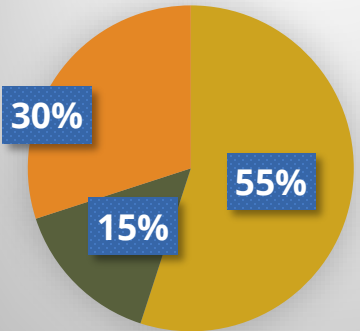
53% saw this type of flooding as becoming **more frequent**

## Rain

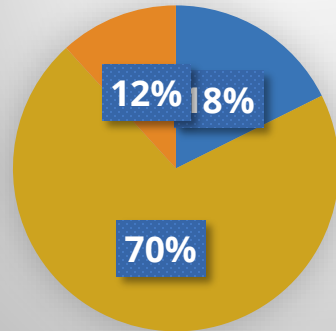
### SURPRISE

## River

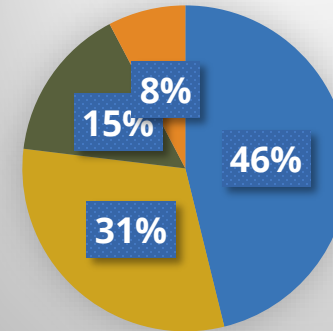
## Ocean/Sound



- Never
- Sometimes
- About half the time
- Most of the time



- Never
- Sometimes
- About half the time
- Most of the time

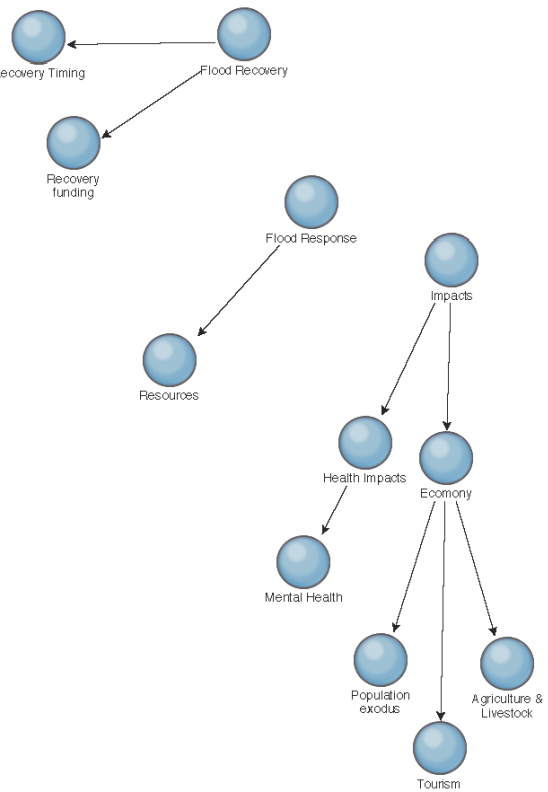
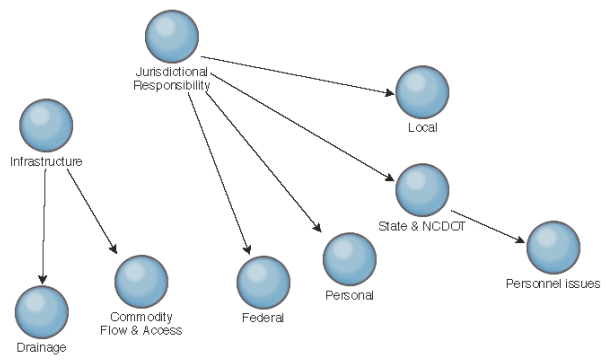
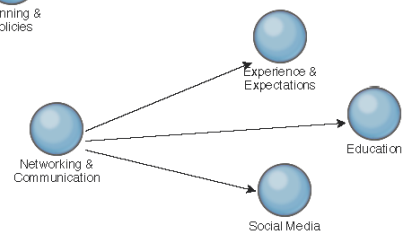
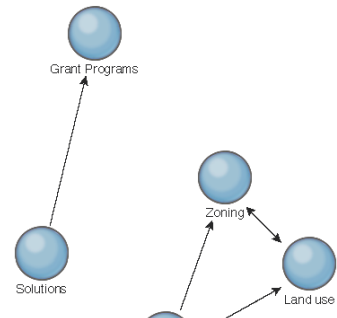
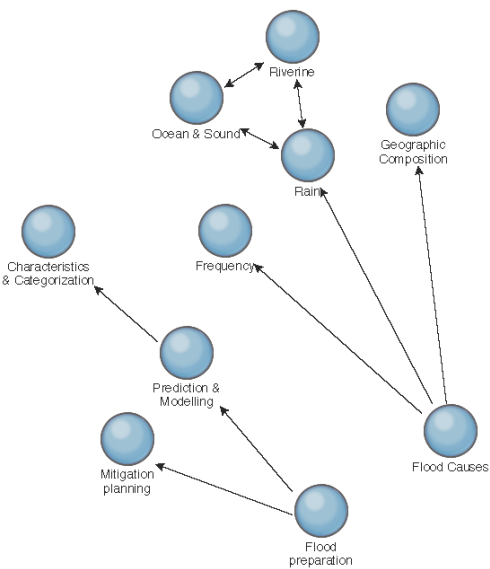


- Never
- Sometimes
- About half the time
- Most of the time

26% saw this type of flooding as becoming **more surprising**

6% saw this type of flooding as becoming **more surprising**

0% saw this type of flooding as becoming **more surprising**



### Flood Causes:

- Rain
- Riverine
- Ocean & Sound

### Infrastructure:

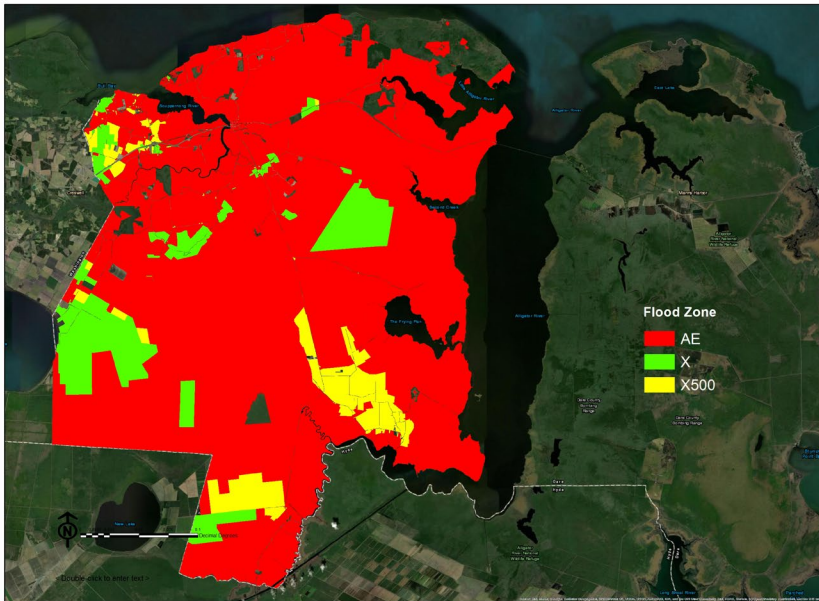
- Drainage
- Commodity Flow & Access

### Impacts:

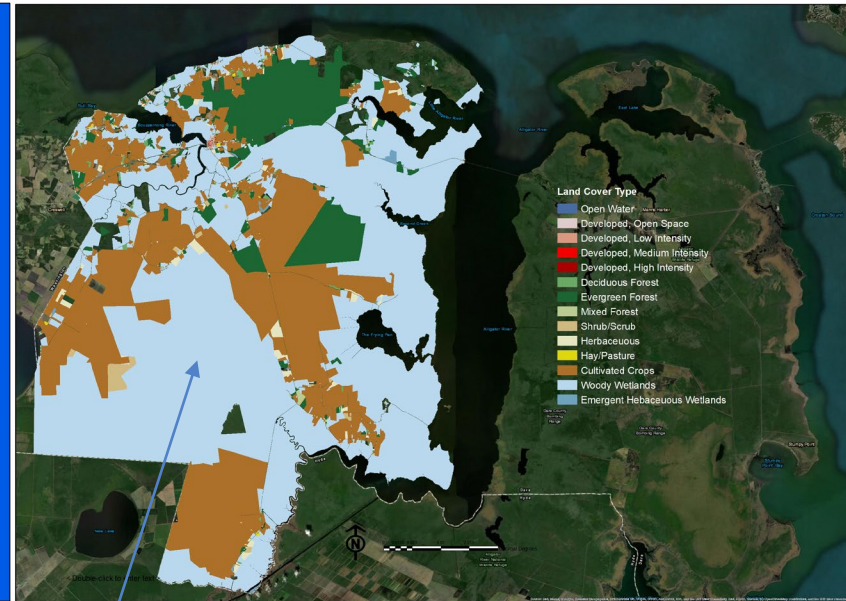
- Economy
  - Tourism
  - Agriculture/Livestock
  - Population exodus

- “clear-cutting in the ‘60s and ‘70s that has created just thousands of acres of black land farmland, which completely reacts to rain events totally different than when all of Tyrell County was totally forested.”
- “53% of Tyrell County is owned by the state or federal government, who won’t let us touch it, who won’t go out and move a tree in it, and then wonder why we’re screaming about the fact our farmland is flooding, and why the town of Columbia is flooding.”

FEMA Flood Zones, Tyrrell County, NC



Land Cover Type, Tyrrell County, NC



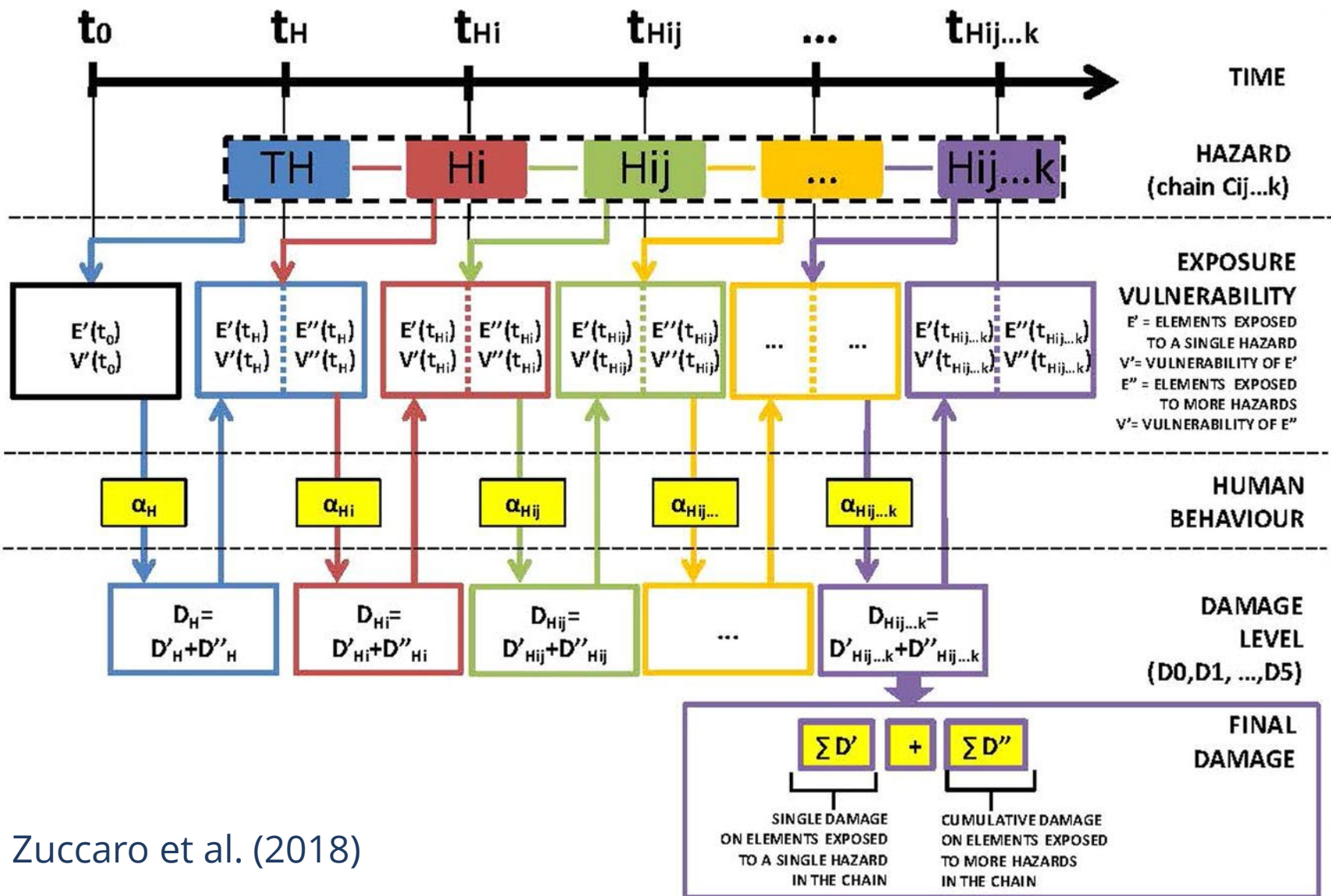
Poquosin Lakes National Wildlife Refuge

# Thank you!

“the **Soil & Water Conservation Districts** in every county have for years been more directed towards agriculture. It’s all about agriculture. They are slowly evolving what they see as their mission to a larger discussion, whether it be climate change or flooding or whatever. They need to be more in this discussion now, because used to they were all about agriculture. That was it. It’s a different world now, and they have accepted that. I’m just not so sure they have been viewed regionally for the expertise they bring to this discussion, because they have kind of transcended beyond agriculture. **And particularly for Tyrell, it’s rain-caused and it’s river-caused”**



Extra slides



Zuccaro et al. (2018)

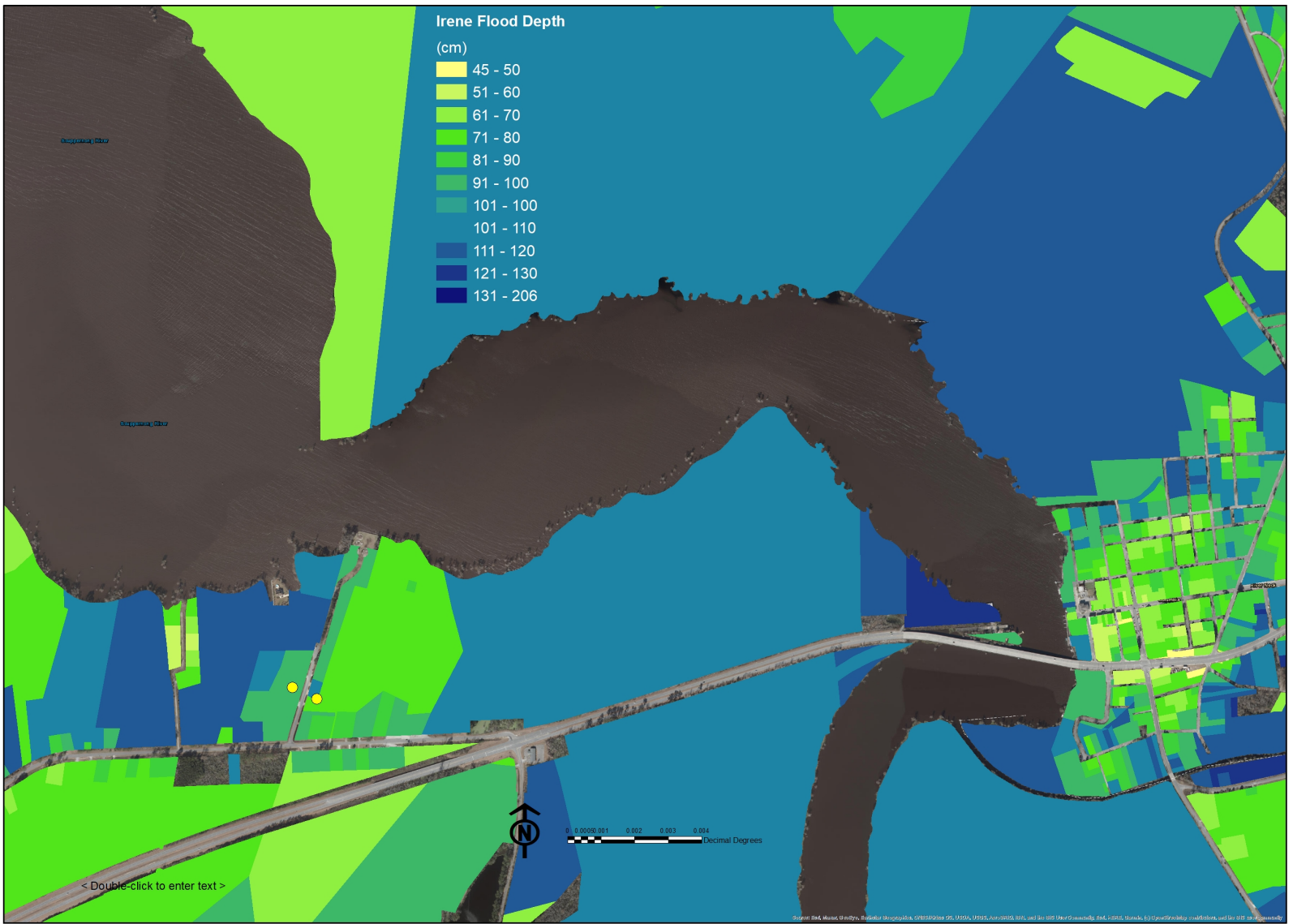
# Hurricane Irene

An example of compound flooding in Tyrrell County



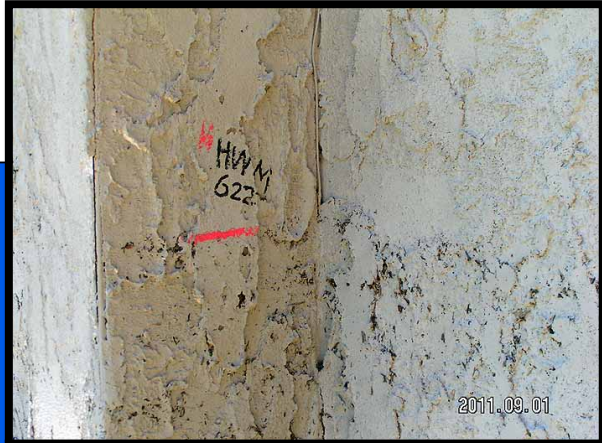


# Irene Flood Depth, Tyrrell County, NC



Irene Flood Depth, Tyrrell County, NC

Local resident indicated this area the only area in town affected by storm surge; downtown area flooding was from rainfall, not storm surge



Drainage?



**“Well why don’t we go clean out the ditches?” Well the ditches are clean. Its not about clean ditches, it’s about backups thirty miles away in Washington County that are creating these things. So you’ve got to look at the land-use changes, you’ve got to look at the regionalization of this, and that’s going to be, in my opinion, the lynchpin of the whole solution. Somehow it’s got to become a regionalized solution. And Frank and I cannot do it in Tyrell and Perquimans and think we’re gonna fix it alone. It’s just not going to work. And that’s why its important that entities like the Albemarle Commission, or East Carolina, or whoever it is has got to bring this together. Because **it’s not just an inconvenience anymore, it’s a threat to quality of life**, and it’s a threat to economics, and people living in Tyrell County. We’re down to 3,600 now. Do you want to just go ahead and turn us into a refuge and pay us off and we’ll leave? You’ve got to give us a chance, and the only way we can have a chance is in a regional content.**

As far as Tyrrell goes, I’m not sure it’s going to be the drainage. It will be the drainage, but with the shrinking tax base we have, you’re not going to have to worry about Tyrell County. Because I can see it on the horizon. The state’s already screaming at us, because we have the lowest fund balance in the state.