

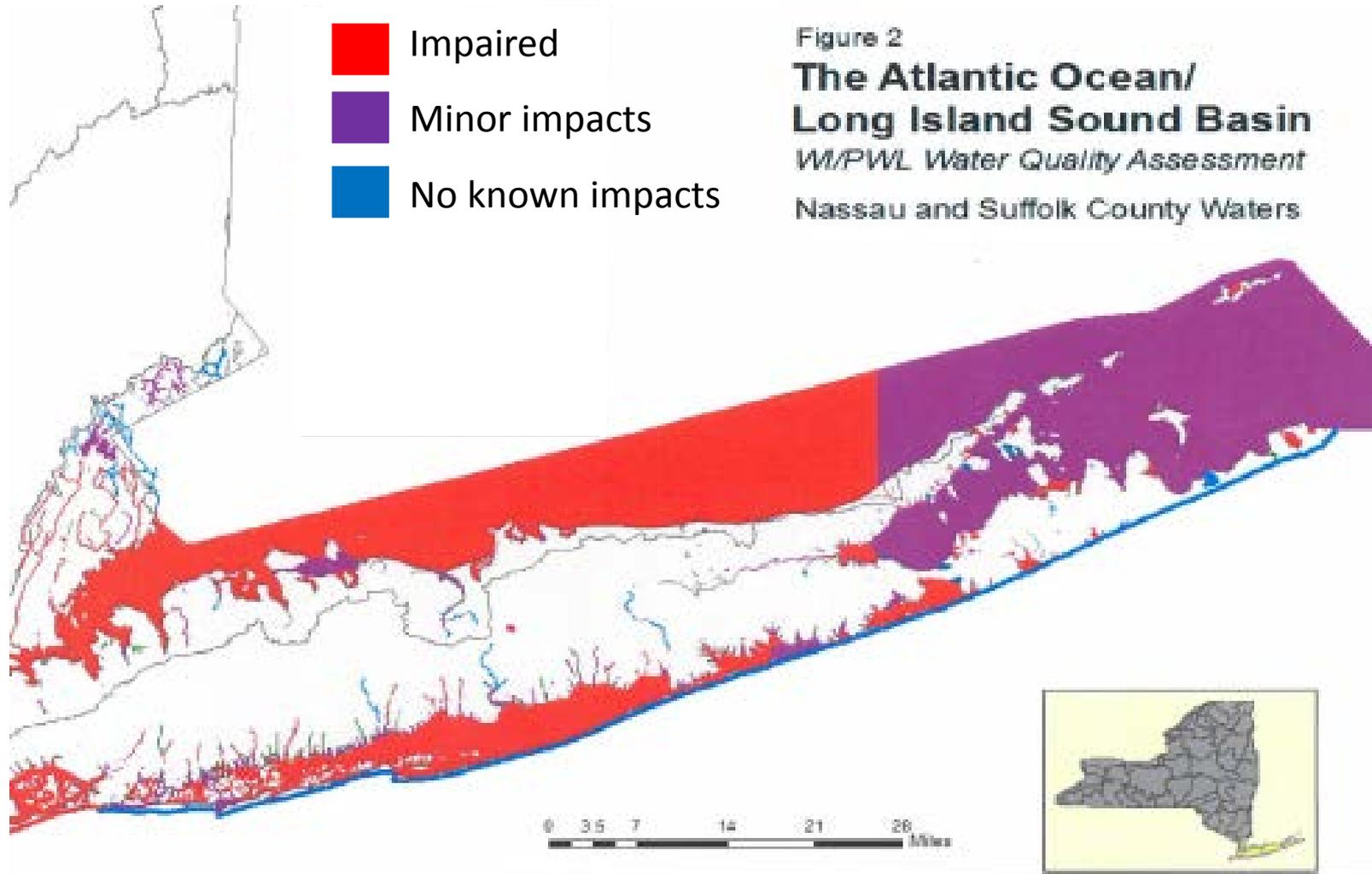
Nitrogen pollution in Long Island's coastal waters – impacts and solutions



Stony Brook
University



Many impairments associated with *nitrogen overload*



Salt marsh ecosystems



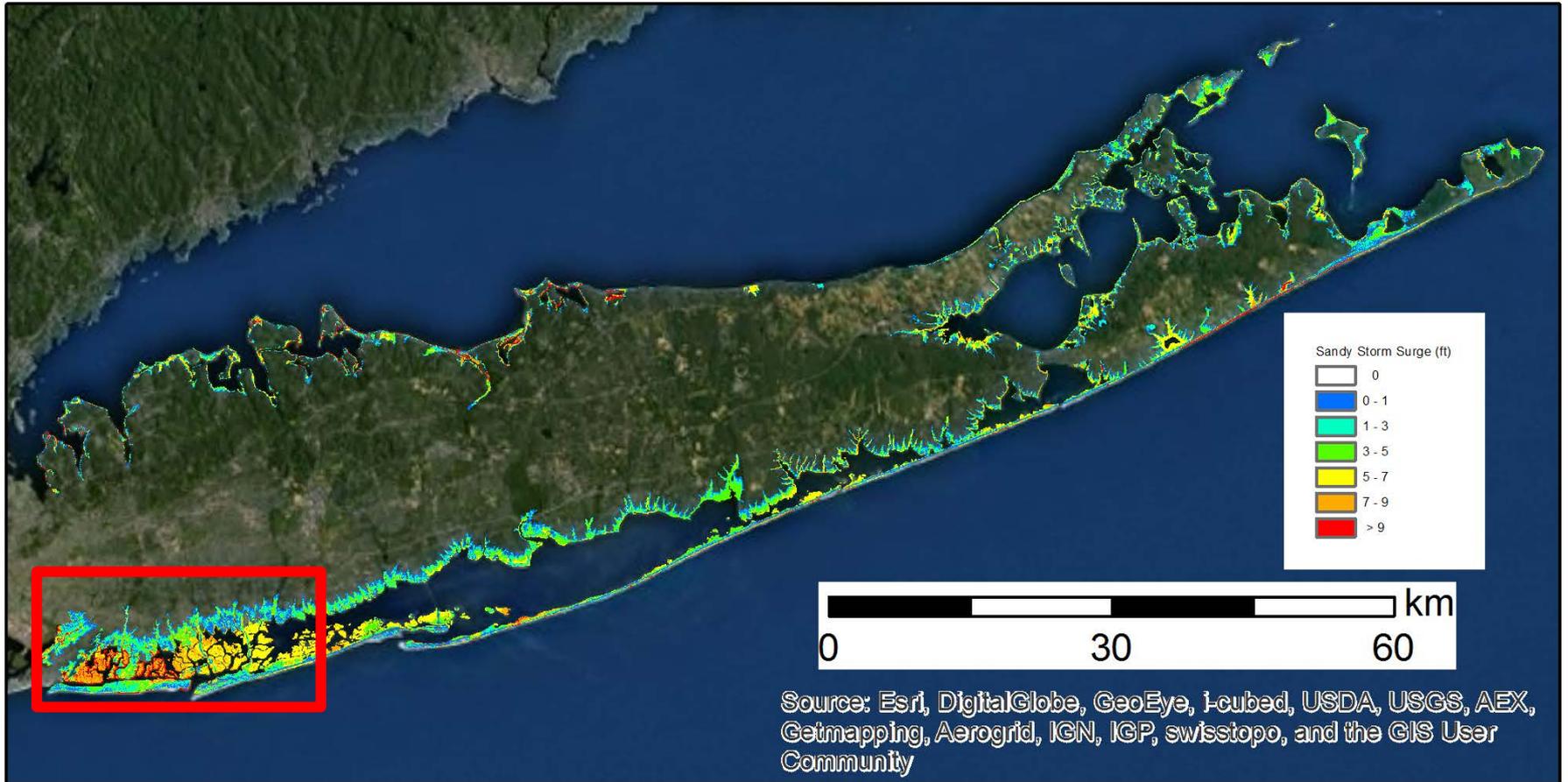
Salt marshes protect coastlines



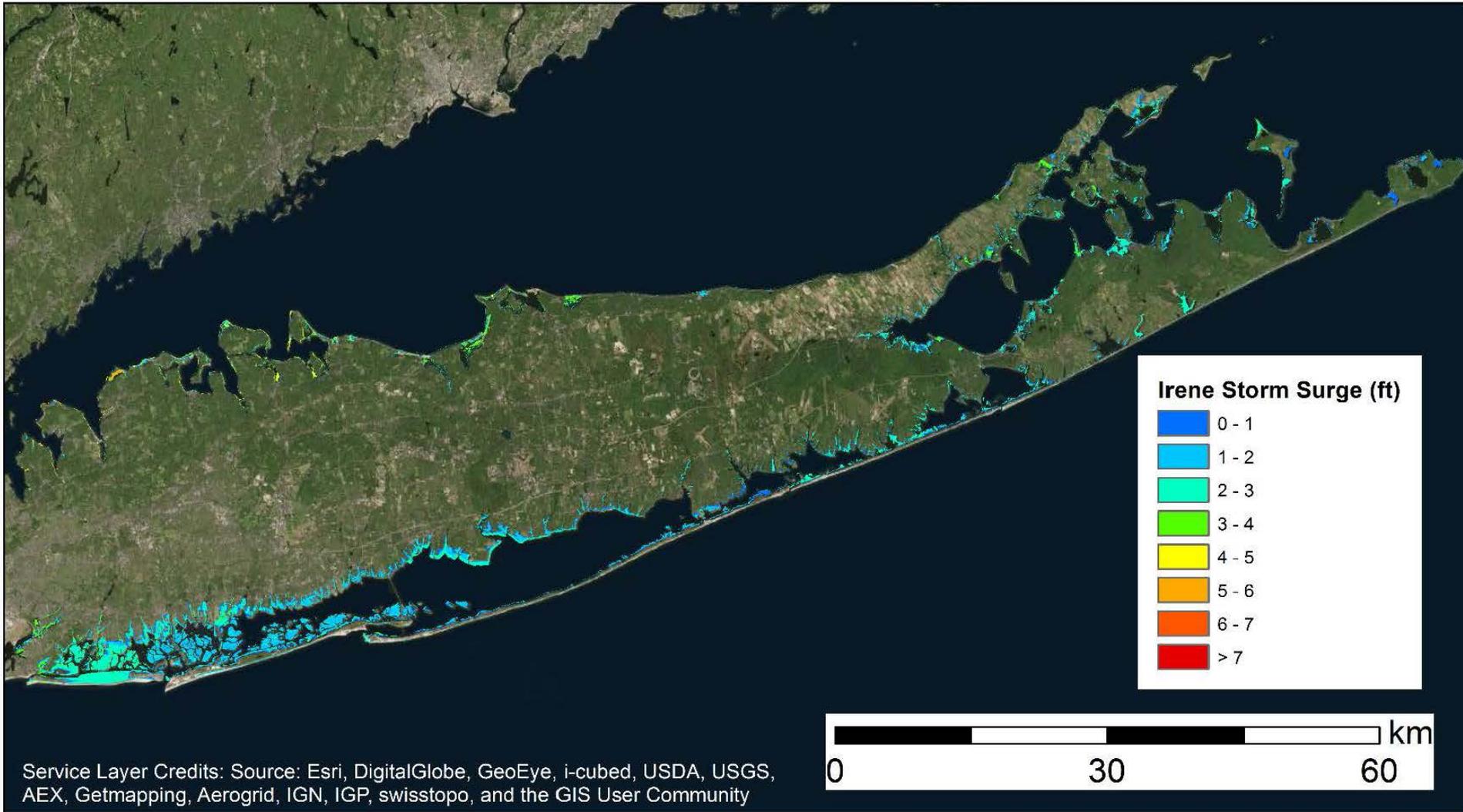
Salt marshes protect coastlines



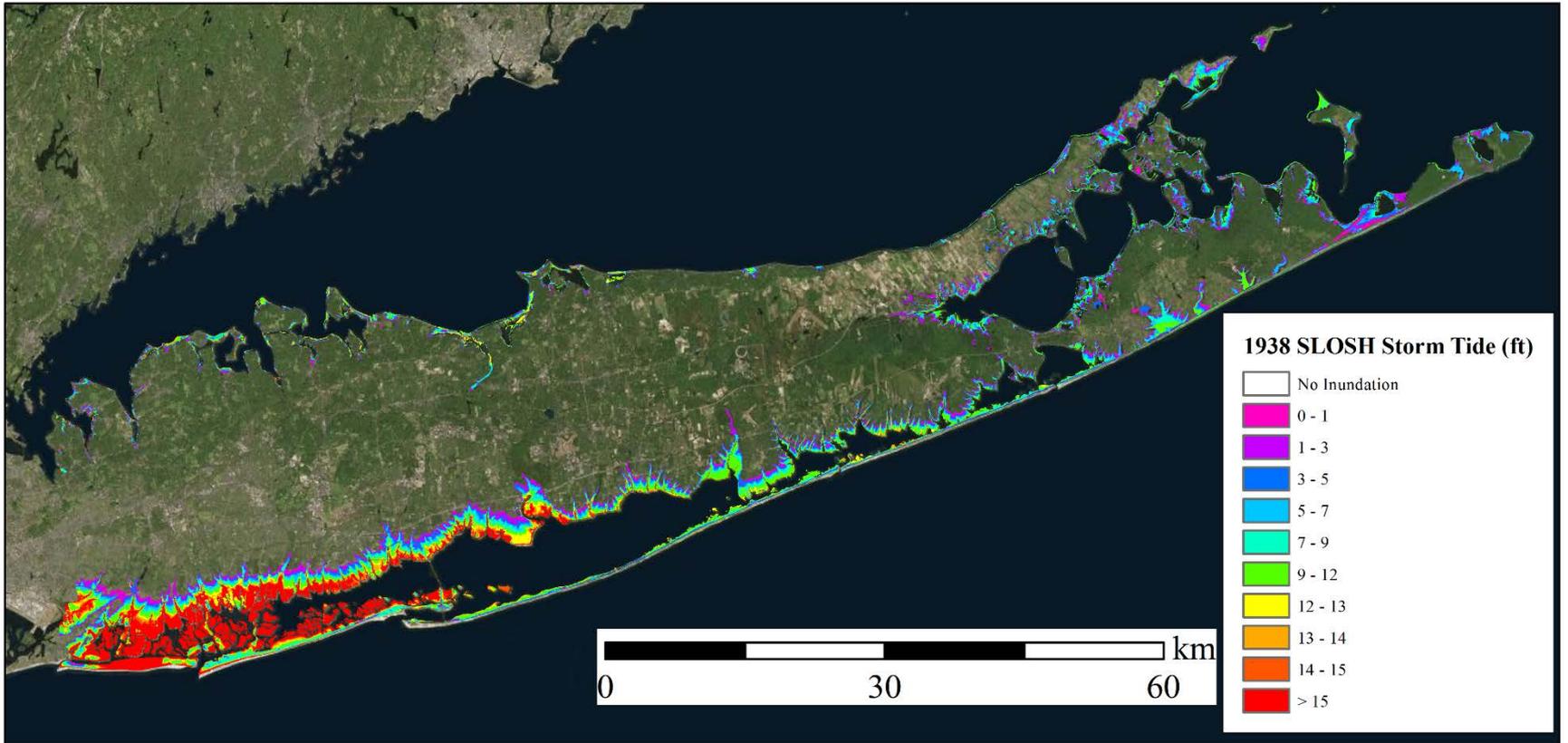
Flooding during Hurricane Sandy



Hurricane Irene



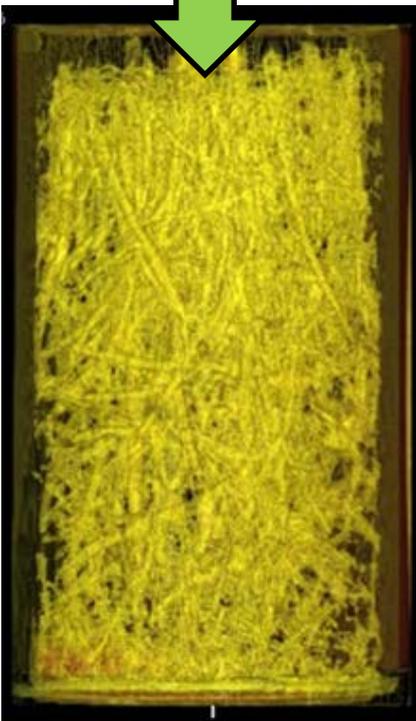
Hurricane of 1938



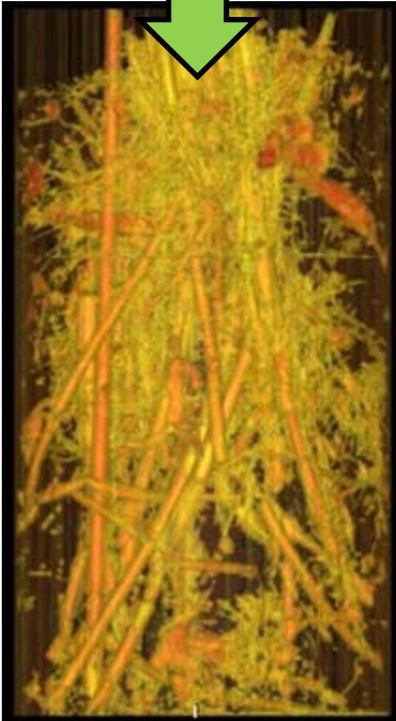
“Coastal eutrophication as a driver of salt marsh loss”, Deegan et al 2012, Nature



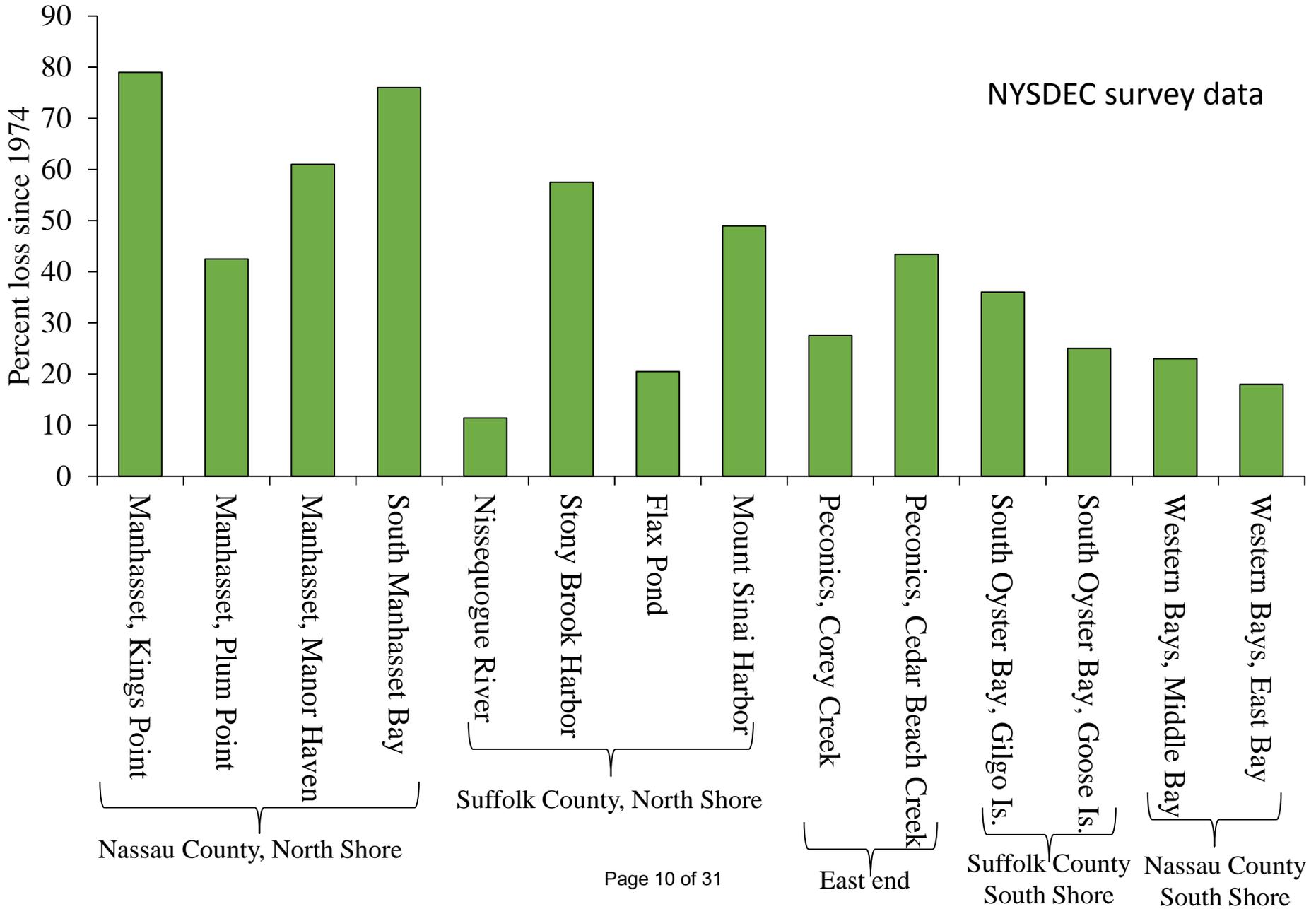
**Dense,
strong
roots**



**Nutrient
weakened,
roots**



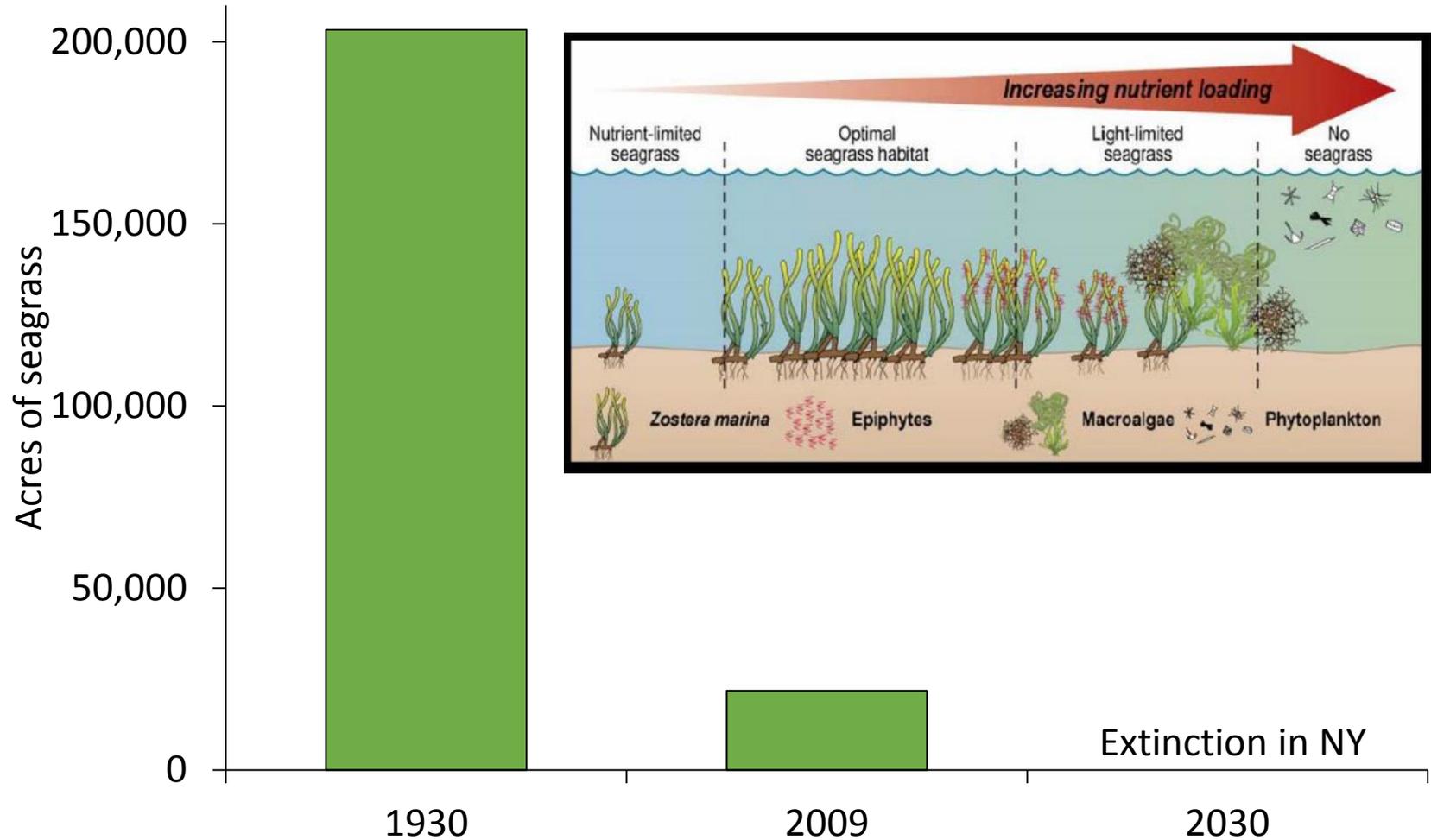
Loss of wetlands on Long Island, since 1974



Seagrass: Critical habitat for fish and shellfish



NYS seagrass, 1930 - 2030



NYSDEC Seagrass Taskforce Final Report, 2010; Suffolk County assessment, 2014



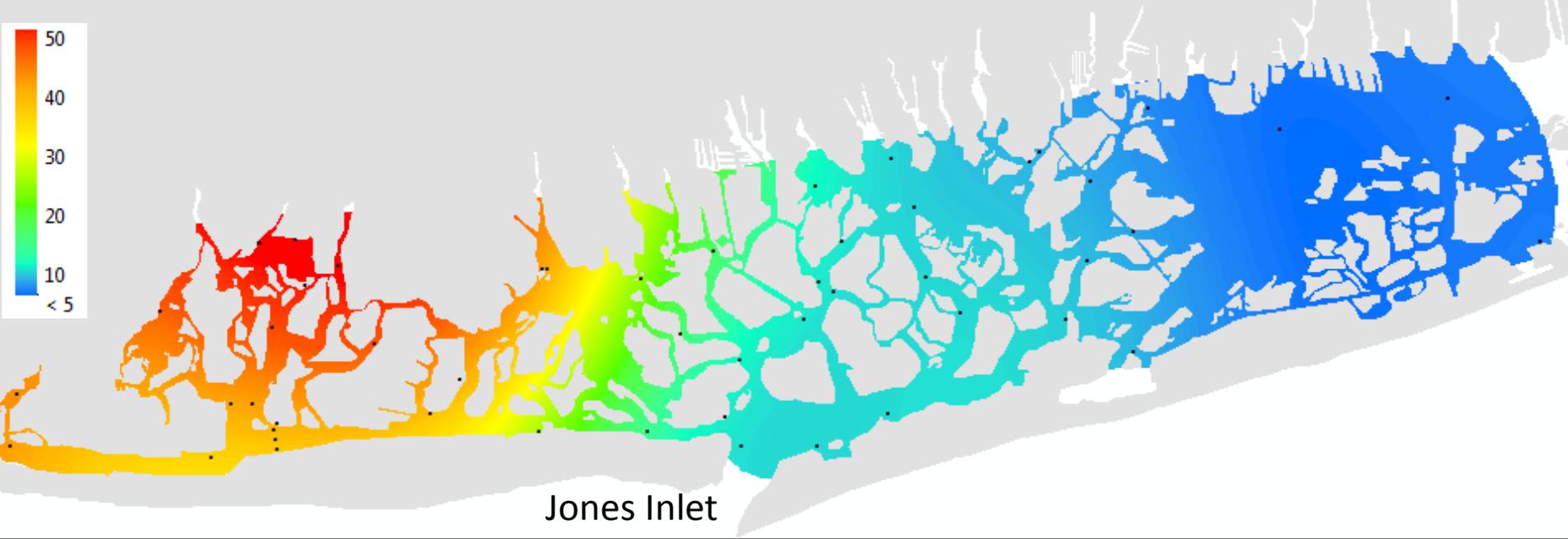
© The Nature Conservancy on Long Island, September 2015

Nitrogen promotes in the water impairments: algal blooms, low oxygen

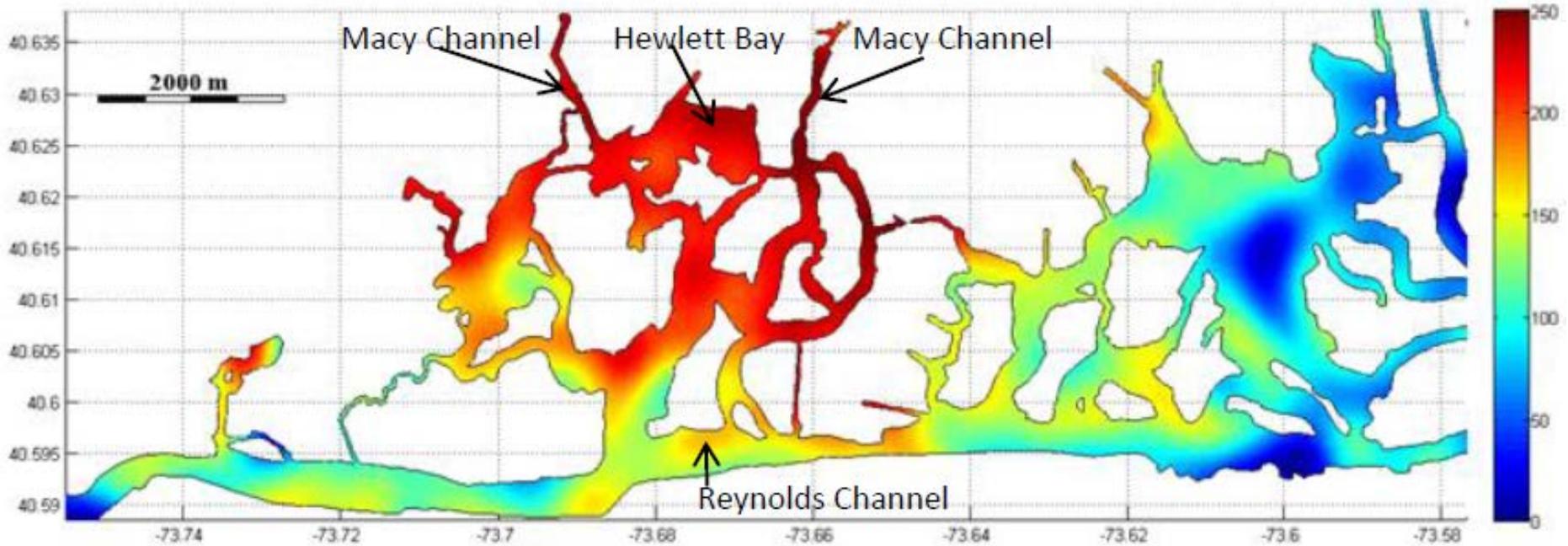
Point Lookout, seaweed bloom, August 2015, unsightly, contributes to low oxygen, low pH



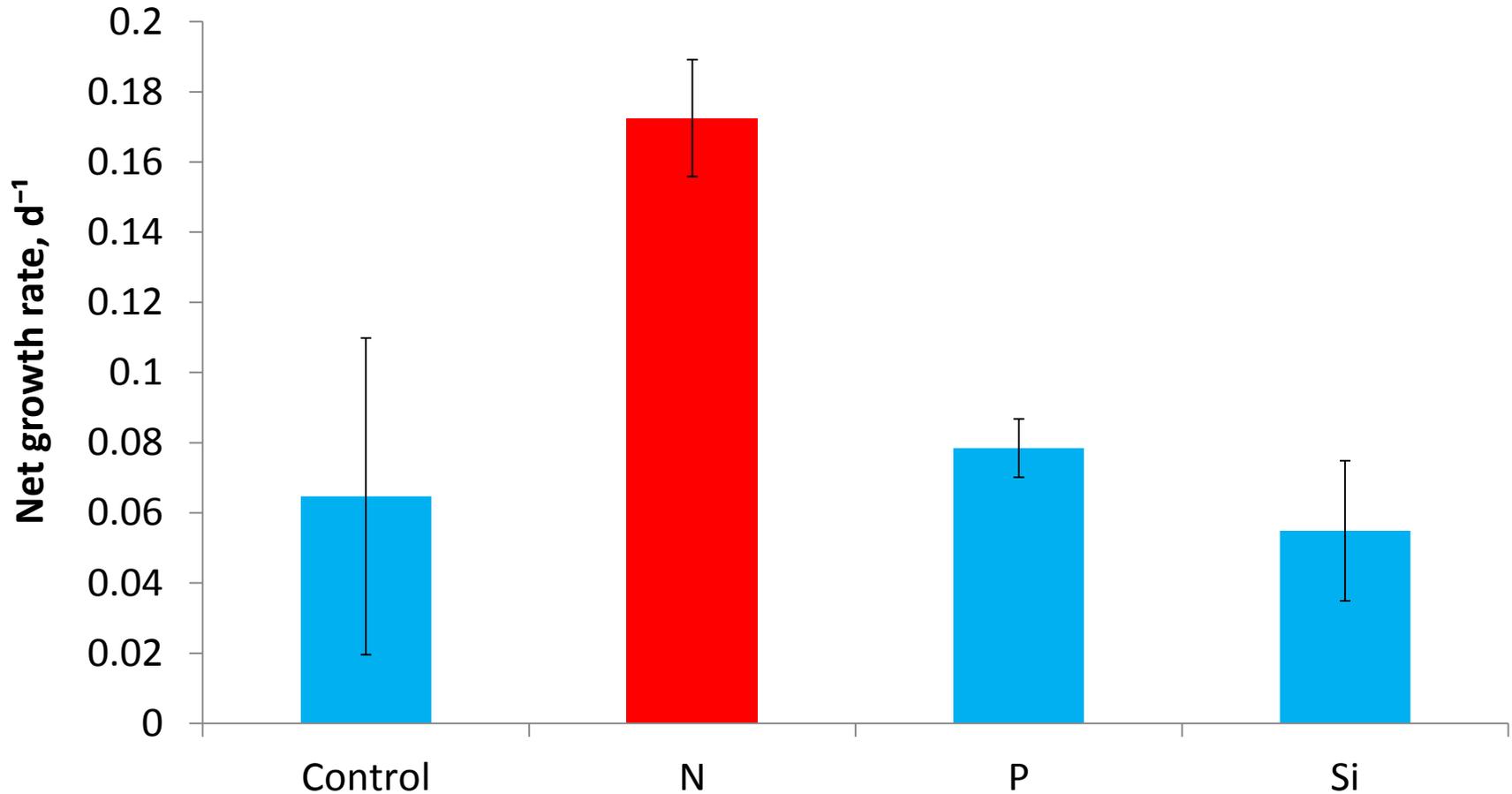
Percent bottom coverage of *Ulva* sp. in Western Bays in the Fall of 2011.



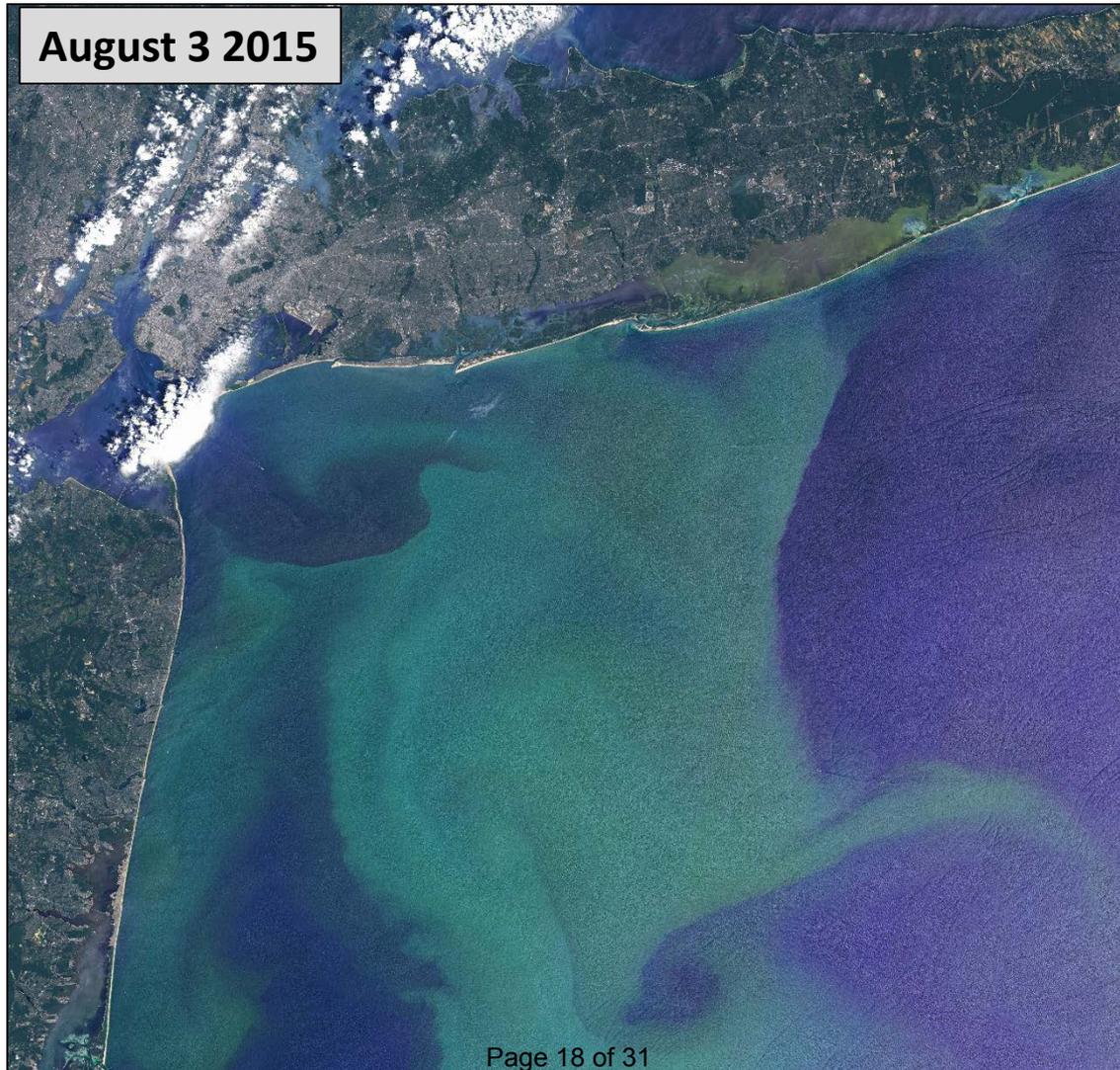
Flushing time of Western Bays (hours)



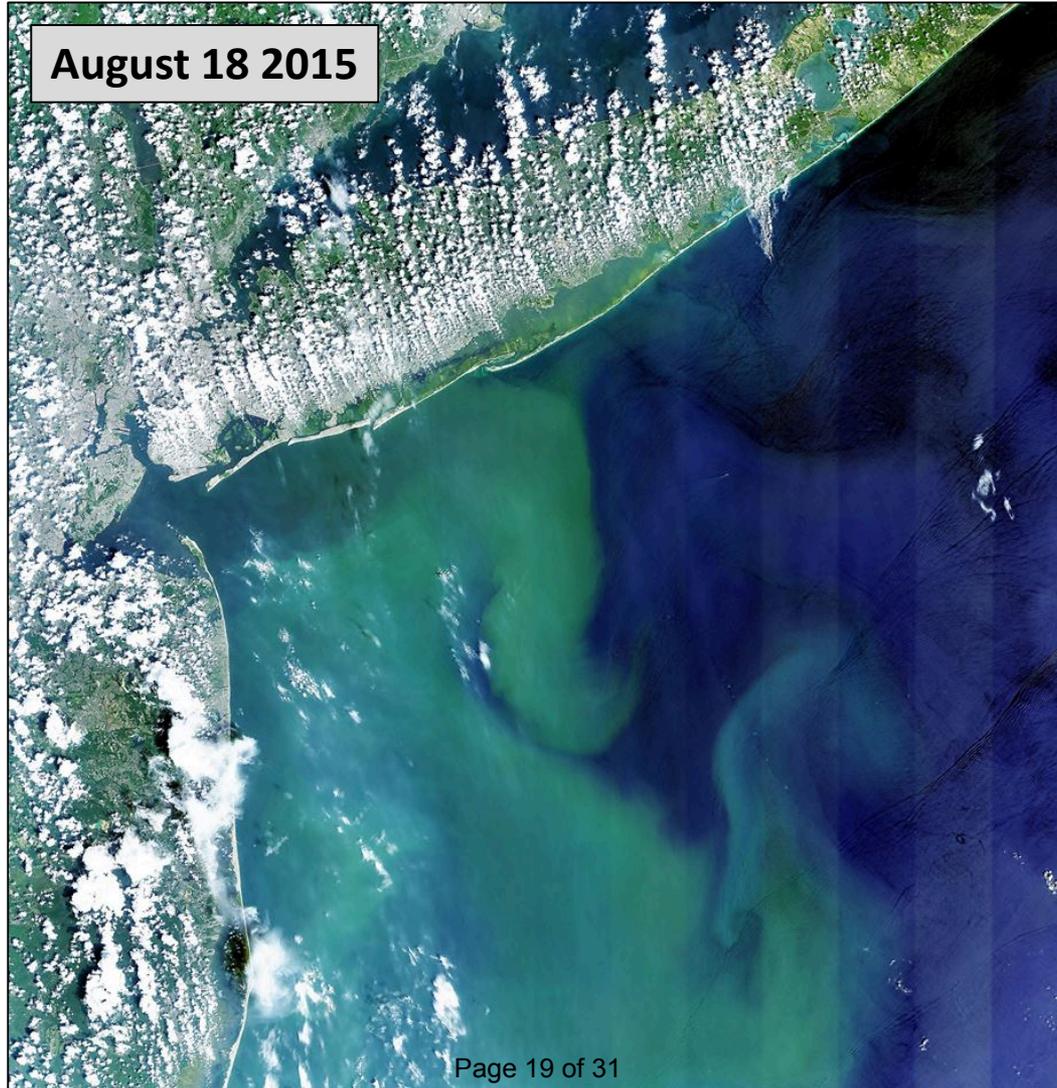
Effects of nutrients on the growth of *Ulva* in the Western Bays



Bay Park ocean outfall with or without N mitigation?



Bay Park ocean outfall with or without N mitigation?



NYS landings of shellfish, 1980 – 2010



Clams



Oysters

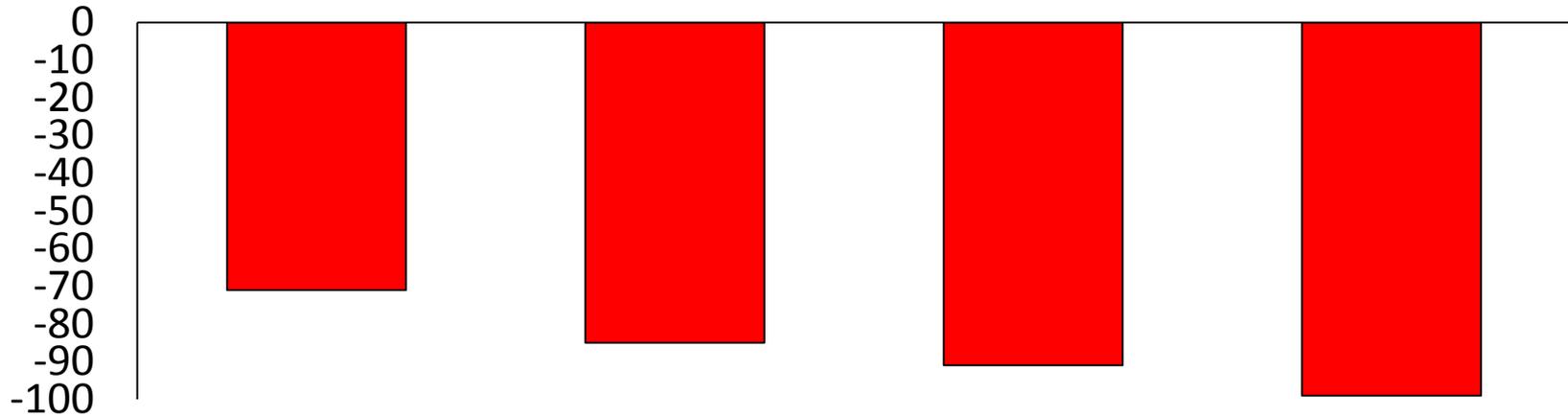


Scallops



Mussels

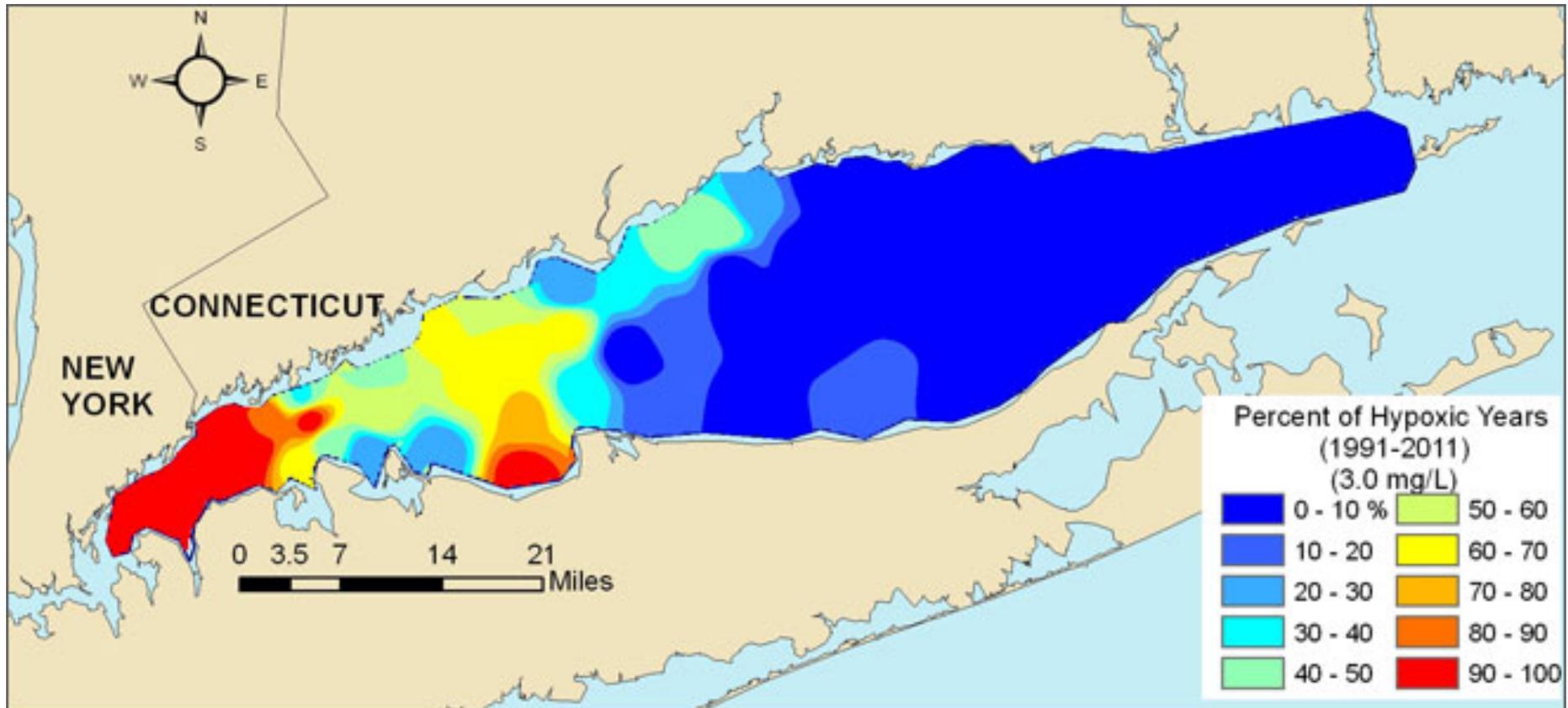
Percent decline since 1980



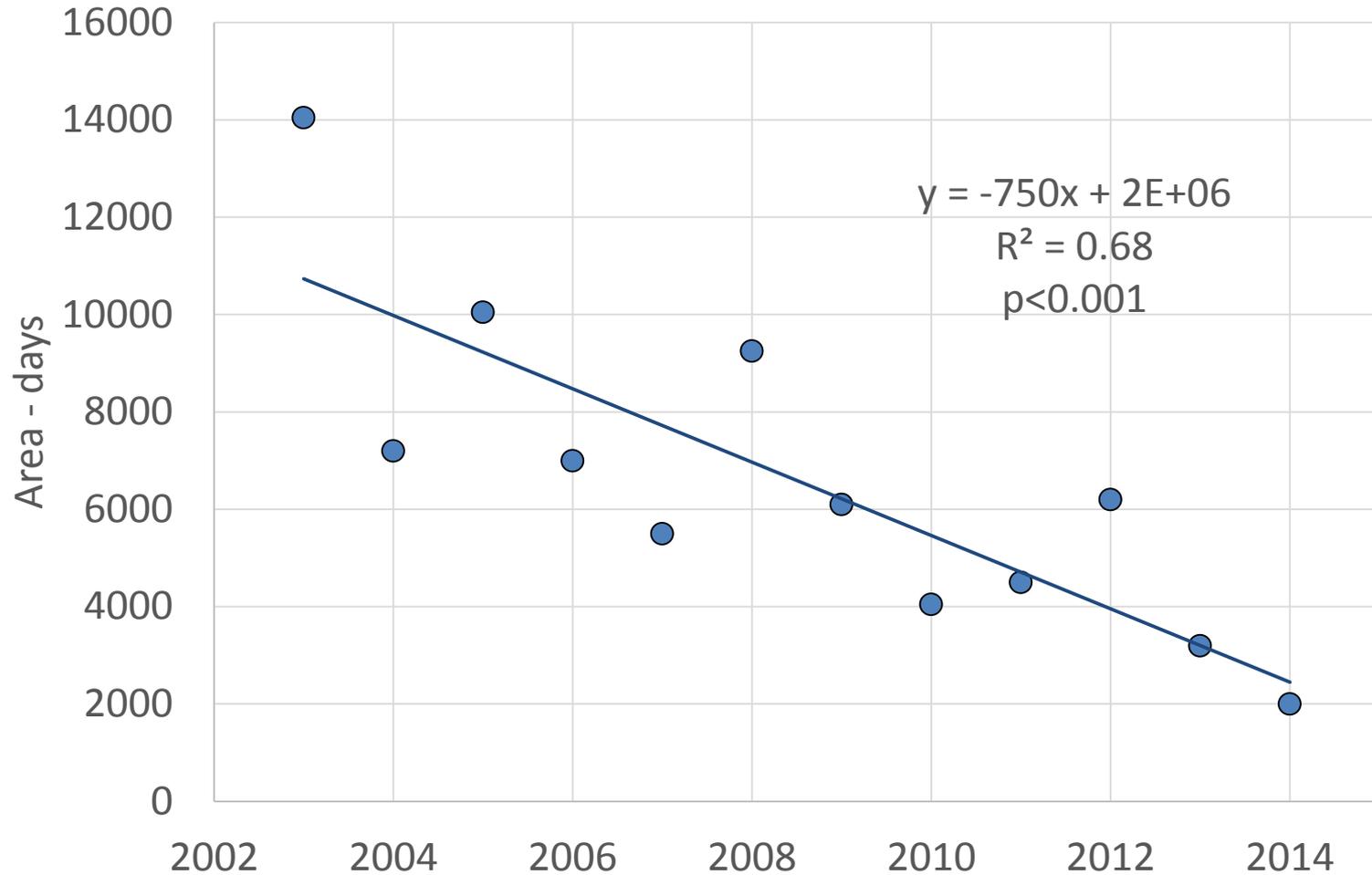
Losses due to nitrogen driven harmful algal blooms, seagrass loss, and water quality degradation.

Has nitrogen mitigation helped hypoxia in Long Island Sound?

- Goal in 1994 to reduce N loads by 58.5%
- In 2014, close to reaching this goal.
- Ecosystem response?



Long Island Sound, 12-year trend in hypoxia area - days



Center for Clean Water Technology

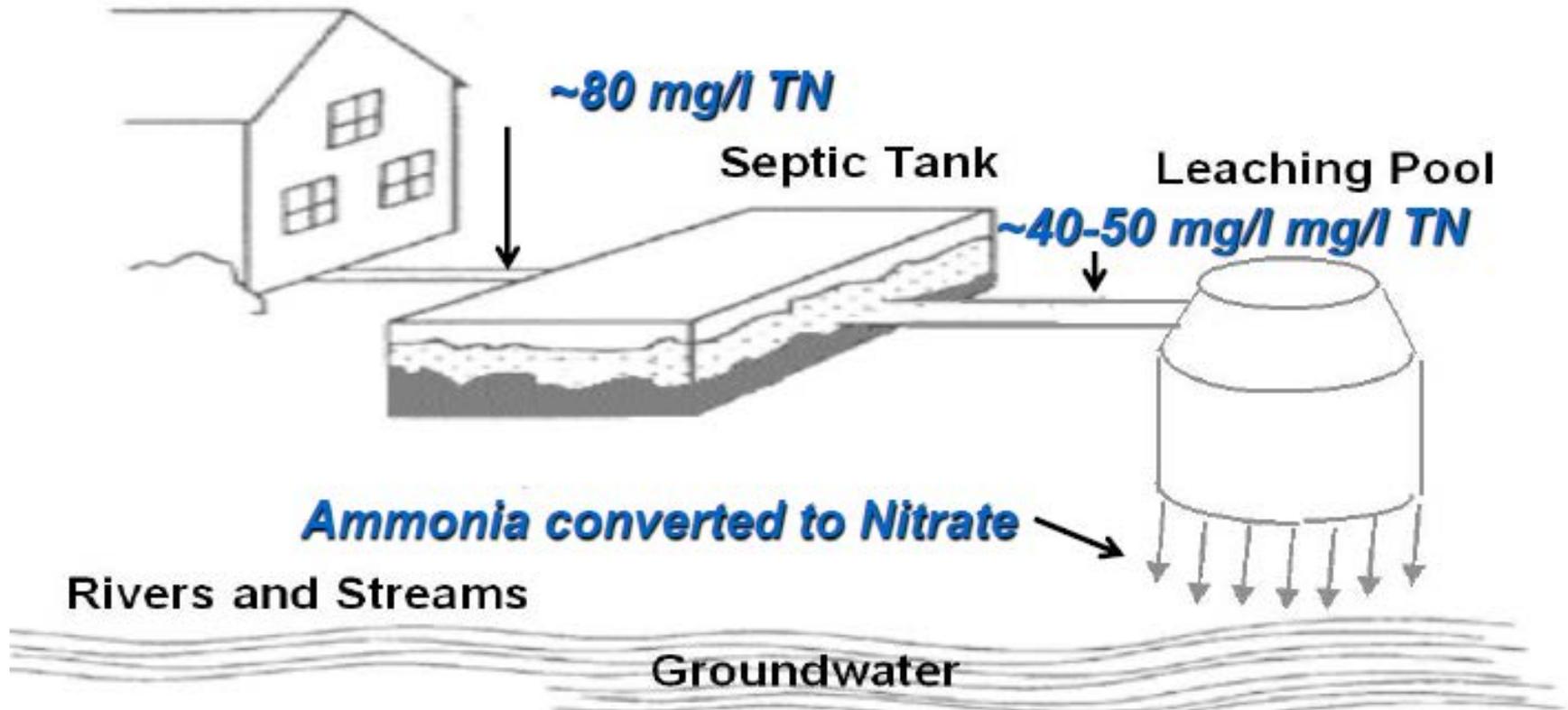


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On-site wastewater disposal

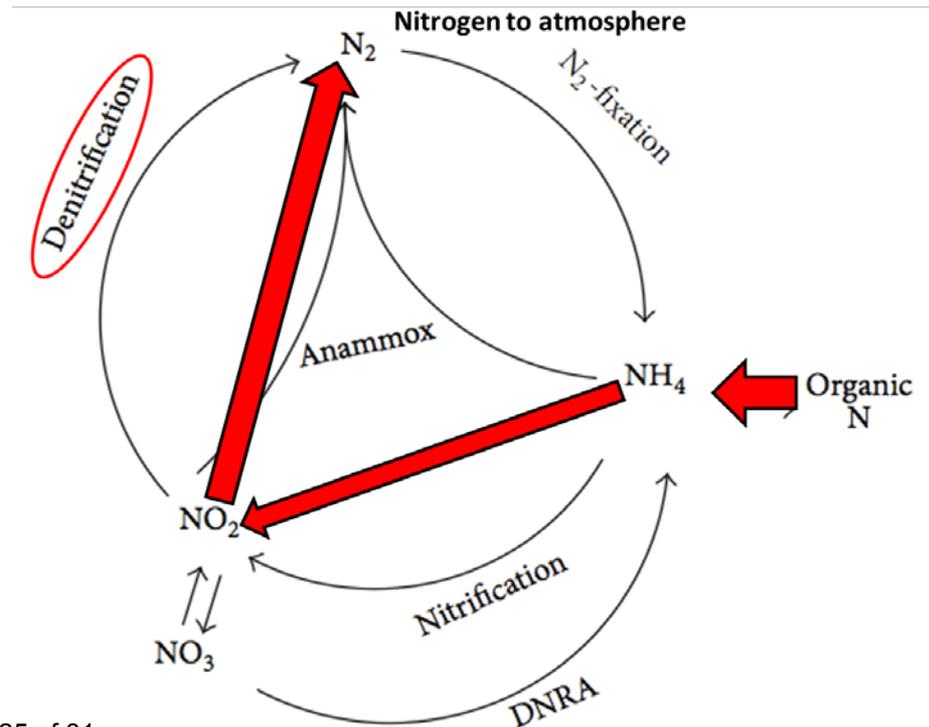
...Engineering a solution...

Coupled septic tanks and leaching pit



CCWT Mission

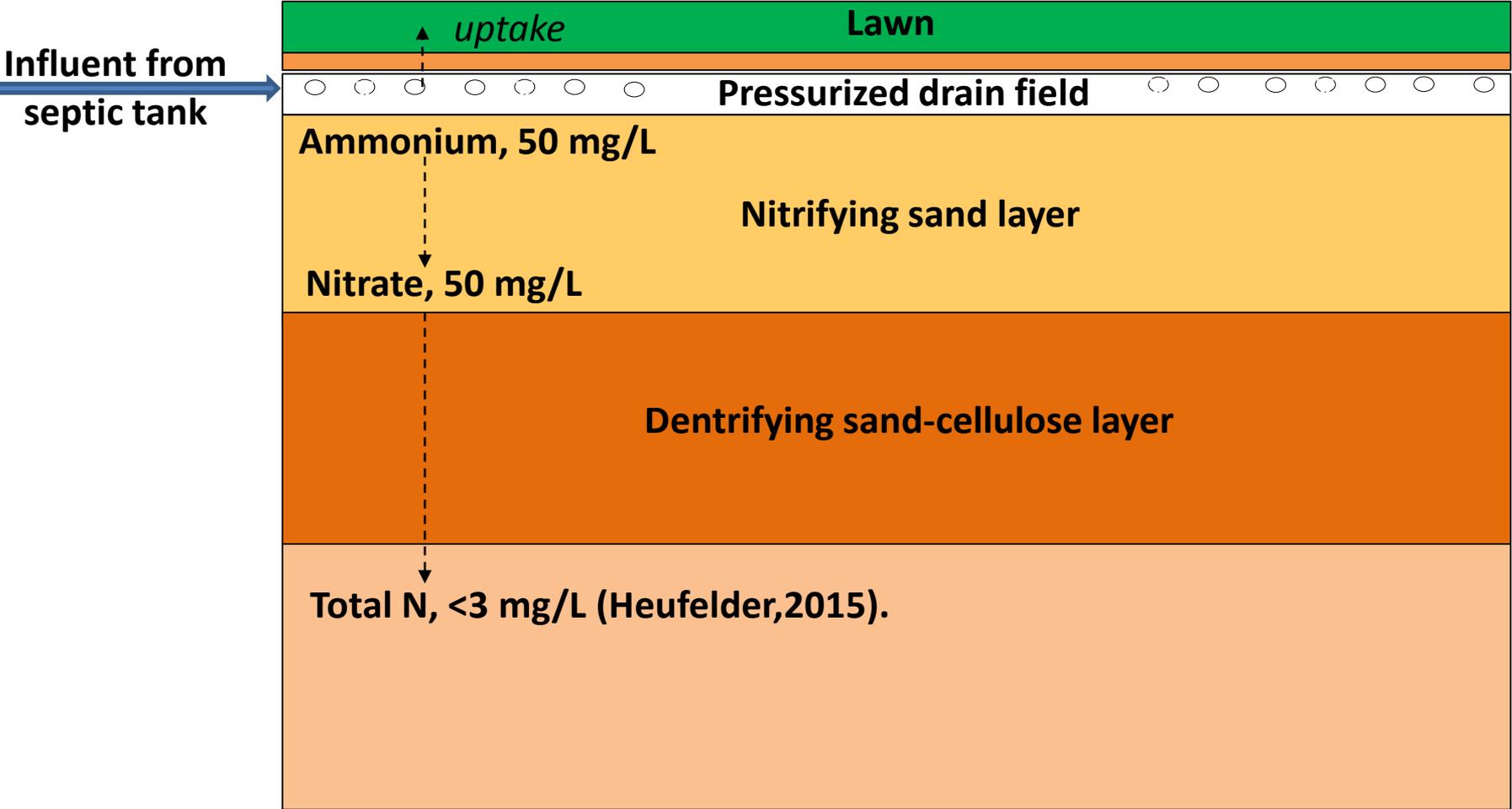
- Develop and commercialize the next generation of nitrogen removal technology for septic systems
 - Improve efficiency of nitrogen removal
 - Reduce system costs
 - Minimize maintenance
 - Shrink the infrastructure



Alternative septic systems



Non-proprietary systems: Pressurized, denitrifying drainfields



Long Island's Coastal Ecosystems

Nitrogen mitigation goal

2015



J. Perinsek ©06

Nitrogen management is needed on a watershed-by-watershed basis.

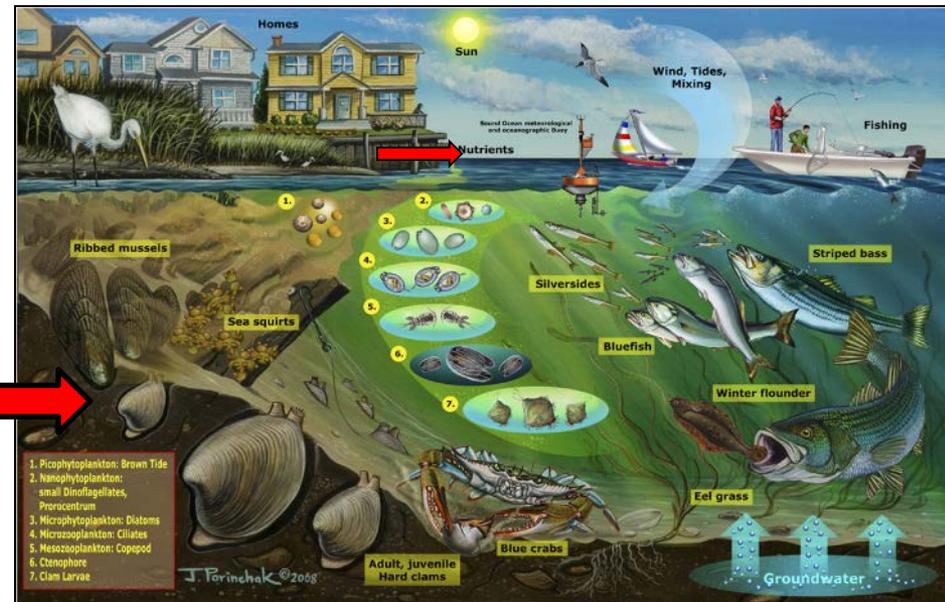
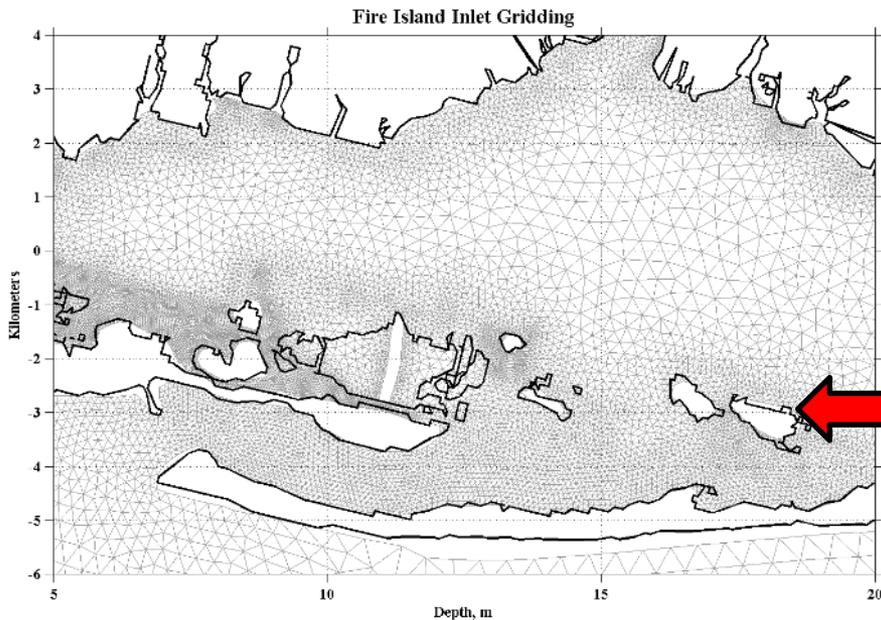


Long Island watersheds and receiving water bodies differ regarding:

- **Nitrogen load**
- **Residence time**
- **Volume of water from land and in sea**
- **Impairment**

How much nitrogen is too much?

- Models must be developed that combine **watershed nitrogen loading, surface water hydrodynamics, plankton dynamics, and ecosystem responses (eelgrass, bivalves).**
- Targeted studies may be needed to refine our understanding of the relationship between nitrogen loading and ecosystem response.



Conclusions

- Excessive nitrogen loading is causing ecosystem and economic harm.
- The Clean Water Technology Center has begun to determine the most effective ways to reduce nitrogen.
- Studies are now needed to determine how much nitrogen loading must be reduced within every watershed across Long Island.