BUGABOO SCRUB FIRE
BURNED AREA EMERGENCY STABILIZATION PLAN
Okefenokee National Wildlife Refuge
August 9, 2007

Measures taken to protect the Chesser Island Homestead, Big Turnaround Fire, Okefenokee NWR

UNIT: Okefenokee National Wildlife Refuge

LOCATION: Folkston, Georgia

FIRE CONTAINMENT DATE: 90% as of 8/1/07

FIRE SIZE: 180,538 acres FWS lands as of 8/1/07

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Southeast Region
Fire Ecologist

Submitted By: _____ Date: _____
Sue Grace, BAER Team Leader, Okefenokee NWR

BURNED AREA EMERGENCY STABILIZATION PLAN REVIEW AND APPROVAL

I. Project Leader approval that the Burned Area Emergency Stabilization Plan meets approved land management plan management objectives**.**

_____

Project Leader, Okefenokee National Wildlife Refuge Date

II. Regional Fire Management Coordinator concurrence that the plan fits the technical definition for use of Emergency Stabilization finding.

_____

Regional Fire Management Coordinator, Region 4 Date

III. Emergency Stabilization Funding Approval (check one box below):

☐ Approved

☐ Approved with Revision (see attached)

☐ Disapproved

_____

Regional Director, Region 4 Date

IV. Emergency Stabilization Funding Approval (check one box below):

☐ Approved

☐ Approved with Revision (see attached)

☐ Disapproved

_____

National Office Date

EXECUTIVE SUMMARY

Introduction

This Emergency Stabilization Plan (ES Plan) has been prepared in accordance with Department of Interior and US Fish and Wildlife Service (FWS) Policy, Okefenokee National Wildlife Refuge (Refuge) Comprehensive Conservation Plan, and Fire Management Plans. This plan provides Emergency Stabilization recommendations for all lands burned within the Big Turnaround Fire Complex perimeter which includes the Bugaboo Scrub Fire that lies within the Okefenokee NWR administered by the FWS. The primary objectives are to:

- Ensure public safety
- Protect cultural resources from further degradation following wildfires.
- Reduce introduction of invasive species into natural ecosystems.
- Prevent changes to hydrologic functions of the Okefenokee Swamp caused by fire damages
- Utilize integrated management actions to improve lands unlikely to recover naturally from severe wildland fire damage by emulating historic ecosystem structure, function, diversity and dynamics according to approved management plans.
- Restore or establish healthy, functioning ecosystems, even if these ecosystems cannot fully emulate historic or pre-fire conditions as specified in the approved management plans.
- Monitor stabilization treatments and treatment effectiveness

This Plan addresses emergency stabilization treatments recommended by the Post-fire Assessment team. Following control of the wildfire, a Post-fire Assessment Team assessed damages caused by the wildfire. There were significant damages caused by both the impacts from the wildfires as well as significant impacts caused by the fire suppression activities, only burned area stabilization treatments are requested in this ES Plan.

A Post-Fire Assessment Team was established to assess the damages caused by fire in the burned area including specialists brought in to assess impacts to wildlife, hydrology, soils, vegetation, invasive species, forestry, cultural resources and to minor facilities on the refuge. The Assessment Team conducted on-site observations and noted damages. A Post-Fire Assessment Report for each discipline is given in Appendix I. The individual stabilization treatment specifications, including treatment implementation and effectiveness are identified below in Part F. A summary of the costs can be found in Part E. Appendix II contains the National Environmental Policy Act (NEPA) compliance documentation summary. Appendix III contains Burned Area Maps. Appendix IV contains photo documentation of the wildfire. Appendices V to VIII contain supporting documentation. The 100+ pages of appendices can be found at the following web site:
ftp://ftp.nifc.gov/incident_specific_data/SOUTHERN/Georgia/07_Big_Turnaround/BAER/

Fire Background

Historic drought conditions and low water levels in the spring of 2007 set the stage for large wildfires in Southeast Georgia and Northeast Florida. The Big Turnaround Complex, which includes the Big Turnaround and Bugaboo Scrub Fires, burned together and spread over 350,000 acres of refuge lands. The Okefenokee National Wildlife Refuge was at the center of the fire complex, with fire burning a

patchwork of swamp shrubs, grasses, and uplands. The following is a summary of the events that occurred, a detailed summary of the fire history and chronology of the Big Turnaround Fire Complex and related fires is given in Appendix VIII. A fire progression map is given in Appendix III.

The Big Turnaround Fire Complex started as the Sweat Farm Road Fire on April 16, 2007 by a downed power line on private lands west of Waycross GA, approximately 20 miles north of the Okefenokee National Wildlife Refuge. During its initial nine mile run on April 16th, the Sweat Farm Road Fire burned over 2 homes, 5 out buildings, several cars and one tractor. By the next day (April 17th) the Sweat Farm Road Fire was estimated to be 20K acres. On this day, the fire made a significant push under extreme drought conditions and burned nearly to the refuge boundary. On April 18th the Sweat Farm Road Fire grew to over 22K acres and burned 15 homes.

From April 19th to the 21st the Sweat Farm Road Fire doubled in size to over 40K acres and burned another home (total homes lost to this date= 18). On April 21st the Sweat Farm Road Fire crossed onto the Okefenokee National Wildlife Refuge lands and became the Big Turnaround Fire. On April 21st the Sweat Farm Road fire grew to over 55K acres and the Big Turnaround Fire grew to 6.5K acres.

From April 22nd to April 23rd, east winds pushed the Big Turnaround Fire further onto the refuge and fire crews (with the assistance of the Greater Okefenokee Association of Landowners) completed over 80% of containment lines around the Swamp Edge Break and Perimeter Road as contingency lines.

On April 24th a wind shift occurred and caused significant spread of the Big Turnaround Fire. Burn out operations continued to try to contain the fire within the Okefenokee Swamp. By the 25th the Big Turnaround Fire grew to over 26K acres. Line construction continued along the Perimeter Road and Swamp's Edge Break to contain the fire. By the 27th the Big Turnaround Fire grew to over 36K acres in size. By May 1st at least one canoe platform on the interior of the swamp along public canoe trails is burned over. The estimated damage is $60K. At this time historic cabins and cultural sites were protected with fire protective wrap on islands within the swamp.

By May 2nd the Big Turnaround Fire has grown to over 43K acres in size. Over 85 miles of fire line was constructed along the Swamp's Edge Break and 14 miles of line completed along the Perimeter Road. On May 5th the Big Turnaround Fire grew to 44.5K acres and lightning starts 3 new fires on the interior of the Okefenokee Swamp; Floyd's Island Prairie Fire, Bugaboo Island Fire, and the Bugaboo Scrub Fire.

On May 7th new fire starts continued to grow in size and the Bugaboo Scrub Fire runs over 9 miles and burns over 16K acres. The Big Turnaround Fire at this time has burned over 53K acres.

On May 8th, the Bugaboo Scrub Fire exhibits extreme fire behavior and absorbs the Bugaboo Island Fire and spreads quickly into Florida and the Osceola National Forest. Spotting up to 2 miles ahead of the fire is observed by field observers. By May 9th, the Bugaboo Scrub Fire grows to 69K acres and the Big Turnaround Fire is estimated at 63K acres.

By May 10th, the Bugaboo Scrub Fire grows to 89K acres and the Big Turnaround grows to 64K acres. The Floyd's Island Prairie Fire is estimated at 1.2K acres. The Florida portion of the Bugaboo Fire is estimated at 45K acres.

By May 11th the Big Turnaround Fire is estimated to be 70K acres in size with 48K acres on refuge lands. This fire merges with the Floyd's Island Prairie Fire of 2K acres. Burnout operations are continued at this time to protect refuge structures and cultural resources. The Bugaboo Scrub Fire is now estimated at 111K acres. The Florida Bugaboo Fire is estimated at 85K acres.

By May 12th, a portion of the Bugaboo Scrub Fire that burns off of refuge lands onto private lands and industry lands is renamed the Bugaboo Scrub II Fire and considered a separate incident. The Florida Bugaboo Fire grows to 102K acres and the Big Turnaround is estimated at 76K acres in size.

From May 13th to May 19th, fires continue to grow with Big Turnaround reaching 110K acres, Bugaboo Scrub Fire growing to 160K acres. On May 20th the Big Turnaround and the Bugaboo Scrub Fire merge and are named the Big Turnaround Fire Complex estimated at 279K acres. At this time there has not been a significant rainfall event for over 80 days. The fires have been burning for over a month solid and continued extreme fire behavior is observed by all field observers and fire behavior specialists assigned to the fire. Burn out operations are continued to contain the fire within the Okefenokee Swamp and protect structures and cultural resources.

From May 19th to July 4th the Big Turnaround Fire Complex continues to grow in size as re-burn activities increase from needle cast and unburned fuels continue to burn. The fire size on July 9th is estimated as 386K acres.

Fire Damages and Threats to Human Safety and Natural Resource

The complex of fires that burned over Southeast Georgia and North Florida under extreme drought conditions from April to July 2007 has been reported as one of the largest fire events in modern history within the lower 48 states. Over 550,000 acres have been burned by the Sweat Farm Road, the Big Turnaround, Bugaboo Scrub, Bugaboo Scrub II, and the Florida Bugaboo fires. To date, no fatalities or major accidents have been reported by the public or fire fighters during this event. However, significant damages have incurred to life and property, as well as natural and cultural resources from the tremendous fire suppression activities that occurred and from fire damages. Over 15 homes, numerous outbuildings, vehicles and equipment have been lost to the fire. The Sweat Farm Road Fire (including the Big Turnaround Fire) and the Bugaboo Scrub Fires (including the Bugaboo Scrub II fire) have been declared Disaster Designation for FEMA funding. While the State of Georgia is pursuing avenues of compensation to private land owners who suffered damages from the fire, the federal lands impacted by damages are described in this Bugaboo Scrub Emergency Stabiliation Plan. A significant amount of repair efforts are ongoing to repair the damages due to the fire suppression activities on refuge lands and are being conducted under the actions of the incident management teams as described in the handbook (2007 FWS Redbook) and Rehabilitation Plans by the Incident Management Teams. The current burned area poses no additional threat to human safety or cultural resources in the area where immediate actions are needed for stabilization.

A Post-Fire Assessment Team was formed to assess damages to forestry, wildlife, hydrology, soils, vegetation and cultural resources as well damages to minor facilities within refuge lands as a result of the fires. The Assessment Team Composition is listed in Part D of the Plan. The Assessment Reports are given in Appendix I. These reports include assessments of damages due to fire suppression activities as well as burned area damages. A summary of the assessments of burn damages to natural and cultural

resources as well as minor facilities is described below.

Wildlife -The Okefenokee NWR provides approximately 18,500 acres of habitat for the endangered red-cockaded woodpecker (CCP 2005). The Post-fire assessment reports of Red-cockaded Woodpecker Habitat burned on the refuge indicates that minimal damages were reported to the habitat itself due to the aggressive prescribed fire management program that maintained frequently burned RCW habitat by the refuge. Further burned damages to RCW cavity trees and additional longer term damages must be assessed on a yearly basis as a minimum following the fires. In areas of Red-cockaded Woodpecker habitat that has been destroyed by fire due to significant longer term damages, replanting of longleaf pine trees may be needed to replace trees where they will not naturally regenerate. To date however, only minimal damages have been reported by the assessment team. Fire damages to RCW habitat included;

- Two trees with natural cavities burned and were killed by fire
- Moderate to high severity scorch on cavity trees but most trees not killed
- One nest lost but birds re-nested successfully
- 11 artificial cavities were immediately repaired following fires
- Re-burn activity within stands, but cavity trees not killed
- Natural cavities burned, but trees not killed
- Vegetation around base of trees removed before fires played a significant role in RCW cavity tree survival following fire
- Further monitoring of habitat needed to assess longer term damages not seen in initial assessments

Most of the significant damages to Red-cockaded Woodpecker habitat were caused by fire suppression activities. Within one forest compartment (Compartment 15), over 35 acres of Red-cockaded Woodpecker habitat was severely disturbed by plow line activities. Fire suppression damage repairs included rehabilitating the lines as soon as possible to minimize the damages caused to longleaf pine tree roots exposed by plowing activities (“tater patching”).

Wading Birds
Three colony sites were known to occur on the refuge prior to the fires. All three showed minimal damage by fire, however the significant drought had more of an impact on the colonies than fire. No colonies appeared to be active this year.

Breeding Birds
Breeding bird surveys were not completed by refuge staff this year due to fire activity. No reports of damages were reported in the initial assessment. Monitoring of hardwood hammocks for extensive habitat loss due to fire will be needed in the future to determine longer term impacts from fires on breeding bird habitats. Replanting of native hardwood species may be needed in the future in areas not able to regenerate naturally.

Sandhill Cranes
The fires occurred during nesting season for the Sandhill Cranes that nest on the refuge however, it is not known whether fires caused significant impacts on nesting success this year. Cranes nest in the open habitat of prairies on the refuge and fires increased this habitat type by reducing the woody scrub

vegetation present before the fires.

Ivory-billed Woodpecker Habitat
Potential habitat for the Ivory-billed Woodpecker does occur on the Okefenokee NWR. It is believed that hardwood wetlands in the northwest portion of the swamp which is potential habitat for the Ivory-billed Woodpecker, was significantly damaged by the fires. If changes in habitat occur as a result of the fires, birds may use alternate habitats to survive throughout the swamp. Future surveys for Ivory-billed Woodpeckers will be continuing in the future by refuge staff.

Black Bear Habitat
As a result of the fires, black bears moved around the edges of the swamp and were observed repeatedly. While some bears most likely were caught in the fire's path, the habitat for bears was minimally damaged by the fires. For the most part, bear habitat was burned in a mosaic pattern and food resources may be limited but available. Mature hardwoods in the northwest portion of the swamp were most severely damaged by fires and more bear movement may be observed as bears continue to find alternative food resources throughout the swamp. In the long term, berry bearing bear food plants are thought to increase in areas burned by the fires in the next few years. Monitoring changes in bear habitat will continue by refuge staff.

Herpetofauna
Herpetofauna assessment report states that while many isolated wetlands and pond areas within the Okefenokee Swamp burned from the fires, the fires created a mosaic pattern of low to high severity burns. The most significant damages reported from the 20 isolated wetlands and ponds assessed showed minimal damages due to fire to herpetofauna habitat.

The long-term benefits of fire to herpetofauna populations and the maintenance of the habitat structure of pine flatwood ecosystems, to which these species have adapted, generally outweigh the loss of individuals during an intense fire event.

The affects of these habitat alterations on herpetofauna populations vary considerably with taxonomic groups as well as life stage events. However, because fire has historically functioned as an influencing component of the Okefenokee ecosystem and continues to be a vital management tool of Okefenokee National Wildlife Refuge (ONWR), long-term effects of fire on amphibian and reptile populations are expected to be minimal.

Alligators
Alligators have been limited to deeper pools of water under the pre-fire drought conditions. The fires had a minimal impact on alligator habitat compared to the extensive drought conditions exhibited before the fires. Changes in water chemistry caused by the fires could impact the health of the alligators or alligator reproduction. Continued water quality monitoring is needed to observe if any water quality changes have occurred following the fires.

Fisheries
Fish populations, much like alligator populations were more significantly impacted by the reduced water levels of the drought than the fire impacts themselves. The majority of the lakes on the refuge did not have standing water prior to June 2nd. An electro-fishing survey will be conducted on the refuge in November 2007 by the Georgia Division of Natural Resources. Water quality will also be monitored on

the refuge following the fires.

Vegetation
A post-fire vegetation assessment was conducted to identify any potential threats to the natural vegetation of the Okefenokee National Wildlife Refuge caused by the wildfires. Many aspects of the natural vegetation were assessed for fire damages including; 1) the potential introduction of invasive species, 2) rare plant population impacts and 3) wetland forest ecosystem impacts.

In terms of invasive species threats, the results of the assessment suggest that there are significant threats to the refuge by the Chinese Tallowtree (*Sabium sebiferum*) and the aggressive Cogongrass (*Imperata cylindrica*) due to the adjacency of known populations on private lands next to the refuge. In addition fire suppression activities could also be a potential source for introductions of these invasive species. Currently there are no known locations of these invasive species on the refuge. It is therefore, recommended to monitor moderate to severely burned sites in the future so that immediate removal or control treatments can be implemented to remove any introduced invasive species caused by the wildfires. In addition, signage may be needed to inform the public of the potential spread of invasive species following certain activities (boating, hiking etc,) in specific refuge public entrances.

There are six plant species of conservation concern on the refuge (CCP 2005). The populations were subjected to a mosaic burn pattern and will likely persist over time. It is recommended that no actions will be needed to recover these populations over time. These species will be included in the normal monitoring program conducted by the refuge staff.

The 2007 wildfires significantly impacted the wetland forests of the Okefenokee Swamp. The combination of extended drought and moderate to high burn severity across many of the wetland forest populations on the refuge resulted in large areas of total tree mortality of forested wetland species throughout the swamp. Mortality of trees is attributed to either being burned or the roots were weakened by fire. Standing dead snags are seen as well as many acres of fallen trees due to weakened roots. Repeated post-fire assessments and reports observe vast areas of dead and downed trees that have fallen due to weakened tree roots following wind events. While these events have killed large stands of wetland forest species, it is believed that the stands will regenerate naturally overtime. It is recommended that the stabilization or rehabilitation treatments should include no salvage operations to remove the dead and downed trees and no replanting of native species or reseeding is necessary at this time. Continued monitoring of this treatment will be required in the future to determine the effectiveness of this treatment decision. Replanting may be necessary where natural regeneration does not occur over time.

Cultural Resources
The post-fire cultural resource assessment involved a non-collection pedestrian inspection of selected sites including areas impacted by fire suppression activities and areas of moderate to high burn severity caused by the wildfires. Prior to the wildfires, 124 recorded cultural resources were recorded in the Okefenokee NWR including the Hebard Hunting Cabin on Floyd’s Island and the Chesser Homestead on Chesser Island. As a result of the post-fire assessment, eight previously unknown archaeological sites were recorded, 24 artifact isolates were plotted and 15 known sites were revisited. Two previously reported identified sites were searched for but not found.

During the wildfire event, fire behavior models were used extensively to determine the potential path of

the wildfires. This predictive modeling information turned out to be invaluable in the protection of the cultural resources on the Refuge. Understanding the potential path of the wildfires from the modeling efforts allowed the Incident Management Team and Refuge Staff time to take adequate measures in protecting cultural resources (See Photo #1, Appendix IV). These actions taken were critical to the survival of cultural resources as many were in the direct path of the wildfires. Post-burn visits conducted by the Cultural Resource Assessment Team indicated that little or no damages were incurred to the standing structures due to direct fire damages or to the protective measures taken. In addition, the wildfires contributed to the exposure of unrecorded cultural resources by consuming the covering vegetation and allowing hidden artifacts and features to be seen.

Impact to prehistoric archaeological sites was minimal since these are largely underground. Only the Indian mound at the southwestern end of Floyds Island exhibited any detrimental effects. There, the surface vegetation was burned away from the slopes of a railroad tramway cut through the mound that exposed the surface soil to rain erosion. Some measure of stabilization is needed at this site to mitigate the impact of rainfall. The Emergency Stabilization Plan includes a specification that includes stabilization costs for this cultural resource.

Two historic sites, one on Chesser Island and one on the northwest side of the Okefenokee NWR were adversely impacted by the fire. The Chesser Island site is a historic homestead with some remnant standing structure and a surface scatter of artifacts. The fire damaged many of the surface artifacts and charred many of the standing timbers associated with structures on the site. The site on the northwest side of the Okefenokee NWR is a historic saw mill that operated in the early 20th Century. It sustained similar damage due to the wildfire and was also impacted directly by fire suppression activities. Both of these sites should be mapped in the future and extensive photographs made of their existing condition. The Refuge should also take measures to restrict access to these sites to ensure that no illicit collecting or damage can occur. A historic site was discovered in a logged-over area on Trail Ridge that resulted from the harvesting of burned timber. Measures should be taken to mark this site for preservation by the Refuge.

Soils

The assessment of soil impacts showed minimal damages caused by the wildfires. The soils of the Okefenokee Swamp include very poorly drained, wetland soils that contain significant amounts of organic materials laid over sandy sediments. Almost the entire area with the swamp and the swamp edge break are considered wetlands with uplands surrounding the swamp. The upland soils immediately adjacent to the swamp include ultisols and spodisols that are found associated with flatwood communities. These soils are fine to medium sandy soils with an organic pan beneath the soil surface. Generally, water does not penetrate quickly into these fine sandy soils but rather may retain water during precipitation events or in areas where extensive ditching or rutting has occurred. Flatwood soils with 2% or more slope are highly erodable. Along the upper ridges found along the nearby Trail Ridge to the east of the swamp are characterized as well to somewhat excessively drained soils that permeate water rapidly following rainfall. These soils can erode following intense and heavy rain events over long periods of time.

While there have been significant impacts to the soils of the Okefenokee Swamp area due to previous land use practices such as road development, ditching, bedding, windrowing, and other land use practices associated with logging activities, there is little impacts to the soils due to the 2007 wildfires. Soil erosion is generally not a threat in the burned area as the watershed is flat, but localized impacts

may be observed. It is recommended that repeated post-storm event monitoring of soil impacts be conducted in moderate to highly burned areas to determine if localized impacts develop following the wildfires over the next few years. This impact could be significant in areas where large amounts of organic materials were consumed by the wildfires and produced extensive damage to tree root systems. These areas are subject to trees falling and causing large and small debris movement within the watershed, which in turn could create erosion and sedimentation where hydrologic changes may occur (See Hydrology Section Below). Further, there appears to be no immediate threat from the wildfires to long term productivity of the soils or soil loss. Short term losses include the oxidation of the organic materials in the swamp soils but this is considered a natural process in fire dependent ecosystems.

Hydrology

One of the most important environmental factors that defines the Okefenokee Swamp is water. Changes to the hydrology of this ecosystem may result in significant consequences to the integrity of the swamp and its wilderness values. People, wildlife, plants and other resources are dependent on its water, within and downstream from the swamp. Wildfire is the natural way of controlling excessive peat accumulation to maintain the variety in wetland and deep water habitats. However, there are also impacts associated with fire, suppression and recovery activities. The recovery of the hydrology of the swamp from the wildfires is normally a natural function that contributes to its diverse character and unique existence. The internal wetlands of the Okefenokee Swamp include various lacustrine, palustrine and riverine habitats with varying water depths of surface or near surface groundwater with organic and peat accumulations. Within the swamp, small upland islands add local character to the water and wetland dominated landscape.

The 615 square mile Okefenokee Swamp Refuge receives water via precipitation and surface runoff from the surrounding 600 square mile contributing area that drains directly into the swamp from the northwest, north, northeast, and a relatively narrow strip along the east. An undetermined amount of springflow from the underlying karst terrain also contributes flow locally and helps to maintain clear water in some areas. Most of the stream inflow and outflow are stained with moderate to high concentrations of tannins and other organic substances common to coastal streams dominated by forested wetlands. Most of the water in the swamp is of precipitation origin. There is localized contribution from creeks that drain into the swamp on the northwest side including: Black River, Alligator Creek, Greasy Branch, Suwannee Creek, Cane Creek, Bear Branch, Surveyors Creek, Barnum Branch, Turkey Branch and Big Branch. The hydrology of the Okefenokee Swamp includes two major outflow drainages;

1) The 1,260 square mile **Suwannee River** is measured by a US Geological Survey stream gage at Fargo, Georgia and contains most of the Okefenokee Swamp. Approximately 89% surface water outflow from the swamp drains into the Suwannee River (Rykiel, 1977), with 4% of this associated with the Cypress Creek tributary and unknown amounts in Alligator Creek, Bay Creek, Bogy Branch, Sweetwater Creek and other small drainages and drainage canals, and
2) The Okefenokee Swamp contributes a minor portion of the 700 square mile **St. Mary's River** measured at the USGS gage near MacClenny, Florida. About 11 % of the Okefenokee Swamp outflow goes to the St. Mary's River to the south of the swamp (Rykiel, 1977).

The post-fire hydrologic and soil assessments revealed that the fire generally reduced, but did not eliminate the organic component of the soils within the swamp. The loss of organic matter and mortality of some trees due to the wildfires has reduced water absorption on the surface and transpiration, resulting in increased water table levels, and in some locations surface extent or movement of water or

evaporation. No mitigation or treatments are currently recommended for these losses, however, it is recommended to conduct repeated monitoring over time to determine if natural recovery has not occurred as a result of any treatment applications. In sloping terrain above 1% slope, additional erosion control treatments may be considered in the future if localized erosion and sediment transport continues. However, rapid needle loss is common on the upland landscapes, and exposed soils typically cover with pine needles. Wildfire impacts to the natural hydrology of the swamp are varied, but more evident in moderate to high burn severity areas.

Large woody debris may also continue to be a contributing factor to changes in the natural hydrologic patterns of the Okefenokee Swamp as dead and dying trees fall into stream channels with some potential for blocking or diverting water flow. Some boating and hiking trails adjacent to water entities may be subject to increased hazards from falling trees and woody debris accumulations in the short term. Rehabilitation treatments are required to mitigate this hazardous situation by closing public access trails until the hazards can be removed. Trail closures during and immediately after high wind events may be considered until public safety checks are made.

Although coastal water systems do not typically move great amounts of large woody debris from location to location, periodic monitoring following major storm or flood events are recommended adjacent to culverts and bridges in rural, community and public developments over the next several years. In areas with large amounts of accumulated woody debris, structures can become plugged or blocked leading to flooding as well as erosion issues. Any situations where public use roads become flooded with flowing water should be evaluated for erosion and the structural integrity of the road as well as the drainage structures reviewed. This was not evident during initial hydrology assessments, but could become an issue over time. Continued extensive monitoring as well as follow-up on public reports of debris, channel blockage, or bank erosion issues, especially after major events over the next two to three years is critical. As vegetation responds and becomes linked to this debris, the likelihood of movement is diminished.

Additional activities related to Burned Area Stabilization and Rehabilitation of the hydrology of the Okefenokee Swamp includes the cleaning of culverts, localized channel, ditch or Suwanee Sill gates from abnormal sediment and/or debris accumulations associated with post-fire storm events. Although portions of this activity has been initiated as part of the immediate fire suppression repair activities, specifications are given in the Emergency Stabilization Plan to continue this work where it is deemed necessary to protect public safety, mitigate damage to facilities and prevent any further degradation of the hydrology of the Okefenokee Swamp due to the wildfires.

Forestry Resources

Forest Compartment Assessments

The assessment report of forestry resources indicates that the majority of forest resources, other than hardwoods and wetlands species, were not significantly damaged by the wildfires. However, continued monitoring for Southern Pine Beetle infestations following longer term mortality of trees is essential for to prevent any additional detrimental damages to forest resources. Replanting may be required in longleaf pine areas that do not regenerate naturally over time. The burn severity reported across the forest stands varied from moderate to severe scorch with little mortality evident. This is most likely caused by the aggressive and successful prescribed fire management program used by the refuge to maintain habitat for the Red-cockaded Woodpecker and to promote the native longleaf pine ecosystem. In some areas, young longleaf pine trees exhibited some damages due to fire but have shown new

growth and relatively minimal damage to trees. Continued monitoring of stands is needed to determine longer term fire damages on young longleaf pine trees. Slash pine trees on the other hand, suffered significant losses from the wildfires with some areas incurring 100% fire damages (Compartments 7 and 8). These trees will be salvaged by Rayonier Inc., in accordance with the perpetual timber lease agreements in place. In addition to slash pine forests damages, hardwood tree species suffered significant damages as well. Big hardwood losses occurred in Compartments 4, and 9. Although natural regeneration of hardwood species is assumed to occur, continued monitoring is needed to determine if regeneration will occur and replanting will be required in areas that do not regenerate naturally.

Hazardous Trees

Hazardous trees were initially identified by firefighting and suppression resources, Refuge Staff, Incident Management Staff, the public and others and were removed immediately to mitigate the hazard to firefighters and to the public. Public trails will need to be monitored and maintained over time including any removal of hazardous trees. Any trails where hazardous trees are identified and not removed will be closed until deemed safe (see Hydrology Section above). This includes the XX miles of canoe trails. Before any tree removal operations, other potential risks will be identified such as high water levels; high winds, poisonous wildlife and etc., and these risks will be mitigated to protect the safety of hazardous tree removal teams. Job Hazards Analysis Documentation should be developed for any hazardous tree removal project.

Management Requirements

The Comprehensive Conservation Plan (CCP) for the Okefenokee National Wildlife Refuge was approved and finalized November 2006 (CCP 2006). This document provides the long-term guidance for management decisions; sets forth goals, objectives, and strategies needed to accomplish refuge purposes; and identifies the Fish and Wildlife Service's best estimate of future needs. This document provides the basic field unit information and issues that will affect the proposed stabilization and rehabilitation actions.

As described in the CCP, the refuge was established in 1936 to protect the ecological system of the 438,000 acre Okefenokee Swamp. Approximately 371,000 acres of the Okefenokee Swamp wetlands are incorporated into the refuge; and 353, 981 acres within the swamp were designated as wilderness by the Okefenokee Wilderness Act of 1974. In 1986 the Okefenokee NWR was designated by the Wetlands Convention as a Wetland of International Importance.

The refuge was established as a refuge and breeding ground for migratory birds and other wildlife. It was established to protect the integrity of the swamp from direct and surrounding land use practices of the area since the late 1800's (see CCP for historical accounts of land use practices within the Okefenokee Swamp Area).

The refuge is the 16th most visited refuge within the Fish and Wildlife Service's Refuge System, documenting over 400,000 visitors per year. Public use and environmental education are clearly important goals of the refuge as well as restoring and maintaining the integrity and ecology of the Okefenokee Swamp.

The CCP states 6 Goals of the refuge that include; 1) Wildlife Management, 2) Resource Protection, 3)

Wilderness values, 4) Public Services, 5) Partnerships, and 6) Administration. Within each of these goals are listed objectives and strategies to achieve these objectives. The objectives that are applicable to this Emergency Stabilization Plan are briefly described below. A more detailed discussion of each objective is described in the CCP (CCP 2006). The CCP was approved in November 2006 by Sam Hamilton, Regional Director.

GOAL 1. Wildlife Management - Protect and provide high quality and protection for threatened and endangered species and conserve the natural diversity, abundance, and ecological function of native flora and fauna on and off refuge lands (CCP 2006, pg. 85)

- *Objective 1*- Protect and maintain the threatened and endangered species populations (CCP 2006, pg. 85)
- *Objective 4*- Maintain, enhance and promote upland linkages to ephemeral wetlands for amphibians (CCP 2006, pg. 87)

GOAL 2. Resource Protection – Restore, maintain, protect and promote native habitats and healthy natural systems where possible to imitate pre-European settlement distribution, frequency , and quality on and off the refuge, and preserve the associated cultural sites and wilderness qualities (CCP 2006, pg. 91)

- *Objective 1*- Restore native upland communities (CCP 2006, pg 91).
- *Objective 2*- Maintain wetland communities (CCP 2006, pg 93).
- *Objective 4*- Reduce non-native invasive species (CCP 2006, pg 96).
- *Objective 5*- Protect cultural resources (CCP 2006, pg. 96).
- *Objective 6*- Preserve wilderness resources (CCP 2006, pg. 97).

GOAL 3. Wilderness Values- Restore, preserve, and protect the primeval character and natural processes of the Okefenokee Wilderness, leaving it untrammeled by man while providing recreational solitude, education, scientific study, conservation ethics, and scenic values (CCP 2006, pg. 97).

- *Objective 1*- Preserve primeval character of wilderness (CCP 2006, Pg. 97).
- *Objective 2*- Provide recreational opportunities in wilderness (CCP 2006, pg. 98).
- *Objective 5*- Promote conservation ethics in wilderness (CCP 2006, pg. 99).
- *Objective 6*- Provide scenic vistas in wilderness (CCP 2006, pg. 99).

GOAL 4. Public Services- Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education, and interpretation when compatible to promote public appreciation, understanding, and action on behalf of the Okefenokee Ecosystem while maintaining the wilderness resource of the Okefenokee Wilderness Area (CCP 2006, pg. 99).

- *Objective 1*- Provide signage and information to public (CCP 2006, pg. 99).
- *Objective 5*- Provide quality opportunities for wildlife observation and photography (CCP 2006, pg. 102).
- *Objective 6*- Expand environmental education and public awareness of refuge's natural ecology and human influences on the swamp ecosystem (CCP 2006, pg. 103).
- *Objective 7*- Provide interpretive media to increase awareness and understanding of refuge's natural and human influences (CCP 2006, pg. 104).

GOAL 6. Administration- Provide adequate staff, partners, volunteers, and others with the facilities and equipment to support the goals and objectives of the refuge in a safe manner while maintaining sensitivity to wilderness ethics and the "zones of influence" (CCP 2006, pg. 109).

- *Objective 5*- Ensure resource protection, enforcement of all refuge-related acts and regulations, and the safety of visitors, staff, volunteers, interns and researchers (CCP 2006, pg. 112).
- *Objective 6*- Implement law enforcement procedures to protect refuge's cultural resources and diminish site destruction due to looting and vandalism (CCP 2006, pg. 112).

Within these broad goals, several objectives are pertinent to the Burned Area Emergency Stabilization Plan for the Bugaboo Scrub Fire. While there were damages reported by the wildfires, a majority of the impacts from the wildfires remain to be determined. The reported damages to date caused by the wildfires include:

- Damaged recreational canoe platforms (3)
- Damaged bridges (2)
- Damaged refuge signs (200)
- Trail maintenance (50 miles of trails)

The repairs of these damages clearly are supported by Goals 4 and 6 above and objectives described therein. However, there is still an unknown amount of longer term resource damage from wildfires that may occur within the next few years. Assessments are needed to determine the extent of damages incurred and what threshold is needed to determine if further treatments are required. The assessments of longer term damages to resources are supported by Goals 1, 2, and 3 above as well as the objectives described therein.

Follow-up restoration treatments that will be implemented to mitigate the damages are also supported by the goals stated in the approved CCP. It is fully anticipated that an amendment will be needed to address any treatments needed to address further damages reported by the future assessments.

As part of the assessments, well-defined thresholds will be described to determine if further treatments are warranted. All follow-up treatments will be implemented according to guidance provided in the approved CCP and it goals and objectives.

The Burned Area Emergency Stabilization Plan proposes to repair known damages that have been reported to canoe platforms, bridges, and signs as well as conduct yearly assessments to determine the extent of damages incurred over the next three years to Red-cockaded Woodpecker habitat, longleaf pine forests, forested wetlands, and from non-native invasive species introductions. In addition, any treatments implemented will be monitored for treatment implementation and effectiveness. All the proposed activities are supported by the approved CCP as stated above (CCP 2006).

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PART A - FIRE LOCATION AND BACKGROUND INFORMATION

Fire Name	Big Turnaround Complex
Fire Number	DEU1 (Bugaboo Scrub)
Agency Unit	Okefenokee NWR
Region	R-4, Southeast Region
State	GA/FL
Counties	GA- Clinch, Charlton, Ware FL- Baker, Columbia
Ignition Date/Cause	May 2, 2007 / Lightning–Bugaboo Scrub
Zone	FWS Fire Management District 5
Date Fully Contained	To Be Determined
Jurisdiction	180,538 acres as of 8/1/07

PART B - NATURE OF PLAN

Type of Action (check one box below)

X	Initial Submission
	Amendment to the Initial Submission

PART C – EMERGENCY STABILIZATION ASSESSMENT

Overall Emergency Stabilization Objectives

- ***Develop Emergency Stabilization Plan***
- ***Assess further damages to natural vegetation due to the introduction of invasive species in the burned area and remove invasive species from burned areas or areas of introduction caused by the wildfires***
- ***Assess further damages to hydrology due to woody debris accumulations from storm events (storm inspection response), remove woody debris from channels to protect hydrology and the public, and remove woody debris from culverts, bridge embankments and other blockages as they develop post-storm events***
- ***Provide fencing to protect existing cultural resources on burned areas where susceptible to***

heavy looting

- ***Stabilize cultural resources on burned areas where susceptible to further erosion***
- ***Monitor stabilization treatments for implementation and effectiveness***

PART D - TEAM ORGANIZATION, MEMBERS, AND RESOURCE ADVISORS

I. Burned Area Emergency Response Team Members:

Position	Team Member (Agency)
Team Leader	Sue Grace, Southeast Region, USFWS
Deputy	Ron Phernetton, Okefenokee NWR
Refuge Project Leader	George Constantino, Okefenokee NWR
Deputy Project Leader	Maury Bedford, Okefenokee NWR
Forestry	Russ Langford, Okefenokee NWR
Forestry	Howard McCullough, Okefenokee NWR
Facilities	Rocky Chesser, Okefenokee NWR
Facilities	Doug Nuss, Okefenokee NWR
Wildlife	Dean Easton, Okefenokee NWR
Wildlife	Sara Aicher, Okefenokee NWR
Vegetation	Cyndy Loftin, USGS, Maine Coop Unit, UME
Hydrology	Bill Hansen, USFS, Francis Marion NF
Soils	Dennis Law, USFS, Francis Marion NF
Soils	Jason Jennings, USFS, Francis Marion NF
Cultural Resources	Dwight Kirkland, Southeast Horizons Inc.

III. Resource Advisors: (Note: Resource Advisors are individuals who assisted the Burned area emergency response team with the preparation of the plan. See Part H for a full list of agencies and individuals who were consulted or otherwise contributed to the development of the plan.)

Name	***Affiliation***
Sue Grace	Regional Fire Ecologist, Fire Management Field Office, Lacombe, LA 985-882-2008

Rocky Chesser	Facilities READ, Okefenokee NWR
Russ Langford	Forestry READ, Okefenokee NWR
Dean Easton	Wildlife READ, Okefenokee NWR
Doug Nuss	Forestry READ, Okefenokee NWR
Chris Wright	READ, Okefenokee NWR
Will Stokes	READ, Okefenokee NWR
Reggie Forcine	READ, Okefenokee NWR
Howard McCullough	READ, Okefenokee NWR
Sara Aicher	Wildlife Biologist, GIS Okefenokee NWR
Drew Wirwa	Wildlife READ, Okefenokee NWR
Jim Burkhart	Ranger, Okefenokee NWR
Shawn Gilette	Ranger, Okefenokee NWR
Ron Phernetton	AD Forester, Okefenokee NWR
Matt Mueller	Technician, Mississippi Sandhill Crane NWR
Sheah Mucci	Technician, Mississippi Sandhill Crane NWR
Richard Kanaski	Regional Archaeologist, Southeast Region, USFWS
Jim Poje	Engineer, Southeast Region, USFWS

PART E - SUMMARY OF ACTIVITIES AND COSTS

The summary of activities and cost table below identifies stabilization costs charged or proposed for funding from sub-activity 9142 funding sources.

EMERGENCY STABILIZATION ACTIVITIES COST SUMMARY TABLE – Bugaboo Scrub Fire

Spec #	Title	Unit	Unit Cost	# of Units	Work Agent	Cost
1	ES Plan Development	EA	$5,400	1	FA	$5,400
2	Invasive Species Control	EA	$ 9,522	1	FA, SC	$9,522
3	Watershed Protection	EA	$20,360	1	FA,SC	$20,360
4	Cultural Resource Protection	EA	$10,539	1	FA, SC	$10,539
					TOTAL COST	$45,821

Work Agent: CA=Coop Agreement, FA=Force Account, G=Grantee, P=Permitee, SC=Service Contract, TSP=Timber Sales Purchaser, V=Volunteer

PART F - INDIVIDUAL SPECIFICATION, Specification #1

TREATMENT/ACTIVITY NAME	Emergency Stabilization Plan Development	**PART E SPECIFICATION #**	#1
NFPORS TREATMENT CATEGORY*	Planning	**FISCAL YEAR(S) (list each year):**	2007
NFPORS TREATMENT TYPE *	BAER/ES Plan	**WUI? Y / N**	N
IMPACTED COMMUNITIES AT RISK	None	**IMPACTED T&E SPECIES**	Red-cockaded Woodpecker

WORK TO BE DONE (describe or attach exact specifications of work to be done):

Number and Describe Each Task:

A. General Description: Prepare the Emergency Stabilization Plan for the Okefenokee National Wildlife Refuge

B. Location/(Suitable) Sites: Plan has been prepared for the proposed stabilization activities within the FWS managed lands. Plan costs include administrative costs, salaries of planning team, per diem travel and supplies.

C. Design/Construction Specifications:
1. Reassess the detailed burned area assessments and burn severity maps prepared relative to natural resource stabilization and rehabilitation and approved Okefenokee NWR land management plan objectives.
2. Write specifications based on assessment data and team recommendations.
3. Submit plan for approval and secure funding from appropriate sources.
4. Per policy, complete annual reports with monitoring narratives and cost details.

D. Purpose of Treatment Specifications: To prepare a comprehensive Emergency Stabilization Plan to stabilize degraded and destroyed natural and cultural resources and minor facilities damaged by the wildfires that will not recover naturally.

E. Treatment Effectiveness Monitoring Proposed: N/A

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES:	**COST / ITEM**
GS-13 Refuge Manager @ $52/hr* X 8 hrs	$416
GS-12 Fire Ecologist @ $49/hr X 40 hrs	$1,960
GS-11 Biologist @ $42/hr X 16 hrs	$672
GS-11 Forester @ $42/hr X 16 hrs	$672
GS-11 Fire Management Officer @ $42/hr X 8 hrs	$336
GS-11 Information Specialist @ 42/hr X 8 hrs	$336
GS-9 Equipment Operator @ $42/hr X 8 hrs	$336
GS-9 Administrative Officer @ $42/hr X 8 hrs	$336
	$336
* all salaries include benefit estimates of 40%	
TOTAL PERSONNEL COSTS	**$5,400**
EQUIPMENT PURCHASE, LEASE AND/OR RENT	**COST / ITEM**
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES	**COST / ITEM**

TOTAL MATERIALS AND SUPPLY COST	
TRAVEL COST	**COST / ITEM**
TOTAL TRAVEL COST	
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	**COST / ITEM**
TOTAL CONTRACT COST	

SPECIFICATION COST SUMMARY:

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY__07	09/1/2007	0930/07	FA	1	$5,400	1	$5,400
FY_08	10/01/07	9/30/08	FA	1	$0	1	$0
FY_							
FY__							
		TOTAL					**$5,400**

Work Agent: C=Coop Agreement, F=Force Account, G=Grantee, P=Permittees, S=Service Contract, T=Timber Sales Purchaser, V=Volunteer

SOURCE OF COST ESTIMATE:

1.	Estimate obtained from 2-3 independent contractual sources.	
2.	Documented cost figures from similar project work obtained from local agency sources.	
3.	Estimate supported by cost guides from independent sources or other federal agencies	
4.	Estimates based upon government wage rates and material cost.	**P**
5.	No cost estimate required - cost charged to Fire Suppression Account	

P = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

See Map of Big Turnaround Fire, Appendix III.

TOTAL COST BY JURSIDICTION:

JURISDICTION	UNITS TREATED	COST
Okefenokee NWR - FWS	180,538	$ 5,400
	TOTAL COST	**$ 5,400**

PART F - INDIVIDUAL SPECIFICATION, Specification #2

TREATMENT/ACTIVITY NAME	Invasive Species Control	**PART E SPECIFICATION #**	# 2
NFPORS TREATMENT CATEGORY*	Invasive Species	**FISCAL YEAR(S) (list each year):**	2008
NFPORS TREATMENT TYPE *	Chemical/Mechanical Control	**WUI? Y / N**	N
IMPACTED COMMUNITIES AT RISK	None	**IMPACTED T&E SPECIES**	Red-cockaded Woodpecker

WORK TO BE DONE (describe or attach exact specifications of work to be done):

A. General Description: Utilize integrated pest management practices (prescribed fire, mechanical, and chemical control methods), as appropriate to immediately treat undesirable exotic species known to exist within the fire perimeter of the Big Turnaround Fire Complex and as defined by monitoring.

B. Location/ (Suitable) Sites: Control all invasive species as defined by annual assessments. Locations will be prioritized based on burn severity, amount of fire suppression activities and location to established populations nearby or adjacent to the refuge boundary.

C. Design/Construction Specifications:

- Control the establishment non-native invasive weeds within the burn area with annual assessments and immediate chemical or mechanical treatments. Infestations of Chinese tallowtree and Cogongrass are known to occur in established populations adjacent to the refuge boundary. Multiple treatments will be required with a variety of control techniques. Ground application of FWS approved chemicals including but not limited to Impr… and Triclopyr may be required. These chemicals have been shown to be effective treatments in the control of Chinese Tallowtree and Cogongrass at Southeast Louisiana Refuges following the Rickwood Fire. Timing of application may need to be adjusted to ensure treatment of each species is conducted in the proper phenological stage to ensure the protection and recovery native and endemic species.
- Prescribed Fire will also be implemented to control Chinese tallowtree in areas of large infestations. Although the Vegetation Assessment does not support the use of prescribed fire in killing Chinese tallowtree, it has been shown to be effective in early growth stages, one year or less (Grace 2001, 2005 and see FEIS- Chinese tallowtree http://www.fs.fed.us/database/feis/plants/tree/triseb/all.html#FIRE%20EFFECTS).

D. Purpose of Treatment Specifications: Immediately treat existing noxious weed occurrences to prevent spread onto non-infested sites within the burn area. Protect the ecological integrity and site productivity of threatened or endangered plant and animal species and their associated habitats on lands administered by the Okefenokee NWR. Prevent spread of noxious weeds into critical habitats of T&E species on unburned lands within and adjacent to the refuge.

E. Treatment Effectiveness Monitoring Proposed: Spot checking of noxious weed sites to ensure control methods are meeting management objectives will occur annually at a minimum. A staff person from the Okefenokee NWR will visit sites controlled within two weeks after initial treatment; this is especially important for weed populations that are sprayed to ensure effectiveness of herbicide application.

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES:	COST / ITEM
GS-12 Biologist @ $49/hr X 40 hrs X 1 year	$1,960
GS-11 Biologist @ $42/hr X 24 hrs X 1 year	$1,008
GS-7 Technician @$24/hr X 40 hrs X 1 year	$960
(*all salaries include benefit estimates of 40%)	
TOTAL PERSONNEL COSTS	**$3,928**

EQUIPMENT PURCHASE, LEASE AND/OR RENT	COST / ITEM
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	

MATERIALS AND SUPPLIES	COST / ITEM
Field and Office supplies @$250 per year X 1 year	$250
ATV gas $25 per day X 5 days X 1 year	$125
Arsenal @ 0.125 gallon per acre X $35 per gallon X 50 acres X 1 year	$219
TOTAL MATERIALS AND SUPPLY COST	**$594**

TRAVEL COST	COST / ITEM
TOTAL TRAVEL COST	**$**

CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	COST / ITEM
Control weeds with herbicides, ground application estimation of 50 acres @ $200 per acre x 1 years	$5,000
TOTAL CONTRACT COST	**$5,000**

SPECIFICATION COST SUMMARY:

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY__08	10/01/2007	08/30/2008	FA, SC	1	$9,522	1	$9,522
						TOTAL COST	**$9,522**

Work Agent: C=Coop Agreement, F=Force Account, G=Grantee, P=Permittees, S=Service Contract, T=Timber Sales Purchaser, V=Volunteer

SOURCE OF COST ESTIMATE:

1.	Estimate obtained from 2-3 independent contractual sources.	
2.	Documented cost figures from similar project work obtained from local agency sources.	
3.	Estimate supported by cost guides from independent sources or other federal agencies	**C**
4.	Estimates based upon government wage rates and material cost.	**P, M**
5.	No cost estimate required - cost charged to Fire Suppression Account	

P = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

See Map of Big Turnaround Fire, Appendix III.

TOTAL COST BY JURSIDICTION:

JURISDICTION	UNITS TREATED	COST
Okefenokee NWR - FWS	180,538	$9,522
	TOTAL COST	**$9,522**

PART F - INDIVIDUAL SPECIFICATION, Specification # 3

TREATMENT/ACTIVITY NAME	Storm Inspections	**PART E SPECIFICATION #**	# 3
NFPORS TREATMENT CATEGORY*	Roads	**FISCAL YEAR(S) (list each year):**	2007, 2008
NFPORS TREATMENT TYPE *	Culverts	**WUI? Y / N**	N
IMPACTED COMMUNITIES AT RISK	None	**IMPACTED T&E SPECIES**	Red-cockaded Woodpecker

WORK TO BE DONE (describe or attach exact specifications of work to be done):

Number and Describe Each Task:

A. General Description: Storm Inspection and response keeps culvert and drainage structures functional by cleaning sediment and debris from the inlet between or during storm events on roads where access is required. Storm inspection and response performed during the storm should meet safety considerations in the Job Hazard Analysis. Storm inspections must be cost effective and does not allow for upsizing or modifying existing drainage structures.

B. Location/(Suitable) Sites: Storm inspections will occur along refuge roads where access is required this includes all refuge roads, swamp's edge break and perimeter road where there is a risk of loss of water control from inadequate or blocked drainage structures. Specific sites for inspection include: road crossings where loss of control of water or exceedance is identified, road access is necessary, road crossings where high sediment and debris is anticipated, bridge crossings, and low water crossings.

C. Design/Construction Specifications:
1. Potential treatment areas will be identified by a hydrologist
2. Hazards that require mitigation prior to implementation will be identified.
3. Clear structures and restore drainage function from identified sites.
4. Visit sites periodically after storm events to monitor treatment implementation and stabilize further drainage repairs needed.

D. Purpose of Treatment Specifications: Storm inspection and response provides needed road access throughout the designated storm season by ensuring road drainage function.

E. Treatment Effectiveness Monitoring Proposed: Implementation of treatments will be monitored following storm events for three years post-fire. Monitoring will include timeliness of storm inspections, and effectiveness of drainage repairs. Monitoring will be conducted by refuge staff for three years following fire. The BAER Team Leader will monitor the implementation annually.

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES:	**COST / ITEM**
GS-12 Hydrologist@ $49/hr X 40 hrs X 1 year	$1,960
GS-11 Ecologist @ $49/hr X 40 hrs X 1 year	$1,960
WG-8 Equipment Operator @ $25 X 120hrs X 1 year	$3,000
* all salaries include benefit estimates of 40%	
TOTAL PERSONNEL COSTS	**$6,920**
EQUIPMENT PURCHASE, LEASE AND/OR RENT	**COST / ITEM**
Excavator @ $750/day X 15 days per year X 1 year	$11,250
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	**$11,250**

MATERIALS AND SUPPLIES	COST / ITEM
Shovels, rakes, pitch forks, axes, pulaskis, chainsaws, culverts @ $1000 per year	$1,000
Gas for vehicles	$200
TOTAL MATERIALS AND SUPPLY COST (Office supplies)	**$1,200**

TRAVEL COST	COST / ITEM
Lodging and per diem costs per person @ $99/day X 5 days X 2 people X 1 year	$990
TOTAL TRAVEL COST	**$990**

CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	COST / ITEM
TOTAL CONTRACT COST	$

SPECIFICATION COST SUMMARY:

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY_07	09/01/2007	09/30/2007	FA,SC	0.1	$	1	$2,036
FY_08	10/01/2007	09/1/2007	FA,SC	0.9	$	1	$18,324
			TOTAL				**$20,360**

Work Agent: C=Coop Agreement, F=Force Account, G=Grantee, P=Permittees, S=Service Contract, T=Timber Sales Purchaser, V=Volunteer

SOURCE OF COST ESTIMATE:

1.	Estimate obtained from 2-3 independent contractual sources.	
2.	Documented cost figures from similar project work obtained from local agency sources.	
3.	Estimate supported by cost guides from independent sources or other federal agencies	**E**
4.	Estimates based upon government wage rates and material cost.	**P,T, M**
5.	No cost estimate required - cost charged to Fire Suppression Account	

P = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

See Map of Big Turnaround Fire, Appendix III.

TOTAL COST BY JURSIDICTION:

JURISDICTION	UNITS TREATED	COST
Okefenokee NWR - FWS	180,538	$20,360
	TOTAL COST	**$20,360**

PART F - INDIVIDUAL SPECIFICATION, Specification # 4

TREATMENT/ACTIVITY NAME	Cultural Resource Protection	**PART E SPECIFICATION #**	# 4
NFPORS TREATMENT CATEGORY*	Cultural Resources	**FISCAL YEAR(S) (list each year):**	2007, 2008
NFPORS TREATMENT TYPE *	Resource Protection	**WUI? Y / N**	N
IMPACTED COMMUNITIES AT RISK	None	**IMPACTED T&E SPECIES**	Red-cockaded Woodpecker

WORK TO BE DONE (describe or attach exact specifications of work to be done):

Number and Describe Each Task:

A. General Description: Heritage site stabilization protects the qualifying site characteristics from exposure by erosion, runoff, sun baking and mechanical disturbance.

B. Location / (Suitable) Sites: Fencing will be erected around the open well/cistern site and in high-use areas where cultural artifacts that are exposed due to the wildfires and are at risk by looters. Erosion control mats/Geotextile fabrics will be placed along the exposed faces of the "tramway cut" as recommended by the FWS Regional Archaeologist, Southeast Region.

C. Design/Construction Specifications:
1. Fencing will be established around sites identified as potential security risk sites as identified in the Cultural Assessment reports.
2. Erosion control mats will be placed along the faces of the "Tramway Cut" at the Tramway Cut Mound site under the supervision of a cultural resource advisor.

D. Purpose of Treatment Specifications: Protective fencing reduces the unacceptable loss of cultural resources due to looting. The erosion control matting will stabilize artifacts exposed by vegetation loss from the wildfires.

E. Treatment Effectiveness Monitoring Proposed: Treatment implementation will be monitored by the Regional Cultural Resource Specialist in FY2008. Cultural Resource Advisor will work on scene with the guidance from the Regional Cultural Resource Specialist to ensure that treatment implementation is effective and complies with state and federal cultural resource protection policies.

LABOR, MATERIALS AND OTHER COST:

PERSONNEL SERVICES:	**COST / ITEM**
GS-12 Regional Archaeologist @ $49/hr X 16 hrs	$784
GS-7 Technicians @ $24/hr X 40 hrs X 2 people	$1,920
GS-7 Motor Boat Operator @ $24/hr X 40 hrs	$960
* all salaries include benefit estimates of 40%	
TOTAL PERSONNEL COSTS	**$3,664**
EQUIPMENT PURCHASE, LEASE AND/OR RENT	**COST / ITEM**
TOTAL EQUIPMENT PURCHASE, LEASE OR RENTAL COST	
MATERIALS AND SUPPLIES	**COST / ITEM**
Fencing @ $125 per roll of (4ftX330ft) x 5 rolls	$625
25 t-posts @ $4 ea X 25	$100
Miscellaneous Hardware (twist wire, stakes and etc)	$250

Gas for Motor Boats @ 50 per day X 10 days	$500
TOTAL MATERIALS AND SUPPLY COST (Office supplies)	**$1,475**
TRAVEL COST	**COST / ITEM**
TOTAL TRAVEL COST	**$**
CONTRACT COST (Labor or Equipment @ Cost/Hour X #Hours X #Fiscal Years = Cost/Item):	**COST / ITEM**
1- 2hr helicopter flights for transportation to site @ $1200/hr X 2 hrs X 1 year	$2,400
1- Cultural Resource Advisor @ $75/hr X 40hrs	$3,000
TOTAL CONTRACT COST	**$5,400**

SPECIFICATION COST SUMMARY:

FISCAL YEAR	PLANNED INITIATION DATE (M/D/YYYY)	PLANNED COMPLETION DATE (M/D/YYYY)	WORK AGENT	UNITS	UNIT COST	PLANNED ACCOMPLISHMENTS	PLANNED COST
FY__07	09/01/2007	09/30/2007	FA, SC	0.1	$1,054	1	$1,054
FY_ 08	10/01/2007	09/01/2007	FA,SC	0.9	$9,485	1	$9,485
FY_							
FY__							
						TOTAL COST	**$ 10,539**

Work Agent: C=Coop Agreement, F=Force Account, G=Grantee, P=Permittees, S=Service Contract, T=Timber Sales Purchaser, V=Volunteer

SOURCE OF COST ESTIMATE:

1.	Estimate obtained from 2-3 independent contractual sources.	
2.	Documented cost figures from similar project work obtained from local agency sources.	
3.	Estimate supported by cost guides from independent sources or other federal agencies	**C**
4.	Estimates based upon government wage rates and material cost.	**P,T, M**
5.	No cost estimate required - cost charged to Fire Suppression Account	

P = Personnel Services, **E** = Equipment **M** = Materials/Supplies, **T** = Travel, **C** = Contract, **F** = Suppression

RELEVANT DETAILS, MAPS AND DOCUMENTATION INCLUDED IN THIS REPORT:

See Map of Big Turnaround Fire, Appendix III.

TOTAL COST BY JURSIDICTION:

JURISDICTION	UNITS TREATED	COST
Okefenokee NWR - FWS	180,538	$10,539
	TOTAL COST	**$10,539**

PART G – POST-EMERGENCY STABILIZATION REQUIREMENT

The following are post-rehabilitation implementation, operation, maintenance, monitoring, and evaluation actions beyond three years from fire control to ensure the effectiveness of initial investments. Costs for monitoring and survival studies will be incurred by the refuge.

Restoration

Refuge staff will continue to monitor the effectiveness of emergency stabilization and rehabilitation treatments following the initial efforts described in this plan.

PART H - CONSULTATIONS

Georgia Forestry Commission, Buford Sanders, Fire Damage Repair Coordinator, Macon, GA
Osceola NF- Susan Kett, BAER Team Lead, Lake City, FL
GOAL- Jim Barrett, GOAL Chairman, Langdale Company, GA
FL DOF- Lee Barkow, FL
USFWS- Bill Leenhouts, National BAER Coordinator, USFWS

August 9, 2007

Memorandum

To: Regional Fire Management Coordinator, R4

From: Regional Burned Area Emergency Response and Rehabilitation Coordinator, R4

Subject: Bugaboo Scrub Fire Emergency Stabilization Plan

The Okefenokee NWR in Georgia and Florida experienced a wildfire that burned over 180K acres of the Okefenokee Swamp starting May 2, 2007 and continues today. Most of the swamp, its habitats and the wilderness burned in the wildfires. Fire behavior was extreme across the area due to extensive drought and wind events. As a result moderate to high burn severity was observed throughout the burned area. In addition, a tremendous fire fight occurred by the suppression forces to contain the wildfires within the swamp proper. Heavy equipment was used extensively throughout the area to make contingency lines. Both the impacts of the wildfires and the impacts of the suppression activities have immediate short and long term impacts on the natural and cultural resources of the refuge.

The short and long term impacts of the wildfires include damages to:

- refuge signs
- canoe shelters
- public trails
- bridges
- red-cockaded woodpecker habitat
- longleaf pine forests
- forested wetland habitats
- hydrology
- soils
- cultural resources
- introductions of invasive species

The refuge accepts that the rehabilitation for this site is a long term commitment and the attached plan is only one small part of the commitment needed to restore the damaged area.

In this Bugaboo Scrub Fire Emergency Stabilization Plan the refuge is requesting $45,821 of funding following the wildfire to mitigate the immediate risks including treating any invasive species introductions immediately and reduce impacts to hydrology. The break down of the costs is listed in the Specification Tables (Part F) in the Plan.

According to US Fish and Wildlife Service, and Department of Interior Policy, the Regional Director may approve Emergency Stabilization Fund requests up to $500,000

after concurrence with Regional Fire Management Coordinator that the plan fits the technical definition for the use of stabilization funds.

After reviewing the Emergency Stabilization Plan for the Bugaboo Scrub Fire at the Okefenokee NWR, I recommend the request for the **$45,821** Emergency Stabilization Funds (sub-activity -9142) be approved as written.

This plan with have to compete for appropriated stabilization funding with other Department of the Interior requests using common criteria as established by the National Rehabilitation Coordinators in consultation with the Office of Wildland Fire Coordination. Availability of funding for the completion of this plan will depend upon its priority ranking.

Sue Wilder
Regional BAER Coordinator, R4
985-882-2008

APPENDIX I - BURNED AREA ASSESSMENT REPORTS

1. Wildlife Assessment

Assessment of Wildlife and Vegetative Resources Following the Big Turnaround Complex Fires of 2007

The following report was compiled from reports submitted by Biologists Aicher and Easton and Drew Wirwa.

Red-cockaded woodpecker habitat within upland management compartments.

Compartment 15

- Most damage from tractor plow work suppression efforts in clusters 15A-B (20 trees) and 15F (3 trees).
- Cavities in two clusters received moderate damage from fire but all were repairable.
- One RCW nest was lost to fire but pair successfully renested.

Compartment 14

- One artificial cavity was repaired after being burned.
- Most of the trees in both clusters had moderate to severe scorch to canopy.

Compartment 13

- Four artificial cavities were repaired after being burned.
- Trees in one cluster had severe scorch to canopy while other clusters had moderate scorch.

Compartment 12

- One artificial cavity was repaired after being burned.
- Trees in one cluster had severe to extreme scorch to canopy due to heavier fuels while the other cluster had low to moderate scorch.

Compartment 11

- None of the artificial cavities damaged.
- Most of the trees in the cluster had moderate to severe canopy scorch; the area re-burned intensely after the burnout was completed.

Compartment 3

- Two artificial cavities were burned but were able to be repaired; one of the trees was severely burned at the base.
- The cluster that was burned out had moderate to severe scorch throughout.

Compartment 4

- Three artificial cavities were burned but were able to be repaired.
- The cluster that was burned out had severe scorch but most of the trees had some regrowth.

Compartment 5

- Four natural cavities were burned but the trees survived; one artificial cavity tree had damage to an old catface.
- Two clusters had moderate to severe scorch while the others had low to moderate scorch.

Compartment 6

- One artificial cavity was burned and repaired.
- The cluster had moderate to severe scorch throughout.

Compartment 7

- One artificial cavity was burned and repaired. Two natural cavities burned; one burned completely through and the bole broke at the cavity
- The cluster had moderate to severe scorch throughout.

Compartment 8

- None of the artificial cavities were damaged. One natural cavity burned up to the cavity.
- One of the clusters had moderate to severe scorch while the other two had minor to moderate scorch.

Red-cockaded woodpecker habitat on the islands within the Okefenokee Swamp.

Two flights were taken by biologist Aicher to assess the red-cockaded woodpecker (RCW) habitat on the islands within the Okefenokee Wilderness. The first on June 13 covered Number One, Mitchell, Blackjack, and Bugaboo Islands. The second on June 25 covered Honey and Billy Islands. The last time these islands burned was in 2005 except Honey Island burned in 2002 and Mitchell was burned in 2006.

On these six islands, 42 RCW clusters exist with 22 being active in 2006. Prior to the fires, the vegetation around high priority trees (presence of active or suitable cavities) was cut short to reduce the intensity of fire at the tree's base. Clusters within the Wilderness are monitored every two years but inserts, drilled starts, restrictor plates and banding are not used within these clusters. If cavity trees are killed without other cavities available and/or suitable habitat is greatly reduced, discussions would follow on what actions should be taken within the wilderness area.

Due to the bark char, the white bands on the RCW trees were for the most part not visible during the flights. The general condition of the trees on the islands was evaluated. This

will be followed up by an on the ground survey of select areas.

Blackjack Island
Fire swept over the island on May 7. This wind driven event pushed the fire southwesterly from Bugaboo Island. The areas with more open canopy through the middle of the island, had 70-90% canopy scorch and bark char reached 30-40 ft. The denser stands of trees on the south side of the island had little scorch. Trees along the north edge of the island burned hot and may be lost.

Although no white bands were observed due to the bark char, the majority of the trees in RCW areas had some green remaining in the canopy. The amount of resin flowing down the tree will determine whether the cavity was damaged. An on-the-ground survey in the near future will examine the specific trees more closely.

Blackjack Lakes in foreground looking south towards Blackjack Island.

East side of Blackjack Island looking south.

East-middle of Blackjack Island looking south.

West end of Blackjack Island

Billy's Island

Billy's Island burned hot around the wetlands within the interior of the island and around the edges. The higher parts of the island burned moderately hot causing some scorch. Bark char reached heights of about 20ft. No mortality of RCW trees is expected. Trees were prepared around so it is not expected that fire burned around cavities. The fire moved slowly across the island on 11-13 May.

The north end of the island burned with low intensity. The overstory was not damaged and the fire crept through the hammock.

South helispot on Billys Island looking southwest.

West side of Long Pond on Billys Island looking northwest.

North helispot on Billys Island looking north.

Honey Island

Honey Island was burned on May 10. The northern 2/3 of the island where the majority of the RCW trees are located had little to no scorch. In addition, the west end of the island had little scorch. Patches around the south helispot burned hot along with stand on the edge of the island. The majority of the RCW trees are expected to be undamaged by the fires.

Honey Island looking southwest.

Honey Island middle.

Near south helispot on Honey Island looking east.

Near south helispot on Honey Island looking west.

West end of Honey Island looking west

West end of Honey Island looking east

Mitchell Island

The majority of Mitchell Island appeared to have a low intensity burn with less than 30% crown scorch. Bark char reached heights of 10-20 ft. Two white bands were observed on trees near the helispot. No tree mortality or cavity damage is expected.

Middle of Mitchell Island

West of Helispot. (3388303.65 4381140.73) (30.6231 -82.2401)

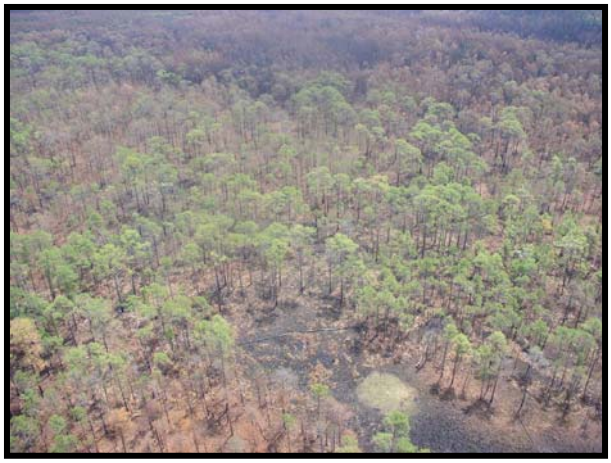
Bugaboo Island

The wet zone crossing the island burned hotter than the rest of the island. There was little scorch throughout the rest of the island. No damage to RCW trees is expected on this island.

Bugaboo Island from helispot looking northeast.
(3403281.02 378646.05) (30.7580 -82.2679)

Number One Island
The east edge of the island including a few trees west of the helispot burned more intensely with some scorch. The main part of the island looked unharmed by the fires. The RCW trees on this island are all inactive and it does not appear that they were damaged.

Number One Island Helispot looking north.
(3390246.87 384142.61) (30.6409 -82.2090)



Number One Island Helispot

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Recently occupied wading bird colony nesting sites

Gum Slough colony site was examined by air on July 27 by Biologist Aicher. The colony site appeared not to have burned. The fire approached this area on April 29 and moved slowly around this area. Backfiring occurred south of Gum Slough. Large trees still remain along the waterway for future use by colonial nesters. This site was not active in 2007.

Biologist Easton flew on 29 June to check for signs of nesting activity north of Cravens Hammock and north of the Pocket. Neither area appeared to have been active this year; Cravens colony site was mostly dry and no nest structures were seen and the site north of the Pocket had some water but no nest structures were seen. Neither site had been impacted by fire.

Breeding birds

Breeding bird surveys were not conducted this spring due to the fires. Numbers would probably have been reduced due to the drought and human activity in the area. With increased water levels, flush of new growth, and high insect populations, breeding birds should return to the area at normal levels.

Sandhill cranes

The Florida Sandhill Cranes would have been present during the time when the fires were moving over the landscape. Nesting would have been occurring in the open prairies. Reproduction for the year may have been reduced due to nest/young mortality from burning. The fires burned patches of the prairies – spotting into these areas and/or creeping through the vegetation. The benefit of the fires to this species is the structural changes in the vegetation. Scrub shrub habitat burned on the edges of the prairies creating more available habitat for foraging and nesting next year. Also, the re-growth of the marsh vegetation in burned areas provides good foraging areas. Three pairs of sandhill cranes were observed in Sapling Prairie during one flight by Ranger Gillette.

Ivory-billed woodpecker habitat

Although no ivory-billed woodpeckers have been identified at Okefenokee NWR during recent surveys, the 2007 fires have not eliminated appropriate habitat for this species. The historic Minnies Island Hammock at the south tip of the island was unharmed by the fires. However, the hardwood wetlands in the northwest portion of the swamp were altered significantly. The majority of the trees have fallen where the fire crept through the duff and burned around the base of the trees. What type of habitat will replace this community is unknown. The fire keeps moving slowly through this habitat and thus, the final extent of change is yet to be seen. However, the ivory-billed woodpecker takes advantage of the insect populations that come in after a fire. Therefore, if present, this bird species would not be confined to traditional habitats within the next several years and could be seen throughout the swamp.

Black bears

The fires direct impact on the black bear could not be assessed due to the logistics of covering the burned area. During the active fire period, fire fighters and staff saw numerous bears moving around the edges of the swamp. As wind-driven fire moved rapidly across certain areas of the swamp, some bears most likely were caught in its path; however, most areas burned with variable intensities creating a mosaic of vegetative structure. With this variability, bears will be able to find enough food to get them through the next year. Reproduction may be down during the coming winter due to less food being available. Black bears in the area are known to prefer black gum fruits. When these are not available, bears tend to move onto the uplands to forage on acorns. With the reduction of the mature hardwoods in the northwest portion of the swamp, black gum fruits may be scarce this coming fall and more bears may be expected within the oak hammocks around the swamp. A greater harvest of black bears may occur this fall. The fires will cause high productivity of other important foods such as various berries over the next two years. The northwest portion of the swamp will be monitored as to what replaces the hardwoods.

Amphibian and reptile habitat

Alligators

The swamp's population of alligators has been reduced due to the drought. Alligators move to the deeper pools of water as water level drops. Due to the shortage of food, smaller alligators are cannibalized. Large concentrations of alligators were observed in Billys Lake and Suwannee Canal. The rebound of alligators will be a delayed response as adequate food supplies become available again. The fires would not have an impact on the alligators unless changes in the chemistry of the water affects reproduction or the health of the alligators.

Other Amphibians and reptiles

(See attached report)

Fisheries

The fisheries were most likely reduced in numbers due to the drought. They were confined to the pools of water remaining that were also shared by numerous alligators. The lakes that held water and supported a fisheries were Billys Lake, Big Water (?), Double Lakes, Gannet Lake, Buzzards Roost and Monkey Lakes, Ohio Lake, Bluff Lake, Durdin Lake (?), Blackjack Lakes, and Suwannee Canal. The majority of the waterways did not have standing water prior to June 2. An electrofishing survey will be conducted in November 2007 – January 2008 by GA DNR and USFWS Fisheries Assistance Office, Panama City. Water quality after the fires will be examined.

Unique Vegetation Communities

Chesser Island Hammock

Despite attempts to keep fire from burning the Chesser Island Hammock, fire entered the hammock on 3 June and burned about 80%. This hammock has had a long history of human occupancy. Refuge history has restricted fire creating a unique vegetation assemblage and structure. This area will be monitored as plants re-establish themselves. The historic plant list for the hammock will be compared to what plants survived or become established.

Minnies Island Hammock

Minnies Island burned on 22-23 May. Again, there were young slash pines that were killed by the fire on the northern 2/3 of the island. The hammock at the southern tip of the island appeared not burned. This hammock has been mentioned in several accounts of the swamp and it is one of the locations where ivory-billed woodpeckers were regularly seen in the past. The surrounding landscape has changed since that time with numerous fires sweeping over the area.

Old Growth Cypress

The two locations where old growth cypress still remains are east of Dinner Pond and east of the boat trail entering Grand Prairie. These two areas had fire approach them and move at least partially through the understory. There are scorched spots within these areas; however, the majority of the large cypress remains standing and appear to be unharmed from an aerial view.

In the northwest portion of the swamp and other areas where hardwoods are falling over, large cypress remains standing. These trees could provide a seed source for replanting the area if water levels are appropriate. This would be a natural stand replacement

process.

Number One Island Old Growth

Number One Island is a place where logging did not occur in the early 1900's. Therefore, there is a layer of old growth longleaf and slash that towers over a secondary forest. The old pines have been aged at 200-350 years old. Although numerous fires have passed over this island in recent years, the canopy has not been affected. This is also true after this year's fires. These trees have always had a built up mound around their base indicating wetter conditions and/or the burning of the duff layer between the trees at some point in the past.

Conclusion

Direct fire damages to red-cockaded woodpecker cavity entrances occurred and were immediately corrected by refuge staff to ensure continued use of the cavities. No other fire damages to the wildlife resources are identified that need immediate attention. Changes have occurred to the landscape and the response to these changes will be identified through future monitoring of the resources.

Fire suppression actions that needed immediate repair occurred in Compartment 15 where "tator raking" was conducted in a 110 year old stand of longleaf pine. Active red-cockaded woodpecker cavities are present in this stand. Roots were cut through that put survival of these trees in jeopardy. An attempt to increase survivability of these trees is currently taking place by using a contractor to turn the ditches in and level the disturbed area.

Fire suppression activities also have been identified as impeding movements of amphibians and reptiles. The leveling of berms and other piles of debris will help in correcting this problem. In addition, restoring the hydrologic gradients associated with wetlands of the area will ensure continued use by amphibians and reptiles during critical life stages.

2. Herpetological Assessment

Herptefauna Assessment as a result of Fire and Fire Suppression
27 June, 2007

Introduction

Historically, the Okefenokee longleaf pine ecosystem was created and maintained by frequent (1-5 year intervals) small-scale fires and infrequent (50-year intervals) large-scale, high-intensity fires, much like the Big Turnaround Complex. Because of the magnitude and intensity of the Big Turnaround Complex, significant alterations of herpetofauna habitat have occurred, and are likely to continue to occur as post-disturbance processes progress. For example, drought conditions have enabled wetland areas to intensively burn that typically do not burn under normal weather conditions. Additionally, as burned roots continue to weaken, trees will continue to fall. Openings in the canopy and increased sunlight will continue to facilitate succession and thickened understory in these areas. The affects of these habitat alterations on herpetofauna populations vary considerably with taxonomic groups as well as life stage events. However, because fire has historically functioned as an influencing component of the Okefenokee ecosystem and continues to be a vital management tool of Okefenokee National Wildlife Refuge (ONWR), long-term effects of fire on amphibian and reptile populations are expected to be minimal.

Swamp Area

Because the interior 90% of ONWR is designated as part of the National Wilderness Area, the fire was allowed to burn through this area absent of any suppression activities. A mosaic-pattern burn was noted over much of the swamp, offering refugia

from direct fire effects for many species of herpetofauna (Figure 1). Moreover, during summer months, amphibians and reptiles may be less affected by fire because many species are already underground or in wetland areas during this time. It is recommended that a monitoring program be implemented within the swamp to document changes in richness and abundance of amphibian and reptile populations.

Upland Management Compartments

The gopher tortoise (*Gopherus polyphemus*) is a Federally Threatened species in certain areas of its range, and is considered a priority species for ONWR. Considerable research and management has been focused on the gopher tortoise because of its population declines and especially because of its value to other species that rely on gopher tortoise burrows. Research has indicated that at least 332 species have close associations with gopher tortoise burrows (Lips 1991). Several species, including other threatened species may depend on gopher tortoise burrows, especially during fire events. Such species may include the gopher frog (*Rana capito*), pine snake (*Pituophis melanoleucus*), indigo snake (*Drymarchon couperi*), and rattlesnake (*Crotalus spp*.). The use of these burrows and other safety zones (e.g., logs, wet areas) has likely resulted in minimal direct fire effects on reptilian populations in the upland management compartments of ONWR.

Several isolated, temporary wetlands in the upland management compartments have been identified and mapped by the Georgia Department of Natural Resources, Wildlife Resource Division. These isolated wetlands are important to the sustainability of amphibian and reptile populations in ONWR. In addition to providing safety zones during fire events, these ponds are considered priority amphibian breeding and larval

development areas and are important cover, foraging and hibernation areas for reptiles. To assess fire effects, a representative sample (20) of these priority areas has been evaluated. Eighteen of the twenty ponds visited were burned. Because all seasonal ponds were unseasonably dry, areas that typically do not burn under normal weather conditions, yielded intense burns (Figure 2). These intensive burns of new areas burned down into the peat and likely resulted in the mortality of many individuals due to direct fire effects. Fire-related mortality of 2 snakes (unknown spp.) and a box turtle (*Terrapene carolina*) were documented within the burned isolated ponds. However fire is a natural component of these systems and is important in maintaining the vegetation structure and heterogeneity of the community. Without fire, accumulation of organic matter facilitates the encroachment of undesired thickets, and closed-canopy hardwood stands. This increase in vegetation can reduce groundwater levels and seepage through evopotranspiration and decreased soil saturation, which can ultimately lead to wetland loss. Research has documented the importance of fire in isolated wetlands for pine barrens treefrogs (*Hyla andersonii*), gopher frogs, flatwood salamanders (*Abystoma cingulatum*), and several other amphibian species (Palis 1997, Means and Moler 1979). The long-term benefits of fire to herpetofauna populations and the maintenance of the habitat structure of pine flatwood ecosystems, to which these species have adapted, generally outweigh the loss of individuals during an intense fire event.

Fire Suppression Effects

All fire suppression activities occurred in the upland management compartments. The primary fire suppression activity affecting amphibian and reptile populations include fire lines and the associated berms. Potato raking was also used extensively in

Compartment 15. Potential effects of fire lines include collapsed burrows caused by heavy equipment and the restriction of individual movements and dispersal caused by the berms. Research examining gopher tortoise response to site preparation documented 100% recovery of gopher tortoises from the collapsed burrows (Alexy et al. 2003). Therefore, although heavy equipment may have a direct negative affect on several other species using burrows, the affect of collapsed burrows on gopher tortoise populations may be minimal. Furthermore, in some cases burrows were avoided during the creation of fire lines (Figure 3).

In addition, because most berms average 2-4 ft tall, they may limit movements of several species, including gopher tortoises. Gopher tortoises follow regular paths to and from their burrows and rarely travel more than 30 m from the burrow (Alexy et al. 2003). Many amphibian species also utilize migration routes to isolated wetland areas for breeding purposes. These fire breaks may act as barriers to migration and dispersal potentially affecting population dynamics in the Okefenokee system. Therefore, it is important that all berms are repaired and the landscape restored to permit dispersal and other life cycle events of amphibians and reptiles.

Indirect effects of these suppression activities include the alterations of the current hydrology of wetland areas. By altering the hydrology, fire lines can significantly alter or drain an isolated wetland on which many amphibian and reptile species depend. It is recommended that all fire lines and associated berms created in response to the fire be repaired and the hydrology restored to its previous state (Figure 4). It is further recommended that a monitoring program be implemented to document alterations in habitat structure along Swamp's Edge Break in locations where the break was altered. In

respect to lines that cannot be restored because they are outside of the refuge jurisdiction, associated wetlands should also be monitored to document alterations to habitat structure.

Figure 1: The fire burned in a mosaic-type pattern across much of the swamp offering refugia from direct fire effects on herptefauna.

Figure 2: Drought conditions permitted intense burning of areas that typically do not burn under normal weather conditions.

Figure 3: Some gopher tortoise burrows (*Gopherus polyphemus*) were marked with flagging and avoided during fire line construction.

Figure 4: Isolated wetlands near rehabbed fire lines should be monitored to document wetland alteration caused by suppression activities.

3. Vegetation Assessment

Okefenokee Swamp Post-Fire Vegetation Assessment
Conducted by Cynthia S. Loftin
USGS Maine Cooperative Fish and Wildlife Research Unit
25-29 June 2007

Assessment Approach

This post-fire vegetation assessment was conducted in the Swamp's Edge Break (SEB) and Perimeter Road vicinities to identify potential threats to Okefenokee National Wildlife Refuge vegetation due to fire management activities. Although most of my review occurred along the swamp perimeter, I participated in two helicopter flights to provide a cursory examination of the extent of the burn in the swamp interior.

The attached table lists locations and descriptions of sites visited during the post-fire vegetation assessment. Sites were selected at 2-3 mile intervals along the Swamp's Edge Break to be accessed with a four-wheel drive vehicle approaching from the swamp perimeter road. Upon arrival at the selected site, I traveled by vehicle a short distance along the break away from the road junction if the SEB surface appeared drivable. I walked a short distance (50-100 m) along the SEB from the perimeter road junction where the SEB surface did not appear drivable. Given the plan to encompass the entire swamp perimeter road stopping at multiple sites during the 5 day survey, I did not walk or drive the entire SEB. In the future, post burn assessments along the SEB should be conducted by ATV so that more of the SEB can be traveled quickly.

Ground Assessment of the SEB
I visited 56 sites along the SEB or perimeter road. Four sites were along the perimeter road but not at the SEB. Sites were distributed as follows: 19 from east of Compartment One to SCRA, 8 from SCRA to Boggy Break, 8 from Boggy Break to Sweetwater Creek, 7 from the Suwannee River to Compartment 10, and 14 from Compartment 11 to the north end of Compartment 15. GPS coordinates of the visited sites are reported in Table 1. Coordinates either were recorded by GPS or retrieved from map layers by referencing hand plotted locations (where the GPS had insufficient battery power). Locations that were photographed are indicated in Table 1. At each site I noted the condition of the SEB, the potential for establishment of non-native vegetation, physical features of the SEB that might encourage establishment of non-native plants, condition of the adjacent swamp or upland, burn condition (severity categorized subjectively based on vegetation and litter condition generally described in the 30-50 m diameter area encompassing the site), and noted actions recommended for SEB rehabilitation (Table 1). Time constraints and safety concerns (e.g., falling trees) prevented extensive exploration at the sites; future post-burn assessments should include more observers over a longer period of time to collect more extensive information about post-burn conditions of vegetation and soil/peat surface in the swamp from these locations along the SEB. This information would aid interpretation of swamp vegetation response to future fires.

Aerial Assessment of the Swamp via two helicopter flights
Two helicopter flights (25 and 28 June) were taken to view the burned swamp interior, and photos were captured along the flight path.

Summary of Swamp's Edge Break Conditions

Post-Fire Conditions in the Swamp's Edge Break (SEB)

The diversity of plant species occurring in the swamp is limited by the somewhat harsh environment these species must tolerate (e.g., occasional or seasonal to long-term drying and inundation; shallow to deep flooded depth; limited availability of nutrients and minerals; extensive to limited shading; limited ground surface for germination; low pH; occasional to frequent burning; competition for space; legacy conditions including previous vegetation and site modification). The Swamp's Edge Break is an environment that differs from natural conditions found anywhere in the swamp. The mineral soils exposed by the SEB provide an opportunity for germination of a combination of species from the adjacent wetland and upland areas, depending on the degree of wetness. In sites that hold water (e.g., created by dozier tread lines and ditches), wetland species will predominate, whereas upland species will predominate in sites that are better drained (e.g., where sand has been piled along the break edge, hills created by mounded or buried debris). Water seepage toward the swamp may be interrupted where tread lines created by heavy equipment in the SEB parallel the swamp edge. This potential disruption in water movement, exposed mineral soils, and the increased light levels at the break edges likely will create a slightly drier environment that will enhance shrub growth along both the swamp and upland edge, and potentially enable herbaceous and shrub species that favor more xeric conditions to encroach on the swamp edge at the driest sites. These artificial troughs and berms should be smoothed wherever possible.

Threat to Threatened and Endangered Plant Species
Six plant species of conservation concern are found in the swamp. The wetland species (*Sarracenia minor, S. flava, S. psittacina*) occurred in Durdin Prairie prior to the burn. Although much of Durdin Prairie burned, the fire was not uniformly severe, and there are likely areas where these species persist. Reconnaissance of Durdin Prairie for these species should be conducted during Fall 07 and Spring 08 to identify plants that survived the fires and newly emerging seedlings. Other locations with known occurrences of the species of conservation concern should be similarly surveyed.

Threat of Non-native Species in the SEB

Locations in the SEB that are adjacent to roads with heavy truck traffic or residential sites pose the greatest risk for introduction of non-native species to the swamp edge. There is a greater threat of spread of non-native species from the SEB to the swamp interior where SEB conditions are similar to those in the swamp (i.e., locations with standing water and accumulated organic material or peat) than where conditions differ between these areas (i.e., xeric sites). Vehicular traffic provides a conduit for introduction of non-native species to the refuge. Post-burn monitoring in early fall and June 2008 should include review of locations along the break with particularly high truck traffic during the fires and currently (e.g., where salvage logging is occurring), near

residences with horticultural plantings (especially wetland plants), and locations with high visitor traffic such as visitor centers, parking areas, and hunt club traffic.

Equipment from outside the refuge that was used in recent fire management activities may have carried seeds and plant fragments from their origination point if they were not washed off before being used on the SEB. Records of vehicle origin, movement on the refuge, and date of departure from the refuge provide a "trail" of potential spread of non-native propagules brought to the refuge. Lists of "problem species" from the equipment origination points should be complied to be referenced in future SEB vegetation assessments.

Horticultural plantings are a source of non-native seeds and sprouts, especially if the plants are located close to the break or refuge boundary or if the landowners dispose of yard waste along the SEB. Residents along the SEB should be advised not to dump yard waste along the break. Visitors to the swamp may unknowingly transport seeds and plant fragments on their vehicles and boats; materials alerting the public of this potential threat to the swamp should be posted at locations likely to be visited by the public, including boat ramps, hunt camps along the perimeter road, and visitors' centers.

Two species currently in the swamp perimeter and that pose possible significant threat of spread into the swamp are Chinese Tallow (*Sapium sebiferum*) and Cogon Grass (*Imperata cylindrica*). Chinese tallow currently is found at Swamp Park in the northern end of the refuge, and Cogan grass occurs on Trail Ridge south of Paxton. Locations where these species currently exist were not burned in the recent fires. Their potential spread may be enhanced, however, by the abundant open conditions along the swamp edge especially to the east that were created by the burn. Both of these species are very difficult to eradicate once established; efforts should be made to work with the landowners to remove these species from their land before the species invade refuge property.

Chinese Tallow is a deciduous tree that produces a fruit with seeds consumed by birds. Its past popularity is attributed to its stature, attractive foliage, flowers, and fruits, and its color in fall. It persists in wetland and upland environments, and it is difficult to eliminate once it has become established, especially in moist areas. Its rapid growth, abundance of seeds that are dispersed by water and birds, and tolerance to disturbances and pests contribute to its success as an invasive exotic species. It can be controlled by herbicide application; mechanical removal and burning have not been used successfully to control this species (but see Grace 2001, 2005 and FEIS 2007). One tree on the property along the swamp walk adjacent to a canal at Swamp Park is estimated to be at least 15 -20 years old; the park attendants indicated that they have two other trees in containers, and they have not found any seedlings in the park. Given the proximity to water and the refuge, the possible spread of seed into the swamp via the waterway, and the potential for this species to invade the surrounding uplands, the park should be encouraged to remove these trees and replace them with a native species, such as red maple (*Acer rubrum*) or blackgum (*Nyssa sylvatica biflora*), which will provide fall color and are native to the swamp.

Cogon grass is a problem species worldwide. It is a fast-growing grass that is resistant to fire, can propagate from rhizome fragments and windborne seeds, and can rapidly establish in soils that are minimally tilled. Most spread is thought to occur via rhizomes, not seeds, although seed production increases with disturbances such as

burning and mowing. It often occurs along roadsides in ditches and right-of-ways. Because this species tolerates poor quality soils, spread into sandy soils with low productivity is a real threat. The proximity of cogon grass to the refuge, especially the perimeter uplands on the east side, poses a threat that should be eliminated. A combination of herbicide, mechanical disturbance, and burning repeatedly applied are required to control this species. Elimination of cogon grass should be followed by introduction of native species (e.g., *Aristida stricta*, *Andropogon* spp.) to the sites where the grass is removed.

Rehabilitation of the SEB

Future conditions in the SEB will be determined by the SEB purpose. The break initially will fill with native herbaceous species, including *Woodwardia*, *Lacnanthes*, *Iris*, and *Xyris* in wet areas, and *Andropogon* and *Panicum* species in slightly drier areas. In fact, this is already occurring in the SEB along much of the swamp's east, north, and south, although continued heavy equipment activity in the SEB will continue to disturb the soil and reduce the germinating herbaceous species that are stabilizing the exposed soil. Application of seed mixtures from commercial vendors to accelerate this re-growth is **strongly discouraged**. Seed mixtures at a minimum introduce genetic material from stock not originating in the swamp, and at worst introduce non-native species to the swamp that may spread to become future problem species. Much of the SEB already is filling naturally with *Lacnanthes caroliniana* and *Woodwardia virginica* from the seed and spore bank, and it is likely that other native species will spread into the SEB from the existing seed bank, transport of wind dispersed seeds during the next dehiscence in the fall especially where the ground surface in the adjacent swamp was not severely burned, and from root fragments that survived the fire and disturbance in the SEB rehabilitation. Water and wind erosion potential will be lessened if remaining debris is chopped and semi-buried or spread over the SEB; although there may be some assimilation of nutrients from this debris, the purpose is primarily to stabilize the soils. This work should be conducted immediately, so that the herbaceous layer which already is providing some erosion control can become established during this growing season. These areas and the vicinity of the swamp break and perimeter road should be assessed via a visual survey in early fall and again in June 2008 to identify occurrence of non-native species.

If the purpose of the SEB is to maintain as an herbaceous strip so that movement of future fires across the ground surface is limited, then periodically mowing may be necessary to reduce shrub growth. Although there is little shrub re-growth occurring currently in the SEB, it is possible that larger root and stump fragments may sprout after being redistributed and partially buried across the break, especially where microtopographic variety is created. If SEB management purpose is to allow regrowth of the swamp edge vegetation to the former edge of the SEB, then the microenvironment should mirror that in the adjacent swamp and upland. This may require creation of hummocks to encourage shrub regeneration (which can be accomplished in part by distributing debris containing live root fragments), contouring tread lines so that seepage occurs towards the swamp, removing berms and linear features created by equipment movement, and not mowing the SEB.

Fire spread in this incident was stopped in some areas by a combination of

conditions in the SEB and effectiveness of burnouts into the swamp to remove the most flammable fuels; however, conditions in the vegetation communities along the swamp edge and into the swamp interior (e.g., degree of peat drying, depth in the peat to water, type and amount of standing vegetation, extent of similar vegetation types and interspersion of different types), behavior of fire moving through the swamp and encountering vegetation assemblages with different burn likelihoods, and close proximity of upland vegetation with high fuel loads ultimately determined the success of the SEB as a fire break. The SEB is most useful as a tool to stop movement of fire along the ground surface from the swamp edge into the surrounding uplands. Movement of future fires from the swamp into the surrounding uplands during extreme fire weather conditions will most likely be thwarted by forestry practices that encourage native forest communities (e.g., longleaf pine) in a "buffer strip" paralleling the swamp perimeter and extending several miles off refuge property into the uplands; these "buffer" forests should be periodically burned to reduce midstory and understory fuels, so that high density growth of non-fire adapted vegetation immediately adjacent to the SEB is reduced. Fires should be permitted to burn into the swamp from the surrounding uplands whenever conditions are likely to carry fire so that the dense swamp edge shrub-scrub is thinned under a somewhat controlled burn, which will enhance the function of the swamp edge break as a fire break.

Suwannee Creek Drainage Rehabilitation

The riparian floodplain surrounding Suwannee Creek was effectively destroyed by earth-moving equipment attempting to create a break sufficient to stop fire movement approaching from the swamp into the surrounding uplands. Aside from the area's importance to wildlife, Suwannee Creek contributes a significant amount of water to the swamp (Loftin 1998, Loftin et al. 2001) which eventually flows into the Suwannee River in the swamp interior. The area in the swamp that received this creek flow previously may experience more extensive drying without this flow. Recovery and rehabilitation of this area should include contouring the riparian area to approximate the original streambed distribution, planting the riparian area with native trees, shrubs, and herbaceous species, and monitoring vegetation recovery, and water quality and flow volume and rates during the next several years.

Observations from helicopter reconnaissance

The helicopter flight paths encompassed the entire swamp perimeter and mid-section. The burn was incomplete and ranged from severe to unburned along these paths. The flight path included areas in each vegetation type that occurred in the swamp prior to the fires. Vegetation appeared to be regrowing in nearly all burned areas along these flight paths. In some areas this regrowth was from basal and root sprouting shrubs, and basal sprouting trees and *Smilax*, and in other areas herbaceous vegetation (*Woodwardia virginica* and *Lacnanthes caroliniana*) is sprouting. The rapidity in this response indicates that there are extensive areas in the swamp that did not burn severely enough to kill the shrubs and trees, and a change in vegetation assemblage type from that which occurred before the fire is unlikely. Other areas experienced severe burn, and vegetation response in these areas is less clear. Several areas that prior to the fires were comprised of dense hardwoods with sparse understory burned through the roots, and the trees fell.

This is a stand-replacing event in these areas that should be monitored during the next few years for regrowth of woody species, herbaceous species presence (many of these areas probably had very little understory growth due to the dense canopy, and the seed bank may be limited), and peat formation from the fallen, unburned debris. Given the Wilderness designation of the swamp, areas with extensive tree fall (e.g., southwestern area of the swamp) should be left alone; removal of downed trees is **strongly discouraged**. The trees provide a source of organic material that over time will eventually become peat and in the meantime aids in stabilizing the soil surface. They also potentially provide a source of seeds for forest regeneration (e.g. seeds that did not dehisce in the previous season).

Post-Fire Vegetation Monitoring Approach

During June-September herbaceous species will germinate from the seed bank in the SEB and adjacent burned areas (with intact organic soils). Although woody species also may sprout from seed, most vegetation growth by shrubs and trees in burned areas and the SEB during this period will be from sprouting roots and bases that survived the mechanical manipulation of SEB creation, widening, and timber salvage. Currently, most herbaceous revegetation in the SEB and adjacent burned swamp is by *Lacnanthes caroliniana* and *Woodwardia virginica*. These species are present in much of the SEB throughout the swamp perimeter, although the sites visited along the eastern swamp generally contained more dense coverage of herbaceous species than the western swamp. Along the western swamp perimeter, pre-burn canopy and midstory forest cover was dense, which probably has resulted in a seed bed that is depauperate. In this region herbaceous species (primarily *Lacnanthes* and *Panicum* spp.) are germinating along the edge of the swamp and road/SEB; where the former canopy was removed by the burn, light availability on the ground has increased, which may lead to a flush of herbaceous growth and root/basal sprouting where the peat burn was not severe.

During September-October 2007 and June-July 2008, the SEB should be revisited to note vegetation species and their spatial extent in the SEB, presence of erosion, occurrence of non-native species, and presence and condition of treadlines and berms that might affect water seepage, especially along the eastern edge of the swamp.

Table 1. Locations and descriptions of ONWR Swamp's Edge Break assessment sites visited during 25-29 June 2007, beginning at Camp Cornelia and traveling counterclockwise around swamp along the Perimeter Road.

Date Visited (Photo ID) Site #	Location Along Swamp's Edge Break (UTM[1])	Swamp's Edge Break Condition	Swamp Vegetation Affected by Fire/Fire Management Actions	Within Season Action to Repair Swamp's Edge Break	Within Season Reassessment	1-3 Year Expectation
6/25/07 OKE62507 189-191 #1	Harris Lane Escape Route 390948 3404805 (map)	60 feet wide; timber pulled and lined up; brush remaining; minor soil reworking done; uniform ground surface created, tread lines creating small pools perpendicular to swamp edge	Light burn here; forested wetland (pines, bays) on swamp side is not modified	Within break, stabilize soil and repair microtopography by thinly spreading on the surface and partially burying chopped slash to match microtopography of the adjacent wetland; minimize ditches, berms, and pits created with equipment treads, especially those running parallel to the break and swamp edge; allow to self-seed	During September-early October, revisit site to check species composition for non-natives, especially in vicinity of road junction	Natural revegetation from adjacent wetland forest if microtopography is recreated; if smooth surface created, ground surface likely will fill with wet to semi-wet herbaceous species (Lacnanthes, Xyris, ferns, Panicum) and eventually shrubs from adjacent swamp or uplands
6/25/07 No photo #2	Duck Island Road 390350 3406300 (map)	60-100 feet wide; timber pulled and lined up; some soil reworking done; *Lacnanthes* germinating	Break widened here into the swamp shrub forest (bay, pine, holly); some berm and ditch features created by treads	Within break, stabilize soil and repair microtopography by thinly spreading on the surface and partially burying chopped slash to match microtopography of the adjacent wetland; minimize	During September-early October, revisit site to check species composition for non-natives, especially in vicinity of road junction near resident	Natural revegetation from adjacent wetland forest (bays, hollies, pine); ground surface likely will fill with semi-wet herbaceous species (Lacnanthes, Xyris, ferns, Panicum) and eventually woody shrubs

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				ditches, berms, and pits created with equipment treads, especially those running parallel to the break and swamp edge; allow to self-seed	turn-off; potential entry point for non-native species, especially where ground surface is elevated and conditions are drier	from adjacent swamp and uplands
6/25/07 No photos #3	Indian Island Road 390782 3407660 (map)		Minor ditching needs to be removed (tread lines); old plow lines along road appear to be filling in with native herbs	leave to self-seed	During September-early October, revisit site to check for presence of non-natives	Monitor for non-natives
6/25/07 No photos #4	Coleson Road 390707 3408620 (map)	Disking appears complete; minor erosion along road bed, water ponded in break; timber pulled and lined up		break on north side of road appears ok; wet area on south side of road eroding; ditches running parallel to swamp edge should be eliminated; chop, spread thinly, and partially bury chopped debris to recreate microtopography of adjacent swamp to encourage recovery	During September-early October, revisit site to check for non-native species and erosion	Self-seed, monitor for non-natives
6/25/07 No photo	North of Coleson Road along Perimeter	Clearing is partially completed; some		Semi-bury chopped slash; monitor for Cogan grass	During September-early October,	Monitor for xeric non-natives (e.g., cogan grass,

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#5	Road 392030 3408912 (map)	debris remains		while allowing to self-seed	revisit site to check for non-native species and erosion	thistle); expect upland herbaceous species to self-seed into this area
6/25/07 No photo #6	Price Road 391040 3409204 (map)	Disking completed; 60-100 ft break width; currently there are depressions in the break that may affect seepage toward the swamp	Wet soils on swamp side, with gum, bays, cypress in swamp side of break; do not disrupt flow to this direction with ditches parallel to break or a berm along break edge creating drier condition	gradient of SEB should be toward the swamp, eliminating ditching; semi-bury chopped slash and thinly spread chipped slash; allow to self-seed; monitor for drying along swamp edge	During September-early October, revisit site to check for non-native species and erosion	Should self-seed with wetland plants and eventually shrubs; monitor for drying in swamp side if depressions in SEB persist
6/25/07 No photo #7	Perimeter road between Scot Kendrix and Roddenbury Road 392104 3411308 (map)	60-100 ft break width	Pine forest	Leave alone to self-seed after debris removed	During September-early October, revisit site to check for non-native species and erosion	Monitor for xeric non-natives (e.g., cogan grass, thistle); expect upland herbaceous species to self-seed into this area
6/25/07 No photo #8	Roddenberry Road 390932 3411950 (map)	Trees pulled to side; may have been disked	Currently microtopography is uniform in SEB; in swamp is wetland forest of bays, hollies, and gum with many hummocks; area in SEB was previously in this forest type	Introduce microtopography into SEB with semi-buried, chopped debris; take care not to create tread ditches when processing trees; should be a gentle slope in ground surface	During September-early October, revisit site to check for non-native species and evidence of ponding along the break edge	Should self-seed with wetland plants and eventually shrubs; monitor for drying in swamp side if depressions in SEB persist

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				toward the swamp		
6/25/07 No photo #9	Paxton Road 391397 3414490 (map)	Trees pulled to the side; area is fairly wet	Wet area with bays and hollies, with microtopographic variety previously	North and south of road, leave some chopped up debris to help stabilize the soil; fairly wet so care should be taken to not create dozier tread lines where water will seep; allow to self-seed	During September-early October, revisit site to check for non-native species and evidence of ponding in break and along break edge	Should self-seed with wetland plants and eventually shrubs; monitor for drying in swamp side if depressions in SEB persist
6/25/07 No photo #10	Dinkins Road 391638 3415372 (map)	Trees pulled to the side; area is fairly wet	Wet area with bays and hollies, with microtopographic variety previously	Berm and trough created on west side of SEB that could affect seepage into swamp; this should be smoothed and sloped toward swamp; leave some chopped up debris to help stabilize the soil; fairly wet so care should be taken to not create dozier tread lines where water will seep; allow to self-seed	During September-early October, revisit site to check for non-native species and evidence of ponding in break and along break edge; allow to self-seed	Should self-seed with wetland plants and eventually shrubs; monitor for drying in swamp side if berms in SEB persist
6/25/07 No photo #11	Crews Road 391788 3417586 (map)	SEB excessively broad here	Wet area with bays, maples shrub-scrub, smilax, Lyonia with microtopographic variety previously;	Remove large debris; chop and bury some debris, taking care to not create dozier treadlines running	During September-early October, revisit site to check for non-native species and	Should self-seed with wetland plants and eventually shrubs; monitor for ponding within SEB

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			SEB to the north side wetter than to the south; some tread ditching	parallel to the swamp edge; allow to self-seed	evidence of ponding in break and along break edge; allow to self-seed	along swamp edge
6/25/07 No photo #12	Howell Road 391697 3418449 (map)	Trees pulled to the side; area is fairly wet on north side of road; Panicum, Lacnanthes, Woodwardia sprouting on bare soil	North side of road in SEB is fairly wet; south side is drier; vegetation here previously wax myrtle, bays, pines, dense Lyonia and Smilax	Remove large debris; chop and bury some debris, taking care to not create dozier treadlines running parallel to the swamp edge; recreate microtopgraphy similar to adjacent swamp conditions; need to retain slight slope toward swamp; allow to self-seed	During September-early October, revisit site to check for non-native species and evidence of ponding in break and along break edge; allow to self-seed	Should self-seed with wetland plants and eventually shrubs; monitor for ponding within SEB along swamp edge
6/25/07 No photo #13	Mizell Road 391273 3424117 (map)	Trees pulled to the side; berms along SEB edge; Lacnanthes, Panicum, Andropogon in and along SEB	Shrub-scrub along swamp edge	Remove large debris; chop and bury some debris, taking care to not create dozier treadlines running parallel to the swamp edge; recreate microtopgraphy similar to adjacent swamp conditions; need to retain slight slope toward swamp; allow to self-seed	During September-early October, revisit site to check for non-native species and evidence of ponding in break and along break edge; allow to self-seed; deer stand with planted bean plot at edge of SEB	Should self-seed with wetland plants and eventually shrubs; monitor for ponding within SEB along swamp edge
6/25/07	Kingfisher	Trees		Remove large	During	Should self-

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No photo #14	Landing 391348 3424921 (map)	pulled to side; berms along edges of SEB		debris; chop and bury some debris, taking care to not create dozier treadlines running parallel to the swamp edge; smooth berms; monitor landing area, roadside, and SEB for plants and seeds brought into area with visitor traffic; allow to self-seed	September-early October, revisit site to check for non-native species	seed with mixture of upland and wetland plants and eventually shrubs; monitor for non-native species within SEB
6/27/07 OKE627 07 44-48 #15	Sawfly Road 391090 3427590	30-60 ft wide; slash piles remain in break; many treadlines, ruts, and slight berm parallel to SEB	Pine, bays, *Lyonia, Itea, Ilex, Smilax, Woodwardia*; burn hotter at edge but mostly lightly scorched	Remove large debris; chop and bury some debris, taking care to not create dozier treadlines running parallel to the swamp edge; lightly distribute copped debris on surface; smooth berms; monitor SEB for plants and seeds	During September-early October, revisit site to check for non-native species	Should self-seed with mixture of upland and wetland plants and eventually shrubs; monitor for non-native species within SEB
6/27/07 OKE627 07 49-55 #16	Turkey Branch Road 389778 3428999	30 ft wide SEB, filled in with *Lacnanthes*, *Panicum*, *Woodwardia*	Holly, pine, bays ; light burn with debris lightly scorched or burned	No action needed; *Lacnanthes* already filling in bare areas	During September-early October, revisit site to check for non-native species	Should self-seed with mixture of upland and wetland plants and eventually shrubs; monitor for non-native species within SEB

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6/27/07 OKE627 07 56-61 #17 (C)	Gum Slough 388734 3431382	Abundant *Lacnanthes* in SEB; no large debris in SEB, no treadlines	Pine stand with shrub edge	No action needed; *Lacnanthes* already filling in bare areas	During September-early October, revisit site to check for non-native species	Should self-seed with mixture of upland and wetland plants and eventually shrubs; monitor for non-native species within SEB
6/26/07 OKE626 07 118-125 #18 (11)	Ohio Lake Road 384850 3433432	30-60 ft wide SEB; some debris removal done; minor trealines parallel to SEB holding water	Pines, bays, maples, hollies; some sprouting at base; light to moderate burn	SEB looks satisfactory, although shallow treadlines holding water; self-seeding with *Lacnanthes, Panicum, Eleocharis, Woodwardia*	During September-early October, revisit site to check for non-native species; smooth treadlines or direct toward swamp edge	Should self-seed with herbs and resprout (shrubs); monitor for non-native species within SEB
6/26/07 OKE626 07 104-117 #19 (12)	SE of Compartment 1 383152 3434925	60 ft+ wide SEB; Trees pulled to side; minor treadlines may hold water	*Carex, Lyonia*, cypress, pines, *Clethra;* cypress stand with shrubs along edge of pine stand	Complete debris chopping and spread; minimize treadlines; *Lacnanthes* and *Woodwardia* spouting in SEB	During September-early October, revisit site to check for non-native species; much stump and base sprouting in burned swamp side of SEB	Should self-seed with herbs and resprout (shrubs); monitor for non-native species within SEB
6/26/07 OKE626 07 37-39 #20	Seldom Seen Point Road 371269 3432083 (map)	30-60 ft wide SEB; little debris in SEB; shrub debris along edge; some ponded water in SEB	SEB fairly wet in places; swamp side cypress, holly, pines, gums, bays with uneven burn, in places little organic soil left; pines to west minimal	May be minimal seed bank here of herbaceous species given prior overstory density and abundance of trees and shrubs; some ferns,	During September-early October, revisit site to check for non-native species	May self-seed with upland-wetland herb mix, although may take 2-3 years given prior sparse understory

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			burn	Lacnanthes, and grasses present		
6/26/07 OKE62607 21-36 #21	End of Compartment 15 Road 370675 3430290 (map)	30-60 wide break; slight berm along SEB edge may affect water movement towards swamp	pine stand on west side, pine-cypress-hardwoods mix pre-burn on swamp side;	No action needed; check that berm is not affecting water movement toward swamp (pooling in SEB while dry at edge)	During September-early October, revisit site to check for non-native species; herb regrowth may be slow due to prior dense canopy	May self-seed with upland-wetland herb mix, although may take 2-3 years given prior sparse understory
6/26/07 OKE62607 37-39 #22	Crooked Sapling Point Road 368226 3429438 (map)	Open SEB, *Panicum*, ferns, *Lyonia* sprouting	Cypress, hollies, pines, gums with some shrub growth; little to know herbaceous growth due to prior dense canopy?	No action needed	During September-early October, revisit site to check for non-native species; herb regrowth may be slow due to prior dense canopy	May self-seed with upland-wetland herb mix, although may take 2-3 years given prior sparse understory
6/26/07 No photos #23	Compartment 14 Road along property line 367052 3428394 (map)	High road bed, berms cleared	Swamp side vegetation previously dense bays, hollies, pines, shrubs	No action needed; no regrowth of herbs here but pines ok	Given proximity to road, watch for non-natives transported by vehicles; check in September-October for non-native species; herb growth may be slow due to apparent prior dense canopy	May self-seed with upland-wetland herb mix, although may take 2-3 years given prior sparse understory

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6/26/07 OKE62607 40-47 #24	Hickory Hammock Road 365621 3425647 (map)	SEB swamp side was cypress, hardwoods and shrubs; SEB fairly uniform surface with berm along edge	Fairly hot fire that removed peat to roots, burned out tree and shrub bases; only minor basal sprouting; bare soils/ash in places	Leave alone and monitor for revegetation by native species; previous dense shrub and tree cover may have kept herbaceous growth to minimum	check in September-October for non-native species; herb growth may be slow due to apparent prior dense canopy	May self-seed with upland-wetland herb mix, although may take 2-3 years given prior sparse understory
6/26/07 OKE62607 48-54 #25	Compartment 13 Road, Green Hammock 366549 3426343 (map)	SEB contains berms that should be smoothed where parallel to swamp edge; some debris in break	Pine-cypress-bay stand; cypress scorched but survived; no understory regrowth	Leave alone and monitor for revegetation by native species; previous dense shrub and tree cover may have kept herbaceous growth to minimum	check in September-October for non-native species; herb growth may be slow due to apparent prior dense canopy	May self-seed with upland-wetland herb mix, although may take 2-3 years given prior sparse understory
6/26/07 OKE62607 55-63 #26	Perimeter Road and SEB 364000 3425750 (map)	SEB 100 ft wide, *Lacnanthes* sprouting in SEB where away from tire tracks; pits and piles in SEB where debris removed	Cypress-hardwood stand with shrubs; patchy moderate burn with some midstory removed; peat removed	Leave alone and monitor for revegetation by native species; previous dense shrub and tree cover may have kept herbaceous growth to minimum; minimal shrub resprouting occurring	check in September-October for non-native species; herb growth may be slow due to apparent prior dense canopy	May self-seed with upland-wetland herb mix, although may take 2-3 years given prior sparse understory
6/26/07 OKE62607 64-68 #27	Smokehouse Jam and Permieter Road East walk-in (escape)	Grasses in plowline; some berms remain that may affect drainage	Shrub-hardwood wetland at end of this road, adjacent to pine stand; midstory	Low potential for non-native species problems due to proximity to dense vegetation of	Check in September-October for non-native species; herb growth may be slow	May self-seed with upland-wetland herb mix, although may take 2-3 years given prior sparse

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	363065 3425029 (map)		burned but remains; resprouting	forested wetland; leave alone and monitor	due to apparent prior dense canopy	understory and dense shrubs
6/26/07 OKE626 07 69-82 #28	Smokehouse Jam and Permieter Road West 361402 3424746 (map)	110ft + break; some debris remains but much removed; leave to re-vegetate naturally	Gum-bay-maple swamp prior to burn; patchy burn with some overstory fallen, dense mid-and overstory remains; minor shrub sprouting but no groundcover	Leave alone and monitor for revegetation by native species; previous dense shrub and tree cover may have kept herbaceous growth to minimum and ground cover may be slow to come in	Check in September-October for non-native species; herb growth may be slow due to apparent prior dense canopy	May self-seed with upland-wetland herb mix, although may take 2-3 years given prior sparse understory and dense shrubs
6/26/07 OKE626 07 83-95 #29	Suwannee Creek 360628 3425158 (map)	Creek riparian zone and creek bed destroyed; previously this was a significant inflowing stream into swamp	Riparian area and creek bed destroyed	Reshape creek bed to original contour and stabilize with embedded and overlain natural material, woody debris, leaf litter; create relief in microtopography to slow flow and increase percolation; replant with native trees, shrubs collected from nearby; do not apply commercial seed mixture (may spread via creek into swamp)	Monitor vegetation regrowth, erosion, water quality	Monitor vegetation regrowth, erosion, water quality
6/28/07	South of Lower	100 ft wide break,	Maples-bays-hardwoods	Leave alone and monitor	Check in September-	May self-seed with upland-

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OKE628 07 1-7 #30	Lake 360463 3424016	debris removed or piled to upland side; lots of debris on ground in wetland side	burned at bases and fallen; canopy and midstory debris remains but scorched; trees fell after ground surface burned	for revegetation by native species; previous dense shrub and tree cover may have kept herbaceous growth to minimum and ground cover may be slow to come in; SEB minor herbaceous re-vegetation occurring	October for non-native species; herb growth may be slow due to apparent prior dense canopy	wetland herb mix, although may take 2-3 years given prior sparse understory and dense shrubs
6/28/07 OKE628 07 8-14 #31	North of Cane Creek 360469 3424294	Debris remains in break	Maples, pines, gums burned out around bases, new litter dropped but most trees still standing; scorched trees and shrubs, lots of fine debris remaining; peat burned off	Chop up and spread out debris, retain stumps; monitor for revegetation	Check in September-October for non-native species; herb growth may be slow due to apparent prior dense canopy	May self-seed with upland-wetland herb mix, although may take 2-3 years given prior sparse understory and dense shrubs
6/28/07 OKE628 07 15-18 #32	Northeast of Cane Creek 359262 3423663	100 ft wide break with slash piled to west; does not appear to have burned here	Cypress-pine with shrubs; debris piled up to side; minor treadlines collecting water; Lacnanthes and other herbs sprouting	Chop up and spread out debris, retain stumps; monitor for revegetation	Check in September-October for non-native species	Monitor vegetation regrowth, erosion
6/28/07 OKE628 07 19-21 #33	End of Cane Creek Road 358024 3423535	100 ft wide break with most of debris removed or in small piles	Pine stand edge with large cleared break	Leave as is	Check in September-October for non-native species	Monitor vegetation regrowth, erosion
6/28/07	West end	Property	Cleared to	Leave as is;	Check in	Monitor

Date Visited (Photo ID) Site #	Location Along Swamp's Edge Break (UTM[1])	Swamp's Edge Break Condition	Swamp Vegetation Affected by Fire/Fire Management Actions	Within Season Action to Repair Swamp's Edge Break	Within Season Reassessment	1-3 Year Expectation
No photo #34	Compartment 11 357474 3422293	line cleared to road	road; potential for introduction of non-native xeric species carried on salvage logging trucks into uplands	monitor	September-October for non-native species	vegetation regrowth, erosion
6/28/07 No photo #35	Perimeter Road west of Compartment 11 353068 3419831	Creek bed riparian area (Barnum Branch) cleared	Riparian area damage	Replant riparian area	Assess replanted area for regrowth and non-native species	Assess replanted area for regrowth and non-native species; monitor erosion and water quality
6/28/07 No photo #36	West edge of Compartment 10 west unit 351741 3416355	100 ft wide break; burned forest to east, unburned to west; slash piled on west side	Pine cleared to widen break; slash piles remain	Allow to naturally regrow; watch for non-natives potentially brought by salvage logging traffic	Monitor regrowth	Monitor regrowth; watch for erosion
6/28/07 OKE628 07 22-27 #37	Big Branch, South end Compartment 10 351524 3415401	Some treadlines present	Trees and shrubs standing; scorched shrubs and trees; no regeneration in burned area; heavy new litter layer	Allow to naturally regrow; watch for non-natives	Monitor regrowth	Monitor regrowth; watch for erosion
6/28/07 OKE628 07 28-35 #38	East end of Compartment 9 351693 3411061	Surface of break is rough; should be smoothed somewhat; SEB wetter in this area, retains water?	Trees and shrubs standing; scorched shrubs and trees; no herb regeneration in burned area but some stump sprouting;	Allow to naturally regrow; watch for non-natives	Monitor regrowth	Monitor regrowth; watch for erosion

Date Visited (Photo ID) Site #	Location Along Swamp's Edge Break (UTM[1])	Swamp's Edge Break Condition	Swamp Vegetation Affected by Fire/Fire Management Actions	Within Season Action to Repair Swamp's Edge Break	Within Season Reassessment	1-3 Year Expectation
			heavy new litter layer; peat removed in burn			
6/28/07 No photos #39	Road SW of sill 361310 3408069	Perimeter road with heavy truck traffic in area		Monitor for non-natives potentially delivered via logging trucks in area	Monitor for non-natives	Monitor for non-natives
6/28/07 No photos #40	SW of sill at refuge boundary 359764 3408934	Perimeter road with heavy truck traffic in area		Monitor for non-natives potentially delivered via logging trucks in area	Monitor for non-natives	Monitor for non-natives
6/29/07 OKE62907 26-32 #41	Sweetwater Road 358066 3397285	100 ft wide break along road bead; salvage logging likely in adjacent burned commercial land	Hot fire in pines revegetating with *Lacnanthes*, *Woodwardia*, andshrub (*Lyonia*) sprouts	Monitor for non-natives potentially delivered via logging trucks in area; proximity of road bed may enhance spread	Monitor for non-natives	Monitor for non-natives
6/29/07 OKE62907 22-25 #42	SW edge of Compartment 7 358406 3396467	60-100 ft wide break with debris piled to south	Break is revegetating with *Lacnanthes*, *Cyrilla* sprouts, *Woodwardia*, *Andropogon*	No action needed; leave alone to revegetate from seed bank; if remove debris, chop and spread	Monitor for non-natives	Monitor for non-natives
6/29/07 OKE62907 19-21 #43	Rough Island area and SEB 356536 3392767	75-100 ft wide SEB with ditch on compartment side and debris piles on south side	Break is revegetating with *Lacnanthes*, *Panicum* spp.; location is close to road that may receive logging truck traffic	No action needed; leave alone to revegetate from seed bank; if remove debris, chop and spread; minimize treadline depressions and berms	Monitor for non-natives	Monitor for non-natives
6/29/07	Indian	30 ft wide	Ditch along	No action	Monitor for	Monitor for

Date Visited (Photo ID) Site #	Location Along Swamp's Edge Break (UTM[1])	Swamp's Edge Break Condition	Swamp Vegetation Affected by Fire/Fire Management Actions	Within Season Action to Repair Swamp's Edge Break	Within Season Reassessment	1-3 Year Expectation
OKE629 07 17-18 #44	Mound Island Road and SEB 357096 3390970	SEB to north, 100 ft wide SEB to south of road	SEB; debris piles along west side; small berms along center of SEB; revegetating with shrubs, grasses, *Woodwardia*, *Lacanthes*	needed; leave alone to revegetate from seed bank; if remove debris to south, chop and spread; minimize treadline depressions and berms	non-natives	non-natives
6/29/07 OKE629 07 13-16 #45	Compartment 16 and SEB 356020 3390240	60-100 ft wide SEB with 1-2 ft high berms running along compartment edge and in SEB	SEB is lower than compartment so may collect water in lowest points; SEB contains small berms down center; revegetating with Lacnanthes and Woodwardia	No action needed; leave alone to revegetate from seed bank; if remove debris, chop and spread; minimize treadline depressions and berms	Monitor for non-natives	Monitor for non-natives
6/29/07 OKE629 07 1-12 #46	Council Road Escape Area to SEB 355794 3389761	100 ft wide SEB with debris pushed to sides	Debris piled to side; SEB revegetating with Lacnanthes in wetter places and grasses in drier areas; shrubs (Lyonia) sprouting in burned area, burned peat covered with new pinestraw layer	No action needed; leave alone to revegetate from seed bank; if remove debris, chop and spread; minimize treadline depressions and berms	Monitor for non-natives	Monitor for non-natives
6/29/07 OKE629 07 36-43 #47	Mims Island Road and SEB 376346 3382318	SEB separated from road by water-filled ditch	Hot burn through pines; shrubs (*Lyonia*), palmettos sprouting in burned forest,	No action needed; monitor for non-natives along elevated road bed, especially if	Monitor for non-natives	Monitor for non-natives

Date Visited (Photo ID) Site #	Location Along Swamp's Edge Break (UTM[1])	Swamp's Edge Break Condition	Swamp Vegetation Affected by Fire/Fire Management Actions	Within Season Action to Repair Swamp's Edge Break	Within Season Reassessment	1-3 Year Expectation
			Lacnanthes revegetating in SEB	salvage logging begins nearby		
6/27/07 No photos #48	Compartment 5 and Radio Tower Road at SEB 384847 3380224	SEB along Perimeter Road; burned out to road	Debris piles along road; no issues	No action needed; monitor for non-natives	monitor for non-natives	monitor for non-natives
6/27/07 OKE627 07 41-42 #49	SEB-Perimeter Road west of Boggy Road 389641 3382423	30 ft wide SEB; small amount debris piled to outside edge of SEB; no burn	SEB cleared; minor revegetation occurring	No action needed; monitor for non-natives	Monitor for non-natives	Monitor for non-natives
6/27/07 OKE627 07 36-40 #50	Stokes Road and SEB 391723 3387040	100 ft wide (with Perimeter Road); debris piled along edge to east; minor treadline ruts and berms	*Lacnanthes, Sagittaria, Carex* sprouting in depressions in break; moderate burn in swamp here; some peat burn; *Woodwardia* sprouting among burned shrubs	No action needed; monitor for non-natives	Monitor for non-natives	Monitor for non-natives
6/27/07 OKE627 07 29-35 #51	Old Crawford Road and SEB 391737 3388575	60-100 ft wide SEB; small amount debris piled to east	Smoothed break and roadbed; moderate burn with some organic layer removed; small amount *Lacnanthes* revegetating, but mostly bare soil	No action needed; monitor for non-natives	Monitor for non-natives	Monitor for non-natives

Date Visited (Photo ID) Site #	Location Along Swamp's Edge Break (UTM[1])	Swamp's Edge Break Condition	Swamp Vegetation Affected by Fire/Fire Management Actions	Within Season Action to Repair Swamp's Edge Break	Within Season Reassessment	1-3 Year Expectation
6/27/07 OKE627 07 25-28 #52	Between Katie and #19 Road 391856 3390473	Burnout fairly hot along break edge, with burned shrub stems, basal sprouting	Shrubs (*Lyonia*), *Smilax*, and *Gordonia* basal sprouting; *Woodwardia* sprouting; mostly intact organic layer	No action needed; monitor for non-natives	Monitor for non-natives	Monitor for non-natives
6/27/07 OKE627 07 16-24 #53	Katie Road and SEB 391871 3391420	30 ft wide break with lots of ponded water; large debris piles to east	minor or no burn, depending on location; where burned, shrubs and trees sprouting (*Lyonia*, *Magnolia*, *Gordonia*); abundant new litter on burned ground	No action needed; monitor for non-natives	Monitor for non-natives	Monitor for non-natives
6/27/07 OKE627 07 12-15 #54	#1 Road 391527 3392234	Minimal burn along break edge	Basal sprouting from shrubs, bays; much green canopy and upper midstory	No action needed; monitor for non-natives	Monitor for non-natives	Monitor for non-natives
6/27/07 No photos #55	Perimeter Road between Joe Cone and #1 Road 391176 3394360	Slash piled along road bed to east; ditch along west side of road	Ditch along road may affect water seepage toward swamp, although does not look recently constructed	No action needed; monitor for non-natives	Monitor for non-natives	Monitor for non-natives
6/27/07 OKE627 07 3-11 #56	Joe Cone Road and SEB 391176 3394672	100 ft wide break with extensive ground work that left ditch parallel to swamp edge, as well as ruts	Debris piles removed and pushed to side; Lacnanthes in SEB, ponded water; shrubs (Lyonia, Smilax) basal sprouting; minor to	Minor ground surface work to fill ditches and ruts; monitor for non-natives	Monitor for non-natives	Monitor for non-natives

Date Visited (Photo ID) Site #	Location Along Swamp's Edge Break (UTM[1])	Swamp's Edge Break Condition	Swamp Vegetation Affected by Fire/Fire Management Actions	Within Season Action to Repair Swamp's Edge Break	Within Season Reassessment	1-3 Year Expectation
		and berms	moderate patchy peat burn; shrubs torched but stems standing			

[1] UTM coordinates were retrieved from GPS or estimated from a map where GPS coordinates were not recorded.

4. Cultural Resource Assessment

Okefenokee National Wildlife Refuge
Post-Burn Cultural Resource Reconnaissance Survey

Weekly Progress Report
25-29 June 2007

S. Dwight Kirkland and Fred C. Cook
Southeastern Horizons, Inc.

Summary

The Okefenokee National Wildlife Refuge (ONWR) Post-Burn Cultural Reconnaissance Survey continued during the week of 25-29 June 2007. Attention shifted away from the Bulldozer Lines (BDL) along the Okefenokee Swamp Edge Break (OSEB) and focused on BDLs crossing the higher ground of Trail Ridge. Our experience of walking several miles of the BDL along the OSEB had shown that most of it is inundated and what little upland ground was examined produced only an occasional isolated chert flake. These were very widely dispersed across the landscape.

The change to the uplands yielded immediate results. Three unrecorded sites were discovered and documented between Roddenberry Road and Chesser Island Road. In addition, we visited and investigated the north end of Billys Island and re-examined most of Chesser Island. The fire burned over most of Billys Island and exposed a variety of cultural resources. We visited and documented three Indian mounds, several railroad tramways, and numerous chimney bases/falls in the area of the Hebard Cypress Company logging camp. The area south of the Chesser Homestead on Chesser Island was re-examined toward the end of the week. A local informant provided details about the location of the Harry Chesser, Sr. homestead which was just south of the current parking area for the Chesser Homestead. Standing posts, brick-masonry pads, a pump head, and abundant surface artifacts were found in the area. Two other recorded sites were revisited although no artifacts were found at their published UTM coordinates.

Daily Progress

On Monday, 25 June, we continued our examination of the BDL along the OSEB between Crews Road and Dinkins Road. During our hike to reach the OSEB, we discovered an unrecorded historic site in an area clear-cut by a timber company. After reaching the BDL at the OSEB, we walked it south to Dinkins Road. We did not examine the BDL south of Dinkins Road because it was inundated. Next we investigated the BDL at the OSEB between Paxton Road and Roddenberry Road. The last 300m of this trek and south of Roddenberry Road was too wet to examine. Most of the BDL at the OSEB south of Roddenberry Road was in wetlands and unable to be examined.

Despite the extended search of these areas only a single small Mississippian Triangular Point was encountered. Its presence in the lowland area was probably due to a hunting loss. After a telephone conversation with Richard Kanaski, it was decided to devote our time to investigating the BDLs that crossed the drier uplands. Therefore, our focus afterwards was on these upland areas on the western slope of Trail Ridge that were inside the ONWR.

On Tuesday, 26 June, we visited Billys Island. It appeared that most of the island was affected by the fire and much of the understory vegetation had burned away. We first investigated the Lee family cemetery and found that it was unaffected by the fire. Apparently the fire burned up to the cemetery but failed to cross the surrounding fence. We then moved south and examined the area where the Hebard Cypress Company logging camp once stood. The railroad tramways were easily recognized and the positions of the cross ties were clearly visible because the leaf litter within the molds had burned out. Several large pieces of metal debris (one said to be part of a locomotive) and other smaller pieces of metal, nails, bricks, and glass were noted in the area near where the machine shop had once stood. We identified and visited the two Indian mounds in the same area. The larger of the two appears to be heavily modified, probably due to soil borrowing for the railroad tramways. A third mound, the McCallie Mound (9CR65), was also found by using a hand-held GPS unit and published UTM coordinates. It was burned over but unaffected by the fire. Before leaving the island we investigated the area of the published coordinates of the Dan Lee Homestead. We found numerous chimney falls, deep depressions that were likely wells, and scattered bricks, metal artifacts, glass, and historic ceramics. It was impossible to tell which of these are associated with the Dan Lee Homestead and which are remnants of the Hebard Cypress Company logging camp.

On Wednesday, 27 June, we continued our reconnaissance of the BDLs on the high ground of the eastern ONWR. We found one artifact isolate (chert flake) in a BDL that runs south of Crews Road across high ground. After finishing that trek, we examined a BDL that surrounds a hunting camp near the intersection of Crews Road and Trail Ridge Road. We found a small site (S-CRW-01) in the BDL north of the hunting camp. It consisted of a scatter of chert flakes and aboriginal pottery (Deptford Simple Stamped and plain sand-tempered). An artifact isolate (two chert flakes) was also discovered about 100m to the south of the site. Later, we moved to a BDL along the southern edge of Price Road. We found another small site (S-PRC-01) at about the midpoint between Trail Ridge Road and the western terminus of Price Road. It was a scatter of chert flakes and aboriginal pottery (Satilla Simple Stamped, Satilla Plain, and plain sand-tempered) scattered adjacent to the south ditch of Price Road. Apparently the artifacts were displaced because this is where the mechanical equipment cut the deepest. After recording the data for this site, we drove south to a BDL that is accessible via Coleson Road. We traversed it northward until encountering the DL at the OSEB which was inundated. One artifact isolate (cord-marked aboriginal pottery) was recorded during this examination. We spent the balance of the day scouting for more upland BDLs between Coleson Road and Camp Cornelia.

On Thursday, 28 June, we began by investigating a BDL that connects to the OSEB near the western terminus of Indian Island Road. After slogging through the mud of BDL at the OSEB, we found that the BDL of our interest illustrated on the map was completely covered in uprooted trees and upturned topsoil. It will have to be examined after it is rehabilitated. We then moved southward examining small segments of BDLs along Duck Island Road and Harris Road. Most were recently rehabilitated and insufficient rain has fallen to expose any artifacts. These BDLs will all be revisited when such rainfall occurs. About midmorning we drove to Chesser Island and examined a burned-over area just south of the parking pad for the Chesser Homestead. A local informant had told us that her grandfather's (Harry Chesser, Sr.) home was at that location. We examined the area and found ample evidence for a homestead. There were standing posts which likely supported a shelter, brick-masonry pads that were probably chimney or step bases, a pump head, and scattered artifacts consisting of bottles, window glass, whiteware, old batteries, metal cans, barrel hoops, and a variety of other indeterminate metal artifacts. The recent fire had done severe damage to the wooden posts and particularly the scattered bottles and historic ceramics. It was obvious that the heat of the fire had shattered most of the bottles and other glass artifacts. In addition, the metal artifacts subjected to the fire will oxidize more quickly.

Since we had already accumulated the field hours for the week by the end of the day on 28 June, no field work was conducted on Friday, June 29. We spent portions of that day updating our notes, writing this progress report, and planning for the week of July 1-7. During the morning, Kirkland met with Chris T. Trowell for about four hours to review the results of our work and consult him about cultural resources within the ONWR. The discussion focused on Billys Island, Floyds Island, Mixon's Hammock, Cow House Island, Chesser Island, the Groom's Field Mounds, and the Martha Dowling North Mounds.

Okefenokee National Wildlife Refuge
Post-Burn Cultural Resource Reconnaissance Survey

Weekly Progress Report
02-06 July 2007

S. Dwight Kirkland and Fred C. Cook
Southeastern Horizons, Inc.

Summary

The Okefenokee National Wildlife Refuge (ONWR) Post-Burn Cultural Reconnaissance Survey continued during the week of July 02-06, 2007. While work focused on the bulldozer lines crossing the higher ground of Trail Ridge, additional work was done along the southwest edge of the swamp and on Floyds Island in the interior. Further investigation also occurred at the homestead of Robert Allen Chesser, Sr., the remnants of which lie south of the standing Chesser Homestead on Chesser Island. We

investigated bulldozer lines at the north end of the ONWR between the Okefenokee Swamp Park and Cowhouse Road and between Kingfisher Landing Road and Mizell Road. During this week we examined and recorded data on three Indian mounds on Chesser Island and two on Floyds Island. We discovered three unrecorded sites and four artifact isolates.

Daily Progress

On Monday, July 2, we revisited the remnant homestead exposed by fire south of Wildlife Drive near the standing Chesser Homestead on Chesser Island. A local informant had told us it was the home of Robert Allen Chesser, Sr., not Harry Chesser, Sr., as we were first told. We spent most of the morning recording details of the site and searching for additional structures. This was prompted by my conversation with Chris Trowell on June 29, when he told me that the site had not been officially reported. We also examined two Indian mounds adjacent to and north of Wildlife Drive that are located about 200m and 300m, respectively, west of the parking area for the Chesser Homestead. We also searched for another Indian mound north of the Chesser Homestead but found only a low rise that may be its remains. After lunch we talked again to the local informant who gave us old photos taken by Francis Harper of the Robert Allen Chesser homestead when it was occupied. We returned to that site and matched the photo with the visible structural remains. Before leaving Chesser Island, we also searched for any remains of the Francis Harper cabin which was supposedly located several hundred meters south of the Chesser homesteads. The local informant had pointed out the location, but we found no evidence of the structure. We recorded essential data on all of these features before leaving. Afterwards, we drove north and examined a bulldozer line south of Harris Road. We found no sites or artifact isolates in that firebreak. As the final action of the day, we returned to S-PRC-01 and S-CRW-01 and clearly flagged their locations for the benefit of the repair crew.

On Tuesday, July 3, we began the day by examining a bulldozer line on the south side of Duck Island Road. We found one artifact isolate (I-DIR-01). After finishing this trek, we drove to the Pogo Heliport and, after a briefing, boarded a helicopter and flew to Floyds Island. Upon arrival we hiked to the Hebard Hunting Cabin and unloading our gear. We then walked southwest to the large Indian mound designated as the Floyds Island Southwest Mound. The fire had burned over its entirety and denuded the surface in patches, particularly the steep slopes formed by the railroad tramway cut through the mound's northern edge. Since the fire had burned away the floral cover and leaf litter, the mineral soil had begun to erode. We found several pieces of aboriginal pottery, mostly plain sand-tempered, although one sherd was a rim fragment with hollow reed punctations in a line paralleling the lip. We also observed a smaller, lower, mound to the north that may have been a habitation site, although no artifacts were found in the vicinity. After completing our work at the Southwest Mound, we returned to the Hebard Hunting Cabin and evaluated its condition following the fire suppression wrapping and fire. The fire did not reach the cabin, although it came as close at 50 m to the southeast. The fire suppression wrapping appears was effective in protecting the structure from

radiant heat and airborne embers. During the process of removing the wrapping, some of the film was left along the edges of the exposed rafters and many of the staples used to affix the film to the house still remain. It is recommended that these be removed since they are not part of the original house as listed on the National Register of Historic Places. After finishing the assessment of the Hebard Hunting Cabin, we walked northeast along the nature trail to reach the Nuss Mound. This mound is of aboriginal construction and is smaller than the Floyds Island Southwest Mound. It stands about 30m southeast of the nature trail and is about 0.5m-0.75m high. Pacing across in north-south and then east-west transects reveals it to be about 20m by 30m. The fire did not burn across the area so it was unaffected. The balance of the day (about three hours) was spent searching for two mounds near the midpoint of the island. That area was also unburned and because of the dense oak scrub in some places and the continuous saw palmetto in others, we did not find these mounds. The fire had burned up to the edge of the island on its northwest side but did not reach the upland in the center of the island. We departed Floyds Island by helicopter around 1715.

On Wednesday, July 4, we moved to the southern and western side of the swamp. We began by walking a bulldozer line off Road #1 at the southern end of the ONWR. We found nothing at that location. After completing that line we investigated another that followed the Okefenokee Swamp Edge Break (OSEB) near Horseshoe Island. We found no sites there either. We then drove northward to investigate an Indian mound referred to as the Buddy Johnson Mound. However, because of all the recent rain, the roads were impassible and we could not reach that location. We next moved north along the west side of the swamp north of Fargo, Georgia and attempted to reach another bulldozer line that crosses a point on the mainland opposite the south end of Rowells Island. Again, because of impassible roads we were unable to reach that area. We talked with a local informant who lived close to the Swamp Perimeter Road and he advised us to wait for drier weather. He stated that currently the roads were impassible even for four-wheel drive vehicles. We made the decision to cease our operations on the west side of the swamp and returned to the east side. We drove to Camp Cornelia and examined the bulldozer line along the OSEB north of Spur Highway 121. We walked about one km and found two sites (S-COR-01 and S-COR-02) and one artifact isolate (I-COR-01) before closing for the day.

On Thursday, July 5, we revisited sites S-COR-01 and S-COR-02 to record missing data then drove north to the Okefenokee Swamp Park area. We examined a bulldozer line that stretches from the park to Cowhouse Road, another that runs between Cowhouse Road and Helispot Road, and another that runs north-south from a right angle turn in Cowhouse Road to the OSEB. The total distance investigated was around four kilometers. We found no sites or artifact isolates in any of these firebreaks. We then moved south to the western terminus of Mizell Road and examined the bulldozer cut at the OSEB north of that point. We examined about 0.8 km of the bulldozier cut ending at a bay head drain and found two artifact isolates (I-MIZ-07 and I-MIZ-08) and one small site (S-MIZ-02). We next drove to the Incident Command Post near the ONWR headquarters. There we met with Sue Grace to update her on our progress. Since she will be leaving on Saturday, July 7, and concluding her role as BAER Team Leader at the

ONWR, we wanted to express our gratitude for her excellent leadership.

Since we had already accumulated the hours for the week by the end of the day on July 5, no field work was conducted on Friday, July 6. We spent portions of that day updating our notes, writing this progress report, and reviewing maps in preparation for the week of July 8-14. We decided to spend Monday and Tuesday (July 9 and 10) conducting literature research at the Georgia Archaeological Site Files in Athens. The remainder of the week will be spent conducting additional reconnaissance in the ONWR.

Okefenokee National Wildlife Refuge
Post-Burn Cultural Resource Reconnaissance Survey

Weekly Progress Report
09-13 July 2007

S. Dwight Kirkland and Fred C. Cook
Southeastern Horizons, Inc.

Summary

The Okefenokee National Wildlife Refuge (ONWR) Post-Burn Cultural Reconnaissance Survey continued during the week of July 09-13, 2007. The first two days of the week were devoted to a trip to Athens, Georgia to consult the records housed at the Georgia Archaeological Site Files (GASF). Site records there were compared to those provided by the U.S. Fish and Wildlife Service (FWS) for sites in the ONWR. Any found in the GASF records that are not listed in the FWS records were added to the FWS maps. The field reconnaissance resumed on Wednesday when we investigated bulldozer firebreaks accessible via Sawfly Road and north of Cowhouse Road. On Thursday, we searched for sites on Blackjack Island and Honey Island but found nothing at the published UTM locations. Later that day we found two artifact isolates on high ground between Crews Road and Howard Road. On Friday we examined a historic site reported by FWS personnel on the northwest side of the Swamp. It is believed to be the remains of a saw mill. We also investigated other areas along the northwest and west perimeter of the Swamp but found few instances where the bulldozer firebreaks were inside the ONWR. Later that day we returned to the west side of the Swamp and examined the bulldozer line at the OSEB south of Mizell Road and found artifacts at the location of the previously recorded 9CR187.

Daily Progress

On Monday, July 9, Kirkland traveled to Athens, Georgia to consult the records housed at the Georgia Archaeological Site Files (GASF). The morning was spent traveling and the afternoon devoted to comparing the GASF topographic maps to those used in our reconnaissance survey. Any sites found on the GASF maps that were not on FWS

topographic maps were transferred to FWS maps.

On Tuesday morning, July 10, Kirkland continued with the topographic map comparison. After that was completed, he consulted the GASF report files for reports of archaeological work in the Okefenokee Swamp and/or the surrounding vicinity. Essential data from these reports were copied for reference during the report writing phase of the post-burn reconnaissance survey.

On Wednesday, July 11, we resumed the field reconnaissance. Before starting the day's work we met with the FWS personnel in the Geographic Information Systems office and secured a map showing all of the bulldozer firebreaks inside the ONWR. We used this map to plan the week's work. Afterwards we drove north to the west end of Sawfly Road and walked the bulldozer break south of that point. We examined it up to the point of overlap with a previous trek north from Kingfisher Landing Road. We found no artifacts, features, or historic structures. Next, we drove north to the next road that leads west to the edge of the ONWR. It has no name on our map. We reached the bulldozer line at OSEB at the road's western end but after consulting the map and looking at the landscape, we determined that it was outside the Refuge boundaries. We left that position and headed north to the vicinity of Cowhouse Road at the northern end of the Swamp. There we walked a bulldozer fire break that runs northeast along the southeastern edge of a cypress swamp. Again we found no cultural materials. Afterwards, we drove to the Pogo Heliport near the Refuge headquarters to schedule a trip into the Swamp to examine sites on Blackjack and Honey Islands.

On Thursday, July 12, we arrived at the Pogo Heliport and boarded a helicopter for our reconnaissance of Blackjack and Honey Islands. We landed on Blackjack Island at around 0800. Using a topographic map showing the location of 9WE47 and a hand-held Global Positioning System (GPS) receiver we searched for the site. During the trek I observed that, at least in this section of the island, the fire had swept over and burned the ground cover almost clean. The longleaf pines appear to have survived the fire with only minor effects. Their bark was scorched to about three to four meters above the ground surface. A flush growth of gallberry, saw palmetto, and other herbaceous species stands at about 50 cm above ground but the space between individual plants had not yet been filled with foliage. Visibility was excellent, one could see at least 1 km under the tree canopy. When we arrived at the published UTM coordinates we found nothing. We flagged a nearby tree and began a search in all directions for any cultural materials. It is estimated that our search extended over and area with a radius of 500m from the calculated coordinates. After about an hour of searching, we returned to the landing site and called for the helicopter to fly us to Honey Island. We arrived on Honey Island at 0946 and began searching for 9WE49. This is the site of a cabin. The conditions on Honey Island were very similar to those observed on Blackjack Island. The fire burned cleanly and cleared the understory. The longleaf pine seemed to be scorched just a bit higher than on Blackjack but the understory looked almost the same. Unfortunately, there were no cultural materials at the published coordinates for 9WE49. We flagged the closest tree and began a search around that point. We found a single modified metal barrel about 200m north of the coordinates. It appears that the drum was used as an

incinerator or stove of some type perhaps by campers. There were no other cultural materials present in the area. We continued the search for the better part of an hour, again to a distance of about 500m in all directions from the coordinates. We arrived back at the helicopter landing site at about 1055 and called for the helicopter to fly us back to Pogo Heliport. We arrived there at 1110. After lunch we met with the assistant Refuge manager and other FWS personnel for about an hour and then drove north along the east side of the Swamp to Crews Road. We examined a bulldozer line that cuts across high ground between Crews Road and Howard Road. We found two artifact isolates in this firebreak.

On Friday, July 13, we began by investigating a historic site on the northwest side of the Swamp reported by FWS personnel. We found the remains of a commercial operation, probably a saw mill. It was composed of a diffuse scatter of bottles, jars, and metal artifacts, plus large, heavy, cast iron parts. The latter are probably parts of a railroad locomotive. There is also evidence of structures in the form of standing charred posts arranged in a rectangular pattern and at least one railroad tramway. There are numerous railroad rails, spikes, large diameter cables, bolts, and scattered bricks on the ground surface. The most striking feature is a large (3m by 3m) well, complete with and underground timber casing. A well of that size undoubtedly supplied large quantities of water for the saw mill operations. After completing our investigation at this site, we drove southward along the Swamp Perimeter Road searching for bulldozer firebreaks inside the ONWR. The only break we found within the ONWR was located at the end of Hickory Hammock Road. It was recently repaired and hadn't had sufficient rainfall to expose any artifacts. We ventured as far south as Suwanee Creek before returning to the east side of the Swamp. We drove to the bulldozer line along the Okefenokee Swamp Edge Break (OSEB) about 1 km south of Mizell Road. We walked northward following the bulldozer line toward Mizell Road and traversed about 1km before reversing our course and returning to the vehicle. We found no cultural materials during this trek. Next we drove north to Mizell Road and investigated a scalped area on the south edge of a clear cut that lies south of the road. We found three fragments of aboriginal pottery in this scalped area. After referring to our maps we determined that this location was that of 9CR187, a site recorded during the 1997 Trail Ridge Survey by Southern Research. After recording the essential site data, we drove to the Refuge headquarters to turn-in the Nomex clothing issued to us for our helicopter flight. Afterwards we closed operations for the week.

5. Soils Assessment

SOILS REPORT ON THE EFFECTS OF 2007 WILDFIRES ON THE OKEFENOKEE SWAMP AND VICINITY [1]

The Okefenokee National Wildlife Refuge lies within the South Atlantic and East Gulf Coastal Plain. A small portion of it is found in northeastern Florida and the majority of its area is in southeast Georgia. Several periods of oceanic formations started the beginning of the Okefenokee Swamp. Through many glaciers and with the climate started to become warmer, the environment humid, rainfall increased, and the ocean levels and ground water began to rise. Parent materials beneath the surface are a thick ban of limestone. Charles Lagoueyte, Soil Scientist with the Natural Resource Conservation Service conducted the most recent soil survey in the swamp indicated that locally there is a lime strata in close proximity to the soil surface that shows slightly to moderately alkaline soils. There are also certain areas where the swamp is extremely acid. The thick clay bottom held water in the basin. Low depression areas remain wet year-round. It was at that point where near continuous open water when the Okefenokee Swamp began to form. As water began to increase within and around the swamp, soil physical and chemical processes began to change. As peat accumulated from years of ponding, flooding and saturation, rising water table, the swamp grew wider and eventually covered higher areas between streams and ponds, leaving small islands within the swamp. Soils even became more difficult to understand, because of the complexity of the change taken over many centuries This is when the soil building processes were rapidly changing relative to geologic time and developing the Okefenokee Swamp as we know it today.

Today the swamp consists of a wide variety of soil types with varying differences in soil moisture regimes (very poorly to poorly drained), physical and chemical properties on depressional landscapes. They are characterized by large, shallow water swamps, lower flatwoods, and bogs. These areas, such as the Pink Hole Swamp are under water for long periods of time during the year. In most cases soil types that are in this category are considered to be wetlands as they have hydric soils, hydrophytic vegetation, and wetland hydrology (US Corps of Engineers, 1987). Many of the soils from the outer edge of the swamp and up to perimeter road are somewhat poorly drained to somewhat excessively drained and also contain different vegetative communities than the swamp. The seasonal mean water table is typically within one or two feet of the surface on the somewhat poorly drain soils and greater than 2 feet on the somewhat excessively drained soils.

[1] Prepared by Dennis Law and Jason Jennings, Soil Scientist and Soil Scientist Trainee, Francis Marion and Sumter National Forests, 4931 Broad River Road, Columbia, SC 29212, dllaw@fs.fed.us

The soils in the swamp and swamp edge break include: Pantego, Kingsferry, Dasher and

Pamlico with Dasher and Pamlico being the dominant soil series. The Pamlico soils are very poorly drained, hydric soils and have 16 to 51 inches of organic materials over dominantly sandy sediments. The Dasher soil series comprise most of the swamp beyond the shallow bog area they are also very poorly drained hydric soils with organic materials extending to a depth greater than 51 inches. All of the soils in the swamp are found in swamp hardwood ecological communities, or scrub bog ecological communities. Predominant vegetation include: ogeechee lime, cypress, black gum, red maple, pond pine in the overstory and fetterbush, sweet pepper bush, button bush, wax myrtle, little leaf cyrillas (ti ti), willow, gallberry and scattered areas of slash pine in the mid story. Almost the entire area within the swamp and swamp edge break are considered wetlands, except for the internal islands of uplands or the relatively straight boundaries in some areas pass from wetland to upland. Only a foot or two elevation difference is enough to make this shift from wetlands to uplands in some areas. In addition, in the uplands, there are also some isolated wetlands (cypress bays).

The flatwoods soils include the Leon, Mandarin, Sapelo, Olustee, Mascotte, Allanton, and Lynn Haven. These soils are ultisols and spodisols, and all contain spodic horizons. They are the dominant soils between the perimeter road to the swamp edge (federal, state, industrial and private lands) and beyond the Perimeter road on private land. Spodisols have an organic pan beneath the soil surface. In some cases the organic pan can restrict root growth when they are dry and when they have elevated iron and aluminum concentrations. These soils are easy to erode because of the fine to medium size sands and lack cohesion in the surface horizon. Water does not infiltrate fine sand rapidly. Soil deposits from exposed or disturbed sites on low sloping terrain of only a few percent are noticeable and accumulate in ditchlines following rainfall. Predominant vegetation include: Longleaf pine, slash pine, water oak, turkey oak, wax myrtle, saw palmetto, gallberry, willow, fetterbush, huckleberry, greenbriar, and several grass species of bluestems.

The dominant soils located on the upper ridges within perimeter road to swamp break along Trail Ridge are the Cenetenary soil series and other similar soils. The soil is well to somewhat excessively drained soils. Permeability is moderately rapid following rainfall. The soils can erode following intense heavy rain over long period of time. There is not a lot of overstory vegetation on these soils. Vegetation on these soils includes longleaf pine, loblolly pine, blackjack oak, turkey oak and post oak.

Thousands of acres on private lands within the Perimeter Road and Swamp Edge Break have been altered by roads, ditches, bedding, windrowing or activities associated with logging and previous old firelines. These types of activities can impact soil productivity and the hydrology of an area. These activities have altered and/or destroyed the native vegetative communities. Some of the bedded areas are restricting surface water movement and altering soil physical properties. Monitoring of all these activities and the fire is needed to determine the long term impacts on the soil resources.

Soils are a continuum by nature based largely on slight elevation, moisture and physical

or chemical changes. Just as bogs, swamps and flatwoods are not readily distinguishable from one to another concerning where one starts and the other stops; soils exhibit this same natural continuum. Abrupt changes are infrequent, but can occur due to past geologic or abrupt surface elevation change. Cultural practices that disrupt and mix surface soils also add to the complexity and can cause soils to be altered in physical or chemical properties.

As stated, sandy surface soils of the flatwoods are highly erosive on sloping terrain with slopes 2 percent or more. Soil erosion is generally not a threat in the burn area as the watershed is nearly flat, but there are localized areas with topography where erosion could be an issue. In addition, depressional areas of swamps and bogs are scattered throughout the burn area. Runoff will be slow and will be mainly directed into the depressions. Erosion and sedimentation, however, can result where runoff water flows through the natural drainage channels, from roads, ditchlines, firelines and other disturbed surfaces found in the burn area.

Several interim reports were made during the soil and hydrology surveys of the area for damage due to suppression, fire or existing conditions. These reports are included as Appendices to refer to for more detail or specific issues addressed during the analysis (refer to Hydrology section). Burn severity on soil effects was not assessed for acres burned high, moderate or low, but was addressed in general as the amount of litter, duff, humus and soil organic surface loss.

The fire affected much of the forest, shrub vegetation, and in some areas a large amount of organic soil materials were consumed in the burn. The trees in areas with burned organic soils have lots of extensive damage to their root systems. These areas are subject to trees falling over at any time, unless they are living and send out new roots before they are blown or fall over. In time the soil and vegetation will recover. The Bay and flatwoods systems have evolved with drought and fire. They tend to be fairly resilient as long as the hydrology of the watershed is not modified. Wetland bay areas normally burn only under extremely dry conditions. Intense fires in these areas are infrequent, and are a natural disturbance process of the ecosystem. Bay/Swamp have recovered in the past from these intense fire regimes, however the recovery is not abrupt. Some species that were common before the fire will not return immediately as they require certain moisture, light, nutrients, and/or other conditions. Recovery becomes more complicated when associated with a wilderness. Many acres on private lands have been modified and this may impact the hydrology on the swamp. Monitoring is critical to determine if future mitigation is needed in the next year.

Most of the litter and duff layers were consumed by the fire, with some humus and soil surface organic matter remaining on potions of the burn area. Localized areas within the fire burned hot and consumed litter duff and most of humus layers down 2 to 3 feet in many areas. In time these soils have the basis to return to productive forest and wetland ecosystems. There is no threat from the fire to the long-term soil productivity as the soil loss is expected to be well within the tolerable limits for the Southern Region. There are some short-term productivity losses due to the rapid oxidation of organic materials on

sandy soils. Nitrogen is typically volatized at high rates when the fire temperatures exceed 650 degrees Celsius. Under natural recovery, the types of plants and vegetation communities reestablished may shift due to changes in the soil exposed and loss of large amounts of the duff and humus layers.

Fireline construction during fire suppression required the use of heavy equipment to remove vegetation as well as the duff, humus, and organic soil surface layers down to mineral soil. The soils within the area can be highly erosive when mineral soil is exposed on slopes. Sedimentation will become an issue in the areas where firelines intersect streams and drainages. Rutting from heavy equipment and vehicles will also contribute to sedimentation by allowing water to be channeled in the ruts causing concentrated flow. Soil productivity within the firelines will be reduced due to the removal of soil surface layers. This may cause the vegetative recovery time to increase. Areas where sopodic horizons are exposed from the removal of surface layers may also lengthen recovery time within that area. The concreted organic layer will reduce infiltration, root penetration, and root expansion.

The removal of debris from the site will also result in a loss of nutrients from the fireline. Placing the debris into the fireline will allow nutrients stored in the debris to be retained on site. The nutrients bound in the debris will play a key role in long term recovery of the site. However, due to the coarse size of most of the debris it may take years for the material to decompose. Chipping the debris will speed this process of micro and macro organisms breaking down the woody material making unavailable nutrients available to plants. Incorporating chips from the debris piles into the soil will aid in the vegetative recovery of the site. Leaving a thick layer of chips on the soil surface will decrease the rate of vegetative recovery for a period of time.

Potato patching is a method of fire suppression used mainly by private landowners and industry. Potato patching involves plowing narrow plow lines through tree plantations. Some areas have plow lines between each row of trees and in other areas plow lines are dispersed throughout the stand. Within the plowed lines there are large amounts of loose soil and debris that has the potential to wash into streams and ditches during times of heavy rain fall. Potato patching within the Okefenokee Refuge boundary was very limited and rehabbed, therefore effects to the soil resource should be minimal. Excessive potato patching occurred between the perimeter road and the swamp edge break. These areas may contribute to erosion and sedimentation into streams and drainage ditches leading into and out of the Okefenokee Swamp. Soil and debris from potato patching may also continue to clog culverts and ditch lines preventing proper water flow around perimeter road.

There is an ongoing need to address suppression activity effects to soils and hydrology (see hydrology report). The areas of primary suppression impact are within or adjacent to drainages and wetlands. The extensive berm and debris will probably create hydrology and soil erosion issues if they are not broken in places or removed in drainage channels.

The roads have been graded so many times resulting in widening beyond their original

width, sometimes covering up culverts and ditchlines. All of the system roads need to have berms removed to allow water to drain off the road doing intense rainfall periods. It will also help to close certain sections of roads following reconstruction and packing of road with a compacter to allow road to harden. There are also issues with the heavy use and damage to some culverts, ditches, etc. from the suppression activities that need to be addressed.

BAER measures are recommended only when excessive human, watershed, and/or environmental damages are eminent to the area from the fire itself. In this instance, damage to the Okefenokee swamp system is difficult to measure or substantiate. The tendency of the Okefenokee Swamp is to be resilient as long as the hydrology remains intact.

Based on my review and circumstances, the damage from the wildfire is minimal on the soil resource compared to the suppression activities. The potential for soil impacts can increase in the future due to extreme storm events and added mortality to vegetation from the drought resulting in erosion from intense rainfall periods. Also the vegetative recovery rate can be slowed down by fire impacts, suppression actions, excess moisture, and loss of seed sources.

I do not recommend any BAER treatments or funding needs at this time relative to soils. There is a need for constant monitoring of the wildfire and its potential affects due to erosion and adequate drainage.

References

Corps of Engineers, 1987. Corps of Engineers Wetland Delineation Manual. Technical Report Y-87-1. Environmental Laboratory, Department of the Army, Waterways Experiment Station, Vicksburg, MS. January, 1987. 80 pages plus Appendices.

6. Hydrology Assessment

HYDROLOGY EFFECTS OF THE 2007 WILDFIRES ON THE OKEFENOKEE SWAMP AND VICINITY 2007 [1]

Specific hydrologic conditions or issues identified in this report are based on field observations and evaluations. It should be noted that much of the work concentrated on the suppression activities and their impacts. Observations related to the fire and the effects of fire (Burned Area Emergency Response -- BAER) were separated from suppression activities or previous conditions that were not related to the fires. At the time of writing this document the full nature of the types of suppression repairs being conducted and the extent of these repairs on the landscape were still being implemented and evaluated. The report will try to be specific on whether the work is suppression, Burned Area Emergency Response (BAER) or non-fire opportunities for later consideration. A variety of topical reports are also included in the Appendix on various subjects to help agency and fire decision makers explore opportunities to mitigate damage, conserve critical resources and consider partnerships or cooperative work.

The hydrology of the Okefenokee Swamp (OS) has many interesting and essential features to consider following the Bugaboo, Sweat Farm and Big Turnaround Complex wildfires of 2007. Most of the OS is within the upper part of the Suwannee River, with the southeast portion of the Swamp contributing to the St. Mary's River. The Suwannee River flows to the Gulf of Mexico and the St. Mary's River flows to the Atlantic Ocean. The OS eastern rim formed from a former barrier island that was built by ocean currents and abandoned by the receding surface of the ocean. There are several theories of how this occurred, and they will not be discussed in detail. The surface soils around the rim and to the swamp interface are sandy ocean materials that are underlain by limestone materials of varying depths, that dip from west to east, being fully exposed in the St Mary's River. Internal OS includes islands, various types of palustrine, lacustrine and riverine wetlands, with varying depths of organic and peat accumulations. Some areas of deep peat accumulation have become established with cypress and other wetland species. Clear water in some areas within the swamp as well as blue waters found in some of the borrow pits in localized areas suggest there are limestone springs and influence areas contributing at least locally to water levels, chemistry and flow patterns.

The residual soil materials are primarily fine to medium texture marine sands, discussed in more detail in the soils report. These materials are highly erosive if exposed and located on sloping terrain of 2% or more. Natural depressions and isolated wetlands typically retain water and accumulate organic materials. Infrequent severe wildfires during drought periods are the primary means of reopening and/or regenerating these peat accumulation areas. Lack of fire in more open swamp areas could lead to clogged natural flow patterns, increased development of pocosin-like peat accumulations, growth of hydrophytic vegetation including trees and eventual conversion from open water habitats to wetland habitats. Fire under drought conditions helps control the extent and depth of peat accumulations to maintain the unique diversity of wetland and open water habitats.

[1] Prepared by William F. Hansen, USDA Forest Service, Francis Marion and Sumter National Forest, 4931 Broad River Road, Columbia, SC 29212, wfhansen@fs.fed.us

The Big Turn Around Complex, Sweat Farm and Bugaboo wildfires in 2007 provided a notable year when drought conditions and wildfires combined to initiate landscape level changes. With our limited time, the extent of these beneficial and detrimental changes can only be estimated.

Many of the past droughts of record were also years of extensive fires, the last being in 2002. Appendix Figure 1 highlights a portion of the Suwannee River flow record. It was noted that there were no extreme daily flow periods that appeared out of the ordinary after any of the past fires. Typically studies have found that clearcutting and severe wildfire in coastal plain and many other areas does not affect the storm peaks to a great degree. Increases in flow are more likely to occur during the baseflow recession and associated with the reduction in vegetation and associated transpiration.

Some hydrologic modifications were detected during field observation and evaluation, some were referenced in other materials, and some were probably overlooked. Hydrologic changes can be obvious to subtle. Examples of the hydrologic changes include:

1. The Suwannee Canal construction occurred between 1890 and 1910, but was never completed. Its intent was to drain the OS to the St Mary's River, and develop it for farmland. Lack of funding and litigation caused the Suwannee Canal Company to go bankrupt before it was finished. Resident and OS Reserve Volunteer, Debby Todd provided local information and insight that suggested that the canal had intercepted springs and seepage flow during construction that added water to the OS. From this information, it is possible that construction of a canal under these conditions may have been more costly and the ability to drain an area with artesian or other groundwater sources may have been in question.
2. Suwannee River Sill installed in 1960 to help retain water in the swamp. It was never that effective, and certainly did not stop severe fires. Loftin et al, 2001 discussed that the sill only affected about 18% of the OS during high water and less than 5% of the swamp had increased hydroperiods during low water or drought conditions. Efforts to remove the sill were evaluated in 1998, but due to the costs and difficulties in removing the sill, the water control gates were left open to allow flow passage at various locations across the sill.
3. In general, suppression limiting fire over extended periods of time can sometimes prevent areas from burning that need to be periodically burned to maintain natural hydrological and ecological function. It is likely that the suppression is most effective in the margins and uplands adjacent to the OS, and that water levels in normal years are probably the limiting factor that prevents more frequent burning of the Swamp.
4. It is not all that unusual that the effects of fire suppression or containment are sometimes more severe on the hydrologic functions than the fire itself, and they need special attention for repair or mitigation. The many miles of new firelines and fire access routes with heavy equipment have locally altered surface drainage patterns by clogging, blocking or diverting drainage patterns with woody debris and soil berms varying from 2-10 feet high. Of special concern is the upland-

wetland interface and adjacent to streams. In some places, the repeated blading of the Swamp Edge Break has entrenched the Break and/or left berms or debris that affect the normal water conveyance into and out of the Swamp. The widening of the fuelbreak along the Swamp Edge Break by 30 feet and Perimeter Roads by 100 feet has created many new problems associated with the debris, berm and flow pattern over many miles.

5. Existing forestry and fire management practices were also very evident in many areas across the contributing OS watersheds and affect hydrology to varying degrees depending on the circumstances. Roads, ditches, bedding, windrowing, potato patching, and other practices can contribute to flow modifications. Ruts produced by heavy equipment on wet soils also retain water for extended periods and can affect hydrology for many decades. Accepted forestry operations continue to allow enough surface water removal of stormwater or elevation of trees above the water table that they could be managed. However, how the practices are aligned on the landscape can make a big difference in how they function hydrologically. Depending on the location and how these practices are located on the landscape, these may actually speed or delay flow rates into or out of the OS or altering flow patterns. The net result of these activities has probably increased the OS water levels during wet periods in response to rainfall and stormwater flow, and decreased levels during dry periods due to lower water tables and higher transpiration rates from dense pine stands as opposed to hardwoods or more open pine savannas and woodlands that occurred historically.
6. Much of the adjacent private and state lands are dedicated to pine management that may or may not be contributing to a net increase in evapotranspiration. Pines often use more water than hardwoods or grass cover types, but on the other hand, use less water for several years after clearcutting. So for short rotation pinelands, water balance changes are complex. However, the extent of clearcutting of fire damaged stands covers significant portions of the OS contributing watersheds. Current pine management on Trail Ridge contributes more stormwater from roads and drained lands to OS, while transpiration from dense pine stands may utilize more water than the historic longleaf pine flatwoods with open grassy terrain described by Dwight Kirkland in a previous report (Brunswick Advertiser and Appeal, September 26, 1885).
7. Drainage canals and some road ditches were designed to facilitate surface water movement and drainage from the OS or adjacent terrain. The historic intent was typically to drain wetlands so they could be farmed or forested with desired pine species.

The suppression activities within the Suwannee and St. Mary's River watersheds probably included well over 1,000 miles of bladed or plowed firelines of varying widths from blade and plow widths up to 30 feet width beyond the Swamp Edge Break and 100 feet additional width along the Perimeter Road in many places. Many of these areas are on private and state lands outside of the Swamp Edge Break and Swamp Perimeter Roads around OS. The full extend of the firelines were not fully known during our field analysis, and the lack of this information limits the accuracy of this analysis. We typically noted many locations where firelines or fuel breaks intersected with Swamp

Edge Break or Perimeter Road that were not on the maps we were given. In some areas, several levels of fireline, fuel breaks, bedding plow or potato patching were installed to reduce fire intensity or help contain the fire. Attempts to obtain high-resolution satellite images were not successful during our initial field trips due to lack of clear days. This would have helped to provide the full detail of the density and location of firelines and associated activities.

Several reports and assessments by the BAER hydrologist, soil scientist and soil scientist trainee relative to the Perimeter Road and Swamp Edge Break helped identify and provide guidance to repair and follow-up BAER efforts. Please refer to the specific field and topical reports in the Appendix that identify issues and address repair, mitigation or after fire follow-up evaluations. Included as a primary Appendix Suppression activities and associated repair were separate from Burned Area Emergency Response (BAER) activities that concentrate on the effects of the fire and post fire issues that can develop from storms, floods, erosion, and sediment. Additional detail on specific topics can be found in these reports as follows:

- Soil and water report of June 15, 2007 (Appendix A)
- Soil and water report of June 17, 2007 (Appendix B)
- Field Reconnaissance report of June 20, 2007 (Appendix C)
- Report of June 24, 2007 (Appendix D)
- Wyden Amendment and Justifications June 26, 2007 (Appendix E)
- Okefenokee Wilderness Hydrologic Opportunity (Appendix F)
- Hydrologic Modifications Coyote Trail - Battle Bay (private land – Appendix G)
- Environmental Compliance COE and GA Forestry BMPs (Appendix H)
- Field Reconnaissance Report of July 2, 2007 (Appendix I)
- Stream Identification and Repair Work (Appendix J)
- Mulching on Swamp Edge Break (Appendix K)

In addition, Hydrology Appendix Figures and Pictures to this document are provided separately to avoid the large size that digital documents can attain by incorporating figures and pictures.

Although management of the Sweat Farm, Bugaboo and Big Turnaround Complex fires were handled separately for logistical reasons, there are overlapping issues relative to these wildfires, the hydrology of OS and the Suwannee and St. Mary's River watersheds. Much of the eastern portion of the Trail Ridge drains toward the Swamp. Some of the northern portion has somewhat larger contributing drainages from private land and/or the Dixon Memorial State Forest before reaching the Swamp. The northwest contains the largest contributing drains to the Swamp including Black River (includes Alligator Creek), Suwannee Creek, Cane Creek, to Cross Swamp. It appears that Tatum Creek is primarily outside the inflow and outflow of the Swamp, but may have some connecting drainages that contribute during high water. Alligator Creek, Bay Creek, Suwannee River, Dragline Canal, Tyger Branch and Canal, Sweetwater Creek, and Cypress Creek flow out of the Swamp. The area along the lower part of Council Road to past Rough Island drains in and Moccasin Creek, St Mary's River, to Styx River drain out. In the

Boggy Break vicinity, the drainage begins to be dominated by the Trail Ridge Road again, draining to the Swamp. The contributing area into our out of the Swamp varies in size with stream and location. In general, the larger the contributing area into or out if the Swamp, the more flow would be associated and more issues with saturated soils, flooding, wetlands, and streams. The smaller drainage areas are most likely to have more upland soils, but the topography is also a primary component. This complexity may add some confusion, but it is important in the understanding of how much water an area is handling as well as understanding on relatively flat areas, is the water moving into or out of the Swamp?

So beyond the effects and mitigation associated with the suppression activities, what are the hydrology effects of the fire that need to be considered and mitigated in Burned Area Emergency Response (BAER)?

1. The fire generally reduced, but did not eliminate the organic component of the soil. The residual organics are sufficient to maintain soil percolation and adsorption for the most part. The loss of organic material does reduce the absorption capacity for water and one ton of organic material can absorb several (3-5) tons of water. Loss of organic accumulation will reduce water absorption on the surface, increase water table levels and in some locations surface extent or movement of water or evaporation. No mitigations are planned for these losses. However, if exposed soil areas on slopes over 2% are later found due to the high fire intensity, evaluation of proximity to streams, active erosion, sediment and response of surface vegetation would be factors to consider on whether to treat or not to treat with seeding, mulch or other erosion control treatments.
2. Fire in various types of wetland and open water conditions during drought conditions can remove or reduce organic materials and vegetation. This is a natural process that can affect lacustrine (lakes), palustrine (wetlands) and riverine (stream) ecosystems by increasing the extent of open water, open channels providing improved flow conduits and may affect the viability and recovery of certain types of plants that were accustomed to drier conditions present under pre-fire conditions. No work is indicated under BAER related to this.
3. Dead woody plants, trees and debris not consumed in the fire will contribute to debris and structure in the open waters as they break off and/or fall in. Some boating and hiking trails adjacent to water may be subject to increased hazards from falling trees and woody debris accumulations in the short term. Monitoring will be needed under BAER to evaluate conditions and periodically remove channel blockage or other public hazards. See Appendix Report on Stream Identification and Repair Guidance for other information.
4. Although coastal systems typically do not move great amounts of woody debris from location to location, regular checks or follow-up of complaints after any major storm or flood events are recommended adjacent to culverts and bridges, and rural, community and public developments for the next several years. In areas where suppression debris and berm was not fully removed, water may find weak points to break through and convey waters or create flooding issues. These

may need BAER follow-up. Rivers with major flow or deeper channels may be able to move or float large woody debris. However, the broad, low gradient, poorly defined channels common to much of this area with extensive shallow flooding and/or braided flow networks do not typically move large woody debris efficiently. Debris adjustments are most likely to occur in confined channels after major tropical storms, tornadoes and hurricanes. Well-defined streams or river channels with sufficient flow velocity and water elevation can float, reorient, erode adjacent to, move and/or relocate debris from place to place. However, past accumulations of debris were not noticed in our limited field reconnaissance. Unless debris is accumulating to abnormal levels, creating blockage to recreational boating, hazards or public nuisance such as in swimming areas, channel blockage contributing to flooding structural improvements or properties, removal by BAER follow-up actions is probably not a priority except on a case-by-case basis. Woody debris adds structural diversity to aquatic habitats so it would not be removed or reoriented unless causing a problem. Recommend extensive monitoring as well as follow-up on public reports of debris, channel blockage or bank erosion issues, especially after major events over the next two to three years. Monitoring and follow-up are needed, but it is believed that this will not become a major issue or BAER activity.

5. Review of the Suwannee River flow record did not suggest major changes in daily flow extremes after years with major fires. There could be some potential for increased surface flows and flooding based on the burn removal of organic materials from channels, reduction in transpiration, extent of logging and other salvage operations, and location in close proximity to tropical storms and hurricanes from both the Atlantic Ocean and Gulf of Mexico. Public notification or awareness as well as signing of any specific public bridge or culvert structures that do not meet design standards for major events (at least 50 or 100 year flood) may be prudent. Public warnings of road flooding issues include loss of road base due to erosion of the fine sandy materials, and potential for holes in the road due to piping (erosion in defined locations). Followup efforts under BAER should check with County, State and Federal roads to help identify if there are any structures needing special attention.

Follow-up evaluation and monitoring of repair efforts associated with suppression activities and monitoring for changes in hydrology and public flooding or other related hazards should be monitored following severe events within the BAER plans.

Estimates of types of BAER activities related to hydrology were assessed as follows:

- Monitoring and follow-up treatments associated with moderate severe to severe storm events (such as intense rainfall over 4 inches and/or winds over 50 mph). Issues of flooding are difficult to assess over large areas due to fire and associated activities until after major storm event(s). Aerial survey and flight photos would help following major event(s) to detect flooding and debris issues. Estimated cost for 5 flights is $50,000. Field reconnaissance following approximately 10 storm events over the next 3 years would also be used to evaluate, assess and report any

culvert, bridge, flooding, boating trail issues with debris on public access routes. Monitoring and expense cost at $600 per day for hydrologist, engineer or experienced professional is estimated at $60,000. Follow-up on public reports estimated at an additional 10 days or $6,000.

- Treatments associated with cleaning fire related and post-fire storm debris from boating trails will be handled within another BAER analysis section to remove or stabilize accumulations of organic debris that are a safety, navigational or flow barrier over the next several years. Since substantial portions of the swamp burned deeply in the organic materials, the continuing mortality or damaged trees as well as those from severed or weakened root systems will present both immediate and continuing issues. Some of the trees have already fallen, and some are standing hazards that should be removed. This subject as well as cost estimates for this work will be addressed in other section(s).
- Clean culverts or localized channel locations from abnormal sediment and floating debris accumulations associated with after post-fire storms. The estimate would assume 200 person days over next 3 years at $250 per day for road work personnel for a cost of $50,000. This cost would increase as the area of work increased and may have to be updated. Follow-up on public reports by an experienced professional estimated at an additional 10 days or $6,000.
- There is a variety of road work and maintenance needed on the Swamp Perimeter road. At this time, none of this work is directly BAER. However, monitoring after severe storm events is needed to protect Okefenokee Swamp Refuge resources after major storm events. It is assumed that most of this could be identified in the other monitoring efforts and included in those reports.
- At this time, there were no other obvious BAER needs related to hydrology.
- Total for hydrology related BAER needs is $129,000 based on the above figures, assumptions and cost estimates.

However, this listing and estimates are subject to update as more information is obtained, these plans are reviewed and/or conditions suggest a reevaluation is needed.

Beyond suppression and BAER issues, several hydrology issues were identified for possible future consideration and follow-up by the Okefenokee Swamp Reserve. These included issues relative to lack of culverts at several drainage locations on Perimeter Road, a drainage canal that is draining the OS wilderness to the Suwannee River, and others. Activities that drain water out of the swamp, prevent water entry into the swamp or actively remove surface water from adjacent lands have some potential to change soil, vegetation and hydrologic conditions (surface and subsurface flow) and alter swamp function. If the real intent of the Suwannee River Sill was to increase flooding and hydroperiod of the Okefenokee Swamp, the canals, drainage ditches, and water diversions may be doing the opposite. A more detailed hydrologic survey and evaluation would be needed if these were to become issues of interest. And the differences between the flow patterns in the Suwannee River and St. Mary's River suggest that geologic discontinuities in the karst terrain may not only allow seepage or spring flow into, but also may curtail inflow or allow flow out of the area that is most noticed during drought

conditions. The infrequent much lower flows in the Suwannee River (even with canals feeding flow into it) than the adjacent St. Mary's River suggest that there could be reasons why the Okefenokee Swamp drains so deeply during drought periods. Since the suppression and BAER evaluation effort was not focused on identifying or evaluating these outside hydrological issues or influences, it is not known if their effect may be significant individually or collectively on the extent, severity or control of wildfire. In addition, some of these hydrologic conditions and changes could have complex interactions with recreation, wildlife and other uses within the Okefenokee Swamp.

Acknowledgements

The efforts and contributions of co-workers Dennis Law and Jason Jennings in field surveys and soils interpretations were instrumental. Thanks to BAER Team Leader Sue Grace Wilder for her support, leadership and guidance. Matt Mueller provided assistance in surveying some of the northern areas in the field. Information on the OS and sill provided by Sara Aicher was very useful. Special thanks to Maranda Stewart, Constance Buford and Erica Mavity for the GIS and other assistance that they provided, the maps prepared, etc. Many others from the Okefenokee Swamp Reserve and Incident Command leadership and staff helped facilitate the completion of this work during emergency conditions. Consultations with the Georgia Forestry Commission Water Specialists including Frank Green, Ken Lucko (USFS), Dennis Martin, and John Colberg were helpful in coordinating with assessments and activities on state and private lands.

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7. Forest Resource Assessment

Assessment of Fire Effects on Timber in Forest Management Compartments Of the Okefenokee National Wildlife Refuge

Compartment 1 **- The southern 1/3 of the entire compartment was part of a burnout that occurred in late April. The burnout occurred at an accelerated pace due to a major run to the southeast of the Big Turnaround Fire. Although there was severe scorch in the upland pine stands, new growth is evident on almost all dominant trees. Very little mortality was observed with most being in small diameter classes from 3-6 inch diameter. Patch regeneration areas planted in recent years with longleaf pine looked fine. Also, there is no visual evidence of pine beetle infestation so far. Close monitoring of this area needs to continue. No timber salvage operation is needed at this time.**

Compartment 2 **– Four Management Units (2-5) were affected by burnouts during the Big Turnaround Fire. Management Unit 2 (Duck Island) had mostly moderate scorch levels with no measurable mortality. Management Unit 3 (Indian Island) was the same as MU2. Management Unit 4 (Kingfisher Landing) suffered moderate to severe scorch with negligible mortality. Management Unit 5 north of Gum Slough had moderate scorch with the only mortality occurring in the area of oaks in the northeast corner of the unit. No timber salvage operation is needed.**

Compartment 3 **- Three Management Units (1, 3 & 5) were affected by burnout. In MU 1, the western tip inside the Swamp's Edge Break had moderate to severe scorch with negligible mortality. The western tip of Management Unit 3, between Swamp Island Drive and Boathouse Rd., had moderate to severe scorch with negligible mortality. No timber salvage operation is needed. Management Unit 5 was burned using aerial ignition and had moderate to severe scorch with negligible mortality. No timber salvage operation is needed.**

Compartment 4 **- Three of the five Managements Units in this compartment were affected by burnouts. The eastern half of Management Unit 1 on Chesser Island was burned out with ground ignition in late May. Due to an ongoing timber sale, the fuels in all of MU 1 were low and scorch from the burnout was low to moderate. The western half of MU 1 and all of MU2 (Chesser Island) along with MU 3 (Clay Point and Ridleys Island) were burned out using aerial and ground ignition in early June. The northern tip of MU 2 on Chesser Island and MU 3 sustained moderate to severe scorch with negligible mortality. There was a spot over into the hardwood hammock behind the Chesser Island Homestead which may cause some mortality in the smaller diameter hardwoods. No timber salvage operation is needed. Management Unit 4 (junction of Perimeter Rd. and Joe Cone Rd.) and Management Unit 5 (junction of Perimeter Rd. and Katie Rd.) were not affected by fire.**

Compartment 5 **- All five Management Units in Compartment 5 were affected by fire. MU 4 had the eastern flank of the Bugaboo Scrub Fire move up onto it in early May. Subsequent burnouts occurred in Management Units 1, 2, 3 & 5. Care was taken in the application of fire in these areas producing mostly low to moderate scorch. Mortality is negligible and no timber salvage operation is needed.**

Compartment 6 **- All three Management Units were affected by the Bugaboo Scrub Fire. In MU 3 (Mims Island), the mature timbered area running north/south making up the main body of the island looked good with the most severe scorch being on the northern tip of Mims Island. The western extension of the island is mostly young planted longleaf pine. This area was hit hard by the fire but new growth in these young longleaf is evident. MU 2 was the most severely burned of all the units with severe scorch throughout the unit. Even so, new growth is evident and there should be negligible mortality. MU 3 had moderate to severe scorch along Dog Fennel Rd. and Dog Fennel Island had severe scorch. Mortality should be negligible and no timber salvage operation is needed.**

Compartment 7 **- Management Unit 1 was affected by ground ignition burnout on the south side of Doe Bed Rd. Scorch levels were moderate to high in this area. Management Unit 2 (east of Sweetwater Rd.) is an area of young planted longleaf pine and naturally seeded slash pine. This area was hit hard by the Bugaboo Scrub Fire and has sustained moderate mortality especially in the slash pine. The mature slash pine between Sweetwater Rd. and Buggs Neck Rd. had low to moderate scorch. MU 3 (Buggs Neck) was hit hard by the fire with some moderate but mostly severe scorch. The same levels of scorch occurred in Management Units 4 and 5 which is Fiddlers Island in its entirety. In the longleaf experimental area on the eastern half of MU 5, mortality will be high in the naturally seeded slash pine. The planted longleaf pine will sustain lower mortality rates. Management Units 6 and 7 are narrow strips of upland along the eastern edge of Buck Island Rd., out to Council Rd. and down to the north edge of Cypress Creek. Most of these uplands were burned out with ground ignition and sustained moderate to severe levels of scorch. Mortality should be negligible and no timber salvage operation is needed.**

Compartment 8 **- Management Unit 5 (The Pocket south and east of Hwy. 177) was affected by the Bugaboo Scrub Fire and subsequent ground ignition burnouts. In mid May, the Bugaboo Scrub Fire advanced onto the southern edge of MU 5 just south of refuge facilities. Accelerated burnout along the south edge of Hwy. 177 ahead of the main fire resulted in severe scorch in the mature mixed pine and extreme scorch in the planted slash pine on the perpetual acres east of the fee kiosk. Mortality in the perpetual acres will approach 100 %. Timber salvage operations on these perpetual acres will occur through Rayonier, Inc. because they still retain management rights to the timber.**

Compartment 9 **- All three Management Units in this compartment were affected by both wildfire and ground ignition burnouts. Some moderate scorch but mostly severe to extreme scorch covers the area. MU 2, the middle unit of the compartment contained an extremely heavy understory of gallberry, palmetto, and titi and hurrah bush that during normal water levels burns very patchy. During the current drought condition, this vertical layer of fuels exploded with extreme fire behavior. Recent rains over the past month have raised the water levels in this MU such that any timber salvage operation would be impossible. This area will need to be continually monitored for the onset of pine beetle attacks and mortality.**

Compartment 10 **- Management Units 1 and 2 in this compartment were affected by an aerial/ground ignition burnout that occurred in mid June. Moderate levels of scorch were the rule with small patches of severe scorch mainly in MU 1. Mortality should be negligible and no timber salvage operation is needed.**

Compartment 11 **- Management Units 1-4 in this compartment were affected by the same aerial ignition operation that burned Compartment 10. Management Units 1, 2 and 4 burned relatively cool with most scorch being in the moderate category. The southern tip of MU 3 consists of a predominant pond pine overstory with a heavy fuel load in the understory. Scorch levels in this area were severe and monitoring for pine beetles and mortality should continue into the near future. Currently no timber salvage operation is needed.**

Compartment 12 **- This entire compartment was burned over by the Big Turnaround Fire. Scorch levels were mostly moderate with small areas of severe scorch. Mortality should be negligible and no timber salvage operation is needed.**

Compartment 13 **- All four management units in this compartment were affected by the Big Turnaround Fire. The fire came onto MU4 (Greasy Branch area) and swept westward through MU 3, 2 & 1. Overall scorch was at the moderate to severe levels. Mortality should be negligible and no timber salvage operation is needed.**

Compartment 14 **- This compartment was affected by the Big Turnaround Fire but also ground ignition burnout. As the main fire made its way southwest through the compartment, scorch levels reached severe to, in some areas, extreme especially along the compartment's southern boundary. Monitoring for pine beetle infestation**

and mortality will need to continue for the near future. Currently no timber salvage operation is needed.

Compartment 15 **- All four management units in this compartment were affected by the Big Turnaround Fire. As a ground ignition burnout continued around Seldom Seen Point, fire behavior became extreme in the transitional fuels on the east side of the Swamps Edge Break. Fire spotted over the SEB and move westward through the compartment spilling over onto Rayonier lands to the west. Although fire behavior in the compartment as a whole was moderate to severe, new growth continues to increase with recent rainfall over the past month. During fire suppression activities in the middle of May, numerous firelines were plowed side by side over a 38 acre area that contained active red cockaded woodpecker clusters. This action created extensive lateral root damage on the pine overstory. Repair of these lines is currently underway but this area will need to be monitored for pine beetle infestation and mortality. Currently no timber salvage operation is needed.**
Compartment 16 **- All four management units in the compartment were affected by ground ignition burnouts ahead of the Bugaboo Scrub Fire. Scorch levels were moderate to severe with small areas in MU 1 and 4 reaching extreme levels. These areas will need to be monitored for pine beetle infestation and mortality. Currently, no timber salvage operation is needed.**

Summary:

Almost every acre of refuge upland was affected by the Big Turnaround Complex of wildfires and numerous burnouts. We will lose pine timber but most of that pine timber will be in the wetland areas of our upland acres. These wetlands do not burn under normal prescribed fire parameters and normal water levels. In drought cycles like the current one, these wetland areas explode with extreme fire behavior that clears out the dense understory and thins out the pine/hardwood overstory.

Longleaf pine is truly a fire adapted species. Throughout all of Okefenokee's upland pine stands, there are man-made and natural patch regeneration areas with various age classes of young longleaf pine in them. These young longleaf have survived with very little mortality due to their fire adaptive characteristics. Okefenokee's mature pine stands have also survived with little mortality due to prudent use of prescribed fire.

There have been numerous trips to the field both in the air and on the ground and also discussions with Retired Forester/FMO Ron Phernetton, Acting FMO Russ Langford, Refuge Biologist Sara Aicher, Assistant Biologist Dean Easton and others. The collective recommendation is to continue to monitor Okefenokee's Forest Management Compartments for pine beetle infestations and mortality especially in those areas with severe to extreme scorch. Because of the age of the mature pine stands (70 – 100 yrs.) and their importance to refuge red cockaded woodpecker populations, timber salvage will be used only if we begin to see evidence of wide spread pine beetle infestations and mortality.

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APPENDIX II - ENVIRONMENTAL COMPLIANCE

Bugaboo Scrub Fire Emergency Stabilization Plan

Federal, State, and Private Lands Environmental Compliance Responsibilities

All projects proposed in the Bugaboo Scrub Fire Burned Area Emergency Stabilization Plan that are prescribed, funded, or implemented by Federal agencies on Federal, State, or private lands are subject to compliance with the National Environmental Policy Act (NEPA) in accordance with the guidelines provided by the Council on Environmental Quality (CEQ) Regulations (40 CFR 1500-1508); Department of the Interior and the U.S. Fish & Wildlife Service. This Appendix documents the Burned Area Emergency Response Team considerations of NEPA compliance requirements for prescribed stabilization and monitoring actions described in this plan for all jurisdictions affected by the Emergency Stabilization Plan for the Bugaboo Scrub Fire.

Related Plans and Cumulative Impact Analysis

The Bugaboo Scrub Fire Emergency Stabilization Plan was reviewed and it was determined that actions proposed in the plan within the boundary of the Big Turnaround Fire Complex are consistent with the management objectives established in the Comprehensive Conservation Plan for the Okefenokee NWR (2006). The Comprehensive Conservation Plan NEPA compliance process specifically addresses:

<u>GOAL 1. Wildlife Management</u> - Protect and provide high quality and protection for threatened and endangered species and conserve the natural diversity, abundance, and ecological function of native flora and fauna on and off refuge lands (CCP 2006, pg. 85)

- *Objective 1*- Protect and maintain the threatened and endangered species populations (CCP 2006, pg. 85)
- *Objective 4*- Maintain, enhance and promote upland linkages to ephemeral wetlands for amphibians (CCP 2006, pg. 87)

<u>GOAL 2. Resource Protection</u> – Restore, maintain, protect and promote native habitats and healthy natural systems where possible to imitate pre-European settlement distribution, frequency, and quality on and off the refuge, and preserve the associated cultural sites and wilderness qualities (CCP 2006, pg. 91)

- *Objective 1*- Restore native upland communities (CCP 2006, pg 91).
- *Objective 2*- Maintain wetland communities (CCP 2006, pg 93).
- *Objective 4*- Reduce non-native invasive species (CCP 2006, pg 96).
- *Objective 5*- Protect cultural resources (CCP 2006, pg. 96).
- *Objective 6*- Preserve wilderness resources (CCP 2006, pg. 97).

<u>GOAL 3. Wilderness Values</u>- Restore, preserve, and protect the primeval character and natural processes of the Okefenokee Wilderness, leaving it untrammeled by man while

providing recreational solitude, education, scientific study, conservation ethics, and scenic values (CCP 2006, pg. 97).

- *Objective 1*- Preserve primeval character of wilderness (CCP 2006, Pg. 97).
- *Objective 2*- Provide recreational opportunities in wilderness (CCP 2006, pg. 98).
- *Objective 5*- Promote conservation ethics in wilderness (CCP 2006, pg. 99).
- *Objective 6*- Provide scenic vistas in wilderness (CCP 2006, pg. 99).

GOAL 4. Public Services- Provide and enhance fully accessible opportunities for hunting, fishing, wildlife observation, wildlife photography, and environmental education, and interpretation when compatible to promote public appreciation, understanding, and action on behalf of the Okefenokee Ecosystem while maintaining the wilderness resource of the Okefenokee Wilderness Area (CCP 2006, pg. 99).

- *Objective 1*- Provide signage and information to public (CCP 2006, pg. 99).
- *Objective 5*- Provide quality opportunities for wildlife observation and photography (CCP 2006, pg. 102).
- *Objective 6*- Expand environmental education and public awareness of refuge's natural ecology and human influences on the swamp ecosystem (CCP 2006, pg. 103).
- *Objective 7*- Provide interpretive media to increase awareness and understanding of refuge's natural and human influences (CCP 2006, pg. 104).

GOAL 6. Administration- Provide adequate staff, partners, volunteers, and others with the facilities and equipment to support the goals and objectives of the refuge in a safe manner while maintaining sensitivity to wilderness ethics and the "zones of influence" (CCP 2006, pg. 109).

- *Objective 5*- Ensure resource protection, enforcement of all refuge-related acts and regulations, and the safety of visitors, staff, volunteers, interns and researchers (CCP 2006, pg. 112).
- *Objective 6*- Implement law enforcement procedures to protect refuge's cultural resources and diminish site destruction due to looting and vandalism (CCP 2006, pg. 112).

Implement an aggressive control program to reduce invasive, exotic vegetation

From U.S. Fish and Wildlife Service, 2003, Recovery plan for the Red-cockaded Woodpecker *(Picoides borealis)*: second revision. U.S. Fish and Wildlife Service, Atlanta, GA. 296 pp.

For Red-cockaded Woodpeckers, restoration of good quality habitat is vital to the recovery of the species. Important management tools in habitat restoration include planting and seeding native, site-appropriate pines and groundcovers and the use of site preparation methods that minimize soil disturbance.

Cumulative Impact Analysis

Cumulative effects are the environmental impacts resulting from the incremental impacts of a proposed action when added to other past, present, and reasonably foreseeable future actions, both Federal and non-Federal. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time. The stabilization treatments for areas affected by the Big Turnaround Fire Complex proposed in the Bugaboo Scrub Fire Burned Area Emergency Stabilization Plan do not result in an intensity of impact (i.e. major ground disturbance, etc.) that would cumulatively constitute a significant impact on the quality of the environment. The treatments are consistent with the above jurisdictional management plans and associated environmental compliance documents and categorical exclusions listed below.

Applicable and Relevant Categorical Exclusions

The individual actions proposed in this plan for Bugaboo Scrub Fire Emergency Stabilization Plan are Categorically Excluded from further environmental analysis as provided for in section 516 DM Appendix 2 of the Departmental Manual. All applicable and relevant Department and Agency Categorical Exclusions are listed below. Categorical Exclusion decisions were made with consideration given to the results of required emergency consultations completed by the Burned Area Emergency Response Team and documented below.

Applicable Department Categorical Exclusions

- The operation, maintenance, and management of existing facilities and routine reoccurring management activities and improvements, including renovations and replacements which result in no or only minor changes in the use and have no negligible and environmental effects on-site or in the vicinity of the site.
- Fire management activities, including prevention and restoration measures, when conducted in accordance with departmental and Service procedures.
- Consultation and technical assistance activities directly related to the conservation of fish and wildlife resources.

Statement of Compliance for the Bugaboo Scrub Fire Burned Area Emergency Stabilization Plan

This section documents consideration given to the requirements of specific environmental laws in the development of the Bugaboo Scrub Fire Burned Area Emergency Stabilization Plan. Specific consultations initiated or completed during development and implementation of this plan are also documented. The following executive orders and legislative acts have been reviewed as they apply to the Bugaboo Scrub Fire Burned Area Emergency Stabilization Plan:

- National Historic Preservation Art (NAPA).
- Executive Order ll988. Flood plain Management.
- Executive Order 11990. Protection of Wetlands.
- Executive Order 12372. Intergovernmental Review.

- Executive Order 12892. Federal Actions to Address Environmental Justice in Minority and Low-income Populations.
- Endangered Species Act.
- Secretarial Order 3127. Federal Contaminated
- Clean Water Act.
- Clean Air Act.

CONSULTATIONS
Refuge Biologist, Okefenokee NWR
Refuge Project Leader, Okefenokee NWR
Refuge Forester, Okefenokee NWR
Regional Fire Ecologist, Lacombe, LA
Refuge Information Specialist, Okefenokee NWR
Refuge Fire Management Officer, Acting, Okefenokee NWR
National Burned Area Emergency Response Coordinator, WO
National Fire Coordinator, WO
Regional Fire Management Coordinator, Atlanta, GA

NEPA Checklist: If any of the following exception applies, the Burned Area Emergency Stabilization Plan cannot be Categorically Excluded and an Environmental Assessment (EA) is required.

(Yes) (No)
( ) (x) Adversely affect Public Health and Safety
( ) (x) Adversely affect historic or cultural resources, wilderness, wild and scenic rivers aquifers, prime farmlands, wetlands, floodplains, ecologically critical areas, or Natural Landmarks.
( ) (x) Have highly controversial environmental effects.
( ) (x) Have highly uncertain environmental effects or involve unique or unknown environmental risks.
( ) (x) Establish a precedent resulting in significant environmental effects.
( ) (x) Relates to other actions with individually insignificant but cumulatively significant environmental effects.
( ) (x) Adversely effects properties listed or eligible for listing in the National Register of Historic Places
( ) (x) Adversely affect a species listed or proposed to be listed as Threatened or Endangered.
( ) (x) Threaten to violate any laws or requirements imposed for the "protection of the environment" such as Executive Order 11988 (Floodplain Management) or Executive Order 1 1990 (Protection of Wetlands).

National Historic Preservation Act
Ground Disturbance:

(X) None

( ) Ground disturbance did occur and an archeologist survey, required under section 110 of the NHPA will be prepared. A report will be prepared under contract as specified by the Burned Area Emergency Stabilization Plan.

A NHPA Clearance Form:

( ) Is required because the project may have affected a site that is eligible or on the national register. The clearance form is attached. SHPO has been consulted under Section 106 (see Cultural Resource Assessment, Appendix I).

(X) Is not required because the Burned Area Emergency Stabilization Plan has no potential to affect cultural resources (initial of cultural resource specialist).

Other Requirements

(Yes)	(No)	
( )	(X)	Does the Burned Area Emergency Stabilization Plan have potential to affect any Native American uses? If so, consultation with affiliated tribes is needed.
( )	(X)	Are any toxic chemicals, including pesticides or treated wood, proposed for use? If so, local agency integrated pest management specialists must be consulted. (The use of Arsenal on Refuge lands must be approved on a yearly basis by submission of pesticide use proposals (PUP) through the regional IPM coordinator).

I have reviewed the proposals in the Bugaboo Scrub Fire Burned Area Emergency Stabilization Plan in accordance with the criteria above and have determined that the proposed actions would not involve any significant environmental effect. Therefore it is categorically excluded from further environmental (NEPA) review and documentation. Burned area emergency response team technical specialists have completed necessary coordination and consultation to insure compliance with the National Historic Preservation Act, Endangered Species Act, Clean Water Act and other Federal, State and local environment review requirements.

_____

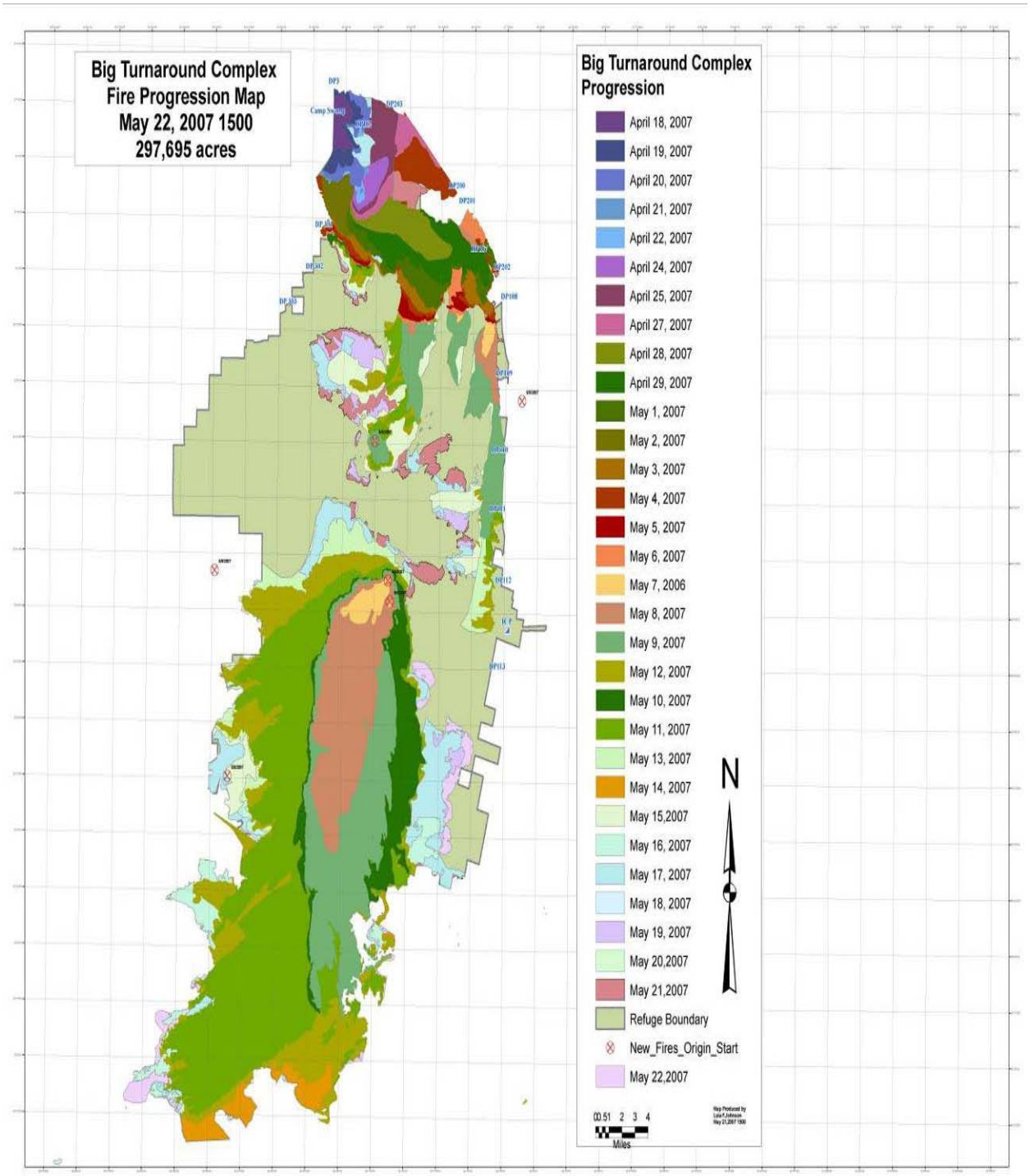
Burned Area Emergency Response Team Environmental Specialist Date

_____

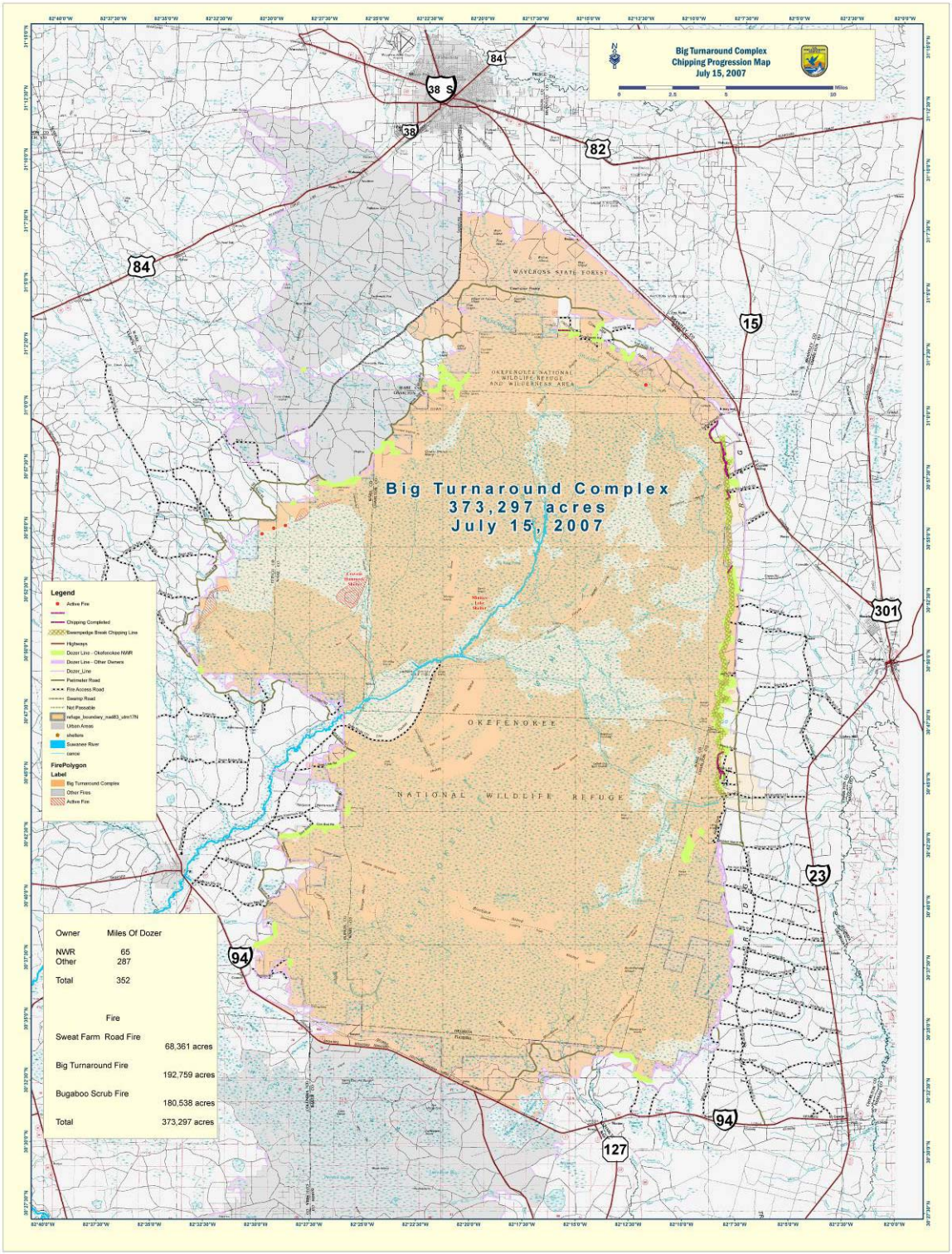
Project Leader, Okefenokee NWR Date

APPENDIX III – MAPS

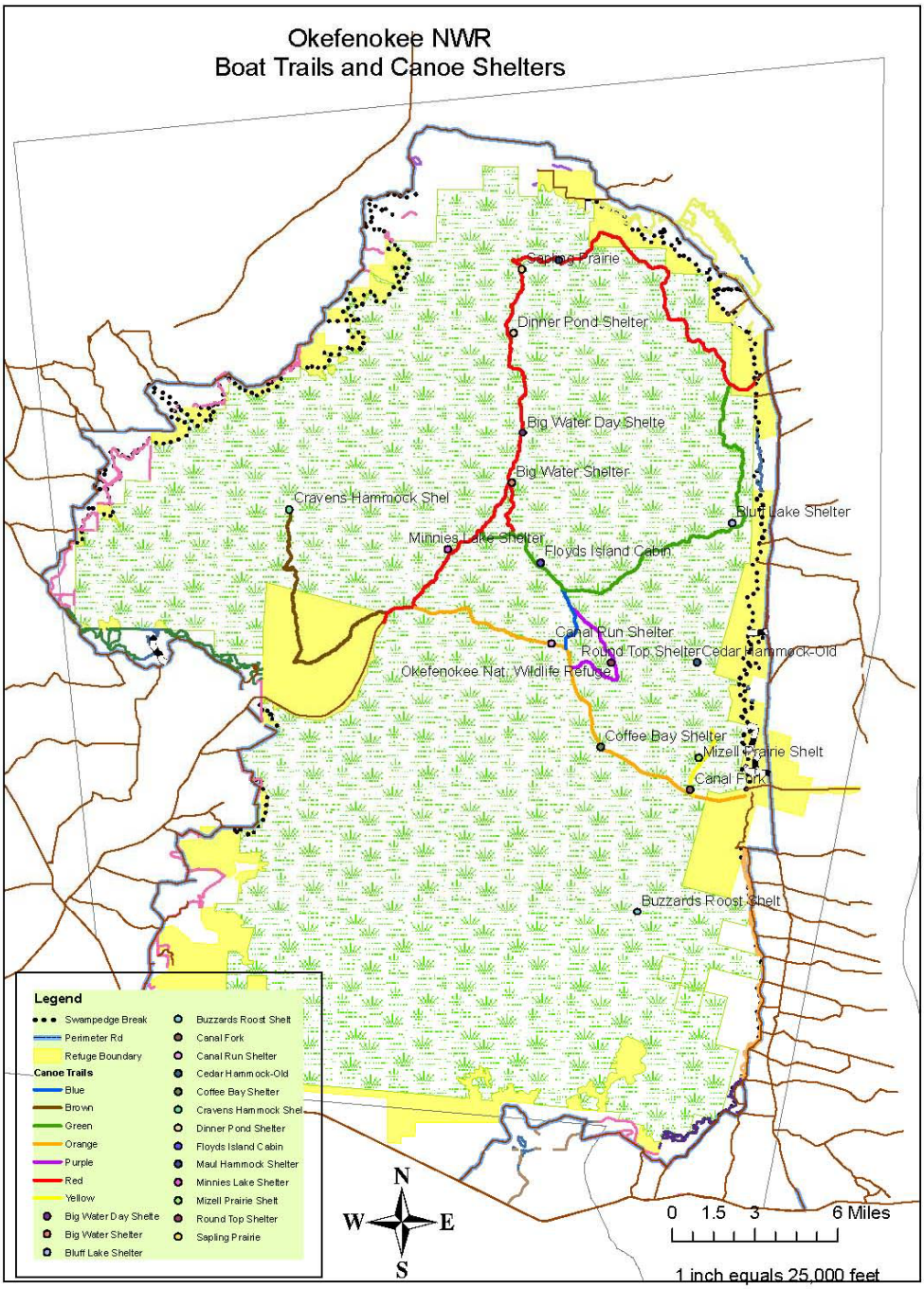
Map 1. Progression Map of fires - 5/22/07



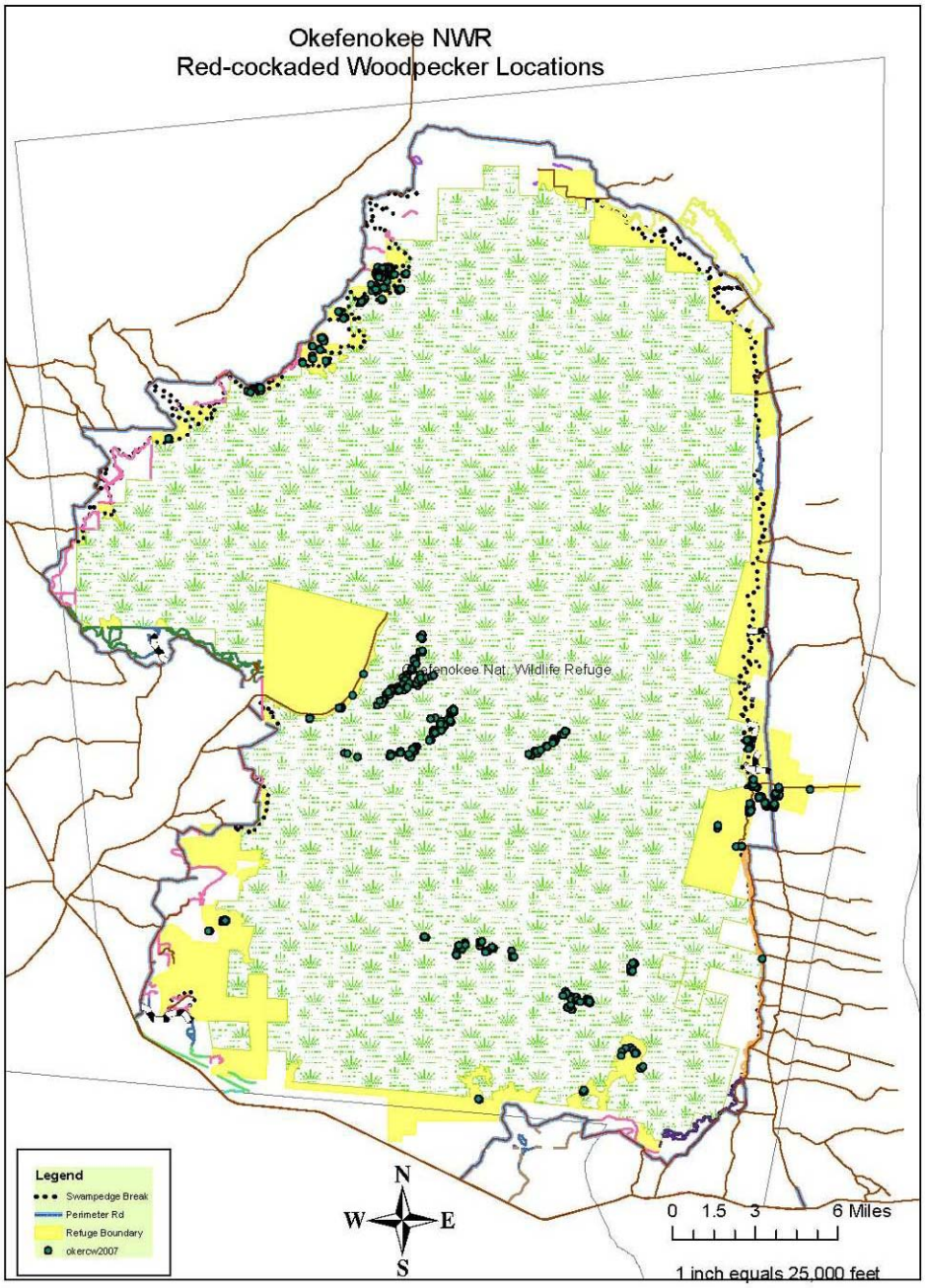
Map 2. Big Turnaround Fire Complex as of July 15, 2007



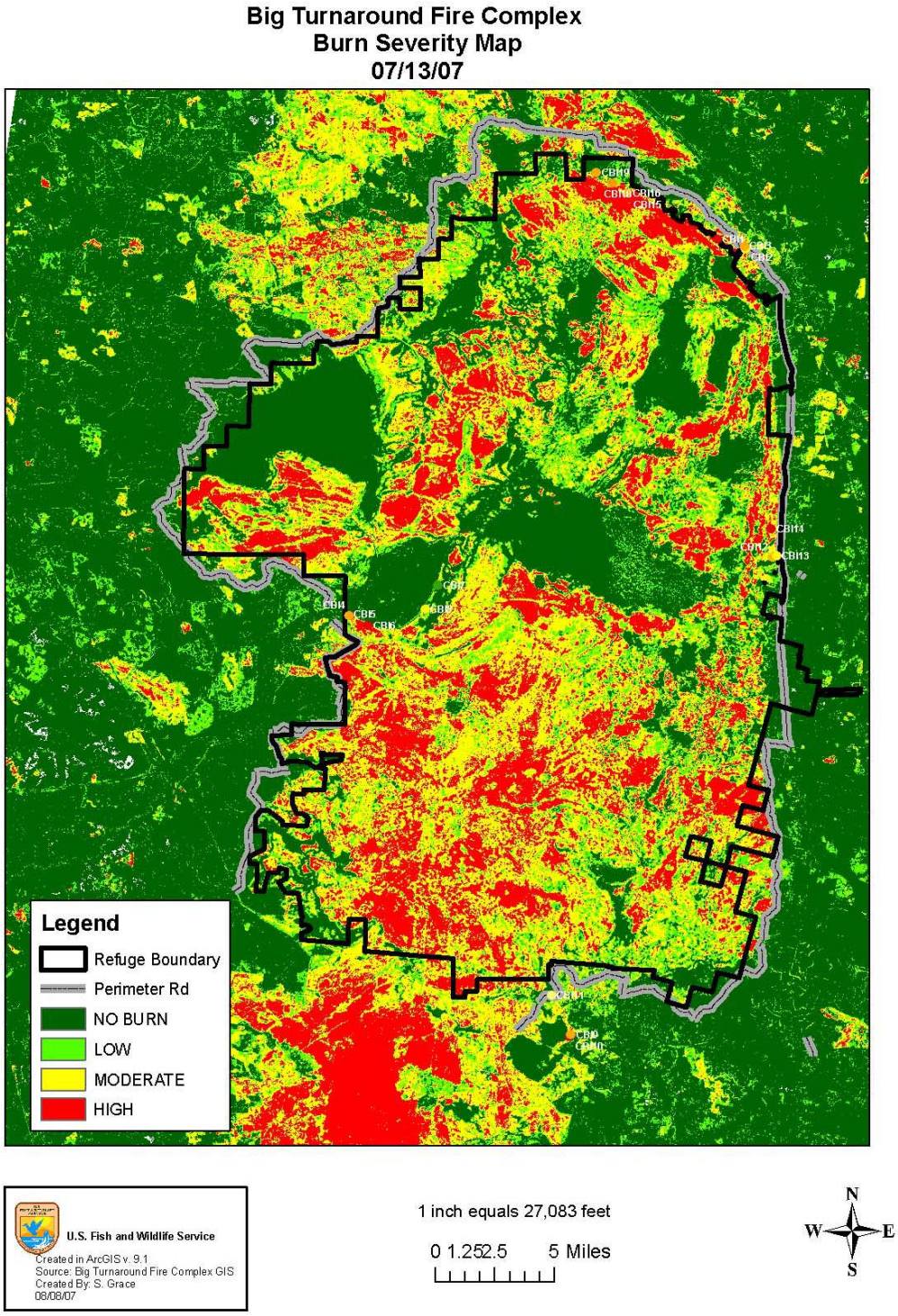
Map 3. Canoe and Boat Trails, Okefenokee NWR



Map 4. Red-cockaded Woodpecker Locations- Okefenokee NWR



Map 5. Burn Severity Map



APPENDIX IV - PHOTO DOCUMENTATION

Photos can also be found on the Big Turnaround Fire Complex Website at:
ftp://ftp.nifc.gov/incident_specific_data/SOUTHERN/Georgia/07_Big_Turnaround/

Photo 1. Chesser Island Homestead protected by fire prevention wrap.

APPENDIX V – PESTICIDE USE PROPOSAL

U.S. Department of Interior
U.S. Fish and Wildlife Service
Pesticide Use Proposal
PUP #: R4-08-41590-01

Refuge, Complex, Hatchery, or Other Site Name: **Okefenokee NWR**
County(ies) and State(s): **Clinch, Charlton, Ware, GA and Baker, Columbia, FL**
Contact Person, Phone, Fax, and Email Address: **Pesticide person at Okefenokee NWR**
Crop/Habitat of Treatment Site: **Longleaf Pine forest**
Location of Proposed Application (management unit or other unique site ID). Attach Map if Available. **Okefenokee Swamp perimeter See attached Map- Appendix III of Big Turnaround Fire Rehab plan above.**
Site Management Goal(s): **Restore native longleaf pine forest and reduce invasive woody species.**
Need(s) for Treatment: Invasive Species State or Federal-listed Noxious Species Native Habitat Restoration Habitat Improvement Listed Species Protection/Recovery Wildlife Health Protection Public Health Protection Crop Pest Other (Specify): 1. **Reduce invasive species, Chinese tallow tree and other woody shrub species that will compete with native longleaf pine seedlings for establishment.**
Target Pest(s) (common and genus/species names for each): **Chinese tallow tree (Sapium sebiferum), noxious native woody species.**
Is there a monitoring plan for the target pest(s)? **yes, see Big Turnaround Fire Rehabilitation Plan above.**

Proposed Action Threshold(s) Triggering Treatment: **high density of Chinese tallow tree resprouts following Big Turnaround Complex of wildfires.**

U.S. Department of Interior
U.S. Fish and Wildlife Service
Pesticide Use Propsal
PUP #: R4-08-41590-01

Year of Last Approved IPM Plan: _____**N/A**_____ Attach IPM Plan if Available.
Is this pesticide use part of your integrated pest management plan? **Yes**
Will non-chemical control methods be attempted? **Yes** If no, please explain rationale for pesticide use if different than previous descriptions.
Trade Name(s) and EPA Reg. Number(s**): Arsenal (EPA 241-299)**
Common or Chemical Name(s): **Imazapyr**
Manufacturer(s): **BASF**
Please attach or give the website for the label(s) and MSDS(s). **www.rrsi.com**
Are the Pest(s) in this PUP Listed on the Pesticide Label? **YES**
Is the Crop, Type of Vegetation, or Site Type Listed on the Pesticide Label? **YES**
If the crop, type of vegetation, or site type is not listed, is there a current Section 24(c) (local needs) or Section 18 emergency exemption under which you are proposing to operate? **N/A**
Is use of the proposed pesticide part of any trial to compare different methods of treatment? **No**

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Is this a restricted use pesticide (RUP)?**YES**
If a RUP, Certified Pesticide Applicator ID#, Company, and Expiration Date: To be contracted. **Monitored by Daniel Breaux ID#00037597: LA Dept of AG and Forestry**
If General Use Pesticide, Lead Pesticide Applicator Name and Company: **This pesticide is under restricted use and requires an applicator's license.**
Is this a tank mix? **Yes**
Formulation: Aqueous Flowable Aqueous Suspension Dust Dry Flowable Emusifiable Concentrate Flowable Microencapsulated Granule Solution Wettable Powder Other (Specify): **Flowable Aqueous Suspension**
Toxic Inert Ingredients Listed on MSDS: **not listed**
Trade Names of Adjuvants (Drift Control Agents, Stickers, Surfactants, Oils): **Red River 90**
Application Date(s): June-Sept 2008
Number of Applications per Site: O**ne**
Not to Exceed Limits on Label (lbs a.i./acre/season): **16oz**
Product Application Rate(s) Proposed: **4 -10 oz/ac**
Maximum Active Ingredient Rate Allowed on Label, if specified (lb a.i./acre): **10 oz/ac**

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Application Method(s): Broadcast Directed-Spray Backpack Spray Cut-Stump Frill Basal Spray Injection Wick/Wipe Ultra Low-Volume (ULV) Chemigation Other (Specify): **Broadcast**
Application Equipment: Hand-Held Backpack Fogger Wet-Blade Mower Boom All-Terrain Vehicle (ATV) Truck Tractor Boat Fixed-Wing Aircraft Helicopter Other (Specify): **Backpack fogger**
Estimated Maximum Size of Treatment Area(s) (to nearest acre or acre foot): **50 acres**
If Spot Treatment, Estimated Average Percent Cover To Be Treated (if not 100%): ___**N/A**_____ %
Average Monthly Rainfall at Site During Proposed Application Period(s) (inches, use range if multiple months): **5 Inches**
Soil Texture(s): Clay Silty Clay Sandy Clay Clay Loam Silty Clay Loam Sandy Clay Loam Silt Silt Loam Loam Sandy Loam Loamy Sand Sand Gravel Other (Specify): **Silt Loam: Abita and Guyton soils**

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Organic Matter in Soil: < 0.5% 0.5% to 1.0% 1.0% to 1.5% 1.5% to 2.0% 2.0% to 2.5% 2.5% to 3.0% 3.0% to 3.5% 3.5% to 4.0% 4.0% to 4.5% 4.5% to 5.0% > 5.0%:**>5**
Slope(s) of Treatment Site: Flat < 3º < 10º >10º; **0-2**
Soil pH, if known: ___mostly acidic____**If unknown:** pH ≤ 7 (mostly)
Top Soil (to 3-ft Depth) During/Following Treatment: Dry Moist Saturated Not Predictable: **Saturated**
Shallowest Depth to Groundwater: < 1 ft < 5 ft < 10 ft < 100 ft > 100 ft Unknown : **<1'**
Distance to Closest Drinking Water Source (well or surface water intake): < 0.25 miles < 0.5 miles < 1 mile < 2 miles > 2 miles **Unknown**
Closest Water to Treatment Site(s): N/A Ditch Drain Canal Creek/Stream River Wetland Pond Spring Lake Estuary Ocean Hatchery Other (Specify): **Natural drain to Bonfouca Bayou. See map - Appendix III of Rehabilitation Plan.**

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Nearest Distance of Treatment Site to Water Body: < 25 ft < 50 ft < 100 ft < 150 ft < 300 ft < 400 ft > 400 ft Unknown : **100 ft**
Organisms that may occur at/near treatment site during or immediately after treatment. Sensitive Plant Species Native Lepidopterans Native Pollinating Insects Honeybees Mussels Crustaceans Fish Amphibians Reptiles Passerines Shorebirds Fish-eating Birds Waterfowl Mammals Other (Specify): **Red-cockaded Woodpeckers**
If no written IPM plan is available, describe IPM methods used for the pests listed in this PUP. Describe sanitation, crop rotations, changes to resistant crop varieties, changes in timing, elimination of alternate host species, fallowing, cover crops, tillage, open-water marsh management, moisture/water manipulations, burning, mechanical/manual removal, biocontrols, pheromones, and any other IPM methods to reduce or eliminate the pests and/or to reduce pesticide risks. **No other controls feasible due to wet ground conditions.**
Best Management Practices (BMPs) Proposed to Reduce Pesticide Risks. If not discussed in your written plan, list planned buffers from water or sensitive habitats, wind speed restrictions, and other BMPs: **Spray when winds are under 5mph and weather conditions are for dry forecast for at least ½ day.**

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Endangered Species Compliance

Federally Listed, Proposed, and Candidate Species and Designated Critical Habitat (Listed Resources): If your proposed application is located near or adjacent to any listed resources you must complete and submit the appropriate Section 7 compliance documentation as part of this PUP.

For species listed by the U.S. Fish and Wildlife Service, you may complete the attached Intra-Service Section 7 form in consultation with and with assistance from the appropriate Endangered Species staff.

For species listed by the National Marine Fisheries Service (NOAA Fisheries), you must contact the appropriate office and complete Section 7 consultation with them.

If a determination of no effect is made, then Section 7 consultation is complete. The obligations under Section 7 must be reconsidered if: (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner not previously considered, (2) this action is subsequently modified in a manner that was not considered in this review, (3) a new species is listed or critical habitat is determined that may be affected by the identified action, (4) if the amount of incidental take anticipated in a biological opinion is exceeded.

Is the appropriate Section 7 documentation completed and attached? **Yes , see Appendix VI below.**

candidate species and/or critical habitats are near or adjacent to the treament site **– yes see map, Appendix III of Rehab Plan above.**

State Listed Species and Their Habitats: If state listed species are in/near your treatment area, it is recommended that you contact the appropriate state agency for consultation procedures.

List all state listed species in/near treatment area:

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PUP Reviewer(s) Signature Page

REVIEWED BY: NAME: DATE: SIGNATURE:
Manager:
Regional IPM Coordinator/Designee:
Other Reviewer if Applicable:
PUP Approval/Disapproval: __PUP Approved As Is __PUP Approved with Required Modifications (listed below) __PUP Disapproved PUP Reviewed by Region __Forwarded to the Washington Office for Review
National IPM Coordinator: PUP Approval/Disapproval: __PUP Approved As Is __PUPApproved with Required Modifications (listed below) __PUP Disapproved
Required Modifications (please attach additional sheets if needed):

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Pesticide Usage Reporting

It is the policy of the U.S. Fish and Wildlife Service to report all pesticide usage. After pesticide application, please submit pesticide usage to the appropriate U.S. Fish and Wildlife office. Regions should include this information in their reporting system (use of this form is not necessary). Please call (703) 358-2148 if you have any questions.

PUP #:
Pesticide Applicator(s) Name, Company, and Contact Number:
Location of Pesticide Application (latitude/longitude; township/range). Attach Map if Available.
Trade Name(s) and EPA Reg. Number(s) of Pesticide(s) Applied:
Common or Chemical Name(s) of Pesticides Applied:
Application Date(s):
Number of Applications:
Amount of Active Ingredient Used Per Acre:
Size of Treatment Area:
Target Pest(s) (common and genus/species names for each):
Was your integrated pest management goal(s) obtained using this pesticide? ☐ Yes ☐ No

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What degree of control did you achieve for the target pest(s)?

Where any effects to non-target organisms observed?

☐ No ☐ Yes, please explain

APPENDIX VI – SECTION 7

INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION FORM

Originating Person: **Mike Housh**
Telephone Number: **912-496-7366**
E-Mail: **Mike_Housh@fws.gov**
Date: **07/30/07**

PROJECT NAME: **Bugaboo Scrub Fire Emergency Stabilization Plan**

I. Service Program:
___ Ecological Services
___ Federal Aid
___ Clean Vessel Act
___ Coastal Wetlands
___ Endangered Species Section 6
___ Partners for Fish and Wildlife
___ Sport Fish Restoration
___ Wildlife Restoration
___ Fisheries
_**X**_ Refuges/Wildlife

II. State/Agency: **US FWS**

III. Station Name: **Okefenokee National Wildlife Refuge**

IV. Description of Proposed Action: **Plant pine seedlings if needed in areas of no natural regeneration to restore habitat for Red-cockaded Woodpecker. See Burned Area Rehabilitation Plan, attached above.**

V. Pertinent Species and Habitat:

A. Include species/habitat occurrence map:

B. Complete the following table:

SPECIES/CRITICAL HABITAT	STATUS[1]
Red-cockaded Woodpecker	**Endangered**

[1]STATUS: E=endangered, T=threatened, PE=proposed endangered, PT=proposed threatened, CH=critical habitat, PCH=proposed critical habitat, C=candidate species, S/A=Similar Appearance

VI. Location (attach map): **see attached map above in Appendix III.**

A. Ecoregion Number and Name:

B. County and State: **Clinch, Charlton, Ware – Georgia**
Baker, Columbia - Florida

C. Section, township, and range (or latitude and longitude): **N 30.71, W-82.29**

D. Distance (miles) and direction to nearest town: **7 miles to Folkston, GA**

E. Species/habitat occurrence: **Red-cockaded Woodpecker Habitat/ Longleaf Pine Forest**

VII. Determination of Effects:

A. Explanation of effects of the action on species and critical habitats in item V. B:

SPECIES/ CRITICAL HABITAT	IMPACTS TO SPECIES/CRITICAL HABITAT
Red-cockaded Woodpecker Habitat	**Potential Impact-nest disturbance during nesting season, nest tree mortality due to fire intensity.**

B. Explanation of actions to be implemented to reduce adverse effects:

SPECIES/ CRITICAL HABITAT	ACTIONS TO MITIGATE/MINIMIZE IMPACTS
Red-cockaded Woodpecker Habitat	**Tree Planting: Hand plant so heavy equipment will not be used around any remaining live insert trees. Plant before nesting season.**

VIII. Effect Determination and Response Requested:

SPECIES/CRITICAL HABITAT	DETERMINATION[1]			REQUESTED
	NE	NA	AA	
Red-cockaded Woodpecker Habitat		**NA**		**Concurrence**

[1]DETERMINATION/ RESPONSE REQUESTED:
NE = no effect. This determination is appropriate when the proposed action will not directly, indirectly, or cumulatively impact, either positively or negatively, any listed, proposed, candidate species or

designated/proposed critical habitat. Response Requested is optional but a "Concurrence" is recommended for a complete Administrative Record.

NA = not likely to adversely affect. This determination is appropriate when the proposed action is not likely to adversely impact any listed, proposed, candidate species or designated/proposed critical habitat or there may be beneficial effects to these resources. Response Requested is a" Concurrence".

AA = likely to adversely affect. This determination is appropriate when the proposed action is likely to adversely impact any listed, proposed, candidate species or designated/proposed critical habitat. Response Requested for listed species is "Formal Consultation". Response requested for proposed and candidate species is "Conference".

_____ _____

Signature (originating station) **Date**

_____

Title

IX. Reviewing Ecological Services Office Evaluation:

A. Concurrence _____ Nonconcurrence _____

B. Formal consultation required _____

C. Conference required _____

D. Informal conference required _____

E. Remarks (attach additional pages as needed):

_____ _____

Signature Date

_____ _____

Title Office

APPENDIX VII - REFERENCES

Department of Interior. 2006. Interagency Burned Area Rehabilitation Guidebook. Version 1.3.

FEIS- Fire Effects Information System- Chinese Tallowtree
http://www.fs.fed.us/database/feis/plants/tree/triseb/all.html#FIRE%20EFFECTS

Grace, James B.; Allain, Larry K.; Baldwin, Heather Q.; Billock, Arlene G.; Eddleman, William R.; Given, Aaron M.; Jeske, Clint W.; Moss, Rebecca. 2005. Effects of prescribed fire in the coastal prairies of Texas. USGS Open-File Report 2005-1287. Reston, VA: U.S. Department of the Interior, Fish and Wildlife Service, Region 2; U.S. Geological Survey. 46 p.

Grace, James B.; Smith, Melinda D.; Grace, Susan L.; [and others]. 2001. Interactions between fire and invasive plants in temperate grasslands of North America. In: Galley, Krista E. M.; Wilson, Tyrone P., eds. Proceedings of the invasive species workshop: The role of fire in the control and spread of invasive species; Fire conference 2000: the first national congress on fire ecology, prevention, and management; 2000 November 27 - December 1; San Diego, CA. Misc. Publ. No. 11. Tallahassee, FL: Tall Timbers Research Station: 40-65.

US Fish and Wildlife Service. 2006. Draft Fire Management Plan. Okefenokee NWR.

US Fish and Wildlife Service. 2006. Burned Area Rehabilitation Plan. Rickwood Fire, Big Branch Marsh NWR.

US Fish and Wildlife Service. 2006. Comprehensive Conservation Plan. Okefenokee NWR.

US Fish and Wildlife Service. 1985. Red-cockaded Woodpecker Recovery Plan. Atlanta, GA.
[54491]

APPENDIX VIII – FIRE CHRONOLOGY

60- DAY GENERAL CHRONOLOGY

Big Turnaround Fire and Related Events – April 16 to June 13, 2007

April 16th

The Sweat Farm Road Fire is started at 1:30 p.m. by a downed power line on private land west of Waycross, Georgia. The Georgia Forestry Commission (GFC) conducts initial attack, with assistance from staff of Okefenokee National Wildlife Refuge, U.S. Fish and Wildlife Service (FWS). One airtanker is dispatched. Homes are evacuated; two homes, five outbuildings, and several cars and tractors are burned. Strong northwest winds and spotting enhances spread of the fire, which is occurring in record drought conditions. The fire makes a 9-mile run, crosses U.S. Highway 84, and is about 13 miles from the Okefenokee National Wildlife Refuge. Highway 84 and numerous county roads are closed. Resources threatened include private timber plantations, threatened and endangered species and habitat, wilderness, and high-value commercial-ready timber.

April 17th

The Sweat Farm Road Fire increases dramatically to an estimated 20,000 acres – over 30 square miles. About 800 homes have been evacuated. Highway 122 is closed and Highway 84 remains closed. The fire makes another significant run and reaches the edge of the designated swamp within the Dixon Memorial State Forest. Okefenokee Swamp Park, a private concessionaire on the Forest and on Okefenokee National Wildlife Refuge, is closed. The Refuge provides two dozer crews to improve fireline north of Okefenokee Swamp Park at the swamp edge break between the wetlands and long-leaf pine forest uplands. The Refuge provides a contract helicopter serve as a lookout to ensure firefighter safety; provide periodic intelligence on fire location, size, direction, behavior, etc.; and map the fire perimeter using Global Positioning System (GPS) technology. The fire is reported to be about ¾ mile northwest of the northern boundary of the Refuge.

A Type 2 Incident Management Team from the Georgia Forestry Commission (GFC) and led by Troy Floyd is ordered by GFC and establishes its Incident Command Post at Jessup, Georgia. A Type 2 Incident Command Team is ordered by the Refuge, due to an erroneous report that the fire has crossed onto Refuge lands south of Waycross. Federal Disaster Designation funding is provided by the Federal Emergency Management Agency (FEMA) to help Waycross response to the needs of people affected by the fire.

Meanwhile, the North Fargo Fire is ignited west of the Refuge at 4 p.m. by a welding accident on CXS railroad land under fire protection by the state. Refuge staff assist with initial attack. The fire crosses Highway 441, and comes within a mile of the Refuge's west boundary. Stephen C. Foster State Park is closed. Smoke is expected to become an issue on local and regional roads during the evening. The Jacksonville, Florida news media issue smoke advisories for highway visibility from Jacksonville to St. Augustine.

April 18th

The Sweat Farm Road Fire grows to 22,000 acres and 15 more homes are burned. The

Floyd Team assumes command, with support of a National Incident Management Organization (NIMO). Ware County schools are closed. Refuge staff assist the Floyd Team with aerial reconnaissance and fire mapping. While the fire was confirmed to have not yet reached the Refuge boundary, Wilderness Overnight Canoe Trails at Kingfisher Landing Unit are closed.

The Refuge Manager approves a decision to suppress the North Fargo Fire using direct attack, to keep the size at less than 3500 acres and the cost under $380,000. The WFSA decision document is consistent with a Memorandum of Understanding with Georgia Forestry Commission and the Okefenokee NWR Fire Management Plan, as well as the goals of the Greater Okefenokee Association of Landowners (GOAL), of which FWS is a participant. While the fire is not an immediate threat to homes in the community of Fargo, but voluntary evacuations occur. Multiple other fire starts within the GFC/FWS mutual response zone are exhibiting extreme fire behavior, taxing fire response resources, and escalating the risk to life and property.

April 19th

The Sweat Farm Road Fire grows to 25,000 acres. Winds from a passing storm front contribute to spread of the fire into the Refuge across its northern boundary. The fire threatens the City of Waycross and a CXS railroad yard with large diesel tanks and hazardous chemicals. An estimated 2,000 additional homes are being evacuated in Waycross and Ware County due to fire and smoke. Numerous spot fires are occurring.

At 7:00 a.m., the Refuge Manager delegates command of the North Fargo Fire to a Southern Area Type 2 Team led by Tony Wilder. The fire is an estimated 2,300 acres and is not posing an immediate threat to homes or commercial timber lands. The Wilder Team sends some firefighting resources to assist with the Sweat Farm Road Fire.

Due to unusually dry weather conditions and increasing fire risk, the Refuge requests 30 days of severity funding (from April 23 – May 22) to hire additional fire staff. The request is submitted to the U.S. Fish and Wildlife Service Fire Management Branch.

April 20th

The Sweat Farm Road Fire nearly doubles to 40,000 acres, burning over 60 square miles. Northeast winds cause the fire to escape containment lines and make significant runs to the southwest. Tractor plows and helicopters working to contain the fire are diverted several times to protect threatened homes. The fire now threatens 2,700 homes in Waycross and the community of Manor; voluntary evacuations occur for Manor. Dixon State Memorial Forest is closed.

The North Fargo Fire is 90 percent contained at 2,500 acres. Private industry assists with suppression efforts. The West entrance to Okefenokee Refuge and Georgia Highway 177 is closed and a Georgia Department of Transportation Strike Team is mobilized.

April 21st

Another home is reported destroyed by the Sweat Farm Road Fire, bringing the total number of homes lost to 18. The fire makes a run in heavy timber towards Manor. There are voluntary evacuations of scattered homes outside of Manor. Structure protection and protection of caged animals is initiated at Okefenokee Swamp Park. Smoke remains a problem in Waycross and parts of southeast Georgia.

The Sweat Farm Road Fire is divided into two once it crosses the swamp Perimeter Road, with the portion burning on the Refuge to be managed as a separate incident named the Big Turnaround Fire. The Refuge Manager amends his original decision document for the North Fargo Fire to include the Big Turnaround Fire, jointly referred to as the Big Turnaround Complex.

Command of this newly designated Big Turnaround Fire is assumed by the Wilder Team, which provides management at and above the Division Supervisor level; the Georgia Team temporarily provides tactical resources until ordered resources arrive.

By the end of the day, the Sweat Farm Road Fire is an estimated 55,619 acres, mostly due to burnout operations; and the Big Turnaround Fire is an estimated 6,500 acres. The North Fargo Fire is fully contained, with smoldering and creeping fire within the perimeter. Crews from the Big Turnaround Fire are assisting the Georgia State Forestry Commission with mop-up operations on the North Fargo Fire.

April 22nd

Intense fire behavior, bordering on extreme, occurs on the Sweat Farm Road Fire with flames lengths reaching up to 100 feet. Multiple spot fires occur outside the fire line. One log trailer is destroyed on a loading deck, along with harvested trees waiting to be loaded. The fire continues to burn to the southwest. Meanwhile, east winds slow activity on the Big Turnaround Fire, allowing crews to build enough line to reach 80 percent containment. Partners from the Greater Okefenokee Association of Landowners (GOAL) assist with reinforcing fireline. The Wilderness Overnight Canoe Trails remain closed. Smoke remains an issue. With North Fargo Fire contained, Stephen C. Foster State Park and the west entrance of the Refuge are opened.

April 23rd

Intense fire behavior, bordering on extreme, continues on the Sweat Farm Road Fire, with numerous spot fires due to low humidities and dry fuels. Schools are now closed in Atkinson County and remain closed in Ware County. The fire is now 50 percent contained. Evacuations are lifted for an area no longer threatened by the fire. The estimated size of the Sweat Farm Road Fire is adjusted to 46, 140 acres due to better measuring using Global Positioning System (GPS) technology and subtraction of acres now being managed as the Big Turnaround Fire.

Extreme fire behavior is forecasted for the Big Turnaround Fire, as crews continue to strengthen line around the swamp edge break and the Refuge’s Perimeter Road. The Okefenokee Swamp Park, hunting camps, and various structures are threatened; structure protection and aerial retardant drops are provided.

April 24th
The fire activity decreases and is moderate on the Sweat Farm Road Fire, which is now 70 percent contained at 46,316 acres. Fire spread is anticipated to the northeast. Limited access is provided to Wilderness Overnight Canoe Trails on the Refuge. Okefenokee Swamp Park is opened, with structure protection remaining in place.

A temperature inversion causes morning fog and smoke prevalent around the Big Turnaround Fire perimeter, now estimated at 7,320 acres. Smoke is a major concern for Ware County. Voluntary evacuations occur due to health problems caused by smoke. Despite advanced preparations to contain Big Turnaround Fire within the swamp edge break, southwest winds cause significant fire spread to the northeast into uplands on the Dixon Memorial State Forest. Fire threatens the Sweat Farm Road Incident Command Post, the communities of Waycross and Manor, and the northwest area of the Refuge. The U.S. Fish and Wildlife Service Southeast Regional Director approves a new decision to suppress the fire using indirect attack, keeping the size under 12,000 acres and the cost under $2,200,000.

April 25th
Fire behavior on the Sweat Farm Road Fire is intense overnight and by morning is threatening to cross Route 177, Swamp Park Road. U.S. Highway 1 is closed overnight and reopened in the early morning. CXS railroad along U.S. Highway 1 closed for 3 hours. Okefenokee Swamp Park is again closed and structure protection remains in place. Laura S. Walker State Park, including a golf course, is closed. One structure is saved from direct threat of the fire. Southwest winds are moving fire to the northeast.

The fireline on the southern perimeter of the Sweat Farm Road Fire burns into the Big Turnaround fire perimeter. Management of this new area is assumed by the Georgia Team managing the Sweat Farm Road Fire (now 46,500 acres and 40 percent contained).

The federal Type 2 team managing the Big Turnaround Fire conducts a burnout in cooperation with crews from Sweat Farm Road Fire. Georgia Route 177 south of U.S. Highway 1 is closed. Big Turnaround Fire has now grown to 10,498 acres, significantly increasing the fire perimeter; the fire is now only 40 percent contained. Extreme fire behavior is expected for the next 48 hours. The Team also continues to assist with mop-up of the North Fargo Fire, providing resources including a half dozen staffed engines.

April 26th
The Sweat Farm Road Fire activity is intense, making a mile run through heavy timber in an hour. Winds in excess of 20 miles per hour carry embers up to ½ mile, creating spot fires across U.S. Highway 1. Closures occur for the highway, the CXS rail line, and temporary evacuation of the Incident Command Post at Waycross due to heavy smoke and fire activity. Crews build additional fireline to reach 50 percent containment.

Evacuations occur north of Highway 1, including Laura S. Walker State Park and the communities of Josephine Park, Astoria, and Aycock. The fire is also a moderate threat to the communities of Slatterville, Fort Mudge, and Hoboken. Numerous new fires are causing reassignment of critical resources to conduct initial attack in surrounding counties.

The Big Turnaround Fire continues to make significant runs to the northeast. The fire size has now grown to 14,746 acres. Evacuations are in progress along Highway 1 and a town meeting in Waycross is cancelled.

April 27th
The Sweat Farm Road Fire has now grown to 49,489 acres. The CXS rail line is reopened. The wind shifts to the northwest and causes new spot fires. Brantley County schools are closed.

The Big Turnaround Fire has grown to 16,424 acres. Structural protection is still in place for the Okefenokee Swamp Park and its historical structures, which are now highly threatened. Canoe camping platforms on the Refuge are also threatened. Crews continue to strengthen fire line along the swamp edge break.

The fire receives one tenth of an inch of rain. The Wilder Team continues to share common responsibilities with the Floyd Team. Evacuations are lifted for Astoria but remain in place for parts of Laura S. Walker State Park.

April 28th
The Wilder Team assists the Floyd Team with major burnout operations on the Sweat Farm Road Fire, in part to protect structures in the Okefenokee Swamp Park. The fire size is now 52,405 acres and is 70 percent contained. Fire behavior is extreme, with torching of trees and crown fires in the forest canopy. Smoke columns extend to the Atlantic Ocean. Crews are continually diverted from building fireline to attack spot fires create by the main fire, and to conduct initial attack on other new fire starts in the area.

The Big Turnaround Fire size is reassessed with better mapping tools and revised to 16,079 acres. Dry northwest winds cause the fire to make a run in the afternoon, with flame lengths of up to 160 feet and spotting up to one-third of a mile ahead of the fire.

Crews continue to strengthen fireline to keep the fire from crossing U.S. Highway 1, which has not been crossed, and to widen the swamp edge break. Road closures are lifted except Highway 1 and State Route 177.

April 29th
The Sweat Farm Road Fire grows slightly to 52,705 acres. Crews work to stop a major run to the southeast and to suppress spot fires throughout the day coming from within the Refuge. Low relative humidity and thick vegetation cause the Big Turnaround Fire to also make another major run to the southeast, increasing the fire size significantly to 26,182 acres. Crews continue to build line along the swamp edge break, to suppress spot

fires along the swamp edge break and Perimeter Road, and to mop-up at Okefenokee Swamp Park. Threatened communities along Highway 1 include Racepond, Homeland, and Folkston. Evacuations are in progress for parts of Charlton County north of Folkston along Highway 1 and U.S. Highway 301. Canoe trails and remote camping platforms on the Refuge remain threatened as well.

April 30th

Fire continues to progress to the southeast. The Sweat Farm Road Fire increases to 53,172 acres. Racepond, Kingfisher Landing, Homeland, the City of Folkston, CXS rail line, and communications facilities are threatened. Charlton County schools are closed. U.S. Highway 1 and State Route 177 remain closed. Georgia Forestry Commission responds to other new fire starts in nearby Brantley, Wayne, Charlton, and Atkinson Counties.

Big Turnaround Fire is now 33,900 acres. The fire is progressing southeast directly ahead of the Sweat Farm Road Fire front. Refuge canoe trails and historic structures are threatened. Low relative humidities continue. Crews anticipate initial attack on new fire starts within the Refuge.

May 1st

Low relative humidity and high fire danger continues. Spanish Creek is added to the list of communities threatened by the fires. The Sweat Farm Road Fire is now 53,202 acres and 75 percent contained. Fire repeatedly jumps containment lines.

The Big Turnaround Fire grows to 36,274 acres. A canoe camping platform on the Refuge is lost at a replacement value of almost $60,000. Canoe trails and structures remain threatened. Historic cabin on Floyd's Island is protected.

May 2nd

The Sweat Farm Road Fire grows slightly to 53,899 acres. Reburning occurs in peat and dried out brush, with erratic winds causing fire whorls and flames up to 100 feet high. Charlton County schools are opened.

The Big Turnaround Fire grows to 39,367 acres. Numerous communities and facilities remain threatened. Four homes and 8 outbuildings are threatened, including some rural homes close to where fire escapes the line. Mandatory evacuations and fire advisories are in effect for numerous areas. Residents of Waycross, Jacksonville and nearby areas with respiratory illness are advised to stay indoors due to heavy smoke. Ware County schools are closed today. A town meeting in Folkston educates residents about Firewise standards, which outline steps to reduce the risk of losing homes to fire.

A Type 1 Incident Command Team led by Mark Ruggiero arrives to assume command of the growing Complex, beginning a transition phase with the Wilder Team. Other fires occurring in Georgia include the 5,000-acre Roundabout Swamp Fire in Atkinson County; along with the 1,400-acre Kneeknocker, 950-acre Fort Mudge, and the 100-acre Racetrack Fires in Brantley County. In Coffee County, public schools and South Georgia

College in Douglas were closed due to heavy smoke and poor visibility.

May 3rd
There is no significant change on the Sweat Farm Road Fire. Charlton County issues a countywide ban on outdoor burning with $1000 fine for violation.

The Ruggiero Team assumes command of the Big Turnaround Fire, which grows steadily to 42,557 acres. To date, over 85 miles of swamp edge break and 14 miles of dozer line along the Perimeter Road have been built or reinforced. The fire continues to advance into the Refuge on several fronts.

Communities and facilities remain threatened. Some evacuation have been lifted. Ware County schools are reopened. Two public meetings are held in Folkston today to establish an Emergency Operations Center and organize volunteers by areas of need. Highway 1 and Route 177 remain closed from Waycross to Folkston, except for local residents.

May 4th
The Big Turnaround Fire size is remapped and reconciled with the Sweat Farm Road Fire to correct duplication in reporting of acreage burned. The Big Turnaround is now calculated at 42,384 acres and is 45 percent contained.

In addition to command of the Big Turnaround, the Ruggiero Team assumes command over operations, including structure protection, on portions of Sweat Farm Road Fire east of Okefenokee Swamp Park Road and west of Highway 1. The Sweat Farm Road Fire is now 80 percent contained. Reburning and hotspots continue on the interior. The fires continue to have a significant effect on local communities.

May 5th
There is no change on the Sweat Farm Road Fire. A Type 2 Incident Management team led by Paul Hannemann arrives to work with the Floyd Team; a transition in command is scheduled for May 8th. The Ruggiero Team continues to manage over 6,000 acres previously included as part of the Sweat Farm Road fire.

Big Turnaround Fire grows to 44,509 acres, with 24,806 acres burned on the Refuge to date. Lightning starts three new fires late in the day near the center of the Refuge on Floyds Island Prairie, Bugaboo Island, and in the Bugaboo Scrub.

May 6th
Big Turnaround Fire grows to 46,522 acres. The Ruggiero Team managing the Complex receives operational support from private timber companies with land adjacent to the Refuge. Aerial holding actions are conducted throughout the day in an attempt to suppress the new Floyds Island, Bugaboo Island, and Bugaboo Scrub fires started the day before on the interior. Other large fires continue to burn in Atkinson and Brantley Counties, straining local firefighting resources.

May 7th

Hannemann's team presented an overview of the Sweat Farm Road Fire to elected officials of Waycross and Ware County, Georgia. The Ruggiero Team and Refuge held a town meeting in Folkston to information on the Big Turnaround Fire. Both teams, Refuge staff, and members of the Greater Okefenokee Association of Landowners (GOAL) met to discuss operational fire management on both sides of the refuge boundary.

North winds and low humidities cause extreme fire behavior, moving the Big Turnaround Fire south at a high rate of spread. Fire continues to advance into refuge on several fronts. Line reinforcement, burnout operations, helicopter bucket drops, and other firefighting tactics continue. Fire size is recalculated to be 46,416 acres.

The new fire starts on the interior grow in size, despite initial attack from the previous day; the Bugaboo Scrub Fire runs over 9 miles and is mapped using GPS technology at 16,434 acres.

May 8th

The Hannemann Team assumes command of the Sweat Farm Road Fire, which remains at 53,899 acres and 80 percent contained. Strong winds cause previously burned areas inside the fire perimeter to reburn in peat and dried out brush. Crews from this fire and the Big Turnaround Fire are diverted to respond to Ten-Mile Bay Fire in Berrien County and a 10-acre fire in Charlton County. Long travel distances for initial and extended attack strain resources, as other fires in southeast Georgia continue to burn. Both teams meet in Waycross with Georgia Forestry Commission and numerous stakeholders to discuss assistance to affected landowners. Congressional staff tour the fire.

The Big Turnaround Fire grows to 53,466 acres and threatens 19 homes, 2 businesses, and 20 outbuildings, including Refuge offices and a concessionaire building. For the first time since the start of the fires, the Refuge is closed. A mandatory evacuation is ordered for 20 homes in the Davis Subdivision west of Folkston and also remains in effect in the Race Pond area. The Bugaboo Scrub Fire exhibits extreme fire behavior overnight, absorbing the Bugaboo Island fire start and spreading rapidly south to the Florida state line. Crews from the Big Turnaround Fire and U.S. Forest Service crews respond, as the fire moves into Florida and Osceola National Forest, and then across Florida State Highway 2. Spotting up to 2 miles occurred. The community of Taylor (300 residents) is evacuated. The fire grows to 40,139 acres, an area of over 60 square miles. Florida Highway 2, Georgia Highway 94 and Georgia State Route 185 are all closed. Smoke limits visibility on Interstate 10. The Floyd's Island Prairie Fire, midway between the Bugaboo Scrub Fire and the Big Turnaround Fire, grows to 547 acres within the Refuge.

May 9th

Hannemann's team met with the CSX Railroad to discuss impacts of the fire on roads and to coordinate operations so the trains could keep running. A staff member for U.S. Senator Saxby Chambliss tours the fire with leaders of the Georgia Forestry Commission. A daily conference call is established between the Operations Sections of various teams.

Bugaboo Scrub Fire gains almost 30,000 acres, becoming the largest active fire in the

Southeast at 68,650 acres. The incident is managed by Ruggiero, along with Big Turnaround Fire at 62,583 acres. The U.S. Fish and Wildlife Service Director approves a decision to confine the new Big Turnaround Fire within the Swamp Edge Break at a size less than 250,000 acres and a cost of under $20,000,000.

Stephen C. Foster State Park is threatened, including a boathouse, gift shop, museum, 16 outbuildings, and 18 homes. The park is evacuated, along with Moccasin Creek (35-40 homes), and Moniac (300 homes and about 1,000 people). Fargo, Taylor, Council, Edith, and Baxter, Florida are threatened. Davis remains evacuated. Voluntary evacuations occur in Folkston and Homeland. Canoe trails and structures on the Refuge remain threatened. A public meeting in Folkston provides fire information.

Florida Highway 2 and Georgia Highways 94 and 185 remain closed. Multiple U.S. and state highways are closed in Charlton and Ware counties. Davis remains evacuated. Smoke advisories are issued for several U.S. and State highways. A Type 1 Incident Management Team led by Mike Quesinberry arrives to manage the part of the Bugaboo Scrub Fire south of Highway 2 as a separate incident named the Florida Bugaboo Fire.

May 10th

U.S. Highway 1 and Charlton County schools reopen. Hannemann's Team, Georgia Forestry Commission, public officials and private landowners in Fargo met to discuss a structure protection plan on the Sweat Farm Road Fire. A public meeting is also held in Fargo to provide fire information to other members of the community.

The Big Turnaround Fire runs to 63,636 acres, with occasional spotting. Crews from this fire and private landowners also continue to respond to the uncontained Bugaboo Scrub Fire, which spreads rapidly to 88,252 acres with no other resources are available. Additional FEMA funds are approved to assist with protecting private lands from spread of the Bugaboo Scrub Fire. The Ruggiero Team also monitors the uncontained Floyd's Island Prairie Fire, an estimated 1,231 acres. A mandatory evacuation is issued for parts of Charlton County. The communities of Davis and Moniac remain evacuated.

The U.S. Forest Service approves a Wild Fire Situation Analysis for the Florida Bugaboo. Quesinberry's Team assumes command under Unified Command with the Florida Division of Forestry. This fire is estimated at 45,000 acres and threatens the communities of Taylor, Moccasin Circle, Five Points and Deep Creek, which is evacuated. A Red Cross shelter is opened in Glen St. Mary's in Baker County, Florida.

May 11th

A public meeting in Fargo provides fire information. The Okefenokee Swamp Park entrance is opened. Crews from both teams implement a community protection plan.

Big Turnaround Fire grows to 69,865 acres – with 48,582 acres within the Refuge -- and merges with Floyd's Island Prairie Fire at 2,020 acres. Burnout operations remove hazardous vegetation around the Incident Command Post and Refuge buildings. The

evacuation of the Davis community is lifted.

Crews from Big Turnaround continue to respond to Bugaboo Scrub Fire, now 111,042 acres and uncontained. The fire is very active, with flames lengths reaching 75-100 feet. An RV camper and outbuilding are discovered destroyed overnight in Moccasin Creek, which remains evacuated. Reeve's Landing is evacuated, while mandatory evacuation of Moniac becomes voluntary. Ruggiero's Team receives assistance from Georgia Forestry Commission and private industry crews. Private timber plantations outside the Refuge are threatened by possible spread of the Bugaboo Scrub Fire outside the Refuge boundary.

Resources begin to arrive for the Florida Bugaboo Fire, grown rapidly to 85,000 acres with rapid fire runs and spotting ahead of the main fire. Infrastructure on the Osceola National Forest is threatened. The fire is 6 ½ miles from crossing Interstate 10 and is 2 miles east of U.S. Highway 441. The Quesinberry Team holds a news conference near the intersection of I-10 and Hwy 441. Taylor residents are allowed back into their homes after a 3-day evacuation.

May 12th

The Sweat Farm Road Fire size is adjusted significantly to 46,264 acres after ground reconnaissance. A knuckleboom loader, butt saw and part of a salvaged log deck were destroyed by a re-burn from scorched needles and foliage that had fallen to the ground. Some areas experience two re-burns in the same spot as up to 3 inches of litter is scorched and additional vegetation falls. Georgia State Representative Mark Williams tours the fire. A smoke alert is issued in Atlanta and central Georgia due to the wildfires.

Moderate to extreme fire behavior occurs as the Big Turnaround Fire grows to 75,901 acres and remains 45 percent contained. The uncontained Bugaboo Scrub Fire increases to 129,090 acres. Moccasin Creek remains evacuated. Dozers build fire breaks around Fargo and defensible space for homes at Reeves Landing. The Bugaboo Scrub Fire is now burning off the Refuge and spreads onto private and timber industry lands; the Georgia Forestry Commission assigns command of this 2,628-acre area to the Hannemann Team to be managed as a separate incident called the Bugaboo Scrub II Fire.

The Florida Bugaboo Fire exhibits extreme fire behavior, growing to 102,000 acres. The fire is 10 percent contained. Interstate 10 and Interstate 75 are closed. Numerous other roads remain closed. Deep Creek and Reeve's Landing remain evacuated.

May 13th

The Sweat Farm Road Fire remains unchanged. Multiple significant reburns occur, requiring response of tractor plows and helicopters. All National Guard helicopters were diverted today to a search and rescue mission and were unavailable for incident use.

The Big Turnaround Fire grows to 84,150 acres with continued moderate to extreme fire behavior. A precautionary evacuation is in place for the Refuge headquarters. The uncontained Bugaboo Scrub Fire makes several runs and grows to 137,185 acres. The Bugaboo Scrub II Fire on state-protected land has not grown, but remains uncontained;

fire line is planned along the western edge to defend against predicted winds.

Activity on the Florida Bugaboo Fire slows, allowing crews to build additional line and conduct burnout operations to reach 30 percent containment. Structure protection is in place for the community of Taylor, parts of which remain evacuated. Interstate 75, Interstate 10, and Florida Highway 2 are reopened.

May 14th
Crews from the Sweat Farm Road Fire assist with initial attack of three new fires ignited by lightning about 14 miles west of Fargo. These fires are contained at less than 2 acres each. Crews also respond to a re-burn from a fire north of Fargo that started in February.

The Big Turnaround Fire, now at 90,042 acres, continues to grow on edges of the fire without containment lines. Acreage calculations on the Bugaboo Scrub Fire are adjusted slightly to 136,565 acres; this fire is now 15 percent contained. A half-inch of rain overnight dampens fire activity slightly. Some local roads are closed due to a danger of falling burned trees. Reeves Landing residents are allowed back into their homes.

Moderate to extreme fire behavior is reported on the Bugaboo Scrub II, with medium to long-range spotting; the fire size remains unchanged and there is as yet no fireline constructed.

Crews on the Florida Bugaboo Fire are making progress building fire line. The fire is 30 percent contained and grows slightly to 109,000 acres as it jumps containment lines. A new fire in the area, suspected to be caused by arson, is contained. Mandatory evacuations are expanded in Florida, impacting an additional 1,000 people. Columbia County schools are closed due to forecasted increased winds and an evacuation is begun for the Five Points community. A public meeting is held in Lake City, Florida to provide fire information the community. Osceola National Forest is closed north of Interstate 10.

May 15th
Additional fire line is constructed on the Sweat Farm Road Fire, now 81 percent contained, with multiple reburns. George State Representative Mark Williams makes a second visit to the incident.

The Big Turnaround Fire and Bugaboo Scrub Fire continue to burn in the interior, but the fire perimeters remain unchanged. The Bugaboo Scrub II Fire has increased slightly in size to 3,787 acres, with high to extreme fire behavior reported; this fire is 5 percent contained.

The Florida Bugaboo Fire grows to 110,500 acres. Extreme fire behavior is observed, with torching and long-distance spotting. Numerous communities remain threatened.

May 16th
The Sweat Farm Road Fire is now 82 percent contained and reburns continue.

Fire activity picks up on the Big Turnaround Fire, with running surface fire spreading to 100,878 acres. The Bugaboo Scrub Fire also grows to 140,821 acres. Crews are burning out hazardous fuels in an area adjacent to Stephen C. Foster State Park and around the Moccasin Creek area.

Progress was made on the Bugaboo Scrub II, now 30 percent contained; acreage was recalculated to 3,768 acres due to an infrared mapping flight.

The Florida Bugaboo Fire grows to 119,501 acres and now 65 percent contained. The fire perimeter is about 120 miles long. Fire jumping the line is again contained. Resources being protected include the Big Swamp Wilderness Area and infrastructure on Osceola National Forest. Structural protection remains in place for threatened homes. Florida Lieutenant Governor Jeff Kottkamp and a delegation of state legislators tour the fire.

Winds from the south are blowing smoke as far north as Atlanta.

May 17th
A town meeting is held in Fargo to provide fire information to the community.

The Big Turnaround grows to 105,418 acres. During the night, 1200 feet of boardwalk including two bridges are destroyed by fire reburning at Okefenokee Swamp Park, a private concessionaire that reopened for business on May 11th. A new Type 1 Incident Management Team (Oltrogge) arrives to relieve the Ruggiero Team. The Bugaboo Scrub Fire gains another 15,000 acres to total 156,455 acres; The Oltrogge Team will assume command of the complex (Big Turnaround and Bugaboo Scrub).

The Bugaboo Scrub II Fire on state-protected land is now 50 percent contained.

The Florida Bugaboo Fire is now 120,515 acres, the largest fire in the state's history. The fire is 70 percent contained, with lines holding on the perimeter and continued extreme fire behavior on the interior. An estimated 730 homes and 2100 people have been affected by mandatory evacuations.

Florida Division of Forest fire crews conduct initial attack of a new 11-acre fire off State Route 6 west of Highway 441.

May 18th
Low relative humidity is forecast for the Sweat Farm Road Fire, which received some rain that helped reduce fire activity. Infrared imaging shows intense heat remaining on the interior of the fire. Crews are implementing a community protection plan in Fargo; a town meeting is also held here to provide updated fire information.

The perimeter of Big Turnaround Fire remains unchanged, while the fire continues to burn the interior south toward the Bugaboo Scrub Fire. The eastern flank has progressed from the interior to within 2.5 miles of the Refuge boundary and adjacent commercial timber land. There is currently no threat to containment lines. Activity has increased in

the “pocket,” the northern part of the Bugaboo Scrub Fire, which is now at 159,473. Five new handcrews arrive to support mop-up operations.

The Bugaboo Scrub II Fire makes significant and sustained runs in pine plantations with extreme fire behavior. The fire is 50 percent contained and recalculated at 5,585 acres.

The Florida Bugaboo Fire, now 80 percent contained, has grown slightly to 121,319 acres. Rain overnight helped moderate fire behavior. Some Florida evacuations are lifted.

May 19th
The Sweat Farm Road Fire is now 85 percent contained. Fire size is remapped to be 55,527 acres. Fire activity is minimal.

The Oltrogge Team assumes command of the Big Turnaround Fire, now at 110,767 acres, along with the Bugaboo Scrub Fire, at 160,727 acres. The Big Turnaround is burning hot and creating heavy smoke columns. Two spot fires are contained near Stephen C. Foster State Park and near Highway 84. Bucket drops slow the progress of the fire, which continues to burn south towards the Bugaboo Scrub, now 160,727 acres.

More line is built around the Bugaboo Scrub II fire, with a slight increase in containment to 52 percent. Communication between managers of the Bugaboo Scrub and Bugaboo Scrub II fires clarifies areas of responsibilities and corrects double reporting of acreage.

The Florida Bugaboo grows to 121,350 acres and is 90 percent contained. All Florida evacuations have now been lifted.

May 20th
Low humidities increase fire activity. Crews from the Sweat Farm Road Fire successfully suppress fire moving off the Refuge from the western edge of the Big Turnaround Fire, protecting high value pine plantations. A temperature inversion traps smoke close to the ground and reduces visibility.

The Big Turnaround Fire and the Bugaboo Scrub Fire merge into one fire now totaling 279,143 acres. This combined fire will be reported as the Big Turnaround Complex.

Bugaboo Scrub II Fire perimeter remains unchanged and containment is now 55 percent. The Florida Bugaboo has grown slightly to 121,401 acres and remains 90 percent contained.

May 21st
The Hannemann Team prepares to transition command on the Sweat Farm Road Fire and Bugaboo Scrub II Fire to another Type 2 Incident Management Team led by Reed Hildreth. Embers from the Big Turnaround Fire blow west onto private lands. Crews from the Bugaboo Scrub II fire are sent to assist with initial attack of spot fires. One firefighter is treated for minor facial burns and returns to duty the following day.

The Big Turnaround Fire is very active with extreme fire behavior on the interior, growing to 282,250 acres. The record for no significant rainfall has now reached 80 days. Air operations assisted the Georgia Forestry Commission on extended attack of a long-burning fire near St. George called the St. George Break Fire. A meeting involving all area stakeholders is held to reach consensus on a proposed burnout operations on the southeast flank. The Florida Bugaboo Fire grows slightly to 122,643 acres.

May 22nd

The Hannemann Team continues transitioning with the Hildreth Team on the Sweat Farm Road and Bugaboo Scrub II Fires. Burnout operations totaling nearly 10,000 acres are accomplished on the Big Turnaround Complex using aerial ignition, with containment at 45 percent. Mop-up and holding containment lines continue on the St. George Break Fire, 800 acres in size. The Oltrogge Team holds a public meeting in Folkston; 60 people are in attendance. Reports for several days refer to these fires collectively as the Georgia Bay Wildfires. The Hannemann and Hildreth teams provide a fire overview to the elected officials in Waycross and Ware County, Georgia.

A Type 1 National Incident Management Organization (NIMO) led by Joe Ferguson and a Type 2 Incident Management Team led by Gary Beauchamp arrive to assume unified command of the Florida Bugaboo Fire. The U.S. Forest Service bans open fires in the Apalachicola, Osceola, and Ocala National Forests.

May 23rd

The Hildreth Team assumes command of the Sweat Farm Road and Bugaboo Scrub II Fires on state-protected land. Spot fires from the Big Turnaround Complex made significant runs to the west, but are contained and become part of the Sweat Farm Road Fire now at 56,527 acres. The Big Turnaround Complex grows to 311,490 acres, in large part due to burnout operations the previous day, and containment increases to 50 percent. Stormy weather moving across the area causes erratic winds and fire behavior, with very active fire on the entire eastern side of the fire. Low humidities continue. Georgia Highways 94 and 185 are reopened. The Ferguson-Beauchamp Team assumes command of the Florida Bugaboo Fire, which is remapped at 123,183 acres.

May 24th

The previous days' spot fires west of the Refuge jump containment lines and continue to move rapidly to the west, threatening 15-20 structures. An area west of the Refuge and south of the Sweat Farm Road Fire is evacuated. The Bugaboo Scrub II Fire is now 60 percent contained; resources are moved to assist with the growing Sweat Farm Road Fire. Intense fire behavior is observed.

Burnout operations continue on the Big Turnaround Complex, now at 327,985 acres. The U.S. Fish and Wildlife Service Director approves a new decision to keep the Big turnaround Fire (Complex) confined within the Swamp Edge Break at a size less than 425,000 acres and a cost of under $43,000,000. Damage is discovered to 60 acres of endangered Red-Cockaded Woodpecker habitat, due to fire suppression operations. The incident is under investigation by law enforcement. Biologists will monitor the area to

assess the viability of 25-30 long-leaf pine nesting trees, the roots of which were cut by tractor plow blades building fireline.

Ware County bans all fireworks. No change is reported on the Florida Bugaboo Fire.

May 25th
The Sweat Farm Road Fire is now 70,544 acres and 65 percent contained, burning in various-aged pine plantations. Suppression efforts continue. Bugaboo Scrub II Fire is now 80 percent contained. Burnout operations continue on the Big Turnaround Complex, now at 344,213 acres. Several reburns were suppressed in the northern part of the Big Turnaround before reaching commercial timber property. The Refuge headquarters office opens; the Refuge remains closed to the public.

May 26th
High winds cause the Sweat Farm Road Fire to make a run to the northeast, increasing fire size to 76,958 acres. The fire is 75 percent contained. Some mandatory evacuations were lifted. Initial attack occurred for 2 new fires 40 miles west of Waycross; one was contained and one remains active. The Bugaboo Scrub II Fire remains unchanged.

The Big Turnaround Complex grows to 361,859 acres as needle cast from scorched pines create carpets on hot soil that ignite four-foot flames. Rain from the previous day helped firefighters make progress with suppressing active fire and this reburn activity. Georgia Emergency Management Agency and Charlton County assisted with suppression efforts. Smoke was very thick in the town of Fargo, due to a temperature inversion. The Georgia Forestry Commission forms a Mop-Up Command comprising 6 task forces working throughout southeast Georgia on various fires.

The Florida Bugaboo Fire causes significant smoke in the Lake City area. Timber salvage operations begin on the fire. The fire area was remapped and the size recalculated to 122,704 acres. Several counties in Florida now have burn bans in place.

The Sweat Farm Road, Big Turnaround, Bugaboo Scrub, Bugaboo Scrub II, and Florida Bugaboo fires have all burned together, making the combined fire of 537,950 acres one of the largest in modern history in the lower 48 states.

May 27th
Spread of the Sweat Farm Road Fire slows and size is currently 80,023 acres and 80 percent contained. Several spot fires were caught and contained. The Big Turnaround Complex grows to 373,517 acres as burnout and suppression operations continue. Big Turnaround crews assist Georgia Forestry Commission and local fire departments with response to the Oker Rock Fire of more than 100 acres northwest of Folkston; that fire is a potential threat to the Incident Command Post. The perimeter of the Florida Bugaboo Fire remains unchanged.

May 28th

Minimal spread occurs on the Sweat Farm Road Fire at 80,023 acres, which remains 80 percent contained. A few small spots were contained The lack of engines is hampering control and mop-up efforts on Sweat Farm Road and Bugaboo Scrub II Fires.

Reburn continues on the interior of the Big Turnaround Complex, now at 376,618 acres. Burnout operations also continue. Georgia Forestry Commission Mop-Up Command continues to assist with control efforts on several fires.

The Florida Bugaboo Fire destroys 12 acres of commercial timber property. This increases the total fire size to 122,716 acres.

May 29th

All evacuations have been lifted for the Sweat Farm Road Fire, now at 81,209 acres with increased containment to 85 percent. Fire again spreads from inside the Refuge boundary, making a significant run to northwest and adding to the acreage burned on the Sweat Farm Road Fire. No change is reported on the Bugaboo Scrub II Fire.

Burnouts continue on the Big Turnaround Complex and merge into the main fire, which makes several runs and spreads to 385,521 acres. There are several active areas of fire with smoke columns on the interior.

The Florida Bugaboo Fire grows as dried out areas burn and is now 124,584 acres. The combined fire in Georgia and Florida covers an area greater than Rhode Island.

May 30th

The Sweat Farm Road Fire grows to 81,994 acres, due to uncontained fire from the western boundary of the Refuge. Overnight burnout operations help reinforce containment lines. Break-outs from previous days remain contained. The Big Turnaround Complex burns actively on the interior and makes several runs toward control lines, reaching 392,390 acres. Burnouts fired off the control line help keep runs from escaping the fire perimeter. No change is reported on the Florida Bugaboo Fire.

May 31th

The Sweat Farm Road Fire grows slightly to 82,049 acres due to spotting from the Bugaboo Scrub II Fire, but overall containment increases to 90 percent contained. The Big Turnaround Complex is now 399,178 acres and 60 percent contained. A second canoe camping platform is discovered burned on the Refuge. Burnout operations continue off control lines. The Ruggiero Team returns to resume command of the Complex.

June 1st

The Sweat Farm Road Fire makes a few short runs in unburned pockets to reach 82,199 acres, with significantly less spread than previous days. The Ruggiero Team officially resumes command of the Big Turnaround Complex, which grows to 402,490 acres. Burnouts continue, including around Chesser Island, the Swamp Boardwalk Tower, and along Swamp Island Drive. Containment increases to 65 percent. The Florida Bugaboo Fire size is recalculated to 108,754 acres, due to subtraction of misreported acres north of

Florida Highway 2.

June 2nd
The Sweat Farm Road Fire grows slightly to 82,216 acres and Bugaboo Scrub II remains at 5,585 acres, with both fires now 98 percent contained. Tropical Storm Barry causes 3-6 inches of rain throughout the area of the fires. The Big Turnaround Complex is now 405,638 acres and 70 percent contained. Firefighters are put on alert for potential hurricane response.

June 3rd
Aerial reconnaissance of the Sweat Farm Road Fire identifies several remaining hot spots within the fire perimeter. Emergency stabilization begins on the Big Turnaround Complex to mitigate damage caused by suppression operations. Containment increases to 80 percent. Planning also begins for additional landscape rehabilitation.

The Florida Bugaboo Fire is fully contained. The Ferguson NIMO Team turns over its operational role in unified command to a smaller NIMO Team led by George Custer, but remains on site to monitor the fire activity.

June 4th
Fire advisories for all communities in Georgia and Florida have now been lifted. Crews on the Sweat Farm Road and Bugaboo Scrub II Fires focus on mop-up, road repair, and clearing roads of fallen trees. Crews on the Big Turnaround Complex proceed with holding, patrolling, monitoring, and mop-up operations, while emergency stabilization continues.

The Beauchamp Team turns over its role in unified command on the Florida Bugaboo Fire to a Type 3 Incident Management Team led by Joey Brady to oversee mop-up operations and rehabilitation efforts.

June 5th
Mop-up and stabilization work continues on all fires. The Big Turnaround Complex receives ½ -inch of rain, while the Florida Bugaboo Fire has received over 4 inches of rain over the last 2 days. Stephen C. Foster State Park is opened for day use only.

June 6th
The Floyd Team resumes command of the Sweat Farm Road Fire from the Hildreth Team. The Big Turnaround Complex is now at 405,893 acres. Protective wrap is removed from historic structures on the Refuge. The Florida Bugaboo Fire managers plan to downsize their operations.

June 7th
The Floyd Team turns over command of a portion of the fully contained Bugaboo Scrub II Fire on the west side of the Refuge; the Ruggerio Team will now manage all fire within the Perimeter Road as part of the Big Turnaround Complex. A burnout is planned for the next day on the west side of the Complex, in cooperation with crews assigned to the

Bugaboo Scrub II Fire, now calculated at 1,467 acres. Rehabilitation is underway of fireline constructed with dozers to avoid excessive soil erosion and restore natural surface water flow.

Fourteen people attend a public meeting in the community of Argyle in connection with the Sweat Farm Road Fire. Forty people attend a public meeting with the Ruggiero Team and Refuge staff in Folkston concerning the Big Turnaround Complex. Stephen C. Foster State Park is now fully opened and all roads are now open in Georgia and Florida.

A Type 3 Incident Management team led by Steve Rippley assumes command of the Florida Bugaboo Fire.

June 8th

Burnout of uplands primarily within the Refuge is successfully accomplished to support containment on the west side of the Big Turnaround Complex. There are still uncontained areas of the fire on the west and southeast flanks. The Charlton County Emergency Operations Center closes.

June 9th

Higher temperatures and continued drying will increase the risk of areas burning again in all fires, despite recent rain. Acreage for the Big Turnaround Complex is adjusted to 386,772 to eliminate duplicate reporting of acres for the Sweat Farm Road Fire. On the Big Turnaround Complex, crews are searching for hot spots, reburns, and any new lightning starts. They also began removing equipment from areas of the fire where mop-up has been fully completed and no threat of reburn exists. Local resources assume responsibility for the Bugaboo Scrub II Fire.

June 10th

Several fires caused by lightning on the Sweat Farm Road Fire are caught and contained. The Sweat Farm Road Fire Crew reports a 10-acre fire in Atkinson County caused by logging equipment that was quickly suppressed.

June 11th

Reconnaissance flight occurs today on the Sweat Farm Road Fire; monitoring and mop-up continues. Mop-up and suppression of reburns continues on the Big Turnaround Complex Fire, which is now 85 percent contained. Firefighters fell hazard trees that are a threat to public safety. Crews are prepared for initial attack on new fires if needed.

June 12th

The Big Turnaround Complex received 1-2 inches of rain. The chosen strategy is succeeding and expected to continue to success as long as the current seasonal weather patterns, which have now resumed, continue. The Ruggerio Team is transitioning with a national Fire Use Management Team (FUMT) led by Jay Perkins. The total suppression cost to date is $24,599,778, less than $100 per acre. The Okefenokee National Wildlife Refuge announces that the refuge will begin reopening portions of the Refuge to the public on beginning Saturday, June 16.

June 13th

The Perkins Team assumes command of Big Turnaround Complex, now 90 percent contained. Staffing is being significantly downsized. Mop-up operations continue. The southern half of the fire received a ½-inch of rain. The potential for additional lightning-caused fires in southeastern Georgia and northern Florida remains. The fire is expected continue to burn on the interior for several more months or until a hurricane event occurs.

Note: On June 24th, a Type 3 Incident Management Team led by Tom Crews assumes command. This team will continue mop-up and fire damage repair work, especially along the west side of the Refuge.