Baldwin County Planning District 26
Wetlands Evaluation and Recommendations

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Introduction

The wetlands within Baldwin County, Alabama are indispensable and fragile natural resources that present significant development constraints including flooding and soils limitations. In their natural state, wetlands serve humanity and nature. They provide habitat for fish and wildlife; contribute to water quality maintenance and pollution control, flooding and erosion control; offer opportunities for scientific study and natural resource education; serve as open space; and provide recreational opportunities. Wise use and conservation of wetlands is essential to the economic well-being of Baldwin County. A considerable percentage of these important natural resources have been lost, degraded, or impaired by draining, sedimentation, filling, excavating, construction, fire suppression, and other activities. Incremental and cumulative losses of wetlands, both authorized and unauthorized, are constantly occurring. Damaging or destroying wetlands threatens public safety and the general welfare of the citizens of Baldwin County as well as overall quality of life.

The Baldwin County Commission has therefore determined that measures are needed to ensure maximum protection of wetlands by discouraging activities that result in wetland loss and adverse effects. Under Baldwin County's current zoning regulations, the following wetland protections are required:

> **Zoning Ordinance, Section 10.4 Wetland Protection Overlay District**
>
> ***10.4.4 Permit Requirements.*** *A U.S. Army Corps of Engineers wetlands jurisdictional determination if the proposed planned development contains wetlands or if the Zoning Administrator or his/her designee determines potential wetlands from the Generalized Wetland map as defined herein, or through a site visit by County Staff. The setback for development from a wetland must be a minimum of 30 feet.*

The purpose of the wetland protection overlay district is to promote wetland conservation and protection while accounting for varying ecological, economic development, and recreational and aesthetic values. Wetlands are to be protected from alterations that will significantly affect or reduce their primary functions, which include improved water quality, flood plain services, erosion control, groundwater recharge, and wildlife habitat.

At the request of the Baldwin County Commission, this report has been produced. It focuses on an evaluation of wetlands within Planning District 26 and wetlands contiguous with the planning district and includes the following:

1. A review of U.S. Army Corps of Engineers / Alabama Department of Environmental Management (Corps/ADEM) permitting requirements under Section 404 of the Clean Water Act and the Alabama Coastal Area Management Program to determine if additional county wetland protections are warranted to ensure that adequate wetland protection is provided for this unique coastal resource.
2. Maps of Planning District 26 displaying remaining coastal wetlands. Areas of high priority for protection and conservation are identified.
3. Recommendations for updates to Article 10, Section 10.4 *Wetland Protection Overlay District* with the intention of ensuring protection of the remaining wetlands within Planning District 26 and including the potential for Baldwin County to implement more stringent wetland protections than those required by the Alabama Department of Environmental Management Coastal Program and the U.S. Army Corps of Engineers Section 404 regulatory program.
4. Separate from this report is an Excel file with priority parcels listed by Parcel ID Number (PPIN).

Planning District 26

Figure 1 depicts Planning District 26, outlined in yellow, which lies along the eastern shore of Mobile Bay south of downtown Fairhope. The red line on the map is the state-designated coastal zone, defined by ADEM as land lying waterward of the continuous 10-ft. contour line. A large percentage of Planning District 26 falls within the state's coastal zone.

Figure 1. Planning District 26 (outlined in yellow)

The district begins along the south side of Molokai Avenue and extends south along Mobile Bay and east to the western shore of Weeks Bay. Scenic Highway 98, County Road 1, and the approximate southern half of Mary Ann Beach Road are within the district. Existing conditions include residential lots along the bays, most of which are occupied by single-family residential development, and residential lots along the east sides of Scenic Highway 98 and County Road 1. Many of the east lots remain in a natural, undeveloped condition. To the east of the small residential lots are larger tracts of natural, undeveloped land that in most cases are entirely wetlands. Most of these tracts are privately owned, but several are owned by the state, county, or the South Alabama Land Trust (SALT). SALT holds conservation easements on a number of tracts in the district or that are contiguous to it. The Grand Hotel is the largest commercial development in the district. A few other small businesses are present as well.

Wetland Regulatory Programs

The vast majority of land in District 26 is wetlands as defined by the Corps and the U.S. Environmental Protection Agency:

> ***Wetlands*** *are those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.*

U.S Army Corps of Engineers Regulatory Program. The U.S. Army Corps of Engineers, through its Regulatory Program, administers and enforces Section 10 of the Rivers and Harbors Act of 1899, Section 404 of the Clean Water Act and Section 103 of the Marine Protection, Research, & Sanctuaries Act. Under Section 10, a permit is required for work or structures in, over, or under navigable waters of the United States. Under Section 404, a permit is required for the discharge of dredged or fill material into waters of the United States and other activities that have the same effect as fill, such as mechanized land-clearing. Section 103 authorizes the Corps to issue permits for the transportation of dredged material for ocean disposal.

Many bodies of water, including wetlands and streams, are considered waters of the United States and are subject to the Corps' regulatory authority. Based on a project's impacts, the Corps will determine what type of permit is required.

With few exceptions, wetlands within and contiguous to Planning District 26 fall under Section 404 jurisdiction. Wetlands waterward of mean high tide fall under Section 10 jurisdiction.

The two basic types of permits that are issued by the Corps to authorize regulated activities in waters of the U.S., including wetlands, are *General Permits* and *Individual Permits*.

General Permits. A general permit is issued for structures, work or discharges that will result in "only minimal adverse effects". General Permits are issued on a nationwide, regional, or statewide basis for a particular category of activities. There are three types of General Permits – Nationwide Permits, Regional General Permits, and Programmatic General Permits. Each type of General Permit is designed to streamline the Department of the Army authorization process for projects that have already been determined to have "minimal adverse effects". Every five years, General Permits are re-assessed and may be re-authorized or modified by the Corps of Engineers.

Nationwide Permits. Nationwide Permits (NWPs) authorize a category of activities throughout the United States, Puerto Rico, and the U.S. Virgin Islands and are valid for an individual project only if the conditions of the appropriate permit type are met. After a review of the project, the Corps issues a verification letter pursuant to the applicable NWP.

An integral part of the Corps' regulatory program is the concept of NWPs for minor activities. NWPs are activity-specific, and are designed to relieve some of the administrative burdens associated with permit processing for both the applicant and the federal government. Some activities authorized by NWPs require pre-construction notification to the Corps before commencing with the work. This notification requirement is necessary to ensure that activities authorized by these NWPs have "*minimal individual and cumulative adverse impacts on the aquatic environment*".

The NWP most commonly used to authorize wetland fill on single-family residential lots in Alabama's coastal zone is *Nationwide Permit 18 - Minor Discharges*, which allows up to one-tenth acre (4,356 sq. ft.) of wetland fill. There must be demonstration of avoidance and minimization of wetland fill, an alternatives statement, a functional assessment of wetlands to be filled, and compensatory mitigation for permitted impacts.

NWP 18 can also be used outside the coastal zone; however, another permit that allows up to one-half acre of wetland fill is also available. *NWP 29 – Residential Developments* is certified by ADEM for use outside the state's coastal zone. Again, there must be demonstration of avoidance and minimization of wetland fill, an alternatives statement, a functional assessment of wetlands to be filled, and compensatory mitigation for permitted impacts. A number of other NWPs are also available for use inside and outside of the coastal zone for activities such as linear transportation project, commercial and institutional development, and utility lines.

Regional General Permits. A Regional General Permit (RGP) is a type of general permit that authorizes categories of activities in a specific geographic area that causes "only minimal individual and cumulative environmental impacts". Each Regional General Permit has specific terms and conditions, all of which must be met for project-specific actions to be verified. Examples of activities authorized by RGPs are docks, minor dredging, and shoreline stabilization.

Standard Individual Permits. Projects that do not meet the terms and conditions of a NWP or RGP are evaluated as an Individual Permit. Individual Permit decisions are made on a case-by-case basis after an individual project evaluation. There are two types of Individual Permits: Standard Permits and Letters of Permission. An Individual Permit is issued when projects have more than minimal individual or cumulative impacts, are evaluated using additional environmental criteria, and involve a more comprehensive public interest review procedure.

Alabama Coastal Area Management Program. Alabama's Coastal Area Management Program (ACAMP) was approved and has been in effect since 1979. Its purpose is to promote, improve, and safeguard the lands and waters located in Alabama's coastal area through a comprehensive and cooperative program designed to preserve, enhance, and develop these valuable resources for present and future generations. The enforceable policies of the program regulate various activities on coastal lands and waters seaward of the continuous 10-foot contour in Baldwin and Mobile counties.

The ACAMP is a joint effort of the Alabama Department of Conservation and Natural Resources-State Lands Division and the ADEM Coastal Program. ALDCNR-SLD is responsible for planning and policy development while ADEM is responsible for permitting, monitoring and enforcement activities, as detailed in the ADEM Division 8 Coastal Programs Rules.

A major focus of ADEM's permitting, monitoring, and enforcement activities in the coastal area is determining federal coastal consistency for projects and activities that require federal permits. ADEM's Coastal Program rules include the review and permitting for the following types of activities when they are to occur within the Coastal Area: beach and dune construction projects, developments and subdivision of properties greater than five acres in size, dredging and filling of state water bottoms and wetlands, the drilling and operation of groundwater wells with a capacity of 50 gpm or greater, the siting of energy facilities, and various other activities that may impact coastal resources.

ADEM has certified NWP 18 – Minor Discharges, for use in the coastal zone if the parcel was platted prior to August 14, 1979, the date the ACAMP regulations went into effect. If the parcel was platted after that date, a variance from certain ACAMP regulations is required, which involves a fee paid to ADEM and a legal opinion explaining why denial of the variance would be a taking of private property without compensation or would be unduly restrictive. If the variance is granted, the Corps can then verify that the project is covered by the NWP if all other required conditions are met.

Wetland Systems in Planning District 26

Three primary types of wetland systems occur in the district: pine savanna/pine flatwoods, bayhead drains, and marsh. A majority of the wetlands in the district can be characterized as fire-suppressed wet pine savanna/pine flatwoods. Pine savannas are open, nearly treeless, fire-dependent plant communities dominated by a diverse array of groundcover

species, few scattered shrubs, and few pine trees. With the long-term exclusion of fire, hardwoods, shrubs, and woody vines invade and form a dense understory, resulting in a loss of diversity in the groundcover layer and subsequent loss of wildlife diversity. This situation also presents a real danger of destructive wildfire.

Bayhead drains are a type of wetland associated with smaller stream systems. These are forested flood plain wetlands dominated by hardwoods, cypress, and an occasional slash pine. These streams flow into Mobile Bay and Weeks Bay. They include Sweetwater Branch, Point Clear Creek, Bailey Creek, Muddy Bayou, and Weeks Branch.

Marsh is the third wetland type present in the district. Brackish tidal marsh is dominated by black needlerush, sawgrass, cordgrass, and other marsh species. It occurs along the western shore of Weeks Bay and spottily along Mobile Bay where development has not yet occurred. Freshwater marsh is present in some of the lowest-lying areas of the Meadows and Gum Swamp. Tidal creeks are associated with these marshes in some cases, as well as artificial drainageways that flow through culverts under roads and into the bays.

US Geological Survey topographic mapping indicates the locations of most wetlands and streams in the district (Figure 2).

Figure 2. USGS Topographic Map of Planning District 26 (outlined in yellow)

Degradation and Loss of Wetlands

In the past 200 years over half of the original 8,000,000 acres of Alabama wetlands have been lost. In the Mobile Bay area, the percentage is much higher and losses continue, both authorized and unauthorized. While the General Permit Program is supposed to result in "only minimal individual and cumulative environmental impacts", the real result has been the systematic filling and degradation of wetlands along the eastern shoreline of Mobile Bay. There are federal and state wetland regulatory programs in place; however, the reality of the situation is that both the Corps and ADEM are woefully understaffed and underfunded. For years both agencies, especially the Corps, have endured an unmanageably heavy workload. For the Corps, that means prioritizing the issuance of permits over making jurisdictional determinations and investigating potential violations of the regulations the Corps is charged with enforcing. As this report is being prepared, over 100 reported potential violations of Section 404 in south Alabama have gone unaddressed by the Corps in recent months due to understaffing and an overwhelming workload (personal conversation with Corps staff member).

Many other wetlands that have not been filled outright have suffered degradation due to fire-suppression, sedimentation, incised stream channels, and invasion by a multitude of exotic plant species. The wetlands in Planning District 26 are some of the most ecologically intact that remain in southwest Alabama and Baldwin County. This wetland system begins south of Fairhope and continues with few interruptions to the western shore of Weeks Bay.

It seems clear that the state and federal regulatory programs are not adequately protecting this irreplacable resource. Additional measures are necessary to protect and conserve remaining wetlands in Planning District 26 and beyond.

Present and Future Threats

In recent years, there has been an increasing interest in the building of single-family homes along the east side of Scenic Highway 98 and County Road 1. Nearly all of the small residential lots that line these roads qualify for up to one-tenth acre of wetland fill under NWP 18. If located outside of the coastal zone, these lots qualify for up to one-half acre of fill under NWP 29. Commercial and institutional development outside the coastal zone can be authorizied under NWP 39, which also limits fill to one-half acre. The incremental filling of wetlands on the hundreds of small residential lots that border the east side Scenic 98 and County Road 1 will cummulatively result in significant wetland loss and degradation of adjacent wetlands. The larger parcels qualify for minor fill under these same NWPs.

Applicants can also pursue more significant wetland fill under a Standard Individual Permit. Obtaining a permit for significant wetland fill is not out of the question. Several years ago the Corps issued a Standard Individual Permit authorizing the filling of 10.49 acres of forested wetlands at the north end of Titi Swamp. Fortunately, the project was never constructed and the permit has since expired. If an applicant presents a plausible purpose and need for the project, conducts a thorough alternatives analysis demonstrating that no other practicable alternatives to the proposed project exist, and agrees to provide required compensatory mitigation, the Corps will in all likelihood issue the permit as was done with the Titi Swamp application.

Another serious threat to the remaining wetlands in District 26 and wetlands contiguous to it is timber extraction. Section 404 of the Clean Water Act includes exemptions from Section 404 regulation for certain activities, including "normal, on-going silvicultural activities". See 33 CFR Part 323.4 at the Appendix for complete language.

Timber extraction, depending on circumstances, may or may not fit the silvicultural exemption. The Corps typically does not investigate timber harvesting activities unless it is reported. Then, unless there are egregious violations of Best Management Practices, it can be difficult for the Corps to demonstrate that the activity does not meet the exemption. Enforcement actions in these situations are rare.

A recent example of the damage that can be done by timber extraction is a 17-acre tract located north of Gum Swamp to the east of Mullet Point. Over half of this tract (PPIN: 021156) was clearcut in 2020. This tract is in the midst of what was an extensive, unbroken wet pine flatwoods ecosystem.

Before Clear-cutting (2019)

After Clear-cutting (2020)

Strategies for Wetland Protection

As previously stated, the wetlands in Baldwin County are indispensable and fragile natural resources that serve humanity and nature. Wise use and conservation of wetlands is essential to the economic well-being of Baldwin County. A combination of strategies can be used to avoid and minimize further wetland loss and degradation in Planning District 26.

Land Acquisition. The best means of assuring long-term wetland protection is to simply acquire priority parcels from willing sellers. Funding sources will need to be identified as well as an appropriate entity or entities that would hold title to the property. Baldwin County, the South Alabama Land Trust (SALT), Coastal Land Trust, and the Alabama Department of Conservation and Natural Resources – State Lands Division are all potential options. Conservation easements should be placed on any such land acquisitions to assure that appropriate uses and management practices can be enforced in perpetuity. SALT, an accredited land trust, is probably the most logical entity to hold the conservation easements.

Beginning on page 11, priority parcels for conservation are depicted. A separate Excel file lists the associated Parcel ID numbers (PPINs) and ownership as currently listed on the county's parcel viewer website. Some of these parcels are already owned by the state, county, or SALT, or are privately owned with existing conservation easements, as noted in the Excel file.

Conservation Easements. In instances where a property owner is unwilling to sell, another option is for the owner to grant a conservation easement to a land trust such as SALT. There can be significant tax benefits associated with granting an easement in certain situations. However, there are also significant expenses. For property owners who want to hold onto their land and assure its protection after they have passed on or sold it, a conservation easement is an excellent option.

Educating property owners about easements and how they work will be important. Periodic workshops on this topic aimed at the target audience (owners of priority parcels) is recommended. In situations where property owners are not motivated by tax incentives (i.e., moderate income) or do not qualify for them, perhaps a fund could be established to help cover the costs of putting an easement in place. Putting an easement on a parcel is almost certain to be less costly than purchasing it.

Incentives and Regulations. Currently, Baldwin County's Wetland Protection Overlay District requires a development setback of 30 feet. If the setback cannot be achieved due to site constraints, then the property owner can apply to the county for a variance on the setback requirement. A county board of adjustment reviews the request and determines whether a variance is warranted. The variance process is onerous for the public and very time-consuming for county staff.

The regulated public nearly always welcomes less regulation of their own activities. Perhaps an incentives-based approach to wetland protection in combination with some revision of the Wetland Protection Overlay District and amendment of the Planning District 26 Local Provisions would yield improved wetland protection results and a more streamlined process.

For example, the county might revise existing regulations to allow for a waiver of the requirement for a variance if the property owner is willing to situate their house within the front setback area if that reduces wetland fill.

Currently, parcels within the coastal zone are limited to no more than one-tenth acre of wetland fill under Nationwide Permit 18. Outside the coastal zone, the limit is one-half acre under Nationwide Permit 29 (Residential Developments) and Nationwide Permit 39 (Commercial and Institutional Developments). The county might consider extending the one-tenth acre limit to all parcels within Planning District 26.

As currently written, Local Provisions for Planning District 26 do not address wetlands or wetland protection in any way. In combination with the above, it is recommended that consideration be given to amending the Local Provisions to eliminate the allowance of accessory structures if building an accessory structure would mean filling wetlands.

The Corps, ADEM, and county are understaffed and unable to keep up with enforcement of their respective regulatory programs. The public in many instances seems to interpret the lack of enforcement as a green light to incrementally fill wetlands without proper authorization. In many cases where permits have been issued, property owners exceed the amount of wetland fill allowed. A drive through Planning District 26 will reveal numerous examples of both. Due to understaffing and a heavy workload, the Corps has not prioritized enforcement for several years. Some potential solutions for addressing this situation might include:

- Increasing the Planning and Zoning Department staff to include an adequate number of field inspectors.

- Provide training for staff on the state and federal regulatory programs, wetland identification and delineation, wetland plant identification, and hydric soil field indicators.
- Encourage the formation of one or more neighborhood watch groups that can assist the county in monitoring for unauthorized wetland fill in Planning District 26. A streamlined process for reporting potential violations could be set up on the county's website.

Priority Parcels for Protection

Below is a brief description of named wetland systems that are present within and contiguous to Planning District 26 followed by USGS topographic maps and aerial photos depicting parcels recommended for protection through acquisition and conservation easements.

The mature trees, shrubs, and other vegetation in these wetlands intercept rainfall in their canopies where some of it evaporates. Much of the water that reaches the ground is taken up by the roots of trees and other plants, the great majority of which is released back into the atmosphere through transpiration. The ground is covered in a thick layer of leaves and pine needles. Below the leaf litter is a thick layer of decomposing organic matter made up of leaves, pine needles, bark, twigs, fibrous roots, etc. This material acts as a sponge that absorbs rainwater and runoff, holds it in place, releasing it slowly and evenly. Water is released slowly and continuously into the stream channels, which discharge clear, clean water into Mobile Bay and Weeks Bay. These wetlands provide habitat for wildlife, support the food web, and attenuating flooding of surrounding land. Protecting the ecological integrity of these wetlands goes hand in hand with protecting public safety, the general welfare of the citizens of Baldwin County, property values, and overall quality of life.

Titi Swamp

The northernmost wetland system in the district is Titi Swamp. Actually, only a minor percentage of the swamp falls inside of District 26 boundaries. A great majority of Titi Swamp is contiguous to the district on its east side. Sweetwater Branch, a clear, perennial stream flows through Titi Swamp, under Scenic Highway 98, and into Mobile Bay. This wetland system is bordered by Nelson Road to the north, Heard Road and Twin Beach Road South to the east, Battles Road to the south, and Scenic Highway 98 to the west.

The sources of water flowing through Sweetwater Branch come from rainfall and runoff from higher elevations that enter Titi Swamp where it is filtered by leaf litter, decomposing organic matter, and soil. Water is released slowly and continuously into Sweetwater Branch, which discharges clear, clean water into Mobile Bay. The stream and surrounding wetlands provide habitat for wildlife and support the food chain. Titi Swamp acts as a sponge that captures, holds, and slowly releases stormwater, thereby attenuating flooding of surrounding developed land.

Figure 3. USGS Topographic Map of Titi Swamp

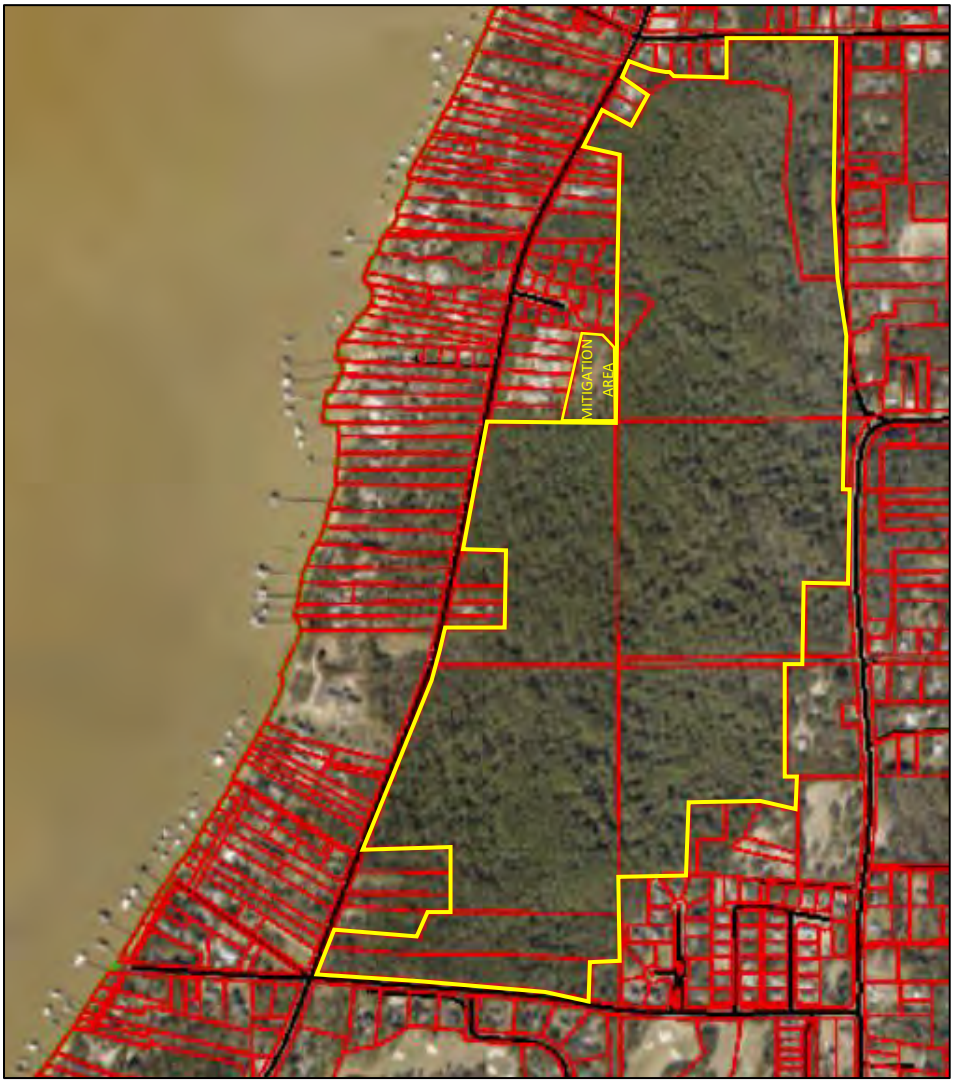

Figure 4. Priority Parcels – Titi Swamp

Ghost Head Swamp

This wetland system is south of Point Clear. It lies between Bailey Creek to the north and Caldwell Swamp to the south. It perhaps can be considered the north end of Caldwell Swamp as one transitions into the other with no discernable dividing line between the two. Scenic Highway 98, a man-made canal, and Birdwatch Lane are to the west. Large residential lots and open fields are to east.

The swamp is primarily composed of wet slash pine-dominated flatwoods that have not experienced fire for many years. Mixed hardwoods and shrubs are present, but the understory is mostly open. Although there has been some hydrologic modification in the form of ditching, it remains ecologically and functionally intact. Ditches are quite old and have not been maintained. Invasive exotic plant species in most areas are minimal or absent. As with Titi Swamp, water enters the system as rainfall and runoff where it is absorbed, held, filtered, and slowly released ultimately to Mobile Bay.

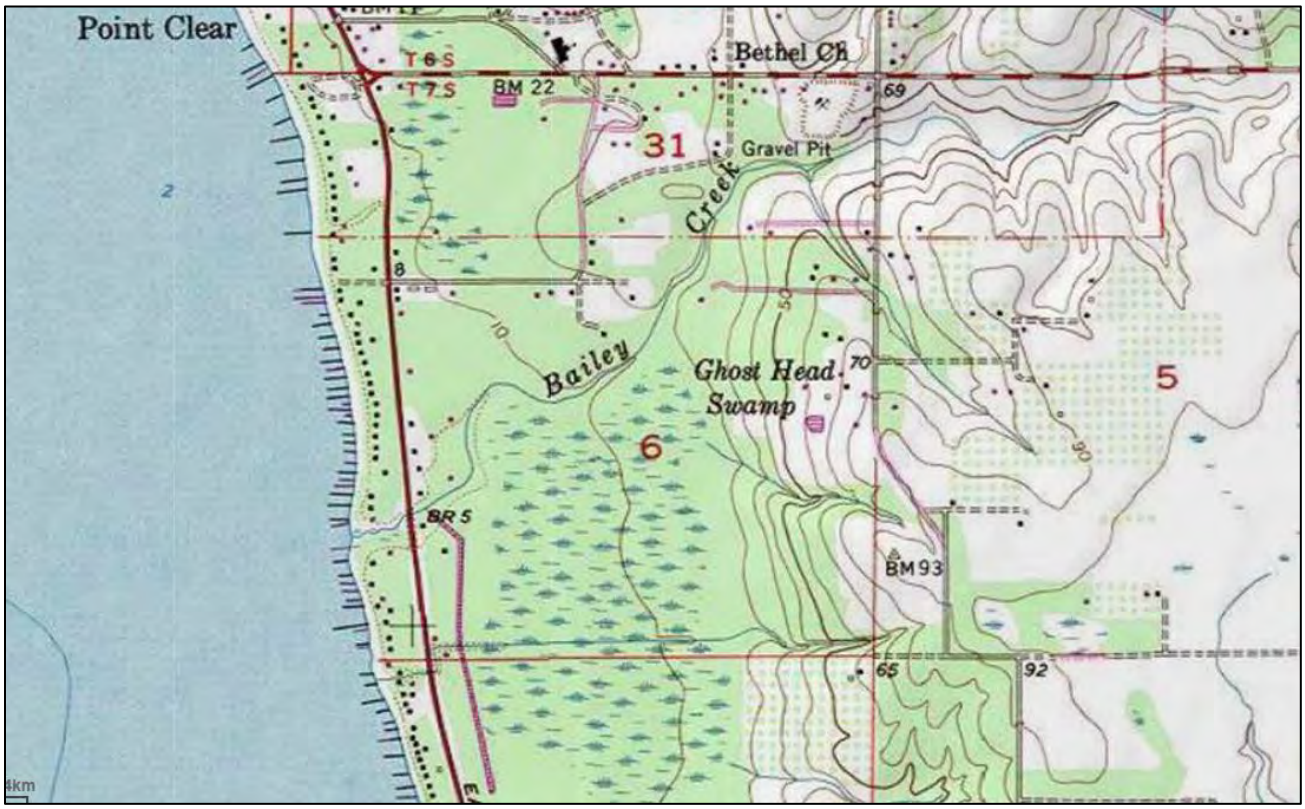

Figure 5. USGS Topographic Map of Ghost Head Swamp

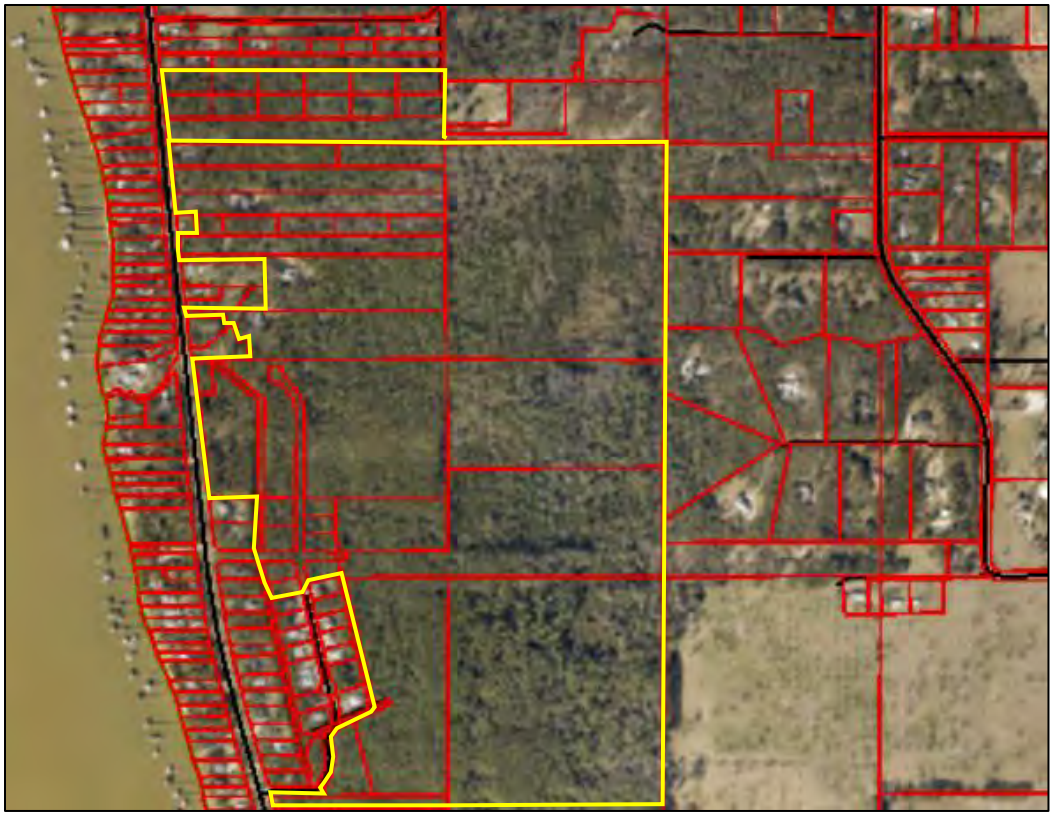

Figure 6. Priority Parcels – Ghost Head Swamp

Caldwell Swamp

Caldwell Swamp is an extensive wetland system that begins south of Bailey Creek and Ghost Head Swamp. It continues south to the point where Scenic Highway 98 turns east. To the west and south is Scenic Highway 98 and to the east is a mix of large residential parcels, forestland, and agricultural fields.

Aside from development of some of the lots that line the east side of Scenic Highway 98, a one-lane dirt road within the Live Oak Avenue right-of-way, and a road constructed on property with Parcel ID Number 26931, this wetland system is primarily in a natural, albeit fire-suppressed, condition. For the most part, the forest is dominated by slash pine except in the wettest areas where tupelo gum and sweetbay magnolia are more prevalent. Some invasive exotic plant species are present along disturbed edges in some areas, but within the interior they are almost nonexistent.

Water enters Caldwell Swamp as rainfall and runoff where it is absorbed, held, filtered, and slowly released ultimately to Mobile Bay. There are several artificial channels or ditches that flow out of the swamp through culverts under the highway and drain into the bay.

Several parcels in Caldwell Swamp are either owned by SALT or have conservation easements on them that are held by SALT.

Figure 7. USGS Topographic Map of Caldwell Swamp

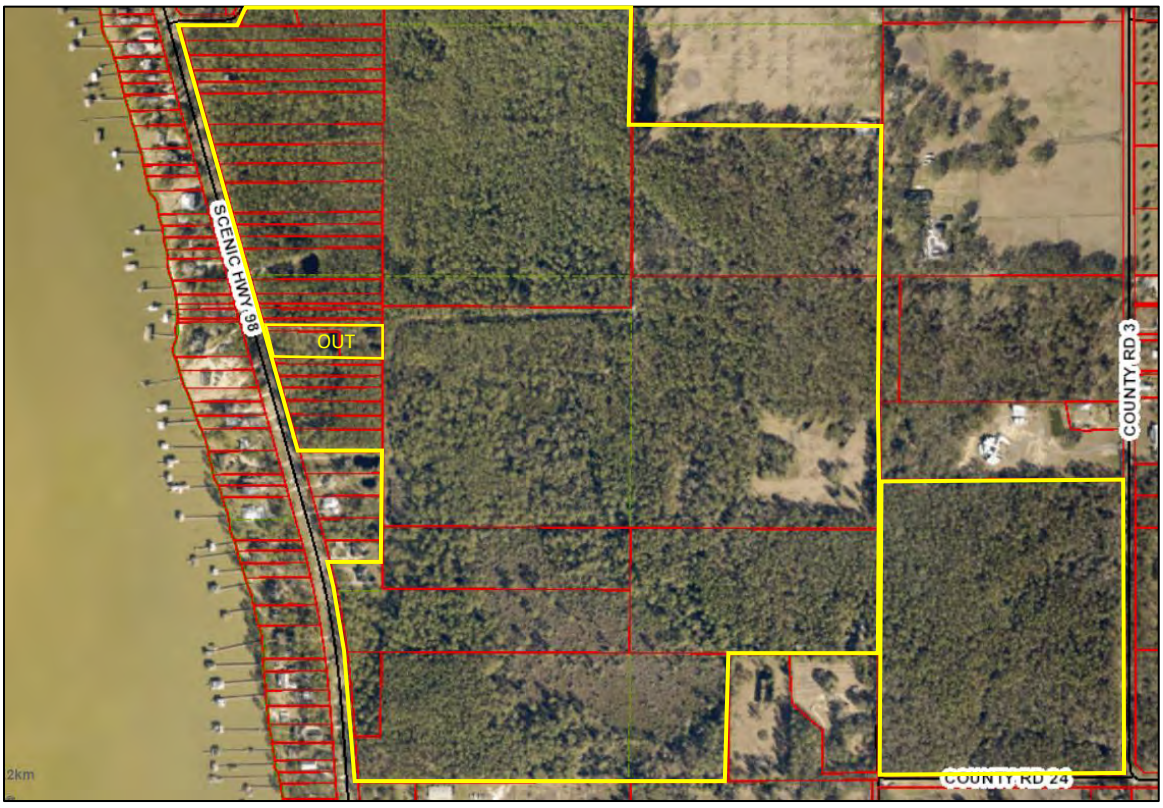

Figure 8(a). Priority Parcels – Caldwell Swamp, North Area

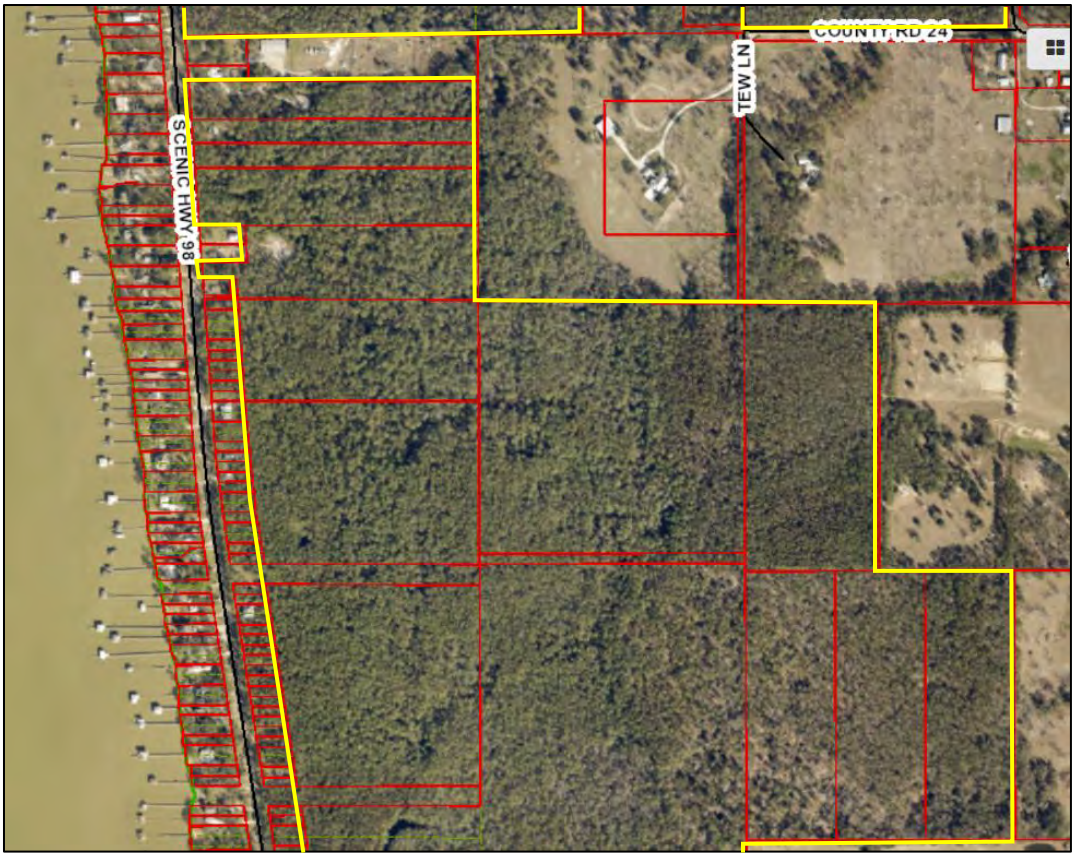

Figure 8(b). Priority Parcels – Caldwell Swamp, Central Area

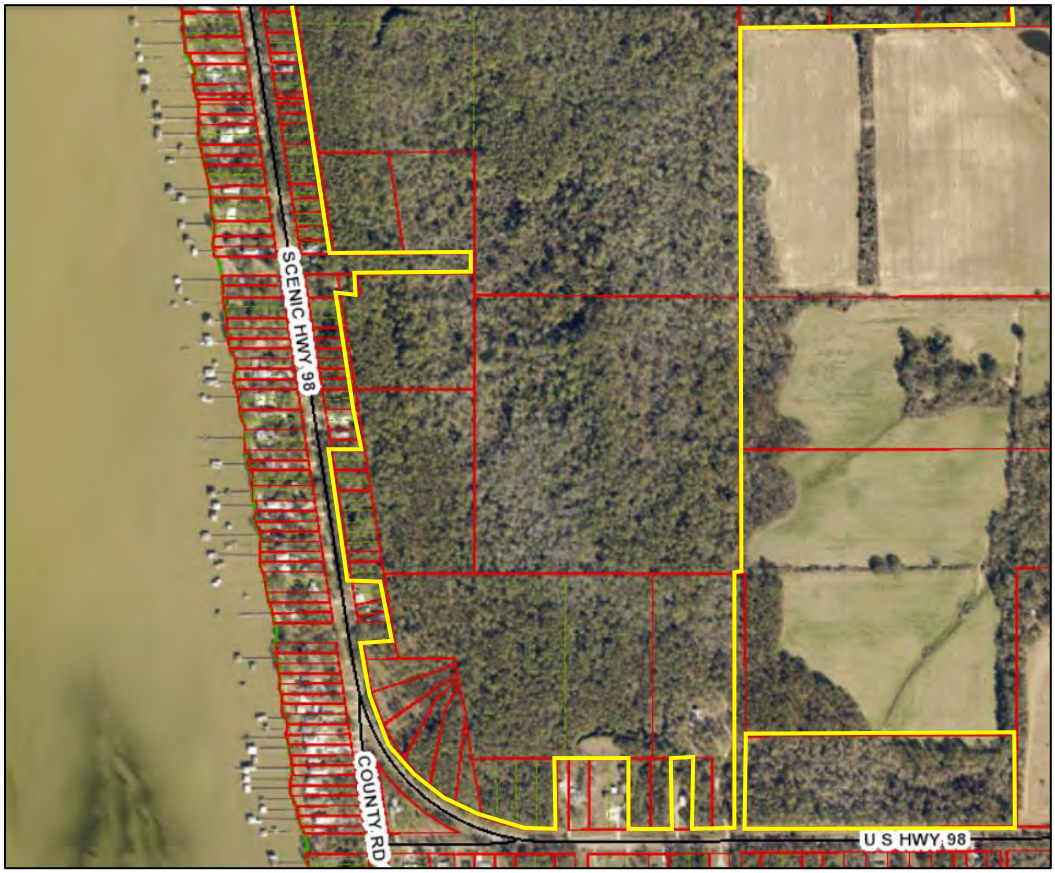

Figure 8(c). Priority Parcels – Caldwell Swamp, South Area

Gum Swamp, the Meadows, and Weeks Bay Wetlands

This wetland system begins south of the east/west segment of Scenic Highway 98 and continues south and east to Weeks Bay. County Road 1 is along the southwestern edge. The eastern part of this area is bisected by Mary Ann Beach Road, which is oriented north/south. Along the eastern edge is the approximate southern half of Weeks Bay.

The great majority of land within this area is undeveloped and a mixture of wet pine flatwoods forest, tupelo gum swamp, and freshwater and brackish marsh. A relative few number of small residential lots are present along the northeast side of County Road 1; this area is composed primarily of larger parcels.

Muddy Bayou, Weeks Branch, and at least two unnamed tidal creeks flow through wetlands and into Weeks Bay, which is a National Estuarine Research Reserve.

Several of the parcels within this wetland system have conservation easements on them that are held by SALT or are owned by the state of Alabama or Baldwin County.

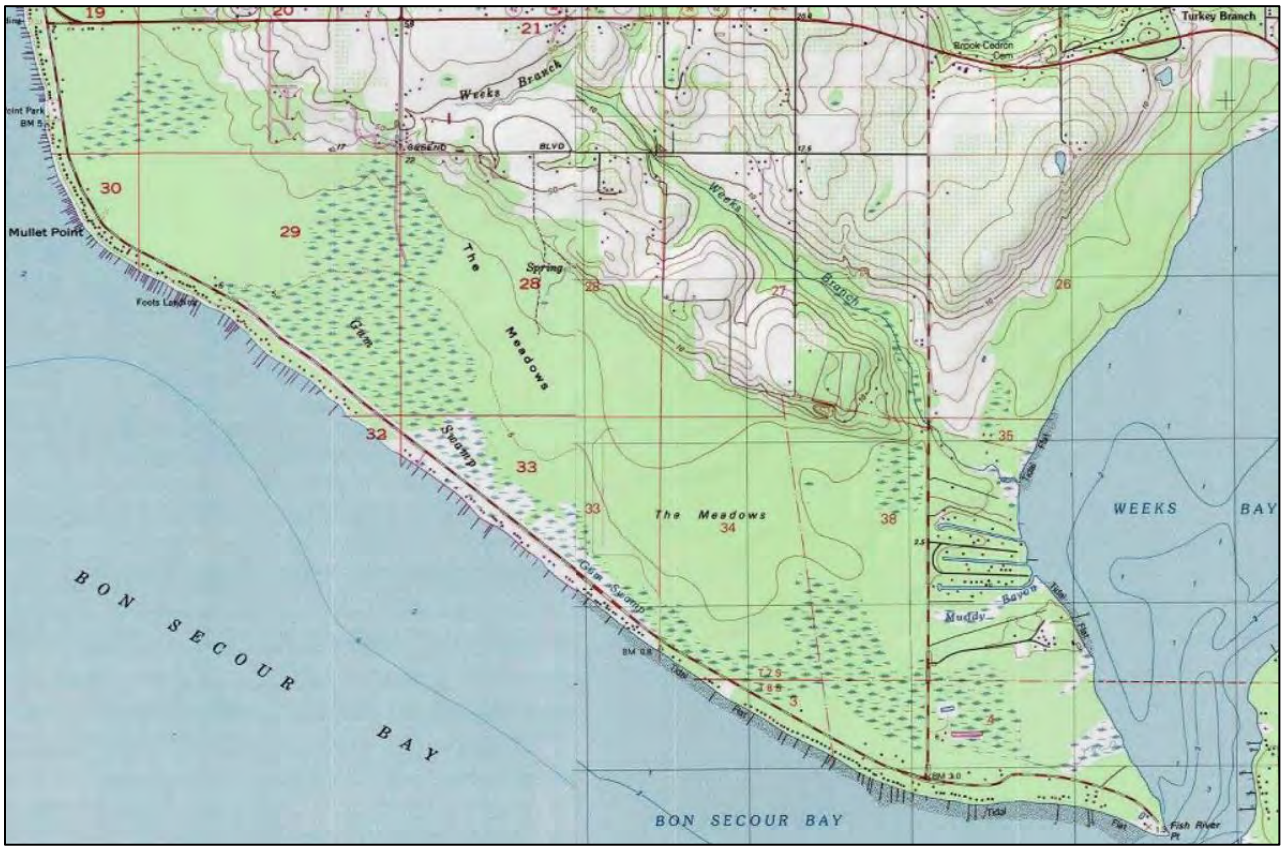

Figure 9. USGS Topographic Map of Gum Swamp, the Meadows, and Weeks Bay Wetlands

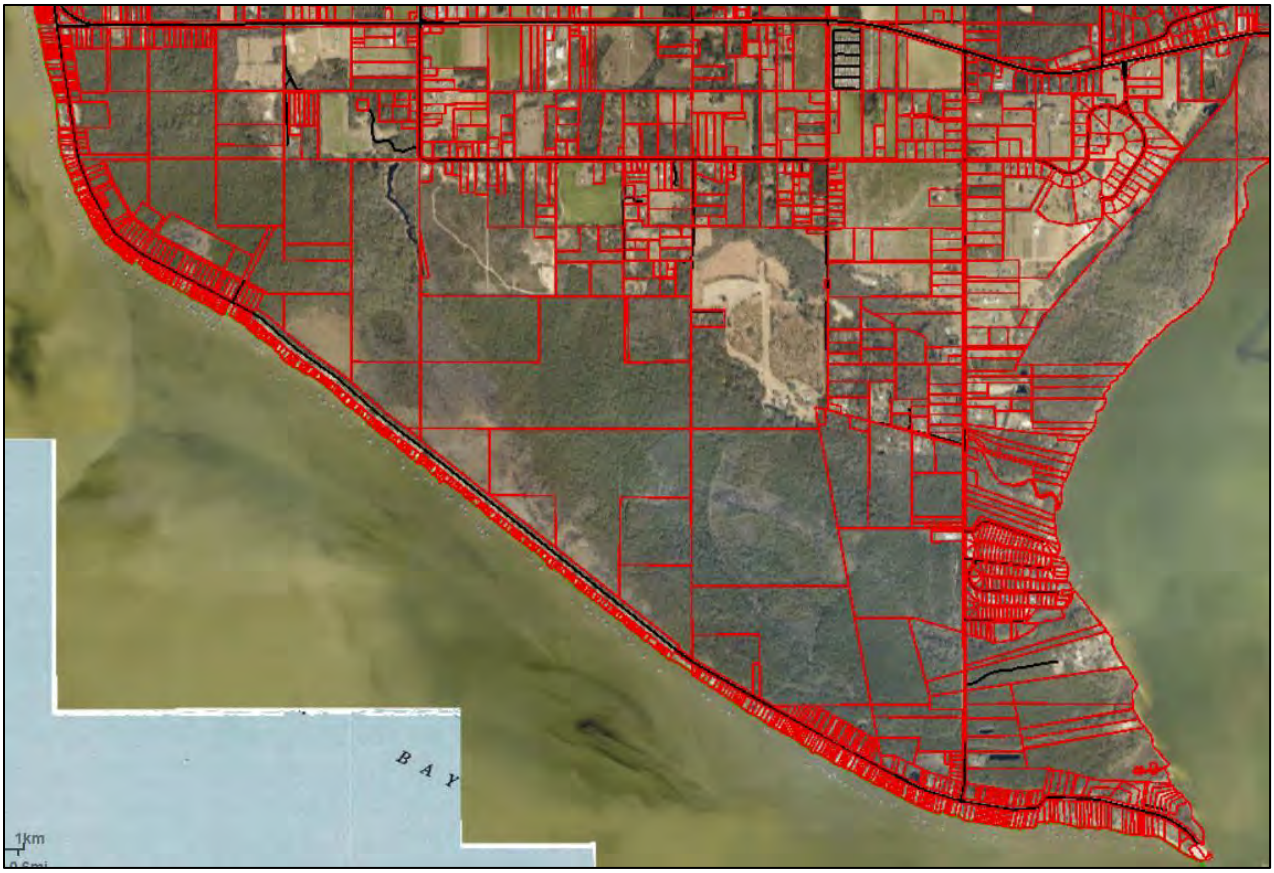

Figure 10(a). Overview – Gum Swamp, the Meadows, and Weeks Bay Wetlands

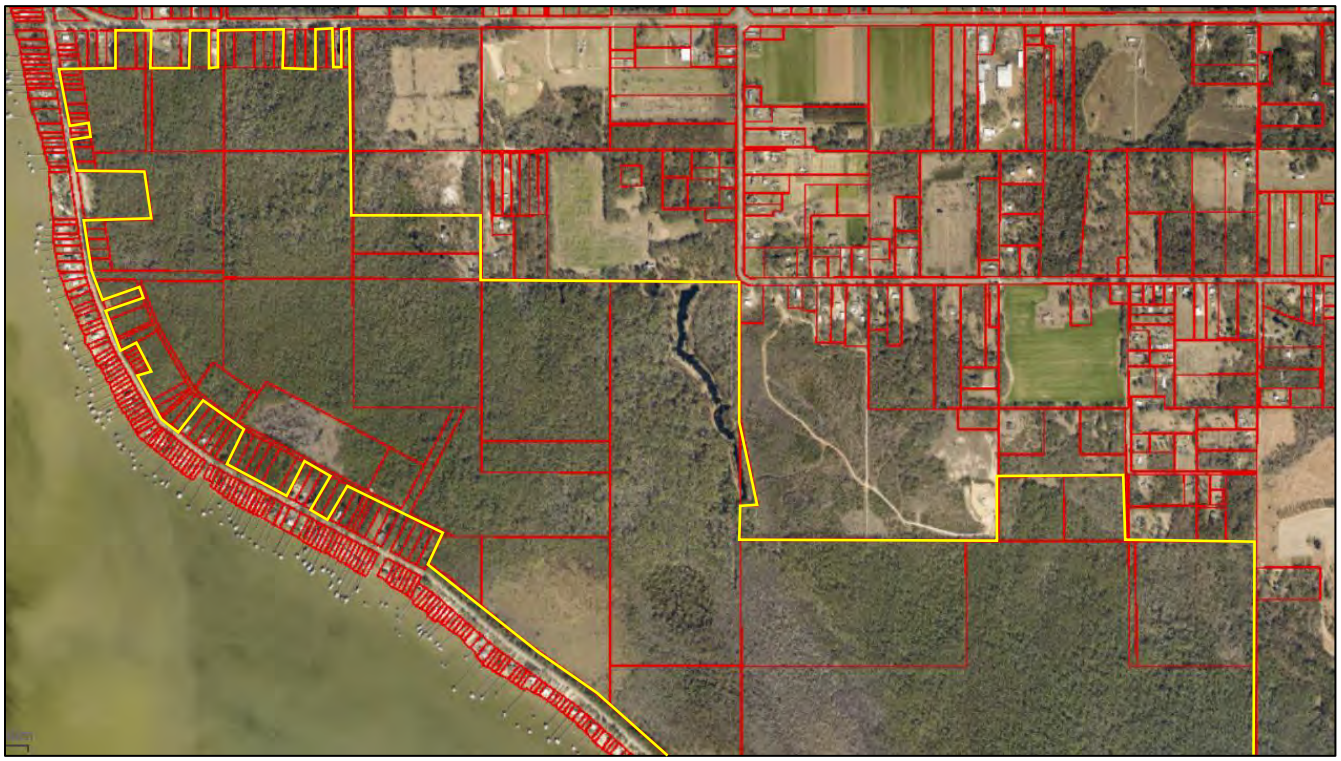

Figure 10(b). Priority Parcels – Gum Swamp, the Meadows, and Weeks Bay Wetlands – West Area

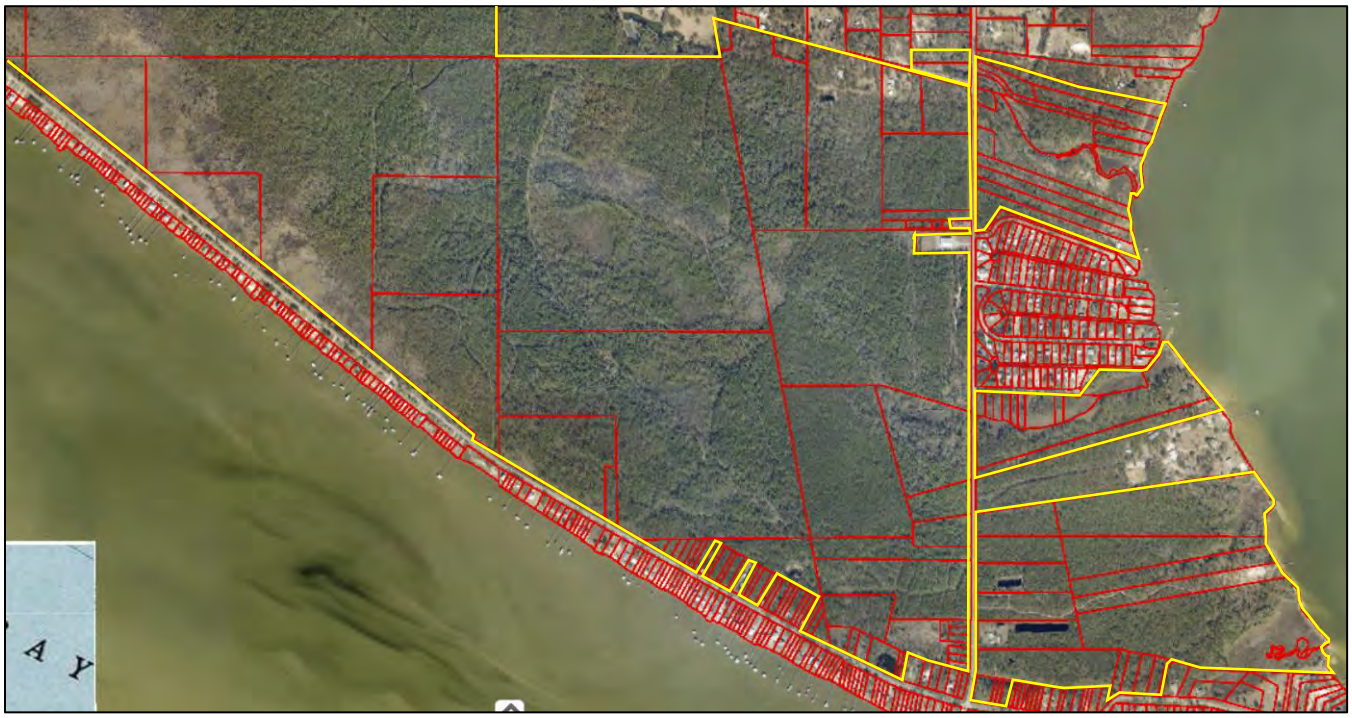

Figure 10(b). Priority Parcels – Gum Swamp, the Meadows, and Weeks Bay Wetlands – East Area

APPENDIX A

Photographs

Sweetwater Branch, Titi Swamp

Bailey Creek

Bailey Creek

Ghost Head Swamp

Caldwell Swamp off of Live Oak Avenue

Caldwell Swamp off of Live Oak Avenue

One-lane dirt road in Live Oak Avenue right of way, which is in Caldwell Swamp.

Savanna-like area (due to mowing) at the south end of Caldwell Swamp.

New fill in wetlands on a lot along the east side of CR 1.

Fill in wetlands on a lot along the east side of CR 1.

View of Gum Swamp from the edge of CR 1.

View of the Meadows from the edge of CR 1.

Fire-suppressed pine savanna, edge of the Meadows.

Numerous undeveloped lots along the east side of Scenic Highway 98 and CR 1 are for sale.

Tidal marsh along the western shore of Weeks Bay.

Muddy Bayou, which flows into Weeks Bay.

Weeks Branch, which flows into Weeks Bay.

APPENDIX B

33 CFR 323.4

Discharges not requiring permits

33 CFR 323.4 Discharges not requiring permits.

(a) General. Except as specified in paragraphs (b) and (c) of this section, any discharge of dredged or fill material that may result from any of the following activities is not prohibited by or otherwise subject to regulation under section 404:

(1) (i) Normal farming, silviculture and ranching activities such as plowing, seeding, cultivating, minor drainage, and harvesting for the production of food, fiber, and forest products, or upland soil and water conservation practices, as defined in paragraph (a)(1)(iii) of this section.

(ii) To fall under this exemption, the activities specified in paragraph (a)(1)(i) of this section must be part of an established (i.e., on-going) farming, silviculture, or ranching operation and must be in accordance with definitions in § 323.4(a)(1)(iii). Activities on areas lying fallow as part of a conventional rotational cycle are part of an established operation. Activities which bring an area into farming, silviculture, or ranching use are not part of an established operation. An operation ceases to be established when the area on which it was conducted has been converted to another use or has lain idle so long that modifications to the hydrological regime are necessary to resume operations. If an activity takes place outside the waters of the United States, or if it does not involve a discharge, it does not need a section 404 permit, whether or not it is part of an established farming, silviculture, or ranching operation.

(iii) (A) Cultivating means physical methods of soil treatment employed within established farming, ranching and silviculture lands on farm, ranch, or forest crops to aid and improve their growth, quality or yield.

(B) Harvesting means physical measures employed directly upon farm, forest, or ranch crops within established agricultural and silvicultural lands to bring about their removal from farm, forest, or ranch land, but does not include the construction of farm, forest, or ranch roads.

(C)(1) Minor drainage means:

(i) The discharge of dredged or fill material incidental to connecting upland drainage facilities to waters of the United States, adequate to affect the removal of excess soil moisture from upland croplands. (Construction and maintenance of upland (dryland) facilities, such as ditching and tiling, incidental to the planting, cultivating, protecting, or harvesting of crops, involve no discharge of dredged or fill material into waters of the United States, and as such never require a section 404 permit.);

(ii) The discharge of dredged or fill material for the purpose of installing ditching or other such water control facilities incidental to planting, cultivating, protecting, or harvesting of rice, cranberries or other wetland crop species, where these activities and the discharge occur in waters of the United States which are in established use for such agricultural and silvicultural wetland crop production;

(iii) The discharge of dredged or fill material for the purpose of manipulating the water levels of, or regulating the flow or distribution of water within, existing impoundments which have been constructed in accordance with applicable requirements of CWA, and which are in established use for the production of rice, cranberries, or other wetland crop species. (The provisions of paragraphs (a)(1)(iii)(C)(1) (ii) and (iii) of this section apply to areas that are in established use exclusively for wetland crop production as well as areas in established use for conventional wetland/non-wetland crop rotation (e.g., the rotations of rice and soybeans) where such rotation results in the cyclical or intermittent temporary dewatering of such areas.)

(iv) The discharges of dredged or fill material incidental to the emergency removal of sandbars, gravel bars, or other similar blockages which are formed during flood flows or other events, where such blockages close or constrict previously existing drainageways and, if not promptly removed, would result in damage to or

loss of existing crops or would impair or prevent the plowing, seeding, harvesting or cultivating of crops on land in established use for crop production. Such removal does not include enlarging or extending the dimensions of, or changing the bottom elevations of, the affected drainageway as it existed prior to the formation of the blockage. Removal must be accomplished within one year of discovery of such blockages in order to be eligible for exemption.

(2) Minor drainage in waters of the U.S. is limited to drainage within areas that are part of an established farming or silviculture operation. It does not include drainage associated with the immediate or gradual conversion of a wetland to a non-wetland (e.g., wetland species to upland species not typically adapted to life in saturated soil conditions), or conversion from one wetland use to another (for example, silviculture to farming). In addition, minor drainage does not include the construction of any canal, ditch, dike or other waterway or structure which drains or otherwise significantly modifies a stream, lake, swamp, bog or any other wetland or aquatic area constituting waters of the United States. Any discharge of dredged or fill material into the waters of the United States incidental to the construction of any such structure or waterway requires a permit.

(D) Plowing means all forms of primary tillage, including moldboard, chisel, or wide-blade plowing, discing, harrowing and similar physical means utilized on farm, forest or ranch land for the breaking up, cutting, turning over, or stirring of soil to prepare it for the planting of crops. The term does not include the redistribution of soil, rock, sand, or other surficial materials in a manner which changes any area of the waters of the United States to dry land. For example, the redistribution of surface materials by blading, grading, or other means to fill in wetland areas is not plowing. Rock crushing activities which result in the loss of natural drainage characteristics, the reduction of water storage and recharge capabilities, or the overburden of natural water filtration capacities do not constitute plowing. Plowing as described above will never involve a discharge of dredged or fill material.

(E) Seeding means the sowing of seed and placement of seedlings to produce farm, ranch, or forest crops and includes the placement of soil beds for seeds or seedlings on established farm and forest lands.

(2) Maintenance, including emergency reconstruction of recently damaged parts, of currently serviceable structures such as dikes, dams, levees, groins, riprap, breakwaters, causeways, bridge abutments or approaches, and transportation structures. Maintenance does not include any modification that changes the character, scope, or size of the original fill design. Emergency reconstruction must occur within a reasonable period of time after damage occurs in order to qualify for this exemption.

(3) Construction or maintenance of farm or stock ponds or irrigation ditches, or the maintenance (but not construction) of drainage ditches. Discharges associated with siphons, pumps, headgates, wingwalls, weirs, diversion structures, and such other facilities as are appurtenant and functionally related to irrigation ditches are included in this exemption.

(4) Construction of temporary sedimentation basins on a construction site which does not include placement of fill material into waters of the U.S. The term “construction site” refers to any site involving the erection of buildings, roads, and other discrete structures and the installation of support facilities necessary for construction and utilization of such structures. The term also includes any other land areas which involve land-disturbing excavation activities, including quarrying or other mining activities, where an increase in the runoff of sediment is controlled through the use of temporary sedimentation basins.

(5) Any activity with respect to which a State has an approved program under section 208(b)(4) of the CWA which meets the requirements of sections 208(b)(4) (B) and (C).

(6) Construction or maintenance of farm roads, forest roads, or temporary roads for moving mining equipment, where such roads are constructed and maintained in accordance with best management practices (BMPs) to assure that flow and circulation patterns and chemical and biological characteristics of waters of the United States are not impaired, that the reach of the waters of the United States is not reduced, and that any adverse effect on the aquatic environment will be otherwise minimized. These BMPs which must be applied to satisfy this provision shall include those detailed BMPs described in the State's approved program description pursuant to the requirements of 40 CFR 233.22(i), and shall also include the following baseline provisions:

(i) Permanent roads (for farming or forestry activities), temporary access roads (for mining, forestry, or farm purposes) and skid trails (for logging) in waters of the U.S. shall be held to the minimum feasible number, width, and total length consistent with the purpose of specific farming, silvicultural or mining operations, and local topographic and climatic conditions;

(ii) All roads, temporary or permanent, shall be located sufficiently far from streams or other water bodies (except for portions of such roads which must cross water bodies) to minimize discharges of dredged or fill material into waters of the U.S.;

(iii) The road fill shall be bridged, culverted, or otherwise designed to prevent the restriction of expected flood flows;

(iv) The fill shall be properly stabilized and maintained during and following construction to prevent erosion;

(v) Discharges of dredged or fill material into waters of the United States to construct a road fill shall be made in a manner that minimizes the encroachment of trucks, tractors, bulldozers, or other heavy equipment within waters of the United States (including adjacent wetlands) that lie outside the lateral boundaries of the fill itself;

(vi) In designing, constructing, and maintaining roads, vegetative disturbance in the waters of the U.S. shall be kept to a minimum;

(vii) The design, construction and maintenance of the road crossing shall not disrupt the migration or other movement of those species of aquatic life inhabiting the water body;

(viii) Borrow material shall be taken from upland sources whenever feasible;

(ix) The discharge shall not take, or jeopardize the continued existence of, a threatened or endangered species as defined under the Endangered Species Act, or adversely modify or destroy the critical habitat of such species;

(x) Discharges into breeding and nesting areas for migratory waterfowl, spawning areas, and wetlands shall be avoided if practical alternatives exist;

(xi) The discharge shall not be located in the proximity of a public water supply intake;

(xii) The discharge shall not occur in areas of concentrated shellfish production;

(xiii) The discharge shall not occur in a component of the National Wild and Scenic River System;

(xiv) The discharge of material shall consist of suitable material free from toxic pollutants in toxic amounts; and

(xv) All temporary fills shall be removed in their entirety and the area restored to its original elevation.

(b) If any discharge of dredged or fill material resulting from the activities listed in paragraphs (a) (1) through (6) of this section contains any toxic pollutant listed under section 307 of the CWA such discharge shall be subject to any applicable toxic effluent standard or prohibition, and shall require a section 404 permit.

(c) Any discharge of dredged or fill material into waters of the United States incidental to any of the activities identified in paragraphs (a) (1) through (6) of this section must have a permit if it is part of an activity whose purpose is to convert an area of the waters of the United States into a use to which it was not previously subject, where the flow or circulation of waters of the United States may be impaired or the reach of such waters reduced. Where the proposed discharge will result in significant discernible alterations to flow or circulation, the presumption is that flow or circulation may be impaired by such alteration. For example, a permit will be required for the conversion of a cypress swamp to some other use or the conversion of a wetland from silvicultural to agricultural use when there is a discharge of dredged or fill material into waters of the United States in conjunction with construction of dikes, drainage ditches or other works or structures used to affect such conversion. A conversion of a section 404 wetland to a non-wetland is a change in use of an area of waters of the United States. A discharge which elevates the bottom of waters of the United States without converting it to dry land does not thereby reduce the reach of, but may alter the flow or circulation of, waters of the United States.

(d) Federal projects which qualify under the criteria contained in section 404(r) of the CWA are exempt from section 404 permit requirements, but may be subject to other State or Federal requirements.

APPENDIX C

Habitat Management Plan
Baldwin County Meadows Property

Habitat Management Plan

Baldwin County Meadows Property

Prepared for the

Baldwin County Commission

March 2015 (Revised January 2017)

by

Wetland Resources
ENVIRONMENTAL CONSULTING

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Habitat Management Plan

Baldwin County Meadows Property

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Habitat Management Plan

Baldwin County Meadows Property

Introduction

This habitat management plan has been developed for the county-owned 135 acres of land that is part of the Meadows, an extensive wetland system along the northeastern shore of Bon Secour Bay. Included in the 135 acres is an approximately 1.5-acre bay front tract, which is across the road from the larger tract. The larger Meadows tract is northeast of CR 1 and west of CR 27 (Mary Ann Beach Rd.) in Section 34, Township 7 South, Range 2 East, Baldwin Co., Alabama. The smaller bay front tract is southwest of CR 1 in Section 33, Township 7 South, Range 2 East.

Map showing state-owned (green outline) and county-owned (blue outline) Meadows property.

USGS Topographic Map
(Yellow Star - county-owned Meadows property; Yellow Arrow - bay front land)

This land was purchased by the Baldwin County Commission in 2010 from private, willing sellers. The purchase was part of a larger land purchase that involved these same sellers totaling approximately 820 acres of the Meadows. Partners in the deal included the Baldwin County Commission, The Conservation Fund, Alabama Department of Conservation and Natural Resources (ADCNR) State Lands Division, Forever Wild Land Trust Program, Weeks Bay National Estuarine Research Reserve, National Oceanic and Atmospheric Administration, and the Weeks Bay Foundation.

This sign was erected at the entrance to the Meadows Property following its acquisition by the Baldwin County Commission.

A detailed plan that will guide future management of this property is needed to ensure the long-term viability and sustainability of this natural system. The ADCNR State Lands Division is developing a plan for the state-owned Meadows property, while Wetland Resources Environmental Consulting has developed a plan for the county-owned tracts. Funding for the development of this plan has been provided by the U.S. Fish & Wildlife Service, through the Service's Southeast Region Coastal Program.

Wetland Resources has collaborated with all involved parties, including the Baldwin County Commission, the ADCNR, the U.S. Fish & Wildlife Service, and the Weeks Bay Foundation, as well as other professionals, including botanist Fred Nation, retired forestry professor/botanist Dr. Harry Larsen, GIS mapping professional Louise Duffy of TTL, Inc., and professional hydraulics and hydrology engineer Kenneth Underwood, to develop management goals and prescriptions.

Key elements of the management plan include Management Goals, Site History, Current Conditions and Habitat Types, Management Prescriptions, Public Access, and a Schedule of Plan Implementation.

Management Goals

Goals for managing this property include:

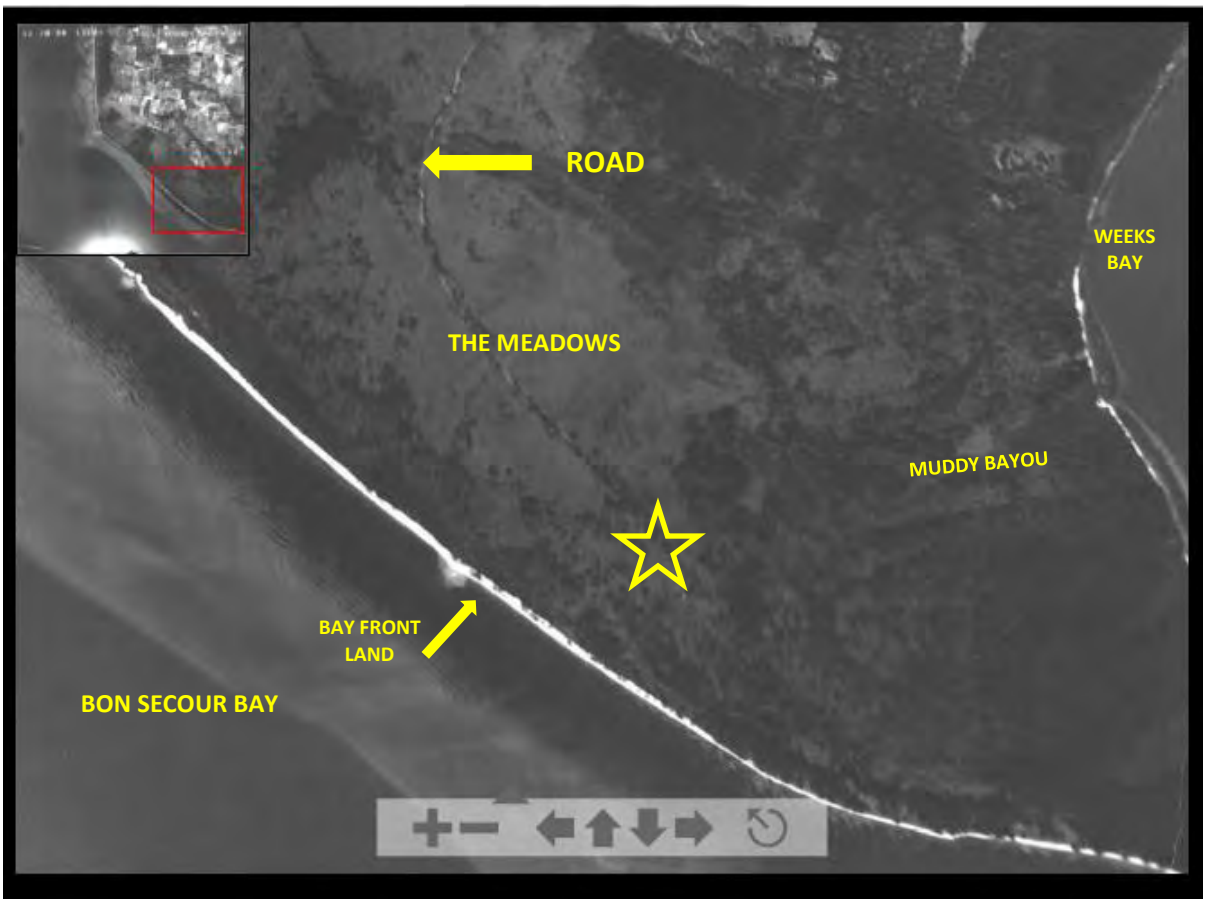
- Providing public access to the land and the bay for educational and passive recreational activities, such as nature study, birdwatching, hiking, and other non-consumptive uses.
- Restoring ecological integrity to the natural habitats that occur on the property through implementation of appropriate management prescriptions, including prescribed fire, invasive exotic plant control, and restoration of the natural hydrology, to the extent feasible.
- Maintaining ecological integrity of the natural habitats that occur on the property through proper long-term management, including forest management, which is addressed in a separate forest management plan developed by W.M. Wright & Co., LLC.

Site History

According to the on-line Encyclopedia of Alabama, Baldwin County's economy consisted largely of agriculture and deerskin trading among the Creeks, settlers, and Europeans during the eighteenth and nineteenth centuries. Export houses operating out of Mobile shipped deerskins obtained from the Creeks to Europe and other continents. Land was extremely cheap, and settlers obtained large tracts of fertile land for growing indigo, tobacco, and rice. In addition, the open rangeland made raising cattle highly profitable, and the abundance of timber made turpentine, potash, and tar valuable exports (http://www.encyclopediaofalabama.org/face/Article.jsp?id=h-1303).

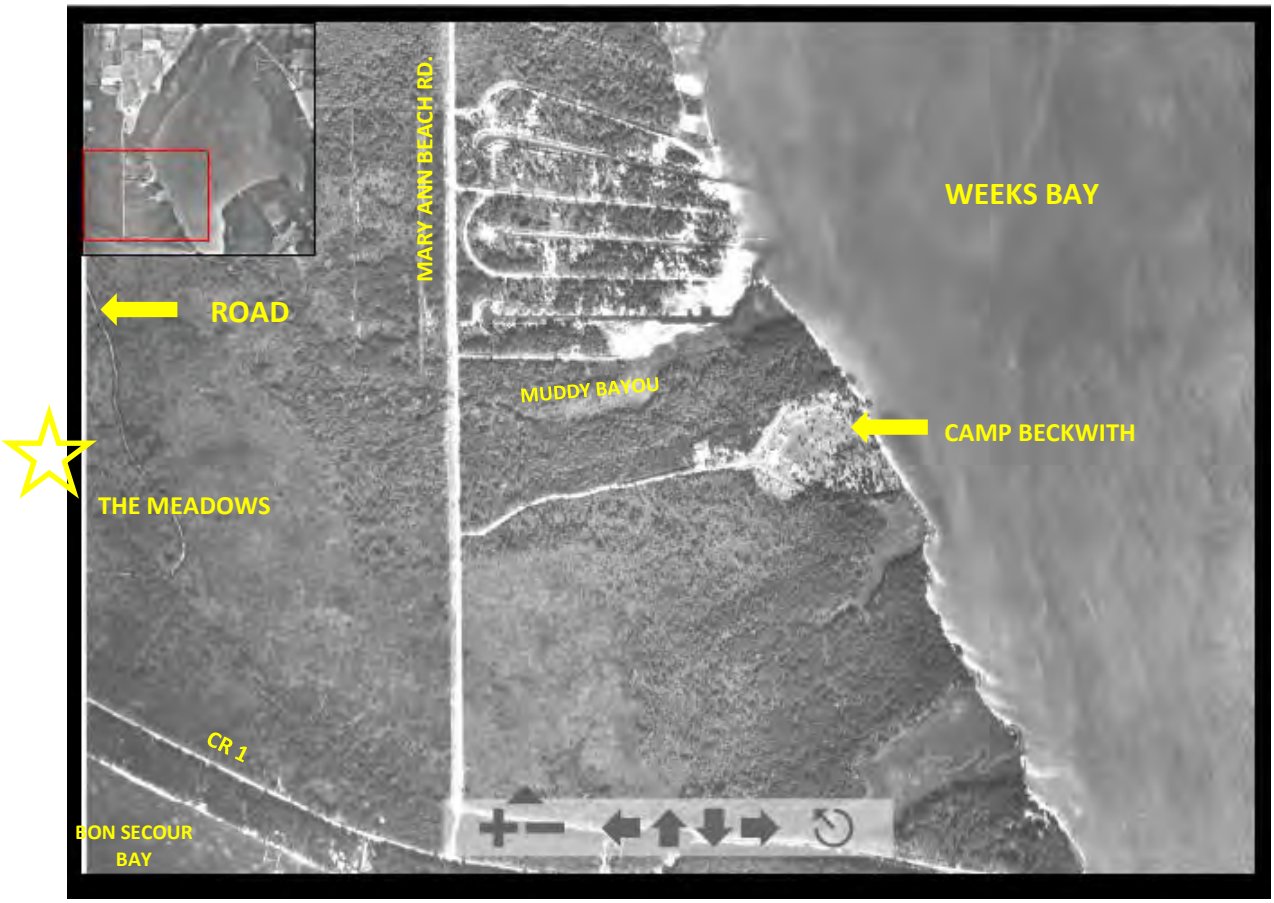
Following is a series of aerial photographs dating from 1938 up to 2013 showing the Meadows region and surrounding vicinity. For reference, the yellow star on each photo is approximately centered on the location of a logging deck that is clearly visible in recent aerial photos.

In the 1938 aerial photo below, a narrow road, perhaps used for timber harvesting and/or pine sap extraction, can be seen. There is no road or other development along Bon Secour Bay, only a sand beach. Much of the land in this area is open with little tree canopy, which may explain why it was known as the Meadows. Whether this condition was natural, because the timber had been removed, or some combination of the two, has not been determined for the purposes of this report. It is expected that fire, both naturally occurring and set by man, was a primary factor in site conditions at the time. The sandy plume that can be seen in the water along the bay looks like an out-flow point where water spilled out of the wetlands and into the bay. This point appears to be the location of the tidal creek that is on the northwest side of the bay front land.



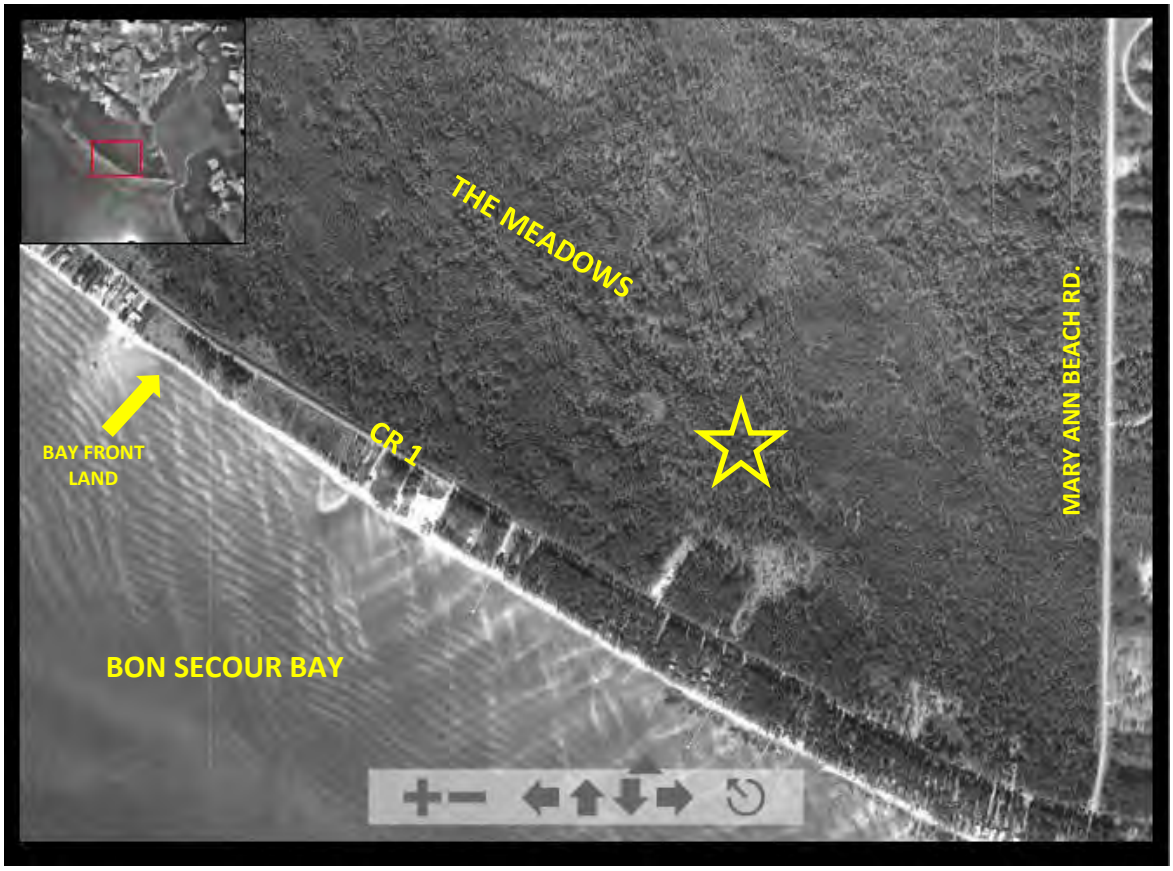
1938 Aerial Photo
(http://alabamamaps.ua.edu/aerials/Counties/Baldwin/index.html)

The 1966 aerial photo below shows tremendous changes to the general area since 1938. Mary Ann Beach Rd., the road running south on the west side of Weeks Bay, has been constructed, along with the Bay Haven residential subdivision between the bay and the road. This subdivision includes roads as well as man-made canals that lead out to Weeks Bay. Undoubtedly, wetlands were filled as material was excavated to create the canals and spread over the ground to create roads and buildable residential lots. Ditches can be seen to the west of the subdivision and north of Muddy Bayou. Excavated material was also used in that area to fill in wetlands. The Camp Beckwith site has been established, with an entrance road leading from Mary Ann Beach Rd. to the camp facilities along Weeks Bay. The road that runs parallel to Mobile and Bon Secour bays had also been constructed all the way to Pelican Point at the mouth of Weeks Bay, enabling the creation of hundreds of bay front lots along the water. It appears that the road system through the Meadows has been expanded. These roads were constructed by excavating ditches on one or both sides of the road footprint and using the excavated material to build up a roadbed. It has not been determined whether the ditches were also intended to drain the property. The Meadows area appears to remain primarily open and meadow-like. The bay front land is not included in this photo.



1966 Aerial Photo
(http://alabamamaps.ua.edu/aerials/Counties/Baldwin/index.html)

By 1974, many of the bay front lots have been developed and some have piers into Bon Secour Bay. While only a narrow strip of the land east of Mary Ann Beach Rd. is visible in the photo below, signs of additional development can be seen there as well. The biggest change to the Meadows is that it no longer appears open, but has been overtaken by an overstory of trees, probably primarily slash pine (*Pinus elliottii*) and longleaf pine (*P. palustris*). If fire has been excluded leading up to this time period, then it is likely that a dense understory of shrubs and hardwood trees were also invading. The internal roads are barely visible or not visible at all. The bay front land appears to be in a natural condition with the sand plume still visible on the northwest end of the property at the mouth of the tidal creek.



1974 Aerial Photo
(http://alabamamaps.ua.edu/aerials/Counties/Baldwin/index.html)

In the 1997 aerial photo below, roads through the Meadows are again visible, possibly indicating timber harvesting activity, which would have necessitated opening up and improving the roads. The bay front land appears unchanged with the possible exception of a slightly receded shoreline.

1997 Aerial Photo (Google Earth; US Geological Survey Image)

The 2008 aerial photo shows what appears to be dense pine tree cover throughout the Meadows area, possibly with some logging activity in the north central part of the photo. The roads may have been improved further by this point. The shoreline of the bay front lands appears to have receded further. A close up view shows that a swath about the width of a driveway has been cleared between CR 1 and the beach. There is also a rip-rap breakwater running paralled to the shoreline between the mouth of the tidal creek and several other properties to the southeast. Otherwise, the bay front land appears unchanged.

2008 Aerial Photo (Google Earth; US Geological Survey Image)

The June 2010 aerial photo was taken following the April 2010 BP Deepwater Horizon oil spill in the Gulf of Mexico. Floating boom can be seen in the water in front of the bay front land. The tree canopy in some areas of the Meadows property appears less dense, indicating that timber harvesting has occurred.

June 2010 Aerial Photo (Google Earth; NOAA Image)

Current Conditions and Habitat Types

In 2010, the Baldwin Co. Commission acquired the Meadows tract and the bay front land, totaling approximately 135 acres. The aerial photo below is dated 2009 and is from the county's on-line database. It also includes parcel boundaries.

2013 Aerial Photo with Property Boundaries (http://isv.kcsgis.com/al.baldwin_revenue/)

In the early 1980s, wetlands in the Meadows were characterized by the U.S. Fish and Wildlife Service as part of the National Wetlands Inventory Program. Wetlands throughout the county-owned tract were placed in the ecological system **Palustrine**, which is defined as *a system of inland, non-tidal wetlands characterized by the presence of trees, shrubs, and emergent vegetation that range from permanently saturated or flooded land to land that is wet only seasonally* (www.thefreedictionary.com).

Specifically, wetlands on the Meadows tract were characterized as the following:

PFO4C – Freshwater Forested/Shrub Wetland (The letter at the end of the designation, in this case **C = Seasonal,** is in reference to the water regime, meaning water is present seasonally)

E1UBL – Estuarine and Marine Wetland (**BL = Saturated, Subtidal**)

National Wetland Inventory Map, US Fish and Wildlife Service

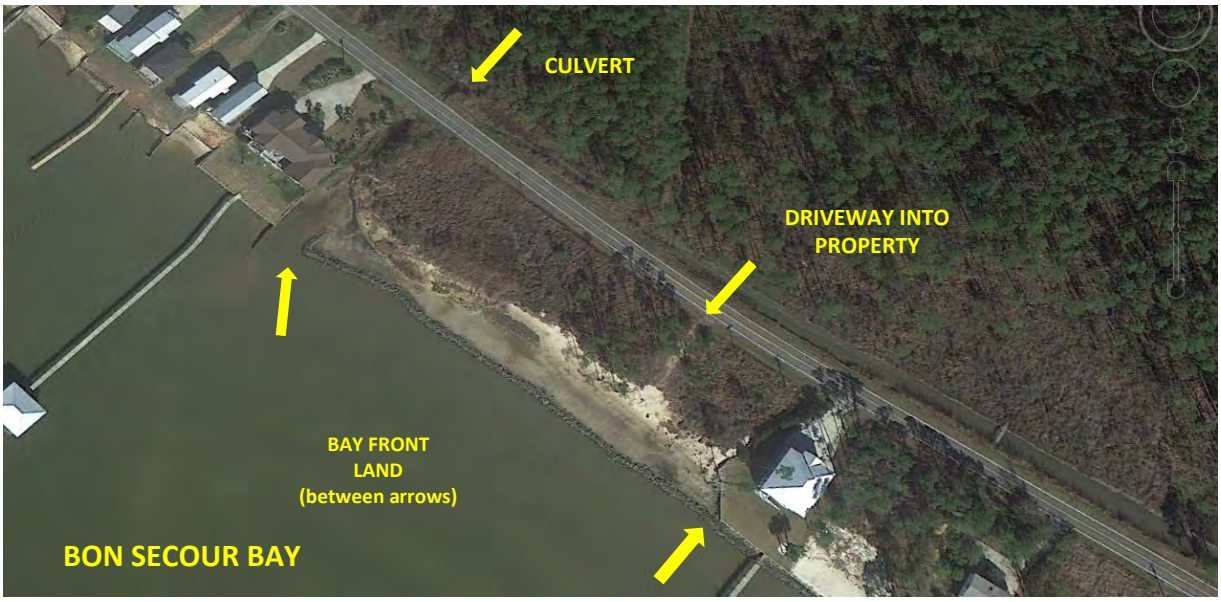
The county-owned Meadows tract is primarily forested wetlands that are dominated by an overstory of slash pine interspersed with hardwood tree species typically associated with wetlands in southwest Alabama, various evergreen shrubs, several species of woody vines, and an impressive diversity of herbaceous species (see the plant inventory at **Appendix A**). With the exception of the road footprints, the great majority of the property is wetlands. A few natural, minor upland inclusions are also present.

It has been more than 30 years since the NWI mapping was done and the Meadows tract has changed to some extent since that time. Timber has been harvested in some areas, a wildfire occurred several years ago in the southwest area, and the main road leading into the property from CR 1 has been built up and improved. In the 30-plus years since the NWI was done, most areas of the property have likely become more densely vegetated with trees and shrubs since fire, other than the wildfire that affected a limited area, has been excluded.

In this 2012 aerial photo, the Meadows and bay front land look essentially unchanged from 2009 - 2010.

2012 Aerial Photo (Google Earth)

The following aerial photo is a closeup view of the bay front land. The tidal creek is clearly visible. It drains water from the Meadows and Gum Swamp on the northeast side of CR 1. The majority of this land is emergent marsh. There is a small stand of slash pines just northwest of the driveway into the property and a few scattered shrubs throughout. A natural beach and sand berm run along the shoreline. The back side of the berm adjoins the emergent marsh. A significant wrack line is present along the shoreward slope of the berm, on top of it, and in some areas, spilling over into the marsh. There is an intertidal area between the line of rip-rap and the shoreline. It appears that the rip-rap, which absorbs wave energy, has been effective in preventing additional loss of land through erosion.



2012 Aerial Photo (Google Earth)

Soils

The USDA Natural Resources Conservation Service soil mapping is shown below. The soils report, which was generated using Web Soil Survey, for the site can be found at **Appendix B**. Four soil map units are included within the boundaries of the county-owned land, all of which are considered ***hydric***. Hydric soils are those that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (USDA Soil Conservation Service, 1994).

USDA Natural Resources Conservation Service Soil Map (www.websoilsurvey.sc.egov)

The following is from the **Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plan Region (Version 2.0), Chapter 3, Hydric Soil Indicators**:

Most hydric soils exhibit characteristic morphologies that result from repeated periods of saturation or inundation that last more than a few days. Saturation or inundation, when combined with microbial activity in the soil, causes the depletion of oxygen. This anaerobiosis promotes certain biogeochemical processes, such as the accumulation of organic matter and the reduction, translocation, or accumulation of iron and other reducible elements. These processes result in distinctive characteristics that persist in the soil during both wet and dry periods, making them particularly useful for identifying hydric soils in the field (USDA Natural Resources Conservation Service, 2010).

Hydric soil indicators are formed predominantly by the accumulation or loss of iron, manganese, sulfur, or carbon compounds in a saturated and anaerobic environment. These processes and the features that develop are described in the following paragraphs.

In an anaerobic environment, soil microbes reduce iron from the ferric (Fe3+) to the ferrous (Fe2+) form, and manganese from the manganic (Mn4+) to the manganous (Mn2+) form. Of the two, evidence of iron reduction is more commonly observed in soils. Areas in the soil where iron is reduced often develop characteristic bluish-gray or greenish-gray colors known as gley. Ferric iron is insoluble but ferrous iron easily enters the soil solution and may be moved or translocated to other areas of the soil. Areas that have lost iron typically develop characteristic gray or reddish-gray colors and are known as redox depletions. If a soil reverts to an aerobic state, iron that is in solution will oxidize and become concentrated in patches and along root channels and other pores. These areas of oxidized iron are called redox concentrations. Since water movement in these saturated or inundated soils can be multi-directional, redox depletions and concentrations can occur anywhere in the soil and have irregular shapes and sizes. Soils that are saturated and contain ferrous iron at the time of sampling may change color upon exposure to the air, as ferrous iron is rapidly converted to ferric iron in the presence of oxygen. Such soils are said to have a reduced matrix (Vepraskas 1992).

While indicators related to iron or manganese depletion or concentration are the most common in hydric soils, they cannot form in soils whose parent materials are low in Fe or Mn. Soils formed in such materials may have low-chroma colors that are not related to saturation and reduction. For such soils, morphological features formed through accumulation of organic matter may be present.

Sulfur is one of the last elements to be reduced by microbes in an anaerobic environment. The microbes convert SO_4^{2-} to H_2S, or hydrogen sulfide gas. This results in a very pronounced "rotten egg" odor in some soils that are inundated or saturated for very long periods. In non-saturated or non-inundated soils, sulfate is not reduced and there is no rotten egg odor. The presence of hydrogen sulfide is a strong indicator of a hydric soil, but this indicator is found only in the wettest sites in soils that contain sulfur-bearing compounds.

Soil microbes use carbon compounds found in organic matter as an energy source. However, the rate at which organic carbon is utilized by soil microbes is considerably lower in a saturated and anaerobic environment than under aerobic conditions. Therefore, in saturated soils, partially decomposed organic matter may accumulate. The result in wetlands is often the development of thick organic surfaces, such as peat or muck, or dark organic-rich mineral surface layers.

The four soil map units included within the county-owned lands are described as follows:

PmB – Plummer loamy sand, 0 to 5 percent slopes

This map unit is composed of Plummer and similar soils (90%) and other minor components (5%). It occurs on marine terraces. Parent material is sandy over loamy fluviomarine deposits derived from sedimentary rock. Drainage class is poorly drained. Depth to the water table is 0 to 12 in. with no frequency of flooding or ponding. The typical soil profile is loamy sand from 0 to 50 in. and sandy loam from 50 to 72 in. Minor components include Scranton, a non-hydric soil, which is 5 percent of the map unit. Scranton occurs on hillslopes.

(It should be noted that Plummer and Rains soils are some of those soils typically associated with pitcher-plant bogs, some of the most diverse plant communities in the southeast.)

RaA – Rains fine sandy loam, 0 to 2 percent slopes

This map unit is composed of Rains and similar soils (90%) and other minor components (5%). It occurs on terraces. Parent material is loamy alluvium derived from sedimentary rock. Drainage class is poorly drained. Depth to the water table is about 0 in. with no frequency of flooding or ponding. The typical soil profile is fine sandy loam at 0 to 9 in., loam at 9 to 48 in., and clay loam at 48 to 70 in. Minor components include Klej, a non-hydric soil, which is 5 percent of the map unit. Klej occurs on hillslopes.

Td – Tidal Marsh

This map unit is composed of Lafitte (brackish marsh) and similar soils (70%), Axis (salt marsh) and similar soils (20%), and other minor components (5%). Tidal marsh occurs on tidal flats.

Lafitte soils' parent material is herbaceous plant remains over mineral soils. Drainage class is very poorly drained. Depth to the water table is about 0 in. with frequency of flooding or ponding listed as frequent.The typical soil profile is muck from 0 to 75 in. and clay from 75 to 80 in.

Axis soils' parent material is loamy marine deposits derived from sedimentary rock. Drainage class is very poorly drained. Depth to the water table is about 0 in. with frequency of flooding or ponding listed as frequent. The typical soil profile is mucky sandy loam from 0 to 7 in., sandy loam from 7 to 40 in., and sandy loam from 40 to 72 in.

Minor components include **Levy**, a hydric soil, which is 5% of the map unit. Levy occurs in backswamps.

Wm – Wet loamy alluvial land

This map unit is composed Johnston and similar soils (45%), Pamlico and similar soils (40%), and other minor components (10%). These soils occur on flood plains.

Johnston soils' parent material is coarse-loamy alluvium derived from sedimentary rock. Drainage class is very poorly drained. Depth to the water table is about 0 in. with no frequency of flooding or ponding. The typical soil profile is loamy sand from 0 to 30 in. and loamy sand from 30 to 60 in.

Pamlico soils' parent material is decomposed herbaceous organic material over sandy alluvium. Drainage class is very poorly drained. Depth to the water table is about 0 in. with no frequency of flooding or ponding. The typical soil profile is muck from 0 to 30 in. and loamy sand 30 to 60 in.

Minor components include **Levy**, a hydric soil, which is 5% of the map unit. Levy occurs in backswamps. Also included is **Dorovan,** a hydric soil, which is 5% of the map unit. Dorovan occurs in depressions.

Plant Communities

The Meadows Tract. The plant communities on the Meadows property can be best characterized as fire-suppressed wet pine savannah and wet pine flatwoods that are interspersed with wetter, emergent marsh areas, some of which are human-altered or man-made, such as the shallow ditches that run parallel to the interior roads. It is not practical or necessary to attempt to carve out or separately map these community differences for the purposes of managing the property. Based on hydrogeomorphic position, soils present, historic natural hydrologic conditions, and other factors, the plant communities appropriate to the area are all fire-dependent communities, with the exception of areas that are permanently or semi-permanently inundated. Minor areas of natural uplands also occur on the property.

The plant community within these slightly elevated areas is somewhat different that the surrounding wetlands, but is also fire-adapted. (The role of fire in these communities is discussed in the Management Prescriptions section.) The overstory is generally dominated by slash pine (*Pinus elliottii*). Due to the lack of periodic fire across the landscape, a dense understory of shrubs, hardwood trees, and woody vines has developed throughout much of the property. The dense cover leads to decreased species diversity in the herbaceous layer and general wildlife habitat degradation. The increased fuel load also greatly increases the chance of catastrophic wildfire.

The artificial "uplands" are the raised roads that run through the property. Many native species have colonized these areas, but they are also providing a suitable means for invasive exotic species to become established. In fact, most invasive plants found on the property are in association with the road system, especially the main road leading into the property from CR 1. See **Appendix A** for a listing of plant species present.

Bay Front Land. The plant community on the bay front land is primarily tidal marsh with one small area of slash pine and a few scattered shrubs. The marsh is dominated by a mix of black needle rush (*Juncus roemerianus*) and saltmarsh cordgrass (*Spartina patens*). Most plant species present are native and appropriate to the plant community type; however, several invasive exotic plants are also present and should be controlled. Chinese tallow trees are scattered around, primarily along the natural berm that runs parallel to the bay. See **Appendix A** for a listing of plant species present.

Bay Front Tract – view of marsh from CR 1

Hydrology

The Meadows Tract. This tract is generally flat and slopes gently in a southwesterly direction toward Mobile Bay. Similar lands to the northwest and some upland areas north of this tract contribute storm water runoff during certain rainfall events. The great majority of this tract (and much of the surrounding area) consists of wetlands with a seasonally high water table. The water table, during the wet season and

following significant rainfall events, is at or near the soil surface. In lower-lying areas, the water table is at times above the surface, creating areas of shallow inundation.

This tract contains a network of roads typically constructed for timber harvesting operations. These roads appear to have been constructed by borrowing materials from adjacent areas along the road alignments, creating roadside ditches. Along the main road leading into the property from CR 1, those borrowed soils are capped with reddish sandy-clay fill material. The former logging deck (marked by the yellow star in aerial photos) is also capped with the same type of fill material. Because of the naturally high groundwater table, the ditches contain water during most seasons of the year. When water flows through these ditches during and/or following a significant rainfall event, the flow velocity is very low, therefore soil erosion and deposition does not appear to be an issue. The road surface varies in elevation relative to the adjacent land. At some locations the road surface elevation approximates that of the adjacent land or is just slightly higher. It other locations the road surface elevation is a foot or higher than the adjacent land. At no location did the internal road network appear to act as a significant damming feature. Ultimately, it appears that the native plant communities have adapted to any alteration of the natural hydrology caused by road and ditch construction.

View of one of the larger ditches excavated for the purpose of road-building.

CR 1 likely has had the greatest impact on the natural hydrologic regime of the extensive wetland system to its east and northeast, which includes the Meadows. While there are numerous culverts and ditches or streams that connect these wetlands to Mobile and Bon Secour bays, they are relatively small and few considering the size of the drainage area. The highway appears to have caused a damming effect, at least to some of the lower elevation wetlands closest to the highway. Again, however, the associated plant communities are healthy and composed of appropriate native species. Significant alteration of the existing hydrology could result in unintended consequences, such as broad-scale invasion of exotic plant species.

Bay Front Land. The shoreline fronting the bay is subject to the ebb and flow of the tide, as well as high-energy wave events such as during hurricanes and other storms. Adjacent shorelines to the northwest and southeast have been bulkheaded or otherwise armored, which may have contributed to shoreline erosion on this property. A previous landowner constructed a rip-rap energy dispersion berm waterward of the shoreline in an apparent attempt to stop erosion and accrete lost land. The open-water area between the rip-rap berm and the mean high tide line does appear to be accreting. This area is shallow and the shoreline now appears to be stable.

View of the intertidal area between the rip-rap and shoreline, looking south.

The shoreline along the tidal creek on the northwest end of the property appears to be stable. This creek is subject to the ebb and flow of the tide. It also drains fresh water from the Meadows through a culvert under CR 1 and into Bon Secour Bay.

Mouth of the Tidal Creek

View of Mouth of Tidal Creek from CR 1

The tidal marsh located between the natural energy berm and the CR 1 road shoulder has a naturally high and fluctuating ground water table. The water table is influenced by the ebb and flow of the tide as well as by rainfall.

Wildlife

The Meadows and Bay Front land is part of a much larger, primarily natural, area that extends along the eastern shore of Mobile and Bon Secour bays, between the city of Fairhope and the mouth of Weeks Bay. There is relatively extensive habitat present to support a nearly full array of wildlife species that occur in this general area. Generally, with proper management, the wildlife that would be expected to utilize this land should be there.

With the exception of a recent survey for reptiles and amphibians done by Weeks Bay Reserve, no formal or detailed surveys for wildlife have been conducted on the Meadows property. Wildlife species expected to utilize the site can be inferred based on habitat type and geographic location. The following species are expected to occur, or potentially occur, at least during some part of their life cycle, in the habitat types that are present in this particular area of Baldwin Co.

Only vertebrates (birds, mammals, reptiles, and amphibians) are included below. Aquatic species, such as fish, and invertebrates are not included.

Birds

Only those species that are year-round residents, or breed in this geographic area, are included in the list below. Migrants and those that winter here are not included; however, migratory birds do utilize the Meadows habitats, either as they migrate through or winter here. (The following list is based on *The Sibley Guide to Birds* by David Allen Sibley, Chanticleer Press, Inc., 2000.)

Pied-billed Grebe	*Podilymbus podiceps*
Brown Pelican	*Pelecanus occidentalis*
Anhinga	*Anhinga anhinga*
Least Bittern	*Ixobrychus exilis*
Great Blue Heron	*Ardea herodias*
Great Egret	*Ardea alba*
Snowy Egret	*Egretta thula*
Tricolored Heron	*Egretta tricolor*
Little Blue Heron	*Egretta caerulea*
Cattle Egret	*Bubulcus ibis*
Green Heron	*Butorides virescens*
Black-crowned Night Heron	*Nycticorax nycticorax*
Yellow-crowned Night Heron	*Nyctanassa violacea*
White Ibis	*Eudocimus albus*
White-faced Ibis	*Plegadis chihi*
Glossy Ibis	*Plegadis falcinellus*
Roseate Spoonbill	*Ajaia ajaja*
Wood Duck	*Aix sponsa*
Turkey Vulture	*Cathartes aura*

Black Vulture	*Coragyps atratus*
Mississippi Kite	*Ictinia mississippiensis*
Swallow-tailed Kite	*Elanoides forficatus*
Cooper's Hawk	*Accipiter cooperii*
Red-shouldered Hawk	*Buteo lineatus*
Broad-winged Hawk	*Buteo platypterus*
Red-tailed Hawk	*Buteo jamaicensis*
Bald Eagle	*Haliaeetus leucocephalus*
Osprey	*Pandion haliaetus*
American Kestrel	*Falco sparverius*
Northern Bobwhite	*Colinus virginianus*
Wild Turkey	*Meleagris gallopavo*
Purple Gallinule	*Porphyrula martinica*
Common Moorhen	*Gallinula chloropus*
American Coot	*Fulica americana*
Clapper Rail	*Rallus longirostris*
King Rail	*Rallus elegans*
Snowy Plover	*Charadrius alexandrinus*
Wilson's Plover	*Charadrius wilsonia*
Killdeer	*Charadrius vociferous*
American Oystercatcher	*Haematopus palliatus*
Black-necked Stilt	*Himantopus mexicanus*
Solitary Sandpiper	*Tringa solitaria*
Willet	*Catoptrophorus semipalmatus*
Laughing Gull	*Larus atricilla*
Caspian Tern	*Sterna caspia*
Royal Tern	*Sterna maxima*
Forster's Tern	*Sterna forsteri*
Least Tern	*Sterna antillarum*
Gull-billed Tern	*Sterna nilotica*
Black Skimmer	*Rynchops niger*
Mourning Dove	*Zenaida macroura*
Eurasian Collared-Dove	*Streptopelia decaocto*
Common Ground Dove	*Columbina passerina*
Rock Dove	*Columba livia*
Yellow-billed Cuckoo	*Coccyzus americanus*
Barn Owl	*Tyto alba*
Great Horned Owl	*Bubo virginianus*
Barred Owl	*Strix varia*
Eastern Screech-Owl	*Otus asio*
Chuck-will's-widow	*Caprimulgus carolinensis*
Common Nighthawk	*Chordeiles minor*
Chimney Swift	*Chaetura pelagica*
Ruby-throated Hummingbird	*Archilochus colubris*
Belted Kingfisher	*Ceryle alcyon*
Red-headed Woodpecker	*Melanerpes erythrocephalus*

Red-bellied Woodpecker	*Melanerpes carolinus*
Downy Woodpecker	*Picoides bubescens*
Hairy Woodpecker	*Picoides villosus*
Northern Flicker	*Colaptes auratus*
Pileated Woodpecker	*Dryocopus pileatus*
Eastern Wood-Pewee	*Contopus virens*
Acadian Flycatcher	*Empidonax virescens*
Great Crested Flycatcher	*Myiarchus crinitus*
Eastern Kingbird	*Tyrannus tyrannus*
Loggerhead Shrike	*Lanius ludovicianus*
Red-eyed Vireo	*Vireo olivaceus*
White-eyed Vireo	*Vireo griseus*
Yellow-throated Vireo	*Vireo glavifrons*
Blue Jay	*Cyanocitta cristata*
American Crow	*Corvus brachyrhynchos*
Fish Crow	*Corvus ossifragus*
Purple Martin	*Progne subis*
Rough-winged Swallow	*Stelgidopteryx serripennis*
Barn Swallow	*Hirundo rustica*
Tufted Titmouse	*Baeolophus bicolor*
Carolina Chickadee	*Poecile carolinensis*
Brown-headed Nuthatch	*Sitta pusilla*
Carolina Wren	*Thryothorus ludovicianus*
Marsh Wren	*Cistothorus palustris*
Blue-gray Gnatcatcher	*Polioptila caerulea*
Eastern Bluebird	*Sialia sialis*
American Robin	*Turdus migratorius*
Wood Thrush	*Hylocichla mustelina*
Northern Mockingbird	*Mimus polyglottos*
Brown Thrasher	*Toxostoma rufum*
European Starling	*Sturnus vulgaris*
Northern Parula	*Parula americana*
Pine Warbler	*Dendroica pinus*
Yellow-throated Warbler	*Dendroica dominica*
Worm-eating Warbler	*Helmintheros vermivora*
Prothonotary Warbler	*Protonotaria citrea*
American Redstart	*Setophaga ruticilla*
Swainson's Warbler	*Limnothlypis swainsonii*
Louisiana Waterthrush	*Seiurus motacilla*
Kentucky Warbler	*Oporornis formosus*
Common Yellowthroat	*Geothlypis trichas*
Hooded Warbler	*Wilsonia citrina*
Yellow-breasted Chat	*Icteria virens*
Summer Tanager	*Piranga rubra*
Northern Cardinal	*Cardinalis cardinalis*
Blue Grosbeak	*Guiraca caerulea*

Indigo Bunting	*Passerina cyanea*
Eastern Towhee	*Pipilo erythrophthalmus*
Bachman's Sparrow	*Aimophila aestivalis*
Field Sparrow	*Spizella pusilla*
Seaside Sparrow	*Ammodramus maritimus*
Eastern Meadowlark	*Sturnella magna*
Brown-headed Cowbird	*Molothrus ater*
Red-winged Blackbird	*Agelaius phoeniceus*
Common Grackle	*Quiscalus quiscula*
Boat-tailed Grackle	*Quiscalus major*
Orchard Oriole	*Icterus spurius*
House Finch	*Carpodacus mexicanus*
House Sparrow	*Passer domesticus*

Mammals

The following list is based, in part, on *A Field Guide to the Mammals* by William H. Burt and Richard P. Grossenheider, Houghton Miflin Co., 1980.

Least Shrew	*Cryptotis parva*
Shorttail Shrew	*Blarina brevicauda*
Eastern Mole	*Scalopus aquaticus*
Mississippi Myotis	*Myotis austroriparius*
Eastern Pipistrel	*Pipistrellus subflavus*
Big Brown Bat	*Eptesicus fuscus*
Evening Bat	*Nycticeius humeralis*
Eastern Yellow Bat	*Lasiurus intermedius*
Eastern Big-eared Bat	*Plecotus refinesquei*
Mexican Freetail Bat	*Tadarida brasiliensis*
Raccoon	*Procyon lotor*
Longtail Weasel	*Mustela frenata*
Mink	*Mustela vison*
River Otter	*Lutra canadensis*
Coyote	*Canis latrans*
Red Fox	*Vulpes fulva*
Gray Fox	*Urocyon cinereoargenteus*
Bobcat	*Felis rufus*
Eastern Gray Squirrel	*Sciurus carolinensis*
Southern Flying Squirrel	*Glaucomys volans*
Beaver	*Castor canadensis*
Eastern Harvest Mouse	*Reithrodontomys humulis*
Cotton Mouse	*Peromyscus gossypinus*
Golden Mouse	*Peromyscus nuttalli*
Eastern Woodrat	*Neotoma floridana*
Rice Rat	*Oryzomys palustris*
Hispid Cotton Rat	*Sigmodon hispidus*
Muskrat	*Ondatra zibethica*

Eastern Cottontail	*Sylvilagus floridanus*
Swamp Rabbit	*Sylvilagus aquaticus*
Whitetail Deer	*Odocoileus virginianus*
Armadillo	*Dasypus novemcinctus*

During a site visit on October 31, 2016, signs of feral pigs (*Sus scrofa*), an invasive, non-native mammal, were noted in the north area of the property.

Reptiles

The following list is based on *Lizards & Crocodilians of the Southeast* by Whit Gibbons, Judy Greene, and Tony Mills, University of Georgia Press, 2009; *Snakes of the Southeast* by Whit Gibbons and Mike Dorcas, University of Georgia Press, 2005; *Turtles of the Southeast* by Kurt Buhlmann, Tracey Tuberville, and Whit Gibbons, University of Georgia Press, 2008; Salamanders of the Southeast by Joe Mitchell and Whit Gibbons, University of Georgia Press, 2010; and Frogs & Toads of the Southeast by Mike Dorcas and Whit Gibbons, University of Georgia Press, 2008. Species in **red** are those that were confirmed to occur on the Meadows property during a survey conducted in summer of 2014 by Weeks Bay Reserve.

American Alligator	*Alligator mississippiensis*
Green Anole	*Anolis carolinensis*
Eastern Fence Lizard	*Sceloporus undulatus*
Mimic Glass Lizard	*Ophisaurus mimicus*
Eastern Glass Lizard	*Ophisaurus ventralis*
Little Brown Skink	*Scincella lateralis*
Southern Coal Skink	*Plestiodon anthracinus pluvialis*
Common Five-lined Skink	*Plestiodon fasciatus*
Broad-headed Skink	*Plestiodon laticeps*
Smooth Earth Snake	*Virginia valeriae valeriae*
Rough Earth Snake	*Virginia striatula*
Marsh Brown Snake	*Storeria dekayi limnetes*
Red-bellied Snake	*Storeria occipitomaculata*
Southeastern Crowned Snake	*Tantilla coronata*
Pine Woods Snake	*Rhadinaea flavilata*
Southern Ringneck Snake	*Diadophis punctatus punctatus*
Northern Scarlet Snake	*Cemophora coccinea copei*
Rough Green Snake	*Opheodrys aestivus*
Eastern Garter Snake	*Thamnophis sirtalis sirtalis*
Eastern Ribbon Snake	*Thamnophis sauritus sauritus*
Eastern Hognose Snake	*Heterodon platirhinos*
Scarlet Kingsnake	*Lampropeltis triangulum elapsoides*
Eastern Kingsnake	*Lampropeltis getula getula*
Black Pine Snake	*Pituophis melanoleucus lodingi*
Gray Rat Snake	*Pantherophis spiloides*
Corn Snake	*Pantherophis guttatus*
Southern Black Racer	*Coluber constrictor priapus*
Coachwhip	*Masticophis flagellum*

Glossy Crayfish Snake	*Regina rigida*
Queen Snake	*Regina septemvittata*
Midland Watersnake	*Nerodia sipedon pleuralis*
Banded Watersnake	*Nerodia fasciata fasciata*
Gulf Salt Marsh Snake	*Nerodia clarkii clarkii*
Yellow-bellied Watersnake	*Nerodia erythrogaster flavigaster*
Diamondback Watersnake	*Nerodia rhombifer*
Brown Watersnake	*Nerodia taxispilota*
Western Green Watersnake	*Nerodia cyclopion*
Mud Snake	*Farancia abacura*
Southern Copperhead	*Agkistrodon contortrix*
Western Cottonmouth	*Agkistrodon piscivorus leucostoma*
Canebrake Rattlesnake	*Crotalus horridus*
Eastern Diamondback Rattlesnake	*Crotalus adamanteus*
Dusky Pigmy Rattlesnake	*Sistrurus miliarius barbouri*
Eastern Coral Snake	*Micrurus fulvius fulvius*
Gulf Coast Box Turtle	*Terrapene carolina major*
Eastern Mud Turtle	*Kinosternon subrubrum subrubrum*
Eastern Chicken Turtle	*Deirochelys reticularia reticularia*
Southern Painted Turtle	*Chrysemys picta dorsalis*
Red-eared Slider Turtle	*Trachemys scripta elegans*
Florida Cooter	*Pseudemys floridana floridana*
Eastern Snapping Turtle	*Chelydra serpentina serpentina*
Common Musk Turtle	*Sternotherus odoratus*
Florida Softshell Turtle	*Apalone ferox*
Mississippi Diamondback Terrapin	*Malaclemys terrapin pileata*
One-toed Amphiuma	*Amphiuma pholeter*
Two-toed Amphiuma	*Amphiuma means*
Lesser Siren	*Siren intermedia*
Greater Siren	*Siren lacertina*
Southern Dusky Salamander	*Desmognathus auriculatus*
Spotted Dusky Salamander	*Desmognathus conanti*
Southern Two-lined Salamander	*Eurycea cirrigera*
Three-lined Salamander	*Eurycea guttolineata*
Dwarf Salamander	*Eurycea quadridigitata*
Mud Salamander	*Pseudotriton montanus*
Flatwoods Salamander	*Ambystoma bishopi*
Mole Salamander	*Ambystoma talpoideum*
Tiger Salamander	*Ambystoma tigrinum*
Marbled Salamander	*Ambystoma opacum*
Eastern Newt	*Notophthalmus viridescens*
Northern Cricket Frog	*Acris crepitans crepitans*
Coastal Plain Cricket Frog	*Acris gryllus gryllus*
Southern Chorus Frog	*Pseudacris nigrita*
Ornate Chorus Frog	*Pseudacris ornata*
Northern Spring Peeper	*Pseudacris crucifer crucifer*

Green Treefrog	*Hyla cinerea*
Barking Treefrog	*Hyla gratiosa*
Cope's Gray Treefrog	*Hyla chrysoscelis*
Squirrel Treefrog	*Hyla squirella*
Pine Woods Treefrog	*Hyla femoralis*
Southern Leopard Frog	*Rana sphenocephala*
Bronze Frog	*Rana clamitans clamitans*
Bullfrog	*Rana catesbeiana*
Pig Frog	*Rana grylio*
Gopher Frog	*Rana capito*
Fowler's Toad	*Bufo fowleri*
Southern Toad	*Bufo terrestris*
Oak Toad	*Bufo quercicus*
Eastern Spadefoot Toad	*Scaphiopus holbrookii*
Eastern Narrowmouth Toad	*Gastrophryne carolinensis*

Management Prescriptions

Prescribed Fire

The Meadows Tract. The wet pine flatwoods / pine savannah ecosystem is a very biologically diverse natural system. This ecosystem is not only fire-tolerant, it is absolutely fire-dependent for its continued existence. Without frequent natural or prescribed fire, this ecosystem cannot persist in the long term. The plant diversity of this system is not in the tree canopy, which is composed primarily of slash and longleaf pine, but in the herbaceous groundcover. In a healthy, fire-maintained pine savannah, it is not uncommon to find 30-50 herbaceous plant species, sometimes more, within a square meter-sized area.

Prior to European settlement, these areas were subjected to frequent fire, both lightening-generated and fires set by Native Americans. Hardwoods and shrubs were a minor component and primarily occurred in wetlands associated with stream corridors and other areas too wet for fire. The forest floor was dominated by bunch grasses, sedges, and a great multitude of wildflowers, legumes, and other broadleaf herbaceous plants. Wet pine savanna is occupied by species such as pitcher-plants and other carnivorous vegetation, orchids, lilies, milkworts, grasses and sedges, and on and on.

Many federally listed wildlife species are dependent on fire-maintained pine flatwoods / savannah, including the gopher tortoise, red-cockaded woodpecker, eastern indigo snake, and flatwoods salamander. Some very rare plant species are extreme fire-followers, only blooming after fire, including the panhandle lily (*Lilium iridollae*), American Chaffseed (*Schwalbea americana*), and several others.

Today, only a tiny percentage of fire-maintained pine flatwoods / savannahs remain and much of it is fire-suppressed, poorly managed, and/or threatened by development.

Where systems remain, it is becoming increasingly difficult to use fire as a management tool due to surrounding development and the general public's lack of understanding about the benefits of prescribed fire, not only to the forest ecosystem, but to the public as well. When residential and commercial development is interspersed with forestland, it is in the best interest of surrounding

property owners for those forestlands to be properly managed to keep forest fuels under control in order to minimize the chance for the occurrence of catastrophic wildfire.

When fire is excluded from these areas, an understory of hardwood trees and shrubs will quickly become established, which is detrimental to the ecosystem as a whole. The plant community is transformed from an incredibly diverse herbaceous-dominated system to one with little to no groundcover and a dense thicket made up of relatively few plants, many of which are of limited value to most wildlife species. Many species of wildlife that depend on the savannah-like plant community are soon crowded out by the dense undergrowth and must move to more suitable habitat or perish. Oftentimes, there is no suitable habitat nearby due to development or other conversion.

Fire-suppressed Pine Savannah

Invasion by hardwood trees and shrubs makes the use of prescribed fire much more problematic because of the extended time period involved in burning hardwood-infested stands and the excessive smoke that is generated in the process. Herbaceous-dominated stands burn off very quickly under the right conditions and produce much less smoke.

When a dense hardwood understory becomes established on a longleaf/slash pine site, natural pine regeneration ceases. The pines that are already established now have to compete with the other woody vegetation for sunlight, nutrients, and water, which slows the growth of the pines.

From the standpoints of plant community diversity, wildlife diversity, timber production, and health and safety of the public, there is no benefit gained by allowing natural pine savanna to become invaded by hardwood trees and shrubs.

Historically, natural fire in this type of system in coastal Alabama is estimated to have occurred at 1 – 3 yr. return intervals (*Frost, C. 2006. History and future of the longleaf pine ecosystem. In: Jose, S., Jokela, E.J., Miller, D.L. (Eds.), The Longleaf Pine Ecosystem: Ecology, Silviculture, and Restoration. Springer, New York, pp. 9-42*). In order to dramatically reduce and control the woody understory and restore more open, meadow-like conditions, it will be necessary to burn frequently and under conditions that produce hot fires.

Fire-managed Pine Savannah

Recommendations:

- Plan to conduct prescribed burns on the property annually until hardwood trees and shrubs have been reduced to occupying 10% or less of the site. Growing season burns, when conditions allow, will result in better control of the target plants.
- The county should enlist the services of an experienced prescribed burn manager to determine when site and weather conditions are appropriate to conduct a burn that will achieve management goals.
- Break the property up into compartments as facilitated by existing roads and trails, which can be used as firebreaks. Doing so will allow smaller areas to be burned, which will aid with fire and smoke control.
- Avoid creation of new firebreaks, which would potentially lead to erosion and/or invasive exotic plant establishment.
- Correlate prescribed burning with invasive exotic plant control efforts.

During a site visit on October 31, 2016, new firebreaks were observed in the north area of the property. It appeared that these breaks were pushed with a dozer in an effort to contain a prescribed fire on the state land to the north. Bare soil areas and soil piles mixed with woody debris were observed. The

pushed up soil should be redistributed to eliminate the piles and restore pre-disturbance elevations and contours. This type of disturbance is an open invitation to invasive exotic plant establishment and can lead to erosion and sedimentation into sensitive wetland habitats.

Bay Front Land. Prescribed fire is not recommended.

Feral Pig Control

Feral pigs (*Sus scrofa*) are not native to North America. Pigs were first brought to the United States in the 1500s by early explorers and settlers as a source of food. Since that time, feral swine populations have become established in various regions of the country, often with the assistance of humans who intentionally release them, and populations continue to expand across the nation. Currently, feral swine populations occur in nearly every county in the state of Alabama. Pigs are destructive to natural habitats and negatively affect certain wildlife species. Feral pigs are not wildlife; they do not belong in natural environments and should be removed.

The following information found at:
https://www.aphis.usda.gov/aphis/ourfocus/wildlifedamage/operational-activities/feral-swine/feral-swine-damage/feral-swine-natural-resource-damage :

Wildlife. *Feral swine compete with native wildlife for multiple resources, specifically food, habitat, and water. Feral swine diets overlap with those of native wildlife, such as bear, deer, and turkey, which results in competition for important and limited natural food supplies. Feral swine activity will often deter other species from living in an area, resulting in competition over prime habitat. Feral swine wallow in mud to maintain proper body temperature which can be particularly problematic during dry seasons when they monopolize and contaminate limited water sources.*

Feral swine also prey directly on the nests, eggs, and young of native ground nesting birds and reptiles, including threatened or endangered species. Game birds such as wild turkeys, grouse, and quail can also be impacted. Feral swine have even been documented killing and eating deer fawns, and actively hunting small mammals, frogs, lizards, and snakes.

Feral swine wallows are prime mosquito habitat which contributes to the prevalence of various mosquito-borne diseases. Wallows can also be a place of transmission for bacteria and parasites from feral swine to native wildlife that come to drink.

Soil and water quality. *Feral swine rooting and wallowing activity increases erosion, especially along waterways and in wetlands. Rooting and trampling can limit water infiltration and nutrient cycling. Large groups of feral swine can deposit significant amounts of fecal material in concentrated areas, contaminating water sources, resulting in increased disease risks for humans, wildlife, and livestock.*

Spread of invasive species. *Feral swine aid in the spread of invasive species of plants. Many invasive plants prefer areas of recent disturbance, such as wallows or rooted areas, and feral swine can spread seeds on their fur or in feces.*

Forest regeneration. *Feral swine can alter the understory growth of forests through rooting and foraging, ultimately shifting the tree species diversity and density in a forest by interfering with seed dispersal since they are huge consumers of mast crops (i.e., acorns, hickory nuts, beech nuts, and tupelo).*

Consumption of mast, not only depletes food sources for native wildlife such as deer and turkey, but this behavior can also alter the forest composition by decreasing the number of large seed-producing trees.

The following information on life history and ecology of feral swine is found at: http://www.outdooralabama.com/wild-boar:

Feral swine breed year round with peaks in the breeding cycle during fall and spring. Females are sexually mature at six months, but typically begin breeding at one year of age. Gestation lasts 115 days with an average of two litters per year. Litter size ranges from four to 14 with an equal sex ratio. Litters are dropped in a nest constructed of grasses and other vegetation. Hog mortality is greatest during the first six months of life due to disease, parasites, and accidents. Adult hogs have higher survival rates due to a lack of natural predators in most areas. Humans are the main predators of feral swine, as hunting of the species is very popular.

Feral pigs live in family groups that typically consist of sows and their young. These groups are called "sounders" and they utilize a home territory that varies in size, depending on food availability and other factors. Adult males may travel over large areas in search of mates. Most effective control is achieved when an entire sounder can be captured and eliminated at one time. Sounder members that are not captured become wary of traps and are much more difficult to catch.

Recommendations:
The property should be monitored for the presence and general location(s) of feral pigs. A knowledgeable and experienced wildlife professional should be enlisted to trap pigs whenever their presence is detected on the property.

Trapping efforts should be coordinated with the Alabama Dept. of Conservation and Natural Resources, which manages the state-owned Meadows land to the north.

The most effective method for controlling this species has proven to be use of a trapping system that involves pre-baiting in a corral-type trap equipped with a door that can be remotely activated. This system includes a motion-sensor camera that sends photos to the trapper's cell phone so that the door can be closed when the entire sounder is in the trap.

Invasive Exotic Plant Species Control

Competition among plant species is a natural part of any ecosystem, but introduction of exotic species can disrupt intricate balances and relationships evolved over thousands of years among native plants and their communities. Oftentimes, the result is a loss of biological diversity within both the plant and animal communities. There are many examples of disastrous exotic plant invasions that have resulted in losses of native species, changes in community structure and function, and even alteration of the physical structure of an ecosystem. The effects of invasions by exotics depend in large part on which species and which natural communities are involved.

Some generalized characteristics of invasive exotic species include having a long life span and high dispersal rates and being able to reproduce vegetatively (without seeds) and/or produce large numbers of seeds. These plants typically have a short generation time and are usually habitat generalists.

Some characteristics of habitats that are prone to invasion include those that have a similar climate to the place of origin of the invading plant; habitats that have been disturbed by humans; early succession

habitats (for example, clear cuts and abandoned agricultural fields or pastures); and habitats that have low natural diversity. A large contributor to the success of exotic plants is an absence of predators, disease, or other factors that keep populations in check in the plant's native regions.

Like a fever when you have the flu, invasion by exotic plant species typically is just a symptom of a greater underlying problem, usually a disturbed or disrupted habitat or ecosystem. When human bodies are overly stressed, our immune systems are weakened and we become vulnerable to "invasion" by foreign bodies that cause disease. Similarly, when some type of stress weakens a natural system, it becomes prone to invasion by exotics because the natural system is "sick." Careful observation will reveal that, in most cases, exotic plant species establishment and invasion is primarily associated with disturbed habitats. The disturbance, which stresses the system, may be quite subtle or readily recognizable. Some forms of disturbance that open the door to invasion by alien plant species include ditching, stream channelization, or severe erosion that results in a change in the natural hydrology of the surrounding land; unnaturally high levels of sediment accumulation in flood plains and riparian areas; soil disturbance caused by timber harvesting, agriculture or even food plot establishment; overgrazing by livestock; a prescribed fire regime that is out of sync with the ecosystem being managed; and activities associated with development, such as road construction.

Healthy, intact, fully functioning ecosystems are surprisingly resistant to invasion by exotic species. For example, it is not uncommon to find plant communities made up almost exclusively of exotics growing within or just outside of road rights-of-way, a highly disturbed situation where the natural hydrology has been altered through the excavation of ditches, the soil has been disturbed during road construction, and native vegetation has been removed and typically replaced with non-native grasses. If the adjacent habitat is relatively undisturbed and the plant community is intact, you will seldom find non-native species becoming established beyond the zone of influence of the roadside ditch or the area that has been disturbed. The plants that compose healthy, intact communities are so busy competing with each other that there is no room, or niche, for invasion by exotics. If exotic species become established at all, they are typically just a minor component in an otherwise diverse plant community and will remain so until a disturbance occurs that disrupts the natural balance.

Invasive exotic plant species currently found on the property are listed below along with control recommendations.

Always read the entire label of any herbicide to be used and carefully follow instructions concerning personal protection equipment and safety, as well as proper application rates and techniques.

Chinese Tallowtree; Popcorn Tree (*Triadica sebifera*)

This deciduous, fast-growing tree can get as tall as 60 ft. and in some situations form pure stands. Leaves are broadly ovate to diamond-shaped and turn bright yellow and scarlet in the fall. Abundant white waxy popcorn-like seeds appear in the fall. Seeds, high in fat and protein, are consumed and spread by birds and other wildlife. Saplings as young as 3 yr. can produce viable seed and remain reproductive for up to 100 yr. to produce 100,000 seeds per year. Infestations intensify by prolific surface root sprouts. Seed viability in the soil is 2 to 7 yr.

General Recommendations:

- Young plants should be removed before they begin producing seeds.
- Small seedlings and young saplings can be pulled by hand and with a weed wrench in moist soil conditions and if infestation is not too dense to make hand removal impractical.

Specific Control Procedures:

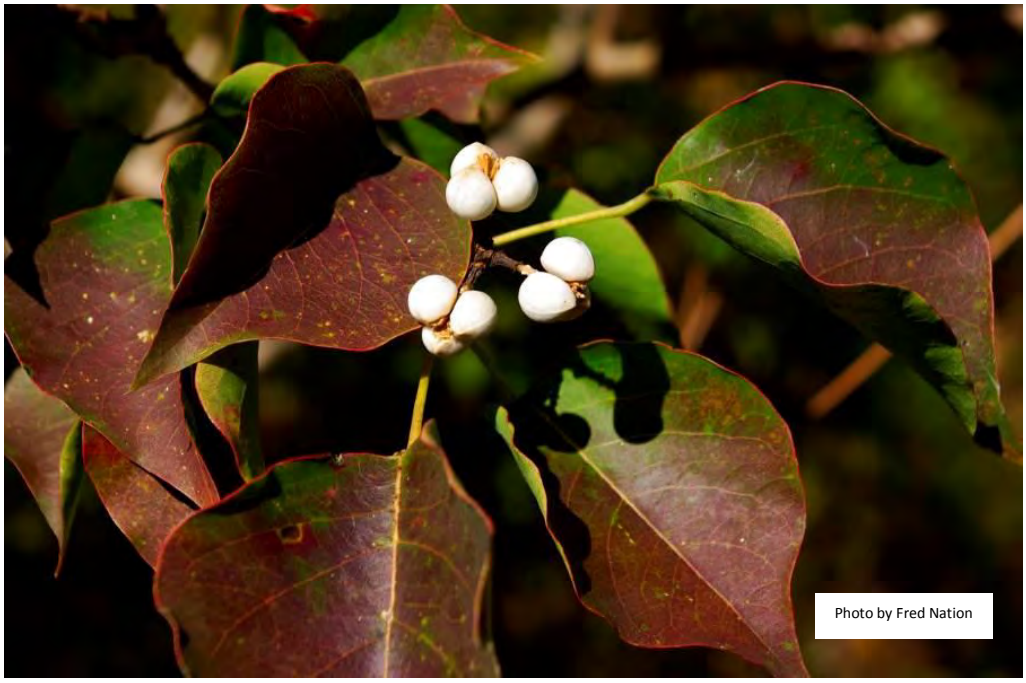
Large Trees and Saplings. These control procedures can be used effectively any time of year *except March and April*. Cut down trees and large saplings to within a couple inches of the ground using a chainsaw or hand saw, then ***immediately*** apply one of the following herbicides to stump tops and sides:

- Garlon 4 as a 20% solution in basal oil
- Garlon 3A as a 20% solution in basal oil
- Glyphosate mixed in water as a 20-50% solution + blue indicator dye
- Undiluted Pathfinder II (a pre-mixed, oil-based triclopyr product)

Dense Infestations of Seedlings and Small Saplings. These control procedures should be used *July through October*. Thoroughly wet all leaves with the following:

- Garlon 4 as a 2% solution in water + a non-ionic surfactant + blue indicator dye

Chinese Tallowtree or Popcorn Tree



Chinese Tallowtree or Popcorn Tree

(Much of the above information is taken from, and/or based on, the USDA Forest Service publication, *A Management Guide for Invasive Plants in Southern Forests*; by James H. Miller, Steven T. Manning, and Stephen F. Enloe; April 2013.)

Chinese Privet (*Ligustrum sinense*)

Chinese privet is a shrub that has been, and continues to be, used extensively in landscaping. It has opposite leaves and is in the olive family. Chinese privet has thin, semi-evergreen, somewhat small leaves. It is thicket-forming, shades out native shrub and herbaceous species, and prevents native tree and shrub recruitment. Chinese privet is one of the most widely spread invasive plants in the South. It has showy clusters of small white flowers in spring that yield abundant clusters of small ovoid, dark purple berries during fall and winter. Chinese privet colonizes by root sprouts and seeds and is spread widely by birds and other animals. Seeds are thought to be viable for only 1 year. Many shallow surface roots may sprout when the parent plant is top-killed.

General Recommendations:

- Young plants should be removed before they begin producing seeds.
- Small seedlings and young saplings can be pulled by hand and with a weed wrench in moist soil conditions and if infestation is not too dense to make hand removal impractical. If the entire root is not removed, re-sprouting is likely.

Specific Control Procedures:

Foliar Application. If within reach, Chinese privet can be effectively controlled by applying herbicide to the leaves. Note that *summer* foliar applications of glyphosate may not be as effective as other times and require a higher percent solution. Otherwise, thoroughly wet all leaves with the following:

- Glyphosate as a 3% solution in water + a non-ionic surfactant + blue indicator dye.

Basal Treatment. For stems too tall for foliar sprays and when safety to surrounding vegetation is desired, apply a basal spray of:

- Garlon 4 as a 20% solution in basal oil, vegetable oil, or mineral oil. Apply solution to the stem between the ground and approximately 12 in. above ground all the way around the stem.
- Undiluted Pathfinder II. Apply solution to the stem between the ground and approximately 12 in. above ground all the way around the stem.

Cut Surface Treatment. For best results, cut surface treatment should be done any time of year *except March and April*. For large stems and when safety to surrounding vegetation is desired, cut with a chainsaw or hand saw and ***immediately*** treat stump tops and sides with one of the following:

- Garlon 3A as a 20% solution in water + a non-ionic surfactant + blue indicator dye
- Glyphosate as a 20% solution in water + a non-ionic surfactant + blue indicator dye

(Much of the above information is taken from, and/or based on, the USDA Forest Service publication, *A Management Guide for Invasive Plants in Southern Forests*; by James H. Miller, Steven T. Manning, and Stephen F. Enloe; April 2013.)

Chinese Privet fruit being eaten and dispersed by an American Robin

Chinese Privet in flower

Chinese Privet with unripe fruit

Rattlebox (*Sesbania punicea*)

This member of the pea family is a deciduous shrub or small tree that grows up to 12 ft. tall. It has compound leaves each with 10-40 small, dark-green leaflets in opposite pairs. Each leaflet is oblong and ends in a tiny pointed tip. The flowers, shaped like typical pea flowers, appear in clusters in spring and

early summer and are reddish-orange in color. The seed pods are longitudinally 4-winged, oblong, and held on short stalks. The tip of the pod is sharply pointed. Rattlebox is native to South America.

General Recommendations:

- Young plants should be pulled by hand or with a weed wrench when soil is moist.
- Young plants should be removed before they begin producing seeds.

Specific Control Procedures:

Large Plants. These control procedures can be used effectively any time of year *except March and April*. Cut down stems to within a couple inches of the ground using a chainsaw or hand saw, then ***immediately*** apply one of the following herbicides to stump tops and sides:

- Garlon 4 as a 20% solution in basal oil
- Garlon 3A as a 20% solution in basal oil
- Undiluted Pathfinder II (a pre-mixed, oil-based triclopyr product)

Rattlebox Seed Pods and Flowers

Rattlebox

(The above information is based on work by *Barry Rice, Global Invasive Species Team, The Nature Conservancy,* as found on the BugwoodWiki. It is also based on information adapted from the USDA Forest Service publication, *A Management Guide for Invasive Plants in Southern Forests*; by James H. Miller, Steven T. Manning, and Stephen F. Enloe; April 2013.)

Beach Vitex (*Vitex rotundifolia*)

Beach vitex is an invasive perennial shrub with a woody stem that can sprawl more than 60 ft. across the ground. Plants are up to 2 ft. tall. Brittle stems tend to break off in high tide and float off and colonize new areas. Leaves are oval, silvery gray, and 1 to 2 in. long. Flowering occurs throughout the year, when small clusters of violet flowers develop at the ends of the branches. Fruit are round, 0.25 in. in diameter, and dark purplish black when mature. Beach vitex is native to the Pacific Rim and was introduced in the continental United States in the 1980s as a beach stabilization plant. Plants prefer sandy soils in full sun.

(The above information is from http://www.extension.org/pages/62677/vitex-rotundifolia-beach-vitex#.Un7NY3bnZes)

One beach vitex plant was found on the bay front land in spring 2013 and was hand-pulled.

General Recommendations:

- The bay front land should be monitored for the reoccurrence of this plant.
- Young plants should be pulled by hand or with a weed wrench when soil is moist.
- Young plants should be removed before they begin producing seeds.

Beach Vitex in Flower

Beach Vitex in Fruit

Japanese Honeysuckle (*Lonicera japonica*)

This woody vine is semi-evergreen to evergreen, high climbing and trailing to 80 ft., branching and often forming arbors in forest canopies and/or groundcover under canopies. It has ovate to oblong opposite leaves that are green above and whitish underneath. Both surfaces are smooth to rough-hairy. Vines root at the nodes when covered by leaves or duff, which makes control difficult. Japanese honeysuckle occurs as dense infestations along forest edges and rights-of-way, as well as under dense tree canopies and as arbors high in canopies. It is shade tolerant and has large woody rootstocks. It spreads mainly by vines rooting at the nodes and less by animal-dispersed seeds. It infrequently seeds within forest stands and has very low germination rates. Seed survival in the soil is less than 2 yr. This species is still planted in wildlife openings and invades surrounding lands where it is planted.

General Recommendations:

- If hand-pulled, bag and dispose of plants and fruit in a dumpster or burn.
- Treat when new plants are young to prevent seed formation.
- Pull, cut, and treat with herbicide when fruit are not present.
- Hand-pull when soil is moist to ensure removal of all stolons and roots.

Specific Control Procedures:

Foliar Treatment. For best results, *July to October, or during warm days in winter*, treat leaves with one of the following:

- Glyphosate as a 2% solution in water + a non-ionic surfactant + blue indicator dye.
- Garlon 3A as a 3- 5% solution in water + a non-ionic surfactant + blue indicator dye.
- Garlon 4 as a 3- 5% solution in water + a non-ionic surfactant + blue indicator dye.

Cut Stem Treatment. Cut large vines just above the soil surface and ***immediately*** treat the freshly cut stem with one of the following:

- Glyphosate as a 20% solution in water + a non-ionic surfactant + blue indicator dye.
- Garlon 3A as a 20% solution in water + a non-ionic surfactant + blue indicator dye.

Japanese Honeysuckle

(Much of the above information is taken from, and/or based on, the USDA Forest Service publication, *A Management Guide for Invasive Plants in Southern Forests*; by James H. Miller, Steven T. Manning, and Stephen F. Enloe; April 2013.)

Japanese Climbing Fern (*Lygodium japonicum*)

This vine is a true perennial fern that climbs and twines and can grow up to 90 ft. long. It often forms mats that cover shrubs and trees. Leaves are lacy and finely divided along thin, wiry stems that range from green to orange to black in color. In sheltered areas, fronds may remain green through winter; otherwise, fronds typically die back and turn tan to brown in winter. New growth appears in mid to late spring from underground slender, dark brown to black, wiry rhizomes, which must be killed to eradicate the plant. This fern spreads by rhizomes and by wind-dispersed spores.

General Recommendations:

- Plant material with fertile fronds should be bagged and sent to the landfill.
- Herbicide treatments and hand removal should be timed to occur when plants are young to prevent spore formation.

Specific Control Procedures:

Hand Removal. When only an occasional plant is present, these can be dug up with a shovel, taking care to remove the entire root system, bagged, and sent to a landfill. If fertile fronds are present, these should be removed and bagged as well.

Foliar Treatment. In *July to September* before spore release, thoroughly wet all leaves to as high as safe with the following:

- Glyphosate as a 2% solution in water + a non-ionic surfactant + blue indicator dye.

Sterile Frond **Fertile Frond**

Japanese Climbing Fern

(Much of the above information is taken from, and/or based on, the USDA Forest Service publication, *A Management Guide for Invasive Plants in Southern Forests*; by James H. Miller, Steven T. Manning, and Stephen F. Enloe; April 2013.)

Cogongrass (*Imperata cylindrica*)

This grass is a very aggressive, colony-forming, dense erect perennial that grows 1 to 6 ft. tall. It has tufts of long leaves hiding short stems, yellow-green blades, each with an off-center mid-vein and finely serrated margins. Flowers and seeds are fluffy and silver-plumed. They appear in spring and sporadically year-round, typically associated with some sort of disturbance, such as mowing or burning. Seed are dispersed by wind and on contaminated clothing, equipment, and products such as pine straw mulch and fill material from borrow pits where it occurs. Dense stands of dead grass persist through winter and are a severe fire hazard. Cogongrass burns hot even when green. Infestations form dense rhizome mats, making eradication difficult. Older infestations are more difficult to control than new patches.

Cogongrass Seed Head

General Recommendations:

- Diligently monitor for new occurrences of cogongrass and treat new patches as soon as feasible while grass is green and actively growing.
- Do not use or transport fill dirt, rock, hay, or pine straw from infested lands.
- Seed production can be stopped by mowing, burning, or herbicide treatments in early stages of flowering or shortly before flowering.
- Clean seed and rhizomes from equipment and personnel working in infestations before leaving the infested site.

Cogongrass

Specific Control Procedures:

Foliar Treatment. When grass is *actively growing* and at least 1-2 ft. high, or for older growth, treat from *June to September*, thoroughly wet all leaves with one of the following:

- Arsenal AC* as a 1% solution in water + a non-ionic surfactant + blue indicator dye. Repeat applications in subsequent years may be required for patch eradication.
- Glyphosate at 2-5% + Arsenal AC at 1% in water + a non-ionic surfactant + blue indicator dye. This treatment will accelerate burn-down of actively growing shoots but may not improve rhizome kill.
- Glyphosate as a 2-5% solution in water + a non-ionic surfactant + blue indicator dye. Two applications per growing season (just before flowering in spring and again in late summer to regrowth) are typically necessary. For eradication, apply in successive years when regrowth is present until no live rhizomes are observed.

**Arsenal AC is soil active, meaning that it can be taken up by the roots of non-target plants and cause damage or death.*

(Much of the above information is taken from, and/or based on, the USDA Forest Service publication, *A Management Guide for Invasive Plants in Southern Forests*; by James H. Miller, Steven T. Manning, and Stephen F. Enloe; April 2013.)

Torpedo Grass (*Panicum repens*)

This perennial grass that can grow up to 3 ft. tall. Plants have long, creeping rhizomes with sharp-pointed (torpedo-like) tips. Leaves are linear, flat or folded, up to 10 in. long, 0.3 in. wide with a whitish,

Torpedo Grass

waxy covering. Leaf sheaths can be glabrous or hairy and the ligule is membranous with short hairs. Flowering occurs nearly year round. Flowers develop in branched, open inflorescences that are about 3-7

in. long. Torpedo grass is native to Africa and Eurasia and was introduced into the United States around 1876. It can occur in a wide variety of habitats. Plants are usually found in damp soils of riparian zones, but can also be found in pastures, lawns, and on sand dunes. This species is salt-tolerant.

(The above information is based on information as found on the BugwoodWiki.)

General Recommendations:

- Diligently monitor for new occurrences and treat as soon as feasible.
- Do not use or transport fill dirt, rock, hay, or pine straw from infested lands.
- Seed production can be stopped by mowing, burning, or herbicide treatments in early stages of flowering or even shortly before flowering.
- Clean seed and rhizomes from equipment and personnel working in infestations before leaving the infested site.
- If this grass is growing in or very near water, herbicide labeled for aquatic application should be used.

Specific Control Procedures:

Foliar Treatment. When grass is *actively growing* and at least 0.5-1 ft. high, or for older growth, treat from *June to September*, thoroughly wet all leaves with the following:

- Glyphosate as a 2-5% solution in water + a non-ionic surfactant + blue indicator dye. Two applications per growing season (just before flowering in spring and again in late summer to regrowth) are typically necessary. For eradication, apply in successive years when regrowth is present until no live rhizomes are observed.

(Control procedures are adapted from the USDA Forest Service publication, *A Management Guide for Invasive Plants in Southern Forests*; by James H. Miller, Steven T. Manning, and Stephen F. Enloe; April 2013.)

Vasey Grass (*Paspalum urvillei*)

This erect, course, tufted perennial grass grows up to 7 ft. tall, sometimes branching. Lower leaf sheaths are sometimes hairy. Leaf blades usually about 2 ft. long by 0.8 in. wide and are hairy at the base. Panicles (flower/seed heads) are erect, with 20 or so spikes (racemes) per stem, densely arranged. Seeds are round and flat. This grass is native to South America. It is commonly found in disturbed habitats.

General Recommendations:

- Learn to distinguish this grass from other native grasses that look similar.
- Seed production can be stopped by mowing, burning, or herbicide treatments in early stages of flowering or even shortly before flowering.
- If this grass is growing in or very near water, herbicide labeled for aquatic application should be used.

Specific Control Procedures:

Foliar Treatment. When grass is *actively growing* and at least 0.5-1 ft. high, or for older growth, treat from *June to September*, thoroughly wet all leaves with the following:

- Glyphosate as a 2-5% solution in water + a non-ionic surfactant + blue indicator dye. Two applications per growing season (just before flowering in spring and again in late summer to regrowth) may be necessary.

Vasey Grass

Other Non-native Grasses

Other invasive exotic grasses observed on the property include bahiagrass (*Paspalum notatum*), centipedegrass (*Eremochloa ophiuroides*), and bermudagrass (*Cynodon dactylon*), all of which are familiar lawn grasses. They are primarily confined to the main road leading into the property from CR 1. Other non-native grasses may also be present. Control procedures recommended here should also be effective on other grass species, if any should be discovered. Both bahiagrass and bermudagrass spread primarily vegetatively by underground rhizomes, but also by seed. They are often found in disturbed habitats, including where fill dirt has been placed.

General Recommendations:

- Do not use or transport fill dirt from infested lands.
- Seed production can be stopped by mowing, burning, or herbicide treatments in early stages of flowering or even shortly before flowering.
- If this grass is growing in or very near water, herbicide labeled for aquatic application should be used.

Specific Control Procedures:

Foliar Treatment. When grass is *actively growing*, treat from *June to September*, thoroughly wet all leaves with the following:

- Glyphosate as a 2-5% solution in water + a non-ionic surfactant + blue indicator dye. Two applications per growing season (just before flowering in spring and again in late summer to regrowth) may be necessary.

Bermudagrass

Centipedegrass

Bahiagrass

Alligatorweed (*Alternanthera philoxeroides*)

Alligatorweed is an emergent or rooted floating plant that invades aquatic areas and adjoining uplands throughout the southern portions of the United States. Plants have hollow stems and can grow to 3 ft. tall. Opposite, elliptical leaves are thick but non-succulent and are up to 4 in. long. Flowering occurs during the summer, and flowers are white, cloverlike heads in the axils of the leaves. Alligatorweed disperses from stem fragments carried by water. The stem fragments root in wet soils or shallow water and grow out into waterways. Alligatorweed also can grow terrestrially, forming smaller, tougher leaves. The thick mats can displace native vegetation and wildlife habitat, clog waterways, restrict oxygen levels of water, increase sedimentation, interfere with irrigation, and prevent drainage. Alligatorweed is native to South America and was introduced in the United States around 1900 in ballast water.
(From http://www.extension.org/pages/62741/alternanthera-philoxeroides-alligatorweed#.Un-Z5XbnZet.)

Photos by James H. Miller, USDA Forest Service, bugwood.org

Alligatorweed

General Recommendations:

- The bay front land and wet ditches on the Meadows tract should be monitored for this plant and any occurrences dealt with as soon as feasible to prevent spreading.
- For best results, herbicide application should be done during dry conditions when plants are not submerged.

Specific Control Procedures:

Thoroughly wet all leaves with one of the following herbicides in water for good control above the water line:

- Garlon 4 (Renovate 3 for aquatic sites) as a 2% solution
- An aquatic-labeled glyphosate herbicide as a 2% solution

(The above information is based on Miller, James H.; Manning, Steven T.; Enloe, Stephen F. 2010. A management guide for invasive plants in southern forests. Gen. Tech. Rep. SRS–131. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station. 120 p.)

Hydrologic Enhancement

The Meadows Tract. Based on the county's LIDAR survey and visual observation of the site, the internal road network in the present condition appears to present no serious impedance to storm water runoff over the tract; however, measures can be taken to allow water to move across the landscape more naturally.

In areas where a road segment is obviously higher than the adjacent natural ground elevation, low-water crossings, or fords, can be constructed. The overflow section should have the surface armored with course gravel and/or riprap or concrete to prevent erosion and allow vehicular traffic to pass during overflow events. If low-water crossings are installed, elevated boardwalks should be constructed along one edge of the crossing to allow for pedestrian access.

Example of a Low-Water Crossing

Installation of crossings should be approached with an attitude of caution and with the knowledge that monitoring of the adjacent plant communities is advisable. As described in the Invasive Exotic Plant Species Control section of this plan, disturbance often leads to invasion, therefore, if crossings are to be constructed, work should be done in such a way as to minimize disturbance of the soil and adjacent plant communities to the extent feasible. Excavated material should be hauled off site and disturbed areas stabilized as quickly as possible with permanent cover (rip-rap, gravel, etc.) and seeding and mulching of adjacent disturbed soils should be done to obtain temporary plant cover until natural herbaceous cover returns. Disturbed areas and the surrounding plant communities should be monitored for invasive exotic plants and any found to occur should be removed or killed as recommended in the Invasive Exotic Plant Species Control Section of this plan.

The Mobile District Corps of Engineers Regulatory Division and the Alabama Dept. of Environmental Management (ADEM) should be consulted prior to beginning work since permitting may be required.

Bay Front Land. No hydrologic restoration or enhancement is recommended.

Forest Management

The Meadows Tract. The long-term forest management objective is to promote the growth and development of a natural, uneven-aged stand of trees dominated by slash and longleaf pine with a low basal area. It will be necessary to periodically thin trees to maintain a target basal area not to exceed 30-40 sq. ft. per acre. Maintenance of low basal area will provide a sparse, open tree canopy that, in combination with frequent burning, will promote a diverse herbaceous groundcover. When tree thinning is done, the lowest quality trees should be harvested, leaving the best trees to mature further and regenerate the stand.

Registered forester William M. Wright of W.M. Wright and Co., LLC was engaged to determine current timber volumes, basal area, etc., and make recommendations on when and where it would be appropriate to conduct thinning operations in order to achieve target stand conditions. A forest management plan has been provided that includes specifications on timber management and logging operations. Any logging that is to be done should be conducted in such a way and under such conditions that will minimize permanent damage to the site.

Bay Front Land. No forest management is necessary; however, there is an opportunity to create a "living shoreline" within the intertidal area between the riprap and the mean high tide line. A *living shoreline* is one in which plants and other natural materials, such as oyster shell, are used to stabilize the substrate and provide habitat for a variety of wildlife species, fish, and other aquatic and wetland organisms. A living shoreline on these public lands could serve as a demonstration project to help educate the public about alternatives to bulkheads. It could also be used by school children and other groups for learning opportunities.

The line of rip-rap that was placed waterward of the shoreline by a previous landowner has served to prevent further erosion along the bay front land by absorbing wave energy. It appears that sand has accreted in the area between the shoreline and the rip-rap. This intertidal zone provides an idea situation for planting appropriate species and creating marsh habitat.

Appropriate plant species include:

Black Needle Rush	*Juncus roemerianus*
Saltmeadow Cordgrass	*Spartina patens*
Smooth Cordgrass	*Spartina alterniflora*

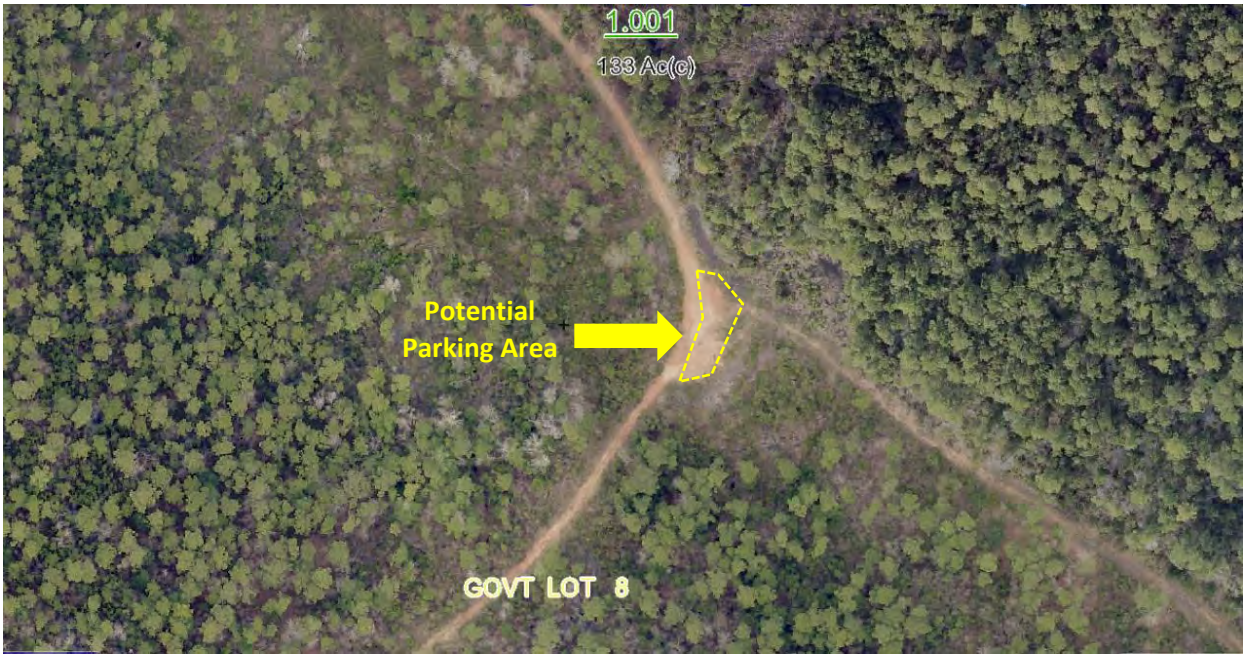
For the purpose of providing access to the marsh and the bay, construction of a pile-supported walkway and pier should be considered.

Note that permits from the Corps of Engineers, ADEM, and the ADCNR State Lands Division would be required for any structures placed waterward of the mean high tide line.

Public Access

Parking

The Meadows Tract. It will be necessary to provide visitors with a suitable and safe area to park vehicles. The former logging deck, marked by the yellow star on the aerial photo on p. 10 and as shown in close-up below, may be a suitable location for a public parking area. This area, which was likely wetlands originally, was filled by a previous landowner for the purpose of landing timber for de-limbing, cutting to length, and loading onto log trucks. This prior filling activity likely falls under the Section 404(f) of the Clean Water Act's silvicultural exemption, which can be found at 33 CFR Part 323.4 and 40 CFR Part 232.3. It should be noted that a change in use of the filled area from an exempt activity to one that would require a permit, such as fill for parking unrelated to silviculture, may trigger the need for a Corps of Engineers wetland fill permit even if the extent of filled wetlands is not to be expanded. *The Corps should be consulted for a formal determination of whether a permit is required.*



Potential Parking Area

If the former logging deck is to be used for parking, then it will be necessary to improve the road segment between CR 1 and the former logging deck. This road corridor is currently somewhat overgrown, so there is a need to clear vegetation from a narrow swath along the road edges. To accommodate regular passenger cars, the road surface may need some improvement, such as grading, filling in mud holes, and perhaps adding an aggregate material such as limestone or gravel.

Potential Parking Area

Remaining wetlands in the vicinity of the proposed parking area should be delineated and mapped so that the parking area footprint can be designed to avoid additional wetland fill if feasible*. If additional fill is necessary, then a Corps/ADEM permit will be required.* Depending on the area to be disturbed, an ADEM storm water permit may also be required. It will be necessary to clear vegetation, old logging debris, etc. from the parking area footprint, grade, possibly add fill, and either pave or cover the area with aggregate material. This project should be designed by a professional engineer.

Bay Front Land. The existing driveway that leads into the property can be improved to accommodate vehicles. Expansion of the driveway footprint would likely impact wetlands; therefore, *a Corps of Engineers/ADEM wetland fill permit would be required*. It may not be necessary to expand the footprint, but merely improve the current driveway surface by leveling and placing aggregate material over the surface.

Interpretive Trails and Signage

The existing former logging roads and other paths provide an essentially ready-made trail system throughout the property. Relatively minimal effort will be required to make these trails user-friendly in

most areas; however, some segments will require boardwalks. Initially, trails should be bush-hogged / mowed and vegetation encroaching from the adjacent natural areas trimmed to open up an adequate path where necessary.

Road / Trail Leading into the Property from CR 1

Some existing trail segments are inundated during the wet season and following heavy rains, so construction of elevated boardwalks through those areas is desirable. Boardwalks are needed as follows:

- Approx. 630 linear ft. of the trail labeled West Trail on the trail map (page 52).
- Approx. 100 linear ft. of the trail beginning east of the main road across the road from the West Trail, beginning at the east edge of the road and running east.
- Approx. 6-8 ft. in the northeast corner of the property, along the Big Loop Trail, to cross a small ditch.
- Approx. 130-ft. of the north part of the Big Loop Trail just to the east of the main road. *Note that this segment is on state-owned property.*

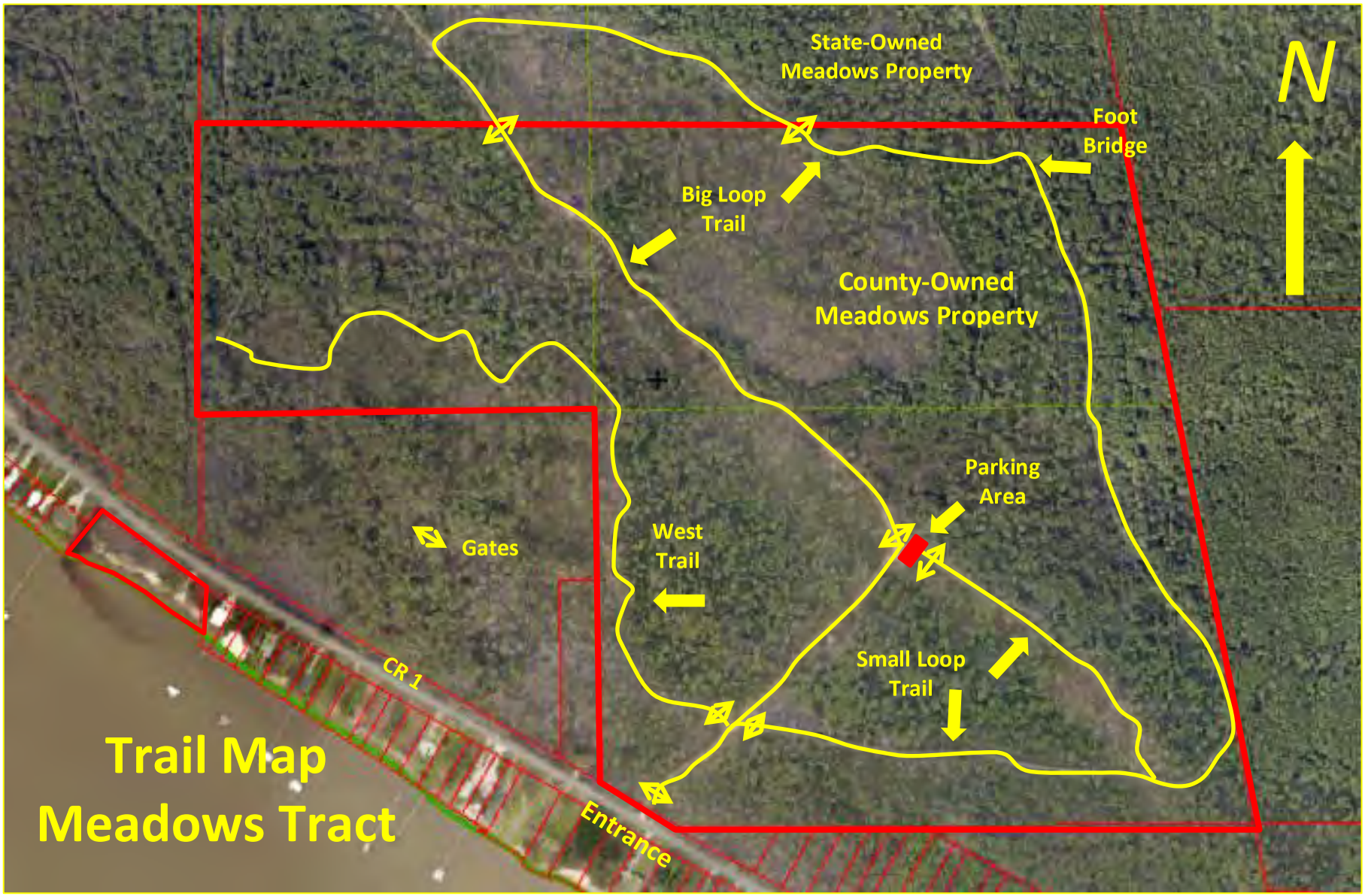
The map on page 52 shows a proposed trail system through the property utilizing existing roads and paths. There are more existing paths than shown on this map, so there is potential for expanding the trail system beyond what is suggested here.

The northernmost trail loop crosses over onto the state-owned part of the Meadows property; therefore, it will be necessary to get permission from the Alabama Dept. of Conservation and Natural Resources (ADCNR) to include state property in the county's trail system. It should be noted that the

ADCNR is currently developing a management plan for the state-owned Meadows lands that will likely include a trail system open to the public. It seems logical that these two trail systems should interconnect and allow for public access to both county and state lands.

Informational and interpretive signage can be placed along the trail system at appropriate locations. Pages 53-60 lists suggested verbiage and other information to be posted. For now, these three main trails are called West Trail, Big Loop Trail, and Small Loop Trail. The County Commission may want to name these trails something more interesting when the time comes to produce signage.

Routine maintenance along the trails will include periodic mowing as necessary, trimming of branches from the adjacent woodlands, controlling invasive exotic plants, repair of the boardwalks as needed, and cleaning and/or replacement of signage.


State-Owned
Meadows Property
N
Foot
Bridge
Big Loop
Trail
County-Owned
Meadows Property
Parking
Area
Gates
West
Trail
Small Loop
Trail
CR 1
Entrance
Trail Map
Meadows Tract

Proposed Signage
The Meadows Tract

<u>Sign to be placed at entrance near CR 1:</u>

The Meadows

This 135-acre tract is owned and managed by the Baldwin County Commission as a natural area available to the public for hiking, plant and wildlife observation, environmental education, and scientific research.

This land is being managed to encourage native plant communities that provide habitat for wildlife. Management practices included prescribed fire, forest management, and control of invasive exotic plants. Maintained trails throughout the park provide the public access for outdoor enjoyment.

- **Open to the Public (daylight hours only)**
- **No Hunting**
- **No Vehicular Access Beyond the Parking Area**
- **Parking in Designated Areas Only**
- **Do Not Block Gates**

For additional information, call: (251) _____

Emergencies, call: (251) _____

Sign just inside the CR 1 entrance gate, on right side of road:

Parking Area 0.2 Mile Ahead

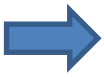
Sign at first trail intersection:

Parking Area

West Trail – 1.2 miles (to end and back)

Sign at Parking Area/Trailhead:

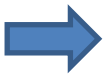
Big Loop Trail– 1.7 miles



Small Loop Trail – 0.6 mile

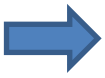
Do Not Block Gates

Sign at northernmost point of Big Loop Trail:



Big Loop Trail

Sign where Small Loop Trail intersects Big Loop Trail:



Small Loop Trail

Big Loop Trail

Sign at Parking Area:

INVASIVE EXOTIC PLANTS

Introduction of exotic species can disrupt intricate balances and relationships evolved over thousands of years among native plants and their communities. Oftentimes, the result is a loss of biological diversity within both the plant and animal communities.

Some generalized characteristics of invasive exotic plants:

- Habitat generalists
- High seed production & dispersal rates
- Ability to reproduce vegetatively (without seeds)
- Short generation time
- A long life span

Some of the Invasive Exotic Plants Being Controlled Here:

Chinese Tallow Tree / Popcorn Tree (*Triadica sebifera*)
Chinese Privet (*Ligustrum sinense*)
Cogongrass (*Imperata cylindrica*)
Vasey Grass (*Paspalum urvillei*)
Torpedo Grass (*Panicum repens*)
Alligator-Weed (*Alternanthera philoxeroides*)
Japanese Climbing Fern (*Lygodium japonicum*)
Japanese Honeysuckle (*Lonicera japonica*)

Somewhere Along the Main Road North of the Parking Lot:

The Role of Fire in the Meadows

The wet pine flatwoods / pine savannah plant community that dominates the Meadows is a biologically diverse natural ecosystem. It is not only fire-tolerant, but absolutely fire-dependent for its continued existence. Without frequent natural or prescribed fire, this ecosystem cannot persist. The wildflowers, grasses, and sedges are soon crowded out by hardwood trees and shrubs, and a nearly impenetrable understory develops. In this ecosystem, plant diversity is not in the tree canopy, which is composed primarily of slash and longleaf pine, but in the herbaceous groundcover. In a healthy, fire-maintained pine savannah, it is not uncommon to find 30-50 herbaceous plant species, sometimes more, within a square meter-sized area.

<u>Sign next to the beaver-impounded ditch east of the main road, near south end of the property:</u>

WHAT BEAVERS DO
FOR OUR WATERWAYS

Conserve Water and Prevent Droughts.

Help Prevent Flooding by holding water back during heavy rains.

Control Soil Erosion and Filter Out Sediment by slowing water flow and allowing sediment to settle out.

Keep Waterways Open by constantly deepening underwater channels and preventing sediment buildup.

Create and Enhance Wildlife Habitat for many species, including wood ducks, wading birds, cavity-nesting species that utilize trees killed by beavers, frogs, fish, and many others.

Sign Along Trail Near a Standing Dead Tree:

SNAGS

Standing dead trees are called *snags*. About 85 species of North American birds excavate nesting holes, use cavities resulting from decay, or use holes created by other species in dead or deteriorating trees.

Snags are also important to numerous species of mammals, reptiles, amphibians, and invertebrates.

Snags that occur in the Meadows are left standing to provide important nesting, roosting, and foraging habitat for birds and other wildlife.

Plant Identification Signs – to be placed where appropriate.

Proposed Signage
Bay Front Tract

<u>Sign to be placed at drive near CR 1:</u>

This park is owned and managed by the Baldwin County Commission as a natural area available to the public for plant and wildlife observation, environmental education, and scientific research.

- **Open to the Public (daylight hours only)**
- **No Hunting**
- **No Vehicular Access Beyond the Parking Area**
- **Parking in Designated Areas Only**

For additional information, call: (251) _____

Emergencies, call: (251) _____

Sign at end of driveway into the property:

Living Shorelines

Bulkheads are the most often-used means of stabilizing eroding shorelines along Alabama's coastal waterways. Negative effects of bulkheads include:

- Restricted water access for people and animals
- Erosion of adjacent shorelines
- Conversion of shoreline habitats to deepwater habitat

What is a *Living Shoreline*? NOAA defines it as "*a shoreline management practice that provides erosion control benefits; protects, restores, or enhances natural shoreline habitat; and maintains coastal processes through strategic placement of plants, stone, sand fill, and other structural organic materials.*"

The shoreline in the park is being stabilized utilizing Living Shoreline techniques.

Sign at edge of the driveway, overlooking the tidal marsh:

Tidal Marsh

This tidal marsh performs many valuable functions, including:

- Absorbs wave energy
- Slows shoreline erosion
- Absorbs excess nutrients before they reach the bay
- Provides food and shelter for crabs, juvenile fish, and other aquatic life
- Provides food, shelter and nesting sites for birds and other wildlife

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Appendix A

Plant Inventory

Inventory of the Vascular Flora
The Meadows Tract
Baldwin County, Alabama

The Meadows (Species in **Bold** are Invasive Exotics)		
Along Main Access Road		
Scientific Name	**Common Name**	**Family**
Acer rubrum	Red Maple	Aceraceae
Agalinus sp.	False Foxglove	Schrophulariaceae
Ambrosia artemisiifolia	Annual Ragweed	Asteraceae
Ampelopsis arborea	Peppervine	Vitaceae
Andropogon glomeratus	Bushy Bluestem	Poaceae
Andropogon virginicus	Broomsedge	Poaceae
Aristida beyrichiana	Beyrich Threeawn	Poaceae
Aronia arbutifolia	Red Chokeberry	Rosaceae
Asclepias lanceolata	Few-Flower Milkweed	Asclepiadaceae
Baccharis halimifolia	Groundseltree	Asteraceae
Campsis radicans	Trumpet Creeper	Bignoniaceae
Carex glaucescens	Southern Waxy Sedge	Cyperaceae
Cephalanthus occidentalis	Common Buttonbush	Rubiaceae
Chamaecrista fasciculata	Partridgepea	Fabaceae
Crotalaria lanceolata	Lanceleaf Rattlebox	Fabaceae
Cyperus sp.	Flat Sedge	Cyperaceae
Dichanthelium scoparium	Velvet Panicum	Poaceae
Diospyros virginiana	Common Persimmon	Ebenaceae
Elephantopus carolinianus	Carolina Elephantsfoot	Asteraceae
Eremochloa ophiuroides	**Centipede Grass**	Poaceae
Erigeron strigosus	Lesser Daisy Fleabane	Asteraceae
Eupatorium capillifolium	Dog-Fennel	Asteraceae
Eupatorium rotundifolium	Round-Leaf Thoroughwort	Asteraceae
Eupatorium sp.	Thoroughwort	Asteraceae
Euthamia caroliniana	Slender Goldentop	Asteraceae
Gelsemium sempervirens	Evening Trumpetflower; Carolina Jessamine	Loganiaceae
Hydrocotyle sp.	Pennywort	Apiaceae
Juncus dichotomus	Forked Rush	Juncaceae
Juncus effusus	Soft Rush	Juncaceae
Juniperus virginiana	Eastern Redcedar	Cupressaceae
Helianthus angustifolius	Swamp Sunflower	Asteraceae
Hibiscus aculeatus	Pineland Hibiscus; Comfortroot	Malvaceae
Hypericum crux-andreae	St. Peter's-Wort	Clusiaceae
Hypericum setosum	Hairy St. John's-Wort	Clusiaceae
Ilex glabra	Gallberry	Aquifoliaceae
Ilex vomitoria	Yaupon	Aquifoliaceae
Imperata cylindrica	**Cogongrass**	Poaceae
Lachnanthes caroliniana	Carolina Redroot	Haemodoraceae

Lespedeza cuneata	**Chinese Bush Clover**	Fabaceae
Ligustrum sinense	**Chinese Privet**	Oleaceae
Linum sp.	Flax	Linaceae
Lobelia puberula	Downy Lobelia	Campanulaceae
Lonicera japonica	**Japanese Honeysuckle**	Caprifoliaceae
Ludwigia sp.	Primrose-Willow	Onagraceae
Ludwigia sp.	Primrose-Willow	Onagraceae
Lygodium japonicum	**Japanese Climbing Fern**	Schizaeaceae
Magnolia virginiana	Sweetbay	Magnoliaceae
Mikania scandens	Climbing Hempvine	Asteraceae
Morella caroliniensis	Evergreen Bayberry	Myricaceae
Morella cerifera	Southern Bayberry; Wax Myrtle	Myricaceae
Nymphaea odorata	American White Waterlily	Nymphaeaceae
Nyssa biflora	Swamp Tupelo; Tupelo Gum	Cornaceae
Panicum anceps	Beaked Panicgrass	Poaceae
Panicum hemitomon	Maiden-Cane	Poaceae
Panicum repens	**Torpedo Grass**	Poaceae
Paspalum plicatum	Brown Seed Crowngrass	Poaceae
Paspalum notatum	**Bahia Grass**	Poaceae
Paspalum urvillei	**Vasey's Grass**	Poaceae
Persea palustris	Swamp Bay	Lauraceae
Pinus elliottii	Slash Pine	Pinaceae
Pteridium aquilinum	Bracken Fern	Dennstaedtiaceae
Ptilimnium capillaceum	Mock Bishopweed	Apiaceae
Polygala lutea	Orange Milkwort	Polygalaceae
Pyrrhopappus carolinianus	False dandelion	Asteraceae
Quercus nigra	Water Oak	Fagaceae
Quercus virginiana	Live Oak	Fagaceae
Rhus copallinum	Winged Sumac	Anacardiaceae
Rubus argutus	Sawtooth Blackberry	Rosaceae
Rubus trivialis	Southern Dewberry	Rosaceae
Rhynchospora chapmanii	Chapman's Beaksedge	Cyperaceae
Salix nigra	Black Willow	Salicaceae
Sambucus nigra	Elderberry	Adoxaceae
Scirpus cyperinus	Woolgrass	Cyperaceae
Sesbania sp.	Sesbania	Fabaceae
Smilax bonanox	Saw Greenbrier	Smilacaceae
Smilax glauca	Cat Greenbrier	Smilacaceae
Smilax laurifolia	Laurel-Leaf Greenbrier	Smilacaceae
Solidago altissima	Canada Goldenrod	Asteraceae
Solidago fistulosa	Pine Barren Goldenrod	Asteraceae
Solidago sempervirens	Seaside Goldenrod	Asteraceae
Solidago stricta	Goldenrod	Asteraceae
Symphyotrichum sp.	Aster	Asteraceae
Typha latifolia	Broad-Leaf Cat-Tail	Typhaceae
Toxicodendron radicans	Poison Ivy	Anacardiaceae
Tradescantia ohiensis	Ohio Spiderwort	Commelinaceae
Triadica sebifera	**Chinese Tallowtree**	Euphorbiaceae

Vaccinium arboreum	Tree Sparkleberry	Ericaceae
Verbena brasiliensis	**Brazilian Vervain**	Verbenaceae
Vigna luteola	Hairypod Cowpea	Fabaceae
Vitis rotundifolia	Muscadine	Vitaceae
Wetland Habitat, Including Ditches		
Acer rubrum	Red Maple	Aceraceae
Aletris lutea	Yellow Colicroot	Nartheciaceae
Andropogon sp.	Bluestem	Poaceae
Aronia arbutifolia	Red Chokeberry	Rosaceae
Arundinaria gigantea	Switchcane	Poaceae
Asclepias lanceolata	Fewflower Milkweed	Asclepiadaceae
Balduina uniflora	Honeycombhead	Asteraceae
Bidens mitis	Smallfruit Beggarticks	Fabaceae
Bigelowia nudata	Pineland Rayless Goldenrod	Asteraceae
Carex glaucescens	Southern Waxy Sedge	Cyperaceae
Centella erecta	Spadeleaf	Araliaceae
Cephalanthus occidentalis	Common Buttonbush	Rubiaceae
Chasmanthium laxum	Slender Woodoats	Poaceae
Cleistes bifaria	Small Spreading Pogonia	Orchidaceae
Clethra alnifolia	Sweet Pepperbush	Clethraceae
Cliftonia monophylla	Buckwheat Tree; Black Titi	Cyrillaceae
Coreopsis linifolia	Savannah Tickseed	Asteraceae
Cyperus compressus	Poorland Flatsedge	Cyperaceae
Cyperus filiculmis	Wiry Flatsedge	Cyperaceae
Cyrilla racemiflora	Titi	Cyrillaceae
Dichanthelium ensifolium	Cypress Witchgrass	Poaceae
Drosera capillaris	Pink Sundew	Droseraceae
Elephantopus elatus	Tall Elephansfoot	Asteraceae
Eriocaulon decangulare	Tenangle Pipewort	Eriocaulaceae
Eupatorium compositifolium	Yankeeweed	Asteraceae
Eupatorium serotinum	Lateflowering Thoroughwort	Asteraceae
Euthamia caroliniana	Slender Goldentop	Asteraceae
Fuirena breviseta	Saltmarsh Umbrella-sedge	Cyperaceae
Fuirena scirpoidea	Southern Umbrella-sedge	Cyperaceae
Gelsemium sempervirens	Evening Trumpetflower; Carolina Jessamine	Loganiaceae
Gaylussacia mosieri	Woolly Huckleberry	Ericaceae
Helianthus heterophyllus	Variableleaf Sunflower	Asteraceae
Hibiscus moscheutos	Crimsoneyed Rosemallow	Malvaceae
Hydrocotyle sp.	Marshpennywort	Araliaceae
Hypericum brachyphyllum	Coastal Plain St. John's-Wort	Clusiaceae
Hypericum cistifolium	Roundpod St. John's-Wort	Clusiaceae
Hypericum crux-andreae	St. Peter's-Wort	Clusiaceae
Hypericum gymnanthum	Claspingleaf St. Johnswort	Clusiaceae
Hyptis alata	Clustered Bushmint	Lamiaceae
Ilex cassine	Dahoon	Aquifoliaceae
Ilex coriacea	Large Gallberry	Aquifoliaceae
Ilex glabra	Gallberry	Aquifoliaceae

Ilex myrtifolia	Myrtle Dahoon	Aquifoliaceae
Ilex opaca	American Holly	Aquifoliaceae
Ilex vomitoria	Yaupon	Aquifoliaceae
Ipomoea sagittata	Saltmarsh Morning-Glory	Convolvulaceae
Juncus acuminatus	Tapertip Rush	Juncaceae
Juncus effusus	Soft Rush	Juncaceae
Juncus marginatus	Grassleaf Rush	Juncaceae
Juncus polycephalos	Manyhead Rush	Juncaceae
Juncus trigonocarpus	Red Pod Rush	Juncaceae
Juncus validus	Roundhead Rush	Juncaceae
Lachnanthes caroliniana	Carolina Redroot	Haemodoraceae
Lachnocaulon anceps	White Head Bogbutton	Eriocaulaceae
Liatris spicata	Blazing Star	Asteraceae
Linum sp.	Flax	Linaceae
Liquidambar styraciflua	Sweetgum	Hamamelidaceae
Lobelia brevifolia	Shortleaf Lobelia	Campanulaceae
Lophiola aurea	Goldencrest	Nartheciaceae
Ludwigia linearis	Narrowleaf Primrose-Willow	Onagraceae
Ludwigia maritima	Seaside Primrose-Willow	Onagraceae
Ludwigia pilosa	Hairy Primrose-Willow	Onagraceae
Ludwigia virgata	Savannah Primrose-Willow	Onagraceae
Lycopodiella alopecuroides	Foxtail Clubmoss	Lycopodiaceae
Lyonia lucida	Fetterbush	Ericaceae
Magnolia virginiana	Sweetbay	Magnoliaceae
Mikania scandens	Climbing Hempvine	Asteraceae
Morella caroliniensis	Evergreen Bayberry	Myricaceae
Morella cerifera	Southern Bayberry; Wax Myrtle	Myricaceae
Nymphaea odorata	American White Waterlily	Nymphaeaceae
Nyssa biflora	Swamp Tupelo	Cornaceae
Osmunda cinnamomea	Cinnamon Fern	Osmundaceae
Osmunda regalis	Royal Fern	Osmundaceae
Oxypolis filiformis	Water Cowbane	Apiaceae
Panicum hemitomon	Maiden-Cane	Poaceae
Panicum repens	Torpedo Grass	Poaceae
Panicum verrucosum	Warty Panicgrass	Poaceae
Paspalum laeve	Field Paspalum	Poaceae
Paspalum urvillei	**Vasey's Grass**	Poaceae
Persea palustris	Swamp Bay	Lauraceae
Phragmites australis	Common Reed	Poaceae
Pinus elliottii	Slash Pine	Pinaceae
Pinus taeda	Loblolly Pine	Pinaceae
Pluchea foetida	Stinking Camphorweed	Asteraceae
Polygala cruciata	Drumheads	Polygalaceae
Polygala lutea	Orange Milkwort	Polygalaceae
Pontederia cordata	Pickerelweed	Pontederiaceae
Proserpinaca pectinata	Comb-Leaf Mermaidweed	Haloragaceae
Pteridium aquilinum	Bracken Fern	Dennstaedtiaceae
Rhexia alifanus	Savannah Meadowbeauty	Melastomataceae

Rhexia lutea	Yellow Meadowbeauty	Melastomataceae
Rhexia mariana	Mariana Meadowbeauty	Melastomataceae
Rhexia virginica	Virginia Meadowbeauty	Melastomataceae
Rhus copallinum	Winged Sumac	Anacardiaceae
Rhynchospora cephalantha	Bunched Beaksedge	Cyperaceae
Rhynchospora elliottii	Elliott's Beaksedge	Cyperaceae
Rhynchospora glomerata	Clustered Beaksedge	Cyperaceae
Rhynchospora gracilenta	Slender Beaksedge	Cyperaceae
Rhynchospora inundata	Narrowfruit Horned Beaksedge	Cyperaceae
Rhynchospora microcephala	Small-Head Beaksedge	Cyperaceae
Rubus argutus	Sawtooth Blackberry	Rosaceae
Rubus trivialis	Southern Dewberry	Rosaceae
Sagittaria latifolia	Broadleaf Arrowhead; Duck Potato	Alismataceae
Sarracenia leucophylla	Whitetop Pitcherplant	Sarraceniaceae
Sarracenia psittacina	Parrot Pitcherplant	Sarraceniaceae
Scirpus cyperinus	Woolgrass	Cyperaceae
Sesbania punicea	**Rattlebox**	Fabaceae
Smilax glauca	Cat Greenbrier	Smilacaceae
Smilax laurifolia	Laurel Greenbrier	Smilacaceae
Smilax walteri	Coral Greenbrier	Smilacaceae
Solidago sempervirens	Seaside Goldenrod	Asteraceae
Sphagnum sp.	Sphagnum Moss	Sphagnaceae
Symphyotrichum dumosum	Rice Button Aster	Asteraceae
Taxodium ascendens	Pond Cypress	Cupressaceae
Toxicodendron vernix	Poison Sumac	Anacardiaceae
Toxicodendron radicans	Poison Ivy	Anacardiaceae
Triadica sebifera	**Chinese Tallowtree**	Euphorbiaceae
Utricularia purpurea	Eastern Purple Bladderwort	Lentibulariaceae
Utricularia radiata	Little Floating Bladderwort	Lentibulariaceae
Utricularia subulata	Zigzag Bladderwort	Lentibulariaceae
Vaccinium corymbosum	Highbush Blueberry	Ericaceae
Vaccinium elliottii	Mayberry; Elliott's Blueberry	Ericaceae
Viola primulifolia	Primroseleaf Violet	Violaceae
Viburnum nudum	Possumhaw	Adoxaceae
Vitis rotundifolia	Muscadine	Vitaceae
Woodwardia areolata	Netted Chainfern	Blechnaceae
Woodwardia virginica	Virginia Chainfern	Blechnaceae
Xyris baldwiniana	Baldwin's Yelloweyed Grass	Xyridaceae
Non-Wetland Habitats (Including Trails Adjacent to Ditches)		
Andropogon virginicus	Broomsedge	Poaceae
Andropogon sp.	Bluestem	Poaceae
Centrosema virginianum	Spurred Butterfly Pea	Fabaceae
Cinnamomum camphora	Camphortree	Lauraceae
Cleistes bifaria	Small Spreading Pogonia	Orchidaceae
Cyperus sp.	Flatsedge	Cyperaceae
Desmodium lineatum	Sand Ticktrefoil	Fabaceae

Dichanthelium sp.	Rosette Grass	Poaceae
Diospyros virginianus	Common Persimmon	Ebenaceae
Erigeron strigosus	Fleabane	Asteraceae
Eupatorium rotundifolium	Round-Leaf Thoroughwort	Asteraceae
Euthamia caroliniana	Slender Goldentop	Asteraceae
Gaylussacia mosieri	Woolly Huckleberry	Ericaceae
Gelsemium sempervirens	Evening Trumpetflower; Yellow Jesssamine	Loganiaceae
Helianthus angustifolius	Swamp Sunflower	Asteraceae
Hibiscus aculeatus	Comfortroot	Malvaceae
Hypericum sp.	St. Johnswort	Clusiaceae
Ilex coriacea	Large Gallberry	Aquifoliaceae
Ilex glabra	Gallberry	Aquifoliaceae
Ilex vomitoria	Yaupon	Aquifoliaceae
Imperata cylindrica	**Cogongrass**	Poaceae
Liquidambar styraciflua	Sweetgum	Hamamelidaceae
Ludwigia sp.	Primrose-willow	Onagraceae
Magnolia grandiflora	Southern Magnolia	Magnoliaceae
Magnolia virginiana	Sweetbay	Magnoliaceae
Nyssa sylvatica	Blackgum	Cornaceae
Parthenocissus quinquefolia	Virginia Creeper	Vitaceae
Persea palustris	Swamp Bay	Lauraceae
Pinus elliottii	Slash Pine	Pinaceae
Pinus palustris	Longleaf Pine	Pinaceae
Polygala cruciata	Drumheads	Polygalaceae
Polypremum procumbens	Rustweed	Tetrachondraceae
Pteridium aquilinum	Bracken Fern	Dennstaedtiaceae
Quercus nigra	Water Oak	Fagaceae
Quercus hemisphaerica	Darlington Oak	Fagaceae
Quercus stellata	Post Oak	Fagaceae
Quercus virginiana	Live Oak	Fagaceae
Rhexia alifanus	Savannah Meadowbeauty	Melastomataceae
Rhus copallinum	Winged Sumac	Anacardiaceae
Rhynchospora inundata	Narrowfruit Horned Beaksedge	Cyperaceae
Rubus argutus	Sawtooth Blackberry	Rosaceae
Smilax auriculata	Earleaf Greenbrier	Smilacaceae
Smilax bona-nox	Saw Greenbrier	Smilacaceae
Smilax glauca	Cat Greenbrier	Smilacaceae
Styrax americanus	American Snowbell	Styracaceae
Toxicodendron radicans	Poison Ivy	Anacardiaceae
Triadica sebifera	**Chinese Tallowtree**	Euphorbiaceae
Vaccinium arboreum	Tree Sparkleberry	Ericaceae
Vaccinium elliottii	Mayberry; Elliott's Blueberry	Ericaceae
Viola primulifolia	Primroseleaf Violet	Violaceae
Vitis rotundifolia	Muscadine	Vitaceae
Bay Front Land		
Alternanthera philoxeroides	**Alligator-Weed**	Amaranthaceae
Ambrosia artemisiifolia	Annual Ragweed	Asteraceae

Ampelopsis arborea	Peppervine	Vitaceae
Andropogon virginicus	Broomsedge	Poaceae
Baccharis halimifolia	Groundseltree	Asteraceae
Bacopa sp.	Waterhyssop	Schrophulariaceae
Bignonia capreolata	Crossvine	Bignoniaceae
Brunnichia ovata	American Buckwheatvine	Polygonaceae
Campsis radicans	Trumpet Creeper	Bignoniaceae
Chamaecrista fasciculata	Partridge Pea	Fabaceae
Chamaesyce hyssopifolia	Hyssopleaf Sandmat	Euphorbiaceae
Cenchrus spinifex	Coastal Sandbur	Poaceae
Cladium mariscus	Jamaica Swamp Sawgrass	Cyperaceae
Conoclinium coelestinum	Blue Mistflower	Asteraceae
Conyza canadensis	Canadian Horseweed	Asteraceae
Crotalaria lanceolata	**Lanceleaf Rattlebox**	Fabaceae
Cynodon dactylon	**Bermudagrass**	Poaceae
Cyperus sp.	Flat Sedge	Cyperaceae
Diodia teres	Poorjoe	Rubiaceae
Distichlis spicata	Coastal Salt Grass	Poaceae
Eupatorium capillifolium	Dogfennel	Asteraceae
Eupatorium mohrii	Mohr's Thoroughwort	Asteraceae
Hibiscus moscheutos	Crimsoneyed Rosemallow	Malvaceae
Euthamia caroliniana	Slender Goldentop	Asteraceae
Hydrocotyle bonariensis	Largeleaf Marshpennywort	Araliaceae
Ilex vomitoria	Yaupon	Aquifoliaceae
Imperata cylindrica	**Cogongrass**	Poaceae
Ipomoea sagittata	Saltmarsh Morning-Glory	Convolvulaceae
Iva frutescens	Bigleaf Sumpweed	Asteraceae
Juncus roemerianus	Black Needle Rush	Juncaceae
Lonicera japonica	**Japanese Honeysuckle**	Caprifoliaceae
Mikania scandens	Climbing Hempvine	Asteraceae
Morella cerifera	Southern Bayberry; Wax Myrtle	Myricaceae
Nyssa biflora	Swamp Tupelo	Cornaceae
Oenothera humifusa	Seabeach Evening Primrose	Onagraceae
Panicum repens	**Torpedo Grass**	Poaceae
Panicum rigidulum	Redtop Panicgrass	Poaceae
Paronychia erecta	Squareflower	Caryophyllaceae
Paspalum notatum	**Bahia Grass**	Poaceae
Paspalum urvillei	**Vasey's Grass**	Poaceae
Phragmites australis	Common Reed	Poaceae
Pinus elliottii	Slash Pine	Pinaceae
Ptilimnium capillaceum	Mock Bishopsweed	Apiaceae
Rubus trivialis	Southern Dewberry	Rosaceae
Rumex verticillatus	Swamp Dock	Polygonaceae
Sagittaria graminea	Grassy Arrowhead	Alismataceae
Sagittaria lancifolia	Bull-Tongue Arrowhead	Alismataceae
Sesbania punicea	**Rattlebox**	Fabaceae
Sesbania vesicaria	Bagpod	Fabaceae
Schoenoplectus robustus	Saltmarsh Bulrush	Cyperaceae

Sida rhombifolia	Cuban Jute	Malvaceae
Smilax bonanox	Saw Greenbrier	Smilacaceae
Solidago sempervirens	Seaside Goldenrod	Asteraceae
Spartina patens	Saltmeadow Cordgrass	Poaceae
Stenotaphrum secundatum	St. Augustine Grass	Poaceae
Toxicodendron radicans	Poison Ivy	Anacariaceae
Triadica sebifera	**Chinese Tallowtree**	Euphorbiaceae
Typha latifolia	Broadleaf Cat-Tail	Typhaceae
Vigna luteola	Hairypod Cowpea	Fabaceae
Vitis rotundifolia	Muscadine	Vitaceae
Vitex rotundifolia	**Beach Vitex (removed)**	Lamiaceae
Wisteria frutescens	American Wisteria	Fabaceae

Appendix B

Soils Report


Soil Map—Baldwin County, Alabama
87° 52' 59" W
87° 50' 38" W
30° 24' 10" N
30° 22' 51" N
415200
415600
416000
416400
416800
417200
417600
418000
418400
418800
3363700
3363300
3362900
3362500
3362100
3361700
3361300
EuC
Ly
GvA
OrA
OrB
EuB
LaB
Sa
Wm
PmB
RaA
County Road 1
Bay Haven Dr
Beckwith Ln
Td
W
Co
Map Scale: 1:17,300 if printed on A landscape (11" x 8.5") sheet.
N
Meters
0 250 500 1000 1500
Feet
0 500 1000 2000 3000
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84
USDA
Natural Resources
Conservation Service
Web Soil Survey
National Cooperative Soil Survey
11/8/2013
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MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Baldwin County, Alabama
Survey Area Data: Version 3, Jul 18, 2006

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 25, 2010—Feb 6, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Baldwin County, Alabama (AL003)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Co	Coastal beaches	2.0	0.2%
EuB	Eustis loamy fine sand, 0 to 5 percent slopes	16.3	1.5%
EuC	Eustis loamy fine sand, 5 to 8 percent slopes	0.7	0.1%
GvA	Greenville loam, 0 to 2 percent slopes	3.3	0.3%
LaB	Lakeland loamy fine sand, 0 to 5 percent slopes	19.2	1.8%
Lv	Local alluvial land	0.6	0.1%
OrA	Orangeburg fine sandy loam, 0 to 2 percent slopes	5.0	0.5%
OrB	Orangeburg fine sandy loam, 2 to 5 percent slopes	22.6	2.1%
PmB	Plummer loamy sand, 0 to 5 percent slopes	516.5	48.5%
RaA	Rains fine sandy loam, 0 to 2 percent slopes	229.3	21.5%
Sa	Sandy alluvial land	2.5	0.2%
Td	Tidal marsh	53.2	5.0%
W	Water	33.9	3.2%
Wm	Wet loamy alluvial land	159.0	14.9%
Totals for Area of Interest		1,064.2	100.0%

Appendix C

Schedule of Plan Implementation

Schedule of Plan Implementation

The schedule will be developed in coordination with the Baldwin County Commission and will depend on availability of funds and other factors.