



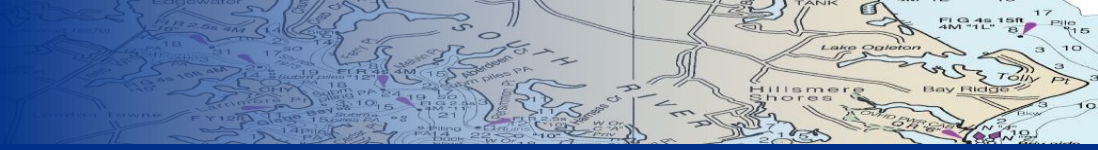
# More than a Mollusk: Using GIS to Effectively Repopulate Oyster Habitats in the South River, MD (A Tributary of the Chesapeake Bay)

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ESRI UC 2017

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It all started with a question:



What are those cages?

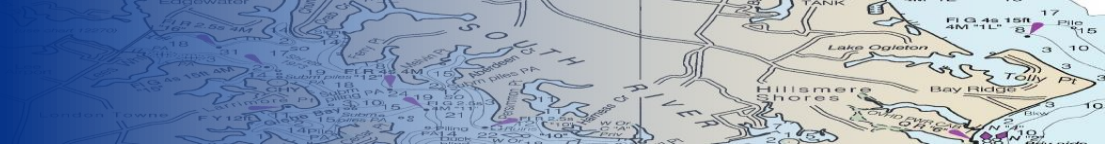


# Discussion Points

- Background/Oyster Impacts
- Oyster Habitats
- Study Area
- Oyster Restoration Workflow Process
  - Phase Workflow
  - Phase Results
- Next Steps
- Acknowledgements and Resources



# Oyster Impacts



## Environmental

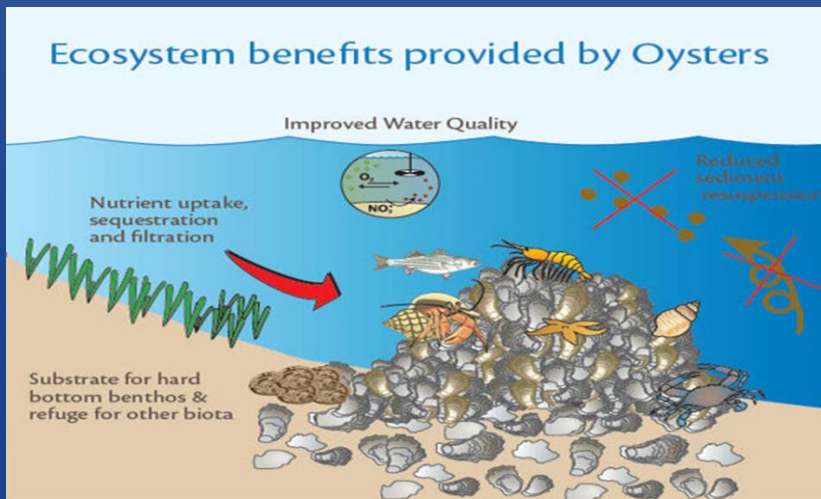


## Economic

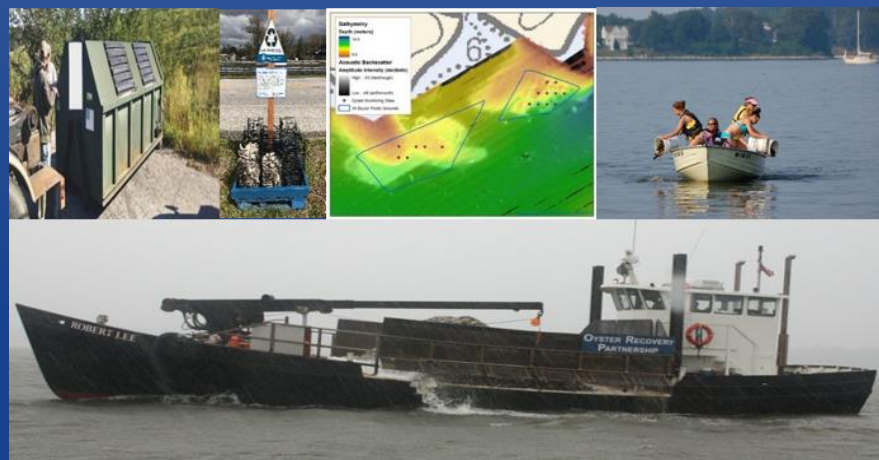


Year	Revenue	Comm Landings
1997	\$4,507,620	1,429,409
1998	\$7,635,153	2,460,954
1999	\$7,111,469	2,439,995
2000	\$7,192,089	2,368,236
2001	\$3,789,301	1,274,210
2002	\$2,172,418	566,990
2003	\$706,256	158,873
2004	\$181,003	42,791
2005	\$3,434,963	737,853
2006	\$1,237,726	273,894
2007	\$3,146,107	317,078
2008	\$2,277,039	249,447
2009	\$3,849,000	497,980
2010	\$4,384,918	431,856
2011	\$3,690,887	356,001
2012	\$5,709,679	618,008
2013	\$7,356,746	787,889
2014	\$15,686,743	1,196,279
<b>Total</b>	<b>\$84,069,117</b>	<b>16,207,743</b>
<b>Avg/Year</b>	<b>\$4,670,506</b>	<b>\$4.6 million</b>
<b>Avg/Year</b>	<b>16,207,743</b>	<b>900,000 lbs</b>

## Vitality Factors

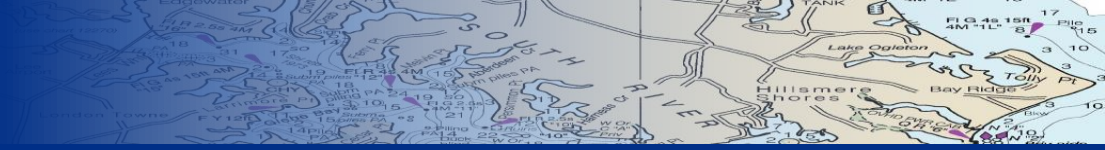


## Restoration Efforts

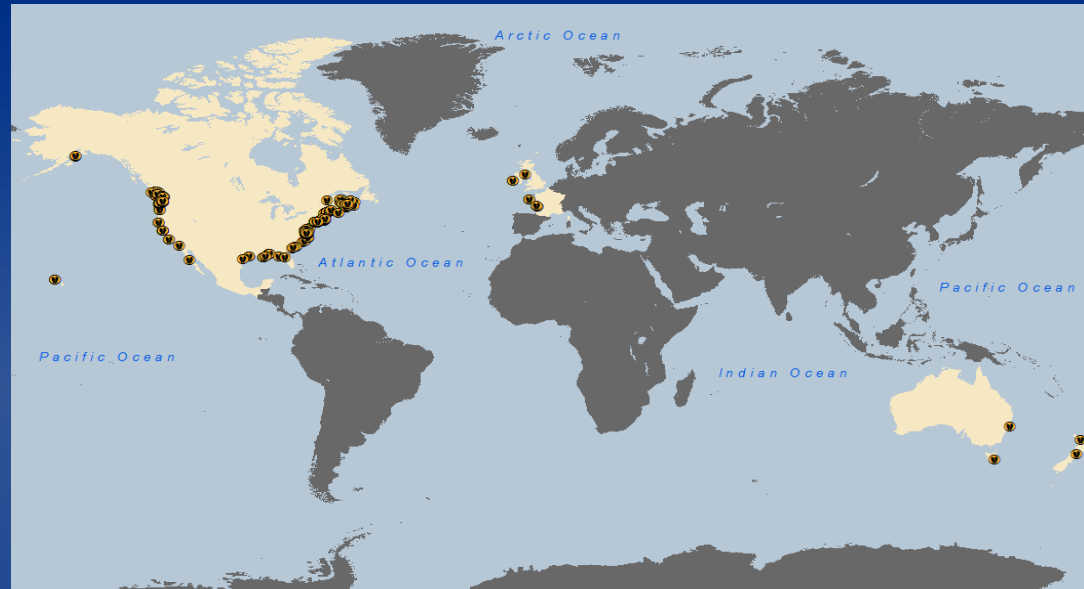




# Oyster Habitats

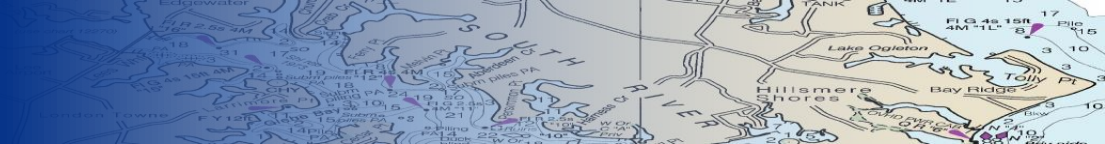


- Over 150 Varieties of Oysters Worldwide
- Majority of Oysters from Nova Scotia to Gulf of Mexico
- Locations within the Maryland Area of the Chesapeake Bay and Tributaries
- Focus on South River, MD

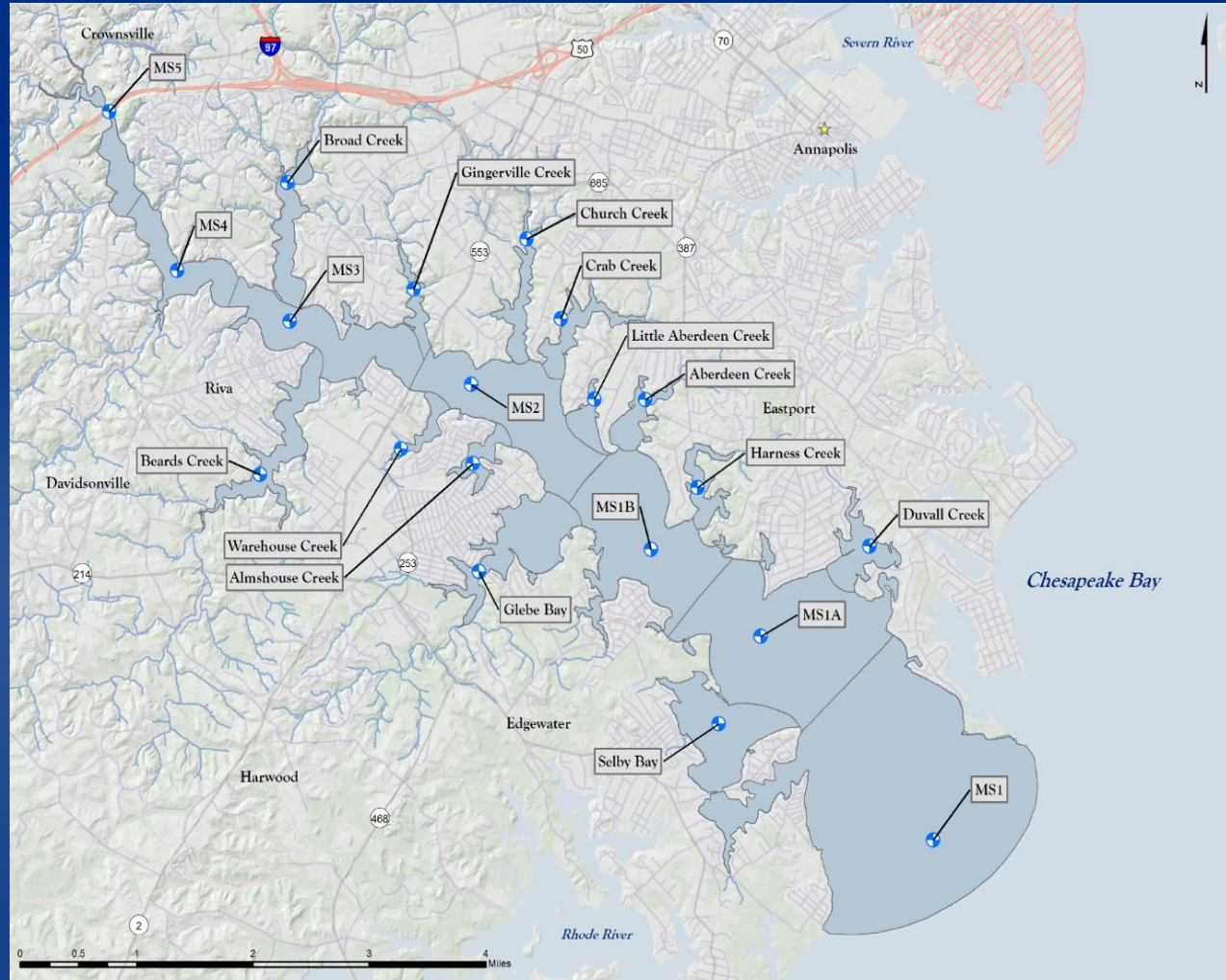




# Study Area

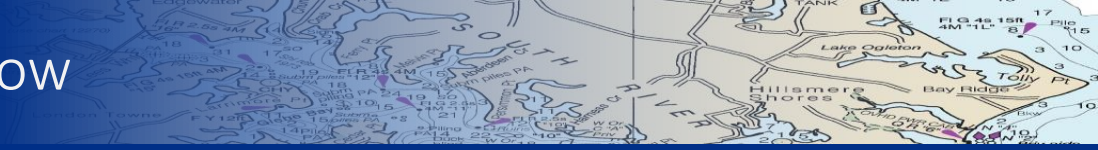


- South River, Maryland
  - 86 miles of Shoreline
  - 10 miles Marsh to Bay
  - ~ 10 Square Miles of water surface
- South River Federation (SRF) Focus
  - Stream and Wetlands
  - Living Shorelines
  - Rain Gardens
  - Oyster Restoration





# Oyster Restoration Workflow



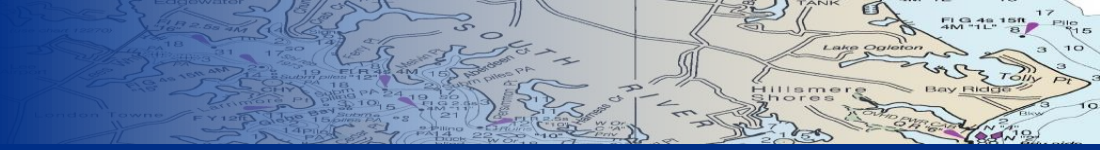
PHASE I: Identification of Suitable Oyster Husbandry Candidates along the South River

PHASE II: Identification of Suitable Oyster Reef Siting Candidates within the South River

PHASE III: Monitoring efforts of existing reef sites and those created from Phase II efforts.



# Methodology



- Research & Collaboration
- Data Collection
- Data Preparation
- Phased Production and Analysis Efforts
- Deliverables





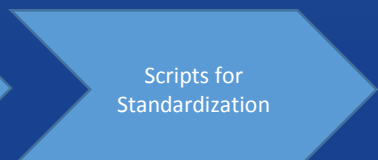
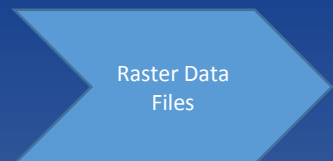
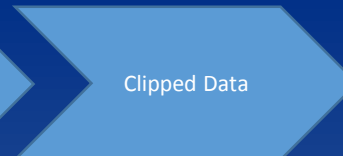
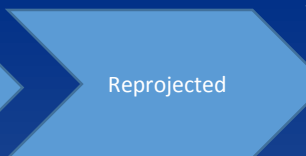
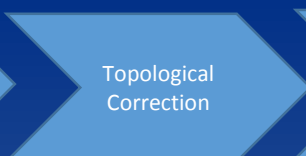
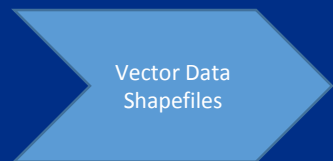
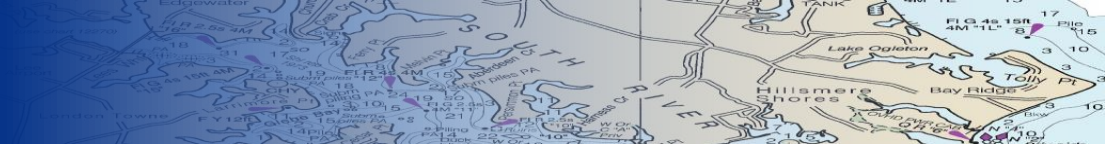
# Research and Collaboration

- Telephone and Email Interviews
- Meetings with the SRF mission managers
- Search for available data sources
- Review similar previous project findings



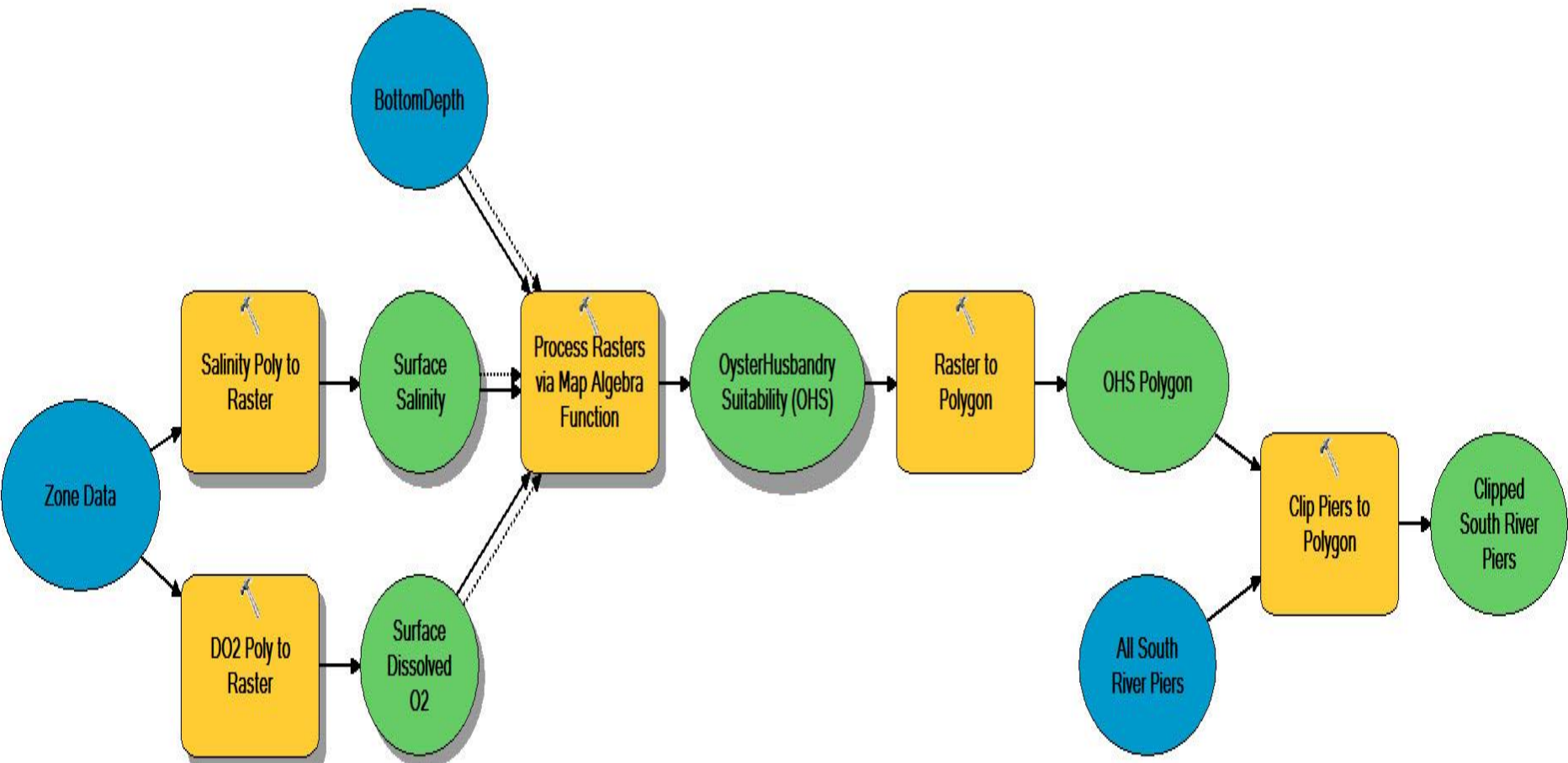
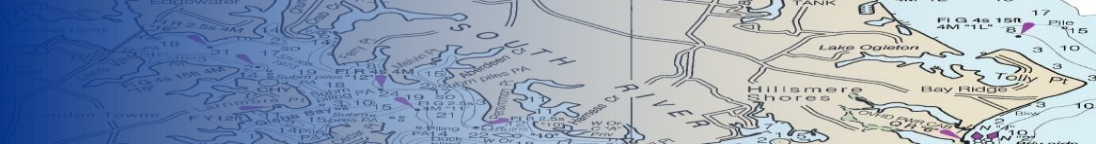


# Data Preparation



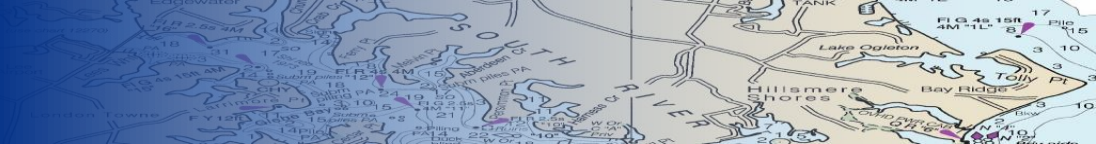


# Phase I



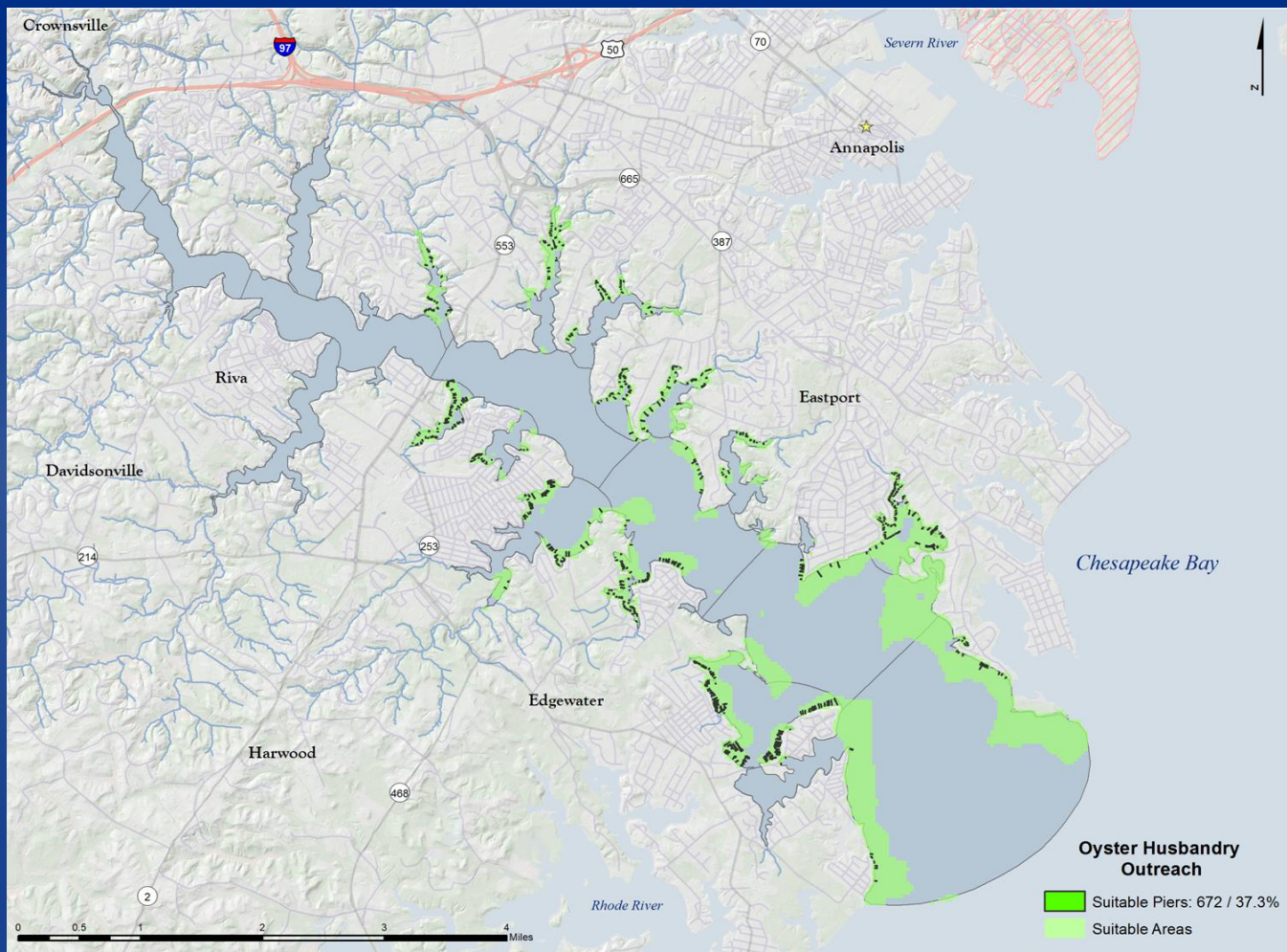


# Phase I



## Process Step Through

- Water Zone Zones
- Dissolved O2
- Salinity
- Bathymetric Layer
- Map Algebra
- Raster to Polygon
- Add South River Piers
- Clip Piers to Vector for Oyster Husbandry Suitable Candidates

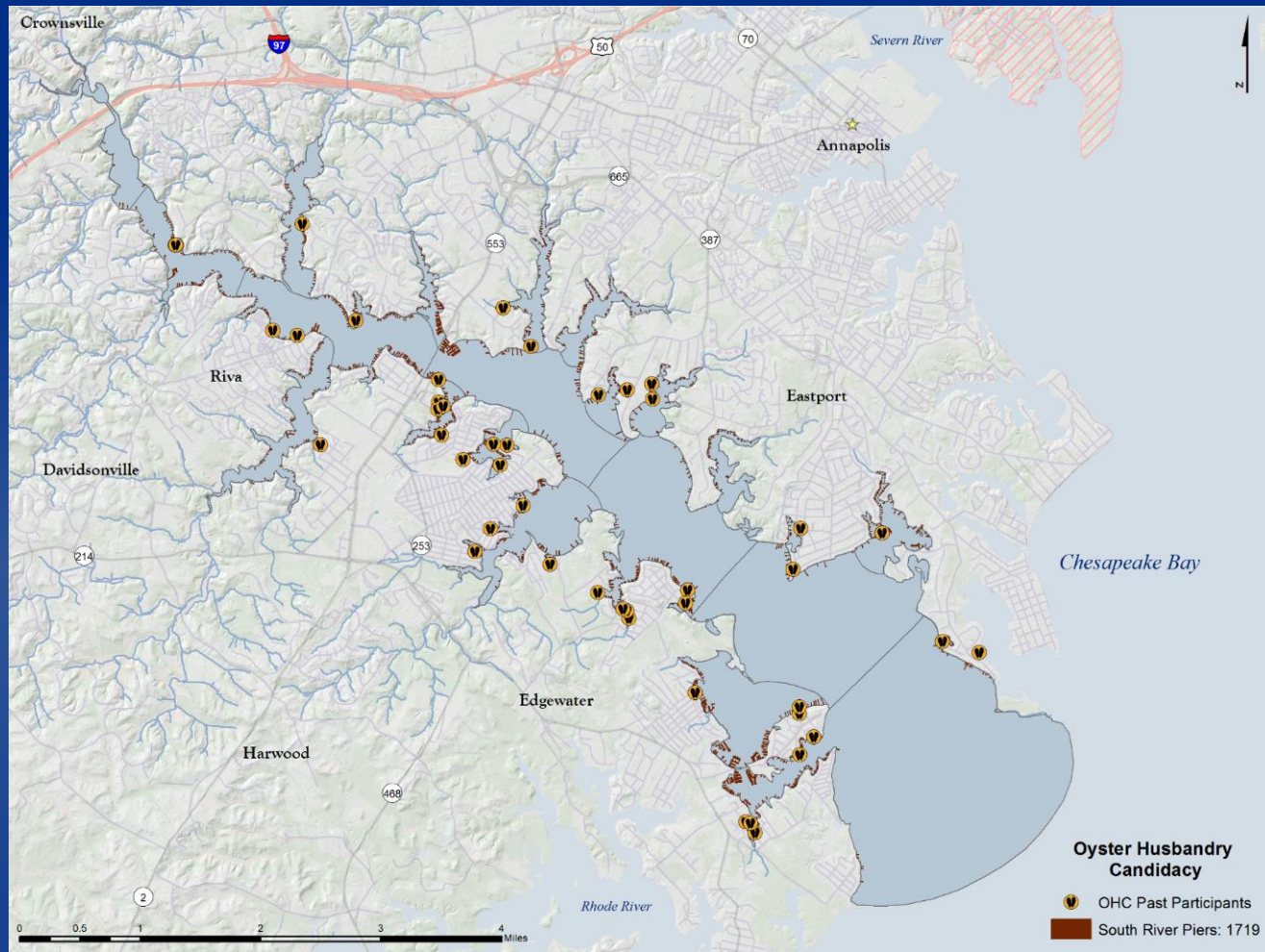




# Phase I Results

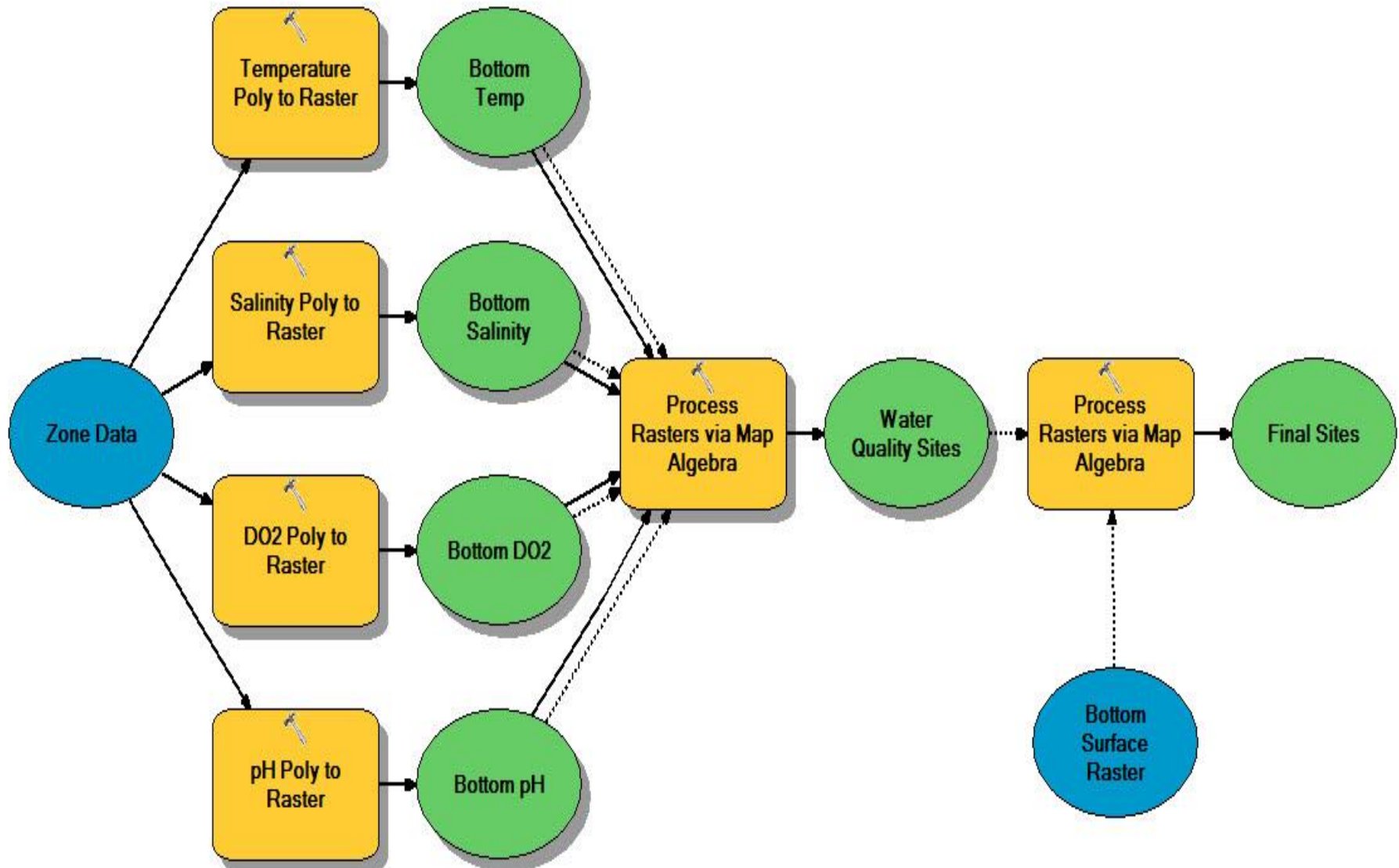
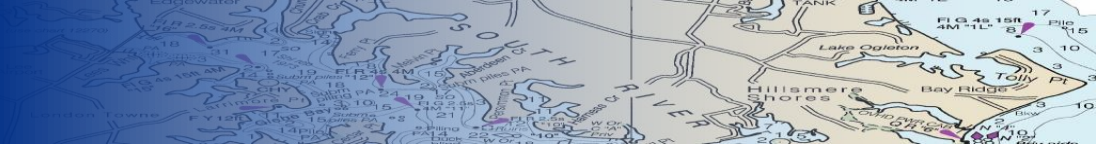


- Past participation shows efforts spread out along entirety of the river regardless of the quality of water in each area
- Match address points to pier data to provide focused outreach to those property owners with piers that match suitable water quality areas based on the data.
- This focused effort assures that areas which can provide the greatest oyster growth has the opportunity to yield more oysters for reef building in Phase II.



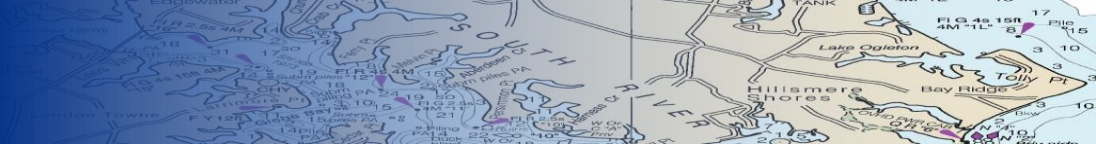


# Phase II



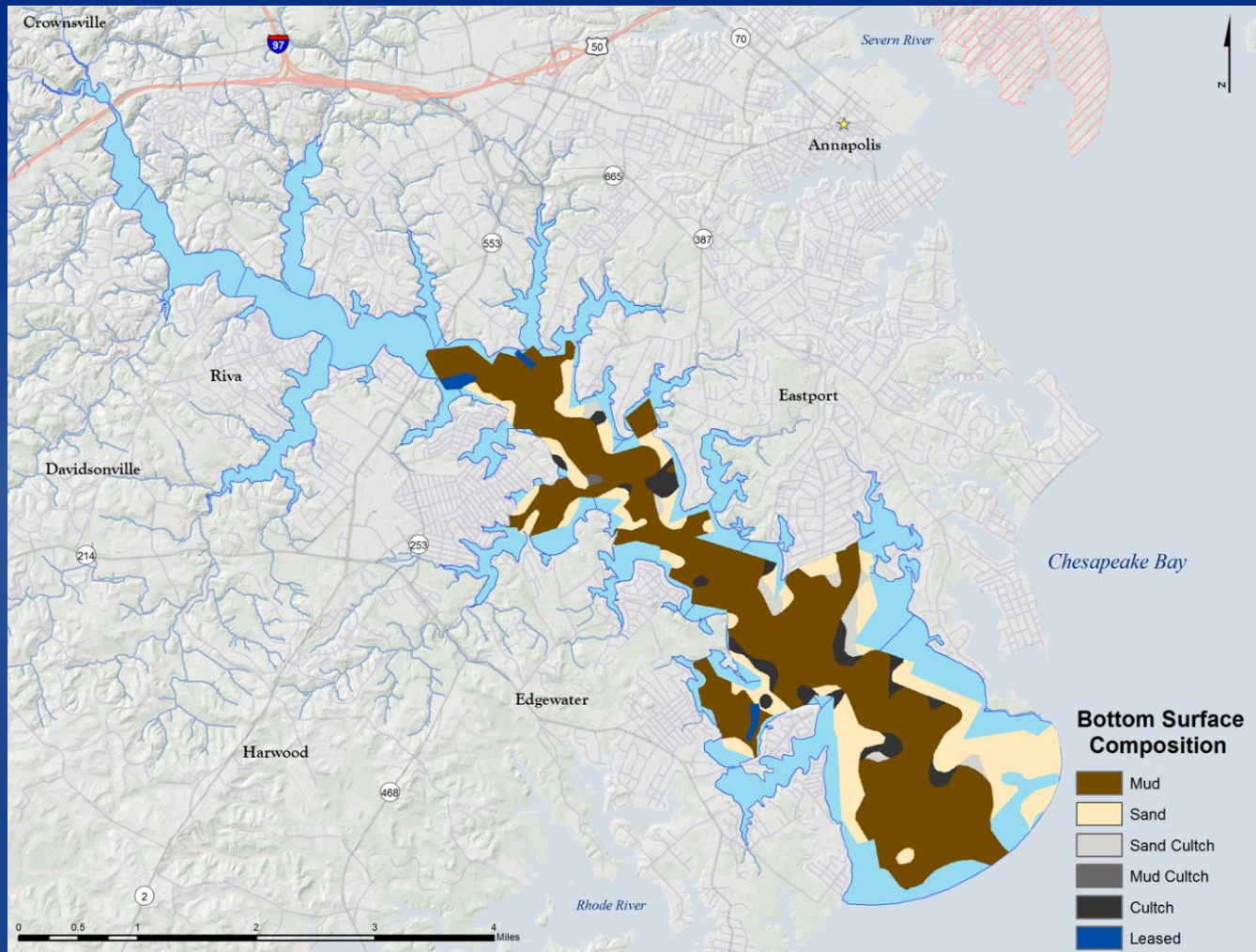


# Phase II



## Process Step Through

- Water Zones
- Temperature
- Salinity
- Dissolved Oxygen
- pH
- Map Algebra 1
- Water Quality Sites
- Bottom Surface Composition
- Map Algebra 2

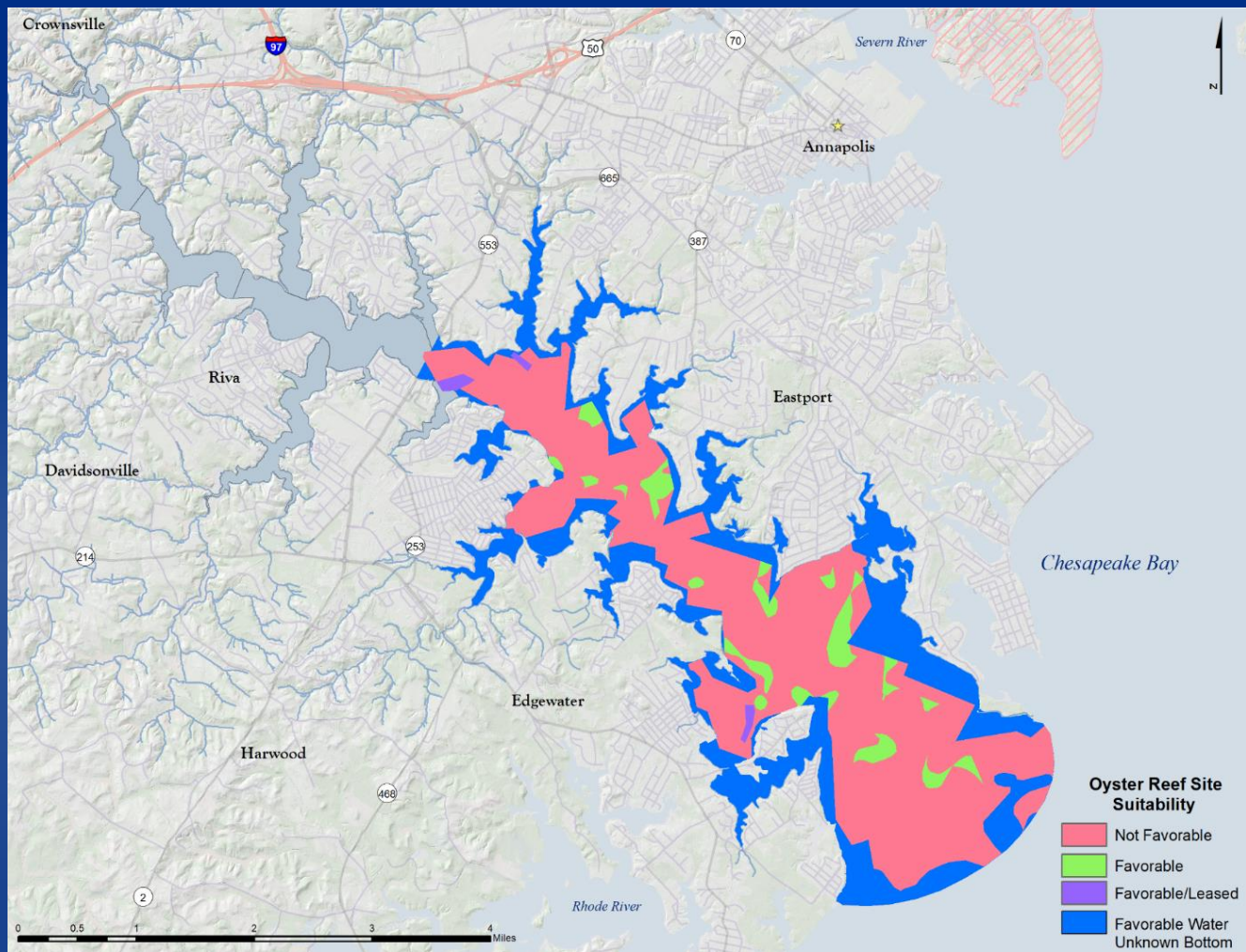






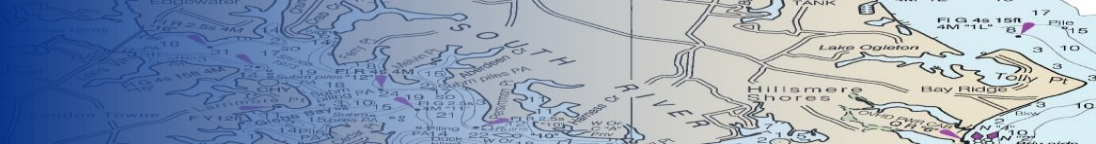
# Phase II Results

- The workflow provides a means for testing combined layer suitability
- Model allows for easy reprocessing of data if criteria changes or different criteria is desired
- Can produce additional questions of oyster reef siting or possibly reveal other factors that cause possible favorable areas to be unfavorable





# Phase III



## Traditional Monitoring Techniques



Sechi Water Clarity Monitoring



Water Collection

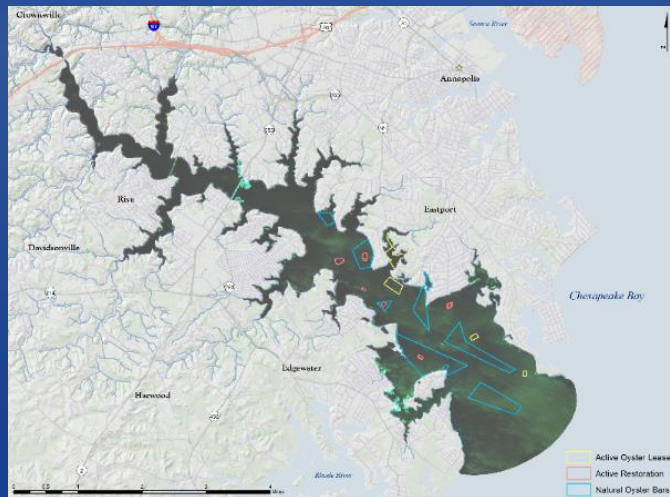


Oyster Health Monitoring

## Drone/Aerial/Satellite Monitoring



Standard Deviation of Oyster Reef

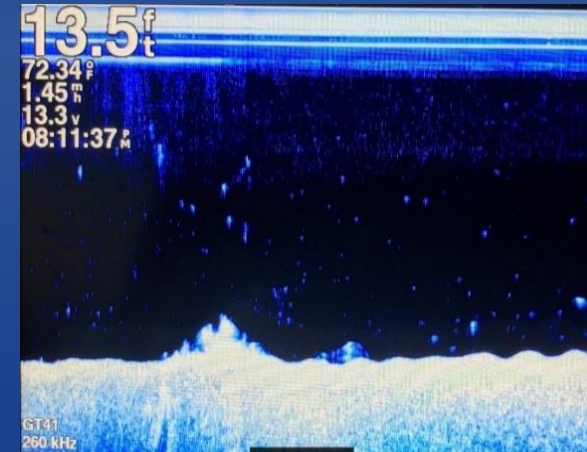


Oyster Monitoring Through Landsat 8

## Sonar Monitoring



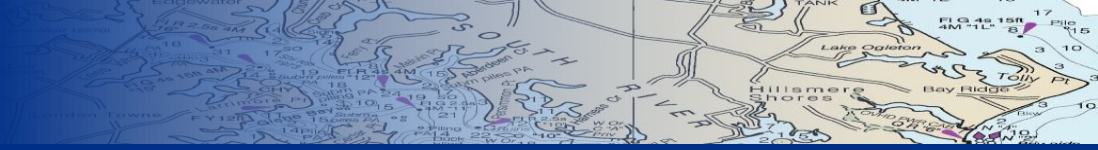
Glebe Bay



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# Next Steps



## South River Federation Deliverables

- Finalized process chart and full documentation of methodology
- Development of an Oyster Siting Tool Toolbox
- All processed files (Raster, SHP, etc.) in GDB and Shapefile formats
- Soft and hard copies of all requested maps
- Incorporation of data collection through use of Arc Collector with Portal
- Future briefs of this workflow to interested members in the scientific community requested on behalf of the South River Federation

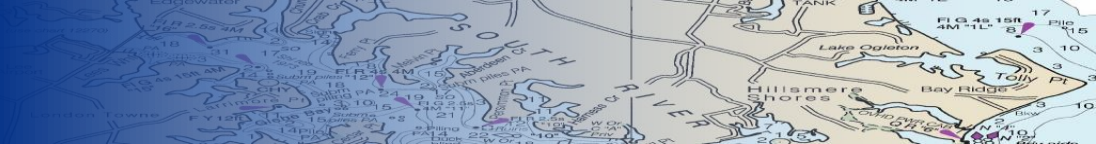


# Acknowledgements

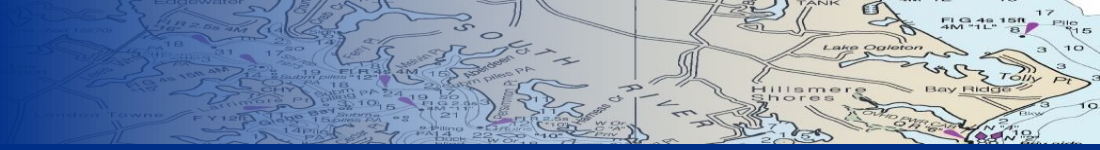
- PSU Advisors Fritz Kessler and Justine Blanford
- Chesapeake Bay Foundation Jackie Shannon
- South River Federations Kirk Mantay, Jesse Illiff, Nancy Merrill, Sarah Giordano



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# QUESTIONS?

