

Monthly Report: March 2016

**BARUCH
INSTITUTE OF
COASTAL
ECOLOGY AND
FOREST
SCIENCE**

Highway 17 North
PO Box 596
Georgetown, SC
29442-0596

**P (843) 546-1013
F (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

02 May 2016

By:
Jamie Duberstein

Bill and Mary:

Please see the bulleted list below for the major actions and accomplishments associated with Cooperative Agreement Number W912HZ-14-2-0002 (Modification Number P00002) for the month of March 2016. Please let me know if you would like me to elaborate on the details of any items I've listed below, or if there are any status updates you'd like on unlisted topics.

Best Regards,

Jamie

Marsh Vegetation

- No new activity to report.

Water Data

- Salinity and water depth data for all monitoring areas were downloaded on 14 and 15 March 2016.
 - Updated 2016 salinity statistics for each area are provided in Table 1 at the end of this report.
- There were no malfunctioning sensors identified in March 2016.
 - Table 2 lists salinity data losses from 01 Jan. – 15 Mar 2016.
- A “spot check” of belowground salinity conditions were measured using a handheld YSI meter during the March 2016 data download.
 - Reports typically provide summaries of hourly Aquatroll measurements of salinity as practical salinity units (psu), though measurements of total dissolved solids as parts per thousand (ppt) are also collected.
 - Here we report both Aquatroll measurements to facilitate comparisons with handheld YSI measurements.
 - Accuracy of the handheld YSI meter is 0.1 (ppt), while accuracy of the Aquatrolls is 0.001 (psu, ppt); Aquatroll values were rounded to the nearest 0.1 to facilitate comparisons.
 - A spot check via handheld YSI was not performed at Swamp 1 in March 2016, and comparisons at Swamp 2 and Swamp 3 are unavailable due to a malfunctioning computer (for downloads) at the time we were downloading data.
 - A comparison of salinity values (Aquatrolls versus handheld YSI) is provided in Table 3.

Forest monitoring

- Monthly measurements of baldcypress tree growth were last taken on 15 March at Swamp 1, Swamp 2, and Swamp 3.
- Average basal area increase since last measurement:
 - Swamp 1: -0.4 cm² (14. Feb. – 15 Mar.)
 - Swamp 2: -0.2 cm² (14. Feb. – 15 Mar.)
 - Swamp 3: -0.4 cm² (14. Feb. – 15 Mar.)

Herpetofauna (MS student) study

- Surveys of reptiles and amphibians are underway.
- Housing is being provided on-site by Savannah National Wildlife Refuge.

Table 1. Year 2016 average, maximum, and minimum salinity (psu: practical salinity units) measured via sensors at above- and below-ground locations at (12) marsh monitoring areas and (3) tidal forest areas. Summaries are based on hourly measurements starting 01 January through 13 March 2016 for all monitoring areas unless noted by superscript; details of data loss provided in Table 2. Measurements taken during dry well conditions were removed from calculations of summary statistics.

Area	Month	Aboveground Salinity (psu)			Belowground Salinity (psu)		
		Avg. (std. err)	Max	Min	Avg (std. err)	Max	Min
Back 1	January	0.03 (0.00)	0.05	0.00	0.09 (0.00)	0.10	0.08
	February	0.03 (0.00)	0.05	0.00	0.07 (0.00)	0.09	0.07
	March	0.08 (0.00)	0.12	0.00	0.09 (0.00)	0.11	0.06
	April						
	May						
	June						
	July						
	August						
	September						
	October						
	November						
	December						
	Annual	0.04 (0.00)	0.12	0.00	0.08 (0.00)	0.11	0.06
Back 2	January	0.03 (0.00) ^a	0.03 ^a	0.03 ^a	0.06 (0.00) ^a	0.09 ^a	0.04 ^a
	February	0.03 (0.00)	0.04	0.00	0.07 (0.00) ^a	0.09 ^a	0.04 ^a
	March	0.05 (0.00)	0.08	0.00	0.08 (0.00)	0.09	0.07
	April						
	May						
	June						
	July						
	August						
	September						
	October						
	November						
	December						
	Annual	0.04 (0.00)	0.08	0.00	0.07 (0.00)	0.09	0.07

^a Incomplete data record. See Table 2 for details.

Table 1 (cont'd). Year 2016 average, maximum, and minimum salinity at above- and below-ground locations in marsh and tidal freshwater forest monitoring areas.

Area	Month	<u>Aboveground Salinity (psu)</u>			<u>Belowground Salinity (psu)</u>		
		Avg. (std. err)	Max	Min	Avg (std. err) ^a	Max	Min
Back 3	January	0.04 (0.00)	0.07	0.00	1.49 (0.01) ^a	1.88 ^a	1.12 ^a
	February	0.03 (0.00)	0.06	0.00	1.15 (0.01) ^a	1.39 ^a	0.62 ^a
	March	0.06 (0.01)	0.13	0.00	0.66 (0.02)	1.46	0.12
	April						
	May						
	June						
	July						
	August						
	September						
	October						
	November						
	December						
	Annual	0.04 (0.00)	0.13	0.00	1.14 (0.01)	1.88	0.12
Back 3.5	January	0.03 (0.00)	0.18	0.00	2.14 (0.01)	2.61	1.23
	February	0.04 (0.00)	0.11	0.00	2.07 (0.00)	2.31	1.83
	March	0.07 (0.01)	0.38	0.00	1.53 (0.03)	2.20	0.43
	April						
	May						
	June						
	July						
	August						
	September						
	October						
	November						
	December						
	Annual	0.05 (0.00)	0.38	0.00	2.00 (0.01)	2.61	0.43

^a Incomplete data record. See Table 2 for details.

Table 1 (cont'd). Year 2016 average, maximum, and minimum salinity at above- and below-ground locations in marsh and tidal freshwater forest monitoring areas.

Area	Month	<u>Aboveground Salinity (psu)</u>			<u>Belowground Salinity (psu)</u>		
		Avg. (std. err)	Max	Min	Avg (std. err)	Max	Min
Back 4	January	0.05 (0.00)	0.57	0.00	2.27 (0.01)	2.65	1.73
	February	0.08 (0.01)	0.62	0.00	2.69 (0.00)	2.83	2.42
	March	0.33 (0.04)	2.39	0.00	2.72 (0.00)	2.79	2.63
	April						
	May						
	June						
	July						
	August						
	September						
	October						
	November						
	December						
		Annual	0.12 (0.01)	2.39	0.00	2.52 (0.01)	2.83
Front 1	January	0.03 (0.00)	0.08	0.00	0.08 (0.00)	0.10	0.05
	February	0.03 (0.00)	0.06	0.00	0.08 (0.00)	0.09	0.07
	March	0.04 (0.00)	0.05	0.00	0.08 (0.00)	0.09	0.08
	April						
	May						
	June						
	July						
	August						
	September						
	October						
	November						
	December						
		Annual	0.03 (0.00)	0.08	0.00	0.08 (0.00)	0.10

^a Incomplete data record. See Table 2 for details.

Table 1 (cont'd). Year 2016 average, maximum, and minimum salinity at above- and below-ground locations in marsh and tidal freshwater forest monitoring areas.

Area	Month	<u>Aboveground Salinity (psu)</u>			<u>Belowground Salinity (psu)</u>		
		Avg. (std. err)	Max	Min	Avg (std. err)	Max	Min
Front 2	January	0.03 (0.00)	0.05	0.01	0.14 (0.00)	0.33	0.05
	February	0.03 (0.00)	0.05	0.00	0.13 (0.00)	0.32	0.05
	March	0.05 (0.00)	0.31	0.01	0.16 (0.00)	0.28	0.08
	April						
	May						
	June						
	July						
	August						
	September						
	October						
	November						
	December						
		Annual	0.04 (0.00)	0.31	0.00	0.14 (0.00)	0.33
Middle 1	January	0.04 (0.00) ^a	0.05 ^a	0.00 ^a	0.2 (0.00)	0.33	0.11
	February	0.04 (0.00)	0.09	0.00	0.23 (0.00)	0.33	0.16
	March	0.05 (0.00)	0.11	0.00	0.23 (0.00)	0.27	0.15
	April						
	May						
	June						
	July						
	August						
	September						
	October						
	November						
	December						
		Annual	0.05 (0.00)	0.11	0.00	0.22 (0.00)	0.33

^a Incomplete data record. See Table 2 for details.

Table 1 (cont'd). Year 2016 average, maximum, and minimum salinity at above- and below-ground locations in marsh and tidal freshwater forest monitoring areas.

Area	Month	<u>Aboveground Salinity (psu)</u>			<u>Belowground Salinity (psu)</u>		
		Avg. (std. err)	Max	Min	Avg (std. err)	Max	Min
Middle 2	January	0.03 (0.00) ^a	0.04 ^a	0.02 ^a	0.07 (0.00)	0.12	0.05
	February	0.03 (0.00)	0.05	0.00	0.09 (0.00)	0.16	0.06
	March	0.06 (0.00)	0.14	0.00	0.11 (0.00)	0.14	0.05
	April						
	May						
	June						
	July						
	August						
	September						
	October						
	November						
	December						
	Annual		0.04 (0.00)	0.14	0.00	0.08 (0.00)	0.16
Middle 3	January	0.04 (0.00) ^a	0.05 ^a	0.03 ^a	0.29 (0.01)	0.60	0.10
	February	0.03 (0.00)	0.03	0.02	0.24 (0.00)	0.50	0.03
	March	0.09 (0.02)	0.27	0.00	0.48 (0.01)	0.74	0.18
	April						
	May						
	June						
	July						
	August						
	September						
	October						
	November						
	December						
	Annual		0.06 (0.01)	0.27	0.00	0.31 (0.00)	0.74

^a Incomplete data record. See Table 2 for details.

Table 1 (cont'd). Year 2016 average, maximum, and minimum salinity at above- and below-ground locations in marsh and tidal freshwater forest monitoring areas.

Area	Month	<u>Aboveground Salinity (psu)</u>			<u>Belowground Salinity (psu)</u>		
		Avg. (std. err)	Max	Min	Avg (std. err)	Max	Min
Middle 4	January	0.02 (0.00) ^a	0.06 ^a	0.00 ^a	1.02 (0.01)	1.52	0.20
	February	0.02 (0.00)	0.08	0.00	1.24 (0.01)	2.11	0.84
	March	0.05 (0.01)	0.45	0.00	1.47 (0.03)	2.48	0.48
	April						
	May						
	June						
	July						
	August						
	September						
	October						
	November						
	December						
		Annual	0.03 (0.00)	0.45	0.00	1.19 (0.01)	2.48
Middle 5	January	0.02 (0.00) ^a	0.10 ^a	0.00 ^a	0.29 (0.00) ^a	0.40 ^a	0.19 ^a
	February	0.05 (0.00)	0.13	0.00	0.43 (0.01) ^a	0.76 ^a	0.26 ^a
	March	0.13 (0.01)	0.63	0.00	0.58 (0.01)	0.90	0.19
	April						
	May						
	June						
	July						
	August						
	September						
	October						
	November						
	December						
		Annual	0.07 (0.01)	0.63	0.00	0.42 (0.00)	0.90

^a Incomplete data record. See Table 2 for details.

Table 1 (cont'd). Year 2016 average, maximum, and minimum salinity at above- and below-ground locations in marsh and tidal freshwater forest monitoring areas.

Area	Month	<u>Aboveground Salinity (psu)</u>			<u>Belowground Salinity (psu)</u>		
		Avg. (std. err)	Max	Min	Avg (std. err)	Max	Min
Swamp 1	January	0.03 (0.00)	0.06	0.00	0.09 (0.00)	0.11	0.08
	February	0.03 (0.00)	0.05	0.00	0.06 (0.00)	0.10	0.03
	March	0.03 (0.00)	0.05	0.00	0.06 (0.00)	0.07	0.05
	April						
	May						
	June						
	July						
	August						
	September						
	October						
	November						
	December						
	Annual		0.03 (0.00)	0.06	0.00	0.07 (0.00)	0.11
Swamp 2	January	0.04 (0.00)	0.09	0.00	0.18 (0.00)	0.22	0.15
	February	0.06 (0.00)	0.08	0.00	0.16 (0.00)	0.18	0.15
	March	N/A ^a	N/A ^a	N/A ^a	N/A ^a	N/A ^a	N/A ^a
	April						
	May						
	June						
	July						
	August						
	September						
	October						
	November						
	December						
	Annual		0.05 (0.00)	0.09	0.00	0.17 (0.00)	0.22

^a Data were not downloaded due to malfunctioning interface device (Rugged Reader). Data will be presented in the next report.

Table 1 (cont'd). Year 2016 average, maximum, and minimum salinity at above- and below-ground locations in marsh and tidal freshwater forest monitoring areas.

Area	Month	<u>Aboveground Salinity (psu)</u>			<u>Belowground Salinity (psu)</u>		
		Avg. (std. err)	Max	Min	Avg (std. err)	Max	Min
Swamp 3	January	0.02 (0.00)	0.08	0.00	0.10 (0.00)	0.14	0.09
	February	0.04 (0.00)	0.06	0.00	0.09 (0.00)	0.12	0.08
	March	N/A ^a	N/A ^a	N/A ^a	N/A ^a	N/A ^a	N/A ^a
	April						
	May						
	June						
	July						
	August						
	September						
	October						
	November						
	December						
	Annual	0.03 (0.00)	0.08	0.00	0.10 (0.00)	0.14	0.08

^a Data were not downloaded due to malfunctioning interface device (Rugged Reader). Data will be presented in the next report.

Table 2. Summary of year 2016 salinity data losses from Aquatroll sensors deployed at SHEP monitoring areas. Water level data losses may be beyond dates listed below.

Area	Position	Data loss period		Discovered	Replaced
		Beginning	End		
Middle 1	Aboveground	01/05/2016 02:53	01/23/2016 00:00	01/13/2016	01/22/2016
Middle 5	Aboveground	01/05/2016 00:47	01/23/2016 00:00	01/13/2016	01/22/2016
Back 2	Aboveground	01/05/2016 00:20	01/23/2016 00:00	01/13/2016	01/22/2016
Back 2	Belowground	01/23/2016 18:06	02/13/2016 12:00	02/13/2016	02/13/2016
Back 3	Belowground	01/19/2016 06:36	02/13/2016 13:00	02/13/2016	02/13/2016
Middle 5	Belowground	01/19/2016 23:42	02/13/2016 18:00	02/13/2016	02/13/2016

Table 3. Comparison of belowground salinity measurements taken via autonomous sensors (In-Situ Aquatrolls) versus a "spot check" measured via handheld YSI salinity meter (units: parts per thousand = ppt). Reports typically provide summaries of hourly Aquatroll measurements of salinity as practical salinity units (psu) though measurements of total dissolved solids as parts per thousand (ppt) are also collected. Here we report both Aquatroll measurements to facilitate comparisons with handheld YSI measurements. Accuracy of the handheld YSI meter is 0.1 (ppt), while accuracy of the Aquatrolls is 0.001 (psu, ppt); Aquatroll values were rounded to the nearest 0.1 to facilitate comparisons. A spot check via handheld YSI was not performed at Swamp 1 in March 2016, and comparisons at Swamp 2 and Swamp 3 are unavailable due to a malfunctioning computer (for downloads) at the time we were downloading data.

Site	Aquatroll Salinity (psu)	Aquatroll Total Dissolved Solids (ppt)	YSI "spot check" (ppt)	YSI Measurement Time	Aquatroll Measurement Time
Back 1	0.1	0.1	0.1	03/14/2016 12:45	03/14/2016 11:45
Back 2	0.1	0.1	0.1	03/14/2016 12:23	03/14/2016 11:00
Back 3	0.6	0.8	1.6	03/14/2016 12:02	03/14/2016 11:00
Back 3.5	1.9	2.3	2.0	03/14/2016 11:48	03/14/2016 11:00
Back 4	2.7	3.2	2.7	03/14/2016 11:18	03/14/2016 11:00
Front 1	0.1	0.1	0.1	03/14/2016 14:56	03/14/2016 13:55
Front 2	0.2	0.3	0.9	03/14/2016 14:39	03/14/2016 10:26
Middle 1	0.3	0.3	0.2	03/14/2016 13:14	03/14/2016 12:45
Middle 2	0.1	0.1	0.1	03/14/2016 13:39	03/14/2016 12:17
Middle 3	0.2	0.3	0.4	03/14/2016 14:11	03/14/2016 11:00
Middle 4	1.6	2.0	2.0	03/14/2016 15:18	03/14/2016 11:00
Middle 5	0.6	0.8	0.4	03/14/2016 15:42	03/14/2016 09:59
Swamp 1	0.1	0.1	N/A	N/A	03/15/2016 08:00
Swamp 2	N/A	N/A	0.1	03/14/2016 12:45	N/A
Swamp 3	N/A	N/A	0.1	03/14/2016 12:45	N/A