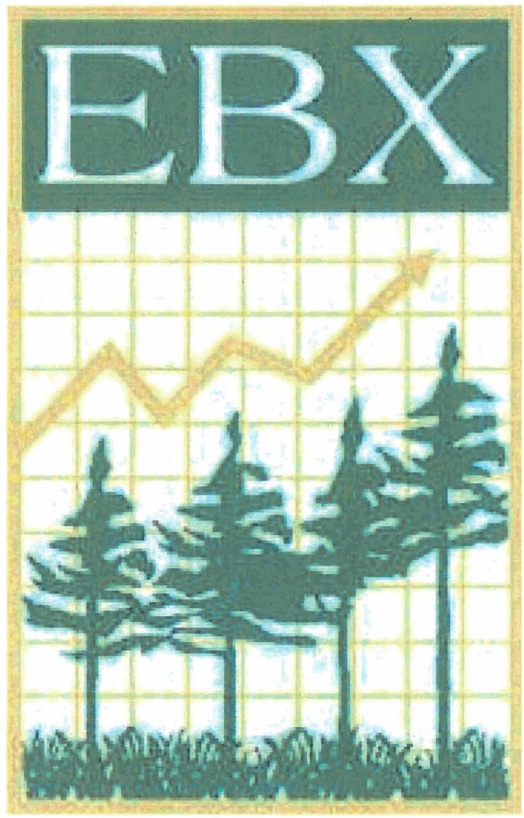
#116

CITY POND STREAM RESTORATION SITE
Annual Monitoring Report for 2005 (Year 1)



Environmental Banc & Exchange, LLC
Managers, Bankers, and Traders of Environmental Rights

"We Invest in the Environment."

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ANNUAL REPORT FOR 2005 (YEAR 1)
City Pond Restoration Site

1.0 SUMMARY

This Annual Report details the monitoring activities during the 2005 growing season on the City Pond Restoration Site. Construction of the site, including planting of trees, was completed in May 2005. The 2005 data represent results from the first year of stream and vegetation monitoring for.

The design for the City Pond property involved the restoration of channel dimension, pattern, and profile on eight separate reaches and the enhancement of dimension, and profile on one reach. After construction, it was determined that 9,869 feet of stream was restored and 705 feet of stream was enhanced.

This Annual Report presents the data from 5 vegetation monitoring stations, photo points, 3 crest gauges, 20 cross-sections, and stream profiles on 8 reaches, as required by the approved Restoration Plan for the site. Photos were taken at cross-sections and all in-stream structures.

Survival success of woody vegetation is being monitored at 5 vegetation monitoring plots, each 0.1 acre in size, placed randomly throughout the site. Survivability of trees in each vegetation plot is used to estimate the average survivability of all trees planted across the site. This Annual Report details the tree survival data obtained from all onsite vegetation monitoring plots and provides the average stems per acre of woody vegetation established throughout the site during the 2005 growing season.

Part of the monitoring effort for this project includes observation of the project's response to local climatic conditions. Weather data from the Wadesboro Weather Station (UCAN: 14386, COOP: 318964) and Blewett Lake Weather Station (UCAN: 144277, COOP: 310884) were used to document precipitation. Rainfall totals were compared to documented bankfull events and observed stream flow to assess stream response to precipitation events. For 2005, rainfall between the months of January to September was 29.05 inches at the weather station compared to the long-term average of 37.69 inches. Due to the lack of rainfall, many of the stream reaches experienced dry conditions for portions of the growing season.

Stream monitoring data showed that subsequent to construction completion, little change occurred in channel dimension and profile. Minor adjustments and shifts in profile are to be expected. In-stream structures continue to function as designed. One area of erosion was documented on Reach R3, maintenance is for this area in the winter of 2006. The vegetation monitoring indicated a range of average survivability between 270 and 670 stems per acre. Most of the site is on track for meeting the initial vegetation survival criteria of 320 stems per acre surviving after the fifth growing season. Only an area of approximately 3.5 acres, in the vicinity of Plot 5, has experienced high mortality and will need to be replanted to original stem counts.

Recommend winter 2006

2.0 INTRODUCTION

2.1 Project Description

The City Pond Stream Restoration Project is located near the town of Wadesboro in Anson County, North Carolina, (Figure 1). Environmental components monitored in this project will be those that allow an evaluation of channel stability and survivability of riparian vegetation. The stream systems that historically flowed through the site were channelized and, as a result, were highly incised prior to restoration. The design for the restored streams involved the construction of new meandering channels across the low slope valleys and restored step pool channels in the higher slope valleys.

The site has a recent history of pasture and hay production, preceded by row crop production. Ditches were used to increase land use and improve drainage when the land was under crop production. The streams on the project site were channelized, and riparian vegetation was cleared in most locations. Stream and riparian functions on the site had been severely impacted as a result of agricultural conversion.

The project involved the restoration and enhancement of 10,574 linear feet (LF) of channelized stream on several unnamed tributaries to City Pond. The project restored 9,869 LF of channel dimension, pattern and profile and enhanced 705 LF of channel dimension and/or profile. Table 1 shows the as-built lengths and restoration type per reach. The as-built plans presented in Figure 2 illustrate the construction and planting that were completed for this project in May 2005. The 2005 monitoring season represents the first year of monitoring for the site.

Table 1. Summary of As-built Lengths and Restoration Approaches.

Reach Name	As-built Length (ft)	Restoration Approach
R1	705	Enhancement Level I
R2	2,611	Restoration
R3	777	Restoration
S1	734	Restoration
S2	1,150	Restoration
S3	710	Restoration
S4	1,711	Restoration
S5	1,744	Restoration
S6	432	Restoration
Total	**10,574**	

2.2 Reach Identification

The project was divided into a total of nine reaches, comprising one main channel (R1, R2, and R3) and six tributary channels (S1 through S6) located on the site (Figure 2). Reach designations are based on the characteristics of each reach, such as breaks in stream type, slope, bed material, and restoration potential. Five tributary channels enter into the main channel and one (S6) discharges into another tributary (S5). The main channel begins off-site and enters the site from the northeast. It flows across the site from the north/northeast, turns in the center of the site and exits the site to the south. After exiting the project site, the main channel flows approximately

3,200 feet before discharging into City Pond. City Pond is the water supply reservoir for the Town of Wadesboro.

2.3 Purpose

Monitoring of the City Pond Site is required to demonstrate successful restoration based on the criteria found in the Restoration Plan. Vegetation and stream stability monitoring are conducted on an annual basis. Success criteria must be met within the five-year monitoring period. This Annual Report details the results of the monitoring efforts for 2005 (Year 1) at the City Pond Restoration Site.

2.4 Project History

November 2004	Construction Began
May 2005	Construction Completed
May 2005	Planting Completed
November 2005	1st Annual Monitoring Report
November 2006 (scheduled)	2nd Annual Monitoring Report
November 2007 (scheduled)	3rd Annual Monitoring Report
November 2008 (scheduled)	4th Annual Monitoring Report
November 2009 (scheduled)	5th Annual Monitoring Report

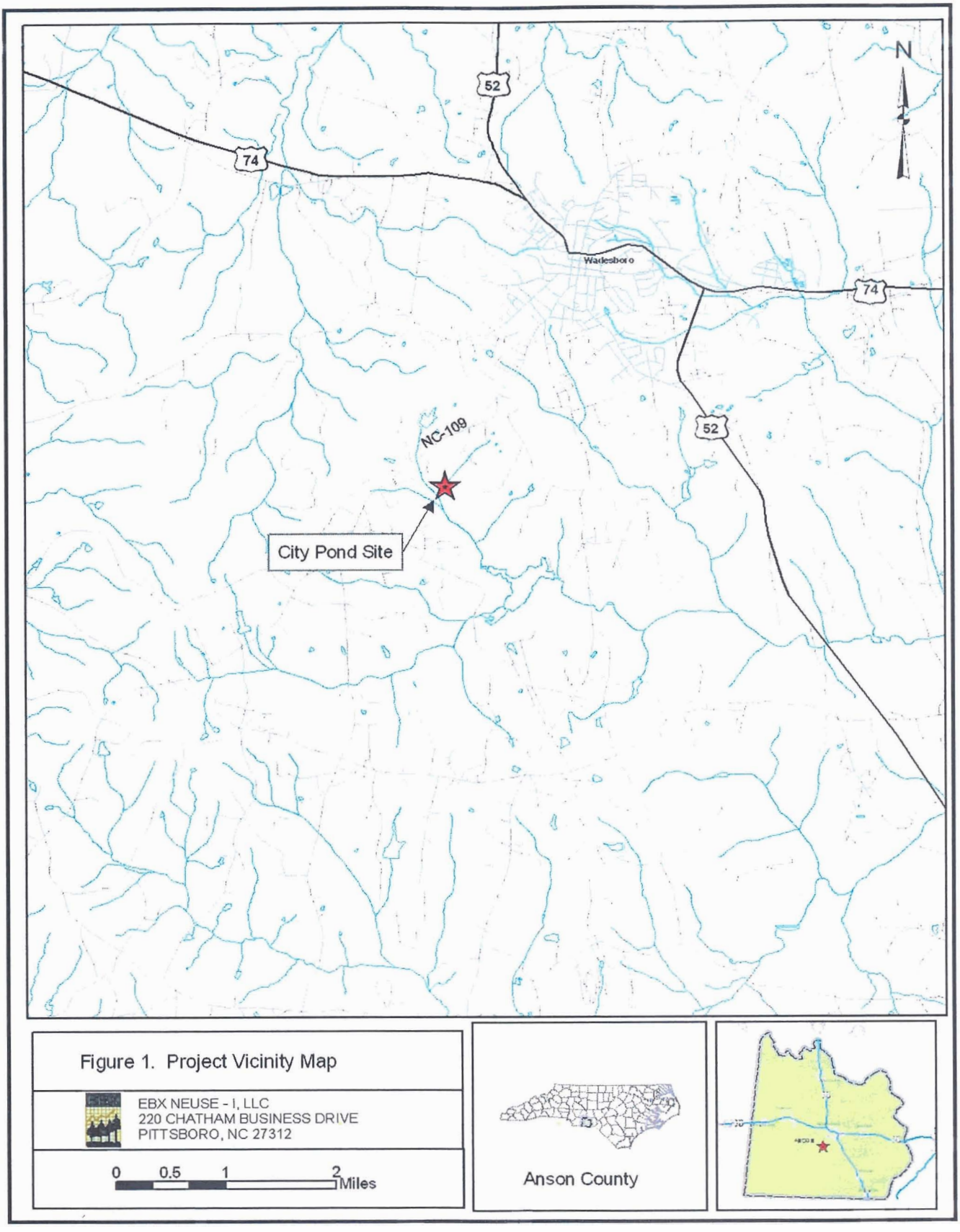


Figure 1. Location of City Pond Stream Restoration Site.

CITY POND

PROJECT: 166

STREAM RESTORATION PROJECT
ENVIRONMENTAL BANC AND EXCHANGE, LLC
CITY POND SITE

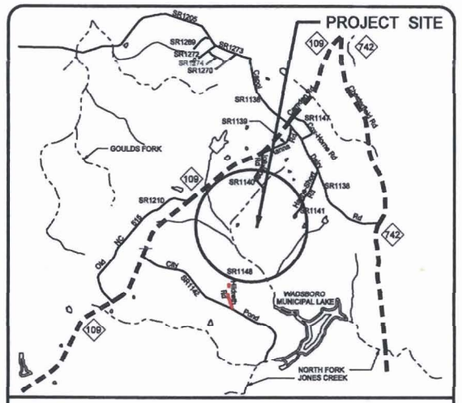
ANSON COUNTY

LOCATION: SOUTH OF WADESBORO ALONG SR 109 BETWEEN SR 1138 AND SR 1142

TYPE OF WORK: AS - BUILT PLAN

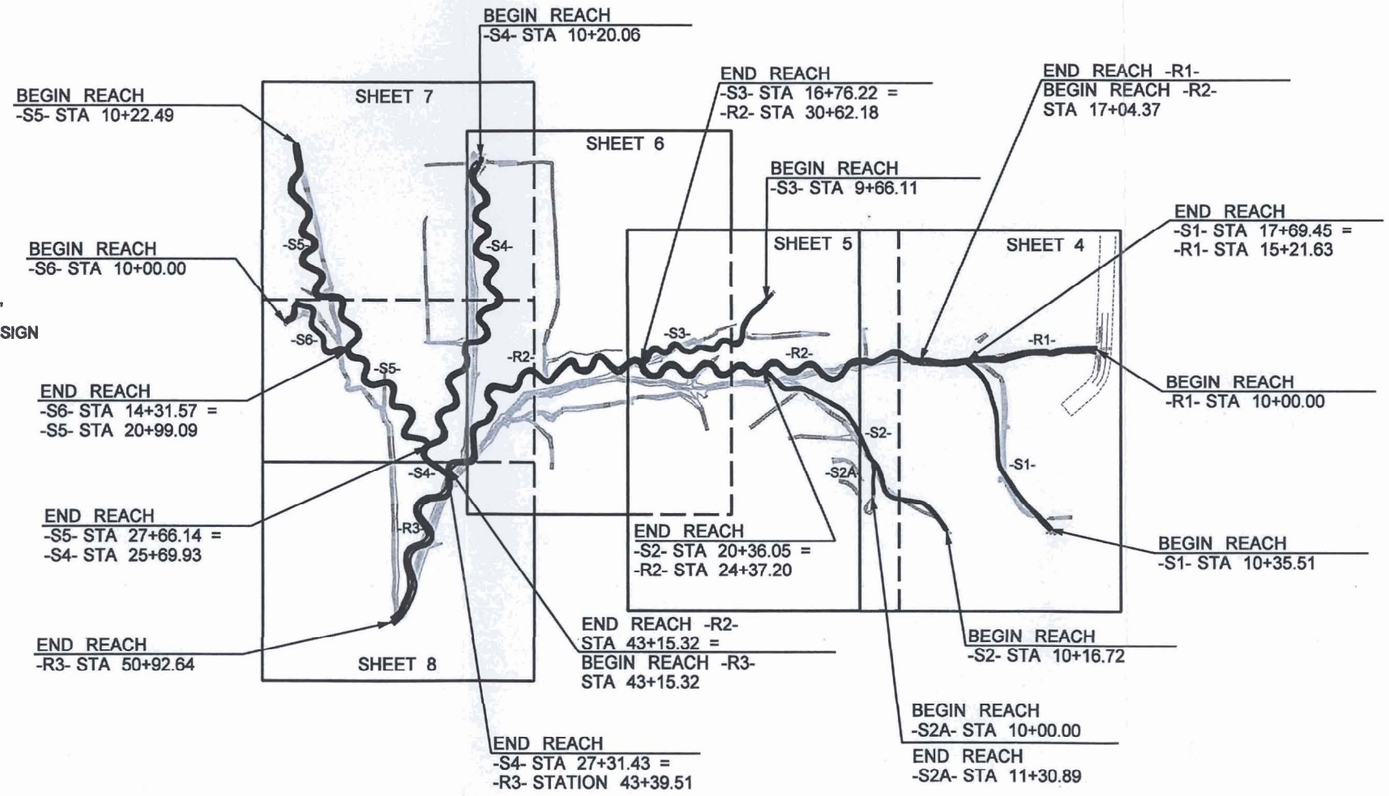
STATE	PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	0166R	1	11

NO.	DATE	CHECKED BY	APPROVED BY
1	07/19/06	STACI RICKS	KEVIN TWEEDY

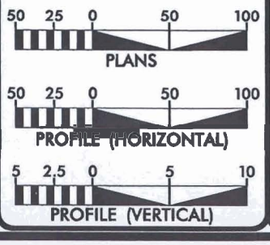


VICINITY MAP

INDEX OF SHEETS



GRAPHIC SCALES



PROJECT SUMMARY

Project Feature	Existing Condition	As-Built Condition
R1	705 LF	705 LF
R2	1,653 LF	2,611 LF
R3	681 LF	777 LF
S1	730 LF	734 LF
S2	876 LF	1,150 LF
S3	591 LF	710 LF
S4	1,188 LF	1,711 LF
S5	1,939 LF	1,744 LF
S6	238 LF	432 LF
Total	8,601 LF	10,574 LF

PREPARED FOR THE OFFICE OF:
EBX NEUSE I, LLC

10055 RED RUN BOULEVARD, SUITE 130
OWING MILLS, MD 21117

220 CHATHAM BUSINESS DRIVE
PITTSBORO, NORTH CAROLINA 27312

EBX CONTACT:
TARA DISY ALLDEN
PROJECT MANAGER

PREPARED IN THE OFFICE OF:
BUCK ENGINEERING
8000 Regency Parkway, Suite 200
Cary, North Carolina 27511
Phone: 919-463-5488
Fax: 919-463-5490

May 2005
COMPLETION DATE:

KEVIN L. TWEEDY
PROJECT ENGINEER

DANIEL TAYLOR
PROJECT DESIGNER

DOUG J. SMITH
PROJECT MANAGER

PROJECT ENGINEER

THIS DOCUMENT ORIGINALLY ISSUED AND SEALED BY:

KEVIN L. TWEEDY
027337
NOVEMBER 22, 2004

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SIGNATURE: ***P.E.***

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JOE JONES RD. - NCSR 1140
60' PUBLIC R/W (SOIL)

CP
N= 17,719.1140'
E= 18,813.7134'
ELEV.=50.00'

56"X78" CMP
N.E. INV.=37.86'
S.W. INV.=37.86'

RESERVED EASEMENT

EIS

EIP

BEGIN REACH
-R1- STATION 10+00.00

WOODS

END OF PUBLIC RIGHT-OF-WAY

GEORGE R. HUNTLEY
ELIZA J. HUNTLEY
DB 186, PG 500

-R1-

JAMES J. HANNA
DAISY B. HANNA
DB 158, PG 235

BEGIN REACH
-S1- STATION 10+35.51

ROBERT L. ROBINSON, JR.
NANNIE R. ROBINSON
DB 180, PG 5

JAMES J. HANNA
DAISY B. HANNA
DB 105, PG 301

BEGINNING OF DEEP DITCH

-S1-

X-1

CP
N= 16,945.9262'
E= 18,911.1276'
ELEV.=52.24'

CP
N= 17,330.3070'
E= 18,469.4354'
ELEV.=50.13'

END REACH
-S1- STATION 17+69.45 =
-R1- STATION 15+21.63

X-2

CREST GAGE #1

END REACH -R1-
STATION 17+04.37 =
BEGIN REACH -R2-
STATION 17+04.37

-R2-

ROBERT L. ROBINSON, JR.
NANNIE R. ROBINSON
DB 180, PG 5

N/F
RUBY HANNAH

BEGIN REACH
-S2- STATION 10+16.72

-S2-

X-20

-R2- MATCHLINE SHEET 5 STATION 18+65.57

-S2- MATCHLINE SHEET 5 STATION 13+70.45

NOTE:
ALL COORDINATES AND ELEVATIONS ARE RELATIVE TO AN ARBITRARY BENCHMARK ON-SITE.

AS – BUILT PLAN

50 25 0 50 100
SCALE (FT)

10/18/2005
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-R2- MATCHLINE SHEET 4 STATION 18+65.57

-S2- MATCHLINE SHEET 4 STATION 13+70.45

VEG. PLOT #1

BEGIN REACH
-S2A- STATION 10+00.00

END REACH
-S2A- STATION 11+30.98

-S2-

-R2-

X-19

X-3

JAMES J. HANNA
DAISY B. HANNA
DB 158, PG 235

JAMES J. HANNA
DB 86, PG 506

JAMES J. HANNA
DAISY B. HANNA
DB 105, PG 301

BEGIN REACH
-S3- STATION 9+66.11

RAIN GAGE
N= 16,699.1553
E= 17,947.5892
ELEV.=30.85'

15"RCP
E. INV.=30.27'
W. INV.=30.33'

END REACH
-S2- STATION 20+36.05 =
-R2- STATION 24+37.20

-S3-

-R2-

X-4

X-18

OLD DIVISION LINE

WOODS

JAMES J. HANNA
DAISY B. HANNA
DB 130, PG 439

JAMES J. HANNA
DB 294, PG 167

VEG. PLOT #2

GEORGIA HANNA
AND OTHERS
DB 235, PG 1

-R2- MATCHLINE SHEET 6 STATION 29+49.34

-S3- MATCHLINE SHEET 6 STATION 16+03.84

AS – BUILT PLAN

50 25 0 50 100
SCALE (FT)

10/18/2005
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-R2- MATCHLINE SHEET 5 STATION 29+49.34

-S3- MATCHLINE SHEET 5 STATION 16+03.84

END REACH
-S3- STATION 16+76.22 =
-R2- STATION 30+62.18

-S3-

-R2-

X-5

VEG. PLOT #3

SPARE MILLSETH
DB 271, PG 113

OLD DIVISION LINE

-R2- MATCHLINE SHEET 8
STATION 38+53.80

AS – BUILT PLAN

50 25 0 50 100
SCALE (FT)

10/18/2005
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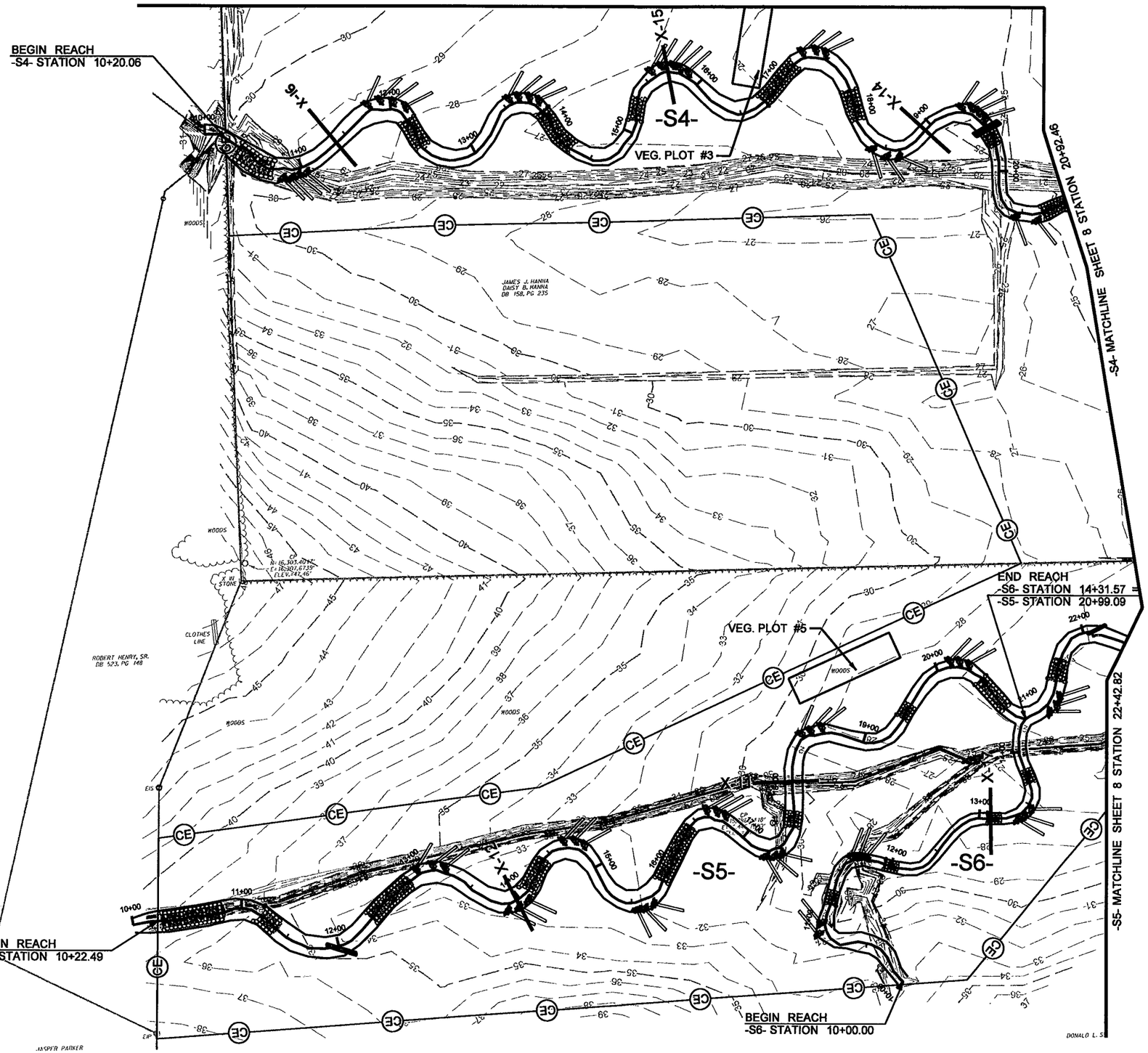

AS – BUILT PLAN

50 25 0 50 100
SCALE (FT)

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Fax: 919-483-5490

-R2- MATCHLINE SHEET 6 STATION 38+53.80

-S4- MATCHLINE SHEET 7 STATION 20+92.46

-S5- MATCHLINE SHEET 7 STATION 22+42.82

CREST GAGE #2

CREST GAGE #3

VEG. PLOT #4

CP
N= 15,824.50
E= 17,196.50
ELEV.=23.29'

CP
N= 15,633.58
E= 16,944.60
ELEV.=22.46'

END REACH -R2-
STATION 43+15.32=
BEGIN REACH -R3-
STATION 43+15.32

END REACH
-S4- STATION 27+31.43 =
-R3- STATION 43+39.51

END REACH
-S5- STATION 27+66.14 =
-S4- STATION 25+69.93

END REACH
-R3- STATION 50+92.64

-R2-

-S4-

-S5-

-R3-

JAMES J. HANNA
DB 89, PG 375

JAMES J. HANNA
DAISY B. HANNA
DB 158, PG 235

DONALD L. SELLARS
BILLY Y. SELLARS
DB 207, PG 874

WOODS

AS - BUILT PLAN

50 25 0 50 100
SCALE (FT)

2/28/03

10/18/2005
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2/26/03

PROJECT REFERENCE NO.	SHEET NO.
0166R	73

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VEGETATION SELECTION

TREES

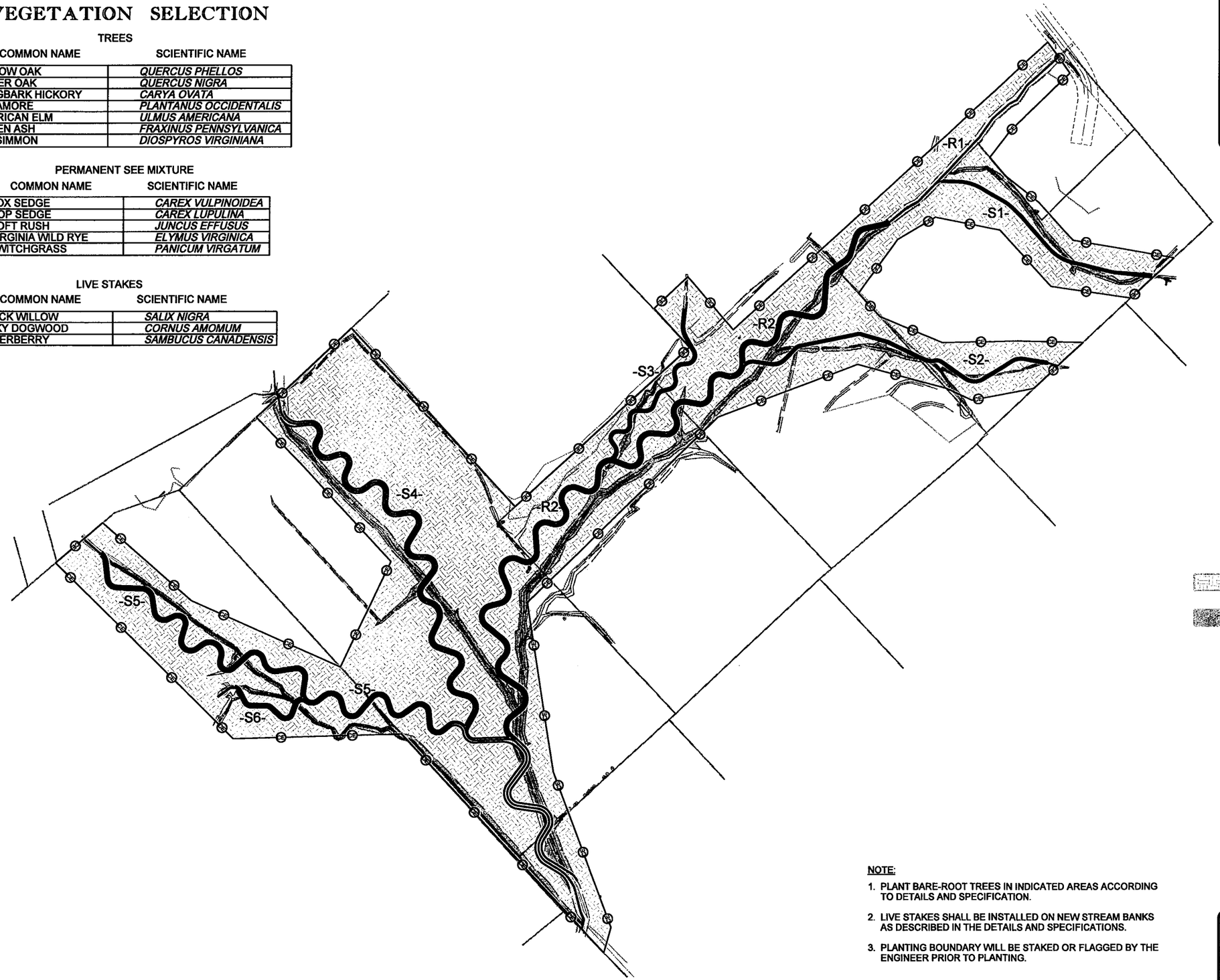
COMMON NAME	SCIENTIFIC NAME
WILLOW OAK	*QUERCUS PHELLOS*
WATER OAK	*QUERCUS NIGRA*
SHAGBARK HICKORY	*CARYA OVATA*
SYCAMORE	*PLANTANUS OCCIDENTALIS*
AMERICAN ELM	*ULMUS AMERICANA*
GREEN ASH	*FRAXINUS PENNSYLVANICA*
PERSIMMON	*DIOSPYROS VIRGINIANA*

PERMANENT SEE MIXTURE

COMMON NAME	SCIENTIFIC NAME
FOX SEDGE	*CAREX VULPINOIDEA*
HOP SEDGE	*CAREX LUPULINA*
SOFT RUSH	*JUNCUS EFFUSUS*
VIRGINIA WILD RYE	*ELYMUS VIRGINICA*
SWITCHGRASS	*PANICUM VIRGATUM*

LIVE STAKES

COMMON NAME	SCIENTIFIC NAME
BLACK WILLOW	*SALIX NIGRA*
SILKY DOGWOOD	*CORNUS AMOMUM*
ELDERBERRY	*SAMBUCUS CANADENSIS*



NAD 83

BARE ROOT PLANTING BOUNDARY

EXISTING CHANNEL FILL BOUNDARY

NOTE:

1. PLANT BARE-ROOT TREES IN INDICATED AREAS ACCORDING TO DETAILS AND SPECIFICATION.
2. LIVE STAKES SHALL BE INSTALLED ON NEW STREAM BANKS AS DESCRIBED IN THE DETAILS AND SPECIFICATIONS.
3. PLANTING BOUNDARY WILL BE STAKED OR FLAGGED BY THE ENGINEER PRIOR TO PLANTING.

REVEGETATION PLAN

150 75 0 150 200
SCALE (FT)

10/30/2005
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3.0 VEGETATION

3.1 Success Criteria

The measure of vegetative success identified in the approved Restoration Plan will be the survival of at least 320 trees per acre at the end of Year 5 of the monitoring period. In addition, herbaceous vegetation, primarily native grasses, planted at the site shall have at least 95 percent coverage of the seeded/planted area. Up to 20 percent of the site species composition may be comprised of volunteer species. Remedial action may be required should these (i.e. red maple, sweet gum, etc.) present a problem and/or exceed 20 percent composition.

Bare root trees were planted within all areas of the project's conservation easement. A minimum 50-foot buffer was established along all restored stream reaches. Planting of bare root trees and spreading of the permanent seed mixture was completed in May 2005. Table 2 summarizes the tree species planted onsite.

Table 2. Tree Species Planted in the City Pond Riparian Buffer.

ID	Common Name	Scientific Name	FAC Status
1	Shagbark Hickory	*Carya ovata*	FACU
2	Willow Oak	*Quercus phellos*	FACW-
3	Persimmon	*Diospyrus virginiana*	FAC
4	Green Ash	*Fraxinus pennsylvan.*	FACW
5	Yellow poplar	*Liriodendron tulipifera*	FAC
6	Sycamore	*Platanus occidentalis*	FACW-
7	Water Oak	*Quercus nigra*	FAC
8	American Elm	*Ulmus americana*	FACW
9	Oak	*Quercus sp.*	

3.2 Description of Species and Monitoring Protocol

The following monitoring protocol was designed to predict vegetative survivability. Five plots were established on the City Pond Restoration Site, to monitor approximately 2 percent of the site. The vegetation monitoring plots were designed to be 1/10th of an acre in size, or 50' x 87' dimensionally. The plots were randomly located and randomly oriented within the riparian buffer.

Plot construction involved using metal fence posts at each of the four corners to clearly and permanently establish the area that was to be sampled. Then ropes were hung connecting all four corners to help in determining if trees close to the plot boundary were inside or outside of the plot. Trees on the boundary and trees just outside of the boundary that appear to have greater than 50 percent of their canopy inside the boundary were counted inside the plot. A piece of white PVC pipe ten feet tall was placed over the metal post on one corner to facilitate visual location of site throughout the five-year monitoring period.

All of the planted stems inside the plot were flagged with orange flagging and marked with a 3 foot tall piece of half inch PVC to mark them as the planted stems (vs. volunteer species) and to help in locating them in the future. Each stem was then tagged with a permanent numbered aluminum tag.

3.3 Results of Vegetative Monitoring

Table 3 presents stem counts for each of the monitoring stations. Each planted tree species is identified across the top row, and each plot is identified down the left column. The numbers on the top row correlate to the ID column of Table 2. Trees are flagged in the field on a quarterly basis before the flags degrade. Flags are utilized because they will not interfere with the growth of the tree. Volunteers are also flagged during this process.

Table 3. 2005 Vegetation Monitoring Plot Species Composition.

Plot	1	2	3	4	5	6	7	8	9	Total	Stem/ac
CP1	0	19	10	1	4	11	6	12	1	64	640
CP2	1	23	0	1	2	6	0	28	1	62	620
CP3	3	4	22	1	3	6	0	8	0	47	470
CP4	0	9	11	20	0	1	13	13	0	67	670
CP5	3	6	2	1	3	5	5	0	2	27	270

Average Stems/Acre: 534

Volunteer species will also be monitored throughout the five-year monitoring period. Table 4 lists the most commonly found woody volunteer species.

Volunteer woody species were observed in most all of the vegetation plots, but were deemed to small to tally. If these trees persist into next growing season and exceed 12 inches tall they will be flagged and added to the overall stems per acre assessment of the site. Sweetgum (*Liquidambar styraciflua*) is the most common volunteer, though privet (*Ligustrum sp.*) was also observed. Tree species identified as volunteers within in the Riparian Buffer are provided in Table 4

Table 4. Volunteer Tree Species Identified within the Riparian Buffer.

ID	Common Name	Scientific Name	FAC Status
A	Sweetgum	*Liquidambar styraciflua*	FAC+
B	Privet	*Ligustrum sp.*	FAC

3.4 Vegetation Observations

After construction of the restoration site, a permanent ground cover seed mixture of Virginia wild-rye (*Elymus virginicus*), switch grass (*Panicum virgatum*), and fox sedge (*Carex vulpinoidea*) was broadcast on the site at a rate of 10 pounds per acre. These species are dominant on the site, though they pose no threat to the survival or health of the planted or naturally occurring hydrophytic vegetation. Hydrophytic herbaceous vegetation is also found on site. Cattails (*Typha sp.*), rush (*Juncus effusus*), spikerush (*Eleocharis obtusa*), knotweed (*Polygonum persicaria*), iris (*Iris sp.*), arrow-leaf tearthumb (*Polygonum sagittatum*), and sedge (*Carex sp.*), all hydrophytic, herbaceous plants, are frequently observed across the site, particularly in areas of inundation. Woolgrass (*Scirpus cyperinus*), an obligate wetland plant, is dominant in the central wetter zone of the site.

There are zones of weedy species occurring on the site, though none seem to be impacting the woody or herbaceous hydrophytic vegetation. Most of the weedy species are annuals and seem to pose very little threat to survivability onsite. Commonly seen weedy vegetation includes hay, dallisgrass (*Paspalum dilatatum*), dog fennel (*Eupatorium capillifolium*), and buttercup (*Ranunculus sp.*). Any threatening weedy vegetation found in the future will be documented and discussed.

3.5 Vegetation Conclusions

The 2005 vegetation monitoring revealed that most of the site has an average tree density greater than 600 stems per acre. Most of this site is on trajectory for meeting the minimum success criteria of 320 trees per acre by the end of Year 5. Only an area of 3.5 acres is experiencing high mortality.

Replanting trees in the 3.5 acre area near Plot 5 is required. High mortality is attributed to dry conditions shortly after the planting occurred and lower quality trees. These trees were part of a separate delivery and records indicate they may have been too dry when planted.

4.0 STREAM MONITORING

4.1 Success Criteria

As stated in the approved Restoration Plan, the stream restoration success criteria for the site include the following:

- *Bankfull Events*: Two bankfull flow events must be documented within the five-year monitoring period.
- *Cross-sections*: There should be little change in as-built cross-sections. Cross-sections shall be classified using the Rosgen stream classification method and all monitored cross-sections should fall within the quantitative parameters defined for "E" or "C" type channels. Cross-section data will be collected annually.
- *Longitudinal Profiles*: The longitudinal profiles should show that the bedform features are remaining stable, e.g. they are not aggrading or degrading. Bedforms observed should be consistent with those observed in "E" and "C" type channels. Profile data will be collected in monitoring Years 1, 3, and 5.
- *Photo Reference Stations*: Photographs will be used to subjectively evaluate channel aggradation or degradation, bank erosion, success of riparian vegetation and effectiveness of erosion control measures. Photos will be taken annually at permanent cross-sections and grade control structures.
- *Benthic Macroinvertebrate Sampling*: Sampling of benthic macroinvertebrates within the restored stream channel was not required during the time that this project was permitted.

4.2 Description of Stream Monitoring

To document the stated success criteria, the following monitoring program was instituted following construction completion on the City Pond Site:

Bankfull Events: Three crest gauges were installed on the site to document bankfull events. The gauges record the highest out-of-bank flow event that occurred and are checked periodically through the year. The gauges are located on the lower part of R1, R2 and S4 (see Figures 2A and 2E).

Cross-sections: Two permanent cross-sections were installed per 1,000 linear feet of stream restoration work, with one of the locations being a riffle cross-section and one location being a pool cross-section. A total of 20 permanent cross-sections were established across the restoration site. Each cross-section was marked on both banks with permanent pins to establish the exact transect used. Permanent cross-section pins were surveyed and located relative to a common benchmark to facilitate easy comparison of year-to-year data. The annual cross-section surveys include points measured at all breaks in slope, including top of bank, bankfull, inner berm, edge of water, and thalweg. Riffle cross-sections are classified using the Rosgen stream classification system. Permanent cross-sections for 2005 (Year 1) were surveyed in October 2005.

Longitudinal Profiles: A complete longitudinal profile will be completed in Years 1, 3, and 5. The profile will be conducted for a length of restored channel at least 3,000 feet in length. Measurements will include thalweg, water surface, inner berm, bankfull, and top of low bank. Each of these measurements will be taken at the head of each feature, e.g. riffle, run, pool, and

glide, and the max pool depth. A common benchmark will be used each year to facilitate comparison of year-to-year data. The longitudinal survey for 2005 (Year 1) was conducted during October 2005.

Photo Reference Stations: Photographs are used to visually document restoration success. Reference stations are marked with wooden stakes and Global Positioning Satellite (GPS) coordinates have been determined for each location. Reference photos are taken at least once per year. Reference photos are taken at each permanent cross-section from both streambanks. The survey tape is centered in the photographs of the bank, and the water line is located in the lower edge of the frame with as much of the bank as possible included in each photo. Photos of each grade control structure are also taken.

Benthic Macroinvertebrates: Benthic macroinvertebrate data will be collected from the within the project reach. Pre-restoration samples were not required at the time this project was permitted. Therefore, pre-restoration sample data is not available for comparison. Post-restoration sampling will begin one year after construction activities have been completed, and annually thereafter for a total of three years. Year 1 results will appear in the Year 2 monitoring report. Sampling will be conducted each year between March and May. Sample collection will follow protocols described in the standard operating procedures of the Biological Assessment Unit of the North Carolina Division of Water Quality (NCDWQ). The Qual-4 collection method will be used for the collection of macroinvertebrate samples, and a North Carolina-certified laboratory will perform the identification of the macroinvertebrate samples. The metrics to be calculated will include total and Ephemeroptera, Plecoptera, and Trichoptera (EPT) taxa richness, EPT abundance and biotic index values.

4.3 Results of Stream Monitoring

Bankfull events on the site were documented during several site visits through the use of the onsite crest gauges and visual evidence of out-of-bank flow. Site visits on July 27 and September 9, 2005 documented rack lines from over bank flows. A site visit on October 9, 2005 documented an actual bankfull event during the site visit. Photos of all three site visits are located in Appendix A.

Year 1 monitoring data for stream stability were collected during October 2005 and compared to baseline data collected in May of 2005. A longitudinal profile of each monitored stream reach was surveyed to document the elevations and location of streambed features and in-stream grade control structures as well as the overall stream reach slope. Permanent cross-sections at 19 locations throughout the entire restoration project (eleven riffles and eight pools, see Appendix B) were re-surveyed to document stream dimension stability.

The Year 1 channel cross-sections showed that overall stream dimension remained stable during the first growing season. Some localized areas of bed scour and/or aggradation were noted, however, these adjustments are common on newly constructed projects and indicate a movement toward greater stability. In this first year after construction, the site is still stabilizing as vegetation matures along the creek buffers. This stabilization process and the possible increase in sediment supply from upstream sources contribute to the slight aggradation observed at some points along the project. In addition, the stream was surveyed after a large bankfull event that likely carried sediment from upstream into the project reaches. It is expected that these areas will continue to gain greater stability during the next growing season.

In-stream structures installed within the restored stream included constructed riffles, cross vanes, log vanes, log weirs, root wads, and step-pool structures. Visual observations of structures throughout the past growing season indicated that nearly all structures are functioning as designed. Root wads placed on the outside of meander bends have provided bank stability and in-stream cover for fish and other aquatic organisms. Log weirs placed in riffle areas have maintained riffle elevations and provided a downstream scour hole that provides habitat. Constructed riffles have maintained riffle elevations and provided areas of aeration as well as habitat for macroinvertebrates. Cross vanes have maintained invert elevations and created scour pools that provide holding and spawning habitat for fish species. Some areas of localized instability have been noticed; however these areas appear to be stabilizing over time as vegetation becomes established. One meander bend on R3 has experienced noticeable erosion on the outside of the bend. Maintenance of this area is planned for the winter of 2005/2006.

Photographs have been taken throughout the monitored season to document the evolution of the restored stream channels (see Appendix A). Due to drier than normal conditions, low stream flows were observed in several reaches during the middle of the growing season. The low flow conditions, as well as the heavy release of nutrients that typically occurs in the first year following construction, have lead to some vegetative growth within several of the restored stream channels. The vegetation in the channel is likely to die off after the first year due to increased flows, decreased nutrient availability, and increased shading.

4.3.1 Climatic Data

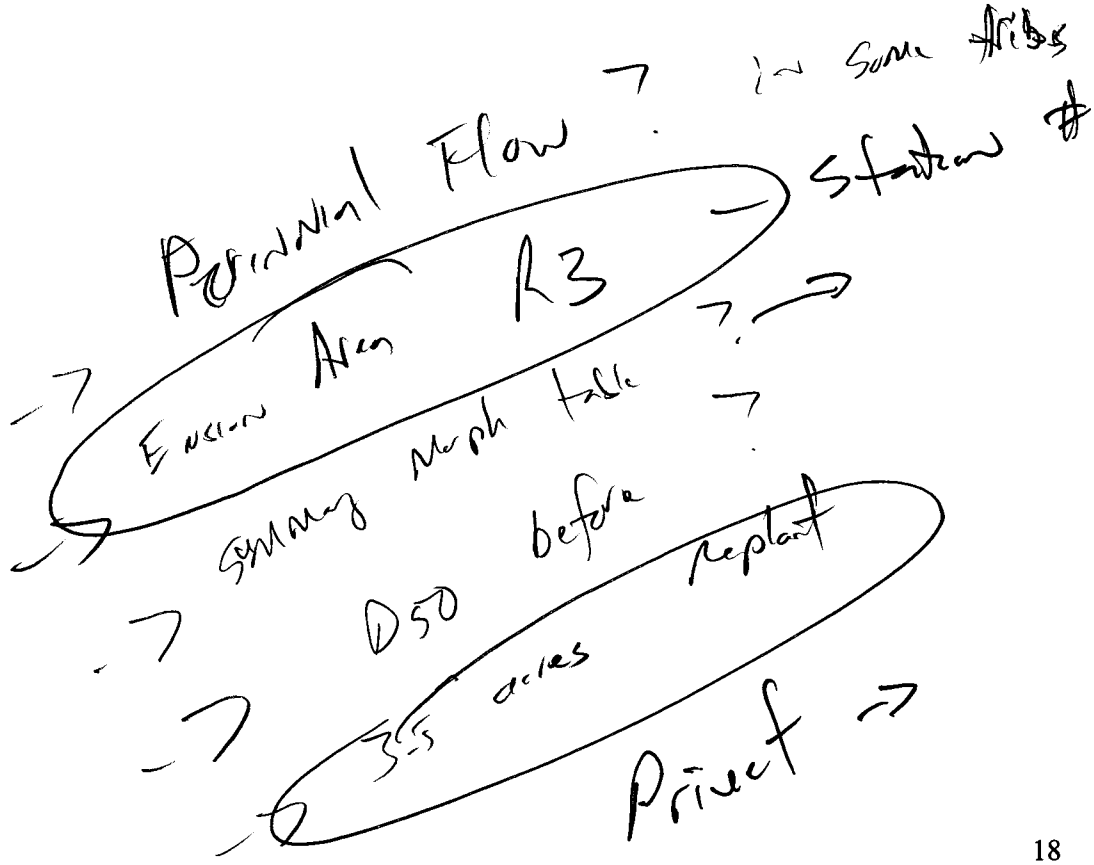
Table 5 and Figure 3 are a comparison of the 2005 monthly rainfall to historical precipitation (WETS table for Anson County, collected between 1971 and 2000) for the Anson County area. Monthly totals for 2005 were collected from an automated weather station in Wadesboro (UCAN: 14386, COOP: 318964) and Blewett Lake (UCAN: 144277, COOP: 310884). Total rainfall for the 2005 growing season was over eight inches below the long-term average. Monthly rainfall data for October 3 through October 22, November, and December 2005 were not available at the time that this report was compiled. Due to the lack of rainfall, many of the stream reaches experienced dry conditions through parts of the growing season. Table 5 shows comparison of historic data with monthly rainfall data from the 2005 growing season.

Table 5. Comparison of Historic Average Rainfall to Observed Rainfall (Inches).

Month	Average	30%	70%	Observed Precipitation, P (in)	
				Month	P
October	3.66	1.85	4.87	October 2004	1.09
November	3.1	2.14	3.86	November 2004	2.3
December	3.28	2.16	3.83	December 2004	1.37
January	4.66	3.31	5.78	January 2005	3.54
February	3.56	2.18	4.37	February 2005	3.08
March	4.61	3.28	5.58	March 2005	3.6
April	2.94	1.54	3.78	April 2005	3.84
May	3.44	2.18	3.93	May 2005	2.69
June	4.56	2.74	5.84	June 2005	4.51*
July	5.26	3.26	6.06	July 2005	3.26*
August	4.41	2.67	5.36	August 2005	3.07*
September	4.25	2.15	5.87	September 2005	1.46*
October	3.66	1.85	4.87	October 2005	0.32*
November	3.1	2.14	3.86	November 2005	N/A
December	3.28	2.16	3.83	December 2005	N/A

Notes:

* Precipitation data not available for Wadesboro Weather Station. Data from Blewett Lake Weather Station.



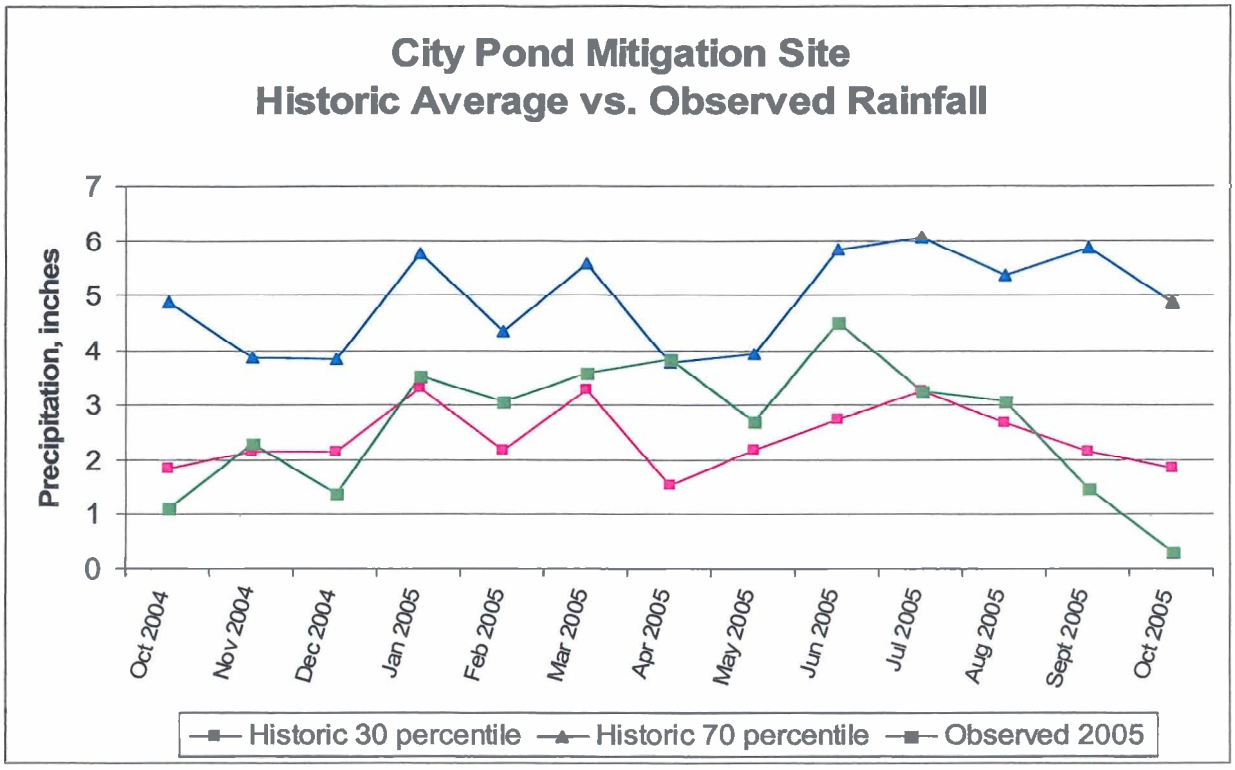


Figure 3. Comparison of Historic Average Rainfall to Observed Rainfall.

4.4 Conclusions

The City Pond Restoration project restored 9,869 linear feet of channel dimension, pattern and profile and enhanced 705 linear feet of channel dimension and/or profile. Based on the data collected thus far, the restored channel is stable and is providing the functions intended. Maintenance work on one bend on R3 will be completed during the winter of 2006. Overall, stable riffle and pool features developed quickly after construction and it is expected that stability of the system will only improve through time.

5.0 OVERALL CONCLSIONS AND RECOMMENDATIONS

- The restored stream channels have remained relatively stable despite several bankfull flows during the first growing season. Due to low rainfall amounts between bankfull events, many of the channels have experienced relatively dry conditions since the completion of construction. All monitoring cross-sections for 2005 showed very little adjustment in stream dimension. Minor shifts in profile include slight aggradation on areas along R3, S3, and S6. Overall stream slope has remained constant, and the restored channels appear to be moving toward greater stability.
- One bend on R3 has experienced erosion on the outside of the bend. Maintenance work consisting of bank sloping and benching is scheduled to occur in the winter of 2005/2006.
- Vegetation monitoring indicates the average number of stems per acre on site to be 600, not including Plot 5, which is a survival rate of 98 percent based on the initial planting count of 612 stems per acre. Dry weather during the growing season and poor quality trees has resulted in the need to replant a 3.5 acre portion of the site.
- Monitoring of vegetation and stream stability will continue.

6.0 WILDLIFE OBSERVATIONS

Observations of deer and raccoon tracks are common on the City Pond site. During certain times of the year, frogs have been very prevalent across the site. Fish, snakes and crayfish have been observed along several of the restored stream reaches. A variety of birds have also been observed.

APPENDICES

(APPENDIX MATERIALS ARE INCLUDED ON ENCLOSED CD)