PLANTS AND PIXELS:

EXPLORING DIFFERENT METHODS TO MAP AND MONITOR SAV IN THE CURRITUCK SOUND

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OBJECTIVES



- Explore potential methods to map and monitor SAV.
  - Examine predictive modeling through remote sensing
  - Develop means to visualize species dominance and coverage
  - Develop classification scheme for SAV

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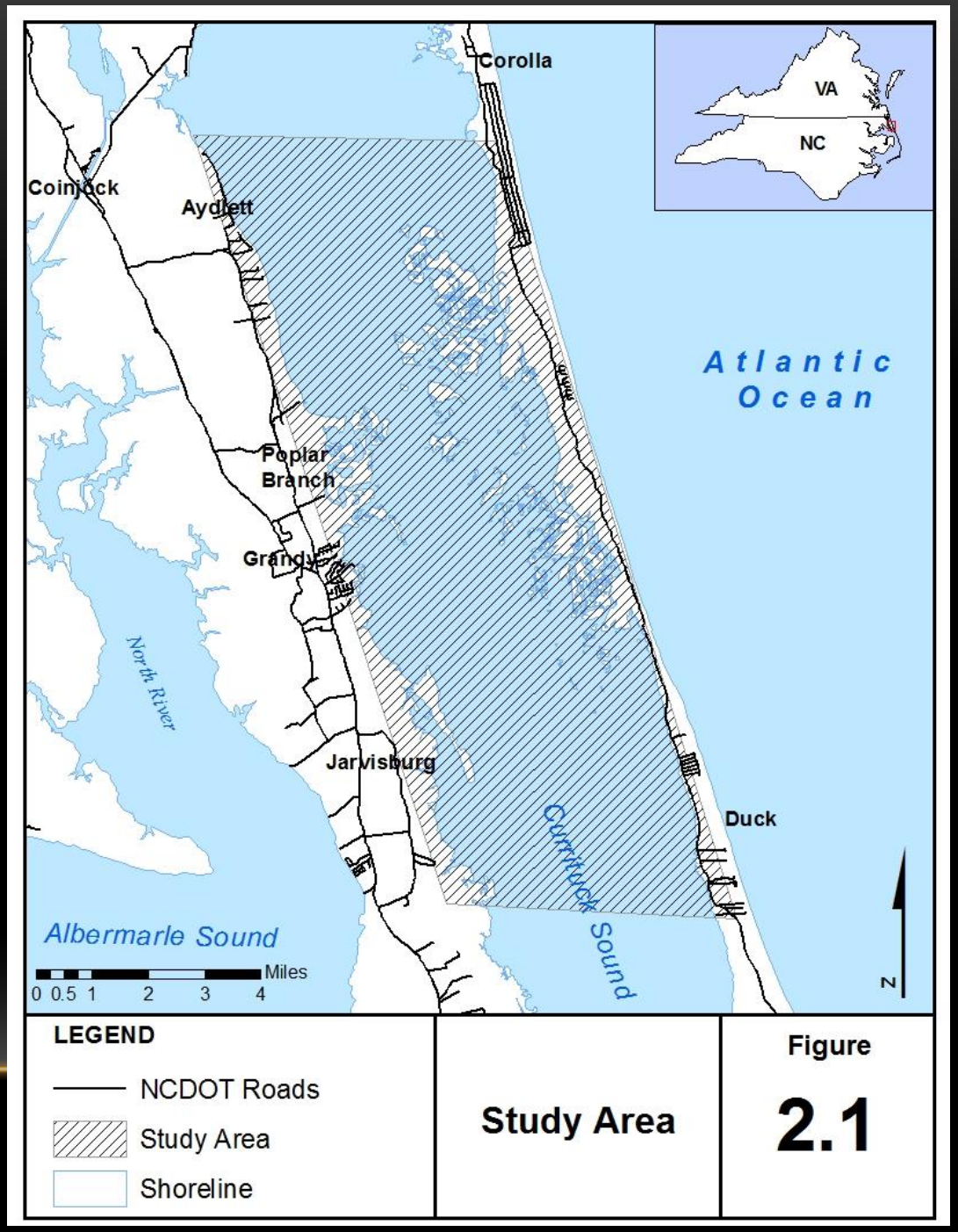
STUDY AREA

- Mid-Currituck
- 13 miles long x 5 miles wide
- Unique area
- Point-Intercept Grid



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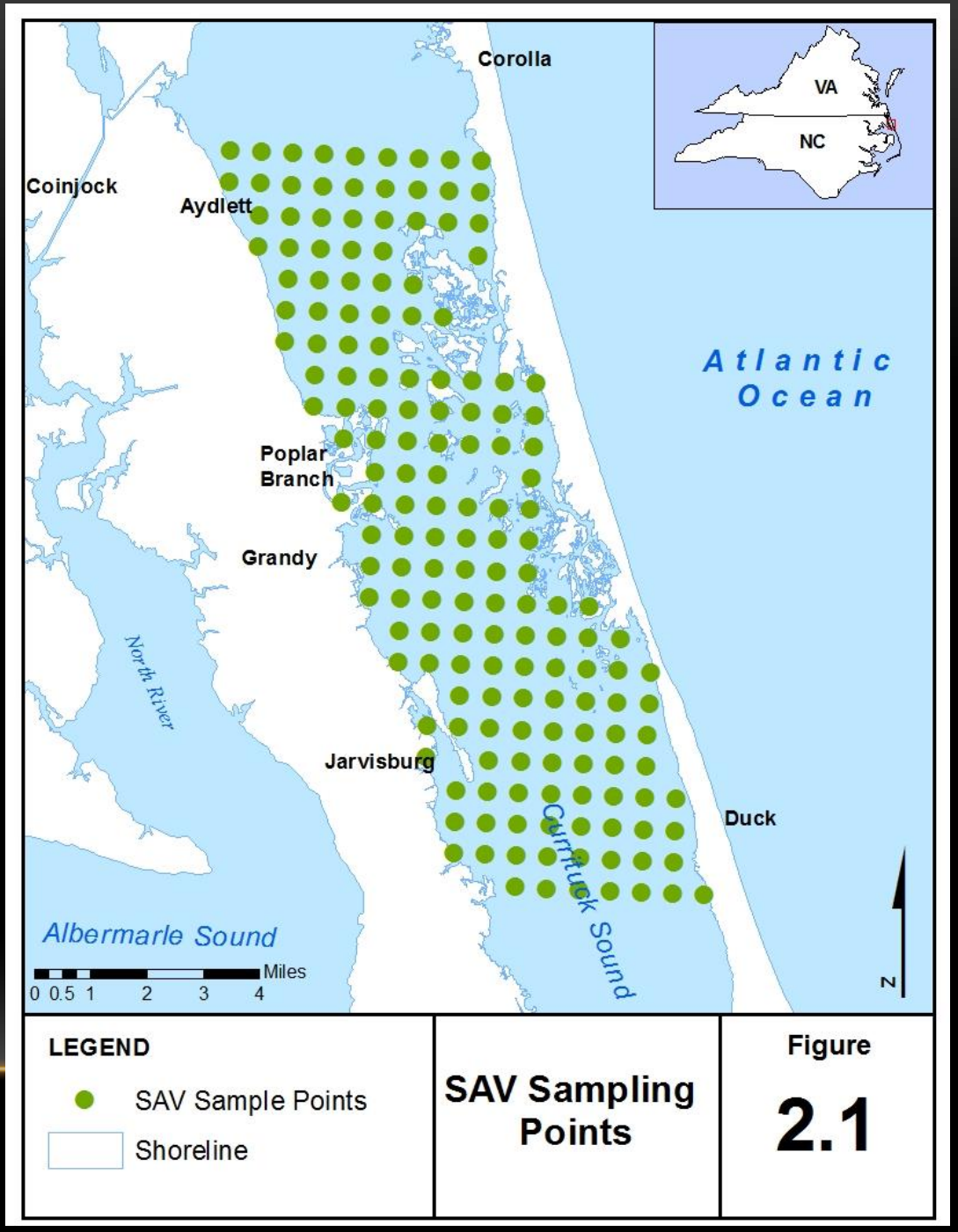


SAMPLING

SAV "runs" and WQ "runs"

- Run 1: 174 pts (Late May – Early June)
- WQ 1: 42 pts

- Run 2: 116 pts (Early July – Early August)
- WQ 2: 30 pts

- Run 3: 30 representative pts (August-September)

SAMPLING

SAV Run

- Date and Time
- Weather
- Plant Coverage
- Water Depth
- Temperature
- Salinity
- Sediment Type
- Secchi Depth
- Plant Status
- Species Present/Absent
- Dominant Species Index

WQ Run

- Ammonia – N
- Color
- DO
- NO2
- NO3
- pH
- Phosphate
- Total Nitrogen
- Total Phosphorus
- Turbidity

SAMPLING

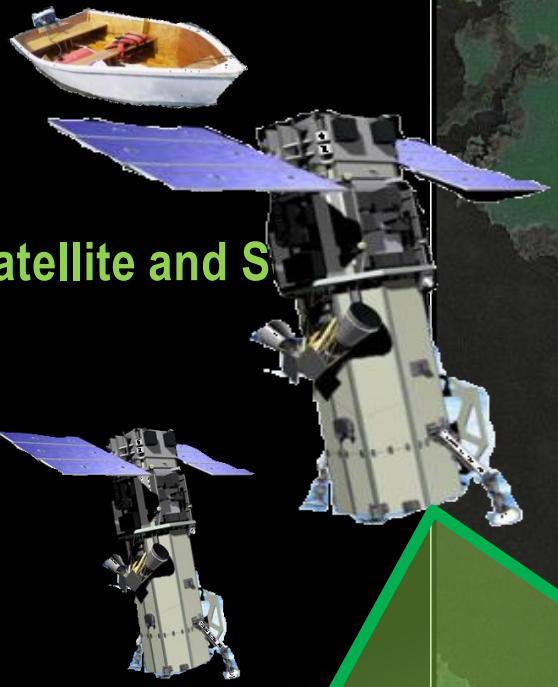
SAV Coverage Categories

- P/A and Coverage (binomial and multinomial): B - 0 (0%) and 1 (1-100%) M – 0 (0%), 1 (1-20%), 2 (21-40%), 3 (41-80%) and 4 (81-100%)

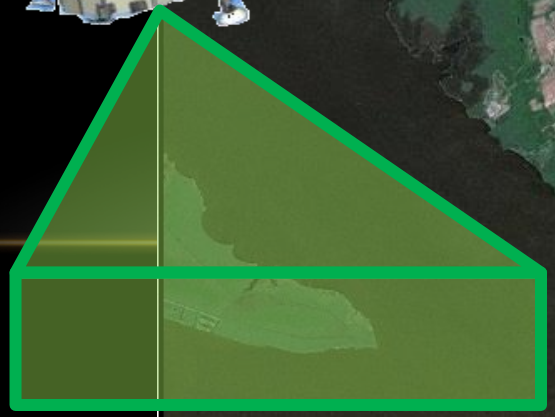
- RS Model (binomial and multinomial): B - 0 (0-20%) and 1 (21-100%), 0 (0-20%), 1 (21-40%), 2 (41-80%), 3 (81-100%)



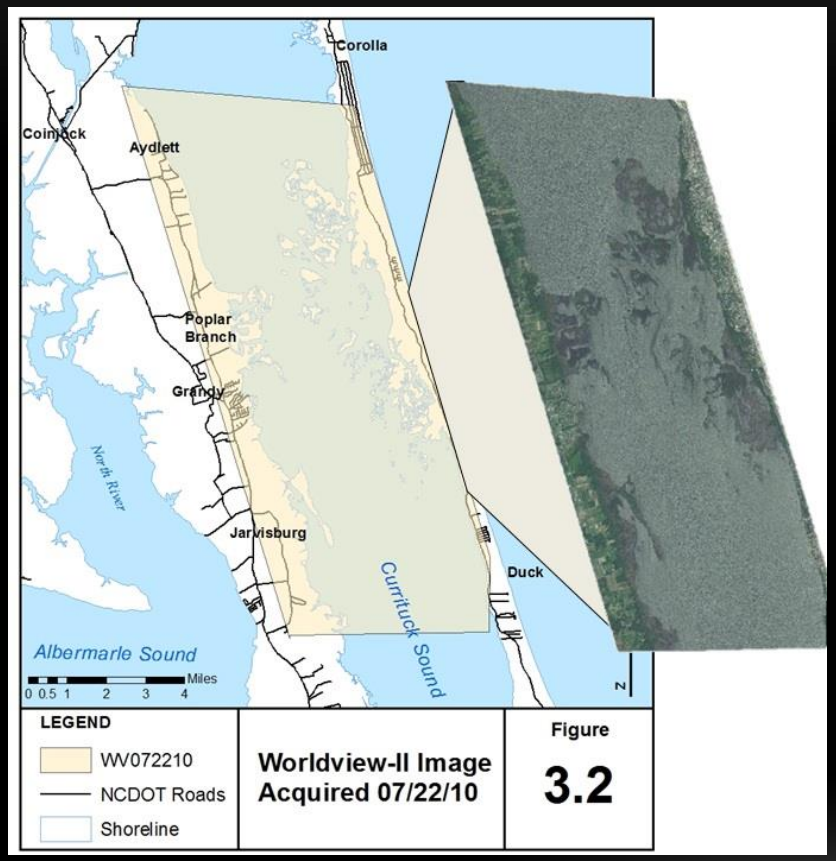

- In-situ sampling

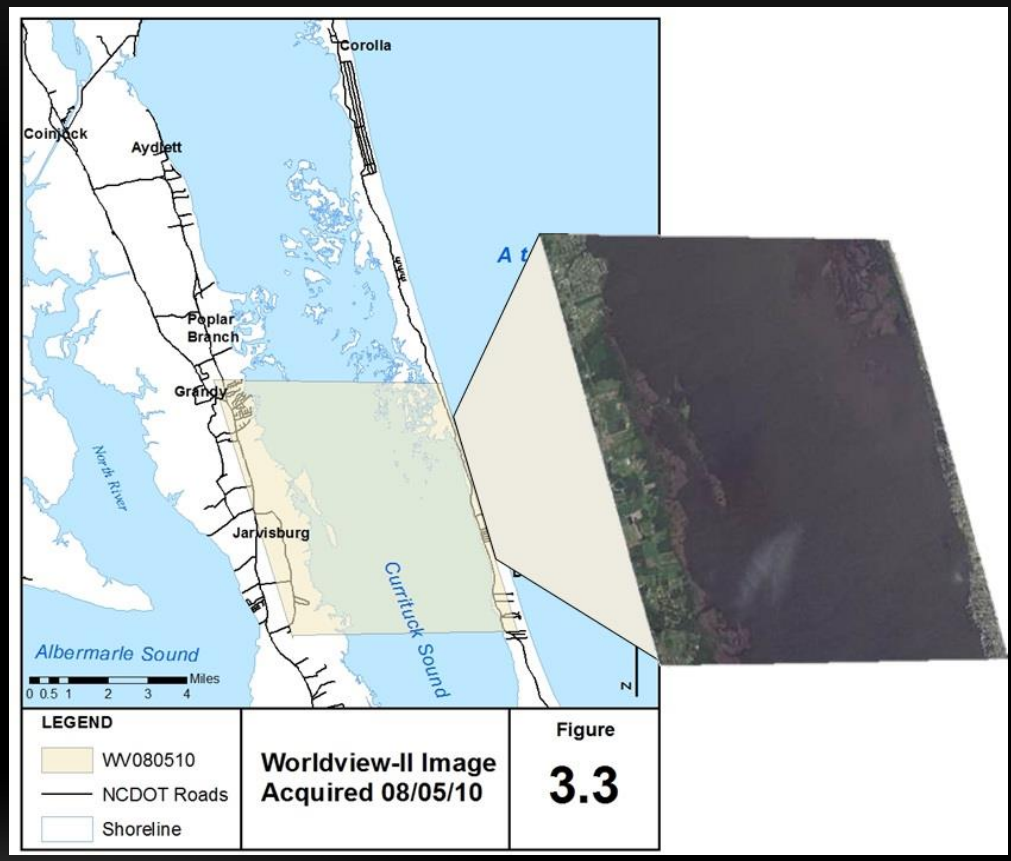


- Satellite and S



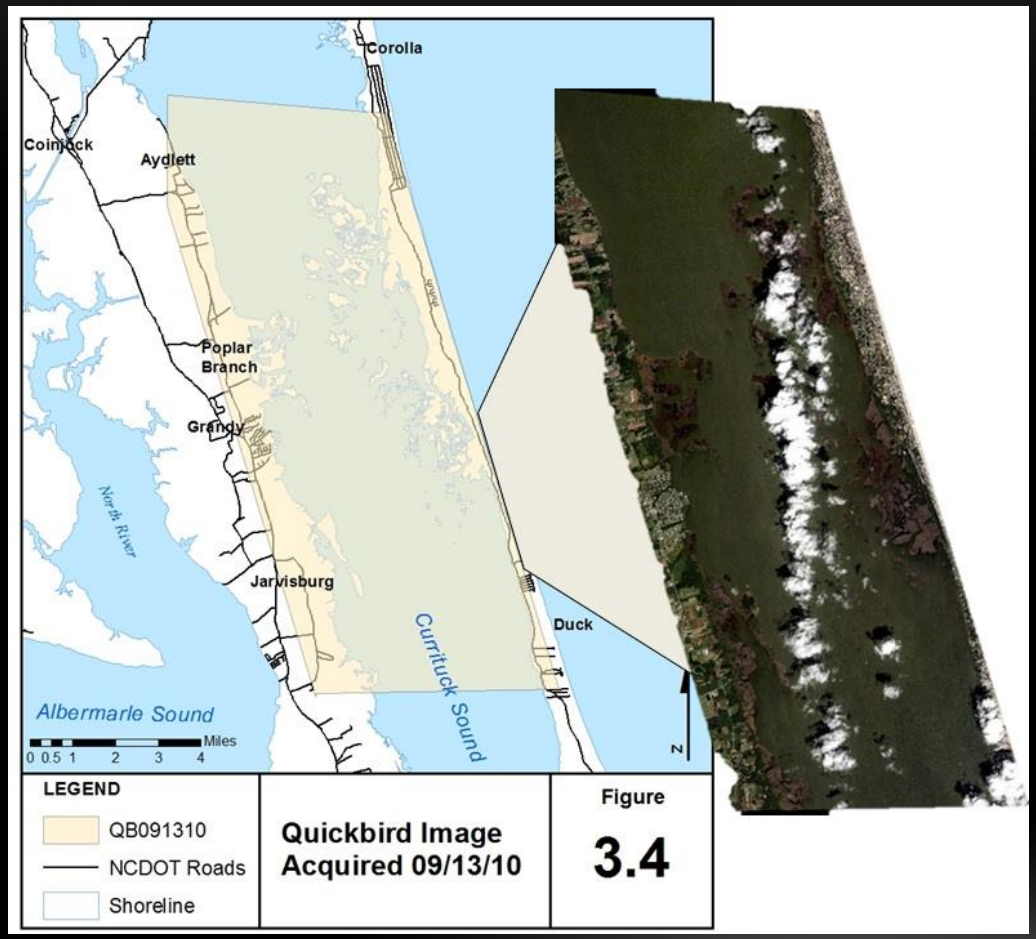
WORLDVIEW-II IMAGERY ACQUISITION





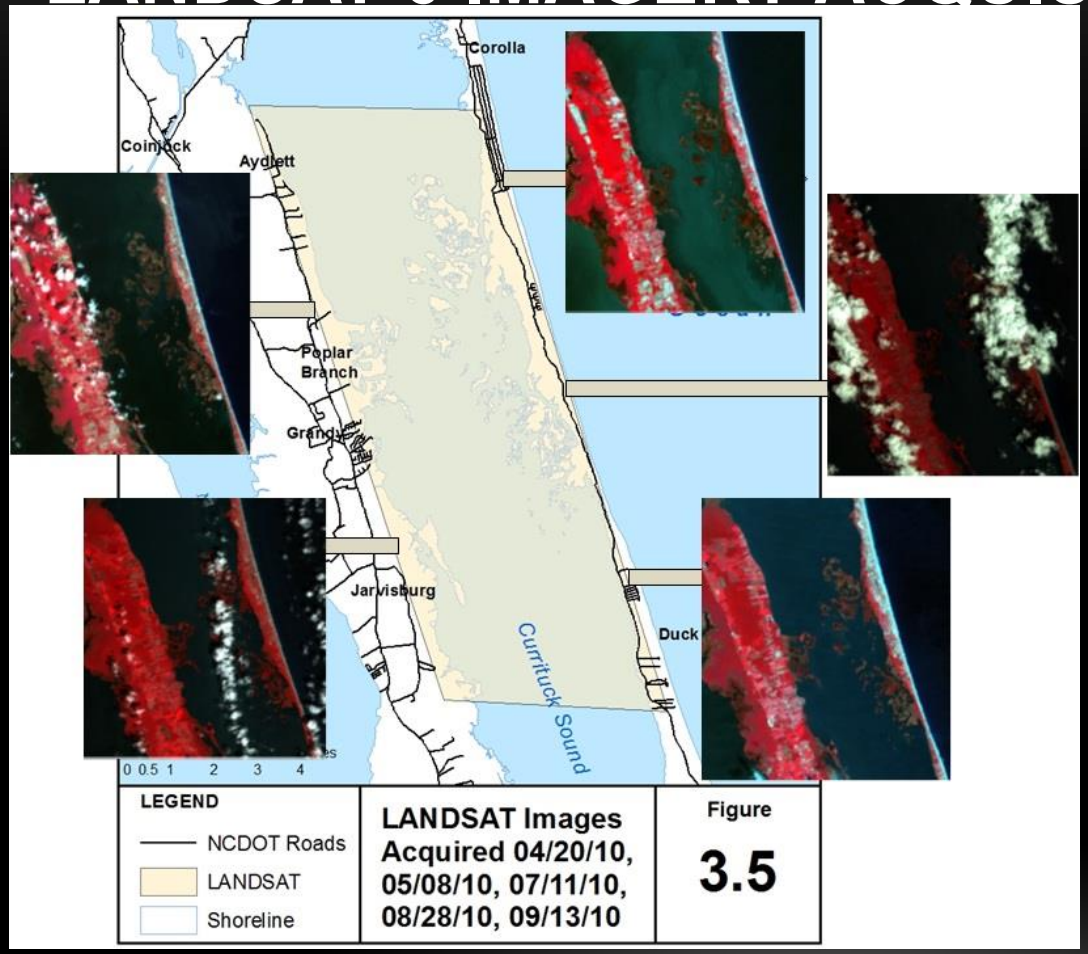
WorldView II – 1.84m (MS)

QUICKBIRD IMAGERY ACQUISITION



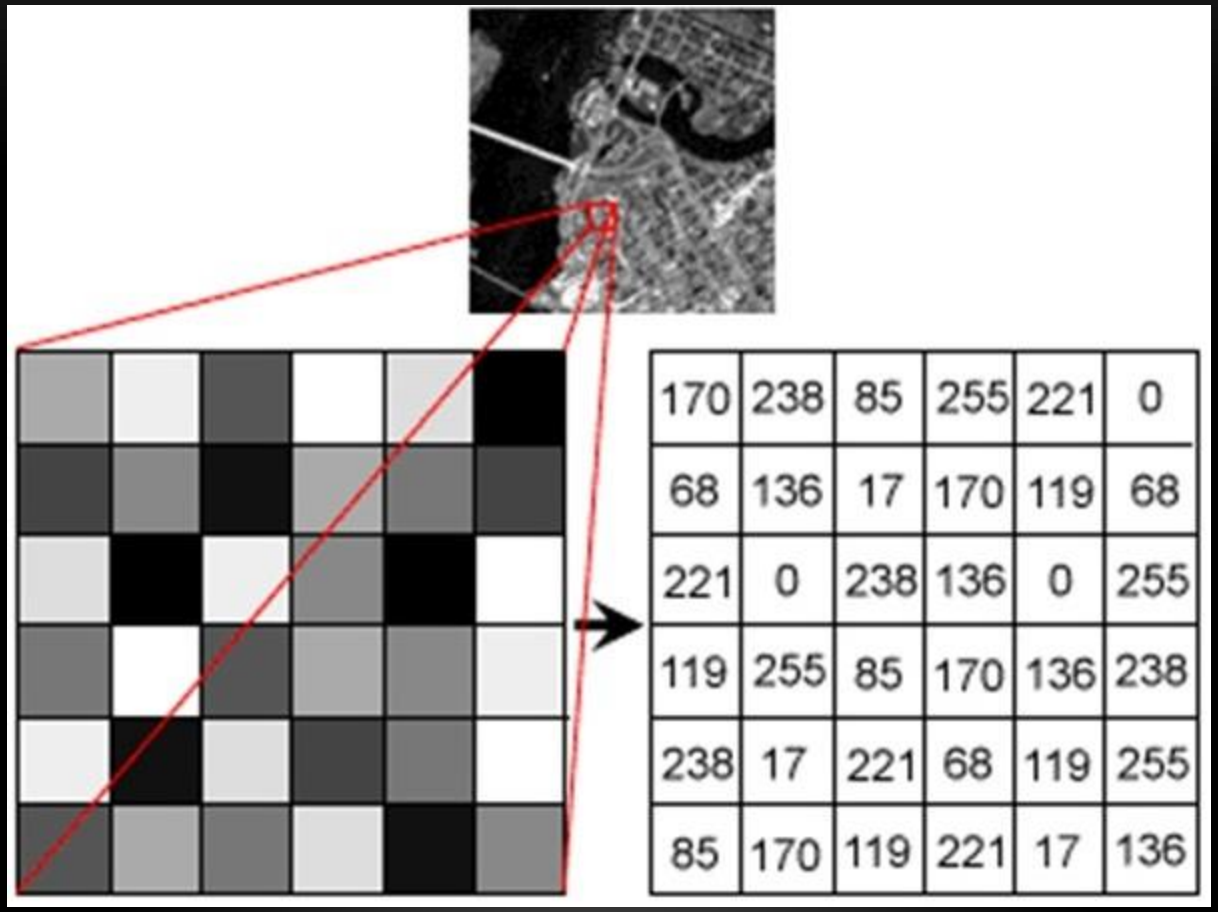
Quickbird – 2.4 m (MS)

LANDSAT 5 IMAGERY ACQUISITION



LANDSAT – 30 m (MS)

SATELLITE IMAGERY



170	238	85	255	221	0
68	136	17	170	119	68
221	0	238	136	0	255
119	255	85	170	136	238
238	17	221	68	119	255
85	170	119	221	17	136

LOGISTIC REGRESSION

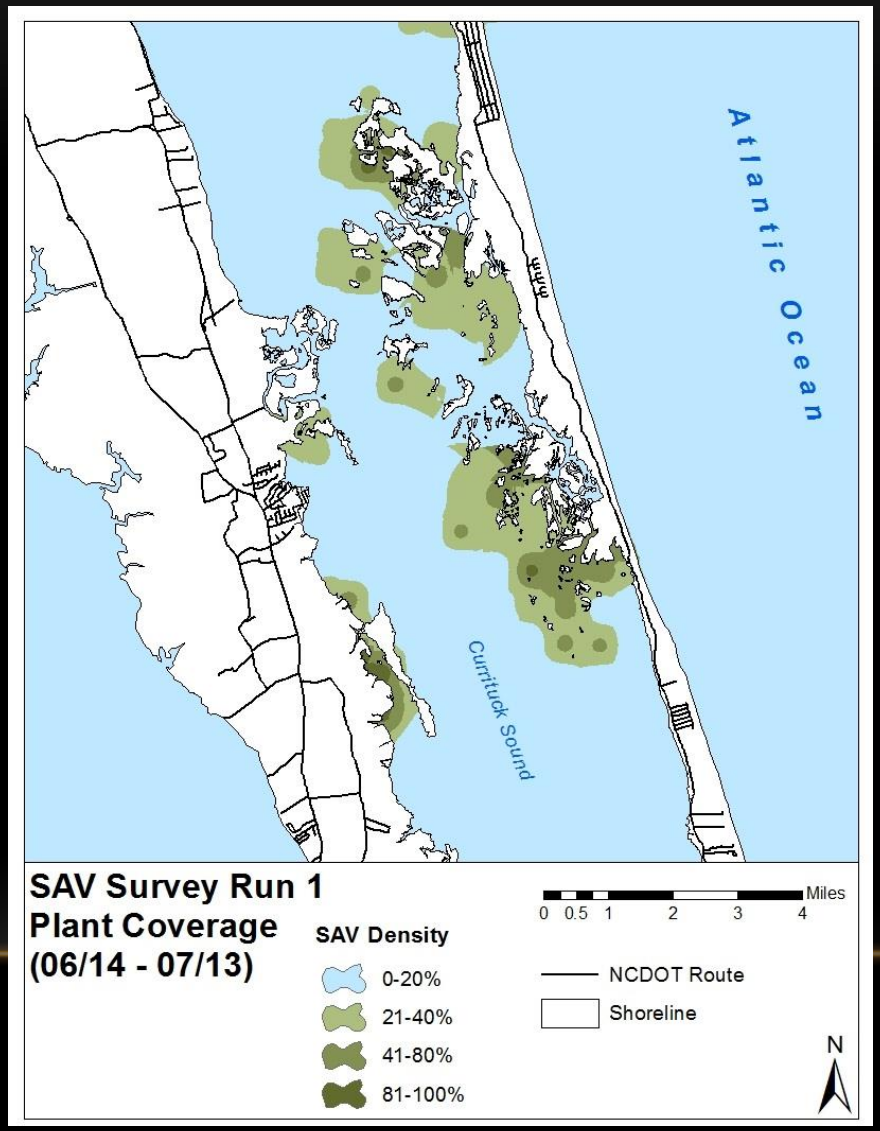
$$\hat{Y}_i = \frac{e^u}{1+e^u}$$

- Where Y-hat is the estimated probability that the ith case is in a category and u is the regular linear regression equation:

$$u = A + B_1 X_1 + B_2 X_2 + \cdots + B_K X_K$$

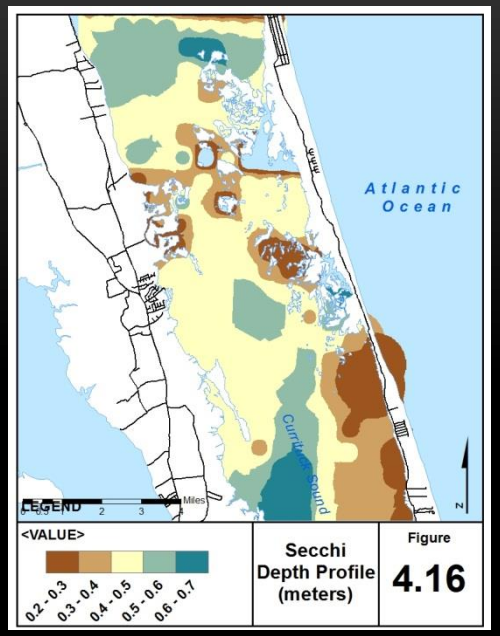
- Independent Variable(s): Spectral Band
- Dependent Variable: Plant Cover Category (0,1, 2 or 3) and binary P/A (0 or 1)

PLANT COVERAGE

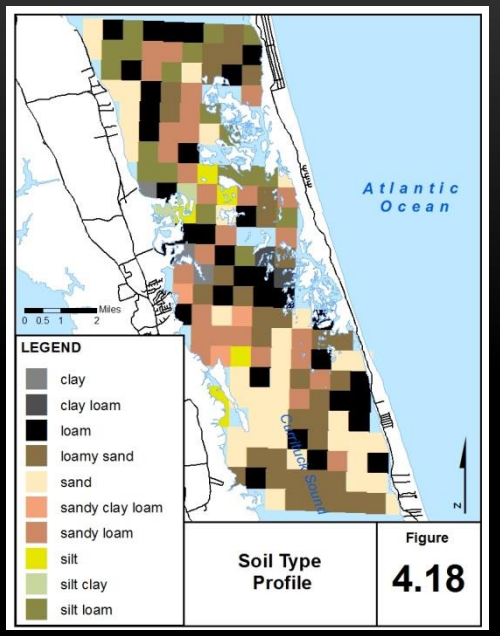


LITTORAL ZONE

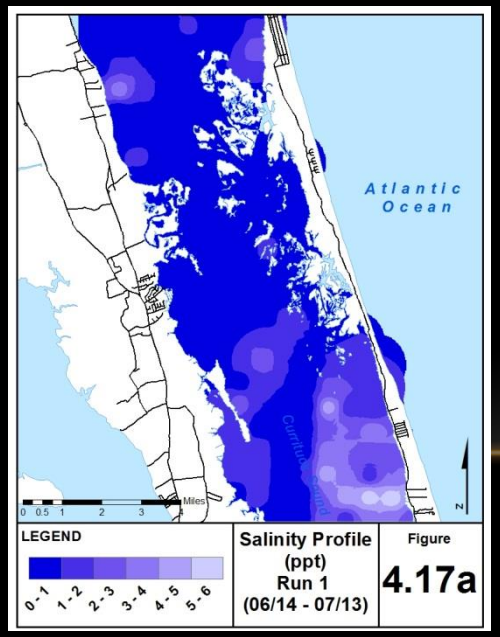
SECCHI DEPTH



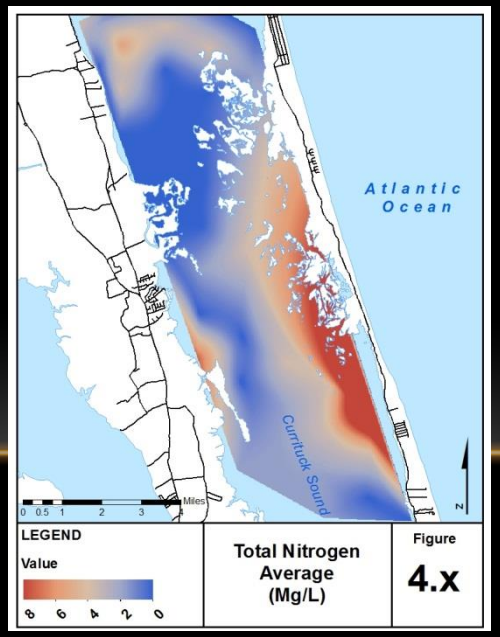
SEDIMENT TYPE



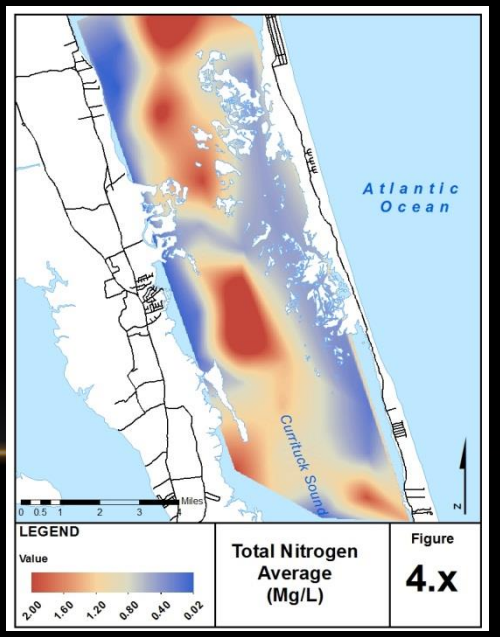
SALINITY



TOTAL N



TOTAL P

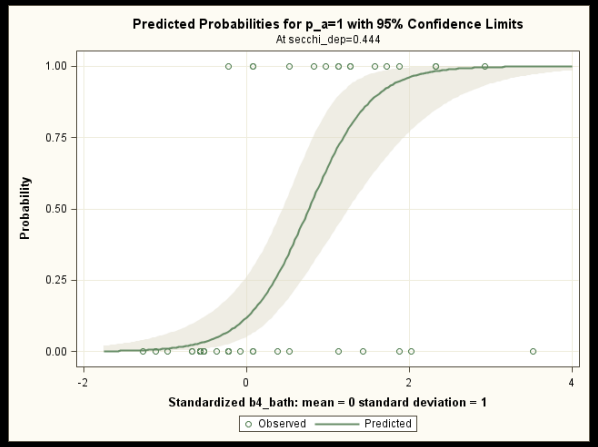


PREDICTIVE MODELING

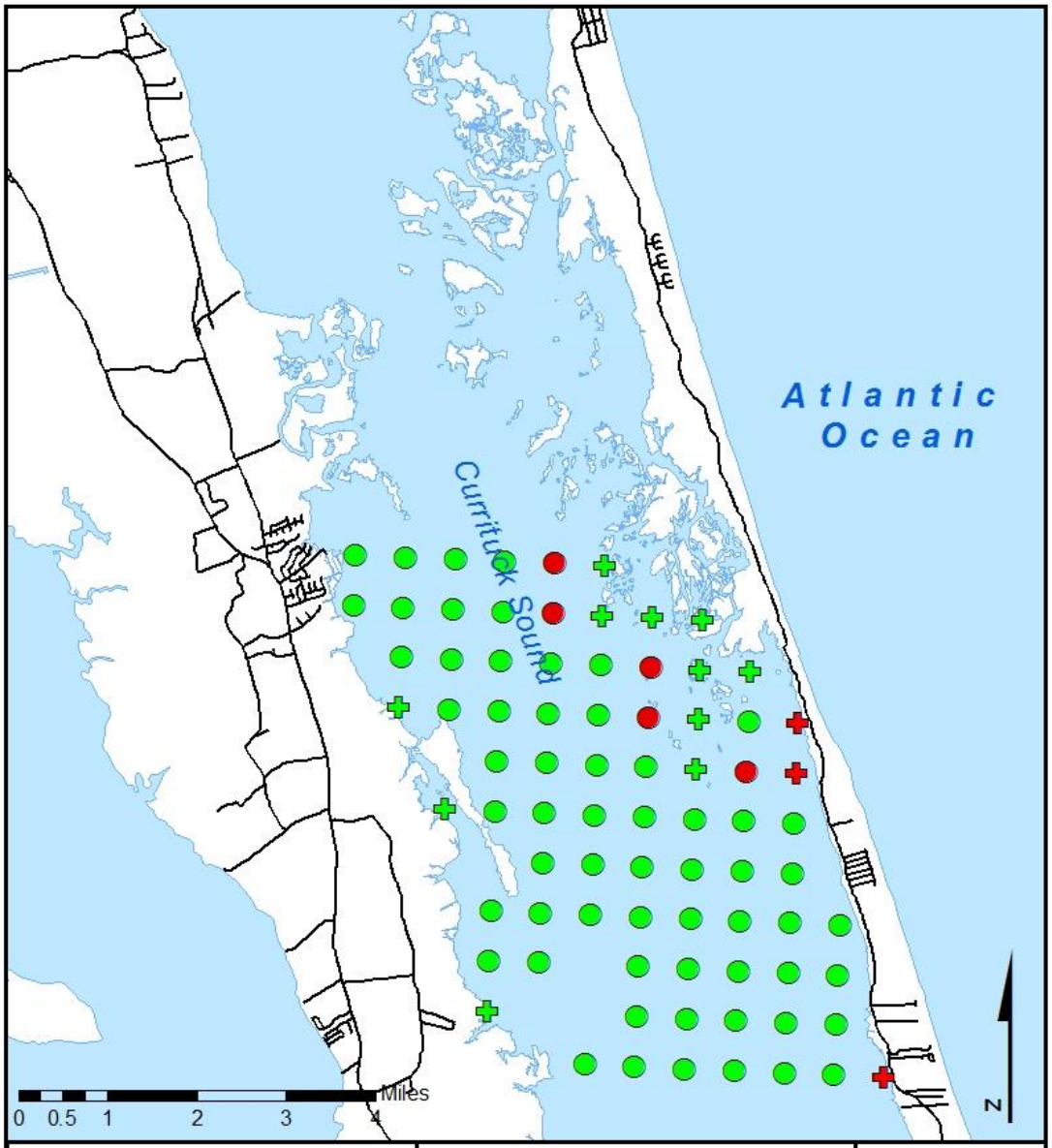
Worldview-II Sensor

Logit (P/A) = B_1(*Band4 x SD*) + A

Sensor	Date	Wald	Likelihood Ratio	Score	% Concordant
Worldview-II	8/5/2010	<0.0001	<0.0001	<0.0001	94.9/88.5



* Model fit determined using Hosmer and Lemeshow GOF



LEGEND

- Correct (1)
- Correct (0)
- False Positive
- False Negative

WorldView-II Model
WV080510
Image Specific
B4, SD

Figure

4.x

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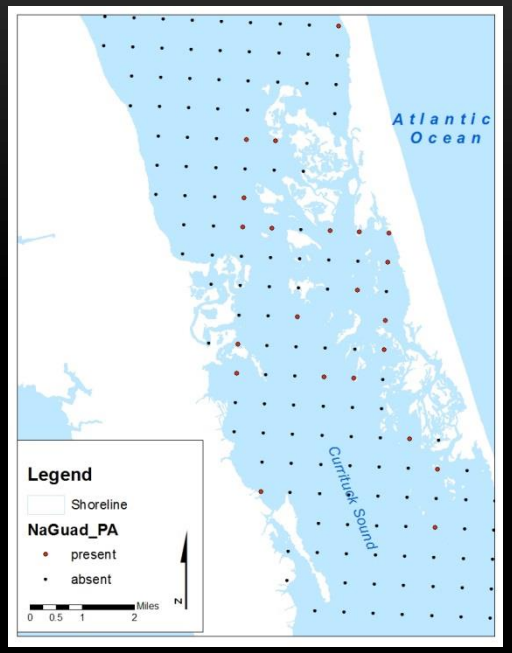
SPECIES DOMINANCE AND COVER

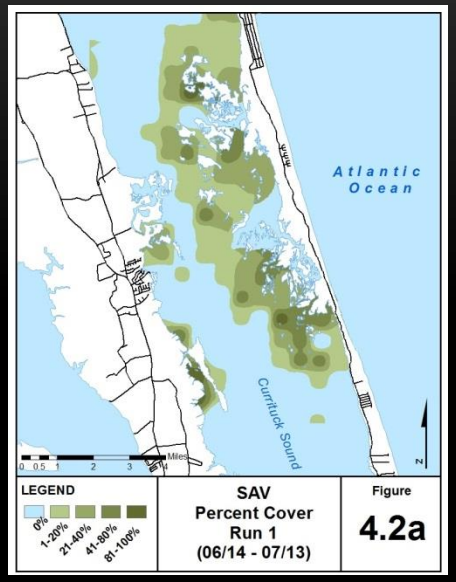
- During Sampling each species collected assigned a dominance category
  1. Dominant – Majority of plant biomass on rake
  2. Shared Dominance – shared majority with one or more species
  3. Subdominant – Not majority but trace amounts

- Determined as a proportion of all species found on rake per site

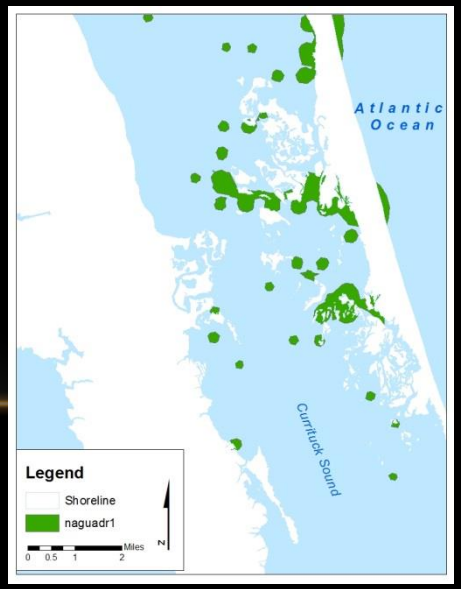
Point Data



SAV Data

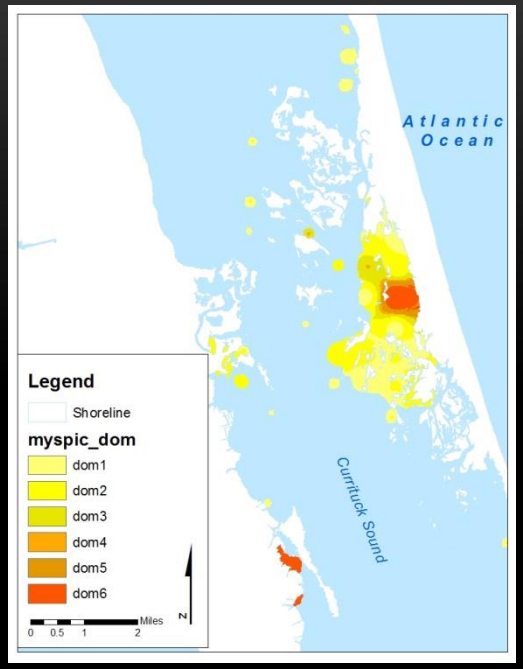


Species Data

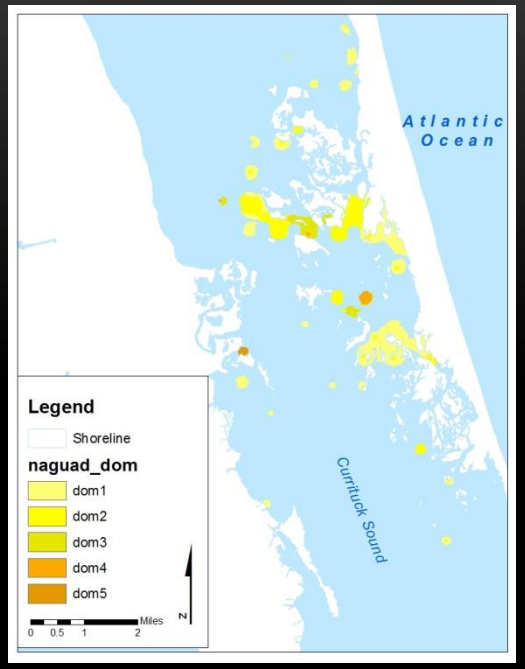


SPATIAL DOMINANCE

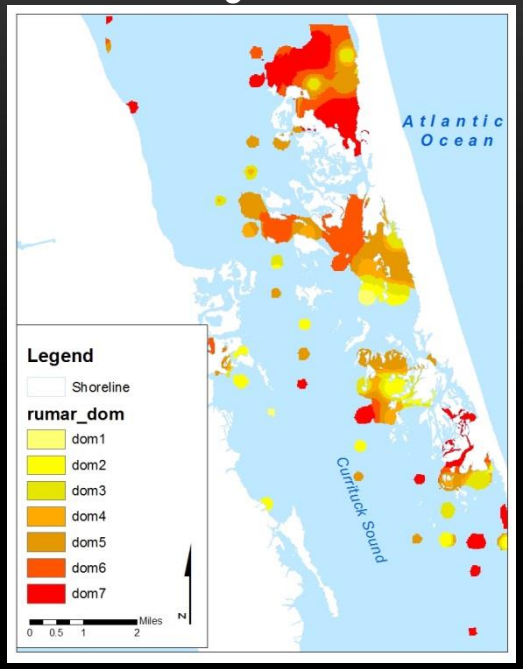
EWM



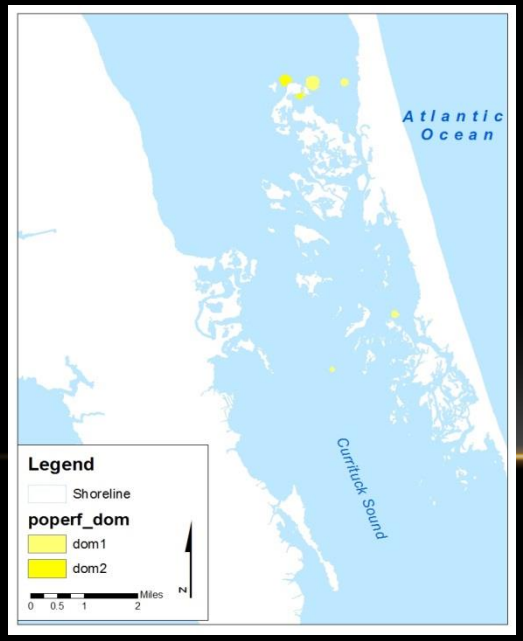
Southern Naiad



Widgeon Grass

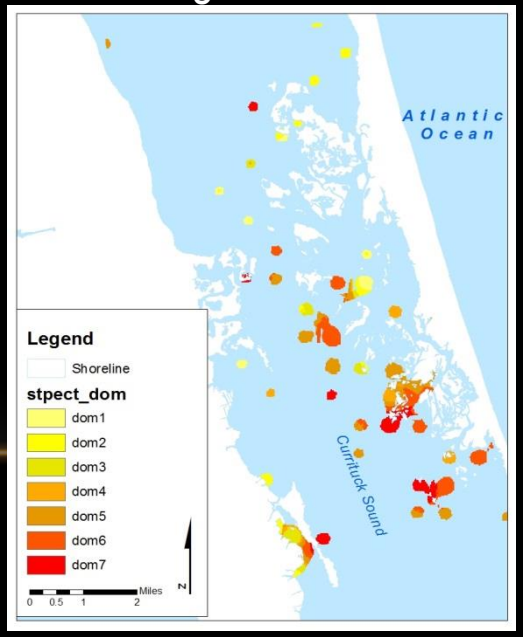


Redhead Grass



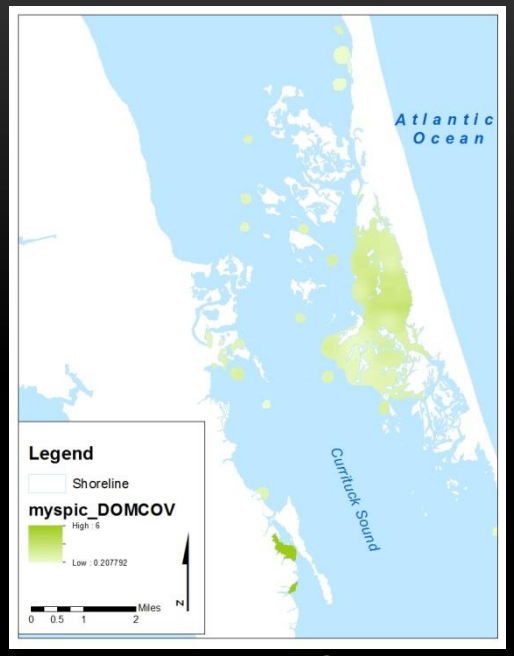
Vallisneria

Sago Pondweed



COVERAGE BY SPECIES

EWM



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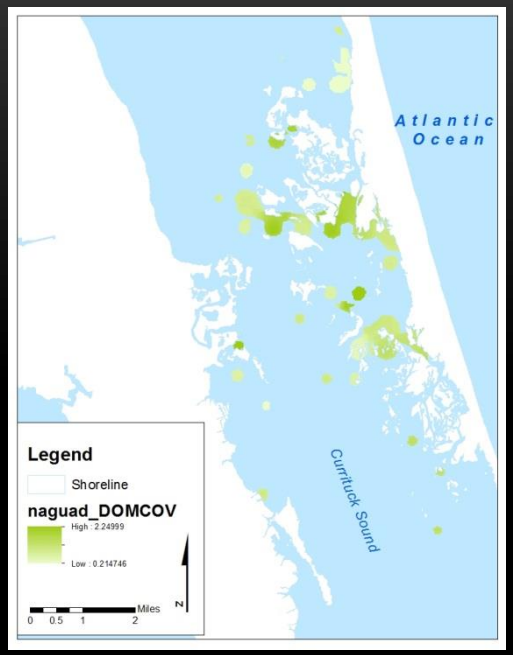

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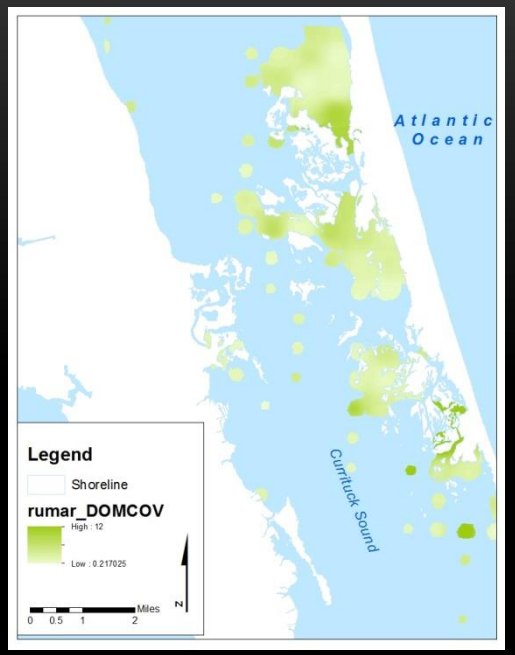

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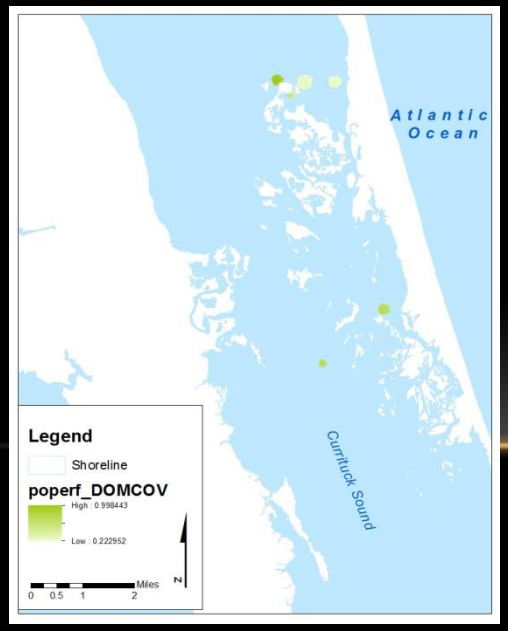

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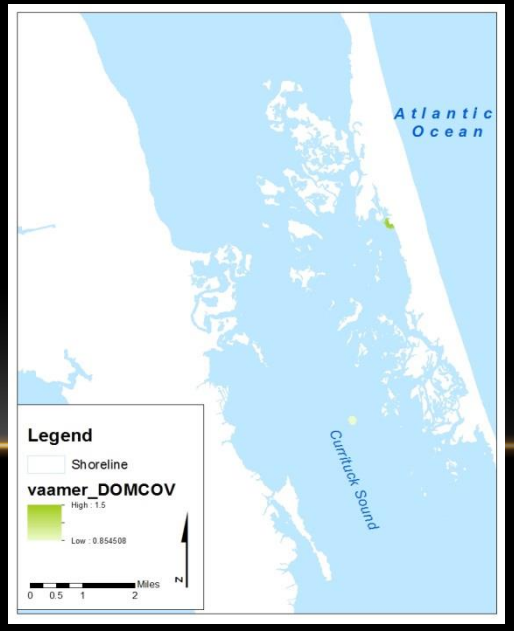

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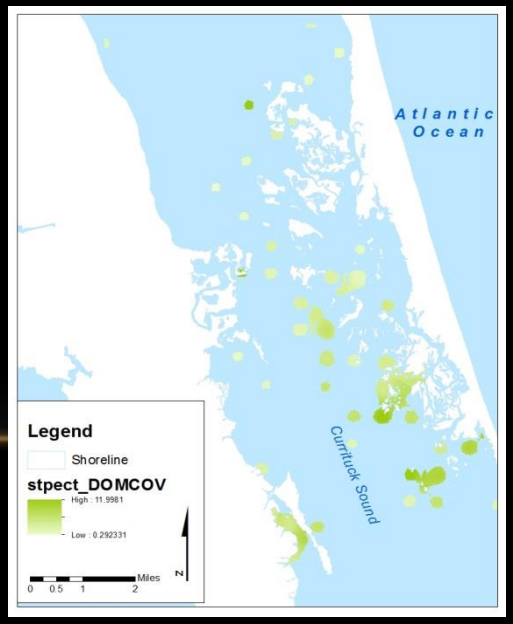

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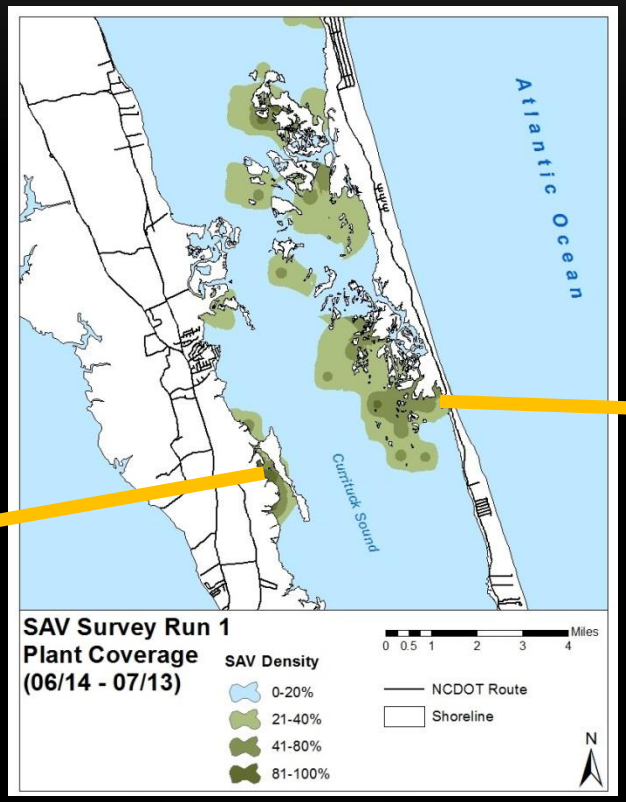
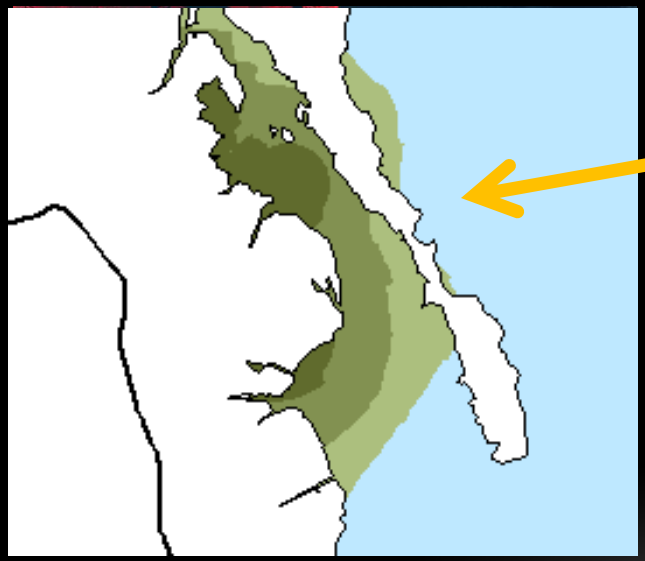
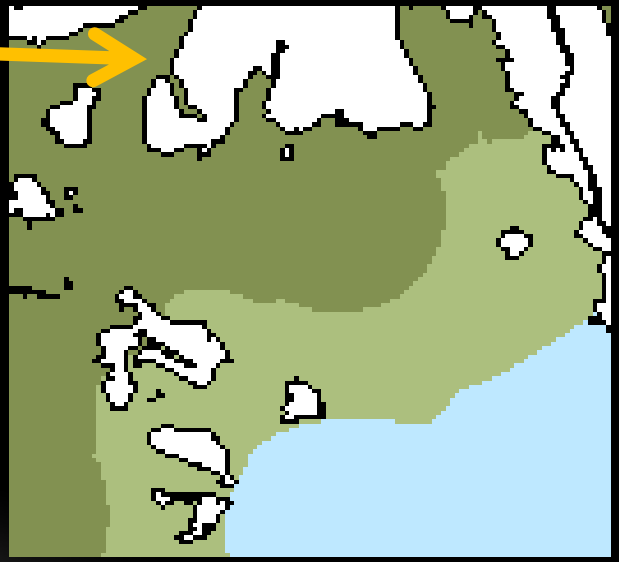
CLASSIFICATION TECHNIQUES



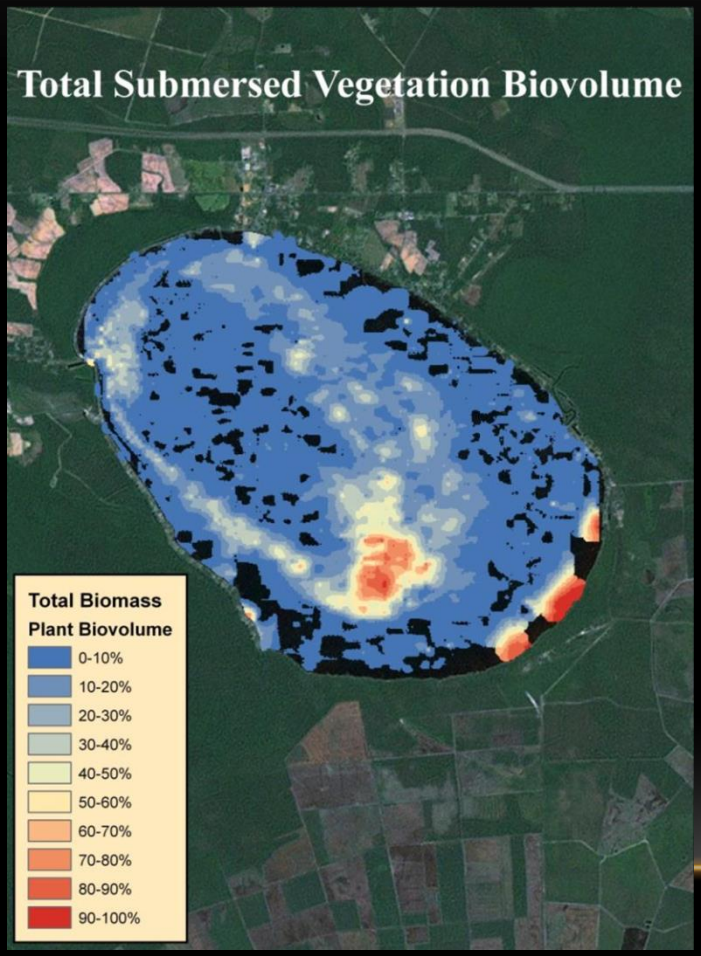


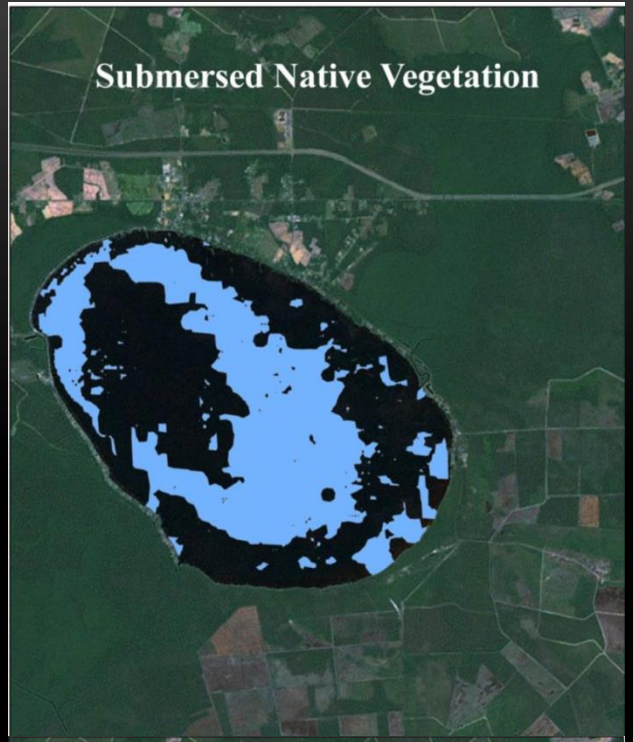


BEYOND THE "TUCK"

- Lake Waccamaw – Hydroacoustic Vegetation Survey
- Lake Gaston and Kerr Lake – Continued mapping of Hydrilla and other AIPS
  - Volunteer Mapping and Monitoring
- Aquatic Invasive Species Awareness Programs (AISAP)
  - Signage/ Boat Inspection and Awareness days

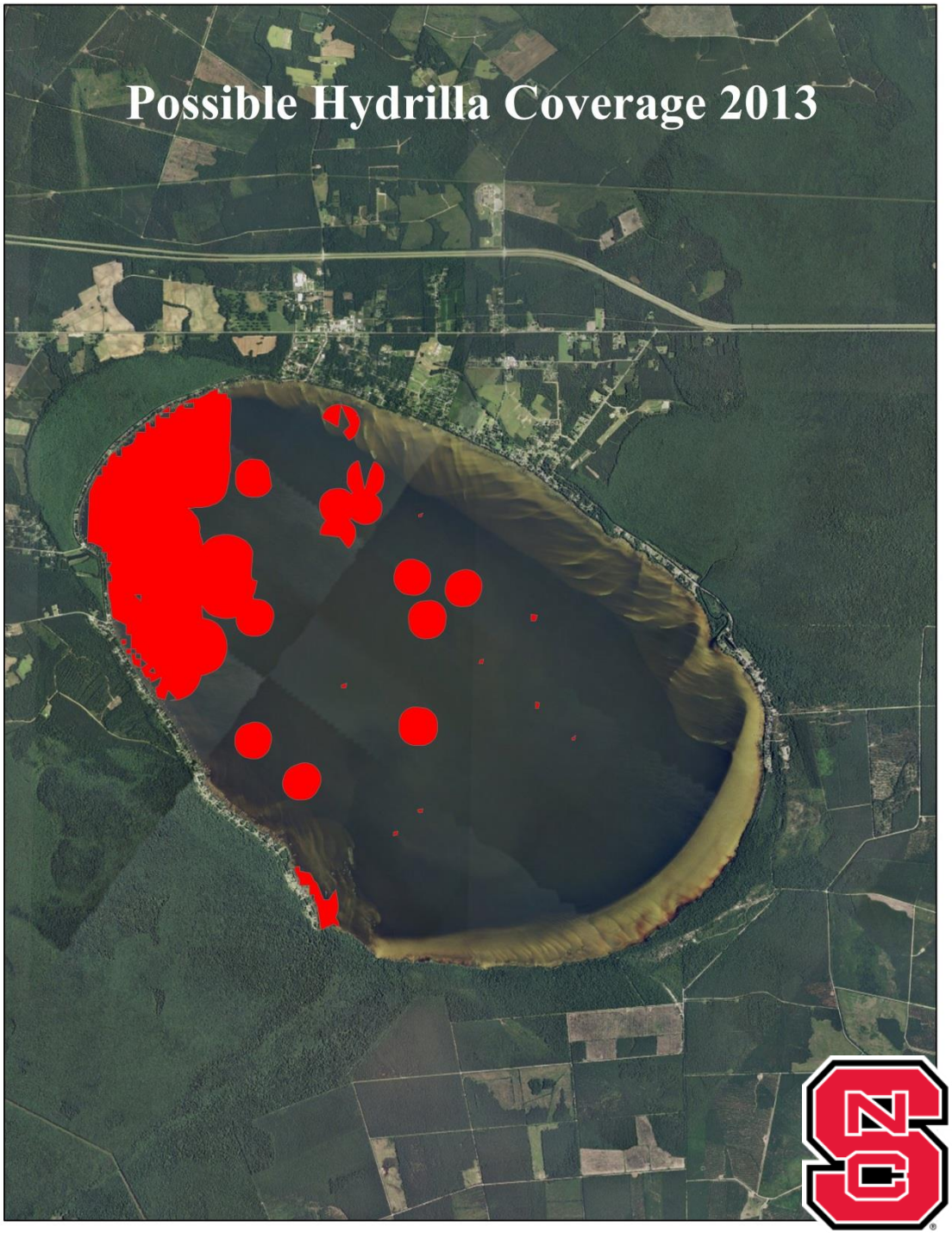
LAKE WACCAMAW



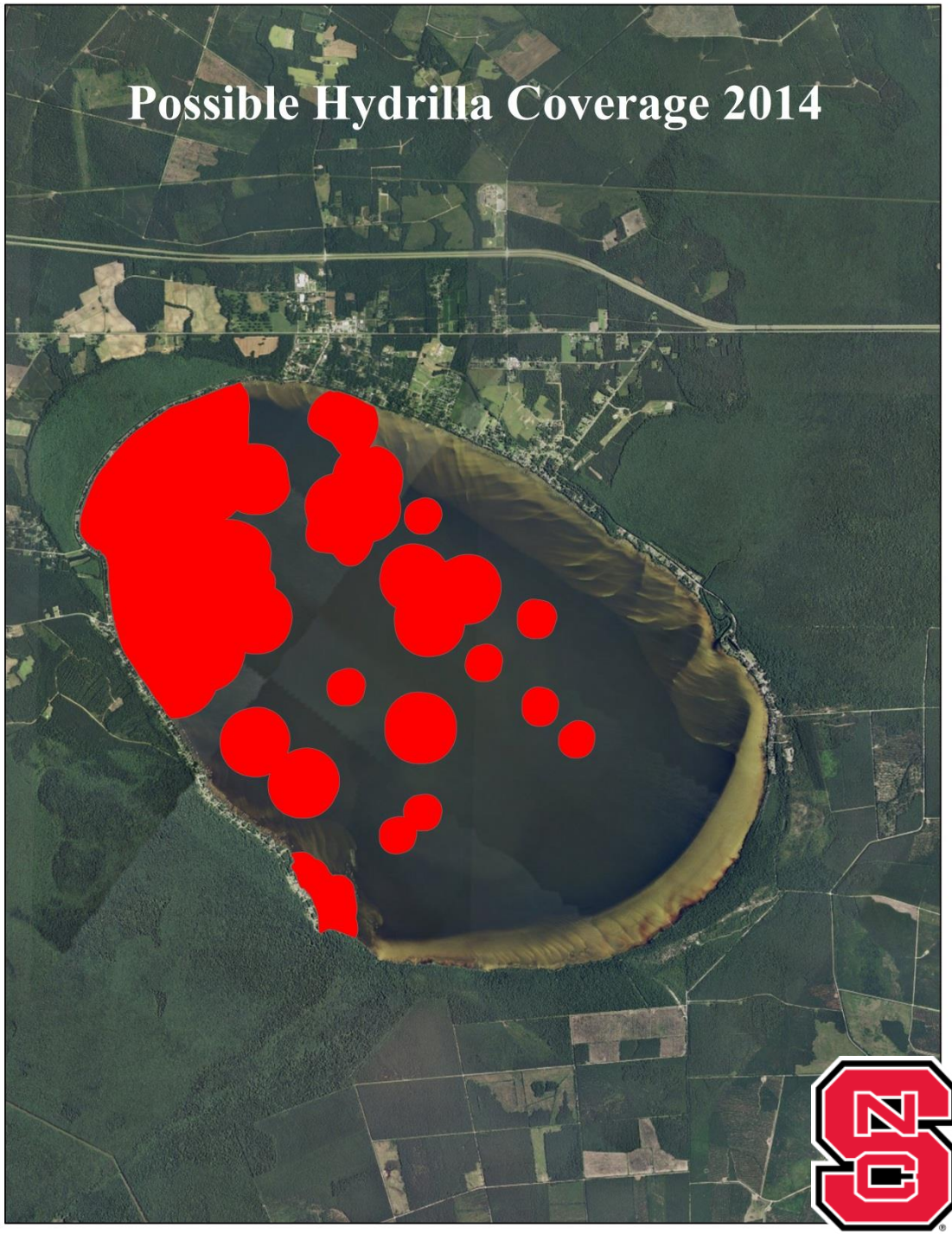


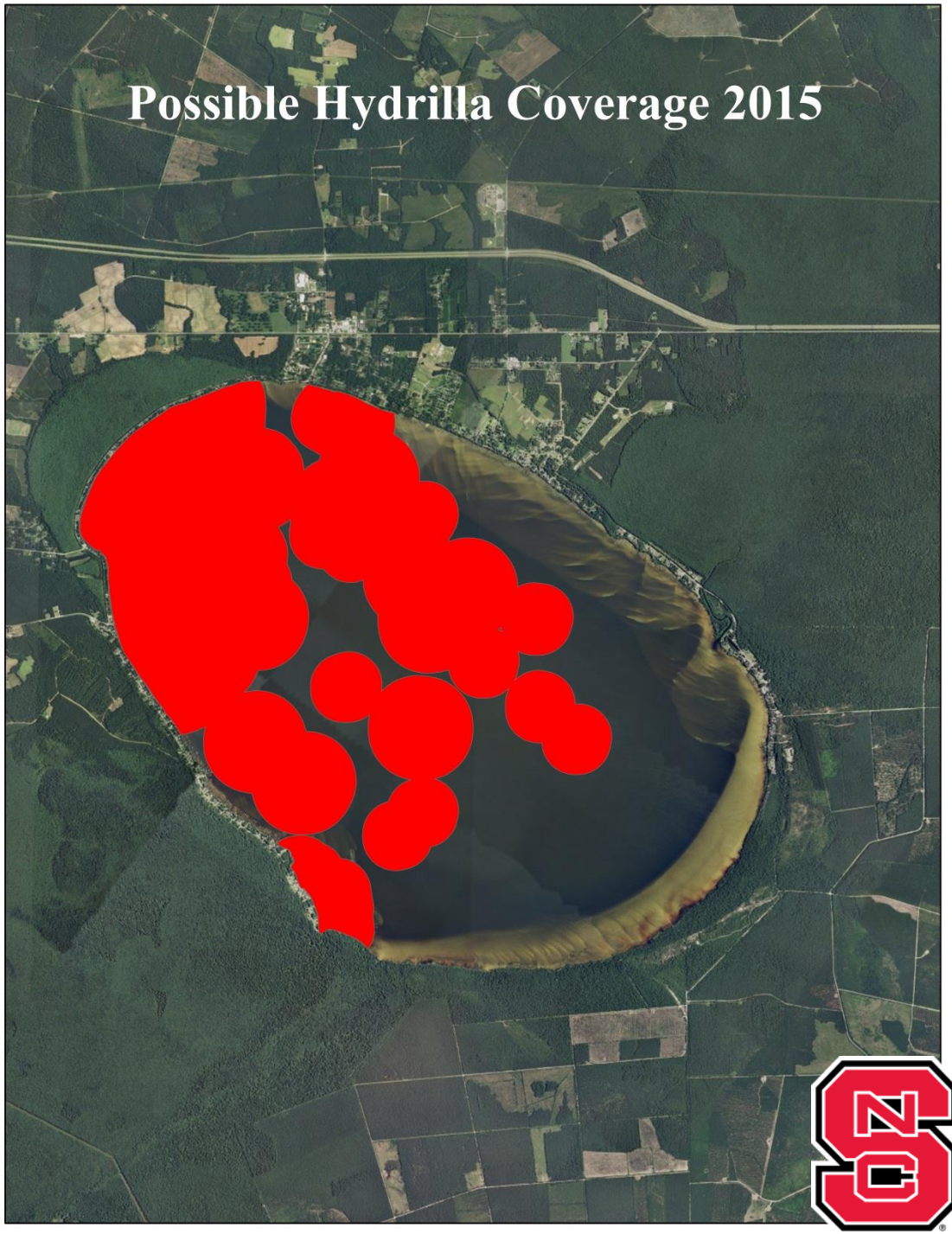
ESTIMATE OF SPREAD WITHOUT MANAGEMENT

2013 - 1474 A



2014 - 2932 A





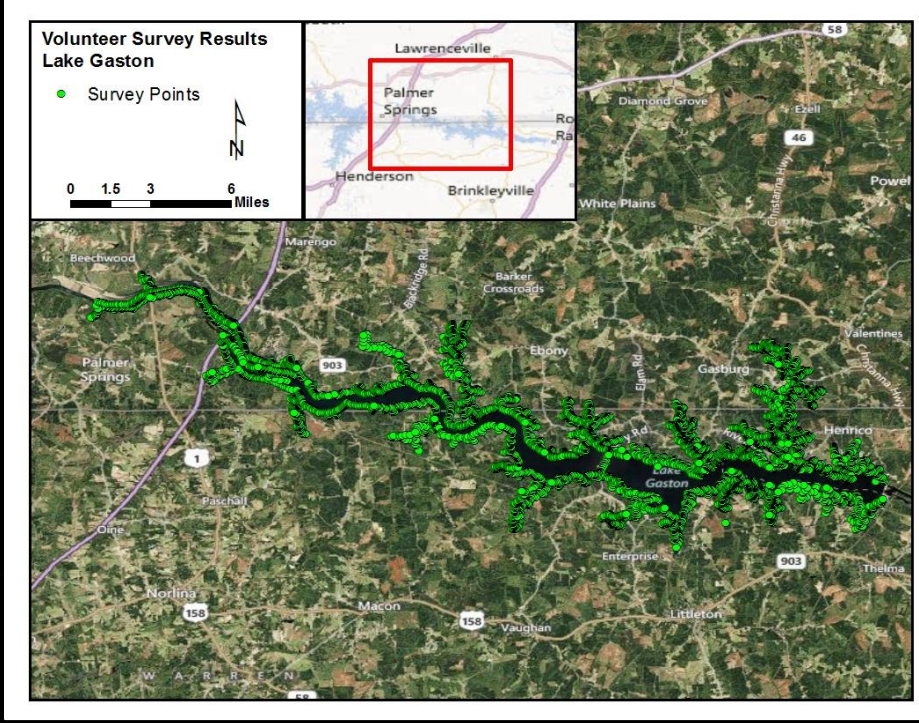
2015 - 4596 A

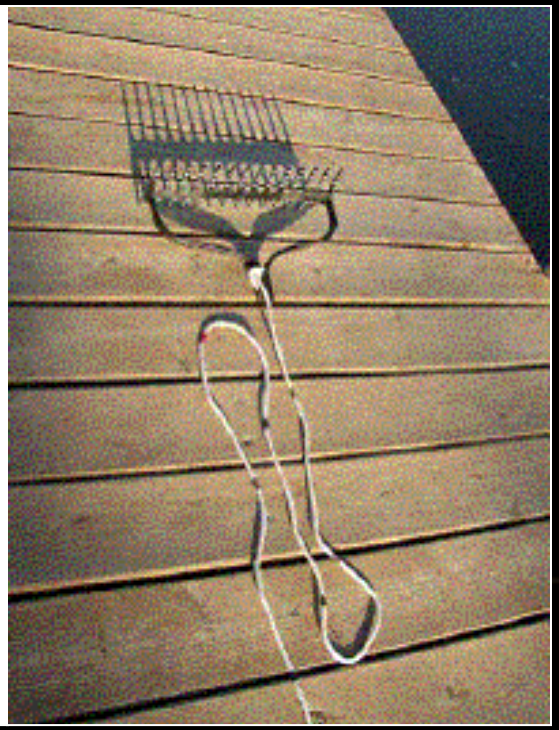
2016 - 5700 A

2017 - 6223 A

LAKE GASTON VOLUNTEER VEGETATION SURVEY

- Approx. 38 Volunteers
- 5,765 points collected (Entire Lake Coverage)
- 80 different collection areas
- 633 hours/ 26 days of total work





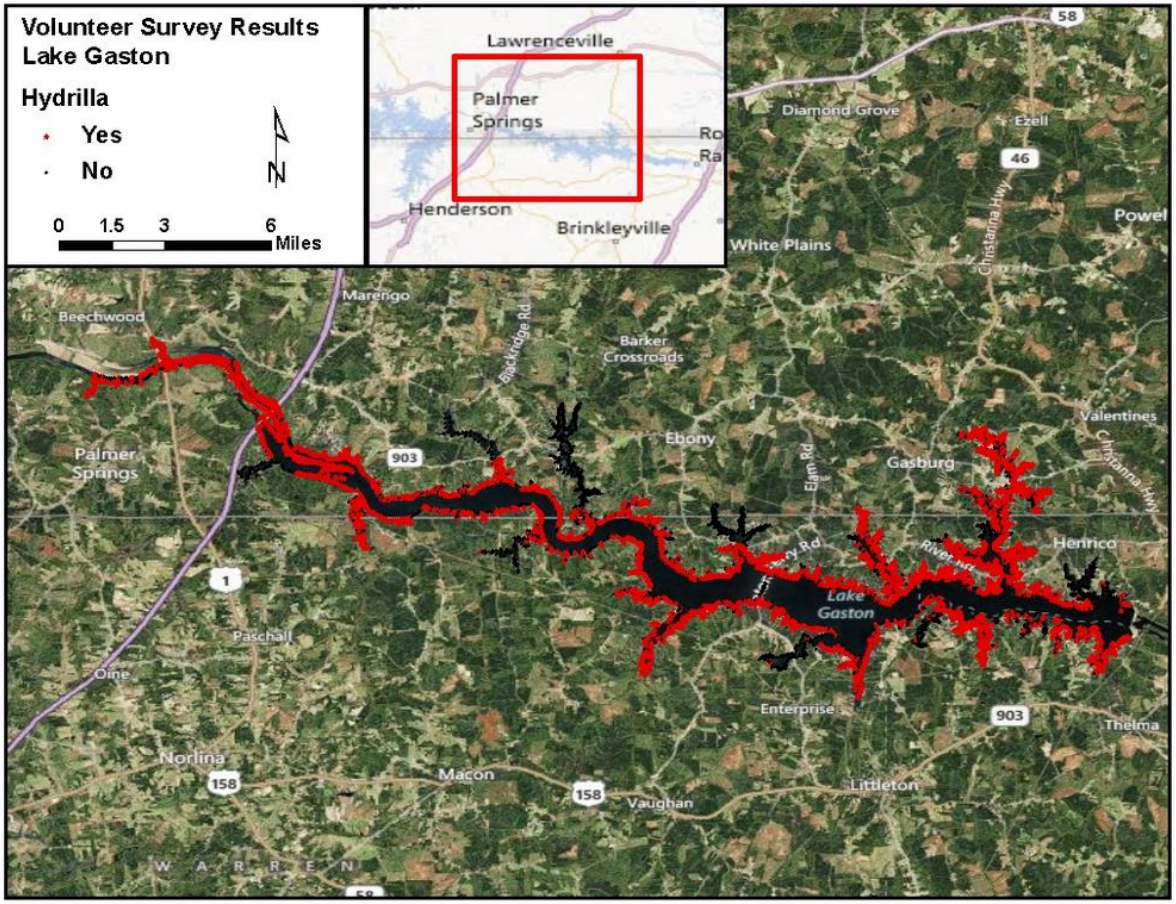
Whole Lake.jpg (JPEG Image, 1056 × 816 pixels) - Scaled (97%) - Mozilla Firefox

File Edit View History Bookmarks Tools Help

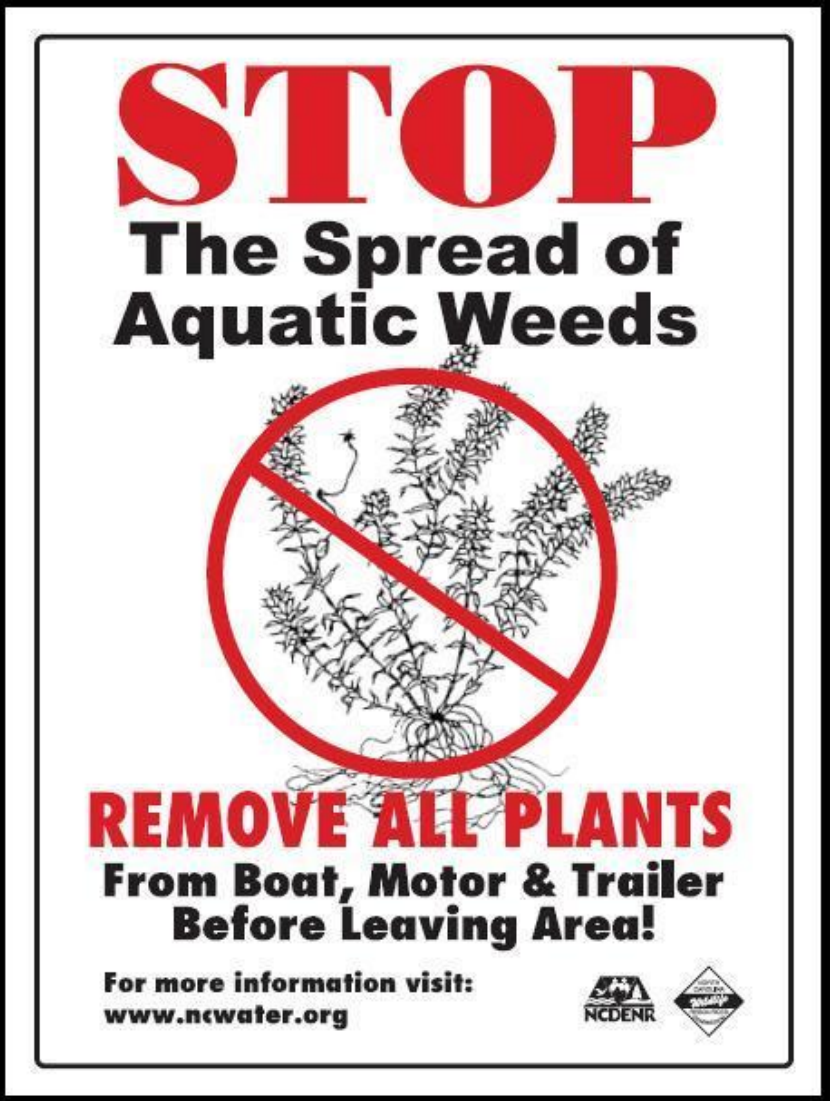
SAV Partnership Meeting Info 4/19 - ... | Whole Lake.jpg (JPEG Image, 1056 × ...

www.weedscience.ncsu.edu/aquaticweeds/gaston/2012/Hydrilla/Whole Lake.jpg

Lake Gaston Aquatic Plant Mapping



AISAP PROGRAM



BOAT/ EQUIPMENT INSPECTION DAYS

- NCWRC and VADGIF Ramps
- Use of “Trainees”
- First Event – April 28th, 2013

CONTACTS

State Regulations and Information Sources

Many states have regulations that prohibit the possession, transportation and release of specific aquatic invaders referred to as prohibited species. In North Carolina the regulatory agencies are:

N.C. Department of Agriculture and Consumer Services, Plant Industry – Plant Protection Section. 919-733-6930
N.C. Wildlife Resources Commission, Division of Wildlife Management. 919-707-0050

To report a sighting or learn more about invasive species, contact one of the natural resource managers listed below:

NCDENR

Kevin Hart
N.C. Division of Marine Fisheries
Habitat Section
252-946-6481
kevin.hart@ncdenr.gov

Rob Emans
N.C. Division of Water Resources
Aquatic Weed Control
919-733-4064
rob.emans@ncdenr.gov

http://www.gsarp.org

www.midatlanticpanel.org

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HELP STOP Aquatic Hitchhikers

STOP AQUATIC HITCHHIKERS!

www.ProtectYourWaters.net

INSPECT

Enjoying the great outdoors

is important to many of us. Boating, fishing, hunting and wildlife watching are traditions that we want to preserve for our children and their children. Today, these traditions are at risk. Aquatic invaders such as zebra mussels, applesnails, snakehead fish, jellyfish, hydrilla and flathead catfish threaten our valuable waters and recreation. These and other non-native, or exotic plants and animals do not naturally occur in our waters and are called invasive species because they cause ecological and/or economic harm.

The main way invasive species get into lakes, rivers, and wetlands is by “hitching” rides with boaters and other outdoor recreationists. If you leave a body of water without taking precautions recommended in this brochure, you may be transporting these harmful species from one lake, river or wetland to another. These “aquatic hitchhikers,” such as Giant Salvinia (right), have invaded our waters; doing harm to lakes, streams, wetlands and their native inhabitants.

Giant Salvinia

The good news is that the majority of waters are not yet infested with invasive species and you can help protect our valuable water resources.

Stop Aquatic Hitchhikers!

Fortunately, there are a few simple actions you can take to prevent the spread of non-native plants and animals.

In many states and provinces it is illegal to transport aquatic invasive species, so taking the following actions may also help avoid a citation (see back page).

“Stop Aquatic Hitchhikers!” is a national campaign that helps recreational users to become part of the solution in stopping the transport and spread of aquatic invasive species.

INSPECT your boat, trailer and equipment and **REMOVE** visible aquatic plants, animals and mud before leaving the water access.

It is important to carefully inspect and remove all plant fragments and debris before you leave the access area to ensure you are not transporting an invasive species. This practice will reduce the chance of moving organisms to new locations.

REMOVE