

Monthly Report: October 2016

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To:

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05 December 2016

By:

Jamie Duberstein

USACE Savannah District:

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 October 2016. I apologize for the delay in this report. The tardiness comes as a result of the conversion from calendar year data reporting, which I followed from February 2014 – September 2016, to Federal Fiscal Year data reporting. My efforts in the past month were focused on the FY16 3rd quarter report and FY16 annual report, both of which follow the Federal Fiscal Year format. This report also follows the Fiscal Year format.

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.

Thank you,

Jamie

Marsh Vegetation

- There are no updates to report.

Water Data

- Data from all water sensors were downloaded on 20 and 21 October 2016.
- An updated salinity table is provided (Table 1)
- There were salinity data losses in October 2016 (Table 2).
 - No salinity data was collected aboveground at the Middle 1 monitoring site.
 - Approximately 11 days of salinity data were lost from the belowground sensor at Middle 4.
- A “spot check” of belowground salinity conditions were measured using a handheld YSI meter during the October sensor download.
 - Salinity values were compared to those measured via Aquatrolls, provided in Table 3.
- Hurricane Matthew impacted the estuary 8 – 9 October 2016.
 - Aboveground salinity conditions at the Middle 4 monitoring site hit a maximum of 16.89 psu. The hourly measurements were very interesting:

<u>Timestamp</u>	<u>Salinity (psu)</u>
10/07/2016 23:00	0.00
10/08/2016 00:00	0.41
10/08/2016 01:00	4.27
10/08/2016 02:00	7.89
10/08/2016 03:00	13.39
10/08/2016 04:00	16.89
10/08/2016 05:00	16.24
10/08/2016 06:00	16.07
10/08/2016 07:00	15.60
10/08/2016 08:00	0.15
10/08/2016 09:00	0.07
10/08/2016 10:00	0.03
10/08/2016 11:00	0.02

- Hyrdographs from a select number of monitoring sites are provided (Figure 1).

Forest monitoring

- Monthly measurements of baldcypress tree growth were last taken on 21 October at all swamp study areas. Recall that no measurements were taken in September, so the growth increments below represent two months.
- Average basal area increase since last measurement:
 - Swamp 1: 1.0 cm² (19 August – 21 October)
 - Swamp 2: 1.1 cm² (19 August – 21 October)
 - Swamp 3: 1.0 cm² (19 August – 21 October)

Herpetofauna study (MS student)

- Year 1 (2016) data are being analyzed and interpreted.

Table 1. Fiscal Year 2017 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 October 2016 through 20 October 2016 for all monitoring areas unless noted by superscript; details of data losses are provided in Table 2. Measurements taken during dry well conditions were removed from calculations of summary statistics.

Area	Month	<u>Aboveground Salinity (psu)</u>			<u>Belowground Salinity (psu)</u>		
		Avg. (std. err.)	Min	Max	Avg. (std. err.)	Min	Max
Back 1	October 2016	0.03 (0.01)	0.00	0.24	0.19 (0.00)	0.12	0.22
	November 2016						
	December 2016						
	January 2017						
	February 2017						
	March 2017						
	April 2017						
	May 2017						
	June 2017						
	July 2017						
	August 2017						
	September 2017						
	FY17		0.03 (0.01)	0.00	0.24	0.19 (0.00)	0.12
Back 2	October 2016	0.14 (0.01)	0.00	1.58	0.31 (0.00)	0.19	0.53
	November 2016						
	December 2016						
	January 2017						
	February 2017						
	March 2017						
	April 2017						
	May 2017						
	June 2017						
	July 2017						
	August 2017						
	September 2017						
	FY17		0.14 (0.01)	0.00	1.58	0.31 (0.00)	0.19

Table 1 (cont'd). Fiscal Year 2017 average, maximum, and minimum salinity at above- and below-ground locations in marsh and tidal freshwater forest monitoring areas.

Area	Month	Aboveground Salinity (psu)			Belowground Salinity (psu)			
		Avg. (std. err.)	Min	Max	Avg. (std. err.)	Min	Max	
Back 3	October 2016	0.26 (0.03)	0.00	2.63	1.44 (0.02)	0.49	1.96	
	November 2016							
	December 2016							
	January 2017							
	February 2017							
	March 2017							
	April 2017							
	May 2017							
	June 2017							
	July 2017							
	August 2017							
	September 2017							
	FY17		0.26 (0.03)	0.00	2.63	1.44 (0.02)	0.49	1.96
	Back 3.5	October 2016	1.44 (0.02)	0.49	1.96	2.23 (0.00)	2.04	2.44
November 2016								
December 2016								
January 2017								
February 2017								
March 2017								
April 2017								
May 2017								
June 2017								
July 2017								
August 2017								
September 2017								
FY17			1.44 (0.02)	0.49	1.96	2.23 (0.00)	2.04	2.44

Table 1 (cont'd). Fiscal Year 2017 average, maximum, and minimum salinity at above- and below-ground locations in marsh and tidal freshwater forest monitoring areas.

Area	Month	Aboveground Salinity (psu)			Belowground Salinity (psu)			
		Avg. (std. err.)	Min	Max	Avg. (std. err.)	Min	Max	
Back 4	October 2016	1.17 (0.09)	0.00	8.96	4.01 (0.02)	3.29	4.50	
	November 2016							
	December 2016							
	January 2017							
	February 2017							
	March 2017							
	April 2017							
	May 2017							
	June 2017							
	July 2017							
	August 2017							
	September 2017							
	FY17		1.17 (0.09)	0.00	8.96	4.01 (0.02)	3.29	4.50
	Front 1	October 2016	0.16 (0.02)	0.00	1.23	0.26 (0.01)	0.09	0.60
November 2016								
December 2016								
January 2017								
February 2017								
March 2017								
April 2017								
May 2017								
June 2017								
July 2017								
August 2017								
September 2017								
FY17			0.16 (0.02)	0.00	1.23	0.26 (0.01)	0.09	0.60

Table 1 (cont'd). Fiscal Year 2017 average, maximum, and minimum salinity at above- and below-ground locations in marsh and tidal freshwater forest monitoring areas.

Area	Month	Aboveground Salinity (psu)			Belowground Salinity (psu)			
		Avg. (std. err.)	Min	Max	Avg. (std. err.)	Min	Max	
Front 2	October 2016	0.59 (0.10)	0.00	12.29	1.63 (0.03)	0.48	6.07	
	November 2016							
	December 2016							
	January 2017							
	February 2017							
	March 2017							
	April 2017							
	May 2017							
	June 2017							
	July 2017							
	August 2017							
	September 2017							
	FY17		0.59 (0.10)	0.00	12.29	1.63 (0.03)	0.48	6.07
	Middle 1	October 2016	N/A ^a	N/A ^a	N/A ^a	0.67 (0.03)	0.31	9.62
November 2016								
December 2016								
January 2017								
February 2017								
March 2017								
April 2017								
May 2017								
June 2017								
July 2017								
August 2017								
September 2017								
FY17			N/A ^a	N/A ^a	N/A ^a	0.67 (0.03)	0.31	9.62

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

Table 1 (cont'd). Fiscal Year 2017 average, maximum, and minimum salinity at above- and below-ground locations in marsh and tidal freshwater forest monitoring areas.

Area	Month	Aboveground Salinity (psu)			Belowground Salinity (psu)			
		Avg. (std. err.)	Min	Max	Avg. (std. err.)	Min	Max	
Middle 2	October 2016	0.87 (0.38)	0.00	11.67	0.97 (0.06)	0.19	11.17	
	November 2016							
	December 2016							
	January 2017							
	February 2017							
	March 2017							
	April 2017							
	May 2017							
	June 2017							
	July 2017							
	August 2017							
	September 2017							
	FY17		0.87 (0.38)	0.00	11.67	0.97 (0.06)	0.19	11.17
	Middle 3	October 2016	0.31 (0.31)	0.00	5.92	1.25 (0.06)	0.32	9.64
November 2016								
December 2016								
January 2017								
February 2017								
March 2017								
April 2017								
May 2017								
June 2017								
July 2017								
August 2017								
September 2017								
FY17			0.31 (0.31)	0.00	5.92	1.25 (0.06)	0.32	9.64

Table 1 (cont'd). Fiscal Year 2017 average, maximum, and minimum salinity at above- and below-ground locations in marsh and tidal freshwater forest monitoring areas.

Area	Month	Aboveground Salinity (psu)			Belowground Salinity (psu)			
		Avg. (std. err.)	Min	Max	Avg. (std. err.)	Min	Max	
Middle 4	October 2016	0.64 (0.11)	0.00	16.89	4.55 (0.10) ^a	3.91 ^a	11.16 ^a	
	November 2016							
	December 2016							
	January 2017							
	February 2017							
	March 2017							
	April 2017							
	May 2017							
	June 2017							
	July 2017							
	August 2017							
	September 2017							
	FY17		0.64 (0.11)	0.00	16.89	4.55 (0.10) ^a	3.91 ^a	11.16 ^a
	Middle 5	October 2016	0.75 (0.08)	0.00	10.82	1.77 (0.01)	1.29	2.42
November 2016								
December 2016								
January 2017								
February 2017								
March 2017								
April 2017								
May 2017								
June 2017								
July 2017								
August 2017								
September 2017								
FY17			0.75 (0.08)	0.00	10.82	1.77 (0.01)	1.29	2.42

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

Table 1 (cont'd). Fiscal Year 2017 average, maximum, and minimum salinity at above- and below-ground locations in marsh and tidal freshwater forest monitoring areas.

Area	Month	Aboveground Salinity (psu)			Belowground Salinity (psu)			
		Avg. (std. err.)	Min	Max	Avg. (std. err.)	Min	Max	
Swamp 1	October 2016	0.07 (0.00)	0.00	0.43	0.07 (0.00)	0.06	0.08	
	November 2016							
	December 2016							
	January 2017							
	February 2017							
	March 2017							
	April 2017							
	May 2017							
	June 2017							
	July 2017							
	August 2017							
	September 2017							
	FY17		0.07 (0.00)	0.00	0.43	0.07 (0.00)	0.06	0.08
	Swamp 2	October 2016	0.48 (0.10)	0.00	10.95	0.20 (0.00)	0.14	0.33
November 2016								
December 2016								
January 2017								
February 2017								
March 2017								
April 2017								
May 2017								
June 2017								
July 2017								
August 2017								
September 2017								
FY17			0.48 (0.10)	0.00	10.95	0.20 (0.00)	0.14	0.33

Table 1 (cont'd). Fiscal Year 2017 average, maximum, and minimum salinity at above- and below-ground locations in marsh and tidal freshwater forest monitoring areas.

Area	Month	Aboveground Salinity (psu)			Belowground Salinity (psu)		
		Avg. (std. err.)	Min	Max	Avg. (std. err.)	Min	Max
Swamp 3	October 2016	0.32 (0.06)	0.00	5.72	0.37 (0.00)	0.25	0.57
	November 2016						
	December 2016						
	January 2017						
	February 2017						
	March 2017						
	April 2017						
	May 2017						
	June 2017						
	July 2017						
	August 2017						
	September 2017						
	FY17		0.32 (0.06)	0.00	5.72	0.37 (0.00)	0.25

Table 2. Summary of FY17 salinity data losses from Aquatroll sensors deployed at SHEP monitoring areas between the dates of 01 October - 20 October 2016. Data loss periods and number of days may include periods within FY16. Minor data losses were incurred when data were downloaded near pre-programmed sensor measurements. Water level data losses may be beyond dates listed below.

Area	Position	Data loss period			Reason
		Beginning	End	# Days	
Middle 1	Aboveground	09/28/2016 03:00	10/20/2016 12:00	22.38	Being diagnosed
Middle 4	Belowground	10/09/2016 07:00	10/20/2016 15:00	11.33	Being diagnosed

Table 3. Comparison of belowground salinity measurements taken October 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 Total		YSI "spot check" (ppt)	YSI Measurement Time	Aquatroll Measurement Time
	Aquatroll Salinity (psu)	Dissolved Solids (ppt)			
Back 1	0.2	0.3	N/A	crew forgot to measure	10/20/2016 10:00
Back 2	0.2	0.3	0.2	10/20/2016 11:21	10/20/2016 11:00
Back 3	0.5	0.6	0.8	10/20/2016 15:40	10/20/2016 15:00
Back 3.5	2.1	2.5	2.1	10/20/2016 16:19	10/20/2016 16:00
Back 4	3.3	3.9	3.3	10/20/2016 16:36	10/20/2016 16:00
Front 1	0.1	0.1	0.1	10/20/2016 13:07	10/20/2016 13:00
Front 2	0.8	1.0	1.3	10/21/2016 13:07	10/21/2016 13:00
Middle 1	0.3	0.5	0.4	10/20/2016 11:55	10/20/2016 11:00
Middle 2	0.4	0.5	0.5	10/20/2016 12:25	10/20/2016 12:00
Middle 3	0.5	0.6	0.4	10/20/2016 13:39	10/20/2016 13:00
Middle 4	N/A	N/A	2.4	10/20/2016 14:50	sensor failed 10/09/2016
Middle 5	1.3	1.6	1.5	10/20/2016 14:22	10/20/2016 14:00
Swamp 1	0.1	0.1	0.1	10/21/2016 10:08	10/21/2016 10:00
Swamp 2	0.3	0.4	0.2	10/21/2016 11:09	10/21/2016 11:00
Swamp 3	0.3	0.4	0.3	10/21/2016 12:03	10/21/2016 12:00

Impact of Hurricane Matthew on Some Savannah River SHEP Marsh Monitoring Areas October 2016

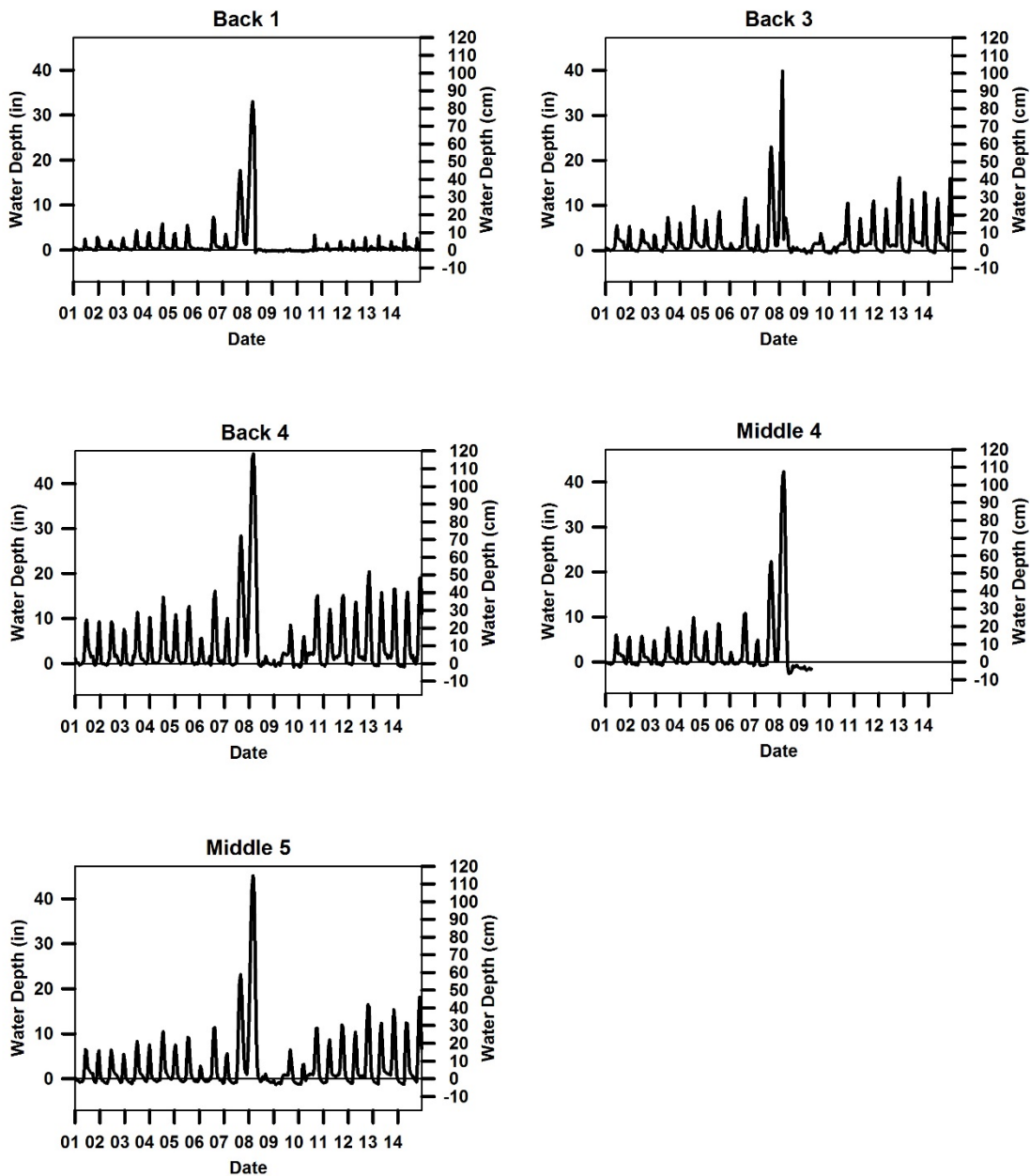


Figure 1. Hydrographs of select SHEP monitoring areas for periods before, during, and after Hurricane Matthew in October 2016. The sensor at Middle 4 failed shortly after the hurricane, making the hydrograph incomplete.