

Where's has the grass gone?
Factors impacting submerged aquatic vegetation
bring together partners at Lake Mattamuskeet

Michelle Moorman
Mattamuskeet NWR



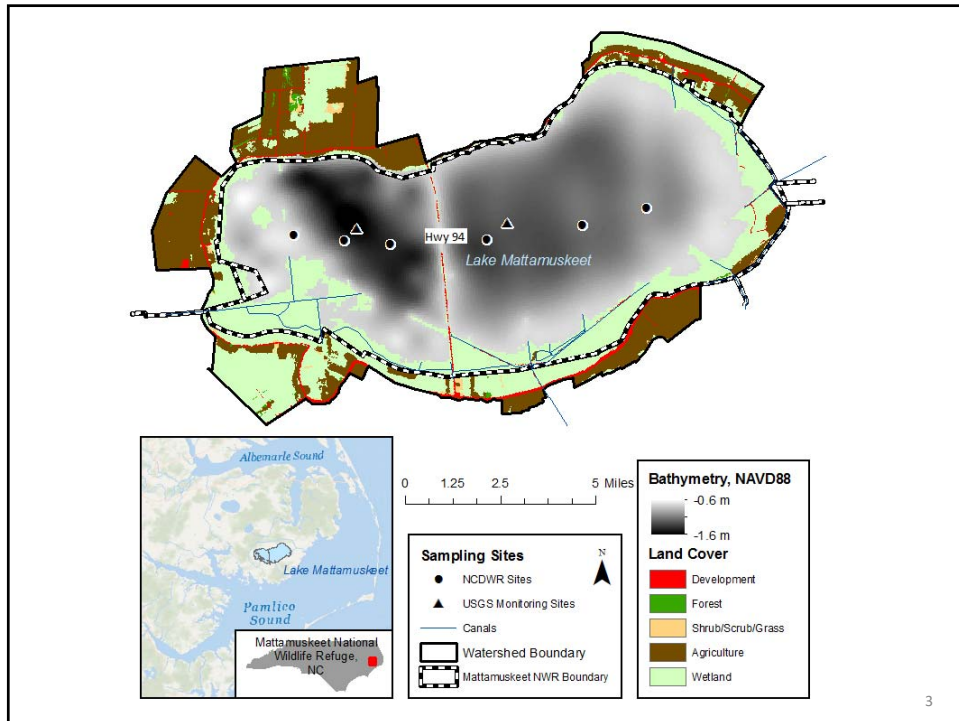
The slide features a background image of a calm lake with a small island of trees in the distance. The text is centered in the upper half. Two logos are positioned in the bottom right corner: the U.S. Fish & Wildlife Service logo and the National Wildlife Refuge System logo.

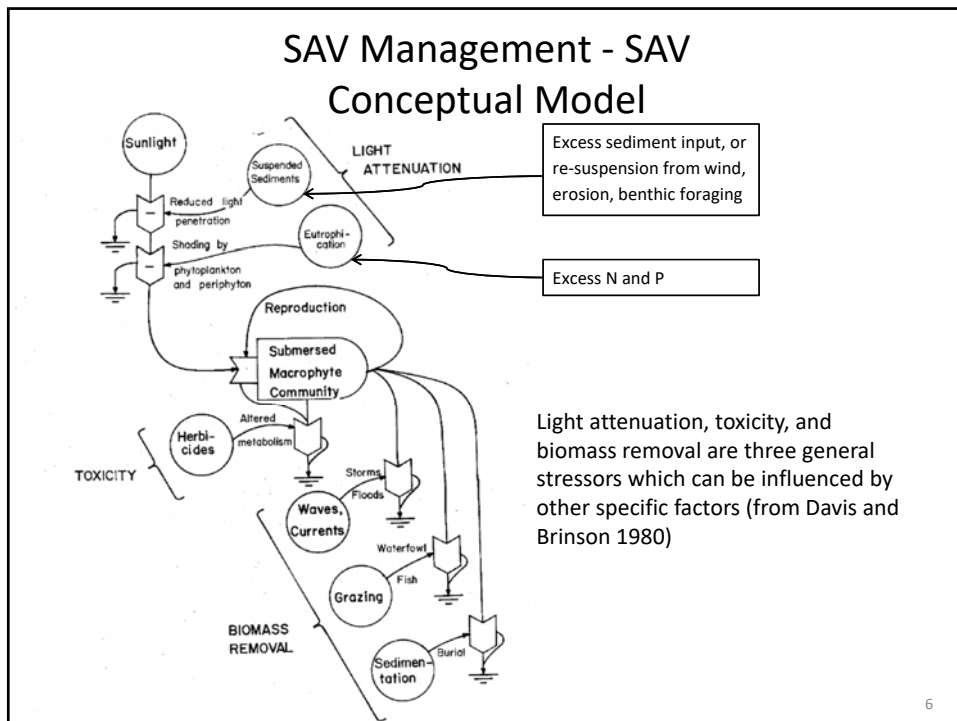
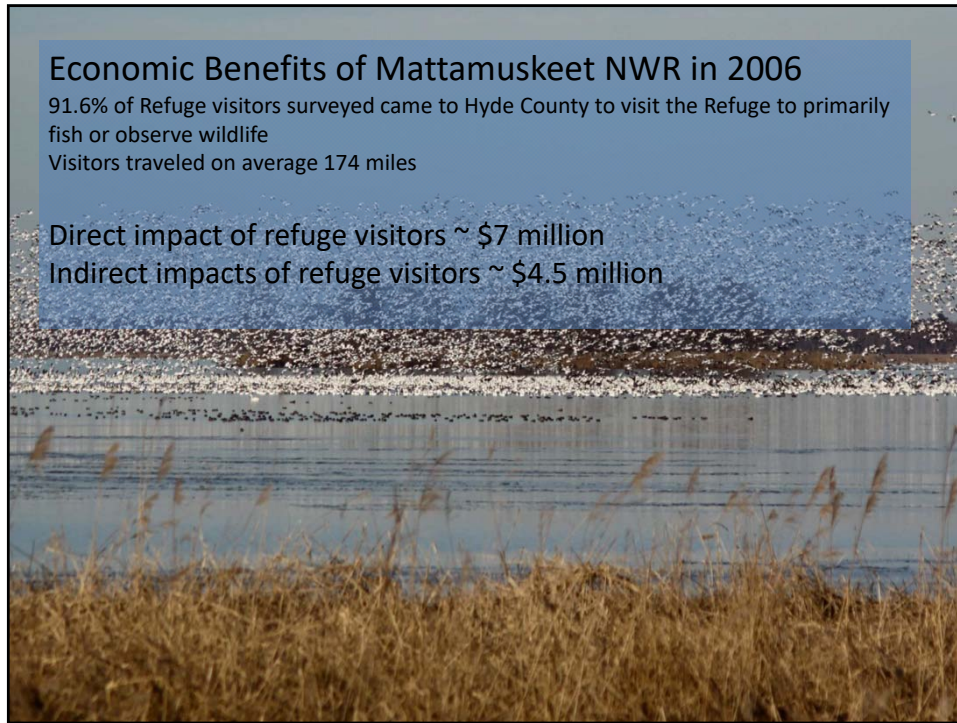
The purpose of Mattamuskeet NWR is to protect and
conserve migratory birds and other wildlife resources
through the protection of wetlands



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The slide contains a photograph of a vast wetland area teeming with a large flock of birds, possibly waterfowl, gathered in a shallow body of water. The birds are densely packed in the foreground and middle ground, with many more flying in the sky above. The background shows a line of trees under a clear sky.





Obj. How has SAV declined and why?

SAV surveys

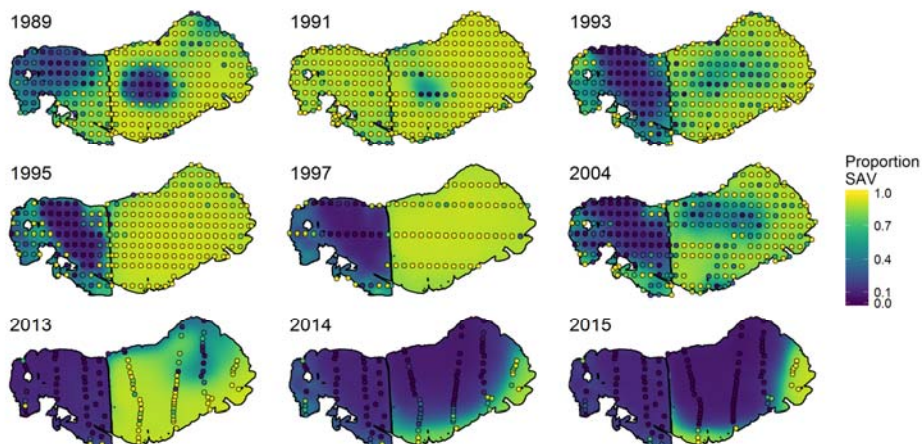
- SAV density surveyed at 1m² plots throughout the lake, 1989-2015
- Percent cover of each species and water depth recorded
- Generalized additive models estimated the distribution of SAV in the lake through time

Water-quality surveys

- Water-quality data collected historically by NC DWR, 1981-2012
- Starting in 2012, two continuous water-quality monitors installed and monthly water-quality measurements collected
- Kendall's Tau trend test conducted on summer water-quality data
- Water-quality data compared to state standards and guidelines

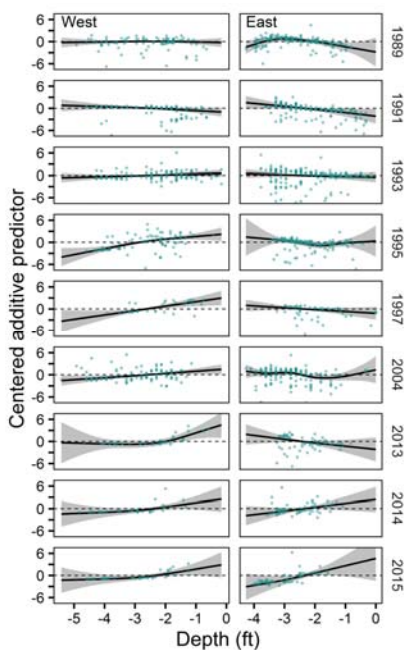


The decline of SAV at Lake Mattamuskeet is concerning

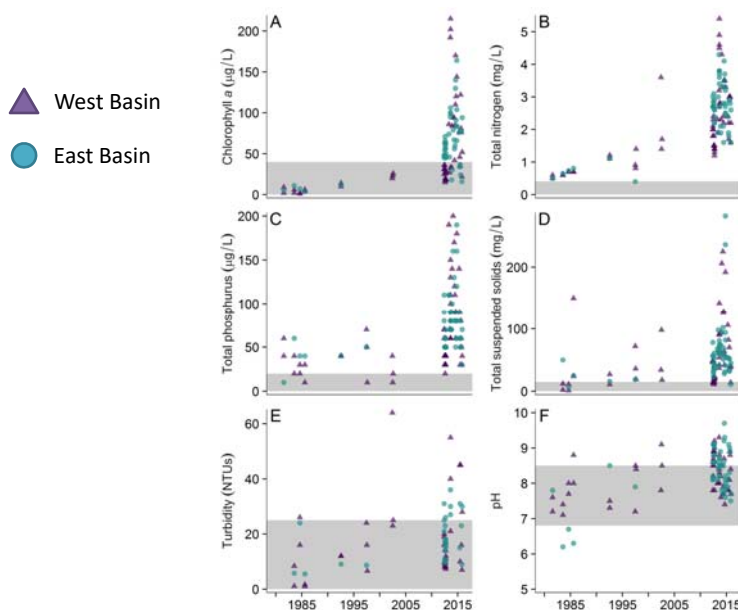


Depth predicts SAV declines

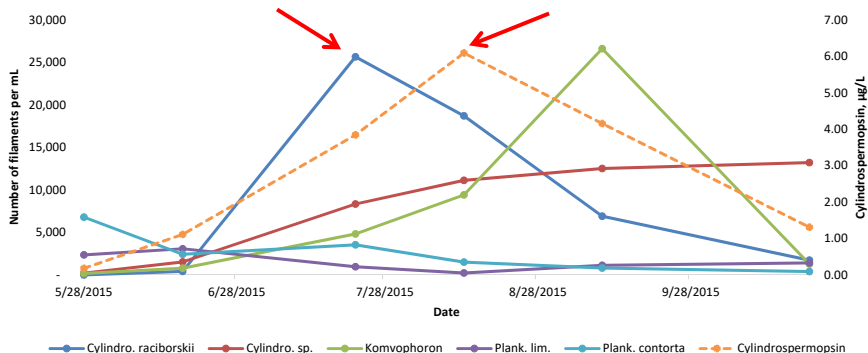
- Depth, one of the few parameters available for the period 1989-2015, became a significant predictor of SAV at the same time SAV declines were observed
- Depth assumed to be related to water clarity



Lake has become more eutrophic since the 1980s



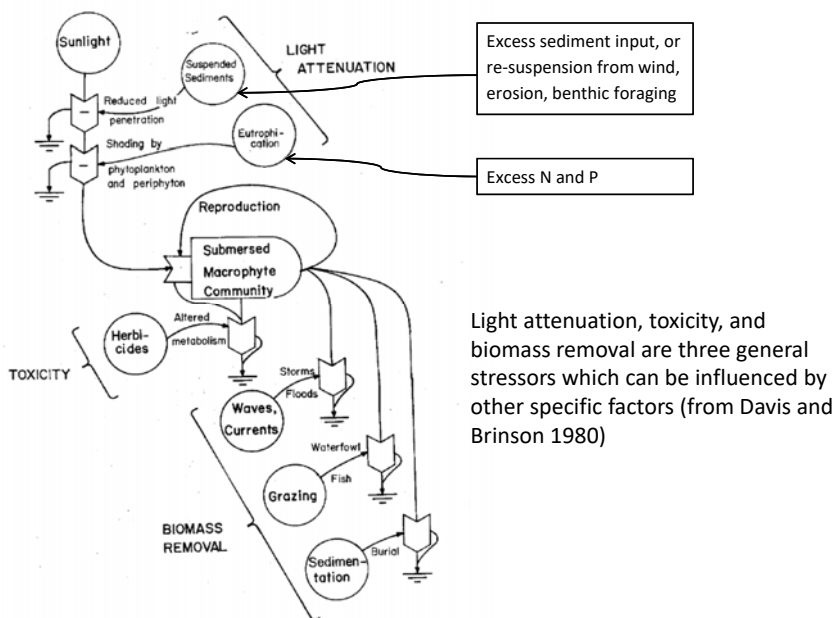
High counts of *Cylindrospermopsis raciborskii* correlated with production of cyanotoxin, Cylindrospermopsin, in summer

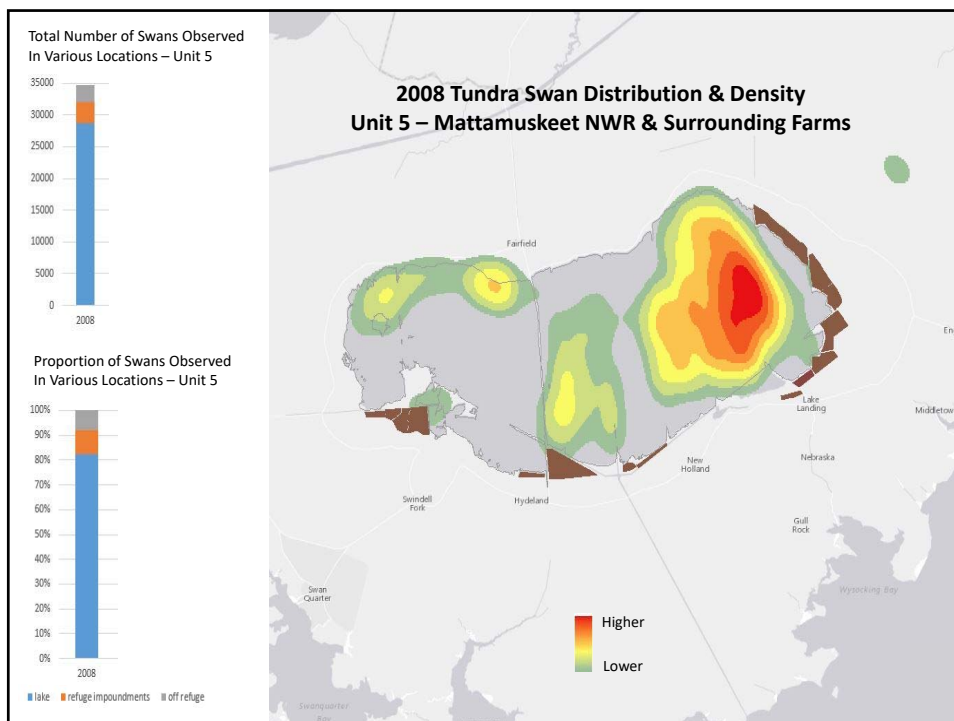
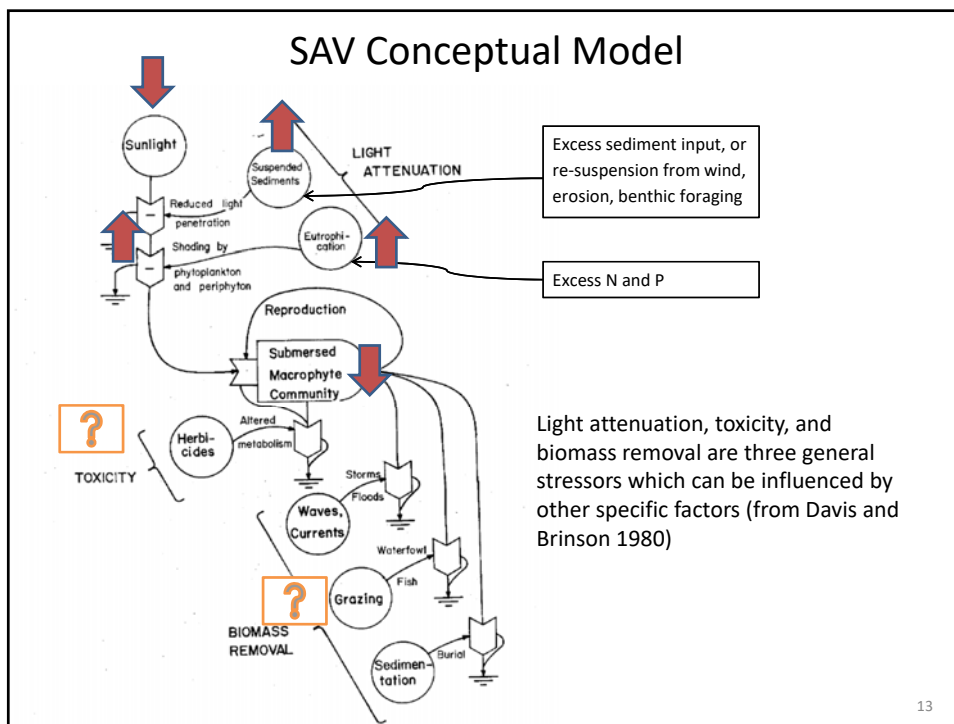


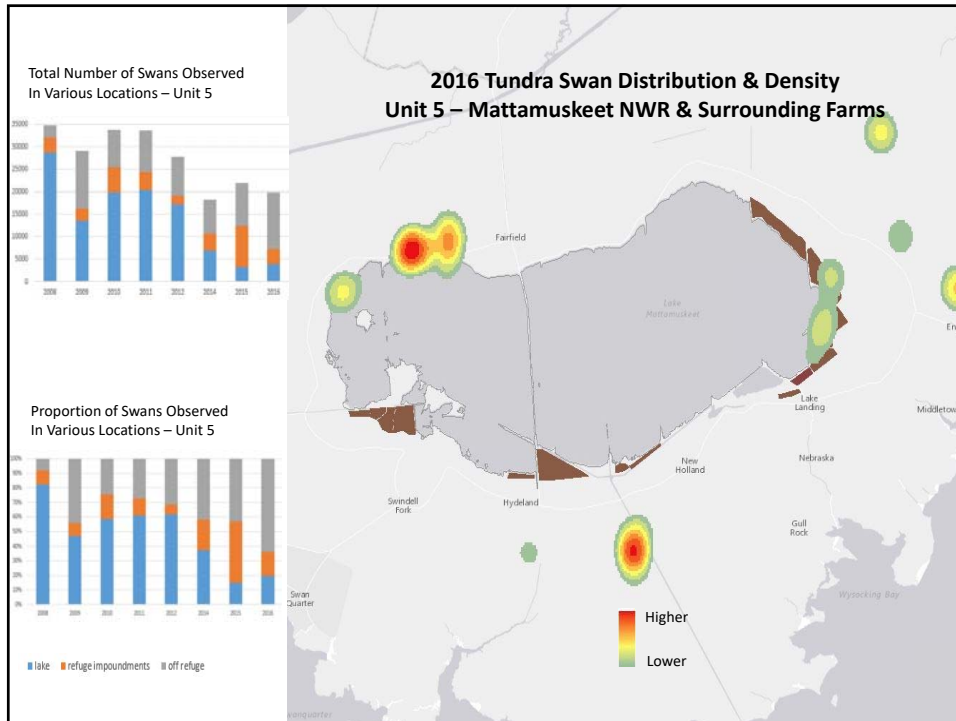
Cylindrospermopsin

- Can impact a wide variety of species
- Bioaccumulation and trophic transfer through the food web is possible
- Can inhibit growth of other phytoplankton and zooplankton grazing
- Human-health effects include flu like symptoms and respiratory problems and adverse impacts on the liver and kidneys
- EPA proposed guideline for recreational waters = 8.0 µg/L

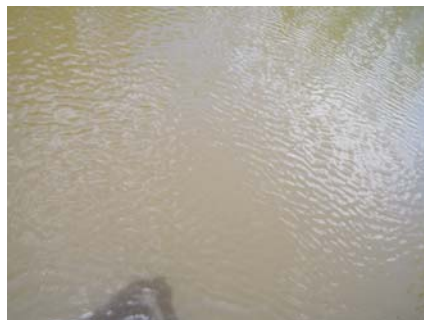
SAV Conceptual Model







The state of Lake Mattamuskeet has shifted:
Water quality is impaired, SAV has disappeared, and cyanobacteria is abundant which is negatively affecting waterfowl habitat

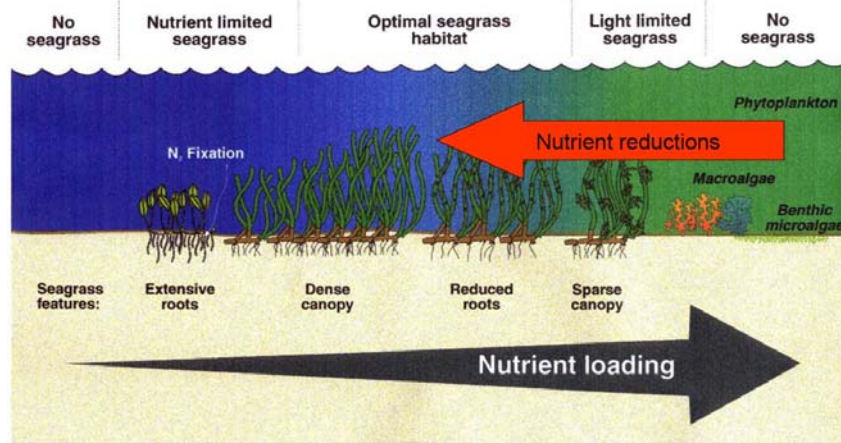


Current state: Turbid waters dominated by cyanobacteria lacking SAV



Desired state: Healthy SAV community with clear water

How can we reduce nutrients and bring back SAVs with time?



The Nine Element Planning Process: Stakeholder driven and supported by multiple partners



Benefits of Collaborative Partnerships at Mattamuskeet NWR



- Sound science has created productive conversations and partnerships
- Transparency and communication are the foundation of the partnerships
- Partnerships are hard work, but the benefits are worth the effort

