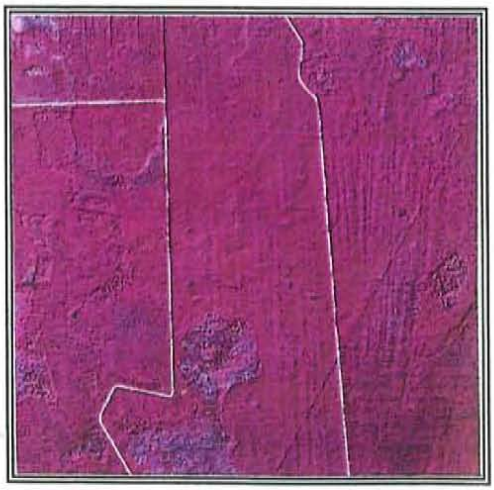
Historic Distribution of Wet Savannas in Tate's Hell State Forest

Final Report

December 1997

Carolyn Kindell,
Project Manager/Ecologist



FNAI

Historic Distribution of Wet Savannas in Tate's Hell State Forest

Final Report
for the
U.S. Fish and Wildlife Service
(Agreement #1448-0004-96-9102)
and Northwest Florida Water Management District

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top: Wet prairie in Apalachicola National Forest, Ann Johnson, FNAI

middle: 1942 BW aerial of a selected portion of Tate's Hell State Forest, National Archives, Washington, D.C.

bottom: 1994 infrared aerial of a selected portion of Tate's Hell State Forest, National Aerial Photography Program, Photo Science, Inc., Gaithersburg, MD.

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ABSTRACT

Tate's Hell State Forest is currently 131,000 acres of low pine flatwoods, pine plantation, swamps, and coastal scrub in Franklin and Liberty Counties, Florida and is managed by the Florida Department of Agriculture's Division of Forestry (FDOF). The original 214,000 acre tract was proposed for purchase under the Florida Conservation and Recreation Lands (CARL) program in 1992, and acquisition is still underway. The Tate's Hell tract is vital to the maintenance of water quality in Apalachicola Bay and provides critical habitat for rare plants, animals, and natural communities. Much of the original landscape patterns and interrelationships of the tract's natural communities have been obscured by prior silvicultural activities that altered the vegetation, natural hydrology, and fire regimes of the area. Ecological restoration of the natural landscape of Tate's Hell lands is an important objective of state ownership.

To assist restoration efforts, the U. S. Fish and Wildlife Service (USFWS) and the Northwest Florida Water Management District (NWFWMD) entered into agreements with the Florida Natural Areas Inventory (FNAI) to reconstruct historic vegetation patterns within the Tate's Hell CARL tract. This report pertains to Phase I of this agreement which targets wet prairie and seepage slope vegetation. Phase II, which begins in January, 1998, will expand the focus to other major community types historically dominant on Tate's Hell. In this report, the vegetation of seepage slopes and wet prairies is referred to as **wet savanna**.

FNAI performed historic research into the pre-disturbance vegetation pattern and conditions of Tate's Hell lands, and then identified and described the vegetation of reference wet savannas on adjacent public lands. Using historic aerial photography, soil maps, and other information, FNAI compiled a map of the probable locations of historic wet savanna in Tate's Hell lands, and then conducted field surveys of potential sites to identify areas with high restoration potential. FNAI compiled a list of rare plants that occur in wet savannas in the area.

This report contains the background, methods, and results from these tasks. Approximately 27,000 acres of probable historic wet savanna areas within the Tate's Hell tract were mapped on mylar overlays for 11 U.S. Geologic Survey 7.5' quadrangle maps. Copies of these overlays are provided to the USFWS, NWFWMD, and the FDOF with this report. In the field FNAI ecologists identified locations of remnant wet savanna in Tate's Hell State Forest and identified areas with high potential for ecological restoration based on the persistence of wet savanna vegetation. Management recommendations for restoration of wet savannas and associated rare plants on Tate's Hell State Forest lands are provided.

ACKNOWLEDGMENTS

The Panama City office of the U.S. Fish and Wildlife service deserves our deepest thanks for its ongoing support and enthusiasm for this project. The hard work of Gail Carmody and Jerry Ziewitz is especially appreciated. Thanks are also due for the logistic and financial support of the Northwest Florida Water Management District, in particular to Duncan Cairns, Dan Tonsmeire, and Gary Miller. This project also benefitted greatly from the expertise and knowledge of the Florida Division of Forestry, most notably Ken Weber, Tony Millender, Doug Dedrick, and Ace Haddock. Special thanks are due for the loan of 1953 aerial photographs of Tate's Hell lands.

To Deborah McKeel of the Florida Geologic Survey library, FNAI is deeply grateful for finding historic documents of immeasurable help to this project. Her discoveries of historic maps and surveys form the basis for much of this report and will continue to benefit this project in the next year. Many thanks are due to Jodi Norman of the Florida Archives Photograph collection for her cheerful, expert assistance and to Melissa Memory of the CARL Archaeological Survey for sharing results of her work on Tate's Hell lands.

FNAI is thankful and privileged to have listened to the recollections of several persons who were familiar with Tate's Hell lands prior to the 1950's. Special thanks are due to Billy and Martha Kersey, Donald Wood, Drew Branch, John Hanse, and Clyde and Lloyd Tucker. The memories of these people contributed greatly to the historic picture of Tate's Hell State Forest lands presented in this report. Special thanks go to Linda Boatwright for introducing FNAI to the Tuckers.

Thanks also to Darrell Leach and Joe Shuster for information on soils that support wet savannas, to Angus Gholson for his generous contributions of time and botanical expertise, to Guy Anglin for sharing his knowledge of wet savanna soils and vegetation, and to Kathy Burks for training in Post Office Bay flora. Amy Parker also deserves thanks for sharing her knowledge of the Tate's Hell landscape and the Tate's Hell hydrologic restoration project.

Thanks to FNAI's Ann Johnson, Jon Blanchard, Deborah Dowler, and Linda Chafin for report editing, and to Angela Crook, Sine Murray, and Carol Johnson for many aspects of report production. Ann Johnson shared her data from Black Creek Bog. Special appreciation goes to Linda Chafin who developed the idea for this project and secured its funding. To the many others who assisted with this project, thank you.

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INTRODUCTION

TATE'S HELL STATE FOREST - MANAGEMENT AND CONSERVATION GOALS

Tate's Hell State Forest is currently 131,000 acres of low pine flatwoods, pine plantation, swamps, and coastal scrub in Franklin and Liberty Counties, Florida. The original 214,000 acre tract was proposed for purchase under the Florida Conservation and Recreation Lands (CARL) program in 1992. Acquisition began in that year and continues to the present.

The Tate's Hell tract was recognized by the CARL program and other agencies as vital to the maintenance of water quality in the Apalachicola Bay, one of the most productive commercial and recreational fisheries in the U. S. (Florida Department of Environmental Protection 1997a). The land is critical habitat for the Florida black bear and contains many known locations for other rare animals, rare plants, and natural communities. The tract forms an important ecological link between the Apalachicola National Forest to the north and northwest, the Apalachicola National Estuarine Research Reserve to the south and southwest, and comes close to the St. Marks National Wildlife Refuge to the east (**Figure 1**).

The Florida Department of Agriculture's Division of Forestry (FDOF) has been assigned lead management responsibility for the Forest. The Florida Game and Freshwater Fish Commission (FGFWFC) functions as the cooperating management agency with respect to fish and wildlife resources, including rare species. FDOF's draft Tate's Hell State Forest Management Plan sets out this over-arching management goal:

> "to restore, protect, and manage ecosystems to maintain biological diversity and ecosystem functions while integrating public use through multiple-use of the total resource."

More specific management and conservation objectives of the FDOF and of the CARL Program for Tate's Hell State Forest are shown in **Table 1**.

Both FDOF and CARL emphasize the need for ecological restoration in Tate's Hell State Forest. The Forest lands, now highly disturbed by prior land uses, likely once supported at least 12 major natural community types: wet flatwoods, mesic flatwoods, wet prairie, seepage slope, baygall, floodplain forest, floodplain swamp, basin swamp, upland hardwood forest, sandhill, and scrub. The original landscape pattern and interrelationships of these communities has been largely obscured by silvicultural activities that have altered the vegetation, hydrology, fire, and other ecosystem functions in Tate's Hell. Restoration of these functions is an important objective of state ownership of Tate's Hell lands.

An important first step in the restoration of native ecosystems in Tate's Hell State Forest is a determination of the probable type and locations of natural communities on the landscape. In September, 1996, the U. S. Fish and Wildlife Service (USFWS) and the Northwest Florida

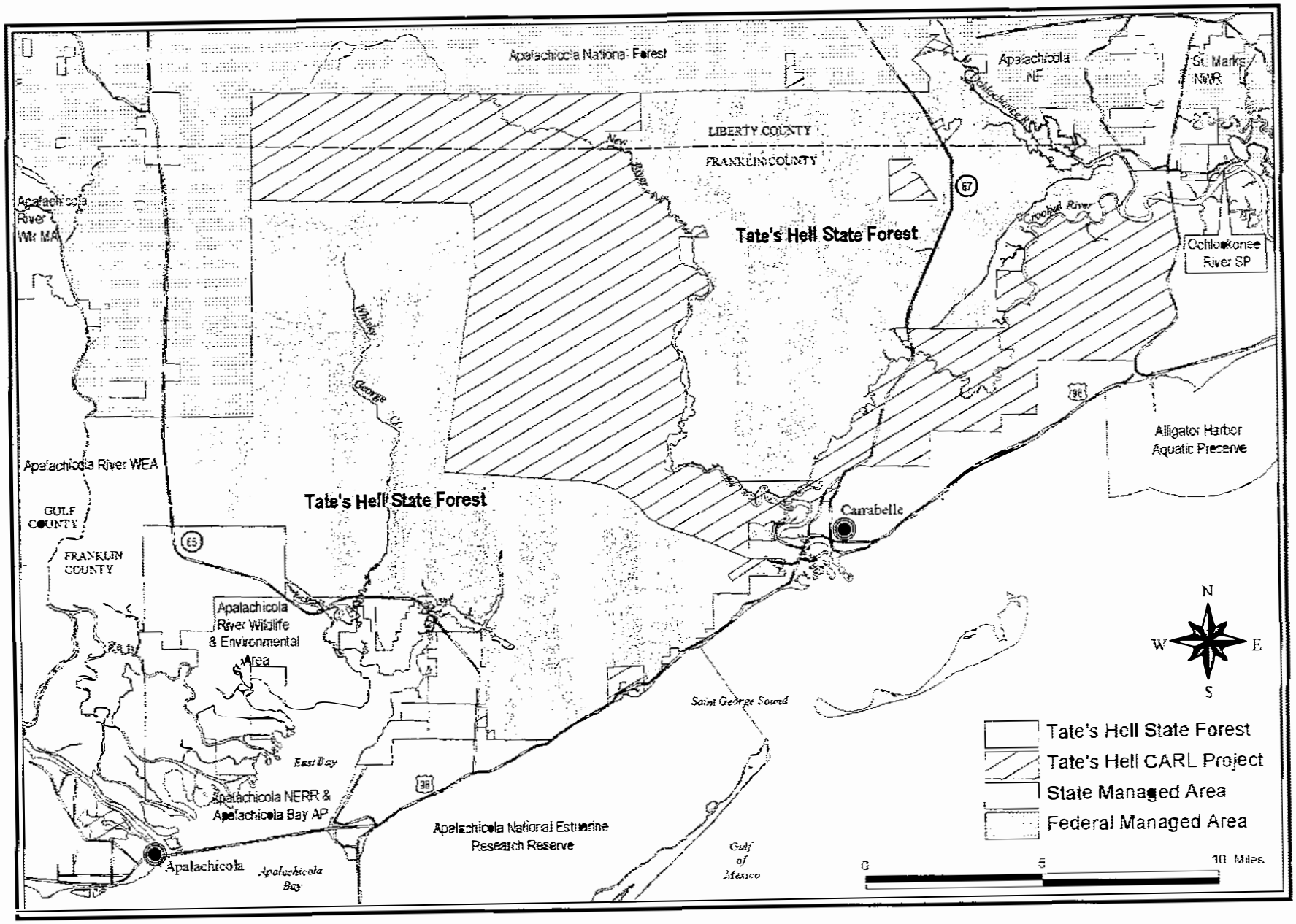

Figure 1. Area map of Tate's Hell State Forest lands and CARL tract boundary.

Table 1. Management and Conservation Objectives of the Florida Division of Forestry and CARL program for Tate's Hell State Forest (FDOF 1997, Florida Department of Environmental Protection 1997b)

Florida Division of Forestry Objectives for Tate's Hell State Forest
> Restore, maintain and protect in perpetuity all native ecosystems.
> Integrate human use through a total resource concept, not emphasizing any particular use over the others or over restoration, maintenance, and protection of native ecosystems.
> Insure long-term viability of populations and species considered rare, endangered, threatened, or of special concern.
> Protect known archeological and historical resources.
CARL program goals for Tate's Hell Tract
> Conservation of lands supporting native, relatively unaltered flora or fauna representing a natural area unique to, or scarce within, a region of Florida or larger geographical area.
> Conservation of lands supporting habitat critical to providing significant protection of an endangered or threatened species of plant or animal.
> Prevent future degradation of the waters of the Apalachicola Bay Aquatic Preserve by preventing future commercial, agricultural, silvicultural, and residential development that might degrade water quality in the streams emptying into Apalachicola Bay.
> Provide for uses and recreational activities that are compatible with the protection of the rare and sensitive resources.
> Restoration of altered ecosystems to correct environmental damage that has already occurred.

Water Management District (NWFWMD) entered into agreements with the Florida Natural Areas Inventory (FNAI) to reconstruct historic vegetation patterns within the Tate's Hell CARL tract. This report pertains to Phase I of this agreement which targets wet prairie and seepage slope vegetation. Phase II, which begins in January 1998, will expand the focus to other major community types historically dominant on Tate's Hell land. The objectives of Phase I of this agreement are listed in **Table 2**.

Seepage slopes and wet prairies are grass- and sedge-dominated wetland communities maintained by a high or perched ground water table and frequent recurrence of fire. Seepage slopes are typically small, occurring in narrow zones of saturated soil along hillsides and gentle slopes. Wet prairies are essentially treeless plains with a dense groundcover of grasses and herbs (FNAI and Florida Department of Natural Resources 1990). These communities are known by a number of names throughout the southeastern coastal plain, such as wet savanna, pitcher-plant prairie, wet meadow, grass-sedge bog, moist pine barren, and herb bog (Folkerts 1982, 1991; Hermann 1988; Wolfe, et al. 1988; FNAI and Department of Natural Resources 1990).

In the Apalachicola National Forest and Tate's Hell area there is so little topographic relief that seepage slope and wet prairie vegetation intergrade into one another, and have been referred to interchangeably as **wet savanna** (Clewell 1971; Hermann 1988; Wolfe, et al. 1988).[1] This term will be used in this report, which is consistent with the use of the term "wet savanna" by other researchers in the ANF and Tate's Hell lands (Clewell 1971, 1986; U.S. Department of Agriculture 1984; Wolfe, et al. 1988; Hermann 1988; Burks 1994), and with the historic origin of the word "savanna," which was adapted by the Spanish from the Arawak Indians of the Greater Antilles and Bahamas as a word for a flat, treeless area (Frost, et al. 1986). The term was also used consistently by early naturalists to describe open, wet, grassy areas (Vignoles 1823, Williams 1827, Mooney and Patrick 1916).

Wet savannas support some of the highest levels of plant species richness of any natural community in the U. S. (Walker and Peet 1983). A diverse array of orchids, insectivorous plants, and showy wild flowers are found in wet savannas throughout the southeast; in the Apalachicola National Forest, this community is important habitat for 25 plant species that are rare, or endemic to northwest Florida (FNAI 1997, Marois 1997). Approximately 97% of these communities in the southeastern coastal plain have been destroyed or severely damaged by modern human activities, primarily exclusion of fire, conversion to pine plantation, agriculture, or building developments (Folkerts 1982).

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[1] It should be noted that the term "savanna" has also been used, in a general sense, to refer to the "parklike" aspect of frequently burned longleaf pine-wiregrass communities in the southeast - those with a grassy understory, an abundance of pines, and little midstory (for example, see Bridges and Orzell 1989). This is <u>not</u> the use of the term in this report. In this report, the term "wet savanna" is restricted to wet, naturally grassy, essentially treeless areas in the Tate's Hell and Apalachicola National Forest area.

Table 2. Objectives of Phase I of the agreement between the USFWS, NWFWMD, and FNAI to reconstruct historic vegetation patterns in Tate's Hell State Forest.

Reconstruction of historic vegetation patterns in Tate's Hell. Phase I Objectives:
> Determine the environmental and vegetation characteristic of **wet savannas** (seepage slope and wet prairie) on managed areas within and adjacent to Tate's Hell.
> Identify sites within Tate's Hell that may have supported these communities prior to conversion of the site to slash pine silviculture.
> Develop a map of Tate's Hell highlighting sites that probably supported seepage slopes and wet prairies.
> Provide historical background and information on the current status of seepage slopes and wet prairies within Tate's Hell.
> Provide management recommendation for re-introducing or preserving populations of rare plant species in these communities.

SCOPE OF THE PRESENT STUDY

The tasks performed by FNAI under Phase I of the agreement with the USFWS and the NWFWMD to reconstruct vegetation patterns within Tate's Hell are listed below.

Task 1. Historic research: search current and historic resources and archives to compile all available information on pre-disturbance vegetation pattern and conditions.

Task 2. Savanna description: determine the characteristic vegetation, topography, soils, and probable hydrologic regime of seepage slopes and wet prairies on adjacent public lands.

Task 3. Map Creation: compile a map of potential sites of seepage slopes and wet prairies on Tate's Hell based on results of steps 1 and 2.

Task 4. Field survey: conduct field surveys of potential sites using the map in step 3 to guide field activities.

Task 5. Submit narrative report on tasks 1-4, including: a summary of findings; lists of dominant and characteristic plant species for reference areas and Tate's Hell probable historic wet savanna areas; a list of rare plants occurring or potentially occurring in Tate's Hell wet savannas; management and population restoration recommendations for rare plants; and general recommendation for ecological restoration of the Tate's Hell landscape.

The methods and results of this report are organized according to these tasks. Task 3 resulted in a series of 11 U. S. Geologic Survey 7.5' quadrangle map overlays, which are submitted under separate cover with this report. A sample of this map, along with samples of the aerial photography used to create the map, are included as figures in this report.

METHODS

TASK 1: HISTORIC RESEARCH

FNAI searched and reviewed current and historic resources and archives for information on pre-disturbance vegetation patterns and conditions on Tate's Hell lands. The materials reviewed fall into four major categories:

1. Published information, primarily reports, journal articles, and historical written travel accounts.

2. Historic unpublished information, such as personal diaries, shipping records, land surveys and photographs.

3. Oral history accounts with Franklin County residents familiar with the area prior to conversion to pine plantation.

4. Historic aerial photography and maps.

The results of this research are presented as a summary of Tate's Hell State Forest ownership, land use, natural landscape history, and accounts by early naturalists in the area. Sources are listed in the references at the end of this report. FNAI maintains a record of all persons and offices contacted and material procured or available for procurement. Records of oral histories are kept in the form of hand-written notes taken during conversations with persons familiar with the Tate's Hell landscape prior to conversion to pine plantation in the late 1950's through the 1970's. Oral history sources used in this report are listed under Personal Communications at the end of this report. The names of other persons who are potentially good sources of oral history have been collected for additional interviews in 1998.

TASK 2: REFERENCE SAVANNA DESCRIPTION

All known studies of savanna vegetation in the Apalachicola National Forest, Tate's Hell, and vicinity were reviewed along with information on soils, topography, and hydrology. Three savannas in the Apalachicola National Forest (ANF) were chosen as suitable reference sites for this study. These areas were chosen because they are well known to local researchers and to FNAI as relatively undisturbed, well-managed examples of this community type and because of their close proximity to Tate's Hell State Forest. Each of these sites is frequently burned in the growing season by the U. S. Forest Service (USFS), and two of the areas (Post Office Bay savanna and Compartment 110 savanna) are recognized as Research Natural Areas by the

USFS. In addition to the present study, each of the reference sites are under study by other researchers. The sites and pertinent reference materials are listed below.

1. Compartment 110 of ANF (Kirn and Anglin 1995-1997; Parker and Rasmussen 1997).

2. Post Office Bay Research Natural Area, ANF (Burks 1994, Burks and Bartodziej 1995).

3. Black Creek "Bog," Compartment 101, ANF (Johnson 1997).

The reference areas were visited by FNAI researchers in 1996 and 1997 in order to collect information on the dominant and characteristic vegetation, soils, hydrology and landscape context of the savannas. Lists of dominant and characteristic plant species present at each site were compiled from existing reports and plot data and from FNAI field ecologist observations. Based on this study of the reference areas and on literature review of other studies in the area, a general description of the hydrology, soils, topography, and vegetation of savannas in the area was written. FNAI compiled lists of all species known to occur at each of the reference areas and identified the most common species at each site. These lists were compiled in tabular format for comparison with data collected under Task 4. All information collected to identify and describe reference savanna vegetation was used to identify and compare probable historic wet savanna sites in Tate's Hell State Forest under Task 4.

TASK 3: MAP CREATION

The probable historic distribution of wet savannas in Tate's Hell was mapped on mylar overlays for U. S. Geologic Survey 7.5' quadrangle maps. The following historic and current sources were used (listed in order of age):

- 1916 Soil Survey of Franklin County (1:63,360 scale).
- 1943, 1944 and 1945 U. S. Geologic Survey 7.5' quadrangle maps depicting treeless areas in white and forested areas in green (1:24,000 scale).
- 1953 black and white aerial photographs (1:15,840 scale).
- 1983 National Wetlands Inventory maps (1:24,000 scale).
- Copies of 1994 soil polygons depicted in the Franklin County Soil Survey (1:25,000 scale).
- 1994 infrared aerial photographs (1:40,000 scale).

The following steps were used to produce the historic distribution of savanna in Tate's Hell.

Step 1. The white (treeless) areas depicted on the 1940 quad maps were transferred to the mylar overlays and represent the baseline polygons of historic savanna.

The 1943 - 1945 quad maps were made from 1942 aerial photography. The white areas represent aerial photograph signatures of lands with less than 20% cover of woody vegetation over 6 ft in height (U. S. Department of Interior 1953; John Conroy, pers. comm.).

Step 2. The baseline polygons were then annotated with information from 1953 black and white aerial photographs, and when available, 1942 and 1947 aerial photographs. Polygons of areas that appeared to support wet savanna vegetation, based on the aerial photographs, were colored yellow.

The 1953 photos depict most of the Tate's Hell lands prior to large-scale conversion to pine plantation and are the best, most complete representation of pre-conversion conditions available to this project at this time. The information transferred from the aerial photographs to each polygon reflected the abundance and type of trees in the polygon area and whether it appeared that the area was open in the 1940's due to logging rather than due to natural savanna vegetation. For tree canopy information, each polygon was labeled with a code depicting canopy cover class (4 classes were used) and leaf type (evergreen or deciduous). The presence of tracks or trails (e.g., wagon trails, logging skid trails, and vehicle tracks) was noted with a "TR" on the mylar map to indicate the possibility that logging had occurred at that location. Tram lines shown in the 1953 photos were also drawn on the map.

Areas within the baseline polygons that appeared, on the old photographs, to be upland ridges, home sites, agricultural fields, or areas that supported a natural community type other than wet savanna were labeled as "out" on the mylar maps. Cypress basin swamps (especially dwarf cypress areas), which at times appeared as white areas in the 1942 aerial photographs, were labeled with the code "cyp."

In some instances, signatures of wet savanna were visible on the aerial photographs but not depicted as open areas on the 1943 - 1945 quad maps. In addition, one quad map, Green Point, was not available in the green and white format that distinguished forested and unforested areas. In both of these instances, likely historic savanna polygons were mapped according to the 1953, 1947, and 1942 aerial photographs. To increase the level of confidence in aerial photograph interpretation at this stage in the map making, field work was conducted to ground truth the 1953 aerial photograph signatures. In addition, the historic aerial photograph signatures that likely depict wet savannas and open flatwoods were confirmed through interviews with persons knowledgeable of the landscape at the time the photos were taken (Kersey, pers. comm.; Wood, pers. comm.)

All polygons representing areas of likely wet savanna vegetation in the historic photographs were colored yellow on the mylar overlays. These yellow polygons represent the probable historic distribution of savanna vegetation on Tate's Hell.

Details on soils and hydrology from the remaining sources (1916 and 1994 Franklin County Soil maps, NWI maps) were added to each polygon in the following steps.

Step 3. Information from the 1916 Soil Survey Map of Franklin County was transferred to each yellow polygon.

The 1916 soil information for each polygon is the code for the soil type(s) mapped at that location. (Ps - Plummer sand, Pf - Plummer fine sand, and H- Hyde). In 1916 the Plummer soils were considered the most likely to support savanna vegetation, although areas within the Hyde soil units were also likely to contain savanna. See page 19 for a discussion of these 1916 soil survey map units.

Step 4. Information from the 1994 Soil Survey of Franklin County was transferred to each yellow polygon.

This information consists of the two-digit code for the soil type depicted on the 1994 soil map. If more than one soil type occurred within a polygon, multiple codes were used.

Step 5. Information from the NWI maps was added to each yellow polygon. This consisted of a single letter code for the hydrologic regime at that location, most commonly A - temporarily flooded, C - seasonally flooded, F - semi-permanently flooded, and U - upland (U. S. Department of Interior 1983).

Step 6. The yellow polygons were qualitatively ranked according to likelihood of containing wet savanna vegetation for field survey purposes. If polygons contained soils or hydrologic information that was dramatically inconsistent with wet savanna conditions (for example, the polygon contained xeric soils and upland designation by NWI), then those polygons were considered "out" and the yellow color was removed.

The FNAI ecologist then compared the soil, hydrologic regime, and aerial photograph features between Tate's Hell historic savannas locations and these features in the large reference area adjacent to Tate's Hell in the ANF compartment 110, which was also mapped and annotated during this process. There were certain areas that were considered to have the highest likelihood of supporting wet savanna at present, based on the information assembled and on most recent aerial photographs. These areas were given priority for visitation in the field.

Step 7. 1997 field survey information on the presence of intact wet savanna was used to identify polygons with a high restoration potential. These polygons are denoted with an "A" on the mylar map. FNAI recommends that these areas receive highest priority for ecological restoration by FDOF at this time.

TASK 4: FIELD SURVEY

Locations within Tate's Hell State Forest with a high likelihood of containing wet savanna vegetation were visited. These sites were chosen based on the historic distribution map created under Task 3 and on information gained in the field during the process of making the map (Steps 2 and Steps 7 under Task 3). Only state- and Federally- owned lands were visited. Private lands within the original Tate's Hell tract boundaries were not visited but were mapped using Steps 1 through 6 above.

FNAI field surveyors recorded brief notes on the dominant vegetation and rare plants, as well as the site's potential for ecological restoration at each site visited. In areas where remnant wet savanna vegetation was found, the surveyor recorded vegetation, soils and other information on an FNAI observation point field form (for example, see Appendix 1).

Plant taxa encountered in areas that contained intact wet savanna in Tate's Hell State Forest were compiled into a species list for this community type. However, many of the historic wet savanna sites did not contain intact savanna vegetation, but were typically dominated either by pines and evergreen shrubs or by old field/clear-cut vegetation. Thus the vegetation data for historic wet savanna sites in Tate's Hell was sorted into three major groups: **moderately intact wet savanna**, **pine/titi**, and **old field/clear-cut**. Plant taxa lists and a vegetation description for each of these groups is presented in this report. Plant taxa lists compiled for each of the three reference savanna sites under Task 2 were used for comparisons to the Tate's Hell historic wet savanna areas.

The locations of rare plants observed in Tate's Hell were noted and entered into the FNAI Biological Conservation Database. A list of all rare plant species tracked by FNAI that have been documented or are likely to occur in Tate's Hell's wet savanna sites was compiled. Recommendations for management and restoration of wet savannas and associated rare plants in Tate's Hell were written. FNAI also compiled general recommendations for restoration of Tate's Hell landscape, future ecological inventory, and exotic species.

Scientific nomenclature used in field surveys generally followed Clewell (1985). Additional taxonomic references included Godfrey and Wooten (1979, 1981), Godfrey (1988) and Peet (1993). Common names used in this report follow, in order of preference, those used in the *Guide to the Natural Communities of Florida* (FNAI and Florida Department of Natural Resources 1990), Clewell (1985) and Godfrey and Wooten (1979, 1981).

RESULTS

TASK 1. HISTORIC RESEARCH

History of Tate's Hell State Forest Land Ownership, Land Use, and Landscape

Ownership

A very brief synopsis of ownership of the territory of Florida since its beginning will help the reader understand the history of Tate's Hell State Forest lands. Since the early 1500's the territory of Florida was considered part of the Spanish empire. Spain relinquished ownership of the territory to the British in 1763 under the Treaty of Paris. After the American Revolution, Spain regained ownership in 1783 in return for her support of the American Colonies. Spain then gave up Florida to the U. S. after the first Seminole War of 1818, and Florida became an official U.S. territory in 1821. Florida was granted statehood in 1845 (Upchurch 1965, Maddox 1982, Memory 1996, Rogers and Willis 1997).

Tate's Hell State Forest and CARL tract are located within a much larger land ownership entity that was known historically as the Forbes Purchase (1804-1861), a body of land bounded by the Apalachicola and St. Marks Rivers and extending from the Gulf of Mexico to a poorly defined northern boundary roughly near the present Georgia-Florida state line. The Forbes Purchase was actually not a purchase at all, but a land-for-debt swap between Panton, Leslie and Company and Seminole Indians in 1804 (Upchurch 1965; Rogers and Willis 1997; Memory, pers. comm.). In the late 1700's, the Company had an important trading business in northwest Florida, with stores throughout the area, including one on the Apalachicola River about 18 miles north of the Gulf. In 1804 the Spanish Government agreed to allow the company to collect land as payment for debts accrued by the Indians. At that time John Forbes was a principal owner of the Company; the name was changed to John Forbes and Company, and the land became known as the Forbes Purchase. In 1819 Carnochan and Mitchel, Inc., as represented by Mr. Colin Mitchel, purchased most of the property for $134,694 and 2 rials of silver. By 1820, the entire Purchase (approximately 1.5 million acres) was owned by Mr. Mitchel.

When Florida became a U. S. territory in 1821, Mitchel's ownership of the land was disputed by the U. S. Government. Court battles were fought over several years, finally ending in a Supreme Court ruling in favor of Mitchel in 1835. At that time, the company was renamed the Apalachicola Land Company (ALC). Throughout the period of title dispute, bits and pieces of the land were occupied by squatters or sold, however a large amount of the original purchase remained under the sole ownership of the ALC (Upchurch 1965, Maddox 1982, Rogers and Willis 1997).

The intention of the ALC was to divide and sell the land, and considerable effort was spent in promoting the town of Apalachicola (Rogers and Willis 1997, Upchurch 1965). Two other

areas targeted for development at this time were lands near the St. Marks and Wakulla Rivers (Hartsfield Survey) in the southeast, and those near the Little River (Little River Survey) in the north part of the Purchase (Upchurch 1965, Maddox 1982). Most of the land remaining in the Forbes Purchase was relatively under-explored and considered of little or no value, except for possible timber extraction (Upchurch 1965). The ACL sold grants to cut live oak timber in 1838 (Upchurch 1965). Cypress was later logged from the Apalachicola River floodplain by the A. B Tripler's Pennsylvania Tie Company (Rogers and Willis 1997).

The Second Seminole War (1835-1842), a financial depression in 1837, increased land taxes, a lack of natural resources considered valuable at the time, continued disputes over ALC's ownership, and slow land sales eventually brought the ALC to failure in 1861. Sale of the land was advertised throughout the U. S., the entire property was auctioned-off, and the Forbes Purchase "ceased to exist as a unit" (Upchurch 1965).

With respect to more recent ownership of Tate's Hell State Forest lands, a full title history is beyond the scope of this report. However, the CARL program's land acquisition files were reviewed for names of the larger landowners prior to state purchase in order to provide additional information for the interested reader. In 1992, when Florida initiated purchase of the land through the CARL program, the major sellers of the property included Procter and Gamble, New River Franklin, Ltd. (part of the Oban, Inc.), Bienville Forest Investment, Inc., Olin Wooten and Wayne Christian, the University of Florida Foundation, the University of West Florida Foundation, J. E. Correy, and Southern Pine Plantations of Georgia, Inc. Prior to these owners, the names of Timberland Investment Group, Southeast Timber, Inc., and St. Joe Paper Company appear in the files. Family names that appear in title transaction documents from the 1940's and 1950's include the Floyd C. Lister family from Wewahitchka; Eddie Bell and Carlos Cox, Edith Coombs, Nicholas and Willie Mae Thompson, all from Carrabelle; and A. S. Mitchell from Mobile, Alabama. There are numerous smaller landowners mentioned in the files as well. The earliest recorded document in the files is a transfer of title for several sections of land in Liberty County, from Sara Onman to James Coombs, in 1890.

Land use

There appears to have been little commercial development in the Tate's Hell area in the 1800's, save for timber extraction and cattle grazing. Williams (1827) described Northwest Florida commerce, in general, as in its "infancy", and very small in volume. From the 1820's to the late 1800's, Apalachicola was most known for its exportation of cotton that was grown in the rich clay soils further north in Georgia, Alabama, and in Florida near the state line. Other exports from North Florida and from Apalachicola included sugar, animal pelts and tallow, beeswax, bricks, and various wood products such as cedar, staves (narrow strips of wood used to make barrels), and lumber (Williams 1827, Rogers and Willis 1997).

In 1855, Carrabelle was essentially a hunting and fishing camp, but by 1877 the town was founded, in part due to a growing timber industry. The relative importance of pine, cedar and cypress to this industry in the 1800's is not clear. A personal diary of a timber inspector for Franklin County in 1872, obtained from the Florida State Archives, yielded much information regarding the social aspects of life in Carrabelle at that time, but no information on timber (Floyd 1872). Franklin county shipping records from the 1800's were examined for timber information. Timber was a common export, but the type of wood (i.e., pine or cypress) was not recorded (Lovett 1839-1900). This information may exist elsewhere, but was not seen during the present study. Lumber was apparently responsible for a 70% increase in shipping volume from Franklin County between 1898 and 1903 (Rogers and Willis 1997). By the 1890's Carrabelle was Franklin County's center for lumber and turpentine exports. The names of several lumber companies in Carrabelle included the Cypress Lumber Company, Loxley Lumber Company, Carrabelle Land and Lumber Company, and Kimball Lumber Company (Rogers and Willis 1997).

FNAI found little written documentation of the emergence or extent of cattle grazing in the Tate's Hell area in the 1800's; however, the legend of Cebe Tate, who "got lost in hell" while rounding up cattle, is thought to have originated in 1873 (Memory 1996). Cattle were likely an important part of the landscape at that time. In 1827, John Williams wrote that cattle were important to Indians and settlers alike in northwest Florida. He noted that when Jackson marched across this area, he confiscated many cattle as settlements were conquered (Williams 1927).

Since the turn of the present century, cattle, turpentine, and lumber are frequently mentioned industries in Franklin County and vicinity. Cattle were apparently common freight shipped out of the area on the Apalachicola Northern Railroad (Branch, pers. comm.), which was built in 1907 (Rogers and Willis 1997). A 1916 Soil Survey of Franklin County (Mooney and Patrick 1916) states that lumbering began around 1875 in the county and that turpentining began in 1890. There was little agriculture outside of small family plots, which is still true today. The largest single crop acreage was 38 acres of corn, and only 3% of Franklin County was in agriculture. The county's flat, poorly drained lands were considered good pasturage, and the entire county was open range for cattle and hogs. Harper (1914), in his note on the Apalachicola Flatwoods region, which includes primarily Franklin and Wakulla counties, states that lumber, turpentine, and grazing were the most important industries in the region.

During the Depression of the 1930's, there was a government-subsidized beef canning factory in Apalachicola (Rogers and Willis 1997), and the U. S. government owned cattle in and around Tate's Hell (John Hanse, Lloyd Tucker, pers. comm.). There are several persons living in the vicinity of Tate's Hell State Forest who were involved in grazing cattle on the land in the early 1900's (Branch, pers. comm, Kersey, pers. comm., Leach pers. comm., Tucker, pers. comm.). The fence law of 1949 (Florida Statutes 1949 Chapter 588 entitled "Legal Fences and Livestock at Large," Sections 588.12, 588.14, 588.17) put an end to free-

ranging cattle in Franklin County (Tucker, pers. comm.). This, along with active anti-burning sentiments from landowners and government since the late 1930's, likely led to the demise of the cattle industry in Franklin County.

Harbeson City, site of a large saw mill north of Carrabelle, was apparently active in the 1920's, although the activities and longevity of the mill are not known to the author at this time. The mill appears to be responsible for the placement tram lines west of the Ochlockonee River and later, west of the New River, within present-day Tate's Hell State Forest land. Large pines that were widely scattered throughout the area were logged from these tram lines (Lloyd Tucker, Billy Kersey, John Hanse, pers. comm.). Harbeson City appears on a 1934 map of the area as owned by the West Florida Milling Company (U. S. Department of Commerce 1934). At that time, an old logging tram lines was mapped from Harbeson City to the east side of the New River. No tram lines were noted west of the New River on this map, however only land six miles inland is shown; tram lines may have existed further north.

According to 1939 government timber and turpentine reports, Harbeson City had a sawmill with a 10-hour day capacity of 40,000 + board ft. There were three sawmills of 1,000 - 19,000 board ft. capacity at East Point, Apalachicola, and Creels, in the southeastern part of Franklin County and two mills in the northwest part of what are now Tate's Hell lands, one in Franklin County and one just north of the Liberty Co line (Florida State Planning Board 1939). Pine was the primary source of timber for these mills. In 1939 there were six active turpentine stills in Franklin county with annual production of less than 900 naval-stores units[2].

The 1939 report also noted that large mills, like those at Harbeson City and Apalachicola, were dependent upon "extensive blocks of old growth timber, [which] are slowly being cut out", and that "the trend is decidedly towards small, mobile equipment which can utilize the light second-growth stands more efficiently." The report goes on to state that "By 1936, the sawmills, as a whole, operated at less than half their annual capacity, an indication of the relatively unfavorable condition of the lumber markets, and the low scattered stands of old growth." The St. Joe Paper Company pulp mill at Port St. Joe was relatively new in 1939 and not yet running to full capacity.

Fire was a common occurrence in northwest Florida in the 1930's, and this report complains that "The continual burning of forests has long been a serious problem". The report notes that, in 1936 alone, 62% of the forest area of Florida was burned. This report hints that the cattle industry and fires were connected, noting that the cattle and forest industries should work more closely together to "avoid conflicts". The prevalence of fire on the landscape is corroborated by oral history accounts from persons associated with the cattle industry in the area in the early 1900's (Tucker, pers. comm, Branch, pers. comm.). Cattlemen in this area maintained forage by annual, spring fires in the grassy understory of longleaf pine-wiregrass habitats.

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[2] One naval-store unit equals a 50-gallon barrel of turpentine and 3 1/3 5000-pound barrels of rosin.

Other, important industries in Franklin County from the early 1900's to the present, centered on coastal resources. The seafood industry expanded in the 1930's, especially as refrigeration techniques developed. In the early 1940's, Camp Gordon Johnson was established (also known as Camp Carrabelle) as a U. S. Amphibious Training Center that sprawled along the coast from Carrabelle and St. George Island to Alligator Point. The military was an important source of revenue and jobs for the local civilian population (1.25 million dollars per year) during this time (Rogers and Willis 1997).

Natural landscape history

Geologic history. Tate's Hell resides in the Gulf Coastal Lowlands physiographic province (Puri and Vernon 1964, Brooks 1982). Lying between the Ochlockonee River and the Apalachicola River, it occurs within a flat, low geologic feature of deep sedimentary materials known as the Apalachicola Embayment. In the Oligocene epoch, when the ocean flowed over this area, currents wore a wide, shallow trough into the continental carbonate rock, which became known as the Gulf Trough. Subsequent continental erosion during the Miocene deposited deep layers of sediments in the trough, and the weight of these deposits eventually pushed the carbonate crust downward, creating the Apalachicola Embayment.

In the Pliocene, and more recently in the Pleistocene, the sediments of the Embayment were reworked multiple times by fluctuations in sea level. At times of high sea level, sediments were deposited in estuarine and lagoonal areas, and other marine features were created, such as dunes or barrier islands. As sea level retreated, these features were stranded. During periods of low sea level when the land was exposed, rainfall and surficial water drainage patterns (stream erosion and ponding) would again rework the land. Although the number and dates of these events remain obscure due to difficulty in aging sediments in this area, the Apalachicola Embayment has likely experienced multiple rises in sea level and reworking by marine action, alternating with periods of low sea level where the land was altered by rainfall drainage patterns (Schmidt 1984).

The eastern edge of the Embayment lies approximately along a north-south line from Tallahassee through Crawfordville. To the east is the Woodville Karst Plain, and to the west (beneath Tate's Hell), the limestone plunges progressively deeper beneath the earth's surface. Deep layers of Miocene and Pliocene clastic materials overtop the limestone, and a very thin layer of Pleistocene sand veneers the surface. In Gulf, southern Liberty, and Franklin counties "massive clay bed and graded quartz sands" make up much of the Pleistocene sediments (Schmidt 1984). These features are not found elsewhere in the panhandle. The clays are low in permeability, thus water is held near or at the surface over much of this area. The surface geology is a flat patchwork of quartz sands and clayey sands, occasionally containing woody material, which indicates "a period of rapid deposition in a fluvial or deltaic environment" (Schmidt 1984). These clays were likely deposited in a brackish or delta environment, as evidenced by the occurrence of freshwater and marine diatoms in some of the sediments (Schmidt 1984). Relict sand bar and barrier island formations are evident today several miles

inland in areas that are now within Tate's Hell State Forest boundaries (Brenneman and Tanner 1958; Puri and Vernon 1964; Wolfe, et al. 1988)

Tate's Hell lands consist of a large area of flat topography with the water table held close to the surface by expansive deposits of clay and clayey sands, interspersed with low quartz sand ridges. These features " allow water and nutrient flows to weave adjacent ecosystems into a closely integrated mosaic landscape" where "uplands, hydric hammocks, poorly drained pine flatwoods, bay swamps, shrub bogs, and cypress swamps intermingle, producing a complex, distinctive landscape" (Ewel 1990). Although Tate's Hell is unique in the Panhandle, similar areas, some with limerock instead of clays as hardpan, exist elsewhere in Florida including Osceola National Forest, San Pedro Bay, Gulf Hammock, the Green Swamp, and the Big Cypress Swamp (Ewel 1990).

Early accounts of the natural landscape and savannas. Alonzo de Pineda produced one of the earliest maps the Gulf Coast in 1519, however, it focused on the shoreline, not inland. One of the earliest written accounts of northwest Florida comes from Alvar Nunez Cabeza de Vaca (1528), who accompanied Panfile de Narvaez on a trip from the Tampa Bay area to "Apalachee Country". They apparently did not visit the Franklin County area, but rather visited the area near present-day Tallahassee, where he described Native American agricultural settlements (Williams 1827).

In his *View of West Florida* (1827), John Lee Williams did not mention visiting lands within the present Tate's Hell State Forest boundary, but he does describe the nearby, slightly drier St. James Island as "a poor pine barren, broken by ponds of water...". He also provides a good general description of northwest Florida savannas, as

> "... no more than natural reservoirs of water like the swamps; except that they are covered with grass and herbs instead of trees and vines; they are usually founded on clay or marle, but sometimes only on hard sand. They are frequently extensive, and form excellent grazing lands," and he also notes that
>
> "Betwixt the Apalachicola and the western branches of Little river, the land is generally a poor pine barren. The southern part of the county, near the seacoast, is covered with saw palmettos, ponds and swamps."

Vignoles (1823) mentioned "fine" lands in the northern portions of the Forbes purchase but makes no note of the lands in the south. He made general observations of Florida's vegetation, including the following:

> "{Florida's}... *Flat Pine Lands* ..are of two kinds: one sort covered with a thick undergrowth of berry and palmetto bushes and dwarf laurel, the pine trees being only sparely scattered on the ground; the other sort has no undergrowth, but abounds in savannas and cypress ponds, - the herbage is luxuriant," and

> "The *Pine Land Savannas* are merely ponds or drains in winter, covered in the dry season with rich crops of natural grass....Pasturage of the most luxuriant kind is afforded by these grounds."

The plat maps of McIver and Williams' 1856 survey of lands west of the Ochlockonee River offer the earliest detailed view of the lands within the Tate's Hell State Forest boundaries (Forbes 1856). Unfortunately, the maps do not give much detail on the presence of wet savannas, and the field notes for the maps are lost (Forbes 1856, Upchurch 1965, Maddox 1982). However, "swamps," are indicated by shaded areas, and several vegetation types are depicted at various places including the names "reed brake", "marsh and swamp", "pine and bay swamp", "juniper swamp", "scrub", and "pine and titi swamp". It is surmised that this survey was conducted toward the end of the Apalachicola Land Company's financial life, when it was believed that the land was of little value, and that the survey, and later treatment of its papers, may have reflected this attitude (Maddox 1982).

Tate's Hell State Forest lies in the area between the Choctawhatchee and the Wakulla Rivers which Harper (1914) describes as the "Apalachicola flatwoods" region. He described great deposits of "alluvium" in the area around the mouth of the Apalachicola River and made detailed observations of Wakulla and Franklin county flora. He notes "drier", "wet", and "damp" flatwoods as the predominant habitats and describes longleaf pine as the most abundant tree for those counties. For the region he notes that "ground water stands nearly everywhere, within a few feet or inches of the surface." The yellow pitcher-plant (*Sarracenia flava*), one indicator species of wet savannas and wet flatwoods in this region, he noted as the fourth most commonly-occurring herb in the Apalachicola flatwoods.

In their 1916 Soil Survey of Franklin county, Mooney and Patrick described the county as

> "Four-fifths...a practically featureless swampy plain comprising open grassy areas locally known as Savannas, areas of open pine woods covered with grass, having a dense growth of titi, cypress swamps and low ridges forested with pine and palmetto."

They noted that soil drainage was best along stream banks, such as along the New River, which were slightly higher in elevation than the surrounding land. They recognized two soil types, Plummer Fine Sand and Plummer Loamy Fine Sand, as important for savanna vegetation. These soils were generally described as low, clayey sands. The vegetation was generally described as "rank" growth of grasses and sedges, carnivorous plants, scattered pine, and cypress. These soils had a water table near the surface and were also known as "crawfish land" because of the frequent occurrence of crawfish chimneys.

Plummer Fine Sand was reported to be the most extensive soil type in the county. It occasionally supported treeless savannas, but more frequently supported longleaf pine flatwoods. The largest areas of Plummer Fine Sand were noted around Tate's Hell Swamp, around Pickett Bay, along the Crooked and New Rivers, and west of Apalachicola.

The Plummer Loamy Fine Sand was a heavier, more clayey soil, which characteristically supported "open prairie" or savanna, occasionally with a very thin pine canopy. Plummer Loamy Fine Sand was reported to be confined to the northwest part of the county. Slash pine and cypress were reported in depressions within both Plummer Fine Sand and Plummer Loamy Fine Sand. In 1916 large areas of both of these soil types were mapped within the present-day boundaries of Tate's Hell State Forest.

The majority of the Tate's Hell State Forest lands are shown on the 1916 soil map as Hyde Fine Sand, a black, mucky sand with a high organic content, typical of swamps and titi thickets. Mooney and Patrick state that Tate's Hell Swamp and Pickett Bay are two examples of Hyde Fine Sand, however they admit that because large sections of these areas were difficult to access, the Hyde Fine Sand map unit includes many other soil types as well. They pointed out that the area they call Tate's Hell Swamp, in particular, contained many areas of Plummer Fine Sand supporting savanna vegetation:

> "Probably the largest occurrences of any soil type in the general body [of Hyde Fine Sand] is that of the Plummer Fine Sand, which characteristically occurs as open grassy areas, or 'savannas,' as grassy flatwoods with a scattered growth of longleaf pine, and depressions or sloughs where cypress and slash pine are the predominant trees. The Hyde fine sand also includes some Plummer Loamy Fine Sand in the other part. Low palmetto and pine ridges, ranging from a few acres to comparatively large bodies are encountered.....In the interior of the swamps there are said to be open ponds, saw-grass ponds, large cypress swamps, and quaking bogs of Muck and Peat."

It should be noted that, since 1916, soil taxonomy and nomenclature have changed, and the soil names used by Mooney and Patrick do not directly translate into soil types of the same names used today (Shuster, pers. comm.). However, their report provides an excellent record of Franklin County's natural landscape and land use early in this century.

Summary

The information reviewed under Task 1 paints a picture of Tate's Hell State Forest Lands as historically very different than the predominantly slash pine and evergreen shrub vegetation that occurs there today. Tate's Hell lands likely historically supported large areas of grassy, treeless savanna intergrading with large expanses of wet pine flatwoods, mesic pine flatwoods, open grassy cypress sloughs, as well as dense swamps and titi thickets.

Tate's Hell land use history includes important episodes of cattle grazing and turpentining, both industries which practiced frequent burning and depended upon wiregrass-associated natural communities in Florida, of which wet savannas are a part. Harvesting trees, particularly pine, cypress, and Atlantic White Cedar, was also a major industry on the Tate's Hell landscape, although prior to the 1950's timber operations were largely restricted to selective tree extraction, and did not include the intensive, large-scale site preparation and re-

planting techniques used after that time. Thus, there are persons living today, and many documents such as the writings of early naturalists, historic aerial photographs and maps of the area, that depict the Tate's Hell landscape prior to the 1950's as more open and grassy than at the present time.

TASK 2: SAVANNA DESCRIPTION

Hydrology, Topographic Position and Soils

Three major environmental factors are believed to interact to give rise to the prairie-like vegetation of wet savannas: fire, hydrology, and soils; however, exactly how these factors combine to produce conditions favorable for wet savanna is not entirely known (Plummer 1963; Clewell 1971; Folkerts 1982, 1991). Frequent fire, particularly in the warm months, reduces the presence or relative abundance of woody vegetation in wiregrass-dominated habitats (for review see Platt et al. 1988, Glitzenstein, et al. 1995, Robbins and Myers 1992). Soils that contain relatively high amounts of clay, or that contain clay layers or hardpan close to the surface, may retard tree and shrub growth by maintaining a high water table and restricting downward root growth (Streng and Harcombe 1982). The soils beneath the savannas often have a high clay content close to the surface, although some authors have noted that sandy soils, if wet enough, may also support savanna (U.S. Forest Service 1984; Clewell 1971).

Wet savannas have a water table close to or at the soil surface for most of the year, except during the driest months in spring and fall, when the surface soils may become very dry, and, if clayey, may crack (Clewell 1971; Wolfe, et al. 1988). These saturated soils occur along slight slopes, or ecotonal areas between mesic flatwoods and drainages such as cypress or bay swamp, where ground water seeps out along the slope. These soils also occurs in broad, flat, low areas where the water table is ponded at the surface by clayey hardpan. Often, because the topography of the study area is subtle, these two situations (soil saturation due to ground water seepage or ponding) often intergrade and may be impossible to distinguish in the field (Clewell 1971).

Soils of several textures - loamy sands, sandy loams, and fine sands - are known to support wet savannas. However, none of these is exclusively associated with wet savanna vegetation; a given soil type can support different vegetation, depending on local hydrologic and fire regimes, or other environmental factors. Plummer Fine Sand is mapped beneath two of the reference savannas, Compartment 110 and Black Creek Bog, and Bladen Fine Sandy Loam is mapped in the Post Office Bay savanna (U. S. Forest Service 1984, Sasser, et al. 1994). Under field examination in 1997 with FNAI staff, Mr. Darrell Leach of the U. S. Natural Resource Conservation Service identified the soil at the Black Creek Bog site as Rains Fine Sandy Loam, which is commonly found to support wet savanna vegetation in Liberty County (Leach, pers. comm.).

FNAI field surveys in Tate's Hell found small fragments of intact savanna on Pelham Fine Sand, Plummer Fine Sand, Scranton Fine Sands, and Scranton Sand Slough. These soils were also identified as highly likely to have supported historic wet savanna in Tate's Hell by one of the authors of the 1994 Franklin County Soil Survey (J. Shuster, pers. comm.; Sasser, et al. 1994). A synopsis of soil types known to support wet savanna in the reference areas and within Tate's Hell is provided in **Table 3**. It is likely that in the coming year, additional soil types will be added to this list as more is learned.

Because wet savanna can occur within small ecotones between titi or cypress drainages and mesic flatwoods, these areas typically go undetected on soil maps due to their small size. Thus, while soil maps make excellent tools for identifying potential wet savanna sites, other sources, such as topographic maps and aerial photographs, must also be employed, along with the field knowledge of the surveyor.

Table 3. Soil types found or likely to support wet savanna vegetation in Tate's Hell State Forest and vicinity.[3]

Soil name	Texture Description	Notes
Plummer Fine Sand	0-58" - fine sand 58-80" - sandy loam, sandy clay loam, fine sandy loam.	Mapped beneath the ANF Compartment 110 reference area; recognized by several authors as important for wet savanna vegetation.
Pelham Fine Sand	0-37" - fine sand 37-80" - sandy clay loam, sandy loam, fine sandy loam	Clay occurs closer to the surface than Plummer fine sand; a loamy subsoil. Noted by J. Shuster as important for wet savanna vegetation.
Scranton Fine Sand	0-7" - fine sand 0-80" - loamy sand, sand, fine sand	Soil type mapped beneath two moderately intact wet savanna fragments in Tate's Hell noted by FNAI surveyors in 1997.
Scranton Slough	0-8" - sand 8-80" - loamy sand, sand, fine sand	Named "slough" due to vegetation similarity with cypress slough and savanna areas of S. Florida. Water sheet-flows, and soil can be seasonally dry (Shuster, pers. comm, Sasser, et al. 1994).
Bladen Fine Sandy Loam	0-5" - fine sandy loam 5-14" - fine sandy loam 14-80" - clay	Mapped beneath Post Office Bay Savanna in ANF (USFS 1984; Anglin 1995; Leach, pers. comm.)
Rains Fine Sandy Loam	0-7" - fine sandy loam 7-34" - sandy clay loam, clay loam 34-80" - sandy clay loam, clay loam, sandy clay.	Occurs beneath Black Creek Bog reference area (Leach, pers. comm). Soil description from Allen, et al. 1989.
Meadowbrook	0-5" - fine sand 5-42" - sand, fine sand 42-80 loamy sand, sandy loam, fine sandy loam	Possibly supported savanna in eastern portion of Tate's Hell State Forest. Recognized as supporting pitcher-plants and associated vegetation (Sasser, et al. 1994).

[3] Soil type is only one of many factors that influence vegetation. Other important factors include hydrology, fire history, and the natural and anthropogenic land disturbance history of the site. Thus, many other vegetation types can also occur on the soil types listed above. In addition, other soil types in Franklin and Liberty County likely give rise to wet savanna vegetation, but have not yet been documented by the author.

Reference Savanna Vegetation Description

There are several studies of wet savanna vegetation in the Apalachicola National Forest. The interested reader is directed to Clewell (1971, 1986); Wolfe, et al. (1988); Burks (1994) Burks and Bartodziej (1995); and Parker and Rasmussen (1997) for accounts of wet savanna vegetation at specific sites in the ANF. The following description is a compilation from these sources as well as FNAI observations at the reference areas throughout the ANF and in Tate's Hell State Forest.

When relatively undisturbed, and when frequently burned, wet savannas in Franklin and Liberty Counties are strikingly lush grasslands with a dense groundcover dominated by wiregrass (*Aristida beyrichiana*), spurned panic grass (*Panicum spretum*), toothache grass (*Ctenium aromaticum*), Chapman's beakrush (*Rhynchospora chapmanii),* plumed beakrush (*Rhynchospora plumosa*), and few-flower beakrush (*Rhynchospora oligantha*). Many other grasses and forbs are common and characteristic in these savannas, including other beakrushes (*Rhynchospora* spp.), nut rushes (*Scleria reticularis* and *Scleria* spp.), marshy three-awn grass (*Aristida palustris*), flattened pipewort (*Eriocaulon compressum*), ten-angle pipewort (*Eriocaulon decangulare*), coastal plain yellow-eyed grass (*Xyris ambigua*), Baldwin's yellow-eyed grass (*Xyris baldwiniana*), rose meadowbeauty (*Rhexia alifanus*), yellow meadowbeauty (*Rhexia lutea*), spurge (*Euphorbia inundata*), and low panic grasses (*Dichanthelium* spp.). Clubmosses (*Lycopodium* spp.) are also common.

Insectivorous plants are often abundant and include pink sundew (*Drosera capillaris*), and dew-threads (*Drosera tracyi*), yellow pitcher-plant (*Sarracenia flava*), parrot pitcher-plant (*Sarracenia psittacina*), hooded pitcher-plant (*Sarracenia minor*), and Chapman's butterwort (*Pinguicula planifolia*).

Common, colorful wild flowers in these wet savannas are sun-bonnets (*Chaptalia tomentosa*), Chapman's crownbeard (*Verbesina chapmaniii),* balduina (*Balduina uniflora*), short-leaf lobelia (*Lobelia brevifolia*), spring fleabane (*Erigeron vernus*), cone flower (*Rudbeckia graminifolia*), sneeze-weed (*Helenium pinnatifidum*), wetland sunflower (*Helianthus heterophyllus),* tickseed (*Coreopsis spp.*), blazing star (*Liatris* spp.), false blazing star (*Carphephorus pseudoliatris*), Bartram's rose-gentian (*Sabatia bartramii*), large-leaved marsh pink (*Sabatia macrophylla*), low pinebarren milkwort (*Polygala ramosa*), yellow colic-root (*Aletris lutea*), asphodel (*Toefieldia racemosa*), and rush-featherling (*Pleea tenuifolia*). Showy orchids can include tuberous grass-pink (*Calopgon tuberosus*), pale grass-pink (*Calopogon pallidus*), and rose pogonia (*Pogonia ophioglossoides*).

Shrubs are sparse and low to the ground, except when fire is excluded for long periods of time. They most commonly include coastal plain St. John's wort (*Hypericum brachyphyllum*), buckwheat tree (*Cliftonia monophylla*), titi (*Cyrilla racemiflora*), St. John's wort (*Hypericum* spp.), bayberry (*Myrica heterophylla*), sweet gallberry (*Ilex coriacea*), myrtle-leaved holly (*Ilex myrtifolia*), and gallberry (*Ilex glabra*).

Twenty-five rare plants tracked by FNAI have been found in wet savannas in the ANF, and some of these have also been documented on Tate's Hell lands. A complete listing of these plants, along with recommendations for management and restoration of wet savanna habitat on Tate's Hell, is provided under Task 4. A comparison of the vegetation of the reference area savannas and areas of historic savanna in Tate's Hell State Forest is also provided. Under Task 4 the reader will find species lists for the reference areas and a discussion of vegetation similarities and differences between the reference areas and Tate's Hell lands.

TASK 3: MAP OF HISTORIC WET SAVANNAS

Tate's Hell State Forest is covered by the 11 U. S. Geologic Survey 7.5' quadrangle maps (herein referred to as quad maps) listed below:

Sumatra	Owens Bridge	Thousand Yard Bay	Sanborn
Fort Gadsden	Tate's Hell Swamp	Pickett Bay	McIntyre
Beverly	Green Point		Carrabelle

FNAI staff compiled a map depicting the probable historic distribution of wet savanna in Tate's Hell State Forest on a set of clear mylar overlays for these 11 quad maps. Paper copies of these overlays are submitted to the USFWS, NWFWMD and FDOF in Appendix 2 of this report. FNAI will use the original mylar overlays for mapping other natural communities in 1998 under Phase II of this project.

Areas of probable historic wet savanna are represented by the yellow polygons on the mylar overlays and paper map copies. A small sample of the map and the section of 1953 aerial photography used to denote the wet savanna areas in the sample, are shown in **Figure 2**, along with more recent aerial photography that shows present land condition and roads. The soil and hydrologic information available also support the assumption that wet savanna historically occurred at those locations.

Figure 2 provides an illustration of how the 1953 black and white aerial photographs were used to determine whether open areas shown on the 1943 - 1945 quad maps (which formed the baseline wet savanna polygons) should be considered wet savanna. Figure 2.A. shows a portion of the mylar overlay on top of the 1943 Fort Gadsden quad map. The forested areas are green. Open, non-forested areas are white and yellow. The forested and non-forested designation refers to that shown on the 1943 map. The yellow color comes from the mylar overlay and depicts areas that the FNAI ecologist considered to be wet savanna, as shown on the 1953 black and white aerial photograph (Figure 2.B.). The white polygons in Figure 2.A. depict non-savanna areas, as interpreted from the 1953 photograph. For instance the photograph signature beneath the numeral "2" on Figure 2.B. was interpreted as an upland pine area and was not colored yellow. In contrast, the smooth, dark grey, sparsely treed signature beneath the numeral "3" was interpreted as wet savanna. There are faint wagon or vehicle tracks in the lower right-hand corner of Figure 2.B., an indication that logging may

have occurred. This information is reflected as the code "TR," for "tracks/trails," in the same location in Figure 2.A. Figures 2.C. and D. are provided to show examples of more recent photography of the same area.

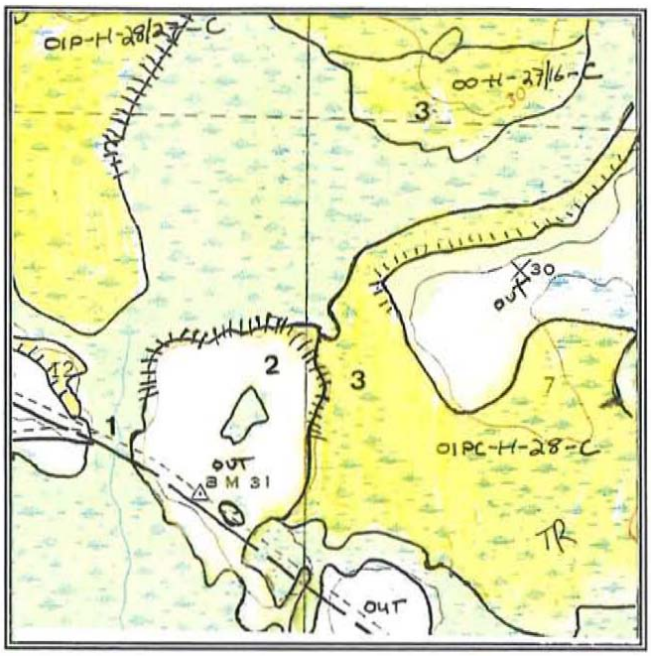
Each yellow polygon in the map is attributed with hand-written codes representing information from the 1953 aerial photographs, 1916 Soil Survey of Franklin County, 1994 Soil Survey of Franklin County, and National Wetlands Inventory maps. **Table 4** lists all the polygon attribute codes used in the historic savanna map in 1997. For example, consider the polygon label code 02PC-H-28-A. The dashed line separates information from each source in the order listed below.

1.	1953 aerial photographs:	"02PC" =	a tree canopy of 02 cover class composed of a mix of evergreen and deciduous trees
2.	1916 Soil Map of Franklin County:	"H" =	the soils were mapped as Hyde soil in the 1916 Soil Survey of Franklin County.
3.	1994 Soil Map of Franklin County	"28" =	the soils were mapped as Plummer Fine Sand (map unit 28) in the 1994 Soil Survey of Franklin County.
4.	National Wetlands Inventory Maps	"A" =	the water regime is depicted in the National Wetlands Inventory map as non-tidal temporarily flooded.

For detailed explanation of how each source was interpreted and information transferred to the map, see the methods section of this report.

Approximately 27,000 acres of probable historic wet savanna were mapped throughout Tate's Hell tract (this includes the entire original CARL tract boundary). The largest concentration of historic wet savanna acreage occurs in the northwestern third of the tract and along the New River north of Double Bridge Road. Other large areas were mapped near the Crooked River and along present-day Florida State Road 67. **Figure 3** shows the areas of highest concentration of historic wet savanna. It should be noted that historic wet savannas also occur, although more sporadically, outside the areas shown in Figure 3. It should also be noted that many very small ecotonal savannas, particularly those associated with the many cypress swamps and strands throughout Tate's Hell, may have been too small to be detected through the historic mapping process.

The majority of field visits to the historic wet savanna areas took place in the northwest, particularly north of Buck Siding Road and west of Tucker Road, where the likelihood of finding intact savanna was highest, based on FNAI element data records, oral history information, and on recent aerial photographs. This portion of Tate's Hell is relatively less disturbed by recent silvicultural practices and ongoing timber harvesting activities than other portions of the forest. FNAI surveyors noted several examples relatively intact wet savanna and wet flatwood vegetation in this area, which are noted by the double cross-hatching in Figure 3. These areas have excellent ecological restoration potential. It is recommended that prescribed warm season fire be applied to these areas as soon as possible to initiate the restoration process.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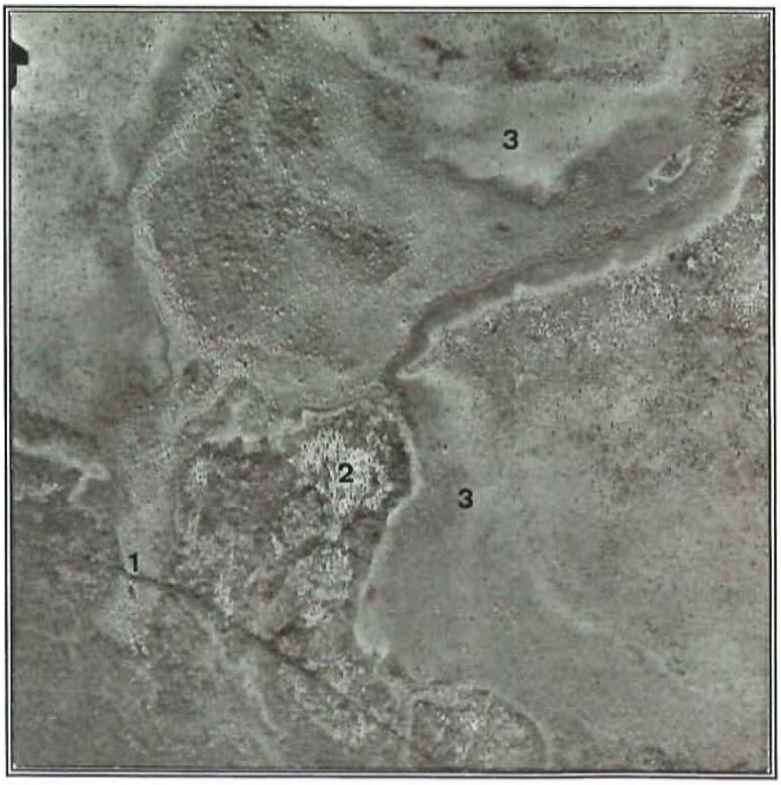
BM 31
01PC-H-28-C
TR
OUT

A.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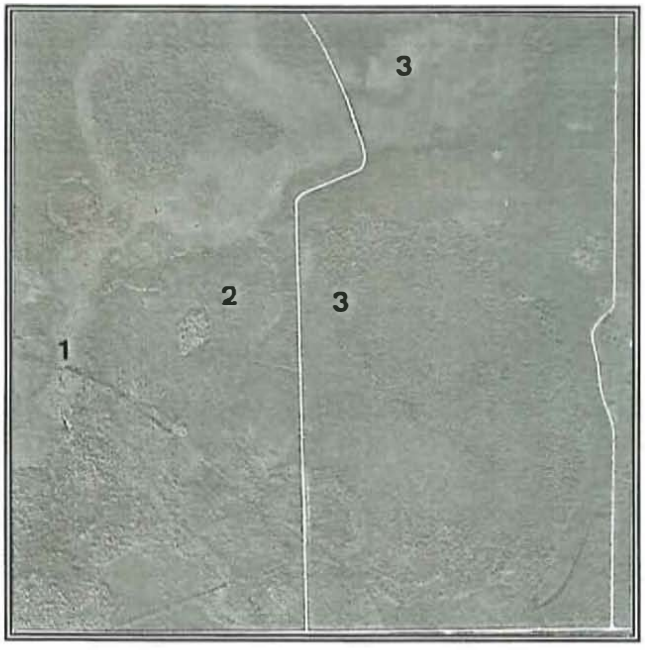
B.

C.



D.

Figure 2. A. Sample area of the probable historic wet savanna map overlay upon 1945 USGS quadrangle map (1:24,000 scale). B. 1953 black and white aerial photograph (1:20,000) of the area shown in A. C. 1994 infrared aerial photograph (1: 38,000) of the area shown in A. D. 1991 black and white aerial photograph (1:25,000) of the area shown in A. For all images: 1 = road stream crossing, 2 = example area of probable uplands as depicted in 1953 photograph, 3 = example area of probable wet savanna as depicted in 1953 photograph.

Table 4. Polygon attribute codes for Tate's Hell historic wet savanna polygons 1997.

1953 AERIAL PHOTOGRAPH INFORMATION			
Tree density code	**Rough estimate of number of trees per 1 cm sq. area on the 1953 aerial photograph (1cm² = approximately 6.2 acres)**		
00	< 10 trees (approx. 2 trees per acre)		
01	10 - 20 trees (approx. < 4 trees per acre)		
02	20 - 40 trees (approx. < 7 trees per acre)		
03	> 40 trees (approx. > 7 trees per acre)		
misc. codes	**Explanation**		
P	Dark tree canopy (evergreen, likely pine)		
C	Pale tree canopy (deciduous, likely cypress)		
Cyp	Areas depicted as open on 1942 aerial photographs that are cypress swamp		
||||||||	Hatch marks denote small areas likely to be ecotonal wet savanna.		
Out	Not likely to be wet savanna. This includes areas dominated by dense shrubs or otherwise densely vegetated, obvious home sites, or areas where tram lines were placed.		
TR	Denotes location of many tracks or trails visible on the 1953 aerial photograph.		
U?	Open areas that appear to be upland ridge, not wet savanna.		
1916 SOIL MAP OF FRANKLIN COUNTY			
Soil Code	**Soil name in 1916**		
Pl	Plummer loamy fine sand		
Ps	Plummer fine sand		
H	Hyde fine sand		
1994 SOIL MAP OF FRANKLIN COUNTY			
Soil code	**Soil name**	**Soil code**	**Soil name**
27	Pelham fine sand	43	Meadowbrook
28	Plummer fine sand	N	not available (Liberty Co.)
31	Rutledge fine sand		
33	Scranton fine sand		
34	Surrency fine sand		
39	Scranton sand, slough		
1983 NATIONAL WETLANDS INVENTORY MAPS			
Water regime code	**Water regime**	**Water regime code**	**Water regime**
A	Temporarily flooded	U	upland
C	Seasonally flooded	T	semipermanently tidal
F	Semi-permanently flooded		

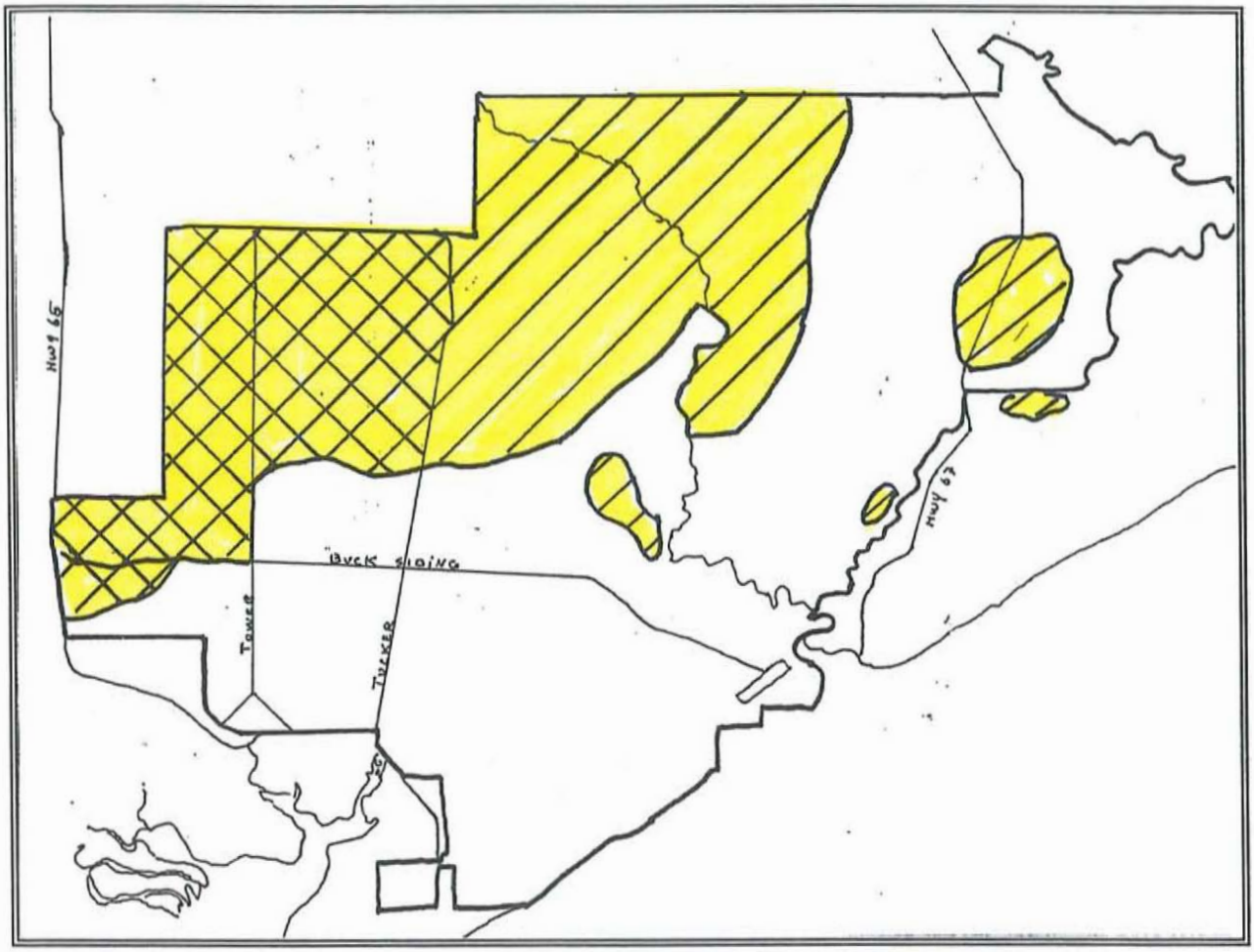


Figure 3. Regions of highest concentration of probable historic wet savanna in Tate's Hell State Forest and Carl tract shown (single cross-hatch). Double cross-hatch depicts area where several locations of remnant wet savanna vegetation were documented by FNAI in 1997.

TASK 4: FIELD SURVEY

The vegetation within Tate's Hell's probable historic wet savanna sites fall into three coarse groups: **moderately intact wet savanna**, **pine-titi**, and **old field/clear-cut**. A general description of the vegetation in each of these groups is given below.

Several small fragments of moderately intact wet savanna were identified in Tate's Hell State Forest. Most are 5 m^2 in size, or less, within larger areas of severe soil disturbance. A few larger areas of moderately intact wet savanna and wet flatwood vegetation (each several acres in size) were found in the northwest part of the Forest, and it is likely that more will be discovered in the next year as field work continues. These moderately intact savanna areas included a mix of species found in the high quality reference areas and species found in areas of severe soil disturbance. These areas are marked with an "A" on the historic wet savanna map, indicating vegetation with high ecological restoration potential. Management recommendations for these areas are given later in this report.

A common distribution pattern of wiregrass (*Aristida beyrichiana)* in Tate's Hell State Forest lands deserves note. Intact wiregrass groundcover was often seen in narrow strips between the deep, roadside drainage ditches and dense pine/titi areas. These strips are typically no more than 3 meters wide, the wiregrass stopping abruptly at the dense pine/titi vegetation. The cause of this distribution pattern is not known. It may be a result of site preparation techniques, where a narrow border of undisturbed soil was left along the drainage ditch bordering a site but the remaining area was chopped, or perhaps the presence of the drainage ditch maintains conditions favorable to wiregrass groundcover in this very narrow zone.

Plants most often used as indicators of **moderately intact wet savanna** groundcover in Tate's Hell included wiregrass, toothache grass (*Ctenium aromaticum*), Chapman's beakrush, and plumed beakrush. Intact savanna consisted of fragments of many individuals of these species in a relatively small area, giving the overall impression of a grassy patch, with grasses typically making up 25-50% cover. Other species almost always found in these areas were St. John's Wort (*Hypericum brachyphyllum*), pipeworts (*Eriocaulon* spp.), trumpets (Sarracenia flava), and coastal plain yellow-eyed grass (*Xyris ambigua*). A complete list of plant taxa found in this vegetation type in Tate's Hell and a comparison to the vegetation of the reference savannas are presented later in this report.

Most of the historic wet savanna areas are presently covered with slash pine and evergreen shrubs. These areas are typically planted or seeded slash pine silviculture areas established by Buckeye Cellulose in the 1960's and 1970's. In many of these areas, herbaceous vegetation is almost absent from the understory, eliminated by dense shading of the overstory plants and by deep leaf litter. Some of the areas surveyed did have very sparsely scattered wiregrass plants; however wiregrass occurrence over large areas is difficult to determine due to poor visibility and difficulty walking in these areas.

The Tate's Hell **pine/titi** areas have a canopy of slash pine (*Pinus elliottii var. elliottii*) and a dense, often almost impenetrable understory of evergreen shrubs. Common understory species include black titi (*Cliftonia monophylla*), white titi (*Cyrilla racemiflora*), little-leaf white titi (*Cyrilla racemiflora* var. *parvifolia*), sweetbay magnolia (*Magnolia virginiana*), swamp bay (*Persea palustris*), bayberry (*Myrica heterophylla*), sweet gallberry (*Ilex coriacea*), gallberry (*Ilex glabra*), black gum (*Nyssa biflora*), and fetter-bush (*Lyonia lucida*). Herbs often included Virginia chainfern (*Woodwardia virginica*), pipeworts (*Eriocaulon* spp.), spikerushes (*Eleocharis* spp.), and panic grasses (*Dichanthelium* spp.).

Large areas of **old field/clear-cut** vegetation are areas of probable historic wet savanna. The vegetation from site to site varies greatly, due to the interaction of many factors, including the original vegetation on the site, soil, hydrology, and disturbance history. The latter includes multiple variables such as the disturbance type (for example, site preparation, soil water drainage, or fertilization), and the environmental conditions at the time of and after the disturbance (for example, season, yearly variation in rainfall, and seed sources available for site colonization). Vegetation found in old field/clear-cut areas is also influenced strongly by the number of years since the disturbance event(s).

Common plants seen within Tate's Hell in historic savanna areas that are now old field/clear-cut include broom-sedge (*Andropogon virginicus*), glaucous broom-sedge (*Andropogon virginicus var. glaucus*), bushy beardgrass (*Andropogon glomeratus var. glomeratus*), worty panic grass (*Panicum verrucosum*), red-top panic grass (*Panicum rigidulum*), wool grass (*Scirpus cyperinus*), laurel-leaf greenbrier (*Smilax laurifolia*), blackberry (*Rubus* spp.), narrow-leaf corkwood (*Stillingia aquatica*), head beakrush (*Rhynchospora glomerata*), and other beakrushes (*Rhynchospora* spp.). Shrubs listed in the previous paragraph were also commonly found, along with St John's Worts (*Hypericum* spp.). Plants typical of wet savanna that commonly occurred in these clear-cuts included trumpets (*Sarracenia flava*), goldcrest (*Lophiola americana*), plumed beakrush (*Rhynchospora plumosa*), whip nutrush (*Scleria triglomerata*), and coastal-plain yellow-eyed-grass (*Xyris ambigua*).

Two other studies of vegetation on Tate's Hell State Forest lands are known to the author, and interested readers are directed to them for further information. Parker and Rasmussen (1997) conducted baseline vegetation monitoring in clear-cut and pine/titi areas within Tate's Hell; Conde, et al (1979) examined the effects of silvicultural activities on vegetation in Tate's Hell.

Comparisons of Tate's Hell and Reference Area Savanna Vegetation

Before comparisons are made, a brief review of the field survey techniques used in Tate's Hell is warranted. Once at a location of historic wet savanna in Tate's Hell, the dominant vegetation was noted, and, if the site appeared to be moderately intact savanna, the surveyor walked through the fragment listing additional species seen. No attempt was made to do a thorough floristic inventory of the site, rather the focus was on recording the general vegetation features and the site's restoration potential. Thus, additional species will certainly

be encountered in the coming year. However, the data collected to date in Tate's Hell does provide a basis for a comparison with the reference areas.

FNAI documented a total of 84 plant taxa across six moderately intact wet savanna fragments in Tate's Hell State Forest, all in the northwest part of the forest. Kirn and Anglin (1995, 1997) and Parker and Rasmussen (1997) recorded a combined total of 137 plant taxa for the ANF Compartment 110 savanna; Johnson (1997) has noted, to date, 112 plant taxa in the Black Creek Bog site, and Burks (1994) and Burks and Bartodziej (1995) recorded 112 taxa in the Post Office Bay Savanna.

Table 5 provides a simple comparison of the number of plant taxa recorded to date in Tate's Hell moderately intact savannas and the reference areas. **Table 6** provides the complete species lists for Tate's Hell moderately intact savanna, the three reference sites, and the pine/titi and old field/clear-cut vegetation in probable historic wet savanna areas. Species that are common or dominant in each area are also noted in Table 6.

A total of 223 taxa were encountered across all three reference sites. Of these, 68 taxa (30%) were also encountered in Tate's Hell intact savannas. Although this may seem low, the large diversity of the flora across all sites must be considered. For example, the reference areas each had total numbers of taxa ranging from 112 to 137, far less than the combined total of 223 taxa. Only 42 taxa were recorded in all three reference sites, indicating that there is considerable variation in the flora among the reference sites.

When only common or dominant plant taxa are considered, Tate's Hell savannas have a considerably higher percentage of those taxa found in the reference sites. Of the 42 taxa that were found in all three reference sites, 26 (62%) were also found in Tate's Hell intact wet savannas. Of the 22 taxa that were considered common or dominant in at least one of the reference areas, 14 (63%) were also found in Tate's Hell moderately intact wet savannas.

There were 8 taxa that were common or dominant in at least one of the reference sites and in Tate's Hell intact savanna: wiregrass (*Aristida beyrichiana*), toothache grass (*Ctenium aromaticum*), flattened hat pin (*Eriocaulon compressum*), coastal plain St. John's Wort (*Hypericum brachyphyllum*), goldcrest (*Lophiola americana*), Chapman's beakrush (*Rhyncospora chapmanii*), plumed beakrush (*R. plumosa*), and yellow pitcher plant (*Sarracenia flava*).

It should be noted that the relative abundances of these important wet savanna species in Tate's Hell are extremely different than in the reference areas. In Tate's Hell, the important savanna matrix species, such as the wiry-leaved grasses and sedges, are relatively scarce, and ruderal species more common than would be found in undisturbed wet savanna. Thus, although these areas show promise for ecological restoration, care must be taken to avoid disturbance to the intact savanna vegetation further. Promotion of this vegetation is dependent upon the application of warm season fire and hydrologic restoration, and lack of further soil disturbance.

The data presented here are encouraging to savanna restoration efforts in Tate's Hell. Although the number of taxa that Tate's Hell savannas have in common with each of the reference area is relatively low (ranges from 30%-40%, see Table 6), it is noteworthy that 63% of the plant taxa found in all 3 reference sites was also found in Tate's Hell. It is likely that with additional field work in 1998 that FNAI will find many additional species in Tate's Hell savannas as well.

Table 5. Comparison of plant taxa found in Tate's Hell Moderately Intact Savanna site and the three reference areas.

Source	Number of plant taxa	Number of plant taxa in common with Tate's Hell moderately intact savanna	Percent of plant taxa in common with Tate's Hell moderately intact savanna
Tate's moderately intact savanna	84	84	100%
Cmpt 110	137	54	39%
Black Creek Bog	112	45	40%
Post Office Bay	112	37	33%
Across all reference areas	223	68	30%
Recorded in all 3 reference areas	42	26	62%
Described as common or dominant in at least one reference area	22	14	63%

Table 6. Plant taxa found in Tate's Hell **moderately intact wet savanna**, the three reference areas, and in Tate's Hell **pine/titi** and **old field/clear-cut** area on likely historic savanna sites. Notations: X = present, X-C =common or dominant. Taxonomy follows that used by the sources listed.

SOURCE	FNAI		Burks	USFS_U	FNAI-AJ		FNAI		FNAI
LOCATION	multi-		POB	ANF-110	ANF-BC		multi-		multi-
CONDITION	mod.		intact	intact	intact		pine-titi		clear-cut
Acer rubrum							X		
Agalinus sp.					X				
Agalinus aphylla	X			X					
Agalinus fasciculata									X
Agalinus filicaulis			X		X				
Aglainus obtusifolia					X				
Agalinus pinetorum			X						
Agalinus setacea					X				
Aletris aurea					X				
Aletris lutea	X		X	X	X				
Aletris lutea x obovata			X						
Aletris obovata			X	X					
Andropogon spp.									
Andropogon arctatus	X			X-C	X				
Andropogon brachystachyus			X						
Andropogon glomeratus	X								
Andropogon glomeratus var. pumilus			X						X-C
Andropogon liebmanii var. pungensis			X						
Andropogon virginicus var. glaucus	X			X					
Andropogon virginicus var. virginicus			X-C						
Aristida beyrichiana	X-C		X-C	X-C	X-C		X		
Aristida longespica (cf)									X
Aristida palustris	X				X				
Aronia arbutifolia					X				
Arnoglossum ovatum					X				
Arundinaria gigantea	X								
Asclepias cinerea				X					
Asclepias connivens			X	X	X				
Asclepias michauxii				X					
Asclepias longifolia					X				
Asclepias viridula			X	X	X				

SOURCE	FNAI		Burks	USFS_U	FNAI-AJ		FNAI		FNAI
LOCATION	multi-		POB	ANF-110	ANF-BC		multi-		multi-
CONDITION	mod.		intact	intact	intact		pine-titl		clear-cut
Aster chapmanii			X		X				
Aster eryngiifolius			X	X					
Aster reticularis			X						
Bermania ???	X				X				
Baccharis halimifolia				X					
Balduina uniflora	X		X	X	X				
Bartonia paniculata				X					
Bartonia verna			X						
Bigelowia nudata	X		X	X	X				
Boltonia diffusa			X						
Calapogon barbatus			X	X	X				
Calapogon pallidus				X					
Calapogon tuberosus			X	X	X				
Carex joorii	X								
Carex stricta			X						
Carphephorus spp.				X					
Carphephorus pseudoliatris	X		X	X-C	X				
Cassia fasciculata									X
Chaptalia tomentosa			X	X-C	X				
Cirsium lecontei			X						
Clethra alnifolia	X			X	X				
Cliftonia monophylla	X-C			X			X-C		
Coreopsis floridana					X-C				
Coreopsis linifolia			X	X	X				
Coreopsis nudata				X	X				
Ctenium aromaticum	X-C		X-C	X-C	X				
Cuscuta grovnii				X					
Cuscuta indecora				X					
Cyperus haspan									X
Cyrilla racemiflora	X			X	X		X-C		
Dichanthelium aciculare									X
Dichanthelium spp.	X						X		
Dichanthelium scabriusculum.									X
Dichromena latifolia	X		X	X	X				
Diodia teres									X
Diodia virginiana									X
Drosera sp.				X					
Drosera brevifolia					X				

SOURCE	FNAI		Burks	USES_U	FNAI-AJ		FNAI		FNAI
LOCATION	multi-		POB	ANF-110	ANF-BC		multi-		multi-
CONDITION	mod.		intact	intact	intact		pine-titi		clear-cut
Drosera capillaris	X-C		X	X	X		X		
Drosera intermedia	X		X						
Drosera tracyi	X		X	X	X				
Eleocharis microcarpa			X						
Eragrostis atrovirens									X
Erianthus gigantea									X
Erigeron vernus				X	X				
Eriocaulon sp.	X			X					
Eriocaulon compressum	X		X-C	X-C	X		X-C		
Eriocaulon decangulare	X-C		X	X-C	X		X		
Eriocaulon spp.									X
Eryngium yuccifolium			X	X					
Eupatorium anomalum									X
Eupatorium leucolepis					X				X
Eupatorium mohrii									X
Eupatorium perfoliatum			X						X
Eupatorium semiserratum									X
Euphorbia inundata			X	X	X				
Euthamia minor									X
Fuirena squarrosa					X				
Fuirena breviseta			X						
Gaylussacia mosieri	X			X					
Gentiana penelliana			X						
Harperocallis flava					X				
Helenium amarum				X					
Helenium vernale			X	X	X				
Helianthus sp.				X					
Helianthus angustifolius					X				X-C
Helianthus heterophyllus			X-C	X-C	X				X-C
Helianthus radula			X	X					
Hedyotis uniflora									X-C
Hibiscus aculeatus				X					
Hypericum sp.				X					
Hypericum brachyphyllum	X-C		X	X-C			X		X-C
Hypericum exile	X				X				
Hypericum fasciculatum	X-C			X			X		
Hypericum cistifolium				X					
Hypericum crux-andreae			X						
Hypericum gentianoides				X					

SOURCE	FNAI		Burks	USFS_U	FNAI-AJ		FNAI		FNAI
LOCATION	multi-		POB	ANF-110	ANF-BC		multi-		multi-
CONDITION	mod.		intact	intact	intact		pine-titi		clear-cut
Hypericum microsepalum	X		X						X
Hypericum setosum			X						
Hypericum tetrapetalum				X					
Hypoxis sp.					X				
Hypoxis micrantha				X					
Hyptis alata					X				
Ilex coriacea	X-C			X	X		X-C		
Ilex glabra			X	X			X		
Ilex myrtifolia	X		X	X			X		
Iris tridentata					X				
Iva microsepalum									X
Juncus sp.	X				X				
Justicia crassifolia				X					
Kummerowia striata									X
Lachnanthes caroliniana	X		X	X			X-C		
Lachnocaulon anceps	X		X				X		
Lachnocaulon sp.									
Lachnocaulon minus			X						
Liatris gracilis									X
Liatris spicata	X		X		X				
Liatris tenuifolia				X					
Lilium catesbaei	X		X	X	X				
Linum floridanum			X		X				
Linum medium			X	X					
Lobelia brevifolia			X	X	X				
Lobelia feayana (?)					X				
Lobelia paludosa			X						
Lobelia puberula					X				
Lophiola americana	X-C		X	X-C	X				
Ludwigia alata					X				
Ludwigia virgata				X					
Lycopodium alopecuroides	X		X						
Lycopodium appressum	X				X				
Lycopodium carolinianum			X	X					
Lycopodium prostratum					X				
Lycopodium spp.	X			X	X				
Lyonia fruticosa	X								
Lyonia lucida				X			X-C		
Macbridea alba				X					

SOURCE	FNAI		Burks	USFS_U	FNAI-AJ		FNAI		FNAI
LOCATION	multi-		POB	ANF-110	ANF-BC		multi-		multi-
CONDITION	mod.		intact	intact	intact		pine-titi		clear-cut
Magnolia virginiana				X	X				
Marshallia tenuifolia				X	X				
Mitreola sessilifolia					X				
Muhlenbergia capllaris var. trichopodes					X				
Muhlenbergia expansa			X	X	X				
Myrica cerifera	X								
Myrica heterophylla	X		X	X	X				
Myrica inodora	X		X						
Nyssa sp.	X			X					
Nyssa biflora				X			X		
Nyssa ursina				X					
Orbexilum pedunculatum			X						
Oxypolis filiformis	X		X	X	X				
Panicum dichotomiflorum									X-C
Panicum erectifolium				X					
Panicum hemitomom			X						
Panicum rigidulum									X-C
Panicum scoparium			X						
Panicum spretum	X		X-C	X-C	X				
Panicum verrucosum	X		X						X-C
Panicum sp.	X			X					
Parnassia sp.					X				
Parnassia grandifolia				X					
Physotegia godfreyi			X	X	X				
Pinguicula ionantha			X		X				
Pinguicula lutea			X	X					
Pinguicula planifolia	X				X				
Pinguicula pumila			X						
Pinus elliottii	X-C			X			X-C		
Pinus palustris									
Pityopsis oligantha				X	X				
Platanthera ciliaris	X			X					
Platanthera integra			X	X					
Platanthera nivea			X	X	X				
Pleea tenuifolia	X		X	X-C	X				
Pogonia ophioglossoides			X	X	X				
Polygala baldwinii					X				
Polygala brevifolia				X					

SOURCE	FNAI		Burks	USFS U	FNAI-AJ		FNAI		FNAI
LOCATION	multi-		POB	ANF-110	ANF-BC		multi-		multi-
CONDITION	mod.		intact	intact	intact		pine-titi		clear-cut
Polygala chapmanii			X						
Polygala crenata			X		X				
Polygala cruciata	X			X	X				
Polygala cymosa			X	X	X				
Polygala hookeri				X	X				
Polygala lutea					X				
Polygala ramosa			X	X	X				
Polypremum procumbens									X
Pteridium aquilinum			X						
Rhexia alifanus	X		X-C	X	X				
Rhexia marianna				X					X
Rhexia lutea	X		X	X-C	X				
Rhexia petiolata	X			X	X				
Rhexia virginica									X
Rhododendron serrulatum				X					
Rhynchospora baldwinii				X	X				
Rhynchospora corniculata	X								
Rhynchospora chapmanii	X-C		X	X-C	X-C				X-C
Rhynchospora ciliaris	X			X	X				
Rhynchospora compressa			X		X				
Rhynchospora elliottii			X						X-C
Rhynchospora fascicularis			X						
Rhynchospora glomerata			X						X-C
Rhynchospora inundata				X					
Rhynchospora macra					X-C				
Rhynchospora oligantha	X		X	X-C	X-C				X-C
Rhynchospora plumosa	X-C		X	X-C	X-C				X-C
Rhynchospora spp.							X		
Rhynchospora stenophylla							X		
Rudbeckia graminifolia			X	X	X				
Rudbeckia hirta				X					
Sabatia bartramii			X	X	X				
Sabatia brevifolia			X		X				
Sabatia difformis	X								
Sabatia macrophylla	X			X	X				
Sabatia stellaris				X					
Sarracenia flava	X-C		X	X-C	X		X		X
Sarracenia leucophylla	X								
Sarracenia minor			X	X					

SOURCE	FNAI		Burks	USFS_U	FNAI-AJ		FNAI		FNAI
LOCATION	multi-		POB	ANF-110	ANF-BC		multi-		multi-
CONDITION	mod.		intact	intact	intact		pine-titi		clear-cut
Sarracenia psittacina	X-C		X	X	X				
Sarracenia purpurea					X				
Serenoa repens				X					
Scoparia dulces									X
Scirpus cyperinus									X-C
Scleria sp.	X								
Scleria baldwinii			X	X	X				
Scleria pauciflora v. caroliniana			X						
Scleria reticularis	X		X-C	X-C					
Scleria triglomerata	X-C				X		X		X-C
Seymeria sp.					X				
Seymeria cassiodes				X					
Sisrinchium nashii				X					
Smilax laurifolia	X-C		X	X	X		X		
Smilax smallii				X			X		
Smilax walteri				X					
Solidago stricta									X
Sphagnum spp. (Bryopphyte)	X			X	X				
Spiranthes praecox			X						
Sporobolus floridanus							X		
Stylosanthes biflora			X						
Styllingia aquatica	X			X					
Syngonanthus flavidulus			X						
Taxodium ascendens	X			X	X		X		
Tofieldia racemosa			X	X-C	X				
Utricularia sp.	X								
Utricularia biflora					X				
Utricularia cornuta				X					
Utricularia juncea	X								
Utricularia subulata			X		X				
Vaccinium corymbosum	X								
Verbesina chapmanii			X	X	X				
Vernonia angustifolia				X					
Viola sp.					X				
Viola primuliflora	X								
Vitus rotundifolia				X					
Woodwardia virginica							X		
Xyris spp.	X			X					

SOURCE	FNAI		Burks	USFS_U	FNAI-AJ		FNAI		FNAI
LOCATION	multi-		POB	ANF-110	ANF-BC		multi-		multi-
CONDITION	mod.		intact	intact	intact		pine-titi		clear-cut
Xyris ambigua	X-C		X	X	X				
Xyris baldwiniana			X	X	X				
Xyris caroliniana			X						
Xyris elliottii				X					
Xyris fimbriata	X								
Xyris flabelliformis (cf)	X								
Xyris serotina			X	X					
Xyris stricta			X						
Zigadenus densus				X					
Zigadenus glaberrimus	X			X					
TOTAL NUMBER OF TAXA	84		112	137	112		27		42

POB = Post Office Bay Savanna (Burks 1994, Burks and Bartodziej 1995), **ANF-110** = Apalachicola National Forest Compartment 110 (Kirn and Anglin 1995, 1997 - USFS; Parker and Rasmussen 1997- University of Georgia), **ANF-BCB** = Black Creek Bog (Johnson 1997 - FNAI); **multi-Tates** = combines plant taxa data from six moderately intact savanna locations in Tate's Hell State Forest visited by FNAI in 1997.

Rare Plants Documented or Likely to Occur in Tate's Hell

Table 7 lists the rare plant species that have been documented or that have a high likelihood of occurring in wet savanna (seepage slope and wet prairie) in Tate's Hell State Forest. Because fire exclusion and past silvicultural activities have resulted in dense pine/titi vegetation throughout much of the Forest, visibility for sighting these rare plants is poor. The lack of fire and shading by woody vegetation also precludes flowering and growth of these rare plants, making them inconspicuous at best, and may result in their disappearance. Restoration and maintenance of wet savanna-associated rare plants in Tate's Hell is dependent upon the aggressive application of ecological burning in historic or likely wet savanna areas. As important is the prohibition of mechanical disturbance in known locations of remnant wet savannas, in upland/wetland ecotones, and in known locations of wet savanna- associated rare plants. More specific management recommendations are provided below.

Table 7. FNAI-tracked plant species known or likely to occur in historic wet savannas (seepage slope and wet prairies) in Tate's Hell State Forest.

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FED STATUS	STATE STATUS
Andropogon arctatus	Pine-woods bluestem[1]	G3	S3	N	N
Asclepias viridula	Southern milkweed	G2	S2	C1	LT
Aster chapmanii	Chapman's aster	G2G3	S2S3	*N	N
Drosera intermedia	Spoon-leaved sundew[1]	G5	S3	N	LT
Euphorbia telephioides	Telephus spurge[2]	G1	S1	LT	LE
Gentiana pennelliana	Wiregrass gentian[1]	G3	S3	*N	LE
Harperocallis flava	Harper's beauty	G1	S1	LE	LE
Hymenocallis henryae	Panhandle spiderlily	G1	S1	*N	N
Justicia crassifolia	Thick-leaved water-willow[1]	G2	S2	*N	LT
Lachnocaulon digynum	Bog-button	G3	S2?	*N	N
Linum westii	West's flax[1]	G2	S2	*N	LT
Macbridea alba	White bird's-in-a-nest[1]	G1	S1	LT	LE
Nyssa ursina	Bog tupeloa[1]	G2Q	S2	N	N
Parnassia caroliniana	Carolina grass-of-parnassus	G2	S1	*N	LE
Parnassia grandifolia	Large-flowered grass-of-parnassus	G2G3	S2	N	LE
Physostegia godfreyi	Apalachicola dragon-head	G3	S3	N	N
Pinguicula ionantha	Violet-flowered butterwort[1]	G2	S2	PT	LE
Pinguicula planifolia	Chapman's butterwort[1]	G3?	S2	*N	LE
Platanthera integra	Yellow fringeless orchid	G3G4	S3S4	N	(LT)
Rhexia parviflora	Small-flowered meadowbeauty[1]	G2	S2	*N	LE
Sarracenia leucophylla	White-topped pitcher-plant[1]	G3	S3	*N	LE
Scutellaria floridana	Florida skullcap	G1	S1	LT	LE
Verbesina chapmanii	Chapman's crownbeard	G2G3	S2S3	C1	LT
Xyris drummondii	Drummond's yellow-eyed grass	G3	S2	*N	N
Xyris scabrifolia	Harper's yellow-eyed grass	G2G3	S1	*N	LT

* Species formerly classified as C2 are marked with an asterisk.
[1] Documented by FNAI in Tate's Hell State Forest
[2] Reported by Parker and Rasmussen 1997, not yet documented by FNAI

Table 7 (continued)

Explanation of Ranks used in Table 7. Using a ranking system developed by The Nature Conservancy and the Natural Heritage Program Network, the Florida Natural Areas Inventory assigns two ranks to each element. The global element rank is based on an element's worldwide status; the state element rank is based on the status of the element in Florida. Element ranks are based on many factors, most importantly, the estimated number of EOs, estimated abundance, range, estimated adequately protected EOs, relative threat of destruction, and ecological fragility.

FNAI GLOBAL ELEMENT RANK

G1 = Critically imperiled globally of extreme rarity (5 or fewer occurrences or less than 1000 individuals) or because of extreme vulnerability to extinction due to some natural or anthropogenic factor.

G2 = Imperiled globally because of rarity (6 to 20 occurrences or less than 3000 individuals) or because of vulnerability to extinction due to some natural or anthropogenic factor.

G3 = Either very rare and local throughout its range (21-100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction of other factors.

G#? = tentative rank (e.g., G2?)

G#G# = range of rank; insufficient data to assign specific global rank (e.g., G2G3)

FNAI STATE ELEMENT RANK

Definition parallels global element rank: substitute "S" for "G" in above global ranks, and "in Florida" for "globally" in above global rank definitions.

FEDERAL LEGAL STATUS (U. S. Fish and Wildlife Service - USFWS)

LE = Listed as Endangered Species in the List of Endangered and Threatened Wildlife and Plants under the provisions of the Endangered Species Act. Defined as any species which is in danger of extinction throughout all or a significant portion of its range.

LT = Listed as Threatened Species. Defined as any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

C = Candidate Species for addition to the List of Endangered and Threatened Wildlife and Plants. Taxa for which the USFWS currently has substantial information on hand to support the biological appropriateness of proposing to list the species as endangered or threatened.

N = Not currently listed, nor currently being considered for addition to the List of Endangered and Threatened Wildlife and Plants.

STATE LEGAL STATUS

Plants (Florida Department of Agriculture and Consumer Services- FDACS)

LE = Listed as Endangered Plants in the Preservation of Native Flora of Florida Act. Defined as species of plants native to the state that are in imminent danger of extinction within the state, the survival of which is unlikely if the causes of a decline in the number of plants continue, and includes all species determined to be endangered or threatened pursuant to the Federal Endangered Species Act of 1973, as amended.

LT = Listed as Threatened Plants in the Preservation of Native Flora of Florida Act. Defined as species native to the state that are in rapid decline in the number of plants within the state, but which have not so decreased in such number as to cause them to be endangered.

CE = Listed as a Commercially Exploited Plant in the Preservation of Native Flora of Florida Act. Defined as species native to state which are subject to being removed in significant numbers from native habitats in the state and sold or transported for sale.

(LT) = Listed threatened as a member of a larger group but not specifically listed by species name.

N = Not currently listed, nor currently being considered for listing.

MANAGEMENT RECOMMENDATIONS

RESTORATION OF WET SAVANNAS AND ASSOCIATED RARE PLANTS

* The application of prescribed fire in the early growing season (March - June) is the most important action necessary for ecological restoration of wet savanna vegetation in Tate's Hell State Forest.

* Highest priority for prescribed fires should be given to areas known to contain examples of intact or remnant wet savannas, and other longleaf pine/wiregrass - associated natural communities. Equal priority should be given to known locations of rare plants and animals dependent upon these community types.

* The intact wet savanna areas in Tate's Hell State Forest documented to date by FNAI are predominantly in the northwest section of the Forest. These areas are primarily on the Fort Gadsden, Tate's Hell, and Green Point quads and are indicated with an "A" on the historic savanna quad maps that accompanies this report. The approximate location of these areas is shown by the double cross-hatching in Figure 3 of this report.

* Intact wet savanna vegetation is highly likely to occur throughout Tate's Hell in ecotones between cypress swamps and mesic flatwoods and in similar ecotonal situations. Mechanical soil disturbance in these ecotonal areas should be prohibited. This includes silvicultural site preparation, ORV traffic, and creation of fire breaks. Fires should be allowed to extinguish naturally at the edges of cypress swamps and other drainages.

ECOLOGICAL RESTORATION OF THE TATE'S HELL LANDSCAPE

* Prescribed fire, particularly in the spring and early summer (March - June), must be re-established as the major environmental factor in the Tate's Hell landscape. Fire return intervals should vary between 2 and 7 years.[4] It is recognized that many locations in Tate's Hell may first need cool season fire for reduction of fuel loads before warm season fires can be applied.

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[4] Details for Tate's Hell land managers regarding recommended season and frequency of prescribed fires can be found in *Seasonal Effects of Prescribe Burning in Florida: A review*, by L. E. Robbins and R. L. Myers; and in *The longleaf pine ecosystem: ecology, restoration and management. Proceedings of the 18th Tall Timbers Fire Ecology Conference*, S. Hermann, editor. Both are available at Tall Timbers Research, Inc., Tallahassee, FL.

MANAGEMENT RECOMMENDATIONS [continued]

* All areas of intact or remnant wiregrass or longleaf pine-associated communities, documented by FNAI, FDOF, or FGFWFC, should receive highest priority for prescribed fire in the growing season.

* Although the present study focuses solely on treeless wet savanna vegetation, it is apparent, from the research conducted to date, that much of the remaining land within Tate's Hell State Forest was covered with widely scattered trees (likely pine and cypress) and herbaceous groundcover (likely wiregrass and beakrushes). These were probably wet flatwoods, mesic flatwoods, and cypress sloughs and strands, which intergrade with the treeless wet savanna areas. All of these community types, when found in relatively intact ecological condition (e.g. intact groundcover), should be protected and restored through prescribed fire, hydrologic restoration, and protection from mechanical disturbances.

* The addition of fertilizers should be avoided in Tate's Hell State Forest. The major native natural communities in this area evolved in low nutrient environments; this condition should be preserved.

* The open physical structure of large, recently clear-cut or thinned areas in Tate's Hell should be maintained with prescribed warm season fire. Examples of these areas include those containing widely scattered cypress with lush grass and sedge groundcover and areas of thinned pine areas with broomsedge and low shrubs beneath.

ECOLOGICAL INVENTORY

* Efforts should be made to locate and map examples of the remaining undisturbed or relatively intact natural communities on Tate's Hell State Forest lands. Identifying such areas is essential for implementation of the FDOF and CARL program objectives of maintaining and protecting native ecosystems. The natural community types targeted for inventory should include wet savannas, wet flatwoods, mesic flatwoods, cypress sloughs and strands, baygall, floodplain forest, floodplain swamp, sandhills, coastal scrub, and upland hardwood forests.

* Efforts should be made to locate and map all occurrences of rare plants and animals in Tate's Hell State Forest Lands. Once located, then these occurrences should be ranked for priority management action and protection based on factors such as population size, distribution and rarity.

[Continued on next page]

* FNAI recommends that the Division of Forestry implement a method for recording locations of intact wiregrass-associated groundcover as it is discovered through forestry inventory, fire management, and other FDOF activities. This information can then be used to prioritize prescribed fires, placing fire into locations where extensive intact wiregrass groundcover is discovered.

EXOTIC SPECIES

12. Two exotic species, seen in Tate's Hell in two cleared areas, were cogon grass (*Imperata cylindrica*) and Japanese climbing fern (*Lygodium japonicum*). It is likely that other locations of invasive exotic plants exist on Forest land. Although not yet seen in Tate's Hell by FNAI staff, popcorn tree (*Sapium sebiferum*) could easily spread into the large areas of disturbed, wet soil presently in Tate's Hell. Every effort should be made to eradicate these species when discovered. As of September, 1997, the cogongrass location appeared to be untreated, or inadequately treated, as the plants appeared healthy and seed production was observed.

DISCUSSION

This report pertains to Phase I of a two year study to map historic vegetation patterns in Tate's Hell State Forest; Phase I focuses on wet prairie and seepage slope vegetation (called wet savanna throughout this report). The results and historic distribution map presented here paint a picture of Tate's Hell lands historically quite different than today. The written, oral, and photographic evidence suggests that large areas of Tate's Hell State Forest and CARL tract lands were more open and grassy than they are today. These areas were not only the treeless wet savanna targeted in Phase I, but were also likely large expanses of pine and cypress flatwoods, sloughs, and swamps, interspersed with low sandy pine ridges of mesic flatwood and sandhill vegetation. Phase II of this study will address the extent and nature of these and other communities associated with the historic wet savannas in Tate's Hell. However, even without Phase II, this report, and the historic documents upon which it is based, presents evidence that large areas of grassy wet savanna, flatwoods, and sloughs have been obscured by the history of land use in Tate's Hell State Forest, particularly silvicultural practices applied to the landscape since the mid 1950's.

Based on the apparent open, grassy nature of large areas of Tate's Hell State Forest lands, and on its turpentine and grazing history, the occurrence of fire was certainly more prevalent than it is today. It is also apparent that the history of ditching and draining has altered the natural hydrology of the landscape, which in turn, has altered the vegetation. These changes in fire and hydrology regimes, along with silvicultural practices have led to a large-scale shift away from a grassy, open, sparsely treed landscape interspersed with titi and swamp drainages to a landscape blanketed instead with dense, planted slash pine and evergreen shrubs, cris-crossed with drainage ditches. The importance of restoring fire in the Tate's Hell landscape, along with hydrologic restoration, cannot be over-emphasized, if ecological restoration of these lands is the goal.

The historic vegetation map presented with this report will be useful as a general guide for ecological restoration and gives the land manager an idea of the probable historic abundance of wet savannas across the landscape. However, due to the dramatic and pervasive changes in Tate's Hell landscape since the mid 1950's, it is doubtful that an exact, acre-by-acre restoration of every area is feasible. Finding sites suitable for restoration to wet savanna will depend not only on historic conditions, but on present-day soil, hydrology, and vegetation.

However, many small areas of remnant wet savanna persist throughout Tate's Hell State Forest lands. These areas have a high potential for restoration and should receive high priority for burning and hydrologic restoration. Also, many recently thinned or clear-cut areas resemble the historic vegetation in structure, if not in species composition. Restoration of the general physical appearance of the landscape, with particular care taken not to damage known intact remnant historic vegetation, is crucial to the success of ecological restoration of the Tate's Hell landscape.

FUTURE WORK PLANNED BY FNAI

Phase II of this project begins in January 1998, and will expand the reconstruction of vegetation patterns in Tate's Hell to slash pine-, longleaf pine-, sand pine-, cypress- and Atlantic white cedar- associated natural community types. FNAI will continue to conduct historic research and field work focused on mapping the historic distribution of these communities. The map at the end of 1998 will be in GIS format. Because several other entities are presently conducting other biological field work on Tate's Hell lands, FNAI plans to coordinate with these agencies (FGFWFC, NWFWMD, FDOF) to exchange information on target community types, with particular emphasis on rare communities such dwarf cypress basin swamps, longleaf pine flatwoods, scrub, and wet savannas. FNAI will continue to document in the Biological Conservation Database all rare plants, animals and high quality examples of natural communities, as they are encountered on Tate's Hell lands.

FNAI will continue to work with FDOF to provide information that can assist them in ecological restoration of Tate's Hell State Forest. For example, under Phase I of this project, FNAI gave an informal presentation to FDOF staff on the rare plants and indicator species of wet savannas found on Tate's Hell lands. FNAI will continue to provide information as needed to FDOF and FGFWFC staff in rare plant identification, as well as in recognition of the natural communities on Tate's Hell lands.

Acquisition of a complete set of 1942 black and white aerial photographs for Tate's Hell lands will occur early in Phase II; these photographs will form the basis for the Phase II mapping of historic vegetation patterns. Prior to purchase of these photographs, however, an attempt will be made to find 1934 aerial photography that was used by the U. S. Coast and Geodetic Survey (U. S. Department of Commerce 1934) to map features of the Franklin County coastal areas. The earlist aerial photography available will be the basis for mapping the historic distribution of natural communities in 1998.

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Leach, Darrell. Soil scientist. U. S. Department of Agriculture, Natural Resources Conservation Service. Bristol, FL.

Memory, Melissa. Archaeologist. Division of Historical Resources, Bureau of Archaeological Research, CARL Archaeological Survey, Tallahassee, FL.

Tucker, Lloyd. Retired from cattle grazing in Tate's Hell area. East Point, FL.

Hanse, John. Retired Florida State Forest Ranger. Carrabelle, FL.

Wood, Donald. Retired St. Joe Paper Company employee. Carrabelle, FL.

Appendix 1

Tate's Hell Observation Point Form and example of field data collected.

Florida Natural Areas Inventory - Tate's Hell Field Form (pg 1 of 2)

Quadname:_____ Field Quad Margin #:_____ Surveyors:_____ date:_____
Town _____ Range:_____ Section: _____ 10/10_____
Aerial photo notes_____
Directions: (also see quad map)_____

Present community type:_____ Potential Historic Community types: _____

DESCRIPTION:_____

Soil series:_____ Source:_____
Comments:_____

DOMINANT VEGETATION WITHIN 20M RADIUS OF REPRESENTATIVE OBSERVATION POINT (OPTIONAL):

STRATA	cov cl	ht cl	DOMINANT SPECIES COVER: Scientific name - Braun/Blanquet scale
canopy			
sub-canopy			
tall shrub/ sapling			
short shrub/ sapling, seedl.			
hrbaceous tot.			
graminoid			
forb			
fern			
non-vascular			
vine / liana			

Cover Class - Use Braun/Blanquet scale: 1=0-1% 2=1-5% 3=5-25% 4=25-50% 5=50-75% 6=75-100%
Height Class - 1<0.5m 2=0.5-2m 3=2-5m 4=5-10m 5=10-15m 6=15-20m 7=20-35m 8>35m

NATURE OF DISTURBANCE
1 firebreaks
2 ORV trails or roads
3 agriculture
4 wildlife food plots
5 forestry site prep.
6 logging activities
7 animal digging
8 ditching or hydrologic
9 shrub encroachment
10 exotics encroachment
12 natural disturbances

SEVERITY OF DISTURBANCE
1 light - <10%
2 moderate - 10-29%
3 heavy - 30-75%
4 severe - >75%
5 unknown - disturbance obscured
Describe:_____

WEEDY SPECIES
1 absent
2 occasional - <5%
3 common - >5%
List:_____

EXOTIC SPECIES
1 absent
2 occasional - <5%
3 common - >5%
List:_____

PAST FIRE
1 not suppressed
2 suppressed
3 not applicable
4 unknown

SEASON OF PAST FIRE
1 spring
2 summer
3 fall / winter
_____

Additional Disturbance Comments:_____

Restoration potential: high medium low Comments:_____

HYDROLOGIC ALTERATION

1 shrub encroachment
2 fire breaks
3 ditching
4 roads
5 impoundment
6 dams in watershed
7 canals
8 salt water intrusion
9 groundwater drawdown
10 cause unknown

COMMENTS (Discuss severity for each type and give overall description):

SUCCESSION COMMENTS

CANOPY AGE
1 old growth
2 older mature
3 mature
4 younger mature
5 prereproductive trees
6 early successional

CANOPY AGE COMMENTS

AGE SIZE/STRUCTURE
1 multi age
2 uniform age
Comments:

DBH & COMMENTS
Ave dbh:
Max dbh:

Succession Comments:

General Comments:

Additional species seen:

Rare species:1. EODATA:

Comments:

Rare species:2. EODATA:

Comments:

Rare species:3. EODATA:

Comments:

Florida Natural Areas Inventory - Tate's Hell Field Form (pg 1 of 2)

Quadname: _____ Field Quad Margin #: _____ Surveyors: Kindell date: 9-6-97
Town _____ Range: _____ Section: _____ 10/10 _____
Aerial photo notes 7005 - 110 - G
Directions: (also see quad map) _____

Example

Present community type: WF Potential Historic Community types: WP, WS

DESCRIPTION: Open patch - very few trees, area has tracks + a few stumps but mostly appears to be intact wet seepage grounddcover. Wiregrass and Rhynchospora chapmanii are dominant, I think mostly wiregrass. Hypericum tyrecy blvd. is dominant shrub. There is a diverse mix of herbaceous plants typical of the seepage part of here. ~~This is not this one~~ There are higher areas within and nearby that also contain wiregrass, along with saw palmetto and slender dogfennel.

Soil series: 39 Seranto sand, slough Source: Franklin Co. Soil Survey
Comments: _____

DOMINANT VEGETATION WITHIN 20M RADIUS OF REPRESENTATIVE OBSERVATION POINT (OPTIONAL):

STRATA	cov cl	ht cl	DOMINANT SPECIES COVER: Scientific name - Braun/Blanquet scale
canopy			not appreciable
sub-canopy			
tall shrub/ sapling			
short shrub/ sapling, seedl.	4	2	Hypericum brachyphyllum - 3 Cliftonia monophylla - 3 Gaylussacia mosieri - 2 Ilex coriacea - 2
hrbaceous tot.	6	1	* - relative abundance - range given
graminoid	6		Aristida stricta - 5 Rhynchospora chapmanii - 3 * mostly in lower areas Ctenium aromaticum - 2
forb			
fern			
non-vascular			
vine / liana			

Cover Class - Use Braun/Blanquet scale: 1=0-1% 2=1-5% 3=5-25% 4=25-50% 5=50-75% 6=75-100%
Height Class - 1<0.5m 2=0.5-2m 3=2-5m 4=5-10m 5=10-15m 6=15-20m 7=20-35m 8>35m

NATURE OF DISTURBANCE
1 firebreaks
(2) ORV trails or roads
3 agriculture
4 wildlife food plots
5 forestry site prep.
(6) logging activities
7 animal digging
(8) ditching or hydrologic
(9) shrub encroachment
10 exotics encroachment
12 natural disturbances

SEVERITY OF DISTURBANCE
1 light - <10%
2 moderate - 10-29%
(3) heavy - 30-75%
4 severe - >75%
5 unknown - disturbance obscured
Describe: _____

WEEDY SPECIES
1 absent
2 occasional - <5%
3 common - >5%
List: _____

EXOTIC SPECIES
(1) absent
2 occasional - <5%
3 common - >5%
List: _____

PAST FIRE
1 not suppressed
(2) suppressed
3 not applicable
4 unknown

SEASON OF PAST FIRE
1 spring
2 summer
3 fall / winter

Additional Disturbance Comments: _____

Restoration potential: (high) medium low Comments: Excellent native groundcover in a relatively large area

OBSERVATION POINT FORM (pg. 2 of 2)

HYDROLOGIC ALTERATION
1 shrub encroachment
2 fire breaks
3 ditching
4 roads
5 impoundment
6 dams in watershed
7 canals
8 salt water intrusion
9 groundwater drawdown
10 cause unknown

COMMENTS (Discuss severity for each type and give overall description):
This side of ROW seems to be affected by drainage from ditches - perhaps the road is even impounding water?

SUCCESSION COMMENTS

CANOPY AGE
1 old growth
2 older mature
3 mature
4 younger mature
5 prereproductive trees
6 early successional

CANOPY AGE COMMENTS
Open - only a few scattered small Taxodium.

AGE SIZE/STRUCTURE
1 multi age
2 uniform age
Comments:

DBH & COMMENTS
Ave dbh:
Max dbh:

Succession Comments:

General Comments: AREA may have been mosaic of wet flatwoods + xeric flatwoods + Nyssa ursina.

Additional species seen: Dichanthelium sp, Bouldinia uniflora, Gaylussacia mosieri, Rhynchospora chapmanii, Sphagnum, Andropogon sp (glaucus), Hypericum tetrapetalum, Ilex glabra, Aletris lutea, Lycopodium alopecuroides, Sclerea triglomerata (cf), Eriocaulon compressum, Liatris spicata, Sophiola americana, Agalinis aphylla, Lycopodium appressum, Polygala cruciata, Lachnanthes, Dichromena latifolia, Xyris ambigua, Hypericum fuscii, Myrica inodora, Cletra alnifolia, Drosera capillaris, " cerifera, Panicum spretum, Cteniium aromaticum

Rare species:1. Native Asparagus EODATA: Vegetative - can't make species confirmation

Comments:

Rare species:2. Black bear EODATA: scratching on pine up to 6 ft. Claw marks

Comments:

Rare species:3. Nyssa ursina EODATA: Only a few low plants seen. Near a small pond at Amanda White Road.

Comments: Green Pinguicula (no flowers)

Carphephorus pseudoliatris.
Rhexia petiolata
Sarracenia repens
Platanthera ciliaris

Min high spots
Sporobolus floridanus
Aster eryngiifolius
Scutellaria integrifolia

c:\tates\fieldfrm.97

Florida Natural Areas Inventory - Tate's Hell Field Form (pg 1 of 2)

Quadname: Ft Gadsden Field Quad Margin #: X Surveyors: Kindle 4 date: 9-6-97
Town ____ Range: ____ Section: 10/10
Aerial photo notes 2005-110 - E
Directions: (also see quad map)

Example

Present community type: WF Potential Historic Community types: WP, WF

DESCRIPTION: Wiregrass and herbaceous groundcover characteristic of wet prairie and wet flatwood persist only in a band nearest the road about 7m wide. Wiregrass clumps become grey + dead as one goes E into slash plantation with a thick understory of Cyrilla racemiflora and Cliftonia monophylla approx 2m tall. Walked E from road only about 30 m + saw no wiregrass, although it may persist further in.

Soil series: 39 - Scranton Sand, Slough Source: Franklin Co Soil Survey
Comments: remnant - only along road

DOMINANT VEGETATION WITHIN ~~20m~~ 5m RADIUS OF REPRESENTATIVE OBSERVATION POINT (OPTIONAL):

STRATA	cov cl	ht cl	DOMINANT SPECIES COVER: Scientific name - Braun/Blanquet scale
canopy	2	4	Slash - 2
sub-canopy			
tall shrub/ sapling	4	2-3	Cliftonia monophylla - 3 Ilex coriacea - 2 Cyrilla racemiflora - 3
short shrub/ sapling, seedl.	3	1	Ilex coriacea - 2 Cliftonia monophylla - 3
hrbaceous tot.	5		
graminoid	4		Aristida stricta - 4 ~~Eriocaulon~~ ~~Xyris caroliniana - 2~~ Ctenium aromaticum - 1
forb			Xyris ambigua - 3
fern			
non-vascular			
vine / liana			

Cover Class - Use Braun/Blanquet scale: 1=0-1% 2=1-5% 3=5-25% 4=25-50% 5=50-75% 6=75-100%
Height Class - 1<0.5m 2=0.5-2m 3=2-5m 4=5-10m 5=10-15m 6=15-20m 7=20-35m 8>35m

NATURE OF DISTURBANCE
1 firebreaks
~~2 ORV trails or roads~~
3 agriculture
4 wildlife food plots
~~5 forestry site prep~~
~~6 logging activities~~
7 animal digging
~~8 ditching or hydrologic~~
~~9 shrub encroachment~~
10 exotics encroachment
12 natural disturbances

SEVERITY OF DISTURBANCE
1 light - <10%
2 moderate - 10-29%
3 heavy - 30-75%
4 severe - >75%
5 unknown - disturbance obscured
Describe:

WEEDY SPECIES
1 absent
2 occasional - <5%
3 common - >5%
List: Fidi

EXOTIC SPECIES
1 absent
2 occasional - <5%
3 common - >5%
List:

PAST FIRE
1 not suppressed
~~2 suppressed~~
3 not applicable
4 unknown

SEASON OF PAST FIRE
1 spring
2 summer
3 fall / winter

Additional Disturbance Comments:

Restoration potential: high medium low Comments:

OBSERVATION POINT FORM (pg. 2 of 2)

HYDROLOGIC ALTERATION

1 shrub encroachment
2 fire breaks
3 ditching (circled)
4 roads (circled)
5 impoundment
6 dams in watershed
7 canals
8 salt water intrusion
9 groundwater drawdown
10 cause unknown

COMMENTS (Discuss severity for each type and give overall description): Area appears well-drained now — was likely wetter prior to ditching. Wet prairie/wet flatwood veg appears to persist near ditch.

SUCCESSION COMMENTS

CANOPY AGE
1 old growth
2 older mature
3 mature
4 younger mature
5 prereproductive trees
6 early successional

CANOPY AGE COMMENTS:

AGE SIZE/STRUCTURE
1 multi age
2 uniform age
Comments:

DBH & COMMENTS
Ave dbh:
Max dbh:

Succession Comments:

General Comments: More thorough survey to E. TW may reveal more native vegetation. The persistence of the vegetation at the point recorded here provides some evidence that this was a wiregrass system.

Additional species seen:
Rhexia alifanus
Sarracenia flava
Smilax laurifolia
Rhexia ~~spp~~ mariana
Rhexia ~~sp2~~ petiolata
Coreopsis decangulata
Vaccinium sp. (likely corymbosum)

Rare species:1. EODATA:

Comments:

Rare species:2. EODATA:

Comments:

Rare species:3. EODATA:

Comments:

Appendix 2

Map of the historic distribution of wet savanna in Tate's Hell State Forest and CARL tract.