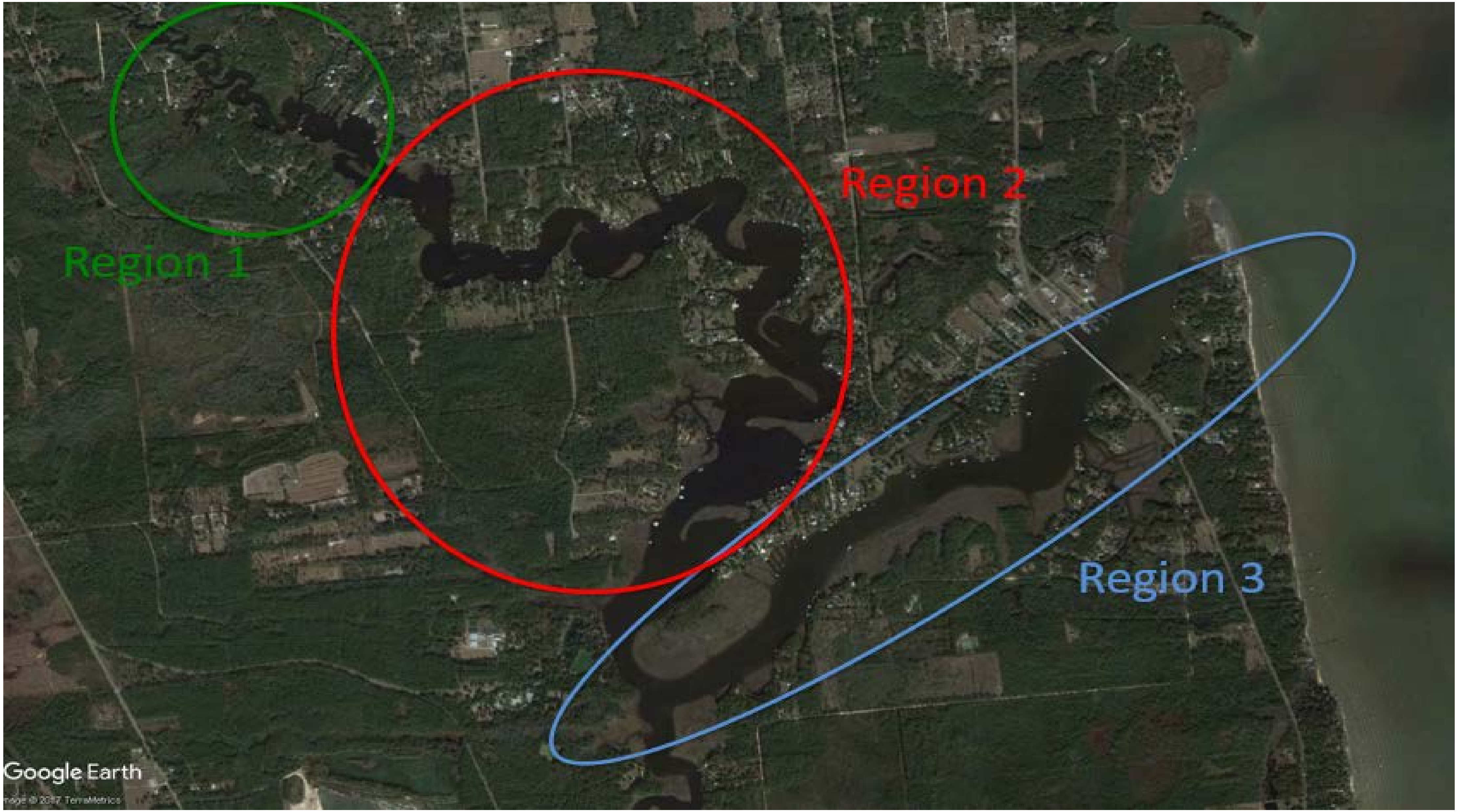
Fowl River Marsh Study - Hydrology

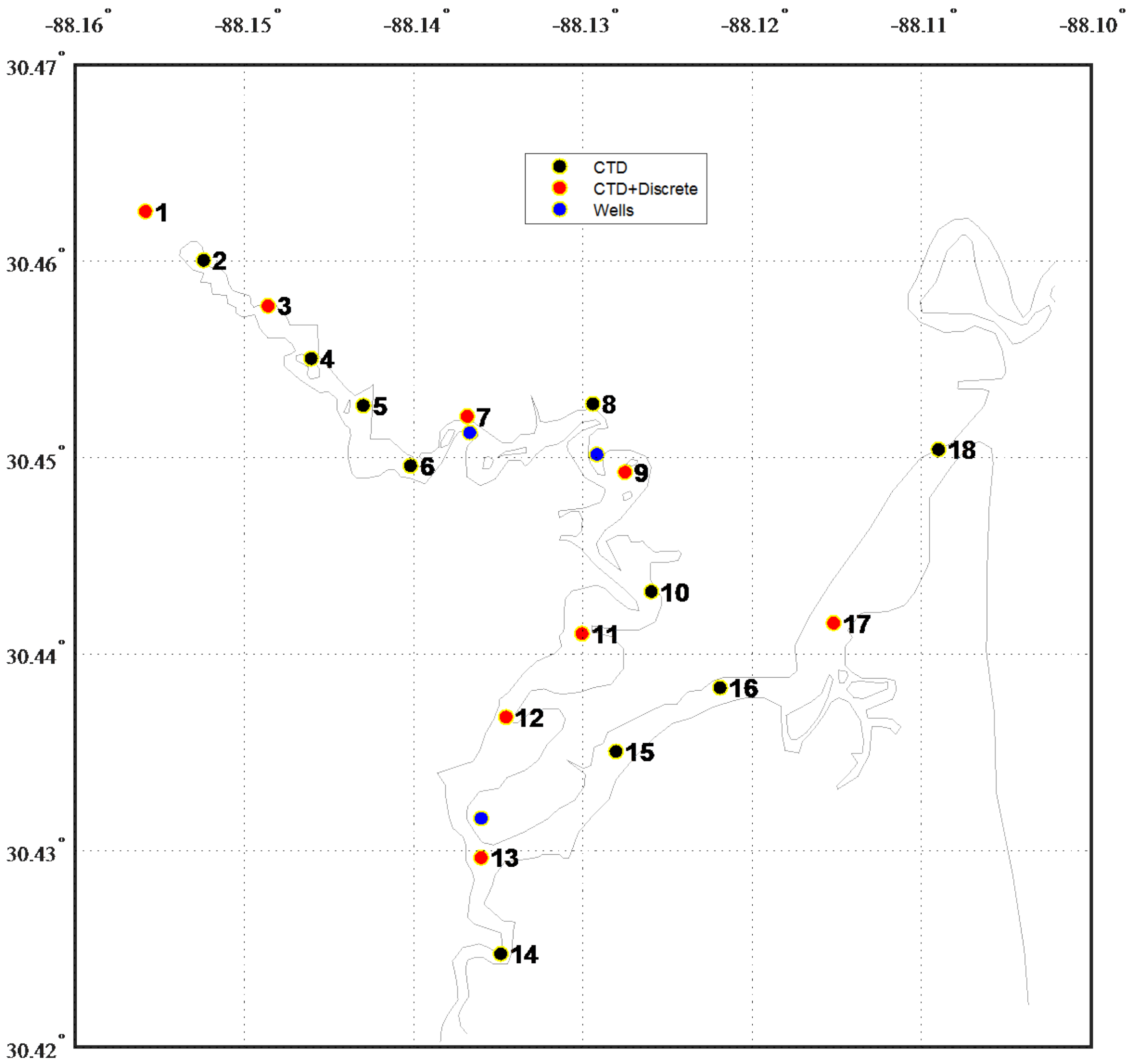
Objectives

- Characterize the monthly and seasonal water surface elevation, salinity, temperature, oxygen and nutrients
- Characterize the high frequency variability in the vertical and horizontal salinity gradients during spring-summer seasons when marsh growth is at maximum
- Develop empirical relationships between river discharge, water level, wind, and hydrologic variables at marsh spits.
- Determine the transports and residence times of salinity, nutrients, organic matter, oxygen, and suspended sediments in the system
- Assess the magnitude and frequency of boat wakes that impinge upon the marsh edge


Region 1
Region 2
Region 3
Google Earth

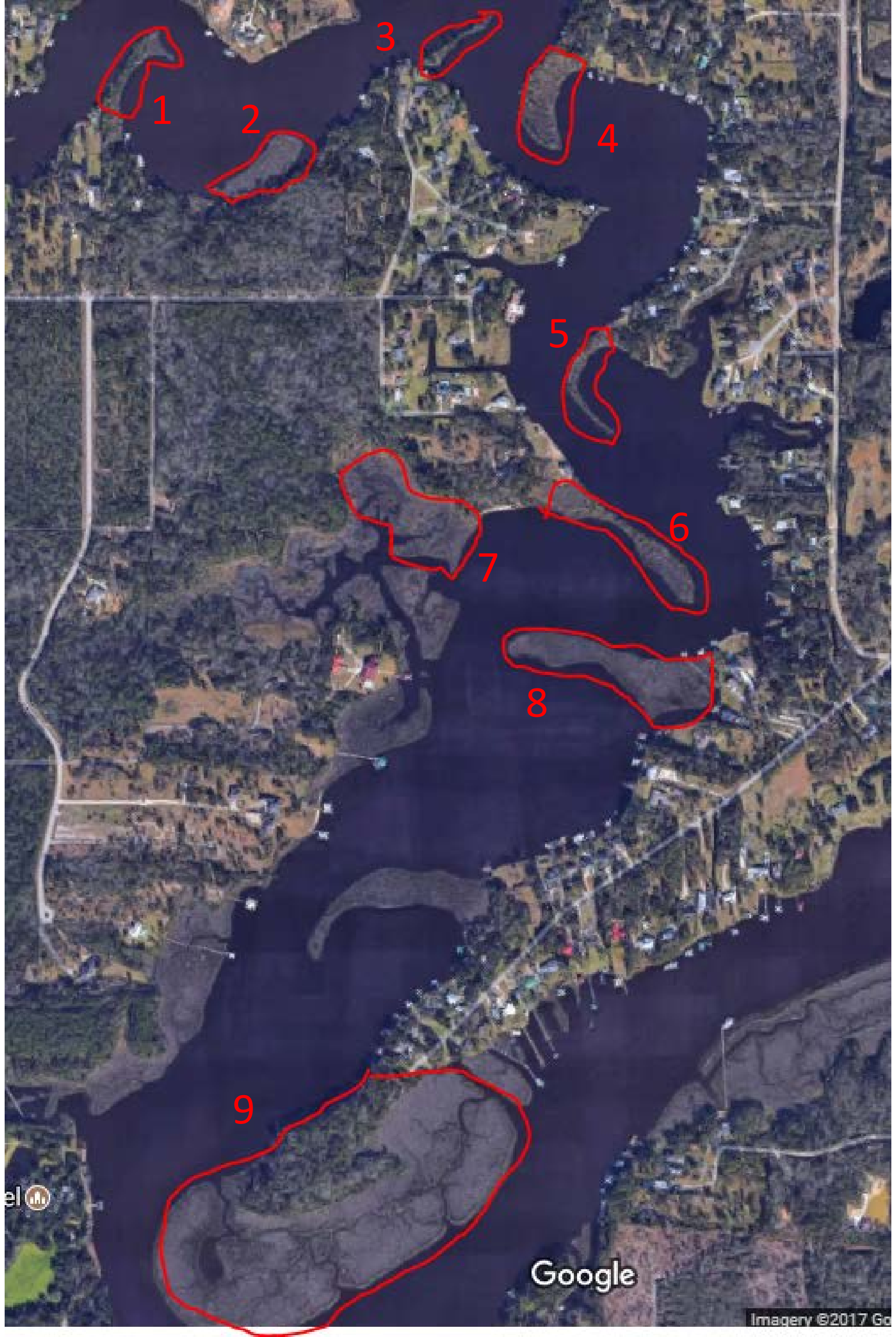
Hydrography

- Completed sampling in Jan, Feb, Mar, Apr; scheduled monthly through 2018
- 18 hydrographic stations
  - CTD (S, T, O_2)
  - 6 sites in Region 1, 6 in Region 2, and 6 in Region 3
- 8 discrete sampling stations
  - TSS, nutrients, organic matter (bulk carbon and nitrogen and isotopes), Chl*a*
  - 2 sites in Region 1, 4 in Region 2, and 2 in Region 3
  - Surface and bottom samples



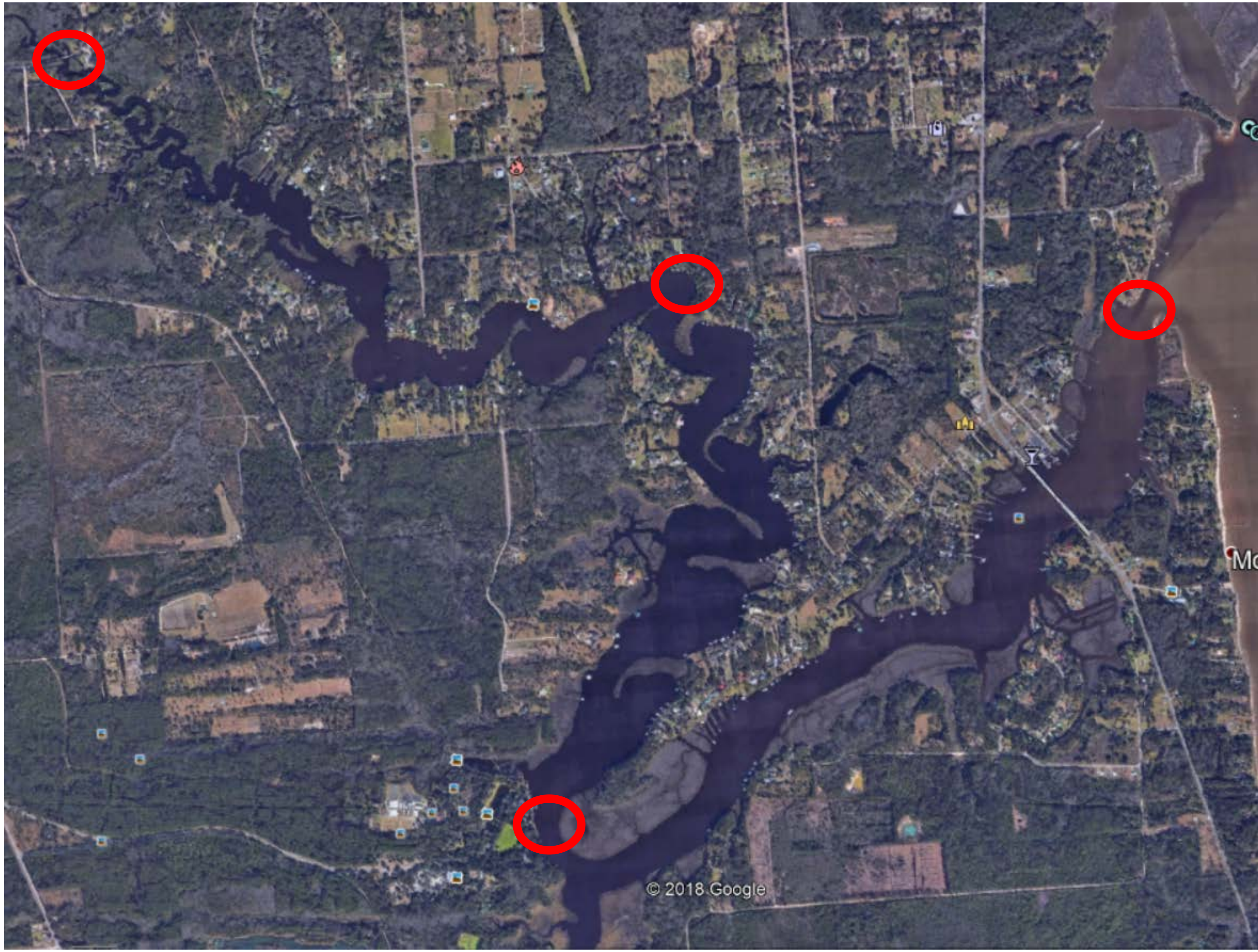
Marsh porewater continuous measurements (begun April 20)

- Installed wells in spits 1, 4, and 9
  - Spit 1: Forested
  - Spit 4: Forested/Marsh
  - Spit 9: Marsh
  - Three wells per spit installed across elevation gradient
  - Surveyed with RTK GPS
- Deployed continuous loggers in each well
  - water surface elevation
  - temperature
  - salinity
  - oxygen



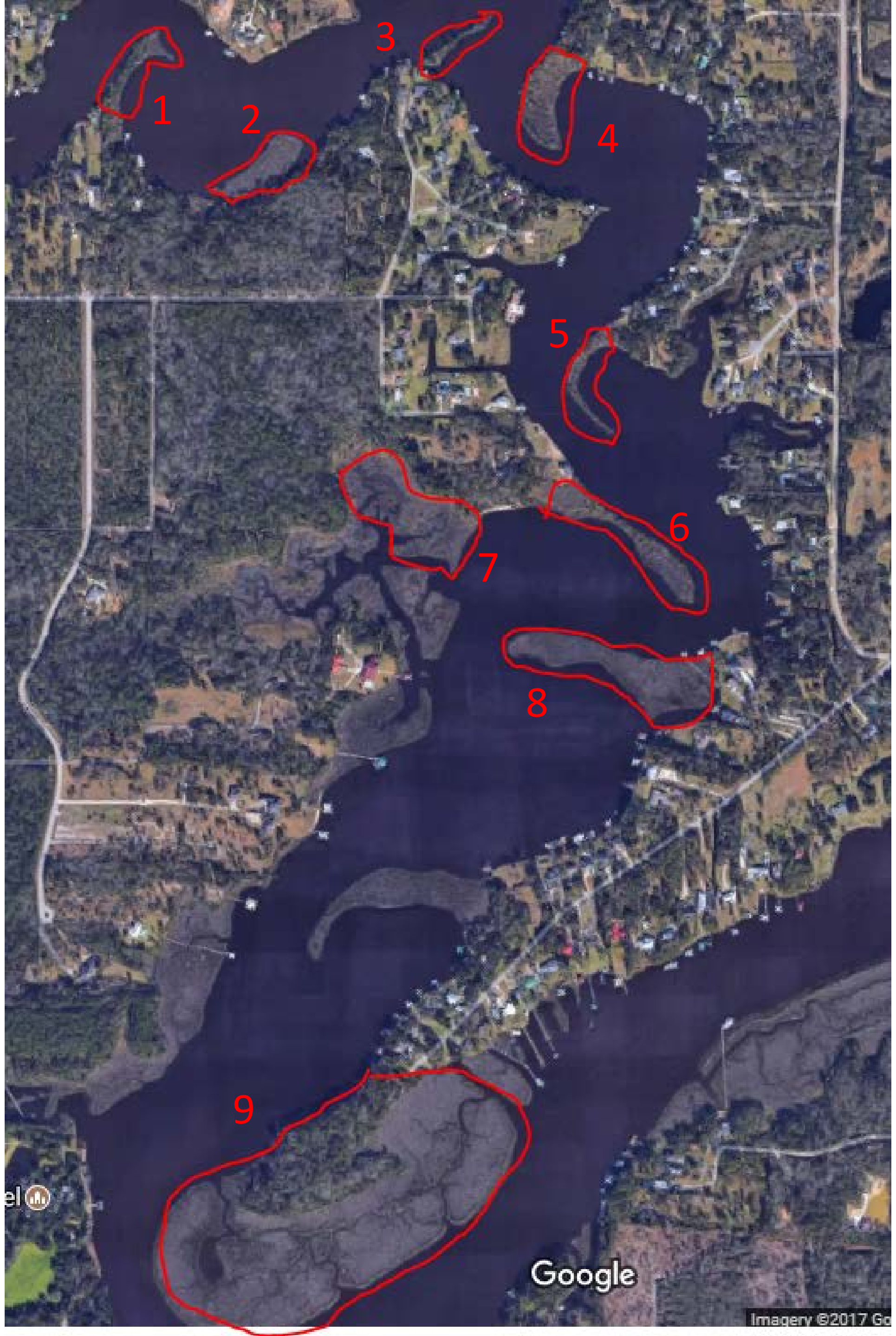
Water column continuous measurements (begun May 1)

- Mouth
  - Water column - velocity
  - Bottom - temperature, salinity, pressure, dissolved oxygen
- Bellingrath Gardens
  - Water column - velocity,
  - Surface and Bottom - temperature, salinity, pressure, dissolved oxygen
- Spit site
  - Bottom – velocity, temperature, salinity, pressure, dissolved oxygen
- Upriver bridge
  - Bottom – velocity, temperature, salinity, pressure, dissolved oxygen



Wave gauges on spit edges (to be installed by Memorial Day)

- Installed near wells on spits 1, 4, and 9
- 3 additional spit sites
- Maintained through Labor Day



Fowl River Marsh Study – Proposed Next Step

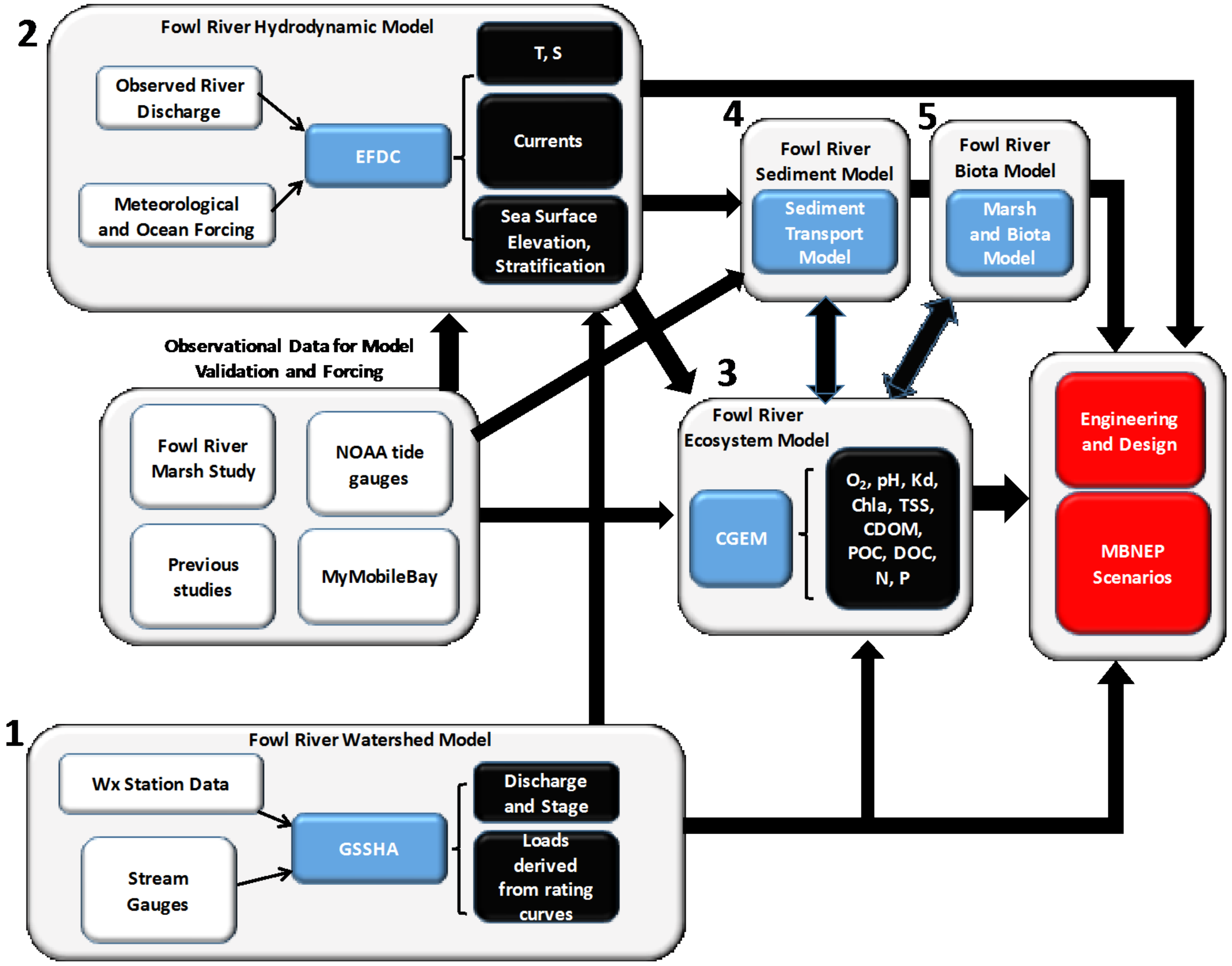
Modeling

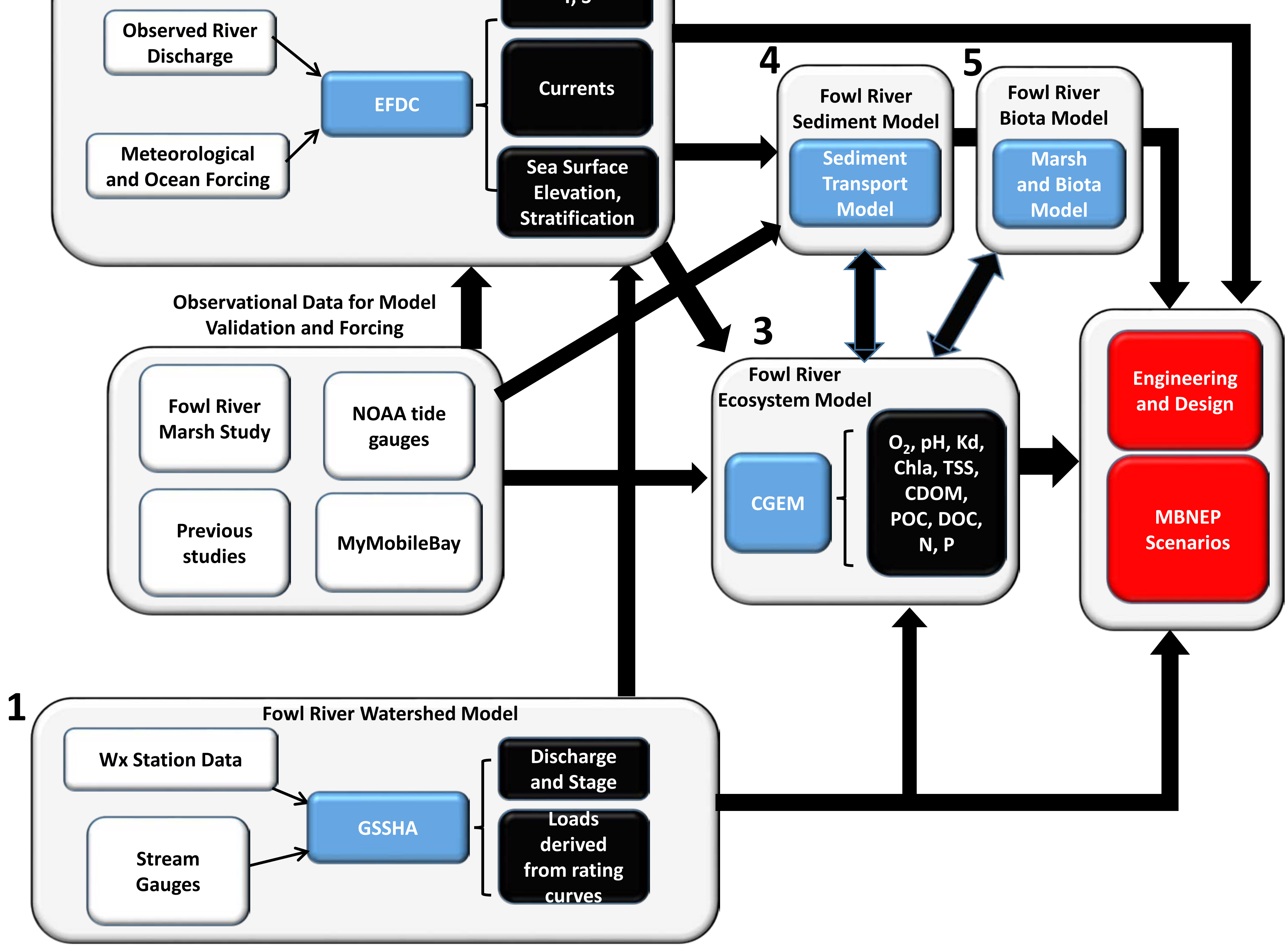
- Engineering and Design phase will require modeling to
  - Facilitate design of the restoration, e.g. raising the elevation of the marshes or armoring the shoreline
  - Evaluate unintended consequences, e.g. creating erosional hotspots downstream of armored shorelines; or altering physics, chemistry, and biology
  - Predict the expected ”life” of the restoration project in the face of other environmental change, e.g. sea level rise; changing watershed land-use; altered hydrology/hydrography
- Modeling provides a predictive capability for NEP to
  - Holistically evaluate impacts of other proposed restoration and conservation projects as outlined in the Fowl River WMP
  - Predict system changes that may occur due to other outside influences
    - SLR, SST, altered hydrology in MB watershed, potential changes in salinity due to dredging, etc.
    - Manage, mitigate, adapt locally to global change
- Transferrable to other sub-estuaries in the Bay and their WMPs

Proposed Modeling System for Fowl River

1. Watershed Hydrology
2. Hydrodynamic
3. Ecosystem
4. Sediment Transport
5. Marsh and River Biotic Community

❖SAC is already collecting many of the data types needed for model forcing and validation




Observed River Discharge
EFDC
Meteorological and Ocean Forcing
Currents
Sea Surface Elevation, Stratification
4
Fowl River Sediment Model
Sediment Transport Model
5
Fowl River Biota Model
Marsh and Biota Model
Observational Data for Model Validation and Forcing
3
Fowl River Ecosystem Model
CGEM
O_2, pH, Kd, Chla, TSS, CDOM, POC, DOC, N, P
Fowl River Marsh Study
NOAA tide gauges
Previous studies
MyMobileBay
Engineering and Design
MBNEP Scenarios
1
Fowl River Watershed Model
Wx Station Data
Stream Gauges
GSSHA
Discharge and Stage
Loads derived from rating curves