

FINAL REPORT

HYDROLOGIC RESTORATION OF TATE'S HELL SWAMP: A COMPARATIVE WATERSHED
ANALYSIS OF ECOSYSTEM RESPONSE AND RECOVERY

RESULTS FROM PRE-RESTORATION ANALYSIS

Submitted to:

U. S. DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

GRANT AGREEMENT NO. 1448-0004-95-9180

Submitted by:

Amy Parker and Todd Rasmussen
Daniel B. Warnell School of Forest Resources
University of Georgia
Athens, GA 30602

June 1997

**Hydrologic Restoration of Tate's Hell Swamp: A Comparative Watershed Analysis of
Ecosystem Response and Recovery
Results from Pre-Restoration Analysis**

Abstract. The State of Florida has purchased approximately 150,000 acres of Tate's Hell Swamp for ecosystem restoration and preservation. The Northwest Florida Water Management District has received a grant from the Environmental Protection Agency to hydrologically restore 6,850 acres of Tate's Hell Swamp. Hydrologic restoration of the East Bay drainage, the major nursery area of Apalachicola Bay, is intended to enhance and preserve the water quality of East Bay, and to create a conservation area for many of Florida's protected and endemic species. The data collected in this study provide the preliminary data for comparison of plant communities, soil nutrients, and water quality following hydrologic restoration. Plant communities in the two disturbed watersheds (WS1 and WS2) are dominated by bedded, natural and row planted, and plantation harvested slash pine (*Pinus elliottii*). The reference watershed, WS3, is dominated by forested wetland vegetation typical of pre-development conditions. We have catalogued nine federal species of special concern and three federally listed threatened species, with an additional eleven state protected species listed as threatened and two state protected species listed as endangered. Federally protected species were found in all four study areas, but seven of the twelve federally protected species were found only in the reference areas (WS3 and RA4). However, species considered to be indicative of good habitat quality, e.g. *Drosera intermedia*, *Aristida stricta*, *Sarracenia psittacina*, and others, have been found in all study areas. Species recognized as indicative of disturbance (Clewett 1985; Glitzenstein et al. 1993; Godfrey and Wooten 1979), e.g. *Andropogon spp.*, *Cyrilla racemiflora*, *Rhynchospora baldwinii*, are common in WS1 sampling transects, but are rare or absent from the transects in reference area 4 (RA4). In addition, species abundances were almost an order of magnitude greater in RA4 (an average of 2171 units per transect) than in WS1 (an average of 218 units per transect). The soils sampled exhibited characteristics of nutrient-poor wetland soils. Phosphorus appears to be the limiting nutrient in most areas sampled. Our water quality data indicate that Tate's Hell Swamp (WS1 and WS2) has frequent or continuous low oxygen events (<4.0 mg dissolved oxygen/L) between May and September, and the overall water quality as indicated by dissolved oxygen, total suspended solids, turbidity, total dissolved solids, and conductivity concentrations in the disturbed watersheds (WS1 and WS2), is poorer than that in the reference watershed. Preliminary analyses indicate that active site management, i.e., frequent prescribed fires, wiregrass restoration, and rare plant propagation, may be necessary to restore natural plant communities in Tate's Hell State Forest. Increased buffer zones surrounding depressional wetlands (e.g., gum swamps, cypress strands and domes) may help restore and maintain wetland functions in these areas, and may improve water quality in waterbodies receiving surface runoff from these sites. Hydrologic restoration of the Tate's Hell wetland system will likely lead to improved onsite and offsite water quality including increased dissolved oxygen concentrations and decreased incidence of hypoxia and anoxia in the water bodies of this wetland and may aid in improving and maintaining good water quality in receiving water bodies.

Table of Contents

Executive Summary	1
Background	4
Project Description	7
Conclusions and Recommendations for Management	8
Section A. Plant Communities	12
Map A1. Site location map.	14
Map A2. Study area location map.	15
Map A3. Watershed 1 plant community map.	16
Map A4. Watershed 2 plant community map.	17
Map A5. Watershed 3 plant community map.	18
Map A6. Study area map with sampling sites.	19
Map A7. Watershed 1 map with plant sampling sites.	20
Map A8. Local surface water hydrology map.	21
Map A9. Study area surface water hydrology map.	22
Map A10. Local transportation map.	23
Map A11. Study area transportation map.	24
Section B. Plant Reference Collection	25
Table B1. Complete plant reference collection species list.	27
Table B2. Protected and FNAI tracked plant species list.	43
Table B3. Plant species list for Watershed 1.	44
Table B4. Plant species list for Watershed 2.	48
Table B5. Plant species list for Watershed 3.	51
Table B6. Plant species list for Reference Area 4.	54
Section C. Plant Diversity	56
Figure C1. Comparison of plant diversity and evenness in WS1 and RA4. ..	59
Figure C2. Comparison of plant diversity and abundance in WS1 and RA4.	60
Table C1. Species richness and diversity transect data from WS1 and RA4.	61
Section D. Plant Response	65
Figure D1. Comparison of average plant diversity and evenness in plant response transect sets.	68
Figure D2. Comparison of average plant diversity and abundance in plant response transect sets.	69
Table D1. Plant response transect data collected in WS1.	70

Section E. Soils	75
Figure E1 a. Bulk density in from Gullybranch Road soil samples.	78
Figure E1 b. Bulk density in from Doublebridge Road soil samples.	79
Figure E2. Soil moisture concentrations in plant community soil samples.	80
Figure E3. Mineral nitrogen concentrations in plant community soil samples.	81
Figure E4. Phosphorus concentrations in plant community soil samples. ...	82
Figure E5. Soluble carbon concentrations in plant community soil samples.	83
Table E1. Soil data collected in WS1 and WS2.	84
Section F. Water Quality	91
Figure F1. Dissolved oxygen concentrations in Watershed 1.	94
Figure F2. Average dissolved oxygen concentrations in Watershed 1, Watershed 2, and Watershed 3.	95
Figure F3. Average pH concentrations for all three watersheds.	96
Figure F4. Average conductivity for all three watersheds.	97
Figure F5. Average TDS concentrations for all three watersheds.	98
Figure F6a. Average water temperature for all three watersheds.	99
Figure F6b. Average air temperature for all three watersheds.	100
Figure F7. Average turbidity for all three watersheds.	101
Figure F8. Average TSS for all three watersheds.	102
Figure F9. Stage height in Watershed 1.	103
Table F1. Comparison of selected water quality parameter averages for each of the three watersheds.....	104
Table F2. Water quality data collected in all three watersheds.	105
Section G. Fish	111
Table G1. Fish data collected in Watersheds 1 and 3.	113
Table G2. Fish species and abundance in Watersheds 1 and 3.	115
References	116

Acknowledgments

We thank Jerry Ziewitz for assistance in editing. We are grateful to Margi Flood, Stan Parker, Laura Jenkins, and Jerry Ziewitz for assistance in fish sampling. We are thankful to Susan Andrews, Mark Fowlkes, Brian Garrett, Scott Ostroff, Earl Parker, Stan Parker, Jerry Williams, and Monica Williams for assistance in water quality sampling. We thank Woody Miley, Lee Edmiston and the staff of the Apalachicola National Estuarine Research Reserve for use of equipment and references. We thank Susan Andrews, Mark Fowlkes and Stan Parker for soil sampling. We appreciate assistance in plant reference collections from Linda Chafin, Mark Fowlkes, Brian Garrett, Dean Lindholm, Scott Ostroff, Earl Parker, Stan Parker, Brad Sanders, Becky Sharitz, Jerry Williams, and Monica Williams. In plant identification assistance and confirmation we thank Guy Anglin, Brian Garrett, Angus Gholson, Dean Lindholm, Earl Parker, Scott Ostroff, and Monica Williams. For plant diversity and response sampling we thank Mark Fowlkes and Brian Garrett. For plant community delineation and ground-truthing efforts we thank Mark Fowlkes, Brian Garrett, Dean Lindholm, Scott Ostroff, Stan Parker and Monica Williams. For digital plant community mapping we are deeply grateful to Joe Wyatt. We thank Duncan Cairns, Dan Tonsmiere, and the Staff at the Northwest Florida Water Management District for guidance and assistance in conducting this project. We thank Ken Weber, and the Staff of Tate's Hell State Forest, and Andy Colanino and Louise Kirn and the Staff of Apalachicola National Forest for assisting us and allowing us to work in their management areas. The work described in this report was supported by Grant Agreement No. 1448-0004-95-9180, and by additional support from The University of Georgia, Office of the Vice-President for Research, and the Warnell School of Forest Resources.

Executive Summary

Prior to drainage for commercial timber plantation in the 1950s and 1960s, Tate's Hell Swamp consisted of 220,000 acres of wetlands between the Apalachicola and Ochlockonee Rivers in the Big Bend of the Florida panhandle. Tate's Hell Swamp originally supported deepwater cypress swamp, seasonally inundated forested wetlands, large areas of wetland savannahs, and an extensive network of intermittent and perennial blackwater streams. This type of habitat provided for a rich diversity of wildlife, including many species that now have state and federal protection.

Surface water from Tate's Hell Swamp drains into Apalachicola Bay, one of the most productive estuaries on the Gulf Coast. A large portion of Tate's Hell Swamp includes the drainage for East Bay, a brackish water estuary sub-basin within Apalachicola Bay. East Bay is the primary nursery area for Apalachicola Bay. Because of its importance to the Apalachicola Bay system, East Bay has been designated an International Biosphere and National Estuarine Research Reserve.

The species richness and diversity of Tate's Hell Swamp, as well as native ecosystem functions, appear to have been dramatically altered by the commercial production of slash pine (*Pinus elliotii*). Beginning in the mid-1950s, government-endorsed practices of 'reclaiming' wetlands (Mitsch and Gosselink 1993) led to the conversion of Tate's Hell Swamp to commercial pine plantations by the Buckeye Cellulose Corporation. Large areas were ditched and drained to improve habitat for cellulose fiber production. Dredge spoils from the drainage ditches were used to raise roadbeds above the land surface to allow vehicular access.

The development of commercial forestry activities hindered ecosystem function by dramatically altering the local hydrology. Altered management of fire within the Swamp further changed the environmental character of the area. Changes in the hydrology and fire patterns allowed the invasion of aggressive primary successors, mostly titi (*Cyrilla racemiflora*) and black titi (*Cliftonia monophylla*). These shrub species eliminated habitat for herbaceous ground cover species by blocking sunlight (Glitzenstein et al. 1993).

Prior to alteration of the natural drainage pattern, the western portion of Tate's Hell Swamp provided water storage to absorb stormwater during wet weather periods. Tate's Hell Swamp also acted as a nutrient and sediment sink that removed these materials from the streamflow prior to discharge into East Bay. Long-term studies of the East Bay estuary (Livingston 1983, 1991) indicate that the fiber production in Tate's Hell Swamp has resulted in faster hydrologic responses to precipitation. The increased flood wave velocity causes periodic increases of nutrients and turbidity in East Bay, and also decreases the dissolved oxygen and pH concentrations in the upper portions of East Bay. Rapid changes in salinity exacerbate the existing water quality problems resulting in a reduction in species richness and abundance in the upper portions of East Bay (Livingston 1983).

As of May 1997, the State of Florida has purchased approximately 150,000 acres of Tate's Hell Swamp for the purpose of ecosystem restoration and preservation, and an additional 65,000 acres have been designated for purchase through the state's Preservation 2000 program. Restoration of the surface water hydrology is seen as the most direct method for aiding the return of the vegetation and hydrology to more natural conditions, and to prevent further deterioration of conditions in the East Bay. The Northwest Florida Water Management District has received a grant from the EPA to

hydrologically restore 6,850 acres of Tate's Hell Swamp by creating low water crossings at natural drainage points over roads, and altering other anthropogenic barriers to water flow to allow re-establishment of the natural hydroperiod, vegetation and bay conditions. Hydrologic restoration of the East Bay drainage is intended to enhance and preserve the water quality of East Bay, and to create a conservation area for many of Florida's protected and endemic species.

The project described in this report consists of a collection of pre-restoration data necessary for an accurate evaluation of the ecological success of the proposed restoration. Current soil maps (Sasser et al. 1994), remnant vegetation, and reference area vegetation indicate that much of Tate's Hell Swamp may have supported herbaceous groundcover vegetation which would have provided fuels for frequent groundfires. Fire intolerant slash pine seedlings would have been eliminated in habitats supporting frequent fire. Our data indicate that for many areas in Tate's Hell, slash pine would have been restricted to the wetter habitat areas where fire was less frequent. It is likely that the dominant canopy species would have been fire-tolerant longleaf pine in much of Tate's Hell Swamp.

Increasing the frequency of prescribed fire in Tate's Hell State Forest will help restore native plant species and habitats. Prescribed fire helps reduce competition from opportunistic shrub species. In addition, frequent burning, even in plantation pine, provides habitat for less common plant species (i.e. *Aristida stricta*, some *Rhynchospora* spp., and ferns), improves habitat for many wildlife species, and may provide a base for regeneration of a more natural community if appropriate management practices are adopted. In addition, groundfires supply a pulse of available carbon and nutrients to the soil, and to streams and drainages receiving surface runoff in subsequent precipitation events. This release of nutrients benefits fire-tolerant individuals in some areas by aiding plant regeneration and germination (Christensen 1993).

In areas of Tate's Hell where the canopy coverage is not reduced by fire management, groundcover fuel species (e.g. *Aristida stricta*, *Rhynchospora* spp., *Andropogon* spp.) are not abundant. The fuel load in these areas is generally high, including pine needles and deadfall as well as decomposing organic material near the ground surface. Fuel for low intensity groundfires is absent. Continued fire suppression in these areas leads to larger fuel loads, reducing the opportunity for safe fuel reduction burns, which, in addition to being dangerous, may reduce the possibility of successful system restoration.

Species diversity in areas of dense canopy is low, though remnants of the natural community are present. The lack of rare and protected species in the WS1 plant response transects, and the reduced abundance of herbaceous groundcover and habitat specific species in these transects, indicate that active site management, i.e., frequent prescribed fires, wiregrass restoration, and rare plant propagation, may be necessary to restore natural plant communities in Tate's Hell State Forest.

Tate's Hell Swamp likely had large acreages of depressional wetlands before the addition of roads and drainage structures. These areas functioned as water storage and filtration areas, and released soluble carbon into receiving water bodies. Though the land cover of depressional wetlands has likely been reduced, they provide habitat for wildlife and rare species. Increased buffer zones surrounding depressional wetlands (e.g., gum swamps, cypress strands and domes) will help restore and maintain wetland functions in these areas, and may improve water quality in waterbodies receiving surface runoff from these sites. Depressional wetlands and low slope wetlands (e.g. wet

savannahs and wet flatwoods) also provide water storage and filtration necessary for improving and maintaining water quality in East Bay. In addition these wetland sites provide quality habitat for fish and wildlife species including rare and protected species habitat. Continued monitoring of vegetation, soils and water quality in the three watersheds will help determine the degree of restoration success and will help follow ecosystem changes as restoration proceeds.

Our data suggest that the abundance and distribution of *Taxodium ascendans*, pond cypress, has been reduced, and this species may also need to be restored for restoration to succeed. Depressional areas where cypress is the dominant canopy species contribute to the nutrient cycle by providing NH_4^+ through the process of ammonification, and produce soluble carbon as organic matter is degraded. Other depressional canopy species (i. e., *Nyssa biflora*, *Chamaecyparis thyoides*, or *Magnolia virginiana*) may also need to be restored, though an evaluation of landscape changes during logging and plantation pine development (1950 - present) and a complete hydrologic evaluation of these areas needs to be conducted prior to specific restoration attempts.

The restoration of the Tate's Hell Swamp wetland system would likely improve the water quality in East Bay and Apalachicola Bay and would provide water storage for flood protection for the lower portions of the Apalachicola River Basin. The additional benefits of restoring a large wetland system may include restored micro-climates, carbon storage potential, nutrient transformation and filtration, wildlife and protected species habitat restoration, additional area for wildlife and recreation, and areas to study wetland ecosystem recovery. To accomplish restoration of the Tate's Hell Swamp wetland ecosystem, we advocate study and implementation of management practices that will help achieve a more natural wetland function. For ecosystem restoration, we specifically encourage:

1. Restoration of herbaceous groundcover species;
2. Re-introduction of a more frequent fire regime;
3. Increased buffer zones around depressional wetlands, and
4. Restoration of wetland hydrology.

Background

The early history of Tate's Hell Swamp is largely unknown; the following account was compiled from a timeline of the area prepared by Conservation and Recreation Lands (CARL) archaeologist Melissa Memory (1996) and a collection of newspaper articles about Tate's Hell Swamp. Native American archaeological sites containing pre-settlement artifacts have been found along the rivers and bays associated with Tate's Hell Swamp, but few artifacts of habitation have been found in the Swamp itself. Prior to 1804, this region of the Florida panhandle was largely unexplored by Europeans. There is some evidence that the area was visited by an expedition party to the west from Tallahassee by members of the Hernando Desoto winter encampment in 1539. Although there were some encampments and a trading company store in the vicinity in the 1700s, there were no surveys or exploration of the region now known as Tate's Hell Swamp until it was acquired by John Forbes and Company.

In 1804, John Forbes and Company, a trading company set up to trade with the local Native American Nations, staged an agreement with 22 Seminole chiefs for a tract of land bounded on the west by the Apalachicola River, on the east by the Wakulla river, on the south by the Gulf of Mexico, with an undefined northern boundary extending into the "swampy interior to the north". At least a portion of Tate's Hell Swamp was included in this trade agreement known as the Forbes Purchase. John Forbes and Company began selling portions of this purchase to settlers and speculators in 1807. The land surveyed and sold was on the west bank of the Wakulla River. This area became known as Pantonia. In 1811, three additional tracts of land were ceded to John Forbes and Company contiguous to the Forbes Purchase. In addition, an island in the Apalachicola River (in what is now Franklin County) was ceded to John Forbes personally, as a gift for services rendered. This additional acquisition contained most of the area now known as Tate's Hell Swamp.

Historical and archaeological records indicate the Swamp was probably utilized by local human populations through much of the 1800s much as it is now, as a place for fishing and hunting trips, with no permanent settlement in the Swamp itself. In 1818, a deed of sale was granted to Colin Mitchel, a merchant from Havana, Cuba, for the Forbes Purchase land, including the Swamp, in several different transactions totaling \$134,694 and two rials of silver. In 1823, the district of Apalachicola was created, followed by the building of a U. S. Customs House in Apalachicola in 1825. With strong economic ties in Bainbridge and Columbus, Georgia, Apalachicola became the second largest cotton shipping port in the U. S., second to Savannah. Because of its importance, Confederate troops occupied Ft. Gadsen on the Apalachicola River in 1862-1863 to control the largest shipping route in the region. Malaria forced them to abandon the fort before the end of the Civil War.

Tate's Hell Swamp was named in 1875 when, according to legend, Cebe Tate, a farmer from the town of Sumatra went into the Swamp looking for livestock and became lost. He came out of the Swamp in the town of Carabelle several days later, and said "My name is Cebe Tate, and I've been through hell!", thus giving the Swamp it's name.

The first records of logging in the Tate's Hell area are from the 1870s, when A. B. Tripler founded the Pennsylvania Tie Company which cut railroad crossties from cypress in the swamps surrounding

the Apalachicola River. In 1882, the Pennsylvania Tie Company was sold and renamed Cypress Lumber Company, and continued to log cypress from the wetlands surrounding the Apalachicola River. Many of these trees probably came from the parts of Tate's Hell Swamp that border the Apalachicola River, as these would be most accessible. It is likely that fire suppression activity occurred at least on the inhabited periphery of the Swamp during this period to prevent damage to homes and property from lightning strike fires. In addition, fire was likely used as a land management tool to clear small areas for grazing livestock and family farms.

Selective cutting of large cypress, cedar and pine continued in Tate's Hell Swamp through the turn of the twentieth century. In the early 1900s, sap was collected from thousands of pines in Tate's Hell Swamp (along with uplands now in the adjacent Apalachicola National Forest), for use in turpentine production. Even today, one occasionally stumbles upon a cat-faced pine tree with the residual scars from the days of turpentine in Tate's Hell Swamp. It is likely that Tate's Hell Swamp functioned well as a forested mosaic wetland, even with these modest disturbances, until large-scale clearcutting and draining of the Swamp altered the hydrology for slash pine (*Pinus elliotii*) plantations.

Historically, virgin slash pine (*Pinus elliotii*) occupied a transition species niche; it grew intermixed with longleaf and loblolly pine, and with cypress, water tupelo and many wetland species. The original habitat of slash pine was restricted to poorly drained flatwoods, stream edges, and pond margins, and seasonally flooded areas including bays, ponds and swamps (Schultz 1981). Fire played a major role in the development of slash and longleaf pine forests because fire-susceptible slash pine seedlings were restricted to wetter habitats where fire was less frequent. The copious seed production of slash pine would result in successful germination of thousands of individuals per acre in favorable areas following a fire. If these areas remained free of fire over the next several years (five or more), the trees would outgrow the threat of ground-fires, and would eventually result in thick stands of slash pine of variable sizes (Schultz 1981). In the areas where fire occurred frequently, long-leaf pine (*Pinus palustris*) would have been the dominant tree species, though severe competition between long-leaf pine individuals would produce much lower stand densities (50 - 120 trees per acre in drier habitats, and <20 trees per acre in wet savannas) than those of the habitat restricted slash pine (Clewell 1981).

Procter and Gamble purchased 185,000 acres of Tate's Hell Swamp in 1953. They began large-scale clearcutting of Tate's Hell Swamp to prepare the land for slash pine plantation. By 1968, wetland conversion was in full swing, with Buckeye Cellulose (a subsidiary of Procter and Gamble) bedding (i.e., planting seeds or seedlings in elevated rows separated by deep furrows) slash pine for cellulose fiber production and creating a network of hundreds of miles of roads. Because the cellulose fiber required was a no-ash fiber, the land was managed to prevent fire from planting until harvest.

The changes in the Swamp resulting from this intensive forest management were hailed by many, especially local residents. Nevertheless, as plantation pine began to dominate the landscape of Tate's Hell Swamp in the late-1960s and 1970s, news articles covering the "taming of the swamp" reminisced about the swamp's lost glory. Tales were frequently told of lost volcanoes and lost lakes teeming with fish, along with stories of vegetation so thick you could walk suspended six feet off the ground. Local lore also told of environmental changes in the Swamp. Many people familiar with

the area reported that there were no rattlesnakes in Tate's Hell Swamp before the Swamp was drained (Basham 1968).

In 1990, after being for sale for two years, Buckeye Cellulose sold 182,000 acres of Tate's Hell Swamp to Southeast Timberland, Inc. for \$46.7 million. Southeast Timberland, after breaking state land sale laws, eventually defaulted on the purchase (Hauserman 1991). Aided by a federal "down payment" appropriation by Congress of \$1 million through the U.S. Forest Service budget (Spears 1992), a consortium of state and private agencies began to buy the land. Florida began to list Tate's Hell Swamp as a priority purchase through their Conservation and Recreation Lands (CARL) Preservation 2000 program in 1992. The first State of Florida acquisition was approximately 30,000 acres, known as the Glawson Tract in 1994. To date, Florida has purchased over 150,000 acres in the Tate's Hell Swamp wetland system and has ear-marked another 65,000 acres for purchase. These lands have multiple-use designation with management plans for continued timber production, recreation, restoration and conservation where appropriate.

Most of these acquisitions are under the management of the Florida Department of Agriculture and Consumer Services' Division of Forestry, and currently make up Tate's Hell State Forest, Florida's second largest state forest. Small parcels (<20,000 acres) of purchased lands in the Tate's Hell Swamp system are currently being managed by the Apalachicola National Forest (part of the New River Corridor) and by the Florida Game and Freshwater Fish Commission (Bloody Bluff and Sand Beach Tracts).

From 1985 to 1993, Tate's Hell Swamp was designated an Area of Critical State Concern. The Swamp drains into one of Florida's non-point source pollution (NPS) priority waters, Apalachicola Bay. In addition, the western half of Tate's Hell Swamp contains the catchment for East Bay, the primary nursery habitat for many of Apalachicola Bay's commercial fish species. The importance of these fisheries made Tate's Hell Swamp a priority site for purchase in Florida's CARL Preservation 2000 Program. In 1995, the Northwest Florida Water Management District (NFWFMD) received funding from the Environmental Protection Agency's (EPA) non-point source pollution program managed through the Florida Department of Environmental Protection, to conduct a demonstration of hydrologic restoration of 6,850 acres in Tate's Hell Swamp. The project described in this document was funded with assistance from the U.S. Department of the Interior Fish and Wildlife Service, to collect preliminary baseline data useful in the recovery of threatened species and in the assessment of wetland response to restoration.

Project Description

The study goals of the project discussed here are two-fold:

1. To evaluate the habitat condition of three comparable watersheds for assessment of the hydrologic restoration proposed by the Northwest Florida Water Management District; and
2. To identify and locate protected species in the study areas.

We selected unrestored, WS2, and reference, WS3, watersheds for the similarities of their hydrologic and soil characteristics with respect to the characteristics in the restoration watershed, WS1 (Map 2). These similarities allow us to study vegetation response to hydrologic restoration by comparing plant community response to structural changes in hydrology in the restored area (WS1) to plant community changes over time in comparable unrestored (WS2) and reference (WS3) watersheds. The similar hydrologic characteristics between the watershed areas allow analyses of changes in water quality over time. The vegetation reference area, RA4, was selected because of the similarity in soil types to those in the study watersheds, and because fire management practices have facilitated maintenance of the natural plant communities in this area. Comparisons of plant diversity and species composition changes over time and in response to changes in hydrology made from transects in WS1 and RA4 will provide a smaller scale comparison of plant response and restoration than the community responses analyzed through changes in plant community composition in each watershed.

Data collected in this study will provide the baseline for comparison of plant communities, soil nutrients, and water quality after restoration.

The specific objectives of this study are to:

- Characterize the plant communities of the three watershed areas;
- Locate individuals and populations of rare and protected species;
- Provide pre-restoration data for plant response through plant community composition and soil nutrient analysis;
- Detail a comparison of plant species richness in the proposed restoration watershed (WS1) and the vegetation reference area (RA4); and
- Compare water quality in the three watershed areas.

The objectives were achieved by mapping plant communities using county tax assessors (1:4800 scale, 1" = 400') base maps, followed by monthly plant collections and water quality sampling in each of the three watersheds. Plant response sampling and soil nutrient analyses were conducted in the watershed proposed for restoration (WS1). Plant species richness sampling was conducted in WS1 and the vegetation reference area (RA4) in Apalachicola National Forest. The results presented here describe some basic differences in vegetation community structure and water quality between the three study watersheds, and differences in plant species richness between the restoration watershed (WS1) and the plant diversity reference site (RA4).

Conclusions and Recommendations for Management

Current soil maps (Sasser et al. 1994), remnant vegetation, and vegetation in the reference areas indicate that much of Tate's Hell Swamp may have supported herbaceous groundcover vegetation which would have provided fuels for frequent groundfires. Fire intolerant slash pine seedlings would have been eliminated in habitats supporting frequent fire. Therefore, it is likely that the dominant canopy species would have been fire-tolerant longleaf pine.

In natural stands of long-leaf pine, the stand density is determined by hydrology and geomorphology, and by the availability of nutrients. Long-leaf pine produces large lateral roots when the placement of deep tap roots are inhibited by a hard-pan or confining layer at a shallow depth. In areas with a shallow confining layer and frequent fire, the density of long-leaf pine is severely restricted by competition for nutrients and root space with other species. In addition, long-leaf pines are highly competitive with each other; competition between individuals can significantly reduce biomass in those competing individuals. In wet savannah habitats maintained by the combination of frequent fire and a shallow confining layer, long-leaf pines seldom had stand densities higher than a few trees per acre (Clewell 1981). Our data indicate that for many areas in Tate's Hell, slash pine would have been restricted to the wetter habitat areas where fire was less frequent.

Increasing the frequency of prescribed fire in Tate's Hell State Forest will help restore native plant species and habitats. Prescribed fire helps reduce competition from opportunistic shrub species. Prescribed burning six years after planting and every 3 - 5 years thereafter are recommended for reducing fire hazard (Wade 1983). Young slash pines greater than 6 feet tall, can survive low intensity ground fires. Appropriate prescribed fire management can also reduce the incidence of southern pine beetle attack (Wade 1983). Burning, even in plantation pine, provides habitat for less common plant species (i.e. *Aristida stricta*, some *Rhynchospora* spp., and ferns), improves habitat for many wildlife species, and may provide a base for regeneration of a more natural community if appropriate management practices are adopted. In addition, groundfires supply a pulse of available carbon and nutrients to the soil, and to streams and drainages receiving surface runoff in subsequent precipitation events. This release of nutrients benefits fire-tolerant individuals in some areas by aiding plant regeneration and germination (Christensen 1993).

In areas where the canopy coverage is not reduced by fire management, groundcover fuel species (e.g. *Aristida stricta*, *Rhynchospora* spp., *Andropogon* spp.) are not abundant. The fuel load in these areas is generally high, including pine needles and deadfall as well as decomposing organic material near the ground surface. Fuel for low intensity groundfires is absent. Continued fire suppression in these areas leads to larger fuel loads, reducing the opportunity for safe fuel reduction burns, which, in addition to being dangerous, may reduce the possibility of successful system restoration.

Species diversity in areas of dense canopy is low, though remnants of the natural community are present. The lack of rare and protected species in the WS1 plant response transects, and the reduced abundance of herbaceous groundcover and habitat specific species in these transects, indicate that active site management, i.e., frequent prescribed fires, wiregrass restoration, and rare plant propagation, may be necessary to restore natural plant communities in Tate's Hell State Forest.

The lack of road maintenance and intensive silvicultural management in WS1 will lead to gradual changes in this site without hydrologic and plant community restoration. The initial hydrologic restoration will begin more rapid recovery of the Tate's Hell wetland system. However, for this process of recovery to be completed in a timely manner (<50 - 200 years), additional habitat restoration will be necessary. Any delay in hydrologic restoration in this area will require collection of additional hydrologic, water quality and vegetation data before structural restoration begins.

Increased buffer zones surrounding depressional wetlands (e.g., gum swamps, cypress strands and domes) will help restore and maintain wetland functions in these areas, and may improve water quality in waterbodies receiving surface runoff from these sites. Depressional wetlands and low slope wetlands (e.g. wet savannahs and wet flatwoods) also provide water storage and filtration necessary for improving and maintaining water quality in East Bay. In addition these wetland sites provide quality habitat for fish and wildlife species including rare and protected species habitat. Continued monitoring of water quality parameters in the three watersheds will help determine the degree of restoration success and will help follow the water quality changes as restoration proceeds.

Our data show that fish species particularly adapted to fluctuating water levels and periods of anoxia (specifically *Fundulus escambiae* and *Gambusia holbrooki*) are found in both the reference site and in Tate's Hell State Forest. *Gambusia holbrooki* are more abundant in Tate's Hell State Forest than in the reference area, possibly indicative of the frequency of hypoxia and anoxia in Tate's Hell. Hydrologic restoration of the Tate's Hell wetland system will likely lead to improved water quality including increased dissolved oxygen concentrations and decreased incidence of hypoxia and anoxia in the receiving water bodies of this wetland.

- Many fire dependent herbaceous species are useful in site management, native groundcover species such as wiregrass, love grass and several of the sedges are helpful in providing fuel for low intensity ground fires.
- Restoration of native groundcover species in this system will help provide fuel for groundfires needed to restore and maintain wet savannah and wet flatwoods habitat, and improve habitat in plantation pine in Tate's Hell State Forest.
- Reintroduction and restoration of these groundcover species may be useful in many areas to provide fuel for spring and fall season prescribed burning, and to facilitate multiple use management in Tate's Hell State Forest.
- Many native species require fire to produce fertile seeds, or produce larger quantities of viable seed after a fire occurrence (Robbins and Myers 1992). Restoration and maintenance of habitat for the protected plant species in disturbed areas will be limited without the restoration of fire into the system cycles.
- Fire reduces competition from woody shrubs and trees, and encourages the growth and reproduction of many native herbaceous species, thereby maintaining species diversity and community structure in the plant community.

- Prescribed fire management could be used to reduce canopy density in harvested, clear-cut, and bedded and natural pine areas to encourage growth of herbaceous groundcover species.
- Opportunistic species are more abundant in disturbed watersheds and will out-compete less hardy wetland species without the restoration of hydrology and natural fire regimes.
- A mosaic of natural habitats may need to be restored to maintain between habitat diversity (beta diversity), as silvicultural practices, such as high density seeding and planting, bedding, and infrequent prescribed burning, threaten diversity between as well as within habitats.
- The lack of natural plant communities can lead to loss of diversity on a larger scale by reducing availability of forage and habitat for wildlife. The focus of the restoration of plant species then should involve restoring and maintaining natural communities, not just canopy structure, using prescribed fire and hydrologic restoration.
- The restoration of herbaceous groundcover and some depressional wetland species such as wiregrass (*Aristida stricta*) and pond cypress (*Taxodium ascendens*) may be necessary to restore native functions to this wetland system and may aid in multiple use management goals for Tate's Hell State Forest.
- Increased buffer zones around streams and depressional areas would encourage expansion of depressional wetland vegetation and allow more area for native habitat restoration and protected species conservation.
- Much of the pine dominated area in WS1 is planted or bedded slash pine, these trees are not mature enough to be merchantable, but they are well established and cover a large acreage, and as a result may prove to be a barrier to restoration of native vegetation communities without management intervention.
- The abundance of species in the disturbed watersheds indicates that a wetland plant seed bed remains that could be encouraged to grow given appropriate conditions.
- Soil disturbance during harvesting changes the site topography, and may result in loss of soil carbon and nutrients (Mitsch and Wu 1995; Greenland 1995), and damage the remaining seed bank (Glitzenstein et al. 1993).
- Best management practices for harvesting timber in areas of vegetation restoration may include modifications to reduce the disturbance to the soil and the native seedbank, and to decrease loss of soil carbon and nutrients.
- The restored hydrology alone will begin improving the habitat in the Tate's Hell wetland system by providing improved water quality and more consistent water quantity to receiving water bodies.
- The water storage provided by hydrologic restoration will serve as a buffer and reduce flooding and drought events in receiving streams.

- The organic soils in WSI will provide for the slow release of water into associated water bodies and eventually into East Bay should hydrologic restoration proceed in this area.
- Consistent stream flow in restored areas should reduce the duration and frequency of low oxygen events, thereby changing the composition of aquatic insects and fish species in these restored streams.

Plant Community Maps

Methods

Plant community maps were created using tax assessors maps for Franklin and Liberty Counties. The tax assessors maps provided the most recent and readily available aerial maps, and the scale of these maps provided a base that allowed easy identification of ecotone delineations. The three study watersheds were outlined, and we delineated plant community types within each watershed. We then visited all types delineated to correct and complete these maps, thoroughly surveying all the watershed areas. Plant communities were divided into ten major categories:

- I bedded pine
- II natural pine
- III cypress
- IIIa cedar-cypress-bay
- IV scrub-shrub
- V gum
- Va bog tupelo (*Nyssa ursina*)
- VI creek and river swamp
- VII clearcuts and wet savannah type areas, and
- VIII harvested areas

These major categories are combined to express community types with multiple canopy and sub-canopy dominants (e.g., II/IIIa represents a natural pine/cedar-cypress-bay co-dominance in an area). In addition, to keep the classification scheme simple, we combined community types that have different habitat histories, but currently have similar vegetation (e.g., VII represents clearcuts, wet savannahs, seepage slopes, roads and roadsides). A key to these classifications is found in Appendix A. Electronic versions of the project site maps and plant community maps we developed were combined with the National Wetland Inventory Tiger hydrology and transportation files for Franklin and Liberty Counties, obtained from the Florida Department of Environmental Protection (now available through the Internet ([http:// www.usfws.gov](http://www.usfws.gov))), to create the geographic representations presented here.

Results

A complete set of the maps developed in this project are in Appendix A (Maps A1-A11). The differences in plant communities between the disturbed (WS1 and WS2) and reference (WS3) watershed areas is striking (Map A2). WS1 and WS2 plant communities dominant canopy species are bedded, natural and row planted, and plantation harvested slash pine (*Pinus elliottii*). Specifically, WS1 canopy coverage is dominated by bedded pine (I) followed by planted pine and bedded pine where the beds have degraded severely (II). There are remnant areas of cypress and gum in WS1, generally in old creekbeds and the lowest depressional areas (Figure A3). In WS2, the dominant canopy vegetation is bedded pine (I) and plantation harvested (VIII) areas (a harvest where approximately 10-20 trees/acre are left standing as seed trees). Again, remnants of forested wetland vegetation still exist in this watershed in the most depressional areas. A large area of the cedar-

cypress-bay association (IIIa) exists in what appears to be an old creekbed as it is just below a break in the natural ridgeline (Figure A4).

In the reference area (WS3), the dominant canopy vegetation is cypress (III), cypress/cedar-cypress-bay (III/IIIa), cedar-cypress-bay (IIIa), and pine/cypress/cedar-cypress-bay (II/III/IIIa), which is typical forested wetland vegetation. Cypress and other wetland forest types in WS3 are bordered by large areas of planted and natural pine flatwoods (II), with a few open canopy areas (VII, II/VII) (Figure A5).

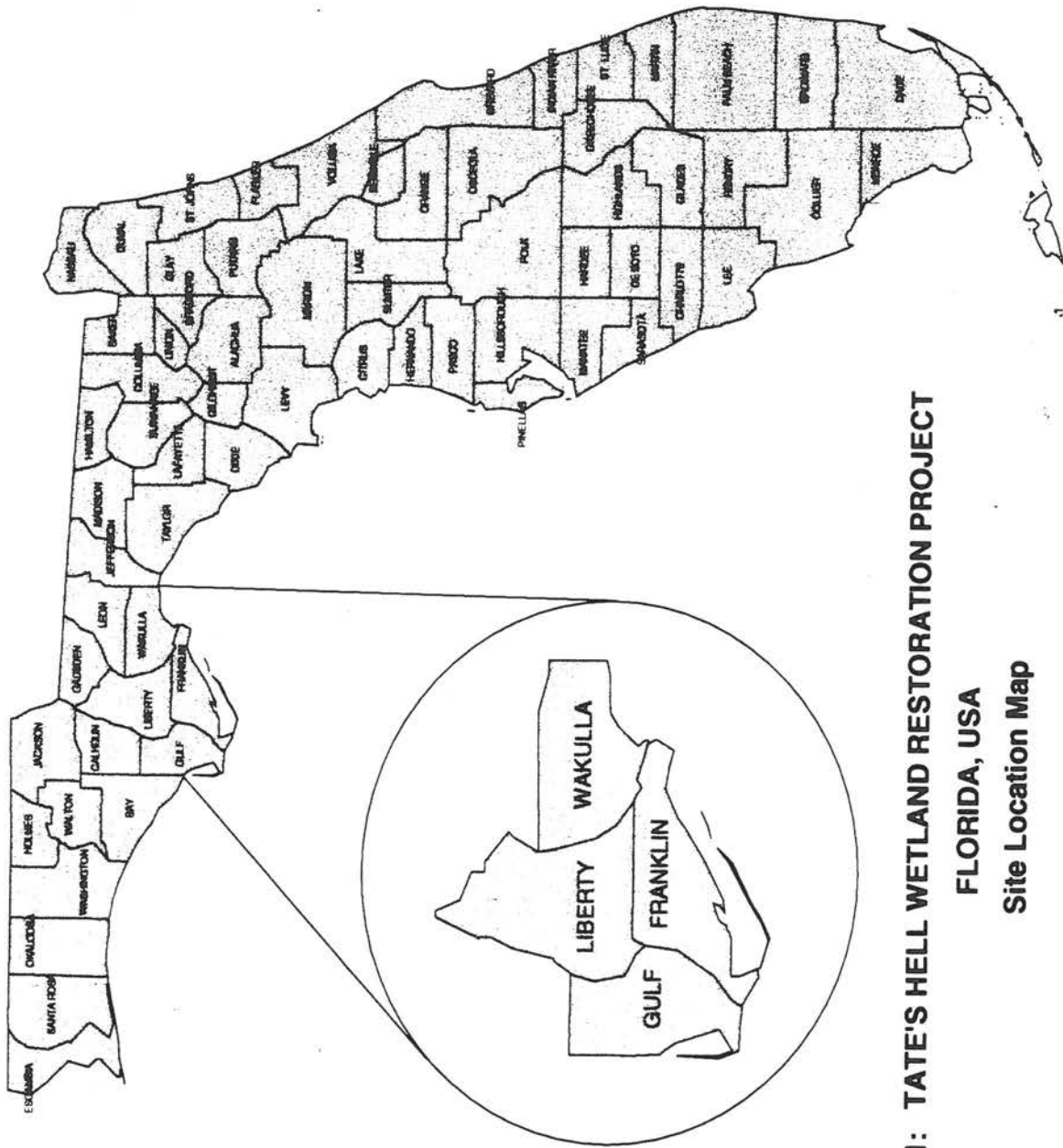
In addition to the plant community maps (Figures A3, A4, A5), we have created project site maps (Figures A1 and A2), sample site maps (Figures A6 and A7), surface water hydrology maps (Figures A8 and A9), and transportation maps (Figures A10 and A11).

Discussion

The soil types in the three watersheds areas are similar, and one would expect that they would support similar vegetation if the hydrology and fire regime were restored in the disturbed watersheds. Vegetation in the three watershed areas varies greatly depending on management history. The reference watershed (WS3) is areally dominated by cypress and cypress with cedar-sweetbay, and pine as co-dominants, while WS1 is dominated in area by natural and bedded pine and WS2 is dominated in area by bedded and harvested pine. We found that remnant forested wetland areas in WS1 and WS2 were limited to depressional areas and intermittent streambeds that still remain in the disturbed landscape. These pockets of remnant populations could provide seed banks for expanding wetland habitat if hydrology were restored in these areas.

In forested areas of Tate's Hell Swamp where immature pine trees are dominant, the opportunistic shrub species *Cyrilla racemiflora* (titi) and *Cliftonia monophylla* (black titi) grow dense, shading out herbaceous species and competing with young pines for nutrients and sunlight. In the most severely fire suppressed areas, individuals of these opportunistic shrubs have grown to heights greater than thirty-five feet. In areas where the pines are more mature, the canopy shades out all but the largest of the titi and black titi individuals. Prescribed fire management could be used to reduce canopy density in both of these habitat types, which would encourage growth of herbaceous groundcover species. Furthermore, the majority of pine trees in WS1 are planted or bedded, these trees are not mature enough to be harvestable, but they are well established and cover a large acreage, and as a result may prove to be a barrier to restoration of native vegetation communities through light and nutrient competition without management intervention.

As restoration proceeds in Tate's Hell, the plant community maps should be updated at least every five years, though annual or bi-annual updates would be preferred. The changes in community composition evident at this scale will be small, but gradual. These updated maps will provide the necessary data to determine changes due to restoration and can be used to evaluate ecosystem recovery and land use changes over time. If restoration in these areas does not proceed in a timely manner, these maps should be updated immediately prior to restoration activities.



Map A1: TATE'S HELL WETLAND RESTORATION PROJECT
FLORIDA, USA
Site Location Map

Tate's Hell Wetland Restoration Project

Map A3:

Watershed 1 - Plant Community Map

- | | | |
|--|---|---|
| <ul style="list-style-type: none"> I - Stalled Pine II - Natural Pine III - Cypress IIIa - Cedar-Sweet Bay-Cypress IV - Scrub/Shrub | <ul style="list-style-type: none"> V - Gum Swamp VI - Creek Swamp VII - Clearcut Areas VIII - Harvested Areas | <ul style="list-style-type: none"> IIIb - Natural Pine/Cypress IIIc - Natural Pine/Cedar-Sweet Bay-Cypress IIIV - Natural Pine/Clearcut Areas IIIVIIa - Natural Pine/Cypress/Cedar-Sweet Bay IIIVIIa - Cypress/Cedar-Sweet Bay-Cypress |
|--|---|---|

Scale 1" = 1 MI

Gully Branch Road

Double Bridge Road

Evans Lake Tram Road

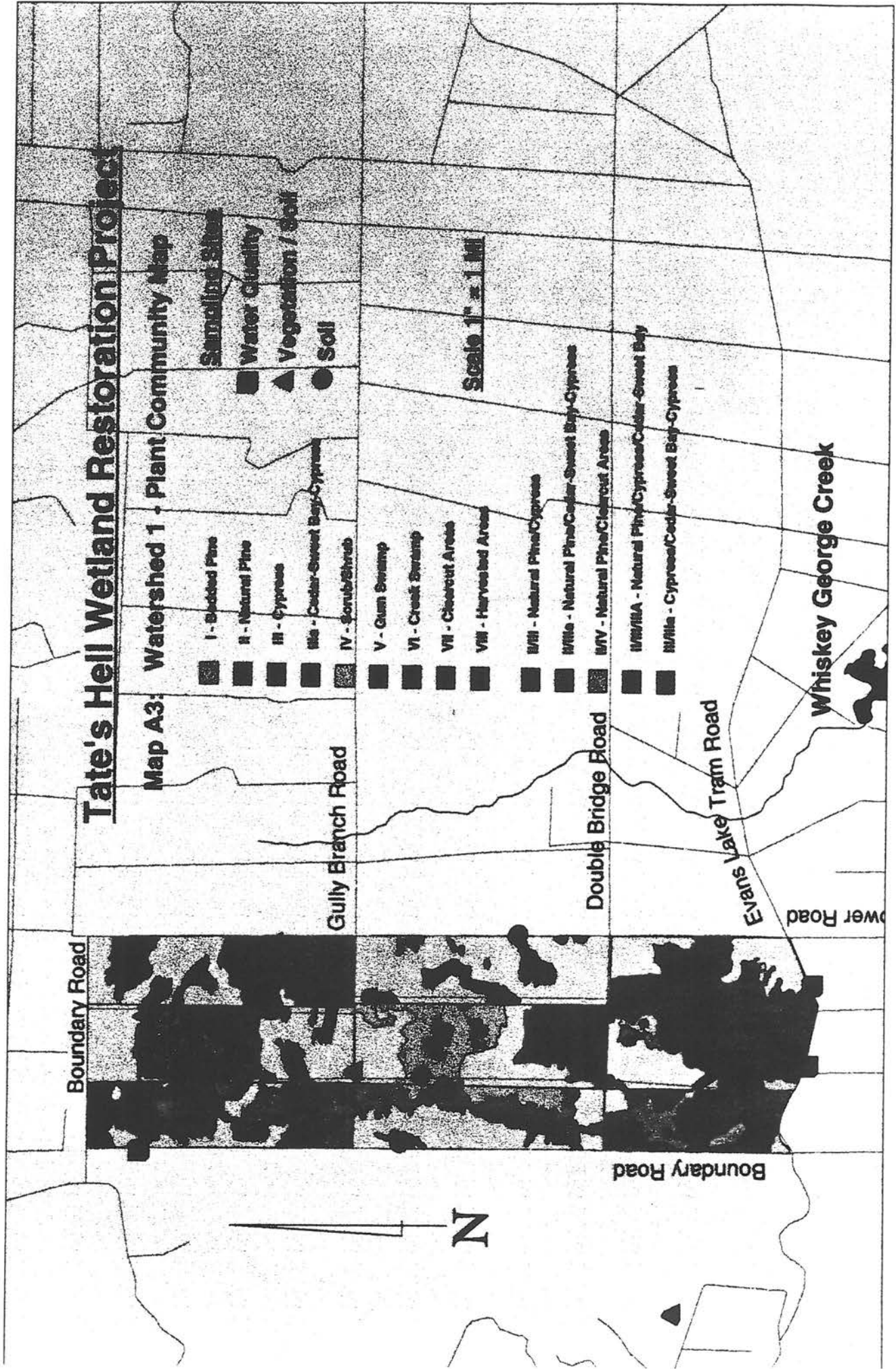
Whiskey George Creek

Boundary Road

Boundary Road

Power Road

N



Tate's Hell Wetland Restoration Project

Map A4: Watershed 2 - Plant Community Map

Sampling Sites
Water Quality
Vegetation / Soil

Scale 1" = 1 MI

- I - Bedded Pine
- II - Natural Pine
- III - Cypress
- IIIA - Cedar-Sweet Bay-Cypress
- IV - Scrub/Shrub
- V - Gum Swamp
- VI - Creek Swamp
- VII - Clearcut Areas
- VIII - Harvested Areas
- II/III - Natural Pine/Cypress
- II/IIIA - Natural Pine/Cedar-Sweet Bay-Cypress
- II/IV - Natural Pine/Clearcut Areas
- II/IIIIA - Natural Pine/Cypress/Cedar-Sweet Bay
- II/IIIIa - Cypress/Cedar-Sweet Bay-Cypress

Gully Branch Road

Double Bridge Road

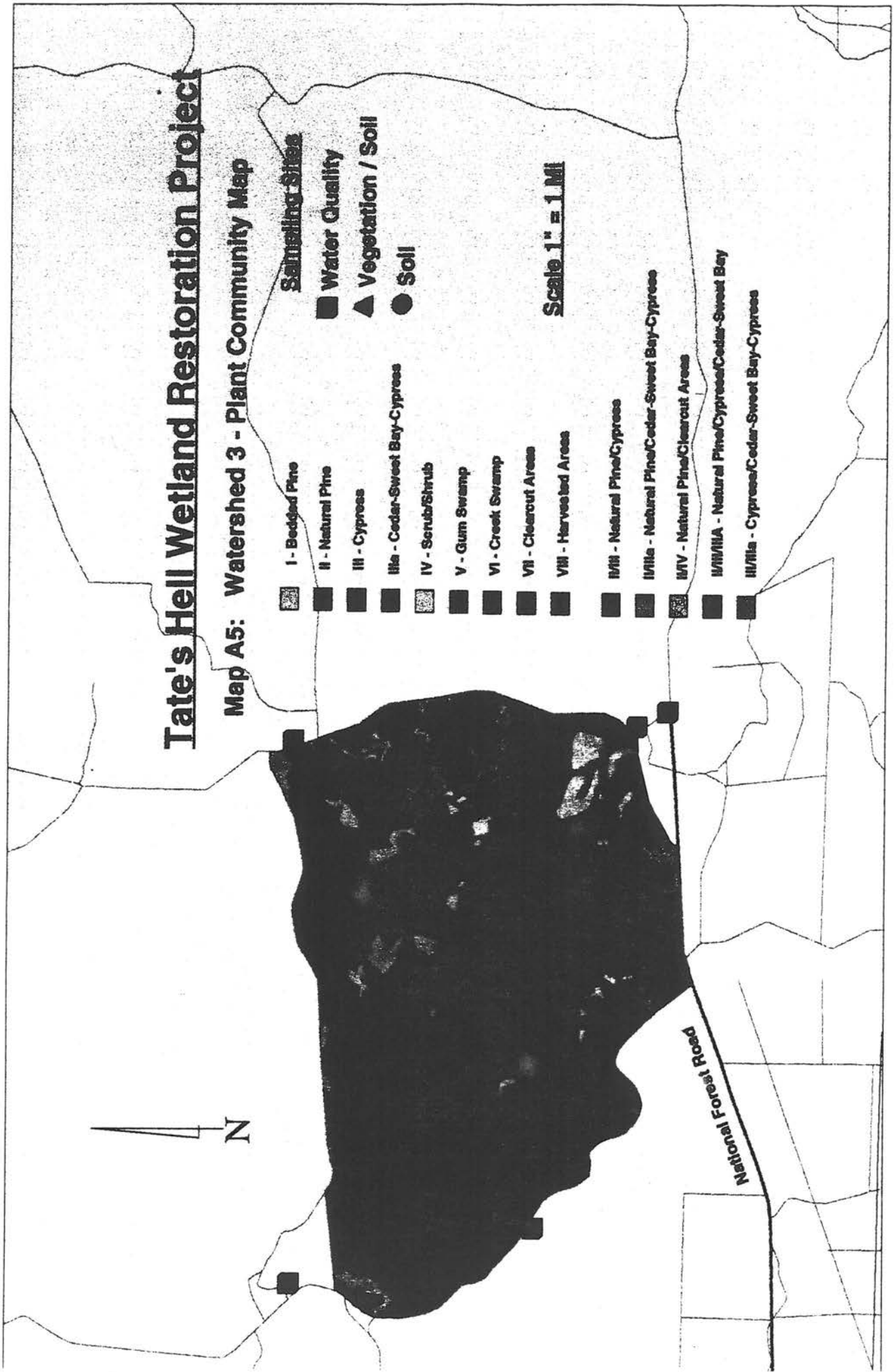
Evans Lake Tram Road

Tower Road

Whiskey George Creek

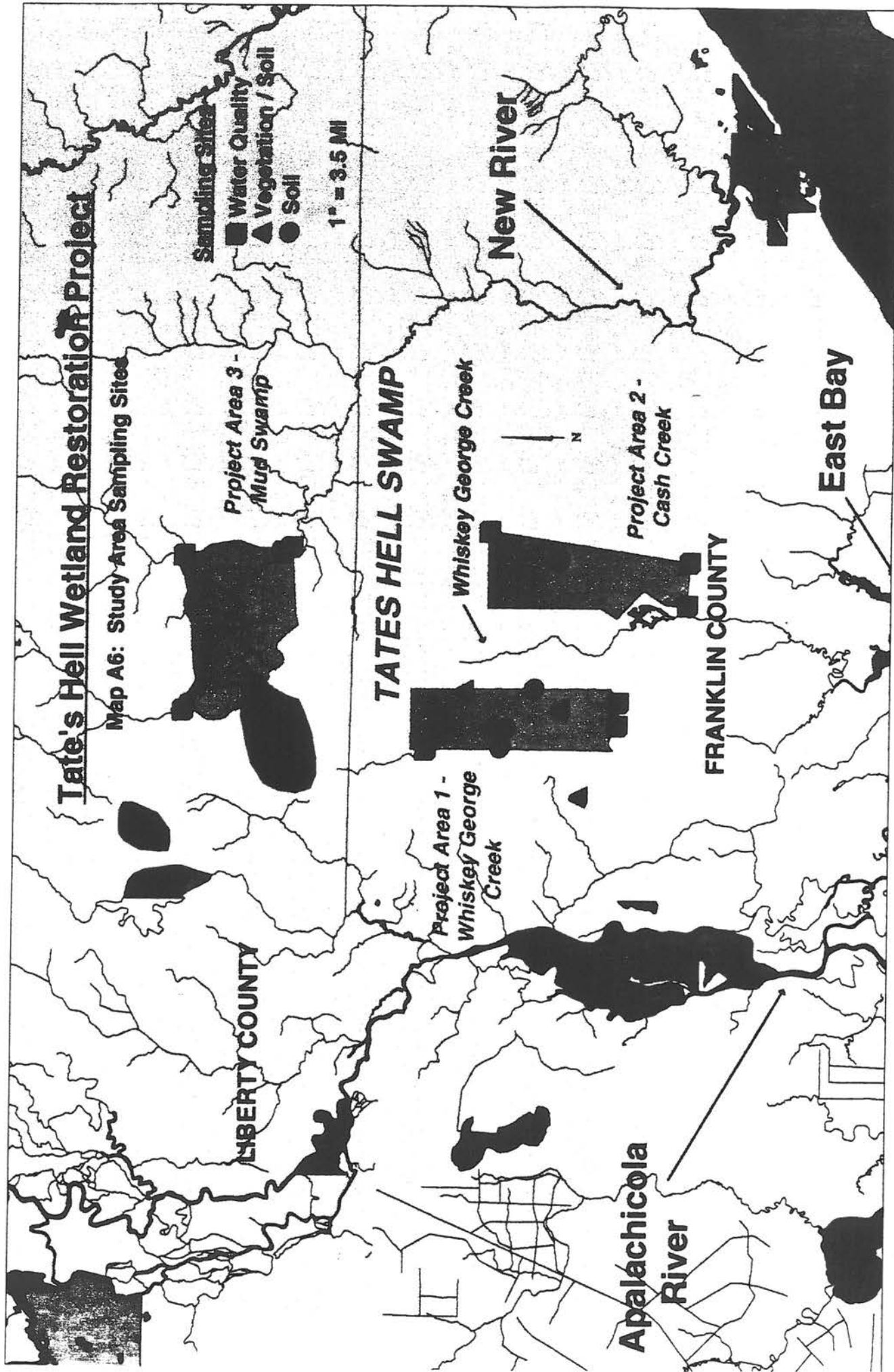
Tate's Hell Wetland Restoration Project

Map A5: Watershed 3 - Plant Community Map



Tate's Hell Wetland Restoration Project

Map A6: Study Area Sampling Sites



Tate's Hell Wetland Restoration Project

Map A7: Watershed 1 - Vegetation Sampling Sites

- I - Bladdered Pine
- II - Natural Pine
- III - Cypress
- IIIa - Cedar-Sweet Bay-Cypress
- IV - Scrub/Shrub

▲ Vegetation / Soil Sampling Sites

- V - Gum Swamp
- VI - Creek Swamp
- VII - Clearcut Areas
- VIII - Harvested Areas

Scale 1" = 1 Mi

- II/III - Natural Pine/Cypress
- II/IIIa - Natural Pine/Cedar-Sweet Bay-Cypress
- III/IV - Natural Pine/Clearcut Areas
- III/IIIa - Natural Pine/Cypress/Cedar-Sweet Bay
- III/IIIa - Cypress/Cedar-Sweet Bay-Cypress

Boundary Road

Gully Branch Road

Double Bridge Road

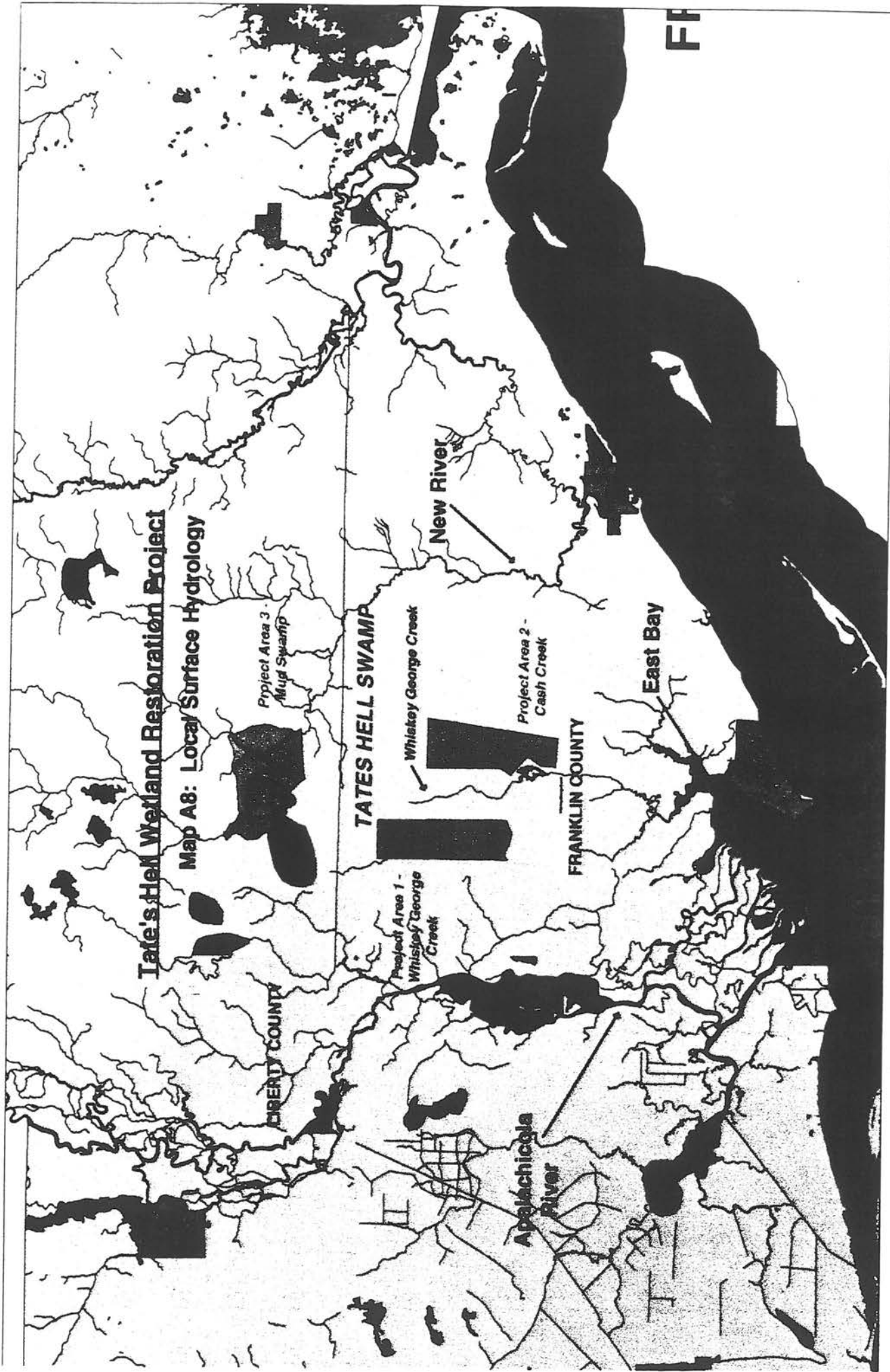
Evans Lake Tram Road

Power Road

Boundary Road

N

N



Tate's Hell Wetland Restoration Project

Map A8: Local Surface Hydrology

Project Area 3 -
Mud Swamp

TATES HELL SWAMP

Whiskey George Creek

Project Area 2 -
Cash Creek

FRANKLIN COUNTY

East Bay

Project Area 1 -
Whiskey George Creek

LIBERTY COUNTY

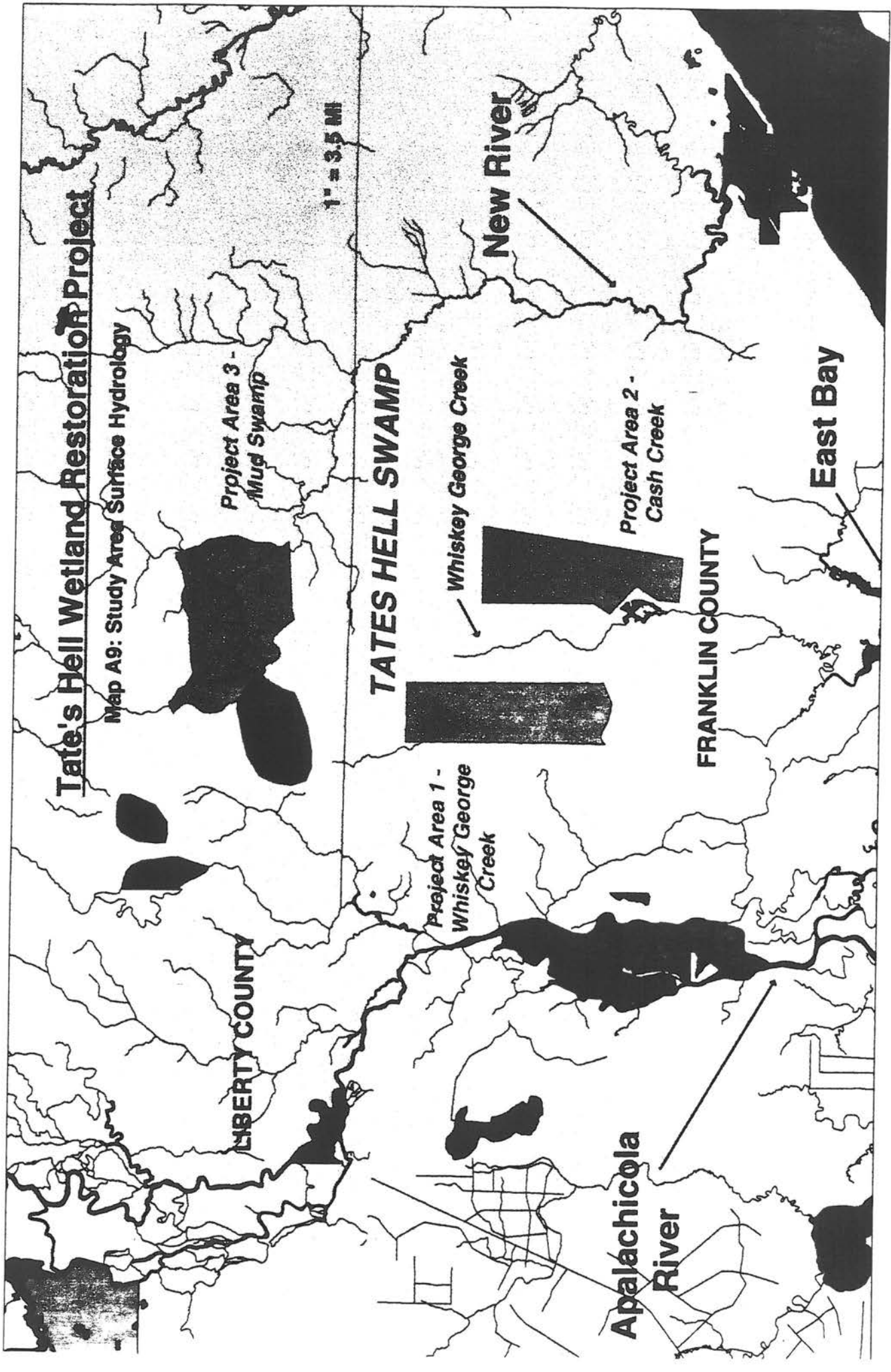
Apalachicola River

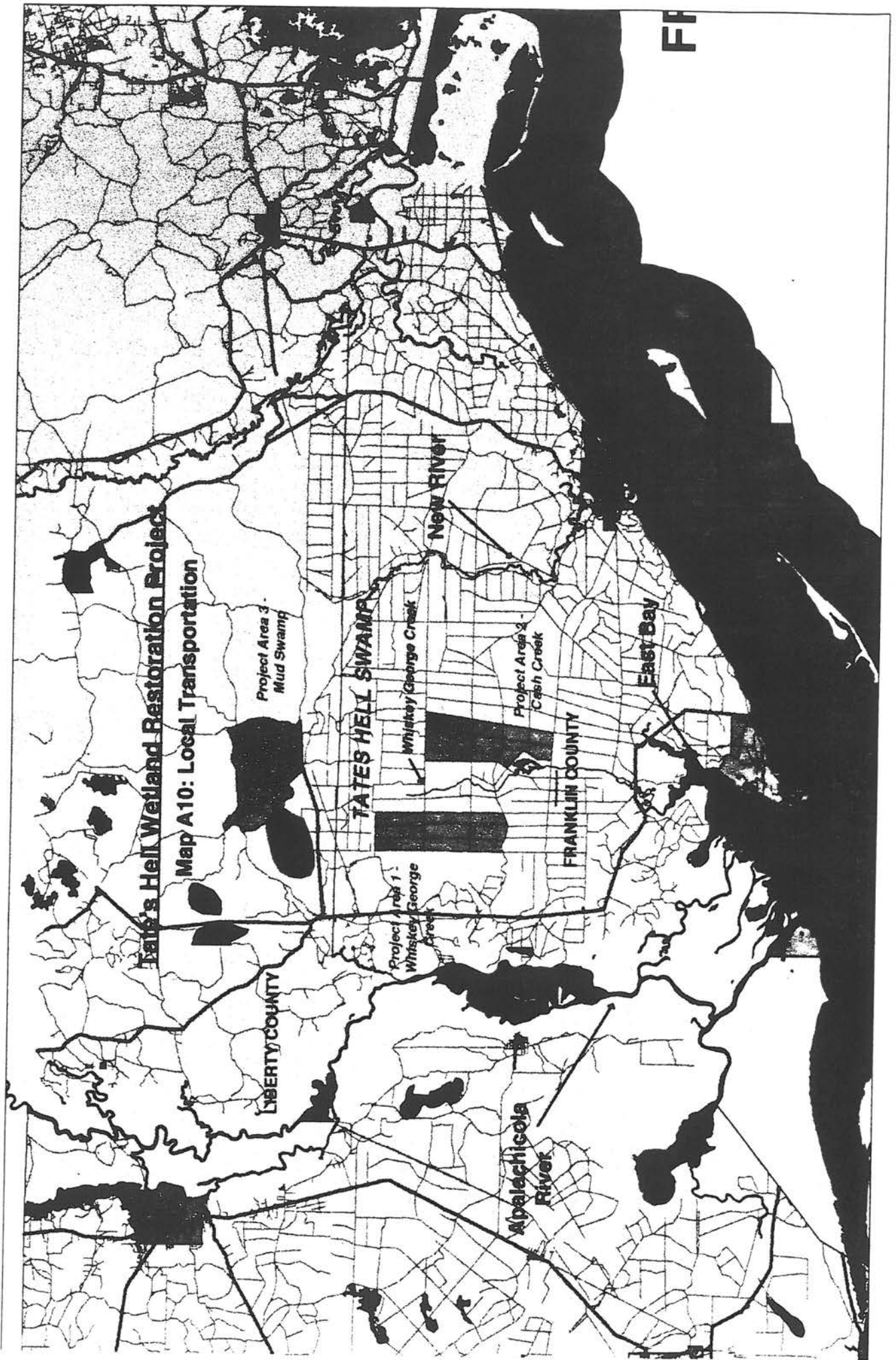
FH

Tate's Hell Wetland Restoration Project

Map A9: Study Area Surface Hydrology

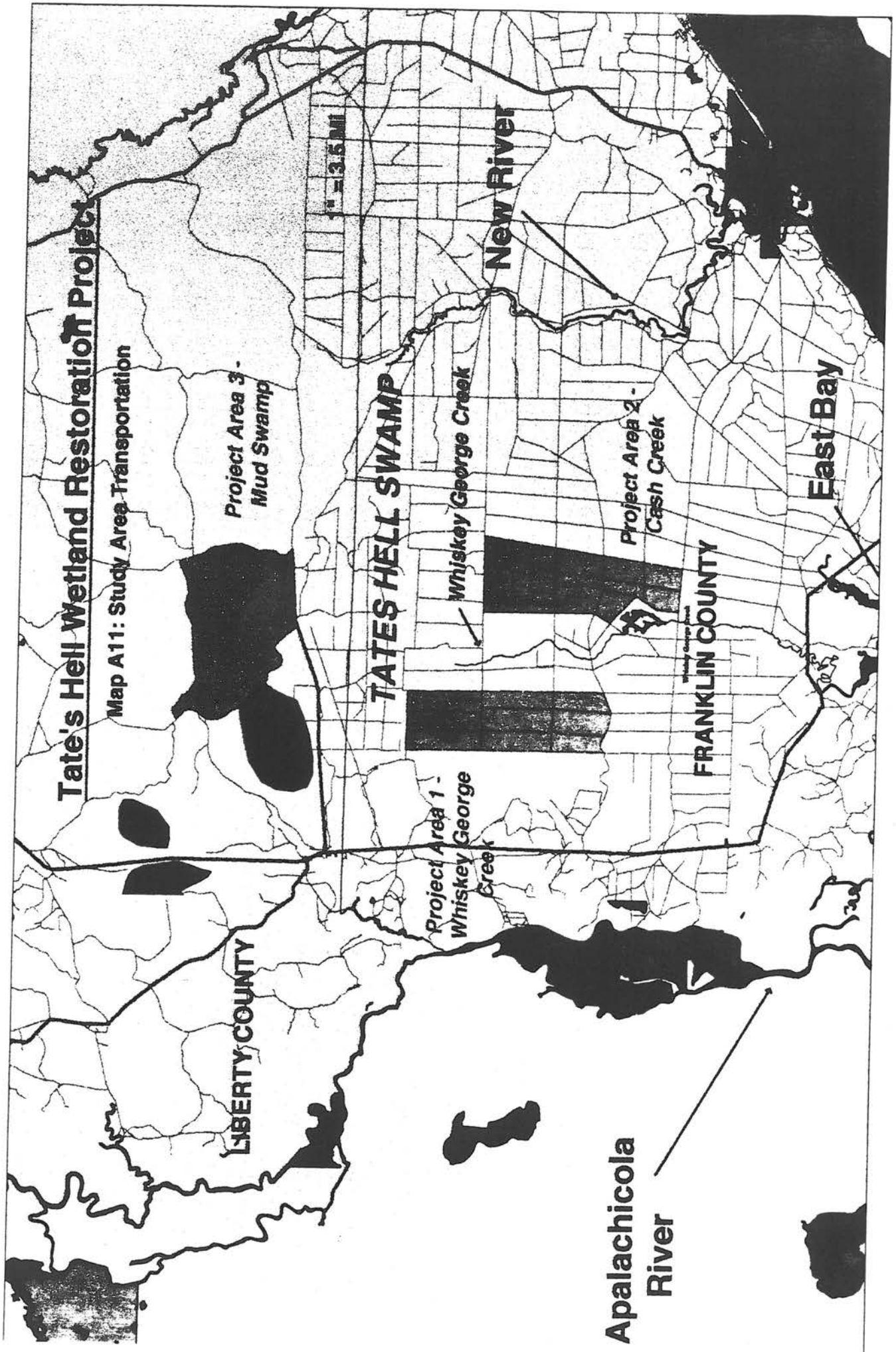
1" = 3.5 MI





Tate's Hell Wetland Restoration Project

Map A11: Study Area Transportation



Plant Reference Collection

Methods

Plants were collected at least monthly from July 1995 through September 1996. Collections were identified and pressed, or pressed and preserved for future identification. Plants recognized as rare or protected were collected only for initial identification and photographed when possible. Areas recognized as species rich, mostly clearcuts and burned areas, were visited frequently to collect new species as the bloom season changed. Species were frequently collected from roadsides, wet savannahs and clearcuts, as a greater diversity of species would be expected in these areas than in canopied areas. In addition, borders between plant community types (ecotones) were also surveyed regularly for species collections. This collection is the result of a qualitative effort to collect and identify as many species in our study areas as possible. We have also surveyed the most likely habitats for protected species in an effort to locate all viable and remnant populations of these organisms.

Results

A complete list of plant species collected, the habitats in which they were found, wetland indicator status, and where and when they were collected is given in Appendix B. The reference collection of plant species currently contains 322 plant species, from 72 families and 172 genera collected in the four study areas (Table B1 summarizes all collected specimens, and Tables B3 through B6 lists specimens by study area). While these numbers will undoubtedly increase as we continue our collections, we have identified and collected the most abundant species. An additional 17 genera and 18 species from Tate's Hell State Forest, Florida Freshwater Fish and Game's Bloody Bluff Tract, and the Apalachicola National Forest were collected outside the study areas during the course of the project.

Table B1 summarizes the state and federally-protected (Wood 1996) and Florida Natural Area Inventory (FNAI) tracked species (FNAI 1995). Nine federal species of special concern have been found, along with three federally-listed threatened species. We have also catalogued eleven species listed as threatened and two species listed as endangered on the Florida protected species list that are not protected by federal listing. Species with federal special status were found in all four study areas, but seven of the twelve special status species were found only in the reference areas (WS3 and RA4) (Table B2). However, species considered to be indicative of good habitat quality (Peet and Allard 1993), e.g. *Drosera intermedia*, *Aristida stricta*, *Sarracenia psittacina*, and others, have been found in all study areas (see Table B1).

Lists of species by study areas can be found in Tables B3-B6 (WS1, WS2, WS3, and RA4, respectively). More species (185) were collected in watershed one (WS1) than in any of the other areas, most likely a result of the greater amount of time spent in WS1. Open habitats, major category VII (clear-cut, seepage slope, wet savannah, road, roadside, ditch edge), had the greatest species richness (258 species) of all habitats types in the study (Table B1-B5). The wetland indicator status of the plants in the reference collection include 108 (34%) obligate wetland species (OBL), 95 (30%) facultative wetland species (FACW), 48 (15%) facultative species (FAC), 26 (8%)

facultative upland species (FACU) and 45 (14%) species with no indicator status in Florida (Reed 1988).

Discussion

The abundance of species in the disturbed watersheds indicates that a wetland plant seed bed remains that could be encouraged to grow given appropriate conditions. Opportunistic species are more abundant in disturbed watersheds and will out-compete less hardy wetland species without the restoration of hydrology and natural fire regimes. Restoration of habitat for the protected species in disturbed areas will be limited without the restoration of fire into the system cycles. Collection areas that were burned just prior to or during the course of this study provided the most species rich collection areas. The contrast in species richness in areas that are burned and areas that are not burned is dramatic. There is evidence that wiregrass (*Aristida stricta*), a dominant species in RA4, will not produce viable seed without being burned (Robbins and Myers 1992). Additionally, burning releases nutrients stored in fuels, providing a surge of nutrients for new seedlings.

Open habitats had greater species richness (258 species) than any other habitat type in the study (Table B1), most likely because of the extra sunlight these species receive due to the lack of canopy vegetation on roadsides. The mowing of the road shoulders in the Apalachicola National Forest and along Florida highway 65 mimics the disturbance of fire (without providing the additional nutrients) and so induces some species to bloom, making these areas particularly species rich. Bedded pine, and natural and planted pine flatwoods had the next greatest number of species with 47 and 44 species collected in these habitats. The lack of an open canopy in these areas limits the growth of herbaceous species by shading out all but the lowest light adapted. Twenty-four species were collected in habitats dominated by cypress, generally cypress strands or domes, 14 species were collected in gum swamp habitats, 11 species were collected in cedar-sweetbay-cypress habitats and 18 species were collected in creek swamp habitats. These areas are usually depressional and have a longer hydroperiod than most other habitats. The low number of species collected in these areas reflects both the limited area for this habitat type, and the limiting effects of saturated soils on plant species.

Harvested areas have little canopy vegetation, yet the number of species collected from these areas is comparatively low (26 species). This lack of species richness may be due to soil disturbance during harvesting, which changes the surface topography in these sites, and may result in loss of soil carbon and nutrients (Mitsch and Wu 1995; Greenland 1995), and damage the remaining seed bank (Glitzenstein et al. 1993). Best management practices for harvesting timber in areas of vegetation restoration may include modifications to reduce the disturbance to the soil and the native seedbank, and to decrease export of soil carbon and nutrients. Increased buffer zones around streams and depressional areas would encourage expansion of depressional wetland vegetation and allow more area for native habitat restoration and protected species conservation. These observations are qualitative observations of between habitat diversity (beta diversity), and can not be viewed as quantitative diversity measurements, however this information does provide preliminary data for future taxonomic and beta diversity studies.

Table B1. Plant family, genera and species, community type, common name, wetland plant status, and protected species status.

#	Date 1st Coll.	Comm. Type	Area	Family	Species	Author	Common Name	Ind.
1	18-May-95	I, II, IIIa, VII	1,2,3	Aceraceae	Acer rubrum	L.	red maple	OBL
2	18-May-95	VII(cc)	1,2,3	Liliaceae	Aletis aurea	Walt.	golden colic-root	FACW
3	02-May-96	VII(d,r,ss,ws)	3,4	Liliaceae	Aletis lutea	Small	Yellow colic-root	FACW
4	02-May-96	VII(d,r,ss,ws)	3,4	Liliaceae	Aletis obovata	Nash	White colic-root	FAC
5	19-Nov-96	VI	3	Betulaceae	Alnus serrulata	(Ait.) Willd.	hazel alder	OBL
6	30-Aug-95	I	2	Vitaceae	Ampelopsis arborea	(L.) Koehne	peppervine	FAC
7	29-Aug-95	IV/VII	2	Gramineae	Andropogon glomeratus	var. hirsutum (Walt.)	bushy bluestem	FACW
8	18-May-95	VII(cc)	1	Gramineae	Andropogon ternarius	Michx.	silver bluestem	FAC
9	13-Nov-95	VII(cc,r)	1,2,3	Gramineae	Andropogon virginicus	L. var. glaucus Hack	broomsedge	FAC
10	15-Aug-95	VII(r)	2	Araliaceae	Aralia spinosa	L.	devil's walkingstick	FAC
11	18-Oct-96	I	1,2	Gramineae	Aristida purpurescens	Poir.	arrowfeather	FACW
12	18-May-95	I, II, VII(cc,ss,ws)	1,2,3,4	Gramineae	Aristida stricta	Michx.	pineland three-awn grass	FAC
13	18-May-95	VII(cc)	1	Gramineae	Aristida virgata?	Trin.	arrowfeather	FACW
14	26-Mar-96	I, VII(d, pond edge)	1,3	Rosaceae	Aronia arbutifolia	(L.) Ell.	red chokeberry	FACW
15	19-Jul-95	I, VII(r)	1,4	Asclepiadaceae	Asclepias cinerea	Walt.	Carolina milkweed	FAC
16	13-Jun-96	II, VII(d,ws)	1,3,4	Asclepiadaceae	Asclepias convivens	Baldw. ex Ell.	Fragrant milkweed	OBL
17	13-May-96	VII(ws)	4	Asclepiadaceae	Asclepias michauxii	Decne.	Weak-stemmed milkweed	FAC+
18	15-Sep-95	VII(ss)	3	Asclepiadaceae	Asclepias tuberosa?	L.	Milkweed	FACW-
19	27-May-96	II, VII(ws)	3,4	Asclepiadaceae	Asclepias viridula***	Chapm.	milkweed	FACW-
20	24-Aug-95	VII(r)	3,4	Annonaceae	Asimina longifolia	Kral	pawpaw	OBL
21	25-Aug-95	II, VII(pond bank,ws)	2,3,4	Compositae	Aster eryngiifolius***	T. & G.	coyote-thistle aster	FAC
22	18-May-95	I, II, IV, VII, VIII	1,2,3,4	Compositae	Baccharis halimifolia	L.	saltbush, silverling, groun	FACW
23	05-Aug-95	VII(cc,ss)	1,3,4	Compositae	Balduna uniflora	Nutt.	one-flower honeycomb-he	FACW
24	15-Oct-95	VII(cc,r)	1,2	Compositae	Bidens alba	(L.) DC.	white beggarticks	OBL
25	07-Sep-95	VII(r)	1,2,3	Compositae	Bidens mitis	(Michx.) DC.	beggarticks	FACW
26	14-Nov-95	VII(ss)	3	Compositae	Bigelovia nudata	(Michx.) DC.	rayless goldenrod	FAC
27	07-Sep-95	VII(d)	2	Cyperaceae	Bulbostylis barbata	(Rottb.) C.B. Clarke	watergrass	FACU
28	17-Jul-95	VII(r)	1	Verbenaceae	Callicarpa americana	L.	beautyberry, beautybush	FACU
29	25-Mar-96	VII(cc,ss,ws), VIII	1,2,3,4	Orchidaceae	Calopogon barbatus*	(Walt.)	Bearded grass-pink	FACW
30	02-May-96	VII(ws)	4	Orchidaceae	Calopogon pallidus	Chapm.	Pale grass-pink	OBL
31	13-May-96	VII(ws)	4	Orchidaceae	Calopogon tuberosus	(L.) BSP	Grass-pink	OBL
32	29-Aug-95	I	2	Convolvulaceae	Calystegia sepium	(L.) R. Br.	hedge bindweed	FAC
33	25-Mar-96	III/IV	3	Cyperaceae	Carex folliculata	L.	sedge	OBL
34	19-Jul-95	VII(d)	1	Cyperaceae	Carex glaucescens	Ell.	southern waxy sedge	OBL
35	18-May-95	VII(slough)	1	Cyperaceae	Carex walteriana	Bailey	Walter's sedge	OBL
36	11-Sep-95	VII(r,ss)	3	Compositae	Carphephorus odoratissimus	(Gmel.) Herb.	deer tongue, vanilla plant	OBL
37	23-Jul-95	VII(r,ws)	1,3,4	Compositae	Carphephorus pseudoliatris	Cass.	bristle-leaf chaffhead	OBL
38	26-Aug-95	VII(d)	2	Leguminosae	Cassia fasciculata	Michx.	partridge pea	FACU
39	05-Aug-95	VII(r)	1	Leguminosae	Cassia obtusifolia	L.	coffee weed	OBL
40	07-Aug-95	VII(r)	1,2	Gramineae	Cenchrus echinatus	L.	southern sandspur	OBL
41	23-Aug-95	VI	2,3	Rubiaceae	Cephalanthus occidentalis	(L.) B.S.P.	buttonbush	OBL
42	18-May-95	IIIa	1,2,3,4	Cupressaceae	Chamaecyparis thyoides	Vent.	Atlantic white cedar	FACW
43	25-Mar-96	VII(d,ss)	3,4	Compositae	Chaptalia tomentosa	(Steud.) Yates	sun-bonnets, pineland dai	FACW
44	18-Dec-95	VII(r)	3	Gramineae	Chasmanthium ornithorhynchum?	Crantz	spikegrass	FACW
45	24-Aug-95	VII(d)	2	Cyperaceae	Cladium jamaicense		sawgrass	OBL

#	COLLECTED FROM
1	Tower rd at Evans Lake Tram ridgeline, Bucksiding rd. btw. Tucker and Oilwell rds., Cat Branch at bridge
2	Tower rd at Evans Lake Tram ridgeline; on roadsides and ditches in NRMSWA
3	NRMSWA 114 triple culverts ditches and seepage slope, and other ditches and wet flatwoods and savannahs in the ANF
4	NRMSWA 114 triple culverts ditches and seepage slope, and other ditches and wet flatwoods and savannahs in the ANF
5	NRMSWA on creek bank at one lane bridge on ANF 114
6	Oil Well rd 300 ft. below Gully Br.
7	clearing W side of rd 1 to E of NW corner (NS rd) between Gullybr. & Dblbr.
8	Tower Rd. N of Evans Lake Tram ridgeline (clearcut area)
9	Tower Rd btw. Dblbr. and Gullybr. across from large clearcut; fairly ubiquitous
10	on E-side of Tucker rd. vic. Dblbr.
11	Hog Branch cypress stringer
12	WS1 1000 ft S of N Boundary Rd ~400 ft W of Rd7; clearcut off Tower Rd 0.25 mi N of Evans Lake Tram; ANF 110 area wet savannah; NRMSWA in pine flatwoods, wet s
13	On Tower rd. at Evans Lake Tram ridgeline in clearcut area
14	on Dblbr. rd @ Tower Rd; Triple culverts on ANF 114 in NRMSWA
15	WS1 1000 ft S of N Boundary Rd ~400 ft W of Rd7; ANF 110 area on "ridge" roadside near Ft. Gadsen Creek
16	in wet savannah on 181 in ANF; wet savannah in area 110; WS1 by ditch on Rd 9 at intersection with Evans Lake Tram.
17	ANF compartment 110 wet savannah
18	seepage slope at triple culverts on 114 in the NRMSWA
19	in ANF 110 area wet savannah; wet flatwoods in ANF on 181
20	on road along FHT3 N of MSNRW; on roadside at Cat Branch Bridge NRMSWA
21	Behind U pond off Oilwell Rd.; wet savannah on ANF 181; in wet flatwoods on 114; ANF 110 area flatwoods and wet savannah; roadsides in ANF and on 65
22	On W Boundary Rd. just S of Gullybranch Rd.; WS1 WQ site 1--first culvert on Evans Lake Tram (x2); and almost everywhere else
23	firebreak just S of the western part of N Boundary Rd. WS1; WS1 firebreak ~750 ft W of Tower Rd 200 ft S of N Boundary; NRMSWA along 114 (@ S culverts); on Rd 7 ~
24	Tower rd at Evans Lake Tram ridgeline, clearcut area
25	Btw. Bucksiding and Evans Lake Tram on SW Boundary Rd. WS2; WQ 1 in the Cash Creek watershed, on Bucksiding at Tower Rd.
26	In NRMSWA, seepage slope by triple culverts on 114 (x2); multiple collections
27	Oilwell Rd. ditch just N of Bucksiding
28	on Rd 9 about 800 ft of S of Gullybr
29	seepage slope by triple culvert on ANF 114; clearcuts and harvested areas in WS1 and WS2; ANF 110 area wetland savannah.
30	ANF 110 area wet savannah; ANF 110 area wet savannah near cypress stringer
31	ANF 110 area wet savannah
32	Intersection Dblbr. & first N rd E of Tucker Rd
33	Cypress/Gum/Ash? area down trail S. of one lane bridge on 114 in NRMSWA
34	ditch by Rd 7 about 950 ft S of N Boundary Rd
35	W Boundary Rd (WS1) below Gullybranch in slough area
36	3rd curve N of 22 on ANF 114 in NRMSWA; ANF 114 triple culvert seepage slope
37	on Rd 9 approx. 1000 ft S of N Boundary Rd ; ANF 110 area wet savannah
38	former road washout on Dry Bridge Rd just E of Pidcock Rd.
39	Tower rd. N of Gully Br. rd.
40	where Gully Br. hits W Boundary rd
41	Dry Br. rd just E of High Bluff Cr.; by Cat Branch; off 22 by the New River, 120-B by the New River bridge
42	Tower Rd. @ Evans Lake Tram ridgeline; W Boundary Rd. ~0.5 mi S of Dblbr. Rd. near cypress stringer; NRMSWA 120-B S of Cat Branch bridge; in all 4 study areas in w
43	Seepage slope by triple culverts on 114; ditches on 181 in ANF
44	Powerline rd. in NRMSWA N of 22
45	Dblbr. Rd W of Tucker Rd. (N ditch)

Table B1. Plant family, genera and species, community type, common name, wetland plant status, and protected species status.

Protected Species: *State Threatened, **State Endangered, ***Federal SSC, ****Federal Threatened

#	Date 1st Coll.	Comm. Type	Area	Family	Species	Author	Common Name	Ind.
46	18-May-95	V,VII(r)	1,3	Orchidaceae	Cleistes divaricata*	(L.) Ames	rosebud orchid, spreading	FAC
47	18-May-95	I,II,III,IIIIa,IV,V,VII	1,2,3,4	Clethraceae	Clethra alnifolia	L.	coast pepperbush	FACW
48	18-May-96	I,II,III,IIIIa,IIIIb,III/IV	1,2,3,4	Cyrillaceae	Cliftonia monophylla	(Lam.) Britton ex Sa	black titi / buckwheat tree	OBL
49	04-Apr-96	II	3	Euphorbiaceae	Cnidioscolus stimulosis	(Michx.) Engelm. &	Tread softly	
50	14-Nov-95	VII(r)	3	Labiatae	Conradina canescens	(T.&G.) Gray	Conradina	
51	05-Aug-95	VII(r)	1	Compositae	Conyza canadensis	(L.) Cronq.	canada horseweed	FACU
52	19-Nov-96	VII(ss)	3	Compositae	Coreopsis gladiata	E.B. Smith	coreopsis	OBL
53	14-Nov-95	VII(r)	3	Compositae	Coreopsis leavenworthii	Walt.	tickseed	FACW
54	14-Nov-95	VII(ss,ws)	3,4	Compositae	Coreopsis nudata	T. & G.	coreopsis	FACW+
55	15-May-96	I	2	Rosaceae	Crataegus phaenopyrum**	Nutt.	swamp coreopsis	FACW
56	07-Sep-95	VII(ss)	3,4	Gramineae	Ctenium aromaticum	(L.F.) Medic	Washington hawthorn	FACW+
57	14-Nov-95	VII(r)	2	Convolvulaceae	Cuscuta compacta	(Walt.) Wood	toothache grass	FAC
58	06-Aug-95	VII(ws)	4	Convolvulaceae	Cuscuta indecora	Juss.	compact dodder	FACW
59	25-Jun-96	IV	1	Cyperaceae	Cyperus haspan	Choisy	dodder, love-vine	
60	11-Aug-95	IV	2	Cyperaceae	Cyperus retrofractus	L.	sheathed flatsedge	OBL
61	06-Sep-95	VII(r)	2	Cyperaceae	Cyperus strigosus	(L.) Torr.	? flatsedge	
62	07-Sep-95	I,II,III,IIIIa,IIIIb,III/IV	1,2,3,4	Cyrillaceae	Cyrtilla racemiflora	L.	straw-colored flatsedge	FACW
63	20-May-95	VII	1	Leguminosae	Desmodium lineatum	DC.	titi / leatherwood	FACW
64	21-Aug-95	VII(r)	2	Gramineae	Dichanthelium spheerocarpon(Pa	(Ell.) Gould	roundseed panicgrass	FACU
65	15-Aug-95	VIII	2	Cyperaceae	Dichromena colorata (Rhynch.)	(L.) Hitchc.	starbrush whitetop sedge	FACW
66	30-Aug-95	VII(ss,ws)	3,4	Cyperaceae	Dichromena latifolia (Rhynch.)	Baldw. ex Elliot	giant whitetop sedge	FACW
67	23-Jul-95	VII(r)	1	Rubiaceae	Digitaria ciliaris	(Retz.) Koel.	Southern crabgrass	FAC
68	30-Jul-95	VII(r)	1,2	Rubiaceae	Diodia teres	Walt.	poor Joe	FACU
69	26-Jul-95	IIIIa	2	Rubiaceae	Diodia virginiana	L.	Virginia buttonweed	FACW
70	24-Aug-95	I,II,VII(cc,ws,ss),VIII	1,2,3,4	Droseraceae	Drosera capillaris	Poir.	pink sundew	OBL
71	25-Apr-96	II,VIII	1,2,3	Droseraceae	Drosera intermedia*	Hayne	spoonleaf sundew	OBL
72	29-Aug-95	VII(cc,ss,ws)	1,3,4	Droseraceae	Drosera tracyi	MacFarlane in Baile	dew-threads	OBL
73	18-May-95	V	1	Polypodiaceae	Dryopteris clintoniana	(D.C. Eaton) Dowell	Clinton's wood fern	FACW
74	18-May-95	I	1	Cyperaceae	Eleocharis ludoviciana	(Kunze) Small	southern shield fern	OBL
75	09-Jul-95	VII(d)	1	Gramineae	Eragrostis atrovirens	(Desf.) Trin	petticoat tickler, Thalia lov	FAC
76	29-Jul-95	VII(r)	2	Gramineae	Eragrostis eliotii	S. Wats.	Elliott lovegrass	FACW
77	30-Aug-95	VII(cc)	1	Gramineae	Eragrostis refracta	(Muhl.) Scribn.	coastal lovegrass	FACW
78	24-Aug-95	VII(r)	1	Gramineae	Eragrostis spectabilis	(Pursh.) Steud.	purple lovegrass	FAC
79	15-Nov-95	VII(r)	2	Compositae	Erechtites hieracifolia	(L.) Raf. ex DC.	fireweed	FAC
80	08-Jul-95	VII(r)	3	Gramineae	Erianthus giganteus	Baldwin	plumegrass	FACW
81	07-Sep-95	VII(r,ws)	1,4	Compositae	Erigeron vernus	(L.) T. & G.	early whitetop fleabane	OBL
82	14-Nov-95	II,VII(cc,ws,ss)	1,2,3,4	Eriocaulaceae	Eriocaulon compressum	Lam.	flattened pipewort	OBL
83	18-May-95	VII(cc)	1	Eriocaulaceae	Eriocaulon lineare	Small	narrow pipewort	OBL
84	05-Aug-95	I,VII(r)	1	Eriocaulaceae	Eriocaulon texense	Koern.	Texas pipewort	OBL
85	09-Aug-95	I,II,VII(ss,ws)	1,3,4	Umbelliferae	Eryngium yuccifolium	Michx.	rattlesnake master	FAC
86	19-Jul-95	VII(r)	3	Compositae	Eupatorium altissimum	L.	white snakeroot	FACU
87	11-Sep-95	VII(cc,r)	1,2,3	Compositae	Eupatorium capillifolium	(Lam.) Small	dog fennel	FACU
88	30-Aug-95	VII(r)	3	Compositae	Eupatorium leucolepis	(DC.) T. & G.	white-bract thoroughwort	FACW
89	11-Sep-95							
90								

#	COLLECTED FROM
46	Tower Rd gum swamp; S. of triple culverts on NRMSWA 114; on roadside
47	Tower Rd gum swamp; Tower Rd @ Evans Lake Tram ridgeline
48	Tower rd at Evans Lake Tram ridgeline (ditch edge); in all communities except gum swamp, especially in wet areas and ditch edges
49	flatwoods in NRMSWA on abandoned road off 114
50	ANF 182 on W side of bridge at New River entrance to NRMSWA, on roadside
51	Intersection of Dblbr. and Tower
52	In NRMSWA 114 triple culverts 'seepage slope'
53	In NR/MSWA, 114 just S of one lane bridge (x2)
54	In NR/MSWA, 120-B at New River bridge
55	NRMSWA triple culverts seepage slope on ANF 114; ANF 110 area wet savannah
56	N side of Buck Siding rd just W of Tucker Rd.
57	In NR/MSWA, seepage slope by triple culverts on 114; ANF 110 area wet savannah in sampling transects
58	Tucker rd between Gully Br & Dblbr.
59	ANF area 110 wet savannah (frequently on <i>Justicia crassifolia</i>)
60	ditch along Rd 9, approx 3700 ft S of Gullybr
61	N end of N-S rd imm. to W of Tucker rd, between Gully Br and Dblbr.
62	just E of Tucker rd on N side of Buck Siding
63	~700 ft N of Gullybr approx. 150 ft E of rd 9 (parviflora); ~800 ft E of Rd 9 ~900 ft N of Gullybr; 800 ft S of Gullybr ~250 ft E of Rd 9; Tower rd @ Evans Lk tram ridgeline(dit
64	just E of Tower rd on ridge S of N Boundary rd
65	Tucker Rd. near the intersection with Dblbr.
66	halfway between Gully Br. & Dblbr. along Oil Well Rd.
67	vic. MSNRW; 114 triple culverts seepage slope; ANF area 110 wet savannah; 65 roadsides and ditches
68	Rd 9 in WS1 ~3500 ft N of Dblbr
69	Evans Lake culvert between rds. 7 & 9; Tucker rd vic Dblbr
70	just NW of 1st rd N going W of Tucker rd along Dblbr. rd(x2)
71	Bedded pine area N of Dblbr off Rd. 7; harvested area off Oilwell Rd. N of gullybranch; ss by 114 triple culverts; flatwoods N of powerline rd. in NRMSWA; cc area off Tow
72	1000 ft S of Gully Br. just off NW boundary rd in WS2; flatwoods in WS3 fairly ubiquitous; clearcut and flatwoods areas in WS1
73	Tower rd just N of Evans Lk tram ridgeline (clearcut area); NRMSWA 114 seepage slope; ANF 110 area wet savannah
74	Tower rd. gum swamp
75	near 7 between rds. 7 & 9, 0.8 mi. N of Dblebr. rd
76	In Rd. 9 ditch ~ 3500 ft N of Gullybr of WS1
77	1200 ft S of Gully Br. on Oil Well rd
78	ANF Rd. 114 3 curves N of 22 in NRMSWA
79	on Tower Rd. N. of Evans Lake Tram (clearcut area)
80	Intersection of Rd. 9 and Evans Lake Tram
81	Oilwell Rd. btw. Buckside and Evans Lake Tram
82	In NR/MSWA 114 just N of triple culverts (x2)
83	Tower rd @ Evans Lk tram ridgeline; ANF 114 triple culverts seepage slope and ditch NRMSWA; ANF area 110
84	Tower rd just N of Evans Lk tram ridgeline (clearcut area); ANF 114 triple culverts seepage slope and ditch NRMSWA; ANF area 110
85	clearing on Tower just N of Gully Br.
86	~350 ft S of N Boundary approx. 1050 ft W of Rd 9; on trail S of one lane bridge on 114 in ANF NRMSWA
87	vic. Dean's plot 9; seepage slope by NRMSWA 114 triple culverts; ANF 110 area wet savannah; ANF 181 wet flatwoods
88	E of ANF 114 on 22 in the NRMSWA
89	Oilwell Rd 1200 ft below Gullybr. Rd
90	E of ANF 114 on 22 in the NRMSWA

Table B1. Plant family, genera and species, community type, common name, wetland plant status, and protected species status.
Protected Species: *State Threatened, **State Endangered, ***Federal SSC, ****Federal Threatened

#	Date 1st Coll.	Comm. Type	Area	Family	Species	Author	Common Name	Ind.
91	24-Aug-95	VII(r)	3	Compositae	Eupatorium linearifolium	Walt.	thoroughwort	
92	11-Sep-95	VII(r)	3	Compositae	Eupatorium mohrii	Greene	thoroughwort	
93	11-Sep-95	VII(r)	3	Compositae	Eupatorium rotundifolium	L.	false hoarhound	FAC
94	20-May-95	VII(r)	1	Euphorbiaceae	Euphorbia floridana	Chapm.	Florida spurge	
95	19-Jul-95	I,VII(cc)	1,4	Euphorbiaceae	Euphorbia inundata	Torr. ex Chapm.	Florida pine spurge	FACW
96	18-Jul-95	VII(cc)	1	Euphorbiaceae	Euphorbia telephioidees****	Chapm.	Telephus' spurge	
97	30-Aug-95	VII(d)	2	Gramineae	Eustachys glauca	Chapm.	saltmarsh fingergrass	FACW
98	22-Jul-95	VI,VII(d)	1,2,3	Oleaceae	Fraxinus caroliniana	Mill.	Carolina ash	OBL
99	15-Jul-95	VII(r)	1,2	Onagraceae	Gaura angustifolia	Michx.	southern gaura	
100	07-Sep-95	VIII	2	Ericaceae	Gaylussacia dumosa	(Andr.) Tor. & Gray	dwarf huckleberry	FAC
101	18-May-95	I,II,IIIa,IV,VII(cc),VIII	1,2,3,4	Ericaceae	Gaylussacia mosieri	Small	woollyberry	FACW
102	25-Mar-96	VII(d,r)	1,2,3	Loganiaceae	Gelsemium rankinii	(L.) Ait. f.	yellow jessamine	FACW+
103	04-Apr-96	II	3	Compositae	Gnaphalium sp.	(Raf.) Rock	rabbit tobacco	
104	21-Aug-96	VII(r,ws)	1,2,3,4	Compositae	Helenium amarum	Walt.	Bitterweed	FACU
105	25-Mar-96	VII(cc,r,ss,ws),VIII	1,2,3,4	Compositae	Helenium vernale	Walt.	Sneezeweed	FACW+
106	07-Sep-95	VII(r)	2	Compositae	Helianthus angustifolius	L.	swamp sunflower	FAC
107	27-May-96	II,VII(d,ws)	3,4	Compositae	Helianthus radula	(Pursh) T. & G.	rayless sunflower	FACW-
108	29-Jul-95	VII(r)	1,2	Compositae	Heterotheca subaxillaris	(Lam.) Britton & Rus	camphor weed	FACU
109	24-Aug-95	II,VII(r)	3,4	Malvaceae	Hibiscus aculeatus	Walt.	pineland rosemallow	FACW
110	18-May-95	VII(d)	1	Umbelliferae	Hydrocotyle bonariensis	Lam.	water pennywort	FACW
111	14-May-95	VI	3	Amariidaceae	Hymenocallis rotata	(Ker-Gawl.) Herb.	spider-lily	OBL
112	08-Jul-95	VII(d,r),VIII	1,2	Guttiferae	Hypericum brachyphyllum	(Spach) Steud.	coastal plain St. Johnswort	FACW
113	24-Aug-95	VII(r)	3,4	Guttiferae	Hypericum cistifolium	Lam.	round-pod St. Johnswort	FACW
114	01-Aug-95	V	1	Guttiferae	Hypericum crux-andreae	(L.) Crantz	St. Peter's-wort	FACW
115	05-Aug-95	I	1	Guttiferae	Hypericum exile	Adams	St. Johnswort	FACW
116	05-Aug-95	I	1	Guttiferae	Hypericum fasciculatum	Lam.	St. Johnswort	FACW
117	15-Aug-95	VII(r)	1,2,3,4	Guttiferae	Hypericum gentianoides	(L.) B.S.P.	orangegrass	FACU
118	29-Aug-95	VII(cc,r)	1,2,3	Guttiferae	Hypericum hypericoides	(L.) Crantz	St. Andrew's cross	
119	05-Aug-95	I	1	Guttiferae	Hypericum microsepalum	(T. & G.) Gray ex S.	small sepal St. Johnswort	FAC
120	15-Dec-95	VII(r)	1,3	Guttiferae	Hypericum myrtifolium	Lam.	sand-weed	FACW
121	18-May-95	VII(cc)	1	Guttiferae	Hypericum sp.	Lam.	St. John's wort	
122	27-May-96	VII(ws)	4	Guttiferae	Hypericum tetrapetalum	Lam.	St. John's wort	FACW
123	25-Mar-96	VII(cc,d,ss)	1,3,4	Hypoxidaceae	Hypoxis micrantha	Pollard	yellow stargrass	FACW
124	06-Sep-95	VII(d)	2	Labiatae	Hyptis alata	(Raf.) Shinnars	cluster bushmint	OBL
125	17-Jul-95	IIIa,VII(cc)	1,2,3	Aquifoliaceae	Ilex cassine	L.	dahoon	FACW
126	18-May-95	I,II,VII(cc,r)	1,2,3,4	Aquifoliaceae	Ilex coriacea	(Pursh) Chapm.	highbush gallberry, baygal	FACW
127	18-May-95	I,VII(r)	1,2,3	Aquifoliaceae	Ilex glabra	(L.) Gray	inkberry, gallberry	FACW
128	18-May-95	III,V	1,2	Aquifoliaceae	Ilex myrtifolia	Walt.	myrtle holly	FACW
129	13-May-96	VI(rb),VII(r)	3	Iridaceae	Iris virginica	L.	Southern blue flag	OBL
130	06-Sep-95	III,VII(d,cc)	1,2	Saxifragaceae	Itea virginica	L.	Virginia willow	FACW
131	29-Aug-95	VII(cc)	2	Juncaceae	Juncus abortivus	Chapm.	pinebarren rush	OBL
132	18-May-95	VII(cc)	1	Juncaceae	Juncus effusus	L.	soft rush	FACW
133	18-May-95	VII(cc)	1	Juncaceae	Juncus elliotii	Chapm.	bog rush	OBL
134	05-Aug-95	VII(cc)	1	Juncaceae	Juncus marginatus	Rosk.	shore rush	FACW
135	07-Sep-95	VIII	2	Juncaceae	Juncus polycephalus	Michx.	many head rush	OBL

#	COLLECTED FROM
91	where Cat br. crosses 120 into MSNRW (ANF)
92	N on ANF 114 3 curves from 22 in NRMSWA
93	E of ANF 114 on 22 in the NRMSWA
94	Tower Rd. @ Evans Lake Tram ridgeline on road
95	~400 ft W of Rd 9 1000 ft S of N Boundary Rd; clearcut off Tower rd. by intermittent pond WS1
96	On ridgeline at Tower Rd. and Evans Lake Tram
97	approx 1 mile E of Tower on Dblbr. rd (ditch)
98	MSNRW on New river; Bucksiding W of Tower rd.; Bucksiding in WS2 E of W Boundary rd.
99	rd 9 @ Gully Br.; 2000 ft S of Gully Br. on Oil Well rd
100	clearing E of E-most point of SW boundary rd (WS2 between Buck Siding & Evans L. T.)
101	Tower Rd clearcut just N of Evans Lake Tram ridgeline; 100 ft E of Rd 7 approx 950 ft S of N Boundary Rd; 350 ft S of N Boundary approx 1050 ft W of Rd 9; 500 ft E of W
102	Clearcut off Tower rd. across from intermittent pond on ditch vegetation
103	pine flatwoods in NRMSWA on abandoned rd. off 114
104	ANF 110 area and along roadsides in study areas 1,2,3,4.
105	ANF 114 triple culverts seepage slope; also found in clearcuts in WS1, and WS2, roadedged along 65, and vegetated roads in all watersheds; ANF area 110 wet savannah
106	Oil Well rd just N of Buck Siding rd
107	ANF area 110 wet savannah; ANF wet flatwoods and wet savannahs
108	On Rd. 9 approx 3500 ft N of Dblbr.; where Dry Br. rd leaves Cash Cr. tract on SE side
109	where 100 hits New river, W side of river (ANF)[100 doesn't hit the New River, 182?]; roadside and ditches in ANF 110 area; on 181 in ANF roadside of wet flatwoods
110	Tower Rd at intersection with Doublebridge Rd on sloping edge of ditch
111	New River at 120-B bridge
112	Rd 9 off Evans Lake Tram; Tucker Rd S of Dblbr.; 1800 ft N of Dblbr. on NW Boundary Rd WS2; WS2 at WQ2 on ditch edge; Tower Rd clearcut transects
113	along 114 to W of MSNRW; ANF 110 area in "borrow pit"
114	In Tower Rd gum swamp ~3400 ft N of Dblbr
115	Approx 750 ft W of Tower Rd near fire line 200 ft S of N Boundary Rd
116	Approx 750 ft W of Tower Rd near fire line 200 ft S of N Boundary Rd
117	Tucker Rd vic. Dblbr on Rd.; On rd near NW Boundary and Dblbr. Rds
118	along WS2 NW boundary rd just N of Dblbr.; Tower Rd. ridgeline area by intermittent pond; by the NR in WS3.
119	Approx 750 ft W of Tower Rd near fire line 200 ft S of N Boundary Rd
120	on old road to bridge-out on 120-B at WQ site 2 in NRMSWA
121	Tower rd @ Evans lake tram ridgeline (clearcut area). Prob. brachyphyllum
122	ANF area wet savannah/flatwoods
123	ANF 114 triple culverts seepage slope; ditchside on 114 in NRMSWA in WS3; clearcut .25 mi n of Evans Lake Tram on Tower Rd.; ridgeline area by intermittent pond off
124	just E of 5 pts in THSF
125	~250 ft E of Rd 9 approx 800 ft S of Gullybr
126	on Rd 9 approx 1000 ft S of N Boundary Rd; approx 100 ft E of Rd 7 ~950 ft S of N Boundary Rd.; just NE of Gully Br. & rd 9; Tower rd @ Evans Lk tram ridgeline; Tower
127	400 ft W of Rd 9 1000 ft S of N Boundary Rd (x2); Tower Rd @ Evans Lk Tram ridgeline; Tower & Dblbr. Rds; on ditch edge by Tower rd. just N. of the intermittent pond a
128	500 ft E of W Boundary Rd approx 1600 ft S of Gullybr; Tower rd gum swamp
129	Roadside ditch on 65 S of Whiskey George Creek; New River riverbank in NRMSWA ANF 22
130	Tower rd N of Evans Lk Tram ridgeline(clearcut area); ~1600 ft S of Gullybr 100ft E of W Boundary Rd; on Evans Lake Tram just W of Tucker rd
131	~1000 ft. S of Gullybr. Rd. in clearing of NW Boundary Rd. in WS2.
132	Tower Rd @ Evans Lk Tram ridgeline (clearcut area)
133	Tower rd just N of Evans Lk Tram ridgeline (clearcut area) x2
134	Clearing just N of Gullybr. on Tower Rd.; Tower Rd just N of Evans Lake Tram ridgeline (clearcut area)
135	SW in WS2--harvested area just N of W end of E-W Rd. btw. Bucksiding and Evans Lake Tram (Rd. 22)

Table B1. Plant family, genera and species, community type, common name, wetland plant status, and protected species status.
Protected Species: *State Threatened, **State Endangered, ***Federal SSC, ****Federal Threatened

#	Date 1st Coll.	Comm. Type	Area	Family	Species	Author	Common Name	Ind.
136	15-Aug-95	VII(d, pond)	2	Juncaceae	Juncus repens	Michx.	creeping rush	OBL
137	18-May-95	VII(cc)	1	Juncaceae	Juncus roemerianus	Scheele	needlerush, black rush	OBL
138	18-May-95	VII(d)	1	Juncaceae	Juncus scirpoides	Lam.	needlepod rush	FACW
139	29-Aug-95	VIII	2	Juncaceae	Juncus sp.		rush	
140	18-May-95	VII(cc)	1	Juncaceae	Juncus trigonocarpus	Steud.	redpod rush	OBL
141	15-Aug-95	VIII	2	Juncaceae	Juncus validus	Coville	roundhead rush	FACW
142	02-May-96	VII(ws)	4	Acanthaceae	Justicia crassifolia***	(Chapm.) Small	thick-leaved water willow	OBL
143	14-Nov-95	VI, VII(d)	3	Acanthaceae	Justicia ovata var. lanceolata	(Walt.) Lindau	water willow	OBL
144	18-Jul-95	I, II, VII(cc, ss, ws, r, d)	1, 2, 3, 4	Haemodorraceae	Lachnanthes caroliniana	(Lam.) Dandy	Carolina redroot	OBL
145	30-Aug-95	VIII	2	Eriocaulaceae	Lachnocaulon minus	(Chapm.) Small	Small's bogbutton	OBL
146	11-Sep-95	VI, VII(d)	1, 3	Ericaceae	Leucothoe axillaris	(Lam.) D. Don	dog hobble	OBL
147	23-Aug-95	III, IIII/IV, VII(r)	1, 2, 3	Ericaceae	Leucothoe racemosa	(Lam.) Gray	fetterbush	FACW
148	25-Aug-95	VII(r)	3	Compositae	Liatris secunda	(L.) Gray	blazing star	FACW
149	06-Sep-95	VII(r)	2	Compositae	Liatris squarrosa	Ell.	blazing star	
150	02-Jul-96	VII(ws)	4	Compositae	Liatris tenuifolia	(L.) Michx.	blazing star	
151	29-Aug-96	II(wf), VII(ws)	4	Liliaceae	Lilium catesbaei*	Nutt.	pine lily	
152	15-Aug-95	VII(d)	2	Hamamelidaceae	Liquidambar styraciflua	Walt.	sweetgum	FACW
153	18-May-95	VII(d)	1	Campanulaceae	Lobelia glandulosa	L.	glandular lobelia	FAC
154	18-May-95	VII(cc, ws)	1, 2, 3, 4	Haemodorraceae	Lophiola americana	(Pursh) Wood	goldcrest	OBL
155	25-Aug-95	VII(r)	2	Onagraceae	Ludwigia alternifolia	L.	bushy seedbox	OBL
156	21-Aug-95	VII	1	Onagraceae	Ludwigia linearis	Walt.	narrow-leaf seedbox	OBL
157	24-Aug-95	VII(r)	2, 3	Onagraceae	Ludwigia maritima	F. Harper	seaside seedbox	FACW
158	31-Jul-95	VII(r)	1	Onagraceae	Ludwigia pilosa	Walt.	hairy seedbox	OBL
159	13-Jun-96	VII(r)	3, 4	Onagraceae	Ludwigia virgata	Michx.	rattlebox	OBL
160	09-Aug-95	II	1	Lycopodiaceae	Lycopodium alopecuroides	L.	foxtail clubmoss	OBL
161	18-May-95	VII(cc)	1	Lycopodiaceae	Lycopodium appressum	(Chapm.) Lloyd & Un	southern bog clubmoss	OBL
162	29-Aug-95	VII	2	Lycopodiaceae	Lycopodium carolinianum	L.	slender clubmoss	OBL
163	09-Jul-95	IV	2	Lycopodiaceae	Lycopodium prostratum	Harper	Harper's clubmoss	OBL
164	13-Jun-96	VII(r)	3	Compositae	Lygodesmia aphylla	(Nutt.) DC.	roserush	
165	18-May-95	VII(cc)	1	Schizaeaceae	Lygodium japonicum	(Thunb.) Swartz	climbing fern	FAC
166	25-Apr-96	VII(cc)	1	Ericaceae	Lyonia fruticosa	(Michx.) G. S. Torr. in	staggerbush	FAC
167	18-May-95	I, III, V	1, 2, 3, 4	Ericaceae	Lyonia lucida	(Lam.) K. Koch	fetterbush	FACW
168	26-Jun-96	II, VII(d, r)	4	Labiatae	Macbridea alba****	Biehler	white birds-in-a-nest	FACW+
169	18-May-95	II/IIIa, IIIa IIIa/IV, VI, V	1, 2, 3, 4	Magnoliaceae	Magnolia virginiana	L.	sweetbay	FACW
170	07-Aug-96	II, VII(ws)	4	Compositae	Marshallia tenuifolia	Raf.	Barbara's buttons	FAC
171	06-Sep-95	VII(r)	2	Scrophulariaceae	Mecardonia acuminata	(Walt.) Small	purple mecardonia	FACW
172	11-Sep-95	III, VII(ss)	3	Loganiaceae	Mitreola sessilifolia	(Walt.) G. Don	miterwort	
173	09-Jul-95	I, II, III, IIIa, IV, VII(ws),	1, 2, 3, 4	Myricaceae	Myrica heterophylla	Raf.	evergreen bayberry	FACW
174	04-Jul-96	II	4	Agavaceae	Nolina atropocarpa***	Bartlett	Florida beargrass	FAC
175	29-Jun-96	VII(d)	1, 2, 3	Nymphaeaceae	Nuphar luteum	(L.) Sibth. & Sm.	spatterdock, cow lily	OBL
176	15-Aug-95	VII(d)	1, 2	Nymphaeaceae	Nymphaea odorata	Ait.	white waterlily	OBL
177	18-May-95	I, II, V, VI, VII(d)	1	Nyssaceae	Nyssia biflora	Walt.	swamp tupelo	OBL
178	22-Jul-95	III, VI	1, 2, 3, 4	Nyssaceae	Nyssia ogeche	W. Bart. ex Marsh	ogeche tupelo	OBL
179	15-Aug-95	III, IIIa, VI(cb), VIII	1, 2, 4	Nyssaceae	Nyssia ursina***	Small	bear tupelo (?)	?
180	18-May-95	VII(r)	1	Onagraceae	Oenothera sp.		evening primrose	

#	COLLECTED FROM
136	ditch along (W side) Tucker Rd, S of Dblbr., 2) pond on Oil Well Rd 4800 ft S of Gullybr.
137	Tower rd N of Evans Lake Tram ridgeline (clearcut area)
138	Tower rd @ Dblbr. rd (ditch)
139	Clearing E of NW Boundary Rd. in WS2, immed. S of Gullybr.
140	Clearcut N of Gullybranch on Tower Rd.
141	Tucker rd S of Dblbr.
142	ANF 110 area wet savannah, multiple collections
143	In NR/MSWA, at 22 on the edge of the New River (at the water's edge)(x2); Cat Branch on 120; at New River on wet "road" 120-B & at the river; ditch at 114 triple culverts
144	Approx 950 ft S of N Boundary Rd about 100 ft E of Rd 7; ~600 ft E of Rd 7 approx 600 ft N of Gullybr; ANF 110 wet savannah; clearcuts, roadsides, shallow ditches, wet
145	clearing N of curve on Oil Well, S Gully Br.
146	Where 22 hits the New River (w-side); N. Boundary Rd. WS1 along ditch
147	~500 ft E of W Boundary Rd approx 1600 ft S of Gullybr; along ANF 114 in NRMSWA; E of Oil Well rd 1200 ft S of Gullybr.; just W of Tucker rd on tramline between Gullyb
148	ANF 114 approx. 3rd bend N of 22 in NRMSWA
149	just E of 5 pts. (where 5 roads meet W of Carrabelle entrance to THSF)
150	ANF 110 wet flatwoods sampling transects
151	E part of ANF 110 area in wet savannah near cypress stringer; wet flatwoods in E part of ANF 110 area
152	on Tucker rd S of Dblbr.
153	Gullybranch rd W of Rd 7
154	Tower rd just N of Evans Lk Tram ridgeline (clearcut area); ANF area 110 wet savannah and wet flatwoods
155	just S of Gullybr. 1st rd E of NW Boundary Rd WS2
156	E of Tower Rd on ridge just S of N Boundary Rd
157	Where Cat Branch crosses into NRMSWA on 120 in the ANF; behind public works off Hwy65
158	road 9 approx 0.7 mi S of Gullybr
159	common on roadsides in ANF and 65 -- collected on 181 in ANF
160	just off Evans Lake Tram ~200 ft W of Rd 7(x2)
161	Clearcut at Tower Rd. N of Evans Lake Tram E of WS1
162	clearing 1200 ft S of Gully Br. on NW boundary rd
163	app. 10m W of rd N, 0.8 mi. N of Dblbr. Rd
164	114 roadside N of triple culverts in NRMSWA
165	Tower Rd at Evans Lake Tram ridgeline (clearcut area)
166	WS1 clearcut off Tower Rd. by intermittent pond
167	Tower Rd gum swamp; between Rds. 7 & 9, 0.8 mi. N of Dblbr. (x2); ~950 ft S of N Boundary Rd just off Rd 7; @ Dblbr. & Tower Rds; behind public works; at intermittent po
168	ANF 110 area on sloping "ridge" near Ft. Gadsen Creek; ANF 110 area roadside ditches (141-143)
169	just NE of Gullybr. & Rd 9; Tower Rd @ Evans Lk Tram ridgeline ditch; clearing just N of Gullybr. on Tower; Tower Rd ~1mi N of Bucksiding
170	ANF 110 area wet savannahs and wet flatwoods
171	Just N of Doublebr. on rd between Tucker & Oil Well
172	N on ANF 114, 3 curves from 22 in NRMSWA; ANF 114 triple culverts seepage slope
173	~1000 ft S of N Boundary Rd approx 400 ft W of Rd 9; W Boundary Rd approx. 1600 ft S of Gullybr; W just off rd 9, 0.8 mi N of Dblbr; ~400 ft W of Rd 9 approx. 0.7 mi S
174	ANF 110 area in flatwoods near Ft. Gadsen Creek
175	WS2 water quality site 1, but in several pools and ditches in the area
176	W-side Tucker rd ditch S of Dblbr.; WS1 W Boundary Rd. ditch N. of Hog Branch
177	Tower Rd, gum swamp; Tower @ Evans Lake tram; Just N of Gullybr E of Rd 9; Int. of Dblbr. and Tower Rds, var. parviflora; Rd 9 ~2m N of Evans Lk Tram; W Boundary ju
178	where 120-B hits New river dir. E of Sumatra (x2); Dry Bridge Rd. just E of High Bluff Creek; along banks of Whiskey George Creek S of Dry Br. Rd.
179	800 ft E of E-most curve in SW Boundary Rd. WS2; Dean's plot 48; WS2 just E of NW Boundary Rd. imm. S of Gullybr.; Nearer 7 between rds. 7 & 9, 0.8 mi. N of Dblbr. rd
180	Tower Rd. at Dblbr. NOT PRESSED

Table B1. Plant family, genera and species, community type, common name, wetland plant status, and protected species status.
Protected Species: *State Threatened, **State Endangered, ***Federal SSC, ****Federal Threatened

#	Date 1st Coll.	Comm. Type	Area	Family	Species	Author	Common Name	Ind.
181	25-Mar-96	VI(stream)	3	Araceae	Orontium aquaticum	L.	golden club	OBL
182	02-Aug-95	III	1	Oleaceae	Osmanthus americanus	(L.) Benth. & Hook.	devilwood, wild olive	FAC
183	26-Mar-96	VII(r)	1,2,3	Polypodiaceae	Osmunda cinnamomea	L.	cinnamon fern	OBL
184	18-May-95	V,VII(cc)	1,2,3	Polypodiaceae	Osmunda regalis	L.	royal fern	OBL
185	24-Aug-95	II,VII(d,r)	1,3,4	Umbelliferae	Oxypolis filiformis	(Walt.) Britt	common water dropwort	FACW
186	18-May-95	VII(cc)	1	Gramineae	Panicum repens	L.	torpedo grass	FAC+
187	06-Sep-95	I	2	Gramineae	Panicum virgatum	L.	switchgrass	FAC
188	24-Apr-96	II(wf),VII(ws)	4	Saxifragaceae	Parnassia grandifolia**	DC.	undine, grass-of-Parnassus	OBL
189	30-Aug-95	VII(r)	2	Vitaceae	Parthenocissus quinifolia	(L.) Planch.	Virginia creeper	FAC
190	08-Jul-95	VII(r)	1,2	Gramineae	Paspalum urvillei	Steud.	Vasey grass	FAC
191	20-May-95	VII(cc,d)	1	Lauraceae	Persea palustris	(Raf.) Sarg.	swamp bay	
192	13-Jun-96	VII(r)	3,4	Compositae	Phoebanthus tenuifolia	(T. & G.) Blake		
193	18-May-95	VII(r)	1	Verbenaceae	Phyla nodiflora	(L.) Greene	capeweed, common frog f	FACW
194	24-Jul-95	II,IIIa,III,IV	1	Ericaceae	Pieris phillyreifolia	(Hook.) DC.	climbing fetterbush	FACW
195	26-Mar-96	VII(cc,d,ss)	1,3	Lentibulariaceae	Pinguicula ionantha****	Godfrey	Godfrey's butterwort	OBL
196	26-Mar-96	VII(cc,d,ss)	1,2,3	Lentibulariaceae	Pinguicula lutea*	Chapm.	yellow butterwort	OBL
197	21-Dec-95	VII(ss)	3	Lentibulariaceae	Pinguicula planifolia***	Chapm.	Chapman's butterwort	OBL
198	18-Dec-95	II(wf)	3	Lentibulariaceae	Pinguicula pumila	Michx.	small butterwort	OBL
199	14-Nov-95	VII(r)	3	Lentibulariaceae	Pinguicula sp.		butterwort	OBL
200	18-May-95	I,II,IV,V,VIII,VII(ws),I	1	Pinaceae	Pinus elliotii	Engelm.	slash pine	FACW
201	19-Jul-95	VII(r)	1,2	Compositae	Pityopsis adenolepis	(Fern.) Semple	golden aster	
202	14-Nov-95	VII(r)	3	Compositae	Pityopsis graminifolia	(Michx.) Nutt.	golden aster	
203	13-Jun-96	VII(ws)	4	Compositae	Pityopsis oligantha	(Chapm. ex T. & G.)	golden aster	
204	30-Apr-96	VII(cc)	2	Plantaginaceae	Plantago lanceolata	L.	English plantain	FAC
205	18-May-95	VII(r)	1	Plantaginaceae	Plantago virginica	L.	hoary plantain	FACU
206	24-Aug-95	VII(cc,ws)	2,4	Orchidaceae	Platanthera ciliaris*	(L.) Lindl.	yellow fringed orchid	FACW
207	15-Aug-96	VII(ws)	4	Orchidaceae	Platanthera integra***	(Nutt.) Gray ex Beck	yellow fringed orchid	OBL
208	13-Jun-96	VII(ws)	4	Orchidaceae	Platanthera nivea*	(Nutt.) Luer	snowy orchid	FACW
209	02-Jul-96	VII(ws)	4	Liliaceae	Pleea tenuifolia	Michx.	rush featherling	OBL
210	09-Aug-95	VII(cc)	1,2	Compositae	Pluchea foetida	(L.) DC.	stinking camphorweed	OBL
211	13-May-96	VII(ws)	4	Orchidaceae	Pogonia ophioglossoides*	(L.) Ker-Gawl.	rose pogonia	OBL
212	29-Aug-95	VIII	2,4	Polygalaceae	Polygala brevifolia	Nutt.	little-leaved milkwort	OBL
213	18-May-95	II,VII	1,4	Polygalaceae	Polygala cruciata	L.	crossleaf milkwort	OBL
214	29-Aug-95	VII(d,r,ws)	1,2,3,4	Polygalaceae	Polygala cymosa	Walt.	tall pine-barren milkwort	OBL
215	30-Aug-95	I,VII(ws)	2,3,4	Polygalaceae	Polygala hookeri	Torr. & Gray	Hooker's milkwort	FACW
216	18-May-95	II,VII	1,2,3	Polygalaceae	Polygala lutea	L.	orange milkwort	FACW
217	29-Aug-95	VII(cc,d,ss),VIII	1,2,3	Polygalaceae	Polygala nana	(Michx.) DC.	dwarf milkwort, bachelor's	FAC
218	15-Aug-95	VI,VII(r)	2,3	Polygonaceae	Polygonum hydropiperoides	Michx.	swamp smartweed	OBL
219	31-Jul-95	VII(r)	1	Polygonaceae	Polygonum punctatum	Elliot	dotted smartweed	FACW
220	29-Jul-95	VII(r)	1	Loganiaceae	Polypermum procumbens	L.	pickersweed	OBL
221	24-Aug-95	III,VI(stream,VII(d)	1,2,3	Pontederiaceae	Pontederia cordata	L.	orangedweed, juniper-leaf	FACU
222	18-May-95	VII(cc,d),pond	1,2	Haloragaceae	Proserpinaca pectinata	Lam.	combleaf mermaid weed	OBL
223	24-Jul-95	VII(r)	1	Cyperaceae	Psilocarya nitens	(Vahl.) A. Wood	short-beak baldrush	OBL
224	26-Jun-96	VI	4	Leguminosae	Psoralea psoraloides	(Walt.) Cory	Sampson's snakeroot	FACU
225	18-May-95	I,VII	1	Polypodiaceae	Pteridium aquilinum	(L.) Kuhn	bracken	FACU

COLLECTED FROM

#

- 181 in creek at one lane bridge on ANF 114
- 182 WS1 ~500 ft E of W Boundary Rd approx 0.3 mi S of Gullybr.
- 183 in ditch on ANF 182? (rd that runs E-W along N boundary of NRMMSWA)
- 184 Tower Rd @ Evans Lk Tram ridgeline; Tower Rd gum swamp
- 185 along S part of 114 W of MSNRW; ANF 110 area ditches; WS1 WQ site 3 by culvert
- 186 Tower rd. at Evans Lake Tram ridgeline (clearcut area)
- 187 N of Dblbr. near intersection of tram & rd between Oil Well & Tucker
- 188 ANF 110 area flatwoods and wet savannahs
- 189 on Oil Well rd 3000 ft S of Gully Br.
- 190 Int. of Rd 9 and Evans Lake Tram; Rd 9 approx 0.66 mi N of Dblbr; WS2 btw. Gullybr. and Dblbr. Rds
- 191 Tower rd @ Evans Lk tram ridgeline clearcut with and without fungal balls (x2); clearing on Tower just N of Gully Br.
- 192 Roadsides on 65 and ANF roadsides 141, 143, 114, 181
- 193 Tower Rd & Dblbr Rd intersection on rd shoulder
- 194 ~500 ft E of W Boundary approx 0.9 mi S of Dblbr; Approx 500 ft E of W Boundary Rd ~0.3 mi S of Gullybr.; ~1400 ft W of Rd 9 approx. 0.7 mi So of Gullybr.
- 195 seepage slope and intermittent pond at 114 triple culverts in NRMMSWA; in ditch by ANF 114 in NRMMSWA; clearcut area W of Rd 9 N of Evans Lake Tram in WS1
- 196 seepage slope at 114 triple culverts in NRMMSWA; in ditch by ANF 114 in NRMMSWA; clearcuts in WS1 and WS2; ditches in NRMMSWA and on 65
- 197 seepage slope and intermittent pond at 114 triple culverts in NRMMSWA
- 198 wet flatwoods below cypress strand in area SE of the one lane bridge on 114
- 199 In NR/MSWA, on 114 just past one lane bridge, in ditch; no flower
- 200 Tower rd gum swamp, naturally occurring; ubiquitous in cultivation in all four study areas, naturally occurring in WS1, WS3, and area 4
- 201 on rd 9 ~100 ft S of N Boundary Rd; 3000 ft S of Gullybr. on Oilwell Rd
- 202 In NR/MSWA, 120-B at New River bridge (x2)
- 203 ANF 110 area wet savannah
- 204 Exotic; WS2 clearcut off Dblbr. E of Oil Well (1 rd. past Oil Well)
- 205 on Tower rd @ Dblbr. rd
- 206 ANF 110 area wet savannah and wet flatwoods
- 207 ANF 110 area wet savannah and wet flatwoods
- 208 ANF 110 area wet savannah and wet flatwoods
- 209 ANF 110 area wet savannah sampling transects
- 210 clearing on Tower just N of Gully Br.; Just W of the N end of the rd. btw. Tucker and Oil Well Rds.
- 211 ANF compartment 110 wet savannah
- 212 woods 1000 ft S of Gullybr. on NW Boundary Rd
- 213 Tower Rd @ Evans Lake Tram ridgeline (clearcut area); ANF 110 area wet flatwoods and wet savannahs
- 214 clearing 1200 ft S of gully br E of NW Boundary rd; 120 roadside before Cat Branch; roadside 65; ANF 110 area wet savannah and ditch; triple culverts ditch and seepage
- 215 E of Oil Well rd 1200 ft. S of Gully Br.; ANF 110 area wet savannah; triple culverts at 114
- 216 Tower rd @ Evans Lake Tram ridgeline (clearcut area) also on 25-Mar-96; pine flatwoods in WS1 and WS3
- 217 pine woods 1000 ft S of Gullybr. on NW Boundary Rd WS2; 120-B just off bridge on road in NRMMSWA WS3; clearcut .25 mi. N of Evans Lk Tram off Tower Rd; ridgeline a
- 218 just E of 5 pts in the eastern part of THSF; Tucker rd & Dblbr Rd intersection; where Cat Branch crosses into MSNRW
- 219 N of Gully Br. on rd 9 approx 0.75 mi S of Gullybr
- 220 on Rd 9 approx 0.66 mi N of Dblbr
- 221 where Cat Br. crosses 120 into MSNRW; just E of 5 points in THSF; triple culverts cypress stringer in NRMMSWA off 114
- 222 ditch, Tower rd & Dblbr.; pond on Oil Well 4800 ft. S of Gully Br.; Clearcut .25 mi. N of Evans Lake Tram off Tower Rd; frequently in ditches, creeks and standing water in c
- 223 on Rd. 7 (puddle) between Dblbr. and Gullybranch; ditch, Tower and Dblbr.
- 224 ANF area 110 near Ft. Gadsden Creek
- 225 Tower rd @ Evans Lk tram ridgeline (clearcut area); ~400 ft W of Rd 9 ~100 ft S of N Boundary Rd (x2)

Table B1. Plant family, genera and species, community type, common name, wetland plant status, and protected species status.

Protected Species: *State Threatened, **State Endangered, ***Federal SSC, ****Federal Threatened

#	Date 1st Coll.	Comm. Type	Area	Family	Species	Author	Common Name	Ind.
226	18-Jul-95	I	1,3	Fagaceae	Quercus minima	(Sarg.) Small	dwarf live oak	
227	20-May-95	III, VII(d)	1,2,3	Fagaceae	Quercus nigra	L.	water oak	FAC
228	24-Aug-95	II	3	Fagaceae	Quercus stellata	Wangenh.	post oak	FACU
229	24-Aug-95	VI(cb,rb)	2,3	Fagaceae	Quercus virginiana	Mill.	live oak	FACU
230	27-May-96	II, VII(cc,ws,r)	1,2,3,4	Melastomataceae	Rhexia alifanus	Walt.	rose meadow-beauty	FACW
231	13-May-96	VII(ss,ws)	3,4	Melastomataceae	Rhexia lutea	Walt.	yellow rhexia	FACW+
232	24-Aug-95	II, VII(r,ws)	1,2,3,4	Melastomataceae	Rhexia mariana	L.	pale meadow-beauty	FACW
233	19-Jul-95	I, III, VII	1,2,3,4	Melastomataceae	Rhexia petiolata	Walt.	ciliate meadow-beauty	FACW
234	08-Jul-95	IV/VIII, VII(r)	1,2,3	Melastomataceae	Rhexia virginica	L.	Virginia meadow-beauty	FACW
235	09-Jul-95	II	1	Ericaceae	Rhododendron serrulatum	(Small) Millais	swamp honeysuckle	OBL
236	17-Jul-95	IIII	1,3	Ericaceae	Rhododendron viscosum	(L.) Torr.	swamp azalea	FACW
237	30-Aug-95	VII(r)	1,2,3	Anacardiaceae	Rhus copallinum	L.	winged sumac	
238	18-May-95	VII(cc,ws)	1,4	Cyperaceae	Rhynchospora baldwinii	Gray	Baldwin's beakrush	OBL
239	15-Aug-95	VII(pond,r)	2	Cyperaceae	Rhynchospora cephalantha	Gray	clustered beakrush	OBL
240	19-Jul-95	I, VII(ss)	1	Cyperaceae	Rhynchospora chapmanii	Curtis	Chapman's beakrush	OBL
241	19-Jul-95	III, VII(cc,ss,r)	1	Cyperaceae	Rhynchospora corniculata	(Lam.) Gray	Short-bristle beakrush	OBL
242	05-Aug-95	VII(cc)	1,2	Cyperaceae	Rhynchospora fascicularis	(Michx.) Vahl	fasciated beakrush	FACW
243	15-Aug-95	VII(r)	2	Cyperaceae	Rhynchospora fernaldii	S. Gale	Fernald's beakrush	FAC
244	29-Aug-95	VII(cc), VIII	2	Cyperaceae	Rhynchospora gracilentia	Gray	slender beakrush	OBL
245	29-Aug-95	III, VIII	2,4	Cyperaceae	Rhynchospora inundata	(Oakes) Fernald	horned beakrush	OBL
246	02-Jul-96	VII(ws)	4	Cyperaceae	Rhynchospora oligantha	Gray	beakrush	OBL
247	28-Jun-96	VII(cc,ws)	1,4	Cyperaceae	Rhynchospora plumosa	Eli.	beakrush	FACW
248	24-Aug-95	VII(ss)	3	Cyperaceae	Rhynchospora sp.			
249	10-Aug-95	II/IIII	1	Cyperaceae	Rhynchospora tracyi	Britton	tracy's beakrush	OBL
250	18-May-95	VII(d,r)	1	Rubiaceae	Rubus argutus (beautifolius Small	Link	highbush blackberry	FAC
251	13-Jun-96	VII(d,ss,ws)	3,4	Compositae	Rudbeckia graminifolia	(T. & G.) Boyn. & Be	Black-eyed Susan	FACW
252	21-Aug-96	VII(r)	1,2,3,4	Compositae	Rudbeckia hirta	L.	Black-eyed Susan	FACU
253	08-Jul-95	VII(d,ws)	1,3,4	Gentianaceae	Sabatia bartramii	Wilbur	Bartram's rose gentian	FACW
254	24-Aug-95	VII(ss), VIII	2,3	Gentianaceae	Sabatia brevifolia	Raf.	short-leaved rose gentian	FACW
255	12-Jun-96	VII(r)	3	Gentianaceae	Sabatia dodecandra	(L.) BSP	ten-petal sabatia	OBL
256	13-Jun-96	VII(r)	3	Gentianaceae	Sabatia grandiflora	(Gray) Small	Sabatia	FACW+
257	30-Jul-96	II, VII(ws)	4	Gentianaceae	Sabatia macrophylla	Hook	Sabatia	FACW+
258	26-Jun-96	VII(ws)	1,4	Gentianaceae	Sabatia stellaris	Pursh	Sabatia	OBL
259	06-Sep-95	IV/VIII, VII(d,slough)	1,2,3	Alismataceae	Sagittaria graminea	Michx.	grassleaf arrowhead	OBL
260	06-Sep-95	VII(d,marsh)	2	Alismataceae	Sagittaria lancifolia	L.	bull-tongue arrowhead	OBL
261	18-May-95	VII(d)	1,2	Salicaceae	Salix caroliniana	Michx.	coastal plain willow	OBL
262	30-Aug-95	IIII	2	Salicaceae	Salix nigra	Marsh.	black willow	OBL
263	25-Mar-96	I, II, VII(cc,ditch,ss,ws)	1,2,3,4	Sarracenaceae	Sarracenia flava	L.	trumpets	OBL
264	07-Sep-95	I, II, VII(ss)	1,3,4	Sarracenaceae	Sarracenia psittacina*	Michx.	parrot pitcher plant	OBL
265	22-Jul-95	VII(ss)	1,2,3	Sarracenaceae	Sarracenia purpurea*	L.	purple pitcher plant	OBL
266	15-Aug-95	IV, VII(cc,d)	1,2	Cyperaceae	Scirpus cyperinus	(L.) Kunth	woolgrass	OBL
267	29-Aug-95	VII(d)	2	Cyperaceae	Scleria baldwinii	(Torr.) Steud	Baldwin's nutrush	FACW
268	18-May-95	VII(r)	1	Cyperaceae	Scleria oligantha	Michx.	littlehead nutrush	FACU
269	05-Aug-95	VII(cc), VIII	1,2	Cyperaceae	Scleria triglomerata	Michx.	whip nutrush	FACU
270	18-May-95	VII(cc,r)	1,2,3,4	Palmae	Serenoa repens	(Bart.) Small	saw palmetto	FACU

#	COLLECTED FROM
226	~400 ft W of Rd 9 ~100 ft S of N Boundary Rd
227	W Boundary Rd approx 0.3 mi S of Gullybr; W Boundary Rd below Gullybr; on Gullybr 1 or 2 rds E of Whiskey George; Dry Bridge Rd ditchside at THSF Rd 23; Dry Bridge
228	MSNRW E of New river roughly opposite ANF Rd. 100
229	Dry Bridge Rd between High Bluff Creek & Ralph's Rd; where 120-B hits New river (ANF directly E of Sumatra)
230	on Tucker Rd N of Evans Lake Tram WS2; ANF area 110 wet savannah sampling transects; roadsides, wet savannahs, wet flatwoods, and clearcuts in all watersheds
231	ANF 114 seepage slope by triple culverts; ANF area 110 wet savannah sampling transects
232	120-B @ the New River in ANF NRMSWA; 114 in NRMSWA; on road edges and wet flatwoods in ANF
233	10 ft. from Rd 9 ~1000 ft S of N Boundary Rd; Hog Branch cypress stringer; clearcut N of Evans Lake Tram
234	Hwy65 just E of firetower; W boundary rd area 2 just N of Buck Siding
235	between rds 7 & 9 ~0.8 mi N of Dbldr.
236	Rd 9 ~800 ft S of Gullybr; County rd 22 ~2 mi E of Sumatra in ANF
237	on Tucker rd, S of Bucksiding, N of Dry Br.
238	ANF area 110 wet savannah plot 1C; Tower Rd. N of Evans Lake Tram ridgeline in clearcut
239	on Gully Br. rd just E of first rd E of Whiskey George(41); Pond edge off Oil Well Rd. 4800 ft. S of Gullybr. in WS2
240	~400 ft W of Rd 9 ~1000 ft S of N Boundary Rd; NRMSWA triple culverts seepage slope on ANF Rd. 114
241	ANF Rd. 114 triple culverts in NRMSWA; side of Rd 7 ~1000 ft S of N Boundary Rd; Hog Branch NW of WS1 in cypress strand; Tower rd. clearcut transects
242	clearing between 9 & Tower just N of Gully Br.
243	On Gullybr. approx. 1 mi. E of Whiskey George creek
244	1800 ft to N of Dbldr. rd just E of NW Boundary rd area 2; clearing 1200 ft. S of Gullybr. on NW Boundary Rd. in WS2
245	harvested area E of WS2 NW Boundary Rd, 1800 ft. N of Dbldr.; ANF 110 area cypress stringer
246	ANF area 110 wet savannah sampling transects
247	ANF area 110 wet savannah plot 1B; Tower rd clearcut transects WS1
248	ANF Rd. 114 triple culverts area just W of NRMSWA
249	Approx 100 ft E of W Boundary Rd ~150 ft N of intersection w/ Gullybr
250	Tower Rd @ Evans Lk Tram ridgeline(roadside); on Oil Well Rd. ~2 mi. S of Dry Bridge Rd.
251	ANF wet savannahs on 181; seepage slope by triple culverts on 114; ANF 110 area wet savannah; occasionally in shallow ANF ditches
252	ANF 110 area; roadsides
253	just E of fire tower in ditch along 65; ANF area 110 wet savannah
254	ss S of the 114 triple culverts to W of MSNRW; to E of 1000 ft S of Gully Br. on NW Boundary Rd
255	on wet part of "road" (120-B) to bridge at WQ2 in NRMSWA
256	in wet savannah on 181 in ANF
257	ANF area 110 wet savannah and wet flatwoods
258	ANF area 110 wet savannah
259	Tower Rd & Dbldr. Rd; clearing to E of E-most bend in (N-S) SW boundary rd (area 2 between Buck Siding and Evans L.T.); Just E of 5 pts in ditch; Tower Rd. in slough N
260	S Buck Siding rd halfway between 5 pts & Tucker rd; 1st rd. right off North rd. S of Dry Bridge rd. in marsh/wetland area in standing water.
261	ditch, Tower rd & Gully Br. rd; Gully Br., 2 rds E of Whiskey George; ditch, Tower rd and Doublebridge
262	intersection of Oil Well & Dbldr. (?)
263	NRMSWA seepage slopes; wet flatwoods; WS1&2 clearcuts and wet flatwoods, frequent in bedding furrows in wet areas; ANF compartment 110 wet savannahs and flatw
264	photographed (not collected) on seepage slope at ANF 114 triple culverts; deep woods between 7 & 9 (closer to 7) 0.5 mi N of Dbldr.
265	photographed (not collected) on seepage slope at the triple culverts on 114
266	~350 ft E of W Boundary Rd. ~200 ft N of Evans Lake Tram; NW ditch of Tucker & Dbldr rds int.; transects in clearcut off Tower Rd. N of Gullybranch
267	1800 ft. N of Dbldr. Rd. in E ditch on NW Boundary Rd. in WS2.
268	Tower Rd. past Evans Lake Tram ridgeline
269	clearing N of curve on Oil Well, S Gully Br.; clearing on Tower just N of Gullybr.
270	Tower rd @ Evans Lk tram ridgeline; Rd 9 N of Evans Lk Tram

Table B1. Plant family, genera and species, community type, common name, wetland plant status, and protected species status.

Protected Species: *State Threatened, **State Endangered, ***Federal SSC, ****Federal Threatened								
#	Date 1st Coll.	Comm. Type	Area	Family	Species	Author	Common Name	Ind.
271	15-Aug-95	VII(r)	1,2,3	Leguminosae	Sesbania vesicaria	(Jacq.) Elliot	bladderpod	FAC
272	11-Sep-95	VII(r)	1,3	Scrophulariaceae	Seymeria cassioides	(Walt.)Blake	Black senna, senna syme	FAC
273	26-Mar-96	VII(cc,d,r)	1,3	Iridaceae	Sisyrinchium atlanticum	Bickn.	blue-eyed grass	FACW-
274	24-Apr-96	VII(r)	4	Iridaceae	Sisyrinchium nashii	Bickn.	blue-eyed grass	FACW-
275	24-Aug-95	VII(r)	3	Smilacaceae	Smilax auriculata	Walt.	earleaf greenbrier	FACU
276	26-Mar-96	IV	2	Smilacaceae	Smilax ecirrhata	(Engelm. ex Kunth)	greenbrier	FACU
277	18-May-95	I,VII(d)	1	Smilacaceae	Smilax glauca	Walt.	cat greenbrier	FAC
278	18-May-95	I,VII(cc,r)	1,2,3,4	Smilacaceae	Smilax laurifolia	L.	bamboo vine	FACW
279	03-Apr-96	III	1,2,3	Smilacaceae	Smilax smallii	Morong	Jackson-brier	FACU
280	09-Jul-95	I,II	1,2,3,4	Smilacaceae	Smilax walteri	Pursh	coral greenbrier	OBL
281	07-Sep-95	VII(r)	2	Compositae	Solidago brachyphylla	Chapm.	goldenrod	FAC+
282	13-Aug-96	VII(ws)	4	Compositae	Solidago fistulosa	Mill.	goldenrod	OBL
283	11-Sep-95	VII(r)	3	Compositae	Solidago stricta	Ait.	willow-leaf goldenrod	OBL
284	18-May-95	VII(r,ss)	1,3	Orchidaceae	Spiranthes tuberosa*	Raf.	little ladies' tresses	FAC
285	05-Aug-95	I	1	Gramineae	Sporobolus floridanus	Chapm.	Florida dropseed	FAC
286	14-Nov-95	VI(rb)	3	Gramineae	Sporobolus indicus?	(L.) R. Br.	smutgrass	FACU+
287	30-Aug-95	III,VII(cb),VII(d,r)	1,2,3,4	Euphorbiaceae	Stillingia aquatica	Chapm.	corkwood	OBL
288	04-Apr-96	I,V,VII(r)	1,3	Styracaceae	Styrax americana	Chapm.	storax	FACW
289	24-Aug-95	VII(r)	3	Symplocaceae	Symplocos tinctoria	Lam.	horse sugar	FAC
290	19-Jul-95	VII(d)	1,2	Eriocaulaceae	Syngonanthus flavidulus	(L.) L'Her.	pond cypress	FACW
291	18-May-95	I,II,III,IIIa,IV,V,II/IIIa,I	1,2,3,4	Taxodiaceae	Taxodium ascendens	Brongn.	bald cypress	OBL
292	22-Jul-95	III	3	Taxodiaceae	Taxodium distichum	(L.) L. Rich.	wood sage	FACW-
293	21-Aug-95	VII(cc)	1	Leguminosae	Tephrosia hispida	(Desv.) Morton	woods fern	FACW
294	24-Jul-95	VII(r)	2	Labiatae	Teucrium canadense	(Walt.) BSP	False asphodel, asphodel	OBL
295	30-Aug-95	I	2	Polypodiaceae	Thelypteris kunthii	(L.) Kuntze	poison ivy	FAC
296	13-Jun-96	VII(ws)	3,4	Liliaceae	Tofieldia racemosa	L.	broadleaf cattail	OBL
297	23-Aug-95	III	1	Anacardiaceae	Toxicodendron radicans	Michx.	horned bladderwort	OBL
298	06-Sep-95	IV,VII(d,slough)	1,2	Typhaceae	Typha latifolia	Walt.	purple bladderwort	OBL
299	29-Aug-95	III,VII(cc,d,ws),pond	1,2,3,4	Lentibulariaceae	Utricularia cornuta	L.	zigzag bladderwort	OBL
300	18-May-95	VII(d,slough)	1	Lentibulariaceae	Utricularia purpurea	Marsh.	sparkleberry	FACU
301	04-Apr-96	VII(cc,d,ss),VIII	1,2,3	Lentibulariaceae	Utricularia subulata	L.	highbush blueberry	FACW
302	24-Aug-95	VII(r)	3	Ericaceae	Vaccinium arboreum	L.	Elliot blueberry	FAC
303	18-Jul-95	IV,V	1	Ericaceae	Vaccinium corymbosum	Chapm.	shiny blueberry	FAC
304	24-Aug-95	VII(r)	3	Ericaceae	Vaccinium elliotii	Lam.	Brazilian vervain	FACU
305	21-Aug-95	VII(cc)	1	Ericaceae	Vaccinium myrsinites	Vell.	Chapman's crownbeard	FACW+
306	10-Aug-95	VII(r)	1	Verbenaceae	Verbenia brasiliensis	Michx.	Ironweed	FACU-
307	27-May-96	VII(ws)	4	Compositae	Verbesina chapmanii****	L.	bog-white violet, longleaf	OBL
308	15-Aug-96	VII(ws)	4	Compositae	Vernonia angustifolia	LeConte	southern coast violet	FAC
309	15-Nov-95	VII	1	Violaceae	Viola lanceolata subs. lanceolata	Michx.	muscadine grape	FAC
310	18-Jul-95	I	1	Violaceae	Viola septemloba	(Thunb.) A. DC.	netted chain fern	OBL
311	26-Mar-96	VII(cc,d,ss)	1,2,3	Violaceae	Viola sp.	(L.) J.E. Smith	Virginia chain fern	OBL
312	18-May-95	VII(r)	1,2,3,4	Vitaceae	Vitis rotundifolia			
313	18-May-95	VII(r)	1	Campanulaceae	Wahlenbergia marginata			
314	18-May-95	II,V	1	Polypodiaceae	Woodwardia areolata			
315	30-Aug-95	I	2	Polypodiaceae	Woodwardia virginica			

#	COLLECTED FROM
271	@ Tucker rd & Gully Br. intersection; Bucksiding Rd. in vicinity of Whiskey George Creek; on roadsides in various places in THS, an opportunistic exotic
272	At New River on 22 in NRMSWA; WS1 W Boundary rd. roadside S of Dblbr.
273	in ditches in ANF (181, 100, 114); roadside on 65; clearcut off Tower rd. on N tram ridgeline
274	ANF 110 area off old logging rd. off 141-143
275	Where 120-B hits New River E of Sumatra
276	In scrub-shrub Hypericum swamp area ~2000ft S of Gullybranch E of Oilwell rd.
277	Tower rd @ Evans Lk tram ridgeline; Evans Lk tram culvert between rds 7 & 9; about 1000 ft S of N Boundar Rd ~400 ft W of Rd 9
278	Rd 9 off Evans Lake Tram (x2); 50m. from Rd 7 between 7 & 9 approx. 0.5 mi. N of Dblbr.; Tower Rd @ Evans Lk Tram ridgeline; Tower & Dblbr. Rds; Tower Rd clearcut t
279	in streambed of cypress stringer N. of 1st culvert on Evans Lake Tram WS1 (x2)
280	on rd 9 ~700 ft N of Gullybr; Btw. Rds. 7 & 9 in WS1, 0.5 mi. N of Dblbr.
281	Oil Well rd just N of Buck Siding
282	ANF 110 area
283	3 curves N of 22 on ANF 114 in NRMSWA; roadside in Bloody Bluff Tract on southwest part of Scott Rd
284	Gullybranch Rd. W of Rd 9
285	Approx. 200 S of N Boundary Rd ~750 ft W of Tower Rd
286	off 22 on the edge of the New River (x2?)
287	along Dry Br. rd @ dwarf cypress swamp; in dwarf cypress near Paddock Rd, but found in most low wet places including ditches, creekbanks and cypress stringers
288	~100 ft W of Rd 9 0.66 mi N of Dblbr, Tower Rd gum swamp; Evans Lk Tram between Rds 7 & 9; between Rds. 7 & 9, 0.8 mi. N of Dblbr.; N of Dblbr. on Rd 9; on floodplai
289	E of Sumatra where 120-B hits New river
290	In Rd 7 ditch approx. 950 ft S of N Boundary Rd; Tucker rd ditch S of Dblebr.
291	Tower rd @ Evans Lk tram ridgeline; Just off Dblbr. Rd. S of impassable pothole W of Rd. 7 E of W. Boundary Rd. in WS1; found in cypress stringers, wet flatwoods, strea
292	WS3 - along the New River
293	E of Tower rd on ridge just S of N boundary
294	Oil Well Rd approx. 3000 ft S of Gullybr.; offsite int. FL67 & Crooked River
295	Oil Well rd S of Gullybr. WS2
296	collected in wet savannah on ANF 181; ANF 110 area wet savannah
297	100 ft E of W Boundary Rd 0.3 mi S of Gullybr
298	slough area across ditch just N. of Tower Rd. gum swamp; N end of N-S rd between Tucker & Oil Well (N of Dblbr.); ditch at Tower and Dblbr.
299	1000 ft S of Gullybr. on NW Boundary Rd in ditch; pond on Oil Well Rd. 4800 ft S of Gullybr.; Tower Rd. clearcut N of Gullybr; ANF 110 area cypress stringer; ANF 110 are
300	slough area in ditch off Gullybr. Rd. (WS1); ditch by Rd. 9 just N of Evans Lake Tram Rd.; WS1 W Boundary rd. ditch N of Hog Branch
301	Tower Rd clearcut 0.5 mi N of Gullybr.; WS2 clearcut off Dblbr. E of Oil Well Rd; in wet clearcut and open (seepage slopes, wet prairies, etc.) in all three watershed areas.
302	Where 120-B hits the New River in the NRMSWA
303	~800 ft E of Rd9 approx. 900 ft N of Gullybr; ~200 ft N of Evans Lake Tram ~350 ft E of W Boundary
304	vic. end of 120-B @ New river directly E of Sumatra (ANF)
305	E of Tower rd on ridge clearcut to S of N Boundary rd
306	on Tower Rd by gum swamp (~3500 ft N of Dblbr)
307	ANF area 110 wet savannah
308	ANF 110 area wet savannah
309	In clearcut by ditch off Tower Rd. ~25 mi. N. of Evans Lake Tram
310	WS1 ~400 ft W of Rd 9 approx 1000 ft S of N Boundary Rd
311	in open area just S. of Dblbr. .25 mi. E of West Boundary rd. in WS1
312	Tower rd N of Evans Lk tram ridgeline (on ditch vegetation)(x2)
313	on Gullybranch W of Rd. 9
314	Tower rd gum swamp; ~150 ft N of Evans Lake Tram approx 200 ft W of Rd 7
315	On Oil Well Rd 1200 ft S of Gully Br.

Table B1. Plant family, genera and species, community type, common name, wetland plant status, and protected species status.

Protected Species: *State Threatened, **State Endangered, ***Federal SSC, ****Federal Threatened

#	Date 1st Coll.	Comm. Type	Area	Family	Species	Author	Common Name	Ind.
316	05-Aug-95	I,II,VII(ws),VIII	1,2,4	Xyridaceae	Xyris ambigua	Beyr. ex Kunth	coastal plain yellow-eyed	OBL
317	13-Jun-96	VII(ws)	4	Xyridaceae	Xyris baldwiniana	Schult.	St. Mary's grass	OBL
318	20-Jul-95	I	1	Xyridaceae	Xyris caroliniana	Walt.	Carolina yellow-eyed grass	FACW
319	27-May-96	VII(ws)	4	Xyridaceae	Xyris elliptica	Chapm.	Yellow-eyed grass	OBL
320	15-Jul-96	VII(cc)	1	Xyridaceae	Xyris stricta	Chapm.	yellow-eyed grass	OBL
321	18-May-95	VII(cc)	1,2,3,4	Liliaceae	Zigadenus densus	(Desr.) Fernald	crow-poison	FACW
322	24-Aug-95	II,VII(ss,ws)	1,2,3,4	Liliaceae	Zigadenus glaberrimus	Michx.	atlantic deathcamas	FACW
O T H E R S :								
1	27-Aug-96	marsh	offsite	Compositae	Arnoglossum ovatum	(Walt.) H. Robins	Indian plantain	FAC
2	26-Mar-95	offsite		Leguminosae	Baptisia lactea or alba			FAC
3	30-Jul-95	offsite		Cyperaceae	Cyperus lecontei	Torr.	LeConte's flatsedge	FACW
4	30-Jul-95	offsite		Cyperaceae	Fuirena breviseta	Coville	saltmarsh umbrellasedge	OBL
5	30-Jul-95	offsite		Cyperaceae	Fuirena scirpoidea	Michx.	southern umbrellasedge	OBL
6	29-Aug-95	offsite		Theaceae	Gordonia lasianthus	(L.) Ellis	loblolly bay	FACW
7	30-Jul-95	offsite		Juncaceae	Juncus sp.		rush	
8	28-Aug-96	offsite		Ericaceae	Kalmia hirsuta	Walt.	wicky	FACW-
9	30-Jul-95	offsite		Myricaceae	Myrica cerifera	L.	southern bayberry	FAC
10	24-Jul-95	VI	offsite	Nyssaceae	Nyssa aquatica	L.	Water tupelo	OBL
11	24-Aug-95	offsite		Lauraceae	Persea borbonia	(L.) Spreng	redbay	FACW
12	30-Jul-95	offsite		Compositae	Pluchea rosea	R. K. Godfr.	rosey camphorweed	FACW
13	28-Feb-96	offsite		Palmae	Sabal palmetto	(Walt.) Lodd. ex Sch	cabbage palm	FAC
14	28-Aug-96	offsite		Sarracenaceae	Sarracenia leucophylla***	Raf.	white-top pitcher plant	OBL
15	08-Aug-95	offsite		Leguminosae	Sesbania punicea	(Cav.) Benth.	purple rattlebush	FAC
16	17-Oct-96	VII(r)	offsite	Compositae	Solidago stricta	Ait.	goldenrod	OBL
17	24-Jul-95	offsite		Caprifoliaceae	Viburnum nudum	L.	possum haw	FACW
18	06-Sep-95	offsite	2	Polygalaceae	Polygala baldwinii	Nutt.	white bachelor's buttons	OBL

#	COLLECTED FROM
316	~150 ft N of Evans Lake Tram ~200 ft W of Rd 7; ~200 ft S of N Boundary approx. 750 ft W of Tower Rd; Clearing just W of Tucker rd, S of Dblebr.; ANF 110 area wet sav
317	ANF 110 area wet savannah near cypress stringer; ANF area 110 wet savannah plot 1A, sampling transects 1-3
318	~1000 ft S of N Boundary Rd ~400 ft W of Rd 9
319	ANF area 110 wet savannah
320	Transects in Tower Rd. clearcut N of Gullybranch Rd. WS1
321	Tower rd @ Evans Lk tram ridgeline (clearcut)
322	120 on E side of MSNRW (S of FH13); on 114 just past one lane bridge; ANF 110 area wet flatwoods and wet savannahs; old clearcuts in WS1, and WS2
1	Whiskey George Creek/East Bay marshes NOT PRESSED
2	on road edge at creek on 65 S of Cash Creek Bridge
3	behind public works on Cash Cr. tract
4	behind public works on Cash Cr. tract
5	behind public works on Cash Cr. tract
6	N side of Dry Br. rd to E of road gully (W of dwarf cypress); Bucksiding E of five points near Carrabelle entrance N of rd in bedded pine
7	Behind public works off hwy 65
8	DOF land proposed for swap for DOC prizon, W of 65 ~4 mi. N of 98
9	behind public works off Hwy65, 2) offsite, FL67 & Crooked river (x2)
10	Intersection of FL 67 and Crooked River
11	FH13 between Carr br. & Wilma (ANF)
12	N of public works off 65
13	In Apalachicola graveyard
14	DOF land proposed for swap for DOC prizon, W of 65 ~4 mi. N of 98; Off Pidcock Rd S of Dry Bridge Rd
15	offsite, imm. E of Carrabelle along I98
16	Roadside on Scott rd in the Bloody Bluff tract
17	offsite, FL67 & Crooked river
18	Just E of 5 pts. 2) ditto

Table B2. List of state and federally protected and FNAI tracked species collected in Franklin and Liberty counties.

Scientific Name	Common Name	Federal Rank	State Rank	FNAI Rank	Location
<i>Asclepias viridula</i>	Southern milkweed	SSC	Threatened	S2, G2	RA4, ANF Rd 181
<i>Aster eryngifolius</i>	aster	SSC			WS2, WS3, RA4
<i>Calopogon barbatus</i>	bearded grass pink		Threatened		WS1, WS2, WS3, RA4
<i>Cleistes divaricata</i>	rosebud orchid		Threatened		WS1, WS3
<i>Crataegus phaenopyrum</i>	Washington thorn		Endangered	S1, G4?	WS2
<i>Drosera intermedia</i>	spoon-leaf sundew		Threatened	S3, G5	WS1, WS2, WS3
<i>Euphorbia telephoides</i>	Telephus' spurge	Threatened	Endangered	S1, G1	WS1
<i>Justicia crassifolia</i>	thick-leaved water willow	SSC	Endangered	S2, G2	RA4
<i>Lilium catesbaei</i>	Southern red lily		Threatened	S3, G4	RA4
<i>Macbridea alba</i>	White bird's in-a-nest	Threatened	Endangered	S2, G2	RA4
<i>Nolina atopocarpa</i>	Florida beargrass	SSC	Endangered	S3, G3	RA4
<i>Nyssa ursina</i>	bog tupelo	SSC		S2, G2Q	WS1, WS2, RA4
<i>Parnassia grandifolia</i>	grass-of-Parnassus		Endangered	S2, G3G4	RA4
<i>Pinguicula ionantha</i>	violet-flowered butterwort	Threatened	Endangered	S2, G2	WS1, WS3
<i>Pinguicula lutea</i>	yellow flowered butterwort		Threatened		WS1, WS2, WS3
<i>Pinguicula planifolia</i>	Chapman's butterwort	SSC	Endangered	S2, G3?	WS3
<i>Phoebanthus tenuifolia</i> *	pine-land false-sunflower			S3, G3	WS3, RA4
<i>Platanthera ciliaris</i>	yellow-fringed orchid		Threatened		WS2, RA4
<i>Platanthera integra</i>	yellow-fringeless orchid	SSC	Threatened	S3S4, G4	RA4
<i>Platanthera nivea</i>	snowy orchid		Threatened		RA4
<i>Pogonia ophioglossoides</i>	rose pogonia		Threatened		RA4
<i>Sarracenia leucophylla</i>	white-top pitcher plant	SSC	Endangered	S3, G3	offsite
<i>Sarracenia psittacina</i>	parrot pitcher plant		Threatened		WS1, WS3, RA4
<i>Sarracenia purpurea</i>	decumbent pitcher plant		Threatened		WS1, WS2, WS3
<i>Spiranthes tuberosa</i>	little ladies' tresses		Threatened		WS1, WS3
<i>Verbesina chapmanii</i>	Chapman's crownbeard	SSC	Threatened	S2S3, G2G3	RA4

* FNAI tracked species not listed by state or federal agencies.

Table B3. Watershed 1 Plant Species List

#	Date	Community Type	Area	Family	Species	Author	Common Name	Ind.
1	18-May-95	II/IIIa, I, II, VII	1,2,3	Aceraceae	Acer rubrum	L.	red maple	OBL
2	18-May-95	VII(cc)	1,2,3	Liliaceae	Aletis aurea	Walt.	golden colic-root	FACW
3	18-May-95	VII(cc)	1	Gramineae	Andropogon ternarius	Michx.	silver bluestem	
4	13-Nov-95	VII(cc,r)	1,2,3	Gramineae	Andropogon virginicus	L. var. glauc	broomsedge	FAC
5	18-Oct-96	I	1,2	Gramineae	Aristida purpurens	Poir.	arrowfeather	FACW
6	18-May-95	I, II, VII(cc,ss,ws)	1,2,3,4	Gramineae	Aristida stricta	Michx.	pineland three-awn gr	FAC
7	18-May-95	VII(cc)	1	Gramineae	Aristida virgata?	Trin.	arrowfeather	FACW
8	26-Mar-96	I, VII(ditch, pond edge)	1,3	Rosaceae	Aronia arbutifolia	(L.) Ell.	red chokeberry	FACW
9	19-Jul-95	I, VII(r)	1,4	Asclepiadaceae	Asclepias cinerea	Walt.	Carolina milkweed	FAC
10	13-Jun-96	II, VII(ws, ditch)	1,3,4	Asclepiadaceae	Asclepias connivens	Baldw. ex El	Fragrant milkweed	
11	18-May-95	I, II, IV, VII, VIII	1,2,3,4	Compositae	Baccharis halimifolia	L.	saltbush, silvering, gr	FAC
12	05-Aug-95	VII(cc,ss)	1,3,4	Compositae	Baccharis uniflora	Nutt.	one-flower honeycom	FACW
13	15-Oct-95	VII(cc,r)	1,2	Compositae	Bidens alba	(L.) DC.	white beggarticks	
14	07-Sep-95	VII(r)	1,2,3	Compositae	Bidens mitis	(Michx.) DC.	beggarticks	OBL
15	17-Jul-95	VII(r)	1	Verbenaceae	Callicarpa americana	L.	beautyberry, beautyb	FACU
16	25-Mar-96	VII(ss,cc,ws), VIII	1,2,3,4	Orchidaceae	Calopogon barbatu*	(Walt.)	Bearded grass-pink	
17	19-Jul-95	ditch	1	Cyperaceae	Carex glaucescens	Ell.	southern waxy sedge	OBL
18	18-May-95	VII(s)	1	Cyperaceae	Carex walteriana	Bailey	Walter's sedge	OBL
19	23-Jul-95	VII(r,ws)	1,3,4	Compositae	Carphophorus pseudoliatris	Cass.	bristle-leaf chaffhead	OBL
20	05-Aug-95	VII(r)	1	Leguminosae	Cassia obtusifolia	L.	coffee weed	
21	07-Aug-95	VII(r)	1,2	Gramineae	Cenchrus echinatus	L.	southern sandspur	
22	18-May-95	IIIa	1,2,3,4	Cupressaceae	Chamaecyparis thyoides	(L.) B.S.P.	Atlantic white cedar	OBL
23	18-May-95	V, VII(r)	1,3	Orchidaceae	Cleistes divaricata*	(L.) Ames	rosebud orchid, sprea	FAC
24	18-May-95	I, II, II/IIa, IV, V, VII	1,2,3,4	Clethraceae	Clethra alnifolia	L.	coast pepperbush	FACW
25	18-May-96	I, II, III, IIIa, II/IIa, IV, VII, VIII	1,2,3,4	Cyrtillaceae	Cliftonia monophylla	(Lam.) Britto	black titi / buckwheat t	OBL
26	05-Aug-95	VII(r)	1	Compositae	Coryza canadensis	(L.) Cronq.	canada horseweed	FACU
27	11-Aug-95	IV	1	Cyperaceae	Cyperus haspan	L.	sheathed flatsedge	OBL
28	20-May-95	I, II, III, IIIa, II/IIa, IV, V, VII, V	1,2,3,4	Cyrtillaceae	Cyrtilla racemiflora	L.	titi / leatherwood	FACW
29	21-Aug-95	VII	1	Leguminosae	Desmodium lineatum	DC.	narrow tick-trefoil	
30	30-Jul-95	VII(r)	1	Gramineae	Digitaria ciliaris	(Retz.) Koel.	Southern crabgrass	FACU
31	26-Jul-95	VII(r)	1,2	Rubiaceae	Diodia teres	Walt.	poor Joe	
32	25-Apr-96	I, II, VII(cc,ws,ss), VIII	1,2,3,4	Droseraceae	Drosera capillaris	Poir.	pink sundew	OBL
33	29-Aug-95	II, VIII	1,2,3	Droseraceae	Drosera intermedia*	Hayne	spoonleaf sundew	OBL
34	18-May-95	VII(cc,ss,ws)	1,3,4	Droseraceae	Drosera tracyi	MacFarlane	dew-threads	OBL
35	18-May-95	V	1	Polypodiaceae	Dryopteris clintoniana	(D.C. Eaton)	Clinton's wood fern	FACW
36	09-Jul-95	I	1	Polypodiaceae	Dryopteris ludoviciana	(Kunze) Sm	southern shield fern	
37	29-Jul-95	ditch	1	Cyperaceae	Eleocharis baldwinii	(Torr.) Chap	Baldwin's spikerush	
38	15-Nov-95	VII(cc)	1	Gramineae	Eragrostis refracta	(Muhl.) Scri	coastal lovegrass	FAC
39	08-Jul-95	VII(r)	1	Gramineae	Eragrostis spectabilis	(Pursh.) Ste	purple lovegrass	
40	18-May-95	VII(r,ws)	1,4	Compositae	Erigeron vernus	(L.) T. & G.	early whitetop fleaban	OBL
41	18-May-95	II, VII(cc,ws,ss)	1,2,3,4	Eriocaulaceae	Eriocaulon compressum	Lam.	flattened pipewort	OBL
42	05-Aug-95	VII(cc)	1	Eriocaulaceae	Eriocaulon lineare	Small	narrow pipewort	OBL
43	09-Aug-95	I, VII(r)	1	Eriocaulaceae	Eriocaulon texense	Koern.	Texas pipewort	OBL
44	19-Jul-95	I, II, VII(ss,ws)	1,3,4	Umbelliferae	Eryngium yuccifolium	Michx.	rattlesnake master	FAC
45	30-Aug-95	VII(cc,r)	1,2,3	Compositae	Eupatorium capillifolium	(Lam.) Small	dog fennel	FACU
46	20-May-95	VII(r)	1	Euphorbiaceae	Euphorbia floridana	Chapm.	Florida spurge	

Table B3. Watershed 1 Plant Species List

#	Date	Community Type	Area	Family	Species	Author	Common Name	Ind.
47	19-Jul-95	I, VII(cc)	1,4	Euphorbiaceae	Euphorbia inundata	Torr. ex Cha	Florida pine spurge	FACW
48	18-Jul-95	VII(cc)	1	Euphorbiaceae	Euphorbia telephioides****	Chapm.	Telephus' spurge	FACW
49	22-Jul-95	riverbank, ditchside	1,2,3	Oleaceae	Fraxinus caroliniana	Mill.	Carolina ash	OBL
50	15-Jul-95	VII(r)	1,2	Onagraceae	Gaura angustifolia	Michx.	southern gaura	FACW
51	18-May-95	I, IV, III/IIa, VII(cc), VIII	1,2,3,4	Ericaceae	Gaylussacia mosieri	Small	woollyberry	FACW
52	25-Mar-96	VII(d,r)	1,2,3	Loganiaceae	Gelsemium sempervirens	(L.) Ait. f.	yellow jessamine	FACW
53	21-Aug-96	VII(r, ws)	1,2,3,4	Compositae	Helenium amarum	(Raf.) Rock	Bitterweed	FACW
54	25-Mar-96	VII(cc, ss, r, ws), VIII	1,2,3,4	Compositae	Helenium vernale	Walt.	Sneezeweed	FACW
55	29-Jul-95	VII(r)	1,2	Compositae	Heterotheca subaxillaris	(Lam.) Britto	camphor weed	FACU
56	18-May-95	VII(ditch)	1	Umbelliferae	Hydrocotyle bonariensis	Lam.	water pennywort	FACW
57	08-Jul-95	VII(d,r), VIII	1,2	Guttiferae	Hypericum brachyphyllum	(Spach) Ste	coastal plain St. John	FACW
58	01-Aug-95	V	1	Guttiferae	Hypericum crux-andreae	(L.) Crantz	St. Peter's-wort	FACW
59	05-Aug-95	I	1	Guttiferae	Hypericum exile	Adams	St. Johnswort	FACW
60	05-Aug-95	I	1	Guttiferae	Hypericum fasciculatum	Lam.	St. Johnswort	FACW
61	15-Aug-95	VII(r)	1,2,3,4	Guttiferae	Hypericum gentianoides	(L.) B.S.P.	orange grass	FACU
62	29-Aug-95	VII(r, cc)	1,2,3	Guttiferae	Hypericum hypericoides	(L.) Crantz	St. Andrew's cross	FACU
63	05-Aug-95	I	1	Guttiferae	Hypericum microsepalum	(T. & G.) Gra	small sepal St. Johns	FAC
64	15-Dec-95	VII(r)	1,3	Guttiferae	Hypericum myrtifolium	Lam.	sand-weed	FAC
65	18-May-95	VII(cc)	1	Guttiferae	Hypericum sp.		St. John's wort	FAC
66	25-Mar-96	VII(ditchside, ss, cc)	1,3,4	Hypoxidaceae	Hypoxis micrantha	Pollard	yellow stargrass	FACW
67	17-Jul-95	IIa	1,2,3	Aquifoliaceae	Ilex cassine	L.	dahoon	FACW
68	18-May-95	I, II, VII(cc, r)	1,2,3,4	Aquifoliaceae	Ilex coriacea	(Pursh) Cha	highbush gallberry, ba	FACW
69	18-May-95	I, VII(r)	1,2,3	Aquifoliaceae	Ilex glabra	(L.) Gray	inkberry, gallberry	FACW
70	18-May-95	III, V	1,2	Aquifoliaceae	Ilex myrtifolia	Walt.	myrtle holly	FACW
71	06-Sep-95	III, VII(d, cc)	1,2	Saxifragaceae	Itea virginica	L.	Virginia willow	FACW
72	18-May-95	VII(cc)	1	Juncaceae	Juncus effusus	L.	soft rush	FACW
73	18-May-95	VII(cc)	1	Juncaceae	Juncus ellipticus	Chapm.	bog rush	FACW
74	05-Aug-95	VII(cc)	1	Juncaceae	Juncus marginatus	Rostk.	shore rush	OBL
75	18-May-95	VII(cc)	1	Juncaceae	Juncus roemerianus	Scheele	needle rush, black rush	FACW
76	18-May-95	VII(ditchside)	1	Juncaceae	Juncus scirpoides	Lam.	needlepod rush	FACW
77	18-May-95	VII(cc)	1	Juncaceae	Juncus trigonocarpus	Steud.	redpod rush	OBL
78	18-Jul-95	I, II, VII(cc, ss, ws, r, d)	1,2,3,4	Haemodorumaceae	Lachnanthes caroliniana	(Lam.) Dand	Carolina redroot	OBL
79	11-Sep-95	VI, VII(d)	1,3	Ericaceae	Leucothoe axillaris	(Lam.) D. D	dog hobble	OBL
80	23-Aug-95	III, III/IV, VII(r)	1,2,3	Ericaceae	Leucothoe racemosa	(L.) Gray	fetterbush	FACW
81	18-May-95	ditchside	1	Campanulaceae	Lobelia glandulosa	Walt.	glandular lobelia	OBL
82	18-May-95	VII(ws, cc)	1,2,3,4	Haemodorumaceae	Lophiola americana	(Pursh) Wo	goldcrest	OBL
83	21-Aug-95	VII	1	Onagraceae	Ludwigia linearis	Walt.	narrow-leaf seedbox	OBL
84	31-Jul-95	VII(r)	1	Onagraceae	Ludwigia pilosa	Walt.	hairy seedbox	OBL
85	09-Aug-95	II	1	Onagraceae	Lycopodium alopecuroides	L.	foxtail clubmoss	OBL
86	18-May-95	VII(cc)	1	Lycopodiaceae	Lycopodium appressum	(Chapm.) Li	southern bog clubmoss	OBL
87	18-May-95	VII(cc)	1	Lycopodiaceae	Lygodium japonicum	(Thunb.) Sw	climbing fern	OBL
88	25-Apr-96	VII(cc)	1	Schizaeaceae	Lyonia fruticosa	(Michx.) G.S	staggybush	FAC
89	18-May-95	I, III, V	1,2,3,4	Ericaceae	Lyonia lucida	(Lam.) K. Ko	fetterbush	FACW
90	18-May-95	IIIa, III/IIa, IIIa/IV, VII, ditch	1,2,3,4	Magnoliaceae	Magnolia virginiana	L.	sweetbay	FACW
91	09-Jul-95	I, II, III, IIIa, IV, offsite, VIII	1,2,3,4	Myricaceae	Myrica heterophylla	Raf.	evergreen bayberry	FACW
92	29-Jun-96	ditch	1,2,3	Nymphaeaceae	Nuphar luteum	(L.) Sibth. &	spatterdock, cow lily	OBL

Table B3. Watershed 1 Plant Species List

#	Date	Community Type	Area	Family	Species	Author	Common Name	Ind.
93	15-Aug-95	ditch	1,2	Nymphaeaceae	Nymphaea odorata	Ait.	white waterlily	OBL
94	18-May-95	I, II, V, ditch	1	Nyssaceae	Nyssa biflora	Walt.	swamp tupelo	OBL
95	22-Jul-95	III, VI	1,2,3,4	Nyssaceae	Nyssa ogeche	W. Bart. ex	ogeche tupelo	OBL
96	15-Aug-95	III, IIIa, VIII, creekbank	1,2,4	Nyssaceae	Nyssa ursina	Small	bear tupelo (?)	?
97	18-May-95	VII(r)	1	Onagraceae	Oenothera sp.		evening primrose	
98	02-Aug-95	III	1	Oleaceae	Osmanthus americanus	(L.) Benth.	devilwood, wild olive	FAC
99	26-Mar-96	VII(r)	1,2,3	Polypodiaceae	Osmunda cinnamomea	L.	cinnamon fern	OBL
100	18-May-95	V, VII(cc)	1,2,3	Polypodiaceae	Osmunda regalis	L.	royal fern	OBL
101	24-Aug-95	II, VII(d, roadside)	1,3,4	Umbelliferae	Oxypolis filiformis	(Walt.) Britt	common water dropw	FACW
102	18-May-95	VII(cc)	1	Gramineae	Panicum repens	L.	torpedo grass	
103	08-Jul-95	VII(r)	1,2	Gramineae	Paspalum urvillei	Steud.	Vasey grass	FAC
104	20-May-95	ditch, VII(cc)	1	Lauraceae	Persea palustris	(Raf.) Sarg.	swamp bay	
105	18-May-95	VII(r)	1	Verbenaceae	Phyla nodiflora	(L.) Greene	capeweed, common fr	FACW
106	24-Jul-95	III, IIIa, IV	1	Ericaceae	Pieris phillyreifolia	(Hook.) DC.	climbing fetterbush	FACW
107	26-Mar-96	VII(cc, ss, ditch)	1,3	Lentibulariaceae	Pinguicula ionantha****	Godfrey	Godfrey's butterwort	OBL
108	26-Mar-96	VII(ss, cc, ditch)	1,2,3	Lentibulariaceae	Pinguicula lutea	Chapm.	yellow butterwort	OBL
109	18-May-95	I, II, IV, V, VII, VII(ws), II/IIIa	1	Pinaceae	Pinus elliotii	Engelm.	slash pine	FACW
110	19-Jul-95	VII(r)	1,2	Compositae	Pityopsis adenolepis	(Fern.) Sem	golden aster	
111	18-May-95	VII(r)	1	Plantaginaceae	Plantago virginica	L.	hoary plantain	FACU
112	09-Aug-95	VII(cc)	1,2	Compositae	Pluchea foetida	(L.) DC.	stinking camphorwee	OBL
113	18-May-95	II, VII	1,4	Polygalaceae	Polygala cruciata	L.	crossleaf milkwort	OBL
114	29-Aug-95	VII(ws, ditch, r, ws)	1,2,3,4	Polygalaceae	Polygala cymosa	Walt.	tall pine-barren milkw	OBL
115	18-May-95	II, VII	1,2,3	Polygalaceae	Polygala lutea	L.	orange milkwort	FACW
116	29-Aug-95	VII(cc, ss, ditchside), VIII	1,2,3	Polygalaceae	Polygala nana	(Michx.) DC.	dwarf milkwort, bache	FAC
117	31-Jul-95	VII(r)	1	Polygonaceae	Polygonum punctatum	Elliot	dotted smartweed	FACW
118	29-Jul-95	VII(r)	1	Loganiaceae	Polypremum procumbens	L.	orangeweet, juniper-I	FACU
119	24-Aug-95	III, ditch	1,2,3	Pontederiaceae	Pontederia cordata	L.	pickersweed	OBL
120	18-May-95	ditch, pond, VII(cc)	1,2	Haloragaceae	Proserpinaca pectinata	Lam.	combleaf mermaid we	OBL
121	24-Jul-95	VII(r in puddle)	1	Cyperaceae	Psilocarya nitens	(Vahl.) A.W	short-beak baldrush	OBL
122	18-May-95	I, VII	1	Polypodiaceae	Pteridium aquilinum	(L.) Kuhn	bracken	
123	18-Jul-95	I	1,3	Fagaceae	Quercus minima	(Sarg.) Sma	dwarf live oak	
124	20-May-95	III, ditch	1,2,3	Fagaceae	Quercus nigra	L.	water oak	FAC
125	27-May-96	II, VII(ws, cc, r)	1,2,3,4	Fagaceae	Rhexia alifanus	Walt.	rose meadow-beauty	FACW
126	24-Aug-95	II, VII(r, ws)	1,2,3,4	Melastomataceae	Rhexia mariana	L.	pale meadow-beauty	FACW
127	19-Jul-95	I, III, VII	1,2,3,4	Melastomataceae	Rhexia petiolata	Walt.	ciliate meadow-beaut	FACW
128	08-Jul-95	VII(r), IV/VIII	1,2,3	Melastomataceae	Rhexia virginica	L.	Virginia meadow-bea	FACW
129	09-Jul-95	II	1	Ericaceae	Rhododendron serrulatum	(Small) Millai	swamp honeysuckle	OBL
130	17-Jul-95	IIIa	1,3	Ericaceae	Rhododendron viscosum	(L.) Torr.	swamp azalea	FACW
131	30-Aug-95	offsite	1,2,3	Anacardiaceae	Rhus copallina	L.	winged sumac	none
132	18-May-95	VII(cc, ws)	1,4	Cyperaceae	Rhynchospora baldwinii	Gray	Baldwin's beakrush	OBL
133	19-Jul-95	I, VII(ss)	1	Cyperaceae	Rhynchospora chapmanii	Curtis	Chapman's beakrush	OBL
134	19-Jul-95	III, VII(cc, ss, r)	1	Cyperaceae	Rhynchospora corniculata	(Lam.) Gray	Short-bristle beakrush	OBL
135	05-Aug-95	VII(cc)	1,2	Cyperaceae	Rhynchospora fascicularis	(Michx.) Va	fasciated beakrush	FACW
136	28-Jun-96	VII(cc, ws)	1,4	Cyperaceae	Rhynchospora plumosa	Ell.	beakrush	
137	10-Aug-95	II/IIIa	1	Cyperaceae	Rhynchospora tracyi	Britton	tracy's beakrush	OBL
138	18-May-95	VII(r, d)	1	Rubiaceae	Rubus argutus (beautifolius)	Link	highbush blackberry	FAC

Table B3. Watershed 1 Plant Species List

#	Date	Community Type	Area	Family	Species	Author	Common Name	Ind.
139	21-Aug-96	VII(r)	1,2,3,4	Compositae	Rudbeckia hirta	L.	Black-eyed Susan	
140	08-Jul-95	VII(d,ws)	1,3,4	Gentianaceae	Sabatia bartramii	Wilbur	Bartram's rose gentia	FACW
141	26-Jun-96	VII(ws)	1,4	Gentianaceae	Sabatia stellaris	Pursh	Sabatia	
142	06-Sep-95	ditch, IV/VIII, VII(slough)	1,2,3	Alismataceae	Sagittaria graminea	Michx.	grassleaf arrowhead	OBL
143	18-May-95	VII(d)	1,2	Salicaceae	Salix caroliniana	Michx.	coastal plain willow	OBL
144	25-Mar-96	I,II,VII(ss,ditch,cc,ws)	1,2,3,4	Sarraceniaceae	Sarracenia flava	L.	trumpets	OBL
145	07-Sep-95	I,II,VII(ss)	1,3,4	Sarraceniaceae	Sarracenia psittacina*	Michx.	parrot pitcher plant	OBL
146	22-Jul-95	VII(ss)	1,2,3	Sarraceniaceae	Sarracenia purpurea*	L.	purple pitcher plant	OBL
147	15-Aug-95	IV,VII(cc,ditch)	1,2	Cyperaceae	Scirpus cyperinus	(L.) Kunth	woolgrass	OBL
148	18-May-95	VII(r)	1	Cyperaceae	Scleria oligantha	Michx.	littlehead nutrush	FACU
149	05-Aug-95	VII(cc), VIII	1,2	Cyperaceae	Scleria triglomerata	Michx.	whip nutrush	FACU
150	18-May-95	VII(cc,r)	1,2,3,4	Palmae	Serenoa repens	(Bartr.) Sma	saw palmetto	FACU
151	15-Aug-95	VII(r)	1,2,3	Leguminosae	Sesbania vesicaria	(Jacq.) Elliot	bladderpod	FAC
152	11-Sep-95	VII(r)	1,3	Scrophulariaceae	Seymeria cassioides	(Walt.) Blake	Black senna, senna s	FAC
153	26-Mar-96	VII(cc,ditches,roadside)	1,3	Iridaceae	Sisyrinchium atlanticum	Bickn.	blue-eyed grass	FAC
154	18-May-95	I,VII,ditch	1	Smilacaceae	Smilax glauca	Walt.	cat greenbrier	FAC
155	18-May-95	I,VII(cc,r)	1,2,3,4	Smilacaceae	Smilax laurifolia	L.	bamboo vine	FACW
156	03-Apr-96	III	1,2,3	Smilacaceae	Smilax smallii	Morong	Jackson-brier	
157	09-Jul-95	I,II	1,2,3,4	Smilacaceae	Smilax walteri	Pursh	coral greenbrier	OBL
158	18-May-95	VII(r,ss)	1,3	Orchidaceae	Spiranthes tuberosa*	Raf.	little ladies' tresses	
159	05-Aug-95	I	1	Gramineae	Sporobolus floridanus	Chapm.	Florida dropseed	FAC
160	30-Aug-95	III,VII(d,r,cb)	1,2,3,4	Euphorbiaceae	Stillingia aquatica	Chapm.	corkwood	OBL
161	04-Apr-96	I,V,VII(r),I,VII(r)	1,3	Styracaceae	Styrax americana	Lam.	storax	FACW
162	19-Jul-95	VII(ditch)	1,2	Eriocaulaceae	Syngonanthus flavidulus	(Michx.) Richland	pond cypress	FACW
163	18-May-95	I,II,III,IIII,IIII,IIII,IIII	1,2,3,4	Taxodiaceae	Taxodium ascendens	Brongn.		OBL
164	21-Aug-95	VII(cc)	1	Leguminosae	Tephrosia hispida	(Michx.) Pers.		
165	23-Aug-95	III	1	Anacardiaceae	Toxicodendron radicans	(L.) Kuntze	poison ivy	FAC
166	06-Sep-95	IV,VII(slough, ditch)	1,2	Typhaceae	Typha latifolia	L.	broadleaf cattail	OBL
167	29-Aug-95	III,VII(cc,ws),pond,ditch	1,2,3,4	Lentibulariaceae	Utricularia cornuta	Michx.	horned bladderwort	OBL
168	18-May-95	ditch, slough area	1	Lentibulariaceae	Utricularia purpurea	Walt.	purple bladderwort	OBL
169	04-Apr-96	VII(ss,cc,ditch),VIII	1,2,3	Lentibulariaceae	Utricularia subulata	L.		OBL
170	18-Jul-95	IV,V	1	Ericaceae	Vaccinium corymbosum	L.	highbush blueberry	FACW
171	21-Aug-95	VII(cc)	1	Ericaceae	Vaccinium myrsinites	Lam.	shiny blueberry	FACU
172	10-Aug-95	VII(r)	1	Verbenaceae	Verbena brasiliensis	Vell.	Brazilian vervain	FAC
173	15-Nov-95	VII	1	Violaceae	Viola lanceolata subs. lance.	L.	bog-white violet, longleaf violet	
174	18-Jul-95	I	1	Violaceae	Viola septemloba	LeConte	southern coast violet	FAC
175	26-Mar-96	VII(cc,ss,ditchededge)	1,2,3	Violaceae	Viola sp.			
176	18-May-95	VII(r)	1,2,3,4	Vitaceae	Vitis rotundifolia	Michx.	muscadine grape	FAC
177	18-May-95	VII(r)	1	Campanulaceae	Wahlenbergia marginata	(Thunb.) A. DC.		
178	18-May-95	II,V	1	Polypodiaceae	Woodwardia areolata	(L.) Moore	netted chain fern	OBL
179	05-Aug-95	I,II,VII(ws),VIII	1,2,4	Xyridaceae	Xyris ambigua	Beyr. ex Ku	coastal plain yellow-e	OBL
180	20-Jul-95	I	1	Xyridaceae	Xyris caroliniana	Walt.	Carolina yellow-eyed	FACW
181	15-Jul-96	VII(cc)	1	Xyridaceae	Xyris stricta	Chapm.	yellow-eyed grass	
182	18-May-95	VII(cc)	1,2,3,4	Liliaceae	Zigadenus densus	(Desr.) Fern	crow-poison	FACW
183	24-Aug-95	II,VII(ss,ws)	1,2,3,4	Liliaceae	Zigadenus glaberrimus	Michx.	atlantic deathcamas	FACW

Table B4. Watershed 2 Plant Species List

#	1st Coll.	Community Type	Area	Family	Species	Author	Common Name	Ind.
1	18-May-95	II,IIIa,I,II,VII	1,2,3	Aceraceae	Acer rubrum	L.	red maple	OBL
2	18-May-95	VII(cc)	1,2,3	Liliaceae	Aletis aurea	Walt.	golden colic-root	FACW
3	30-Aug-95	I	2	Vitaceae	Ampelopsis arborea	(L.) Koehne	peppervine	FAC
4	29-Aug-95	IV/VII	2	Gramineae	Andropogon glomeratus	var. hirsutu	bushy bluestem	FACW
5	13-Nov-95	VII(cc,r)	1,2,3	Gramineae	Andropogon virginicus	L. var. glauc	broomsedge	FAC
6	15-Aug-95	VII(r)	2	Araliaceae	Aralia spinosa	L.	devil's walkingstick	FAC
7	18-Oct-96	I	1,2	Gramineae	Aristida purpurens	Poir.	arrowfeather	FACW
8	18-May-95	I,II,VII(cc,ss,ws)	1,2,3,4	Gramineae	Aristida stricta	Michx.	pineland three-awn g	FAC
9	25-Aug-95	II,VII(pond edge,	2,3,4	Compositae	Aster eryngiifolius***	T. & G.	aster	FAC
10	18-May-95	I,II,IV,VII,VIII	1,2,3,4	Compositae	Baccharis halimifolia	L.	saltbush, silverling, g	FAC
11	15-Oct-95	VII(cc,r)	1,2	Compositae	Bidens alba	(L.) DC.	white beggarticks	OBL
12	07-Sep-95	VII(r)	1,2,3	Compositae	Bidens mitis	(Michx.) DC.	beggarticks	FAC
13	07-Sep-95	ditch	2	Cyperaceae	Bulbostylis barbata	(Rottb.) C.B. (Walt.)	Bearded grass-pink	FAC
14	25-Mar-96	VII(ss,cc,ws),VIII	1,2,3,4	Orchidaceae	Calopogon barbatus*	(L.) R. Br.	hedge bindweed	FAC
15	29-Aug-95	I	2	Convolvulaceae	Calystegia sepium	Michx.	partridge pea	FACU
16	26-Aug-95	VII(d)	2	Leguminosae	Cassia fasciculata	L.	southern sandspur	OBL
17	27-Aug-95	VII(r)	1,2	Gramineae	Cenchrus echinatus	L.	buttonbush	OBL
18	23-Aug-95	VI	2,3	Rubiaceae	Cephalanthus occidentalis	(L.) B.S.P.	Atlantic white cedar	OBL
19	18-May-95	IIa	1,2,3,4	Cupressaceae	Chamaecyparis thyoides	Crantz	sawgrass	OBL
20	24-Aug-95	ditch	2	Cyperaceae	Cladium jamaicense	L.	coast pepperbush	FACW
21	18-May-95	I,II,III/IIa,IV,V,VII	1,2,3,4	Clethraceae	Clethra alnifolia	(Lam.) Britto	black titi / buckwheat	OBL
22	18-May-96	I,II,III,IIa,II/IIa,IV,	1,2,3,4	Cyrtillaceae	Cliftonia monophylla	(L.F.) Medic	Washington hawthorn	FAC
23	07-Sep-95	I	2	Rosaceae	Crataegus phaenopyrum**	Juss.	compact dodder	FAC
24	06-Aug-95	VII(r)	2	Convolvulaceae	Cuscuta compacta	(L.) Torr.	? flatsedge	FACW
25	06-Sep-95	IV	2	Cyperaceae	Cyperus retrofractus	L.	straw-colored flatsed	FACW
26	07-Sep-95	VII(r)	2	Cyperaceae	Cyperus strigosus	L.	titi / leatherwood	FACW
27	20-May-95	I,II,III,IIa,II/IIa,IV,	1,2,3,4	Cyrtillaceae	Cyrtilla racemiflora	(Ell.) Gould	roundseed panicgras	FACU
28	15-Aug-95	VII(r)	2	Gramineae	Dichanthelium sphaerocarpon	(L.) Hitchc.	starbrush whitetop se	FACW
29	30-Aug-95	VIII	2	Cyperaceae	Dichromena colorata (Rhynch.	L.	Virginia buttonweed	FACW
30	24-Aug-95	IIa	2	Rubiaceae	Diodia virginiana	Poir.	pink sundew	OBL
31	25-Apr-96	I,II,VII(cc,ws,ss),	1,2,3,4	Droseraceae	Drosera capillaris	Hayne	spoonleaf sundew	OBL
32	29-Aug-95	II,VIII	1,2,3	Droseraceae	Drosera intermedia*	(Desf.) Trin	petticoat tickler, Thali	FAC
33	30-Aug-95	VII(r)	2	Gramineae	Eragrostis atrovirens	(L.) Raf. ex	fireweed	FAC
34	07-Sep-95	VII(r)	2	Compositae	Erechtites hieracifolia	Lam.	flattened pipewort	OBL
35	18-May-95	II,VII(cc,ws,ss)	1,2,3,4	Eriocaulaceae	Eriocaulon compressum	(Lam.) Small	dog fennel	FACU
36	30-Aug-95	VII(cc,r)	1,2,3	Compositae	Eupatorium capillifolium	Chapm.	saltmarsh fingergrass	FACW
37	30-Aug-95	VII(ditch)	2	Gramineae	Eustachys glauca	Mill.	Carolina ash	OBL
38	22-Jul-95	riverbank, ditchsi	1,2,3	Oleaceae	Fraxinus caroliniana	Michx.	southern gaura	FAC
39	15-Jul-95	VII(r)	1,2	Onagraceae	Gaura angustifolia	(Andr.) Tor.	dwarf huckleberry	FACW
40	07-Sep-95	VIII	2	Ericaceae	Gaylussacia dumosa	Small	woollyberry	FACW
41	18-May-95	I,IV,II/IIa,VII(cc),	1,2,3,4	Ericaceae	Gaylussacia mosieri	(L.) Ait. f.	yellow jessamine	FAC
42	25-Mar-96	VII(d,r)	1,2,3	Loganiaceae	Gelsemium sempervirens	(Raf.) Rock	Bitterweed	FAC
43	21-Aug-96	VII(r,ws)	1,2,3,4	Compositae	Helenium amarum	Walt.	Sneezeweed	FAC
44	25-Mar-96	VII(cc,ss,r,ws), VI	1,2,3,4	Compositae	Helenium vernale	L.	swamp sunflower	FACU
45	07-Sep-95	VII(r)	2	Compositae	Helianthus angustifolius	(Lam.) Britto	camphor weed	FACU
46	29-Jul-95	VII(r)	1,2	Compositae	Heterotheca subaxillaris	(Spach) Ste	coastal plain St. John	FACW
47	08-Jul-95	VII(d,r),VIII	1,2	Guttiferae	Hypericum brachyphyllum			

Table B4. Watershed 2 Plant Species List

#	1st Coll.	Community Type	Area	Family	Species	Author	Common Name	Ind.
48	15-Aug-95	VII(r)	1,2,3,4	Guttiferae	Hypericum gentianoides	(L.) B.S.P.	orange grass	FACU
49	29-Aug-95	VII(r, cc)	1,2,3	Guttiferae	Hypericum hypericoides	(L.) Crantz	St. Andrew's cross	OBL
50	06-Sep-95	ditchside	2	Labiatae	Hyptis alata	(Raf.) Shinn	cluster bushmint	FACW
51	17-Jul-95	IIla	1,2,3	Aquifoliaceae	Ilex cassine	L.	dahoon	FACW
52	18-May-95	I, II, VII(cc, r)	1,2,3,4	Aquifoliaceae	Ilex coriacea	(Pursh) Cha	highbush gallberry, b	FACW
53	18-May-95	I, VII(r)	1,2,3	Aquifoliaceae	Ilex glabra	(L.) Gray	inkberry, gallberry	FACW
54	18-May-95	III, V	1,2	Aquifoliaceae	Ilex myrtifolia	Walt.	myrtle holly	FACW
55	06-Sep-95	III, VII(d, cc)	1,2	Saxifragaceae	Itea virginica	L.	Virginia willow	FACW
56	29-Aug-95	VII(cc)	2	Juncaceae	Juncus abortivus	Chapm.	pinebarren rush	OBL
57	07-Sep-95	VIII	2	Juncaceae	Juncus polycephalus	Michx.	many head rush	OBL
58	15-Aug-95	ditch, pond	2	Juncaceae	Juncus repens	Michx.	creeping rush	OBL
59	29-Aug-95	VIII	2	Juncaceae	Juncus sp.		rush	FACW
60	15-Aug-95	VIII	2	Juncaceae	Juncus validus	Coville	roundhead rush	OBL
61	18-Jul-95	I, II, VII(cc, ss, ws, r)	1,2,3,4	Hamamelidaceae	Lachnanthes caroliniana	(Lam.) Dand	Carolina redroot	OBL
62	30-Aug-95	VIII	2	Eriocaulaceae	Lachnocaulon minus	(Chapm.) S	Small's bogbutton	OBL
63	23-Aug-95	III, IIII/V, VII(r)	1,2,3	Ericaceae	Leucothoe racemosa	(L.) Gray	fetterbush	FACW
64	06-Sep-95	VII(r)	2	Compositae	Liatris squarrosa	(L.) Michx.	blazing star	FAC
65	15-Aug-95	VII(d)	2	Hamamelidaceae	Liquidambar styraciflua	L.	sweetgum	OBL
66	18-May-95	VII(ws, cc)	1,2,3,4	Hamamelidaceae	Lophiola americana	(Pursh) Woo	goldcrest	OBL
67	25-Aug-95	VII(r)	2	Onagraceae	Ludwigia alternifolia	L.	bushy seedbox	FACW
68	24-Aug-95	VII(r)	2,3	Onagraceae	Ludwigia maritima	F. Harper	seaside seedbox	OBL
69	29-Aug-95	VII	2	Lycopodiaceae	Lycopodium carolinianum	L.	slender clubmoss	OBL
70	09-Jul-95	IV	2	Lycopodiaceae	Lycopodium prostratum	Harper	Harper's clubmoss	OBL
71	18-May-95	I, III, V	1,2,3,4	Ericaceae	Lyonia lucida	(Lam.) K. Ko	fetterbush	FACW
72	18-May-95	IIla, II, IIIa, IIIa/IV, V	1,2,3,4	Magnoliaceae	Magnolia virginiana	L.	sweetbay	FACW
73	06-Sep-95	VII(r)	2	Scrophulariaceae	Mecardonia acuminata	(Walt.) Smal	purple mecardonia	FACW
74	09-Jul-95	I, II, IIIa, IV, offsit	1,2,3,4	Myricaceae	Myrica heterophylla	Raf.	evergreen bayberry	FACW
75	29-Jun-96	ditch	1,2,3	Nymphaeaceae	Nuphar luteum	(L.) Sibth. &	spatterdock, cow lily	OBL
76	15-Aug-95	ditch	1,2	Nymphaeaceae	Nymphaea odorata	Ait.	white waterlily	OBL
77	22-Jul-95	III, VI	1,2,3,4	Nyssaceae	Nyssa ogeche	W. Bart. ex	ogeche tupelo	OBL
78	15-Aug-95	III, IIIa, VII, creekb	1,2,4	Nyssaceae	Nyssa ursina	Small	bear tupelo (?)	?
79	26-Mar-96	VII(r)	1,2,3	Polypodiaceae	Osmunda cinnamomea	L.	cinnamon fern	OBL
80	18-May-95	V, VII(cc)	1,2,3	Polypodiaceae	Osmunda regalis	L.	royal fern	FAC
81	06-Sep-95	I	2	Gramineae	Panicum virgatum	L.	switchgrass	FAC
82	30-Aug-95	VII(r)	2	Vitaceae	Parthenocissus quinquefolia	(L.) Planch.	Virginia creeper	FAC
83	08-Jul-95	VII(r)	1,2	Gramineae	Paspalum urvillei	Steud.	Vasey grass	FAC
84	26-Mar-96	VII(ss, cc, ditch)	1,2,3	Lentibulariaceae	Pinguicula lutea	Chapm.	yellow butterwort	OBL
85	19-Jul-95	VII(r)	1,2	Compositae	Pityopsis adenolepis	(Fern.) Sem	golden aster	OBL
86	30-Apr-96	VII(cc)	2	Plantaginaceae	Plantago lanceolata	L.	English plantain	OBL
87	24-Aug-95	VII(cc, ws)	2,4	Orchidaceae	Platanthera ciliaris*	(L.) Lindl.	yellow fringed orchid	OBL
88	09-Aug-95	VII(cc)	1,2	Compositae	Pluchea foetida	(L.) DC.	stinking camphorwee	OBL
89	06-Sep-95	offsite	2	Polygalaceae	Polygala baldwinii	Nutt.	white bachelor's butt	OBL
90	29-Aug-95	VIII	2,4	Polygalaceae	Polygala brevifolia	Nutt.	little-leaved milkwort	OBL
91	29-Aug-95	VII(ws, ditch, r, ws)	1,2,3,4	Polygalaceae	Polygala cymosa	Walt.	tall pine-barren milkw	OBL
92	30-Aug-95	I, VII(ws)	2,3,4	Polygalaceae	Polygala hookeri	Torr. & Gray	Hooker's milkwort	FACW
93	18-May-95	II, VII	1,2,3	Polygalaceae	Polygala lutea	L.	orange milkwort	FACW
94	29-Aug-95	VII(cc, ss, ditchsid	1,2,3	Polygalaceae	Polygala nana	(Michx.) DC.	dwarf milkwort, bach	FAC

Table B4. Watershed 2 Plant Species List

#	1st Coll.	Community Type	Area	Family	Species	Author	Common Name	Ind.
95	15-Aug-95	VI, VII(r)	2,3	Polygonaceae	Polygonum hydropiperoides	Michx.	swamp smartweed	OBL
96	24-Aug-95	III, ditch	1,2,3	Pontederiaceae	Pontederia cordata	L.	pickersweed	OBL
97	18-May-95	ditch, pond, VII(cc)	1,2	Haloragaceae	Proserpinaca pectinata	Lam.	combleaf mermaid w	OBL
98	20-May-95	III, ditch	1,2,3	Fagaceae	Quercus nigra	L.	water oak	FAC
99	24-Aug-95	creekbank, riverba	2,3	Fagaceae	Quercus virginiana	Mill.	live oak	FACU
100	27-May-96	II, VII(ws, cc, r)	1,2,3,4	Melastomataceae	Rhexia alifanua	Walt.	rose meadow-beauty	FACW
101	24-Aug-95	II, VII(r, ws)	1,2,3,4	Melastomataceae	Rhexia mariana	L.	pale meadow-beauty	FACW
102	19-Jul-95	I, III, VII	1,2,3,4	Melastomataceae	Rhexia petiolata	Walt.	ciliate meadow-beaut	FACW
103	08-Jul-95	VII(r), IV/VIII	1,2,3	Melastomataceae	Rhexia virginica	L.	Virginia meadow-bea	FACW
104	30-Aug-95	offsite	1,2,3	Anacardiaceae	Rhus copallina	L.	winged sumac	none
105	15-Aug-95	VII(pond, r)	2	Cyperaceae	Rhynchospora cephalantha	Gray	clustered beakrush	OBL
106	05-Aug-95	VII(cc)	1,2	Cyperaceae	Rhynchospora fascicularis	(Michx.) Vah	fasciated beakrush	FACW
107	15-Aug-95	VII(r)	2	Cyperaceae	Rhynchospora fernaldii	S. Gale	Fernald's beakrush	FAC
108	29-Aug-95	VII(cc), VIII	2	Cyperaceae	Rhynchospora gracilentia	Gray	slender beakrush	OBL
109	29-Aug-95	III, VIII	2,4	Cyperaceae	Rhynchospora inundata	(Oakes) Fer	horned beakrush	OBL
110	21-Aug-96	VII(r)	1,2,3,4	Compositae	Rudbeckia hirta	L.	Black-eyed Susan	FACW
111	24-Aug-95	VII(ss), VIII	2,3	Gentianaceae	Sabatia brevifolia	Raf	short-leaved rose ge	FACW
112	06-Sep-95	ditch, IV/VIII, VII(sl)	1,2,3	Alismataceae	Sagittaria graminea	Michx.	grassleaf arrowhead	OBL
113	06-Sep-95	VII(ditch, marsh)	2	Alismataceae	Sagittaria lancifolia	L.	bull-tongue arrowhea	OBL
114	18-May-95	VII(d)	1,2	Salicaceae	Salix caroliniana	Michx.	coastal plain willow	OBL
115	30-Aug-95	IIa	2	Salicaceae	Salix nigra	Marsh.	black willow	OBL
116	25-Mar-96	I, II, VII(ss, ditch, cc, VII(ss))	1,2,3,4	Sarraceniaceae	Sarracenia flava	L.	trumpets	OBL
117	22-Jul-95	VII(ss)	1,2,3	Sarraceniaceae	Sarracenia purpurea*	L.	purple pitcher plant	OBL
118	15-Aug-95	IV, VII(cc, ditch)	1,2	Cyperaceae	Scirpus cyperinus	(L.) Kunth	woolgrass	OBL
119	29-Aug-95	VII(ditch)	2	Cyperaceae	Scleria baldwinii	(Torr.) Steud	Baldwin's nutrush	FACW
120	05-Aug-95	VII(cc), VIII	1,2	Cyperaceae	Scleria triglomerata	Michx.	whip nutrush	FACU
121	18-May-95	VII(cc, r)	1,2,3,4	Palmae	Serenoa repens	(Bartr.) Sma	saw palmetto	FACU
122	15-Aug-95	VII(r)	1,2,3	Leguminosae	Sesbania vesicaria	(Jacq.) Elliot	bladderpod	FAC
123	26-Mar-96	IV	2	Smilacaceae	Smilax ecklonii	(Engelm. ex greenbrier	greenbrier	FACW
124	18-May-95	I, VII(cc, r)	1,2,3,4	Smilacaceae	Smilax laurifolia	L.	bamboo vine	FACW
125	03-Apr-96	III	1,2,3	Smilacaceae	Smilax smallii	Morong	Jackson-brier	OBL
126	09-Jul-95	I, II	1,2,3,4	Smilacaceae	Smilax walteri	Pursh	coral greenbrier	OBL
127	07-Sep-95	VII(r)	2	Compositae	Solidago brachyphylla	Chapm.	goldenrod	OBL
128	30-Aug-95	III, VII(d, r, cb)	1,2,3,4	Euphorbiaceae	Stillingia aquatica	Chapm.	corkwood	OBL
129	19-Jul-95	VII(ditch)	1,2	Eriocaulaceae	Syngonanthus flavidulus	(Michx.) Richland	pond cypress	FACW
130	18-May-95	I, II, III, IIa, II/IIa, III/	1,2,3,4	Taxodiaceae	Taxodium ascendens	Brongn.	wood sage	OBL
131	24-Jul-95	VII(r)	2	Labiatae	Teucrium canadense	(Desv) Mort	woods fern	FACW
132	30-Aug-95	I	2	Polypodiaceae	Thelypteris kunthii	L.	broadleaf cattail	OBL
133	06-Sep-95	IV, VII(slough, ditch)	1,2	Typhaceae	Typha latifolia	Michx.	horned bladderwort	OBL
134	29-Aug-95	III, VII(cc, ws), pon	1,2,3,4	Lentibulariaceae	Utricularia cornuta	L.	horned bladderwort	OBL
135	04-Apr-96	VII(ss, cc, ditch), VI	1,2,3	Lentibulariaceae	Utricularia subulata	L.	horned bladderwort	OBL
136	26-Mar-96	VII(cc, ss, ditch, edg)	1,2,3	Violaceae	Viola sp.	Michx.	muscadine grape	FAC
137	18-May-95	VII(r)	1,2,3,4	Vitaceae	Vitis rotundifolia	(L.) J.E. Smi	Virginia chain fern	OBL
138	30-Aug-95	I	2	Polypodiaceae	Woodwardia virginica	Beyr. ex Ku	coastal plain yellow-e	OBL
139	05-Aug-95	I, II, VII(ws), VIII	1,2,4	Xyridaceae	Xyris ambigua	(Desr.) Fern	crow-poison	FACW
140	18-May-95	VII(cc)	1,2,3,4	Liliaceae	Zigadenus densus	Michx.	atlantic deathcamas	FACW
141	24-Aug-95	II, VII(ss, ws)	1,2,3,4	Liliaceae	Zigadenus glaberrimus	Michx.	atlantic deathcamas	FACW

Table B5. Watershed 3 Plant Species List

#	Date 1st Coll.	Comm. Type	Area	Family	Species	Author	Common Name	Ind.
1	18-May-95	II/IIIa,I,II,VII	1,2,3	Aceraceae	Acer rubrum	L.	red maple	OBL
2	18-May-95	VII(cc)	1,2,3	Liliaceae	Alettris aurea	Walt.	golden colic-root	FACW
3	02-May-96	VII(ws,ss,d,r)	3,4	Liliaceae	Alettris lutea	Small	Yellow colic-root	
4	02-May-96	VII(ws,ss,d,r)	3,4	Liliaceae	Alettris obovata	Nash	White colic-root	
5	19-Nov-96	VI	3	Betulaceae	Alnus serrulata	(Ait.)Willd.	hazel alder	
6	13-Nov-95	VII(cc,r)	1,2,3	Gramineae	Andropogon virginicus	L. var. glaucus	broomsedge	FAC
7	18-May-95	I,II,VII(cc,ss,ws)	1,2,3,4	Gramineae	Aristida stricta	Michx.	pineland three-awn grass	FAC
8	26-Mar-96	I,VII(ditch,pond edg)	1,3	Rosaceae	Aronia arbutifolia	(L.) Ell.	red chokeberry	FACW
9	13-Jun-96	II,VII(ws,ditch)	1,3,4	Asclepiadaceae	Asclepias connivens	Baldw. ex Ell.	Fragrant milkweed	
10	15-Sep-95	VII(ss)	3	Asclepiadaceae	Asclepias tuberosa?	L.	Milkweed	
11	27-May-96	II,VII(ws)	3,4	Asclepiadaceae	Asclepias viridula***	Chapm.	milkweed	
12	24-Aug-95	VII(r)	3,4	Annonaceae	Asimina longifolia	Kral	pawpaw	
13	25-Aug-95	II,VII(pond edge,ws)	2,3,4	Compositae	Aster eryngiifolius***	T. & G.	aster	
14	18-May-95	I,II,IV,VII,VIII	1,2,3,4	Compositae	Baccharis halimifolia	L.	saltbush, silverling, grou	FAC
15	05-Aug-95	VII(cc,ss)	1,3,4	Compositae	Balduna uniflora	Nutt.	one-flower honeycomb-h	FACW
16	07-Sep-95	VII(r)	1,2,3	Compositae	Bidens mitis	(Michx.) DC.	beggarticks	OBL
17	14-Nov-95	VII(ss)	3	Compositae	Bigelovia nudata	(Michx.) DC.	rayless goldenrod	
18	25-Mar-96	VII(ss,cc,ws),VIII	1,2,3,4	Orchidaceae	Calopogon barbatus*	(Walt.)	Bearded grass-pink	
19	25-Mar-96	III/V	3	Cyperaceae	Carex folliculata	L.	sedge	
20	11-Sep-95	VII(r,ss)	3	Compositae	Carphephorus odoratissimus	(Gmel.)Herb.	deer tongue, vanilla plant	
21	23-Jul-95	VII(r,ws)	1,3,4	Compositae	Carphephorus pseudoliatris	Cass.	bristle-leaf chaffhead	OBL
22	23-Aug-95	VI	2,3	Rubiaceae	Cephalanthus occidentalis	L.	buttonbush	OBL
23	18-May-95	IIIIa	1,2,3,4	Cupressaceae	Chamaecyparis thyoides	(L.) B. S. P.	Atlantic white cedar	OBL
24	25-Mar-96	VII(ss,ditches)	3,4	Compositae	Chaptalia tomentosa	Vent.	sun-bonnets, pineland daisy	
25	18-Dec-95	VII(r)	3	Graminae	Chasmanthium ornithorhynch	(Steud.) Yates	spikegrass	
26	18-May-95	V,VII(r)	1,3	Orchidaceae	Cleistes divaricata*	(L.) Ames	rosebud orchid, spreadin	FAC
27	18-May-95	I,II,III/IIa,IV,V,VII	1,2,3,4	Clethraceae	Clethra alnifolia	L.	coast pepperbush	FACW
28	18-May-96	I,II,III,IIIIa,IIIIa,IV,VI	1,2,3,4	Cyrtillaceae	Cliffonia monophylla	(Lam.) Britton e	black titi / buckwheat tree	OBL
29	04-Apr-96	II	3	Euphorbiaceae	Cnidocolus stimulosus	(Michx.) Engelm	Tread softly	
30	14-Nov-95	VII(r)	3	Labiatae	Conradina canescens	(T. & G.) Gray	Conradina	
31	19-Nov-96	VII(ss)	3	Compositae	Coreopsis floridana	E. B. Smith	coreopsis	
32	14-Nov-95	VII(roadside)	3	Compositae	Coreopsis gladiata	Walt.	tickseed	
33	14-Nov-95	VII(r)	3	Compositae	Coreopsis leavenworthii	T. & G.	coreopsis	
34	15-May-96	VII(ss,ws)	3,4	Compositae	Coreopsis nudata	Nutt.	swamp coreopsis	
35	14-Nov-95	VII(ss)	3,4	Gramineae	Ctenium aromaticum	(Walt.) Wood	toothache grass	
36	20-May-95	I,II,III,IIIIa,IIIIa,IV,V,VII	1,2,3,4	Cyrtillaceae	Cyrtilla racemiflora	L.	titi / leatherwood	FACW
37	23-Jul-95	VII(ss,ws)	3,4	Cyperaceae	Dichromena latifolia (Rhynch.)	Baldw. ex Elliot	giant whitetop sedge	
38	25-Apr-96	I,II,VII(cc,ws,ss),VIII	1,2,3,4	Droseraceae	Drosera capillaris	Poir.	pink sundew	OBL
39	29-Aug-95	II,VIII	1,2,3	Droseraceae	Drosera intermedia*	Hayne	spoonleaf sundew	OBL
40	18-May-95	VII(cc,ss,ws)	1,3,4	Droseraceae	Drosera tracyi	MacFarlane in	dew-threads	OBL
41	24-Aug-95	VII(r)	3	Gramineae	Eragrostis eliotii	S. Wats.	Elliott lovegrass	FACW
42	14-Nov-95	VII(r)	3	Gramineae	Erianthus giganteus	Baldwin	plumegrass	
43	18-May-95	II,VII(cc,ws,ss)	1,2,3,4	Eriocaulaceae	Eriocaulon compressum	Lam.	flattened pipewort	OBL
44	19-Jul-95	I,II,VII(ss,ws)	1,3,4	Umbelliferae	Eryngium yuccifolium	Michx.	rattlesnake master	FAC
45	11-Sep-95	VII(r)	3	Compositae	Eupatorium altissimum	L.	white snakeroot	FACU
46	30-Aug-95	VII(cc,r)	1,2,3	Compositae	Eupatorium capillifolium	(Lam.) Small	dog fennel	FACU
47	11-Sep-95	VII(r)	3	Compositae	Eupatorium leucolepis	(DC.) T. & G.	white-bract thoroughwort	FACW
48	24-Aug-95	VII(r)	3	Compositae	Eupatorium linearifolium	Walt.	thoroughwort	
49	11-Sep-95	VII(r)	3	Compositae	Eupatorium mohrii	Greene	thoroughwort	

Table B5. Watershed 3 Plant Species List

#	Date 1st Coll.	Comm. Type	Area	Family	Species	Author	Common Name	Ind.
50	11-Sep-95	VII(r)	3	Compositae	Eupatorium rotundifolium	L.	false hoarhound	FAC
51	22-Jul-95	riverbank, ditchside	1,2,3	Oleaceae	Fraxinus caroliniana	Mill.	Carolina ash	OBL
52	18-May-95	I, IV, II/IIIa, VII(cc), VIII	1,2,3,4	Ericaceae	Gaylussacia mosieri	Small	woollyberry	FACW
53	25-Mar-96	VII(d/r)	1,2,3	Loganiaceae	Gelsemium sempervirens	(L.) Ait. f.	yellow jessamine	
54	04-Apr-96	II	3	Compositae	Gnaphalium sp.	(Raf.) Rock	rabbit tobacco	
55	21-Aug-96	VII(r,ws)	1,2,3,4	Compositae	Helenium amarum	Walt.	Bitterweed	
56	25-Mar-96	VII(cc,ss,r,ws), VIII	1,2,3,4	Compositae	Helenium vernale	(Pursh) T. & G.	Sneezeweed	
57	27-May-96	II, VII(ws, ditches)	3,4	Compositae	Helianthus radula	Walt.	rayless sunflower	
58	24-Aug-95	II, VII(r)	3,4	Malvaceae	Hibiscus aculeatus	(Ker-Gawl.) Her	pineland rosemallow	FACW
59	14-May-95	VI	3	Amaryllidaceae	Hymenocallis rotata	Lam.	round-pod St. Johnswort	OBL
60	24-Aug-95	VII(r)	3,4	Guttiferae	Hypericum cistifolium	(L.) B.S.P.	orange grass	FACW
61	15-Aug-95	VII(r)	1,2,3,4	Guttiferae	Hypericum gentianoides	(L.) Crantz	St. Andrew's cross	FACU
62	29-Aug-95	VII(r,cc)	1,2,3	Guttiferae	Hypericum hypericoides	Lam.	sand-weed	
63	15-Dec-95	VII(r)	1,3	Guttiferae	Hypericum myrtifolium	Pollard	yellow stargrass	
64	25-Mar-96	VII(ditchside,ss,cc)	1,3,4	Hypoxidaceae	Hypoxis micrantha	(Pursh) Chapm.	highbush gallberry, bayg	FACW
65	17-Jul-95	IIla	1,2,3	Aquifoliaceae	Ilex cassine	(L.) Gray	inkberry, gallberry	FACW
66	18-May-95	I, II, VII(cc,r)	1,2,3,4	Aquifoliaceae	Ilex coriacea	L.	Southern blue flag	
67	18-May-95	I, VII(r)	1,2,3	Aquifoliaceae	Ilex glabra	(Walt.) Lindau	water willow	OBL
68	13-May-96	VII(r,riverbank)	3	Iridaceae	Iris virginica	(Lam.) Dandy	Carolina redroot	
69	14-Nov-95	VI, VII(d)	3	Acanthaceae	Justicia ovata var. lanceolata	(Lam.) D. Don	dog hobble	FACW
70	18-Jul-95	I, II, VII(cc,ss,ws,r,d)	1,2,3,4	Haemodioraceae	Leucothoe axillaris	(L.) Gray	fetterbush	
71	11-Sep-95	VI, VII(d)	1,3	Ericaceae	Leucothoe racemosa	Ell.	blazing star	OBL
72	23-Aug-95	III, III/IV, VII(r)	1,2,3	Ericaceae	Liatris secunda	(Pursh) Wood	goldcrest	FACW
73	25-Aug-95	VII(r)	3	Compositae	Lophiola americana	F. Harper	seaside seedbox	
74	18-May-95	VII(ws,cc)	1,2,3,4	Haemodioraceae	Ludwigia maritima	Michx.	rattlebox	
75	24-Aug-95	VII(r)	2,3	Onagraceae	Ludwigia virgata	(Nutt.) DC.	roserush	FACW
76	13-Jun-96	VII(r)	3,4	Onagraceae	Lygodesmia aphylla	(Lam.) K. Koch	fetterbush	FACW
77	13-Jun-96	VII(r)	3	Compositae	Lyonia lucida	(Walt.) G. Don	sweetbay	
78	18-May-95	I, III, V	1,2,3,4	Ericaceae	Magnolia virginiana	Raf.	miterwort	FACW
79	18-May-95	IIIa, II/IIIa, IIIa/IV, VII, III, VII(ss)	1,2,3,4	Magnoliaceae	Mitreola sessilifolia	(L.) Sibth. & Sm.	evergreen bayberry	
80	11-Sep-95	III, VII(ss)	3	Loganiaceae	Myrica heterophylla	W. Bart. ex Mar	spatterdock, cow lily	OBL
81	09-Jul-95	I, II, III, IIIa, IV, offsite, ditch	1,2,3,4	Myricaceae	Nuphar luteum	L.	ogeechee tupelo	OBL
82	29-Jun-96	III, VI	1,2,3	Nymphaeaceae	Nyssa ogeche	L.	golden club	OBL
83	22-Jul-95	III, VI	1,2,3,4	Nyssaceae	Orontium aquaticum	L.	cinnamon fern	OBL
84	25-Mar-96	VI(stream)	3	Araceae	Osmunda cinnamomea	(Walt.) Britt	royal fern	FACW
85	26-Mar-96	VII(r)	1,2,3	Polypodiaceae	Osmunda regalis	(T. & G.) Blake	common water dropwort	
86	18-May-95	V, VII(cc)	1,2,3	Polypodiaceae	Oxypolis filiformis	Godfrey	Godfrey's butterwort	OBL
87	24-Aug-95	II, VII(d,roadside)	1,3,4	Umbelliferae	Phoebanthus tenuifolia	Chapm.	yellow butterwort	OBL
88	13-Jun-96	VII(r)	3,4	Compositae	Pinguicula ionantha****	Chapm.	Chapman's butterwort	OBL
89	26-Mar-96	VII(cc,ss,ditch)	1,3	Lentibulariaceae	Pinguicula lutea	Michx.	small butterwort	OBL
90	26-Mar-96	VII(ss,cc,ditch)	1,2,3	Lentibulariaceae	Pinguicula planifolia***	(Michx.) Nutt.	golden aster	OBL
91	21-Dec-95	VII(ss)	3	Lentibulariaceae	Pinguicula pumila	Walt.	tall pine-barren milkwort	OBL
92	18-Dec-95	II(wet flatwoods)	3	Lentibulariaceae	Pinguicula sp.	Torr. & Gray	Hooker's milkwort	FACW
93	14-Nov-95	VII(r)	3	Lentibulariaceae	Pityopsis graminifolia	(Michx.) DC.	dwarf milkwort, bachelor	FAC
94	14-Nov-95	VII(r)	3	Compositae	Polygala cymosa			
95	29-Aug-95	VII(ws,ditch,r,ws)	1,2,3,4	Polygalaceae	Polygala hookeri			
96	30-Aug-95	I, VII(ws)	2,3,4	Polygalaceae	Polygala lutea			
97	18-May-95	II, VII	1,2,3	Polygalaceae	Polygala nana			
98	29-Aug-95	VII(cc,ss,ditchside),	1,2,3	Polygalaceae				

Table B5. Watershed 3 Plant Species List

#	Date 1st Coll.	Comm. Type	Area	Family	Species	Author	Common Name	Ind.
99	15-Aug-95	VI,VII(r)	2,3	Polygonaceae	Polygonum hydropiperoides	Michx.	swamp smartweed	OBL
100	24-Aug-95	III,ditch	1,2,3	Pontederiaceae	Pontederia cordata	L.	pickerelweed	OBL
101	18-Jul-95	I	1,3	Fagaceae	Quercus minima	(Sarg.) Small	dwarf live oak	
102	20-May-95	III,ditch	1,2,3	Fagaceae	Quercus nigra	L.	water oak	FAC
103	24-Aug-95	II	3	Fagaceae	Quercus stellata	Wangenh.	post oak	FACU
104	24-Aug-95	creekbank, riverban	2,3	Fagaceae	Quercus virginiana	Mill.	live oak	FACU
105	27-May-96	II,VII(ws,cc,r)	1,2,3,4	Melastomataceae	Rhexia alifanus	Walt.	rose meadow-beauty	FACW
106	13-May-96	VII(ws,ss)	3,4	Melastomataceae	Rhexia lutea	Walt.	yellow rhexia	FACW
107	24-Aug-95	II,VII(r,ws)	1,2,3,4	Melastomataceae	Rhexia mariana	L.	pale meadow-beauty	FACW
108	19-Jul-95	I,III,VII	1,2,3,4	Melastomataceae	Rhexia petiolata	Walt.	ciliate meadow-beauty	FACW
109	08-Jul-95	VII(r),IV/VIII	1,2,3	Melastomataceae	Rhexia virginica	L.	Virginia meadow-beauty	FACW
110	17-Jul-95	IIla	1,3	Ericaceae	Rhododendron viscosum	(L.) Torr.	swamp azalea	FACW
111	30-Aug-95	offsite	1,2,3	Anacardiaceae	Rhus copallina	L.	winged sumac	none
112	24-Aug-95	VII(ss)	3	Cyperaceae	Rhynchospora sp.	(T. & G.) Boyn.	coneflower	
113	13-Jun-96	VII(ws,ss,d)	3,4	Compositae	Rudbeckia graminifolia	L.	Black-eyed Susan	
114	21-Aug-96	VII(r)	1,2,3,4	Compositae	Rudbeckia hirta	Wilbur	Bartram's rose gentian	FACW
115	08-Jul-95	VII(d,ws)	1,3,4	Gentianaceae	Sabatia bartramii	Raf.	short-leaved rose gentia	FACW
116	24-Aug-95	VII(ss),VIII	2,3	Gentianaceae	Sabatia brevifolia	(L.) BSP	ten-petal sabatia	
117	12-Jun-96	VII(r)	3	Gentianaceae	Sabatia dodecandra	(Gray) Small	Sabatia	
118	13-Jun-96	VII(r)	3	Gentianaceae	Sabatia grandiflora	Michx.	grassleaf arrowhead	OBL
119	06-Sep-95	ditch,IV/VIII,VII(slow)	1,2,3	Alismataceae	Sagittaria graminea	L.	trumpets	OBL
120	25-Mar-96	I,II,VII(ss,ditch,cc,w)	1,2,3,4	Sarraceniaceae	Sarracenia flava	Michx.	parrot pitcher plant	OBL
121	07-Sep-95	I,II,VII(ss)	1,3,4	Sarraceniaceae	Sarracenia psittacina*	L.	purple pitcher plant	OBL
122	22-Jul-95	VII(ss)	1,2,3	Sarraceniaceae	Sarracenia purpurea*	(Bartr.) Small	saw palmetto	FACU
123	18-May-95	VII(cc,r)	1,2,3,4	Palmae	Serenoa repens	(Jacq.) Elliot	bladderpod	FAC
124	15-Aug-95	VII(r)	1,2,3	Leguminosae	Sesbania vesicaria	Bickn.	blue-eyed grass	FAC
125	11-Sep-95	VII(r)	1,3	Scrophulariaceae	Seymeria cassioides	(Walt.) Blake	Black senna, senna sym	
126	26-Mar-96	VII(cc,ditches,roads)	1,3	Iridaceae	Sisyrinchium atlanticum	Walt.	earleaf greenbrier	FACU
127	24-Aug-95	VII(r)	3	Smilacaceae	Smilax auriculata	L.	bamboo vine	FACW
128	18-May-95	I,VII(cc,r)	1,2,3,4	Smilacaceae	Smilax laurifolia	Morong	Jackson-brier	
129	03-Apr-96	III	1,2,3	Smilacaceae	Smilax smallii	Pursh	coral greenbrier	OBL
130	09-Jul-95	I,II	1,2,3,4	Smilacaceae	Smilax walteri	Alt.	willow-leaf goldenrod	OBL
131	11-Sep-95	VII(r)	3	Compositae	Solidago stricta	Raf.	little ladies' tresses	
132	18-May-95	VII(r,ss)	1,3	Orchidaceae	Spiranthes tuberosa*	(L.) R. Br.	smutgrass	OBL
133	14-Nov-95	VII(riverbank)	3	Graminae	Sporobolus indicus?	Chapm.	corkwood	FACW
134	30-Aug-95	III,VII(d,r,cb)	1,2,3,4	Euphorbiaceae	Stillingia aquatica	Lam.	horser sugar	FAC
135	04-Apr-96	I,V,VII(r),I,VII(r)	1,3	Styracaceae	Styrax americana	(L.) L'Her.	pond cypress	OBL
136	24-Aug-95	VII(r)	3	Symplocaceae	Symplocos tinctoria	Brongn.	bald cypress	OBL
137	18-May-95	I,II,III,IIla,IIIIa,III/IV	1,2,3,4	Taxodiaceae	Taxodium ascendens	(Walt.) BSP	False asphodel, asphodel	
138	22-Jul-95	III	3	Taxodiaceae	Taxodium distichum	Michx.	horned bladderwort	OBL
139	13-Jun-96	VII(ws)	3,4	Liliaceae	Toxifolia racemosa	L.	sparkleberry	FACU
140	29-Aug-95	III,VII(cc,ws),pond,d	1,2,3,4	Lentibulariaceae	Utricularia cornuta	Marsh.	Elliot blueberry	FAC
141	04-Apr-96	VII(ss,cc,ditch),VIII	1,2,3	Lentibulariaceae	Utricularia subulata	Chapm.	muscadine grape	FACW
142	24-Aug-95	VII(r)	3	Ericaceae	Vaccinium arboreum	Michx.	crow-poison	FACW
143	24-Aug-95	VII(r)	3	Ericaceae	Vaccinium elliotii	Michx.	atlantic deathcamas	
144	26-Mar-96	VII(cc,ss,ditchedge)	1,2,3	Violaceae	Viola sp.			
145	18-May-95	VII(r)	1,2,3,4	Vitaceae	Vitis rotundifolia			
146	18-May-95	VII(cc)	1,2,3,4	Liliaceae	Zigadenus densus			
147	24-Aug-95	II,VII(ss,ws)	1,2,3,4	Liliaceae	Zigadenus glaberrimus			

Table B6. Vegetation Reference Area 4 Plant Species List

#	Date 1st Co	Comm. Type	Area	Family	Species	Author	Common Name	Ind.
1	02-May-96	VII(ws,ss,d,r)	3,4	Liliaceae	Aletis lutea	Small	Yellow colic-root	
2	02-May-96	VII(ws,ss,d,r)	3,4	Liliaceae	Aletis obovata	Nash	White colic-root	
3	18-May-95	I,II,VII(cc,ss,ws)	1,2,3,4	Gramineae	Aristida stricta	Michx.	pineland three-awn gr	FAC
4	19-Jul-95	I,VII(r)	1,4	Asclepiadaceae	Asclepias cinerea	Walt.	Carolina milkweed	FAC
5	13-Jun-96	II,VII(ws,ditch)	1,3,4	Asclepiadaceae	Asclepias convivens	Baldw. ex El	Fragrant milkweed	
6	13-May-96	VII(ws)	4	Asclepiadaceae	Asclepias michauxii***	Decne.	Weak-stemmed milkweed	
7	27-May-96	II,VII(ws)	3,4	Asclepiadaceae	Asclepias viridula***	Chapm.	milkweed	
8	24-Aug-95	VII(r)	3,4	Annonaceae	Asimina longifolia	Kral	pawpaw	
9	25-Aug-95	II,VII(pond edge,w)	2,3,4	Compositae	Aster eryngiifolius***	T. & G.	aster	
10	18-May-95	I,II,IV,VII,VIII	1,2,3,4	Compositae	Baccharis halimifolia	L.	saltbush, silverling, gr	FAC
11	05-Aug-95	VII(cc,ss)	1,3,4	Compositae	Balduina uniflora	Nutt.	one-flower honeycom	FACW
12	25-Mar-96	VII(ss,cc,ws),VIII	1,2,3,4	Orchidaceae	Calopogon barbatus*	(Walt.)	Bearded grass-pink	
13	02-May-96	VII(ws)	4	Orchidaceae	Calopogon pallidus	Chapm.	Pale grass-pink	
14	13-May-96	VII(ws)	4	Orchidaceae	Calopogon tuberosus	(L.) BSP	Grass-pink	
15	23-Jul-95	VII(r,ws)	1,3,4	Compositae	Carphophorus pseudoliatris	Cass.	bristle-leaf chaffhead	OBL
16	18-May-95	IIa	1,2,3,4	Cupressaceae	Chamaecyparis thyoides	(L.) B.S.P.	Atlantic white cedar	OBL
17	25-Mar-96	VII(ss,ditches)	3,4	Compositae	Chaptalia tomentosa	Vent.	sun-bonnets, pineland daisy	
18	18-May-95	I,II,IIIa,IV,V,VII	1,2,3,4	Clethraceae	Clethra alnifolia	L.	coast pepperbush	FACW
19	18-May-96	I,II,III,IIIa,IIIIa,IV	1,2,3,4	Cyrtaceae	Cliftonia monophylla	(Lam.) Britto	black titi / buckwheat t	OBL
20	15-May-96	VII(ss,ws)	3,4	Compositae	Coreopsis nudata	Nutt.	swamp coreopsis	
21	14-Nov-95	VII(ss)	3,4	Gramineae	Ctenium aromaticum	(Walt.) Woo	toothache grass	
22	25-Jun-96	VII(ws)	4	Convolvulaceae	Cuscuta indecora	Choisy	dodder,love-vine	
23	20-May-95	I,II,III,IIIa,IIIIa,IV	1,2,3,4	Cyrtaceae	Cyrilla racemiflora	L.	titi / leatherwood	FACW
24	23-Jul-95	VII(ss,ws)	3,4	Cyperaceae	Dichromena latifolia (Rhynch.	Baldw. ex El	giant whitetop sedge	FACW
25	25-Apr-96	II,VII(cc,ws,ss),VI	1,2,3,4	Droseraceae	Drosera capillaris	Poir.	pink sundew	OBL
26	18-May-95	VII(cc,ss,ws)	1,3,4	Droseraceae	Drosera tracyi	MacFarlane	dew-threads	OBL
27	18-May-95	VII(r,ws)	1,4	Compositae	Eriogon vernalis	(L.) T. & G.	early whitetop fleaban	OBL
28	18-May-95	II,VII(cc,ws,ss)	1,2,3,4	Eriocaulaceae	Eriocaulon compressum	Lam.	flattened pipewort	OBL
29	19-Jul-95	I,II,VII(ss,ws)	1,3,4	Umbelliferae	Eryngium yuccifolium	Michx.	rattlesnake master	FAC
30	19-Jul-95	I,VII(cc)	1,4	Euphorbiaceae	Euphorbia inundata	Torr. ex Cha	Florida pine spurge	FACW
31	18-May-95	I,IV,IIIIa,VII(cc),VI	1,2,3,4	Ericaceae	Gaylussacia mosieri	Small	woollyberry	FACW
32	21-Aug-96	VII(r,ws)	1,2,3,4	Compositae	Helenium amarum	(Raf.) Rock	Bitterweed	
33	25-Mar-96	VII(cc,ss,r,ws),VIII	1,2,3,4	Compositae	Helenium vernalis	Walt.	Sneezeweed	
34	27-May-96	II,VII(ws,ditches)	3,4	Compositae	Helianthus radula	(Pursh) T. & rayless	sunflower	FACW
35	24-Aug-95	II,VII(r)	3,4	Malvaceae	Hibiscus aculeatus	Walt.	pineland rosemallow	FACW
36	24-Aug-95	VII(r)	3,4	Guttiferae	Hypericum cistifolium	Lam.	round-pod St. Johnsw	FACW
37	15-Aug-95	VII(r)	1,2,3,4	Guttiferae	Hypericum gentianoides	(L.) B.S.P.	orangegrass	FACU
38	27-May-96	VII(ws)	4	Guttiferae	Hypericum tetrapetalum	Lam.	St. John's wort	
39	25-Mar-96	VII(ditchside,ss,cc)	1,3,4	Hypoxidaceae	Hypoxis micrantha	Pollard	yellow stargrass	
40	18-May-95 ;	I,II,VII(cc,r)	1,2,3,4	Aquifoliaceae	Ilex coriacea	(Pursh) Cha	highbush gallberry, ba	FACW
41	02-May-96	VII(ws)	4	Acanthaceae	Justicia crassifolia***	(Chapm.) S	thick-leaved water willow	
42	18-Jul-95	I,II,VII(cc,ss,ws,r,d)	1,2,3,4	Haemodorumaceae	Lachnanthes caroliniana	(Lam.) Dand	Carolina redroot	OBL
43	02-Jul-96	VII(ws)	4	Compositae	Liatris tenuifolia	Nutt.	blazing star	
44	29-Aug-96	II(wf),VII(ws)	4	Liliaceae	Lilium catesbaei*	Walt.	pine lily	
45	18-May-95	VII(ws,cc)	1,2,3,4	Haemodorumaceae	Lophiola americana	(Pursh) Wo	goldcrest	OBL
46	13-Jun-96	VII(r)	3,4	Onagraceae	Ludwigia virgata	Michx.	rattlebox	
47	18-May-95	I,III,V	1,2,3,4	Ericaceae	Lyonia lucida	(Lam.) K.Ko	fetterbush	FACW
48	26-Jun-96	II,VII(r,d)	4	Labiatae	Macbridea alba****	Biehler	white birds-in-a-nest	
49	18-May-95	IIIa,II/IIIa,IIIIa/IV,VII	1,2,3,4	Magnoliaceae	Magnolia virginiana	L.	sweetbay	FACW
50	07-Aug-96	II,VII(ws)	4	Compositae	Marshallia tenuifolia	Raf.	Barbara's buttons	

Table B6. Vegetation Reference Area 4 Plant Species List

#	Date 1st Co	Comm. Type	Area	Family	Species	Author	Common Name	Ind.
51	09-Jul-95	I,II,III,IIla,IV,offsite, II	1,2,3,4	Myricaceae	Myrica heterophylla	Raf.	evergreen bayberry	FACW
52	04-Jul-96	II	4	Agavaceae	Nolina atopocarpa***	Bartlett	Florida beargrass	
53	22-Jul-95	III,VI	1,2,3,4	Nyssaceae	Nyssa ogeche	W. Bart. ex	ogeche tupelo	OBL
54	15-Aug-95	III,IIla,VIII,creekba	1,2,4	Nyssaceae	Nyssa ursina	Small	bear tupelo (?)	?
55	24-Aug-95	II,VII(d,roadside)	1,3,4	Umbelliferae	Oxypolis filiformis	(Walt.) Britt	common water dropw	FACW
56	24-Apr-96	II(wf),VII(ws)	4	Saxifragaceae	Parnassia grandifolia**	DC.	undine, grass-of-Parnassus	
57	13-Jun-96	VII(r)	3,4	Compositae	Phoebanthus tenuifolia	(T. & G.) Blake		
58	13-Jun-96	VII(ws)	4	Compositae	Pityopsis oligantha	(Chapm. ex	golden aster	
59	24-Aug-95	VII(cc,ws)	2,4	Orchidaceae	Platanthera ciliaris*	(L.) Lindl.	yellow fringed orchid	
60	15-Aug-96	VII(ws)	4	Orchidaceae	Platanthera integrifolia***	(Nutt.) Gray	yellow fringed orchid	
61	13-Jun-96	VII(ws)	4	Orchidaceae	Platanthera nivea*	(Nutt.) Luer	snowy orchid	
62	02-Jul-96	VII(ws)	4	Liliaceae	Pilea tenuifolia	Michx.	rush featherling	
63	13-May-96	VII(ws)	4	Orchidaceae	Pogonia ophioglossoides*	(L.) Ker-Ga	rose pogonia	OBL
64	29-Aug-95	VIII	2,4	Polygalaceae	Polygala brevifolia	Nutt.	little-leaved milkwort	OBL
65	18-May-95	II,VII	1,4	Polygalaceae	Polygala cruciata	L.	crossleaf milkwort	OBL
66	29-Aug-95	VII(ws,ditch,r,ws)	1,2,3,4	Polygalaceae	Polygala cymosa	Walt.	tall pine-barren milkw	OBL
67	30-Aug-95	I,VII(ws)	2,3,4	Polygalaceae	Polygala hookeri	Torr. & Gray	Hooker's milkwort	FACW
68	26-Jun-96	VI	4	Leguminosae	Psoralea psoraloides	(Walt.) Cory	Sampson's snakeroot	
69	27-May-96	II,VII(ws,cc,r)	1,2,3,4	Melastomataceae	Rhexia alifanus	Walt.	rose meadow-beauty	FACW
70	13-May-96	VII(ws,ss)	3,4	Melastomataceae	Rhexia lutea	Walt.	yellow rhexia	
71	24-Aug-95	II,VII(r,ws)	1,2,3,4	Melastomataceae	Rhexia mariana	L.	pale meadow-beauty	FACW
72	19-Jul-95	I,III,VII	1,2,3,4	Melastomataceae	Rhynchospora baldwinii	Walt.	ciliate meadow-beaut	FACW
73	18-May-95	VII(cc,ws)	1,4	Cyperaceae	Rhynchospora inundata	Gray	Baldwin's beakrush	OBL
74	29-Aug-95	III,VIII	2,4	Cyperaceae	Rhynchospora oligantha	(Oakes) Fer	horned beakrush	OBL
75	02-Jul-96	VII(ws)	4	Cyperaceae	Rhynchospora plumosa	Gray	beakrush	
76	28-Jun-96	VII(cc,ws)	1,4	Cyperaceae	Rudbeckia graminifolia	Ell.	beakrush	
77	13-Jun-96	VII(ws,ss,d)	3,4	Compositae	Rudbeckia hirta	(T. & G.) Bo	coneflower	
78	21-Aug-96	VII(r)	1,2,3,4	Compositae	Sabatia bartramii	L.	Black-eyed Susan	
79	08-Jul-95	VII(d,ws)	1,3,4	Gentianaceae	Sabatia macrophylla	Wilbur	Bartram's rose gentia	FACW
80	30-Jul-96	II,VII(ws)	4	Gentianaceae	Sabatia stellaris	Hook	Sabatia	
81	26-Jun-96	VII(ws)	1,4	Gentianaceae	Sarracenia flava	Pursh	Sabatia	
82	25-Mar-96	I,II,VII(ss,ditch,cc,	1,2,3,4	Sarraceniaceae	Sarracenia psittacina*	L.	trumpets	OBL
83	07-Sep-95	I,II,VII(ss)	1,3,4	Sarraceniaceae	Serenoa repens	Michx.	parrot pitcher plant	OBL
84	18-May-95	VII(cc,r)	1,2,3,4	Palmae	Sisyrinchium nashii	(Bart.) Sma	saw palmetto	FACU
85	24-Apr-96	VII(r)	4	Iridaceae	Smilax laurifolia	Bickn.	blue-eyed grass	
86	18-May-95	I,VII(cc,r)	1,2,3,4	Smilacaceae	Smilax walteri	L.	bamboo vine	FACW
87	09-Jul-95	VII(ws)	4	Compositae	Solidago fistulosa	Pursh	coral greenbrier	OBL
88	13-Aug-96	VII(d,ws)	1,2,3,4	Euphorbiaceae	Stillingia aquatica	Mill.	goldenrod	OBL
89	30-Aug-95	III,VII (d,r,cb)	1,2,3,4	Taxodiaceae	Taxodium ascendens	Chapm.	corkwood	OBL
90	18-May-95	I,II,III,IIla,IIIIa,IIII	1,2,3,4	Liliaceae	Tofieldia racemosa	Brongn.	pond cypress	OBL
91	13-Jun-96	VII(ws)	3,4	Liliaceae	Utricularia cornuta	(Walt.) BSP	False asphodel, asphodel	
92	29-Aug-95	III,VII(cc,ws),pond,	1,2,3,4	Lentulariaceae	Verbesina chapmanii***	Michx.	horned bladderwort	OBL
93	27-May-96	VII(ws)	4	Compositae	Vernonia angustifolia	Coleman	Chapman's crownbeard	
94	15-Aug-96	VII(r)	4	Compositae	Vitis rotundifolia	Michx.	Ironweed	
95	18-May-95	I,II,VII(ws),VIII	1,2,3,4	Vitaceae	Xyris ambigua	Michx.	muscadine grape	FAC
96	05-Aug-95	VII(ws)	1,2,4	Xyridaceae	Xyris baldwiniana	Beyr. ex Ku	coastal plain yellow-e	OBL
97	13-Jun-96	VII(ws)	4	Xyridaceae	Xyris elliptica	Schult.	St. Mary's grass	
98	27-May-96	VII(cc)	1,2,3,4	Liliaceae	Zigadenus densus	Chapm.	Yellow-eyed grass	
99	18-May-95	II,VII(ss,ws)	1,2,3,4	Liliaceae	Zigadenus glaberrimus	(Desr.) Fern	crow-poison	FACW
100	24-Aug-95					Michx.	atlantic deathcamas	FACW

Plant Diversity

Methods

Vegetation transects were established in the same soil and habitat types in the vegetation reference area (RA4) and WS1 to provide a comparison of species richness and abundance. Three 30 meter by 15 centimeter transects were established 100 meters due north of Apalachicola National Forest road 143 in the compartment 110 wet savannah and 100 meters due west of Tower Road in a clear-cut in the hydrologic restoration area in Tate's Hell State Forest. These transects were placed 100 meters from the boundary of the community type and the road to eliminate edge effects. Transects were sampled for species richness and abundance in 10 meter segments and the results were tallied. Abundance was tallied by units with each unit approximating an individual (individuals of clump grasses such as wiregrass and rhizomatous species are difficult to distinguish, so clumps that appear distinct count as one unit, and separate above ground stalks of rhizomatous species are counted as individual units).

Species assemblage diversity was estimated from vegetation transect data using Hill's diversity indices N1 and N2. These values represent what Hill (1973) terms the "effective number of species". The effective number of species is a measure of the degree to which proportional abundances are distributed among the species, and is expressed as: N0, the number of all species present in the sample; N1, the number of abundant species in the sample, and N2, the number of very abundant species in the sample. This measure of diversity is derived from two commonly used diversity indices, the Shannon-Wiener function (H') and Simpson's index (λ) (Ludwig and Reynolds 1988). The equations for Hill's numbers are (Hill 1973):

$N0 = S$ where S is the total number of species.

$N1 = e^{H'}$ where H' is the Shannon-Wiener function $H' = -\sum p_i \ln p_i$. p_i , the proportional abundance of the i th species equals (n_i/N) , where n_i equals the number of individuals in the i th species, and where N equals the total number of individuals in the sample.

$N2 = 1/\lambda$ where λ is Simpson's index $\lambda = \sum (n_i(n_i - 1) / N(N-1))$. n_i equals the number of individuals in the i th species, and N equals the total number of individuals in the sample.

This diversity measure is fairly easily interpreted, because the unit of measure is species. As the number of species increases, less weight is placed on rare species and proportionally lower values are obtained for N1 and N2 as measures of abundant and very abundant species, respectively. Therefore, if one species comprises most of the total abundance, N1 and N2 will be low, however, if the unit abundance is evenly distributed over many species, N1 and N2 will approach the value of N0 (Ludwig and Reynolds 1988). Evenness (E), a measure of the distribution of unit abundance between species in a sample, was also calculated from the diversity transect abundance data using the Shannon's, $H'/H'_{\max}$, where $H'_{\max}$ equals $\ln(S)$ (Krebs 1989).

Results

Data collected in plant diversity transects are presented in Appendix C. A total of 36 species were found in the RA4 wet savannah in comparison to 27 species in the clear-cut in watershed one (Figures C1). Species richness transect data are presented in Table C1. Species recognized as indicative of disturbance (Clewett 1985; Glitzenstein et al. 1993; Godfrey and Wooten 1979), e.g., *Andropogon* spp., *Cyrilla racemiflora*, and *Rhynchospora baldwinii*, are common in WS1 transects, but are rare or absent from the transects in RA4. In comparison, RA4 transects had several rare and protected species, most notably *Justicia crassifolia* and *Sarracenia psittacina*, as well as several species indicative of good habitat condition (*Aristida stricta*, *Ctenium aromaticum*, *Pilea tenuifolia*).

In addition, species abundances (shown in Table C1) were almost an order of magnitude greater in RA4 (an average of 2171 units per transect) than in WS1 (an average of 218 units per transect). The greatest number of species in a transect, 32 species, was found in RA4. Species diversity as measured by Hill's numbers, was greater in RA4 (Hill's N1 average = 13.70 abundant species, Hill's N2 average = 8.99 very abundant species) than in WS1 (Hill's N1 average = 9.37 abundant species, Hill's N2 average = 6.61 very abundant species). Evenness measures were similar for both areas, the average evenness value for RA4 was 0.77, and the average evenness value for WS1 was 0.78.

Discussion

Plant diversity is greater in the wet savannah in RA4 than in the clear-cut in WS1. The lack of canopy in these areas allows herbaceous species to succeed. The fire management in RA4 provides the appropriate disturbance to maintain natural herbaceous communities at this site, including several protected species. As with other studies in intensively managed silviculture sites (Conde et al. 1983), the number and diversity of species in the disturbed site (WS1 transects) appears to be fairly high, though lower than that of the reference area (Figure C1). However species that colonize and dominate in the disturbed area are opportunistic species that take advantage of the disturbance. Opportunistic shrub species *Hypericum* spp., *Ilex* spp., *Cyrilla racemiflora* and *Cliftonia monophylla* gain height and width quickly to shade out competitor herbaceous species. Opportunistic herbaceous species propagate rapidly, either vegetatively or through copious seed production, and compete for space and nutrients with less prolific species. Therefore, while species diversity may initially be maintained at acceptable levels following a clear-cut, the composition of the resulting plant community will lack the necessary community structure to maintain a diverse plant community.

Herbaceous plant communities in much of the southeastern coastal plain were historically maintained by the occurrence of frequent fires (Frost 1993, Walker 1993). Many native species require fire to produce fertile seeds, or produce larger quantities of viable seed after a fire occurrence (Robbins and Myers 1992). Fire reduces competition from woody shrubs and trees, and encourages the growth and reproduction of many native herbaceous species, thereby maintaining species diversity and community structure in the plant community. In addition, many of these fire dependent species are necessary for proper site management. Many of the native groundcover species such as wiregrass, love grass and several of the sedges are necessary to carry ground fires. The absence of these species makes proper fire management difficult at best. The restoration and reintroduction of these groundcover species may be necessary in many areas to provide fuel for

spring and fall season prescribed burning. However, once restored, these species will aid in management by providing fuel for low intensity fires, and facilitating multiple use management in Tate's Hell State Forest.

The lack of natural plant communities can lead to loss of diversity on a larger scale by reducing availability of forage and habitat for wildlife. The focus of the restoration of plant species then should involve restoring and maintaining natural communities, not just canopy structure, using prescribed fire and hydrologic restoration. In 1993, Means proposed that natural community maintenance on specific sites may not be enough to maintain restored or remnant habitat (in Glitzenstein et al. 1993). He suggests that a mosaic of natural habitats may need to be restored to maintain between habitat diversity (beta diversity), as current silvicultural practices, such as high density seeding and planting, bedding, and infrequent prescribed burning, threaten diversity between as well as within habitats. The lack of rare and protected species in the WS1 transects, and the reduced number of habitat specific species in these transects indicate that active site management, i.e., wiregrass seeding, and rare plant propagation, may be necessary to restore natural plant communities after hydrologic restoration.

As restoration proceeds in WS1, the transects established here should continue to be monitored on an annual basis. Annual monitoring of these transects will detect changes in plant community composition and diversity, and will also identify successional changes in the clear-cut habitat. We encourage the Division of Forestry to conduct small scale prescribed burns in this large clear-cut area to promote regeneration of remnant herbaceous populations, and to test management options for improving groundcover on similar sites. If prescribed burning is begun on this site, monitoring vegetation response to these fires would increase our understanding of herbaceous groundcover restoration, a necessary component of wet savannah and wet flatwood restoration.

Figure C1. Diversity and Evenness

WS1 and RA4 Hill's Diversity Numbers

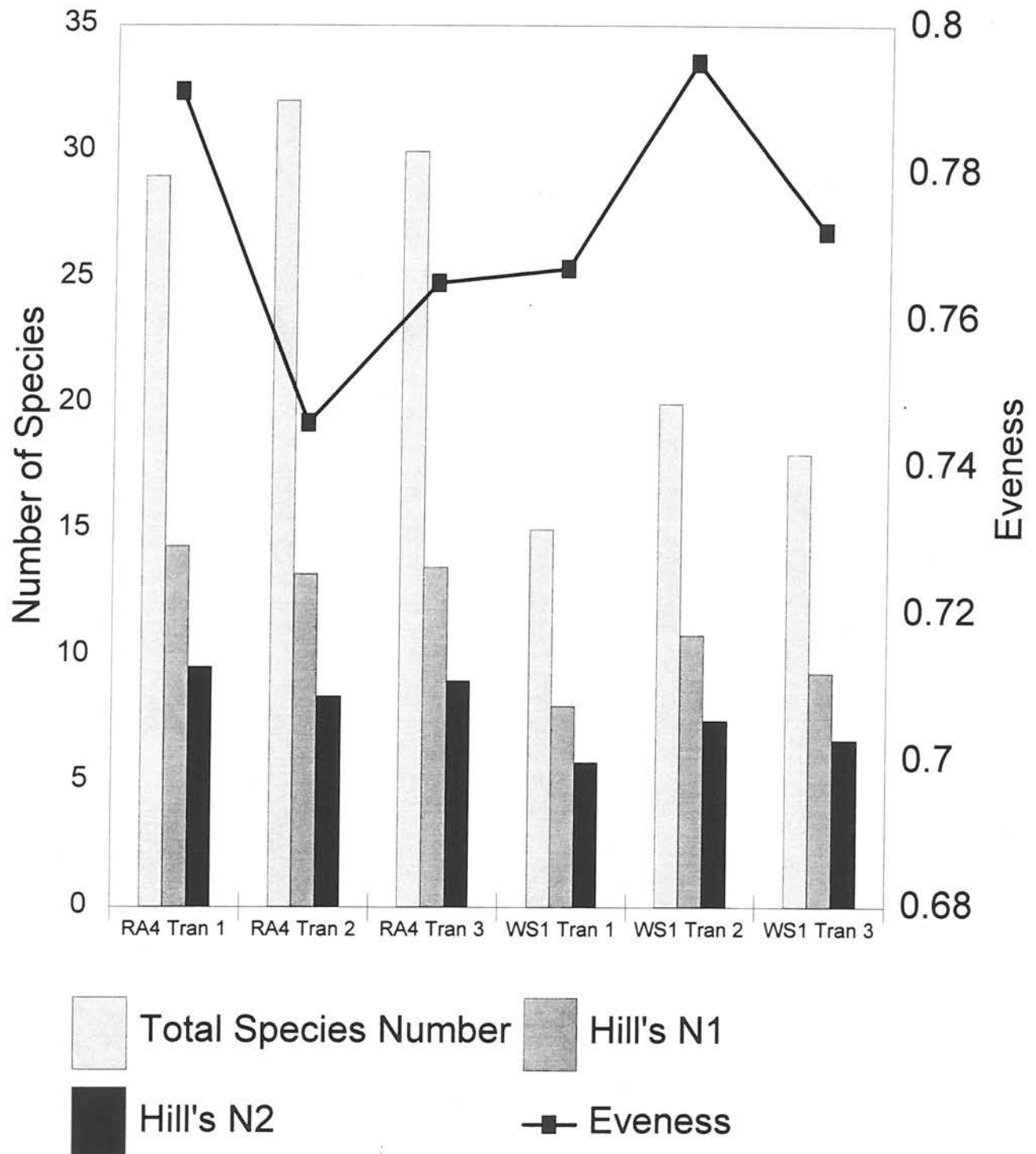


Figure C2. Diversity and Abundance RA4 and WS1

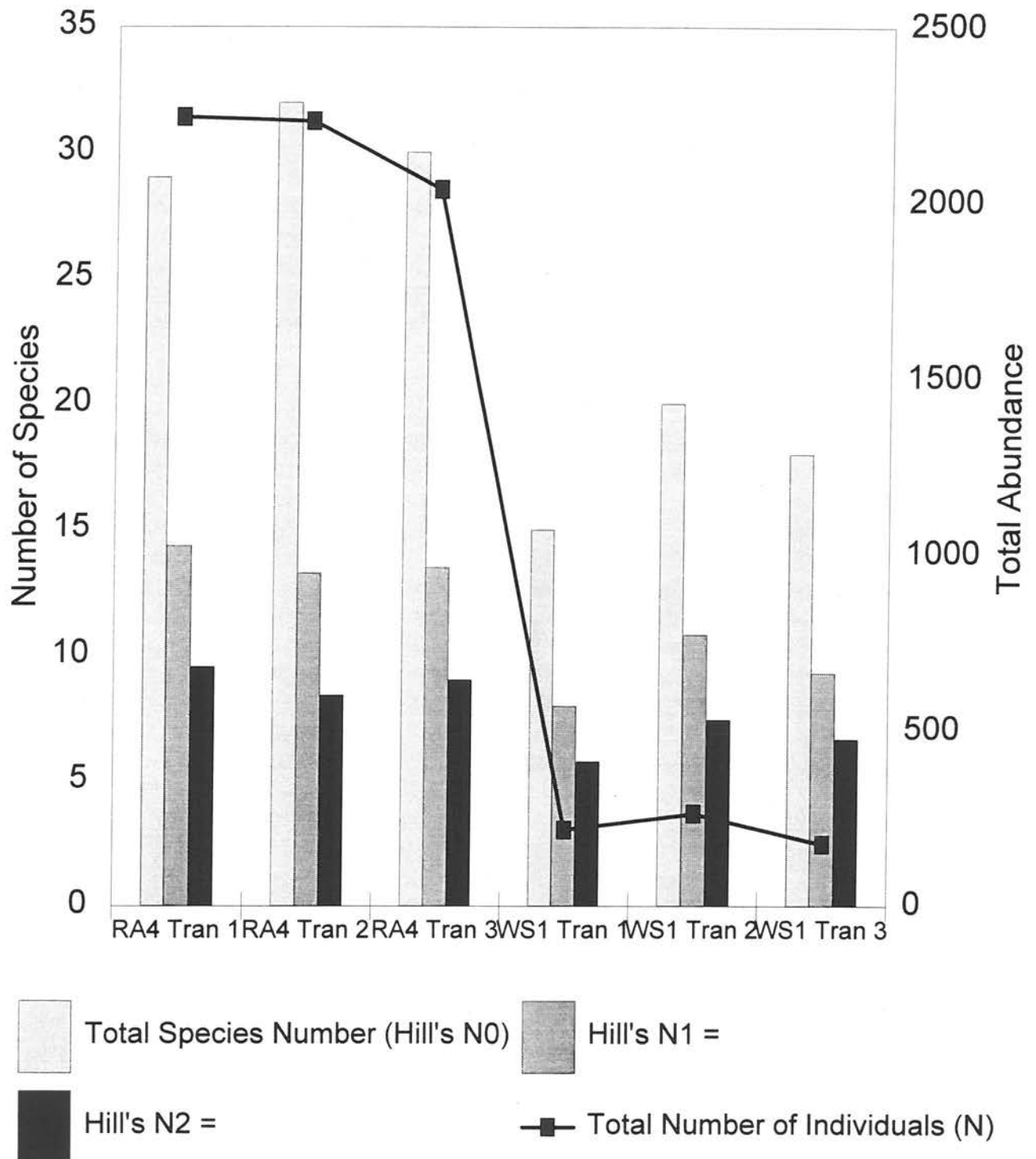


Table C1. Vegetation Transects in Demonstration Area

Plant Species Richness Transects

RA4 Transect One**Site:** ANF Compartment 110 (100 meters away from the road)**Compass Reading:** 338 degrees from 100m bar**Transect Starts:** 115m**Transect Ends:** 145m**Date:** 02-Jul-96**Total Time :** 2.63 hrs

Species	0-10m	10-20m	20-30m	TOTAL	Simpson's Index	Shannon-Wiener	% Cover
Andropogon sp.	17	7	25	49	4.6729E-04	-0.0835	1
Aristida stricta	170	200	190	560	6.2194E-02	-0.3464	3
Bog Button	75	82	60	217	9.3124E-03	-0.2259	2
Carphephorus	21	12	15	48	4.4822E-04	-0.0822	1
Ctenium aromaticum	39	58	21	118	2.7429E-03	-0.1549	1
Cuscuta gronvii	11	1	18	30	1.7285E-04	-0.0577	1
Dichromena latifolia							
Drosera spp.	5	25	11	41	3.2583E-04	-0.0731	1
Euphorbia inundata							
Gnaphalium spp.							
Guy's Deertongue	21	26	14	61	7.2716E-04	-0.0980	1
Helianthus	23	6	18	47	4.2954E-04	-0.0810	1
Hypericum spp.	41	61	44	146	4.2060E-03	-0.1778	1
Hypericum spp. (under 1 cm)	31	27	91	149	4.3812E-03	-0.1801	1
Ilex coriacea							
Justicia crassifolia	38	32	18	88	1.5211E-03	-0.1270	1
Liatris tenuifolia			2	2	3.9735E-07	-0.0063	1
Lycopodium							
Myrica heterophylla							
Nyssa spp.			1	1	0.0000E+00	-0.0034	1
Panicum	62	28	25	115	2.6047E-03	-0.1523	1
Pinus elliotii							
Pleea tenuifolia	95	87	31	213	8.9715E-03	-0.2235	1
Polygala hookerii	2	5	7	14	3.6159E-05	-0.0317	1
Rhexia alifanus	13	2	2	17	5.4040E-05	-0.0370	1
Rhexia lutea							
Rhynchospora baldwinii	5	5	8	18	6.0795E-05	-0.0387	1
Rhynchospora oligantha	4		2	6	5.9603E-06	-0.0158	1
Rhynchospora plumosa	6	6	6	18	6.0795E-05	-0.0387	1
Sarracenia flava	10	1	10	21	8.3444E-05	-0.0437	1
Sarracenia minor		3		3	1.1921E-06	-0.0088	1
Sarracenia psittacina	4	1	1	6	5.9603E-06	-0.0158	1
Sebatia bartramii							
Smilax ecirrhata	1		4	5	3.9735E-06	-0.0136	1
Smilax smallii							
Smilax spp.			1	1	0.0000E+00	-0.0034	1
Sphagnum							
Unknown	6	9	37	52	5.2689E-04	-0.0872	1
Xyris ambigua	44	72	46	162	5.1819E-03	-0.1898	1
Xyris baldwiniana	13	6	17	36	2.5033E-04	-0.0663	1
Total Number of Individuals	757	762	725	2244	0.1048	2.6637	

Total Species Number 29

Total Number of Individuals (N) 2244

Hill's N2 = 9.544

Hill's N1 = 14.349

Evenness = 0.791

Table C1. Vegetation Transects in Demonstration Area

Plant Species Richness Transects

Transect Two**Site:** 110 site (100 meters away from the road)**Transect Starts:** 90m**Compass Reading:** 341 degrees from 100m bar**Transect Ends:** 120m**Date:** 02-Jul-96**Total Time** 1.75

Species	0-10m	10-20m	20-30m	TOTAL	Simpson's Inde	Shannon-Wiener	% Cover
Andropogon	31	27	12	70	9.6909E-04	-0.1085	1
Aristida stricta	159	233	149	541	5.8615E-02	-0.3435	3
Bog Button	54	51	50	155	4.7893E-03	-0.1852	1
Carphephorus spp.	18	14	10	42	3.4550E-04	-0.0747	1
Ctenium aromaticum	61	38	34	133	3.5224E-03	-0.1680	1
Cuscuta gronvii	9	1	2	12	2.6484E-05	-0.0281	1
Dichromena latifolia							
Drosera spp.	13	3	3	19	6.8619E-05	-0.0406	1
Euphorbia inunda							
Gnaphalium spp.		1		1	0.0000E+00	-0.0035	
Guy's Deertongue	7	25	10	42	3.4550E-04	-0.0747	1
Helianthus	7	17	5	29	1.6292E-04	-0.0564	1
Hypericum spp.	43	41	26	110	2.4057E-03	-0.1483	1
Hypericum spp. (under 1 cm)	143	10	38	191	7.2812E-03	-0.2103	1
Ilex coriacea		7		7	8.4269E-06	-0.0181	
Justicia crassifolia	41	23	10	74	1.0839E-03	-0.1129	1
Liatris tenuifolia							
Lycopodium							
Myrica heterophylla	4			4	2.4077E-06	-0.0113	1
Nyssa spp.		2		2	4.0128E-07	-0.0063	
Panicum	13	35	12	60	7.1026E-04	-0.0972	1
Pinus elliotii	1			1	0.0000E+00	-0.0035	1
Pleea tenuifolia	113	200	107	420	3.5309E-02	-0.3143	2
Polygala hookerii	3	13	5	21	8.4269E-05	-0.0439	1
Rhexia alifanus	4		8	12	2.6484E-05	-0.0281	1
Rhexia lutea		10	5	15	4.2134E-05	-0.0336	
Rhynchospora baldwinii	12	6	6	24	1.1075E-04	-0.0487	1
Rhynchospora oligantha	5	15	3	23	1.0152E-04	-0.0471	1
Rhynchospora pulmosa	3	2	6	11	2.2070E-05	-0.0262	1
Sarracenia flava	1	11	5	17	5.4574E-05	-0.0371	1
Sarracenia minor							
Sarracenia psittacina							
Sebatia bartramii							
Smilax ecirrhata			1	1	0.0000E+00	-0.0035	
Smilax smallii							
Smilax spp.	1		1	2	4.0128E-07	-0.0063	1
Sphagnum	1	2	4	7	8.4269E-06	-0.0181	1
Unknown	21	7	10	38	2.8210E-04	-0.0693	1
Xyris ambigua	58	39	16	113	2.5393E-03	-0.1510	1
Xyris baldwiniana	5	12	19	36	2.5281E-04	-0.0665	1
Total Number of Individuals	831	845	557	2233	1.1917E-01	2.5847	
Total Number of Species (S)	32		Hill's N2 =	8.391	Evenness= 0.7458		
Total Number of Individuals (N)	2233		Hill's N1 =	13.259			

Table C1. Vegetation Transects in Demonstration Area

Plant Species Richness Transects

Date: 9-Jul-96

Site: Tower Road N of Gullybranch in large clearcut with NFWFMD monitoring wells
Second set of transects, 100 m from Tower Road going W

Transect: south (left)

notes:

Date: 11-Jul-96

Species:	Type:	0-10m	10-20m	20-30m	Total	Simpson's Index	Shannon-Wiener	% cover
<i>Pinus elliotii</i>	sc			3	3	1.2920E-04	-0.0594	1
<i>Cynilla racemiflora</i>	sc		7		7	9.0439E-04	-0.1111	1
<i>Ilex coriacea/glabra</i>	sh	10	41		51	5.4910E-02	-0.3408	3
<i>Ilex cassine</i>	sh	22		7	29	1.7485E-02	-0.2696	1
<i>Hypericum spp.</i>	sh		9		9	1.5504E-03	-0.1324	1
<i>Smilax laurifolia</i>	wv	6	5	2	13	3.3592E-03	-0.1691	1
<i>Rhynchospora baldwiniana</i>	he		1	12	13	3.3592E-03	-0.1691	1
<i>Xyris sp.(ambigua)</i>	he		1	2	3	1.2920E-04	-0.0594	1
<i>Sphagnum sp.</i>	he	3	3	4	10	1.9380E-03	-0.1423	1
large sedge	he		1	1	2	4.3066E-05	-0.0434	1
umbel-like sedge	he		1	1	2	4.3066E-05	-0.0434	1
double-headed sedge	he			3	3	1.2920E-04	-0.0594	1
triangular sedge	he			2	2	4.3066E-05	-0.0434	1
small glabrous grass	he	43	7	15	65	8.9578E-02	-0.3614	1
other herb.	he		1	3	4	2.5840E-04	-0.0739	1
Total		84	77	55	216	0.1739	2.0780	

Total Number of Species

15

Hill's N2 = 5.751796

Evenness = 0.7673

Total Number of Individuals

216

Hill's N1 = 7.988468

Transect: center

notes:

Date: 11-Jul-96

Species:	Type:	0-10m	10-20m	20-30m	Total	Simpson's Index	Shannon-Wiener	% cover
<i>Gaylussacia mosieri</i>	sc	5			5	2.8805E-04	-0.0751	1
<i>Cynilla racemiflora</i>	sc	3	11		14	2.6213E-03	-0.1557	1
<i>Ilex coriacea/glabra</i>	sh	23		4	27	1.0111E-02	-0.2332	2
<i>Ilex cassine</i>	sh	3	1	2	6	4.3208E-04	-0.0860	1
<i>Hypericum spp.</i>	sh		7		7	6.0491E-04	-0.0963	1
<i>Smilax laurifolia</i>	wv	1	3	3	7	6.0491E-04	-0.0963	1
<i>Rhynchospora baldwiniana</i>	he		3	5	8	8.0654E-04	-0.1060	1
<i>Rhynchospora ciliaris</i>	he	8	16	2	26	9.3617E-03	-0.2283	1
<i>Xyris sp.(ambigua)</i>	he	22	12	30	64	5.8071E-02	-0.3435	2
<i>Xyris other</i>	he		3	3	6	4.3208E-04	-0.0860	1
<i>Sphagnum sp.</i>	he	1	1	2	4	1.7283E-04	-0.0635	1
<i>Andropogon sp.</i>	he			3	3	8.6415E-05	-0.0509	1
large sedge	he	1	3		4	1.7283E-04	-0.0635	1
sedge 6	he			4	4	1.7283E-04	-0.0635	1
sedge 7	he			2	2	2.8805E-05	-0.0370	1
umbel-like sedge	he	7	1	1	9	1.0370E-03	-0.1152	1
multi-head sedge	he		1		1	0.0000E+00	-0.0211	1
triangular sedge	he			3	3	8.6415E-05	-0.0509	1
small glabrous grass	he		19	40	59	4.9286E-02	-0.3349	1
other herb.	he		3	2	5	2.8805E-04	-0.0751	1
Total		74	84	106	264	0.1347	2.3818	

Total Number of Species

20

Hill's N2 = 7.4259

Evenness = 0.7951

Total Number of Individuals

264

Hill's N1 = 10.82457

Transect: north

notes:

Date: 12-Jul-96

Species:	Type:	0-10m	10-20m	20-30m	Total	Simpson's Index	Shannon-Wiener	% cover
<i>Cynilla racemiflora</i>	sc		5	12	17	8.8312E-03	-0.2258	2
<i>Hypericum spp.</i>	sh	25	10	10	45	6.4286E-02	-0.3487	2
<i>Smilax laurifolia</i>	wv	3	5	3	11	3.5714E-03	-0.1733	1
<i>Panicum spp.</i>	he		3		3	1.9481E-04	-0.0694	1
<i>Rhynchospora baldwiniana</i>	he			1	1	0.0000E+00	-0.0294	1
<i>Xyris sp.(ambigua)</i>	he	2		5	7	1.3636E-03	-0.1283	1
<i>Sphagnum sp.</i>	he		1		1	0.0000E+00	-0.0294	1
composite	he	1			1	0.0000E+00	-0.0294	1
large sedge	he	6	1	5	12	4.2857E-03	-0.1831	1
unknown sedge T6-2	he		1		1	0.0000E+00	-0.0294	1
unknown sedge T6-3	he			5	5	6.4935E-04	-0.1012	1
unknown sedge T6-1	he	2			2	6.4935E-05	-0.0509	1
triangular sedge	he	1			1	0.0000E+00	-0.0294	1
tall hairy grass	he	4		3	7	1.3636E-03	-0.1283	1
small glabrous grass	he	17	20	7	44	6.1429E-02	-0.3466	1
red-stemmed grass	he	3			3	1.9481E-04	-0.0694	1
other shrub	he	11			11	3.5714E-03	-0.1733	1
other herb.	he		4		4	3.8961E-04	-0.0860	1
Total		75	50	51	176	0.1502	2.2310	

Total Number of Species

18

Hill's N2 = 6.6580

Evenness =

0.7719

Total Number of Individuals

176

Hill's N1 = 9.308893

Plant Response

Methods

Transects for monitoring vegetation response to hydrologic restoration were established in WS1. All transects were placed in Plummer fine sand (Sasser et al. 1994) for monitoring vegetation response to hydrologic restoration. Transects were placed perpendicular to artificial hydrologic structures (i.e., ditches and roads). The 30 meter by 15 centimeter sampling transects began 0.5 meters or 1 meter from the ditch and extended 30 meters into the cell. These transects were positioned to detect vegetation response to structural changes in hydrology.

Fifteen transects were placed in five different areas. Four transect sets were placed in bedded pine areas and one set was placed in a clear-cut area. The four bedded pine transect sets are aligned north to south on opposite sides of Gullybranch and Doublebridge Roads, in the demonstration area. These transects will also provide a comparison for the effects of prescribed burns on the vegetation, as the center cell between Gullybranch and Doublebridge Roads in WS1 is a priority burn area for the 1997 prescribed burns in Tate's Hell State Forest. The clear-cut area transects are aligned east to west from Tower Road in the northeastern corner cell in WS1. The Northwest Florida Water Management District is monitoring groundwater hydrology in this area and will share these data to correlate with future plant response data. Data collected in these transects include species richness and abundance. Hill's numbers of species richness and diversity (as defined in the previous section) were calculated for the transects and averaged for each set of transects.

Results

The data collected in plant response transects are provided in Appendix D. Slash pine, *Pinus elliottii*, was never numerically dominant even in bedded pine habitat. The proximity of the ditches and roads appear to have an effect on species composition and abundance, as wet adapted species are more dominant in northern transects than in the southern transects indicating that the road may act as a hydrologic barrier (Table D1).

In addition, herbaceous species are more abundant in the northern Gullybranch Road transects, where shrubs and canopy vegetation are minimal (Table D1), than in the other bedded pine transects. (A fuel reduction burn was conducted in this area on 3/2/95.) The clear-cut transects had the greatest species richness (average 17.7 species) and abundance (average 210 units) with the single exception of the northern set of Gullybranch Road transects which had an average of 18 species, including a dense population of the herbaceous species *Lachnanthes caroliniana*, and *Eriocaulon* spp. with a maximum abundance of 798 units (average 733 units), 542 of which were *Lachnanthes caroliniana*. Transects in the clear-cut site had the greatest diversity (Average Hill's $N1 = 9.9$ very abundant species), and bedded pine transect sets on Doublebridge Road (WS1) had greater diversity than bedded pine transect sets on Gullybranch Road (Figure D1). Transect sets with the least amount of canopy cover had the greatest average number of species and the highest total abundance (Tower Road clear-cut and Gullybranch North bedded pine).

Species richness was greater in the northern transect sets (average of 12.3 and 18 species on Doublebridge and Gullybranch Roads, respectively) than in the southern transect sets (average of

10.3 and 7.3 species on Doublebridge and Gullybranch Roads, respectively). However, diversity analyses showed a greater number of very abundant (Hill's N1) and abundant (Hill's N2) species were present in from Doublebridge Road transects (North transect set N1 = 7.4 species, N2 = 6.1 species; South transect set N1 = 6.9 species, N2 = 6.1 species) than in the Gullybranch Road transects (North transect set N1 = 3.82 species, N2 = 2.91 species; South transect set N1 = 5.09, N2 = 4.41). Evenness was similar in all transects sampled in WS1 (Range = 0.78-0.80), with the exception of the Gullybranch North set of plant response transects with an evenness value of 0.49 (Figure D1).

Discussion

The Gullybranch North bedded pine transects which had the greatest number of individuals and the greatest species richness of the bedded pine transect sets, were burned in a fuel reduction burn in March of 1995. In these transects, the species richness and relative abundance indicate that opening the canopy may increase species numbers and total abundance, though these increases may not be accompanied by an increase in species diversity, as is shown in the Gullybranch North bedded pine transect set (Figure D1), and is reflected in the evenness measure for this transect set (0.49). While this type of single species increase in abundance may not be desirable, these areas do at least temporarily (see Glitzenstein et al., 1993) provide habitat for less common species (i.e. *Aristida stricta*, some *Rhynchospora* spp., and ferns), and may provide a base for regeneration of a more natural community if appropriate management practices, including increased prescribed fire, are adopted. In areas where the canopy is not open, species diversity is reduced, though here too there are remnants of the natural community that might be restored with improved hydrology and proper fire management.

Plant response transects were established to measure plant response to hydrologic restoration. Transects were placed in bedded pine and clear-cut habitats in Plummer fine sand. Initial transect data was collected to determine changes in the plant community as the hydrology is restored. The lack of road maintenance and intensive silvicultural management in WS1 will lead to gradual changes on the site without restoration, so at a minimum these transects should be sampled July - September of the year structural hydrologic restoration proceeds, though annual sampling during July - September of each year is preferred. In addition, these transects should be sampled immediately after the structural hydrologic restoration to record changes in the physical landscape as a result of this restoration process, and in the following July - September to determine initial plant response to hydrologic restoration. Finally, a monitoring program including annual sampling of the plant response transects for a minimum of five years after restoration would provide a solid long-term data set of the changes in plant species composition to determine plant community response to restoration, and help evaluate the success of the structural restoration.

These plant response transects are also designed to determine the effects of fire management on the plant community. The Doublebridge and Gullybranch Road transects sets are on either side of these east-west roads. The area designated for burning will use these roads as fire breaks, therefore the Gullybranch south and Doublebridge north transect sets are designed to be the experimental transect sets to determine plant response to fire management. The Gullybranch north and Doublebridge south transect sets will function as the controls for plant response to fire management. If prescribed burning proceeds in WS1, these transects should be sampled in the two weeks immediately before and after the burn to determine initial response to burning. After the burn, these transects should be

sampled monthly to bi-monthly to identify changes in the plant community in response to burning, and to identify species as they come into bloom in response to the burn. This sampling should be conducted in addition to the annual sampling in July - September.

Figure D1. Plant Response Averages

Hill's Diversity Numbers and Evenness

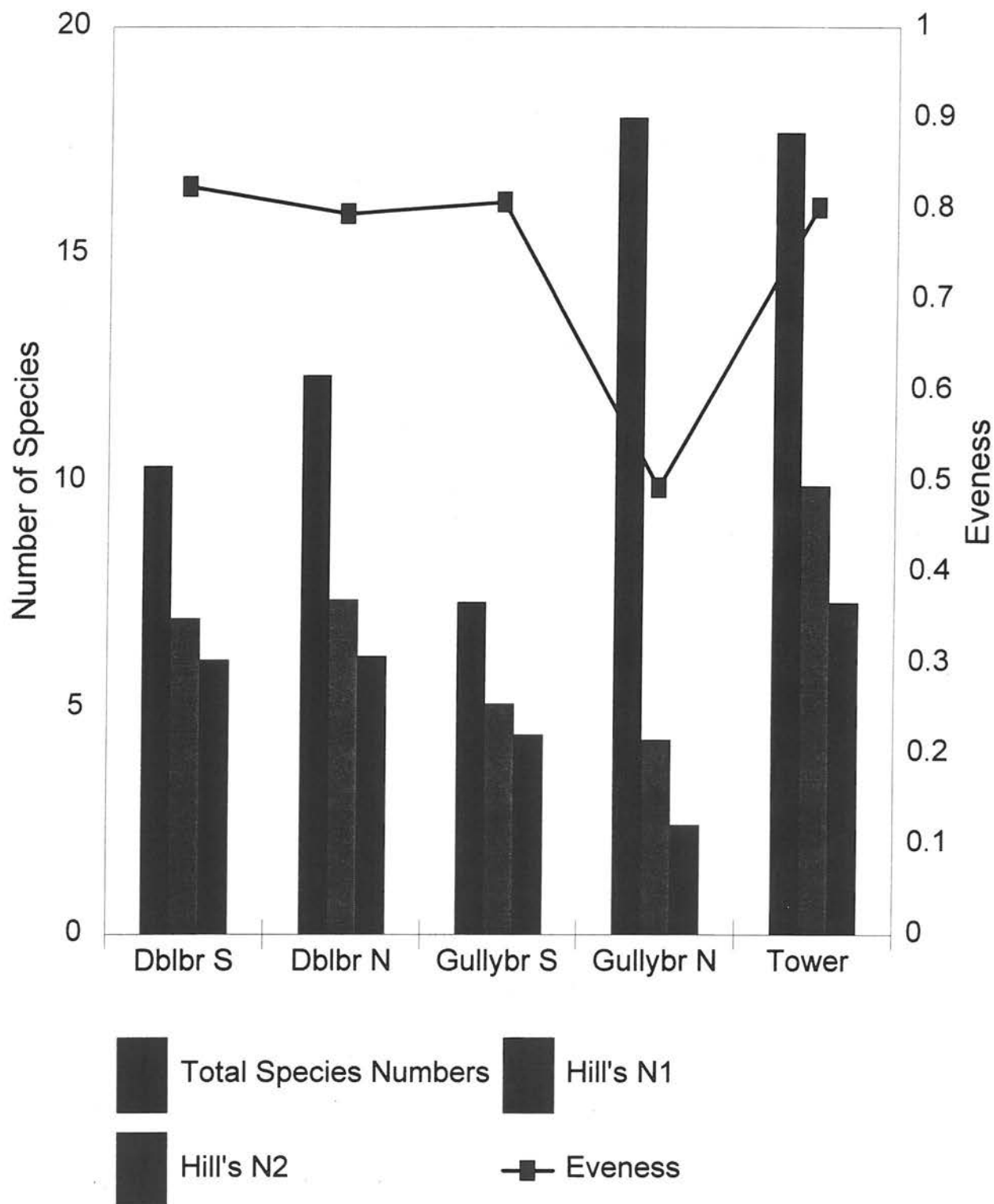


Figure D2. Plant Response Averages

Hill's Diversity Numbers and Abundance

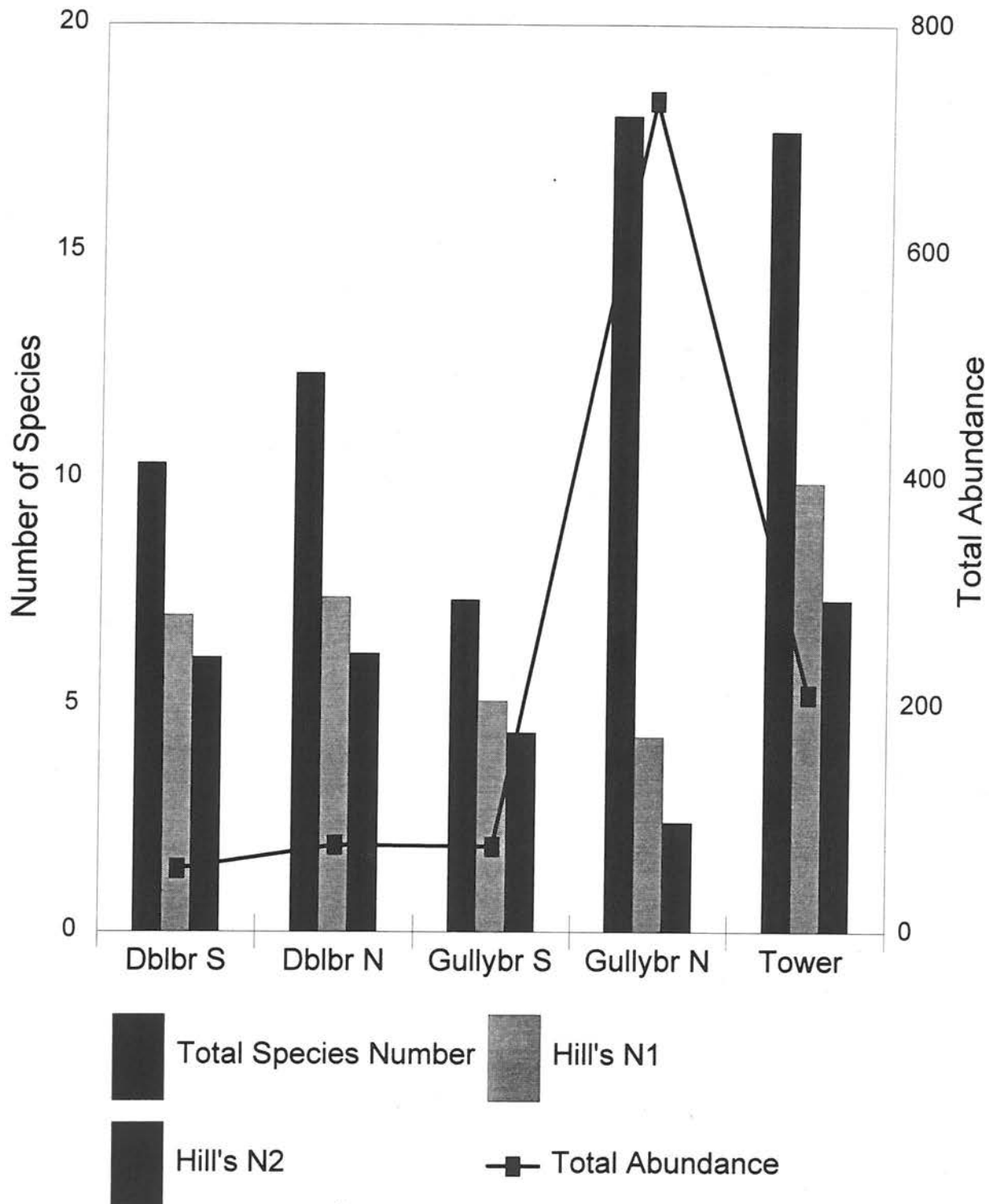


Table D1. Vegetation Transects in Demonstration Area

Plant Response Monitoring Transects

Date: 10-Sep-96, 11-Sep-96

Site: 4th Northern Plot from Tower Rd on Gully Branch Rd.

W side of center cell (near Rd 7) in the northern three cells of the demonstration area
(counting from N going W-E, this is cell 2)

Gullybranch North

Subtransect: center

notes: add DBH

Date: 09-11-96

Species:	Type:	0-10m	10-20m	20-30m	Total	Simpson's Index	Shannon-Wiener	% cove
<i>Nyssa biflora/ursina</i>	sc			1	1	0.0000E+00	-0.0098	1
<i>Ilex coriacea/glabra</i>	sw	1		1	2	4.5431E-06	-0.0175	1
<i>Aristida stricta</i>	he	2	4	4	10	2.0444E-04	-0.0632	1
<i>Eriocaulon decangulare</i>	he	17	17	6	40	3.5436E-03	-0.1692	2
<i>Hypericum spp.</i>	he			1	1	0.0000E+00	-0.0098	1
<i>Lachnanthes caroliniana</i>	he	270	160	49	479	5.2009E-01	-0.2356	3
<i>Panicum spp.</i>	he	2	16	35	53	6.2603E-03	-0.2018	1
<i>Rhynchospora cephalantha</i>	he	1	9	3	13	3.5436E-04	-0.0770	1
<i>Smilax launfolia</i>	sw		3	6	9	1.6355E-04	-0.0583	1
<i>Sphagnum spp.</i>	he	3		6	9	1.6355E-04	-0.0583	1
<i>Xyris spp.</i>	he	1	1	1	3	1.3629E-05	-0.0244	1
Unknown sedge	he	9	2		11	2.4987E-04	-0.0679	1
Unknown grass	he	8			8	1.2721E-04	-0.0532	1
Parsely like herb	he	5			5	4.5431E-05	-0.0368	1
Grasslike equatant leaves	he	17			17	6.1786E-04	-0.0938	1
Unknown herb.	he	1		2	3	1.3629E-05	-0.0244	1
Total		337	212	115	664	0.5319	1.2011	

Total Number of Species

16

Hill's N2 = 1.88

Evenness = 0.4332

Total Number of Individual

664

Hill's N1 = 3.32

Subtransect: west

notes: add DBH

Date: 09-10-96

Species:	Type:	0-10m	10-20m	20-30m	Total	Simpson's Index	Shannon-Wiener	% cove
<i>Pinus elliotii</i>	ca				1	0.0000E+00	-0.0089	1
<i>Cliffortia monophylla</i>	sh				9	1.3238E-04	-0.0537	1
<i>Nyssa biflora/ursina</i>	sc				2	3.6771E-06	-0.0160	1
<i>Ilex coriacea/glabra</i>	sw				1	0.0000E+00	-0.0089	1
<i>Smilax launfolia</i>	sw				27	1.2907E-03	-0.1210	1
<i>Aristida stricta?</i>	he				5	3.6771E-05	-0.0338	1
<i>Eriocaulon decangulare</i>	he				47	3.9750E-03	-0.1754	1
<i>Hypericum spp.</i>	he				11	2.0224E-04	-0.0627	1
<i>Lachnanthes caroliniana</i>	he				377	2.6062E-01	-0.3431	3
<i>Panicum spp.</i>	he				128	2.9888E-02	-0.3039	1
<i>Rhynchospora cephalantha</i>	he				11	2.0224E-04	-0.0627	1
<i>Rhynchospora plumosa</i>	he				6	5.5157E-05	-0.0391	1
<i>Sphagnum spp.</i>	he				10	1.6547E-04	-0.0583	1
<i>Xyris spp.</i>	he				10	1.6547E-04	-0.0583	1
Unknown shrub	he				1	0.0000E+00	-0.0089	1
Unknown grass	he				31	1.7099E-03	-0.1332	1
Parsely like herb	he				5	3.6771E-05	-0.0338	1
Unknown herb.	he				1	0.0000E+00	-0.0089	1
Unknown sedge	sh				45	3.6403E-03	-0.1706	1
Unknown bog button	he				4	2.2063E-05	-0.0283	1
unknown fern	he				6	5.5157E-05	-0.0391	1
Total		0	0	0	738	0.3022	1.7688	

Total Number of Species

21

Hill's N2 = 3.31

Evenness =

0.5810

Total Number of Individual

738

Hill's N1 = 5.86

Subtransect: east

notes: add DBH

Date: 09-11-96

Species:	Type:	0-10m	10-20m	20-30m	Total	Simpson's Index	Shannon-Wiener	% cove
<i>Nyssa biflora/ursina</i>	sc			1	1	0.0000E+00	-0.0084	1
<i>Ilex coriacea/glabra</i>	sw	4			4	1.8868E-05	-0.0265	1
<i>Smilax launfolia</i>	sw	3	6	3	12	2.0755E-04	-0.0631	1
<i>Aristida stricta?</i>	he	5	4		9	1.1321E-04	-0.0506	1
<i>Eriocaulon decangulare</i>	he	18	3		21	6.6037E-04	-0.0957	1
<i>Hypericum spp.</i>	he	8			8	8.8049E-05	-0.0461	1
<i>Lachnanthes caroliniana</i>	he	437	72	33	542	4.6104E-01	-0.2627	3
<i>Panicum spp.</i>	he	47	19	6	72	8.0377E-03	-0.2170	1
<i>Rhynchospora cephalantha</i>	he	2	1		3	9.4339E-06	-0.0210	1
<i>Sphagnum spp.</i>	he	6	5	4	15	3.3019E-04	-0.0747	1
<i>Xyris spp.</i>	he	3			3	9.4339E-06	-0.0210	1
other bog button	he	5	1	1	7	6.6037E-05	-0.0415	1
Unknown sedge	he	21	29	2	52	4.1698E-03	-0.1780	1
Unknown grass	he	41			41	2.5786E-03	-0.1525	1
unknown moss	he		2		2	3.1446E-06	-0.0150	1
unknown fern	he			4	4	1.8868E-05	-0.0265	1
Unknown herb.	he		1	1	2	3.1446E-06	-0.0150	1
Total		600	143	55	798	0.4774	1.3155	

Total Number of Species

17

Hill's N2 = 2.09

Evenness = 0.4643

Total Number of Individual

798

Hill's N1 = 3.73

Table D1. Vegetation Transects in Demonstration Area

Plant Response Monitoring Transects

Date: 09-11-96

Site: 4th Southern Plot from Tower Rd on Gully Branch Rd.
W side of the center block (near Rd 7) in the demonstration area (WS1)
(counting from the N from W-E, this is cell 5)

Gullybranch South

Subtransect: center

notes:

Date: 09-11-96

Species:	Type:	0-10m	10-20m	20-30m	Total	Simpson's Index	Shannon-Wiener	% cove
<i>Pinus elliottii</i>	ca	2			2	1.3495E-03	-0.1523	1
<i>Smilax laurifolia</i>	wv	2	1	1	4	8.0972E-03	-0.2336	1
<i>Cliftonia monophylla</i>	sc	1	3	2	6	2.0243E-02	-0.2880	2
<i>Cyrilla racemiflora</i>	sc	2	3	3	8	3.7787E-02	-0.3249	1
<i>Ilex coriacea/glabra</i>	sc	5	5	6	16	1.6194E-01	-0.3655	1
<i>Aristida stricta?</i>	he	2			2	1.3495E-03	-0.1523	1
unknown			1		1	0.0000E+00	-0.0939	1
Total		14	13	12	39	0.2308	1.6106	

Total Number of Species

7

Hill's N2 = 4.33

Evenness = 0.8277

Total Number of Individual

39

Hill's N1 = 5.01

Subtransect: west

notes:

Date:

Species:	Type:	0-10m	10-20m	20-30m	Total	Simpson's Index	Shannon-Wiener	% cove
<i>Pinus elliottii</i>	co		3	2	5	2.2878E-03	-0.1561	1
<i>Cliftonia monophylla</i>	sc	9	18	19	46	2.3679E-01	-0.3497	3
<i>Cyrilla racemiflora</i>	sc	1	3	2	6	3.4317E-03	-0.1756	1
<i>Ilex coriacea/glabra</i>	sc	10	14	4	28	8.6479E-02	-0.3608	1
<i>Smilax laurifolia</i>	sw		1	2	3	6.8634E-04	-0.1099	1
<i>Aristida stricta?</i>	he			6	6	3.4317E-03	-0.1756	1
Total		20	39	35	94	0.3331	1.3277	

Total Number of Species

6

Hill's N2 = 3.00

Evenness = 0.7410

Total Number of Individual

94

Hill's N1 = 3.77

Subtransect: east

notes:

Date:

Species:	Type:	0-10m	10-20m	20-30m	Total	Simpson's Index	Shannon-Wiener	% cove
<i>Pinus elliottii</i>	co		2	1	3	7.1667E-04	-0.1116	1
<i>Cliftonia monophylla</i>	sc	8	13	4	25	7.1667E-02	-0.3541	3
<i>Cyrilla racemiflora</i>	sc	1	5	5	11	1.3139E-02	-0.2539	1
<i>Ilex coriacea/glabra</i>	sc	8	8		16	2.8667E-02	-0.3042	1
<i>Smilax laurifolia</i>	sw	2		2	4	1.4333E-03	-0.1363	1
<i>Aristida stricta?</i>	he	1		1	2	2.3889E-04	-0.0832	1
<i>Xyris sp.</i>	he			1	1	0.0000E+00	-0.0491	1
<i>Bog buttons</i>	he			19	19	4.0850E-02	-0.3258	1
<i>Lycopodium spp.</i>	he			11	11	1.3139E-02	-0.2539	1
Total		20	28	44	92	0.1699	1.8722	

Total Number of Species

9

Hill's N2 = 5.89

Evenness = 0.8521

Total Number of Individual

92

Hill's N1 = 6.50

Table D1. Vegetation Transects in Demonstration Area

Plant Response Monitoring Transects

Date: 23-Sep-96

Site: Doublebridge Road North Transect Set

E side of the center cell in the demonstration area to the N of Dblbr Rd
(counting from the top (N), this is cell 5)

Doublebridge North

Transect: center

notes: add DBH

Species:	Type:	0-10m	10-20m	20-30m	Total	Simpson's Index	Shannon-Wiener	% cover
<i>Pinus elliotii</i>	c	2	1	2	5	3.0111E-03	-0.1706	1
<i>Cliftonia monophylla</i>	sc	1	6	7	14	2.7401E-02	-0.3018	2
<i>Cynilla racemiflora</i>	sc							1
<i>Ilex coriacea/glabra</i>	sc							1
<i>Magnolia virginiana</i>	sc			1	1	0.0000E+00	-0.0537	1
<i>Nyssa biflora/ursina</i>	sc	10	12	6	28	1.1382E-01	-0.3669	2
<i>Lyonia lucida</i>	sh		1	2	3	9.0334E-04	-0.1210	1
<i>Smilax smallii</i>	sw	1	1		2	3.0111E-04	-0.0906	1
<i>Smilax laurifolia</i>	sw	7	5	2	14	2.7401E-02	-0.3018	1
<i>Enocaulon compressum</i>	he	2			2	3.0111E-04	-0.0906	1
<i>Lachnanthes caroliniana</i>	he	12			12	1.9874E-02	-0.2812	1
unknown herb. vine	he	1			1	0.0000E+00	-0.0537	1
Total		36	26	20	82	0.1930	1.8320	

Total Number of Species 10 Hill's N2 = 5.18

Total Number of Individual 82 Hill's N1 = 6.25

Evenness = 0.7956

Transect: west

notes: add DBH

Species:	Type:	0-10m	10-20m	20-30m	Total	Simpson's Index	Shannon-Wiener	% cover
<i>Pinus elliotii</i>	co	1	1	1	3	8.0192E-04	-0.1161	1
<i>Cliftonia monophylla</i>	sc	7	5	4	16	3.2077E-02	-0.3114	2
<i>Cynilla racemiflora</i>	sc	1			1	0.0000E+00	-0.0513	1
<i>Ilex coriacea/glabra</i>	sc		2		2	2.6731E-04	-0.0867	1
<i>Quercus nigra?</i>	sc			1	1	0.0000E+00	-0.0513	1
<i>Magnolia virginiana</i>	sc		1		1	0.0000E+00	-0.0513	1
<i>Myrica heterophylla</i>	sc		1		1	0.0000E+00	-0.0513	1
<i>Nyssa biflora/ursina</i>	sc	2	2	4	8	7.4846E-03	-0.2194	1
<i>Ilex myrtifolia</i>	sh		2	2	4	1.6038E-03	-0.1416	1
<i>Lyonia lucida</i>	sh			1	1	0.0000E+00	-0.0513	1
<i>Smilax smallii</i>	sw	1		2	3	8.0192E-04	-0.1161	1
<i>Smilax laurifolia</i>	sw	7	5	3	15	2.8067E-02	-0.3031	1
<i>Aristida stricta?</i>	he		1		1	0.0000E+00	-0.0513	1
<i>Lachnanthes caroliniana</i>	he	12			12	1.7642E-02	-0.2732	1
Bog botton small	he	18			18	4.0898E-02	-0.3260	1
Total		49	20	18	87	0.1296	2.2017	

Total Number of Species 15 Hill's N2 = 7.71

Total Number of Individual 87 Hill's N1 = 9.04

Evenness = 0.8130

Transect: 3 east

notes: add DBH

Species:	Type:	0-10m	10-20m	20-30m	Total	Simpson's Index	Shannon-Wiener	% cover
<i>Pinus elliotii</i>	co	1		1	2	5.4645E-04	-0.1121	1
<i>Acer rubrum</i>	sc	1			1	0.0000E+00	-0.0674	1
<i>Cliftonia monophylla</i>	sc	3	10	4	17	7.4317E-02	-0.3561	3
<i>Cynilla racemiflora</i>	sc	4			4	3.2787E-03	-0.1787	1
<i>Ilex coriacea/glabra</i>	sc	1			1	0.0000E+00	-0.0674	1
<i>Nyssa biflora/ursina</i>	sc	3		4	7	1.1475E-02	-0.2484	1
<i>Taxodium ascendens</i>	sc							1
<i>Ilex myrtifolia</i>	sh		3		3	1.6393E-03	-0.1481	1
<i>Lyonia lucida</i>	sh		2	3	5	5.4645E-03	-0.2050	1
<i>Smilax laurifolia</i>	sw	8	5	5	18	8.3607E-02	-0.3601	1
<i>Aristida stricta?</i>	he	1			1	0.0000E+00	-0.0674	1
<i>Lachnanthes caroliniana</i>	he	2			2	5.4645E-04	-0.1121	1
Bog botton small	he	6			6	8.1967E-03	-0.2281	1
Total		24	20	17	61	0.1809	1.9228	

Total Number of Species 12 Hill's N2 = 5.53

Total Number of Individual 61 Hill's N1 = 6.84

Evenness = 0.7738

Table D1. Vegetation Transects in Demonstration Area

Plant Response Monitoring Transects

Date: 20-Sep-96,23-Sep-96**Site:** Doublebridge Road South Transect SetE side of the center cell in the lower three cells in the demonstration area to the S of Dblbr Rd
(counting from the top (N), this is cell 8)**Doublebridge South****Transect:** center**notes:** didn't add dbh, check spp that just cover

Species:	Type:	0-10m	10-20m	20-30m	Total	Simpson's Index	Shannon-Wiener	% cove
<i>Pinus elliottii</i>	c		2		2	7.8431E-04	-0.1270	3
<i>Cliftonia monophylla</i>	sc		7	8	15	8.2353E-02	-0.3599	2
<i>Ilex coriacea/glabra</i>	sc		1	8	9	2.8235E-02	-0.3061	1
<i>Ilex myrtifolia</i>	sh							1
<i>Nyssa biflora/ursina</i>	sc							1
<i>Lyonia lucida</i>	sh		3		3	2.3529E-03	-0.1667	1
<i>Smilax laurifolia</i>	sw	3	9	3	15	8.2353E-02	-0.3599	1
unknown shrub	he	1			1	0.0000E+00	-0.0771	1
herbaceous vine	he	3	1		4	4.7059E-03	-0.1996	1
unknown	he	2			2	7.8431E-04	-0.1270	1
Total		9	23	19	51	0.2016	1.7234	

Total Number of Species 8 Hill's N2 = 4.96**Total Number of Individua** 51 Hill's N1 = 5.60

Evenness = 0.8288

Transect: west**notes:** didn't add dbh, check spp that just cover, no cover

Species:	Type:	0-10m	10-20m	20-30m	Total	Simpson's Index	Shannon-Wiener	% cove
<i>Pinus elliottii</i>	co	1	1	2	4	3.6298E-03	-0.1844	2
<i>Cliftonia monophylla</i>	sc	6	3	4	13	4.7187E-02	-0.3352	2
<i>Cyrilla racemeifolia</i>	sc		2	2	4	3.6298E-03	-0.1844	1
<i>Ilex coriacea/glabra</i>	sc		1	4	5	6.0496E-03	-0.2113	1
<i>Nyssa biflora/ursina</i>	sc	2	5		7	1.2704E-02	-0.2552	1
<i>Magnolia virginiana</i>	sc		1		1	0.0000E+00	-0.0700	1
<i>Ilex myrtifolia</i>	sh							1
<i>Lyonia lucida</i>	sh	1	1	3	5	6.0496E-03	-0.2113	1
<i>Smilax smallii</i>	sw	2			2	6.0496E-04	-0.1161	1
<i>Smilax laurifolia</i>	sw	7	1	3	11	3.3273E-02	-0.3153	1
<i>Clethra alnifolia</i>	sh	1			1	0.0000E+00	-0.0700	1
<i>Taxodium ascendens</i>	sc							1
<i>Eriocaulon compressum</i>	he	1			1	0.0000E+00	-0.0700	1
<i>Myrica heterophylla</i>				2	2	6.0496E-04	-0.1161	1
<i>Gelsemium sempervirens</i>				1	1	0.0000E+00	-0.0700	1
small herb. vine	he	1			1	0.0000E+00	-0.0700	1
Total		22	15	21	58	0.1137	2.2794	

Total Number of Species 14 Hill's N2 = 8.79**Total Number of Individua** 58 Hill's N1 = 9.77

Evenness = 0.8637

Transect: east**notes:** didn't add dbh, check spp that just cover

Species:	Type:	0-10m	10-20m	20-30m	Total	Simpson's Index	Shannon-Wiener	% cove
<i>Pinus elliottii</i>	ca	1		2	3	1.8149E-03	-0.1532	3
<i>Taxodium ascendens</i>	ca	1			1	0.0000E+00	-0.0700	1
<i>Cliftonia monophylla</i>	sc	1	3	5	9	2.1779E-02	-0.2891	2
<i>Ilex coriacea/glabra</i>	sc		4	3	7	1.2704E-02	-0.2552	1
<i>Ilex myrtifolia</i>	sc			1	1	0.0000E+00	-0.0700	1
<i>Nyssa biflora/ursina</i>	sc			3	3	1.8149E-03	-0.1532	1
<i>Magnolia virginiana</i>	sc							1
<i>Clethra alnifolia</i>	sh			1	1	0.0000E+00	-0.0700	1
<i>Lyonia lucida</i>	sh	1	7	16	24	1.6697E-01	-0.3651	2
<i>Smilax laurifolia</i>	sw	3	1	5	9	2.1779E-02	-0.2891	1
Total		7	15	36	58	0.2269	1.7150	

Total Number of Species 9 Hill's N2 = 4.41**Total Number of Individua** 58 Hill's N1 = 5.56

Evenness = 0.7805

Table D1. Vegetation Transects in Demonstration Area

Plant Response Monitoring Transects

Date: 9-Jul-96

Site: Tower Road N of Gullybranch in large clearcut with NFWMD monitoring wells
First set of transects, 0.5 m from Tower Road going W

Tower Road Plant Response Transects

Transect south (left)

notes:

Date: 9-Jul-96

Species:	Type:	0-10m	10-20m	20-30m	Total	Simpson's Index	Shannon-Wiener	% cover
<i>Gaylussacia mosieri</i>	sc	5		5	10	1.3263E-03	-0.1250	1
<i>Cynilla racemiflora</i>	sc	3		2	5	2.9472E-04	-0.0758	1
<i>Ilex coriacea/glabra</i>	sh		5	8	13	2.2989E-03	-0.1494	1
<i>Hypericum spp.</i>	sh	2	1	17	20	5.5998E-03	-0.1968	1
<i>Smilax laurifolia</i>	wv		8	6	14	2.6820E-03	-0.1569	1
<i>Rhynchospora baldwiniana</i>	he	2		1	3	8.8417E-05	-0.0513	1
<i>Rhynchospora ciliaris</i>	he		1	1	2	2.9472E-05	-0.0373	1
<i>Xyris sp.</i>	he		6	8	14	2.6820E-03	-0.1569	1
<i>Panicum spp.</i>	he		1	3	4	1.7683E-04	-0.0640	1
large sedge	he	3	4	5	12	1.9452E-03	-0.1416	1
triangular sedge	he		2		2	2.9472E-05	-0.0373	1
multi-head sedge	he		1	1	2	2.9472E-05	-0.0373	1
thick-bladed grass	he	23	2	8	33	1.5561E-02	-0.2615	1
small glabrous grass	he	34	75	2	111	1.7993E-01	-0.3636	2
red-stemmed grass	he			4	4	1.7683E-04	-0.0640	1
other herb.	he		9	3	12	1.9452E-03	-0.1416	1
Total		72	115	74	261	0.2148	2.0605	
Total Number of Species	16	Hill's N2 =		4.86	Evenness =		0.7432	
Total Number of Individuals	261	Hill's N1 =		7.85				

Transect center

notes:

Date: 9-Jul-96

Species:	Type:	0-10m	10-20m	20-30m	Total	Simpson's Index	Shannon-Wiener	% cover
<i>Cynilla racemiflora</i>	sc			2	2	3.4578E-05	-0.0398	1
<i>Hypericum spp.</i>	sh	20	10	24	54	4.9481E-02	-0.3352	2
<i>Smilax laurifolia</i>	wv	25		2	27	1.2137E-02	-0.2452	1
<i>Lachnanthes caroliniana</i>	he			1	1	0.0000E+00	-0.0228	1
<i>Rhynchospora baldwiniana</i>	he	2	12		14	3.1466E-03	-0.1653	1
<i>Rhynchospora ciliaris</i>	he			5	5	3.4578E-04	-0.0804	1
<i>Rhynchospora oligantha</i>	he		1		1	0.0000E+00	-0.0228	1
<i>Rhynchospora plumosa</i>	he		4		4	2.0747E-04	-0.0680	1
<i>Xyris sp. (ambigua)</i>	he		12	27	39	2.5622E-02	-0.2947	2
<i>Xyris other</i>	he			7	7	7.2614E-04	-0.1028	1
<i>Eriocaulon sp.</i>	he			1	1	0.0000E+00	-0.0228	1
wide sedge	he			2	2	3.4578E-05	-0.0398	1
long-ended sedge	he			2	2	3.4578E-05	-0.0398	1
star sedge	he		5		5	3.4578E-04	-0.0804	1
umbel-like sedge	he		3	10	13	2.6971E-03	-0.1575	1
multi-head sedge	he	1			1	0.0000E+00	-0.0228	1
round-top sedge	he	3			3	1.0373E-04	-0.0546	1
triangular sedge	he	1			1	0.0000E+00	-0.0228	1
sedge-like grass	he		1		1	0.0000E+00	-0.0228	1
small glabrous grass	he	10	4	10	24	9.5436E-03	-0.2297	1
red-stemmed grass	he	1	1	9	11	1.9018E-03	-0.1409	1
parsley-like herb.	he	3			3	1.0373E-04	-0.0546	1
other herb.	he		16	4	20	6.5698E-03	-0.2066	1
Total		66	69	106	241	0.1130	2.4718	
Total Number of Species	23	Hill's N2 =		8.85	Evenness =		0.7883	
Total Number of Individuals	241	Hill's N1 =		11.84				

Transect north

notes:

Date: 9-Jul-96

Species:	Type:	0-10m	10-20m	20-30m	Total	Simpson's Index	Shannon-Wiener	% cover
<i>Cynilla racemiflora</i>	sc	3	1	2	6	1.8455E-03	-0.1435	1
<i>Ilex coriacea/glabra</i>	sh	2			2	1.2303E-04	-0.0650	1
<i>Hypericum spp.</i>	sh	29		1	30	5.3519E-02	-0.3400	2
<i>Smilax laurifolia</i>	wv			6	6	1.8455E-03	-0.1435	1
<i>Panicum spp.</i>	he	4			4	7.3819E-04	-0.1083	1
<i>Rhynchospora ciliaris</i>	he		3	4	7	2.5837E-03	-0.1589	1
<i>Rhynchospora plumosa</i>	he		1		1	0.0000E+00	-0.0379	1
<i>Xyris other</i>	he			10	10	5.5364E-03	-0.1992	1
composite	he	8			8	3.4449E-03	-0.1733	1
umbel-like sedge	he	3		4	7	2.5837E-03	-0.1589	1
triangular sedge	he	3	10	7	20	2.3376E-02	-0.2900	1
small glabrous grass	he	3	12	3	18	1.8824E-02	-0.2759	1
red-stemmed grass	he			1	1	0.0000E+00	-0.0379	1
other herb.	he			8	8	3.4449E-03	-0.1733	1
Total		55	27	46	128	0.1179	2.3055	
Total Number of Species	14	Hill's N2 =		8.48	Evenness =		0.8736	
Total Number of Individuals	128	Hill's N1 =		10.03				

Soils

Methods

Soils were sampled for a variety of physical and chemical parameters including bulk density, soil moisture, mineral nitrogen (NO_2^- - NO_3^- - N and NH_4^+ - N), Olson-P phosphorus and soluble carbon (Methods of Soil Analyses 1982; Dierburg and Brezonik 1985). Nitrogen and carbon samples were extracted for analysis with 0.5 M K_2SO_4 . Nitrogen extracts were analyzed for NO_2^- - NO_3^- - N and NH_4^+ - N using an Alpkem analyzer. Soil samples were collected to correlate with the plant response transects in WS1. The soils sampled in these transects were all the same type, Plummer fine sand (28), as described in the Soil Survey of Franklin County (Sasser et al. 1994). Soils were sampled with a soil corer for the top 15 cm of soil and separated into 0-5 and 5-15 cm depths for analyses. Samples collected from the plant response transects were collected one meter and 10 meters from the ditch, and selected transects were also sampled at 30 meters.

Additional habitat types sampled included cedar (IIIa), Rutledge fine sand (31); cypress (III), Pickney-Pamlico complex, depressional (36); scrub/shrub (IV), Plummer fine sand (28); clear-cut (VIIcc), Plummer fine sand (28); and gum (V), Dorovan-Pamlico complex, depressional (11). These samples were analyzed as whole core (0-15 cm) samples, without separating the top 0-5 cm and bottom 5-15 cm (Appendix E). The samples were collected in January and February of 1996 in anticipation of prescribed fire in these areas. (This area has not been burned, but is on the priority list for burning this year (1997)).

Results

The data collected from soil samples are displayed in Appendix E. Bulk density, the dry weight of soil material per unit volume, was measured in the bedded pine transects (Figure E1) and indicated these soils had bulk densities within the range expected for organic soils (Mitsch and Gosselink 1993). Soil moisture was highest in the gum and cypress plant community soil samples (Figure E2). Mineral nitrogen (N) concentrations are also highest in the depressional areas (cypress = 16.84 mg N/kg soil, gum = 32.02 mg N/kg soil) (Figure E3). Phosphorus concentrations are very low or below detection limits (0.000 - 0.17 mg P/kg soil) in all habitat types except for the scrub/shrub area (Figure E4). The high level of phosphorus in this scrub/shrub area may be indicative of previous fertilization. Average soluble carbon concentration (0-15 cm sample depth) was highest in cypress (125.45 mg C/kg soil) and gum (111.35 mg C/kg soil) areas (Figure E5).

Discussion

Bulk density and soil moisture measurements are consistent with those of organic soils. The soils sampled exhibited characteristics of nutrient poor wetland soils. The high organic content of the soil samples in WS1 indicates the availability of water storage capacity. Organic soils have a greater water storage capacity than do mineral soils, due to more available pore space (Mitsch and Gosselink 1993). The organic soils in WS1 will provide for the slow release of water into associated water bodies and eventually into East Bay should hydrologic restoration proceed in this area.

The high ammonia concentrations in the cypress and gum areas are indicative of mineralization of nitrogen in organic matter degradation (Table E1). Nitrogen mineralization is the biological transformation of organically combined nitrogen to ammonium nitrogen during organic matter degradation (Gambrell and Patrick 1978). This pathway is commonly known as ammonification. The ammonium ion (NH_4^+) produced may be absorbed directly through plant root systems, or by anaerobic microbes in the soil, or may migrate upward to be oxidized and made more available for plant uptake as nitrate. Denitrification may also occur in the anaerobic soils resulting in the loss of nitrogen as it is converted to gaseous nitrous oxide, N_2O , and molecular nitrogen, N_2 . However, this process is inhibited in acid soils, so the loss of nitrogen to denitrification is most likely not significant in Tate's Hell (Mitsch and Gosselink 1993).

Phosphorus has frequently been found to be the limiting nutrient in wetlands (Mitsch et al. 1979; Brown 1981; Mitsch and Reeder 1992) as appears to be the case in most areas sampled here. Previously in Tate's Hell Swamp, Buckeye Cellulose was known to have fertilized much of their pine plantation with rock phosphorus, a slow release fertilizer, and current timber lease holders aerially fertilize their plantations with phosphorus. The very low phosphorus concentrations in all areas sampled except the scrub/shrub area indicate that this area of young planted slash pine may have been fertilized at planting or have rock phosphorus remaining from a previous application.

Soluble carbon was highest in cypress (125.45 mg C/kg soil) and gum (111.35 mg C/kg soil) sites and lowest in clear-cut (50.70 mg C/kg soil) and scrub/shrub areas (50.80 mg C/kg soil). This may be indicative of fermentation of organic matter in the cypress and gum areas, in which high molecular weight carbohydrates are broken down to low molecular weight organic compounds usually as dissolved organic carbon (DOC). Hence, the export of DOC from the depressional areas to associated water bodies is greater than that exported from other habitat types in Tate's Hell Swamp. This export of carbon to the associated streams and bays may constitute a significant portion of the organic carbon input into East Bay, and as such may directly affect the productivity of East Bay.

The soils sampled have bulk density measurements and soil moisture concentrations consistent with organic, rather than mineral soils for all areas sampled. However, the soluble carbon measurements indicate that twice as much carbon may be exported from depressional plant community soils as from the other soils types sampled in WS1. In addition, the amount of ammonia in the depressional soils indicate that ammonification occurs in these depressional areas as well. The loss of acreage of depressional areas resulting from the drainage and silvicultural practices in Tate's Hell State Forest appears to be fairly extensive. Efforts to restore the hydrology and plant communities in Tate's Hell could benefit East Bay by increasing the input of dissolved organic carbon into the East Bay estuary-marsh complex, and providing an input of available nitrogen to East Bay.

The soil sample sites that correlate with the plant response transects should be sampled annually to determine change in soil composition. In addition, soil samples should be taken to monitor changes in soil nutrients after a burn. These samples should be taken immediately before and immediately after prescribed burns, and again immediately following the first rain event after a burn. Additionally, water nutrient samples should be collected from upstream and downstream surface drainages immediately before and immediately after the prescribed burn, and during and immediately following the first rain event after the prescribed burn. Analyses of these samples will

help determine the change in soil nutrient concentrations due to prescribed burning, and follow the transport of these nutrients through surface runoff.

Figure E1 a. Gullybranch Soil Samples
Bulk Density

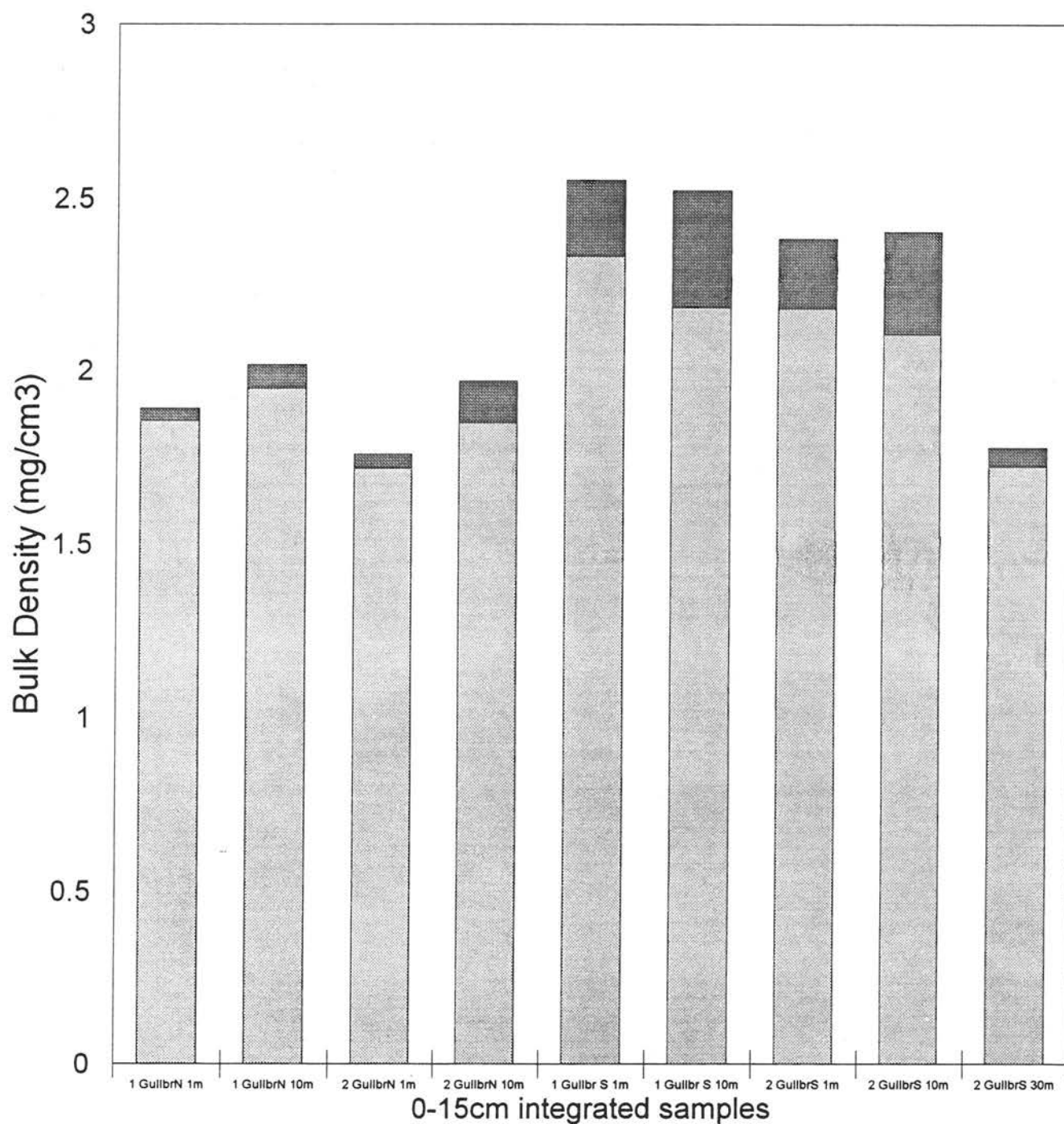


Figure E1 b. Doublebridge Soil Samples
Bulk Density

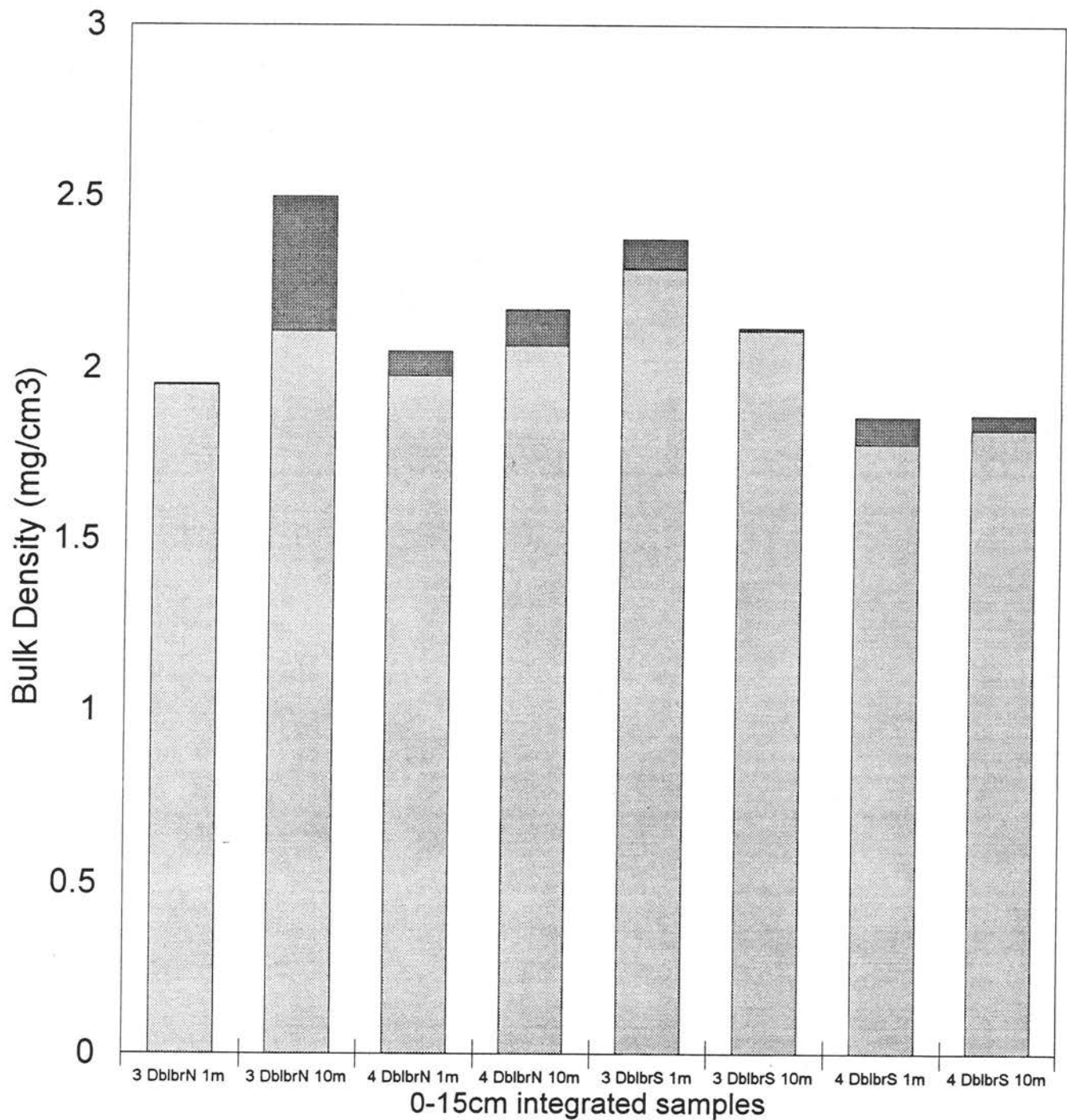


Figure E2. Plant Community Soils
Soil Moisture Concentrations

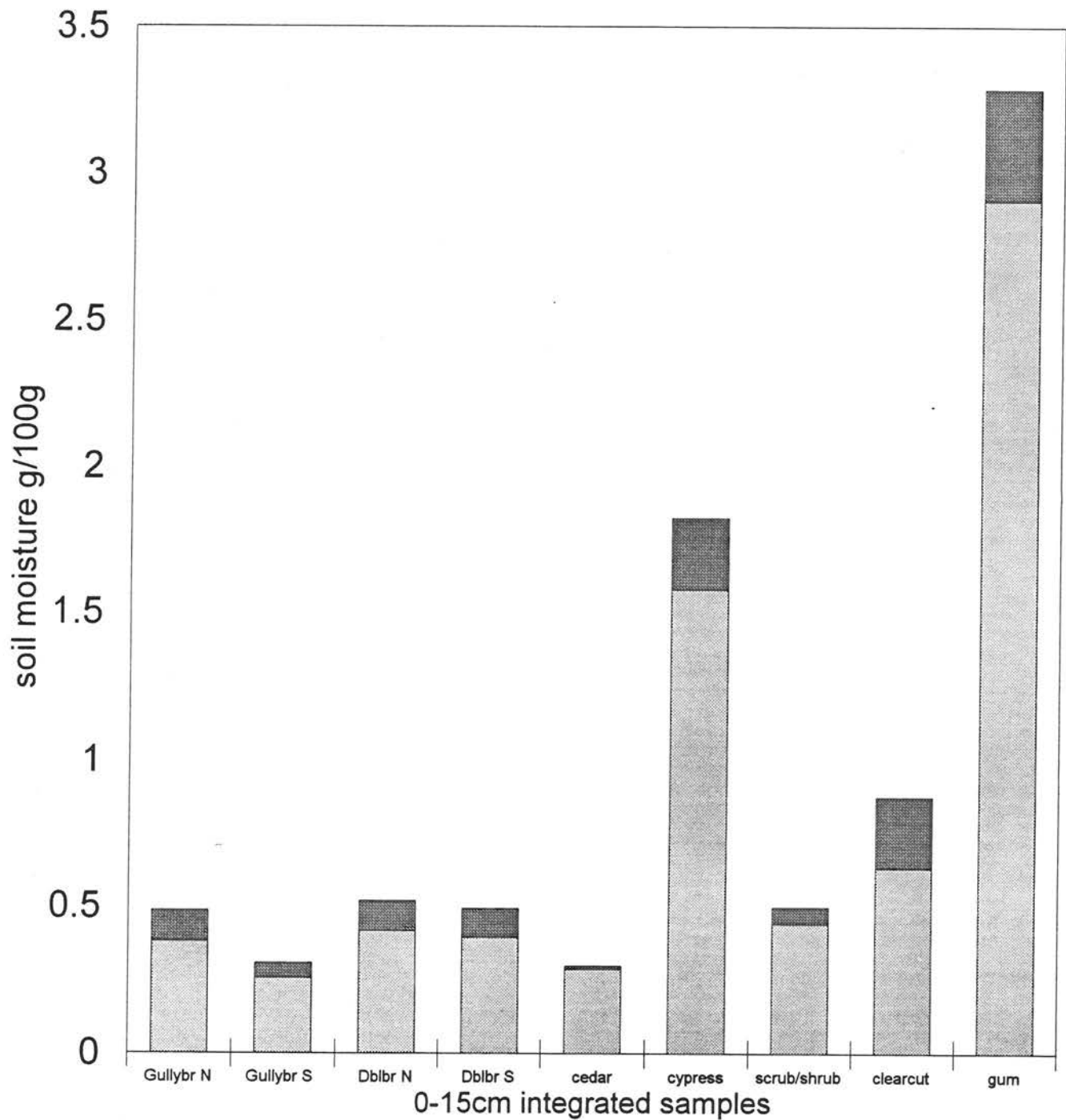


Figure E3. Plant Community Soils Mineral Nitrogen Concentrations

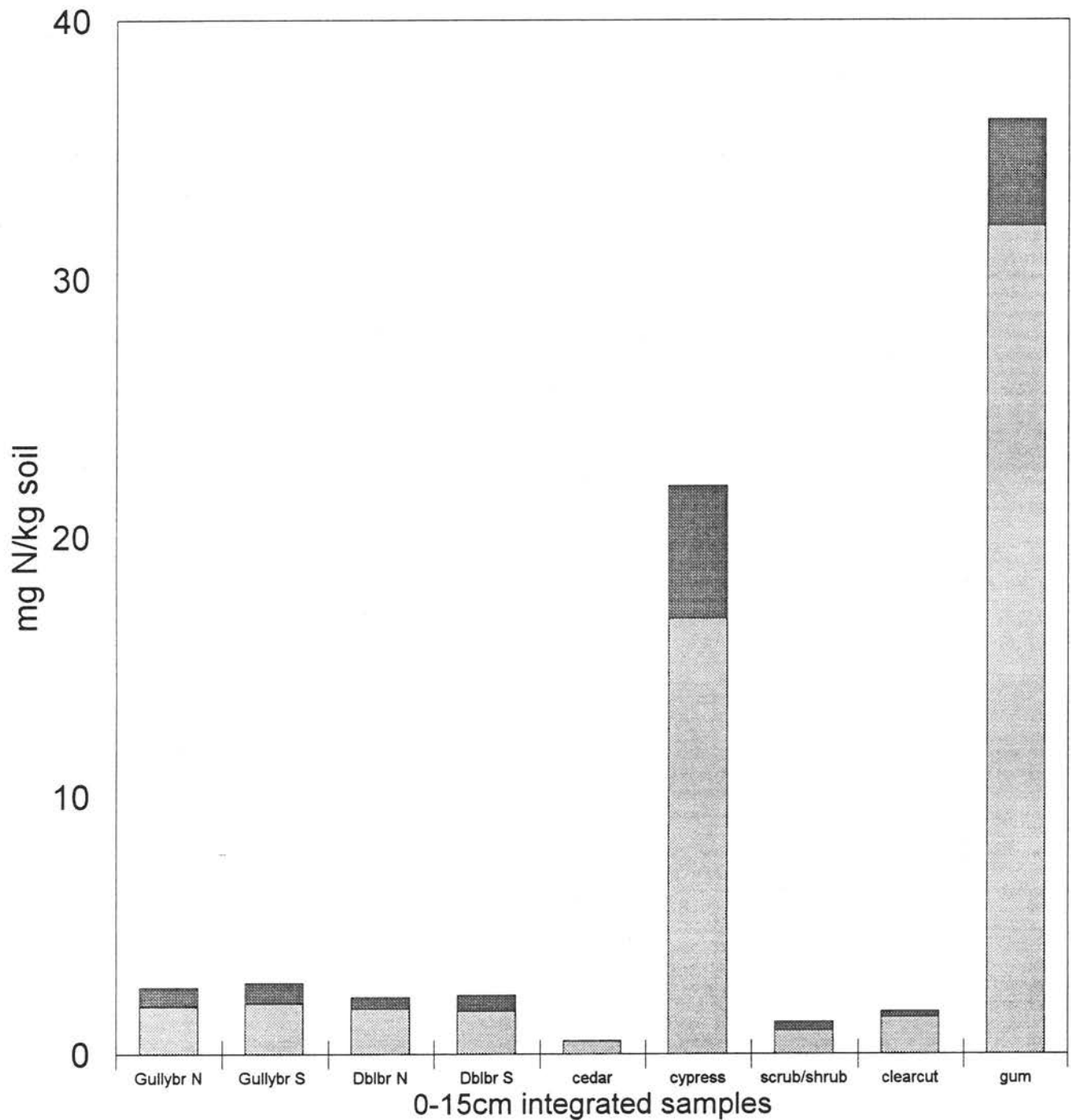


Figure E4. Plant Community Soils Phosphorous Concentrations

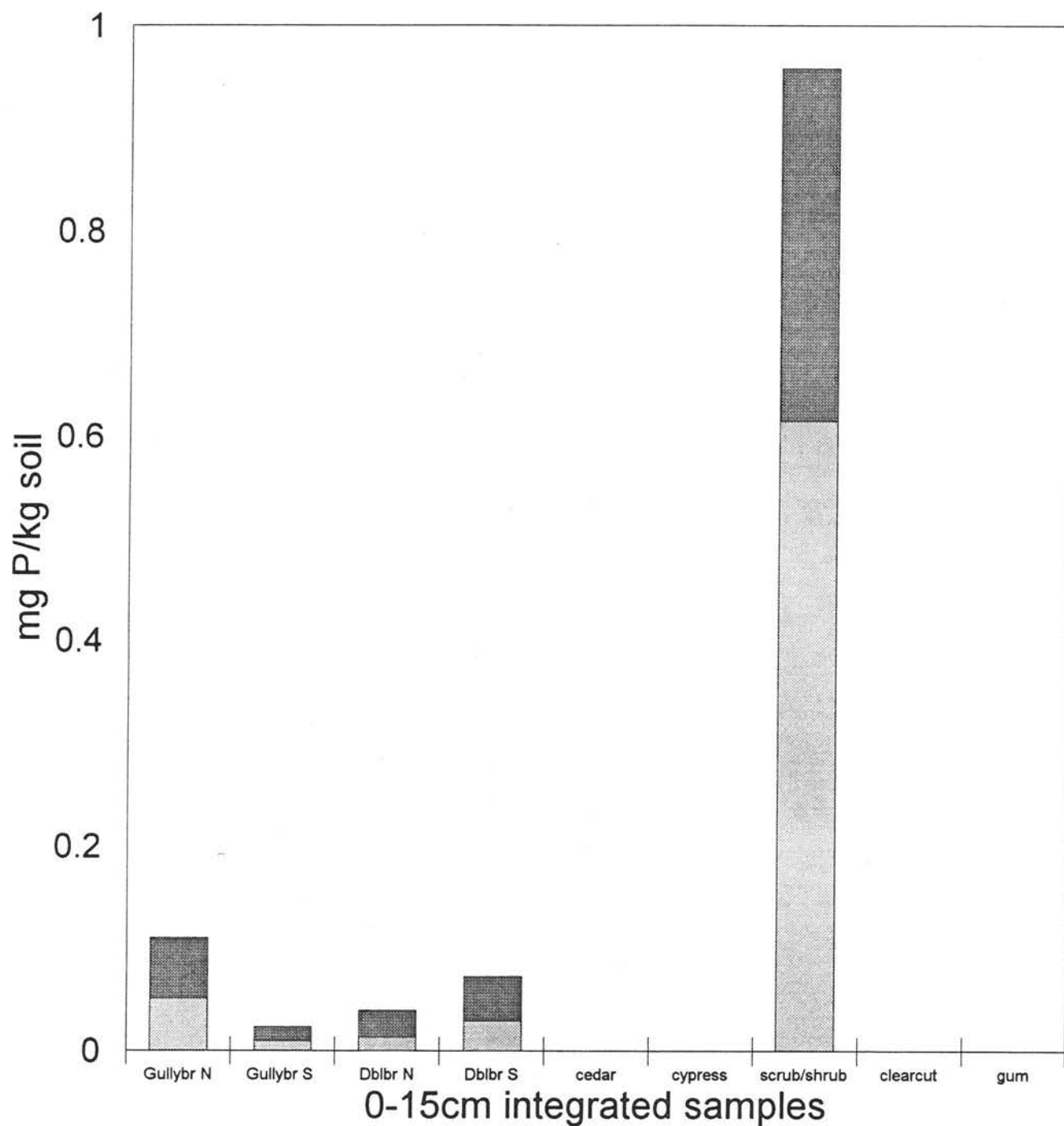


Figure E5. Plant Community Soils Soluble Carbon Concentrations

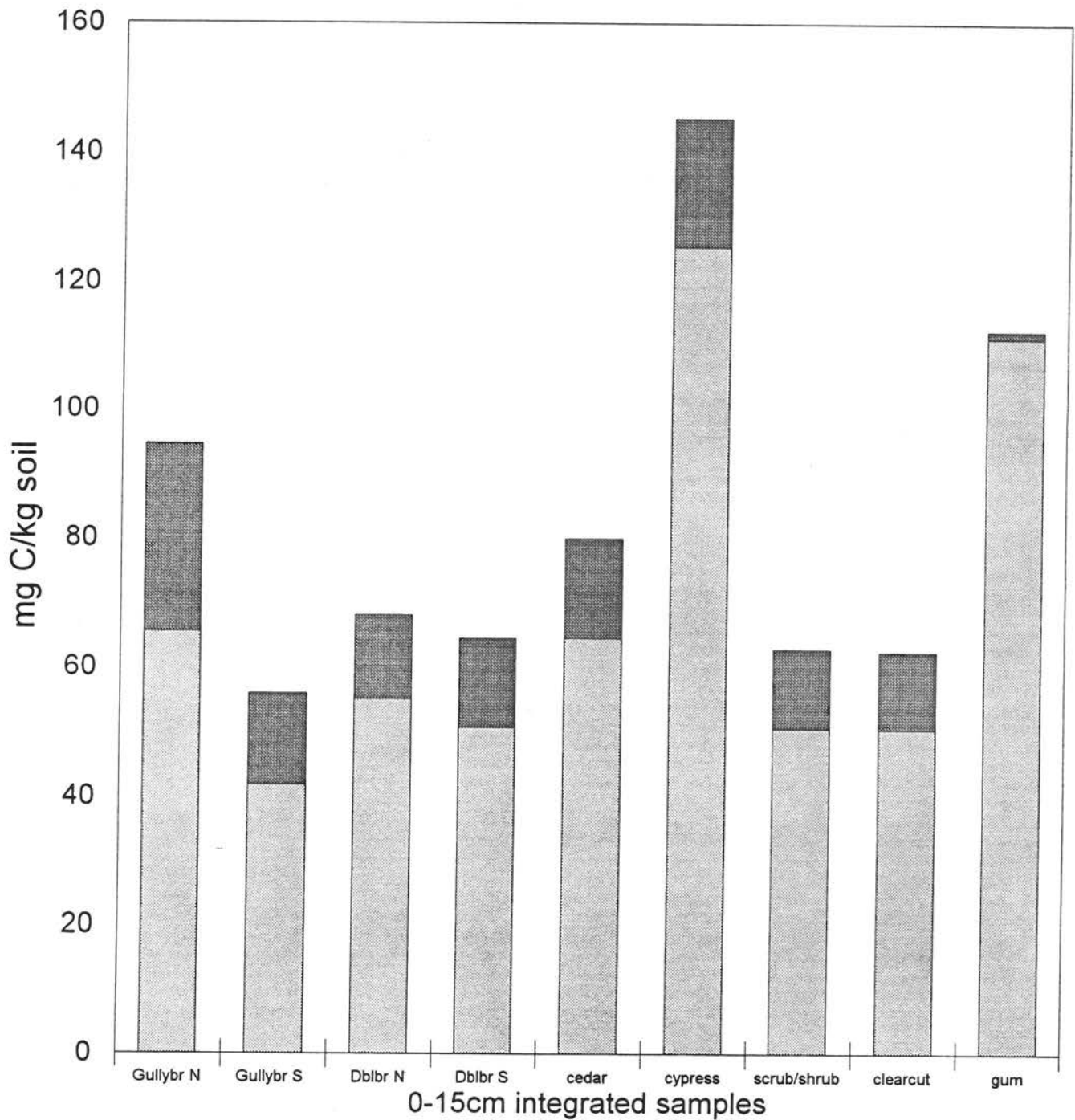


Table E1. Soil Data from WS1 row planted and bedded pine areas (Plummer fine sand (28)), scrub/shrub (28), clearcut (28), cypress (33), cedar (31), gum (V).

Gullybranch	bblck	blck	plot	dist	depth	x axis labels	b.d. mg/cm3	moistg/100g	mg NH4/kg soil	mg NO2-NO3/kg so	min N	mg P/kg soil	mg C/kg soil
1	1	1	A	1	0-5	1A 1 1m, 0-5cm	0.9899	1.1098	1.4664	1.866	3.333	0.398	43.5
1	1	2	A	1	0-5	1A 2 1m, 0-5cm	1.1015	0.6335	1.6783	1.055	2.733	0.069	52.0
						1A 1m, 0-5cm	1.0457	0.8717	1.5724	1.461	3.033	0.234	47.75
						Standard Deviation	0.0789	0.3368	0.1498	0.573	0.424	0.233	6.01
1	1	1	A	10	0-5	1A 1 10m, 0-5cm	1.5015	0.5195	0.6628	1.136	1.799	0.184	43.4
1	1	2	A	10	0-5	1A 2 10m, 0-5cm	1.7218	0.3861	0.7734	1.146	1.919	0.000	36.8
						1A 10m, 0-5cm	1.6117	0.4528	0.7181	1.141	1.859	0.092	40.10
						Standard Deviation	0.1558	0.0943	0.0782	0.007	0.085	0.130	4.67
1	1	1	D	1	0-5	1D 1 1m, 0-5cm	1.4043	0.1429	0.6620	0.045	0.707	0.147	92.6
1	1	2	D	1	0-5	1D 2 1m, 0-5cm	1.1270	0.4462	0.9513	0.043	0.994	0.000	104.2
						1D 1m, 0-5cm	1.2657	0.2945	0.8067	0.044	0.851	0.074	98.40
						Standard Deviation	0.1961	0.2145	0.2046	0.001	0.203	0.104	8.20
1	1	1	D	10	0-5	1D 1 10m, 0-5cm	1.8157	0.3119	1.6434	0.403	2.047	0.000	49.9
1	1	2	D	10	0-5	1D 2 10m, 0-5cm	1.3713	0.5217	2.0079	0.313	2.321	0.000	75.2
						1D10m, 0-5cm	1.5935	0.4168	1.8257	0.358	2.184	0.000	62.55
						Standard Deviation	0.3142	0.1484	0.2577	0.064	0.194	0.000	17.89
1	1	1	A	1	5-15	1A 1 1m, 5-15cm	2.2723	0.3506	0.1045	0.634	0.739	0.245	13.2
1	1	2	A	1	5-15	1A 2 1m, 5-15cm	2.1711	0.5162	0.3719	0.837	1.209	0.000	14.4
						1A 1m, 5-15cm	2.2217	0.4334	0.2382	0.736	0.974	0.123	13.80
						Standard Deviation	0.0716	0.1171	0.1891	0.144	0.332	0.173	0.85
1	1	1	A	10	5-15	1A 1 10m, 5-15cm	2.1477	0.3889	0.2204	2.084	2.304	0.248	28.9
1	1	2	A	10	5-15	1A 2 10m, 5-15cm	2.2221	0.3294	0.0942	1.892	1.986	0.000	33.0
						1A 10m, 5-15cm	2.1849	0.3592	0.1573	1.988	2.145	0.124	30.95
						Standard Deviation	0.0526	0.0421	0.0892	0.136	0.225	0.175	2.90
1	1	1	D	1	5-15	1D 1 1m, 5-15cm	2.1624	0.3310	1.6875	0.893	2.581	0.000	51.4
1	1	2	D	1	5-15	1D 2 1m, 5-15cm	2.2039	0.2883	0.6373	0.813	1.450	0.000	31.7
						1D 1m, 5-15cm	2.1832	0.3097	1.1624	0.853	2.016	0.000	41.55
						Standard Deviation	0.0293	0.0302	0.7426	0.057	0.800	0.000	13.93
1	1	1	D	10	5-15	1D 1 10m, 5-15cm	2.1274	0.2906	0.4563	0.982	1.438	0.000	37.5
1	1	2	D	10	5-15	1D 2 10m, 5-15cm	1.9718	0.3256	0.4829	1.706	2.189	0.041	48.4
						1D 10m, 5-15cm	2.0496	0.3081	0.4696	1.344	1.814	0.021	42.95
						Standard Deviation	0.1100	0.0247	0.0188	0.512	0.531	0.029	7.71
1	1	1	B	1	0-5	1B 1 1m, 0-5cm	1.6170	0.3225	0.3448	0.306	0.650	0.053	33.1
1	1	2	B	1	0-5	1B 2 1m, 0-5cm	2.4434	0.0917	0.8249	0.102	0.927	0.076	27.5
						1B 1m, 0-5cm	2.0302	0.2071	0.5849	0.204	0.789	0.065	30.30
						Standard Deviation	0.5844	0.1632	0.3395	0.144	0.196	0.016	3.96
1	1	1	B	10	0-5	1B 1 10m, 0-5cm	2.1678	0.3556	0.3482	0.978	1.327	0.032	34.0
1	1	2	B	10	0-5	1B 2 10m, 0-5cm	2.2033	0.2360	0.6294	0.737	1.367	0.000	30.7
						1B 10m, 0-5cm	2.1856	0.2958	0.4888	0.858	1.347	0.016	32.35
						Standard Deviation	0.0251	0.0846	0.1988	0.170	0.028	0.023	2.33
1	1	1	C	1	0-5	1C 1 1m, 0-5cm	1.5374	0.1267	0.8805	0.004	0.884	0.077	73.1
1	1	2	C	1	0-5	1C 2 1m, 0-5cm	1.3439	0.2264	1.3529	0.026	1.379	0.000	112.5
						1C 1m, 0-5cm	1.4407	0.1766	1.1167	0.015	1.132	0.039	92.80
						Standard Deviation	0.1368	0.0705	0.3340	0.016	0.350	0.054	27.86
1	1	1	C	10	0-5	1C 1 10m, 0-5cm	1.8329	0.2557	3.3011	0.209	3.510	0.146	46.8
1	1	2	C	10	0-5	1C 2 10m, 0-5cm	1.3273	0.3463	1.3105	0.102	1.412	0.000	60.1
						1C 10m, 0-5cm	1.5801	0.3010	2.3058	0.156	2.461	0.073	53.45
						Standard Deviation	0.3575	0.0641	1.4076	0.076	1.484	0.103	9.40
1	1	1	B	1	5-15	1B 1 1m, 5-15cm	2.4866	0.2451	0.5859	0.810	1.396	0.040	21.9
1	1	2	B	1	5-15	1B 2 1m, 5-15cm	2.9369	0.1102	0.4750	0.290	0.765	0.000	22.4
						1B 1m, 5-15cm	2.7118	0.1777	0.5305	0.550	1.081	0.020	22.15
						Standard Deviation	0.3184	0.0954	0.0784	0.368	0.446	0.028	0.35
1	1	1	B	10	5-15	1B 1 10m, 5-15cm	2.5811	0.2745	0.3078	1.086	1.393	0.000	4.5
1	1	2	B	10	5-15	1B 2 10m, 5-15cm	2.4989	0.2394	0.3463	1.468	1.815	0.000	14.4
						1B 10m, 5-15cm	2.5400	0.2570	0.3271	1.277	1.604	0.000	9.45
						Standard Deviation	0.0581	0.0248	0.0272	0.270	0.298	0.000	7.00
1	1	1	C	1	5-15	1C 1 1m, 5-15cm	2.4069	0.1704	0.7878	0.285	1.073	0.000	35.0
1	1	2	C	1	5-15	1C 2 1m, 5-15cm	2.6600	0.1588	0.8376	0.274	1.111	0.000	50.6
						1C 1m, 5-15cm	2.5335	0.1646	0.8127	0.280	1.092	0.000	42.80
						Standard Deviation	0.1790	0.0082	0.0352	0.008	0.027	0.000	11.03
1	1	1	C	10	5-15	1C 1 10m, 5-15cm	2.0380	0.3548	1.7635	0.540	2.304	0.000	20.7
1	1	2	C	10	5-15	1C 2 10m, 5-15cm	2.1991	0.2186	0.6514	0.742	1.393	0.000	46.3
						1C 10m, 5-15cm	2.1186	0.2867	1.2075	0.641	1.849	0.000	33.50
						Standard Deviation	0.1139	0.0963	0.7864	0.143	0.644	0.000	18.10
Gullybranch	2	3	A	1	0-5	2A 3 1m, 0-5cm	1.2148	0.4799	1.1736	0.305	1.478	0.056	86.7
2	2	4	A	1	0-5	2A 4 1m, 0-5cm	1.4738	0.2834	0.6791	0.048	0.727	0.000	162.2
						2A 1m, 0-5cm	1.3443	0.3817	0.9264	0.177	1.103	0.028	124.45
						Standard Deviation	0.1831	0.1389	0.3497	0.182	0.531	0.040	53.39
2	3	3	A	10	0-5	2A 3 10m, 0-5cm	1.3979	0.5293	0.6086	0.186	0.795	0.126	75.4
2	2	4	A	10	0-5	2A 4 10m, 0-5cm	1.5403	0.3360	0.0634	0.048	0.112	0.000	72.5
						2A 10m, 0-5cm	1.4691	0.4327	0.3360	0.117	0.454	0.063	73.95
						Standard Deviation	0.1007	0.1367	0.3855	0.098	0.483	0.089	2.05
2	3	3	D	1	0-5	2D 3 1m, 0-5cm	1.2625	0.2914	0.7993	0.037	0.837	0.000	134.7
2	2	4	D	1	0-5	2D 4 1m, 0-5cm	1.4582	0.3222	0.5639	0.061	0.625	0.000	108.2

Table E1. Soil Data from WS1 row planted and bedded pine areas (Plummer fine sand (28)), scrub/shrub (28), clearcut (28), cypress (33), cedar (31), gum (V).

bblok	blok	plot	dist	depth	x axis labels	b.d. mg/cm3	moistg/100g	mg NH4/kg soil	mg NO2-NO3/kg so	min N	mg P/kg soil	mg C/kg soi
					2D 1m, 0-5cm	1.3604	0.3068	0.6816	0.049	0.731	0.000	121.45
					Standard Deviation	0.1384	0.0218	0.1665	0.017	0.150	0.000	18.74
2	3	D	10	0-5	2D 3 10m, 0-5cm	1.5251	0.2523	1.0389	0.316	1.355	0.082	85.7
2	4	D	10	0-5	2D 4 10m, 0-5cm	1.2424	0.2536	1.7137	0.463	2.177	0.000	123.2
					2D 10m, 0-5cm	1.3838	0.2530	1.3763	0.390	1.766	0.041	104.45
					Standard Deviation	0.1999	0.0009	0.4772	0.104	0.581	0.058	26.52
2	3	A	1	5-15	2A 3 1m, 5-15cm	1.3470	0.8046	0.7410	0.896	1.637	0.000	76.3
2	4	A	1	5-15	2A 4 1m, 5-15cm	2.3788	0.2934	0.5646	0.550	1.114	0.000	120.2
					2A 1m, 5-15cm	1.8629	0.5490	0.6528	0.723	1.376	0.000	98.25
					Standard Deviation	0.7296	0.3615	0.1247	0.245	0.370	0.000	31.04
2	3	A	10	5-15	2A 3 10m, 5-15cm	2.1887	0.3222	0.6035	0.921	1.525	0.020	61.4
2	4	A	10	5-15	2A 4 10m, 5-15cm	2.1354	0.2799	0.4794	0.414	0.893	0.152	64.9
					2A 10m, 5-15cm	2.1621	0.3011	0.5415	0.668	1.209	0.086	63.15
					Standard Deviation	0.0377	0.0299	0.0878	0.359	0.447	0.093	2.47
2	3	D	1	5-15	2D 3 1m, 5-15cm	1.8382	0.2975	1.5266	0.446	1.972	0.000	72.8
2	4	D	1	5-15	2D 4 1m, 5-15cm	2.0364	0.3086	1.5704	1.061	2.631	0.000	67.1
					2D 1m, 5-15cm	1.9373	0.3031	1.5485	0.754	2.302	0.000	69.95
					Standard Deviation	0.1401	0.0078	0.0310	0.435	0.466	0.000	4.03
2	3	D	10	5-15	2D 3 10m, 5-15cm	2.2494	0.2707	0.9159	1.539	2.455	0.000	69.6
2	4	D	10	5-15	2D 4 10m, 5-15cm	1.6607	0.3162	3.9041	2.226	6.130	0.000	108.9
					2D 10m, 5-15cm	1.9551	0.2935	2.4100	1.883	4.293	0.000	89.25
					Standard Deviation	0.4163	0.0322	2.1130	0.486	2.599	0.000	27.79
2	3	B	1	0-5	2B 3 1m, 0-5cm	1.6942	0.3560	2.0574	1.204	3.262	0.000	67.5
2	4	B	1	0-5	2B 4 1m, 0-5cm	1.1362	0.3422	1.8591	0.951	2.810	0.000	63.7
					2B 1m, 0-5cm	1.4152	0.3491	1.9583	1.078	3.036	0.000	65.60
					Standard Deviation	0.3946	0.0098	0.1402	0.179	0.320	0.000	2.69
2	3	B	10	0-5	2B 3 10m, 0-5cm	1.7262	0.3051	2.1856	2.023	4.209	0.000	40.2
2	4	B	10	0-5	2B 4 10m, 0-5cm	1.6231	0.3517	1.6270	2.047	3.674	0.000	81.8
					2B 10m, 0-5cm	1.6747	0.3284	1.9063	2.035	3.942	0.000	61.00
					Standard Deviation	0.0729	0.0330	0.3950	0.017	0.378	0.000	29.42
2	4	B	30	0-5	2B 4 30m, 0-5cm	1.4548	0.3390	1.6251	0.607	2.232	0.000	71.5
2	4	B	30	0-5	2B 4 30m, 0-5cm	1.2205	0.2875	0.6049	0.780	1.385	0.000	64.0
					2B 30m, 0-5cm	1.3377	0.3133	1.1150	0.694	1.809	0.000	67.75
					Standard Deviation	0.1657	0.0364	0.7214	0.122	0.599	0.000	5.30
2	3	C	1	0-5	2C 3 1m, 0-5cm	1.4442	0.4104	0.8696	0.009	0.879	0.000	62.3
2	4	C	1	0-5	2C 4 1m, 0-5cm	1.6586	0.3011	4.6806	0.047	4.728	0.000	54.9
					2C 1m, 0-5cm	1.5514	0.3558	2.7751	0.028	2.804	0.000	58.60
					Standard Deviation	0.1516	0.0773	2.6948	0.027	2.722	0.000	5.23
2	3	C	10	0-5	2C 3 10m, 0-5cm	1.8356	0.2510	1.3745	0.720	2.094	0.000	51.6
2	4	C	10	0-5	2C 4 10m, 0-5cm	1.2421	0.2432	1.8157	0.127	1.943	0.000	71.5
					2C 10m, 0-5cm	1.5389	0.2471	1.5951	0.424	2.019	0.000	61.55
					Standard Deviation	0.4197	0.0055	0.3120	0.419	0.107	0.000	14.07
2	4	C	30	0-5	2C 3 30m, 0-5cm	1.3895	0.4076	1.5600	0.303	1.863	0.000	94.3
2	4	C	30	0-5	2C 4 30m, 0-5cm	0.8629	0.5832	4.6590	0.298	4.957	0.000	120.0
					2C 30m, 0-5cm	1.1262	0.4954	3.1095	0.301	3.410	0.000	107.15
					Standard Deviation	0.3724	0.1242	2.1913	0.004	2.188	0.000	18.17
2	3	B	1	5-15	2B 3 1m, 5-15cm	2.5255	0.2536	0.4284	1.574	2.003	0.000	43.2
2	4	B	1	5-15	2B 4 1m, 5-15cm	2.1652	0.2509	1.3008	0.865	2.166	0.000	41.7
					2B 1m, 5-15cm	2.3454	0.2523	0.8646	1.220	2.085	0.000	42.45
					Standard Deviation	0.2548	0.0019	0.6169	0.501	0.115	0.000	1.06
2	3	B	10	5-15	2B 3 10m, 5-15cm	2.2184	0.3160	2.0093	1.758	3.767	0.000	46.2
2	4	B	10	5-15	2B 4 10m, 5-15cm	2.4749	0.2640	0.8169	1.730	2.546	0.000	32.0
					2B 10m, 5-15cm	2.3467	0.2900	1.4131	1.744	3.157	0.000	39.10
					Standard Deviation	0.1814	0.0368	0.8432	0.020	0.863	0.000	10.04
2	4	B	30	5-15	2B 4 30m, 5-15cm	1.8273	0.3516	0.4542	2.066	2.520	0.000	65.5
2	4	B	30	5-15	2B 4 30m, 5-15cm	1.9052	0.3917	0.5991	1.148	1.747	0.000	62.0
					2B 30m, 5-15cm	1.8663	0.3717	0.5267	1.607	2.134	0.000	63.75
					Standard Deviation	0.0551	0.0284	0.1025	0.649	0.547	0.000	2.47
2	3	C	1	5-15	2C 3 1m, 5-15cm	2.4218	0.2687	0.6107	0.758	1.369	0.000	52.3
2	4	C	1	5-15	2C 4 1m, 5-15cm	2.9857	0.2035	0.3519	0.813	1.165	0.000	34.3
					2C 1m, 5-15cm	2.7038	0.2361	0.4813	0.786	1.267	0.000	43.30
					Standard Deviation	0.3987	0.0461	0.1830	0.039	0.144	0.000	12.73
2	3	C	10	5-15	2C 3 10m, 5-15cm	2.6829	0.1677	0.6772	1.584	2.261	0.000	42.1
2	4	C	10	5-15	2C 4 10m, 5-15cm	2.0292	0.2539	1.1240	1.658	2.782	0.000	43.5
					2C 10m, 5-15cm	2.3561	0.2108	0.9006	1.621	2.522	0.000	42.80
					Standard Deviation	0.4622	0.0610	0.3159	0.052	0.368	0.000	0.99
2	4	C	30	5-15	2C 4 30m, 5-15cm	2.0168	0.3528	0.6953	2.047	2.742	0.000	70.1
2	4	C	30	5-15	2C 4 30m, 5-15cm	2.1427	0.3114	0.8275	1.185	2.012	0.000	59.6
					2C 30m, 5-15cm	2.0798	0.3321	0.7614	1.616	2.377	0.000	64.85
					Standard Deviation	0.0890	0.0293	0.0935	0.610	0.516	0.000	7.42
Doublebridg	3	5	A	0-5	3A 5 1m, 0-5cm	1.0679	0.8721	0.7200	1.253	1.973	0.422	75.8
3	6	A	1	0-5	3A 6 1m, 0-5cm	1.3013	0.4801	1.1838	0.731	1.915	0.000	65.8
					3A 1m, 0-5cm	1.1846	0.6761	0.9519	0.992	1.944	0.211	70.80
					Standard Deviation	0.1650	0.2772	0.3280	0.369	0.041	0.298	7.07

Table E1. Soil Data from WS1 row planted and bedded pine areas (Plummer fine sand (28)), scrub/shrub (28), clearcut (28), cypress (33), cedar (31), gum (V).

	bblok	bick	plot	dist	depth	x axis labels	b.d. mg/cm3	moistg/100g	mg NH4/kg soil	mg NO2-NO3/kg so	min N	mg P/kg soil	mg C/kg soi
	3	5	A	10	0-5	3A 5 10m, 0-5cm	2.0549	0.4198	0.3760	0.147	0.523	0.000	49.3
	3	6	A	10	0-5	3A 6 10m, 0-5cm	1.7878	0.4460	0.6744	0.199	0.874	0.000	68.9
						3A 10m, 0-5cm	1.9214	0.4329	0.5252	0.173	0.699	0.000	59.10
						Standard Deviation	0.1889	0.0185	0.2110	0.037	0.248	0.000	13.86
	3	5	D	1	0-5	3D 5 1m, 0-5cm	1.4441	0.2749	0.7078	0.360	1.067	0.000	78.4
	3	6	D	1	0-5	3D 6 1m, 0-5cm	1.5285	0.2721	1.0840	0.191	1.275	0.068	79.0
						3D 1m, 0-5cm	1.4863	0.2735	0.8959	0.276	1.171	0.034	78.70
						Standard Deviation	0.0597	0.0020	0.2660	0.120	0.147	0.048	0.42
	3	5	D	10	0-5	3D 5 10m, 0-5cm	2.3211	0.3424	0.3315	0.792	1.123	0.000	34.6
	3	6	D	10	0-5	3D 6 10m, 0-5cm	1.9282	0.4247	1.1104	2.187	3.298	0.000	40.7
						3D 10m, 0-5cm	2.1247	0.3836	0.7210	1.490	2.211	0.000	37.65
						Standard Deviation	0.2778	0.0582	0.5508	0.986	1.538	0.000	4.31
	3	5	A	1	5-15	3A 5 1m, 5-15cm	2.5026	0.3699	0.4390	0.611	1.050	0.000	26.7
	3	6	A	1	5-15	3A 6 1m, 5-15cm	2.1523	0.4173	0.9232	0.617	1.541	0.000	36.0
						3A 1m, 5-15cm	2.3275	0.3936	0.6811	0.614	1.296	0.000	31.35
						Standard Deviation	0.2477	0.0335	0.3424	0.004	0.347	0.000	6.58
	3	5	A	10	5-15	3A 5 10m, 5-15cm	1.5105	0.7325	1.1623	0.144	1.306	0.000	76.4
	3	6	A	10	5-15	3A 6 10m, 5-15cm	2.0585	0.6667	0.2811	0.543	0.824	0.000	6.8
						3A 10m, 5-15cm	1.7845	0.6996	0.7217	0.344	1.065	0.000	41.60
						Standard Deviation	0.3875	0.0465	0.6231	0.282	0.341	0.000	49.21
	3	5	D	1	5-15	3D 5 1m, 5-15cm	2.1510	0.4981	1.3375	1.653	2.990	0.000	65.5
	3	6	D	1	5-15	3D 6 1m, 5-15cm	2.2012	0.3501	0.5513	0.779	1.330	0.000	50.2
						3D 1m, 5-15cm	2.1761	0.4241	0.9444	1.216	2.160	0.000	57.85
						Standard Deviation	0.0355	0.1047	0.5559	0.618	1.174	0.000	10.82
	3	5	D	10	5-15	3D 5 10m, 5-15cm	2.6498	0.2282	0.5337	1.094	1.627	0.000	37.1
	3	6	D	10	5-15	3D 6 10m, 5-15cm	2.3686	0.3783	0.1664	2.092	2.259	0.000	42.9
						3D 10m, 5-15cm	2.5092	0.3033	0.3501	1.593	1.943	0.000	40.00
						Standard Deviation	0.1988	0.1061	0.2597	0.706	0.447	0.000	4.10
	3	5	B	1	0-5	3B 5 1m, 0-5cm	1.6787	0.4530	0.6638	0.468	1.131	0.000	40.2
	3	6	B	1	0-5	3B 6 1m, 0-5cm	1.7294	0.2854	1.0358	0.616	1.651	0.000	44.2
						3B 1m, 0-5cm	1.7041	0.3692	0.8498	0.542	1.391	0.000	42.20
						Standard Deviation	0.0359	0.1185	0.2630	0.105	0.368	0.000	2.83
	3	5	B	10	0-5	3B 5 10m, 0-5cm	1.2197	0.4359	0.7558	0.135	0.890	0.158	43.9
	3	6	B	10	0-5	3B 6 10m, 0-5cm	2.0304	0.2873	0.5796	0.505	1.085	0.000	36.4
						3B 10m, 0-5cm	1.6251	0.3616	0.6677	0.320	0.988	0.079	40.15
						Standard Deviation	0.5733	0.1051	0.1246	0.262	0.138	0.112	5.30
	3	5	C	1	0-5	3C 5 1m, 0-5cm	1.6961	0.3727	0.3533	0.061	0.415	0.000	47.6
	3	6	C	1	0-5	3C 6 1m, 0-5cm	2.2819	0.3266	1.2176	0.872	2.090	0.000	54.1
						3C 1m, 0-5cm	1.9890	0.3497	0.7855	0.467	1.253	0.000	50.85
						Standard Deviation	0.4142	0.0326	0.6112	0.573	1.184	0.000	4.60
	3	5	C	10	0-5	3C 5 10m, 0-5cm	1.8549	0.2931	0.8212	0.263	1.084	0.000	47.5
	3	6	C	10	0-5	3C 6 10m, 0-5cm	1.8137	0.1971	1.2282	0.113	1.341	0.009	57.6
						3C 10m, 0-5cm	1.8343	0.2451	1.0247	0.188	1.213	0.005	52.55
						Standard Deviation	0.0291	0.0679	0.2878	0.106	0.182	0.006	7.14
	3	5	B	1	5-15	3B 5 1m, 5-15cm	2.4605	0.2833	0.0767	0.903	0.980	0.000	15.6
	3	6	B	1	5-15	3B 6 1m, 5-15cm	2.4947	0.2941	0.4690	1.661	2.130	0.056	40.9
						3B 1m, 5-15cm	2.4776	0.2887	0.2729	1.282	1.555	0.028	28.25
						Standard Deviation	0.0242	0.0076	0.2774	0.536	0.813	0.040	17.89
	3	5	B	10	5-15	3B 5 10m, 5-15cm	2.3097	0.3312	0.5564	0.974	1.530	0.042	38.0
	3	6	B	10	5-15	3B 6 10m, 5-15cm	2.3617	0.3148	0.4089	1.142	1.551	0.192	44.0
						3B 10m, 5-15cm	2.3357	0.3230	0.4827	1.058	1.541	0.117	41.00
						Standard Deviation	0.0368	0.0116	0.1043	0.119	0.015	0.106	4.24
	3	5	C	1	5-15	3C 5 1m, 5-15cm	2.2572	0.2965	0.7215	0.659	1.380	0.000	43.7
	3	6	C	1	5-15	3C 6 1m, 5-15cm	2.7900	0.2938	0.4649	0.722	1.187	0.000	44.4
						3C 1m, 5-15cm	2.5236	0.2952	0.5932	0.691	1.284	0.000	44.05
						Standard Deviation	0.3767	0.0019	0.1814	0.045	0.136	0.000	0.49
	3	5	C	10	5-15	3C 5 10m, 5-15cm	2.2625	0.3382	0.6412	1.047	1.688	0.000	46.5
	3	6	C	10	5-15	3C 6 10m, 5-15cm	2.2393	0.2639	0.5849	0.932	1.516	0.000	43.5
						3C 10m, 5-15cm	2.2509	0.3011	0.6131	0.990	1.602	0.000	45.00
						Standard Deviation	0.0164	0.0525	0.0398	0.081	0.122	0.000	2.12
Doublebridg	4	7	A	1	0-5	4A 7 1m, 0-5cm	1.8421	0.3344	1.1621	0.251	1.413	0.000	82.0
	4	8	A	1	0-5	4A 8 1m, 0-5cm	1.6755	0.3870	0.4658	0.053	0.518	0.000	59.2
						4A 1m, 0-5cm	1.7588	0.3607	0.8140	0.152	0.966	0.000	70.60
						Standard Deviation	0.1178	0.0372	0.4924	0.140	0.633	0.000	16.12
	4	7	A	10	0-5	4A 7 10m, 0-5cm	2.0557	0.6715	1.6159	0.126	1.742	0.000	51.7
	4	8	A	10	0-5	4A 8 10m, 0-5cm	1.6208	0.3175	0.6459	0.067	0.713	0.000	53.3
						4A 10m, 0-5cm	1.8383	0.4945	1.1309	0.097	1.228	0.000	52.50
						Standard Deviation	0.3075	0.2503	0.6859	0.042	0.728	0.000	1.13
	4	7	D	1	0-5	4D 7 1m, 0-5cm	1.1140	0.3639	2.5139	0.028	2.542	0.000	159.9
	4	8	D	1	0-5	4D 8 1m, 0-5cm	1.6008	0.3747	0.6922	0.011	0.703	0.000	61.5
						4D 1m, 0-5cm	1.3574	0.3693	1.6031	0.020	1.623	0.000	110.70
						Standard Deviation	0.3442	0.0076	1.2881	0.012	1.300	0.000	69.58
4	7	D	10	0-5	4D 7 10m, 0-5cm	1.9084	0.2967	0.9075	0.272	1.180	0.208	77.3	

Table E1. Soil Data from WS1 row planted and bedded pine areas (Plummer fine sand (28)), scrub/shrub (28), clearcut (28), cypress (33), cedar (31), gum (V).

bblok	blok	plot	dist	depth	x axis labels	b.d. mg/cm3	moistg/100g	mg NH4/kg soil	mg NO2-NO3/kg so	min N	mg P/kg soil	mg C/kg soi
4	8	D	10	0-5	4D 8 10m, 0-5cm	1.2771	0.4529	1.8469	0.177	2.024	0.000	89.2
					4D 10m, 0-5cm	1.5928	0.3748	1.3772	0.225	1.602	0.104	83.25
					Standard Deviation	0.4464	0.1105	0.6643	0.067	0.597	0.147	8.41
4	7	A	1	5-15	4A 7 1m, 5-15cm	2.4822	0.2804	0.9492	0.993	1.942	0.000	45.0
4	8	A	1	5-15	4A 8 1m, 5-15cm	1.8331	0.4385	0.7660	0.872	1.638	0.000	70.5
					4A 1m, 5-15cm	2.1577	0.3595	0.8576	0.933	1.790	0.000	57.75
					Standard Deviation	0.4590	0.1118	0.1295	0.086	0.215	0.000	18.03
4	7	A	10	5-15	4A 7 10m, 5-15cm	2.0686	0.5481	0.9397	0.619	1.559	0.000	42.2
4	8	A	10	5-15	4A 8 10m, 5-15cm	2.0581	0.4282	0.3693	0.952	4.022	0.000	43.1
					4A 10m, 5-15cm	2.0634	0.4882	2.0045	0.786	2.791	0.000	42.65
					Standard Deviation	0.0074	0.0848	1.5059	0.235	1.742	0.000	0.64
4	7	D	1	5-15	4D 7 1m, 5-15cm	2.1114	0.2596	2.5375	0.280	2.817	0.000	69.4
4	8	D	1	5-15	4D 8 1m, 5-15cm	2.3052	0.4039	1.0490	0.760	1.809	0.000	52.2
					4D 1m, 5-15cm	2.2083	0.3318	1.7933	0.520	2.313	0.000	60.80
					Standard Deviation	0.1370	0.1020	1.0525	0.339	0.713	0.000	12.16
4	7	D	10	5-15	4D 7 10m, 5-15cm	2.6245	0.2824	1.2490	0.864	2.113	0.000	52.8
4	8	D	10	5-15	4D 8 10m, 5-15cm	2.1865	0.3284	0.9585	1.097	2.056	0.000	45.1
					4D 10m, 5-15cm	2.4055	0.3054	1.1038	0.981	2.085	0.000	48.95
					Standard Deviation	0.3097	0.0325	0.2054	0.165	0.040	0.000	5.44
4	7	B	1	0-5	4B 7 1m, 0-5cm	0.8215	0.8492	1.8214	0.532	2.354	0.000	111.7
4	8	B	1	0-5	4B 8 1m, 0-5cm	1.6511	0.6626	2.4541	0.146	2.600	0.000	60.4
					4B 1m, 0-5cm	1.2363	0.7559	2.1378	0.339	2.477	0.000	86.05
					Standard Deviation	0.5866	0.1319	0.4474	0.273	0.174	0.000	36.27
4	7	B	10	0-5	4B 7 10m, 0-5cm	1.6853	0.3908	0.9617	0.385	1.347	0.551	58.0
4	8	B	10	0-5	4B 8 10m, 0-5cm	1.1205	0.5873	0.9130	0.171	1.084	0.000	102.0
					4B 10m, 0-5cm	1.4029	0.4891	0.9374	0.278	1.216	0.276	80.00
					Standard Deviation	0.3994	0.1389	0.0344	0.151	0.186	0.390	31.11
4	7	C	1	0-5	4C 7 1m, 0-5cm	1.5449	0.3572	1.0124	0.033	1.045	0.000	130.7
4	8	C	1	0-5	4C 8 1m, 0-5cm	1.3305	0.6185	0.8925	0.036	0.928	0.000	100.9
					4C 1m, 0-5cm	1.4377	0.4879	0.9525	0.035	0.987	0.000	115.80
					Standard Deviation	0.1516	0.1848	0.0848	0.002	0.083	0.000	21.07
4	7	C	10	0-5	4C 7 10m, 0-5cm	1.2500	0.6443	3.1015	0.331	3.433	0.131	88.3
4	8	C	10	0-5	4C 8 10m, 0-5cm	1.0620	0.5895	3.8529	0.198	4.051	0.000	121.2
					4C 10m, 0-5cm	1.1560	0.6169	3.4772	0.265	3.742	0.066	104.75
					Standard Deviation	0.1329	0.0387	0.5313	0.094	0.437	0.093	23.26
4	7	B	1	5-15	4B 7 1m, 5-15cm	1.7780	0.5117	0.5753	0.932	1.508	0.000	22.6
4	8	B	1	5-15	4B 8 1m, 5-15cm	2.1538	0.4183	0.5057	1.427	1.933	0.000	18.7
					4B 1m, 5-15cm	1.9659	0.4650	0.5405	1.180	1.721	0.000	20.65
					Standard Deviation	0.2657	0.0660	0.0492	0.350	0.301	0.000	2.76
4	7	B	10	5-15	4B 7 10m, 5-15cm	1.9051	0.4149	0.5782	1.304	1.882	0.000	43.1
4	8	B	10	5-15	4B 8 10m, 5-15cm	2.0678	0.3176	0.3663	1.133	1.499	0.000	47.7
					4B 10m, 5-15cm	1.9865	0.3663	0.4723	1.219	1.691	0.000	45.40
					Standard Deviation	0.1150	0.0688	0.1498	0.121	0.271	0.000	3.25
4	7	C	1	5-15	4C 7 1m, 5-15cm	2.0371	0.5582	0.5344	0.194	0.729	0.000	51.8
4	8	C	1	5-15	4C 8 1m, 5-15cm	2.0218	0.3938	0.7274	0.656	1.384	0.000	51.4
					4C 1m, 5-15cm	2.0295	0.4760	0.6309	0.425	1.057	0.000	51.60
					Standard Deviation	0.0108	0.1162	0.1365	0.327	0.463	0.000	0.28
4	7	C	10	5-15	4C 7 10m, 5-15cm	2.1154	0.3848	0.6872	1.705	2.392	0.000	33.2
4	8	C	10	5-15	4C 8 10m, 5-15cm	2.2716	0.3750	1.7523	1.255	3.007	0.000	63.4
					4C 10m, 5-15cm	2.1935	0.3799	1.2198	1.480	2.700	0.000	48.30
					Standard Deviation	0.1105	0.0069	0.7531	0.318	0.435	0.000	21.35
	cedar			0-15	cedar, 0-15cm		0.2797	0.2895	0.201	0.491	0	53.7
	cedar			0-15	cedar, 0-15cm		0.294	0.3526	0.146	0.499	0	75.5
					cedar, 0-15cm		0.2869	0.3211	0.174	0.495	0.000	64.60
					Standard Deviation		0.0101	0.0446	0.039	0.006	0.000	15.41
	cypress			0-15	cypress, 0-15cm		1.4071	2.9275	17.519	20.446	0	139.4
	cypress			0-15	cypress, 0-15cm		1.7511	3.4241	9.815	13.239	0	111.5
					cypress, 0-15cm		1.5791	3.1758	13.667	16.843	0.000	125.45
					Standard Deviation		0.2432	0.3511	5.448	5.096	0.000	19.73
	scrub			0-15	scrub-shrub, 0-15cm		0.4808	0.2282	0.445	0.673	0.373	59.4
	scrub			0-15	scrub-shrub, 0-15cm		0.4016	0.2797	0.862	1.141	0.858	42.2
					scrub-shrub, 0-15cm		0.4412	0.2540	0.654	0.907	0.616	50.80
					Standard Deviation		0.0560	0.0364	0.295	0.331	0.343	12.16
	clearcut			0-15	clearcut, 0-15cm		0.8056	0.9718	0.302	1.274	0	59.1
	clearcut			0-15	clearcut, 0-15cm		0.4597	0.8586	0.694	1.553	0	42.3
					clearcut, 0-15cm		0.6327	0.9152	0.498	1.414	0.000	50.70
					Standard Deviation		0.2446	0.0800	0.277	0.197	0.000	11.88
	gum			0-15	gum, 0-15cm		3.1768	1.5974	27.503	29.1	0	110.6
	gum			0-15	gum, 0-15cm		2.6403	1.1552	33.782	34.937	0	112.1
					gum, 0-15cm		2.9086	1.3763	30.643	32.019	0.000	111.35
					Standard Deviation		0.3794	0.3127	4.440	4.127	0.000	1.06

Table E1. Soil Data from WS1 row planted and bedded pine areas (Plummer fine sand (28)), scrub/shrub (28), clearcut (28), cypress (33), ceda

x axis labels	b.d. mg/cm	moistg/100g	mg NH4/kg soil	mg NO2-NO3/kg so	min N	mg P/kg soi	mg C/kg soil
1 GullbrN 1m A 1m, 0-15cm av	1.8336	0.5780	0.6785	0.975	1.653	0.159	25.00
SD	0.0740	0.1896	0.1761	0.285	0.363	0.193	2.55
1D 1m, 0-15cm av	1.8804	0.3047	1.0450	0.586	1.631	0.024	60.31
SD	0.0844	0.0910	0.5651	0.038	0.603	0.034	12.04
1 GullbrN 1m Gullybr N 1m av	1.8570	0.4414	0.8618	0.781	1.642	0.092	42.66
SD	0.0331	0.1933	0.2592	0.275	0.016	0.095	24.97
GullbrN 10 A 10m, 0-15cm av	1.9957	0.3901	0.3424	1.708	2.051	0.113	33.97
SD	0.0867	0.0593	0.0856	0.093	0.179	0.160	3.48
1D 10m, 0-15cm av	1.8991	0.3440	0.9171	1.019	1.936	0.014	49.42
SD	0.1774	0.0655	0.0977	0.364	0.420	0.019	11.07
GullbrN 10 Gullybr N 10m av	1.9474	0.3671	0.6298	1.364	1.994	0.064	41.70
SD	0.0683	0.0326	0.4064	0.487	0.081	0.070	10.92
2 GullbrN 1m A 1m, 0-15cm av	1.6918	0.4938	0.7431	0.543	1.285	0.009	106.90
SD	0.5493	0.2880	0.1990	0.224	0.423	0.013	38.42
2D 1m, 0-15cm av	1.7469	0.3043	1.2624	0.521	1.783	0.000	86.95
SD	0.1396	0.0124	0.0757	0.297	0.362	0.000	8.88
2 GullbrN 1m Gullybr N 1m av	1.7194	0.3991	1.0028	0.532	1.534	0.005	96.93
SD	0.0390	0.1340	0.3672	0.016	0.352	0.006	14.11
GullbrN 10 A 10m, 0-15cm av	1.9334	0.3445	0.4737	0.486	0.960	0.078	66.71
SD	0.0585	0.0651	0.1860	0.272	0.459	0.092	2.33
2D 10m, 0-15cm av	1.7665	0.2801	2.0689	1.390	3.459	0.014	94.27
SD	0.3449	0.0219	1.5732	0.360	1.933	0.019	27.37
GullbrN 10 Gullybr N 10m av	1.8500	0.3123	1.2713	0.938	2.210	0.046	80.49
SD	0.1180	0.0455	1.1280	0.639	1.767	0.045	19.49
Gullybr N 1m Gullybr N 1m Avg	1.7882	0.4202	0.9323	0.656	1.588	0.048	69.79
SD	0.0848	0.1380	0.2720	0.214	0.213	0.075	35.44
ullybr N 10 ullybr N 10m Av	1.8987	0.3397	0.9505	1.151	2.102	0.055	61.09
SD	0.0968	0.0452	0.7851	0.525	1.029	0.049	25.85
Gullybr N Gullybr N Average	1.8434	0.3799	0.9414	0.904	1.845	0.051	65.44
SD	0.1029	0.1043	0.5440	0.456	0.741	0.059	29.09
Gullbr S 1 B 1m, 0-15cm av	2.4868	0.1874	0.5484	0.436	0.984	0.035	24.84
SD	0.4062	0.1178	0.1646	0.294	0.364	0.024	1.54
1C 1m, 0-15cm av	2.1728	0.1685	0.9130	0.192	1.105	0.013	59.30
SD	0.1651	0.0288	0.1338	0.010	0.134	0.018	16.58
Gullbr S 1 Gullybr S 1m av	2.3298	0.1780	0.7307	0.314	1.045	0.024	42.07
SD	0.2220	0.0134	0.2578	0.173	0.086	0.016	24.37
Gullbr S 10 B 10m, 0-15cm av	2.4230	0.2968	0.3804	1.139	1.519	0.005	17.01
SD	0.0472	0.0445	0.0839	0.237	0.209	0.007	5.46
1C 10m, 0-15cm av	1.9409	0.2914	1.5699	0.481	2.051	0.024	40.08
SD	0.1943	0.0857	0.9914	0.121	0.921	0.034	15.23
Gullbr S 10 Gullybr S 10m av	2.1820	0.2941	0.9752	0.810	1.785	0.015	28.55
SD	0.3409	0.0038	0.8411	0.465	0.376	0.013	16.31
2 GullbrS 1m B 1m, 0-15cm av	2.0384	0.2842	1.2255	1.173	2.398	0.000	50.09
SD	0.3009	0.0045	0.4596	0.395	0.183	0.000	1.60
2C 1m, 0-15cm av	2.3235	0.2756	1.2382	0.536	1.774	0.000	48.35
SD	0.3172	0.0564	1.0119	0.035	0.995	0.000	10.25
2 GullbrS 1m Gullybr S 1m av	2.1810	0.2799	1.2319	0.855	2.086	0.000	49.22
SD	0.2016	0.0061	0.0090	0.450	0.441	0.000	1.23
GullbrS 10 B 10m, 0-15cm av	2.1249	0.3027	1.5759	1.840	3.416	0.000	46.33
SD	0.1456	0.0355	0.6953	0.019	0.703	0.000	16.43
2C 10m, 0-15cm av	2.0864	0.2228	1.1298	1.226	2.356	0.000	48.99
SD	0.4482	0.0427	0.3146	0.173	0.282	0.000	5.31

Table E1. Soil Data from WS1 row planted and bedded pine areas (Plummer fine sand (28)), scrub/shrub (28), clearcut (28), cypress (33), ceda

	x axis labels	b.d. mg/cm	moistg/100g	mg NH4/kg soil	mg NO2-NO3/kg so	min N	mg P/kg soi	mg C/kg soil
GullbrS 10	Gullybr S 10m av	2.1057	0.2628	1.3529	1.533	2.886	0.000	47.66
	SD	0.2969	0.0565	0.3154	0.434	0.750	0.000	1.88
GullbrS 30	B 30m, 0-15cm av	1.6918	0.3524	0.7208	1.306	2.026	0.000	65.07
	SD	0.0916	0.0310	0.3067	0.475	0.564	0.000	3.41
	2C 30m, 0-15cm av	1.7651	0.3860	1.5363	1.182	2.718	0.000	78.81
	SD	0.1825	0.0606	0.7858	0.410	1.068	0.000	10.97
GullbrS 30	Gullybr S 30m av	1.7285	0.3692	1.1286	1.244	2.372	0.000	71.94
	SD	0.0518	0.0238	0.5766	0.088	0.489	0.000	9.72
Gullybr S 1m	Gullybr S 1m Avg	2.2554	0.2289	0.9813	0.584	1.565	0.012	45.65
	SD	0.1933	0.0595	0.3254	0.418	0.655	0.017	14.68
ullybr S 10	ullybr S 10m Av	2.1438	0.2784	1.1640	1.172	2.336	0.007	38.10
	SD	0.0539	0.0374	0.5626	0.556	0.799	0.011	14.55
Gullybr S	Gullybr S Avg	2.1996	0.2537	1.0726	0.878	1.950	0.010	41.87
	SD	0.1926	0.0530	0.4366	0.553	0.792	0.013	14.12
3 DblbrN 1m	A 1m, 0-15cm av	1.9503	0.4868	0.7705	0.739	1.510	0.070	44.37
	SD	0.2204	0.1139	0.3376	0.125	0.246	0.098	6.74
	3D 1m, 0-15cm av	1.9485	0.3744	0.9284	0.906	1.834	0.011	64.73
	SD	0.0435	0.0708	0.4603	0.454	0.835	0.016	7.39
3 DblbrN 1m	3 Dblbr N 1m avg	1.9494	0.4306	0.8495	0.823	1.672	0.041	54.55
	SD	0.0013	0.0795	0.1117	0.118	0.229	0.042	14.40
DblbrN 10	A 10m, 0-15cm av	1.8297	0.6116	0.6569	0.287	0.944	0.000	47.38
	SD	0.3219	0.0373	0.4871	0.201	0.310	0.000	37.55
	3D 10m, 0-15cm av	2.3823	0.3297	0.4724	1.559	2.031	0.000	39.22
	SD	0.2249	0.0903	0.3558	0.798	0.807	0.000	4.17
DblbrN 10	Dblbr N 10m av	2.1060	0.4707	0.5647	0.923	1.488	0.000	43.30
	SD	0.3907	0.1993	0.1305	0.899	0.769	0.000	5.77
4 DblbrN 1m	A 1m, 0-15cm av	2.0260	0.3599	0.8432	0.675	1.518	0.000	61.99
	SD	0.3464	0.0872	0.2493	0.104	0.353	0.000	17.40
	4D 1m, 0-15cm av	1.9275	0.3441	1.7305	0.355	2.085	0.000	77.27
	SD	0.2054	0.0709	1.1303	0.231	0.907	0.000	31.11
4 DblbrN 1m	4 Dblbr N 1m avg	1.9768	0.3520	1.2869	0.515	1.802	0.000	69.63
	SD	0.0697	0.0112	0.6274	0.226	0.401	0.000	10.80
DblbrN 10	A 10m, 0-15cm av	1.9891	0.4902	1.7162	0.558	2.275	0.000	45.90
	SD	0.1065	0.1394	1.2353	0.172	1.407	0.000	0.80
	4D 10m, 0-15cm av	2.1373	0.3283	1.1940	0.731	1.925	0.034	60.27
	SD	0.3548	0.0582	0.3568	0.133	0.224	0.049	6.42
DblbrN 10	Dblbr N 10m av	2.0632	0.4093	1.4551	0.645	2.100	0.017	53.09
	SD	0.1048	0.1145	0.3693	0.122	0.247	0.024	10.16
Dblbr N 1m	Dblbr N 1m Avg	1.9631	0.3913	1.0682	0.669	1.737	0.020	62.09
	SD	0.0432	0.0649	0.4463	0.231	0.277	0.034	13.56
Dblbr N 10m	Dblbr N 10m Avg	2.0846	0.4400	1.0099	0.784	1.794	0.009	48.19
	SD	0.2349	0.1374	0.5616	0.548	0.585	0.017	8.80
Dblbr N	Dblbr N Avg	2.0238	0.4156	1.0390	0.726	1.765	0.014	55.14
	SD	0.1693	0.1028	0.4706	0.394	0.425	0.025	12.93
3 DblbrS 1m	B 1m, 0-15cm av	2.2223	0.3153	0.4632	1.038	1.501	0.019	32.85
	SD	0.0280	0.0442	0.2727	0.394	0.666	0.027	12.92
	3C 1m, 0-15cm av	2.3472	0.3131	0.6566	0.617	1.273	0.000	46.29
	SD	0.3891	0.012	0.3232	0.219	0.482	0.000	1.85
3 DblbrS 1m	3 Dblbr S 1m avg	2.2848	0.3142	0.5599	0.828	1.387	0.010	39.57

Table E1. Soil Data from WS1 row planted and bedded pine areas (Plummer fine sand (28)), scrub/shrub (28), clearcut (28), cypress (33), ceda

x axis labels		b.d. mg/cm	moistg/100g	mg NH4/kg soil	mg NO2-NO3/kg so	min N	mg P/kg soi	mg C/kg soil
SD		0.0883	0.0016	0.1368	0.298	0.161	0.013	9.50
DblbrS 10	B 10m, 0-15cm av	2.1012	0.3357	0.5437	0.814	1.358	0.104	40.72
	SD	0.2138	0.0424	0.111	0.166	0.055	0.108	4.59
3C 10m, 0-15cm av		2.1134	0.2826	0.7489	0.725	1.479	0.001	47.49
	SD	0.0206	0.0576	0.1216	0.089	0.141	0.002	3.78
DblbrS 10	Dblbr S 10m avg	2.1073	0.3092	0.6463	0.770	1.419	0.053	44.11
	SD	0.0086	0.0375	0.1451	0.063	0.086	0.073	4.79
4 DblbrS 1m	B 1m, 0-15cm av	1.7251	0.5610	1.0676	0.902	1.970	0.000	42.23
	SD	0.3716	0.0878	0.1806	0.325	0.259	0.000	13.82
4C 1m, 0-15cm av		1.8342	0.4799	0.7370	0.296	1.033	0.000	72.79
	SD	0.0573	0.1389	0.1194	0.220	0.338	0.000	7.14
4 DblbrS 1m	4 Dblbr S 1m avg	1.7797	0.5205	0.9023	0.599	1.502	0.000	57.51
	SD	0.0771	0.0573	0.2338	0.429	0.663	0.000	21.61
DblbrS 10	B 10m, 0-15cm av	1.7939	0.4068	0.6257	0.908	1.534	0.091	56.82
	SD	0.2089	0.0919	0.1118	0.131	0.243	0.129	12.45
4C 10m, 0-15cm av		1.8511	0.4581	1.9647	1.079	3.044	0.022	66.93
	SD	0.1179	0.0174	0.6799	0.244	0.436	0.031	21.98
DblbrS 10	Dblbr S 10m avg	1.8225	0.4325	1.2952	0.994	2.289	0.057	61.88
	SD	0.0404	0.0363	0.9468	0.121	1.068	0.049	7.15
Dblbr S 1m	Dblbr S 1m Avg	2.0322	0.4173	0.7311	0.713	1.444	0.005	48.54
	SD	0.2994	0.1236	0.2521	0.329	0.399	0.010	17.12
Dblbr S 10m	Dblbr S 10m Avg	1.9649	0.3708	0.9708	0.882	1.854	0.055	52.99
	SD	0.1662	0.0773	0.6680	0.151	0.797	0.051	11.40
Dblbr S	Dblbr S Avg	1.9986	0.3941	0.8509	0.7974	1.6490	0.0296	50.7650
	SD	0.2270	0.0986	0.4846	0.2535	0.6232	0.0430	13.6723
cedar	cedar, 0-15cm		0.2797	0.2895	0.201	0.491	0.000	53.7
	cedar, 0-15cm		0.294	0.3526	0.146	0.499	0.000	75.5
	cedar, 0-15cm		0.2869	0.3211	0.174	0.495	0.000	64.60
	Standard Deviation		0.0101	0.0446	0.039	0.006	0.000	15.41
cypress	cypress, 0-15cm		1.4071	2.9275	17.519	20.446	0.000	139.4
	cypress, 0-15cm		1.7511	3.4241	9.815	13.239	0.000	111.5
	cypress, 0-15cm		1.5791	3.1758	13.667	16.843	0.000	125.45
	Standard Deviation		0.2432	0.3511	5.448	5.096	0.000	19.73
scrub/shrub	scrub-shrub, 0-15cm		0.4808	0.2282	0.445	0.673	0.373	59.4
	scrub-shrub, 0-15cm		0.4016	0.2797	0.862	1.141	0.858	42.2
	scrub-shrub, 0-15cm		0.4412	0.2540	0.654	0.907	0.616	50.80
	Standard Deviation		0.0560	0.0364	0.295	0.331	0.343	12.16
clearcut	clearcut, 0-15cm		0.8056	0.9718	0.302	1.274	0	59.1
	clearcut, 0-15cm		0.4597	0.8586	0.694	1.553	0	42.3
	clearcut, 0-15cm		0.6327	0.9152	0.498	1.414	0.000	50.70
	Standard Deviation		0.2446	0.0800	0.277	0.197	0.000	11.88
gum	gum, 0-15cm		3.1768	1.5974	27.503	29.1	0	110.6
	gum, 0-15cm		2.6403	1.1552	33.782	34.937	0	112.1
	gum, 0-15cm		2.9086	1.3763	30.643	32.019	0.000	111.35
	Standard Deviation		0.3794	0.3127	4.440	4.127	0.000	1.06

Water Quality

Methods

Water quality samples were taken monthly in the three watershed areas from July 1995 - September 1996. Each watershed was sampled at a minimum of three water quality sampling sites. WS1 and WS2 were sampled at one entrance and two exit sites in each respective watershed; WS3 was sampled at three entrance, one exit and one downstream water quality sampling site. A deep aquifer well was added to the sampling sites during the course of the project to compare surface and ground water chemistry measurements.

All measurements were taken following APHA (1992) approved methods. Parameters sampled included dissolved oxygen concentrations (mg/L), pH concentrations, conductivity (μ S), total dissolved solids (TDS) (mg/L), water and air temperatures ($^{\circ}$ C), turbidity (NTU) and total suspended solids (TSS) (mg/L), and stage height (ft). Water and air temperatures and dissolved oxygen were measured using YSI 57 dissolved oxygen meters and a Solomat multi-function meter. pH was tested using handheld pHtester pH meters, and a Solomat multi-function meter. Conductivity, TDS and water temperature were measured with an Oakton conductivity meter and a Solomat multi-function meter. Turbidity and TSS were measured using a Solomat multi-function meter. Stage height from surface at each site was recorded from Northwest Florida Water Management District field staff gauges at the three water quality sampling sites in WS1.

Meters were calibrated before each sampling period. Dissolved oxygen meters were calibrated before sampling and were calibrated to air temperature at each sampling site. pH meters were calibrated before sampling and in the field as needed. Data were analyzed and examined for water quality differences.

Results

The water quality data collected are presented in Appendix F. Table F1 contains the water quality data collected. The differences in water quality between the reference (WS3) and disturbed watersheds (WS1 and WS2) is apparent with consistently higher dissolved oxygen values in the reference watershed (Table F2). During dry periods of low or no water flow, low dissolved oxygen concentrations occurred at WS1 exit point sampling sites (Figure F1), with measurable oxygen available only in the top 5-8 cm of the water column (See Appendix VI). Very low oxygen concentrations (<4 mg/L) at water quality sampling sites occurred most frequently in WS1, but also occurred at exit points in WS2 and in Cat Branch in WS3 during times of very low water (Table F2).

Monthly pH concentrations follow the same pattern in all three watersheds. This pattern is negatively correlated (Average pH correlation with stage: WS1 $r = -0.89$; WS2 $r = -0.95$; WS3 $r = -0.92$) with staff gauge height in the three watersheds (Figure F3). Watershed average monthly conductivity is consistently highest in WS2, and lowest in WS3 (Figure F4). Average monthly watershed TDS concentrations, as expected, follow the same pattern as that found with conductivity, WS2 consistently has the highest TDS concentration, and WS3 has the lowest measured TDS concentrations (Figure F5). Water and air temperatures were highly correlated in all three watersheds (Figure F6, Average water temperature correlation with average air temperature within a

watershed: WS1 $r = 0.96$; WS2 $r = 0.92$; WS3 $r = 0.89$), with the highest temperatures measured in the summer months, and the lowest in the winter. Turbidity and TSS concentrations were measured monthly from May through September 1996 (Figures F7 and F8, respectively). These measurements are also highly correlated with each other in all three watersheds (Average TSS correlation with average turbidity within a watershed: WS1 $r = 0.997$; WS2 $r = 0.999$; WS3 $r = 0.998$). TSS and turbidity in the disturbed watersheds (WS1 and WS2) are negatively correlated with staff gauge height (Figure F9), with the highest turbidity during low water (June 1996) (Average turbidity correlation with stage: WS1 $r = -0.84$; WS2 $r = -0.86$; Average TSS correlation with stage: WS1 $r = -0.83$; WS2 $r = -0.86$). Turbidity and TSS show a very weak positive correlation in relation to staff gauge height in the reference watershed (WS3), where the highest turbidity occurred during high water (September 1996) (Average turbidity correlation with stage: WS3 $r = 0.22$; Average TSS correlation with stage: WS3 $r = 0.20$).

Discussion

Water quality was better in WS3 than in WS1 and WS2. WS3 had lower conductivity values and total dissolved solids (TDS) concentrations and higher dissolved oxygen concentrations (Table F1 and Table F2). The increased drainage in WS1 and WS2 appear to result in more frequent occurrences of low oxygen events in these watersheds than in the less responsive WS3 (Figure F2). While low oxygen events are normal in wetlands, these events generally follow seasonal low water cycles and are usually short-term (Mitsch and Gosselink 1993). Our data indicate that in WS1 and WS2, these low oxygen events (<4.0 mg dissolved oxygen/L) are frequent or continuous from May - September. Water transported from these areas to receiving water bodies is low in dissolved oxygen, and may contribute to water quality problems in receiving water bodies as indicated in Livingston (1991).

The changes in pH and TDS concentrations during times of decreased surface water input, indicate that these watersheds are groundwater dominated wetlands. Our data indicate that the drainage in WS1 and WS2 leads to rapid changes in pH and TDS concentrations and increased turbidity and TSS concentrations in receiving water bodies during drought cycles. The wetland character and water storage properties in these watersheds appear to have been dramatically altered by drainage; the once gradual changes during times of drought have been converted to rapid changes immediately following precipitation events. This increased pulse of water following large precipitation events -- particularly those precipitation events that follow periods of drought -- carries low pH, low oxygen water as a slug into receiving water bodies, impairing the water quality in these areas.

Hydrologic restoration of these areas is the first step to restoring wetland system function to the impaired watersheds and to improving and maintaining water quality in receiving waterbodies. The initial hydrologic restoration will begin the recovery of the Tate's Hell wetland system. However, for this process of recovery to be completed in a timely manner ($<50 - 200$ years), additional habitat restoration will be necessary. The restoration of herbaceous groundcover and some depressional wetland species such as wiregrass (*Aristida stricta*) and pond cypress (*Taxodium ascendens*) may be necessary to restore native functions to this wetland system and may aid in multiple use management goals for Tate's Hell State Forest. The restoration of herbaceous groundcover in this system will help provide fuel for groundfires needed to maintain the wet savanna and wet flatwoods habitat in Tate's Hell. These groundfires in turn supply a pulse of available carbon and nutrients to the soil,

and to streams receiving the surface runoff (Christensen 1993). These streams in turn supply carbon and nutrients to the receiving waterbodies, providing enrichment for these receiving waters.

The restored hydrology alone will begin improving the habitat in the Tate's Hell wetland system by providing improved water quality and more consistent water quantity to receiving water bodies. The water storage provided by hydrologic restoration will serve as a buffer and reduce flooding and drought events in receiving streams. Consistent stream flow in restored areas should reduce the duration and frequency of low oxygen events, thereby changing the composition of aquatic insects and fish species in these restored streams. These changes can be identified by continuing to monitor water quality parameters. As restoration proceeds, water quality should be monitored weekly immediately before, during, and immediately after restoration. In addition to the regular water quality parameters, water samples for carbon and nutrient analyses should be taken at immediately before restoration and immediately after restoration to determine any changes in water chemistry as a result of the restoration. An experiment monitoring the changes in the aquatic insect community should be conducted before, during and after the structural restoration. Fish should be sampled before and after restoration and annually following the restoration, to determine changes in fish species composition in response to restoration. Continued monitoring of water quality parameters in the three watersheds will help determine the degree of restoration success and will help follow the water quality changes as restoration proceeds.

Figure F1. Dissolved Oxygen WS1

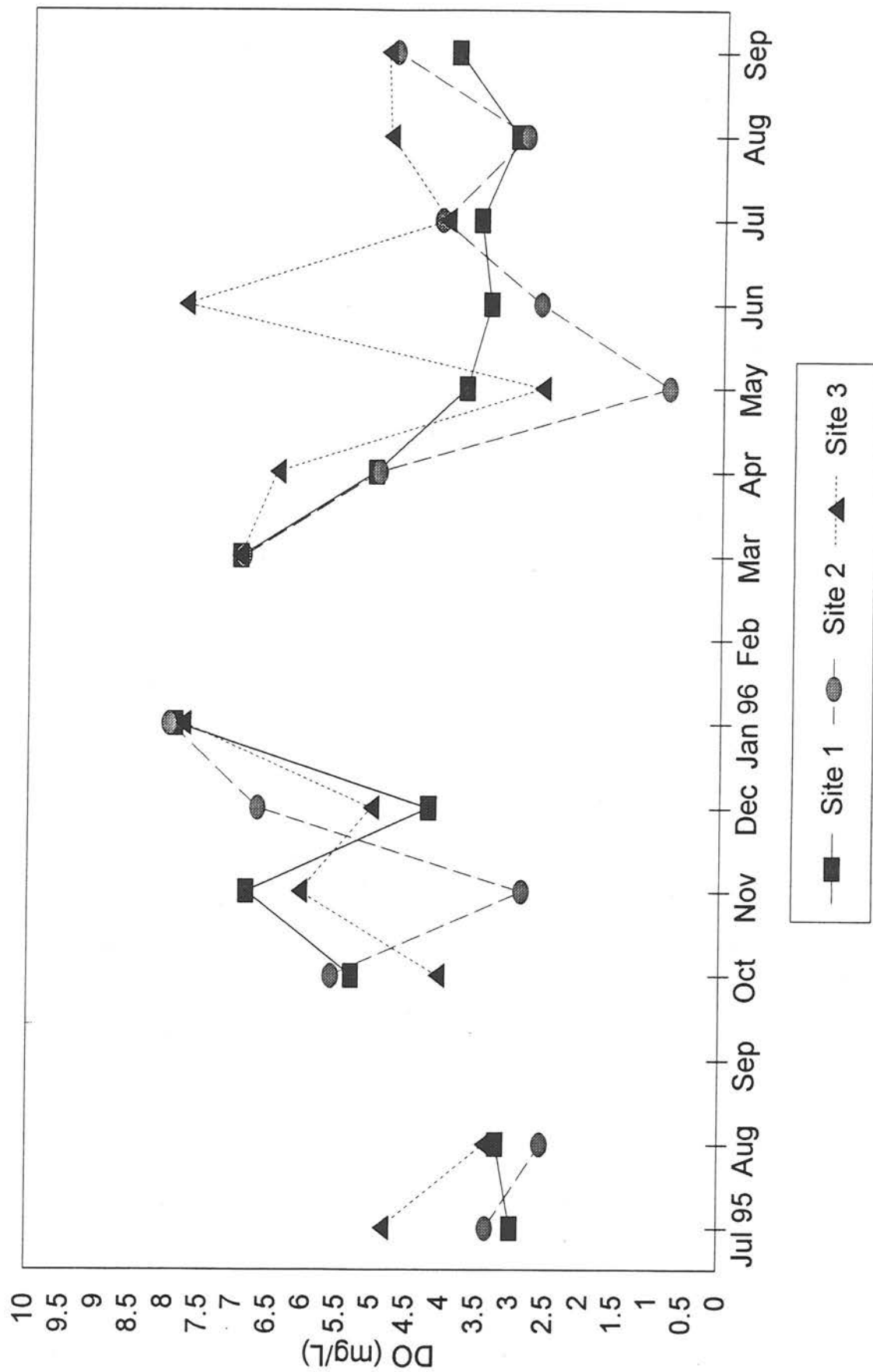


Figure F2. Dissolved Oxygen

Watershed Averages

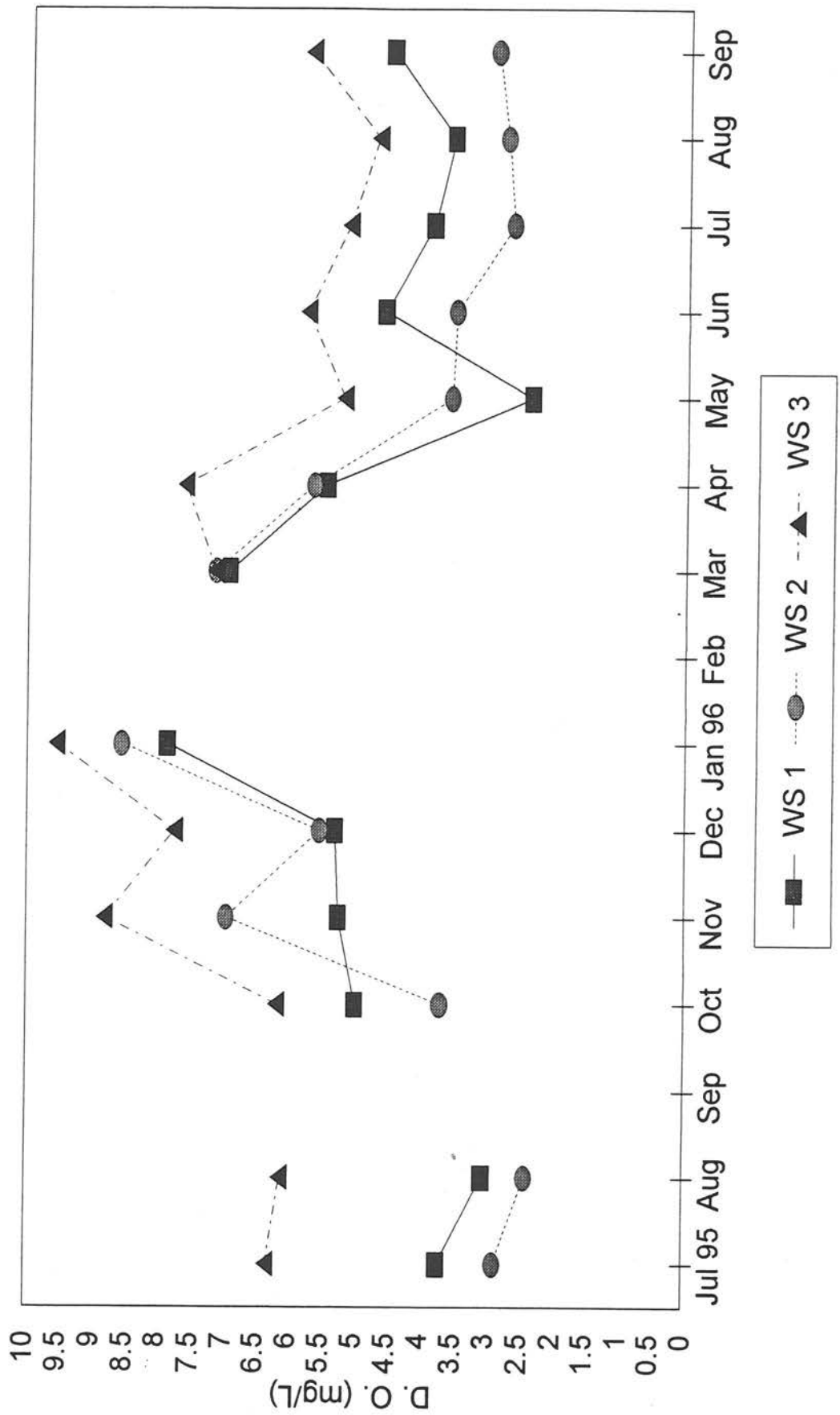


Figure F3. pH Concentrations

Watershed Averages

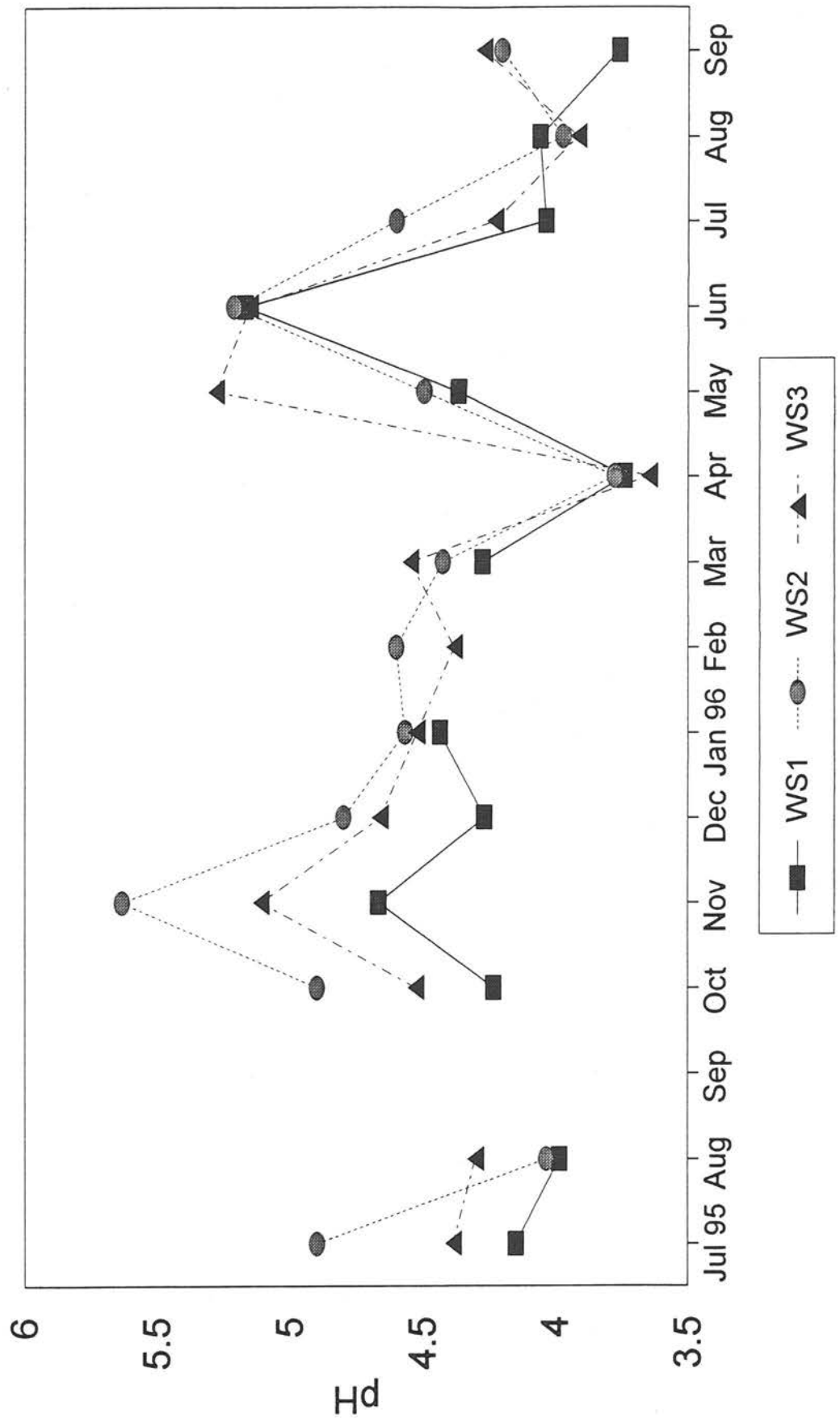


Figure F4. Conductivity Concentrations

Watershed Averages

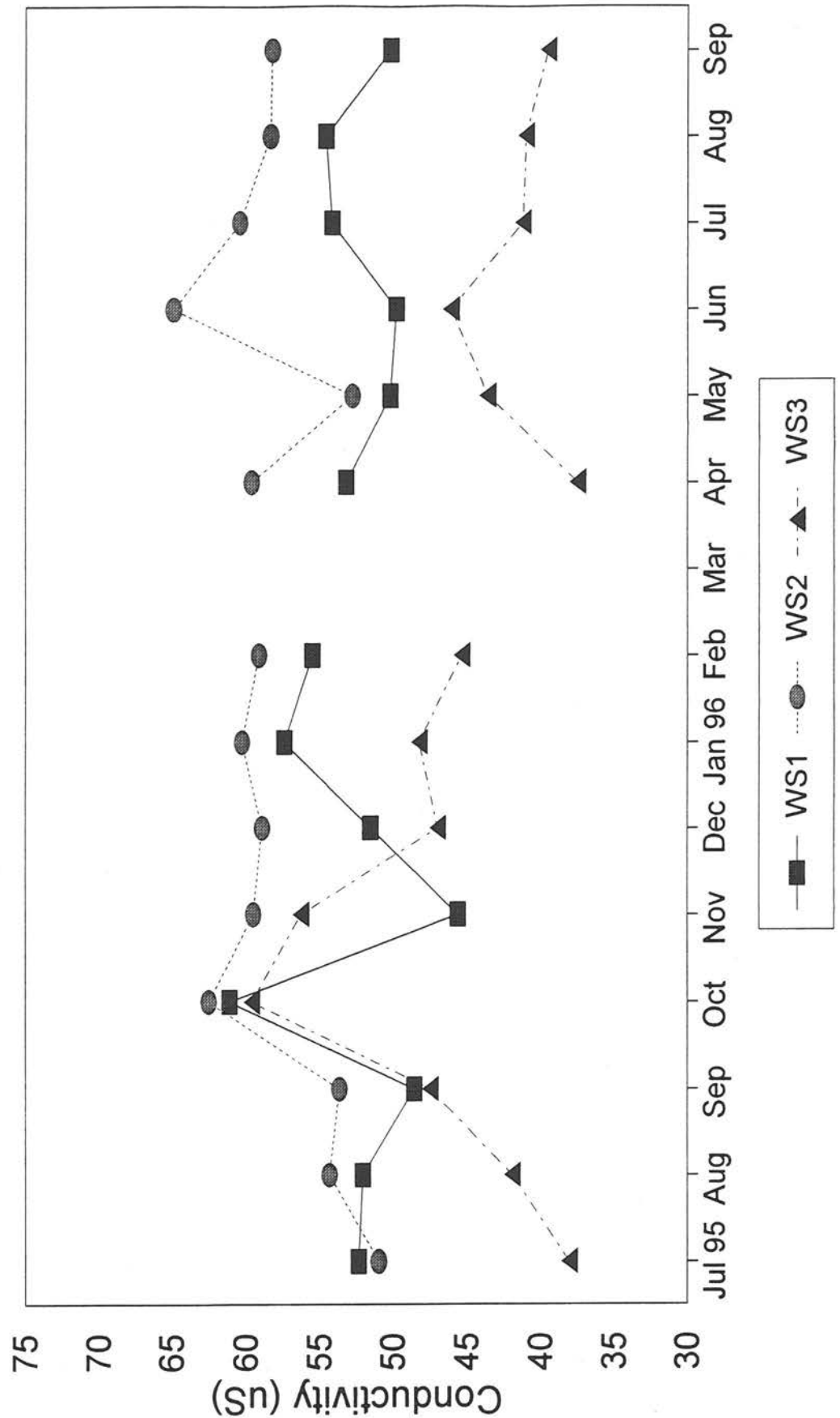


Figure F5. TDS Concentrations

Watershed Averages

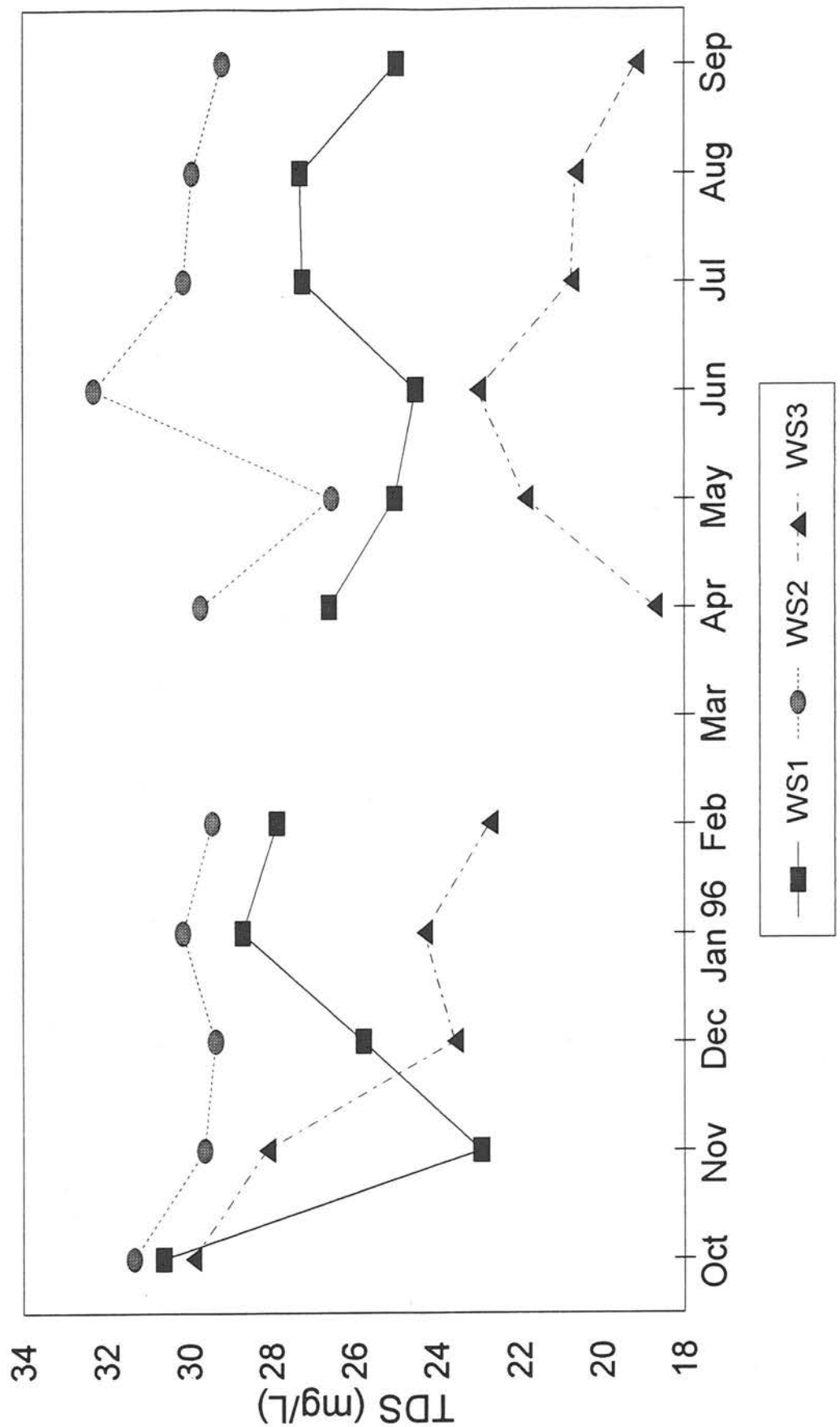


Figure F6 a. Water Temperature Watershed Averages

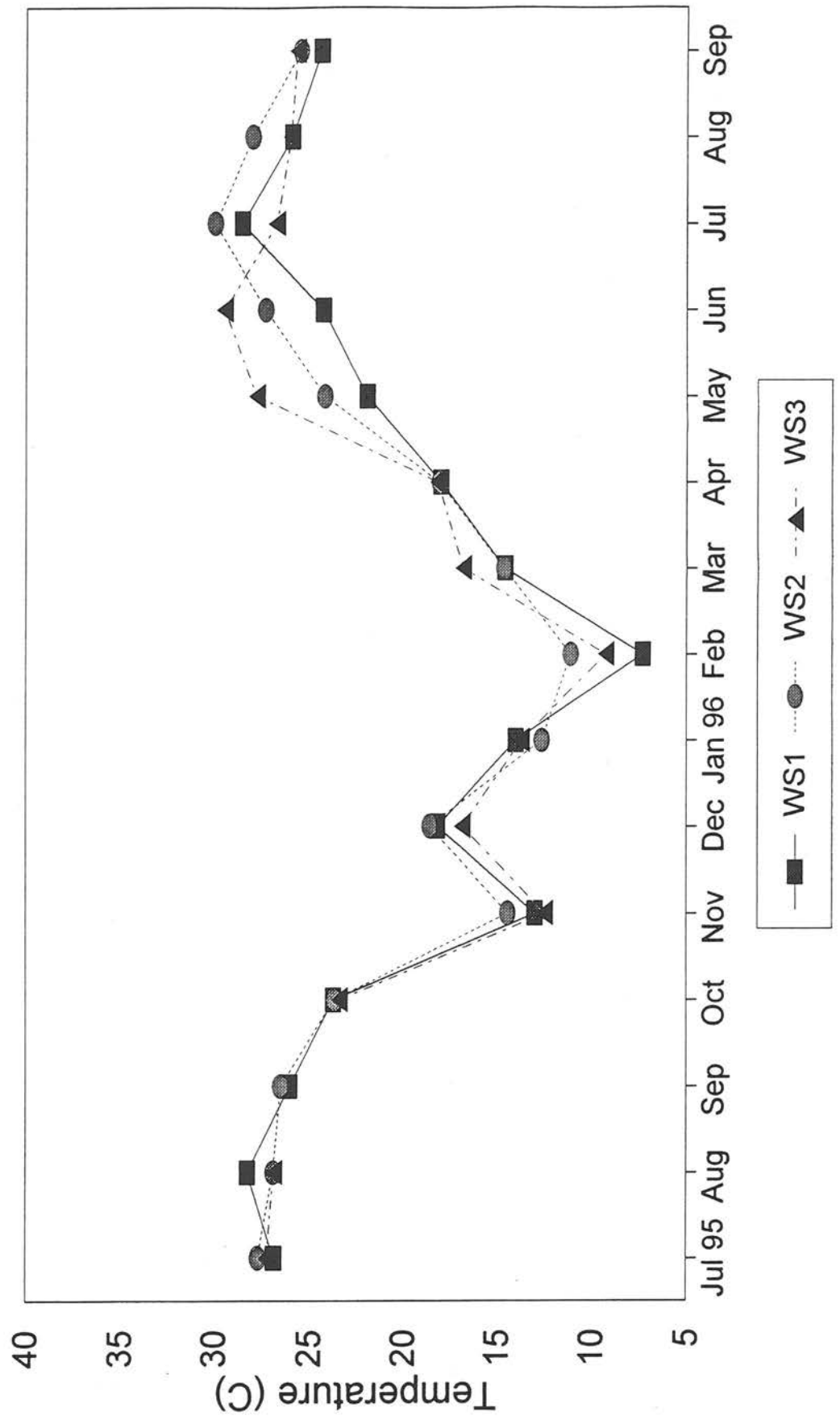


Figure F6 b. Air Temperature Watershed Averages

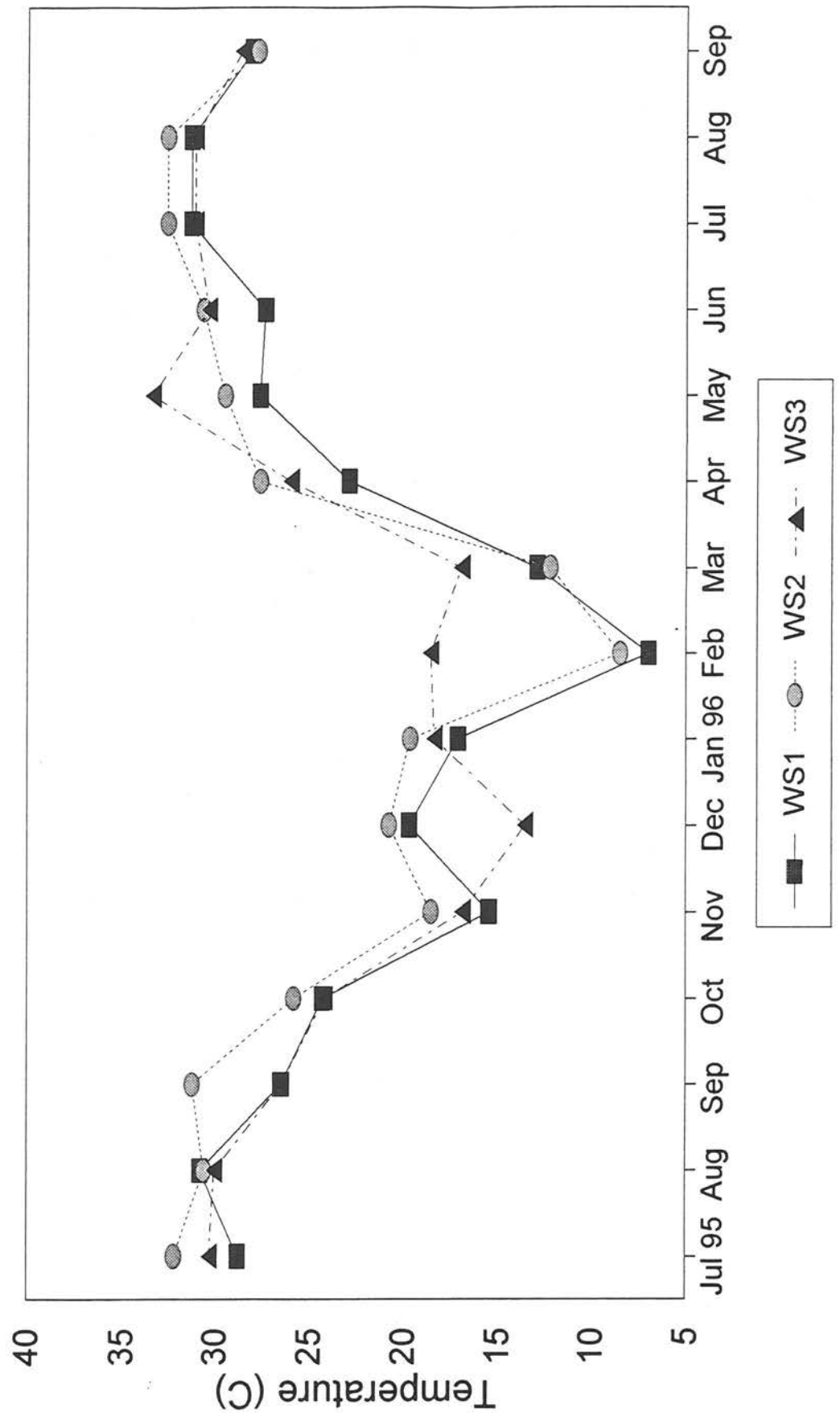


Figure F7. Turbidity Concentrations

Watershed Averages

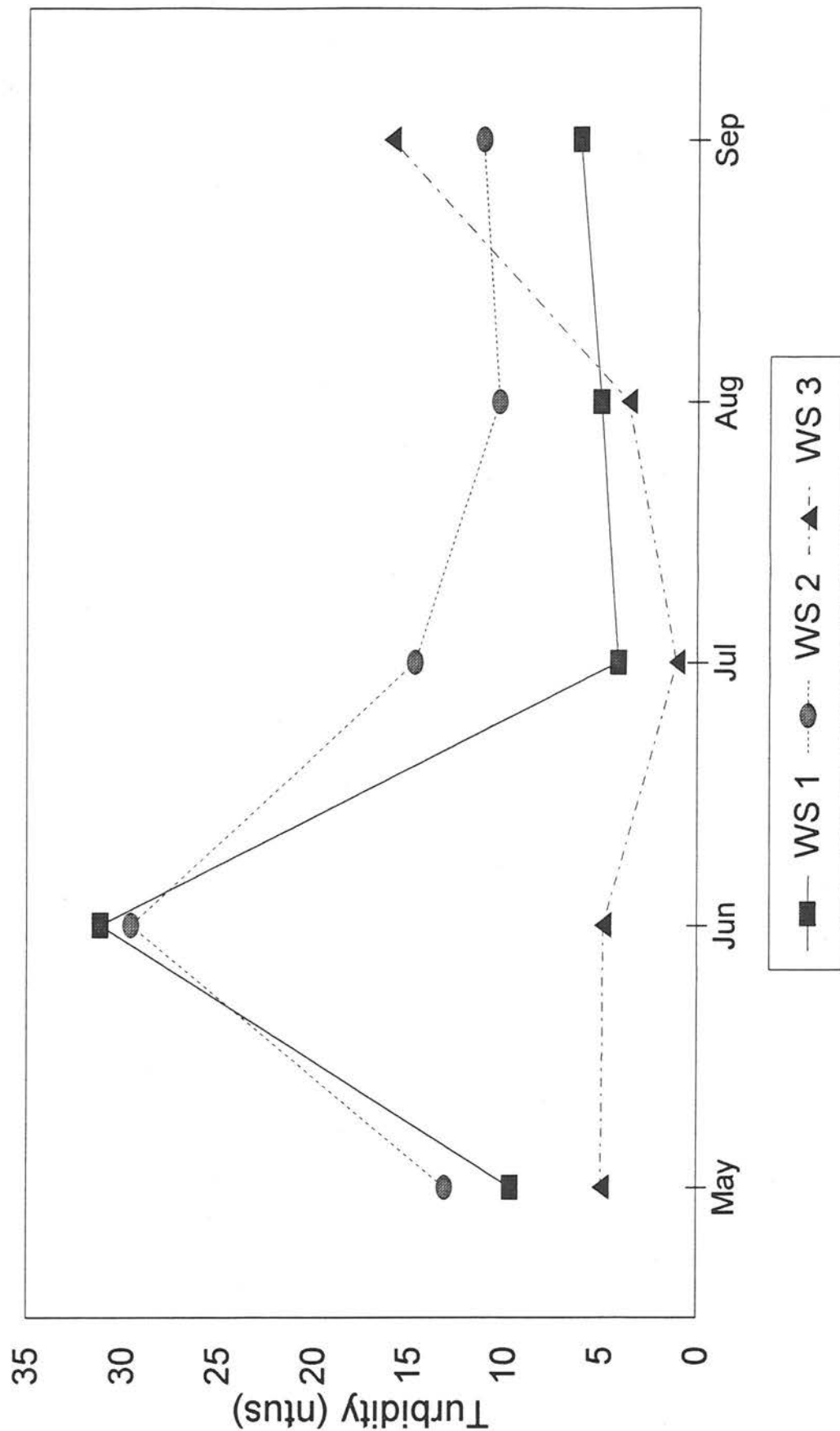


Figure F8. TSS Concentrations Watershed Averages

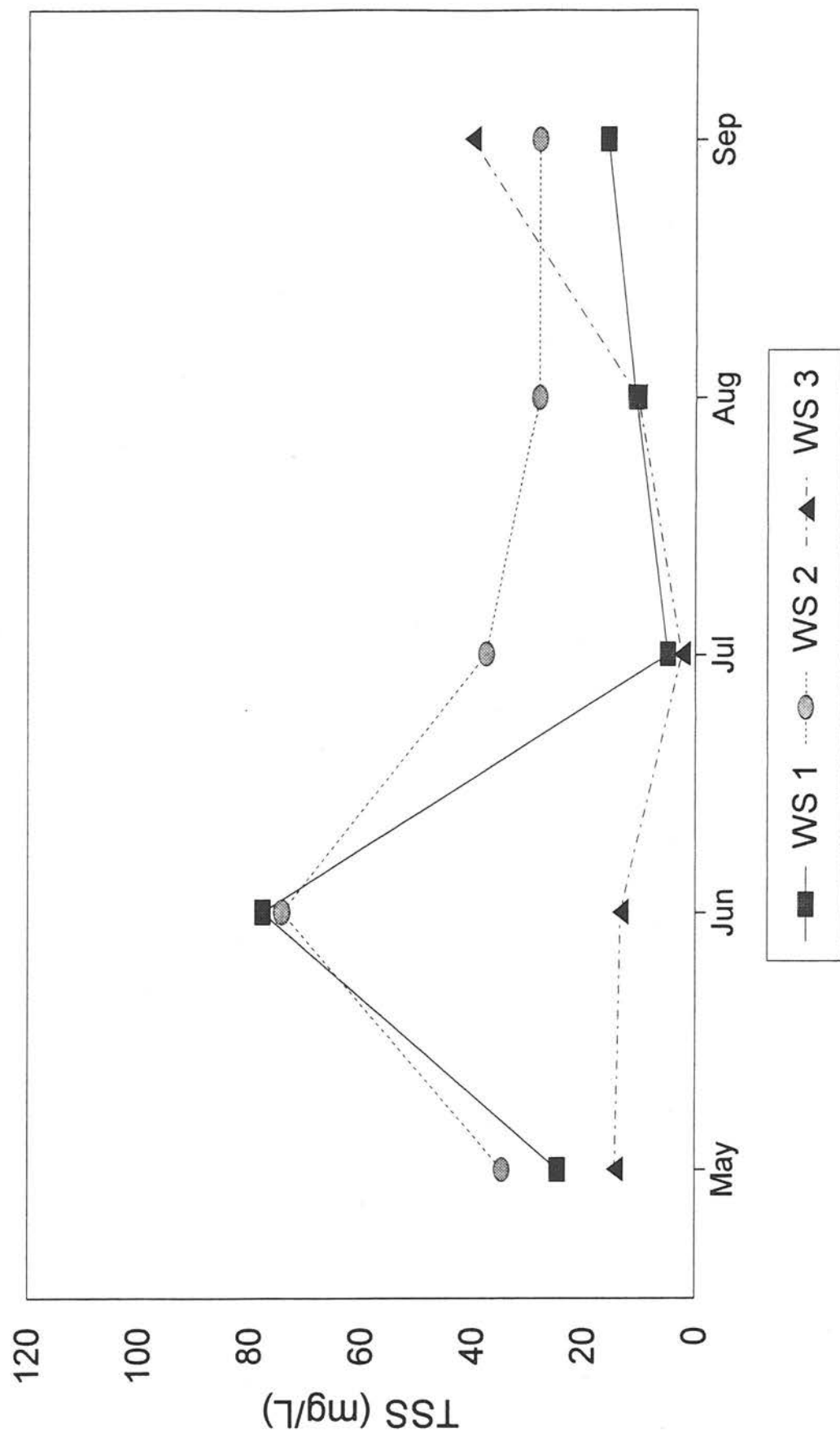


Figure F9. Staff Gauge Height Watershed One

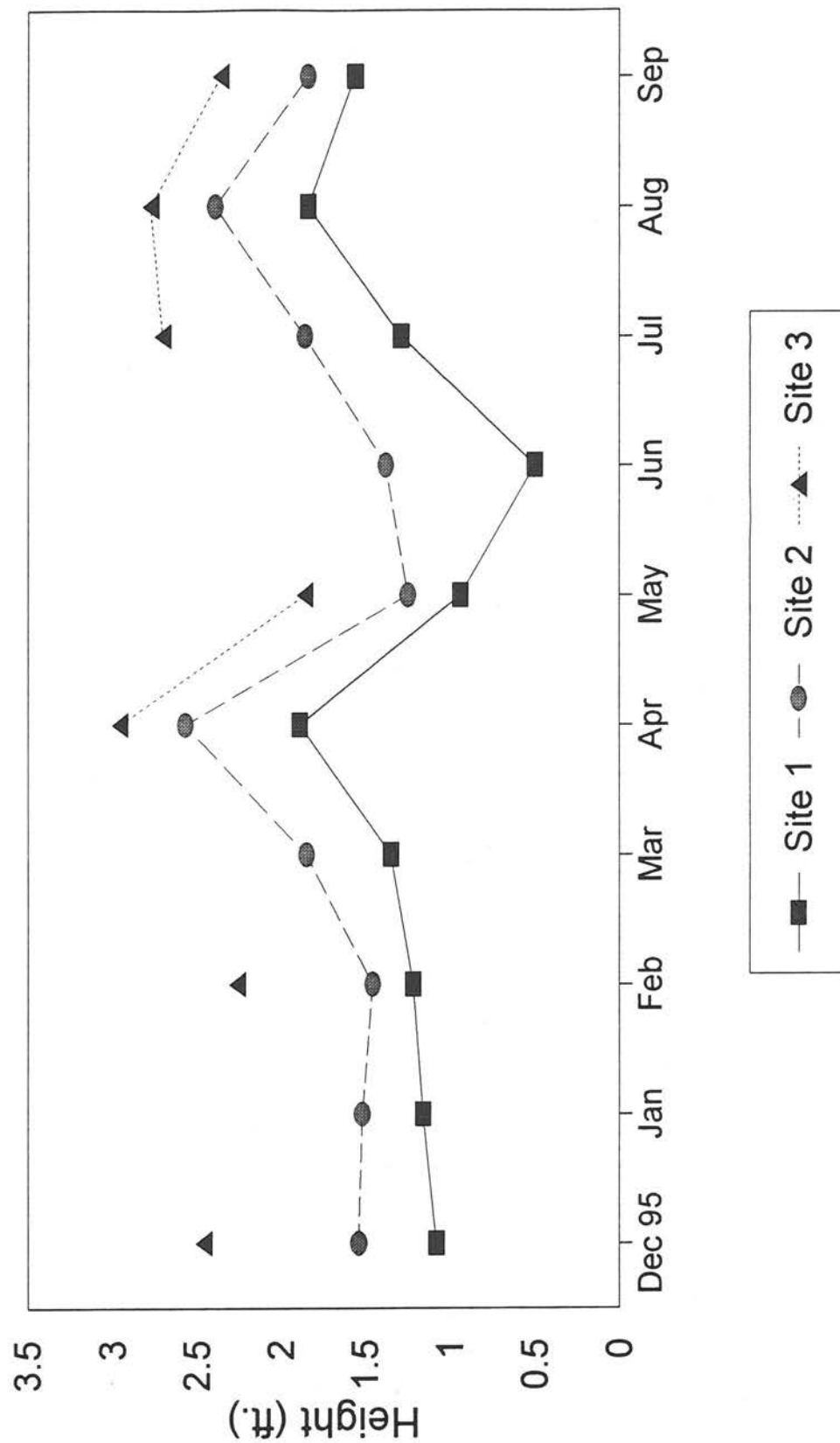


Table F1. Comparison of selected water quality parameter averages for each of the three watersheds in each month data was collected. The reference watershed (WS3) has consistently higher dissolved oxygen (D. O.) concentrations and consistently lower conductivity and turbidity values than the disturbed watersheds (WS1 and WS2).

Month	pH			D. O. (mg/L)			Conductivity (µS)			Turbidity (ntus)		
	WS1	WS2	WS3	WS1	WS2	WS3	WS1	WS2	WS3	WS1	WS2	WS3
July '95	4.15	4.90	4.38	3.73	2.89	6.33	52.3	51.0	38.0			
August	3.98	4.03	4.30	3.06	2.42	6.12	52.1	54.3	41.9			
September							48.6	53.7	47.5			
October	4.23	4.90	4.53	5.00	3.71	6.20	61.1	62.5	59.6			
November	4.27	5.63	5.11	5.26	6.97	8.82	45.6	59.5	56.3			
December	4.27	4.80	4.66	5.32	5.55	7.77	51.6	58.9	47.0			
January '96	4.43	4.57	4.52	7.88	8.58	9.55	57.4	60.3	48.3			
February		4.60	4.38				55.5	59.1	45.4			
March	4.27	4.42	4.54	6.95	7.16	7.17						
April	3.74	3.78	4.61	5.47	5.67	7.64	53.2	59.6	37.4			
May	4.36	4.49	5.28	2.38	3.60	5.22	50.2	52.8	43.6	9.7	13.1	5.0
June	5.17	5.21	5.15	4.61	3.53	5.79	49.8	64.9	46.1	31.2	29.6	4.9
July	4.03	4.60	4.23	3.88	2.67	5.16	54.1	60.4	41.2	4.2	14.7	1.1
August	4.06	3.97	3.91	3.58	2.78	4.73	54.6	58.3	41.0	5.1	10.4	3.7
September	3.76	4.20	4.27	4.51	2.93	5.75	50.2	58.2	39.4	6.1	11.2	16.0

Table F2. Water Quality data collected in all three watersheds.
July 1995

	Date	Time	pH	Cond. umhos/cm	Temp.(W) oC	Sal./TDS ppt/ppm	D.O. mg/L	Temp.(A) oC	Temp.(W) oC	Calib. mg/L
Mud Swamp\New River WA, W3	25-Jul-95	12:00noo	4.3	41		0	5.29	27.9	23.9	
Site 1	25-Jul-95	12:45 pm	4.25	39		0	5.45	30.2	26.9	
Site 2	25-Jul-95	1:30 pm	4.6	34		0	8.24	32.8	30.9	
Site 3										
Site 4										
Site 5										
Whiskey George Creek Tract, W1	26-Jul-95	12:50 pm	4.1	61		0	2.99	27.8	26.2	
Site 1	26-Jul-95	1:20 pm	4.1	61		0	3.35	28.1	25.9	
Site 2	26-Jul-95	2:45 pm	4.25	35		0	4.85	30.5	28.5	
Site 3										
Cash Creek Tract, W2	25-Jul-95	4:45 pm	5.45	46		0	2.51	33.4	27.1	
Site 1	25-Jul-95	5:00 pm	4.1	56		0	3.26	31	28.3	
Site 2	25-Jul-95	5:45 pm								
Site 3										

Table F2. Water Quality data collected in all three watersheds.
August 1995

	Date	Time	pH	Cond. umhos/cm	Temp.(W) oC	TDS ppm	D.O. mg/L	Temp.(A) oC	Temp.(W) oC	Calib. mg/L
Mud Swamp\New River WA, W3	24-Aug-95	11:17 am	4.3	40.3	27.2		6.01	28.2	26.5	7.78
Site 1	24-Aug-95	11:45 am	4.3	40.9	26.9		5.99	30.2	26.5	
Site 2	24-Aug-95	12:40 pm	4.6	38.3	28.8		7.42	31.8	28.7	
Site 3	24-Aug-95	1:54 pm	4.2	42.5	27.5		5.75	29.4	26.4	
Site 4	24-Aug-95	3:02 pm	4.1	47.7	26.1		5.45	30.5	26.2	
Site 5										
Whiskey George Creek Tract, W1	23-Aug-95	3:46 pm	3.9	57.7	28.5		3.21	31.3	28.3	
Site 1	23-Aug-95	4:06 pm	3.9	59.4	28.3		2.57	30.2	27.4	
Site 2	23-Aug-95	3:12 pm	4.15	39.1	30.8		3.39	30.9	29	
Site 3										
Cash Creek Tract, W2	23-Aug-95	11:21 am	4.1	57.8	27.1		1.41	31	26.2	
Site 1	23-Aug-95	11:52 am	3.9	55.2	28.8		2.49	29.2	28.3	
Site 2	23-Aug-95	10:50 am	4.1	50	26.6		3.35	31.6	26.2	7.28
Site 3										

Table F2. Water Quality data collected in all three watersheds.
September 1995

	Date	Time	pH	Cond. umhos/cm	Temp.(W) oC	Sal./TDS ppt/ppm	D.O. mg/L	Temp.(A) oC	Temp.(W) oC	Calib. mg/L
Mud Swamp\New River WA, W3	15-Sep-95		6.4	47.5	28.1			26.5		
Site 1										
Site 2										
Site 3										
Site 4										
Site 5										
Whiskey George Creek Tract, W1							0.7	25	24.3	
Site 1	14-Sep-95	7:15 pm		59.2	24.3		1.5	28	27.8	
Site 2	14-Sep-95	6:45 pm		38	27.8					
Site 3										
Cash Creek Tract, W2	14-Sep-95	3:05 pm		47.1	27.7		1.2	31.5	27.7	
Site 1										
Site 2	14-Sep-95	2:50 pm		60.2	25.3		1.5	31	25.3	
Site 3										

Table F2. Water Quality data collected in all three watersheds.
October 1995

	Date	Time	pH	Cond. umhos/cm	Temp.(W) oC	TDS ppm	D.O. mg/L	Temp.(A) oC	Temp.(W) oC	Calib. mg/L
Mud Swamp\New River WA, W3										
Site 1	10-Oct-95	4:37 pm	4.7	53.1	23.4	26.8	3.96	24.6	23.1	8.29
Site 2	10-Oct-95	4:57 pm	4.5	53.2	23.3	26.7	5.77	23.4	23	8.5
Site 3	10-Oct-95	5:24 pm	4.7	64.5	25	32.3	8.78	24.7	25.1	8.28
Site 4	10-Oct-95	5:40 pm	4.2	67.6	22.5	33.9	6.27	24.1	22.4	8.39
Site 5	10-Oct-95									
Whiskey George Creek Tract, W1										
Site 1	10-Oct-95	3:05 pm	4.3	62.2	23.4	31.2	5.32	23.2	24.4	8.31
Site 2	10-Oct-95	3:18 pm	4.1	67.1	23.7	33.6	5.61	25.1	23.7	8.25
Site 3	10-Oct-95	2:28 pm	4.3	54.1	23.3	27.1	4.08	24.6	23.1	8.31
Cash Creek Tract, W2										
Site 1	10-Oct-95	12:50 pm	5.2	68.4	23.2	34.4	2.82	24.4	23.4	8.36
Site 2	10-Oct-95	1:12 pm	4.4	66.3	24.4	33	5.08	26.6	24.2	8.01
Site 3	10-Oct-95	1:49 pm	5.1	52.9	23.7	26.6	3.23	26.5	23.5	7.97

Table F2. Water Quality data collected in all three watersheds.
November 1995

	Date	Time	pH	Cond. umhos/cm	Temp.(W) oC	Sal./TDS ppm	D.O. mg/L	Temp.(A) oC	Temp.(W) oC	Calib. mg/L
Mud Swamp\New River WA, W3										
Site 1	14-Nov-95	11:10 am	4.7	43.0	12.6	21.4	9.50	18.5	13.0	9.36
Site 2	14-Nov-95	12:10 pm	4.65	43.4	12.0	21.9	9.78	16.3	11.8	9.71
Site 3	14-Nov-95	1:05 pm	6.8	111.2	15.6	55.3	5.77	17.6	14.3	9.60
Site 4	14-Nov-95	2:08 pm	4.5	44.8	12.1	22.4	9.89	17.3	11.9	9.58
Site 5	14-Nov-95	3:45 pm	4.9	39.0	11.6	19.6	9.18	14.8	11.4	10.15
Whiskey George Creek Tract, W1										
Site 1	13-Nov-95	4:20 pm	4.7	41.4	16.6	21.2	6.85	17.0	15.5	9.85
Site 2	13-Nov-95	4:44 pm	4.4	54.3	10.7	26.9	2.87	15.7	10.7	9.96
Site 3	13-Nov-95	5:33 pm	4.9	41.1	13.6	20.7	6.07	13.8	12.8	10.37
Cash Creek Tract, W2										
Site 1	17-Nov-95	3:36 pm	6.0	50.8	14.7	25.3	5.94	19.9	13.6	9.11
Site 2	17-Nov-95	3:55 pm	4.5	53.1	16.5	26.4	7.69	17.9	15.7	9.46
Site 3	17-Nov-95	4:27 pm	6.4	74.6	13.7	37.2	7.29	17.9	14.1	9.48

Table F2. Water Quality data collected in all three watersheds.
December 1995

	Date	Time	pH	Cond. umhos/cm	Temp.(W) oC	TDS ppm	D.O. mg/L	Temp.(A) oC	Temp.(W) oC	Calib. mg/L	Staff Gauge
Mud Swamp\New River WA, W3											
Site 1	19-Dec-95	3:44 pm	4.5	44.5	19.0	22.4	7.77	17.9	19.3	9.52	
Site 2	19-Dec-95	3:56 pm	4.5	42.1	18.4	20.9	7.12	16.9	18.6	9.67	
Site 3	19-Dec-95	4:36 pm	5.4	44.4	19.5	22.4	8.78	16.9	20.0	9.67	
Site 4	20-Dec-95	1:20 pm	4.5	53.6	13.6	26.9	7.39	8.0	14.0	11.83	
Site 5	20-Dec-95	1:44 pm	4.4	50.3	12.0	25.2	7.79	8.2	12.4	11.73	
Whiskey George Creek Tract, W1											
Site 1	19-Dec-95	2:10 pm	4.6	44.3	19.3	22.1	4.22	19.2	18.2	9.19	1.08
Site 2	19-Dec-95	2:31 pm	4.1	60.1	18.1	30.0	6.69	18.2	18.0	9.47	1.54
Site 3	19-Dec-95	1:25 pm	4.1	50.3	18.7	25.2	5.04	21.8	18.4	8.76	2.46
Cash Creek Tract, W2											
Site 1	19-Dec-95	11:36 am	4.3	62.1	18.6	30.7	4.48	21.7	18.5	8.77	
Site 2	19-Dec-95	12:01 pm	4.5	56.7	19.0	28.6	5.53	19.9	19.2	9.09	
Site 3	19-Dec-95	12:40 pm	5.6	57.9	18.2	28.8	6.65	20.8	18.1	8.95	

Table F2. Water Quality data collected in all three watersheds.
January 1996

	Date	Time	pH	Cond. us	Temp.(W) C	Sal./TDS ppm	D.O. mg/L	Temp.(A) C	Temp.(W) C	Calib. mg/L	Staff Guage
Mud Swamp\New River WA, W3											
Site 1	18-Jan-96	6:05 pm	4.5	44.1	15.8	21.9	8.99	18.7	15.9	9.32	
Site 2	18-Jan-96	5:01 pm	4.5	44.6	15.6	22.4	8.85	19.1	15.8	9.24	
Site 3	18-Jan-96	4:01 pm	5.0	52.5	17.6	27.0	9.13	21.0	17.8	8.90	
Site 4	15-Jan-96	6:04 pm	4.3	52.0	8.9	25.7	10.62	16.1	9.3	9.83	
Site 5	15-Jan-96	5:04 pm	4.3	48.1	9.8	24.5	10.15	17.1	9.9	9.62	
Whiskey George Creek Tract, W1											
Site 1	16-Jan-96	5:04 pm	4.6	56.3	13.3	27.6	7.89	17.1	13.7	9.65	1.16
Site 2	16-Jan-96	5:37 pm	4.3	61.7	14.5	31.0	7.98	15.1	14.8	10.05	1.52
Site 3	16-Jan-96	3:43 pm	4.4	54.2	14.3	27.5	7.78	19.2	13.6	9.22	2.40
Cash Creek Tract, W2											
Site 1	16-Jan-96	11:14 am	4.5	61.8	12.1	31.1	7.62	18.2	12.3	9.38	
Site 2	16-Jan-96	11:51 am	4.5	62.6	12.6	31.0	8.83	18.2	12.6	9.38	
Site 3	16-Jan-96	1:03 pm	4.7	56.4	12.9	28.4	9.29	22.6	13.1	8.62	
Fire Tower Groundwater Well	18-Jan-96		7.1	691.0	19.8	346.0					

Table F2. Water Quality data collected in all three watersheds.
February 1996

	Date	Time	pH	Cond. us	Temp.(W) oC	TDS ppm	D.O. mg/L	Temp.(A) oC	Temp.(W) oC	Calib. mg/L	Staff Guage
Mud Swamp\New River WA, W3											
Site 1	18-Feb-96	~11:00 am	4.3	42.9	8.6	21.8	10.42*	19.2	8.1	9.22	
Site 2	18-Feb-96	~10:00 am	4.4	44.6	6.4	21.9	9.91*	17.0	6.7	9.65	
Site 3	18-Feb-96	~12:30 pm	4.9	52.0	13.3	25.7	14.35*	19.8	13.8	9.03	
Site 4	18-Feb-96	~2:30 pm	4.1	42.4	9.3	22.0	13.56*	17.8	9.7	9.41	
Site 5	18-Feb-96	~1:30 pm	4.2	45.0	8.0	22.2	13.47*	19.2	8.2	9.30	
Whiskey George Creek Tract, W1											
Site 1	17-Feb-96	9:18 am		47.9	9.4	23.8	8.92	4.8	6.1		1.22
Site 2	17-Feb-96	10:30 am		65.4	5.7	32.9	11.15	3.9	6.1		1.46
Site 3	17-Feb-96	11:30 am		53.2	9.7	26.9	8.47	12.3	9.8		2.26
Cash Creek Tract, W2											
Site 1	17-Feb-96	5:50 pm	4.5	61.7	10.8	30.9	10.25	7.8	11.5		
Site 2	17-Feb-96	6:20 pm	4.3	63.0	11.8	31.4	11.17	7.8	13.1		
Site 3	17-Feb-96	5:23 pm	5.0	52.6	8.5	26.0	11.18	10.0	8.7	11.25	

*This set of DO measurements for 18 Feb 96 appears to be inaccurate, a substantial air bubble was in the probe when we checked that evening.

Table F2. Water Quality data collected in all three watersheds.
March 1996

	Date	Time	pH	Cond. us	Temp.(W) oC	TDS *kohms	D.O. mg/L	Temp.(A) oC	Temp.(W) oC	Calib. mg/L	Staff Guage
Mud Swamp\New River WA, W3											
Site 1	19-Mar-96	12:10 pm	4.87	33.7	20.0		6.69	20.0	17.5	9.20	
Site 2	19-Mar-96	12:45 pm	4.52	37.9	17.3	26.4	6.75	15.2	16.1	10.20	
Site 3	19-Mar-96	2:03 pm	4.87	33.2	18.8	30.2	7.80	14.0	17.5	10.40	
Site 4	19-Mar-96	2:50 pm	4.23	44.4	17.3	22.5	6.92	16.5	16.9	9.80	
Site 5	19-Mar-96	3:50 pm	4.23	44.5	16.4	22.4	7.70	19.0	16.0	9.30	
Whiskey George Creek Tract, W1											
Site 1	20-Mar-96	11:17 am	4.28	75.8	13.6	13.2	6.96	15.1	12.5	10.70	1.35
Site 2	19-Mar-96	5:54 pm	4.09	61.8	17.3	16.2	6.91	12.6	16.7	10.63	1.85
Site 3	20-Mar-96	2:40 pm	4.45	39.3	15.2	25.4	6.97	11.1	14.6	11.00	
Cash Creek Tract, W2											
Site 1	20-Mar-96	4:00 pm	4.39	74.4	16.6	13.4	6.77	10.5	15.6	11.17	
Site 2	20-Mar-96	4:30 pm	4.26	65.9	16.0	15.1	7.71	13.2	15.7	10.52	
Site 3	20-Mar-96	3:15 pm	4.62	52.7	13.3	19.0	7.00	13.0	12.7	10.52	
Fire Tower Groundwater Well	19-Mar-96	11:30 am	5.72	684.2	19.4	0.23 ppt					

Table F2. Water Quality data collected in all three watersheds.
April 1996

Mud Swamp/New River WA, W3														
Date	Time	pH 1	mV 1	Cond. 2 us	W.Temp.2 oC	Cond. 1 us	W.Temp.1 oC	TDS 2 ppm	TDS 1 ppm	kohms 1	D.O.3 mg/L	A.Temp.3 oC	W.Temp.3 oC	Calib.3 mg/L
15-Apr-96	1:00pm	4.67	119.0	33.2	18.8	33.35	19.8	16.2	17.0	29	6.95	24.1	18.9	8.38
15-Apr-96	Site 1	4.61	125.0	36.4	18.2			18.4			7.21	25.0	17.9	8.24
15-Apr-96	2:20pm	4.80*	115.2*	30.4	20.9	30.62*	21.9*	15.4	38.0*	34*	8.71	31.0	21.0	7.41
15-Apr-96	2:50pm	4.70	118.8	42.7	16.4	42.56	17.6	21.1		24	7.82	26.0	16.2	8.07
15-Apr-96	3:20pm	4.26	143.8	44.5	17.5	44.33	18.2	22.6	26.0	22	7.53	23.9	16.8	8.37
Whiskey George Creek Tract, W1														
Date	Time	pH 1	mV 1	Cond. 2 us	W.Temp.2 oC	Cond. 1 us	W.Temp.1 oC	TDS 2 ppm	TDS 1 ppm	kohms 1	D.O.3 mg/L	A.Temp.3 oC	W.Temp.3 oC	Calib.3 mg/L
16-Apr-96	12:00noo	3.51	151.7	70.6	16.0	71.72	16.7	35.6	38.0	13	5.01	28.1	15.8	7.83
16-Apr-96	4:00pm	3.83	145.9	54.6	18.3	55.21	18.9	27.1	29.0	18	4.96	19.1	18.0	9.20
16-Apr-96	6:30pm	3.88	142.6	34.4	20.7	35.30	20.8	17.1	19.0	28	6.44	21.5	20.2	8.80
Cash Creek Tract, W2														
Date	Time	pH 1	mV 1	Cond. 2 us	W.Temp.2 oC	Cond. 1 us	W.Temp.1 oC	TDS 2 ppm	TDS 1 ppm	kohms 1	D.O.3 mg/L	A.Temp.3 oC	W.Temp.3 oC	Calib.3 mg/L
17-Apr-96	4:15pm	3.67	155.4	67.3	17.9	67.75	19.1	33.2	36.0	14	5.88	26.0	17.9	8.09
17-Apr-96	2:30pm	3.82	146.2	57.9	20.0	58.11	21.1	29.1	31.0	17	5.36	26.6	19.8	8.07
17-Apr-96	12:00noo	3.84	144.5	53.6	16.7	53.82	17.2	26.9	28.0	18	5.77	30.2	16.5	7.51
18-Apr-96	4:00pm	7.20	-25.6	0.699	21.6	0.700	20.2	346.0	346.0	1.443				

*Very variable readings from Solomat
2 Oakton Conductivity/TDS Meter
1 Solomat Multifunction Meter
3 YSI Dissolved Oxygen Meter

Table F2. Water Quality data collected in all three watersheds.
May 1996

Mud Swamp/New River WA, W3																		
Date	Time	pH 4	pH 1	mV 1	Cond. 2 us	W.Temp.2 oC	Cond. 1 us	W.Temp.1 oC	TDS 2 ppm	TDS 1 ppm	kohms 1	TSS 1 mg/L	Turbidity ntus	D.O.3 mg/L	A.Temp.3 oC	Calib.3 mg/L	D.O.1 mg/L	W.Temp.1 oC
20-May-96	04:45 PM	4.9	4.70	124.1	35.9	33.6	36.00	34.1	18.2	20	27	24.2	6.5	6.37	32.2	32.8	7.26	33.2
16-May-96	03:15 PM	4.7	4.33	146.9	39.3	24.9	40.05	24.9	19.7	22	24	13.0	5.2	6.20	31.7	24.6	6.55	24.6
20-May-96	04:05 PM	6.9	6.53	15.3	77.2	29.8	74.78	33.2	38.6	41	13	31.5	12.1	5.85	40.9	29.1	6.32	30.5
20-May-96	02:06 PM	5.9	5.62	65.3	33.6	30.4	33.50	32.5	16.9	18	29	3.0	1.1	5.62	33.4	29.4	7.12	31.3
20-May-96	11:14 AM	5.6	5.22	95.6	32.0	24.2	32.71	24.9	15.9	18	30	0.7	0.2	1.98	28.7	23.0	2.83	24.0
Whiskey George Creek Tract, W1																		
Date	Time	pH 4	pH 1	mV 1	Cond. 2 us	W.Temp.2 oC	Cond. 1 us	W.Temp.1 oC	TDS 2 ppm	TDS 1 ppm	kohms 1	TSS 1 mg/L	Turbidity ntus	D.O.3 mg/L	A.Temp.3 oC	Calib.3 mg/L	D.O.1 mg/L	W.Temp.1 oC
15-May-96	11:22 AM	4.5	4.26	149.6	63.8	23.1	63.80	25.0	31.8	33.0	16	16.7	6.8	3.72	28.8	23.5	7.70	25.5
15-May-96	03:21 PM	4.6	4.27	150.1	51.5	21.4	50.31	23.8	25.9	27.0	20	51.5	20.1	0.78	24.9	20.5	8.26	20.8
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
Cash Creek Tract, W2																		
Date	Time	pH 4	pH 1	mV 1	Cond. 2 us	W.Temp.2 oC	Cond. 1 us	W.Temp.1 oC	TDS 2 ppm	TDS 1 ppm	kohms 1	TSS 1 mg/L	Turbidity ntus	D.O.3 mg/L	A.Temp.3 oC	Calib.3 mg/L	D.O.1 mg/L	W.Temp.1 oC
14-May-96	11:49 AM		4.51	135.7	55.7	22.5	53.64	25.2	28.2	29.0	18	5.5	2.2	2.50	32.1	22.4	7.35	32.1
14-May-96	03:14 PM	4.3	3.85	148.0	55.2	26.3	53.30	30.5	27.6	28.0	19	57.1	23.0	4.13	29.1	26.4	7.67	29.2
14-May-96	06:21 PM	5.4	5.12	101.5	47.4	24.1	46.68	25.0	23.8	25.0	21	41.7	14.2	4.16	27.3	23.8	4.19	23.8
Fire Tower Groundwater Well																		
Date	Time	pH 4	pH 1	mV 1	Cond. 2 us	W.Temp.2 oC	Cond. 1 us	W.Temp.1 oC	TDS 2 ppm	TDS 1 ppm	kohms 1	TSS 1 mg/L	Turbidity ntus	D.O.3 mg/L	A.Temp.3 oC	Calib.3 mg/L	D.O.1 mg/L	W.Temp.1 oC
15-May-96	11:22 AM	4.5	4.26	149.6	63.8	23.1	63.80	25.0	31.8	33.0	16	16.7	6.8	3.72	28.8	23.5	7.70	25.5
15-May-96	03:21 PM	4.6	4.27	150.1	51.5	21.4	50.31	23.8	25.9	27.0	20	51.5	20.1	0.78	24.9	20.5	8.26	20.8
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4.56	130.6	35.4	24.6	34.59	23.5	17.3	19.0	28	5.7	2.3	2.63	29.2	21.8	7.65	23.6
16-May-96	11:33 PM	4.9	4															

Table F2. Water Quality data collected in all three watersheds.
June 1996

Mud Swamp/New River WA, W3														
Date	Time	pH 4	pH 1	mV 1	Cond. 2	Cond. 2	WTemp.2	Cond. 1	WTemp.1	TDS 2	TDS 1	kohms 1	TSS 1	Turbidity 1
					us	us	oC	us	oC	ppm	ppm		mg/L	ntus
12-Jun-96	12:59 PM	4.5	4.27	141.9	35.5	28.8	28.8	35.28	30.7	17.4	19	28	17.2	7.7
12-Jun-96	02:30 PM	4.3	4.24	143.4	35.5	28.8	28.8	36.71	28.7	18.1	20	27	15.2	3.4
13-Jun-96	01:30 PM	4.4	4.45	132.4	29.1	30.9	30.9	29.91	31.9	14.8	16	33	16.7	6.5
13-Jun-96	03:39 PM	6.4	6.59	8.3	61.4	32.0	32.0	62.23	32.3	30.5	33	16	2.5	1.2
13-Jun-96	11:35 AM	6.4	6.21	28.7	68.8	24.8	24.8	69.64	25.6	34.2	37	14	15.7	5.8
Whiskey George Creek Tract, W1														
Date	Time	pH 4	pH 1	mV 1	Cond. 2	Cond. 2	WTemp.2	Cond. 1	WTemp.1	TDS 2	TDS 1	kohms 1	TSS 1	Turbidity 1
					us	us	oC	us	oC	ppm	ppm		mg/L	ntus
19-Jun-96	01:00 PM	4.5	4.61	122.9	61.0	25.1	25.1	55.90	25.7	29.6	31	16	109.7	42.9
19-Jun-96	04:20 PM	4.5	4.45	135.5	33.3	23.4	23.4	34.89	23.8	16.6	18	28	86.7	36.3
19-Jun-96	05:35 PM	6.2	6.45	13.54	55.1	27.7	27.7	56.65	27.4	27.3	30	16	36.7	14.3
Cash Creek Tract, W2														
Date	Time	pH 4	pH 1	mV 1	Cond. 2	Cond. 2	WTemp.2	Cond. 1	WTemp.1	TDS 2	TDS 1	kohms 1	TSS 1	Turbidity 1
					us	us	oC	us	oC	ppm	ppm		mg/L	ntus
20-Jun-96	10:10 AM	5.1	4.82	113.1	49.5	25.7	25.7	49.88	25.5	24.5	20	20	24.7	10.1
20-Jun-96	12:05 PM	4.2	4.41	135.1	67.1	26.2	26.2	69.37	27	34.2	36.0	14	9.7	3.9
20-Jun-96	~3:30pm	6.3	6.41	10.8	78.1	26.0	26.0	79.23	26	38.2	42.2	12	188.5	74.7
19-Jun-96	12:15 PM	7.1	6.82	8.9	717.0	22.4	22.4	689.00	22.6	349.0	358.0	1.398		
Fire Tower Groundwater Well														
Date	Time	pH 4	pH 1	mV 1	Cond. 2	Cond. 2	WTemp.2	Cond. 1	WTemp.1	TDS 2	TDS 1	kohms 1	TSS 1	Turbidity 1
					us	us	oC	us	oC	ppm	ppm		mg/L	ntus
19-Jun-96	12:15 PM	7.1	6.82	8.9	717.0	22.4	22.4	689.00	22.6	349.0	358.0	1.398		

2 Oakton Conductivity/TDS Meter
1 Solomat Multifunction Meter
3 YSI Dissolved Oxygen Meter
4 pHTester pH Meter

Table F2. Water Quality data collected in all three watersheds.
July 1996

Mud Swamp/New River WA, W3														
Date	Time	pH 4	pH 1	mV 1	Cond. 2	Cond. 2	WTemp.2	Cond. 1	WTemp.1	TDS 2	TDS 1	kohms 1	TSS 1	Turbidity 1
					us	us	oC	us	oC	ppm	ppm		mg/L	ntus
16-Jul-96	12:30 PM		4.25	148.3	40	27.6	27.6	41.21	27.5	20.1	22	24	3.2	1.3
16-Jul-96	12:45 PM		4.28	145.2	38.1	27.3	27.3	39.47	28.1	19.1	21	25	0.7	0.3
16-Jul-96	03:34 PM		4.33	142.5	32.5	27.9	27.9	32.72	28.3	16.4	17	30		
16-Jul-96	02:30 PM		4.11	155.6	44.6	25.9	25.9	45.87	26.1	22.5	24	21		
22-Jul-96	11:30 AM		4.16	153.8	50.7	26.2	26.2	51.59	26.7	25.6	27	19	3.2	1.7
Whiskey George Creek Tract, W1														
Date	Time	pH 4	pH 1	mV 1	Cond. 2	Cond. 2	WTemp.2	Cond. 1	WTemp.1	TDS 2	TDS 1	kohms 1	TSS 1	Turbidity 1
					us	us	oC	us	oC	ppm	ppm		mg/L	ntus
18-Jul-96	12:00 PM		3.94	165.6	72.7	26.4	26.4	73.11	27	36.2	39	13	2.3	0.9
19-Jul-96	04:00 PM		3.95	164.9	54.1	30	30	55.7	31.5	27.2	30	17	6.8	2.6
18-Jul-96	11:30 AM		4.21	150.3	35.6	30.8	30.8	37.27	30.5	18.3	21	26	5.7	9
Cash Creek Tract, W2														
Date	Time	pH 4	pH 1	mV 1	Cond. 2	Cond. 2	WTemp.2	Cond. 1	WTemp.1	TDS 2	TDS 1	kohms 1	TSS 1	Turbidity 1
					us	us	oC	us	oC	ppm	ppm		mg/L	ntus
17-Jul-96	12:54 PM		4.46	129.4	44.8	29.6	29.6	44.6	30.4	21.7	24	22	13.2	5.3
17-Jul-96	~2:00pm		4.3	145.5	54.7	33.3	33.3	55.13	33.8	27.5	30	18	15	5.2
17-Jul-96	10:30 AM		5.03	102.4	81.7	28.5	28.5	88.47	28.2	41.2	47	11	84.5	33.7
19-Jul-96	~5:00 pm		6.83	-6.8	667.000	31.0	31.0	702.000	25.3	322.9	349.0	1.427	4.7	2.1

2 Oakton Conductivity/TDS Meter
1 Solomat Multifunction Meter
3 YSI Dissolved Oxygen Meter
4 pHTester pH Meter

Table F2. Water Quality data collected in all three watersheds, August 1996

Mud Swamp/New River WA, W3		Date	Time	pH 4	pH 1	mV 1	Cond. 2	Cond. 2	WTemp 2	Cond. 1	WTemp 1	TDS 2	TDS 1	kohms 1	TSS 1	Turbidity 1	D.O.3	A Temp.3	WTemp.3	Calib.3	D.O.1	WTemp.1	Staff Gauge
Site 1		14-Aug-96			4.64	125.7	us	30.5	27.5	30.04	28.2	14.8	16	32	15	5.9	3.84	32.6	26.7	7.3	3.58	26.4	N
Site 2		14-Aug-96	01:30 PM		3.58	187.5	42.3	27	43.16	27.6	27.6	21.7	23	23	13.5	5.5	4.53	32	26	7.28	4.19	25.8	
Site 3		14-Aug-96	01:08 PM		3.85	171.1	29.2	27.2	27.83	28	14.8	15	15	36	7.3	3.1	5.02	31.1	27.3	7.42	5	27.2	
Site 4		14-Aug-96	12:30 PM		3.65	186.5	53.1	25.5	54.15	26.8	25.5	25.1	28	175.43	4	1.6	5.03	28.5	25.2	7.73	4.62	25	
Site 5		14-Aug-96	11:20 AM		3.85	164.7	49.8	24.9	49.67	25.5	25.5	25.1	26	19	12.2	2.2	5.22	27	24.8	7.95	4.96	24.7	
Whiskey George Creek Tract, W1		Date	Time	pH 4	pH 1	mV 1	Cond. 2	Cond. 2	WTemp 2	Cond. 1	WTemp 1	TDS 2	TDS 1	kohms 1	TSS 1	Turbidity 1	D.O.3	A Temp.3	WTemp.3	Calib.3	D.O.1	WTemp.1	Staff Gauge
Site 1		15-Aug-96	11:45 AM		4.01	161.3	67.8	23.6	69.58	24.2	24.2	33.9	37	14	12.7	7.2	3.01	31.2	23.7	7.41	2.59	23.3	1.84
Site 2		15-Aug-96	01:15 PM		3.95	164	59.3	26	58.85	27	29.6	31	30	17	7	2.8	2.87	32	26	7.28	2.4	25.6	2.395
Site 3		15-Aug-96			4.21	149.8	36.6	28.5	37.25	28.7	28.7	18.4	20	26	12.6	5.2	4.85	33.6	28.1	7.11	4.09	27.7	2.78
Cash Creek Tract, W2		Date	Time	pH 4	pH 1	mV 1	Cond. 2	Cond. 2	WTemp 2	Cond. 1	WTemp 1	TDS 2	TDS 1	kohms 1	TSS 1	Turbidity 1	D.O.3	A Temp.3	WTemp.3	Calib.3	D.O.1	WTemp.1	Staff Gauge
Site 1		14-Aug-96	03:30 PM		4	177.2	52.7	28.5	57.53	28.2	28.4	28.4	31	17	7	2.6	4.19	30.5	27.6	7.47	3.9	27.5	
Site 2		14-Aug-96	04:15 PM		3.88	169.5	56.5	28.3	56.35	29.3	28.4	30	30	17	15.5	5.8	3.11	32	28.3	7.28	2.7	28.2	
Site 3		14-Aug-96	02:30 PM		4.03	159.5	65.8	28.3	66.4	28.8	28.8	33	35	15	61.5	22.7	1.03	34	28.1	7.05	0.06	27.8	
Fire Tower Groundwater Well		17-Aug-96	05:00 PM		7.18	-24.7	703.000	25.1	715.000	25.1	25.1	352.0	357.0	1.402	3.2	1.7							

2 Oakton Conductivity/TDS Meter
1 Solomat Multifunction Meter
3 YSI Dissolved Oxygen Meter
4 pHTester pH Meter

Table F2. Water Quality data collected in all three watersheds, September 1996

Mud Swamp/New River WA, W3		Date	Time	pH 4	pH 1	mV 1	Cond. 2	Cond. 2	WTemp 2	Cond. 1	WTemp 1	TDS 2	TDS 1	kohms 1	TSS 1	Turbidity 1	D.O.3	A Temp.3	WTemp.3	Calib.3	D.O.1	WTemp.1	Staff Gauge
Site 1		16-Sep-96	05:30 PM		4.71	136.9	35.3	26	35.82	26.6	26.6	17.8	19	27	66.7	26.7	5.3	27	27	7.97	4.86	26	
Site 2		16-Sep-96	05:00 PM		4.63	143.7	34.3	25.5	34.92	26.2	26.2	17.4	19	28	22.6	8.6	5.56	28.1	26	7.8	5.12	25.2	
Site 3		16-Sep-96	04:30 PM		4.45	153.5	26	28.4	27.14	29.1	29.1	13	15	36	84.7	34.1	6.49	28.5	28.2	7.76	6.5	28	
Site 4		16-Sep-96	03:40 AM		3.89	184.5	47.5	25	47.62	26.2	26.2	20.8	25	21	10.5	4.2	5.75	30.5	24.8	7.48	5.56	24	
Site 5		16-Sep-96	02:30 PM		3.66	200.4	54.1	24	52.89	24.1	24.1	26.9	28	18	17.2	6.6	5.64	29	23.7	7.69	4.91	23.3	
Whiskey George Creek Tract, W1		Date	Time	pH 4	pH 1	mV 1	Cond. 2	Cond. 2	WTemp 2	Cond. 1	WTemp 1	TDS 2	TDS 1	kohms 1	TSS 1	Turbidity 1	D.O.3	A Temp.3	WTemp.3	Calib.3	D.O.1	WTemp.1	Staff Gauge
Site 1		19-Sep-96	01:01 PM		3.5	184.5	62.8	23.2	63.13	23.7	23.7	31.5	33	15	30.5	11.7	3.88	28.5	23.2	7.74	3.47	23	1.56
Site 2		19-Sep-96	12:44 PM		3.83	167.3	52.3	24.2	53.21	24.7	26.2	26.2	28	18	4.5	1.8	4.76	26.7	24.4	8	4.18	24.2	1.84
Site 3		20-Sep-96	01:34 AM		3.95	156.3	35.4	25.7	35.24	26.6	26.6	17.2	19	27	12.5	4.9	4.89	29	25.6	7.67	4.09	25.5	2.36
Cash Creek Tract, W2		Date	Time	pH 4	pH 1	mV 1	Cond. 2	Cond. 2	WTemp 2	Cond. 1	WTemp 1	TDS 2	TDS 1	kohms 1	TSS 1	Turbidity 1	D.O.3	A Temp.3	WTemp.3	Calib.3	D.O.1	WTemp.1	Staff Gauge
Site 1		18-Sep-96	10:42 AM		4.05	175.7	66	24.7	66.5	25.1	25.1	33.1	35	15	15.6	6.4	3.75	28	24.9	7.81	3.53	24.5	
Site 2		18-Sep-96	10:15 AM		4.28	160.4	53.4	25.3	55.16	25.7	26.9	26.9	18	31.7	12.7	3.28	25.1	25.5	25.5	8.22	2.96	25.2	
Site 3		18-Sep-96	11:15 AM		4.27	164.9	55.3	26.1	55.66	26.6	26.6	27.6	30	18	36.7	14.5	1.76	30.1	26.1	7.52	1.56	25.7	
Fire Tower Groundwater Well		19-Sep-96	02:21 PM		6.76	-15.8	664.000	25.4	715.000	25.3	25.3	335.0	357.0	1.400	1.7	0.5	1.54	30.1	24.1	7.51			

2 Oakton Conductivity/TDS Meter
1 Solomat Multifunction Meter
3 YSI Dissolved Oxygen Meter
4 pHTester pH Meter

Fish

Methods

A limited survey of fish species in Tate's Hell Swamp and the New River/Mud Swamp Wilderness Area was conducted on September 14 and 15, 1995, on collection permit number FNW-95-1 issued September 12, 1995. Fish were sampled using electro-shocking, seining and dipnets at two sites in Tate's Hell State Forest, and three sites in the New River/Mud Swamp Wilderness Area. Sampling was attempted at three other sites in Tate's Hell Swamp and one additional site in the New River/Mud Swamp Wilderness Area, but no fish were collected in these attempts.

During this sampling effort the water was very low, as we had not had rainfall in several weeks, and water was not flowing in many of the streams and ditches. The New River was flowing, but the channel was reduced to about 5 meters width in the bend just north of county road 22, less than 1 meter just south of county road 22. Therefore, sites selected for sampling were in areas where the water was flowing or where there was deep standing water. Fish collected were preserved in formalin, identified and added to the collection at the University of Georgia Museum of Natural History. Survey and accession numbers and location of sampling sites for these collections can be found in Appendix G.

Results

The data collected from the fish species survey are presented in Appendix G (Table G1). A total of 18 species of fish were collected in Tate's Hell Swamp and the New River/Mud Swamp Wilderness Area reference site (Table G2). The two sites sampled in Tate's Hell produced a total of eight species, two of which (*Leptolucania ommata*, pygmy killifish and *Enneacanthus gloriosus*, bluespotted sunfish) were not collected in Mud Swamp. The three sites sampled in the New River/Mud Swamp Wilderness Area yielded 15 species; nine were collected only in this area (Table 11).

Only the main channel of the New River was flowing at the ANF 182 bridge at the entrance of the New River/Mud Swamp Wilderness area (WS3); the water depth at the deepest point at this site was less than 4 feet. The lack of flowing water and the length of time since the last rainfall event probably resulted in reduced availability of organisms during this sampling effort. The lack of flowing water supplying new organisms and the length of drought prior to sampling resulted in a large collection of predator species and very few prey species in most sites. Diversity was highest in the New River/Mud Swamp Wilderness Area, at the Cat Branch sampling site (Hill's $N1 = 8.533$), and lowest in Tate's Hell State Forest at the Bucksiding sampling site (Hill's $N1 = 1.332$). Total abundance per effort was greatest at the Ralph's Road sampling site ($n = 64$) in Tate's Hell State Forest.

Discussion

We sampled fish communities during a very dry period in which water was not flowing in most of the streams and drainage ditches, and fish were concentrated in depressions of deeper water. This concentration of fish makes them more readily available to predators, and typically attracts predators

(O'Bryan and Carlson 1995). During this sampling period, the Apalachicola National Forest Road 114 cypress strand, where we found brown water snakes, *Nerodia taxispilota* and/or *fasciata*, and water moccasins, *Agkistrodon piscivorus*, had an abundance of fish predators but lacked any fish.

Fish species that were collected from Tate's Hell Swamp and Mud Swamp are typical of wetland streams. Species particularly adapted to fluctuating water levels and periods of anoxia (specifically *Fundulus escambiae* and *Gambusia holbrooki*) are found in both areas. *Gambusia holbrooki* are more abundant in Tate's Hell State Forest than in the reference area, possibly indicative of the frequency of anoxia at the Tate's Hell site.

The diversity of species found in the New River/Mud Swamp Wilderness Area is greater than that found in Tate's Hell State Forest. This difference in diversity is possibly a result of the difference in water quality between the watershed areas as discussed above, but this single sampling effort provides too little definitive evidence to support any speculation. These data do provide preliminary evidence that the fish community in Tate's Hell State Forest is diverse enough to recover to more natural relative abundances with hydrologic restoration and water quality improvement.

Table G1. Tate's Hell Swamp and New River/Mud Swamp Fish Survey September 1995
Collection Permit # FNW-95-1 issued on September 12, 1995
All fishes are adults unless noted.

Drainage-Apalachicola River and Bay

Collectors: 14-Sep-95: M Flood, MF; S Parker, SP; 15-Sep-95: MF, SP, A Parker, AP; J Ziewitz, JZ; L Jenkins, LJ
Specimens reside at the UGA Museum of Natural History and accession numbers are preceded by the UGAMNH designation.

Survey	Accession #	Date	Family	Scientific Name	Common Name	Adults	Juveniles	Location
MGF 95-06	2882	15-Sep-95	Ictaluridae	Ameiurus nebulosus	brown bullhead	2		Tate's Hell Swamp, ditch on Bucksiding btw Broad and Ralph Rds
MGF 95-02	2879	14-Sep-95	Ictaluridae	Ameiurus nebulosus	brown bullhead	1		Tate's Hell Swamp, ditch on Bucksiding btw Broad and Ralph Rds
MGF 95-06	2882	15-Sep-95	Anguillidae	Anguilla rostrata	American eel	1		Tate's Hell Swamp, bridge on Bucksiding btw Broad and Ralph Rds
MGF 95-06	2882	15-Sep-95	Aphredoderidae	Aphredoderus sayanus	pirate perch	2		Tate's Hell Swamp, bridge on Bucksiding btw Broad and Ralph Rds
MGF 95-02	2879	14-Sep-95	Aphredoderidae	Aphredoderus sayanus	pirate perch	5		Tate's Hell Swamp, bridge on Bucksiding btw Broad and Ralph Rds
MGF 95-06	2882	15-Sep-95	Centrarchidae	Centrarchus macropterus	fler	1		Tate's Hell Swamp, bridge on Bucksiding btw Broad and Ralph Rds
MGF 95-02	2879	14-Sep-95	Centrarchidae	Centrarchus macropterus	fler	1		Tate's Hell Swamp, bridge on Bucksiding btw Broad and Ralph Rds
MGF 95-01	2878	14-Sep-95	Centrarchidae	Centrarchus macropterus	fler	1		Tate's Hell Swamp, bridge on Bucksiding btw Broad and Ralph Rds
MGF 95-05	2881	15-Sep-95	Centrarchidae	Elasoma okfenokee	Okfenokee pygmy sunfish	2		Tate's Hell Swamp, bridge on Bucksiding btw Broad and Ralph Rds
MGF 95-02	2879	14-Sep-95	Centrarchidae	Enneacanthus gloriosus	bluespotted sunfish	5		Tate's Hell Swamp, bridge on Bucksiding btw Broad and Ralph Rds
MGF 95-06	2882	15-Sep-95	Esocidae	Esoc americanus	redfin/grass pickerel	2		New River off 22 below ANF120-B bridge
MGF 95-02	2879	14-Sep-95	Percidae	Etheostoma fusiforme	swamp darter	1		New River off 22 below ANF120-B bridge
MGF 95-03	2880	15-Sep-95	Percidae	Etheostoma fusiforme	swamp darter	4		New River off 22 below ANF120-B bridge
MGF 95-03	2880	15-Sep-95	Cyprinodontidae	Fundulus escambiae	Eastern starhead topminnow	3		New River off 22 below ANF120-B bridge
MGF 95-06	2882	15-Sep-95	Cyprinodontidae	Fundulus escambiae	Eastern starhead topminnow	1		New River off 22 below ANF120-B bridge
MGF 95-02	2879	14-Sep-95	Poeciliidae	Gambusia holbrooki	Eastern mosquitofish	30		New River off 22 below ANF120-B bridge
MGF 95-03	2880	15-Sep-95	Poeciliidae	Gambusia holbrooki	Eastern mosquitofish	12		New River off 22 below ANF120-B bridge
MGF 95-05	2881	15-Sep-95	Poeciliidae	Gambusia holbrooki	Eastern mosquitofish	6		New River at ANF 182 at bridge
MGF 95-05	2881	15-Sep-95	Atherinidae	Labidesthes sicculus	brook silverside	4		New River at ANF 182 at bridge
MGF 95-03	2880	15-Sep-95	Atherinidae	Labidesthes sicculus	brook silverside	3		New River at ANF 182 at bridge
MGF 95-03	2880	15-Sep-95	Centrarchidae	Lepomis gulosus	warmouth	1	5	New River at ANF 182 at bridge
MGF 95-06	2882	15-Sep-95	Centrarchidae	Lepomis gulosus	warmouth	2		New River tributary, Cat Branch at ANF 120 bridge
MGF 95-02	2879	14-Sep-95	Centrarchidae	Lepomis gulosus	warmouth	2		New River tributary, Cat Branch at ANF 120 bridge
MGF 95-06	2882	15-Sep-95	Centrarchidae	Lepomis marginatus	dollar sunfish	2		New River tributary, Cat Branch at ANF 120 bridge
MGF 95-03	2880	15-Sep-95	Centrarchidae	Lepomis marginatus	dollar sunfish	3	10	New River tributary, Cat Branch at ANF 120 bridge
MGF 95-01	2878	14-Sep-95	Cyprinodontidae	Leptolucania ommata	pygmy killifish	11		New River tributary, Cat Branch at ANF 120 bridge
MGF 95-02	2879	14-Sep-95	Cyprinodontidae	Leptolucania ommata	pygmy killifish	19		New River tributary, Cat Branch at ANF 120 bridge
MGF 95-06	2882	15-Sep-95	Centrarchidae	Micropterus salmoides	largemouth bass	1		New River tributary, Cat Branch at ANF 120 bridge
MGF 95-05	2881	15-Sep-95	Cyprinidae	Notropis cummingsae	dusky shiner	1		New River tributary, Cat Branch at ANF 120 bridge
MGF 95-03	2880	15-Sep-95	Percidae	Percina nigrofasciata	blackbanded darter	1		New River tributary, Cat Branch at ANF 120 bridge

Species richness in THS sites equal 2 and 8 respectively with a total of 8 different species.

Species richness in NRMSWA sites equals 7, 4, and 9 respectively with a total of 15 different species.

Of the 17 species collected, six species were common to both areas, 2 species were collected only in THS, and 9 species were collected only in the NRMSWA.

Table G1. Tate's Hell Swamp and New River/Mud Swamp Fish Survey September 1995
Collection Permit # FNW-95-1 issued on September 12, 1995

Survey	Accession #	Date	Family	Scientific Name	Adults	Juveniles	Total	Simpson's Index	Shannon-Wiener
MGF 95-01	2878	14-Sep-95	Centrarchidae	Centrarchus macropterus	1		1	0	-0.2071
MGF 95-01	2878	14-Sep-95	Cyprinodontidae	Leptolucania ommata	11		11	0.83	-0.0798
				Total			12	0.83	0.2868
				Hill's N0 =	2		Hill's N2 =	1.200	
							Hill's N1 =	1.332	
MGF 95-02	2879	14-Sep-95	Aphredoderidae	Aphredoderus sayanus	5		5	0.0050	-0.1992
MGF 95-02	2879	14-Sep-95	Centrarchidae	Centrarchus macropterus	1		1	0.0000	-0.0650
MGF 95-02	2879	14-Sep-95	Centrarchidae	Enneacanthus gloriosus	5		5	0.0050	-0.1992
MGF 95-02	2879	14-Sep-95	Centrarchidae	Lepomis gulosus	2		2	0.0005	-0.1083
MGF 95-02	2879	14-Sep-95	Cyprinodontidae	Leptolucania ommata	19		19	0.0848	-0.3605
MGF 95-02	2879	14-Sep-95	Ictaluridae	Ameiurus nebulosus	1		1	0.0000	-0.0650
MGF 95-02	2879	14-Sep-95	Percidae	Etheostoma fusiforme	1		1	0.0000	-0.0650
MGF 95-02	2879	14-Sep-95	Poeciliidae	Gambusia holbrooki	30		30	0.2158	-0.3552
				Total		8	64	0.3110	1.4173
				Hill's N0 =			Hill's N2 =	3.215	
							Hill's N1 =	4.126	
MGF 95-03	2880	15-Sep-95	Atherinidae	Labidesthes sicculus	3		3	0.0035	-0.1885
MGF 95-03	2880	15-Sep-95	Centrarchidae	Lepomis gulosus	1		6	0.0174	-0.2780
MGF 95-03	2880	15-Sep-95	Centrarchidae	Lepomis marginatus	3	5	13	0.0906	-0.3630
MGF 95-03	2880	15-Sep-95	Cyprinodontidae	Fundulus escambiae	3	10	3	0.0035	-0.1885
MGF 95-03	2880	15-Sep-95	Percidae	Etheostoma fusiforme	4		4	0.0070	-0.2239
MGF 95-03	2880	15-Sep-95	Percidae	Percina nigrofasciata	1		1	0.0000	-0.0890
MGF 95-03	2880	15-Sep-95	Poeciliidae	Gambusia holbrooki	12		12	0.0767	-0.3579
				Total		7	42	0.1986	1.6888
				Hill's N0 =			Hill's N2 =	5.035	
							Hill's N1 =	5.413	
MGF 95-05	2881	15-Sep-95	Atherinidae	Labidesthes sicculus	4		4	0.0769	-0.3627
MGF 95-05	2881	15-Sep-95	Centrarchidae	Elassoma okfenokee	2		2	0.0128	-0.2880
MGF 95-05	2881	15-Sep-95	Cyprinidae	Notropis cummingsae	1		1	0.0000	-0.1973
MGF 95-05	2881	15-Sep-95	Poeciliidae	Gambusia holbrooki	6		6	0.1923	-0.3569
				Total		4	13	0.2821	1.2048
				Hill's N0 =			Hill's N2 =	3.545	
							Hill's N1 =	3.336	
MGF 95-06	2882	15-Sep-95	Anguillidae	Anguilla rostrata	1		1	0.0000	-0.1885
MGF 95-06	2882	15-Sep-95	Aphredoderidae	Aphredoderus sayanus	2		2	0.0110	-0.2780
MGF 95-06	2882	15-Sep-95	Centrarchidae	Centrarchus macropterus	1		1	0.0000	-0.1885
MGF 95-06	2882	15-Sep-95	Centrarchidae	Lepomis gulosus	2		2	0.0110	-0.2780
MGF 95-06	2882	15-Sep-95	Centrarchidae	Lepomis marginatus	2		2	0.0110	-0.2780
MGF 95-06	2882	15-Sep-95	Centrarchidae	Micropterus salmoides	1		1	0.0000	-0.1885
MGF 95-06	2882	15-Sep-95	Cyprinodontidae	Fundulus escambiae	1		1	0.0000	-0.1885
MGF 95-06	2882	15-Sep-95	Esocidae	Esox americanus	2		2	0.0110	-0.2780
MGF 95-06	2882	15-Sep-95	Ictaluridae	Ameiurus nebulosus	2		2	0.0110	-0.2780
				Total		9	14	0.0549	2.1440
				Hill's N0 =			Hill's N2 =	18.200	
							Hill's N1 =	8.533	

Table G2. List of fish species collected in Tate's Hell State Forest (THSF) and the New River/Mud Swamp Wilderness Area (NRMSWA).

Scientific Name	Common Name	Abundance		Location
		Adults	Juveniles	
Ameiurus nebulosus	brown bullhead	1, 1		THSF, NRMSWA
Anguilla rostrata	American eel	1		NRMSWA
Aphredoderus sayanus	pirate perch	5, 2		THSF, NRMSWA
Centrarchus macropterus	flier	2, 1		THSF, NRMSWA
Elassoma okefenokee	Okefenokee pygmy sunfish	2		NRMSWA
Enneacanthus gloriosus	blue-spotted sunfish	5		THSF
Etheostoma fusiforme	swamp darter	1, 4		THSF, NRMSWA
Esox americanus	redfin/grass pickerel intergrade	2		NRMSWA
Fundulus escambiae	Eastern starhead topminnow	4		NRMSWA
Gambusia holbrooki	Eastern mosquitofish	30, 18		THSF, NRMSWA
Labidesthes sicculus	brook silverside	7		NRMSWA
Lepomis gulosus	warmouth	2, 3	0, 5	THSF, NRMSWA
Lepomis marginatus	dollar sunfish	5	10	NRMSWA
Leptolucania ommata	pygmy killifish		30	THSF
Micropterus salmoides	largemouth bass		1	NRMSWA
Notropis cummingsae*	dusky shiner		1	NRMSWA
Percina nigrofasciata	blackbanded darter		1	NRMSWA

* FNAI tracked species, G5 S4 global and state ranks, respectively.

References

- American Public Health Association. 1992. *Standard methods for the examination of water and wastewater*. Seventeenth edition. American Public Health Association. Washington, D.C. USA.
- Basham, D. 1968. Mystery of a Big Swamp Vanishing. Tallahassee Democrat, Natural History, May 12, 1968.
- Brown, S. 1981. A comparison of the structure, primary productivity and transpiration of cypress ecosystems in Florida. *Ecological Monographs* 51: 403-427.
- Cairns, D. 1994. Restoration of the East Bay basin and associated wetland resources of the Apalachicola Bay Watershed. Northwest Florida Water Management District.
- Christensen, N. L. 1993. The effects of fire on nutrient cycles in longleaf pine ecosystems. *in* Proceedings 18th Tall Timbers Fire Ecology Conference, The Longleaf Pine Ecosystem: Ecology, Restoration and Management.
- Clewell, A. F. 1985. Guide to the Vascular Plants of the Florida Panhandle. University Press of Florida. Florida State University Press, Tallahassee, Florida.
- Conde, L. F., B. F. Swindel, and J. E. Smith. 1983. Plant species cover, frequency, and biomass: Early responses to clearcutting, chopping and bedding in *Pinus elliottii* flatwoods. *Forest Ecology and Management* 6: 307-317.
- Cox, J., R. Kautz, M. MacLaughlin, and T. Gilbert. 1994. Closing the Gaps in Florida's Wildlife Habitat Conservation System. Florida Game and Freshwater Fish Commission, Office of Environmental Services.
- Dierburg, F. E. and P. L. Brezonik. 1985. Nitrogen and phosphorus removal by cypress swamp sediment. *Water Air Soil Pollution* 24: 207.
- Florida Natural Areas Inventory Tracking Lists of Special Plants and Lichens, Invertebrates, Vertebrates, and Natural Communities. October 1995. Florida Natural Areas Inventory, Tallahassee, Florida.
- Frost, C. C. 1993. Four centuries of changing landscape patterns in the longleaf pine ecosystem. *in* Proceedings 18th Tall Timbers Fire Ecology Conference, The Longleaf Pine Ecosystem: Ecology, Restoration and Management.
- Glitzenstein, J. S., facilitator; D. Hardin, D. B. Means, K. W. Outcalt, J. Walker, and N. Wilkins. 1991. Panel Discussion: Silviculture effects on groundcover plant communities in longleaf pine forests. *in* Proceedings 18th Tall Timbers Fire Ecology Conference, The Longleaf Pine Ecosystem: Ecology, Restoration and Management.
- Godfrey, R. K. and J. W. Wooten. 1981a. Aquatic and Wetland Plants of the Southeastern United States. Monocotyledons. The University of Georgia Press, Athens, Georgia.
- and ----- . 1981b. Aquatic and Wetland Plants of the Southeastern United States. Dicotyledons. The University of Georgia Press, Athens, Georgia.
- Greenland, D. J. 1995. Land use and soil carbon in different agroecological zones. *in* Soil Management and Greenhouse Effect. Eds. R. Lal, J. Kimble, E. Levine, B. A. Stewart. CRC Press, Inc., Boca Raton, Florida.
- Hauserman, J. 1991. Future of Tate's Hell in Question. Tallahassee Democrat, Local/State, June 2, 1991.
- Hill, M. O. 1973. Diversity and evenness: A unifying notation and its consequences. *Ecology* 54: 427-432.

- Krebs, C. J. 1989. Fortran programs for ecological methodology. Exeter Software, Setauket, New York, USA.
- Livingston, R. J. 1983. Resource atlas of the Apalachicola estuary. Report Number 55, Florida Sea Grant College.
- Livingston, R.J. 1991. Historical relationships between research and resource management in the Apalachicola River estuary. *Ecological Applications* 1:361-382.
- Ludwig, J. A. and J. F. Reynolds. 1988. *Statistical Ecology: A primer on methods and computing*. John Wiley and Sons, New York, New York, USA.
- Magurran, A. E. 1988. *Ecological Diversity and Its Measurement*. Princeton University Press, Princeton, NJ.
- Memory, M. 1996. Time line for historical events relating to Tate's Hell and vicinity. C. A. R. L. Archaeological Survey, Bureau of Archaeological Research, State of Florida, Department of State. Tallahassee, Florida.
- Methods of Soil Analysis Part 2 (Second Edition). 1982. Agronomy Series #9 (Pt. 2). Soil Science Society of America. Madison, WI.
- Mitsch, W. J. and J. G. Gosselink. 1993. *Wetlands* (Second Edition). Van Nostrand Reinhold, New York, USA.
- Mitsch, W. J. and B. C. Reeder. 1992. Nutrients and hydrologic budgets of a Great Lakes coastal freshwater wetland during a drought year. *Wetlands Ecology and Management* 1(4): 211-223.
- Mitsch, W. J. and X. Wu. 1995. Wetlands and global change. *in* Soil Management and Greenhouse Effect. Eds. R. Lal, J. Kimble, E. Levine, B. A. Stewart. CRC Press, Inc., Boca Raton, Florida.
- Mitsch, W. J., C. L. Dorage, and J. R. Wiemhoff. 1979. Ecosystem dynamics and a phosphorous budget of an alluvial cypress swamp in southern Illinois. *Ecology* 60: 1116-1124.
- O'Bryan, P.D., and D.B. Carlson. 1995. Managing Florida's mosquito control impoundments to enhance feeding opportunities for wading birds and waterfowl. Pages D-99-D-115 *in* W.R. Whitman, T. Strange, L. Widjeskog, R. Whittemore, P. Kehoe, and L. Roberts, eds. *Waterfowl habitat restoration, enhancement, and management in the Atlantic Flyway*. Third ed. Environmental Manage. Comm., Atlantic Flyway Council Tech. Sect., and Delaware Division of Fish and Wildlife, Dover, Delaware.
- Peet, R. K. And D. J. Allard. 1993. Longleaf pine vegetation of the southern Atlantic and eastern Gulf Coast regions: A preliminary classification. *in* Proceedings 18th Tall Timbers Fire Ecology Conference, The Longleaf Pine Ecosystem: Ecology, Restoration and Management.
- Reed, P. B., Jr. May 1988. National list of plant species that occur in wetlands: Florida. National Wetlands Inventory, U. S. Fish and Wildlife Service. NERC-88/18.09.
- Robbins, L. E. and R. L. Myers. 1992. Seasonal effects of prescribed burning in Florida: A review. Tall Timbers Research, Inc., Tallahassee, Florida.
- Sasser, L. D., K. L. Monroe, and J. N. Schuster. February 1994. Soil Survey of Franklin County, Florida. United States Department of Agriculture, Soil Conservation Service in cooperation with the University of Florida, Institute of Food and Agricultural Sciences, Agricultural Experiment Stations, and Soil Science Department; and the Florida Department of Agriculture and Consumer Services.
- Schultz, R. P. 1983. The original slash pine forest - An historical view. *in* The Managed Slash Pine Ecosystem. Ed. E. L. Stone. School of Forest Resources and Conservation, University of Florida, Gainesville, Florida.

- Spears, G. 1992. Down payment OK'd for Tate's Hell Swamp. Tallahassee Democrat, Congress, October 2, 1992.
- Wade, D. D. 1983. Fire management in the slash pine ecosystem. *in* The Managed Slash Pine Ecosystem. Ed. E. L. Stone. School of Forest Resources and Conservation, University of Florida, Gainesville, Florida.
- Walker, J. 1993. Rare vascular plant taxa associated with the longleaf pine ecosystems: Patterns in taxonomy and ecology. *in* Proceedings 18th Tall Timbers Fire Ecology Conference, The Longleaf Pine Ecosystem: Ecology, Restoration and Management.
- Wood, D. A. 1996. Florida's Endangered Species, Threatened Species and Species of Special Concern. Published by the Bureau of Nongame Wildlife, Division of Wildlife, Florida Game and Freshwater Fish Commission, Florida.