Fowl River Marsh Study - Vegetation

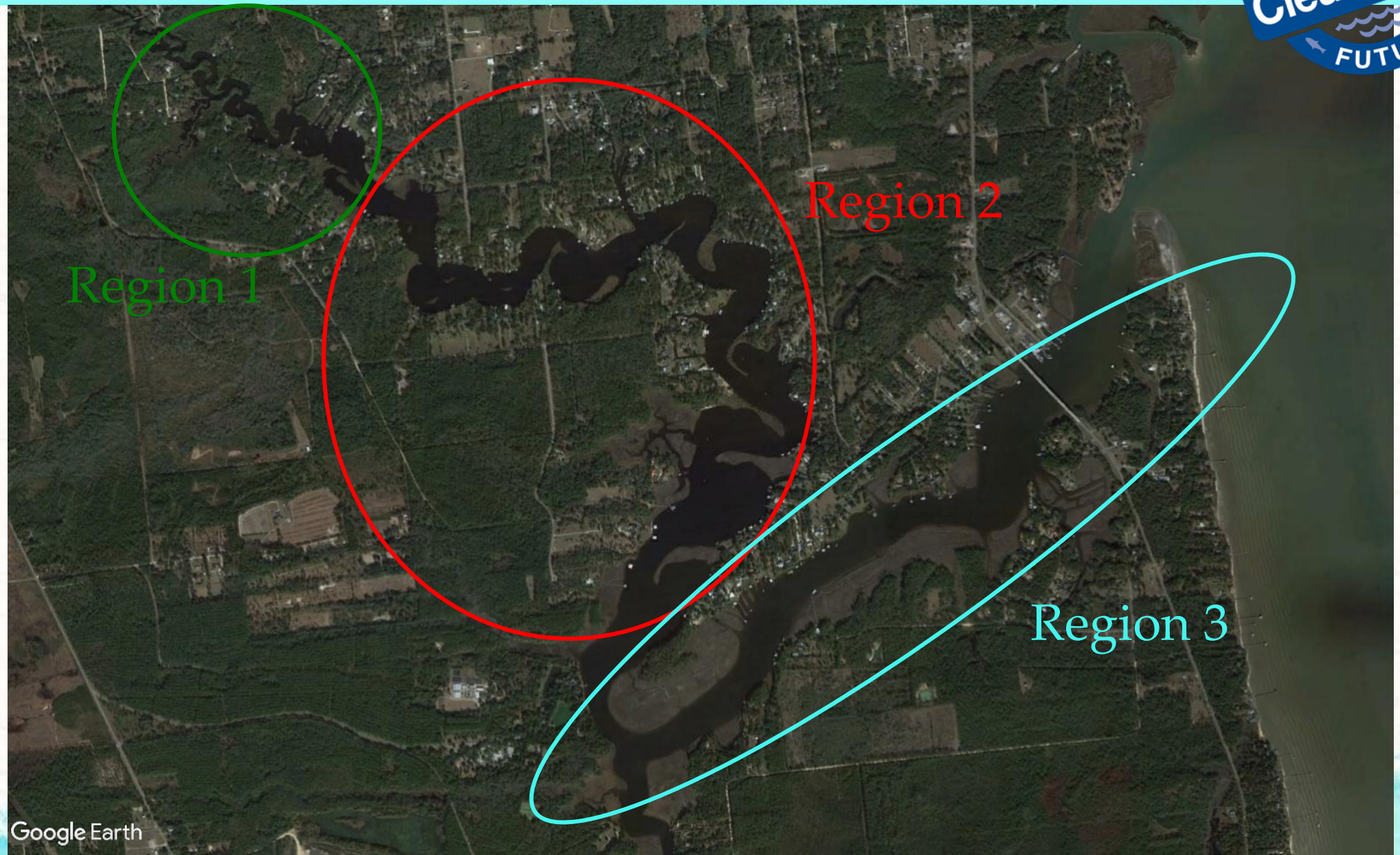


Photo by S. St. John

Photo by S. St. John

Fowl River Marsh Study - Vegetation

Measurements:

1) Plant species diversity, % cover, distribution
2) Plant community zonation
3) Habitat quality indices – HGM and FQI

↕ Measured in Summer

4) Plant morphology and productivity
5) Marsh elevation
6) Sediment erosion/accrual on the marsh

↕ Measured in Spring and Fall

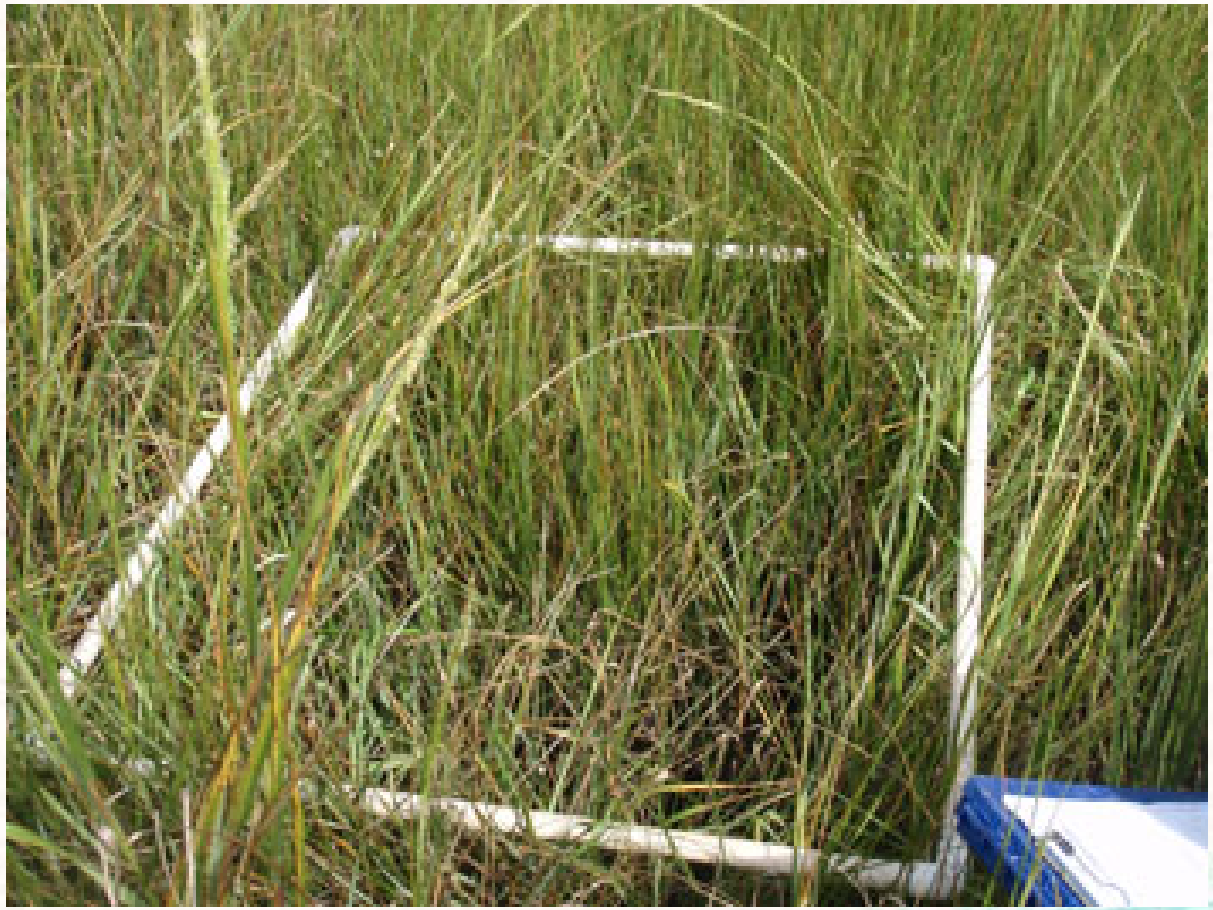
7) Marsh porewater measurements:
   - Monthly measurements of salinity, oxygen and sulfide
   - Continuous records of salinity and water level

Fowl River Marsh Study - Vegetation

PLANT SPECIES DIVERSITY, % COVER, AND DISTRIBUTION

Percent coverage will be measured within 1-m^2 quadrats placed along the study transects, and also haphazardly to account for site heterogeneity.

All plant species will be identified.



Fowl River Marsh Study - Vegetation

PLANT COMMUNITY ZONATION

Plant community zones, including SAV bed boundaries, will be delineated and mapped with GPS.

Fowl River Marsh Study - Vegetation

TIDAL MARSH HYDROGEOMORPHIC MODEL

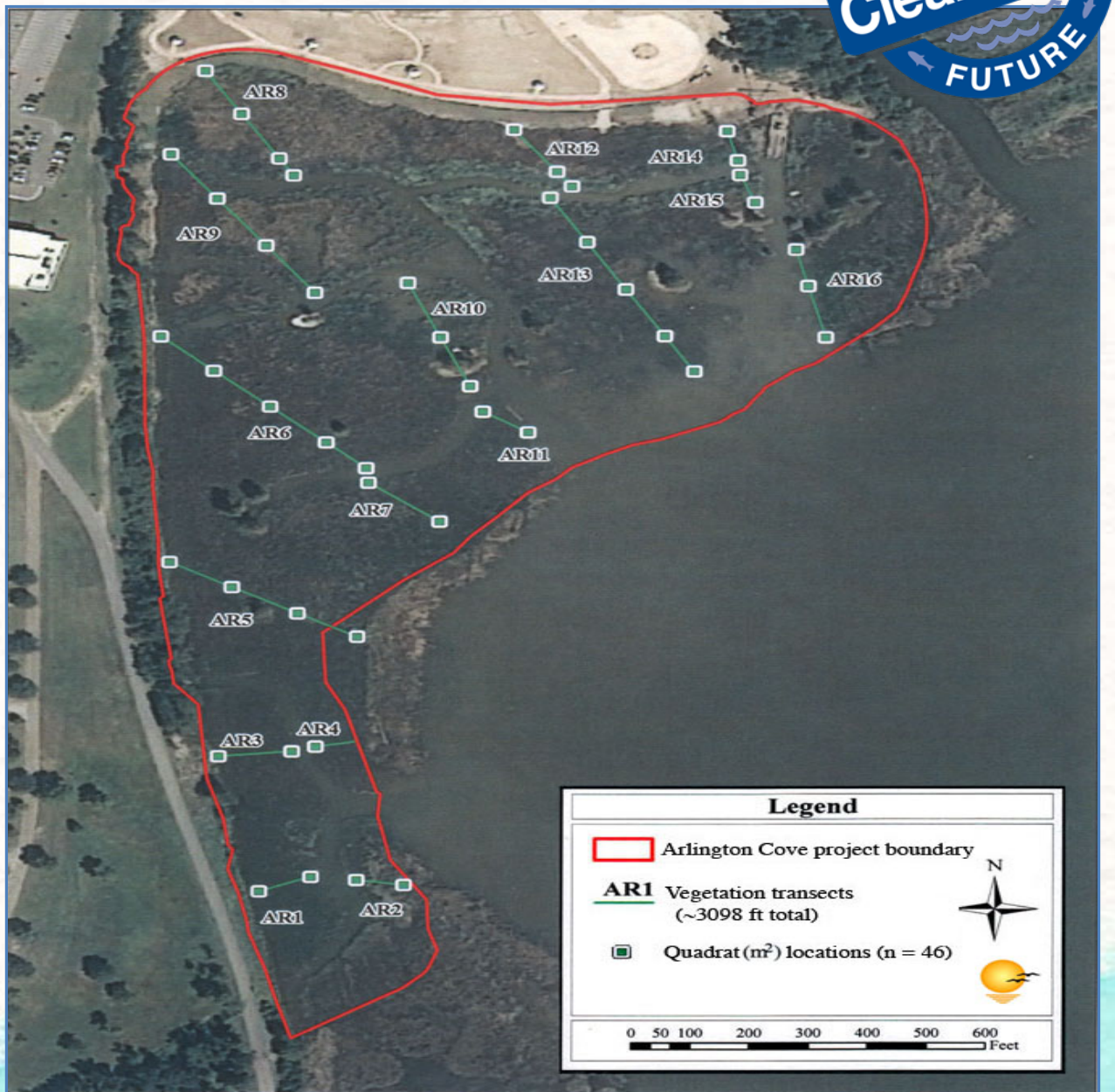
Mathematically derived indices assess the capacity of Alabama fringing tidal marshes to perform specific ecosystem functions (Shafer et al. 2007).

Multiple variables are combined using mathematical expressions to estimate major ecosystem functions.

Mean % Cover of Marsh Vegetation

Mean Height

Functional Capacity Equations	
Wave Energy Attenuation	$FCI = [(3V_{WIDTH} + V_{COVER}) / 4 \times V_{EXPOSE}]^{1/2}$
Biogeochemical Cycling	$FCI = [V_{HYDRO} \times V_{COVER} \times V_{LANDUSE}]^{1/3}$
Nekton Utilization Potential	$FCI = (V_{EDGE} + V_{HYDRO} + V_{NHD}) / 3$
Provide Habitat for Tidal Marsh Dependent Wildlife Species	$FCI = \{V_{SIZE} \times \text{Minimum}(V_{HEIGHT} \text{ or } V_{COVER}) \times ((V_{EDGE} + V_{WHD}) / 2)\}^{1/3}$
Maintain Plant Community Composition and Structure	$FCI = (\text{Minimum}(V_{COVER} \text{ or } V_{EXOTIC} \text{ or } V_{WIS} \text{ or } V_{WOODY})$



Fowl River Marsh Study - Vegetation

FLORISTIC QUALITY INDEX (FQI)

FQI is used to estimate wetland habitat quality based on plant species composition.

A coefficient of conservatism (C value) is scaled from 0 to 10 and is applied to each plant species in a local flora.

C values are based on:

1. Breadth of habitat preference(s)
2. Tolerance to disturbance

C values

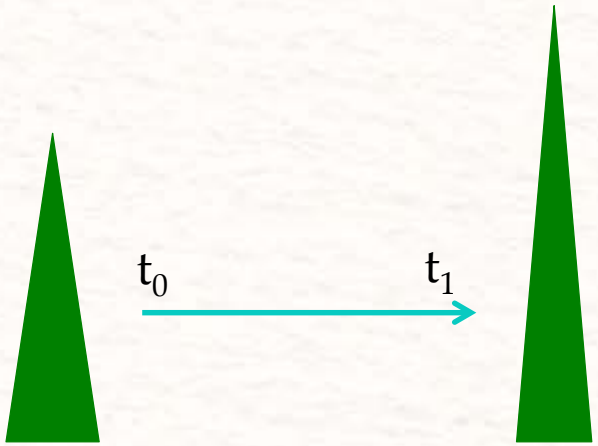
Black needlerush = 8
Sawgrass = 7
Bulltongue arrowhead = 4

Fowl River Marsh Study - Vegetation

PLANT MORPHOLOGY AND PRODUCTIVITY

Stem density, number of leaves per stem,
and leaf length and width

Above-ground (leaf) productivity: leaf length increases



Below-ground (roots and rhizomes) productivity

forestry.gov.uk

Fowl River Marsh Study - Vegetation

MARSH ELEVATION

Trimble® Real Time Kinematic (RTK) GPS (TSC-2 controller and Trimble-R8 Model-3 rover): horizontal and vertical accuracy < 5 cm

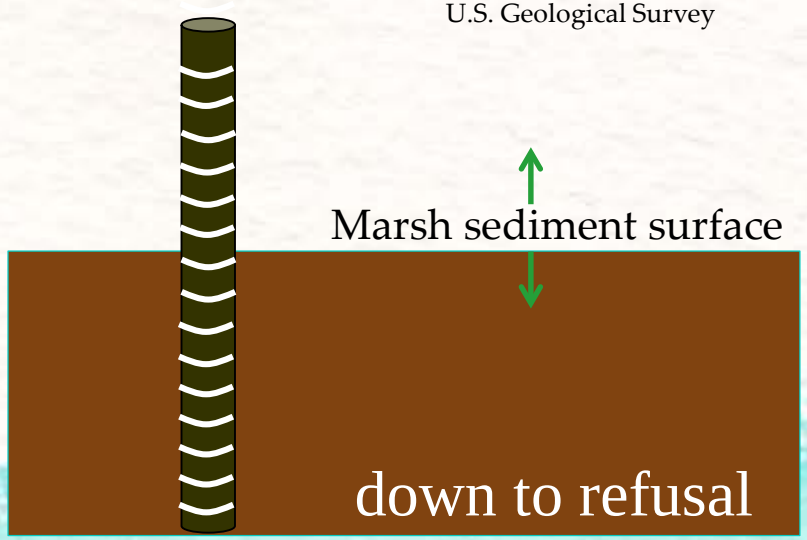
Fowl River Marsh Study - Vegetation

MARSH SEDIMENT ACCRUAL/EROSION

Horizon markers: feldspar

U.S. Geological Survey

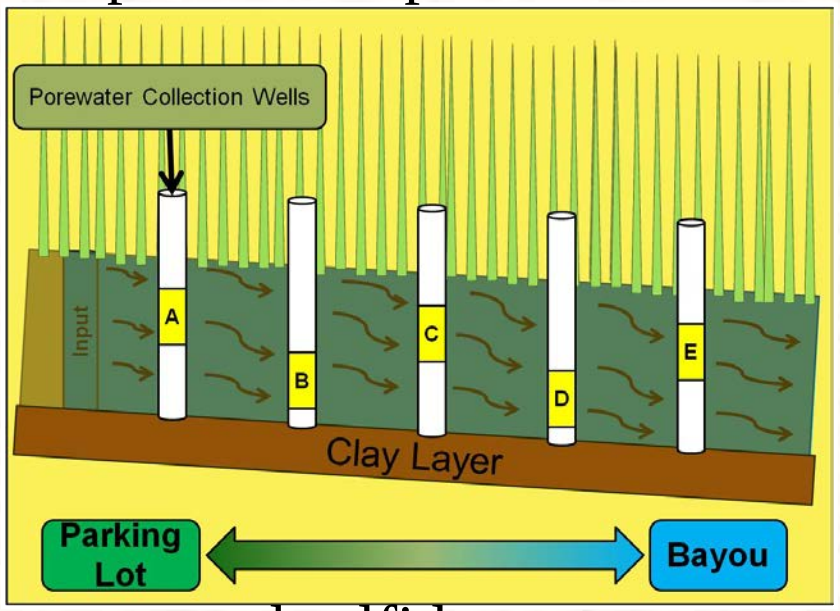
Sedimentation pins



Fowl River Marsh Study - Vegetation

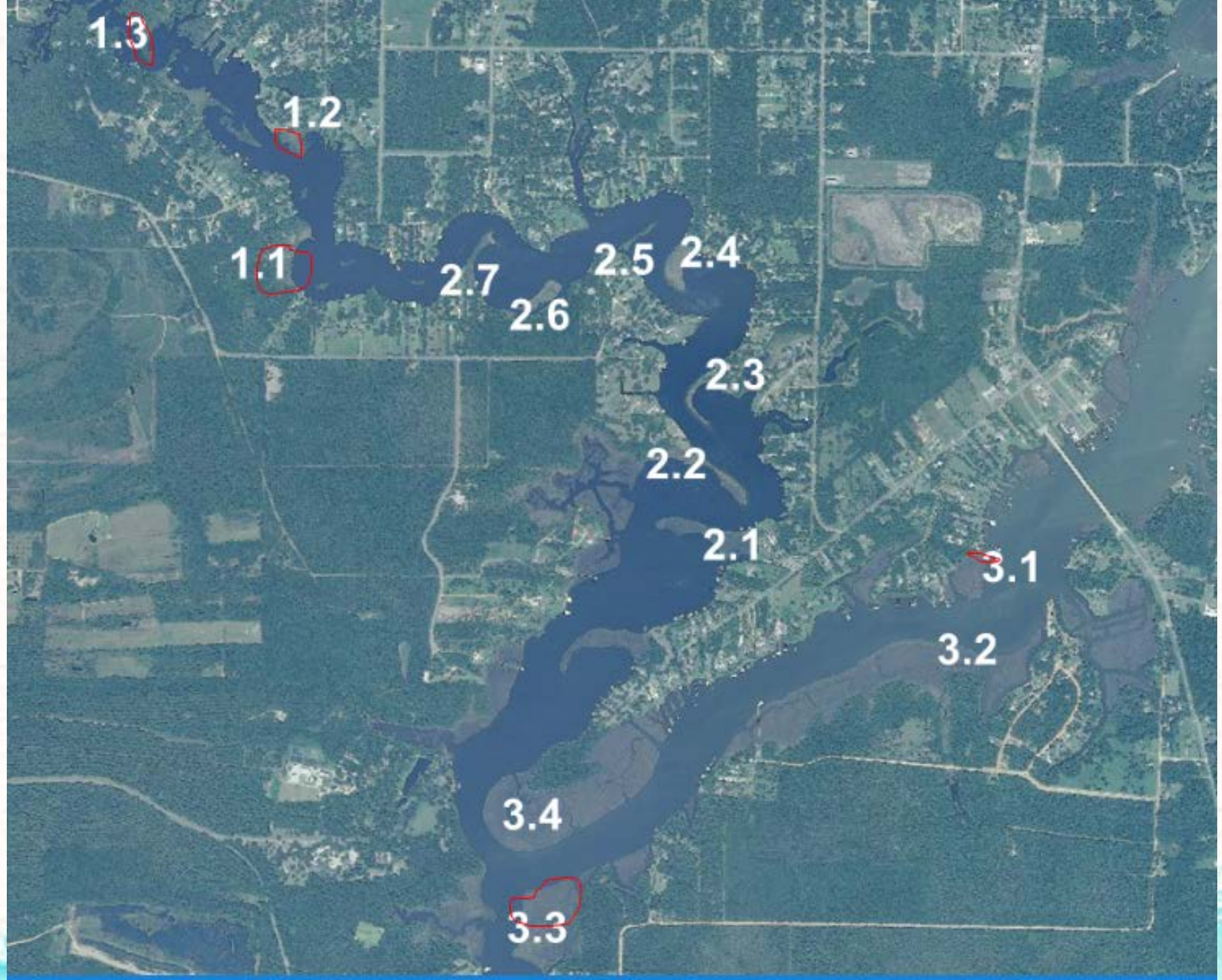
MARSH POREWATER SALINITY, OXYGEN AND SULFIDE

Marsh sediment wells: slotted PVC pipe 10 cm in diameter and 30 cm deep to encompass the complete rhizosphere



Monthly measurements of porewater salinity, oxygen and sulfide: pump wells dry and sample the recharged water

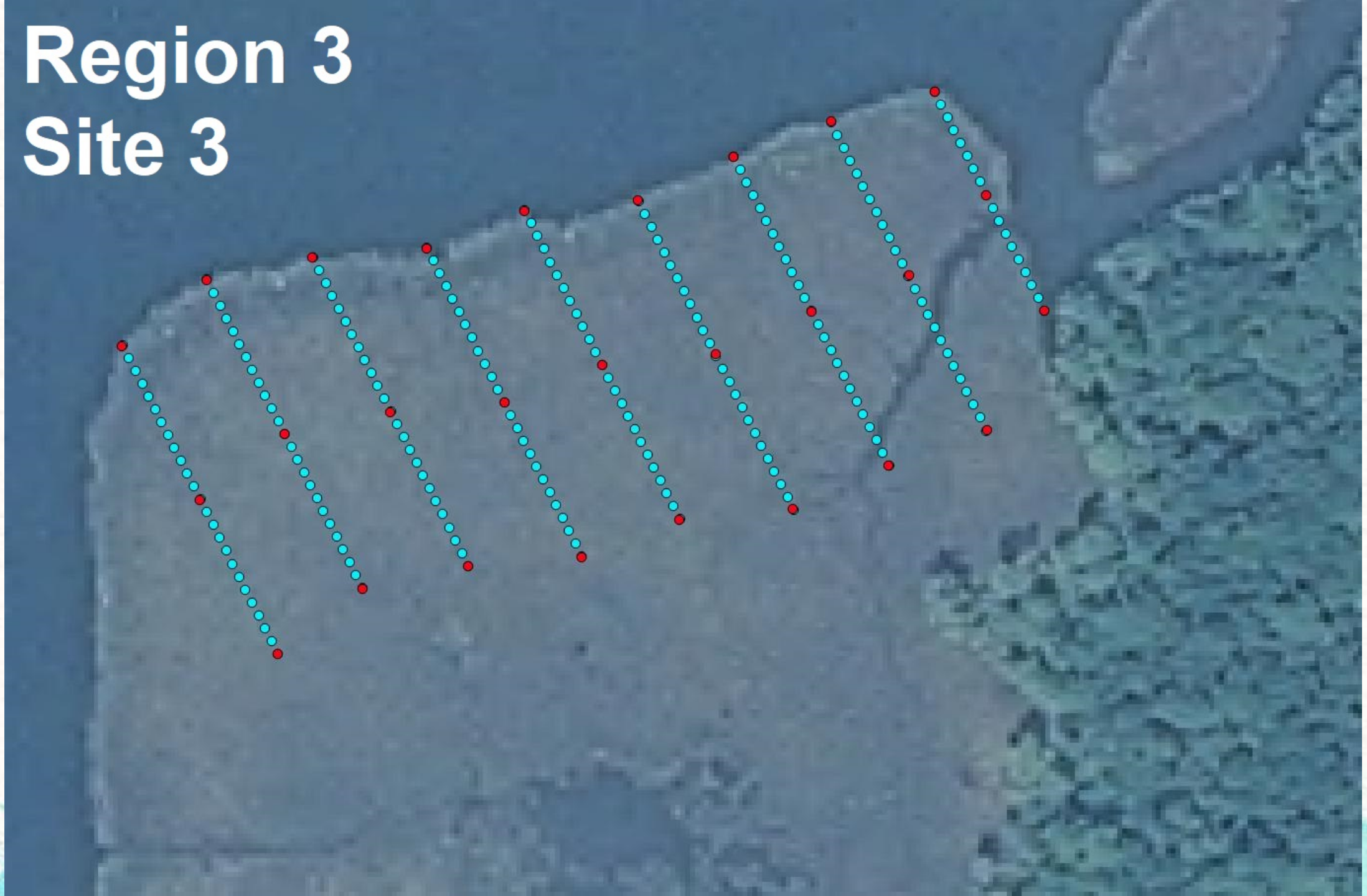
Continuous records of water level and porewater salinity: loggers located in a second set of similar wells


1.3
1.2
1.1
2.7
2.6
2.5
2.4
2.3
2.2
2.1
3.1
3.2
3.4
3.3

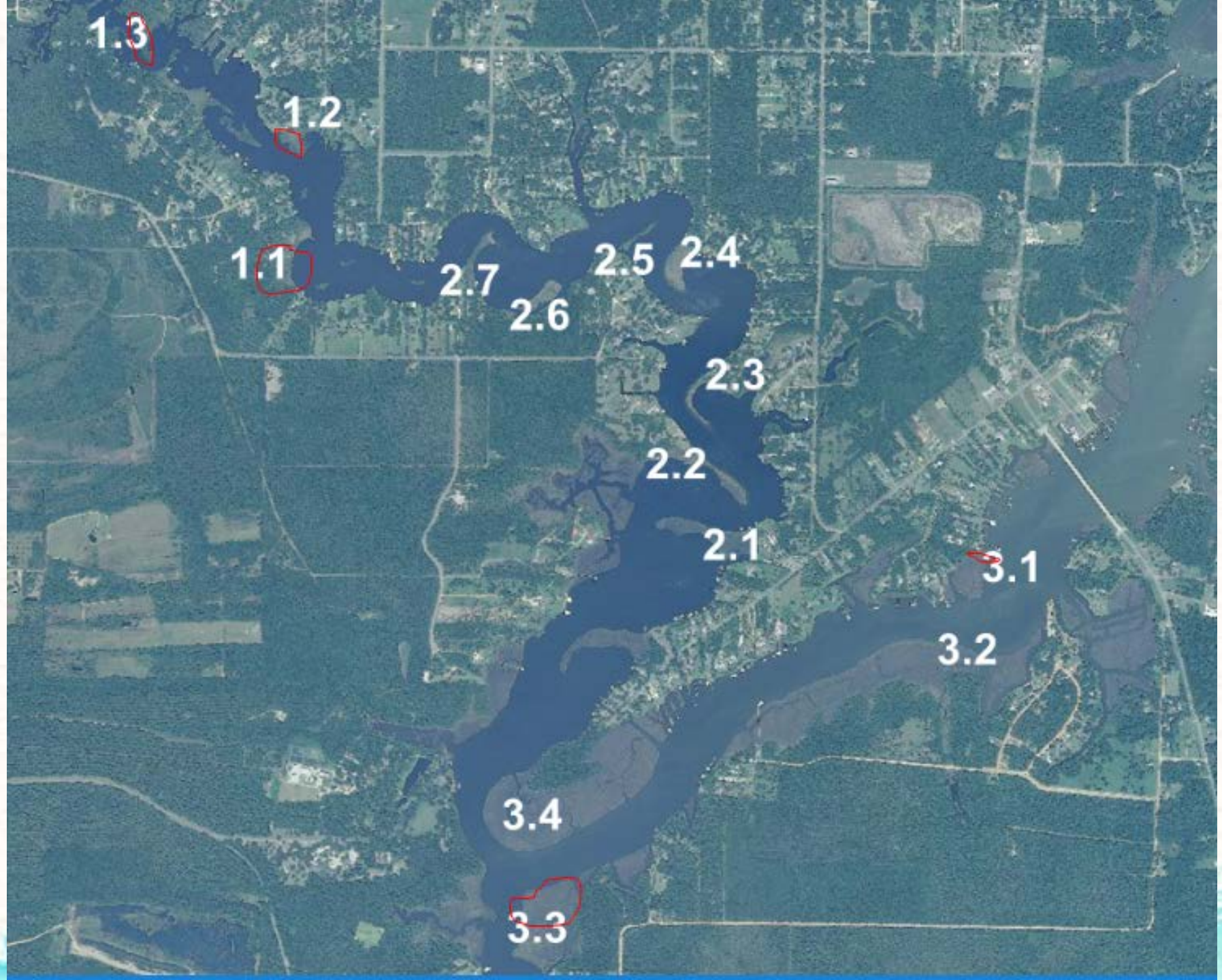
Region 1
Site 2

Region 2
Site 5

Region 2
Site 1


Region 3
Site 3

Measurement	When	Where
Diversity and Cover (also HGM and FQI)	Mid summer (one time)	All stations (green and red on the map)
Morphology/Growth	Spring and Fall	Red stations on the map
Sediment accrual/erosion (feldspar)	One time (from Spring to Fall)	Red stations on the map
Elevation (RTK)	Spring and Fall	All stations (green and red on the map)
Porewater Salinity	Monthly	Red stations on the map


1.3
1.2
1.1
2.7
2.6
2.5
2.4
2.3
2.2
2.1
3.1
3.2
3.4
3.3

Region 2
Site 5

Region 2
Site 7

Having the SAC carry out the hydrodynamic model phase: why it may be a good idea:

1) SAC has most of the needed expertise

2) SAC is already doing the first phase of the project, i.e. producing most of the empirical data that will feed the model

3) SAC is very familiar with the Fowl River system (lots of past work done in the system)

4) By having SAC carry out this second phase, the hydrodynamic model will become MBNEP property and, thus, guarantee public availability (in turn, this could be efficiently transferred to firms in charge of the Engineering and Design Phase III)

5) SAC is not bound to any political or special interest agenda, and thus has complete impartiality to present the study's conclusions as the data warrant it

Possible way forward:

1) Decision by SAC: do we want to keep the Hydrodynamic Model Phase II in house?

2) If the answer is YES:

2.1) Flesh out the final model: what other compartments/metrics/measurements/ data sets do we need?

2.2) What are the personnel and equipment needs? (make sure it fits the budget)

2.3) Time line (Start and end Date): How much overlap with the current Phase I, so we can best transfer and use the empirical data for the model? How can we best couple the Hydrodynamic Model with the Engineering and Design Phase III?