



Presentation to the NOCCG, July 25, 2023

Estimating the Benefits of Ocean Color Data in Mitigating HAB Events

Research Team

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- Many thanks to Marilyn Yuen Murphy and Samir Chettri for their support on this project
- Funding for this work was provided by NESDIS/STAR Product Development, Readiness, and Application Program

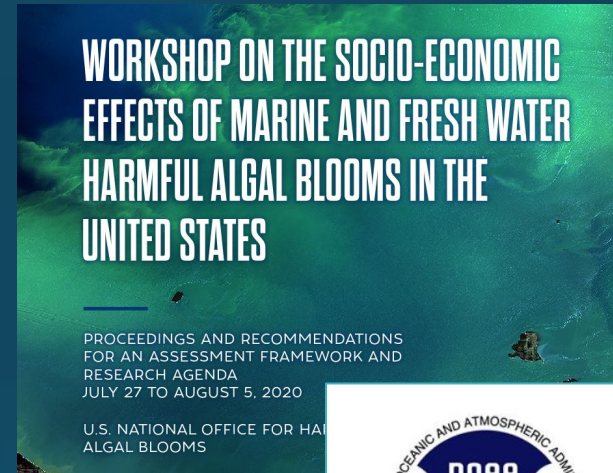
Overview

- Intro and Context
- Approach
 - Estimating the Impact of Harmful Algal Blooms (HABs)
 - Assessing how Ocean Color (OC) can mitigate HAB impacts
- Findings
- Discussion

*Technical report will available soon through the NOAA Repository

TASK: Assess the benefits of ocean color data

- Identify key social and economic benefits
- Build on work that has already been done
- Develop new tools and techniques for valuing satellite observations/information
- 6-month timeframe



U. S. Department of Commerce

National Oceanic and Atmospheric Administration (NOAA)

The Value of Geostationary Ocean Color

NOAA Technical Report



GeoXO Benefit Analysis



Jeffery Adkins, Integrated Systems Solutions, Inc.
Contractor for the NOAA Chief Economist

<https://repository.library.noaa.gov/view/noaa/47719>

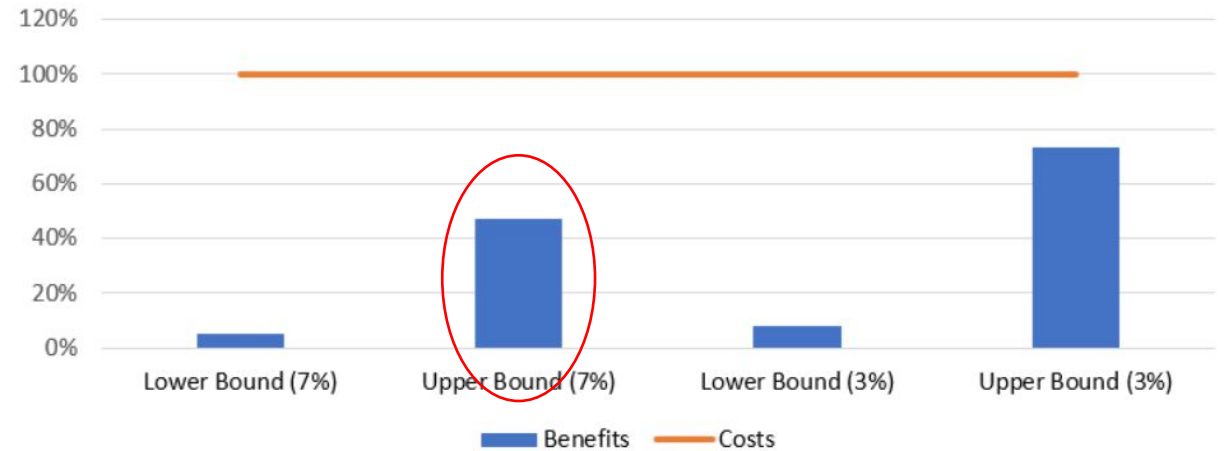
<https://repository.library.noaa.gov/view/noaa/33278>

https://hab.who.edu/wp-content/uploads/2021/04/HAB-Socioeconomics-Workshop-Proceedings_14.pdf

Approach

- Start by considering the full universe of ocean color benefits
- Identify best value chain for a deeper dive
- Develop a framework that can provide initial estimates AND be used to refine estimates in the future

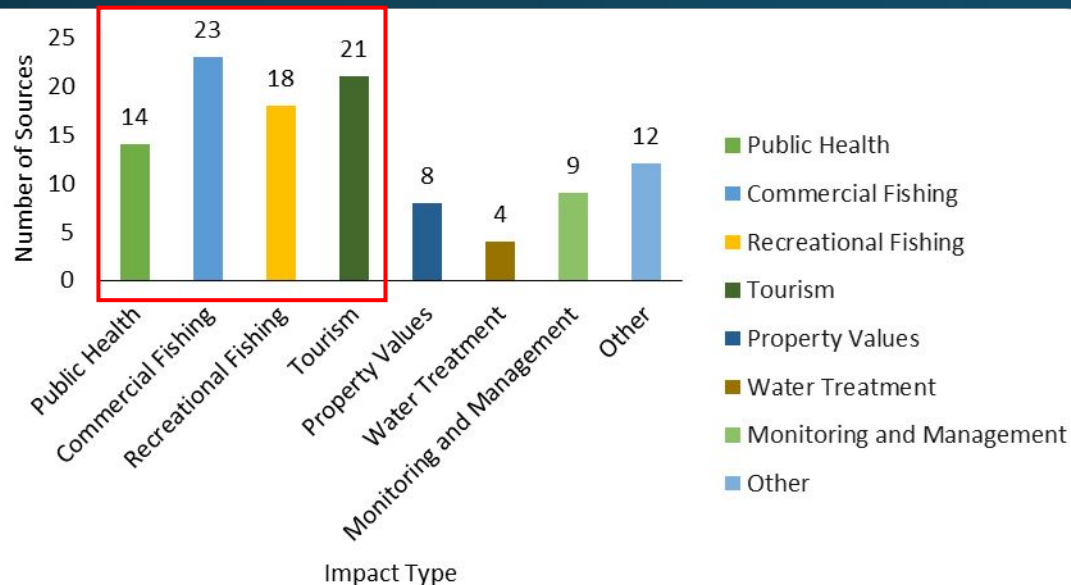
Ocean Color: Benefit / Cost Comparison
Partial Benefits/Full Costs



Ocean Color	Annual Value, Millions of 2019 \$		Present Value, 2033 to 2052, Millions of 2019 \$			
			7 Percent Discount Rate		3 Percent Discount Rate	
	Low	High	Low	High	Low	High
Quantified Benefits (8 of 22 value chains)	\$5.19	\$49.56	\$23.10	\$219.80	\$53.30	\$506.50
Total Costs			\$465.40	\$465.40	\$689.70	\$689.70
Benefits / Costs			5%	47%	8%	73%

Approach

- Estimating the economic impact of HABs
 - Benefits transfer meta analysis – applying economic damage estimates to known HAB events across the US



- How can Ocean Color mitigate HAB impacts?
 - Intended extensive outreach to HAB users to understand how OC information reduces the impacts of HAB events
 - Short-time frame impeded outreach efforts
 - Used assumption of 5% reduction from Geo/XO study
- Geospatial Analysis
 - Analyze HAB impacts on a spatial scale
 - Overlay with CDC's Social Vulnerability Index

Findings: Regression Analysis

Table 3. Final Combined Model Estimates for HAB damages.

Impacts baseline	West			East			Gulf of Mexico			Great Lakes		
	B	p-value		B	p-value		B	p-value		B	p-value	
β_0	45.57	0.39		37.68	0.68		37.45	0.69		11.83	0.09	*
Commercial Fishing	16.81	0.56		1.68	0.28		14.94	0.27		16.95	0.84	
Recreational Fishing	-40.12	0.45		-75.51	0.00	***	34.19	0.00	***	10.10	0.53	
Tourism	4.02	0.86		-20.97	0.09	*	18.59	0.17		9.05	0.64	
Year	-0.02	0.46		-0.02	0.46		-0.02	0.46		0.46	0.46	
ln(Population)	3.47	0.67		0.87	0.78		-3.50	0.24		1.57	0.26	
ln(County GDP)	-2.36	0.73		-0.03	0.94		2.20	0.45		1.05	0.33	
ln(Com Fishing Income)	-1.50	0.30		0.08	0.55		0.46	0.00	***	-3.63	0.03	**
ln(Rec Fishing Income)	-1.20	0.00	***	-1.61	0.00	***	-1.20	0.00	***	-1.20	0.00	***
ln(Tourism Income)	-0.32	0.84		-0.40	0.98		1.41	0.00	***	-0.32	0.84	
N	21			43			37			22		
Adjusted R ²	0.72											

*, **, *** indicate statistical significance at the 10%, 5%, and 1% level, respectively, significant values are in **Bold**.

Health Impacts
as a baseline

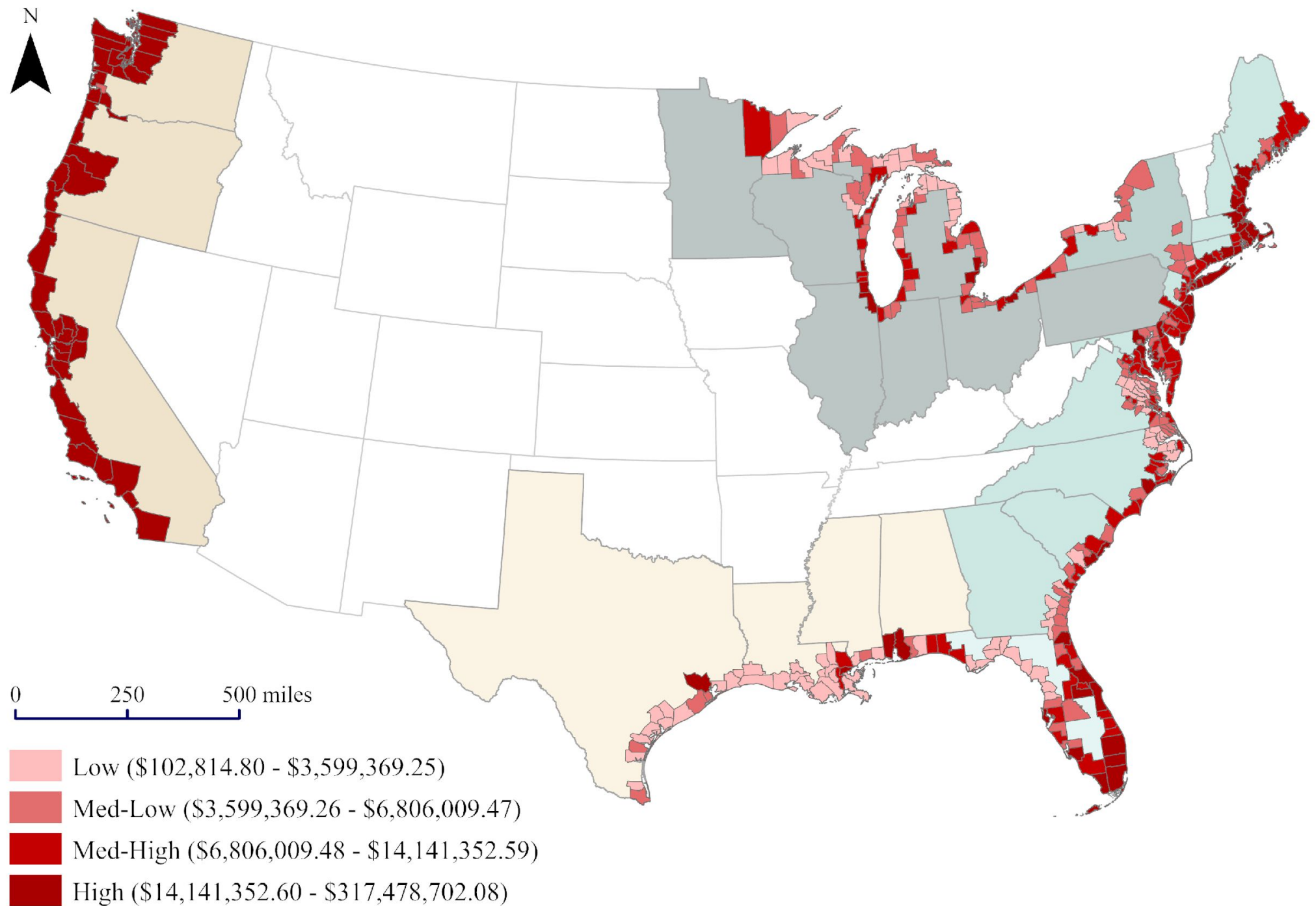
Findings: National Damage Estimates

Table 5. Total Expected Annual Damages (\$Thousands)

	Commercial Fishing	Recreational Fishing	Tourism	Public Health	Total
North Atlantic	29,660	0	47,057	12	76,729
Southeast & Caribbean	22,558	0	36,780	10	59,348
Gulf of Mexico	5,741	13,238	2,748	211	21,938
West	259,075	120	822,815	302	1,082,311
Great Lakes	3,071	16,256	42,255	471	62,053
Total	320,104	29,613	951,655	1,005	1,302,378

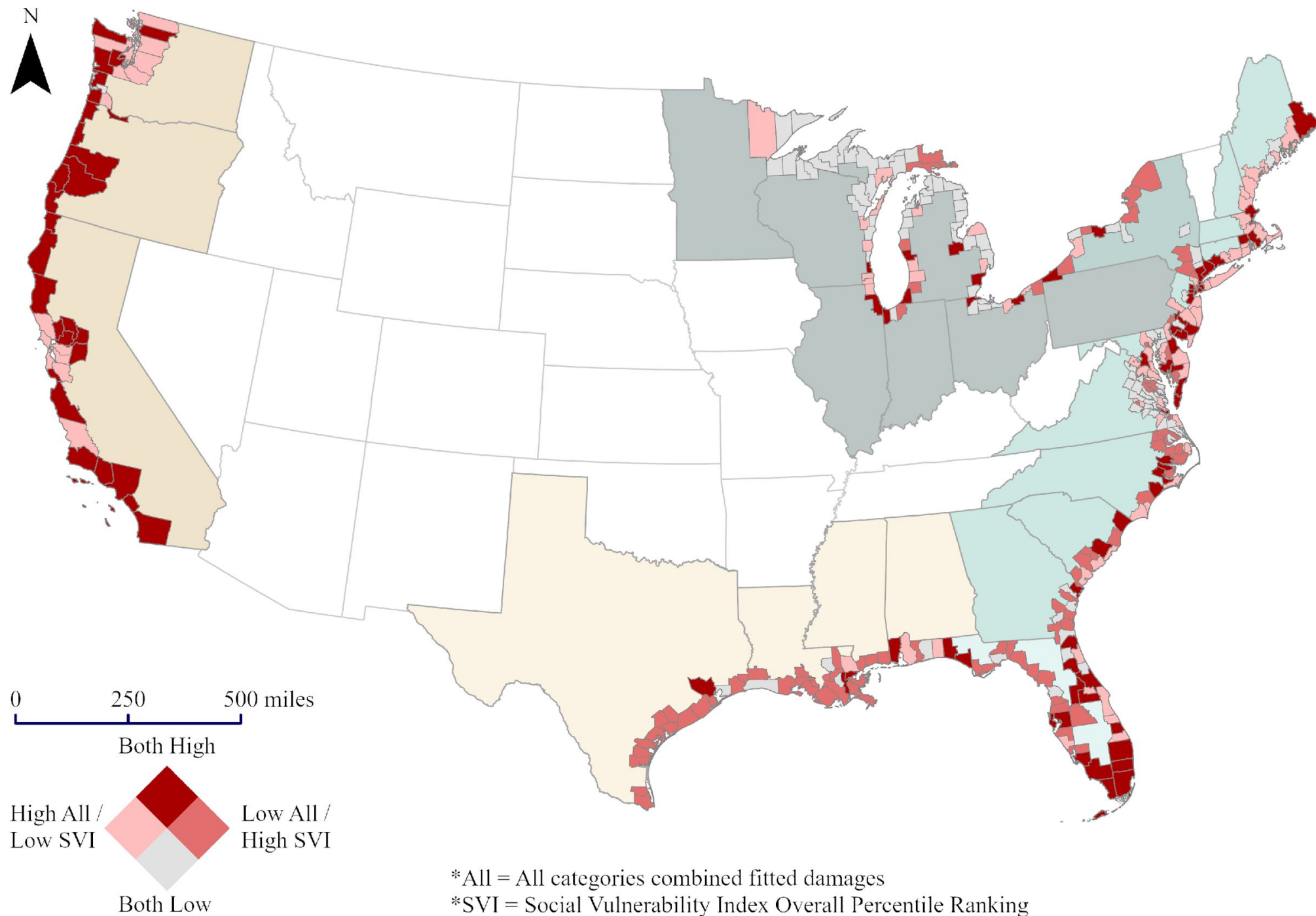
Findings:

Estimated
expected
annual
damages due
to HAB
events by
county.



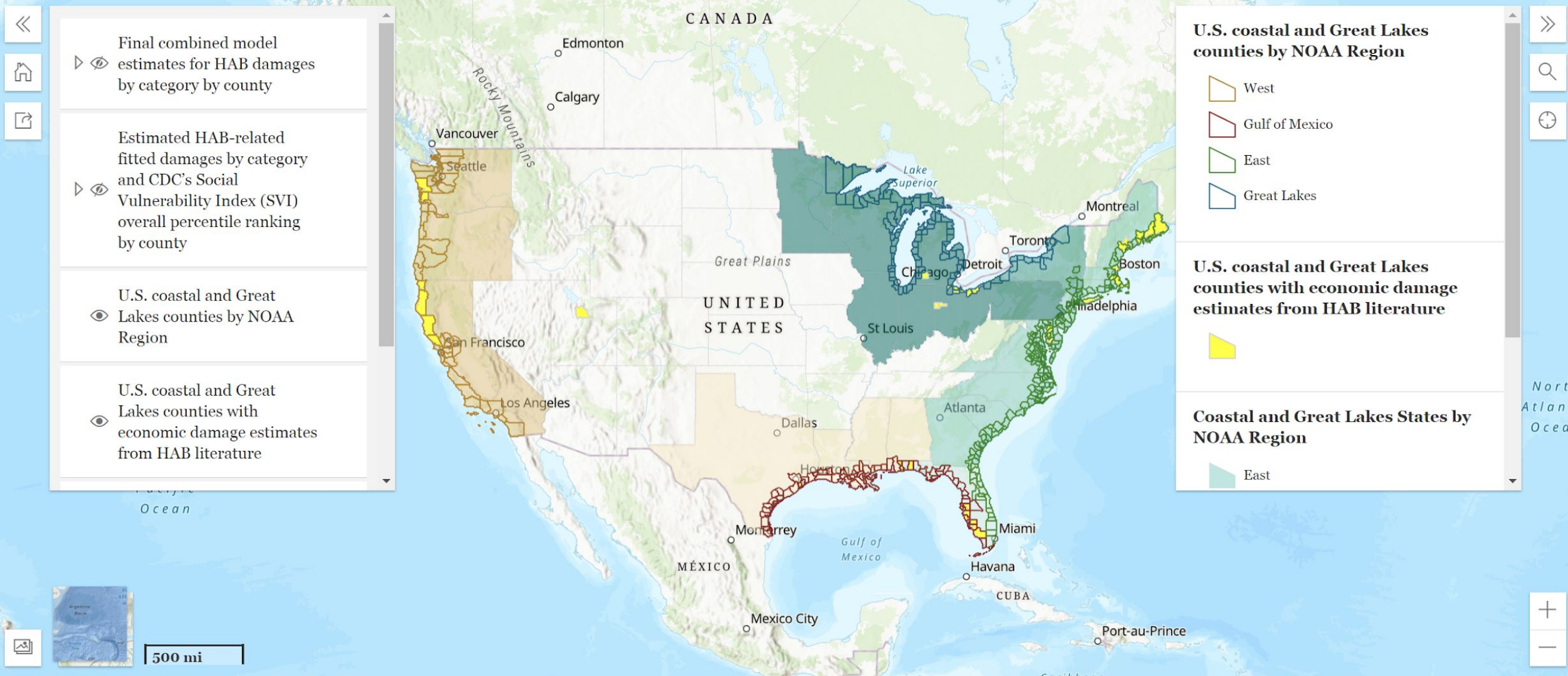
Findings:

Estimated
expected
annual
damages due
to HAB events
combined
with the
CDC's Social
Vulnerability
Index





Estimates of the Benefits of Ocean Color Data in Mitigating HAB Events

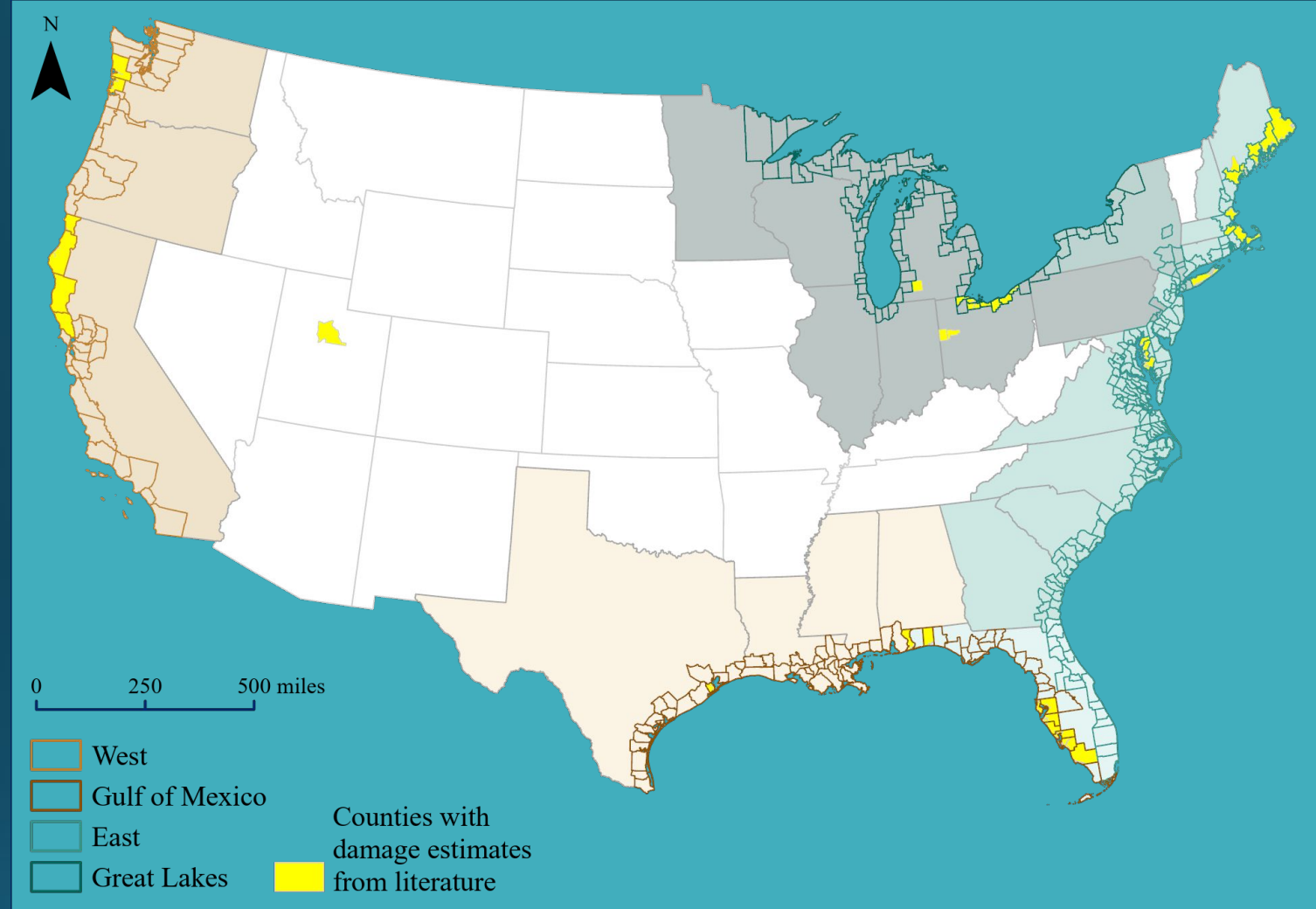


Discussion

- Total expected annual HAB damages across the CONUS is \$1.3 billion
- Total Expected annual benefit from ocean color products is \$65.1 million
- This analysis is just a first step – delivers a framework to drive future work

Discussion

- HAB studies are focused in few areas across the US
- HAB studies focus on larger, less frequent events
- Limited understanding of how ocean color products are *used* to mitigate HAB events



A satellite image of North America and the surrounding oceans. The United States and Canada are visible in the upper half, with the Great Lakes and the Gulf of Mexico clearly shown. The Pacific Ocean is in the lower half, with the Hawaiian Islands visible. A dark blue rectangular box is overlaid on the image, containing the text "Thank you! Questions?".

Thank you! Questions?

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