

Quarterly Report

01 July – 30 September 2014

**Faculty of
FORESTRY**

**School of
AGRICULTURAL,
FOREST, AND
ENVIRONMENTAL
SCIENCES**

College of
AGRICULTURE,
FORESTRY & LIFE
SCIENCES

Baruch Institute of
Coastal Ecology and
Forest Sciences
Hwy. 17 N.
177 Hobcaw Rd.
Georgetown, SC
29440

(843) 546-1013
FAX (843) 546-6296

To:

William Bailey and Mary E. Richards
Planning Division
Savannah District
US Army Corps of Engineers
100 W. Oglethorpe Ave.
Savannah, GA 31401

Office of Naval Research
100 Alabama Street, SW
Suite 4R15
Atlanta, GA 30303-3104

Sherry Whitaker
U.S. Army Engineer Research and Development Center
3909 Halls Ferry Road
Vicksburg, MS 39180

03 October 2014

By:

Jamie Duberstein
Baruch Institute of Coastal Ecology and Forest Science
Clemson University
PO Box 596
Georgetown, SC 29442
Cell: 706-410-6722

US Army Corp. of Engineers:

Please see below for an executive summary, then details of major accomplishments, actions, and progress associated with the vegetation and salinity monitoring within the Savannah National Wildlife Refuge. This work is done under Cooperative Agreement Number W912HZ-14-2-0002 under the terms of the Piedmont South Atlantic Coast (PSAC) Cooperative Ecosystems Studies Unit (CESU). The Cooperative Agreement Title is "Identifying and Evaluating Impacts to Wetlands from the Savannah River Estuary".

Respectfully,

Jamie Duberstein
Clemson University

Executive Summary:

Vegetation data from July and August have been entered into spreadsheet format, and we are hoping to improve the dataset by identifying some unknown species in the upcoming weeks. Analysis of the June sample is underway, and we plan to relate our community analysis to those of Kitchens et al. (2003) and Wetzel and Kitchens (2007). Post-processing of the water stage data is underway, and all sensors appear to be functioning properly. A barometric pressure sensor was damaged by hogs but has since been repaired and will be re-deployed in October 2014. Fortunately, we had two barometric pressure sensors deployed so no data loss incurred. We've begun compilation of historic salinity data that we received from Drs. Kitchens and Welch, and we plan to compare those monthly belowground salinity averages to monthly averages we compute from data collected this past year. Tidal forest areas have been identified and surveys will be conducted in early October. The final 2014 marsh vegetation sample is scheduled for late October.

July:

- Marsh vegetation samples from June were identified, counted, weighed, and entered into an Excel spreadsheet.
 - Multivariate analysis will be conducted on these data so that pre-construction communities can be identified.
 - Results of this analysis (of June vegetation) will be used in conjunction with the satellite imagery taken during the same time; GIS analysis will be done by Dr. Christa Zweig, sub-contractor to this cooperative agreement.

- The barometric pressure sensor located at "Back 4" was damaged in May. Damage was sufficient to cause the plastic cap covering the sensor itself to break. We attempted to repair the unit in June by removing the spider web covering the sensor, then replacing the broken plastic end cap. Data downloaded in July indicate that something was wrong with the instrument (when compared to the other barometric pressure sensor, located at "Swamp 1"). Once retrieved from the field (during the August marsh vegetation sample), the faulty instrument will be sent back to the company for diagnosis and recalibration or replacement.
 - Barometric pressure is used to post-process the water level (i.e., stage) data at each area.

- Progress was made on the tidal freshwater forest areas. The updated coordinates (UTM) are below. Water monitoring stations mentioned below have the same design and equipment as those on marsh sites.
 - "Swamp 1", the area farthest upstream, was already approved by USACE. This area is already established with corner markers. The area was outfitted with a water monitoring station on 08/01/2014.
 - UTM: 17S 485276 (east) N3566909 (north)

 - "Swamp 2" is located on Georgia DNR land, but managed by USFWS. Written permission has been granted by the GA DNR for use of this area to do our monitoring. This area was already approved by USACE. Plot corner markers have been established. A water monitoring station was deployed on site on 08/01/2014.
 - UTM: 17S 485729 (east) 3564048 (north)

- “Swamp 3” was moved based on reconnaissance results. The previous target area, owned by the Georgia Ports Authority, is not a wetland. Several areas were investigated, and we settled on an area owned by USFWS (Figs. 1 and 2). Plot corner markers were placed and a water monitoring station was deployed on site on 08/01/2014.
 - UTM: 17S 485865 (east) 3562174 (north)
- Forest surveys will be conducted at some point prior to leaf-off.

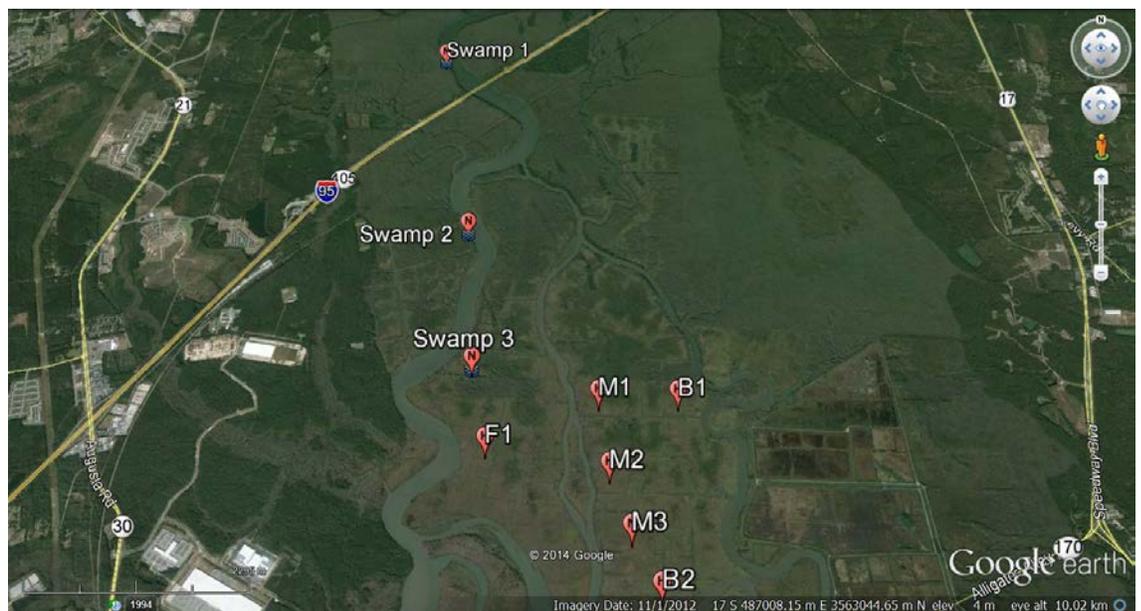


Figure 1. Locations of the three forested wetland monitoring areas (Swamp 1, 2, and 3) with respect to some marsh monitoring areas. Letters inside balloons indicate whether these are new (N) or historic (H) monitoring areas; there were no historic forested wetland monitoring areas.

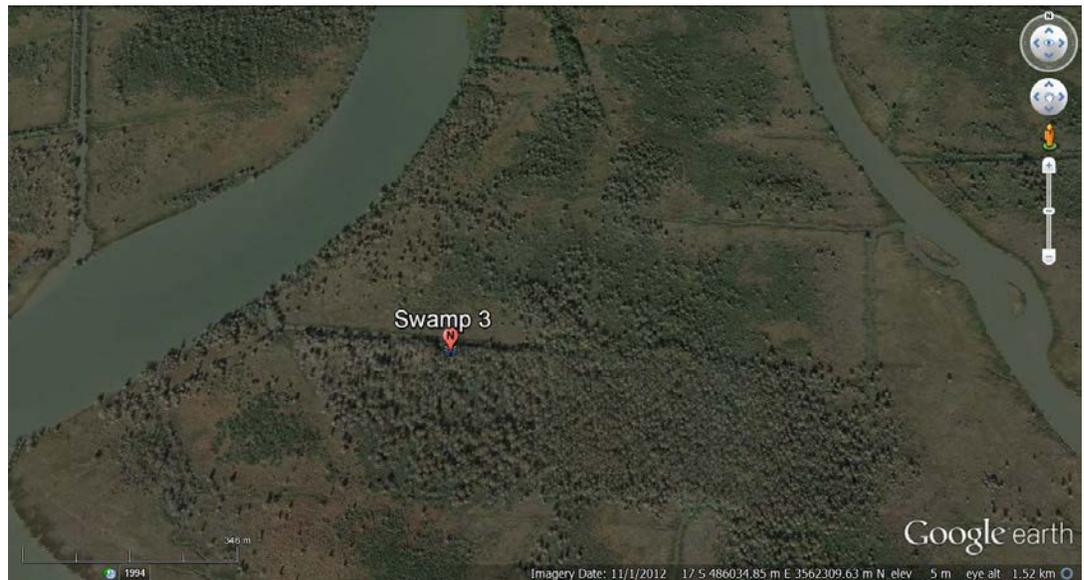


Figure 2. A closer look at Swamp 3

- Duberstein attended an Ecological Flow workshop put on by The Nature Conservancy on July 23-24 in Augusta, Georgia. This workshop was organized to provide USACE guiding principles for magnitude, duration, and seasonality of flow rates delivered through Savannah River dams. Duberstein provided input as to estuarine marsh vegetation concerns related to discharge at Thurmond (and subsequently Clyo).
 - This workshop gave great insight into the need to relate our measurements to flow rates at Clyo. Discharge at Clyo is expressed 2 days later in the estuary; this was a key insight gained during the workshop.

August:

- Statistical analyses of the June sample were initiated but errors in the dataset were discovered. Analyses were postponed to ensure complete accuracy in the dataset.
- The marsh vegetation sample event was conducted in mid-August. The samples were sorted by species, stems counted, and weighed to obtain dry mass.
 - This was the third of four samples scheduled for the year. The next sample will occur in October 2014.

- The barometric pressure sensor located at “Back 4” that was damaged by hogs was retrieved from the field during the August marsh vegetation sample.
- The project truck was acquired 28 August 2014.
- Forest surveys were scheduled for early October 2014.
- We were in the process of submitting the 2015 Mod through the Clemson University Office of Sponsored Programs and CESU.

September:

- Statistical analyses of the June 2014 sample event were continued.
 - Historical analyses (e.g., Kitchens et al. 2003; Wetzel and Kitchens 2007) have identified between 7-8 different communities, though the datasets used included multiple samples per year and multiple years.
 - Our analysis of the June 2014 marsh will only include data related to that point in time (n=108 samples).
- Data from the August marsh vegetation sample event were entered into spreadsheet format. These include stem counts (i.e., number of individuals) and dry weights for each species, by sample.
 - This was the third of four samples scheduled for the year. The next sample will begin 25 October 2014.
 - We worked on identification of some unknown species.
- Post-processing of water data was initiated.
 - Height or depth of water will be adjusted so that ground level represents zero (0).

- Organization of historic salinity data was initiated in anticipation of comparisons to be made with the current monitoring effort.
 - Multiple files were acquired from Dr. Kitchens (via Dr. Welch), and there are many instances of data loss.
 - We are working to compile a dataset that includes a continuous hourly timestamp for the years for which we have data. Salinity and water stage data will be entered for each site, inasmuch as the computer files of historic dataset support.

- Surveys of the three tidal forest areas are scheduled for October 6-8, 2014.

- The final 2014 marsh vegetation sample collection is scheduled for October 25-27.

- The barometric pressure sensor located at "Back 4" has been repaired and recalibrated by the company.
 - We will re-deploy the sensor sometime in October. Potential deployments are during the time when we are collecting forest survey data, else during the October marsh sample collection.
 - Barometric pressure is used to post-process the water level (i.e., stage) data at each area.
 - Although data from the barometric pressure sensor at "Back 4" has been unavailable, we still have barometric pressure data from the alternate sensor located at the "Swamp 1" area. We will use those barometric pressure data to post-process the water depths/heights from the 15 monitoring areas.

- A poster summarizing Clemson's role with SHEP was presented at the Clemson University Baruch Institute's open house on 23 September 2014.
 - A copy of this poster was provided via email to Mary Richards at USACE, Savannah District.
 - The recommended citation for this poster is:

Duberstein JA, Conner WH, Salter Jr, JS (2014) Monitoring Impacts to Soil Salinity and Vegetation Associated With the Savannah Harbor Expansion Project. Clemson University Baruch Institute open house. 23 October. Georgetown, SC.