

Wastewater Infrastructure Storm Resilience

Peter Watson, MS Student, CEE (Presenter)

Dr. Christine Kirchhoff, P.E., Asst. Prof., CEE

Dr. Amy C. Burnicki, Asst. Prof. in Res., CEE

History of Storms

Hurricane of 1938



Bushnell Park

(NOAA Photo Library)

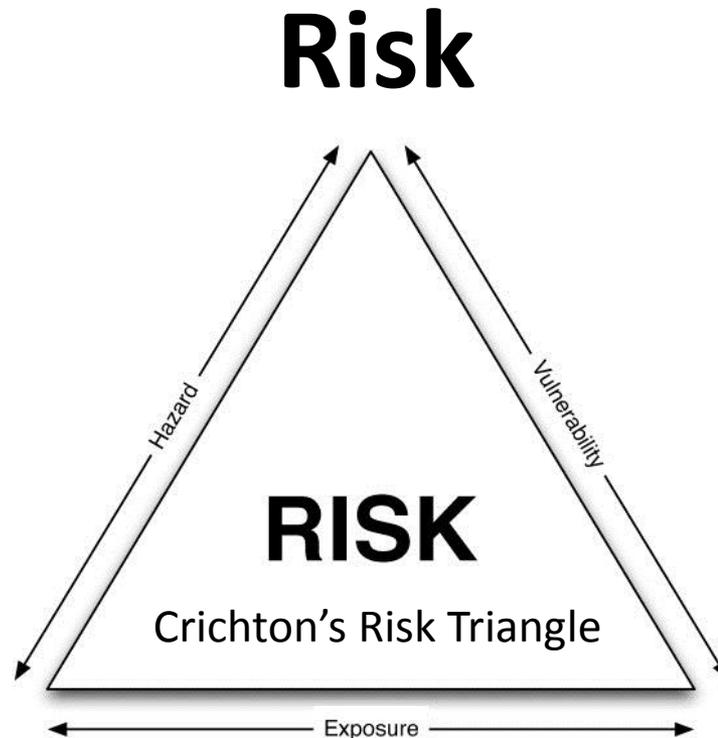
Flood of 1955



Waterbury

(Igor I. Sikorsky Historical Archives)

- **Recent Storms: Sandy, Irene, Alfred**
- **What will happen in the future?**



Wastewater Infrastructure Risk

- Hazards: Flooding, Storm Surge, Sea Level Rise, etc
- Vulnerability: Low Elevation, Close to Bodies of Water
- Exposure: Infrastructure, Public Health, Environmental Health

Resilience

IS NOT JUST MITIGATION OF RISK!

“Resilience is the ability of a system and its component parts to **anticipate, absorb, accommodate, or recover from the effects of a potentially hazardous event** in a timely and efficient manner, including **through ensuring the preservation, restoration, or improvement of its essential basic structures.**” IPCC 2012

- The Time Dimension is Important
- Requires Human Involvement, Management, and Decision Making Processes

Our Work

GOALS

- Learn Recent Storm Impacts
- Find Out What Adaptive Changes Have Been Made and Why
- Understand What Factors Influence Changes and the Decision Making Processes behind them.

METHODS

1. Survey

- Three Sections (Impacts & Resilience, Treatment Facility, Collection System)

2. GIS Data Gathering

- Visualize and Confirm Survey Info, Add Data From Hazards (DFIRM, SLR, SLOSH)

3. Interviews

- Investigate the Nature and Motivation Behind Adaptive Changes in Depth

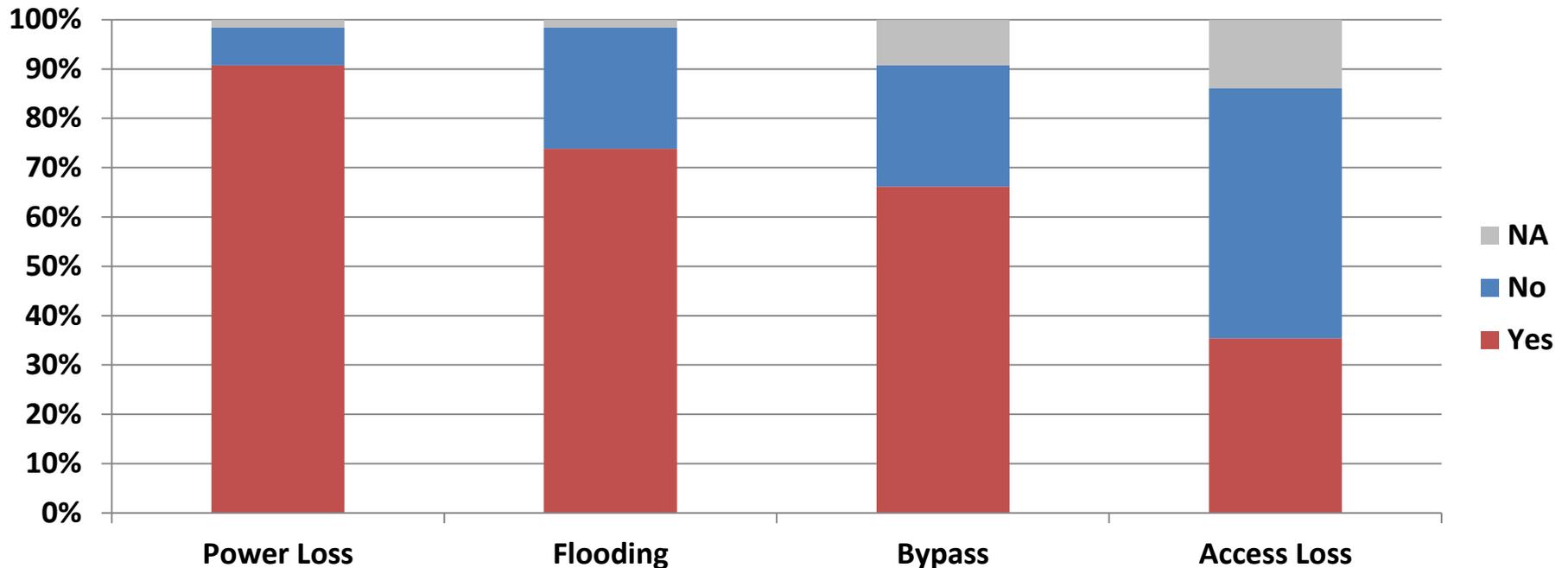
Survey Results

- **Good Response:** 86 of 98 Systems (87%)
- **Impacts:** 62 of 86 Systems (72%)
- **Changes:** 67 of 86 Systems (78%)

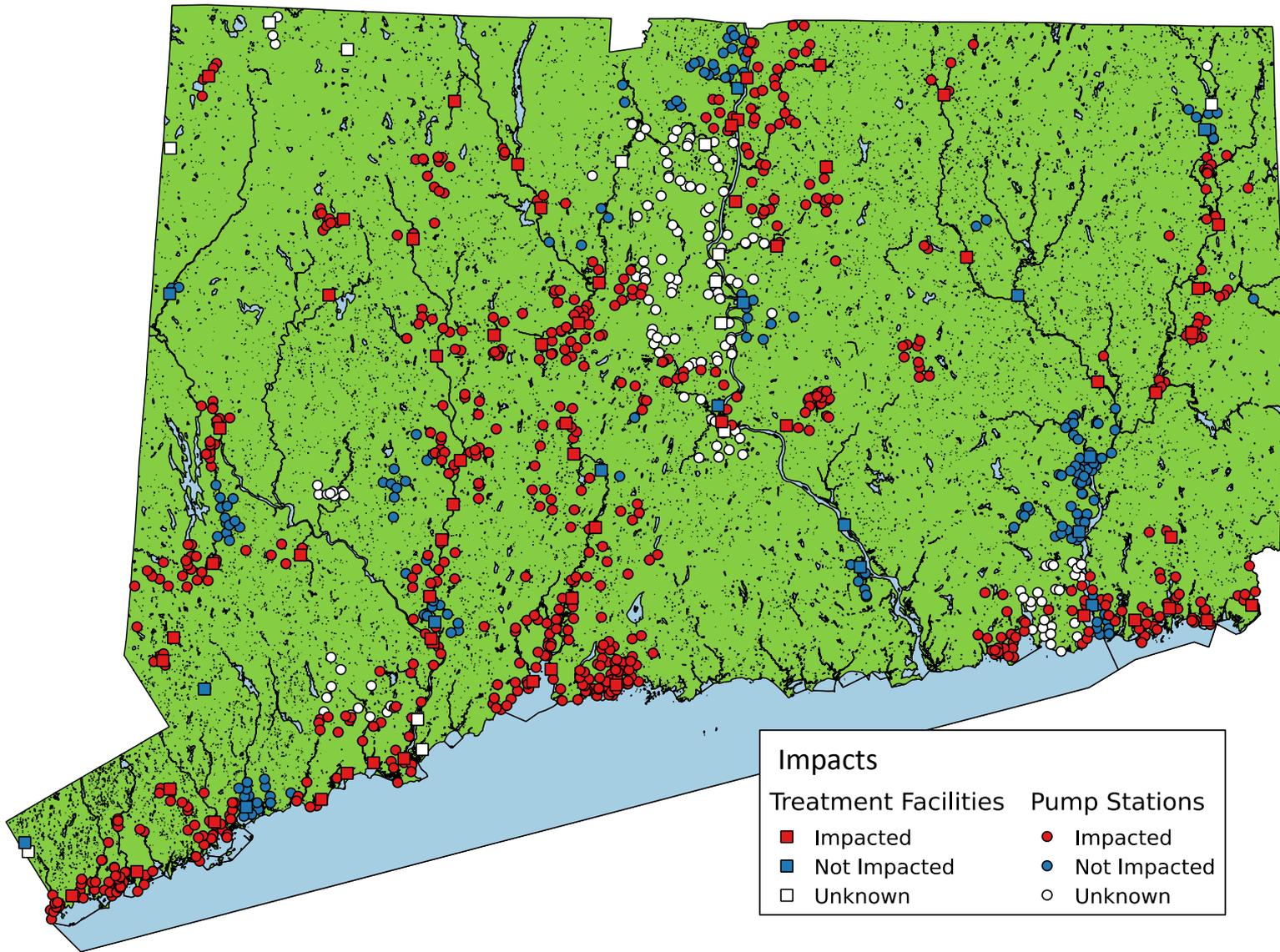
Interview Results

- So far only **four** of approx. 30 have been done.
- Already the responses have helped give depth and context to survey results.

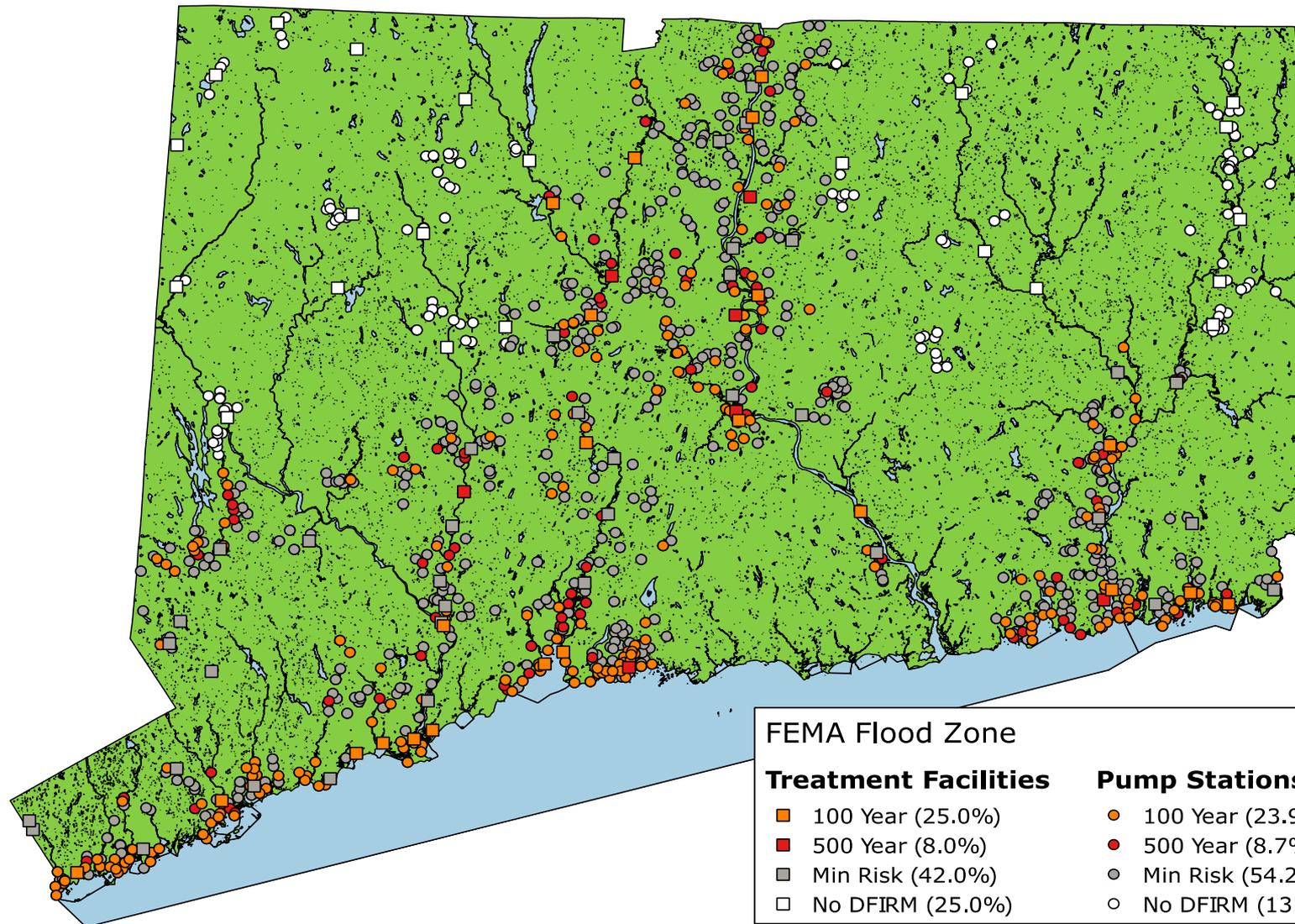
Impacts



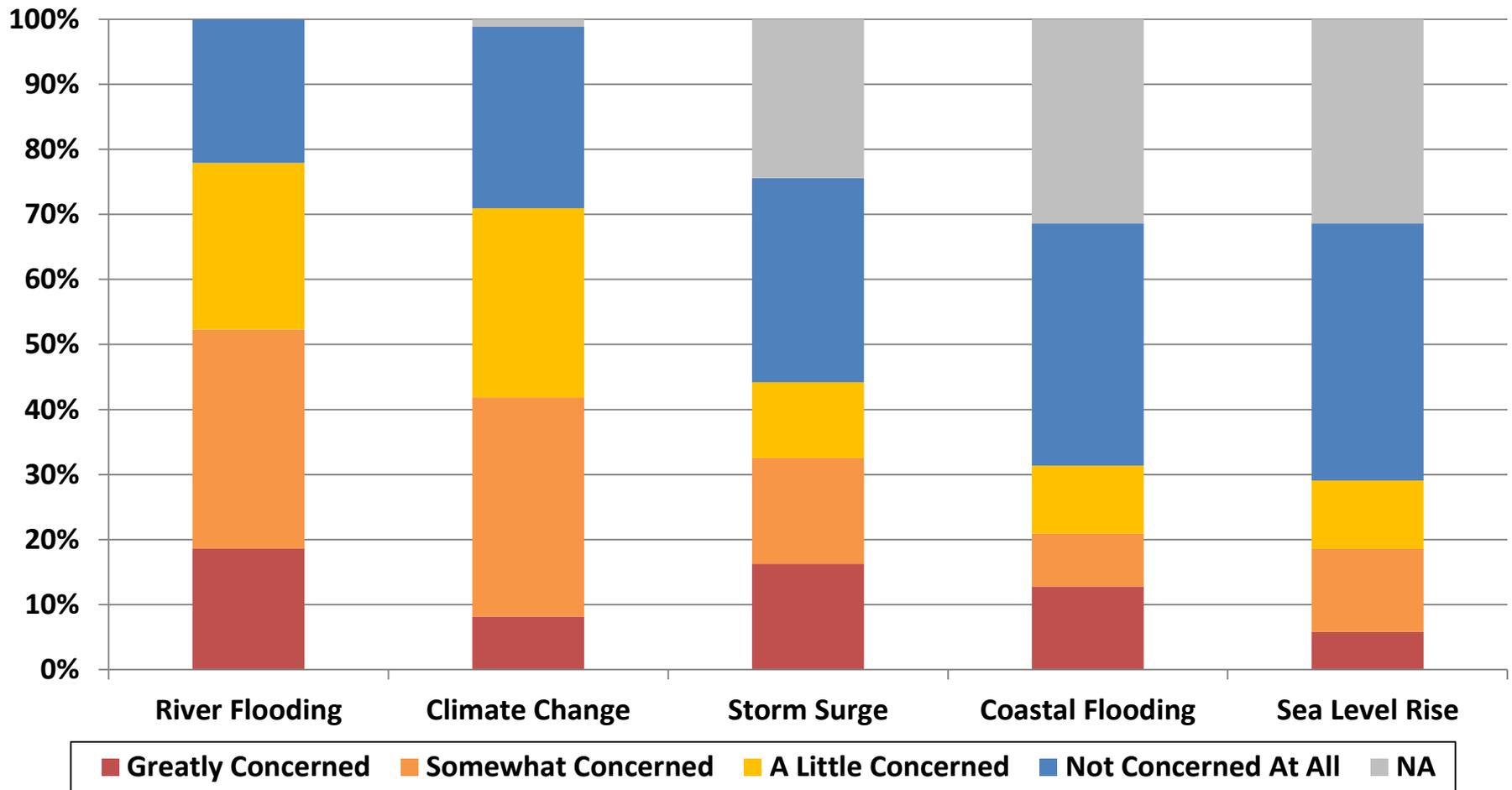
- **Power Loss:** Common, but Manageable
 - WPCF Gen 100% & PS Gen 80%
- **Flooding:** Severity is Case-by-Case
- **Bypass:** Bypassing Secondary Treatment is Common
- **Access Loss:** Rarer but Concerning



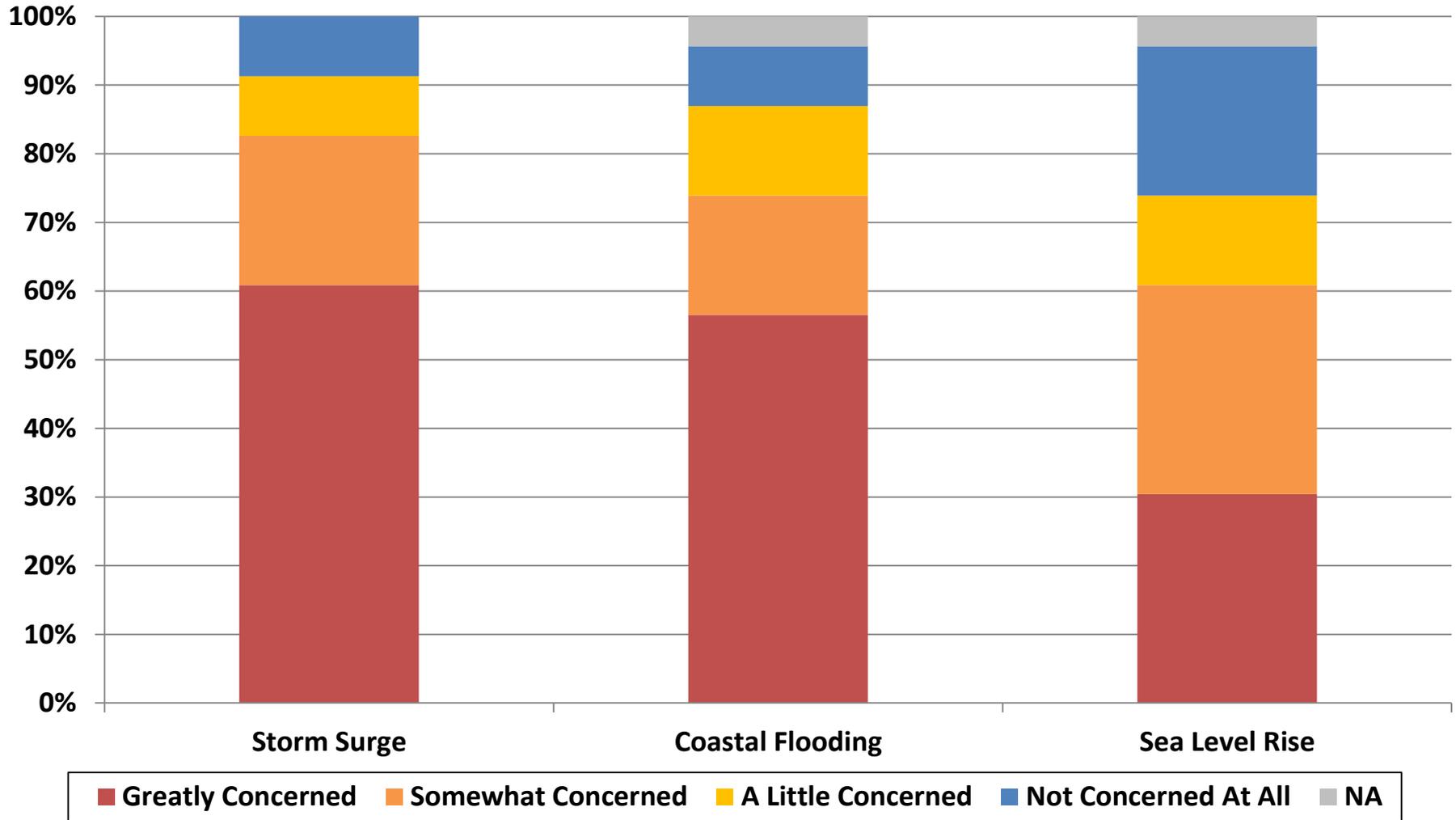
Hazards

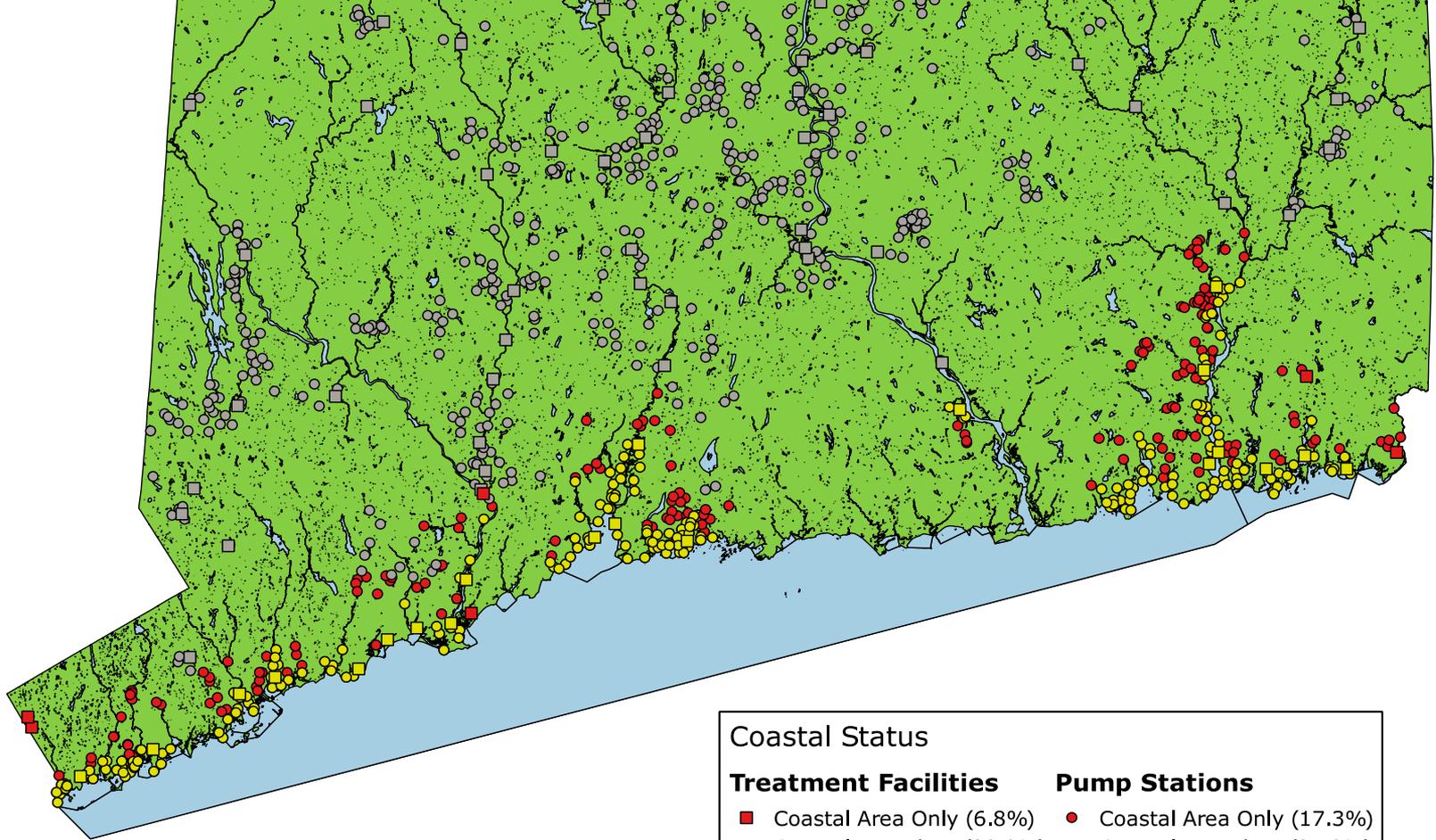


Concerns



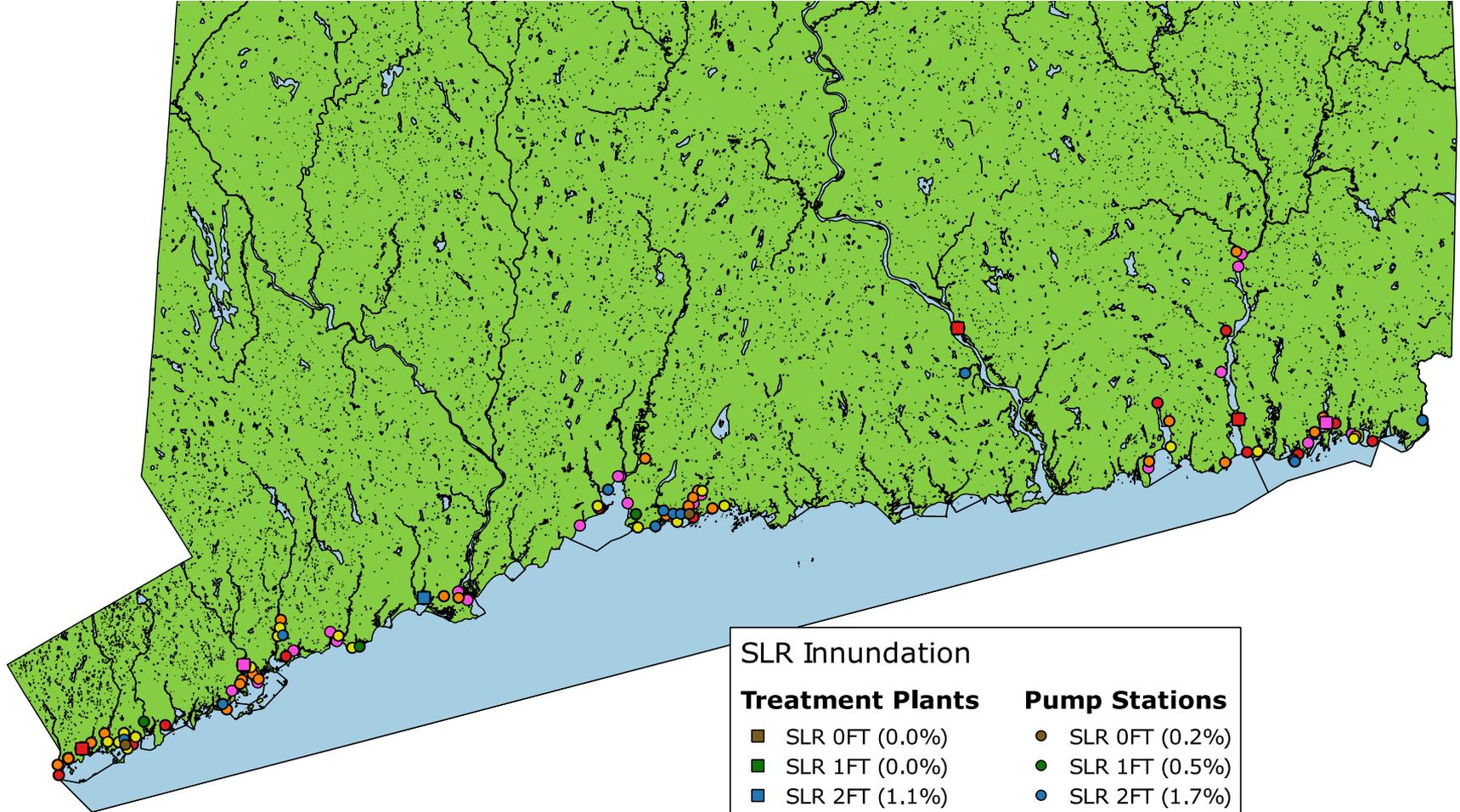
Coastal Concerns



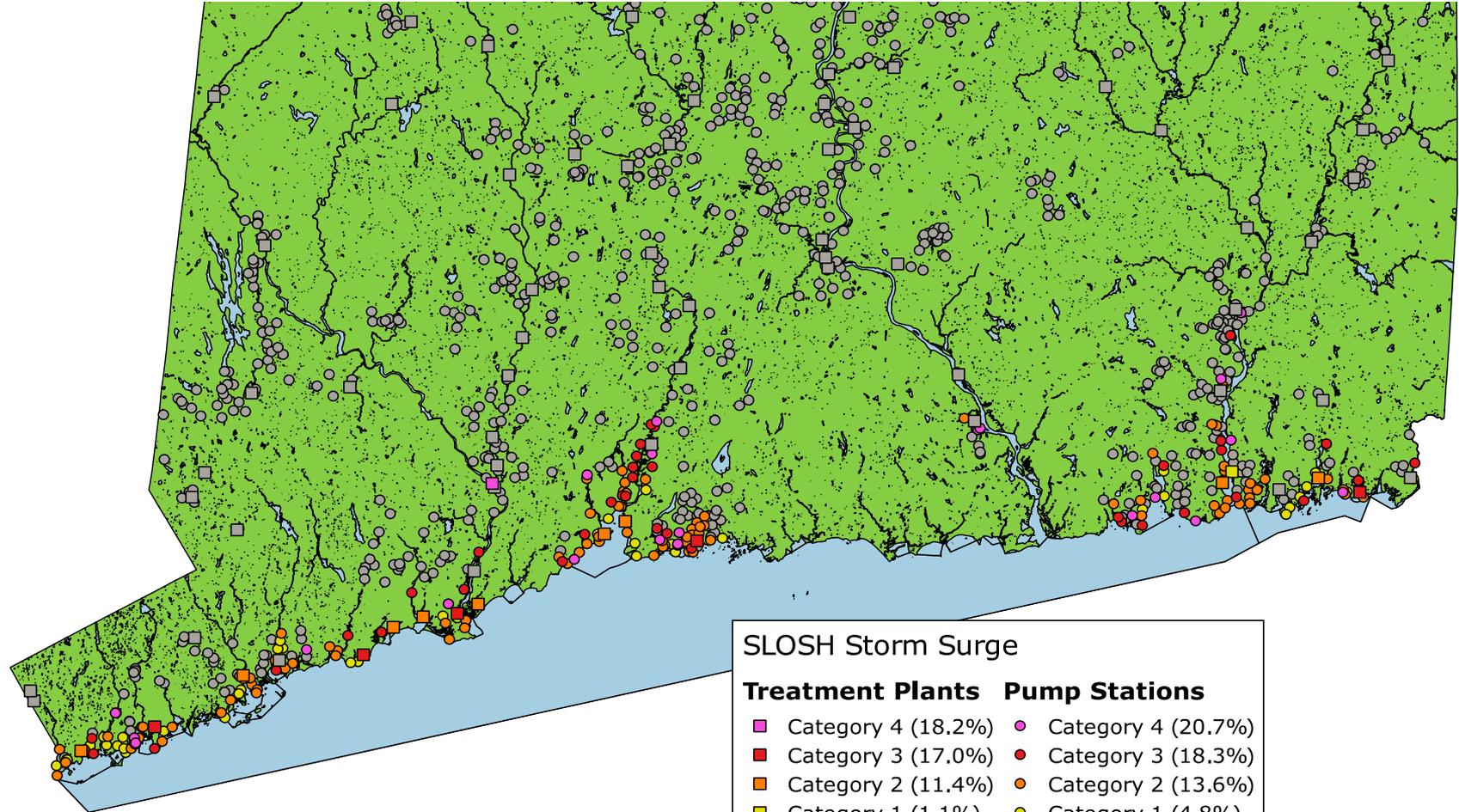


| Coastal Status | |
|----------------------------|-----------------------------|
| Treatment Facilities | Pump Stations |
| ■ Coastal Area Only (6.8%) | ● Coastal Area Only (17.3%) |
| ■ Coastal Boundary (23.9%) | ● Coastal Boundary (24.0%) |
| ■ Neither (69.3%) | ● Neither (58.7%) |

- ~30% of WPCFs, ~40% of PSs are Coastal
- No Strong Correlation between Being Coastal and Being Impacted



Data from a NOAA Office of Coastal Management Model (Digital Coast Project)



*Percentages Are Cumulative

Sea, Lake, and Overland Surges from Hurricanes (SLOSH) Storm Surge Projections

Our Next Steps

- Further Statistical Analysis
- Continue Interviews

Thank You!

Stacy Pappano, DEEP

Carlos Esguerra, DEEP

Beth Doran, DEEP

Syed Bokhari, DEEP

All The Survey Respondents and You!

QUESTIONS?

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