Shellfish Aquaculture Vulnerability Model

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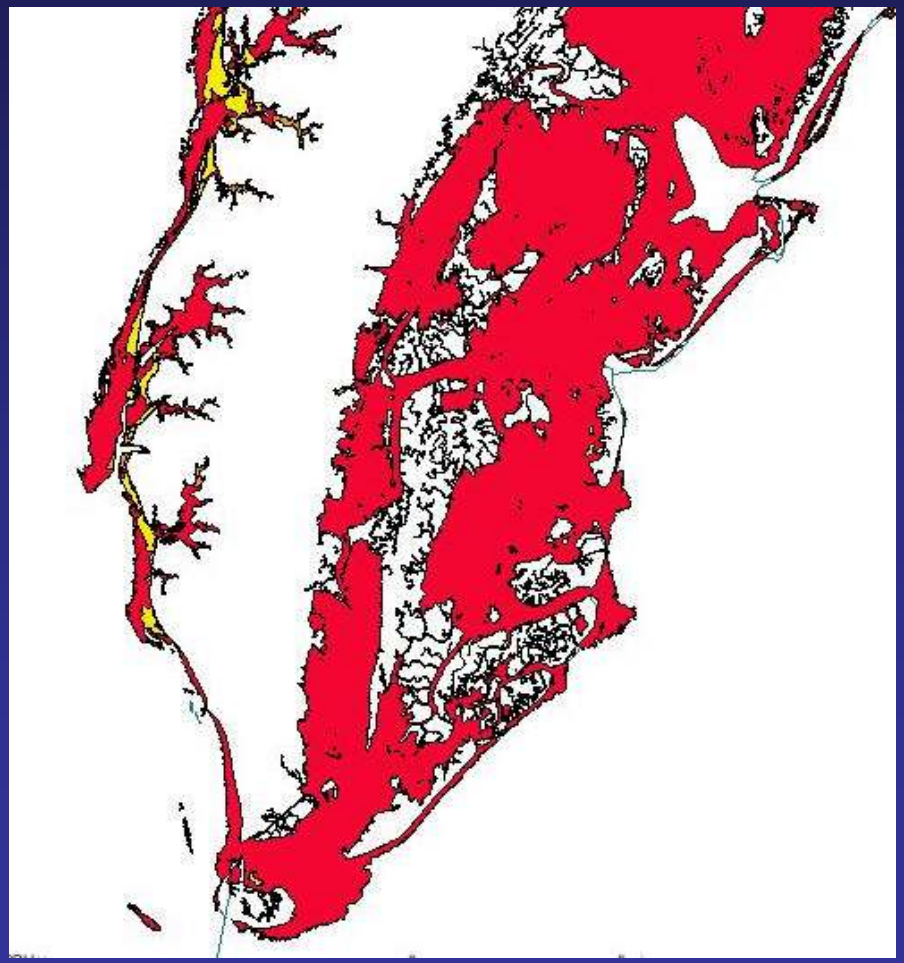
MANAGEMENT PROGRAM

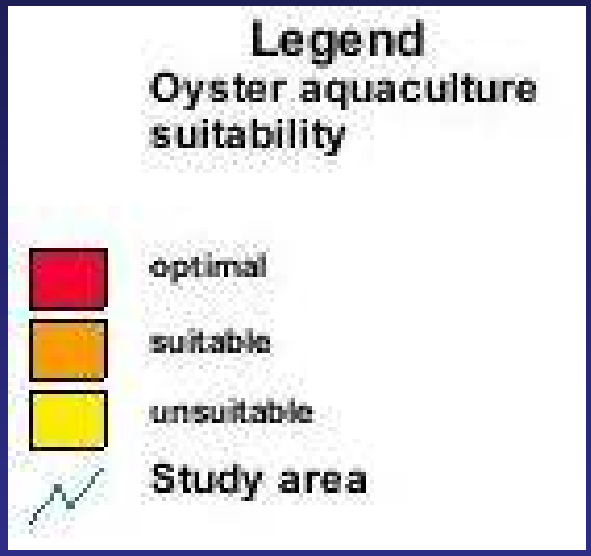
Project History: Phase 1

Objective

- Develop a spatial model using available GIS data to determine suitable sites for aquaculture

Oyster Aquaculture Suitability Phase I





Bathymetry
Salinity
Water Quality
SAV

Aquaculture Suitability – Phase II

OBJECTIVE

- To be more spatially discriminating
- Develop a product that considered the influence that land practices has on aquaculture

Criteria for Assessing Vulnerability Integrates the Following Attributes

- Bathymetry
- Salinity
- Water Quality: Shellfish Condemnation Zones
- SAV (presence/absence)
- Land use*
- Local Zoning *

Land Use Designations (NLCD, 2001)

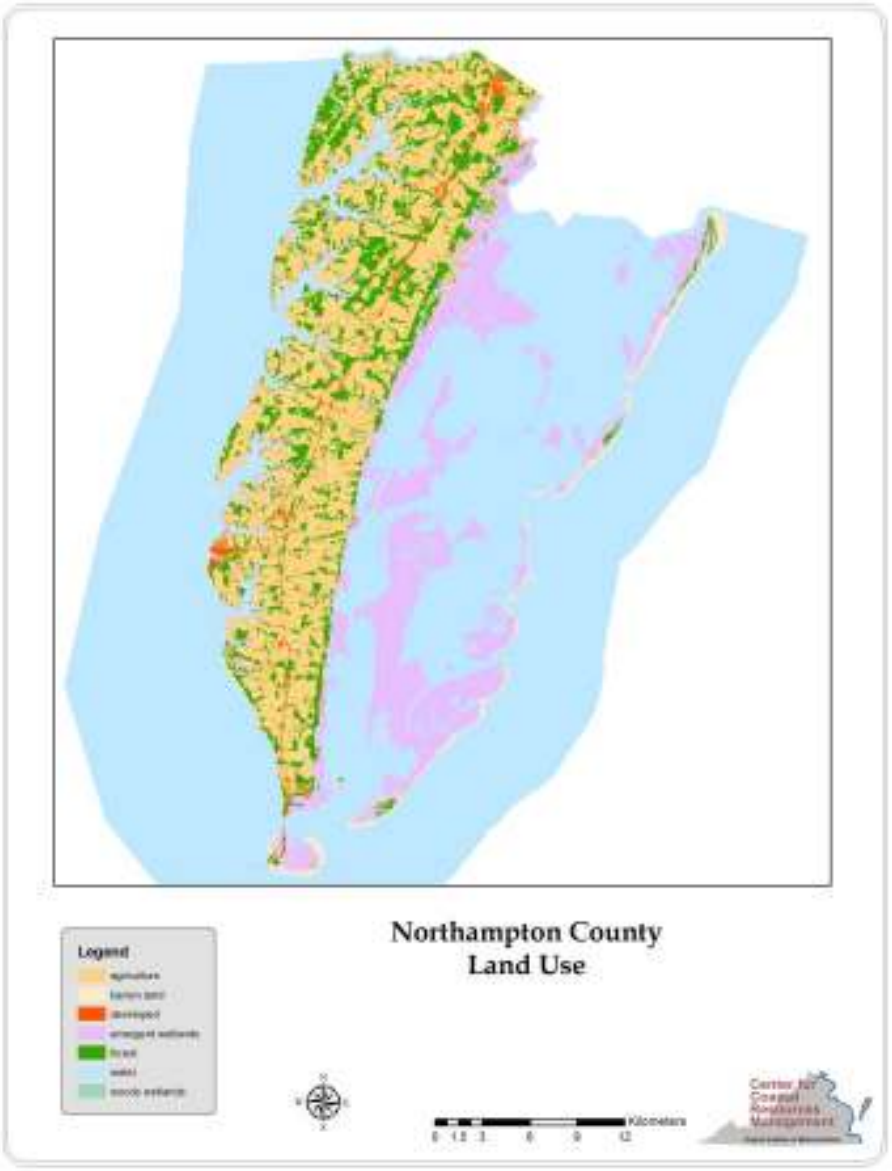
- Natural:

  forests, wetlands, scrub-shrub, barren, etc

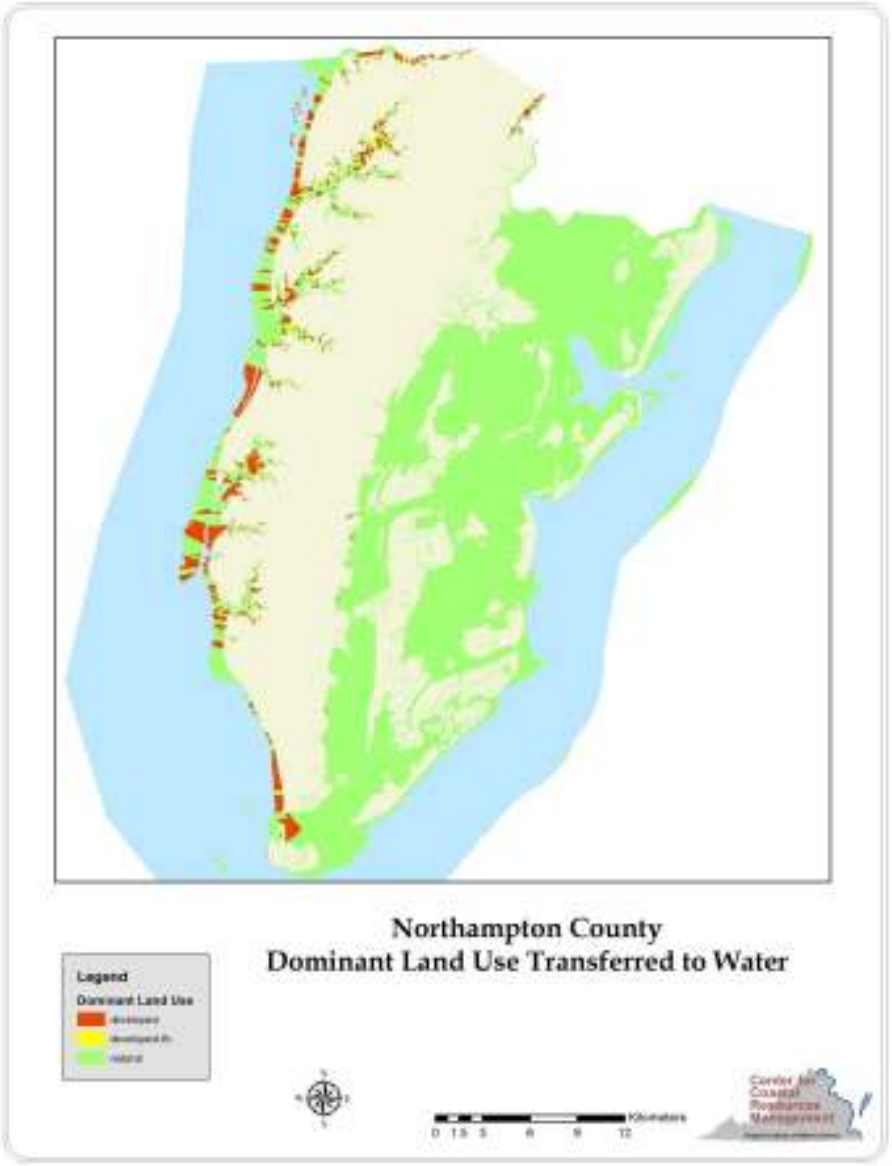
- Developed and Agriculture:

  low-high density development, crop and pastureland

- Developed and Agriculture with forest buffers



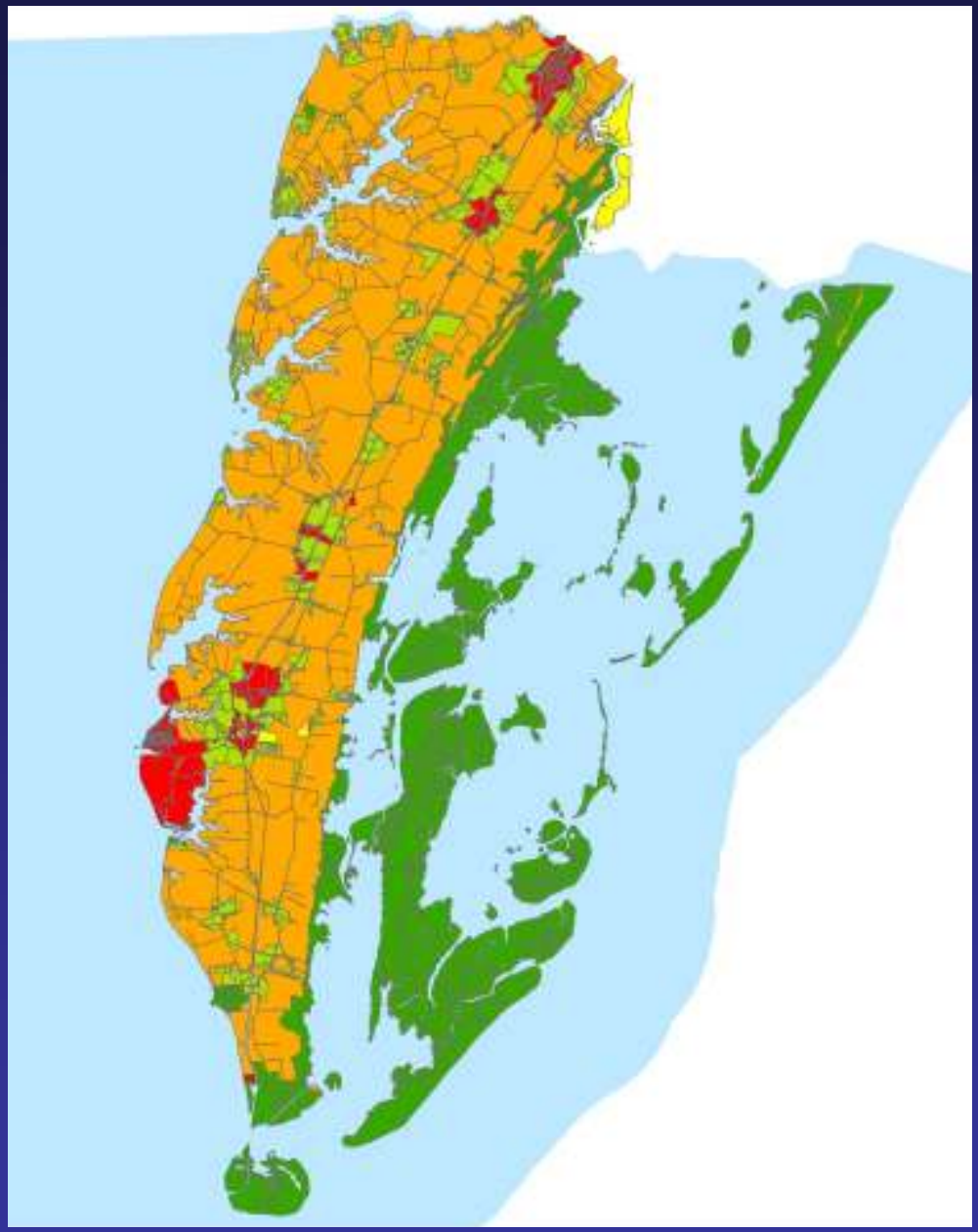
Northampton County
Land Use



Northampton County
Dominant Land Use Transferred to Water

County Zoning Risk Assessment Values

Northampton County:	Rating	Score
C (conservation)	A	1
CD_R1 (single-family residential)	B	2
CD_RR (rural residential)	B	2
RV_R (rural village residential)	B	2
RV_RM (rural village mixed residential)	B	2
RV_RR (rural village rural residential)	B	2
A1 (agriculture)	C	3
RV_C (rural village commercial)	C	3
RWVA (waterfront village?)	C	3
RWVC (waterfront village commercial?)	C	3
RWVR (waterfront village residential?)	C	3
EB_CW (commercial waterfront)	D	4
TOWN …	D	4



Northampton County

Local Zoning

- A = 1
- B = 2
- C = 3
- D = 4
- other

PHASE I vs. PHASE II

Suitability Index	Vulnerability Index
Optimal	Risk Level 0
	Risk Level 1
Suitable	Risk Level 2
	Risk Level 3
Unsuitable	Risk Level 4

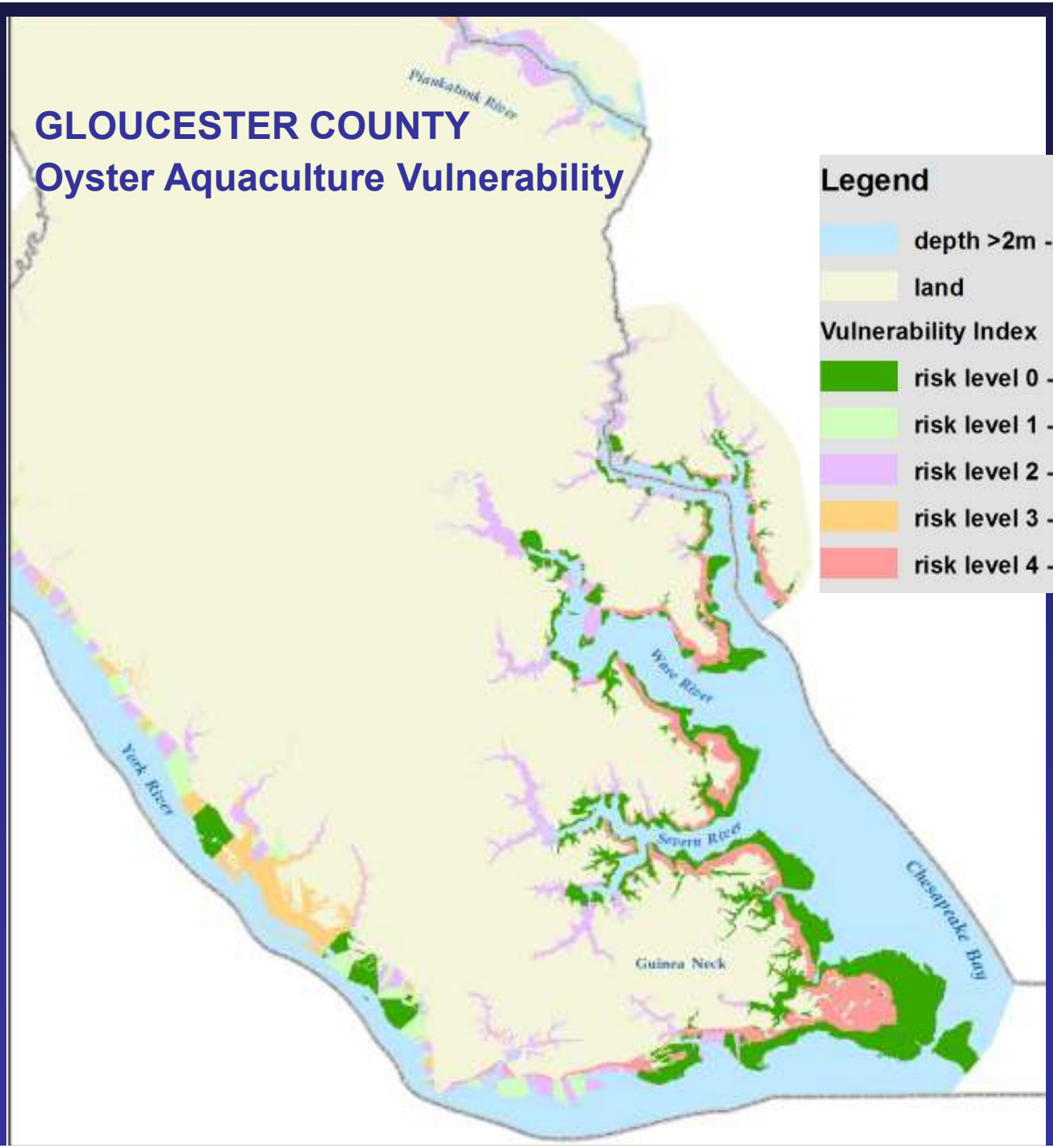
Shellfish Aquaculture Vulnerability Index

Risk Level 0	No Threats
Risk Level 1	Minimal Risk
Risk Level 2	Existing Water Quality Issues
Risk Level 3	Future Water Quality Issues Likely
Risk Level 4	Significant Ecological Conflicts Exist

Model Criteria and Output

	Level 0	Level 1	Level 2	Level 3	Level 4
SAV	Absent	Absent	Absent	Absent	present
Salinity	≥20	≥15	≥15	≥15	<15
Shell. Clos.	Open	Open	**Open Seas.Open Condemed**	**Open Seas.Open Condemed**	prohibited
Bathym.	≤ 2m	≤ 2m	≤ 2m	≤ 2m	>2m
Dom. LU	Natural	Natural Dev-FB	Natural Dev-FB Devel.	Natural Dev-FB Devel.	n/a
Zoning	A	A	A,B	B,C,D	n/a
Z. Mod.	If B→1 If C,D →3	If B,C, D →3	If C,D →3	None	n/a

GLOUCESTER COUNTY
Oyster Aquaculture Vulnerability

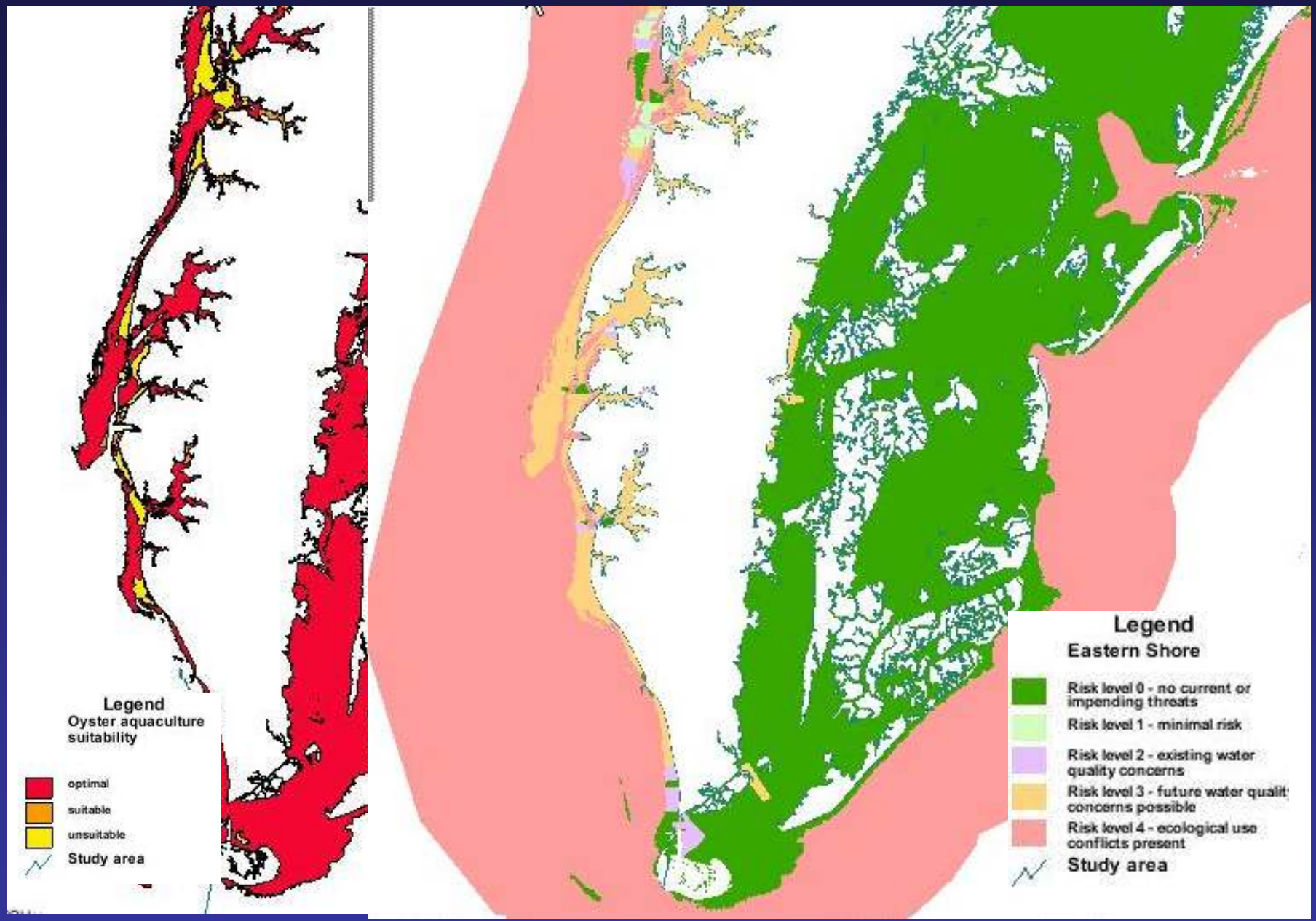


Legend

- depth >2m - study limits for shellfish growing
- land

Vulnerability Index

- risk level 0 - no current or impending threats
- risk level 1 - minimal risk
- risk level 2 - existing H2O quality concerns
- risk level 3 - future H2O quality concerns possible
- risk level 4 - ecological use conflicts present


Legend
Oyster aquaculture suitability
optimal
suitable
unsuitable
Study area
Legend
Eastern Shore
Risk level 0 - no current or impending threats
Risk level 1 - minimal risk
Risk level 2 - existing water quality concerns
Risk level 3 - future water quality concerns possible
Risk level 4 - ecological use conflicts present
Study area

Legend

- depth >2m - study limits for shellfish growing
- land

Vulnerability Index

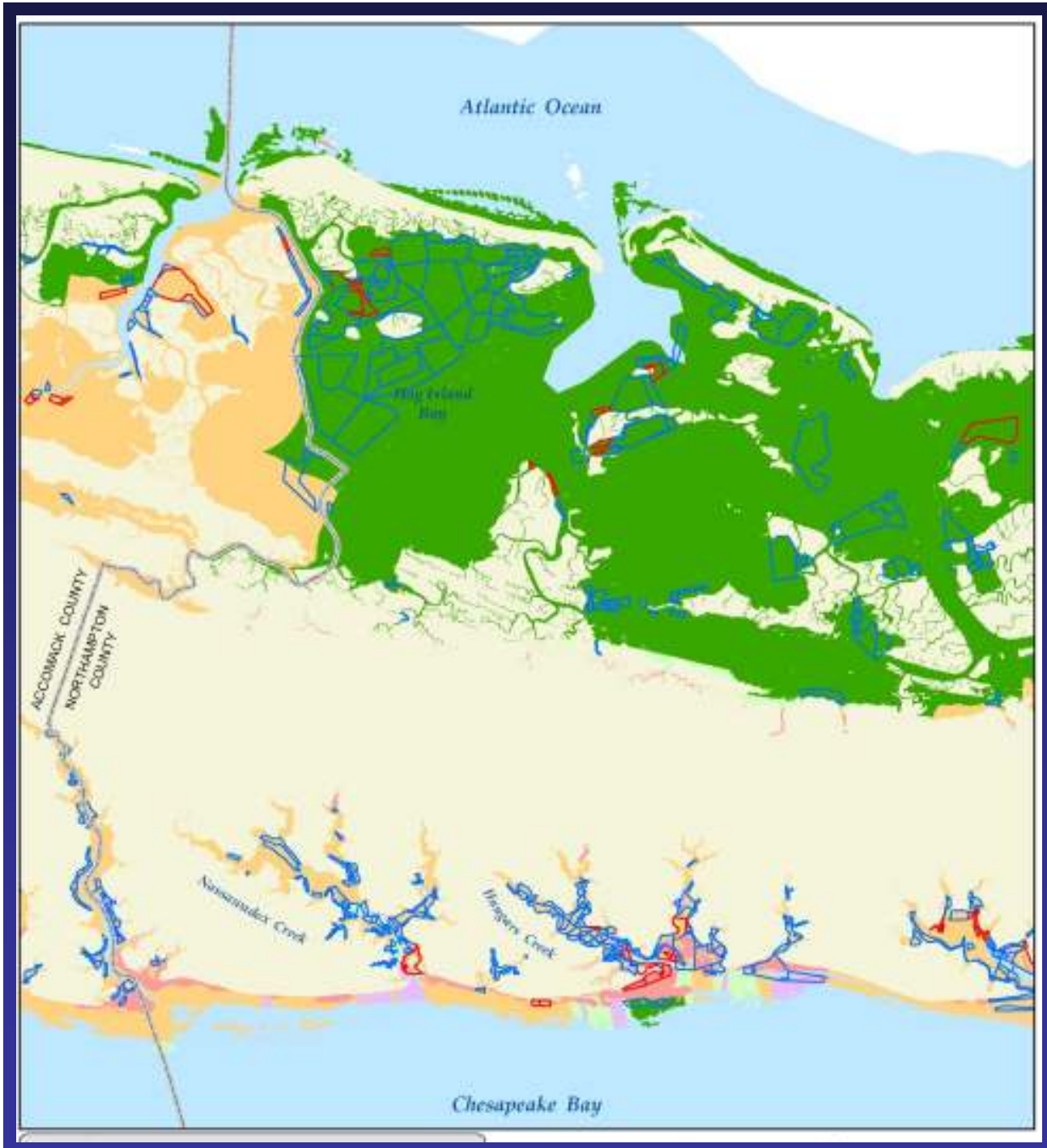
- risk level 0 - no current or impending threats
- risk level 1 - minimal risk
- risk level 2 - existing H2O quality concerns
- risk level 3 - future H2O quality concerns possible
- risk level 4 - ecological use conflicts present

Eastern Shore Hard Clam Aquaculture Vulnerability Model

Plate 5

0 1 2 4 6 8 Kilometers

Center for Coastal Resources Management



MODEL REVIEW

Active Leases

Inactive Leases

From VMRC, 2007

Other related activities

- Incorporate the model into Coastal GEMS
- Incorporate the model into Blue Infrastructure
- Posted model results to the CCRM website
- Model for the lower Rappahannock River Baylor Grounds

Upcoming activities

- Expand the model to Maryland with funding through NOAA Sea Grant
  - Form a small advisory group
  - Assemble the necessary data
  - Revise the existing model as appropriate