Breaux Bridge Wetland Assimilation Monitoring Report

September-November 2018

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December 4, 2018

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Discharge Location

Discharge has been occurring solely from pipe outlet #1 for over three years. The permit requires that the discharge be distributed between the different outlets. The discharge location must be changed to one of the other outlets.

Publications

Comite Resources is dedicated to publishing its work in peer-reviewed scientific journals. Below are five recently published papers, PDF's of which are available using the links given at the end of each reference. We highly recommend that those involved with the assimilation wetlands review the materials. We are available for meetings or calls to discuss any issues or questions that you may have.

Day, J.W., R.G. Hunter, R.R. Lane, G.P. Shaffer, and J.N. Day. 2018. Long-term assimilation wetlands in coastal Louisiana: review of monitoring data and management. *Ecological Engineering*, in press. Available at **https://tinyurl.com/y8tm8e64**

Day, J.W., R.D. DeLaune, J.R. White, R.R. Lane, R.G. Hunter, and G.P. Shaffer. 2018. Can denitrification explain coastal wetland loss: A review of case studies in the Mississippi Delta and New England. *Estuarine, Coastal & Shelf Science* 213: 294-304. Available at **https://tinyurl.com/yb6lqoy2**

Hillmann, E.R., G.P. Shaffer, W.B. Wood, J.W. Day, J. Day, J. Mancuso, R.R. Lane, and R.G. Hunter. 2018. Above-and belowground response of baldcypress and water tupelo seedlings to variable rates of nitrogen loading: Mesocosm and field studies. *Ecological Engineering* doi.org/10.1016/j.ecoleng.2018.08.019 Available at **https://tinyurl.com/y86yrsnu**

Hunter, R.G., J.W. Day, A.R. Wiegman, and R.R. Lane. 2018. Municipal wastewater treatment costs with an emphasis on assimilation wetlands in the Louisiana coastal zone. *Ecological Engineering*, in press. Available at **https://tinyurl.com/yawawge9**

Hunter, R.G., J.W. Day, R.R. Lane, G.P. Shaffer, J.N. Day, W.H. Conner, J.M. Rybczyk, J.A. Mistich, and J-Y. Ko. 2018. Using natural wetlands for municipal effluent assimilation: a half-century of experience for the Mississippi River Delta and surrounding environs. In *Multifunctional Wetlands*, N. Nagabhatla and C.D. Metcalfe (eds.). Springer, Cham, Switzerland. Pp.15-81. Available at **https://tinyurl.com/yd9s7bsr**

Turner Rebuttal

The rebuttal to the Turner et al. (2017) paper, which also rebuts the Bodker et al. (2015) paper, has been accepted for publication! The abstract is given below. Our rebuttal shows that the hypotheses presented by Turner et al. (2017) and Bodker et al. (2015) are flawed and biased, with the underlying premise without supporting evidence. We expect publication in the journal Wetlands Ecology & Management within the next few months.

> Turner et al. (2017) report on wetland degradation following introduction of secondarily-treated municipal effluent into a freshwater emergent and forested wetland in southeastern Louisiana, referred to as the Hammond assimilation wetland (HAW). They assign the cause of the wetland loss to a combination of increased decomposition and decreased soil strength due to the presence of nutrients from the effluent that led to buoyancy in the marsh soil. They do not, however, discuss or even cite two other papers that have examined the same wetland and have come to different conclusions (Shaffer et al. 2015; Lane et al. 2015), specifically that nutria herbivory was the main cause of the wetland deterioration (Figure 1), or a workshop in October 2016 where these issues were discussed in detail. Most importantly, the authors fail to mention or consider that the wetland vegetation began to recover as soon as nutria control was implemented (Figure 2), though with a different species assemblage most likely due to the combined impacts of herbivory (Shaffer et al. 2015) and perhaps increased water levels (Lane et al. 2015). In general, Turner et al. (2017) selectively cite the literature to support their conclusions. There have been recent concerns that because denitrification, defined as the microbially-mediated reduction of nitrogenous oxides to nitrogen gas, is coupled to the oxidation of organic matter, there is the potential for marsh soil weakening or destabilization as a result of this nitrate addition (Bodker et al. 2015; Turner 2010; Kearney et al. 2011). The observations have primarily been anecdotal or based on simple correlations of nitrate loading and soil strength measurements or measurements of belowground biomass (Darby and Turner 2008a,b,c; Deegan et al. 2012) that do not clearly indicate causation. The two central issues in this paper are the role of nutria in the marsh deterioration and the role of nutrients in causing marsh deterioration. We show below that there is strong evidence that nutria were the primary cause of marsh deterioration at the Hammond assimilation wetland and that based on stoichiometry, the amount of nitrate in the effluent could not explain the observed wetland loss.

Bodker, J.E., R.E. Turner, A. Tweel, C. Schulz, and C. Swarzenski. 2015. Nutrient-enhanced decomposition of plant biomass in a freshwater wetland. Aquatic Botany 127: 44-52.

Turner, R.E., J.E. Bodker, and C. Schulz. 2017. The belowground intersection of nutrients and buoyancy in a freshwater marsh. Wetlands Ecology & Management: 1-9.

Site visits

September 20, 2018: Comite Resources field crew Jason Day and Joel Mancuso traveled to the Breaux Bridge assimilation wetland to carry out monthly monitoring. Dissolved oxygen, conductivity, temperature, salinity and pH were measured at all sites (see data below). They also collected leaf litter and measured water levels at the Treatment, Mid, Out, and Reference sites. The Out site was dry. Discharge was at pipe one.

Discrete water quality data from September 20, 2018.

Site	DO (mg/l)	Cond (mS)	Temp. (˚C)	Sal (PSU)	pH	Water Level (cm)
Pipe	0.1	589.6	29.4	0.3	7.3	.
Tmt	0.7	489.6	25.1	0.3	6.9	18.2
Mid	0.5	299.5	24.8	0.2	6.8	5.8
Out	1.3	326.3	25.9	0.2	7.5	dry
Ref	0.3	386.1	24.9	0.2	6.7	2.3

Dissolved Oxygen was low coming out of the Pipe (0.1 mg/L), and relatively low throughout the assimilation wetlands, ranging from 0.3 – 1.3 mg/L. Conductivity ranged from ~300 mS at the Mid site to ~600 mS at Pipe. Water temperature ranged from 24.8˚C at the Mid site to 29.4˚C at the Pipe. Salinity ranged from 0.2 to 0.3 PSU. pH was ranged from 6.7 to 7.5. Water level was 18.2 cm at the Treatment site, 5.8 cm at the Mid site, 2.3 cm at the Reference site, and dry at the Out site. All these parameters are within expected normal ranges and there are no issues of concern.

October 24, 2018: Jason Day and Joel Mancuso returned to the Breaux Bridge assimilation wetland. They measured leaf litter biomass, water levels, dissolved oxygen, conductivity, temperature, salinity and pH at all of the sites (see data below). There was little to no water at the Out site. Discharge was at pipe one.

Discrete water quality data from October 24, 2018.

Site	DO (mg/l)	Cond (mS)	Temp. (˚C)	Sal (PSU)	pH	Water Level (cm)
Pipe	0.6	480.9	20.5	0.3	6.6	
Tmt	1.0	481.5	20.3	0.3	6.8	21.7
Mid	1.5	233.1	19.5	0.2	7.0	4.4
Out	2.6	185.3	18.9	0.1	7.1	dry
Ref	1.4	290.5	17.8	0.2	6.7	2.3

Dissolved Oxygen was 0.6 mg/L coming out of the Pipe, and was higher at the Treatment (1.0 mg/L), Mid (1.5 mg/L), Out (2.6 mg/L) and Reference (1.4 mg/L) sites. Conductivity ranged from ~185 mS at the Out site to ~480 mS at the Pipe and Treatment site. Temperature ranged 17.8 to 20.5˚C. Salinity decreased from 0.3 PSU at the Treatment site to 0.1 PSU at the Out site. pH was ranged from 6.6 to 7.1. Water level was 21.7 cm at the Treatment site, 4.4 cm at the Mid site, 2.3 cm at the Reference site, and dry at the Out site. All of these parameters are within expected ranges and no corrective actions are necessary.

Joel Mancuso at the Treatment site October 24, 2018.

November 29, 2018: Comite Resources biologists Jason Day and Joel Mancuso visited the Breaux Bridge assimilation wetland to conduct monthly monitoring. Leaf litter biomass and water levels were collected from each site. They measured water levels at the Treatment, Mid, Out, and Reference sites. They also measured dissolved oxygen, conductivity, temperature, salinity and pH at the Treatment, Mid, Out, Pipe and Reference sites (data given below). New feldspar accretion markers were laid down at the Treatment and Reference sites. Discharge was from pipe one.

Jason Day taking water probe measurements at the Out site on November 29, 2018.

Discrete water quality data from November 29, 2018.

Site	DO (mg/l)	Cond (mS)	Temp. (˚C)	Sal (PSU)	pH	Water Level (cm)
Pipe	11.0	407.9	13.9	0.2	7.2	
Tmt	3.6	436.4	15.5	0.3	7.2	6.5
Mid	1.9	454.6	15.6	0.2	7.6	2.6
Out	1.6	149.4	13.0	0.1	8.9	dry
Ref	2.1	253.5	15.9	0.1	8.1	7.8

Dissolved Oxygen was super saturated coming from the Pipe at 11.0 mg/L, which evidently raised DO levels at the Treatment (3.6 mg/L), Mid (1.9 mg/L), and Out (1.6 mg/L) sites. Conductivity generally ranged from ~150 mS at the Out site to ~450 mS at the Mid site. Water temperature was cold, fluctuating from 13.0 to 15.9˚C. Salinity ranged 0.3 PSU at the Treatment to 0.1 PSU at the Out and Reference sites. pH fluctuated from 7.2 to 8.9. Water level was 6.5 cm at the Tmt site, 2.6 cm at the Mid site, 7.8 cm at the Reference site, and dry at the Out site. All of these parameters are within expected ranges and no corrective actions are necessary.

New feldspar plot at the Reference site on November 29, 2018.

Lab Results from August 22, 2018

Corporate Address: 1717 Seaboard Drive,
Baton Rouge, LA 70810
Louisiana Division: Baton Rouge, LA (225)769-1930
Alabama Division: Mobile, AL (251) 344-9915

Certificate of Analyses

TNI# 01978

Date Reported: **8/30/2018**

Comite Resources

AET Work Order/Project #: 1808572

Parameter	Analytical Result	Units	Qual	Date/Time Analyzed	Analyst	Method No
Client ID Breaux Bridge Reference		**Date:** 08/22/2018 8:00 AM		**Lab ID:**1808572-001	**Matrix:** Water	
Nitrate	0.11	mg/L		08/23/2018 4:11 PM	KPJ	300.0
Nitrite	< 0.02	mg/L		08/23/2018 4:11 PM	KPJ	300.0
Orthophosphate	0.32	mg/L		08/23/2018 4:11 PM	KPJ	300.0
Ammonia	< 0.02	mg/L		08/29/2018 10:24 AM	EJF	4500NH3G-
TKN	2.12	mg/L		08/29/2018 1:19 PM	EJF	4500NorgC-
Phosphorus, Total	0.68	mg/L		08/23/2018 2:00 PM	BPB	365.3
TSS	8.8	mg/L		08/23/2018 10:18 AM	AJD	2540D-2011
Client ID Breaux Bridge Treatment		**Date:** 08/22/2018 9:30 AM		**Lab ID:**1808572-002	**Matrix:** Water	
Nitrate	0.05	mg/L		08/23/2018 10:19 PM	KPJ	300.0
Nitrite	0.08	mg/L		08/23/2018 10:19 PM	KPJ	300.0
Orthophosphate	3.67	mg/L		08/23/2018 10:19 PM	KPJ	300.0
Ammonia	3.09	mg/L		08/29/2018 10:25 AM	EJF	4500NH3G-
TKN	9.96	mg/L		08/29/2018 1:20 PM	EJF	4500NorgC-
Phosphorus, Total	4.97	mg/L		08/23/2018 2:00 PM	BPB	365.3
TSS	28.8	mg/L		08/23/2018 10:18 AM	AJD	2540D-2011
Client ID Breaux Bridge Mid		**Date:** 08/22/2018 9:15 AM		**Lab ID:**1808572-003	**Matrix:** Water	
Nitrate	0.11	mg/L		08/23/2018 7:52 PM	KPJ	300.0
Nitrite	0.06	mg/L		08/23/2018 7:52 PM	KPJ	300.0
Orthophosphate	4.88	mg/L		08/23/2018 7:52 PM	KPJ	300.0
Ammonia	5.58	mg/L		08/29/2018 10:26 AM	EJF	4500NH3G-
TKN	12.6	mg/L		08/29/2018 1:21 PM	EJF	4500NorgC-
Phosphorus, Total	6.32	mg/L		08/23/2018 2:00 PM	BPB	365.3
TSS	7.6	mg/L		08/23/2018 10:18 AM	AJD	2540D-2011

Qualifiers:

B	Analyte detected in the associated Method Blank	B-M	Analyte detected in the associated Method Blank
E	Value above quantitation range/Estimated Value	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	S	Spike Recovery outside accepted recovery limits

Date Reported: **8/30/2018**

Comite Resources

AET Work Order/Project #: 1808572

Parameter	Analytical Result	Units	Qual	Date/Time Analyzed	Analyst	Method No
Client ID Breaux Bridge Out		**Date:** 08/22/2018 11:00 AM		**Lab ID:**1808572-004	**Matrix:** Water	
Nitrate	0.56	mg/L		08/23/2018 11:33 PM	KPJ	300.0
Nitrite	< 0.02	mg/L		08/23/2018 11:33 PM	KPJ	300.0
Orthophosphate	0.15	mg/L		08/23/2018 11:33 PM	KPJ	300.0
Ammonia	< 0.02	mg/L		08/29/2018 10:27 AM	EJF	4500NH3G-
TKN	0.34	mg/L		08/29/2018 1:22 PM	EJF	4500NorgC-
Phosphorus, Total	0.24	mg/L		08/23/2018 2:00 PM	BPB	365.3
TSS	< 4.0	mg/L		08/23/2018 10:18 AM	AJD	2540D-2011
Client ID Breaux Bridge Pipe		**Date:** 08/22/2018 9:00 AM		**Lab ID:**1808572-005	**Matrix:** Water	
Nitrate	0.13	mg/L		08/23/2018 6:38 PM	KPJ	300.0
Nitrite	0.10	mg/L		08/23/2018 6:38 PM	KPJ	300.0
Orthophosphate	3.59	mg/L		08/23/2018 6:38 PM	KPJ	300.0
Ammonia	2.91	mg/L		08/29/2018 10:28 AM	EJF	4500NH3G-
TKN	9.56	mg/L		08/29/2018 1:23 PM	EJF	4500NorgC-
Phosphorus, Total	5.13	mg/L		08/23/2018 2:00 PM	BPB	365.3
TSS	36.4	mg/L		08/23/2018 10:18 AM	AJD	2540D-2011

Qualifiers:

B	Analyte detected in the associated Method Blank	B-M	Analyte detected in the associated Method Blank
E	Value above quantitation range/Estimated Value	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	S	Spike Recovery outside accepted recovery limits