# KEY BRANCH MITIGATION SITE
# ANSON COUNTY, NORTH CAROLINA

## STATE PROJECT NO. 8.T550803
## T.I.P. NO. R-~~2239~~ 2231 wm

# MITIGATION PLAN

## NORTH CAROLINA
## DEPARTMENT OF TRANSPORTATION

## AUGUST 24, 2001

## *KEY BRANCH MITIGATION PLAN*

### TABLE OF CONTENTS


Page

EXECUTIVE SUMMARY ..... *iii*

1.0 BACKGROUND
- 1.1 Site Description ..... 1
- 1.2 Watershed Characteristics ..... 1
- 1.3 Historical Site Conditions ..... 6

2.0 EXISTING CONDITIONS
- 2.1 Vegetative Communities ..... 7
- 2.2 Soils ..... 9
  - 2.2.1 Determination and Extent of Hydric Soils on Site ..... 12
- 2.3 Hydrology/Hydraulics ..... 12
  - 2.3.1 Surface Water ..... 14
  - 2.3.2 Groundwater ..... 14
  - 2.3.3 Water Budget ..... 17
- 2.4 Assessment of Site Conditions ..... 17

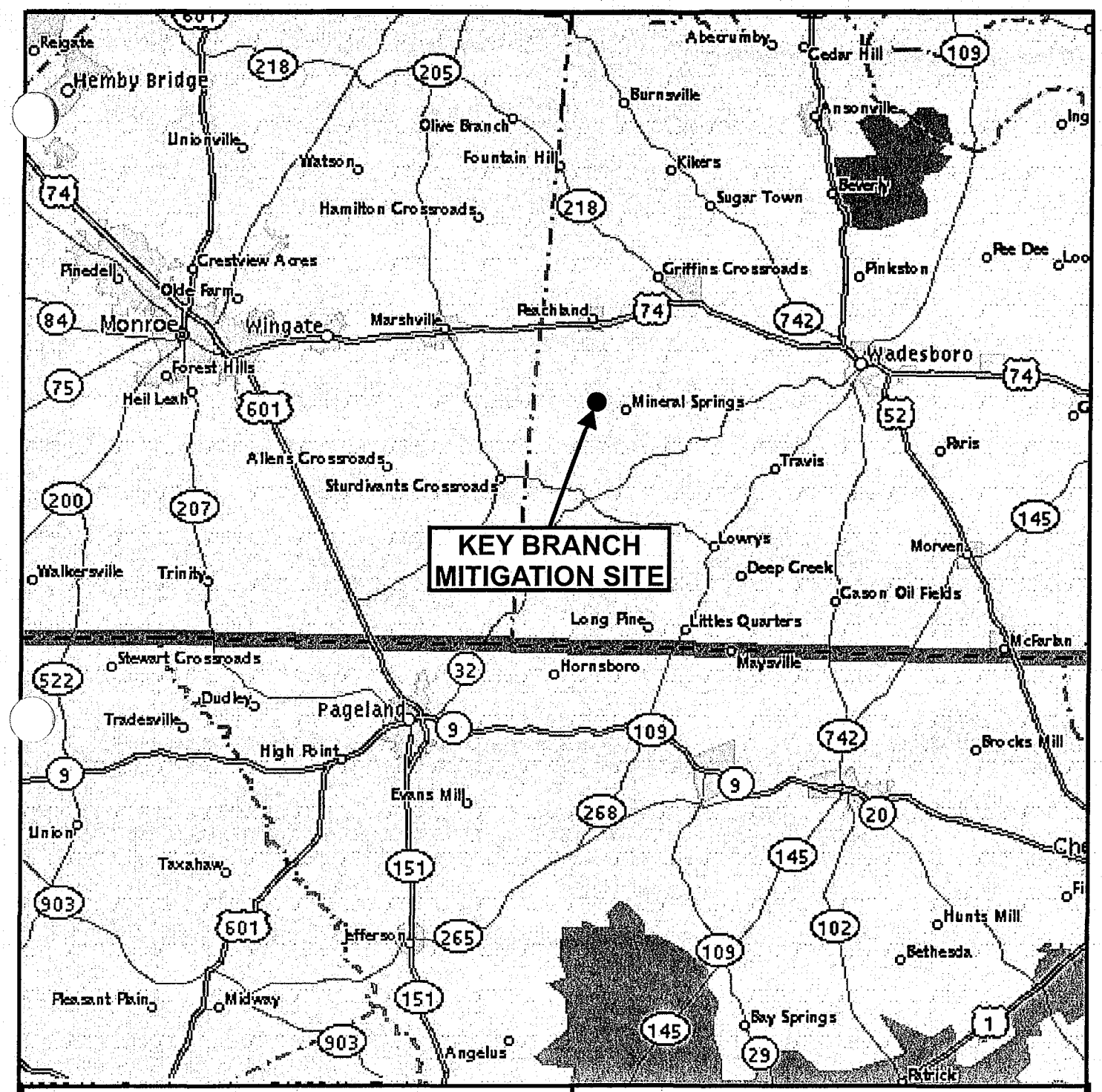
3.0 WETLAND AND STREAM RESTORATION ACTIVITIES
- 3.1 Goals and Objectives ..... 19
- 3.2 Wetland Restoration ..... 19
  - 3.2.1 Hydrologic/Hydraulic Alterations ..... 19
  - 3.2.2 Soil Modifications ..... 23
  - 3.2.3 Vegetative Communities ..... 23
- 3.3 Stream Restoration ..... 24
  - 3.3.1 Dimension, Pattern, and Profile ..... 24
  - 3.3.2 Bank Stabilization ..... 25
  - 3.3.3 Riparian Vegetation Establishment ..... 25

4.0 WETLAND AND STREAM MANAGEMENT ACTIVITIES
- 4.1 Post Implementation Documentation ..... 25
- 4.2 Monitoring and Success Criteria ..... 25
  - 4.2.1 Hydrology ..... 25
  - 4.2.2 Vegetation ..... 31
  - 4.2.3 Streams ..... 31
  - 4.2.4 Reporting ..... 31

5.0 OTHER ECOLOGICAL & NON-ECOLOGICAL SITE CONCERNS
- 5.1 Historical/Archaeological ..... 31
- 5.2 Rare, Threatened, and Endangered Species ..... 32
- 5.3 Utilities/Easements ..... 32
- 5.4 Preliminary Project Schedule ..... 32

6.0 DISPENSATION OF PROPERTY ..... 32

REFERENCES ..... 33




| Lower Yadkin River Basin<br>**Key Branch Site** | **Figure 1.**<br>**Vicinity Map** |
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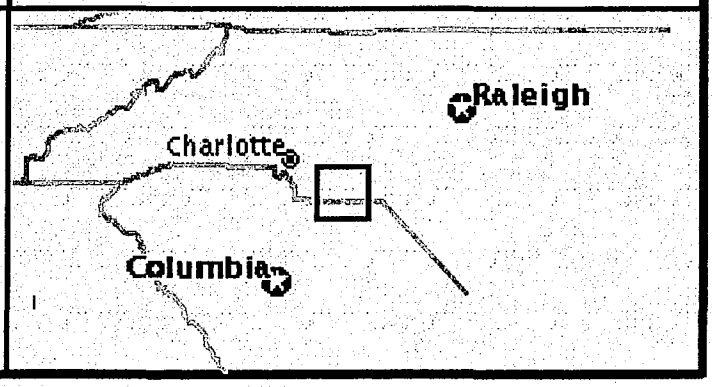

**Lower Yadkin River Basin**

# Key Branch Mitigation Site

**Figure 2**

# Mitigation Site Boundary

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Site Boundary

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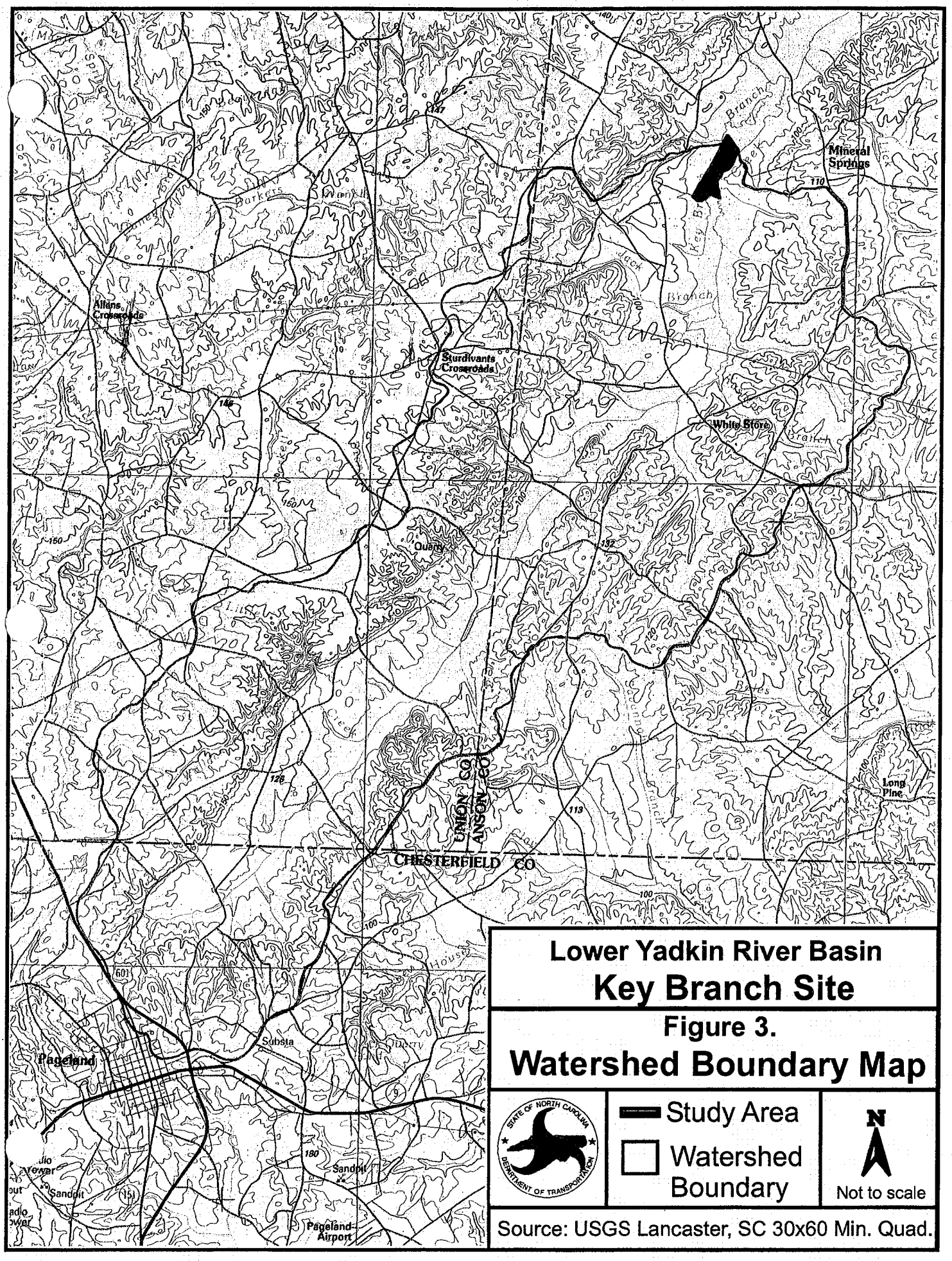
Mineral Springs
Allens Crossroads
Sturdivants Crossroads
White Store
Quarry
Long Pine
UNION CO
ANSON CO
CHESTERFIELD CO
Pageland
Substa
Sandpit
Pageland Airport
Key Branch
Jack Branch
Barkers
Lake
Bates
Branch
Lower Yadkin River Basin
Key Branch Site
Figure 3.
Watershed Boundary Map
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Study Area
Watershed Boundary
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Source: USGS Lancaster, SC 30x60 Min. Quad.

channels prior to transitioning into the DA complex that dominated the floodplain interior. The well-developed floodplains consist of wetland environments with stable channel conditions. The anastomosed channels are generally stable due to the presence of cohesive bank materials and dense root mass. Channel patterns typically display a range of low to high width/depth ratios and sinuosities, with high meander belt widths. Channel slopes are typically in the 0.05% to 0.1% range. Dominant channel bed material for these streams is silt-clay with sand inclusions associated with localized land disturbance.

According to the NCDWQ, the water quality rating for this section of the Brown Creek watershed is Class C. Class C waters are protected for secondary recreation, fishing, wildlife, fish and aquatic life propagation and survival, agriculture and other suitable uses. There are no restrictions on watershed development activities.[2] Additionally, NCDWQ has assigned all surface waters in this portion of the Brown Creek watershed a water quality use-support rating of "partially supporting." Sedimentation and non-point source pollution are identified as probable causes of impairment. Water quality sampling conducted as part of the field investigation also identified elevated fecal coliform levels in both Brown Creek and Key Branch.

### 1.3 Historical Site Conditions

Historical site conditions were evaluated to assist the assessment of the existing site conditions as a preface to the development of this mitigation plan. The intent of this review was to understand the chronology of disturbance to aid in the evaluation of the site and develop an appropriate restoration strategy. Aerial photographs of the site were obtained for 1938, 1950, 1956, 1968, 1977, 1984, and 1993 (Appendix B). In summary, these photos showed a gradual conversion of the floodplain/wetland complex to agriculture between 1938 and 1984. During this period, the site was denuded of native vegetation, Key Branch and Brown Creek were channelized and relocated, the site was ditched, and an impoundment was created.

The following chronology of events was established through historical research, interviews with local property owners, and aerial photo interpretation:

**1938** – The site is 85% forested with two agricultural fields along the eastern side of the site. Brown Creek, Key Branch and another unnamed tributary, meander across the site in a DA stream pattern. Based on texture and color, the community types found on site appear consistent with those immediately downstream of the sites, which are currently wetland and have not been disturbed since 1938 as evidenced by the aerial photographs.

**1950** - The northern 10% and southern 30% of the site have been logged. Key Branch has been ditched and relocated to its current position and several meanders have been removed from Brown Creek.

**1956** – Additional logging in the northern portion of the property increase the cleared area to approximately 45% of the site. The logged area is cleared and 5 lateral ditches are installed. Darkened patches in the cleared area indicate remaining surface debris, ponded water or possibly emergent vegetation. The northern area of the site previously logged has re-vegetated.

**1968** – Logging continues in the middle portion of the site as an additional 20% of the site is cleared, connecting the northern and southern agricultural fields. Adjacent land to the west is also logged and a ditch is extended into the relocated Key Branch that now forms the western site boundary. Darkened areas in the northern portions of the site persist and begin to connect, forming a dendritic pattern migrating south.

[2] Classification and Water Quality Standards Assigned to the Waters of the Yadkin River Basin, NCDENR Division of Water Quality, Raleigh, NC, 1998.

**PFO1A -**
Palustrine Forested
Broad-leaved Deciduous
Temporarily Flooded

**PFO1Ax -**
Palustrine Forested
Broad-leaved Deciduous
Temporarily Flooded
Excavated

**PFO1C -**
Palustrine Forested
Broad-leaved Deciduous
Seasonally Flooded

**PSS1C -**
Palustrine Scrub-shrub
Broad-leaved Deciduous
Seasonally Flooded

**U -**
Primarily represents upland areas, but may include unclassified wetlands such as man-modified areas, non-photo-identifiable areas, and/or unintentional omissions.

- Mitigation Site

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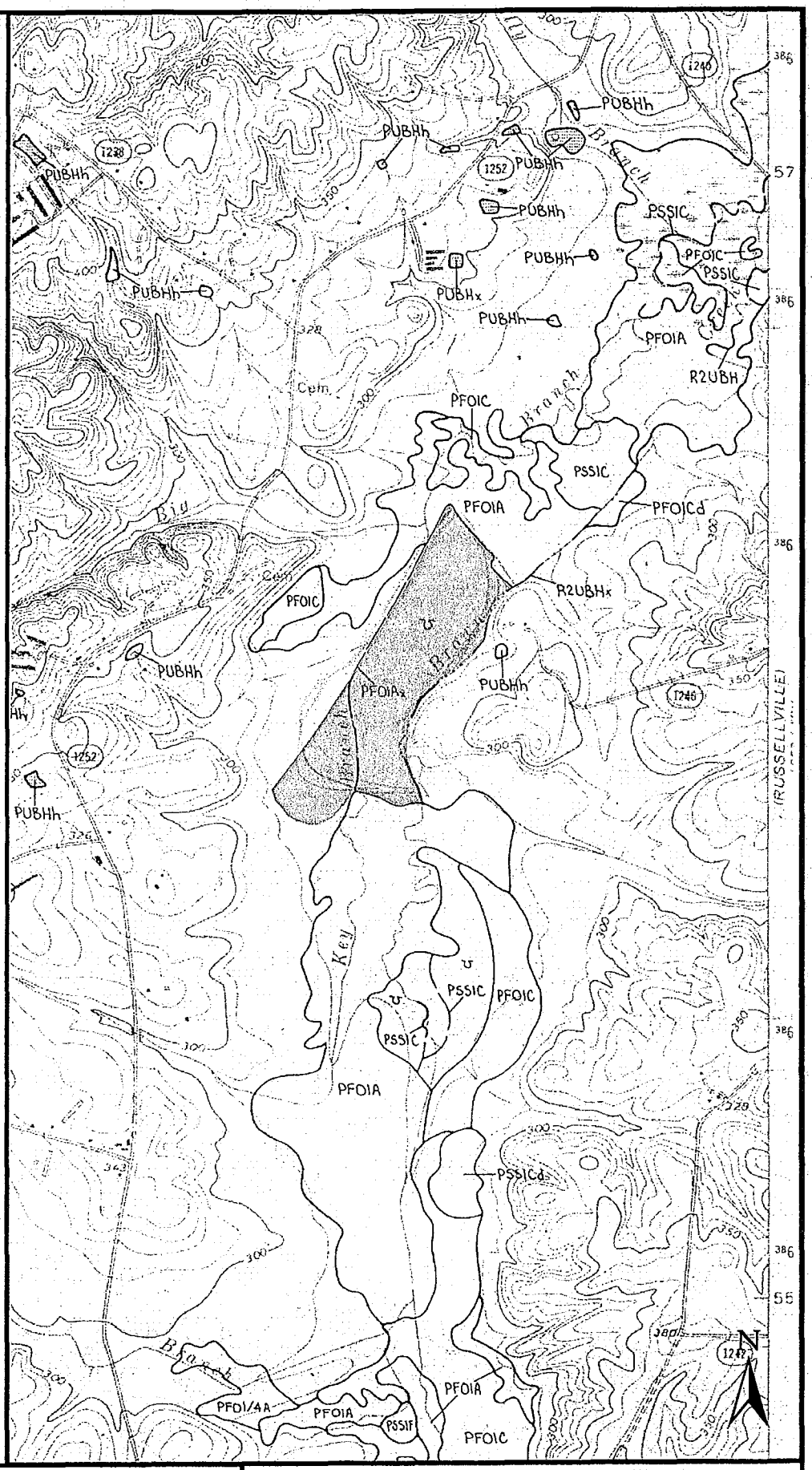


**Lower Yadkin River Basin**
**Key Branch Mitigation Site**

**Figure 4.**
**USFWS NWI Map**

(Source: USFWS Marshville, NC NWI based on 1984 aerial photogrammetry.)

**Lower Yadkin River Basin**
**Key Branch Mitigation Site**

**Figure 5.**
**Existing Communities**

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- Piedmont Semi-permanent Impoundment
- Piedmont Swamp Forest
- Piedmont Levee Forest
- Agricultural field
- Impoundment

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Not to scale

**Piedmont Levee Forest** - Remnants of Piedmont Levee Forest are found along the active levee positions of Brown Creek and Key Branch and occupy approximately 10% of the site. Woody species of the canopy include *Fraxinus pennsylvanica* (green ash), *Platanus occidentalis* (sycamore), *Betula nigra* (river birch), *Liquidambar styraciflua* (sweet gum), *Acer rubrum* (red maple), and *Quercus michauxii* (swamp chestnut oak). The midstory includes *Acer negundo* (boxelder) and *Acer rubrum* (red maple). The understory includes vines and herbs such as *Arundinaria gigantea* (giant cane) and *Toxicodendron radicans* (poison ivy). The age of the existing vegetation is less then 25 years as the location where it is found was cleared in 1977.

**Piedmont Swamp Forest** – A smaller area of early successional Piedmont Swamp Forest occupies approximately 5% of the site in the northeastern most corner. Species identified in this community consist mainly of *Fraxinus pennsylvanica* (green ash) along the periphery of the larger semi-permanent impoundment wetland area. The age of the existing vegetation is less then 17 years, as the location where it is found was barren in 1984. The hydroperiod in this area is being controlled by extensive beaver activity. The effectiveness of the constructed drainage ditch network has been eliminated and agricultural use of this portion of the site has been abandoned.

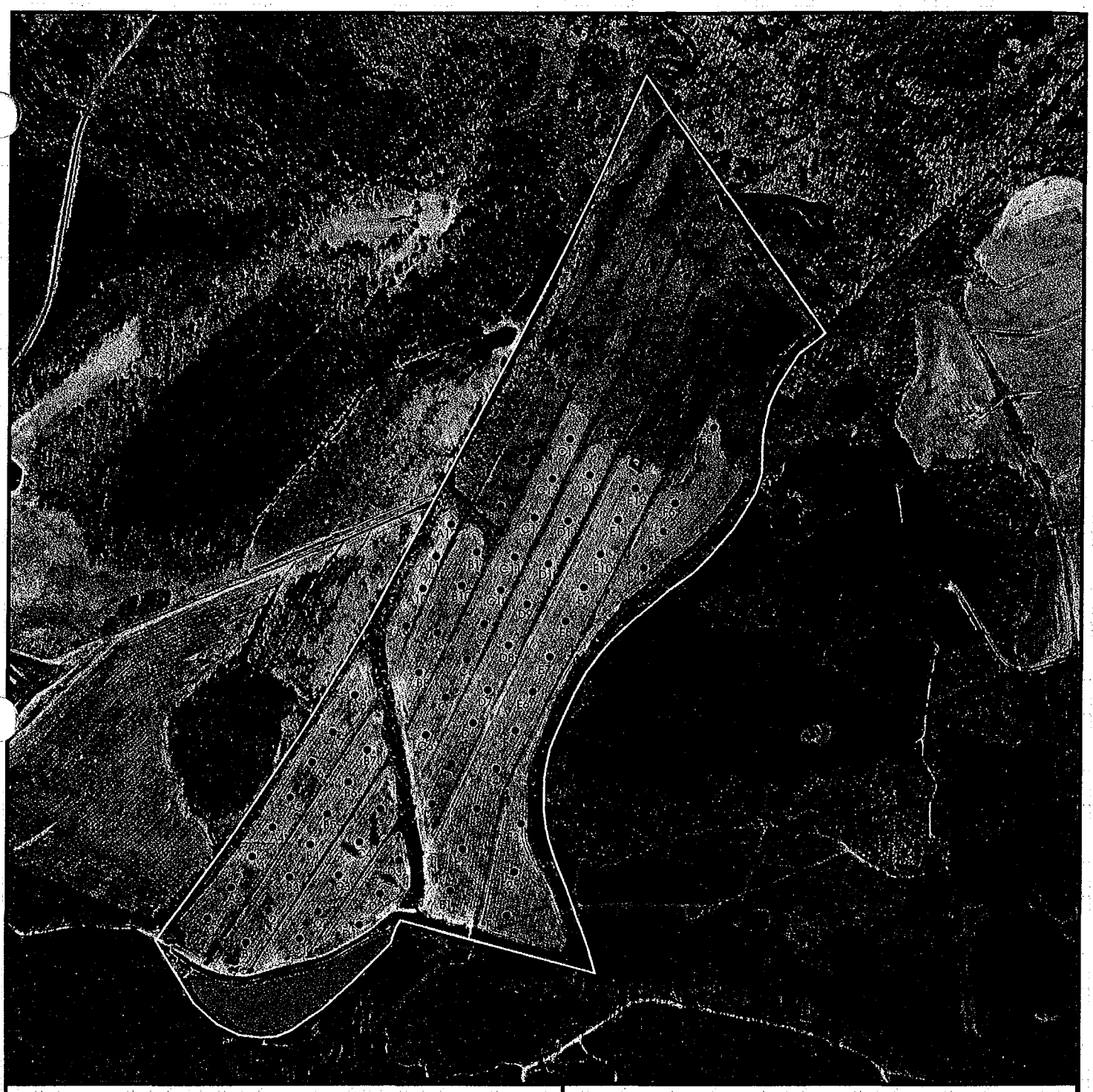
## 2.2 Soils

A detailed soils evaluation was conducted to determine the type, distribution and extent of soil types on site. This evaluation was conducted by establishing six transects on site running parallel to the existing ditch network. At 200 foot intervals (96 points) along the transects, borings were taken and the soils were classified (Figure 6) (Appendix C). Based on this analysis, the distribution of soil types on the site was found to be fairly consistent with the preliminary Anson County Soil Survey (1994). Soils in the study area include Chewacla, Tetotum, and Udorthents (Figure 7). The Chewacla soils are found on the floodplain and are formed by deposition of recent alluvium. Under natural conditions, flooding is frequent. The Tetotum soil is found in riparian corridors, where they typically occur as primary stream terraces. The Udorthents soil mainly consists of spoil, suspected as having been cut from the ditching and dredging on site (Table 1).

**Chewacla** soils occupy the relict floodplain of Brown Creek. This series is formed in materials weathered from sedimentary Triassic sandstone, mudstone and conglomerates that were subsequently deposited as recent alluvium. The texture of the Chewacla series tends to be finer as silt and clay particles settle out during overbank flooding events. The seasonal high water table tends to occur within 1.5 feet of the surface. This is considered a secondary hydric soil, *i.e.* hydric inclusions may be found within the map unit. The Chewacla ponded variant occupies approximately 1/3 of the Key Branch site.

**Tetotum** soils are found on the historic levee position of Brown Creek. This series are very deep and moderately well drained soils formed on nearly level to very steep stream terraces. They formed in moderately fine textured fluvial sediments derived from old alluvium underlain by stratified coarse to medium textured sediments. Runoff is slow on nearly level areas and medium to rapid on steeper areas. The seasonal high water table is from 1.5 to 2.5 ft. below the surface from December through April during most years on nearly level and gently sloping areas. On steeper areas most wetness is due to lateral seepage. The Tetotum series is not listed as a hydric soil.

**Udorthents** are found throughout the site where ditches have been created, streams relocated, and or significant land clearing activities took place to create the existing agricultural fields.



**Lower Yadkin River Basin**

# Key Branch Mitigation Site

**Figure 6.**

# Soil Boring Locations

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A2 **Soil Boring Location and Designation**

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**Lower Yadkin River Basin**

# Key Branch Mitigation Site

**Figure 7.**

# Soils

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**Soil Series:**

- **ChA - Chewacla**
- **ChA var. - Chewacla ponded**
- **Te - Tetotum**
- **Udorthents** (Spoil along creeks and ditches)

N

Not to scale

| Table 1. Soil Characteristics | | | | | | |
|---|---|---|---|---|---|---|
| **Soil Series** | **Taxonomic classification** | **Landscape position** | **Seasonal high water table** | **Drainage class** | **Hydric** | **Approx. acreage** |
| Chewacla | Fluvaquentic Dystrudepts | Floodplain | Within 1.5 ft. | Somewhat poorly drained | Secondary | 74.0 |
| Chewacla var. Ponded | Fluvaquentic Dystrudepts | Floodplain | Ponded | Somewhat poorly drained | Secondary | 30.0 |
| Tetotum | Aquic Hapludults | Low stream terrace | 1.5 ft. to 2.5 ft. | Moderately well drained | No | 4.0 |
| | Udorthent | Levee (spoil) | | | No | Insitu |

### 2.2.1 Determination and Extent of Hydric Soils on Site

This site is located in the Triassic Basin; thus, the soils in this geologic feature are often formed from red parent material, as is the case with the Brown Creek watershed. As a result, the determination of the soils' current/historic status as hydric must be ascertained as a precursor to determining the extent of wetland restoration that can be achieved on site. In support of this effort, numerous sources (NRCS, ACOE etc.) were consulted to determine the appropriate procedure to delineate the hydric soils on site, given the parent material from which they formed and disturbances to the site; including:

- NRCS guidance for identifying hydric soils formed from red parent material with a hue of 7.5 YR or redder, a layer at least 4" thick, with a matrix value of 4 or less and a chroma of 4 or less and 2% or more with redox depletions and/or concentrations as soft masses and/or pore linings and the layer is entirely within 12 in. of the soil surface. The minimum thickness requirement is 2 inches if the layer is the mineral surface layer.[3]

- ACOE guidance (David Franklin letter of 12/12/2000 to NCDOT regarding restoration of Chewacla soils on the Shepherds Tree Mitigation Site) on Chewacla soils required that "depleted (reduced) soils must occur in the upper 12 inches" of the soil profile to be considered hydric for the purposes of determining wetland restoration areas.

As none of the soils on site are considered wholly hydric by inclusion in the state or county hydric soils lists, an in-depth review of the soil properties was conducted in accordance with both the NRCS and the ACOE guidance. The depth of acceptance was extended below 12" if evidence suggested the historic surface was buried at the location of the boring due to the crowning between the ditches created from the side cast material. This evaluation identified that 72.5 acres of the site meet the hydric soils criteria for the purposes of restoration (Figure 8). None of the agricultural areas hold Prior Converted wetland status, according to the NRCS office in Anson County.

## 2.3 Hydrology/Hydraulics

The hydrology of the study site was evaluated during the field review. According to the data collected and analyzed, the site's hydrology and hydraulics appear to mimic those characteristically found in Piedmont riparian zones within the Triassic Basin. The low topographic expressions of the floodplains within the Triassic Basin allow for longer, more frequent flooding than what is thought to be typical of other Piedmont geologic terrains. The low expressions of the floodplains and seasonal high water tables generally yield more wetlands meeting the requirements for jurisdictional hydrology in early spring. The

[3] Field Indicators of Hydric Soils – A Guide for Identifying and Delineating Hydric Soils, Version 4.0. USDA, NRCS.

**Lower Yadkin River Basin**
# Key Branch Mitigation Site

**Figure 8.**
# Depleted Soils

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**Depleted soils within 12" of the surface**

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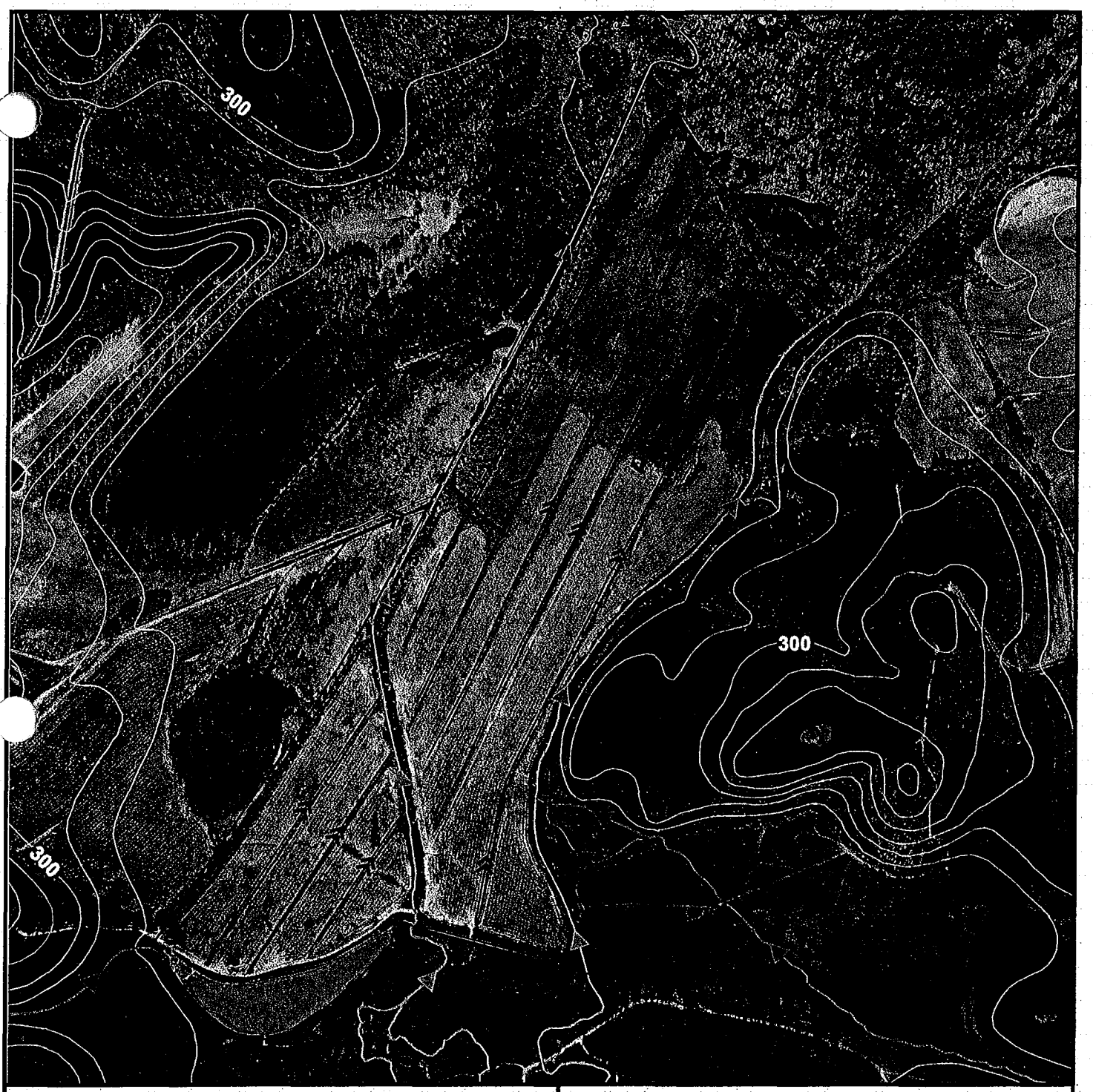


**Lower Yadkin River Basin**
# Key Branch Mitigation Site

**Figure 9.**
# Surface Hydrology

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- Drainage ditch
- Key Branch
- Brown Creek
- Tributaries
- Ephemeral Tributary
- Site Boundary
- Impoundment

N

Not to scale

(Contour Lines, 10' Interval, Referenced from the USGS Marshville, NC 7.5 Min. Quad.)

| Lower Yadkin River Basin<br>**Key Branch Mitigation Site** | Figure 10.<br>**GW Monitoring Gauges** |
|---|---|

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6 **Groundwater Monitoring Gauge I.D. Number**

1. S317578 (+0.35')
2. S31F943
3. S342CD9
4. S3169B3
5. Removed
6. S31F89B
7. S31FA5C
8. S31FA95
9. S31733F
10. S31F88F
11. S31F8F3
12. S31F8B7
13. S2EAD00
14. S31F8DA

### 2.3.3 Water Budget

Existing site hydrology was modeled by developing an annual water budget that calculates water inputs and outputs, and the change in storage on a monthly time step (Appendix E). Under existing conditions, the only water input to the site on a regular basis is precipitation (P). Historical precipitation data was obtained from the USDA National Water and Climate Center for WETS Station #8964 in Wadesboro, Anson County, NC, located approximately 11.3 miles from the Key Branch site. Total annual precipitation for the years of the period of record were reviewed, and three years were selected that represented average (1970), dry (1988) and wet (1989) precipitation conditions.

Any potential for direct surface runoff to the site has been removed by the presence of various ditches and channelized streams around the perimeter of the site. Although groundwater input to the site is likely due to the landscape position of the site on the valley floor, groundwater inputs were not included since they are difficult to quantify and their exclusion from the water budget provides for a conservative estimate of water availability. Overbank flooding by either Brown Creek or Key Branch occurs on site, however these floodwater inputs do not occur at a frequency to be considered in an annual water budget.

Water outputs from the site include potential evapotranspiration (PET) and a groundwater loss to the network of drainage ditches (Go). PET was calculated by the Thornthwaite method using the average monthly temperatures and daytime hours for Wadesboro. Groundwater losses to the ditch network were estimated using average ditch dimensions, and approximate hydraulic gradients between a water table level adjacent to the ditch and a water surface within the ditch. Groundwater loss to the ditches was estimated for hydrologic conditions expected for January and June, and then losses for intervening months were interpolated. Since there is no specific stream channel or outfall from the site, no surface water output is calculated; however, during months of excess water balance, overland runoff to the ditches is calculated as Excess Water in the water budget table.

Net water input or output was calculated in inches normalized across the site on a monthly time step and added or subtracted from a running wetland water volume expressed as a depth in inches as normalized across the total area of the site. A maximum wetland water volume of 7.2 inches was used in the model based on 48 inches of soil with a specific yield of 0.15. Negligible surface water storage is present on site.

The intent of developing an existing conditions water budget was to provide a working model to calibrate and modify for the purpose of modeling the water budget of the proposed site design. The Existing Conditions Water Budget (Appendix E) shows that the annual hydrograph for the Average Year (1970) approximates the typical hydroperiod of the gauges on site. The absence of surface water inputs or groundwater discharge to the site causes the site to dry out rapidly as PET rates increase in the spring. Groundwater monitoring data shows a majority of the site meets minimum wetland hydrology criteria, and the existing conditions water budget supports this conclusion.

## 2.4 Assessment of Site Conditions

The Key Branch mitigation site has an extensive history of disturbance, which has led to its current condition. Historically, the site was part of an extensive bottomland hardwood wetland/floodplain complex that extended from the South Carolina state line to the Yadkin River. The site was systematically altered beginning prior to 1938 for the purposes of agricultural production. As a result, the site has undergone a transition from functioning bottomland hardwood ecosystem to agricultural fields. In the process, the site has lost all of its former functions and values.

## 3.1 Goals and Objectives

The goal of the Key Branch mitigation project is to re-establish an integrated wetland-stream complex that will restore the ecosystem processes, structure, and composition that were historically present on the site.

Restored functions of the system will include:

- Nutrient removal/transformation
- Flood flow alteration
- Aquatic species diversity/abundance
- Wildlife species diversity/abundance

These functions will be restored through:

- Restoration/preservation of bottomland hardwood/swamp hardwood communities
- Restoration of floodplain/wetland interfaces
- Restoration of natural stream channels and drainage patterns
- Re-establishment of wildlife habitat

Table 2 and Figure 11 summarize the mitigation types and extent for the proposed communities that will fulfill the restoration goals and objectives.

**Table 2. Mitigation Type and Extent**

| Community Type | Restoration | Preservation |
|---|---|---|
| Piedmont Bottomland Hardwood Forest | 108.9 ac. | |
| Piedmont Swamp Hardwood Forest | | 3.6 ac. |
| Riparian Buffer/Piedmont Levee Forest | | 6.1 ac. |
| Perennial Stream | 6577 lf | |

## 3.2 Wetland Restoration

This site historically contained Piedmont bottomland hardwood, Piedmont swamp hardwood, and Piedmont levee alluvial forest community types. Given the historic impacts to the site and the proposed restoration activities, only Piedmont bottomland hardwood is proposed for restoration (Figure 12).

Specific actions proposed to achieve the wetland restoration goals and objectives include:

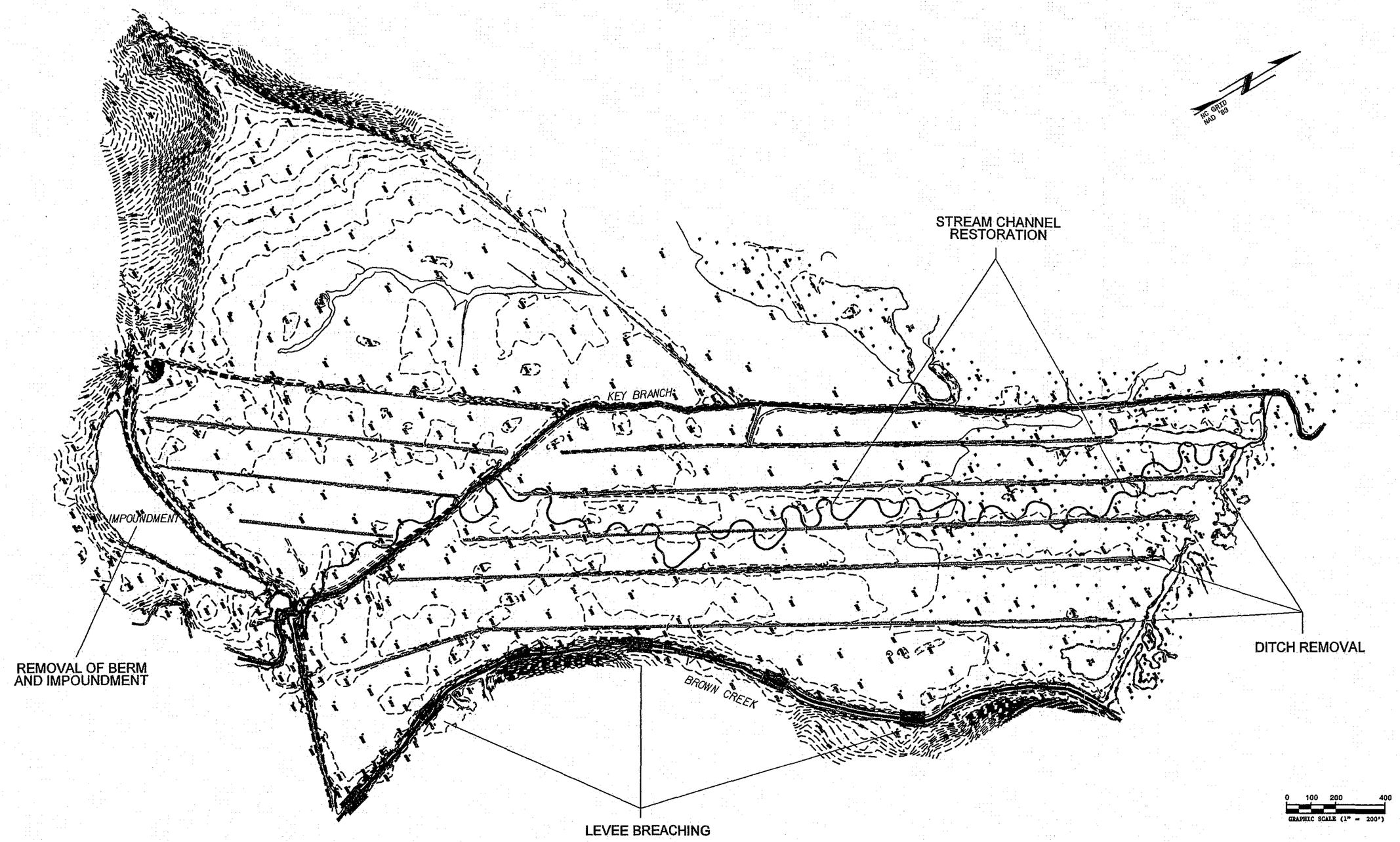
- Filling of lateral ditches to limit offsite drainage
- Removal of impoundment berm to site elevation to increase discharge onto the site
- Breaching of the levee along Brown Creek to restore connectivity of the stream and floodplain
- Restoration of Key Branch through the site to re-establish stream/wetland interface
- Re-vegetation of the site with bottomland hardwood species

### 3.2.1 Hydrologic Alterations

Currently the site possesses hydrologic features sufficient to meet the minimum jurisdictional criteria set forth by the ACOE. However, in order to further improve the site's functionality and increase habitat diversity, modifications that will affect the site's hydroperiod are being proposed (Figure 13). These actions are described in more detail below:

**Ditch Removal:** Ten lateral ditches found on site enhance removal of precipitation and flood flows. When constructed, the excavated material was placed between the rows and crowned, directing runoff into the ditches. Eight of the ten ditches will be filled by returning sidecast material. The two ditches along the western site boundary will remain open to prevent hydraulic trespass onto the adjacent property. Channel blocks will be placed strategically in the ditches prior to filling to prevent lateral seepage.

| PROJECT REFERENCE NO. |
|---|
| 1298031G8 |
| KEYBRANCH MITIGATION SITE |

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PROJECT NAME:

KEY BRANCH
MITIGATION
PLAN

SHEET TITLE:

FIGURE 13
HYDROLOGY / HYRAULIC
ALTERATIONS

SHEET NO.:

1

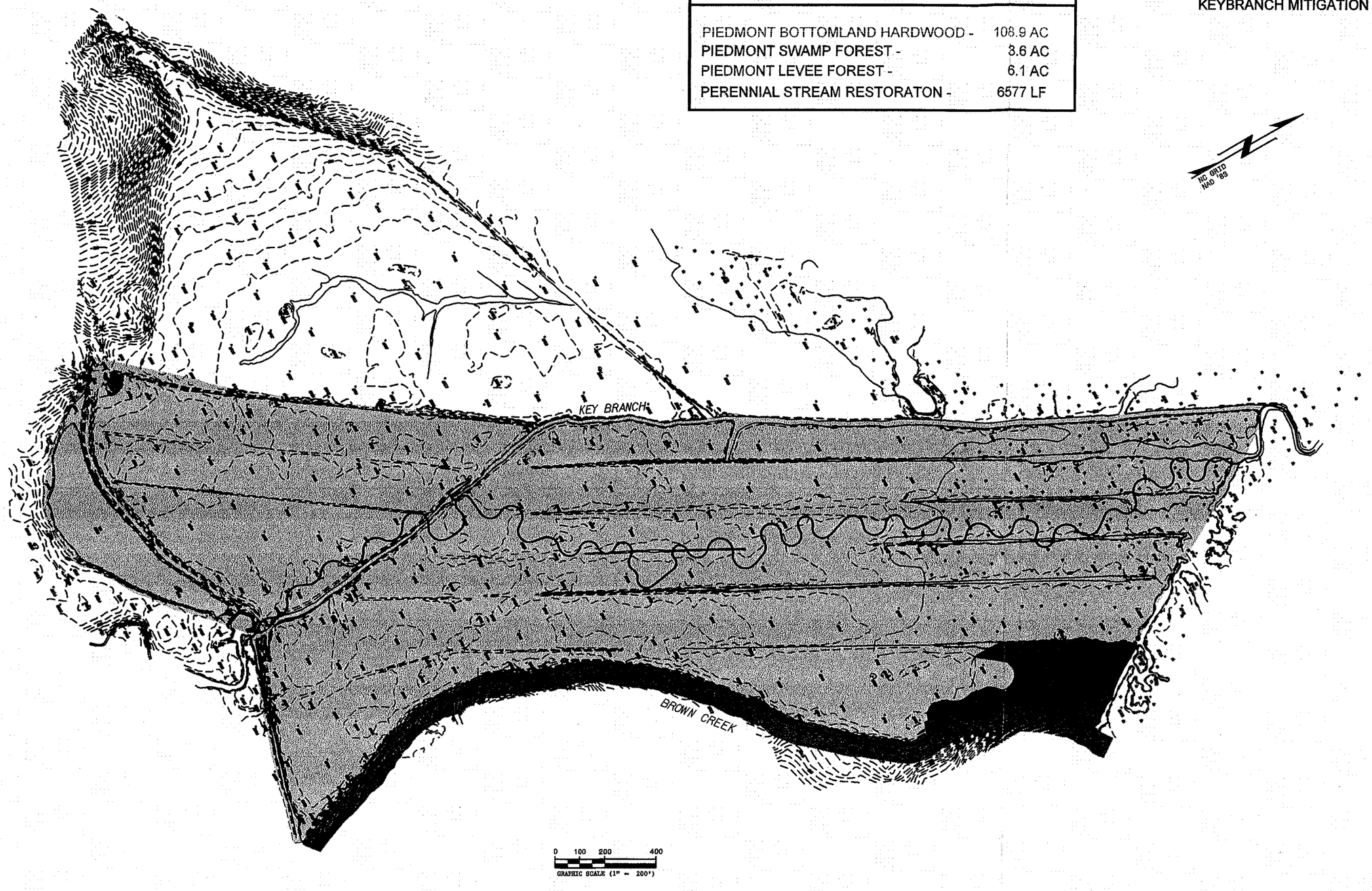
KCI JOB NO.: 1298031 G

PROJECT REFERENCE NO.

1298031G8

KEYBRANCH MITIGATION SITE

| MITIGATION POTENTIAL | |
|---|---|
| PIEDMONT BOTTOMLAND HARDWOOD - | 108.9 AC |
| PIEDMONT SWAMP FOREST - | 3.6 AC |
| PIEDMONT LEVEE FOREST - | 6.1 AC |
| PERENNIAL STREAM RESTORATON - | 6577 LF |

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KEY BRANCH MITIGATION PLAN

SHEET TITLE:

FIGURE 11
MITIGATION TYPE
EXTENT

SHEET NO.:

1

KCI JOB NO.: 1298031 G

| Target Association | Piedmont Bottomland Forest | Piedmont Levee Forest |
|---|---|---|
| **Site Specific Species** | Cherrybark Oak — *Quercus pagoda*<br>Willow Oak — *Quercus phellos*<br>Swamp Chestnut Oak — *Quercus michauxii*<br>Overcup Oak — *Quercus lyrata*<br>Water Oak — *Quercus nigra*<br>American Elm — *Ulmus americana*<br>Green Ash — *Fraxinus pennsylvanica*<br>River Birch — *Betula nigra* | Existing |

| | | |
|---|---|---|
| **Soils** | Chewacla (Fluvaquentic Dystrudepts) | Tetotum (Aquic Hapludults) |

**State of North Carolina**
**Dept. Of Transportation**

**Lower Yadkin River Basin**
**Key Branch Mitigation Site**

**Figure 12.**
**Planned Natural Community Distribution**

**Impoundment Removal:** The impoundment at the southern end of the site drains water from off of the site and re-directs it into the ditch that contains Key Branch. This restricts a hydrologic source to the site. The pond is one to two feet deep and the berm is approximately five feet high. The water surface in the pond is approximately the same as the site elevation. The pond will be drained and the berm material will be used to level the area. This operation will increase drainage onto the site.

**Levee Breaching**: The levee adjacent to Brown Creek extends approximately four feet above the bankfull elevation. In order to allow greater than bankfull discharges to flood the site, removal of portions of the levee sufficient to allow floodplain access will be necessary. A minimum of six (6) twenty-foot (20 ft.) wide breaches will be established and stabilized.

**Stream Channel Restoration**: All natural stream channels have been significantly altered from their original form. Stream restoration will include the re-establishment of a stable pattern, profile, and cross-section for the portion of Key Branch on the mitigation site. This will restore stream/floodplain connectivity and provide increased water quality and wildlife habitat diversity functions. This is described in greater detail in Section 3.3.

**Post-Restoration Water Budget**: A post-restoration water budget was developed by modifying the existing conditions water budget to reflect the proposed modifications (Appendix E). The principal change in the water budget is to remove the monthly groundwater loss to the ditch network. Other contributions to site hydrology are an increased frequency of flooding from Brown Creek and the restored stream and redirecting surface runoff from a relatively small watershed above the impoundment. Although these inputs will help maintain wetland hydrology onsite, they have not been incorporated into the proposed conditions water budget. First, overbank flooding from the adjacent streams will be difficult to predict on an annual basis. Second, the quantity of surface runoff from the small watershed is expected to be negligible relative to the total acreage of the site.

The proposed conditions water budget shows the annual hydrographs for the same three climatic years. The critical difference between the existing and proposed conditions is that an additional 2-3 weeks of wetland hydrology is created during early summer, and the fall months show a more rapid water table recharge. Therefore, the proposed conditions water budget predicts wetter conditions than existing.

### 3.2.2 Soil Modifications

The soils on site have undergone significant disturbance over the past 70 years. Farming operations have compacted the soil, thus decreasing infiltration. In order to restore a condition that is conducive to the re-establishment of Piedmont Bottomland Hardwood systems on site, all portions of the agricultural field areas, with the exception of a twenty-foot buffer on either side of the restored Key Branch and at the location of any ditch plugs, will be ripped to a depth of 18-20 inches.

### 3.2.3 Vegetative Communities

The site will be restored to a Piedmont Bottomland Hardwood Community. Re-establishment of vegetative communities on the existing agricultural fields will be accomplished through planting. In accordance with previous agency comments regarding the site, targeted community re-establishment in the inundated portion of the site will be accomplished through natural succession.

Due to the absence of records specifying community composition on the site prior to disturbance and the lack of undisturbed vegetative communities on the site suitable for reference use, a reference wetland complex was identified to aid in the selection of species for the restoration. The reference wetland is located approximately 700 feet south (upstream) of the mitigation site within the same wetland/floodplain complex. Species lists compiled for the site are found in Appendix F.

Based on the information from the reference wetland, the following community-planting plan was developed as a guide for the vegetative re-establishment of the targeted community. The following species will be planted at a density of 680 stems/acre (bare root seedlings), based upon availability at the time of planting:

**Piedmont Bottomland Forest Community**

| Scientific Name | Common Name | Indicator |
|---|---|---|
| *Quercus pagoda* | Cherrybark Oak | FAC+ |
| *Quercus phellos* | Willow Oak | FACW- |
| *Quercus michauxii* | Swamp Chestnut Oak | FACW- |
| *Quercus lyrata* | Overcup Oak | OBL |
| *Quercus nigra* | Water Oak | FAC |
| *Ulmus americana* | American Elm | FACW |
| *Fraxinus pennsylvanica* | Green Ash | FACW |
| *Betula nigra* | River Birch | FACW |

## 3.3 Stream Restoration

As evidenced by the historical aerial photographs, this portion of the Brown Creek watershed was dominated by a complex wetland/stream system that included stable DA, C and E stream types. Field investigation and aerial photograph examination of current conditions in undisturbed portions of the watershed supports this conclusion. However, as documented, historic impacts have replaced all natural fluvial features on the site with channelized, excavated and bermed drainage ditches. The disturbed features provide reduced ecological value and have resulted in water quality degradation, loss of aquatic and riparian habitat, and lowering of the groundwater table.

The stream restoration component of this mitigation plan is intended to restore natural stream channels similar to those that existed prior to disturbance. Stream restoration objectives include restoring the sediment transport, water quality, and habitat functions of the system while complimenting the restored wetland community types. To this end, a conceptual stream design based on hydraulic geometry data from a selected reference reach has been developed.

### 3.3.1 Dimension, Pattern and Profile

A Rosgen Level II stream assessment was performed on a selected reference reach. For this project, the selected reference site is a stable C6 stream reach located approximately 4500 feet downstream of the project site within the same wetland/stream complex (Appendix F). Selection of this site is appropriate due to its geomorphic similarity (i.e. geology, floodplain/landscape position, topographic relief, watershed land use and land cover) with the project site.

The conceptual stream design proposes the restoration of appropriate geomorphologic dimension, pattern and profile for approximately 6500 feet of C6 stream channel with corresponding cross-sectional modifications, instream habitat development, bank stabilization, and riparian corridor establishment (Figures 14, 15, and 16). Design criteria (dimensionless ratios) developed from the reference site which form the basis for the restoration design are provided in Table 3.

### 3.3.2 Bank Stabilization

Bank stabilization of the restored streams will rely exclusively on appropriate geomorphic design incorporating natural stabilization/habitat structures and bioengineering techniques. Examples of some types that may be most appropriate for application to this site are provided (Figure 17).

### 3.3.3 Riparian Vegetation Establishment

Reestablishment of riparian vegetation will consist of planting and seeding a twenty (20) foot wide riparian buffer adjacent to each side of the restored channel. The plantings will include both bare root and live stake materials. The riparian zones of the restored streams will be a sub-component of the overall bottomland hardwood community type being restored. Within the buffer zone, the following species, if available, will be planted at a density of 680 stems/acre (bare root seedlings or live stakes).

| Scientific Name | Common Name | Indicator |
|---|---|---|
| *Betula nigra* | River birch | FACW |
| *Salix nigra* | Black willow | OBL |
| *Cephalanthus occidentalis* | Buttonbush | OBL |
| *Cornus amomum* | Silky dogwood | FACW+ |

## 4.0 WETLAND AND STREAM MANAGEMENT ACTIVITIES

### 4.1 Post Implementation Documentation

An "as built" report will be submitted to the COE within 90 days of the completion of planting and gauge installation and will include: elevations, photographs, gauge locations, and a description of initial species composition by community and sampling plot locations. Included within the report will be a list of species planted, planting densities and a total number of stems in the mitigation area. This information will form the base for further monitoring and evaluation.

### 4.2 Monitoring and Success Criteria

The monitoring program will be implemented to document system development and progress towards achieving mitigation goals and objectives. Vegetative data will be correlated with the appropriate hydrologic data from the groundwater monitoring gauges to determine if these objectives are being met. If, after the completion of five growing seasons, jurisdictional status has not been achieved where desired, or the desired vegetation has not been established, NCDOT will implement appropriate corrective measures. The restored stream will also be monitored to determine if the criteria for success have been achieved. Photographs will be taken once a year at the permanent photograph stations.

### 4.2.1 Hydrology

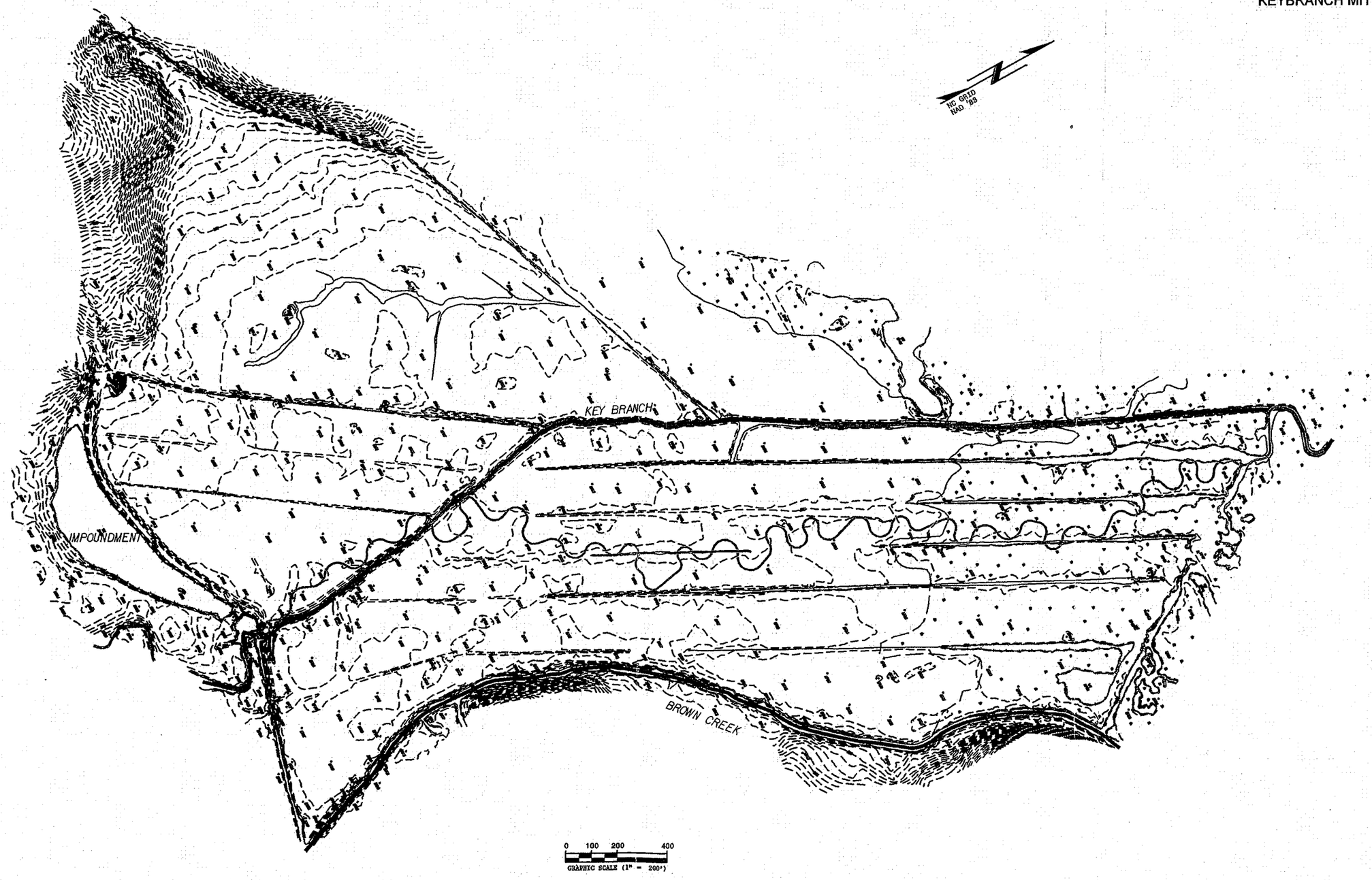
The success of a wetland mitigation project is largely driven by the hydrology of the site, which incorporates groundwater elevation with surface water flows to maintain soil saturation for a defined period of time. The Army Corps of Engineers 1987 Wetland Delineation Manual defines an area as a wetland if the soil is ponded, flooded, or saturated within 12 inches of the surface for 5% to 12.5% of the growing season (12.4 – 31 days) in a normal year. A "normal" year, based on NRCS climatological data for Anson County, must receive an annual rainfall of between 42 and 49 inches. Hydrologic success will be considered if the COE criteria are met.

In order to determine if the COE criteria are achieved, automated groundwater monitoring gauges will be installed in the post-mitigation community. These gauges will be provided and maintained by the NCDOT to monitor hydrologic fluctuations in the water table. Gauge installation will follow the COE standard methods (WRP Technical Note HY-IA3.1, August 1993).

PROJECT REFERENCE NO.

1298031G8

KEYBRANCH MITIGATION SITE

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DRAWN BY :

CHECKED BY :

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PROJECT NAME:

KEY BRANCH MITIGATION PLAN

SHEET TITLE:

FIGURE 14
CONCEPTUAL STREAM PLANFORM

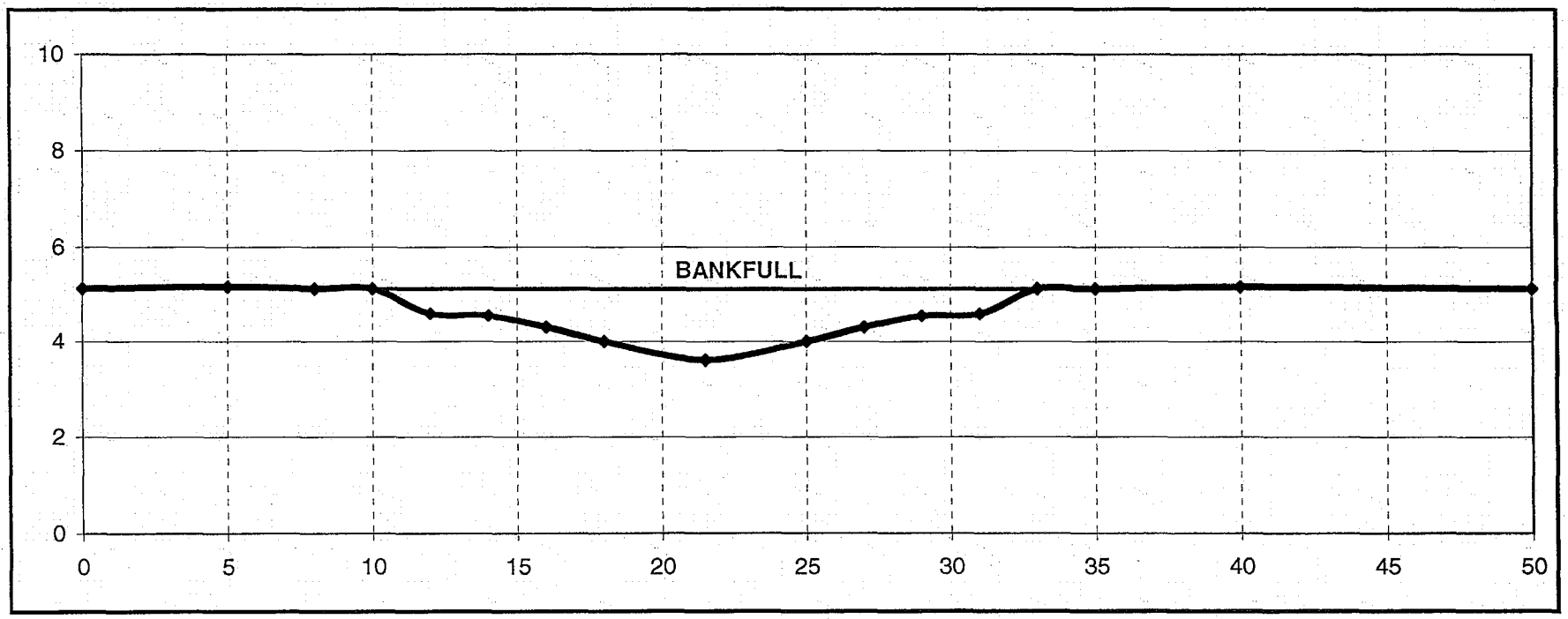
SHEET NO.:

1

KCI JOB NO.: 1298031 G

## FIGURE 15. TYPICAL RIFFLE CROSS-SECTION
## KEY BRANCH STREAM RESTORATION

| Parameter | Acceptable Range | Typical Section |
|---|---|---|
| Bankfull Width (ft) | 22-25 | **23** |
| Cross-Sectional Area ($ft^2$) | 17-21 | **19.3** |
| Mean Depth (ft) | 0.65-0.93 | **0.84** |
| Maximum Depth (ft) | 1.2-1.7 | **1.53** |
| W/D Ratio | 27-34 | **27** |
| Entrenchment Ratio | > 7.0 | **> 7.0** |
| Channel Type | C6 | **C6** |



## FIGURE 16. TYPICAL POOL CROSS-SECTION
## KEY BRANCH STREAM RESTORATION

| Parameter | Acceptable Range | Typical Section |
|---|---|---|
| Bankfull Width (ft) | 22-25 | **22** |
| Cross-Sectional Area ($ft^2$) | 17-21 | **18.1** |
| Mean Depth (ft) | 0.65-0.93 | **0.82** |
| Maximum Depth (ft) | 1.7-2.1 | **2.0** |
| W/D Ratio | 27-34 | **27** |
| Entrenchment Ratio | > 7.0 | **> 7.0** |
| Channel Type | C6 | **C6** |

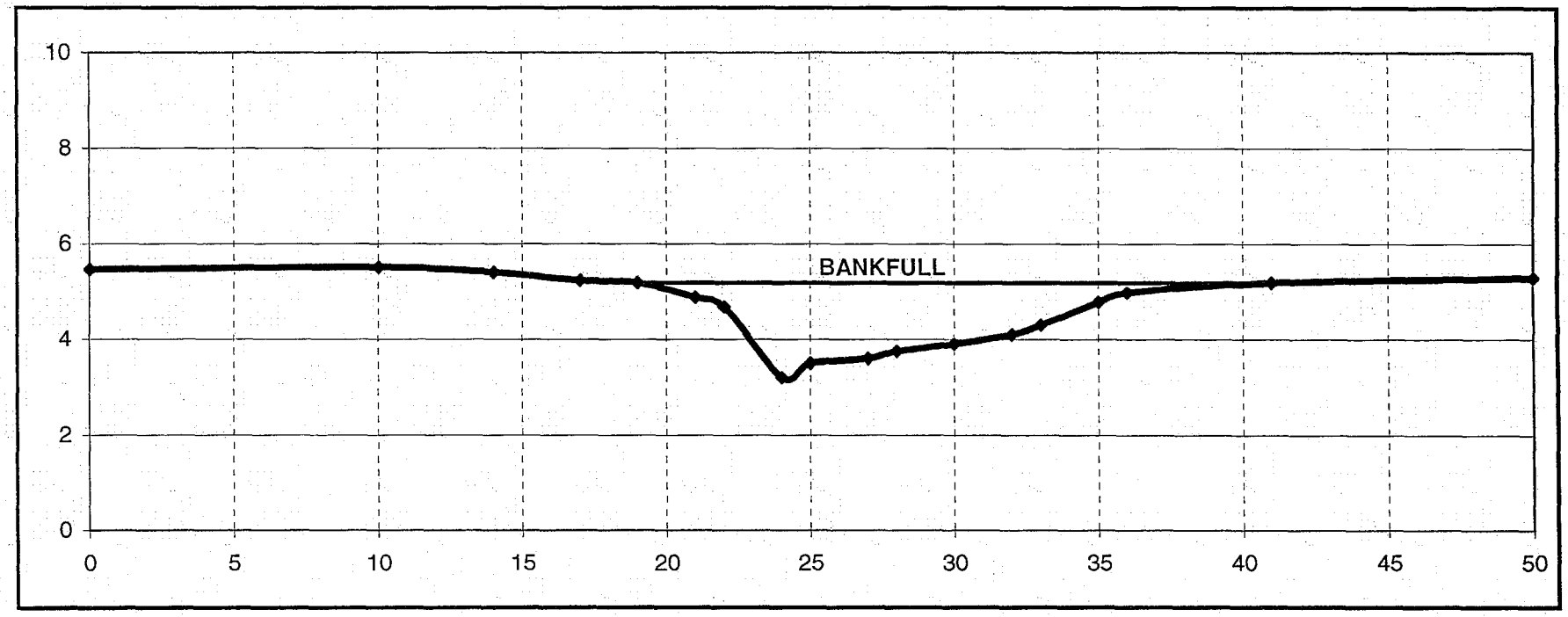


*TABLE 3 - MORPHOLOGICAL DESIGN CRITERIA*

| | Variables | Project Site Existing Channel* | Reference Reach | Project Site Restored Reach |
|---|---|---|---|---|
| | Stream Type | Modified | C6 | C6 |
| | Drainage Area ($mi^2$) | - | 1.6-2.0** | 0.97 |
| | Bankfull Width ($W_{bkf}$) | - | 27-35' | 22-25'*** |
| | Bankfull Mean Depth ($d_{bkf}$) | - | 1.01-1.16' | 0.65-0.93' |
| | Bankfull Cross-Sectional Area ($A_{bkf}$) ($ft^2$) | - | 35-37 | 17-21 |
| | Width/Depth Ratio ($W_{bkf}/d_{bkf}$) | - | 27-34 | 27-34 |
| | Bankfull Max Depth ($d_{mbkf}$) | - | 1.75-2.17' | 1.15-1.74' |
| | Width of Floodprone Area ($W_{fpa}$) | - | > 200' | >150' |
| | Entrenchment Ratio (ER) | - | > 7.0 | > 7.0 |
| | Channel Materials (D50) (mm) | Silt/Clay | Silt/Clay | Silt/Clay |
| | Water Surface Slope (S) | - | 0.19% | .05% |
| | Sinuosity (K) | - | 1.49 (=1590/1065) | 1.49 |
| *Dimension* | Pool Depth (dp) | - | 2.26-2.79' | 2.04 |
| | Riffle Depth (dr) | - | 1.01-1.16' | 0.65-0.93' |
| | Ratio - Max. Pool Depth: Mean Bkf. Depth | - | 2.58 (=2.79/1.08) | 2.58 (=2.04/0.79) |
| | Bankfull mean velocity (u) (ft./sec.) | - | 3.0-3.4 | **** |
| | Bankfull discharge (Q) (CFS) | - | 108-120 | **** |
| *Pattern* | Meander Length ($L_m$) | - | 370-465' | 265-378' |
| | Radius of Curvature ($R_c$) | - | 50.0-72.8' | 35-60' |
| | Belt Width ($W_{blt}$) | - | 220' | 160-180' |
| | Meander Width Ratio (MWR) | - | 6.3-8.1 | 6.3-8.1 |
| | Ratio- Rad. of Curv.: Bkf Width ($R_c/W_{bkf}$) | - | 1.4-2.7 | 1.4-2.7 |
| | Ratio- Meander Length:Bkf Width ($L_m/W_{bkf}$) | - | 10.6-17.2 | 10.6-17.2 |
| *Profile* | Valley Slope (ft./ft.) | - | 0.28% | .07% |
| | Water Surface Slope (ft./ft.) | - | 0.19% | .05% |
| | Riffle Slope (ft./ft.) | - | 0.25-0.46% | .07-.12% |
| | Pool Slope (ft./ft.) | - | 0.04-0.15% | .01-.04% |
| | Pool to Pool Spacing (ft.) | - | 115-245' | 73-228' |
| | Pool Length (ft.) | - | 40-65' | 29-53' |
| | Ratio - Pool Slope:Water Surface Slope | - | 0.2-0.8 | 0.2-0.8 |
| | Ratio - Pool to Pool Spacing:Bkf width | - | 3.3-9.1 | 3.3-9.1 |

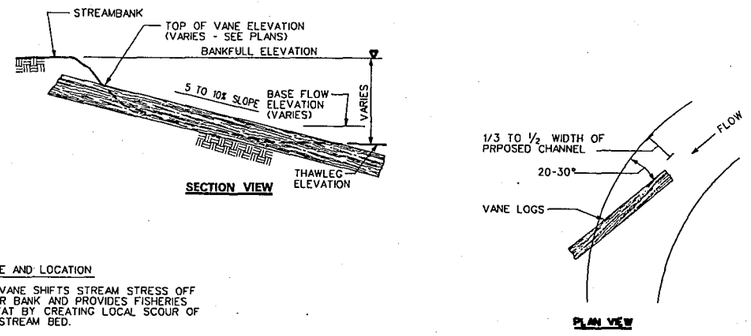
* Existing channel on site is devoid of natural features due to extensive human disturbance.

** Due to the interconnected nature of this system, it was determined that this range reflected conditions at this location.

*** Cross-sectional area used for this calculation was extracted from the NC Rural Piedmont Regional Curve Wbkf = $\sqrt{(17.9)(27)}$= 22 and $\sqrt{(17.9)(34)}$ = 25; thus 22-25' constitutes the range.

**** Bankfull mean velocity and discharge on the restoration site will be controlled by down-valley inundation.

PROJECT REFERENCE NO.
1298031G8
KEYBRANCH MITIGATION SITE

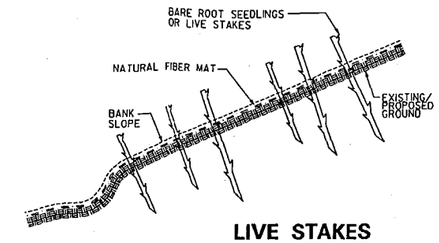



USAGE AND LOCATION

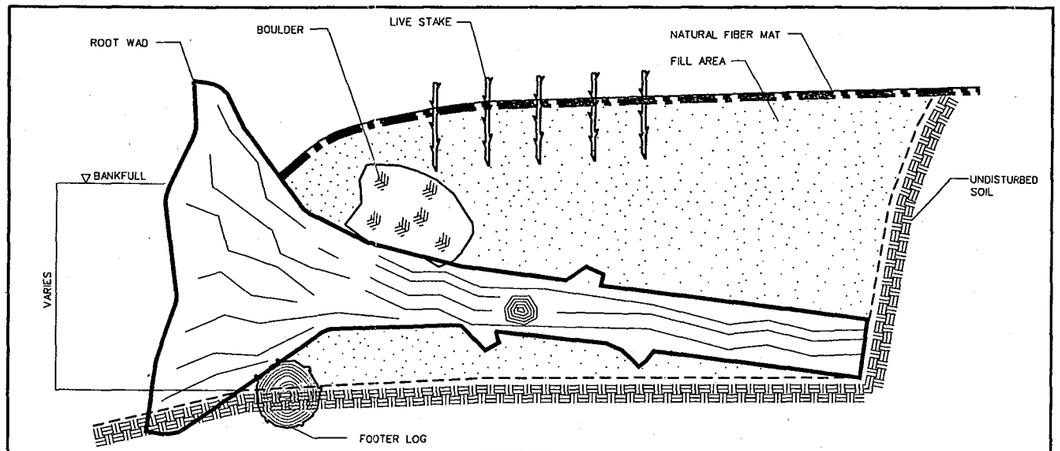
THE VANE SHIFTS STREAM STRESS OFF OUTER BANK AND PROVIDES FISHERIES HABITAT BY CREATING LOCAL SCOUR OF THE STREAM BED.

VANES SHOULD BE LOCATED IN AREAS OF HIGH SHEAR STRESS ALONG THE OUTER BANK REGION.

**LOG VANE**
SCALE: NTS




**LIVE STAKES**
SCALE: N.T.S.




**ROOT WAD STABILIZATION DETAIL**
SCALE: N.T.S.

NOTE:
1. ALL WOOD MATERIAL (STUMP, LOGS, ETC) SHALL BE HARDWOOD.
2. FOOTER LOG AND BOULDER NOT REQUIRED IF POINT- DRIVE INSTALLATION METHOD IS USED.

DATE OF ORIGINATION : 01-11-99
DRAWN BY :
CHECKED BY :

REVISIONS

| NO. | DESCRIPTION | DATE |
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PROJECT NAME:
KEY BRANCH MITIGATION PLAN

SHEET TITLE :
FIGURE 17
TYPICAL INSTREAM HABITAT / BANK STABILIZATION TECHNIQUES

SHEET NO. :
1

KCI JOB NO. : 1298031 G

In order to determine if the annual rainfall is "normal" for the given year, rainfall amounts will be tallied using data obtained from the closest NOAA gauge station, or a rain gauge will be installed onsite. Hydrologic monitoring will continue for 5 years following implementation.

### 4.2.2 Vegetation

Recovery and restoration of the vegetation on a wetland mitigation site is dependent upon hydrology and soil saturation. Vegetative succession is influenced by active planting of vegetation as well as volunteer encroachment. The success criteria will incorporate the assumption that exact species composition and other successional changes cannot be strictly controlled under natural conditions.

Prior to planting, the mitigation area will be inspected for proper elevation and soil suitability. Following planting, permanent vegetation sampling plots and photograph stations will be established within each community type.

NCDOT will monitor site vegetation for five years following planting. A survivability of 320 stems per acre for all planted seedlings will be used to determine success for the first three years. The required survival criterion will decrease by 10% per year after the third year of vegetation monitoring (i.e., for an expected 290 stems per acre for year 4, and 260 stems per acre for year 5). Remedial action will be taken as needed to rectify problems throughout the monitoring period.

### 4.2.3 Streams

NCDOT will develop a monitoring plan establishing the methodologies and criteria for assessing geomorphological and biological parameters of the restored stream and for evaluating the success of the restoration. In general, NCDOT will monitor the streams in accordance with USACOE and NCDENR protocols: i.e., monitoring will follow the most recent NCDENR guidance: *Internal Technical Guide for Streamwork in North Carolina* (Version 3.0, April 2001) and the *Interim, Internal Technical Guide: Benthic Macroinvertebrate Monitoring Protocols for Compensatory Stream Restoration Projects* (NC Division of Water Quality, 401/Wetlands Unit, May 2001).

### 4.2.4 Reporting

Monitoring reports will be prepared and submitted for each year monitoring occurs and after all monitoring tasks for each year are completed. Each report will summarize the new monitoring data and compare the new data against previous findings. Data tables, cross sections, profiles, photographs and other graphics will be included in the report as necessary. Each report will address, in detail, any significant changes in monitored parameters that are identified.

## 5.0 OTHER ECOLOGICAL AND NON-ECOLOGICAL CONCERNS

### 5.1 Historical/Archaeological

The North Carolina Department of Cultural Resources, State Historic Preservation Office (SHPO) conducted a review of the proposed mitigation project to determine the presence of historic preservation sites or sites of archeological importance on or near the study site. No sites of historical importance listed on the National Register of Historic Places (NRHP) were noted on the subject property. However, the abutting property north of the project site was identified as a historic site listed on the National Register of Historic Places: the Billy Horne Farm (I.D. # AN359). The SHPO determined that the proposed mitigation project would have no impact on this historic site.

Additionally, no sites of archaeological significance were identified on either the subject site or adjacent areas. However, SHPO determined that an archaeological survey of the site should be required prior to proceeding with the mitigation activities.

NCDOT will conduct a survey to assess the presence of archaeological sites within the boundaries of the site prior to implementing the mitigation project. If archaeological sites meeting eligibility requirements for protection are identified, NCDOT will modify planned mitigation activities accordingly to avoid/minimize potential impacts.

### 5.2 Rare, Threatened, and Endangered Species (RTE)

Available records were reviewed at the North Carolina Department of Parks and Recreation, Natural Heritage Program (NC NHP) on December 8, 1998 to determine the presence of any rare, threatened, or endangered (RTE) species or critical habitats on or near the study site. Additionally, during the field investigation, the existing site conditions were evaluated in order to determine if habitat suitable for supporting Anson County RTE species exists on the site. No occurrences of RTE species or critical habitats were identified on or near the mitigation site.

### 5.3 Utilities/Easements

Deed records, aerial photographs, USGS and NWI maps, and county planning maps were reviewed to assess the presence and potential impact of any utilities and easements on wetland and stream restoration. The review of these documents did not identify any utilities or easements associated with the project site.

### 5.4 Preliminary Project Schedule

| Activity | Status/Anticipated Completion date |
|---|---|
| Site Acquisition | Completed |
| Mitigation Planning | On-going |
| Site Design | Winter 2001-2002 |
| Site Construction | Summer 2002 |
| Site Planting | Winter 2002-2003 |

## 6.0 DISPENSATION OF PROPERTY

NCDOT has already acquired a conservation easement ensuring that the subject site will be protected as conservation land in perpetuity. NCDOT maintains responsibility at the present time for implementation of the mitigation activities and post-restoration monitoring andmanagement. NCDOT is in the process of identifying conservation groups and natural resource agencies (public or private) as potential recipients of the conservation easement for final dispensation of the property. However, until an appropriate organization and an acceptable agreement can be reached, control of the mitigation site will remain with NCDOT.

## REFERENCES


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# Appendix A

# Site Photographs

**Satellite Photograph:** False-color, infra-red photograph of the study site area. Notice that the study site is a major break in the Brown Creek habitat corridor (the distinct green area in the photo).

(Source: NAPP, 3/11/98)

**Photo 1. Aerial photograph of the project site looking to the south.**

**Photo 2. Additional aerial photograph showing the southern portion of the study site. The tree line crossing from left to right through the agricultural field is Key Branch.**

**Photo 3. Typical view of the drainage ditches present on the site, taken in the middle of the large agricultural field looking south.**

**Photo 4. View of the large agricultural field, taken approximately midway up the eastern site boundary looking to the west.**

**Photo 5. View of the smaller agricultural field located in the southwest corner of the site. Taken looking northwest. Treeline visible in the upper right of photo is Key Branch.**

**Photo 6. Typical view of the section of Brown Creek that passes between the large agricultural field (to the left of the photo) and the abandoned field (to the right of the photo).**

**Photo 7. Typical view of Key Branch looking downstream (northwest), taken from near the point where the stream enters the study site.**

**Photo 8. Typical view of impoundment located in the southwest corner of the study site. Photo taken looking west/southwest.**

# Appendix B

# Historical Aerial Photographs

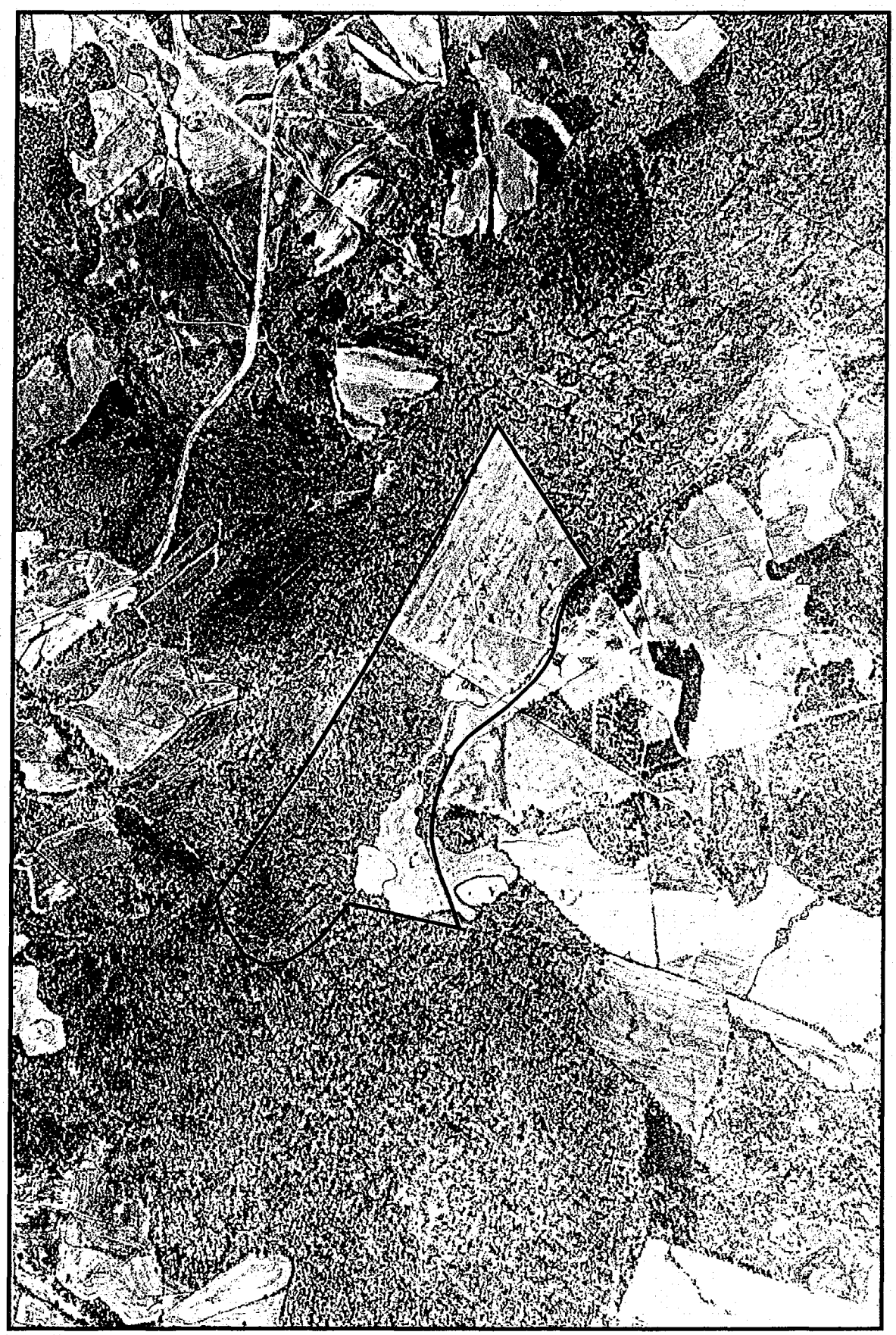
**Key Branch Mitigation Site**

**1938 Historic Aerial Photograph**

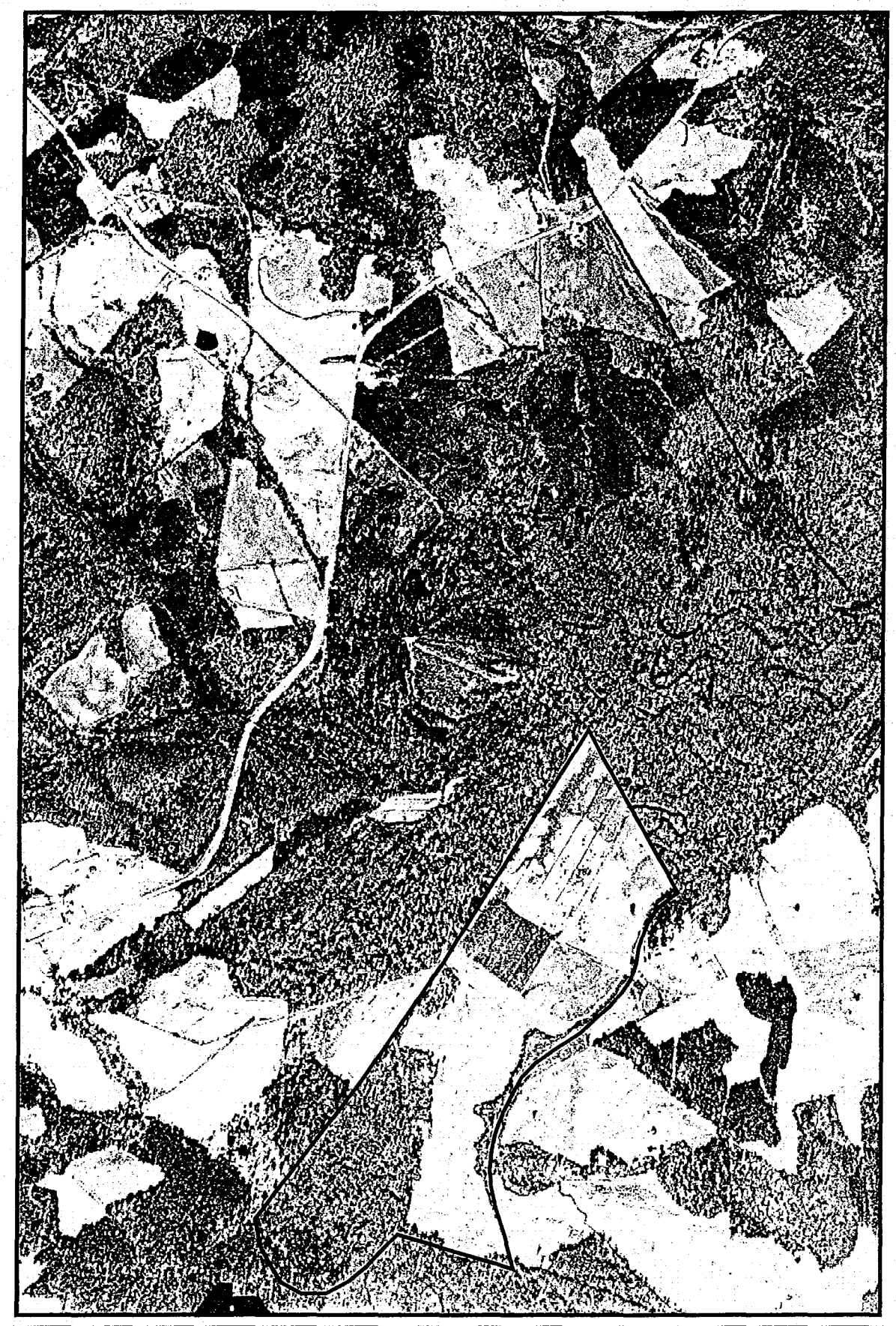
N

Not to scale

| | | |
|---|---|---|
| | **Key Branch Mitigation Site** | N |
| | **1950 Historic Aerial Photograph** | Not to scale |



| | | |
|---|---|---|
| | **Key Branch Mitigation Site** | N |
| | **1956 Historic Aerial Photograph** | Not to scale |



| | | |
|---|---|---|
| | **Key Branch Mitigation Site** | N |
| | **1968 Historic Aerial Photograph** | Not to scale |

**Key Branch Mitigation Site**

**1977 Historic Aerial Photograph**

N

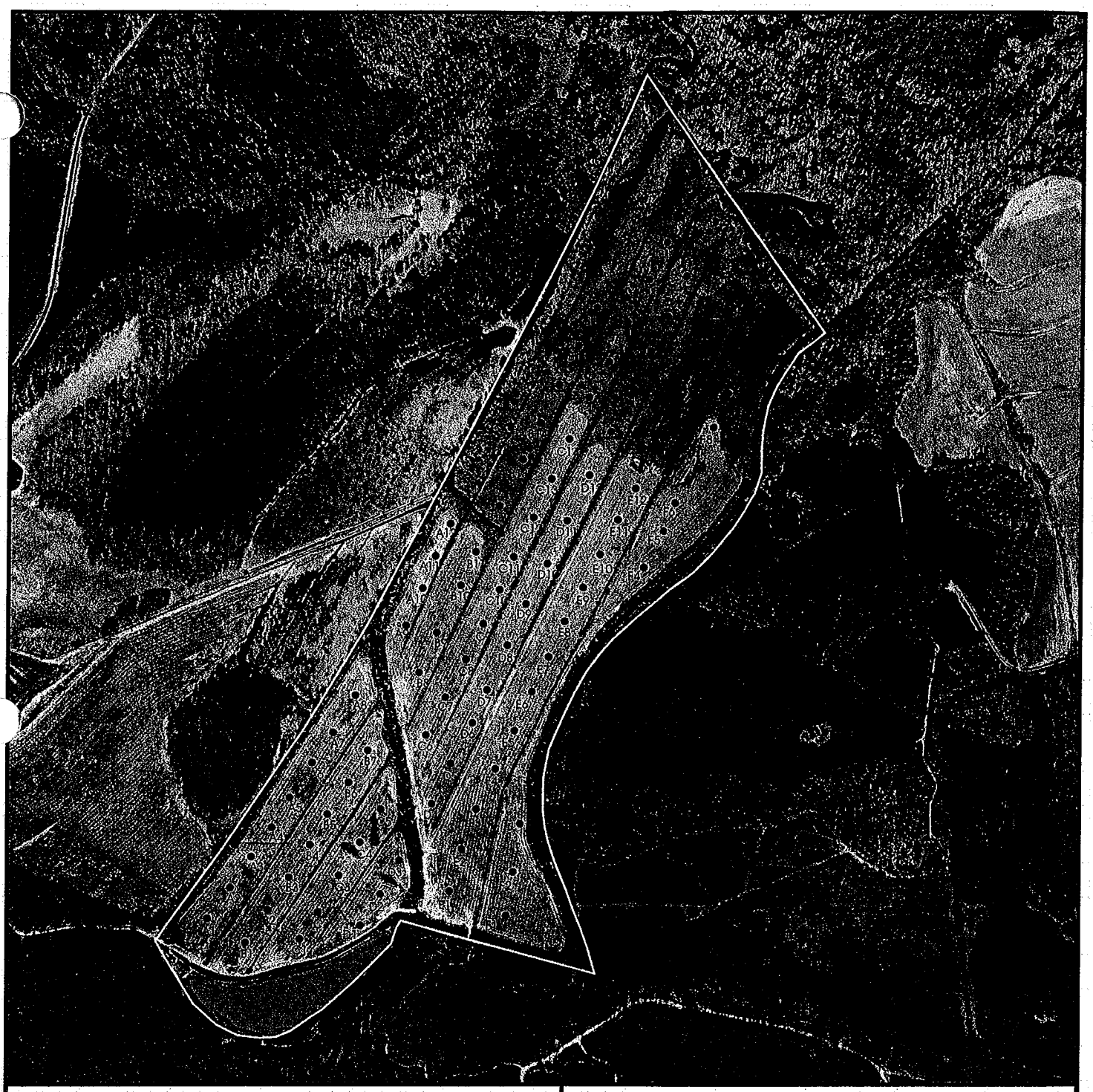
Not to scale

| | | |
|---|---|---|
| | **Key Branch Mitigation Site** | N |
| | **1984 Historic Aerial Photograph** | Not to scale |

| | | |
|---|---|---|
| | **Key Branch Mitigation Site** | N |
| | **1993 Historic Aerial Photograph** | Not to scale |

# Appendix C

# Soils Information



## Lower Yadkin River Basin
# Key Branch Mitigation Site

## Soil Boring Locations

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

A2 Soil Boring Location and Designation

N

Not to scale

# SOIL BORINGS PROFILE DATA

## A Transect:

| | |
|---|---|
| Plot ID | A1 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-14 | A | 10YR 6/3 | 10YR 6/8 | Few/distinct | Silty clay loam | Plow layer |
| 14-34 | B | 10YR 7/2 | 10YR 6/8 | Few/distinct | Silty clay loam | |
| | | | | | | |

| | |
|---|---|
| Plot ID | A2 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-14 | A | 10YR 6/3 | 10YR 6/8 | Few/distinct | Silty clay loam | Plow layer |
| 14-23 | B | 10YR 7/2 | 10YR 6/8 | Few/distinct | Silty clay loam | |
| | | | | | | |

| | |
|---|---|
| Plot ID | A3 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-8 | A | 10YR 6/2 | 10YR 5/6 | Few/faint | Silty clay loam | Plow layer |
| 8-34 | B | 10YR 7/2 | 10YR 5/6 | Few/distinct | Silty clay loam | |
| | | | | | | |

| | |
|---|---|
| Plot ID | A4 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-12 | A | 10YR 5/3 | 10YR 5/6 | Few/distinct | Silty clay loam | Plow layer |
| 12-24 | B | 2.5Y 6/2 | 10YR 5/6 | Few/distinct | Silty clay loam | |
| 24-34 | B | 2.5Y 7/1 | 10YR 5/6 | Common/distinct | Silty clay loam | |
| | | | | | | |

| | |
|---|---|
| Plot ID | A5 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-12 | A | 10YR 5/3 | 10YR 5/6 | Few/faint | Silty clay loam | Plow layer |
| 12-24 | B | 2.5Y 6/2 | 10YR 5/6 | Few/distinct | Silty clay loam | |
| 24-34 | B | 2.5Y 7/1 | 10YR 5/6 | Common/distinct | Silty clay loam | |
| | | | | | | |

| | |
|---|---|
| Plot ID | A6 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-12 | A | 10YR 6/2 | 10YR 5/8 | Few/distinct | Silty clay loam | Plow layer |
| 12-34 | B | 2.5Y 6/2 | 10YR 5/8 | Few/distinct | Silty clay loam | |
| | | | | | | |

| | |
|---|---|
| Plot ID | A7 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-12 | A | 10YR 6/2 | 10YR 5/8 | Few/distinct | Silty clay loam | Plow layer |
| 12-34 | B | 2.5Y 6/2 | 10YR 5/8 | Few/distinct | Silty clay loam | |
| | | | | | | |
| | | | | | | |

| | |
|---|---|
| Plot ID | A8 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-16 | A | 10YR 6/2 | 10YR 5/8 | Few/distinct | Silty clay loam | Plow layer |
| 16-34 | B | 2.5YR 6/2 | 10YR 5/8 | Common/distinct | Silty clay loam | |
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| | | | | | | |

| | |
|---|---|
| Plot ID | A9 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-8 | A | 10YR 5/4 | 10YR 5/8 | Few/faint | Silty clay loam | Plow layer |
| 8-24 | B | 10YR 5/4 | 10YR 5/8 | Few/faint | Silty clay loam | |
| 24-34 | B | 10YR 6/2 | 10YR 6/8 | Few/distinct | Silty clay loam | |
| | | | | | | |

| | |
|---|---|
| Plot ID | A10 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-4 | A | 10YR 5/4 | 10YR 5/8 | Few/faint | Silty clay loam | Plow layer |
| 4-12 | B | 10YR 5/4 | 10YR 5/8 | Few/faint | Silty clay loam | |
| 12-24 | B | 10YR 6/2 | 10YR 6/8 | Few/distinct | Silty clay loam | |
| 24-34 | B | 10YR 7/1 | 10YR 6/8 | Common/distinct | Silty clay loam | |

| | |
|---|---|
| Plot ID | A11 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-4 | A | 10YR 5/4 | 10YR 5/8 | Few/faint | Silty clay loam | Plow layer |
| 4-12 | A | 10YR 5/4 | 10YR 5/8 | Few/faint | Silty clay loam | |
| 12-18 | B | 10YR 6/2 | 10Yr 5/8 | Few/distinct | Silty clay loam | |
| 18-24 | B | 5Y 7/1 | 10YR 5/8 | Common/distinct | Silty clay loam | |

| | |
|---|---|
| Plot ID | A12 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-18 | A | 10YR 5/4 | 10YR 5/8 | Few/faint | Silty clay loam | Plow layer |
| 18-28 | B | 10YR 6/2 | 10YR 5/8 | Few/distinct | Silty clay loam | |
| 28-34 | B | 5YR 7/1 | 10YR 5/8 | Few/distinct | Silty clay loam | |
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## B Transect:

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|---|---|
| Plot ID | B1 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-8 | A | 10YR 4/3 | 7.5YR 5/8 | Few/distinct | Silty clay loam | Plow layer |
| 8-12 | A | 10YR 6/2 | 7.5YR 5/8 | Few/distinct | Silty clay loam | |
| 12-34 | B | 10YR 6/3 | 7.5YR 5/8 | Few/distinct | Silty clay loam | |
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| | |
|---|---|
| Plot ID | B2 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-24 | B | 10YR 6/2 | 7.5YR 5/8 | Few/distinct | Silty clay loam | Plow layer |
| 24-34 | B | 10YR 6/3 | 7.5YR 5/8 | Few/distinct | Silty clay loam | |
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| | |
|---|---|
| Plot ID | B3 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-12 | A | 10YR 6/2 | 10YR 6/8 | Few/distinct | Silty clay loam | Plow layer |
| 12-27 | B | 2.5Y 6/2 | 10YR 6/8 | Few/distinct | Silty clay loam | |
| 27-34 | B | 2.5Y 6/2 | 10YR 5/8 | Few/distinct | Silty clay loam | |
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| | |
|---|---|
| Plot ID | B4 |
| Investigator | KMryncza & KNunnery |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-12 | A | 10YR 5/3 | 10YR 5/6 | Few/faint | Silty clay | Plow layer |
| 12-24 | B | 10YR 5/1 | 7.5YR 5/8 | Many/distinct | Silty clay | |
| | | | | | | |

| | |
|---|---|
| Plot ID | B5 |
| Investigator | KMryncza & KNunnery |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-16 | B | 10YR 5/3 | 7.5YR 5/6 | Few/faint | Silty clay | Plow layer |
| 16-24 | B | 10YR 5/2 | 7.5YR 5/6 | Many/distinct | Silty clay | |
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| | |
|---|---|
| Plot ID | B6 |
| Investigator | KMryncza & KNunnery |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-12 | A | 10YR 5/3 | 10.5YR 5/6 | Few/faint | Silty clay | Plow layer |
| 12-24 | B | 10YR 5/2 | 10.5YR 5/6 | Few/faint | Silty clay | |
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| | |
|---|---|
| Plot ID | B7 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-9 | A | 10YR 4/1 | 7.5YR 5/6 | Few/distinct | Silty clay loam | Plow layer |
| 9-24 | B | 10YR 6/1 | 7.5YR 5/8 | Few/distinct | Silty clay loam | |
| 24-34 | B | 10YR 5/1 | 7.5YR 5/8 | Few/distinct | Silty clay loam | |
| | | | | | | |

| | |
|---|---|
| Plot ID | B8 |
| Investigator | MHanley |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-16 | A | 10YR 5/3 | 10YR 6/6 | Common/distinct | Silty clay loam | Plow layer |
| 16-28 | B | 10YR 6/2 | 10YR 6/6 | Common/distinct | Silty clay loam | |
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| | |
|---|---|
| Plot ID | B9 |
| Investigator | MHanley |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-16 | A | 10YR 5/3 | 10YR 6/6 | Common/distinct | Silty clay loam | Plow layer |
| 16-24 | B | 10YR 6/2 | 10YR 6/6 | Common/distinct | Silty clay loam | |
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| | |
|---|---|
| Plot ID | B10 |
| Investigator | MHanley |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-15 | A | 10YR 5/3 | 10YR 6/6 | Common/distinct | Silty clay loam | Plow layer |
| 16-28 | B | 10YR 6/2 | 10YR 6/6 | Common/distinct | Silty clay loam | |
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| | |
|---|---|
| Plot ID | B11 |
| Investigator | MHanley |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-14 | A | 10YR 5/2 | 7.5YR 3/3 | Common/faint | Silty clay loam | Plow layer |
| 14-28 | B | 10YR 5/2 | 7.5YR 3/3 | Common/faint | Silty Clay | |
| | | | | | | |
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| | |
|---|---|
| Plot ID | B12 |
| Investigator | MHanley |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-11 | A | 10YR 5/3 | 7.5YR 3/3 | Common/faint | Silty clay loam | Plow layer |
| 11-24 | B | 10YR 5/2 | 7.5YR 3/3 | Common/faint | Silty clay loam | |
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| | |
|---|---|
| Plot ID | B13 |
| Investigator | MHanley |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-12 | A | 10YR 5/3 | 7.5YR 3/3 | Common/faint | Silty clay loam | Plow layer |
| 12-24 | B | 10YR 5/2 | 7.5YR 3/3 | Common/faint | Silty clay loam | |
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| | |
|---|---|
| Plot ID | B14 |
| Investigator | MHanley |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-14 | A | 10YR 5/3 | 7.5YR 3/3 | Common/faint | Silty clay loam | Plow layer |
| 14-24 | B | 10YR 5/2 | 7.5YR 3/3 | Common/faint | Silty clay loam | |
| | | | | | | |
| | | | | | | |

| | |
|---|---|
| Plot ID | B15 |
| Investigator | MHanley |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-11 | A | 10YR 5/3 | 7.5YR 3/3 | Common/faint | Silty clay loam | Plow layer |
| 11-28 | B | 10YR 5/2 | 7.5YR 3/3 | Common/faint | Silty clay loam | |
| | | | | | | |
| | | | | | | |

| | |
|---|---|
| Plot ID | B16 |
| Investigator | MHanley |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-9 | A | 10YR 5/3 | 7.5YR 3/3 | Common/faint | Silty clay loam | Inundated 4in. |
| 9-24 | B | 10YR 5/2 | 7.5YR 3/3 | Common/faint | Silty clay loam | |
| | | | | | | |
| | | | | | | |

| | |
|---|---|
| Plot ID | B17 |
| Investigator | MHanley |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-28 | B | 10YR 5/2 | 7.5YR 3/3 | Common/faint | Silty clay loam | Inundated 9in. |
| | | | | | | |
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## C Transect:

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|---|---|
| Plot ID | C1 |
| Investigator | KMryncza & KNunnery |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-18 | B | 10YR 4/3 | 7.5YR 5/8 | Common/distinct | Silty clay | Plow layer |
| 18-24 | B | 10YR 5/2 | 10YR 4/6 | Common/distinct | Silty clay | |
| | | | | | | |

| | |
|---|---|
| Plot ID | C2 |
| Investigator | KMryncza & KNunnery |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-18 | A | 10YR 5/3 | 10YR 5/6 | Few/faint | Silty clay | Plow layer |
| 18-24 | B | 10YR 6/2 | 10YR 5/8 | Many/distinct | Silty clay | |
| | | | | | | |

| | |
|---|---|
| Plot ID | C3 |
| Investigator | KMryncza & KNunnery |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-16 | A | 10YR 5/3 | 10YR 5/6 | Few/faint | Silty clay | Plow layer |
| 16-24 | B | 10YR 5/2 | 10YR 5/8 | Common/distinct | Silty clay | |
| | | | | | | |

| | |
|---|---|
| Plot ID | C4 |
| Investigator | KMryncza & KNunnery |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-20 | A | 10.5YR 5/3 | 10YR 5/6 | Few/faint | Silty clay | Plow layer |
| 20-24 | B | 10YR 5/2 | 10YR 5/8 | Common/distinct | Silty clay | |
| | | | | | | |

| | |
|---|---|
| Plot ID | C5 |
| Investigator | KMryncza & KNunnery |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-16 | A | 10YR 5/3 | 10.5YR 5/6 | Few/faint | Silty clay | Plow layer |
| 16-24 | B | 10YR 5/6 | 10.5YR 5/6 | Few/faint | Silty clay | |
| | | | | | | |

| | |
|---|---|
| Plot ID | C6 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-16 | A | 10YR 6/2 | 10YR 6/8 | Common/distinct | Silty clay | Plow layer |
| 16-36 | B | 10YR 6/2 | 10YR 6/8 | Common/distinct | Silty clay | |
| | | | | | | |

| | |
|---|---|
| Plot ID | C7 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-14 | A | 10YR 6/2 | 10YR 6/8 | Common/distinct | Silty clay loam | Plow layer |
| 14-36 | B | 10YR 6/2 | 10YR 6/8 | Common/distinct | Silty clay loam | |
| | | | | | | |

| | |
|---|---|
| Plot ID | C8 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-12 | A | 10YR 6/2 | 10YR 6/8 | Common/distinct | Silty clay loam | Plow layer |
| 12-36 | B | 10YR 6/2 | 10YR 6/8 | Common/distinct | Silty clay loam | |
| | | | | | | |

| | |
|---|---|
| Plot ID | C9 |
| Investigator | JRoss & Jure |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-24 | A | 10YR 5/3 | 10YR 5/8 | Few/faint | Silty clay loam | Plow layer |
| 24-36 | B | 10YR 6/2 | 10YR 6/8 | Few/distinct | Silty clay loam | |
| | | | | | | |

| | |
|---|---|
| Plot ID | C10 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-32 | A | 10YR 5/3 | 10YR 5/8 | Few/faint | Silty clay loam | Cap.Fringe 21in. |
| 32-36 | B | 10YR 6/2 | 10YR 6/8 | Common/distinct | | |
| | | | | | | |

| | |
|---|---|
| Plot ID | C11 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-16 | A | 10YR 6/3 | 10YR 5/6 | Common/faint | Silty clay loam | Plow layer |
| 16-26 | B | 10YR 6/3 | 10YR 5/6 | Common/faint | Silty clay loam | |
| 26-36 | B | 10YR 6/2 | 10YR 5/6 | Common/faint | Silty clay loam | |
| | | | | | | |

| | |
|---|---|
| Plot ID | C12 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-18 | A | 10YR 6/3 | 10YR 5/6 | Common/faint | Silty clay loam | Plow layer |
| 18-27 | B | 10YR 6/3 | 10YR 5/6 | Common/faint | Silty clay loam | |
| 27-32 | B | 10YR 6/2 | 10YR 5/6 | Common/distinct | Silty clay loam | |
| | | | | | | |

| Plot ID | C13 | | | | | |
|---|---|---|---|---|---|---|
| Investigator | JRoss & JUre | | | | | |
| Map Unit Name | Chewacla loam | | | | | |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts | | | | | |
| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
| 0-3 | A | 10YR 5/4 | 10YR 5/5 | Few/faint | Silty clay loam | Plow layer |
| 3-18 | A | 10YR 5/4 | 10YR 5/5 | Few/faint | Silty clay loam | |
| 18-36 | B | 10YR 6/2 | 10YR 5/6 | Few/faint | Silty clay loam | |
| | | | | | | |

| Plot ID | C14 | | | | | |
|---|---|---|---|---|---|---|
| Investigator | KMryncza & KNunnery | | | | | |
| Map Unit Name | Chewacla loam | | | | | |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts | | | | | |
| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
| 0-18 | B | 10YR 5/3 | 7.5YR 5/6 | Common/distinct | Sandy clay | Inundated 1in. |
| | | | | | | Sulfidic odor |
| | | | | | | |

| Plot ID | C15 | | | | | |
|---|---|---|---|---|---|---|
| Investigator | KMryncza & KNunnery | | | | | |
| Map Unit Name | Chewacla loam | | | | | |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts | | | | | |
| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
| 0-10 | B | 10YR 5/2 | 7.5YR 5/6 | Common/distinct | Sandy clay | Inundated 2-3 in. |
| 10-15 | B | 10YR 5/3 | 7.5YR 5/6 | Few/distinct | Sandy clay | Sulfidic odor |
| 15-18 | B | 10YR 5/2 | 7.5YR 5/6 | Few/faint | Sandy clay | |
| | | | | | | |

| Plot ID | C16 | | | | | |
|---|---|---|---|---|---|---|
| Investigator | KMryncza & KNunnery | | | | | |
| Map Unit Name | Chewacla loam | | | | | |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts | | | | | |
| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
| 0-18 | B | 10YR 5/3 | 7.5YR 5/6 | Common/distinct | Sandy clay | Inundated 2-3 in. |
| | | | | | | Sulfidic odor |
| | | | | | | |

| Plot ID | C17 | | | | | |
|---|---|---|---|---|---|---|
| Investigator | KMryncza & KNunnery | | | | | |
| Map Unit Name | Chewacla loam | | | | | |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts | | | | | |
| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
| 0-6 | B | 10YR 4/3 | 10YR 5/6 | Few/faint | Sandy clay | Inundated 3-4 in. |
| 6-18 | B | 10YR 5/2 | 10YR 7/6 | Common/faint | Sandy clay | Sulfidic odor |
| | | | | | | |

| Plot ID | C18 | | | | | |
|---|---|---|---|---|---|---|
| Investigator | KMryncza & KNunnery | | | | | |
| Map Unit Name | Chewacla loam | | | | | |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts | | | | | |
| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
| 0-18 | B | 10YR 4/3 | 7.5YR 5/6 | Common/distinct | Sandy clay | Inundated 1-2in. |
| | | | | | | Sulfidic odor |
| | | | | | | |

| | |
|---|---|
| Plot ID | C19 |
| Investigator | KMryncza & KNunnery |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-18 | B | 10YR 5/2 | 7.5YR 5/6 | Common/distinct | Sandy clay | Inundated 4-6in. |
| | | | | | | Sulfidic odor |
| | | | | | | |

| | |
|---|---|
| Plot ID | C20 |
| Investigator | KMryncza & KNunnery |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-18 | B | 10YR 5/2 | 7.5YR 5/6 | Common/distinct | Sandy clay | Inundated 10in. |
| 18-24 | B | 10YR 5/1 | 7.5YR 5/6 | Common/distinct | Sandy clay | Sulfidic odor |
| | | | | | | |

## D Transect:

| | |
|---|---|
| Plot ID | D1 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-8 | A | 10YR 5/4 | 10YR 5/6 | Few/faint | Silty clay loam | Plow layer |
| 8-19 | B | 10YR 6/4 | 10YR 5/8 | Few/distinct | Silty clay loam | |
| 19-30 | B | 10YR 6/1 | 10YR 6/8 | Few/distinct | Silty clay loam | |
| 30-34 | B | 10YR 7/2 | 10YR 6/8 | Few/distinct | Silty clay loam | |
| | | | | | | |

| | |
|---|---|
| Plot ID | D2 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-12 | B | 10YR 6/2 | 2.5Y 5/8 | Few/distinct | Silty clay loam | Plow layer |
| 12-34 | B | 10YR 6/2 | 10YR 6/8 | Few/distinct | Silty clay loan | |
| | | | | | | |

| | |
|---|---|
| Plot ID | D3 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-8 | A | 10YR 5/4 | N/A | N/A | Sandy clay loam | Plow layer |
| 8-14 | B | 2.5Y 6/2 | 10YR 5/6 | Few/distinct | Sandy clay loam | |
| | | | | | | |

| | |
|---|---|
| Plot ID | D4 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-12 | A | 10YR 6/2 | 10YR 6/6 | Common/faint | Silty clay loam | Plow layer |
| 12-24 | B | 10YR 6/2 | 10YR 6/6 | Common/faint | Silty clay loam | |
| 24-36 | B | 10YR 6/2 | 10YR 6/6 | Common/faint | Silty clay | |
| | | | | | | |

| | |
|---|---|
| Plot ID | D5 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-14 | A | 10YR 6/2 | 10YR 5/6 | Common/faint | Silty clay loam | Plow layer |
| 14-24 | B | 10YR 6/2 | 10YR 5/6 | Common/faint | Silty clay loam | |
| 24-30 | B | 10YR6/2 | 10YR 5/6 | Common/faint | Silty clay | |
| | | | | | | |

| | |
|---|---|
| Plot ID | D6 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-16 | A | 10YR 6/1 | N/A | N/A | Silty clay loam | Plow layer |
| 16-20 | B | 10YR 6/1 | 10YR 5/3 | Common/faint | Silty clay loam | |
| 20-36 | B | 10YR 7/1 | 10YR 7/8 | Common/distinct | Silty clay | |
| | | | | | | |

| | |
|---|---|
| Plot ID | D7 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-12 | A | 10YR 6/6 | 10YR 7/2 | Few/faint | Sandy clay loam | Plow layer |
| 12-24 | B | 10YR 6/6 | 10YR 5/8 | Common/distinct | Sandy clay loam | |
| | | | | | | |

| | |
|---|---|
| Plot ID | D8 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-12 | A | 10YR 6/3 | 10YR 5/6 | Common/distinct | Sandy clay loam | Plow layer |
| 12-24 | B | 10YR 6/3 | 10YR 5/6 | Common/distinct | Sandy clay loam | |
| 24-30 | B | 10YR 6/2 | 10YR 5/6 | Common/distinct | Silty clay | |
| | | | | | | |

| | |
|---|---|
| Plot ID | D9 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-12 | B | 7.5YR 5/4 | 7.5YR6/3 | Common/faint | Silty clay loam | Plow layer |
| 12-34 | B | 7.5YR 5/4 | 7.5YR 6/3 | Common/faint | Silty clay | |
| | | | | | | |

| | |
|---|---|
| Plot ID | D10 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-12 | A | 10YR 5/4 | | Faint | Silty clay loam | Plow layer |
| 12-20 | B | 10YR 6/3 | 10YR 5/6 | Common/distinct | Silty clay loam | |
| 20-34 | B | 10YR 6/2 | 10YR 5/6 | Common/distinct | Silty clay | |
| | | | | | | |

| | |
|---|---|
| Plot ID | D11 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-12 | A | 10YR 6/3 | 10YR 5/6 | Common/distinct | Silty clay loam | Plow layer |
| 12-26 | B | 10YR 6/3 | 10YR 5/6 | Common/distinct | Silty clay | |
| 26-30 | B | 10YR 6/2 | 10YR 5/6 | Common/distinct | Silty clay | |
| | | | | | | |

| | |
|---|---|
| Plot ID | D12 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-12 | A | 10YR 6/2 | 10YR 5/4 | Common/distinct | Silty clay loam | Plow layer |
| 12-24 | B | 10YR 6/2 | 10YR 5/4 | Common/distinct | Silty clay | |
| 24-30 | B | 2.5YR 6/2 | 10YR 5/6 | Common/distinct | Silty clay | |
| | | | | | | |

| Plot ID | D13 |
|---|---|
| Investigator | KMryncza & KNunnery |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-14 | A | 10YR 4/3 | 10YR 5/6 | Few/faint | Sandy clay | Plow layer |
| 14-18 | B | 10YR 5/4 | 10YR 5/6 | Few/faint | Sandy clay | |
| | | | | | | |

| Plot ID | D14 |
|---|---|
| Investigator | KMryncza & KNunnery |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-18 | B | 10YR 4/2 | 7.5YR 4/6 | Many/distinct | Sandy clay | Inundated 3-4in. |
| | | | | | | Sulfidic odor |
| | | | | | | |

| Plot ID | D15 |
|---|---|
| Investigator | KMryncza & KNunnery |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-18 | B | 10YR 4/2 | 7.5YR 4/6 | Common/distinct | Sandy clay | Inundated 4in. |
| | | | | | | Sulfidic odor |
| | | | | | | |

| Plot ID | D16 |
|---|---|
| Investigator | KMryncza & KNunnery |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-14 | B | 10YR 5/3 | 7.5YR 5/6 | Few/faint | Sandy clay | Inundated 3-4 in. |
| 14-18 | B | 10YR 5/4 | 7.5YR 5/6 | Few/faint | Sandy clay | Sulfidic odor |
| | | | | | | |

| Plot ID | D17 |
|---|---|
| Investigator | KMryncza & KNunnery |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-12 | B | 10YR 5/3 | 7.5YR 4/6 | Common/distinct | Sandy clay | Inundated 3in. |
| 12-18 | B | 10YR 5/2 | 10YR 5/8 | Common/distinct | Sandy clay | Sulfidic odor |
| | | | | | | |

| Plot ID | D18 |
|---|---|
| Investigator | KMryncza & KNunnery |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-12 | B | 10YR 5/3 | 7.5YR 5/6 | Common/distinct | Sandy clay | Inundated 6in. |
| 12-18 | B | 10YR 5/2 | 7.5YR 5/6 | Common/distinct | Sandy clay | Sulfidic odor |
| 18-24 | B | 10YR 5/4 | 7.5YR 5/6 | Common/distinct | Sandy clay | |
| | | | | | | |

## E Transect:

| | |
|---|---|
| Plot ID | E1 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-6 | A | 10YR 6/3 | 10YR 5/4 | Common/faint | Clay | Plow layer |
| 6-12 | A | 10YR 6/3 | 10YR 5/4 | Common/faint | Waxy Clay | |
| 12-24 | B | 10YR 6/2 | 10YR 6/8 | Common/distinct | Silty Clay Loam | |
| 24-30 | B | 10YR 6/2 | 10YR 6/8 | Common/distinct | Silty Clay | |

| | |
|---|---|
| Plot ID | E2 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-18 | A | 10YR 6/3 | 10YR 5/6 | Common/faint | Silty Clay Loam | Plow Layer |
| 18-24 | A | 10YR 6/3 | 10YR 5/6 | Common/faint | Sandy Clay | |
| 24-32 | B | 2.5Y 6/2 | 10YR 6/8 | Common/distinct | Silty clay loam | |
| | | | | | | |

| | |
|---|---|
| Plot ID | E3 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-20 | A | 10YR 6/3 | 10YR 6/8 | Common/distinct | Silty clay loam | Plow layer |
| 20-24 | A | 10YR 6/3 | 10YR 6/8 | Common/distinct | Silty clay loam | |
| 24-36 | B | 10YR 6/2 | 10YR 6/8 | Common/distinct | Silty clay loam | |
| | | | | | | |

| | |
|---|---|
| Plot ID | E4 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-28 | A | 10YR 6/3 | 10YR 5/4 | Common/distinct | Sandy clay loam | Plow layer |
| 28-32 | B | 10YR 6/3 | 10YR 5/4 | Common/distinct | Sandy clay loam | |
| | | | | | | |

| | |
|---|---|
| Plot ID | E5 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-24 | A | 10YR 5/3 | 10YR 5/4 | Common/faint | Silty clay loam | Plow layer |
| 24-32 | B | 10YR 5/3 | 10YR 5/4 | Common/faint | Silty clay loam | |
| | | | | | | |

| | |
|---|---|
| Plot ID | E6 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-18 | A | 10YR 6/3 | 10YR 5/4 | Common/faint | Silty clay loam | Plow layer |
| 18-24 | A | 10YR 6/3 | 10YR 5/4 | Common/faint | Silty clay loam | |
| 24-32 | B | 10YR 5/4 | 10YR 5/4 | Common/faint | Silty clay loam | Slightly wet |
| | | | | | | |

| | |
|---|---|
| Plot ID | E7 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-26 | A | 10YR 5/4 | 10YR 4/3 | Common/faint | Clay loam | Plow layer |
| 26-32 | B | 10YR 5/4 | 10YR 4/3 | Common/faint | Clay loam | |
| | | | | | | |

| | |
|---|---|
| Plot ID | E8 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-12 | A | 7.5YR 5/4 | None | | Sandy clay loam | Plow layer |
| 12-24 | A | 7.5YR 5/4 | None | | Sandy clay loam | |
| 24-32 | B | 10YR 5/4 | 10YR 5/4 | Few/faint | Silty clay loam | |
| | | | | | | |

| | |
|---|---|
| Plot ID | E9 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-24 | A | 10YR 5/2 | 10YR 5/8 | Few/distinct | Silty clay loam | Plow layer |
| 24-32 | B | 10YR 5/2 | 10YR 5/8 | Few/distinct | Silty clay loam | Cap. Fringe |
| | | | | | | |

| | |
|---|---|
| Plot ID | E10 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-12 | A | 10YR 5/3 | 10YR 5/8 | Common/distinct | Silty clay loam | Plow layer |
| 12-32 | B | 10YR 5/3 | 10YR 5/8 | Common/distinct | Silty clay loam | |
| | | | | | | |

| | |
|---|---|
| Plot ID | E11 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-12 | A | 10YR 6/2 | 10YR 5/6 | Few/distinct | Silty clay loam | Plow layer |
| 12-20 | A | 10YR 6/2 | 10YR 5/6 | Few/distinct | Silty clay loam | Disturbed layer |
| 20-24 | B | 10YR 6/3 | 10YR 6/6 | Few/distinct | Silty clay loam | |
| 24-32 | B | 10YR 5/2 | 10YR 5/8 | Few/distinct | Silty clay loam | |
| | | | | | | |

| | |
|---|---|
| Plot ID | E12 |
| Investigator | JRoss & Jure |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-2 | A | 10YR 5/4 | 10YR 5/5 | Few/distinct | Silty clay loam | Plow layer |
| 2-12 | A | 10YR 5/4 | 10YR 5/5 | Few/distinct | Silty clay loam | |
| 12-24 | B | 2.5Y 6/2 | 2.5Y 6/6 | Common/distinct | Silty clay loam | |
| 24-32 | B | 2.5Y 6/3 | 2.5Y 6/6.8 | | Silty clay loam | |

| Plot ID | E13 | | | | | |
|---|---|---|---|---|---|---|
| Investigator | KMryncza & KNunnery | | | | | |
| Map Unit Name | Chewacla loam | | | | | |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts | | | | | |
| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
| 0-12 | A | 10YR 5/2 | N/A | N/A | Sandy clay | Edge of overgrown field |
| 12-18 | B | 10YR 5/2 | 7.5YR 5/6 | Few/faint | Sandy clay | Sulfidic odor |
| | | | | | | |

| Plot ID | E14 | | | | | |
|---|---|---|---|---|---|---|
| Investigator | KMryncza & KNunnery | | | | | |
| Map Unit Name | Chewacla loam | | | | | |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts | | | | | |
| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
| 0-18 | A | 10YR 5/3 | N/A | N/A | Sandy clay | Sulfidic odor |
| 18-24 | B | 10YR 5/2 | 7.5YR 5/6 | Few/faint | Sandy clay | |
| | | | | | | |

| Plot ID | E15 | | | | | |
|---|---|---|---|---|---|---|
| Investigator | KMryncza & KNunnery | | | | | |
| Map Unit Name | Chewacla loam | | | | | |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts | | | | | |
| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
| 0-8 | A | 10YR 6/2 | 10YR 5/6 | Common/distinct | Sandy clay | Sulfidic odor |
| 8-18 | B | 10YR 5/4 | 10YR 5/6 | Few/common | Sandy clay | |
| | | | | | | |

| Plot ID | E16 | | | | | |
|---|---|---|---|---|---|---|
| Investigator | KMryncza & KNunnery | | | | | |
| Map Unit Name | Chewacla loam | | | | | |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts | | | | | |
| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
| 0-12 | A | 10YR 5/4 | N/A | N/A | Sandy clay | Sulfidic odor |
| 12-18 | B | 10YR 6/6 | 7.5YR5/6 | Few/faint | Sandy clay | |
| | | | | | | |

| Plot ID | E17 | | | | | |
|---|---|---|---|---|---|---|
| Investigator | KMryncza & KNunnery | | | | | |
| Map Unit Name | Chewacla loam | | | | | |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts | | | | | |
| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
| 0-6 | A | 10YR 5/2 | N/A | N/A | N/A | Inundated 1-2 in. |
| 6-18 | B | 10YR 6/4 | 7.5YR 5/6 | Few/faint | Sandy clay | Sulfidic odor |
| | | | | | | |

| Plot ID | E18 | | | | | |
|---|---|---|---|---|---|---|
| Investigator | KMryncza & KNunnery | | | | | |
| Map Unit Name | Chewacla loam | | | | | |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts | | | | | |
| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
| 0-12 | B | 10YR 4/2 | 7.5YR 5/6 | Common/distinct | Sandy clay | Inundated 2-4 in. |
| 12-18 | B | 10YR 6/2 | 7.5YR 5/8 | Common/distinct | Sandy clay | Sulfidic odor |
| | | | | | | |

## F Transect:

| | |
|---|---|
| Plot ID | F1 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-12 | B | 10YR 5/4 | 10YR 5/6 | Few/distinct | Silty clay | Plow layer |
| 12-24 | B | 10YR 5/4 | 10YR 5/8 | Few/distinct | Silty clay | |
| 24-34 | B | 10YR 6/2 | 10YR 6/6 | Few/distinct | Silty clay | |
| | | | | | | |

| | |
|---|---|
| Plot ID | F2 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-20 | A | 10YR 6/3 | 10YR 6/8 | Few/distinct | Silty clay | Plow layer |
| 20-34 | B | 10YR 6/3 | 10YR 6/8 | Few/distinct | Silty clay | |
| | | | | | | |

| | |
|---|---|
| Plot ID | F3 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-18 | A | 10YR 5/3 | 10YR 5/6 | Few/faint | Silty clay loam | Plow layer |
| 18-30 | B | 10YR 5/3 | 10YR 5/6 | Few/faint | Silty clay loam | |
| 30-34 | B | 10YR 5/3 | 10YR 5/8 | Common/distinct | Silty clay | |
| | | | | | | |

| | |
|---|---|
| Plot ID | F4 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-13 | A | 10YR 6/2 | 10YR 6/6 | Common/faint | Silty clay loam | Plow layer |
| 13-34 | B | 10YR 6/2 | 10YR 6/6 | Common/faint | Silty clay loam | |
| | | | | | | |

| | |
|---|---|
| Plot ID | F5 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-18 | A | 10YR 6/2 | 10YR 6/6 | Common/distinct | Silty clay loam | Plow layer |
| 18-34 | B | 10YR 6/2 | 10YR 6/6 | Common/distinct | Silty clay loam | |
| | | | | | | |

| | |
|---|---|
| Plot ID | F6 |
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-18 | A | 10YR 6/2 | 10YR 6/6 | Common/distinct | Silty clay loam | Plow layer |
| 18-34 | B | 10YR 6/2 | 10YR 6/6 | Common/distinct | Silty clay loam | |
| | | | | | | |

| Plot ID | F7 |
|---|---|
| Investigator | JRoss & JUre |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-30 | A | 10 YR 6/2 | 10YR 6/6 | Common/distinct | Silty clay | Plow layer |
| 30-34 | B | 10 YR 6/2 | 10YR 6/6 | Common/distinct | Silty clay | |
| | | | | | | |

| Plot ID | F8 |
|---|---|
| Investigator | KMryncza & KNunnery |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-12 | A | 10YR 4/3 | 10YR 5/8 | Few/faint | Sandy clay | Plow layer |
| 12-18 | B | 10YR 4/4 | 10YR 5/8 | Few/faint | Sandy clay | |
| 18-24 | B | 10YR 5/6 | 10YR 5/8 | Few/faint | Sandy clay | |
| | | | | | | |

| Plot ID | F9 |
|---|---|
| Investigator | KMryncza & KNunnery |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-2 | A | 10YR 4/2 | | | Silty clay | Inundated 1-2in. |
| 2-18 | B | 10YR 4/3 | 7.5YR 4/6 | Few/faint | Silty clay | |
| | | | | | | |

| Plot ID | F10 |
|---|---|
| Investigator | KMryncza & KNunnery |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

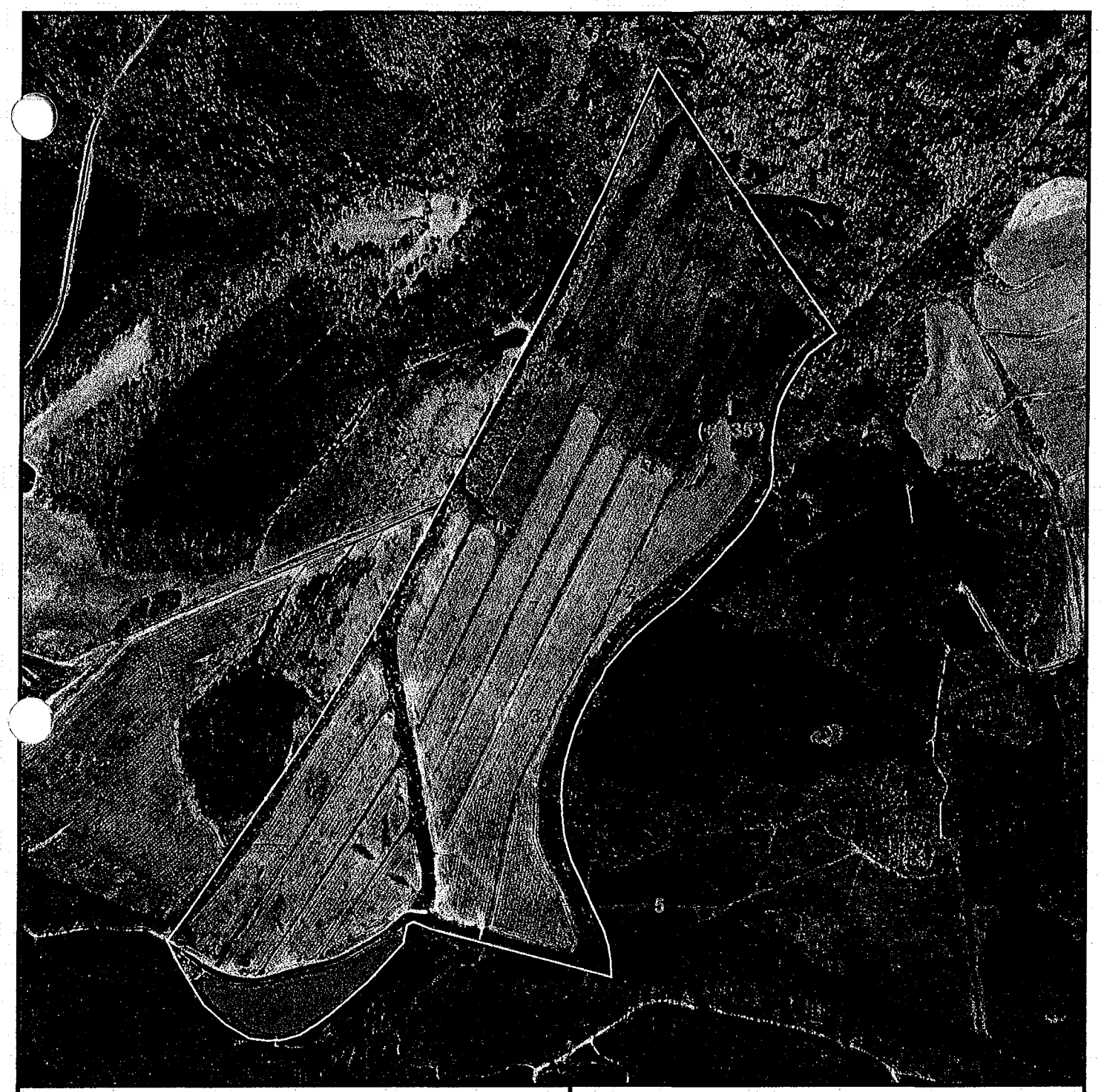
| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-12 | B | 10YR 4/2 | 7.5YR 4/6 | Few/faint | Sandy clay | Inundated 12in. |
| 12-18 | B | 10YR 4/2 | 7.5YR 4/4 | Few/faint | Sandy clay | Sulfidic odor |
| | | | | | | |

| Plot ID | F11 |
|---|---|
| Investigator | KMryncza & KNunnery |
| Map Unit Name | Chewacla loam |
| Taxonomy-subgroup | Fluvaquentic Dystrudepts |

| Depth (in) | Horizon | Matrix Color | Mottle Colors | Mottle | Texture | Comments |
|---|---|---|---|---|---|---|
| 0-12 | B | 10YR 5/3 | 7.5YR 4/6 | Few/faint | Sandy clay | Inundated 6in. |
| 12-18 | B | 10YR 5/4 | 7.5YR 4/6 | Few/faint | Sandy clay | Sulfidic odor |
| | | | | | | |

# Appendix D

# Ground Water Hydrographs



**Lower Yadkin River Basin**

# Key Branch Mitigation Site

# Monitoring Gauge Index Map

1. S317578 (+0.35')
2. S31F943
3. S342CD9
4. S3169B3
5. Removed
6. S31F89B
7. S31FA5C
8. S31FA95
9. S31733F
10. S31F88F
11. S31F8F3
12. S31F8B7
13. S2EAD00
14. S31F8DA

N

Not to scale

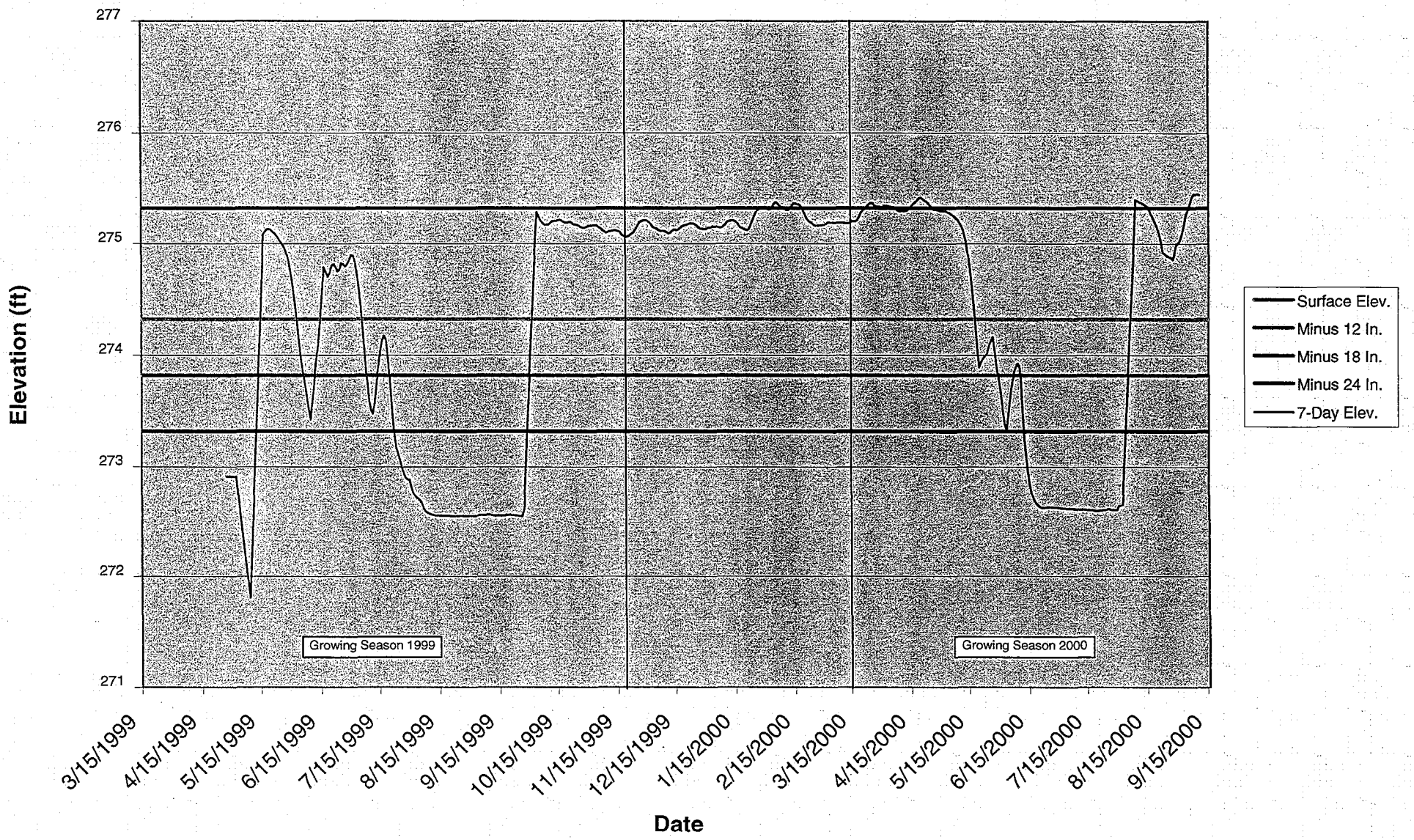
*Key Branch Mitigation Site*
*Groundwater Data Summary*

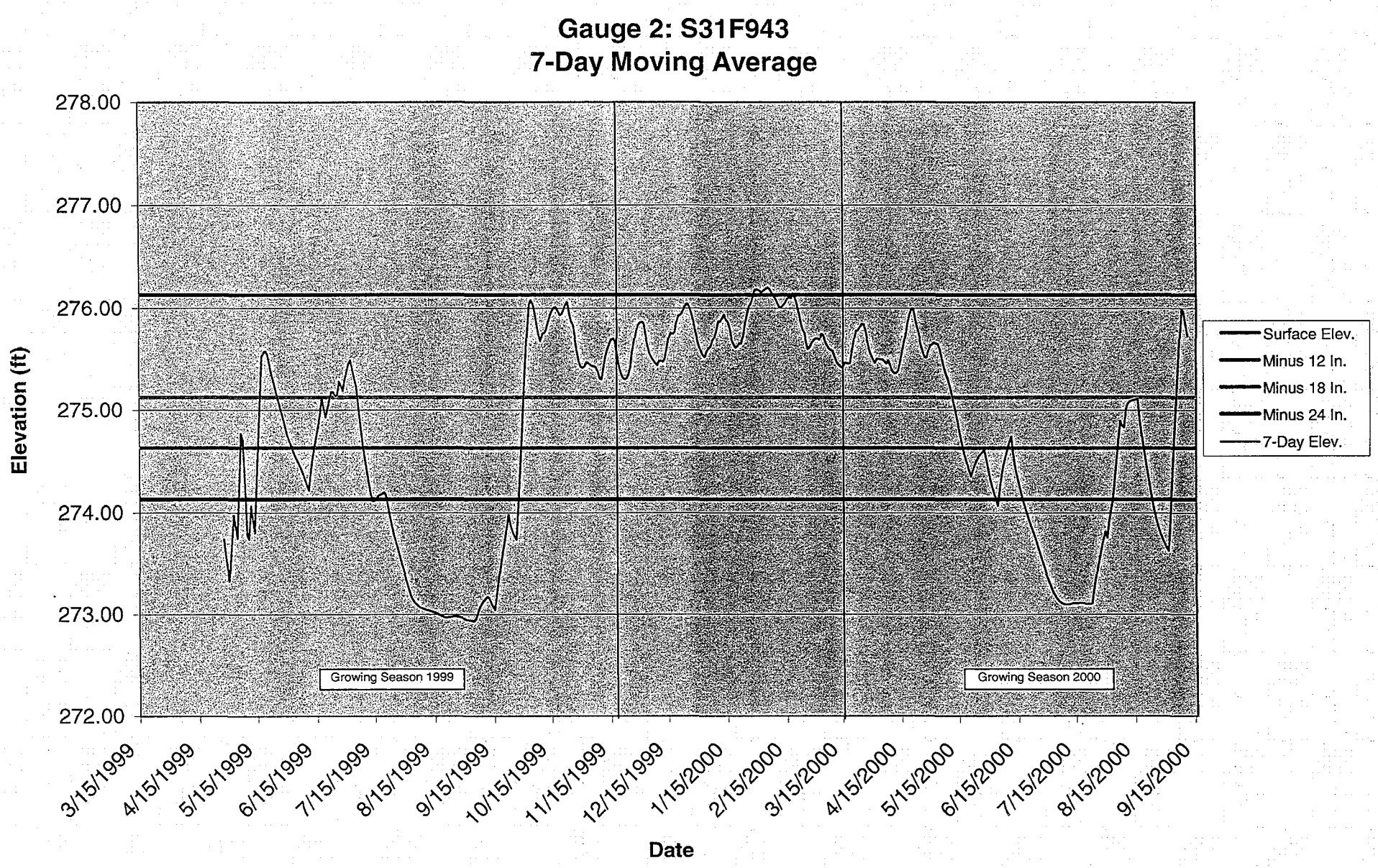
| Gauge Number | Period of Growing Season with Groundwater within 12" of surface | | | Percentage of Growing Season | Jurisdictional Status | Notes |
|---|---|---|---|---|---|---|
| | Begin Date | End Date | Duration (Days) | | | |
| 1 | 9/28/1999 | 11/19/1999 | 53 | 21.37% | YES | Data begins 4/21/99. |
| | 3/15/2000 | 5/14/2000 | 61 | 24.60% | | |
| | 8/3/2000 | 10/6/2000 | 68 | 27.42% | | Data ends 10/9/00. |
| 2 | 9/27/1999 | 11/19/1999 | 54 | 21.77% | YES | Data begins 4/21/99. |
| | 3/15/2000 | 5/8/2000 | 55 | 22.18% | | |
| | 9/2/2000 | 9/11/2000 | 10 | 4.03% | | Data ends 9/11/00. |
| 3 | 5/13/1999 | 5/19/1999 | 7 | 2.82% | NO | Data begins 4/21/99. |
| | | | | | | Gauge destroyed; data ends 8/20/99. |
| 4 | 9/28/1999 | 10/27/1999 | 10 (2) 18 | 11.29% | YES[1] | Data begins 4/21/99. |
| | | | | | | Data ends 9/11/00. |
| 5 | * | * | * | * | * | Not applicable; gauge off of site. |
| 6 | 9/27/1999 | 10/26/1999 | 10 (3) 17 | 10.89% | YES[1] | Data begins 4/21/99. |
| | 3/20/2000 | 3/22/2000 | 3 | | | Data ends 3/22/00. |
| 7 | 10/11/1999 | 10/26/1999 | 16 | 6.45% | YES[1] | Data begins 4/21/99. |
| | | | | | | Data ends 9/11/00. |
| 8 | 9/28/1999 | 11/19/1999 | 53 | 21.37% | YES | Data begins 4/21/99. |
| | 3/15/2000 | 4/20/2000 | 37 | 14.92% | | Data ends 4/20/00. |
| 9 | 9/29/1999 | 11/19/1999 | 9 (2) 41 | 20.16% | YES | Data begins 4/21/99. |
| | 3/15/2000 | 5/6/2000 | 53 | 21.37% | | Data ends 9/11/00. |
| 10 | 9/27/1999 | 11/19/1999 | 54 | 21.77% | YES | Data begins 4/21/99. |
| | 3/15/2000 | 5/4/2000 | 51 | 20.56% | | |
| | 9/3/2000 | 9/11/2000 | 9 | 3.63% | | Data ends 9/11/00. |
| 11 | 9/29/1999 | 10/27/1999 | 9 (2) 18 | 10.89% | YES[1] | Data begins 4/21/99. |
| | | | | | | Data ends 9/11/00. |
| 12 | 9/27/1999 | 10/27/1999 | 31 | 12.50% | YES | Data begins 4/21/99. |
| | | | | | | Data ends 3/22/00. |
| 13 | 9/27/1999 | 10/29/1999 | 33 | 13.31% | YES | Data begins 4/21/99. |
| | | | | | | Data ends 9/11/00. |
| 14 | 9/26/1999 | 10/26/1999 | 31 | 12.50% | YES | Data begins 4/21/99. |
| | | | | | | Data ends 9/11/00. |

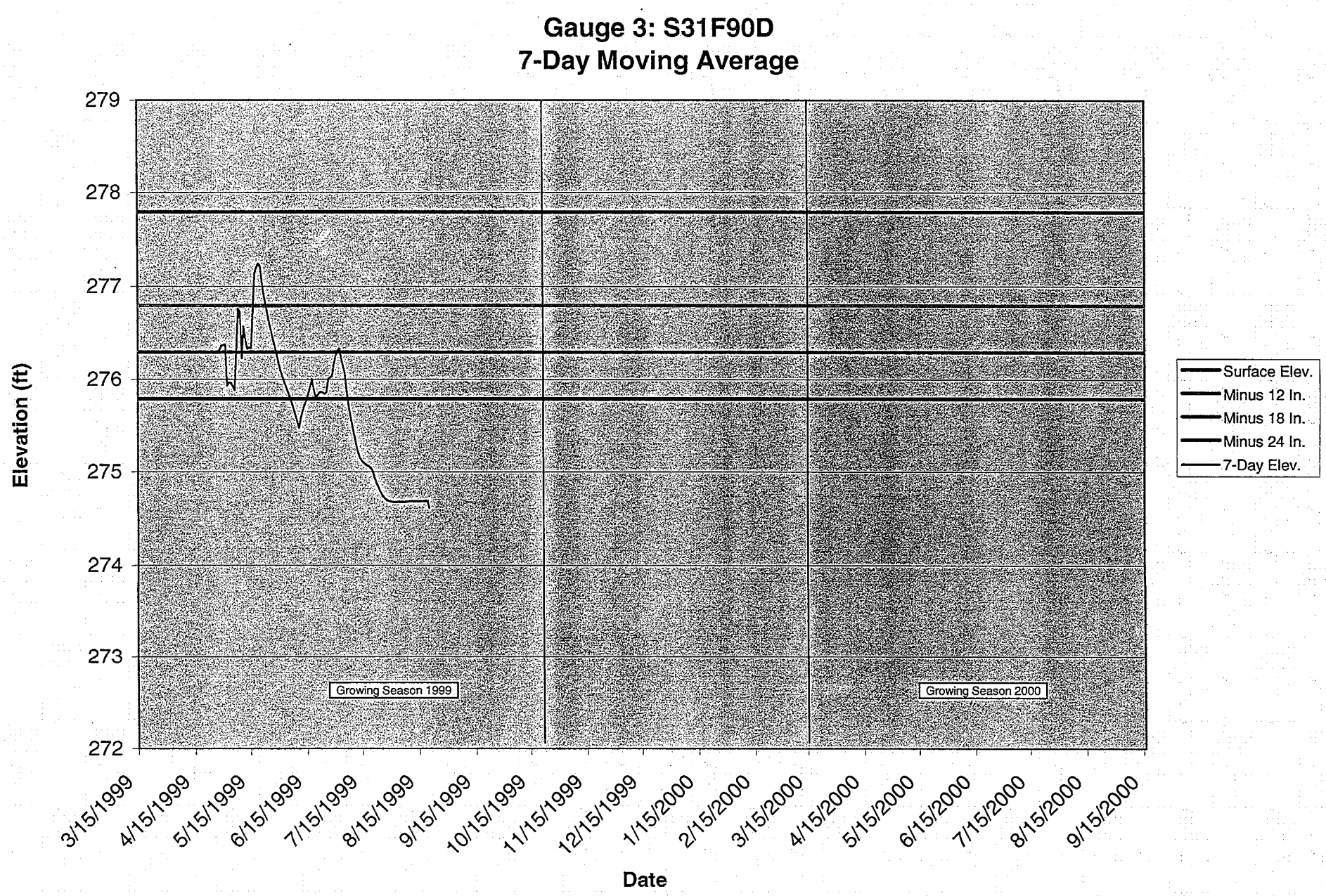
Note: ( ) indicates a break in duration.

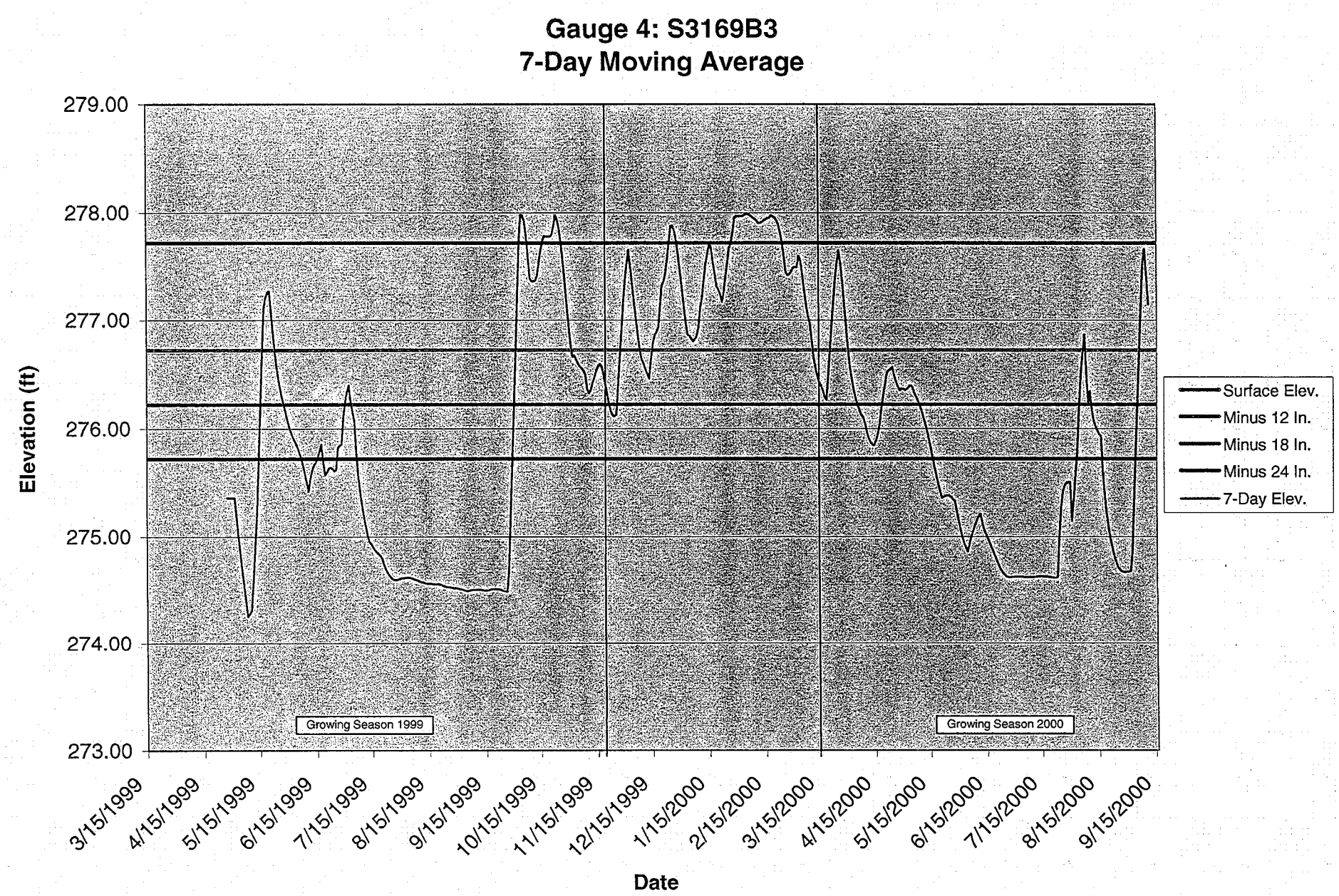
1. Jurisdictional status determined in accordance with ACOE minimum requirement of 5% of growing season.

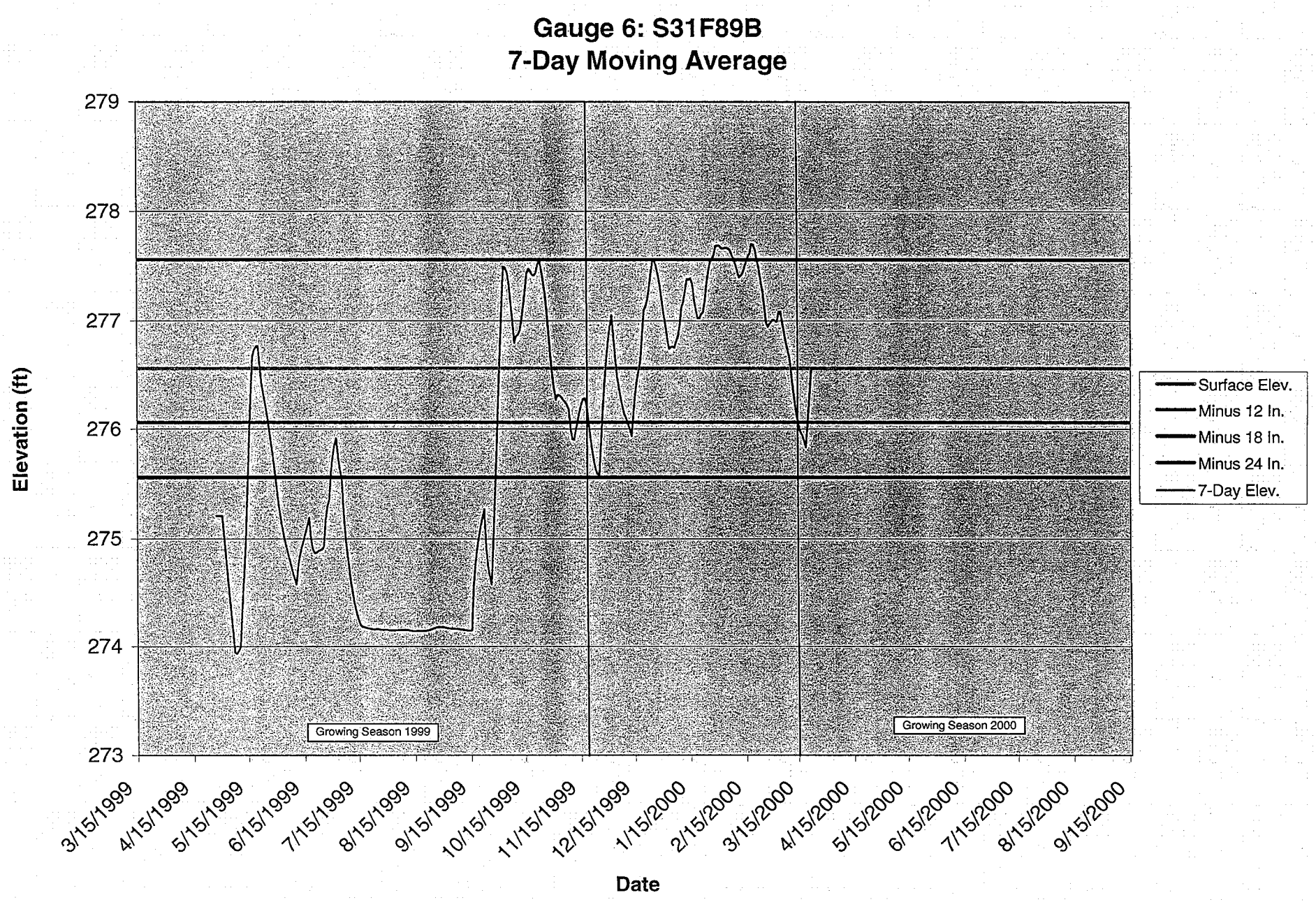
# Gauge 1: S317578
## 7-Day Moving Average

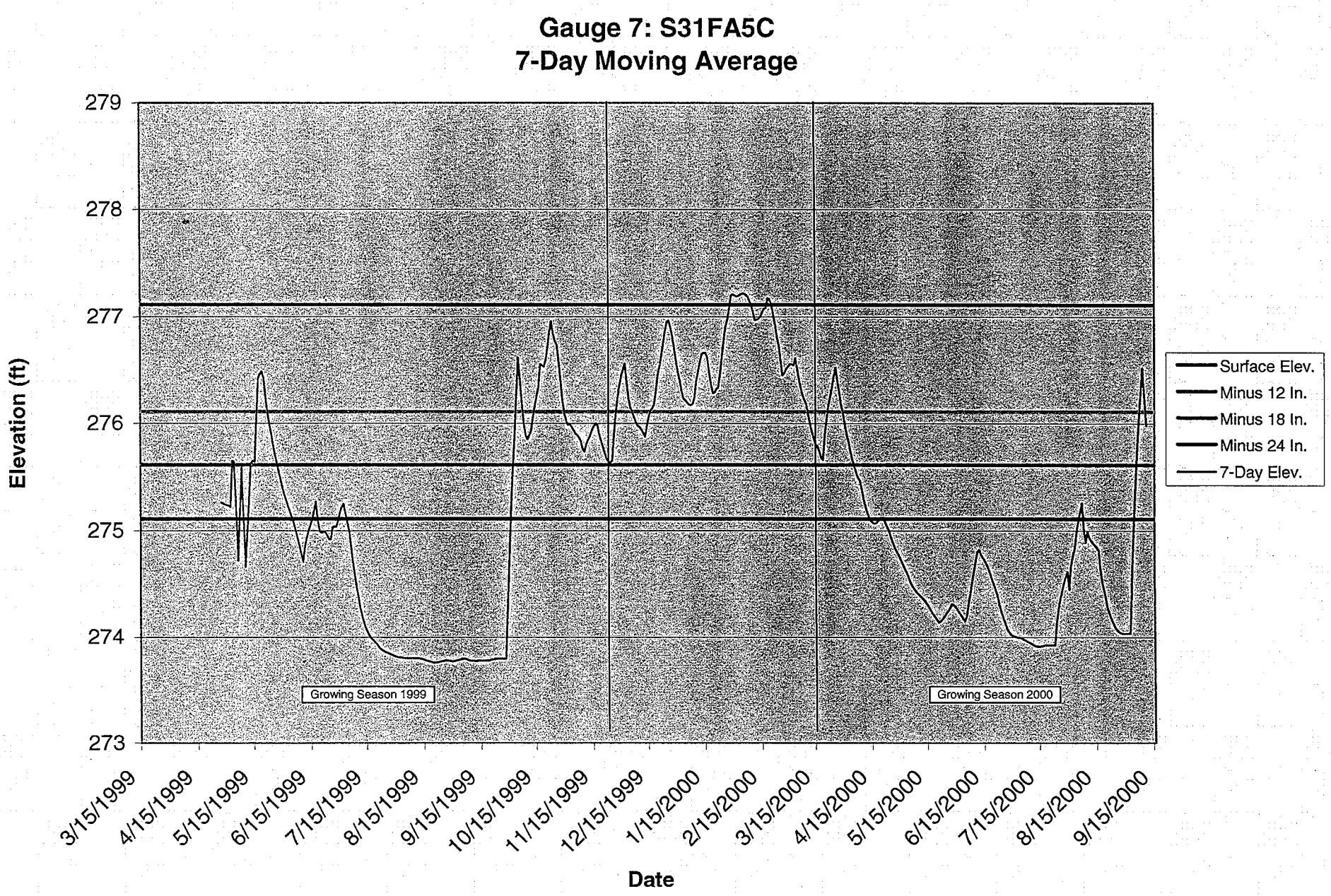


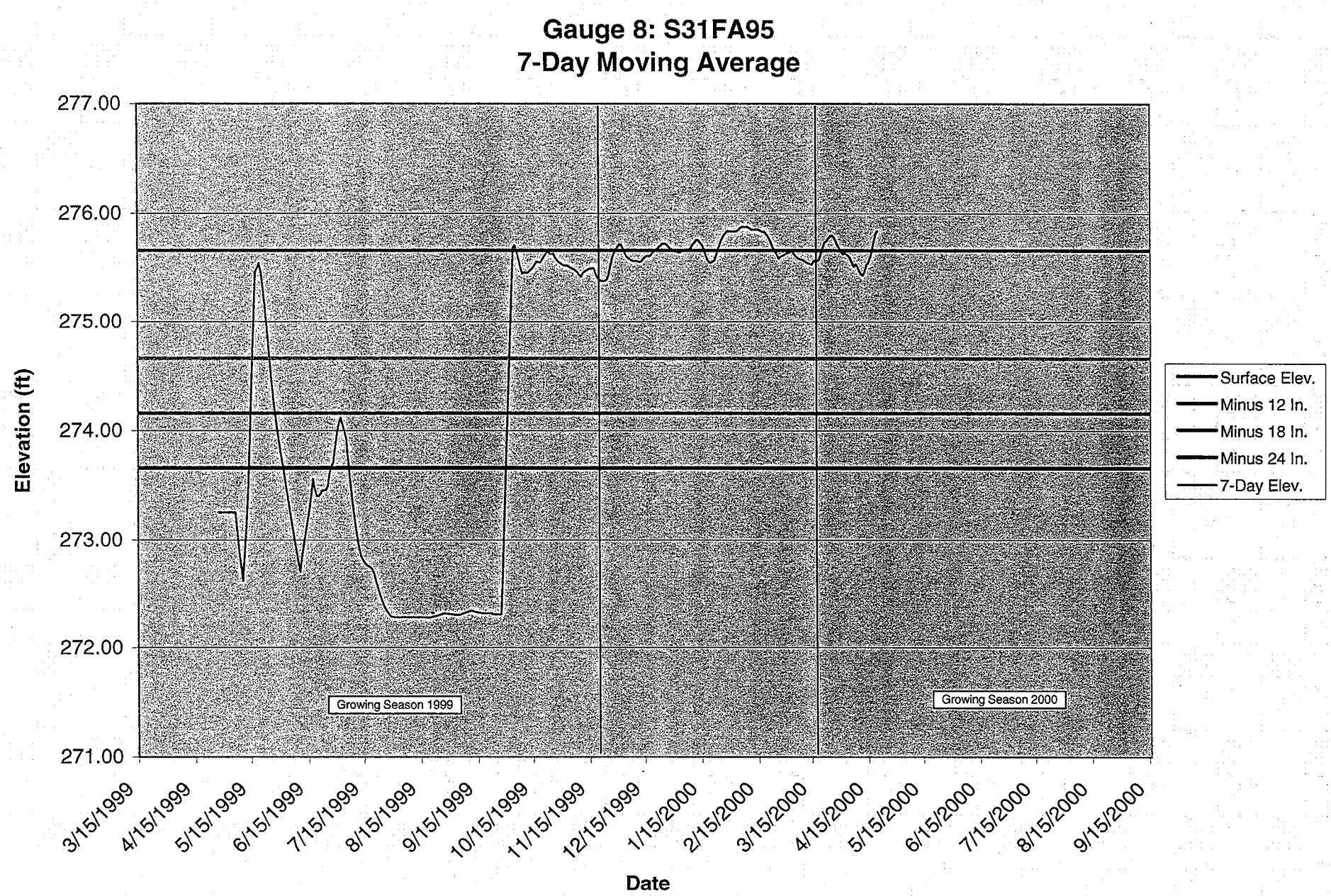

Gauge 2: S31F943
7-Day Moving Average
278.00
277.00
276.00
275.00
274.00
273.00
272.00
Elevation (ft)
Growing Season 1999
Growing Season 2000
Surface Elev.
Minus 12 In.
Minus 18 In.
Minus 24 In.
7-Day Elev.
3/15/1999
4/15/1999
5/15/1999
6/15/1999
7/15/1999
8/15/1999
9/15/1999
10/15/1999
11/15/1999
12/15/1999
1/15/2000
2/15/2000
3/15/2000
4/15/2000
5/15/2000
6/15/2000
7/15/2000
8/15/2000
9/15/2000
Date

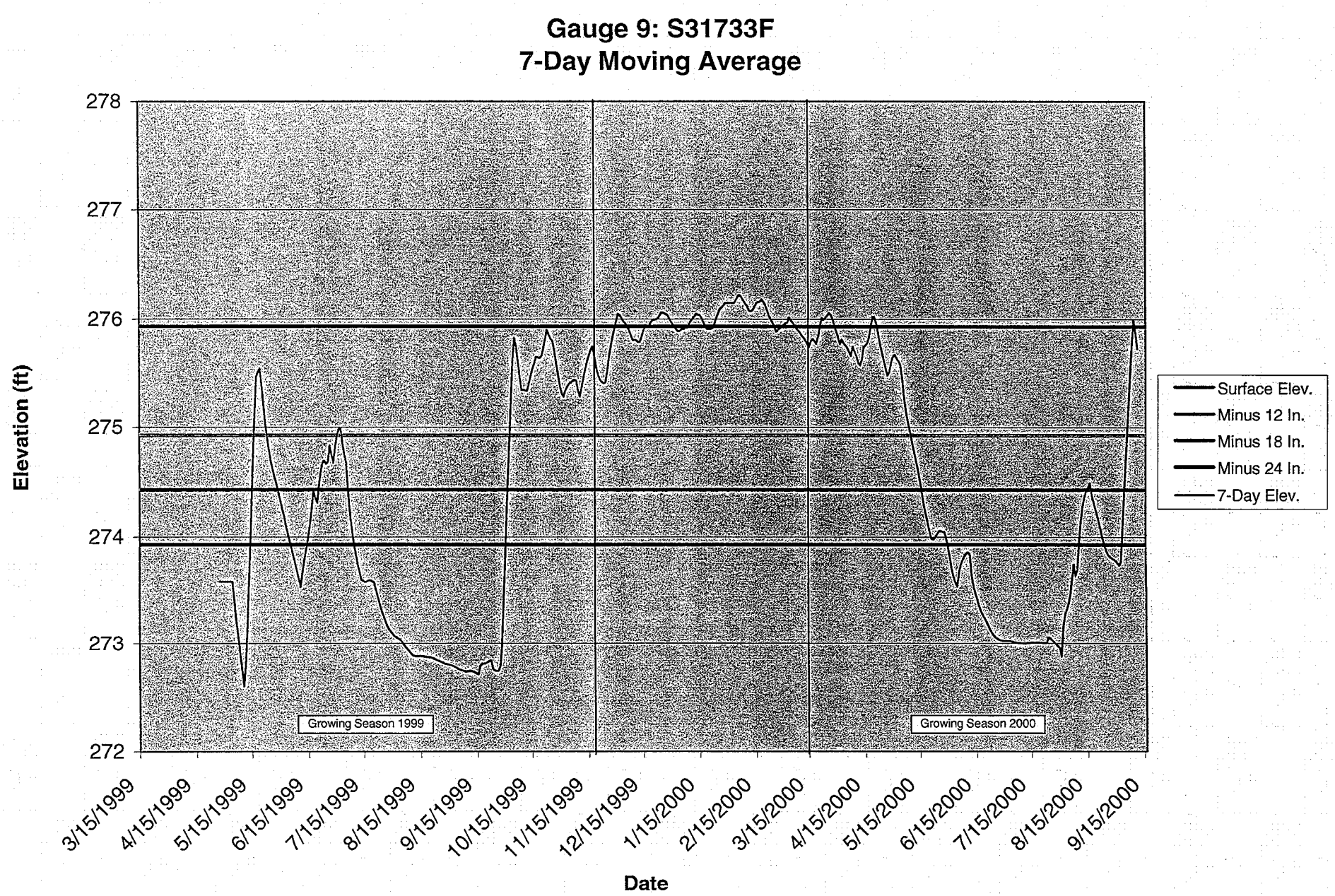

Gauge 3: S31F90D
7-Day Moving Average
Elevation (ft)
279
278
277
276
275
274
273
272
Growing Season 1999
Growing Season 2000
3/15/1999
4/15/1999
5/15/1999
6/15/1999
7/15/1999
8/15/1999
9/15/1999
10/15/1999
11/15/1999
12/15/1999
1/15/2000
2/15/2000
3/15/2000
4/15/2000
5/15/2000
6/15/2000
7/15/2000
8/15/2000
9/15/2000
Date
Surface Elev.
Minus 12 In.
Minus 18 In.
Minus 24 In.
7-Day Elev.

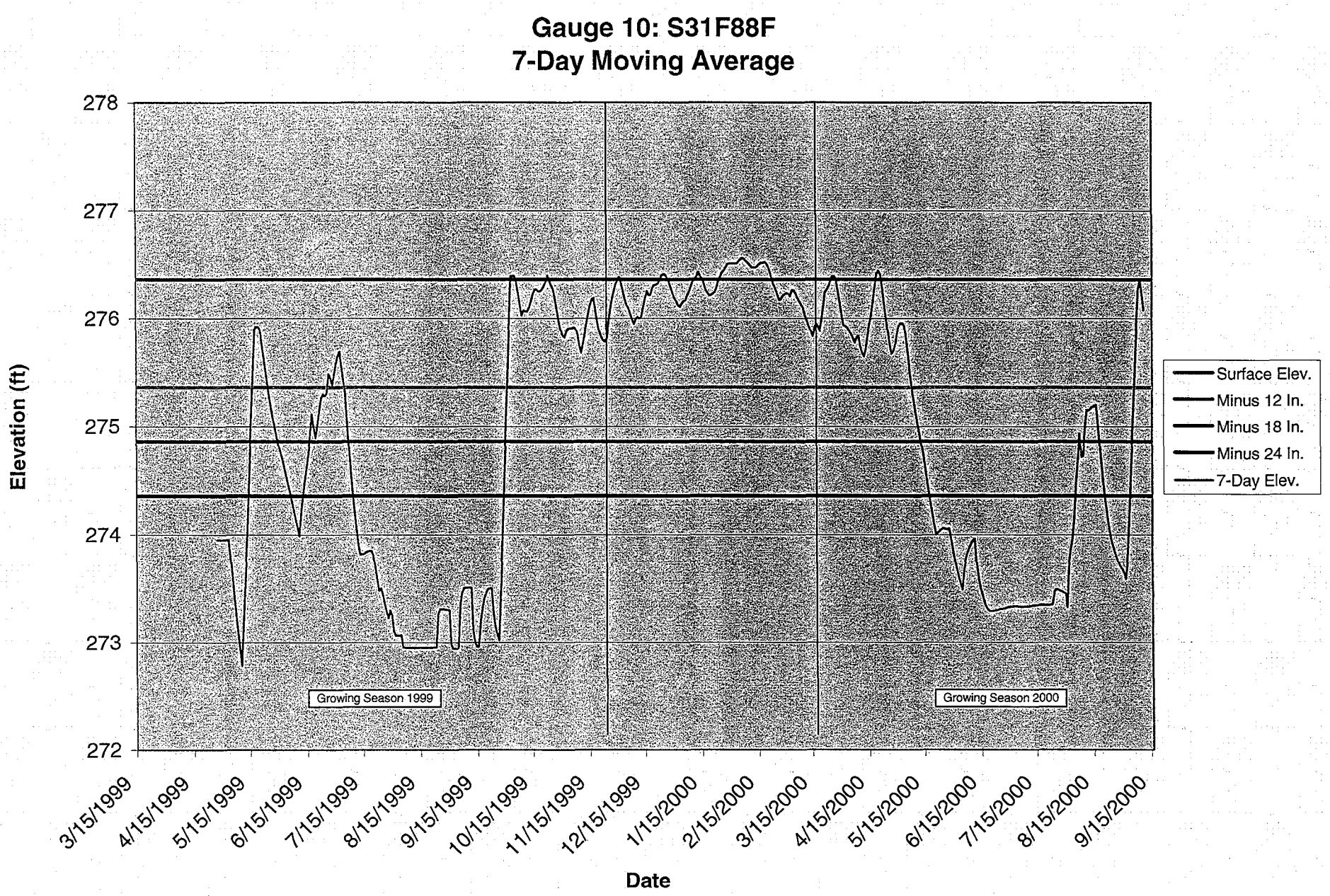

Gauge 4: S3169B3
7-Day Moving Average
Elevation (ft)
279.00
278.00
277.00
276.00
275.00
274.00
273.00
Growing Season 1999
Growing Season 2000
3/15/1999
4/15/1999
5/15/1999
6/15/1999
7/15/1999
8/15/1999
9/15/1999
10/15/1999
11/15/1999
12/15/1999
1/15/2000
2/15/2000
3/15/2000
4/15/2000
5/15/2000
6/15/2000
7/15/2000
8/15/2000
9/15/2000
Date
Surface Elev.
Minus 12 In.
Minus 18 In.
Minus 24 In.
7-Day Elev.

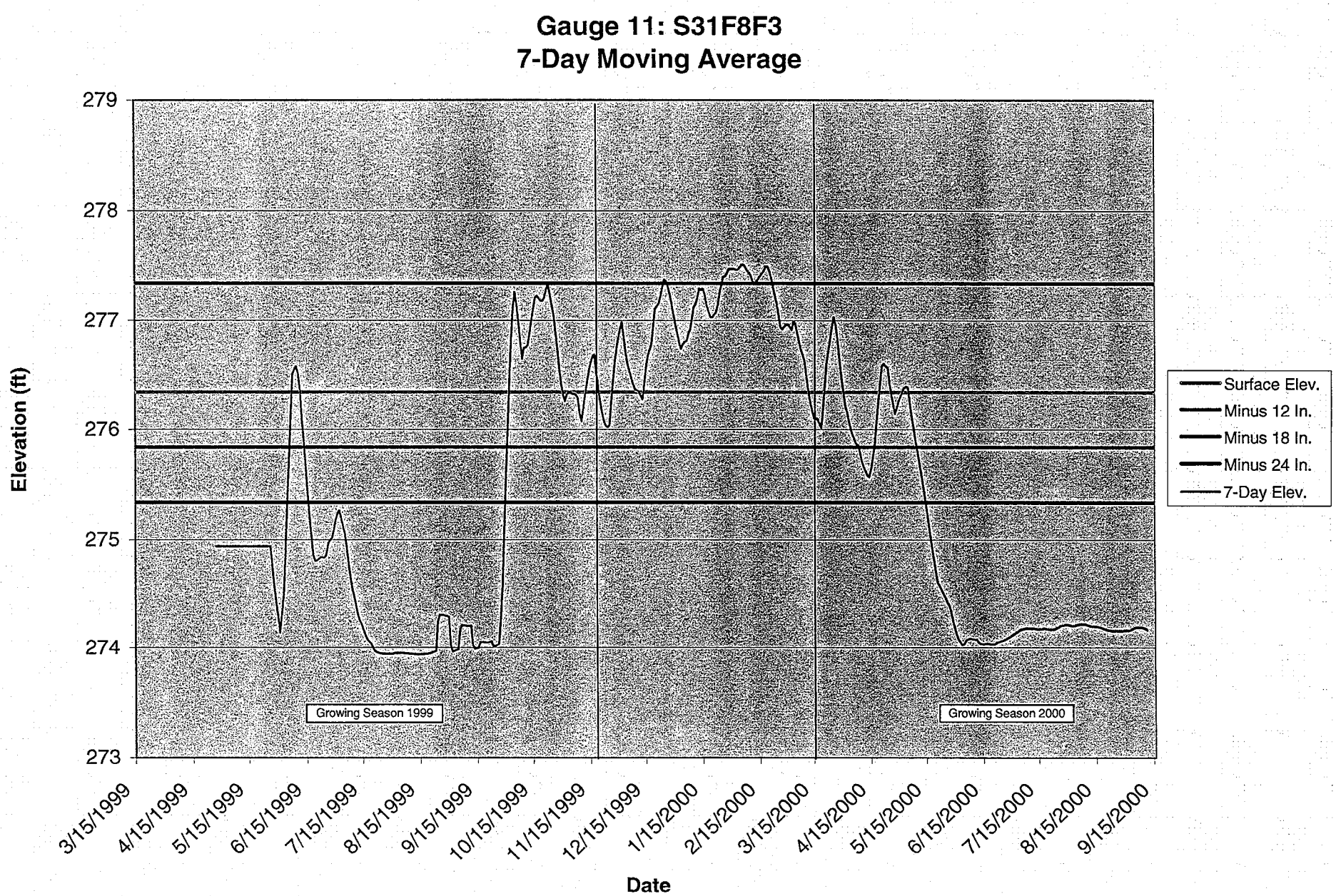

Gauge 6: S31F89B
7-Day Moving Average
Elevation (ft)
279
278
277
276
275
274
273
Growing Season 1999
Growing Season 2000
3/15/1999
4/15/1999
5/15/1999
6/15/1999
7/15/1999
8/15/1999
9/15/1999
10/15/1999
11/15/1999
12/15/1999
1/15/2000
2/15/2000
3/15/2000
4/15/2000
5/15/2000
6/15/2000
7/15/2000
8/15/2000
9/15/2000
Date
Surface Elev.
Minus 12 In.
Minus 18 In.
Minus 24 In.
7-Day Elev.


Gauge 7: S31FA5C
7-Day Moving Average
Elevation (ft)
279
278
277
276
275
274
273
Growing Season 1999
Growing Season 2000
Surface Elev.
Minus 12 In.
Minus 18 In.
Minus 24 In.
7-Day Elev.
3/15/1999
4/15/1999
5/15/1999
6/15/1999
7/15/1999
8/15/1999
9/15/1999
10/15/1999
11/15/1999
12/15/1999
1/15/2000
2/15/2000
3/15/2000
4/15/2000
5/15/2000
6/15/2000
7/15/2000
8/15/2000
9/15/2000
Date

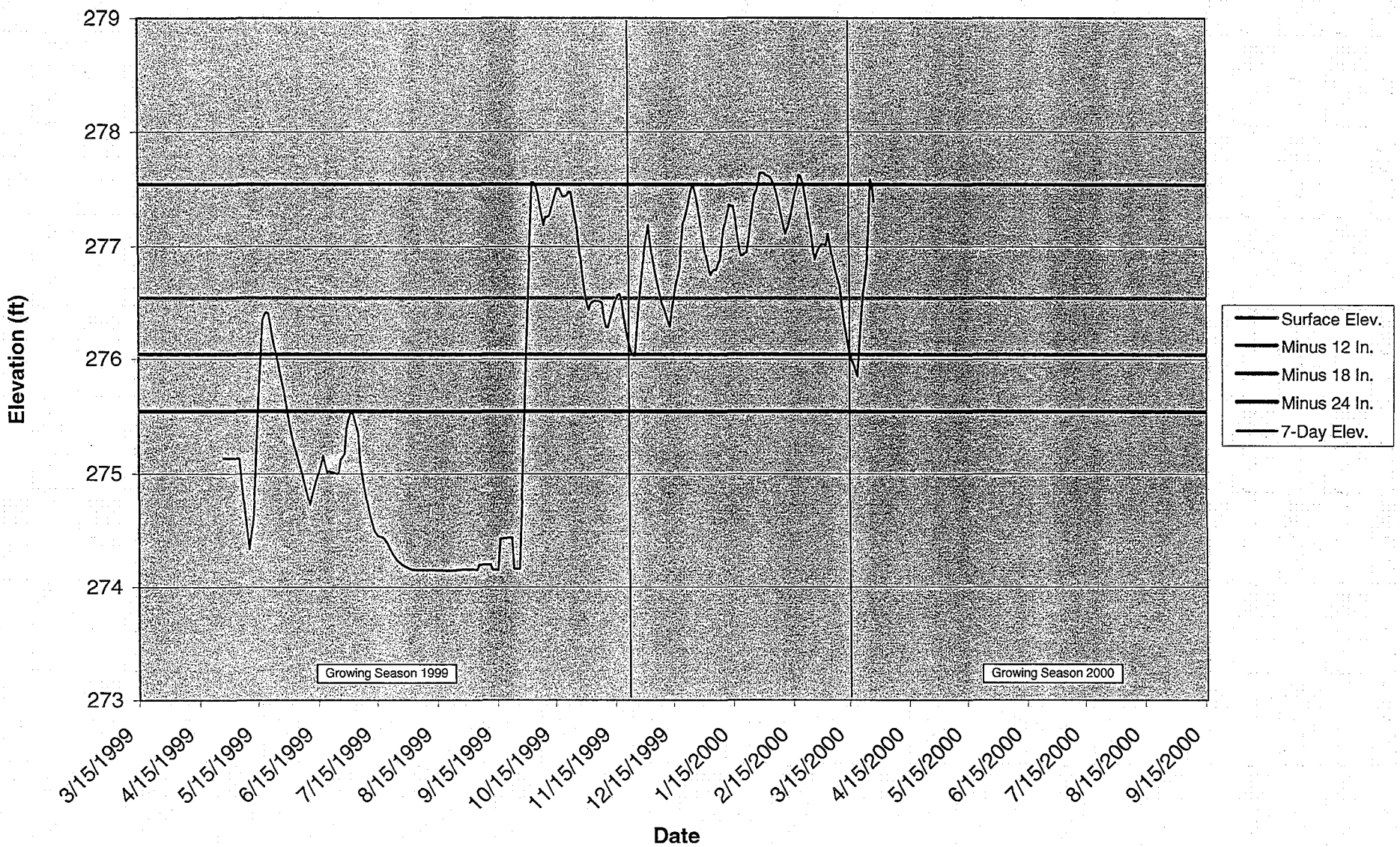

Gauge 8: S31FA95
7-Day Moving Average
Elevation (ft)
277.00
276.00
275.00
274.00
273.00
272.00
271.00
Growing Season 1999
Growing Season 2000
3/15/1999
4/15/1999
5/15/1999
6/15/1999
7/15/1999
8/15/1999
9/15/1999
10/15/1999
11/15/1999
12/15/1999
1/15/2000
2/15/2000
3/15/2000
4/15/2000
5/15/2000
6/15/2000
7/15/2000
8/15/2000
9/15/2000
Date
Surface Elev.
Minus 12 In.
Minus 18 In.
Minus 24 In.
7-Day Elev.

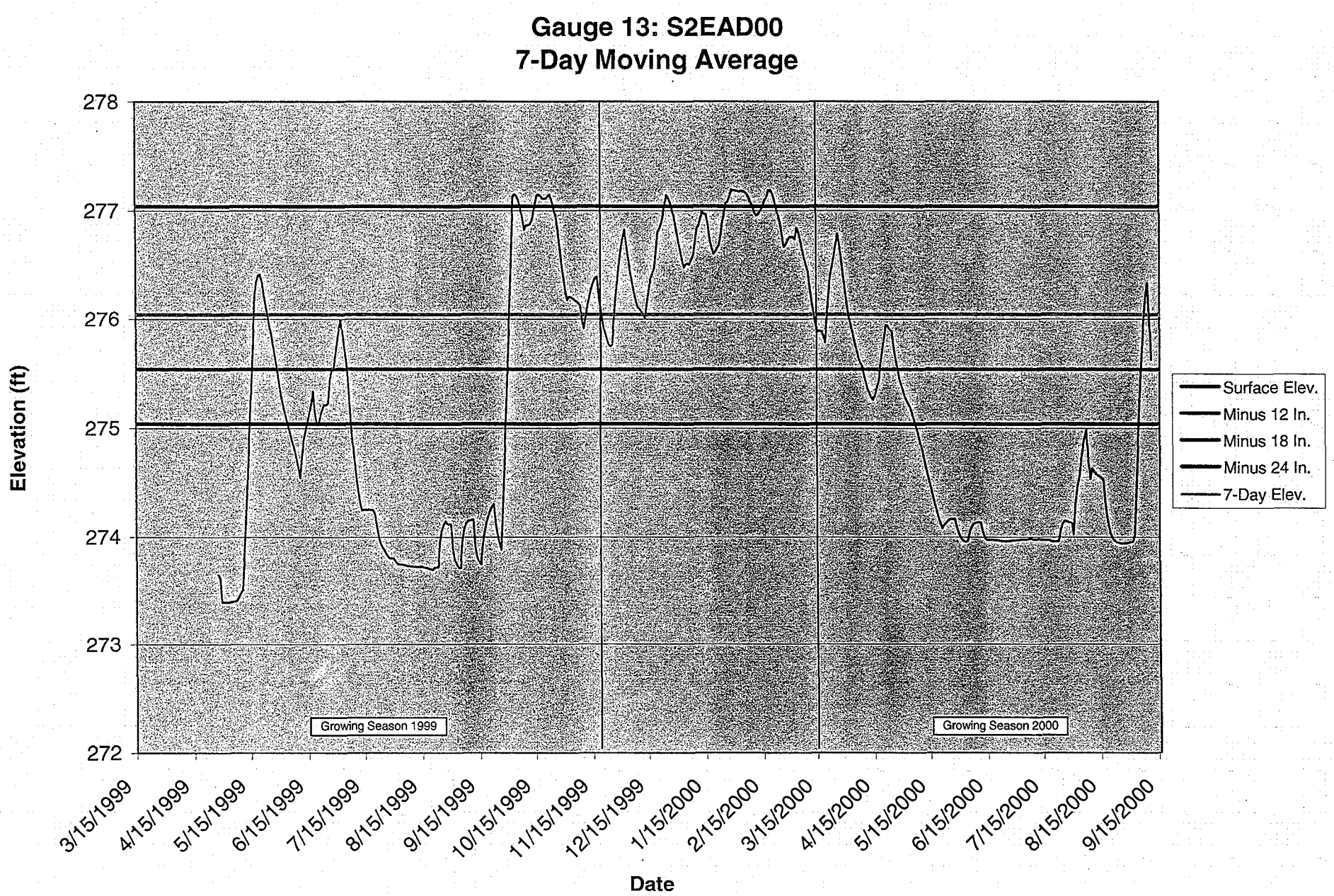

Gauge 9: S31733F
7-Day Moving Average
Elevation (ft)
278
277
276
275
274
273
272
Growing Season 1999
Growing Season 2000
3/15/1999
4/15/1999
5/15/1999
6/15/1999
7/15/1999
8/15/1999
9/15/1999
10/15/1999
11/15/1999
12/15/1999
1/15/2000
2/15/2000
3/15/2000
4/15/2000
5/15/2000
6/15/2000
7/15/2000
8/15/2000
9/15/2000
Date
Surface Elev.
Minus 12 In.
Minus 18 In.
Minus 24 In.
7-Day Elev.

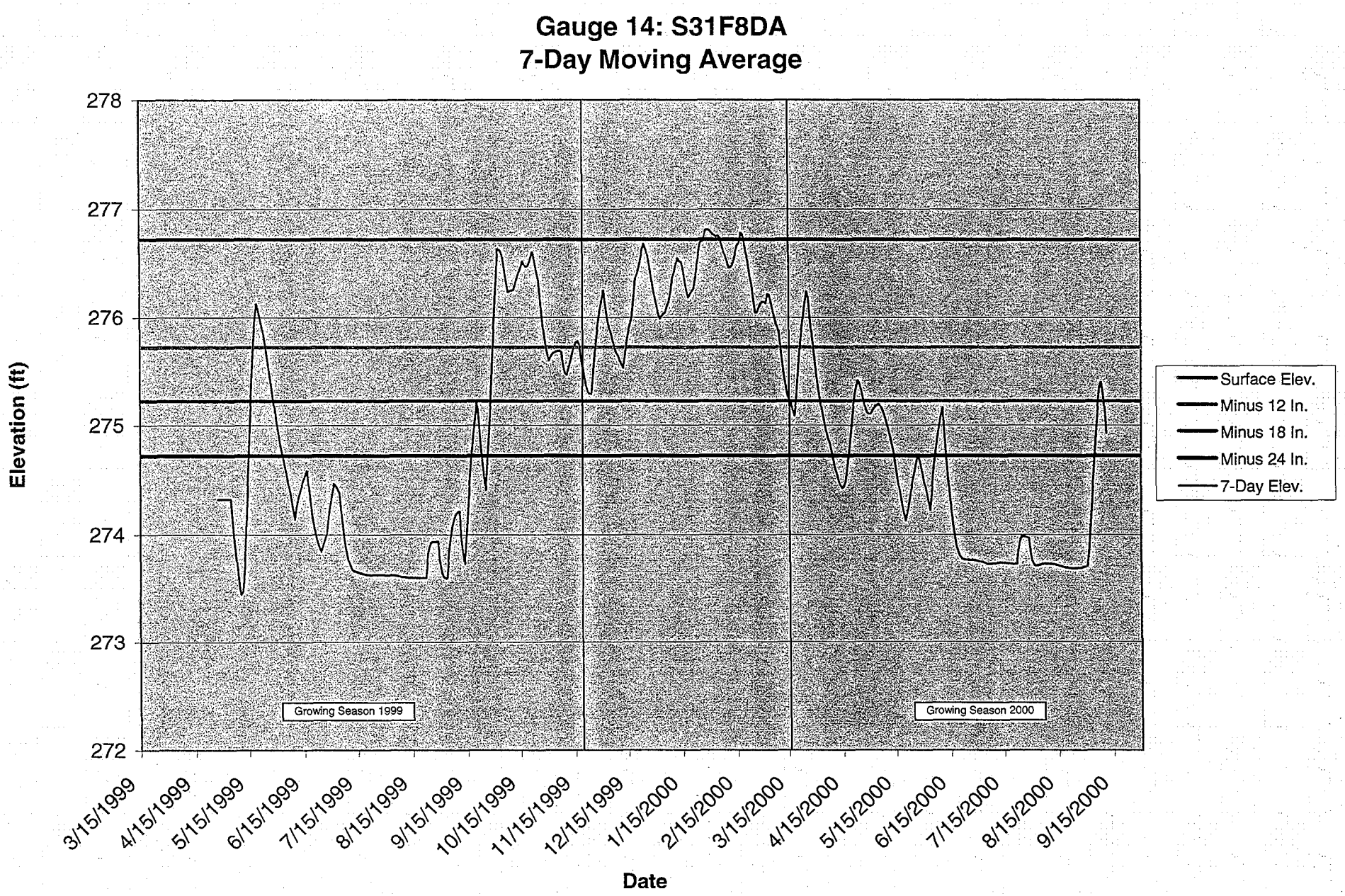

Gauge 10: S31F88F
7-Day Moving Average
Elevation (ft)
278
277
276
275
274
273
272
Growing Season 1999
Growing Season 2000
Surface Elev.
Minus 12 In.
Minus 18 In.
Minus 24 In.
7-Day Elev.
3/15/1999
4/15/1999
5/15/1999
6/15/1999
7/15/1999
8/15/1999
9/15/1999
10/15/1999
11/15/1999
12/15/1999
1/15/2000
2/15/2000
3/15/2000
4/15/2000
5/15/2000
6/15/2000
7/15/2000
8/15/2000
9/15/2000
Date


Gauge 11: S31F8F3
7-Day Moving Average
Elevation (ft)
279
278
277
276
275
274
273
Growing Season 1999
Growing Season 2000
3/15/1999
4/15/1999
5/15/1999
6/15/1999
7/15/1999
8/15/1999
9/15/1999
10/15/1999
11/15/1999
12/15/1999
1/15/2000
2/15/2000
3/15/2000
4/15/2000
5/15/2000
6/15/2000
7/15/2000
8/15/2000
9/15/2000
Date
Surface Elev.
Minus 12 In.
Minus 18 In.
Minus 24 In.
7-Day Elev.

# Gauge 12: S31F8B7
## 7-Day Moving Average




Gauge 13: S2EAD00
7-Day Moving Average
Elevation (ft)
278
277
276
275
274
273
272
Growing Season 1999
Growing Season 2000
3/15/1999
4/15/1999
5/15/1999
6/15/1999
7/15/1999
8/15/1999
9/15/1999
10/15/1999
11/15/1999
12/15/1999
1/15/2000
2/15/2000
3/15/2000
4/15/2000
5/15/2000
6/15/2000
7/15/2000
8/15/2000
9/15/2000
Date
Surface Elev.
Minus 12 In.
Minus 18 In.
Minus 24 In.
7-Day Elev.


Gauge 14: S31F8DA
7-Day Moving Average
Elevation (ft)
278
277
276
275
274
273
272
Growing Season 1999
Growing Season 2000
3/15/1999
4/15/1999
5/15/1999
6/15/1999
7/15/1999
8/15/1999
9/15/1999
10/15/1999
11/15/1999
12/15/1999
1/15/2000
2/15/2000
3/15/2000
4/15/2000
5/15/2000
6/15/2000
7/15/2000
8/15/2000
9/15/2000
Date
Surface Elev.
Minus 12 In.
Minus 18 In.
Minus 24 In.
7-Day Elev.

# Appendix E

# Existing and Post-Restoration Water Budgets Precipitation Data

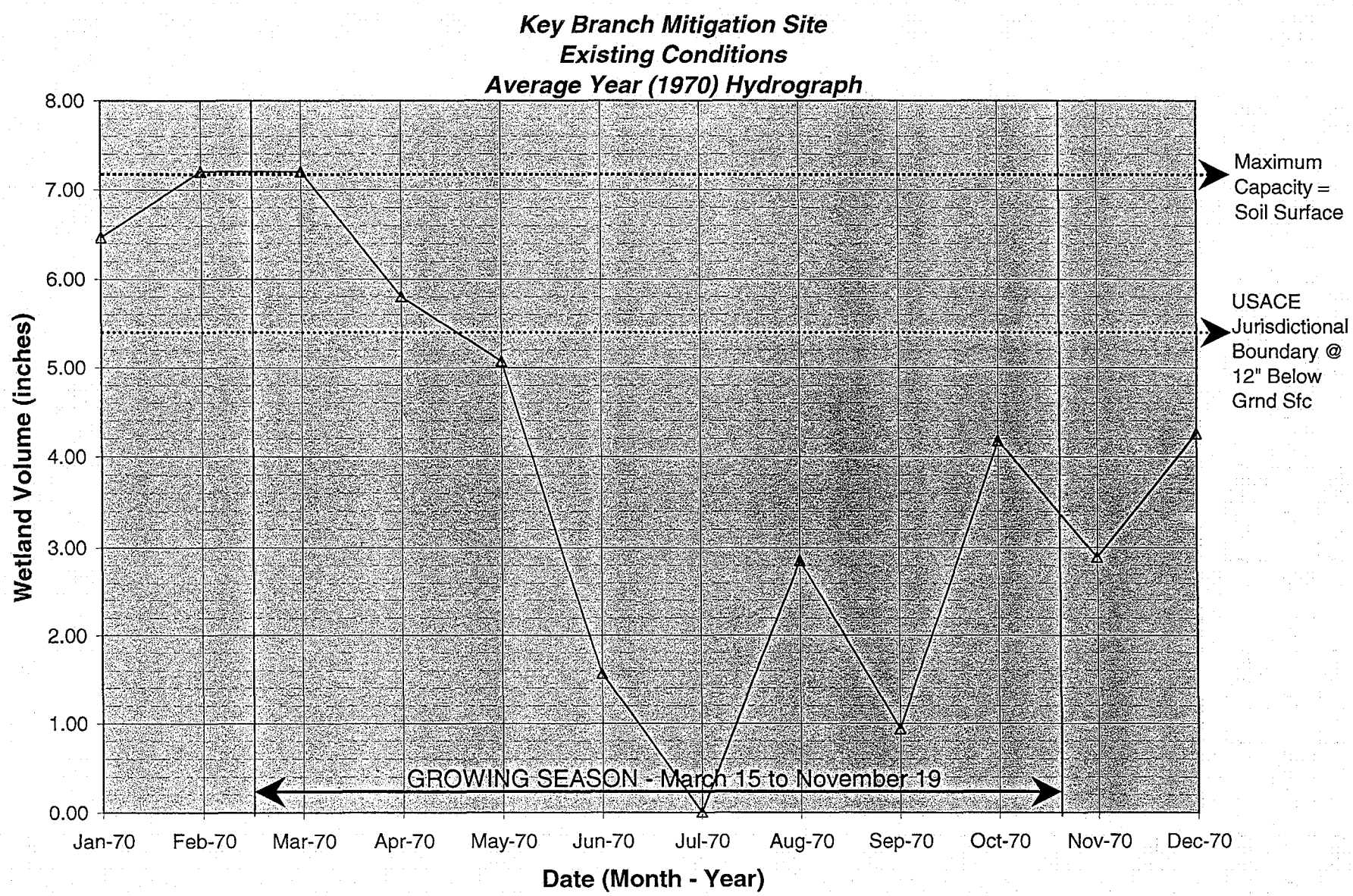
# Key Branch Mitigation Site
# Existing Conditions
# Water Budget

| Dry Year | Water Inputs | | | Water Outputs | | | Change in Storage | Excess Water | Wetland Volume |
|---|---|---|---|---|---|---|---|---|---|
| 1988 | P | Si | Gi | PET | So | Go | | | |
| Jan-88 | 3.93 | * | 0 | 0.22 | * | 0.36 | 3.35 | 0.00 | 5.39 |
| Feb-88 | 1.44 | * | 0 | 0.44 | * | 0.36 | 0.64 | 0.00 | 6.03 |
| Mar-88 | 1.94 | * | 0 | 1.27 | * | 0.37 | 0.30 | 0.00 | 6.33 |
| Apr-88 | 1.76 | * | 0 | 2.63 | * | 0.38 | -1.25 | 0.00 | 5.08 |
| May-88 | 1.69 | * | 0 | 4.30 | * | 0.39 | -3.00 | 0.00 | 2.08 |
| Jun-88 | 1.58 | * | 0 | 5.92 | * | 0.41 | -4.75 | 0.00 | 0.00 |
| Jul-88 | 3.3 | * | 0 | 6.49 | * | 0.4 | -3.59 | 0.00 | 0.00 |
| Aug-88 | 6.6 | * | 0 | 5.94 | * | 0.39 | 0.27 | 0.00 | 0.27 |
| Sep-88 | 5.25 | * | 0 | 4.68 | * | 0.39 | 0.18 | 0.00 | 0.46 |
| Oct-88 | 3.08 | * | 0 | 2.96 | * | 0.38 | -0.26 | 0.00 | 0.19 |
| Nov-88 | 3.78 | * | 0 | 1.70 | * | 0.37 | 1.71 | 0.00 | 1.91 |
| Dec-88 | 1.16 | * | 0 | 0.67 | * | 0.36 | 0.13 | 0.00 | 2.04 |
| **Annual Total** | **35.51** | | **0** | **37.21** | | **4.56** | **-6.26** | **0.00** | |

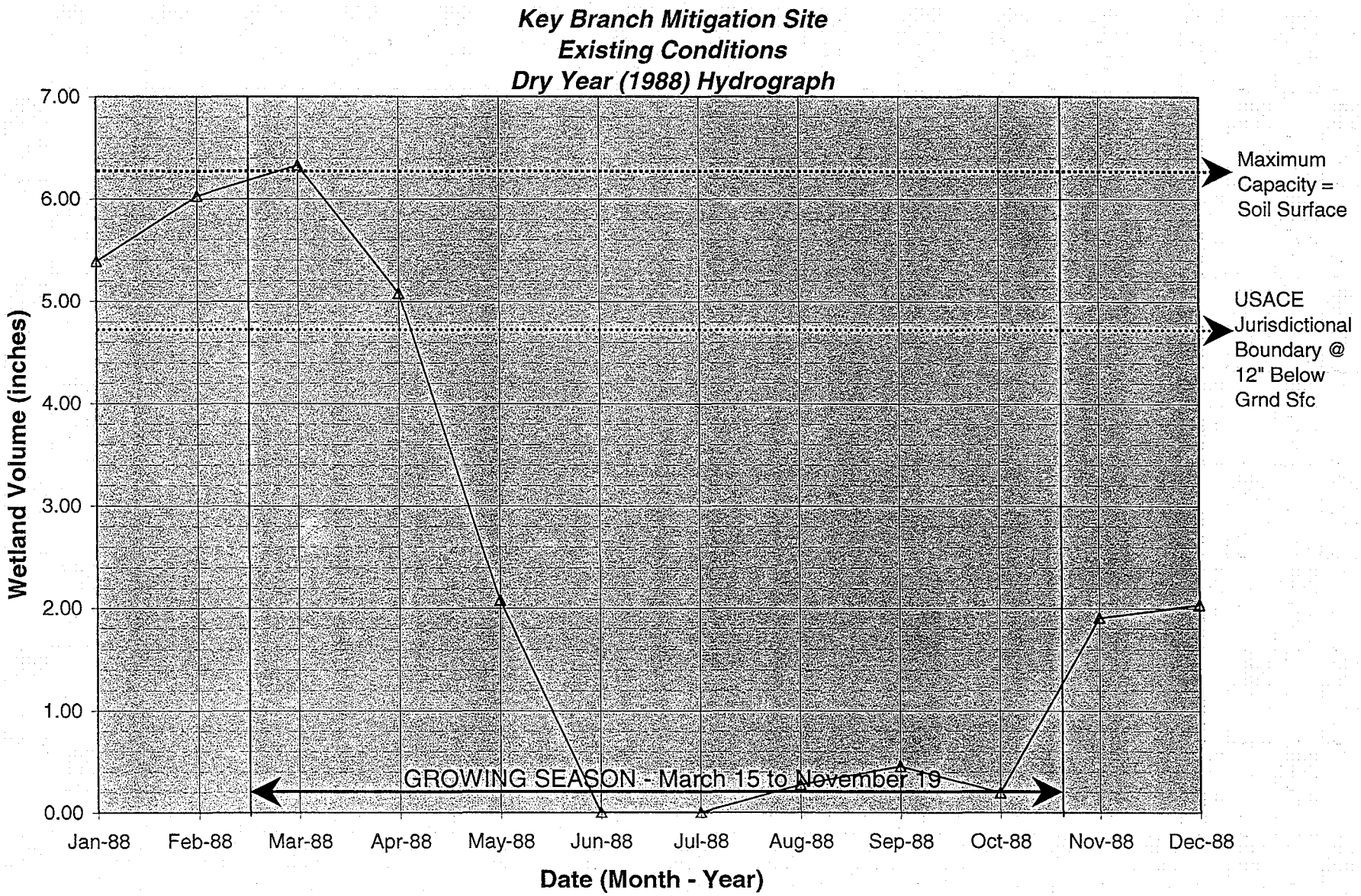
| Avg. Year | Water Inputs | | | Water Outputs | | | Change in Storage | Excess Water | Wetland Volume |
|---|---|---|---|---|---|---|---|---|---|
| 1970 | P | Si | Gi | PET | So | Go | | | |
| Jan-70 | 2.79 | * | 0 | 0.22 | * | 0.36 | 2.21 | 0.00 | 6.47 |
| Feb-70 | 3.78 | * | 0 | 0.44 | * | 0.36 | 2.98 | 2.25 | 7.20 |
| Mar-70 | 4.73 | * | 0 | 1.27 | * | 0.37 | 3.09 | 3.09 | 7.20 |
| Apr-70 | 1.61 | * | 0 | 2.63 | * | 0.38 | -1.40 | 0.00 | 5.80 |
| May-70 | 3.96 | * | 0 | 4.30 | * | 0.39 | -0.73 | 0.00 | 5.07 |
| Jun-70 | 2.82 | * | 0 | 5.92 | * | 0.41 | -3.51 | 0.00 | 1.56 |
| Jul-70 | 4.21 | * | 0 | 6.49 | * | 0.4 | -2.68 | 0.00 | 0.00 |
| Aug-70 | 9.18 | * | 0 | 5.94 | * | 0.39 | 2.85 | 0.00 | 2.85 |
| Sep-70 | 3.15 | * | 0 | 4.68 | * | 0.39 | -1.92 | 0.00 | 0.94 |
| Oct-70 | 6.58 | * | 0 | 2.96 | * | 0.38 | 3.24 | 0.00 | 4.17 |
| Nov-70 | 0.78 | * | 0 | 1.70 | * | 0.37 | -1.29 | 0.00 | 2.89 |
| Dec-70 | 2.4 | * | 0 | 0.67 | * | 0.36 | 1.37 | 0.00 | 4.26 |
| **Annual Total** | **45.99** | | **0** | **37.21** | | **4.56** | **4.22** | **5.34** | |

| Wet Year | Water Inputs | | | Water Outputs | | | Change in Storage | Excess Water | Wetland Volume |
|---|---|---|---|---|---|---|---|---|---|
| 1989 | P | Si | Gi | PET | So | Go | | | |
| Jan-89 | 1.9 | * | 0 | 0.22 | * | 0.36 | 1.32 | 1.32 | 7.20 |
| Feb-89 | 5.06 | * | 0 | 0.44 | * | 0.36 | 4.26 | 4.26 | 7.20 |
| Mar-89 | 5.65 | * | 0 | 1.27 | * | 0.37 | 4.01 | 4.01 | 7.20 |
| Apr-89 | 4.96 | * | 0 | 2.63 | * | 0.38 | 1.95 | 1.95 | 7.20 |
| May-89 | 7.6 | * | 0 | 4.30 | * | 0.39 | 2.91 | 2.91 | 7.20 |
| Jun-89 | 4.86 | * | 0 | 5.92 | * | 0.41 | -1.47 | 0.00 | 5.73 |
| Jul-89 | 8.48 | * | 0 | 6.49 | * | 0.4 | 1.59 | 0.12 | 7.20 |
| Aug-89 | 3.28 | * | 0 | 5.94 | * | 0.39 | -3.05 | 0.00 | 4.15 |
| Sep-89 | 4.89 | * | 0 | 4.68 | * | 0.39 | -0.18 | 0.00 | 3.98 |
| Oct-89 | 4.8 | * | 0 | 2.96 | * | 0.38 | 1.46 | 0.00 | 5.43 |
| Nov-89 | 3.06 | * | 0 | 1.70 | * | 0.37 | 0.99 | 0.00 | 6.43 |
| Dec-89 | 3.61 | * | 0 | 0.67 | * | 0.36 | 2.58 | 1.81 | 7.20 |
| **Annual Total** | **58.15** | | **0** | **37.21** | | **4.56** | **16.38** | **16.38** | |

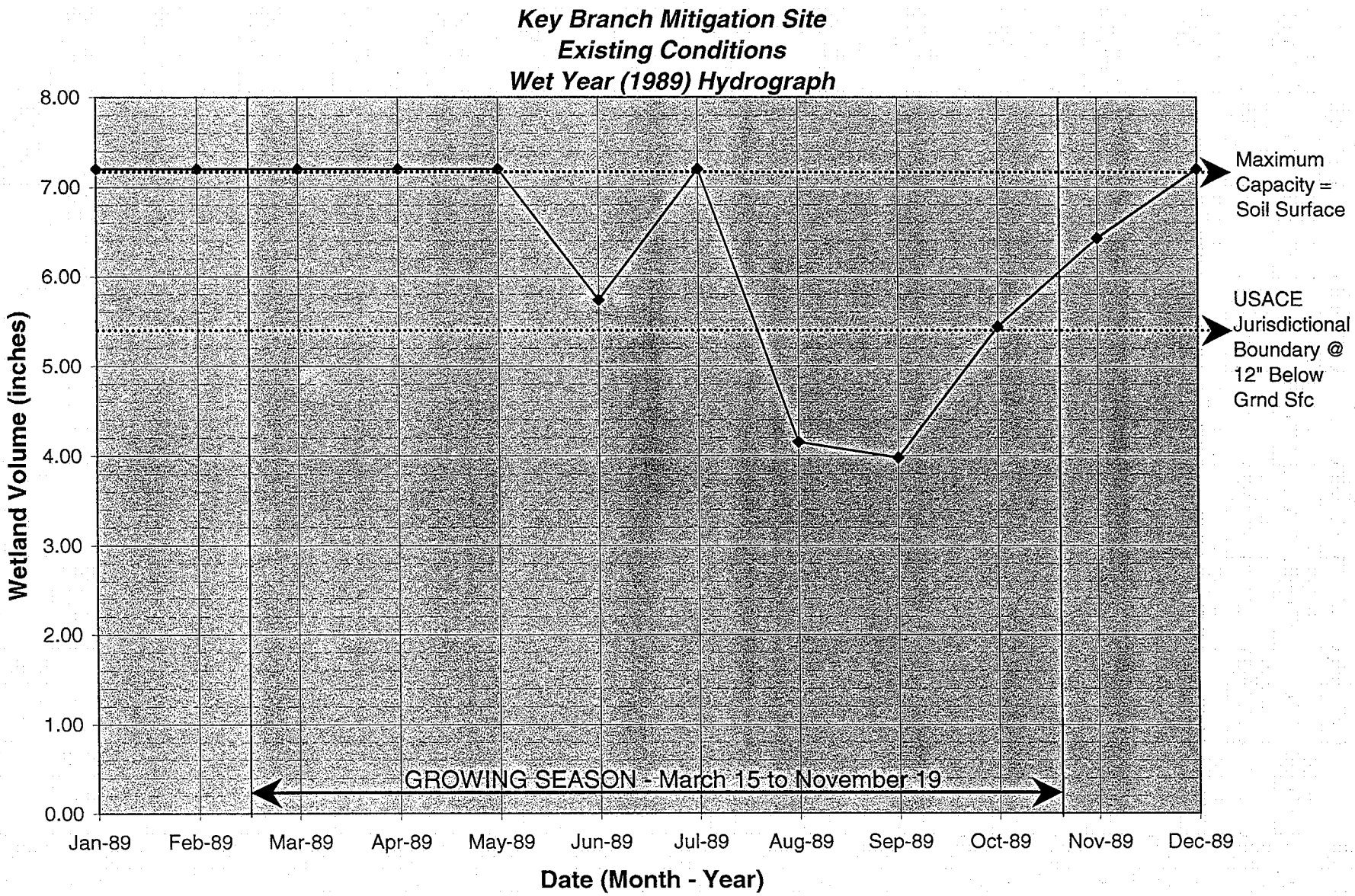
Note: * Current site conditions divert any surface runoff from the site, thus no surface inputs or outputs were calculated.




AppE_Existing WaterBudget
6/24/2002




AppE_Existing WaterBudget
6/24/2002




AppE_Existing WaterBudget
6/24/2002

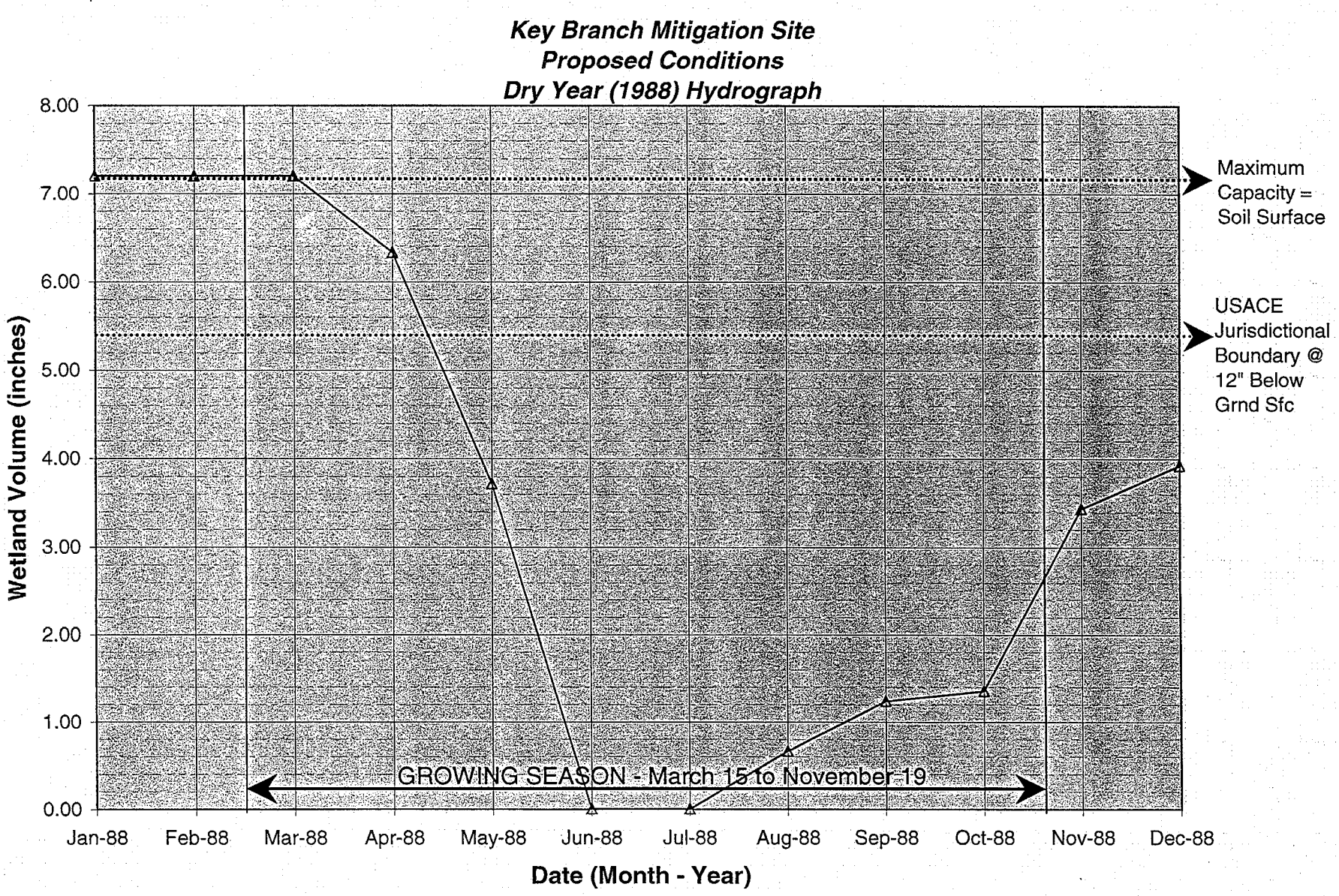
# Key Branch Mitigation Site
# Proposed Conditions
# Water Budget

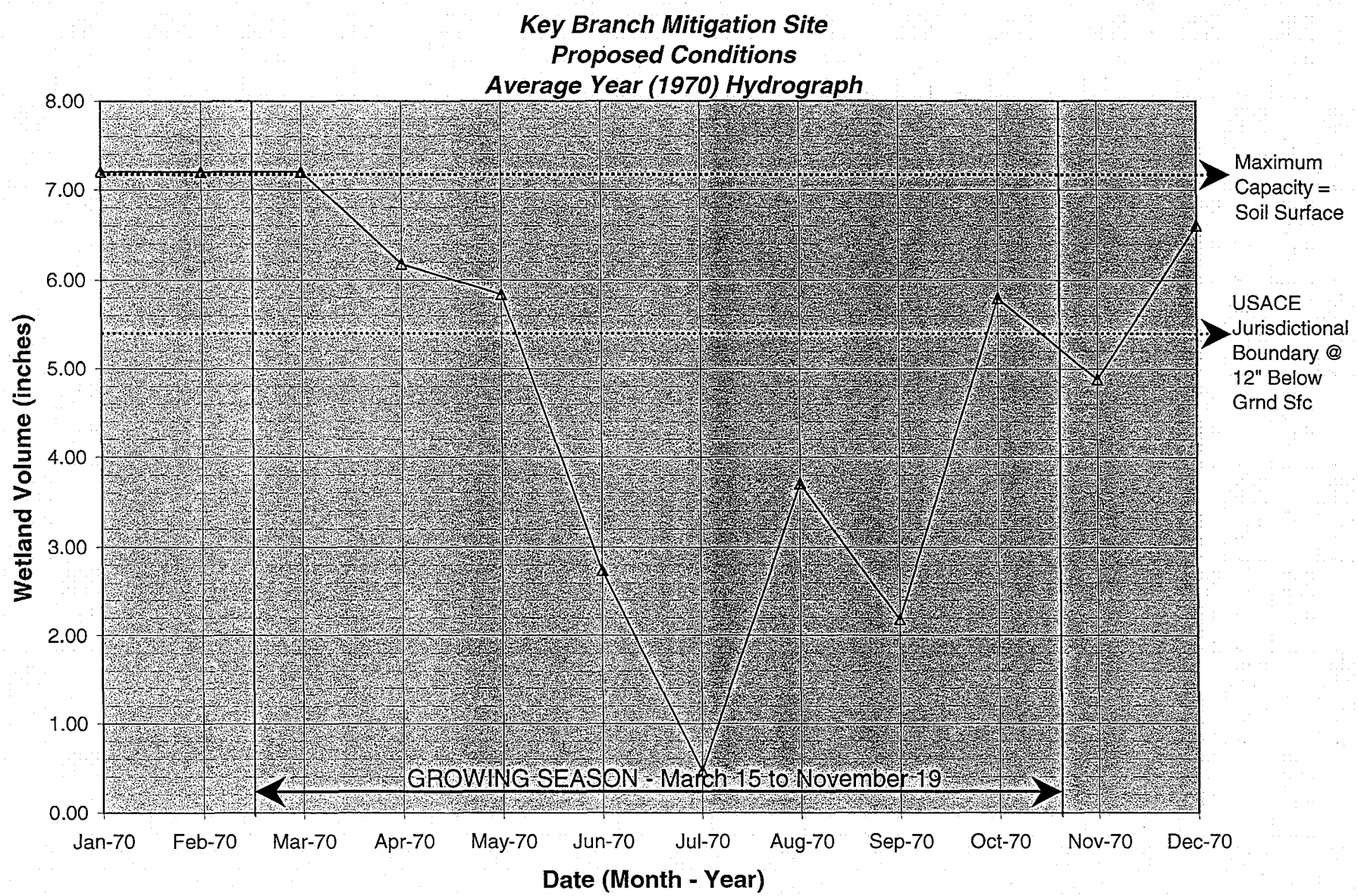
| Dry Year | Water Inputs | | | Water Outputs | | | Change in Storage | Excess Water | Wetland Volume |
|---|---|---|---|---|---|---|---|---|---|
| 1988 | P | Si | Gi | PET | So | Go | | | |
| Jan-88 | 3.93 | * | 0 | 0.22 | * | 0 | 3.71 | 0.44 | 7.20 |
| Feb-88 | 1.44 | * | 0 | 0.44 | * | 0 | 1.00 | 1.00 | 7.20 |
| Mar-88 | 1.94 | * | 0 | 1.27 | * | 0 | 0.67 | 0.67 | 7.20 |
| Apr-88 | 1.76 | * | 0 | 2.63 | * | 0 | -0.87 | 0.00 | 6.33 |
| May-88 | 1.69 | * | 0 | 4.30 | * | 0 | -2.61 | 0.00 | 3.72 |
| Jun-88 | 1.58 | * | 0 | 5.92 | * | 0 | -4.34 | 0.00 | 0.00 |
| Jul-88 | 3.3 | * | 0 | 6.49 | * | 0 | -3.19 | 0.00 | 0.00 |
| Aug-88 | 6.6 | * | 0 | 5.94 | * | 0 | 0.66 | 0.00 | 0.66 |
| Sep-88 | 5.25 | * | 0 | 4.68 | * | 0 | 0.57 | 0.00 | 1.24 |
| Oct-88 | 3.08 | * | 0 | 2.96 | * | 0 | 0.12 | 0.00 | 1.35 |
| Nov-88 | 3.78 | * | 0 | 1.70 | * | 0 | 2.08 | 0.00 | 3.44 |
| Dec-88 | 1.16 | * | 0 | 0.67 | * | 0 | 0.49 | 0.00 | 3.93 |
| **Annual Total** | **35.51** | | **0** | **37.21** | | **0** | **-1.70** | **2.11** | |

| Avg. Year | Water Inputs | | | Water Outputs | | | Change in Storage | Excess Water | Wetland Volume |
|---|---|---|---|---|---|---|---|---|---|
| 1970 | P | Si | Gi | PET | So | Go | | | |
| Jan-70 | 2.79 | * | 0 | 0.22 | * | 0 | 2.57 | 1.98 | 7.20 |
| Feb-70 | 3.78 | * | 0 | 0.44 | * | 0 | 3.34 | 3.34 | 7.20 |
| Mar-70 | 4.73 | * | 0 | 1.27 | * | 0 | 3.46 | 3.46 | 7.20 |
| Apr-70 | 1.61 | * | 0 | 2.63 | * | 0 | -1.02 | 0.00 | 6.18 |
| May-70 | 3.96 | * | 0 | 4.30 | * | 0 | -0.34 | 0.00 | 5.84 |
| Jun-70 | 2.82 | * | 0 | 5.92 | * | 0 | -3.10 | 0.00 | 2.74 |
| Jul-70 | 4.21 | * | 0 | 6.49 | * | 0 | -2.28 | 0.00 | 0.46 |
| Aug-70 | 9.18 | * | 0 | 5.94 | * | 0 | 3.24 | 0.00 | 3.70 |
| Sep-70 | 3.15 | * | 0 | 4.68 | * | 0 | -1.53 | 0.00 | 2.18 |
| Oct-70 | 6.58 | * | 0 | 2.96 | * | 0 | 3.62 | 0.00 | 5.80 |
| Nov-70 | 0.78 | * | 0 | 1.70 | * | 0 | -0.92 | 0.00 | 4.88 |
| Dec-70 | 2.4 | * | 0 | 0.67 | * | 0 | 1.73 | 0.00 | 6.61 |
| **Annual Total** | **45.99** | | **0** | **37.21** | | **0** | **8.78** | **8.78** | |

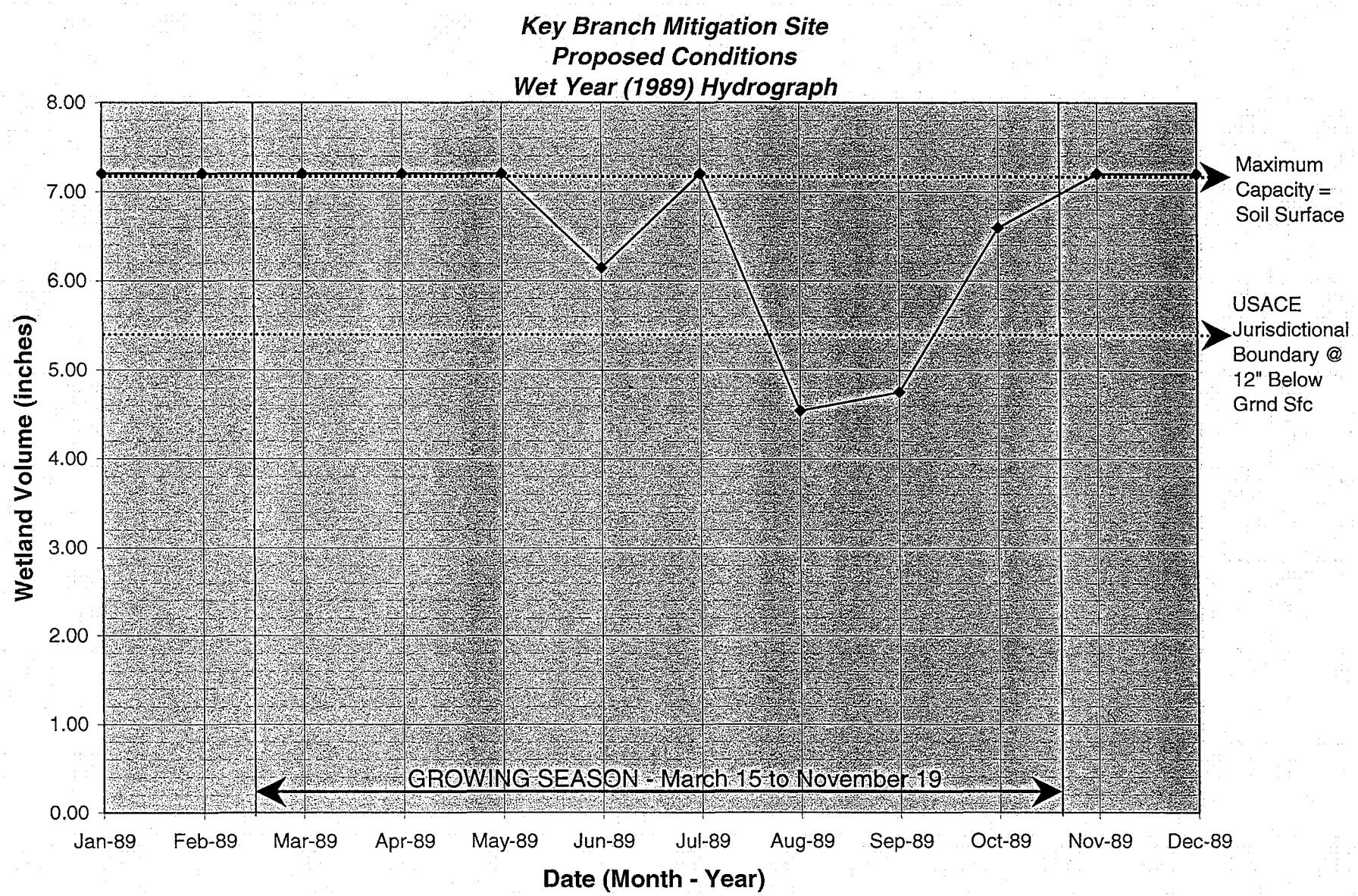
| Wet Year | Water Inputs | | | Water Outputs | | | Change in Storage | Excess Water | Wetland Volume |
|---|---|---|---|---|---|---|---|---|---|
| 1989 | P | Si | Gi | PET | So | Go | | | |
| Jan-89 | 1.9 | * | 0 | 0.22 | * | 0 | 1.68 | 1.68 | 7.20 |
| Feb-89 | 5.06 | * | 0 | 0.44 | * | 0 | 4.62 | 4.62 | 7.20 |
| Mar-89 | 5.65 | * | 0 | 1.27 | * | 0 | 4.38 | 4.38 | 7.20 |
| Apr-89 | 4.96 | * | 0 | 2.63 | * | 0 | 2.33 | 2.33 | 7.20 |
| May-89 | 7.6 | * | 0 | 4.30 | * | 0 | 3.30 | 3.30 | 7.20 |
| Jun-89 | 4.86 | * | 0 | 5.92 | * | 0 | -1.06 | 0.00 | 6.14 |
| Jul-89 | 8.48 | * | 0 | 6.49 | * | 0 | 1.99 | 0.93 | 7.20 |
| Aug-89 | 3.28 | * | 0 | 5.94 | * | 0 | -2.66 | 0.00 | 4.54 |
| Sep-89 | 4.89 | * | 0 | 4.68 | * | 0 | 0.21 | 0.00 | 4.76 |
| Oct-89 | 4.8 | * | 0 | 2.96 | * | 0 | 1.84 | 0.00 | 6.59 |
| Nov-89 | 3.06 | * | 0 | 1.70 | * | 0 | 1.36 | 0.76 | 7.20 |
| Dec-89 | 3.61 | * | 0 | 0.67 | * | 0 | 2.94 | 2.94 | 7.20 |
| **Annual Total** | **58.15** | | **0** | **37.21** | | **0** | **20.94** | **20.94** | |

Note: * Proposed site design will route surface flows through the site, thus surface water input and output are not included.


Key Branch Mitigation Site
Proposed Conditions
Dry Year (1988) Hydrograph
Wetland Volume (inches)
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Jan-88
Feb-88
Mar-88
Apr-88
May-88
Jun-88
Jul-88
Aug-88
Sep-88
Oct-88
Nov-88
Dec-88
Date (Month - Year)
Maximum Capacity = Soil Surface
USACE Jurisdictional Boundary @ 12" Below Grnd Sfc
GROWING SEASON - March 15 to November 19




AppE_Post-Restoration WaterBudget
6/24/2002




AppE_Post-Restoration WaterBudget
6/24/2002

*Key Branch Mitigation Site*

| Rainfall Data (Inches): Wadesboro, NC | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Average* | 1994* | 1995* | 1996* | 1997* | 1998* | 1999** | 2000** |
| January | **4.22** | 3.42 | 4.15 | 3.45 | 4.08 | 11.58 | 5.69 | 7.68 |
| February | **3.98** | 3.22 | 5.25 | 1.75 | 3.81 | 6.04 | 2.07 | 1.92 |
| March | **4.51** | 4.86 | 2.16 | 5.00 | 3.41 | 5.47 | 3.62 | 3.06 |
| April | **2.65** | 1.01 | 0.70 | 3.47 | 3.65 | 5.64 | 5.31 | 3.31 |
| May | **3.95** | 2.50 | 2.33 | 1.80 | 1.46 | 2.87 | 2.12 | 1.38 |
| June | **4.28** | 7.33 | 9.65 | 2.92 | 3.41 | 4.23 | 7.13 | 3.07 |
| July | **5.26** | 5.62 | 4.50 | 4.53 | 10.15 | 3.37 | 3.63 | 4.89 |
| August | **4.67** | 4.60 | 5.60 | 6.50 | 0.62 | 3.72 | 4.46 | 5.54 |
| September | **3.72** | 4.74 | 1.72 | 5.28 | 4.02 | 5.44 | 12.22 | 8.02 |
| October | **3.42** | 3.14 | 8.22 | 4.05 | 5.36 | 3.58 | 2.49 | 0.00 |
| November | **2.92** | 2.83 | 4.35 | 3.01 | 5.09 | 1.51 | 2.23 | 3.18 |
| December | **3.45** | 2.70 | 1.26 | 2.23 | 4.40 | 3.85 | 1.73 | 1.77 |
| Annual Sum | **47.04** | **45.97** | **49.89** | **43.99** | **49.46** | **57.30** | **52.70** | **43.82** |
| | | | | | | | | |
| Deviation from Avg. | | **- 1.07** | **+ 2.85** | **- 3.05** | **+ 2.42** | **+ 10.26** | **+ 5.66** | **- 3.22** |

*NRCS WETS Data

**Town of Wadesboro, NC Data

WETS Station : WADESBORO, NC8964 Creation Date: 08/30/1999
Latitude: 3458 Longitude: 08004 Elevation: 00480
State FIPS/County(FIPS): 37007 County Name: Anson
Start yr. - 1961 End yr. - 1990

| Month | Temperature (Degrees F.) avg daily max | avg daily min | avg | Precipitation (Inches) avg | 30% chance will have less than | more than | avg # of days w/.1 or more | avg total snow fall |
|---|---|---|---|---|---|---|---|---|
| January | 50.6 | 30.0 | 40.3 | 4.22 | 2.98 | 5.00 | 7 | 1.5 |
| February | 54.8 | 32.3 | 43.6 | 3.98 | 2.50 | 4.81 | 6 | 2.0 |
| March | 63.9 | 40.6 | 52.2 | 4.51 | 3.16 | 5.35 | 7 | 0.8 |
| April | 73.3 | 48.9 | 61.1 | 2.65 | 1.54 | 3.23 | 5 | 0.0 |
| May | 80.4 | 57.3 | 68.9 | 3.95 | 2.69 | 4.72 | 6 | 0.0 |
| June | 86.7 | 65.0 | 75.9 | 4.28 | 2.64 | 5.18 | 6 | 0.0 |
| July | 89.7 | 68.9 | 79.3 | 5.26 | 3.39 | 6.33 | 8 | 0.0 |
| August | 88.6 | 68.1 | 78.3 | 4.67 | 2.79 | 5.66 | 6 | 0.0 |
| September | 83.3 | 61.8 | 72.6 | 3.72 | 1.69 | 4.54 | 4 | 0.0 |
| October | 73.7 | 49.4 | 61.6 | 3.42 | 1.50 | 4.16 | 4 | 0.0 |
| November | 64.7 | 41.5 | 53.1 | 2.92 | 1.81 | 3.54 | 4 | 0.1 |
| December | 54.4 | 33.4 | 43.9 | 3.45 | 2.31 | 4.13 | 6 | 0.6 |
| Annual | ----- | ----- | ----- | ------ | 42.85 | 50.43 | -- | ---- |
| Average | 72.0 | 49.8 | 60.9 | ------ | ------ | ------ | -- | ---- |
| Total | ----- | ----- | ----- | 47.04 | ------ | ------ | 69 | 5.0 |

GROWING SEASON DATES

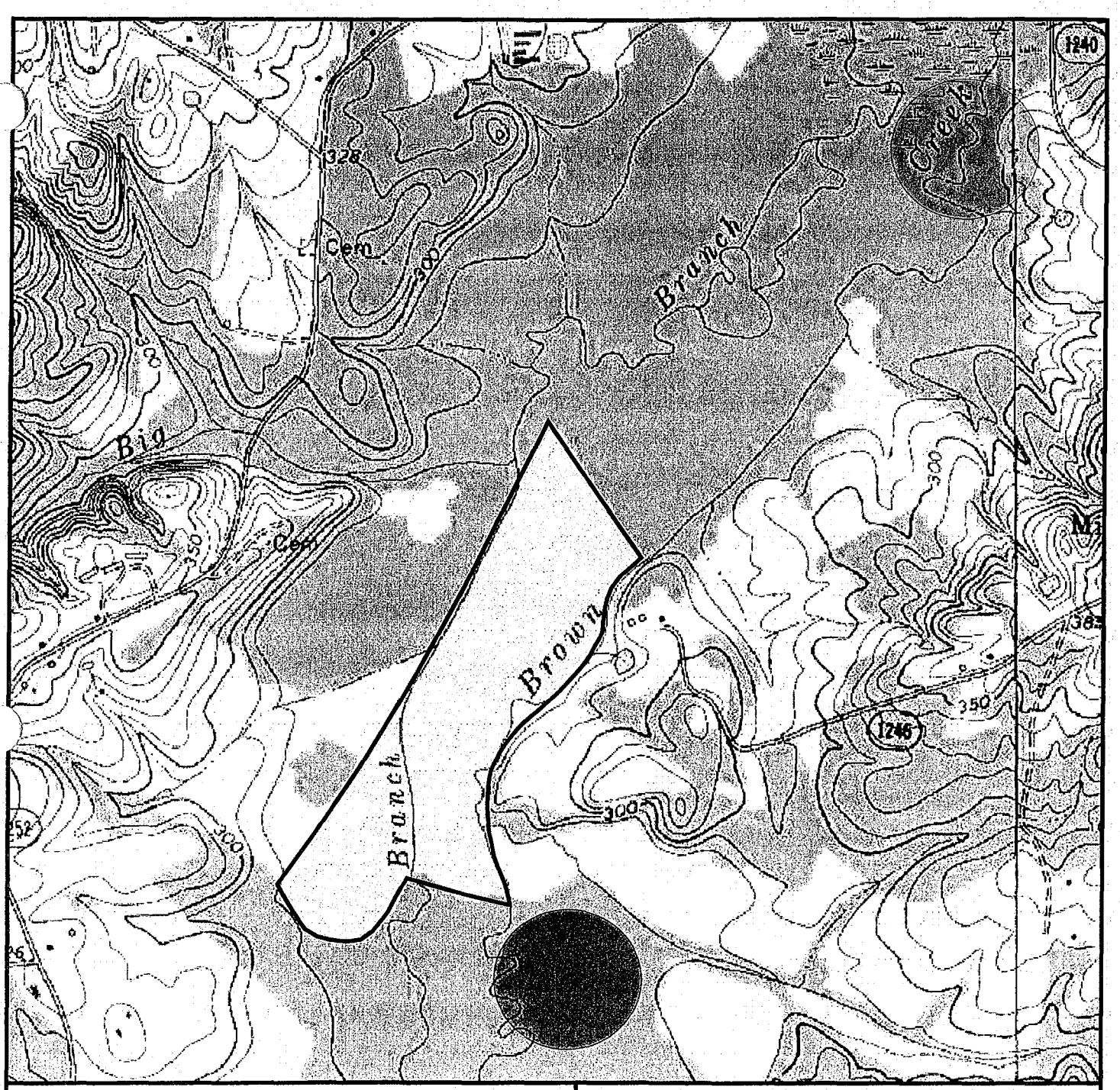
| Probability | Temperature: 24 F or higher | 28 F or higher | 32 F or higher |
|---|---|---|---|
| | Beginning and Ending Dates Growing Season Length | | |
| 50 percent * | 2/26 to 12/ 5<br>283 days | 3/15 to 11/18<br>248 days | 3/27 to 11/ 4<br>222 days |
| 70 percent * | 2/19 to 12/12<br>297 days | 3/11 to 11/23<br>257 days | 3/22 to 11/ 9<br>232 days |

* Percent chance of the growing season occurring between the Beginning and Ending dates.

total 1948-1999 prcp

Station : NC8964, WADESBORO
----- Unit = inches

| yr | jan | feb | mar | apr | may | jun | jul | aug | sep | oct | nov | dec | annl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 48 | | | | | | | | M1.91 | 5.48 | M0.75 | 3.24 | | 11.38 |




**Lower Yadkin River Basin**

# Key Branch Mitigation Site

# Wetland and Stream Reference Sites

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

- Key Branch Mitigation Site
- Wetland Reference Site
- Stream Reference Reach

(USGS Marshville, NC 7.5 Min. Topo. Quad.)

# Wetland Reference Site Photos

**Typical wetland reference site conditions.**

**View of shallow depressional swale located within the wetland reference site.**

## Wetland Reference Site - Typical Plant Community

**Location: Reference Site East** (1/10 Acre Quadrat Plot Sampling)

| Stratum | Species | Indicator Status | DBH(inches) | Rank |
|---|---|---|---|---|
| Overstory | *Quercus michauxii* | FACW- | 14,12,8,8 | 1 |
| | *Acer rubrum* | FAC | 9 | 4 |
| | *Ulmus americana* | FACW | 6,12 | 3 |
| | *Liquidambar styraciflua* | FAC | 18,7,28 | 2 |
| Saplings | *Quercus michauxii* | FACW- | | |
| | *Fraxinus pennsylvanica* | FACW | | |
| | *Ilex decidua* | FACW- | | |
| | *Carpinus caroliniana* | FAC | | |
| Woody Vines | *Campsis radicans* | FAC | | |
| | *Toxicodendron radicans* | FAC | | |
| | *Smilax walteri* | OBL | | |
| Herbaceous | *Arisaema triphyllum* | FACW- | | |

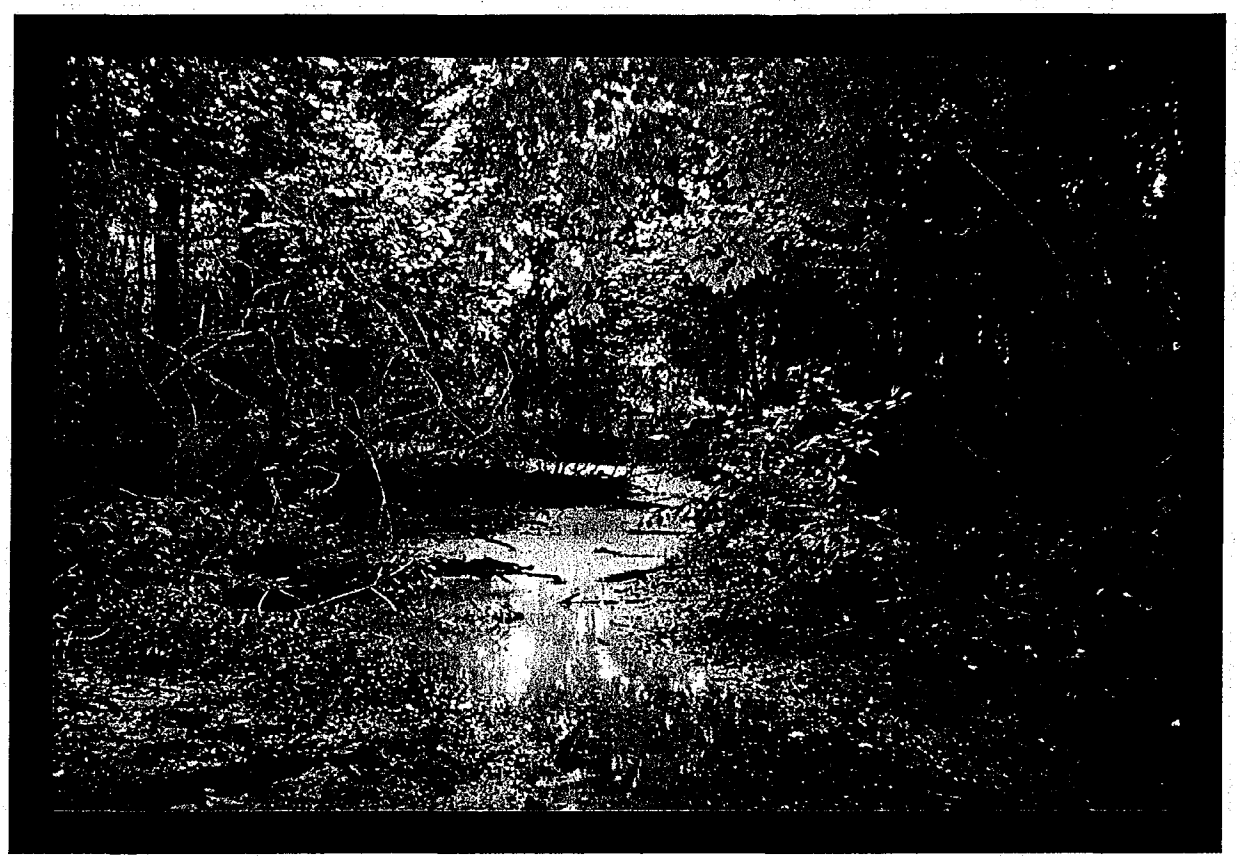
**Location: Reference Site West** (1/10 Acre Quadrat Plot Sampling)

| Stratum | Species | Indicator Status | DBH(inches) | Rank |
|---|---|---|---|---|
| Overstory | *Quercus pagoda* | FAC | 14, 24 | 2 |
| | *Quercus michauxii* | FACW- | 15,14,11,12, 7,11,18,11 | 1 |
| | *Acer rubrum* | FAC | 12 | 3 |
| | *Carya cordiformis* | FAC | 7 | 4 |
| Saplings | *Quercus michauxii* | FACW- | | |
| | *Carya cordiformis* | FAC | | |
| | *Fraxinus pennsylvanica* | FACW | | |
| | *Ilex decidua* | FACW- | | |
| | *Carpinus caroliniana* | FAC | | |
| Woody Vines | *Campsis radicans* | FAC | | |
| | *Toxicodendron radicans* | FAC | | |
| | *Smilax walteri* | OBL | | |
| Herbaceous | *Arisaema triphyllum* | FACW- | | |

**KEY:**

| | |
|---|---|
| FAC | Facultative |
| FAC+ | Facultative positive |
| FAC- | Facultative negative |
| FACW | Facultative wet |
| FACW+ | Facultative wet positive |
| FACW- | Facultative wet negative |
| OBL | Obligate |

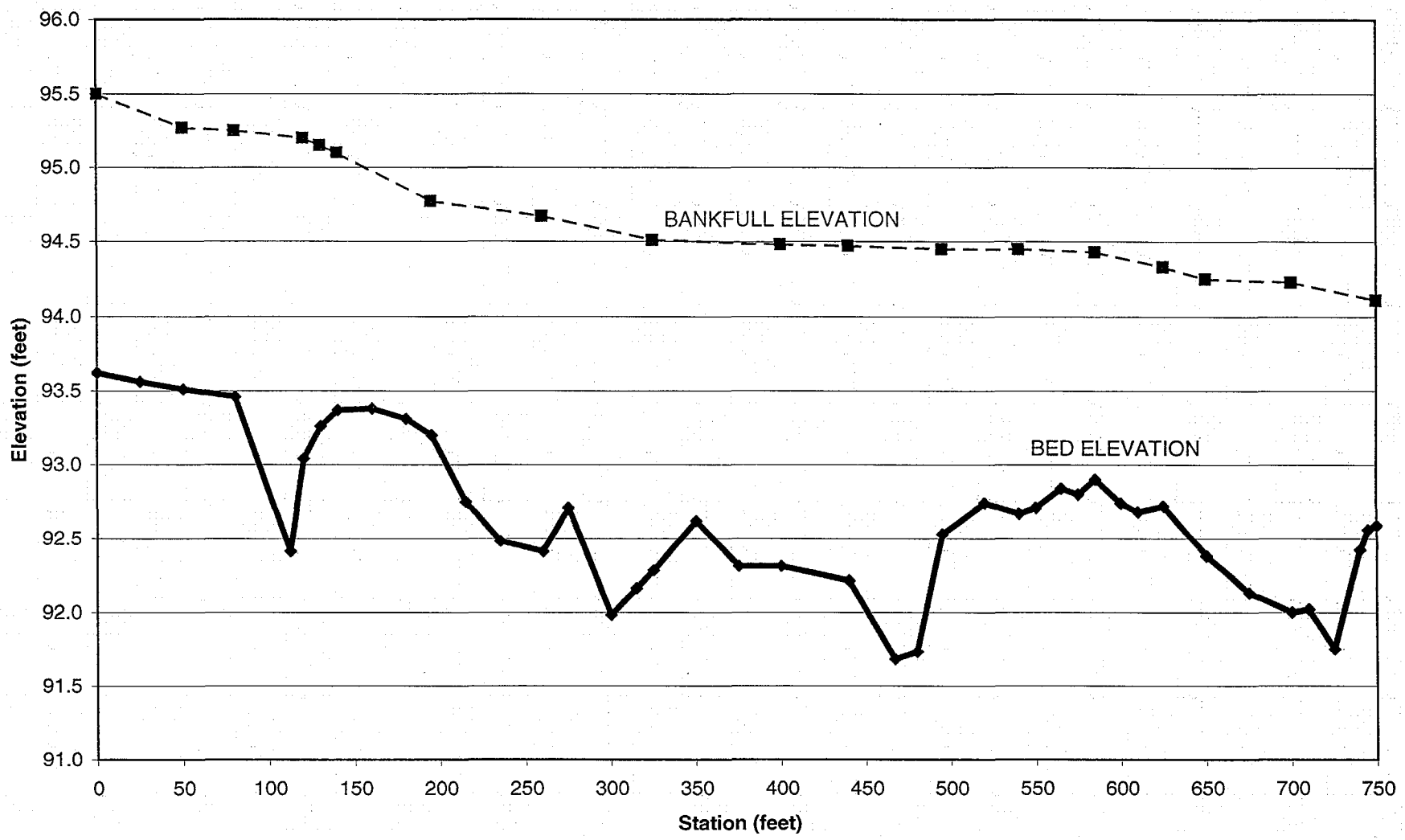
# Stream Reference Reach Site Photos



**Typical riffle section in stream reference reach.**

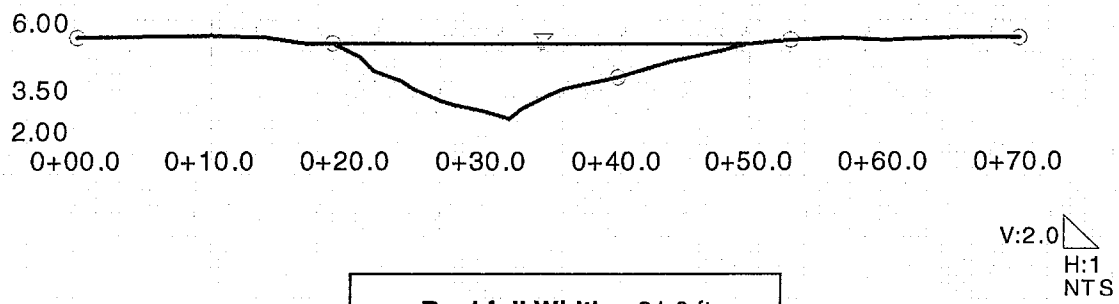
**Typical pool section in stream reference reach.**

***Key Branch Mitigation Site***
**Reference Reach Profile**



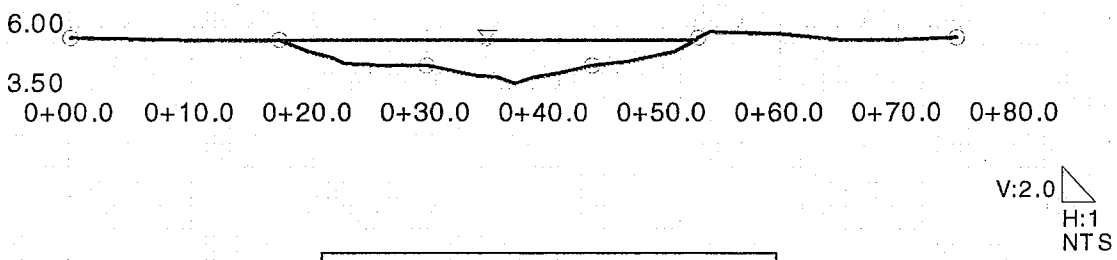
# *Key Branch Mitigation Site*
# Reference Reach Pool and Riffle Cross-Sections

## POOL #1 @ Station 01+15




**Bankfull Width** – 31.0 ft
**Cross-Section Area** – 40.8 $ft^2$
**Mean Depth** – 1.32 ft
**Maximum Depth** – 2.71 ft
**W/D Ratio** – 23.5
**Pool Slope** – 0.0014 (0.14%)

## RIFFLE #1 @ Station 00+50




**Bankfull Width** – 35.1 ft
**Cross-Section Area** – 35.5 $ft^2$
**Mean Depth** – 1.01 ft
**Maximum Depth** – 1.75 ft
**W/D Ratio** – 34.7
**Riffle Slope** – 0.0046 (0.46%)

# Appendix G

# Mitigation Planning Checklist

# COMPENSATORY MITIGATION PLANNING CHECKLIST

ACTION ID: _____

SITE NAME: **Key Branch Mitigation Site**

LOCATION/WATERBODY/COUNTY: The site is located between Lower White Store Rd (SR1252) and Mineral Springs Church Road (SR 1240) in Anson County, North Carolina. Site is between Key Branch and Brown Creek, in Brown Creek subbasin of Yadkin River watershed.

USGS QUAD(S): Marshville, NC Quadrangle

SOIL SURVEY SHEET NO.: A7

PREPARED BY: R. Bailey DATE: 8/13/01

## I. INTRODUCTION

A. Type of Mitigation (Circle / a separate checklist may be prepared if more than one type)

1. (Restoration) Creation Enhancement (Preservation)
   a) (In-kind) Out-of-kind Both
   b) On-site (Off-site) Both
2. (Up-front) (Concurrent) After-the fact (Bank)

B. Wetland types and acreage Impacted / Attach or Describe:

C. Wetland types and acreage **Mitigated:** Attach or Describe:

Bottomland hardwoods, swamp hardwoods, perennial streams

D. Describe mitigation **Ratios**:

Suggested: 1.5:1 for wetlands restoration; 2:1 for wetlands creation; 3:1 for wetland enhancement; 10:1 for wetland preservation; 2:1 for stream restoration.

| | YES | NO |
|---|---|---|
| E. Will any Endangered Species, Archeological Resources, or Haz/Tox Sites be impacted by this effort? | | X |
| F. Has a wetland determination been undertaken and verified? | | X |

## II. TARGET GOALS AND FUNCTIONS

| | YES | NO |
|---|---|---|
| A. Are there stated **GOALS?** | X | |

Describe: Restoration of bottomland hardwood function and values, water quality, wildlife/fisheries habitat.

B. Describe Success Criteria: 320 and 240 trees per acre by 3rd and 5th year respectively

| | YES | NO |
|---|---|---|
| Are they: 1. Specific | X | |
| 2. Measurable | X | |
| 3. Attainable | X | |

| | YES | NO |
|---|---|---|
| C. Target **FUNCTIONS** chosen and indicated? | | |

Describe: Water quality, flood cycling, wildlife/fisheries habitat.

| | YES | NO |
|---|---|---|
| D. Was a **Reference Ecosystem** (RE) report prepared? (Attach) | | X |

1. Describe comparison between the RE and the

Mitigation Plan: The watershed size, wetland types, soils, plant communities, streams, and hydrology are similar in the RE and the mitigation area.

## II. STRUCTURAL COMPONENT

### A. VEGETATION:

| | | Yes | No |
|---|---|---|---|
| 1. | Are plantings listed to species? | X | |
| 2. | Are "local" (200 North/South) Propagules to be planted and Verified by a nursery certificate? | X | |
| 3. | Have diversity and densities of species within the RE been considered in the plan? | X | |
| 4. | Has consideration been given to planting the interface between the mitigation site and upland habitats with suitable transition zone species? | X | |
| 5. | Describe Quality Control during planting: | | |

### B. SOILS:

| | | YES | NO |
|---|---|---|---|
| 1. | Have the soils been mapped? | X | |
| 2. | Soils Series/Phases: Secondary Hydric: Chewacla<br>Alluvial: Tetotum | | |
| 3. | Fertility Sampling undertaken In RE? (Attach Report) | | X |
| 4. | Fertility Sampling undertaken On mitigation site? (Attach Report) | X | |
| | | YES | NO |
| 5. | Are fertility results within the standards for the proposed plantings? | | X |

Describe Results / Amendments Required:

Recommended amendments are listed in Appendix C of the Mitigation Plan.

6. Are the soil types appropriate for the target wetland? X ____

Describe: Yes, the soil types are those commonly found in the proposed communities.

7. If PC Farmland, has the site been evaluated for:

| | YES | NO |
|---|---|---|
| a. Plow pans | ____ | ____ |
| b. Field crowns | ____ | ____ |
| c. Herbicide carry-over | ____ | ____ |
| d. Drainage system | ____ | ____ |

Describe: _____

## C. HYDROLOGY:

| | YES | NO |
|---|---|---|
| 1. Were the principles of **HGM** or other classification system considered? | X | ____ |

Describe: Existing conditions and the loss of wetlands on site were evaluated according to the loss of wetland functions and values (i.e. WET) within the site.

2. Describe the primary hydrologic input (s): Precipitation, high local watertable

| | YES | NO |
|---|---|---|
| 3. Was a Hydrology Model/Water Budget developed? | X | |
| a. Were low, average, and high Precipitation/water table/ flood conditions considered? | X | |

Describe the Water Budget: See Mitigation Plan.

| | | |
|---|---|---|
| 4. Will the hydrologic regime predicted by the Water Budget be appropriate for the target wetland? | X | |

Describe: The predicted hydrologic regime was developed using long-term data gathered from the Wadesboro, NC area.

| | | |
|---|---|---|
| 5. Have Monitoring gauges/tide/ Flood gauges been installed? | X | |

Describe: Thirteen 40 in. groundwater monitoring gauges were installed on the site.

**NOTES:**

## IV□ MONITORING

A. Name and number of person responsible for the success of this project: _____

| | YES | NO |
|---|---|---|
| B. Is there a Monitoring Plan? | X | |

Describe: Hydrological monitoring will involve the installation of groundwater monitoring gauges. Vegetative monitoring will be conducted for the planted areas of the mitigation site and will occur at the end of each growing season for 5 consectutive years.

| | YES | NO |
|---|---|---|
| C. As Built Report provided? | | |
| D. Procedure to account for beneficial natural regeneration? | X | |

Describe: _____

## V. CONSIDERATION OF CAUSES OF FAILURE

A. How does project rate regarding the following:

1. Elevation: _____

| | YES | NO | N/A |
|---|---|---|---|
| a. Have Biological Benchmarks been established? | X | | |
| b. Is there a grading plan? | | | X |
| c. Is the grading plan specific? | | | X |
| d. Is discing proposed after grading and/or prior to planting? | X | | |

2. Describe provisions for Drainage: _____

_____

_____

3. Describe Erosion Control Measures: _____

_____

_____

4. Describe management of Human Impacts: _____

_____

_____

5. Describe management of Herbivory/Noxious Plants: _____

_____

_____

| | | YES | NO |
|---|---|---|---|
| B. | Are there Contingency Plans built into the proposal to address these factors? | _____ | _____ |

Describe when and how will these contingencies be

implemented: _____

_____

_____

_____

**NOTES:** _____

_____

_____

## VI. SITE MANAGEMENT

A. Describe Final Disposition of the property:

Refer to Section 6.0 of the Mitigation Plan

B. Who will manage the site after the mitigation effort is deemed a success? Refer to Section 6.0 of the Mitigation Concept Plan

| | YES | NO |
|---|---|---|
| C. Will wetland functions be impacted by current or future land use patterns? | | X |

Describe:

| | YES | NO |
|---|---|---|
| D. Will this site have the opportunity to function as planned? | X | |

Describe:

E. Describe how this project rates ecologically:

**HIGHLIGHT AND ADDRESS ALL PROBLEMS AND/OR INADEQUACIES WITH THE MITIGATION PLAN/SITE AS INDICATED BY THIS CHECKLIST.**