

An underwater photograph showing a dense field of seagrass. The seagrass blades are long, narrow, and green, with some brownish tips. The water is clear and blue-green. The text is overlaid on the top half of the image.

**THE EXTENT AND STATUS OF SUBMERGED AQUATIC  
VEGETATION IN NORTH CAROLINA**

**JUD KENWORTHY**

**&**

**APNEP SAV MONITORING AND ASSESSMENT TEAM**

# MAXIMUM EXTENT OF SAV IN NC



# "DIAMOND IN THE ROUGH"

1 December 2006

[Translator Disclaimer](#)

## A Global Crisis for Seagrass Ecosystems

*ROBERT J. ORTH, TIM J. B. CARRUTHERS, WILLIAM C. DENNISON, CARLOS M. DUARTE, JAMES W. FOURQUREAN, KENNETH L. HECK Jr., A. RANDALL HUGHES, GARY A. KENDRICK, W. JUDSON KENWORTHY, SUZANNE OLYARNIK, FREDERICK T. SHORT, MICHELLE WAYCOTT, SUSAN L. WILLIAMS*

[Author Affiliations +](#)

BioScience, 56(12):987-996 (2006). [https://doi.org/10.1641/0006-3568\(2006\)56\[987:AGCFSE\]2.0.CO;2](https://doi.org/10.1641/0006-3568(2006)56[987:AGCFSE]2.0.CO;2)

RESEARCH ARTICLE



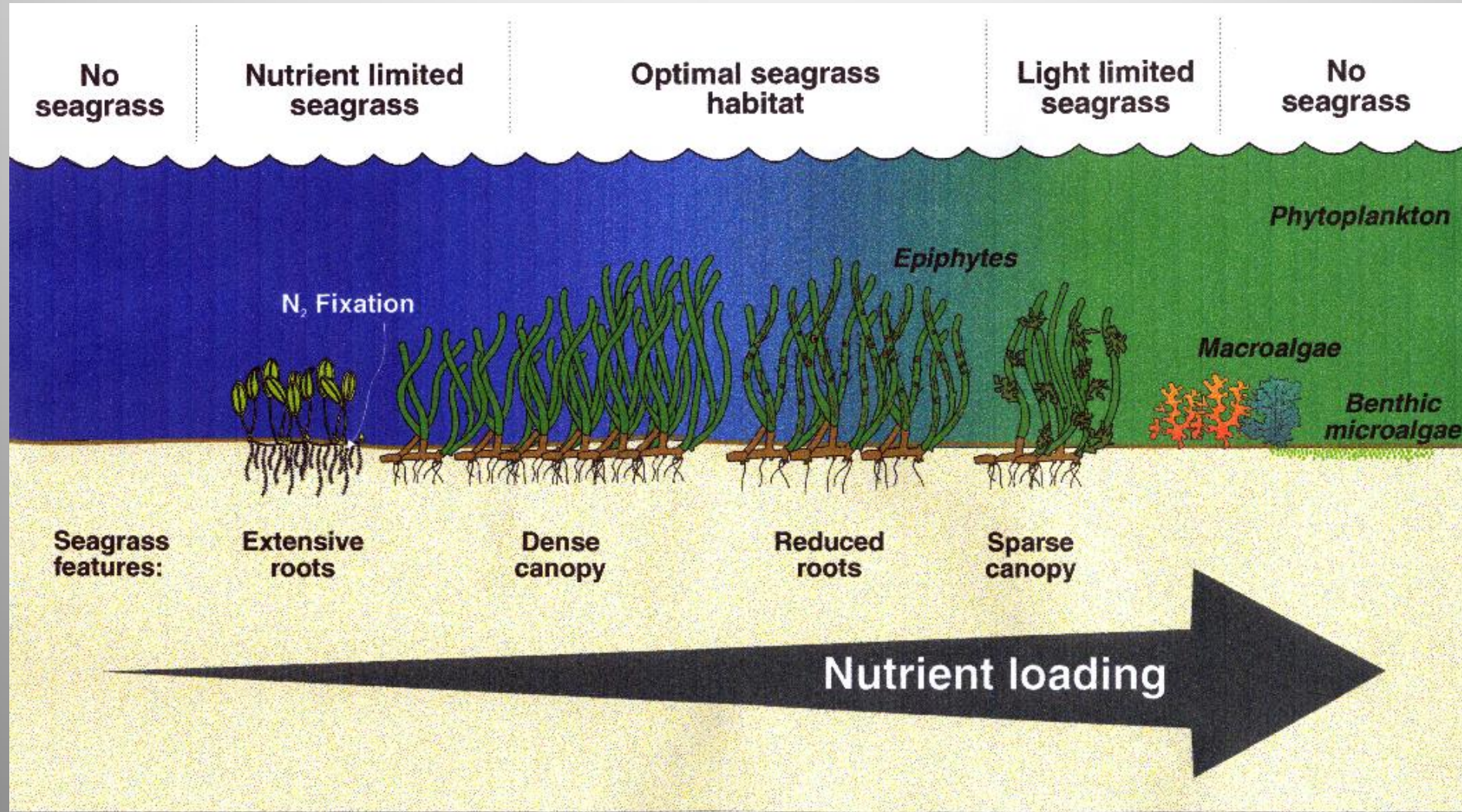
## Accelerating loss of seagrasses across the globe threatens coastal ecosystems

Michelle Waycott, Carlos M. Duarte, Tim J. B. Carruthers, Robert J. Orth, William C. Dennison, Suzanne Olyarnik, Ainsley Calladine, James W. Fourqurean, Kenneth L. Heck Jr., A. Randall Hughes, Gary A. Kendrick, W. Judson Kenworthy, Frederick T. Short, and Susan L. Williams

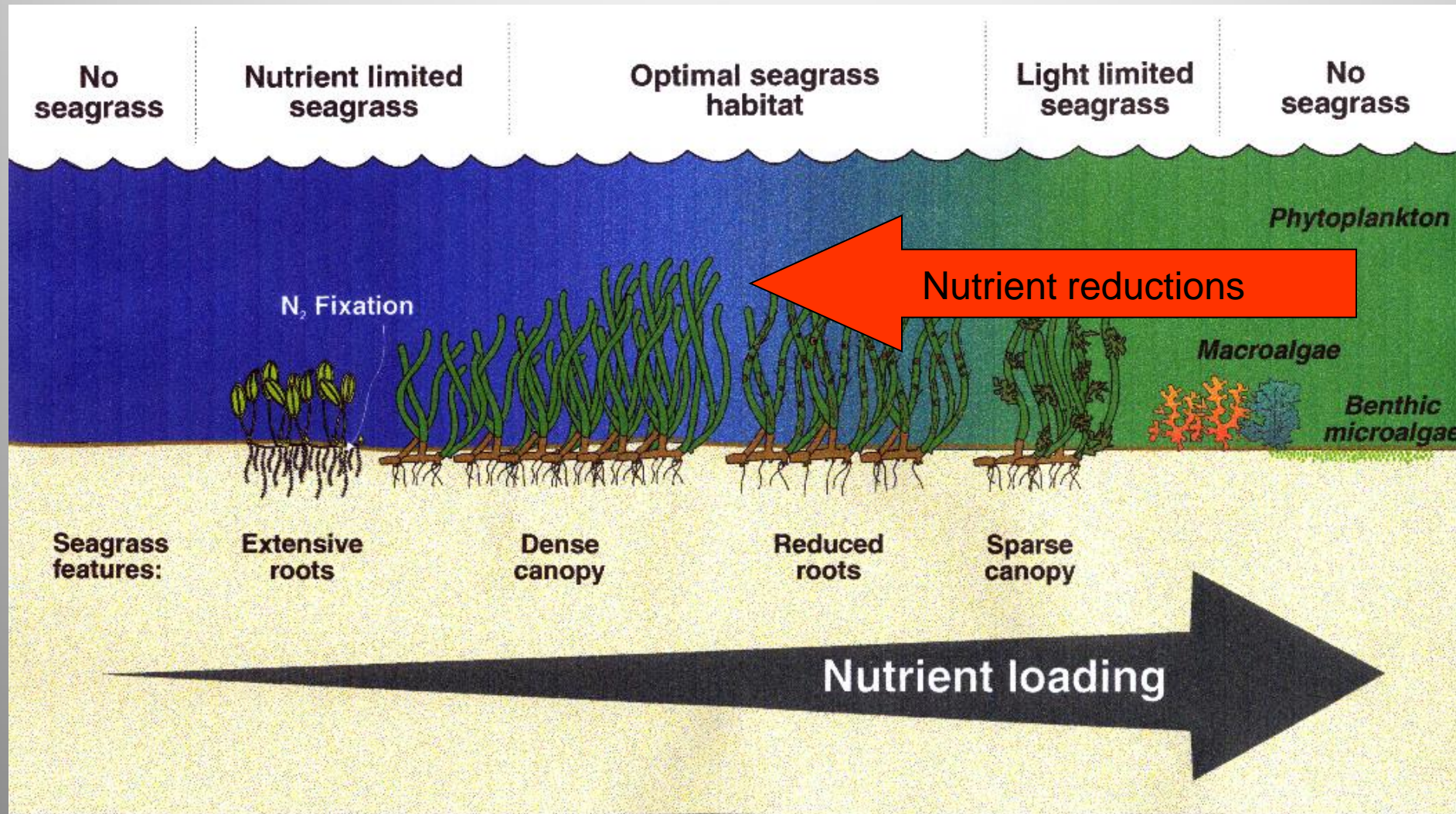
PNAS July 28, 2009 106 (30) 12377-12381; <https://doi.org/10.1073/pnas.0905620106>

# IMPAIRED WATER QUALITY

Nutrient and sediment loading = major cause of SAV declines



# Nutrient and sediment reductions can lead to SAV recoveries



# SAV RESTORATION

## SAV RESTORATION IS EXPENSIVE

**Journal of Applied Ecology**



*Journal of Applied Ecology* 2015

doi: 10.1111/1365-2664.12562

### **Global analysis of seagrass restoration: the importance of large-scale planting**

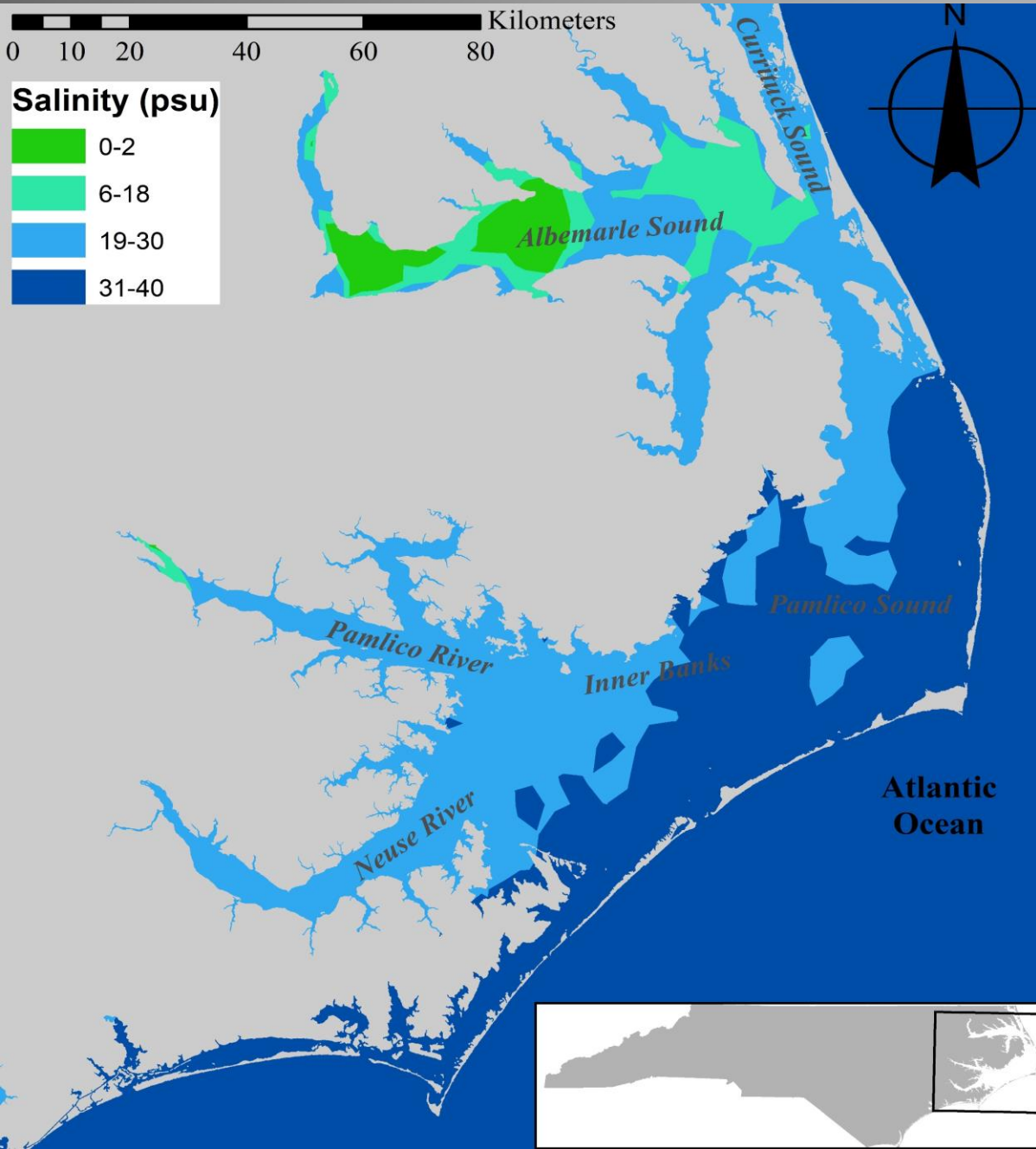
Marieke M. van Katwijk<sup>1\*</sup>, Anitra Thorhaug<sup>2</sup>, Núria Marbà<sup>3</sup>, Robert J. Orth<sup>4</sup>, Carlos M. Duarte<sup>3,5,6</sup>, Gary A. Kendrick<sup>5</sup>, Inge H. J. Althuizen<sup>1</sup>, Elena Balestri<sup>7</sup>, Guillaume Bernard<sup>8</sup>, Marion L. Cambridge<sup>5</sup>, Alexandra Cunha<sup>9</sup>, Cynthia Durance<sup>10</sup>, Wim Giesen<sup>1,11</sup>, Qiuying Han<sup>12</sup>, Shinya Hosokawa<sup>13</sup>, Wawan Kiswara<sup>14</sup>, Teruhisa Komatsu<sup>15</sup>, Claudio Lardicci<sup>7</sup>, Kun-Seop Lee<sup>16</sup>, Alexandre Meinesz<sup>17</sup>, Masahiro Nakaoka<sup>18</sup>, Katherine R. O'Brien<sup>19</sup>, Erik I. Paling<sup>20</sup>, Chris Pickerell<sup>21</sup>, Aryan M. A. Ransijn<sup>1</sup> and Jennifer J. Verduin<sup>22</sup>

PROBABILITY OF SUCCESS = 36%

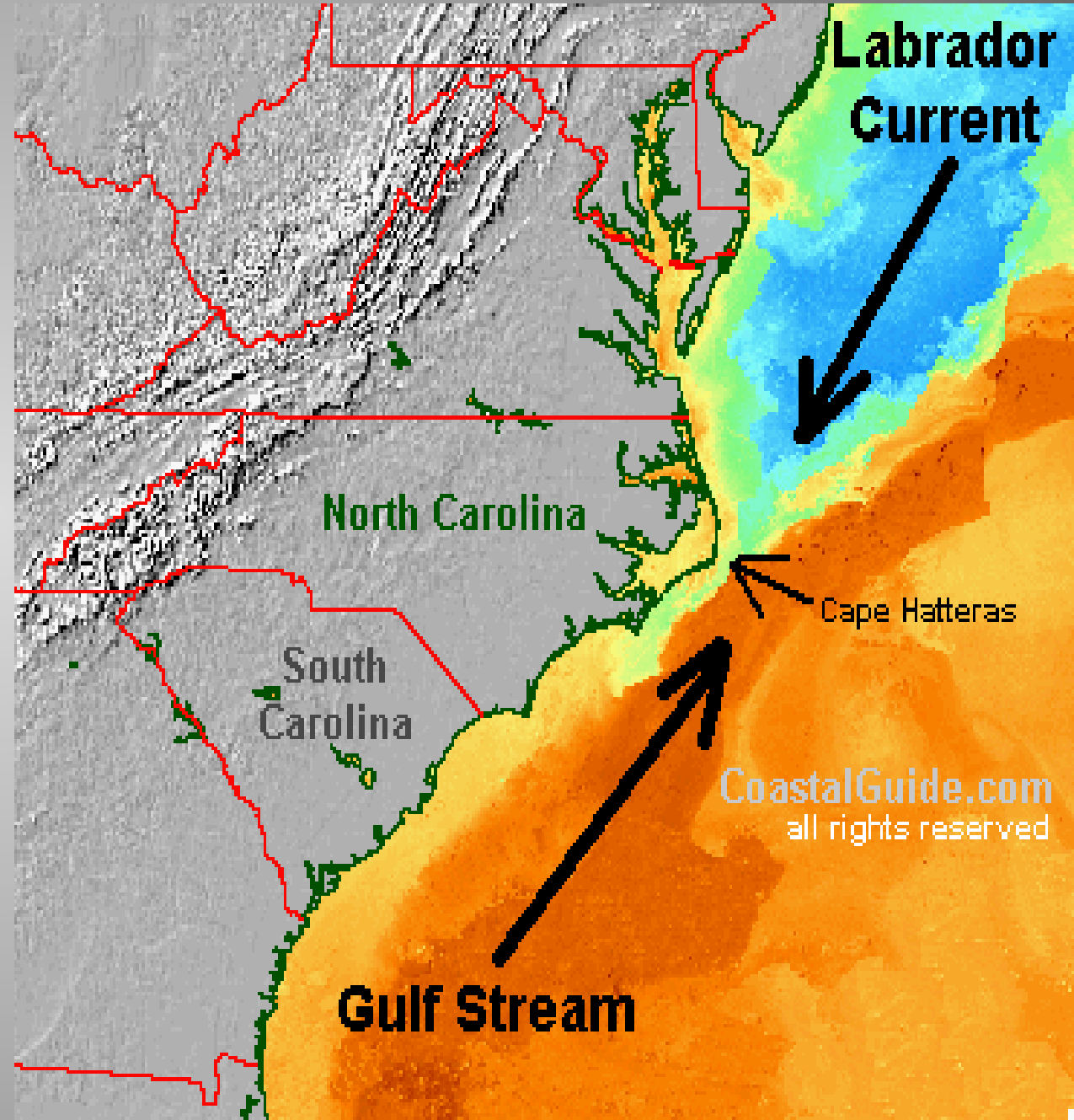
# EXTENT AND STATUS OF SAV IN NC



# SALINITY GRADIENT



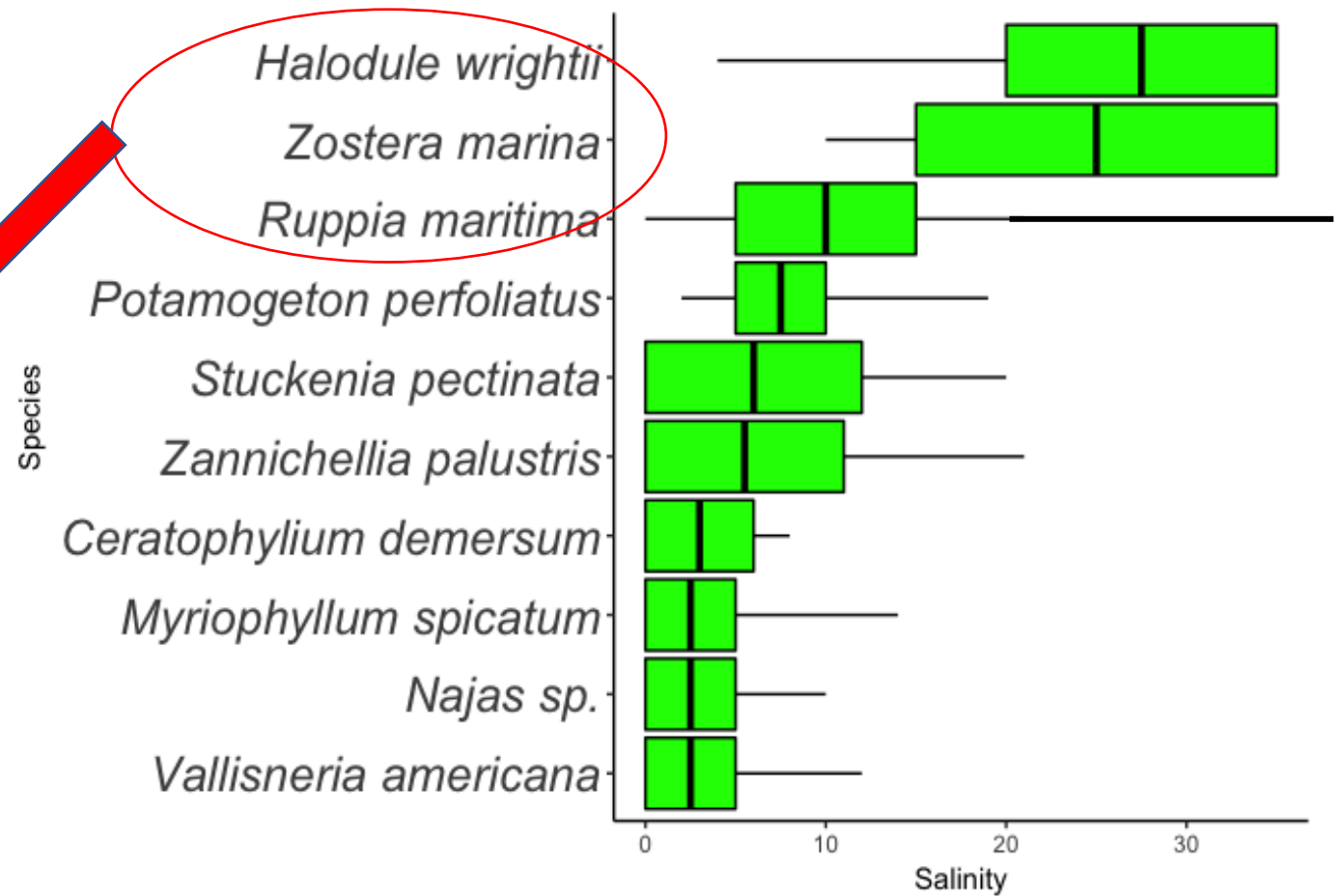
# TEMPERATURE





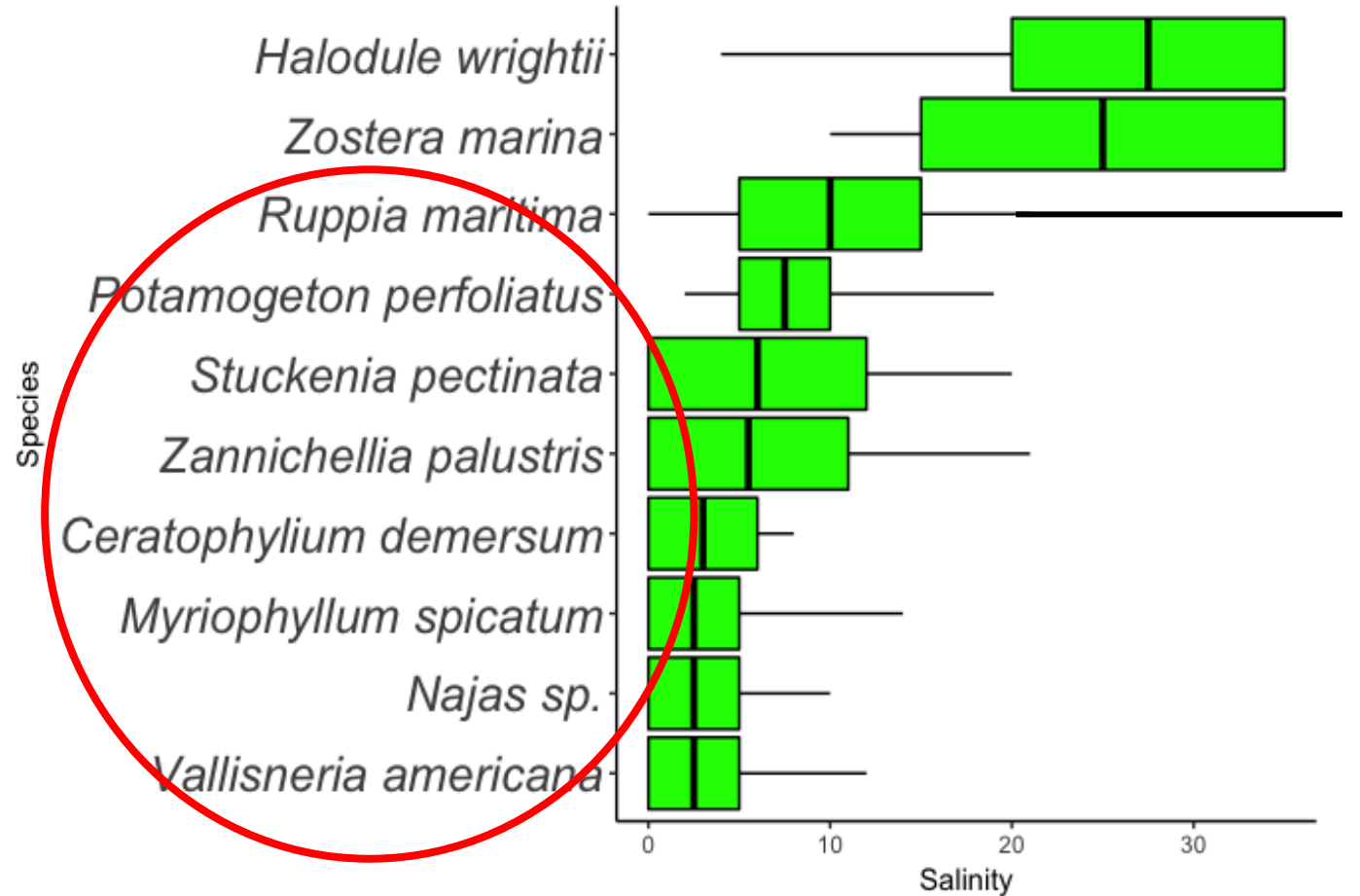
# TWO SAV PERSONALITIES

## TWO DIFFERENT ENVIRONMENTS



# TWO SAV PERSONALITIES

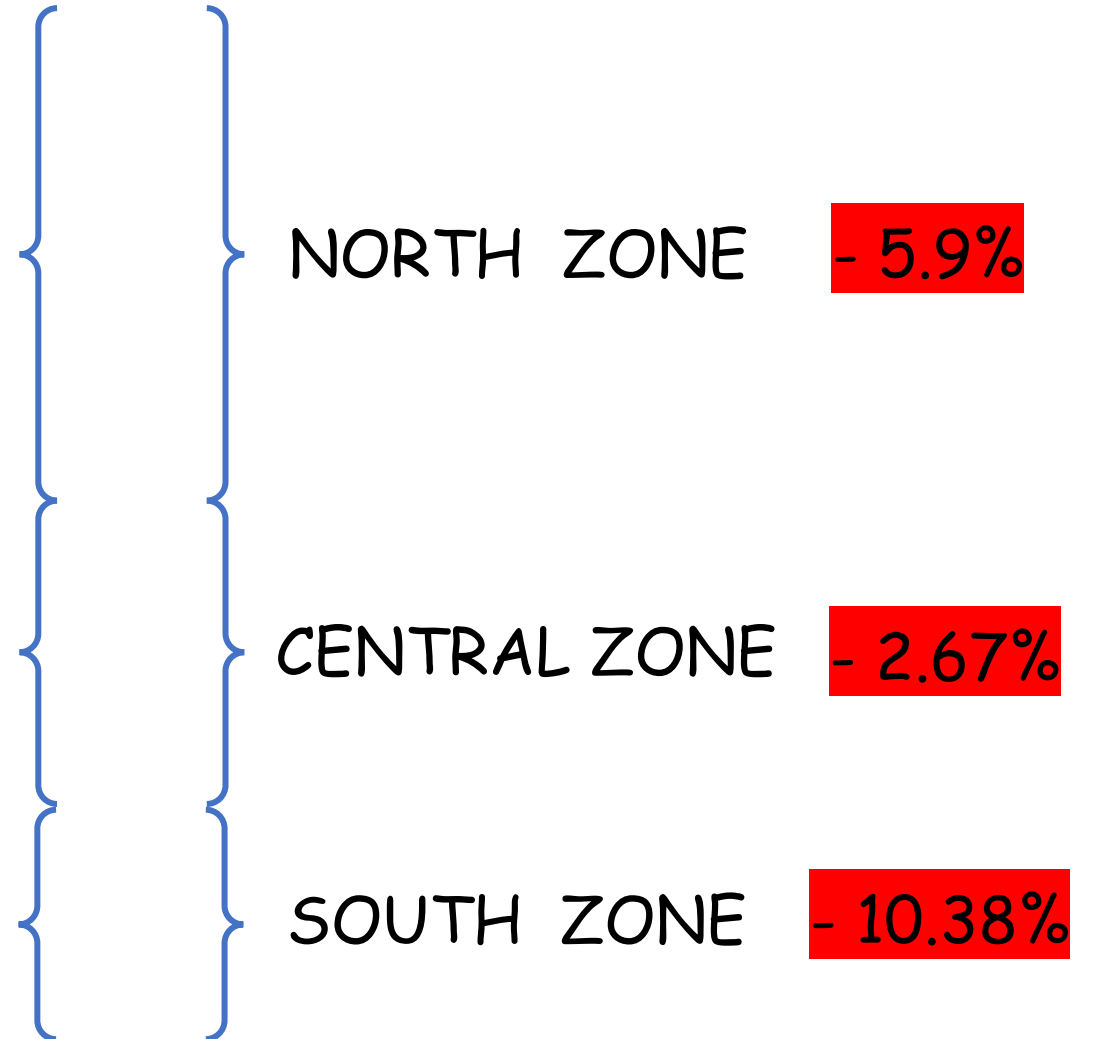
## TWO DIFFERENT ENVIRONMENTS





# APNEP Indicator Report: Extent of Submerged Aquatic Vegetation, High-Salinity Estuarine Waters

SAV Monitoring & Assessment Team





SOUTH ZONE

- 1.48% YEAR<sup>-1</sup>

BY 2025 = 20 % LOSS

# LOW SALINITY SAV STATUS AND TRENDS

THE HISTORICAL RECORD IS LONG BUT  
QUITE FRAGMENTED

BLINKING YELLOW LIGHTS



# LOW SALINITY SAV; FORENSIC ECOLOGY

RECURRING THEMES (1900 - 2000)

LARGE FLUCTUATIONS IN SAV ABUNDANCE

CHANGES IN SPECIES COMPOSITION

PROLIFERATION OF NON-NATIVE SPECIES

PERSISTENT SAV

WATER TURBIDITY

EXTREME WEATHER EVENTS / PRECIPITATION

FLUCTUATIONS IN SALINITY

# LOW SALINITY SAV; 2010 - 2020



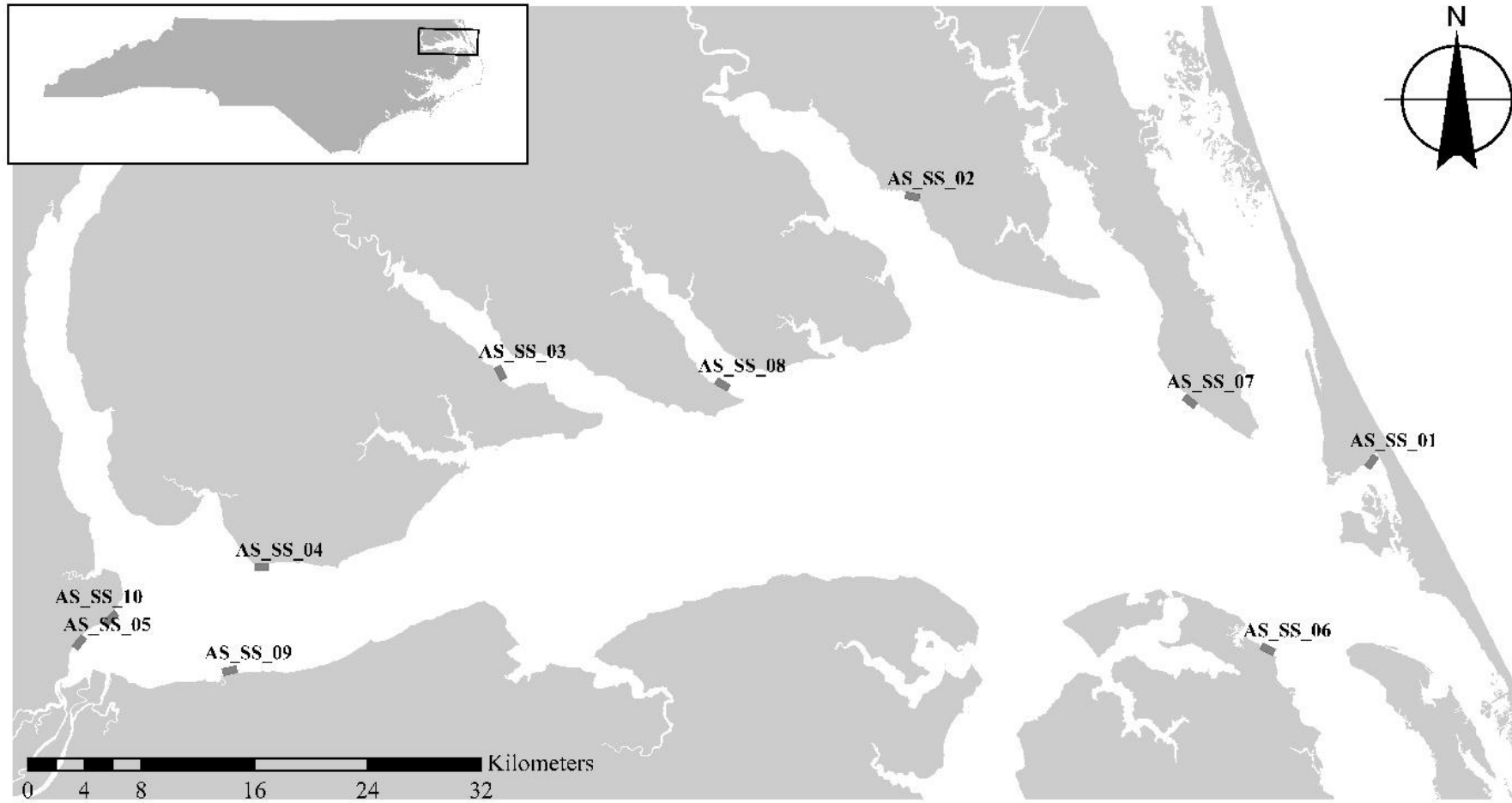
HYDROACOUSTIC SURVEYS (2014-2019)

ALBEMARLE, PAMLICO, NEUSE

ESTABLISH / MONITOR SENTINEL SITES

TEN SITES IN EACH SUB-ESTUARY

# TEN SENTINEL SITES IN ALBEMARLE SOUND

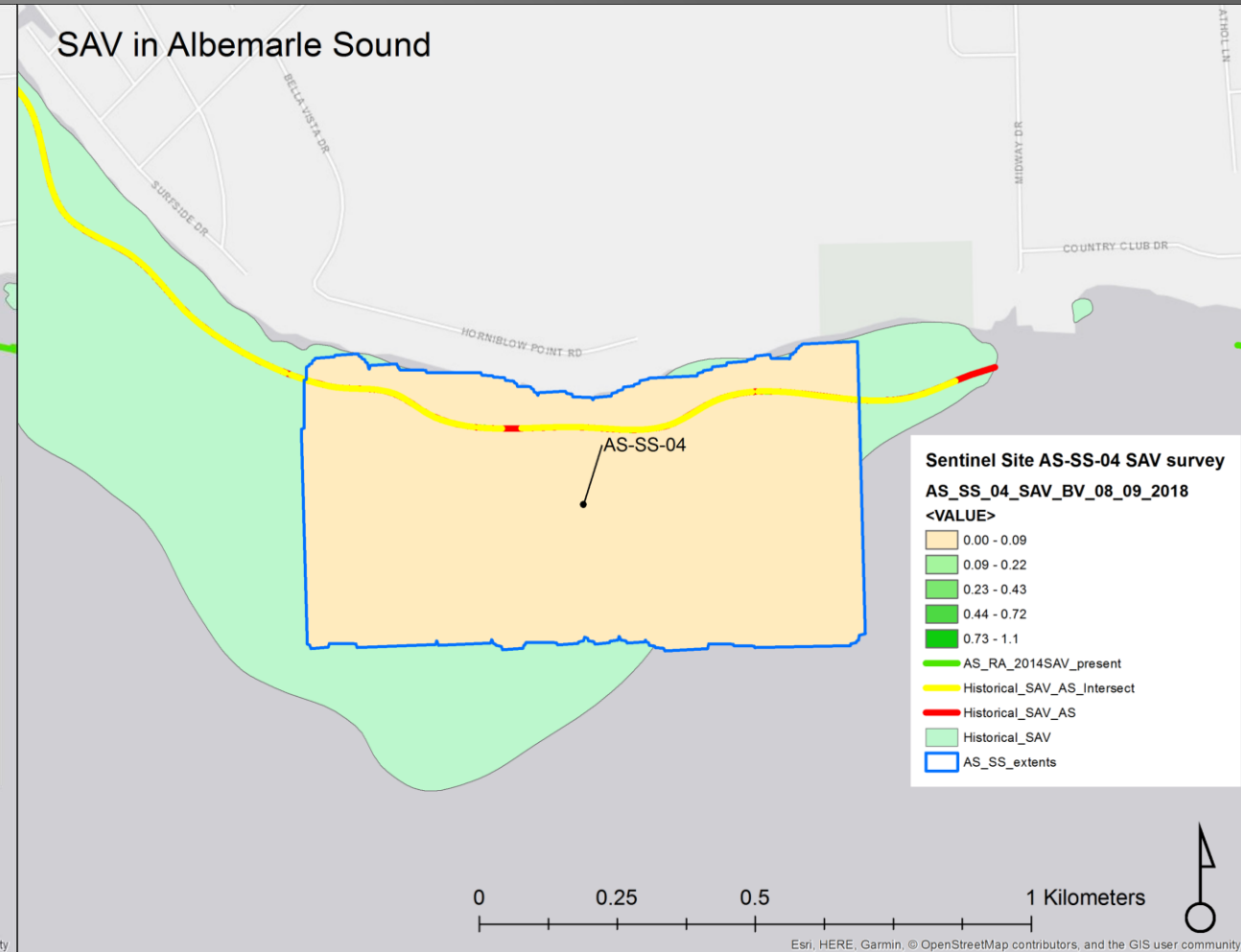
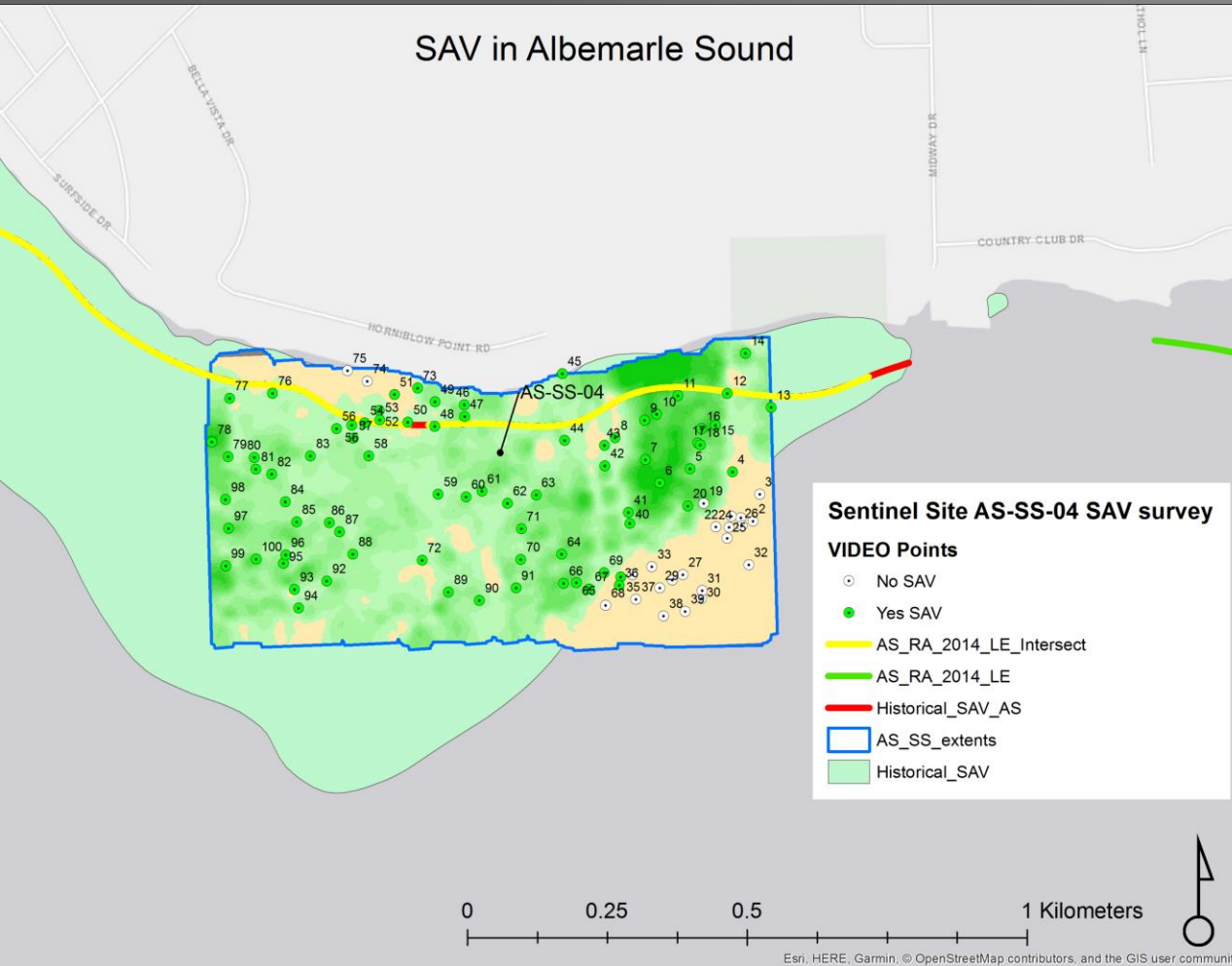




# THE LIGHT GOES OUT

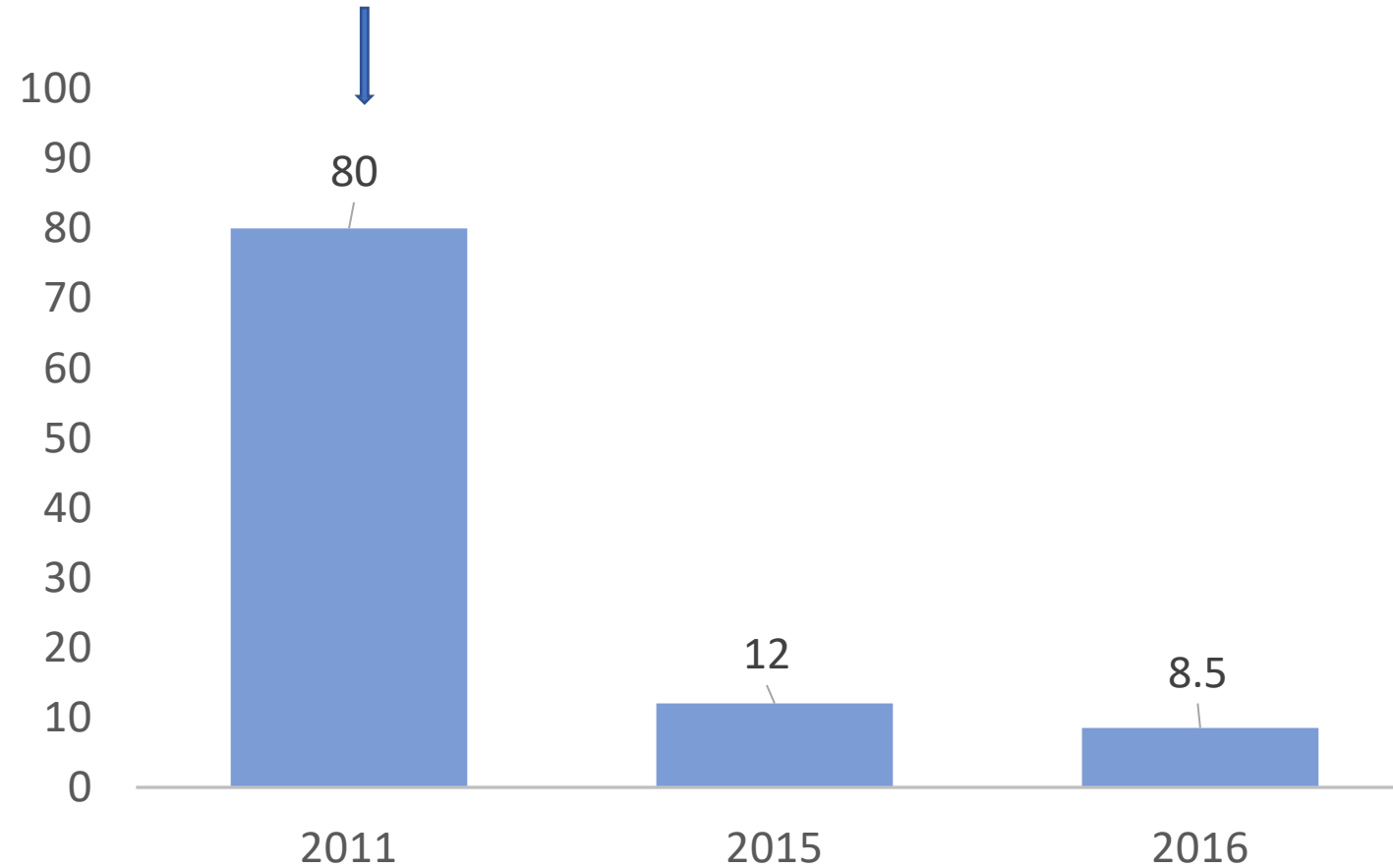
(2015 35.6 Ha)

(2019 0.0 Ha)

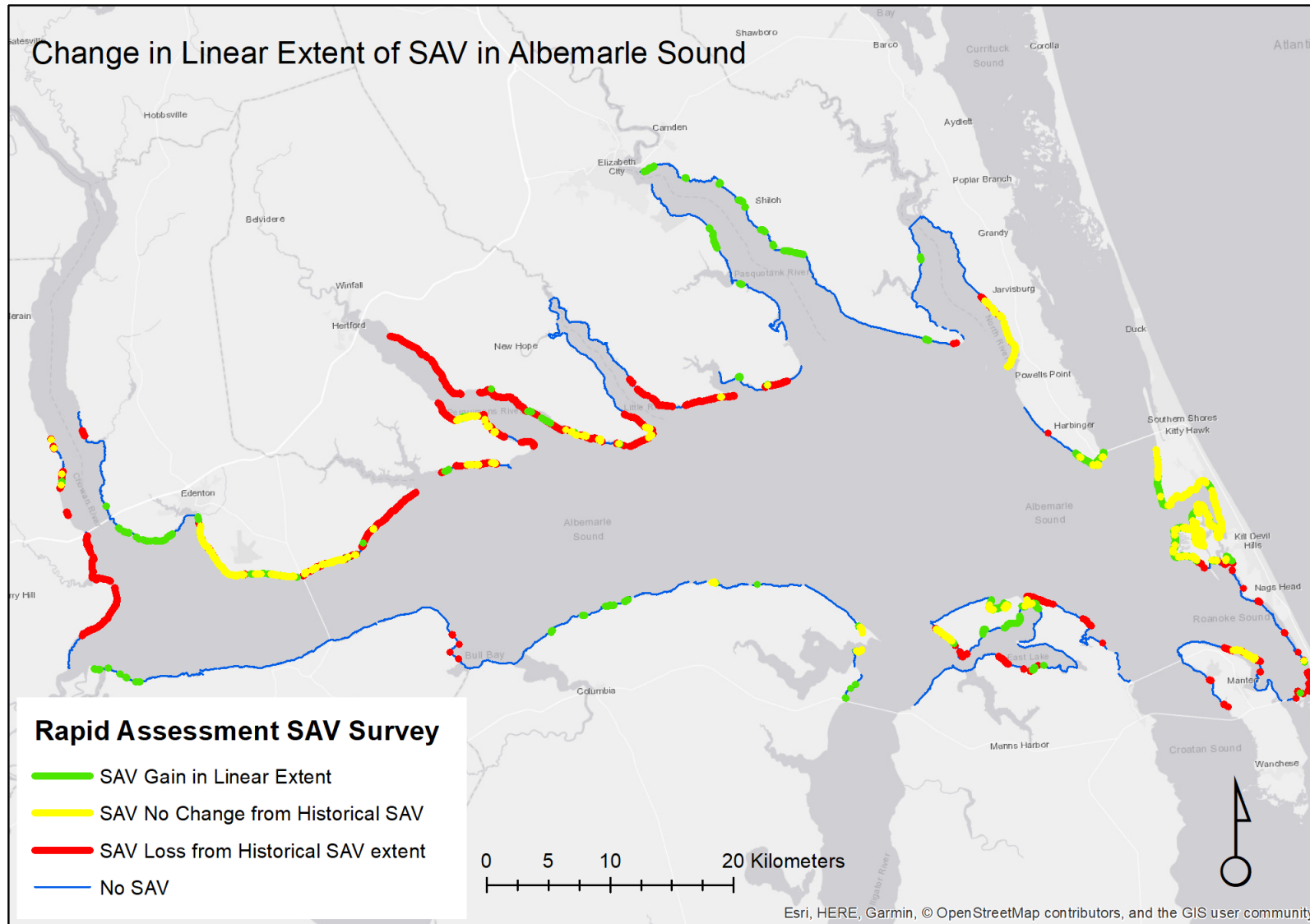


# CHANGE IN PERCENT SAV COVER

QUIBLE & ASSOC. SURVEYS (2007-2011)



# DETECTED ~ 50% OF THE HISTORICAL LAYER



# Change in Linear Extent of SAV in Low Salinity

Estuary	Historical SAV LE (m)	2014-2017 SAV LE (m)	No Change in SAV LE from Historical (m)	Change in SAV LE (GAIN?)	Change in SAV LE (LOSS ?)	% change in SAV LE (LOSS?)
Albemarle Sound	117,778	90,565	56,457	+34,108	-61,321	-52.06
Pamlico River	29,223	6,036	756	+5,280	-28,467	-97.41
Neuse River	10,512	9,519	2,827	+6,692	-7,685	-73.11
<b>TOTAL</b>	<b>157,513</b>	<b>106,120</b>	<b>60,040</b>	<b>+46,080</b>	<b>-97,473</b>	<b>-61.88</b>

## CHPP SOURCE DOCUMENT 2016

"In North Carolina, SAV loss has not been quantified, but anecdotal reports indicate that the extent of SAV may have been reduced by as much as 50%, primarily on the mainland side of the sounds (North Carolina Sea Grant 1997), (J. Hawkins, pers. com., B. J. Copeland, pers. com.)."

WHAT IS THE SAV CRISIS IN NC?

HOW DO WE AVOID THE CRISIS?

WHY ARE THE LIGHTS GETTING DIMMER?