Morgan Creek Floodplain
Orange/Durham Counties, North Carolina
EEP Project# 258

MY-01 Monitoring Report

Data Collected: November 2011
Submitted: March, 2012

Prepared for:
North Carolina Department of Environment and Natural Resources
Ecosystem Enhancement Program
Parker Lincoln Building
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APPENDICES

I. Executive Summary

The Morgan Creek Floodplain project is located within the Mason Farm Biological Reserve (MFBR), owned by the University of North Carolina at Chapel Hill (UNC-CH), and was constructed for the North Carolina Ecosystem Enhancement Program (NCEEP). MFBR is located adjacent to the North Carolina Botanical Garden and the A.E. Finley Golf Course. The project is located within the Morgan Creek Local Watershed planning area, 14-digit HUC 03030002060080. The site has been used for biological research by the UNC-CH. Restoration activities involved the construction of berm openings to increase floodwater access to the restoration site and also establishing native plant community within the open field. Five armored openings were constructed in the berm to reconnect the natural floodwaters of Morgan Creek to floodplain. The project includes the restoration of 14.37 acres of wetlands, the preservation of 5.61 acres of wetlands, and preservation of 3200 linear feet of riparian buffer along the south bank of Morgan Creek. The Catena Group delineated the wetland preservation area in 2005 and the reference wetland in February 2008, none of which were verified by the US Army Corps of Engineers (USACE). Wetland delineation termination forms are included in Appendix G.

Project Goals:

- Increased overbank flooding to promote wetland habitats.
- Attenuation of floodwater sediments and nutrients within the floodplain.
- Retention of floodwaters thereby reducing downstream flooding.
- Reduced stormwater flow bank shear stress on Morgan Creek thereby improving localized bank and channel stabilization.

Project Objectives:

- Increase the frequency of floodplain flooding
- Restore wetland hydrology to 14.37 acres of impacted wetlands
- Preserve a 5.61-acre wetland
- Re-establish native wetland and riparian plant communities
- Treat and remove invasive exotic plant species
- Preserve 3200 linear feet of riparian buffer on the south bank of Morgan Creek

Currently the vegetation is meeting the success criteria with 356 planted stems/acre. Five vegetation plots were monitored using Version 4.2 of the CVS-EEP vegetation monitoring protocol. Level I of this protocol was implemented for MY-01 which excludes natural stems. MY-02 data collection will follow the Level II protocol which includes natural stems. The success criterion for planted woody species is 320 stems/acre after MY-03. A mortality rate of ten percent will be allowed after MY-04 (288 stems/acre), with another ten percent allowed after MY-05 (260 stems/acre). MY-01 vegetation data was collected on August 23, 2011. Data collected for these plots are in Appendix C. Vegetation problem areas include the presence of the invasive exotic kudzu (Pueraria montana) and an area of low planted stem density in the vicinity of vegetation monitoring plot 2. Kudzu was identified as a severe vegetative problem area in three different locations along the berm within the conservation easement. . Additional invasive exotics that were observed during MY-01 include Japanese stiltgrass

(Microstegium vimineum), porcelain berry (Ampelopsis brevipedunculata), Chinese privet (Ligustrum sinense), Johnson grass (Sorghum halapense), and Japanese honeysuckle (Lonicera japonica). Japanese stiltgrass, Japanese honeysuckle, and porclain berry were observed scattered throughout the conservation easement. Although these species are present, the functionality of the project is not expected to be impaired significantly by these species.

Wetland Hydrology

Nine groundwater gauges were installed according to the specifications of Technical Note HY-1A-3.1 (USACE 1993). The gauges record data every twelve hours and are downloaded on a bi-monthly basis. Seven of these gauges are located within the conservation easement. Five gauges (1, 2, 4, 5, and 6) are in Wetland Restoration Soil Unit 1, where groundwater is expected to be within 12 inches of the surface for at least 12.5% of the growing season. Two gauges (3 and 9) are in Wetland Soil Unit 2 where the groundwater is expected to be within 12 inches of the surface for at least 5% of the growing season. The growing season is 221 days (March 27 - Nov 3) (NRCS-USDA 2011). Gauge 8 is located in the Big Woods section of the MFBR at the request of UNC-CH. Gauge 10 is located upstream in the reference wetland. Gauge 7 was originally established as the reference wetland gauge but was later removed due to impoundment effects from beavers which moved into the area after the gauge was installed. A new reference wetland was chosen and a replacement gauge (Gauge 10) was installed on July 11, 2007.

Gauges 1, 2, 5, and 6 within Soil Unit 1 met the wetland hydrological requirements. Gauge 4 of Soil Unit 1 did not meet the anticipated hydrology, having wetland hydrology for only 8% of the growing season. Gauge 4 was installed in an area that appears to be located on an old road bed perpendicular to Morgan Creek which was likely used for agriculture field access. Since the old road bed was likely somewhat compacted and slightly elevated, it was chosen to test the restoration response compared to the rest of the site. As such, this area is lacking behind the rest of the site. Gauge 3 did not meet the anticipated hydrology for Soil Unit 1 obtaining wetland hydrology for only 2% of the growing season. Gauge 3 is the closest gauge to Morgan Creek and near the edge of the wetland restoration area. A combination of factors are likely influencing the groundwater levels for Gauge 3, primarily being slightly elevated at the toe slope of the berm and the lateral effect of Morgan Creek that may be causing water table drawdown.

Gauge 9 did meet the anticipated hydrological requirement for Soil Unit 2 obtaining wetland hydrology for 14% of the growing season (Appendix E). Gauge 8 within Big Woods obtained wetland hydrology for 12% of the growing season. The wetland reference gauge obtained wetland hydrology for 28% of the growing season. Flooding through the berm openings was observed after rain events on May 27, 2011, and November 3, 2011. Several onsite data collection methods are being used to correlate the USGS stream gauge height reading and streambank overflow conditions. According to the USGS surface water level gauge located approximately 1500 ft upstream of the site, similar flood events occurred on September 7th and 21st of 2011 (See Figure 3).

Precipitation data is collected on site with an RDS rain bucket gauge. On more than one occasion during the monthly gauge downloads, bird scat (i.e. seeds) was observed clogging the rain bucket opening resulting in unmeasured rainwater pooling in the bucket. Additionally, ants were establishing colonies directly beneath the rain gauge during the monitoring period. Internal rain bucket wiring was damaged from chewing. Due to wildlife interference with the rain bucket data collection, the rainfall data was supplemented with the NC Climate Office (Station name: Chapel Hill-Williams Airport) data (NCCO 2011). A USGS stream gauge located, approximately 1500ft upstream of the project site (Station ID #02097517), was used to correlate precipitation data and groundwater gauge data (USGS 2011).

Summary information/data related to the occurrence of items such as beaver or encroachment, and statistics related to performance of various project and monitoring elements, can be found in the tables and figures in the report appendices. Narrative background and supporting information formerly found in these reports can be found in the Baseline Monitoring Report (formerly Mitigation Plan) and in the Mitigation Plan (formerly Restoration Plan) documents available on EEP's website. All raw data supporting the tables and figures in the appendices is available from EEP upon request.

II. Methodology

Methodologies follow EEP monitoring report template Version 1.3.1 (01/15/10) and CVS-EEP Protocol for Recording Vegetation (Lee et al 2008). Photos were taken with a digital camera. A Trimble Geo XT handheld unit with sub-meter accuracy was used to collect groundwater gauge locations, vegetation monitoring plot origins, and problem area locations.

A. Vegetation Methodologies

Five vegetation monitoring plots were monitored according to Level I of the EEP/CVS protocol Version 4.2 was used to collect data for MY-01, which excludes natural stems. CVS data collection was conducted on August 23, 2011. The plots are 10 meters square and marked with 1" diameter PVC pipe at each corner. Data collected for these plots are in Appendix C. Flora of the Carolinas, Virginia, Georgia, and Surrounding Areas (Weakley 2011) was used as the taxonomic standard for vegetation. See figures in Appendix A for monitoring plot locations.

B. Wetland Methodologies

Nine RDS groundwater monitoring gauges (1-6; 8-10) are downloaded bi- monthly to ensure proper function throughout the growing season. Data is provided in an Excel spreadsheet along with incorporation of local rainfall data collected by an on-site rain gauge and supplemented with data from the State Climate Office.

III. References

Lee, Michael T. Peet, Robert K. Roberts, Steven D., Wentworth, Thomas R. (2008). *CVS-EEP Protocol for Recording Vegetation Version 4.2.*

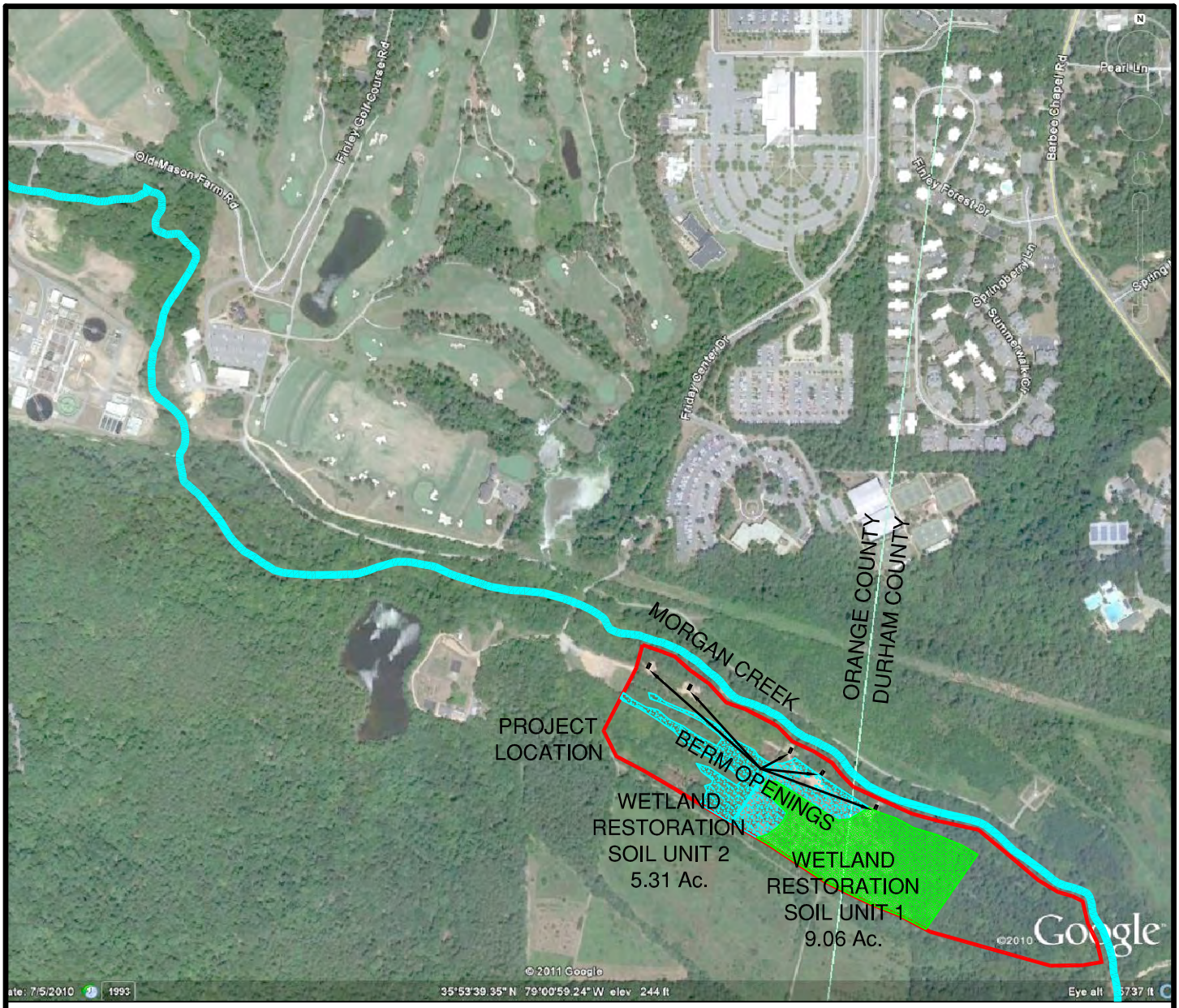
NRCS-USDA 2011. Climate Information for Orange County in the State of North Carolina. Retrieved August 18, 2011. From http://www.wcc.nrcs.usda.gov/cgibin/state.pl?state=nc)

NCCO 2011. NC Climate Office Annual Precipitation Data (Station name: Chapel Hill-Williams Airport) Data acquired November 1, 2011.

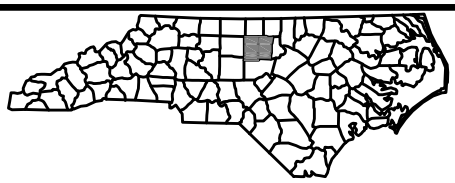
USGS 2011. USGS Real-Tim Water Data for North Carolina. Stream Gauge Station ID #02097517. Data acquired from November 1, 2011. http://waterdata.usgs.gov/nc/nwis/rt

Weakley, Alan (2011). *Flora of the Carolinas, Virginia, Georgia, and Surrounding Areas*. Working Draft May 2011. http://www.herbarium.unc.edu/flora.htm.

Appendix A. Project Vicinity Map and Background Tables



2010 IMAGE FROM GOOGLE EARTH – ACCESSED MARCH 2011



Ecosystem Enhancement PROGRAM

North Carolina – Ecosystem Enhancement Program

Morgan Creek Floodplain
Orange/Durham Counties, North Carolina
EEP ID #258

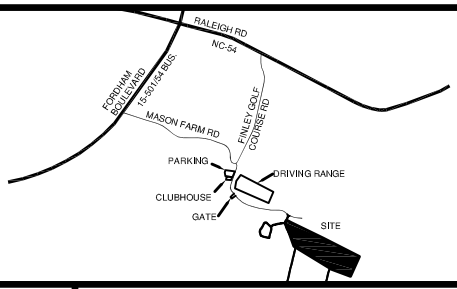


FIGURE 1
MORGAN CREEK FLOODPLAIN (EEP # 258)
AERIAL VICINITY MAP

N

800 400 0 800

SCALE 1" = 800'

WARD CONSULTING ENGINEERS, PC
8368 Six Forks Rd, Suite 104
Raleigh, NC 27615
PH: (919) 870-0526
FAX (919) 870-5359

Table 1a. Project Components

Table 1a. Project Components
Morgan Creek Floodplain - EEP# 258

Project Component or Reach ID	Existing Feet/Acres	Restoration Level	Approach	Footage or Acreage	Stationing	Mitigation Ratio	Mitigation Units	BMP Elements1	Comment
Wetlands	14.37	R		14.37		1:1	14.37		
Wetlands	5.61	P		5.61		5:1	1.12		

1 = BR = Bioretention Cell; SF = Sand Filter; SW = Stormwater Wetland; WDP = Wet Detention Pond; DDP = Dry Detention Pond; FS = Filter Strip; Grassed Swale = S; LS = Level Spreader; NI = Natural Infiltration Area, O = Other; CF = Cattle Fencing; WS = Watering System; CH = Livestock Housing

Table 1b. Component Summations

Table 1b. Component Summations
Morgan Creek Floodplain - EEP# 258

Restoration Level	Stream (lf)	Riparian Wetland (Ac)		Non-Ripar (Ac)	Upland (Ac)	Buffer (Ac)	BMP
		Riverine	Non-Riverine				
Restoration		14.37					
Enhancement							
Enhancement I							
Enhancement II							
Creation							
Preservation		5.61					
Totals (Feet/Acres)		**19.98**					
MU Totals		**15.49**					

Non-Applicable

Table 2. Project Activity and Reporting History

Table 2. Project Activity and Reporting History Morgan Creek Floodplain- EEP# 258		
Activity or Deliverable	**Data Collection Complete**	**Completion or Delivery**
Conservation easement MOA	NA	Aug-05
Restoration Plan	Jul-06	Aug-06
Final Design – Construction Plans	Aug-06	Nov-08
Permanent Conservation Easement	NA	May-09
Construction	NA	Jul-10
Bare root, containerized plantings	NA	Dec-10
Mitigation Plan / As-built (Year 0 Monitoring – baseline)	Mar-11	May-11
Year 1 Monitoring	Nov-11	Dec-11
Year 2 Monitoring		
Year 3 Monitoring		
Year 4 Monitoring		
Bolded items are examples of those items that are not standard, but may come up and should be included. Non-bolded items represent events that are standard components over the course of a typical project.		

Table 3. Project Contacts Table

Table 3. Project Contacts Table Morgan Creek Floodplain - EEP# 258		
Designer Primary project design POC	Ward Consulting Engineers, P.C. 8368 Six Forks Rd, Suite 104 Raleigh, NC 27615-5083 Becky Ward 919-870-0526	
Construction Contractor Construction contractor POC	River Works, Inc. 8000 Regency Parkway, Suite 200 Cary, NC 27518 Will Pedersen 919-459-9001	
Survey Contractor Survey contractor POC	Turner Land Surveying, PLLC 3201 Glenridge Dr Raleigh, NC 27604 Elisabeth Turner 919-875-1378	
Planting Contractor Planting contractor POC	Bruton Natural Systems, Inc. P.O. Box 1197 Fremont, NC 27930 Charlie Bruton 919-424-6555	
Seeding Contractor Contractor point of contact	River Works, Inc. 8000 Regency Parkway, Suite 200 Cary, NC 27518 Will Pedersen 919-459-9001	
Seed Mix Sources	Green Resource 336-855-6363	
Nursery Stock Suppliers	Core Nursery 919-542-6186 Mellow Marsh Farm, Inc. 919-742-1200 Dykes and Son Nursery 931-668-8833 ArborGen (SuperTree Seedlings) 800-222-1290 NC Forestry Service (Claridge Nursery) 919-731-7988	
Monitoring Performers	Ward Consulting Engineers, P.C 8368 Six Forks Rd, Suite 104 Raleigh, NC 27615-5083	The Catena Group 410-B Millstone Dr Hillsborough, NC 27278
Stream Monitoring POC	N/A	
Vegetation Monitoring POC	Christopher Sheats (The Catena Group) 919-732-1300	
Wetland Monitoring POC	Christopher Sheats (The Catena Group) 919-732-1300	

Table 4. Project Attribute Table

Table 4. Project Attribute Table	
Morgan Creek Floodplain - EEP# 258	
Project County	Orange/Durham
Physiographic Region	Piedmont (Triassic Basin)
Ecoregion	Central Piedmont
Project River Basin	Cape Fear River Basin
USGS HUC for Project (14 digit)	03030002060080
NCDWQ Sub-basin for Project	03-06-06
Within extent of EEP Watershed Plan?	Haw River (Jordan Lake)
WRC Hab Class (Warm, Cool, Cold)	Warm
% of project easement fenced or demarcated	100%
Beaver activity observed during design phase?	No
Restoration Component Attribute Table	
	Site
Drainage area	N/A
Stream order	N/A
Restored length (feet)	N/A
Perennial or Intermittent	N/A
Watershed type (Rural, Urban, Developing etc.)	N/A
Watershed LULC Distribution (e.g.)	N/A
Residential	N/A
Ag-Row Crop	N/A
Ag-Livestock	N/A
Forested	N/A
Etc.	N/A
Watershed impervious cover (%)	N/A
NCDWQ AU/Index number	N/A
NCDWQ classification	WS-IV;NSW
303d listed?	Yes
Upstream of a 303d listed segment?	Yes
Reasons for 303d listing or stressor	Standard Violation
Total acreage of easement	31.54
Total vegetated acreage within the easement	19.75
Total planted acreage as part of the restoration	11.8
Rosgen classification of pre-existing	N/A
Rosgen classification of As-built	N/A
Valley type	N/A
Valley slope	N/A
Valley side slope range (e.g. 2-3.%)	N/A
Valley toe slope range (e.g. 2-3.%)	N/A
Cowardin classification	N/A
Trout waters designation	N/A
Species of concern, endangered etc.? (Y/N)	No
Dominant soil series and characteristics	Chewacla
Series	-
Depth	-
Clay%	-
K	-
T	-
Use N/A for items that may not apply. Use "-" for items that are unavailable and "U" for items that are unknown	

Appendix B. Visual Assessment Data

STREAM CROSSING

USGS STREAM GAUGE 1420 FT FROM BERM OPENING 1

GAUGE 10 2090 FT FROM BERM OPENING 1

VPA-1

BERM OPENING #1

BERM OPENING #2

VPA-1

MORGAN CREEK

BERM OPENING #3

VPA-1

ORANGE COUNTY

DURHAM COUNTY

ROAD OPENINGS

WETLAND RESTORATION SOIL UNIT 2 5.31 Ac.

Gauge 9

Veg Plot 1

Gauge 3

BERM OPENING #4

Rain Gauge

CONSERVATION EASEMENT BOUNDARY 31.54 Ac.

Veg Plot 2

Gauge 2

VPA-2

Gauge 1

Veg Plot 3

Gauge 4

Veg Plot 5

BERM OPENING #5

EXISTING BERM

Gauge 5

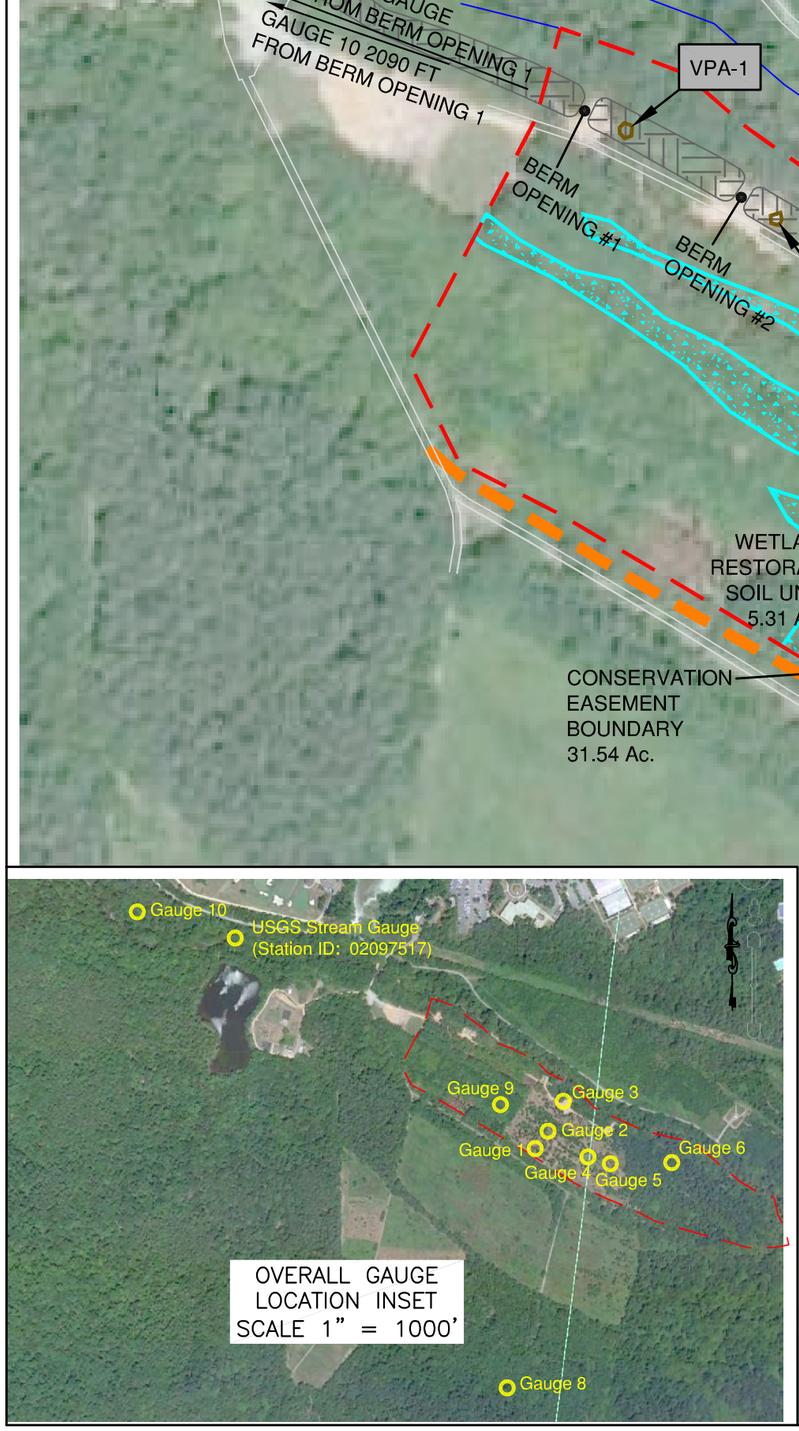
Gauge 6

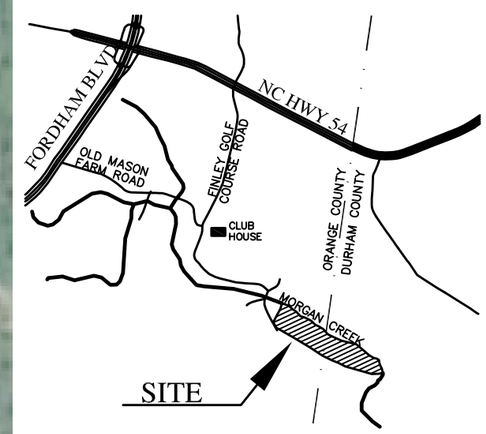
Gauge 8 1590 FT FROM Gauge 1

Veg Plot 4

WETLAND RESTORATION SOIL UNIT 1 9.06 Ac.

WETLAND PRESERVATION 5.61 Ac.





LEGEND

- GROUNDWATER GAUGE
- VEGETATION PLOT
- CONSERVATION EASEMENT
- EXISTING DITCH LINE
- PHOTO LOCATION
- VPA-4 VEGETATION PROBLEM AREA

Vegatation Plot Pin Coordinate Table (NAD83)

Vegatation Plot Number	Origin	
	Northing	Easting
1	779061.78	1996214.53
2	778733.74	1996110.92
3	778642.85	1996377.94
4	778516.57	1996540.48
5	778700.17	1996618.61

2010 Aerial Photo from Google Earth

200 100 0 200 400

SCALE 1" = 200'

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Ecosystem Enhancement PROGRAM

MORGAN CREEK FLOODPLAIN (EEP #258)

CURRENT CONDITIONS PLAN VIEW

ORANGE/DURHAM COUNTIES NORTH CAROLINA

DATE: 30 NOVEMBER 2011

REVISIONS:

PROJECT NAME: MORGAN CREEK

DWG NAME: CCPV

SCALE: 1' = 200'

SHEET NO.

FIGURE 2

Table 5 Vegetation Condition Assessment

Planted Acreage[1] **11.8**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	Very limited cover of both woody and herbaceous material.	0.1 acres	Brown Line	0	0.00	0.0%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.01 acres	Brown Line	1	0.09	0.7%
			Total	1	0.09	0.7%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.25 acres	Brown Line	0	0.00	0.0%
			Cumulative Total	1	0.09	0.7%

Easement Acreage[2] **31.54**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern[4]	Areas or points (if too small to render as polygons at map scale).	500 SF	Brown Line	3	0.01	0.0%
5. Easement Encroachment Areas[3]	Areas or points (if too small to render as polygons at map scale).	none	Brown Line	0	0.00	0.0%

High Concern:				**Low/Moderate Concern:**	
Vines	**Genus/Species**	**Shrubs/Herbs**	**Genus/Species**	**Shrubs/Herbs**	**Genus/Species**
Kudzu	*Pueraria lobata*	Japanese Knotweed	Polygonum cuspidatum	Japanese Privet	Ligustrum Japonicum
Porcelain Berry	Ampelopsis brevipeduncu	Oriental Bittersweet	Celastrus orbiculatus	Glossy Privet	Ligustrum lucidum
Japanese Honeysuckle	Lonicera japonica	Multiflora Rose	Rosa multiflora	Fescue	Festuca spp.
Japanese Hops	Humulus japonicus	Russian olive	Elaeagnus angustifolia	English Ivy	Hedera helix
Wisterias	Wisteria spp.	Chinese Privet	Ligustrum sinense	Microstegium	Microstegium vimineum
Winter Creeper	Euonymus fortunei	Chinese Silvergrass	Miscanthus sinensis	Burning Bush	Euonymus alatus
Bush Killer (Watch List)	Cayratia japonica	Phragmites	Phragmites australis	Johnson Grass	Sorghum halepense
		Bamboos	Phyllostachys spp	Bush Honeysuckles	Lonicera, spp.
Trees		Sericea Lespedeza	Sericea Lespedeza	Periwinkles	Vinca minor
Tree of Heaven	Ailanthus altissima	Garlic Mustard (Watch List)	Alliaria petiolata	Morning Glories	Morning Glories
Mimosa	Albizia julibrissin	Cogon Grass (Watch List)	Imperata cylindrica	Bicolor Lespedeza (Watch List)	Lespedeza bicolor
Princess Tree	Paulownia tomentosa	Giant Reed (Watch List)	Arundo donax	Chinese Yams (Watch List)	Dioscorea oppositifolia
China Berry	Melia azedarach	Tropical Soda Apple (Watch List)	Solanum viarum	Air Potato (Watch List)	Dioscorea bulbifera
Callery Pear	Pyrus calleryana	Japanese Spirea (Watch List)	Spiraea japonica	Japanese Climbing Fern (Watch List)	Lygodium japonicum
White Mulberry	Morus alba	Japanese Barberry (Watch List)	Berberis thunbergii		
Tallow Tree (Watch List)	Triadica sebifera				

Vegetation Plot Photos

Photo 1. Veg Plot 1 (August 23, 2011)

Photo 2. Veg Plot 2 (August 23, 2011)

Photo 3. Veg Plot 3 (August 23, 2011)

Photo 4. Veg Plot 4 (August 23, 2011)

Photo 5. Veg Plot 5 (August 23, 2011)

Appendix C. Vegetation Plot Data

Table 6. Vegetation Plot Criteria Attainment		
Vegetation Plot ID	**Vegetation Survival Threshold Met?**	**Tract Mean**
VP 1	Yes	100%
VP 2	No	
VP 3	Yes	
VP 4	Yes	
VP 5	Yes	

Table 7. CVS Metadata

Report Prepared By	Chris Sheats
Date Prepared	11/14/2011 14:40
database name	Mason Farms CVS Data entry Tool.mdb
database location	Z:\Jobs\2005\4114 (Mason Farms)\Monitoring\Baseline Monitoring Report MY-00 (2011)\VEGETATION DATA
computer name	CHRIS-PC
file size	37335040
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
PROJECT SUMMARY----------	
Project Code	258
project Name	Mason Farms
Description	Wetland Enhancement and Restoration on Mason Farms Biological Reserve in Orange/Durham Counties
River Basin	Cape Fear
length(ft)	
stream-to-edge width (ft)	
area (sq m)	
Required Plots (calculated)	
Sampled Plots	5

Table 8. CVS Stem Count Total and Planted by Plot and Species

EEP Project Code 258. Project Name: Morgan Creek Floodplain

			Current Plot Data (MY1 2011)															Annual Means					
			E258-01-0001			E258-01-0002			E258-01-0003			E258-01-0004			E258-01-0005			MY1 (2011)			MY0 (2011)		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Alnus serrulata	hazel alder	Shrub Tree				1	1	1	1	1	1	2	2	2				4	4	4	6	6	6
Betula nigra	river birch	Tree	1	1	1				1	1	1				2	2	2	4	4	4	5	5	5
Carya cordiformis	bitternut hickory	Tree																			1	1	1
Cornus amomum	silky dogwood	Shrub				1	1	1	2	2	2				3	3	3	6	6	6	7	7	7
Diospyros virginiana	common persimmon	Tree	2	2	2	1	1	1	3	3	3							6	6	6	6	6	6
Liriodendron tulipifera var. tulipifera	Tulip-tree, Yellow Poplar, Whitewood	Tree													1	1	1	1	1	1	3	3	3
Nyssa sylvatica	blackgum	Tree	2	2	2				1	1	1							3	3	3	2	2	2
Platanus occidentalis var. occidentalis	Sycamore, Plane-tree	Tree	2	2	2	1	1	1				1	1	1				4	4	4	4	4	4
Quercus michauxii	swamp chestnut oak	Tree	1	1	1													1	1	1	1	1	1
Quercus phellos	willow oak	Tree				1	1	1				3	3	3	2	2	2	6	6	6	6	6	6
Sambucus canadensis	Common Elderberry	Shrub Tree				1	1	1	1	1	1	3	3	3				5	5	5	7	7	7
Staphylea trifolia	American bladdernut	Shrub Tree																			5	5	5
Ulmus rubra	slippery elm	Tree										1	1	1				1	1	1			
Unknown		unknown																			1	1	1
Vaccinium corymbosum	highbush blueberry	Shrub																			4	4	4
Viburnum dentatum var. dentatum	southern arrowwood	Shrub Tree	2	2	2							1	1	1				3	3	3	8	8	8
		Stem count	10	10	10	6	6	6	9	9	9	11	11	11	8	8	8	44	44	44	66	66	66
		size (ares)	1			1			1			1			1			5			5		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.12			0.12		
		Species count	6	6	6	6	6	6	6	6	6	6	6	6	4	4	4	12	12	12	15	15	15
		Stems per ACRE	404.7	404.7	404.7	242.8	242.8	242.8	364.2	364.2	364.2	445.2	445.2	445.2	323.7	323.7	323.7	356.1	356.1	356.1	534.2	534.2	534.2

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%

Appendix D. Stream Survey Data

(Not Applicable for this Project)

Appendix E. Hydrologic Data

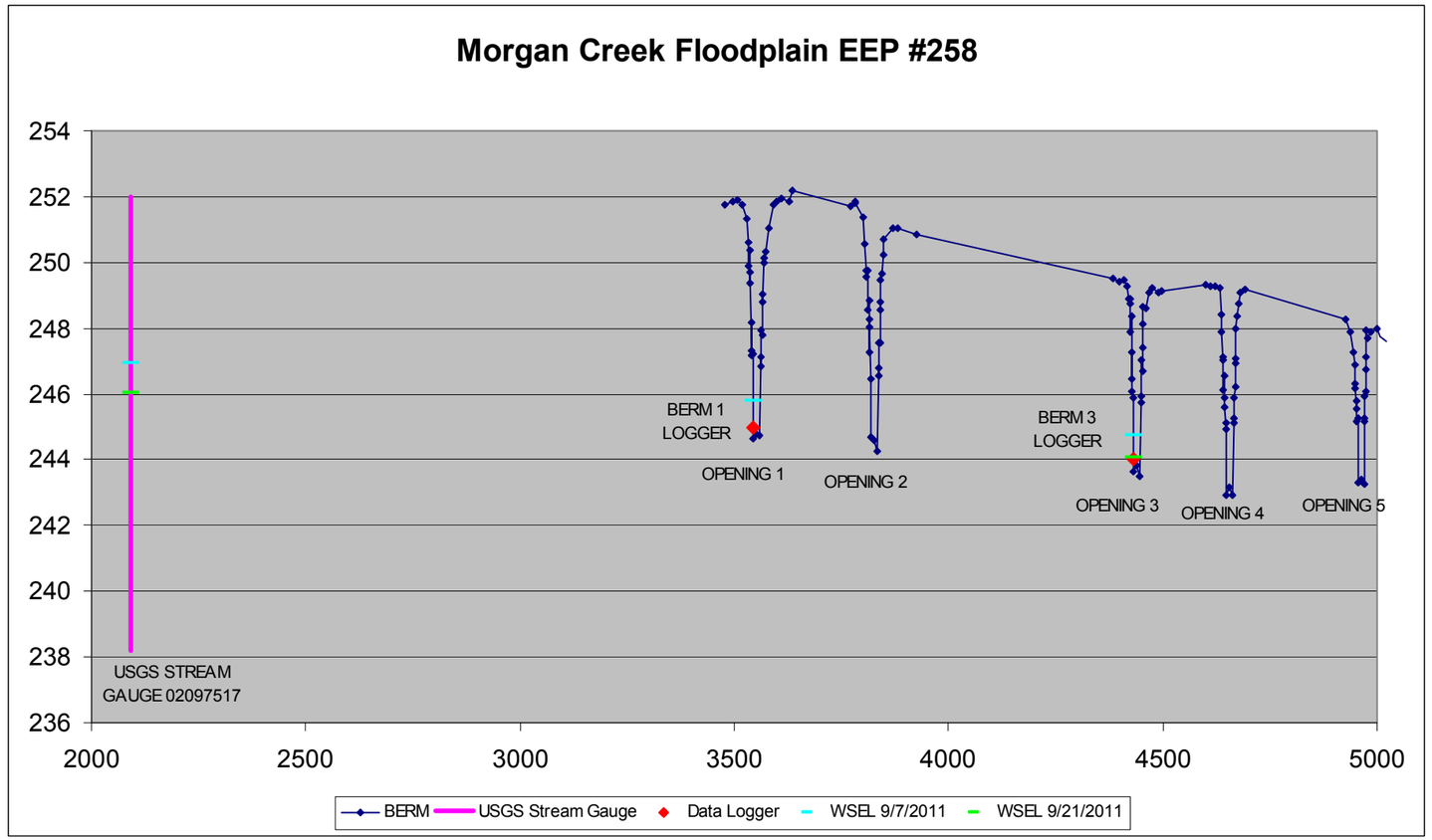
Table 9. Bankfull Events Accessing Through Berm Openings Morgan Creek Floodplain - EEP # 258			
Date of Data Collection	**Date of Occurrence**	**Method**	**Photo #**
17-Dec-10	n/a	Visual observation of wrack lines	6
3-Jun-11	27-May-11	USGS Gauge height >11.0 feet, Visual observation of overland flow/indicators	7
1-Aug-11	31-Jul-11	USGS Gauge height >9.0 feet, Visual observation of overland flow/indicators	8
7-Sep-11	7-Sep-11	USGS Gauge height >8.5 feet	n/a

The USGS stream gauge (02097517 Morgan Creek near Chapel Hill, NC) located on the adjacent Morgan Creek provides real time gauge height updates to monitoring performers. On September 30, 2010, the gauge height reached a maximum height of 7.8 feet in which flow was observed through berm opening #4. An alert has been established through USGS to notify monitoring performers of any gauge height of 8.0 feet or greater, where flow will access the floodplain through the berm openings. Monitoring performers are documenting each berm activation event, and correlating gauge height, in order to better quantify the volume of flow through the openings during a given rain event for future monitoring purposes.

Photo 6. Wrack lines at berm opening #4

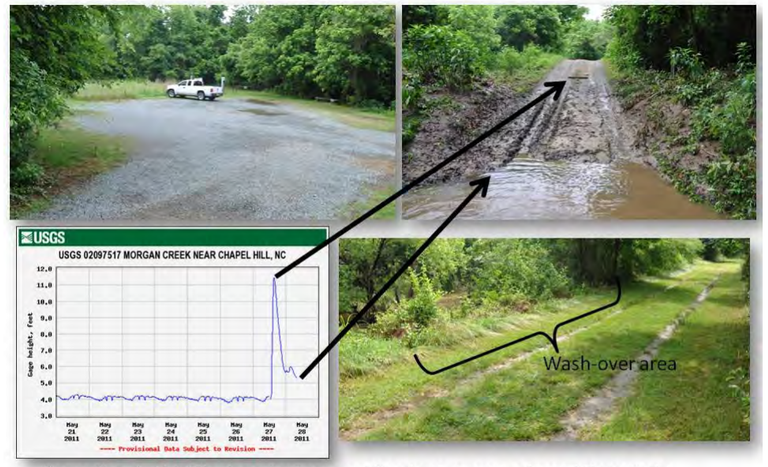
Photo 7. Overland flow

Photo 8. Overland flow indicators at Berm #1



Observed Water Elevation				
Date	Gauge	Gauge Station	Gauge Reading	Flow Elevation
9/7/2011	USGS	2091.19	8.71	246.92
	Berm 1	3544.71	0.81	245.78
	Berm 3	4431.37	0.74	244.74
9/21/2011	USGS	2091.19	7.82	246.03
	Berm 1	3544.71	-	-
	Berm 3	4431.37	0.08	244.08

Data loggers installed at berm openings 1 and 3 only



As predicted – this 6" rain and subsequent floodwaters were released through the berm openings and did not (as usual) cause berm overtopping and flooding above and within the parking lot. There was also minimal wash-over across the loop road and with no erosion.

Mason Farm Biological Reserve berm openings after 6" rain – 27 May, 2011

FIGURE 3 - BERM FLOW EXHIBIT

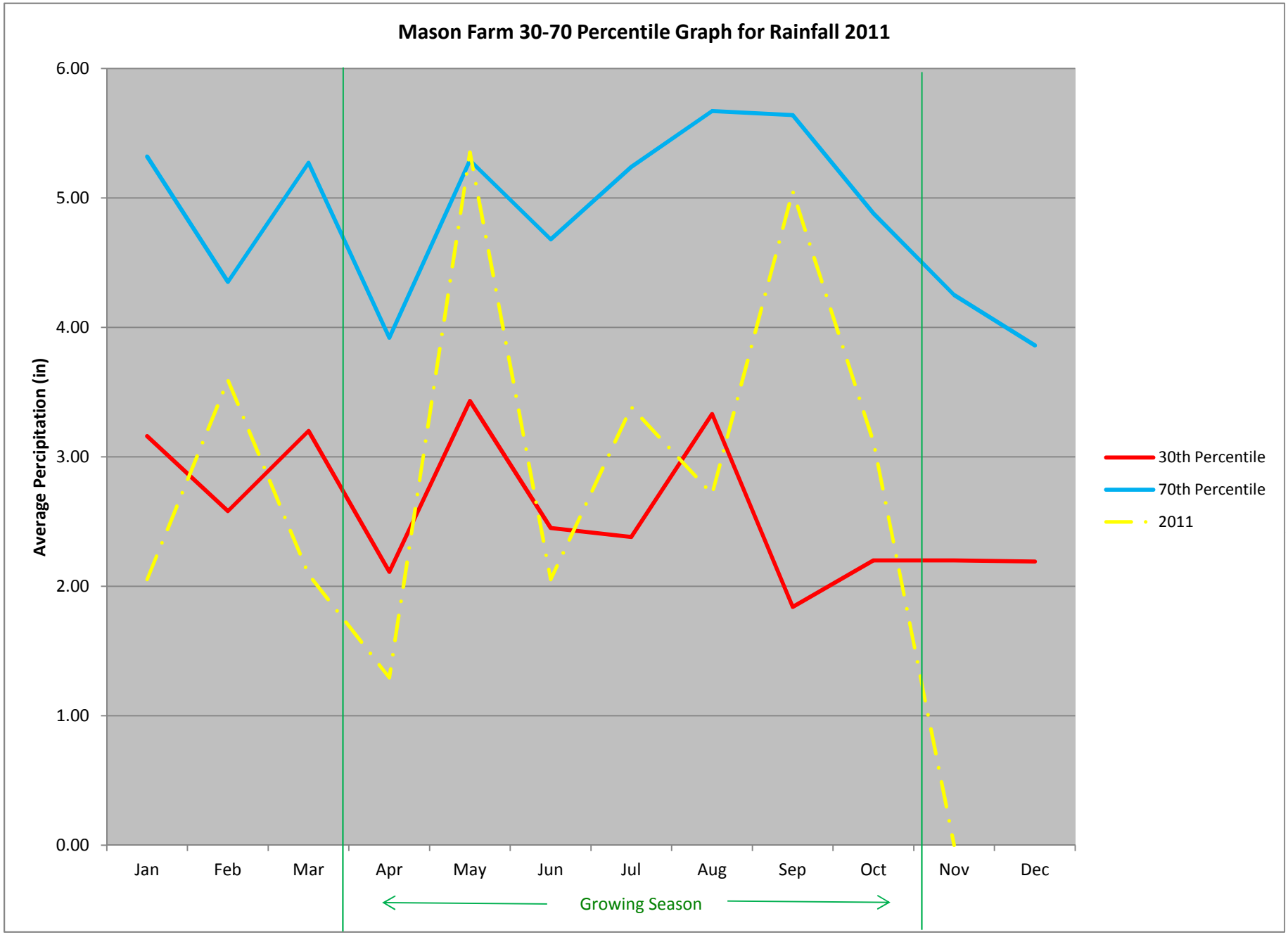
Table 10. Wetland Criteria Attainment

	2011		
Gauge #	**Max # Consecutive Days**	**% Growing Season**	**Success Criteria Attained**
1	61	28	Yes
2	34	15	Yes
3	5	2	No
4	8	4	No
5	53	24	Yes
6	51	23	Yes
8	26	12	Yes
9	32	14	Yes
10	61	28	Yes

Growing Season: 221 Days, March 23 to November 3 (source: http://www.wcc.nrcs.usda.gov/cgibin/state.pl?state=nc)

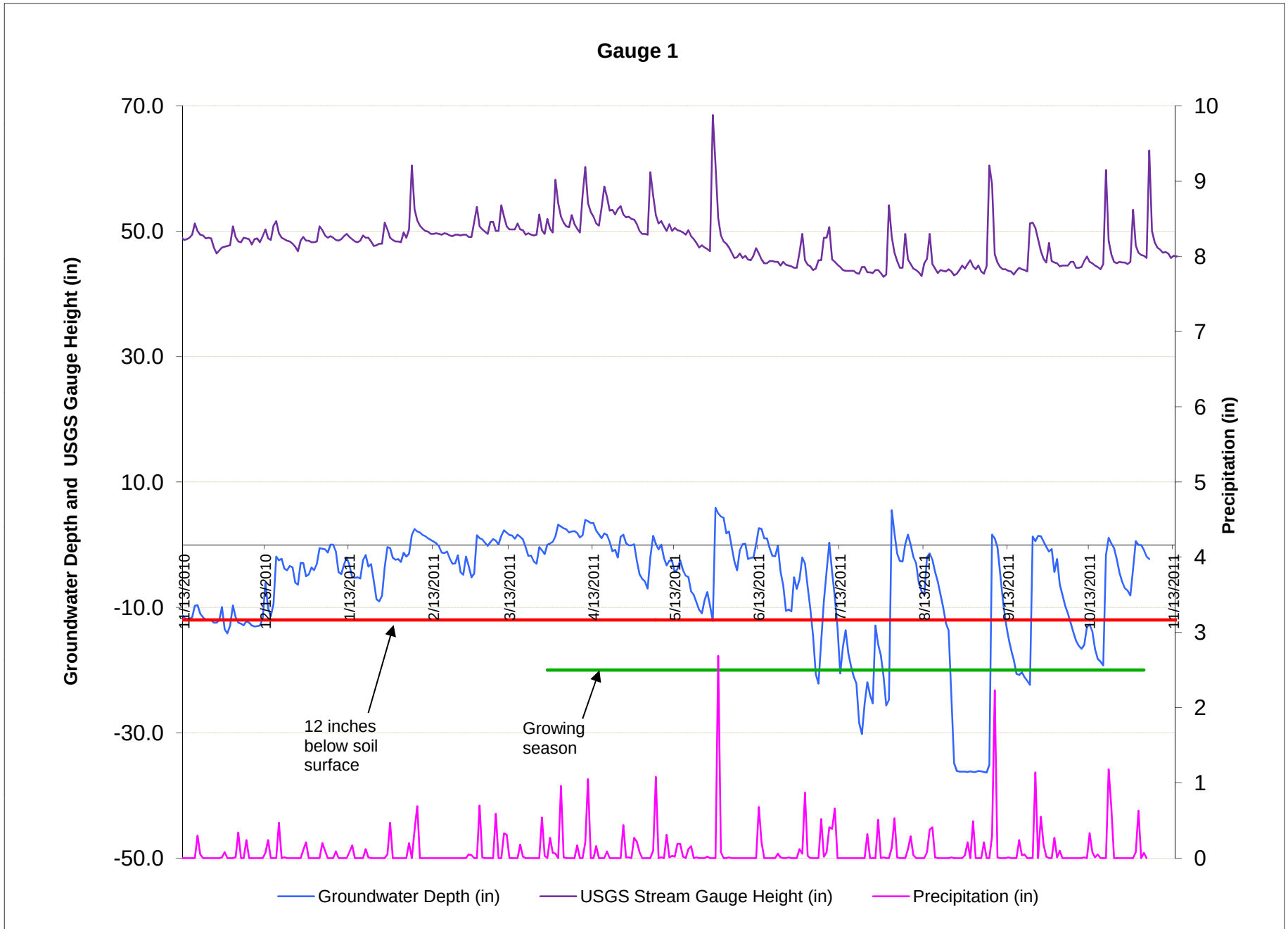
-Wetland Soil Unit #1 Wetland Hydrology Criteria (Gauges 1,2,4,5,6): groundwater within 12 inches of the surface for at least 12.5% of the growing season

-Wetland Soil Unit #2 Wetland Hydrology Criteria (Gauges 3,9): groundwater within 12 inches of the surface for at least 5% of the growing season



Growing Season: March 27 to November 3 (221 days)
(http://www.wcc.nrcs.usda.gov/cgibin/state.pl?state=nc)

2010-2011 Rain Data: Station KIGX
(http://www.nc-climate.ncsu.edu/services/request.php)



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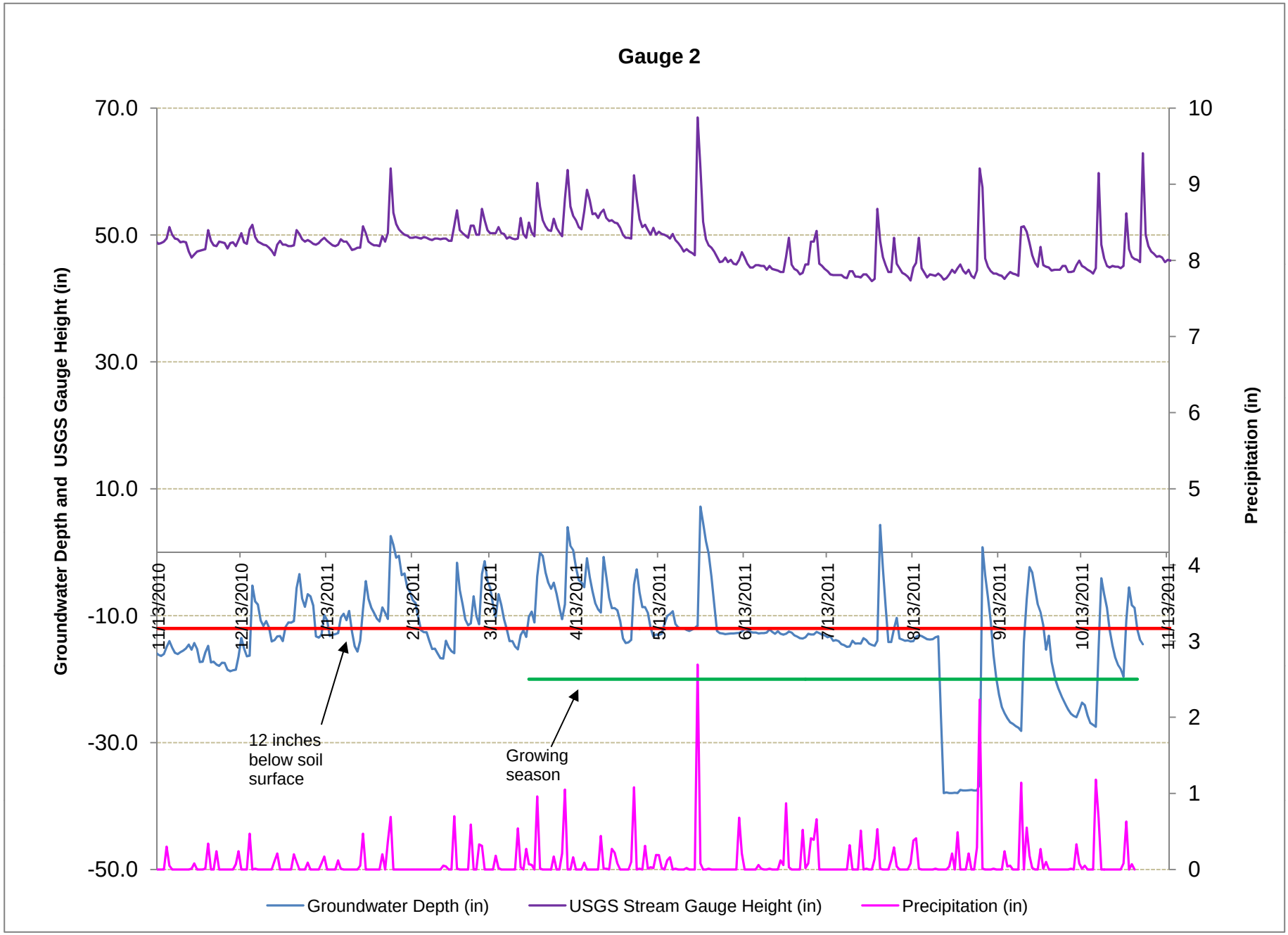

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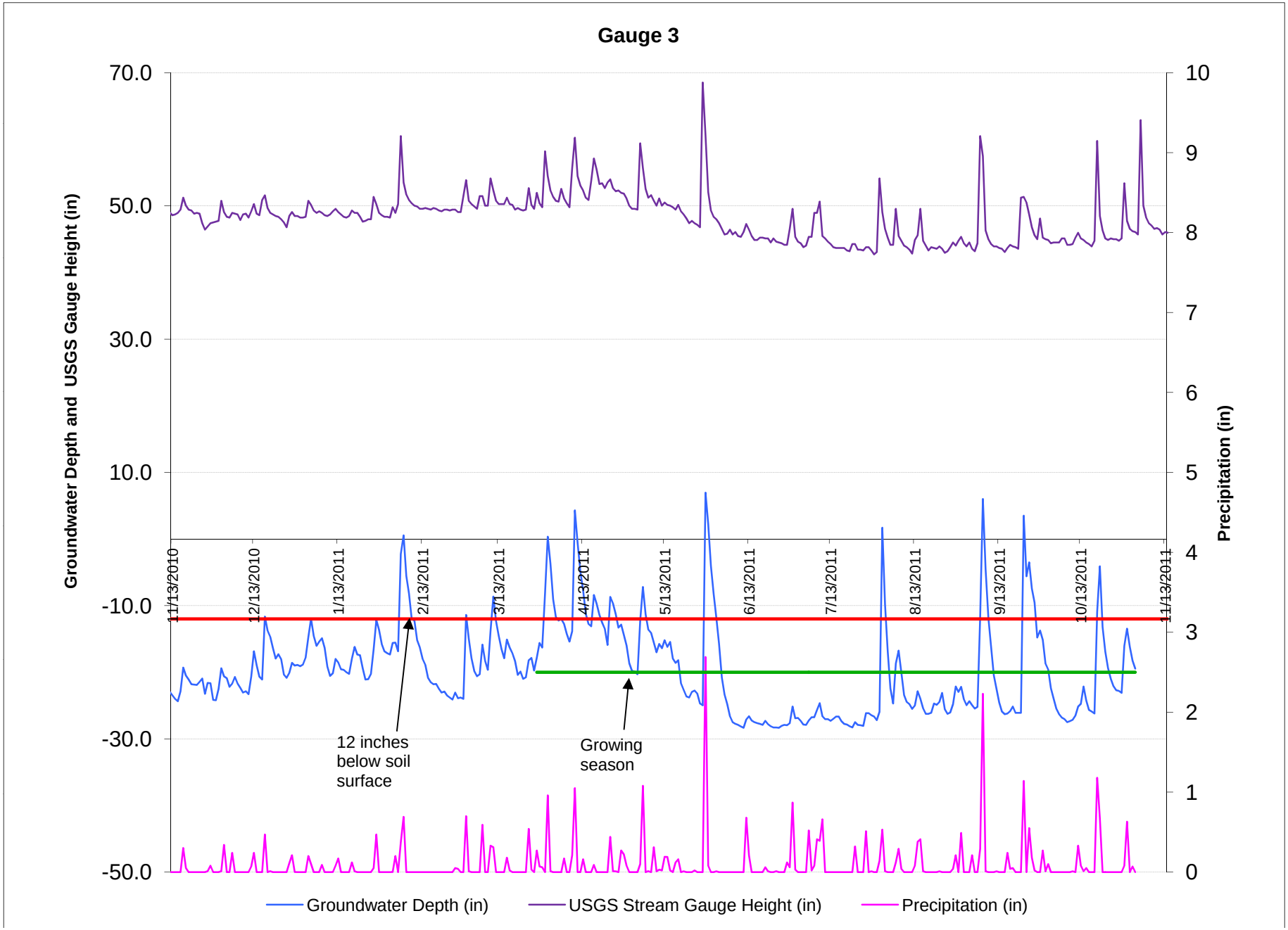

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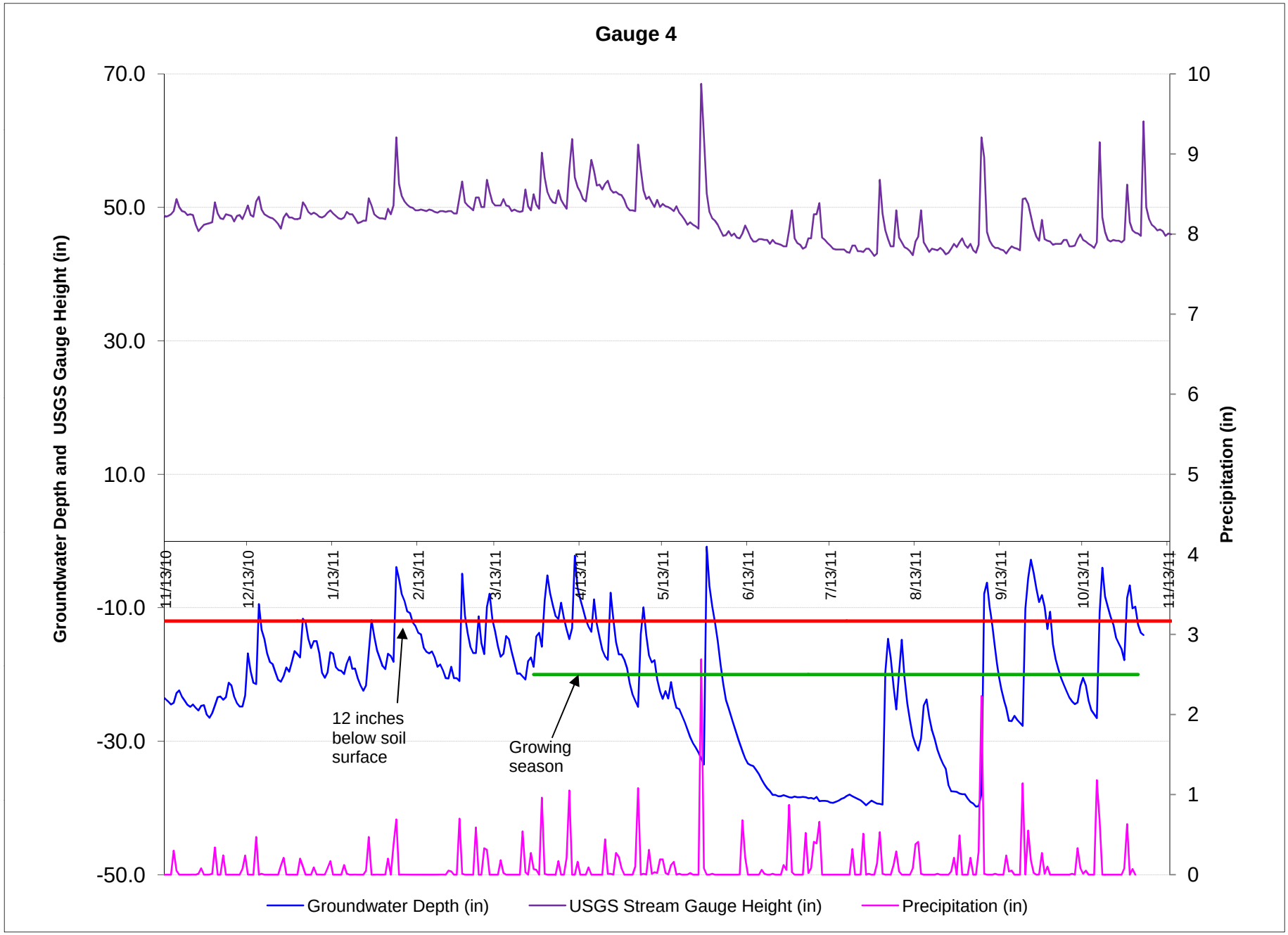

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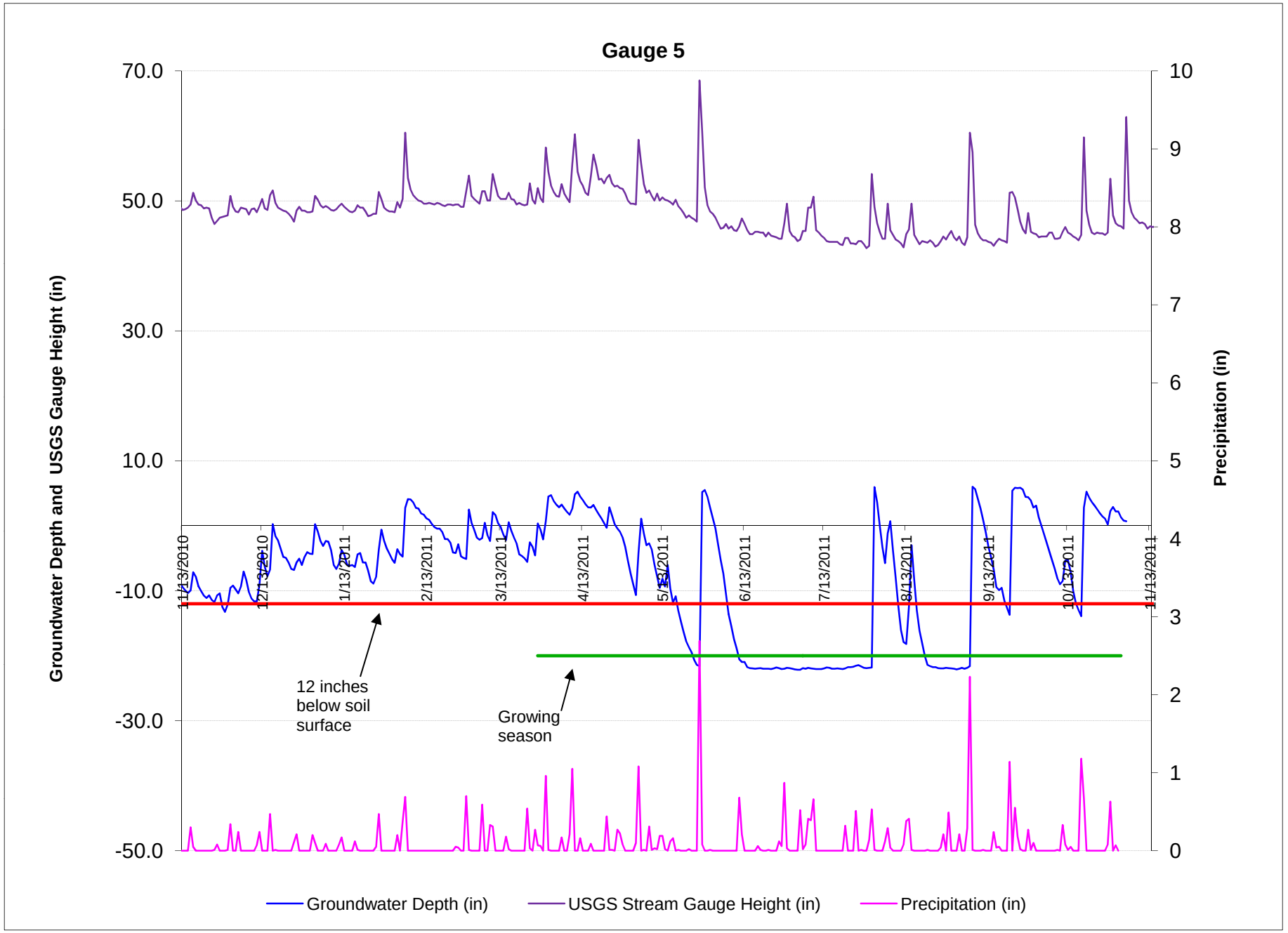

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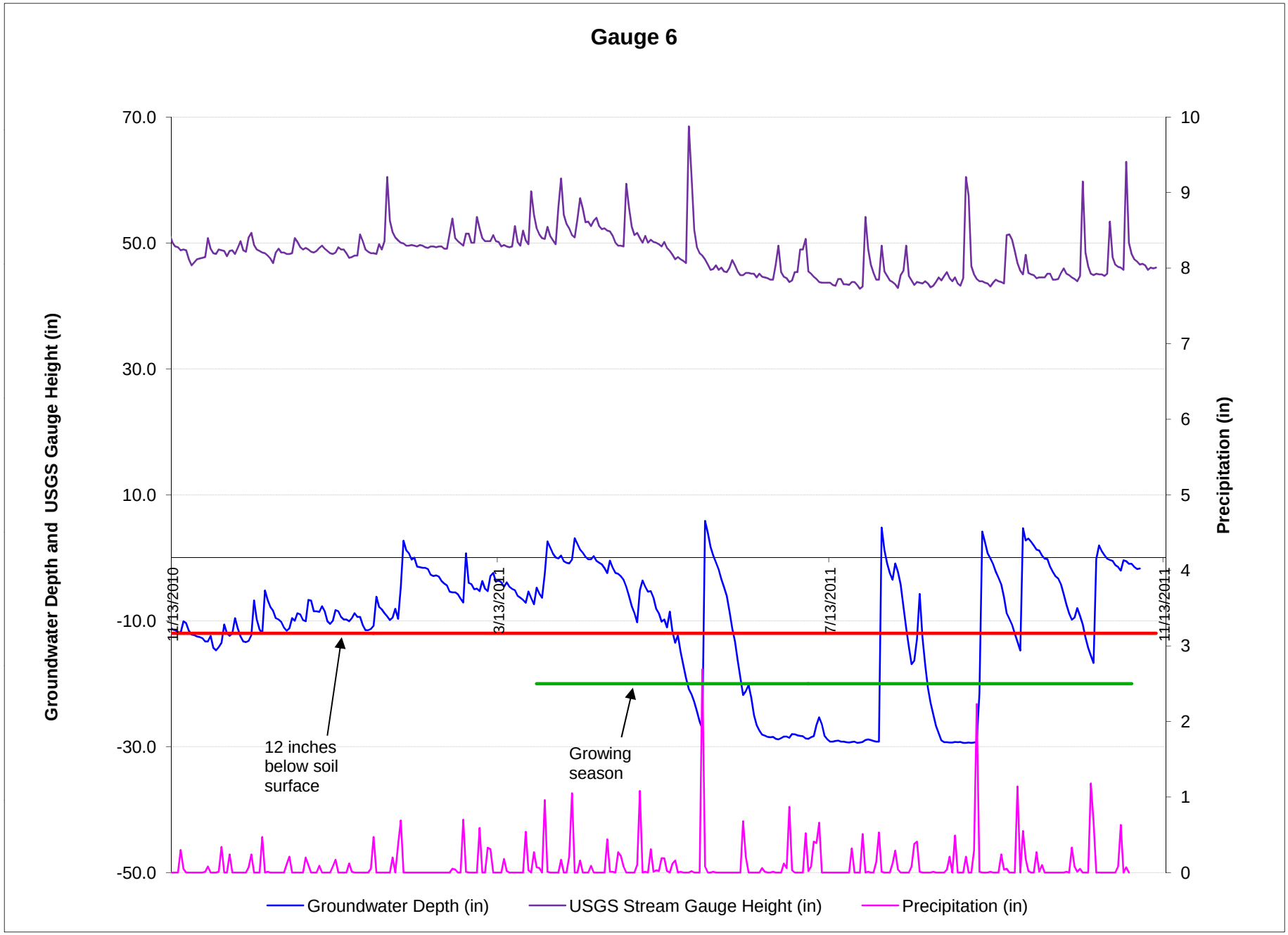

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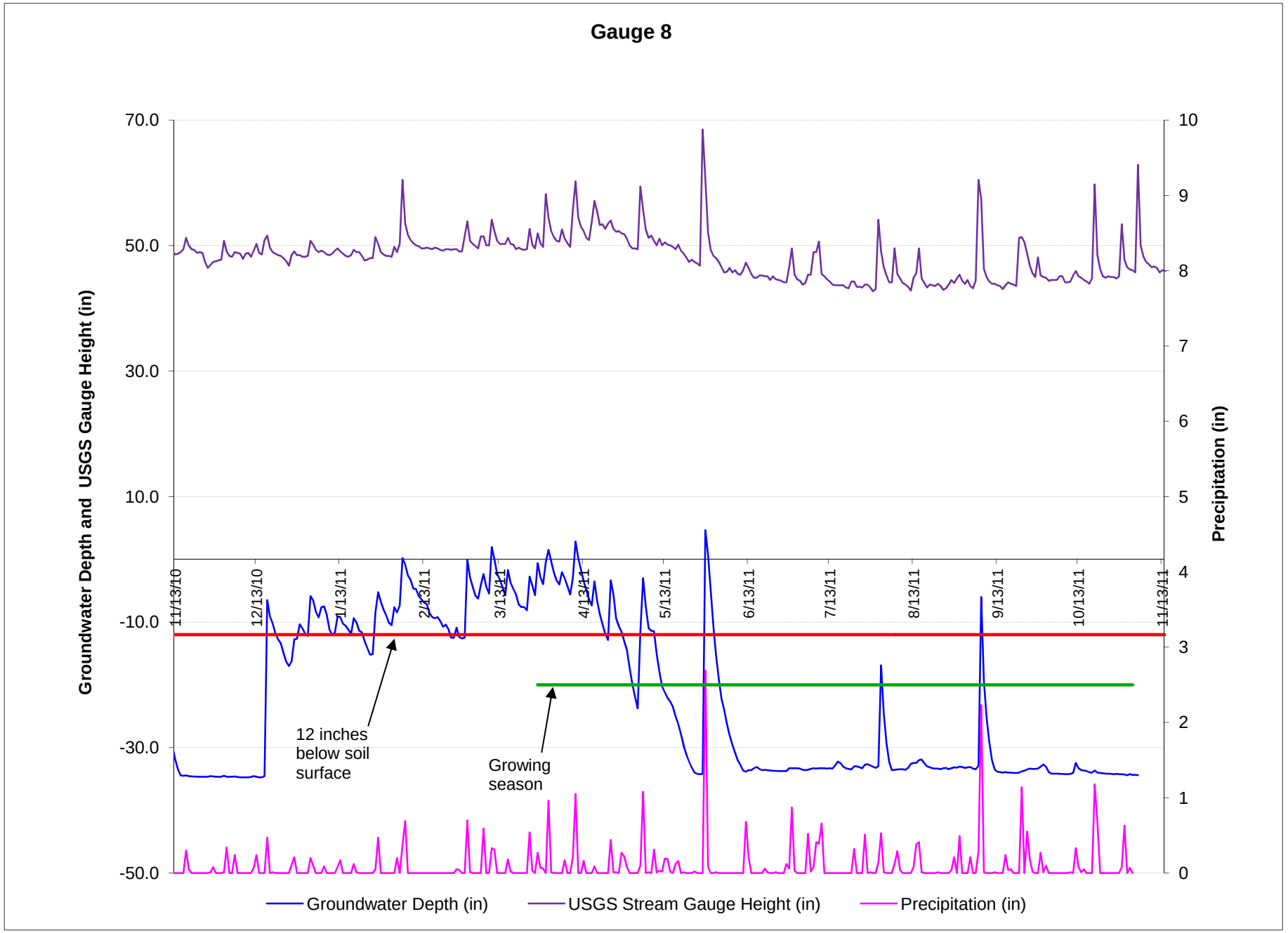

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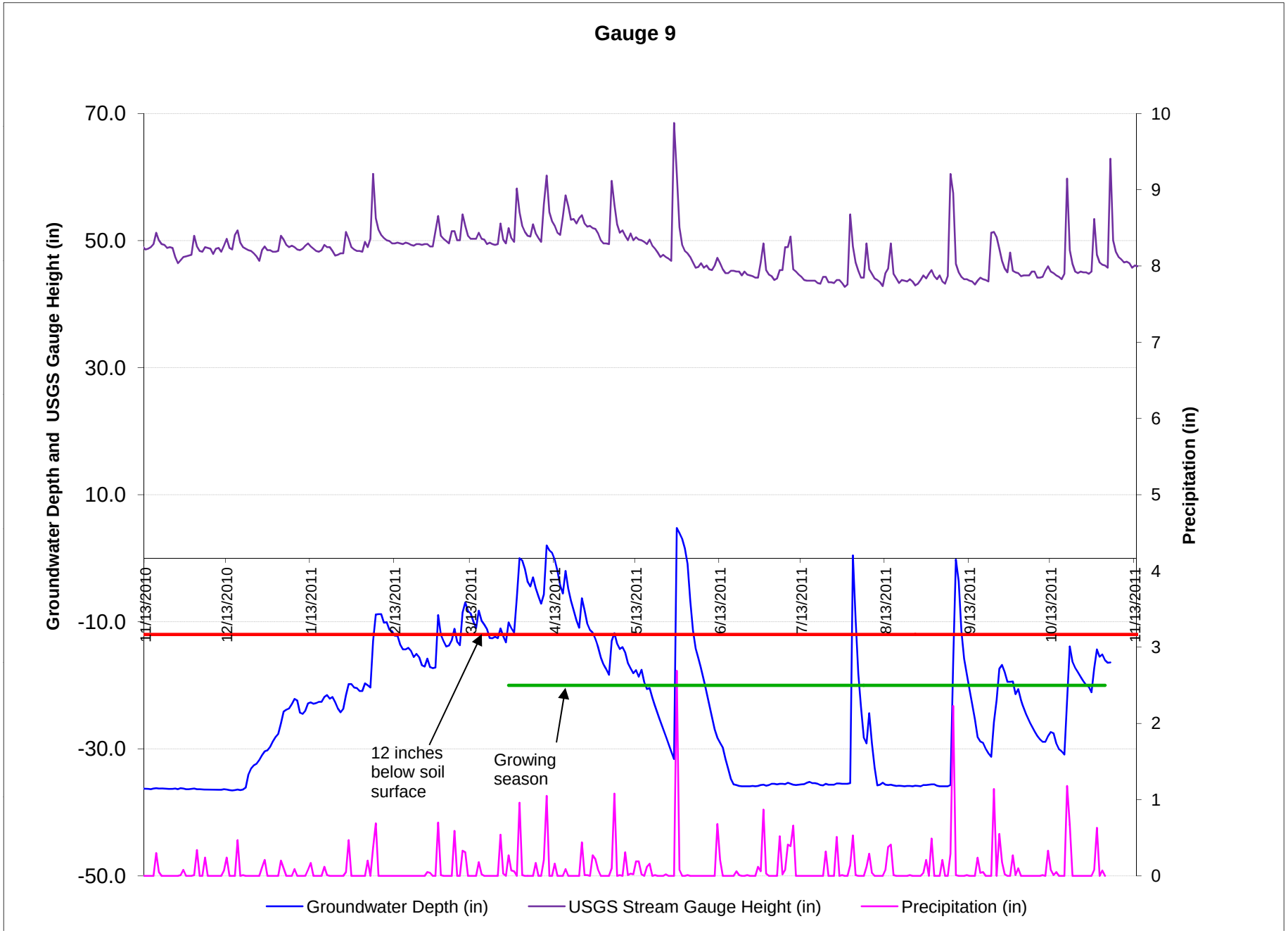

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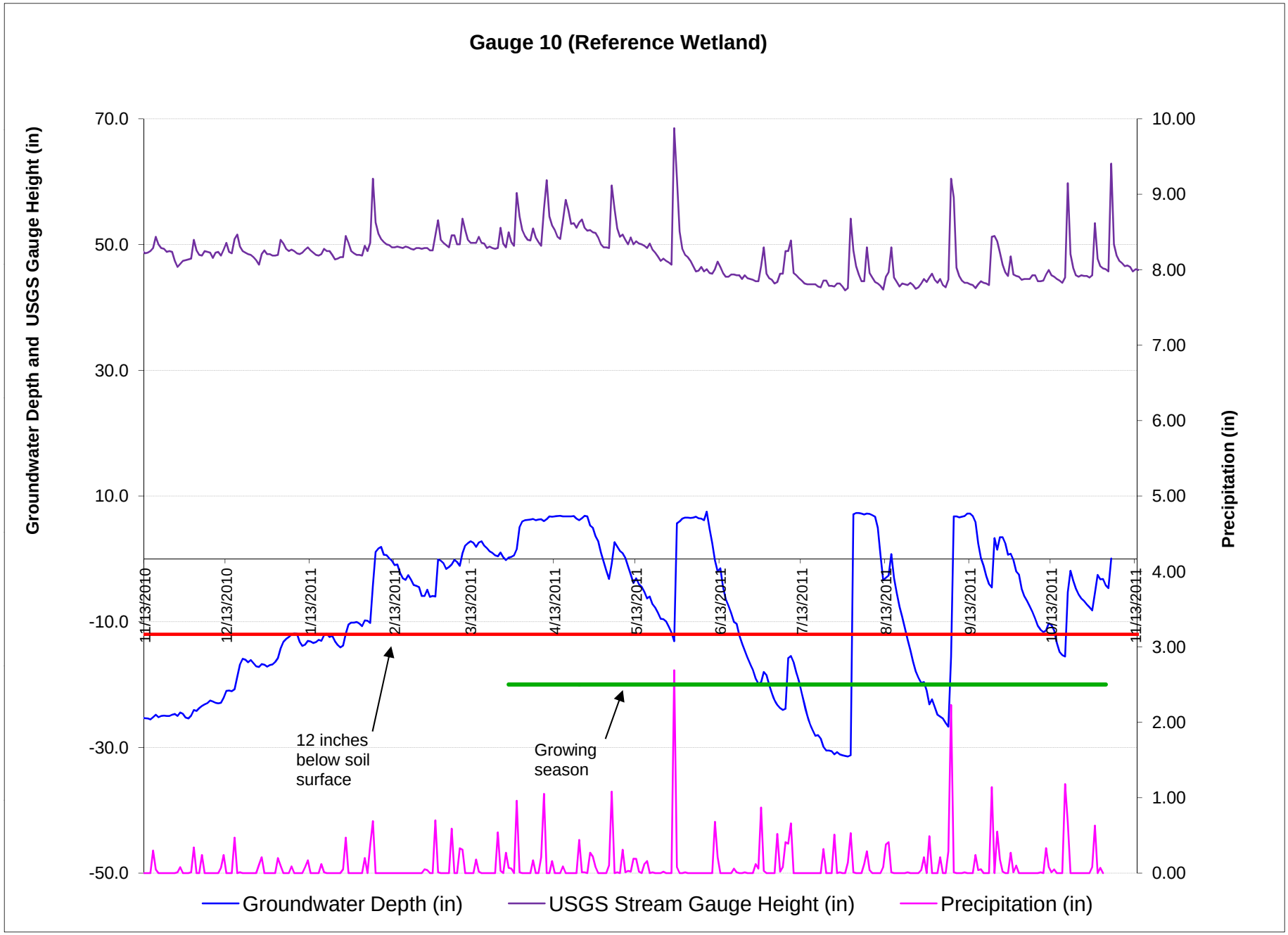

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