Tar River Headwaters Wetland Restoration Site

Person County NC -- Tar-Pamlico River HUC# 03020101-0102

MY-3 (2019) Annual Fall Monitoring Report

NC-DEQ Division of Mitigation Services: DMS Project # 97071
DEQ Contract #6746 DWR # 2016-0233 ACE #SAW-2016-01101
Data Collected: Sep-Nov 2019 Draft Report: December 2019

NC Environmental Quality	**Submitted To:** **N.C. Department of Environmental Quality** **DEQ Division of Mitigation Services** **1652 Mail Service Ctr, Raleigh, NC 27699-1652** --- **DMS Project Manager: Lindsay Crocker** **DEQ-DMS Contract # 006746**

MOGENSEN MITIGATION, INC.
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MOGENSEN MITIGATION, INC

Mitigation Project Name	**Tar River Headwaters Restoration**		**County**	**Person**		**USACE Action ID**	**N/A**
DMS ID	**97071**		**Date Project Instituted**	**2/8/2016**		**NCDWR Permit No**	**N/A**
River Basin	**Tar-Pamlico**		**Date Prepared**	**6/18/2019**			
Cataloging Unit	**03020101**						

Credit Release Milestone	Stream Credits						Wetland Credits							
	Scheduled Releases (Stream)	Warm	Cool	Cold	Anticipated Release Year (Stream)	Actual Release Date (Stream)	Scheduled Releases (Forested)	Riparian Riverine	Riparian Non-riverine	Non-riparian	Scheduled Releases (Coastal)	Coastal	Anticipated Release Year (Wetland)	Actual Release Date (Wetland)
Potential Credits (Mitigation Plan)								**7.277**						
Potential Credits (As-Built Survey)								**7.277**						
1 (Site Establishment)	**N/A**				N/A	N/A	**N/A**				**N/A**		N/A	N/A
2 (Year 0 / As-Built)	**N/A**				N/A	N/A	**30%**	2.183			**N/A**		2017	4/26/2017
3 (Year 1 Monitoring)	**N/A**				N/A	N/A	**10%**	0.728			**N/A**		2018	4/25/2018
4 (Year 2 Monitoring)	**N/A**				N/A	N/A	**10%**	0.728			**N/A**		2019	4/26/2019
5 (Year 3 Monitoring)	**N/A**				N/A	N/A	**15%**				**N/A**		2020	
6 (Year 4 Monitoring)	**N/A**				N/A	N/A	**5%**				**N/A**		2021	
7 (Year 5 Monitoring)	**N/A**				N/A	N/A	**15%**				**N/A**		2022	
8 (Year 6 Monitoring)	**N/A**				N/A	N/A	**5%**				**N/A**		2023	
9 (Year 7 Monitoring)	**N/A**				N/A	N/A	**10%**				**N/A**		2024	
Stream Bankfull Standard	**N/A**						**N/A**				**N/A**			
Total Credits Released to Date								**3.639**						

NOTES:

CONTINGENCIES:

Signature of Wilmington District Official Approving Credit Release

27 Sept 2019

Date

1 - For NCDMS, no credits are released during the first milestone

2 - For NCDMS projects, the second credit release milestone occurs automatically when the as-built report (baseline monitoring report) has been made available to the NCIRT by posting it to the NCDMS Portal, provided the following criteria have been met:

1) Approval of the final Mitigation Plan
2) Recordation of the preservation mechanism, as well as a title opinion acceptable to the USACE covering the property
3) Completion of all physical and biological improvements to the mitigation site pursuant to the mitigation plan
4) Reciept of necessary DA permit authorization or written DA approval for porjects where DA permit issuance is not required

3 - A 10% reserve of credits is to be held back until the bankfull event performance standard has been met

Mitigation Project Name	**Tar River Headwaters Restoration**	**County**	**Person**	**USACE Action ID**	**N/A**
DMS ID	**97071**	**Date Project Instituted**	**2/8/2016**	**NCDWR Permit No**	**N/A**
River Basin	**Tar-Pamlico**	**Date Prepared**	**6/18/2019**		
Cataloging Unit	**03020101**				

DEBITS (released credits only)

	Ratios	1	1.5	2.5	5	**1.05123**	3	2	5	1	3	2	5	1	3	2	5
		Stream Restoration	**Stream Enhancment I**	**Stream Enhancement II**	**Stream Preservation**	**Riparian Restoration**	**Riparian Creation**	**Riparian Enhancement**	**Riparian Preservation**	**Nonriparian Restoration**	**Nonriparian Creation**	**Nonriparian Enhancement**	**Nonriparian Preservation**	**Coastal Marsh Restoration**	**Coastal Marsh Creation**	**Coastal Marsh Enhancement**	**Coastal Marsh Preservation**
As-Built Amounts (feet and acres)						**7.650**											
As-Built Amounts (mitigation credits)						**7.277**											
Percentage Released						**50%**											
Released Amounts (feet / acres)						**3.825**											
Released Amounts (credits)						**3.639**											
NCDWR Permit	USACE Action ID	Project Name															
Remaining Amounts (feet / acres)						**3.825**											
Remaining Amounts (credits)						**3.639**											

ROY COOPER
Governor

Mitigation Services
ENVIRONMENTAL QUALITY

January 28, 2020
Sent via email to gpottern@rjcacarolina.com

Gerald Pottern

Re: Tar River Headwaters Draft Year 3 Monitoring Report
Tar-Pam 01 River Basin, Contract 006746, Person County, DMS Project No. 97071

Gerald,

The Division of Mitigation Services (DMS) received the subject report on 1/5/2020 and a site visit occurred during the growing season 2019. After review, DMS offers the following comments:

Tar River Wetlands:

1. The picture on the front page is the same as MY2. Suggest adding a new picture to represent MY3.
2. Table 2. Update Year 3 monitoring dates.
3. Table 7. Update table header to show MY3 (instead of MY2)
4. Hydroperiod (Table 8). IRT will likely want to see % for all gauges over the monitoring period. Suggest this MY and future years create a table that shows hydroperiod by gauge by year.

Tar River Stream and Ditch:

1. Project success criteria for the riparian buffer is 260 stems per acre (planted and volunteer). Update report to show project is meeting success. If needed, insert this from Mitigation Plan, "*Performance standards were established to verify that the vegetation component supports community elements necessary for forest development and the maintenance of diffuse flow through the riparian buffer in accordance with North Carolina Division of Water Resources Administrative Code 15A NCAC 02B.0295 (Mitigation Program Requirements for Protection and Maintenance of Riparian Buffers). Performance standards are dependent upon the density and growth of at least four native hardwood tree species where no one species is greater than 50% of the stems. After five years of monitoring, an average density of 260 woody stems per acre must be surviving and diffuse flow maintained*."
2. During the DWR review period, Katie Merritt found an error on the MY2 asset table. Please update the report to remove the nutrient offset credit in the stream section, and add the asterisks as shown below:

Table 1. Project Components and Mitigation Assets
Tar River Headwaters Stream and Ditch Buffer, DMS # 97071

RIPARIAN BUFFER (15A NCAC 02B.0295)								NUTRIENT OFFSET (15A NCAC 02B.0240)	
Reach ID or Component	Restoration Level	Buffer Width (ft)	Creditable Area (sf)*	Initial Credit Ratio (x:1)	% Full Credit	Mitigation Credits (BMU)		Nutrient Offset: N (lbs)	Nutrient Offset: P (lbs)
Ditch TOB-50'	Restoration	0-30	29,621	1	100%	29,621	OR	2,571	165
		30-50	19,655	1	100%	19,655			
Stream TOB-50'	Restoration	0-30	4,787	1	100%	4,787	N/A	-	-
		30-50	1,697	1	100%	1,697			
						55,760			

* Creditable buffer areas are at least 30 ft wide.

**Creditable nutrient offset areas are at least 50 ft wide.

Please submit 1 hard copy and an electronic copy of the final report, and ensure bonding is up to date before submitting your invoice. Place the DMS comment letter or response to comment behind the cover page of the monitoring report.

Kind Regards,

LHCrocker.

Lindsay Crocker, Project Manager
NCDEQ Division of Mitigation Services

Table of Contents

1.0. Project Background Summary

1.1. Project Location and Setting

The Tar River Headwaters Wetland Restoration Site (TRHWR) is a full-delivery wetland mitigation project located in eastern Person County, between Roxboro and Oxford, North Carolina, within the Piedmont Physiographic Province (Figure 1). The easement comprises 9.98 acres, most of which is drained and degraded wetlands or former wetlands with hydric soil indicators. The remaining areas include non-hydric soils, drainage ditches, and a 570-foot long riparian corridor along a ditch and intermittent stream connecting the TRHWR site to the adjacent Tar River Headwaters Riparian Buffer and Nutrient Offset Mitigation Bank project. Both projects are implemented by Mogensen Mitigation, Inc. (MMI), and are located on a 228-acre farm owned by Roy and Joyce Huff, in the Tar-Pamlico River Basin 12-digit HUC # 03020101-0102. The Huff Farm property is located at 333 Bunnie Huff Road, Oxford NC 27565. The access road into the TRHWR site is at Latitude = 36.3913, Longitude = -78.8171.

1.2. Pre-Restoration Conditions

The TRHWR site was cleared and ditched for pasture use in the 1940s according to the owner, and was used for grazing cattle until January 2017 when the conservation easement fence was installed. The project involves plugging drainage ditches to restore wetland hydrology, fencing to exclude livestock, and planting native trees and shrubs to restore a Headwater Forest wetland ecosystem similar to what occurred prior to site clearing and drainage. Remnant native trees left for shade, hydrophytic groundcover plants mixed among the pasture grasses, and plant species recorded in adjacent natural forests (on the same soil mapping unit) provided data for the planting plan.

The project will restore approximately 7.65 acres of headwater riparian wetland (6.53 acres reestablishment plus 1.12 acres rehabilitation) and will generate an estimated 7.28 or more riparian wetland mitigation credits. Approximately 1.27 acres with non-hydric soils in the southeast corner of the mitigation site will also be reforested, and a 100-foot wide by 570-ft long riparian corridor (1.06 acre) extending southeastward along the ditch will connect the TRHWR site to MMI's adjacent stream restoration and nutrient buffer bank project to the south. Total acreage of the wetland mitigation site and riparian connector is 9.98 acres.

Restoration activities including tree planting, surface flow dispersal, and cattle exclusion will reduce soil erosion and nutrient-enriched runoff from adjacent pasture and cropland within its watershed, and help retain agricultural chemicals used on these lands. It is expected to improve water quality and habitat in the receiving tributary and reduce fine sediment loading which will enhance the overall watershed particularly in the adjacent stream and nutrient mitigation bank.

1.3. Mitigation Goals and Performance Criteria

The subject watershed HUC #03020101-0102 is designated by NCDEQ as a Targeted Local Watershed (TLW) for water quality improvement projects, and the Tar River reach within and downstream of this local HUC is recognized as a Significant Natural Heritage Area (SNHA) for its high diversity of aquatic life including protected species of river mussels and fishes. The TRHWR project is intended to support

these TLW and SNHA designations by improving water quality and habitat on the property and downstream. Specific project goals and objectives as identified in the TRHWR Final Mitigation Plan (December 2016) include:

GOALS:

- Restore the natural jurisdictional wetland hydro-period to five or more acres of forested wetland within a nine-acre site;
- Restore forested wetland habitat and improve habitat connectivity between Denny Store Gabbro Forest (NHP Natural Heritage Area) to the north and the Tar River tributaries;
- Buffer storm water runoff from fecal and other cattle-related pollutants and fertilizer.

OBJECTIVES:

- Plug existing ditches and create sheet flows throughout the site. Aerate soils to reduce compaction, improve infiltration, and create micro-topography to retain surface flows;
- Preserve the remnant mature Swamp White Oaks (a regionally rare species) for seed source. Plant appropriate native hardwood trees at a sufficient frequency to establish a diverse bottomland wetland forest. Treat and/or remove invasive species which may cause problems for site restoration, including Chinese privet and multi-flora rose;
- Install fencing to exclude cattle and establish a conservation easement to provide permanent protection on the site.

PERFORMANCE STANDARDS and MONITORING:

GOAL	OBJECTIVE	PERFORMANCE STANDARD	MONITORING APPROACH
Restore natural hydro-period for headwater forest wetland.	Plug existing ditches and create sheet flow throughout the site. Aerate soils to reduce compaction, improve infiltration, and create micro-topography to retain surface flows.	Water must be on or within 12 inches of the surface for 10% of the growing season. Hydrographs will indicate jurisdictional hydrology.	Use 11 shallow groundwater self-reading gauges throughout the site at a frequency of about one per acre. Visual inspection of ponding duration.
Restore forested wetland habitat and improve habitat connectivity with existing forests.	Preserve mature swamp white oak trees for seed source. Plant appropriate native hardwood trees at 10-ft average spacing (435 stems/ac) Treat invasive species.	Survival of 320 stems per acre at year 3, 260 stems per acre at year 5 and 210 stems per acre at MY 7.	Monitor vegetation plots annually and calculate densities of surviving planted & volunteer stems.
Buffer storm water runoff from fecal and other cattle-related nutrient inputs.	Plant trees, fence perimeter and establish a permanent conservation easement.	Insure the integrity of the cattle exclusion fencing for the life of the contract.	Visual inspection will note fence condition through site pictures. Observations will be included in annual monitoring reports.

1.4. Mitigation Approach

Prior to restoration, the TRHWR project area contained 6.53 acres of former riparian wetland (ditched and drained, grazed pasture) with redoximorphic soil characteristics indicating hydric soils, but lacking adequate wetland hydrology based on groundwater gauge data and field observations during 2015-2016. Although the drainage ditches are shallow, they have effectively reduced water retention across much of the site over the past 70 years due to the slow infiltration rate, rapid runoff, and shallow hardpan in these soils. The project will re-establish jurisdictional wetlands in this area by plugging the drainage ditches to increase rainfall retention and dispersal, fencing out livestock, controlling invasive species, and planting suitable native tree species. These 6.53 acres of wetland restoration will generate riparian wetland credits at 1:1 ratio, yielding 6.53 WMU.

Another 1.12 acres in the TRHWR project area has been less effectively drained by the ditches, and still has sufficient hydrology to meet jurisdictional wetland criteria, based on groundwater gauge data and field observations during 2015-2016. The project will rehabilitate these areas of degraded jurisdictional wetland (grazed pasture with reduced hydrology) by plugging ditches to increase hydrology, fencing out livestock, and planting suitable native tree species. These 1.12 acres of wetland rehabilitation will generate riparian wetland credits at 1.5:1 ratio, yielding 0.75 WMU. TRHWR project components and mitigations assets are summarized in Table 1, matching the proposed assets in the Mitigation Plan.

2.0. Monitoring Methods

Vegetation plots are monitored annually in accordance with current DMS monitoring guidance (June 2017). The nine installed CVS vegetation plots, each 10 x 10 meters, represents 2.8 percent of the planted mitigation area. Vegetation monitoring will occur between September and early November, prior to the loss of leaves. The vegetation success criteria are specified in the Performance Standards above. If success criteria are not met, site maintenance and monitoring will continue until the success criteria are met.

The twelve onsite groundwater monitoring gauges (RDS and Hobo) and one offsite reference wetland gauge are downloaded and maintained at least quarterly. Gauge data in the mitigation credit areas are plotted and evaluated for success based on the mitigation plan performance standard of continuous saturation within 12 inches of the ground surface for 10 percent of the growing season. Growing season based on air temperature at a weather station east of Roxboro is from March 28 to November 3, which is 221 days (from USDA WETS table). MMI installed a Hobo dual-probe soil temperature logger near the middle of the TRHWR site (beside GW-H) in late January 2017. Soil temperature on the site remained above 41 F at both 10-inch and 20-inch depths throughout February and March 2017. The lowest temperatures recorded were 42.7 F at 10 inches and 45.4 F at 20 inches. Based on soil temperatures remaining above the USDA-designated temperature for plant physiological activity, March 1 is used as the start of the growing season, based on field discussions with DMS and USACE. The revised growing season length is thus 248 days, and the groundwater hydrology success criterion is 25 days. Subsequent soil temperature data from 2018 and 2019 confirm the use of March 1 as an acceptable start date.

The conservation easement perimeter fence and ditch plug integrity will be monitored visually and documented with photo points.

3.0. Current Conditions Summary

Groundwater gauge data for 2019 were collected from January 1 through November 5; CVS vegetation plot data and photos were collected in September. MMI scientists made several visits to the TRHWR site between February and November 2019 to collect gauge data and evaluate the condition of the ditches, ditch plugs, and planted and volunteer trees. All nine CVS plots had 8 or more surviving trees (planted plus native volunteer hardwoods, excluding sweetgum) and met the 320 stems per acre success criteria (Tables 6 and 7). Outside of the CVS plots, planted stem survival looks generally good throughout the site, with an estimated 10 to 20 percent apparent mortality. Leader die-back is common on many of the taller seedlings, especially on tulip poplar and river birch, but many of the trees exhibiting leader die-back also had vigorous basal sprouts. There are scattered small areas with tree densities less than 320 stems per acre, but none exceeding the "problem area" size threshold, and no "low woody density" areas or "invasive exotic" problem areas were designated this year. Groundcover vegetation is excellent throughout, with both treated areas (non-wetland and drained wetland) and non-treated areas (existing wetland) showing dense and diverse herbaceous cover. Small unflagged trees outside of the CVS plots remain difficult to see due to the dense groundcover.

All ditch plugs appear to be stable and performing as designed. Survival of planted trees, live-stakes, and herbaceous cover on the plug slopes and tops appears to be providing good protection; no erosion on the plugs was observed. Ponding behind each of the ditch plugs was evident during spring and early summer, but were dry during late summer and fall.

Twelve groundwater gauges (A through L) on the project site are roughly arranged in four transects perpendicular to the main ditch, as recommended by mitigation plan reviewers during field meetings (Figure 2). Three gauges (A, H and J) are within existing wetland rehabilitation areas, seven gauges (D, E, F, G, I, L, and K) are within the drained wetland reestablishment areas, and two gauges (B and C) are downslope from ditch plug #4 in areas not expected to generate wetland credits. Wetland hydrology success for the TRHWR site is based on saturation within 12 inches of the ground surface for 10% of the 248-day growing season (March 1 to November 3). The gauges measure the free water table depth and do not account for capillary fringe saturation which can extend above the free water table in fine-textured soils (https://vernonjames.ces.ncsu.edu/eleventh-annual-on-site/soil-wetness/).

Rainfall in 2019, relative to the 30-year normal values (30^{th} to 70^{th} percentiles), was normal to high during January to April, and generally low for the rest of the growing season except for a few days of heavy rain in June (Figure 5). In 2019 all 13 gauges (ten in the mitigation credit area, two outside the credit area, and one off-site reference gauge) exceeded the minimum of 25 consecutive days for hydrologic success during the early part of the growing season, with consecutive day saturation periods ranging from 34 to 64 days (Table 8).

Soil temperature data for 2019 support the accepted growing season start date of March 1. Soil temperature remained above 41 F from January 28 onward, and the lowest recorded soil temperature after March 1 was 42.8 F on March 8.

4.0. References

Lee, Michael T., Peet, Robert K., Roberts, Steven D., Wentworth, Thomas R. (2008). *CVS-EEP Protocol for Recording Vegetation version 4.2, October 2008*. Retrieved September 2011, from: http://cvs.bio.unc.edu/methods.htm

LeGrand, Harry E. Jr. (2007) Natural Areas Inventory of Person County, NC. NC Natural Heritage Program, Raleigh NC.

NC Division of Mitigation Services. (2017). *NC-DMS Annual Monitoring Report Format, Data Requirements, and Content Guidance, June 2017.* http://portal.ncdenr.org/web/eep/dbb-resources

Schafale, M.P., Weakley, A.S. 1990. Classification of the Natural Communities of North Carolina, Third Approximation. NC Natural Heritage Program, Raleigh, NC.

Sink, Larry T. (1995). *Soil Survey of Person County, North Carolina*. USDA Soil Conservation Service (Natural Resources Conservation Service), Raleigh, NC.

United States Department of Agriculture, Natural Resources Conservation Service, 2016. Web Soil Survey. Available: http://websoilsurvey.nrcs.usda.gov/app/

APPENDIX A. Project Background Data

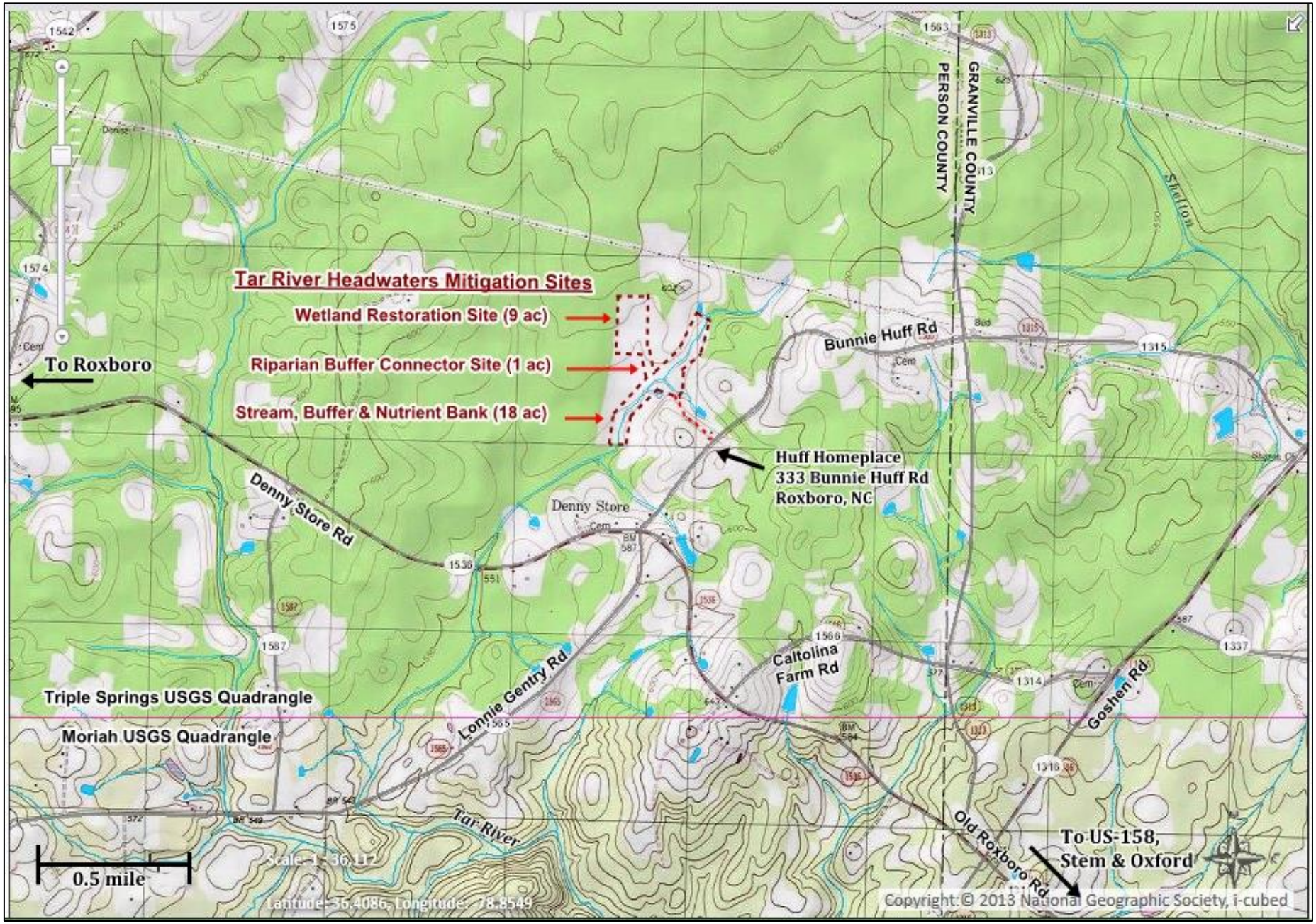


Figure 1. Project Vicinity Map: Tar River Headwaters Wetland Restoration Site and related mitigation projects on the Huff Farm property, Person County NC, Tar-Pamlico River HUC# 03020101-0102. DIRECTIONS: From US-158 in Berea, Granville County NC, turn right (northwest) on Old Roxboro Rd, which becomes Denny Store Rd where it crosses into Person County. Turn right (north) on Bunnie Huff Rd, go 0.4 mile, and turn left into the driveway just past the Huff Homeplace sign. Proceed through the gate at end of driveway to the project sites.

Table 1. Project Components and Mitigation Credits									
Tar River Headwaters Wetland Restoration Site, DMS Project # 97071									
Mitigation Credits									
	Stream		**Riparian Wetland**		**Non-riparian Wetland**		**Buffer**	**Nitrogen Nutrient Offset**	
Type	**R**	**RE**	**R**	**RE**	**R**	**RE**			
Acres			7.650						
Credits			7.270						
TOTAL CREDITS			7.277						
Project Components									
Project Component or Reach ID	**Stationing/ Location**		**Existing Footage or Acreage**		**Approach (PI, PII etc.)**		**Restoration or Restoration Equivalent**	**Restoration Footage or Acreage**	
Drained Wetland	--		6.530		Restore Hydrology, Fence & Plant		R (Reestablish)	6.530 ac	
Grazed Wetland	--		1.120		Fence & Plant		R (Rehabilitate)	1.120 ac	
Component Summation									
Restoration Level	**Stream (lin. feet)**		**Riparian Wetland (acres)**				**Non-Riparian Wetland (acres)**	**Buffer (sq. feet)**	**Upland (acres)**
			Riverine		**Non-Riverine**				
Re-establishment **(1: 1.0)**					6.530 ac				
Rehabilitation **(1: 1.5)**					1.120 ac				
Enhancement I									
Enhancement II									
Creation									
Preservation									
High Quality Preservation									
TOTAL feet or acres	-		-		**7.650 ac**				
TOTAL WMU	-		-		**7.277**				

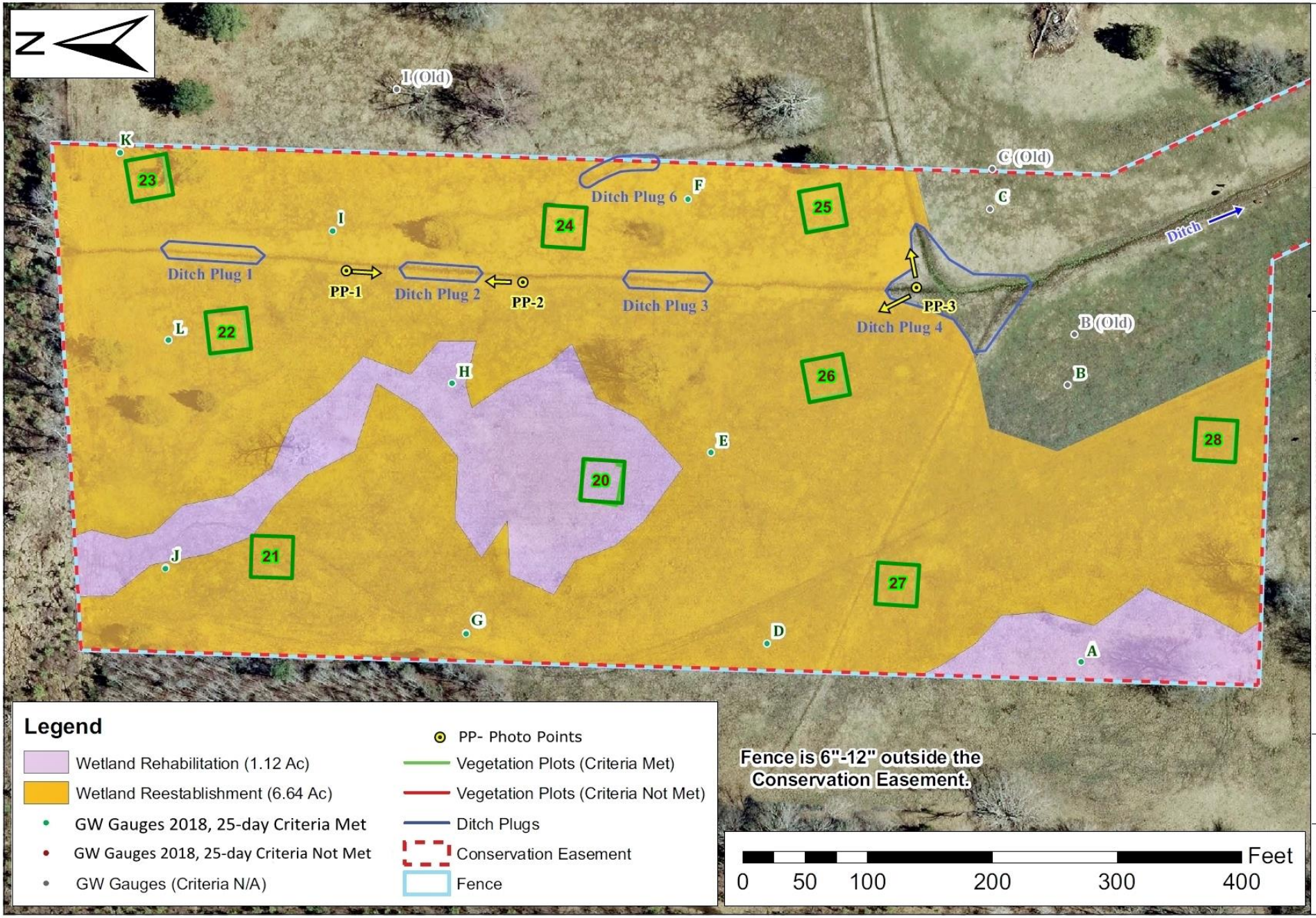
Table 2. Project Activity & Reporting History Tar River Headwaters Wetland Restoration Site, DMS Project# 97071		
Activity or Report	**Data Collection Complete**	**Actual Completion or Delivery**
Mitigation Plan		Dec 2016
Final Construction Plans		Dec 2016
Construction		Jan 2017
Planting		Feb 2017
Baseline Monitoring/Report	Feb 2017	Apr 2017
Year 1 Monitoring	Nov 2017	Dec 2017
Year 2 Monitoring	Nov 2018	Dec 2018
Year 3 Monitoring	Nov 2019	Jan 2020
Year 4 Monitoring		
Year 5 Monitoring		

Table 3. Project Contacts Table Tar River Headwaters Wetland Restoration Site, DMS Project # 97071	
Designer	Ecological Engineering, Raleigh NC Heather Smith: 919-557-0929
Construction Contractor	KBS Earthworks, Greensboro NC Kory Strader & Brett Strader: 336-685-4339
Survey Contractor	Michael T. Brandon, PLS, Roxboro NC Michael Brandon: 336-597-8673
Fence Contractor	Strader Fencing, Inc., Julian NC Kenneth Strader: 336-314-2935
Herbicide and Seeding	KBS Earthworks, Greensboro NC Kory Strader & Brett Strader: 336-685-4339
Planting Contractor	Mogensen Mitigation Inc, Charlotte NC Rich Mogensen: 704-576-1111; Gerald Pottern: 919-556-8845
Nursery Stock Suppliers	Mellowmarsh Farms, Siler City NC Joanie McLean: 919-742-1200
Monitoring Performers	Mogensen Mitigation Inc, Charlotte NC Rich Mogensen: 704-576-1111; Gerald Pottern: 919-556-8845

Table 4. Project Attributes				
Tar River Headwaters Wetland Restoration Site, DMS Project # 97071				
Project Name	Tar River Headwaters Wetland Restoration Site			
County	Person County			
Project Area (acres)	9.9 acres (Wetland + Buffer Easement combined)			
Project Coordinates (lat. and long.)	36.3895, -78.8153			
Project Watershed Summary Information				
Physiographic Province	Piedmont, Carolina Slate Belt			
River Basin	Tar-Pamlico River-01			
USGS Hydrologic Unit 8-digit	3020101	**USGS Hydrologic Unit 12-digit**	-0102	
DWQ Sub-basin	Tar-Pam-01			
Project Drainage Area (acres)	60			
Project Drainage Area Percentage of Impervious Area	0%			
CGIA Land Use Classification	Pasture, Crop, and Deciduous Forest			
Wetland Summary Information (Post-Restoration)				
Parameters	**Wetland Area**			
Size of Wetland (acres)	1.12 ac existing + 6.53 ac drained = 7.65 ac			
Wetland Type (non-riparian, riparian riverine or riparian non-riverine)	Riparian non-riverine (Headwater)			
Mapped Soil Series	Iredell Loam (IrB)			
Drainage class	Iredell = moderately well; Hydric inclusions = poorly			
Soil Hydric Status	Drained Hydric			
Source of Hydrology	Shallow ponding; perched on shallow aquitard			
Hydrologic Impairment	Drainage ditches (1940s)			
Native vegetation community	Headwater depression wetland forest (prior to pasture conversion)			
Percent composition exotic invasive vegetation	20% Fescue (sprayed)			
Regulatory Considerations				
Regulation	**Applicable?**	**Resolved?**	**Supporting Documentation**	
Waters of the United States – Section 404	Yes	Yes	Prelim JD	
Waters of the United States – Section 401	Yes	Yes	Prelim JD	
Endangered Species Act	No	N/A	US FWS Letter	
Historic Preservation Act	No	N/A	NC SHPO Letter	
Coastal Zone Management Act (CZMA) Coastal Area Management Act (CAMA)	No	N/A	N/A	
FEMA Floodplain Compliance	No	N/A	NC Floodmaps Data	
Essential Fisheries Habitat	No	N/A	N/A	

APPENDIX B. Visual Assessment Data

Figure 2. Current Conditions Plan View
Table 5. Vegetation Conditions Assessment
Figure 3. Vegetation Plot Photos
Figure 4. Photo Point Photos



Mogensen Mitigation, Inc.
P. O. Box 690429
Charlotte, NC 28227
(704) 576-1111

CURRENT CONDITIONS PLAN VIEW MY3 (2019)
TAR RIVER HEADWATERS WETLAND RESTORATION SITE
DMS PROJECT #97071

PERSON COUNTY
NORTH CAROLINA

FIGURE 2

Table 5: Vegetation Condition Assessment Table -- MY-3 (2019)

Tar River Headwaters Wetland Restoration #97071. Person County HUC #03020101-0102

Planted Acreage = 7.65

Vegetation Problem Category	Definitions	Mapping Threshold (acres)	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material	0.1	N/A	0	0	0%
Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1	N/A	0	0	0%
			Total	**0**		**0%**
Areas of Poor Growth Rates or Vigor *	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.25	N/A	0	0	0%
			Cumulative Total	0	0	**0%**

Easement Acreage = 9.98

Vegetation Problem Category	Definitions	Mapping Threshold (SF)	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale).	1000	N/A	0	0	0%
Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	none	N/A	0	0	0%

Figure 3. Vegetation Plots: Tar River Headwaters Wetland Restoration Site #97071 MY-3 (Sep 2019)

CVS VegPlot-20: MY-0 Spring 2017

CVS VegPlot-20: MY-3 Sept 2019

CVS VegPlot-21: MY-0 Spring 2017

CVS VegPlot-21: MY-3 Sept 2019

Figure 3. Vegetation Plots: Tar River Headwaters Wetland Restoration Site #97071 MY-3 (Sep 2019)

CVS VegPlot-22: MY-0 Spring 2017

CVS VegPlot-22: MY-3 Sept 2019

CVS VegPlot-23: MY-0 Spring 2017

CVS VegPlot-23: MY-3 Sept 2019

Figure 3. Vegetation Plots: Tar River Headwaters Wetland Restoration Site #97071 MY-3 (Sep 2019)

CVS VegPlot-24: MY-0 Spring 2017

CVS VegPlot-24: MY-3 Sept 2019

CVS VegPlot-25: MY-0 Spring 2017

CVS VegPlot-25: MY-3 Sept 2019

Figure 3. Vegetation Plots: Tar River Headwaters Wetland Restoration Site #97071 MY-3 (Sep 2019)

CVS VegPlot-26: MY-0 Spring 2017

CVS VegPlot-26: MY-3 Sept 2019

CVS VegPlot-27: MY-0 Spring 2017

CVS VegPlot-27: MY-3 Sept 2019

Figure 3. Vegetation Plots: Tar River Headwaters Wetland Restoration Site #97071 MY-3 (Sep 2019)

CVS VegPlot-28: MY-0 Spring 2017

CVS VegPlot-28: MY-3 Sept 2019

CVS VegPlot-29: MY-0 Spring 2017

CVS VegPlot-29: MY-3 Sept 2019

Figure 4. Photo Points: Tar River Headwaters Wetland Restoration Site #97071 MY-3 (Sept 2019)

Photo Point 1: MY-0 Spring 2017

Photo Point 1: MY-3 Sept 2019

Photo Point 2: MY-0 Spring 2017

Photo Point 2: MY-3 Sept 2019

Figure 4. Photo Points: Tar River Headwaters Wetland Restoration Site #97071 MY-3 (Sept 2019)

Photo Point 3: MY-0 Feb 2017 -- facing east

Photo Point 3: MY-3 Sept 2019 -- facing east

Photo Point 3: MY-0 Feb 2017 -- facing north

Photo Point 3: MY-3 Sept 2019 -- facing north

APPENDIX C. Vegetation Plot Data

Table 6. Vegetation Plot Success Summary
Table 7. Vegetation Plot Stem Count Data

Tar River Headwaters Wetland Restoration (TRHWR) Project, DMS # 97071.
Monitoring Year 3 (Sept 2019) -- Person County NC. Tar-Pam HUC# 03020101

Table 6. CVS Plot Stem Density and Success Summary

CVS Plot #	Wetland Planted Stems		Planted + Volunteer Stems		Invasive Woody Stems	Success Criteria Met?
	per plot	per acre	per plot	per acre		
97071- 20	7	283	14	567	0	Yes
97071- 21	7	283	10	405	0	Yes
97071- 22	9	364	20	809	0	Yes
97071- 23	12	486	18	728	0	Yes
97071- 24	6	243	8	324	0	Yes
97071- 25	9	364	9	364	0	Yes
97071- 26	9	364	9	364	0	Yes
97071- 27	8	324	9	364	0	Yes
97071- 28	10	405	11	445	0	Yes
Project Avg	8.6	346	12.0	486	0	Yes

Success Criteria = 320 planted + volunteer stems per acre at MY3, 260 planted + volunteer stems at MY5, and 210 planted + volunteer stems per acre at MY7 (planted spp only).

Tar River Headwaters Wetland Restoration (TRHWR) Project, DMS # 97071.
Monitoring Year 3 (Sept 2019) -- Person County NC. Tar-Pamlico HUC# 03020101-0102.

Table 7. CVS Plot Stem Counts and Density by Species.

			Current Plot Data (MY3 - Sept 2019)											
		Growth	97071-20		97071-21		97071-22		97071-23		97071-24		97071-25	
Scientific Name	Common Name	Type	Plant	Total	Plant	Total	Plant	Total	Plant	Total	Plant	Total	Plant	Total
Betula nigra	River Birch	Tree (P)	4	4	3	3	2	2	4	4				
Carpinus caroliniana	Musclewood	Tree (P)												
Cornus amomum	Silky dogwood	Shrub		1										
Diospyros virginiana	Persimmon	Tree (P)	1	2		1						1		
Fraxinus pennsylvanica	Green Ash	Tree (P)		2	1	3	3	8	2	4	1	2		
Liriodendron tulipifera	Tulip Poplar	Tree (P)			2	2								
Liquidambar styraciflua	American sweetgum	Tree				3				1				
Nyssa biflora	Swamp Blackgum	Tree (P)												
Pinus taeda	Loblolly pine	Tree								1				
Platanus occidentalis	Sycamore	Tree (P)	2	2			2	2						
Quercus bicolor	Swamp White Oak	Tree (P)									1	1	1	1
Quercus michauxi	Swp Chestnut Oak	Tree (P)							2	2				
Quercus phellos	Willow Oak	Tree (P)					1	1	4	4	2	2	8	8
Quercus nigra	Water Oak	Tree (P)												
Ulmus alata	Winged Elm	Tree						2		2				
Ulmus americana	American Elm	Tree (P)		3	1	1	1	5		2	2	2		
		Stem count	7	14	7	10	9	20	12	18	6	8	9	9
		ares	1	1	1	1	1	1	1	1	1	1	1	1
(P) = planted species		acres	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
		Species count	3	6	4	6	5	6	4	8	4	5	2	2
		Stems per ACRE	283	567	283	405	364	810	486	729	243	324	364	364

			Plot Data (MY3 Sep 2019)				Annual Means							
		Growth	97071-27		97071-28		MY0 (2017)		MY1 (2017)		MY2 (2018)		MY3 (2019)	
Scientific Name	Common Name	Type	Plant	Total	Plant	Total	Plant	Total	Plant	Total	Plant	Total	Plant	Total
Betula nigra	River Birch	Tree (P)			2	2	23	23	23	23	22	22	22	22
Carpinus caroliniana	Musclewood	Tree (P)	2	2	4	4	6	6	6	6	6	6	6	6
Cornus amomum	Silky dogwood	Tree										1		1
Diospyros virginiana	Persimmon	Tree (P)					2	2			1	3	1	4
Fraxinus pennsylvanica	Green Ash	Tree (P)	1	1	2	3	9	9	10	10	10	17	10	23
Liriodendron tulipifera	Tulip Poplar	Tree (P)					12	12	6	6	1	2	2	2
Liquidambar styraciflua	American sweetgum	Tree										3		4
Nyssa biflora	Swamp Blackgum	Tree (P)					1	1						
Pinus taeda	Loblolly pine	Tree										3		1
Platanus occidentalis	Sycamore	Tree (P)	1	1			5	5	5	5	5	5	5	5
Quercus bicolor *	Swamp White Oak	Tree (P)					3	3	3	3	4	4	2	2
Quercus michauxi *	Swp Chestnut Oak	Tree (P)											2	2
Quercus phellos *	Willow Oak	Tree (P)			2	2	14	14	1	1	18	19	19	19
Quercus nigra *	Water Oak	Tree (P)					6	6	17	17				
Ulmus alata	Winged Elm	Tree												4
Ulmus americana	American Elm	Tree (P)	4	5			10	10	11	14	5	18	8	18
		Stem count	8	9	10	11	91	91	82	85	72	97	77	108
		ares	1	1	1	1	9	9	9	9	9	9	9	9
(P) = planted species		acres	0.025	0.025	0.025	0.025	0.222	0.222	0.22	0.22	0.22	0.22	0.22	0.22
		Species count	4	4	4	4	11	11	11	11	9	12	10	14
		Stems per ACRE	324	364	405	445	409	409	369	382	324	436	346	486

Plant = Planted Stems; Total = Planted + Volunteer Stems exluding Pinus, Liquidambar, Rosa, Baccharis, and exotics
*** Quercus species misidentified in 2017 were corrected in 2018-2019, thus the changes in names and numbers**

Color codes for Plot Density & Success

Exceeds criteria by 10% or more	(352 or more)
Exceeds criteria by less than 10%	(320 - 351)
Fails criteria by less than 10%	(289 - 319)
Fails criteria by more than 10%	(288 or less)

APPENDIX D. Hydrologic Data

Figure 5. Monthly Rainfall Plot with Percentiles
Figure 6. Groundwater Gauge and Rainfall Data
Table 8. Hydrologic Success Attainment

Figure 5. Monthly Rainfall Totals (2019) with 30th and 70th Percentiles.
From USDA WETS table, 30-year historical data (1981-2010) at ROXBORO 7 ESE, NC
NCCRONOS Station 317516

Month 2019	Month Total in	30th % normal	70th % normal
Jan	3.96	2.45	4.46
Feb	6.28	2.58	3.82
Mar	3.67	2.99	5.32
Apr	4.65	2.18	4.21
May	1.05	2.51	4.04
Jun	7.63	2.15	4.45
Jul	2.89	3.38	5.44
Aug	3.39	2.57	4.9
Sep	0.34	1.94	4.85
Oct	4.40	2.65	4.72
Nov	3.05	1.89	4.42
Dec		2.56	4.52

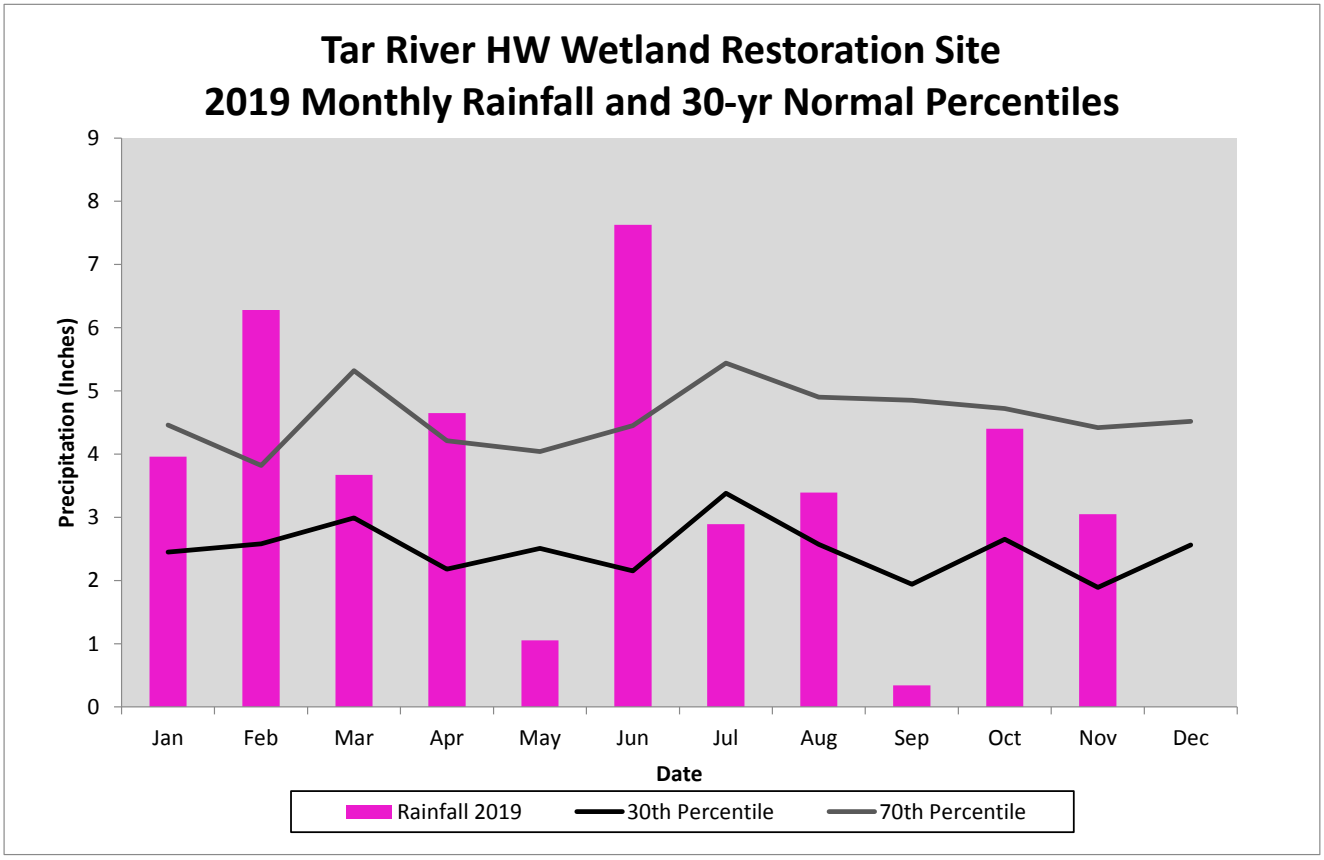
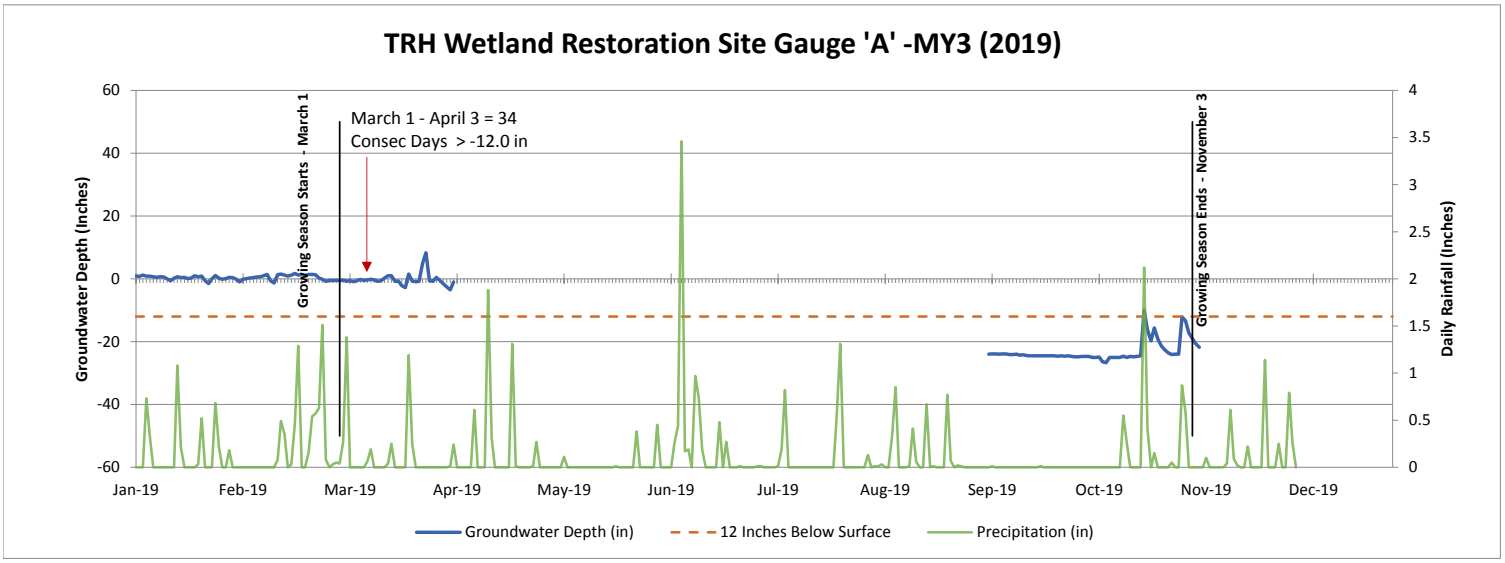
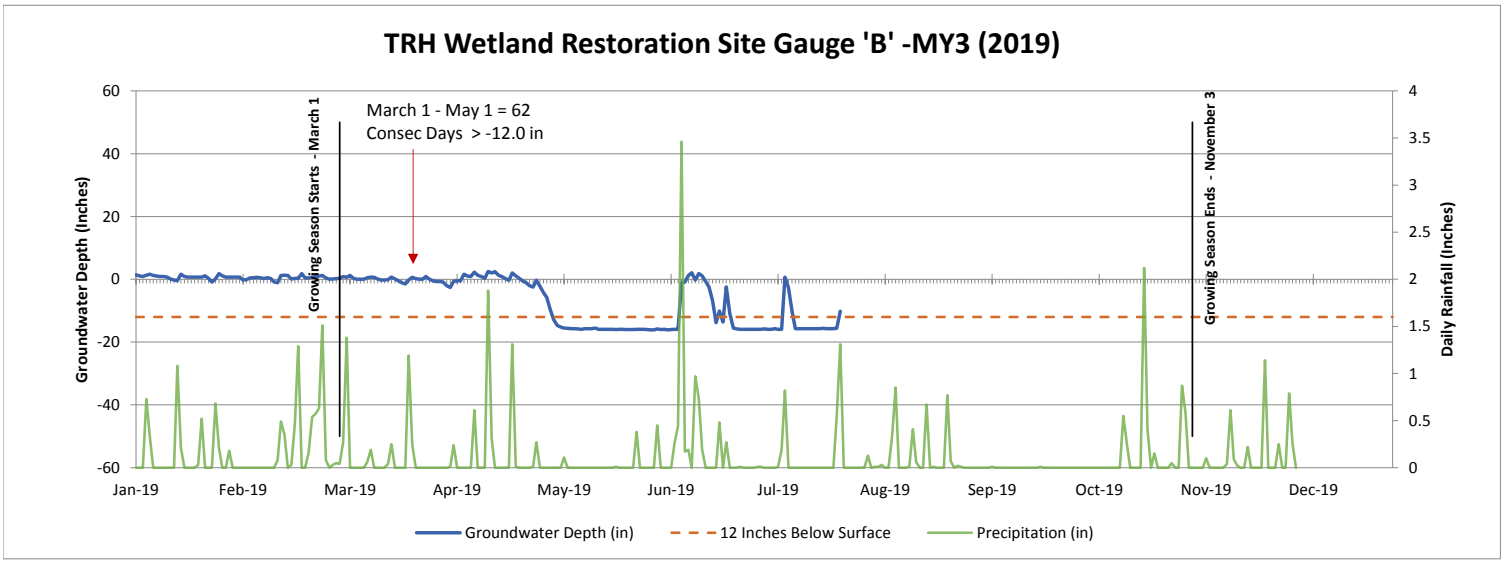


Figure 6A. Groundwater Gauges and Rainfall Data Plots 2019 -- Tar River Headwaters Wetland Restoration # 97071





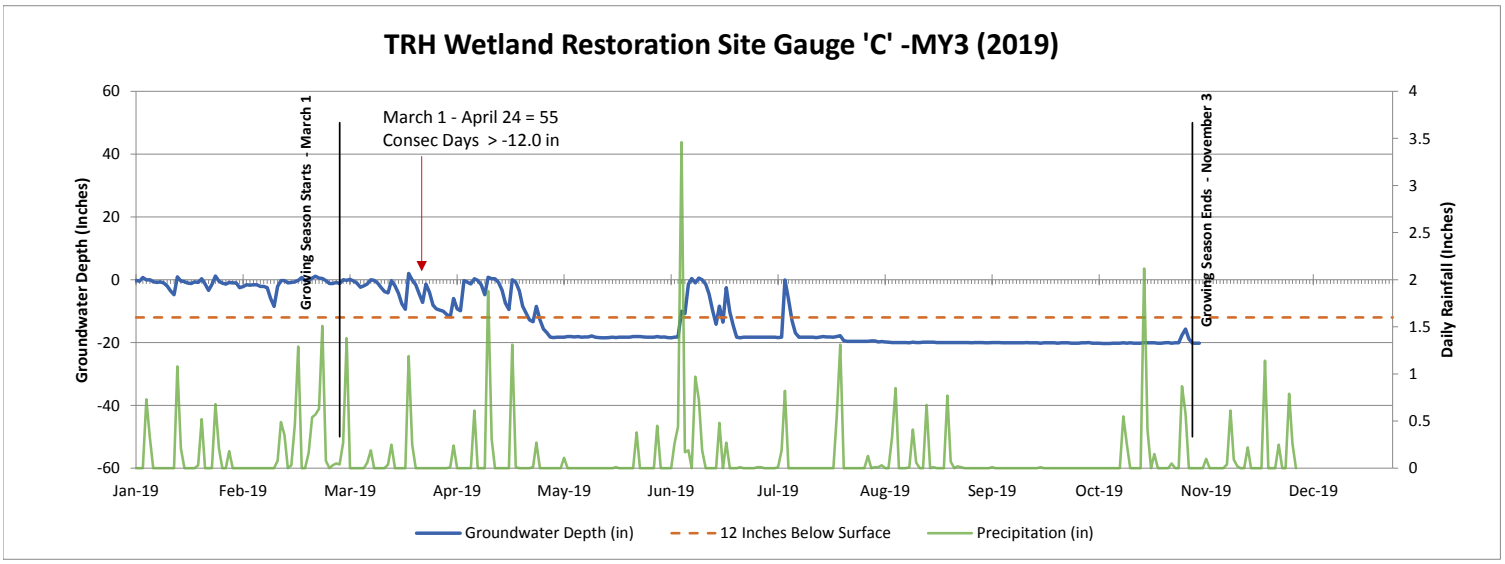
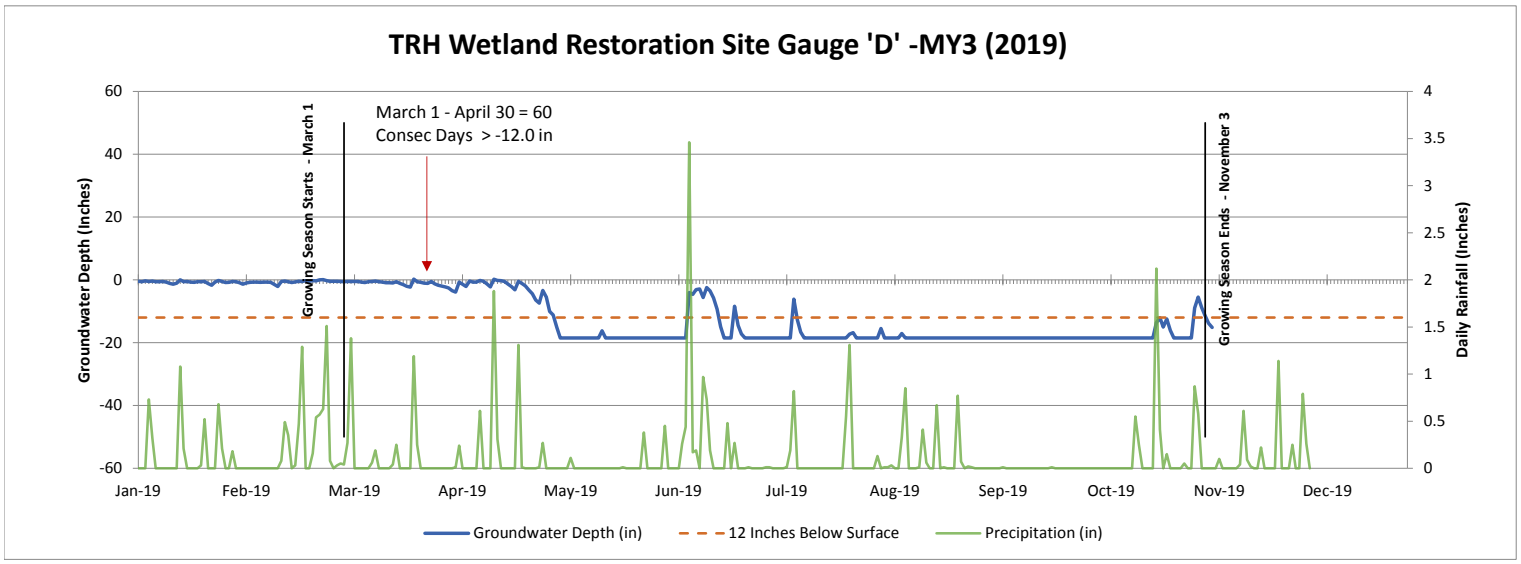
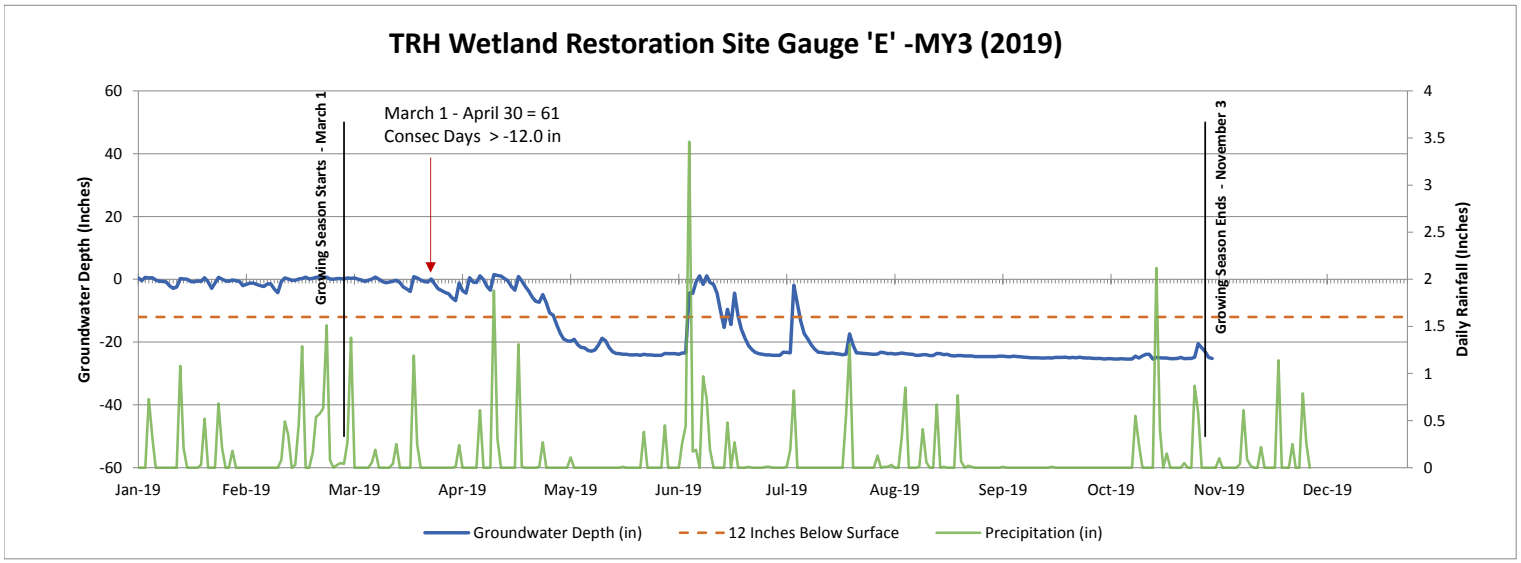


Figure 6B. Groundwater Gauges and Rainfall Data Plots 2019 -- Tar River Headwaters Wetland Restoration # 97071





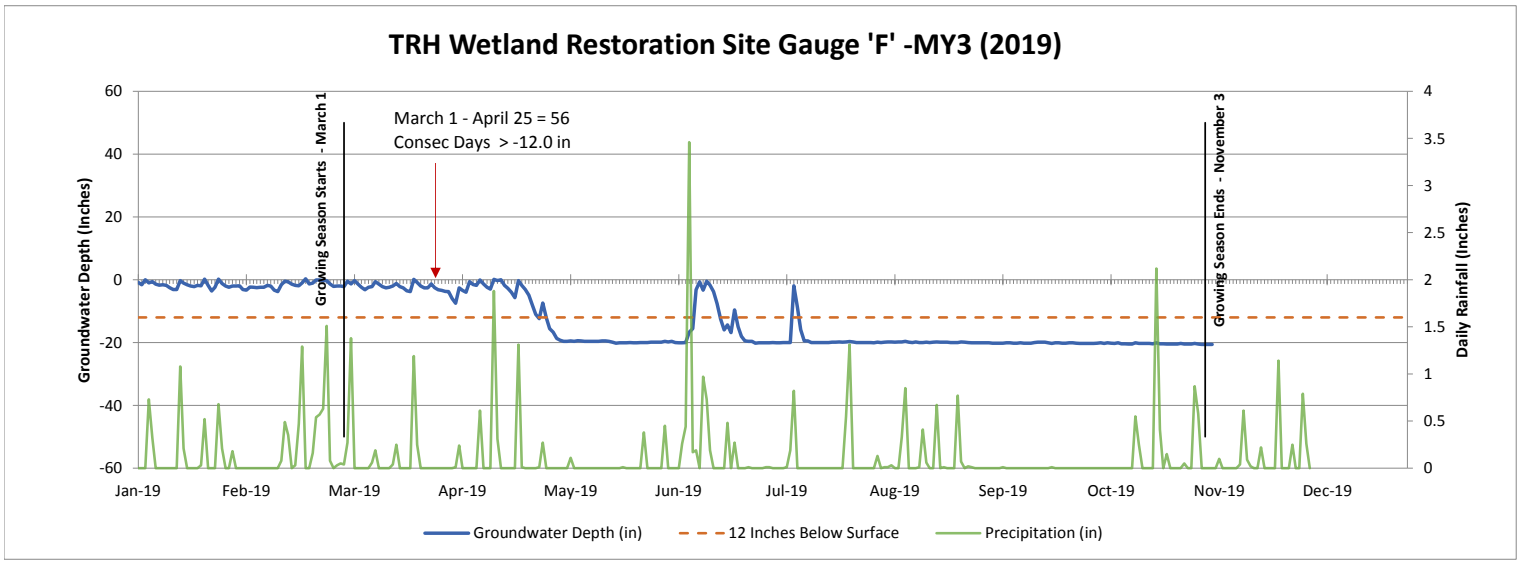
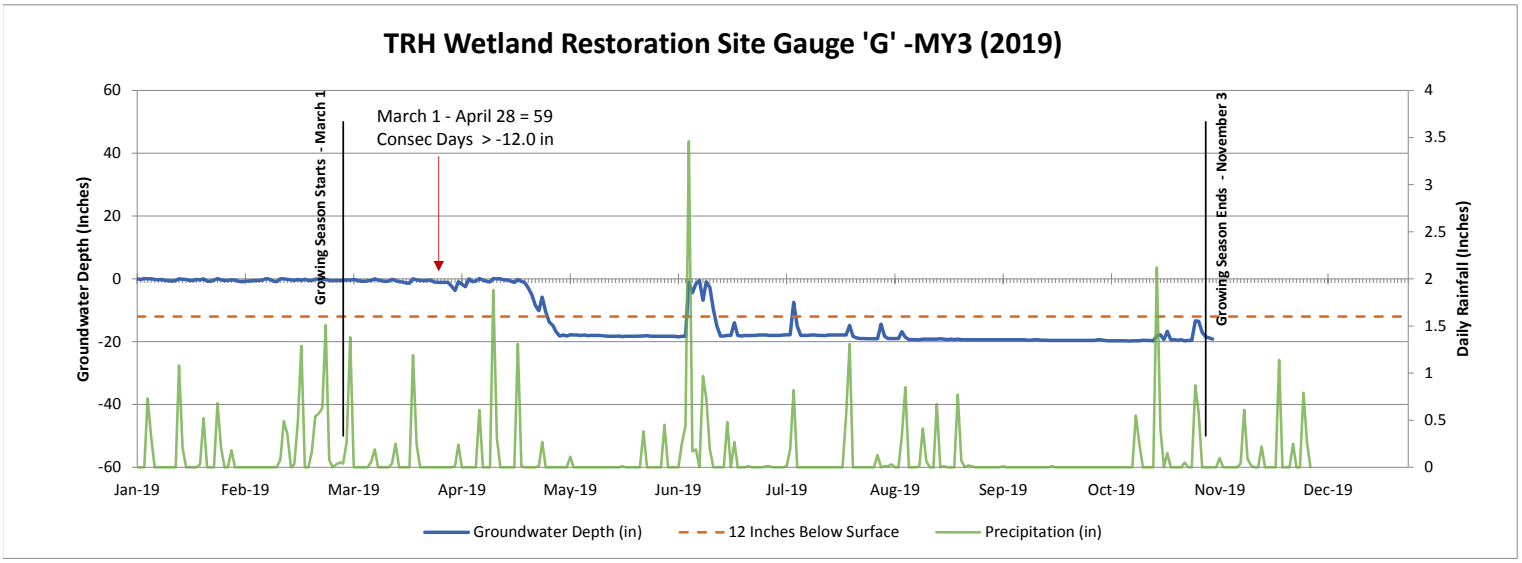
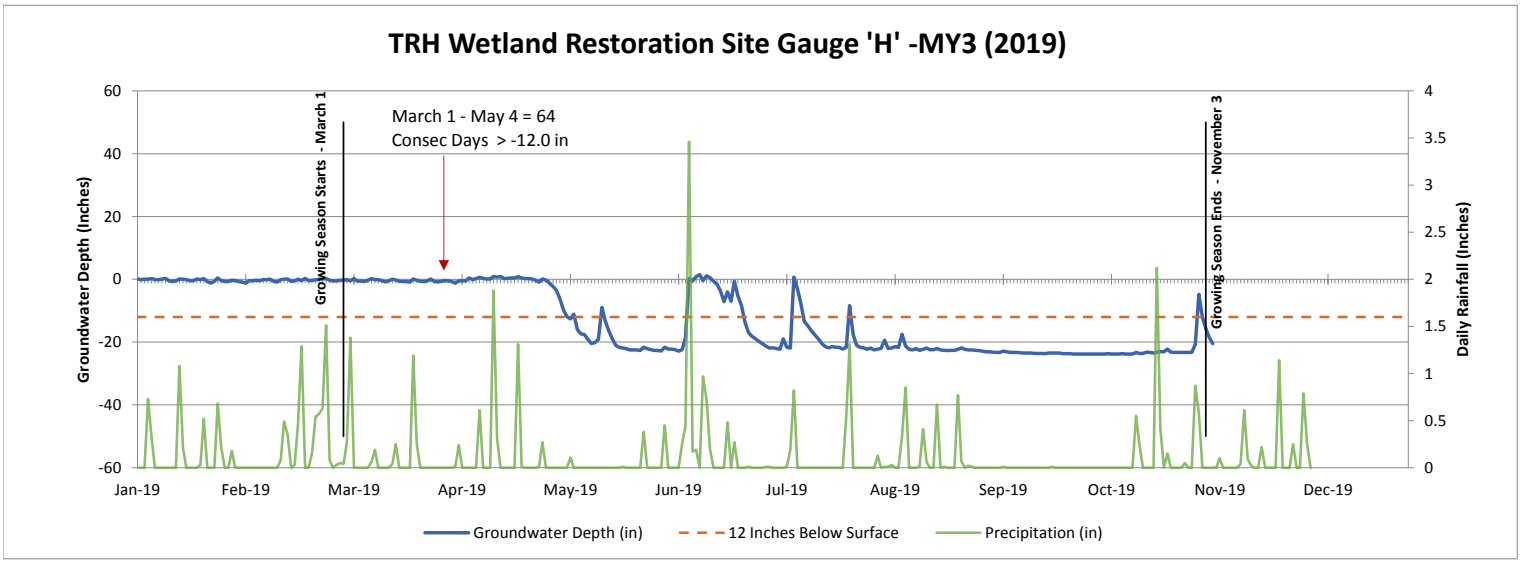


Figure 6C. Groundwater Gauges and Rainfall Data Plots 2019 -- Tar River Headwaters Wetland Restoration # 97071





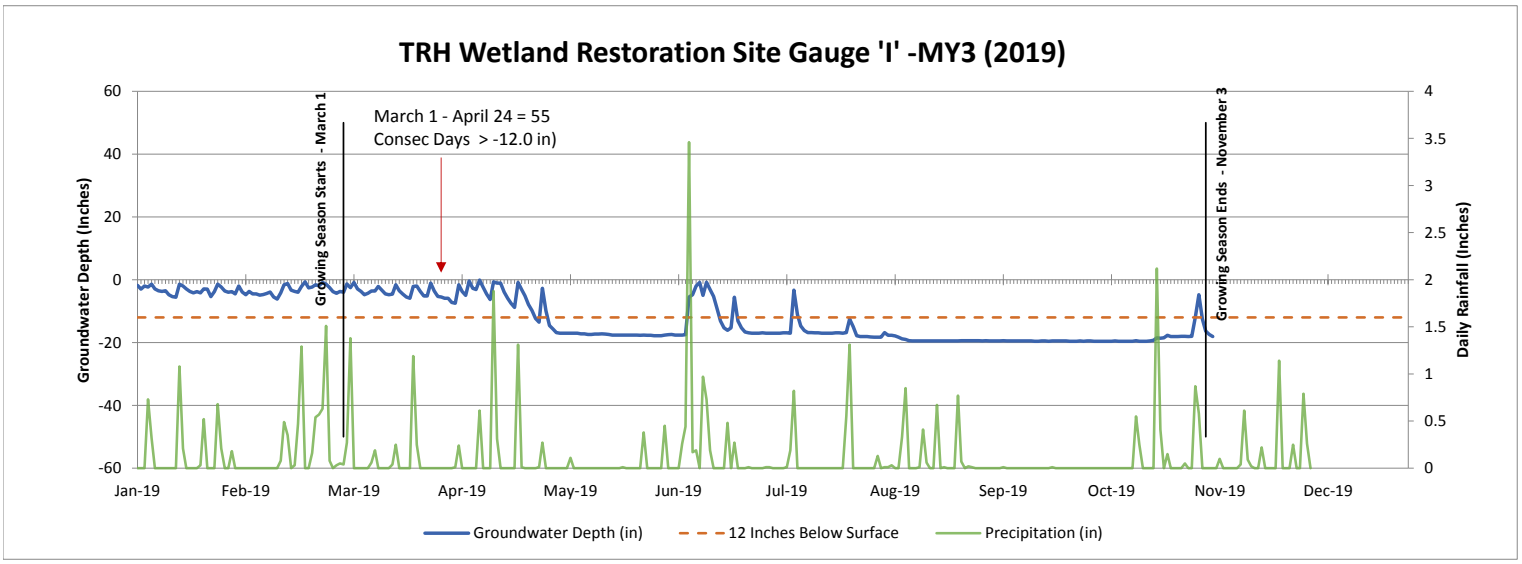
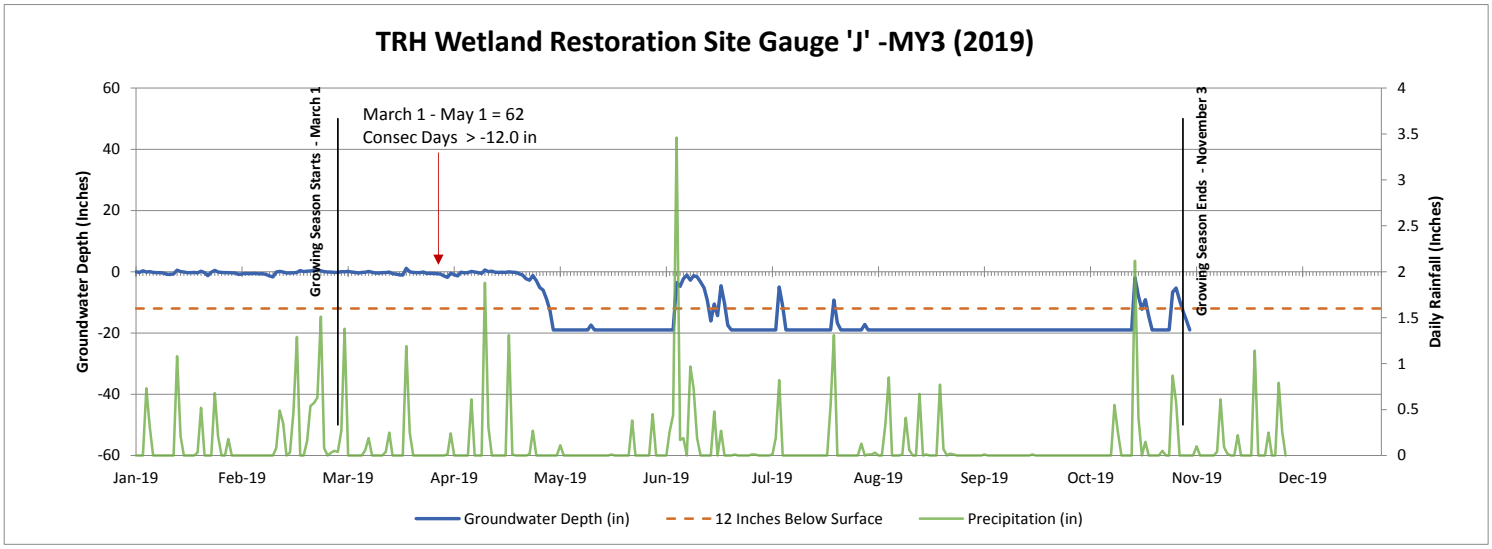
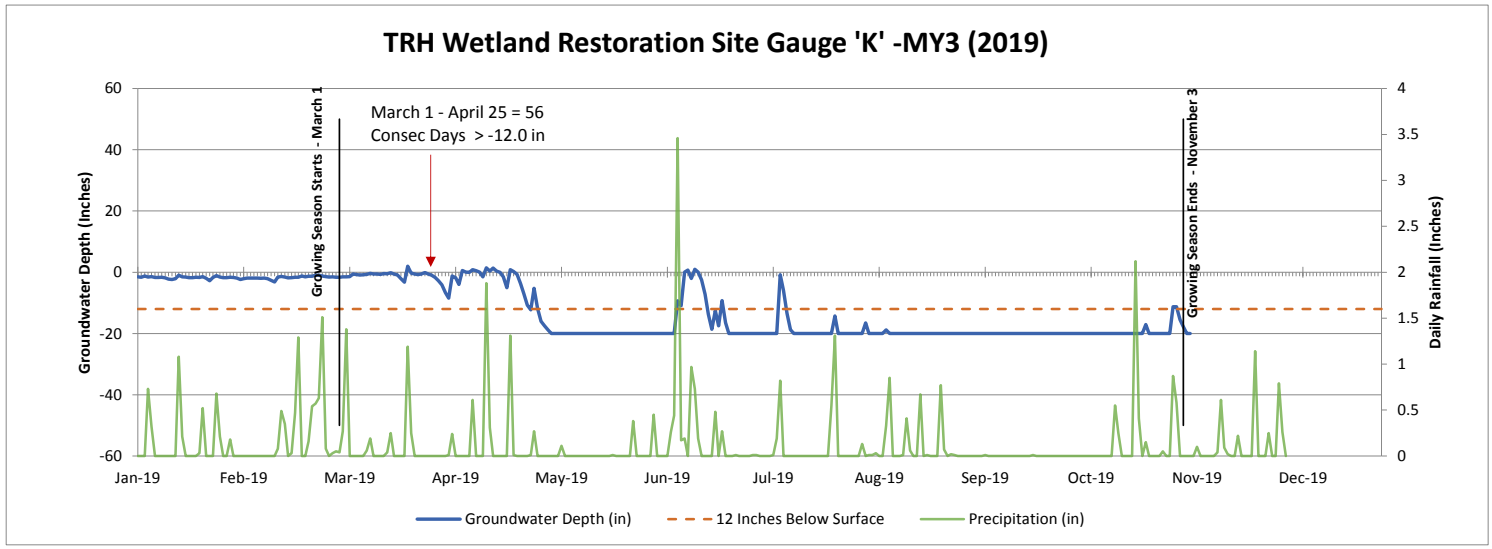


Figure 6D. Groundwater Gauges and Rainfall Data Plots 2019 -- Tar River Headwaters Wetland Restoration # 97071





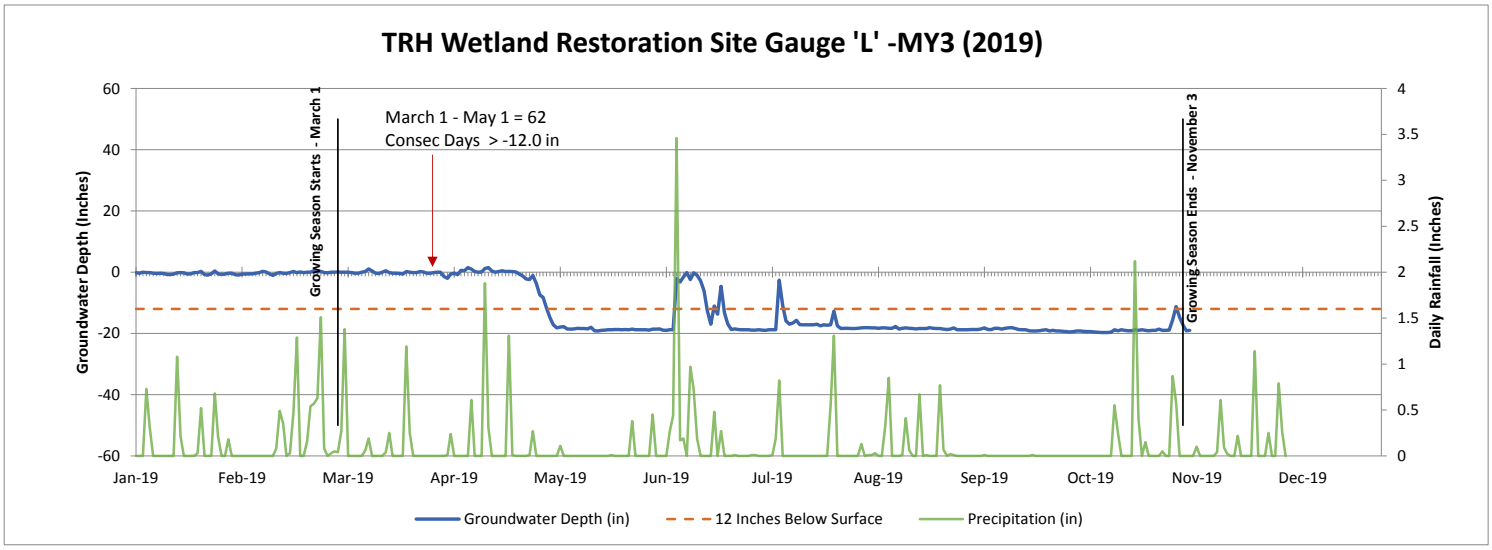


Figure 6E. Groundwater Gauges and Rainfall Data Plots 2019 -- Tar River Headwaters Wetland Restoration # 97071

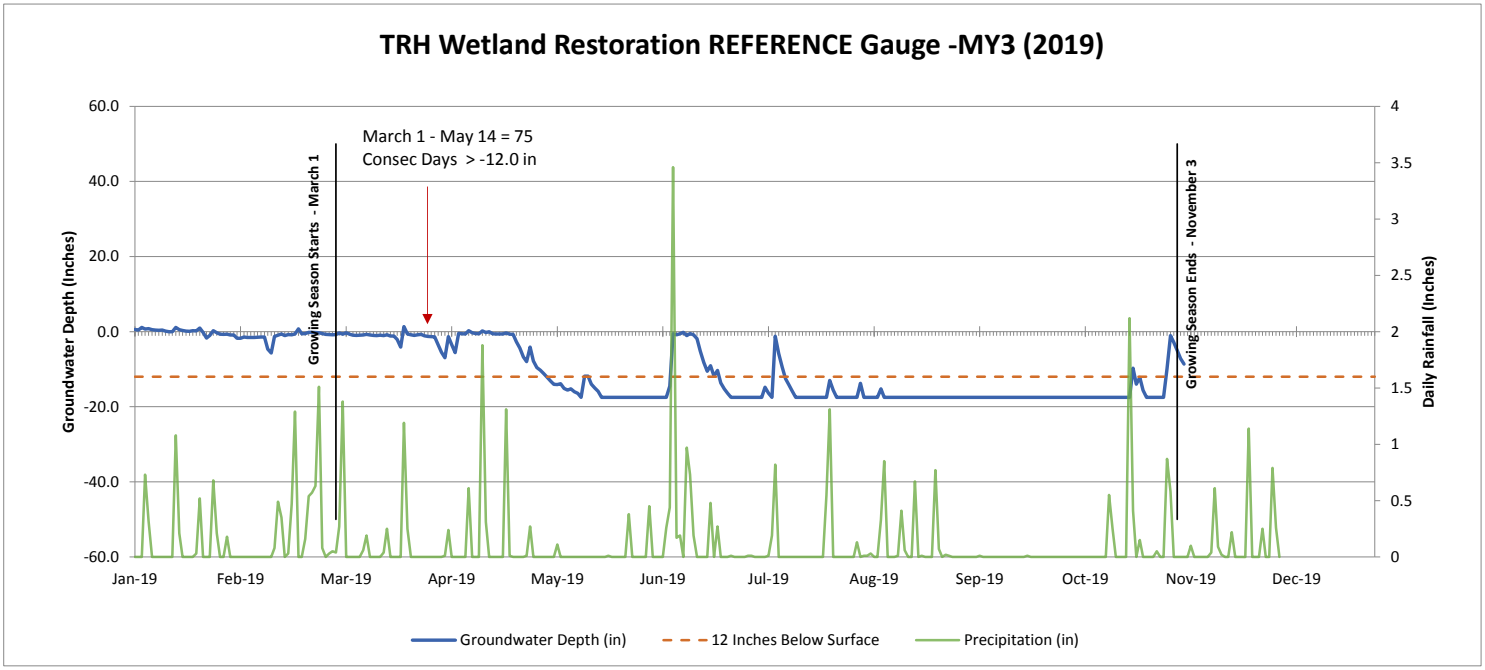


Table 8. Hydrologic Success Attainment 2016 - 2019, Groundwater Wells
Tar River Headwaters Wetland Mitigation Site # 97071.

Groundwater Gauges -- Maximum Consecutive Days in Growing Season with Water Table above -12.0 inches

	2016				2017				2018				2019			
WELL	start	end	days	% GS	start	end	days	% GS	start	end	days	% GS	start	end	days	% GS
A	4/27	5/27	31	12	4/23	5/16	24	10	3/1	5/4	65	26	3/1	4/3	34	14
B *	4/28	5/9	12	5	4/23	5/16	24	10	3/1	6/7	99	40	3/1	5/1	62	25
C *	6/23	7/11	19	8	4/23	5/21	29	12	3/1	5/14	75	30	3/1	4/24	55	22
D	4/27	5/16	20	8	3/13	4/11	30	12	3/1	5/12	73	29	3/1	4/30	61	25
E	4/23	6/2	41	17	4/24	5/17	24	10	3/1	5/3	64	26	3/1	4/30	61	25
F	3/1	3/20	20	8	3/31	4/10	11	4	3/1	5/3	64	26	3/1	4/25	56	23
G	4/27	5/15	19	8	3/31	4/13	14	6	3/1	5/9	70	28	3/1	4/28	59	24
H	3/1	4/7	38	15	4/23	5/17	25	10	3/1	6/9	101	41	3/1	5/4	65	26
I	4/22	5/12	21	8	4/23	5/20	28	11	3/1	5/3	64	26	3/1	4/24	55	22
J	4/28	5/16	19	8	5/22	6/2	12	5	3/1	5/12	73	29	3/1	5/1	62	25
K	4/27	5/11	15	6	3/31	4/10	11	4	3/1	5/2	63	25	3/1	4/25	56	23
L	na	na	na	na	3/1	6/10	102	41	3/1	6/15	107	43	3/1	5/1	62	25
Ref	4/1	6/14	75	30	3/1	6/9	101	41	3/1	5/14	75	30	3/1	5/14	75	30

Growing Season based on USDA 30-yr air temp data at Roxboso ESE gauge is Mar 28 to Nov 3 (221 Days).
Adjusted Growing Season based on on-site soil temperature > 41° F is Mar 1 to Nov 3 (248 Days).
Mitigation Plan success criterion is 10% of growing season (25 consecutive days WT < 12" below surface).
Blue = Gauge meets hydrologic success. Brown = Gauge does not meet hydrologic success
* Gauges B and C are in non-credit areas and do not contribute to project success evaluation.
Yellow Gauge A error after 4/3/2019; actual end of hydroperiod may have been 2 to 3 weeks later.
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