MONITORING PLAN
FOR
CITY OF MONTICELLO

WETLANDS EFFLUENT
DISCHARGE SYSTEM

FEBRUARY, 1988

d s & n inc., consulting engineers • gainesville, florida

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I. INTRODUCTION AND PURPOSE

As part of its program to enlarge and improve its capacity to handle and treat wastewater, the City of Monticello proposes to use a basin system of wetland communities for terminal disposal and treatment of the advanced secondarily treated effluent from its treatment plant. The practice of using wetlands for successful wastewater treatment is well documented over the past 15 years, but cautious introduction of new technology requires patient, long-term appraisal of any and all effects to biotic and abiotic elements of the environment. This plan describes current knowledge of site conditions and monitoring schedules and techniques for detection of any significant changes in the wetland system following initiation of discharge from the wastewater treatment plant. Field and laboratory procedures as well as the qualifications of all involved personnel are also described.

II. CHARACTERIZATION OF SITE AND ADJACENT SYSTEMS

The wetland study site is located in Jefferson County, Florida, (Range 5 East, Township 1 North, Sections 5, 6, 8, 31) (Figure 1). The northern edge of the site is some 1.4 miles south-southeast from the city limits of Monticello, and 2.5 miles south from Monticello's sewage treatment plant. The wetland is a broad headwater mixed Blackgum-Sweetbay swamp which occupies a large depression in the rolling hills type topography of the area. The basin collectively receives water from five streams which enter along the western border. Four of the streams converge to form two larger streams which enter along the northwest corner and at the approximate middle of the basin. Another stream is isolated and enters at the southwestern corner.

In addition to stream inputs, the swamp receives a minor amount of subsurface seepage from the surrounding hills and substantial overland flow during periods of intense rainfall.

The swamp is part of a very large wetland system which is a component of the Wolf Creek Drainage Basin. Wolf Creek is located approximately 2.2 miles (11,600 feet) east of the proposed wetland study site. Essentially, all the area between the site and Wolf Creek appears to be a mixed hardwood swamp system. (National Wetlands Inventory Classification, categories PF06/3F and PF06F) Preliminary studies of National Wetlands Inventory maps of the region show that these two wetland classifications are quite common, making up more than 50% of the wetlands and 25% of all land use types within a 10 mile radius of the site.

A road-berm system (Figures 15 and 16) has been constructed along the northeastern edge of the system. This road-berm structure has resulted in the isolation of the site from the remaining Wolf Creek Drainage Basin. Presently, no vegetative connection is present across this road, however a hydraulic connection has been maintained via placement of a series of variable sized culverts in the road-berm which facilitates water flow between the two areas. Flow has been noted at this point from the wetland study site into the Wolf Creek Drainage Basin.

A. PROPERTY OWNERSHIP

The proposed treatment wetland site is currently owned by only three (3) landowners. (See Figure 2). Negotiations are currently underway with all three land owners for either fee simple title or a long term lease or easement over the subject wetland that would give the City all the necessary property rights for at least the design 40 year duration of the project. All of the property owners contacted have indicated a desire to cooperate with the City and to negotiate an equitable price for the subject property. Should negotiations totally collapse, legal council has indicated that condemnation of the property is an available option. Therefore, the City has decided to proceed with the acquisition process, and property maps and easements are currently being drawn up.

B. CLIMATE

Northwest Florida is characterized by a humid, subtropical climate with relatively high average temperatures (81 degrees fahrenheit in summer, 54 degrees fahrenheit in winter). Daily temperature maxima and minima far exceed these averages. Winter lows can approach 0 degrees fahrenheit for several hours in the night, and recovery during the following day may not exceed 25 degrees fahrenheit. Summer highs can surpass 105 degrees fahrenheit, with humidity in excess of 95 percent.

Precipitation in the region can vary by slightly less than fourfold (1) with a range of 29 to 112 inches per year. Average monthly rainfall (Figure 3) ranges from 3 to 8 inches. Two annual peaks of precipitation occur seasonally. The first, in winter, is the result of major weather fronts moving in from the northwest. The second, larger rainfall peak occurs in summer. Convective thunderstorm systems move in off the Gulf of Mexico, often dropping up to several inches of rain on an early summer afternoon.

C. TOPOGRAPHY

Local topography surrounding the site (Figure 4) is characterized by steeper gradients than normally expected for Florida, especially the peninsular section of the state. Total vertical elevation drops from the upper slopes of the site's watershed to the base can exceed 100 feet over a mile. Locally, slopes can be even steeper. At the southern rim of the basin surrounding the wetland site, vertical elevation drops some 60 feet over a tenth of a mile, or 1.3 inches drop per linear foot.

The topography of the proposed wetland treatment site is quite flat with elevation varying less than one foot over the 2800 foot East-West axis and the 5000 foot North-South axis of the site.

D. SOILS

Preliminary reference to the Soil Conservation Service Maps (Figure 5) indicates that nearly the entire proposed wetland site is underlain by very poorly drained soil of the Surrency Series. This is a member of the loamy, silicious, thermic family of Arenic Umbric Paleaquults. These soils are common in nearly level drainageways and depressions with slopes of less than one per cent. The water table is at the surface for long periods of the year, and ponding is common. Table 1 lists the soil's characteristics.

The most striking feature of the soil horizon down to 5 feet is that starting at the four foot depth level, a sandy clay loam of low permeability is found. Considering that actual soil borings on site (See Appendix C) indicate that the soil layer is underlain by essentially impermeable clay layers at depths of 18-25 feet, the chances of a direct geo-hydrological connection between the proposed treatment wetland and underlying aquifers appear remote.

E. GEOLOGY AND HYDROGEOLOGY

Geological deposits in the region are primarily marine in origin and exhibit a general dip toward the south. Only strata deposited within the past 60 million years are important in regard to surface and groundwater resources. This is evident in cross sections of the area (Figures 6 and 7). The geological cross-section (Figure 6) shows Monticello perched on a relatively young clay formation (Miccosukee), which in turn lies upon other strata which consist of clastics and clays. It is evident that the Monticello area is over 100 feet above the limestone deposits which contain the Floridan Aquifer. This estimate is supported by the dimensions shown in the hydrologic cross section (Figure 7) where preliminary measurements indicate that the Monticello area is some 100-140 feet above the Floridan Aquifer. The vertical order of strata indicates that most of the distance between the surface and the Floridan Aquifer is taken up by a surficial aquifer with a relatively thin intermediate aquifer separating the two.

Since preliminary examinations indicate that thick clay layers and two aquifers (surficial and intermediate) separate the proposed wetland treatment site from the Floridan Aquifer, there does not appear to be cause for immediate concern. However, more thorough geologic and hydrogeologic studies of the area will be consulted to resolve this point with greater certainty.

F. HYDROLOGY

Since many characteristics of wetland flora and fauna as well as soils are the result of adaptations to the area's hydrology, maintaining a wetland ecosystem's integrity hinges on understanding the periodicity and volume of water flows into and out of the treatment wetland. Being the terminal basin of the watershed, the proposed treatment wetland is frequently flooded for long periods of time, and a broad, flat hardwood swamp has adapted to this water regime.

1. Surface Water

a. Regional flows directions and site inflows

The regional watershed (Figure 8-see enclosed pocket) is a system of creeks, some intermittent, conducting water in a southeasterly direction toward the Aucilla River which forms the border of Jefferson and Madison counties. The streams and overland sheetflow (Figure 4) which feed the proposed wetland treatment site follow this general pattern of east to southeasterly flow. These creeks flowing in from the west do not maintain clearly incised channels for more than 100 yards into the Nyssa swamp on the site's western edge. The stream channels broaden into flat swamp forest floor with numerous local depressions. In these transition zones, stream flow spreads into sheet flow.

On-site inspection visits since May, 1987 have thus far indicated that streams 1 and 3, the northernmost and southernmost inflow streams from the west, show minor continuous flow even during a fairly severe drought during the Fall. Stream 2 remained completely dry for over one month. Observations made at these preliminary visits also suggest not much flow volume or speed in the three inflowing streams during non-storm runoff conditions. Stream depths in 2 and 3 rarely exceeded 4 inches and flow appeared to be mostly confined to the upper half of the water column in those places where vegetation or the banks narrowed the channel. Only stream 1 has so far demonstrated flow from top to bottom of the water column, but the relatively slow flow rate (0.3 foot/sec) across a three to four foot wide channel does not suggest a major input during non-storm flow conditions.

d. Receiving Waters

The downstream ecological systems which receive discharge from the treatment wetland are very similar to its deep water part: the Nyssa swamp. These semi-permanently flooded deciduous hardwood swamps occupy broad flood-plains on the way to and along the banks of Wolf Creek.

This area was apparently connected to the study site before construction of a road berm system. Presently, a drainage canal exits on the study site, running in a northeasterly direction and passing under the road through a collection of culverts, proceeding northeasterly into the adjacent wetland for a short distance (several hundred feet) before the incised stream channel completely dissipates.

The canal at the entrance to this community appears to have been dug, with the removed fill piled along the edges to form a higher and dryer fringe along the canal's perimeter. After some 350 feet, the incised channel of the canal develops into a low, broad network of interconnecting channels. At the time of field reconnaissance, the wetland which exists beyond the canal was inundated to depths ranging from 20 to 50 centimeters. The substrate was primarily composed of very deep mucky peats, in contrast to the canal's substrate which was sandy and very firm.

There are few clearly incised stream channels in the hardwood swamp connecting the discharge point with Wolf Creek. Though the direct linear distance is 1.5 miles, the fact that the water channel flattens out into a broad plain of anastomosing channels and depressions suggests the path of water flow is not direct and streaming but sinuous and spreading.

Neither the Nyssa swamp flood plain receiving the treatment wetland discharge nor the Wolf Creek basin are flooded year round. During the recent drought in the fall of 1987, the former was observed with a completely dry forest floor as well as all stream channels, and the latter was seen to be a series of ponded depressions, connected by a generally higher dry stream channel. During the dry portion of the year, there appears to be no flow in Wolf Creek since the water level was too low to connect all ponded depressions along the channel.

e. Existing Surface Water Quality

Preliminary appraisal of ambient water quality was hampered by a complete lack of water in the interior of the proposed treatment wetland during the months of October and November, 1987.

In general, preliminary data indicates that the stream inflows are not loading the proposed site with high concentrations of nutrients. (Ammonia < 0.02 mg/l, Phosphorus = 0.04 mg/l (Refer to Table 3).

The water quality of Wolf Creek both up and downstream from the connecting point to outfall from the proposed treatment wetland site shows fairly high nutrient concentrations (Ammonia: 1.6-1.8 mg/l, Total Phosphorus: 0.66-0.83 mg/l) and BOD (range=3.0-7.0). For comparison, water quality data from the City of Monticello wastewater treatment plant outfall was recorded in October, 1987, with Ammonia=1.99 mg/l, Total Phosphorus=6.45 mg/l and 5 day BOD=22. (Refer to Table 3).

Baseline water quality monitoring over the year prior to initiation of discharge from the Monticello Wastewater Treatment Plant will establish seasonal patterns of water quality parameters both in the wetland site, at inflow - outfall points, and at a station in the receiving wetland at a point were the incised stream channel disappears. (Figure 13).

2. Groundwater

Groundwater flow in the area of the proposed treatment wetland appears to closely follow surface water flow patterns. Due to the presence of a continuous clay layer at fairly shallow depths, deep percolation in the watershed is almost nil. The presence of so many small, intermittent surface water streams is quite consistent with this observation, as most rainfall runs off into the steams, rather than percolating into a regional groundwater flow regime. In order to verify the existence of a continuous barrier to downward groundwater flow under and around the treatment wetland, 6 deep borings have been drilled. (See Appendix C). These boring locations were at the four (4) proposed groundwater well locations, as well as in two central locations in the interior of the treatment wetland. All of these borings confirmed what was indicated by the vegetation and surface hydrology of the area, that essentially no downward groundwater flow occurs in the vicinity of the treatment wetland.

3. Existing Wells in The Area

The only public water supply wells found within 5 miles of the proposed treatment wetland site are wells 1, 2, and 3 of the City of Monticello. These wells, located near town center under the city's water tower, are situated some 140 feet above the wetland site elevation and draw directly from the Floridan Aquifer. Given a typical daily water demand of some 400,000 gallons (Donnie Anderson, City Manager) it is inconceivable that the cone of influence from the wells would extend anywhere near the 1.4 miles lying between the wells and the treatment wetland site.

Within a mile radius of the wetland site, a relatively sparse rural population does own and operate some private wells. During the baseline monitoring program, these wells will be located, their flows quantified, and determinations will be made of any possible interaction between their water intake and the waters issuing from the treatment wetland.

G. VEGETATIVE COMMUNITIES

1. Description of Vegetative Communities

A brief description of the vegetative communities occurring throughout the area is given, and a vegetative communities map (Figure 10) is provided for reference. Several different community types are present in the area and distribution of the communities is primarily in response to different hydrologic factors which occur along the gradient between the hilltops and the depressional wetland area. Vegetative communities are described following Clewell[1] where applicable. Each vegetation association has been named in accordance with nomenclative described in the Land Use; Cover and Forms Classification System compiled by the Department of Transportation (DOT). Each community is preceded by the map symbol number which references specific locations.

a. Oak-Hickory Woods(mesic) (423 oak-pine-hickory)

The oak-hickory hoods exists as a peripheral community around the wetland systems. The canopy consists of an assemblage of oak species primarily dominated by water oak (*Quercus nigra*), laurel oak (*Quercus hemisphaerica*), live oak (*Quercus virginiana*) and southern red oak (*Quercus falcata*). Common understory species are black cherry(*Prunus serotina*), persimmon (*Diospyros virginiana*), dogwood (*Cornus florida*) and

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[1]A.S. Clewell, Guide to the Vascular Plants of the Florida Panhandle, Tallahassee, University Press of Florida. Florida State University. 605 pages.

hawthorn (Cretagus sp.). Pignut hickory (Carya glabra) also exists throughout the zone. The oak-hickory woods in this area has apparently been disturbed in the past as evidenced by large open areas which are extensively overgrown by an array of vines and scrubs which include muscadine grape (Vitis rotundifolia), blackberry (Rubus argutus), summer grape (Vitis aestivalis), catbriar (Smilax bona-nox) and bamboo-vine (Smilax laurifolia). The oak- hickory woods represent the most upland community in the area, occurring on the tops of slopes and characterized by sandy soils with diminutive litter accumulation.

b. Mesic Hardwood Hammock (431 beech-magnolia)

The mesic hardwood hammock occurs adjacent to the oak-hickory woods on the downslope side. The slopes are often quite steep in comparison to other communities in Florida and are generally dominated by an assortment of hardwood species. Water oak, Live oak and Laurel oak are present, but several additional species share in co-dominance. These are white oak (Quercus alba), sweetgum (Liquidambar styraciflua), american beech (Fagus grandiflora), sugar maple (Acer saccharum), ironwood (Carpinus caroliniana), hophornbeam (Ostrya virginiana), swamp chestnut oak (Quercus michauxii), southern magnolia (Magnolia grandiflora), sourwood (Oxydendron arboreum), and devil's walking stick (Aralia spinosa). Within the mesic hardwood hammock a very pronounced deeply incised stream channel is present and soils are covered with abundant litter.

c. Hydric Hardwood Hammock (439 mixed-hardwood/other hardwood)

The hydric hardwood hammock presently described is similar in species to the bottomland hardwood forests described by Clewell. Soils are saturated with some degree of organic matter accumulation present. The stream channel has broadened out into a series of shallow, anastomosing rivulets which fan out in all directions. Shallow depressions which exhibit regular and periodic inundation form a mosaic of inundated pools throughout the area.

Many of the species which occur in the mesic hardwood hammock also are found in this hydric zone. Diamond leaf oak (Quercus laurifolia) replaces laurel oak, and canopy dominance is primarily shared by four species which include sweetgum, tulip poplar (Liriodendron tulipifera), sweetbay (Magnolia virginiana) and red maple (Acer rubrum). American holly (Ilex opaca) and wax myrtle (Myrica cerifera) are the dominant subcanopy species. The herbaceous ground cover is composed of an extensive mat of Sphagnum moss in which netted chain fern (Woodwardia aereolata) and royal fern (Osmunda regalis) form an extensive ground cover. Blackgum (Nyssa sylvatica var. biflora) occurs throughout the zone, however it is not dominant.

The hydric hardwood hammock occurs at the base of slopes leading down from the uplands, and no noticeable slope (relief) is evident throughout the community.

d. Nyssa Swamp

(1) Shallowly Inundated (613 gum-swamp)

The shallowly inundated Nyssa swamp is characterized by deep peat soils in which the water level ranges from the peat surface to several inches in depth. The dominant tree species are blackgum (Nyssa sylvatica var. biflora), sweetbay (Magnolia virginiana) and red maple (Acer rubrum). However, very large sweetgum (Liquidambar styraciflua) and tulip poplar (Liriodendron tulipifera) occupy significant canopy area. The understory is primarily composed of the shrub virginia willow (Itea virginica) and an extensive fern growth covers much of the swamp forest floor consisting of cinnamon fern (Osmunda cinnamomea), royal fern (Osmunda regalis) and netted chain fern (Woodwardia aereolata).

(2) Deepwater (613 gum-swamp)

The deepwater Nyssa swamp is dominated by blackgum, sweetbay and red maple. The most notable difference between this area and the shallow water zone is the reduction in the occurrence of tulip poplar and sweetgum. Soils consist of very deep, fine peats which are grey colored with silt reflecting the large erosional input from the surrounding uplands especially in the northwest section. Inundation depths commonly exceed 50 centimeters and generally the unflooded areas consist primarily of large, raised hummocks. Extensive growth of lizard's tail (Saururus cernuus) and burrweed (Sparganium americanum) occur within the open water areas. The trees within this area are very large and exhibit expanded buttresses which reflect the long duration of flooding. It appears that the area is frequently inundated with occasional drydown occurring during periods of low rainfall.

e. Bayswamp - Disturbed (611 bay-swamp)

A large expanse along the eastern portion of the wetland is dominated by bays. Sweetbay (Magnolia virginiana) is by far the most dominant with loblolly bay (Gordonia lasianthus) occurring occasionally throughout the area. Swamp red-bay (Persea palustris) is also present but primarily occurs as a subcanopy individual although occasionally individuals reach the upper canopy. Blackgum, sweetgum and tulip poplar are present in many locations but do not approach the numbers of bays which occur in this area.

The bay community which is present has been subjected to some kind of disturbance in the past. Conversations with local residents indicate that extensive logging of blackgum has historically occurred within the area. The density of trees which occurs in the community appears to be less than what is present in the adjacent blackgum community. This is readily apparent on recent (see pocket) aerial photographs (dated February 8, 1987) in which large areas are shown to be devoid of canopy vegetation. Ground reconnaissance revealed that these areas are typically open canopy areas in which a very extensive shrub and vine cover of muscadine grape (Vitis rotundifolia), blackberry (Rubus sp.) and several catbriar species (Smilax sp.) form an almost impenetrable barrier. Peat accumulation in the area is substantial, however the surface is dryer than in surrounding areas. Surface water is generally isolated such that the community is a mosaic of isolated pools which exhibit characteristics of regular and periodic flooding and are probably connected during periods of extensive rainfall.

f. Mixed Blackgum-Sweetbay Transition (611-613 bayswamp-gum-swamp-transition)

A mixed blackgum and sweetbay transitional area exists between the blackgum dominated area (#4B) and the bay dominated community (#5). The area is co-dominated by these two species. However, from the signature evident on aerial photographs dated February 8, 1987, tree densities are not as great as in the Blackgum swamp. The area ranges from shallowly to deeply inundated which contrasts with the relatively dryer bay community.

A distinction is being made for this community type based on inspection on the ground because aerial photograph signatures do not reveal any differences which would distinguish this area from the bay community.

Several old roads (logging) appear to be present in this area, however, they are not readily apparent on aerial photography.

g. Mixed Upland Riparian Systems

The term "mixed upland riparian systems" refers to the mosaic of community types located along the northwestern border of the proposed wetland treatment systems. These areas are typically hardwood dominated and vary from mesic to hydric depending on their location and relation to the slope. All the community types have been previously described, though in this area community types number 4, 5 and 6 are probably not to be found. The distribution of communities is in relation to the major stream systems which run through the area. The streams are deeply incised, and the water flow is rapid.

h. Old Field Assemblages (260 rural open lands)

Much of the upland areas surrounding the wetlands site have been extensively managed for agriculture over the last 50 years. Historically, management involved the production of cattle and watermelons. Much of the area in the recent past was used for propagation of Tung tree (Aleurites fordii) for tung oil production, however, no groves presently exist on the site. Many of the areas are presently in an old field successional state in which perennial species dominate. The area is in many places highly eroded with bare exposed areas contributing to the extensive sediment loading of the wetlands during periods of high rainfall. A portion of the land in the northwest section is presently being used for nursery production of Pecan trees (Carya illinoensis). However, this represents only a small percentage of the land area. Much of the old field areas around the site have been historically used in crop production. A distinction has been made with regard to the present use on the enclosed community map. Primarily a distinction has been made between areas used for row or field crops. However, these descriptions should be understood as preliminary since interpretations were based on aerial photography and not field truthing. This interpretation generally applies to areas which were not located in the immediate vicinity of the site.

i. Blackgum Swamp: Shallowly-Deeply Inundated (613 gum-swamp)

The receiving wetland located adjacent to the northeast boundary of the study site is a predominately Blackgum swamp which is similar to the areas described as community types 4 and 6. This area was apparently connected to the study site before construction of a road-berm system. Presently a drainage canal exits the study site running in a northeasterly direction and passes under the road through a collection of culverts and proceeds northeast into the adjacent wetland for a short distance (perhaps several hundred feet).

The canal at the entrance to this community appears to have been dug with the removed fill piled along the edges to form a higher and dryer fringe along the canal's perimeter. After some 350 feet the incised channel of the canal develops into a low, broad network of interconnecting channels. At the time of field reconnaissance the wetland which exists beyond the canal was inundated to depths ranging from 20 to 50 centimeters. The substrate was primarily composed of very deep mucky peats, in contrast to the canal's substrate which was sandy and very firm.

H. THREATENED AND ENDANGERED SPECIES

To date, no investigations have been made at the wetland site or its watershed to determine whether any threatened and endangered flora and/or fauna exist or migrate through there. An official list has been obtained from the Florida Natural Areas Survey (Appendix B). However, this list is accompanied by a caveat that it merely summarizes the existing incomplete knowledge base and that no "definitive statement on the presence, absence, or condition of biological elements" can be provided. No reliable determination of the presence or absence of threatened and endangered species can be made until sufficient on-site visits have been made by experts (for these procedures please refer to Section III.1.e.). However, these lists provide the best possible reference point for planning survey procedures and for alerting investigators for particular species, habitats or tracks to search for.

I. HUMAN ACTIVITIES WITH POTENTIAL IMPACT ON SITE

There are no known industrial or commercial sources of air pollution upwind from the proposed treatment wetland site, therefore the likelihood of wind mediated impacts on the subject wetland are unlikely. Human use of the landscape (Figure 10) in the watershed surrounding the site consists mainly of low intensity agriculture such as 1) pecan plantation and nursery, 2) improved pasture, and 3) some row cropping.

As noted previously, two detention ponds have been created in the northwest section of the watershed which drains into stream No.1. These can serve to dampen pulses of runoff and to precipitate sediments and nutrients prior to inflow to the wetland site.

Human population density in the watershed is extremely low, 19 persons per square mile or 9.4% of the state average. Conversation with the son of Mr. Tommy Martin, an owner of a section of the proposed treatment wetland site and one of the nearest inhabitants, revealed that there has been trespassing by poachers on the upland "old field assemblages" and contiguous forest land (land use codes 8, 7, and 1, Figure 10) in pursuit of wild turkeys. Mr. Martin, Jr. claimed that such trespassing is rare and that he is regularly guarding against it.

In the swamp, interior preliminary inspections have revealed no current evidence of human intrusion save for some shot-gun shells on the very outer margins. Logging operations appear to have occurred several decades earlier with some logging road construction through the center which has left a linear depression several hundred feet long. No water movement has been noted in this depression, and it does not appear to have altered the site's hydrology. Conversations with local residents give the impression that the majority of logging occurred in the eastern section. Inspection of aerial photographs and on-site field surveys show that the eastern portion of the site is a wetland community dominated by bays, sweetbay and loblolly bay. It is quite possible that such a community would establish itself following the removal of blackgum. This idea is reinforced by field observations that the bay swamp is not flooded at a time (December - January of this year) when large portions of the blackgum swamp was under six inches of water. If the eastern section is indeed slightly higher and drier it would have been a more likely candidate for logging. Therefore, preliminary inspection indicates that logging has occurred in the eastern half of the site, and that the removal of nyssa (blackgum) has lead to establishment of a bay swamp wetland community.

III. PROPOSED MONITORING

To establish and define the parameters related to the composition and functioning of the environment in the proposed treatment wetland site, a monitoring program is proposed. Since the environmental values of the undisturbed wetland ecosystem give the clearest point for comparison, a baseline monitoring program will be executed over the year prior to the initiation of discharge to the wetlands from Monticello's wastewater treatment system. The following activities are proposed to achieve this:

A. VEGETATION MONITORING

1. Sampling Location and Frequency

Belt transects (elongated quadrats) will be placed in the wetland community at locations indicated in Figure 13. The adequate number of sample quadrats which will be established will be determined by construction of species area curves as described in Smith (1980) (See Figure 11). Because all communities have different characteristics, the number of quadrats needed may vary. For this reason, a predetermined number may not be adequate. Therefore, the number of quadrats will be determined concurrent with field sampling. It is also important to note that the diversity of many wetlands may increase as the size of the strata decrease eg. the herbaceous component is more diverse than the canopy component. Therefore, separate species area curves for each stratum will be generated and sampling of that stratum will be discontinued when criteria are satisfied. Examples of species area curves are given in Figure 11 as described in Smith (1980). All woody vegetation (canopy, subcanopy, shrubs) will be sampled once during the baseline monitoring program. Herbaceous monitoring will be performed on a quarterly schedule.

2. Sampling Methodology

a. Herbaceous vegetation

Herbaceous vegetation will be monitored using the following modified line-intercept technique. The modified method incorporates the principle of the line-intercept method described by Phillips [2]; however, the width of the transect is extended and cover classifications and permanent frequency intervals are established.

The method, as illustrated in Figure 12 and Table 4, consists of observations of plant species occurring along the belt transects. Each transect is divided into continuous 10 foot intervals, each of which is 2 feet wide. The 10 foot intervals are further divided into five 2 x 2 foot intervals (Figure 12). Species cover is determined on the basis of the percent cover occupied within each 10 x 2 foot cover interval. Six cover categories have been assigned to estimate ranges of percent cover that are visually determined (Table 4). In addition, frequency is determined on the basis of occurrence within each 2 x 2 foot interval. Therefore, a maximum value of five frequency plots is possible for each 10 foot interval. Data are

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[2]Phillips, E. A. 1959. Methods of vegetation study. Holt, Reinhart and Winston, Inc.,New York. 107 pp.

tabulated and summarized by species, as follows:

(1) Total frequency - the total number of 2 x 2 foot intervals where the species occurred.

(2) Relative frequency - the total number of occurrence intervals in relation to the total number of possible 2 x 2 foot intervals.

(3) Average occurrence cover value - the average cover category value assigned on all 10 x 2 foot intervals only where the species occurred.

(4) Average occurrence percent cover - the percent cover for each species calculated for only where it occurred.

(5) Total area covered - the total square foot coverage exhibited by the species.

(6) Total percent cover - the percent of the total transect area that was covered by each individual species.

This sampling method was developed and used for several reasons. First and most important, is that it establishes an absolute measure of species occurrence by using defined frequency intervals. The use of small continuous frequency intervals allows the movement of existing vegetation to be accurately mapped and subsequent changes easily followed with time. In addition, because frequency data are based on species presence or absence, it is absolute and no error is introduced by estimation, which is needed in determining cover percentages. The method also estimates cover using several defined cover categories. Although estimates are not absolute and are somewhat variable when performed by different people, they serve as a suitable comparative mechanism when used to compare cover among several different transects. It should be noted that it is very easy to estimate coverages of less than 10% or greater than 80% by a species in a given interval. However, it is very difficult to estimate cover of 10 - 20 species which totally occupy a given expanse of a cover interval. For this reason a very large range has been used to estimate cover in the mid-cover ranges: 30 - 70%.

The occurrence of bare ground throughout the transects has been given the same consideration as plant species cover. Bare ground or non-vegetated surface is present in all systems and is not necessarily a definitive characteristic of newly reclaimed areas or disturbed systems. Bare ground is defined as all ground area not covered by some form of vegetative structure as viewed from above. The analysis of bare ground allows for the determination of some form of vegetation stratification index. With bare ground considered, vegetation coverage of an area can never be greater than 100%; however, total percent coverages of all plant species within a transect are often totalled and equal greater than 100% cover. Analyses indicate that a great degree of plant stratification occurs; however, the area are most often not 100% covered by vegetation. The bare ground methodology was incorporated because the Florida Department of Environmental Regulation (FDER) personnel have indicated that coverages based totally upon species occurrences (which often total much greater than 100%) may no longer be an acceptable method of assessing cover by herbaceous vegetation.

b. <u>Canopy, Subcanopy and Shrub</u>

Elongated quadrats (belt transects) will be established in all designated community types at three specific locations, as follows:

(1) Point of effluent discharge

(2) Approximate geographic center of the treatment wetland

(3) Point of wetland discharge

The dimensions of the permanent elongated quadrats will be 100 m X 10 m (0.1 HA).

All individuals in the quadrat which have a diameter at breast height (DBH) greater than or equal to one inch will be measured (canopy and subcanopy). A reduced plot size will be used to measure the individuals which are less than one inch (shrub) DBH. Said reduced plot will either be 2.5 m X 100 m or 5 m X 100 m depending upon the density of these strata. However, in this stratum only the number of stems will be counted to allow for density determination. Data analysis will consist of separating subcanopy (1" $\leq$ DBH $\leq$ 4") and canopy (DBH $\geq$ 4 ") sized individuals. An importance value will be generated based upon relative frequency, relative dominance and relative density as defined by Smith and Chapter 17-4.022(1) FAC. An importance value for shrub class individuals will be calculated using relative density and relative frequency.

B. FAUNAL MONITORING

The primary purpose of the following monitoring plan is to determine the extent of faunal change within the treatment wetland and to insure that Shannon-Weaver species diversity, based on macroinvertebrates retained by a U. S. Standard No. 30 mesh sieve, is not reduced to less than 50 % of background levels.

1. Methodology

a. Macroinvertebrates

Three sampling locations have been selected for the purpose of monitoring mosquitoes and benthic macroinvertebrates. These sites will coincide with locations designated as water quality monitoring stations #4, #5 and #6 (Figure #13) Monitoring Station Location Map. Macroinvertebrate sampling will be conducted quarterly. Preliminary observations indicate that there is virtually no flow at the proposed sampling sites. Under such conditions, a grab sampler such as the petite Ponar dredge is generally preferable to artificial substrate samplers (ie. the Hester-Dendy multiplate sampler). However, the specific sampler to be used will be selected following a thorough survey of the study area. During the first quarterly sampling effort, 10 petite Ponar grab samples will be collected at each sampling location. This series of samples will be used to determine the number of grabs required to comply with Chapter 17-6.055(3)(c)(2)(a), FAC. After the required number of grabs has been established for each sampling location, the number of grabs collected will remain constant throughout the study period.

Samples will be sieved in the field using a U. S. Standard No. 30 mesh bucket sieve. Organisms retained by the sieve will be preserved in 80 % ethanol. Rose Bengal stain will be added to facilitate accurate sorting of samples. In the laboratory, organisms will be sorted and counted under a stereoscopic dissecting microscope (7x to 80x). In the case of excessively large samples, subsampling may be desirable, but subsamples will not consist of less than one-quarter of the original sample (Weber 1973). Any portion of a sample that is not analyzed will be preserved and stored for future reference.

Organisms will be identified with the aid of a wide assortment of taxonomic literature including, but not limited to Berner and Pescador (in press), Brinkhirst (1986), Brinkhirst and Jamieson (1971), Wiederholm (1983), Needham and Westfall (1955), Wiggins (1977), Brigham et al. (1982), and Beck (1976). Organisms will be identified to the lowest practical taxonomic level. Oligochaetes and chironomids will be identified to the species level whenever possible. Oligochaete and chironomid specimens will be mounted in CMC-10 mounting medium, which contains a clearing agent and all mounted organisms will be identified using a compound light microscope (40x to 1,000x). A synoptic reference collection of all macroinvertebrates collected during the study period will be maintained.

Data generated by the first quarterly sampling effort will be analyzed by calculating Shannon-Weaver species diversity index of both 1) individual samples and 2) their composites with respect to sampling location. Thereafter only the composite diversity will be reported.

b. Mosquitoes

Mosquito larvae and pupae will be collected at each of the three sampling locations using a white enamel dipper. Sampling methodology will be in accordance with those described by Service (1976). As suggested in the most recent proposed revision of Chapter 17-6 of the FAC, mosquitoes will be sampled every 2 weeks during their peak season (May - August) for a total of 8 sampling efforts. Quantitative macroinvertebrate samples will also provide data on mosquito populations, particularly concerning Mansonia and Coquillettidia which are generally found attached to vascular hydrophytes.

c. Quality Assurance and Quality Control

Quality assurance procedures will be closely followed during sample collection and analysis. A chain of custody record will accompany all samples to the laboratory and will be signed and dated by all people who retain custody of the samples. The chain of custody record includes container identification, sample description, date and time of sampling, analyses required, method of transport, and the names of the collectors.

Upon arrival in the laboratory, samples will be inventoried and a sequential log number will be assigned to each sample. Information to be recorded in the logbook includes the log date, project number, sample type, container identification code, and the sample log number.

d. Fish

Fish samples will be taken quarterly at three specific locations. These areas correspond to water quality sample locations 4, 5, & 6, indicated in Figure 13. The investigators will use seines and dip nets to sample the fish fauna within in area of about 25 meters squared at each station. To insure standardization of sampling effort, exactly 5 seine hauls and one man hour of dip netting will be repeated at each station each quarter. The fish will be preserved in a 10% Buffered formalin solution immediately after field collection, followed by a change to a 40% isopropyl alcohol solution after a 1-7 day fixation period (ref. Standard methods).

In the laboratory, fish will be identified using references such as Eddy (1969), Pflieger (1975) and Lee/et al. (1980).

e. Threatened and Endangered Species

A description of threatened and endangered (T & E) fauna and flora will be prepared and referred to the community type of the treatment wetland. Lists will be prepared based upon the OFFICIAL List of Endangered and Potentially Endangered Fauna and Flora in Florida (prepared by the Florida Game and Freshwater Fish Commission, July 1, 1987). In addition, a complete computer search of endangered species for Jefferson County with habitat specific criteria will be performed by the Florida Natural Areas Inventory (see Appendix B).

After a comprehensive search list has been prepared field searches will be performed for mammals, birds, reptiles and amphibians that occur in all community types of the treatment wetland. An intensive walk-through search will be conducted along all vegetation transects and two additional transects which completely traverse the treatment wetland. A systematic search will utilize several methods of detection to include direct observation, habitat identification, audible detection, scat identification and tracks. In addition, both daytime and nighttime searches will be employed.

T & E plant species will be monitored at several times during the year. Walk through surveys will be performed during each water quality sampling trip on a monthly basis. Surveys will also be performed during the quarterly herbaceous monitoring program. In addition, an extensive survey will be performed in all community types which comprise the treatment wetland. Voucher species of all T & E species will be obtained for taxonomic verification by the extension service of the University of Florida Herbarium.

C. SURFACE WATER

1. Sampling Location and Frequency

Seven surface water quality sample stations (Figure 13) will be established in the treatment wetland and in the influent streams. Surface water grab samples will be taken monthly at stations 4 and 6, bimonthly at stations 5 and quarterly at stations 1, 2, 3, and 7. (Table 5) All samples will be collected in clean polyethylene containers furnished by the laboratory. Preservatives will be added to each container according to FDER and EPA requirements for specific parameters. Samples will be stored on ice and transported in coolers to the analytical lab immediately upon completion of sampling event. Proper chain of custody procedures will be strictly followed and laboratory procedures will adhere to a strict quality control/quality assurance program prepared by the lab and approved by the Florida Department of Environmental Regulation.

The parameters to be analyzed at each station are listed in Table 6 along with the total number of analyses to be performed during the baseline monitoring.

a. Station 1 - stream inflow at the northwestern section of the site.

b. Station 2 - stream inflow along the western boundary near the approximate geographic center of the site.

c. Station 3 - stream inflow at the southwestern corner of the wetland.

d. Station 4 - point of discharge from the treatment wetland

e. Station 5 - the approximate geographic center of the treatment wetland.

f. Station 6 - the vicinity of the point of discharge of effluent into the treatment wetland.

g. Station 7 - located in the receiving wetlands downstream of the treatment wetland effluent at a point of no perceptible flow.

2. Sampling Methodology

a. Field Determined Parameters

(1) Temperature

Field measurements of temperature will be made at each sampling location. Temperature measurements will be made using a combination temperature , dissolved oxygen probe with a YSI Model 57 DO meter. In addition, these measurements will be calibrated using a high quality mercury laboratory thermometer. Temperature measurements will be made at all locations as described in the dissolved oxygen methodology.

(2) Measurement of Dissolved Oxygen

Dissolved oxygen (DO) measurements will be performed at all sampling locations during each designated water sampling event using a YSI Model 57 oxygen meter. At each water quality station DO measurements will be made at three specific locations within the water column which corresponds to the (1) top; just below the surface, (2) bottom; at the sediment-water interface, and (3) the approximate middle of the water column. Measurements are being performed in this fashion because variations with water depths are often greater than variations between sample locations in wetland systems. In addition to these measurements, 48 hour diurnal measurements will be performed monthly at two of the sample stations. At Station 4, which corresponds to the point of effluent discharge from the treatment wetland diurnal will be performed as follows:

First Day:	Second Day:
6:00 AM	6:00 AM
12:00 Noon	12:00 Noon
6:00 PM	6:00 PM
12:00 Midnight	

At Station 6, which corresponds to the point of discharge of wastewater effluent into the treatment wetland a 48 hour dawn/dusk measurement will be performed with measurements distributed as follows:

First Day	Second Day
6:00 AM	6:00 AM
12:00 Noon	12:00 Noon
6:00 PM	6:00 PM

(3) pH

Field measurements will be performed using a portable pH meter with relative accuracy and repeatability of ± 0.05 pH. A standard two buffer (pH 7 and pH 4) calibrative procedure will be performed prior to each measurement and electrode response slope will be recorded.

(4) Conductivity

Field conductivity measurements will be performed *in situ* at the time of water quality sampling using YSI Model 33 Portable Conductivity/Salinity Meter.

b. Lab Determined Parameters

Using standard lab methods as described in the lab's QA/QC document.

(1) Color

(2) BOD_5

(3) TSS

(4) TP as P

(5) OP as P

(6) TKN as N

(7) NH_3 as N

(8) No_3 - No_2 as N

(9) SO_4 as S

(10) Fecal Coliforms

(11) Chlorophyll a

(12) Metals - Hg, Pb, Cd, Cr, Cu, Zn, Fe, Me, Ag

3. Quality Assurance and Quality Control

CH2M Hill laboratories will perform quantitative chemical analysis pursuant to the procedures which are described in FDER generic QA/QC document reference number 87534G.

D. GROUNDWATER

1. Sampling Location and Frequency

Four groundwater wells will be placed around the treatment wetland (Refer to Figure 13). Two lateral wells will be placed along the east and west perimeters (Locations 1 and 3) in the sloping region descending into the wetland. A third well (Location 4) will be placed in the descending slope of the southern perimeter with the fourth well (Location 3) being located in the road-berm system which forms the northern perimeter of the wetland.

The wells will be screened in the sandy clay stratum that is directly above the layer described as fine or heavy clay in the test borings. This will insure that all flow above the essentially impervious heavy clay layer is sampled.

The wells will be monitored quarterly to determine water levels and once for analysis of primary and secondary drinking water contaminants as defined in Chapter 17-22.104 and Chapter 17-22.105 FAC. Parameters to be analyzed are summarized in Table 7. Samples will be collected in a manner to ensure compliance with FDER QA/QC procedures and proper chain of custody procedures followed. Analytical analysis will be performed in accordance with an approved QA/QC plan provided by the analytical laboratory.

2. Groundwater Monitoring/Sampling Methodology

All wells will be baled until three (3) well volumes have been removed prior to retrieving a sample. Following the retrieval of samples, the bottles will be labeled and stored in accordance with the QA/QC procedure required by the analytical lab.

3. Quality Assurance and Quality Control

CH2M Hill laboratories will perform quantitative chemical analysis pursuant to the procedures which are described in FDER generic QA/QC document reference number 87534G.

E. SEDIMENT MONITORING

1. Sampling Frequency

Sediment samples will be collected once during the baseline monitoring period. Sampling will be done during one of the first three monthly monitoring trips so that the data will be available as soon as possible.

2. Sampling Location

Sediment samples will be taken at Station 4 (discharge point from treatment wetland) and Station 6 (effluent discharge point) to comply with criteria defined in Chapter 17-6.055(11) FAC. Data points at both these locations will enable parameter gradients to be established across the entire subject wetland. This will be of great assistance in the design of the system as well as in documenting any changes that occur in the sampled parameters over time.

3. Sampling Methodology

Sediment will be sampled with a one inch diameter PVC corer. Following the removal of large liter debris, the top four inches of the sample obtained will be homogenized for analysis in the approved laboratory. Strict chain of custody records will be kept and samples will be delivered promptly to the approved testing laboratory for analysis using the procedures established in the lab's QA/QC plan.

4. Parameters to be Sampled

All parameters defined in Chapter 17-6.055(11) will be analyzed on sediment cores. These are as follows:

a. pH
b. Total Phosphorus
c. Total Kjeldahl Nitrogen (TKN)
d. NH_3 (as N)

e. NO_3^- + NO_2 (as N)
f. $SO_4^{=}$ (as S)
g. $S^{=}$ (a S)
h. Heavy Metals – (Hg, Pb, Cd, Cr, Cu, Zn, Fe, Ni, Ag)

F. PLANT TISSUE ANALYSIS

To facilitate determination of changes which occur in plant nutrient concentrations, a baseline for plant tissue nutrients will be determined. Two samples will be taken from each transect. One individual from each of the dominant two tree types will be analyzed (eg. 2 samples/transect). Each sample will consist of a bole, leaf, and branch component which will be analyzed individually for nutrient concentration. Hammer corers will be used to sample small bole sections while the shotgun method will be employed for removal of canopy branches and associated foliage. All parameters defined in Chapter 17-6.055(11) will be analyzed once during the baseline monitoring. Parameters to be determined are listed as follows: TP, TKN, Hq, Pb, Cd, Cr, Zn, Fe, Ni, Ag.

IV. DETERMINATION OF PROJECT BOUNDARY

Establishing the limits of the proposed treatment wetland site is greatly facilitated by topography and the logistical needs of the City of Monticello. The site lies in a bowl-shaped basin whose relatively steep sides often provide hydrological gradients sharp enough to provide concise definitions to vegetative communities. In addition, the need for site access for construction and maintenance of effluent delivery systems and ecological monitoring has helped establish the City's intention to purchase land encompassing the access roads around the site. Therefore, the project boundary shall be clearly set on the aforementioned bermed road on the site's northern edge as well as the continuation of the road on the higher ground to the east and south (see Figure 2). Both of these areas are relatively dry, grassy upland communities with no vegetative connection to any wetland communities.

The remaining segments of the project boundary will be flagged by staff ecologists along the southwest, west, and north-west edges. Since the City of Monticello wishes to avoid any question of interaction between the project site and neighboring lands, these western boundaries will be intentionally marked well upslope of the line demarcating the limits of the various wetland communities on the project site's outer edge. In view of this, no need is perceived to request a jurisdictional determination. All lines will be flagged for inspection by any concerned governmental agency and these lines will be surveyed. A map of the site with the project boundary lines superimposed on the vegetational communities will be readily available for inspection.

V. ESTIMATION OF DETENTION TIME AT PROPOSED DESIGN FLOW

A. GENERAL

The determination of detention time for the subject system is extremely important as it is a pass/fail criterion that must be met in order to satisfy the requirements of the FDER Wastewater to Wetlands rule. Reasonable assurance must be provided to the Department that a minimum detention time of 14 days can be maintained, based on annual average flow rates after the system is constructed and design flows are being received by the wetland.

Because of the unique (single point) nature of the outfall from the subject wetland, it will be extremely easy to control the water level in the treatment wetland by placing a control structure at the outfall point of the wetland. The structure, if needed, would be so minor it could probably be permitted as part of the wetland treatment system without requiring a separate dredge and fill permit.

B. METHODOLOGY

In order to calculate detention times, two basic parameters must be determined with as much accuracy as possible. These are:

a) Total Storage Volume Available

b) Total volume of flow to be passed through the "Storage Volume Available".

1. Determination of "Storage Volume Available"

During the establishment of the staff gages and during the location of various monitoring stations in the subject wetland, extensive survey data has been obtained. This data includes top of peat elevations, bottom of peat elevations, and numerous control elevations identified by d s & n hydrologists and ecologists during field survey operations. Generally, the top of peat elevations over the entire 260 acre treatment wetland do not vary by more than one foot. In addition, depth of peat soundings were found to vary from 2 feet to 8 feet deep, with an average value of approximately 3.66'. By running short survey lines into the wetland from around the entire perimeter, the bottom of the bowl shape was found to correlate well with the signature of the wetland found on the aerial photographs. The average elevation of the top of the peat at this point is approximately elevation 84.00 and covers 170 (plus or minus 10) acres. While a complete topographic survey has not been undertaken, we do feel that enough elevations have been established to enable a reasonably accurate ($\pm$ 15%) estimate of volumes and areas to be computed.

The treatment wetland is capable of impounding water up to the top elevation of the access road at elevation 85.18. Therefore stage-storage calculations were done up to this top-of-road elevation.

Because of the extensive volume of peat (muck) in the system, we feel that the storage volume available in the peat should be taken into account in any determination of detention time. This is because of the high voids ratios (40-60%) and extremely high hydraulic conductivities (> 100'/day) normally associated with peat deposits of the type found on the project site. These high voids ratios and hydraulic conductivities allow water to flow through the peat at rates more indicative of surface water than of groundwater. On-site observations tend to corroborate this conclusion, as evidence of substantial water movement through the peat has been observed when the floor of the swamp was essentially dry.

For purposes of volume calculations, we have assumed a peat depth of 3.66 and a conservative voids ratio of 40%. Incremental volumes were calculated using the following formula:

$$V = 1/3\ h((B1 + B2) + (B1 \times B2)^{0.5})$$

Where V = volume (cf)
h = depth
B1 = Area at lower incremental elevation (sf)
B2 = Area at higher incremental elevation (sf)

Note that for all elevations below the top of peat elevation, the volume obtained by the above formula was multiplied by 0.40 (voids ratio of peat).

For a detailed tabulation of volume values, see Table 9.

2. <u>Determination of Volume of Flow passed through the "Available Storage Volume"</u>.

The volume of flow must include both the design flow of 1 mgd (133,690 cfd), plus all stormwater runoff which will naturally pass through the wetland. The amount of stormwater runoff was calculated using average monthly rainfall amounts and using the SCS runoff equation to calculate runoff. A composite runoff curve number of 73 was used (Table 10), applied over the entire 1328 acre contributing watershed, and the total amount of monthly (and yearly) runoff was converted to an average daily amount and then added to the design flow to arrive at a total daily flow figure (Table 11).

3. <u>Detention Time Calculations</u>

The total flow figures obtained above (both with 1 mgd flow and without) were then divided by the storage available to arrive at detention time at any given stage. This approach gives a good feel for the relationships involved and affirmatively demonstrates that adequate detention time can be easily provided, even using wettest month flow data.

C. Summary

On an annual average basis, the attached graphs (Figure 18) and tabulation (Table 9) show that the required 14 day detention time can be provided at approximately elevation 83.74. Correlating this elevation to the normal pool elevation (84.69) found from the existing moss lines in the swamp (see figure #15) we feel that an artificial impoundment of water is unnecessary to meet the 14 day requirement. In addition, a thorough study of the figures presented reveals that even with the increased flow through the wetland caused by the 1 mgd effluent discharge , detention time at the normal pool elevation (average moss line) averages 27 days, well in excess of the 14 day requirement.

In the interest of thoroughness, we have also calculated and tabulated detention values in the swamp if the volume of storage available in the peat were ignored. Figure 18 shows that even if this were assumed, the wetland could still provide the required detention time, albeit with a raising of the normal pool to elevation 84.81. We feel that this is not an accurate depiction of detention time, but include this calculation only to demonstrate that under the most unfavorable assumptions possible, the subject wetland could still meet the pass/fail criteria for detention time included in the FDER Wastewater to Wetlands Rule.

VI. ESTIMATION OF TRAVEL TIME AT PROPOSED DESIGN FLOW

A. GENERAL

In the specific case of the relationship of this wetland site to the Aucilla River, it is essential to know if the treatment wetland is greater than 24 hours annual travel time to Outstanding Florida Waters, Class II waters, or other prohibited categories listed in Sec.17-6.055(2), FAC.

B. METHODOLOGY

In order to estimate the travel time for effluent from the discharge point of the proposed treatment wetland to a water body with an Outstanding Florida Water classification such as the Aucilla River, several variables must be addressed. First, it is extremely unlikely that the flow path is linear, given the observed absence of incised channels in the kind of forested swamp, (Blackgum) prevalent regionally, with its dense, arboreal vegetation. Therefore, a realistic calculation would account for the sinuous, spreading course that water must follow to reach the Aucilla River. Secondly, the variability in water velocity is highly correlated to the variability in bottom configuration and vegetation stands.

Technically, a detention time calculation would be more appropriate than a travel time calculation, since flow through the Wolf Creek Swamp system in most times of the year is more of a storage/detention system than a flow through system. One must also realize that even though Wolf Creek is called a "creek", it completely loses its defined flow channel at various points along its way to the Aucilla River (see Figure 8, pocket).

FDER rules do not require the actual determination of travel time in situations such as this. They only require that the applicant provide reasonable assurance that the travel time is at <u>least</u> 24 hours. We therefore have determined that a worst case analysis of the travel time criteria that demonstrates compliance should certainly provide reasonable assurance, since all of the unknown factors would tend to increase the travel time, thereby providing even more factor of safety against failure to meet the requirements of the rule.

Assumptions:

In determining a worst case situation, the following assumptions were made.

1) That flow proceeds in as direct a path as possible from the effluent discharge point to the Aucilla River. This defined a flow path that goes directly into Wolf Creek, and then along the approximate flow path of Wolf Creek

into the Aucilla River. (See Figure 8). This distance is 59,750' as scaled from USGS maps.

2) The slope of the worst case travel path is assumed to be linear, with no high spots or pools along the way. Using elevations obtained from USGS maps, an average slope of 0.00058 ft/ft was obtained.

3) Flow was assumed to follow the rules of open channel flow.

4) Values for Mannings Roughness Coefficient "^" were given as 0.4 to 0.8 for flow through "woods" in the latest release of SCS-TR55. In order to completely investigate all expected flow regimes, the analysis varies "n" values from 0.5 to 0.9 and calculates travel times given all of these values.

5) In order to investigate all possible flow conditions through the system, assumed flow depths were also varied from 0.3' to 3' deep and travel time calculated for each case.

6) The width of flow path through the wetland was assumed to be 100'. This value is used to calculate the hydraulic radius in Manning's equation, but turns out to be a very insensitive parameter that does not significantly change the outcome of the calculation unless it were assumed to be very small (<10').

Summary:

The results of the calculations are presented in Figure 9 and on Table 8. These calculations show that travel time varies from 4.8 days to 38.9 days over the range of assumptions analyzed. As the assumptions are so conservative, and such a large safety factor is demonstrated in these calculations, we feel that further detailed study of this issue is unnecessary.

VII. ANSWERS TO MAJOR QUESTIONS NORMALLY RAISED

QUESTION 1

If the downstream receiving waters currently fail to meet the water quality standards, how does the applicant propose to demonstrate compliance with department rules?

Response 1

Compliance with department rules can be clearly demonstrated since there is only one point of discharge from the proposed treatment wetland (PTW). A power company berm cuts off surface water flow along the east and north sections of the PTW except for a road with five culvert pipes in the northeast corner (Figures 2, 13, 14). All discharge from the PTW exits at this point, so any variance with water quality limits can be precisely determined by monthly monitoring visits to this site.

QUESTION 2

Are there any minimum water quality criteria which the proposed discharge will be unable to meet?

Response 2

The impact on the water quality of the discharge from the treatment wetland is expected to be very minor, if noticeable at all. Baseline monitoring will establish any background parameters that are not being met by the system in its natural condition. Any deviation from this natural condition can be easily documented and its cause isolated by the extensive monitoring program proposed, which will likely be continued into the operation phase of the project. We anticipate that the extensive pretreatment measures proposed will provide much flexibility of operation and will allow corrective measures to be taken should any water quality violation be caused by the discharge. In addition, since initial design flows are expected to be only about half of ultimate design flows, the assimilative capacity of the biological systems involved will not be taxed at design rates for many years. This will give the system time to adjust to the new inflows, as well as allowing much data to be generated for management of the system to optimize water quality parameters.

QUESTION 3

What will be the hydrological and ecological impact of the discharge on the type, nature and function of the wetland, or on threatened or endangered species?

Response 3

The hydrological impact on the wetland should not be large enough to be readily noticeable. Not only is maximum system discharge engineered to be well with DER limits, but the wastewater treatment system will be designed to give sufficient effluent storage to allow maintenance of discharge levels within seasonal max/min patterns.

Maximum discharge for the proposed wastewater treatment plant redesign is one million gallons per day (1 mgd). When applied to the subject wetland area of some 260 acres, this translates to an application rate of one inch per week or half that allowed under Chapter 17.-6.080 (5) (a)1.

Natural drainage from the proposed treatment wetland site will not allow the effluent to stand and raise surface water levels appreciably. Rather, a higher flow-through will result. Preliminary examination of water level fluctuations measured over a one month period by a stage recorder at the site discharge point (surface water Monitoring Station #4), supports this conclusion. After charge-up by rainfall and loading by streams and sheetflow from the surrounding watershed, the rate of site discharge as seen in the slope of declining water levels appears to be fairly rapid. Complete stage/storage/discharge relationships for the PJW will be developed over the course of the 12 month monitoring period as required by FDER rules.

The City of Monticello's wastewater treatment system will be redesigned so that a terminal flow-through artificial wetland system can afford up to 60 days storage capacity during the dry season. This storage capacity would give the City the management prerogative to allow no effluent discharge to the proposed treatment wetland site for a period of up to two months. Such capacity would allow management of effluent discharge to approximate those levels typically occurring in the dry season. The oscillating wet and dry conditions which contribute to the anaerobic/aerobic states important in nutrient cycling in wetlands would thereby be protected.

During the wet summer months, maximum design discharge rates could potentially increase inflow to the proposed treatment wetland site (PTWS) by an average of 40% (Figure 17). While Clewell has noted that Nyssa swamps are among the wettest in the Florida panhandle and therefore appear adapted to high water conditions, it is important to emphasize that water levels will probably not rise appreciably due to the apparently quick discharge rate for the PTWS. A higher flow through rate will probably not mean prolonged flooding periods or higher flooding levels. These parameters will be carefully scrutinized during baseline and operational monitoring.

Ewel[3] has noted that wetland communities with longer hydroperiods (WCLH) are already adapted to lengthier periods of inundation and anaerobic root environment. A wetland community adapted to a shorter hydroperiod (WCSH) would exhibit increased respiration as it adjusted to the stress of a longer hydroperiod. Therefore any discharge which lengthened the hydroperiod in a WCLH would not decrease gross or net primary productivity (GPP and NPP) because of greater respiration levels. Rather GPP and NPP would rise because nutrient loading from municipal wastewater discharge would stimulate productivity more than respiration would increase to handle higher anoxia levels.

These studies support the contention that wetland communities are among the best adapted natural systems for thriving while removing nutrients from the water column. As Tilton and Kadlic[4] note, the larger surface area found in wetland soils and vegetation contributes to higher levels of absorption, adsorption, microbial transformation, and biological utilization than normally occur in more channelized water courses.

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[3]Ewel, K.C.(1985) "Responses of Wetlands and Neighboring Ecosystems to Wastewater". In Ecological Considerations In Wetlands Treatment of Municipal Wastewater, Van Nostrand Reinhold Company, New York

[4]Tilton, D.L. and Kadlec, R.H.., 1979, "The Utilization of a Freshwater Wetland for Nutrient Removal from Secondarily Treated Wastewater Effluent, Journal Environmental Quality 8(3):328.

Because of the noted ability of deepwater wetland communities to handle higher loads and longer hydroperiods, Ewel states that the most likely effect on species diversity from municipal wastewater discharge is either no effect or an increase.

Given a slightly altered hydrology, ecological impacts should be minor if any do occur at all. While the flow-through rate may be higher, it does not seem likely that this would change nutrient cycles or the composition of the canopy, sub-canopy or herbaceous vegetation layers. In that event, faunal species composition shifts do not seem likely either.

QUESTION 4

Will the proposed discharge be able to meet the loading and detention criteria established by the Wastewater to Wetlands rule?

Response 4

The conceptual design proposed for the upgrade to the City's Wastewater Treatment facility includes upgrade of the treatment plant itself to a 750,000 gpd extended aeration facility, with the partially (75% of secondary levels) treated effluent then being routed through a 100-130 acre artificial wetland for additional TSS, nitrogen, BOD, and phosphorus removal. This artificial wetland can also be managed to bring ph and DO levels closer to those found in the Proposed Treatment Wetland. In addition to the previously referenced 2 month storage capacity available in the proposed artificial wetland, it will allow a great deal of flexibility of management of the effluent prior to ultimate disposal in the PTW. We feel that the system, as proposed, will be able to easily meet all of the loading (nutrient and hydraulic) and detention criteria established by the Wastewater to Wetlands rule.

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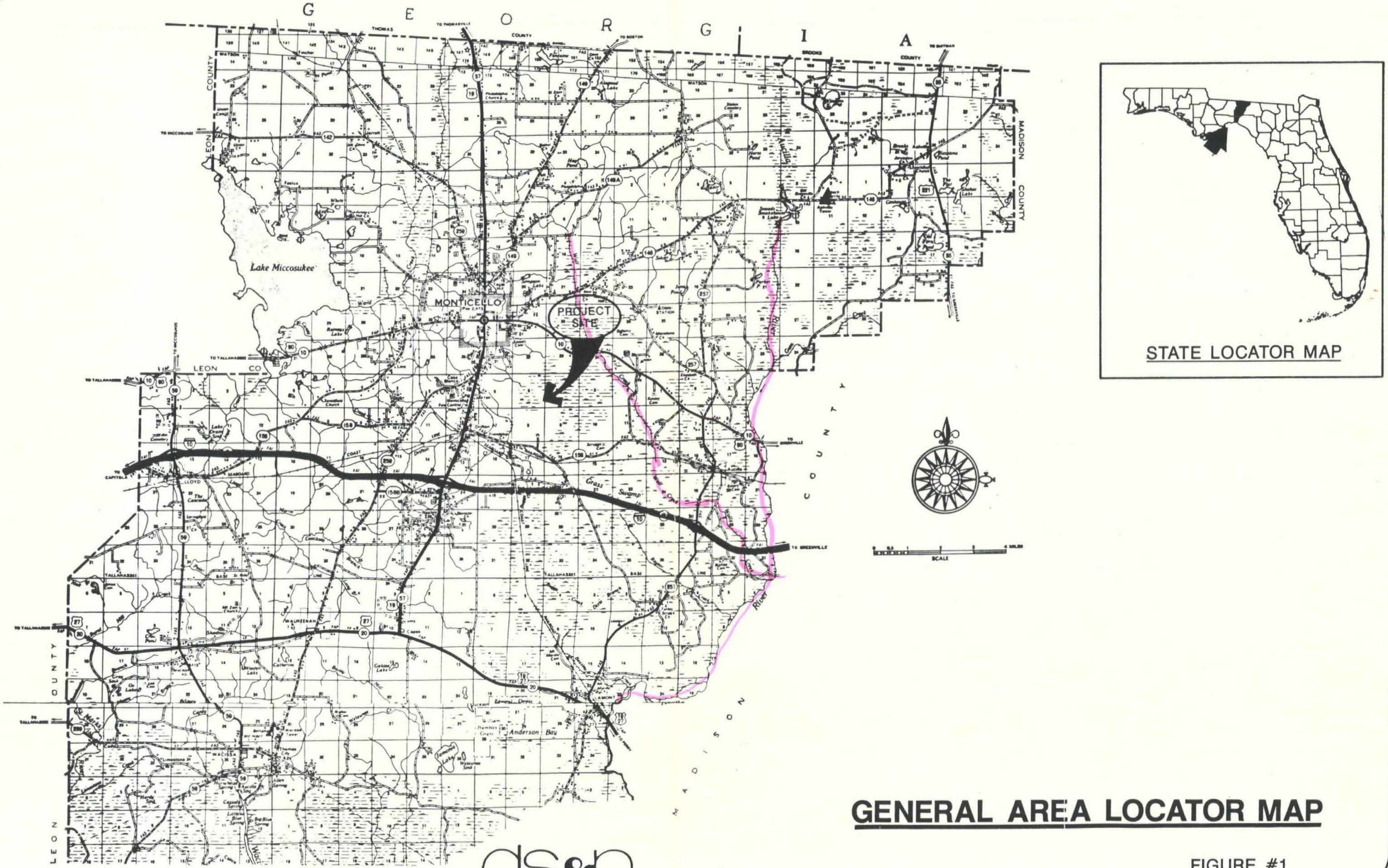
LIST OF FIGURES



GENERAL AREA LOCATOR MAP

FIGURE #1

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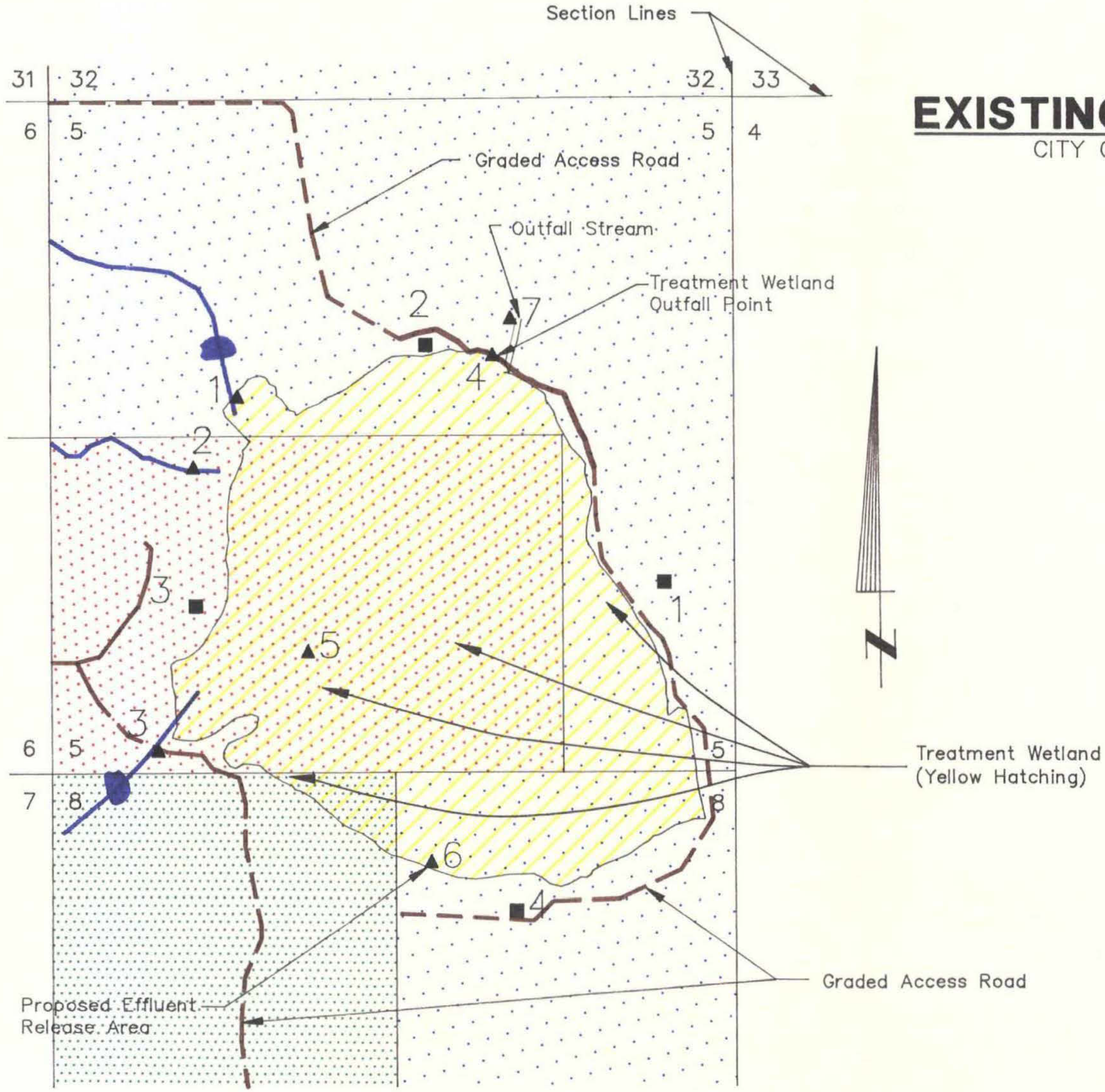
EXISTING PROPERTY OWNERSHIP MAP

CITY OF MONTICELLO WETLANDS DISCHARGE SYSTEM

0' 1000' 2000' 4000'

GRAPHIC SCALE



LEGEND

	Jumpy Run Plantation 97.5 Acres of Treatment Wetland
	Thomas Jr. & Caroline Martin 161.9 Acres of Treatment Wetland
	Louise B. Morris 7.1 Acres of Treatment Wetland
▲ 1	Surface Water Sampling Location
■ 1	Groundwater Monitoring Well

Source: Property Appraiser's Office, Jefferson County, Florida

FIGURE #2

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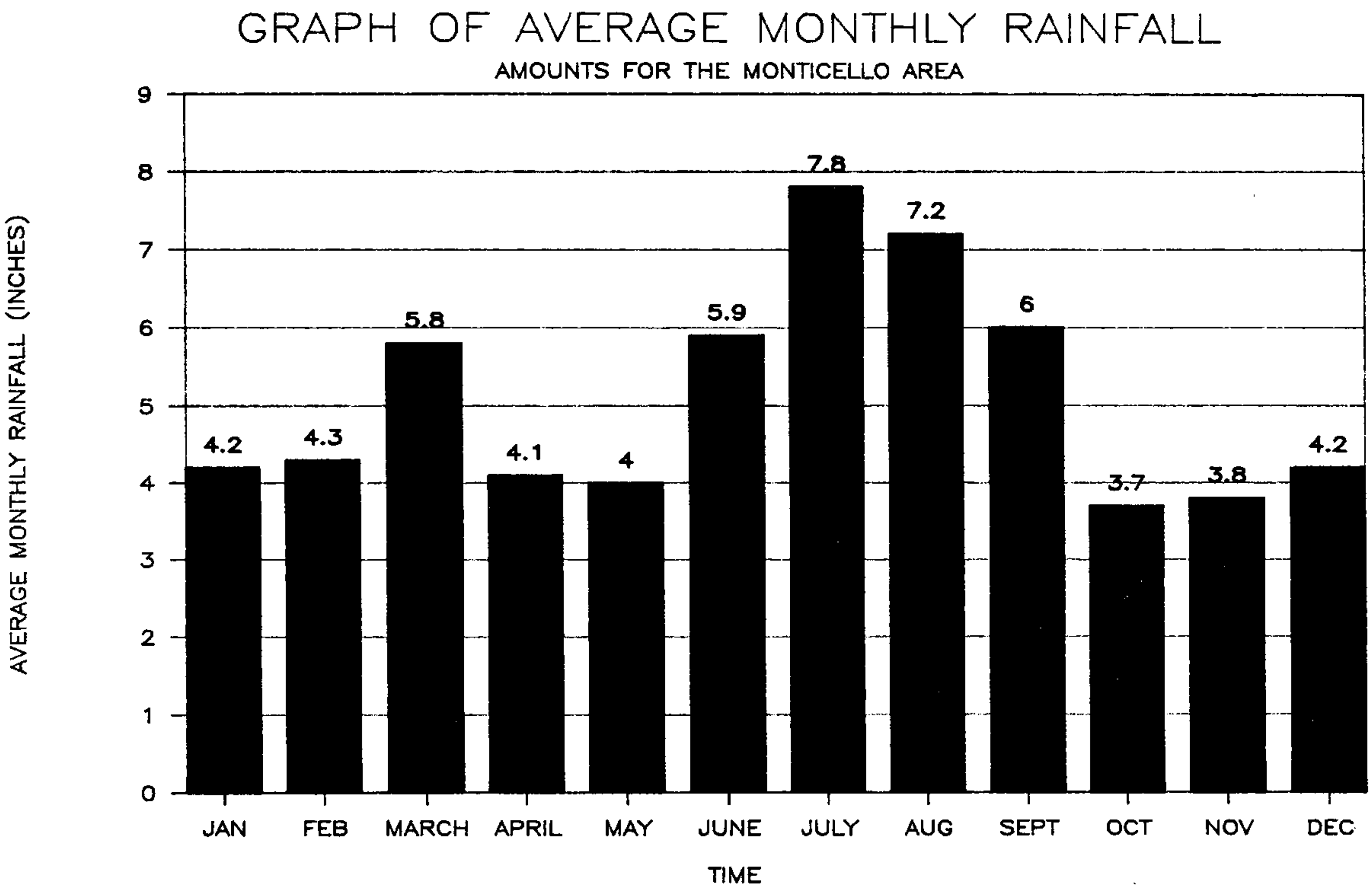

SOURCE: WATER RESOURCES ATLAS OF FLORIDA, 1984

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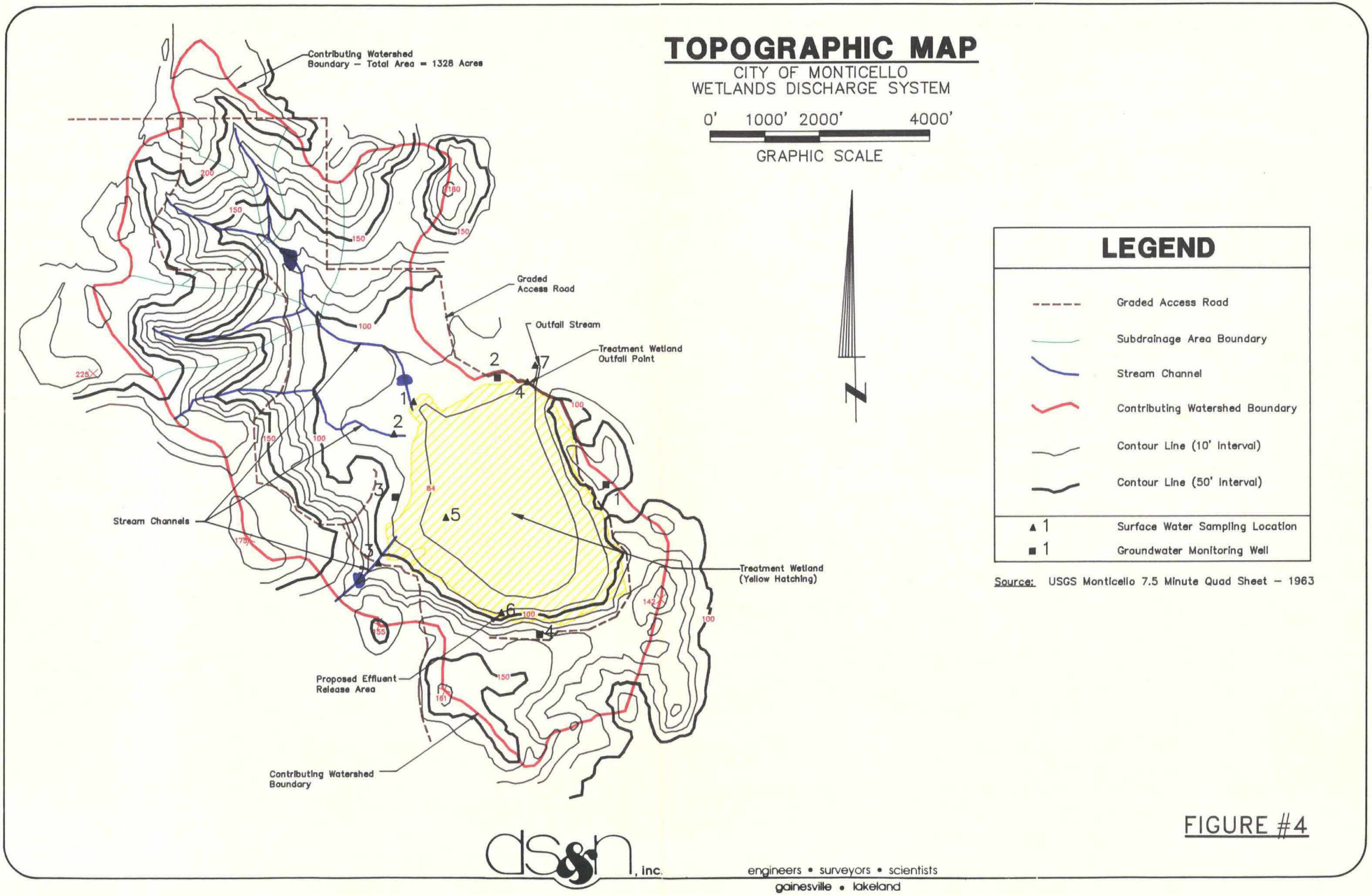
FIGURE #3


TOPOGRAPHIC MAP
CITY OF MONTICELLO
WETLANDS DISCHARGE SYSTEM
0' 1000' 2000' 4000'
GRAPHIC SCALE
LEGEND
Graded Access Road
Subdrainage Area Boundary
Stream Channel
Contributing Watershed Boundary
Contour Line (10' Interval)
Contour Line (50' Interval)
1 Surface Water Sampling Location
1 Groundwater Monitoring Well
Source: USGS Monticello 7.5 Minute Quad Sheet – 1963
Contributing Watershed Boundary – Total Area = 1328 Acres
Graded Access Road
Outfall Stream
Treatment Wetland Outfall Point
Stream Channels
Treatment Wetland (Yellow Hatching)
Proposed Effluent Release Area
Contributing Watershed Boundary
FIGURE #4
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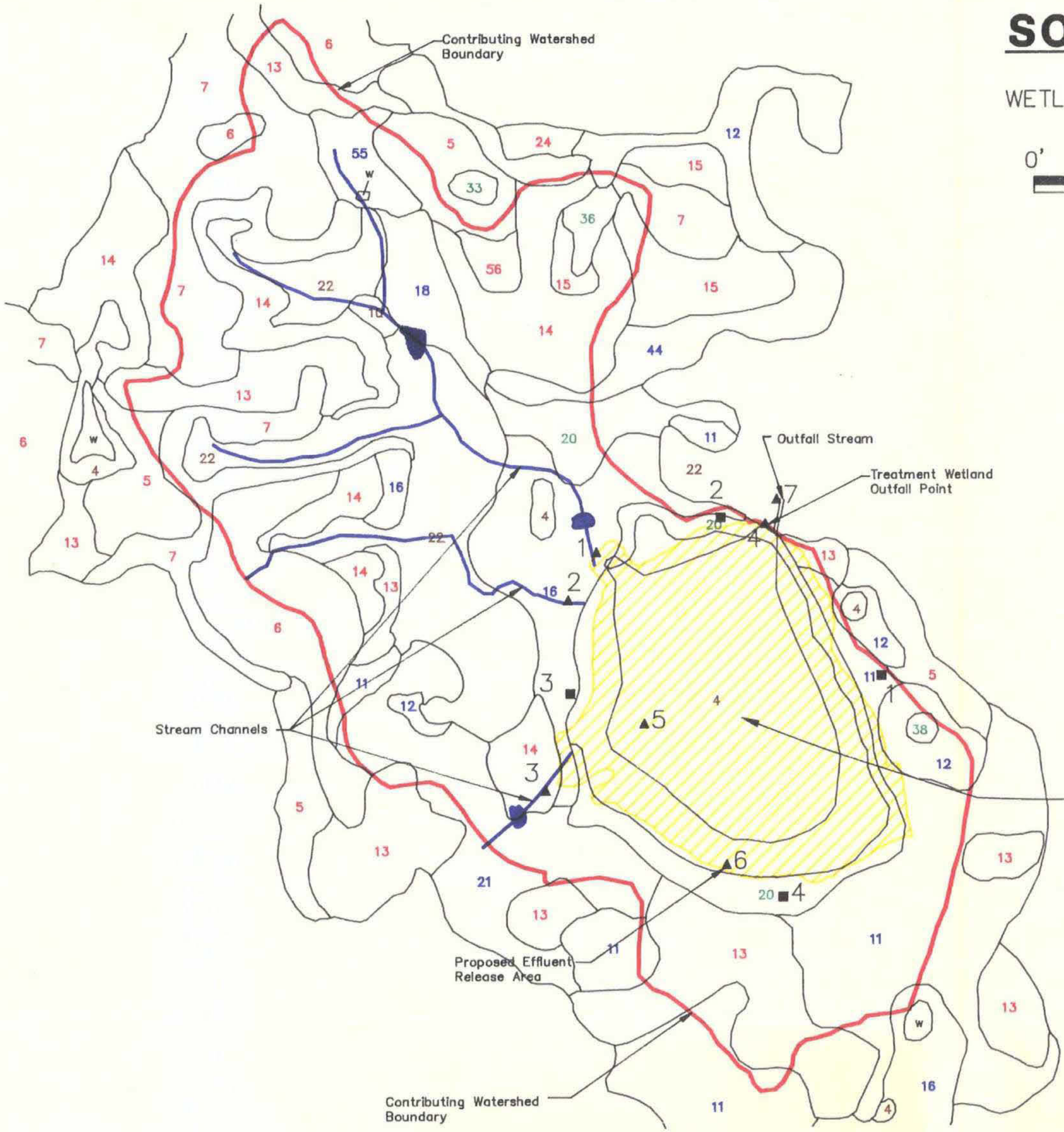
SOIL TYPE MAP

CITY OF MONTICELLO
WETLANDS DISCHARGE SYSTEM

0' 1000' 2000' 4000'
GRAPHIC SCALE



LEGEND

HYDROLOGIC SOIL GROUP	SOIL NUMBER	SOIL SERIES
B/D	4	SURRENCY SERIES
B	5	FUQUAY SERIES
B	6	DOTHAN SERIES
B	7	DOTHAN SERIES GRAVELLY
B/D	10	RAINS SERIES
A	11	LUCY SERIES
A	12	LUCY SERIES
B	13	ORANGEBURG SERIES
B	14	ORANGEBURG SERIES
B	15	ORANGEBURG SERIES
A	16	BLANTON SERIES
A	18	TROUP SERIES
C	20	ALBANY SERIES
A	21	BONIFAY SERIES
B/D	22	PLUMMER SERIES
B	24	FUQUAY SERIES
C	33	LEEFIELD SERIES
C	36	LYNCHBURG SERIES
C	38	MICCOSUKEE SERIES
A	44	TROUP SERIES
A	55	LUCY SERIES
B	56	TIFTON SERIES

▲ 1 SURFACE WATER SAMPLING LOCATION

■ 1 GROUNDWATER MONITORING WELL

Source: USDA – Soil Conservation Service Published Soil Survey of Jefferson County.

FIGURE #5

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REGIONAL GEOLOGICAL CROSS SECTION

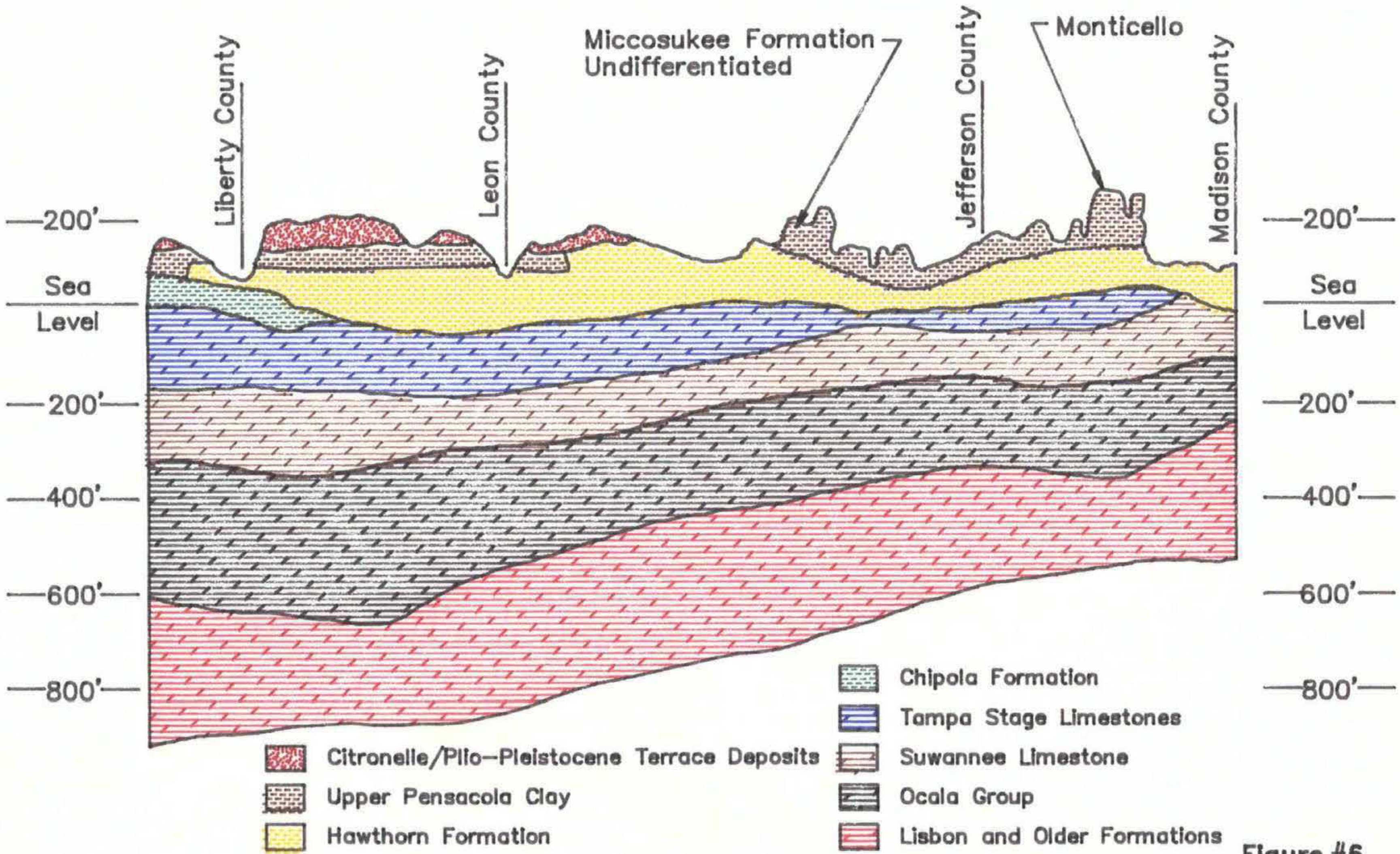

Figure #6

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REGIONAL HYDROLOGICAL CROSS SECTION

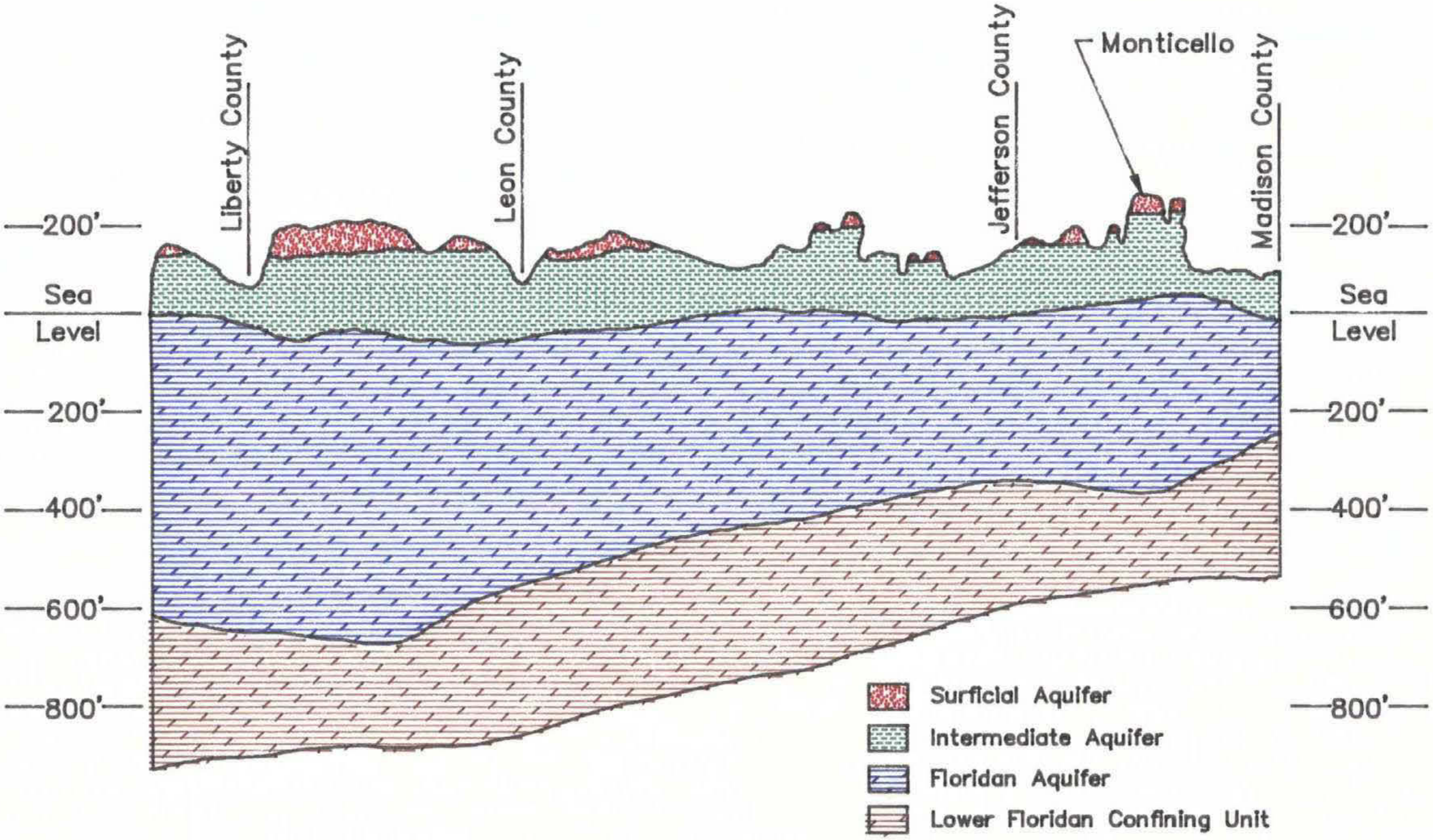

Figure #7

ds&n

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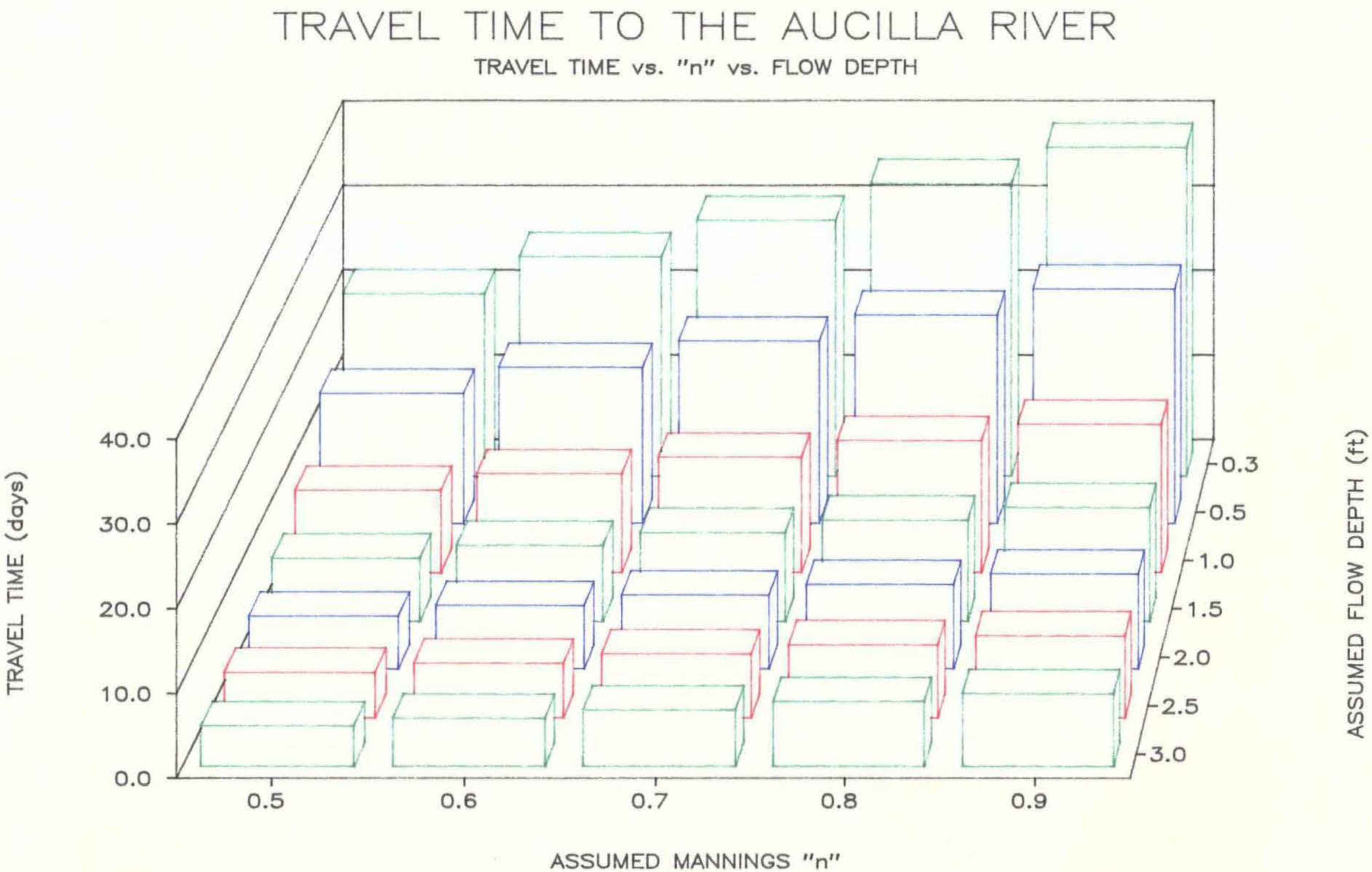

FIGURE #9

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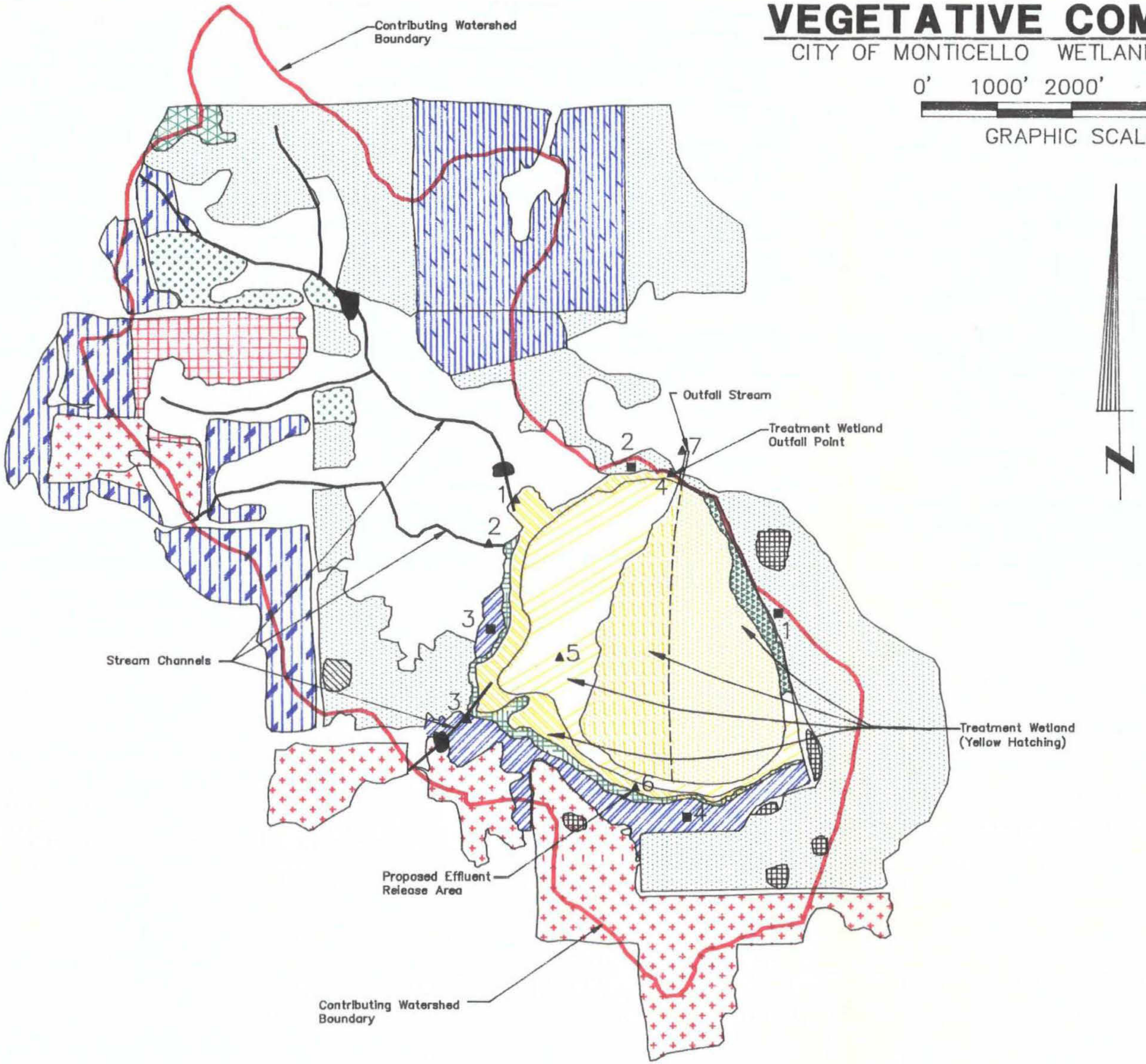
VEGETATIVE COMMUNITIES MAP

CITY OF MONTICELLO WETLANDS DISCHARGE SYSTEM

0' 1000' 2000' 4000'

GRAPHIC SCALE



LEGEND

	1 423	OAK–HICKORY WOODS (MESIC) OAK–PINE–HICKORY
	2 431	MESIC HARDWOOD HAMMOCK BEECH–MAGNOLIA
	3 439	HYDRIC HARDWOOD HAMMOCK OTHER HARDWOODS
	4 613	NYSSA SWAMP a. SHALLOWLY INUNDATED b. DEEPWATER GUM SWAMP
	5 611	BAY SWAMP (DISTURBED) BAY SWAMP
	3,4,&5	COMBINATION OF THREE VEGETATION TYPES (TRANSITION ZONE)
	6 611–613	MIXED BLACKGUM–SWEETBAY TRANSITION BAYSWAMP – GUMSWAMP TRANSITION
	7 615,423,439,431	MIXED UPLAND RIPARIAN SYSTEMS (615 – STREAM AND LAKE SWAMP)
	8 260	OLD FIELD ASSEMBLAGES RURAL OPEN LANDS
	9 215	FIELD CROPS
	10 241	PECAN TREE NURSERY
	11 223	PECAN GROVE
	12 211	IMPROVED PASTURE
	13 616	ISOLATED WETLANDS, INLAND PONDS
	14 530	RESERVOIR
	15 643	ISOLATED WETLAND, WET PRAIRIE
	16 214	ROW CROPS
	17 200	UNKNOWN AGRICULTURAL LANDS
▲ 1		SURFACE WATER SAMPLING LOCATION
■ 1		GROUNDWATER MONITORING WELL

KEY TO LEGEND:

Top Number: Project Classification
Bottom Number: Florida D.O.T. Land Use, Cover, and Forms Classification System

Source: Aerial Photo Interpretation With Field Reconaissance and Truthing by ds&n Personnel During June and July 1987.

FIGURE #10

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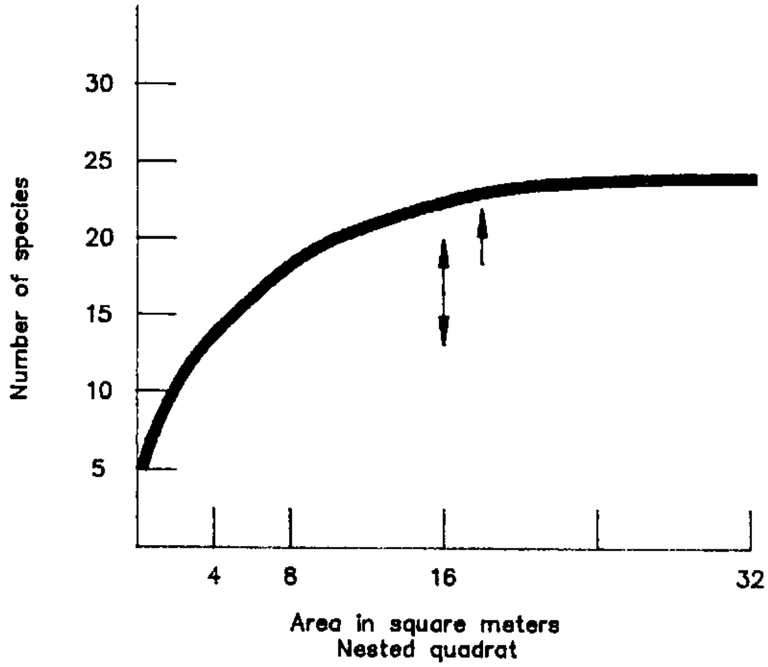
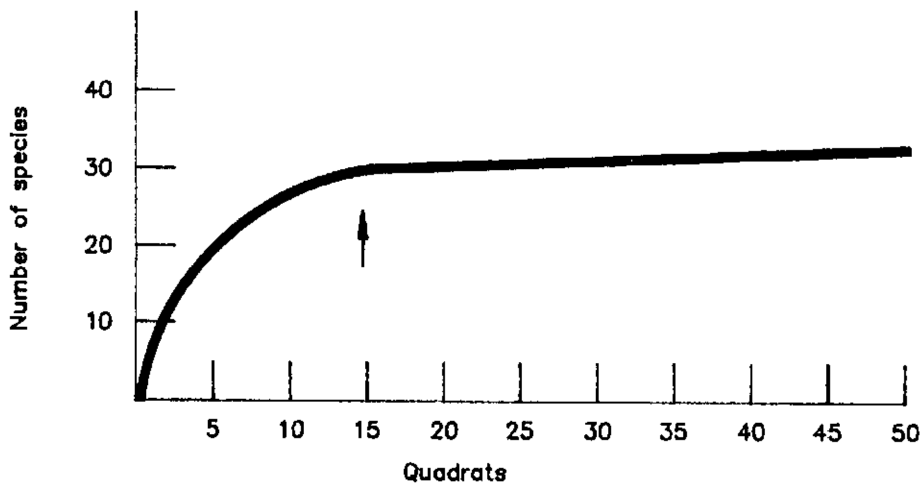


MINIMAL AREA OF QUADRAT



MINIMAL NUMBER OF QUADRATS

Source: Smith, R.L. 1980, Biology and Field Ecology, 3rd Edition, Harper and Row Publishers, New York.

FIGURE #11

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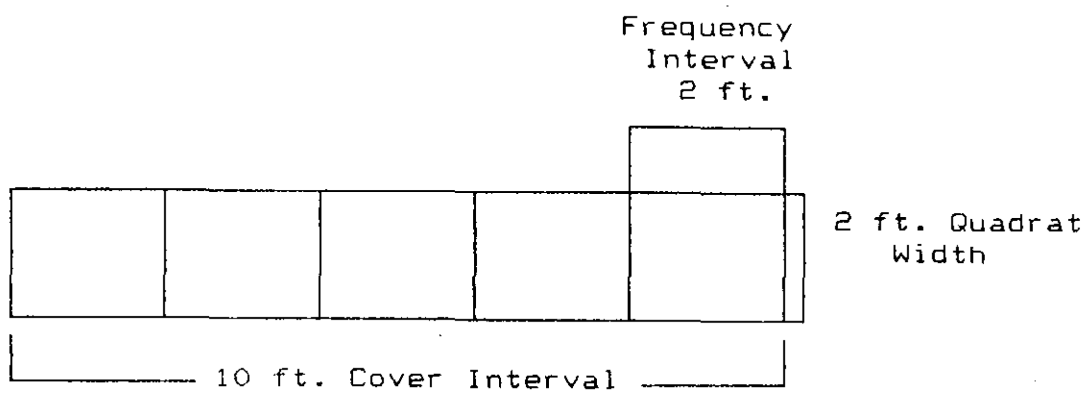
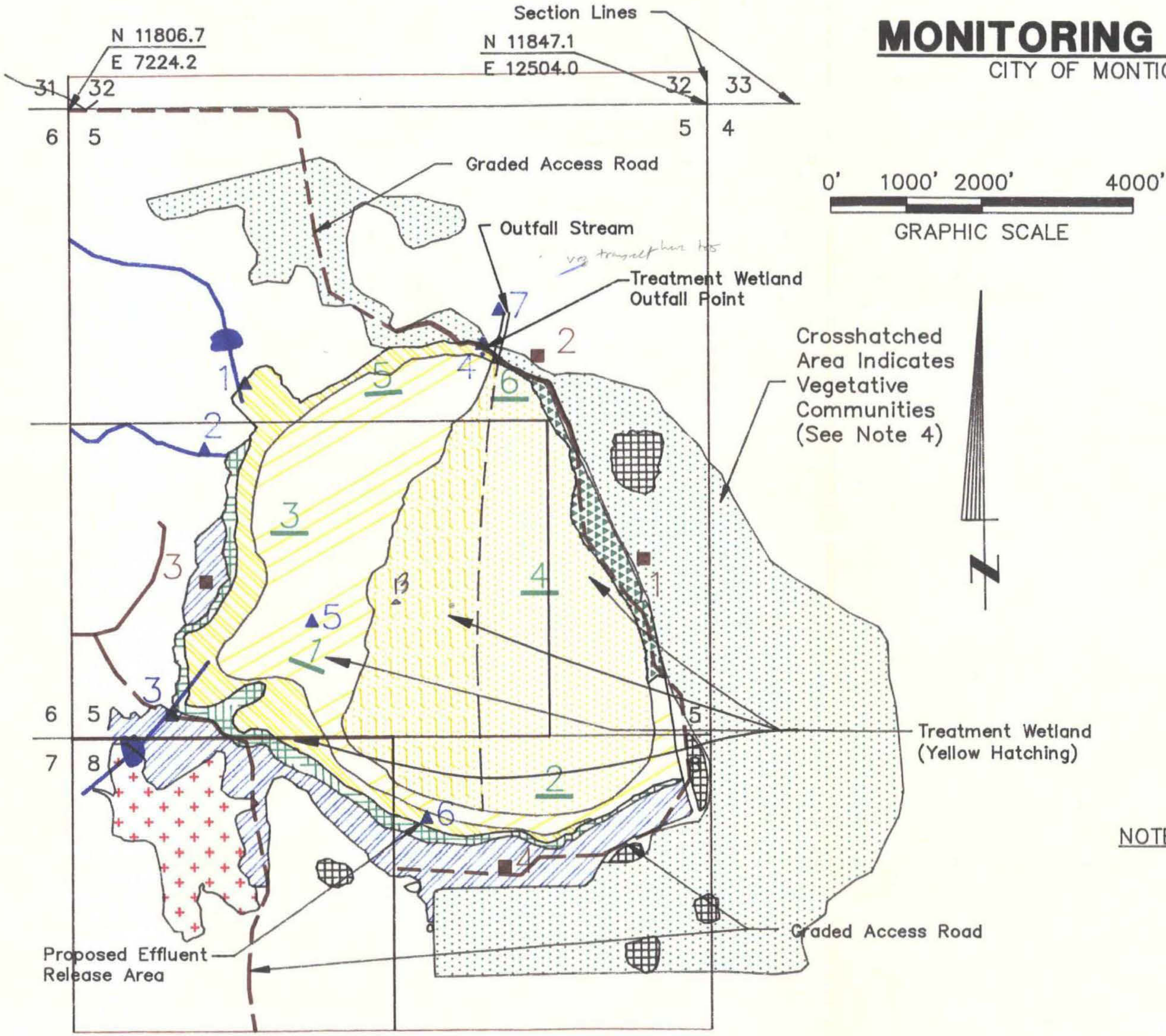


Configuration of herbaceous transect interval. Each 10 ft. X 2 ft. interval of the transect is assigned a cover value for each species. The interval is further divided into 2 ft. X 2 ft. intervals in which species frequency is recorded.

FIGURE #12

MONITORING STATION LOCATION MAP

CITY OF MONTICELLO WETLANDS DISCHARGE SYSTEM



LOCATIONS

No.	Northing	Easting	No.	Northing	Easting
■1	8045	11985	▲1	9488	8678
■2	9744	11101	▲2	8933	8347
■3	7843	8369	▲3	6709	8084
■4	5471	10840	▲4	9823	10637
			▲5	7493	9228
1	7025	9125	▲6	5851	10184
2	6050	11250	▲7	10113	10775
3	8250	9050			
4	7750	11125			
5	9425	9825			
6	9375	10875			

LEGEND

▲ 1	Surface Water Sampling Location
■ 1	Groundwater Monitoring Well
2	Vegetative Transect

NOTES:
1) Coordinates for Vegetative Transects are to Center of 300' Long Transect.
2) Staff Gauges shall be Established at all Surface Water Sampling Locations.
3) A Continuously Recording Water Level Recorder has been Established at Surface Water Sampling Location 4.
4) Refer To Figure #10, Vegetative Communities Map for Key to Vegetative Communities.

FIGURE #13

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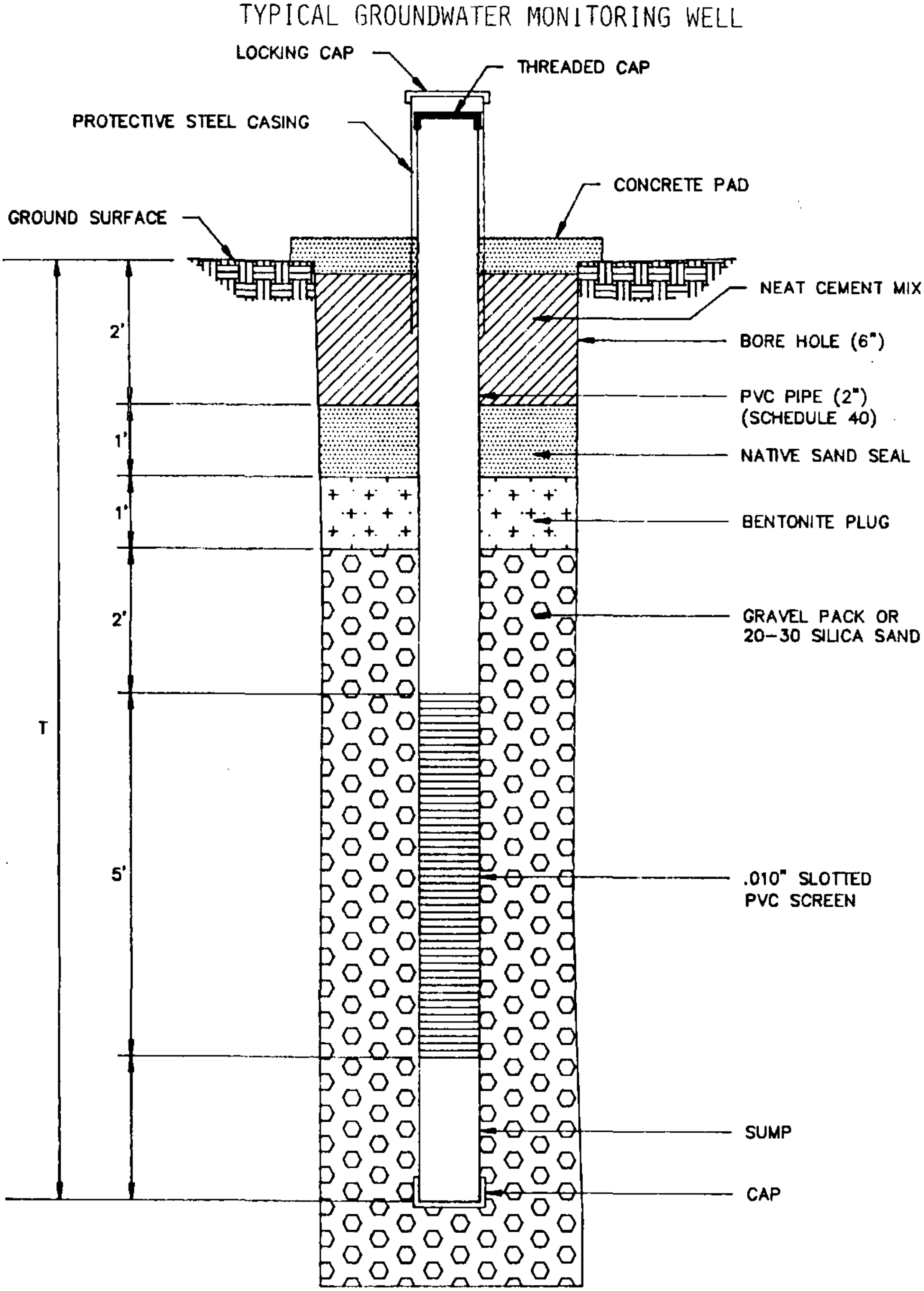

FIGURE #14

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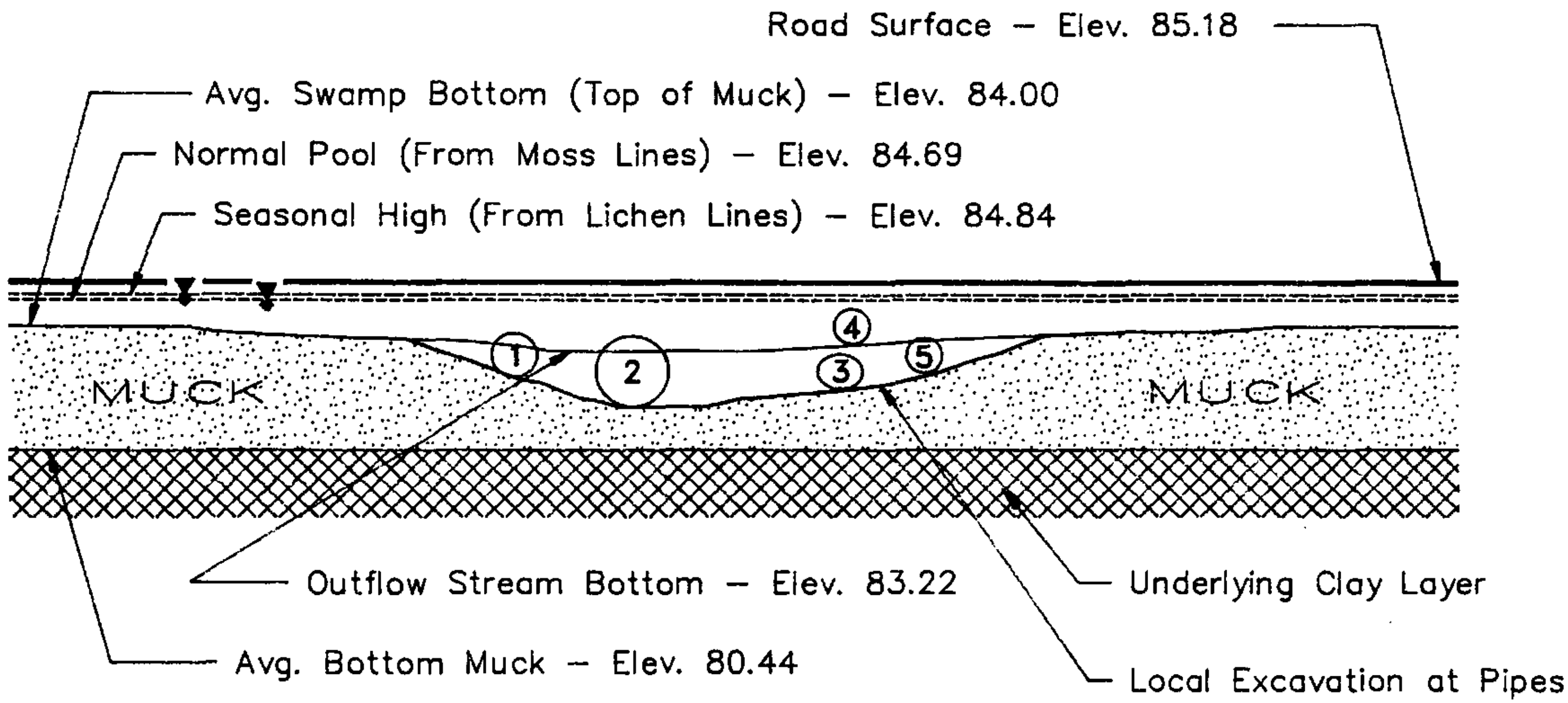


PIPE LEGEND			
PIPE	**LENGTH–SIZE**	**S INVERT**	**N INVERT**
1	18' – 15" CMP	82.31	82.31
2	18' – 24" RCP	81.35	80.99
3	20' – 12" x 15" CMP	81.85	81.79
4	18' – 12" CMP	83.13	82.62
5	21' – 12" CMP	82.30	82.22

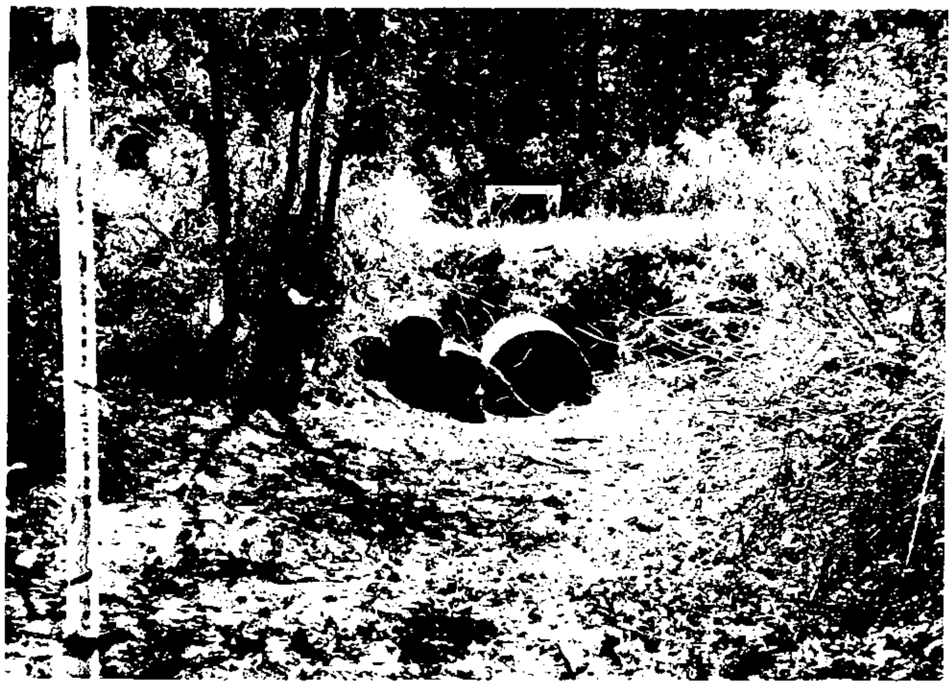
GENERALIZED CROSS SECTION AT SWAMP OUTFALL

4' 2' 0' 8'

GRAPHIC SCALE

d s & n inc., consulting engineers • gainesville, florida

FIGURE #15



Discharge point from Proposed Treatment Wetland seen from the northeast, downstream, looking upstream to the southwest. Note dry creek bed during drought, November, 1987.

FIGURE #16

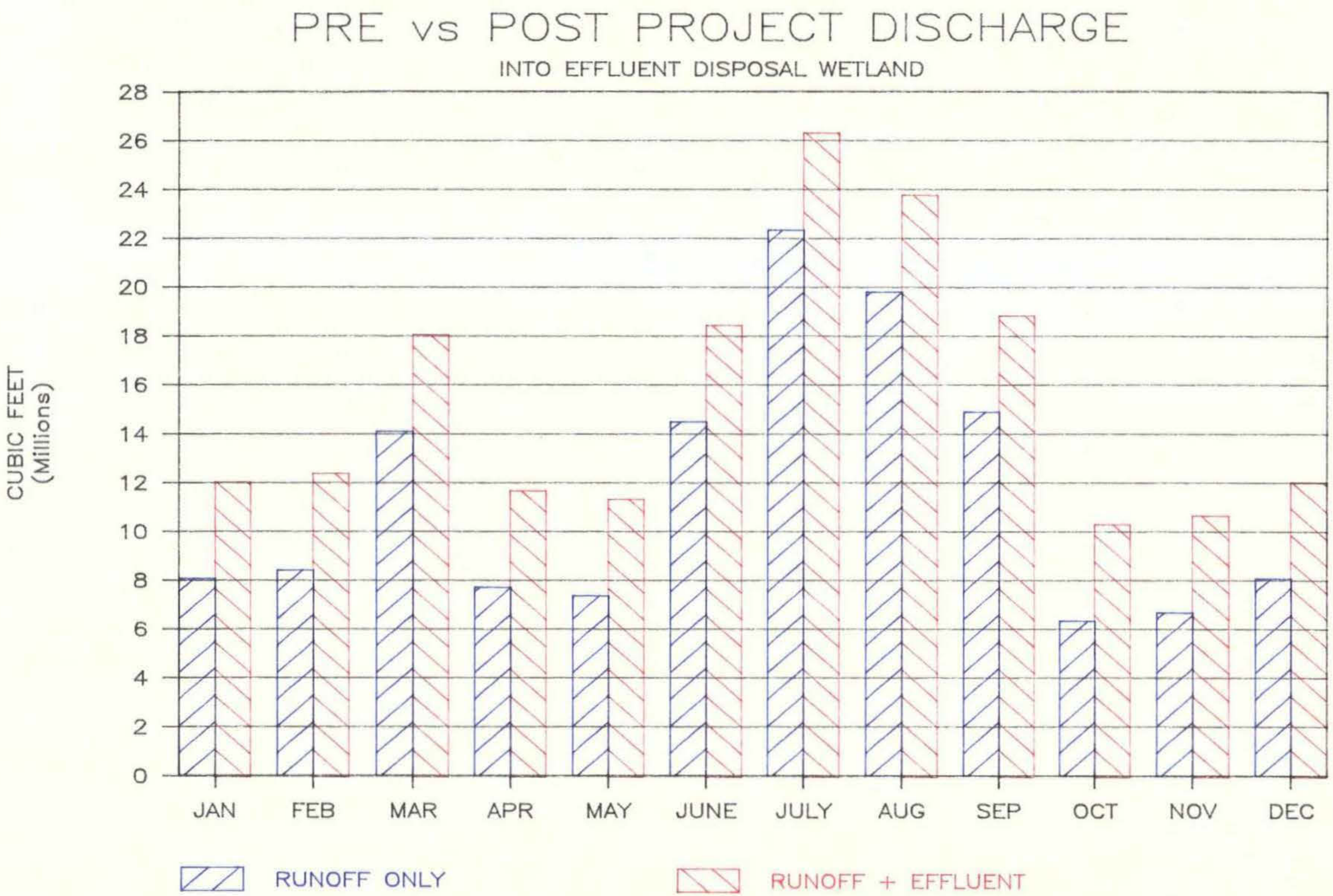


FIGURE 17

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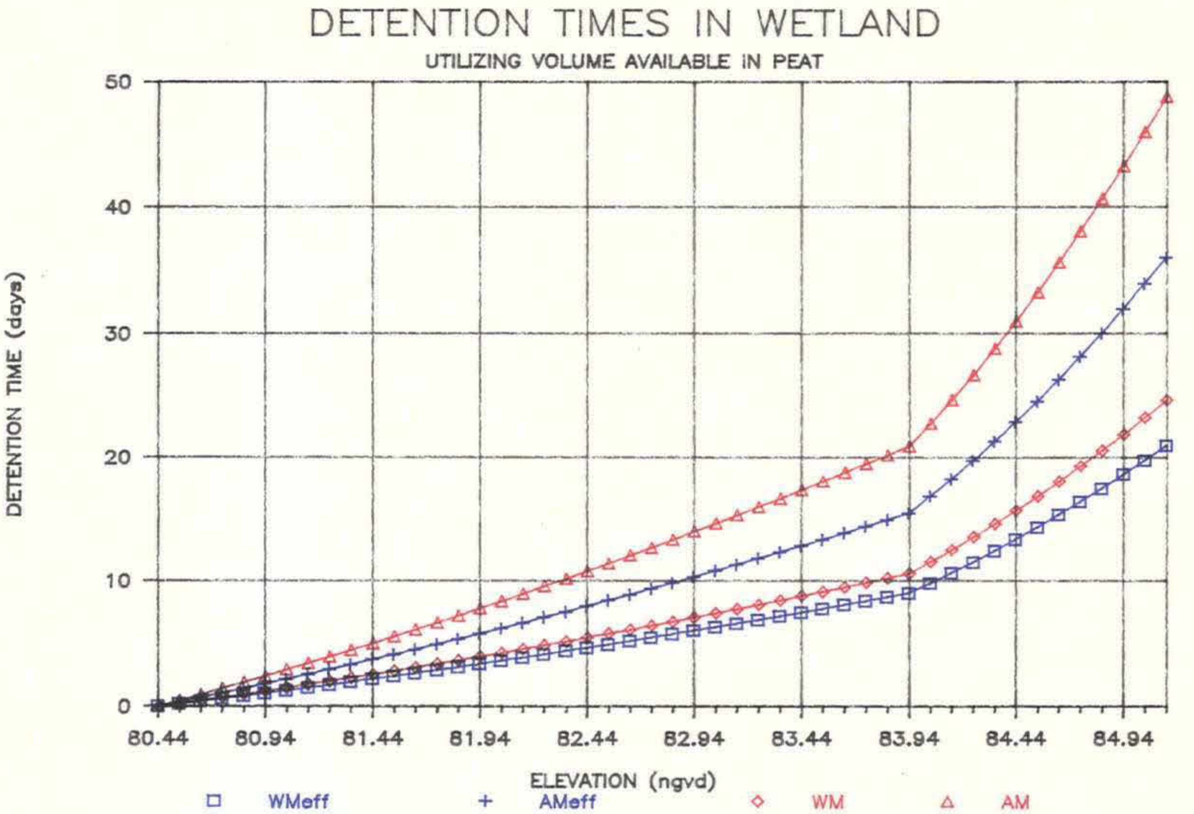


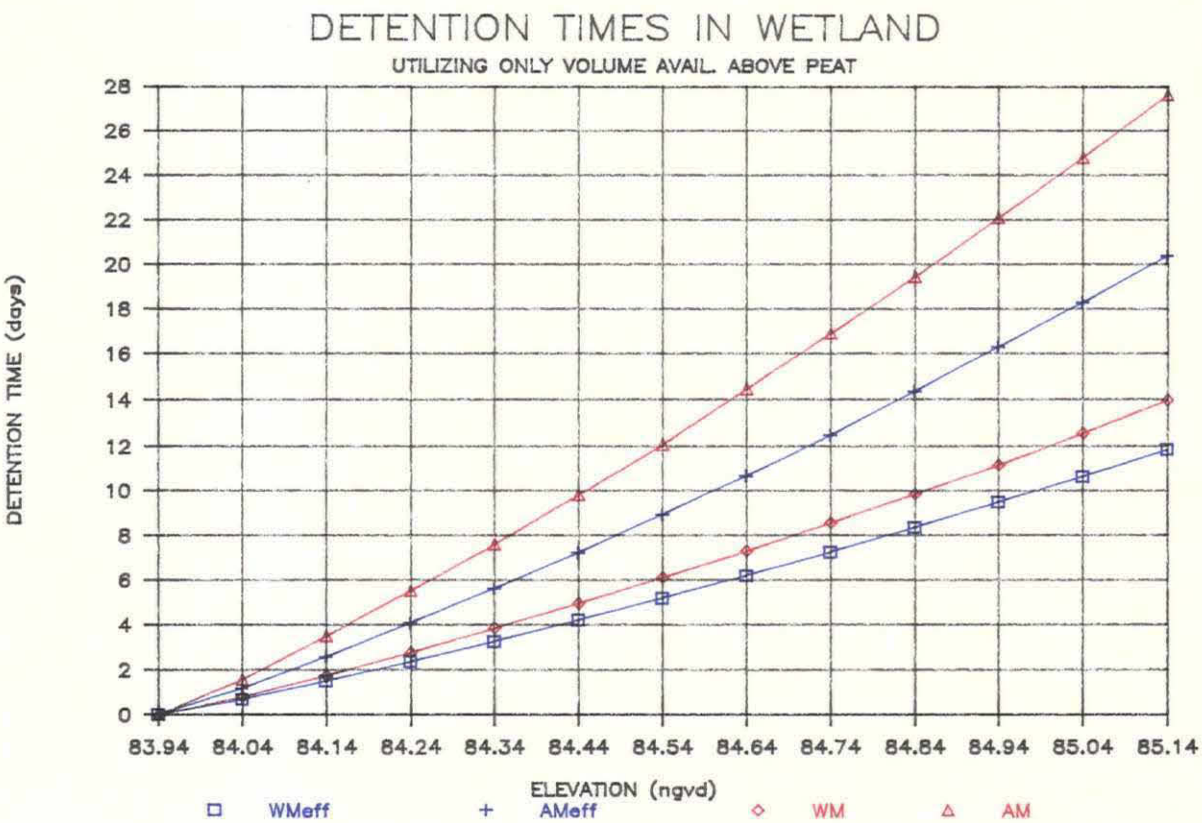
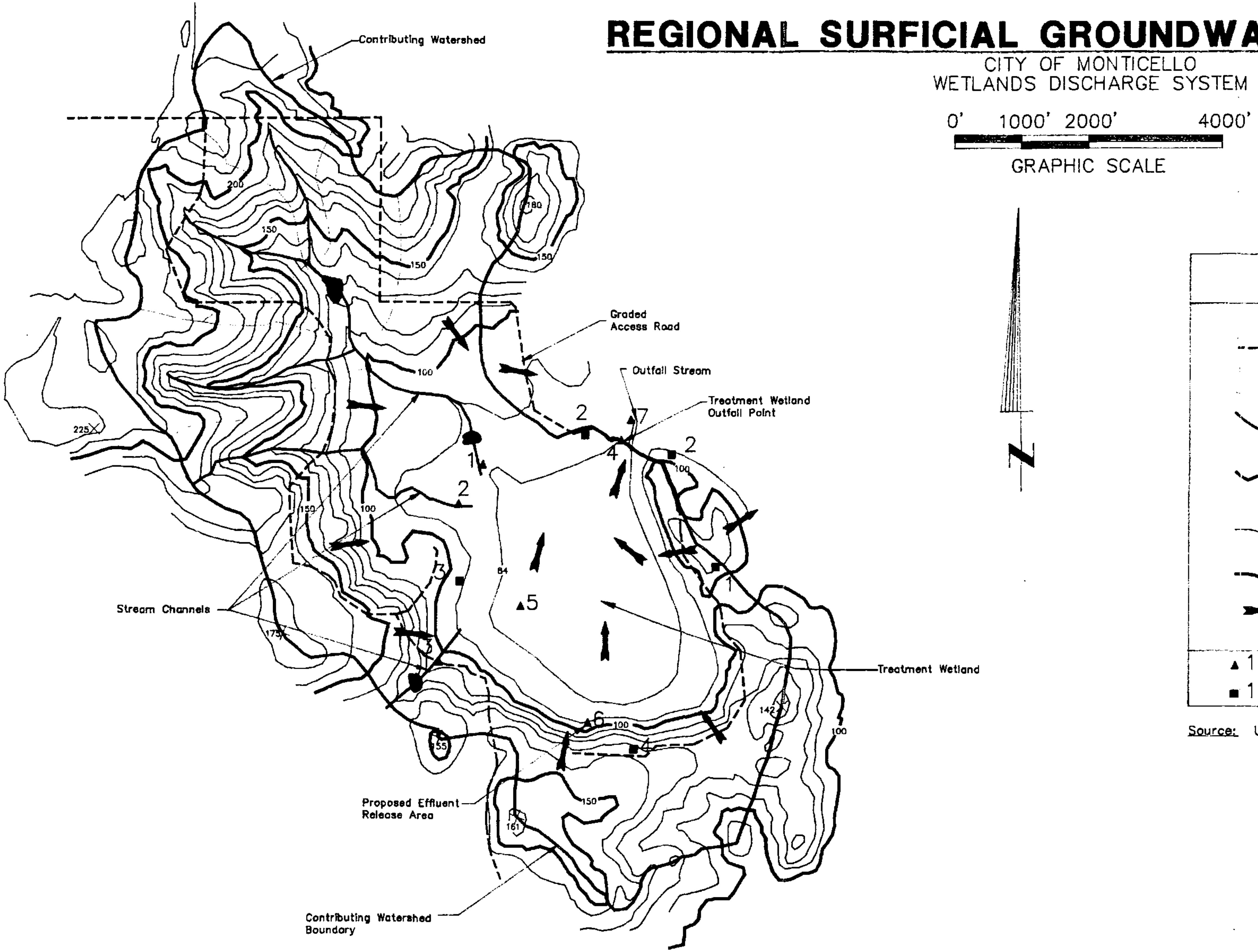


FIGURE #18

d s & n inc., consulting engineers • gainesville, florida

REGIONAL SURFICIAL GROUNDWATER FLOW MAP

CITY OF MONTICELLO
WETLANDS DISCHARGE SYSTEM



LEGEND

Source: USGS Monticello 7.5 Minute Quad Sheet – 1963

FIGURE #19

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LIST OF TABLES

General Characteristics of Soil Underlying Proposed Wetland Site (Surrency Series)

Depth (Inches)	Horizon Name	General Characteristics	Clay (%)	Permeability (in/hour)	Available Water Capacity (in/in)	Soil Reaction (pH)
0-1	01	Spongy layer of moss				
0-12	A1	Black loamy sand, weak fine and medium granular structure; very friable; many small and medium tree and shrub roots, extremely acid				
			5-10	6-20	0.05-0.08	3.6-5.0
12-32	A2	Grayish brown sand, most sand grains are clean, very friable, few fine and medium roots, extremely acid				
32-48	B21tg	Light gray sand loam with bodies of loamy sand, very friable, very strongly acid few small roots	10-18	2.0-6.0	0.06-0.10	4.5-5.5
48-65	B22tg	Grayish brown sandy clay loam, very friable, very strongly acid	23-38	0.6-2.0	0.10-0.15	4.5-5.5

Source: USDA Soil Conservation Service Published Soil Survey for Jefferson County, Florida

TABLE #1

PRELIMINARY DISSOLVED OXYGEN MEASUREMENTS

for

PROPOSED TREATMENT WETLAND AND RELATED SITES

STATION DESCRIPTION	TEMP (Degrees/ Celsius)	DISSOLVED OXYGEN TOP	MIDDLE	BOTTOM
Discharge point from site	25.5	1.1	0.7	0.5
Receiving wetlands	25.0	1.5	1.1	0.9
Wetlands site - 500 feet south from north central edge along old canal (logging road)	29.0	0.6	0.3	0.3
Wetlands site - 800 feet north of south edge -1500 feet east of west edge	27.0	0.4	0.3	0.3
Inflow to wetland site - northwest stream	28.5	5.8	5.7	5.0
Inflow to wetland site - west stream	28.0	1.8	1.4	0.9

TABLE #2

Surface Water Quality Measurements

for

Proposed Treatment Wetland Inflows

and

Points on Wolf Creek

Parameter	Wetland NW Stream Sta. 1	Inflows SW Stream Sta. 3	Points on Downstream Sta. 8	Wolf Creek Upstream Sta. 9	Monticello W/W Treatment Plant Outfall Sta. 12
GENERAL					
pH (units)	NA	NA	6.6	6.0	7.3
Color (APHA)	NA	NA	400	120	20
SOLIDS					
Total Susp. Solids	NA	NA	10	30	5.3
ANIONS					
Sulfate	NA	NA	13	5.6	29
NUTRIENTS					
Ammonia	<0.02	<0.02	1.63	1.8	1.99
Nitrate	0.40	0.25	0.22	0.09	8.48
TKN	0.21	0.33	3.29	5.95	3.83
Total Phosphorus	0.04	0.03	0.66	0.83	6.45
OXYGEN DEMAND					
BOD (5 day)	NA	NA	3.0	7.1	22

NA - NOT ANALYZED

TABLE #3

Cover value categories and assigned ranges (%) for each classification in herbaceous monitoring.

Category	Range (%)	Assigned Cover Values	% range/ category
0	0	0 = 0%	
1	1	1 = 1%	1
2	1-10	2 = 10%	10
3	10-30	3 = 30%	20
4	30-70	4 = 70%	40
5	70-90	5 = 90%	20
6	90-100	6 = 100%	10

TABLE #4

Sampling Frequency at Water Quality
Monitoring Stations

Station	N	D	J	F	M	A	M	J	J	A	S	O	TOTAL
1	x			x			x			x			4
2	x			x			x			x			4
3	x			x			x			x			4
4	x	x	x	x	x	x	x	x	x	x	x	x	12
5	x		x		x		x		x		x		6
6	x	x	x	x	x	x	x	x	x	x	x	x	12
7	x			x			x			x			4
Total	7	2	3	6	3	2	7	2	3	6	3	2	46

Macroinvertebrates

Station	J	A	J	O	TOTAL
1					
2					
3					
4	x	x	x	x	4
5	x	x	x	x	4
6	x	x	x	x	4
7					
Total	3	3	3	3	12

TABLE #5

Surface Water Quality

Parameters To Be Sampled

	Station						
	1	2	3	4	5	6	7
Parameter	Q	Q	Q	M	BM	M	Q
COLOR	-	-	-	12	-	12	-
BOD5	-	-	-	12	-	12	-
TS5	-	-	-	12	-	12	-
SO4	-	-	-	12	-	12	-
FECALS	-	-	-	12	-	12	-
TOTAL P	4	4	4	12	6	12	4
ORTHO-P	-	-	-	12	-	12	-
TKN	4	4	4	12	6	12	4
NH3N	-	-	-	12	-	12	-
NO2N	-	-	-	12	-	12	-
NO3-N	-	-	-	12	-	12	-
PH	4	4	4	12	6	12	4
DO	4	4	4	84	6	84	4
CON	4	4	4	12	6	12	4
Temp	4	4	4	12	6	12	4
CHLA	-	-	-	4	-	4	-
Metals	-	-	-	1	-	1	-
Priority	-	-	-	1	-	1	-

TABLE #6

Groundwater Quality

Parameters to be Sampled

	Parameter	Station 1	Station 2	Station 3	Station 4	# Analysis
10	Inorganics					
	As	1	1	1	1	4
	Ba	1	1	1	1	4
	Co	1	1	1	1	4
	Cr	1	1	1	1	4
	Pb	1	1	1	1	4
	Hg	1	1	1	1	4
	No3	1	1	1	1	4
	Se	1	1	1	1	4
	Ag	1	1	1	1	4
	Na	1	1	1	1	4
	Organics	1	1	1	1	4
	Turbidity	1	1	1	1	4
	Fecal Coliforms	1	1	1	1	4
	Volatile Organics	1	1	1	1	4
20	Ce	1	1	1	1	4
	Cu	1	1	1	1	4
	Color	1	1	1	1	4
	Corrosivity	1	1	1	1	4
	Foaming Agents	1	1	1	1	4
	Fe	1	1	1	1	4
	Mn	1	1	1	1	4
	Odor	1	1	1	1	4
	pH	1	1	1	1	4
	Sulfate	1	1	1	1	4
	TDS	1	1	1	1	4
	ZN	1	1	1	1	4
					Total	112

TABLE #7

PROJECT :CITY OF MONTICELLO EFFLUENT DISPOSAL SYSTEM
PROJECT NO. :8705
BY :d s & n inc. consulting engineers
DATE : 04-Jan-80

SUBJECT :TABULATION OF WORST CASE TRAVEL TIMES TO THE AUCILLA RIVER FOR VARIOUS "n" AND DEPTH OF FLOW VALUES USING MANNING'S EQUATION

UNVARYING DATA:

AVERAGE WATERSHED SLOPE	0.00058 ft/ft
DISTANCE TO AUCILLA RIVER FROM OUTFALL POINT	59,750 ft

ASSUMED VALUES FOR MANNINGS "n"	0.5	0.5	0.5	0.5	0.5	0.5	0.5
ASSUMED AVERAGE FLOW DEPTH THRU WOLF CREEK SYSTEM	3	2.5	2	1.5	1	0.5	0.3
ASSUMED FLOW WIDTH OF EFFLUENT PLUME THRU WOLF CREEK SYSTEM	100	100	100	100	100	100	100
CALCULATED VALUES:							
HYDRAULIC RADIUS "R"	2.83	2.38	1.92	1.46	0.98	0.50	0.30
AVERAGE VELOCITY (fps)	0.144	0.128	0.111	0.092	0.071	0.045	0.032
TRAVEL TIME TO AUCILLA (days)	4.8	5.4	6.2	7.5	9.8	15.4	21.6
ASSUMED VALUES FOR MANNINGS "n"	0.6	0.6	0.6	0.6	0.6	0.6	0.6
ASSUMED AVERAGE FLOW DEPTH THRU WOLF CREEK SYSTEM	3	2.5	2	1.5	1	0.5	0.3
ASSUMED FLOW WIDTH OF EFFLUENT PLUME THRU WOLF CREEK SYSTEM	100	100	100	100	100	100	100
CALCULATED VALUES:							
HYDRAULIC RADIUS "R"	2.83	2.38	1.92	1.46	0.98	0.50	0.30
AVERAGE VELOCITY (fps)	0.120	0.107	0.093	0.077	0.059	0.037	0.027
TRAVEL TIME TO AUCILLA (days)	5.8	6.5	7.5	9.0	11.7	18.5	25.9
ASSUMED VALUES FOR MANNINGS "n"	0.7	0.7	0.7	0.7	0.7	0.7	0.7
ASSUMED AVERAGE FLOW DEPTH THRU WOLF CREEK SYSTEM	3	2.5	2	1.5	1	0.5	0.3
ASSUMED FLOW WIDTH OF EFFLUENT PLUME THRU WOLF CREEK SYSTEM	100	100	100	100	100	100	100
CALCULATED VALUES:							
HYDRAULIC RADIUS "R"	2.83	2.38	1.92	1.46	0.98	0.50	0.30
AVERAGE VELOCITY (fps)	0.103	0.091	0.079	0.066	0.051	0.032	0.023
TRAVEL TIME TO AUCILLA (days)	6.7	7.6	8.7	10.5	13.7	21.6	30.2
ASSUMED VALUES FOR MANNINGS "n"	0.8	0.8	0.8	0.8	0.8	0.8	0.8
ASSUMED AVERAGE FLOW DEPTH THRU WOLF CREEK SYSTEM	3	2.5	2	1.5	1	0.5	0.3
ASSUMED FLOW WIDTH OF EFFLUENT PLUME THRU WOLF CREEK SYSTEM	100	100	100	100	100	100	100
CALCULATED VALUES:							
HYDRAULIC RADIUS "R"	2.83	2.38	1.92	1.46	0.98	0.50	0.30
AVERAGE VELOCITY (fps)	0.090	0.080	0.069	0.058	0.044	0.028	0.020
TRAVEL TIME TO AUCILLA (days)	7.7	8.6	10.0	12.0	15.6	24.6	34.6
ASSUMED VALUES FOR MANNINGS "n"	0.9	0.9	0.9	0.9	0.9	0.9	0.9
ASSUMED AVERAGE FLOW DEPTH THRU WOLF CREEK SYSTEM	3	2.5	2	1.5	1	0.5	0.3
ASSUMED FLOW WIDTH OF EFFLUENT PLUME THRU WOLF CREEK SYSTEM	100	100	100	100	100	100	100
CALCULATED VALUES:							
HYDRAULIC RADIUS "R"	2.83	2.38	1.92	1.46	0.98	0.50	0.30
AVERAGE VELOCITY (fps)	0.080	0.071	0.062	0.051	0.039	0.025	0.018
TRAVEL TIME TO AUCILLA (days)	8.7	9.7	11.2	13.5	17.6	27.7	38.9

SOURCE: Manning's "n" for Woods from SCS TR-55, Page 3-3.

TABLE #8

PROJECT : City of Monticello Wetlands Discharge System
P.N. : 8705
BY : G. JEFFERY HINES
DATE : February, 1988

SUBJECT : Calculation of Stage Storage Relationships and Detention Times for Treatment Wetland

DATA:

CONTROL ELEVATIONS:

1) ELEVATION OF ROAD SURFACE AT OUTFALL = 85.18 ngvd
2) NORMAL SEASONAL HIGH (FROM LICHEN LINES) = 84.84 ngvd
3) NORMAL POOL ELEVATION (FROM MOSS LINES) = 84.69 ngvd
4) AVERAGE BOTTOM ELEVATION (TOP OF PEAT) = 84.00 ngvd
5) LOWEST INVERT OF PIPE AT OUTFALL = 81.35 ngvd
6) AVERAGE BOTTOM OF PEAT ELEVATION = 80.44 ngvd
7) AREA OF WETLAND AT ELEV 80.44 CONTOUR = 100 acres
8) AREA OF WETLAND AT ELEV 84.00 CONTOUR = 160 acres
9) AREA OF WETLAND AT ELEV 85.18 CONTOUR = 250 acres

ASSUMPTIONS:

1) VOIDS RATIO OF PEAT = 40 %

CALCULATED VALUE:

STORAGE VOLUME IN PEAT AT TOP OF PEAT ELEVATION = 7,990,477 cf

NOTES: 1) Surface areas and elevations are from actual field data obtained by d s & n survey and ecological monitoring crews during 1987.
2) Detention times are derived from adding 1 mgd of effluent to the runoff generated from the 1328 acre watershed, using average rainfall values for the Monticello area (Source: Water Resources Atlas of Florida, 1984) and generating runoff using the SCS runoff equation with a composite watershed runoff curve number of 73.

ELEVATION (ngvd)	DEPTH (ft)	SURFACE AREA (sf)	INCREMENTAL VOLUME (cf)	TOTAL VOLUME (cf)	VOLUME ABOVE PEAT (cf)	DETENTION TIMES WITH 1 MGD EFFLUENT: USING TOTAL VOLUME AVAILABLE, INCLUDING VOLUME IN PEAT — WETTEST MONTH (days)	AVERAGE YEARLY (days)	DETENTION TIMES WITH 1 MGD EFFLUENT: USING ONLY VOLUME AVAILABLE ABOVE TOP OF PEAT — WETTEST MONTH (days)	AVERAGE YEARLY (days)	DETENTION TIMES W/O 1 MGD EFFLUENT: USING TOTAL VOLUME AVAILABLE, INCLUDING VOLUME IN PEAT — WETTEST MONTH (days)	AVERAGE YEARLY (days)	DETENTION TIMES W/O 1 MGD EFFLUENT: USING ONLY VOLUME AVAILABLE ABOVE TOP OF PEAT — WETTEST MONTH (days)	AVERAGE YEARLY (days)
80.44	0.0	4,356,000	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
80.54	0.1	4,429,416	175,531	175,531	0	0.2	0.3	0.0	0.0	0.2	0.5	0.0	0.0
80.64	0.2	4,502,831	178,464	353,995	0	0.4	0.7	0.0	0.0	0.5	0.9	0.0	0.0
80.74	0.3	4,576,247	181,398	535,393	0	0.6	1.0	0.0	0.0	0.7	1.4	0.0	0.0
80.84	0.4	4,649,663	184,332	719,725	0	0.8	1.4	0.0	0.0	1.0	1.9	0.0	0.0
80.94	0.5	4,723,079	187,265	906,990	0	1.0	1.8	0.0	0.0	1.2	2.4	0.0	0.0
81.04	0.6	4,796,494	190,199	1,097,189	0	1.2	2.1	0.0	0.0	1.5	2.9	0.0	0.0
81.14	0.7	4,869,910	193,133	1,290,322	0	1.5	2.5	0.0	0.0	1.7	3.4	0.0	0.0
81.24	0.8	4,943,326	196,067	1,486,389	0	1.7	2.9	0.0	0.0	2.0	3.9	0.0	0.0
81.34	0.9	5,016,742	199,000	1,685,389	0	1.9	3.3	0.0	0.0	2.3	4.5	0.0	0.0
81.44	1.0	5,090,157	201,934	1,887,323	0	2.1	3.7	0.0	0.0	2.5	5.0	0.0	0.0
81.54	1.1	5,163,573	204,868	2,092,191	0	2.4	4.1	0.0	0.0	2.8	5.6	0.0	0.0
81.64	1.2	5,236,989	207,801	2,299,992	0	2.6	4.5	0.0	0.0	3.1	6.1	0.0	0.0
81.74	1.3	5,310,404	210,735	2,510,728	0	2.9	4.9	0.0	0.0	3.4	6.7	0.0	0.0
81.84	1.4	5,383,820	213,669	2,724,397	0	3.1	5.3	0.0	0.0	3.7	7.2	0.0	0.0
81.94	1.5	5,457,236	216,603	2,940,999	0	3.3	5.8	0.0	0.0	4.0	7.8	0.0	0.0
82.04	1.6	5,530,652	219,536	3,160,536	0	3.6	6.2	0.0	0.0	4.2	8.4	0.0	0.0
82.14	1.7	5,604,067	222,470	3,383,006	0	3.9	6.6	0.0	0.0	4.5	9.0	0.0	0.0
82.24	1.8	5,677,483	225,404	3,608,409	0	4.1	7.1	0.0	0.0	4.8	9.6	0.0	0.0
82.34	1.9	5,750,899	228,338	3,836,747	0	4.4	7.5	0.0	0.0	5.2	10.2	0.0	0.0
82.44	2.0	5,824,315	231,271	4,068,018	0	4.6	8.0	0.0	0.0	5.5	10.8	0.0	0.0
82.54	2.1	5,897,730	234,205	4,302,223	0	4.9	8.4	0.0	0.0	5.8	11.4	0.0	0.0
82.64	2.2	5,971,146	237,139	4,539,362	0	5.2	8.9	0.0	0.0	6.1	12.0	0.0	0.0
82.74	2.3	6,044,562	240,072	4,779,434	0	5.4	9.4	0.0	0.0	6.4	12.7	0.0	0.0
82.84	2.4	6,117,978	243,006	5,022,440	0	5.7	9.8	0.0	0.0	6.7	13.3	0.0	0.0
82.94	2.5	6,191,393	245,940	5,268,380	0	6.0	10.3	0.0	0.0	7.1	14.0	0.0	0.0
83.04	2.6	6.264,809	248,873	5,517,253	0	6.3	10.8	0.0	0.0	7.4	14.6	0.0	0.0
83.14	2.7	6,338,225	251,807	5,769,061	0	6.6	11.3	0.0	0.0	7.7	15.3	0.0	0.0
83.24	2.8	6.411,640	254,741	6,023,802	0	6.9	11.8	0.0	0.0	8.1	16.0	0.0	0.0
83.34	2.9	6,485,056	257,675	6,281,476	0	7.2	12.3	0.0	0.0	8.4	16.7	0.0	0.0
83.44	3.0	6,558,472	260,608	6,542,084	0	7.4	12.8	0.0	0.0	8.8	17.4	0.0	0.0
83.54	3.1	6,631,888	263,542	6,805.626	0	7.7	13.3	0.0	0.0	9.1	18.1	0.0	0.0
83.64	3.2	6,705,303	266,476	7,072,102	0	8.1	13.8	0.0	0.0	9.5	18.8	0.0	0.0
83.74	3.3	6,778,719	269,409	7,341.512	0	8.4	14.4	0.0	0.0	9.9	19.5	0.0	0.0
83.84	3.4	6,852,135	272,343	7,613,855	0	8.7	14.9	0.0	0.0	10.2	20.2	0.0	0.0
83.94	3.5	6,925,551	275,277	7,889.132	0	9.0	15.4	0.0	0.0	10.6	20.9	0.0	0.0
84.04	3.6	7,102.495	700,682	8,589,814	599,337	9.8	16.8	0.7	1.2	11.5	22.8	0.8	1.6
84.14	3.7	7,434,732	726,071	9,315,885	1,325,409	10.6	18.2	1.5	2.6	12.5	24.7	1.8	3.5
84.24	3.8	7,766,969	759,265	10,075,150	2,084,673	11.5	19.7	2.4	4.1	13.5	26.7	2.8	5.5
84.34	3.9	8,099,207	792,458	10,867,607	2,877,131	12.4	21.3	3.3	5.6	14.6	28.8	3.9	7.6
84.44	4.0	8,431,444	825,650	11,693,258	3,702,781	13.3	22.9	4.2	7.3	15.7	31.0	5.0	9.8
84.54	4.1	8,763,681	858,843	12,552,101	4,561,624	14.3	24.6	5.2	8.9	16.9	33.3	6.1	12.1
84.64	4.2	9,095,919	892,036	13,444,136	5,453,660	15.3	26.3	6.2	10.7	18.1	35.7	7.3	14.5
84.74	4.3	9,428,156	925,228	14,369,364	6,378,888	16.4	28.1	7.3	12.5	19.3	38.1	8.6	16.9
84.84	4.4	9,760,393	958,420	15,327,784	7,337,308	17.5	30.0	8.4	14.4	20.6	40.7	9.9	19.5
84.94	4.5	10,092,631	991,612	16,319,397	8,328,920	18.6	32.0	9.5	16.3	21.9	43.3	11.2	22.1
85.04	4.6	10,424,868	1,024,804	17,344,201	9,353,724	19.8	34.0	10.7	18.3	23.3	46.0	12.6	24.8
85.14	4.7	10,757,105	1,057,996	18,402,197	10,411.721	21.0	36.0	11.9	20.4	24.7	48.8	14.0	27.6

TABLE #9

PROJECT : City of Monticello Wetlands Discharge System
P.N. : 8705
BY : d s & n inc., consulting engineers
DATE : January, 1988

SUBJECT : Tabulation of Weighted Runoff Curve Numbers for Watershed Including Effluent Discharge Wetland.

DRAINAGE AREA	PERVIOUS SURFACE									
	AREA (acres)	HYDROLOGIC SOIL GROUP								WEIGHTED CURVE NUMBER
		A		B		C		D		
		%	CN	%	CN	%	CN	%	CN	
1	1328	30.3	65	31.3	70	6.3	76	32.1	83	73

Source: SCS TR-55, Second Edition, June 1986

TABLE #10

PROJECT : City of Monticello Wetlands Discharge System
P.N. : 8705
BY : d s & n inc., consulting engineers
DATE : January, 1988

SUBJECT : Tabulation of Pre and Post Project Discharges Into Treatment Wetland

DATA:

SCS RUNOFF CURVE NUMBER: 73
ACREAGE OF WATERSHED : 1328 acres

MONTH	RAINFALL (in)	RUNOFF (in)	RUNOFF ONLY (cf)	RUNOFF AND EFFLUENT (cf)	% CHANGE
JAN	4.2	1.67	8,062,674	12,073,370	150%
FEB	4.3	1.75	8,417,836	12,428,532	148%
MAR	5.8	2.92	14,092,985	18,103,680	128%
APR	4.1	1.60	7,711,108	11,721,803	152%
MAY	4.0	1.53	7,363,292	11,373,988	154%
JUNE	5.9	3.01	14,490,061	18,500,756	128%
JULY	7.8	4.63	22,334,682	26,345,377	118%
AUG	7.2	4.11	19,804,310	23,815,005	120%
SEP	6.0	3.09	14,889,035	18,899,730	127%
OCT	3.7	1.32	6,344,038	10,354,733	163%
NOV	3.8	1.39	6,679,578	10,690,273	160%
DEC	4.2	1.67	8,062,674	12,073,370	150%
AVERAGE	5.1	2.35	11,309,123	15,531,718	142%

Note: SCS Runoff equation used to compute runoff, assuming entire monthly rainfall amount is received as one storm. This results in the maximum runoff possible and therefore gives conservative values for runoff volumes.

TABLE #11

APPENDICES

<u>Title</u>

A. Regional Water Quality Parameters

B. Threatened and Endangered Species

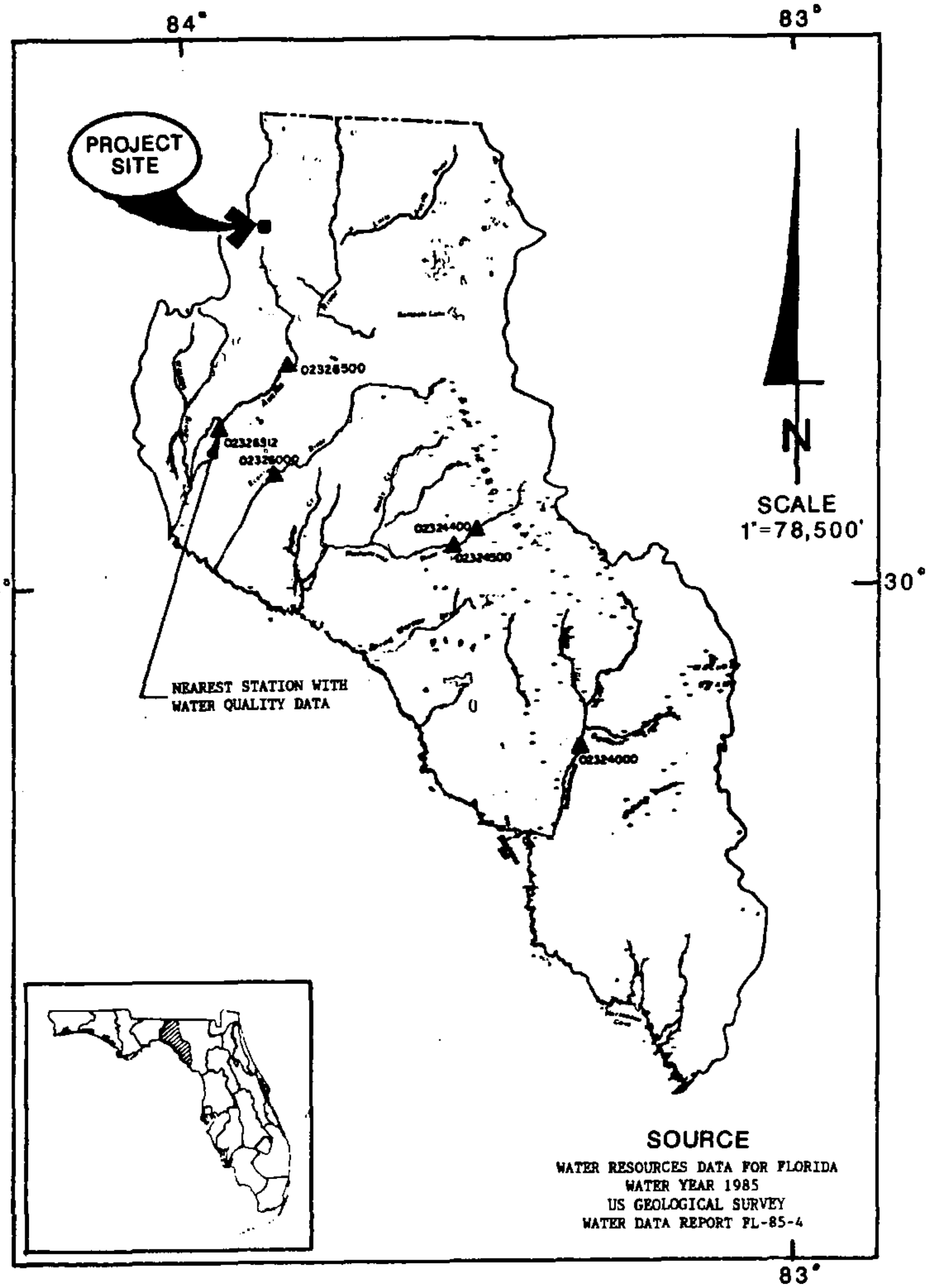
C. Soil Tests

D. Experience and Qualifications of:

   1. Environmental Specialists

   2. Laboratory Analysts

LOCATION OF STREAM GAGING STATIONS



STEINHATCHEE, FENOLLOWAY, ECONFINA, & AUCILLA RIVER BASINS

WATER QUALITY DATA

AUCILLA RIVER BASIN STATION 02326512

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (UMHOS)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (NTU)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARD-NESS (MG/L AS CACO3)
OCT 25...	1140	52	340	8.0	22.5	1.4	6.0	69	53	K10	170
JAN 31...	1715	81	310	7.8	12.0	1.0	9.0	84	71	27	160
MAY 06...	1515	46	302	7.8	23.5	.90	6.2	73	K8	<1	160
AUG 15...	1530	462	92	7.5	25.0	1.5	6.3	77	51	250	47

DATE	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	ALKA-LINITY FIELD (MG/L AS CACO3)	ALKA-LINITY LAB (MG/L AS CACO3)	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)
OCT 25...	10	53	10	3.2	4	.1	.30	164	169	3.2
JAN 31...	2	48	8.6	3.1	4	.1	.40	154	149	4.7
MAY 06...	12	48	8.9	3.1	4	.1	.30	145	139	4.4
AUG 15...	14	14	2.8	2.4	--	.2	<.10	--	33	2.0

DATE	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N)
OCT 25...	7.8	5.4	.20	6.6	200	190	.27	28	--	--
JAN 31...	7.5	6.3	.10	4.6	179	170	.24	39	<.10	.040
MAY 06...	8.4	6.3	.10	4.3	166	170	.23	21	<.10	.080
AUG 15...	--	6.7	<.10	7.1	112	--	.15	140	.30	.030

DATE	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS NH4)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS TOTAL (MG/L AS PO4)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)	ALUM-INUM, DIS-SOLVED (UG/L AS AL)	ARSENIC DIS-SOLVED (UG/L AS AS)	BARIUM, DIS-SOLVED (UG/L AS BA)
OCT 25...	--	--	--	--	--	--	--	10	<1	14
JAN 31...	.05	.30	.090	--	.060	.040	.12	50	<1	9
MAY 06...	.10	.30	.060	--	.040	.060	.18	60	<1	13
AUG 15...	.04	1.0	.080	.25	.010	.020	.06	250	<1	13

DATE	BERYL-LIUM, DIS-SOLVED (UG/L AS BE)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	COBALT, DIS-SOLVED (UG/L AS CO)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, DIS-SOLVED (UG/L AS PB)	LITHIUM DIS-SOLVED (UG/L AS LI)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	MERCURY DIS-SOLVED (UG/L AS HG)
OCT 25...	<.0	<1	1	<3	--	47	3	<4	33	<.1
JAN 31...	<.5	1	<1	<3	1	210	3	4	11	<.1
MAY 06...	<.5	<1	<1	<3	1	370	1	<4	24	<.1
AUG 15...	.5	<1	<1	<3	--	690	--	<4	41	<.1

DATE	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO)	NICKEL, DIS-SOLVED (UG/L AS NI)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SILVER, DIS-SOLVED (UG/L AS AG)	STRON-TIUM, DIS-SOLVED (UG/L AS SR)	VANA-DIUM, DIS-SOLVED (UG/L AS V)	ZINC, DIS-SOLVED (UG/L AS ZN)	SEDI-MENT, SUS-PENDED (MG/L)	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT 25...	<10	<1	<1	<1	59	<6	3	3	.42	61
JAN 31...	<10	<1	<1	<1	48	<6	11	<1	--	<1
MAY 06...	<10	1	<1	<1	54	<6	4	2	.25	50
AUG 15...	<10	--	<1	<1	20	<6	12	16	20	38

WATER RESOURCES DATA FOR FLORIDA
WATER YEAR 1985
US GEOLOGICAL SURVEY
WATER DATA REPORT FL-85-4

DEPARTMENT OF NATURAL SCIENCES
THE FLORIDA STATE MUSEUM
UNIVERSITY OF FLORIDA
GAINESVILLE, FL 32611
(904)546-2187

August 18, 1987

Pete Wallace
Rt. 1; Box 338F
Gainesville, FL 32601

Dear Pete:

The Florida Natural Areas Inventory lists 52 species of vertebrates (9 fish, 7 amphibian, 11 reptile, 18 bird and 7 mammal) that may occur in Jefferson County, Florida as "Special Elements". This list includes all the officially listed Threatened, Endangered and Special Concern Species of the State and Federal programs, as well as other rare, endemic or sensitive species, many of which are currently under review by State and Federal agencies for possible inclusion in future T & E lists.

Obviously, many of these species can be written off right away based on habitat. For instance, if there aren't any swift-flowing streams, we can forget some of the fishes; if there isn't any sandhills, we can forget some of the reptiles, etc. I would guess we could find around 20 - 30 listed species in a 250 acre bay swamp.

I will need to do some seining, dip-netting and scooping with a "Goin Dredge" to search for some of the fishes and amphibians; some night-time listening for frogs; day-time and night-time searching for amphibians, reptiles and some of the mammals; day-time transects for birds (auditory and visual searching); and track searching for some of the mammals. An aerial survey for large birds and nests (ospreys, eagles, cranes, herons, hawks, etc.) would also be advisable.

If possible, please look at a copy of the final report for the Osceola National Forest Endangered Species Study that I prepared in 1977. You can see it at the FWS Lab on 16th Avenue in Gainesville. In that survey, we found 32 listed species, many in bay swamp type habitats.

My final report to you would include lists, location maps and summary accounts of the natural history, status, distribution, etc. of each species encountered as well as brief accounts of listed species not found, but still suspected of occurring in the study area. I could also comment on potential threats to each species.

I would like to get $150.00 per day plus expenses and would be available to work a few days each quarter as you explained on the telephone. I already have all the sampling equipment I would need.

If you're interested, let's get together and talk details.

Thanks for considering me.

Sincerely,

Steve

Steven P. Christman, Ph.D.
Visiting Assistant Curator

FLORIDA NATURAL AREAS INVENTORY

254 East Sixth Avenue • Tallahassee, Florida 32303 • (904) 224-8207

December 31, 1987

Jan Sendzimir
D S & N, Inc.
408 West University Ave., Suite 605
Gainesville, FL 32601

Dear Mr. Sendzimir:

This package is in response to your request for information concerning a wetland site in Jefferson County. We did not have any on-site information but I have included some possible candidates for occurring within your site in the attached response.

I have enclosed a 'capsule' description sheet of our natural community classifications, Special Animal and Special Plant lists and a sheet explaining the Florida Natural Areas Inventory ranking system and federal and state legal statuses.

Our element occurrence lists for Jefferson, Leon, and Wakulla Counties are also included. These lists include those records that we currently have in our computerized data base for the county. I want to emphasize that these lists will change as we update old records and add new records to the data base. As these records provide an incomplete county list of species of concern you may also wish to consult the FCREPA series (Florida Committee on Rare and Endangered Plants and Animals, Rare and Endangered Biota of Florida, University Presses of Florida).

I hope this information proves helpful and if you have further questions or need additional information please let me know.

Sincerely,

Katy NeSmith

Katy NeSmith
Data Manager

encls.

3008357, -47

FLORIDA NATURAL AREAS INVENTORY

254 East Sixth Avenue • Tallahassee, Florida 32303 • (904) 224-8207

December 31, 1987

Jan Sendzimir
D S & N, Inc.
408 West University Ave., Suite 605
Gainesville, FL 32601

DATA REQUEST REPLY

Jefferson County

T1N R5E Secs 5, 8
U.S.G.S. 7.5 minute quads Monticello, Lamont

Information on known occurrences of Special Plants, Special Animals, and exemplary Natural Communities. We currently have no occurrences of special elements for this site in our data base. Many elements are known from the region and may possibly occur on-site.

Special Plants

Other possible special plants (not on the county list) whose ranges include Jefferson County and occur in freshwater, forested wetlands include:

Sium floridanum, Florida water-parsnip (FNAI G1Q/S1; Federal- C2).
Litsea aestivalis, pondspice (FNAI G4G5/S2; Federal- 3C; State- **Threatened**).
Physostegia leptophylla, slender-leaved dragon-head (FNAI G3G5/S3S5; Federal- C2).
Myriophyllum laxum, Piedmont water-milfoil (FNAI G2G3/S2S3; Federal- C2) - found in open pools/ponds/ditches which may occur within forested system.
Leitneria floridana, corkwood (FNAI G3G4/S3; Federal- 3C; State- **Threatened**) in fresh and brackish water.

Special Animals

Any of the herons, ibis, and egrets listed on the county lists very likely use the site for feeding. Wood Storks are also possible.

Other possible special animals:

Mustela frenata olivacea, southeastern weasel (FNAI G5T4/S3?).
Mustela vison mink, southern mink (G5T5/S3).

The quantity and quality of data collected by the Florida Natural Areas Inventory are dependent on the research and observations of many individuals and organizations. In most cases, this information is not the result of comprehensive or site-specific field surveys; many natural areas in Florida have never been thoroughly surveyed, and new species of plants and animals are still being discovered. For these reasons, the FNAI cannot provide a definitive statement on the presence, absence, or condition of biological elements in any part of Florida. Florida Natural Areas Inventory reports summarize the existing information known to FNAI at the time of the request regarding the biological elements or locations in question. They should never be regarded as final statements on the elements or areas being considered, nor should they be substituted for on-site surveys required for environmental assessments.

Information provided by this data base may not be published without prior written notification to the Florida Natural Areas Inventory and FNAI must be credited as an information source in these publications. FNAI data may not be resold for profit.

Sincerely,

Katy NeSmith

Katy NeSmith
Data Manager

encls.

3008357, -47

December 1, 1987

FLORIDA NATURAL AREAS INVENTORY

ELEMENT OCCURRENCE RECORDS FOR JEFFERSON COUNTY CURRENTLY IN THE INVENTORY DATABASE:

SCIENTIFIC NAME	COMMON NAME	GRANK	SRANK	FED STATUS	STATE STATUS	Count
AMPHIBIANS						
AMPHIUMA PHOLETER	ONE-TOED AMPHIUMA	G3	S3		N	1
REPTILES						
ALLIGATOR MISSISSIPPIENSIS	AMERICAN ALLIGATOR	G5	S4	LTSA	LS	1
CLEMMYS GUTTATA	SPOTTED TURTLE	G5	S3?		N	1
DRYMARCHON CORAIS COUPERI	EASTERN INDIGO SNAKE	G4T3	S3	LT	LT	2
GOPHERUS POLYPHEMUS	GOPHER TORTOISE	G2	S2	C2	LS	1
MACROCLEMYS TEMMINCKII	ALLIGATOR SNAPPING TURTLE	G3?	S3?	C2	LS	1
PSEUDEMYS CONCINNA SUWANNIENSIS	SUWANEE COOTER	G5T3	S3	3C	LS	1
BIRDS						
ARAMUS GUARAUNA	LIMPKIN	G5	S3		LS	1
HALIAEETUS LEUCOCEPHALUS	BALD EAGLE	G3	S2S3	LE	LT	1
PICOIDES BOREALIS	RED-COCKADED WOODPECKER	G2	S2	LE	LT	1
INVERTEBRATES						
PROCAMBARUS HORSTI	HORST'S CAVE CRAYFISH	G1	S1		N	1
SPECIAL PLANTS						
BRICKELLIA CORDIFOLIA	FLYR'S BRICKELL-BUSH	G1G3	S2	C2	LT	1
RIBES ECHINELLUM	MICCOSUKEE GOOSEBERRY	G1	S1	LT	LE	2
SALIX FLORIDANA	FLORIDA WILLOW	G2	S2	C2	LT	1

FLORIDA NATURAL AREAS INVENTORY

ELEMENT OCCURRENCE RECORDS FOR JEFFERSON COUNTY CURRENTLY IN THE INVENTORY DATABASE (continued):

SCIENTIFIC NAME	COMMON NAME	GRANK	SRANK	FED STATUS	STATE STATUS	Count
NATURAL COMMUNITIES						
BLACKWATER STREAM		G4	S2			1
SPRING-RUN STREAM		G2	S2			2
AQUATIC CAVE		G3	S2			1
OTHER						
GEOLOGICAL FEATURE	WACISSA RIVER					1

Total items 18
Total records tallied 21

December 1, 1987

FLORIDA NATURAL AREAS INVENTORY

ELEMENT OCCURRENCE RECORDS FOR WAKULLA COUNTY CURRENTLY IN THE INVENTORY DATABASE:

SCIENTIFIC NAME	COMMON NAME	GRANK	SRANK	FED STATUS	STATE STATUS	Count
AMPHIBIANS						
AMBYSTOMA CINGULATUM	FLATWOODS SALAMANDER	G4	S3?	C2	N	2
AMPHIUMA PHOLETER	ONE-TOED AMPHIUMA	G3	S3		N	4
REPTILES						
ALLIGATOR MISSISSIPPIENSIS	AMERICAN ALLIGATOR	G5	S4	LTSA	LS	2
CLEMMYS GUTTATA	SPOTTED TURTLE	G5	S3?		N	4
DRYMARCHON CORAIS COUPERI	EASTERN INDIGO SNAKE	G4T3	S3	LT	LT	3
GOPHERUS POLYPHEMUS	GOPHER TORTOISE	G2	S2	C2	LS	6
MACROCLEMYS TEMMINCKII	ALLIGATOR SNAPPING TURTLE	G3?	S3?	C2	LS	1
NERODIA FASCIATA CLARKII	GULF SALT MARSH SNAKE	G5T3	S3?		N	2
PITUOPHIS MELANOLEUCAS MUGITUS	FLORIDA PINE SNAKE	G5T3?	U	C2	LS	1
PSEUDEMYS CONCINNA SUWANNIENSIS	SUWANEE COOTER	G5T3	S3	3C	LS	2
BIRDS						
HALIAEETUS LEUCOCEPHALUS	BALD EAGLE	G3	S2S3	LE	LT	3
PANDION HALIAETUS	OSPREY	G5	S3S4		LS*	1
PICOIDES BOREALIS	RED-COCKADED WOODPECKER	G2	S2	LE	LT	18
MAMMALS						
NEOFIBER ALLENI	ROUND-TAILED MUSKRAT	G3?	S3?	C2	N	1
TRICHECHUS MANATUS	WEST INDIAN MANATEE	G2?	S2?	LE	LE	2

December 1, 1987

FLORIDA NATURAL AREAS INVENTORY

ELEMENT OCCURRENCE RECORDS FOR WAKULLA COUNTY CURRENTLY IN THE INVENTORY DATABASE:

SCIENTIFIC NAME	COMMON NAME	GRANK	SRANK	FED STATUS	STATE STATUS	Count
INVEREBRATES						
CRANGONYX HOBBSI	HOBBS' CAVE AMPHIPOD	G2G3	S2S3	C2	N	1
CRANGONYX SP 1	A CAVE AMPHIPOD	U	U		N	1
PROCAMBARUS ORCINUS	WOODVILLE CAVE CRAYFISH	G2	S2		N	5
SPECIAL PLANTS						
AGRIMONIA INCISA	INCISED GROOVE-BUR	G3	S2	C2	N	2
ASCLEPIAS VIRIDULA	SOUTHERN MILKWEED	G2	S2	C2	LT	1
BAPTISIA SIMPLICIFOLIA	SCARE-WEED	G2G3	S2S3	C2	LT	3
GENTIANA PENNELLIANA	WIREGRASS GENTIAN	G2?	S2	3C	LE	1
LIATRIS PROVINCIALIS	GODFREY'S BLAZING STAR	G2	S2	C2	LE	1
MAGNOLIA ASHEI	ASHE'S MAGNOLIA	G2	S2	3C	LE	2
PITYOPSIS FLEXUOSA	BENT GOLDEN-ASTER	G3	S3	C2	LE	1
LILIUM CATESBAEI	SOUTHERN RED LILY	G4G5	S2	N	LT	1
NATURAL COMMUNITIES						
ESTUARINE TIDAL MARSH		G4	S4			1
DEPRESSION MARSH		G5	S5			1
SPRING-RUN STREAM		G2	S2			1
AQUATIC CAVE		G3	S2			13
MESIC FLATWOODS		G5	S5			1
SANDHILL	SCRUBBY LONGLEAF PINE FOREST	G4	S3			3
SCRUB	OAK SCRUB	G3	S2			1

Total items 33

Total records tallied 92

November 4, 1987

FLORIDA NATURAL AREAS INVENTORY

ELEMENT OCCURRENCE RECORDS FOR LEON COUNTY CURRENTLY IN THE INVENTORY DATABASE:

LEFT(NAME,45)	LEFT(COMNAME,45)	GRANK	SRANK	ET->FEDSTATUS	ET->STATEPROT	Count
FISHES						
NOTROPIS LEEDSI	BANNERFIN SHINER	G3	S2		N	1
AMPHIBIANS						
NOTOPHTHALMUS PERSTRIATUS	STRIPED NEWT	G3	S3		N	1
REPTILES						
ALLIGATOR MISSISSIPPIENSIS	AMERICAN ALLIGATOR	G5	S4	LTSA	LS	1
DRYMARCHON CORAIS COUPERI	EASTERN INDIGO SNAKE	G4T3	S3	LT	LT	1
GOPHERUS POLYPHEMUS	GOPHER TORTOISE	G2	S2	C2	LS	3
MACROCLEMYS TEMMINCKII	ALLIGATOR SNAPPING TURTLE	G3?	S3?	C2	LS	2
BIRDS						
CASMERODIUS ALBUS	GREAT EGRET	G5	S4		N	2
EGRETTA CAERULEA	LITTLE BLUE HERON	G5	S4		LS	2
EUDOCIMUS ALBUS	WHITE IBIS	G5	S4		N	1
MYCTERIA AMERICANA	WOOD STORK	G5	S2	LE	LE	1
PICOIDES BOREALIS	RED-COCKADED WOODPECKER	G2	S2	LE	LT	6
INVERTEBRATES						
PROCAMBARUS ORCINUS	WOODVILLE CAVE CRAYFISH	G2	S2		N	3

ELEMENT OCCURRENCE RECORDS FOR LEON COUNTY CURRENTLY IN THE INVENTORY DATABASE (continued):

LEFT(NAME,45)	LEFT(COMNAME,45)	GRANK	SRANK	ET->FEDSTATUS	ET->STATEPROT	Count
SPECIAL PLANTS						
BAPTISIA SIMPLICIFOLIA	SCARE-WEED	G2G3	S2S3	C2	LT	3
HEDEOMA GRAVEOLENS	MOCK PENNYROYAL	G2	S2	C1	LE	2
HEXASTYLIS ARIFOLIA	HEARTLEAF	G5	S3	N	LT	2
MAGNOLIA ASHEI	ASHE'S MAGNOLIA	G2	S2	3C	LE	1
PITYOPSIS FLEXUOSA	BENT GOLDEN-ASTER	G3	S3	C2	LE	3
PYCNANTHEMUM FLORIDANUM	FLORDIA MOUNTAIN-MINT	G3	S3	3C	N	1
STACHYS HYSSOPIFOLIA VAR LYTHROIDES	TALLAHASSEE HEDGE-NETTLE	GUT1	S1	C2	N	1
MALAXIS UNIFOLIA	GREEN ADDER'S-MOUTH	G5	S3	N	(LT)	1
NATURAL COMMUNITIES						
CLASTIC UPLAND LAKE		G3	S2			1
ALLUVIAL STREAM		G4	S2			1
AQUATIC CAVE		G3	S2			2
TERRESTRIAL CAVE		G3	S1			1
SANDHILL	SCRUBBY LONGLEAF PINE FOREST	G4	S3			3
UPLAND HARDWOOD FOREST	BEECH/MAGNOLIA FOREST	G4	S3			1
OTHER						
BIRD ROOKERY						3

Total items 27

Total records tallied 50

November 4, 1987

FLORIDA NATURAL AREAS INVENTORY

ELEMENT OCCURRENCE RECORDS FOR LEON COUNTY CURRENTLY IN THE INVENTORY DATABASE:

LEFT(NAME,45)	LEFT(COMNAME,45)	GRANK	SRANK	ET->FEDSTATUS	ET->STATEPROT	Count
FISHES						
NOTROPIS LEEDSI	BANNERFIN SHINER	G3	S2		N	1
AMPHIBIANS						
NOTOPHTHALMUS PERSTRIATUS	STRIPED NEWT	G3	S3		N	1
REPTILES						
ALLIGATOR MISSISSIPPIENSIS	AMERICAN ALLIGATOR	G5	S4	LTSA	LS	1
DRYMARCHON CORAIS COUPERI	EASTERN INDIGO SNAKE	G4T3	S3	LT	LT	1
GOPHERUS POLYPHEMUS	GOPHER TORTOISE	G2	S2	C2	LS	3
MACROCLEMYS TEMMINCKII	ALLIGATOR SNAPPING TURTLE	G3?	S3?	C2	LS	2
BIRDS						
CASMERODIUS ALBUS	GREAT EGRET	G5	S4		N	2
EGRETTA CAERULEA	LITTLE BLUE HERON	G5	S4		LS	2
EUDOCIMUS ALBUS	WHITE IBIS	G5	S4		N	1
MYCTERIA AMERICANA	WOOD STORK	G5	S2	LE	LE	1
PICOIDES BOREALIS	RED-COCKADED WOODPECKER	G2	S2	LE	LT	6
INVERTEBRATES						
PROCAMBARUS ORCINUS	WOODVILLE CAVE CRAYFISH	G2	S2		N	3

ELEMENT OCCURRENCE RECORDS FOR LEON COUNTY CURRENTLY IN THE INVENTORY DATABASE (continued):

LEFT(NAME,45)	LEFT(COMNAME,45)	GRANK	SRANK	ET->FEDSTATUS	ET->STATEPROT	Count
SPECIAL PLANTS						
BAPTISIA SIMPLICIFOLIA	SCARE-WEED	G2G3	S2S3	C2	LT	3
HEDEOMA GRAVEOLENS	MOCK PENNYROYAL	G2	S2	C1	LE	2
HEXASTYLIS ARIFOLIA	HEARTLEAF	G5	S3	N	LT	2
MAGNOLIA ASHEI	ASHE'S MAGNOLIA	G2	S2	3C	LE	1
PITYOPSIS FLEXUOSA	BENT GOLDEN-ASTER	G3	S3	C2	LE	3
PYCNANTHEMUM FLORIDANUM	FLORDIA MOUNTAIN-MINT	G3	S3	3C	N	1
STACHYS HYSSOPIFOLIA VAR LYTHROIDES	TALLAHASSEE HEDGE-NETTLE	GUT1	S1	C2	N	1
MALAXIS UNIFOLIA	GREEN ADDER'S-MOUTH	G5	S3	N	(LT)	1
NATURAL COMMUNITIES						
CLASTIC UPLAND LAKE		G3	S2			1
ALLUVIAL STREAM		G4	S2			1
AQUATIC CAVE		G3	S2			2
TERRESTRIAL CAVE		G3	S1			1
SANDHILL	SCRUBBY LONGLEAF PINE FOREST	G4	S3			3
UPLAND HARDWOOD FOREST	BEECH/MAGNOLIA FOREST	G4	S3			1
OTHER						
BIRD ROOKERY						3

Total items	27
Total records tallied	50

FLORIDA NATURAL AREAS INVENTORY

Element Rank Explanations

An element is any exemplary or rare component of the natural environment, such as a species, plant community, bird rookery, spring, sinkhole, cave, or other ecological feature. An element occurrence (EO) is a single extant habitat which sustains or otherwise contributes to the survival of a population or a distinct, self-sustaining example of a particular element. The major function of the Florida Natural Areas Inventory is to define the state's elements of natural diversity, then collect information about each element occurrence.

The Florida Natural Areas Inventory assigns 2 ranks for each element. The global element rank is based on a 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, the most important ones being estimated number of element occurrences (EOs), estimated abundance (number of individuals for species; area for natural communities), range, estimated adequately protected EOs, relative threat of destruction, and ecological fragility.

Global Element Rank (priority)

- G1 = Critically imperiled globally because of extreme rarity (5 or fewer occurrences or less than 1000 individuals) or because of extreme vulnerability to extinction due to some natural or man-made 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 biological or man-made 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 because of other factors.
- G4 = apparently secure globally (may be rare in parts of range)
- G5 = demonstrably secure globally
- GH = of historical occurrence throughout range, may be rediscovered (e.g., ivory-billed woodpecker)
- GX = believed to be extinct throughout range
- G#? = Tentative rank (e.g., G2?)
- G#G# = range of rank; insufficient data to assign specific global rank (e.g., G2G3)
- G#T# = rank of taxonomic subgroup such as subspecies or variety; numbers have same definition as above (e.g., G3T1)
- G#Q = rank of questionable species - ranked as species but questionable whether it is species or subspecies; numbers have same definition as above (e.g., G2Q)
- G#T#Q = same as above, but validity as subspecies or variety is questioned.
- GU = due to lack of information, no rank or range can be assigned (e.g., GUT2).
- G? = not yet ranked (temporary)

State Element Rank (priority)

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

Additional state element ranks:

- SA = accidental in Florida, i.e., not part of the established biota
- SE = an exotic species established in state; may be native elsewhere in North America

FEDERAL/STATE LEGAL STATUS

FEDERAL

- LE = Listed as Endangered Species in the List of Endangered and Threatened Wildlife and Plants under the provisions of the Endangered Species Act. An "Endangered Species" is defined as any species which is in danger of extinction throughout all or a significant portion of its range.
- PE = Proposed for addition to the List of Endangered and Threatened Wildlife and Plants as Endangered Species.
- LT = Listed as Threatened Species. A "Threatened Species" is 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.
- PT = Proposed for listing as Threatened Species.
- C1 = Candidate Species for addition to the List of Endangered and Threatened Wildlife and Plants, Category 1. Taxa for which the U.S. Fish and Wildlife Service currently has substantial information on hand to support the biological appropriateness of proposing to list the species as endangered or threatened.
- C2 = Candidate Species, Category 2. Taxa for which information now in possession of the U.S. Fish and Wildlife Service indicates that proposing to list the species as endangered or threatened is possibly appropriate, but for which conclusive data on biological vulnerability and threat(s) are not currently available to support proposed rules at this time.
- 3A = Candidate Species, Category 3A. Taxa which are no longer being considered for listing as endangered or threatened because of persuasive evidence of extinction.
- 3B = Candidate Species, Category 3B. Taxa which are no longer being considered for listing as endangered or threatened because the names do not represent taxa meeting the Endangered Species Act's definition of "species".
- 3C = Candidate Species, Category 3C. Taxa that have proven to be more abundant or widespread than was previously believed and/or those that are not subject to any identifiable threat.
- AC = Agency Concern. Species which are not currently listed or candidates, but which are a matter of concern to the U.S. Fish and Wildlife Service.
- LTSA = Threatened due to similarity of appearance.
- N = Not currently listed, nor currently being considered for addition to the List of Endangered and Threatened Wildlife and Plants.

STATE

Animals

LE - Listed as Endangered Species by the Florida Game and Fresh Water Fish Commission. An Endangered Species is defined as a species, subspecies, or isolated population which is resident in Florida during a substantial portion of its life cycle and so few or depleted in number or so restricted in range of habitat due to any man-made or natural factors that it is in immediate danger of extinction or extirpation from the state, or which may attain such a status within the immediate future unless it or its habitat are fully protected and managed in such a way as to enhance its survival potential; or migratory or occasional in Florida and included as endangered on the United States Endangered and Threatened Species List. This definition does not include species occurring peripherally in Florida while common or under no threat outside the State.

LT - Listed as Threatened Species by the Florida Game and Fresh Water Fish Commission. A Threatened Species is defined as a species, subspecies, or isolated population which is resident in Florida during a substantial portion of its life cycle and which is acutely vulnerable to environmental alteration declining in number at a rapid rate, or whose range or habitat is declining in area at a rapid rate due to any man-made or natural factors and as a consequence is destined or very likely to become and endangered species within the foreseeable and predictable future unless appropriate protective measures or management techniques are initiated or maintained; or migratory or occasional in Florida and included as threatened on the United States Endangered and Threatened Species List. This definition does not include species occurring peripherally in Florida while common or under no threat outside the State.

LS - Listed as Species of Special Concern by the Florida Game and Fresh Water Fish Commission. A Species of Special Concern is defined as a species, subspecies, or isolated population which warrants special protection, recognition, or consideration because it occurs disjunctly or continuously in Florida and has a unique and significant vulnerability to habitat modification, environmental alteration, human disturbance, or substantial human exploitation which, in the foreseeable and predictable future, may result in its becoming a threatened species unless appropriate protective or management techniques are initiated or maintained; may already meet certain criteria for consideration as a threatened species but for which conclusive data are limited or lacking; may occupy such an unusually vital and essential ecological niche that should it decline significantly in numbers or distribution other species would be adversely affected to a significant degree; or has not sufficiently recovered from past population depletion.

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

Plants

LE - Listed as Endangered Plants in the Preservation of Native Flora of Florida Act. "Endangered Plants" means 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.

PE - Proposed by the Florida Department of Agriculture as Endangered Plants.

LT - Listed as Threatened Plants in the Preservation of Native Flora of Florida Act. "Threatened plants" means 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.

PT - Proposed by the Florida Department of Agriculture for listing as Threatened Plants.

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

PC - Proposed by the Florida Department of Agriculture for listing as Commercially Exploited Plants.

(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.

FLORIDA NATURAL AREAS INVENTORY

SPECIAL PLANTS LIST

GLOBAL RANK	STATE RANK	FED STAT	STATE STAT	NAME	COMMON NAME
G4	S1	N	LE	ACACIA CHORIOPHYLLA	TAMARINDILLO
G5	S3	N	LE	ACROSTICHUM AUREUM	GOLDEN LEATHER FERN
G5	S1	N	LT	ACTAEA PACHYPODA	WHITE BANEBERRY
G5	S3S4	N	(LT)	ADIANTUM CAPILLUS-VENERIS	SOUTHERN MAIDENHAIR FERN
G?	S1	N	LE	ADIANTUM MELANOLEUCUM	FRAGRANT MAIDENHAIR FERN
G5TUQ	SU	C2	N	AGALINIS PURPUREA VAR CARTERI	CARTER'S LARGE PURPLE FALSE-FOXGLOVE
GHQ	SH	C2	N	AGALINIS STENOPHYLLA	NARROW-LEAVED FALSE-FOXGLOVE
G3	S2	C2	N	AGRIMONIA INCISA	INCISED GROOVE-BUR
G1	S1	LE	LE	AMORPHA CRENULATA	CRENULATE LEAD-PLANT
G?	S1	N	N	AMYRIS BALSAMIFERA	BALSAM TORCHWOOD
G3	S3	3C	N	ANDROPOGON ARCTATUS	PINE-WOODS BLUESTEM
GU	S2	N	N	ANEMONE BERLANDIERI	TEXAS ANEMONE
G5	S1	N	LT	ANEMONELLA THALICTROIDES	RUE-ANEMONE
G5T1	S1	C2	LE	AQUILEGIA CANADENSIS VAR AUSTRALIS	MARIANNA COLUMBINE
G2	S2	C2	N	ARGYTHAMNIA BLODGETTII	BLODGETT'S WILD-MERCURY
G?	SE?	C1	LE	ARISTIDA FLORIDANA	KEYS WIRE-GRASS
G2	S1	C2	N	ARISTIDA SIMPLICIFLORA	SOUTHERN THREE-AWNED GRASS
G2G3	S2S3	N	LE	ASCLEPIAS CURTISSII	CURTISS' MILKWEED
G2	S2	C2	LT	ASCLEPIAS VIRIDULA	SOUTHERN MILKWEED
G1	S1	LE	LE	ASIMINA TETRAMERA	FOUR-PETAL PAWPAW
G?	S2	N	LE	ASPLENIUM AURITUM	AURICLED SPLEENWORT
G?	S1S2	N	(LT)	ASPLENIUM DENTATUM	SLENDER SPLEENWORT
G2	S1S2	C2	(LT)	ASPLENIUM HETERORESILIENS	WAGNER'S SPLEENWORT
G4	S1	N	LE	ASPLENIUM MONANTHES	SINGLE-SORUS SPLEENWORT
G1G3	SU	C2	(LT)	ASPLENIUM PLENUM	
G?	S1	N	LE	ASPLENIUM PUMILUM	DWARF SPLEENWORT
G?	S1	N	LE	ASPLENIUM SERRATUM	BIRD'S NEST SPLEENWORT
G2Q	S2	3B	N	ASTER PLUMOSUS	PLUMOSE ASTER
G1	S1	C2	LT	ASTER SPINULOSUS	PINE-WOODS ASTER
G5?TU	S1S3	N	N	ASTER VIMINEUS VAR VIMINEUS	APALACHICOLA RIVER ASTER
G2Q	S2	C2	LT	BAPTISIA HIRSUTA	HAIRY WILD-INDIGO
G3	S2	3C	LT	BAPTISIA MEGACARPA	APALACHICOLA WILD INDIGO
G2G3	S2S3	C2	LT	BAPTISIA SIMPLICIFOLIA	SCARE-WEED
G5	S1	N	LE	BLECHNUM OCCIDENTALE	SINKHOLE FERN
G3	S3	PT	LE	BONAMIA GRANDIFLORA	FLORIDA BONAMIA
G4G5	S1	N	(LT)	BOTRYCHIUM LUNARIOIDES	WINTER GRAPE-FERN
G?	S1	N	N	BOURRERIA CASSINIFOLIA	LITTLE STRONGBARK
G2G3	S1	N	N	BOURRERIA RADULA	ROUGH STRONGBARK
GU	SH	C2	(LT)	BRASSIA CAUDATA	SPIDER ORCHID
G1G3	S2	C2	LT	BRICKELLIA CORDIFOLIA	FLYR'S BRICKELL-BUSH
G1G2	S1S2	C2	N	BRICKELLIA MOSIERI	FLORIDA THOROUGHWORT BRICKELL-BUSH
G?	S1	N	LE	BULBOPHYLLUM PACHYRRACHIS	RAT-TAIL ORCHID
G5	S2	N	LT	BUMELIA LYCIOIDES	BUCKTHORN
G?	S1	N	LE	BURMANNIA FLAVA	FAKAHATCHEE BURMANNIA
G2?	S2	C2	LT	CACALIA DIVERSIFOLIA	VARIABLE-LEAVED INDIAN-PLANTAIN
G3	S3	C1	LT	CALAMINTHA ASHEI	ASHE'S SAVORY
G2G3	S2S3	C2	N	CALAMINTHA DENTATA	TOOTHED SAVORY
G1	S1	C2	N	CALAMOVILFA CURTISSII	CURTISS' SANDGRASS
G3G5	S2	N	LT	CALLIRHOE PAPAVER	WOODS POPPY-MALLOW
G1	S1	C2	LE	CAMPANULA ROBINSIAE	BROOKSVILLE BELLFLOWER
G?	S1	N	LE	CAMPYLOCENTRUM PACHYRRHIZUM	LEAFLESS ORCHID
G?	S1	N	LE	CAMPYLONEURUM ANGUSTIFOLIUM	NARROW STRAP FERN
GU	SU	C2	N	CANNA PERTUSA	TATTERED CANNA
G2?	S2	C2	N	CAREX BALTZELLII	BALTZELL'S SEDGE
G3?	S2	C2	N	CAREX CHAPMANII	CHAPMAN'S SEDGE
G1G2	S1S2	C1	LE	CASSIA KEYENSIS	BIG PINE PARTRIDGE PEA
G?	S1	N	LE	CATESBAEA PARVIFLORA	SMALL-FLOWERED LILY-THORN
G?	S1	N	LE	CATOPSIS BERTERONIANA	POWDERY CATOPSIS
G?	S1	N	(LT)	CATOPSIS NUTANS	NODDING CATOPSIS
G?	S1	N	LE	CELTIS IGUANAEA	IGUANA HACKBERRY
G?	S1	N	LE	CELTIS PALLIDA	SPINY HACKBERRY
G2?	S1S3	3C	N	CENTROSEMA ARENICOLA	SAND BUTTERFLY PEA
GUT1	S1	LE	LE	CEREUS ERIOPHORUS VAR FRAGRANS	FRAGRANT WOOLY CACTUS
G2G3	S2S3	C2	LE	CEREUS GRACILIS	PRICKLY-APPLE
G1	S1	LE	LE	CEREUS ROBINII	KEY TREE-CACTUS

FLORIDA NATURAL AREAS INVENTORY

SPECIAL PLANTS LIST

GLOBAL RANK	STATE RANK	FED STAT	STATE STAT	NAME	COMMON NAME
G2	S2	C2	N	CHAMAESYCE CUMULICOLA	SAND-DUNE SPURGE
G2?T2	S2	LE	N	CHAMAESYCE DELTOIDEA SSP DELTOIDEA	DELTOID SPURGE
G2?T1	S1	C1	N	CHAMAESYCE DELTOIDEA SSP SERPYLLUM	WEDGE SPURGE
G2T1	S1	C1	N	CHAMAESYCE PORTERIANA VAR KEYENSIS	PORTER'S HAIRY-PODDED SPURGE
G2T2	S2	C1	N	CHAMAESYCE PORTERIANA VAR PORTERIANA	PORTER'S BROAD-LEAVED SPURGE
G2T2	S2	C1	N	CHAMAESYCE PORTERIANA VAR SCOPARIA	PORTER'S BROOM SPURGE
G?	S2	N	(LT)	CHEILANTHES MICROPHYLLA	SOUTHERN LIP FERN
G2	S2	LE	LE	CHIONANTHUS PYGMAEUS	PYGMY FRINGE-TREE
G1	S1	LE	LE	CHRYSOPSIS FLORIDANA	FLORIDA GOLDEN ASTER
G2	S2	N	N	CHRYSOPSIS GODFREYI	GODFREY'S GOLDEN-ASTER
G3G5T2	S2	C1	LE	CHRYSOPSIS GOSSYPINA SSP CRUISEANA	CRUISE'S GOLDEN-ASTER
G4G5	S3?	N	N	CLEMATIS CATESBYANA	A VIRGIN'S BOWER
G3	S3	C1	LT	CLITORIA FRAGRANS	PIGEON-WING
G?	S1	N	LE	CLUSIA ROSEA	A BALSAM APPLE
G3G4	S3	N	LC	COCCOTHRINAX ARGENTATA	SILVER PALM
G1G3	S3	C2	N	COELORACHIS TUBERCULOSA	PIEDMONT JOINTGRASS
G?	S1S2	N	N	COLUBRINA CUBENSIS	COLUBRINA
G1G2Q	S1S2	C1	LT	COMMELINA GIGAS	CLIMBING DAYFLOWER
G2	S2	C2	N	CONRADINA BREVIFOLIA	SHORT-LEAVED ROSEMARY
G1	S1	C2	LT	CONRADINA GLABRA	APALACHICOLA ROSEMARY
G3	S3	C2	N	CONRADINA GRANDIFLORA	LARGE-FLOWERED ROSEMARY
G3G5	S2S3	N	LE	CORDIA SEBESTENA	GEIGER TREE
G5	S2	N	LT	CORNUS ALTERNIFOLIA	ALTERNATE-LEAF DOGWOOD
G2G3	S2	C2	LE	CROOMIA PAUCIFLORA	CROOMIA
G?	S2	N	N	CROSSOPETALUM ILICIFOLIUM	CHRISTMAS BERRY
G2?	S2S3	C2	N	CROTON ELLIOTTII	ELLIOTT'S CROTON
G5	S2S3	N	LT	CRYPTOTAENIA CANADENSIS	CANADA HONEWORT
G2Q	S2	3C	N	CTENIUM FLORIDANUM	FLORIDA TOOTHACHE GRASS
G1	S1	C2	LE	CUCURBITA OKEECHOBEENSIS	OKEECHOBEE GOURD
G?	S1	N	LE	CUPANIA GLABRA	CUPANIA
G2?	S2	C2	N	CUPHEA ASPERA	TROPICAL WAXWEED
G5	S2	N	N	CYNOGLOSSUM VIRGINIANUM	WILD COMFREY
G?	S1	N	LE	CYRTOPODIUM PUNCTATUM	COW-HORNED ORCHID
G1	S1	LE	LE	DEERINGOTHAMNUS PULCHELLUS	BEAUTIFUL PAWPAW
G1	S1	LE	LE	DEERINGOTHAMNUS RUGELII	RUGEL'S PAWPAW
G?	S1	N	LE	DENNSTAEDTIA BIPINNATA	HAY SCENTED FERN
G1	S1	LE	LE	DICERANDRA CORNUTISSIMA	LONGSPURRED MINT
G1	S1	LE	LE	DICERANDRA FRUTESCENS	SCRUB MINT
G1	S1	LE	LE	DICERANDRA IMMACULATA	LAKELA'S MINT
G?	S2	N	N	DICHROMENA FLORIDENSIS	FLORIDA WHITE-TOP SEDGE
G1?	S1	C2	N	DIGITARIA FLORIDANA	FLORIDA CRABGRASS
G1?	S1	C2	N	DIGITARIA GRACILLIMA	LONGLEAF CRABGRASS
G1?	S1	C2	N	DIGITARIA PAUCIFLORA	FEW-FLOWERED CRABGRASS
G4	S3?	N	N	DIRCA PALUSTRIS	EASTERN LEATHERWOOD
G5	S3	N	LT	DROSERA INTERMEDIA	SPOON-LEAVED SUNDEW
G5	SH	N	N	ELEOCHARIS ROSTELLATA	BEAKED SPIKERUSH
G?	S1	N	LE	ELTROPLECTRIS CALCARATA	
G2G4T2	S2	C2	N	ELYTRARIA CAROLINIENSIS VAR ANGUSTIFOLIA	NARROW-LEAVED CAROLINA SCALYSTEM
G1G3T1	S1	C2	LE	ENCYCLIA BOOTHIANA VAR ERYTHRONIOIDES	DOLLAR ORCHID
G?	S1	N	LE	ENCYCLIA PYGMAEA	DWARF EPIDENDRUM
G?	S1	N	LE	EPIDENDRUM ACUNAE	ACUNA'S EPIDENDRUM
G?	S2	N	(LT)	EPIDENDRUM NOCTURNUM	NIGHT-SCENTED ORCHID
G5	S2	N	LE	EPIGAEA REPENS	TRAILING ARBUTUS
G2	S2	C2	LT	ERAGROSTIS TRACYI	SANIBEL LOVEGRASS
G2?T2Q	S1S2	C2	N	ERIOCHLOA MICHAUXII VAR SIMPSONII	A CUPGRASS
G3Q	S3	C2	LT	ERIOGONUM FLORIDANUM	SCRUB BUCKWHEAT
G?	S3S4	N	LT	ERNODEA LITTORALIS	BEACH-CREEPER
G2	S2	LE	N	ERYNGIUM CUNEIFOLIUM	WEDGE-LEAVED BUTTON-SNAKEROOTS
G3G5	S2	N	LT	ERYTHRONIUM UMBILICATUM	DIMPLED FAWN-LILY
G4G5	S3S4	N	LT	EUGENIA CONFUSA	TROPICAL IRONWOOD
G?	S1	N	LE	EUGENIA RHOMBEA	RED STOPPER
G5	S2	N	N	EUONYMUS ATROPURPUREUS	BURNINGBUSH

FLORIDA NATURAL AREAS INVENTORY

SPECIAL PLANTS LIST

GLOBAL RANK	STATE RANK	FED STAT	STATE STAT	NAME	COMMON NAME
G?	S2?	N	N	EUPHORBIA COMMUTATA	WOOD SPURGE
G1	S1	LT	LE	EUPHORBIA GARBERI	GARBER'S SPURGE
G1	S1	C2	N	EUPHORBIA TELEPHIOIDES	TELEPHUS SPURGE
G2T1T3	S1	C1	N	FORESTIERA SEGREGATA VAR PINETORUM	FLORIDA PINEWOOD PRIVET
G2	S2	C2	N	GALACTIA PINETORUM	PINELAND MILK-PEA
G1	S1	LE	N	GALACTIA SMALLII	SMALL'S MILKPEA
G2?	S2	3C	LE	GENTIANA PENNELLIANA	WIREGRASS GENTIAN
G1G2	S1S2	C2	N	GLANDULARIA MARITIMA	COASTAL VERVAIN
G1?	S1	C1	N	GLANDULARIA TAMPENSIS	TAMPA VERVAIN
G5	S2	N	(LT)	GOODYERA PUBESCENS	DOWNY RATTLESNAKE PLANTAIN
G4G5	S3?	N	LE	GOSSYPIUM HIRSUTUM	WILD COTTON
G?	S2	N	LE	GUAIACUM SANCTUM	LIGNUM-VITAE
G?	S1	N	LE	GUZMANIA MONOSTACHYA	FUCH'S BROMELIAD
G2?	S2	C2	N	GYMNOPOGON FLORIDANUS	FLORIDA BEARDGRASS
G1	S1	LE	LE	HARPEROCALLIS FLAVA	HARPER'S BEAUTY
G2G3	S2S3	C2	LT	HARTWRIGHTIA FLORIDANA	HARTWRIGHTIA
G2	S2	C1	LE	HEDEOMA GRAVEOLENS	MOCK PENNYROYAL
G5T1Q	S1	C2	N	HEDYOTIS NIGRICANS VAR PULVINATA	NARROW-LEAVED BLUETS
G3G4	S3	N	N	HELIANTHEMUM ARENICOLA	GULF ROCKROSE
G2	S2	C2	N	HELIANTHUS CARNOSUS	LAKE-SIDE SUNFLOWER
G5?T2	S2	C1	N	HELIANTHUS DEBILIS SSP VESTITUS	HAIRY CUCUMBER-LEAF SUNFLOWER
G?T1T3	S1S3	C2	N	HELIOTROPIUM POLYPHYLLUM VAR HORIZONTALE	PROSTRATE MANY-LEAVED TURNSOLE
G?	S2	N	LE	HEPATICA NOBILIS	LIVERLEAF
G5	S3	N	LT	HEXASTYLIS ARIFOLIA	HEARTLEAF
G?	S2	N	LT	HIPPOMANE MANCINELLA	MANCHINEEL
G5	S1	N	LT	HYDRANGEA ARBORESCENS	WILD HYDRANGEA
G3Q	S1	C2	N	HYMENOCALLIS CORONARIA	STREAM-BANK SPIDERLILY
G2G4	S2S3	3C	N	HYMENOCALLIS LATIFOLIA	BROAD-LEAVED SPIDERLILY
G2	S1	N	LT	HYPELATE TRIFOLIATA	INKWOOD
G2	S2	LE	LE	HYPERICUM CUMULICOLA	HIGHLANDS SCRUB HYPERICUM
G2	S2	C1	LT	HYPERICUM EDISONIANUM	EDISON'S ASCYRUM
G2	S2	C2	LE	HYPERICUM LISSOPHLOEUS	SMOOTH-BARKED ST. JOHN'S-WORT
G3	S2	C2	(LT)	ILEX AMELANCHIER	SERVICEBERRY HOLLY
G3	S3	3C	N	ILEX ARENICOLA	SCRUB HOLLY
G?	S2	N	LT	ILEX KRUGIANA	KRUG'S HOLLY
G3G5	S3	N	LT	ILLICIUM FLORIDANUM	FLORIDA ANISE
G1	S1	C2	LT	ILLICIUM PARVIFLORUM	STAR ANISE
G?	S2	N	LE	IONOPSIS UTRICULARIOIDES	DELICATE IONOPSIS
G5	S1	N	N	ISOPYRUM BITERNATUM	FALSE RUE-ANEMONE
G2	S2	C2	LE	JACQUEMONTIA CURTISSII	PINELAND JACQUEMONTIA
G1	S1	C2	LE	JACQUEMONTIA RECLINATA	BEACH JACQUEMONTIA
G3G5	S3	N	LT	JACQUINIA KEYENSIS	JOEWOOD
G3?	S1	3C	N	JUNCUS GYMNOCARPUS	COVILLE'S RUSH
G1G2	S1S2	C1	LE	JUSTICIA COOLEYI	COOLEY'S WATER-WILLOW
G2?	S2	C2	N	JUSTICIA CRASSIFOLIA	THICK-LEAVED WATER-WILLOW
G5	S3	N	LT	KALMIA LATIFOLIA	MOUNTAIN LAUREL
G1G3Q	S1	C2	N	KOSTELETZKYA SMILACIFOLIA	SOUTHERN SEA-SHORE MALLOW
G3	S3	C2	N	LECHEA CERNUA	NODDING PINWEED
G2	S2	C2	N	LECHEA DIVARICATA	PINE PINWEED
G1	S1	C2	N	LECHEA LAKELAE	LAKELA'S PINWEED
G3G4	S3	3C	LT	LEITNERIA FLORIDANA	CORKWOOD
G1G3	S1	C2	LE	LEPANTHOPSIS MELANANTHA	TINY ORCHID
G3	S3	C1	LE	LIATRIS OHLINGERAE	FLORIDA GAY-FEATHER
G2	S2	C2	LE	LIATRIS PROVINCIALIS	GODFREY'S BLAZING STAR
G?	S1	N	LE	LICARIA TRIANDRA	GULF LICARIA
G?	S2?	C2	N	LILAEOPSIS CAROLINENSIS	CAROLINA LILAEOPSIS
G4G5	S2	N	LT	LILIUM CATESBAEI	SOUTHERN RED LILY
G1	S1	C2	LE	LILIUM IRIDOLLAE	PANHANDLE LILY
G4G5	S1S2	N	N	LILIUM MICHAUXII	CAROLINA LILY
G5	S1	N	N	LILIUM SUPERBUM	TURK'S CAP LILY
G2	SH	LE	N	LINDERA MELISSIFOLIA	PONDBERRY
G1G2	S1S2	C2	LE	LINUM ARENICOLA	SAND FLAX
G2T1	S1	C1	N	LINUM CARTERI VAR CARTERI	CARTER'S SMALL-FLOWERED FLAX

FLORIDA NATURAL AREAS INVENTORY

SPECIAL PLANTS LIST

GLOBAL RANK	STATE RANK	FED STAT	STATE STAT	NAME	COMMON NAME
G2T2	S2	C1	N	LINUM CARTERI VAR SMALLII	CARTER'S LARGE-FLOWERED FLAX
G5?TU	S1?	C2	N	LINUM SULCATUM VAR HARPERI	HARPER'S GROOVED-YELLOW FLAX
G2	S2	C2	LT	LINUM WESTII	WEST'S FLAX
G4G5	S2	3C	LT	LITSEA AESTIVALIS	PONDSPICE
G1G3Q	S1S3	N	N	LUDWIGIA SPATHULIFOLIA	
G1	S1	LE	LE	LUPINUS ARIDORUM	BECKNER'S LUPINE
G2	S2	3C	LT	LUPINUS WESTIANUS	GULF COAST LUPINE
G2	S1	N	LE	LYCOPODIUM DICHOTOMUM	HANGING CLUBMOSS
G1	S1	C2	N	LYTHRUM CURTISSII	CURTISS' LYTHRUM
G2G3	S2S3	C2	N	LYTHRUM FLAGELLARE	LOWLAND LOOSESTRIFE
G1	S1	C2	LE	MACBRIDEA ALBA	WHITE BIRDS-IN-A-NEST
G5	S2	N	LT	MAGNOLIA ACUMINATA	CUCUMBER MAGNOLIA
G2	S2	3C	LE	MAGNOLIA ASHEI	ASHE'S MAGNOLIA
G3	S2	N	LE	MAGNOLIA PYRAMIDATA	PYRAMID MAGNOLIA
G5	S3	N	(LT)	MALAXIS UNIFOLIA	GREEN ADDER'S-MOUTH
G3G5	S3	N	LE	MALLOTONIA GNAPHALODES	SEA LAVENDER
G1G2	SUSH	C2	N	MARSHALLIA MOHRII	MOHR'S BARBARA'S-BUTTONS
G?	S1	N	LT	MARSHALLIA OBOVATA	BARBARA'S BUTTONS
G2	S1	C2	LE	MATELEA ALABAMENSIS	ALABAMA ANGLEPOD
G?	S1	N	LE	MATELEA BALDWYNIANA	BALDWYN'S SPINY-POD
G2	S2	C2	LE	MATELEA FLORIDANA	FLORIDA SPINY-POD
G?	S1	N	LE	MAXILLARIA CRASSIFOLIA	HIDDEN ORCHID
G5	S2	N	LT	MEDEOLA VIRGINIANA	INDIAN CUCUMBER-ROOT
G2Q	S2	C2	N	MELANTHERA PARVIFOLIA	SMALL-LEAVED MELANTHERA
G1Q	S1	C2	N	MINUARTIA GODFREYI	GODFREY'S SANDWORT
G5	S3	C2	N	MONOTROPA BRITTONII	INDIAN-PIPES
G5	S1	N	LE	MONOTROPA HYPOPITHYS	PINESAP
G1Q	S1	C2	LE	MONOTROPSIS REYNOLDSIAE	PIGMY-PIPES
G4T3	S3	C2	LT	MYRCIANTHES FRAGRANS VAR SIMPSONII	TWINBERRY
G2G3	S2S3	C2	N	MYRIOPHYLLUM LAXUM	PIEDMONT WATER-MILFOIL
G2	S2	C2	LE	NEMASTYLIS FLORIDANA	FALL-FLOWERING IXIA
G1	S1	C2	LE	NOLINA ATOPOCARPA	FLORIDA BEAR-GRASS
G1	S1	C2	N	NOLINA BRITTONIANA	BRITTON'S BEAR-GRASS
G5T2	S5T1T2	C2	N	NUPHAR LUTEUM SSP ULVACEUM	WEST FLORIDA COWLILY
G?	SH	N	N	NYMPHAEA BLANDA	SLEEPING-BEAUTY WATER-LILY
G2G3	S2S3	N	LE	OKENIA HYPOGAEA	BURROWING FOUR-O'CLOCK
G1G3Q	S1	N	LE	ONCIDIUM VARIEGATUM	DANCING-LADY ORCHID
G1G3	S1	3C	LE	OPHIOGLOSSUM PALMATUM	HAND FERN
G1	S1	C2	(LT)	OPUNTIA SPINOSISSIMA	FLORIDA SEMAPHORE CACTUS
G1G3	S1	C2	N	OPUNTIA TRIACANTHA	THREE-SPINED PRICKLY-PEAR
G5T3	S3	C2	LE	OXYPOLIS FILIFORMIS SSP GREENMANII	GIANT WATER-DROPWORT
G4G5	S1	N	LE	PACHYSANDRA PROCUMBENS	ALLEGHENY-SPURGE
G2	S2	N	N	PANICUM ABSCISSUM	CUTTHROAT GRASS
G5	S2?	C2	N	PANICUM NUDICAULE	NAKED-STEMMED PANIC GRASS
G2?Q	S2	C2	N	PANICUM PINETORUM	BONITA SPRINGS PANIC GRASS
G2	S1	C2	N	PARNASSIA CAROLINIANA	CAROLINA GRASS-OF-PARNASSUS
G3?	S2	N	LE	PARNASSIA GRANDIFOLIA	LARGE-FLOWERED GRASS-OF-PARNASSUS
G2	S2	LT	N	PARONYCHIA CHARTACEA	PAPER-LIKE NAIL-WORT
G3G4	S3	N	N	PARONYCHIA ERECTA	BEACH SAND-SQUARES
G4G5	S2S3	N	N	PAVONIA SPINIFEX	YELLOW HIBISCUS
G?	S3	N	N	PELTANDRA SAGITTIFOLIA	SPOON-FLOWER
G1G2	S1S2	C2	LE	PEPEROMIA FLORIDANA	EVERGLADES PEPEROMIA
G?	S1	N	LE	PEPEROMIA GLABELLA	CYPRESS PEPEROMIA
G5?T4	S3	3C	N	PERSEA HUMILIS	SCRUB BAY
G?	S1SH	N	N	PHARUS PARVIFOLIUS	CREEPING-LEAF STALKGRASS
G?	S1	N	LE	PHORADENDRON RUBRUM	MAHOGONY MISTLETOE
GUT2	S2	C2	N	PHYLLANTHUS PENTAPHYLLUS VAR FLORIDANUS	FLORIDA FIVE-PETALED LEAF-FLOWER
G3G5	S3S5	C2	N	PHYSOSTEGIA LEPTOPHYLLA	SLENDER-LEAVED DRAGON-HEAD
G2	S2	C2	N	PINGUICULA IONANTHA	VIOLET-FLOWERED BUTTERWORT
G3?	S2	C2	N	PINGUICULA PLANIFOLIA	CHAPMAN'S BUTTERWORT
GX	SX	3A	N	PISONIA FLORIDANA	ROCK KEY DEVIL'S-CLAWS

FLORIDA NATURAL AREAS INVENTORY

SPECIAL PLANTS LIST

GLOBAL RANK	STATE RANK	FED STAT	STATE STAT	NAME	COMMON NAME
G3	S3	C2	LE	PITYOPSIS FLEXUOSA	BENT GOLDEN-ASTER
G3G4	S3S4	3C	(LT)	PLATANTHERA INTEGRA	YELLOW FRINGELESS ORCHID
U	S1SX	N	LT	PLEOPELTIS REVOLUTA	STAR-SCALE FERN
G5	S1	N	N	PODOPHYLLUM PELTATUM	MAY APPLE
G3G5T1	S1	C2	N	POLYGALA BOYKINII VAR SPARSIFOLIA	BOYKIN'S FEW-LEAVED MILKWORT
G1?	S1	C1	LE	POLYGALA LEWTONII	LEWTON'S POLYGALA
G1	S1	LE	LE	POLYGALA SMALLII	TINY POLYGALA
G3	S3	LE	N	POLYGONELLA BASIRAMIA	HAIRY JOINTWEED
G2	S1	C1	LT	POLYGONELLA MACROPHYLLA	LARGE-LEAVED JOINTWEED
G2G3	S2S3	3C	N	POLYGONELLA MYRIOPHYLLA	SMALL'S JOINTWEED
G?	S2	N	LT	POLYGONUM MEISNERIANUM	MEXICAN TEAR-THUMB
G2G3	S1?	C2	N	POLYMNIA LAEVIGATA	TENNESSEE LEAFCUP
G?	S2	N	LE	POLYRRHIZA LINDENII	GHOST ORCHID
GU	SU	C2	N	POTAMOGETON FLORIDANUS	FLORIDA PONDWEED
G2G3	S2S3	LE	LT	PRUNUS GENICULATA	SCRUB PLUM
GU	S1	N	LE	PSEUDOPHOENIX SARGENTII	FLORIDA CHERRY-PALM
G3G4	S2	C2	(LT)	PTEROGLOSSASPIS ECRISTATA	A WILD COCO
G3	S3	3C	N	PYCNANTHEMUM FLORIDANUM	FLORDIA MOUNTAIN-MINT
G?	S1	N	LE	REMIREA MARITIMA	BEACH-STAR
G?	S1	N	LE	RESTREPIELLA OPHIOCEPHALA	SNAKE ORCHID
G2	S2	C2	LE	RHEXIA PARVIFLORA	A MEADOWBEAUTY
G2	S2	C2	N	RHEXIA SALICIFOLIA	PANHANDLE MEADOWBEAUTY
G3G5	SX	3C	LE	RHIPSALIS BACCIFERA	MISTLETOE CACTUS
G3G4	S3	3C	LE	RHODODENDRON AUSTRINUM	ORANGE AZALEA
G1G2	S1S2	LE	LE	RHODODENDRON CHAPMANII	CHAPMAN'S RHODODENDRON
G3	S3	C2	N	RHYNCHOSIA CINEREA	BROWN-HAIRED SNOUTBEAN
G1	S1?	3C	N	RHYNCHOSPORA CULIXA	GEORGIA BEAKED-RUSH
G1?	SU	C2	N	RHYNCHOSPORA PUNCTATA	PINELAND BEAKED-RUSH
G1	S1	LT	LE	RIBES ECHINELLUM	MICCOSUKEE GOOSEBERRY
G2Q	S2	C1	LE	ROYSTONEA ELATA	FLORIDA ROYAL PALM
G3	S1	C2	LE	RUDBECKIA NITIDA	ST. JOHN'S-SUSAN
G4T1T3	S1	C2	N	RUDBECKIA TRILOBA VAR PINNATILOBA	PINNATE-LOBED CONEFLOWER
GUQ	S1	PE	N	SABAL MIAMIENSIS	MIAMI PALMETTO
G2	S1	N	LE	SACHSIA BAHAMENSIS	BAHAMA SACHSIA
G4T1T2	S2	C2	(LT)	SACOILA LANCEOLATA VAR PALUDICOLA	A LADIES'-TRESSES
G2	S2	C2	LT	SALIX FLORIDANA	FLORIDA WILLOW
GHQ	SH	3B	N	SALVIA BLODGETTII	BLODGETT'S SAGE
G?	S1	N	N	SALVIA CHAPMANII	CHAPMAN'S SAGE
G3G5	S3	N	LE	SARRACENIA LEUCOPHYLLA	WHITE-TOP PITCHERPLANT
G3?	S2	3C	LE	SARRACENIA RUBRA	SWEET PITCHER-PLANT
G5	S3S4	N	LT	SCAEVOLA PLUMIERI	BEACHBERRY
G?	S2	3C	LT	SCHISANDRA COCCINEA	SCHISANDRA
G2?	S2	C2	N	SCHIZACHYRIUM NIVEUM	RIPARIAN AUTUMNGRASS
G1G3	S1	C2	LE	SCHIZAEA GERMANII	TROPICAL CURLY-GRASS
G1G2	S1	C2	N	SCHWALBEA AMERICANA	CHAFFSEED
G1	S1	C2	N	SCUTELLARIA FLORIDANA	FLORIDA SKULLCAP
G3?Q	S3?	C2	N	SIDA RUBROMARGINATA	RED-MARGINED SIDA
G2	S2	C1	N	SILENE POLYPETALA	FRINGED CAMPION
G1Q	S1	C2	N	SIUM FLORIDANUM	FLORIDA WATER-PARSNIP
G4G5TH	SH	3A	N	SOLANUM BAHAMENSE VAR RUGELII	RUGEL'S KEY WEST HORSE-NETTLE
G5T3T5	S3S5	C2	N	SOLANUM CAROLINENSE VAR FLORIDANUM	
G3G5	S3	N	N	SOPHORA TOMENTOSA	NECKLACE POD
G1G2	S1S2	C2	LT	SPHENOSTIGMA COELESTINUM	BARTRAM'S IXIA
G1	S1	C2	LE	SPIGELIA GENTIANOIDES	GENTIAN PINKROOT
G1G2	S1S2	3C	LE	SPIGELIA LOGANIOIDES	A PINKROOT
G1G3	S1S2	C2	LE	SPIRANTHES POLYANTHA	GREEN LADIES-TRESSES
GUT1	S1	C2	N	STACHYS HYSSOPIFOLIA VAR LYTHROIDES	TALLAHASSEE HEDGE-NETTLE
G5	S1	N	LT	STAPHYLEA TRIFOLIA	AMERICAN BLADDERNUT
G4G5	S3	N	LE	STEWARTIA MALACODENDRON	SILKY CAMELLIA
G4G5T1	S1	C2	N	STILLINGIA SYLVATICA SSP TENUIS	A QUEEN'S DELIGHT
G?	S2	N	LE	STRUMPFIA MARITIMA	PRIDE-OF-BIG-PINE
G3G5	S3	N	LE	SURIANA MARITIMA	BAY CEDAR
G2	S2	C1	LE	TAXUS FLORIDANA	FLORIDA YEW
G2?	S1	N	LE	TECTARIA CORIANDRIFOLIA	HATTIE BAUER HALBERD FERN

FLORIDA NATURAL AREAS INVENTORY

SPECIAL PLANTS LIST

GLOBAL RANK	STATE RANK	FED STAT	STATE STAT	NAME	COMMON NAME
GH?Q	SH?	C2	(LT)	TECTARIA X AMESIANA	AMES HALBERD FERN
G1Q	S1	C1	N	TEPHROSIA ANGUSTISSIMA	A DEVIL'S SHOESTRING
G1G3	S1	C2	N	TEPHROSIA MOHRII	PINELAND HOARY-PEA
G3G5	S3	N	LT	TETRAZYGIA BICOLOR	TETRAZYGIA
G1	S1	C1	N	THALICTRUM COOLEYI	COOLEY'S MEADOWRUE
GXQ	SX	N	(LT)	THELYPTERIS MACILENTA	EDWARD'S MAIDEN FERN
G?	S1	N	LC	THRINAX MORRISII	BRITTLE THATCH PALM
G?	S2	N	LC	THRINAX RADIATA	FLORIDA THATCH PALM
G3G5	S3	N	LT	TILLANDSIA FLEXUOSA	BANDED WILD-PINE
G?	S2	N	LE	TILLANDSIA PRUINOSA	FUZZY-WUZZY AIR-PLANT
G1	S1	LE	LE	TORREYA TAXIFOLIA	FLORIDA TORREYA
G2	S2	C2	N	TRAGIA SAXICOLA	PINELAND NOSEBURN
G3	S2	N	LE	TRILLIUM LANCIFOLIUM	NARROW-LEAVED TRILLIUM
G1	S1	C2	(LT)	TRIPHORA CRAIGHEADII	CRAIGHEAD'S NODDING-CAPS
GH	SH	C2	(LT)	TRIPHORA LATIFOLIA	BROAD-LEAVED NODDING-CAPS
G2	S2	C1	N	TRIPSACUM FLORIDANUM	FLORIDA GAMA GRASS
G?	S1	N	LE	TROPIDIA POLYSTACHYA	YOUNG-PALM ORCHID
G4?	S1	N	N	ULMUS CRASSIFOLIA	CEDAR ELM
G?	S1	N	N	UVULARIA FLORIDANA	FLORIDA MERRYBELLS
G?	S2	N	LE	VANILLA BARBELLATA	WORM-VINE ORCHID
G1G3	S1	N	(LT)	VANILLA MEXICANA	SCENTLESS VANILLA
G5	S2	3C	LE	VERATRUM WOODII	FALSE HELLEBORE
G2	S2	C2	LT	VERBESINA CHAPMANII	CHAPMAN'S CROWNBEARD
G2	S2	C1	N	VERBESINA HETEROPHYLLA	VARIABLE-LEAF CROWNBEARD
G1	S1.	C1	LE	VICIA OCALENSIS	OCALA VETCH
G?	S1	N	LE	VIOLA HASTATA	HALBERD-LEAVED YELLOW VIOLET
G1	S1	PE	LE	WAREA AMPLEXIFOLIA	CLASPING WAREA
G1	S1	LE	LE	WAREA CARTERI	CARTER'S WAREA
G3G5	S2	C2	N	XYRIS DRUMMONDII	DRUMMOND'S YELLOW-EYED GRASS
G2?	S2	C2	N	XYRIS ISOETIFOLIA	QUILLWORT YELLOW-EYED GRASS
G2	S2	3C	LE	XYRIS LONGISEPALA	KARST POND XYRIS
G1G2Q	S1	C2	LT	XYRIS SCABRIFOLIA	HARPER'S YELLOW-EYED GRASS
G?	S1	N	LE	ZANTHOXYLUM FLAVUM	YELLOWHEART, SATINWOOD
G2G4	S2S3	3C	LE	ZEPHYRANTHES SIMPSONII	RAIN LILY
GH	SH	C2	N	ZIZIA LATIFOLIA	BRISTOL GOLDEN ALEXANDERS

NUMBER OF RECORDS: 350

FLORIDA NATURAL AREAS INVENTORY

SPECIAL VERTEBRATES LIST

GLOBAL RANK	STATE RANK	FED STAT	STATE STAT	NAME	COMMON NAME
** FISHES					
G5	S3	N	N	ACANTHARCHUS POMOTIS	MUD SUNFISH
G3	SA	LE	LE	ACIPENSER BREVIROSTRUM	SHORTNOSE STURGEON
G3	S2	C2	LS	ACIPENSER OXYRHYNCHUS	ATLANTIC STURGEON
G5	S3	N	N	AGONOSTOMUS MONTICOLA	MOUNTAIN MULLET
G3	S1	C2	LT	AMMOCRYPTA ASPRELLA	CRYSTAL DARTER
G5	SU	N	N	AWAOUS TAJASICA	RIVER GOBY
G5	S2	N	N	BAIRDIELLA SANCTAELUCIAE	STRIPED CROAKER
G5T2	S2	N	LS	CYPRINODON VARIEGATUS HUBBSI	LAKE EUSTIS PUPFISH
G5T2Q	S2	N	N	CYPRINODON VARIEGATUS POP 1	FLORIDA KEYS SHEEPSHEAD MINNOW
G5	S3	N	N	ENNEACANTHUS CHAETODON	BLACKBANDED SUNFISH
G4	S1	N	LS	ETHEOSTOMA HISTRIO	HARLEQUIN DARTER
G2	S2	LE	LE	ETHEOSTOMA OKALOOSAE	OKALOOSA DARTER
G5	S1	N	LS	ETHEOSTOMA OLMSTEDI	TESSELLATED DARTER
G4	S2	N	N	ETHEOSTOMA PARVIPINNE	GOLDSTRIPE DARTER
G5	S2	N	N	ETHEOSTOMA PROELIARE	CYPRESS DARTER
G5T4	S3	N	N	FUNDULUS GRANDIS SAGUANUS	SOUTHERN GULF KILLIFISH
G3	S2	N	LS	FUNDULUS JENKINSI	SALTMARSH TOPMINNOW
G5T2Q	S2	N	N	FUNDULUS SIMILIS SSP 1	FLORIDA KEYS SOUTHERN LONGNOSE KILLIFISH
G3	S3	N	N	GAMBUSIA RHIZOPHORAE	MANGROVE GAMBUSIA
G3?	S3?	N	N	GOBIONELLUS STIGMATURUS	SPOTTAIL GOBY
G5?	S2	N	N	HYBOGNATHUS HAYI	CYPRESS MINNOW
G5	S2	N	N	HYBOPSIS AESTIVALIS	SPECKLED CHUB
G4	S3	N	N	ICTALURUS BRUNNEUS	SNAIL BULLHEAD
G3	S3	N	N	ICTALURUS SERRACANTHUS	SPOTTED BULLHEAD
G5	S3	N	LS	LEPISOSTEUS SPATULA	ALLIGATOR GAR
G5T2Q	S2	N	N	LUCANIA PARVA POP 1	FLORIDA KEYS RAINWATER KILLIFISH
G2Q	S2	N	LT	MENIDIA CONCHORUM	KEY SILVERSIDE
G2G3	S2S3	N	LS	MICROPTERUS NOTIUS	SUWANNEE BASS
G2	S1	N	LS	MICROPTERUS SP 1	SHOAL BASS
G4	S1	N	LS	MOXOSTOMA CARINATUM	RIVER REDHORSE
G2	S2	N	N	MOXOSTOMA SP 1	GREYFIN REDHORSE

GLOBAL RANK	STATE RANK	FED STAT	STATE STAT	NAME	COMMON NAME
G2	S1	C2	LS	NOTROPIS CALLITAENIA	BLUESTRIPE SHINER
G5	S4	N	N	NOTROPIS CUMMINGSAE	DUSKY SHINER
G3	S2	N	N	NOTROPIS LEEDSI	BANNERFIN SHINER
G1	S1	C2	LE	NOTROPIS SP 2	BLACKMOUTH SHINER
G4	S4	N	N	NOTROPIS WELAKA	BLUENOSE SHINER
G3	S1S2	N	N	NOTROPIS ZONISTIUS	BANDFIN SHINER
G5	S3	N	N	OOSTETHUS BRACHYURUS	OPPOSUM PIPEFISH
G5	S1	N	N	PERCINA OUACHITAE	SADDLEBACK DARTER
G5	SA	N	N	PETROMYZON MARINUS	SEA LAMPREY
G5T2Q	S2	N	N	POECILIA LATIPINNA POP 1	FLORIDA KEYS SAILFIN MOLLY
G5	S2	N	LS	RIVULUS MARMORATUS	RIVULUS
G1	S1	N	LS	STARKSIA STARCKI	KEY BLENNY
G5	S3	N	N	UMBRA PYGMAEA	EASTERN MUDMINNOW
** AMPHIBIANS					
G4?	U	C2	N	AMBYSTOMA CINGULATUM	FLATWOODS SALAMANDER
G5	S3?	N	N	AMBYSTOMA TIGRINUM	TIGER SALAMANDER
G3	S3	N	N	AMPHIUMA PHOLETER	ONE-TOED AMPHIUMA
G5	S1	N	N	DESMOGNATHUS MONTICOLA	SEAL SALAMANDER
G2	S2	C2	LS	HAIDEOTRITON WALLACEI	GEORGIA BLIND SALAMANDER
G5	S2	N	N	HEMIDACTYLIUM SCUTATUM	FOUR-TOED SALAMANDER
G4	S3	AC	LS	HYLA ANDERSONII	PINE BARRENS TREEFROG
G3	S3	N	N	NOTOPHTHALMUS PERSTRIATUS	STRIPED NEWT
G5T1T2	S1S2	C2	N	PSEUDOBRANCHUS STRIATUS LUSTRICOLUS	GULF HAMMOCK DWARF SIREN
G5	S3	C2	LS	RANA AREOLATA	GOPHER FROG
G2	S2	N	LS	RANA OKALOOSAE	FLORIDA BOG FROG
G5	S2?	N	N	RANA VIRGATIPES	CARPENTER FROG
G4G5	S1	N	N	STEREOCHILUS MARGINATUS	MANY-LINED SALAMANDER

FLORIDA NATURAL AREAS INVENTORY

SPECIAL VERTEBRATES LIST

GLOBAL RANK	STATE RANK	FED STAT	STATE STAT	NAME	COMMON NAME
** REPTILES					
G5	S2	N	N	AGKISTRODON CONTORTRIX	COPPERHEAD
G5	S4	LTSA	LS	ALLIGATOR MISSISSIPPIENSIS	AMERICAN ALLIGATOR
G3	S2	LT	LT	CARETTA CARETTA	LOGGERHEAD
G3	S2	LE	LE	CHELONIA MYDAS	GREEN TURTLE
G5	S3?	N	N	CLEMMYS GUTTATA	SPOTTED TURTLE
G2?	S1	LE	LE	CROCODYLUS ACUTUS	AMERICAN CROCODILE
G5	S3	N	N	CROTALUS HORRIDUS	CANEBRAKE RATTLESNAKE
G3	S2	LE	LE	DERMOCHELYS CORIACEA	LEATHERBACK TURTLE
G5T1	S1	C2	LT	DIADOPHIS PUNCTATUS ACRICUS	KEY RINGNECK SNAKE
G4T3	S3	LT	LT	DRYMARCHON CORAIS COUPERI	EASTERN INDIGO SNAKE
G5T2Q	S2	N	LS	ELAPHE GUTTATA POP 1	LOWER KEYS RED RAT SNAKE
G3?	S1	LE	LE	ERETMOCHELYS IMBRICATA	HAWKSBILL
G5	S3	N	N	EUMECES ANTHRACINUS	COAL SKINK
G4?T2	S2	C2	LS	EUMECES EGREGIUS EGREGIUS	FLORIDA KEYS MOLE SKINK
G4?T1	S1	N	N	EUMECES EGREGIUS INSULARIS	CEDAR KEYS MOLE SKINK
G4?T2	S2	PT	LT	EUMECES EGREGIUS LIVIDUS	BLUE-TAILED MOLE SKINK
G5T?	U	N	N	FARANCIA ERYTROGRAMMA SEMINOLA	SOUTH FLORIDA RAINBOW SNAKE
G2	S2	C2	LS	GOPHERUS POLYPHEMUS	GOPHER TORTOISE
G2	S2	C2	LS	GRAPTEMYS BARBOURI	BARBOUR'S MAP TURTLE
G4?	S2	N	LS	GRAPTEMYS PULCHRA	ALABAMA MAP TURTLE
G5T2Q	S1S2	C2	LE	KINOSTERNON BAURII BAURII	KEY MUD TURTLE
G5	S2S3	N	N	LAMPROPELTIS CALLIGASTER	MOLE SNAKE
G5T2	S2	N	N	LAMPROPELTIS GETULUS GOINI	APALACHICOLA COMMON KINGSNAKE
G1	S1	LE	LE	LEPIDOCHELYS KEMPII	ATLANTIC RIDLEY
G3?	S3?	C2	LS	MACROCLEMYS TEMMINCKII	ALLIGATOR SNAPPING TURTLE
G5T2?	S2?	N	N	MALACLEMYS TERRAPIN RHIZOPHORARUM	MANGROVE TERRAPIN
G2	S2	PT	LT	NEOSEPS REYNOLDSI	SAND SKINK
G5T3	S3?	N	N	NERODIA FASCIATA CLARKII	GULF SALT MARSH SNAKE
G5T1Q	S1	LT	LT	NERODIA FASCIATA TAENIATA	ATLANTIC SALT MARSH SNAKE
G5T3?	U	C2	LS	PITUOPHIS MELANOLEUCAS MUGITUS	FLORIDA PINE SNAKE
G1	SU	PT	N	PSEUDEMYS ALABAMENSIS	ALABAMA RED-BELLIED TURTLE
G5T3	S3	3C	LS	PSEUDEMYS CONCINNA SUWANNIENSIS	SUWANEE COOTER
G3	S3	C2	N	SCELOPORUS WOODI	FLORIDA SCRUB LIZARD
G3	S3	C2	LT	STILOSOMA EXTENUATUM	SHORT-TAILED SNAKE
G5T1Q	S1	N	LT	STORERIA DEKAYI POP 1	LOWER KEYS BROWN SNAKE
G1G2Q	S1S2	C2	LT	TANTILLA OOLITICA	RIM ROCK CROWNED SNAKE
G5T1Q	S1	N	LT	THAMNOPHIS SAURITUS POP 1	LOWER KEYS RIBBON SNAKE
G5T4?	S2?	N	N	TRIONYX MUTICUS CALVATUS	GULF COAST SMOOTH SOFTSHELL
** BIRDS					
G4	S3?	N	N	ACCIPITER COOPERII	COOPER'S HAWK
G5	S2S3	N	LS	AJAIA AJAJA	ROSEATE SPOONBILL
G4T3	S1	N	N	AMMODRAMUS MARITIMUS FISHERI	LOUISIANA SEASIDE SPARROW
G4T2	S2	C2	LS	AMMODRAMUS MARITIMUS JUNCICOLUS	WAKULLA SEASIDE SPARROW
G4T1	S1	LE	LE	AMMODRAMUS MARITIMUS MIRABILIS	CAPE SABLE SEASIDE SPARROW
G4TX	SX	LE	LE	AMMODRAMUS MARITIMUS NIGRESCENS	DUSKY SEASIDE SPARROW
G4T2Q	S2?	C2	N	AMMODRAMUS MARITIMUS PELONOTUS	SMYRNA SEASIDE SPARROW
G4T2	S2	N	LS	AMMODRAMUS MARITIMUS PENINSULAE	SCOTT'S SEASIDE SPARROW
G4T1	S1	LE	LE	AMMODRAMUS SAVANNARUM FLORIDANUS	FLORIDA GRASSHOPPER SPARROW
G5	S1	N	N	ANOUS STOLIDUS	BROWN NODDY
G5T3	S3	LT	LT	APHELOCOMA COERULESCENS COERULESCENS	FLORIDA SCRUB JAY
G5	S3	N	LS	ARAMUS GUARAUNA	LIMPKIN
G5T2	S2	N	N	ARDEA HERODIAS OCCIDENTALIS	GREAT WHITE HERON
G5T3	S3	N	LS	ATHENE CUNICULARIA FLORIDANA	FLORIDA BURROWING OWL
G4?	S3	N	N	BUTEO BRACHYURUS	SHORT-TAILED HAWK
GH	SX	LE	LE	CAMPEPHILUS PRINCIPALIS	IVORY-BILLED WOODPECKER
G5	S4	N	N	CASMERODIUS ALBUS	GREAT EGRET
G4?	S2	C2	LT	CHARADRIUS ALEXANDRINUS	SNOWY PLOVER

FLORIDA NATURAL AREAS INVENTORY

SPECIAL VERTEBRATES LIST

GLOBAL RANK	STATE RANK	FED STAT	STATE STAT	NAME	COMMON NAME
G2	S2	LT	LT	CHARADRIUS MELODUS	PIPING PLOVER
G4	S3	N	N	CHORDEILES GUNDLACHII	ANTILLEAN NIGHTHAWK
G5T3	S2	N	LS	CISTOTHORUS PALUSTRIS GRISEUS	WORTHINGTON'S MARSH WREN
G5T3	S3?	N	LS	CISTOTHORUS PALUSTRIS MARIANAE	MARIAN'S MARSH WREN
G5	S3	N	N	COCCYZUS MINOR	MANGROVE CUCKOO
G3	S2	C2	LT	COLUMBA LEUCOCEPHALA	WHITE-CROWNED PIGEON
GX	SX	N	N	CONUROPSIS CAROLINENSIS	CAROLINA PARAKEET
G5T3	S3	N	N	DENDROICA DISCOLOR PALUDICOLA	FLORIDA PRAIRIE WARBLER
G5T3Q	S2S3	C2	N	DENDROICA DOMINICA STODDARDI	STODDARD'S YELLOW-THROATED WARBLER
G1	S1	LE	LE	DENDROICA KIRTLANDII	KIRTLAND'S WARBLER
G5T4	S3	N	LS	DENDROICA PETECHIA GUNDLACHI	CUBAN YELLOW WARBLER
GX	SX	N	N	ECTOPISTES MIGRATORIUS	PASSENGER PIGEON
G5	S4	N	LS	EGRETTA CAERULEA	LITTLE BLUE HERON
G4	S2	C2	LS	EGRETTA RUFESCENS	REDDISH EGRET
G5	S4	N	LS	EGRETTA THULA	SNOWY EGRET
G5	S4	N	LS	EGRETTA TRICOLOR	TRICOLORED HERON
G5	S1S3	N	N	ELANUS CAERULEUS	BLACK-SHOULDERED KITE
G5	S4	N	N	EUDOCIMUS ALBUS	WHITE IBIS
G4	SU	N	N	FALCO COLUMBARIUS	MERLIN
G3	S2	LT	LE	FALCO PEREGRINUS	PEREGRINE FALCON
G5T3T4	S3?	C2	LT	FALCO SPARVERIUS PAULUS	SOUTHEASTERN AMERICAN KESTREL
G5	S1	N	N	FREGATA MAGNIFICENS	MAGNIFICENT FRIGATEBIRD
G3	SX	N	N	GEOTRYGON CHRYSIA	KEY WEST QUAIL-DOVE
G1	SX	LE	N	GRUS AMERICANA	WHOOPING CRANE
G5T2T3	S2S3	N	LT	GRUS CANADENSIS PRATENSIS	FLORIDA SANDHILL CRANE
G5	S3	N	LS	HAEMATOPUS PALLIATUS	AMERICAN OYSTERCATCHER
G3	S2S3	LE	LT	HALIAEETUS LEUCOCEPHALUS	BALD EAGLE
G5	S1	N	N	HELMITHEROS VERMIVORUS	WORM-EATING WARBLER
G5	S4	N	N	IXOBRYCHUS EXILIS	LEAST BITTERN
G5	S3?	N	N	LATERALLUS JAMAICENSIS	BLACK RAIL
G5	S2	LE	LE	MYCTERIA AMERICANA	WOOD STORK
G5	S3?	N	N	NYCTICORAX NYCTICORAX	BLACK-CROWNED NIGHT-HERON
G5	S3?	N	N	NYCTICORAX VIOLACEUS	YELLOW-CROWNED NIGHT-HERON
G5	S3S4	N	LS*	PANDION HALIAETUS	OSPREY
G5	S3	AC	LS	PELECANUS OCCIDENTALIS	BROWN PELICAN
G2	S2	LE	LT	PICOIDES BOREALIS	RED-COCKADED WOODPECKER
G5	S3?	N	N	PICOIDES VILLOSUS	HAIRY WOODPECKER
G5	S2	N	N	PLEGADIS FALCINELLUS	GLOSSY IBIS
G5	S2	PT	LT	POLYBORUS PLANCUS	CRESTED CARACARA
G5T3	S3	C2	N	RALLUS LONGIROSTRIS INSULARUM	MANGROVE CLAPPER RAIL
G5T3?	S3?	N	N	RALLUS LONGIROSTRIS SCOTTII	FLORIDA CLAPPER RAIL
G5	S1S2	N	N	RECURVIROSTRA AMERICANA	AMERICAN AVOCET
G4?T1	S1	LE	LE	ROSTRHAMUS SOCIABILIS PLUMBEUS	SNAIL KITE
G5	S3	N	N	RYNCHOPS NIGER	BLACK SKIMMER
G5	S3	N	N	SEIURUS MOTACILLA	LOUISIANA WATERTHRUSH
G5	S3	N	N	SETOPHAGA RUTICILLA	AMERICAN REDSTART
G5	S2	N	N	SITTA CAROLINENSIS	WHITE-BREASTED NUTHATCH
G4	S3	N	LT	STERNA ANTILLARUM	LEAST TERN
G5	S2?	N	N	STERNA CASPIA	CASPIAN TERN
G3	S1	PT	LT	STERNA DOUGALLII	ROSEATE TERN
G5	S1	N	N	STERNA FUSCATA	SOOTY TERN
G5	S3	N	N	STERNA MAXIMA	ROYAL TERN
G4?	S2	N	N	STERNA SANDVICENSIS	SANDWICH TERN
GH	SH	LE	LE	VERMIVORA BACHMANII	BACHMAN'S WARBLER
G5	S3	N	N	VIREO ALTILOQUUS	BLACK-WHISKERED VIREO
G5	SX	N	N	ZENAIDA AURITA	ZENAIDA DOVE

* = Applicable in Monroe County only

** MAMMALS

GLOBAL RANK	STATE RANK	FED STAT	STATE STAT	NAME	COMMON NAME
G4	SX	LE	N	BISON BISON	BISON
G5T1	S1	C2	LS	BLARINA CAROLINENSIS SHERMANI	SHERMAN'S SHORT-TAILED SHREW
G4	SX	LE	N	CANIS LUPUS	GRAY WOLF
GH	SX	LE	N	CANIS RUFUS	RED WOLF
G5	S3	N	N	EPTESICUS FUSCUS	BIG BROWN BAT
G5?T2?	S2?	C2	N	EUMOPS GLAUCINUS FLORIDANUS	FLORIDA MASTIFF BAT
G4T1	S1	LE	LE	FELIS CONCOLOR CORYI	FLORIDA PANTHER

FLORIDA NATURAL AREAS INVENTORY

SPECIAL VERTEBRATES LIST

GLOBAL RANK	STATE RANK	FED STAT	STATE STAT	NAME	COMMON NAME
G5THQ	SH	3A	LE	GEOMYS PINETIS GOFFI	GOFF'S POCKET GOPHER
G5	SU	N	N	LASIURUS CINEREUS	HOARY BAT
G5T1	S1	C2	LS	MICROTUS PENNSYLVANICUS DUKECAMPBELLI	SALTMARSH VOLE
GH	SH	LE	N	MONACHUS TROPICALIS	CARIBBEAN MONK SEAL
G5T4	S3?	N	N	MUSTELA FRENATA OLIVACEA	SOUTHEASTERN WEASEL
G5T3	S3?	C2	N	MUSTELA FRENATA PENINSULAE	FLORIDA WEASEL
G5T2?	S2?	C2	LT	MUSTELA VISON EVERGLADENSIS	EVERGLADES MINK
G5T3	S3	C2	N	MUSTELA VISON LUTENSIS	FLORIDA MINK
G5T5	S3	N	N	MUSTELA VISON MINK	SOUTHERN MINK
G2	S1	LE	LE	MYOTIS GRISESCENS	GRAY BAT
G5	SH	N	N	MYOTIS KEENII	KEEN'S BAT
G3	SH	LE	LE	MYOTIS SODALIS	INDIANA BAT
G3?	S3?	C2	N	NEOFIBER ALLENI	ROUND-TAILED MUSKRAT
G5T1	S1	LE	LE	NEOTOMA FLORIDANA SMALLI	KEY LARGO WOODRAT
G5T1	S1	LE	LE	ODOCOILEUS VIRGINIANUS CLAVIUM	KEY DEER
G2Q	S2	C1	LE	ORYZOMYS ARGENTATUS	SILVER RICE RAT
G5T1	S1	C2	N	ORYZOMYS PALUSTRIS PLANIROSTRIS	PINE ISLAND RICE RAT
G5T1	S1	C2	LS	ORYZOMYS PALUSTRIS SANIBELI	SANIBEL ISLAND RICE RAT
G5T1	S1	LE	LE	PEROMYSCUS GOSSYPINUS ALLAPATICOLA	KEY LARGO COTTON MOUSE
G5T1	S1	C2	N	PEROMYSCUS GOSSYPINUS ANASTASAE	ANASTASIA ISLAND COTTON MOUSE
G5T1	S1	C2	LE	PEROMYSCUS GOSSYPINUS RESTRICTUS	CHADWICK BEACH COTTON MOUSE
G5T1	S1	LE	LE	PEROMYSCUS POLIONOTUS ALLOPHRYS	CHOCTAWHATCHEE BEACH MOUSE
G5T1	S1	3A	LE	PEROMYSCUS POLIONOTUS DECOLORATUS	PALLID BEACH MOUSE
G5T1	SH	LE	LE	PEROMYSCUS POLIONOTUS TRISSYLLEPSIS	PERDIDO KEY BEACH MOUSE
G4	S3?	C2	N	PLECOTUS RAFINESQUII	SOUTHEASTERN BIG-EARED BAT
G3	S3	C2	LS	PODOMYS FLORIDANUS	FLORIDA MOUSE
G5T2?	S2?	C2	N	PROCYON LOTOR AUSPICATUS	KEY VACA RACCOON
G5T2	S2	C2	LT	SCIURUS NIGER AVICENNIA	MANGROVE FOX SQUIRREL

GLOBAL RANK	STATE RANK	FED STAT	STATE STAT	NAME	COMMON NAME
G5T3	S3	C2	LS	SCIURUS NIGER SHERMANI	SHERMAN'S FOX SQUIRREL
G5T2	S2	3C	N	SIGMODON HISPIDUS EXSPUTUS	LOWER KEYS COTTON RAT
G5T1T2	S1S2	C2	N	SIGMODON HISPIDUS INSULICOLA	INSULAR COTTON RAT
G5T1	S1	C2	LS	SOREX LONGIROSTRIS EIONIS	HOMOSSASSA SHREW
G5T4	S4	N	N	SOREX LONGIROSTRIS LONGIROSTRIS	SOUTHEASTERN SHREW
G5T2	S2	C2	N	SYLVILAGUS PALUSTRIS HEFNERI	LOWER KEYS RABBIT
G5	S1	N	LS	TAMIAS STRIATUS	EASTERN CHIPMUNK
G2?	S2?	LE	LE	TRICHECHUS MANATUS	WEST INDIAN MANATEE
G5T3	S3	C2	LT*	URSUS AMERICANUS FLORIDANUS	FLORIDA BLACK BEAR

* = Not applicable in Baker and Columbia counties and Apalachicola National Forest

FLORIDA NATURAL AREAS INVENTORY

MARCH 1986

SPECIAL INVERTEBRATES LIST

GLOBAL RANK	STATE RANK	FED STATUS	ST STATUS	NAME	COMMON NAME
PORIFERA					
U	U	C2	N	DOSILIA PALMERI	OKLAWAHA SPONGE
U	U	C2	N	EPHYDATIA SUBTILIS	KISSIMMEE SPONGE
CNIDARIA: ANTHOZOA					
U	U	N	N	ACROPORA CERVICORNIS	STAGHORN CORAL
U	U	N	N	ACROPORA PALMATA	ELKHORN CORAL
U	U	N	N	ACROPORA PROLIFERA	STAGHORN CORAL
U	U	N	N	AGARICIA AGARICITES	LETTUCE CORAL
U	U	N	N	COLPOPHYLLIA NATANS	GIANT BRAIN CORAL
U	U	N	N	DENDROGYRA CYLINDRUS	PILLAR CORAL
U	U	N	N	DIPLORIA CLIVOSA	BRAIN CORAL
U	U	N	N	DIPLORIA LABYRINTHIFORMIS	BRAIN CORAL
U	U	N	N	DIPLORIA STRIGOSA	BRAIN CORAL
U	U	N	N	EUSMILIA FASTIGIATA	FLOWER CORAL
U	U	N	N	MEANDRINA MEANDRITES	BRAIN CORAL
U	U	N	N	MONTASTREA ANNULARIS	SMALL STAR CORAL
U	U	N	N	MONTASTREA CAVERNOSA	LARGE STAR CORAL
U	U	N	N	MUSSA ANGULOSA	LARGE FLOWER CORAL
U	U	N	N	SIDERASTREA SIDEREA	STARLET CORAL
MOLLUSCA: GASTROPODA					
U	U	N	N	AMNICOLA SP 1	
G1	S1	C2	N	APHAOSTRACON ASTHENES	BLUE SPRING APHAOSTRACON
G1	S1	N	N	APHAOSTRACON CHALAROGYRUS	LOOSE-COILED SNAIL
G1	S1	C2	N	APHAOSTRACON MONAS	WEKIWA SPRING APHAOSTRACON
G1	S1	C2	N	APHAOSTRACON PYCNUS	THICK-SHELLED APHAOSTRACON
G1	S1	N	N	APHAOSTRACON THEIOCRENETUS	SULFUR SPRING APHAOSTRACON
G1	S1	C2	N	APHAOSTRACON XYNOELICTUS	FENNEY SPRINGS APHAOSTRACON
G1	S1	C2	N	CINCINNATIA HELICOGYRA	HELICOID SPRING SNAIL
G1	S1	C2	N	CINCINNATIA MICA	SAND GRAIN SNAIL
G1	S1	C2	N	CINCINNATIA MONROENSIS	ENTERPRISE SPRING SNAIL
G1	S1	C2	N	CINCINNATIA PARVA	BLUE SPRING SNAIL
G1	S1	C2	N	CINCINNATIA PONDEROSA	PONDEROSA SPRING SNAIL
G1	S1	C2	N	CINCINNATIA VANHYNINGI	SEMINOLE SPRING SNAIL
G1	S1	C2	N	CINCINNATIA WEKIWAE	WEKIWA SPRING SNAIL
U	SU	N	N	DRYMAEUS MULTILINEATUS FORM LATIZONATUS	WIDE-BANDED FOREST SNAIL
U	U	N	N	ELIMIA ALBANYENSIS	
G2	S2	N	N	ELIMIA CLENCHI	CLENCH'S ELIMIA
U	S2	N	LS	LIGUUS FASCIATUS MATECUMBENSIS	FLORIDA TREE SNAIL
U	S1	N	LS	LIGUUS FASCIATUS SEPTENTRIONALIS	FLORIDA TREE SNAIL
U	S1	N	LS	LIGUUS FASCIATUS SOLIDUS	FLORIDA TREE SNAIL
G3	S3	N	N	ORTHALICUS FLORIDENSIS	BANDED TREE SNAIL
G2T2	S2	N	N	ORTHALICUS RESES NESODRYAS	FLORIDA KEYS TREE SNAIL
G2T1	S1	LT	LT	ORTHALICUS RESES RESES	STOCK ISLAND TREE SNAIL
U	U	C2	N	VERTIGO HEBARDI	
MOLLUSCA: BIVALVIA					
U	U	C2	N	ALASMIDONTA WRIGHTIANA	A MUSSEL
G2	S2	N	N	LAMPSILIS HADDLETONI	HADDLETON'S LAMPSILID CLAM
G3?	S3?	N	N	PANOPEA BITRUNCATA	ATLANTIC GEODUCK
G2	S2	N	N	PTYCHOBRANCHUS JONESI	JONES' LAMPSILID CLAM
G2	S2	C2	N	VILLOSA CHOCTAWENSIS	ATHEARN'S VILLOSA
ARACHNIDA: AMBLYPYGI					
U	U	N	N	PARAPHRYNUS RAPTATOR	DUSKY-HANDED TAILLESS WHIP SCORPION
ARACHNIDA: ARANEAE					
U	U	C2	N	CEGONIA IRVINGI	KEY GNAPHOSID SPIDER
U	U	C2	N	CYCLOCOSMIA TORREYA	TORREYA TRAP-DOOR SPIDER
U	U	N	N	EUSTALA ELEUTHRA	ORB WEAVER
U	U	N	N	GEOLYCOSA XERA	MCCRONE'S BURROWING WOLF SPIDER
U	U	N	N	HABROCESTUM PARVULUM	JUMPING SPIDER
U	U	N	N	LATRODECTUS BISHOPI	RED WIDOW SPIDER
U	U	C2	N	LYCOSA ERICETICOLA	ROSEMARY WOLF SPIDER
U	U	N	N	PHIDIPPUS XERUS	JUMPING SPIDER
U	U	C2	N	SOSIPPUS PLACIDUS	LAKE PLACID FUNNEL WOLF SPIDER
U	U	N	N	SPHODROS ABBOTI	PURSE-WEB SPIDER
U	U	N	N	UMMIDIA SP 1	
MALACOSTRACA: DECAPODA					
G4	S3S4	N	N	ARATUS PISONII	MANGROVE CRAB
G2	S2	N	N	CAMBARUS CRYPTODYTES	DOUGHERTY PLAIN CAVE CRAYFISH

FLORIDA NATURAL AREAS INVENTORY

SPECIAL INVERTEBRATES LIST

MARCH 1986

GLOBAL RANK	STATE RANK	FED STATUS	ST STATUS	NAME	COMMON NAME
G5	S4	N	N	CONIOPSIS CRUENTATA	MANGROVE CRAB
G1	S1	C1	N	PALAEMONETES CUMMINGI	FLORIDA CAVE SHRIMP
G1	S1	C2	N	PROCAMBARUS ACHERONTIS	ORLANDO CAVE CRAYFISH
G1	S1	N	N	PROCAMBARUS ERYTHROPS	RED-EYED CAVE CRAYFISH
G1	S1	N	N	PROCAMBARUS FRANZI	ORANGE LAKE CAVE CRAYFISH
G1	S1	N	N	PROCAMBARUS HORSTI	HORST'S CAVE CRAYFISH
G2	S2	N	N	PROCAMBARUS LEITHEUSERI	LEITHEUSER'S CAVE CRAYFISH
G3	S3	N	N	PROCAMBARUS LUCIFUGUS	LIGHT-FLEEING CAVE CRAYFISH
G1	S1	N	N	PROCAMBARUS MILLERI	MILLER'S CAVE CRAYFISH
G2	S2	N	N	PROCAMBARUS ORCINUS	WOODVILLE CAVE CRAYFISH
G2G3	S2S3	N	N	PROCAMBARUS PALLIDUS	PALLID CAVE CRAYFISH
G2	S2	N	N	PROCAMBARUS PICTUS	BLACK CREEK CRAYFISH
G1	S1	N	N	PROCAMBARUS SP 1	A CAVE CRAYFISH
G4?	SH	N	N	SESARMA BENEDICTI	BENEDICT'S WHARF CRAB
G2	S2	N	N	TROGLOCAMBARUS MACLANEI	MCLANE'S CAVE CRAYFISH
U	U	N	N	TROGLOCAMBARUS SP 1	

MALACOSTRACA: ISOPODA

GLOBAL RANK	STATE RANK	FED STATUS	ST STATUS	NAME	COMMON NAME
G1	S1	N	N	CAECIDOTEA HOBBSI	HOBBS' CAVE ISOPOD
U	U	N	N	CAECIDOTEA PARVA	
U	U	N	N	CAECIDOTEA SP 1	

MALACOSTRACA: AMPHIPODA

GLOBAL RANK	STATE RANK	FED STATUS	ST STATUS	NAME	COMMON NAME
G2	S2	C2	N	CRANGONYX GRANDIMANUS	FLORIDA CAVE AMPHIPOD
G2G3	S2S3	C2	N	CRANGONYX HOBBSI	HOBBS' CAVE AMPHIPOD
U	U	N	N	CRANGONYX SP 1	

INSECTA: EPHEMEROPTERA

GLOBAL RANK	STATE RANK	FED STATUS	ST STATUS	NAME	COMMON NAME
U	U	C2	N	DOLANIA AMERICANA	AMERICAN SAND-BURROWING MAYFLY
U	U	C2	N	HOMOEONEURIA DOLANI	BLACKWATER SAND-FILTERING MAYFLY
U	U	C2	N	PSEUDIRON MERIDIONALIS	MERIDION BLACKWATER MAYFLY

INSECTA: ODONATA

GLOBAL RANK	STATE RANK	FED STATUS	ST STATUS	NAME	COMMON NAME
U	U	N	N	ARGIALLAGMA PALLIDULUM	EVERGLADES SPRITE
G2	S2	C1	N	CORDULEGASTER SAYI	SAY'S SPIKETAIL
U	U	N	N	DIDYMOPS FLORIDENSIS	MAIDENCANE CRUISER
U	U	N	N	DROMOGOMPHUS ARMATUS	SOUTHEASTERN RAKELEG
U	U	N	N	ENALLAGMA TRAVIATUM	SLENDER BLUET
U	U	N	N	ERPETOGOMPHUS DESIGNATUS	EASTERN RINGTAIL
U	U	N	N	GOMPHAESCHNA ANTILOPE	SOOTY DARNER
U	U	N	N	GOMPHUS CAVILLARIS	SANDHILL CLUBTAIL
U	U	N	N	GOMPHUS DIMINUTUS	DIMINUTIVE CLUBTAIL
U	U	N	N	GOMPHUS GEMINATUS	TWIN-STRIPED CLUBTAIL
U	U	N	N	GOMPHUS HODGESI	HODGES' CLUBTAIL
U	U	N	N	GOMPHUS HYBRIDUS	COCOA CLUBTAIL
U	U	N	N	GOMPHUS MODESTUS	GULF CLUBTAIL
U	U	C2	N	GOMPHUS TOWNESI	BRONZE CLUBTAIL DRAGONFLY
U	U	N	N	GOMPHUS VASTUS	COBRA CLUBTAIL
U	U	N	N	HELOCORDULIA SELYSII	SELYS' SKIMMER
U	U	N	N	HETAERINA AMERICANA	COMMON RUBYWING
U	U	N	N	LESTES INAEQUALIS	ELEGANT DRYAD
U	U	N	N	LIBELLULA JESSEANA	PURPLE CHASER
U	U	N	N	MACROMIA ALLEGHANIENSIS	ALLEGHENY RIVER CRUISER
U	U	N	N	NANNOTHEMIS BELLA	BOG ELF
U	U	C2	N	NEUROCORDULIA CLARA	APALACHICOLA TWILIGHT SKIMMER DRAGONFLY
U	U	N	N	NEUROCORDULIA MOLESTA	SMOKY SHADOWFLY
U	U	N	N	NEUROCORDULIA OBSOLETA	UMBER SHADOWFLY
U	U	N	N	PROGOMPHUS ALACHUENSIS	TAWNY SAND CLUBTAIL
U	U	C2	N	PROGOMPHUS BELLEI	BELLE'S SAND CLUBTAIL
G1G3	U	C1	N	SOMATOCHLORA CALVERTI	CALVERT'S EMERALD
U	U	N	N	SOMATOCHLORA GEORGIANA	COPPERY EMERALD
U	U	N	N	STYLURUS LAURAE	LAURA'S CLUBTAIL
U	U	N	N	STYLURUS POTULENTUS	YELLOW-SIDED CLUBTAIL
U	U	N	N	STYLURUS TOWNESI	TOWNES' CLUBTAIL
G4G5	U	N	N	TACHOPTERYX THOREYI	GRAY PETALTAIL
U	U	N	N	TETRAGONEURIA SPINOSA	ROBUST TONGTAIL

INSECTA: ORTHOPTERA

GLOBAL RANK	STATE RANK	FED STATUS	ST STATUS	NAME	COMMON NAME
U	U	C2	N	BELOCEPHALUS MICANOPY	BIG PINE KEY CONEHEAD
U	U	C2	N	BELOCEPHALUS SLEIGHTI	KEYS SHORT-WINGED CONEHEAD
U	U	C2	N	CYCLOPTILUM IRREGULARIS	KEYS SCALY CRICKET
U	U	C2	N	TETTIGIDEA EMPEDONEPIA	TORREYA PYGMY GRASSHOPPER

INSECTA: MALLOPHAGA

GLOBAL RANK	STATE RANK	FED STATUS	ST STATUS	NAME	COMMON NAME
U	U	N	N	ACTORNITHOPHILUS GRANDICEPS	MALLOPHAGA
U	U	N	N	ACUTIFRONS MEXICANUS	MALLOPHAGA
U	U	N	N	ARDEICOLA LOCULATOR	MALLOPHAGA
U	U	N	N	AUSTROMENOPON HAEMATOPI	MALLOPHAGA
U	U	N	N	BRUEELIA DEFICIENS	MALLOPHAGA
U	U	N	N	CICONIPHILUS QUADRIPUSTULATUS	MALLOPHAGA
U	U	N	N	COLPOCEPHALUM FLAVESCENS	MALLOPHAGA
U	U	N	N	COLPOCEPHALUM MYCTERIAE	MALLOPHAGA

SPECIAL INVERTEBRATES LIST

GLOBAL/STATE RANK		FED/ST STATUS		NAME	COMMON NAME
U	U	N	N	COLPOCEPHALUM OCCIDENTALIS	MALLOPHAGA
U	U	N	N	COLPOCEPHALUM POLYBORI	MALLOPHAGA
U	U	N	N	COLPOCEPHALUM SCALARIFORME	MALLOPHAGA
U	U	N	N	COLPOCEPHALUM SPINEUM	MALLOPHAGA
U	U	N	N	CRASPEDORRHYNCHUS HALIETI	MALLOPHAGA
U	U	N	N	CRASPEDORRHYNCHUS OBSCURUS	MALLOPHAGA
U	U	N	N	DEGEERIELLA DISCOCEPHALUS	MALLOPHAGA
U	U	N	N	DEGEERIELLA RUFA CARRUTHI	MALLOPHAGA
U	U	N	N	ESTHIOPTERUM BREVICEPHALUM	MALLOPHAGA
U	U	N	N	FALCOLIPEURUS JOSEPHI	MALLOPHAGA
U	U	N	N	FALCOLIPEURUS QUADRIGUTTATUS	MALLOPHAGA
U	U	N	N	FELICOLA SP 1	
U	U	N	N	FREGATIELLA AURIFASCIATA	MALLOPHAGA
U	U	N	N	GRUIMENOPON CANADENSE	MALLOPHAGA
U	U	N	N	HELEONOMUS ASSIMILIS	MALLOPHAGA
U	U	N	N	KURODAIA HALIAEETI	MALLOPHAGA
U	U	N	N	NEOPHILOPTERUS HETEROPYGUS	MALLOPHAGA
U	U	N	N	PECTINOPYGUS FREGATIPHAGUS	MALLOPHAGA
U	U	N	N	PECTINOPYGUS OCCIDENTALIS	MALLOPHAGA
U	U	N	N	PIAGETIELLA BURSAEPELECANI	MALLOPHAGA
U	U	N	N	QUADRACEPS AURATUS	MALLOPHAGA
U	U	N	N	QUADRACEPS GIEBELI	MALLOPHAGA
U	U	N	N	QUADRACEPS NYCHTHEMERUS	MALLOPHAGA
U	U	N	N	SAEMUNDSSONIA HAEMATOPI	MALLOPHAGA
U	U	N	N	SAEMUNDSSONIA MELANOCEPHALUS	MALLOPHAGA
U	U	N	N	TRICHODECTES PINGUIS EUARCTIDOS	MALLOPHAGA

INSECTA: COLEOPTERA

GLOBAL/STATE RANK		FED/ST STATUS		NAME	COMMON NAME
U	U	N	N	ACANTHOCERUS AENEUS	SCARAB BEETLE
U	U	C2	N	ANOMALA EXIGUA	EXIGUOUS ANOMALA SCARAB BEETLE
U	U	C2	N	ANOMALA EXIMIA	ARCHBOLD ANOMALA SCARAB BEETLE
U	U	N	N	ANOMALA FLAVIPENNIS OKALOUSENSIS	SCARAB BEETLE
U	U	N	N	ANOMALA ROBINSONI	SCARAB BEETLE
U	U	N	N	APHODIUS AEGROTUS	SCARAB BEETLE
U	U	N	N	APHODIUS HALDEMANI	SCARAB BEETLE
U	U	N	N	APHODIUS LAEVIGATUS	SCARAB BEETLE
U	U	C2	N	APHODIUS TROGLODYTES	APHODIUS TORTOISE COMMENSAL SCARAB BEETLE
U	U	N	N	APHOTAENIUS CAROLINUS	SCARAB BEETLE
U	U	N	N	ATAENIUS BREVICOLLIS	SCARAB BEETLE
U	U	N	N	ATAENIUS HAVANENSIS	SCARAB BEETLE
U	U	N	N	ATAENIUS RUDELLUS	SCARAB BEETLE
U	U	N	N	ATAENIUS SARAMARI	SCARAB BEETLE
U	U	N	N	ATAENIUS SCIURUS	SCARAB BEETLE
U	U	N	N	ATAENIUS STROHECKERI	SCARAB BEETLE
U	U	C2	N	ATAENIUS SUPERFICIALIS	BIG PINE KEY ATAENIUS DUNG BEETLE
U	U	C2	N	ATAENIUS WOODRUFFI	WOODRUFF'S ATAENIUS DUNG BEETLE
U	U	N	N	BOLBOCEROSOMA HAMATUM	SCARAB BEETLE
U	U	C2	N	COPRIS GOPHERI	COPRIS TORTOISE COMMENSAL SCARAB BEETLE
U	U	N	N	COPRIS HOWDENI	SCARAB BEETLE
U	U	N	N	COTINIS SP 1	SCARAB BEETLE
U	U	N	N	CREMASTHOCHEILUS SQUAMULOSUS	SCARAB BEETLE
U	U	C2	N	CYCLOCEPHALA MIAMIENSIS	MIAMI ROUNDHEAD SCARAB BEETLE
U	U	C2	N	DESMOPACHRIA CENCHRAMIS	FIG SEED DIVING BEETLE
U	U	N	N	DIPLOTAXIS RUFA	SCARAB BEETLE
U	U	N	N	EUCANTHUS ALUTACEUS	SCARAB BEETLE
U	U	C2	N	GRONOCARUS MULTISPINOSUS	SPINY FLORIDA SANDHILL SCARAB BEETLE
U	U	N	N	HYPOTRICHIA SPISSIPES	SCARAB BEETLE
U	U	C2	N	MICRONASPIS FLORIDANA	FLORIDA INTERTIDAL FIREFLY
U	U	N	N	MYCOTRUPES CARTWRIGHTI	SCARAB BEETLE
U	U	N	N	MYCOTRUPES GAIGEI	SCARAB BEETLE
U	U	C2	N	MYCOTRUPES PEDESTER	SCRUB ISLAND BURROWING SCARAB BEETLE
U	U	C2	N	NICROPHORUS AMERICANUS	
U	U	N	N	ONTHOPHAGUS ACICULATULUS	SCARAB BEETLE
U	U	C2	N	ONTHOPHAGUS POLYPHEMI POLYPHEMI	ONTHOPHAGUS TORTOISE COMMENSAL SCARAB BEETLE
U	U	C2	N	ONTHOPHAGUS POLYPHEMI SPARSISETOSUS	ONTHOPHAGUS TORTOISE COMMENSAL SCARAB BEETLE
U	U	N	N	PELTOTRUPES PROFUNDUS	SCARAB BEETLE
U	U	C2	N	PELTOTRUPES YOUNGI	OCALA BURROWING SCARAB BEETLE
U	U	C2	N	PHOTURIS BRUNNIPENNIS FLORIDANA	EVERGLADES BROWNWING FIREFLY
U	U	C2	N	PHOTURIS SP 1	TURTLE MOUND FIREFLY
U	U	N	N	PHYLLOPHAGA ELIZORIA	SCARAB BEETLE
U	U	N	N	PHYLLOPHAGA ELONGATA	SCARAB BEETLE
U	U	N	N	PHYLLOPHAGA OKEECHOBEA	SCARAB BEETLE
U	U	N	N	PHYLLOPHAGA OVALIS	SCARAB BEETLE
U	U	N	N	PHYLLOPHAGA PANORPA	SCARAB BEETLE
U	U	N	N	PHYLLOPHAGA YOUNGI	SCARAB BEETLE
U	U	C2	N	POLYLAMINA PUBESCENS	WOOLY GULF DUNE SCARAB BEETLE
U	U	N	N	PSEUDATAENIUS WALTHERHORNI	SCARAB BEETLE
U	U	N	N	RUTELA FORMOSA	SCARAB BEETLE
U	U	N	N	SERICA DELICATA	SCARAB BEETLE
U	U	C2	N	SERICA FROSTI	FROST'S SPRING SERICAN SCARAB BEETLE
U	U	N	N	SERICA PUSILLA	SCARAB BEETLE
U	U	N	N	SERICA RHYPHA	SCARAB BEETLE
U	U	C2	N	SERICA TANTULA	TANTULA SERICAN SCARAB BEETLE
U	U	C2	N	TRIGONOPELTASTES FLORIDANA	SCRUB PALMETTO FLOWER SCARAB BEETLE
U	U	C2	N	TROX HOWELLI	CARACARA COMMENSAL SCARAB BEETLE

FLORIDA NATURAL AREAS INVENTORY

MARCH 1986

SPECIAL INVERTEBRATES LIST

INSECTA: TRICHOPTERA

GLOBAL RANK	STATE RANK	FED STATUS	ST STATUS	NAME	COMMON NAME
U	U	N	N	AGARODES LIBALIS	SPRING-LOVING PSILONEURAN CADDISFLY
U	U	C2	N	AGARODES ZICZAC	ZIGZAG BLACKWATER RIVER CADDISFLY
U	U	C2	N	CERACLEA FLORIDANA	BANKS' FLORIDA CERACLEAN CADDISFLY
U	U	N	N	CERNOTINA TRUNCONA	FLORIDA CERNOTINAN CADDISFLY
U	U	N	N	CHEUMATOPSYCHE PETERSI	PETERS' CHEUMATOPSYCHE CADDISFLY
U	U	N	N N	CHIMARRA FLORIDA	FLORIDIAN FINGER-NET CADDISFLY
U	U	N	N	HYDROPTILA BERNERI	BERNER'S MICROCADDISFLY
U	U	N	N	HYDROPTILA MOLSONAE	MOLSON'S MICROCADDISFLY
U	U	N	N	NEOTRICHIA ELEROBI	ELEROB'S MICROCADDISFLY
U	U	C2	N	OCHROTRICHIA PROVOSTI	PROVOST'S MICROCADDISFLY
U	U	N	N	OECETIS DAYTONA	DAYTONA LONG-HORNED CADDISFLY
U	U	C2	N	OECETIS PARVA	BANKS' LITTLE SETODINE CADDISFLY
U	U	N	N	OECETIS PRATELIA	LITTLE MEADOW LONG-HORNED CADDISFLY
U	U	N	N	ORTHOTRICHIA CURTA	SHORT ORTHOTRICHIAN MICROCADDISFLY
U	U	N	N	ORTHOTRICHIA DENTATA	DENTATE ORTHOTRICHIAN MICROCADDISFLY
U	U	N	N	ORTHOTRICHIA INSTABILIS	CHANGEABLE ORTHOTRICHIAN MICROCADDISFLY
U	U	C2	N	OXYETHIRA FLORIDA	DENNING'S FLORIDA OXYETHIRAN MICROCADDISFLY
U	U	N	N	OXYETHIRA NOVASOTA	NOVASOTA OXYETHIRAN MICROCADDISFLY
U	U	N	N	OXYETHRIA JANELLA	LITTLE-ENTRANCE OXYETHIRAN MICROCADDISFLY
U	U	N	N	TRIAENODES FLORIDA	FLORIDIAN TRIAENODE CADDISFLY
U	U	N	N	TRIAENODES FURCELLA	LITTLE-FORK TRIAENODE CADDISFLY
U	U	C2	N	TRIAENODES TRIDONTA	THREE-TOOTH TRIAENODES CADDISFLY

INSECTA: LEPIDOPTERA

GLOBAL RANK	STATE RANK	FED STATUS	ST STATUS	NAME	COMMON NAME
U	U	C2	N	ANAEA FLORIDALIS	FLORIDA LEAFWING
U	U	N	N	CHLOROSTRYMON MAESITES MAESITES	MAESITES HAIRSTREAK
U	S1	C2	N	EUMAEUS ATALA FLORIDA	FLORIDA ATALA
U	U	N	N	EUNICA TATILA TATILISTA	FLORIDA PURPLEWING
U	U	C2	N	HEMIARGUS THOMASI BETHUNE-BAKERI	MIAMI BLUE BUTTERFLY
G4?T3?	SA	N	N	HERACLIDES ANDRAEMON BONHOTEI	BAHAMAN SWALLOWTAIL
G4?T1	S1	LE	LE	HERACLIDES ARISTODEMUS PONCEANUS	SCHAUS' SWALLOWTAIL
U	U	3C	N	MITOURA HESSELI	HESSEL'S HAIRSTREAK BUTTERFLY
U	U	N	N	PROSERPINUS GAURAE	GAURA SPHINX
U	U	C2	N	PYREFERRA CEROMATICA	CEROMATIC NOCTUID MOTH
U	U	C2	N	STRYMON ACIS BARTRAMI	BARTRAM'S HAIRSTREAK

INSECTA: DIPTERA

GLOBAL RANK	STATE RANK	FED STATUS	ST STATUS	NAME	COMMON NAME
U	U	C2	N	ASAPHOMYIA FLORIDENSIS	FLORIDA ASAPHOMYIAN TABANBID FLY
U	U	C2	N	MERYCOMYIA BRUNNEA	BROWN MERYCOMYIAN TABANID FLY
U	U	C2	N	MIXOGASTER DELONGI	DELONG'S MIXOGASTER FLOWER FLY
U	U	C2	N	NEMAPALPUS NEARCTICUS	SUGARFOOT FLY

FLORIDA NATURAL AREAS INVENTORY

MARCH 1986

NATURAL COMMUNITIES LIST

TERRESTRIAL

GLOBAL RANK	STATE RANK	NAME
G4	S3	BEACH DUNE
G3	S2	BLUFF
G3	S2	COASTAL BERM
G3	S1	COASTAL ROCK BARREN
G3	S3	COASTAL STRAND
G2	S2	DRY PRAIRIE
G4	S3	MARITIME HAMMOCK
G5	S5	MESIC FLATWOODS
G3	S3	OVERWASH PLAIN
G2	S1	PINE ROCKLAND
G4	S4	PRAIRIE HAMMOCK
G3	S2	ROCKLAND HAMMOCK
G4	S3	SANDHILL
G3	S2	SCRUB
G3	S3	SCRUBBY FLATWOODS
G3	S3	SHELL MOUND
G3	S2	SINKHOLE
G3	S2	SLOPE FOREST
G2	S1	UPLAND GLADE
G4	S3	UPLAND HARDWOOD FOREST
G4	S4	UPLAND MIXED FOREST
G5	S4	UPLAND PINE FOREST
G3	S2	XERIC HAMMOCK

PALUSTRINE

GLOBAL RANK	STATE RANK	NAME
G4	S3	BASIN MARSH
G5	S4	BASIN SWAMP
G4	S4	BAYGALL
G4	S3	BOG
G4	S3	BOTTOMLAND FOREST
G5	S5	DEPRESSION MARSH
G5	S5	DOME
G4	S4	FLOODPLAIN FOREST
G3	S3	FLOODPLAIN MARSH
G4	S4	FLOODPLAIN SWAMP
G3	S3	FRESHWATER TIDAL SWAMP
G4	S3	HYDRIC HAMMOCK
G4	S3	MARL PRAIRIE
G4	S3	SEEPAGE SLOPE
G5	S5	SLOUGH
G4	S4	STRAND SWAMP
G4	S3	SWALE
G4	S4	WET FLATWOODS
G5	S4	WET PRAIRIE

LACUSTRINE

GLOBAL RANK	STATE RANK	NAME
G3	S2	CLASTIC UPLAND LAKE
G2	S1	COASTAL DUNE LAKE
G2	S1	COASTAL ROCKLAND LAKE
G4	S3	FLATWOOD/PRAIRIE LAKE
G4	S4	MARSH LAKE
G4	S2	RIVER FLOODPLAIN LAKE
G3	S2	SANDHILL UPLAND LAKE
G3	S3	SINKHOLE LAKE
G4	S3	SWAMP LAKE

RIVERINE

GLOBAL RANK	STATE RANK	NAME
G4	S2	ALLUVIAL STREAM
G4	S2	BLACKWATER STREAM
G4	S2	SEEPAGE STREAM
G2	S2	SPRING-RUN STREAM

ESTUARINE

GLOBAL RANK	STATE RANK	NAME
G3	S2	ESTUARINE ALGAL BED
G3	S3	ESTUARINE COMPOSITE SUBSTRATE
G3	S3	ESTUARINE CONSOLIDATED SUBSTRATE
G2	S1	ESTUARINE CORAL REEF
G2	S2	ESTUARINE GRASS BED
G3	S3	ESTUARINE MOLLUSK REEF
G2	S1	ESTUARINE OCTOCORAL BED
G2	S2	ESTUARINE SPONGE BED
G4	S4	ESTUARINE TIDAL MARSH
G3	S3	ESTUARINE TIDAL SWAMP
G5	S5	ESTUARINE UNCONSOLIDATED SUBSTRATE
G1	S1	ESTUARINE WORM REEF

MARINE

GLOBAL RANK	STATE RANK	NAME
G3	S2	MARINE ALGAL BED
G3	S3	MARINE COMPOSITE SUBSTRATE
G3	S3	MARINE CONSOLIDATED SUBSTRATE
G2	S1	MARINE CORAL REEF
G2	S2	MARINE GRASS BED
G3	S3	MARINE MOLLUSK REEF
G2	S1	MARINE OCTOCORAL BED
G2	S2	MARINE SPONGE BED
G4	S4	MARINE TIDAL MARSH
G3	S3	MARINE TIDAL SWAMP
G5	S5	MARINE UNCONSOLIDATED SUBSTRATE
G1	S1	MARINE WORM REEF

SUBTERRANEAN

GLOBAL RANK	STATE RANK	NAME
G3	S2	AQUATIC CAVE
G3	S1	TERRESTRIAL CAVE

'lorida Natural Areas Inventory
54 East Sixth Avenue
allahassee, FL 32303
04/224-8207

2/84

FLORIDA NATURAL COMMUNITIES

Terrestrial

Lands not regularly inundated or saturated and characterized by upland vegetation.

Scrub	- old dune with deep fine white sand substrate; xeric; subtropical; occasional or rare fire; vegetation characterized by sand pine and/or scrub oaks and/or rosemary and cladonia.
Sandhill	- upland with deep sand substrate; xeric; temperate; annual or frequent fire; vegetation characterized by longleaf pine and/or turkey oak with wiregrass understory.
Xeric Hammock	- upland with deep sand substrate; xeric-mesic; subtropical or temperate; rare or no fire; vegetation characterized by live oak.
Upland Pine Forest	- upland with sand substrate; mesic-xeric; temperate; frequent or occasional fire; vegetation characterized by shortleaf pine and/or loblolly pine and/or longleaf pine and red oak and wiregrass.
Upland Mixed Forest	- upland with sand/clay substrate; mesic; temperate; rare or no fire; vegetation characterized by loblolly pine and/or shortleaf pine and/or laurel oak and/or magnolia and spruce pine and/or mixed hardwoods.
Upland Hardwood Forest	- upland with clay substrate; mesic; temperate; rare or no fire; vegetation characterized by spruce pine, magnolia, beech, pignut hickory, white oak, and mixed hardwoods.
Slope Forest	- steep slope on bluff or in sheltered ravine; sand/clay substrate; mesic-hydric; temperate; rare or no fire; vegetation characterized by magnolia, beech, spruce pine, Shumard oak, Florida maple, pyramid magnolia, and mixed hardwoods.
Mesic Flatwoods	- flatland with sand substrate; mesic; subtropical; frequent fire; vegetation characterized by slash pine or longleaf pine with saw palmetto, gallberry and/or wiregrass understory.
Scrubby Flatwoods	- flatland with sand substrate; xeric-mesic; subtropical; occasional fire; vegetation characterized by longleaf pine or slash pine with scrub oaks and wiregrass understory.
Pine Rockland	- flatland with exposed limestone substrate; mesic-xeric; tropical; frequent fire; vegetation characterized by South Florida slash pine.
Rockland Hammock	- flatland with limestone substrate; mesic; tropical or subtropical; rare or no fire; vegetation characterized by mixed hardwoods.
Dry Prairie	- flatland with sand substrate; mesic-xeric; subtropical; annual or frequent fire; vegetation characterized by wiregrass, saw palmetto, and mixed grasses and herbs.
Prairie Hammock	- flatland with sand/organic soil over marl or limestone substrate; mesic; subtropical; occasional or rare fire; vegetation characterized by live oak and/or cabbage palm.
Sinkhole	- karst feature with steep limestone walls; mesic-hydric; tropical, subtropical, or temperate; no fire; vegetation characterized by ferns, herbs, shrubs, and hardwoods.
Beach Dune	- active coastal dune with sand substrate; xeric; tropical, subtropical or temperate; occasional or rare fire; marine influence; vegetation characterized by sea oats and/or mixed halophytic grasses and herbs.
Coastal Strand	- stabilized coastal dune with sand substrate; xeric; tropical, subtropical, or temperate; occasional or rare fire; marine influence; vegetation characterized by dense saw palmetto and/or seagrape and/or mixed stunted shrubs, yucca, and cacti.
Maritime Hammock	- stabilized coastal dune with sand substrate; xeric-mesic; tropical, subtropical, or temperate; rare or no fire; marine influence; vegetation characterized by mixed hardwoods and/or live oak.
Overwash Plain	- coastal flatland with sand substrate; mesic-hydric; tropical, subtropical, or temperate; frequent or occasional fire; marine influence; vegetation characterized by slash pine and/or cabbage palm or buttonwood and/or mixed halophytic shrubs and herbs.
Coastal Berm	- old bar or storm debris ridge with sand/shell substrate; xeric-mesic; tropical or subtropical; rare or no fire; marine influence; vegetation characterized by buttonwood, and/or mixed halophytic herbs, shrubs, and/or trees.
Coastal Rock Barren	- flatland with exposed limestone substrate; xeric; tropical; no fire; marine influence; vegetation characterized by algae and mixed halophytic herbs, and/or cacti and stunted shrubs.
Shell Mound	- Indian midden with shell substrate; xeric-mesic; tropical or subtropical; rare or no fire; marine influence; vegetation characterized by mixed hardwoods.
Upland Glade	- upland with calcareous rock and/or clay substrate; hydric-xeric; temperate; vegetation characterized by sparse mixed grasses and herbs with occasional stunted trees and shrubs.
Bluff	- steep slope with rock, sand, and/or clay substrate; hydric-xeric; temperate; sparse vegetation characterized by mixed grasses, herbs, and shrubs.

Florida Natural Areas Inventory
254 East Sixth Avenue
Tallahassee, Florida 32303
(904) 224-8207

FLORIDA NATURAL COMMUNITIES

Palustrine

Lands regularly inundated or saturated by freshwater and characterized by wetland vegetation.

Bottomland Forest - flatland with sand/clay/organic substrate; occasionally inundated; temperate; rare or no fire; vegetation characterized by water oak, red maple, beech, magnolia, tuliptree, sweetgum, bays, cabbage palm, and mixed hardwoods.

Floodplain Forest - floodplain with alluvial substrate of sand, silt, clay or organic soil; seasonally inundated; subtropical or temperate; rare or no fire; vegetation characterized by diamondleaf oak, overcup oak, water oak, swamp chestnut oak, blue palmetto, cane and mixed hardwoods.

Floodplain Swamp - floodplain with organic/alluvial substrate; usually inundated; subtropical or temperate; rare or no fire; vegetation characterized by cypress, tupelo, blackgum, and/or pop ash.

Freshwater Tidal Swamp - rivermouth wetland; organic soil with extensive root mat; inundated with freshwater in response to tidal cycles; rare or no fire; vegetation characterized by cypress, bays, cabbage palm, gums, and/or cedars.

Floodplain Marsh - floodplain with organic/sand/alluvial substrate; seasonally inundated; subtropical; frequent or occasional fire; vegetation characterized by maidencane, pickerel weed, sagittaria, buttonbush, and mixed emergents.

Strand Swamp - broad, shallow channel with peat over mineral substrate; seasonally inundated; flowing water; tropical or subtropical; occasional or rare fire; vegetation characterized by cypress and/or willow.

Slough - broad, shallow channel with peat over mineral substrate; usually inundated; flowing water; tropical or subtropical; rare or no fire; vegetation characterized by pop ash and/or pond apple or waterlily.

Swale - broad, shallow channel with sand/peat substrate; seasonally inundated; flowing water; tropical or subtropical; frequent or occasional fire; vegetation characterized by maidencane, pickerel weed, and/or mixed emergents.

Dome - rounded depression in sand/limestone substrate with peat accumulating toward center; seasonally inundated; still water; tropical, subtropical, or temperate; occasional or rare fire; woody vegetation tallest in center, characterized by cypress, blackgum, or bays.

Depression Marsh - rounded depression in sand substrate with peat accumulating toward center; seasonally inundated; still water; tropical, subtropical, or temperate; frequent or occasional fire; vegetation in concentric bands, characterized by maidencane, fire flag, pickerel weed, and mixed emergents.

Basin Swamp - basin with peat substrate; seasonally inundated; still water; subtropical or temperate; occasional or rare fire; vegetation characterized by cypress, blackgum, bays and/or mixed hardwoods.

Basin Marsh - basin with peat substrate; seasonally inundated; temperate or subtropical; frequent fire; vegetation characterized by sawgrass and/or cattail and/or buttonbush and/or mixed emergents.

Baygall - wetland at base of slope with peat substrate; maintained by downslope seepage--usually saturated, occasionally inundated; subtropical or temperate; rare or no fire; vegetation characterized by bays and/or dahoon holly and/or red maple and/or mixed hardwoods.

Bog - wetland on deep peat substrate; maintained by capillary action--soil usually saturated, occasionally inundated; subtropical or temperate; rare fire; vegetation characteriz by sphagnum moss and titi and/or bays and/or dahoon holly, and/or mixed hydrophytic shrubs.

Seepage Slope - wetland on or at base of slope with organic/sand substrate; maintained by downslope seepage--usually saturated, but rarely inundated; subtropical or temperate; frequent or occasional fire; vegetation characterized by sphagnum moss with pond pine and/or mixed grasses and herbs or mixed hydrophytic shrubs.

Wet Prairie - flatland with sand substrate; seasonally inundated; subtropical or temperate; annual or frequent fire; vegetation characterized by maidencane, beakrush, spikerush, wiregrass, St. John's Wort, mixed herbs.

Marl Prairie - flatland with marl over limestone substrate; seasonally inundated; tropical; frequent to no fire; vegetation characterized by sawgrass, spikerush, and/or mixed grasses, sometimes with dwarf cypress.

Wet Flatwoods - flatland with sand substrate; seasonally inundated; subtropical or temperate; frequent fire; vegetation characterized by slash pine or pond pine and/or cabbage palm with mixed grasses and herbs.

Hydric Hammock - lowland with sand/clay/organic soil, often over limestone; mesic-hydric; subtropical or temperate; rare or no fire; vegetation characterized by water oak, cabbage palm, red cedar, red maple, bays, hackberry, hornbeam, blackgum, needle palm, and mixed hardwoods.

Florida Natural Areas Inventory
254 East Sixth Avenue
Tallahassee, Florida 32303

FLORIDA NATURAL COMMUNITIES

Marine

Subtidal, intertidal and supratidal zones of the sea, landward to the point at which seawater becomes significantly diluted with freshwater inflow from the land.

Estuarine

Subtidal, intertidal, and supratidal zones of a coastal body of water, usually semi-enclosed by land but with a connection to the open sea, within which seawater is significantly diluted with freshwater inflow from the land.

Consolidated Substrate - expansive subtidal, intertidal and supratidal area composed primarily of nonliving compacted or coherent and relatively hard, naturally formed mass of mineral matter (e.g., coquina limerock and relic reefs); octocorals, sponges, stony corals, nondrift macrophytic algae, blue-green mat-forming algae and seagrasses sparse, if present.

Unconsolidated Substrate - expansive subtidal, intertidal and supratidal area composed primarily of loose mineral matter (e.g., coralgal, gravel, marl, mud, sand and shell); octocorals, sponges, stony corals, nondrift macrophytic algae, blue-green mat-forming algae and seagrasses sparse, if present.

Octocoral Bed - expansive subtidal area occupied primarily by living sessile organisms of the Class Anthozoa, Subclass Octocorallia (e.g., soft corals, horny corals, sea fans, sea whips, and sea pens); sponges, stony corals, nondrift macrophytic algae and seagrasses sparse, if present.

Sponge Bed - expansive subtidal area occupied primarily by living sessile organisms of the Phylum Porifera (e.g., sheepswool sponge, Florida loggerhead sponge and branching candle sponge); octocorals, stony corals, nondrift macrophytic algae and seagrasses sparse, if present.

Coral Reef - expansive subtidal area with elevational gradient or relief and occupied primarily by living sessile organisms of the Class Hydrozoa (e.g., fire corals and hydrocorals) and Class Anthozoa, Subclass Zoantharia (e.g., stony corals and black corals); includes deepwater bank reefs, fringing barrier reefs, outer bank reefs and patch reefs, some of which may contain distinct zones of assorted macrophytes, octocorals, & sponges.

Mollusk Reef - substantial subtidal or intertidal area with relief from concentrations of sessile organisms of the Phylum Mollusca, Class Bivalvia (e.g., molluscs, oysters, & worm shells); octocorals, sponges, stony corals, macrophytic algae and seagrasses sparse, if present.

Worm Reef - substantial subtidal or intertidal area with relief from concentrations of sessile, tubicolous organisms of the Phylum Annelida, Class Polychaeta (e.g., chaetopterids and sabellarids); octocorals, sponges, stony corals, macrophytic algae and seagrasses sparse, if present.

Algal Bed - expansive subtidal, intertidal or supratidal area, occupied primarily by attached thallophytic or mat-forming prokaryotic algae (e.g., halimeda, blue-green algae); octocorals, sponges, stony corals and seagrasses sparse, if present.

Grass Bed - expansive subtidal or intertidal area, occupied primarily by rooted vascular macrophytes, (e.g., shoal grass, halophila, widgeon grass, manatee grass and turtle grass); may include various epiphytes and epifauna; octocorals, sponges, stony corals, and attached macrophytic algae sparse, if present.

Composite Substrate - expansive subtidal, intertidal, or supratidal area, occupied primarily by Natural Community elements from more than one Natural Community category (e.g., Grass Bed and Algal Bed species; Octocoral and Algal Bed species); includes both patchy and evenly distributed occurrences.

Tidal Marsh - expansive intertidal or supratidal area occupied primarily by rooted, emergent vascular macrophytes (e.g., cord grass, needlerush, saw grass, saltwort, saltgrass and glasswort); may include various epiphytes and epifauna.

Tidal Swamp - expansive intertidal and supratidal area occupied primarily by woody vascular macrophytes (e.g., black mangrove, buttonwood, red mangrove, and white mangrove); may include various epiphytes and epifauna.

Florida Natural Areas Inventory
254 East Sixth Avenue
Tallahassee, Florida 32303
904/224-8207

FLORIDA NATURAL COMMUNITIES

Lacustrine

Lentic waters of natural topographic depressions. Emergent vegetation is confined to the perimeter, if present; floating and submersed aquatics may be found throughout.

Clastic Upland Lake - generally irregular basin in clay uplands; predominantly with inflows, frequently without surface outflow; clay or organic substrate; characteristically colored, acidic, soft water with low mineral content (sodium, chloride, sulfate); oligo-mesotrophic to eutrophic.

Sandhill Upland Lake - generally rounded solution depression in deep sandy uplands or sandy uplands shallowly underlain by limestone; predominantly without surface inflows/outflows; typically sand substrate with organic accumulations toward middle; characteristically clear, acidic, moderately soft water with varying mineral content; ultra-oligotrophic to mesotrophic.

Flatwood/Prairie Lake - generally shallow basin in flatlands with high water table; frequently with a broad littoral zone; still water or flow-through; sand or peat substrate; variable water chemistry, but characteristically colored to clear, acidic to slightly alkaline, soft to moderately hard water with moderate mineral content (sodium, chloride, sulfate); oligo-mesotrophic to eutrophic.

Marsh Lake - generally shallow, open water area within wide expanses of freshwater marsh; still water or flow-through; peat, sand or clay substrate; occurs in most physiographic regions; variable water chemistry, but characteristically highly colored, acidic, soft water with moderate mineral content (sodium, chloride, sulfate); oligo-mesotrophic to eutrophic.

Swamp Lake - generally shallow, open water area within basin swamps; still water or flow-through; peat, sand or clay substrate; occurs in most physiographic regions; variable water chemistry, but characteristically highly colored, acidic, soft water with moderate mineral content (sodium, chloride, sulfate); oligo-mesotrophic to eutrophic.

River Floodplain Lake - meander scar, backwater, or larger flow-through body within major river floodplains; sand, alluvial or organic substrate; characteristically colored, alkaline or slightly acidic, hard or moderately hard water with high mineral content (sulfate, sodium, chloride, calcium, magnesium); mesotrophic to eutrophic.

Coastal Dune Lake - basin or lagoon influenced by recent coastal processes; predominantly sand substrate with some organic matter; salinity variable among and within lakes, and subject to saltwater intrusion and storm surges; characteristically slightly acidic, hard water with high mineral content (sodium, chloride).

Coastal Rockland Lake - shallow basin influenced by recent coastal processes; predominantly barren oolitic or Miami limestone substrate; salinity variable among and within lakes, and subject to saltwater intrusion, storm surges and evaporation (because of shallowness); characteristically slightly alkaline, hard water with high mineral content (sodium, chloride).

Sinkhole Lake - typically deep, funnel-shaped depression in limestone base; occurs in most physiographic regions; predominantly without surface inflows/outflows, but frequently with connection to the aquifer; characteristically clear, alkaline, hard water with high mineral content (calcium, bicarbonate, magnesium).

Florida Natural Areas Inventory
254 East Sixth Avenue
Tallahassee, FL 32303
904/224-8207

FLORIDA NATURAL COMMUNITIES

Riverine

Natural lotic waters from the source of origin downstream to the limits of tidal influence and bounded by a channel bank.

Seepage Stream - upper perennial or intermittent/seasonal watercourse characterized by clear to lightly colored water derived from shallow groundwater seepage

Alluvial Stream - lower perennial or intermittent/seasonal watercourse characterized by turbid water with suspended silt, clay, sand and small gravel; generally with a distinct, sediment-derived (alluvial) floodplain and a sandy, elevated natural levee just inland from the bank

Blackwater Stream - perennial or intermittent/seasonal watercourse characterized by tea-colored water with a high content of particulate and dissolved organic matter derived from drainage through swamps and marshes; generally lacking an alluvial floodplain

Spring-run Stream - perennial watercourse with deep aquifer headwaters and characterized by clear water, circumneutral pH and, frequently, a solid limestone bottom

Florida Natural Areas Inventory
254 East Sixth Avenue
Tallahassee, FL 32303
904/224-8207

FLORIDA NATURAL COMMUNITIES

Subterranean

Twilight, middle and deep zones of natural chambers overlain by the earth's crust and characterized by climatic stability and assemblages of trogloxenic, troglophilic, and troglobitic organisms.

Aquatic Cave - cavernicolous area permanently or periodically submerged; often characterized by troglobitic crustaceans and salamanders; includes high energy systems which receive large quantities of organic detritus and low energy systems

Terrestrial Cave - cavernicolous area lacking standing water; often characterized by bats, such as Myotis, and other terrestrial vertebrates and invertebrates; includes interstitial areas above standing water such as fissures in the ceiling of caves

DEFINITIONS OF TERMS

Terrestrial and Palustrine Natural Communities

Physiography

- Upland - high area in region with significant topographic relief; generally undulating
- Lowland - low area in region with or without significant topographic relief; generally flat to gently sloping
- Flatland - generally level area in region without significant topographic relief; flat to gently sloping
- Basin - large, relatively level lowland with slopes confined to the perimeter or isolated interior locations
- Depression - small depression with sloping sides, deepest in center and progressively shallower towards the perimeter
- Floodplain - lowland adjacent to a stream; topography influenced by recent fluvial processes
- Bottomland - lowland not on active floodplain; sand/clay/organic substrate.

Hydrology

- occasionally inundated - surface water present only after heavy rains and/or during flood stages
- seasonally inundated - surface water present during wet season and flood periods
- usually inundated - surface water present except during droughts

Climatic Affinity of the Flora

- tropical - community generally occurs in practically frost-free areas
- subtropical - community generally occurs in areas that experience occasional frost, but where freezing temperatures are not frequent enough to cause true winter dormancy
- temperate - community generally occurs in areas that freeze often enough that vegetation goes into winter dormancy

Fire

- annual fire - burns about every 1-2 years
- frequent fire - burns about every 3-7 years
- occasional fire - burns about every 8-25 years
- rare fire - burns about every 26-100 years
- no fire - community develops only when site goes more than 100 years without burning

VEGETATION

- anise - *Illicium floridanum*
- bays - swamp bay - *Persea palustris*
  - gordonia - *Gordonia lasianthus*
  - sweetbay - *Magnolia virginiana*
- beakrush - *Rhynchospora* spp.
- beech - *Fagus grandifolia*
- blackgum - *Nyssa biflora*
- blue palmetto - *Sabal minor*
- bluestem - *Andropogon* spp.
- buttonbush - *Cephalanthus occidentalis*
- cabbage palm - *Sabal palmetto*
- cacti - *Opuntia* and *Cereus* spp., predominantly *stricta* and *pentagonus*
- cane - *Arundinaria gigantea* or *A. tecta*
- cattail - *Typha* spp.
- cedars - red cedar - *Juniperus silicicola*
  - white cedar - *Chamaecyparis thyoides* or *C. henryi*
- cladonia - *Cladonia* spp.
- cypress - *Taxodium distichum*
- dahoon holly - *Ilex cassine*
- diamondleaf oak - *Quercus laurifolia*
- fire flag - *Thalia geniculata*
- Florida maple - *Acer barbaratum*
- gallberry - *Ilex glabra*
- gums - tupelo - *Nyssa aquatica*
  - blackgum - *Nyssa biflora*
  - Ogeechee gum - *Nyssa ogeche*
- hackberry - *Celtis laevigata*
- hornbeam - *Carpinus caroliniana*
- laurel oak - *Quercus hemisphaerica*
- live oak - *Quercus virginiana*
- loblolly pine - *Pinus taeda*
- longleaf pine - *Pinus palustris*
- magnolia - *Magnolia grandiflora*
- maidencane - *Panicum hemitomon*
- needle palm - *Rhapidophyllum hystrix*
- overcup oak - *Quercus lyrata*
- pickerel weed - *Pontederia cordata* or *P. lanceolata*
- pignut hickory - *Carya glabra*
- pop ash - *Fraxinus caroliniana*
- pond apple - *Annona glabra*
- pond pine - *Pinus serotina*
- pyramid magnolia - *Magnolia pyramidata*
- railroad vine - *Ipomoea pes-caprae*
- red cedar - *Juniperus silicicola*
- red maple - *Acer rubrum*
- red oak - *Quercus falcata*
- rosemary - *Ceratiola ericoides*
- sagittaria - *Sagittaria lancifolia*
- sand pine - *Pinus clausa*
- saw palmetto - *Serenoa repens*
- sawgrass - *Cladium jamaicensis*
- scrub oaks - *Quercus geminata*, *Q. chapmanii*, *Q. myrtifolia*, *Q. inopina*
- sea oats - *Uniola paniculata*
- seagrape - *Coccoloba uvifera*
- shortleaf pine - *Pinus echinata*
- Shumard oak - *Quercus shumardii*
- slash pine - *Pinus elliottii*
- sphagnum moss - *Sphagnum* spp.
- spikerush - *Eleocharis* spp.
- spruce pine - *Pinus glabra*
- St. John's wort - *Hypericum* spp.
- swamp chestnut oak - *Quercus prinus*
- sweetgum - *Liquidambar styraciflua*
- titi - *Cyrilla racemiflora*
- tuliptree - *Liriodendron tulipfera*
- tupelo - *Nyssa aquatica*
- turkey oak - *Quercus laevis*
- water oak - *Quercus nigra*
- waterlily - *Nymphaea odorata*
- white cedar - *Chamaecyparis thyoides*
- white oak - *Quercus alba*
- willow - *Salix caroliniana*
- wiregrass - *Aristida stricta*
- yucca - *Yucca aloifolia*

J & M TESTING LAB, INC.

Consulting Geotechnical & Materials Engineers

MATERIALS TESTING

Main Office — State Rd. 280 East • Chipley, Fla. 32428 • 904/638-1506

Branch Offices — Route 2, Box 100, Oats Drive • Newton, Al. 205/299-3050

Box 773 Aenon Church Rd. • Tallahassee, Fla. • 904/574-0482

Nite 904/638-7720

D S & N, INC.

JAN 11 1988

January 7, 1988

Mr. G. Jeffery Hines
d s & n, Inc. Consulting Engineers
408 West University Avenue
Suite 605, The Seagle Building
Gainesville, Florida 32601

Subject: City of Monticello W/W TR Plant - Monticello, Florida
P.N. 8705

Dear Mr. Hines:

As requested, J & M Testing Laboratory, Inc. has made a Sub-Soil Investigation of the materials on the above subject. The locations of the borings are as shown on the attached sketch.

This investigaion consisted of making six (6) auger borings, twenty five feet deep, taking samples at each materials stratum layer change.

The samples of the materials were transported to the laboratory, where a description of the materials was established on each stratum layer. The soils description was established, then a laboratory permeability was performed on the clayey stratums, to determine the rate of permeability of the soils. These results are shown on the attached, figure #1.

Based on our test results, the soils incountered in stratum layers from eighteen to twenty five feet would essentially be impermeable.

We appreciate being of service to you. If we can assist you further, please feel free to contact our office.

Sincerely,

James E. Peel,
President

Edwin H. Jones, P.E.
Vice-President of Engineering

JEP:jh
Enclosure

J & M TESTING LAB, INC.

Consulting Geotechnical & Materials Engineers
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Nite 904/638-7720

D S & N, INC.

JAN 11 1988

BORING LOG & SOIL CLASSIFICATION

TEST HOLE NO.	DEPTH	DESCRIPTION	LL PL RI - 200	GROUP
			PERMEABILITY	
Boring #1	0-1'	Fine gray sand		
	1-2'	Dk. tan fine sand		
	2-3'	Tan fine sand		
	3-4'	Gray fine S/C		
	4-6'	Gray mod.-heavy S/C	6.32 X 10 to the -5	
	6-15'	Gray heavy clay	8.96 X 10 to the -8	
	15-25'	Grayheavy clay (Water Table)		
Boring #2	0-6"	Dk. gray fine sand		
	6"-2'	Tan fine sand		
	2-4'	Lt. tan fine sand		
	4-6'	Lt. tan fine S/C		
	6-12'	Tan to orange fine S/C		
	12-15'	Tan to orange fine S/C (Water Table)	6.32 X 10 to the -5	
	15-20'	Baige fine sandy clay		
	20-25'	Orange fine heavy clay	9.46 X 10 to the -9	
Boring #3	0-5'	Dk. black muck		
	5-9'	Dk. brown to orange muck		
	9-15'	Lt. orange silty sand		
	15-18'	Lt. tan to gray fine clay (very wet)		
	18-25'	Lt. tan to gray fine clay (getting dryer)	8.96 X 10 to the -8	
Boring #4	0-1'	Orange to tan fine C/S		
	1-4'	Orange fine clayey sand		
	4-5'	Orange fine clay		
	5-6'	Orange to gray fine clay		
	6-18'	Orange to gray touches of red heavy clay	8.96 X 10 to the -8	
	18-25'	Reddish orange to gray fine heavy clay	9.46 X 10 to the -9	

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Box 773 Aenon Church Rd. • Tallahassee, Fla. • 904/574-0482
Nite 904/638-7720

D S & N, INC.

JAN 11 1988

BORING LOG & SOIL CLASSIFICATION

TEST HOLE NO.	DEPTH	DESCRIPTION	LL PL RI - 200 PERMEABILITY	GROUP
Boring #5	0-2'	Ornage fine clayey sand		
	2-5'	Orange fine clay		
	6-18'	Tan to orange heavy clay	9.46 X 10 to the -9	
	18-25'	Orange heavy clay		
Boring #6	0-5'	Dk. black muck		
	5-9'	Dk. brown to orange muck		
	9-15'	Lt. orange silty sand		
	15-18'	Lt. tan to gray fine clay (very wet)		
	18-25'	Lt. tan to gray fine clay (getting dryer)	8.96 X 10 to the -8	

CONSULTANTS

jan peter sendzimir

ecologist

background and present responsibilities: Between the years 1968 and 1976, Mr. Sendzimir taught biology and related sciences in Millbrook, New York, and East Providence, Rhode Island. He went on to work in the sales and research department of Sencor, an engineering firm designing heavy machinery for the handling and rolling of steel and non-ferrous strip and slabs. In cooperation with Dr. H.T. Odum, he conducted a three month research on energy analysis of ten nations in the First, Second and Third Worlds for the International Institute for Applied Systems Analysis in Laxenburg, Austria. At the Delta Institute for Hydrobiological Research, Mr. Sendzimir conducted a six month research of energy analysis of the mussel fishery of Eastern Scheldt and Wadden Sea and a dynamic computer simulation of saline lake ecosystem, Lake Grevelingen. His work for the Center of Wetlands, University of Florida, Gainesville, included; three month field work in a variety of wetland ecosystems followed by computer-aided statistical analysis. Three months drafting of a model code ordinance for controlling development on sensitive lands in conjunction with the Department of Urban and Regional Planning, College of Architecture, and the Center for Governmental Responsibility, College of Law. Mr. Sendzimir has been involved with a long term planned development focusing on reforestation, low intensity agriculture and housing potential with large natural open space buffer zones in Marion and Alachua Counties. For the towns of Bushnell and Fanning Springs, Mr. Sendzimir worked as an associate planner formulating procedures guiding the development of these small towns, as well as creating procedures on the Coastal Zone Element and the Housing Element of the Comprehensive Plan for the region of Levy County, Florida. These documents include an inventory of all natural and human resources and analysis of how the government must meet human needs both now and in the future. Mr. Sendzimir continues to be involved in ecology field studies with the Center for Wetlands, University of Florida, and Central Florida Planning and Development, Inc., Dunnellon, Florida.

education:
- Hiram College
B.A. Biology, 1974
- Rhode Island College
M.A. in teaching Biology 1976
- University of Florida
M.S. in Ecosystems Analysis 1984

publications:
- A Wetlands Study of Seminole County, University of Florida.
- Energy Analysis Overview of Nations

International Institute for
Applied Systems Analysis
Laxenburg, Austria.
- Energy perspectives of the
Mussel Fishery of the
Eastern Scheldt Estuary
Center for Wetlands,
University of Florida.
- Comprehensive Plan for the
City of Bushnell, Florida.
- Zoning Ordinance for the
Town of Fanning Springs,
Florida.

PETER M. WALLACE

HOME ADDRESS
Route 1, Box 338F
Gainesville, FL 32609

BUSINESS ADDRESS
7325 NW 13th Blvd.
Suite 90
Gainesville, FL 32606

PERSONAL HISTORY

Born: 13 April 1953, Newport News, Virginia
Marital Status: Single
Social Security Number: 223-82-1045

EDUCATION

1988 M.S., Expected May 1988, Environmental Engineering Sciences, University of Florida.
1979 B.S., Biology, Virginia Polytechnic Institute and State University, cum laude.
1973 U.S. Army Medical Laboratory School, Ft. Sam Houston, Texas.
1971 Kecoughtan High School, Hampton, Virginia, Honor Graduate.

INTERESTS

- Use of natural wetlands for wastewater renovation
- Reclamation of disturbed or devastated lands
- Community ecology
- Mycorrhizal associations and effects on plant growth

PROFESSIONAL EXPERIENCE AND CURRENT PROJECTS

1987 Hernando County, Florida.
Vegetation survey and plant community mapping of Sandhill communities to be used for construction of rapid infiltration basins (for Camp, Dresser and McKee, Inc.).

1987 Lake County, Florida.
Vegetation survey and reclamation design of buffer communities for rapid infiltration basins for the Woodlea Road Wastewater Treatment Facility, Tavares, Florida (for Camp, Dresser and McKee, Inc.).

1987 Orange County, Florida.
Burned Swamp restoration and re-use program. Vegetation monitoring and water quality sampling of Burned Swamp and associated wetlands (for Camp, Dresser and McKee, Inc.).

1987 Hamilton County, Florida.
Monitoring growth and survival of tree seedlings in phosphate mined reclamation sites at Occidental Chemical (for Environmental Services and Permitting).

1987 Clay County, Florida.
Design and monitoring of field growth experiments to assess effects of several treatments on growth and survival of seedlings planted in reclaimed titanium mines (for Environmental Services and Permitting, Inc.).

1984 -present Alachua County, Florida.
Tupelo Creek -- A Native Plant Nursery, owner and manager, development of propagation techniques for native Florida plants. Current inventory: 72,000 plants. 1988 orders: 142,000 plants.

1987 Seminole County, Florida.
Northwest Area Regional Wastewater facilities, preliminary report on plant community investigations and wastewater application to wetlands of the Yankee Lake property.

1985 -87 Orange County, Florida.
Orange County Eastern Service Area Wastewater Treatment Facility, water quality monitoring, vegetation analysis and development of plant species systems for biological treatment of wastewater.

1987 Orange County, Florida.
Shingle Creek Monitoring Program: water quality sampling, vegetation monitoring and mapping of the shingle Creek Drainage Basin (for Camp, Dresser, and McKee, Inc.).

1987 Manatee County, Florida.
Southeast Manatee Regional Reuse Program: water quality sampling, vegetation monitoring and mapping of selected Manatee County wetlands (for Camp, Dresser and McKee, Inc.).

1987 Sarasota County, Florida.
City of Sarasota Reclaimed Water Reuse Program: water quality sampling and vegetation mapping of selected Sarasota County wetlands (for Camp, Dresser and McKee, Inc.).

1987 Jefferson County, Florida.
Vegetation monitoring and community mapping of Jefferson County wetlands to be used in wastewater renovation (for d s & n, inc.).

1987 Polk County, Florida.
Design and reclamation of several storm retention basins with native woody and herbaceous wetland plants (for d s & n, inc.).

1986 Hillsborough County, Florida.
Hillsborough County Wetlands Augmentation Study: water quality monitoring and vegetation analysis (for Camp, Dresser and McKee, Inc.).

1986 Hamilton County, Florida.
Development of success criteria used in reclamation success assessment in areas mined for phosphate by Occidental Chemical Company.
Involved in negotiations with representatives of FDER, FDNR, EPA and the U.S. Army Corps of Engineers (for Environmental Services and Permitting, Inc.).

1985-86 Orange County, Florida.
Orange County Landfill, water quality monitoring, vegetation mapping and analysis of nutrient uptake potentials of wetland vegetation and soils (for Camp, Dresser and McKee, Inc.).

1982-87 Polk County, Florida.
Fort Green Mine--Payne Creek Reclamation Site: monitoring changes in wetland tree growth and distribution patterns of herbaceous wetland vegetation following reclamation (for Agrico Chemical Company).

1985 St. Mary's, Georgia
Designs for reclamation of borrow areas to functional wetlands--Conceptual Guidelines for Etowah Park and Towee Trail, Kings Bay Submarine Base (for Alvarez, Lehman and Associates, Inc.).

1976 Hampton Roads, Virginia
Hampton Roads Sanitation District - Process Control Supervisor. State board certification of operators of water and wastewater work: wastewater operator S-III #600 - Commonwealth of Virginia.

1975 Ft. Gordon, Georgia
U.S. Army Medical Laboratory, Eisenhower Medical Center, clinical hematology.

1974 Taegu, Republic of South Korea
U.S. Army medical laboratory technician, 543rd General Dispensary. Clinical chemistry, hematology, parasitology, serology bacteriology.

1973 Newport News, Virginia.
Newport News Shipping and Drydock Company, materials processing.

1971 Newport News, Virginia.
Horne Brothers, Inc. Ship repair, machinist.

AWARDS

1982 Nitrogen fixation Potential of Ecosystems in Different Successional Stages following Phosphate Mining. Grant-in-aid Research Award, $350 Sigma Xi, The Scientific Research Society.

1974 Letter of commendation for superior accomplishment from Major Carl M. Goldblum, M.D. Commander 543rd General Dispensary, Taegu, Korea.

1974 Letter of commendation for superior accomplishment from General E.H. Vogel, Jr., Superintendent of the Academy of Health Sciences of the U.S. Army, Ft. Sam Houston, Texas.

1974 Award of the Association of the United States army. Distinguished Honor Graduate, Academy of Health Sciences, Ft. Sam Houston, Texas.

1973 Outstanding honor Graduate, Special Leadership Preparation Program, First Basic Training Combat Brigade, Fort Jackson, South Carolina.

1972 State Scholarship, Virginia Polytechnic Institute and State University, Blacksburg, Virginia.

1971 Interact Club Scholarships, Kecoughtan High School, Hampton, Virginia.

PUBLICATIONS

Wallace, P.M., E.F. Benfield, and J.R. Webster. 1987. Comparative study of detrital processing in ponds and streams in southwestern Virginia. In preparation.

Neal, J.L., A.E. Linkins, and P.M. Wallace. 1980. Influence of temperature on nonenzymatic hydrolysis of p-Nitrophenyl phosphate in soil. Commun. in Soil Science and Plant Analysis 12(3):279-287.

Best, G.R., W.J. Dunn and P.M. Wallace. 1983. Enhancing ecological succession: 1. Effects of various soil amendments on establishment and growth of forest trees from seeds. In Symposium on Reclamation and the Phosphate Industry. Florida Institute of Phosphate Research, Bartow, Florida.

Wallace, P.M., and G.R. Best. 1983. Enhancing ecological succession: 3. Succession of endomycorrhizal fungi on phosphate strip minded lands. In Symposium on Reclamation and the Phosphate Industry. Florida Institute of Phosphate Research, Bartow, Florida.

Best, G.R., W.J. Dunn, P.M. Wallace, and J.M. Feiertag. 1983. Enhancing ecological succession: 4. Growth, density, and species richness of forest communities established from seed on amended overburden soils. In Symposium on Surface Mining, Hydrology, Sedimentology, and Reclamation. University of Kentucky, Lexington.

Wallace, P.M., and G.R. Best. 1983. Enhancing ecological succession: 6. Succession of endomycorrhizal fungi on phosphate strip mined lands. In Symposium on Surface Mining, Hydrology, Sedimentology, and Reclamation. University of Kentucky, Lexington.

Wallace, P.M., G.R. Best, J.A. Feiertag, and K.M. Kervin. 1984. Mycorrhizae enhanced growth of sweetgum (Liquidambar styraciflua) in phosphate mined overburden soils. In Symposium on Surface Mining, Hydrology, Sedimentology, and Reclamation. University of Kentucky, Lexington.

Wallace, P.M., and G.R. Best. 1984. Applications of mycorrhizal fungi in reclamation of phosphate mined lands. J.J. Ferguson, ed. In Proceedings of a conference: "Applications of mycorrhizal fungi in crop production" at the University of Florida, Gainesville, Feb. 22-23, 1984. pp.69-78.

Wallace, P.M. G.R. Best, and J.A. Feiertag. 1985. Mycorrhizae enhanced growth of sweetgum (Liquidambar styraciflua) in phosphate mined overburden soils. In Better Reclamation with Trees, Conference June 5-7, 1985. University of Southern Illinois, Carbondale.

Erwin, K.L., G.R. Best, W.J. Dunn, and P.M. Wallace. 1985. Effects of hydroperiod on survival and growth of tree seedlings in phosphate surface-mined reclaimed wetland. In J. of the Society of Wetland Scientists.

EDUCATION EXPERIENCE AND PROJECTS

1985 Graduate Research Assistant. Project: Tree growth following reclamation of phosphate mined lands. Effects of herbicides on tree growth for Mobil Chemical Company under direction of the Center for Wetlands, University of Florida, Gainesville.

1983-85 Graduate Research Assistant. Project: Development of guidelines for reclamation of phosphate mined lands, Center for Wetlands, University of Florida, Gainesville.

1981-82 Graduate Research Assistant. Project: Enhancing ecological succession on phosphate mined lands, Center for Wetlands, University of Florida, Gainesville.

1981 Graduate Research Assistant. Project: Root dynamics in woody plant communities in the Okeefenokee Swamp under the direction of Dr. G. Ronnie Best, Center for Wetlands,University of Florida, Gainesville.

1981 Graduate Research Assistant. Project: Enhanced ecological succession following phosphate mining, under the direction of

Center for Wetlands, University of Florida, Gainesville.

Wallace, P.M., and G.R. Best. 1984. Mycorrhizae enhanced growth of sweetgum in phosphate mined overburden soils. Poster session: Annual Meeting of the Ecological Society of America with AIBS, Colorado State University, Ft. Collins.

Wallace, P.M., and G.R. Best. 1984. Most probable number(MPN) determinations of mycorrhizal fungi in phosphate mined overburden soils. Annual Meeting of the Ecological Society of America with AIBS,Colorado State University, Ft. Collins.

Wallace, P.M. 1985. Mycorrhizae and reclamation. Presented at the Annual Meeting of the Florida Native Plant Society, May 1985, Winter Park, Florida.

Wallace, P.M., G.R. Best, and J.H. Feiertag. 1985. Mycorrhizae enhanced growth of sweetgum (Liquidambar styraciflua) in phosphate mined overburden soils. Presented at Better Reclamation with Trees Conference, June 5-7, University of Southern Illinois, Carbondale.

Wallace, P.M. 1986. Methods and principles for creation of artificial wetlands. Invited speaker for the FDER workshop on wetlands mitigation, June, 1986, Tallahassee, Florida.

Wallace, P.M., J.H. Feiertag, and G.R. Best. 1987. Mycorrhize enhanced growth of sweetgum (Liquidambar styraciflua) in phosphate mined overburden soils. Poster session and abstract In Mycorrhizae in the next decade Practical Applications and Research priorities. 7th Annual North American Conference on Mycorrhizae, May 3-8, 1987. Gainesville, FL.

TECHNICAL REPORTS AND CONTRIBUTIONS TO TECHNICAL REPORTS

Wallace, P.M. 1986. Plant community descriptions in Hillsborough County wetlands. In Hillsborough County wetland augmentation program. For Camp, Dresser and McKee, Inc. in conjunction with Bio-Ecological Services Team, Inc.(Best, Inc.).

Wallace, P.M. 1986. Predictive effects of wastewater on hydric hammocks--community descriptions and discussion. In Northwest Regional Service Area Wastewater Treatment Facility--Preliminary design memorandum for effluent disposal. For Camp, Dresser and McKee, Inc. in conjunction with Best, Inc.

Wallace, P.M. 1985. Plant community descriptions. In Orange County Eastern Service Area Wastewater Treatment Facility--Report in support for petition for exception from certain class III water quality standards, Dec. 1984. For Camp, Dresser and McKee, Inc. in conjunction with Best, Inc..

Wallace, P.M. 1985. Plant community descriptions, wetland values discussions and water quality discussions. In Development of a Conceptual Operating Permit for the Orange County Landfill. For Camp, Dresser and McKee, Inc., in conjunction with Best, Inc.

Wallace, P.M. 1985. Wetland Plants: planting specification document for the Towee Trail. For U.S. Navy and Alvarez, Lehman and Associates, Inc.

Wallace, P.M. 1985. Borrow pit reclamation designs--plant species and density recommendations and detailed planting scheme for Towee Trail. For Alvarez, Lehman and Associates, Inc.

Wallace, P.M. 1985. Habitat reclamation guidelines and wetland design criteria. In Reclamation of the Etowah Park Borrow Site as a Freshwater Wetland: Conceptual Design Guidelines. For Alvarez, Lehman and Associates, Inc..

Best, G.R., W.J. Dunn, and P.M. Wallace. 1983-85. Assessment of forest and wetland community development at Agrico's Ft. Green mine, Payne Creek reclamation site. 1st, 2nd, 3rd and 4th Annual Reports.

Best, G.R., P.M. Wallace, and W.J. Dunn. 1985. Enhancing ecological succession following phosphate mining. 1st, 2nd and Final Reports to the Florida Institute of Phosphate Research, Bartow, Florida.

Wallace, P.M., A. Hernandez, and G.R. Best. 1985. Survival and growth of wiregrass (*Aristida stricta*) transplants in the Southwest Orange County Rapid Infiltration Basin Reforestation Area. For Camp, Dresser and McKee, Inc.

Best, G.R., M. Brown, S. Humphrey, W.J. Dunn, P.M. Wallace, and R. Wolfe. 1984. Proposed plan for reforestation of the Southwest Orange County Rapid Infiltration Basin sites. For Camp, Dresser and McKee, Inc.

Wallace, P.M., and M.H. Rector. 1984. Jurisdictional assessment and plant community descriptions for certain Manatee County wetlands. For Camp, Dresser and McKee, Inc.

Wallace, P.M., and G.R. Best. 1984. Root dynamics in wetland ecosystems: chromatographic assay---a method for identifying woody plant roots. Center for Wetlands subcontract to the Institute of Ecology, University of Georgia.

Dunn, W.J., P.M. Wallace and M. Rector. 1984. Reclamation handbook for phosphate mining of Hookers Praire, Polk County, Florida. For: Environmental Services and Permitting, Inc., Gainesville, Florida.

Best, G.R., H.T. Odum, W.J. Dunn, and P.M. Wallace. 1982. Enhanced ecological succession following phosphate mining. First

Annual Report to the Florida Institute of Phosphate Research, Bartow, Florida.

Best, G.R., M.T. Brown, W.J. Dunn, and P.M. Wallace. 1982. Environmental evaluation of a proposed wastewater infiltration basin in East Orange County. Prepared for Camp, Dresser and McKee, Inc., Orlando, Florida.

ANGUS K. GHOLSON, JR.

ADDRESS

Post Office Box 385
Chattahoochee, Florida 32324
(904) 663-4417

PERSONAL HISTORY

Born: 24 September 1921, Chattahoochee, Florida
Marital Status: Married, Two children

EDUCATION

1948 B.S., Forestry, University of Florida, cum laude

PROFESSIONAL EXPERIENCE AND CURRENT PROJECTS

1988 Curator of the AKG Herbarium, a private herbarium with 12,000+ specimens, Chattahoochee, Florida.

1987 Performed Floristic Studies in Florida Panhandle and closely adjacent Georgia and Alabama.

1987 Performed Floristic Studies in the Apalachicola National Forest for The Florida Natural Areas Inventory an arm of the Nature Conservancy.

1986 Performed Floristic Studies for The Nature Conservancy on Ichayway Plantation, Baker County, Georgia.

1985 Performed Floristic Studies in the Florida Panhandle for the Florida Natural Areas Inventory an arm of The Nature Conservancy.

1984 Performed Floristic Studies along the Apalachicola River for the U.S. Army Corps of Engineers, Mobile, Alabama District.

1983 Retired from the U.S. Army Corps of Engineers.

1970 Founded AKG Herbarium, Chattahoochee, Florida.

1983 Resource Manager of the Jim Woodruff Dam and Lake Seminole Project for U.S. Army Corps of Engineers since 1971.

1971 U.S. Army Corps of Engineers, Jim Woodruff Dam and Lake Seminole Project as Assistant Resource Manager.

CURRENT ACTIVITIES

Assisting graduate students, Botanical Departments of Colleges, Universities, and various Governmental (State and Federal) Agencies with Botanical and Floristic efforts.

Resume of:
David L. Evans
2302 N.W. 15th Place
Gainesville, Florida 32605
Telephone: (904) 373-0548

Education:

Ph.D.	University of Florida	Environmental Engineering Sciences (in progress)	
M.S.	Tennessee Technological University	Biology (Fisheries)	1976
B.S.	Earlham College	Biology	1972

Experience:

1981 - Present — Water and Air Research, Inc.; Gainesville, Florida; Environmental Scientist
Collect and identify macroinvertebrates from various aquatic systems (lakes, ponds, reservoirs, springs, streams, and rivers).

1987 — Environmental Services and Permitting, Inc.; Gainesville, Florida; Quality Assurance Consultant
Performed taxonomic verifications on larval Chironomidae.

1983 — Jones-Edmunds and Associates, Inc.; Gainesville, Florida; Consultant
Conducted benthic surveys, identified chironomid larvae and other major taxonomic groups of benthic invertebrates.

1981 — R.E.C.R.A., Inc.; Nashville, Tennessee; Environmental Consultant
Collected and identified benthic macroinvertebrates and zooplankton; set up and performed various bioassay tests dealing primarily with heavy metals and various chemical wastes.

1980 - 1981 — Tennessee Technological University; Cookeville, Tennessee; Consultant
Collected and identified macroinvertebrates; analyzed water quality and faunae (fish and macroinvertebrates) of various lotic systems which were exposed to acid mine drainage, pesticides, and sewage; analyzed data with computer.

1979 - 1981 — A.W.A.R.E., Inc.; Nashville, Tennessee; Biological Consultant
Mounted and identified chironomid larvae.

1980 — Chincoteague National Wildlife Refuge; Chincoteague, Virginia; Biological Consultant
Collected and identified benthic invertebrates from estuaries and salt marshes in the vicinity of the refuge.

1979 - 1980 Fairfield Glade, Tennessee; Environmental Consultant
Designed and supervised a chironomid midge control program for several impoundments; collected and identified larval midge communities before and after treatment to determine effectiveness of larvicide.

1978 - Tennessee Technological University; Cookeville, Tennessee; Student
Studied for three years under Mr. William M. Beck, Jr., one of the foremost American authorities on the larval chironomids. Thesis title: The Spatial and Seasonal Distribution of Benthic Macroinvertebrates in a Spring-Fed Quarry with Special Reference to the Chironomidae (Diptera).

Post Graduate Studies

Mr. William M. Beck, Jr. - Former Florida State biologist and faculty of Florida A&M.

Dr. Selwyn Roback - Philadelphia Academy of Natural Sciences

Dr. Ralph Brinkhirst - Institute of Ocean Sciences

Professional Activities and Memberships

Founder of Florida Association of Benthologists
Editor of Florida Benthological Newsletter
North American Benthological Society
Florida Association of Benthologists
Florida Entomological Society
American Fisheries Society

Publications and Presentations

A Comparison of Three Methods for Sampling Aquatic Macroinvertebrates in a Freshwater Mixed Emergent Marsh. North American Benthological Society Annual Meeting, 1987.

Aquatic Macroinvertebrate Taxonomy and Ecology in Florida: An Industrial Perspective. Florida Entomological Society Annual Meeting, 1987.

Application of Aquatic Macroinvertebrate Community Assessment: Industrial Case Studies. Florida Entomological Society Annual Meeting, 1987.

Suggested Methods for Sampling Aquatic Macroinvertebrate Communities of Freshwater Mixed Emergent Marshes. Florida Association of Benthologists Meeting, 1987.

Development of the Aquatic Macroinvertebrate Community in a Newly Created Freshwater Emergent Marsh. North American Benthological Society Annual Meeting, 1988.

Numerous technical reports.

DLE/PERSONAL.2
2/8/88

CURRICULUM VITAE (September, 1986)

NAME: Steven P. Christman

DATE AND PLACE OF BIRTH: 21 May 1945; Grass Valley, California

CURRENT ADDRESS: Department of Natural Sciences
Florida State Museum
University of Florida
Gainesville, FL 21311

Post Office Box 391
Hawthorne, Florida 32640

TELEPHONE: (904) 546-2187

CURRENT POSITION:
Visiting Assistant Curator, Natural Sciences, Florida State Museum, Gainesville.

One-half time contractor for Florida Game and Fresh Water Fish Commission, on a project to determine the distribution of rare plants in Florida sand pine scrub habitats.

MILITARY STATUS:
Honorable Discharge, November 1970 after six years service, three years active duty, U.S. Army Special Forces. Included duty in the United States, West Germany and South Viet Nam.

EDUCATION:
Ph.D., 1975, Department of Zoology, University of Florida; Major Professor: Dr. Archie F. Carr.

B.S., 1971, Department of Zoology, University of Florida.

OTHER TRAINING:
Remote Sensing Applications Training, EROS Data Center, Sioux Falls, SD.
Military Schools: Radio Operations (North Carolina); Mountain Climbing (Germany); SCUBA and Underwater Recovery (Germany); Jump School (Georgia); Jungle Survival (Viet Nam).

AWARDS AND SCHOLARSHIPS:
U.S. Fish and Wildlife Service Special Achievement, 1978.
U.S.D.I. Quality Step Increase, 1978.
Florida State Museum Curators' Austin Award, 1974.
National Defense Educational Graduate Fellowship, 1973.
Sigma Xi Grant-in-Aid, 1971.
New York State Viet Nam Veteran's Scholarship, 1967-68.
New York State Regents Scholarship, 1963-64 & 1967-68.

PROFESSIONAL EXPERIENCE:

July 1984 - August 1985
Wildlife Biologist (Research)
Patuxent Wildlife Research Center

Duties with PWRC have included the planning and implementation of an experimental study to determine the optimum type of cave gating system for protection of endangered cave-dwelling bats.

May 1976 - July 1984
Wildlife Biologist (Research)
Denver Wildlife Research Center (formerly National Fish and Wildlife Laboratory)

Responsibilities with DWRC have included:

1. The planning and administration of an 18 month field study of the potential effects of phosphate mining on endangered species in the Osceola National Forest, Florida. I supervised 16 biologists, technicians and other staff and was the principal author and editor of the published 414 page final report, "Osceola National Forest Phosphate Extraction and Processing: Impacts on Federally Listed Threatened or Endangered and Other Species of Concern."

2. The planning, administration and production of status summary accounts of U.S. threatened and endangered wildlife. I supervised nine biologists during the two year study and was the principal author of several of the accounts and was responsible for the overall effort that resulted in 40 status summary accounts and maps of threatened and endangered wildlife published by the Office of Biological Services under the title, "Selected Vertebrate Endangered Species of the Seacoast of the United States."

3. The planning, administration and supervision of three technicians on a one year study of the ecological literature of the Galveston Bay, Texas area. The final report was published in two volumes entitled, "Annotated Bibliography of the Fish and Wildlife Resources of Galveston Bay."

4. The planning, administration and development of a computerized list of all the vertebrate species of the world. I supervised five biologists and technicians during the six month study which resulted in the listing of over 37,000 species of vertebrates, and the final report, "Vertebrates of the World: A Preliminary List".

5. The development of a computerized data base of state laws protecting threatened and endangered wildlife. I supervised three technicians on the study which resulted in the published document, "Rare and Endangered Vertebrates of the Southeastern Coastal Plain: A Summary of Public Concern for Sensitive Wildlife."

6. A review of existing storage formats and facilities for rapid retrieval of endangered species information and production of the final report, "Endangered Species in Coastal Ecosystems: Recommendations for a National Endangered Species Data Bank."

7. Participation in ecological field studies at the St. Marks National Wildlife Refuge, Florida relating forestry management practices to non-game wildlife populations. Responsibilities included population censusing and data analysis.

8. Participation in an interdisciplinary study of the efficacy and impacts to non-target wildlife of an experimental fire ant insecticide. I was responsible for the bird investigations and co-authored the published manuscript, "Hazards to Birds and Mammals Following Nifluridide Baiting for Fire Ant Control."

9. The planning, design and execution of studies of non-game wildlife response to habitat management in bottomland hardwoods of the Mississippi Delta at White River National Wildlife Refuge, Arkansas. Specifically, I examined the effects of greentree reservoir management on transient spring migrant birds, nesting songbirds, and over- and under-story vegetation. Some of the results were published under the title, "Breeding Bird Response to Greentree Reservoir Management." I implemented an innovative transect-based technique for estimating breeding bird densities published under the title, "Plot Mapping: Estimating Densities of Breeding Bird Territories by Combining Spot Mapping and Transect Techniques." I updated the refuge bird list and provided the first lists of amphibians, reptiles and mammals known from White River NWR.

10. A floral and faunal inventory of St. Vincent Island National Wildlife Refuge on the Florida Gulf Coast. Field work included migratory and breeding bird surveys and censuses and surveys of fresh water fish, amphibians, reptiles, mammals and plants. I provided the refuge with lists of the fishes, amphibians, reptiles, birds, mammals, trees and shrubs known to occur on the island.

11. Other responsibilities with DWRC have included continuation of my studies on the systematics, ecology and evolution of southeastern amphibians and reptiles.

12. I have served as acting Field Station Leader during periods of the leader's absence.

February 1975 - April 1976
Contract Biologist
Florida Game and Fresh Water Fish Commission

Served as Field Team Leader for the amphibian and reptile portions of an environmental impact assessment of the proposed Cross Florida Barge Canal. I developed and implemented population census methods for amphibians and reptiles ("herp arrays"), described in "Techniques for Herpetofaunal Community Analysis." I directed and coordinated the efforts of a three-biologist field team, and co-authored two volumes of the final report.

June 1975 - January 1976
Contract Biologist
U.S. Fish and Wildlife Service

Developed an innovative computerized method for comparing mapped environmental and biological data. I produced a climatic data base for the Southeastern Coastal Plain consisting of atmospheric data for all weather stations, and a similar data base for water quality and flow data for southeastern rivers.

December 1973 - present
Consultant
Florida Audubon Society Committee on Rare and Endangered Plants and Animals

Participated in endangered species policy formation and prepared status summary papers on endangered and threatened amphibians and reptiles in Florida. I authored 12 of the chapters in the published book, "Rare and Endangered Biota of Florida".

1972 - 1974
Teaching Assistant
Department of Zoology, University of Florida

Participated in the organization and implementation of laboratory programs in Comparative Vertebrate Anatomy, General Ecology and General Zoology. Duties included lecturing, preparation of laboratory exercises, and preparation and administration of examinations.

1971 -1972
Research Assistant
Department of Natural Sciences, Florida State Museum

Duties included the description and analysis of phenotypic variation in southeastern reptiles, and the identification and curatorship of amphibian and reptile specimens.

1970 -1971
Research Assistant
Naval Undersea Center, Department of the Navy

Duties included the compilation and review of the literature on the dangerous crocodilians and snakes of Southeast Asia. I authored a bibliography on crocodilians and poisonous snakes of Southeast Asia, and co-authored the published report, "Handbook of Dangerous Animals for Field Personnel."

1969 - 1970
Museum Technician
Department of Natural Sciences, Florida State Museum

Duties included the preparation, identification and curatorship of specimens of fish, amphibians and reptiles.

TEACHING EXPERIENCE:
Laboratory Teaching Assistant: Introductory Zoology
Comparative Vertebrate Anatomy
General Ecology

RESEARCH INTERESTS:
Habitat and wildlife management, ecology, evolution, biogeography, vertebrate biology, preserve design and endangered species biology.

PROFESSIONAL MEMBERSHIPS:
American Association for the Advancement of Science
The Wildlife Society
American Society of Ichthylogists and Herpetologists
Society for the Study of Amphibians and Reptiles
Herpetologists' League
American Forestry Association

PUBLICATIONS:

1959. Sound production in newts. Herpetologica 15(1):13.

1959. A record size horned toad. Herpetologica 15(3):180.

1970. Hyla andersoni in Florida. Quart. Jour. Florida Acad. Sci. 33(1):36.

1971. The origin of snakes. Bull. Maryland Herp. Soc. 7(1):10-22.

1971. The possible evolutionary history of two Florida skinks. Quart. Jour. Florida Acad. Sci. 33(4):291-293.

1972. (with H.W. Campbell). Dangerous land snakes of Southeast Asia. Pp. 27-84 in: Pickwell, G.V. and W.E. Evans, eds., Handbook of dangerous animals for field personnel. Undersea Surveillance and Ocean Sci. Dept., U.S. Naval Undersea Center.

1972. (with H.W. Campbell and W.E. Evans). Crocodiles of Southeast Asia. Pp. 85-96 in: Pickwell, G.V. and W.E. Evans, eds., Handbook of dangerous animals for field personnel. Undersea Surveillance and Ocean Sci. Dept., U.S. Naval Undersea Center.

1973. (with L.R. Franz). Feeding habits of the striped newt, Notophthalmus perstriatus. Jour. Herpetology 7(2):133-135.

1974. Geographic variation for salt water tolerance in the southern leopard frog, Rana sphenocephala. Copeia 1974(3):773-778.

1974. The supposed giant extinct rattlesnake of Florida. Plaster Jacket 22:1-7.

1974. Recent amphibians and reptiles. Pp. 115-120 in: Gilbert, C.R., ed., Catalogue of type specimens in the Department of Natural History, Florida State Museum. Bull. Florida St. Mus. (Biol. Sci.) 18(2):101-120.

1975. The status of the extinct rattlesnake, Crotalus giganteus. Copeia 1975(1):43-47.

1975. (with H.I. Kochman). The southern distribution of the many-lined salamander, Stereochilus marginatus. Florida Sci. 38(3):140-141.

1976. (with H.D. Prange). The allometrics of rattlesnake skeletons. Copeia 1976(3):542-545.

1978. (with W.S. Lippincott and H.I. Kochman). An annotated bibliography of the fish and wildlife resources of Galveston Bay, Texas. U.S. Fish and Wildl. Svc. Biol. Svc. Pgm. FWS/OBS-78-71. 2 vol.

1978. (with W.S. Lippincott). Rare and endangered vertebrates of the Southeastern Coastal Plain: A summary of public concern for sensitive wildlife. U.S. Fish and Wildl. Svc. Biol. Svc. Pgm. FWS/OBS-78-31. 46 pp.

1978. Florida Keys mole skink. Pp. 36-38.
Blue-tailed mole skink. Pp. 38-40.
Cedar Keys mole skink. Pp. 57-58.
Sand skink. Pp. 40-41.
Many-lined salamander. Pp. 12-14.
Lower Keys ringneck snake (with W. Weaver). Pp. 41-42.
Lower Keys ribbon snake (with W. Weaver). Pp. 46-47.
Lower Keys brown snake (with W. Weaver). Pp. 44-45.
Gulf salt marsh snake (with H.I. Kochman). Pp. 62-63.
Atlantic salt marsh snake (with H.I. Kochman). Pp. 27-28.
Carpenter frog (with D.B. Means). Pp. 15-17.
Striped newt (with D.B. Means). Pp. 14-15.

Chapters in: McDiarmid, R.W., ed., Rare and endangered biota of Florida, Vol. 3, Amphibians and Reptiles. Univ. Presses of Florida. xxii + 74 pp.

1979. (with others). Rana virgatipes. Geog.Dist., Herp. Rev. 10(2):59.

1979. (with others). Stereochilus marginatus. Geog. Dist., Herp. Rev. 10(2):59.

1980. (with others). Stereochilus marginatus. Geog. Dist., Herp. Rev. 11(1):13.

1980. Preliminary observations on the gray-throated form of Anolis carolinensis (Reptilia: IGUANIDAE). Florida Fld. Natur. 8(1):11-16.

1980. Patterns of geographic variation in Florida snakes. Bull. Florida St. Mus. (Biol. Sci.) 25(3):157-256.

1980. (with others). Notophthalmus perstriatus. Geog. Dist., Herp. Rev. 11(1):13.

1980. (with others). Trionyx spiniferus asperus. Geog. Dist., Herp. Rev. 11(1):14.

1982. (with H.W. Campbell). The herpetological components of Florida sandhill and sand pine scrub associations. Pp. 163-171 in: Scott, N.J., ed., Herpetological Communities. U.S. Fish and Wildl. Svc., Wildl. Res. Rpt. 13. 239 pp.

1982. (with H.W. Campbell). Field techniques for herpetofaunal community analysis. Pp. 193-200 in: Scott, N.J., ed., Herpetological Communities. U.S. Fish and Wildl. Svc., Wildl. Res. Rpt. 13. 239 pp.

1982. (with H.W. Campbell). The systematic status of Phyllorhynchus decurtatus porelli Powers and Banta. Jour. Herp. 16(2):182-183.

1982. Storeria dekayi (Holbrook). Cat. Amer. Amphib. Rept. 306.1-306.4.

1983. Mississippi Delta bottomland hardwoods - Managed. Breeding Bird Census. Amer. Birds 37(1):67.

1983. Mississippi Delta bottomland hardwoods - Unmanaged. Breeding Bird Census. Amer. Birds 37(1):67-68.

1984. Plot mapping: Estimating densities of breeding bird territories by combining spot mapping and transect techniques. The Condor 86:237-241.

1984. Gulf of Mexico barrier island. Breeding Bird Census. Amer. Birds 38(1):119-120.

1984. Timber management is not wildlife management. Proc. 4th Ann. Mtg, Gopher Tortoise Council. Pp. 5-18.

1984. (with others). Hazards to birds and mammals following nifluridide baiting for controlling fire ants. Proc. SE Game and Fish Comm. 38: xxxxx.

1984. Breeding bird response to greentree reservoir management. Jour. Wildl. Manage. 48(4):1164-1172.

PUBLISHED REPORTS:

1976. Herpetology study, Cross Florida Barge Canal Restudy Report. Wildlife Study, Vol. 2, App. B. Dept. Army, Jacksonville Dist., Corps Engineers. 5 vol.

1976. Endangered, threatened, rare, special concern, status undetermined and biologically sensitive species. Cross Florida Barge Canal Restudy Report, Dept. Army, Jacksonville Dist., Corps Engineers. vii + 267 pp.

1978. Osceola National Forest phosphate extraction and processing: impacts on federally listed threatened or endangered and other species of concern. U.S. Fish and Wildl. Svc., Office Biol. Svc., Washington. 414 pp.

1980. Selected vertebrate endangered species of the seacoast of the United States. U.S. Fish and Wildl. Svc., Biol. Svc. Pgm., FWS/OBS-80-01.27.

PAPERS GIVEN (ABSTRACTS PUBLISHED):

1970. Comments on the possible evolutionary history of two Florida skinks. 50th Ann. Mtg. Amer. Soc. Ichthy. Herpetol., New Orleans.

1972. Comments on the green-throated population of Anolis carolinensis in Florida. 52nd Ann. Mtg. Amer. Soc. Ichthy. Herpetol., Boston.

1974. Geographic variation for salt water tolerance in the leopard frog, Rana sphenocephala. 35th Ann. Mtg. Assoc. SE Biol., Savannah, Georgia.

1974. Giant rattlesnakes and skeletal morphometrics. Joint Ann. Mtg. Soc. Stdy. Amphib. Rept. and Herp. League, Auburn, Alabama.

1977. Patterns of geographic variation in Florida snakes. 57th Ann. Mtg. Amer. Soc. Ichthy. Herpetol., Gainesville, Florida.

1977. The herpetofauna of Florida sand pine scrub. Joint Ann. Mtg. Soc. Stdy. Amphib. Rept. and Herp. League, Lawrence, Kansas.

1977. (with H.W. Campbell). Techniques for herpetofaunal community analysis. Joint Ann. Mtg. Soc. Stdy. Amphib. Rept. and Herp. League, Lawrence, Kansas.

1978. (with H.I. Kochman, H.W. Campbell and C.R. Smith). Successional changes in community structure: amphibians and reptiles in Florida sand pine scrub. Joint Ann. Mtg. Soc. Stdy. Amphib. Rept.and Herp. League, Tempe, Arizona.

1984. Development of an optimal cave gate for protection of endangered cave-dwelling bats. 1984 Natl. Cave Mgmnt. Symp., Rolla, Missouri.

KATHRYN D. STARCHER
Laboratory Supervisor

Education

B.S., Biology, Oglethorpe University

Experience

Ms. Starcher is responsible for a variety of functions in the laboratory. These include supervising laboratory personnel and coordinating work assignments, compiling and summarizing data, maintaining a quality control program, preparing equipment and materials for field assignments, and performing laboratory analyses.

Ms. Starcher uses advanced laboratory equipment such as atomic absorption spectrophotometers, TOC analyzers, the Warburg respirometer, and autoanalyzers. She has experience in a variety of analytical procedures including standard analyses such as BOD, COD, and nutrient and mineral determination, and has assisted with jar tests and bench-scale activated sludge pilot studies. Types of samples she has analyzed include groundwater, surface water, seawater, estuarine water, domestic and industrial wastes, solid wastes, hazardous wastes, plants, soils, and sludge.

For the Sugar Cane Growers Cooperative in Belle Glade, Florida, Mrs. Starcher analyzed industrial process waste, treatment pond wastewater, monitoring canal water, and monitoring well water. She developed a practical cadimium reduction procedure for nitrate nitrogen analysis of the Cooperative's industrial wastewater. Other analyses of this waste included phosphorus and kheldahl nitrogen, BOD, and solids.

Mrs. Starcher also analyzed rainwater, agricultural irrigation and runoff water, and shallow monitoring well water for the Florida Sugar Cane League, Clewiston, Florida.

Before joining CH2M HILL, Ms. Starcher taught high school chemistry and physical science in the Duval County, Florida, school system.

Membership in Professional Organizations

Florida Society of Environmental Analysts

CATHERINE L. PUGH
Laboratory Technician

Education

B.S., Chemistry Education, Auburn University
B.S., Chemistry, University of Alabama in Birmingham

Experience

Ms. Pugh is responsible for a variety of analyses in the laboratory. She has used advanced laboratory equipment such as atomic absorption spectrophotometers, autoanalyzers, and TOC analyzers. She has experience in a variety of analytical procedures including standard analyses such as BOD and nutrient determination. Types of samples she has analyzed include groundwater, surface water, domestic and industrial wastes, sludges and soils.

For General Development Utilities, Ms. Pugh devised procedures for soil column testing using limestone and native and treated waters.

Ms. Pugh has been responsible for organizing, implementing and overseeing a Quality Control/Quality Assurance program for the laboratory.

Before joining CH2M HILL, Ms. Pugh worked in a research and development laboratory studying air pollution control including 2 years of onsite sampling at a field station.

gnRE2A

CHARLIE JARMAN
Environmental Scientist

Education

B.S., Physics, University of Southern Mississippi

Experience

Mr. Jarman is primarily responsible for analyzing samples in the Gas Chromatography Laboratory and preparing corresponding reports. He also maintains the instruments and assists in the routine operation of the GC laboratory, including preparation of standards, sample tracking, and the laboratory quality control program.

Mr. Jarman has nine years of laboratory and instrument experience, including five years as a Hewlett Packard Field Service Engineer for gas chromatographs, laboratory data systems, and mass spectrometers. He also worked as a GC/MS operator at two certified EPA Contract Laboratories.

Prior to entering the laboratory field, Mr. Jarman worked as an engineer in the offshore oil industry and as a technical writer in consumer electronics.

Membership in Professional Organizations

American Chemical Society

gnRE1

THOMAS C. EMENHISER
Manager, Laboratory Services

Education

B.S., Chemistry, University of Florida

Experience

Mr. Emenhiser is manager of the full-service environmental laboratory operating from CH2M HILL's Gainesville office. He has over 12 years of experience in industrial wastewater treatment, hazardous waste assessment, and water quality investigations. He has worked on a wide variety of projects and has a broad range of experience in several technical areas.

As manager of the Gainesville laboratory, Mr. Emenhiser established the laboratory test procedures for analyzing the indicator parameters for gasoline contamination samples. The Gainesville laboratory analyzes approximately 100 samples per month for benzene, toluene, and xylenes by U.S. EPA Method 602. These compounds are the typical indicator parameters for petroleum hydrocarbon contamination studies. Mr. Emenhiser is well versed not only in the details of the analytical procedures but also in interpreting data sets that assess the extent and the source (e.g., gasoline, kerosene, diesel fuel) of contamination.

During the last several years, Mr. Emenhiser has been involved in several projects associated with the EPA's RCRA and Superfund programs. He was the project team leader for the Biscayne Aquifer groundwater sampling project. This project required groundwater sampling of 120 wells in the Miami area in accordance with EPA sampling protocol, including maintenance of field notebooks, chain of custody records, and organic/inorganic traffic reports.

Mr. Emenhiser has been the field manager for several industrial wastewater characterization and treatability studies, including those conducted for Engelhard Industries at Attapulgus, Georgia; and Hercules, Inc., at their Gibbstown, N.J. and Brunswick, Georgia facilities. His responsibilities on these projects included the characterization of the strength and quantity of wastewater streams to determine their overall pollutant load and the evaluation of alternative experimental techniques (e.g., dissolved air flotation, activated carbon adsorption, jar test coagulation, and bench-scale biological reactors) for development of the optimum treatment/disposal system for the respective facilities.

THOMAS C. EMENHISER

Mr. Emenhiser has been involved in several process designs for industrial wastewater treatment facilities and spent 6 months in Caracas, Venezuela completing a preliminary design on the treatment of upgrader and produced wastewaters for the Lagoven Oil Company.

Mr. Emenhiser also has extensive experience in surface-water quality investigations. He has been involved in limiting nutrient investigations and non-point source water quality and quantity studies for the Florida Sugar Cane League, Deseret Ranches, and Jacksonville Suburban Utilities.

Membership in Professional Organizations

Water Pollution Control Federation
Florida Pollution Control Association

Publications

With Udai P. Singh, J.I. Garcia-Bengochea, and James E. Orban. Cleanup of Miami Drum Hazardous Waste Site. Journal of Environmental Engineering. 1984.

With Udai P. Singh. Innovative Sampling Techniques for Ground Water Monitoring at Hazardous Waste Sites. Ground Water Monitoring Review. 1984.

With Udai P. Singh, Norman N. Hatch, J.I. Garcia-Bengochea, and James E. Orban. Remedial Investigations at Biscayne Aquifer Hazardous Waste Sites. Presented at the American Society of Civil Engineers Specialty Conference on Environmental Engineering, Los Angeles, California. 1984.

With Rufus J. Bruner, Norman N. Hatch, and Udai P. Singh. Sampling Procedures for the Biscayne Aquifer Protection Study. Presented at the National Water Well Association's Fourth National Symposium and Exposition on Aquifer Restoration and Ground Water Modeling, Columbus, Ohio. 1984.

With Ross Sproul. Effects of Hydrogen Sulfide in Florida Groundwaters. Presented at the Third Annual Groundwater Symposium of the Northwest Florida Water Management District.

THOMAS C. EMENHISER

With Earl E. Shannon and J.J. Smith, Jr. Anaerobic-Aerobic Biopond Treatment of Sugarcane Mill Process Wastewaters. Presented at the 52nd Annual Conference of the Water Pollution Control Federation, Houston, Texas. 1979.

gnRE1

AMIR VARSHOVI

Education

University of South Florida B.A. Chemistry
University of Florida. Additional studies in the academic areas of Environmental Science and Soil Science.

Experience

Responsibilities at CH2M HILL, initially assisted with metals analysis and sample preparation. Currently responsible for analysis of organic priority pollutants using gas chromatography, purge and trap techniques.

Before joining CH2M HILL worked as an analytical chemist for West Cement plant in Iran. Responsibilities included elemental analysis of soils using x-ray fluoresence spectrometry and flame photometry.

Membership in professional organizations.

Water pollution control Federation.

ISAAC D. LYNCH
Technical Biologist III

Education

A.S., Environmental Science Technology, Santa Fe Community College

Experience

Mr. Lynch is the Inorganic Lab Supervisor for the Gainesville laboratory. His duties include overseeing the wet chemistry and metals analysis operations, checking data for correlation and quality control, and supervising and training new lab technicians.

Mr. Lynch is experienced in laboratory work, particularly in inorganic water quality analyses (i.e., primary and secondary drinking water standards, etc.). He is skilled in field sampling, performing atomic absorption spectrophotometry, and performing and supervising wet chemistry analyses.

Membership

Florida Society of Environmental Analysis

RE2A/Lynch

RON JONES
Technician

Education

A.S., Environmental Science Technology, Sante Fe Community College

Experience

In the laboratory in the Gainesville office, Mr. Jones performs a wide variety of analyses. Some of these include TKN, NH_3, MBAS, oil and grease, cyanide, VOA, and atomic absorption spectroscopy.

Mr. Jones has a total of nine years of experience in the laboratory and in the field. As the supervisor of the environmental science lab at Sante Fe Community College, he provided the instructional support of environmental science students. During this time, he gained experience in atomic absorption spectroscopy and gas chromatography.

At the Midwest Research Institute in Kansas City, Missouri, Mr. Jones gained experience in sampling and analysis of air pollutants as described in the Federal Register, Methods 1 through 8.

RE1/Jones R

MARJORIE BROOKE CARUSO
Laboratory Technician

Education

B.S., Horticulture, The Pennsylvania State University

Experience

Ms. Caruso is a laboratory technician in the Gainesville office. In this capacity, she performs many analyses pertaining to water quality criteria (titrations, turbidity, pH, color, etc.). She also is experienced with Kjeldahl units and autoanalyzers. Ms. Caruso has conducted analyses on many different sample matrices such as water, sludge, and soil.

Before joining CH2M HILL, Ms. Caruso operated a gas chromatograph as a hydrocarbon well analyst. Ms. Caruso also operated a mass spectrophotometer (used for quantitative analysis of elements in plant material) in the Plant Nutrition Laboratory of the Pennsylvania State University.

RE1/Caruso

TAD R. CONNINE
Technical Biologist II

Education

B.S., University of of Florida, 1986
A.S., Florida State University, 1984

Experience

Mr. Connine's primary functions in CH2M HILL's Gainesville Environmental Laboratory are digestion and preparation of samples, and determining metals concentrations by Atomic Absorbtion spectrophotometry. Tad also performs wet chemistry analysis.

Mr. Connine was previously employed by ABC Research. There he digested environmental and food samples, and analyzed for metals by Atomic Absorbtion spectrophotometry.

Mr. Connine also has experience isolating, identifying, and mapping human histone genese with human and bacterial laboratory genetic studies.

gnRE7/046

DONALD E. HASH
Sample Coordinator
Lab Administrator

Education

B.S., Biology, Virginia Polytechnic Institute and State University; Minor--Chemistry; Minor--Computer Sciences

Experience

Mr. Hash is responsible for a variety of functions in the CH2M HILL Gainesville Environmental Lab. These include purchasing/receiving, sample receiving/custody, sample tracking, data reporting, coordination with field crews, client/customer contact, sample kits/protocols, chain of custody requirements, coordination with other labs (internal and external), and various other clerical duties. He has also performed GC 601/602 analyses.

Prior to joining CH2M HILL, Mr. Hash has been a commercial laboratory manager at ABC Research supervising the Food Chemistry section. Ordering supplies, coordinating technicians/testing, and performing analyses using GC/EDC, GC/FID, GC/TSD, GC/TCD on a wide variety of matrices. Previous to Food Chemistry, Mr. Hash was a member of the Research Micro Department at ABC performing tests studying the microbial integrity of foods.

Also, Mr. Hash spent 10 years in academia doing research at VPI and SU Department of Anaerobic Microbiology. There, he published four technical papers in international journals and spent 5 years developing software for statistical analyses of bacterial populations in dental patients with periodontitis.

Membership in Professional Organizations

Florida Society of Environmental Analysts
American Chemical Society
American Society for Microbiologists
Association of Official Analytical Chemists

Publications

Moore, W.E.C., D.E. Hash, L.V. Holdeman, and E.P. Cato. 1980. Polyacrylamide slab gel electrophoresis of soluble proteins for studies of bacterial floras. Appl. Environ. Microbiol. 39:900-907.

DONALD E. HASH

Cato, E.P., D.E. Hash, L.V. Holdeman, and W.E.C. Moore. 1982. Electrophoretic study of Clostridium species. J. Clin. Microbio. 15:688-702.

Moore, W.E.C., L.V. Holdeman, R.M. Smibert, D.E. Hash, J.A. Burmeister, and R.R. Ranney. 1982. Bacteriology of severe periodontitis in young adult humans. Infect. Immun. 38:1137-1148.

Cato, Elizabeth P., John L. Johnson, D.E. Hash, and Lillian V. Holdeman. 1983. Synonomy of Peptococcus glycinophilus (Cardon and Barker 1946) Douglas 1957 with Peptostreptococcus micros (Prevot 1933) Smith 1957 and electrophoretic differentiation of Peptostreptococcus micros from Peptococcus magnus (Prevot 1933) Holdeman and Moore 1972. Int. J. Syst. Bacteriol. 33:207-210.

gnRE7/045

MARILYN WIGLE
Metals Analyst

Education

Coursework, Microbiology, University of Florida
A.A., General Science, Brevard Community College
Additional courses in chemistry and microbiology at the University of Florida

Experience

Ms. Wigle is primarily responsible for the preparation and analysis of metals samples by atomic absorption spectrophotometry. She also has experience with mercury and total organic carbon determinations.

Before joining CH2M HILL, Ms. Wigle was a chemist in General Electric's Battery Business Department in their Advanced Engineering Laboratory.

gnRE7/044

HECTOR HERNANDEZ
Laboratory Aide

Education

A.A., Business, Santa Fe Community College

Experience

In the Gainesville office laboratory, Mr. Hernandez performs various analyses which include biochemical oxygen demand, total suspended solids, total dissolved solids, percent solids, MBAS, oil and grease analyses, and sample distillation.

Mr. Hernandez has a year experience in laboratory work. Prior to working in the laboratory Mr. Hernandez worked as an assistant in an environmental engineering consulting firm.

gnRE7/043

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JEFFERSON COUNTY
FLORIDA

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ANSPORTATION

JEFFERSON COUNTY
FLORIDA

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