RESTORATION AND ENHANCEMENT OF THE LONGLEAF PINE ECOSYSTEM AND MIXED MESOPHYTIC FOREST FLOODPLAINS ON APPLICABLE FOREVER WILD LAND TRUST LANDS.

Final Report: SWG Grant Number: T-03-02

December 2009

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PROJECT SUMMARY

The recent purchase of vast tracts of land across Alabama has afforded ADCNR - State Lands Division (SLD) the opportunity to restore ecosystem function across broad landscapes. The primary objective of this project was to enable SLD personnel to initiate and/or expand restoration and enhancement activities for two such landscapes: longleaf pine (*Pinus palustris*) habitats of the Gulf Coastal Plain in south Alabama and mixed mesophytic forests within broad floodplains of the TN river basin of North Alabama. Restoration and enhancement activities undertaken were: prescribed fire, invasive plant species eradication, overstory replanting, Gopher Tortoise (*Gopherus polyphemus*) reintroduction, and mounting nest boxes for Southeastern American Kestrel. These activities were used to improve habitat quality to benefit the suite of terrestrial vertebrate species that are primarily or exclusively dependent on these ecosystems; especially 86 (43 terrestrial and 43 aquatic, Priority 1 & 2) species/subspecies of Greatest Conservation Need (GCN) as identified in Alabama's Comprehensive Wildlife Conservation Strategy (CWCS). Tracts targeted for longleaf pine restoration and enhancement activities were: Grand Bay Savanna Forever Wild (FW) tracts (Mobile County), Jacinto Port FW/SLD tracts-upland portions (Mobile County), Lillian Swamp FW/SLD tracts (Baldwin County), Pike County Pocosin FW tract (Pike County), Perdido River-Longleaf Hills FW/SLD tracts (Baldwin County) , Splinter Hill Bog-Ben May & IP FW/SLD tracts (Baldwin County); and the Wehle tract (Bullock County). The Walls of Jericho FW tract (Jackson County) was targeted for floodplain forest restoration. Grant funds supported prescribed fire over 5,276 acres at 7 FW/SLD tract, invasive species removal on 6 tracts, the relocation of 23 gopher tortoises, placement of 10 kestrel boxes, gopher tortoise burrow surveys on 3 tracts, and GCN bird surveys on 7 tracts. These grant grant-enabled activities have helped SLD establish a program of routine prescribed fires and invasive species treatments, continue a pilot study of gopher tortoise relocation, and collect species inventory data to guide management actions. With these actions SLD is working to restore functionality to impaired ecosystems and improve habitat for 95 GCN species.

PURPOSE AND NEED

The longleaf pine ecosystem (the myriad of communities dominated by longleaf pine that range from xeric uplands to mesic flatwoods) is recognized as one of the most endangered ecosystems in the United States (Noss *et al.* 1995, Jose *et al.* 2006). Experts estimate that longleaf pine remains over only 2.2% of its original extent and as of 2000 only 9.0% of that remaining acreage (0.2% of the original extent) was being managed with fire frequency sufficient to support the associated flora and fauna (Frost 2006). Reasons for this ecosystem's decline are primarily attributed to extensive timber harvest and conversion of habitat for other land uses. Where remaining, most sites are in poor condition as a result of fire suppression and subsequent hardwood encroachment. With the clear-cutting of the Flomaton Natural Area (57 acres) in Escambia County, the last stand of virgin longleaf pine in the Coastal Plain of Alabama was lost (Kush 2009). Mountain Longleaf National Wildlife Refuge (111 acres) in Calhoun County is now the last remnant of old-growth longleaf pine forest in Alabama (Varner and Kush 2004).

Ecologically, the longleaf pine ecosystem supports one of the highest floral and faunal diversities in North America with many species found nowhere else (Means 2006). The extensive loss of habitat compounded with the isolated nature and poor quality of remaining sites has resulted in the precipitous decline of many vertebrate species dependent on this ecosystem. This is regarded as the primary reason why species have been listed as threatened, endangered, or special concern by many federal, state, and non-governmental entities. In Alabama, 30 species associated with the longleaf pine ecosystem are recognized as GCN species (Priority 1 or 2). Further, the longleaf pine community has more identified Priority 1 GCN species than any other habitat type listed in Alabama's CWCS (WFFD 2005). The limited amount of existing, high quality, longleaf habitat combined with the high number of GCN species dependent on this community warrants the need for extensive restoration and enhancement activities in Alabama.

Nationwide, approximately 70-84% of riparian forests have been lost (Noss et. al 1995). Beginning with the advent of agriculture in North America the broad, fertile floodplains of the TN river basin were converted from mixed mesophytic forests to agricultural land. Culminating with the impoundment of the TN river system, the loss of broad forested floodplain in North Alabama is nearly complete.

Today it is extremely rare to find mixed mesophytic forests within broad, flat floodplains in North Alabama (Wheeler Wildlife Refuge and the adjacent U.S. Army's Redstone Arsenal being notable exceptions.) Remnant forest of this type can be found within the Paint Rock River watershed, one of the few Tennessee River watersheds that have not been impounded. The Paint Rock harbors 19 fish, 21 mussel and 2 aquatic snail GCN species. This includes the federally endangered Palezone Shiner (*Notropis albizonatus*), Alabama Lampshell (*Lampsilis virescens*), and Pale Lilliput (*Toxolasma cylindrellus*). The Nature Conservancy has targeted the Paint Rock River watershed as a "landscape conservation area" and is working to restore riparian habitat in the area. The mostly intact forests at the headwaters of the River's three major tributaries ensure the river is fed by cool, filtered water, upon which these species rely. Reforestation of riparian habitat within the watershed will ensure the continued persistence of these listed species, as well as 65 additional aquatic and terrestrial GCN species.

Forever Wild tracts targeted for longleaf pine restoration and enhancement activities were: Grand Bay Savanna tracts (Mobile County; 2,734 acres), Jacinto Port FW/SLD (Forest Legacy) tracts-upland portions (Mobile County; 1,143 acres combined), Lillian Swamp FW/SLD tracts (Coastal Impact Assistance Program [CIAP]; Baldwin County; 1,858 acres combined), Perdido River-Longleaf Hills FW/SLD (Forest Legacy, CIAP) tracts (Baldwin County; 13,292 acres combined), Pike County Pocosin tract (Pike County; 190 acres), Splinter Hill Bog-Ben May & IP FW/SLD (CIAP) tracts (Baldwin County; 1,233 acres combined), and the Wehle tract (Bullock County; 1,505 acres). These tracts represent six recognized *priority areas for conservation* listed in Alabama's CWCS. The Walls of Jericho Forever Wild Tract (Jackson County, 12,510 acres) was targeted for floodplain forest restoration and enhancement.

OBJECTIVES

1. Evaluate/assess the statuses of associated GCN species on targeted SLD and Forever Wild tracts. This will enable SLD personnel to determine the presence and abundance of GCN species to identify and prioritize habitat restoration and enhancement activities needed for each targeted tract.

2. Initiate or expand restoration and enhancement activities (detailed below) on targeted SLD and Forever Wild tracts to reintroduce, attract, and/or benefit existing populations of GCN species.

3. Monitor performed restoration and enhancement actions to evaluate their effectiveness for achieving stated objectives. This will involve activities like "photo-documenting" reference sites to showcase habitat change over time, performing breeding bird point counts, follow-up herbicide treatments to eradicate "recurring" problem sites, etc.

APPROACH AND METHODS

During the initial phase of the grant SLD biologists and land managers visited various FW/SLD tracts to determine restoration needs, take stock of initial conditions on the tracts, determine which tracts to target and what restoration activities to implement, and how to inventory and monitor GCN species. The following tracts (Figure 1) and activities were decided upon.

Project Locations

Clearwater Tract (Mobile Tensaw Delta) – While thousands of acres of the Delta are composed of bottomland hardwoods, cypress/tupelo swamps, bogs, marshes, bayous, creeks and lakes, approximately 600 acres of the Clearwater tract lie in uplands above the floodplain of the Delta. This upland portion has been converted to loblolly pine plantation by a previous owner, but presumably was originally covered by longleaf, grading down into the hardwoods of the Delta. Due to the plantation, habitat is in a severely degraded condition, but the site could eventually host typical upland longleaf pine GCN species including the Gopher Tortoise, Florida Pine Snake (*Pituophis melanoleucus mugitus*), Eastern Diamondback Rattlesnake (*Crotalus adamanteus*), Henslow's Sparrow (*Ammodramus henslowii*), and Bachman's Sparrow (*Aimophila aestivalis*).

Grand Bay Savanna – A majority of this tract is characterized by a relatively low-lying, flat terrain embedded with bogs and wet meadows. This "savanna" area is sparsely forested with slash pine (*Pinus elliottii*) and is currently being maintained with prescribed fires. Along the northern boundary of the tract, several linear sandy uplands extend southward and are dominated by semi-mature longleaf pine. There is a relatively dense hardwood understory growing beneath the longleaf, which is indicative of fire suppression. These uplands transition into extensive seepage bogs and cypress domes. Five GCN species have been documented on this tract and include Speckled Kingsnake,

Henslow's Sparrow, American Kestrel, Wood Thrush (*Hylocichla mustelina*), and American Woodcock (*Scolopax minor*).

Jacinto Port Forever Wild/SLD (Forest Legacy) tracts-upland portions – Located east of Saraland in Mobile County, Jacinto Port represents an upland-sandhill component of the extensive Mobile-Tensaw River Delta. The forest is composed of numerous regenerating hardwood species interspersed with semi-mature longleaf. The subcanopy and shrub layers are relatively dense, which suggests long term fire suppression throughout this upland region. A herpetofaunal survey was recently completed which documented the occurrence of 45 species of reptiles and amphibians, including two GCN species; Speckled Kingsnake (*Lampropeltis getula holbrooki*) and Gopher Tortoise (Nelson *et al.* 2006). Additionally, this tract is a suspected thoroughfare for American Black Bear (*Ursus americanus floridanus*) into the adjacent bottomland hardwood forests of the Mobile-Tensaw River Delta.

Lillian Swamp Forever Wild/SLD (CIAP) tracts – Forming the western side of Perdido Bay, Lillian Swamp represents a mosaic of habitats comprising sandy pine uplands and open savanna imbedded with bogs and titi-bay swales. Much of the hydrology of the area has been altered due to extensive ditching. Additionally, dense hardwood undergrowth indicates long term fire suppression. A herpetofaunal survey was recently completed and at least three GCN species were documented (J. Borden personal communication).

Perdido River-Longleaf Hills FW/SLD (Forest Legacy) tracts – These two tracts were recently purchased through the Forever Wild Program and a partnership between the Alabama Forestry Commission and SLD through a U.S. Forest Service Forest Legacy grant, respectively. These purchases are a component of the Perdido River Conservation Initiative in which available lands are being purchased for conservation along this watershed. To date, more than 18,000 acres of land has been conserved collectively along the Perdido River. These tracts fall within the "longleaf pine/wiregrass" portion of this community's range whereby longleaf pine is the dominant tree in the upland areas (Frost 2006). A significant portion of the uplands have been managed extensively for timber production and much of the area has either been cleared recently or is currently in a timber reservation. The collective size of these tracts offers a tremendous opportunity to restore a significant portion of longleaf pine community in Alabama.

Pike County Pocosin – Located southeast of Troy, this tract possesses two distinct plant communities: mesic forested ravines (referred to as the pocosin) and forested sandy uplands (see Diamond *et al.* 2002 for a more detailed habitat account). Much of the forested sandy uplands have been converted to pine plantation consisting of various sized stands of planted loblolly and sand pine (*Pinus clausa*). The latter species is not native to Pike County and occupies a significant area of the sandy uplands. Additionally, a native population of Gopher Tortoises exists in the sandy uplands where tree canopies are more open.

Figure 1. Forever Wild and State Lands Division tracts where restoration and enhancement activities were implemented, 2007-2009.

Splinter Hill Bog-Ben May & IP tracts – Located in northern Baldwin County, Splinter Hill Bog represents the headwaters of the Perdido River watershed. SLD and TNC own contiguous tracts managed for conservation accounting for approximately 2,200 acres collectively. The surrounding landscape is dominated by forested upland sandhills with embedded seepage bogs. Portions of these tracts possess mature stands of longleaf, while other areas are currently in a pine plantation rotation. Other locations on these tracts have recently been cleared. In addition to its diverse flora, five GCN species have been documented and include Florida Pine Snake (*Pituophis melanoleucus mugitus*), Eastern Diamondback Rattlesnake (*Crotalus adamanteus*), Gopher Tortoise,

Henslow's Sparrow (*Ammodramus henslowii*), and Bachman's Sparrow (*Aimophila aestivalis*).

Walls of Jericho – Within the Walls of Jericho tract Turkey Creek and Mill Creek converge with Hurricane Creek, one of the three major headwaters of the Paint Rock River. Hurricane Creek flows through a wide, wooded floodplain as it spills out of the Cumberland Plateau through steep slopes covered by large, mature hardwoods. It is thought that this combination of steep slopes, mature hardwoods and a wide, wooded floodplain accounts for the presence of the densest population of breeding Cerulean Warblers (*Dendroica cerulean*; P1) in Alabama. Three other GCN passerines also breed here: Wood Thrush, Worm-eating Warbler (*Helmitheros vermivorus*), and Kentucky Warbler (*Oporornis formosus*) as well as a rich diversity of other songbirds. The cool waters of Hurricane Creek, filtered by wooded slopes and floodplains are home to the GCN species Palezone Shiner (*Notropis albizonatus*), Blotchside Logperch (*Percina burtoni*), and Tennessee Heelsplitter (*Lasmigona holstonia*). Yet, at this point of convergence, the mixed mesophytic canopy is pierced by different sized fescue pastures which were still in use until the property was purchased for conservation. These fields are currently being maintained by mowing and provide little or no benefit for wildlife. The openings encourage invasion by exotic plants, potentially alter the temperature of Hurricane Creek, and give a foothold to the parasitic Brown-headed cowbird (*Molothrus ater*), which may be suppressing reproduction of the Cerulean Warbler and other birds. Rafinesque's Big-eared Bat (*Corynorhinus rafinesquii*), Gray Myotis (*Myotis grisescens),* and Northern Myotis (*Myotis septentionalis*) have been documented at the confluence of Turkey Creek and Hurricane Creek. Green Salamander (*Aneides aeneus*), Long-tailed Weasel (*Mustela frenata*), Allegheny Woodrat (*Neotoma magister*), and Pygmy Shrew (*Sorex hoyi*) have been documented elsewhere on the tract. Quickly becoming known as a premier hiking spot in Alabama, the Walls of Jericho hosts hundreds of visitors per weekend who will have the opportunity to see the positive work of the Forever Wild program and Alabama's Comprehensive Wildlife Conservation Strategy.

Wehle tract – Located in southeast Bullock County, the upland portions of the Wehle tract are a fire-maintained, open pine woodland dominated by shortleaf and loblolly pine with some hardwoods. This tract falls within the "transitional" region of longleaf pine whereby it is typically associated with shortleaf and loblolly pine and some fire-adapted hardwoods in a climax state (Frost 2006). The upland soils are well-drained and sandy and host a diverse floral and faunal assemblage. Three notable GCN species (Priority 2) are residents and include the Eastern Kingsnake (*Lampropeltis getula getula*), Southeastern Pocket Gopher (*Geomys pinetis*), and Bachman's Sparrow (*Aimophila aestivalis*). Wintering American Kestrels and Brazilian Free-tailed Bats (*Tadarida brasiliensis*) have also been documented on this tract.

Restoration and Enhancement Activities

Prescription Fires – The initiation of this management activity on a rotational basis is critical for habitat restoration and enhancement within the longleaf pine ecosystem. Both growing- and dormant-season controlled burns are an important step for removing competing hardwoods, reducing fuel load, and reestablishing nutrient recycling. In addition, it enables fire-tolerant plant species to recover and perpetuate, thereby substantially improving habitat for wildlife. Prescribed fires may also be used to

assist with the removal of invasive species and to prepare a site for replanting of native species.

Fires were prescribed such that some portion of the property burned each year, with the goal of all acreage on most properties burned on a minimum 2-year rotation. Where fuel conditions were judged appropriate a growing season fire was prescribed. Fire lane installation and prescribed fires were performed either by SLD or a private contractor. Contractors were hired when equipment needs exceeded SLD resources: mechanized equipment for fire lanes or a helicopter for prescribed fires. Fire lanes were a minimum of 10 feet wide. Prescribed fires were performed by burn bosses certified by the Alabama Forestry Commission with highly trained support crew.

Invasive Plant Species Eradication – Most, if not all, Forever Wild tracts have infestations of invasive plants that have either become naturalized or are aggressively displacing native plant species. Without appropriate control measures, nonnative plant infestations significantly lower the quality of habitat and negatively affect native plant and animal species dependent upon this community-type. The major invasive species targeted for eradication was Cogongrass (*Imperata cylindrica*), an extreme threat to pine forests in southern Alabama. In the north treatment was made to Chinese Privet (*Ligustrum sinense*), and Tall Fescue (*Lolium arundinaceum*).

Cogongrass treatment was conducted twice annually, once in the spring prior to the plant setting, to prevent the release of seeds, and once in the fall when the physiological activity of the plant makes it most susceptible to herbicide. Prior to spraying each season, properties were scouted to locate infestations. That reconnaissance was used to best delegate herbicide application between SLD resources and commercial contractors. Locations that had been treated previously were revisited to determine if another herbicide application was needed. Cogongrass was treated with a solution of 2% glyphosate and .25% to 1% imazapyr. Application was made by a variety of commercial spraying equipment.

Tall fescue was treated at the Walls of Jericho to prepare pastures for tree planting and conversion to native warm season grasses. A 2% solution of glyphosate was applied after the fields had been cleared by a prescribed fire and fescue had regrown to approximately 8 inches. Application was made by an ATV mounted broadcast sprayer. Privet was also treated at the Walls via backpack sprayer or ATV mounted sprayer with a 2% glyphosate solution.

Overstory Replanting – Portions of FW/SLD properties were clearcut by previous landowners and need to be replanted with native longleaf pine. Containerized longleaf pine seedlings were obtained from a commericial vendor and hand-planted by SLD staff. Planting containerized seedlings is the recommended manner for reestablishment because seedling survival rates are highest when planted correctly. Additionally, the window of time for which they can be planted is longer than seed or bareroot seedling plantings.

Gopher Tortoise Relocation – A successful component of longleaf pine community restoration is the reintroduction of associated wildlife. Translocation of targeted species associated with upland pine-sandhill communities has proven to be a successful conservation tool to curb population declines of imperiled community-dependent species (Costa and DeLotelle 2006). A classic example is with the Gopher Tortoise (*Gopherus polyphemus*; Tuberville *et al.* 2005). Gopher Tortoises are considered a keystone species of this community-type because many other vertebrate and

invertebrate species depend on their burrows for a variety of life history uses. Prior to this grant, 17 Gopher Tortoises were relocated to the Wehle tract under a USFWS Endangered Species Act Section 6 grant, to begin reintroducing the species to the tract (State Lands Division 2006). Under this grant SLD sought to continue Gopher Tortoise reintroduction at Wehle.

Upon arrival at Wehle tortoise were processed as detailed in the State Lands Division Final Report for the Section 6 project (2006), including taking standard morphometrics, a health examination, and drilling of scutes to give the animal a unique identifying number. SLD staff constructed a database to house data. Tortoises were not tested for Upper Respiratory Tract Disease. A starter burrow was dug to give each tortoise shelter until it constructed a burrow of its own. Tortoises transferred to Wehle were placed in holding pens for 1 year to achieve a high level of tortoise retention (Tuberville et al. 2005).

Suitable holding pen locations were selected by identifying areas of acceptable soil type, overstory canopy cover, and herbaceous cover (Ashton and Ashton 2008; Guyer & Hermann unpublished manuscript). We used Virtual Alabama 5.0, a GIS system provided by the Alabama Department of Homeland Security (GTAC 2009), aerial imagery from Virtual Alabama, and digital soil survey maps from the Natural Resources Conservation Service (2006) to locate areas with priority or suitable soils for gopher tortoises (Guyer & Hermann unpublished manuscript) that appeared to have an open canopy and herbaceous understory. We then visited these locations in the field to verify their suitability. Pens were constructed with Beltech #935 (36" x 75' roll) professional grade silt fence made by Belton Industries Inc., South Carolina and installed by use of a ditch digger to excavate trenches to seat the fencing 6" into the ground.

Mounting Nest Boxes for Southeastern American Kestrel – Nest boxes were built by SLD to specifications given at http://www.birdwatching-bliss.com/american-kestrel-nest-box.html (2008). SLD biologists mounted the boxes approximately 15-20' above ground in locations suitable for kestrels – on a tree standing free from others over an open understory. Boxes were monitored by SLD staff for use by kestrels.

Species Inventory and Monitoring

Gopher Tortoise Burrow Surveys – Surveys for gopher tortoise burrows were conducted to establish a baseline population estimate for select properties by which the effectiveness of future restoration efforts could be compared. Areas of known or suspected burrow locations were searched for burrows. The surveyor walked the search area, using a GPS track log to ensure the entire area was covered. Upon discovering a burrow, each location was marked as a waypoint with the GPS and flagged with standard forestry flagging. Waypoints were downloaded from the GPS and emailed to the central office in Montgomery, where they were entered into the Natural Heritage Database. At the Wehle tract, burrows were then marked with a pole of electrical conduit, flagging, and a sequential, numerical tag.

Bird Surveys – SLD staff employed a variety of techniques and protocols to inventory GCN bird species on targeted tracts. These methods included avian point counts, marshbird surveys, mist netting, winter sparrow surveys, and informal searches and observations.

RESULTS

Restoration and Enhancement Activities

Prescription Fires – SLD used grant funding to conduct prescribed fires at 7 FW/SLD properties, burning 5,276 acres (Table 1). In 2009 SLD implemented its first growing season fires at Perdido, Splinter Hill Bog, and Grand Bay Savanna. Fires at Perdido and Splinter Hill Bog did not carry well through the mixed herbaceous layer of grasses and low shrubs and there was almost no wind to push the fire. Yet, where the fire did burn at Perdido, wire grass (*Aristida beyrichiana*) resprouted 4 inches within a week and at Splinter Hill Bog toothache grass (*Ctenium aromaticum*) exploded in a profusion of seedheads. The fire at Grand Bay Savanna was very successful, achieving close to 90% coverage of the prescribed area. It burned hot, consuming thick stands of Swamp Titi (*Cyrilla racemiflora*), and other vegetation that had withstood several years of winter fire, substantially opening the understory. Here too, toothache grass bloomed profusely, completely covering the landscape in some places.

Fire was used at the Walls of Jericho to prepare fescue fields for herbicide treatment. Additional fires were prescribed at 2 more properties, Clearwater MTD and Jacinto Port, but these were not completed (Table 1). In the case of Clearwater, the contractor failed to perform the contracted services. At Jacinto Port weather conditions prevented the fire from burning.

Table 1. Properties and acreages of prescribed fires funded under this grant during the 2008 and 2009 fire season.

Tract	2008	2009
Clearwater		99*
Grand Bay Savanna	1000	1975
Jacinto Port		600**
Lillian Swamp	473	
Perdido		40
Pike County Pocosin	55	60
Splinter Hill Bog	580	417
Walls of Jericho		26
Wehle	450	200

* Not completed, contractor reneged on contract.
** Weather conditions prevented fire from burning.

Invasive Plant Species Eradication – Grant funds were used to fight over 200 acres of cogongrass at the following properties in 2007-2009: Clearwater, Grand Bay Savanna, Jacinto Port, Perdido River Longleaf Hills, Splinter Hill Bog. Infestations were monitored each spring and summer. Typically infestation sites were less than an acre and often found along roadsides. Herbicide applications were usually 90-95% effective after the first application, with follow-up applications required to prevent resprouting grass from re-infesting the site. Infestations were usually eradicated after the second or third herbicide application. Two non-native species were treated at the Walls of Jericho:

privet, and fescue. The foliar spray application to privet was nearly 100% lethal, but seasonal application will be required until all the shrubs have been found and treated. Broadcast spray application to fescue was 90% effective, requiring follow-up spot spraying to treat remaining growth. Follow-up monitoring will be required to find and eliminate any resprouting fescue.

Overstory Replanting **–** Two thousand longleaf pine trees were planted in a 40 acre clearcut on the Perdido tract. Trees were purposefully planted sparsely to supplement existing longleaf pine naturally regenerating on the site. The sparse planting befits the relatively high elevation and xeric soils of the location, typical of a longleaf sandhill community. Follow-up monitoring will determine tree survivorship.

Gopher Tortoise Relocation – In 2008 an agreement was made with the Environmental Management Division, Conservation Branch, at the U.S. Army's Fort Benning, to transfer 50 tortoises from the base to Wehle. Due to Base Realignment and Closure activities at Fort Benning, the Conservation Branch was actively capturing and relocating tortoises within the base and was willing to send the tortoises off base to a facility ready to receive them.

In anticipation of receiving tortoises we constructed 3 holding pens August 18 and 19, 2008. Pens were numbered in ascending order continuing the count from 3 previous pens. Thus, Pens 4, 5, and 6 were 14, 10, and 7 acres, respectively. Based on site assessments and Ashton and Ashton (2008), we determined Pen 4 could hold 1 tortoise per acre, Pen 5 could hold 2-3 tortoises per acre, and Pen 6 could hold 1-2 tortoises per acre, thus accommodating the expected 50.

Tortoises were to arrive in late September of 2008, but only 10 were transferred that October. Trapping at Benning resumed the following summer, but by then BRAC plans had changed and subsequently tortoise relocation efforts were curtailed. Still, Wehle received 18 more tortoises from Benning before trapping efforts at the base were suspended, for a total of 28. Two additional tortoises, found as waifs, were also brought to Wehle. Tortoises were transferred from Fort Benning to the Wehle tract by employees in the lab of Sharon Hermann at Auburn University. In summary, Pen 4 received 11 tortoises (8 males, 3 females). Nine arrived in October 2008 and 1 (waif) in May 2009. Pen 5 received 12 tortoises (3 males, 7 females, 1 subadult, and 1 undetermined) in June 2009 and Pen 6 received 10 tortoises (4 males, 5 females, 1 subadult), 9 in June and July 2009 and 1 waif in September. We found tortoise #9 dead at the mouth of a burrow, cause of death unknown. It had been transferred to Wehle in September of 2006. We also discovered 2 juvenile burrows on the tract.

Mounting Nest Boxes for Southeastern American Kestrel – A total of 10 boxes were mounted, 2 each at Grand Bay Savanna, Jacinto Port, Lillian Swamp, Perdido River Longleaf Hills, and Splinter Hill Bog. Boxes were mounted in March 2009 prior to the onset of the breeding season and monitored through the breeding season. None were used by kestrels. (One box at Splinter Hill appeared to have resident bluebirds.) Monitoring of the boxes will continue.

Species Inventory and Monitoring

Gopher Tortoise Burrow Surveys – Preliminary tract inspections performed in the early stages of the grant led to the location of a population of gopher tortoises in the loblolly pine plantation of the Clearwater tract. Burrow surveys were completed at

Clearwater, Pike County Pocosin, and Wehle in 2008. The number of burrows located and marked was: Clearwater-57, Pike County Pocosin-30, and Wehle-39. Burrows at Wehle were all numerically tagged for future monitoring of the population. An additional survey at Perdido in 2007, not supported by funds from this grant, located 161 burrows.

Bird surveys – SLD staff conducted surveys at all of the tracts targeted for restoration and enhancement activities in this grant except the Walls of Jericho. Nine GCN species were documented at 6 FW/SLD tracts (Table 2). No GCN birds were documented at Jacinto Port.

Table 2. Avian species of Greatest Conservation Need documented by State Lands Division staff at properties targeted for restoration and enhancement activities under this grant. Henslow's Sparrow is ranked Priority 1, Highest Conservation Need; all others are ranked Priority 2, High Conservation Need. GBS = Grand Bay Savanna, JPT = Jacinto Port, LIL = Lillian Swamp, PCP = Pike County Pocosin, PER = Perdido, SHB = Splinter Hill Bog, WEH = Wehle.

Species	GBS	JPT	LIL	PCP	PER	SHB	WEH
American Kestrel			X				X
American Oystercatcher	X						
Bachman's Sparrow					X	X	X
Henslow's Sparrow	X				X	X	
Kentucky Warbler				X			X
Nelson's Sparrow	X						
Northern Harrier			X		X		
Seaside Sparrow	X						
Wood Thrush				X		X	X
Worm-eating Warbler				X			X

DISCUSSION

SLD's original proposal for State Wildlife Grant funds cast a wide net, contemplating a range of activities including basic restoration actions such as prescribed fire, fighting invasive species, stream crossing refurbishment, comprehensive species monitoring for adaptive management, artificial structures to shelter imperiled species, and even relocating rare species about which little is known. The grant proposal specified an initial assessment phase during which different options would be evaluated and the most appropriate actions determined.

We chose to use a small amount of the funds to continue our gopher tortoise reintroduction project, as it serves as a pilot study for exporting the methodology to other tracts. After site assessments, it was determined that the need for prescribed fire and the eradication of invasive species were so essential to improve deteriorating habitat for GCNs, that the limited funds provided by this grant would be dedicated largely to those activities. The habitat was not ready for introducing gopher frogs and indigo snakes. While measurement of pretreatment and postreatment conditions is required to evaluate

the success of restoration activities in sufficient detail to provide for adaptation of those strategies to refine their efficacy, we decided that conditions on the ground were such that any prescribed fire or eradication effort would be beneficial, and the actions needed so basic as to lessen the need for fine tuning this early in the restoration process. Dedicating funding from this grant to a comprehensive pre- and post-treatment monitoring program would have necessarily decreased funding for the treatments themselves.

We adopted a more modest approach for species inventory and monitoring, choosing to focus on the gopher tortoise and bird species. Each can be surveyed for with relative ease and our findings can be used as an anecdotal baseline against which we can compare future conditions. Once basic measures of restoration success have been reached, such as converting from a shrub-scrub entanglement to an open, herbaceous understory, we can then pursue fine-tuning our restoration strategies by assessing the extent to which each tract will have recovered the full compliment of biodiversity in the herbaceous layer, whether we have attracted the full suite of bird species we would expect or whether we have healthy gopher tortoise populations. To this extent, we have met the 3 objectives we set for ourselves with our proposal for SWG funding. With the advent of the Inventory and Conservation Protocol SWG (T-5-P) and the Sandhills multistate competitive SWG, protocols have been established and data collected that will enable adaptive management at Clearwater, Perdido, Splinter Hill Bog, the Walls of Jericho, and Wehle.

The written proposal for these SWG funds stated, "The expected result is to restore ecosystem function by reducing or eliminating threats that interrupt inherent ecosystem processes." The 2 key elements to restoring ecosystem function and reducing threats are prescribed fire (for the longleaf pine ecosystem) and eradicating invasive species.

SLD is making advancements with its prescribed fire program. Grant funding allowed SLD to increase the number of acres burned annually and prescribe fires over areas where it had not previously been able to do so, by using grant funding to contract helicopter services and fireline construction. Much of our acreage in south Alabama that historically hosted a fire-maintained longleaf pine ecosystem is now under a 2-3 year fire rotation. In some cases this rotation is only checking the succession of hardwoods from becoming worse, whereas other locations are seeing an improvement in habitat conditions. A few areas are still awaiting the reintroduction of fire. In the best cases, some areas are transitioning to growing season fires as fuel sources become ready. While attempts at growing season fire at Perdido and Splinter Hill Bog proved that we had not quite achieved the grassy herbaceous layer needed to carry a growing season fire, the fire at Grand Bay Savanna demonstrated the power of a growing season fire to restore habitat to historic conditions.

The fight to remove invasive plants from FW/SLD properties will likely never end. Even if we could eradicate all the invasives currently on our properties, our tracts lie within a fragmented landscape in which these plants proliferate. Our tracts will always receive propagules from the surrounding landscape and suffer renewed invasions. Our best hope is to control the invasions we have and catch new ones before they become perverse.

A third important ecosystem function identified in this grant is the provisioning of cool, clean water to the Paint Rock River watershed. The reforestation of former

agricultural pastures along Hurricane Creek is well underway, with the non-native fescue removed and the fields prepared for the planting of trees. These trees will repair gaps in the riparian woodland buffer along the creek. A second element of this project originally proposed by SLD was the refurbishment of former stream crossings used by live stock and farm machinery. Gravel was to be used to repair damage to the stream banks. Transporting the truck loads of gravel along the narrow, unpaved, and rocky road to the site proved a daunting task, causing several equipment break-downs. We are still looking for other options.

There are currently 53 gopher tortoises at Wehle. The best sites for penning tortoises have been used. More suitable habitat will become available over the next year or two as the understory re-establishes itself and fire is returned to an area that was logged for habitat restoration. We do not have plans to receive any more tortoises from Fort Benning. Pen 4 will be removed this winter, freeing those tortoises. Pens 5 and 6 will be removed in the summer of 2010. We are likely entering an interim phase of the project where we watch the population to see if the newly released tortoises move and wait for more habitat to become available. Eventually the population will need another 50 tortoises to reach what is thought to be the minimum self-sustaining size (Craig Guyer, personnal communication). Future monitoring will be required to track the trajectory of the population.

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