

1st Quarter Report

01 January – 30 March, 2016

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Please see below for an executive summary, then bulleted items highlighting 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:

There was no vegetation activity to report this quarter. There were several autonomous water quality/quantity sensors that malfunctioned. Because of the number of failing sensors, we changed the frequency of data downloads from every two months to monthly so that malfunctioning sensors could be identified more quickly. We worked with the manufacturer toward minimizing future data losses, and they decided to exchange the old style sensor for new sensor with updated circuit boards. No such exchange had been made prior to 31 March 2016 because of the time required for them to produce new sensors. Tables for monthly salinity statistics, salinity data losses, and comparisons of autonomous sensors to measurements taken via handheld salinity meters are provided. Measurements of baldcypress tree growth continued and summaries are provided, though little growth occurred this quarter. A herpetological study began this quarter, the details of which are provided below.

January 2016

Marsh Vegetation

- No new activity to report.

Water Data

- Salinity and water depth data for all monitoring areas were downloaded on 13 and 14 January 2016.
 - Six (6) aboveground salinity sensors were found to have failed since the previous download:
 - Back 2
 - Middle 1
 - Middle 2
 - Middle 3
 - Middle 4
 - Middle 5
 - Replacement sensors for the six (6) sensors discovered faulty on 13 and 14 January were deployed in the field on 22 January 2016.
- Though we previously downloaded data from salinity/water level sensor every two months, due to the recent sensor mass-failure we now download data from all sensors monthly. We've also begun carrying backup sensors of each type (above- and below-ground) with us on the field missions for immediate replacement of faulty sensors. We were already carrying backup belowground sensors.
- An updated synopsis of 2015 salinity conditions was provided to the Army Corps in the January 2016 monthly report. This 1st quarter 2016 report only contains 2016 data (Table 1).
- A synopsis of salinity data loss is provided in Table 2.

Forest monitoring

- Monthly measurements of baldcypress tree growth were last taken on 14 January at Swamp 1, Swamp 2, and Swamp 3.
- Average basal area increase since last measurement:
 - Swamp 1: 0.0 cm² (15 Dec. – 14 Jan.)
 - Swamp 2: 0.0 cm² (15 Dec. – 14 Jan.)
 - Swamp 3: 0.0 cm² (15 Dec. – 14 Jan.)

February 2016

Marsh Vegetation

- No new activity to report.

Water Data

- Salinity and water depth data for all monitoring areas were downloaded on 13 and 14 February 2016.
 - Three (3) belowground salinity/water level sensors were found to have failed since the previous download:
 - Back 2
 - Back 3
 - Middle 5
 - Replacement sensors were deployed immediately after being discovered (*i.e.*, within minutes).
- An updated synopsis of salinity data loss is provided in Table 2.
- In-Situ is working with us to minimize future sensor failures.
- By request of Bill Bailey at the Army Corps, salinity conditions were measured via a separate hand-held salinity meter during the February 2016 data download. These measurements were only taken in belowground wells because aboveground wells were not usually flooded during the time we were on-site. Measurements were taken using a handheld YSI meter, and were intended to verify autonomous salinity readings taken by the Aquatrolls. A comparison of February 2016 salinity values (Aquatrolls versus handheld YSI) is provided in Table 3.

Forest monitoring

- Monthly measurements of baldcypress tree growth were last taken on 14 February at Swamp 1, Swamp 2, and Swamp 3.
- Average basal area increase since last measurement:
 - Swamp 1: 0.1 cm² (14. Jan. – 14 Feb.)
 - Swamp 2: 0.1 cm² (14. Jan. – 14 Feb.)
 - Swamp 3: 0.1 cm² (14. Jan. – 14 Feb.)

Herpetofauna study

- A study of herpetofauna (amphibians and reptiles) was developed by Dr. Duberstein and his MS student Sidney Godfrey. The goals are to document species occurrences in tidal forest habitat.
- The primary question being addressed is species occurrence along a salinity gradient.
- A secondary question being addressed will relate the herpetofaunal diversity to microtopography within 10 x 10m areas, *i.e.*, the relative abundance (percentage of area) of hummocks versus hollows.
- The following sites are used for the salinity aspect (Figure 1):
 - Swamp 1
 - Swamp 2
 - Swamp 3
 - Steamboat (a USGS study site)
- The microtopography aspect will utilize the same sites as those used in the salinity aspect, and sites in an additional area along the Little Back River (Figure 1).
- Several permits are required, and have been obtained, including:
 - Clemson IACUC approval
 - USFWS Special Use Permit
 - State of South Carolina Scientific Collection Permit
 - State of Georgia Scientific Collection Permit
- The study will utilize multiple methods to discern species occurrence, including:
 - Daytime surveys
 - Night surveys
 - Cover boards
 - Automated voice recorders, aka "Frogloggers"
 - A variety of traps:
 - Crawfish traps
 - Minnow traps
 - "Trash can" traps
 - Turtle hoop nets
- Due to the remote nature of some target sampling areas and/or the cost of some equipment, some remote sites will not use trash can traps, turtle hoop nets, and night surveys.

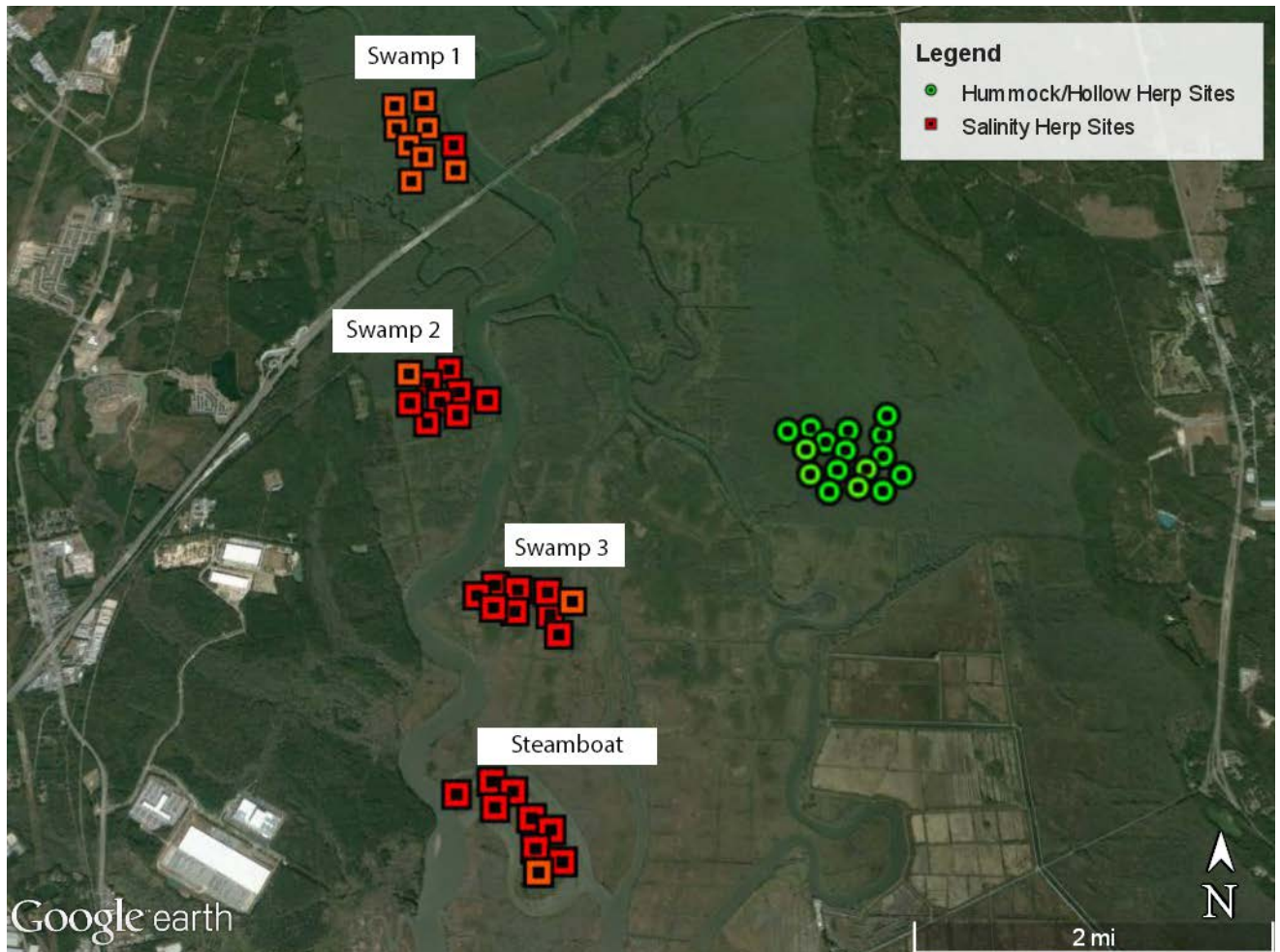


Figure 1. Locations of herpetofauna survey sites along the Savannah River. Sites are located in tidal forest habitat.

March 2016

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.
- 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 March 2016 salinity values (Aquatrolls versus handheld YSI) is provided in Table 4.

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)	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 all (through March 2016) major salinity data losses from Aquatroll sensors deployed at SHEP monitoring areas. Some additional measurements were lost due to downloading sensor data, but those losses were restricted to one or two hourly measurements.

Area	Position	Data loss period		Discovered	Replaced
		Beginning	End		
Swamp 3	Belowground	12/16/2014 09:00	01/13/2015 12:00	12/16/2014	01/13/2015
Middle 4	Aboveground	06/22/2015 18:23	08/20/2015 00:00	07/21/2015	08/20/2015
Back 3.5	Belowground	09/07/2015 02:05	10/11/2015 00:00	09/21/2015	10/10/2015
Back 4	Aboveground	11/30/2015 14:06	12/11/2015 12:00	11/30/2015	12/11/2015
Back 4	Belowground	11/30/2015 13:20	12/11/2015 12:00	11/30/2015	12/11/2015
Middle 3	Belowground	10/15/2015 04:33	12/11/2015 12:00	11/30/2015	12/11/2015
Middle 4	Belowground	10/16/2015 04:16	12/11/2015 12:00	11/30/2015	12/11/2015
Middle 2	Aboveground	12/19/2015 05:24	01/23/2016 00:00	01/13/2016	01/22/2016
Middle 3	Aboveground	12/19/2015 04:41	01/23/2016 00:00	01/13/2016	01/22/2016
Middle 4	Aboveground	11/30/2015 10:00	01/23/2016 00:00	01/13/2016	01/22/2016
Back 4	Belowground	09/21/2015 09:33	09/21/2015 11:20	N/A	N/A
Back 4	Aboveground	09/21/2015 09:39	09/21/2015 12:06	N/A	N/A
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 February 2016 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.

Site	Aquatroll Salinity (psu)	Aquatroll Total Dissolved Soilds (ppt)	YSI "spot check" (ppt)	YSI Measurement Time	Aquatroll Measurement Time
Back 1	0.1	0.1	0.1	02/13/2016 11:09	02/13/2016 10:45
Back 2	0.1 ^a	0.1	0.1	02/13/2016 11:35	01/23/2016 18:06
Back 3	1.7 ^a	2.1	1.4	02/13/2016 12:16	01/19/2016 06:36
Back 3.5	1.9	2.4	1.8	02/13/2016 12:37	02/13/2016 12:00
Back 4	2.6	3.2	2.3	02/13/2016 13:08	02/13/2016 12:00
Front 1	0.1	0.1	0.1	02/13/2016 15:36	02/13/2016 14:55
Front 2	0.1 ^b	0.1	0.2	02/14/2016 13:07	02/13/2016 11:26
Middle 1	0.2	0.3	0.2	02/13/2016 15:08	02/13/2016 14:45
Middle 2	0.1	0.1	0.1	02/13/2016 14:36	02/13/2016 13:17
Middle 3	0.1	0.1	0.1	02/13/2016 13:54	02/13/2016 12:00
Middle 4	1.3	1.6	0.5	02/13/2016 16:34	02/13/2016 12:00
Middle 5	0.3 ^a	0.4	0.4	02/13/2016 17:08	01/19/2016 23:42
Swamp 1	0.1	0.1	0.1	02/14/2016 08:33	02/14/2016 08:00
Swamp 2	0.1	0.2	0.1	02/14/2016 09:48	02/14/2016 08:00
Swamp 3	0.1	0.1	0.1	02/14/2016 11:06	02/14/2016 08:00

a: The nearest Aquatroll measurement was considerably further away temporally due to a malfunctioning instrument.

b: The nearest Aquatroll measurement was further away temporally due to timing of barometric pressure sensor download (adjusts water depth measurements).

Table 4. Comparison of belowground salinity measurements taken March 2016 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 interface device (Rugged Reader, for downloads) at the time we were downloading data.

Site	Aquatroll Salinity (psu)	Aquatroll Total Dissolved Soilds (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