Making the case for nature-based solutions to coastal erosion in Virginia’s coastal bays
Amy Ferguson | M.S. Candidate | Department of Environmental Sciences | University of Virginia

Background
Sea level rise, increased storminess, and human population growth amplify coastal erosion problems, pressuring landowners to implement shoreline protection measures. Growing concern over the negative impacts of traditional shoreline protection methods (seawalls or bulkheads) has increased interest in nature-based solutions, called “living shorelines.” Studies offer encouraging findings that living shorelines that use natural marsh vegetation and constructed oyster reefs can control erosion while maintaining ecosystem functions. This project explores the factors influencing erosion along salt marshes and the suitability of individual shorelines for nature-based protection techniques. Field study in Virginia’s coastal bays investigated the effects of marsh vegetation and constructed oyster reefs on dampening waves, the main driver of shoreline erosion. Using geospatial information, a Marsh Vulnerability Index (MVI) was developed that relates disparate factors related to shoreline erosion and serves as the foundation for living shoreline design and placement recommendations.

Field methods
The wave-dampening effects of marsh vegetation and oyster reefs were investigated through field study in Virginia’s coastal bays. Wave measurements were collected at all five sites.

Field results
Results suggest that combining marsh vegetation with constructed oyster reefs may offer effective and sustainable long-term coastal protection.

- **Constructed oyster reefs are effective at dampening waves at low to moderate water levels.**

- **Marsh vegetation dampened waves by 91% over a 20-meter transect at high water levels.**

Geospatial methods
A Geographic Information System (GIS) was used to relate and manipulate spatial data collected at different scales and units to develop a Marsh Vulnerability Index (MVI).

- The MVI incorporates high resolution spatial datasets on eight salt marsh erosion variables.
- Erosion variables are assigned a risk value in the range of 1 to 5 in order of increasing vulnerability and combined via a simple geospatial computation to reveal erosion potential.

Geospatial results
- **MVI output shows generally good agreement with historical shoreline erosion rates.**

Future work
Resultant data will be available to the public through The Nature Conservancy’s Coastal Resilience online decision-support tool, where it can be used with other spatial data to find cost-effective, nature-based solutions to coastal erosion problems.

References

Funding sources

![Funding sources](Image)