

2000 MONITORING REPORT
- FINAL REPORT -
For
SEVEN SPRINGS
WETLAND MITIGATION PROJECT
Wayne County, NC

Prepared For:



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Introduction

The following Annual Report for the Seven Spring Mitigation Project summarizes the sixth and final year of monitoring. It includes work performed under the Professional Services Agreement dated November 16, 1994 between NCDOT and Triangle Wetland Consultants, L.L.C. (TWC).

The Triangle Group (TTG) made six visits to the Seven Springs site (Figure 1) during 2000 to collect hydrological data and most recently to evaluate vegetation survival and growth. During these visits, the overall development of the project was evaluated.

The project has progressed beyond expectations with planted trees reaching heights greater than 25 feet and wetland hydrology restored to the site during the growing season. During our last visit to sample vegetation, there was minimal beaver activity and a few trees damaged from deer antler rubbing.

Hydrologic Data

Groundwater well and iron rod oxidation data were collected from February 23, to May 3, 2000. Average depth to groundwater during the 2000 growing season ranged from 17.1 inches on March 10 to 8.5 inches on March 21 (Appendix A –2000 Well Hydrographs). Average groundwater depth in the reference plot during the 2000 growing season was 14.2 inches. Average iron rod oxidation depth for plots A - G ranged from 14.3 inches on March 10 to 13.4 inches on March 21. Average iron rod oxidation depth for the reference area during the growing season was 12.2 inches.

During the 2000-early growing season, only plots C and F met the criteria for wetland hydrology. For those plots achieving wetland hydrology, ground water was within 12 inches of the soil surface for 14 consecutive days during the growing season. Although the majority of groundwater wells did not indicate wetland hydrology this growing season, the general trend for this site for the last six growing seasons has indicated wetland hydrology.

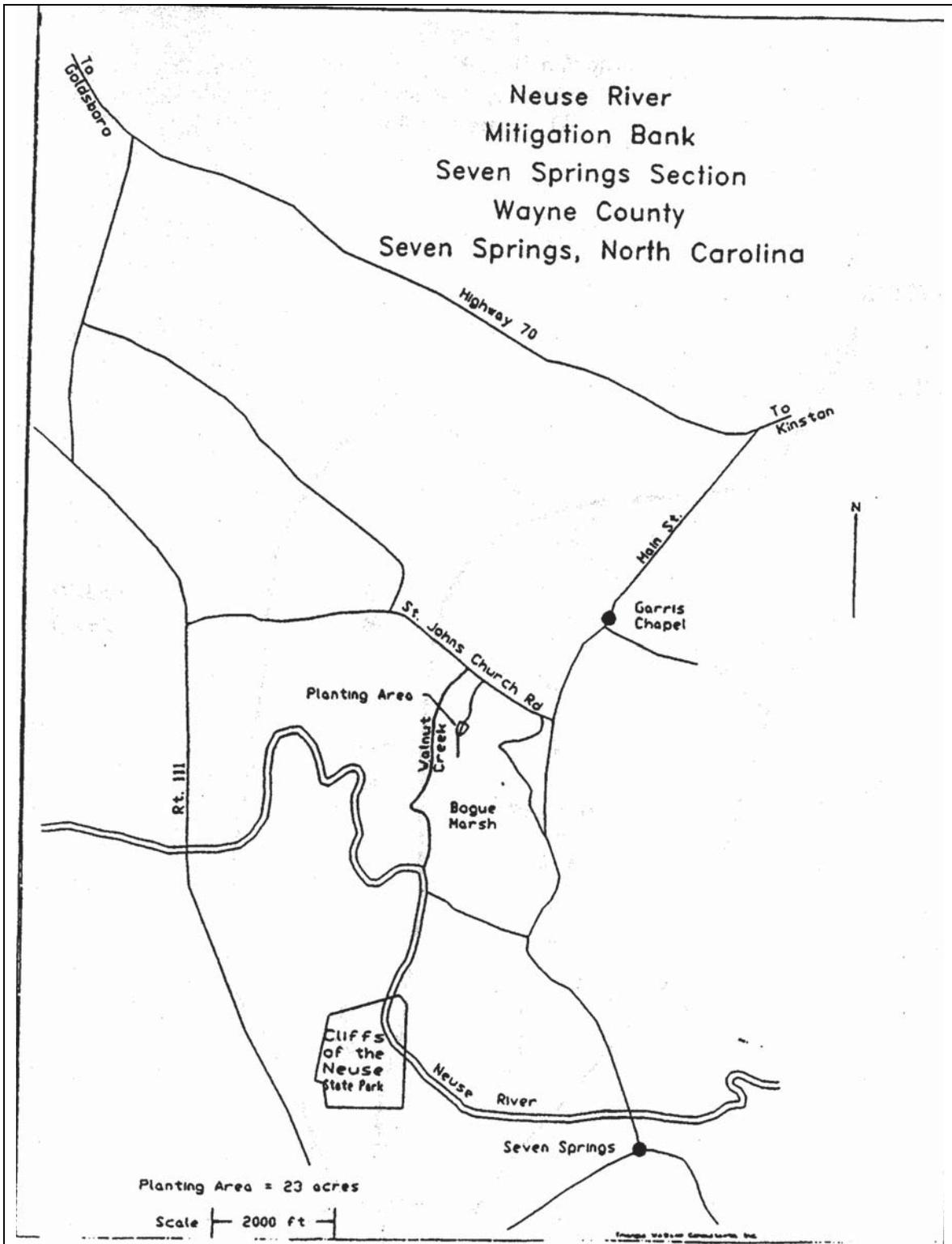
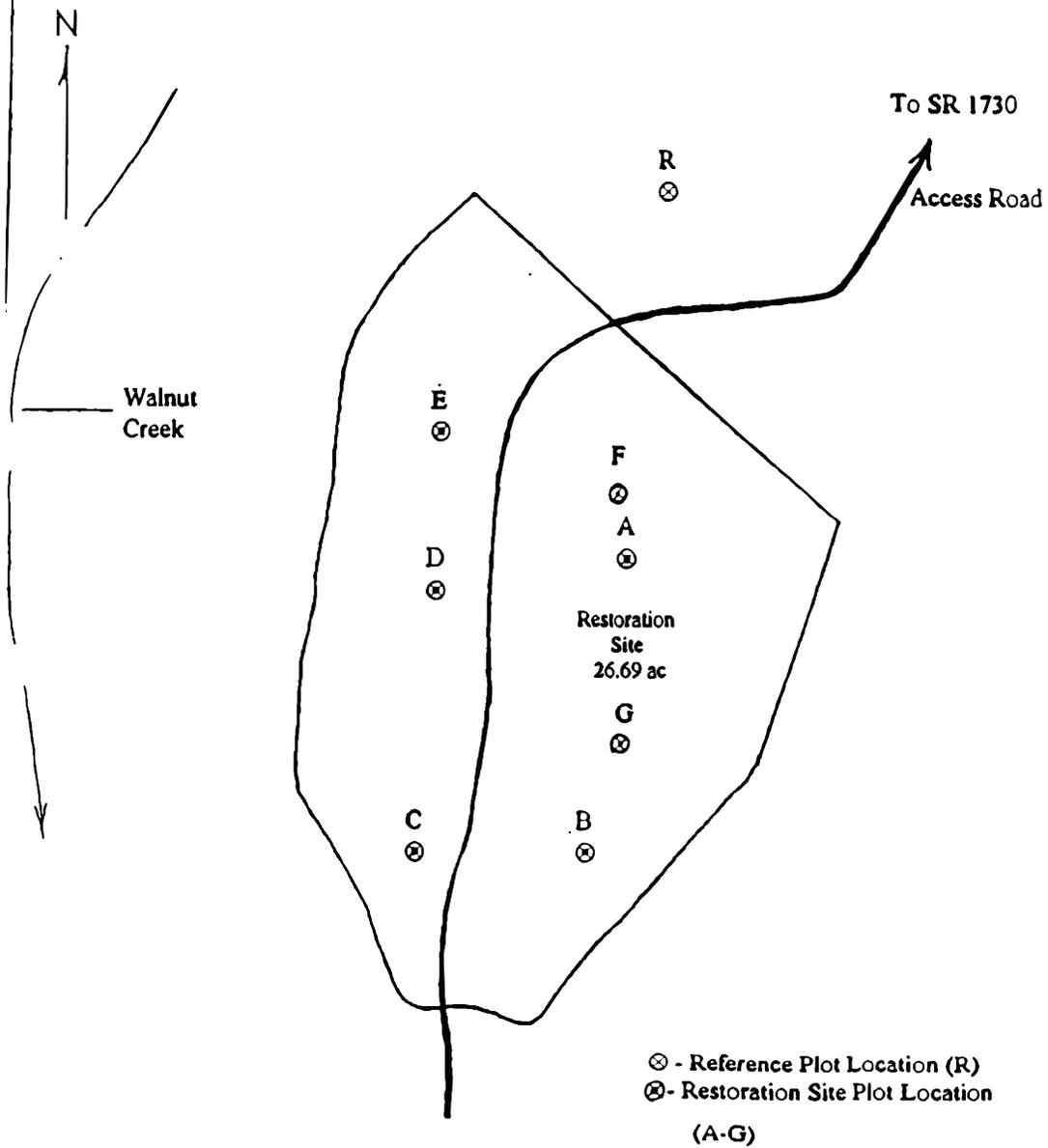


Figure 1: Project Location Map
 Seven Springs Wetland Mitigation Site, Wayne County, NC

Figure 2
Neuse River Mitigation Project
Seven Springs Section
Plot Locations 1]



1] Data collected at the reference and restoration sites include vegetation, soils, and hydrology (groundwater well, iron rod, and redox electrodes).

Vegetation Data

Plant community data were collected in November, 2000 at seven 0.10-acre circular monitoring plots centered on the monitoring wells (A - G). Estimates of woody species regeneration, and size of woody regeneration were recorded. Overall survival and species diversity of planted and naturally regenerating woody species were acceptable (Appendix B – Seedling Inventory).

Planted tree and natural regeneration survival and growth indicate that there are an average of 509 planted stems/ac. and 211 stems/ac. of natural regeneration (Total stems/ac. = 741) (Appendix B – Seedling Inventory). This is an increase in total stems/ac. from 1999, which is indicative of natural regeneration of loblolly pine and other hardwoods. The vegetation success criterion for this project is 320 planted stems per acre, which has been achieved during every monitoring period since 1994.

There currently is a very heavy grass and weed cover on a portion of the site, which can obscure some seedlings during monitoring. Blackberry (*Rubus* spp.) is a major understory herbaceous component in almost all plots and is providing good wildlife habitat and protection for smaller seedlings. Natural regeneration, primarily sweetgum, red maple, and loblolly pine continue to be an important component of the seedlings on the site. These species are also major components of the reference stand. Some of the naturally regenerated loblolly pine is well over 20 feet tall, which is nearly as tall as the planted hardwoods. However, periodic flooding over the past few years, including flooding from past hurricanes, has greatly reduced the number of loblolly pine on the site.

The average height of planted species is 8.6 ft. with a maximum average height of 13.7 ft. after 7 growing seasons (n=7). River birch and sycamore are the tallest planted species, with some trees exceeding 25 feet in height. Bald cypress and sweetgum are growing well, with several trees exceeding 20 feet in height. The average height of natural regenerated species is 8.3 ft. with a maximum average height of 10.9 ft. after 7 growing seasons (n=7). Overall, the planted and natural regeneration are attaining very good total height and diameter growth. Height increment is increasing each year as well.

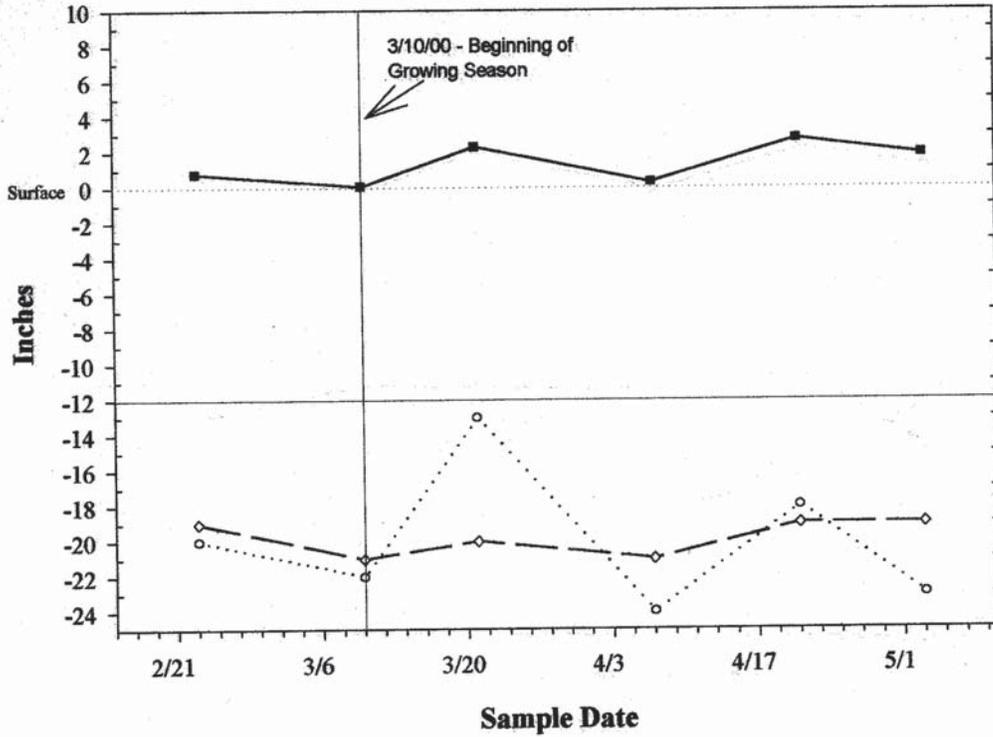
Conclusions

Vegetative monitoring data indicate excellent stocking of desirable woody species within the Seven Springs Wetland Mitigation Project. Growth and survival of oak species, bald cypress, and other planted hardwoods were high and should result in a substantial component of these species dominating the restored forested wetland. Well data trends indicate that virtually the entire site exhibits wetland hydrology although data from this past growing season exhibits lower groundwater levels. One possible explanation of the lower groundwater data could be from changes in the floodplain and drainage characteristics from past hurricanes. Evidence of this is also seen in the reference well data. This area is prone to overbank inundation from nearby Walnut Creek and Neuse River. The project site has experienced several flood events including flooding from past hurricanes and is serving to mitigate the damaging effects of these floodwaters. Formerly an agricultural field, this wetland restoration project is functioning as a forested wetland and helping to protect and improve water quality in the Neuse River watershed. From data collected for this site over the last 7 growing seasons, it is evident this site has been restored to a functional wetland. We propose to discontinue monitoring and declare this project successful having met wetland restoration success criteria during the monitoring period.

APPENDIX A

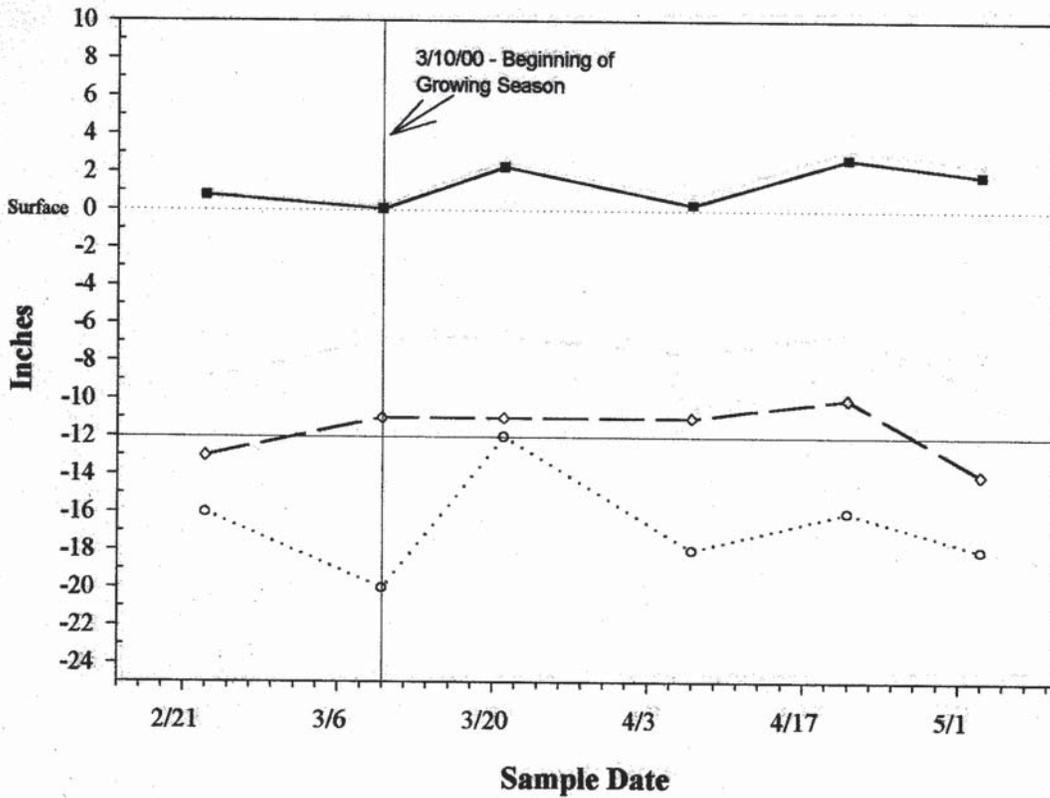
2000 WELL HYDROGRAPHS

**2000 Hydrological Monitoring
Seven Springs
Wayne County, NC
Well A**



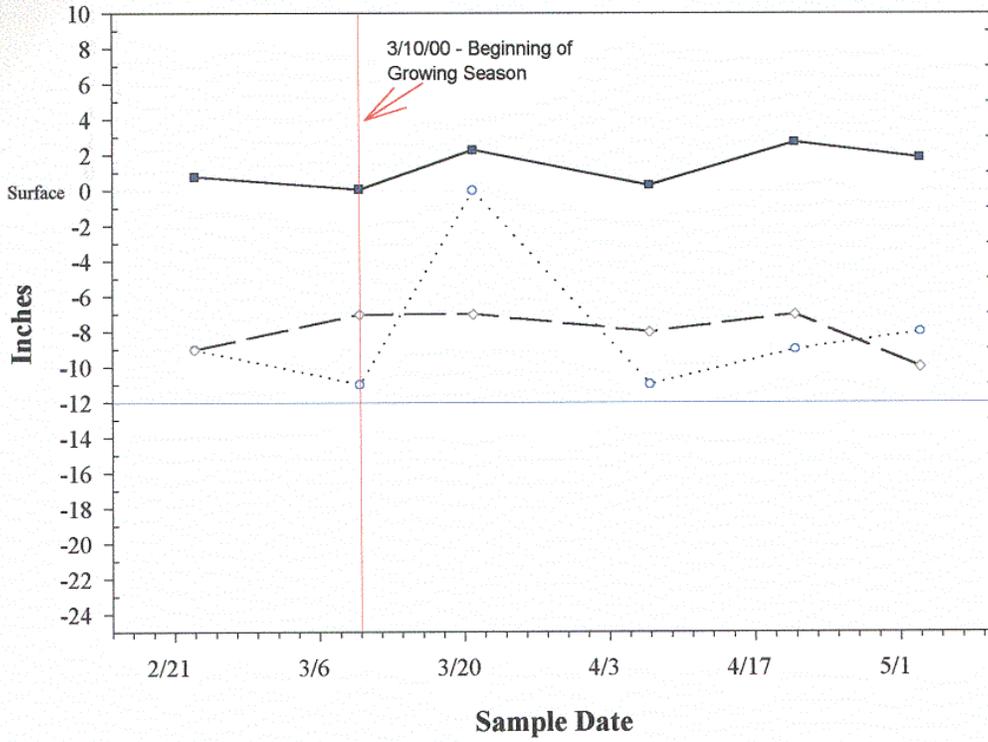
—■— Cumulative Precipitation (Between Sample Events)
 Gauge: Goldsboro 4SE, NC UCAN: 1418, COOP: 313510
*(Information was provided by the State Climate
 Office of North Carolina at NC State University).*
 ...○... Water Level
 —◇— Iron Rod Oxidation

**2000 Hydrological Monitoring
Seven Springs
Wayne County, NC
Well B**



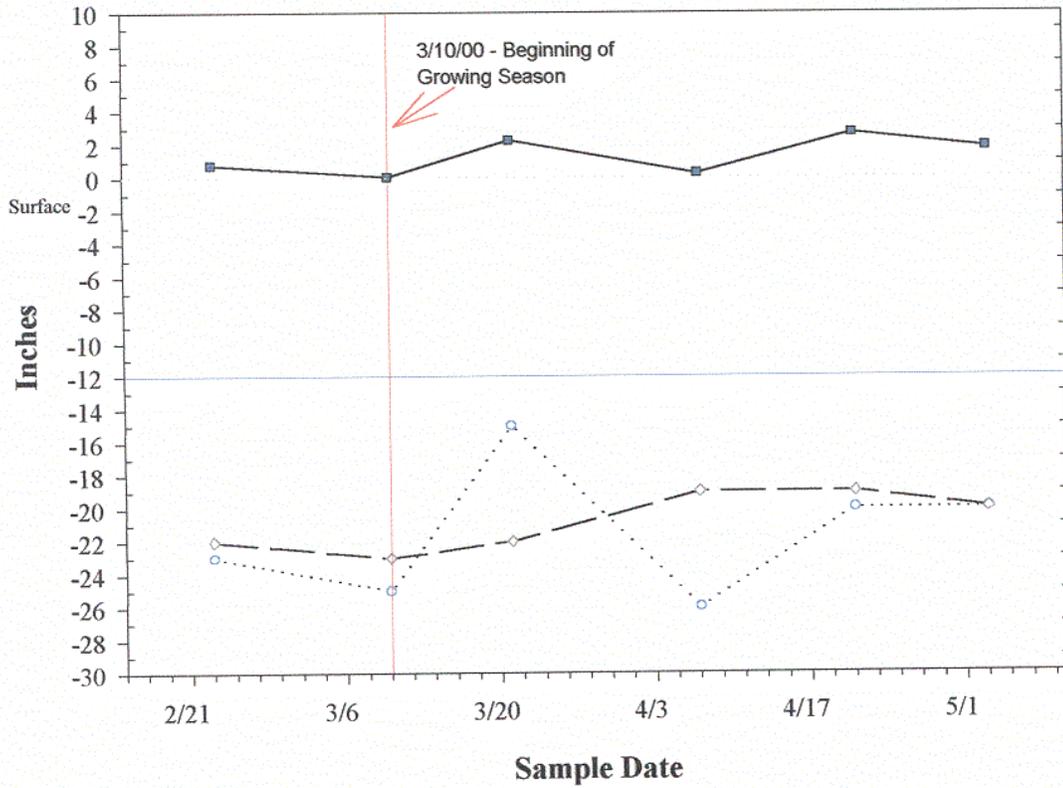
—■— Cumulative Precipitation (Between Sample Events)
 Gauge: Goldsboro 4SE, NC UCAN: 1418, COOP: 313510
 (Information was provided by the State Climate
 Office of North Carolina at NC State University).
 ...○... Water Level
 —◇— Iron Rod Oxidation

**2000 Hydrological Monitoring
Seven Springs
Wayne County, NC
Well C**



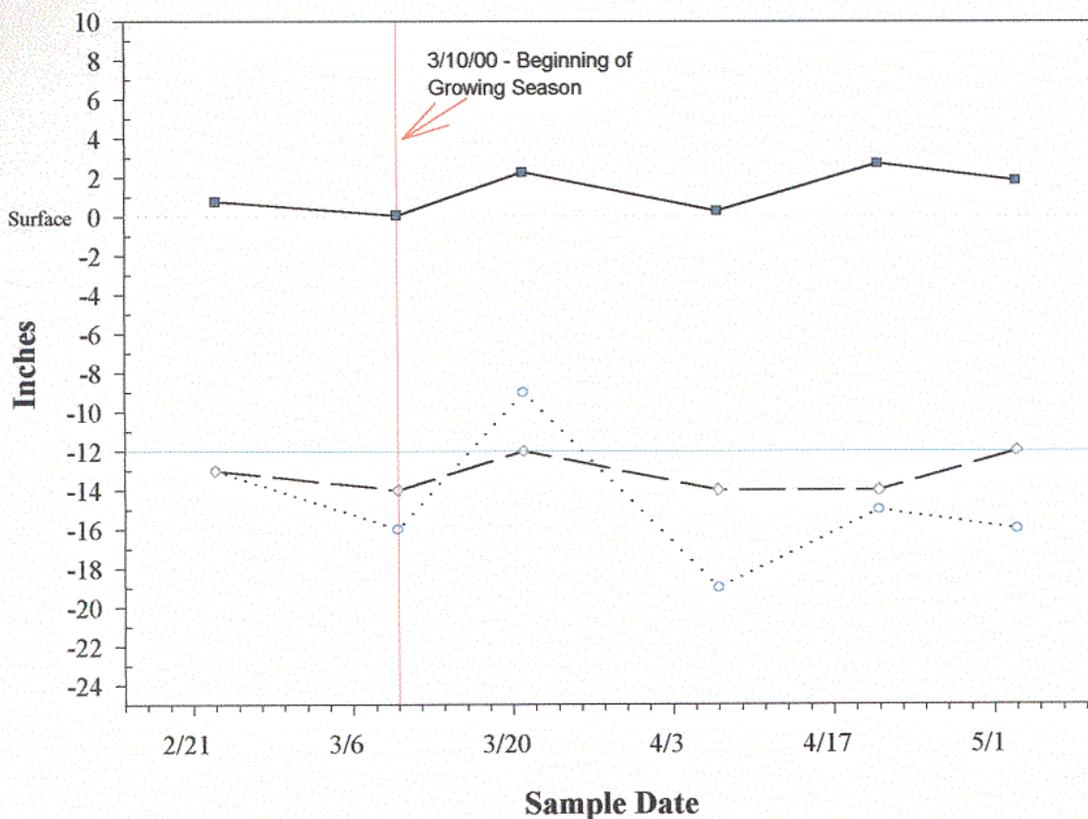
—■— Cumulative Precipitation (Between Sample Events)
 Gauge: Goldsboro 4SE, NC UCAN: 1418, COOP: 313510
(Information was provided by the State Climate Office of North Carolina at NC State University).
 ...○... Water Level
 —◇— Iron Rod Oxidation

**2000 Hydrological Monitoring
Seven Springs
Wayne County, NC
Well D**



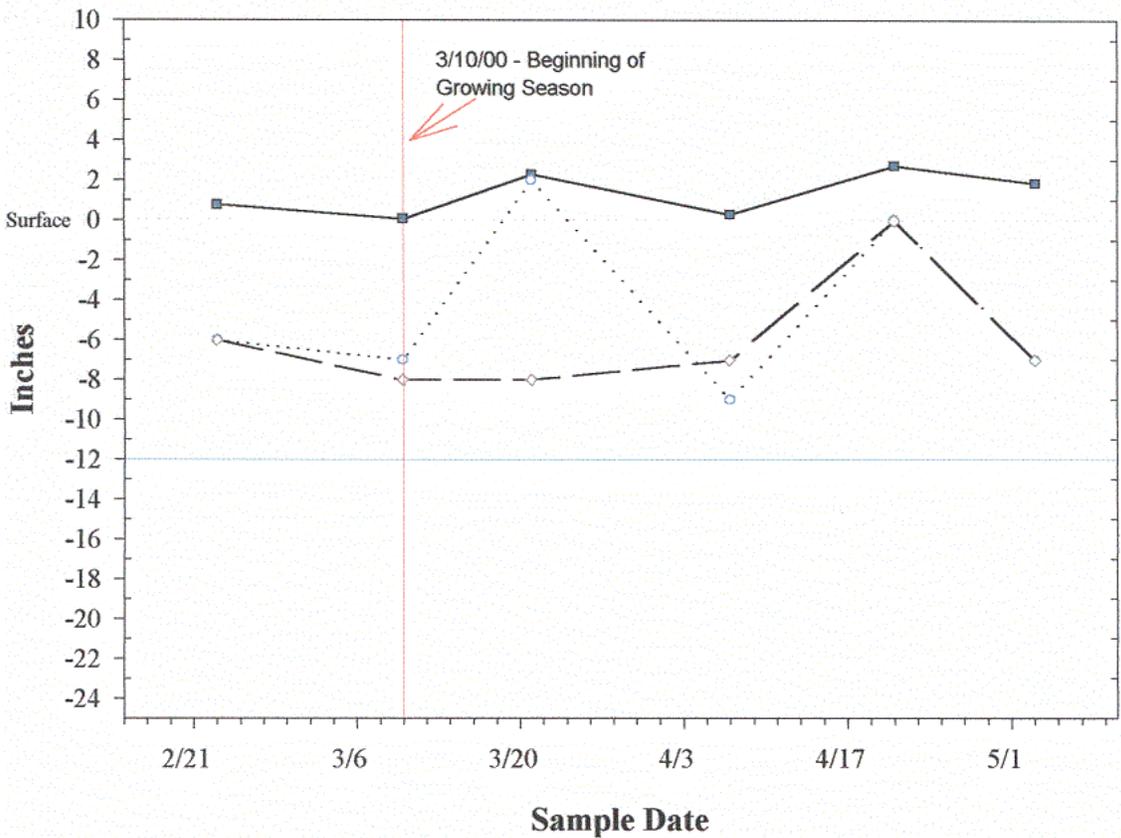
—■— Cumulative Precipitation (Between Sample Events)
 Gauge: Goldsboro 4SE, NC UCAN: 1418, COOP: 313510
(Information was provided by the State Climate Office of North Carolina at NC State University).
 ...○... Water Level
 —◇— Iron Rod Oxidation

**2000 Hydrological Monitoring
Seven Springs
Wayne County, NC
Well E**



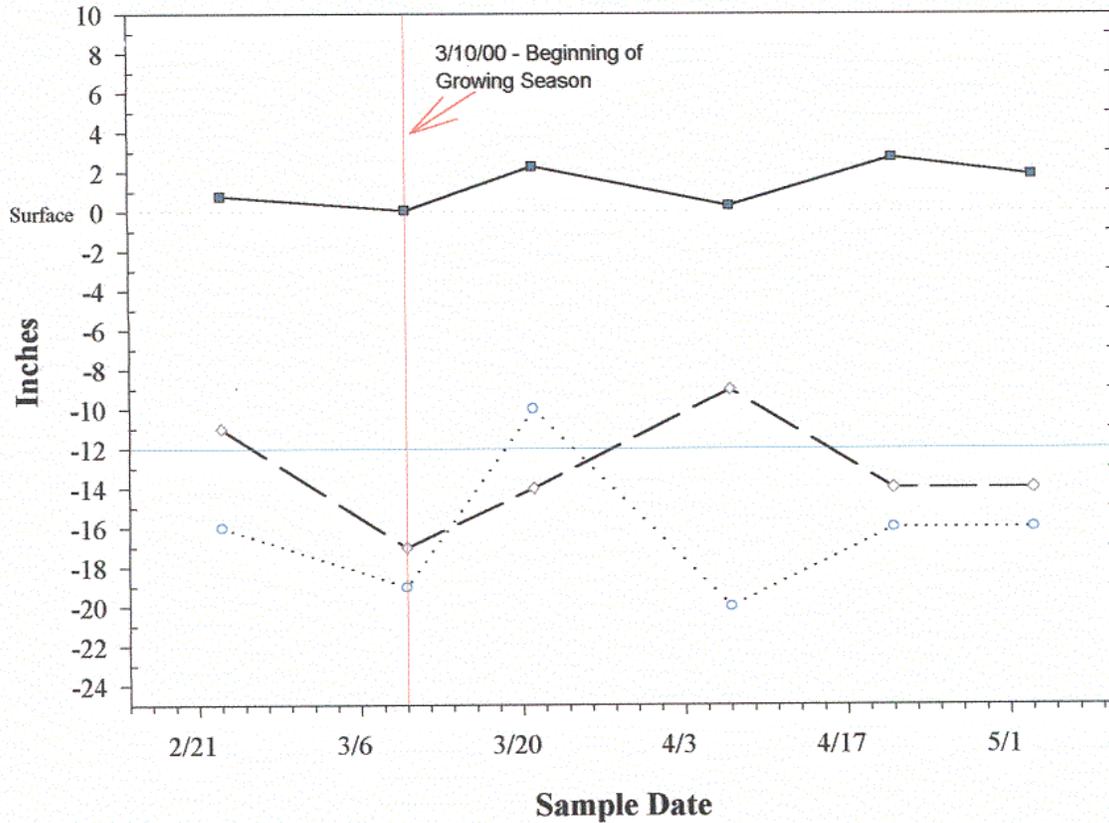
—■— Cumulative Precipitation (Between Sample Events)
 Gauge: Goldsboro 4SE, NC UCAN: 1418, COOP: 313510
*(Information was provided by the State Climate
 Office of North Carolina at NC State University).*
 ...○... Water Level
 —◇— Iron Rod Oxidation

2000 Hydrological Monitoring Seven Springs Wayne County, NC *Well F*



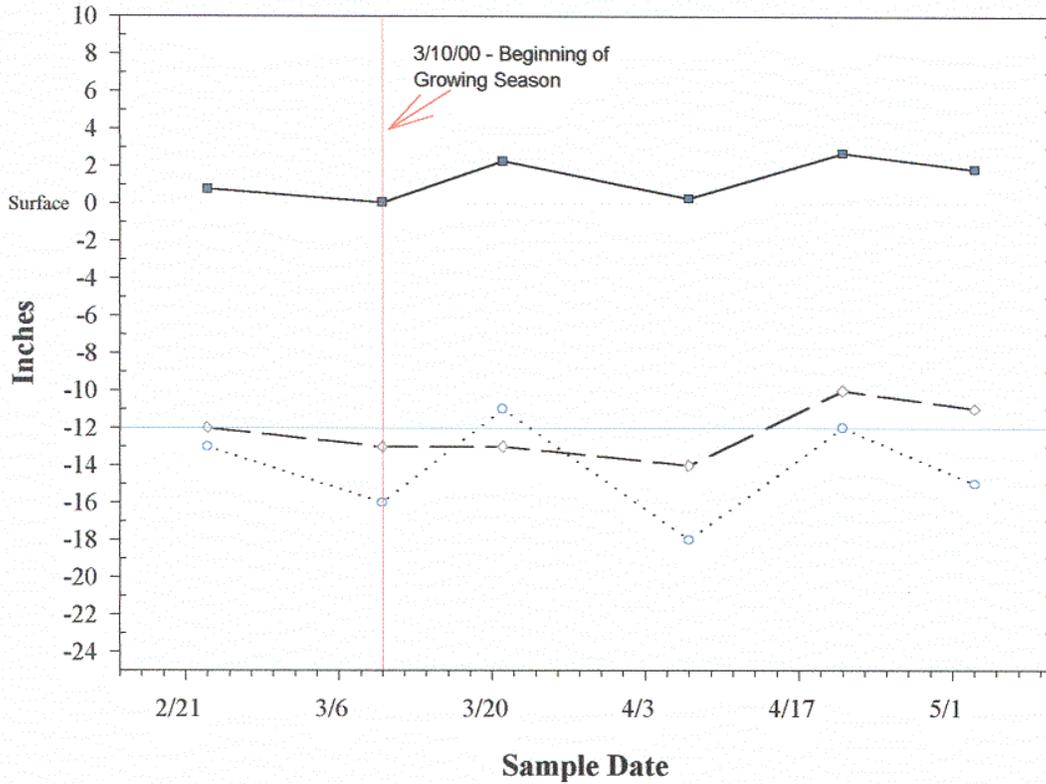
—■— Cumulative Precipitation (Between Sample Events)
 Gauge: Goldsboro 4SE, NC UCAN: 1418, COOP: 313510
(Information was provided by the State Climate Office of North Carolina at NC State University).
 ...○... Water Level
 —◇— Iron Rod Oxidation

2000 Hydrological Monitoring Seven Springs Wayne County, NC *Well G*



—■— Cumulative Precipitation (Between Sample Events)
 Gauge: Goldsboro 4SE, NC UCAN: 1418, COOP: 313510
(Information was provided by the State Climate Office of North Carolina at NC State University).
 ...○... Water Level
 —◇— Iron Rod Oxidation

**2000 Hydrological Monitoring
Seven Springs
Wayne County, NC
Reference Well**



—■— Cumulative Precipitation (Between Sample Events)
 Gauge: Goldsboro 4SE, NC UCAN: 1418, COOP: 313510
 (Information was provided by the State Climate
 Office of North Carolina at NC State University).
 ...○... Water Level
 —◇— Iron Rod Oxidation

APPENDIX B

SEEDLING INVENTORY

SEVEN SPRINGS MITIGATION PROJECT

Seedling Inventory – November 2000

Based on 1/10th acre (37 ft. radius) plots

PLOT A:

Planted Species:	Trees/plot	Trees/ac	Mean ht. (ft)	Max. ht. (ft)
River birch (<i>Betula nigra</i>)	1	10	21	21
Persimmon (<i>Diospyros virginiana</i>)	1	10	13	13
Sweetgum (<i>Liquidambar styraciflua</i>)	5	50	19.2	23
Sycamore (<i>Platanus occidentalis</i>)	38	380	17.2	23
Swamp chestnut oak (<i>Quercus michauxii</i>)	4	40	9.5	17
Water oak (<i>Quercus nigra</i>)	10	100	14.2	17
Cherrybark oak (<i>Quercus pagodafolia</i>)	2	20	13.5	14
Average:			14.4	17.8
Subtotal:	60	600		
Natural Regeneration:				
Red maple (<i>Acer rubrum</i>)	1	10	12	12
Groundsel tree (<i>Baccharis halimifolia</i>)	3	30	8.6	13
Loblolly pine (<i>Pinus taeda</i>)	2	20	20	21
Average:			14.3	17.0
Subtotal:	5	50		
TOTAL:	67	670		

PLOT B:

Planted Species:	Trees/plot	Trees/ac	Mean ht. (ft)	Max. ht. (ft)
Sweetgum (<i>Liquidambar styraciflua</i>)	8	80	11.3	22
Sycamore (<i>Platanus occidentalis</i>)	4	40	17	24
Water oak (<i>Quercus nigra</i>)	1	10	10	10
Bald cypress (<i>Taxodium distichum</i>)	55	550	10.5	19
Average:			12.2	18.8
Subtotal:	55	550		
Natural Regeneration:				
Loblolly pine (<i>Pinus taeda</i>)	1	10	19	19
Average:			19.0	19.0
Subtotal:	1	10		
TOTAL:	69	690		

PLOT C:

Planted Species:	Trees/plot	Trees/ac	Mean ht. (ft)	Max. ht. (ft)
River birch (<i>Betula nigra</i>)	2	20	15	17
Green ash (<i>Fraxinus pennsylvanica</i>)	1	10	15.3	17
Sweetgum (<i>Liquidambar styraciflua</i>)	4	40	13.2	19
Sycamore (<i>Platanus occidentalis</i>)	2	20	10.8	15
Water oak (<i>Quercus nigra</i>)	1	10	12.1	15
Bald cypress (<i>Taxodium distichum</i>)	18	180	10.8	16
Average:			12.4	16.4
Subtotal:	26	260		
Natural Regeneration:				
Red maple (<i>Acer rubrum</i>)	80	800	5.8	20
Groundsel tree (<i>Baccharis halimifolia</i>)	1	10	15	15
Average:			10.4	17.5
Subtotal:	81	810		
TOTAL:	107	1070		

PLOT D:

Planted Species:	Trees/plot	Trees/ac	Mean ht. (ft)	Max. ht. (ft)
Persimmon (<i>Diospyros virginiana</i>)	2	20	7.5	11
Sweetgum (<i>Liquidambar styraciflua</i>)	17	170	11.1	20
Sycamore (<i>Platanus occidentalis</i>)	19	190	10.1	20
Swamp chestnut oak (<i>Quercus michauxii</i>)	4	40	4	6
Water oak (<i>Quercus nigra</i>)	8	80	4.2	7
Willow oak (<i>Quercus phellos</i>)	11	110	4.6	6
Average:			6.9	11.7
Subtotal:	61	610		
Natural Regeneration:				
Red maple (<i>Acer rubrum</i>)	3	30	4.2	7
Average:			4.2	7.0
Subtotal:	3	30		
TOTAL:	64	640		

PLOT E:

Planted Species:	Trees/plot	Trees/ac	Mean ht. (ft)	Max. ht. (ft)
Persimmon (<i>Diospyros virginiana</i>)	1	10	6	6
Sweetgum (<i>Liquidambar styraciflua</i>)	4	40	4	11
Sycamore (<i>Platanus occidentalis</i>)	9	90	9.5	15
Water oak (<i>Quercus nigra</i>)	21	210	3.8	5
Cherrybark oak (<i>Quercus pagodifolia</i>)	3	30	3.4	5
Willow oak (<i>Quercus phellos</i>)	2	20	4.5	5
Average:			5.2	7.8
Subtotal:	40	400		
Natural Regeneration:				
Red maple (<i>Acer rubrum</i>)	35	350	1.5	4
Groundsel tree (<i>Baccharis halimifolia</i>)	5	50	2.1	5
Southern Waxmyrtle (<i>Myrica cerifera</i>)	16	160	4.1	5
Average:			2.6	4.7
Subtotal:	21	210		
TOTAL:	61	610		

PLOT F:

Planted Species:	Trees/plot	Trees/ac	Mean ht. (ft)	Max. ht. (ft)
Green ash (<i>Fraxinus pennsylvanica</i>)	2	20	6.1	8
Sweetgum (<i>Liquidambar styraciflua</i>)	13	130	6.3	12
Bald cypress (<i>Taxodium distichum</i>)	37	370	11.9	18
Average:			8.1	12.7
Subtotal:	52	520		
Natural Regeneration:				
Red maple (<i>Acer rubrum</i>)	5	50	4.8	9
Groundsel tree (<i>Baccharis halimifolia</i>)	24	240	3.8	5
Average:			4.3	7.0
Subtotal:	24	240		
TOTAL:	76	760		

PLOT G:

Planted Species:	Trees/plot	Trees/ac	Mean ht. (ft)	Max. ht. (ft)
Persimmon (<i>Diospyros virginiana</i>)	4	40	8.3	14
Sweetgum (<i>Liquidambar styraciflua</i>)	14	140	6.4	12
Sycamore (<i>Platanus occidentalis</i>)	1	10	10	10
Swamp chestnut oak (<i>Quercus michauxii</i>)	2	20	4.5	5
Water oak (<i>Quercus nigra</i>)	3	30	10.8	16
Cherrybark oak (<i>Quercus pagodifolia</i>)	1	10	4	4
Bald cypress (<i>Taxodium distichum</i>)	37	370	9.5	15
Average:			7.6	10.9
Subtotal:	62	620		
Natural Regeneration:				
Red maple (<i>Acer rubrum</i>)	9	90	2.1	3
Groundsel tree (<i>Baccharis halimifolia</i>)	4	40	4.2	5
Average:			3.2	4.0
Subtotal:	13	130		
TOTAL:	75	750		

APPENDIX C

PROJECT PHOTO POINTS

**Seven Springs Mitigation Project
Photo Point A – Northwest Corner
2000**



Photo 1 – East View



Photo 2 – Southeast View



Photo 3 – South View



Photo 4 – Southwest View

Seven Springs Mitigation Project
Photo Point B – Access Road, North Boundary
2000



Photo 1 – East View



Photo 2 – Southwest View



Photo 3 – Northwest View



Photo 4 – North View – Access Road



Photo 5 – Northeast View