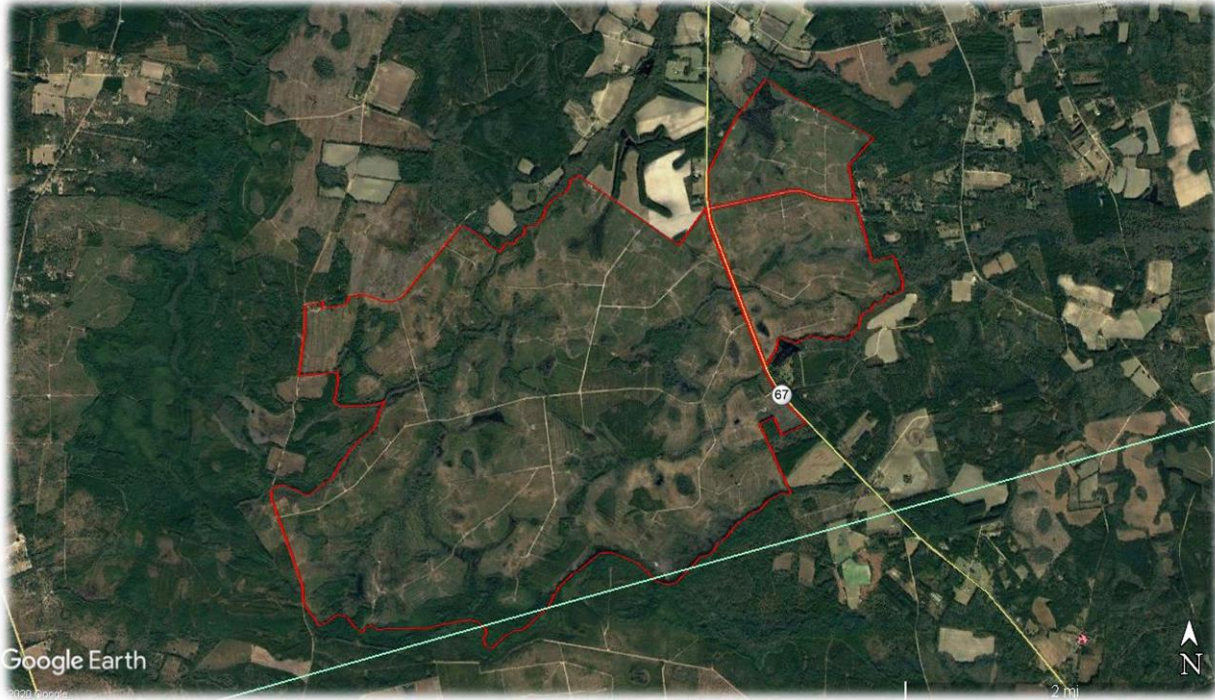




THE TRUST FOR  
TOMORROW

WORKING FOR A SUSTAINABLE FUTURE



# GLOVER WRE

## Wetlands Restoration Plan of Operations (WRPO)

**BULLOCH COUNTY, GEORGIA**

**Easement Type:** Perpetual

**Address:** 50 Old Donaldson School Rd., Pembroke, GA 31321

**Site Entrance:** 32.19609°, -81.68348°

4494.5 acres

**Prepared by:** The Trust for Tomorrow

**Date:** July 23, 2020

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Additional supporting documentation located in the WRP case file includes: Legal Easement Boundary Survey, Warranty Easement Deed, Environmental Evaluations, National Policy Guidance, and Photos.

## 1. INTRODUCTION

This Wetland Reserve Plan of Operations (WRPO) will outline the goals and objectives for the restoration of Glover WRE, an Agricultural Conservation Easement Program – Wetland Reserve Easement (ACEP-WRE) enrolled easement, which is to restore, protect, enhance, maintain and manage hydrology, native vegetation, natural topography, and other landscape features of eligible enrolled land. The Natural Resources Conservation Service (NRCS) will work with the landowner, the US Fish and Wildlife Service, and other conservation partners to ensure cost-effective restoration and the maximization of wildlife benefits and wetland functions and values that will result from the restoration. The wetland, upland, and other habitat components of the ACEP-WRE easement will be restored to the maximum extent practicable as identified in this plan.

The Glover WRE is located primarily in Bulloch County, Georgia, and surrounds Luke Swamp which drains into Black Creek, a tributary of the Ogeechee River. A small part of the property is in northern Bryan County. The WRE also falls adjacent to the Canoochee Sandhills WMA, which was recently opened to the public in 2020 and contains 6,324 acres of protected land in Bulloch and Bryan counties. Due to past land clearing activities, this region has lost large areas of forested wetlands, causing declines in wildlife habitat, water quality, and ground water recharge. The easement area once contained a large continuous bottomland forest along Luke Swamp, as well as Longleaf pine stands on hills and flats. The goal of this WRPO is to restore depressional forested wetlands and Longleaf pine stands to increase the quantity and quality of native plant and animal species that depend on these habitat types, as well as to improve migratory bird habitat. These goals will be achieved through the following conservation practices: installation of low-water stream crossings, planting of bottomland hardwoods and cypress, implementation of prescribed burning, planting of Longleaf and Slash pine, and restoration of natural landscape features and macro/micro topography to emulate a more natural hydrologic regime and habitat community.

## 2. BASELINE RESOURCE INVENTORY

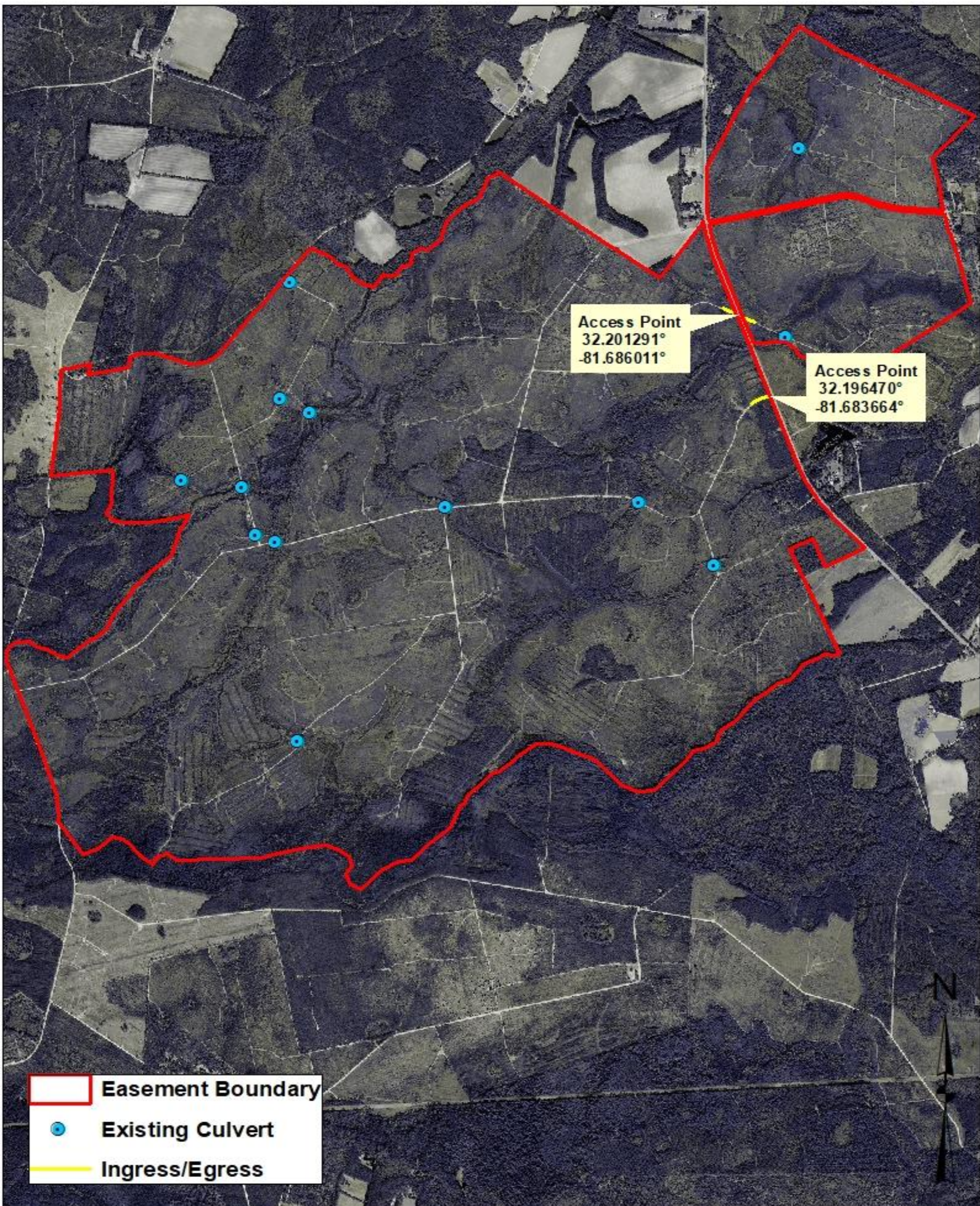
### 2.1 Easement Boundary, Access, and Infrastructure

Map 2.1 below provides location of the project access roads, the easement boundary, and known infrastructure. The Glover WRE contains 4494.5 acres and can be accessed from GA Highway 67, northwest of Pembroke, GA. Site investigations found 13 culverts restricting hydrology that need to be removed or replaced (resized.) All access roads are maintained as needed and are in good working order.

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Map 2.1 Glover WRE Easement Boundary, Access and Infrastructure





## 2.2 Natural Resources Inventory

The following table (Table 1) and map (Map 2.2) provide an inventory of existing habitat types and landscape features on the easement. Restoration efforts will focus on restoring and enhancing depressional wetlands, including Cypress ponds, Bottomland Hardwood forest and Longleaf and Slash pine stands.

**Table 1. Glover WRE Existing Habitat Types**

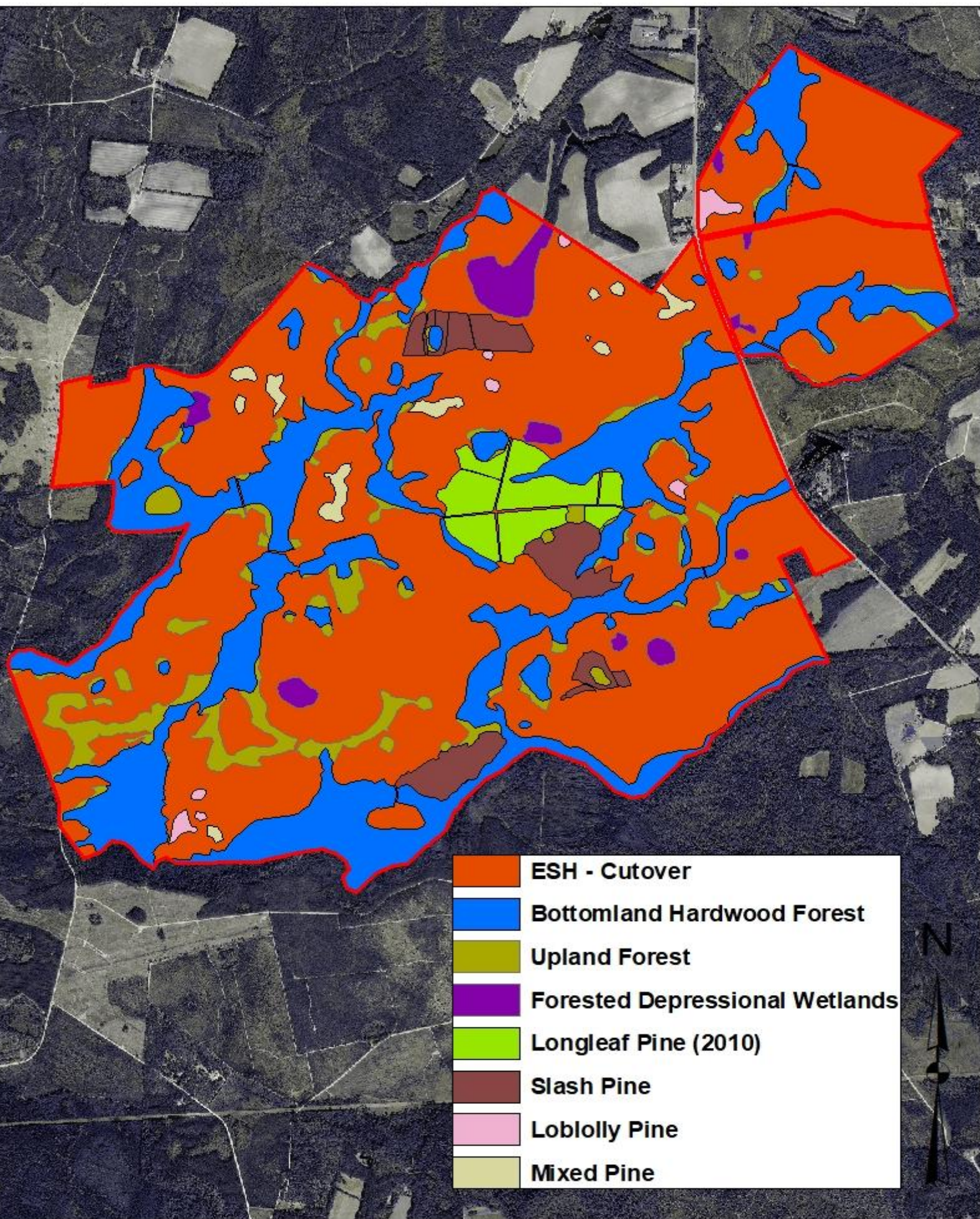
Habitat Type	Total Acres
Bottomland Hardwood Forest	1019.7
Forested Depressional Wetlands	81.9
Upland Forest	240.9
Early Successional Habitat (ESH) – Cutover	2831.8
Longleaf Pine (2010*)	128.4
Loblolly Pine	22.3
Slash Pine	130.9
Mixed Pine	38.6
<b>TOTAL</b>	<b>4494.5</b>

\* denotes approximate year planted

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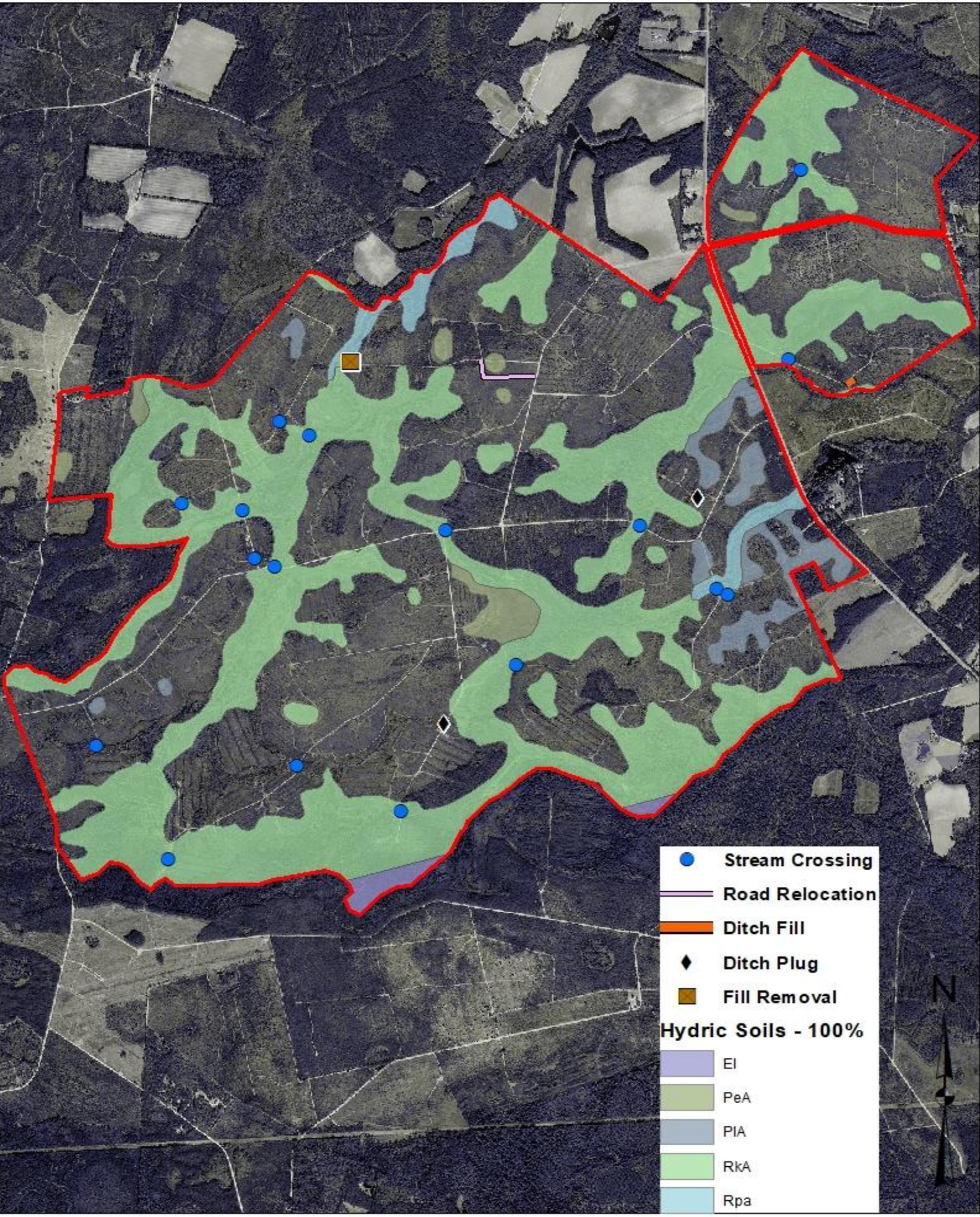
Map 2.2 Glover WRE Natural Resources Inventory





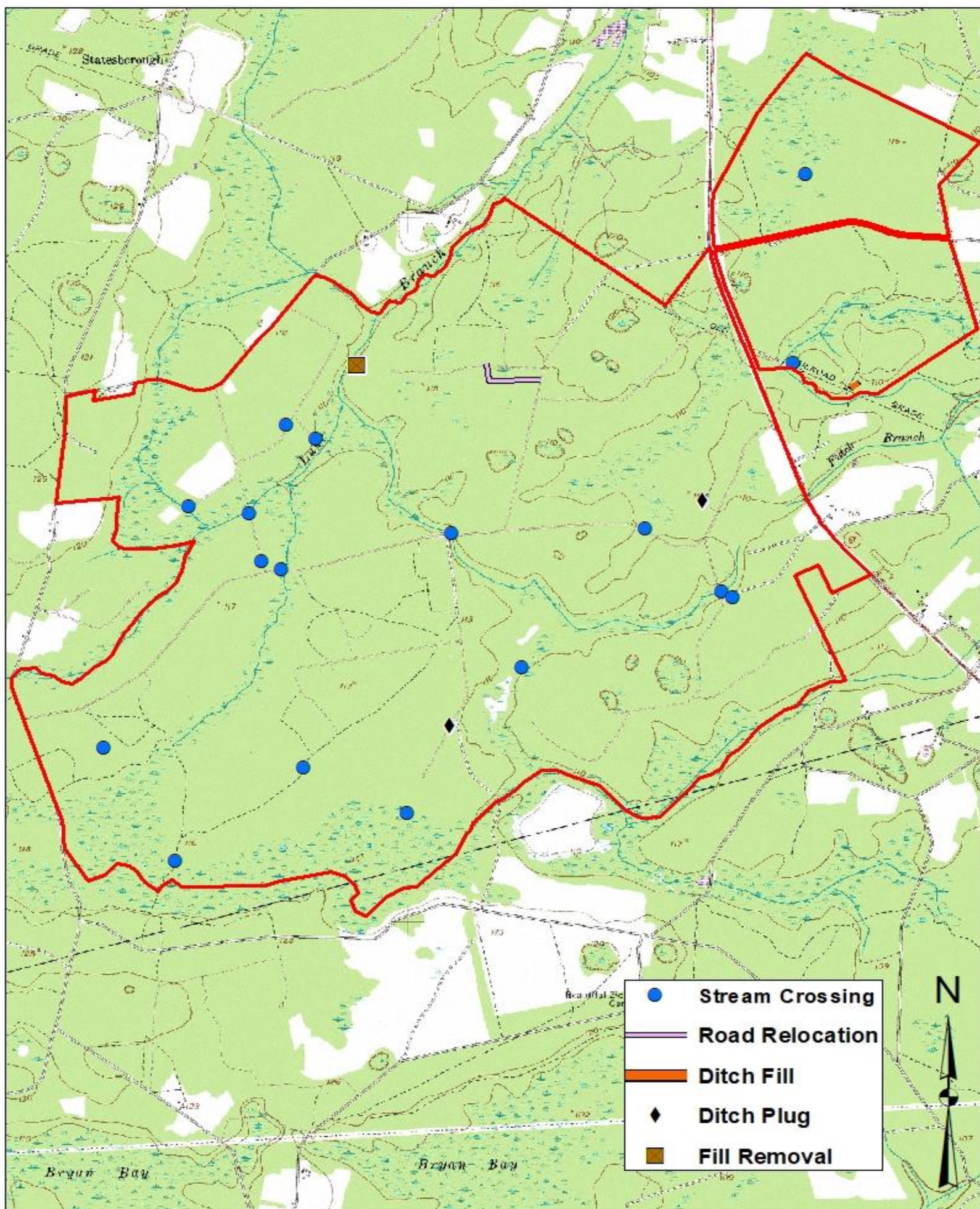
2.3 Glover WRE Hydric Soils Map with Conservation Practices

In addition to the soils map below, a detailed report is provided in the Appendix.





## 2.4 Glover WRE USGS Map with Conservation Practices





## **2.5 Planned Conservation Practices**

The following tables and maps provide a list of proposed Conservation Practices along with locations and schedules to assist with required habitat and hydrologic restoration and long-term management of the easement. Individual practices will be discussed in greater detail in *Section 3. Restoration Plan* and the attached Engineering Plans (Attachment 1). Long-term management practices will be discussed in greater detail in *Section 4. Management Plan*.

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Map 2.5 Glover WRE Planned Conservation Practice Map

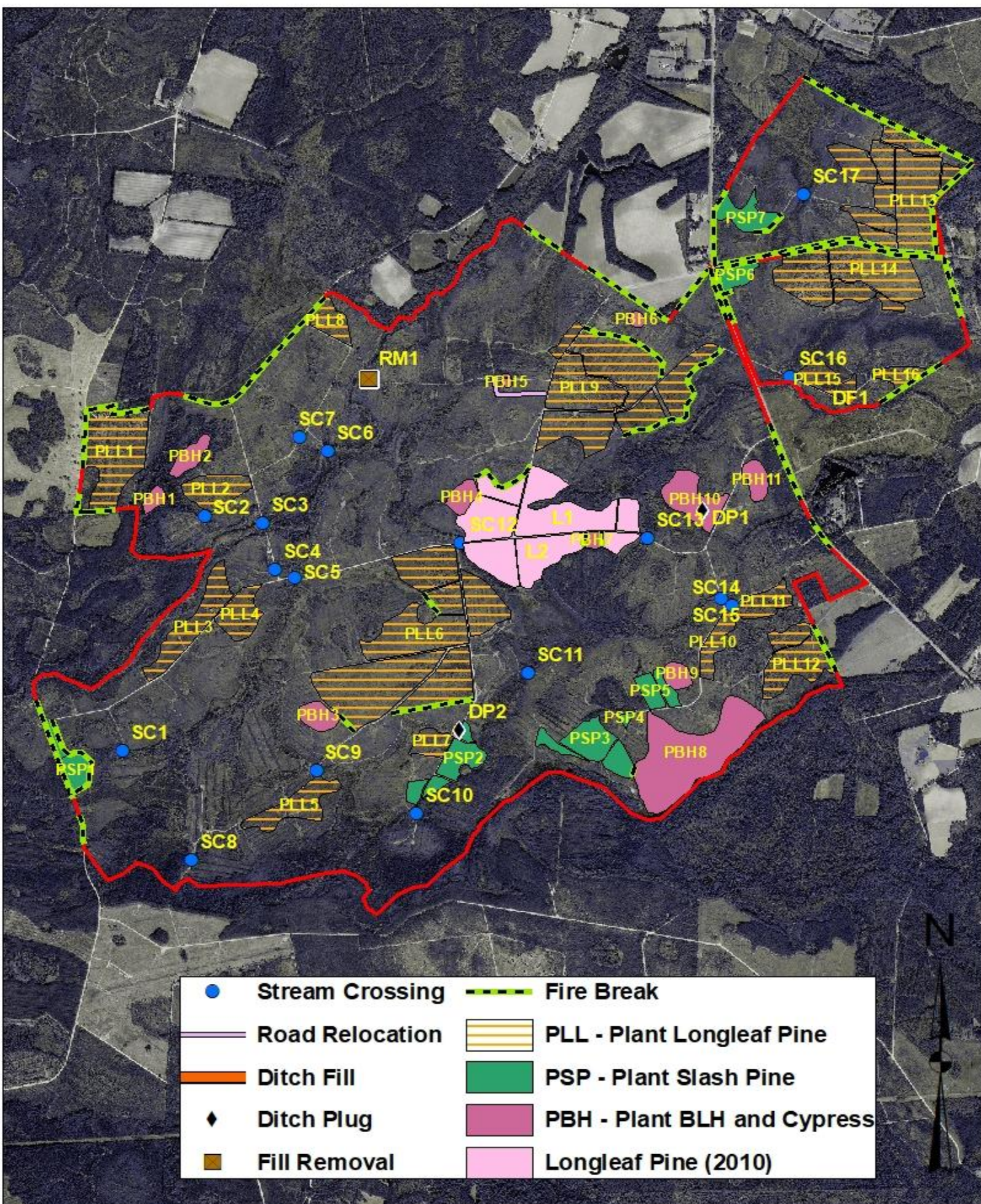




Table 2. Glover WRE Planned Conservation Practices and Implementation Schedule							
Map ID	Conservation Practice Name	Amount #	Amount	Activity	2021 Time of Year	2022 Time of Year	2023 Time of Year
STREAM COMPONENTS							
SC1-SC17	Stream Crossing	578	17	Install Low Water Rock Crossings		Summer-Fall	
SC1-SC17	Critical Area Planting	342	4.0ac	Seed Disturbed Areas		Summer-Fall	
ACCESS ROAD COMPONENTS							
RL1	Access Road	560	1500 ft	Relocate Access Road		Summer-Fall	
RL1	Critical Area Planting	342	1.0ac	Seed Disturbed Areas		Summer-Fall	
DEGRADED FORESTED WETLAND ENHANCEMENT COMPONENTS							
PBH1-PBH2, PBH4-PBH8, PBH10-PBH11	Light Site Prep	490	135ac	Herbicide Spraying	Summer		
PBH1-PBH11	Tree Planting	612	151ac	Plant Bareroot Cypress and BLH	Winter		
PBH1-PBH2, PBH4-PBH8, PBH10-PBH11	Herbaceous Weed Control	315	135ac	Release Spray		Spring/Summer	
DF1	Macro/Micro Topography	657	115 ft	Ditch Fill		Summer-Fall	
RM1	Macro/Micro Topography	657	10 CY	Fill Removal		Summer-Fall	
DP1-DP2	Ditch Plug	657	2	Ditch Plug		Summer-Fall	
DF1, DP1-DP2, RM1	Critical Area Planting	342	1.0ac	Seed Disturbed Areas		Summer-Fall	
LONGLEAF PINE SAVANNAH RESTORATION							
PLL1-PLL16	Heavy Site Prep	490	734.7ac	Roller Chopper	Spring-Summer		
PLL1-PLL16	Light Site Prep	490	734.7ac	Herbicide Spraying	Summer		
PLL1-PLL16	Fire Breaks	394	16,000 ft	Install Firebreaks	Summer		
PLL1-PLL16	Prescribed Burning	338	734.7ac	Burning as part of site prep	Winter		
PLL1-PLL16	Tree Planting	612	734.7ac	Plant Containerized Longleaf	Winter		
PLL1-PLL16	Herbaceous Weed Control	315	734.7ac	Release Spray		Spring/Summer	
SLASH PINE FLATWOODS RESTORATION							
PSP1-PSP7	Heavy Site Prep	490	100.4ac	Roller Chopper	Spring-Summer		
PSP1-PSP7	Light Site Prep	490	100.4ac	Herbicide Spraying	Summer		
PSP1-PSP7	Fire Breaks	394	3650 ft	Install Firebreaks	Summer		
PSP1-PSP7	Prescribed Burning	338	100.4ac	Burning as part of site prep	Winter		
PSP1-PSP7	Tree Planting	612	100.4ac	Plant Bareroot Slash Pine	Winter		
PSP1-PSP7	Herbaceous Weed Control	315	100.4ac	Release Spray		Spring/Summer	
PRESCRIBED BURNING COMPONENTS - EARLY SUCCESSIONAL HABITAT							
ESH Burn Units 1-3	Fire Breaks	394	34,500 ft	Install Firebreaks	Summer	Summer	Summer
ESH Burn Units 1-3	Prescribed Burning	338	1274ac	Prescribed Burning	September 1 - March 31 (Unit 1)	September 1 - March 31 (Unit 2)	September 1 - March 31 (Unit 3)
PRESCRIBED BURNING COMPONENTS - 2010 LONGLEAF PINE							
L1-L2	Fire Breaks	394	2350 ft	Install Firebreaks	Summer		
L1-L2	Prescribed Burning	338	128.4ac	Prescribed Burning	Winter		

## 2.6 Fish and Wildlife

The Glover WRE is located in the Ogeechee River basin, a major tributary of Georgia's Coastal Marsh and Island Ecosystem. This area supports some of the richest and diverse flora and fauna in Georgia and the southeastern United States. These estuarine systems are protected by an upstream network of rivers and swamps that are located entirely in the State of Georgia and drains approximately 5,540 square miles. The river's drainage to the coast plays a significant role in forming Wassaw, Ossabaw, St. Catherines, Blackbeard, and Sapelo islands. With intimate swamps and bottomland hardwoods adjoining the river, the Ogeechee River Basin retains a pristine quality and provides food, water, and shelter for large numbers of animal species. The fish fauna of the Ogeechee River Basin includes American shad, redbreast, crappie, striped bass, shellcracker, and catfish. The endangered shortnose sturgeon (*Acipenser brevirostrum*) breeds in the basin. The Georgia State Wildlife Action Plan (GA SWAP) identifies this section of the Ogeechee River basin as a high priority site with global significance within the Ecoregion because it supports several high priority natural communities including Bottomland Hardwood Forest, Forested Depressional Wetlands, Longleaf Pine Savannah, and Pine Flatwoods. Additionally, it provides habitat for rare species including the Gopher Tortoise, Eastern Indigo Snake, Swallow-Tailed Kite, Frosted Flatwoods Salamander, Gopher Frog, Tiger Salamander, Southern Dusky Salamander, Dwarf Waterdog, Southeastern Myotis, Prothonotary Warbler, Rusty Blackbird, American Kestrel, and Purple Honeycomb head. The river also has a namesake tree, the Ogeechee Lime (*Nyssa ogeche*), whose bright red fruits are found floating in quiet eddies of the river during the fall.

The Glover WRE is also located within the Ogeechee River Focus Area of the Atlantic Coast Joint Venture (ACJV). This focus area is comprised of forests, agricultural lands, and wetlands. Much of the forested areas are bottomland hardwood forests and pine or mixed pine-hardwood forests, with the wetlands primarily in the bottomland hardwood forest types. Forestry and agriculture are a major part of the economy in this focus area. A variety of habitats throughout this focus area supports a high diversity of animals, including endangered and threatened species, waterfowl, and neotropical migratory birds. The wetlands of this region support an abundant breeding population of Wood Duck. This area also supports wintering populations of both diving and dabbling ducks, including the American Black Duck, Mallard, American Wigeon, Ring-neck Duck, Hooded Merganser. The Ogeechee River is important to many other migratory birds, primarily waterbirds and landbirds. Important species here are Wood Stork, Swallow-tailed Kite, Swainson's Warbler, Painted Bunting, Rusty Blackbird, Prairie Warbler, and Prothonotary Warbler. Other high priority species associated with the pine grassland savannas in this focus area are Red-cockaded Woodpecker, Northern Bobwhite quail, Bachman's Sparrow, and American Kestrel.

This area also supports habitat for three federally threatened and endangered species, the Wood stork, Red-cockaded Woodpecker and Eastern Indigo Snake, and one species of management concern, the Gopher Tortoise. The Glover WRE is located within a Priority County, a high ranking under NRCS Working Lands for Wildlife "Gopher Tortoise Conservation Initiative", a program which works with private landowners to restore the Gopher Tortoise's primary habitat- the Longleaf pine forest. Biologists were able to identify a single Gopher Tortoise burrow in the central Longleaf pine stand back in 2016. The Gopher Tortoise is considered a keystone species, or indicator of health, of the Longleaf pine ecosystem. Many species of concern are supported by the activities of Gopher tortoise, including the Eastern Indigo snake, Florida gopher frog and Striped newt.

## 2.7 Threatened, Endangered and At-Risk Species

To comply with the Endangered Species Act (ESA), NRCS considers the effects of any proposed action on federally listed Threatened, Endangered or Candidate species (plant or animal). Federally listed species are administered by the U. S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS). NRCS must make an initial effects determination for any endangered or threatened species, designated critical habitats, proposed species or habitats, candidate species, or State or Tribal species of concern protected by State or Tribal law or regulation present, or potentially present, within the project area. Once the effects determination has been completed, there may be a need to initiate consultation with the USFWS or NMFS that would result in the development of negotiated "reasonable and prudent measures" (RPMs) to mitigate potential negative impacts. Under Georgia State law, the Georgia Department of Natural Resources, Wildlife Resources Division (DNR-WRD) maintains a state list of Threatened, Endangered or Sensitive wildlife and plant species. Collectively, these federal



and state listed species will be referred to in the WRPO as “T&E Species”. All T&E Species reviews will be submitted to the NRCS State Biologist unless otherwise indicated.

**During the ranking process, the Glover easement received a high score for the presence of Gopher Tortoise. A Gopher Tortoise burrow was identified in the central Longleaf Pine stand in 2016. Therefore, this WRPO has proposed various conservation practices to enhance Gopher Tortoise habitat through its restoration and management plan.**

#### **USFWS IPaC Information:**

<b>Common Name</b>	<b>Scientific Name</b>	<b>USFWS Status</b>	<b>Species Type</b>
Eastern Indigo Snake	<i>Drymarchon corais couperi</i>	Threatened	Reptile
Gopher Tortoise	<i>Gopherus polyphemus</i>	Candidate	Reptile
Frosted Flatwoods Salamander	<i>Ambystoma cingulatum</i>	Threatened	Amphibian
Canby's Dropwort	<i>Oxypolis canbyi</i>	Endangered	Flowering Plant
Pondberry	<i>Lindera melissifolia</i>	Endangered	Flowering Plant
American Kestrel	<i>Falco sparverius paulus</i>	Bird of Conservation Concern	Migratory Bird
Prothonotary Warbler	<i>Protonotaria citrea</i>	Bird of Conservation Concern	Migratory Bird
Swallow-tailed Kite	<i>Elanoides forficatus</i>	Bird of Conservation Concern	Migratory Bird

## **2.8 Cultural Resources**

The NRCS has responsibilities to historic and cultural properties under the National Historic Preservation Act of 1966 (NHPA). NRCS takes into account the effects of its actions, or the voluntary actions of participants, on any cultural resource. A Cultural Resource Specialist (CRS) determines the need for a field survey based upon a Cultural Resource Review. Please refer to the permanent easement folder for official NRCS cultural review form.

## **2.9 Watershed Concerns and Conservation**

The primary threats to fish and wildlife populations in this region is related to municipal, industrial, and agricultural source and non-point source pollution and discharge into the Ogeechee River Basin. Key environmental stressors are high levels of fecal coliform bacteria, concentration of heavy metals, nutrient loading, fish tissue contamination, stream flow and temperature modification, and sediment loading and habitat degradation. The Floridan Aquifer underlies much of this focus area, and there are heavy demands upon the water resources of the basin for agriculture, industry, municipal use. Wetlands in this area are critical to maintaining and enhancing regional water quality through their ability to remove pollutants from surface water runoff, and their significant contribution to direct recharge of underground aquifers. Groundwater withdrawals for agricultural, industrial, and municipal uses have resulted in dewatering of many of the small but significant depression wetlands, especially along this region. These stressors affect the water quality of the basin, and the organisms that inhabit the basin. Blackwater river systems have been altered from nutrient loadings and hydrologic disruptions from groundwater and surface water withdrawals, draining of adjacent wetlands, and insufficient stream buffers. Impacts on these systems from human activities include increased flow variability, altered water regimes, reduced dissolved oxygen, and increased silt loads.

Fire suppression is also a significant problem with increased development, as many fire-dependent habitats now lie adjacent to residential areas, highways, or commercial/industrial zones. Throughout the region, a lack of fire has resulted in the decline in the extent and quality of habitats affecting gopher tortoise, eastern indigo snake, and numerous land birds.

Past silviculture and agriculture activities have created numerous opportunities for habitat restoration, especially on private lands. Conservation actions recommended by the ACJV and GA SWAP include the acquisition and protection of high priority sites, the use incentive-based habitat restoration and management programs on private lands and encourage the restoration of important wildlife habitats through the reintroduction of prescribed fire, hydrologic restoration, and revegetation efforts. Because much of this area is in private ownership, working with

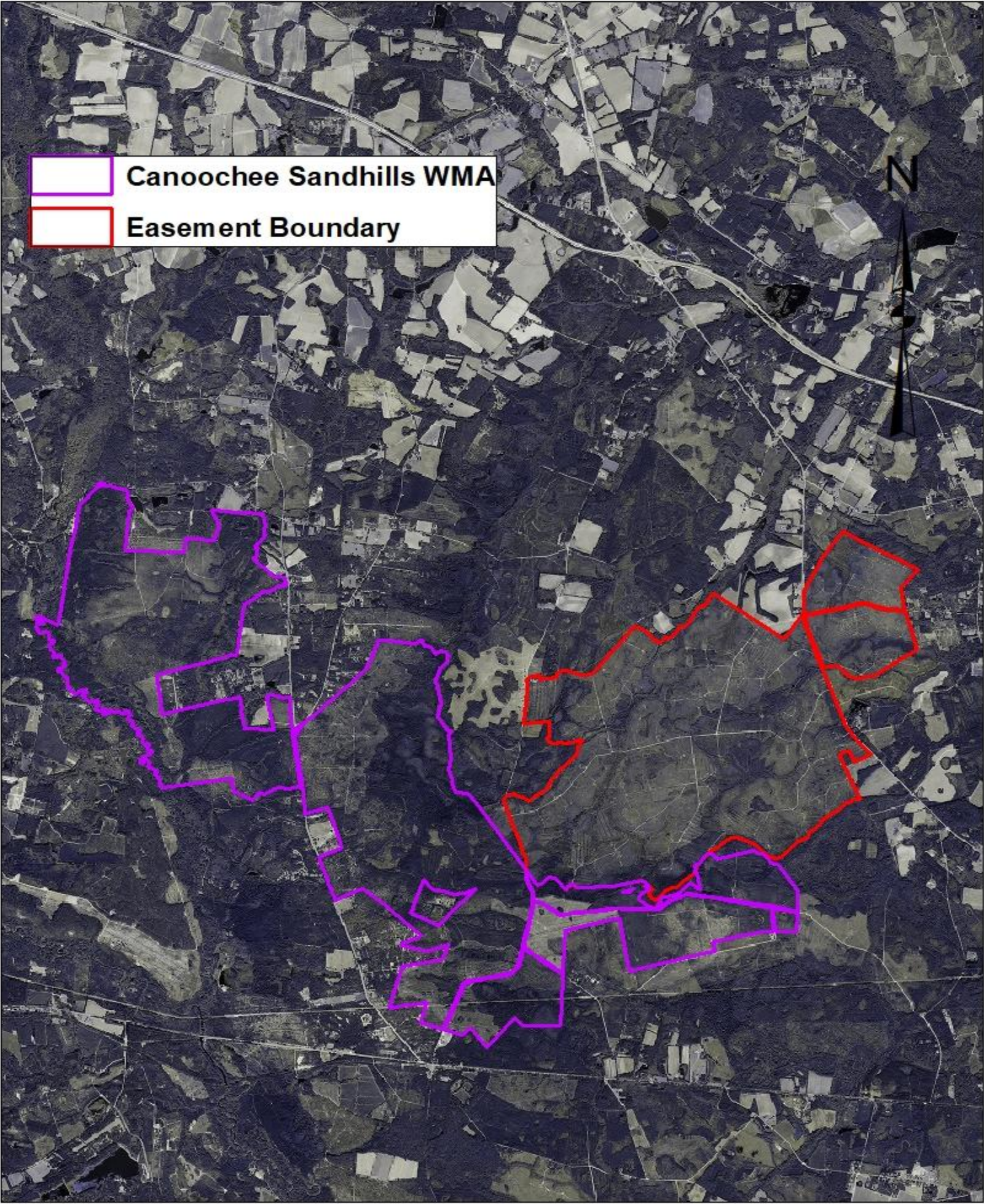


landowners to manage and protect these lands is important. The Glover WRE is part of a much larger effort by the GA Department of Natural Resources (DNR) in the Ogeechee River Basin. The Glover WRE is adjacent to Canoochee Sandhills Wildlife Management Area (WMA.) The Canoochee Sandhills WMA was recently opened to the public in 2020 and contains 6,324 acres of protected land in Bulloch and Bryan counties. **This WRPO will help to offset watershed impacts by providing for the restoration and management of high priority habitats through hydrologic restoration, timber stand improvement, and prescribed fire.**

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Map 2.9 Ogeechee River Conservation Corridor





### 3. RESTORATION PLAN

#### 3.1 Habitat Types Being Restored/Enhanced

Large areas of the easement were bedded, then clearcut in 2015 for industrial development, prior to program enrollment. The proposed restoration plan and supporting management activities (Section 4) will restore wetland hydrology, floodplain connectivity and native plant communities to riverine wetlands previously altered by clearcutting, ditching, road building and other silviculture activities. High Priority Habitats as identified in the GA SWAP to be restored include: Bottomland Hardwood Forest, Forested Depressional Wetlands, Longleaf Pine Savannah, and Pine Flatwoods. The WRPO will also increase habitat management capabilities by recommending prescribed burns on a rotational basis. Overall, approximately 983.7 acres (54%) of previously altered wetlands will be restored or enhanced. Additionally, approximately 2,578.8 acres of upland early successional habitat and Longleaf Pine stands will be restored and enhanced through the proposed conservation practices (see Table 3).

**Table 3. Glover WRE Wetland and Upland Habitats Table**

Existing Habitat Types	Existing Acres	Restored Acres	Enhanced Acres	Total Acres Restored & Enhanced
<b>Wetlands</b>				
Forested- Longleaf Pine plantation/ savannah (2010*)	10.2	13.5	10.2	23.7
Forested- Slash Pine plantation/flatwoods	27.4			
Forested-Loblolly Pine plantation	10.6			
Forested-Mixed Pine plantation	11.2			
Bottomland Hardwood Forest-Mixed Hardwood	1019.7	822.3 – hydro 107.6 - planting		929.9
ESH- Cutover	649.6			
Forested Depressional Wetlands- Cypress/Gum Ponds	81.9	30.1		30.1
<b>Upland</b>				
Forested- Longleaf Pine plantation/ savannah (2010*)	118.2	721.2	118.2	839.4
Forested- Slash Pine plantation/flatwoods	103.5	100.4	103.5	203.9
Forested-Loblolly Pine plantation	11.7		11.7	11.7
Forested-Mixed Pine plantation	27.4		27.4	27.4
Upland Forest-Mixed Hardwood	240.9		221.6	221.6
ESH- Cutover	2182.2		1274.8	1274.8
<b>Total</b>	<b>4494.5</b>	<b>1687.5</b>	<b>1767.4</b>	<b>3454.9</b>



### 3.2 Target Species

Habitat restoration activities on the Glover WRE will benefit numerous wetland and upland animal species. These wetlands provide excellent breeding and brood rearing habitat for Wood ducks, and migration habitat for American Black ducks, Mallard, American Wigeon, Ring-neck Duck, Hooded Merganser. Upland habitat for two species of state and regional importance, Northern Bobwhite quail and Gopher tortoise, will also benefit from the management and enhancement of the ESH and Longleaf Pine Forest.

Conservation Practice	#	Species Benefitted
Prescribed Burning	338	Northern Bobwhite Quail, Gopher Tortoise, Indigo Snake, American Kestrel
Longleaf Pine Planting	612	Red-cockaded Woodpecker, Gopher Tortoise, Bachman's Sparrow
Slash Pine Planting	612	Swallow-tailed Kite
Bottomland Hardwood and Cypress Planting	612	Wood Stork, Wood Duck, Prothonotary Warbler

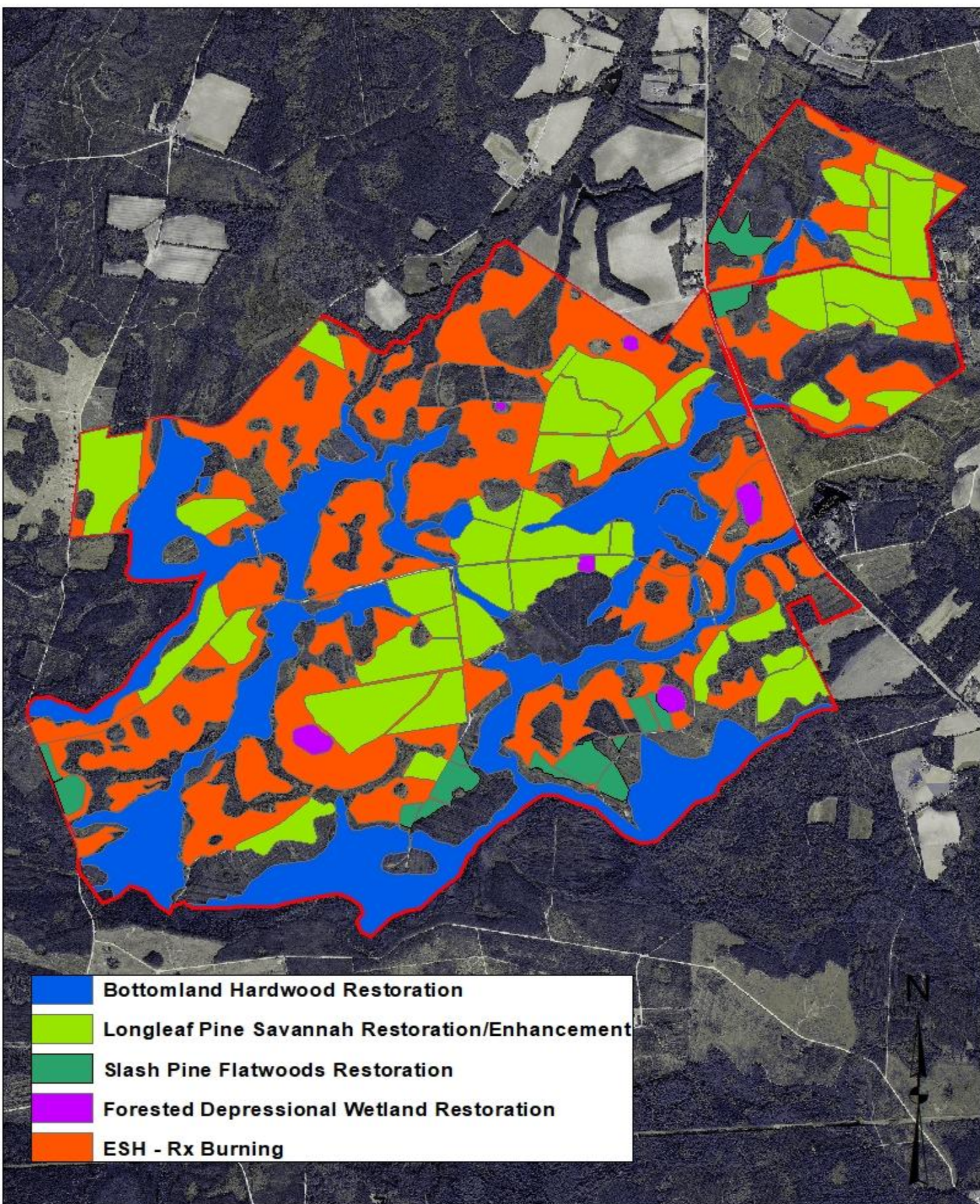
### 3.3 Restoration Goals and Objectives

The wetland restoration goals of this project are to restore hydrologic connectivity between existing Riverine wetland systems and restore native plant communities to wetlands. Additionally, Longleaf Pine Savannahs, Pine Flatwoods, and Early Successional Habitat will be managed to maximize wildlife habitat benefits. The habitat and structural objectives required to reach these goals are provided below. These objectives will ensure the project meets the overall program goals of ACEP-WRE by restoring the native plant communities and hydrologic regimes to the maximum extent practicable, while maximizing the habitat benefit for wetland-dependent (and adjacent upland) wildlife.

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Map 3.1 Restoration by Habitat Type





### **3.3.1 Agronomic/Wildlife Habitat Practices**

Below is a list of practices and their intent to restore wildlife habitat and wetland functions that will have financial assistance provided for in the first 3 years. Please refer to the Planned Conservation Practice Map (Map 2.5) and Table 2 for practice locations and implementation schedules. **Be advised that many of the practices listed below require a Compatible Use Authorization (CUA) to implement, please see Section 4.3 for more details.**

#### **490 HEAVY SITE PREP – ROLLER CHOPPER**

Areas to be reforested to Longleaf Pine (PLL1-PLL16) and Slash Pine (PSP1-PSP7) should be treated by mechanical means to prepare the land for the establishment of trees. Recommended heavy site prep includes using a roller chopper on cutover areas to level debris and any remaining beds. No bedding will be done prior to tree planting in order to make stand elevations as natural as possible to increase hydrologic conductivity. All activities will meet NRCS 490 standards and specifications.

#### **490 LIGHT SITE PREP – HERBICIDE SPRAYING**

Areas to be reforested to Longleaf Pine (PLL1-PLL16) and Slash Pine (PSP1-PSP7) should be treated by chemical means, after re-sprout from roller chopping. Bottomland areas planted in hardwoods (PBH1-2, PBH4-8, PBH10-11) will also receive chemical treatment as light site prep. Forested depressional wetlands will receive no site prep prior to planting. Recommended site prep includes a broad herbicide application for burndown and vegetative control. All activities will meet NRCS 490 standards and specifications.

#### **394 FIRE BREAKS**

Fire breaks will be established in places where burning will occur near easement boundaries, as well as in locations where Longleaf and Slash pine are planted. The wide roads that occur throughout the property, as well as saturated wetlands, will serve as natural or existing firebreaks in most locations. Fire breaks should be made with an offset harrow so the landowner may maintain these breaks for future use. All activities will meet NRCS 394 standards and specifications as well as the Georgia Forestry Commission's Best Management Practices.

*Wildlife Managers Note-* firebreaks can be seeded to perennial cool season clovers or annual warm season mixes to provide foraging areas for wild turkey, deer, quail and rabbits. Warm season mixes can consist of annual grains (wheat, sorghum and millets), cowpeas or lespedeza. A combination of cool season, warm season and fallow plots will provide year-round habitat for wildlife and protect the soil from erosion.

#### **338 PRESCRIBED BURN**

Prescribed burns shall occur annually, with three different "burn units" being burned on a 3-year rotation. Prescribed burning should first take place in winter following site prep and prior to tree planting in areas to be planted in Longleaf Pine (PLL1-PLL16) and Slash Pine (PSP1-PSP7.) Prescribed burns to manage planted longleaf pine will begin in the winter of 2025, after the seedlings have had a chance to become established, usually 4-5 years after planting. Burning after the seedlings have had a chance to become established will encourage them to exit the "grass stage" and begin to add height. Prescribed burns to manage planted slash pine will begin in the winter of 2030 at the earliest, after seedlings have had at least 10 years to become established. The existing Longleaf stands should also be burned on a 3-year rotation. Early Successional Habitat (ESH1-ESH3) should be burned on a 3-year rotation based on burn unit (see Map 4.2(a-c) and Table 3).

A prescribed burn plan will be written and executed by a state certified prescribed burner. An individual burn permit shall be obtained for each planned burn. All activities will meet NRCS 338 standards and specifications as well as the Georgia Forestry Commission's regulations.

The Georgia Forestry Commission (GFC) and Georgia DNR will be consulted to develop a prescribed burning plan for the site. Because the Georgia DNR regularly conducts burning on the adjacent Canoochee Sandhills WMA, it would be better to schedule burns in the WRE around the same time to help reduce the impact of smoke on nearby roads and communities.

#### **612 TREE ESTABLISHMENT – LONGLEAF PINE PLANTING**

Upon completion of all site prep activities prescribed above, containerized Longleaf Pine shall be planted on a 6x12 spacing at a rate of 605 trees per acre. Seedlings will be planted to establish restore a native plant community that

provides wildlife habitat, erosion control, and improves water quality. All plantings should meet NRCS 612 standards and specifications for Longleaf Tree Establishment.

#### **612 TREE ESTABLISHMENT – SLASH PINE PLANTIING**

Upon completion of all site prep activities prescribed above, containerized Slash Pine shall be planted on a 6x12 spacing at a rate of 605 trees per acre. Seedlings will be planted to establish restore a native plant community that provides wildlife habitat, erosion control, and improves water quality. All plantings should meet NRCS 612 standards and specifications for Slash Pine Tree Establishment.

#### **612 TREE ESTABLISHMENT – CYPRESS AND BOTTOMLAND HARDWOOD PLANTING**

Bald Cypress, Pond Cypress, and bottomland hardwoods shall be planted on a 12'x12' spacing at a rate of 302 trees per acre. All activities will meet NRCS 612 standards and specifications.

#### **315 HERBACEOUS WEED CONTROL**

After planting, a release spray is recommended to reduce vegetative competition to Longleaf pine, Slash pine, and Hardwood tree seedlings. All activities will meet NRCS 315 standards and specifications.

### **3.3.2 Structural/Engineering Practices**

#### **578 STREAM CROSSING**

Seventeen (17) stream crossings are planned across the easement to enhance floodplain connectivity between existing riparian wetlands. Existing structures or blockages will be removed, and a stabilized crossing will be constructed across the stream to allow controlled access for people, equipment, and vehicles.

#### **657 WETLAND RESTORATION – Marco/Micro Topography**

Ditches that were previously dug for drainage purposes will be filled back to original elevations, or as close as possible, using the existing spoil piles located along the sides of ditches. This practice should restore wetland hydrology close to its original condition prior to disturbance. No fill shall be above the natural grade of land on either side of ditches. Existing fill material placed in drainages will also be removed to restore natural riparian flow patterns. All activities should meet NRCS 657 standards and specifications.

#### **657 DITCH PLUG**

Two (2) ditch plugs are planned for areas where open channels were previously constructed to drain wetlands. The channels will be filled to restore wetland hydrology to as close as possible to natural conditions.

#### **560 ACCESS ROAD**

Relocate approximately 1500 feet of access road around a Cypress pond in order to prevent water quality issues. Currently a small depressional wetland is bisected by an access road. Removing fill from the road and rerouting the small section around the wetland would be an easy and effective way to increase connectivity and restore a high-priority habitat type.

### **3.4 Partner Contributions**

The restoration phase of this project, including the structural practices and portions of the agronomic practices, will be implemented by the Trust for Tomorrow through an existing cooperative agreement. The Trust will handle the design, permitting, contracting and construction management for the project.

### **3.5 Conservation Plan Schedule of Operations**

Tables with implementation schedules for the planned conservation practices are provide in Section 2.5 (Table 2). Cost estimates for planned Agronomic and Engineering practices are provided below in Section 3.6 and in the



Engineering Plans (Attachment 1). All appropriate practice job sheets, specifications and engineering designs are provided in the WRPO (see Attachment 1 and Appendix). All practices must be scheduled in Customer Service Toolkit and uploaded to the National Conservation Planning Database.

### 3.6 Restoration Costs

#### Agronomic:

See table below with per unit rates for similar projects in Georgia. Bids from contractors will be inserted once received and approved.

Conservation Practice	Per Unit Rates	Number of Units	Total Costs
394-Firebreak	\$0.04/ft	56,500	\$2,260
338-Prescribed Burning	\$30.00/ac	2,237.5	\$67,125
342- Critical Area Planting-includes lime, fertilizer, and mulch	\$6,000.00/ac	6	\$36,000
490 – Site Prep – Roller Chopping	\$65/ac	835.1	\$54,282
490 – Site Prep – Herbicide Spraying	\$85/ac	970.1	\$82,459
612 – Tree Planting – Plant BLH and Cypress	\$250	151	\$37,750
612 – Tree Planting – Plant Longleaf Pine	\$225	734.7	\$165,308
612 – Tree Planting – Plant Slash Pine	\$180	100.4	\$18,072
315 – Herbaceous Weed Control – Release Spray	\$85/ac	970.1	\$82,459
<b>TOTAL</b>			<b>\$545,715</b>

#### Engineering:

See Engineering Plans estimates (Attachment 1). Bids from contractors will be inserted once received and approved.

### 3.7 Clearance and Permits for Restoration

Permits will be obtained once the final design is approved. Proposed practices should be covered under NW permits 3 and 27. Required permits and other forms of documentation (file letters) will be provided in Attachment 2.

### 3.8 Operation and Maintenance (O&M)

Project restoration will use the best available science in the design, installation, and management of conservation practices to maximize benefits to wildlife, plant diversity, and water quality. As such, long term O&M of practices will be needed and are therefore provided below and in the Conservation Practice Standards. Upon completion of the implementation phase of this project, the WRPO may be updated to identify the specific O&M needs and subsequent responsibilities, budgets, etc., to ensure that the collective conservation investment is properly maintained.

#### 3.8.1 Summary of O&M Responsibility

Landowner assumes responsibility as described below for inspection of structures after storm events or heavy rain. NRCS or authorized representative will inspect structures the year following installation and every 5 years during onsite monitoring events or as required in current NRCS Easement Monitoring Policy. NRCS will respond in a timely manner to landowner requests for inspection about potential damages during storm events or heavy rains. If a structure is damaged due to weather events or events outside of the landowner's control, NRCS will have the authority for repairs as described in the Warranty Easement Deed recorded on the property.

#### 3.8.2 Structural O&M Responsibility

Anticipated structural O&M includes:

Access Roads and Forest Trails and Landings- Travel ways will be maintained to provide and protect access to the WRE and provide soil erosion and water quality protection. Maintenance activities such as light grading, prescribed burning, and/or mowing can be utilized to maintain roads. Heavy grading, scraping, and/or crowning can be utilized to repair roads that have become damaged by adverse weather conditions and/or excessive traffic. All access road maintenance will be covered under a Compatible Use Authorization (CUA), which will be renewed on a 10-year rotation. No additional roads or travel ways will be authorized without a separate CUA. Existing culverts and drainage ditches that are not part of the restoration activities will be maintained to allow the natural movement of storm water through the property without damage to access roads.

*Wildlife Managers Note-* Planting lightly used roads to cool season clover mixes or native warm season forb mixes can provide great linear food plots, bugging areas and travel corridors for wildlife. Similar to firebreaks, a good mix of cool and warm season forbs is preferred. If a roadbed has ample daylight, planting the road top to a clover and winter wheat mix and the slopes and shoulders to a native warm season grass and forb mix is a great opportunity to provide cover and foraging habitat in a continuous corridor across the easement.

Stream Crossings - These practices will require periodic maintenance and may also require operational items to maintain satisfactory performance. Responsibility for practice O&M will be site specific and determined on a case by case basis. The O&M program includes the following items: 1) Inspecting the stream crossing and appurtenances after each major storm event and make repairs if needed; 2) Removal of any accumulation of organic material, woody material, or excess sediment from the crossings and passages; 3) Immediately repair any erosion, vandalism, or vehicular damage; 4) Replace weathered or displaced rock as needed to the constructed grade and 5) Maintain metal T-post along the side of the crossing to prevent any motorized vehicles from going off of the rock during high water events. **Please note NRCS must be contacted prior to any mechanical and structural work associated with this item.**

### 3.8.3 Vegetative O&M

NRCS will evaluate the post-restoration site conditions and determine the needs and feasibility of maintenance at that time. If maintenance is recommended, practice guidance with an implementation schedule will be developed and NRCS funds may be requested to complete the maintenance activities. The WRPO will also be updated at that time.

### 3.9 Photo Documentation of Restoration

Photos will be taken before, during, and after restoration to document the restoration phase and effectiveness of the practices with location points of photography recorded on a map of the easement or agreement area and with the points located to adequately serve as future monitoring photo points. The baseline photos may serve as the “before restoration” conditions in many cases. Photos will be archived in the WRPO case file. The Trust for Tomorrow will provide an as-built report after construction is completed.

## 4. MANAGEMENT PLAN

### 4.1 Anticipated Long-Term Management Actions

The management and maintenance activities which NRCS considers to be compatible with the easement purposes and objectives for which it was established are included in this plan. Management practices can be carried out by the landowner to the extent possible however they may require a **Compatible Use Authorization (CUA)** to implement (see Section 4.3). In the event a management activity is described as a “prohibited” use in the Part III of the Warranty Easement Deed, the WRPO management plan can serve as the basis for Compatible Use Authorizations. The compatible uses are subject to modification or cancellation by NRCS should NRCS determine that the compatible use guidelines are not being adhered to or the compatible uses are not having the desired effect on the WRE easement resources. CUAs must be signed by the NRCS State Conservationist or NRCS State Leader for



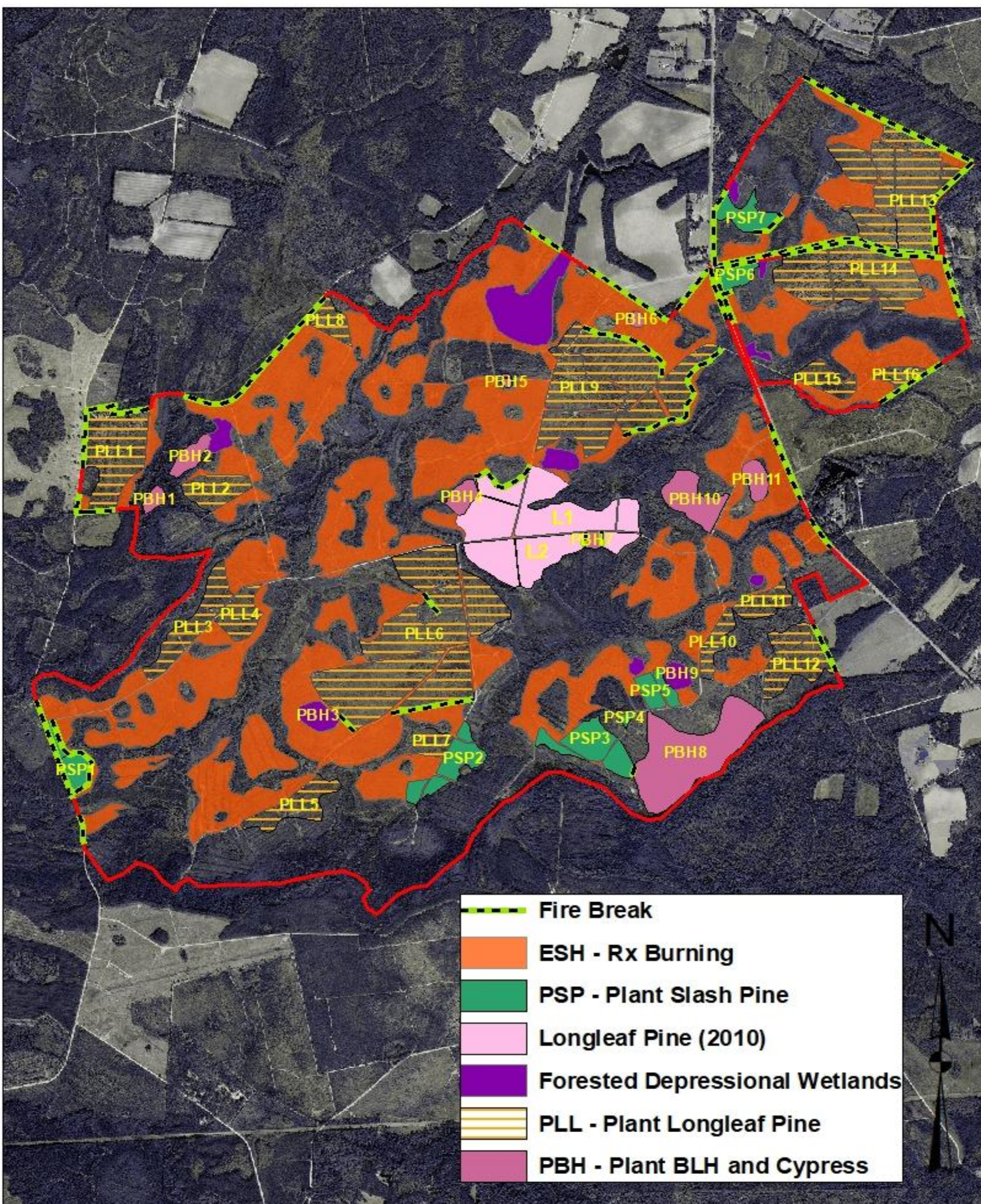
Programs to be considered legal. Activities carried out on the easement area without the NRCS written approval are in violation of the terms of the Warranty Easement Deed.

Ongoing and future management as identified in this WRPO should follow the principles of adaptive management as the guiding framework for collaborative implementation of this plan and future land management practices. Typically, management guidelines are re-evaluated every 5 years and new habitat goals are identified, with recommended conservation practices and installation guidelines. **The proposed practice management plan and schedule, along with accompanying maps, is provided below.** This plan provides guidance through the year 2030, at which point the plan should be updated. A summary of the proposed practices is provided below. Please note that this WRPO does not provide funding for the proposed practices, however funding may be available in the future. Additionally, the proposed forestry practices and schedules are based on current silviculture practices and market trends. Timber stand recommendations should be re-evaluated at least every five years to adjust for habitat goals, disease, storm damage and market conditions.

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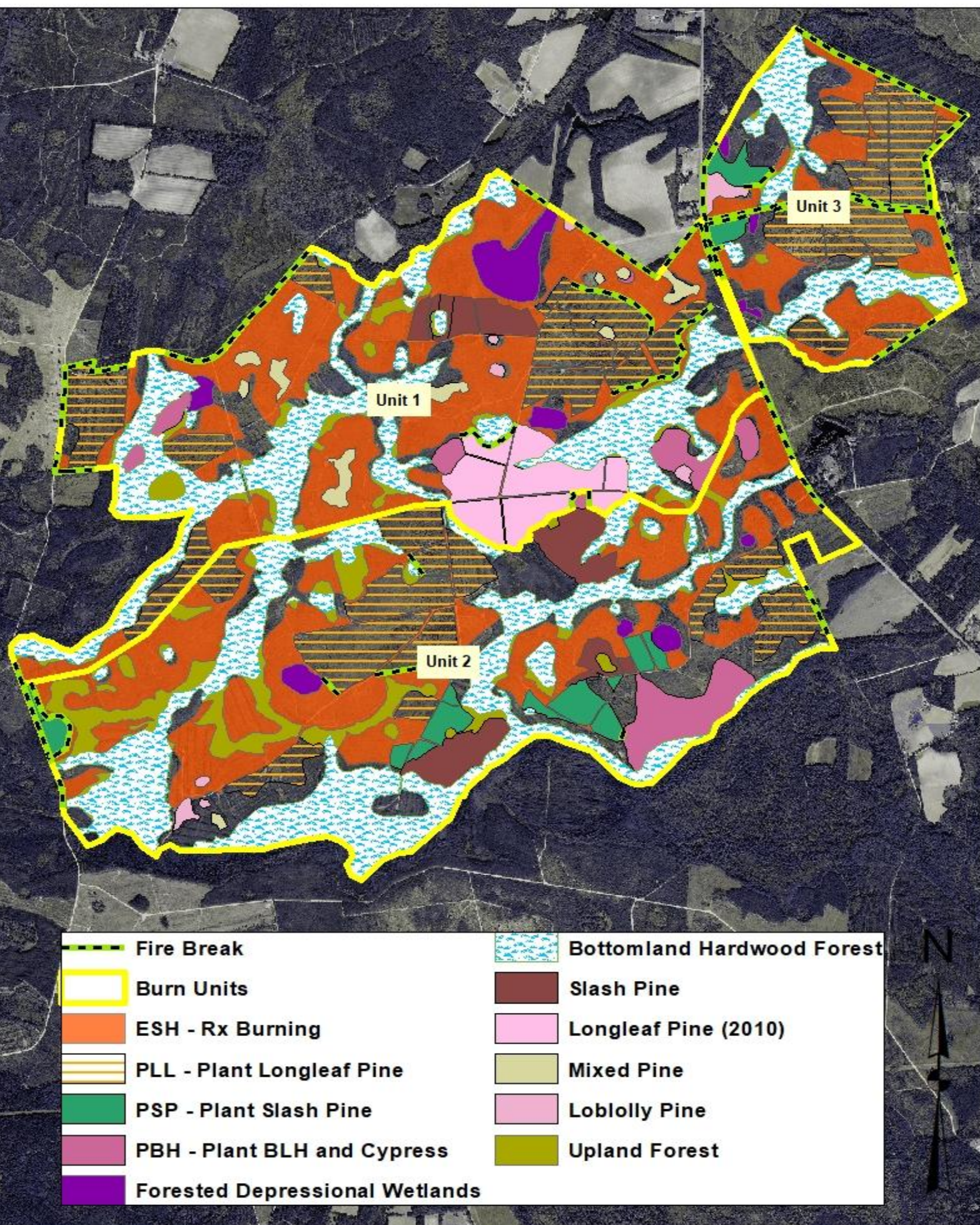


Map 4.1.1 Glover WRE Management Plan



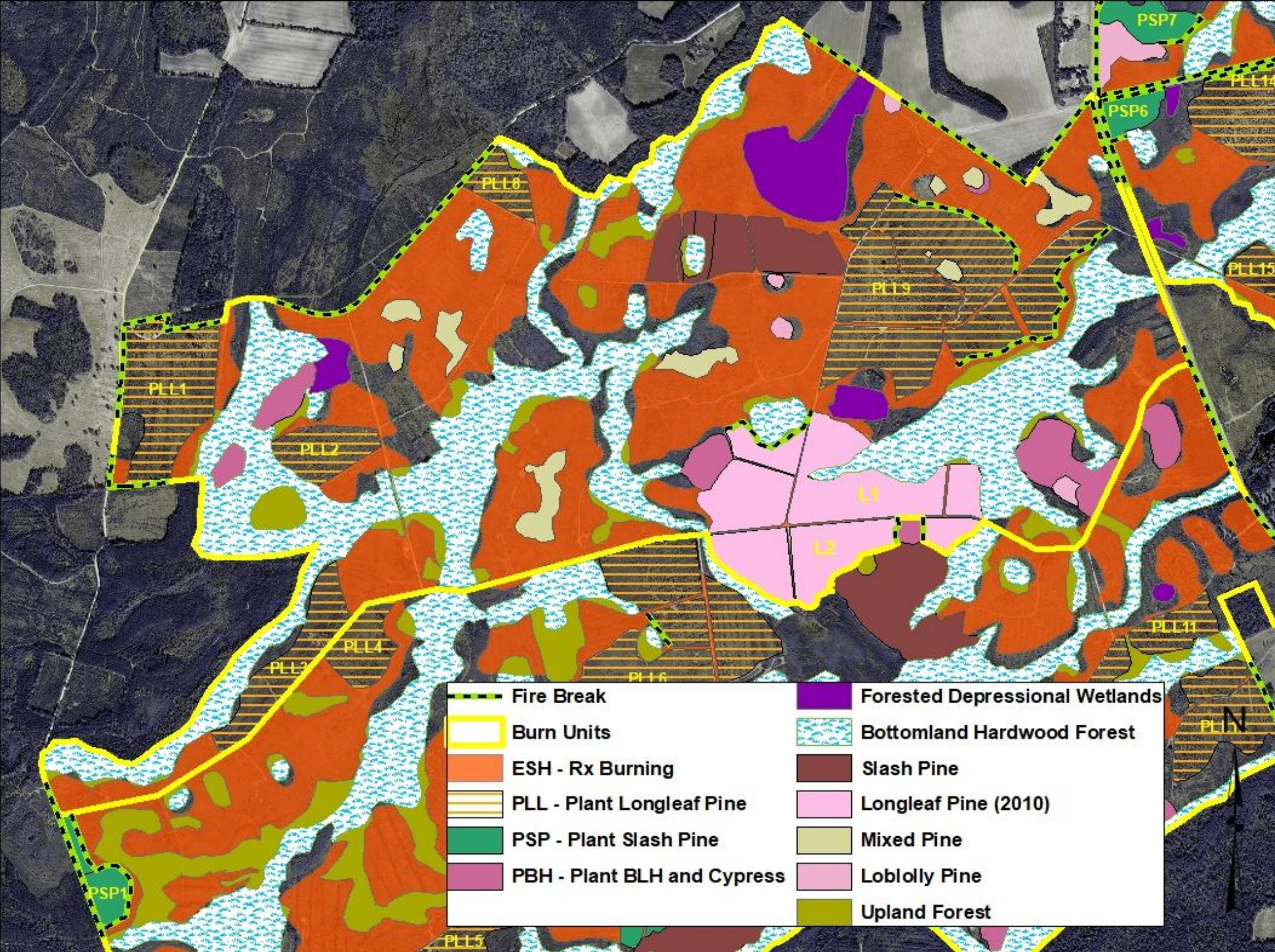


Map 4.2 Burn Unit Reference Map (Overview)



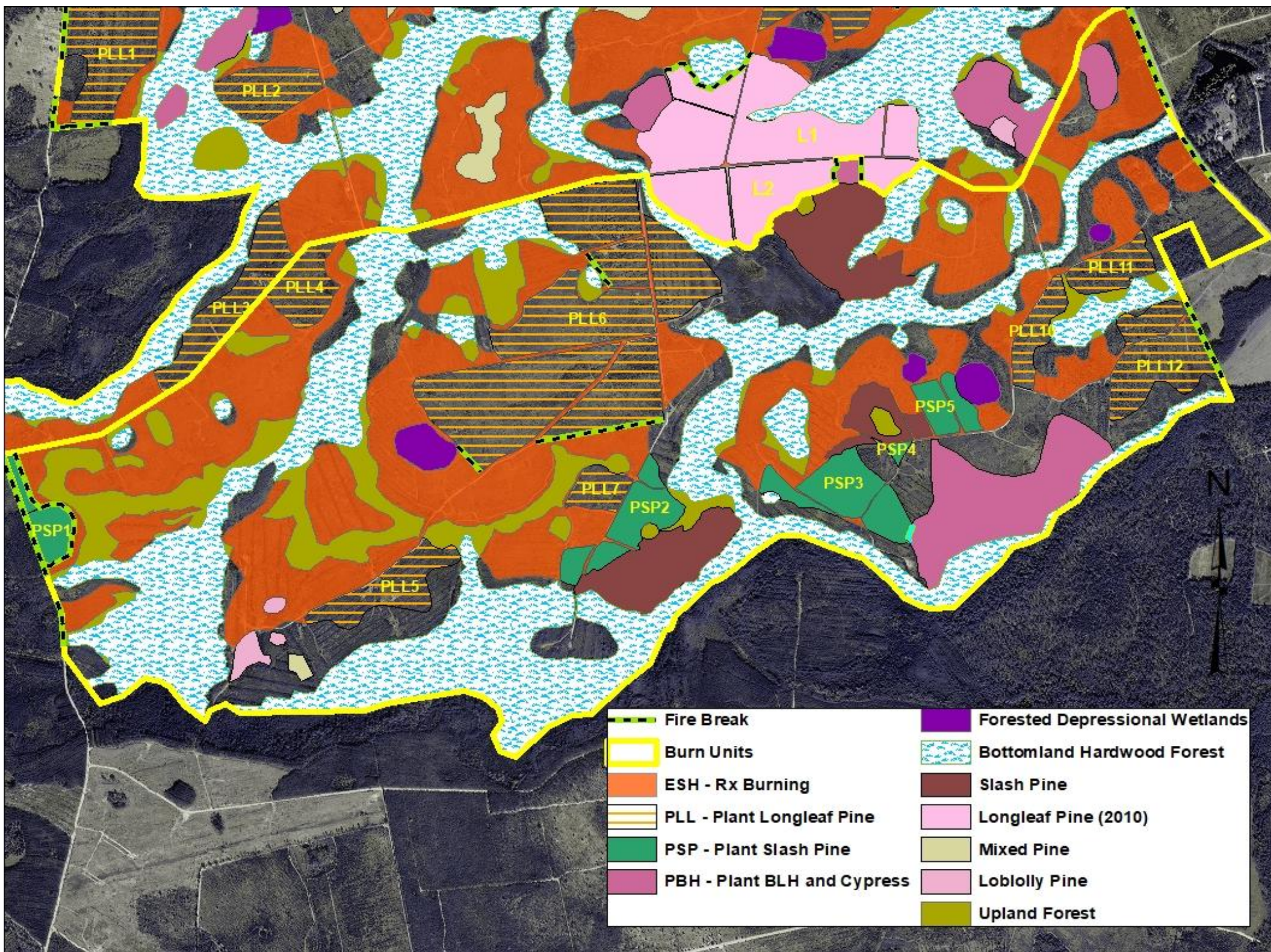


Map 4.2A – Unit 1 Reference Map





Map 4.2B – Unit 2 Reference Map





Map 4.2C – Unit 3 Reference Map

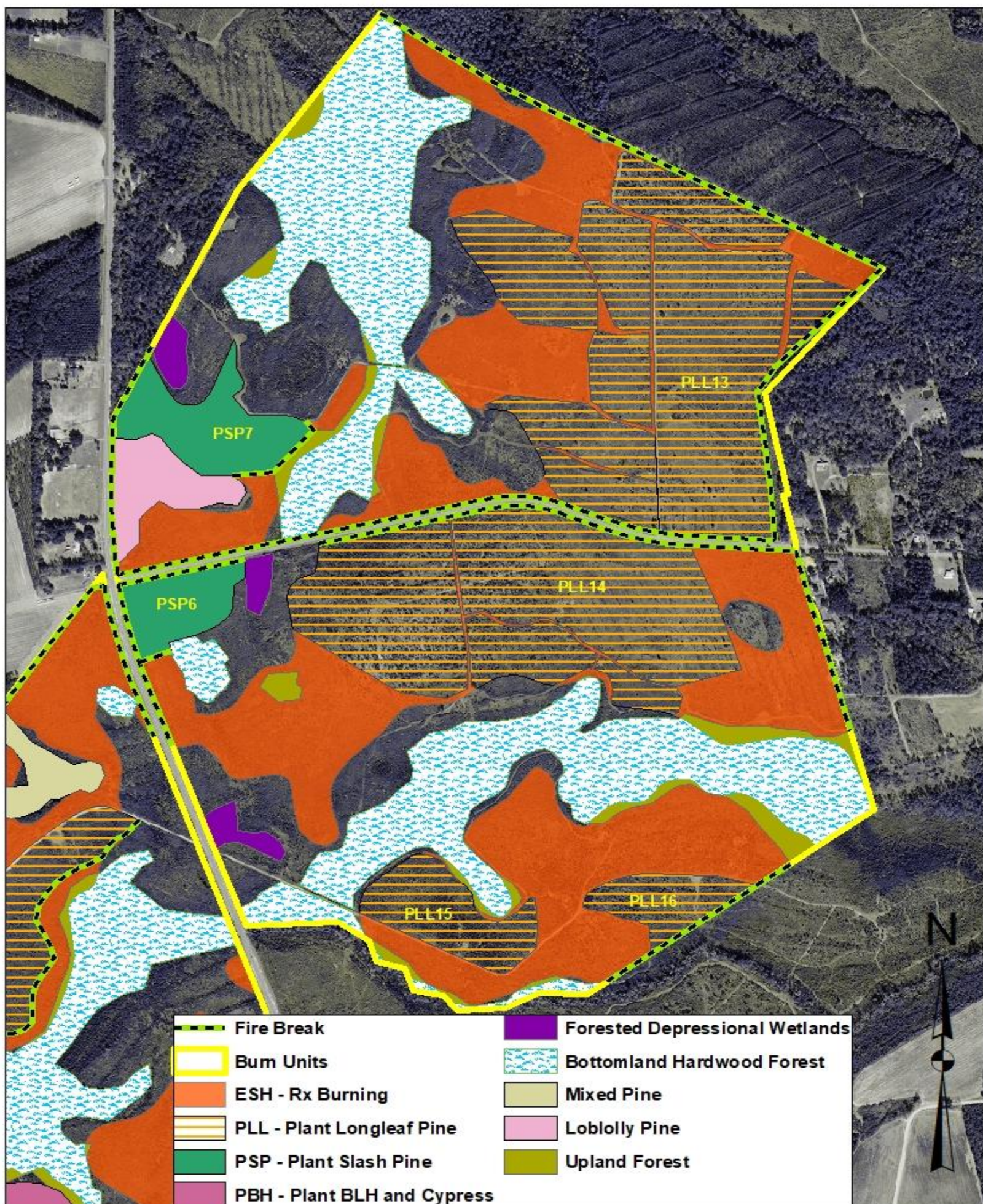




Table 4. Glover WRPO Long-Term Management Schedule												
Burn Unit	Map ID or Stand#	CPS*	Amount	Activity	Frequency	2024	2025	2026	2027	2028	2029	2030
1	Burn Unit 1	394	22,300 ft	Maintain Firebreaks	Before Rx Burn		Summer			Summer		
	ESH	338	915 ac	Prescribed Burning	3 year rotation		Fall/Winter			Fall/Winter		
	PLL1-PLL3, PLL8-PLL9	338	245.3 sc	Prescribed Burning	Begin 3 year rotation 4-5 years after planting		Fall/Winter			Fall/Winter		
	L1-L2	338	128.4ac	Prescribed Burning	3 year rotation		Fall/Winter			Fall/Winter		
2	Burn Unit 2	394	11,500 ft	Maintain Firebreaks	Before Rx Burn			Summer			Summer	
	ESH	338	940.7 ac	Prescribed Burning	3 year rotation			Fall/Winter			Fall/Winter	
	PLL4-PLL7, PLL10-PLL12	338	290.7 ac	Prescribed Burning	Begin 3 year rotation 4-5 years after planting			Fall/Winter			Fall/Winter	
	PSP1-PSP5	338	71.6 ac	Prescribed Burning	Begin 3 year rotation 10 years after planting							
3	Burn Unit 3	394	22,700 ft	Maintain Firebreaks	Before Rx Burn				Summer			Summer
	ESH	338	383 ac	Prescribed Burning	3 year rotation				Fall/Winter			Fall/Winter
	PLL13-PLL16	338	198.7 ac	Prescribed Burning	Begin 3 year rotation 4-5 years after planting				Fall/Winter			Fall/Winter
	PSP6-PSP7	338	28.8 ac	Prescribed Burning	Begin 3 year rotation 10 years after planting							Fall/Winter

\*CPS= Conservation Practice Standard

#### 4.1.2 Management for Longleaf Pine Stands

Restored Longleaf pine stands may be managed to increase wildlife habitat and species diversity through the use of prescribed burning. Prescribed burns will be carried out on a 3-year rotation. The GFC and GA DNR will be consulted prior to controlled burning as they frequently prescribe fires in nearby areas as well as the adjacent WMA. Also, fire breaks and early successional habitat areas can be used for food plots for numerous wildlife species. Maintaining these fire breaks is also essential in reducing the chance of wildfire spreading from this property to adjoining land. Fire breaks were not placed in areas where wide roads or wet areas would serve the same function. Thinnings may also be required in the future to restore a “savannah” type habitat structure and should be considered in future plan updates.

**More information for the management and prescribed burning of Longleaf Pine can be found at:**

<https://longleafalliance.org/> and <https://talltimbers.org/information-resources/>

#### 4.1.3 Management for Slash Pine Stands

Restored Slash pine stands may be managed to increase wildlife habitat and species diversity through the use of prescribed burning. Prescribed burns will be carried out on a 3-year rotation. Planted Slash pines will be given at least 10 years to become established before any fire is prescribed. The GFC and GA DNR will be consulted prior to controlled burning as they frequently prescribe fires in nearby areas as well as the adjacent WMA. Also, fire breaks and early successional habitat areas can be used for food plots for numerous wildlife species. Maintaining these fire breaks is also essential in reducing the chance of wildfire spreading from this property to adjoining land. Fire breaks were not placed in areas where wide roads or wet areas would serve the same function. Thinnings may also be required in the future to restore a “wet pine flat” type habitat structure and should be considered in future plan updates.

**More information for the management and prescribed burning of Slash Pine can be found at:**

<https://talltimbers.org/information-resources/>

#### 4.1.4 Management of Early Successional Habitats

Food plots, access roads, and fire breaks can all be managed to enhance Early Successional Habitat (ESH) on the easement through disturbance practices, including prescribed burning, light disking, mowing, or planting native grasses and forbs. When planting food plots, managers should practice “dirty” farming, which promotes the growth of native plants along with planted crops by avoiding herbicide use. Managers can also promote dirty crops by widely spacing planted rows to let sunlight promote habitat between rows. Firebreaks should be planted to a mixture of clovers and cool season grains (wheat, oats or rye). **Please be aware that management activities in Early Successional Habitats should be avoided during the primary nesting season of April 1 through August 31 of each year unless otherwise specified in the WRPO.**

#### 4.1. Summary of Management Responsibility

Long-term management of the easement is the responsibility of the landowner, but NRCS can provide assistance with planning and implementation as necessary. **All management activities shall be approved by NRCS in advance and may require a Compatible Use Authorization (CUA) to implement (see Section 4.3).** Cost-share funds may be available for some management practices through NRCS or other conservation partners.

#### 4.2 Invasive Plant and Pest Control Strategies

A plan to control invasive weeds and pests must be approved in writing by the NRCS prior to implementation by the Landowner. Although no invasive plants were observed on site, Chinese Privet has been an issue on several easements in the area.

#### 4.3 Compatible Uses Authorizations (CUA's)

**A CUA is required any time the landowner carries out an activity that has the potential to affect the hydrology, soil, or vegetation of the easement area, even when they are carrying out activities determined necessary by NRCS.** The United States may authorize, in writing and subject to such terms and conditions the NRCS may prescribe at its sole discretion, the temporary use of the Easement Area for compatible economic uses, including



but not limited to, timber management, prescribed burning, wildlife openings, brush management, and herbaceous weed control.

CUA's will only be made if, upon a determination by NRCS in the exercise of its sole discretion and rights, the proposed use is consistent with the long-term protection and enhancement of the wetland and other natural values of the Easement Area. The NRCS shall prescribe the amount, method, timing, intensity, and duration of the compatible use. CUA's do not vest any rights in the Landowner and can be revoked by NRCS at any time. This plan specifically details what compatible uses may be authorized. The landowner may request from NRCS that additional compatible uses be included over time.

#### **4.4 Maintaining Easement Boundaries**

The easement boundary must remain clearly marked at all times with permanent markers (WRE signs) at each corner and approximately every 500 feet of straight run or at minimum distance determined necessary by NRCS. This will help reduce accidental encroachment or inappropriate use of the easement. Areas within intense vegetation and forested areas with very low risk of accidental encroachment may not be visible after vegetation has grown around signs (example: riparian areas with dense vegetation). Easement boundary maintenance is the responsibility of the landowner with assistance from NRCS as necessary.

### **5. MONITORING**

#### **Policy Reference 528.156 -GA.1 - MONITORING**

It is necessary from a practical and legal standpoint to enforce easements effectively and to detect violations. To prevent violations and encourage proper participation, NRCS will monitor WRE easements on an annual basis. While restoration is being implemented, all enrollments will be monitored through onsite visits, at least annually.

Monitoring the WRE site is necessary to ensure that full wetland functions and values are achieved and maintained. NRCS staff and partners knowledgeable about wildlife habitat, wetland restoration, and wetland functions and values will participate in site monitoring. The landowner is encouraged to attend and at a minimum be contacted by NRCS prior to doing the on-site inventory. The information obtained through the monitoring process will be used to assess the effectiveness of restoration activities, evaluate habitat conditions and the need for management activities, and identify any possible easement violations. Sites will be visited, and a Status Review will be completed at least once a year during the restoration phase, and/or if there is an active management or O&M agreement. Status reviews will be maintained for the duration of the easement. Reference the case file for the existing status reviews. Once restoration has been completed the site will be visited at least once every five years with aerial monitoring the other four years. During the site visit NRCS will complete the WRE Monitoring Worksheet and these will be maintained for the duration of the easement. Reference the case file for the existing monitoring worksheets. Any suspected violations should be immediately reported to the State Office, who will contact the National WRP Manager.

#### **5.1 Monitoring Checklist Protocol**

Monitoring will be completed using the National WRP Monitoring Checklist. When NRCS is scheduling a field visit, the property owners will be notified in advance and provided the opportunity to participate. To the extent practicable, NRCS will accommodate for the owner's schedule. Monitoring results will be maintained in the WRE case file.

#### **5.2 Photo Point Monitoring**

Points will be established to allow for long-term photo monitoring. Photo points will be compared and analyzed to show habitat trends and conditions and to assist in making management decisions. Photos will be archived in the WRPO case file.

#### **5.3 Ecological Monitoring**

Ecological monitoring protocols that quantify ecological objectives have not yet been established but will be encouraged over time. These may include habitat trend assessments, wildlife surveys, rare plant surveys, and water quality testing.



## PLAN APPROVAL

**Plan Prepared by:**

\_\_\_\_\_ Date: \_\_\_\_\_

Trust for Tomorrow

**Plan Approved By:**

\_\_\_\_\_ Date: \_\_\_\_\_

NRCS Field Team Leader

\_\_\_\_\_ Date: \_\_\_\_\_

NRCS Engineer

\_\_\_\_\_ Date: \_\_\_\_\_

NRCS Biologist/Forester OR Authorized Representative

\_\_\_\_\_ Date: \_\_\_\_\_

NRCS Field/Area Office Representative

***I acknowledge that I have received, reviewed and agree to the implementation of this plan.***

\_\_\_\_\_ Date: \_\_\_\_\_

Landowner Name

## **Conservation Practice Standards**





**Natural Resources Conservation Service  
CONSERVATION PRACTICE STANDARD  
HERBACEOUS WEED TREATMENT**

**Code 315**

**(Ac)**

**DEFINITION**

The removal or control of herbaceous weeds including invasive, noxious and prohibited plants.

**PURPOSE**

- Enhance accessibility, quantity, and/or quality of forage and/or browse.
- Restore or release native or create desired plant communities and wildlife habitats consistent with the site potential.
- Protect soils and control erosion
- Reduce fine fuel loads and wildfire hazard
- Pervasive plant species are controlled to a desired level of treatment that will ultimately contribute to creation or maintenance of an ecological site description "steady state," addressing the need for forage, wildlife habitat, and/or water quality.

**CONDITIONS WHERE PRACTICE APPLIES**

On all lands except active cropland where removal, reduction, or manipulation of herbaceous vegetation is desired.

This practice does not apply to removal of herbaceous vegetation by prescribed fire (use Conservation Practice Standard (CPS) Prescribed Burning (Code 338) or removal of herbaceous vegetation to facilitate a land-use change (use CPS Land Clearing (Code 460)).

**CRITERIA**

**General Criteria Applicable to All Purposes**

Herbaceous weed treatment will be applied in a manner to achieve the desired control of the target species and protection of desired species. This will be accomplished by mechanical, chemical, or biological methods either alone or in combination.

NRCS will not develop biological or chemical treatment recommendations except for biological control utilizing grazing animals. CPS Prescribed Grazing (Code 528) is used to ensure desired results are achieved and maintained.

NRCS may provide clients with acceptable biological and/or chemical control references.

NRCS may provide clients with current acceptable references to achieve desired management objectives.

When herbicides are used, environmental hazards and site-specific application criteria listed on pesticide labels, and contained in extension service and other approved pest management references, must be followed.

Herbaceous weed treatment will include post-treatment measures as needed to achieve resource management objectives.

Livestock and people access will be controlled based on management methods applied and restrictions as listed on the chemical labels.

Manage and/or dispose of treated weed species in a manner that will prevent the spread of herbaceous weeds to new sites.

**Additional Criteria to Enhance Accessibility, Quantity, and Quality of Forage and/or Browse**

Herbaceous weed treatment will be applied in a manner to minimize negative impact to forage and/or other non-targeted plants. Timing and sequence of control shall be planned in coordination with specifications developed for CPSs Prescribed Grazing (Code 528) or Forage Harvest Management (Code 511).

**Additional Criteria to Restore or Release Native or Create Desired Plant Communities and Wildlife Habitats Consistent with the Site Potential**

Apply herbaceous weed treatment in a manner to protect the health and vigor of native or desired plant species.

Use applicable ecological site description (ESD) State and transition models or other suitable information, to develop specifications that are ecologically sound and defensible. Treatments must be congruent with dynamics of the ecological site(s) and keyed to states and plant community phases that have the potential and capability to support the desired plant community. If an ESD is not available, base specifications on the best approximation of the desired plant community composition, structure, and function.

Treatments will be conducted during periods of the year when weed species are most vulnerable and will promote restoration of the native or desired plant communities.

Apply herbaceous weed treatment in a manner that maintains or enhances important wildlife habitat requirements.

Treatments will be conducted during periods of the year that accommodate reproduction and other life cycle requirements of target wildlife and pollinator species.

Apply treatments that maintain or enhance plant community composition and structure to meet the requirements of target wildlife species.

**Additional Criteria to Protect Soils and Control Erosion**

Apply herbaceous weed treatment to minimize soil disturbance and soil erosion.

Additional treatment will be applied to protect soils and prevent erosion (e.g. CPS 342, 422, 512, 612, etc.).

**Additional Criteria to Reduce Fine Fuel Loads and Wildfire Hazard**

Treat weed species in a manner that creates a native or desired plant community which reduces the potential for accumulating excessive fuel loads and increased wildfire hazards.



Apply treatment methods in a manner that minimize the potential for unintended impacts to air resources (e.g., smoke, chemical drift, etc.).

#### **Additional Criteria to Control Pervasive Plant Species to a Desired Level of Treatment**

Additional treatments are planned and will be applied to achieve effective control of pervasive plant species through reapplication.

#### **CONSIDERATIONS**

Consider using CPS Integrated Pest Management (Code 595) in support of herbaceous weed treatment. Consider soil erosion potential and difficulty of vegetation establishment when choosing a method of control that causes soil disturbance.

Consider the appropriate time period for treatment. Some herbaceous weed management activities can be effective when applied within a single year; others may require multiple years of treatment(s) to achieve desired objectives.

Consider the impacts of using herbicides with residual activity and how the residual activity will impact planting desired species.

Consider impacts to wildlife species, in general, treatments that create a mosaic pattern may be the most desirable.

Consider impacts to pollinators. Leave pollinator habitat where possible or plant pollinator habitat if it is lacking. When applying chemical control methods attempt to avoid applications during significant bloom periods. Consider applying chemicals in late evening or when daylight temperatures are below 55°F.

Consider impacts to wildlife food supplies, space, and cover availability when planning the method and amount of herbaceous weed management.

State-issued licenses may be required when using chemical pesticide treatments.

For air quality purposes, consider using chemical methods of herbaceous weed treatment that minimize chemical drift and excessive chemical usage and consider mechanical methods of herbaceous weed management that minimize the entrainment of particulate matter.

Adjacent land uses must be considered before chemicals are used.

#### **PLANS AND SPECIFICATIONS**

Prepare plans and specifications for each field or treatment unit according to the criteria included in this standard. At a minimum, a herbaceous weed treatment practice plan shall include—

1. Goals and objectives statement.
2. Plan map and soil map for the site.
3. Pretreatment cover or density of the target plant(s) and the planned post-treatment cover or density.
4. Maps, drawings, and/or narratives detailing or identifying areas to be treated, pattern of treatment (if applicable), and areas that will not be disturbed.
5. A monitoring plan that identifies what shall be measured (including timing and frequency) and the changes in the plant community (compare with objectives) that will be achieved.

#### **Mechanical Treatment Methods.**

Plans and specifications will include items 1 through 5 above, plus the following:

- Type of equipment to use for management.
- Dates of treatment for effective management.

- Operating instructions (if applicable).
- Techniques and procedures to be followed.

#### **For Chemical Treatment Methods.**

Plans and specifications will include items 1 through 5, above, plus the following:

- Acceptable chemical treatment references for containment and management of target species.
- Documented techniques to be used, planned dates and rates of application. Only provide planned herbicides to be used and application rates when they have been provided by UGA Cooperative Extension Service or a licensed private applicator.
- Evaluation and interpretation of herbicide risks associated with the selected treatment(s) using WIN-PST or other approved tools.
- Any special mitigation, timing considerations or other factors (such as soil texture and organic matter content) that must be considered to ensure the safest, most effective application of the herbicide.
- Reference to product label instructions.

#### **For Biological Treatment Methods.**

Plans and specifications will include items 1 through 5, above, plus the following:

- Acceptable biological treatment references for the selected biological agent used to contain and manage the target species.
- Document release date, kind, and number of agents.
- Timing, frequency, duration, and intensity of grazing or browsing.
- Desired degree of grazing or browsing use for effective management of target species.
- Maximum allowable degree of use on desirable non-target species.
- Special mitigation, precautions, or requirements associated with the selected treatment(s).

### **OPERATION AND MAINTENANCE**

#### **Operation**

Herbaceous weed treatment practices shall be applied using approved materials and procedures. Operations will comply with all local, State, and Federal laws and ordinances.

The operator will develop a safety plan for individuals exposed to chemicals, including telephone numbers and addresses of emergency treatment centers and the telephone number for the nearest poison control center.

The National Pesticide Information Center (NPIC) telephone number in Corvallis, Oregon, may also be given for nonemergency information: 1-800-858-7384, Monday to Friday, 6:30 a.m. to 4:30 p.m., Pacific Time. The national Chemical Transportation Emergency Center (CHEMTRAC) telephone number is: 1-800-424-9300.

- Follow label requirements for mixing/loading/storage setbacks from wells, intermittent streams and rivers, natural or impounded ponds and lakes, and reservoirs.
- Post signs, according to label directions and/or Federal, State, Tribal, and local laws, around fields that have been treated. Follow restricted entry intervals.
- Dispose of herbicide and herbicide containers in accordance with label directions and adhere to Federal, State, Tribal, and local regulations.
- Read and follow label directions and maintain appropriate Material Safety Data Sheets (MSDS). MSDS and herbicide labels may be accessed on the Internet at: <http://www.greenbook.net/>.
- Calibrate application equipment according to recommendations before each seasonal use and with each major chemical and site change.
- Replace worn nozzle tips, cracked hoses, and faulty gauges on spray equipment.
- Maintain records of plant management for at least 2 years. Herbicide application records shall be in



accordance with USDA Agricultural Marketing Service's Pesticide Recordkeeping Program and State-specific requirements.

### **Maintenance.**

Success of the practice shall be determined by evaluating regrowth or reoccurrence of target species after sufficient time has passed to monitor the situation and gather reliable data. Length of evaluation periods will depend on the herbaceous weeds species being monitored, proximity of propagules (seeds, plant materials and roots) to the site, transport mode of seeds (wind or animals) and methods and materials used.

Following initial application, some regrowth, re-sprouting, or reoccurrence of herbaceous weeds may be expected. Spot treatment of individual plants or areas needing retreatment should be completed as needed when weed vegetation is most vulnerable to desired treatment procedures.

Review and update the plan periodically to: incorporate new IPM technology, respond to grazing management and complex weed population changes, and avoid the development of weed resistance to herbicide chemicals.

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**NATURAL RESOURCES CONSERVATION SERVICE**  
**CONSERVATION PRACTICE STANDARD**  
**PRESCRIBED BURNING**

(Ac.)

**CODE 33** ☐

**DEFINITION**

Controlled fire applied to a predetermined area.

**PURPOSE**

- Control undesirable vegetation.
- Prepare sites for harvesting, planting or seeding.
- Control plant disease.
- Reduce wildfire hazards.
- Improve wildlife habitat.
- Improve plant production quantity and/or quality.
- Remove slash and debris.
- Enhance seed and seedling production.
- Facilitate distribution of grazing and browsing animals.
- Restore and maintain ecological sites.

**CONDITIONS WHERE PRACTICE APPLIES**

This practice applies on all lands as appropriate.

**CRITERIA**

**General Criteria Applicable to All Purposes**

All prescribed burns shall address the following items:

- Location and description of the burn area.
- Pre-burn vegetation cover.
- Resource management objectives.

- Required weather conditions for prescribed burn.
- Notification check list.
- Pre-burn preparation.
- Equipment checklist/personnel assignments and needs/safety requirements.
- Post burn evaluation criteria.
- Firing sequence.
- Ignition method.
- Approval signatures

The procedure, equipment, and the number of trained personnel shall be adequate to accomplish the intended purposes.

The expected weather conditions, human and vehicular traffic that may be impeded by heat or smoke, liability (e.g., utility lines) and safety and health precautions shall be integrated into the timing, location and expected intensity of the burn.

Timing of burning will be commensurate with soil and site conditions to maintain site productivity and minimize effects on soil erosion and soil properties (structure, soil moisture).

Weather parameters and other data that affect fire behavior should be monitored during the burn. Carbon release should be minimized by the timing and burn intensity.

Consider the location of utilities such as electric power lines and natural gas pipelines to prevent damage to the utility and avoid personal injury.

Smoke impacts must be considered before the burn and should be monitored during the burn.

### **CONSIDERATIONS**

Burning should be managed with consideration for wildlife and pollinator needs such as nesting, feeding and cover.

Existing barriers such as lakes, streams, wetlands, roads and constructed firebreaks are important to the design and layout of this practice.

Notify adjoining landowners, local fire departments and public safety officials as appropriate within the airshed prior to burning.

### **PLANS AND SPECIFICATIONS**

Specifications will be prepared by certified individuals and prepared for each site and recorded using approved specification sheets, job sheets, technical notes, and narrative statements in the conservation plan, or other

acceptable documentation. All necessary permits must be obtained and a burning plan developed before implementation of the practice.

### **OPERATION AND MAINTENANCE**

The kinds and expected variability of site factors (e.g., fuel condition and moisture content, weather conditions, human and vehicular traffic that may be impeded by heat or smoke, liability, and safety and health precautions) shall be monitored during the operation of this practice. Sufficient fire suppression equipment and personnel shall be available commensurate with the expected behavior of these factors during the time of burning to prevent a wildfire or other safety, health or liability incident.

Maintenance shall include monitoring of the burned site and adjacent areas until ash, debris and other consumed material is at pre-burn temperatures.





**Natural Resources Conservation Service**  
**CONSERVATION PRACTICE STANDARD**

**Critical Area Planting**

**Code 342**

**(Ac)**

**DEFINITION**

Establishing permanent vegetation on sites that have, or are expected to have, high erosion rates, and on sites that have physical, chemical, or biological conditions that prevent the establishment of vegetation with normal seeding/planting methods.

**PURPOSE**

- Stabilize areas with existing or expected high rates of soil erosion by wind or water.
- Stabilize stream and channel banks, pond and other shorelines, earthen features of structural conservation practices.
- Stabilize areas such as sand dunes and riparian areas.

**CONDITIONS WHERE PRACTICE APPLIES**

This practice applies to highly disturbed areas such as—

- Active or abandoned mined lands.
- Urban restoration sites.
- Construction areas.
- Conservation practice construction sites.
- Areas needing stabilization before or after natural disasters such as floods, hurricanes, tornados, and wildfires.
- Eroded banks of natural channels, banks of newly constructed channels, and lake shorelines.
- Other areas degraded by human activities or natural events.

**CRITERIA**

**General Criteria Applicable to All Purposes**

**Site preparation.** Conduct a site investigation to identify any physical, chemical, or biological conditions that could affect the successful establishment of vegetation.

Clear areas to be planted of unwanted materials and smooth or shape, if needed, to meet planting purpose(s).

Prepare a suitable seedbed for all seeded species. Rip compacted layers and re-firm the soil prior to seedbed preparation, as needed.

As site conditions dictate, when grading slopes, stockpile topsoil to be redistributed over area to be planted.

**Species selection.** Select species for seeding or planting that are suited to local site conditions and intended uses, and common to the site or location.

Selected species will have the capacity to achieve adequate density and vigor to stabilize the site within an appropriate period.

**Establishment of vegetation.** Plant seeds using the method or methods best suited to site and soil conditions.

Limit sod placement to areas that can naturally supply needed moisture or sites that can be irrigated during the establishment period. Place and anchor sod using techniques to ensure that it remains in place until established.

Specify species, rates of seeding or planting, legume inoculation, minimum quality of planting stock (e.g., pure live seed (PLS) or stem caliper), method of seedbed preparation, and method of establishment before application. Use only viable, high-quality seed or planting stock.

Seed or plant at a time and in a manner that best ensures establishment and growth of the selected species.

Plant during approved times for the species to be used.

Apply soil amendments (e.g., lime, fertilizer, compost) according to the requirements in the local Field Office Technical Guide.

Mulch or otherwise stabilize (e.g., polyacrylamide (PAM)) plantings as necessary to ensure successful establishment.

**Additional Criteria to Stabilize Stream and Channel Banks, Pond and Other Shorelines, Earthen Features of Structural Conservation Practices**

**Bank and channel slopes.** Shape channel side slopes so that they are stable and allow establishment and maintenance of desired vegetation.

A combination of vegetative and structural measures may be necessary on slopes steeper than 3:1 to ensure adequate stability.

**Species selection.** Plant material used for this purpose must—

- Be adapted to the hydrologic zone into which they will be planted.
- Be adapted and proven in the regions in which they will be used.
- Be compatible with existing vegetation in the area.
- Protect the channel banks but not restrict channel capacity.

**Establishment of vegetation.** Specify species, planting rates, spacing, methods and dates of planting based on local planting guides or technical notes.

Identify and protect desirable existing vegetation during practice installation.

Use a combination of vegetative and structural practices with living and inert material when flow velocities, soils, and bank stability preclude stabilization by vegetative establishment alone. Use Conservation Practice Standard (CPS) Streambank Stabilization (Code 580) for the structural measures.

Control existing vegetation on a site that will compete with species to be established vegetatively (e.g., bare-root, containerized, ball-and-burlap, potted) to ensure successful establishment of the planted species.



Plant streambank stabilization vegetation in accordance with the NRCS Engineering Field Handbook Part 650, Chapter 16, "Streambank and Shoreline Protection," and Chapter 18, "Soil Bioengineering for Upland Slope Protection & Erosion Reduction."

**Site protection and access control.** Restrict access to planted areas until fully established.

#### **Additional Criteria to Stabilize Areas Such As Sand Dunes and Riparian Areas**

Plants for sand dunes and coastal sites must be able to survive being buried by blowing sand, sand blasting, salt spray, salt water flooding, drought, heat, and low nutrient supply.

Include sand trapping devices such as sand fences or brush matting in the revegetation/stabilization plans where applicable.

#### **CONSIDERATIONS**

Species or diverse mixes that are adapted to the site and have multiple benefits should be considered. Native species may be used when appropriate for the site.

To benefit pollinators and other wildlife, flowering shrubs and wildflowers with resilient root systems and good soil-holding capacity also should be considered for incorporation as a small percentage of a larger grass-dominated planting. Where appropriate consider a diverse mixture of forbs to support pollinator habitat.

Planning and installation of other CPSs such as Diversion (Code 362), Obstruction Removal (Code 500), Subsurface Drain (Code 606), Underground Outlet (Code 620), or Anionic Polyacrylamide Application (Code 450) may be necessary to prepare the area or ensure vegetative establishment.

Areas of vegetation established with this practice can create habitat for various type of wildlife. Maintenance activities, such as mowing or spraying, can have detrimental effects on certain species. Perform management activities at the times and in a manner that causes the least disruption to wildlife.

#### **PLANS AND SPECIFICATIONS**

Prepare plans and specifications for each field or management unit according to the criteria and operation and maintenance sections of this standard. Record practice specifications using approved Implementation Requirements document.

Address the following elements in the plan, as applicable, to meet the intended purpose(s):

- Practice purpose(s)
- Site preparation
- Topsoil requirements
- Fertilizer application
- Seedbed/planting area preparation
- Timing and method of seeding/planting
- Selection of species
- Seed/plant source
- Seed analysis/pure live seed (PLS)
- Seeding rate/plant spacing
- Mulching, PAM, or other stabilizing materials
- Supplemental water needed for establishment
- Protection of plantings
- Describe successful establishment (e.g., minimum percent ground/canopy cover, percent survival, stand density)

**OPERATION AND MAINTENANCE**

- Control access to the area to ensure the site remains stable.
- Protect plantings shall be protected from pests (e.g., weeds, insects, diseases, livestock, or wildlife) as necessary to ensure long-term survival.
- Inspections, reseeding or replanting, and fertilization may be needed to ensure that this practice functions as intended throughout its expected life.
- Observe establishment progress and success at regular intervals until the practice has met the criteria for successful establishment and implementation.
- Description of successful establishment (e.g., minimum percent ground/canopy cover, percent survival, stand density).

**REFERENCES**

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## **NATURAL RESOURCES CONSERVATION SERVICE CONSERVATION PRACTICE STANDARD**

### **FIREBREAK**

(Ft.)

**CODE 394**

#### **DEFINITION**

A permanent or temporary strip of bare or vegetated land planned to retard fire.

#### **PURPOSE**

- Reduce the spread of wildfire.
- Contain prescribed burns.

#### **CONDITIONS WHERE PRACTICE APPLIES**

This practice applies on all land uses where protection from wildfire is needed or prescribed burning is applied.

#### **CRITERIA**

##### **General Criteria Applicable to All Purposes**

Firebreaks may be temporary or permanent and shall consist of fire-resistant vegetation, non-flammable materials, bare ground, or a combination of these.

Firebreaks will be of sufficient width and length to contain the expected fire.

Firebreaks shall be located to minimize risk to the resources being protected.

Erosion control measures shall be installed to prevent sediment from leaving the site.

Plant species selected for vegetated firebreaks will be noninvasive and capable of retarding fire.

#### **CONSIDERATIONS**

Use barriers such as streams, lakes, ponds, rock cliffs, roads, field borders, skid trails, landings, drainage canals, railroads, utility right-of-ways, cultivated land, or other areas as existing firebreaks. Electric lines can be hazardous in heavy smoke as they may conduct electricity.

When using barriers consider the effects on wildlife and fisheries.

Attempt to locate firebreaks near ridge crests and valley bottoms.

If winds are predictable, firebreaks should be located perpendicular to the wind and on the windward side of the area to be protected.

Consider using diverse species combinations which best meet locally native wildlife and pollinator needs.

Locate on the contour where practicable to minimize risk of soil erosion.

Design and layout should include multiple uses.

Consider the beneficial and other effects of installation of the firebreak on cultural resources and threatened and endangered species, natural areas, riparian areas and wetlands.

#### **PLANS AND SPECIFICATIONS**

Specifications for applying this practice shall be prepared for each site and recorded using approved specification sheets, job sheets,

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technical notes, and narrative statements in the conservation plan and the burn plan, or other acceptable documentation.

#### **OPERATION AND MAINTENANCE**

Mow, disk, or graze vegetative firebreaks to avoid a build-up of excess litter and to control weeds. Treatment should be timed to reduce impacts to nesting when possible.

Inspect all firebreaks for woody materials such as dead limbs or blown down trees and remove them from the firebreak.

Inspect firebreaks at least annually and rework bare ground firebreaks as necessary to keep them clear of flammable vegetation.

Repair erosion control measures as necessary to ensure proper function.

Access by vehicles or people will be controlled to prevent damage.

Bare ground firebreaks, which are no longer needed, will be stabilize.



**NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE STANDARD**

**TREE □ SHRUB SITE PREPARATION**

(Ac.)

**CODE 49 □**

**DEFINITION**

Treatment of areas to improve site conditions for establishing trees and/or shrubs.

**PURPOSE**

- Encourage natural regeneration of desirable woody plants.
- Permit artificial establishment of woody plants.

**CONDITIONS WHERE PRACTICE APPLIES**

On all lands needing treatment to establish trees and/or shrubs.

**CRITERIA**

**General Criteria Applicable to All Purposes**

The method, intensity and timing of site preparation will match the limitations of the site, equipment, and the requirements for establishing the desired woody species.

An appropriate site preparation method will be chosen to achieve the intended purpose and to protect desirable vegetation, site and soil conditions. Other complementary practices and measures will be used as necessary to control erosion, runoff, compaction and displacement to acceptable levels.

Slash and debris shall be removed, treated or eliminated as appropriate. Refer to the standard Slash Treatment, 384.

Remaining slash and debris shall not create habitat for or harbor harmful levels of pests.

Remaining slash and debris shall not hinder needed equipment operations or create an undue fire hazard. Refer to the standard Prescribed Burning, 338, for slash and debris that will be burned.

Measures, including the use of equipment, will be implemented to control or protect against locally invasive and noxious species that may arise from site preparation activities. If pesticides are used, refer to the standard Pest Management, 595.

**CONSIDERATIONS**

Impacts on wildlife species, habitat and aesthetics should be considered when selecting site preparation methods.

Particulates, smoke, and other air pollutants generated by site preparation may have on-site and off-site effects on air quality.

NRCS, Georgia

October 2017

<p>Conservation practice standards are reviewed periodically and updated if needed. To obtain the current version of this standard, contact your Natural Resources Conservation Service <a href="#">State Office</a> or visit the <a href="#">electronic Field Office Technical Guide</a>.</p>
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## **PLANS AND SPECIFICATIONS**

Specifications for applying this practice and protection of the site shall be prepared and recorded using approved specification sheets, job sheets, technical notes and narrative statements in the conservation plan or other acceptable documentation.

## **OPERATION AND MAINTENANCE**

Maintain erosion control measures as necessary.

Control locally invasive and noxious plants as necessary. If pesticides are used, refer to the standard Pest Management, 595.

Access by vehicles or equipment during or after site preparation shall be controlled to minimize erosion, compaction and other site impacts. Refer to the standard Use Exclusion, 472.



## NATURAL RESOURCES CONSERVATION SERVICE CONSERVATION PRACTICE STANDARD

### ACCESS ROAD

(Ft.)

CODE 5 ☐ ☐

#### DEFINITION

An access road is an established route for equipment and vehicles.

#### PURPOSE

An access road is used to provide a fixed route for vehicular travel for resource activities involving the management of timber, livestock, agriculture, wildlife habitat, and other conservation enterprises.

#### CONDITIONS WHERE PRACTICE APPLIES

This practice applies where access is needed from a private or public road or highway to a land use enterprise or conservation measure, or where access is needed in a planned land use area.

Access roads range from single purpose, seasonal use roads, designed for low speed and rough driving conditions, to all-purpose, all-weather roads. Single purpose roads provide access to areas such as forest fire lines, forest management activities, remote recreation areas, or for maintenance of facilities.

This practice does not apply to temporary or infrequently used trails used for logging. Use NRCS Conservation Practice Standard (CPS) *Forest Trails and Landings* (Code 655). Trails and walkways used for animals, pedestrians, or off-road vehicles are addressed in NRCS CPS *Trails and Walkways* (Code 575).

#### CRITERIA

##### Legal Criteria

**Federal, State and Local Laws.** All planned activities shall comply with all federal, state, and local laws and regulations. All permits shall be obtained before starting construction.

**Cultural Resources.** Ground disturbing activities have the potential to affect significant cultural resources. Complete a cultural resources review prior to ground disturbing activities to assure that existing cultural resources will not be adversely impacted.

Design the access road to serve the enterprise or planned use with the expected vehicular or equipment traffic. Factors in the design include the type of vehicle or equipment and the speed, loads, soils, climate, and other conditions under which vehicles and equipment are expected to operate.

**Location.** Locate the access road to serve the purpose intended, to facilitate the control and disposal of surface and subsurface water, to control or reduce erosion, and to make the best use of topographic features. Design the layout of the road to follow natural contours and slopes to minimize disturbance of drainage patterns. Locate the access road where it can be maintained and where water management problems are not created. To reduce potential pollution, position the road as far as possible from water bodies and watercourses. To the extent possible, do not impede overland flow.

**Alignment.** Adapt the gradient and horizontal alignment to the intensity of use, the mode of travel, the type of equipment and load weights, and the level of development.

Grades normally should not exceed 10 percent except for short lengths. A maximum grade of 15 percent should only be exceeded if necessary for special uses such as field access roads or fire protection roads.

Conservation practice standards are reviewed periodically and updated if needed. To obtain the current version of this standard, contact your Natural Resources Conservation Service [State Office](#) or visit the [Field Office Technical Guide](#).

**NRCS, Georgia**

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**Width.** The minimum width of the roadbed for an all-purpose road is 14 feet for one-way traffic and 20 feet for two-way traffic. The roadbed width includes a tread-width of 10 feet for one-way traffic or 16 feet for two-way traffic and 2 feet of shoulder width on each side. Increase the two-way traffic width by a minimum of 4 feet for trailer traffic. Single purpose roads will have a minimum width of 10 feet with greater widths at curves and turnouts. Use vegetation or other measures to protect the shoulders from erosion.

Use turnouts on single lane roads where vehicles travel in both directions on a limited basis. Design the turnout to accommodate the anticipated vehicle use.

Provide a turnaround at the end of dead end roads. Size the turnaround for the anticipated vehicle type that will be using the road.

Provide parking space as needed to keep vehicles from parking on the shoulder or other undesirable locations.

**Side Slopes.** Design all cuts and fills to have stable slopes that are a minimum of 2 horizontal to 1 vertical. For short lengths, rock areas, or very steep hillsides, steeper slopes may be permitted if soil conditions warrant and special stabilization measures are installed.

Where possible, avoid areas with geological conditions and soils that are subject to slides. When the area cannot be avoided, treat the area to prevent slides.

**Drainage.** The type of drainage structures used will depend on the intended use and runoff conditions. Provide a culvert, bridge, ford, or surface cross drain for water management at every natural drainage way. The capacity and design of the drainage feature must be consistent with sound engineering principles and must be adequate for the class of vehicle, road type, land use in the watershed, and intensity of use.

When a culvert or bridge is installed in a drainage way, it must have a minimum capacity that is sufficient to convey the design storm runoff without causing erosion or road overtopping. Table 1 lists minimum design storm frequencies for various road types.

Table 1

Road Intensity □ Usage	Storm Frequency
(Forest Access Roads, Farm Field Access Roads) Intermittent; single purpose or farm use	2 year - 24 Hour
(Farm Driveways, Recreation Facility Access Roads) Frequent; farm headquarters, livestock access, isolated recreation areas	10 year - 24 Hour
(Public Access Roads, Camp grounds, etc.) High intensity; residential or public access	25 year - 24 Hour

Use NRCS CPS *Stream Crossing (Code 578)* to design stream crossings.

An erosion-resistant low point or overflow area may be constructed across the access road to supplement the culvert capacity on non-public use roads.

Surface cross drains, such as broad-based or rolling dips, may be used to control and direct water flow off the road surface on low-intensity use forest, ranch or similar roads. Protect the outlets of drainage measures to limit erosion. On steep grades where water could run down the road, use a broad-based dip or other similar feature to divert runoff. The surface cross drain must be constructed of materials that are compatible with the use and maintenance of the road surface. The discharge area for a surface cross drain must be well-vegetated or have other erosion resistant materials. See Figure 1 -Recommended



Spacing of Surface Cross Drains Based on Soil Type. Reduce separation distances as needed to account for local hydrologic conditions.

Crown the road surface to direct precipitation off of the road.

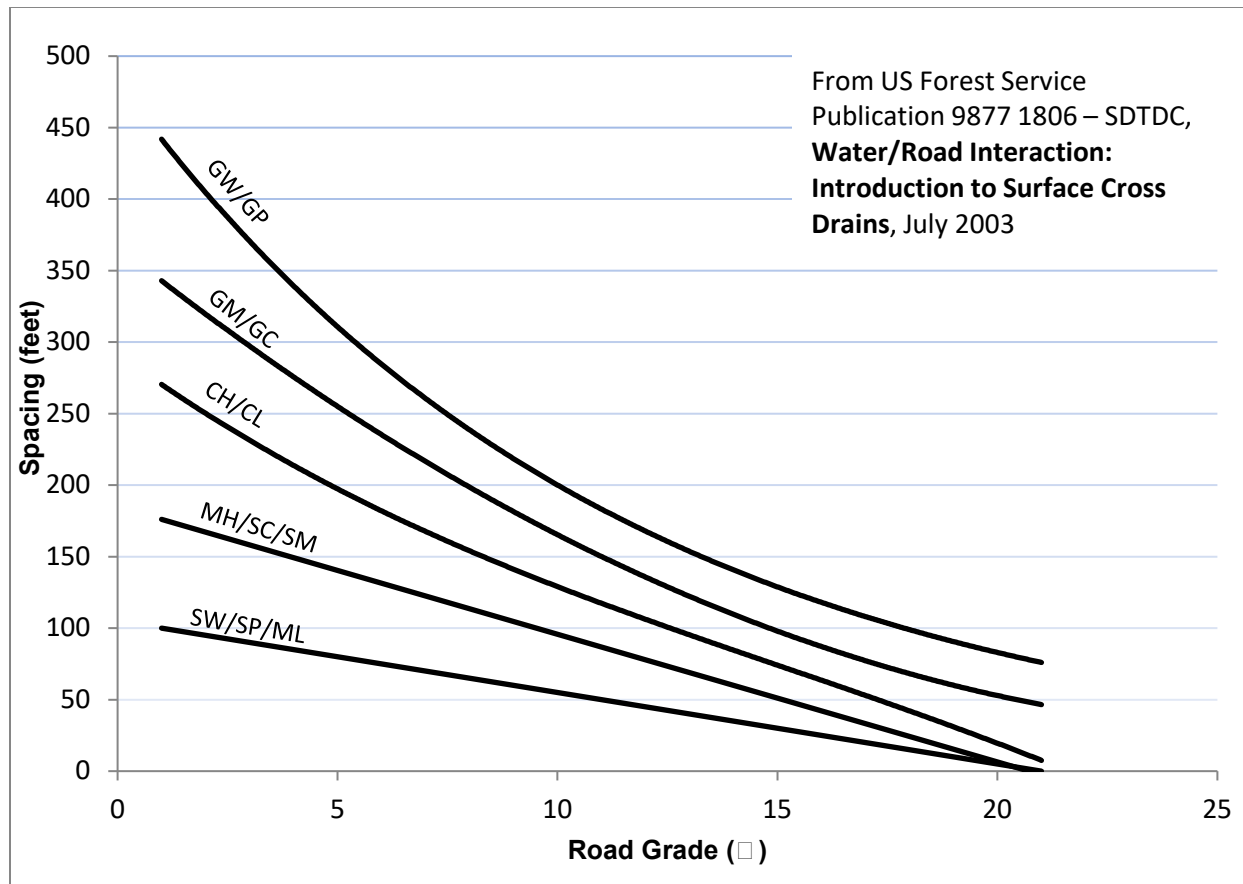
Provide ditches, as needed, to move water away from the road. Maintain unobstructed flow into the ditches to prevent flows from causing roadside erosion. The capacity of a roadside ditch must be adequate to carry the drainage from the road surface. Design ditch channels to have stable grades and side slopes. Provide a stable outlet for the ditch. Protection may include riprap or other similar materials. Use NRCS CPSs such as *Structure for Water Control (Code 587)*; *Lined Waterway or Outlet (Code 468)*; or *Grade Stabilization Structure (Code 410)*, if needed.

**Surfacing.** Install a wearing course or surface treatment on the access road if required by traffic needs, soil, climate, erosion control, particulate matter emission control, or other site condition. If none of these factors apply, no special treatment of the surface is required.

When a treatment is used, the type of treatment will depend on local conditions, available materials, and the existing road base. On roads made of soils with weak bearing capacity, such as silts, organics, and clays, or where it is necessary to separate the surfacing material from the foundation material, place a geotextile material specifically designed for road stabilization applications under the surface treatment. Use the criteria in NRCS CPS *Heavy Use Area Protection (Code 561)* to design the surface treatment. Do not use toxic and acid-forming materials to build the road.

If dust control is needed, use NRCS CPS *Dust Control on Unpaved Roads and Surfaces (Code 373)*.

Figure 1. Recommended Spacing of Surface Cross Drains Based on Soil Types



**Safety.** Provide passing lanes, turnouts, guardrails, signs, and other facilities as needed for safe traffic flow. Design an intersection to a public highway to meet applicable federal, state and local criteria.

**Erosion Control.** Use the criteria in NRCS CPS *Critical Area Planting (Code 342)* or the NRCS State-approved seeding specification to vegetate road banks and disturbed areas as soon soil and climatic conditions are favorable. If permanent vegetation cannot be established in a timely manner, use appropriate temporary measures to control erosion. If the use of vegetation is precluded and protection against erosion is needed, use the criteria in NRCS CPS *Mulching (Code 484)* to provide surface protection.

During and after construction, use erosion and sediment control measures to minimize off-site damages.

## CONSIDERATIONS

Consider visual resources and environmental values during planning and design of the road system.

Limiting the number of vehicles and vehicle speed will reduce the potential for generation of particulate matter and decrease safety and air quality concerns.

Consider using additional conservation practices to reduce the potential for generation and transport of particulate matter emissions such as NRCS CPSs *Dust Control on Unpaved Roads and Surfaces (Code 373)* or *Windbreak/Shelterbelt Establishment (Code 380)*.

During adverse weather, some roads may become unsafe or may be damaged by use. Consider restricting access to the road at that time.

Consideration should be given to the following:

- Effects on downstream flows, wetlands or aquifers that would affect other water uses or users.

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- Effects on wildlife habitats that would be associated with the practice.
- Utilizing buffers where possible to protect surface water.
- Short-term and construction-related effects of this practice.

## PLANS AND SPECIFICATIONS

Provide plans and specifications that describe the requirements for applying the practice to achieve its intended purpose. As a minimum, include:

- A plan view of the proposed road that shows water features, known utilities, and other features that affect the design.
- Road width and length with profile and typical cross section(s) including turnouts, parking, and turnarounds.
- Design road grades or maximum grades when applicable.
- Soils investigation. Location of soil borings and plot of the soil/geologic boring showing the USCS, as needed
- Type and thickness of surface treatment including any subbase preparation.
- Grading plan.
- Cut and fill slopes where applicable.
- Planned drainage features.
- Location, size, type, length and invert elevations of all required water control structures.
- Vegetative requirements that include vegetation materials to be used, establishment rates, and season of planting.
- Erosion and sediment control measures, as needed.
- Safety features.
- Construction and material specifications.

## OPERATION AND MAINTENANCE

Prepare a written Operation and Maintenance Plan for the access road. As a minimum, include the following activities:

- Inspect culverts, roadside ditches, water bars and outlets after each major runoff event and restore flow capacity as needed. Ensure proper cross section is available and outlets are stable.
- Maintain vegetated areas in adequate cover to meet the intended purpose(s).
- Fill low areas in travel treads and re-grade, as needed, to maintain road cross section. Repair or replace surfacing materials as needed.
- Selection of chemical treatment(s) for surface treatment or snow/ice removal, as needed. Select the chemicals used for surface treatment or snow and ice removal to minimize adverse effects on stabilizing vegetation.
- Selection of dust control measures, as needed.

## REFERENCES

United States Forest Service. July 2003. *Water/Road Interaction: Introduction to Surface Cross Drains* (Publication 9877 1806 – SDTDC).





**Natural Resources Conservation Service**  
**CONSERVATION PRACTICE STANDARD**  
**STREAM CROSSING**

**Code 5□□**

**(No.)**

**DEFINITION**

A stabilized area or structure constructed across a stream to provide controlled access for people, livestock, equipment, or vehicles.

**PURPOSE**

This practice is applied to—

- Improve water quality by reducing sediment, nutrient, or organic loading to a stream.
- Reduce streambank and streambed erosion.

**CONDITIONS WHERE PRACTICE APPLIES**

This practice applies to all land uses where—

- An intermittent or perennial watercourse (stream) exists.
- Controlled access from one side of the stream to the other side is necessary to reduce or eliminate environmental degradation.
- Soils, geology, fluvial geomorphology, and topography are suitable for construction of a stream crossing.

**CRITERIA**

**General Criteria Applicable to All Stream Crossings**

Apply this standard in accordance with all Federal, State, Tribal, and local regulations, including floodplain regulations, and flowage easements.

Identify significant cultural resources or threatened or endangered species that could be affected by the implementation of the practice.

The landowner/contractor is responsible for locating all buried utilities in the project area, including drainage tile and other structural measures.

Do not create a passage barrier where aquatic species are present and using the stream.

**Location.** Locate the stream crossing in an area where the streambed is stable or where the streambed can be stabilized (see NRCS Conservation Practice Standard (CPS) Channel Bed Stabilization (Code 584); and Title 210, National Engineering Handbook (NEH) Part 650, Chapter 16, "Streambank and Shoreline Protection"). Do not place a crossing where the channel grade or alignment changes abruptly,

excessive seepage or instability is evident, overfalls exist (evidence of incision and bed instability), where large tributaries enter the stream, or within 300 feet of known spawning areas of listed species.

Install the stream crossing perpendicular to the direction of stream flow where possible. Consider potential future lateral migration of the stream in developing the design.

Avoid the use of or minimize the number of stream crossings through evaluation of alternative trail or travel-way locations, and land user operations. Where feasible, use existing roads. Discourage livestock loafing in the stream by locating crossings, where possible, out of shady riparian areas or by including gates in the design.

**Access road crossings.** Where the stream crossing is installed as part of an access road, design the crossing in accordance with CPS Access Road (Code 560) and Title 210, National Engineering Manual (NEM), Part 536 "Structural Engineering."

**Width.** Provide an adequate travel-way width for the intended use. Make a "livestock-only" crossing no less than 6 feet wide and no more than 20 feet wide, as measured from the upstream end to the downstream end of the stream crossing, not including the side slopes.

**Side slopes.** Make all side slope cuts and fills stable for the channel materials involved. Make the side slopes of cuts or fills in soil materials no steeper than 2 horizontal to 1 vertical (2:1). Make rock cuts or fills no steeper than 1.5 horizontal to 1 vertical (1.5:1).

**Stream approaches.** Where possible, blend approaches to the stream crossing with existing site topography. Use streambank soil bioengineering practices and other streambank stabilization measures such as CPS Streambank and Shoreline Protection (Code 580) as appropriate and feasible. Design stable approaches, with gradual ascent and descent grades that are no steeper than 5 horizontal to 1 vertical (5:1). Construct approaches with suitable material to withstand repeated and long-term use. Design the minimum width of the approaches equal to the width of the crossing surface.

Divert surface runoff around the approaches to prevent erosion. Use CPSs Diversion (Code 362), Structure for Water Control (Code 587), Lined Waterway or Outlet (Code 468), or Grade Stabilization Structure (Code 410) as needed.

**Rock.** Use only rock that is sound, durable, and able to withstand exposure to air, water, and freezing and thawing. Use rock of sufficient size and density to resist mobilization by design flood flows. Use appropriate rock sizes that will accommodate the intended traffic without causing injury to livestock or people, or damage to vehicles using the crossing. For a rock livestock crossing, use a hoof contact zone or alternative surfacing method over the rock.

**Fencing.** Exclude livestock access to the crossing using fence and gates, as needed. Install cross-stream fencing at fords, with breakaway wire, swinging floodgates, hanging electrified chain, or other devices to allow the passage of floodwater and large woody material during high flows. Design and construct all fencing in accordance with CPS Fence (Code 382).

**Vegetation.** As soon as practical after construction, vegetate highly disturbed areas in accordance with CPS Critical Area Planting (Code 342). In areas where the vegetation may not survive, use CPS Heavy Use Area Protection (Code 561).

#### **Criteria Applicable to Bridge Crossings**

Design the bridge in a manner that is consistent with sound engineering principles and adequate for its intended use. Refer to 210-NEM, Part 536.

Design the bridge to fully span the stream, passing at least the bank-full flow where the design flow is not dictated by regulations. At design flow capacity, the structure must convey stream flow, sediment, and other materials without appreciably altering stream flow characteristics and pass the design flow without causing erosion or overtopping of the structure.

For all bridge crossings, perform a geologic subsurface investigation that is in sufficient detail and analysis to support the design. Describe the soil material observed, subgrade conditions, bearing capacity, and depth to bedrock; and any geologic conditions or hazards that needs to be addressed in the design, construction, or operation of the bridge Refer to 210- NEM, Part 531, "Geology."

Adequately protect the bridge so that flows exceeding the bridge's flow capacity can safely bypass without damaging the bridge or eroding the streambanks.

Follow requirements in 210-NEM, Part 536 on acceptable bridge materials and necessary safety measures.

#### **Criteria Applicable to Culvert Crossings**

Design the culvert in a manner that is consistent with sound engineering principles and adequate for its intended use.

If the culvert is not associated with a road crossing, design the culvert to have sufficient capacity to pass at least the bank-full flow or the 2-year, 24-hour storm flow, whichever is greater, without appreciably altering stream flow characteristics. Adequately protect the culvert crossing so that flows in excess of culvert capacity can safely bypass the structure without damaging it, or eroding the streambanks or crossing fill material. Do not use culverts in locations where large flows of sediment or large woody material are expected, or where the channel gradient exceeds 6 percent (100 horizontal to 6 vertical).

At least one culvert pipe must be placed with its entire length set 6 inches below the existing stream bottom. Additional culverts may be used at various elevations to maintain terrace or floodplain hydraulics and water surface elevations. The length of the culvert system must be adequate to extend the full width of the crossing, including side slopes, and inlet or outlet extensions.

Acceptable culvert materials include concrete, corrugated metal, corrugated plastic, new or used high quality steel, and any other materials that meet requirements of CPS Pond (Code DM-NAG1 378). Evaluate the need for safety measures such as guardrails at the culvert crossing.

#### **Additional Criteria Applicable to Perennial Stream Culvert Crossings**

The width of the base flow culvert(s) shall be equal to the bank-full flow or the 2 year, 24-hour storm flow, whichever is greater. The culvert(s) shall not permanently widen/constrict the channel or reduce/increase the stream depth.

Multiple culverts may not be used to receive base flows.

Bank-full flows shall be accommodated through maintenance of the existing bank-full cross sectional area.

The upstream and downstream invert of culverts (except bottomless culverts) installed on perennial streams will be buried/embedded to a depth of 20% of the culvert height to allow for natural substrate to colonize the structure's bottom and encourage aquatic organism movement.

Culvert slope shall be consistent with average stream segment slope, but shall not exceed 4 percent.



Culverts shall be of adequate size to accommodate flooding and sheet flow in a manner that does not cause flooding of associated uplands or disruption of hydrologic characteristics that support aquatic sites upstream or downstream of the culvert.

Where adjacent floodplain is available, flows exceeding bank-full shall be accommodated by installing an equalizer culvert at the floodplain elevation.

#### **Criteria Applicable to Ford Crossings**

Ford crossings have the least detrimental impact on water quality when their use is infrequent. Ford crossings are adapted for crossing wide, shallow watercourses with firm streambeds. Do not place ford crossings immediately downstream from a pipe or culvert because of potential damage from localized high-velocity flows. Use a culvert crossing or curbed bridge if the stream crossing is to have frequent or daily use, such as in a dairy operation.

Ensure that the cross-sectional area of the crossing is equal to or greater than the natural channel cross-sectional area. To the extent possible, design the top surface of the ford crossing to follow contours of the streambed. Slope the crossing toward the center of stream to provide a thalweg (low-flow) channel. Where possible, recess the subgrade of the stream crossing so that the constructed surface of the crossing is at or below the original surface of the streambed. Never construct the top surface of the ford crossing to be higher than 0.5 feet above the original streambed at the upstream edge.

Where possible, design the downstream edge of the ford crossing to be at exactly the same elevation as the original streambed. Never install the downstream edge with a low-flow hydraulic drop greater than 0.5 feet above the original stream bottom. Provide cutoff walls at the upstream and downstream edges of the ford when needed to protect against undercutting.

Evaluate the need for water depth signage.

**Concrete fords.** Use a concrete ford crossing only where the foundation of the stream crossing has adequate bearing strength. Perform a subsurface investigation that is in sufficient detail and analysis to support the design. Describe the soil material observed, subgrade conditions, bearing capacity, and depth to bedrock. Refer to 210- NEM, Part 531, Subpart B, "Engineering Geology."

Use a minimum thickness of 5 inches of placed concrete. Construct the concrete slab on a minimum 4-inch-thick gravel base, unless the foundation is otherwise acceptable. Refer to 210- NEM, Part 536 for design criteria.

Dewatering of the site and toe walls is required during placement of the concrete to lessen the potential for segregation and to maintain the proper water/cement ratio. Flowing water will erode concrete that is not sufficiently hardened. The stream must be diverted or retained from flowing over the concrete until the concrete makes its final set, and a minimum of 12 hours after placement of the concrete.

Construct toe walls at the upstream and downstream ends of the crossing. Make the toe walls a minimum of 6 inches thick and 18 inches deep. Extend the toe walls in the stream approaches to the bank-full flow elevation.

**Rock fords and the use of geosynthetic materials.** In steep areas subject to flash flooding and where normal flow is shallow or intermittent, use coarse aggregate or crushed rock at ford crossings. When the site has a soft or unstable subgrade, use geotextiles to improve the foundation bearing capacity in the design of rock ford crossings. Select geotextile material for separation and stabilization according to American Association of State Highway and Transportation Officials (AASHTO) M-288.

**Table 1 Geotextile Requirements**

PROPERTY	TEST METHOD	MINIMUM REQUIREMENT
Grab Tensile Strength	Grab Test – ASTM D 4632	180 lbs
Mullen Bursting Strength	Diaphragm Test – ASTM D 3786	320 psi
CBR Puncture Resistance	ASTM D 6241	433 lbs

Dewater and excavate the bed of the channel to the necessary depth and width and cover with geotextile material. Install the geotextile material to extend across the bottom of the stream and, at least, up the side slopes to at least the bank-full flow elevation.

Use durable geosynthetic materials and install them according to the manufacturer's recommendations, including the use of staples, clips, and anchor pins. Cover the geotextile material with at least 6 inches of crushed rock. Use minimum 6-inch-deep geocells if geocells are installed.

Design the rock ford stream crossing to remain stable for the bank-full design flow. Minimum design flow 2 year 24 hour storm event. Compute channel velocities and choose rock size using procedures and guidelines set forth in the appropriate section in 210-NEH, Part 630, "Hydrology;" 210-NEH, Part 654, Technical Supplement (TS) 14N "Fish Passage and Screening Design;" and 210-NEH 650, Chapter 16, Appendix 16A, "Size Determination for Rock Riprap," or other procedures approved by the State conservation engineer.

## CONSIDERATIONS

For culvert crossings, consider incorporating natural streambed substrates throughout the culvert length for passage of aquatic organisms. See Bunte and Abt, (2001) for sampling procedures. Natural streambeds provide passage and habitat benefits to many life stage requirements for aquatic organisms and may reduce maintenance costs.

Consider including a well-graded rock riprap apron on the downstream edge of concrete crossings to dissipate flow energy.

Consider all life stages of aquatic organisms in the stream crossing design to accommodate their passage, in accordance with the species' requirements. NRCS aquatic organism passage standards can be found in CPS Aquatic Organism Passage (Code 396). Design criteria are available in 210-NEH, Part 654, TS 14N; Clarkin, Keller, et.al, (2006); and Forest Service stream simulation guidance (USFS, 2008). Also, see Harrelson, et al. (1994), for stream reference site descriptions. Consider the habitat requirements of other aquatic or terrestrial species that may be affected by construction of a stream crossing. For example, a crossing may be designed with features that also promote safe crossing by terrestrial vertebrates.

For concrete fords, consider using precast concrete panels in lieu of cast-in-place concrete slabs. To the extent possible, the panels must follow the contours of the streambed in order to avoid potential problems with sediment accumulation. As with the poured-in-place concrete, install a gravel base and toe walls.

Locate stream crossings to avoid adverse environmental impacts and consider—

- Using the "riffle" section of the stream for the proposed crossing, for it is frequently one of the most stable sections of a stream. When riffles are not present, consider using a stable straight reach.
- Effects on upstream and downstream flow conditions that could result in increases in erosion, deposition, or flooding. Consider habitat upstream and downstream of the crossing to avoid fragmentation of aquatic and riparian habitats.
- Short-term and construction-related effects on water quality.

- Overall effect on erosion and sedimentation that will be caused by the installation of the crossing and any necessary stream diversion.
- Effects of large woody material on the operation and overall design of the crossing.

## PLANS AND SPECIFICATIONS

Prepare plans and specifications for stream crossings in accordance with this standard. Clearly describe the requirements for applying the practice to achieve its intended purpose in the plans and specifications must as a minimum, include the following in plans and specifications:

- Location of stream crossing.
- Stream crossing width and length with profile and typical cross sections.
- Thickness, gradation, quantities, and type of rock or stone.
- Type, dimensions, and anchoring requirements of geotextile.
- Thickness, compressive strength, reinforcement, and other special requirements for concrete, if used.
- Applicable structural details of all components, including reinforcing steel, type of materials, thickness, anchorage requirements, lift thickness, covering.
- Load limits for bridges and culverts.
- Vegetative requirements that include seed and plant materials to be used, establishment rates, and season of planting.
- Location, type, and extent of fencing required.
- Method of surface water diversion and dewatering during construction or a statement making the contractor responsible for selecting such.
- Location of utilities and notification requirements.
- Additional site-specific considerations.

## OPERATION AND MAINTENANCE

Develop an operation and maintenance plan and implement it for the life of the practice.

Include the following items in the operation and maintenance plan, as a minimum:

- Inspect the stream crossing, appurtenances, and associated fence at least annually and after each major storm event. Make repairs, if needed.
- Remove any accumulation of organic material, woody material, or excess sediment.
- Replace surfacing stone used for livestock crossing as needed.

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**Natural Resources Conservation Service**  
**CONSERVATION PRACTICE STANDARD**  
**TREE □ SHRUB ESTABLISHMENT**

**Code □12**

**(Ac)**

**DEFINITION**

Establishing woody plants by planting seedlings or cuttings, by direct seeding, and/or through natural regeneration.

**PURPOSE**

Establish woody plants to—

- Maintain or improve desirable plant diversity, productivity, and health by establishing woody plants.
- Create or improve habitat for desired wildlife species compatible with ecological characteristics of the site.
- Control erosion.
- Improve water quality. Reduce excess nutrients and other pollutants in runoff and groundwater.
- Sequester and store carbon.
- Restore or maintain native plant communities.
- Develop renewable energy systems.
- Conserve energy.
- Provide for beneficial organisms and pollinators.

**CONDITIONS WHERE PRACTICE APPLIES**

Tree/shrub establishment can be applied on any site capable of growing woody plants.

**CRITERIA**

**General Criteria Applicable to All Purposes**

Select one or more species that are suited to soil and site conditions, and appropriate for the planned purpose(s).

Determine desired stocking levels for trees and/or shrubs based on ecological characteristics of the site and species, and landowner objectives. Plant, seed, and/or naturally regenerate at densities/rates that reflect anticipated seedling mortality, to achieve desired stocking levels in the established stand.

Use NRCS Conservation Practice Standard (CPS) Tree/Shrub Site Preparation (Code 490) to prepare sites for planting, seeding, or natural regeneration, if conditions are not suitable for establishing the desired plants.

When utilizing natural regeneration to establish trees and/or shrubs, ensure that a source of seed and/or vegetative propagules is or will be present, or that advanced reproduction exists, sufficient to achieve

objectives. Where natural regeneration relies on seed sources, apply any needed stand treatments and/or site preparation at appropriate times to facilitate germination and establishment of seeds from desired species. Modify forest stand conditions as needed, using CPS Forest Stand Improvement (Code 666), to create favorable stand structure for initiating natural regeneration. Use NRCS CPSs Prescribed Burning (Code 338), Brush Management (Code 314), and/or Herbaceous Weed Control (Code 315), as needed, to obtain the desired species composition, density, and arrangement of trees/shrubs in naturally regenerated areas. Implement coppice regeneration (originating from root shoots or stump sprouts) based on suitability of tree species, age, diameter, and site conditions. Determine the correct timing for coppice regeneration based on species characteristics.

Use tree/shrub planting to accomplish or supplement forest stand regeneration in locations where natural regeneration of desired species is not possible, or will not meet objectives.

Select only viable, high-quality, and adapted plant materials. Select planting stock that conforms to established seed transfer protocols within the State, and complies with minimum standards accepted by the American National Standards Institute (ANSI). Do not plant any species on the Federal or State invasive species or noxious weed lists.

Choose appropriate planting dates and handling methods to increase rates of survival. Select planting techniques and timing appropriate for soil and site conditions.

Alter species selection and/or timing of planting/seeding to minimize potential effects of residual chemical carryover, as needed.

Evaluate the site to determine if mulching, supplemental water or other cultural treatments (e.g., tree protection devices, shade cards, brush mats, etc.) are needed to assure adequate survival and establishment. Minimize the need for supplemental water and/or nutrients by choosing site-adapted plant materials, planting methods, and planting seasons. Where supplemental moisture is needed to achieve tree/shrub establishment use NRCS CPS Irrigation System, Microirrigation (Code 441).

Protect tree and shrub plantings, seeded areas, and naturally regenerated areas, from unacceptable adverse impacts of pests, wildlife, livestock, and/or fire. Protect from pests, as necessary, by applying integrated pest management techniques for pest prevention, avoidance, monitoring, and suppression.

Removal of products (e.g., trees, biomass, medicinal herbs, nuts, fruits, etc.) is allowed, provided that conservation purpose(s) are not compromised by the loss of vegetation or by harvesting disturbance.

#### **Additional Criteria for Reducing Nutrients and Pollutants**

When plantings are used to remove excess nutrients from runoff or groundwater, select species that have fast-growth characteristics, extensive root systems, and a high-nutrient uptake capacity. Trees and shrubs used to reduce pollutants must be tolerant of the types of pollutants contained in effluent or soils at the site.

#### **Additional Criteria for Restoring or Maintaining Native Plant Communities**

Species selected for planting, or those favored in natural regeneration, will be native to the site and will create a successional state that progresses toward the identified target plant community.

#### **Additional Criteria for Sequestering and Storing Carbon**

For shorter term, rapid carbon sequestration, select species that have high-growth rates, recognizing that they are typically short-lived. For longer term storage of carbon, select plants with a long life span, the ability to reach a large size, high-wood density, and potential for use in long-lived products. Establish and maintain a fully stocked stand.



**Additional Criteria for Developing Renewable Energy Systems**

Select plants that can provide adequate types and amounts of plant biomass to supply identified bioenergy needs.

Manage the intensity and frequency of energy biomass removals to prevent long-term negative impacts to the site.

Harvest biomass for energy in a manner that will not compromise other intended purpose(s) and functions of the site.

**Additional Criteria to Conserve Energy**

Increase energy efficiency by planting trees to provide shade for buildings.

Select plants with a potential height growth that will be taller than the structure or facility being protected.

Use proper plant densities to optimize the shade produced.

Design tree and shrub plantings to avoid damage to structures, and to allow adequate space for maintenance access to walls and windows. Plant at a distance that is greater than mature crown spread, and select species that develop deep root systems.

To protect structures from heat loss due to wind, use NRCS CPS Windbreak Establishment (Code 380).

**Additional Criteria for Habitat for Beneficial Organisms**

Plant trees and shrubs that provide habitat and food sources for beneficial organisms, such as pollinators, predatory and parasitic insects, spiders, insectivorous birds and bats, raptors, and terrestrial rodent predators. Select plant species that meet dietary, nesting, and cover requirements for the intended beneficial organisms during the critical period for control of target pests and, if possible, for the entire year.

Protect beneficial organisms from harmful pesticides.

**CONSIDERATIONS**

Consider utilizing plant materials that have been selected and tested in the Plant Materials Program or in similar tree/shrub improvement programs.

Consider using diverse tree and shrub species combinations which best meet the needs of desired wildlife and pollinator species.

When selecting plant materials, consider whether the species, variety, or cultivar possesses aggressive traits, and whether it poses a potential threat to the existing or desired plant community.

Consider the potential impacts of extreme weather events (e.g., drought, flooding, wind, late spring frosts) when selecting plant species and sites for planting.

When using trees and shrubs for carbon sequestration and storage, consider using modeling tools to predict carbon sequestration rates and amounts of stored carbon.

Tree/shrub arrangement and spacing should allow for and anticipate the need for future access lanes for purposes of stand management and fire control.

When underplanting, trees and shrubs should be planted sufficiently in advance of overstory removal to ensure full establishment where feasible.

Consider establishing species with growth rates and at densities that make them competitive with weeds and undesirable plants.

Consider using species that provide subsistence and cultural values, (e.g., as used by Tribes).

Consider designing plantings to enhance visual quality in farmsteads, recreation areas, and along public rights-of-way, by applying foliage color, season and color of flowering, mature plant height, edge-feathering, and other landscaping techniques.

### **Considerations for Organic Systems During Vegetation Establishment**

Natural mulches, such as wood products or hay, can be used to support tree/shrub establishment by controlling competing vegetation, as a viable alternative to using herbicides. Certified weed-free mulches are preferred. NRCS Use CPS Mulching (Code 484).

Pests may be managed through augmentation or introduction of predators or parasites and development of habitat for natural enemies of pests; non-synthetic controls such as lures, traps, and repellents may be used.

Invasive plant species may be controlled through mulching with fully biodegradable materials; mowing; livestock grazing with protection for plantings; hand weeding and mechanical cultivation; pre-irrigation; flame, heat, or electrical means. Use NRCS CPS Prescribed Burning (Code 338), as needed.

### **Considerations for Reducing Energy Use**

When trees are planted to reduce summer energy use in buildings, consider prioritizing their placement on the west side of the building, where the greatest daily solar heat gain occurs. The second priority is the east side. Trees or shrubs planted within 30 to 50 feet of a building generally provide effective shade to windows and walls, depending on tree height potential.

Deciduous tree or shrub species planted adjacent to the south side of buildings in cool climates can provide shade in the summer yet allow sun to reach the building in winter.

## **PLANS AND SPECIFICATIONS**

Prepare plans and specifications that describe requirements for applying the practice to achieve its intended purpose, and obtain any required permits.

Use job sheets or other acceptable documentation. At a minimum, provide—

- Objective(s) for establishment.
- Sketches, drawings, and detail drawings.
- Map showing the location of plantings and/or natural regeneration areas.
- Soils map, and description of soils and Ecological Sites (if available).
- Establishment method by species or vegetation type.
- Number of trees/shrubs per acre to be planted, by species.
- Timing of planting and/or natural regeneration relative to considerations for seasonal factors, plant physiology, disease, insects, and wildlife impacts.
- Mitigation measures, if needed, to reduce wildfire hazard or the potential for disease and insect pests.

## **OPERATION AND MAINTENANCE**

Prepare an operation and maintenance plan for this site. As a minimum, include the following activities:

- Burn or mow the area periodically, if needed to maintain the health of the plant community. Do not conduct maintenance practices and activities during the primary reproductive period of wildlife.

Exceptions can be considered to maintain the health of the vegetative community if such exceptions do not conflict with agency requirements.

- Control access by vehicles and/or equipment during or after tree/shrub establishment to protect new plants and minimize erosion, compaction and other site impacts.
- Inspect the site at an appropriate time following planting, seeding, and/or natural regeneration to determine whether the survival rate for tree and shrubs meets practice and client objectives. Replant or provide supplemental planting when survival is not adequate.
- Inspect the trees and shrubs periodically, and protect them from adverse impacts of insects, diseases, competing vegetation, fire, livestock, wildlife, non-functioning tree shelters and/or weed barriers, etc.
- If needed, control competing vegetation until the desired trees/shrubs are established. Control plant species on the Federal or State invasive species and noxious weed lists.
- If needed, apply nutrients to maintain vigor of desirable trees/shrubs.

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# NATURAL RESOURCES CONSERVATION SERVICE

## CONSERVATION PRACTICE STANDARD

### WETLAND RESTORATION

(Ac.)

CODE ☐ 5 ☐

#### DEFINITION

The return of a wetland and its functions to a close approximation of its original condition as it existed prior to disturbance on a former or degraded wetland site.

#### PURPOSE

To restore wetland function, value, habitat, diversity, and capacity to a close approximation of the pre-disturbance conditions by restoring:

- Conditions conducive to hydric soil maintenance.
- Wetland hydrology (dominant water source, hydroperiod, and hydrodynamics).
- Native hydrophytic vegetation (including the removal of undesired species, and/or seeding or planting of desired species).
- Original fish and wildlife habitats.

#### CONDITIONS WHERE PRACTICE APPLIES

This practice applies only to natural wetland sites with hydric soils which have been subject to the degradation of hydrology, vegetation, or soils.

This practice is applicable only where the natural hydrologic conditions can be approximated by actions such as modifying drainage, restoring stream/floodplain connectivity, removing diversions, dikes, and levees, and/or by using a natural or artificial water source to provide conditions similar to the original, natural conditions.

This practice does not apply to:

- The treatment of point and non-point sources of water pollution (Constructed Wetland - 656);

- The rehabilitation of a degraded wetland, the reestablishment of a former wetland, or the modification of an existing wetland, where specific wetland functions are augmented beyond the original natural conditions; possibly at the expense of other functions. (Wetland Enhancement - 659);
- The creation of a wetland on a site location which was historically non-wetland (Wetland Creation - 658).
- The management of fish and wildlife habitat on wetlands restored under this standard.

#### CRITERIA

##### General Criteria Applicable to All Purposes

The purpose, goals, and objectives of the restoration shall be clearly defined in the restoration plan, including soils, hydrology, vegetation, and fish and wildlife habitat criteria that are to be met and are appropriate for the site and the project objectives.

These planning steps shall be done with the use of a functional assessment-type procedure, or a state approved equivalent. The objectives will be determined by an analysis of current and historic site functions. They will be based on those functions which can reasonably be supported by current site constraints. Data from historic and recent aerial photography and/or other remotely sensed data, soil maps, topographic maps, stream gage data, intact reference wetlands, and historical records shall be gathered.

The soils, hydrology and vegetative conditions existing on the site, the adjacent landscape, and the contributing watershed shall be documented in the planning process.

The nutrient and pesticide tolerance of the

plant and animal species likely to occur shall be evaluated where known nutrient and pesticide contamination exists. Sites suspected of containing hazardous material shall be tested to identify appropriate remedial measures. If remedial measures are not possible or practicable, the practice shall not be planned.

The availability of sufficient water rights should be reviewed prior to restoration.

Upon completion, the site shall meet soil, hydrology, vegetation and habitat conditions of the wetland that previously existed on the site to the extent practicable.

Where offsite hydrologic alterations or the presence of invasive species impact the site, the design shall compensate for these impacts to the extent practicable.

Invasive species, federal/state listed noxious plant species, and nuisance species (e.g., those whose presence or overpopulation jeopardize the practice) shall be controlled on the site as necessary to restore wetland functions. The establishment and/or use of non-native plant species shall be discouraged.

The landowner shall obtain all applicable and necessary local, state and federal permits before starting restoration activities.

#### **Criteria for Hydric Soil Restoration**

Restoration sites will be located on soils that are hydric.

If the hydric soil is covered by fill, sediment, spoil, or other depositional material, the material covering the hydric soil shall be removed to the extent needed to restore the original soil functions.

Soil hydrodynamic and bio-geochemical properties such as permeability, porosity, pH, or soil organic carbon levels shall be restored to the extent needed to restore hydric soil functions.

#### **Criteria for Hydrology Restoration**

The hydroperiod, hydrodynamics, and dominant water source of the restored site shall approximate the conditions that existed before alteration. The restoration plan shall document the adequacy of available water sources based on groundwater investigation, stream gage data, water budgeting, or other appropriate means.

The work associated with the wetland shall not adversely affect adjacent properties or other water users unless agreed to by signed written letter, easement or permit.

Timing and level setting of water control structures, if needed, will be based on the actions needed to maintain a close approximation of the original, natural hydrologic conditions.

The original natural water supply should be used to reestablish the site's hydrology to approximate the hydrologic conditions of the wetland type. If this is not possible, an alternate natural or artificial water supply can be used; however, these sources shall not be diverted from other wetland resources. If the alternate water source requires energy inputs, these shall be estimated and documented in the restoration plan.

To the extent technically feasible reestablish macro-topography and/or micro-topography. Use reference sites within the local area to determine desired topographic relief. The location, size, and geometry of earthen structures, if needed, shall match that of the original macro/micro topographic features to the extent practicable. If reference sites are not available or original topography has been excessively altered, refer to the Wetland Restoration (657) Specification Sheet for Topographic Restoration and Enhancement for guidance on creating macro/micro topography habitat.

Macro/micro topographic features, including ditch plugs installed in lieu of re-filling the entire surface drainage ditches, shall meet the requirements of other practice standards to which they may apply due to purpose, size, water storage capacity, hazard class, or other parameters.

The channel may be plugged with earth fill without a flow control device where flow duration and rate will not cause erosion and head cutting. The minimum length of a channel to be filled will be based on the hydraulic conductivity (permeability) of the soil at the site.

For channel plugs, the minimum length to be filled is 50 feet for soils with an average hydraulic conductivity of less than 0.6 inches

per hour, 100 feet for 0.6 to 2.0 inches per hour, and 150 feet for greater than 2.0 inches per hour.

The side slopes on channel plugs will be 3:1 or flatter. All fill will be compacted to achieve the density of adjacent materials. The fill for channel plug will be crowned a minimum of one foot above the top of the lowest existing channel bank to account for settlement and to prevent concentrated flow over the channel block.

Plug embankments with an effective height of less than 6 feet will meet the criteria for Dike (356). Embankments with an effective height greater than 6 feet will meet the criteria for Pond (378).

Embankments meeting criteria for dikes will safely handle a 10-year frequency, 24-hour storm at the dike design high water level.

Embankment material should be soils which are stable for fill construction. Organic soils should not be used for embankment materials.

Excavations from within the wetland shall remove sediment to approximate the original topography or establish a water level that will compensate for the sediment that remains.

Water control structures that may impede the movement of target aquatic species or species of concern shall meet the criteria in Fish Passage, Code 396.

Wetland restoration sites that exhibit soil oxidation and/or subsidence, resulting in a lower surface elevation compared to pre-disturbance, shall take into account the appropriate hydrologic regime needed to support the original wetland functions.

### **Subsurface Drainage Removal**

In areas where subsurface drains were used to remove surface water or soil saturation, the existing system will be modified to restore the wetland hydrologic conditions.

Use old drainage records, interviews and site investigations as needed to determine the extent of the existing system. The effect of any modification to the existing subsurface drainage system on upstream landowners will be evaluated, and the landowner will be notified of potential offsite impacts. This

evaluation will include both surface and subsurface impacts.

Where the subsurface drain serves as an outlet for upstream properties, it will be necessary to meet applicable state and local laws and regulations pertaining to subsurface drainage and flooding.

Upstream surface and subsurface drainage will not be impacted unless appropriate easements are obtained or mitigation measures are implemented.

The effects of the subsurface drainage system may be eliminated by the following:

- a. removing a portion of the drain at the downstream edge of the site,
- b. modifying the drain with a water control device, or
- c. installing non-perforated pipe through the wetland site.

The minimum length of drain to be removed is 50 feet for soils with an average hydraulic conductivity of less than 0.6 inches per hour, 100 feet for 0.6 to 2.0 inches per hour and 150 feet for greater than 2.0 inches per hour.

All envelope filter material or other flow enhancing material will also be removed for the length. The trench will be filled and compacted to achieve a density equal to adjacent material.

A water control device placed on the inlet of an existing drain will limit inflow that will prevent damage to the drain downstream of the site. If the drain serves other areas, inflow will be limited to the capacity originally apportioned to the drain.

### **Criteria for Vegetative Restoration**

Hydrophytic vegetation restoration shall be of species typical for the wetland type(s) being established and the varying hydrologic regimes and soil types within the wetland. Preference shall be given to native wetland plants with localized genetic material.

Where natural colonization of acceptable species can realistically be expected to occur within 5 years, sites may be left to revegetate naturally. If not, the appropriate species will be established by seeding or planting.



Adequate substrate material and site preparation necessary for proper establishment of the selected plant species shall be included in the plan.

Where planting and/or seeding is necessary, the minimum number of native species to be established shall be based on a reference wetland with the type of vegetative communities and species planned on the restoration site:

- Where the dominant vegetation will be herbaceous community types, a subset of the original vegetative community shall be established within 5 years, or a suitable precursor to the original community will be established within 5 years that creates conditions suitable for the establishment of the native community. Species richness shall be addressed in the planning of herbaceous communities. Seeding rates shall be based upon the percentage of pure live seed and labeled with a current seed tag from a registered seed laboratory identifying the germination rate, purity analysis, and other seed statistics.
- Where the dominant vegetation will be forest or woodland community types, vegetation establishment will include a minimum of three (3) species.
- Refer to the criteria and follow Conservation Practice Tree and Shrub Establishment (612) for establishing forest species.

## **CONSIDERATIONS**

### **Soil Considerations**

Consider making changes to physical soil properties, including:

- Increasing or decreasing saturated hydraulic conductivity by mechanical compaction or tillage, as appropriate.
- Incorporating soil amendments.
- The effect of construction equipment on soil density, infiltration, and structure.

Consider changes in soil bio-geochemical properties, including the increasing soil organic carbon by incorporating compost.

Increasing or decreasing soil pH with lime, gypsum, or other compounds.

### **Hydrology Considerations**

Consider the general hydrologic effects of the restoration, including:

- Impacts on downstream stream hydrographs, volumes of surface runoff, and groundwater resources due to changes of water use and movement created by the restoration.

Consider the impacts of water level management, including:

- Increased predation due to concentrating aquatic organisms, including herptivores, in small pool areas during draw downs
- Increased predation of amphibians due to high water levels that can sustain predators.
- Decreased ability of aquatic organisms to move within the wetland and from the wetland area to adjacent habitats, including fish and amphibians as water levels are decreased.
- Increases in water temperature on-site, and in off-site receiving waters.
- Changes in the quantity and direction of movement of subsurface flows due to increases or decreases in water depth.
- The effect changes in hydrologic regime have on soil bio-geochemical properties, including: oxidation/reduction; maintenance of organic soils; and salinity increase or decrease on site and on adjacent areas.

### **Vegetation Considerations**

Consider:

- The relative effects of planting density on fish and wildlife habitat versus production rates in woody plantings.
- The potential for vegetative buffers to increase function by trapping sediment, cycling nutrients, and removing pesticides.

- The selection of vegetation for the protection of structural measures that is appropriate for wetland function.
- The potential for invasive or noxious plant species to establish on bare soils after construction and before the planned plant community is established.
- The use of prescribed burning to restore wetland and adjacent upland plant communities.

### **Fish and Wildlife Habitat Considerations**

Consider:

- The addition of coarse woody debris on sites to be restored to woody plant communities for an initial carbon source and fish and wildlife cover. Consider adding 1 to 2 dead snags, tree stumps or logs per acre to provide structure and cover for wildlife and a carbon source for food chain support
- The potential to restore habitat capable of supporting fish and wildlife with the ability to control disease vectors such as mosquitoes.
- The potential to establish fish and wildlife corridors to link the site to adjacent landscapes, streams, and water bodies and to increase the sites colonization by native flora.
- The need to provide barriers to passage for unwanted or predatory species.

### **PLANS AND SPECIFICATIONS**

Plans and specifications for this practice shall be prepared for each site. Plans and specifications shall be recorded using approved specifications sheets, job sheets, or other documentation. The plans and specifications for structural features will include, at a minimum, a plan view, quantities, and sufficient profiles and cross-sections to define the location, line, and grade for stakeout and checkout. Plans and specifications shall be reviewed and approved by staff with appropriate job approval authority.

### **OPERATION AND MAINTENANCE**

A separate Operation and Maintenance Plan will be prepared for sites that have structural features. The plan will include specific actions for the normal and repetitive operation of installed structural items, especially water control structures, if included in the project. The plan will also include the maintenance actions necessary to assure that constructed items are maintained for the life of the project. It will include the inspection schedule, a list of items to inspect, a checklist of potential damages to look for, recommended repairs, and procedures for documentation.

Management and monitoring activities needed to ensure the continued success of the wetland functions may be included in the above plan, or in a separate Management and Monitoring Plan. In addition to the monitoring schedule, this plan may include the following:

- The timing and methods for the use of fertilizers, pesticides, prescribed burning, or mechanical treatments.
- Circumstances when the use of biological control of undesirable plant species and pests (e.g. using predator or parasitic species) is appropriate, and the approved methods.
- Actions which specifically address any expected problems from invasive or noxious species.
- The circumstances which require the removal of accumulated sediment.
- Conditions which indicate the need to use haying or grazing as a management tool, including timing and methods.

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