MONITORING YEAR 2 ANNUAL REPORT

FINAL

DEEP MEADOW MITIGATION SITE

Union County, NC
DEQ Contract No. 6887
DMS Project No. 97131
USACE Action ID No. SAW-2012-01107
NCDEQ DWR Certification No. 18-0264

Yadkin River Basin
HUC 03040105

Data Collection Period: April 2021 – November 2021
FINAL Submission Date: January 13, 2022

PREPARED FOR:

NC Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

PREPARED BY:

Wildlands Engineering, Inc.
1430 South Mint Street, Suite 104
Charlotte, NC 28203

Phone: 704.332.7754
Fax: 704.332.3306

January 13, 2022

Mr. Harry Tsomides
NC Department of Environmental Quality
Division of Mitigation Services
5 Ravenscroft Dr., Suite 102
Asheville, NC 28801

Re: Draft - Monitoring Year 2 Report for the
Deep Meadow Mitigation Site
Yadkin River Basin – CU 03040105– Yadkin County
DMS Project # 97131
Contract # 006887

Dear Mr. Tsomides:

Wildlands Engineering, Inc. (Wildlands) has reviewed the Division of Mitigation Services (DMS) comments and observations from the Deep Meadow Mitigation Site Draft Year 2 Monitoring Report received on January 3, 2022. The report text has been revised for the final submittal to reflect the most current condition of the site. Your comments and observations from the report are noted below in **Bold**. Wildlands' response to those comments are noted in *Italics*.

DMS' Comment: Section 1.4.5 Stream Areas of Concern and Management Activity: Wildlands notes that the gully outside of the easement across from the ford crossing on Meadow Branch has continued to erode. Thank you for providing photos of this area. It is understood that Wildlands is working with the property owner to stabilize this area and prevent excess sediment from entering the stream. As this issue was also noted in the MY1 report (2020), can Wildlands estimate a date for this floodplain stabilization work?

Wildlands' Response: Floodplain stabilization work began outside the easement boundaries in early December of 2021. Wildlands will begin stabilization work within the easement boundaries in the first quarter of 2022. Wildlands plans to monitor this area closely in Monitoring Year 3.

DMS' Comment: Section 1.4.6 Wetland Assessment: With the gage success rate being less than ideal, Wildlands has indicated intent to add two gages to the project in response to performance issues over the first two years at GWGs 3 and 11.

1) **It is assumed that Wildlands will continue to monitor these two wells, correct? If not, please indicate.**
2) **Please map the locations of the two new wells, or if not yet known, estimate where they will be installed on the map.**

Wildlands' Response: Wildlands' will continue to monitor all groundwater wells, as well as newly installed groundwater wells until project closeout. Proposed well locations have been added to Figures 3.0 - 3.2.

DMS' Comment: Figures 3.0 - 3.2: There a "bankfull" line on the CCPVs (thick black dashed line), it is recommended removing this unless it serves a specific monitoring function on the maps.

Wildlands' Response: Wildlands removed the bankfull line on Figures 3.0 - 3.2.

DMS' Comment: Digital Support File: There appears to be a typo in the asset table for W-E6. The as-built column now suggests that there are 0.020 acres of Re-establishment.

Wildlands' Response: Table 1: Project Quantities and Credits has been updated to reflect the 0.200 acres of wetland re-establishment for W-E6.

DMS' Comment: Digital Support File: Please ensure that the values reported in Table 6 are consistent with the feature lengths. For example, the feature representing bank erosion at WF2 is 87 ft compared to the 36 ft reported.

Wildlands' Response: All values reported in Table 6(a-c) have been updated to match feature lengths.

DMS' Comment: Digital Support File: The table 7 export and simple export from the submitted CVS mdb have values that do not match Table 10a. Please review the mdb and ensure that the data support the creation of the table included in the report.

Wildlands' Response: Table 10 (a-c) have been updated to match the table 7 export and simple export from the submitted CVS mdb.

DMS' Comment: Digital Support File: If available, please submit the MY1 mobile veg plot features.

Wildlands' Response: Wildlands has included the MY1 mobile vegetation plot features in the MY2 geodatabase.

Enclosed please find two (2) hard copies of the Year 2 Final Monitoring Report and one (1) USB with all the final corrected electronic files for DMS distribution. Wildlands has ordered the monitoring bond for MY2; however, we have not received confirmation from Kristie Corson at DMS that it was received or approved. Please contact me at 704-332-7754 x101 if you have any questions.

Sincerely,

Kristi Suggs
ksuggs@wildlandseng.com

EXECUTIVE SUMMARY

Wildlands Engineering, Inc. (Wildlands) implemented a full-delivery stream and wetland mitigation project at the Deep Meadow Mitigation Site (Site) for the North Carolina Department of Environmental Quality (DEQ) Division of Mitigation Services (DMS). The project restored, enhanced, and preserved a total of 4,365 linear feet (LF) of perennial stream in Union County, NC. In addition, the project rehabilitated 0.58 acres and re-established 8.26 acres of riparian wetlands. The Site is located within the DMS targeted watershed for the Yadkin River Basin Hydrologic Unit Code (HUC) 03040105070060 and the NC Division of Water Resources (DWR) Subbasin 03-07-14. The project is providing 2,838.933 stream mitigation units (SMUs) and 8.590 wetland mitigation units (WMUs) for the Yadkin River Basin HUC 03040105 (Yadkin 05).

The immediate drainage area of the Site and the larger surrounding watershed have a long history of agricultural activity. Stream and wetland functional stressors to the Site were related to these historic and current land use practices. Major stream stressors included channel incision and widening, an absence of stabilizing riparian vegetation, a lack of bedform diversity and aquatic habitat, and agricultural related impacts such as channel manipulation or straightening and concentrated run-off inputs from agricultural fields. The primary stressors to the wetlands on the Site were lack of wetland vegetation, agricultural impact including ditching to drawdown the water table, and the lack of hydrologic connection to the floodplain tributaries and hillside seeps. The effects of these stressors resulted in channel instability, loss of floodplain connection, degraded water quality, and the loss of both aquatic and riparian habitat throughout the watershed of the Site when compared to reference conditions. The project approach for the Site focused on evaluating existing functional condition, potential for recovery, and need for intervention.

The project goals defined in the Mitigation Plan (Wildlands, 2018) were established with careful consideration of 2009 Lower Yadkin Pee Dee River Basin Restoration Priorities (RBRP) goals and objectives to address stressors identified in the watershed through the implementation of stream restoration and enhancement activities and wetland re-establishment and rehabilitation activities, as well as riparian buffer re-vegetation. The established project goals include:

- Improve stream channel stability,
- Reconnect channels with historic floodplains and re-establish wetland hydrology and function in relic wetland areas,
- Improve in-stream habitat,
- Reduce sediment and nutrient inputs from adjacent agricultural fields,
- Restore and enhance native floodplain and wetland vegetation, and
- Permanently protect the project Site from harmful uses.

Site construction and as-built surveys were completed between September 2019 and November 2020. Monitoring Year (MY) 2 assessments and Site visits were completed between April and November 2021 to assess the conditions of the project.

Overall, the Site has met the required stream and vegetation success criteria for MY2. The average planted stem density for the Site is 405 stems per acre and is on track to meet the MY3 requirement of 320 stems per acre. Geomorphic surveys indicate that cross-section bankfull dimensions closely match the baseline monitoring with some minor adjustments, and streams are functioning as intended. At least one bankfull event was documented on EF1, WF1, and WF2 since the start of 2021. Due to below average monthly rainfall during the growing season, two of the eleven groundwater gages met the wetland hydrology success criteria. The MY2 visual assessment identified a few areas of concern including populations of invasive plant species and isolated areas of bank scour. Wildlands will continue

to monitor these areas and adaptive management will be implemented as necessary throughout the seven-year monitoring period to benefit the ecological health of the Site.

TABLE OF CONTENTS

TABLES

APPENDICES

Section 1: PROJECT OVERVIEW

The Deep Meadow Mitigation Site (Site) is located in Union County approximately two miles north of Wingate, NC and approximately six miles northeast of Monroe, NC (Figure 1). The project is located within the NC Division of Mitigation Services (DMS) targeted watershed for the Yadkin River Basin Hydrologic Unit Code (HUC) 03040105070060 and NC Division of Water Resources (DWR) Subbasin 03-07-14. Located in the Slate Belt within the Piedmont physiographic province (NCGS, 1985), the project watershed is dominated by agricultural and forested land.

The Site contains Meadow Branch, three unnamed tributaries of Meadow Branch, two existing riparian wetlands and ten proposed riparian wetlands. The unnamed tributaries are referred to by Wildlands as West Fork 1 (WF1), West Fork 2 (WF2), and East Fork 1 (EF1). The existing wetlands are referred to as W-H1 and W-H2, while the proposed wetlands are named W-E1 through W-E10. Meadow branch has a gentle (0.22%) unconfined alluvial valley. EF1 transitions from a gentle (1.00%) moderately confined valley at the upstream project limits to an unconfined valley as it approaches Meadow Branch. WF1 and WF2 are also located in unconfined valleys within the project. The two existing riparian wetlands are in the floodplain of Meadow Branch at the toe of slope. The Site drains approximately 6.99 square miles of rural land.

1.1 Project Quantities and Credits

A conservation easement has been recorded and is in place on 23.8 acres. The project is providing 2,838.933 stream mitigation units (SMUs) and 8.587 wetland mitigation units (WMUs) for the Yadkin River Basin HUC 03040105. Annual monitoring will be conducted for seven years with close-out anticipated to commence in 2027 given the success criteria are met.

Table 1: Project Quantities and Credits

PROJECT MITIGATION QUANTITIES							
Project Segment	**Mitigation Plan Footage**	**As-Built Footage**	**Mitigation Category**	**Restoration Level**	**Mitigation Ratio (X:1)**	**Credits**	**Comments**
Stream							
Meadow Branch	2,449	2,449	Warm	EII	2.5	979.600	Bank stabilization and in-stream structures with planted buffer
EF1	1,322	1,322	Warm	R	1.0	1,322.000	Full channel restoration, planted buffer
WF1	116	116	Warm	EI	1.5	77.333	Bank stabilization
WF1	20	20	Warm	P	10.0	2.000	No work proposed
WF2	391	458	Warm	R	1.0	458.000	Full channel restoration, planted buffer
					Total:	**2,838.933**	**Stream Mitigation Units**
Wetland							
W-H1	0.28	0.28	Warm	Rehabilitation	1.5	0.187	Planted, removed agriculture activities, reduced drainage to Meadow Branch

W-H2	0.30	0.30	Warm	Rehabilitation	1.5	0.200	Planted, removed agriculture activities, reduced drainage to Meadow Branch
W-E1	0.40	0.37	Warm	Re-establishment	1.0	0.400	Planted, removed agriculture activities, removed adjacent drainage swales
W-E2	1.70	1.72	Warm	Re-establishment	1.0	1.700	Planted, removed agriculture activities, removed adjacent drainage swales
W-E3	0.40	0.41	Warm	Re-establishment	1.0	0.400	Planted, removed agriculture activities, removed adjacent drainage swales
W-E4	0.40	0.36	Warm	Re-establishment	1.0	0.400	Planted, removed agriculture activities, removed adjacent drainage swales
W-E5	0.40	0.37	Warm	Re-establishment	1.0	0.400	Planted, removed agriculture activities, removed adjacent drainage swales
W-E6	0.20	0.20	Warm	Re-establishment	1.0	0.200	Planted, removed agriculture activities, removed adjacent drainage swales
W-E7	1.50	1.53	Warm	Re-establishment	1.0	1.500	Planted, removed agriculture activities, removed adjacent drainage swales
W-E8	1.00	1.04	Warm	Re-establishment	1.0	1.000	Planted, removed agriculture activities, removed adjacent drainage swales
W-E9	0.50	0.53	Warm	Re-establishment	1.0	0.500	Planted, removed agriculture activities, removed adjacent drainage swales
W-E10	1.70	1.73	Warm	Re-establishment	1.0	1.700	Planted, removed agriculture activities, removed adjacent drainage swales
					Total:	**8.587**	**Wetland Mitigation Units**

Table 1.1: Credit Summary Table

Restoration Level	Stream			Riparian	Non-Rip	Coastal
	Warm	Cool	Cold	Wetland	Wetland	Marsh
Restoration	1,780.000			--		
Re-establishment	--			8.200		
Rehabilitation	--			0.387		
Enhancement I	77.333			--		
Enhancement II	979.600			--		
Preservation	2.000			--		
Total:	**2838.933**			**8.587**		

*Actual as-built wetland acreage/potential crediting slightly differs (excess or loss) that of the Mitigation Plan, the project credit assets listed reflect those of the approved Mitigation Plan.

1.2 Project Goals and Objectives

The Site is providing numerous ecological benefits within the Yadkin Valley Basin. The project goals were established with careful consideration to address stressors that were identified in the DWR 2008 Yadkin River Basinwide Plan (NCDWR, 2008). Table 2 below describes expected outcomes to water quality and ecological processes and provides project goals and objectives.

Table 2: Goals, Performance Criteria, and Functional Improvements

Goal	Objective/Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Improve stability of stream channels.	Construct stream channels that will maintain stable cross-sections, patterns, and profiles over time.	Reduction in sediment inputs from bank erosion, reduction of shear stress, and improved overall hydraulic function.	Bank height ratios remain below 1.2 over the monitoring period. Visual assessments showing progression towards stability.	6 cross-section surveys and 3 reachwide sediment surveys	All cross sections have a BHR <1.2. Channels are stable have maintained the constructed riffle and pool sequence.
Reconnect channels with floodplains and riparian wetlands to allow a natural flooding regime.	Reconstruct stream channels with appropriate bankfull dimensions and depth relative to the existing floodplain. Remove overburden to reconnect with adjacent wetlands.	Dispersion of high flows on the floodplain, increase in biogeochemical cycling within the system, and recharging of riparian wetlands.	Four bankfull events monitoring period.	Crest gage on EF1, WF1, WF2	In MY2, at least one bankfull event was recorded on WF1 and WF2. 2/11 (18%) groundwater gages met the wetland success criteria in MY2.

Improve instream habitat.	Install habitat features such as constructed riffles, cover logs, and brush toes into restored/enhanced streams. Add woody materials to channel beds. Construct pools of varying depth.	Increase and diversify available habitats for macroinvertebrates, fish, and amphibians leading to colonization and increase in biodiversity over time.	There is no required performance standard for this metric.	N/A	N/A
Restore and enhance native floodplain and streambank vegetation.	Plant native tree and understory species in riparian zones and plant appropriate species on streambanks.	Reduction in floodplain sediment inputs from runoff, increased bank stability, increased LWD and organic material in streams	Survival rate of 320 stems per acre at MY3	12 permanent vegetation plots, and 4 mobile vegetation plots	12/16 (75%) vegetation plots have met the MY3 success criteria of 320 stems per acre.
Permanently protect the project Site from harmful uses.	Establish conservation easements on the Site.	Protect Site from encroachment on the riparian corridor and direct impact to streams and wetlands.	Prevent easement encroachment.	Visually inspect the perimeter of the Site to ensure no easement encroachment is occurring.	A drainage gully has formed near the easement boundary near the Meadow Branch ford crossing. Repairs to follow but no adaptive management plan needed.

1.3 Project Attributes

Prior to construction activities, the Site had a history of crop production with adjacent floodplains altered for agricultural uses. These practices resulted in sedimentation, erosion, and degraded in-stream habitat. EF1 was re-routed to the edge of the valley and shortened to perpendicularly join Meadow Branch. Existing wetlands were ditched to improve field drainage and cleared for row crops. Riparian buffers also exhibited a lack of stabilizing streamside vegetation due to agricultural practices. Pre-construction conditions are outlined in Table 3 and Table 6 of Appendix 2.

The final mitigation plan was submitted and accepted by DMS in January of 2018 and the NC Interagency Review Team (IRT) in May of 2018. Construction activities were completed in September 2019 by Land Mechanic Designs, Inc. Kee Mapping and Surveying completed the as-built survey in December 2019. Planting was completed following construction in January 2020 by Bruton Natural Systems, Inc. Directions and a map of the Site are provided in Figure 1 and project components are illustrated for the Site in Figure 2.

Table 2: Project Attributes

PROJECT INFORMATION			
Project Name	Deep Meadow Mitigation Site	**County**	Union County
Project Area (acres)	23.8	**Project Coordinates**	35.022333, -80.447611
PROJECT WATERSHED SUMMARY INFORMATION			
Physiographic Province	Piedmont Physiographic Province	**River Basin**	Yadkin River
USGS HUC 8-digit	3040105	**USGS HUC 14-digit**	3040105070060
DWR Sub-basin	03-07-14	**Land Use Classification**	**Meadow Branch**- Forest (25%), Cultivated (50%), Grassland (3%), Shrubland (< 1%), Urban (21%), Open Water (< 1%) **EF1**- Forest (27%), Cultivated (65%), Grassland (4%), Shrubland (2%), Urban (2%), Open Water (0%) **WF1**- Forest (28%), Cultivated (70%), Grassland (0%), Shrubland (0%), Urban (2%), Open Water (0%) **WF2**- Forest (16%), Cultivated (57%), Grassland (20%), Shrubland (4%), Urban (3%), Open Water (0%
Project Drainage Area (acres)	5,024	**Percentage of Impervious Area**	4%

REACH SUMMARY INFORMATION				
Parameters	**Meadow Branch**	**EF1**	**WF1**	**WF2**
Pre-project length (feet)	2,570	1,201	136	391
Post-project (feet)	2,499	1,322	136	458
Valley confinement (Confined, moderately confined, unconfined)	Unconfined	Moderately Confined	Unconfined	Unconfined
Drainage area (acres)	4,472	25	26	41.25
Perennial, Intermittent, Ephemeral	Perennial			
DWR Water Quality Classification	C			
Dominant Stream Classification (existing)	C4/5	Incised and straightened E4	G4	Incised and straightened E4
Dominant Stream Classification (proposed)	C4/5	C4	C4	C4
Dominant Evolutionary class (Simon) if applicable	Stage VI	Stage III	Stage III	Stage IV

WETLAND SUMMARY INFORMATION		
Parameters	**WH-1**	**WH-2**
Size of Wetland (acres)	0.28	0.30
Wetland Type	Riparian Riverine	
Mapped Soil Series	Tatum/Chewacla	Chewacla
Drainage Class	Well Drained/ Poorly Drained	Poorly Drained
Soil Hydric Status	No / Yes	Yes
Source of Hydrology	Groundwater and bankfull events	
Restoration or enhancement method	Rehabilitation (hydrologic, vegetative)	

REGULATORY CONSIDERATIONS			
Parameters	**Applicable?**	**Resolved?**	**Supporting Documentation**
Water of the United States - Section 404	Yes	Yes	USACE Action ID #SAW-2012-01107
Water of the United States - Section 401	Yes	Yes	DWR# 18-0264
Division of Land Quality (Erosion and Sediment Control)	Yes	Yes	NPDES Construction Stormwater General Permit NCG010000
Endangered Species Act	Yes	Yes	Categorical Exclusion in Mitigation Plan
Historic Preservation Act	Yes	Yes	
Coastal Zone Management Act (CZMA or CAMA)	No	N/A	N/A
FEMA Floodplain Compliance	Yes	Yes	Union County Floodplain Development Permit #20180991
Essential Fisheries Habitat	No	N/A	N/A

1.4 Monitoring Year 2 Data Assessment

Annual monitoring for MY2 was conducted between April and November 2021, with hydrology data collected between January and mid-November 2021, to assess the condition of the project. The stream, vegetation, and hydrologic success criteria for the Site follows the approved success criteria presented in the Deep Meadow Mitigation Plan (Wildlands, 2018).

1.4.1 Vegetation Assessment

The MY2 vegetation survey was completed in September 2021, resulting in an average planted stem density of 405 stems per acre for all monitored permanent and mobile vegetation plots. The Site is on track to meet the interim MY3 requirement of 320 planted stems per acre, with 12 out of 16 vegetation plots exceeding this requirement. Stem density in permanent and mobile vegetation plots on Site ranges from 172 to 567 planted stems per acre. Stems in both the permanent and mobile vegetation plots appear to be thriving, with an average vigor of 3 or greater, indicating robust overall health and minimal stem damage. Four permanent vegetation plots (1,3,6 and 7) failed to meet stem density requirements in MY2. Of the four vegetation plots that failed during MY2, two of the failing plots (1 and 6) are in wetland areas that have been saturated for more than 12% of the 2021 growing season. In these areas, hydrophytic common rush (Juncus effusus) and switchgrass (Panicum virgatum) are very dense and currently outcompeting planted stems. The other two failing plots (3 and 7) are in areas of the Site where herbaceous plants are shading smaller stems. Wildlands will continue to monitor these areas during the next vegetation assessment to evaluate if these failing vegetation plots represent larger areas of low stem density. Please refer to Appendix 2 for vegetation plot photographs and Appendix 3 for vegetation data tables.

1.4.2 Vegetation Areas of Concern and Management Activity

Overall, herbaceous cover has become well-established throughout the Site. Several invasive species continue to be monitored and treated throughout the monitoring year. Floodplain species which have undergone targeted treatment include Johnson grass (Sorghum halepense) and Japanese honeysuckle (Lonicera japonica), both of which have been eradicated from the Site. The predominant nuisance species observed during MY2 visual assessments was parrot-feather (Myriophyllum aquaticum) totaling 3.0% of the conservation easement acreage. Water primrose (Ludwigia peploides) and water smartweed (Polygonum amphibium) were observed growing in a few isolated areas on Site and were treated during the summer of 2021. These isolated areas of in-stream vegetation will likely be shaded out as the riparian areas develop a canopy. Live stakes were added along the banks to facilitate canopy growth. In total, over 96% of the Site is free of invasive and undesirable species. As needed, nuisance species will be treated throughout the post-construction monitoring period. These vegetation areas of concern are documented on Table 7 and shown on the Current Condition Plan View (CCPV) Figures 3.0 – 3.2 in Appendix 2.

1.4.3 Stream Assessment

Morphological surveys for MY2 were conducted in April and September 2021. Cross-section survey results indicate that channel dimensions are stable and functioning as designed on all Restoration and Enhancement I reaches. All 6 cross-sections on EF1 and WF1 are stable with bank height ratios less than 1.2, and only minor changes in the bankfull area and width-to-depth ratio. Max pool depths increased slightly in pool cross-sections, which is not indicative of instability and enhances aquatic habitat. Cross-sections 2, 4, and 6 exhibited slight channel narrowing, likely the result of sediment deposition and the establishment of streambank vegetation.

Reachwide pebble counts along all Restoration and Enhancement I reaches indicate maintenance of coarser materials in riffle features and finer particles in the pool features. Please refer to Appendix 2 for the visual stability assessment tables, CCPV Figures 3.0 – 3.2, and stream photographs, and Appendix 4 for the morphological tables and plots.

1.4.4 Stream Hydrology Assessment

In MY2, crest gages documented at least one bankfull event on WF1 and WF2. Therefore, WF1 and WF2 have recorded two bankfull events in separate years. EF1 recorded multiple bankfull events in MY1 but did not have a documented bankfull event in MY2. Currently, the Site is on track to meet the hydrologic success criteria for bankfull events. Please refer to Appendix 5 for hydrology summary data, plot.

1.4.5 Stream Areas of Concern and Management Activity

Overall, project streams were resilient to multiple large storm events that occurred during 2021. Currently, Restoration reaches WF2 and EF1 are 96% and 97% stable, respectively, and performing as intended. MY2 visual stream assessments revealed minimal areas of concern, including localized instances of bank scour on WF2 and EF1. At station 212+00 along EF1, floodplain flows are washing behind a brushtoe structure creating a scour pocket near the top of bank. On WF1, gravel and cobble from the crossing has washed into the channel, causing aggradation from the top of WF1 to station 320+00. Wildlands will continue to monitor these areas and remedial actions will be implemented if areas of concern begin to threaten the stability of the project. There are no structural instabilities located on Meadow Branch, however the gully outside of the easement across from the ford crossing on Meadow Branch has continued to erode throughout the year. Wildlands is currently working with the property owner to stabilize this area. In December 2021, the property owner partially filled in the portion of the gully that lies outside of the easement. Wildlands plans to resume this floodplain stabilization work within the easement boundaries in the first quarter of 2022. Repairs will consist of laying back the banks and installing a series of stone check dams to prevent gully reformation and excess sediment from entering the stream. Several beaver dams were also identified and removed from Meadow Branch. Dams on the Site have not impacted or impeded stream flow, but APHIS has been contacted regarding safe and sustainable dam removal.

Wildlands will continue to monitor all areas of concern in future years for signs of accelerated instability. If instability is observed, the area will be addressed and evaluated for effectiveness in the MY3 report. Stream areas of concern are noted in this report and on the CCPV figures. Please refer to Appendix 2 for stream stability tables, area of concern photos, and CCPV Figures 3.0 – 3.2.

1.4.6 Wetland Assessment

The final performance standard for wetland hydrology will be a free groundwater surface within 12 inches of the ground surface for 23 consecutive days (10% percent) of the defined growing season for Union County (March 23 through November 6) under typical precipitation conditions. If a gage does not meet the performance standard for a given monitoring year, rainfall patterns will be analyzed, and the hydrograph will be compared to that of the reference wetlands analyzed in the Deep Meadow Mitigation Plan (2018) to assess whether atypical weather conditions occurred during the monitoring period.

Of the eleven groundwater gages (GWGs) installed during baseline monitoring, only two GWGs (GWG1 and GWG5 located in W-E10 and W-E1, respectively) have met the success criteria for MY2. A review of 2021 precipitation data revealed monthly precipitation levels were significantly lower in 2021 compared to the 30-year monthly precipitation average (NCCRONOS, 2021). Additionally, the reference gage, which is used to compare the hydrologic response within the restored wetland areas on Site to other

natural wetlands in the area, had 26 consecutive days of groundwater saturation within 12 inches, and only met wetland success criteria by 3 days. Several large storm events this year have resulted in at least one bankfull event on WF1 and WF2, but rapidly draining soils, coupled with below average rainfall have prevented sustained wetland recharge.

In response to a comment received from the Interagency Review Team (IRT) in reference to well locations documented in the Baseline Monitoring Report (Wildlands, 2020), GWGs 3 and 11 are located just outside of the wetland Re-Establishment areas for W-E6 and W-E8, respectively. The current location of these wells is as close as possible to the proposed gage location as noted in the Mitigation Plan (Wildlands, 2018). Multiple holes were bored in the areas surrounding the proposed gage location, but refusal was reached at 3 - 4 feet due to a shallow layer of bedrock. Though the location of GWG11 is not ideal, it is the assumption that if the wetland meets criteria on the edge wetland boundary, the remainder of the lower-lying wetland will also meet. An additional groundwater gage will be installed before the onset of the growing season, near the center of W-E6 to provide a more direct portrayal of groundwater hydrology in this portion of the Site. Please refer to Appendix 2 for the groundwater gage locations on CCPV Figures 3.0 – 3.2 and the groundwater gage photographs. Please refer to Appendix 5 for groundwater hydrology data and plots.

1.5 Monitoring Year 2 Summary

Overall, the Site has met the required stream and vegetation success criteria for MY2. The average planted stem density for the Site is 405 stems per acre and is on track to meet the MY3 requirement of 320 stems per acre. Geomorphic surveys indicate that cross-section bankfull dimensions closely match the baseline monitoring with some minor adjustments, and streams are functioning as intended. At least one bankfull event was documented on WF1 and WF2 since the start of 2021. Due to below average monthly rainfall during the growing season, two of the eleven groundwater gages met the wetland hydrology success criteria. The MY2 visual assessment identified a few areas of concern including populations of invasive plant species and isolated areas of bank scour. Wildlands will continue to monitor these areas and adaptive management will be implemented as necessary throughout the seven-year monitoring period to benefit the ecological health of the Site.

Section 2: METHODOLOGY

Geomorphic data were collected following the standards outlined in The Stream Channel Reference Site: An Illustrated Guide to Field Techniques (Harrelson et al., 1994) and in the Stream Restoration: A Natural Channel Design Handbook (Doll et al., 2003). All Integrated Current Condition Mapping was recorded using a Trimble handheld GPS with sub-meter accuracy and processed using Pathfinder and ArcGIS. Stream gages were installed in riffles and monitored quarterly. Hydrologic monitoring instrument installation and monitoring methods are in accordance with the United States Army Corps of Engineers (USACE, 2003) standards. Vegetation monitoring protocols followed the Carolina Vegetation Survey-EEP Level 2 Protocol (Lee et al., 2008).

Section 3: REFERENCES

Doll, B.A., Grabow, G.L., Hall, K.A., Halley, J., Harman, W.A., Jennings, G.D., and Wise, D.E. 2003. Stream Restoration A Natural Channel Design Handbook.

Harrelson, Cheryl C; Rawlins, C.L.; Potyondy, John P. 1994. *Stream Channel Reference Sites: An Illustrated Guide to Field Technique.* Gen. Tech. Rep. RM-245. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 61 p.

Lee, Michael T., Peet, Robert K., Steven D., Wentworth, Thomas R. 2006. CVS-EEP Protocol for Recording Vegetation Version 4.0. Retrieved from http://www.nceep.net/business/monitoring/veg/datasheets.htm

North Carolina Climate Retrieval and Observations Network of the Southeast Database (NCCRONOS). 2020. State Climate Office of North Carolina. Version 2.7.2. Station ID Monroe 2 SE. Accessed November 2021.

North Carolina Division of Water Resources (NCDWR), 2015. Surface Water Classifications. http://portal.ncdenr.org/web/wq/ps/csu/classifications

North Carolina Division of Mitigation Services (DMS), April 2015. DMS Annual Monitoring and Closeout Reporting Template.

North Carolina Division of Mitigation Services (DMS), October 2015. DMS Stream and Wetland Mitigation Plan Template and Guidance.

North Carolina Geological Survey (NCGS), 1985. Geologic Map of North Carolina: North Carolina Survey, General Geologic Map, scale 1:500,000. https://deq.nc.gov/about/divisions/energy-mineral-land- resources/north-carolina-geological-survey/ncgs-maps/1985-geologic-map-of-nc4

Rosgen, D. L. 1994. A classification of natural rivers. *Catena* 22:169-199.

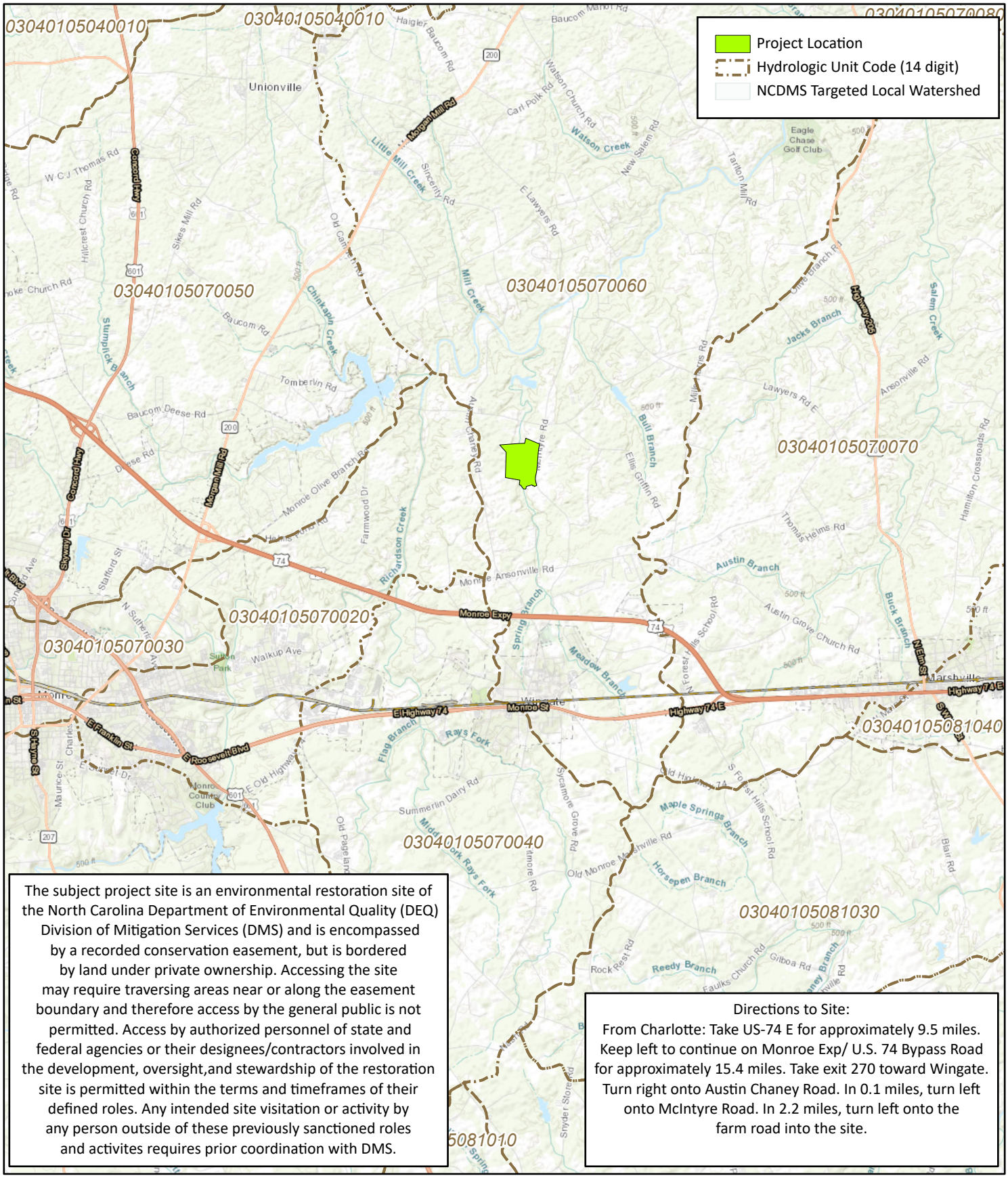
Rosgen, D.L. 1996. Applied River Morphology. Pagosa Springs, CO: Wildland Hydrology Books.

United States Army Corps of Engineers (USACE), October 2016. Stream Mitigation Guidelines. USACE, NCDENR-DWQ, USEPA, NCWRC.

Wildlands Engineering, Inc (Wildlands), 2020. Deep Meadow Mitigation Site As-built Baseline Monitoring Report. DMS, Raleigh, NC.

Wildlands, 2018. Deep Meadow Site Mitigation Plan. DMS, Raleigh, NC.

APPENDIX 1. General Figures and Tables

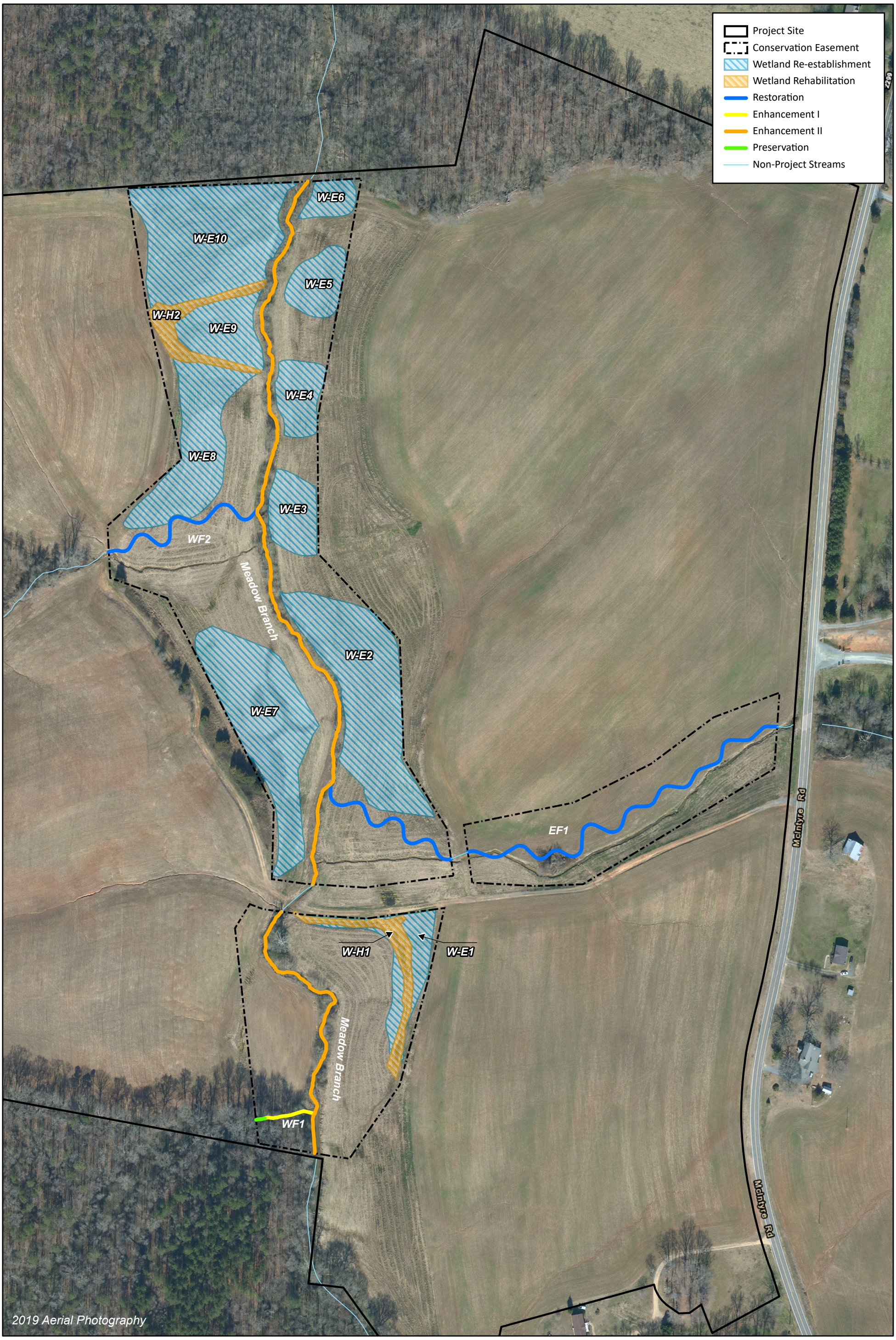


WILDLANDS ENGINEERING

0 1.5 3 Miles

Figure 1 Project Vicinity Map
Deep Meadow Mitigation Site
DMS Project No. 97131
Monitoring Year 2 - 2021

Union County, NC



WILDLANDS ENGINEERING

0 200 400 Feet

N

Figure 2 Project Component/ Asset Map
Deep Meadow Mitigation Site
DMS Project No. 97131
Monitoring Year 2 - 2021

Union County, NC

Table 4. Project Activity and Reporting History

Deep Meadow Mitigation Site
DMS Project No. 97131
Monitoring Year 2 - 2021

Activity or Report		Data Collection Complete	Completion or Delivery
404 Permit		July 2018	July 2018
Mitigation Plan		June 2016 - October 2017	May/June 2018
Final Design - Construction Plans		January 2019	January 2019
Construction		July - September 2019	September 2019
Temporary S&E mix applied to entire project area[1]		July - September 2019	September 2019
Permanent seed mix applied to reach/segments[1]		July - September 2019	September 2019
Bare root and live stake plantings for reach/segments		December 2019 - January 2020	January 2020
Baseline Monitoring Document (Year 0)		October 2019 - January 2020	March 2020
Year 1 Monitoring	Invasive treatment	May- September 2020	November 2020
	Stream Survey	August 2020	
	Vegetation Survey	August 2020	
Year 2 Monitoring	Stream Survey	May 2021	November 2021
	Invasive treatment	August 2021	
	Vegetation Survey	September 2021	
	Beaver Dam Removal	October 2021	
Year 3 Monitoring	Stream Survey		
	Vegetation Survey		
Year 4 Monitoring	Stream Survey		
	Vegetation Survey		
Year 5 Monitoring	Stream Survey		
	Vegetation Survey		
Year 6 Monitoring	Stream Survey		
	Vegetation Survey		
Year 7 Monitoring	Stream Survey		
	Vegetation Survey		

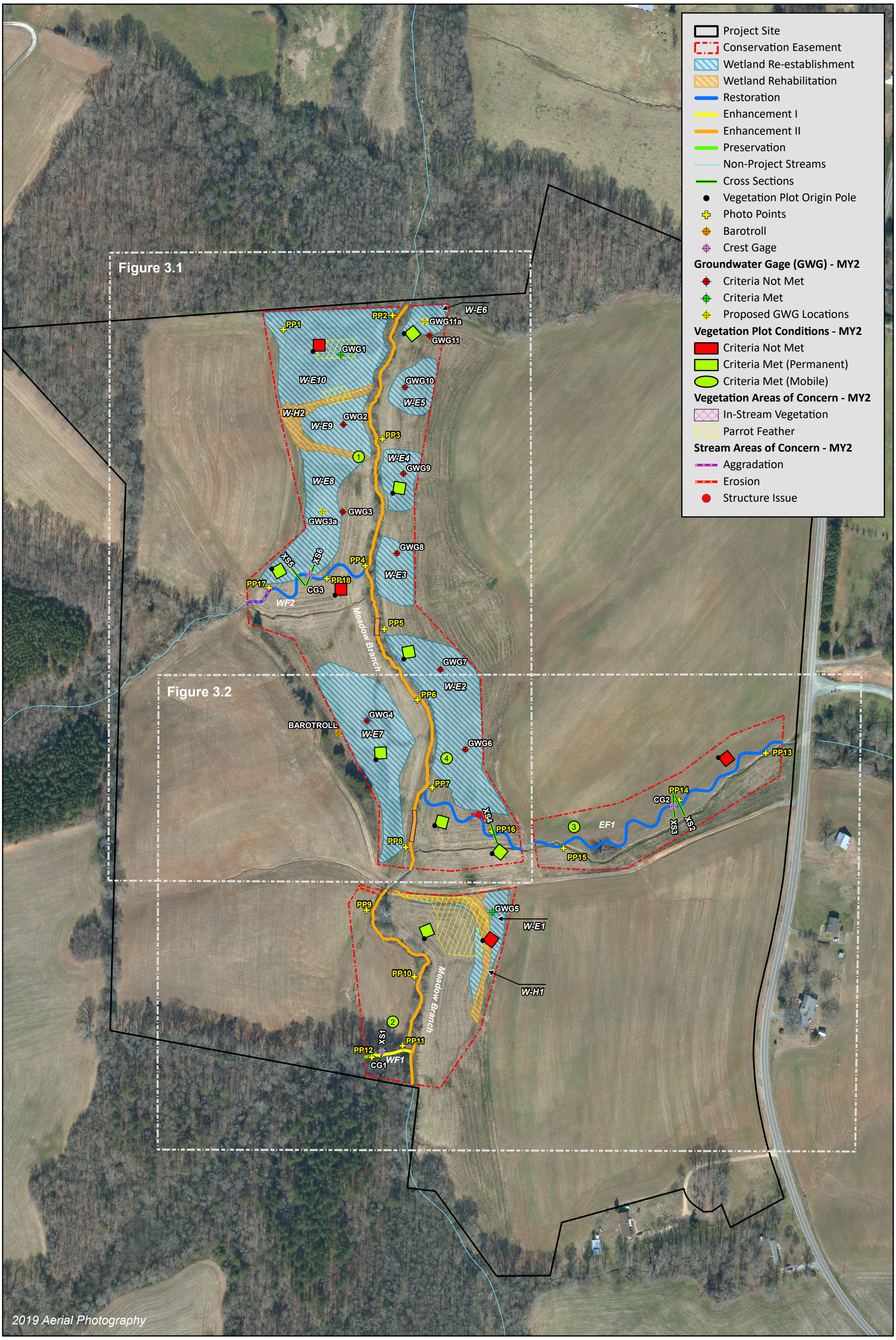
[1]Seed and mulch is added as each section of construction is completed.

Table 5. Project Contact Table

Deep Meadow Mitigation Site
DMS Project No. 97131
Monitoring Year 2 - 2021

Designers Aaron Earley, PE, CFM	**Wildlands Engineering, Inc.** 1430 South Mint Street, Suite 104 Charlotte, NC 28203 704.332.7754
Construction Contractors	**Land Mechanic Designs, Inc.** 126 Circle G Lane Willow Spring, NC 27592
Planting Contractor	**Bruton Natural Systems, Inc.** PO Box 1197 Freymont, NC 27830
Seeding Contractor	**Land Mechanic Designs, Inc.** 126 Circle G Lane Willow Spring, NC 27592
Seed Mix Sources	**Land Mechanic Designs, Inc.**
Nursery Stock Suppliers Bare Roots Live Stakes Herbaceous Plugs	**Bruton Natural Systems, Inc.**
Monitoring Performers	**Wildlands Engineering, Inc.**

APPENDIX 2. Visual Assessment Data

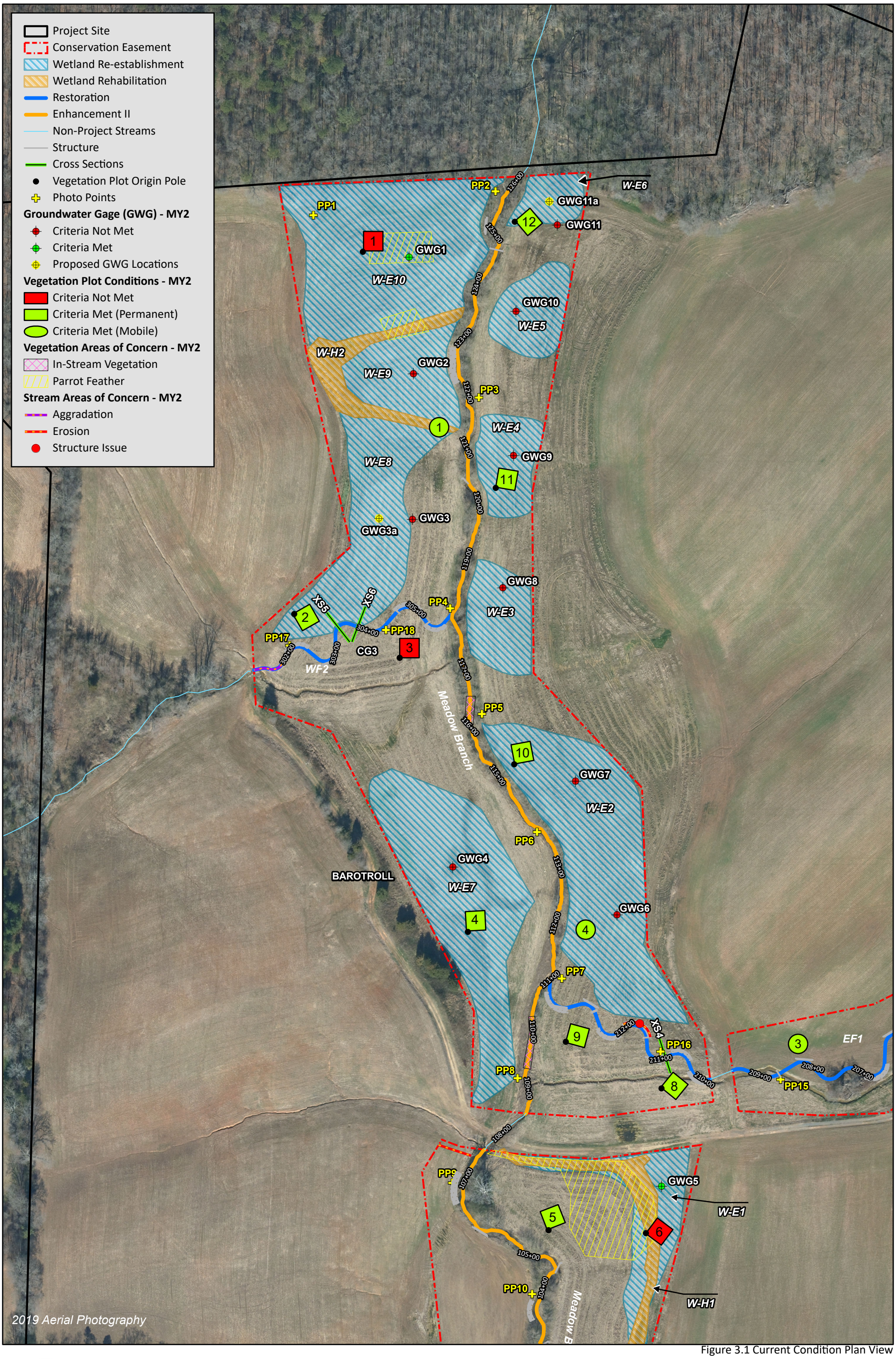


WILDLANDS ENGINEERING

0 250 500 Feet

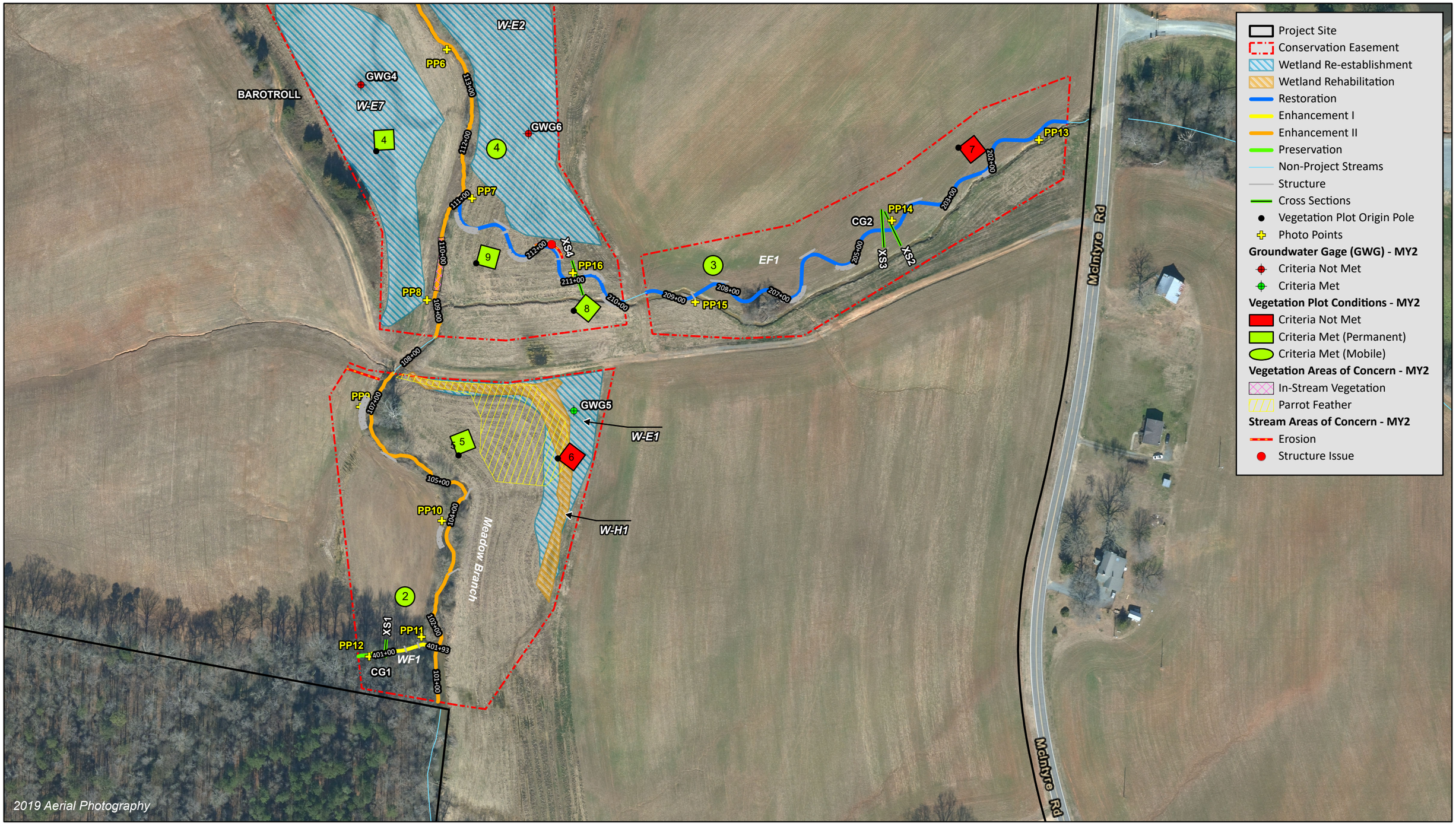
N

Figure 3.0 Current Condition Plan View (Key)
Deep Meadow Mitigation Site
DMS Project No. 97131
Monitoring Year 2 - 2021
Union County, NC



WILDLANDS ENGINEERING

Figure 3.1 Current Condition Plan View
Deep Meadow Mitigation Site
DMS Project No. 97131
Monitoring Year 2 - 2021
Union County, NC



WILDLANDS ENGINEERING

Figure 3.2 Current Condition Plan View
Deep Meadow Mitigation Site
DMS Project No. 97131
Monitoring Year 2 - 2021

Union County, NC

Table 6a. Visual Stream Morphology Stability Assessment Table

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 2 - 2021

Reach: EF1										
Assessed Length:	**1,322**	**Date of Assessment: 10/18/2021, 11/9/2021**								
Major Channel Category	**Channel Sub-Category**	**Metric**	**Number Stable, Performing as Intended**	**Total Number in As-Built**	**Number of Unstable Segments**	**Amount of Unstable Footage**	**% Stable, Performing as Intended**	**Number with Stabilizing Woody Vegetation**	**Footage with Stabilizing Woody Vegetation**	**Adjust % for Stabilizing Woody Vegetation**
1. Bed	**1. Vertical Stability (Riffle and Run units)**	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	23	23			100%			
	3. Meander Pool Condition	Depth Sufficient	23	23			100%			
		Length Appropriate	23	23			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	23	23			100%			
		Thalweg centering at downstream of meander bend (Glide)	23	23			100%			
2. Bank	**1. Scoured/Eroded**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			1	60	98%	0	0	98%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	1	60	98%	0	0	98%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	21	21			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	6	6			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	6	6			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	14	15			93%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	15	15			100%			

Table 6b. Visual Stream Morphology Stability Assessment Table

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 2 - 2021

Reach: WF1										
Assessed Length:	**116**	**Date of Assessment: 10/18/2021, 11/9/2021**								
Major Channel Category	**Channel Sub-Category**	**Metric**	**Number Stable, Performing as Intended**	**Total Number in As-Built**	**Number of Unstable Segments**	**Amount of Unstable Footage**	**% Stable, Performing as Intended**	**Number with Stabilizing Woody Vegetation**	**Footage with Stabilizing Woody Vegetation**	**Adjust % for Stabilizing Woody Vegetation**
1. Bed	**1. Vertical Stability (Riffle and Run units)**	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	4	4			100%			
	3. Step Pool Condition	Depth Sufficient	4	4			100%			
		Length Appropriate	4	4			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	N/A	N/A			N/A			
		Thalweg centering at downstream of meander bend (Glide)	N/A	N/A			N/A			
2. Bank	**1. Scoured/Eroded**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	4	4			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	4	4			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	4	4			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	N/A	N/A			N/A			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	N/A	N/A			N/A			

Table 6c. Visual Stream Morphology Stability Assessment Table

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 2 - 2021

Reach: WF2										
Assessed Length:	**458**	**Date of Assessment: 10/18/2021, 11/9/2021**								
Major Channel Category	**Channel Sub-Category**	**Metric**	**Number Stable, Performing as Intended**	**Total Number in As-Built**	**Number of Unstable Segments**	**Amount of Unstable Footage**	**% Stable, Performing as Intended**	**Number with Stabilizing Woody Vegetation**	**Footage with Stabilizing Woody Vegetation**	**Adjust % for Stabilizing Woody Vegetation**
1. Bed	**1. Vertical Stability (Riffle and Run units)**	Aggradation			1	87	91%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	8	8			100%			
	3. Meander Pool Condition	Depth Sufficient	7	7			100%			
		Length Appropriate	7	7			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	7	7			N/A			
		Thalweg centering at downstream of meander bend (Glide)	7	7			N/A			
2. Bank	**1. Scoured/Eroded**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	8	8			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	4	4			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	4	4			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	3	4			75%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	4	4			100%			

Table 7. Vegetation Condition Assessment Table

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 2 - 2021

Planted Acreage:	**21.5**	**Date of Assessment: 10/18/2021, 11/9/2021**			
Vegetation Category	**Definitions**	**Mapping Threshold (acres)**	**Number of Polygons**	**Combined Acreage**	**% of Planted Acreage**
Bare Areas	Very limited cover of both woody and herbaceous material	0.1	0	0.00	0.0%
Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 5, or 7 stem count criteria.	0.1	0	0.0	0.0%
		Total	**0**	**0.0**	**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.	0.1	0	0.0	0.0%
		Cumulative Total	**0**	**0.0**	**0.0%**

Easement Acreage:	**23.8**	**Date of Assessment: 10/18/2021, 11/9/2021**			
Vegetation Category	**Definitions**	**Mapping Threshold (SF)**	**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	5	0.8	3.2%
Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	none	0	0.00	0.0%

Stream Photographs
Monitoring Year 2

Photo Point 1 – W-E10, North *(10/19/2021)*

Photo Point 1 – W-E10, South *(10/19/2021)*

Photo Point 1 – W-E10, East *(10/19/2021)*

Photo Point 1 – W-E10, West *(10/19/2021)*

Photo Point 2 – MB outlet, view upstream *(10/19/2021)*

Photo Point 2 – MB outlet, view downstream *(10/19/2021)*

Photo Point 3 – Meadow Branch, view upstream *(10/19/2021)*

Photo Point 3 – Meadow Branch, view downstream *(10/19/2021)*

Photo Point 4 – Meadow Branch, view upstream *(10/19/2021)*

Photo Point 4 – Meadow Branch, view downstream *(10/19/2021)*

Photo Point 4 – WF2 Confluence, view upstream *(10/19/2021)*

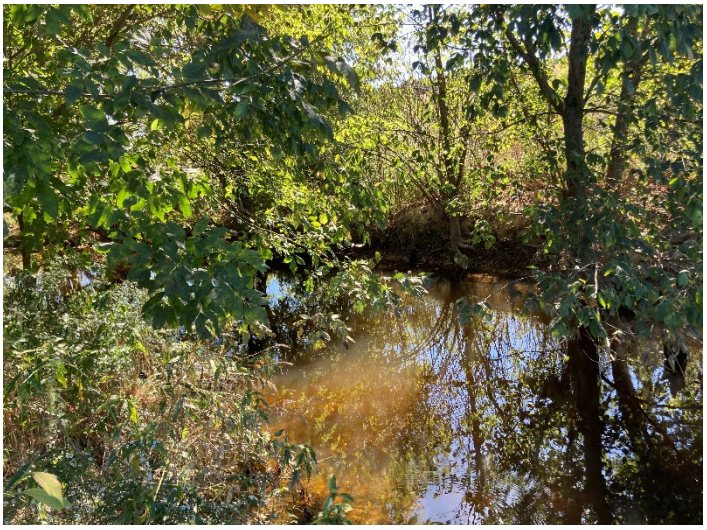


Photo Point 5 – Meadow Branch, view upstream *(10/19/2021)*

Photo Point 5 – Meadow Branch, view downstream *(10/19/2021)*

Photo Point 6 – Meadow Branch, view upstream *(10/19/2021)*

Photo Point 6 – Meadow Branch, view downstream *(10/19/2021)*

Photo Point 7 – Meadow Branch, view upstream *(10/19/2021)*

Photo Point 7 – Meadow Branch, view downstream *(10/19/2021)*

	
Photo Point 8 – Meadow Branch, view upstream *(10/19/2021)*	**Photo Point 8** – Meadow Branch, view downstream *(10/19/2021)*
	
Photo Point 9 – Meadow Branch, view upstream *(10/19/2021)*	**Photo Point 9** – Meadow Branch, view downstream *(10/19/2021)*
	
Photo Point 10 – Meadow Branch, view upstream *(10/19/2021)*	**Photo Point 10** –Meadow Branch, view downstream *(10/19/2021)*

Photo Point 11 – Meadow Branch, view upstream *(10/19/2021)*

Photo Point 11 – Meadow Branch, view downstream *(10/19/2021)*

Photo Point 11 –WF1 Confluence, view upstream *(10/19/2021)*

Photo Point 12 – WF1 Start, view upstream *(10/19/2021)*

Photo Point 12 – WF1 Start, view downstream *(10/19/2021)*

Photo Point 13 – EF1 Start, view upstream *(10/19/2021)*

Photo Point 13 – EF1 Start, view downstream *(10/19/2021)*

Photo Point 14 – EF1, view upstream *(10/19/2021)*

Photo Point 14 – EF1, view downstream *(10/19/2021)*

Photo Point 15 – EF1, view upstream *(10/19/2021)*

Photo Point 15 – EF1, view downstream *(10/19/2021)*

	
Photo Point 16 – EF1, view upstream *(10/19/2021)*	**Photo Point 16** – EF1, view downstream *(10/19/2021)*
	
Photo Point 17 – WF2 Start, view upstream *(10/19/2021)*	**Photo Point 17** – WF2 Start, view downstream *(10/19/2021)*
	
Photo Point 18 – WF2, view upstream *(10/19/2021)*	**Photo Point 18** – WF2, view downstream *(10/19/2021)*

Vegetation Photographs
Monitoring Year 2

Vegetation Plot 1 - *(09/02/2021)*

Vegetation Plot 2 - *(09/02/2021)*

Vegetation Plot 3 - *(09/02/2021)*

Vegetation Plot 4 - *(09/07/2021)*

Vegetation Plot 5 - *(09/02/2021)*

Vegetation Plot 6 - *(09/02/2021)*

Vegetation Plot 7 - *(09/07/2021)*

Vegetation Plot 8 - *(09/02/2021)*

Vegetation Plot 9 - *(09/02/2021)*

Vegetation Plot 10 - *(09/02/2021)*

Vegetation Plot 11 - *(09/02/2021)*

Vegetation Plot 12 - *(09/02/2021)*

Mobile Vegetation Plot Photographs
Monitoring Year 2

	
Mobile Vegetation Plot 1 - North *(09/02/2021)*	**Mobile Vegetation Plot 2** – North *(09/07/2021)*
	
Mobile Vegetation Plot 3 - North *(09/07/2021)*	**Mobile Vegetation Plot 4** - North *(09/02/2021)*

Groundwater Gage Photographs
Monitoring Year 2

	
Groundwater Gage 1 - *(04/19/2021)*	**Groundwater Gage 2** - *(04/19/2021)*
	
Groundwater Gage 3 - *(04/19/2021)*	**Groundwater Gage 4** - *(04/19/2021)*
	
Groundwater Gage 5 - *(04/19/2021)*	**Groundwater Gage 6** - *(04/19/2021)*

Groundwater Gage 7 - *(04/19/2021)*

Groundwater Gage 8 - *(04/19/2021)*

Groundwater Gage 9 - *(04/19/2021)*

Groundwater Gage 10 - *(04/19/2021)*

Groundwater Gage 11 - *(04/19/2021)*

Stream Gage Photographs
Monitoring Year 2

WF1 - Crest Gage 1 - *(02/11/2021)*

EF1 - Crest Gage 2 - *(02/11/2021)*

WF2 - Crest Gage 3 - *(02/11/2021)*

Area of Concern Photographs
Monitoring Year 2

EF1: Bank Eroding behind structure at 211+70 - 212+00 (11/09/2021)

WF2: Gravel from crossing washing into stream at 301+00 (11/09/2021)

WF2: Aggradation in channel at 301+00 - 302+00 (11/09/2021)

Meadow Branch: Erosion gully running from agricultural field into CE before flowing into Meadow Branch at 107+50 (05/19/2021)

Meadow Branch: Deposition from erosion gully into Meadow Branch at 107+50 (05/19/2021)

Meadow Branch: Partially filled in erosion gully outside of CE at 107+50 (01/12/2022)

Meadow Branch: Deposition from partially filled in erosion gully into Meadow Branch at 107+50 (01/12/2022)

	
Meadow Branch: In-Stream vegetation at 116+00 (10/18/2021)	**Meadow Branch**: In-Stream vegetation at 110+00 (10/18/2021)

APPENDIX 3. Vegetation Plot Data

Table 8. Vegetation Plot Criteria Attainment

Deep Meadow Mitigation Site
DMS Project No. 97131
Monitoring Year 2 - 2021

Permanent Vegetation Plot	Success Criteria Met (Y/N)	Tract Mean (MY2 - 2021)	
1	N	67%	75%
2	Y		
3	N		
4	Y		
5	Y		
6	N		
7	N		
8	Y		
9	Y		
10	Y		
11	Y		
12	Y		
Mobile Vegetation Plot	**MY2 Success Criteria Met (Y/N)**		
1	Y	100%	
2	Y		
3	Y		
4	Y		

Table 9. CVS Permanent Vegetation Plot Metadata

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 2 - 2021

Report Prepared By	Sara Thompson
Date Prepared	9/20/2021 11:52
Database Name	cvs-eep-entrytool-v2.5.0_Deep Meadow (MY2).mdb
Database Location	Z:\ActiveProjects\005-02162 Deep Meadow\Monitoring\Monitoring Year 2_2021\Vegetation Assessment
Computer Name	SARA2020
File Size	76816384
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
PROJECT SUMMARY----------	
Project Code	97131
Project Name	Deep Meadow Mitigation Site
Description	Stream and wetland mitigation project in Union County, NC.
Sampled Plots	12

Table 10a. Planted and Total Stem Counts
Deep Meadow Mitigation Site
DMS Project No. 97131
Monitoring Year 2 - 2021

Current Permanent Vegetation Plot Data (MY2 2021)															
Scientific Name	**Common Name**	**Species Type**	**Permanent Plot 1**			**Permanent Plot 2**			**Permanent Plot 3**			**Permanent Plot 4**			
			PnoLS	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	
Acer negundo	Boxelder Maple	Tree			6			10			7				
Acer rubrum	Red Maple	Tree			5									7	
Alnus serrulata	Tag Alder, Smooth Alder, Hazel Alder	Shrub Tree													
Betula nigra	River Birch, Red Birch	Tree	1	1	1	3	3	3	2	2	2				
Cephalanthus occidentalis	Buttonbush	Shrub Tree										1	1	1	
Cornus amomum	Silky Dogwood	Shrub Tree	2	2	2	1	1	2				1	1	1	
Diospyros virginiana	American Persimmon, Possumwood	Tree	2	2	2	1	1	1				1	1	1	
Fraxinus pennsylvanica	Green Ash, Red Ash	Tree			1				3	3	3				
Lindera benzoin	Northern Spicebush	Shrub Tree													
Liquidambar styraciflua	Sweet Gum, Red Gum	Tree			13			3							
Liriodendron tulipifera	Tulip Poplar	Tree													
Platanus occidentalis	Sycamore, Plane-tree	Tree	2	2	2	3	3	3	1	1	1	2	2	2	
Populus deltoides	Eastern Cottonwood	Tree				2	2	2			2	1	1	1	
Quercus michauxii	Basket Oak, Swamp Chestnut Oak	Tree				1	1	1				1	1	1	
Quercus pagoda	Cherrybark Oak, Swamp Spanish Oak	Tree													
Quercus phellos	Willow Oak	Tree				1	1	1	1	1	1	1	1	1	
Salix sericea	Silky Willow	Shrub Tree													
		Stem count	7	7	32	12	12	26	7	7	16	8	8	15	
		size (ares)		1			1			1			1		
				0.0247			0.0247			0.0247			0.0247		
		Species count	4	4	8	7	7	9	4	4	6	7	7	8	
		Stems per ACRE	283	283	1295	486	486	1052	283	283	647	324	324	607	

Current Permanent Vegetation Plot Data (MY2 2021)															
Scientific Name	**Common Name**	**Species Type**	**Permanent Plot 5**			**Permanent Plot 6**			**Permanent Plot 7**			**Permanent Plot 8**			
			PnoLS	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	
Acer negundo	Boxelder Maple	Tree			205						5			6	
Acer rubrum	Red Maple	Tree													
Alnus serrulata	Tag Alder, Smooth Alder, Hazel Alder	Shrub Tree	1	1	1							1	1	1	
Betula nigra	River Birch, Red Birch	Tree	3	3	3				3	3	3	3	3	3	
Cephalanthus occidentalis	Buttonbush	Shrub Tree				2	2	2							
Cornus amomum	Silky Dogwood	Shrub Tree													
Diospyros virginiana	American Persimmon, Possumwood	Tree													
Fraxinus pennsylvanica	Green Ash, Red Ash	Tree	1	1	1				1	1	4	1	1	4	
Lindera benzoin	Northern Spicebush	Shrub Tree													
Liquidambar styraciflua	Sweet Gum, Red Gum	Tree													
Liriodendron tulipifera	Tulip Poplar	Tree	1	1	1										
Platanus occidentalis	Sycamore, Plane-tree	Tree	2	2	2	1	1	1	3	3	3	2	2	2	
Populus deltoides	Eastern Cottonwood	Tree													
Quercus michauxii	Basket Oak, Swamp Chestnut Oak	Tree	2	2	2							1	1	1	
Quercus pagoda	Cherrybark Oak, Swamp Spanish Oak	Tree													
Quercus phellos	Willow Oak	Tree	2	2	2	1	1	1							
Salix sericea	Silky Willow	Shrub Tree													
		Stem count	12	12	217	4	4	4	7	7	15	8	8	17	
		size (ares)		1			1			1			1		
		size (ACRES)		0.0247			0.0247			0.0247			0.0247		
		Species count	7	7	8	3	3	3	3	3	4	5	5	6	
		Stems per ACRE	486	486	8782	162	162	162	283	283	607	324	324	688	

Color for Density
Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%
Volunteer species included in total

PnoLS: Number of planted stems excluding live stakes
P-all: Number of planted stems including live stakes
T: Total stems

Table 10b. Planted and Total Stem Counts
Deep Meadow Mitigation Site
DMS Project No. 97131
Monitoring Year 2 - 2021

Current Permanent Vegetation Plot Data (MY2 2021)														
Scientific Name	**Common Name**	**Species Type**	**Permanent Plot 9**			**Permanent Plot 10**			**Permanent Plot 11**			**Permanent Plot 12**		
			PnoLS	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	Boxelder Maple	Tree			50			272			3			8
Acer rubrum	Red Maple	Tree												
Alnus serrulata	Tag Alder, Smooth Alder, Hazel Alder	Shrub Tree												
Betula nigra	River Birch, Red Birch	Tree	2	2	2	1	1	1	3	3	3			
Cephalanthus occidentalis	Buttonbush	Shrub Tree							2	2	2	2	2	2
Cornus amomum	Silky Dogwood	Shrub Tree							1	1	1	2	2	2
Diospyros virginiana	American Persimmon, Possumwood	Tree							2	2	2	4	4	4
Fraxinus pennsylvanica	Green Ash, Red Ash	Tree	1	1	1									6
Lindera benzoin	Northern Spicebush	Shrub Tree												
Liquidambar styraciflua	Sweet Gum, Red Gum	Tree												
Liriodendron tulipifera	Tulip Poplar	Tree	3	3	3									
Platanus occidentalis	Sycamore, Plane-tree	Tree	3	3	3	5	5	5	2	2	3			
Populus deltoides	Eastern Cottonwood	Tree			15	2	2	2				2	2	2
Quercus michauxii	Basket Oak, Swamp Chestnut Oak	Tree	4	4	4	1	1	1	1	1	1			
Quercus pagoda	Cherrybark Oak, Swamp Spanish Oak	Tree												
Quercus phellos	Willow Oak	Tree	1	1	1	2	2	2	1	1	1	2	2	2
Salix sericea	Silky Willow	Shrub Tree			1									
		Stem count	14	14	80	11	11	283	12	12	16	12	12	26
		size (ares)		1			1			1			1	
		size (ACRES)		0.0247			0.0247			0.0247			0.0247	
		Species count	6	6	9	5	5	6	7	7	8	5	5	7
		Stems per ACRE	567	567	3237	445	445	11453	486	486	647	486	486	1052

Permanent Vegetation Plot Annual Mean											
Scientific Name	**Common Name**	**Species Type**	**MY2 (2021)**			**MY1 (2020)**			**MY0 (2020)**		
			PnoLS	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	Boxelder Maple	Tree			572			356			
Acer rubrum	Red Maple	Tree			12						
Alnus serrulata	Tag Alder, Smooth Alder, Hazel Alder	Shrub Tree	2	2	2	4	4	4	6	6	6
Betula nigra	River Birch, Red Birch	Tree	21	21	21	24	24	24	26	26	26
Cephalanthus occidentalis	Buttonbush	Shrub Tree	7	7	7	7	7	7	8	8	8
Cornus amomum	Silky Dogwood	Shrub Tree	7	7	8	9	9	9	10	10	10
Diospyros virginiana	American Persimmon, Possumwood	Tree	10	10	10	13	13	13	13	13	13
Fraxinus pennsylvanica	Green Ash, Red Ash	Tree	7	7	20	7	7	10	7	7	7
Lindera benzoin	Northern Spicebush	Shrub Tree				2	2	2	12	12	12
Liquidambar styraciflua	Sweet Gum, Red Gum	Tree			16						
Liriodendron tulipifera	Tulip Poplar	Tree	4	4	4	6	6	6	17	17	17
Platanus occidentalis	Sycamore, Plane-tree	Tree	26	26	27	27	27	27	27	27	27
Populus deltoides	Eastern Cottonwood	Tree	7	7	24	8	8	8	13	13	13
Quercus michauxii	Basket Oak, Swamp Chestnut Oak	Tree	11	11	11	18	18	18	18	18	18
Quercus pagoda	Cherrybark Oak, Swamp Spanish Oak	Tree							1	1	1
Quercus phellos	Willow Oak	Tree	12	12	12	18	18	18	22	22	22
Salix sericea	Silky Willow	Shrub Tree			1						
		Stem count	114	114	747	143	143	502	180	180	180
		size (ares)		12			12			12	
		size (ACRES)		0.2965			0.2965			0.2965	
		Species count	11	11	15	12	12	13	13	13	13
		Stems per ACRE	384	384	2519	482	482	1693	607	607	607

Color for Density
Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%
Volunteer species included in total

PnoLS: Number of planted stems excluding live stakes
P-all: Number of planted stems including live stakes
T: Total stems

Table 10c. Planted and Total Stem Counts
Deep Meadow Mitigation Site
DMS Project No. 97131
Monitoring Year 2 - 2021

Current Mobile Vegetation Plot (MP) Data (MY2 2021)						
Scientific Name	**Common Name**	**Species Type**	**MP1**	**MP2**	**MP3**	**MP4**
			PnoLS	**PnoLS**	**PnoLS**	**PnoLS**
Acer negundo	Box Elder Maple	Tree				
Acer rubrum	Red Maple	Tree				
Alnus serrulata	Tag Alder, Smooth Alder, Hazel Alder	Shrub Tree			3	
Betula nigra	River Birch, Red Birch	Tree	4	3		1
Cephalanthus occidentalis	Buttonbush	Shrub Tree				3
Cornus amomum	Silky Dogwood	Shrub Tree				
Diospyros virginiana	Persimmon	Tree			1	
Fraxinus pennsylvanica	Green Ash, Red Ash	Tree	2	4	4	2
Lindera benzoin	Northern Spicebush	Shrub Tree				
Liquidambar styraciflua	Sweet Gum, Red Gum	Tree				
Liriodendron tulipifera	Tulip Poplar	Tree			3	
Platanus occidentalis	Sycamore, Plane-tree	Tree	3	4	1	3
Populus deltoides	Eastern Cottonwood	Tree				2
Quercus michauxii	Basket Oak, Swamp Chestnut Oak	Tree				
Quercus pagoda	Cherrybark Oak, Swamp Spanish Oak	Tree			2	
Quercus phellos	Willow Oak	Tree			1	
Salix sericea	Silky Willow	Shrub Tree				
		Stem count	9	11	15	11
		size (ares)	1	1	1	1
		size (ACRES)	0.0247	0.0247	0.0247	0.0247
		Species count	3	3	7	5
		Stems per ACRE	364	445	607	445

Current Mobile Vegetation Plot (MP) Data (MY2 2021) Total Stem Counts & Annual Means					
Scientific Name	**Common Name**	**Species Type**	**MY2 (2021)**	**MY1 (2020)**	**MY0 (2020)**
			PnoLS	**PnoLS**	**PnoLS**
Acer negundo	Box Elder Maple	Tree			
Acer rubrum	Red Maple	Tree			
Alnus serrulata	Tag Alder, Smooth Alder, Hazel Alder	Shrub Tree	3	3	1
Betula nigra	River Birch, Red Birch	Tree	8	4	9
Cephalanthus occidentalis	Buttonbush	Shrub Tree	3	3	2
Cornus amomum	Silky Dogwood	Shrub Tree			1
Diospyros virginiana	American Persimmon, Possumwood	Tree	1	1	
Fraxinus pennsylvanica	Green Ash, Red Ash	Tree	12	10	3
Lindera benzoin	Northern Spicebush	Shrub Tree			1
Liquidambar styraciflua	Sweet Gum, Red Gum	Tree			
Liriodendron tulipifera	Tulip Poplar	Tree	3	3	5
Platanus occidentalis	Sycamore, Plane-tree	Tree	11	8	20
Populus deltoides	Eastern Cottonwood	Tree	2	2	4
Quercus michauxii	Basket Oak, Swamp Chestnut Oak	Tree			2
Quercus pagoda	Cherrybark Oak, Swamp Spanish Oak	Tree	2	2	5
Quercus phellos	Willow Oak	Tree	1	1	9
Salix sericea	Silky Willow	Shrub Tree			
		Stem count	46	37	62
		size (ares)	4	4	4
		size (ACRES)	0.0988	0.0988	0.0988
		Species count	10	10	12
		Stems per ACRE	465	374	627

Overall Site Annual Mean		
MY2 (2021)	**MY1 (2020)**	**MY0 (2020)**
PnoLS	**PnoLS**	**PnoLS**
5	4	7
29	30	35
10	7	10
7	9	11
11	18	13
19	13	10
	2	13
7	8	22
37	42	48
9	16	16
11	22	20
2	2	6
13	18	31
160	189	242
16	16	16
0.3954	0.3954	0.3954
13	13	13
405	478	612

Color for Density
Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%
Volunteer species included in total

PnoLS: Number of planted stems excluding live stakes
P-all: Number of planted stems including live stakes
T: Total stems

APPENDIX 4. Morphological Summary Data and Plots

Table 11a. Baseline Stream Data Summary
Deep Meadow Mitigation Site
DMS Project No. 97131
Monitoring Year 2 - 2021

		Pre-Restoration Condition						Design						As-Built/Baseline					
Parameter	**Gage**	**WF1**		**WF2**		**EF1**		**WF1**		**WF2**		**EF1**		**WF1**		**WF2**		**EF1**	
		Min	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Dimension and Substrate - Riffle																			
Bankfull Width (ft)		4.9		6.1		8.2		8.1		8.9		10.2		9.3		9.8		10.3	13.1
Floodprone Width (ft)		6.0		>82		29	>39	18	36	26	70	30	68	13.3		64.5		57.0	64.9
Bankfull Mean Depth (ft)		0.7		0.9		1.5		0.9		0.7		0.8		0.4		0.7		0.5	0.6
Bankfull Max Depth (ft)		1.1		1.1		1.6		0.5	0.9	0.8	1.2	1.0	1.3	0.7		1.2		0.8	1.0
Bankfull Cross-sectional Area (ft^2)[1]	N/A	3.2		5.1		8.4		4.4		6.6		8.7		4.0		7.1		5.0	7.9
Width/Depth Ratio		7.3		7.5		8.0		15.0		12.7		12.0		21.3		13.6		21.3	21.9
Entrenchment Ratio[3]		1.3		12.0		3.8		2.2		6.0		5.0		1.4		6.6		4.9	5.5
Bank Height Ratio		3.4		1.4		1.4		1.0		1.0		1.0		1.0		1.0		1.0	
D_{50} (mm)		---		SC		16.0	41.3	---		---		---		24.4		37.5		37.4	51.8
Profile																			
Riffle Length[1] (ft)																			
Riffle Slope (ft/ft)[1]		---		---	---	---	---	---	---	0.014	0.036	0.007	0.031	---	---	0.00963	0.04802	0.00191	0.07879
Pool Length (ft)	N/A																		
Pool Max Depth (ft)		N/A		N/A		2.2		---		1.4	2.6	1.4	2	---		1.5	2.8	1.3	2.3
Pool Spacing (ft)		N/A		34	53	42	81	---	---	22	69	41	75	---	---	57	87	38	73
Pool Volume (ft^3)[1]																			
Pattern																			
Channel Beltwidth (ft)		---		---		---		N/A[2]		23	56	23	57	N/A[2]		23	56	23	57
Radius of Curvature (ft)		---		---		---		N/A[2]		18	27	20	35	N/A[2]		18	27	20	35
Rc/Bankfull Width	N/A	---		---		---		N/A[2]		2.1	3.1	2.3	4.0	N/A[2]		2.1	3.1	2.3	4.0
Meander Length (ft)		---		---		---		N/A[2]		73	135	93	146	N/A[2]		73	135	93	146
Meander Width Ratio		---		---		---		N/A[2]		2.7	6.5	2.7	6.5	N/A[2]		2.7	6.5	2.7	6.5
Substrate, Bed and Transport Parameters																			
Ri%/Ru%/P%/G%/S%																			
SC%/Sa%/G%/C%/B%/Be%																			
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$	N/A	---		SC/SC/SC/36.7/78.5/180.0		SC/10.5/19.7/68.5/>2048/>2048		---		---		---		0.1/18.0/35.9/98.3/160.7/256.0		SC/0.2/8.0/67.2/128.0/256.0		SC/0.3/12.1/81.3/137.0/256.0	
Reach Shear Stress (Competency) lb/ft^2		---		---		---		---		0.59		0.49		0.68		0.59		0.24	0.29
Max part size (mm) mobilized at bankfull		---		---		---		---		103		90		---		---		---	
Stream Power (Capacity) W/m^2																			
Additional Reach Parameters																			
Drainage Area (SM)		0.09		0.20		0.35		0.09		0.20		0.35		0.09		0.20		0.35	
Watershed Impervious Cover Estimate (%)		4%						4%						4%					
Rosgen Classification		G4		E4		E4		C4b		E4		E4		B4		C4		C3/4	
Bankfull Velocity (fps)		4.1		4.5		4.1		3.3		3.2		3.4		3.3		3.4		2.1	2.3
Bankfull Discharge (cfs)		10		20		30		10		20		30		13		24		10	18
Q-NFF regression (2-yr)																			
Q-USGS extrapolation (1.2-yr)	N/A	---		---		---		13		24		36		---		---		---	
Max Q-Mannings		---		---		---		126		44		97		---		---		---	
Valley Slope (ft/ft)		0.0166		0.0170		0.0094		0.0167		0.0183		0.0124		---		---		---	
Channel Thalweg Length (ft)		136		391		1,201		136		458		1,322		136		458		1,322	
Sinuosity		1.00		1.00		1.04		1.00		1.40		1.30		---		1.40		1.30	
Bankfull/Channel Slope[1] (ft/ft)		0.0192		0.0168		0.0101		0.0160		0.0133		0.0095		0.0274		0.0135		0.0078	

1. As-Built/ Baseline channel slope (ft/ft) was measured from channel bed rather than water surface slope due to a dry channel during survey data collection
2. Pattern data is not applicable for A-type and B-type channels
3. ER is based on the width of the cross-section, in lieu of assuming the width across the floodplain.

SC: Silt/Clay <0.062 mm diameter particles
(---): Data was not provided
N/A: Not Applicable

Table 11b. Reference Reach Data Summary
Deep Meadow Mitigation Site
DMS Project No. 97131
Monitoring Year 2 - 2021

		Reference Reach Data											
Parameter	**Gage**	**UT to Richland Creek**		**UT to Cane Creek**		**Spencer Creek 3**		**UT to Rocky Creek**		**Foust Creek US**		**Long Branch**	
		Min	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Dimension and Substrate - Riffle													
Bankfull Width (ft)	N/A	8.8	10.4	11.5	12.3	6.3	9.3	12.2		18.5	19.4	14.8	18.6
Floodprone Width (ft)		28.0	31.0	31.0		14.0	125.0	72.4		55.0	101.0	>50.0	
Bankfull Mean Depth		0.8	0.9	0.8	1.0	0.8	1.0	1.3		1.2	1.3	1.3	2.1
Bankfull Max Depth		1.1	1.3	1.2	1.6	1.0	1.2	1.8		1.8	2.1	1.9	2.9
Bankfull Cross-sectional Area (ft^2)		7.8	8.5	8.9	12.2	6.6	8.7	16.3		23.9	24.1	34.6	
Width/Depth Ratio		10.0	12.8	12.3	14.4	7.9	9.3	9.1		14.3	15.7	7.9	13.8
Entrenchment Ratio		2.5	4.0	2.5	2.7	1.7	4.3	6.0		2.9	5.3	>3.4	
Bank Height Ratio		1.4	2.1	1.4	2.5	1.0		1.0		---	---	1.2	1.5
D50 (mm)		---		27.8		11.0		22.6		61.0		41.6	
Profile													
Riffle Length (ft)	N/A	---		---		---		---		---		---	
Riffle Slope (ft/ft)		0.018	0.036	0.015	0.035	0.018	0.034	0.061	0.089	---	---	0.012	0.013
Pool Length (ft)		---		---		---		---		---		---	
Pool Max Depth (ft)		14.7	16.0	2.5	2.9	1.2	1.8	2.2		2.5	2.9	2.2	
Pool Spacing (ft)		33	93	49	91	9	46	26	81	---	---	50	105
Pool Volume (ft^3)		---		---		---		---		---		---	
Pattern													
Channel Beltwidth (ft)	N/A	---		102		10	50	---		---		60	
Radius of Curvature (ft)		---		23	38	12	85	---		---		16	87
Rc/Bankfull Width		---		2.0	3.1	1.9	9.1	---		---		1.1	4.7
Meander Length (ft)		---		---		53	178	---		---		---	---
Meander Width Ratio		---		8.3	8.9	1.6	5.4	---		---		3.2	4.1
Substrate, Bed and Transport Parameters													
Ri%/Ru%/P%/G%/S%	N/A												
SC%/Sa%/G%/C%/B%/Be%													
d16/d35/d50/d84/d95/d100		---		0.6/12.2/27.8/74.5/128		1.9/8.9/11/64/128		<0.063/2.4/22.6/120/256		9.6/37/61/130/1100		8.1/26.6/41.6/124.8/225.5	
Reach Shear Stress (Competency) lb/ft^2													
Max part size (mm) mobilized at bankfull													
Stream Power (Capacity) W/m^2													
Additional Reach Parameters													
Drainage Area (SM)	N/A	0.28		0.29		0.37		1.05		1.40		1.49	
Watershed Impervious Cover Estimate (%)		---		---		---		---		---		---	
Rosgen Classification		C4/E4		E4		E4		E4b		C4		C/E4	
Bankfull Velocity (fps)		4.1		3.8		5.0	5.6	5.5		4.0		4.0	
Bankfull Discharge (cfs)		32		40		35		85		95		124	
Q-NFF regression (2-yr)													
Q-USGS extrapolation (1.2-yr)													
Q-Mannings													
Valley Length (ft)		---		---		---		---		---		---	
Channel Thalweg Length (ft)		---		---		---		---		---		---	
Sinuosity		1.00		1.40		1.00	1.30	1.10		---		1.30	
Water Surface Slope (ft/ft)		---		---		---		---		---		---	
Bankfull/Channel Slope (ft/ft)		0.0131	0.0178	0.0150		0.0190	0.0220	0.0240		0.0090		0.0040	

SC: Silt/Clay <0.062 mm diameter particles
(---): Data was not provided N/A: Not Applicable

Table 12. Morphology and Hydraulic Summary (Dimensional Parameters - Cross-Section)

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 2 - 2021

	WF1 Cross-Section 1, Riffle								EF1 Cross-Section 2, Pool								EF1 Cross-Section 3, Riffle							
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
Bankfull Elevation [1]	485.90	485.96	486.02						491.66	491.66	491.62						491.48	491.52	491.56					
Low Bank Elevation	485.90	485.89	485.97						491.66	491.69	491.62						491.48	491.48	491.62					
Bankfull Width (ft)	9.3	9.0	7.7						11.6	11.4	9.6						10.3	10.2	10.3					
Floodprone Width (ft)[2]	13.3	13.2	13.6						---	---	---						57.0	57.0	62.6					
Bankfull Mean Depth (ft)	0.4	0.4	0.4						1.0	1.1	1.2						0.5	0.5	0.5					
Bankfull Max Depth (ft)	0.7	0.7	0.7						1.8	2.1	2.1						0.8	0.8	0.9					
Bankfull Cross-Sectional Area (ft^2)	4.0	3.3	3.4						11.1	12.7	11.8						5.0	4.6	5.6					
Bankfull Width/Depth Ratio	21.3	24.7	17.4						12.1	10.2	7.8						21.3	22.5	19.0					
Bankfull Entrenchment Ratio	1.4	1.5	1.8						---	---	---						5.5	5.6	6.1					
Bankfull Bank Height Ratio	1.0	0.9	0.9						---	---	---						1.0	1.0	1.1					
	EF1 Cross-Section 4, Riffle								**WF2 Cross-Section 5, Pool**								**WF2 Cross-Section 6, Riffle**							
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
Bankfull Elevation [1]	487.26	487.20	487.31						485.68	485.68	485.68						485.50	485.63	485.69					
Low Bank Elevation	487.26	487.21	487.28						485.68	485.71	485.68						485.50	485.58	485.58					
Bankfull Width (ft)	13.1	13.1	11.1						11.3	10.5	9.8						9.8	10.6	10.0					
Floodprone Width (ft)[2]	64.9	65.9	64.8						---	---	---						64.5	63.7	64.9					
Bankfull Mean Depth (ft)	0.6	0.6	0.7						0.9	1.0	1.1						0.7	0.6	0.6					
Bankfull Max Depth (ft)	1.0	1.0	1.1						1.8	2.0	2.0						1.2	1.0	1.0					
Bankfull Cross-Sectional Area (ft^2)	7.9	8.0	7.6						9.9	10.5	10.6						7.1	6.6	6.1					
Bankfull Width/Depth Ratio	21.9	21.4	16.4						13.0	10.6	9.0						13.6	17.1	16.5					
Bankfull Entrenchment Ratio	4.9	5.0	5.8						---	---	---						6.6	6.0	6.5					
Bankfull Bank Height Ratio	1.0	1.0	1.0						---	---	---						1.0	0.9	0.9					

[1]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

[2]Floodprone width is calculated from the width of cross-section but may valley width may extend further.

Table 13a. Monitoring Data - Stream Reach Data Summary
Deep Meadow Mitigation Site
DMS Project No. 97131
Monitoring Year 2 - 2021

WF1

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle[2]																
Bankfull Width (ft)	10.0		9.0		7.7											
Floodprone Width (ft)	16.1		13.2		13.6											
Bankfull Mean Depth (ft)	0.7		0.4		0.4											
Bankfull Max Depth (ft)	1.0		0.7		0.7											
Bankfull Cross-sectional Area (ft^2)	6.5		3.3		3.4											
Width/Depth Ratio	15.3		24.7		17.4											
Entrenchment Ratio	1.6		1.5		1.8											
Bank Height Ratio	2.1		0.9		0.9											
D_{50} (mm)	24.4															
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	---	---														
Pool Length (ft)																
Pool Max Depth (ft)	---															
Pool Spacing (ft)	---	---														
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)	N/A[1]															
Radius of Curvature (ft)	N/A[1]															
Rc/Bankfull Width (ft/ft)	N/A[1]															
Meander Length (ft)	N/A[1]															
Meander Width Ratio	N/A[1]															
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$	0.1/18.0/35.9/98.3/ 160.7/256.0		2.0/10.1/26.2/80.3/ 151.8/256.0		7.3/14.9/26.9/107.4/ 162.1/362.0											
Reach Shear Stress (Competency) lb/ft^2	0.68															
Max part size (mm) mobilized at bankfull	---															
Stream Power (Capacity) W/m^2																
Additional Reach Parameters																
Drainage Area (SM)	0.09															
Watershed Impervious Cover Estimate (%)	4%															
Rosgen Classification	B4															
Bankfull Velocity (fps)	3.3															
Bankfull Discharge (cfs)	13															
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	136															
Sinuosity	---															
Bankfull/Channel Slope (ft/ft)	0.0274															

[1]Pattern data is not applicable for A-type and B-type channels

[2]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13b. Monitoring Data - Stream Reach Data Summary
Deep Meadow Mitigation Site
DMS Project No. 97131
Monitoring Year 2 - 2021

EF1

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle[1]																
Bankfull Width (ft)	10.3	13.1	10.2	13.1	10.3	11.1										
Floodprone Width (ft)	57.0	64.9	57.0	65.9	62.6	64.8										
Bankfull Mean Depth (ft)	0.5	0.6	0.5	0.6	0.5	0.7										
Bankfull Max Depth (ft)	0.8	1.0	0.8	1.0	0.9	1.1										
Bankfull Cross-sectional Area (ft^2)	5.0	7.9	4.6	8.0	5.6	7.6										
Width/Depth Ratio	21.3	21.9	21.4	22.5	16.4	19.0										
Entrenchment Ratio	4.9	5.5	5.0	5.6	5.8	6.1										
Bank Height Ratio	1.0		1.0		1.0	1.1										
D_{50} (mm)	37.4	51.8														
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.001911	0.078794														
Pool Length (ft)																
Pool Max Depth (ft)	1.3	2.3														
Pool Spacing (ft)	38	73														
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)	23	57														
Radius of Curvature (ft)	20	35														
Rc/Bankfull Width (ft/ft)	2.3	4.0														
Meander Length (ft)	93	146														
Meander Width Ratio	2.7	6.5														
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$	SC/0.3/12.1/81.3/137.0/256.0		4.73/12.2/20.5/71.7/104.7/180.0/		SC/20.7/49.5/120.7/196.6/512.0											
Reach Shear Stress (Competency) lb/ft^2	0.24	0.29														
Max part size (mm) mobilized at bankfull	---															
Stream Power (Capacity) W/m^2																
Additional Reach Parameters																
Drainage Area (SM)	0.35															
Watershed Impervious Cover Estimate (%)	0															
Rosgen Classification	C3/4															
Bankfull Velocity (fps)	2.1	2.3														
Bankfull Discharge (cfs)	10	18														
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	1,322															
Sinuosity	1.30															
Bankfull/Channel Slope (ft/ft)	0.0078															

[1]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13c. Monitoring Data - Stream Reach Data Summary
Deep Meadow Mitigation Site
DMS Project No. 97131
Monitoring Year 2 - 2021

WF2

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle[1]																
Bankfull Width (ft)	9.8		10.6		10.0											
Floodprone Width (ft)	64.5		63.7		64.9											
Bankfull Mean Depth (ft)	0.7		0.6		0.6											
Bankfull Max Depth (ft)	1.2		1.0		1.0											
Bankfull Cross-sectional Area (ft^2)	7.1		6.6		6.1											
Width/Depth Ratio	13.6		17.1		16.5											
Entrenchment Ratio	6.6		6.0		6.5											
Bank Height Ratio	1.0		0.9		0.9											
D_{50} (mm)	37.5															
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.009632	0.04802														
Pool Length (ft)																
Pool Max Depth (ft)	1.5	2.8														
Pool Spacing (ft)	57	87														
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)	23	56														
Radius of Curvature (ft)	18	27														
Rc/Bankfull Width (ft/ft)	2.1	3.1														
Meander Length (ft)	73	135														
Meander Width Ratio	2.7	6.5														
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$	SC/0.2/8.0/67.2/ 128.0/256.0		SC/1.6/14.7/70.9/ 110.1/256.0		SC/9.4/19.4/79.2/ 128.0/180.0											
Reach Shear Stress (Competency) lb/ft^2	0.59															
Max part size (mm) mobilized at bankfull	---															
Stream Power (Capacity) W/m^2																
Additional Reach Parameters																
Drainage Area (SM)	0.20															
Watershed Impervious Cover Estimate (%)	4%															
Rosgen Classification	C4															
Bankfull Velocity (fps)	3.4															
Bankfull Discharge (cfs)	24															
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	458															
Sinuosity	1.40															
Bankfull/Channel Slope (ft/ft)	0.0135															

[1]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

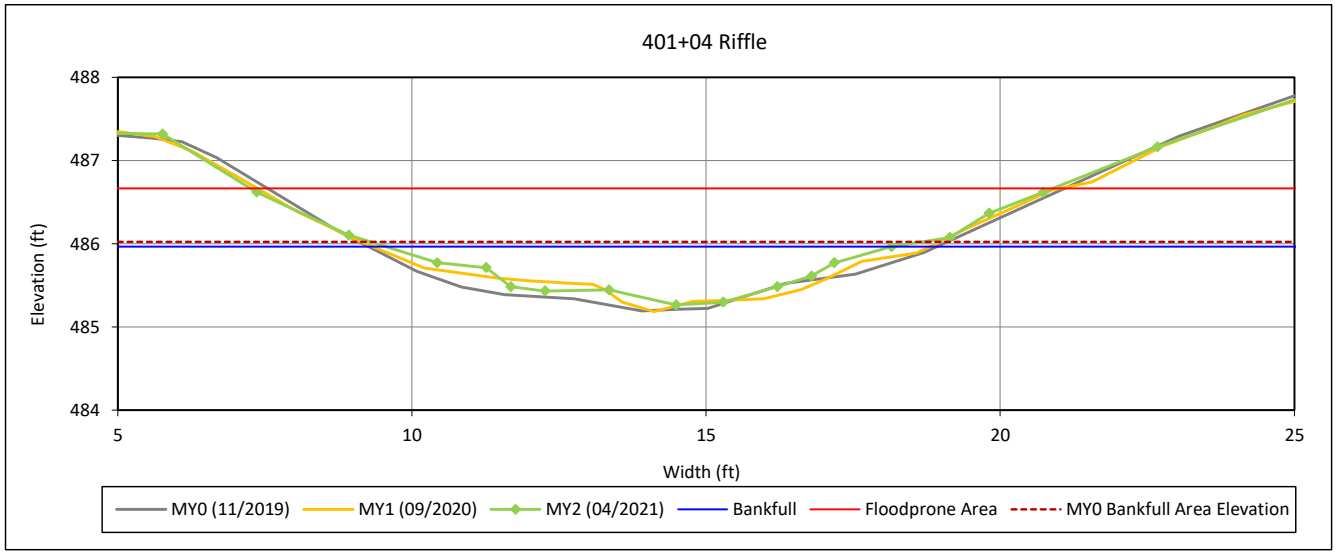
(---): Data was not provided

N/A: Not Applicable

Cross-Section Plots

Deep Meadow Mitigation Site
NCDMS Project No. 97131
Monitoring Year 2 - 2021

Cross-Section 1 - WF1



Bankfull Dimensions	
3.4	x-section area (ft.sq.)
7.7	width (ft)
0.4	mean depth (ft)
0.7	max depth (ft)
7.9	wetted perimeter (ft)
0.4	hydraulic radius (ft)
17.4	width-depth ratio
13.6	W flood prone area (ft)
1.8	entrenchment ratio
0.9	low bank height ratio

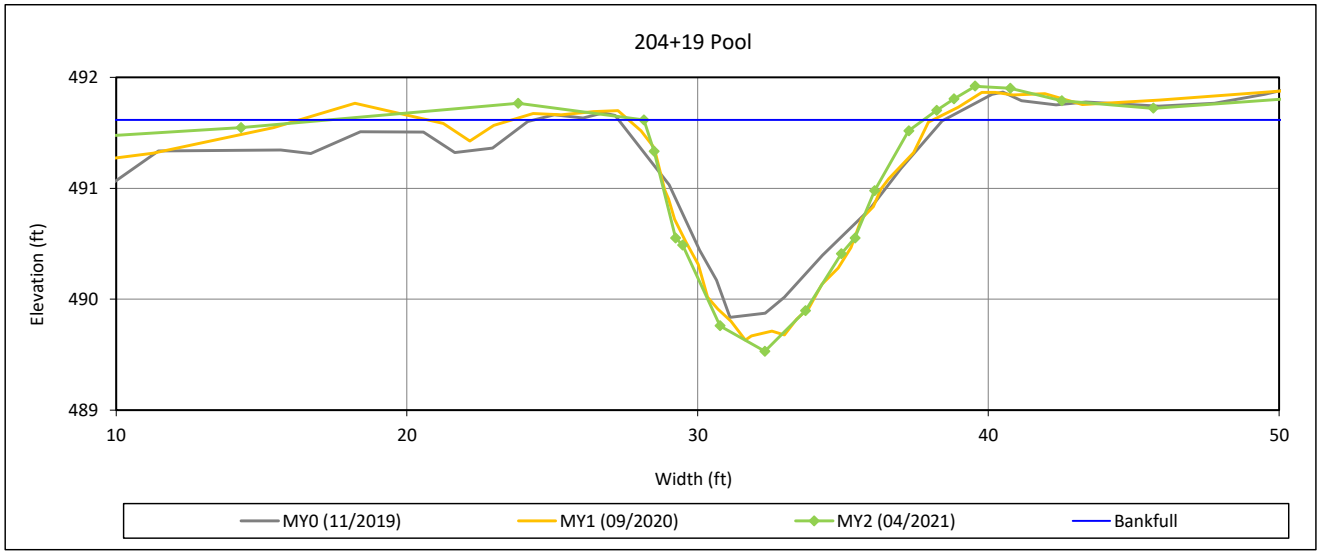
Survey Date: 04/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Deep Meadow Mitigation Site
NCDMS Project No. 97131
Monitoring Year 2 - 2021

Cross-Section 2 - EF1



Bankfull Dimensions	
11.8	x-section area (ft.sq.)
9.6	width (ft)
1.2	mean depth (ft)
2.1	max depth (ft)
10.7	wetted perimeter (ft)
1.1	hydraulic radius (ft)
7.8	width-depth ratio

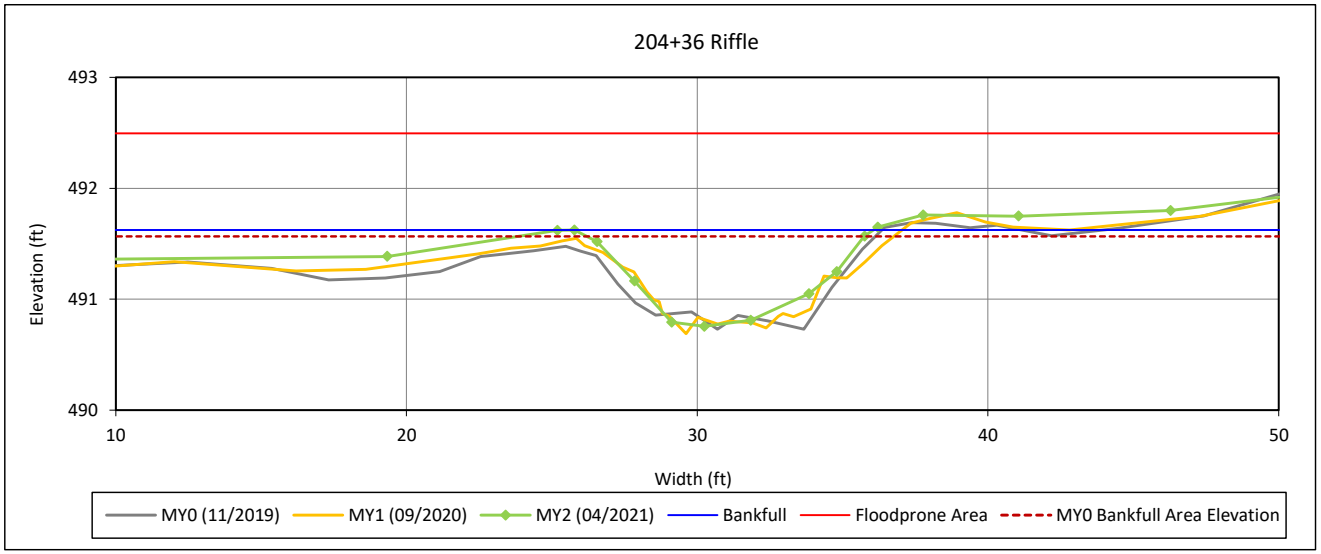
Survey Date: 04/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Deep Meadow Mitigation Site
NCDMS Project No. 97131
Monitoring Year 2 - 2021

Cross-Section 3 - EF1



Bankfull Dimensions	
5.6	x-section area (ft.sq.)
10.3	width (ft)
0.5	mean depth (ft)
0.9	max depth (ft)
10.5	wetted perimeter (ft)
0.5	hydraulic radius (ft)
19.0	width-depth ratio
62.6	W flood prone area (ft)
6.1	entrenchment ratio
1.1	low bank height ratio

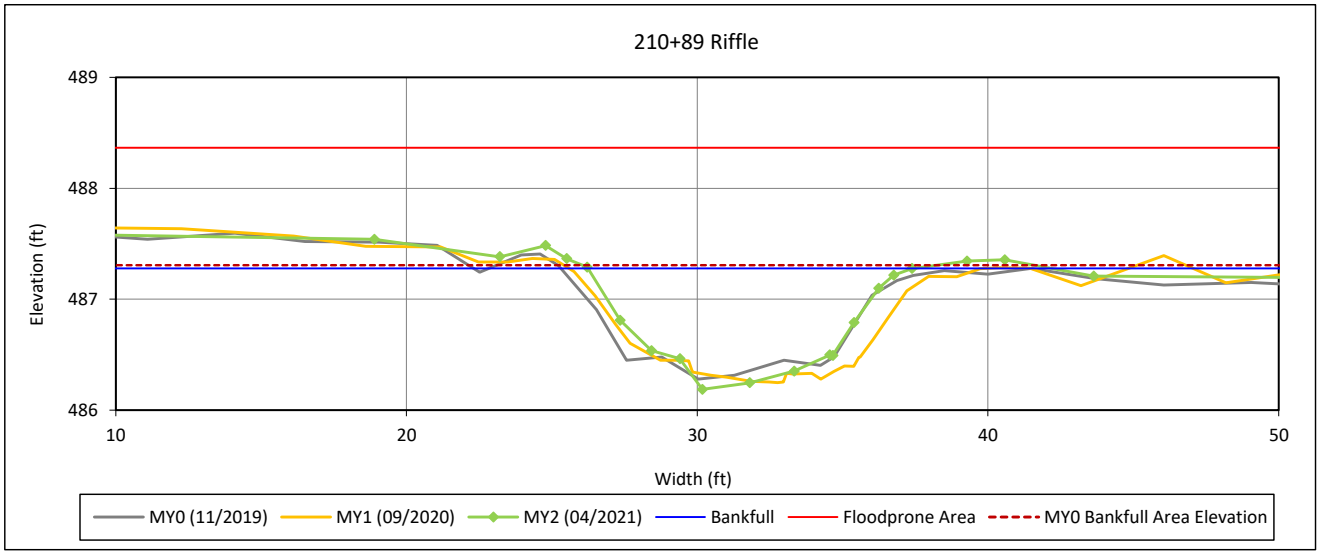
Survey Date: 04/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Deep Meadow Mitigation Site
NCDMS Project No. 97131
Monitoring Year 2 - 2021

Cross-Section 4 - EF1



Bankfull Dimensions	
7.6	x-section area (ft.sq.)
11.1	width (ft)
0.7	mean depth (ft)
1.1	max depth (ft)
11.5	wetted perimeter (ft)
0.7	hydraulic radius (ft)
16.4	width-depth ratio
64.8	W flood prone area (ft)
5.8	entrenchment ratio
1.0	low bank height ratio

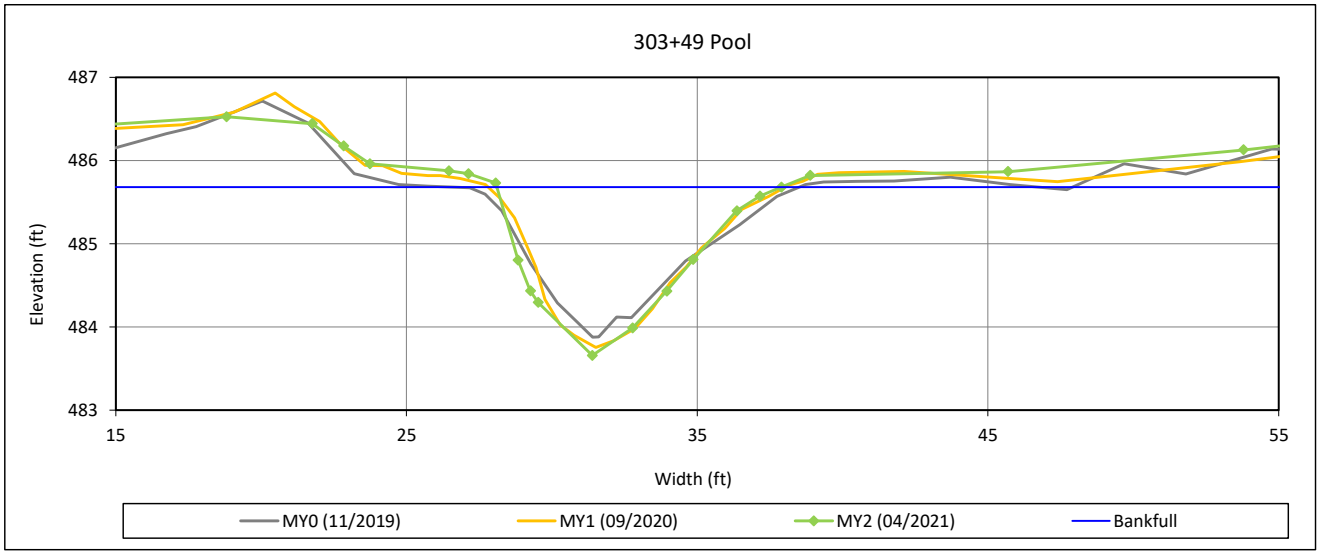
Survey Date: 04/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Deep Meadow Mitigation Site
NCDMS Project No. 97131
Monitoring Year 2 - 2021

Cross-Section 5 - WF2



Bankfull Dimensions	
10.6	x-section area (ft.sq.)
9.8	width (ft)
1.1	mean depth (ft)
2.0	max depth (ft)
10.8	wetted perimeter (ft)
1.0	hydraulic radius (ft)
9.0	width-depth ratio

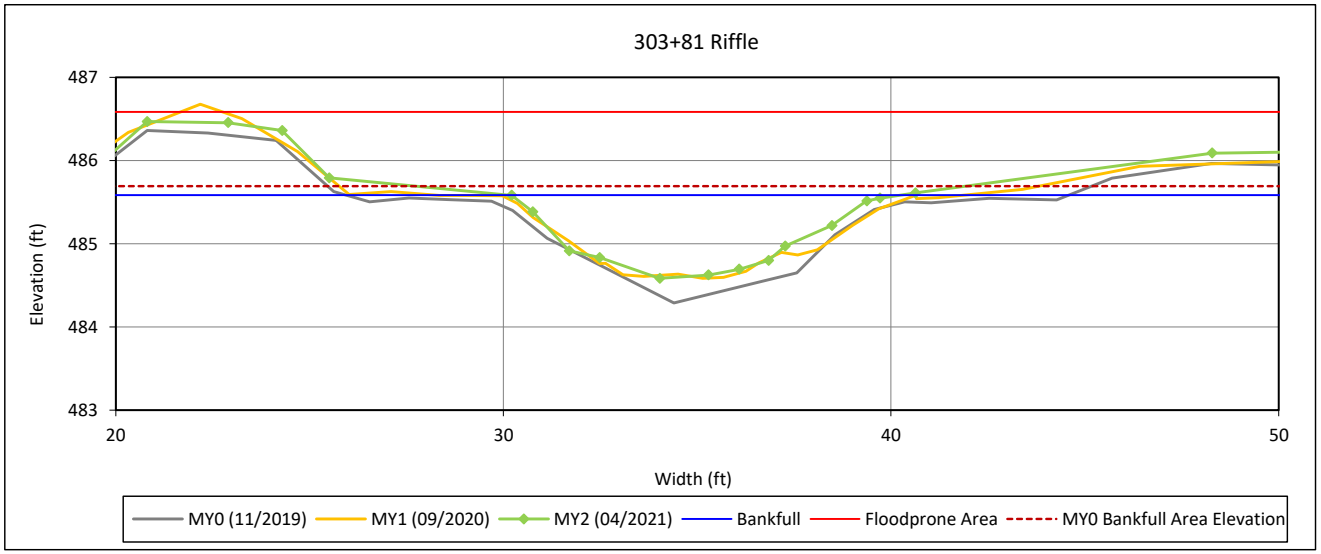
Survey Date: 04/2021
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Deep Meadow Mitigation Site
NCDMS Project No. 97131
Monitoring Year 2 - 2021

Cross-Section 6 - WF2



Bankfull Dimensions	
6.1	x-section area (ft.sq.)
10.0	width (ft)
0.6	mean depth (ft)
1.0	max depth (ft)
10.3	wetted perimeter (ft)
0.6	hydraulic radius (ft)
16.5	width-depth ratio
64.9	W flood prone area (ft)
6.5	entrenchment ratio
0.9	low bank height ratio

Survey Date: 04/2021
Field Crew: Wildlands Engineering

View Downstream

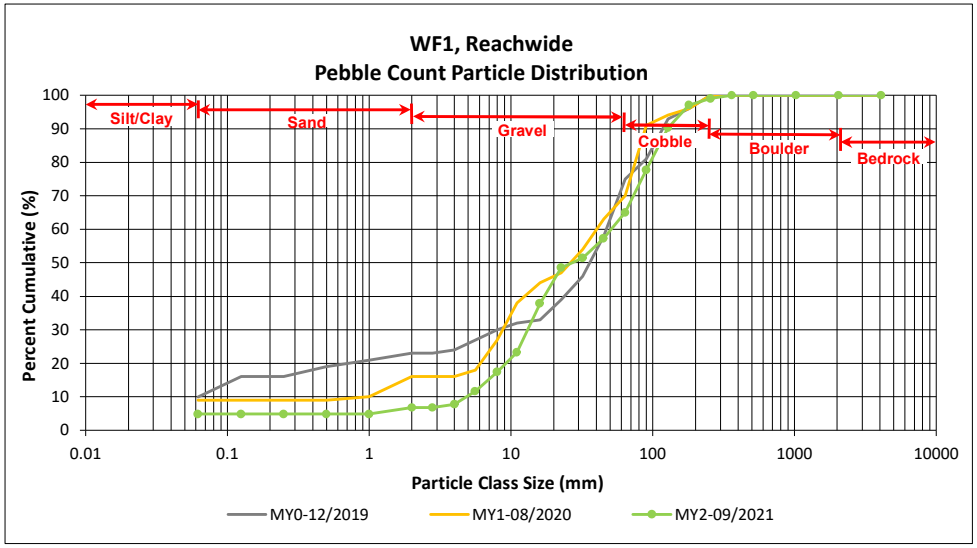
Reachwide Pebble Count Plots

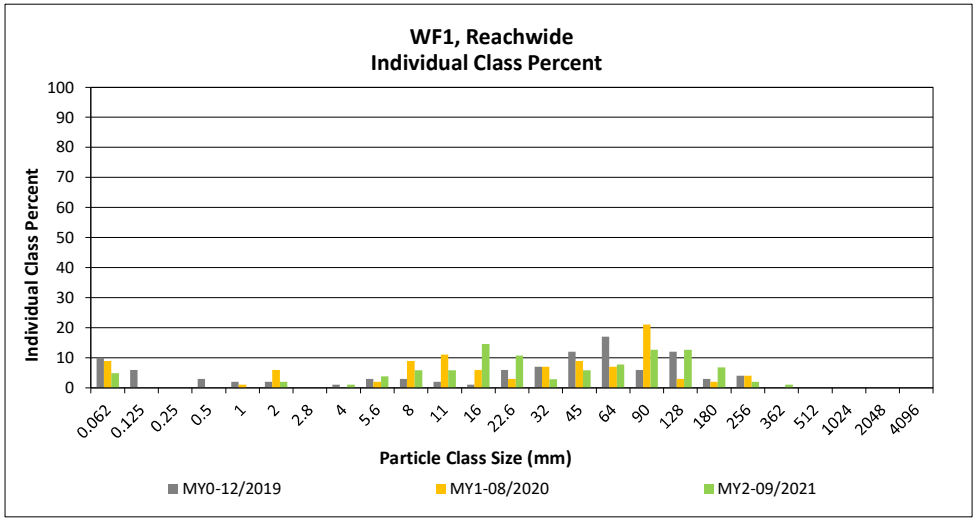
Deep Meadow Mitigation Site
DMS Project No. 97131
Monitoring Year 2 - 2021

WF1, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		5	5	5	5
SAND	Very fine	0.062	0.125					5
	Fine	0.125	0.250					5
	Medium	0.25	0.50					5
	Coarse	0.5	1.0					5
	Very Coarse	1.0	2.0	1	1	2	2	7
GRAVEL	Very Fine	2.0	2.8					7
	Very Fine	2.8	4.0		1	1	1	8
	Fine	4.0	5.6		4	4	4	12
	Fine	5.6	8.0		6	6	6	17
	Medium	8.0	11.0		6	6	6	23
	Medium	11.0	16.0		15	15	15	38
	Coarse	16.0	22.6		11	11	11	49
	Coarse	22.6	32	1	2	3	3	51
	Very Coarse	32	45	5	1	6	6	57
	Very Coarse	45	64	7	1	8	8	65
COBBLE	Small	64	90	13		13	13	78
	Small	90	128	13		13	13	90
	Large	128	180	7		7	7	97
	Large	180	256	2		2	2	99
BOULDER	Small	256	362	1		1	1	100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**53**	**103**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	7.3
D_{35} =	14.9
D_{50} =	26.9
D_{84} =	107.4
D_{95} =	162.1
D_{100} =	362.0





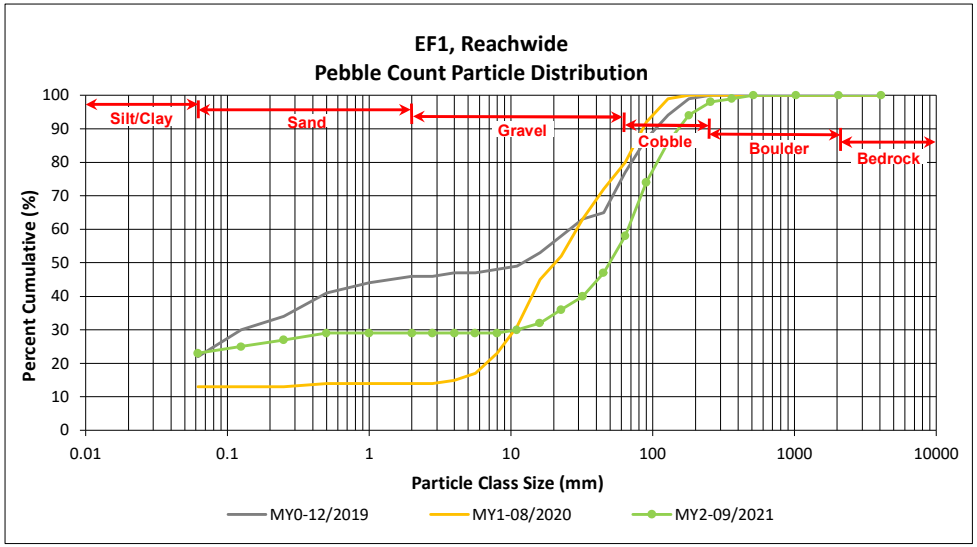
Reachwide Pebble Count Plots

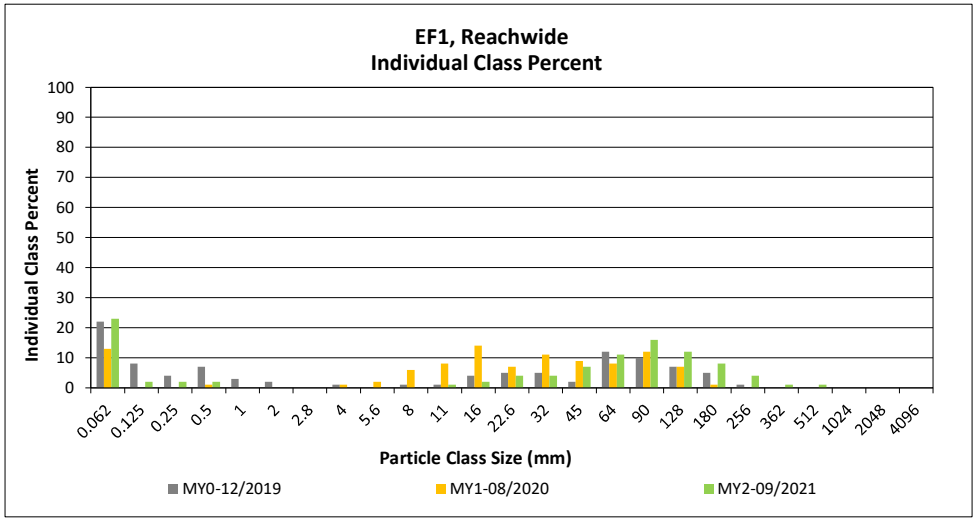
Deep Meadow Mitigation Site
DMS Project No. 97131
Monitoring Year 2 - 2021

EF1, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		23	23	23	23
SAND	Very fine	0.062	0.125		2	2	2	25
	Fine	0.125	0.250		2	2	2	27
	Medium	0.25	0.50		2	2	2	29
	Coarse	0.5	1.0					29
	Very Coarse	1.0	2.0					29
GRAVEL	Very Fine	2.0	2.8					29
	Very Fine	2.8	4.0					29
	Fine	4.0	5.6					29
	Fine	5.6	8.0					29
	Medium	8.0	11.0		1	1	1	30
	Medium	11.0	16.0		2	2	2	32
	Coarse	16.0	22.6		4	4	4	36
	Coarse	22.6	32	1	3	4	4	40
	Very Coarse	32	45	4	3	7	7	47
	Very Coarse	45	64	8	3	11	11	58
COBBLE	Small	64	90	15	1	16	16	74
	Small	90	128	10	2	12	12	86
	Large	128	180	6	2	8	8	94
	Large	180	256	4		4	4	98
BOULDER	Small	256	362	1		1	1	99
	Small	362	512	1		1	1	100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	50	50	100	100	100

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	20.7
D_{50} =	49.5
D_{84} =	120.7
D_{95} =	196.6
D_{100} =	512.0





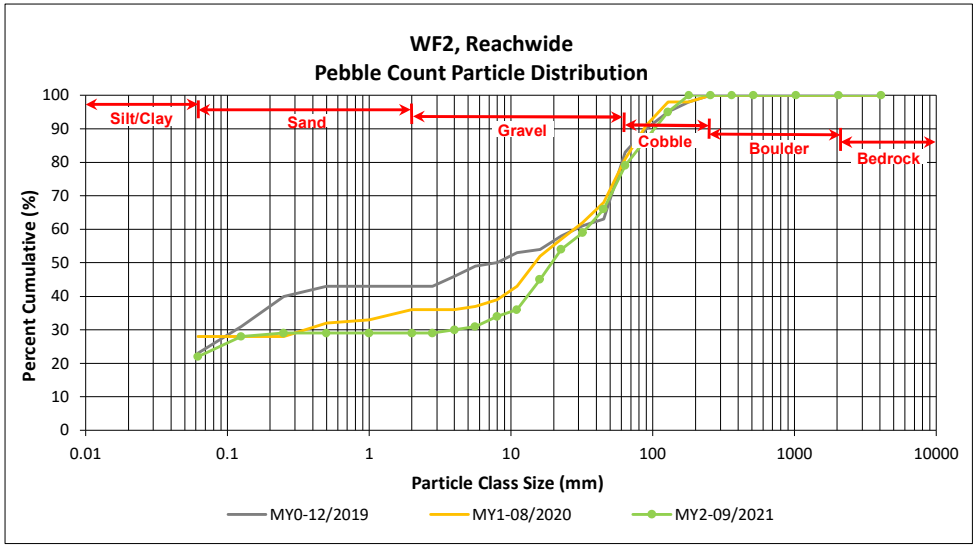
Reachwide Pebble Count Plots

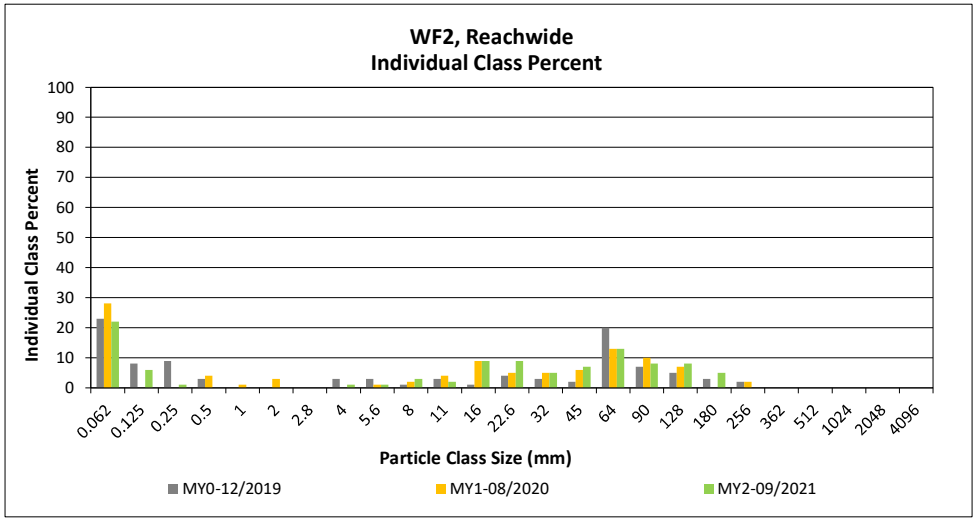
Deep Meadow Mitigation Site
DMS Project No. 97131
Monitoring Year 2 - 2021

WF2, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		22	22	22	22
SAND	Very fine	0.062	0.125		6	6	6	28
	Fine	0.125	0.250		1	1	1	29
	Medium	0.25	0.50					29
	Coarse	0.5	1.0					29
	Very Coarse	1.0	2.0					29
GRAVEL	Very Fine	2.0	2.8					29
	Very Fine	2.8	4.0		1	1	1	30
	Fine	4.0	5.6		1	1	1	31
	Fine	5.6	8.0		3	3	3	34
	Medium	8.0	11.0		2	2	2	36
	Medium	11.0	16.0	3	6	9	9	45
	Coarse	16.0	22.6	5	4	9	9	54
	Coarse	22.6	32	4	1	5	5	59
	Very Coarse	32	45	6	1	7	7	66
	Very Coarse	45	64	12	1	13	13	79
COBBLE	Small	64	90	7	1	8	8	87
	Small	90	128	8		8	8	95
	Large	128	180	5		5	5	100
	Large	180	256					100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	50	50	100	100	100

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	9.4
D_{50} =	19.4
D_{84} =	79.2
D_{95} =	128.0
D_{100} =	180.0





APPENDIX 5. Hydrology Summary Data and Plots

Table 14. Verification of Bankfull Events
Deep Meadow Mitigation Site
DMS Project No. 97135
Monitoring Year 2 - 2021

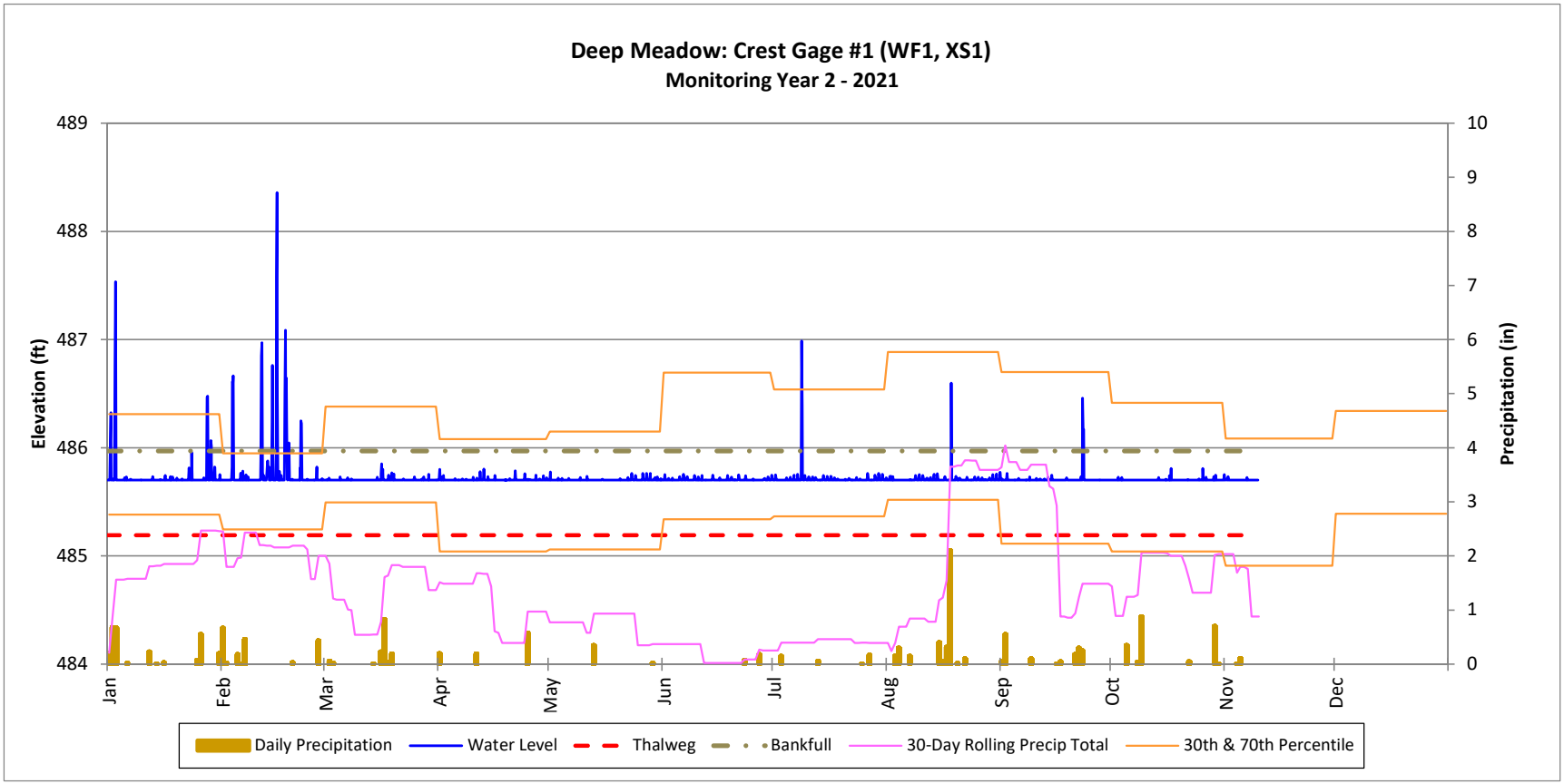
Reach	MY	Date of Occurrence	Date of Data Collection	Method
WF1	MY1	11/12/2020	11/13/2020	Photographic Documentation
WF1	MY2	1/1/2021	1/1/2021	Crest Gage
		1/3/2021	1/3/2021	
		1/28/2021 - 1/29/2021	1/28/2021 - 1/29/2021	
		2/4/2021	2/4/2021	
		2/11/2021	2/11/2021	
		2/14/2021 - 2/16/2021	2/14/2021 - 2/16/2021	
		2/18/2021 - 2/20/2021	2/18/2021 - 2/20/2021	
		2/22/2021	2/22/2021	
		7/8/2021	7/8/2021	
		8/18/2021	8/18/2021	
		9/23/2021	9/23/2021	
EF1	MY1	2/6/2020	2/6/2020	Crest Gage
		4/13/2020	4/13/2020	
		5/21/2020	5/21/2020	
		5/27/2020	5/27/2020	
		8/9/2020	8/9/2020	
		8/15/2020	8/15/2020	
		10/11/2020	10/11/2020	
		11/12/2020	11/12/2020	
EF1	MY2	No bankfull events recorded	No bankfull events recorded	Crest Gage
WF2	MY1	1/25/2020	1/25/2020	Crest Gage
		2/6/2020	2/6/2020	
		4/13/2020	4/13/2020	
		5/21/2020	5/21/2020	
		5/27/2020	5/27/2020	
		8/9/2020	8/9/2020	
		8/15/2020	8/15/2020	
		10/11/2020	10/11/2020	
		10/30/2020	10/30/2020	
		11/12/2020	11/13/2020	Crest Gage and Photographs
WF2	MY2	2/16/2021	2/16/2021	Crest Gage

Recorded In-Stream Flow Events

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 2 - 2021

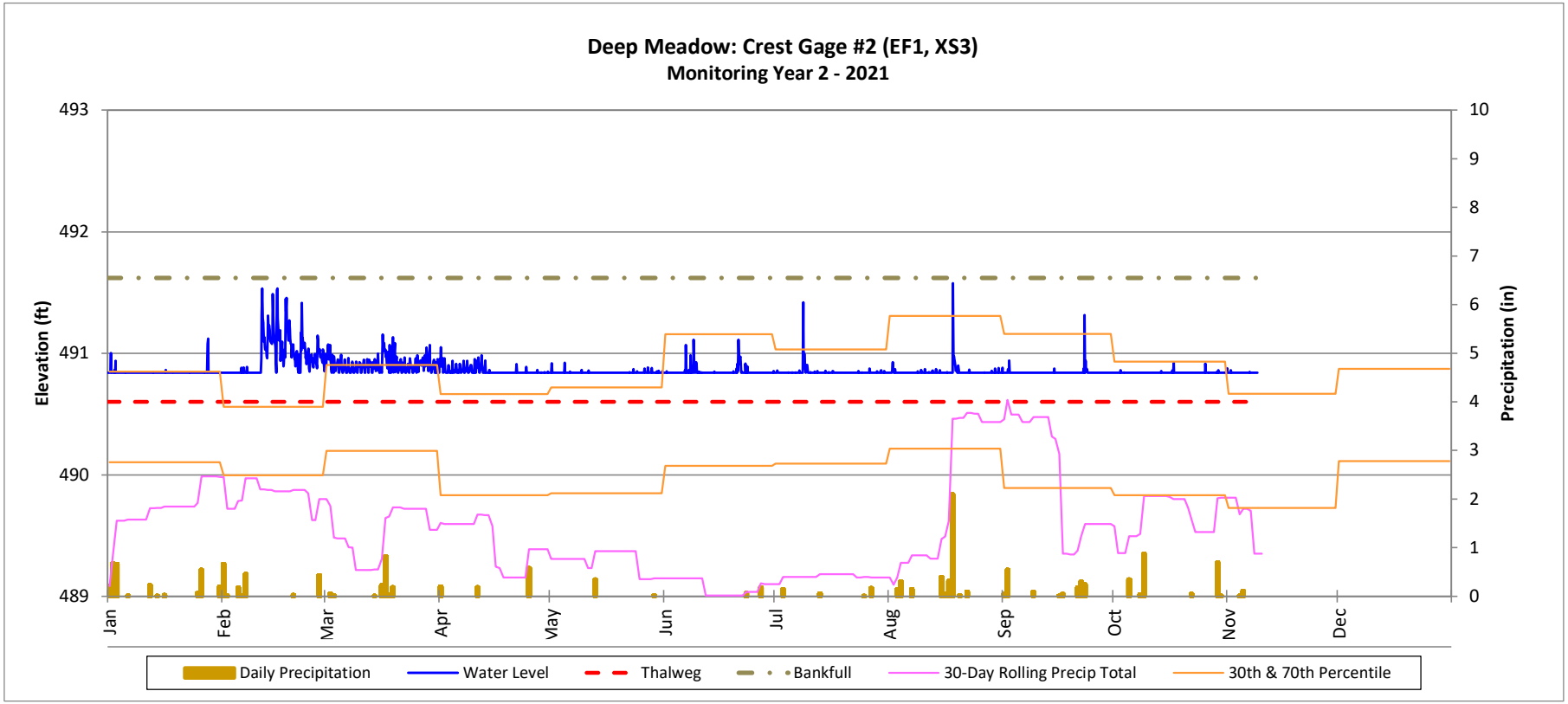


Recorded In-Stream Flow Events

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 2 - 2021



Recorded In-Stream Flow Events

Deep Meadow Mitigation Site
DMS Project No. 97131
Monitoring Year 2 - 2021

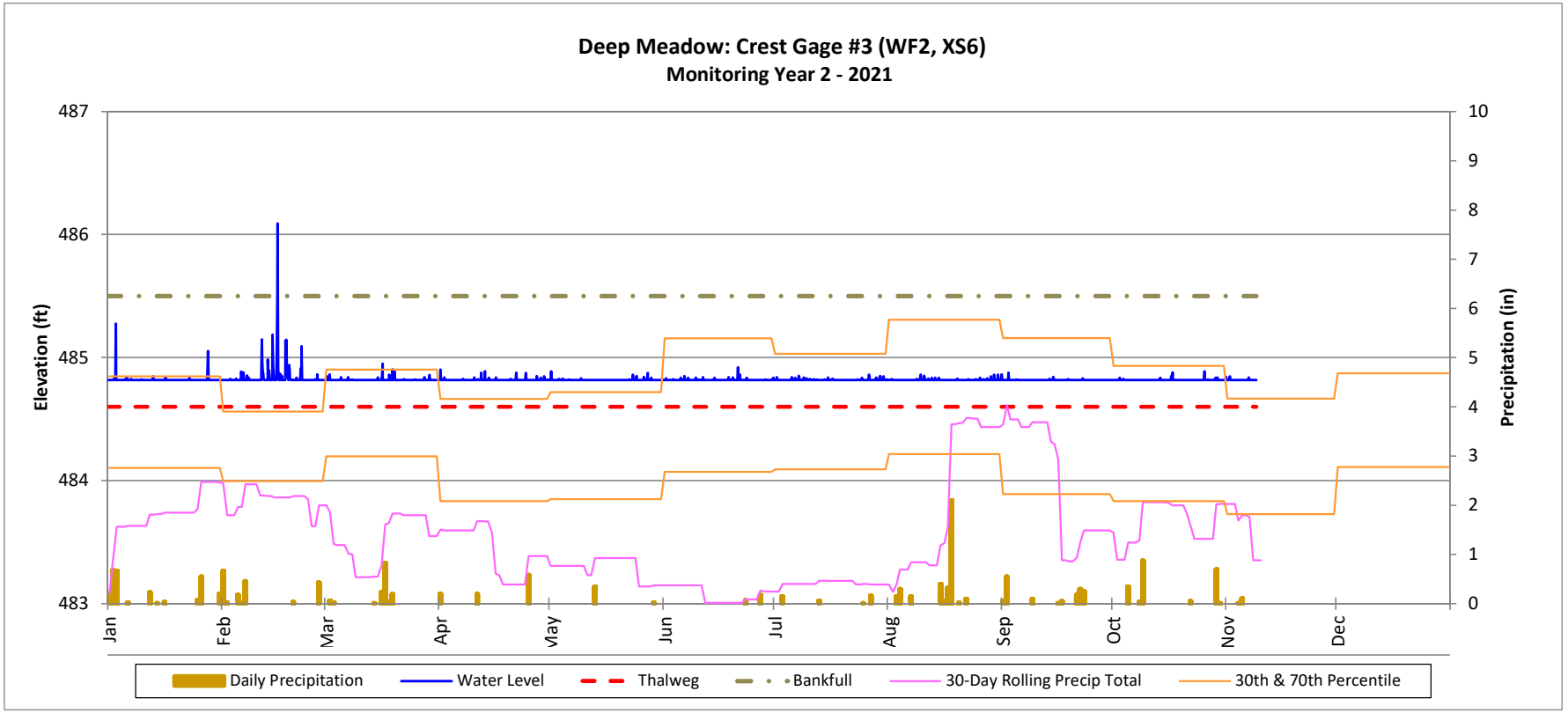


Table 15. Wetland Gage Attainment Summary

Deep Meadow Mitigation Site

DMS Project No. 97135

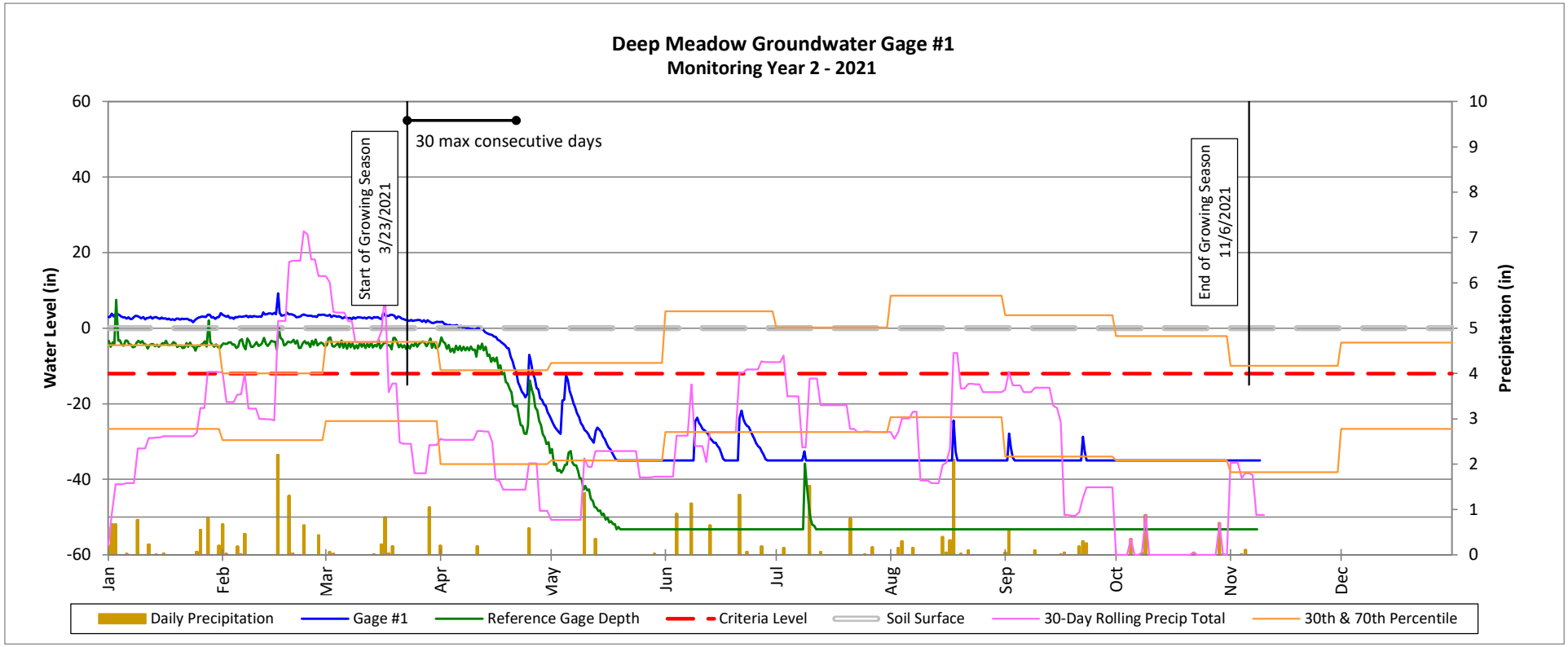
Monitoring Year 2 - 2021

Summary of Groundwater Gage Results for Monitoring Years 1 through 7							
Gage	Success Criteria Achieved/Max Consecutive Days During Growing Season (Percentage)[1]						
	MY1	MY2	MY3	MY4	MY5	MY6	MY7
1	Yes/111 days (48.5%)	Yes/30 days (13.1%)					
2	Yes/58 days (25.3%)	No/13 days (5.7%)					
3	Yes/25 days (10.9%)	No/10 days (4.4%)					
4	Yes/63 days (27.5%)	No/11 days (4.8%)					
5	Yes/229 days (100%)	Yes/42 days (18.3%)					
6	Yes/51 days (22.3%)	No/12 days (5.2%)					
7	Yes/58 days (25.3%)	No/14 days (6.1%)					
8	Yes/51 days (22.3%)	No/11 days (4.8%)					
9	Yes/27 days (11.8%)	No/2 days (0.9%)					
10	Yes/26 days (11.4%)	No/7 days (3.1%)					
11	No/20 days (8.7%)	No/11 days (4.8%)					
Reference	Yes/49 days (21.4%)	Yes/26 days (11.4%)					

[1] Success Criteria: Water table within 12 inches of ground surface for 23 consecutive days (10%) of the growing season (March 23 - November 6)

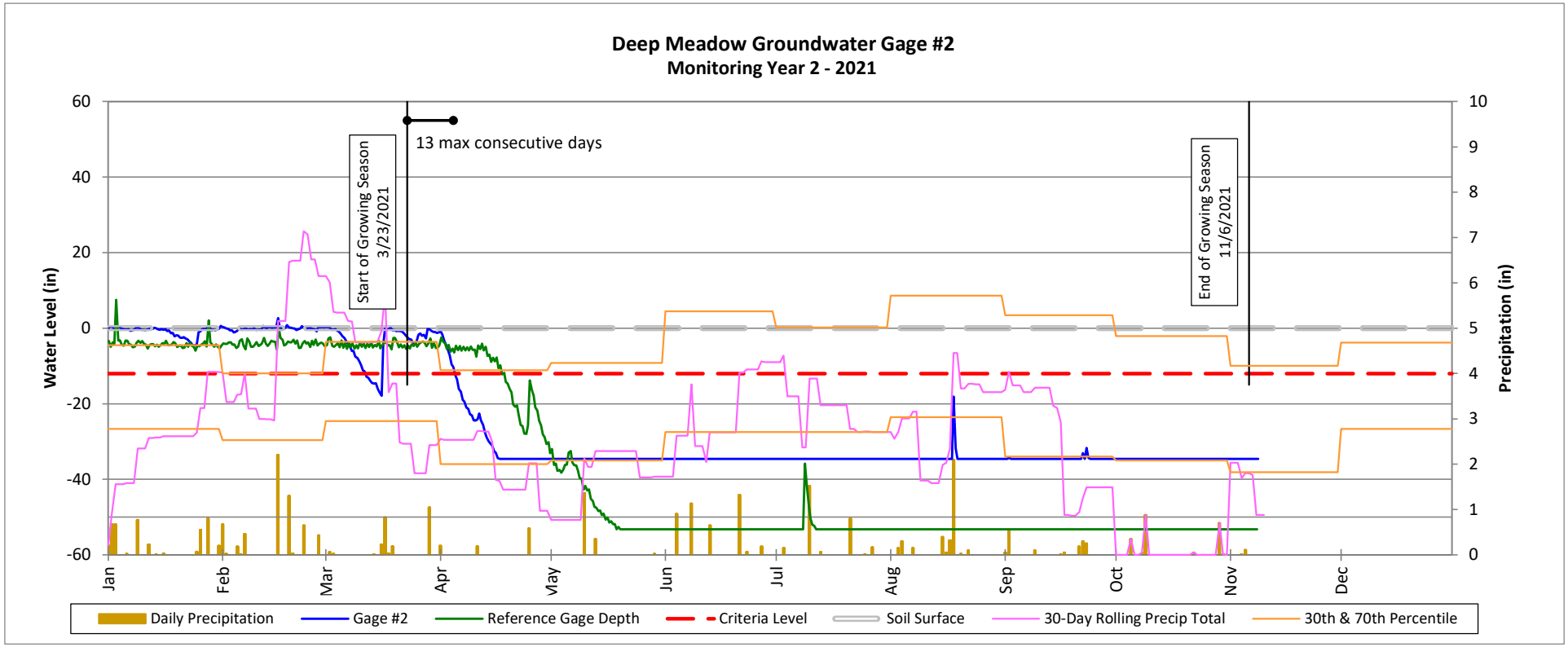
Groundwater Gage Plots

Deep Meadow Mitigation Site
DMS Project No. 97131
Monitoring Year 2 - 2021
Wetland W-E10



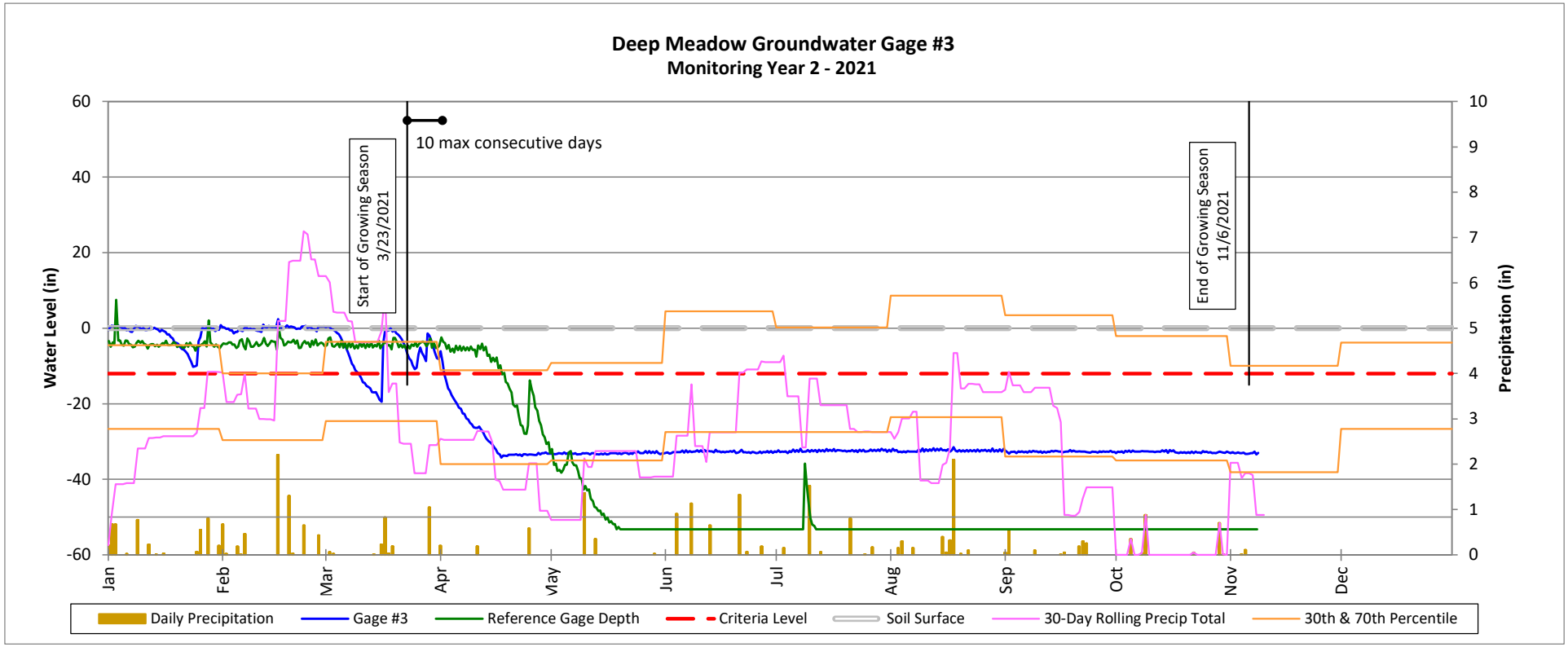
Groundwater Gage Plots

Deep Meadow Mitigation Site
DMS Project No. 97131
Monitoring Year 2 - 2021
Wetland W-E9



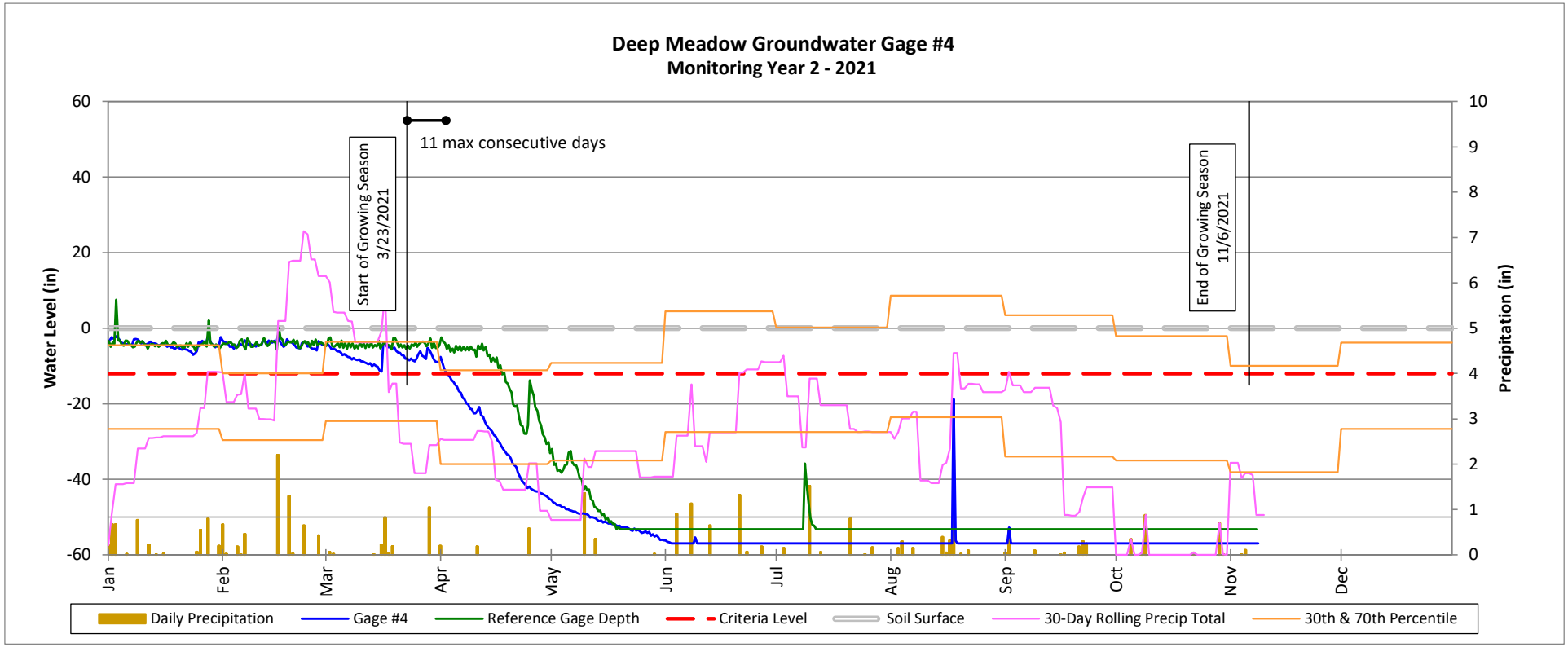
Groundwater Gage Plots

Deep Meadow Mitigation Site
DMS Project No. 97131
Monitoring Year 2 - 2021
Wetland W-E8



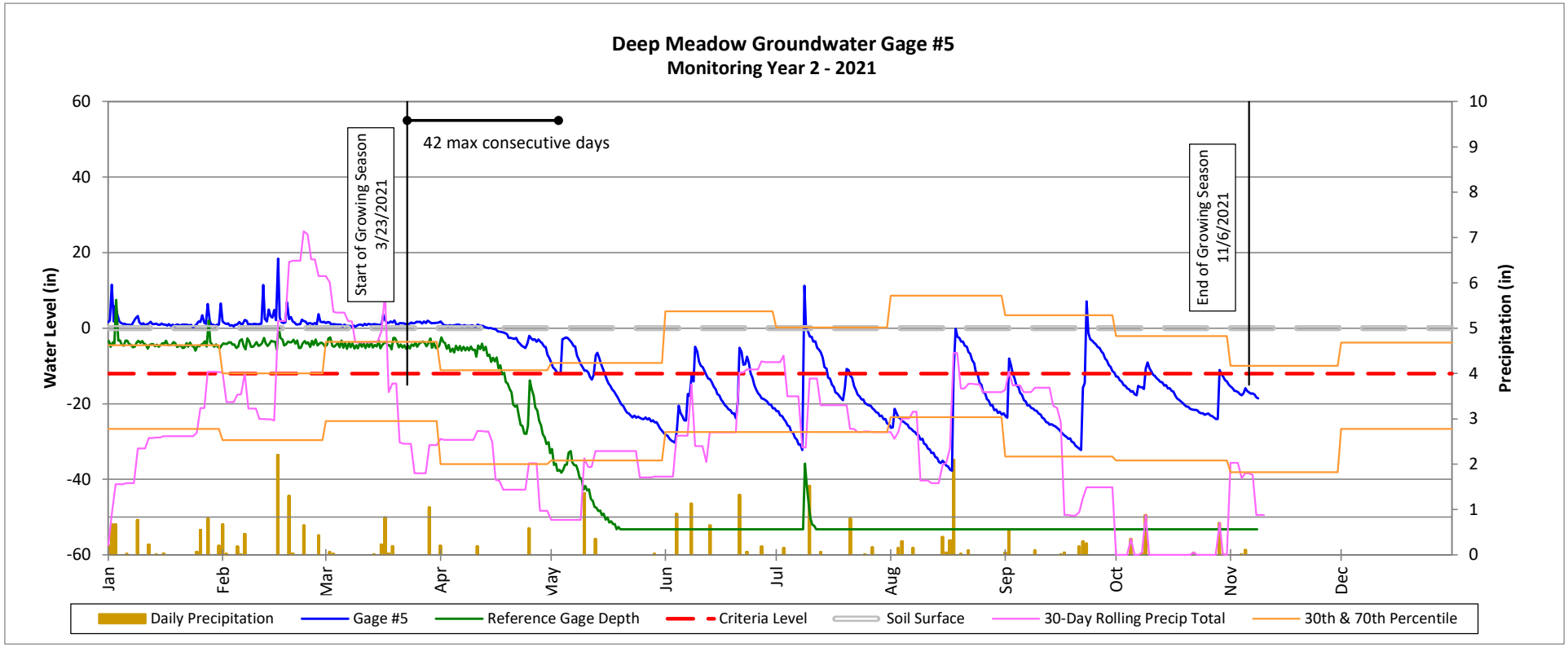
Groundwater Gage Plots

Deep Meadow Mitigation Site
DMS Project No. 97131
Monitoring Year 2 - 2021
Wetland W-E7



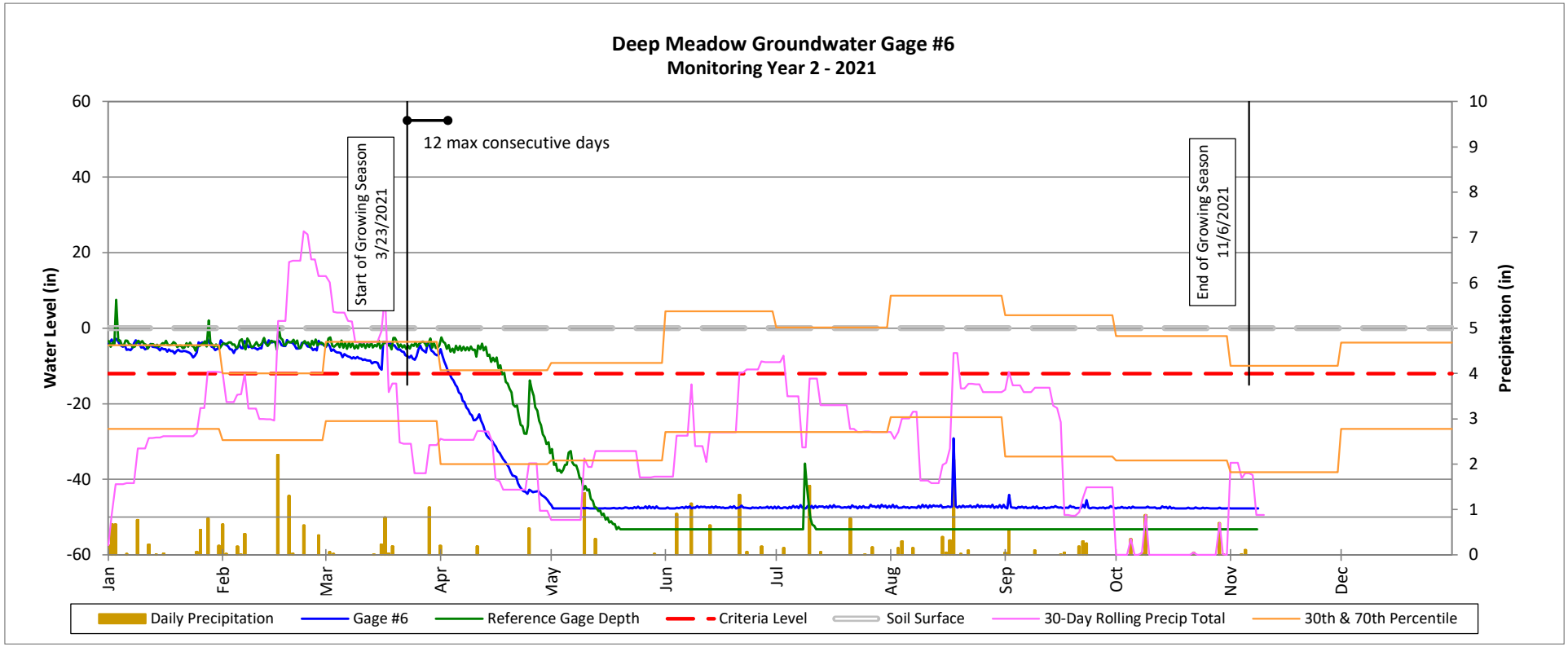
Groundwater Gage Plots

Deep Meadow Mitigation Site
DMS Project No. 97131
Monitoring Year 2 - 2021
Wetland W-E1



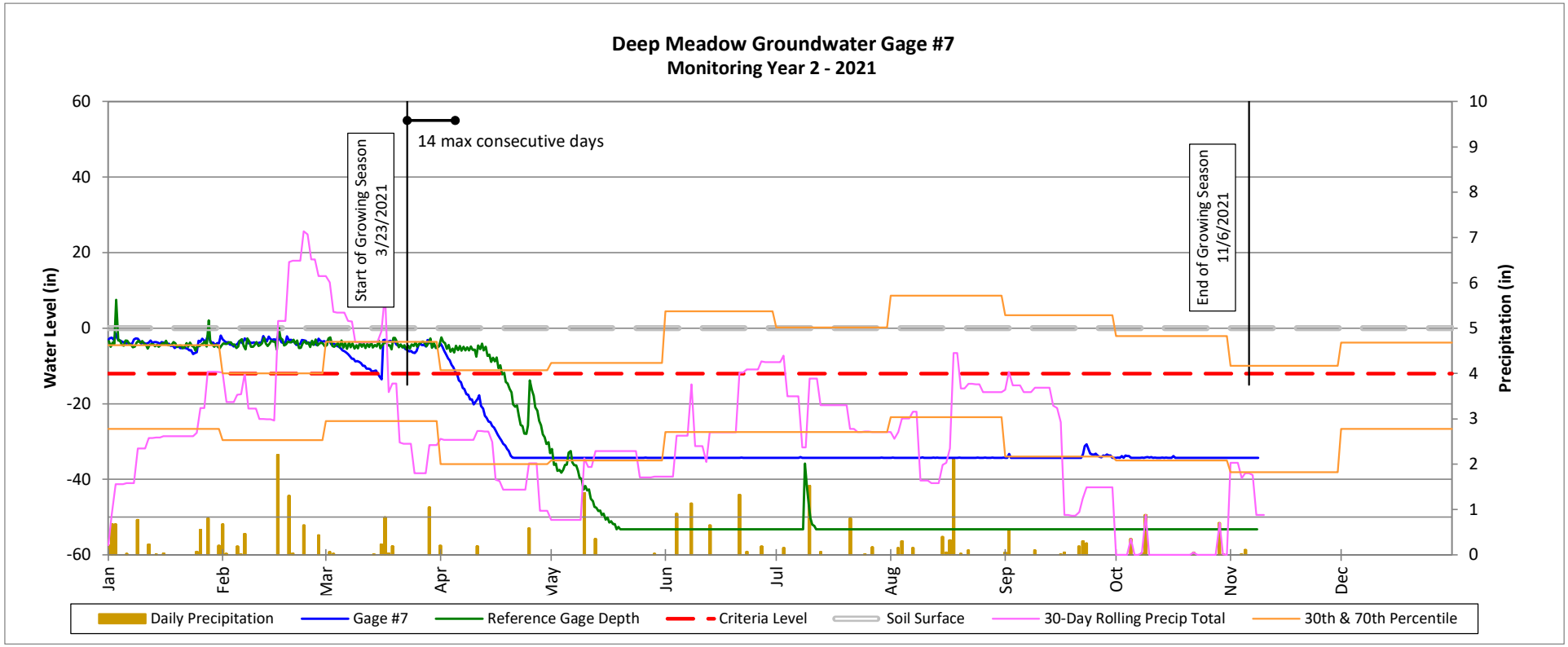
Groundwater Gage Plots

Deep Meadow Mitigation Site
DMS Project No. 97131
Monitoring Year 2 - 2021
Wetland W-E2



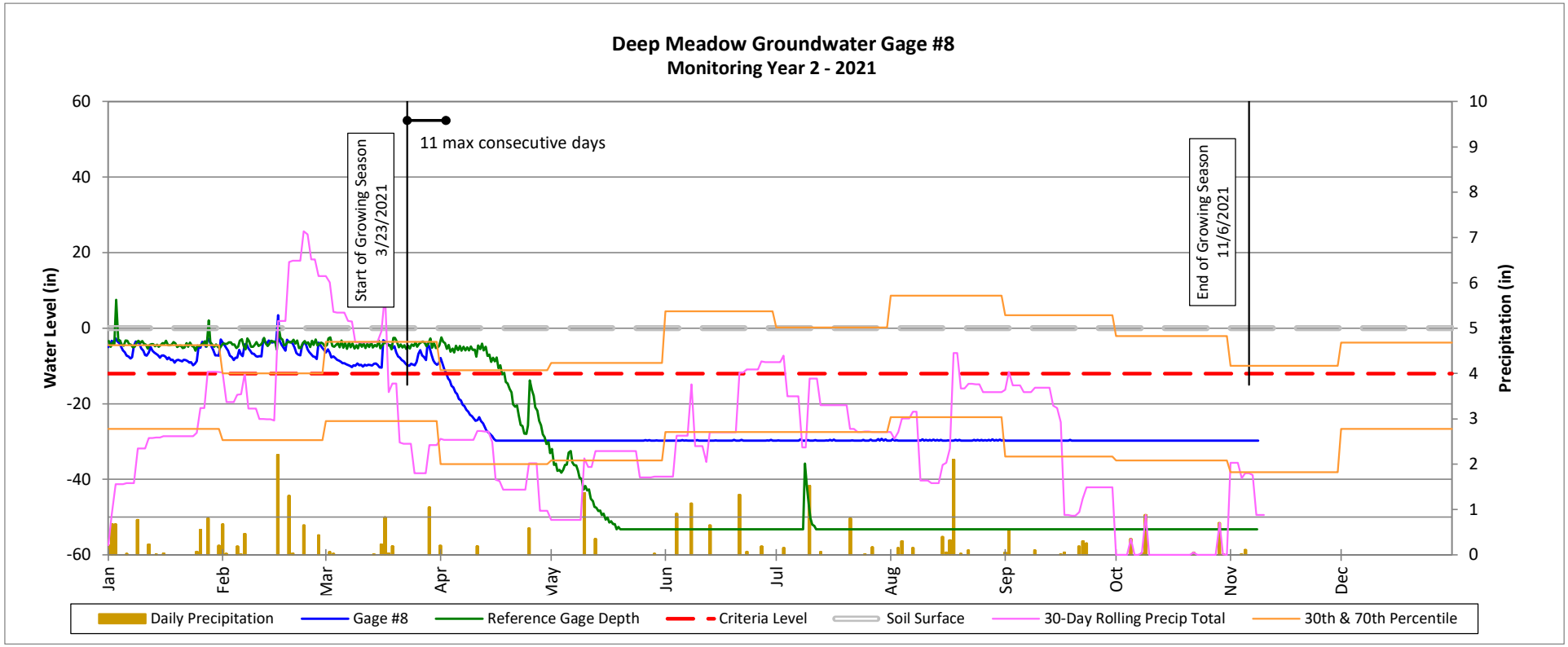
Groundwater Gage Plots

Deep Meadow Mitigation Site
DMS Project No. 97131
Monitoring Year 2 - 2021
Wetland W-E2



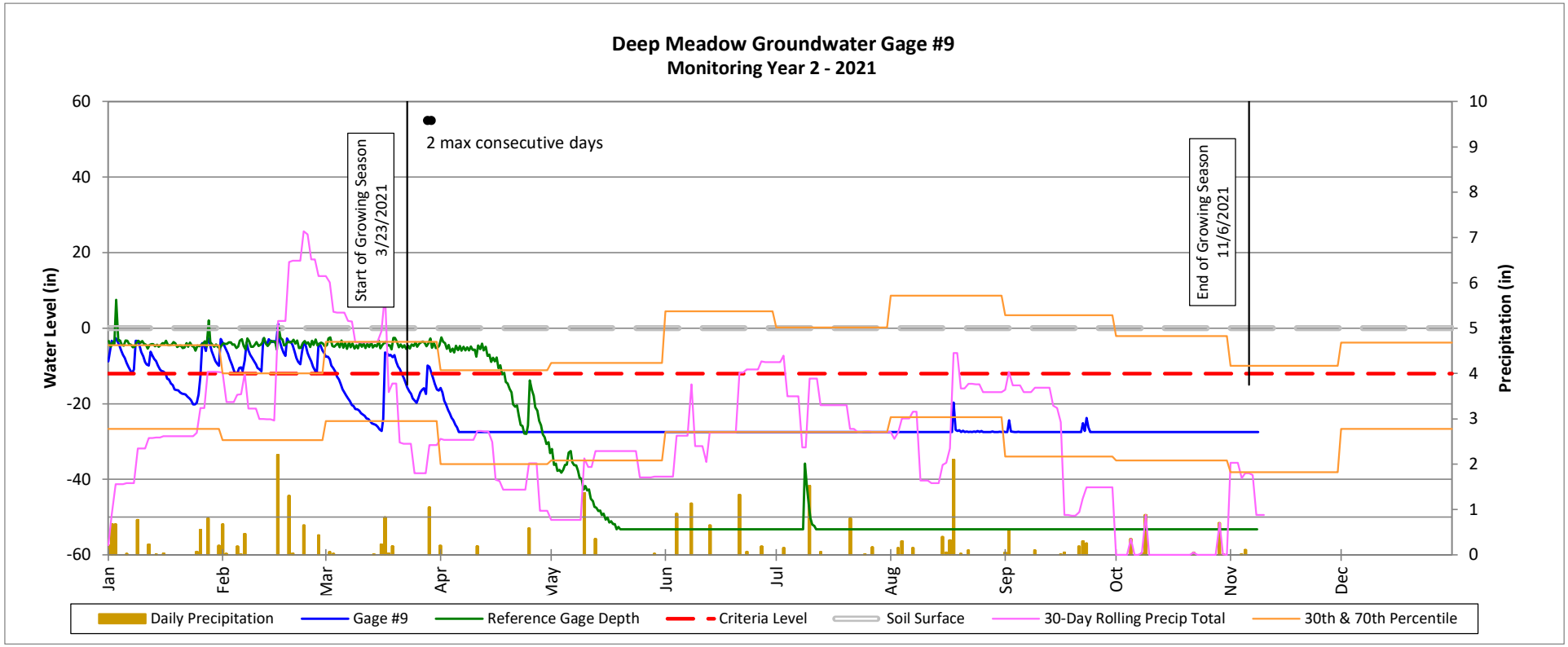
Groundwater Gage Plots

Deep Meadow Mitigation Site
DMS Project No. 97131
Monitoring Year 2 - 2021
Wetland W-E3



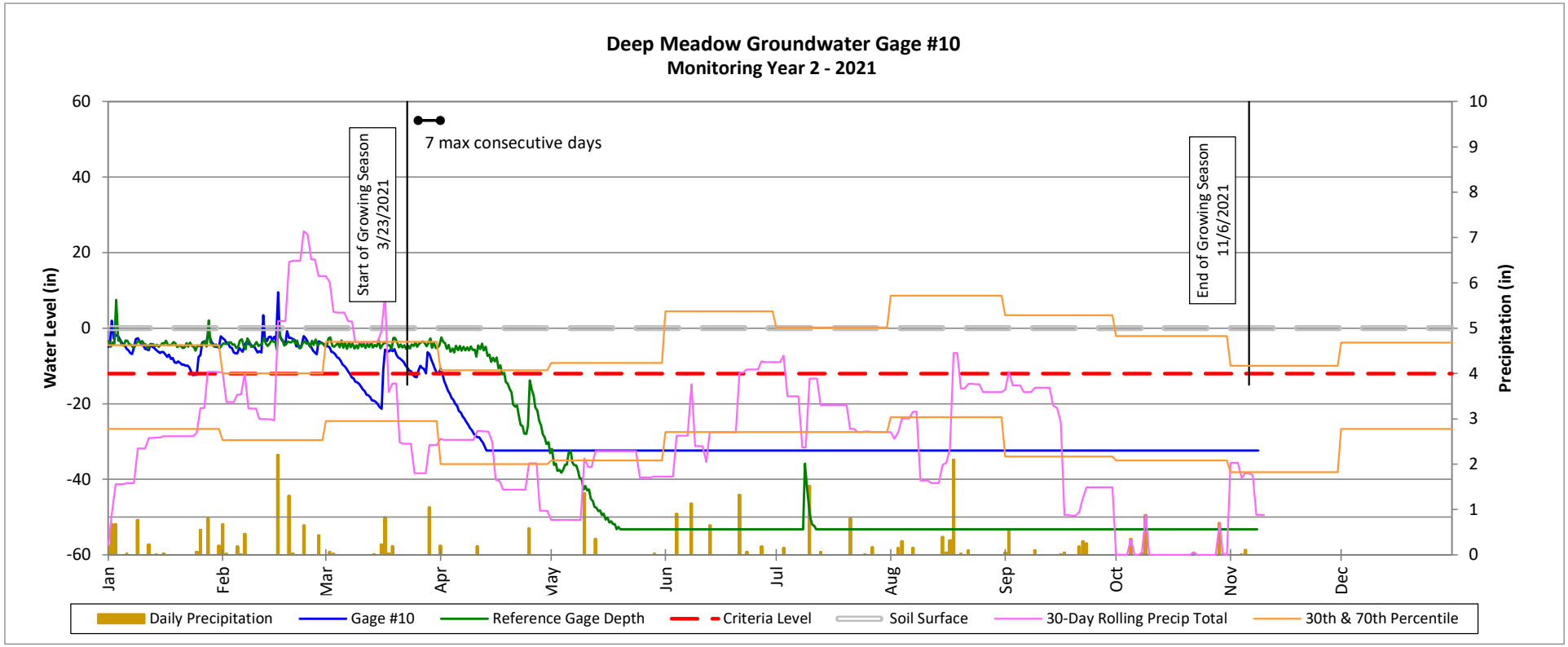
Groundwater Gage Plots

Deep Meadow Mitigation Site
DMS Project No. 97131
Monitoring Year 2 - 2021
Wetland W-E4



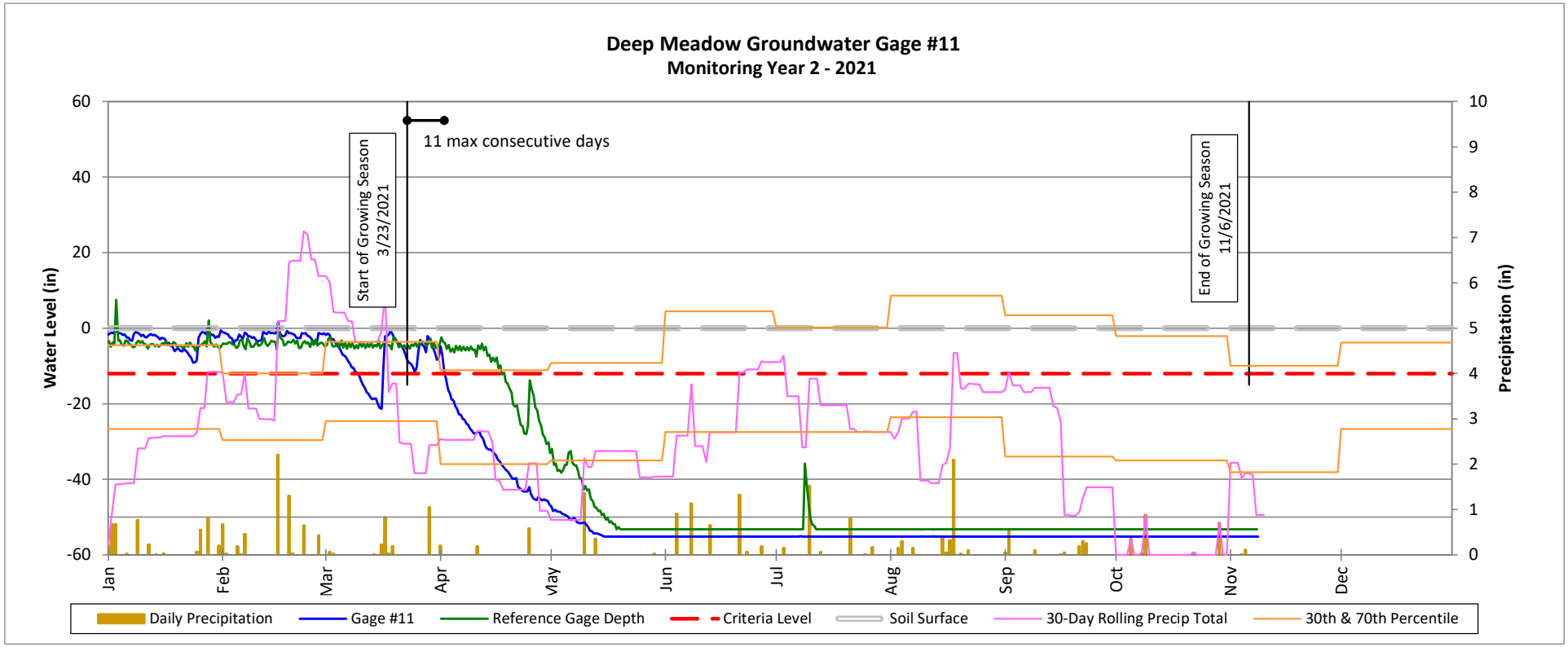
Groundwater Gage Plots

Deep Meadow Mitigation Site
DMS Project No. 97131
Monitoring Year 2 - 2021
Wetland W-E5



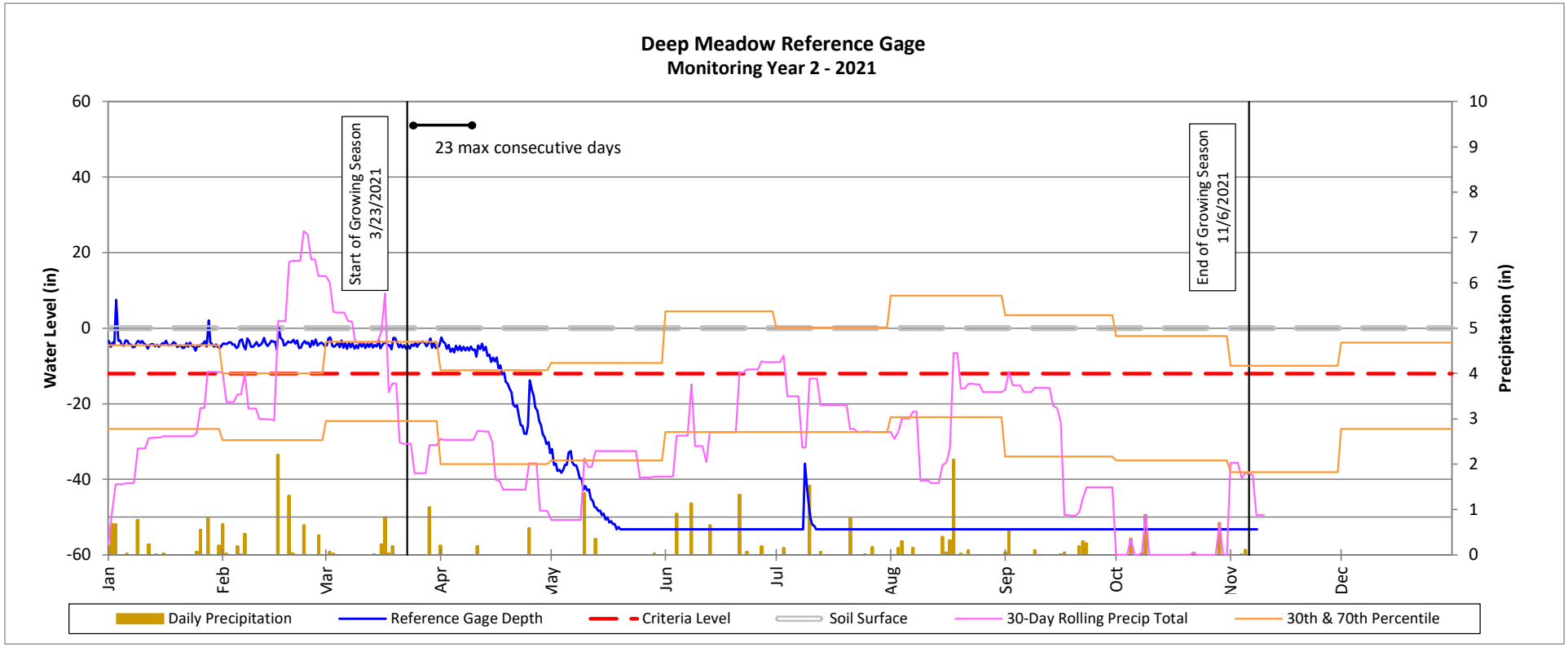
Groundwater Gage Plots

Deep Meadow Mitigation Site
DMS Project No. 97131
Monitoring Year 2 - 2021
Wetland W-E6



Groundwater Gage Plots

Deep Meadow Mitigation Site
DMS Project No. 97131
Monitoring Year 2 - 2021
Reference Gage

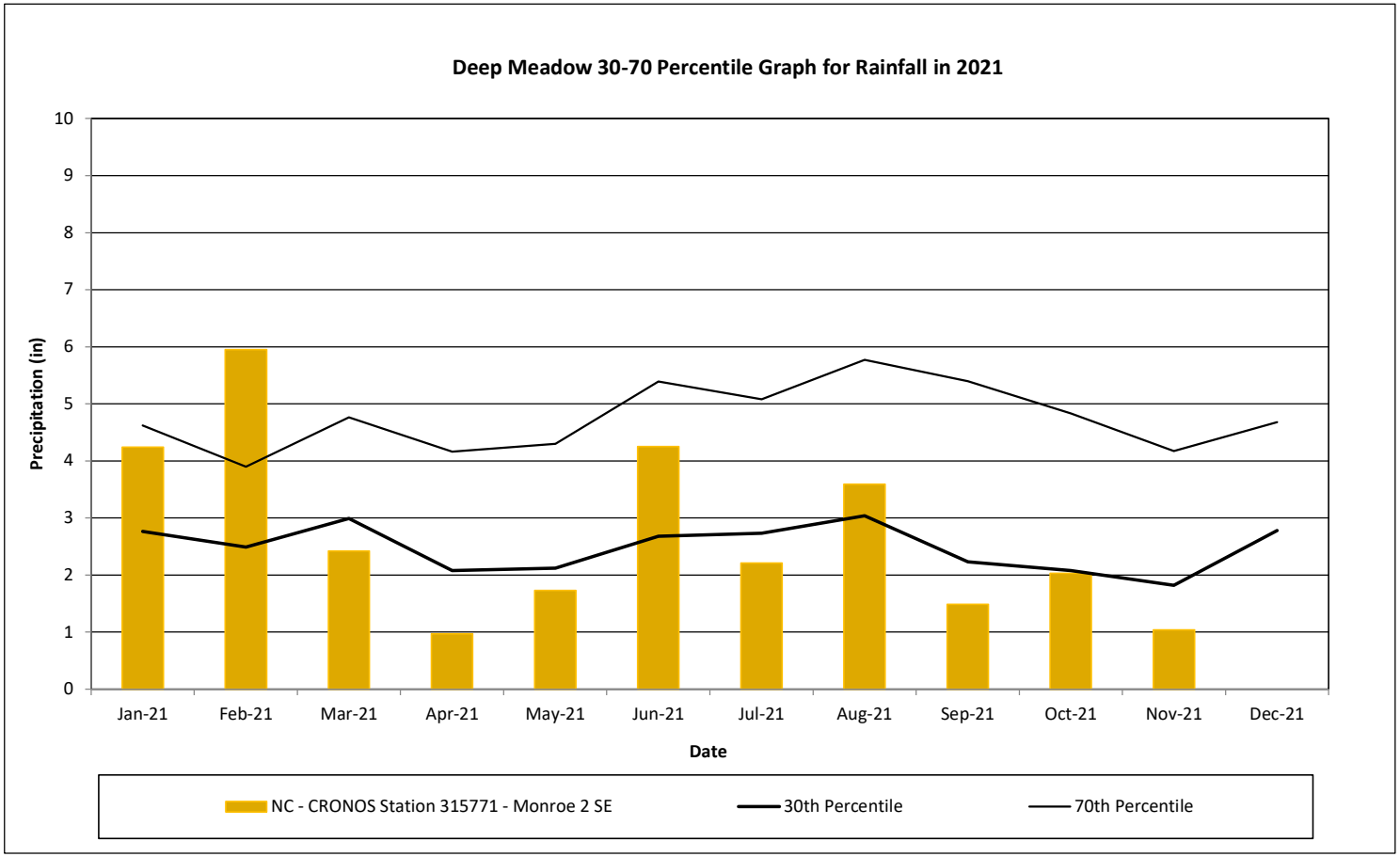


Monthly Rainfall Data

Deep Meadow Mitigation Site

DMS Project No. 97135

Monitoring Year 2 - 2021



Annual Rainfall collected by NC - CRONOS Station 315771 - Monroe 2 SE (Downloaded 11/30/2021)

30th and 70th percentile rainfall data collected from WETS station Monroe 2 SE, NC