WHITELACE CREEK STREAM AND WETLAND RESTORATION SITE

2006 Annual Monitoring Report (Year 1)

Lenoir County
EEP Project No. 420
Design Firm: EcoScience Corporation

January 2007

Prepared for: **NCDENR/ ECOSYSTEM ENHANCEMENT PROGRAM**
1619 Mail Service Center
Raleigh, NC 27699-1619

Prepared by: **ECOSCIENCE CORPORATION**
1101 Haynes Street, Suite 10
Raleigh, NC 27604

Ecosystem Enhancement PROGRAM

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1.0 EXECUTIVE SUMMARY

EcoScience Corporation (ESC) was retained by the North Carolina Ecosystem Enhancement Program (EEP) to provide stream, wetland, and Neuse River riparian buffer restoration and enhancement design services for the Whitelace Creek Stream and Wetland Restoration Site (hereafter referred to as the Site). The Site, confined within an EEP-owned conservation easement, is located west of Kinston in Lenoir County, North Carolina (Figure 1, Appendix A). The Site comprises approximately 37.0 acres, and is located in the Neuse River Basin (Cataloguing Unit 03020202040020).

Restoration activities including excavation of the floodplain to provide Level 1 stream enhancement, riverine wetland enhancement and restoration, and Neuse River riparian buffer enhancement and restoration were completed in December of 2005. Planting of indigenous species was completed in March of 2006. This 2006 monitoring report represents the first year of vegetation, stream and hydrology monitoring. In order to ensure the Site meets regulatory stream, wetland, and riparian buffer restoration monitoring criteria, each parameter will be monitored annually for five (5) years or until success criteria has been achieved (Figure 2, Appendix A). The Site must demonstrate vegetation and hydrologic success and demonstrate channel stability for a minimum of five years or until the Site is deemed successful. The following paragraphs summarize the results of the first year of monitoring.

Vegetation Monitoring

Vegetation success criteria for the planted wetland and Neuse River riparian buffer restoration and enhancement areas is based on a minimum survival of 320 stems per acre until year three and 260 stems per acre of planted species at the end of year five. Volunteer woody vegetation is also included as a supplement to the vegetation report. Of the fifteen 10 by 10 meter vegetation plots, eight achieved the density criterion of 320 stems per acre. Of the plots that had poor survival, four were bottomland hardwood plots, two were cypress/gum swamp plots, and one was a mesic hardwood forest plot. Five plots received damage from high flood waters and two plots were dominated by aggressive, weedy species. Remedial planting is recommended prior to the second year of monitoring.

Stream Restoration Monitoring

Only the dimension characteristics of Whitelace Creek were restored for this project. Excavation and reestablishment of the floodplain was the primary means for restoring the channel. Stream pattern and profile were not altered. The three stream monitoring cross-sections are newly established and therefore comparisons for stability purposes are not currently available. However, from visual assessments, the stream appears to be very stable with no observed problem areas. The stream banks have well established vegetation with no signs of bank failure. Based on Rosgen classification, the stream is currently designated as a C5/E5 providing a channel that is slightly entrenched, with low to moderate width/depth ratios, and moderate sinuosity. The crest gauge at Whitelace Creek indicated two bankfull events in the current monitoring year. The first bankfull event occurred in the first few days of May 2006 when the water level rose approximately 1 inch above bankfull. The second bankfull occurred in June 2006 when the crest gauge indicated that the water rose approximately 2 inches above bankfull.

Ground Water Hydrology Monitoring

The 2006 hydrologic monitoring results indicate hydrologic success within all restored wetland areas. All seven on-site groundwater monitoring gauges exhibited saturation within 12 inches of the ground surface for at least 12.5 percent (consecutive days) of the growing season (March 15 – November 19 or 249 days).

2.0 PROJECT BACKGROUND

2.1 LOCATION AND SETTING

The Site is located adjacent to the Kennedy Home approximately one mile south of US 70 and 6.5 miles west of Kinston, North Carolina. Site directions: from Raleigh, follow US 70 East toward Kinston. Approximately 8 miles east of La Grange take a right on Kennedy Home Road. Continue approximately 0.3 miles, take the first left onto Kennedy Dairy Road. Follow Kennedy Dairy Road through the Kennedy Home complex. Continue through the traffic circle, stay right until you merge onto Baptist Orphanage Road. Travel approximately 0.5 miles until you come to a small concrete bridge spanning Whitelace Creek. At this point you are near the middle of the Site. The stream enhancement reach begins approximately 2,400 feet upstream of the bridge and ends approximately 3,500 feet downstream. The 7.7 acres of riverine wetland restoration encompasses the constructed floodplain adjacent to approximately 3,500 linear feet of Whitelace Creek, including two closed hog waste lagoons. The 13.0 acres of riverine wetland enhancement occurs primarily within the riparian areas within the eastern (downstream) portion of the Site.

2.2 RESTORATION STRUCTURE AND OBJECTIVES

Whitelace Creek was previously dredged and straightened to accommodate past land uses (i.e., a large dairy operation and other agricultural practices). Jurisdictional riverine wetlands were identified adjacent to the stream in many areas. However, particularly in upstream portions of the Site, channel dredging activities had reduced the acreage of riverine wetlands by lowering the streambed elevation, thereby adversely affecting wetland hydrology.

Restoration objectives include the restoration of historic stream and wetland functions that existed on-site prior to dredging and vegetation removal. Site alterations at Whitelace Creek include the excavation or reestablishment of the floodplain and in-situ stream channel modification to the existing stream. These activities have reintroduced surface water flood hydrodynamics from a 10.1-mile watershed along the restored length of stream and floodplain. Characteristic wetland soil features, groundwater wetland hydrology, and hydric vegetation communities have developed in floodplain areas adjacent to the channel. The existing channel has been modified to reflect regional stream characteristics and accommodate bankfull flows. Oxbow lakes and backwater sloughs have been accounted for in floodplain construction activities. Subsequently, wetland soil surfaces have been restored and the Site reforested with streamside and riparian forest communities. Forested stream and upland buffers have been included along the entire stream and floodplain to further protect water quality and enhance opportunities for wildlife.

Table 1. Project Structure Whitelace Creek Stream and Wetland Restoration Site/ EEP Project No. 420					
Project Segment or Reach ID	**Mitigation Type**	**Approach**	**Restored Linear Footage or Acreage**	**Stationing**	**Comment**
Reach 1	E1	P2	3,693 l.f.	0+35 – 37+58	Total accounts for 30 l.f. gap in easement at road crossing
Reach 2	S	SS	2,208 l.f.	37+58 – 59+66	
Riverine Wetland Restoration	R	P2	7.7 ac	NA	Stations 0+00 – 37+58 mark the extents of floodplain grading
Riverine Wetland Enhancement	E	NA	13.0 ac	NA	
Neuse River Buffer Restoration	R	NA	27.1 ac	NA	
Neuse River Buffer Enhancement	E	NA	7.2 ac	NA	

R = Restoration
E1 = Stream Enhancement 1
S = Stabilization
E = Wetland/Riparian Buffer Enhancement
P2 = Priority 2
SS = Streambank Stabilization

2.3 PROJECT HISTORY AND BACKGROUND

Table 2. Project Activity and Reporting History Whitelace Creek Stream and Wetland Restoration Site/ EEP Project No. 420			
Activity Report	**Scheduled Completion**	**Data Collection Complete**	**Actual Completion or Delivery**
Restoration Plan	NA	NA	Feb 2004
Final Design (90%)	NA	NA	Nov 2004
Construction	Aug 2005	NA	Aug 2005
Temporary S&E mix applied to entire project area	NA	NA	July 2005
Permanent seed mix applied to reach/segments	NA	NA	Aug 2005
Bare Root Seedling Installation	March 2006	NA	March 2005
Mitigation Plan	NA	NA	April 2006
Final Report	NA	NA	April 2006
Year 1 Vegetation Monitoring	Sept 2006	Sept 2006	Dec 2006
Year 1 Stream Monitoring	Sept 2006	Sept 2006	Dec 2006
Year 1 Hydrology Monitoring	Nov 2006	Nov 2006	Nov 2006

NA – Not Applicable

Table 3. Project Contacts Whitelace Creek Stream and Wetland Restoration Site/ EEP Project No. 420	
Designer	EcoScience Corporation 1101 Haynes Street Suite 101 Raleigh, NC 27604
Construction Contractor	Shamrock Environmental Corporation PO Box 14987 Greensboro, NC 27415
Planting Contractor	Emerald Forest Incorporated 4651 Backwoods Road Chesapeake, Virginia 23322-2456
Seeding Contactor	Wheat Swamp Landscaping 4675 Ben Dail Road LaGrange, NC 28551-8038
Seed Mix Sources	IKEX, Inc. PO Box 250 Middlesex, NC 27557
Nursery Stock Suppliers	Warren County Nursery 6492 Beersheba Highway McMinnville, Tennessee 37110 Pinelands Nursery and Supply 323 Island Road Columbus, New Jersey 08022 Coastal Plain Conservation Nursery 3067 Connors Drive Edenton, NC 27932
Monitoring Performers	EcoScience Corporation 1101 Haynes Street, Suite 101 Raleigh, NC 27604 (919) 828-3433
Stream Monitoring POC	Jens Geratz
Vegetation Monitoring POC	Elizabeth Scherrer
Wetland Monitoring POC	Craig Terwilliger

Table 4. Project Background Whitelace Creek Stream and Wetland Restoration Site / EEP Project No. 420	
Project County	Lenoir
Drainage Area	10.1 square miles
Impervious cover estimate (%)	<1 percent
Stream Order	2nd order
Physiographic Region	Coastal Plain
Ecoregion (Griffith and Omernik)	Southeastern Floodplains and Low Terraces
Rosgen Classification of As-built	C/E
Cowardin Classification	R2UB23Cb
Dominant soil types	Johnston, stream channels, 80% of Site
	Lakeland, uplands/terraces, 15% of Site
	Pactolus, uplands/terraces, 4% of Site
	Kalmia, terraces, 1% of Site
Reference Site ID (SCO #)	01-05471-01A
USGS HUC for Project and Reference	03020202040020
NCDWQ Sub-basin for Project and Reference	03-04-05
NCDWQ classification for Project and Reference	C SW NSW
Any portion of any project segment 303d listed?	No
Any portion of any project segment upstream of a 303d listed segment?	No
Reasons for 303d listing or stressor	No
Percent of project easement fenced	No

3.0 PROJECT MONITORING AND RESULTS

3.1 VEGETATION ASSESSMENT

3.1.1 Soil Data

Table 5. Preliminary Soil Data Whitelace Creek Stream and Wetland Restoration Site/ EEP Project No. 420			
Series	**Max Depth (in.)**	**% Clay on Surface**	**OM %**
Johnston (Js)	60	5-25	3-20
Lakeland (La)	80	0-10	0
Pactolus (Pa)	80	10-15	0
Kalmia (K)	60	0-15	0

3.1.2 Vegetation Problem Areas

Table 6. Vegetative Problem Areas Whitelace Creek Stream and Wetland Restoration Site/ EEP Project No. 420			
Feature/ Issue	**Plot #**	**Probable Cause**	**Photo #**
Flood Damage to Young Seedlings	Vegetation Plots 1,2,3,4,5	Heavy rains	Photo 1, 2
Invasive/weed Populations	Vegetation Plot 11	Invasion of *Murdannia keisak*	Photo 3
	Vegetation Plots 13, 14	Overrun by *Polygunum sagittatum*	Photo 4

A vegetation problem area plan view and photos are provided in Appendix B.

3.1.3 Stem Counts

Fifteen (15) 10 X 10 meter vegetation monitoring plots were installed to monitor planted wetland and Neuse River riparian buffer restoration and enhancement areas. Stem counts were conducted for all woody species, including volunteer species. An inventory of planted species is given in Table 7a. A tally of volunteer woody species is listed in Table 7b.

Table 7a: Stem Counts, Planted Species, Arranged by Plot Whitelace Creek Stream and Wetland Restoration Site/ EEP Project No. 420																	
Tree Species	**Plots**														**Year 1 Total***		**Percent Survival**
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
Betula nigra	1	1								1						3	NA
Carpinus caroliniana var. *caroliniana*		1		1	1	1	1									5	NA
Carya aquatica			1				2	1	1	1	2		1			9	NA
Chamaecyparis thyoides		2		3				1	1			15				22	NA
Fraxinus pennsylvanica		1		1					2	4						8	NA
Liriodendron tulipifera var. tulipifera															2	2	NA
Nyssa biflora	1			4			3	2	2	3	5	3			1	24	NA
Platanus occidentalis var. *occidentalis*		3	1				2			2						8	NA
Quercus laurifolia		1	1		1	1			1							5	NA
Quercus lyrata				1	1	1	1			1						5	NA
Quercus michauxii				1	1	1		1	1							5	NA
Quercus pagoda	1				3			2		3					2	11	NA
Quercus phellos				1			1	1		1						4	NA
Taxodium distichum	1					1	3	3	3	2	7		2	3		25	NA
Ulmus americana var. *americana*							1			1						2	NA
Plot Totals	4	9	3	12	7	5	14	11	11	19	14	18	3	3	5	138	NA
Density (trees/acre)	162	364	121	486	283	202	567	445	445	769	567	728	121	121	202	359	

* Initial Totals for planted species within vegetation plots are not available.

Table 7b. Stem Counts, Volunteer Species Arranged by Plot Whitelace Creek Stream and Wetland Restoration Site/ EEP Project No. 420																
Tree Species	**Plots**															**Year 1 Total**
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Acer rubrum var. *rubrum*								63	9		34	18				4
Ampelopsis arborea					1											1
Baccharis halimifolia		7		2	2		9	9	3		1	1				8
Betula nigra								1			1					2
Carya aquatica									1							1
Diospyros virginiana															1	1
Fraxinus pennsylvanica												1				1
Liquidambar styraciflua		12							2			1			2	4
Pinus taeda									8							1
Salix nigra							37	2			6					13
Plot Totals	0	19	0	2	3	0	46	75	23	0	42	21	0	0	3	35

3.2 STREAM ASSESSMENT

Table 8. Verification of Bankfull Events Whitelace Creek Stream and Wetland Restoration Site/ EEP Project No.			
Date of Data Collection	**Date of Occurrence**	**Method**	**Photo***
May 5, 2006	Early May 2006	Crest Gauge	Na
June 22, 2006	Mid June 2006	Crest Gauge	Na

*Photos of Crest Gauge are provided in Appendix C

Table 9. Morphology and Hydraulic Monitoring Summary Whitelace Creek Stream and Wetland Restoration Site /EEP Project No. 420 Whitelace Creek Stream Enhancement (3,693 l.f)			
Parameter	**Cross-Section 1 Riffle**	**Cross-Section 2 Riffle**	**Cross-Section 3 Riffle**
Dimension	**MY1**	**MY1**	**MY1**
BF Width (ft)	25.4	28.1	11.0
Floodprone Width (ft)	82.0	>200	163.8
BF Cross Sectional Area (ft^2)	36.0	37.1	13.6
BF Mean Depth (ft)	1.4	1.3	1.2
BF Max Depth (ft)	2.0	2.8	1.8
Width/Depth Ratio	18	21.3	9.0
Entrenchment Ratio	3.2	>7.0	14.8
Wetted Perimeter(ft)	26.3	29.6	12.4
Hydraulic radius (ft)	1.4	1.3	1.1

3.3 WETLAND ASSESSMENT

Table 10. Wetland Criteria Attainment Whitelace Creek Stream Enhancement and Wetland Restoration Site / EEP Project No. 420						
Tract	**Well ID**	**Well Hydrology Threshold Met?**	**Tract Mean**	**Vegetation Plot ID**	**Vegetation Density Met (320 stems/acre)**	**Tract Mean**
1	1	✓ (100%)	93% of growing season	VP1	N0(161)	995 stems/acre
1	2	✓ (100%)		VP2	✓ (1133)	
1	3	✓ (100%)		VP3	NO(121)	
1	4	✓ (53%)		VP4	✓ (567)	
1	5	✓ (100%)		VP5	✓ (364)	
1	6	✓ (100%)		VP6	NO(202)	
1	7	✓ (100%)		VP7	✓ (2388)	
REF	Ref Site 1	(32%)	40% of growing season	VP8	✓ (3480)	
REF	Ref Site 2	(32%)		VP9	✓ (1376)	
REF	Ref Site 3	✓ (57%)		VP10	✓ (728)	
				VP11	✓ (2266)	
				VP12	✓ (1578)	
				VP13	NO(121)	
				VP14	NO(121)	
				VP15	✓ (324)	

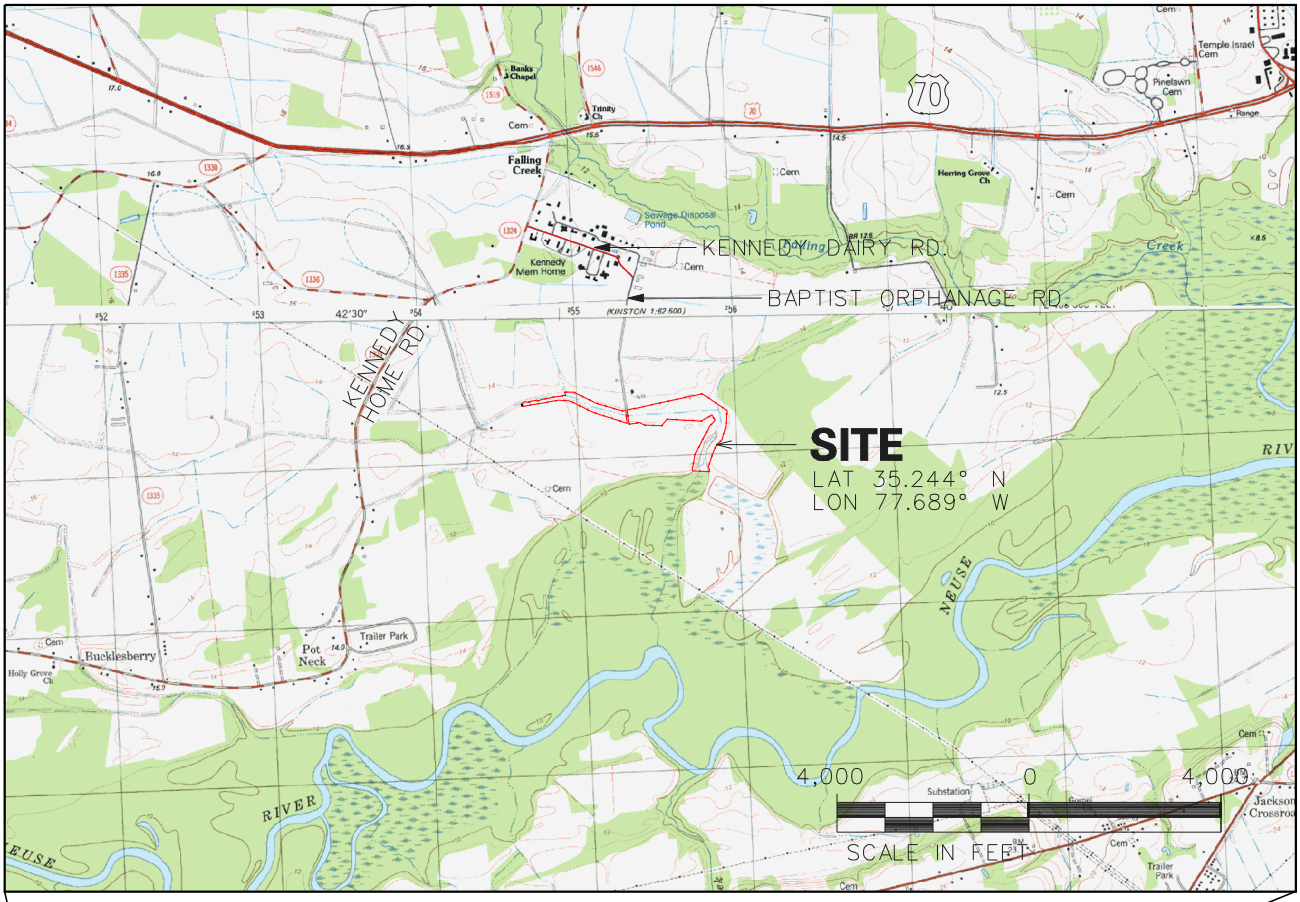
A wetland problem area plan view is provided in Appendix D.

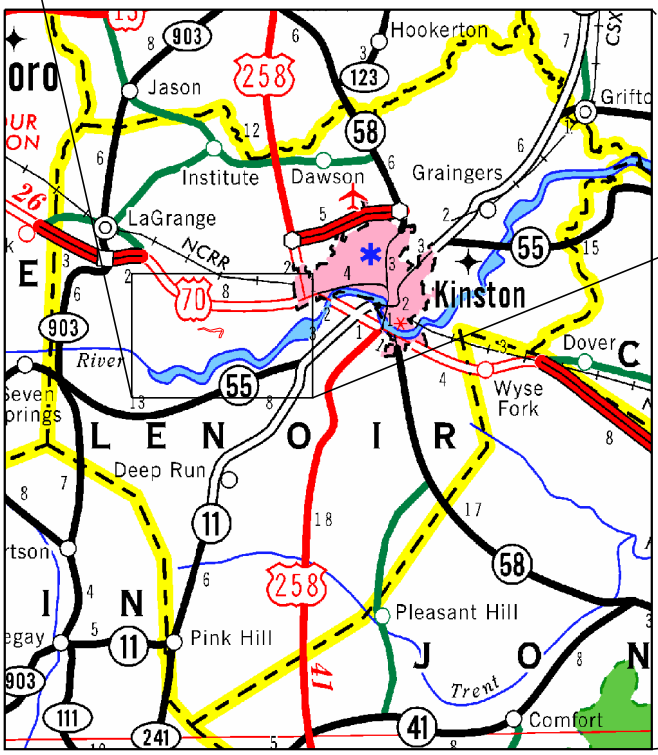
Table 11. Coordinates for Monitoring Features Whitelace Creek Stream Enhancement and Wetland Restoration Site / EEP Project No. 420		
Vegetation Plots	**Easting**	**Northing**
plot 1	2389407.03374999000	546788.57675000000
plot 2	2390056.85337000000	546913.32700000000
plot 3	2390349.44050000000	546961.71100000000
plot 4	2390749.71875000000	546686.34900000000
plot 5	2391193.47136999000	546561.67062500000
plot 6	2391302.68149999000	546605.69250000000
plot 7	2391741.74963000000	546596.57437499900
plot 8	2391999.76150000000	546494.84199999900
plot 9	2392603.49688000000	546750.45362499900
plot 10	2392674.60087999000	546561.46512499900
plot 11	2393024.60117000000	546569.40700500000
plot 12	2393012.93912999000	546829.05575000000
plot 13	2393217.61038000000	546678.65275000000
plot 14	2393408.04925000000	546275.19625000000
plot 15	2392913.21212999000	545461.44437499900
Cross Sections (right pin)		
xs1-rpin	2389870.74649999000	546830.35225000000
xs2-rpin	2391030.75025000000	546532.74175000000
xs3-rpin	2391692.50650000000	546388.62800000000
Ground Water Monitoring Gauges		
gauge 1	2389582.13125000000	546821.31374999900
gauge 2	2390535.43850000000	546779.92125000000
gauge 4	2391124.06399999000	546564.90375000000
gauge 3	2390442.91949999000	546936.53150000000
gauge 5	2390960.23400000000	546710.71349999900
gauge 6	2391724.78049999000	546613.28500000000
gauge 7	2392112.93575000000	546642.17174999900
Reference Ground Water Monitoring Gauges		
gauge 1	2378304.88600000000	571372.36900000000
gauge 2	2378005.69600000000	571523.01600000000
gauge 3	2390417.78600000000	557993.69000000000

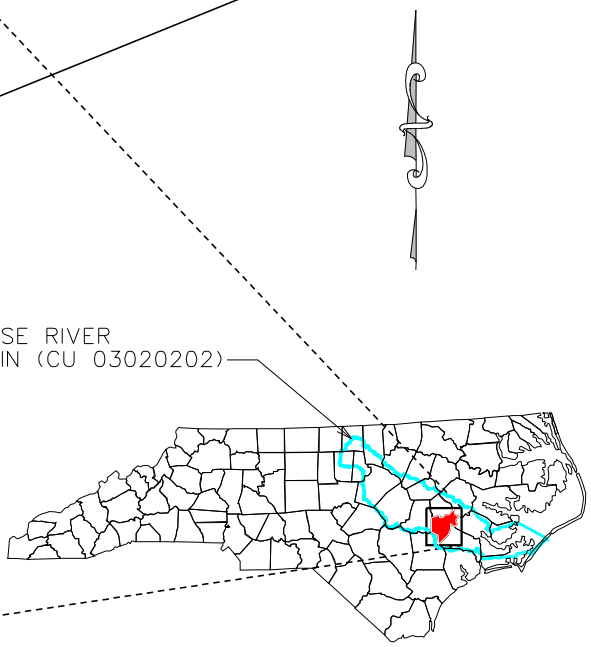
A map of reference ground water monitoring gauge locations is provided in Appendix D.

APPENDIX A

FIGURES







EcoScience Corporation
Raleigh, North Carolina

Client: Ecosystem Enhancement Program

Project:

SITE LOCATION MAP

WHITELACE CREEK STREAM AND WETLAND RESTORATION SITE

LENOIR COUNTY, NORTH CAROLINA

Dwn By:	Ckd By:
GWN	JWG

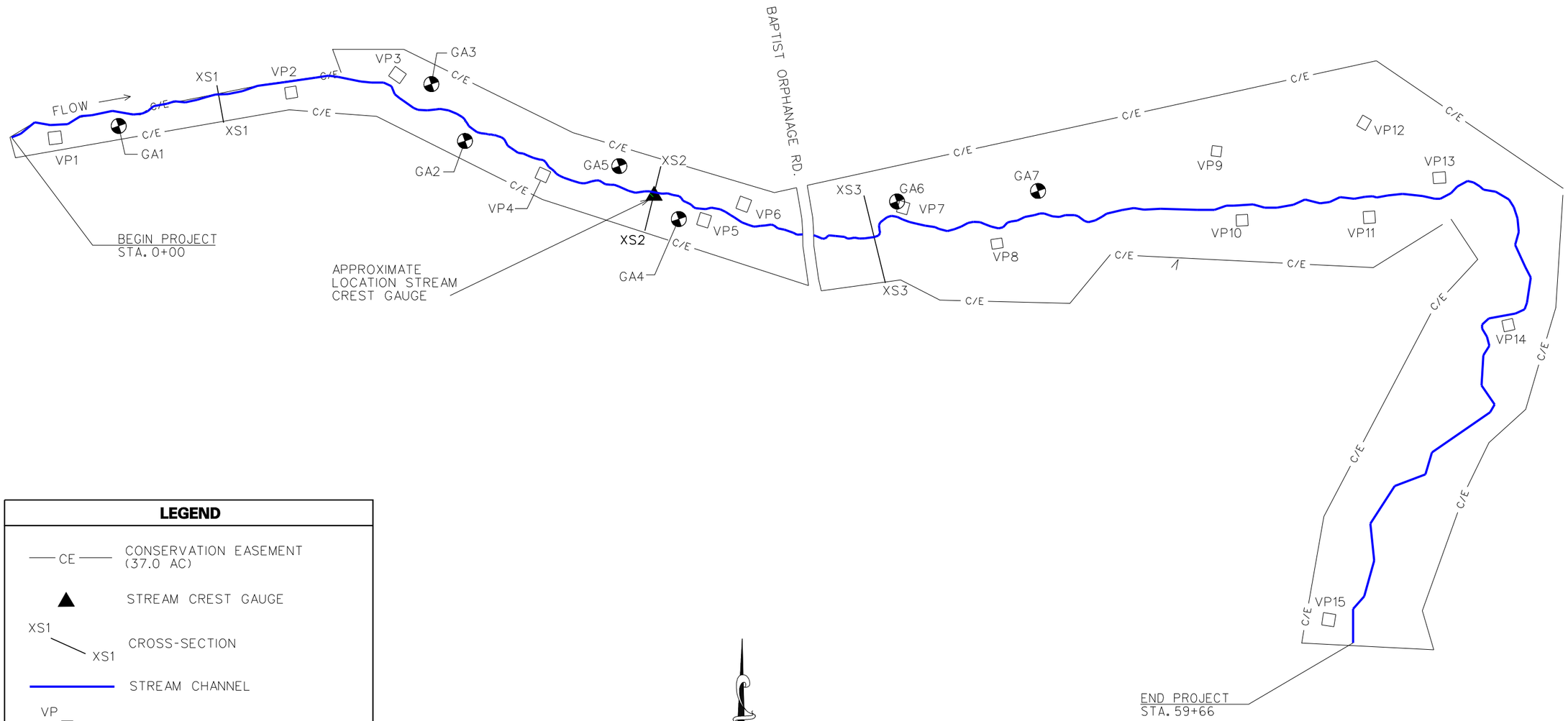
Date: NOV 2006

Scale: AS SHOWN

ESC Project No.: 02-111

FIGURE

1



LEGEND

- CE — CONSERVATION EASEMENT (37.0 AC)
- STREAM CREST GAUGE
- XS1 / XS1 — CROSS-SECTION
- STREAM CHANNEL
- VP — VEGETATION PLOT (10M X 10M)
- GA1 — GROUNDWATER MONITORING GAUGE

NAD 83
NGVD 1929

300 0 300
SCALE IN FEET

EcoScience Corporation
Raleigh, North Carolina

REVISIONS

Client:
NCDENR ECOSYSTEM ENHANCEMENT PROGRAM

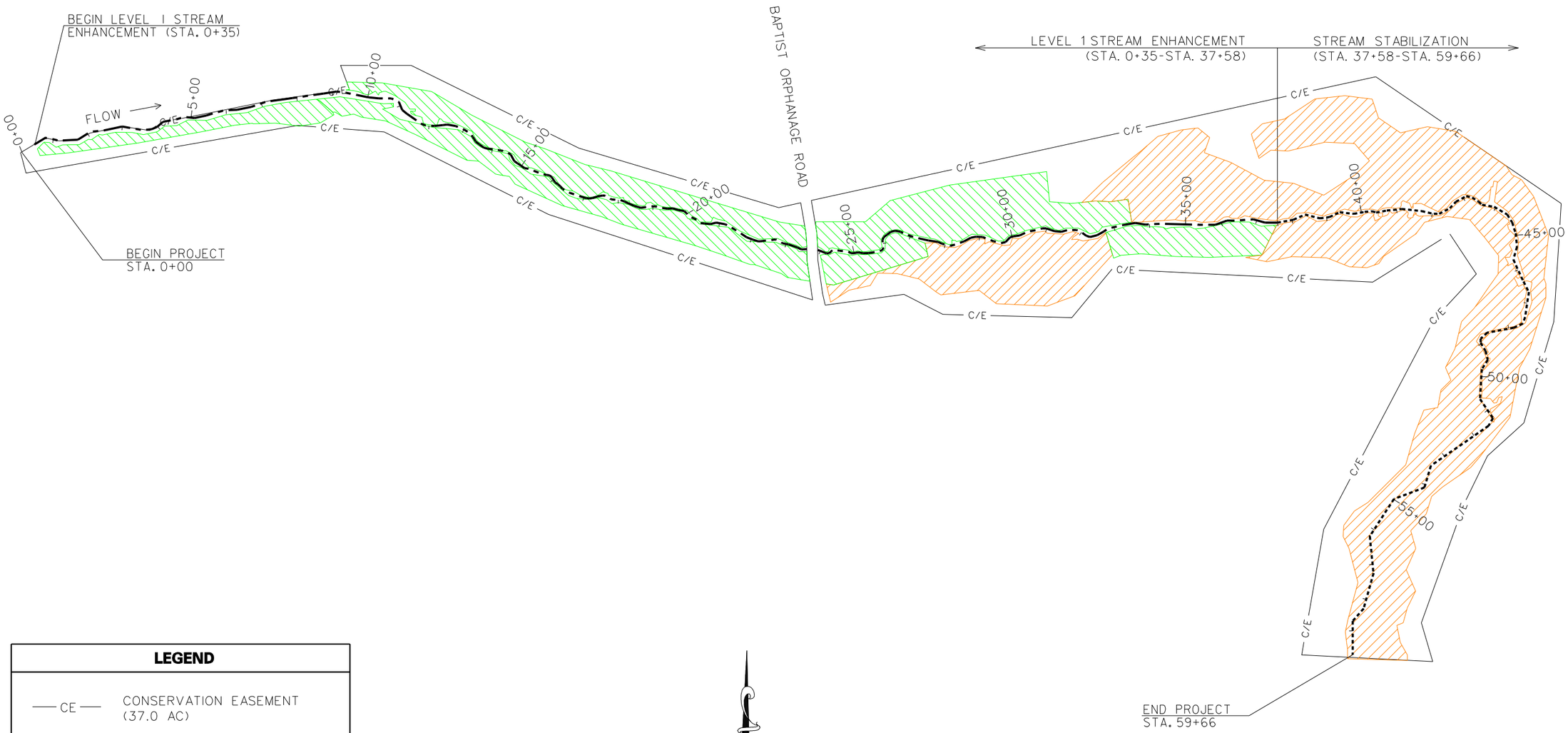
Project:
WHITELACE CREEK STREAM AND WETLAND RESTORATION SITE
EEP Project No. 420
LENOIR COUNTY, NORTH CAROLINA

Title:
MONITORING PLAN VIEW

Dwn By:	Date:
GWN	NOV 2006
Ckd By:	Scale:
GWN	AS SHOWN

ESC Project No.: 02-111

FIGURE
2



LEGEND

—— CE ——	CONSERVATION EASEMENT (37.0 AC)	
	RIVERINE WETLAND ENHANCEMENT	(13.0 AC)
	RIVERINE WETLAND RESTORATION	(7.7 AC)
— - —	LEVEL 1 STREAM ENHANCEMENT	(3,693 LF)
----------	STREAM STABILIZATION	(2,208 LF)

NAD 83
NGVD 1929

300 0 300
SCALE IN FEET

EcoScience Corporation
Raleigh, North Carolina

REVISIONS

Client:
NCDENR ECOSYSTEM ENHANCEMENT PROGRAM

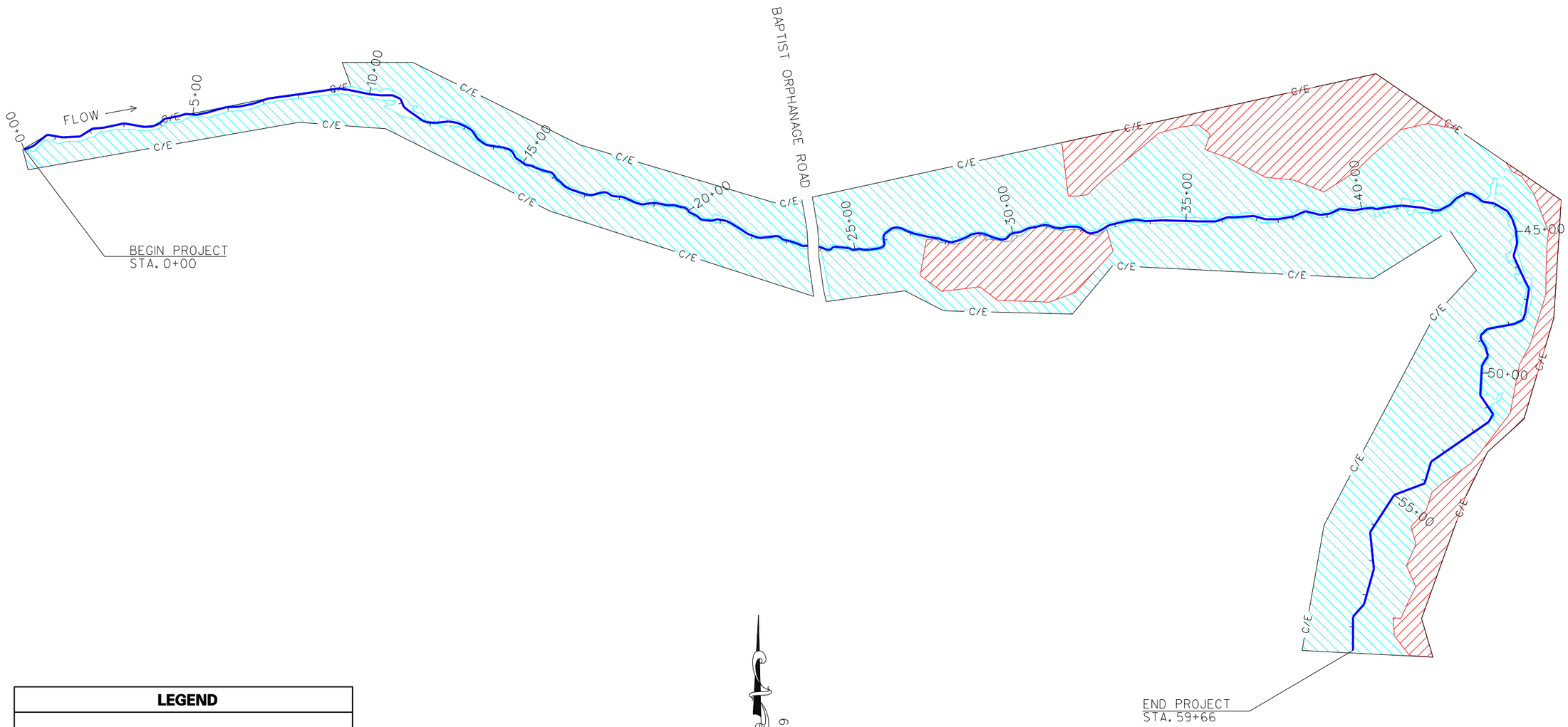
Project:
WHITELACE CREEK STREAM AND WETLAND RESTORATION SITE
EEP Project No. 420
LENOIR COUNTY, NORTH CAROLINA

Title:
STREAM AND WETLAND SITE MITIGATION UNITS

Dwn By:	Date:
GWN	NOV 2006
Ckd By:	Scale:
JWG	AS SHOWN

ESC Project No.: 02-111

FIGURE
3



LEGEND

—— CE ——	CONSERVATION EASEMENT (37.0 AC)	
	STREAM CHANNEL	
	NEUSE RIVER BUFFER ENHANCEMENT	(7.2 AC)
	NEUSE RIVER BUFFER RESTORATION	(27.1 AC)

NAD 83
NGVD 1929

300 0 300
SCALE IN FEET

EcoScience Corporation
Raleigh, North Carolina

REVISIONS

Client:
NCDENR ECOSYSTEM ENHANCEMENT PROGRAM

Project:
WHITELACE CREEK STREAM AND WETLAND RESTORATION SITE
EEP Project No. 420
LENOIR COUNTY, NORTH CAROLINA

Title:
NEUSE RIVER RIPARIAN BUFFER SITE MITIGATION UNITS

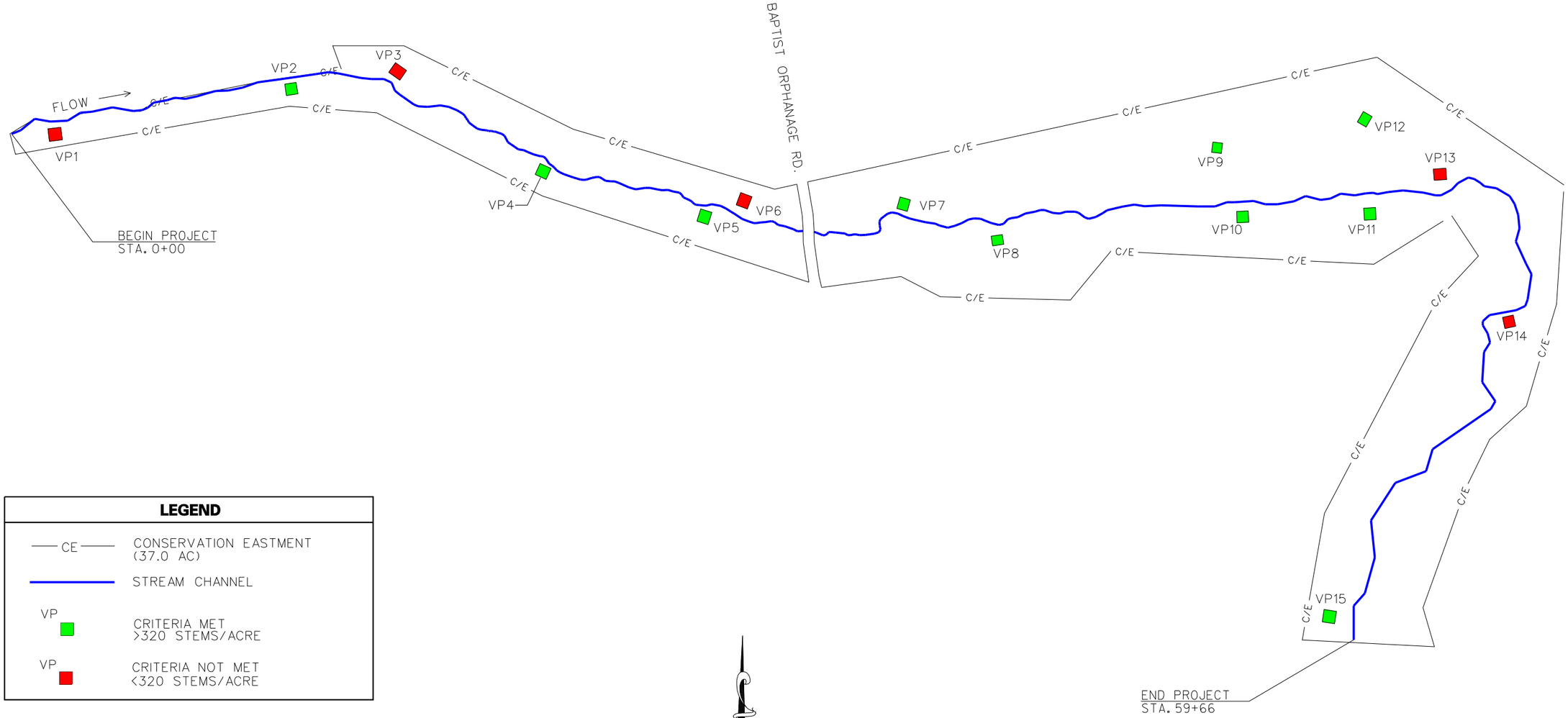
Dwn By:	Date:
GWN	NOV 2006
Ckd By:	Scale:
JWG	AS SHOWN

ESC Project No.: 02-111

FIGURE
4

APPENDIX B

VEGETATION DATA



LEGEND

—— CE ——	CONSERVATION EASTMENT (37.0 AC)
	STREAM CHANNEL
VP ■	CRITERIA MET >320 STEMS/ACRE
VP ■	CRITERIA NOT MET <320 STEMS/ACRE

NAD 83
NGVD 1929

300 0 300
SCALE IN FEET

EcoScience Corporation
Raleigh, North Carolina

REVISIONS

Client:
NCDENR ECOSYSTEM ENHANCEMENT PROGRAM

Project:
WHITELACE CREEK STREAM AND WETLAND RESTORATION SITE
EEP Project No. 420
LENOIR COUNTY, NORTH CAROLINA

Title:
VEGETATION PROBLEM AREAS

Dwn By:	Date:
GWN	NOV 2006
Ckd By:	Scale:
JWG	AS SHOWN

ESC Project No.: 02-111

FIGURE
B

Whitelace Creek Stream and Wetland Restoration Site
Year 1 Monitoring
Vegetation Data Collected Aug 06

Project name: White Lace Creek
Team: EcoScience
Survey level: 2
Texonomic standard: Weakley
Pub. date: Aug. 06
State: NC
County: Lenoir
Quadrangle: Deep Run
Directions to site:
Hwy 70 to Kennedy Home Rd. First left.
Right at house at end of road. Right at auto shop.
Straight through fields.

GPS location: 0, 0 (SW corner)
Datum: NAD83
Coordinate accuracy: 1 m
Compass type: magnetic
Plot placement: Representative
Plot type: Standard
Posts: 0-0, 10-0, 0-10, 10-10
Plot size: 1 Are (0.02471044 acre)

	3,4,5,6,7,8,10	9,11,13,14	1,2	12		
Planted species	BLH	Cyp/Gum	Streamside	AWC	Mesic	**Weakley terminology**
Arundinaria gigantea	x		x			
Betula nigra			x			
Carpinus caroliniana			x			*Carpinus caroliniana* var. *caroliniana*
Carya aquatica	x	x				
Carya glabra					x	*Carya glabra* var. *glabra*
Chamaecyparis thyoides	x			x		
Fagus grandifolia					x	*Fagus grandifolia* var. *caroliniana*
Fraxinus caroliniana		x				
Fraxinus pennsylvanica	x	x	x			
Ilex decidua			x			*Ilex decidua* var. *decidua*
Liriodendron tulipifera	x		x	x	x	*Liriodendron tulipifera* var. 1
Nyssa biflora	x	x	x	x		
Nyssa sylvatica					x	
Pinus serotina				x		
Platanus occidentalis			x			*Platanus occidentalis* var. *occidentalis*
Populus heterophylla		x				
Quercus alba					x	
Quercus falcata					x	
Quercus laurifolia	x				x	
Quercus lyrata	x	x				
Quercus michauxii	x	x				
Quercus nigra	x					
Quercus pagoda	x				x	
Quercus phellos	x		x		x	
Quercus rubra					x	*Quercus rubra* var. *rubra*
Taxodium distichum	x	x	x			
Ulmus americana	x		x			*Ulmus americana* var. *americana*

Volunteers:	**Weakley terminology**
Acer rubrum	*Acer rubrum* var. *rubrum*
Ampelopsis aborea	
Baccharis halimifolia	
Diospyros virginiana	
Liquidambar styraciflua	
Pinus taeda	
Salix nigra	

VEGETATION PROBLEM AREA PHOTOS

Photo 1. Plot 1, flooded after heavy rains

Photo 2. Plot 2, Flooded after heavy rains

Photo 3. Plot 11, Invasion of *Murdannia keisak*

Photo 4. Plot 13 overrun by *Polygonum sagittatum*

VEGETATION PLOT PHOTOS

Plot 1

Plot 2

Plot 3

Plot 4

Plot 5

Plot 6

Plot 7

Plot 8

Plot 9

Plot 10

Plot 11

Plot 12

Plot 13

Plot 14

Plot 15

APPENDIX C

STREAM GEOMORPHOLOGY DATA

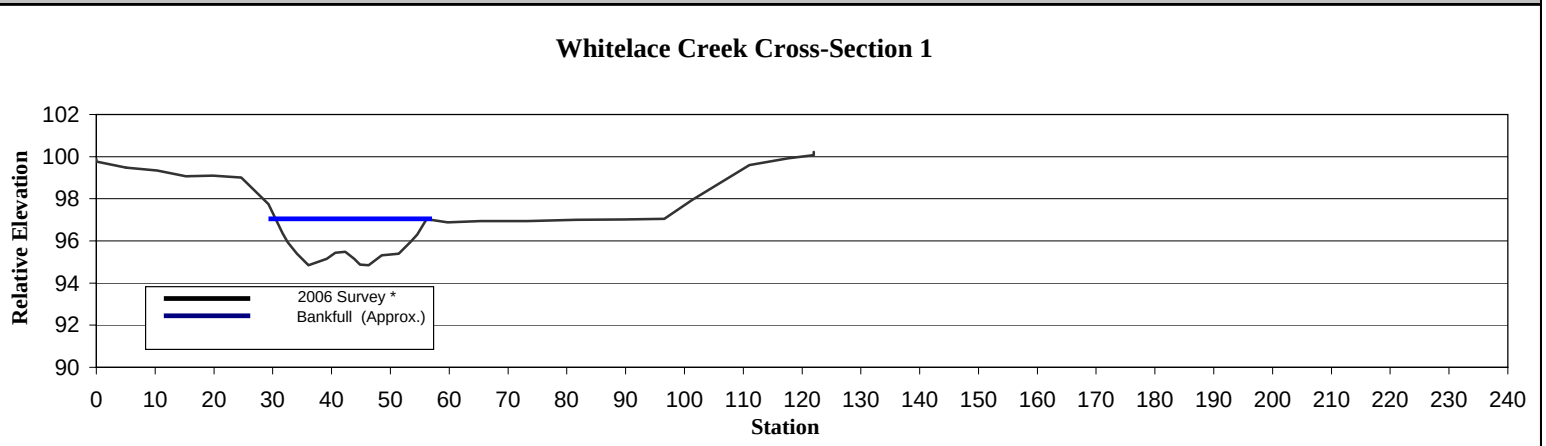
CREST GAUGE PHOTOS

Photo 1. Crest gauge full view

Photo 2. Crest gauge close up

Survey Data		
Station	Elevation	Feature
0.00	99.89	xs01lp
0.00	99.76	xs01blpin
5.05	99.48	xs01blpin
10.33	99.34	xs01
15.22	99.07	xs01
19.80	99.10	xs01
24.63	99.01	xs01tob
29.27	97.75	xs01
31.65	96.36	xs01
32.51	95.93	xs01eow
34.12	95.39	xs01
36.10	94.85	xs01
39.19	95.15	xs01
40.64	95.44	xs01
42.34	95.49	xs01
43.87	95.15	xs01
44.82	94.87	xs01
46.30	94.84	xs01
48.55	95.32	xs01
51.39	95.39	xs01
53.50	95.98	xs01eow
54.55	96.30	xs01
56.16	97.03	xs01tob
59.75	96.88	xs01
65.37	96.95	xs01
73.34	96.95	xs01
81.65	97.01	xs01
89.56	97.02	xs01
96.55	97.06	xs01
101.29	97.94	xs01
106.02	98.75	xs01
111.05	99.59	xs01
117.60	99.93	xs01
122.00	100.07	xs01brpin
122.00	100.23	xs01rpin

Summary Data	
Bankfull XS Area	36
Bankfull Width	25.4
Bankfull Mean Depth	1.4
Bankful Max Depth	2
Width/Depth Ratio	18
Entrenchment Ratio	3.2
Classification	C5



*No active channel restoration was performed so no as-built survey isincluded

Cross- section 1, looking downstream

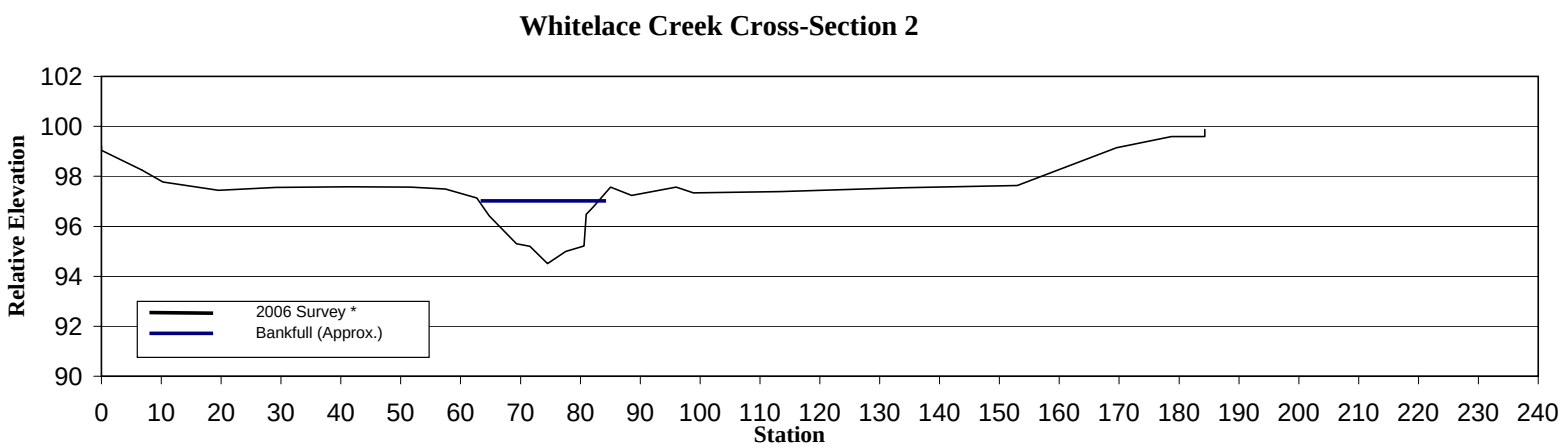
Cross- section 1, looking upstream

Project	Whitelace Creek Stream and Wetland Restoration Site, Lenoir County	Project #	420
		Figure	Cross-Section 1

Survey Date	Survey Weather	Field Team	Location
19-Oct-06	Overcast	Craig Terwilliger, Michael Gloden	Station 6+03

Survey Data		
Station	**Elevation**	**Feature**
0.00	99.22	lpin
0.00	99.05	blpin
6.77	98.24	xs2
10.27	97.77	xs2
19.55	97.44	xs2
29.09	97.55	xs2
41.24	97.58	xs2
51.66	97.57	xs2
57.45	97.49	xs2
62.72	97.13	xs2 tob
64.78	96.42	xs2 eow
69.35	95.31	xs2
71.58	95.20	xs2
74.49	94.50	xs2
77.57	95.00	xs2
80.62	95.22	xs2
80.98	96.49	xs2 eow
82.13	96.78	xs2 tob
85.03	97.56	xs2
88.56	97.23	xs2
95.98	97.57	xs2
98.88	97.34	xs2
113.38	97.39	xs2
133.90	97.54	xs2
153.00	97.63	xs2
169.53	99.15	xs2
178.73	99.60	xs2
184.31	99.60	brpin
184.31	99.87	rpin

Summary Data	
Bankfull XS Area	37.1
Bankfull Width	28.1
Bankfull Mean Depth	1.3
Bankful Max Depth	2.8
Width/Depth Ratio	28.1
Entrenchment Ratio	>7.0
Classification	C5



*No active channel restoration was performed so no as-built survey is included

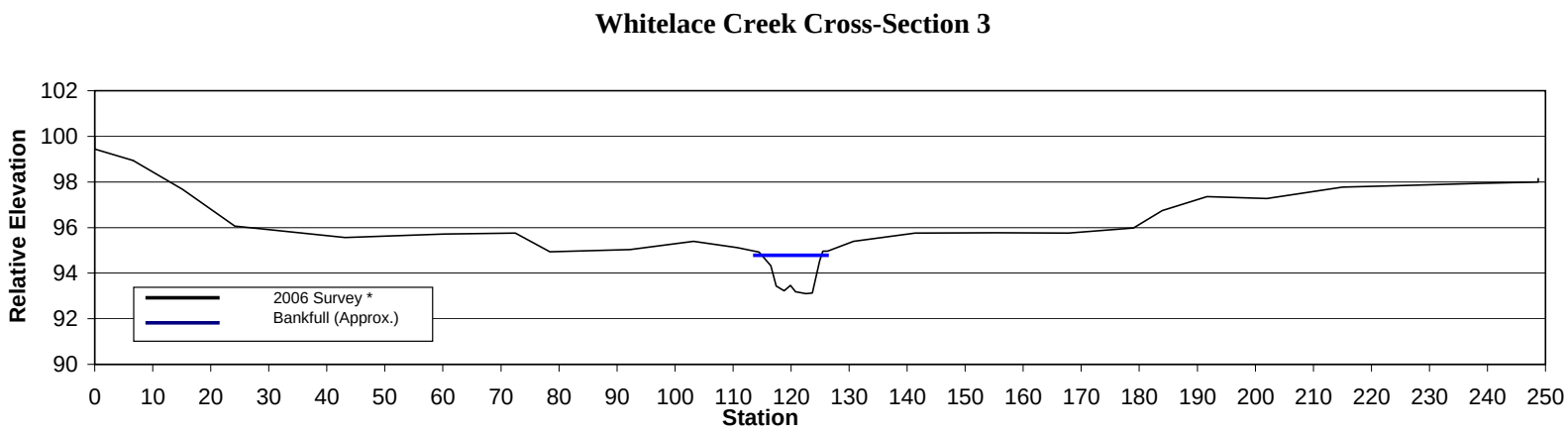
Cross-section 2, looking downstream

Cross-section 2, looking upstream

Project	Whitelace Creek Stream and Wetland Restoration Site, Lenoir County	Project #	420
		Figure	Cross-Section 2
Survey Date	**Survey Weather**	**Field Team**	**Location**
19-Oct-06	Overcast	Craig Terwilliger, Michael Gloden	Station 19+20

Survey Data		
Station	**Elevation**	**Feature**
0.00	100.00	xs03rpin
0.00	99.44	xs03brpin
6.60	98.94	xs03
15.11	97.67	xs03
24.16	96.06	xs03
43.13	95.56	xs03
60.24	95.72	xs03
72.47	95.76	xs03
78.45	94.93	xs03
92.27	95.04	xs03
103.19	95.40	xs03
110.79	95.12	xs03
114.50	94.92	xs03
116.52	94.33	xs03tob..
117.42	93.44	xs03
118.81	93.22	xs03eow
119.90	93.46	xs03
120.74	93.19	xs03
122.55	93.10	xs03
123.67	93.12	xs03
124.93	94.53	xs03
125.48	94.96	xs03
126.29	94.96	xs03eow
130.76	95.40	xs03tob
141.37	95.75	xs03
155.54	95.76	xs03
167.80	95.75	xs03
178.97	95.98	xs03
183.99	96.75	xs03
191.64	97.35	xs03
201.97	97.27	xs03
215.03	97.77	xs03
225.40	97.85	xs03
239.05	97.93	xs03
248.75	98.00	xs03blpin
248.74	98.14	xs03lpin

Summary Data	
Bankful XS Area	13.6
Bankfull Width	11
Bankfull Mean Depth	1.2
Bankful Max Depth	1.8
Width/Depth Ratio	9
Entrenchment Ratio	14.8
Classification	E5



*No active channel restoration was performed so no as-built survey is included

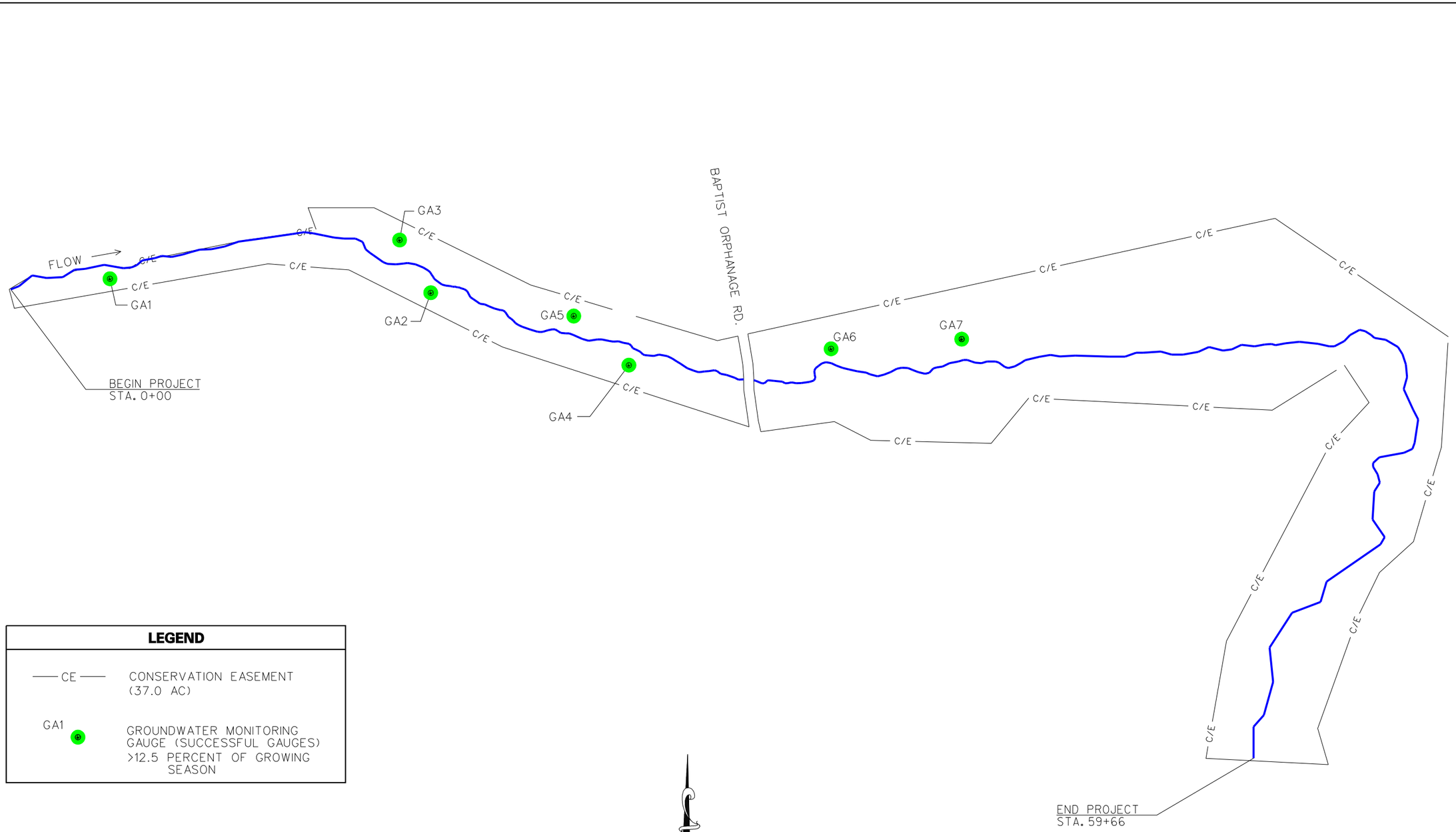
Cross-section 3, looking downstream

Cross-section 3, looking upstream

Project	**Whitelace Creek Stream and Wetland Restoration Site, Lenoir County**	**Project #**	420
		Figure	Cross-Section 3
Survey Date	**Survey Weather**	**Field Team**	**Location**
19-Oct-06	Overcast	Craig Terwilliger, Michael Gloden	Station 25+66

APPENDIX D

HYDROLOGY DATA



LEGEND

—— CE ——	CONSERVATION EASEMENT (37.0 AC)
GA1 ⊕	GROUNDWATER MONITORING GAUGE (SUCCESSFUL GAUGES) >12.5 PERCENT OF GROWING SEASON

EcoScience Corporation
Raleigh, North Carolina

REVISIONS

Client:
NCDENR ECOSYSTEM ENHANCEMENT PROGRAM

Project:
WHITELACE CREEK STREAM AND WETLAND RESTORATION SITE
EEP Project No. 420
LENOIR COUNTY, NORTH CAROLINA

Title:
WETLAND PROBLEM AREAS

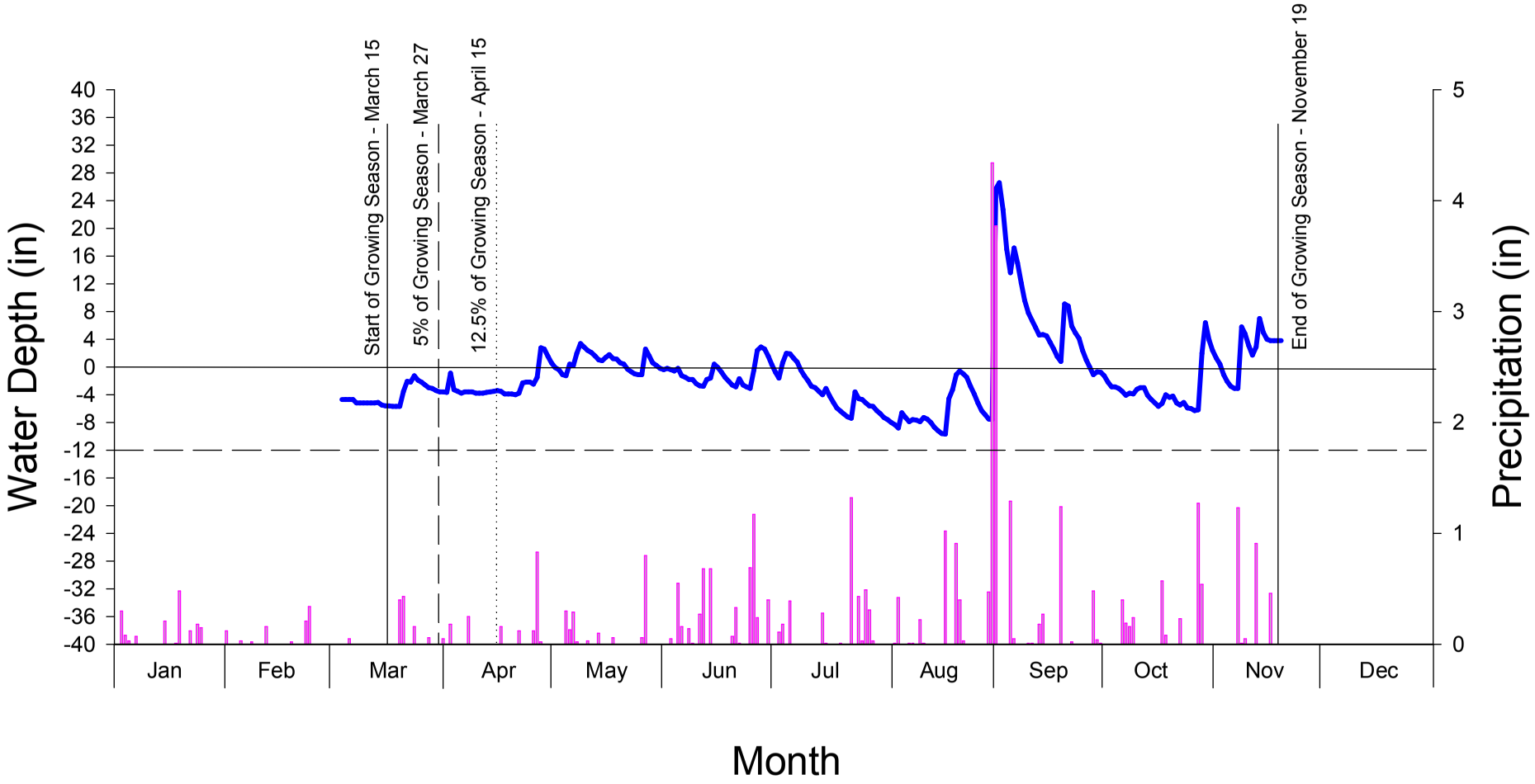
Dwn By: GWN	Date: NOV 2006
Ckd By: JWG	Scale: AS SHOWN
ESC Project No.: 02-111	

FIGURE
D

Whitelace Creek

2006

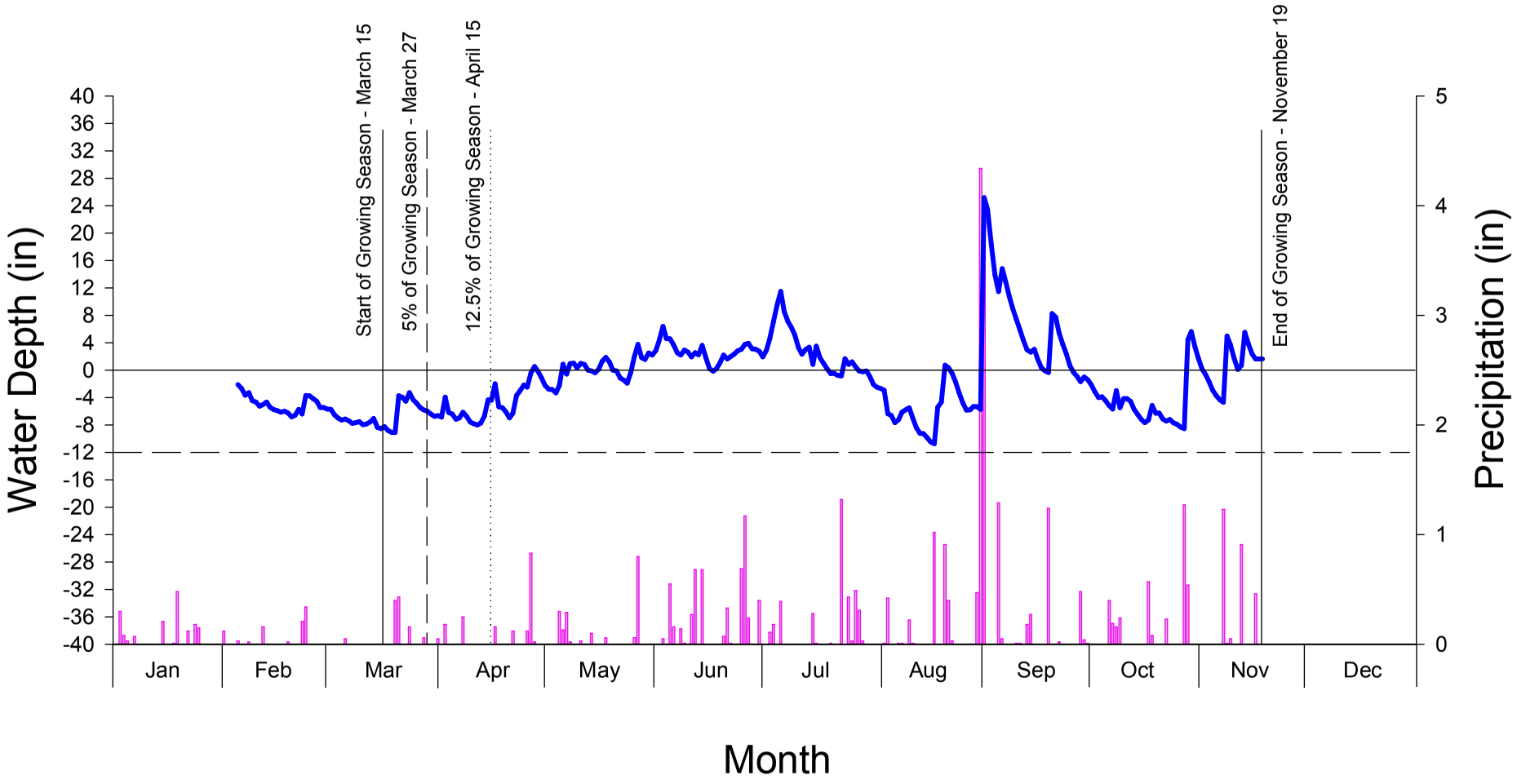
Monitoring Gauge 1 - AB36017



Whitelace Creek

2006

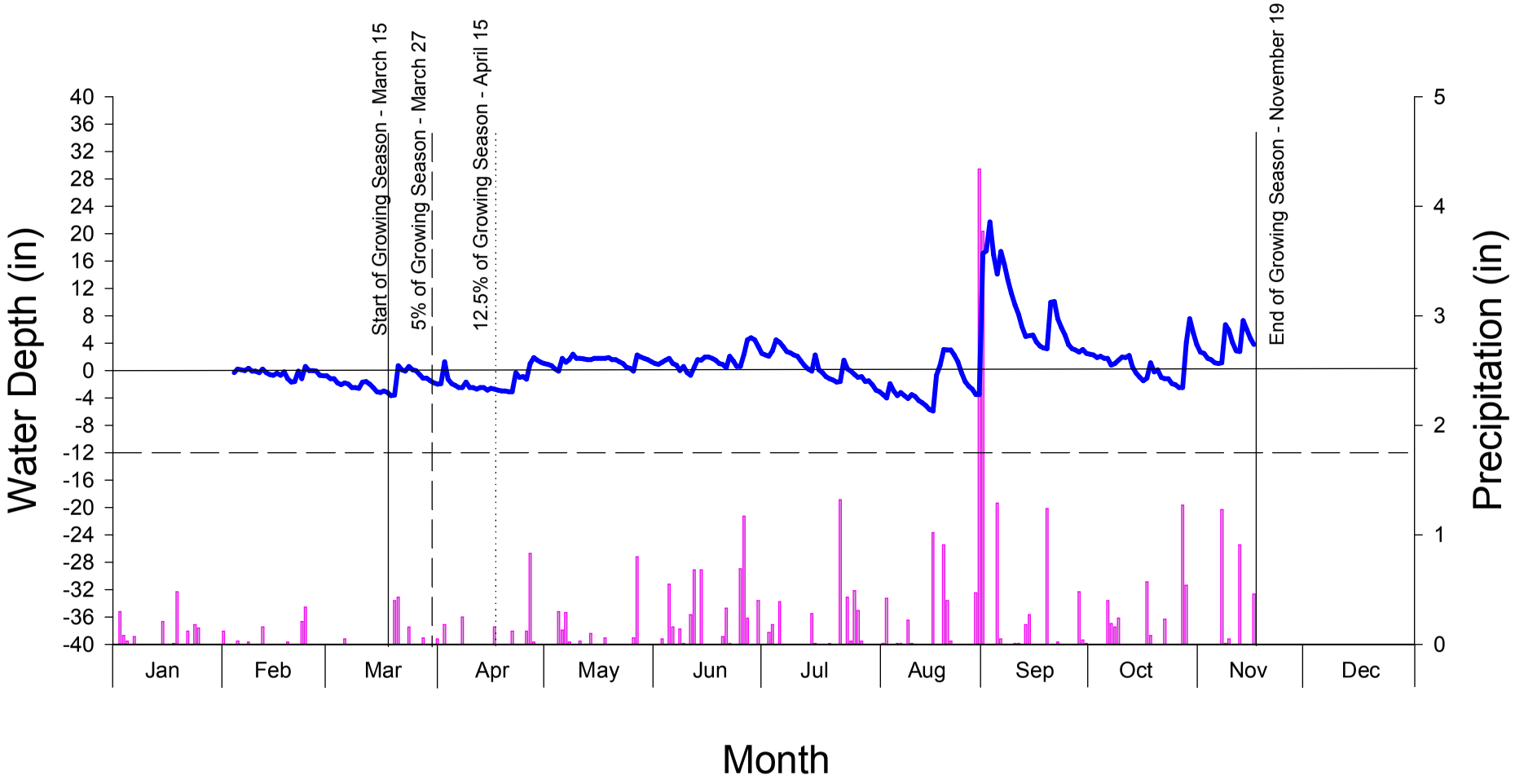
Monitoring Gauge 2 - N3D45EA7



Whitelace Creek

2006

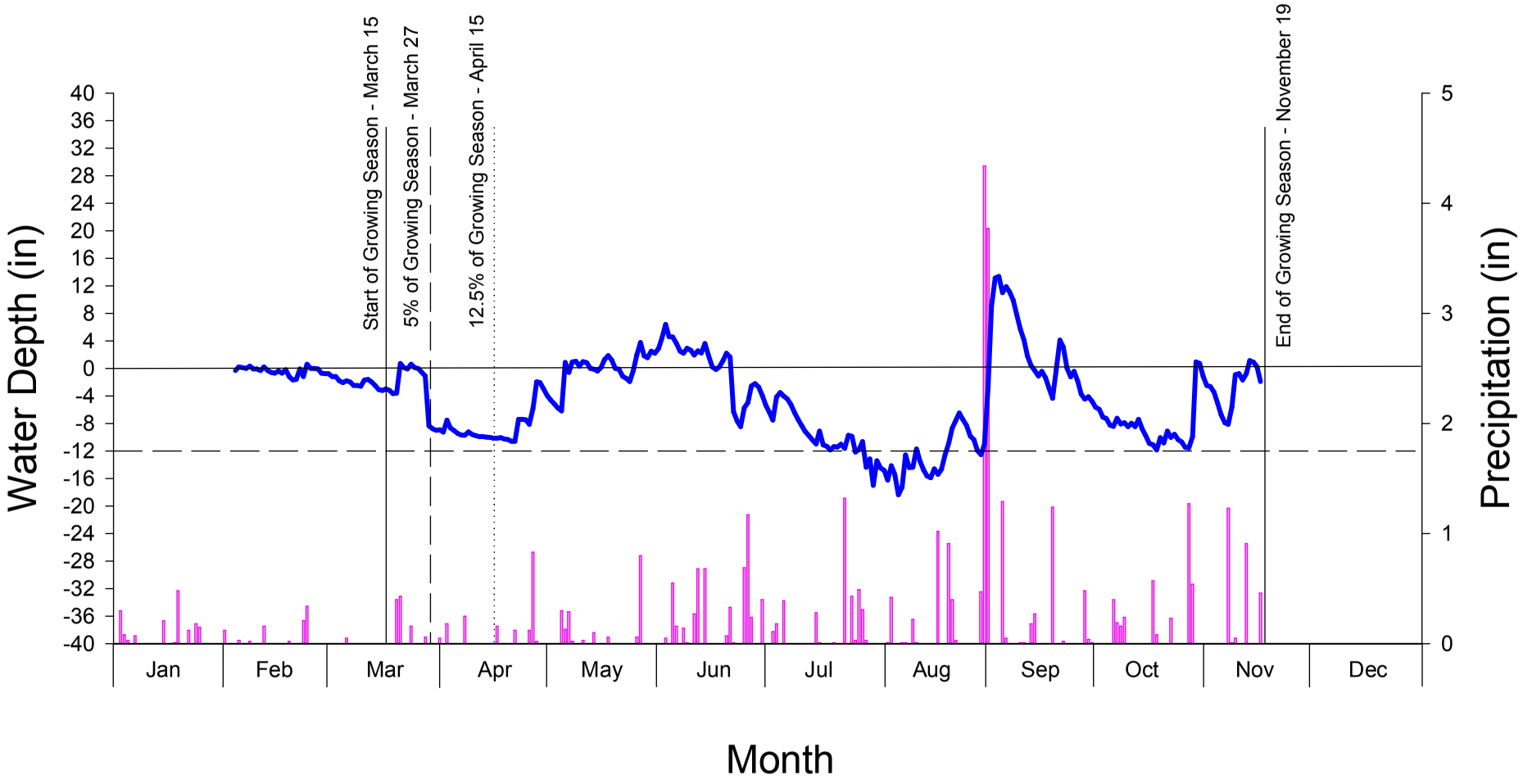
Monitoring Gauge 3 - A287A2A



Whitelace Creek

2006

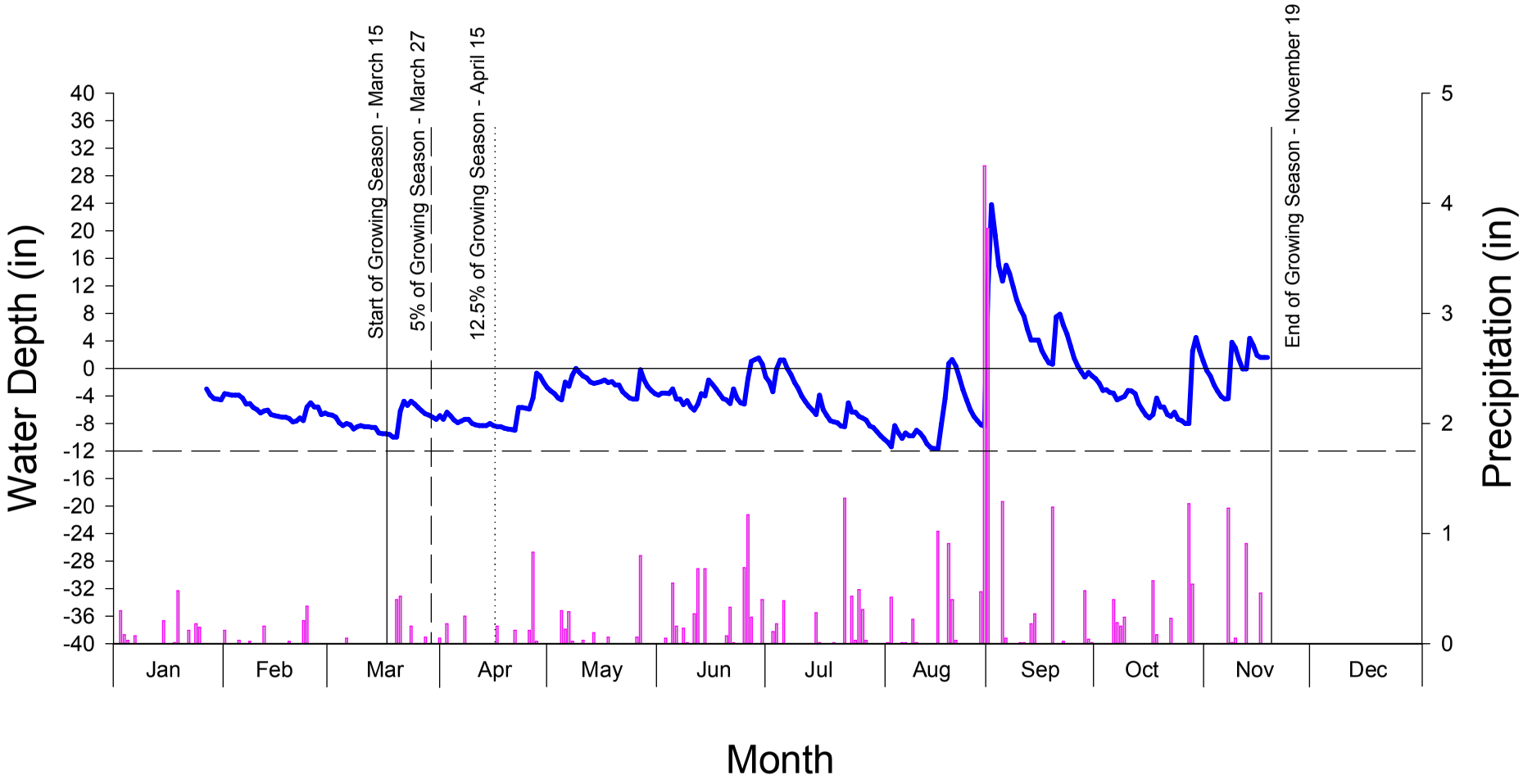
Monitoring Gauge 4 - N3D45F5A



Whitelace Creek

2006

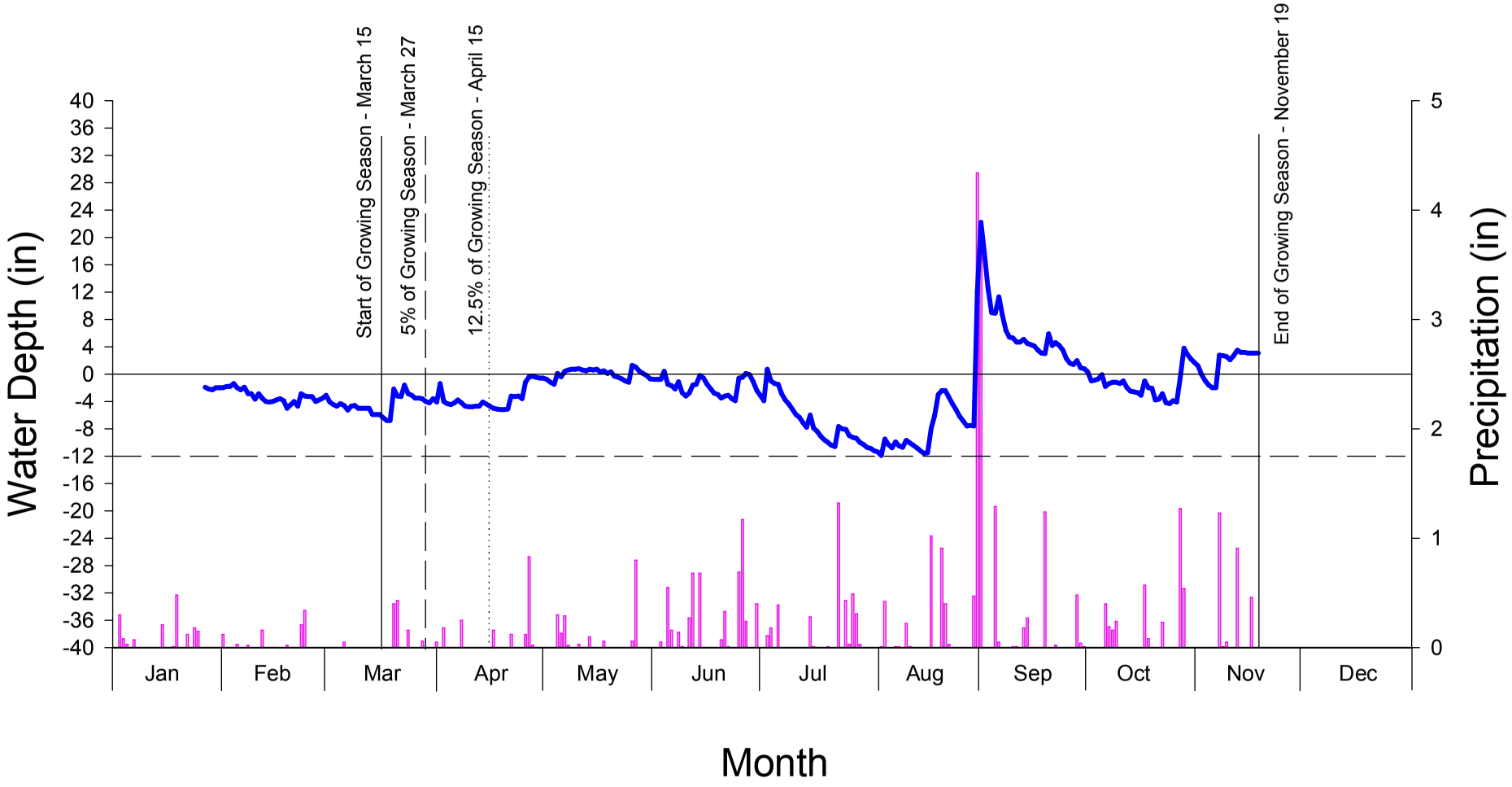
Monitoring Gauge 5 - A27B888



Whitelace Creek

2006

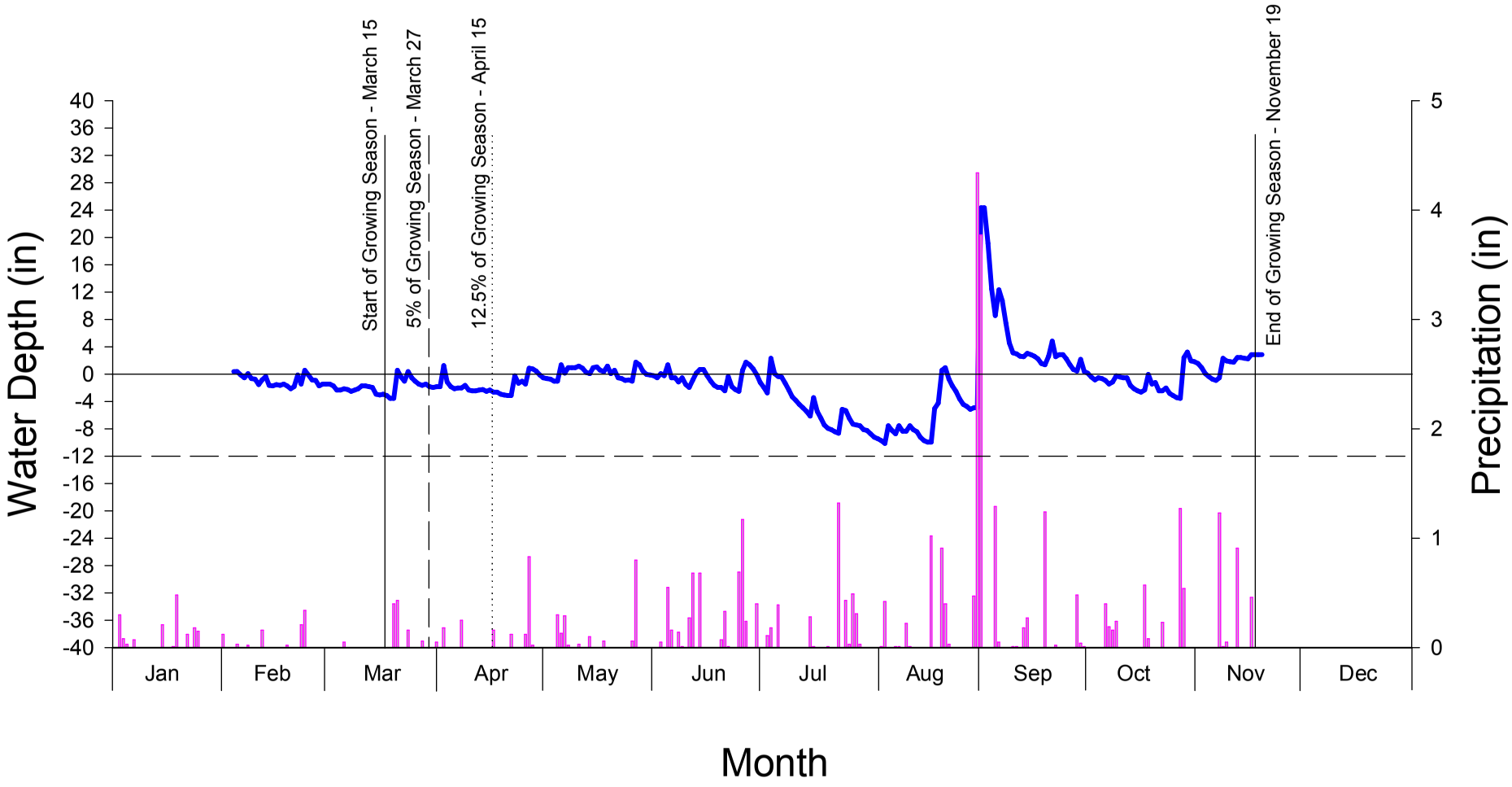
Monitoring Gauge 6 - AB36333



Whitelace Creek

2006

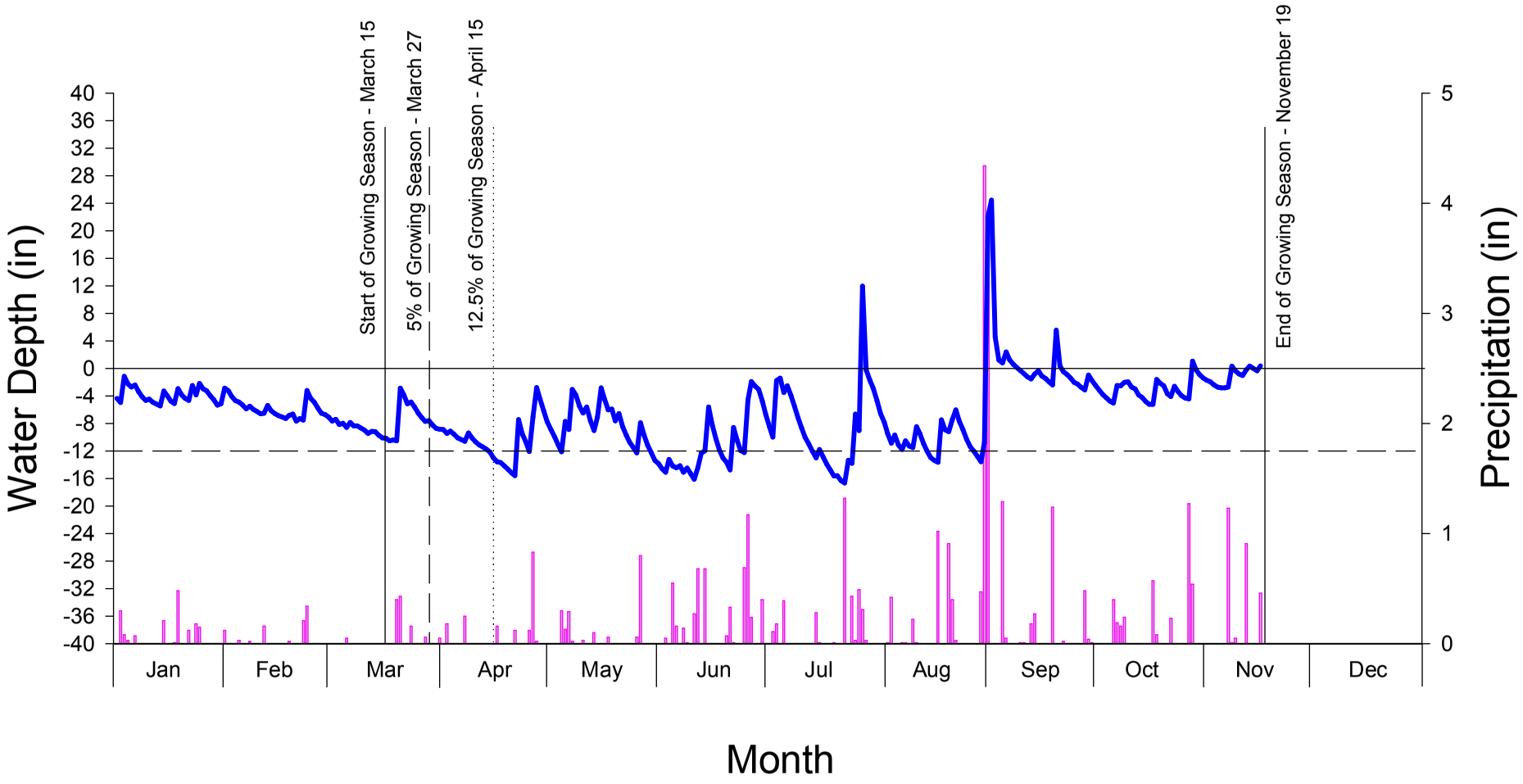
Monitoring Gauge 7 - A28BC19



Whitelace Creek

2006

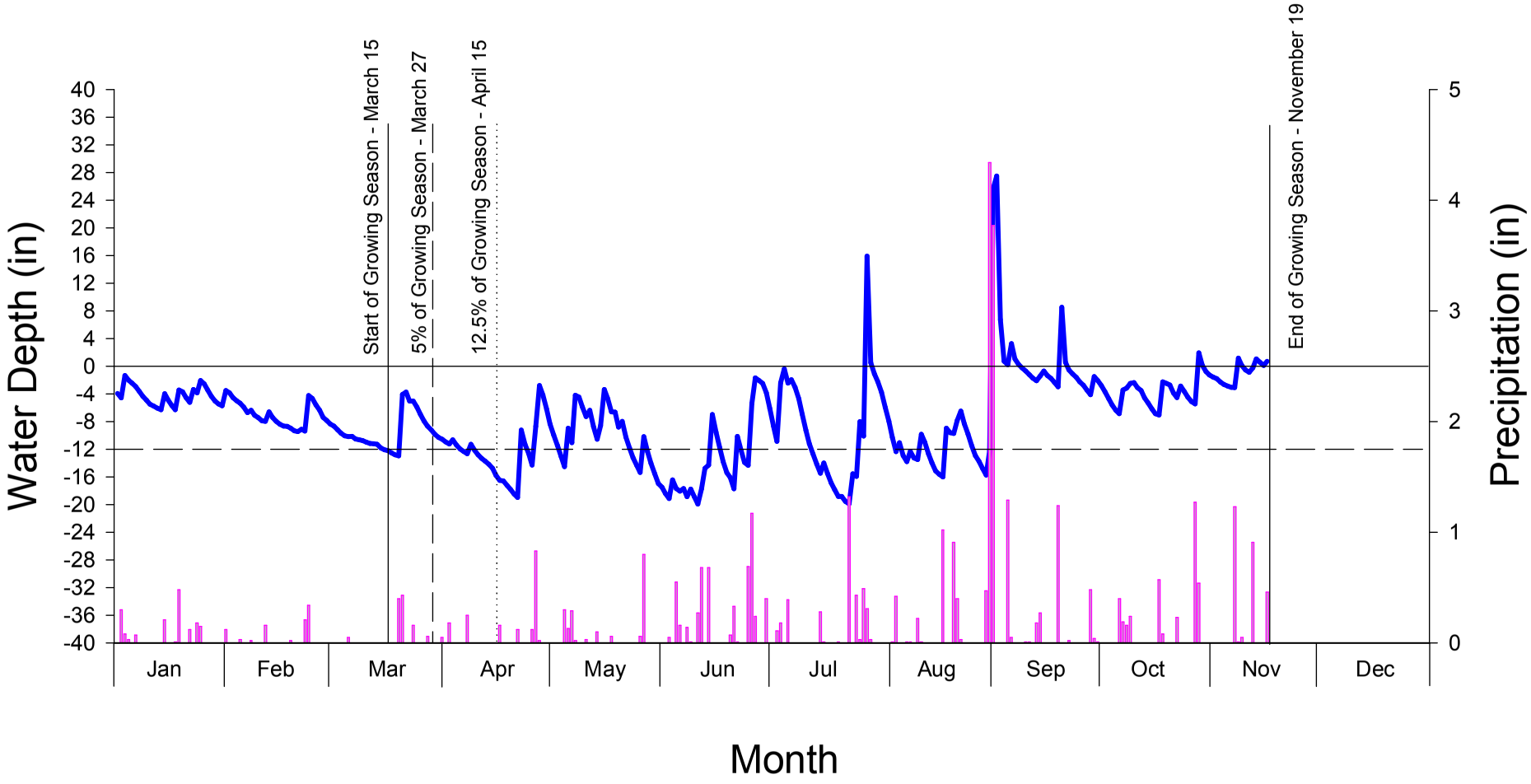
Reference Gauge 1 - N3D457A5



Whitelace Creek

2006

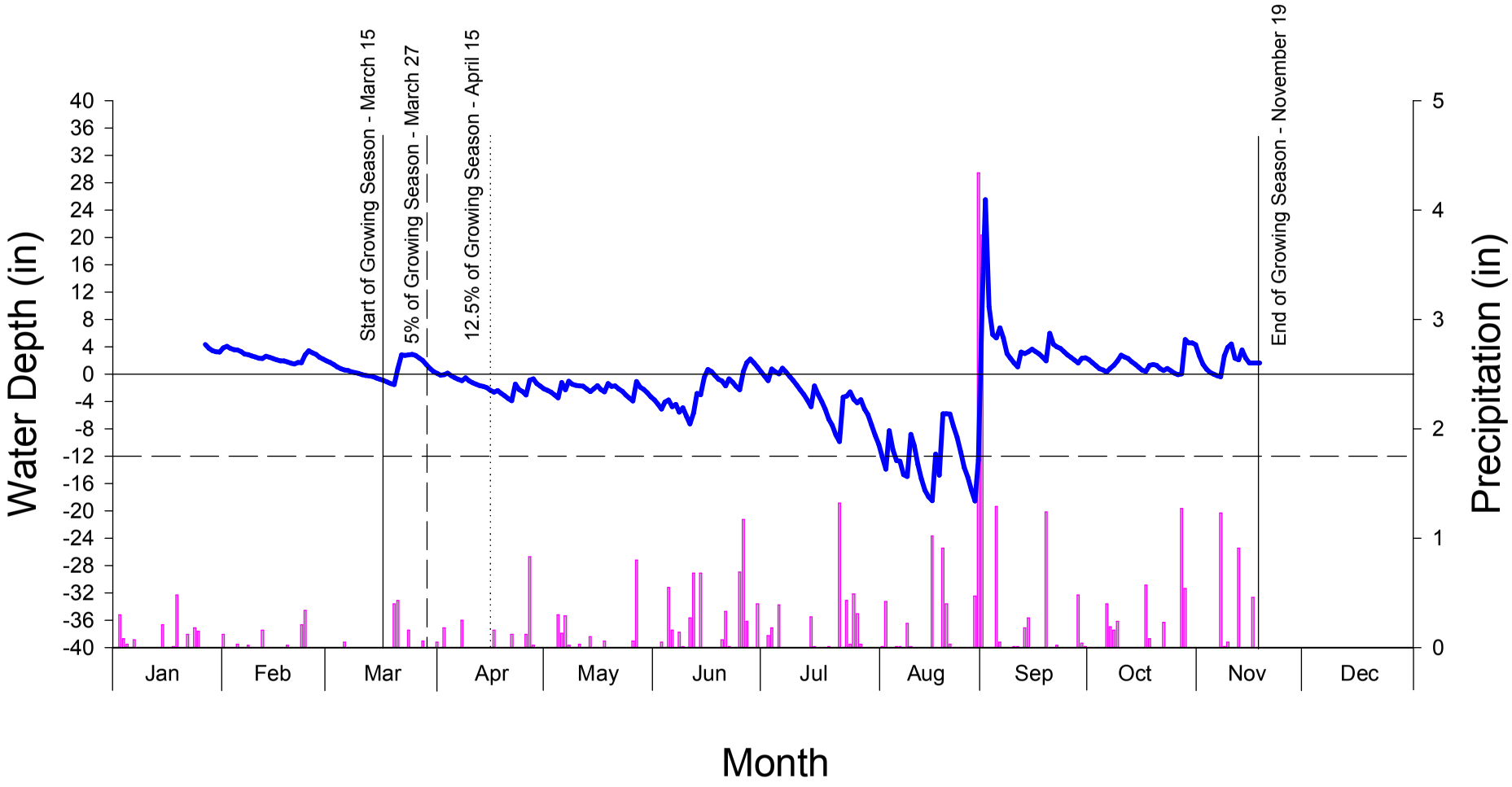
Reference Gauge 2 - N3D44981



Whitelace Creek

2006

Reference Gauge 3 - N3D448AB



EcoScience Corporation
Raleigh, North Carolina

Client: Ecosystem Enhancement Program

Project:

REFERENCE GROUNDWATER MONITORING GAUGE LOCATIONS WHITELACE CREEK STREAM AND WETLAND RESTORATION SITE

EEP Project No. 420

LENOIR COUNTY, NORTH CAROLINA

Dwn By:	Ckd By:
GWN	JWG

Date: NOV 2006

Scale: AS SHOWN

ESC Project No.: 02-111

FIGURE

D11