

Quarterly Report

01 April – 30 June 2015

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**School of
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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
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Executive Summary:

This quarter we downloaded hydrology and salinity data up through 22 April, measured monthly growth of 20 baldcypress trees in each of the three swamp monitoring areas, and collected and sorted a synoptic marsh vegetation sample in June. Monthly and [current] annual average, maximum, and minimum aboveground and belowground salinity conditions are provided in Table 1. General trends in tree growth up to April are provided, though strict interpretation of these data is not advised given the potential error associated with the settling of the dendrometer bands. Average tree growth rates are provided for the months of May and June; these data are reliable. The marsh vegetation samples were sorted by species (and stems counted) but are still drying. Analyses of the June 2015 marsh vegetation can commence once dry weights are obtained and importance values are calculated.

April 2015

Marsh Vegetation

- We set the date for the June marsh vegetation sample.

Water Data

- Data from 23 February – 22 April were downloaded from the sensors (In-Situ AquaTrolls) deployed at each monitoring area.
- All sensors collecting aboveground salinity and belowground salinity measurements were calibrated immediately after data were downloaded. This was done on-site.
 - In-Situ suggests calibration annually. Timing of this calibration is right at one year from initial deployment.

Forest monitoring

- Monthly measurements of baldcypress tree growth, determined via dendrometer band expansion, began February 2015.
- Measurements were taken 22 April 2015.
 - Growth rates were still low for all trees (< 1 mm).
 - Swamp 2 had the highest growth rates to date. One tree had 1 mm growth and several others were showing 0.5 – 0.75 mm growth.
 - Swamp 1 had growth measurements similar to Swamp 2, though the maximum was only 0.75 mm.
 - Swamp 3 had the lowest growth rates. Most trees showed zero growth, while some show 0.25 mm.

May 2015

Marsh Vegetation

- Final plans were made for the June marsh vegetation sample event (independent contractors, accommodations, etc.).

Water Data

- No updates for May

Forest monitoring

- We have dendrometer bands on 20 baldcypress trees in each area.
 - Measurements were taken 18 May 2015.
 - Average growth (circumference) from 22 April - 18 May:
 - Swamp 1: 0.23 mm.
 - Swamp 2: 0.56 mm.
 - Swamp 3: 0.18 mm.

June 2015

Marsh Vegetation

- A synoptic sample of marsh vegetation at all sample locations (n=108) within all marsh monitoring areas (n=12) was performed.
 - Field sampling took two days: 22 and 23 June.
 - Marsh vegetation samples were sorted by species and counted immediately following the field collection.
 - Samples are currently being dried so that dry mass can be obtained.
- The next synoptic sample will be in October 2015.

Water Data

- Our current records include hourly measurements for the year through 22 April.
- The next scheduled download of water data is July 2015.
- A summary of salinity parameters is provided in Table 1.

Forest monitoring

- We have dendrometer bands on 20 baldcypress trees in each area.
 - Measurements were last taken 22 June 2015.
 - Average growth (circumference) from 18 May – 22 June:
 - Swamp 1: 3.83 mm.
 - Swamp 2: 3.78 mm.
 - Swamp 3: 2.69 mm.

Table 1. Average, maximum, and minimum salinity (practical salinity units = psu) measured at (12) marsh monitoring areas and (3) tidal forest areas. Salinity values of zero were not included in this analysis because they indicate a dry well. Summaries are based on hourly measurements starting 01 January 2015 0:00 for all monitoring areas except Swamp 3; a faulty sensor led to data acquisition starting 13 January 2015 12:00 for Swamp 3. Averages herein reflect hourly measurement up until 22-23 April depending on the sensor.

| Area | Month | Aboveground Salinity (psu) | | | Belowground Salinity (psu) | | |
|----------|---------------|----------------------------|------|------|----------------------------|------|------|
| | | Avg. (std. err) | Max | Min | Avg (std. err) | Max | Min |
| Back 1 | January | 0.11 (0.01) | 0.17 | 0.03 | 0.17 (0.00) | 0.20 | 0.12 |
| | February | 0.13 (0.01) | 0.17 | 0.02 | 0.17 (0.00) | 0.19 | 0.15 |
| | March | 0.06 (0.00) | 0.10 | 0.00 | 0.15 (0.00) | 0.16 | 0.13 |
| | April | 0.07 (0.01) | 0.19 | 0.00 | 0.13 (0.00) | 0.15 | 0.11 |
| | Annual | 0.07 (0.01) | 0.19 | 0.00 | 0.16 (0.00) | 0.20 | 0.11 |
| Back 2 | January | 0.09 (0.01) | 0.23 | 0.00 | 0.24 (0.00) | 0.37 | 0.15 |
| | February | 0.15 (0.01) | 0.41 | 0.00 | 0.23 (0.00) | 0.30 | 0.14 |
| | March | 0.10 (0.01) | 0.27 | 0.00 | 0.19 (0.00) | 0.23 | 0.12 |
| | April | 0.23 (0.02) | 0.42 | 0.00 | 0.20 (0.00) | 0.29 | 0.12 |
| | Annual | 0.13 (0.01) | 0.42 | 0.00 | 0.22 (0.00) | 0.37 | 0.12 |
| Back 3 | January | 0.13 (0.02) | 0.90 | 0.00 | 0.76 (0.01) | 1.19 | 0.29 |
| | February | 0.17 (0.03) | 1.23 | 0.00 | 0.77 (0.01) | 1.01 | 0.33 |
| | March | 0.17 (0.02) | 0.56 | 0.00 | 0.77 (0.01) | 1.02 | 0.29 |
| | April | 0.23 (0.04) | 1.47 | 0.00 | 0.52 (0.01) | 0.95 | 0.26 |
| | Annual | 0.18 (0.02) | 1.47 | 0.00 | 0.72 (0.00) | 1.19 | 0.26 |
| Back 3.5 | January | 0.17 (0.02) | 1.36 | 0.00 | 2.09 (0.00) | 2.33 | 1.85 |
| | February | 0.27 (0.03) | 2.17 | 0.00 | 2.10 (0.00) | 2.25 | 1.92 |
| | March | 0.19 (0.02) | 1.28 | 0.00 | 2.06 (0.00) | 2.34 | 1.75 |
| | April | 0.32 (0.04) | 2.22 | 0.00 | 1.99 (0.01) | 2.25 | 1.70 |
| | Annual | 0.23 (0.01) | 2.22 | 0.00 | 2.07 (0.00) | 2.34 | 1.70 |
| Back 4 | January | 0.47 (0.05) | 5.01 | 0.00 | 3.13 (0.01) | 3.63 | 2.75 |
| | February | 0.58 (0.07) | 5.77 | 0.00 | 2.95 (0.01) | 3.30 | 0.03 |
| | March | 0.43 (0.05) | 3.27 | 0.00 | 2.98 (0.01) | 3.23 | 2.13 |
| | April | 0.48 (0.06) | 4.29 | 0.00 | 2.76 (0.01) | 2.97 | 2.40 |
| | Annual | 0.49 (0.03) | 5.77 | 0.00 | 2.97 (0.01) | 3.63 | 0.03 |

Table 1, continued.

| Area | Month | Aboveground Salinity (psu) | | | Belowground Salinity (psu) | | |
|----------|---------------|----------------------------|------|------|----------------------------|------|------|
| | | Avg. (std. err) | Max | Min | Avg (std. err) | Max | Min |
| Front 1 | January | 0.06 (0.01) | 0.17 | 0.00 | 0.34 (0.00) | 0.42 | 0.24 |
| | February | 0.11 (0.01) | 0.33 | 0.00 | 0.30 (0.00) | 0.36 | 0.18 |
| | March | 0.06 (0.00) | 0.15 | 0.00 | 0.24 (0.00) | 0.33 | 0.12 |
| | April | 0.08 (0.01) | 0.48 | 0.00 | 0.20 (0.00) | 0.28 | 0.12 |
| | Annual | 0.08 (0.01) | 0.48 | 0.00 | 0.27 (0.00) | 0.42 | 0.12 |
| Front 2 | January | 0.21 (0.03) | 2.55 | 0.00 | 0.80 (0.00) | 1.07 | 0.59 |
| | February | 0.38 (0.06) | 4.75 | 0.00 | 0.83 (0.01) | 1.28 | 0.58 |
| | March | 0.09 (0.02) | 1.33 | 0.00 | 0.56 (0.00) | 0.87 | 0.37 |
| | April | 0.22 (0.03) | 4.06 | 0.00 | 0.65 (0.01) | 0.94 | 0.32 |
| | Annual | 0.22 (0.02) | 4.75 | 0.00 | 0.71 (0.00) | 1.28 | 0.32 |
| Middle 1 | January | 0.11 (0.01) | 0.50 | 0.00 | 0.51 (0.00) | 0.60 | 0.36 |
| | February | 0.15 (0.02) | 0.93 | 0.00 | 0.50 (0.00) | 0.65 | 0.22 |
| | March | 0.15 (0.02) | 0.72 | 0.00 | 0.40 (0.00) | 0.57 | 0.24 |
| | April | 0.17 (0.02) | 0.83 | 0.00 | 0.39 (0.00) | 0.46 | 0.34 |
| | Annual | 0.14 (0.01) | 0.93 | 0.00 | 0.45 (0.00) | 0.65 | 0.22 |
| Middle 2 | January | 0.28 (0.05) | 1.95 | 0.00 | 0.60 (0.01) | 1.25 | 0.37 |
| | February | 0.30 (0.08) | 3.19 | 0.00 | 1.00 (0.02) | 2.08 | 0.46 |
| | March | 0.24 (0.03) | 0.96 | 0.00 | 0.71 (0.01) | 1.08 | 0.31 |
| | April | 0.20 (0.04) | 1.53 | 0.00 | 0.49 (0.00) | 0.82 | 0.29 |
| | Annual | 0.24 (0.02) | 3.19 | 0.00 | 0.71 (0.01) | 2.08 | 0.29 |
| Middle 3 | January | 0.17 (0.05) | 2.05 | 0.00 | 1.44 (0.01) | 2.15 | 0.93 |
| | February | 0.23 (0.11) | 2.34 | 0.00 | 1.76 (0.02) | 3.40 | 1.23 |
| | March | 0.11 (0.02) | 1.13 | 0.00 | 1.05 (0.02) | 1.64 | 0.30 |
| | April | 0.11 (0.03) | 1.64 | 0.00 | 0.88 (0.01) | 1.50 | 0.53 |
| | Annual | 0.13 (0.02) | 2.34 | 0.00 | 1.30 (0.01) | 3.40 | 0.30 |
| Middle 4 | January | 0.28 (0.05) | 3.59 | 0.00 | 2.84 (0.01) | 3.47 | 2.22 |
| | February | 0.26 (0.06) | 5.55 | 0.00 | 2.73 (0.01) | 3.22 | 2.20 |
| | March | 0.11 (0.02) | 1.30 | 0.00 | 2.74 (0.01) | 3.35 | 2.16 |
| | April | 0.19 (0.04) | 2.42 | 0.00 | 2.61 (0.01) | 3.26 | 2.16 |
| | Annual | 0.21 (0.02) | 5.55 | 0.00 | 2.74 (0.01) | 3.47 | 2.16 |
| Middle 5 | January | 0.21 (0.02) | 1.93 | 0.00 | 1.12 (0.01) | 1.79 | 0.58 |
| | February | 0.29 (0.03) | 2.36 | 0.00 | 1.15 (0.01) | 1.80 | 0.48 |
| | March | 0.13 (0.01) | 1.18 | 0.00 | 0.63 (0.01) | 1.01 | 0.36 |
| | April | 0.25 (0.03) | 3.28 | 0.00 | 0.83 (0.01) | 1.08 | 0.51 |
| | Annual | 0.22 (0.01) | 3.28 | 0.00 | 0.93 (0.01) | 1.80 | 0.36 |

Table 1, continued.

| Area | Month | Aboveground Salinity (psu) | | | Belowground Salinity (psu) | | |
|---------|---------------|----------------------------|------|------|----------------------------|------|------|
| | | Avg. (std. err) | Max | Min | Avg (std. err) | Max | Min |
| Swamp 1 | January | 0.04 (0.00) | 0.06 | 0.01 | 0.07 (0.00) | 0.08 | 0.06 |
| | February | 0.04 (0.00) | 0.05 | 0.01 | 0.06 (0.00) | 0.07 | 0.05 |
| | March | 0.04 (0.00) | 0.05 | 0.00 | 0.07 (0.00) | 0.07 | 0.05 |
| | April | 0.04 (0.00) | 0.05 | 0.03 | 0.07 (0.00) | 0.10 | 0.05 |
| | Annual | 0.04 (0.00) | 0.06 | 0.01 | 0.07 (0.00) | 0.10 | 0.05 |
| Swamp 2 | January | 0.06 (0.00) | 0.13 | 0.00 | 0.17 (0.00) | 0.18 | 0.15 |
| | February | 0.06 (0.00) | 0.10 | 0.00 | 0.14 (0.00) | 0.16 | 0.09 |
| | March | 0.05 (0.00) | 0.09 | 0.01 | 0.12 (0.00) | 0.15 | 0.09 |
| | April | 0.06 (0.00) | 0.10 | 0.00 | 0.13 (0.00) | 0.16 | 0.06 |
| | Annual | 0.06 (0.00) | 0.13 | 0.00 | 0.14 (0.00) | 0.18 | 0.06 |
| Swamp 3 | January | 0.03 (0.00) | 0.20 | 0.00 | 0.14 (0.00) | 0.29 | 0.07 |
| | February | 0.05 (0.00) | 0.58 | 0.00 | 0.30 (0.01) | 1.11 | 0.00 |
| | March | 0.02 (0.00) | 0.15 | 0.00 | 0.18 (0.00) | 0.22 | 0.14 |
| | April | 0.06 (0.01) | 0.66 | 0.00 | 0.16 (0.00) | 0.19 | 0.13 |
| | Annual | 0.04 (0.00) | 0.66 | 0.00 | 0.20 (0.00) | 1.11 | 0.00 |