

JOHN M. BETHEA STATE FOREST

2015

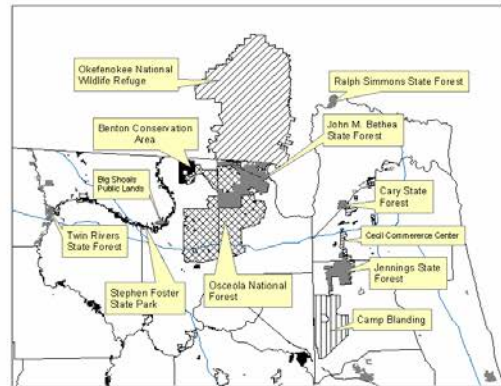
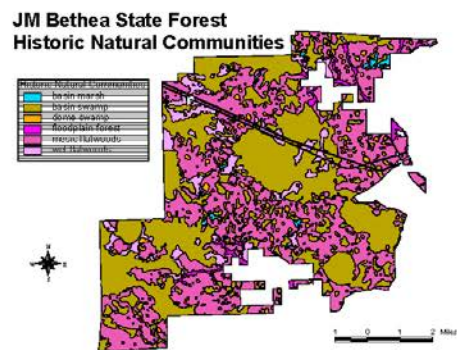
10-YEAR MANAGEMENT PLAN

EXHIBITS

Exhibit U

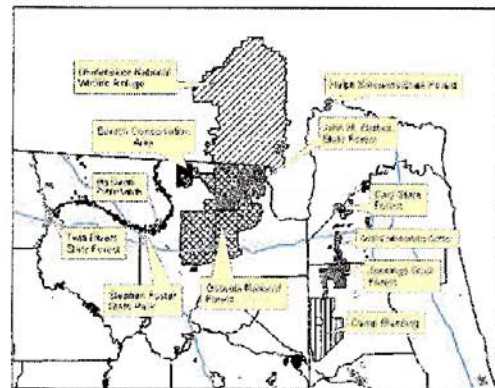
John M. Bethea State Forest Restoration Plan

RESTORATION AT JOHN M. BETHEA STATE FOREST



Prepared by the
Florida Division of Forestry
January 21, 2009

Approved _____



Approved

Approved 

Land Acquisition History

The John M. Bethea State Forest (JMBSF) was acquired by the State of Florida in April, 2001. The original acquisition consisted of 34,244.7 acres of JMBSF purchased with CARL program funding, and 21,873.6 acres purchased with CARL and SOR funding. After portions of the original acquisition were traded to the federal government, the JMBSF consisted of 37,736 acres.

The main objectives for the acquisition of the property and the primary goals of the Division of Forestry (DOF) in managing the tract are:

- To conserve and protect environmentally unique and irreplaceable lands that contain native, relatively unaltered flora and fauna representing a natural area unique to, or scarce within, a region of this state or a larger geographical area.
- To conserve and protect native species habitat or endangered or threatened species.
- To conserve, protect, manage, or restore important ecosystems, landscapes, and forests, if the protection and conservation of such lands is necessary to enhance or protect significant surface water, ground water, coastal, recreational, and timber resources, or to protect fish or wildlife resources which cannot otherwise be accomplished through local and state regulatory programs.
- To provide areas, including recreational trails, for natural resource-based recreation.
- To preserve archaeological or historical sites.

The forest is also part of an important corridor between two larger federal land bases, the Osceola National Forest to the south and west, and the Okefenokee National Wildlife Refuge to the north, which is important for the movement of black bear and other wildlife.

Historical Natural Communities

An assessment of the historic natural communities at JMBSF was completed by the Florida Natural Areas Inventory (FNAI) in 2005 (see map on cover). This assessment was based on interpretation of 1943 aerial photographs, a timber-type map for Baker County from the 1930's, and ground-truthing by the staff of FNAI. The assessment suggests that JMBSF was historically a complex of mesic and wet flatwoods interspersed with basin swamps and marshes and scattered dome swamps. The 1943 aerials show open-canopied flatwoods savannas, woodlands and prairies crossed with a network of trails. Wetland areas appear to be open-canopied woodlands and forests, along with marshes and prairies. Presumably, the area had a history of selective logging and open range grazing prior to the time of these photographs. The timber-type map shows that the flatwoods were longleaf-dominated savannas, with a few stands of slash pine and loblolly pine. Larger stands of slash pine were located west of the current state forest boundary in Pinhook Swamp and Impassable Bay. The larger basin swamps were labeled as cypress-gum forests, or "bays". Forests of hardwoods and slash pine occupied portions of these larger basin swamps and some of the smaller to medium sized basin and dome swamps. Many of the wet areas were labeled as a mix of hardwoods and slash pine. Agricultural lands were identified along the Middle Prong and St. Mary's River.

Land Use History

The past uses of JMBSF include timber management, naval stores production, agriculture, hunting, and fishing. In the early 1900's as many as 10,000 people reportedly lived in the Baxter area in and around the northern portion of the state forest. The land uses during this early time included naval stores production, logging and sawmill operations, agriculture and grazing. A small sawmill that operated in the 1940's was located on an inholding near Baxter.

In the early 1950's, Hunt Oil Co. owned the property, which was later sold to Continental Can Corporation. The property was then acquired by KMI, an English-owned conglomerate, who sold off some of the surrounding properties. The majority of the lands that are now state forest were kept by the Continental Can Corporation and sold to the US Steel Corporation in the early 1980's. Continental Can Corporation then leased the property back from US Steel. Jefferson Smurfit took over the Continental Can Corporation lease in the late 1980's and then bought the property from US Steel in the mid 1990's. In the late 1990's Stone Container and Jefferson Smurfit merged to become Smurfit-Stone. Rayonier purchased the property from Smurfit-Stone in 1999. Prior to state acquisition most of this land was leased to hunt clubs.

At the time of the original acquisition by the state, approximately forty-four percent was plantations of southern pine species. Eleven percent of the total forest acreage was considered to be of natural pines. Cutover mesic flatwoods acreage was about 4% of the total forest acreage. The remaining acreage on the forest was comprised of native hardwoods. Within these acres the primary hardwood community type was basin swamp, dome swamp, and bottomland forest, the bulk of which occurred in the floodplain area of the St. Mary's River.

The JMBSF is a modified landscape transformed by large timber companies into a fiber production area primarily for local paper mills. The methods used to transform these lands were to bed (raise the soil in long mounds), in some places deeply, and plant slash or loblolly pine on the beds and wait for the first pulpwood removal.

Wildfire History

This area has experienced catastrophic wildfires many times in the past 20 years. A review of recent fire history demonstrates that fire management should be the central focus of any management strategy developed for the JMBSF. Wetland dominated landscapes such as this are notorious for a heavy buildup of waxy vegetation, especially gallberry, that occurs with the elimination of native, grass-dominated ground cover and the absence of regular prescribed fire. Recent large scale wildfires include the Friendly Fire in 1999, the Blackjack Island Fire in 2002, the Impassible I Fire in 2004 and the Bugaboo Fire in 2007. During the 1999 and 2002 large wildfires, a practice called stripping was used in a pre-suppression effort to slow down the advancing wildfire from entering swamp fuels. This practice entailed using dozers and fire plows to plow every third row in a pine plantation in advance of the fires' path. During the Blackjack Island fire, 1,228 acres were treated on the eastern side of the forest and 1,163 acres

were treated on the western parcel. This plowing has further modified the ground cover and surface water flows in these areas and has been done twice in a 3 year time frame. One of the objectives under this plan is to mitigate the effects of stripping these areas and work towards restoring more fire tolerant species such as longleaf pine and understory grasses in these areas adjacent to the Okefenokee Swamp. In 2007, lightning ignited two fires on Bugaboo Island approximately 18 miles north of the John Bethea State Forest in the Okefenokee Swamp. Initial attempts at suppression were unsuccessful and the fires burned together and began exhibiting extreme fire behavior. The second day the fire made a southerly run of approximately 15 miles, threatening to cross the state line onto the John Bethea State Forest. The Bugaboo Fire crossed into Florida on the third day at 0700. All attempts to suppress the fire were ineffective as it moved south towards the town of Taylor. Fire behavior remained extreme through the day and well into the evening making it extremely difficult to protect threatened structures in and around Taylor. On May 10th the fire made another major run to the southwest, this time threatening Lake City, Florida. Fire behavior on this day could be described as plume dominated, with high rates of spread and flame lengths measuring in the 100 to 200 foot range. At about 1900 -2000 hours, the fire hit an area recently prescribed burned by the USFS. This area effectively slowed the progress of the fire allowing firefighters to establish control lines and stop the fire.

Restoration and Management

Restoration and management at JMBSF is a long-term proposition that will require an adaptive management approach. Precise restoration targets cannot be brought into sharp focus at this point, but may include communities that do not precisely match the presumed composition, structure or function of historical conditions. In addition, restoration and management at JMBSF must also address the need to develop a landscape that will be resistant to wildfires or will promote an increased ability to control the wildfires that are expected to impact upon this landscape in the future. Furthermore, DOF considers the ability of this forest to generate revenue through sound silvicultural management to be essential to its land management program.

There is little information and experience in the restoration of such an altered, wetland-dominated landscape such as this one. This plan will guide activities in the coming year as an action plan. Activities described in this plan for subsequent years will be adapted based on experience and analysis of previous years' efforts, as well as on any new information that may become available from other restoration projects and research. This restoration plan has four major components that address prescribed fire, hydrological restoration, wetland restoration and silviculture. The restoration of prescribed fire and hydroperiod are considered key elements to restoring and managing this landscape.

Fire Management Plan

The JMBSF has had a low prescribed fire record, averaging just over 500 acres per year for the six years since acquisition. The matrix of the forest is low flat woods or wetlands, which means that in many years the terrain is wet and difficult to burn. During dry years great care must be taken not to kill the pine overstory due to fuel accumulations or to have escapes

from prescribed burns. One of the major problems in starting a prescribed burning program in this area is that no prescribed fire has been used in the past 20 years prior to state acquisition. Most pine plantations have never been prescribed burned. During dry years, the previous timber industry owners often site prepared areas that would normally be too wet to plant. This practice resulted in areas along the edges of the basin swamps and dome swamps acquiring a thick understory of plant species normally only found in wetland vegetative classes. When these pine plantations with this wetland understory are prescribed burned, the results can be extremely difficult to control. The prescribed fire can burn with intensity similar to a wildfire. In these areas around margins of wetlands, extreme care must be exercised in order to contain the prescribed burn, which reduces the number of acres that can be safely burned in a single day. In addition to the problem with typical wetland fuels in the pine plantation edges, a significant challenge is dealing with the young trees in areas with high fuel loading. In many cases the gallberry is three to five feet tall, with the bottom branches of the trees in the same area as the top of the shrubs. The lack of prescribed fire has also allowed gallberry root mats to develop, which impede the establishment of longleaf and grasses after timber harvest. The use of herbicide helps in planting success but the high water table makes longleaf difficult to establish in many years.

Fire exclusion in these wetland areas by previous landowners has left many of these wetlands with extremely high fuel loadings. When prescribed burning adjacent to these areas, the possibility of fire-brands falling into these high fuel loaded wetlands often slows the number of acres that can be burned in a day. One of the future goals for these wetland margin areas is to allow the margins to burn with the associated mesic flatwoods prescribed burn. In the years since the state forest was acquired, drought conditions have made this goal unachievable except in the case of embedded dome swamps. With the return of wetter conditions, this practice of burning these wetland types with the adjacent mesic flatwoods should be achievable.

The goals of the Fire Management Plan (see Attachment) are to develop a "Firewise" State Forest, providing opportunities for a defensible forest during dry years with the ultimate outcome of minimizing damage from catastrophic wildfires; and, to establish the fire return interval necessary to maintain the health and vitality of the ecosystems within the forest boundaries. At JMBSF, the use of all available methods, including prescribed burning and mechanical and chemical vegetation control, are considered in the Plan.

The ultimate prescribed burning goal is to achieve a fire return interval of between two and four years. Using the acreages of historical natural communities as mapped by FNAI, this would mean burning 5,000 to 10,000 acres annually. As a practical matter, the average annual prescribed burn acreage will be increased initially to 5,000 to 8,000 acres. Prescribed burning plans will consider whether the age class and species of existing timber stands can tolerate prescribed fire. In the near future, annual prescribed burning plans that encompass up to 10,000 acres will be necessary in order to adapt to years and conditions that are most favorable for prescribed burning. In order to achieve these kinds of objectives, the potential for night burning will be evaluated and prescribed burning parameter guidelines specific to JMBSF and Baker County will be developed. Prescribed burning at JMBSF will also be expanded to include more aerial burning and burning during the growing season. Strengthening

partnerships with federal and private neighbors through cooperative projects is addressed by the Plan.

There are clear interactions between silvicultural practices and prescribed burning at JMBSF; these interactions will require some adjustments to standards set for normal state forest management. These exceptions may include reduced stocking densities, increased row spacing, creation of unplanted buffers and open areas that can be used as food plots, wildlife openings or locations for ground cover restoration, and re-orientation of rows to run perpendicular to the predominant direction of wildfires. Existing dense plantations must be thinned as a high priority, using both row thinning methods and select thinning. Each method has its own advantages and disadvantages, which must be weighed on a stand by stand basis. Row thinning is easier to supervise and quicker in a silvicultural sense but selective thinning results in the uniform reduction of the canopy across the entire stand, thus reducing the potential for major crown fires.

The Fire Management Plan also calls for greater coordination with Baker County on road maintenance and upgrading the forest road network to increase the width of primary and secondary roads to 30 feet, ensuring clear and permanent road identification, and the creation of turn around spots sufficient to accommodate fire-fighting equipment on dead-end roads. As the Plan evolves further, it will identify established anchor points for making stands against wildfire threats, developing trigger points for strategic and tactical decisions within or in proximity to the forest, and address personnel management strategies and resource requirement lists for fire events.

Hydrological Restoration Plan

Following the May 2007 Bugaboo Wildfire, the DOF deployed an experienced Hydrological Evaluation and Assessment Team in July, 2007, to examine existing roads, firelines and water control and drainage structures on JMBSF to determine their influence on the hydrology of the forest. The Team developed a Hydrological Restoration Plan (see Attachment) with the objectives of identifying priority “at risk” areas and recommending management practices that would restore both the hydrology and hydroperiod within the area affected by the Bugaboo Wildfire. The intent of this plan was to provide information and offer guidance in the rehydration of parts of the JMBSF that were impacted by previous land management activities in an effort to mitigate wildfire effects, especially in areas that have been made drier. The Team recommended that the JMBSF undergo a more thorough assessment involving elevation mapping and hydrological modeling, especially in areas bordering private properties adjacent to JMBSF.

The Hydrological Restoration Plan calls for road and structure maintenance on the primary roads as a priority for the forest management team at JMBSF, especially while salvage logging is ongoing. The Plan prioritizes actions in four quadrants of the state forest. These actions will include reinforcing low water crossings, repairing or replacing culverts, and reshaping road beds. Many of the existing culverts and low-water crossings on the primary roads should be elevated to slow the flow of surface water exiting the forest. The Plan also calls for rehabbing and reworking pushed firelines to restore sheet flow and reworking

roadways that are trapping, channeling and re-directing surface drainage. New firelines that tie into road ditches, existing firelines, waterbodies or wetlands should be blocked with soil plugs above the discharge point but outside of any Streamside Management Zone or wetland edge. Older firelines and drainage ditches should be plugged to prevent accelerated flow out of the system or wetland drainage. Any expanded fireline that is left intact as a fire safety lane should be maintained in such a way that surface flow during the wet seasons is maintained as naturally as possible.

Wetland/Upland Ecosystem Restoration

An approximately two square mile area in the forest is being evaluated as a focus area for restoration of ecological structure, function and composition. The DOF is seeking partnerships with other agencies, such as the Institute of Food and Agricultural Sciences with the University of Florida, in order to conduct adaptive management and research projects whose results can be exported to the ecological restoration of other areas of the forest. Development of these partnerships is an effort to leverage grant funding for applied management and research projects that address the complexity of restoration issues in a highly modified, wet landscape. The projects being discussed are restoration of Basin Marshes, Dome Swamps, and upland ground cover in their vicinity.

The historical Natural Communities map generated by the Florida Natural Areas Inventory for JMBSF identified 18 Basin Marsh occurrences for a total of about 299 acres. These ranged in size from 2.5 to 115.7 acres. Basin Marshes are ephemeral wetlands that provide important habitat for wildlife, especially amphibians and reptiles. The ecological function of these wetlands is closely tied to the condition of the surrounding wet and mesic flatwoods. An open pine canopy with a frequently burned ground cover of wiregrass and other grasses and forbs surrounding these Basin Marshes is especially important for the amphibians that depend on the wetlands to complete their life cycles. The Basin Marshes at JMBSF range in condition from small remnants overgrown with trees and shrubs to those that have been bedded and planted with off-site pine species. Some of the latter are hardly recognizable as wetlands.

These ecological restoration projects will involve the removal of off-site planted pines and encroaching hardwoods from the basins identified in the 1943 aerials. Some of these wetlands were bedded, so it may be necessary to apply intensive treatments such as harrowing to level the beds and other mechanical means to restore slopes and contours of the basins. Any ditches or fire lines that lead into the marsh will be harrowed or restored to grade. Restoration of ground cover in the surrounding wet and mesic flatwoods will focus on these communities within one-half mile of the basin marsh. Treatments may involve removal of off-site pines where these were not consumed by the wildfire. Identification of a seed source for wetter site ground cover will be necessary. Restoration may eventually involve both planting of wiregrass plugs and reseeded of scarified sites.

The historical natural communities map identified 393 Dome Swamp occurrences for a total of about 1,483 acres. These ranged in size from 0.5 to 26.2 acres. Cypress trees were harvested from these before acquisition by the state. Many were surrounded by fire lines. As a

result, some have no cypress and are a dense thicket of vines and hardwood shrub and tree species. Others have remnant cypress and slash pines over the dense thicket. Restoration of these may involve rehabilitation of the ecotonal fire lines and ditches, mechanical treatment to reduce hardwood cover, prescribed burning, and replanting cypress. Some of these actions may be contrary to Silvicultural BMPs and may not be possible or may require the granting of exemptions from BMPs.

Silviculture Plan

Since 2004, approximately 1,160 acres of timber have been harvested, not counting salvage sales from the significant wildfires. For the health of the stands and reduction of fuels, many acres are still in need of thinning. JMBSF personnel have developed a harvest plan for the remaining merchantable stands; implementation of this plan is on schedule.

The Bugaboo Fire burned approximately 28,000 acres of JMBSF and severely damaged about 6,500 acres of pine plantations, resulting in a significant loss to the timber resource on the Forest. The Silviculture Plan includes goals and objectives for thinning, site preparation and reforestation for the affected stands. The primary goals are to thin overly dense stands that were not burned and to reforest those areas formerly in pine production that were adversely affect by the recent wildfire in order to establish a Firewise State Forest that will better withstand the next wildfire event. Reforestation will be implemented by planting longleaf and slash pine where these are most appropriate, given their historical distribution and current site conditions. Site preparation prescriptions will be a combination of prescribed burning, mechanical and chemical treatments where appropriate.

Reforestation will take into consideration all aspects of hydrological restoration, which may result in the loss of some planted areas. Decisions whether to plant longleaf pine, slash pine or cypress can be dependent on the future hydrological objectives. Thus, reforestation must be adaptive and the Plan contained herein will be used as a living document.

Reforestation for 2007-08 concentrated on those stands that were planted during the 2005, 2006 and 2007 winters and were <1 to 3 years of age; that were treated with herbicide in the 2006 spring; and, that were burned over during Bugaboo in the 2007 spring. No additional site preparation treatments are recommended for the majority of this acreage. Rows were reoriented perpendicular to the general direction of wildfire movement in strategic areas to facilitate wildfire suppression. To facilitate increased survival rates, the 1,873 acres planted in 2007-08 were post-plant band-sprayed with Arsenal over the top of the seedlings. About 88% of these areas was planted with longleaf pine.

About 87% of the 1,607 acres scheduled for planting in 2008-09 will be planted to longleaf, and will include stands that were clearcut during the Bugaboo Fire salvage. Site preparation consists of spot raking and piling of logging debris, single drum chopping and broadcast application of herbicides to control gallberry and other herbaceous vegetation.

About 82% of the 1,261 acres scheduled for reforestation in 2009-10 will be planted to longleaf and will include stands currently about 4 to 8 years of age that were severely damaged

by the wildfire. Mechanical site preparation will be used to lay down residual snags and to control woody vegetation. A follow-up treatment of appropriate herbicide may be used to further control competing vegetation.

About 93% of the 971 acres scheduled for reforestation in 2010-11 will be planted to longleaf and will include stands currently about 9 to 13 years of age that retain an insufficient density of trees due to the severe wildfire damage. Mechanical site preparation will be used to lay down residual snags and surviving trees and to control woody vegetation. A follow-up treatment of appropriate herbicide may be used to further control competing vegetation.

Two years after planting, longleaf pine stands will be evaluated for dormant season prescribed fire suitability and, if appropriate, will be prescribed burned when they reach 2 to 3 years of age. Subsequent prescribed fires should be conducted once the pines reach sapling stage and thereafter with a return interval of no more than three years.

Six to eight years after planting, slash pine stands will be evaluated for dormant season prescribed fire suitability and, if appropriate will be prescribed burned when they reach 8 to 10 years of age. Subsequent prescribed fires should be conducted once the pines reach sapling stage and thereafter with a return interval of no more than 5 years.

Evaluation

A meeting will be held at JMBSF headquarters during 2009 to evaluate progress made during the first two years of restoration and to develop or modify plans for the coming year. All Action Items listed in this plan will be addressed. Those that have not been accomplished will be scheduled as Action Items in specific coming years. This meeting will consist of key staff from JMBSF, the Suwannee Forestry Center, the Forest Management Bureau and the Forest Resource Planning and Support Services Bureau.

Reforestation efforts will be judged based on the current State Forest Handbook criteria. Given the unusual restoration circumstances at JMBSF, it may be necessary to evaluate whether these are appropriate for restoration. Prescribed burns will also be subjected to post-burn evaluations as described in the State Forest Handbook.

John M. Bethea State Forest
Fire Management Plan

In the past eight years, the area now known as the John M. Bethea State Forest has seen several catastrophic wildfires burn onto and through the Forest. The Forest borders multiple large swamps (Pinhook, Impassable Bay and the Okeefenokee) which are major fire corridors in dry years. These swamps present significant fire control problems for the managing agencies and private landowners bordering the forest. Suppression efforts in these swamps are limited for several reasons, such as agency rules, equipment accessibility, fuel loading and fire behavior during these events.

As we develop a plan to re-establish our forest it must be accepted that time will be needed to fully realize the results of our efforts. Prior to State acquisition of this property it was managed with the primary focus of producing timber. This management practice has significantly altered the forest from what it is believed to have been many years ago. The result of this manipulation is a very homogeneous forest that will require intensive management and planning to achieve the desired future condition.

It has become readily apparent that a standard cookie cutter approach will not produce acceptable results in any program area of this forest. Therefore, we have established several committees to create plans and evaluate results that will allow this forest to withstand future fire onslaughts and thrive in this environment. This will require creative thinking and compromise throughout the organization over time.

A review of recent fire history demonstrates that fire management should be the central focus of any management strategy developed for the JMBSF. Without a centrally focused fire management plan, which is congruent with all other program areas, no single program area will be successful. *Understanding this is pivotal for successful development of future plans on the John Bethea State Forest.*

Goals -

- a. Develop a "Firewise" State Forest, providing opportunities for a defensible forest during dry years with the ultimate outcome of minimizing damage from catastrophic wildfires.
- b. Establish the fire return interval necessary to maintain the health and vitality of the ecosystems within the forest boundaries.

As we begin to develop the fire management plan, it is important to review the acquisition objectives for the property.

Fuels Management – This is crucial to meeting the overall goals of the fire management plan. History has shown managing fuels through prescribed fire, herbicide or mechanical means provides a greater probability of success during suppression actions and fire damage is greatly reduced overall. On JMBSF, we will need to apply all of these methods to manage fuel loading across the landscape with the overall intent of returning fire frequency to the appropriate level of two to four years.

John M. Bethea State Forest
Fire Management Plan

Prescribed Burning – A fire return interval of two to four years seems to be ideal in most areas of the forest. However, there are many areas (primarily heavy gallberry sites) that will need a fire return of less than four years to maintain fuel loads at an acceptable level. Adjusting this interval at the stand level is expected but this is a good overall target for most of the forest. Establishing this as our return interval (“ideal”) will require burning an average of 5,000 to 10,000 acres annually. Although this is a reasonable goal, it will be difficult to achieve during the initial years of implementation for several reasons. We discuss these reasons and our plan to mitigate them throughout this section.

Burning methods –

- ◆ Previous fuel loads dictated the majority of burning be accomplished through the standard method of hand ignition during daylight hours. This is labor intensive and generally slow burning method. The recent Bugaboo fire coupled with increased longleaf planting will allow for a more aggressive approach in the burning program, potentially increasing our total burn acreage. The fuel accumulations on the east side of the forest remain, presenting challenges when burning in these stands. These areas will be evaluated for potential night burning opportunities, as well as other initial fuel treatments, such as mowing, as a means to reduce fuel loads to acceptable levels, allowing for more aggressive burning.
- ◆ Ideally, the burning program will transition from the standard burning practice to more aerial burning as fuel loads are reduced and we become proficient with this more complex type of burning. This will be accomplished through training and planned cooperation with adjacent federal agencies.
- ◆ Develop and propose some specific burning parameter guidelines to submit for pre-approval through Forest Protection to minimize delays and increase burning opportunities overall.

Seasonal timing

- ◆ Due to historical fuel loads and containment concerns, growing season burning has not been accomplished. The fuel load reductions resulting from the Bugaboo Fire and additional longleaf plantations have created more opportunities to conduct growing season burns. Transitioning acreage, where appropriate, to growing season burns will increase the overall timeframe to meet the annual burning goals. Initially, this transition will provide the best opportunity to meet the ideal burn acreages.

John M. Bethea State Forest
Fire Management Plan

Strengthen Partnerships

- ◆ Continue to strengthen relationships developed with our neighbors, US Forest Service, US Fish & Wildlife, Rayonier and Langdale, through additional cooperative projects. These projects should include but not be limited to, road and bridge projects, boundary maintenance and burning across forest boundaries where it is mutually beneficial.

Training

- ◆ The continued development adjacent to the forest, increasing aerial and night burning projects, and multi-agency burns will result in more complex burn projects in the future. Training decreases the learning curve, facilitating the development of more confident and competent prescribed burners. Identify personnel across the Suwannee Forestry Center for advanced training in the planning, preparation, and execution of increasingly complex burn projects. Courses should include Inter-Agency Prescribed Fire, Complex Prescribed Fire and PLDO training at a minimum. A mentoring program should be established with sister State forests that currently have an established aerial ignition program, such as Tate's Hell and Withlacoochee State Forests. This will provide additional insight and experience for planning and safely conducting complex aerial burns.

Mechanical Treatments

- ◆ This practice should be conducted on sites where burning is currently impractical due to fuel loads or timber stand types. Mid rotation slash pine stands should be evaluated for this treatment due to long fire return interval and the risk of unacceptable mortality that could be caused by burning too early. Schedule mowed areas for burning within one to two years post treatment, eliminating artificial duff buildup. As an alternative, breaking these stands into smaller blocks and using backing fire should be considered.

Herbicide Applications

- ◆ Though herbicide application may be the least desirable fuel treatment, consideration for a site-specific application where ground cover is predominately gallberry is necessary. Additionally, younger Slash Pine stands should be evaluated for herbicide application to control vegetation prior to implementing a feasible burning rotation.

John M. Bethea State Forest
Fire Management Plan

Silviculture - This section provides general guidelines which if followed will assist in creating a “Firewise” forest in the future.

Reforestation- The Division has standard reforestation guidelines to follow when replanting on a state forest. These guidelines are generally consistent with accepted forestry practices providing a sound baseline to produce a valuable timber stand over time. These guidelines work very well in most places and have a proven record of accomplishment. However, the JMBSF is a unique situation that may require thoughtful application of reforestation guidelines and perhaps modification to the guidelines in some areas in order to protect the valuable timber already established, as well as on reforested acres.

Tree species selection

- ◆ As reforestation begins, every consideration should be given to planting longleaf when possible. This will provide early opportunities to re-introduce fire in the stand without allowing shrub vegetation to be reestablished. Additionally, the fire tolerant nature of this species will help to reduce timber damage when a wildfire does burn through the stand.
- ◆ Slash Pine is a less desirable selection due to difficulties with re-establishing fire in these stands, generally 10-13 years in wet flatwood sites. In these stands, early rotation mowing and/or herbicide applications may be necessary to facilitate fire return without unacceptable mortality from wildfire or prescribed burning.

Row spacing

- ◆ The standard row spacing should be at a 12 foot minimum, with 13 – 14 feet being ideal. This will optimize tractor operation during suppression activities while minimizing root damage caused by the fireline plow. However, this additional spacing creates problems when attempting to utilize existing beds during reforestation efforts.
- ◆ Leave 10 to 15 feet minimum (both sides) between the stand and any roads in the planting area. This increased width will provide greater opportunities for success during counterfire, burnout and holding operations conducted in suppression efforts. The increased grasses on the roadside will decrease the amount of time needed to establish a good baseline during prescribed fire operations, allowing for a safer burn and more efficient use of available resources.

John M. Bethea State Forest
Fire Management Plan

Open Areas

- ◆ Establish open areas periodically by not planting a row or two within larger interior stands and next to pre-established anchor points. Create open strips within a ½ mile of all boundaries, specifically those adjacent to fire corridors (major swamps). Orientation of these strips will be determined prior to planting and harvesting operations. These open areas may be used as food plots, wildlife corridors/openings and fire breaks during suppression activities. Proper maintenance for these strips will be harrowing prior to fire season or prescribed burn operations and mowing as needed to minimize shrub encroachment and enhance native wildlife browse.
- ◆ Evaluate the feasibility of creating 30 – 50 foot open areas around all major bays such as Pinhook and Impassable, effectively establishing a swamp edge break around historical fire corridors. Any established breaks in these areas will be harrowed flat not to create any further hydrological issues.

Row Orientation

- ◆ Row orientation in reforested areas should be perpendicular to major fire corridors. For example north and south of SR 2 and the railroad track pines need to be planted generally east and west within ½ mile on both sides. This particular location will be one of the major anchor points created on the forest. Further discussion regarding anchor point development is in the Wildfire Operations section.

Timber Harvesting

- ◆ Thinning is perhaps the most important method to increase the probability of success during suppression activities and to prevent the loss of timber and ecological resources due to wildfires. At least in the beginning of this plan, preference and emphasis will be given to third-row thinning especially in stands of a younger age class. The reason is that this method will allow the thinning of a greater number of acres and is less dependent on manpower availability. Thinning using selection methods in older stands will be tested during the first few years of the plan to determine the feasibility of this approach (see Silviculture Plan). These methods can thus be carefully evaluated and monitored to determine if they create more breaks within the stand when compared to a row thin, if they create better access throughout the stand, and if the uniform canopy reduction can reduce the potential for major crown fire runs. These potential advantages can

John M. Bethea State Forest
Fire Management Plan

then be evaluated to determine whether a balance can be reached with the ability to achieve long-term silvicultural goals and costs of conducting selection thinnings. Reducing the probability of extreme fire behavior and increasing overall firefighter safety, especially when traveling across the rows as compared to within the rows, are primary objectives for all these thinning operations.

- ◆ Historically, thinned stands have decreased mortality rates after a wildfire burns through when compared to unthinned stands. The thinning operations that are currently in progress will help to control vegetation, re-establish fire return intervals and reduce potential losses during future wildfire events. Thinned stands will be placed on the burning rotation and burned within two years of thinning being completed.

Road Considerations

Primary Road Network

- ◆ Work with Baker County officials to develop better maintenance schedules and possibly pursue potential grant funding to enhance the major county grades bisecting the forest.

Secondary Road Network

- ◆ Increase width of all secondary roads by 10 feet on each side, with the standard being a minimum of 30 feet, tree line to tree line.
- ◆ Ensure road network is correctly and permanently marked and develop a marking scheme identifying all dead end roads.
- ◆ Create turn around spots along all dead end roads; distance between turnarounds will be based on road length.
- ◆ Completing these items will increase safety of firefighting personnel, reduce response times, provide clearer direction for outside personnel assisting during major wildfires and increase burnout and holding options. Additionally these enhancements will create additional breaks for use during prescribed fire operations, creating opportunities for more efficient use of available resources.

John M. Bethea State Forest
Fire Management Plan

- ◆ Evaluate industry standard map books to determine applicability, scale and detail needed for state forest management.

Wildfire Planning Considerations - Fires over the last ten years have provided opportunities to hone our firefighting skills. We have developed outstanding working relationships with cooperators in the area, readily assisting each other during trying times. We have safely battled major wildfires with multiple agencies, private landowners, and industry personnel all with different experience levels, equipment, and fire fighting strategies. We have become well versed in establishing and maintaining this type of network, minimizing potential conflicts when the big fire breaks. Firefighters in this area are as good initial attack firefighters as you will find anywhere in the state and country. An area needing some fine-tuning is the transition from initial attack to extended and reinforced attack. The development of a fire management plan will assist with this transition and provide the framework for decision making during future fire events.

Established Baselines – These baselines will be established along major roads bisecting the forest, effectively breaking the forest into zones or quadrants. These quadrants can then be used to assist in determining trigger points (predetermined action based on current or expected events) for future wildfires. The first ½ mile on each side will be intensively managed to provide the greatest potential of success in controlling any major wildfire. These areas will incorporate many if not all of the ideas mentioned throughout the plan, to include decreasing the fire return interval to two years.

- ◆ These areas have been selected by Resource and Operations personnel with intimate knowledge of fire history, behavior, suppression tactics and resource planning knowledge.
- ◆ Maintenance work on these areas will be identified in the forest's annual action plan and conducted primarily by Operations personnel.
- ◆ Location considerations were included but were not limited to major roads, interior forest roads that traverse the entire forest, major breaks or open areas developed around major fire corridors.

i. Trigger Point Development

- ◆ Develop course of action based on fire location, expected fire weather, fire behavior, and resources available for each anchor point on the forest. This should be used as a guide when making strategic and tactical decisions within or in proximity to the forest.

John M. Bethea State Forest
Fire Management Plan

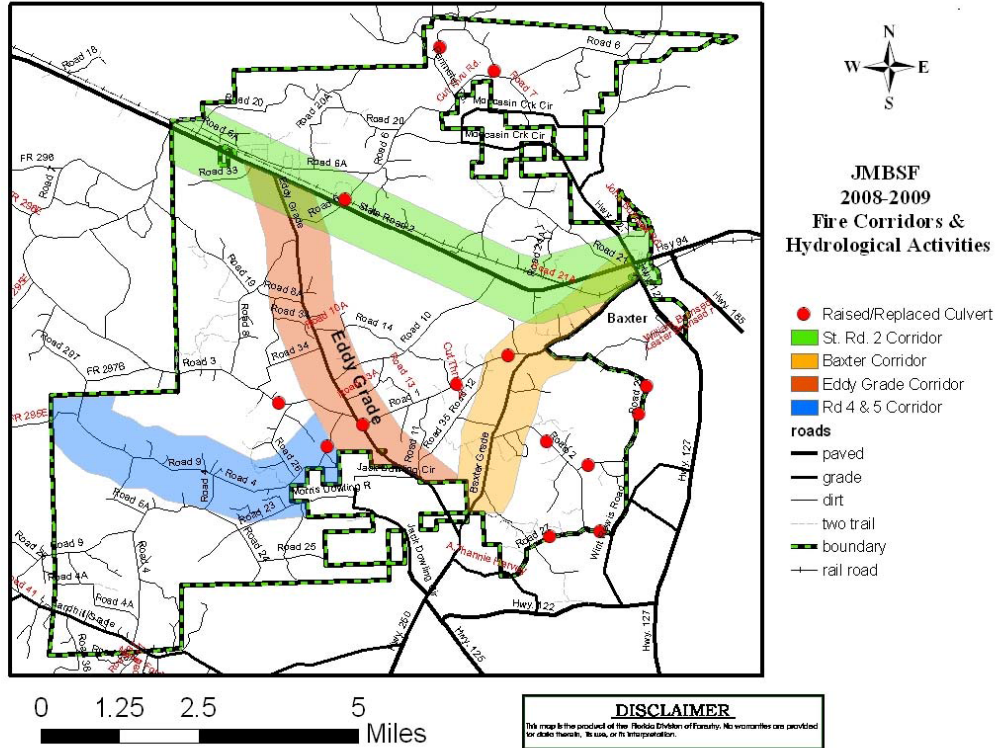
j. *Resource Utilization*

- ◆ Develop tiered personnel management strategy assigning specific roles and responsibilities to assigned personnel, implemented during any major operations such as wildfire or large prescribed fire.
- ◆ Develop resource requirement lists for fire events; consider holding, burnout operations and suppression activities. Completing some minor modifications and this could easily transfer to the burning program.
- ◆ Relocate Su 52/53 from Taylor to the Pinhook Fire Station at the JMBSF headquarters.

Discussion Items:

1. Identify stands which should be considered in rotation and prioritize these stands for future burning. Development of priorities should consider stand location (proximity to major swamps and boundary), stand type and burn history. We do not need to lose what is currently in rotation!
2. Increased burn acreage and maintenance issues created by development of open areas etc...throughout our forest will strain the limits of our current workforce. Look at staffing requirements, current structure and personnel management issues. Develop courses of action based on current and ideal staffing. Consider all options for increasing burn opportunities.
3. Improve weather monitoring system or better utilize available systems.

John M. Bethea State Forest
Fire Management Plan



John M. Bethea State Forest
Fire Management Plan

Action Items:

1. Relocate Su 52/53 from Taylor to the Pinhook Fire Station at the JMBSF headquarters. Complete.
2. Identify stands which should be considered in rotation and prioritize these stands for future burning. Complete.
3. Identify personnel in the Suwanee Forestry Center for advanced training in the planning, preparation and execution of aerial burning and in complex prescribed burning projects. Complete, still need to execute some of the training.
4. Identify stands on the east (unburned) side of the forest with
 - a. Potential for night burning. Identification complete, burning has commenced.
 - b. Potential for other fuel treatments.
5. Identify stands suitable for growing season burning. In Progress
6. Hold a meeting with potential partner agencies to discuss fire management strategies, cooperative projects, restoration, road and bridge projects, boundary maintenance and burning across forest boundaries. In Progress, working with USFWS and GOAL.
7. Conduct both row thinning and selective thinning and compare the efficacy and efficiency of the methods. In Progress, all stands in thinning window will be complete by close of FY08-09.
8. Refine map of potential open (nonreforested) areas along major roads and in the vicinity of boundaries. Fully develop a baseline open area along at least one of the major road corridors in the forest. In Progress.
9. Increase width of select secondary roads by 10 feet on each side; if initial results are promising, develop plan for accomplishing this on a wider group of secondary roads. In Progress.
10. Develop road marking scheme that identifies dead end roads. In Progress.
11. Create turn-around spots on dead end roads that can accommodate DOF equipment. In Progress.
12. Evaluate industry standard map books to determine applicability, scale and detail needed for state forest management. In Progress.
13. Improve weather monitoring system or better utilize available systems. In Progress.

John M. Bethea State Forest
Fire Management Plan

14. Evaluate mid-rotation slash pine stands for the potential use of mechanical fuel reduction treatments such as mowing and chopping prior to prescribed burning.
15. Evaluate slash pine stands for the potential of use of herbicides to control vegetation prior to implementing prescribed burning.
16. Evaluate the feasibility of creating 30 to 50 foot open areas that are harrowed around major bays, such as Pinhook and Impassable.
17. Meet with Baker County officials to develop better maintenance schedules and possibly pursue grant funding to enhance the major county grades bisecting the forest.
18. Develop a fire management plan that addresses the transition from initial attack to extended and reinforced attack, and provides a framework for decision making during future events.
19. Develop course of action based on fire location, expected fire weather, fire behavior, and resources available for each anchor point on the forest to be used as guide (trigger points) when making strategic and tactical decisions.
20. Develop tiered personnel management strategy assigning specific roles and responsibilities to assigned personnel, implemented during any major operations such as wildfire or large prescribed fire.
21. Develop resource requirement lists for fire events; consider holding, burnout operations and suppression activities.

John M. Bethea State Forest
Post-2007 Bugaboo Fire Hydrological Restoration Plan

INTRODUCTION

In May 2007 the wildfire event known as the “Bugaboo Fire” burned over 120,000 acres in northeast Florida, including over 29,000 acres of the John M. Bethea State Forest (JMBSF) in Baker County. While the fire consumed over 70% of the standing timber in the forest exposing the forest floor to direct impact from rainfall; fire suppression efforts further exposed soil and road structures to erosion and degradation.

Additionally, the current salvage timber harvesting operations are impacting roads and water management structures that may ultimately have a long term impact on the hydrological integrity of the forest.

The JMBSF, acquired by the State of Florida in 2001, has been vulnerable to wildfire events over the years but in the recent past several major fires (the “Friendly Fire” in 1999 and the “Impassable Bay Fire” in 2004) have resulted in the loss of tens of thousands of dollars in timber revenue.

Consequently, the Division of Forestry is developing methods and forest management practices to make JMBSF more “resistant” to devastating affects of wildfires by taking a comprehensive look at various aspects of the forest’s management, such as planting row/drill orientation, species composition, and, as this document reports, hydrologic restoration.

PURPOSE

A Hydrological Evaluation and Assessment Team (“Team”), made up of four individuals from the Hydrology Section in the Forest Resource Planning and Support Services Bureau, conducted a field assessment from July 27 – August 1, 2007. The team was assigned the task of looking at existing roads, firelines and water control and drainage structures on JMBSF to determine their influence on the hydrology of the forest.

Based on their observations in the field the team has developed this Hydrological Restoration Plan with the objective of identifying priority “at risk” areas and provide guidance by recommending management practices that would restore both the hydrology and hydroperiod within the area affected by the Bugaboo Wildfire.

METHODOLOGY

The Team divided the entire forest into four quadrants, Northeast (NE), Southeast (SE), Southwest (SW), and Northwest (NW), and each team member assessed one quadrant. Because most of the burned area lay in the north and western portions of the forest the SE was combined with the SW Quadrant ([See Attachment 2, Map 1](#)).

John M. Bethea State Forest
Post-2007 Bugaboo Fire Hydrological Restoration Plan

Each Quadrant was assessed using a GPS unit and standard Assessment Form developed specifically for this project. Each assessment point was located by lat./long. (for mapping purposes) and described by identifying type of structure and condition or status encountered, proposed remedy for problematic situations, and priority in terms of hydrological improvement. ([See Attachment 1](#))

The Team identified **12** Hydrological Priority Areas on the Forest, which are listed below by Quadrant and team member responsible for assessing the area. The findings and recommendations for restoration for each Priority Area are discussed in detail in this Plan. ([Refer to Maps 2-5 of Attachment 2 and Attachment 3](#))

The **NE QUADRANT** was assessed by G. Marshall and earlier by T. Gilpin during a separate Wetland Restoration Needs Assessment and revealed the following Priority Areas:

- 1) St. Mary's River/Bugaboo Pushed Fire Break Area, 2) Okefenokee Swamp Fire Break/Perimeter Road Area, 3) Perimeter Road/ "Cut Through" Road/ Road 6 Area, 4) Bugaboo Pushed Fire Break/Road 21/Moccasin Swamp Area, and 5) Moccasin Creek Area ([See Attachment 2, Map 2](#))

The **NW QUADRANT** was assessed by T. Gilpin and had the following Priority Areas:

- 1) Road 20/ Okefenokee Swamp Fire Break Area, 2) Road 6/ Railroad Track Area, 3) "Potato Patch" Firelines, and 4) Interior Road Areas ([See Attachment 2, Map 3](#))

The **SW/SE QUADRANTS** were assessed by L. Barnwell and R. Lima and revealed the following Priority Areas:

- 1) Pinhook Swamp Area, 2) Moccasin Swamp Area, and 3) Little River Bay Area ([See Attachment 2, Map 4](#))



Photo 1: Plowed Fireline connected to Moccasin Creek

John M. Bethea State Forest
Post-2007 Bugaboo Fire Hydrological Restoration Plan

GENERAL OBSERVATIONS

The Team mapped a total of 228 waypoints, identified and evaluated a total of 192 structures, 186 of which fell within a priority area. Findings included 37 Above- and Below-Grade Roads (AGR/BGR), 16 culverted stream/drainage crossings (CX), 28 improved low-water crossings (LWX), 29 bridges, approximately 7 miles of field drainage ditches (DCH), and over 100 miles of road ditches (RD) and firelines (OFL/NFL), including approximately 2.5 miles of new pushed firelines (PL).

It should be noted that some areas covered in this assessment have historically been wetter but are now drier as a result of land management practices implemented by previous land owners over the last 50+ years. Consequently, these sites currently support artificially regenerated pine plantations and plant communities adapted to drier sites.

In addition, it should be understood that the intention of this Plan is to provide information and offer guidance in the re-hydration of parts of the forest impacted by previous land management activities in an effort to mitigate wildfire affects on JMBSF. If these recommendations are followed some of those sites may be wetter, more closely resembling their natural historical condition.

Finally, it should be noted that prior to the implementation of the recommendations offered in this plan the property should undergo a more thorough assessment involving state-of-the-art elevation mapping (LIDAR) and hydrological modeling to determine all potential off-site impacts. This is particularly critical for those areas bordering private properties adjacent to the state forest.



Photo 2: Service Road channeling surface flow into Road 20 ditch

John M. Bethea State Forest
Post-2007 Bugaboo Fire Hydrological Restoration Plan

**FINDINGS/RECOMMENDATIONS
NORTHEASTERN QUADRANT**

Field Assessment By
Greg Marshall

(See Attachment 2, Map 2)

The Northeast Quadrant of JBSF consists of wet flatwoods, mesic flatwoods, floodplain forest, basin swamps, dome swamps and basin marshes (JBSF Stand map). Most of the area has been drained and converted to pine plantation over the last 50 years. Otherwise the dominant ecological community would likely be wet flatwoods and basin swamps.

The drainage in this quadrant flows from the north through Cross Branch which flows out of the Okefenokee Swamp to the north; from the west through Lake Holes Branch out of the Lake Holes Swamp; and from the south from Moccasin Swamp to Moccasin Creek. Much of the water in the area flows into Moccasin Creek which flows southeast into the St. Mary's River. Plowed lines, pushed firelines, ditches, roads, and plantation rows disrupt the natural hydrological pattern in the area.

The road network in the quadrant consists of several primary forest roads (Rd 6, Rd 7, Rd 21, Perimeter and 'Cut-Thru' Roads) and numerous secondary roads. All of the roads included in this assessment need improvements and maintenance such as replacing, cleaning and removing culverts; adding armoring material to low water crossings; raising low water crossings and culverts; installing turnouts at bridge approaches; and re-pulling road ditches.

Firelines and push lines are another concern on the forest and need to be addressed. The majority of these lines are draining the water directly to road ditches which is accelerating the drainage of the area. These lines can be found along stand edges (swamps and hills) and through ponds and plantations. These lines need to be plugged in order to allow the water to recharge in the forest.

However, from a hydrological standpoint, listed below are several key areas of concern that need to be considered high priority:

4. ST. MARY'S RIVER/BUGABOO PUSHED FIRE BREAK AREA
(Bugaboo Waypoint # 154, 216-218)

The condition of this spot has improved somewhat since the fire. The woody debris has been re-distributed to some extent and the flow of the waterbody has resumed a somewhat natural pattern. To try to do more at this point would create more negative impact than positive. **Recommend monitoring for degradation.**

John M. Bethea State Forest
Post-2007 Bugaboo Fire Hydrological Restoration Plan

However, some old firelines tie directly or indirectly into the Pushed Line from the north. **Recommend ditch plugs where surface flow is being re-directed and channeled into the St. Mary's River or its flood plain.**

The Bugaboo Pushed Fireline, though effective in cutting off fuel to an open run of a wildfire, leaves soils exposed, potential for channelization, as well as a berm of debris and soil which impedes natural sheet flow across a landscape. In this case, where the pushed line ties directly into the St. Mary's River water quality may be impacted by sediment discharge. **Recommend elongated ditch plugs or high water bars where surface flow is being re-directed into the St. Mary's River floodplain; rehab pushed fireline by either pulling berm back into open area or breaking wide "holes" in berm and maintain open as a fire "safety lane" in which only grasses or low groundcover vegetation is encouraged.** * *This should be done as soon as possible, before the site is overgrown with mid-story vegetation*

5. OKEFENOKEE SWAMP FIRE BREAK/PERIMETER ROAD AREA
(Bugaboo Waypoint # 172)

The forest's north boundary lies adjacent to the "Okefenokee Swamp Break" (a 30-ft. wide firebreak). In several places along its route the swamp break traps water and redirects flow during the wet season. Where practical, and without creating a problem for our neighbor to the north, **Recommend installing ditch plugs at all points where the swamp break intersects with roads, firelines and "potato patch" lines leading onto the State Forest.**

Observations:

- On a secondary road north of the intersection of Road 6 and Perimeter Road in the northeast portion of the forest surface drainage from the swamp break has overtopped a damaged 18" metal culvert and caused erosion to the east. The water ultimately flows to a drain that contributes to the St. Mary's River. **Recommend replacing the culvert with the same size, thus avoiding the necessity of acquiring a Noticed General ("Jiffy") Permit from St. John's River Water Management District (SJRWMD).**

6. PERIMETER ROAD/CUT THROUGH/ROAD 6 AREA
(Bugaboo Waypoints #195, 196, 197, 199, 223, 225)

This area lies adjacent to the north forest boundary and is influenced by the Okefenokee Swamp Break, particularly during lower water levels when the water is trapped or channeled by the swamp break and forced to flow south into the State Forest. **Recommend removing "Cut-Thru" Road if deemed unnecessary to operations; if "Cut-Thru" remains, provide additional conveyance either with culverts or elevated low-water crossings on both Perimeter and "Cut-Thru" Roads to slowly encourage flow through the area.**

John M. Bethea State Forest
Post-2007 Bugaboo Fire Hydrological Restoration Plan

Observations:

- On the north portion of Perimeter Road, close to the north forest boundary, the water is impounding on the north side of the road. This water needs to be slowly redirected across the road through elevated low water crossings.
- “Cut Thru” Road is acting as a dam and the water is impounding on the north side. The water can be redirected along the road and conveyed under Perimeter Road to Lake Holes Branch during high water periods by replacing the culvert and installing an elevated low water crossing. If another low-water crossing is in close proximity to this location that one should be elevated. Also, an elevated low water crossing can be installed on “Cut Thru” Road to encourage the water south at high periods. Caution needs to be taken as water can be redirected onto adjacent landowners.
- On the west side of the loop, on both sides of Perimeter Road, a basin marsh site exists that is important to restore to its natural plant community.
- Previous industrial landowner(s) delineated timber stands and, effectively, wetland plant communities, by plowing or blading shallow firelines around their peripheries and tying them into nearby road ditches. Over time some of these lines have eroded to an extent which causes significant surface water channelization during storm events and in some cases draining wetlands.

7. BUGABOO PUSHED FIRE BREAK/ROAD 21/MOCCASIN SWAMP AREA
(Waypoints #174 & #154)

There are two large pushed firelines that were a result of the Bugaboo Fire that need to be rehabbed as soon as practical and maintained. These lines need to be rehabbed by leveling and spreading grass seed in order to stabilize the line. If this is not achieved the lines will continually accelerate the drainage causing an erosion problem in the future. If the lines are not maintained after rehab the open areas will become overgrown with vegetation and once again become a fire danger. If the lines cannot be maintained the lines need to be chemically treated to control woody vegetation and then planted with slash pine. **Recommend immediate rehab effort by either pulling berm back into open area or breaking wide “holes” in berm and maintain open as a fire “safety lane” in which only grasses or low groundcover vegetation is encouraged. * This should be done as soon as possible, before the site is overgrown with mid-story vegetation.**

Observations:

- A section of the road within the Pushed Fireline, near the forest boundary in Section 35, has a small berm on each side, channelizing water within the road and impeding natural flow (**Photo # 3**). The road edges should be disked to permit flow across the travel lane. Some areas of the road may need armoring with rock, tile or other suitable material.

8. MOCCASIN CREEK AREA
(Bugaboo Waypoint #s149, 161-163, 204)

This area may need additional hydrological assessment to identify potential off-site impacts resulting from restoration efforts. A number of private properties exist adjacent to the forest in this area so residents should be notified of any restoration activities occurring there. New firelines that tie into Moccasin Creek and road ditches need to be plugged to

John M. Bethea State Forest
Post-2007 Bugaboo Fire Hydrological Restoration Plan

prevent wetland drain and water pollution. **Recommend ditch plug on south end of fireline near SW curve of Moccasin Creek Circle and on north end at the creek itself; immediately remove debris from ingress of culverts on Moccasin Creek on W Moccasin Creek Circle.**

Observations:

- A secondary road the runs south off of Road 6 along the edge of a basin marsh. The road is accelerating and redirecting the drainage of the area. The area is low and the water flows west towards Moccasin Creek. This area has great potential for ecological restoration.
- The north east portion of a secondary road located on the northwest side of Moccasin Swamp needs to be removed (closing it off will not keep ATV's out) since it is underwater and it does not provide benefit for land management operations.
- The water flows southeast across the road towards Moccasin Creek.
- New fireline ties directly into Moccasin Creek from secondary road leading southwest from Moccasin Creek Circle; road being used as loading area for logging operation (**Photo #1**).



Photo 3: “Bugaboo” Line showing road trapping & channeling surface flow and berms associated with line construction.

John M. Bethea State Forest
Post-2007 Bugaboo Fire Hydrological Restoration Plan

**FINDINGS/RECOMMENDATIONS
NORTHWESTERN QUADRANT**

Field Assessment By
Tom Gilpin

(See Attachment 2, Map 3)

9. ROAD 20/ OKEFENOKEE SWAMP FIRE BREAK AREA

(Bugaboo Waypoint #s 123-125, 128-131, 133,138)

This part of the forest tends to remain wetter than other parts of the forest, being so close to the Okefenokee. Road 20 runs east-west, following a “ridge” of high ground – mesic and wet flatwoods - and is the primary access to this area. It was constructed at grade for most of its length but has ditches on both sides and is elevated above grade in numerous places to provide drier access.

In general, surface drainage appears to flow north, except where the road ditches or firelines intercept and re-direct it (**Photo #2**). At the time of this assessment the Division Road Crew was working on Road 20 – re-shaping the road bed, replacing culverts and making improvements to the low-water crossings – in response to traffic damage incurred after the fire. Their progress, however, was slow, and has since ceased altogether because of the extremely wet conditions.

As in other parts of the forest basic road maintenance is needed: several culverts and low-water crossings need to be improved or re-worked. Also, several dips in the road need to be made low-water crossings to provide continued flow.

If the intention is to re-hydrate parts of the forest that have burned in recent fires: **Recommend major effort in relocating, elevating, and/or removing crossings on Road 20 to slow rate of surface drainage to the north. Several culverts can be replaced with elevated low-water crossings, armored with rock or other appropriate material.**

Observations:

- On the western end of Road 20 new road work has been done and early traffic is beginning to rut the roadbed. Access to road should be restricted once the salvage logging is complete until road can stabilize.
- Western end Road 20 impedes surface flow and forces flow northeast along its eastern ditch. **Recommend installing additional conveyance, either cross-drain culvert or low-water hard-surface crossing to encourage flow to west side road ditch.**
- Some old firelines tie directly into road ditches. **Recommend installing ditch plugs at these locations just outside the road ditch.**
- “Potato patch” lines perpendicular to the western end of Road 20 are cut off from the ditches by a secondary plow line. However, these lines themselves are tied to nearby drains or other firelines and are re-directing flow, in some cases accelerating drainage. **Recommend re-evaluating these lines and install ditch plugs where needed.**

John M. Bethea State Forest
Post-2007 Bugaboo Fire Hydrological Restoration Plan

10. ROAD 6 / RAILROAD TRACK AREA

(Bugaboo Waypoint #s 140, 141)

Several old ditches installed by previous landowners to purposely drain wetlands exist on the forest. Many are deep, wide structures, but most are like the one found here, 2-3 feet deep and 6-8 feet wide. Most are covered by dense shrubby vegetation and are difficult to locate on an aerial photograph. Since this area burned in the Bugaboo Fire the spoil pile are accessible. **Recommend filling the ditch as much as possible with remnant spoil along the ditch, effectively plugging the drain to the wetland.**

Observations:

- Old drainage ditch extends from west side of Road 6 about 10 chains into a dome swamp, effectively draining it.
- Ditches adjacent to old woods road leading into an old burn area parallel to the railroad track still transport water from the bay swamp west. Ditch plugs needed.

11. "POTATO PATCH" FIRELINE AREAS

(Wetland Restoration Assessment Waypoint #s 122-126, 132-133, 139, 142)

Due to the high fire activity in the past many of the flatwoods pine plantations have firelines pulled down their rows ("potato patch"). Initially, the potato patch lines are pulled down every third or fifth row but over the years, as the practice is repeated, the lines are shifted to another, un-plowed row. Ultimately, in some areas, every row ends up being plowed. In areas where these rows tie into road ditches and/or firelines the surface drainage is accelerated, altering the hydroperiod of the site. **(Photo # 4)**

Since DOF typically does not implement the practice of "bedding" when planting state forest lands, it is anticipated that drainage from planted sites will ultimately revert more or less to a natural sheet flow pattern across the landscape in the future.

At the present time most of the "potato patching" that is altering the hydrology on JMBSF occurs adjacent to the primary roads in the northern part of the forest (Roads 6, 6A, 7, 20, and Perimeter Road); many of the plantations in which they occur are either being salvaged now or will be harvested with the next 5 years.

- In those areas being cut now and which will be machine planted: **Recommend plowing lines within the plantation area perpendicular to the row direction after planting. The length of these plow lines should not be extensive but should be between the crest of the "hill" and the road ditches, wetlands, and/or firelines. It is important not to connect these lines to a swamp or an existing line or ditch.**

- Where re-planting will be done by hand: **Recommend plowing lines within the plantation area perpendicular to the row direction before or after planting. The length of these plow lines should not be extensive but should be between the crest of the "hill" and the road ditches, wetlands, and/or firelines. It is important not to connect these lines to a swamp or an existing line or ditch.**

John M. Bethea State Forest
Post-2007 Bugaboo Fire Hydrological Restoration Plan

-In those areas where a final harvest is not scheduled within the next 5 years: **Recommend re-pulling road ditches with an emphasis on creating a berm to stop or at least minimize the drainage from the plantation.**

12. INTERIOR ROAD AREAS

(Wetland Restoration Assessment Waypoint #s 153,194, 172, 174)

Forest road construction, more than any other forest management activity, can affect water movement on a tract of land with as little topographic relief as JMBSF has. Under normal circumstances, where natural hydrology is impeded by above grade roads, the solution is to remove all or part of the road to improve flow.

Although JMBSF doesn't have any roads that run above grade their full extent, there are a considerable number of above-grade sections of road that significantly affect the hydrology of the forest. However, on JMBSF the objective is to lengthen the hydroperiod to minimize the amount of water draining from the area, thus reducing the risk of destructive fire events. Consequently, there are very few recommendations for road closures in this plan.

Recommendations made in this Restoration Plan, if followed, should re-hydrate many areas of the forest where secondary and tertiary roads will become flooded and less desirable for traffic. The State Forest management team should be aware of any undesirable hydrological changes that interfere with management objectives by flooding important forest roads.

**FINDINGS/RECOMMENDATIONS
SOUTHERN QUADRANTS**

Field Assessment By
Lee Barnwell and Roy Lima

(See Attachment 2, Map 4)

Critical areas of impact south of Highway 2 were noted in three separate quadrants: 1) the area west of Eddy Grade to the property line encompassing Pinhook Swamp and associated forest roads; 2) the area between Eddy Grade and Baxter Grade encompassing Moccasin Swamp; and 3) the area southwest of Eddy Grade involving Roads 3, 4, 9 and 26 and encompassing Little River Bay.

1. PINHOOK SWAMP AREA, WEST OF EDDY GRADE

[Bugaboo Waypoint #s 22, 23, 78-81 (Lima); 150-152, 159-160 (Gilpin)]

Generally speaking, the existing water control structures (i.e. low water hard surface crossings, culvert crossings, and bridges) are in fair-to-good condition. However, Eddy Grade, the primary access in the southwestern part of the forest, impounds surface flow where it is above grade, and is subject to flooding where it is at- or below grade. Additional conveyance is recommended through culvert replacement or improvement.

John M. Bethea State Forest
Post-2007 Bugaboo Fire Hydrological Restoration Plan

Eddy Grade, with open access by the public, particularly on the south end of the road, is a county road. Baker County holds a 100-ft right-of-way easement and is responsible for maintenance. ** Any reparations or maintenance work recommended for Eddy Grade in this Plan must be coordinated with the county.*

It appears that surface flow in an area along and at the end of Road 33 south of SR 2 is being accelerated by the road ditch which extends into a wetland. According to aerial photographs and industry type maps this area was historically wetter than it is now, and would flow south under Road 19 into Pinhook Swamp. Two metal culverts and a Low Water Crossing provide conveyance on Road 19. However, one of the culverts is badly damaged and essentially nonfunctional. **Recommend replacing the damaged culvert on Road 19, remove the western section of Road 33, and plug the south ditch from where Road 33 turns NW.**

Observations:

- The north-south orientation of Eddy Grade occasionally impounds the flow of water from west to east.
- Several culverts are in poor condition and should be replaced with like diameters.
- Existing road conditions are degrading near low lying areas due to timber salvage operations and truck traffic.
- Existing culverts along Eddy Grade appear to be in good condition and functioning satisfactorily. However, several waypoints were noted where flow patterns across the road dictate additional road work or perhaps Low Water Crossings should be installed. Road washouts and vehicular traffic is a concern.

2. MOCCASIN SWAMP AREA, S. OF SR 2, BETWEEN EDDY GRADE, & RD 10
(Bugaboo Waypoint #s 4, 6, 8-69)

The greatest concern for hydrological restoration occurs within this area of the forest. Moccasin Swamp occupies a very large area on both sides (north and south) of Highway 2. The general surface water flow into Moccasin Swamp is from the south and east. Problems were observed where existing above-grade roads, Road 10, in particular, serve as impediments to the natural direction of flow. Conveyance under Road 10 is inadequate, both in number of and capacity of structures. Here the team observed that while one side of the swamp was hydrated, the other remained dry. **Additional conveyance under Road 10 is recommended to equalize the hydrology on both sides of road.**

Observations:

- Road 10 from Highway 2 to the intersection of Eddy Grade is a high priority item. The general flow is from the southeast to the northwest into Moccasin Swamp. Two concrete bridges were noted and are in good shape. Two existing Low Water Crossings are functional but need additional rock or other inert material, especially along both approaches to the wetland drain. The four crossings on this road seem to be inadequate - Road 10 is an above grade fill road constructed through the southeast one-third of Moccasin Swamp and impedes flow into Moccasin Swamp.
- The flow along Road 14 is southwest to northeast into Moccasin Swamp. Four Low Water Crossings were found to be in similar condition, all requiring improvements such as additional rock in the channel and along both of the approaches.

John M. Bethea State Forest
Post-2007 Bugaboo Fire Hydrological Restoration Plan

3. LITTLE RIVER BAY, SW OF EDDY GRADE, TO WESTERN FOREST LINE
(Bugaboo Waypoint #s 74-76, 59, 61, 64-65)

This area, though burned in the Bugaboo Fire, had much of its fuel load reduced dramatically in the Impassable Bay Fire. For the most part, this area of the forest, seems to be least impacted from a hydrological standpoint. Most of the structures encountered in this area remain intact. However, the hydrology in several areas on the western extreme of the forest is being affected by old firelines draining wetlands and/or re-directing surface flow.

Recommend plugging firelines prior to intersecting with road ditches.

Fire suppression and logging traffic has severely degraded some roads in this area, primarily Road 24, Road 4 and the lower part of Eddy Grade. Where surface drainage connects with primary water arteries during the rainy season water quality may be an issue.

Recommend re-working roads and stabilizing with armoring if continued use is anticipated; with vegetation, if not.

Observations:

- Direction of flow north of Road 3 is to the east from Pinhook Swamp toward Moccasin Swamp.
- Surface water flows south from Road 3 into Little River Bay. Existing bridges are in good shape.
- Flow continues south under Road 4 into Gum Swamp and Gum Swamp Creek. Culverts, bridges, and LW crossings are in good shape.
- There is a need for road work along a stretch on Road 24 between Road 4 and Road 25. Two wallowed/rutted spots have occurred at waypoints 064 and 065 on Road 24; perhaps due to logging truck traffic. Installation of several LW crossings is recommended.
- The extreme southwest portion of the forest west of Road 4 has flow problems. Waypoints 075 and 076 are old firelines that tie into Road 9 and should be plugged.
- Waypoint 077 is a ditch and should be plugged. This should help retain water within existing isolated wetlands north and south of Road 9.
- Established LW crossings are functioning satisfactorily. However, several were observed that need improving. **Improvements such as adding rock (slag, tile, etc.) along both sides of the approaches in addition to the channel itself.**

John M. Bethea State Forest
Post-2007 Bugaboo Fire Hydrological Restoration Plan



Photo 4: “Potato Patch” Fireline Re-Directing surface flow into Road 6 Ditch

SUMMARY

(See [Attachment 2, Map 5](#))

Any comprehensive effort to restore the hydrology on John M. Bethea State Forest should take into consideration the Division’s land management objectives and any long-term off-site impacts since there are private properties adjacent to the forest.

Road and structure maintenance on the primary roads on JMBSF is imperative for continued land management activities. Salvage logging operations, although slowed by recent rains, may continue for the next month, so road maintenance should be a priority for the forest management team, including reinforcing low-water crossings, repairing or replacing culverts, and reshaping road beds. As soon as practical after salvage operations cease road beds and shoulders should be stabilized in an appropriate and expedient manner.

Also, as soon as possible, the Bugaboo Pushed Firelines should be rehabbed and reworked to restore sheet flow across those lanes. Roadways that are trapping, channeling, and re-directing surface drainage should be reworked by disk or blade before erosion and sediment discharge into waterbodies and wetlands occurs.

John M. Bethea State Forest
Post-2007 Bugaboo Fire Hydrological Restoration Plan

New firelines that tie into road ditches, pushed lines, waterbodies, or wetlands should be blocked with soil plugs just above the discharge point, outside of any SMZ or wetland edge.

Older firelines and drainage ditches should be plugged to prevent accelerated flow out of the system or wetland drain.

“Potato patch” firelines can be dealt with at the time of final timber harvest. “Cut-off” lines should be pulled perpendicular to the direction of the beds, between the break of the “hill” and the discharge point, being careful not to tie these lines into other channels such as old firelines, wetlands or road ditches. In those cases where the “potato patch” lines must be dealt with before final harvest, it may be practical to re-pull the road ditches, provided that enough soil is available to create sufficient berms to plug the ends of the lines.

Many of the existing culverts and low-water crossings on the primary roads, particularly Roads 6, 20, Perimeter, and Eddy Grade Roads, should be elevated to slow the flow of surface water exiting the forest. Sections of the Eddy Grade Road need to be reinforced with fill and armoring material, especially in the Little River Bay area. Any work on the Eddy Grade Road will require the cooperation of Baker County since is a county-maintained roadway.

Finally, any expanded fireline that is left intact as a fire “safety lane” should be maintained in such a way that surface flow during the wet seasons is maintained as naturally as possible.

ACTION ITEMS
(By Priority Area)

(See Attachment 3)

1. Moccasin Creek Area (NE)

1a. - West Moccasin Creek Circle (Wypt. #211-213): *Immediately* remove debris from ingress end of double culverts on Moccasin Creek.

1b. - Near SW curve of Moccasin Creek Circle (Wypt. #147-148): Install ditch plugs on both ends of fireline - south end near secondary road and north end at Moccasin Creek.

2. St. Mary’s River/Bugaboo Pushed Fire Break Area (NE)

2a. - Bugaboo Pushed Fireline: Recommend elongated ditch plugs or high water bars where surface flow is being re-directed into the St. Mary’s River floodplain; rehab pushed fireline by either pulling berm back into open area or breaking wide “holes” in berm and maintain open as a fire “safety lane” in which only grasses or low groundcover vegetation is encouraged. ** This should be done as soon as possible, before the site is overgrown with mid-story vegetation*

2b. - St. Mary’s River channel (Wypt # 154): Continue monitoring for degradation

John M. Bethea State Forest
Post-2007 Bugaboo Fire Hydrological Restoration Plan

.2c. - Some old firelines tie directly or indirectly into the Pushed Line from the north. Recommend ditch plugs where surface flow is being re-directed and channeled into the St. Mary's River or its flood plain.

3. Bugaboo Pushed Fire Break/Road 21/Moccasin Swamp Area (NE)

3a. - Recommend immediate rehab effort by either pulling berm back into open area or breaking wide "holes" in berm and maintain open as a fire "safety lane" in which only grasses or low groundcover vegetation is encouraged. ** This should be done as soon as possible, before the site is overgrown with mid-story vegetation.*

3b. - Section of the road within Pushed Fireline (Wypt. #143-145, **Photo #3**): Disk raised road shoulders (berms) to facilitate flow across the travel lane and to prevent channelization of surface flow.

3c. - Armor problematic sections of road with rock, tile, or other suitable material.

4. Moccasin Swamp Area (SW)

4a. - Additional conveyance under Road 10 is recommended to equalize the hydrology on both sides of road.

4b. - Road 14: Four Low Water Crossings were found to be in similar condition, all requiring improvements such as additional rock in the channel and along both of the approaches.

5. Road 20/ Okefenokee Swamp Fire Break Area (NW)

5a. - Western end of Road 20 (Wypt. # 126): Restrict access to road once salvage logging is complete and stabilize road with vegetation.

5b. - Western end of Road 20: Install additional conveyance, either cross-drain culvert or low-water hard-surface crossing to encourage flow to west side road ditch.

5c. - Road 20: Replace damaged culverts in flatwoods with elevated low-water crossings, armored with rock or other appropriate material.

5d. - Road 20: Implement comprehensive, consistent effort in relocating, elevating, and/or removing crossings to slow rate of surface drainage to the north.

5e. - (Wypt. #123 -125): Install ditch plugs at ends of old firelines prior to connecting with road ditches.

6. Perimeter Road/ "Cut Through" Road/Road 6 Area (NE)

6a. - "Cut Thru" Road: Remove road or redirect surface flow to Lake Holes Branch by replacing the culvert on Perimeter Road and installing an elevated low-water crossing. Another low-water crossing in close proximity to this location that one should be elevated as well.

6b. - Install an elevated low water crossing on "Cut Thru" Road to encourage the water to flow south during the wet season. Caution needs to be taken as water can be redirected onto adjacent landowners.

6c. - Install ditch plugs in shallow firelines (industry) where they tie into nearby road ditches, especially where wetlands are impacted.

6d. - West side of Perimeter Road loop: restore natural basin marsh plant community site through passive management.

John M. Bethea State Forest
Post-2007 Bugaboo Fire Hydrological Restoration Plan

7. “Potato Patch” Firelines (NE/NW)

7a. - For salvaged/harvested areas with existing “potato patch” lines: Plow shallow lines within the plantation area perpendicular to the row direction before or after planting, depending on method used.

7b. - In those areas where a final harvest is not scheduled within the next 5 years: Re-pull road ditches with an emphasis on creating a berm to stop or at least minimize the drainage from the plantation.

8. Pinhook Swamp Area (SW)

8a. - Recommend replacing the damaged culvert on Road 19, remove Road 33, and plug the ditch associated with Road 33.

8c. - Eddy Grade, the primary access in the southwestern part of the forest, impounds surface flow where it is above grade, and is subject to flooding where it is at- or below grade. Additional conveyance is recommended

8b. - Existing road conditions are degrading near low lying areas due to timber salvage operations and truck traffic.

9. Little River Bay Area (SW)

9a. -Roads 4 and 24; lower part of Eddy Grade: Where surface drainage connects with primary water arteries during the rainy season water quality may be an issue. Recommend re-working roads and stabilizing with armoring if continued use is anticipated; with vegetation, if not.

9b. -The hydrology in several areas on the western extreme of the forest is being affected by old firelines draining wetlands and/or re-directing surface flow. Recommend plugging firelines prior to intersecting with road ditches.

9d. - Road 9 (Wypts. 075, 076) are old firelines that tie into and should be plugged.

9c. - Road 9 (Wypt. 077) is a ditch and should be plugged.

10. Road 6/ Railroad Track Area (NW)

10a. - Road 6 (Wypt. #140): Fill field ditch as much as possible with remnant spoil along the ditch.

11. Okefenokee Swamp Fire Break/Perimeter Road Area (NE)

11a. - Recommend installing ditch plugs at all points where the swamp break intersects with roads, firelines and “potato patch” lines leading onto the State Forest.

11a. - Secondary road north of the intersection of Road 6 and Perimeter Road: Recommend replacing the culvert with the same size.

12. Interior Road Areas (Forest-wide)

No Recommendations

John M. Bethea State Forest Silviculture Plan

Introduction

The spring 2007 Bugaboo Fire burned over approximately 28,000 acres of the 37,000 acre John M. Bethea State Forest. As a result, approximately 6,500 acres of productive pines were severely damaged. This included some pine stands that had recently been initially thinned. In the aftermath, the Bugaboo Fire resulted in a significant loss to the timber resource on the State Forest.

This silviculture plan is an effort to lay out recommendations for thinning, site preparation and tree planting on the State Forest. The other components of the JMBSF Restoration Plan, which includes Hydrological Restoration, Wetland/Upland Ecosystem Restoration and Fire Management, will all be considered when determining the silvicultural recommendations. These will influence the manner in which pine stands are site prepared and planted as well as site suitability and species selection. Some former planted pine stands and/or portions of these stands are expected to be no longer suitable for pine production, once the natural hydrology is restored and assessments of Desired Future Conditions (DFC) in the aftermath of the fire are taken into account. However, as it cannot yet be accurately determined which pine stands will be affected, this plan component will provide recommendations for replanting all of the former pine stands to the same or the more appropriate pine species.

The goal of this silviculture plan is to reforest those areas formerly in pine production that were adversely affected by the recent wildfire, to thin overly dense pine plantations, and to establish a "Firewise" State Forest that will better withstand the next wildfire event. The recommendations in this section established a timeline of four years to accomplish these goals. Budget constraints, seedling availability and other factors make it impractical to accomplish this goal in any less time and may result in a need to extend this timeline. The feasibility of plan implementation within the proposed timeline will depend on several factors. These include adequate funding, tree seedling availability, favorable weather conditions and contractor availability to name a few. Any shortfalls in the above may alter the proposed schedule and lengthen the timber resource recovery period.

Furthermore, in an attempt to better promote the native ground cover in some areas, it may later be determined that it is more advantageous to use prescribed fire on a 2 to 3 year rotation for 5 to 6 years prior to planting of pines. Certainly, prescribed fire will be used as a preferred method of site preparation whenever feasible and in combination with other mechanical and/or chemical treatments.

The silviculture section of this plan should be considered a living document. There are some unknowns that once learned could change some of the recommendations outlined in this plan. As formerly mentioned, once some of the restoration measures are undertaken to restore the natural hydrology, a mean annual hydroperiod increase is anticipated in some areas. As such, affected pine stands will need to be evaluated to determine tree species suitability and perhaps a reassessment of DFC undertaken. In some instances, cypress or other tree species may be planted instead of pines or areas

John M. Bethea State Forest
Silviculture Plan

may be excluded from tree planting in an effort to restore natural community types. For this reason, the recommendations outlined in this plan, particularly those 3 and 4 years out, need to be flexible and this reforestation component used as a guideline for restoring the timber resource on the former pine stands only. There may be additional opportunities to expand this plan in time to include the restoration of basin swamps, basin marshes and other wetland habitats that have been altered by past silvicultural activities, fire exclusion and other factors. However, it will take additional information derived from historical maps and photos, field observations, photo points, research study, and other methods to make an appropriate assessment on these areas prior to implementing any on the ground practices.

The ground cover in many areas has not recovered from the intensive site preparation used to establish the plantations, the various wildfire events and the salvage harvest operations that ensued after the wildfires. It should be noted that irrespective of the acreage prescribed burned in the last few years, most of the property now associated with the John M. Bethea State Forest, formerly with Rayonier Incorporated SE Forest Resources, has sustained more than one and in many areas three or more fires over the last two decades as a result of recurring wildfires. These fires include the Shorts, Blackjack, Friendly, Impassible Bay, Road 1 and Bugaboo. All these were large fires that resulted in significant timber resource losses to the area. As such, the existing groundcover and associated plant composition that exists, whether from the respective seedbank or residual plant rootstocks, is to some extent attributable to these fires, most of which occurred during the spring or summer season.

The Site Preparation and Planting plans below outline specific recommendations for site preparing and establishing pines on the areas that were formerly in pine production but severely damaged by the Bugaboo Fire. The associated maps, recommended species and site prep treatments are found in this section.

John M. Bethea State Forest
Silviculture Plan

Thinning and Harvest Plan

Since acquisition of the John M. Bethea State Forest (JMBSF), planned harvesting has been limited. Since 2004, approximately 1,160 acres have been harvested, not counting salvage sales from the significant wildfires that have plagued the area. With the current pine forest types that are present in the area, predominantly densely stocked, fiber producing type stands, many acres are in need of thinning.

As has been seen after the numerous wildfires in the past, well managed open stands are more fire resistant than the densely stocked, short rotation type stands that are currently present. By thinning these densely stocked timber stands, the health of the forest will be improved and hazardous fuels will be reduced, both on the forest floor and in the canopy. Also, after initial thinnings, prescribed fire can be reintroduced with less chance of mortality in the remaining stand. Fire without thinning in densely stocked stands has very little ecological benefit and is mainly done as a hazard reduction treatment. Fire after thinning is a much safer, more cost effective practice with more ecological benefits.

Following the Bugaboo Wildfire, JMBSF personnel developed a harvest plan that entailed conducting an initial thinning on all the remaining merchantable pine stands prior to FY 2008-2009's end. This plan is on schedule with two outstanding timber sales that need to be advertised and sold to effectively meet this goal (see attached map). It is crucial that future, first thins be done in a timely manner to maintain the health and productivity of stands while allowing beneficial prescribed burning and restoration to begin.

Selection thinning methods were primarily used in older age class stands. These methods employed marking by DOF staff as well as logger-select. Logger select thinnings resulted in minimal additional cost, required slightly more time to administer, but provided better and more uniform residual tree spacing for the purpose of wildfire protection, provided more sunlight to the forest floor, better facilitated prescribed burning, and promoted other ecological benefits. Future selection efforts will require adequate monitoring and will be coordinated with the State Lands Section of the Forest Management Bureau.

Future thinnings, especially in younger age class pine stands, should emphasize third row thinnings, if time constraints are a concern. This method will allow a larger number of acres to be addressed as compared to selective thinnings, because it requires less manpower and supervision. Row thinning will also insure that enough of a stand will remain to ensure adequate volume for future thinnings.

JMBSF
2008-2009
Timber Sales
1457 Acres

JMBSF 08-09 Timber Sales

- ☐ 2008 North Sale
☐ 2009 HWY 127 Sale
☐ 2009 West Sale
☐ 2008 Road 35

roads

— paved

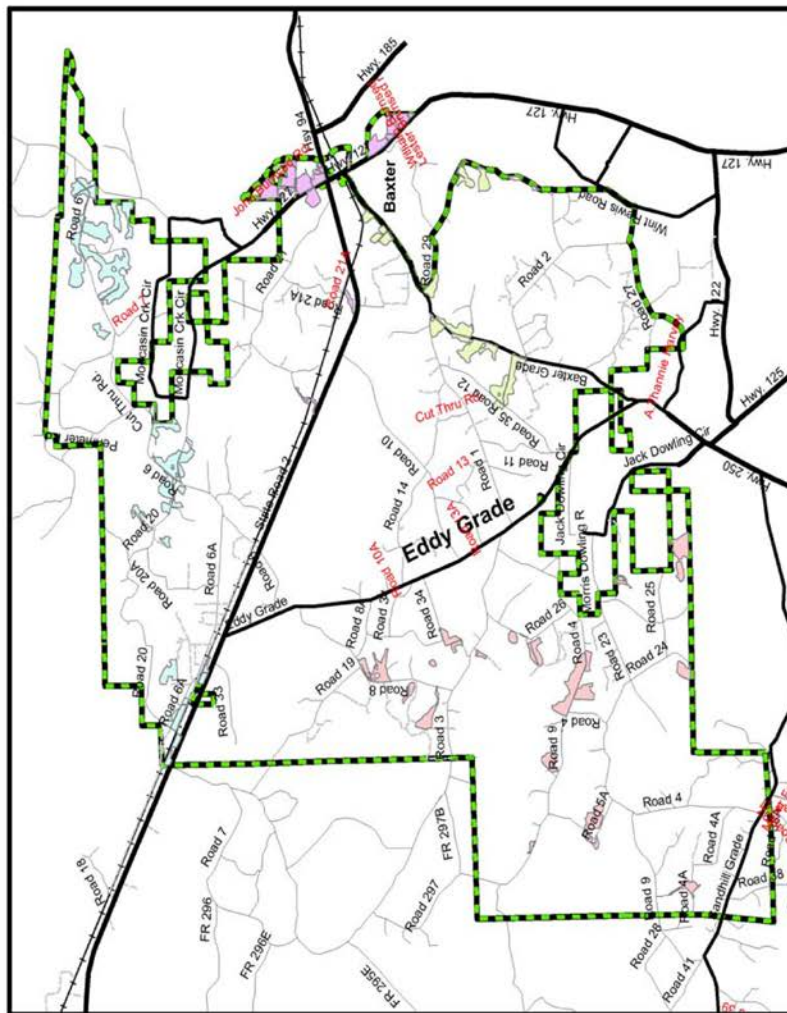
— grade

— dirt

two trail

■ boundary

— rail road



DISCLAIMER

DISCLAIMER

This man is the product of the Florida Division of Forestry. No warranties are provided for clarity, fitness, its use, or its interpretation.

A horizontal scale bar with tick marks at 0, 1.25, 2.5, and 5 miles. The bar is divided into four equal segments, each representing 1.25 miles. The word "Miles" is written at the right end of the bar.

John M. Bethea State Forest
Silviculture Plan

**Site Prep and Planting
2007-2008**

The reforestation effort for the 2007-08 FY was concentrated on those stands that were planted during the 2005, 2006 and 2007 winters, <1 to 3 years of age, and/or that were treated with herbicide in the 2006 spring, and that were burned over during Bugaboo in the 2007 spring. Prior to this most recent wildfire event, most of these stands were formerly site prepared at some time by band spraying of herbicide in strips over the tops of the existing beds.

As these stands were burned over in the 2007 spring, the existing ground cover is the result of the later half of a single growing season. Evidence of the formerly herbicided strips is in the form of a somewhat altered composition, reduced density and less height growth of the woody and herbaceous plants within the strips. This is particularly noticeable in those stands that were treated in the 2006 fall. As such, no additional site preparation treatments are recommended for the majority of this acreage. The exception is those stands, approximately 262 acres in total, that are within ½ mile north of SR 2, and in which the residual beds are oriented in a north to south direction. To facilitate fire suppression efforts in the future, these rows are to be reoriented in an east to west direction, parallel to SR 2. As such, the recommendation for these stands is to disk harrow strips in the fall on 12 foot centers perpendicular to the existing beds and residual stump rows in an east to west orientation. This practice will serve to help knock down the residual beds, break up the dense gallberry root mat and facilitate the machine planting of pines at a right angle to the former planting rows.

The following summarizes the accomplishments for the 2007-2008 FY reforestation season. Approximately 267 acres were planted with longleaf pines in September of 2007. Normal winter (dormant season) planting occurred on approximately 1,592 acres from December 2007 through February of 2008. Of the total 1,873 acres reforested, 1,660 acres were planted with longleaf pine and 213 acres were planted with slash pine. Stocking densities ranged from 605 trees per acre to 726 trees per acre.

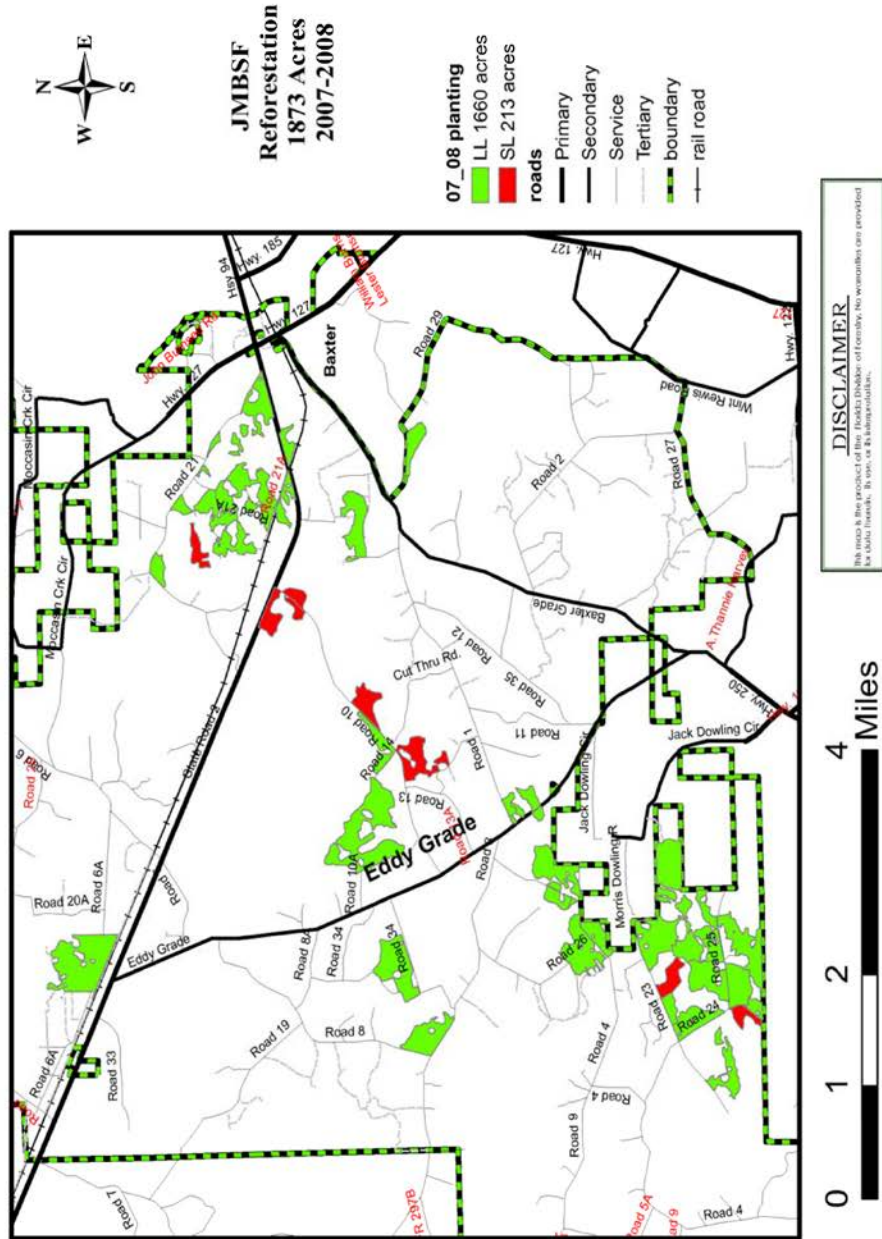
Site preparation consisted of previously herbicided strips and newly disked or harrowed strips, as mentioned above. Trees were planted in the strips and a post plant herbicide treatment of Arsenal Applicators Concentrate (Imazapyr) was made in the Spring of 2008 at the rate of 4 ounces per treated acre in five foot wide bands.

In addition to the above accomplishments, to further facilitate both future fire suppression efforts and the use of prescribed fire, 15' wide strips along portions of stand boundaries that adjoin a forest road are to be excluded from any tree planting. These strips are to be maintained by mowing and/or disking and may also function as permanent openings to benefit a variety of resident wildlife species or as sites for ground cover restoration.

John M. Bethea State Forest
Silviculture Plan

Two years after planting, all of the longleaf stands planted in FY 2008 will be evaluated for dormant season prescribed fire suitability and if appropriate, a controlled burn will be executed when these reach 2 to 3 years of age. Subsequent prescribed fires should be conducted once the pines reach sapling stage 8+ feet with a return interval of no more than three years.

John M. Bethea State Forest Silviculture Plan



John M. Bethea State Forest
Silviculture Plan

**Site Prep and Planting
2008-2009**

The reforestation efforts for the 2008-2009 FY have focused on those slash pine stands, planted and natural, and portions of those stands that were clearcut harvested during the Bugaboo salvage operation and/or the result of other timber sales conducted for restoration purposes. A total of 1,406 out of 1,607 acres or 87 percent of these stands are to be planted back to longleaf pine. Initial site preparation entailed spot raking and piling the residual logging debris in and around the scattered loading decks. Single drum chopping was incorporated on all the sites as well.

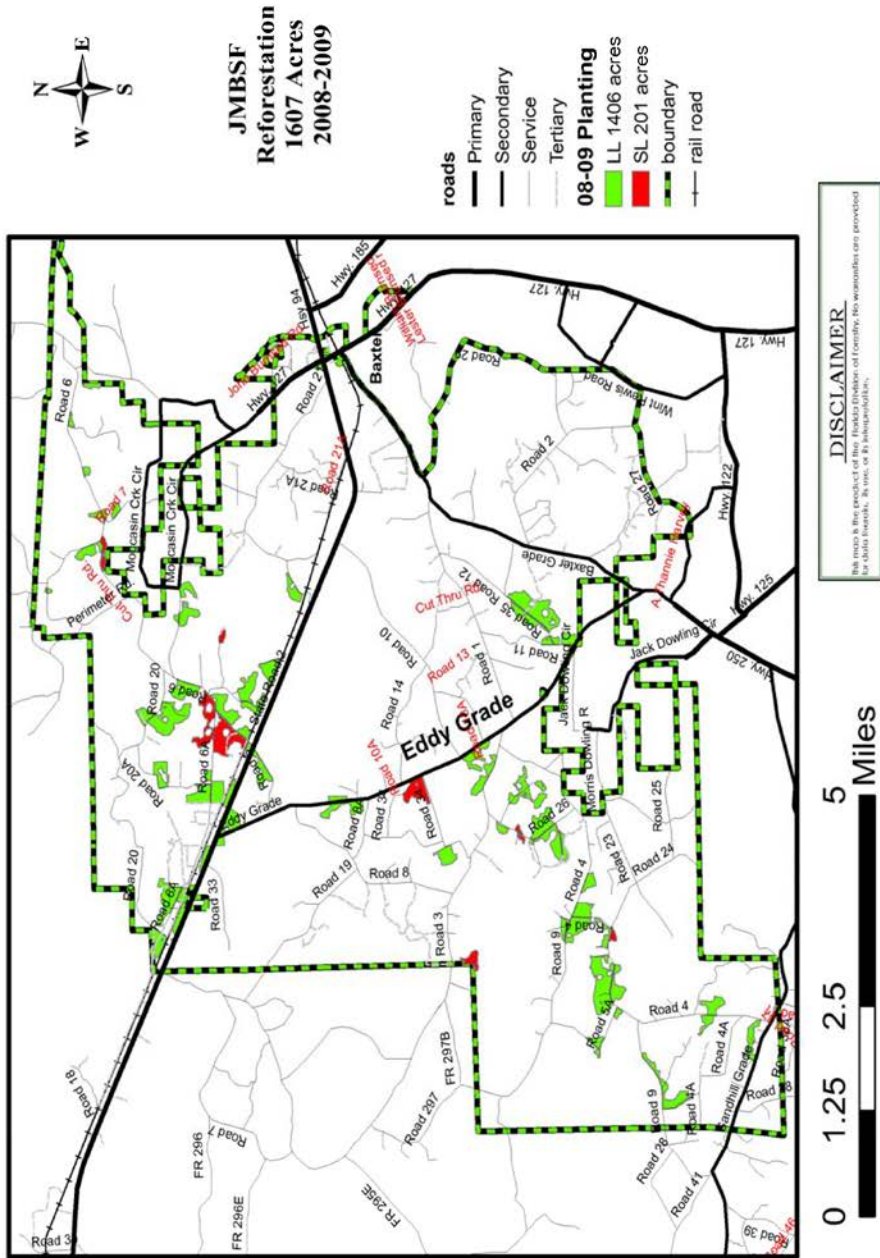
In the fall of 2008, Chopper herbicide was applied at the rate of 48 ounces per acre to control heavier areas of gallberry and other herbaceous vegetation on 784 acres. This was done as a broadcast application.

Approximately 520 acres was strip disk harrowed on twelve foot centers. These strips were double disked, two passes over the same strip, with an un-disked strip left in between.

Planting will be done by machine, either V-Blade with a crawler type tractor or rough woods with rubber tired tractors. Planting will consist of 1,406 acres of longleaf pine and 201 acres of bareroot slash pine according to the planting schedule. Bareroot stock will be planted on a 5' x 12' spacing to establish 726 seedlings per acre. Containerized longleaf will be planted on a 5'6" x 12' spacing to establish 660 seedlings per acre.

Two years after planting, evaluate all of the longleaf stands planted in FY 2008-2009 for dormant season prescribed fire suitability and if appropriate, execute a controlled burn when these reach 2 to 3 years of age. Subsequent prescribed fires should be conducted once the pines reach sapling stage, 8+ feet, with a return interval of no more than three years.

John M. Bethea State Forest Silviculture Plan



John M. Bethea State Forest
Silviculture Plan

**Site Prep and Planting
2009-2010**

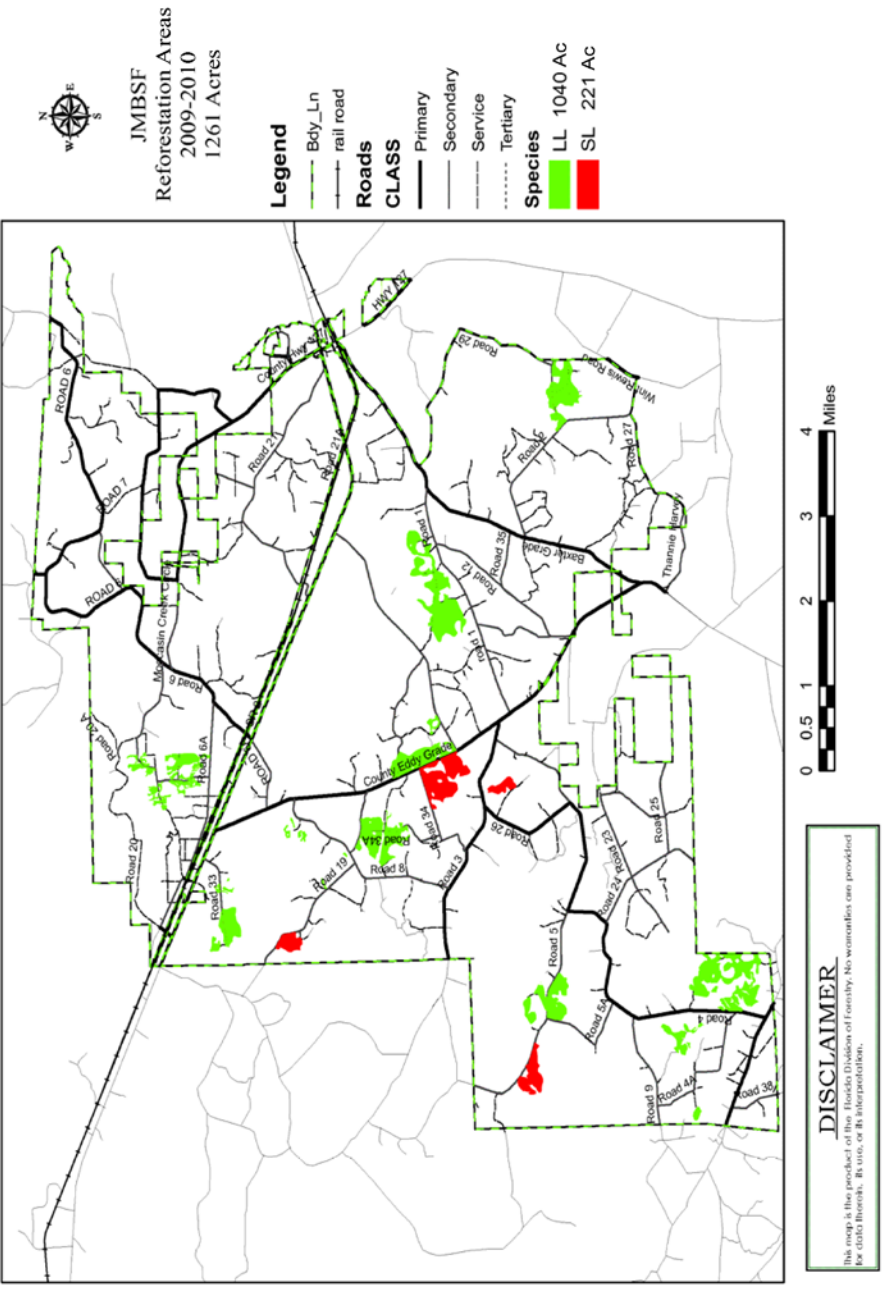
The reforestation effort for the 2009-2010 FY will concentrate on those planted slash pine stands and portions of the same, 4 to 8 years of age that were severely damaged by the wildfire. There are some slash pines scattered throughout these stands that survived but an insufficient amount to carry the stand to rotation age. Furthermore, 1,040 out of 1,261 acres or 82 percent of these sites are to be planted with longleaf pine. As such, mechanical site preparation to effectively lay down most of the residual snags and surviving trees and control the woody and herbaceous vegetation is recommended. Subsequently, a follow-up treatment with an appropriate herbicide to further control the competing vegetation will help to ensure a successful reforestation effort.

Prior to any treatments, in the 2009 spring, evaluate these stands for prescribed burning suitability. For those stands with sufficient surface fuel contiguity, prescribe burn in the late spring and/or summer. In the 2008 fall, determine which stands will require single drum chopping and follow up with this practice in the 2009 spring. In the ensuing summer, apply a tank mix of Chopper @ 48 oz. /ac. and Accord @ 32 oz. /ac. or other appropriate herbicide tank mix at an appropriate rate to control the gallberry and other herbaceous and woody vegetation.

Follow up, in the winter, with machine planting 1,040 acres of containerized and/or bareroot longleaf and 221 acres of bareroot slash pine for a total of 1,261 acres. (See map for details) All bareroot seedling stock should be planted on a 5' x 12' spacing to establish 726 seedlings per acre. Containerized longleaf could be planted on a 6' x 12' spacing to establish 605 seedlings per acre.

Two years after planting, evaluate all of the longleaf stands planted in FY 2009-2010 for dormant season prescribed fire suitability and if appropriate, execute a controlled burn when these reach 2 to 3 years of age. Subsequent prescribed fires should be conducted once the pines reach sapling stage, 8+ feet, with a return interval of no more than three years.

John M. Bethea State Forest Silviculture Plan



John M. Bethea State Forest
Silviculture Plan

**Site Prep and Planting
2010-2011**

The reforestation effort for the 2010-2011 FY will concentrate on those planted slash pine stands, and portions of these, 9 to 13 years of age that were severely damaged as a result of the wildfire. There are also some slash pines scattered throughout these stands that survived, but an insufficient amount to carry the stand to rotation age. Furthermore, 905 out of 971 acres or 93 percent of these sites are to be restored to longleaf pine. As such, mechanical site preparation to effectively lay down most of the larger residual snags and surviving trees as well as control the woody and herbaceous vegetation is recommended. Subsequently, a follow-up treatment with an appropriate herbicide to further control the competing vegetation will help to ensure a successful reforestation effort.

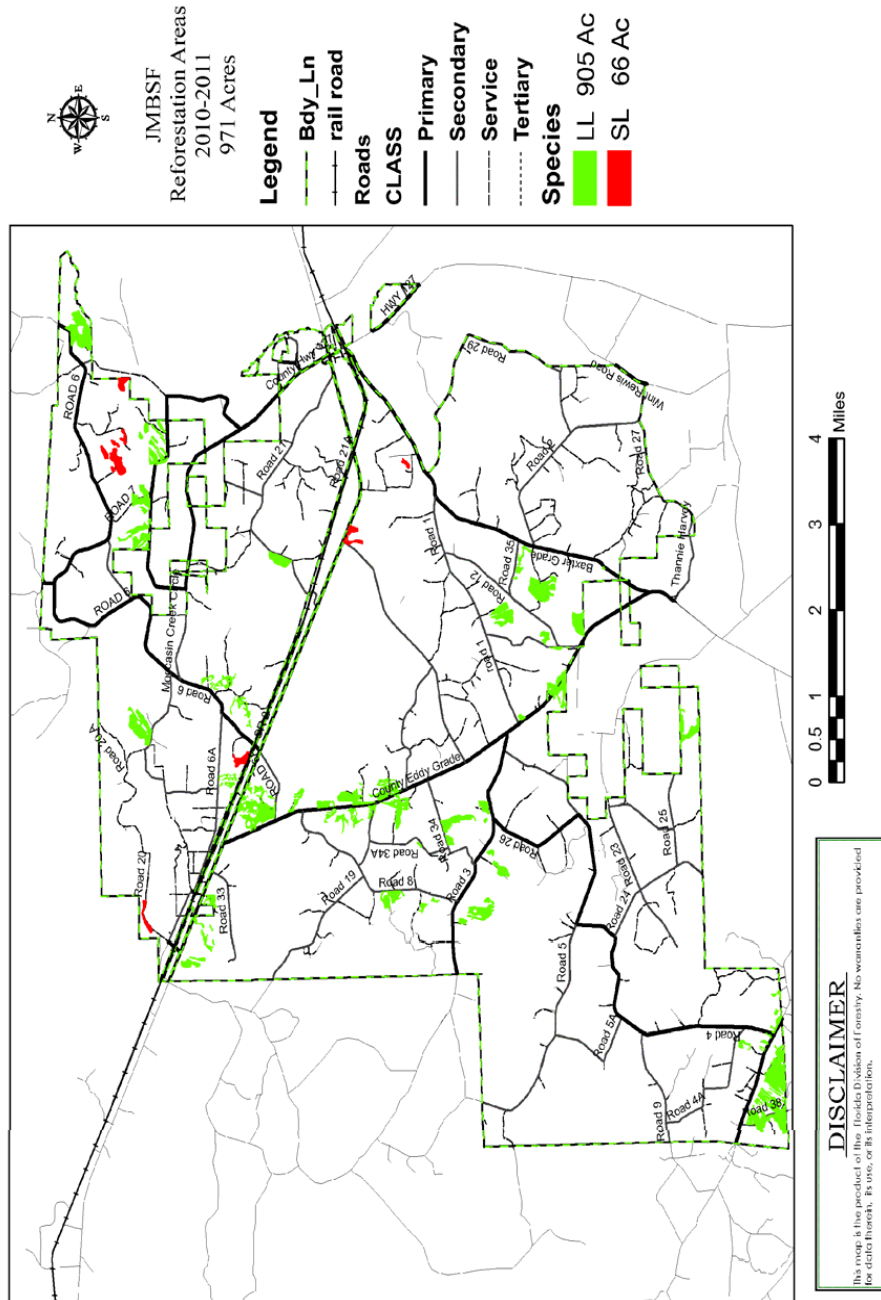
In regards to prescribed fire, for site preparation, fuels reduction and natural community restoration, evaluate these stands for burning feasibility in the 2009 spring. Evaluate the two year roughs on these stands for prescribed burning suitability. For those stands with sufficient surface fuel contiguity, prescribe burn in the late spring and/or summer. In the 2009 fall, determine which stands will necessitate a tandem drum chop. It is expected that due to the size of the residual pines, in the pre-merchantable to small pulpwood size classes, that a tandem drum chopper will be needed to prepare these sites. Tandem drum chop these stands in the 2010 spring.

In the summer, apply a tank mix of Chopper @ 48 oz. /ac. and Accord @ 32 oz. /ac. or other appropriate herbicide at an appropriate rate to control gallberry and other herbaceous vegetation.

Follow up, in the winter, with V-blade planting 905 acres of containerized and/or bareroot longleafs and 66 acres of bareroot slash pine. Bareroot stock should be planted on a 5' x 12' spacing to establish 726 seedlings per acre. Containerized longleaf should be planted on a 6' x 12' spacing to establish 605 seedlings per acre.

Two years after planting, evaluate all of the longleaf stands planted in FY 2010-2011 for dormant season prescribed fire suitability and if appropriate, execute a controlled burn when these reach 2 to 3 years of age. Subsequent prescribed fires should be conducted once the pines reach sapling stage 8+ feet with a return interval of no more than three years.

John M. Bethea State Forest Silviculture Plan



Florida Division of Forestry - John M. Bethea State Forest
Post-2007 Bugaboo Fire Hydrological Restoration Plan

ATTACHMENT 1

POST-BUGABOO HYDROLOGICAL RESTORATION JOHN M. BETHEA STATE FOREST

FIELD DATA SHEETS

Florida Division of Forestry
Post-Fire Hydrological Restoration Assessment Waypoints for
JOHN M. BETHEA STATE FOREST - July 27 - August 1, 2007

ATTACHMENT 1

Reference			Observations		Status/ Condition (2)	Remedy - (To Minimize, Redirect, or Stop Flow) (3)	Priority 1 = High 2 = Med. 3 = Low	Quadrant/Date
No.	WyPt.	Flow Dir.	Structure (1)	Size (Dia.)				
1	37	S	(Multiple) CR	18"/18"	FAC	CU	2	SW/SE
2	38	S	BX		FLD	NA	3	7/27/2007
3	39	S	CR		(Not Found)	NA	3	(Lima)
4	40	S	BX		FLD	NA	3	
5	41	S	LWX		FLD	IX	2	
6	42	S	CR	18"	D	IX (Fill)	2	
7	43	S	CR		(Not Found)	NA	3	
8	44	E	CR	24	D	RPL+CU	1	
9	45	?	BX		FLD	NA	3	
10	46	S	BX		FLD	NA	3	
11	47	W	FL		FX	DP+	2	
12	48	W	BX		FLD	IX (Rock Spillover)	1	
13	49	S	BX		FLD	NA	3	
14	50	S	LWX		D	IX (Rock)	1	
15	51	S	BX		FLD	NA	3	
16	52	S	BX		FAC	NA	3	
17	53	S	BX (Bailey)		FLD	NA	3	
18	54	S	BX (Concrete)		FLD	NA	3	
19	55	S	BX (Wood)		FLD	NA	3	
20	56	S	CR		FX	RPL (Difficult)	3	
21	57	E	LWX		D	XC (Rock)	2	
22	58	E	BX (Concrete)		FLD	NA	3	
23	59	E-S	LWX		D	IX (Rock)	1	
24	60	SW	CR	24	FLD	NA	3	
25	61	E	CR	12	FLD	CU	1	
26	62	E	BX (Wood)		FAC	NA	3	
27	63	NE	BX (Concrete)		FLD	NA	3	
28	64	NE	Road		FLD	LW+	1	
29	65	?	Road		FLD	LW+ (3)	1	
30	66	N	CR	18	FLD	NA	3	
31	67	N	DCH		FLD/WTB	DP+	1	
32	68	N	CR	24	FLD	NA	3	
33	69	S	(Multiple) CR	10"/10"	FLD	NA	3	
34	70	S	CR	?	FLD	NA	3	
35	71	S	BX (Wood)		FLD	NA	3	
36	72	S	BX (Concrete)		FLD	NA	3	
37	73	N	BX (Wood)		FLD	NA	3	
38	74	S	FL		FLD	DP+	1	
39	75	S	FL		FLD	DP+	1	
40	76	S	DCH		FLD/WTB	DP+	1	
41	77	N	CR	18	FLD	NA	3	

PLEASE SEE PAGE 6 FOR CODE INDEX

Florida Division of Forestry
Post-Fire Hydrological Restoration Assessment Waypoints for
JOHN M. BETHEA STATE FOREST - July 27 - August 1, 2007
ATTACHMENT 1

Reference			Observations		Status/ Condition (2)	Remedy - (To Minimize, Redirect, or Stop Flow) (3)	Priority 1 = High 2 = Med. 3 = Low	Quadrant/Date
No.	WyPt.	Flow Dir.	Structure (1)	Size (Dia.)				
42	78	E	LWX		FLD	IX (Rock)	1	
43	79	S	LWX		FLD	IX (Rock)	1	
44	80	E	CR	10	D	RPL/LW+	1	
45	81	E	DCH		FLD/WTD	DP+	1	
46	82	E	CR	?	(Not Found)	C+?	3	
47	83	SE	CR	18	FX	IX	1	
48	84	SE	LWX		FLD	NA	3	
49	85	SE	CR	18	FLD	NA	3	
50	86	SE	CR	18	FLD	NA	3	
51	87	NW	CR	18	D	NA	3	
52	88	NW	CR	24	FLD	NA	3	SW/SE
53	4	NW	LWX		D	IX (Rock)	1	7/30/2007
54	5	NW	BX (Concrete)		WTD	NA	3	(Lima)
55	6	NW	AGR	24	WR/FX	C+	1	
56	7	NW	BX (Concrete)		WTD	NA	3	
57	8	NW	AGR		WR/FX	LW+	1	
58	9	NW	AGR		WR/FX	LW+	1	
59	10	NW	OFL		FLD	PL+	1	
60	11	NW	AGR		WR/FX	LW+	1	
61	12	NE	AGR		WR/FX	LW+	1	
62	13	NE	OFL		FLD	PL+	1	
63	14	N	LWX		WR	IX (Rock)	1	
64	15	NE	BGR		WR	LW+	1	
65	16	NE	LWX		FLD	IX (Rock)	1	
66	17	NE	LWX		FAC	IX (Rock)	1	
67	18	NE	LWX		FLD	IX (Rock)	1	
68	19	NE	LWX		FLD	IX (Rock)	1	
69	20	N	CR		FAC	CU	1	
70	21	SE	AGR		FX	C+	2	
71	22	NE	AGR		FX	CU	1	
72	23	W	AGR		FLD	C+	1	
73	24	E	CR	24	FAC	NA	3	
74	25	S	CR	18	FX	IX (Clean)	1	
75	26	E	CR	24	FAC	CU	2	
76	27	NE	CR	18	FX	RPL	1	
77	28	S	AGR		FLD	C+	1	
78	29	?	BGR		FLD	LW+	1	
79	30	E	LWX		D	NA	3	
80	31	NE	CR	24	FLD	NA	3	
81	32	NE	BGR		WTD	LW+	2	
82	33	NE	AGR	24	FLD	NA	3	
83	34	N	BGR/LWX		D	NA	3	

PLEASE SEE PAGE 6 FOR CODE INDEX

Florida Division of Forestry
Post-Fire Hydrological Restoration Assessment Waypoints for
JOHN M. BETHEA STATE FOREST - July 27 - August 1, 2007
ATTACHMENT 1

Reference			Observations		Status/ Condition (2)	Remedy - (To Minimize, Redirect, or Stop Flow) (3)	Priority 1 = High 2 = Med. 3 = Low	Quadrant/Date
No.	WyPt.	Flow Dir.	Structure (1)	Size (Dia.)				
84	35	E	CR	36	DM/ (Crushed)/FX	IX	1	
85	36	SE	BX (Concrete)		WTD	NA	3	
86	37	x	CR		(Removed)	NA	3	SW/SE
87	38	E	CR	36	D	IX (Shoulders)	1	7/31/2007
88	39	E	CR	?	(Not Found)	RPL	2	(Lima)
89	40	E	LWX		D	IX (Rock)	3	
90	41	E	CR (Concrete)	24	DM/ (Crushed)	RPL	1	
91	42	E	BX (Wood)		D	IX (Approaches)	2	
92	43	E	AGR		D/FX	LW+	2	
93	44	E	BX (Wood)		D	NA	3	
94	45		CR	?	(Not Found)	?		
95	46	NE	LWX		D	IX (Rock)	2	
96	47	SE	CR (Concrete)	24	D/(Buried)	RPL	1	
97	48		CR (Concrete)	24	D	IX (Clean)	2	
98	49	SW	CR (Concrete)	36	D	IX (Clean)	2	
99	50	SW	(2) CR (Metal & Concrete)	48/36	WTD	NA	3	
100	51	SW	CR (Concrete)	24	WTD	IX (Clean)	2	
101	54	S	CR (Metal)	24	D	RPL	2	
102	55		BX (Concrete)		WTD	NA	3	
103	56	S	CR	?	DM (Buried)/WTD	LW+	1	
104	57	SE	CR	36	WTD/WR	IX (Clean & Rock)	1	
105	149		LWX/PTCH		WTD	CU/DP+	1	NE
106	150		PL		FZ	DP+	2	7/27/2007
107	152	S	PL		FZ	DP+	2	(Marshall)
108	153	S	BGR		FZ	DP+/XR	3	
109	154		PL		FZ	WB+	1	
110	155		PTCH		FZ	PL+	3	
111	156		LWX/RD		FZ	CU	2	
112	157		PL		FZ	DP+	2	
113	158		BX/RD		FZ	WTO	3	
114	159		PTCH/RD		FZ	XR	3	
115	160		PTCH/FL		FZ/WTD	PL+	3	
116	161		BGR/RD		FZ	?	3	
117	162		AGR		FZ	DP+	3	
118	163		FL		FZ	DP+	3	
119	164		FL		FZ/WTD	DP+	1	
120	165		PTCH		?	?	3	
121	166		PL		FZ	DP+	3	
122	167		BX		ERN	WTO+	2	
123	168		PL/CR		FZ/WTD	DP+/LW+	1	
124	169		PTCH		FZ	?	?	
125	170		PL		FZ	DP+	1	

PLEASE SEE PAGE 6 FOR CODE INDEX

Florida Division of Forestry
Post-Fire Hydrological Restoration Assessment Waypoints for
JOHN M. BETHEA STATE FOREST - July 27 - August 1, 2007
ATTACHMENT 1

Reference			Observations		Status/ Condition (2)	Remedy - (To Minimize, Redirect, or Stop Flow) (3)	Priority 1 = High 2 = Med. 3 = Low	Quadrant/Date
No.	WyPt.	Flow Dir.	Structure (1)	Size (Dia.)				
126	171		PL		FZ	DP+	3	
127	172		AGR		FX	C+ or XR	1	
128	173		PTCH		?	?		
129	174		BGR/PL		FZ/FX	DP+ or XR	1	
130	175		AGR		?	WTO+	2	
131	176		FL		FZ	DP+	2	
132	178	S	CR	?	FX/DM	RPL	2	
133	179	S	CR	?	FX/FZ/DM	RPL	2	
134	180	S	RD		ERN/FAC	WTO+	3	
135	181		OFL/PTCH		FZ	DP+	3	
136	182		PL/PTCH		FZ	DP+	3	
137	183							
138	184		RD		FZ	WTO+	3	NE
139	185		BX		FZ	WTO+	3	7/30/2007
140	186		PL		FZ	DP+	3	(Marshall)
141	187		OFL		WTD	DP+	1	
142	188		PL/BGR		FZ	DP+/XR	2	
143	189		OFL		FZ	DP+	2	
144	190		PL		FZ	DP+	3	
145	191		PL		FZ	DP+	2	
146	192		CX	?	FX	IX (Clean)	2	
147	193		BX/RD		FZ	WTO+	2	
148	194		AGR/LWX		FX/FZ	XR	2	
149	195		AGR/CR		FX	LW+	1	
150	196	S	AGR		FX	C+ or LW+	1	
151	197		AGR		FX	C+ or LW+	1	
152	198		LWX		FX	IX	2	
153	199		CX		FX/DM?	RPL	2	
154	200		PL		FZ	DP+	2	
155	201		PL		FZ	DP+	2	
156	202		BX		ERN/FX	WTO+	1	
157	203		NFL		FZ	DP+	2	
158	204		ABGR		FLD	WTO+	3	
159	205		ABGR		WR	LW+	3	
160	206		ABGR		FX	LW+	3	
161	207		RD		FX/LOG	RD = Remove Debris	3	
162	208		PL		FZ	DP+	3	NE
163	209		BGR		FZ	XR/DP+?	3	7/31/2007
164	210		BX		ERN	WTO+	3	(Marshall)
165	211		OFL		FZ	DP+	2	
166	212		CX		FX	RPL	2	
167	213		PL		FZ	DP+	2	

PLEASE SEE PAGE 6 FOR CODE INDEX

Florida Division of Forestry
Post-Fire Hydrological Restoration Assessment Waypoints for
JOHN M. BETHEA STATE FOREST - July 27 - August 1, 2007
ATTACHMENT 1

Reference			Observations		Status/ Condition (2)	Remedy - (To Minimize, Redirect, or Stop Flow) (3)	Priority 1 = High 2 = Med. 3 = Low	Quadrant/Date
No.	WyPt.	Flow Dir.	Structure (1)	Size (Dia.)				
168	214		DCH		FZ/WTB	DP+	1	
169	215		OFL		FZ	DP+	3	
170	216		DCH		WTB	DP+	1	
171	217		LWX		WTB	DP+ or CU	1	
172	218		CR	18"	WTB	CU	1	
173	219		OFL		FZ	DP+	3	
174	220		CX		WTB	CU	1	
175	221		OFL		WTB	DP+	1	
176	222		CX		WTB	CU	1	
177	223		LWX/PL		FZ/WTB	IX/DP+	1	
178	224		PL		FZ/WTB	DP+	1	
179	225		CR		FZ	LW+	3	
180	226		LWX		WTB	XC	1	
181	120		CR (DOT)	12"	D	NA	3	NW
182	121	W	OFL/RD		D	NA	3	7/27/2007
183	122	N	RD (Road 20)		FX/FZ	C+	2	(Gilpin)
184	123		NFL/RD		WTB	DP+	1	
185	124	N	OFL/RD		FZ	DP+	1	
186	125	N	CX	24"	D/FX	RPL or XC	1	
187	126	N	AGR		WR	ERD/IX	2	
188	127	NE	HWX/RD		ERN	IX	3	
189	128	E	BGR/RD		FAC/WTB/FZ	DP+	1	
190	129		OFL/RD		FZ	DP+	1	
191	130	S	NFL/RD/CX/PG	24"	FAC/FX/FZ/DM	RPL or CU	1	NW
192	131	NW	CX/DCH		FX/FZ	RPL	1	7/30/2007
193	132	E	CX/BGR	18"	D	NA	3	(Gilpin)
194	133	N	CX/DCH or OFL	24"	DM/WTB	XC or CU	1	
195	134		PTCH/RD		FZ	PL+	2	
196	135	E	LWX		FLD	NA	3	
197		E-S-E	CX/DCH	24"?	DM/FAC/WTB?	XC or CU	2	
198	136		PTCH/RD		D	NA	3	
199	137	NE	CX	?	FX	IX	2	
200	138	NW	(Multiple) CX	Var.	FX	IX	1	
201	139	S	LWX		ERN	IX	3	
202	140	S	DCH/RD		FZ/WTB	DP+	1	
203	141	S	BGR/RD		FZ	XR	2	NW
204	142		PL (Cutthru from Rd 21)		D/FX?	NA	3	7/31/2007
205	143		PL/ULWX		FX/FZ/WR	RB/IX/SL	1	(Gilpin)
206	144		PL/ULWX		FZ/WR	IX/SL	1	
207	145		PL/BGR		FLD/FZ	RB/SL	1	
208	146		BX (Moccasin Crk)		OK	NA	3	
209	147		NFL/RD		FX/FZ	DP+/RB	1	

PLEASE SEE PAGE 6 FOR CODE INDEX

ATTACHMENT 1

AGR = Above Grade Road	LWX = Low Water Crossing
BGR = Below Grade Road	PG = Exisiting Plug
BR = Bridge Crossing	PL = Pushed Line
CX = Culverted Crossing	PTCH = "Potato Patch" Lines
CR = Cross-Drain Culvert	NFL = New Fireline
DCH = Field Ditch or Canal	OFL = Old Fireline
LOG = Logging Debris	RD = Road Ditch
	ULWX = Unimproved LWX

D = Dry
DM = Damaged
ERN = Erosion
FAC = Flow Accelerated
FLD = Flooded
FX = Flow Impeded
FZ = Flow Redirected
LD = Logging Debris
WR = Wallowed/Rutted
WTD = Wetland Drain

C+ = Install Culvert	NAC = No Action
CD = Lower Culvert	RB = Remove Berm
CU = Raise Crossing	RPL = Replace Culvert
DP+ = Install Ditch Plug	SL = Est. Safety Lane
ERD = Elevate Road	WB+ = Install Water Bar
IX = Improve Crossing	WD+ = Install Wing Ditch
LW+ = Install LWX	WTO+ = Install Turnout
PL+ = Install Plug Line	XC = Remove Crossing
	XR = Remove Road

PLEASE SEE PAGE 6 FOR CODE INDEX

ATTACHMENT 2

**POST-BUGABOO HYDROLOGICAL RESTORATION MAPS
JOHN M. BETHEA STATE FOREST**

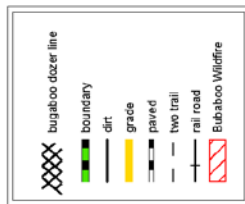
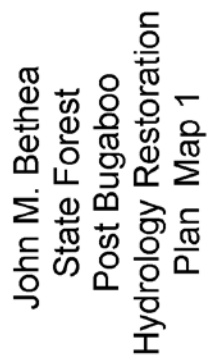
**MAP 1:
MAP SHOWING EXTENT OF “BUGABOO” FIRE DAMAGE W/IN JMBSF**

**MAP 2:
NE QUADRANT SHOWING PRIORITY ASSESSMENT POINTS**

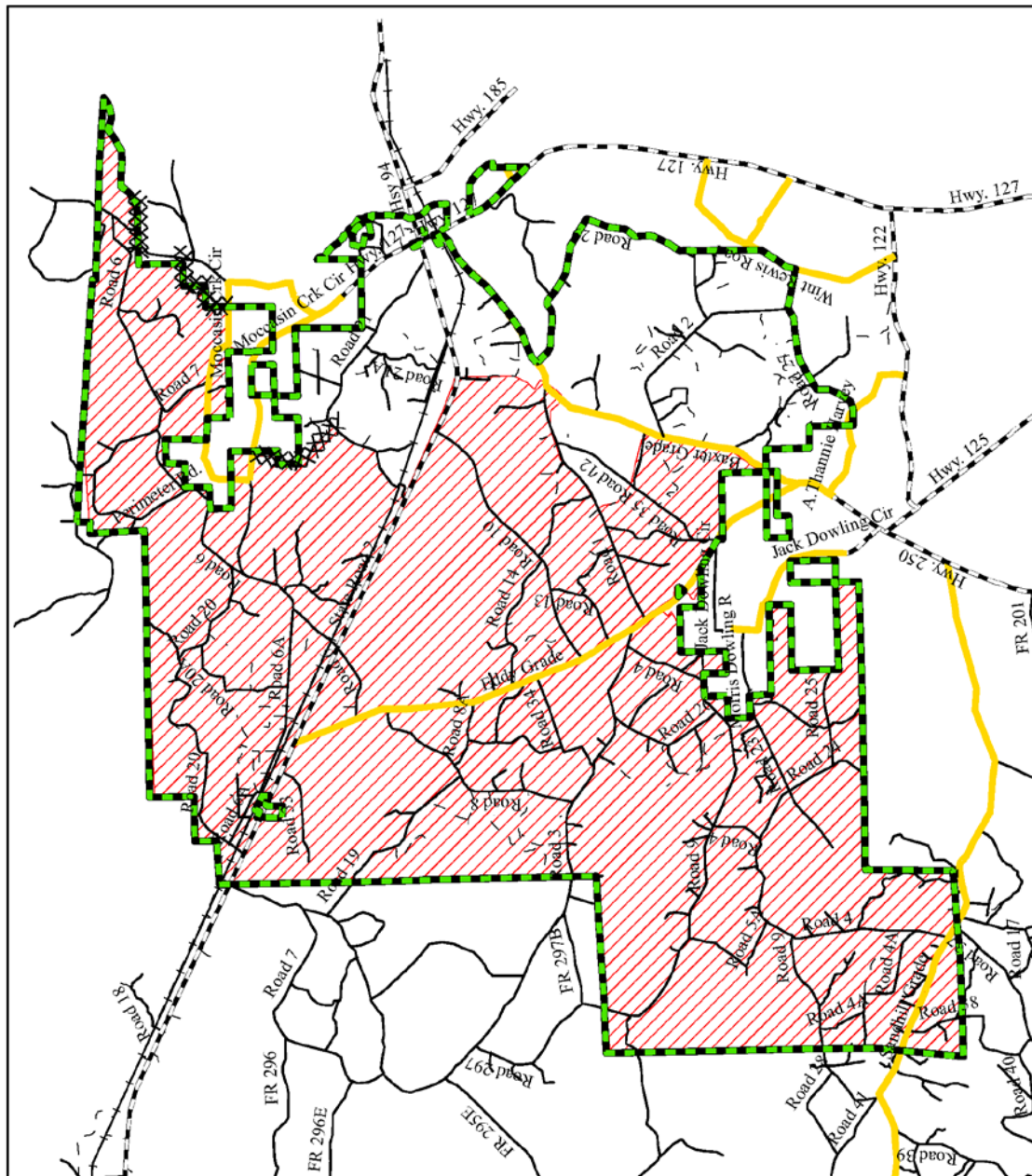
**MAP 3:
NW QUADRANT SHOWING PRIORITY ASSESSMENT POINTS**

**MAP 4:
SE & SW QUADRANTS SHOWING PRIORITY ASSESSMENT POINTS**

**MAP 5:
HYDROLOGY RESTORATION OVERVIEW MAP
SHOWING PRIORITY ASSESSMENT POINTS AND DETECTED
FLOW PATTERNS**

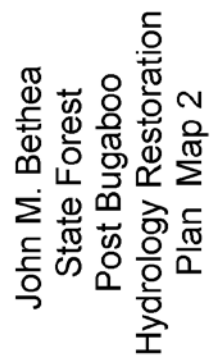


drawn by
Lee Barnwell
Forestry Supervisor II
8/19/07



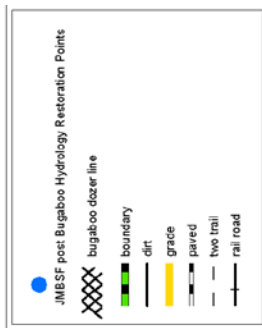
DISCLAIMER

This map is the product of the Florida Division of Forestry. No warranties are provided for data therein, its use, or its interpretation.



DISCLAIMER

This map is the product of the Florida Division of Forestry. No warranties are provided for data therein, its use, or its interpretation.

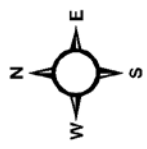


Direction of Surface Flows

SE Flow

drawn by
Lee Barnwell
Forestry Supervisor II
8/9/07





John M. Bethea
State Forest
Post Bugaboo
Hydrology Restoration
Plan Map 3

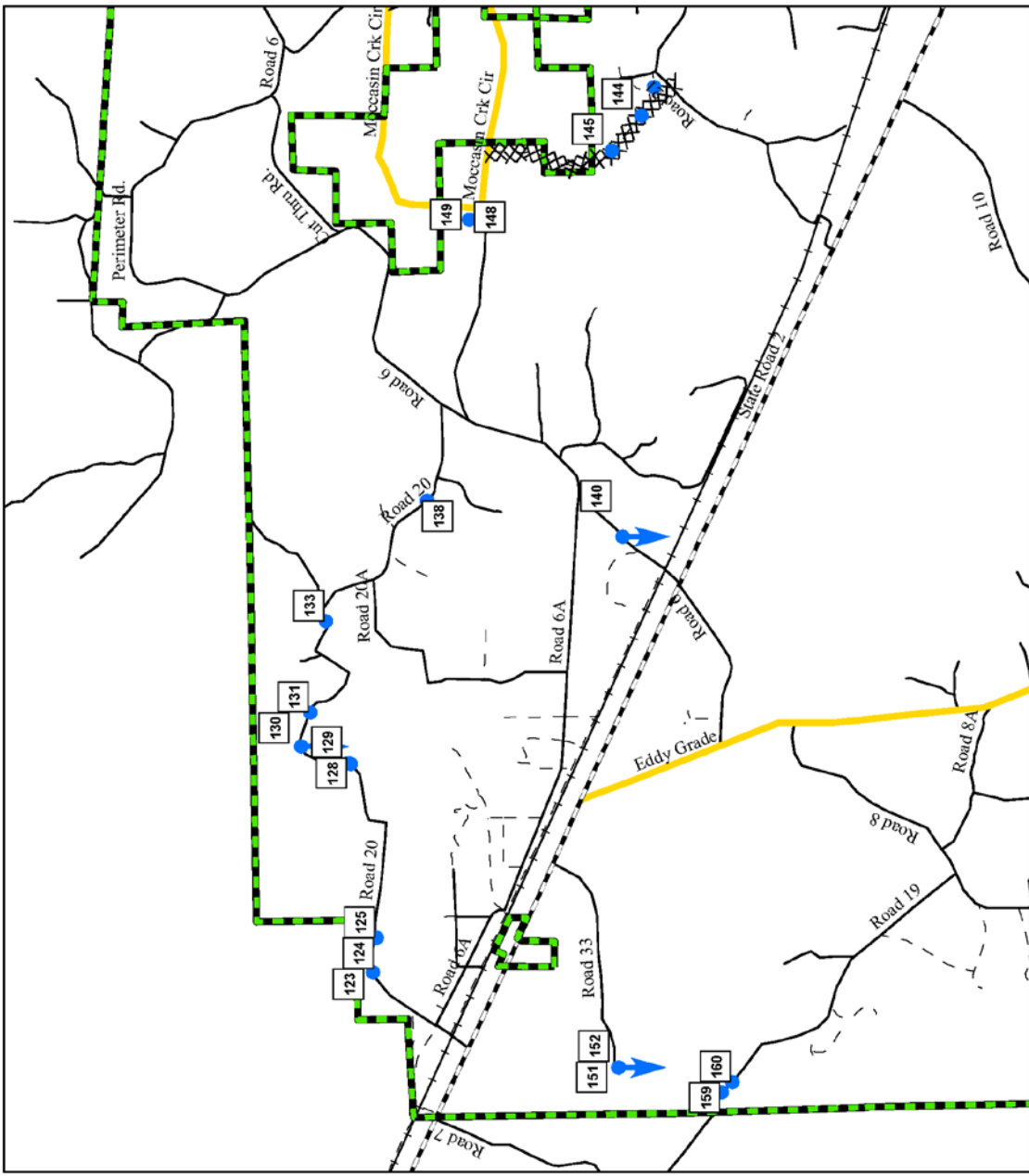
JMBSF post Bugaboo Hydrology Restoration Points

- bugaboo dozer line
- boundary
- dirt
- grace
- gravel
- two trail
- rail road

Direction of Surface Flows

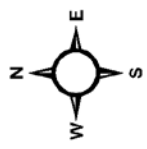
SE Flow

drawn by
Lee B. Smith
Forestry Supervisor II
9/30/07



DISCLAIMER

This map is the product of the Florida Division of Forestry. No warranties are provided for data therein, its use, or its interpretation.



John M. Bethea
State Forest
Post Bugaboo
Hydrology Restoration
Plan Map 4

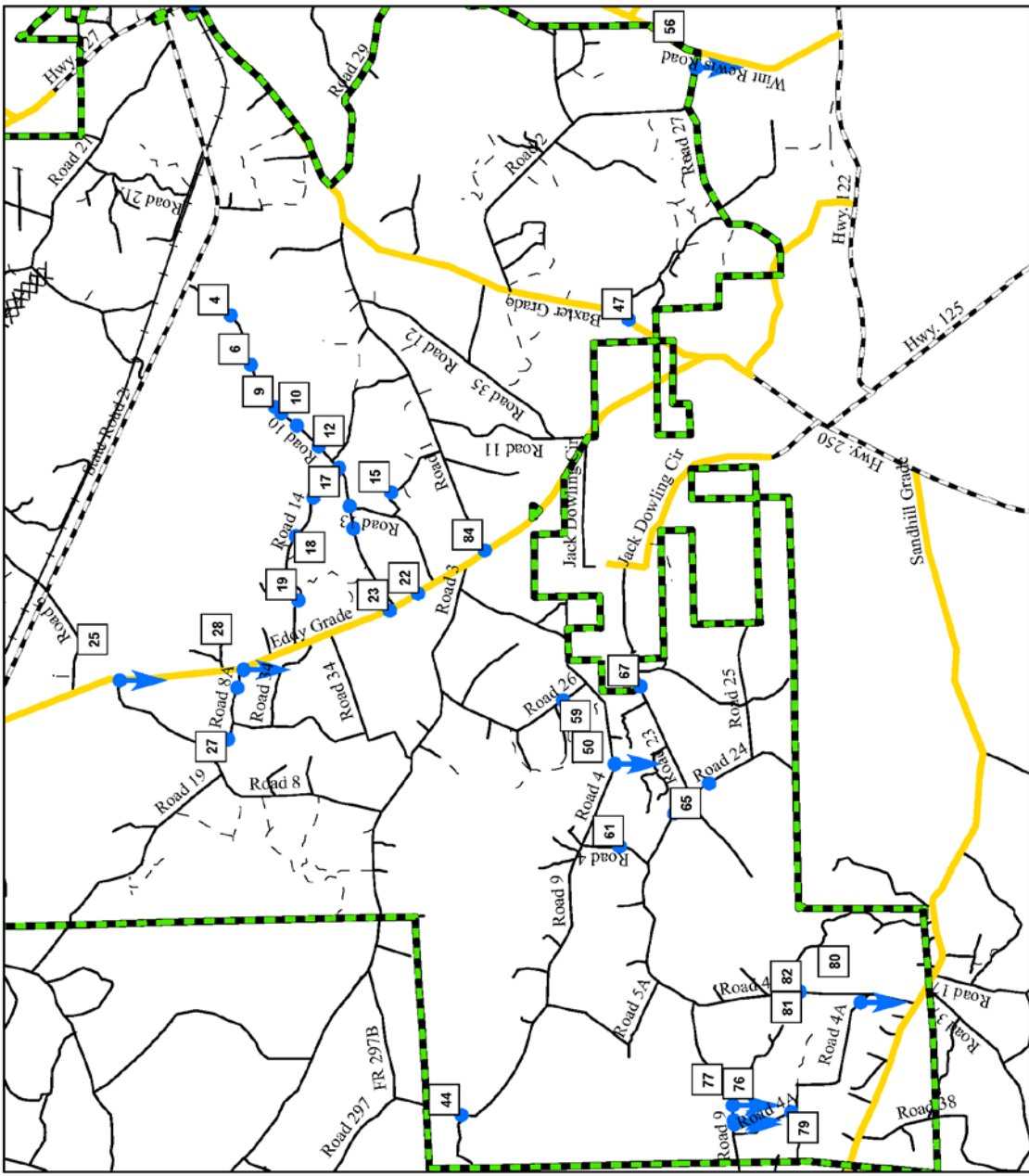
JMBSF Post Bugaboo Hydrology Restoration Points

- bugaboo dozer line
- boundary
- dirt
- grace
- pared
- two trail
- rail road

Direction of Surface Flows

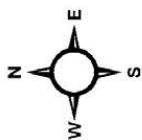
SE Flow

drawn by
Lee B. Smith
Forestry Supervisor II
9/30/07



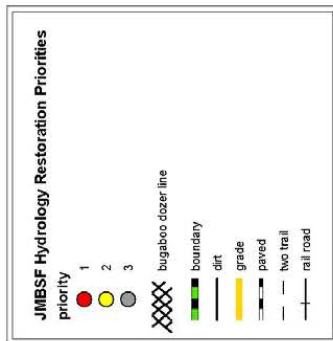
DISCLAIMER

This map is the product of the Florida Division of Forestry. No warranties are provided for data therein, its use, or its interpretation.

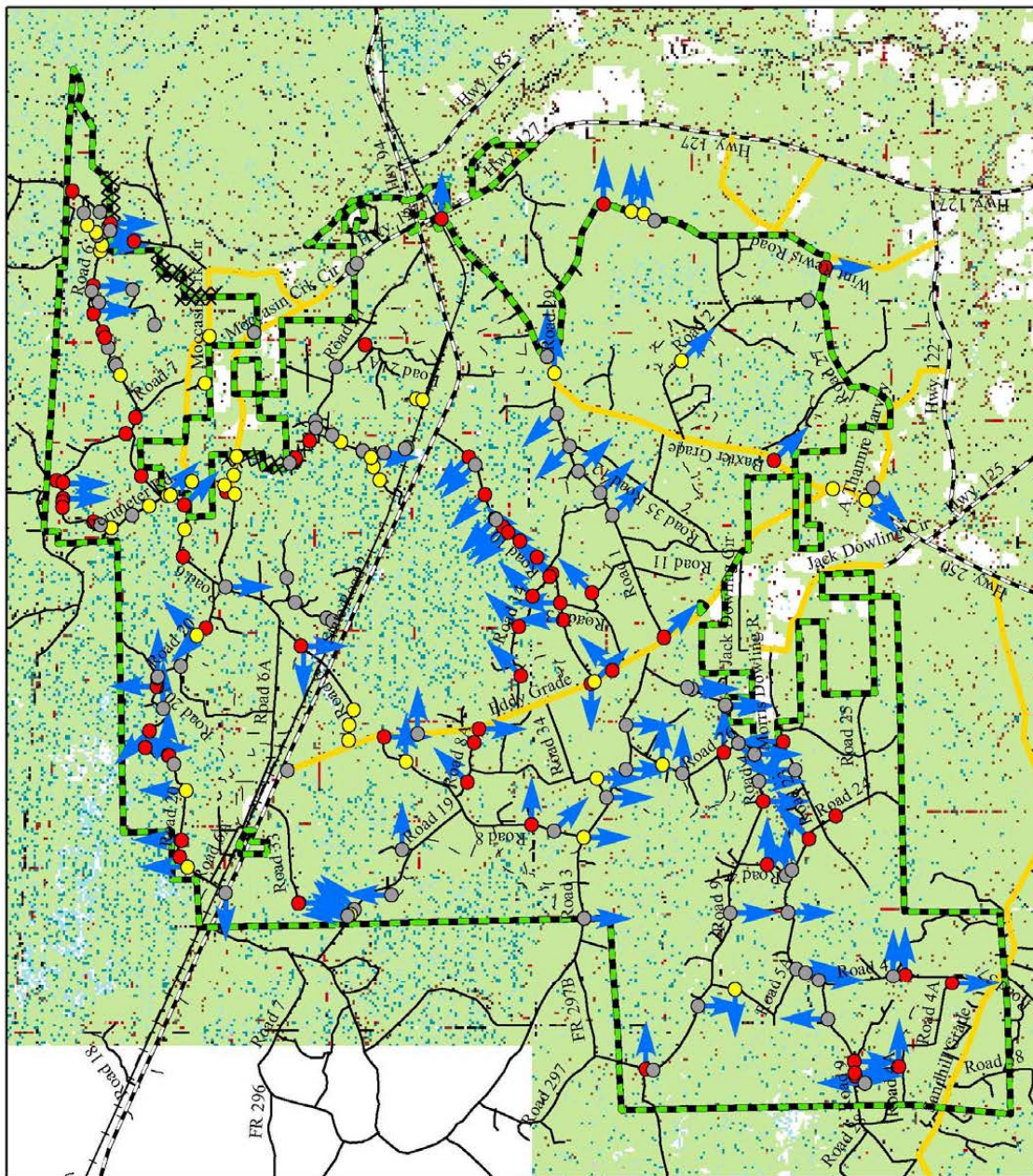


John M. Bethea State Forest Post Bugaboo Hydrology Restoration Plan Overview

Map 5



drawn by
Lee Barnwell
Forestry Supervisor II
6/8/07



DISCLAIMER

This map is the product of the Florida Division of Forestry. No warranties are provided for data therein, its use, or its interpretation.

Florida Division of Forestry - John M. Bethea State Forest
Post-2007 Bugaboo Fire Hydrological Restoration Plan

ATTACHMENT 3

POST-BUGABOO HYDROLOGICAL RESTORATION JOHN M. BETHEA STATE FOREST

ACTION ITEM PLAN/TIMETABLE

ATTACHMENT 3
JOHN M. BETHEA STATE FOREST
POST-BUGABOO HYDROLOGICAL RESTORATION
ACTION ITEMS PLAN/SCHEDULE

PRTY. #	PRIORITY AREA	FOREST QUAD/ WAYPT. REF.	ACTION	SCHEDULED	REFERENCE (Page #s)
1	Moccasin Creek Area	NE/	1a: Immediately remove debris from culverts; 1b: Ditch Plugs on Fireline	1 st Qtr., FY2007-08	9 - 10
2	St. Mary's River/Bugaboo Pushed Line	NE/154,	2a: Ditch Plugs & Water Bars on Bugaboo Line; 2b: Monitor tributary to SMR; 2c: Ditch Plugs on Firelines	1 st & 2 nd Qtrs., FY2007-08	7 - 8
3	Bugaboo Pushed Line/Road 21/ Moccasin Creek	NE/	3a: Bugaboo Line Rehab, Berm Removal, Stabilization Activities; 3b: Remove Berms on Road Shoulders within Bugaboo Line; 3c: Armor Road Sections	1 st & 2 nd Qtrs., FY2007-08	9
4	Moccasin Swamp/Road 10	SW	4a: Create Additional Conveyance under Road 10 with installation of culverts or LWHs Crossings; 4b: Improve (reinforce LW Crossings on Road 14	2 nd & 3 rd Qtrs., FY2007-08	5
5	Road 20/ Okfefenokee Swamp Break	NW	5a: Restrict Traffic on Rd 20 until Stabilized; Install additional conveyance under west end of Road 20 5b: Replaced damaged culverts, elevate crossings; 5d: Install Ditch Plugs on Firelines;	1 st & 3 rd Qtrs., FY 2007-08	11 - 12
6	Perimeter Road/ "Cut Thru" Road Loop	NE	6a: Remove "Cut Thru" Road or Re-direct flow to Lake Holes Branch under Perimeter Road; 6b: Or install elevated LWHs Crossings on "Cut Thru" Road 6c: Install Ditch Plugs in Old Firelines (Delineation Lines); 6d: Monitor Basin Marsh reversion in west Perimeter Loop Area	3 rd & 4 th Qtrs., FY2007-08	8 - 9

ATTACHMENT 3

**JOHN M. BETHEA STATE FOREST
POST-BUGABOO HYDROLOGICAL RESTORATION**

**ACTION ITEMS PLAN/SCHEDULE
(Continued)**

PRTY. #	PRIORITY AREA	FOREST QUAD./WAY PT. REF.	ACTION	SCHEDULED	REFERENCE (Page #)
7	"Potato Patch" Firelines	NE&NW/	7a: Plow "cut-off" across beds; 7b: Re-Work Road Ditches – outer berms	1st & 3rd Qtrs., FY 2007-08	12 – 13
8	Pinhook Swamp	SW/	8a: Replace Damaged Culverts; Improve Crossings on Road 19; 8b: Work with County to Improve Crossings and Sections of Eddy Grade	3rd & 4th Qtr., FY 2007-08	4
9	Little River Bay	SW/	9a: Re-work, Stabilize, Improve Crossings on Road 4 and 24, and Eddy Grade; 9b: Install Ditch Plugs on Firelines; 9c: Install Ditch Plug in Field Ditch off Road 9	1st & 2nd Qtrs., FY 2008-09	5 – 6
10	Road 6/Railroad Track	NW/	10a: Install Ditch Plug in Field Ditch off Road 6	1st & 2nd Qtrs., FY 2008-09	12
11	Okfenokee Swamp FireBreak/Perimeter Road	NW/	11a: Install Ditch Plugs As Needed Along Southern Edge Of Break; 11b: Replace culvert on Secondary Road off of Road 6	1st & 2nd Qtrs., FY 2008-09	8
12	Interior Forest Roads	Forest-wide	12a: Restore Historically wet areas through passive management	On-going	13