NCCOS NATIONAL CENTERS FOR COASTAL OCEAN SCIENCE

Spatial Modeling Support for Eastern Bay

NOAA/NOS/NCCOS Marine Spatial Ecology Division

Cooperative Oxford Laboratory

SCIENCE SERVING COASTAL COMMUNITIES

COOPERATIVE OXFORD LABORATORY

LOCATION | Oxford, Maryland

PROPERTY ACREAGE | 13 acres

FACILITY SQFT. | 10,325 sqft. main facility + 12 outbuildings

NCCOS STAFF | 11FTE, 4 Affiliates

PARTNER STAFF | 14 USCG, 16 MDNR, 7 NMFS

PARTNERS | MD Dept. of Natural Resources, NMFS, US Coast Guard

The laboratory, centrally located in Chesapeake Bay on the Tred Avon River, was established in 1960 primarily to investigate oyster diseases that devastated the fishery in the late 1950s. The facility became the Cooperative Oxford Laboratory in 1987. Scientific capabilities include expertise in field ecology, advanced underwater acoustic technologies, histopathology, fish health, marine mammal and sea turtle stranding response, ecological assessments, ecological forecasting, quantifying ecosystem services, research to enhance preparedness and recovery in the face of coastal change, and research to improve restoration and resilience practices.

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To lead Federal efforts in reversing the decline in the Eastern Oyster

- Foundational research on parasites MSX and Dermo
- Development of shellfish aquaculture
- Maryland's first oyster sanctuary

SCIENCE HIGHLIGHTS

COOPERATIVE OXFORD LABORATORY

AQUACULTURE SERVICES

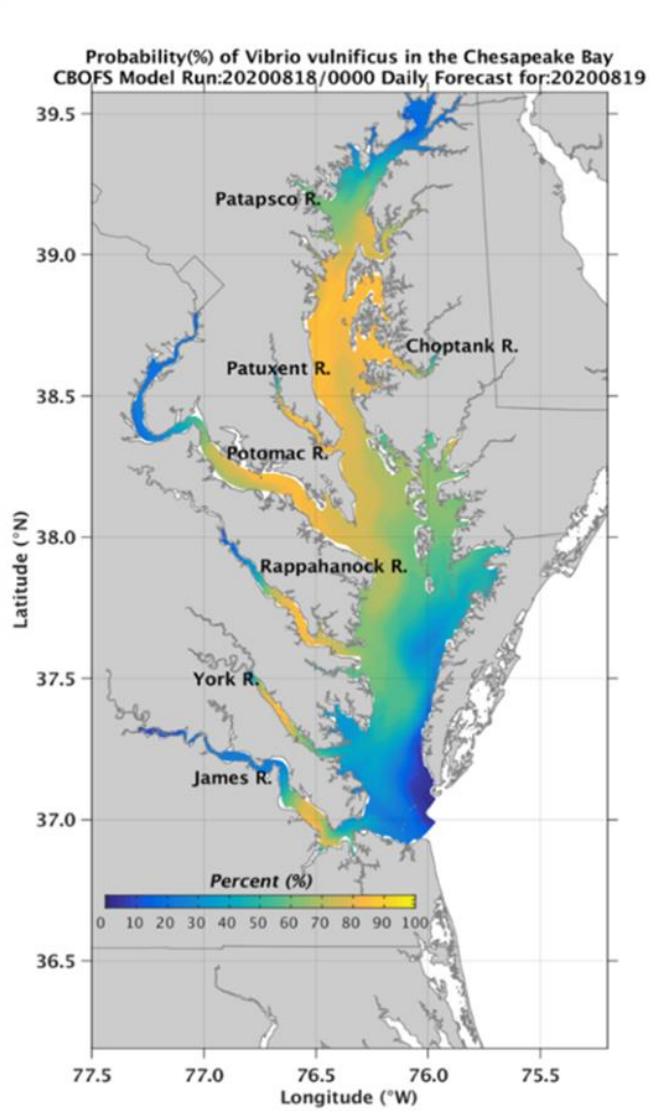
➢ National pathogen forecasting
➢ Shellfish bed closure tools
➢ Direct setting of oysters and alternative substrates
➢ Bio-extraction of nutrients

HABITAT

➢ Fish habitat mapping
➢ Shellfish restoration
➢ "Habitat Focus Area" monitoring & Assessment

CLIMATE

➢ Weather & water modeling
➢ Climate influence on fish and shellfish recruitment



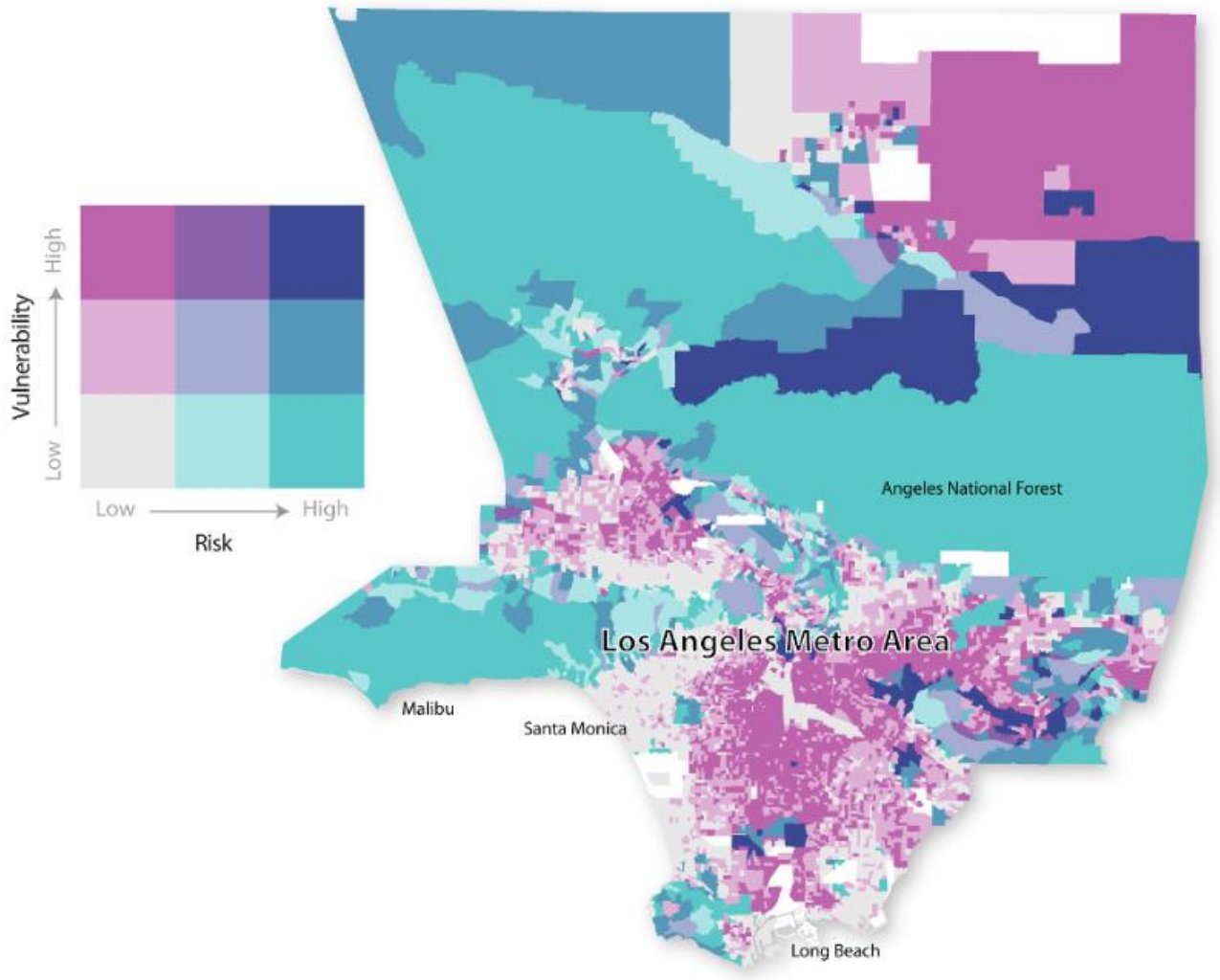
SCIENCE HIGHLIGHTS

BIOGEO: SOCIAL SCIENCE TEAM

Ecosystem Services Valuation
- ➢ Cultural Values and Attachments
- ➢ Baseline Services Valuation

Vulnerability and Resilience Assessment
- ➢ Adaptation: Hazards & Risk
- ➢ Vulnerability and Risk in Coastal Communities

Human Uses of Coastal & Marine Resources
- ➢ Recreational uses
- ➢ NOS Special Places



SCIENCE HIGHLIGHTS

BIOGEOGRAPHY BRANCH (BioGEO)

MONITORING, ASSESSMENT & RESTORATION

- National Coral Reef Monitoring Program (NCRMP)
- Biogeographic assessments
- Integrated open-ocean ecosystem restoration

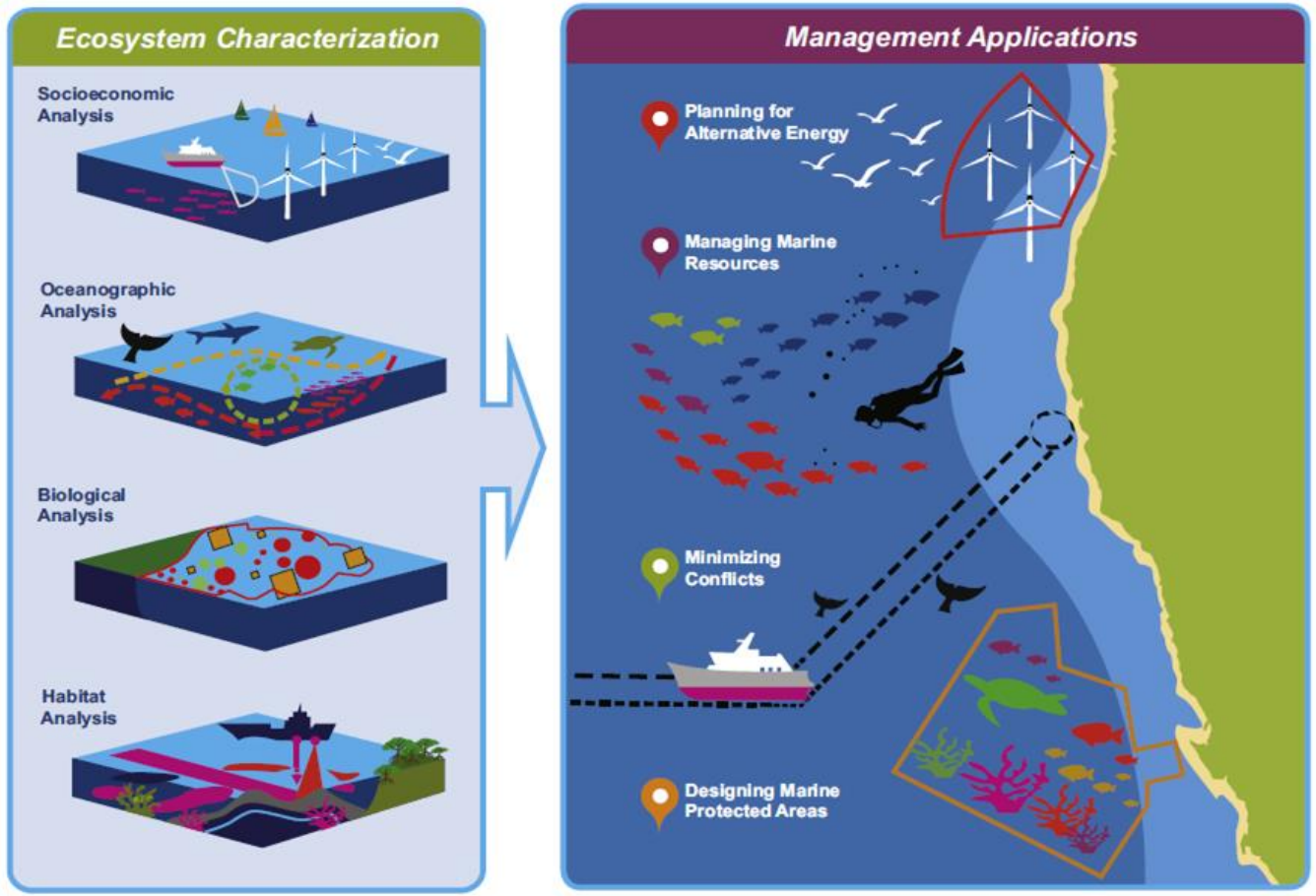
PREDICTIVE MODELING

- Marine resource distribution
- Critical habitat distribution

MARINE SPATIAL PLANNING

- Offshore wind
- Aquaculture
- Science to support protected area management

HABITAT MAPPING



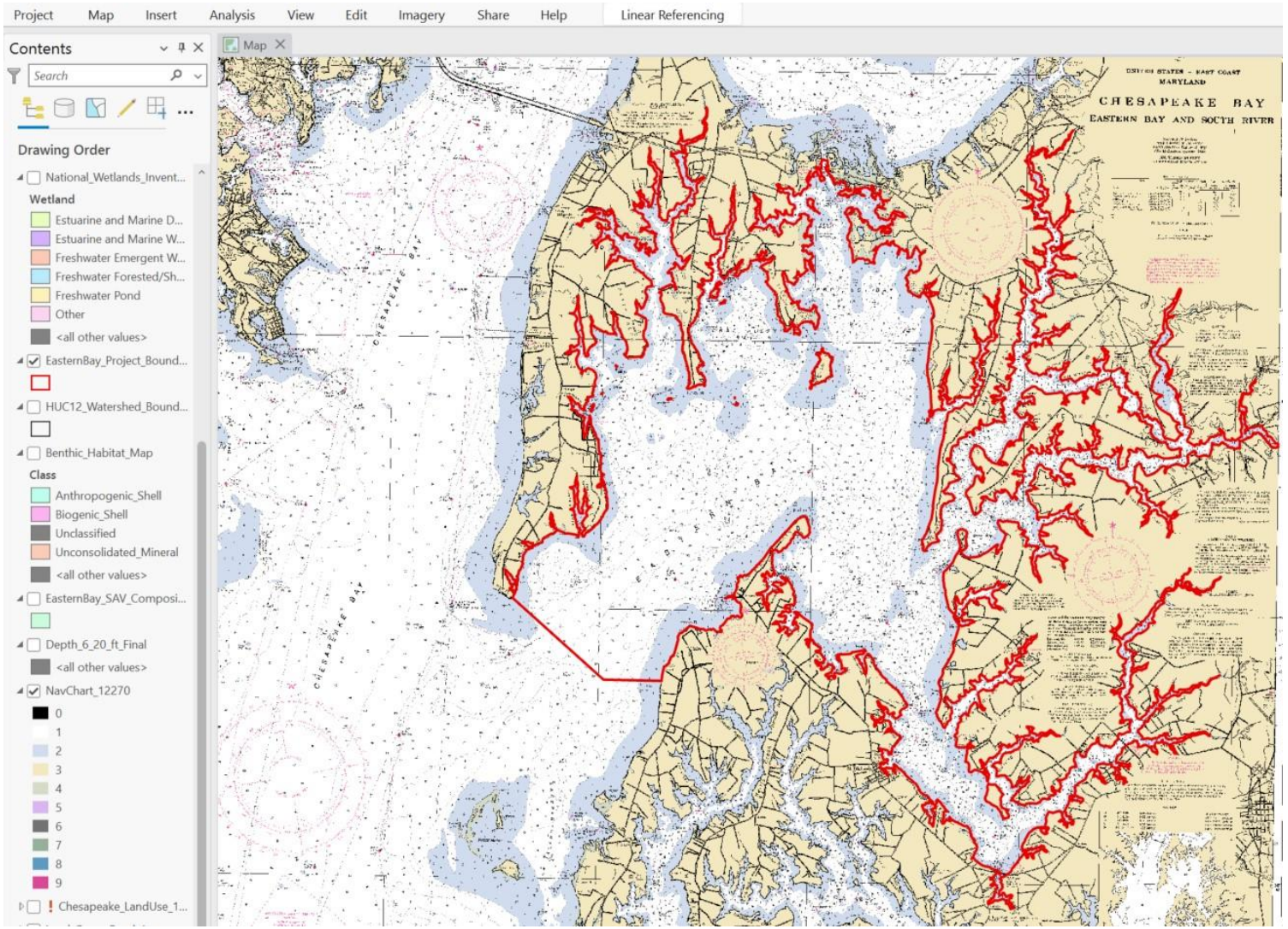
Eastern Bay Project

Goal: *Provide project support in identifying areas for potential oyster restoration with respect to competing uses and stakeholder needs.*

Jane Thomas, Integration and Application Network (ian.umces.edu/media-library)

Task 1 – Geodatabase Development

- Starting with DNR tools already available.
- Building in layers to address other potential concerns
- Adding additional stand alone tools



Current layers

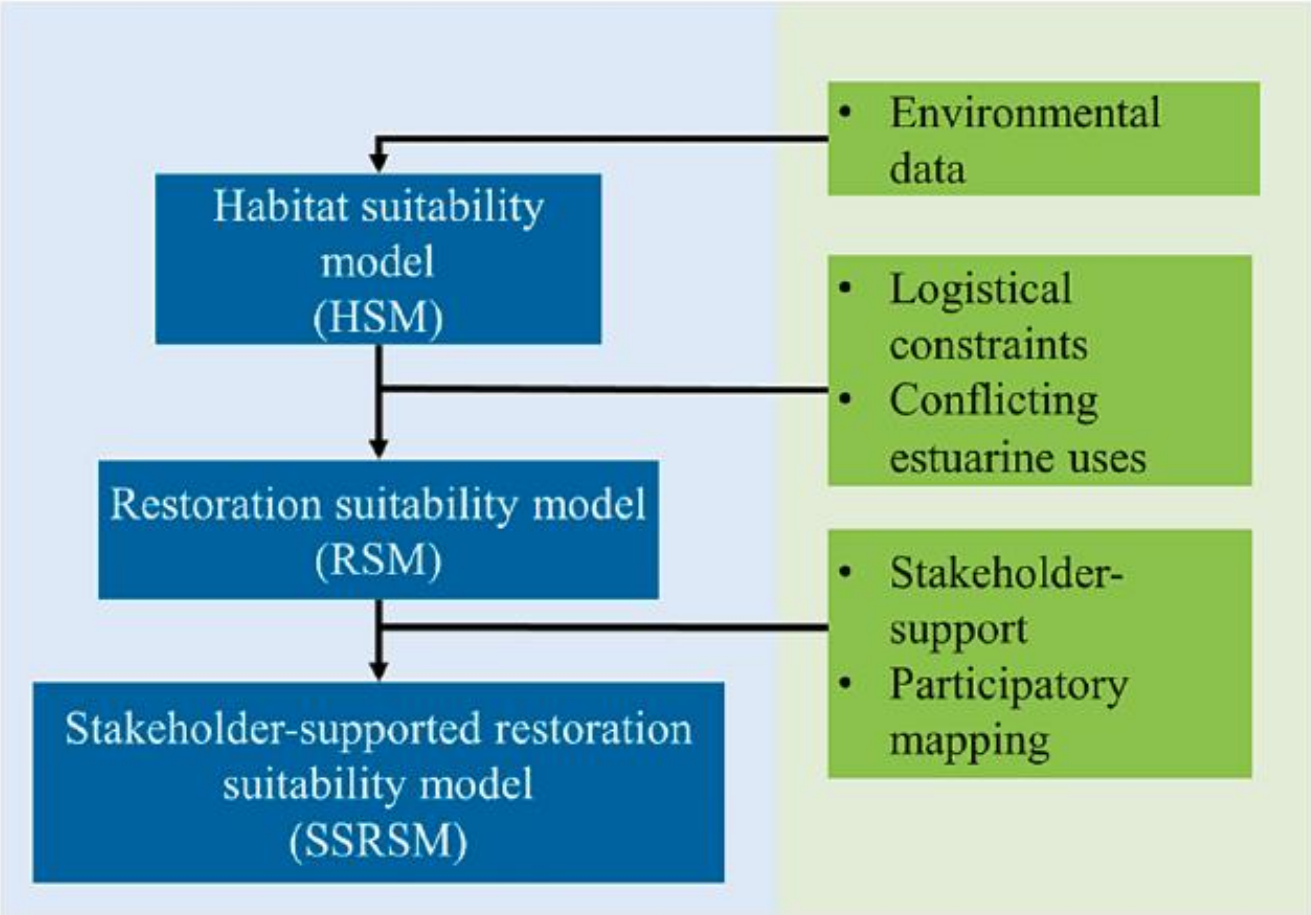
- Habitat characteristics
- Water quality
- Oyster bars, sanctuaries, leases, etc..
- Public fishing areas
- Infrastructure (marina’s, piers, etc…)
- Land use/shoreline inventory
- Regulatory boundaries (MDE classification, etc..)

Spatial Modeling

Integration of social data into restoration suitability modelling for oyster reefs

Alice H Howie a,b,*, Simon E. Reeves b,c, Chris L. Gillies d, Melanie J. Bishop

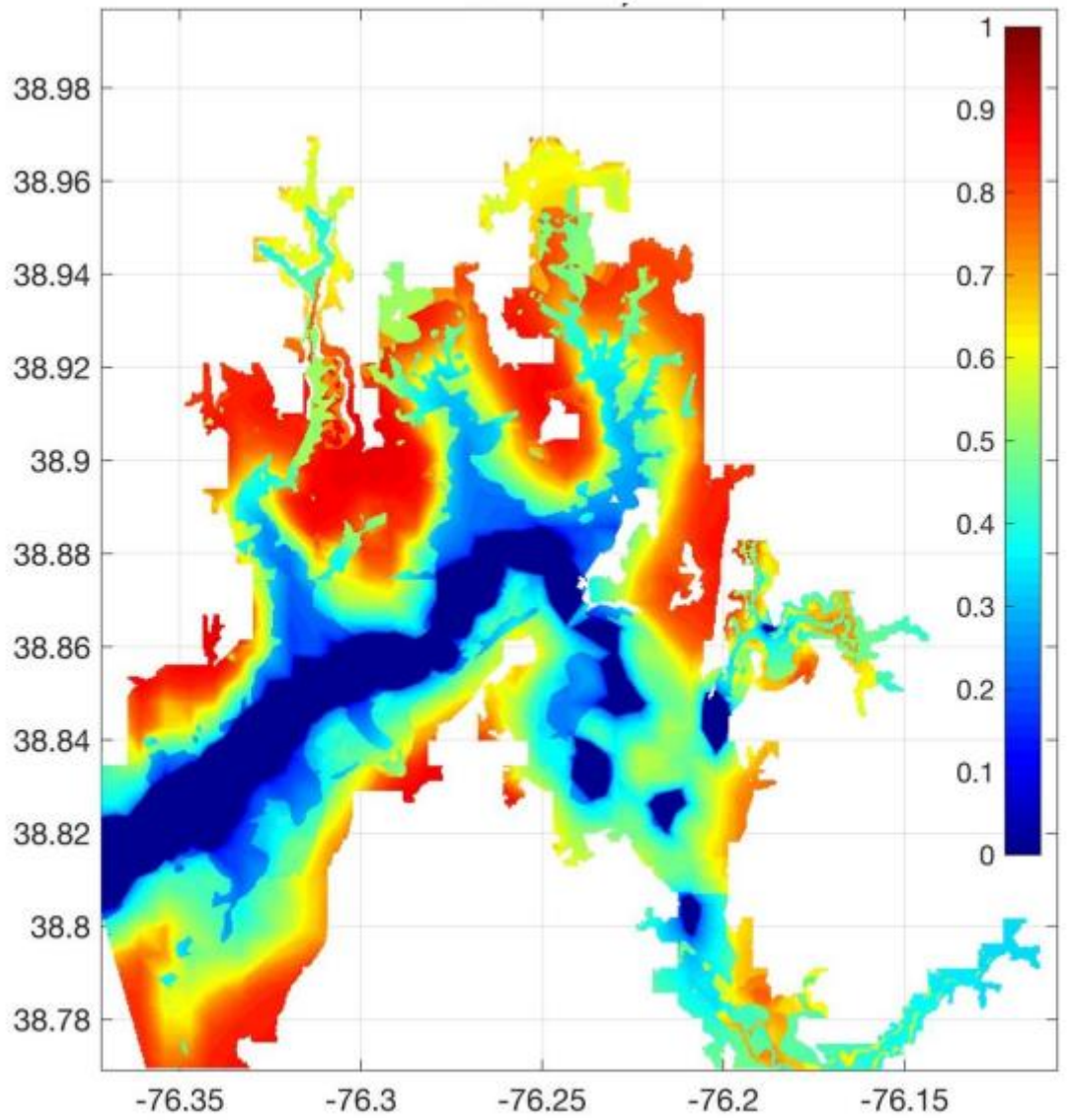
Ecological Indicators 158 (2024) 111531



ORP HSI

Table 2. References for variables used in HSI for oysters.

Variable	Reference
Minimum salinity	Sonait et al. 2013, Hijuelos et al. 2017, Préau et al. 2015
Depth	Hijuelos et al. 2017, Theuerkauf and Lipscius 2016, Starke et al. 2011
Dissolved Oxygen	Cho et al. 2012
Chlorophyll a	Cho et al. 2012, Theuerkauf et al. 2018
ISS	Cho et al. 2012
Sediment Type	Starke et al. 2011, Theuerkauf and Lipscius 2016



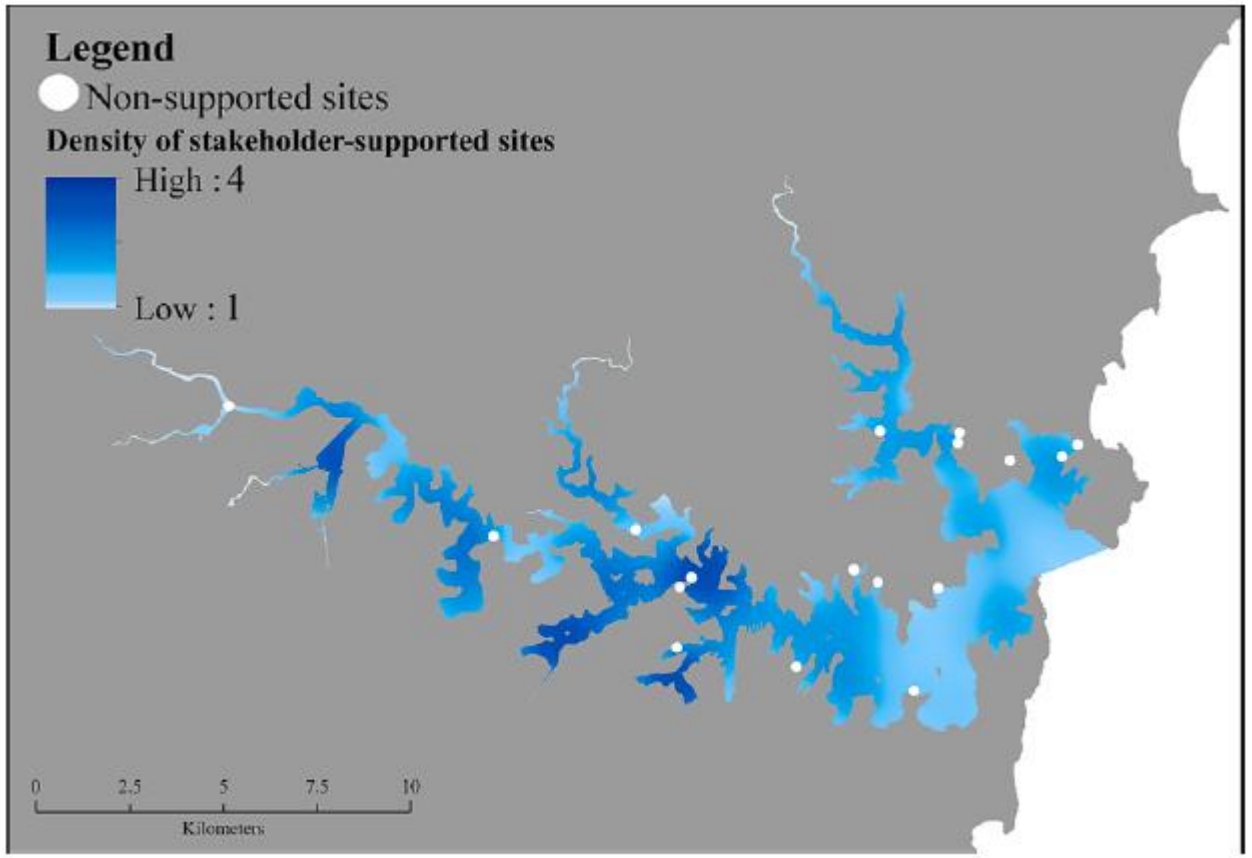
Coleman, K.E., Amrhein, E., Wills, E., Coleman, S., and H.W. Slacum. 2021. **Improving Oyster Restoration Siting to Maximize Available Habitat and Environmental Benefits.** Prepared for the National Fish and Wildlife Foundation. Oyster Recovery Partnership, 1805A Virginia Street, MD, 21403.

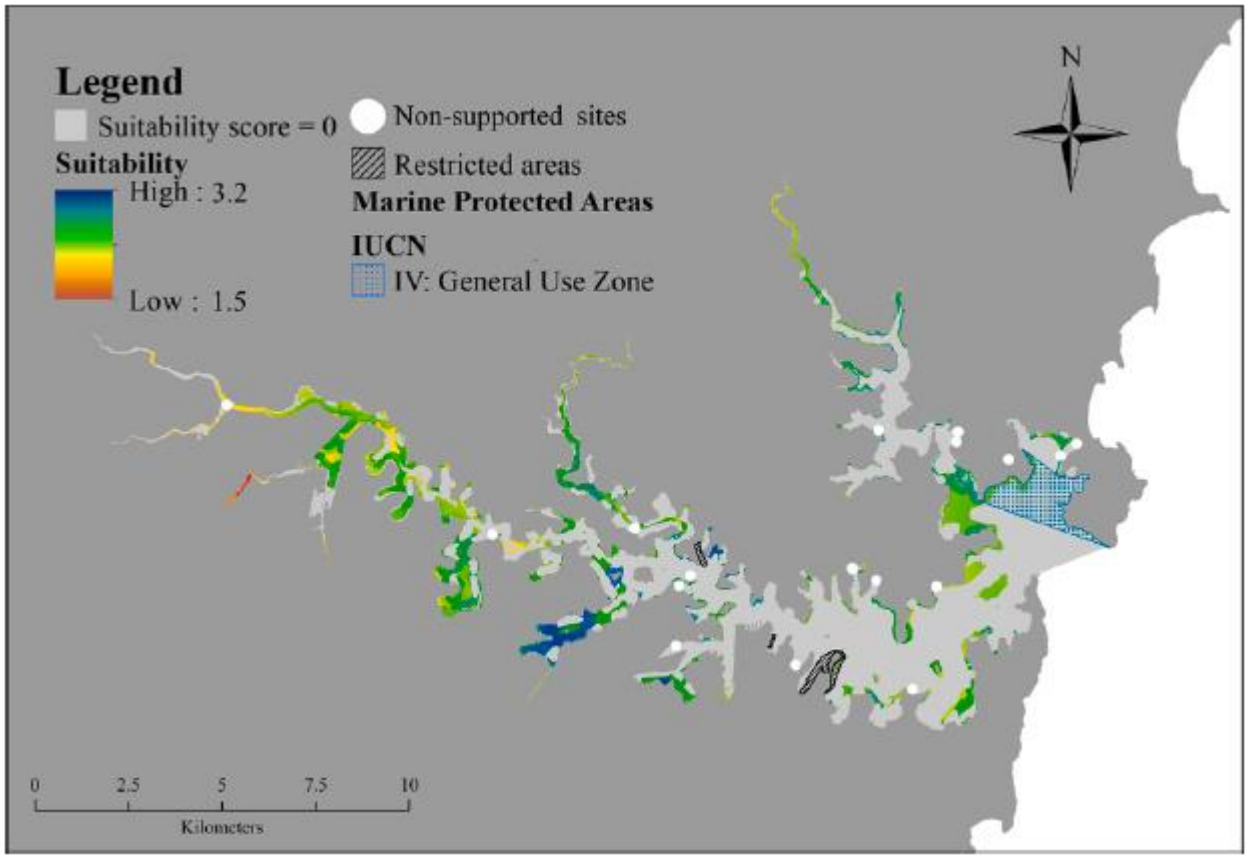
Restoration Suitability

Table 2
Suitability ranges for each parameter used in the construction of the RSM in Sydney Harbour estuary. Criteria indicate how data were transformed (reclassified) in constructing each data layer. Suitability is on a scale of 0 (unsuitable) to 4 (highly suitable) for ecological data, and on a scale of 0 (excluded) to 1 (no effect on suitability) for conflicting estuarine use data.

Data type	Parameter	Criteria	Rationale
Ecological	Biogenic habitats	Areas within 5 m buffer = 0; areas within 5–200 m buffer = 4; all other areas = 2	Limit impact to existing biogenic habitats, but proximity is beneficial as connectivity to other structured habitats increases diversity and/or abundance of associated fish and invertebrates.
Conflicting estuarine uses	Depth	Depths below −15 m = 0; all other areas = 1	Logistically difficult to construct oyster reefs below – 15 m and higher risk to worker safety.
	Public wharfs and boat ramps	Areas within 50 m buffer = 0; all other areas = 1	Reduce threat of collision and prevent navigational hazards with large vessels.
	Recognised mooring area	Areas within 50 m buffer = 0; all other areas = 1	Avoid social conflict and seabed damage with installation of new mooring sites
	Public swimming areas	Areas within 50 m buffer = 0; all other areas = 1	Avoid social conflict and public health risks (e.g., abrasions/cuts, consumption of unsanitary oysters).
	Presence of cultural heritage items or places	Areas within 250 m buffer = 0; all other areas = 1	Reduce risk of negatively impacting heritage sites and culturally sensitive areas.
	Navigation channels	Navigation channels = 0; all other areas = 1	Avoid social conflict, reduce threat of collision with large vessels, reduce risk to recreational divers, Prevent navigational hazards with large vessels.
	Marine Protected Areas (MPAs)	Included as an overlay on final model	Avoid impacts of restoration work on vulnerable and protected marine habitats.
	Restricted-use zones	Included as an overlay on final model	Avoid conflicting uses of the area, utilisation of areas for restoration in restriction zones; restoration activities would require special permissions from military or airport bodies.

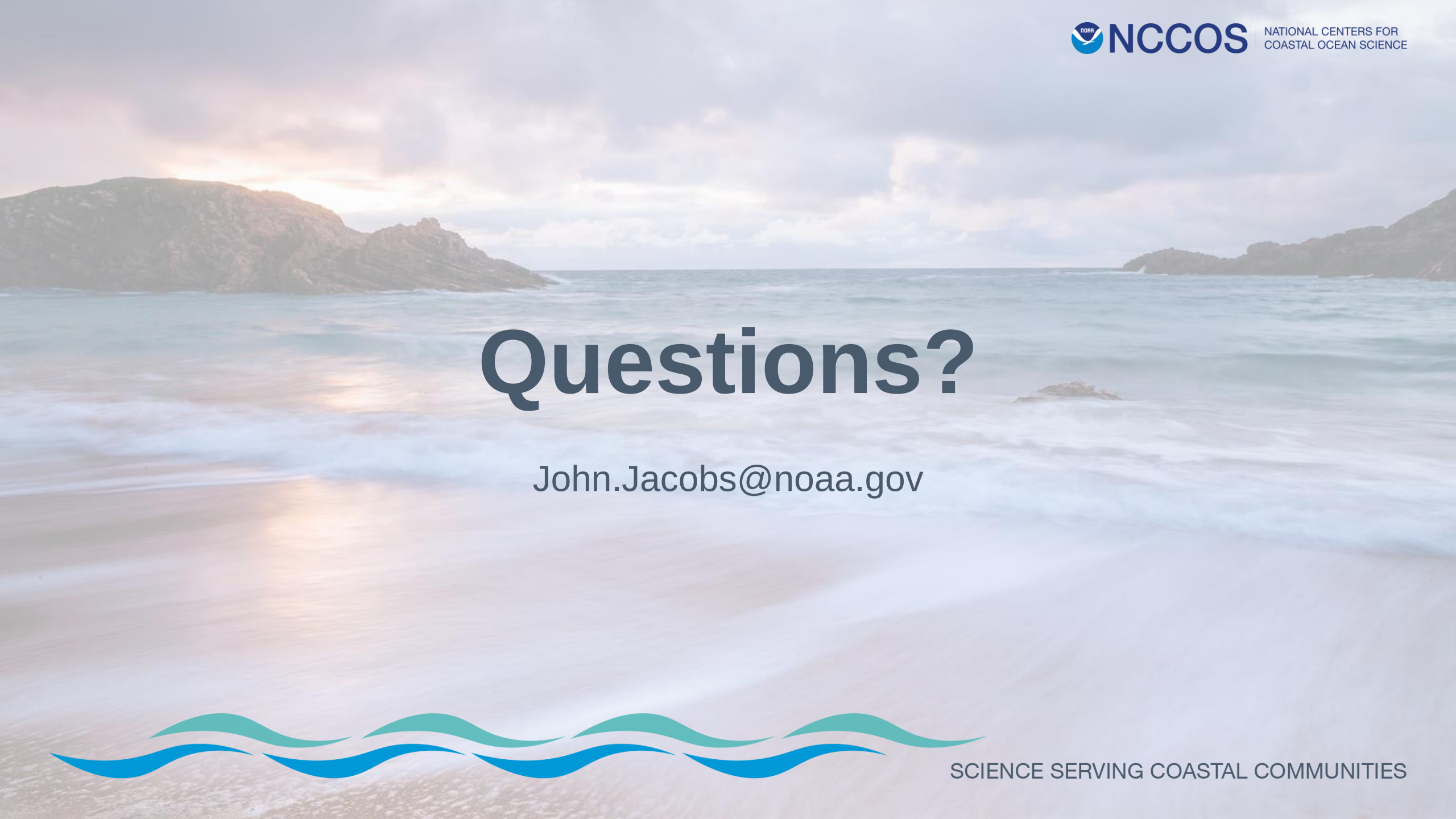
Stakeholder Input




Legend
Suitability score = 0
Non-supported sites
Restricted areas
Suitability
High : 3.2
Low : 1.5
Marine Protected Areas
IUCN
IV: General Use Zone
N
0
2.5
5
7.5
10
Kilometers

Where we are….

- Geodatabase nearing completion of first draft
- Spatial analyst onboard in April (we hope!)
- Seeking input on the utility of the approach
- Potential to use as a framework for future efforts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Questions?
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