



**Letter of Transmittal**

**To:**  
Harry Tsmoides

**From:**  
Kristi Suggs

**Company:**  
NCDEQ DMS

**Address:**  
DEQ, Asheville Regional Office  
2090 US 70 Highway  
Swannanoa, NC 28778

**Project Number:**  
DMS Project No. 97131  
NCDEQ Contract No. 6887

**Re:**  
Deep Meadow Mitigation Site  
Monitoring Year 4 Annual Report - FINAL

**Date:**  
01/29/2024

**Via:**     Overnight             Regular Mail             Pick-Up             Hand Delivery

The following items are being transmitted:

COPIES	DATE	DESCRIPTION
2	01/29/2024	Deep Meadow Mitigation Site – Monitoring Year 4 Annual Report FINAL (Hardcopy)
1	01/29/2024	Deep Meadow Mitigation Site – Monitoring Year 4 Annual Report FINAL (USB Drive)

**Comments/Remarks/Instructions:** Here is the final MY4 Report for your review. Please let me know if you need any additional information. Thank you!

**Signed:**

**Copies To:** File



# MONITORING YEAR 4 ANNUAL REPORT

FINAL

## DEEP MEADOW MITIGATION SITE

Union County, NC  
Yadkin River Basin  
HUC 03040105

DMS Project No. 97131  
NC DEQ Contract No. 6887  
DWR Certification No. 18-0264  
USACE Action ID No. SAW-2012-01107  
Data Collection Period: January 2023 – November 2023

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### PREPARED FOR:



### NC Department of Environmental Quality Division of Mitigation Services

1652 Mail Service Center  
Raleigh, NC 27699-1652



January 29, 2024

Mr. Harry Tsomides  
Western Regional Supervisor  
NCDEQ – Division of Mitigation Services  
Asheville Regional Office  
2090 U.S. 70 Highway  
Swannanoa, NC 28778-8211

RE: Deep Meadow Stream and Wetland Mitigation Site – Draft Monitoring Year 4 Report  
Yadkin River Basin – HUC 03040105  
Union County, NC  
DMS Project ID No. 97131  
Contract # 006887

Dear Mr. Tsomides:

Wildlands Engineering, Inc. (Wildlands) has reviewed the Division of Mitigation Services' (DMS) comments from the Deep Meadow Stream and Wetland Mitigation Site Monitoring Year 4 report that was received on January 3, 2024. The report text has been revised for the final submittal as needed. Additionally, DMS conducted a Site walk on December 12, 2023. DMS' comments and observations from the report and Site walk are noted below in **Bold**. Wildlands' responses are noted in *Italics*.

MY4 Draft Report Comments

**DMS' Comment: The report mentions that a wetland expansion request is not part of this submittal but will be forthcoming. However additional wetland expansion areas are mapped on the CCPVs. Does Wildlands have a timeline for a more formal request?**

*Wildlands' Response: As stated in Section 1.4.7 and prior to a formal request for approval, Wildlands plans to reassess the Site prior to the onset of the growing season (March 1, 2024) for MY5 to see if there are any additional areas that can be added to the wetland expansion areas. If additional areas are found and additional hydrologic monitoring of the proposed areas is needed, Wildlands will also install the monitoring wells at that time. Once the investigation is complete, Wildlands will submit a request for the approval of all the expansion areas proposed. It is anticipated that this request will be submitted to DMS for review in April 2024.*

**DMS' Comment: Beaver dams and associated aggradation are noted in the report, and photos provided; however, the visual assessment tables indicate 0% aggradation across the site. Please clarify or update the tables.**

*Wildlands' Response: Beaver dams and areas of aggradation are located on Meadow Branch, which consists of Enhancement II level mitigation. The visual assessment tables are only required for restored reaches.*

**DMS' Comment: Thank you for all hard follow up work this year addressing boundary issues, landowner outreach, thinning of box elders, and additional wetland studies.**

*Wildlands' Response: Thank you for the comment.*



**DMS' Comment:** The visual vegetation and visual stream tables were missing from the submission. No spatial data was submitted. Please submit the missing tables and spatial data.

*Wildlands' Response:* The files have been updated accordingly.

#### MY4 Site Walk Comments and Observations

**DMS' Comment:** There were several breached beaver dams up and down Meadow Branch. Channel conditions surrounding the dams looked stable and relatively unaffected.

*Wildlands' Response:* Noted.

**DMS' Comment:** Several soil borings in each of the proposed wetland expansion areas revealed strong hydric soils and wetland-type conditions.

*Wildlands' Response:* Noted.

**DMS' Comment:** The main farm crossing had a large root wad/root mass and other debris blocking flow on the downstream side. In addition, there are two large willows growing here. Wildlands may want to evaluate the flow through this area and clear/maintain as appropriate.

*Wildlands' Response:* Wildlands removed the debris jam and will continue to monitor all internal crossings for signs of blockage and instability.

**DMS' Comment:** One of the metal post markers between corners 15 and 14 (the one nearest the deer stand) has been completely destroyed (photo available on request). The horse tape was cut as well in that area. That is an area where hunters are mowing and maintaining a shooting lane right along (outside) the easement. The deer stand appears to be just outside the easement line. It looked like possibly a bush hog mangled the metal post/signage. The horse tape had been cut on several posts and was not seen discarded anywhere.

*Wildlands' Response:* Wildlands will add additional easement signposts and PVC poles between easement markers 14 and 15.

**DMS' Comment:** There are numerous 'abandoned' large hay bales/rolls along the right floodplain of EF1 along the easement, wrapped in torn/degrading white plastic. Most of these are just outside the easement line; however, there are still two broken bales clearly inside the easement.

*Wildlands' Response:* Wildlands confirmed on January 4<sup>th</sup> that the hay bales have been removed from the easement. A photo is included in the Resolved Easement Inspection Photos. Wildlands will assess to see if supplemental planting is necessary in MY5.

**DMS' Comment:** The horse tape is sagging pretty low (a foot or two off the ground) between corners 26 and 27, this is a 186-LF segment. Recommend placing a post in between these corners to support the tape as this is a heavily trafficked area.

*Wildlands' Response:* Wildlands will add additional easement signposts and PVC poles between easement markers 26 and 27.

**DMS' Comment:** Please keep in mind the DEQ stewardship requirement that signage should occur at least every 200 LF (e.g., in between corners 25 and 26 - 268 LF).

*Wildlands' Response:* Wildlands will add additional easement signposts and PVC poles between easement markers 25 and 26.



**DMS' Comment:** The PVC extensions were all attached with small-medium plastic household zip ties. These zip ties may degrade and break over time so please monitor their integrity as they are making the easement line much more visible to the crop farmer. Wildlands may eventually want to attach the PVC with a more permanent solution.

*Wildlands' Response:* Wildlands will replace zip-ties with hose clamps as needed.

**DMS' Comment:** The eroded gully (outside the easement) looks a lot better since the recent repair. Thank you for addressing that.

*Wildlands' Response:* Noted.

**DMS' Comment:** Overall the stream conditions looked good; no areas of erosion or major concern were observed.

*Wildlands' Response:* Noted.

Enclosed please find two (2) hard copies of the Year 4 Final Monitoring Report and one (1) USB with all the electronic files for DMS distribution. Wildlands has ordered the monitoring bond for MY4, and we have received confirmation from Kristie Corson at DMS that it was received or approved. Please contact me at 704-332-7754 x110 if you have any questions.

Sincerely,

A handwritten signature in blue ink that reads "Kristi Suggs".

Kristi Suggs  
Senior Environmental Scientist

PREPARED BY:

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

Phone: 704.332.7754  
Fax: 704.332.3306

## 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 8.587 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) 4 is a reduced monitoring year, so vegetation plot and cross-section data were not collected. Monitoring Year (MY) 4 assessments and Site visits were completed between January and November 2023 to assess the conditions of the project.

Overall, the Site has met most of the required stream, vegetation, and hydrologic success criteria for MY4. While permanent vegetation plots were not assessed this year, several mobile plots were surveyed and resulted in a measured stem density of 596 stems per acre. Additionally, several areas of low stem density were supplementally planted this year, and areas of box elder were selectively pruned to prevent the establishment of a monoculture. Herbaceous and woody vegetation is thriving, and the Site is expected to meet the interim MY5 requirement of 260 stems per acre. While geomorphic surveys were not completed this year, visual assessments revealed the streams are stable and functioning as

intended. At least one bankfull event was documented on EF1, WF1, and WF2 in MY4. The Site has met the hydrologic requirement of four bankfull events in separate years for reaches WF1 and WF2, while EF1 has partially met its bankfull criteria with at least three bankfull events in separate years. Eight of the seventeen groundwater gages met the wetland hydrology success criteria with the revised growing season (March 1<sup>st</sup> to November 28<sup>th</sup>). The MY4 visual assessment identified a few areas of concern including minor easement encroachment and a few areas of invasive plant species accounting for approximately 1.3% of the Site, and a couple small areas of aggradation. 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.



**DEEP MEADOW MITIGATION SITE**  
Monitoring Year 4 Annual Report

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\*Content not required for Monitoring Year 4 Report

## 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
<b>Stream</b>							
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
					<b>Total:</b>	<b>2,838.933</b>	<b>Stream Mitigation Units</b>

PROJECT MITIGATION QUANTITIES							
Project Segment	Mitigation Plan Footage	As-Built Footage	Mitigation Category	Restoration Level	Mitigation Ratio (X:1)	Credits	Comments
<b>Wetland</b>							
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
					<b>Total:</b>	<b>8.587</b>	<b>Wetland Mitigation Units</b>

**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			--		
<b>Total:</b>	<b>2,838.933</b>			<b>8.587</b>		

\*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 provides 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 show progression towards stability.	3 reachwide sediment surveys (not required after MY2); 6 cross-section surveys	Channels are stable and have maintained the constructed riffle and pool sequence.

Goal	Objective/Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
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 to occur in separate years on restoration and EI reaches throughout the 7- year monitoring period. Free groundwater within 12-in. of the soil surface for a minimum of 28 consecutive days or 10% of the growing season.	Crest gages were installed on EF1, WF1, and WF2. Eleven groundwater gages installed in MY0. Two groundwater gages were added in MY3. Four groundwater gages were added in MY4.	Reaches meeting bankfull criteria: MY1: 3/3 reaches MY2: 2/3 reaches MY3: 3/3 reaches MY4: 3/3 reaches Groundwater gages meeting wetland success criteria: MY1: 10/11 gages MY2: 2/11 gages MY3: 2/13 gages MY4: 8/17 gages
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 an increase in biodiversity over time.	There is no required performance standard for this metric.	N/A	N/A

Goal	Objective/Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
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	210 planted stems per acre at MY7. Interim survival rate of 320 planted stems per acre at MY3 and 260 at MY5.	12 permanent vegetation plots, and 4 mobile vegetation plots were installed in MY0. 4 additional mobile plots were installed in MY4 to document vegetative success in the proposed wetland expansion areas and potential monoculture areas.	Vegetation plots meeting the MY3 success criteria. MY1: 16/16 (100%) MY2: 12/16 (75%) MY3: 14/16 (88%) MY4: Permanent VPs not monitored; 4/4 (100%) of the assessed mobile VPs met MY3 criteria and the MY5 criteria.
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.	Conservation easement boundary was inspected during MY4. Replaced missing and damaged easement signs and posts. Added PVC markers to easement posts for visibility above vegetation. Contacted landowner and/or tenant farmer about mowing encroachment and herbicidal overspray on easement vegetation, and to remove hay bales from the easement. Added or replaced horse tape as a visual boundary for easement to deter future encroachment occurrences. Confirmed that approximately 18 - 24 inches of the CMP outlet at the crossing on EF-1 lies within the easement limits.

### 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, below, and Table 10a 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 3: Project Attributes**

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

Annual monitoring for MY4 was conducted between January and November 2023 to assess the condition of the project. The geomorphic, vegetative, and hydrologic success criteria for the Site follows the approved success criteria presented in the Deep Meadow Mitigation Plan (Wildlands, 2018) and the 2016 IRT Stream and Wetland Compensatory Mitigation Update (USACE, 2016).

### 1.4.1 Vegetation Assessment

MY4 is a reduced monitoring year that does not require detailed vegetation inventory and analysis; however, Wildlands established and surveyed four mobile vegetation plots in MY4. Two of the mobile plots were assessed to evaluate box elder stem densities in the right floodplain of Meadow Branch, while per the IRT request, two additional mobile vegetation plots were established in the wetland expansion areas. The survey was completed in August 2023 and resulted in an average planted stem density of 596 stems per acre. Visual assessments conducted throughout the remainder of the Site reveal that herbaceous cover is well established and planted bare roots and live stakes are healthy and thriving. Refer to Table 9d in Appendix 3 for MY4 vegetation data, and Appendix 2 for the mobile plot photos, the Vegetation Condition Assessment Table, and the Current Condition Plan View (CCPV) Figures

3.0-3.2. See Section 1.4.2 and 1.4.6 for additional information about selective pruning and wetland expansion areas.

### 1.4.2 Vegetation Areas of Concern and Management Activity

#### Invasive Species

MY4 visual assessments reveal that a majority of the conservation easement is unaffected by invasive species. Invasive species, previously observed on the Site and included johnson grass (*Sorghum halepense*), Japanese honeysuckle (*Lonicera japonica*), and morning glory (*Ipomoea purpurea*), were treated with herbicidal applications in June 2023. These treatments were highly effective in reducing the size and density of invasive species populations within the conservation easement. A few scattered patches of johnson grass and Japanese honeysuckle remain and are depicted on the CCPV Figures. Additionally, several patches of Asian spiderwort (*Murdannia keisak*) and parrot feather (*Myriophyllum aquaticum*) were observed in the riffles of Meadow Branch and were treated twice in July 2023. At the end of MY4, ninety-nine percent (99%) of the Site is free of invasive and undesirable species. As needed, invasive species will continue to be treated throughout the post-construction monitoring period. Vegetation areas of concern are documented on Table 7 and shown on the CCPV Figures in Appendix 2.

#### Selective Pruning

In MY2, box elder (*Acer negundo*) populations on the Site were at risk in forming a monoculture in several areas throughout the project. In MY3, Wildlands determined that competition among the riparian species had started to suppress the proliferation of some of the box elders within the Site. To further suppress the establishment of a monoculture, in the summer of MY4, Wildlands selectively pruned box elders in right floodplain of Meadow Branch from stations 114+00 to 124+00, where populations were the densest. Pruned areas left six- to eight-foot buffers around the native trees planted on the Site, resulting in sufficient space for continued tree growth and increased light availability. Wildlands will continue to monitor and selectively prune box elder populations on Site.

#### Supplemental Planting

In MY3, Wildlands identified 2 permanent vegetation plots (1 and 6) that were failing due to over-saturation and competition from dense herbaceous hydrophytic species. In February 2023, Wildlands supplementally planted approximately 0.38 acres or 1.7% of the entire planted area, with woody hydrophytic species from the project’s Final Mitigation Plan (Wildlands, 2018). Planted quantities are as follows:

**Table 4: Supplemental Planting Species Quantities**

Supplemental Planting List – February 2023				
Scientific Name	Common Name	Source	Wetland Indicator Status	Quantity
<i>Betula nigra</i>	River birch	Livestake	FACW	12
<i>Quercus michauxii</i>	Swamp chestnut oak	Livestake	FACW	12
<i>Cornus amomum</i>	Silky dogwood	Livestake	FACW	12
<i>Platanus occidentalis</i>	Sycamore	Livestake	FACW	10
<i>Quercus pagoda</i>	Cherry bark oak	Livestake	FACW	12
<i>Cephalanthus occidentalis</i>	Buttonbush	Livestake	OBL	12

Areas on Site that were supplementally planted (VP1 and VP6) will be monitored during the MY5 vegetation survey. Management activities are shown on the CCPV Figures in Appendix 2.

### Conservation Easement

DMS conducted a boundary inspection of the Deep Meadow Site on March 14<sup>th</sup>, 2023. They observed several easement issues related to missing/damaged signposts, bales of hay within the easement, and scalloping and mowing associated with adjacent agricultural management. DMS provided an inspection report and made several requests to preserve the integrity of the conservation easement.

Wildlands successfully completed several action items in November 2023 such as:

- Replaced missing and damaged easement signs and posts.
- Added PVC markers to easement posts for visibility above vegetation.
- Added or replaced horse tape as a visual boundary for easement to deter future encroachment occurrences.
- Confirmed that approximately 18 - 24 inches of the CMP outlet at the crossing on EF-1 lies within the easement limits.
- Contacted landowner about mowing encroachment and herbicidal overspray on easement vegetation.
- Met with the landowner on December 12, 2023, and discussed the removal of the hay bales from the easement. The landowner agreed to remove them. A Site visit on January 4<sup>th</sup> revealed that the hay bales had been removed from the easement.

Several of the easement violations will require continued communication and compliance enforcement with the landowner from Wildlands. These areas will continue to be monitored closely in MY5 and throughout the remainder of the monitoring period. Continued management activity will be conducted as needed. Refer to Appendix 6 for a copy of the Boundary Inspection Report and photos of the resolved boundary issues and Appendix 2 for CCPV Figures.

#### **1.4.3 Stream Assessment**

MY4 is a reduced monitoring year that does not require morphological surveys; therefore, the stream cross-section surveys were not performed this year. Visual assessments reveal that project streams are functioning as designed. Refer to Appendix 2 for the Visual Stream Morphology Stability Assessment Tables, CCPV Figures, and reference photographs.

#### **1.4.4 Stream Hydrology Assessment**

In MY4, all reaches recorded at least one bankfull event. So far through MY4, WF1 and WF2 have recorded 4 bankfull events in separate years and have met the bankfull performance standard while EF1 has partially met its bankfull criteria with at least three bankfull events in separate years. Wildlands will continue to collect stream hydrology data throughout the monitoring period. Refer to Appendix 5 for the stream hydrologic summaries and data plots.

#### **1.4.5 Stream Areas of Concern and Management Activity**

Based on MY4 visual assessments, restoration reaches WF2 and EF1 are 100% stable and performing as intended. Minimal areas of concern were observed on Meadow Branch and included recurring beaver dams and localized segments of aggradation. At the upstream section of Meadow Branch near Station 101+80, a mid-channel bar has developed where a recurring beaver dam was located. The dam has been removed several times in MY2, MY3, and MY4, but currently the remnant aggradation persists. Wildlands will continue to monitor this area in MY5. While Asian spiderwort (*Murdannia keisak*) on the Site was greatly reduced in MY4, several short segments of in-stream vegetation and deposition were documented on Meadow Branch. Currently, these areas are having no negative impact on the stream's overall function and stability. They will likely dissipate as winter storms continue to mobilize sediment.

As previously discussed, several beaver dams were identified and removed from Meadow Branch in MY4. Since beaver activity was the likely a contributing factor in the aggradation mentioned above, APHIS (Animal and Plant Health Inspection Service) was contacted for removal. Wildlands will continue to monitor all areas of concern and management activity will be implemented if signs of accelerated instability pose a threat to the Site. Refer to Appendix 2 for stream stability tables, area of concern photos, and CCPV Figures.

#### **1.4.6 Wetland Assessment**

Eleven groundwater gages (GWG) were initially installed during baseline monitoring across the wetland re-establishment and rehabilitation areas. Since as-built, six additional GWGs have been installed on Site. At the beginning of MY3 (February 2022), two additional groundwater gages (GWG 3a and GWG 11a) were installed to better define the wetland re-establishment areas W-E8 and W-E6, respectively. At the beginning of MY4 (February 2023), Wildlands delineated two additional wetland areas totaling 1.03 acres not originally proposed for wetland credit. At this time, Wildlands installed four additional groundwater gages before the beginning of the MY4 growing season. One of these gages (GWG 4a) was installed to better capture wetland re-establishment area, W-E7, since GWG 4 was originally installed on a small, localized hummock. The remaining three gages (GWG 12a, 13a, and 13b) were installed in the two additional wetland areas delineated to support the potential expansion of the wetland areas. Wetland expansion areas and GWG locations are shown on the CCPV Figures in Appendix 2. See Section 1.4.7 for additional information about the proposed wetland expansion areas.

In MY3, the IRT approved a revised growing season of March 1<sup>st</sup> to November 28<sup>th</sup> based on soil temperature data and seasonal vegetation indicators. Therefore, the current performance standard for wetland hydrology is free groundwater within 12 inches of the ground surface for 28 consecutive days or 10% of the growing season under normal precipitation conditions. Also, in MY3, the IRT suggested that Wildlands should include the number of cumulative days that the wetland gages are meeting performance criteria and compare it with the number of consecutive day gage data; therefore, this data has been presented in Table 15 in Appendix 5. In MY3, the IRT also requested the inclusion of soil profiles with the groundwater gage data in MY4 and MY6 reports. Soil temperature data, seasonal vegetation indicator photographs for 2023, and soil profiles and photos are also included in Appendix 5. A discussion of the results from the soil profile is discussed with the gage data results, below.

Groundwater gage data from MY4 revealed that eight (GWG 1, 2, 4a, 5, 6, 7, 13a, and 13b) of the 17 GWGs met the consecutive day success criteria with a percentage of the growing season ranging from 13.2 to 27.5% while 14 of the GWGs met the success criteria when using the cumulative number of days. These included the eight gages that met the consecutive day criteria, as well as GWG3, 3a, 4, 8, 11, and 11a. Groundwater for all 6 GWGs that met the performance criteria for cumulative days stayed within 15 inches from the ground surface from March 1<sup>st</sup> through mid- to late-April. Refer to Table 15 in Appendix 5 for a comparison of the data.

As previously stated, Wildlands, per the IRT request, dug soil cores near each GWG and analyzed the soil profiles to determine if the soils have or are developing hydric indicators. Results from the soil profiles for MY4 indicate that GWG1, 4a, 5, 12a, 13a, and 13b exhibit a depleted matrix (F3) soil indicator, while GWG7 exhibits a Piedmont floodplain soils (F19) indicator. Soils cores from GWG4, 6, and 11a seem to be trending toward the Piedmont floodplain soils (F19) indicator. These results show that some of the soil profiles seem to positively correlate with the groundwater gage data; however, it is not the case for all the samples. Wildlands will bore new soil cores and reassess the soil profiles in MY6. Refer to Table 16 in Appendix 5 for soil profile data. Photos of soil profiles are also included in Appendix 5.

In MY3, Wildlands determined that an on-site rain gage would provide more accurate precipitation data, and one was installed in August 2022. The gage successfully collected data through April 30, 2023; however, during a Site visit in July 2023, Wildlands observed that the rain gage was damaged and no longer functioning. Wildlands tried repairing the gage and reinstalled it in August, but the damage was too extensive, and the rain gage did not collect any data for the remainder of the year. Therefore, precipitation data for 2023 was referenced from a near-by NOAA weather station in Union County, Monroe 2 SE. For reference, the on-site precipitation data from January 1<sup>st</sup> to April 30<sup>th</sup> was plotted with the rainfall data collected from the weather station. A new on-site rain gage will be installed this winter before the start of MY5. Refer to the rainfall graph in Appendix 5 for the monthly precipitation data.

While several of the GWGs have continually failed to meet success criteria during years with normal amounts of total rainfall, it is to be noted that much of the state was in a drought in 2023, with Union County being in a severe drought (D2) from September through the end of the growing season (National Drought Mitigation Center, 2023). Groundwater recharge is expected to occur in the winter, but any winter rain will have to first overcome this water storage deficit. It is likely that the effect of this drought could be observed during 2024 (MY5) in both the stream and groundwater gages. Wildlands will continue to monitor and investigate wetland areas in MY5.

#### **1.4.7 Proposed Wetland Expansion Areas**

Based on wetland groundwater hydrology data from MY2, groundwater hydrology was weak in much of the wetland re-establishment areas in the floodplain of Meadow Branch. Therefore, during the credit release site walk in May of 2022 (MY3), the IRT suggested that additional gages be installed along restoration reaches in areas not currently proposed for wetland credit in case additional wetlands are needed to offset failing gages. As previously discussed in Section 1.4.6, Wildlands installed 4 additional GWGs, before the onset of the growing season for 2023. Soil cores deemed these additional areas to have wetland potential and that the addition of the gages would provide hydrologic data that would support the potential expansion of wetland acreage for credit and to better capture wetland re-establishment area of W-E7.

Initially, Wildlands planned to submit a memo to the IRT in the MY4 report submittal and request the inclusion of the expansion areas, W-Ex1 and W-Ex2. Groundwater results and the data collected from the soil borings in MY4 support that these areas are good candidates for potential wetland expansion, and they also suggest that there may be other areas that need to be investigated for credit. Therefore, due to an overly dry fall, Wildlands decided to hold-off with the request memo until early 2024. At this time, Wildlands will reassess the Site, before the start of the growing season, to see if there are any additional areas that need to be further investigated for credit, install additional wells, if needed, and delineate the re-establishment areas of the failing gages to determine areas at risk. This data will be included in the expansion request memo and submitted shortly after the reassessment work is complete.

### **1.5 Monitoring Year 4 Summary**

Overall, the Site has met most of the required stream, vegetation, and hydrologic success criteria for MY4. While permanent vegetation plots were not assessed this year, several mobile plots were surveyed and resulted in a measured stem density of 596 stems per acre. Additionally, several areas of low stem density were supplementally planted this year, and potential monoculture areas were selectively pruned. Herbaceous and woody vegetation is thriving, and the Site is expected to meet the interim MY5 requirement of 260 stems per acre. While geomorphic surveys were not completed this year, visual assessments revealed that the streams are stable and functioning as intended. At least one bankfull event was documented on EF1, WF1, and WF2 in MY4. The Site has met the hydrologic requirement of 4

bankfull events in separate years for reach WF1 and WF2, while EF1 has partially met the hydrologic requirement. Eight of the seventeen groundwater gages met the wetland hydrology success criteria with the revised growing season (March 1<sup>st</sup> to November 28<sup>th</sup>). The MY4 visual assessment identified a few areas of concern including beaver dams, documented easement encroachment, populations of invasive plant species, and minimal areas of aggradation. 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

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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 *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 ArcPro. Crest gages and groundwater gages are monitored quarterly. Hydrologic instrument installations are in accordance with the United States Army Corps of Engineers (USACE, 2005) standards and monitoring with the IRT's *Stream and Wetland Mitigation Update* (2016). Vegetation monitoring protocols followed the *Carolina Vegetation Survey-EEP Level 2 Protocol* (Lee et al., 2008).

## Section 3: REFERENCES

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## **APPENDIX 1. General Figures and Tables**

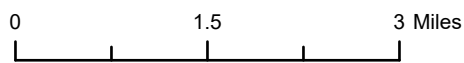
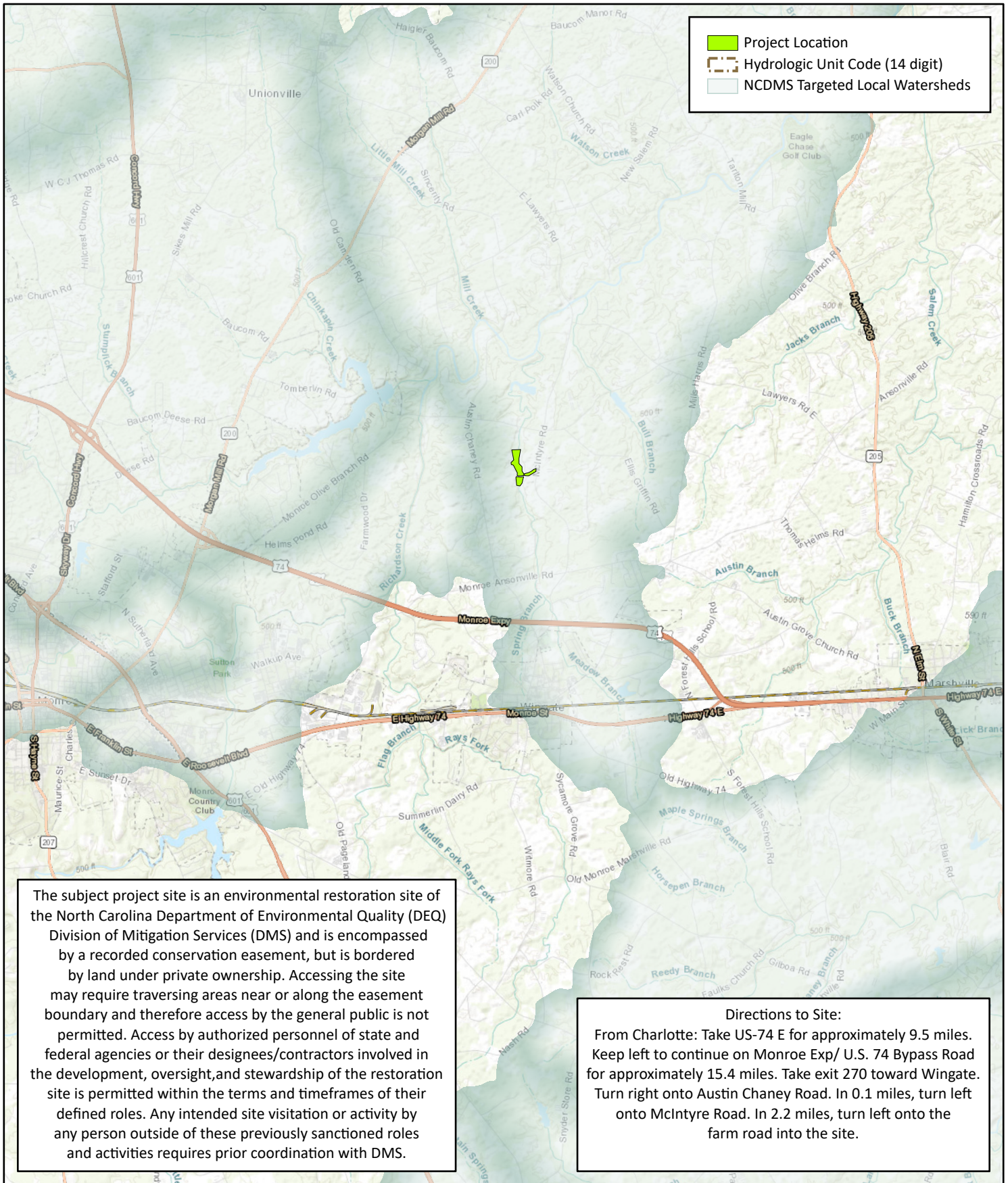
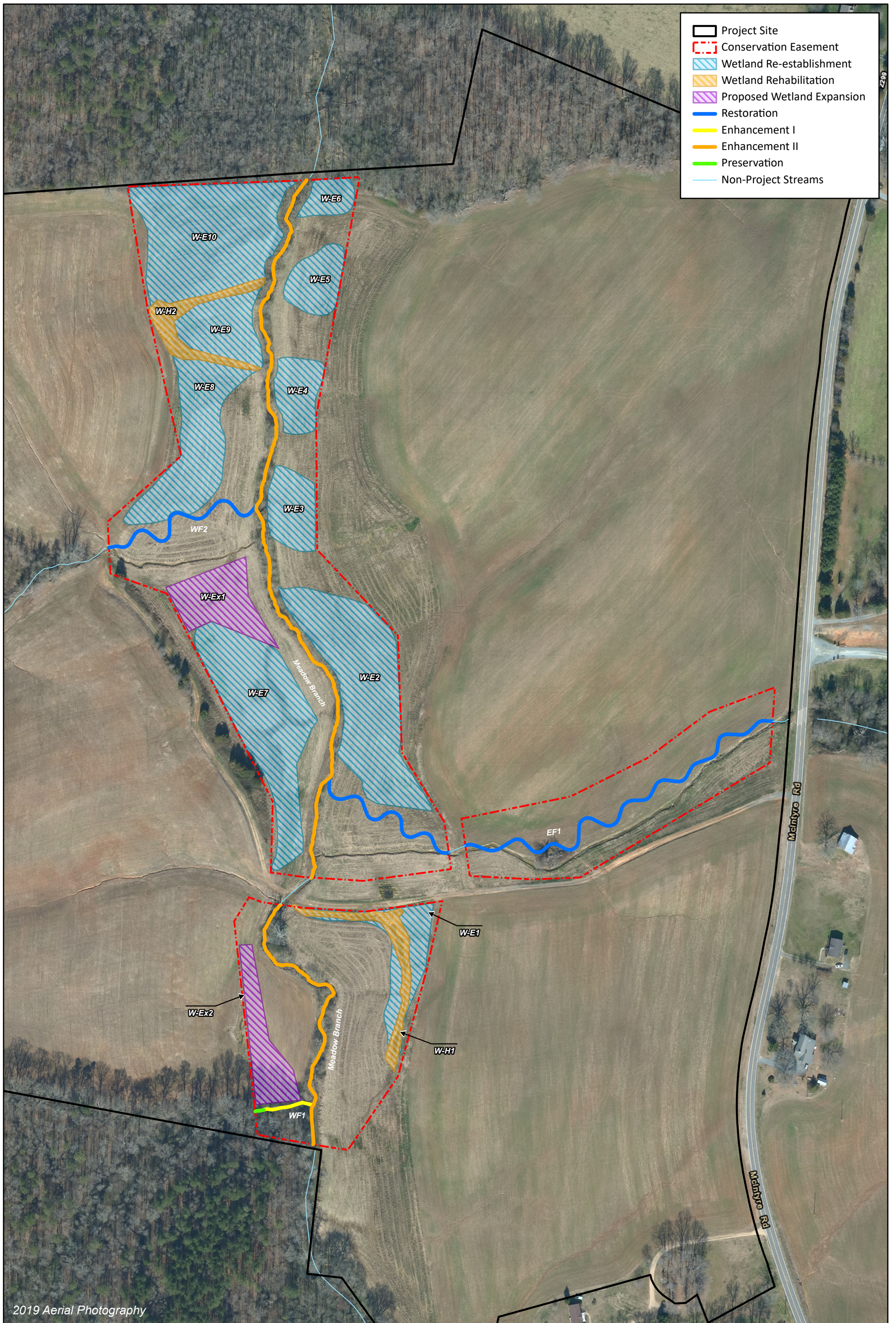


Figure 1 Project Vicinity Map  
 Deep Meadow Mitigation Site  
 DMS Project No. 97131  
 Monitoring Year 4 - 2023



2019 Aerial Photography

- Project Site
- Conservation Easement
- Wetland Re-establishment
- Wetland Rehabilitation
- Proposed Wetland Expansion
- Restoration
- Enhancement I
- Enhancement II
- Preservation
- Non-Project Streams

**Table 4. Project Activity and Reporting History**

Deep Meadow Mitigation Site  
DMS Project No. 97131  
**Monitoring Year 4 - 2023**

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 <sup>1</sup>		July - September 2019	September 2019
Permanent seed mix applied to reach/segments <sup>1</sup>		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	March 2022	November 2022
	Vegetation Survey	August 2022	
	Invasive Treatment	June - September 2022	
	Beaver Dam Removal	September 2022	
Year 4 Monitoring	Stream Survey	N/A	December 2023
	Supplemental Planting	March 2023	
	Box Elder Thinning	May 2023	
	Vegetation Survey	August 2023	
	Invasive Treatment	July 2023	
	Beaver Dam Removal	May/October 2023	
Year 5 Monitoring	Stream Survey		
	Vegetation Survey		
Year 6 Monitoring	Stream Survey		
	Vegetation Survey		
Year 7 Monitoring	Stream Survey		
	Vegetation Survey		

<sup>1</sup>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 4 - 2023**

<b>Designers</b> Aaron Earley, PE, CFM	<b>Wildlands Engineering, Inc.</b> 1430 South Mint Street, Suite 104 Charlotte, NC 28203 704.332.7754
<b>Construction Contractors</b>	<b>Land Mechanic Designs, Inc.</b> 126 Circle G Lane Willow Spring, NC 27592
<b>Planting Contractor</b>	<b>Bruton Natural Systems, Inc.</b> PO Box 1197 Fremont, NC 27830
<b>Seeding Contractor</b>	<b>Land Mechanic Designs, Inc.</b> 126 Circle G Lane Willow Spring, NC 27592
<b>Seed Mix Sources</b>	<b>Land Mechanic Designs, Inc.</b>
<b>Nursery Stock Suppliers</b> Bare Roots Live Stakes Herbaceous Plugs	<b>Bruton Natural Systems, Inc.</b>
<b>Monitoring Performers</b>	<b>Wildlands Engineering, Inc.</b>
Monitoring, POC	Kristi Suggs (704) 332.7754 x.110

## **APPENDIX 2. Visual Assessment Data**

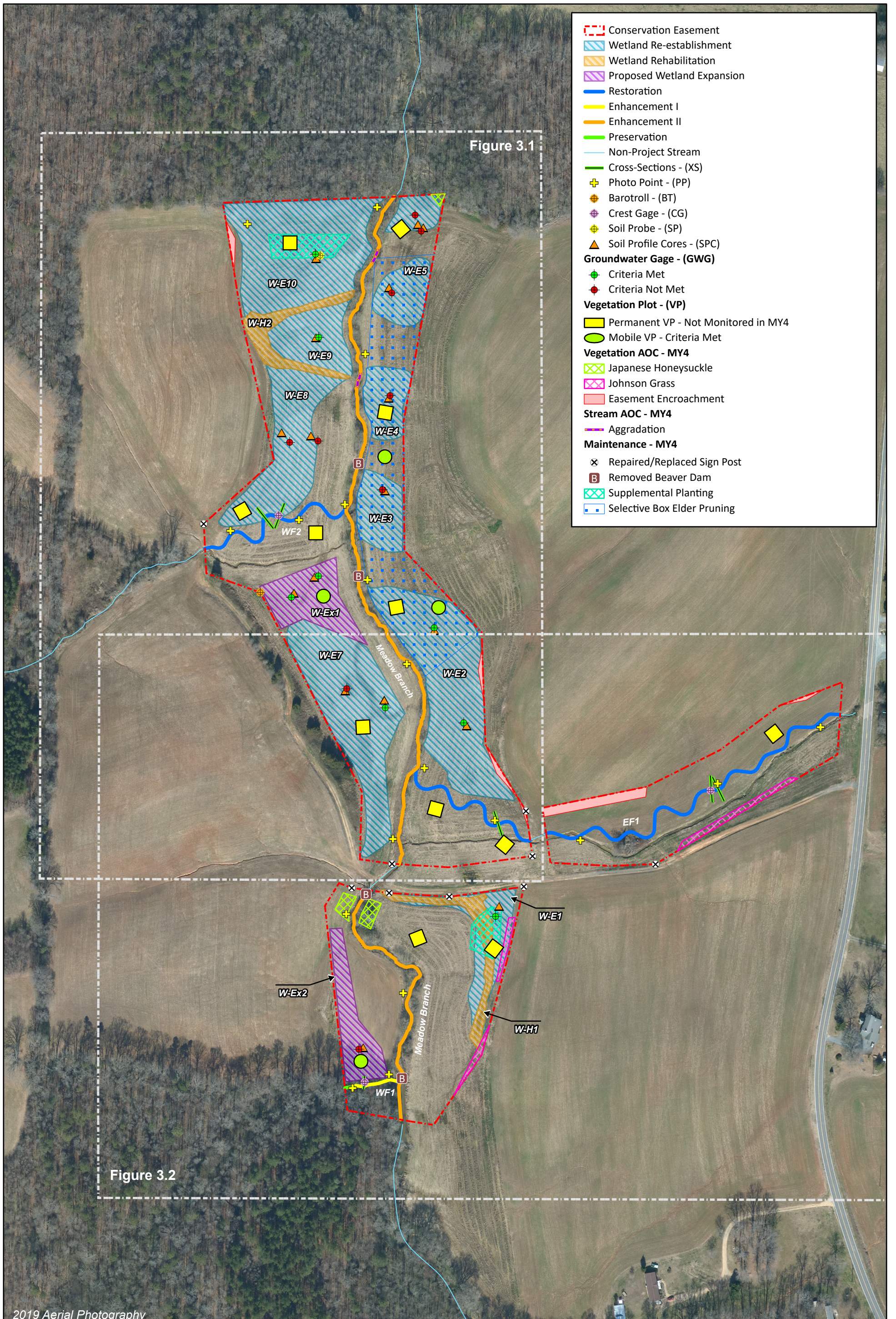


Figure 3.1

Figure 3.2

2019 Aerial Photography



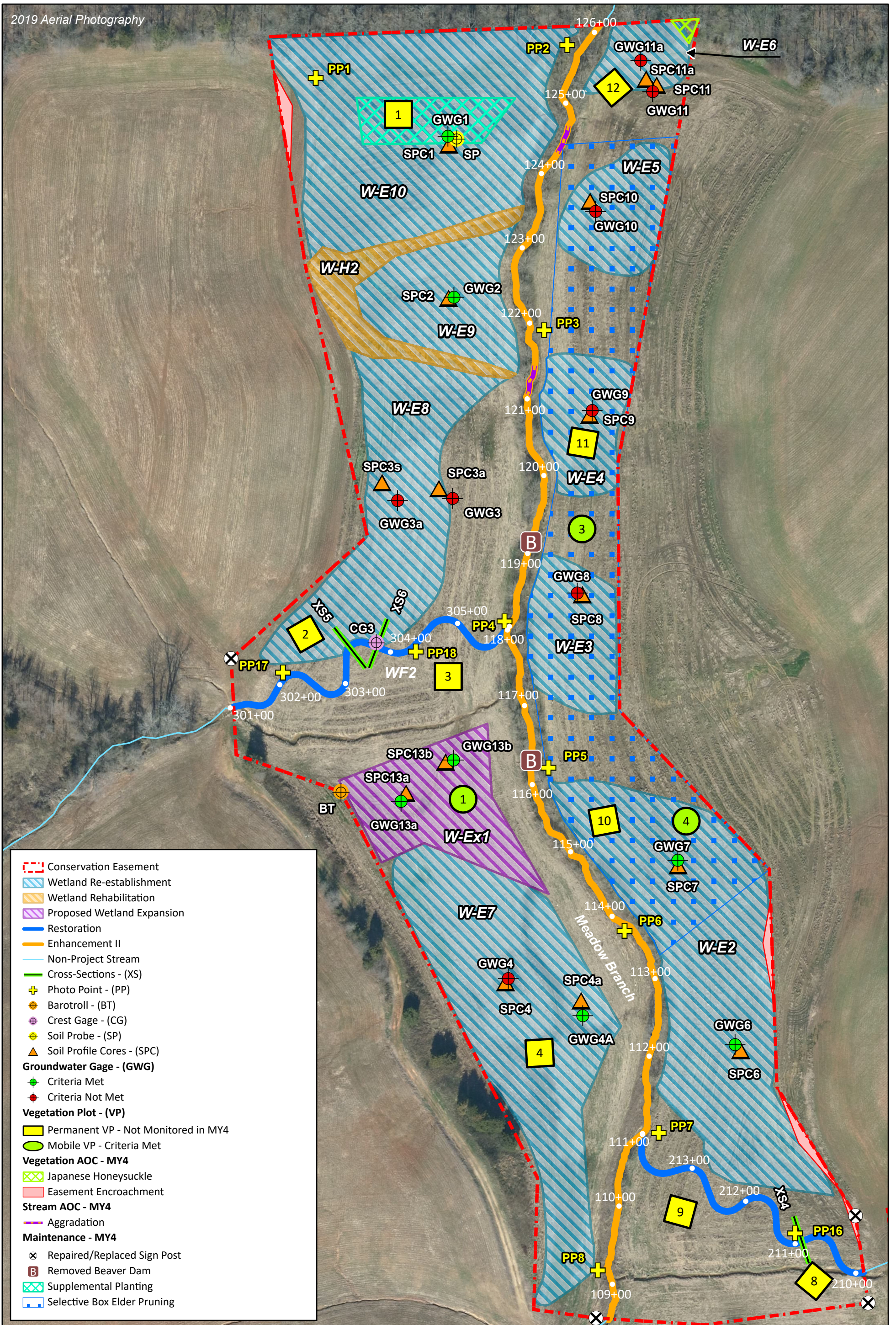


Figure 3.1 - Current Condition Plan View  
 Deep Meadow Mitigation Site  
 DMS Project No. 97131  
 Monitoring Year 4 - 2023  
 Union County, NC

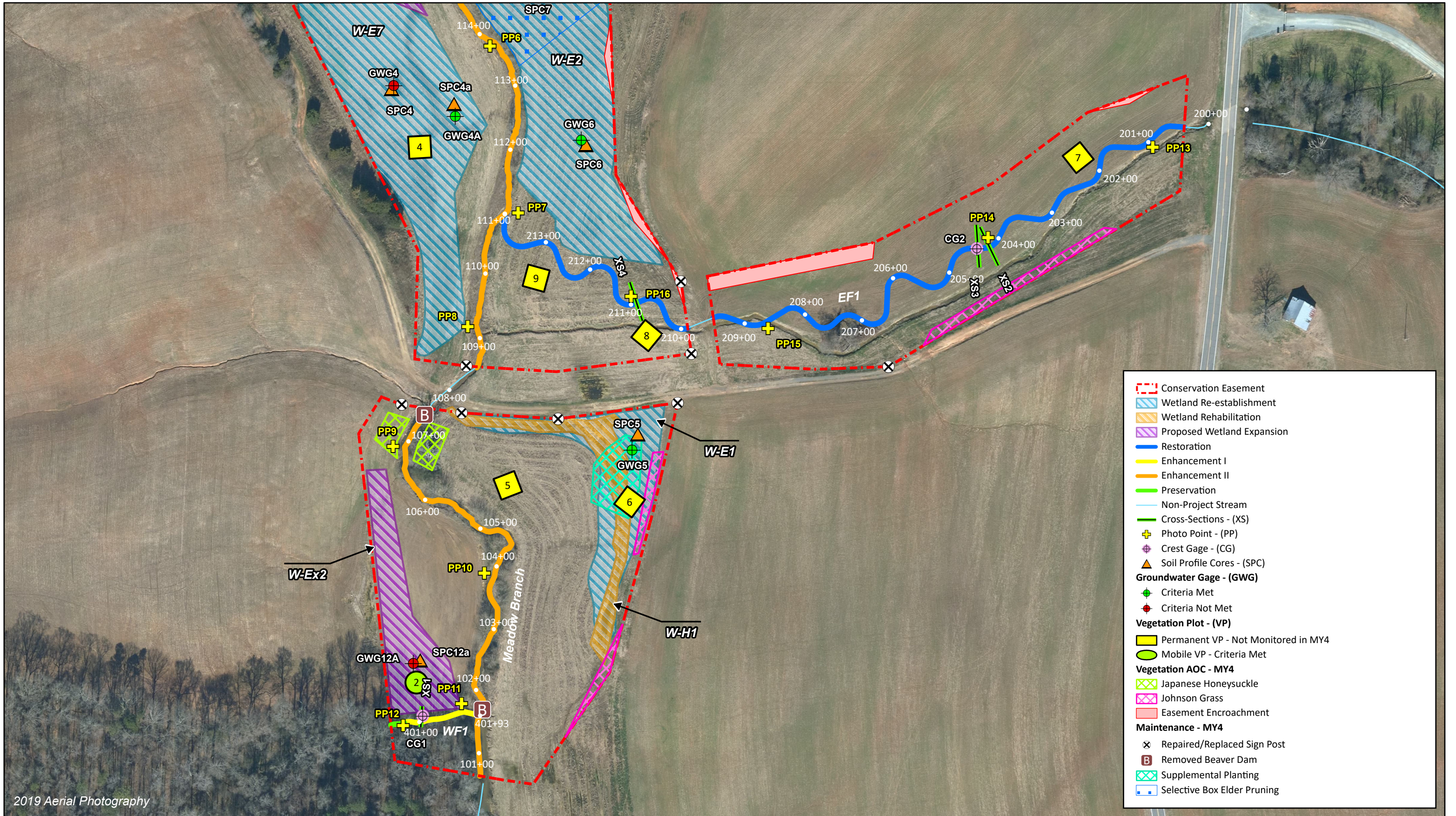


Figure 3.2 - Current Condition Plan View  
 Deep Meadow Mitigation Site  
 DMS Project No. 97131  
 Monitoring Year 4 - 2023  
 Union County, NC



**Table 6a. Visual Stream Morphology Stability Assessment Table**

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 4 - 2023

Reach: EF1										
Assessed Length:	1,322	Date of Last Assessment: 11/29/2023								
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%				
		Date of Last Assessment: 11/28/2022	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			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%
<b>Totals</b>					0	0	100%	0	0	100%
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%.	15	15			100%			
	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 4 - 2023

Reach: WF1										
Assessed Length:	116		Date of Last Assessment: 11/29/2023							
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%			
		Date of Last Assessment: 11/28/2022	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%
<b>Totals</b>					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 4 - 2023

Reach: WF2										
Assessed Length:	458		Date of Last Assessment: 11/29/2023							
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	8	8			100%			
	3. Meander Pool Condition	Depth Sufficient	7	7			100%			
		Date of Last Assessment: 11/28/2022	7	7			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	7	7			100%			
Thalweg centering at downstream of meander bend (Glide)		7	7			100%				
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%
<b>Totals</b>					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%.	4	4			100%			
	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 4 - 2023

<b>Planted Acreage:</b>		<b>21.5</b>		<b>Date of Last Assessment: 11/29/2023</b>		
<b>Vegetation Category</b>	<b>Definitions</b>	<b>Mapping Threshold (acres)</b>	<b>Number of Polygons</b>	<b>Combined Acreage</b>	<b>% of Planted Acreage</b>	
<b>Bare Areas</b>	Very limited cover of both woody and herbaceous material	0.1	0	0.0	0.0%	
<b>Low Stem Density Areas</b>	Woody stem densities clearly below target levels based on MY3, 5, or 7 stem count criteria.	0.1	0	0.0	0.0%	
<b>Total</b>			<b>0</b>	<b>0.0</b>	<b>0.0%</b>	
<b>Areas of Poor Growth Rates or Vigor</b>	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.1	0	0.0	0.0%	
<b>Cumulative Total</b>			<b>0</b>	<b>0.0</b>	<b>0.0%</b>	

<b>Easement Acreage:</b>		<b>23.8</b>		<b>Date of Last Assessment: 11/29/2023</b>		
<b>Vegetation Category</b>	<b>Definitions</b>	<b>Mapping Threshold (SF)</b>	<b>Number of Polygons</b>	<b>Combined Acreage</b>	<b>% of Easement Acreage</b>	
<b>Invasive Areas of Concern</b>	Areas or points (if too small to render as polygons at map scale).	1000	6	0.26	1.1%	
<b>Easement Encroachment Areas</b>	Areas or points (if too small to render as polygons at map scale).	none	6	0.21	0.9%	

## **Stream Photographs**

**Monitoring Year 4**



**Photo Point 1 – W-E10, North (04/10/2023)**



**Photo Point 1 – W-E10, South (04/10/2023)**



**Photo Point 1 – W-E10, East (04/10/2023)**



**Photo Point 1 – W-E10, West (04/10/2023)**



**Photo Point 2 – MB outlet, view upstream (04/10/2023)**



**Photo Point 2 – MB outlet, view downstream (04/10/2023)**



**Photo Point 3** – Meadow Branch, view upstream (04/10/2023)



**Photo Point 3** – Meadow Branch, view downstream (04/10/2023)



**Photo Point 4** – Meadow Branch, view upstream (04/10/2023)



**Photo Point 4** – Meadow Branch, view downstream (04/10/2023)



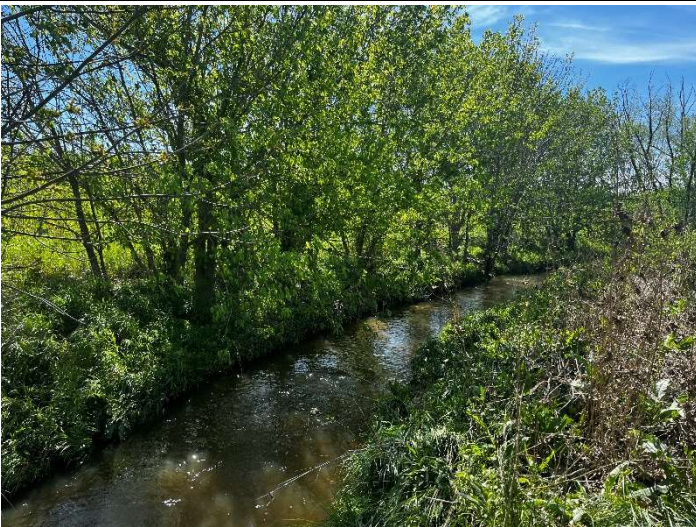
**Photo Point 4** – WF2 Confluence, view upstream (04/10/2023)



**Photo Point 5 – Meadow Branch, view upstream (04/10/2023)**



**Photo Point 5 – Meadow Branch, view downstream (04/10/2023)**



**Photo Point 6 – Meadow Branch, view upstream (04/10/2023)**



**Photo Point 6 – Meadow Branch, view downstream (04/10/2023)**



**Photo Point 7 – Meadow Branch, view upstream (04/10/2023)**



**Photo Point 7 – Meadow Branch, view downstream (04/10/2023)**





**Photo Point 8** – Meadow Branch, view upstream (04/10/2023)



**Photo Point 8** – Meadow Branch, view downstream (04/10/2023)



**Photo Point 9** – Meadow Branch, view upstream (04/10/2023)



**Photo Point 9** – Meadow Branch, view downstream (04/10/2023)



**Photo Point 10** – Meadow Branch, view upstream (04/10/2023)



**Photo Point 10** – Meadow Branch, view downstream (04/10/2023)



**Photo Point 11 – Meadow Branch, view upstream (04/10/2023)**



**Photo Point 11 – Meadow Branch, view downstream (04/10/2023)**



**Photo Point 11 –WF1 Confluence, view upstream (04/10/2023)**



**Photo Point 12 – WF1 Start, view upstream (04/10/2023)**



**Photo Point 12 – WF1 Start, view downstream (04/10/2023)**



**Photo Point 13 – EF1 Start, view upstream (04/10/2023)**



**Photo Point 13 – EF1 Start, view downstream (04/10/2023)**



**Photo Point 14 – EF1, view upstream (04/10/2023)**



**Photo Point 14 – EF1, view downstream (04/10/2023)**



**Photo Point 15 – EF1, view upstream (04/10/2023)**



**Photo Point 15 – EF1, view downstream (04/10/2023)**



**Photo Point 16 – EF1, view upstream (04/10/2023)**



**Photo Point 16 – EF1, view downstream (04/10/2023)**



**Photo Point 17 – WF2 Start, view upstream (04/10/2023)**



**Photo Point 17 – WF2 Start, view downstream (04/10/2023)**



**Photo Point 18 – WF2, view upstream (04/10/2023)**



**Photo Point 18 – WF2, view downstream (04/10/2023)**

## **Culvert/Crossing Photographs**

**Monitoring Year 4**



**Culvert Photo – EF1, inlet (04/10/2023)**



**Culvert Photo – EF1 outlet (04/10/2023)**



**Ford Crossing Photo – WF2, looking northwest (04/10/2023)**



**Ford Crossing Photo – WF2, looking southeast (04/10/2023)**



**Ford Crossing Photo – Meadow Branch, looking east  
(04/10/2023)**



**Ford Crossing Photo – Meadow Branch, looking west  
(04/10/2023)**

## **Mobile Vegetation Plot Photographs**

**Monitoring Year 4**



**Mobile Vegetation Plot 1, Wetland Expansion Area - North**  
*(08/17/2023)*



**Mobile Vegetation Plot 2, Wetland Expansion Area - North**  
*(08/17/2023)*



**Mobile Vegetation Plot 3, Potential Monoculture Area - North**  
*(08/17/2023)*



**Mobile Vegetation Plot 4, Potential Monoculture Area - North**  
*(08/17/2023)*



## **Areas of Concern Photographs**

**Monitoring Year 4**



**Meadow Branch, station 101+80** – Recurring beaver dam and associated aggradation (9/29/2023)



**Meadow Branch, station 101+80, aerial photo** – Recurring beaver dam and associated aggradation (11/7/2023)



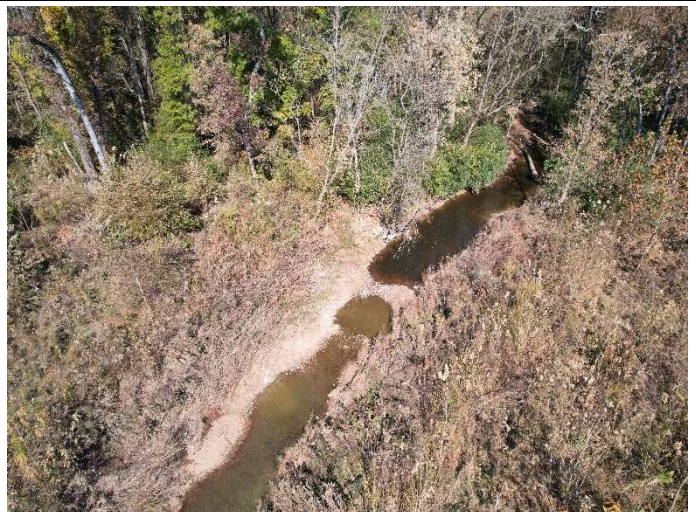
**Meadow Branch, station 121+15** – In-stream vegetation and associated aggradation (9/29/2023)



**Meadow Branch, station 121+15, aerial photo** – In-stream vegetation and associated aggradation (11/7/2023)



**Meadow Branch, station 124+50** – In-stream vegetation and associated aggradation (9/29/2023)



**Meadow Branch, station 124+50, aerial photo** – In-stream vegetation and associated aggradation (11/7/2023)



**Between Platted Corners 2 and 3 – Easement encroachment, haybales within easement (11/28/2023)**



**Between Platted Corners 2 and 3, aerial photo – Easement encroachment, haybales within easement (11/28/2023)**



**Between Platted Corners 19 and 20 – Herbicidal overspray (11/28/2023)**



**Between Platted Corners 5 and 6 – Herbicidal overspray (11/7/2023)**



**Between Platted Corners 25 and 26 – Mowing and scalloping (11/28/2023)**



**Between Platted Corners 26 and 27 – Mowing and scalloping (11/28/2023)**

## **Groundwater Gage Photographs**

**Monitoring Year 4**



**Groundwater Gage 1 - (11/28/2023)**



**Groundwater Gage 2 - (11/28/2023)**



**Groundwater Gage 3 - (11/28/2023)**



**Groundwater Gage 3a - (11/28/2023)**



**Groundwater Gage 4 - (11/28/2023)**



**Groundwater Gage 4a - (11/28/2023)**



**Groundwater Gage 5 - (11/28/2023)**



**Groundwater Gage 6 - (11/28/2023)**



**Groundwater Gage 7 - (11/28/2023)**



**Groundwater Gage 8 - (11/28/2023)**



**Groundwater Gage 9 - (11/28/2023)**



**Groundwater Gage 10 - (11/28/2023)**



**Groundwater Gage 11 - (11/28/2023)**



**Groundwater Gage 11a - (11/28/2023)**



**Groundwater Gage 12a - (11/28/2023)**



**Groundwater Gage 13a - (11/28/2023)**



**Groundwater Gage 13b - (11/28/2023)**

## **Stream Gage Photographs**

**Monitoring Year 4**





**WF1 - Crest Gage 1 - (11/28/2023)**



**EF1 - Crest Gage 2 - (11/28/2023)**



**WF2 - Crest Gage 3 - (11/28/2023)**

### **APPENDIX 3. Vegetation Plot Data**

Vegetative Assessment and Analysis Not Required in Monitoring Year 4  
Data Included from Monitoring Year 3

**Table 8. Vegetation Plot Criteria Attainment**

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 3 - 2022

Permanent Vegetation Plot	MY3 Success Criteria Met (Y/N)	Tract Mean (MY3 - 2022)	
1	N	83%	88%
2	Y		
3	Y		
4	Y		
5	Y		
6	N		
7	Y		
8	Y		
9	Y		
10	Y		
11	Y		
12	Y		
Mobile Vegetation Plot	MY3 Success Criteria Met (Y/N)	100%	
1	Y		
2	Y		
3	Y		
4	Y		

**Table 9a. Planted and Total Stem Counts**

Deep Meadow Mitigation Site  
 DMS Project No. 97131  
 Monitoring Year 3 - 2022

Current Permanent Vegetation Plot Data (MY3 2022)														
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
<i>Acer negundo</i>	Boxelder Maple	Tree			9			10			27			23
<i>Acer rubrum</i>	Red Maple	Tree			14			4			1			
<i>Alnus serrulata</i>	Tag Alder, Smooth Alder, Hazel Alder	Shrub Tree												
<i>Betula nigra</i>	River Birch, Red Birch	Tree	1	1	1	3	3	3	2	2	2			
<i>Cephalanthus occidentalis</i>	Buttonbush	Shrub Tree						2					1	1
<i>Cornus amomum</i>	Silky Dogwood	Shrub Tree	2	2	2	1	1	1					1	1
<i>Diospyros virginiana</i>	American Persimmon, Possumwood	Tree	2	2	2	1	1	1					1	1
<i>Fraxinus pennsylvanica</i>	Green Ash, Red Ash	Tree			1				3	3	4		1	1
<i>Lindera benzoin</i>	Northern Spicebush	Shrub Tree												
<i>Liquidambar styraciflua</i>	Sweet Gum, Red Gum	Tree			15			9			1			
<i>Liriodendron tulipifera</i>	Tulip Poplar	Tree												
<i>Platanus occidentalis</i>	Sycamore, Plane-tree	Tree	2	2	2	3	3	3	1	1	1	2	2	2
<i>Populus deltoides</i>	Eastern Cottonwood	Tree			7	2	2	2	1	1	8	2	2	3
<i>Quercus michauxii</i>	Basket Oak, Swamp Chestnut Oak	Tree				1	1	1					1	1
<i>Quercus pagoda</i>	Cherrybark Oak, Swamp Spanish Oak	Tree												
<i>Quercus phellos</i>	Willow Oak	Tree				1	1	1	1	1	1	1	1	1
<i>Salix sericea</i>	Silky Willow	Shrub Tree												
Stem count			7	7	53	12	12	37	8	8	45	10	10	34
size (ares)			1			1			1			1		
size (ACRES)			0.0247			0.0247			0.0247			0.0247		
Species count			4	4	9	7	7	11	5	5	8	8	8	9
Stems per ACRE			283	283	2145	486	486	1497	324	324	1821	405	405	1376

Current Permanent Vegetation Plot Data (MY3 2022)														
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
<i>Acer negundo</i>	Boxelder Maple	Tree			135						2			16
<i>Acer rubrum</i>	Red Maple	Tree												
<i>Alnus serrulata</i>	Tag Alder, Smooth Alder, Hazel Alder	Shrub Tree	1	1	1							1	1	1
<i>Betula nigra</i>	River Birch, Red Birch	Tree	3	3	3				3	3	3	3	3	3
<i>Cephalanthus occidentalis</i>	Buttonbush	Shrub Tree				2	2	2						
<i>Cornus amomum</i>	Silky Dogwood	Shrub Tree												
<i>Diospyros virginiana</i>	American Persimmon, Possumwood	Tree												
<i>Fraxinus pennsylvanica</i>	Green Ash, Red Ash	Tree	1	1	5				3	3	7	1	1	3
<i>Lindera benzoin</i>	Northern Spicebush	Shrub Tree												
<i>Liquidambar styraciflua</i>	Sweet Gum, Red Gum	Tree			7									
<i>Liriodendron tulipifera</i>	Tulip Poplar	Tree	1	1	1									
<i>Platanus occidentalis</i>	Sycamore, Plane-tree	Tree	2	2	2	1	1	1	3	3	3	2	2	2
<i>Populus deltoides</i>	Eastern Cottonwood	Tree												
<i>Quercus michauxii</i>	Basket Oak, Swamp Chestnut Oak	Tree	2	2	2							1	1	1
<i>Quercus pagoda</i>	Cherrybark Oak, Swamp Spanish Oak	Tree												
<i>Quercus phellos</i>	Willow Oak	Tree	2	2	2							1	1	1
<i>Salix sericea</i>	Silky Willow	Shrub Tree												
Stem count			12	12	158	3	3	3	9	9	15	9	9	27
size (ares)			1			1			1			1		
size (ACRES)			0.0247			0.0247			0.0247			0.0247		
Species count			7	7	9	2	2	2	3	3	4	6	6	7
Stems per ACRE			486	486	6394	121	121	121	364	364	607	364	364	1093

**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 9b. Planted and Total Stem Counts**

Deep Meadow Mitigation Site  
 DMS Project No. 97131  
 Monitoring Year 3 - 2022

Current Permanent Vegetation Plot Data (MY3 2022)														
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
<i>Acer negundo</i>	Boxelder Maple	Tree			62			133			25			37
<i>Acer rubrum</i>	Red Maple	Tree												
<i>Alnus serrulata</i>	Tag Alder, Smooth Alder, Hazel Alder	Shrub Tree												
<i>Betula nigra</i>	River Birch, Red Birch	Tree	2	2	2	1	1	1	3	3	3			
<i>Cephalanthus occidentalis</i>	Buttonbush	Shrub Tree							2	2	2	2	2	2
<i>Cornus amomum</i>	Silky Dogwood	Shrub Tree							1	1	1	2	2	2
<i>Diospyros virginiana</i>	American Persimmon, Possumwood	Tree							2	2	2	4	4	4
<i>Fraxinus pennsylvanica</i>	Green Ash, Red Ash	Tree	1	1	4			2						19
<i>Lindera benzoin</i>	Northern Spicebush	Shrub Tree												
<i>Liquidambar styraciflua</i>	Sweet Gum, Red Gum	Tree						10						
<i>Liriodendron tulipifera</i>	Tulip Poplar	Tree	3	3	3									
<i>Platanus occidentalis</i>	Sycamore, Plane-tree	Tree	3	3	3	5	5	5	2	2	2			
<i>Populus deltoides</i>	Eastern Cottonwood	Tree			51	2	2	14				2	2	2
<i>Quercus michauxii</i>	Basket Oak, Swamp Chestnut Oak	Tree	4	4	4	1	1	1	1	1	1			
<i>Quercus pagoda</i>	Cherrybark Oak, Swamp Spanish Oak	Tree												
<i>Quercus phellos</i>	Willow Oak	Tree	1	1	1	2	2	2	1	1	1	2	2	2
<i>Salix sericea</i>	Silky Willow	Shrub Tree												
<b>Stem count size (ares)</b>			14	14	130	11	11	168	12	12	37	12	12	68
<b>size (ACRES)</b>			1			1			1			1		
<b>Species count</b>			0.0247			0.0247			0.0247			0.0247		
<b>Stems per ACRE</b>			6	6	8	5	5	8	7	7	8	5	5	7
			567	567	5261	445	445	6799	486	486	1497	486	486	2752

Permanent Vegetation Plot Annual Mean														
Scientific Name	Common Name	Species Type	MY3 (2022)			MY2 (2021)			MY1 (2020)			MY0 (2020)		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
<i>Acer negundo</i>	Boxelder Maple	Tree			479			585			356			
<i>Acer rubrum</i>	Red Maple	Tree			19									
<i>Alnus serrulata</i>	Tag Alder, Smooth Alder, Hazel Alder	Shrub Tree	2	2	2	2	2	2	4	4	4	6	6	6
<i>Betula nigra</i>	River Birch, Red Birch	Tree	21	21	21	21	21	21	24	24	24	26	26	26
<i>Cephalanthus occidentalis</i>	Buttonbush	Shrub Tree	7	7	9	7	7	7	7	7	7	8	8	8
<i>Cornus amomum</i>	Silky Dogwood	Shrub Tree	7	7	7	7	7	8	9	9	9	10	10	10
<i>Diospyros virginiana</i>	American Persimmon, Possumwood	Tree	10	10	10	10	10	10	13	13	13	13	13	13
<i>Fraxinus pennsylvanica</i>	Green Ash, Red Ash	Tree	10	10	46	7	13	23	7	7	10	7	7	7
<i>Lindera benzoin</i>	Northern Spicebush	Shrub Tree							2	2	2	12	12	12
<i>Liquidambar styraciflua</i>	Sweet Gum, Red Gum	Tree			42			16						
<i>Liriodendron tulipifera</i>	Tulip Poplar	Tree	4	4	4	4	4	4	6	6	6	17	17	17
<i>Platanus occidentalis</i>	Sycamore, Plane-tree	Tree	26	26	26	26	26	27	27	27	27	27	27	27
<i>Populus deltoides</i>	Eastern Cottonwood	Tree	9	9	87	7	8	25	8	8	8	13	13	13
<i>Quercus michauxii</i>	Basket Oak, Swamp Chestnut Oak	Tree	11	11	11	11	11	11	18	18	18	18	18	18
<i>Quercus pagoda</i>	Cherrybark Oak, Swamp Spanish Oak	Tree										1	1	1
<i>Quercus phellos</i>	Willow Oak	Tree	12	12	12	12	12	12	18	18	18	22	22	22
<i>Salix sericea</i>	Silky Willow	Shrub Tree						1						
<b>Stem count size (ares)</b>			119	119	775	114	121	752	143	143	502	180	180	180
<b>size (ACRES)</b>			12			12			12			12		
<b>Species count</b>			0.2965			0.2965			0.2965			0.2965		
<b>Stems per ACRE</b>			11	11	14	11	11	14	12	12	13	13	13	13
			401	401	2614	384	408	2536	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 9c. Planted and Total Stem Counts**

Deep Meadow Mitigation Site  
 DMS Project No. 97131  
 Monitoring Year 3 - 2022

Current Mobile Vegetation Plot (MP) Data (MY3 2022)						
Scientific Name	Common Name	Species Type	MP1	MP2	MP3	MP4
			PnoLS	PnoLS	PnoLS	PnoLS
<i>Acer negundo</i>	Box Elder Maple	Tree				
<i>Acer rubrum</i>	Red Maple	Tree				
<i>Alnus serrulata</i>	Tag Alder, Smooth Alder, Hazel Alder	Shrub Tree				
<i>Betula nigra</i>	River Birch, Red Birch	Tree		1	1	
<i>Cephalanthus occidentalis</i>	Buttonbush	Shrub Tree	2			1
<i>Cornus amomum</i>	Silky Dogwood	Shrub Tree	1		1	1
<i>Diospyros virginiana</i>	Persimmon	Tree				1
<i>Fraxinus pennsylvanica</i>	Green Ash, Red Ash	Tree		4	4	5
<i>Lindera benzoin</i>	Northern Spicebush	Shrub Tree				
<i>Liquidambar styraciflua</i>	Sweet Gum, Red Gum	Tree				
<i>Liriodendron tulipifera</i>	Tulip Poplar	Tree				
<i>Platanus occidentalis</i>	Sycamore, Plane-tree	Tree	1	4		1
<i>Populus deltoides</i>	Eastern Cottonwood	Tree	4		1	1
<i>Quercus michauxii</i>	Basket Oak, Swamp Chestnut Oak	Tree		1		
<i>Quercus pagoda</i>	Cherrybark Oak, Swamp Spanish Oak	Tree			1	
<i>Quercus phellos</i>	Willow Oak	Tree			1	1
<i>Salix sericea</i>	Silky Willow	Shrub Tree				
<b>Stem count</b>			8	10	9	11
<b>size (ares)</b>			1	1	1	1
<b>size (ACRES)</b>			0.02	0.02	0.02	0.02
<b>Species count</b>			4	4	6	7
<b>Stems per ACRE</b>			324	405	364	445

Current Mobile Vegetation Plot (MP) Data (MY3 2022) Total Stem Counts & Annual Means							Overall Site Annual Mean			
Scientific Name	Common Name	Species Type	MY3 (2022)	MY2 (2021)	MY1 (2020)	MY0 (2020)	MY3 (2022)	MY2 (2021)	MY1 (2020)	MY0 (2020)
			PnoLS	PnoLS	PnoLS	PnoLS	PnoLS	PnoLS	PnoLS	PnoLS
<i>Acer negundo</i>	Box Elder Maple	Tree								
<i>Acer rubrum</i>	Red Maple	Tree								
<i>Alnus serrulata</i>	Tag Alder, Smooth Alder, Hazel Alder	Shrub Tree		3	3	1	2	5	4	7
<i>Betula nigra</i>	River Birch, Red Birch	Tree	2	4	4	9	23	29	30	35
<i>Cephalanthus occidentalis</i>	Buttonbush	Shrub Tree	3	3	3	2	10	10	7	10
<i>Cornus amomum</i>	Silky Dogwood	Shrub Tree	3			1	10	7	9	11
<i>Diospyros virginiana</i>	American Persimmon, Possumwood	Tree	1	1	1		11	11	18	13
<i>Fraxinus pennsylvanica</i>	Green Ash, Red Ash	Tree	13	12	10	3	23	19	13	10
<i>Lindera benzoin</i>	Northern Spicebush	Shrub Tree				1			2	13
<i>Liquidambar styraciflua</i>	Sweet Gum, Red Gum	Tree								
<i>Liriodendron tulipifera</i>	Tulip Poplar	Tree		3	3	5	4	7	8	22
<i>Platanus occidentalis</i>	Sycamore, Plane-tree	Tree	6	11	8	20	32	37	42	48
<i>Populus deltoides</i>	Eastern Cottonwood	Tree	6	2	2	4	15	9	16	16
<i>Quercus michauxii</i>	Basket Oak, Swamp Chestnut Oak	Tree	1			2	12	11	22	20
<i>Quercus pagoda</i>	Cherrybark Oak, Swamp Spanish Oak	Tree	1	2	2	5	1	2	2	6
<i>Quercus phellos</i>	Willow Oak	Tree	2	1	1	9	14	13	18	31
<i>Salix sericea</i>	Silky Willow	Shrub Tree								
<b>Stem count</b>			38	42	37	62	157	160	189	242
<b>size (ares)</b>			4	4	4	4	16	16	16	16
<b>size (ACRES)</b>			0.10	0.10	0.10	0.10	0.40	0.40	0.40	0.40
<b>Species count</b>			10	10	10	12	12	12	13	13
<b>Stems per ACRE</b>			384	425	374	627	397	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

**Table 9d. Additional Mobile Vegetation Plots**

Deep Meadow Mitigation Site

DMS Project No. 97131

**Monitoring Year 4 - 2023**

Mobile Vegetation Plot Data - MY4						
Scientific Name	Common Name	Species Type	Wetland Expansion Plot 1	Wetland Expansion Plot 2	Monoculture Area Plot 3	Monoculture Area Plot 4
<i>Acer negundo</i> <sup>1</sup>	Box Elder	Tree	5	4	11	8
<i>Alnus serrulata</i>	Tag Alder, Smooth Alder, Hazel Alder	Shrub/Tree		1		
<i>Betula nigra</i>	River Birch, Red Birch	Tree	1	3	1	1
<i>Cephalanthus occidentalis</i>	Buttonbush	Shrub Tree			3	2
<i>Cornus amomum</i>	Silky Dogwood	Shrub Tree				4
<i>Diospyros virginiana</i>	American Persimmon, Possumwood	Tree		1	1	1
<i>Fraxinus pennsylvanica</i>	Green Ash, Red Ash	Tree	7	5	1	4
<i>Lindera benzoin</i>	Northern Spicebush	Shrub/Tree				
<i>Liriodendron tulipifera</i>	Tulip Poplar	Tree				
<i>Platanus occidentalis</i>	Sycamore, Plane-tree	Tree	5		3	1
<i>Populus deltoides</i>	Cottonwood	Tree	3			
<i>Quercus michauxii</i>	Basket Oak, Swamp Chestnut Oak	Tree		2	4	
<i>Quercus pagoda</i>	Cherrybark Oak, Swamp Spanish Oak	Tree				
<i>Quercus phellos</i>	Willow Oak	Tree		3	2	
	<b>Stem count<sup>2</sup></b>		16	15	15	13
	<b>size (area)</b>		1	1	1	1
	<b>size (ACRES)</b>		0.02	0.02	0.02	0.02
	<b>Species count<sup>2</sup></b>		4	6	7	6
	<b>Stems per Acre<sup>2</sup></b>		648	607	607	526

<sup>1</sup> *Acer negundo* (Box elder) was not an approved species from the project's Final Mitigation Plan (Wildlands, 2018) and was not planted on Site. Those found on the Site are volunteers.

The NC IRT requested for them to be documented when vegetation plot data is collected to evaluate box elder stem densities.

<sup>2</sup> Stem count, species count, and stems per acre are calculated excluding the box elder volunteers.

## **APPENDIX 4. Morphological Summary Data and Plots**

Stream Assessment and Analysis Not Required in Monitoring Year 4  
Data Included from Monitoring Year 3



**Table 10a. Baseline Stream Data Summary**

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 3 - 2022

Parameter	Gage	Pre-Restoration Condition						Design						As-Built/Baseline						
		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	
<b>Dimension and Substrate - Riffle</b>																				
Bankfull Width (ft)	N/A	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 <sup>2</sup> ) <sup>1</sup>		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 <sup>3</sup>		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 <sub>50</sub> (mm)		---		SC		16.0	41.3	---		---		---		24.4		37.5		37.4		51.8
<b>Profile</b>																				
Riffle Length <sup>1</sup> (ft)	N/A																			
Riffle Slope (ft/ft) <sup>1</sup>		---		---		---	---	---	---	0.014	0.036	0.007	0.031	---	---	0.009632	0.04802	0.001911	0.078794	
Pool Length (ft)																				
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 <sup>3</sup> ) <sup>1</sup>																				
<b>Pattern</b>																				
Channel Beltwidth (ft)	N/A							N/A <sup>2</sup>	23	56	23	57	N/A <sup>2</sup>		23	56	23	57		
Radius of Curvature (ft)								N/A <sup>2</sup>	18	27	20	35	N/A <sup>2</sup>		18	27	20	35		
Rc/Bankfull Width								N/A <sup>2</sup>	2.1	3.1	2.3	4.0	N/A <sup>2</sup>		2.1	3.1	2.3	4.0		
Meander Length (ft)								N/A <sup>2</sup>	73	135	93	146	N/A <sup>2</sup>		73	135	93	146		
Meander Width Ratio								N/A <sup>2</sup>	2.7	6.5	2.7	6.5	N/A <sup>2</sup>		2.7	6.5	2.7	6.5		
<b>Substrate, Bed and Transport Parameters</b>																				
Ri%/Ru%/P%/G%/S%	N/A																			
SC%/Sa%/G%/C%/B%/Be%																				
D <sub>16</sub> /D <sub>35</sub> /D <sub>50</sub> /D <sub>84</sub> /D <sub>95</sub> /D <sub>100</sub>		---		SC/SC/SC/36.7/78		SC/10.5/19.7/68.5/		---		---		---		0.1/18.0/35.9/98.3/		SC/0.2/8.0/67.2/		SC/0.3/12.1/81.3/13		
Reach Shear Stress (Competency) lb/ft <sup>2</sup>		---		---		---		---		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 <sup>2</sup>																				
<b>Additional Reach Parameters</b>																				
Drainage Area (SM)	N/A	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)		---		---		---		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 <sup>1</sup> (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 10b. Reference Reach Data Summary**

Deep Meadow Mitigation Site  
 DMS Project No. 97131  
 Monitoring Year 3 - 2022

Parameter	Gage	Reference Reach Data											
		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
<b>Dimension and Substrate - Riffle</b>													
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 <sup>2</sup> )		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		
<b>Profile</b>													
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 <sup>3</sup> )		---		---		---		---		---		---	
<b>Pattern</b>													
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
<b>Substrate, Bed and Transport Parameters</b>													
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 <sup>2</sup>		---		---		---		---		---		---	
Max part size (mm) mobilized at bankfull		---		---		---		---		---		---	
Stream Power (Capacity) W/m <sup>2</sup>	---		---		---		---		---		---		
<b>Additional Reach Parameters</b>													
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 11. Morphology and Hydraulic Summary (Dimensional Parameters - Cross-Section)**

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 3 - 2022

Dimension and Substrate	WF1 Cross-Section 1, Riffle								EF1 Cross-Section 2, Pool								EF1 Cross-Section 3, Riffle							
	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 <sup>1</sup>	485.90	485.96	486.02	486.04	---				491.66	491.66	491.62	491.61	---				491.48	491.52	491.56	491.54	---			
Low Bank Elevation	485.90	485.89	485.97	486.05	---				491.66	491.69	491.62	491.61	---				491.48	491.48	491.62	491.57	---			
Bankfull Width (ft)	9.3	9.0	7.7	9.6	---				11.6	11.4	9.6	10.2	---				10.3	10.2	10.3	10.2	---			
Floodprone Width (ft) <sup>2</sup>	13.3	13.2	13.6	14.5	---				---	---	---	---	---				57.0	57.0	62.6	60.1	---			
Bankfull Mean Depth (ft)	0.4	0.4	0.4	0.4	---				1.0	1.1	1.2	1.0	---				0.5	0.5	0.5	0.5	---			
Bankfull Max Depth (ft)	0.7	0.7	0.7	0.7	---				1.8	2.1	2.1	1.8	---				0.8	0.8	0.9	0.9	---			
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	4.0	3.3	3.4	4.3	---				11.1	12.7	11.8	10.5	---				5.0	4.6	5.6	5.3	---			
Bankfull Width/Depth Ratio	21.3	24.7	17.4	21.6	---				12.1	10.2	7.8	9.9	---				21.3	22.5	19.0	19.6	---			
Bankfull Entrenchment Ratio	1.4	1.5	1.8	1.5	---				---	---	---	---	---				5.5	5.6	6.1	5.9	---			
Bankfull Bank Height Ratio	1.0	0.9	0.9	1.0	---				---	---	---	---	---				1.0	1.0	1.1	1.0	---			
Dimension and Substrate	EF1 Cross-Section 4, Riffle								WF2 Cross-Section 5, Pool								WF2 Cross-Section 6, Riffle							
	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 <sup>1</sup>	487.26	487.20	487.31	487.27	---				485.68	485.68	485.68	485.65	---				485.50	485.63	485.69	485.67	---			
Low Bank Elevation	487.26	487.21	487.28	487.22	---				485.68	485.71	485.68	485.65	---				485.50	485.58	485.58	485.58	---			
Bankfull Width (ft)	13.1	13.1	11.1	11.1	---				11.3	10.5	9.8	9.5	---				9.8	10.6	10.0	9.3	---			
Floodprone Width (ft) <sup>2</sup>	64.9	65.9	64.8	63.4	---				---	---	---	---	---				64.5	63.7	64.9	62.6	---			
Bankfull Mean Depth (ft)	0.6	0.6	0.7	0.7	---				0.9	1.0	1.1	1.0	---				0.7	0.6	0.6	0.7	---			
Bankfull Max Depth (ft)	1.0	1.0	1.1	1.0	---				1.8	2.0	2.0	1.8	---				1.2	1.0	1.0	1.0	---			
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	7.9	8.0	7.6	7.3	---				9.9	10.5	10.6	9.6	---				7.1	6.6	6.1	6.1	---			
Bankfull Width/Depth Ratio	21.9	21.4	16.4	17.0	---				13.0	10.6	9.0	9.3	---				13.6	17.1	16.5	14.1	---			
Bankfull Entrenchment Ratio	4.9	5.0	5.8	5.7	---				---	---	---	---	---				6.6	6.0	6.5	6.8	---			
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0	---				---	---	---	---	---				1.0	0.9	0.9	1.0	---			

<sup>1</sup>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.

<sup>2</sup>Floodprone width is calculated from the width of cross-section but valley width may extend further.

**Table 12a. Monitoring Data - Stream Reach Data Summary**

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 3 - 2022

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
<b>Dimension and Substrate - Riffle<sup>2</sup></b>																
Bankfull Width (ft)	9.3		9.0		7.7		9.6		---							
Floodprone Width (ft)	13.3		13.2		13.6		14.5		---							
Bankfull Mean Depth (ft)	0.4		0.4		0.4		0.4		---							
Bankfull Max Depth (ft)	0.7		0.7		0.7		0.7		---							
Bankfull Cross-sectional Area (ft <sup>2</sup> )	4.0		3.3		3.4		4.3		---							
Width/Depth Ratio	21.3		24.7		17.4		21.6		---							
Entrenchment Ratio	1.4		1.5		1.8		1.5		---							
Bank Height Ratio	1.0		0.9		0.9		1.0		---							
D <sub>50</sub> (mm)	24.4															
<b>Profile</b>																
Riffle Length (ft)																
Riffle Slope (ft/ft)	---	---														
Pool Length (ft)																
Pool Max Depth (ft)		---														
Pool Spacing (ft)	---	---														
Pool Volume (ft <sup>3</sup> )																
<b>Pattern</b>																
Channel Beltwidth (ft)	N/A <sup>1</sup>															
Radius of Curvature (ft)	N/A <sup>1</sup>															
Rc/Bankfull Width (ft/ft)	N/A <sup>1</sup>															
Meander Length (ft)	N/A <sup>1</sup>															
Meander Width Ratio	N/A <sup>1</sup>															
<b>Substrate, Bed and Transport Parameters</b>																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
D <sub>16</sub> /D <sub>35</sub> /D <sub>50</sub> /D <sub>84</sub> /D <sub>95</sub> /D <sub>100</sub>	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 <sup>2</sup>	0.68															
Max part size (mm) mobilized at bankfull	---															
Stream Power (Capacity) W/m <sup>2</sup>																
<b>Additional Reach Parameters</b>																
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															

<sup>1</sup>Pattern data is not applicable for A-type and B-type channels

<sup>2</sup>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

**Table 12b. Monitoring Data - Stream Reach Data Summary**

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 3 - 2022

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
<b>Dimension and Substrate - Riffle<sup>1</sup></b>																
Bankfull Width (ft)	10.3	13.1	10.2	13.1	10.3	11.1	10.2	11.1	---							
Floodprone Width (ft)	57.0	64.9	57.0	65.9	62.6	64.8	60.1	63.4	---							
Bankfull Mean Depth (ft)	0.5	0.6	0.5	0.6	0.5	0.7	0.5	0.7	---							
Bankfull Max Depth (ft)	0.8	1.0	0.8	1.0	0.9	1.1	0.9	1.0	---							
Bankfull Cross-sectional Area (ft <sup>2</sup> )	5.0	7.9	4.6	8.0	5.6	7.6	5.3	7.3	---							
Width/Depth Ratio	21.3	21.9	21.4	22.5	16.4	19.0	17.0	19.6	---							
Entrenchment Ratio	4.9	5.5	5.0	5.6	5.8	6.1	5.7	5.9	---							
Bank Height Ratio	1.0		1.0		1.0	1.1	1.0		---							
D <sub>50</sub> (mm)	37.4	51.8														
<b>Profile</b>																
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 <sup>3</sup> )																
<b>Pattern</b>																
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														
<b>Substrate, Bed and Transport Parameters</b>																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
D <sub>16</sub> /D <sub>35</sub> /D <sub>50</sub> /D <sub>84</sub> /D <sub>95</sub> /D <sub>100</sub>	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 <sup>2</sup>	0.24	0.29														
Max part size (mm) mobilized at bankfull	---															
Stream Power (Capacity) W/m <sup>2</sup>																
<b>Additional Reach Parameters</b>																
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															

<sup>1</sup>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 12c. Monitoring Data - Stream Reach Data Summary**

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 3 - 2022

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	
<b>Dimension and Substrate - Riffle<sup>1</sup></b>																	
Bankfull Width (ft)	9.8		10.6		10.0		9.3		---								
Floodprone Width (ft)	64.5		63.7		64.9		62.6		---								
Bankfull Mean Depth (ft)	0.7		0.6		0.6		0.7		---								
Bankfull Max Depth (ft)	1.2		1.0		1.0		1.0		---								
Bankfull Cross-sectional Area (ft <sup>2</sup> )	7.1		6.6		6.1		6.1		---								
Width/Depth Ratio	13.6		17.1		16.5		14.1		---								
Entrenchment Ratio	6.6		6.0		6.5		6.8		---								
Bank Height Ratio	1.0		0.9		0.9		1.0		---								
D <sub>50</sub> (mm)	37.5																
<b>Profile</b>																	
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 <sup>3</sup> )																	
<b>Pattern</b>																	
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															
<b>Substrate, Bed and Transport Parameters</b>																	
Ri%/Ru%/P%/G%/S%																	
SC%/Sa%/G%/C%/B%/Be%																	
D <sub>16</sub> /D <sub>35</sub> /D <sub>50</sub> /D <sub>84</sub> /D <sub>95</sub> /D <sub>100</sub>	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 <sup>2</sup>	0.59																
Max part size (mm) mobilized at bankfull	---																
Stream Power (Capacity) W/m <sup>2</sup>																	
<b>Additional Reach Parameters</b>																	
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																

<sup>1</sup>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

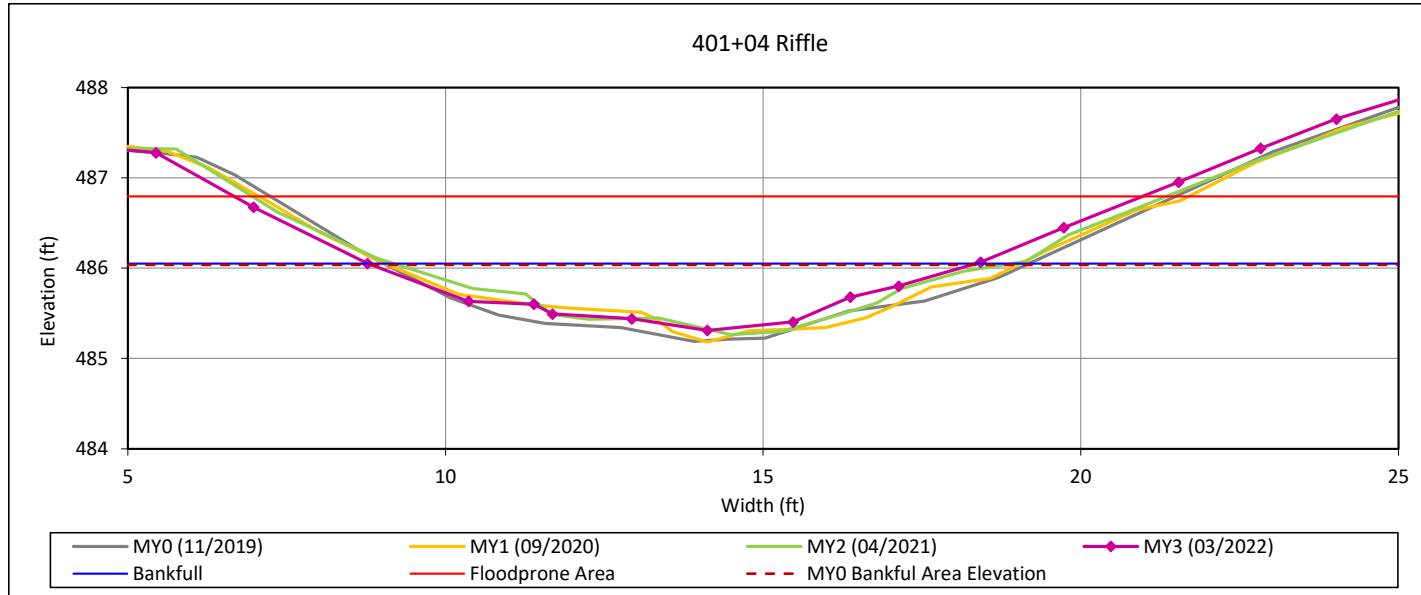
### Cross-Section Plots

Deep Meadow Mitigation Site

NCDMS Project No. 97131

Monitoring Year 3 - 2022

#### Cross-Section 1 - WF1



#### Bankfull Dimensions

4.3	x-section area (ft.sq.)
9.6	width (ft)
0.4	mean depth (ft)
0.7	max depth (ft)
9.8	wetted perimeter (ft)
0.4	hydraulic radius (ft)
21.6	width-depth ratio
14.5	W flood prone area (ft)
1.5	entrenchment ratio
1.0	low bank height ratio

Survey Date: 03/2022

Field Crew: Wildlands Engineering



View Downstream

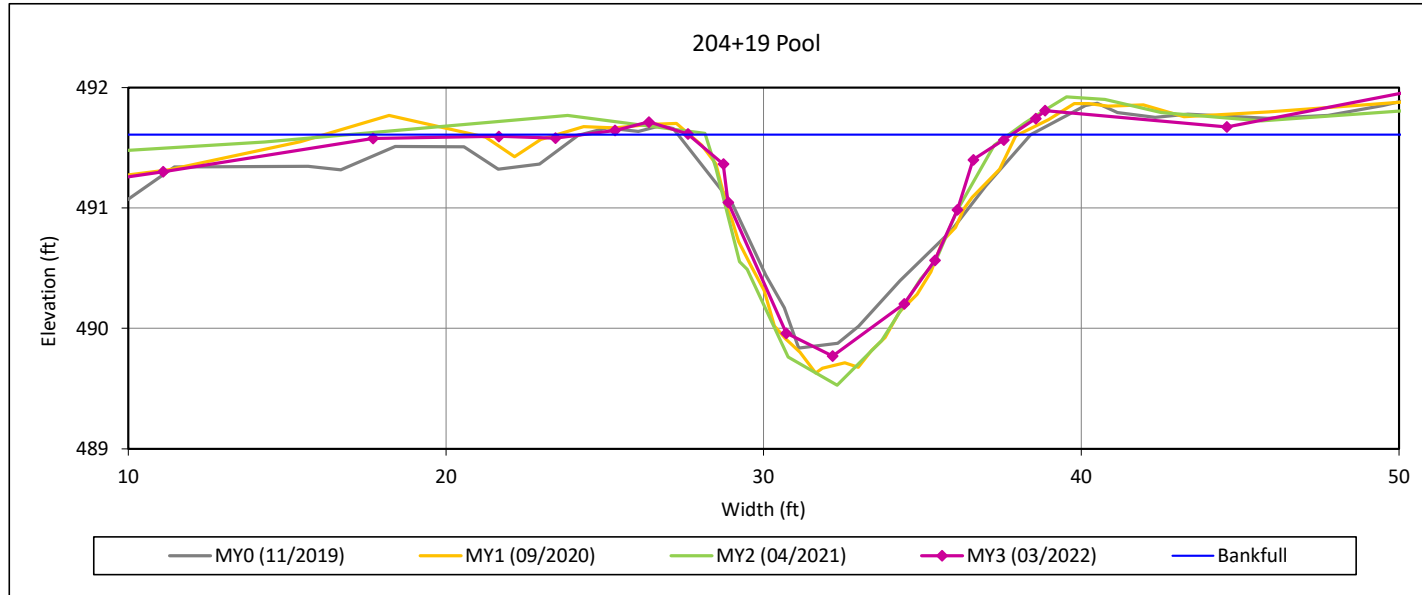
### Cross-Section Plots

Deep Meadow Mitigation Site

NCDMS Project No. 97131

Monitoring Year 3 - 2022

#### Cross-Section 2 - EF1



#### Bankfull Dimensions

10.5	x-section area (ft.sq.)
10.2	width (ft)
1.0	mean depth (ft)
1.8	max depth (ft)
11.1	wetted perimeter (ft)
0.9	hydraulic radius (ft)
9.9	width-depth ratio

Survey Date: 03/2022  
Field Crew: Wildlands Engineering



View Downstream



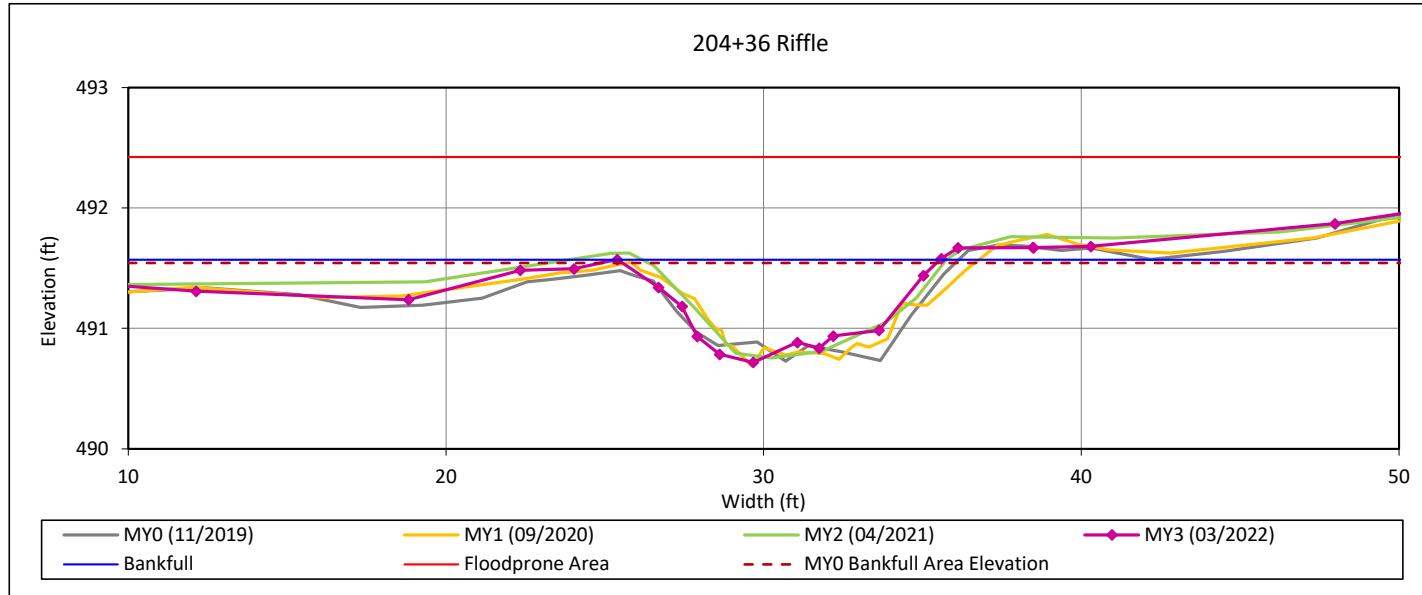
### Cross-Section Plots

Deep Meadow Mitigation Site

NCDMS Project No. 97131

Monitoring Year 3 - 2022

#### Cross-Section 3 - EF1



#### Bankfull Dimensions

5.3	x-section area (ft.sq.)
10.2	width (ft)
0.5	mean depth (ft)
0.9	max depth (ft)
10.4	wetted perimeter (ft)
0.5	hydraulic radius (ft)
19.6	width-depth ratio
60.1	W flood prone area (ft)
5.9	entrenchment ratio
1.0	low bank height ratio

Survey Date: 03/2022

Field Crew: Wildlands Engineering



View Downstream

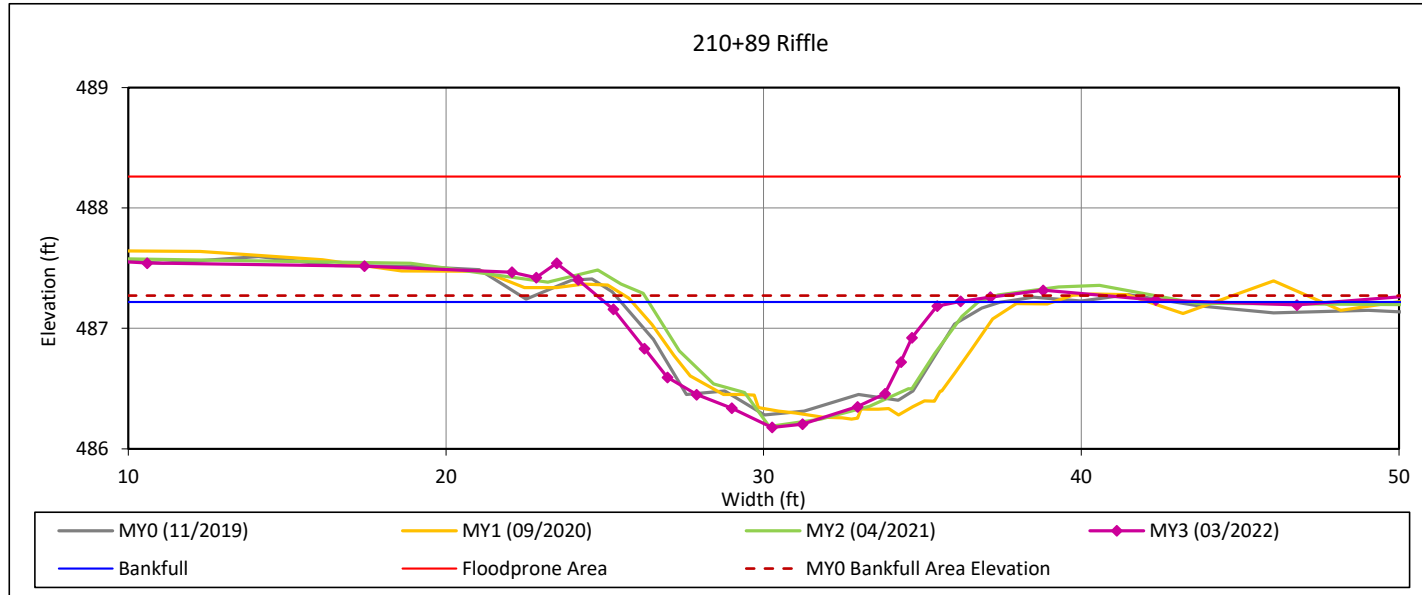
### Cross-Section Plots

Deep Meadow Mitigation Site

NCDMS Project No. 97131

Monitoring Year 3 - 2022

#### Cross-Section 4 - EF1



#### Bankfull Dimensions

7.3	x-section area (ft.sq.)
11.1	width (ft)
0.7	mean depth (ft)
1.0	max depth (ft)
11.4	wetted perimeter (ft)
0.6	hydraulic radius (ft)
17.0	width-depth ratio
63.4	W flood prone area (ft)
5.7	entrenchment ratio
1.0	low bank height ratio

Survey Date: 03/2022

Field Crew: Wildlands Engineering



View Downstream

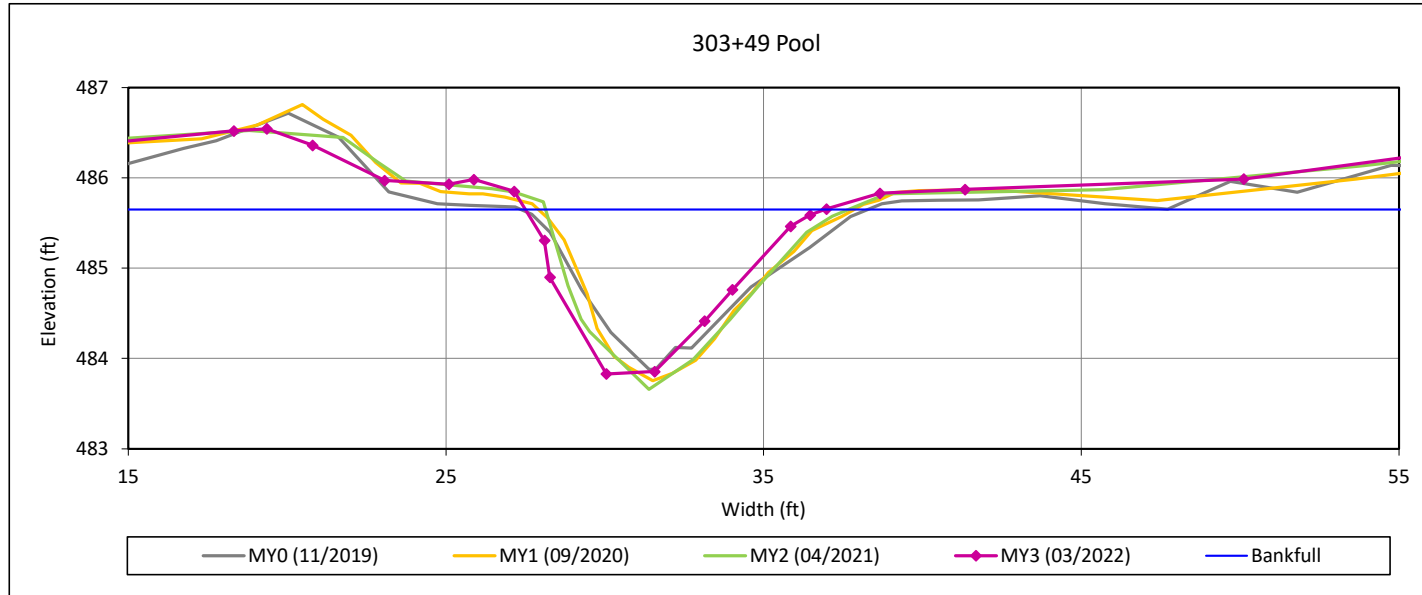
### Cross-Section Plots

Deep Meadow Mitigation Site

NCDMS Project No. 97131

Monitoring Year 3 - 2022

#### Cross-Section 5 - WF2



#### Bankfull Dimensions

9.6	x-section area (ft.sq.)
9.5	width (ft)
1.0	mean depth (ft)
1.8	max depth (ft)
10.4	wetted perimeter (ft)
0.9	hydraulic radius (ft)
9.3	width-depth ratio

Survey Date: 03/2022  
Field Crew: Wildlands Engineering



View Downstream

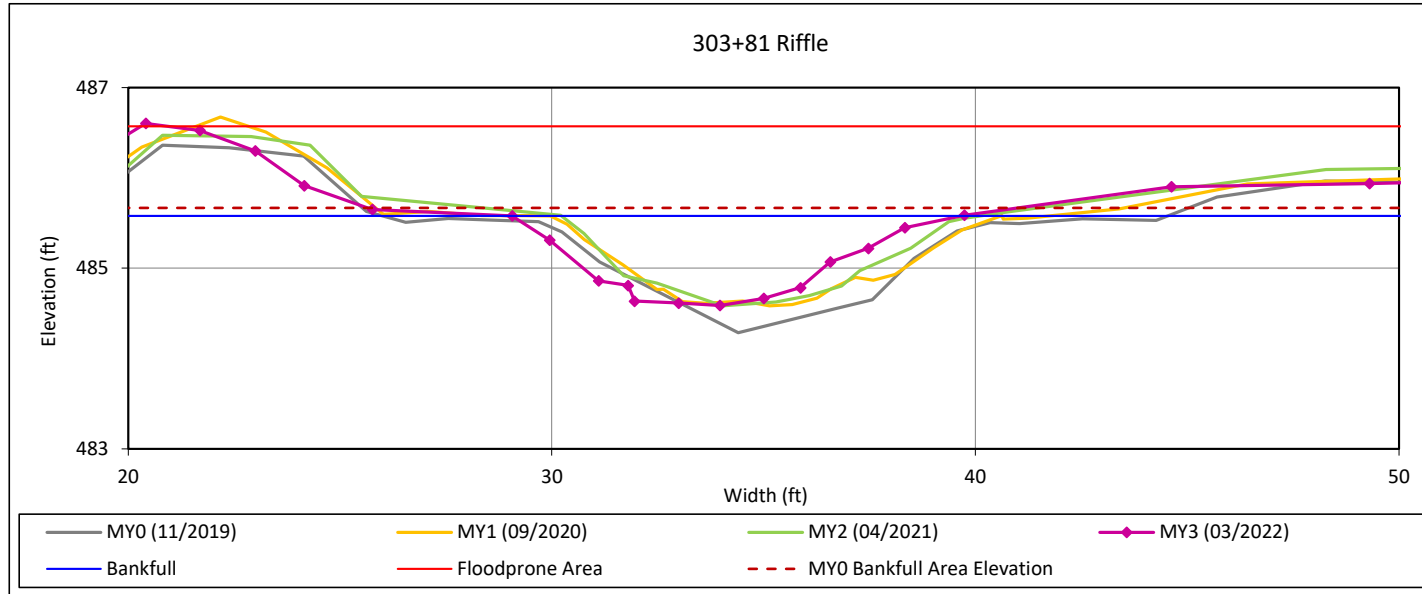
### Cross-Section Plots

Deep Meadow Mitigation Site

NCDMS Project No. 97131

Monitoring Year 3 - 2022

#### Cross-Section 6 - WF2



#### Bankfull Dimensions

6.1	x-section area (ft.sq.)
9.3	width (ft)
0.7	mean depth (ft)
1.0	max depth (ft)
9.6	wetted perimeter (ft)
0.6	hydraulic radius (ft)
14.1	width-depth ratio
62.6	W flood prone area (ft)
6.8	entrenchment ratio
1.0	low bank height ratio

Survey Date: 03/2022

Field Crew: Wildlands Engineering



View Downstream

## **APPENDIX 5. Hydrology Summary Data and Plots**

**Table 13a. Verification of Bankfull Events**

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 4 - 2023

Bankfull Events - Monitoring Years 1-4				
Reach	MY	Date of Occurrence	Date of Data Collection	Method
WF1	MY1	11/12/2020	11/13/2020	Photographic Documentation
	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		
	MY3	1/2/2022	1/2/2022	
		1/16/2022	1/16/2022	
		1/29/2022 - 1/31/2022	1/29/2022 - 1/31/2022	
		2/4/2022	2/4/2022	
		3/12/2022	3/12/2022	
		3/16/2022	3/16/2022	
		3/31/2022	3/31/2022	
		4/5/2022	4/5/2022	
		4/18/2022	4/18/2022	
		7/9/2022	7/9/2022	
	9/9/2022	9/9/2022		
	9/30/2022	9/30/2022		
	2/6/2020	2/6/2020		
	MY4	1/4/2023	1/4/2023	
		1/23/2023	1/23/2023	
		1/25/2023	1/25/2023	
		2/3/2023	2/3/2023	
		2/12/2023	2/12/2023	
		3/27/2023	3/27/2023	
		4/7/2023	4/7/2023	
6/21/2023		6/21/2023		
8/28/2023	8/28/2023			
9/10/2023	9/10/2023			
EF1	MY1	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	
	MY2	No bankfull events recorded	No bankfull events recorded	
	MY3	1/3/2022	1/3/2022	
		3/12/2022	3/12/2022	
	MY4	4/18/2022	4/18/2022	
		1/25/2023	1/25/2023	
		2/12/2023	2/12/2023	
4/8/2023		4/8/2023		
		9/10/2023	9/10/2023	

**Table 13b. Verification of Bankfull Events**

Deep Meadow Mitigation Site

DMS Project No. 97131

**Monitoring Year 4 - 2023**

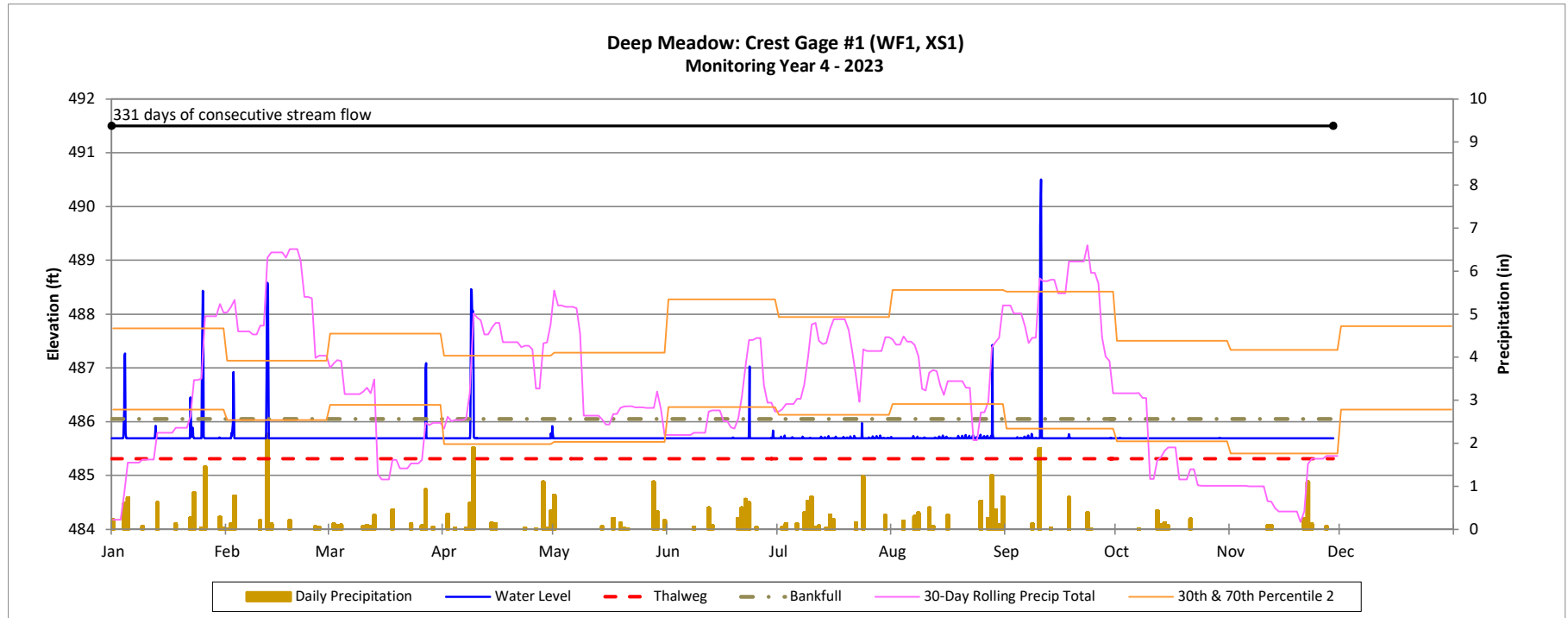
Bankfull Events - Monitoring Years 1-4				
Reach	MY	Date of Occurrence	Date of Data Collection	Method
WF2	MY1	1/25/2020	1/25/2020	Crest Gage
		2/6/2020	2/6/2020	
		4/13/2020	4/13/2020	
		5/21/2020	5/21/2020	
		5/27/2020	5/27/2020	
		8/9/2020	8/9/2020	
		8/15/2020	8/15/2020	
		10/11/2020	10/11/2020	
		10/30/2020	10/30/2020	
	11/12/2020	11/13/2020		
	MY2	2/16/2021	2/16/2021	Crest Gage and Photographs
	MY3	1/3/2022	1/3/2022	
	MY4	1/25/2023	1/25/2023	Crest Gage
		2/12/2023	2/12/2023	
4/8/2023		4/8/2023		
9/10/2023		9/10/2023		

### Recorded Bankfull Events Plot

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 4 - 2023



Annual daily precipitation data downloaded from the AgACIS Station - Monroe 2 SE from January 1 - November 29, 2023 was used because the on-site rain gage malfunctioned (NOAA, 2023). 30th and 70th percentile rainfall data downloaded from WETS data (1992 - 2022) - Monroe 2 SE (NOAA, 2023).

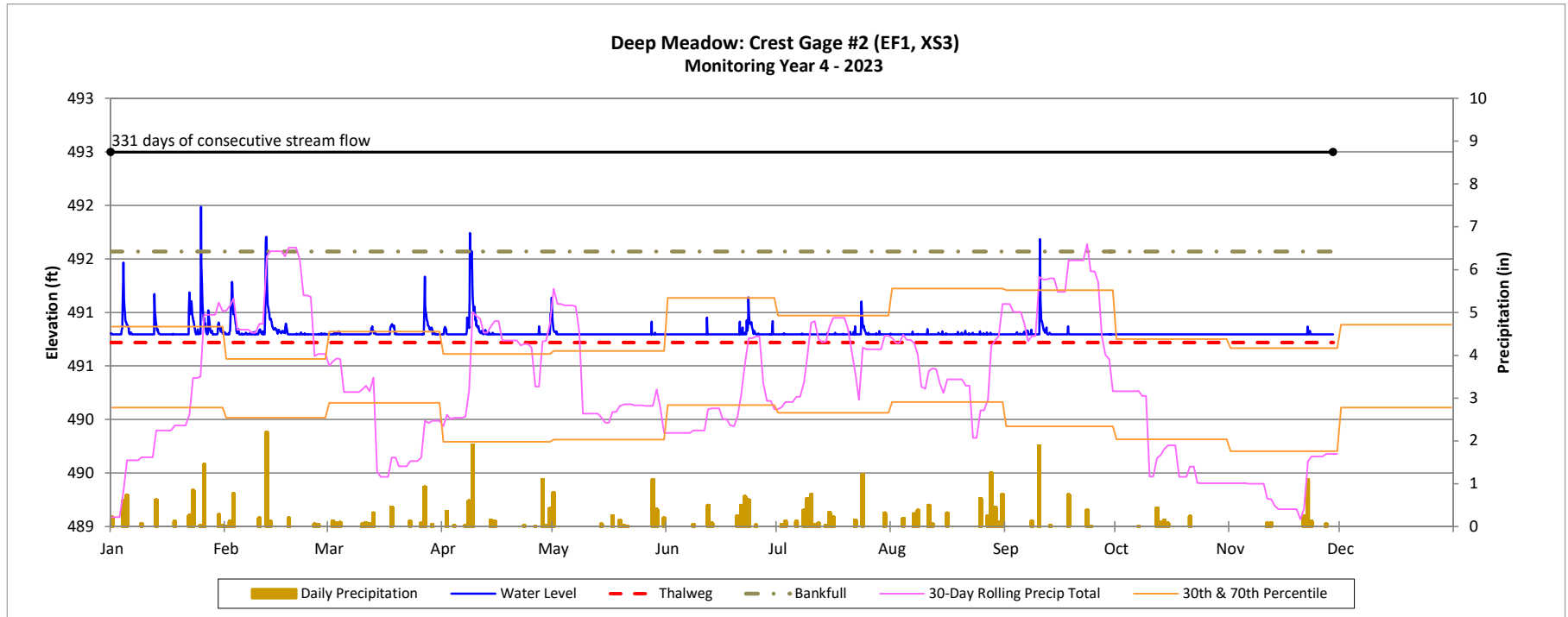


### Recorded Bankfull Events Plot

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 4 - 2023



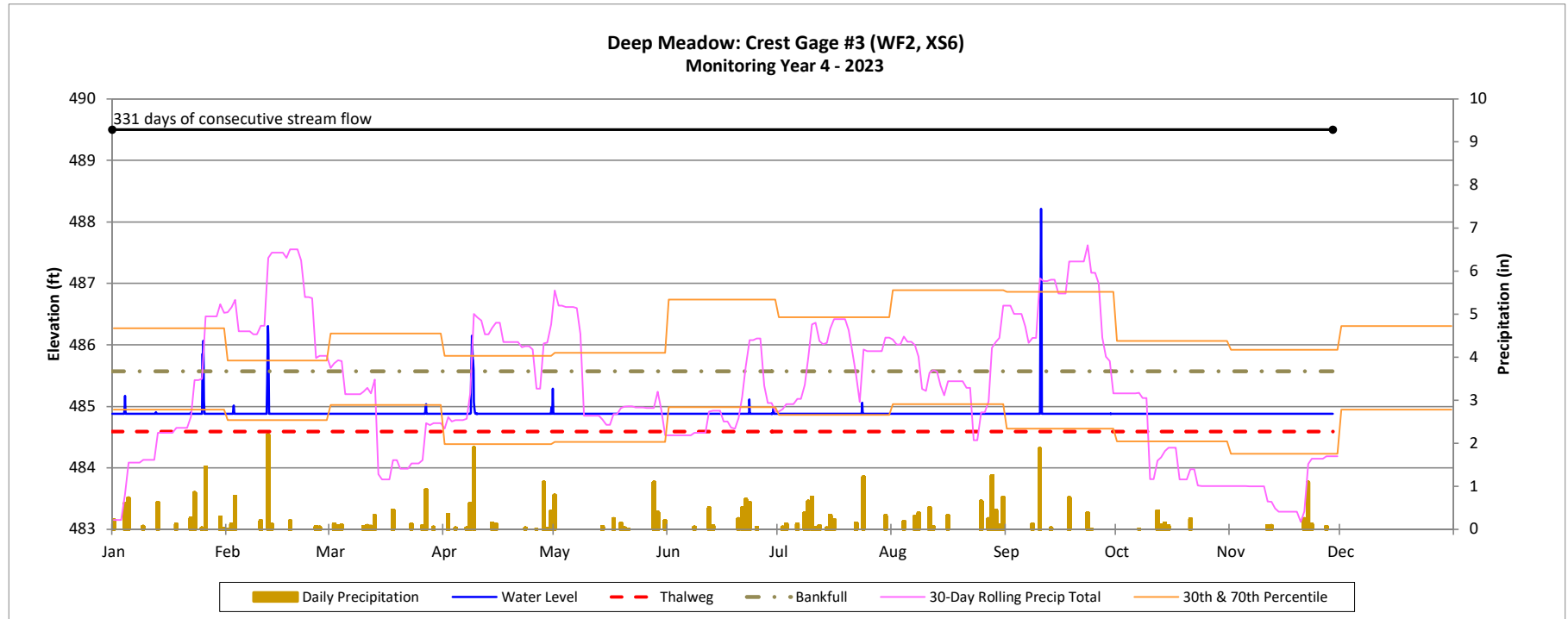
Annual daily precipitation data downloaded from the AgACIS Station - Monroe 2 SE from January 1 - November 29, 2023 was used because the on-site rain gage malfunctioned (NOAA, 2023). 30th and 70th percentile rainfall data downloaded from WETS data (1992 - 2022) - Monroe 2 SE (NOAA, 2023).

### Recorded Bankfull Events Plot

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 4 - 2023



Annual daily precipitation data downloaded from the AgACIS Station - Monroe 2 SE from January 1 - November 29, 2023 was used because the on-site rain gage malfunctioned (NOAA, 2023). 30th and 70th percentile rainfall data downloaded from WETS data (1992 - 2022) - Monroe 2 SE (NOAA, 2023).

**Table 14. Wetland Gage Attainment Summary**

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 4 - 2023

Summary of Groundwater Gage Results - Monitoring Years 1-7									
Groundwater Gage	Max Consecutive Days During Growing Season (Percentage) <sup>1</sup>						MY5	MY6	MY7
	MY1 - Original Growing Season <sup>2</sup>	MY2 - Original Growing Season <sup>2</sup>	MY3 - Original Growing Season <sup>2</sup>	MY3 - Revised Growing Season <sup>3</sup>	MY4 - Original Growing Season <sup>2</sup>	MY4 - Revised Growing Season <sup>3</sup>			
1	111 days (48.5%)	30 days (13.1%)	70 days (29.0%)	80 days (29.3%)	53 days (23.1%)	76 days (27.8%)			
2	58 days (25.3%)	13 days (5.7%)	17 days (7.1%)	27 days (9.9%)	26 days (11.4%)	36 days (13.2%)			
3	25 days (10.9%)	10 days (4.4%)	16 days (6.6%)	18 days (6.6%)	10 days (4.4%)	10 days (3.7%)			
3a	N/A	N/A	18 days (7.5%)	20 days (7.3%)	9 days (3.9%)	9 days (3.3%)			
4	63 days (27.5%)	11 days (4.8%)	19 days (7.9%)	21 days (7.7%)	10 days (4.4%)	10 days (3.7%)			
4a	N/A	N/A	N/A	N/A	31 days (13.5%)	54 days (19.8%)			
5	229 days (100%)	42 days (18.3%)	91 days (37.8%)	101 days (37.0%)	52 days (22.7%)	75 days (27.5%)			
6	51 days (22.3%)	12 days (5.2%)	18 days (7.5%)	20 days (7.3%)	15 days (6.6%)	38 days (13.9%)			
7	58 days (25.3%)	14 days (6.1%)	16 days (6.6%)	18 days (6.6%)	25 days (10.9%)	48 days (17.6%)			
8	51 days (22.3%)	11 days (4.8%)	15 days (6.2%)	17 days (6.2%)	10 days (4.4%)	10 days (3.7%)			
9	27 days (11.8%)	2 days (0.9%)	10 days (4.1%)	12 days (4.4%)	3 days (1.3%)	3 days (1.1%)			
10	26 days (11.4%)	7 days (3.1%)	14 days (5.8%)	16 days (5.9%)	8 days (3.5%)	8 days (2.9%)			
11	20 days (8.7%)	11 days (4.8%)	15 days (4.4%)	17 days (6.2%)	10 days (4.4%)	10 days (3.7%)			
11a	N/A	N/A	17 days (7.1%)	19 days (7.0%)	10 days (4.4%)	10 days (3.7%)			
12a	N/A	N/A	N/A	N/A	8 days (3.5%)	8 days (2.9%)			
13a	N/A	N/A	N/A	N/A	28 days (12.2%)	51 days (18.7%)			
13b	N/A	N/A	N/A	N/A	28 days (12.2%)	51 days (18.7%)			
Reference	49 days (21.4%)	26 days (11.4%)	49 days (20.3%)	59 days (21.6%)	32 days (14.0%)	54 days (19.85)			

<sup>1</sup> The wetland hydrology success criteria is free groundwater within 12 inches of the ground's surface for 10% of the growing season.

<sup>2</sup> The original growing season defined in the Mitigation Plan (Wildlands, 2018) is March 23rd to November 6th. Therefore, the original success criteria is 23 consecutive days of the original growing season.

<sup>3</sup> In MY3, the growing season was revised to March 1st to November 28th. Therefore, the revised success criteria is 28 consecutive days of the revised growing season.

**Table 15. Wetland Gage Attainment Criteria Comparison**

Deep Meadow Mitigation Site

DMS Project No. 97131

**Monitoring Year 4 - 2023**

Criteria Comparison - MY4				
Groundwater Gage	Most Consecutive Days Meeting Criteria	Percent Consecutive Days in Growing Season	Total Days Meeting Criteria	Percent Cumulative Days in Growing Season
1	76	27.8%	120.0	44.0%
2	36	13.2%	54.0	19.8%
3	10	3.7%	35.0	12.8%
3a	9	3.3%	31.0	11.4%
4	10	3.7%	43.0	15.8%
4a	54	19.8%	71.0	26.0%
5	75	27.5%	109.0	39.9%
6	38	13.9%	51.0	18.7%
7	48	17.6%	52.0	19.0%
8	10	3.7%	40.0	14.7%
9	3	1.1%	7	2.6%
10	8	2.9%	17	6.2%
11	10	3.7%	34.0	12.5%
11a	10	3.7%	40.0	14.7%
12a	8	2.9%	22	8.1%
13a	51	18.7%	60.0	22.0%
13b	51	18.7%	64.0	23.4%
Reference	54	19.8%	62.0	22.7%

The wetland hydrology success criteria defined by the Mitigation Plan (Wildlands, 2018) is free groundwater within 12 inches of the ground's surface for 10% of the revised growing season from March 1 to November 28 or 28 days.

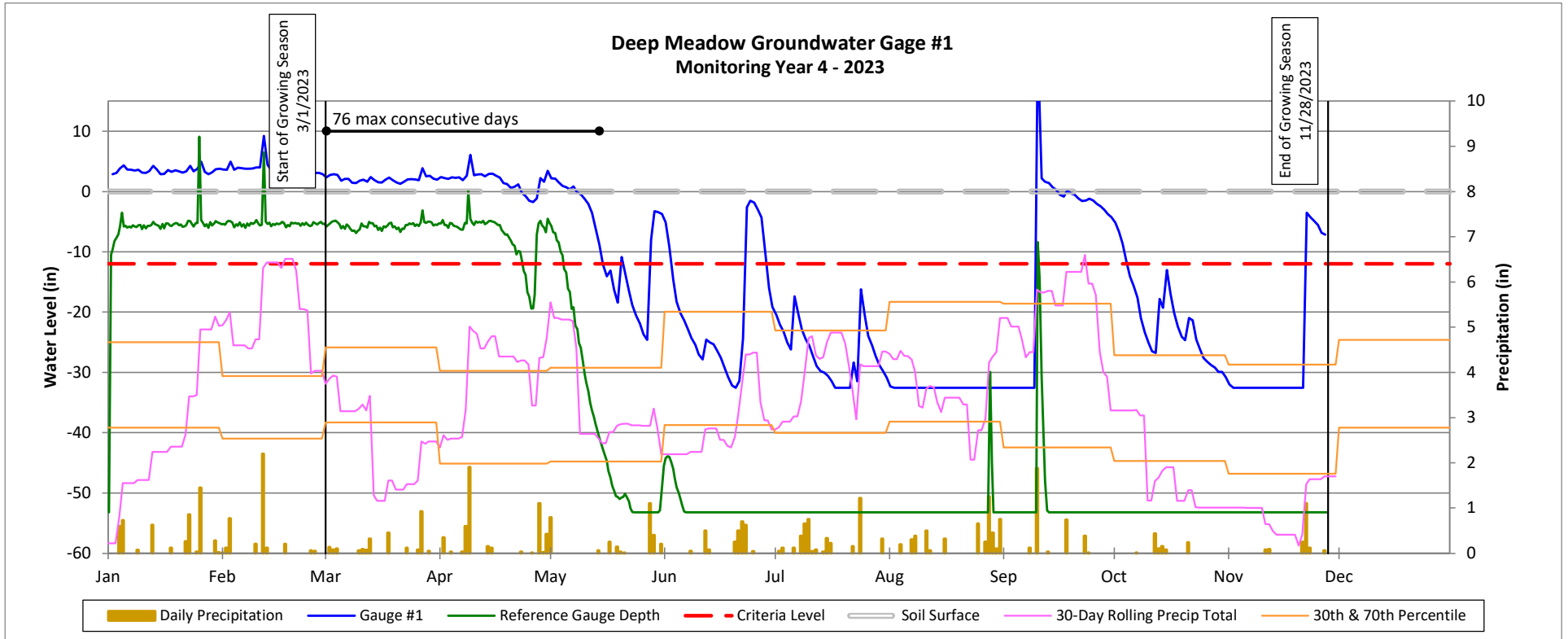
## Groundwater Gage Plot

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 4 - 2023

Wetland W-E10



The wetland hydrology success criteria is defined in the Mitigation Plan (Wildlands, 2018) as free groundwater within 12 inches of the ground's surface for 10% of the revised growing season (28 days). Annual daily precipitation data downloaded from the AgACIS Station - Monroe 2 SE from January 1 - November 29, 2023 was used because the on-site rain gage malfunctioned (NOAA, 2023). 30th and 70th percentile precipitation data downloaded from WETS NC - CRONOS Station 315771 - Monroe 2 SE (NOAA, 2023).

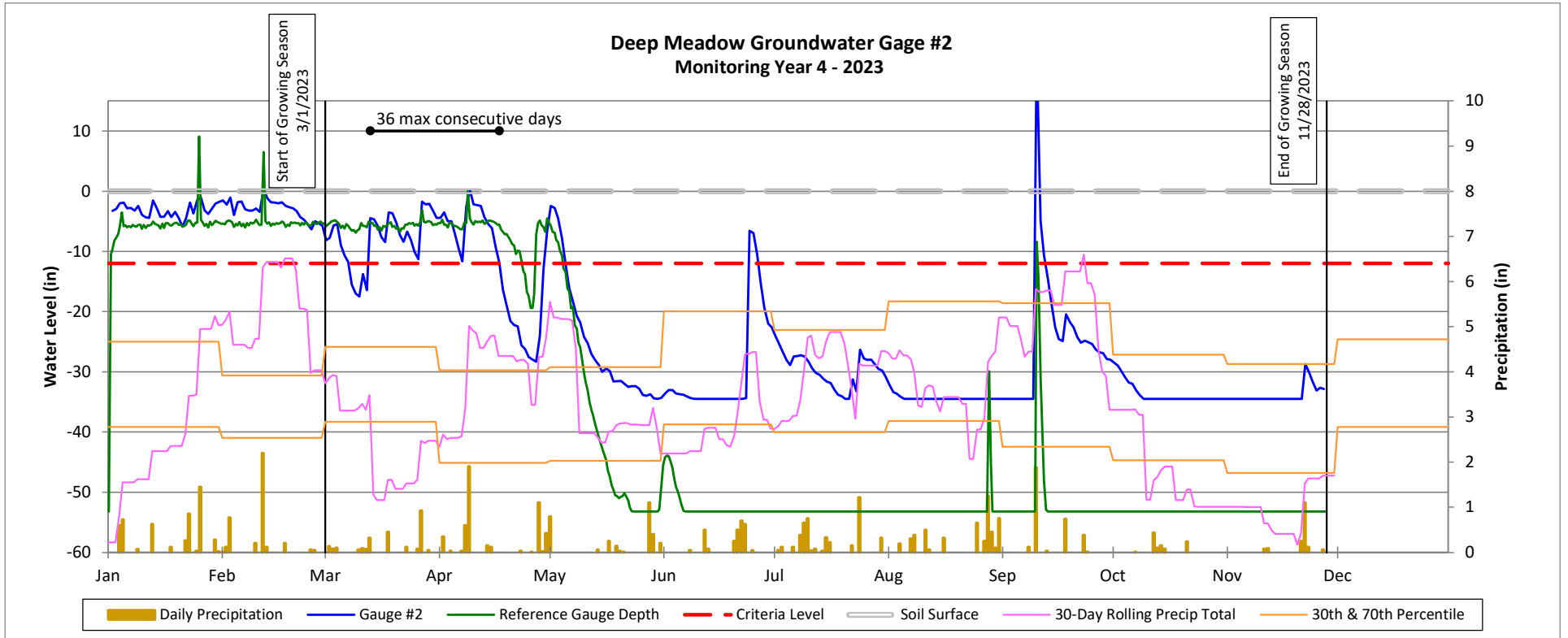
## Groundwater Gage Plot

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 4 - 2023

Wetland W-E9



The wetland hydrology success criteria is defined in the Mitigation Plan (Wildlands, 2018) as free groundwater within 12 inches of the ground's surface for 10% of the revised growing season (28 days). Annual daily precipitation data downloaded from the AgACIS Station - Monroe 2 SE from January 1 - November 29, 2023 was used because the on-site rain gage malfunctioned (NOAA, 2023). 30th and 70th percentile precipitation data downloaded from WETS NC - CRONOS Station 315771 - Monroe 2 SE (NOAA, 2023).

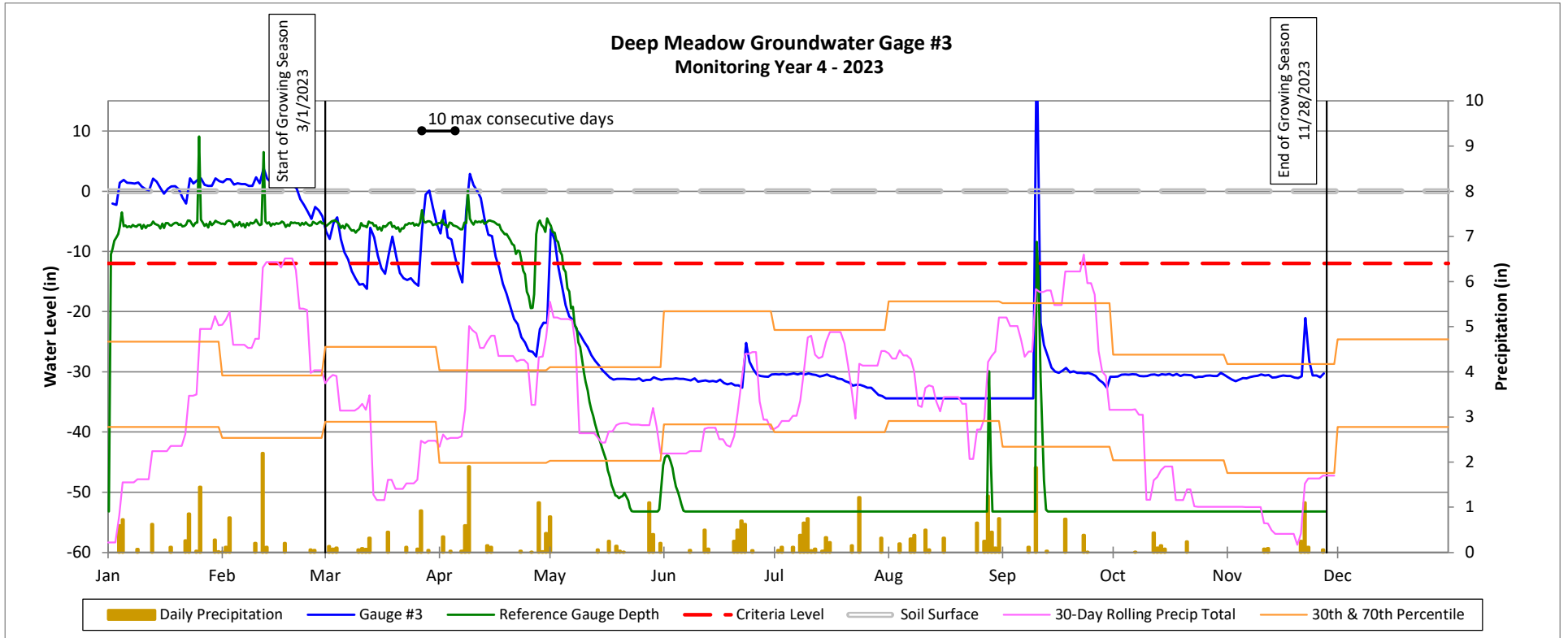
## Groundwater Gage Plot

Deep Meadow Mitigation Site

DMS Project No. 97131

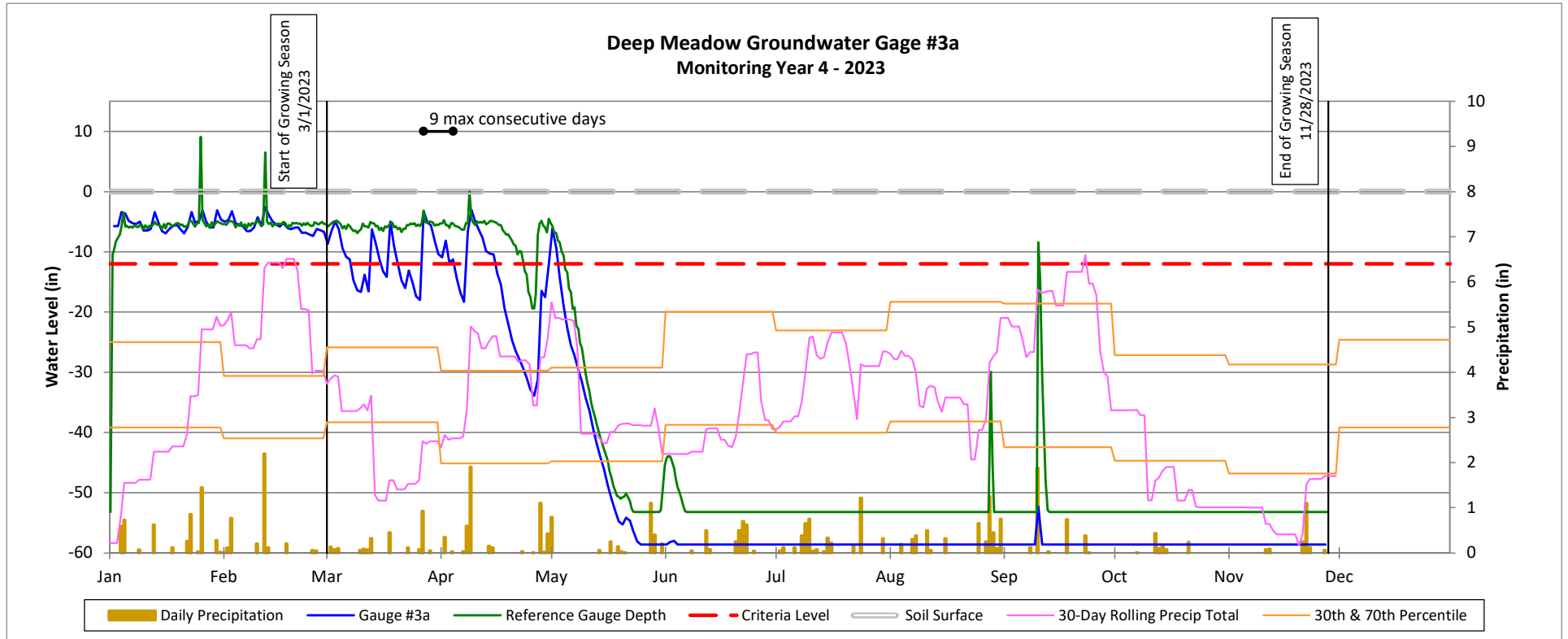
Monitoring Year 4 - 2023

Wetland W-E8



The wetland hydrology success criteria is defined in the Mitigation Plan (Wildlands, 2018) as free groundwater within 12 inches of the ground's surface for 10% of the revised growing season (28 days). Annual daily precipitation data downloaded from the AgACIS Station - Monroe 2 SE from January 1 - November 29, 2023 was used because the on-site rain gage malfunctioned (NOAA, 2023). 30th and 70th percentile precipitation data downloaded from WETS NC - CRONOS Station 315771 - Monroe 2 SE (NOAA, 2023).

Deep Meadow Mitigation Site  
 DMS Project No. 97131  
**Monitoring Year 4 - 2023**  
 Wetland W-E8



The wetland hydrology success criteria is defined in the Mitgation Plan (Wildlands, 2018) as free groundwater within 12 inches of the ground's surface for 10% of the revised growing season (28 days). Annual daily precipitation data downloaded from the AgACIS Station - Monroe 2 SE from January 1 - November 29, 2023 was used because the on-site rain gage malfunctioned (NOAA, 2023). 30th and 70th percentile precipitation data downloaded from WETS NC - CRONOS Station 315771 - Monroe 2 SE (NOAA, 2023).



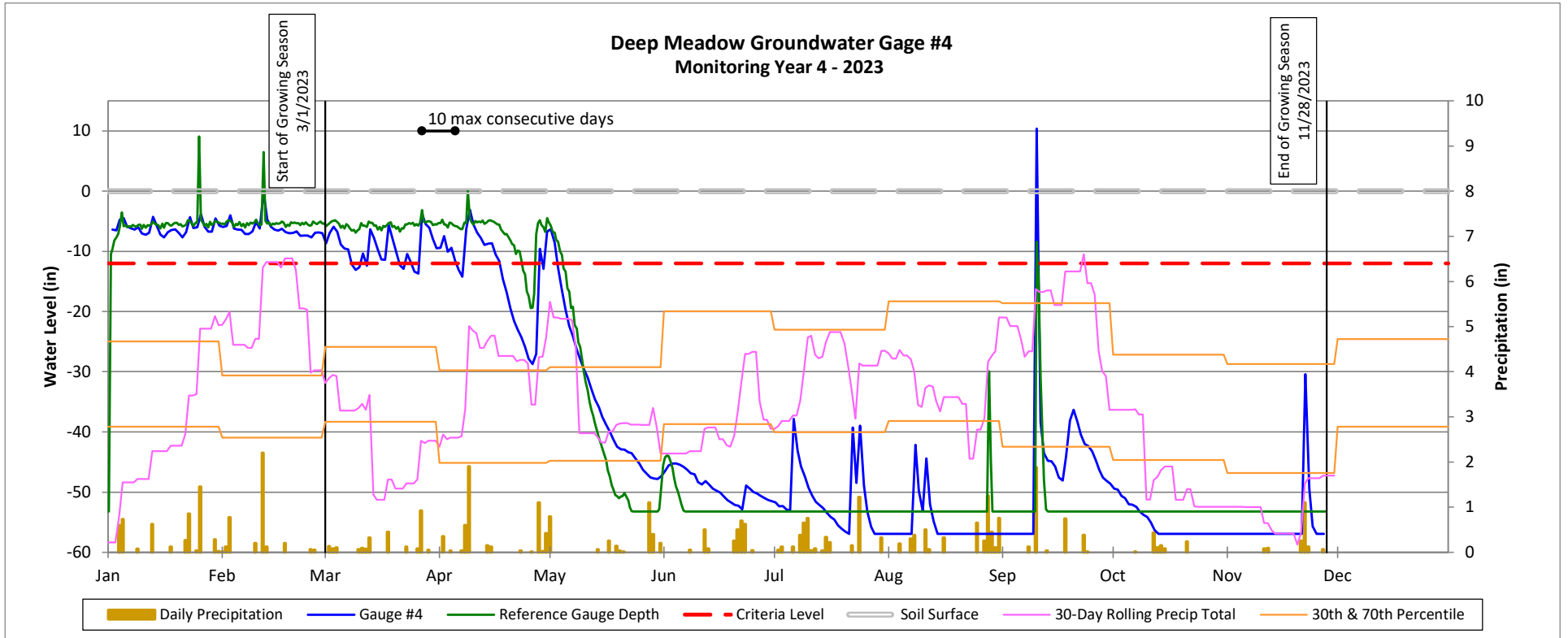
## Groundwater Gage Plot

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 4 - 2023

Wetland W-E7



The wetland hydrology success criteria is defined in the Mitigation Plan (Wildlands, 2018) as free groundwater within 12 inches of the ground's surface for 10% of the revised growing season (28 days). Annual daily precipitation data downloaded from the AgACIS Station - Monroe 2 SE from January 1 - November 29, 2023 was used because the on-site rain gage malfunctioned (NOAA, 2023). 30th and 70th percentile precipitation data downloaded from WETS NC - CRONOS Station 315771 - Monroe 2 SE (NOAA, 2023).

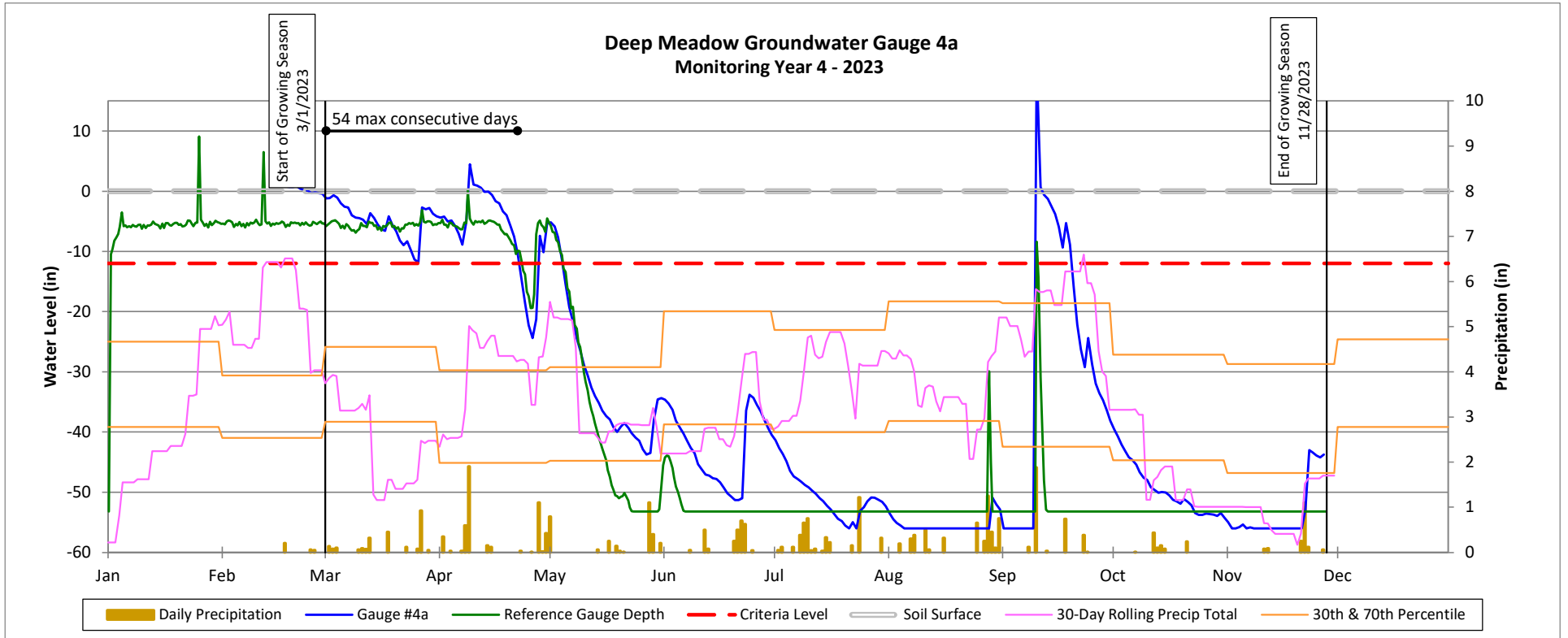
## Groundwater Gage Plot

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 4 - 2023

Wetland W-E7



The wetland hydrology success criteria is defined in the Mitigation Plan (Wildlands, 2018) as free groundwater within 12 inches of the ground's surface for 10% of the revised growing season (28 days). Annual daily precipitation data downloaded from the AgACIS Station - Monroe 2 SE from January 1 - November 29, 2023 was used because the on-site rain gage malfunctioned (NOAA, 2023). 30th and 70th percentile precipitation data downloaded from WETS NC - CRONOS Station 315771 - Monroe 2 SE (NOAA, 2023).

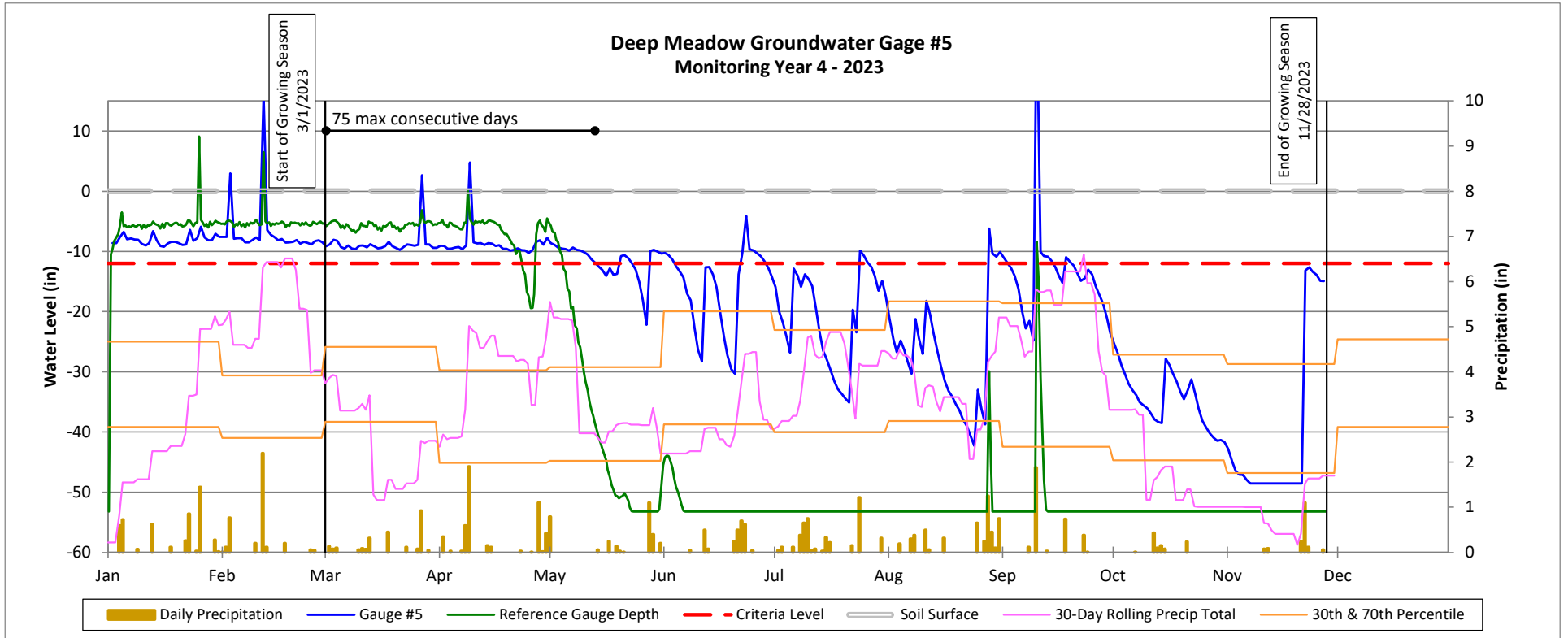
## Groundwater Gage Plot

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 4 - 2023

Wetland W-E1



The wetland hydrology success criteria is defined in the Mitigation Plan (Wildlands, 2018) as free groundwater within 12 inches of the ground's surface for 10% of the revised growing season (28 days). Annual daily precipitation data downloaded from the AgACIS Station - Monroe 2 SE from January 1 - November 29, 2023 was used because the on-site rain gage malfunctioned (NOAA, 2023). 30th and 70th percentile precipitation data downloaded from WETS NC - CRONOS Station 315771 - Monroe 2 SE (NOAA, 2023).

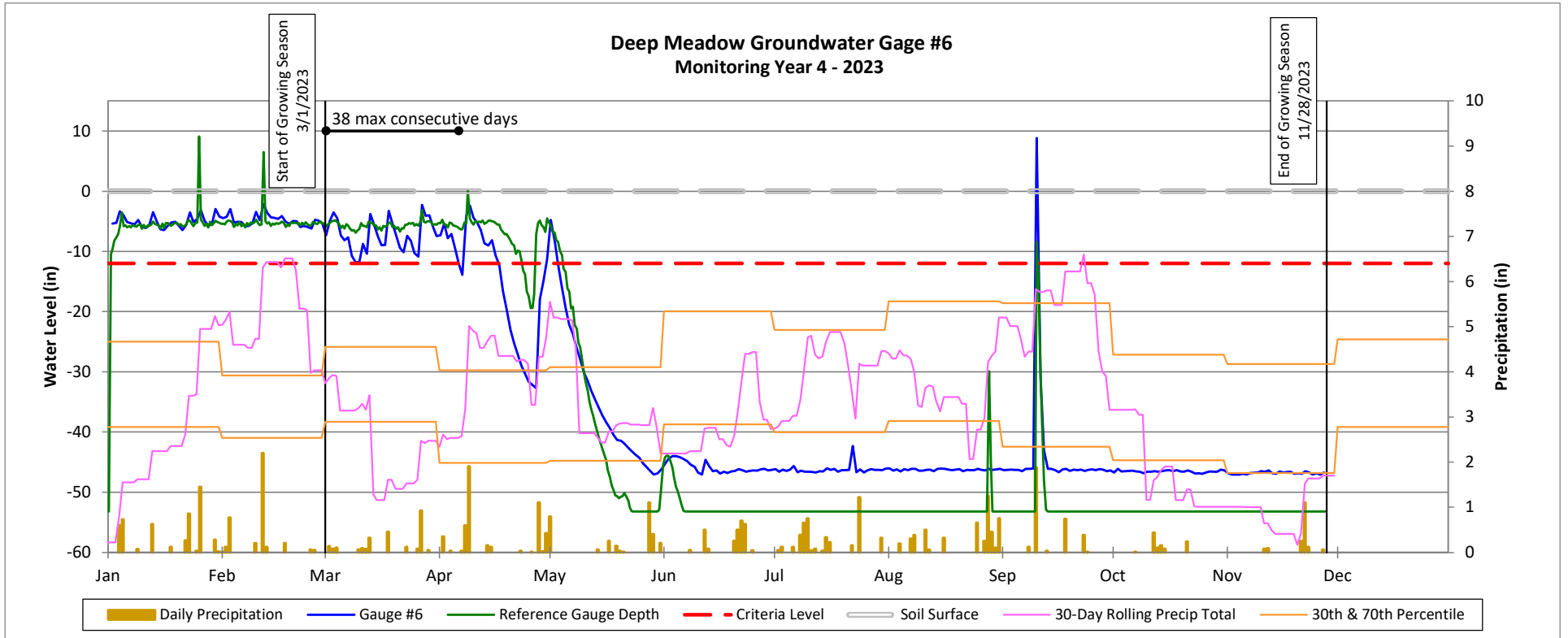
## Groundwater Gage Plot

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 4 - 2023

Wetland W-E2



The wetland hydrology success criteria is defined in the Mitigation Plan (Wildlands, 2018) as free groundwater within 12 inches of the ground's surface for 10% of the revised growing season (28 days). Annual daily precipitation data downloaded from the AgACIS Station - Monroe 2 SE from January 1 - November 29, 2023 was used because the on-site rain gage malfunctioned (NOAA, 2023). 30th and 70th percentile precipitation data downloaded from WETS NC - CRONOS Station 315771 - Monroe 2 SE (NOAA, 2023).

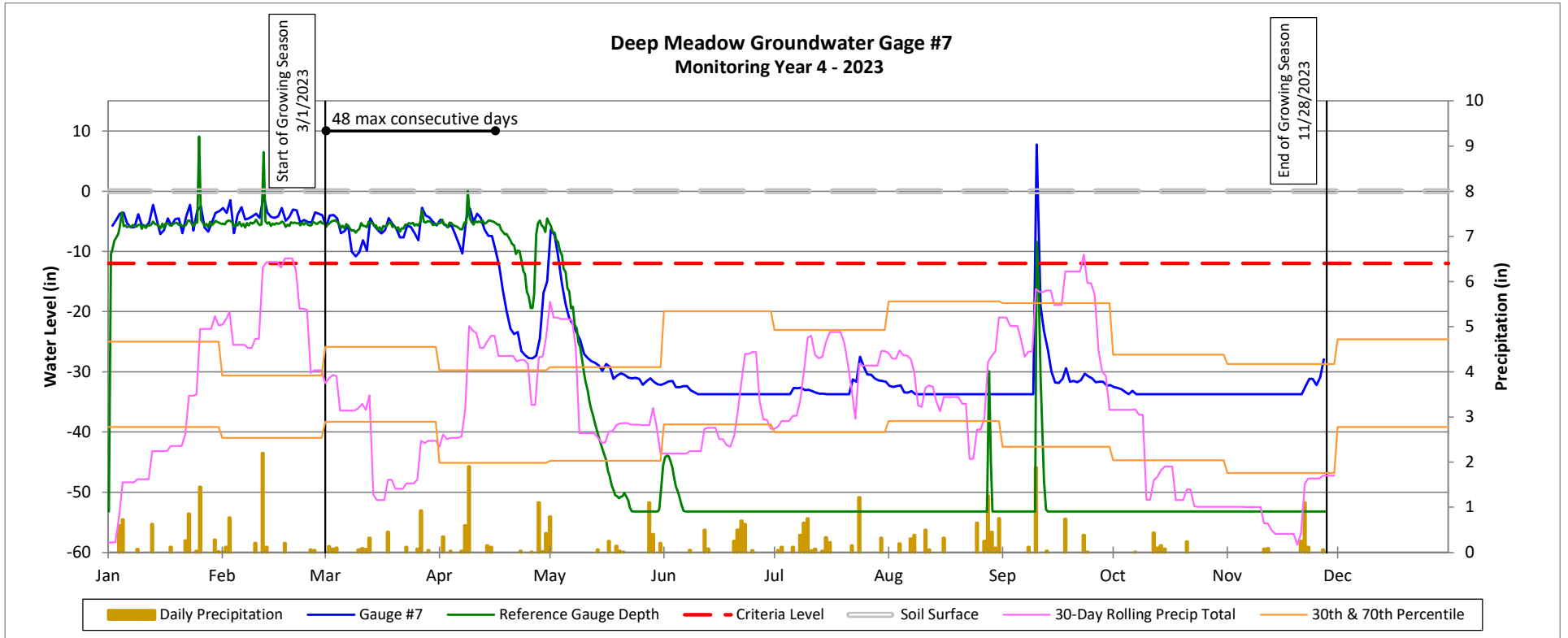
## Groundwater Gage Plot

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 4 - 2023

Wetland W-E2



The wetland hydrology success criteria is defined in the Mitigation Plan (Wildlands, 2018) as free groundwater within 12 inches of the ground's surface for 10% of the revised growing season (28 days). Annual daily precipitation data downloaded from the AgACIS Station - Monroe 2 SE from January 1 - November 29, 2023 was used because the on-site rain gage malfunctioned (NOAA, 2023). 30th and 70th percentile precipitation data downloaded from WETS NC - CRONOS Station 315771 - Monroe 2 SE (NOAA, 2023).

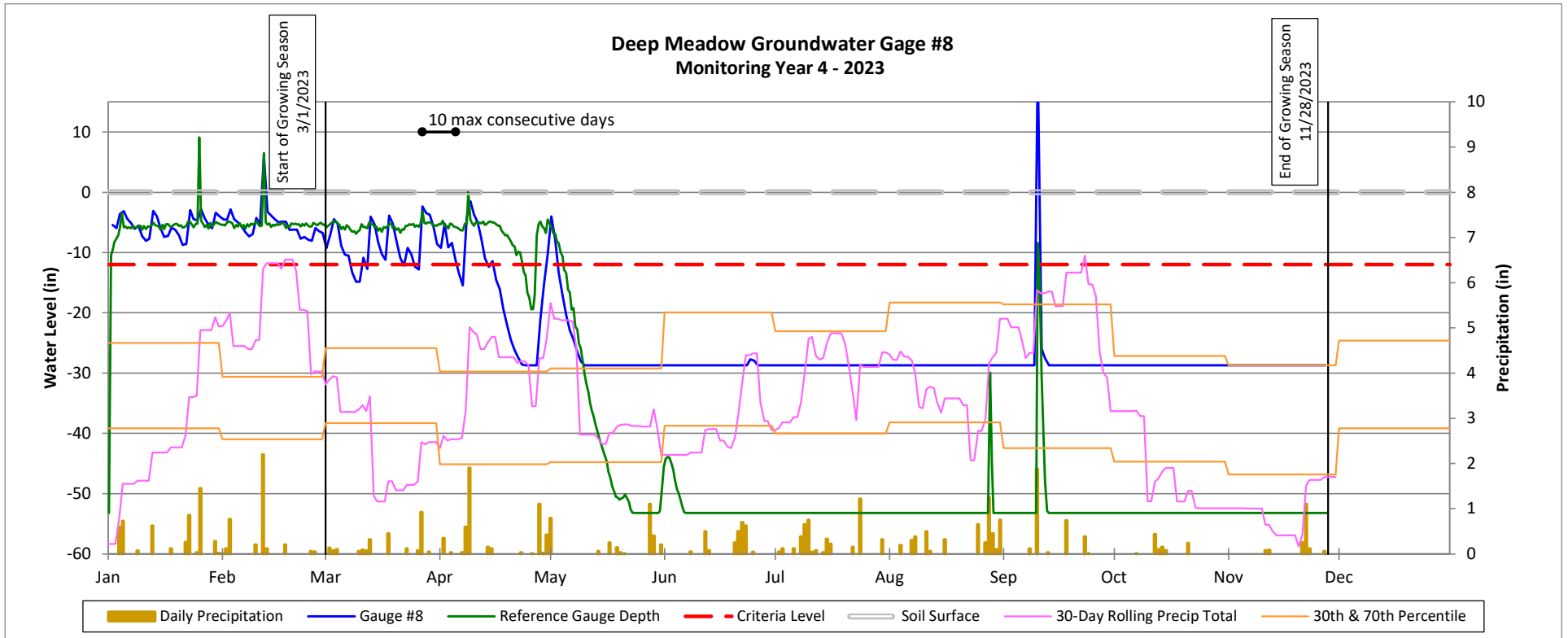
## Groundwater Gage Plot

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 4 - 2023

Wetland W-E3



The wetland hydrology success criteria is defined in the Mitigation Plan (Wildlands, 2018) as free groundwater within 12 inches of the ground's surface for 10% of the revised growing season (28 days). Annual daily precipitation data downloaded from the AgACIS Station - Monroe 2 SE from January 1 - November 29, 2023 was used because the on-site rain gage malfunctioned (NOAA, 2023). 30th and 70th percentile precipitation data downloaded from WETS NC - CRONOS Station 315771 - Monroe 2 SE (NOAA, 2023).

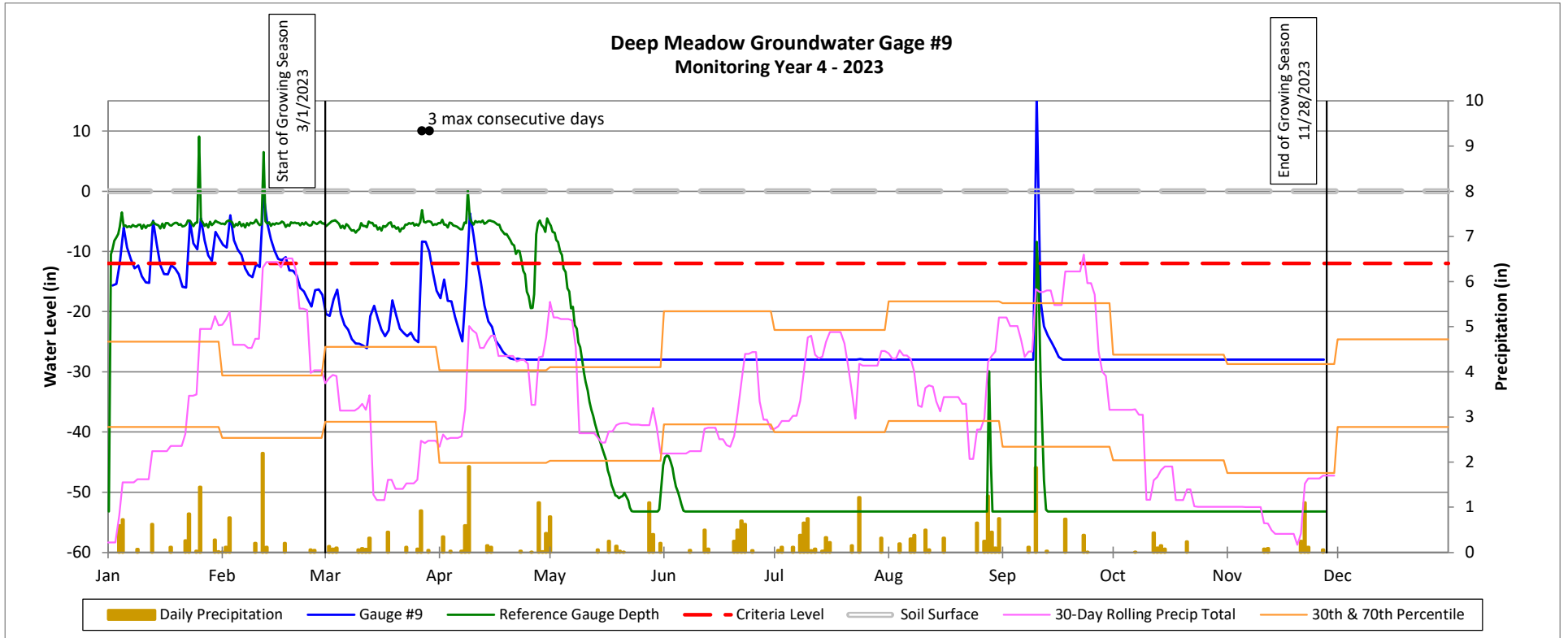
## Groundwater Gage Plot

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 4 - 2023

Wetland W-E4



The wetland hydrology success criteria is defined in the Mitigation Plan (Wildlands, 2018) as free groundwater within 12 inches of the ground's surface for 10% of the revised growing season (28 days).

Annual daily precipitation data downloaded from the AgACIS Station - Monroe 2 SE from January 1 - November 29, 2023 was used because the on-site rain gage malfunctioned (NOAA, 2023).

30th and 70th percentile precipitation data downloaded from WETS NC - CRONOS Station 315771 - Monroe 2 SE (NOAA, 2023).

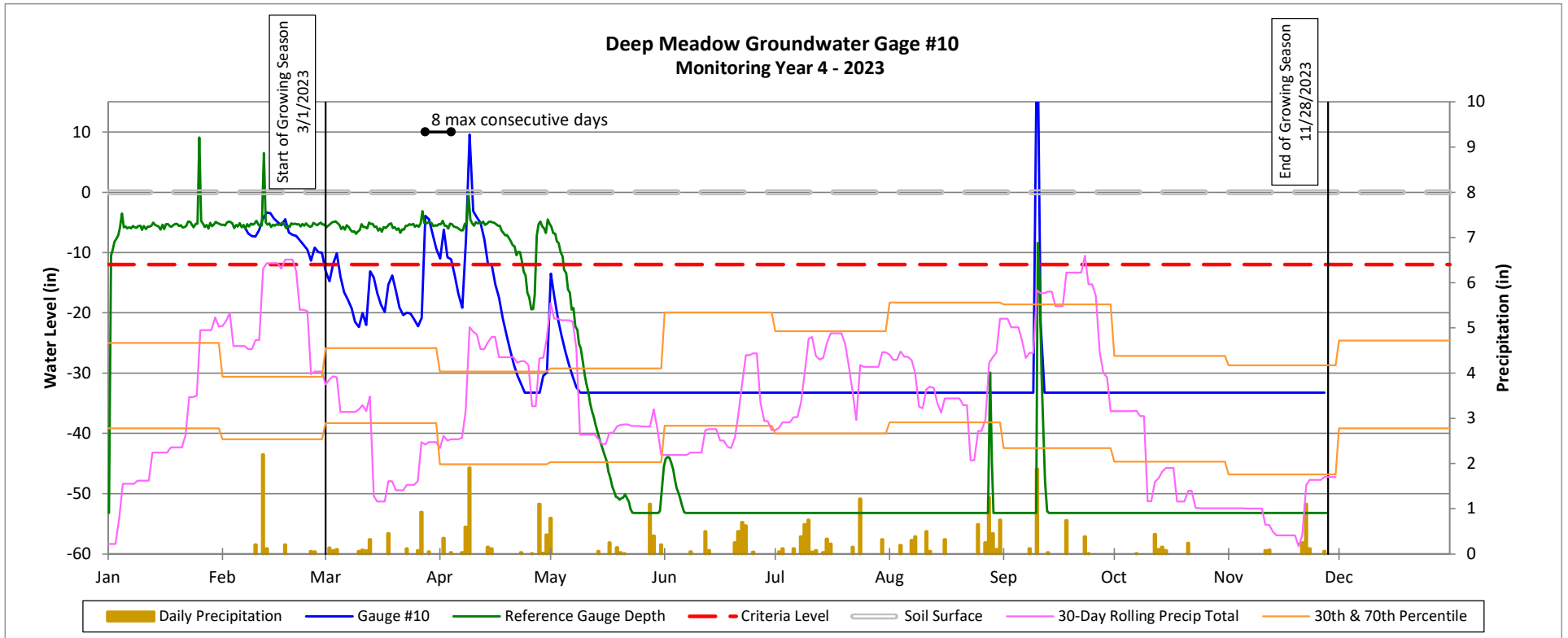
## Groundwater Gage Plot

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 4 - 2023

Wetland W-E5



The wetland hydrology success criteria is defined in the Mitigation Plan (Wildlands, 2018) as free groundwater within 12 inches of the ground's surface for 10% of the revised growing season (28 days).

Annual daily precipitation data downloaded from the AgACIS Station - Monroe 2 SE from January 1 - November 29, 2023 was used because the on-site rain gage malfunctioned (NOAA, 2023).

30th and 70th percentile precipitation data downloaded from WETS NC - CRONOS Station 315771 - Monroe 2 SE (NOAA, 2023).



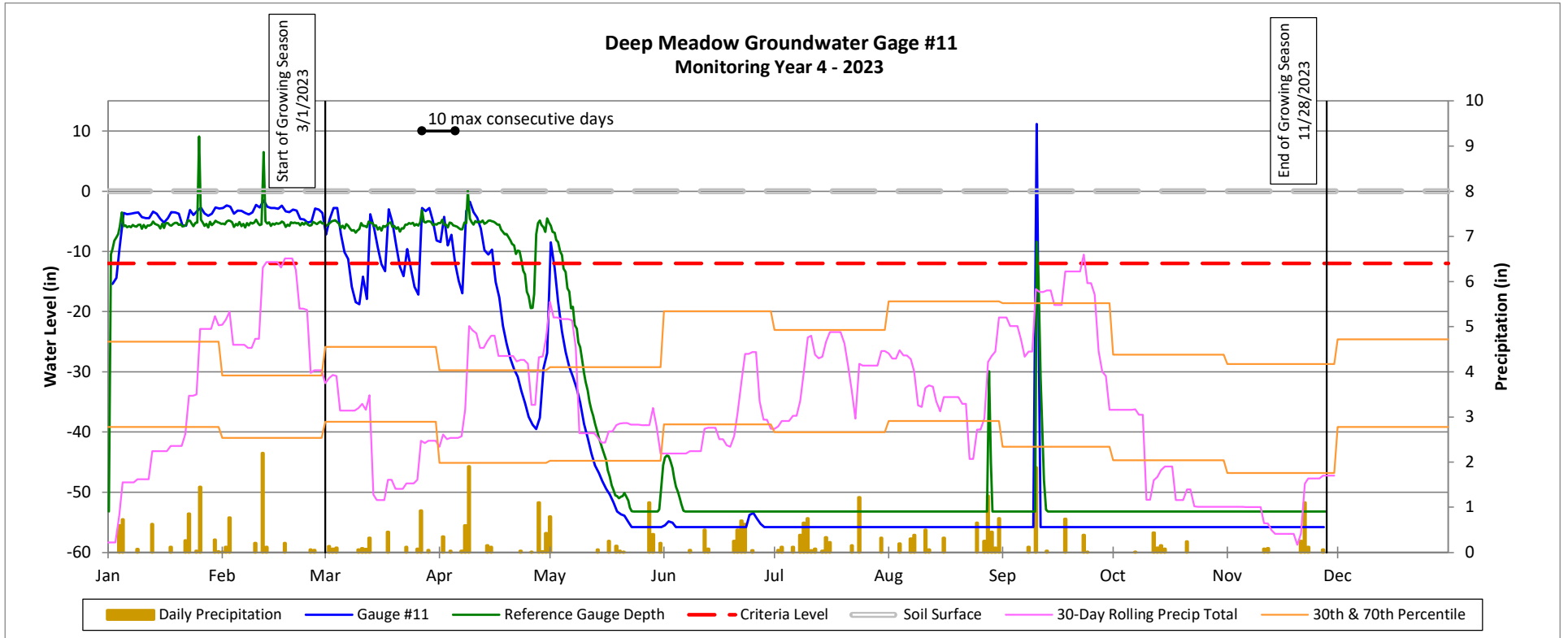
## Groundwater Gage Plot

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 4 - 2023

Wetland W-E6



The wetland hydrology success criteria is defined in the Mitigation Plan (Wildlands, 2018) as free groundwater within 12 inches of the ground's surface for 10% of the revised growing season (28 days). Annual daily precipitation data downloaded from the AgACIS Station - Monroe 2 SE from January 1 - November 29, 2023 was used because the on-site rain gage malfunctioned (NOAA, 2023). 30th and 70th percentile precipitation data downloaded from WETS NC - CRONOS Station 315771 - Monroe 2 SE (NOAA, 2023).

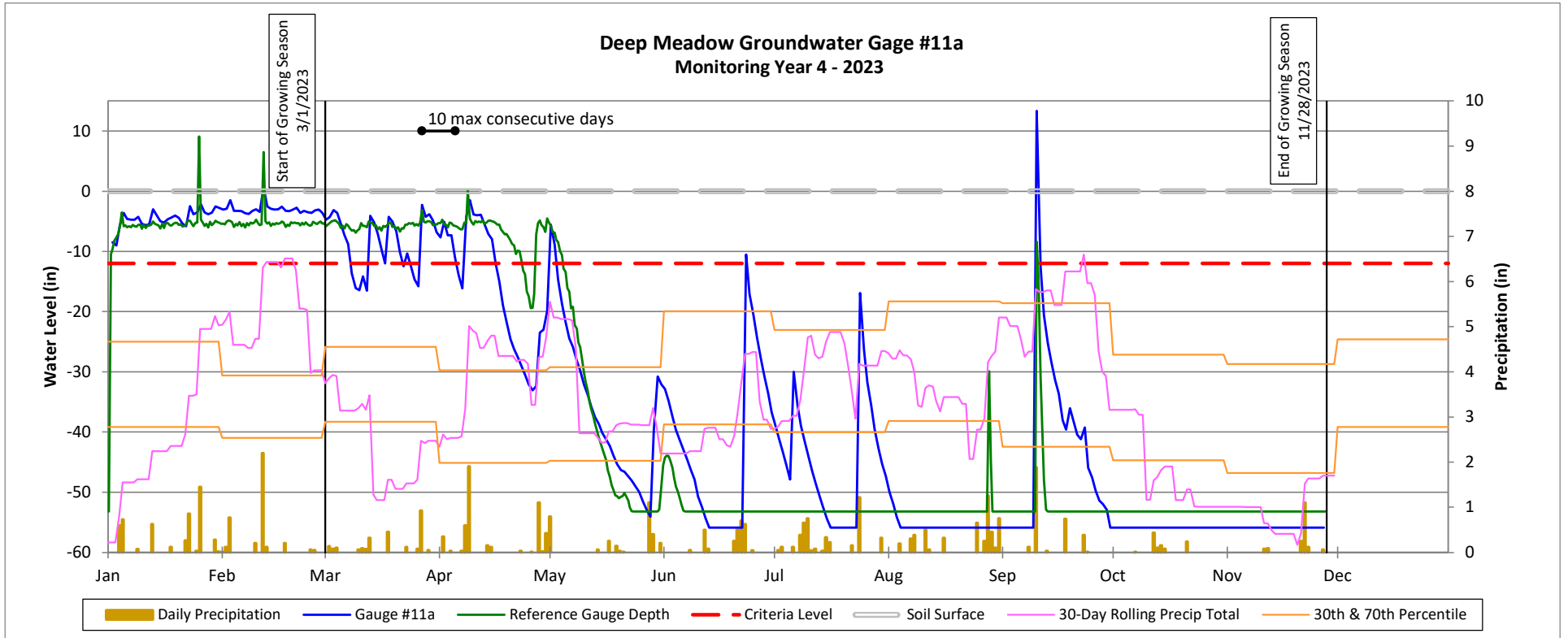
## Groundwater Gage Plot

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 4 - 2023

Wetland W-E6



The wetland hydrology success criteria is defined in the Mitigation Plan (Wildlands, 2018) as free groundwater within 12 inches of the ground's surface for 10% of the revised growing season (28 days). Annual daily precipitation data downloaded from the AgACIS Station - Monroe 2 SE from January 1 - November 29, 2023 was used because the on-site rain gage malfunctioned (NOAA, 2023). 30th and 70th percentile precipitation data downloaded from WETS NC - CRONOS Station 315771 - Monroe 2 SE (NOAA, 2023).

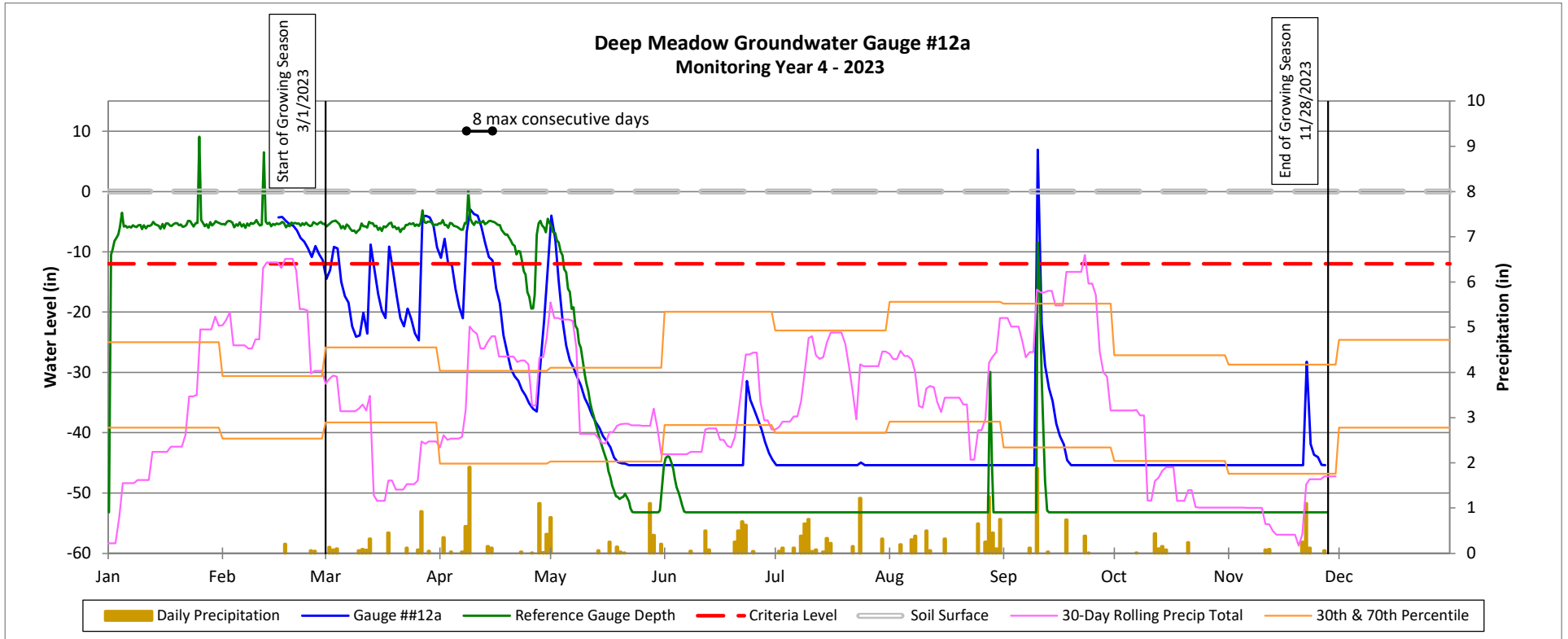
## Groundwater Gage Plot

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 4 - 2023

Proposed Wetland Expansion W-Ex2



The wetland hydrology success criteria is defined in the Mitigation Plan (Wildlands, 2018) as free groundwater within 12 inches of the ground's surface for 10% of the revised growing season (28 days). Annual daily precipitation data downloaded from the AgACIS Station - Monroe 2 SE from January 1 - November 29, 2023 was used because the on-site rain gage malfunctioned (NOAA, 2023). 30th and 70th percentile precipitation data downloaded from WETS NC - CRONOS Station 315771 - Monroe 2 SE (NOAA, 2023).

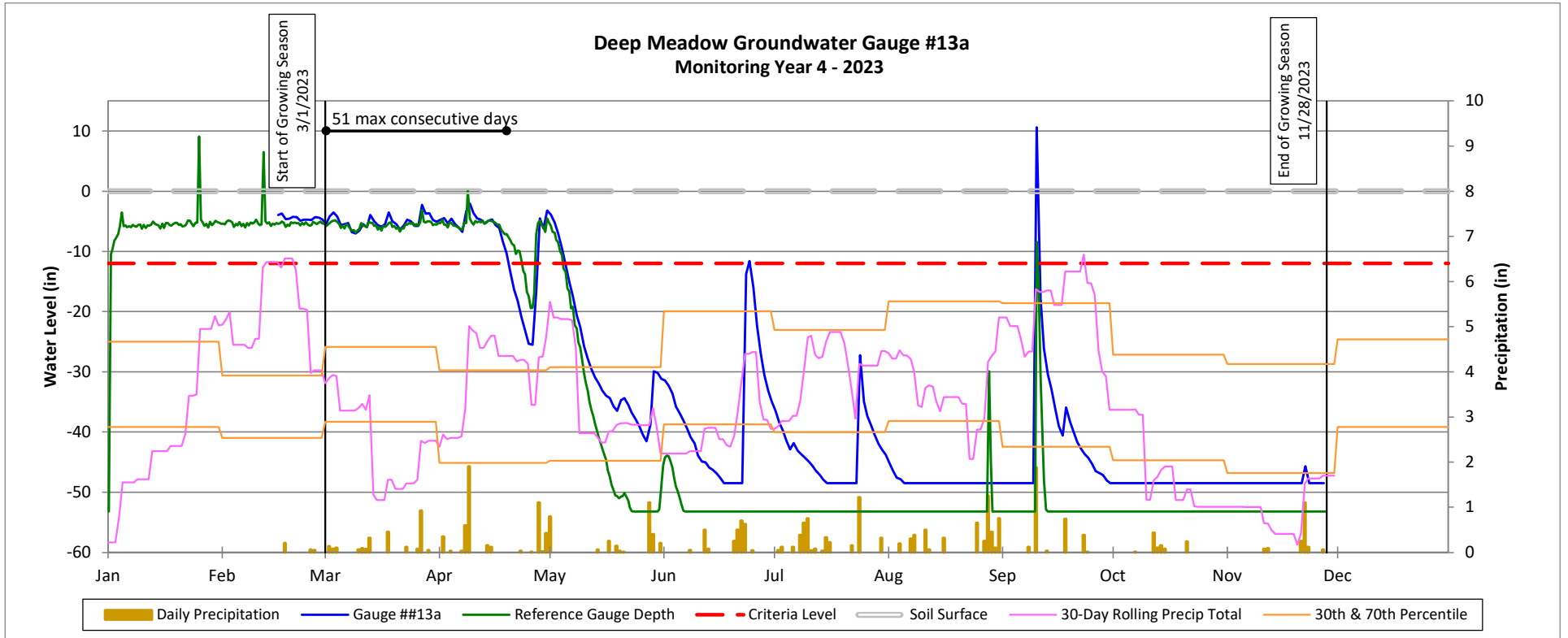
## Groundwater Gage Plot

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 4 - 2023

Proposed Wetland Expansion W-Ex1



The wetland hydrology success criteria is defined in the Mitigation Plan (Wildlands, 2018) as free groundwater within 12 inches of the ground's surface for 10% of the revised growing season (28 days). Annual daily precipitation data downloaded from the AgACIS Station - Monroe 2 SE from January 1 - November 29, 2023 was used because the on-site rain gage malfunctioned (NOAA, 2023). 30th and 70th percentile precipitation data downloaded from WETS NC - CRONOS Station 315771 - Monroe 2 SE (NOAA, 2023).

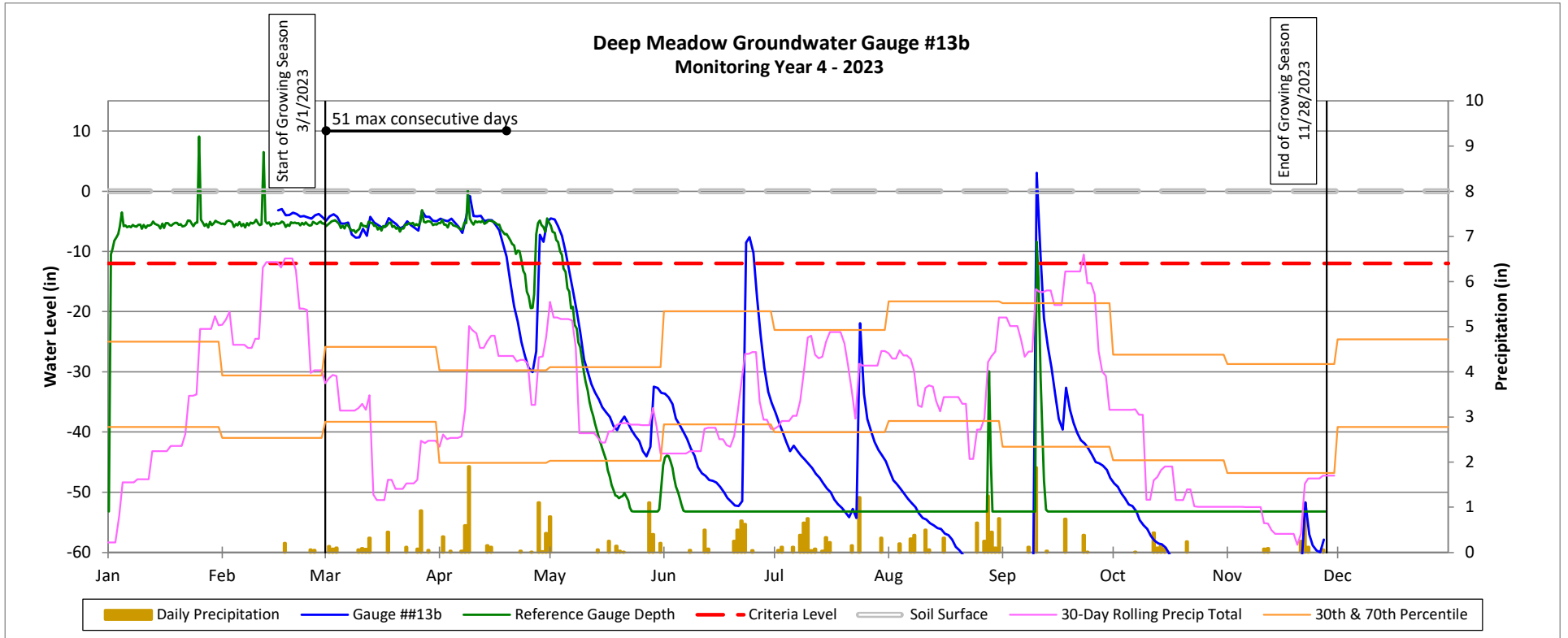
## Groundwater Gage Plot

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 4 - 2023

Proposed Wetland Expansion W-Ex1



The wetland hydrology success criteria is defined in the Mitigation Plan (Wildlands, 2018) as free groundwater within 12 inches of the ground's surface for 10% of the revised growing season (28 days). Annual daily precipitation data downloaded from the AgACIS Station - Monroe 2 SE from January 1 - November 29, 2023 was used because the on-site rain gage malfunctioned (NOAA, 2023). 30th and 70th percentile precipitation data downloaded from WETS NC - CRONOS Station 315771 - Monroe 2 SE (NOAA, 2023).

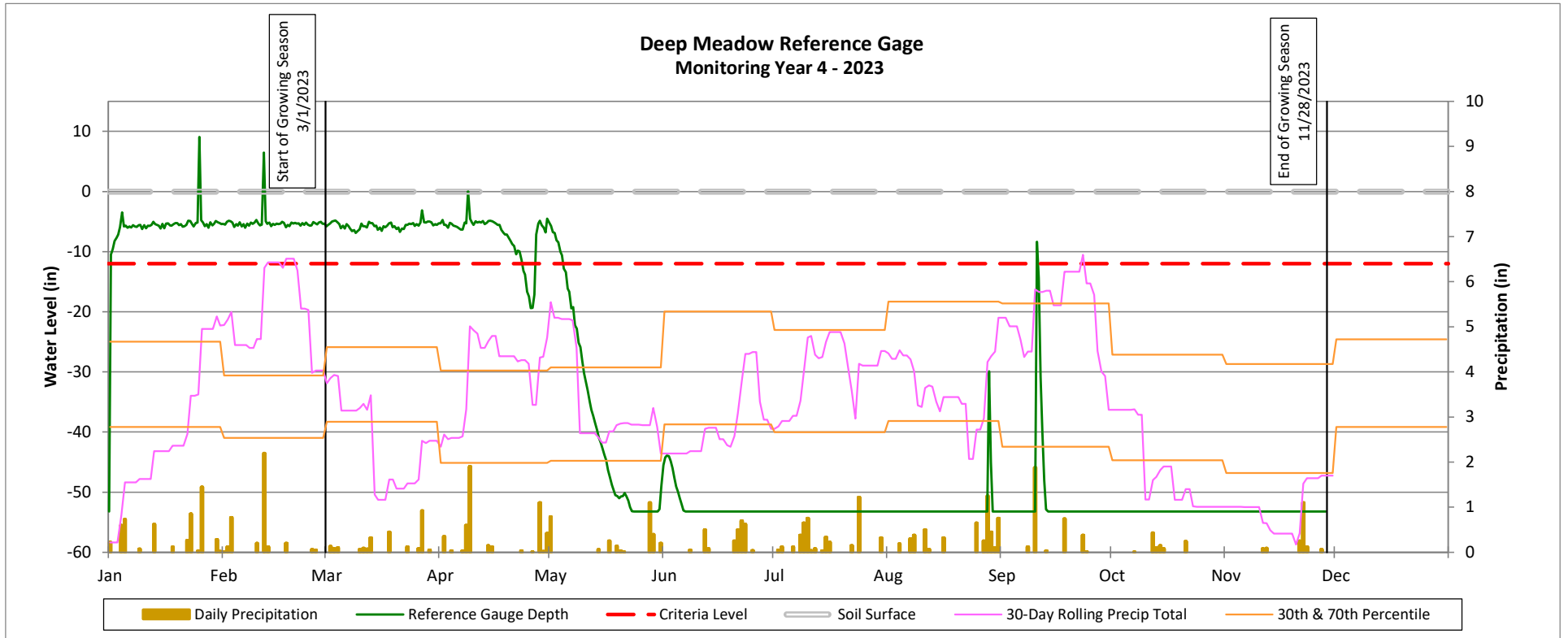
## Groundwater Gage Plot

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 4 - 2023

Reference Wetland



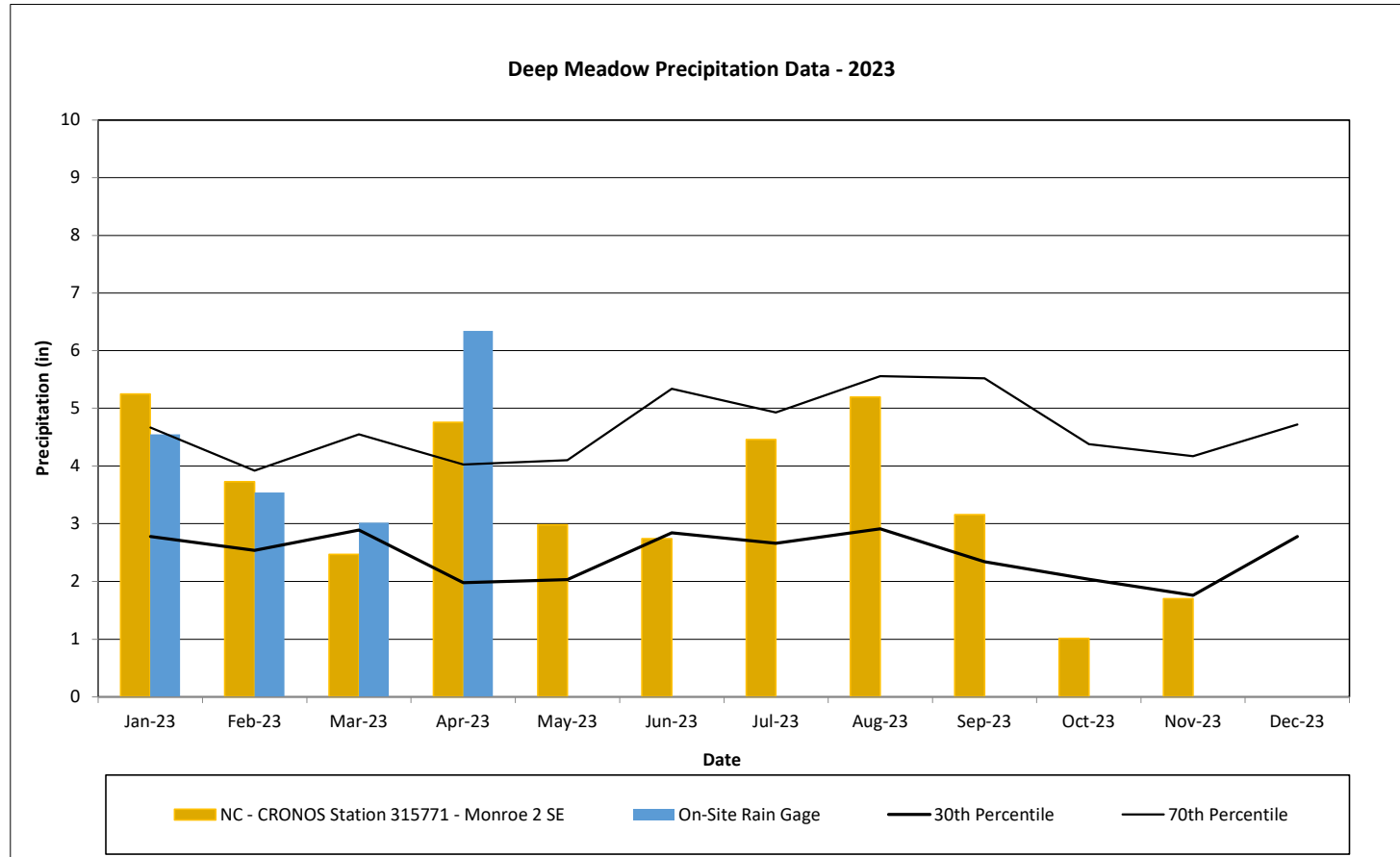
Annual daily precipitation data downloaded from the AgACIS Station - Monroe 2 SE from January 1 - November 29, 2023 was used because the on-site rain gage malfunctioned (NOAA, 2023). 30th and 70th percentile precipitation data downloaded from WETS NC - CRONOS Station 315771 - Monroe 2 SE (NOAA, 2023).

## Monthly Precipitation Data

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 4 - 2023



Annual precipitation data was derived from an on-site rain gage from January 1st - April 30th, 2023 and the AgACIS Station - Monroe 2 SE from January 1 - November 30, 2023 (NOAA, 2023).

30th and 70th percentile rainfall data downloaded from WETS data (1992 - 2022) - Monroe 2 SE (NOAA, 2023).

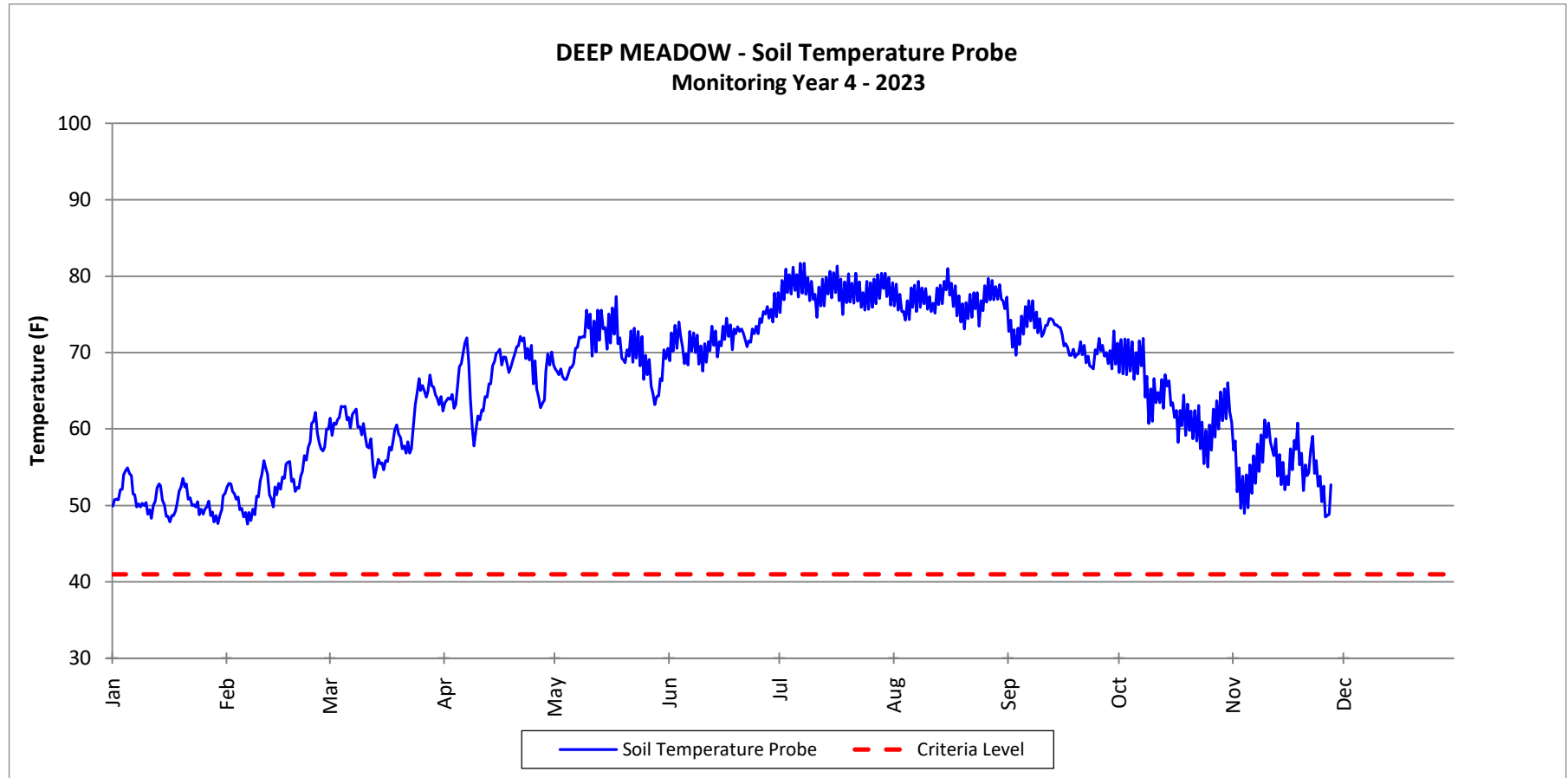
The on-site rain gage was damaged and stopped recording data on 4/30/2023. A component of the rain gage was replaced in July 2023, but failed to record precipitation data for the remainder of the year. A new

## Soil Temperature Data

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 4 - 2023





## **Vegetation Seasonal Indicator Photographs**

**Monitoring Year 4**



**Start of the Growing Season - Elderberry Bud Burst -**  
*(03/01/2023)*



**End of the Growing Season - Over 50% Leaf Drop -**  
*(11/29/2023)*

**Table 16. Soil Core Data**

Deep Meadow Mitigation Site

DMS Project No. 97131

Monitoring Year 4 - 2023

Soil Core Data - MY4 <sup>1</sup>				
Groundwater Gage	Depth (inches)	Color	Redox	Texture
1	0 - 4.8"	2.5YR 5/4	N/A	Clay loam
	4.8 - 20.4"	2.5YR 7/2	2.5Y 6/6 (20%)	Clay
	20.4 - 24"	2.5Y 7/2	2.5Y 6/6 (50%)	Clay
2	0 - 6"	2.5Y 6/4	N/A	Clay loam
	6 - 20.4"	2.5Y 7/4	10YR 5/8 (10%)	Clay loam
	20.4 - 24"	2.5Y 7/3	2.5Y 6/8 (40%)	Clay
3	0 - 21.6"	2.5Y 5/4	N/A	Clay loam
	21.6 - 26.4"	2.5Y 5/4	2.5Y 6/8 (50%)	Clay
3a	0 - 14.3"	2.5Y 5/4	N/A	Clay loam
	14.3 - 24"	2.5Y 5/3	10YR 8/4 (30%)	Clay
4	0 - 4.8"	2.5Y 5/3	10YR 5/6 (20%)	Clay
	4.8 - 24.0"	10YR 4/4	N/A	Clay
5	0 - 12"	5Y 5/1	7.5YR 5/6 (15%)	Clay loam
	12 - 24"	10YR 4/1	10YR 5/4 (25%)	Clay loam
6	0 - 6"	2.5Y 5/3	N/A	Clay loam
	6 - 20.4"	2.5Y 5/3	2.5Y 5/6 (10%)	Clay
	20.4 - 26.4"	2.5Y 5/2	2.5Y 5/6 (20%)	Clay
7	0 - 7.2"	10YR 4/3	N/A	Clay loam
	7.2 - 26.4"	10YR 5/3	7.5YR 4/4 (20%)	Clay
8	0 - 10.2"	2.5Y 5/4	N/A	Clay loam
	10.2 - 18"	2.5Y 5/4	10YR 4/6 (15%)	Clay
	18 - 25.5"	2.5Y 5/4	2.5Y 5/6 (40%)	Clay
9	0 - 9.6"	2.5Y 5/4	N/A	Clay loam
	9.6 - 24"	2.5Y 6/4	7.5YR 4/6 (40%)	Clay
10	0 - 14.4"	2.5Y 5/4	N/A	Clay loam
	14.4 - 22.8"	2.5Y 5/4	N/A	Clay
	22.8 - 26.4"	2.5Y 5/6	N/A	Clay
11	0 - 6"	2.5Y 5/4	N/A	Clay
	6 - 13.2"	2.5Y 5/6	2.5Y 6/4 (5%)	Clay
	13.2 - 24"	2.5Y 6/6	10YR 5/8 (30%)	Clay
11a	0 - 4.8"	2.5Y 5/3	2.5Y 6/8 (10%)	Clay
	4.8 - 15.6"	2.5Y 5/4	2.5Y 6/8 (45%)	Clay
	15.6 - 24"	2.5Y 6/4	N/A	Clay
4a <sup>2</sup>	0 - 4.8"	5Y 5/1	7.5YR 4/6 (5%)	Silt loam
	4.8 - 18"	5Y 6/2	5YR 4/6 (25%)	Clay loam
	18 - 33.6"	2.5Y 6/2	5YR 5/4 (40%)	Clay loam
	33.6 - 45.6"	5Y 6/1	7.5 YR 5/6 (25%)	Clay loam
	45.6 - 54"	Gley 5/1	7.5YR 4/6 (10%)	Clay
12a <sup>2</sup>	0 - 6"	2.5Y 5/3	N/A	Silty loam
	6 - 12"	2.5Y 5/2	7.5YR 5/6 (15%)	Silty loam
	12 - 14.4"	2.5Y 6/4	10YR 5/6 (10%)	Silty loam
	14.4 - 36"	10YR 5/6	2.5Y 6/3 (20%)	Silty loam
	36 - 48"	10YR 5/6	N/A	Silty sand
13a <sup>2</sup>	0 - 4"	2.5Y 4/1	10YR 4/4 (5%)	Silt loam
	4 - 10"	2.5Y 6/3	7.5YR 5/6 (15%)	Silt loam
	10 - 20"	10YR 5/3	7.5YR 5/6 (50%)	Clay loam
	20 - 31"	7.5YR 5/4	N/A	Clay loam
	31 - 40"	7.5YR 5/4	N/A	Silt Clay
	40 - 48"	2.5Y 6/4	N/A	Clay Clay
13b <sup>2</sup>	0 - 5"	2.5 Y 6/2	10YR 5/4 (10%)	Silt loam
	5 - 28"	2.5 Y 7/3	7.5YR 5/6 (25%)	Silt loam
	28 - 45"	5Y 6/2	7.5YR 4/6 (50%)	Clay loam
	45 - 57"	10YR 5/4	N/A	Clay loam
	57 - 67"	Gley 6/1	7.5YR 4/4 (20%)	Clay loam

<sup>1</sup> Soil core data was collected in February 2023, adjacent to installed groundwater gages.

<sup>2</sup> Soil profiles for newly installed groundwater gages extend the length of the groundwater well casing

## **Soil Core Photographs**

**Monitoring Year 4**



**Wetland W-E10 – Soil Core 1 - (02/13/2023)**



**Wetland W-E9 – Soil Core 2 - (02/13/2023)**



**Wetland W-E8 – Soil Core 3 - (02/15/2023)**



**Wetland W-E8 – Soil Core 3a - (02/13/2023)**



**Wetland W-E7 – Soil Core 4 - (02/13/2023)**



**Wetland W-E7 – Soil Core 4a - (02/15/2023)**



**Wetland W-E1 – Soil Core 5 - (02/15/2023)**



**Wetland W-E2 – Soil Core 6 - (02/13/2023)**



**Wetland W-E2 – Soil Core 7 - (02/13/2023)**



**Wetland W-E3 – Soil Core 8 - (02/13/2023)**



**Wetland W-E4 – Soil Core 9 - (02/13/2023)**



**Wetland W-E5 – Soil Core 10 - (02/13/2023)**



**Wetland W-E6 – Soil Core 11 - (02/13/2023)**



**Wetland W-E6 – Soil Core 11a - (02/13/2023)**



**Wetland W-E2 – Soil Core 12a - (02/15/2023)**



**Wetland W-E3 – Soil Core 13a - (02/15/2023)**



**Wetland W-E4 – Soil Core 13b - (02/15/2023)**

## **APPENDIX 6. Conservation Easement Inspection**





NORTH CAROLINA  
Environmental Quality

ROY COOPER

Governor

ELIZABETH S. BISER

Secretary

MARC RECKTENWALD

Director

March 14, 2023

Harry Tsomides  
Project Manager  
NCDEQ-DMS  
Asheville Regional Office  
2090 U.S. 70 Highway  
Swannanoa, NC 28778-8211  
Cell: (828) 545-7057

Subject: Conservation Easement Inspection Report - MY3 Site  
Deep Meadow  
Yadkin River Basin - CU# 03040105 - Union County  
DMS ID No. 97131 - Contract #6887

Dear Kristi,

The MY3 DMS boundary inspection was conducted on March 14, 2023 by myself and Kelly Phillips. The inspection was conducted in accordance with the DMS Property Checklist which included a pre-inspection office review of the plat, aerial photographs, as-built, conservation easement and monitoring reports. The entire easement boundary was inspected to validate the easement integrity and identify any potential issues on the site. The site inspection results are shown in the attached checklist and kmz map, with embedded photos.

**Office Review:**

- The As-Built shows minor crossing riprap installed below McIntyre Road and on the upstream side of the tributary crossing.
- The MY3 report indicates horse tape was added to three areas due to scallop mowing/row crops and encroachment was due to bent or missing marker posts. Minimal scalloping was noted (0.04 ac) and a missing corner post was re-set by the surveyor in August 2022. Supplemental signs, PVC markers and horse tape were added to mark the easement boundary to prevent future scalloping.
- Review of aerial imagery showed potential row crop encroachment.

**Field Inspection:**

- The easement corners were adequately monumented with stamped aluminum caps. Most of the monument caps were buried and not visible.
- The easement corners were marked with metal posts (T-Posts & U-Channel) with attached easement signs. The marker posts at platted corners 36, 37 & 38 were missing along the main crossing area. Corner 12 was twisted, and the sign was misaligned. The easement signs at corners 8, 17 & 27 were damaged. PVC markers were damaged at corners 10, 17 and south of 22.
- In-line marker spacing met specification.
- Equipment & hay was located inside the easement at corner 2.
- A row of hay extends across the easement line between corners 2 & 3.
- A small area of grading was located at corner 27 (approximately 8' X 3').
- The upstream end of the CMP culvert at the tributary extends approximately 2 feet into the easement.
- Numerous areas of mowing and crop scalloping were present. The extent of the encroachment ranged from one row of crops to approximately 10 feet of mowing. Possible herbicide drift/overspray is visible along some of the row crop boundary areas where a distinct change is visible in the herbaceous vegetation.
- Damaged and bent signs, detached PVC markers, bent posts and broken horse tape were noted.



North Carolina Department of Environmental Quality | Division of Mitigation Services  
217 West Jones Street | 1652 Mail Service Center | Raleigh, North Carolina 27699-1652  
919.707.8976

**Action Items**

- Replace missing corner markers and repair any bent or damaged posts, horse tape, knocked-down PVC markers, and damaged easement signs. Where yellow plastic clips can be abandoned in favor of rivets/screws, that is recommended.
- Remove equipment and hay from the easement, recommend additional marking or taping around this crossing area to deter equipment parking and hay encroachments.
- Coordinate with the landowner and install supplemental boundary marking as necessary to eliminate scallop mowing/row crop encroachment.
- Evaluate easement implications of the CMP culvert pipe extension into easement.

Let me know if you have any questions or need additional information; thanks in advance for all you do to stay on top of property challenges!

Sincerely,



Harry Tsomides  
Project Manager, NCDEQ-DMS





December 6, 2023

Harry Tsomides  
Project Manager  
NCDEQ-DMS  
Asheville Regional Office  
2090 U.S. 70 Highway  
Swannanoa, NC 28778-8211  
Cell: (828) 545-7057

RE: **Conservation Easement Inspection Report – MY3 Site  
Deep Meadow Mitigation Site**  
Yadkin River Basin - CU# 03040105 - Union County  
DMS ID No. 97131 - Contract #6887

Dear Mr. Tsomides:

Wildlands Engineering, Inc. (Wildlands) has reviewed the Division of Mitigation Services (DMS) comments from the Conservation Easement Inspection Report – MY3 Site for the Deep Meadow Mitigation Project conducted on March 14, 2023. The draft report has been updated to reflect those comments. DMS' comments and observations from the report are listed below and noted in **bold**. Wildlands' response to those comments are noted in *Italics*.

**Action Items:**

1. **DMS' comment: Replace missing corner markers and repair any bent or damaged posts, horse tape, knocked-down PVC markers, and damaged easement signs. Where yellow plastic clips can be abandoned in favor of rivets/screws, that is recommended.**

*Wildlands' response: Wildlands replaced missing and damaged signposts, PVC markers and easement signs in November 2023. New horse tape was pulled in areas where the tape was broken. Wildlands will continue to replace yellow plastic clips as the opportunity presents itself.*

2. **DMS' comment: Remove equipment and hay from the easement, recommend additional marking or taping around this crossing area to deter equipment parking and hay encroachments.**

*Wildlands' response: The landowner was contacted in April and September 2023 and agreed to move the haybales. As of the last field inspection in November 2023, the haybales were still within the easement.*

3. **DMS' comment: Coordinate with the landowner and install supplemental boundary marking as necessary to eliminate scallop mowing/row crop encroachment.**

*Wildlands' response: The landowner was contacted in April and September 2023 and agreed to stop mowing within the easement. Additional horsetape and PVC markers were installed throughout the Site in November 2023.*



**4. DMS' comment: Evaluate easement implications of the CMP culvert pipe extension into easement.**

*Wildlands' response: Wildlands confirmed that the downstream end of the CMP culvert pipe extended approximately 2 LF into the easement.*

Please refer to Appendix 6 for the Resolved Boundary Inspection photographs and Appendix 2 for the Current Condition Plan View (CCPV) Figure 3.0 – 3.2.

Sincerely,

A handwritten signature in blue ink that reads "Kristi Suggs".

Kristi Suggs  
Senior Environmental Scientist

**Resolved Easement Inspection Photographs**

**Monitoring Year 4**



**Easement Corner 36** – New easement post (11/29/2023)



**Easement Corner 37** – New easement post (11/29/2023)



**Easement Corner 38** – New easement post (11/29/2023)



**Easement Corner 12** – New easement post (11/29/2023)



**Easement Corner 8** – New easement post (11/29/2023)



**Easement Corner 17** – New PVC marker and sign (11/29/2023)



**Easement Corner 27 – New PVC marker and sign (11/29/2023)**



**Easement Corner 10 – New PVC marker (11/29/2023)**



**Between Easement Corners 19 and 20 – New horse tape (11/29/2023)**



**Between Easement Corners 22 and 24 – New horse tape (11/29/2023)**



**Between Easement Corners 24 and 25 – New horse tape (11/29/2023)**



**Between Easement Corners 25 and 26 – New horse tape (11/29/2023)**



**Between Easement Corners 26 and 27 – New horse tape (11/29/2023)**



**Between Easement Corners 31 and 33 – New horse tape (11/29/2023)**



**Between Easement Corners 2 and 3 – Hay bales removed from easement boundary (01/04/2024)**