UNITED STATES GOVERNMENT

memorandum

DATE: FEB. 14 1983

REPLY TO ATTN OF: Refuge Supervisor, FWS, Wildlife Resources, Atlanta, GA (RF/ME)

SUBJECT: Panther Swamp Habitat Management Plan

TO: Refuge Manager, Hillside NWR Complex

The Panther Swamp Habitat Management Plan has been reviewed and approved. The plan is well prepared and conforms to both national and regional forest management guidelines. In carrying out this plan, the refuge manager must ensure that on the ground activities are based primarily on wildlife needs and not the economic benefits to be derived.

As you know, this refuge was acquired to protect and sustain bottomland hardwood habitat for use by migratory birds. The plan, as written, provides latitude for implementation of a variety of silvicultural practices to accomplish this goal. It will be the responsibility of the refuge manager to select options that will favor wildlife management activities such as maintaining adequate natural cavities for cavity nesting species, sufficient beaver pond habitat for wood duck broods, a variety of mast producing species, etc.

Region 4 has numerous successful forest habitat management programs and Panther Swamp National Wildlife Refuge certainly has the potential to produce substantial wildlife benefits with spinoff economic gains. I commend you on preparation of this plan and encourage implementation immediately.

Sam D. Drake Jr.
Sam Drake

Concur: _____
ARD-Wildlife Resources

OPTIONAL FORM NO. 10
(REV. 1-80)
GSA FPMR (41 CFR) 101-11.6
5010-114

* GPO : 1981 O - 341-526 (7008)

Panther Swamp Habitat Management Plan

1983 - 1997

Panther Swamp National Wildlife Refuge

Yazoo City, Mississippi

Prepared by: Lawrence Moore
Administrative Forester

Submitted by: George Chandler
Refuge Manager

Approved by: Sam D. Drake, Jr.
Regional Office

Date: February 7, 1983

Entrance to Panther Swamp Refuge

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FOREST MANAGEMENT PLAN

Part I. PROGRAM RELATION TO REFUGE OBJECTIVES

A. Preface

The Department of the Interior is the nation's principal land managment agency. It has responsibility for managing most of the nation's forest, wildlife, water, fish, mineral, park and recreational resources, and historical sites. The Fish and Wildlife Service of the Department of the Interior is responsible for managing the renewable resources on over 400 National Wildlife Refuges. Although national wildlife refuges protect and provide habitat for many types of wildife, they play an especially important role in management of migratory waterfowl. Numerous and various programs are necessary for properly managing this vast acreage.

Refuge forest management programs in the southeast have received considerable recognition from others who are interested in forest and wildlife management. Our programs are based on multiple use with wildlife receiving top priority. Sound silvicultural practices are modified somewhat to assure that the forest resource provides optimum wildlife habitat and creates a favorable environment where wildlife-oriented public use will be encouraged.

B. History

The alluvial valley of the Mississippi River is one of the most productive hardwood and wildlife habitats on the continent. This type of habitat depends greatly on wetness. A few feet change in elevation can mean the difference between a bald cypress swamp in standing water and a swamp chestnut oak-cherrybark oak type forest which grows on the highest of the first bottom ridges. Important mast species such as willow oak and water oak are found predominantly in overflow areas of the basin. Other species found include sycamore, sweetgum, green ash, American elm, cedar elm, sugarberry, Nuttall oak, black locust, water locust, overcup oak, bitter

pecan, black willow, and cottonwood. A lush understory of grasses, herbs, browse, and soft mast plants are associated with the forests in the basin.

Typical Sweetgum-Nuttall-Willow Oak type found in Panther Swamp.

This wetland forest type is a complex ecosystem consisting of a variety of plant and animal associations and differing from the adjacent upland environment chiefly because of seasonal inundation. The biota of this wetland ecosystem is adapted to and dependent upon high soil moisture which results from seasonal flooding. The wetlands are essential for furbrearers, wood ducks, and wintering migratory waterfowl. The enhanced vegetative productivity in the overflow area encourages the high productivity of all wildlife in the area. The season and length of time that the forest floor is inundated generally controls the type of vegetation and associated animal life and the biological functioning of the ecosystem.

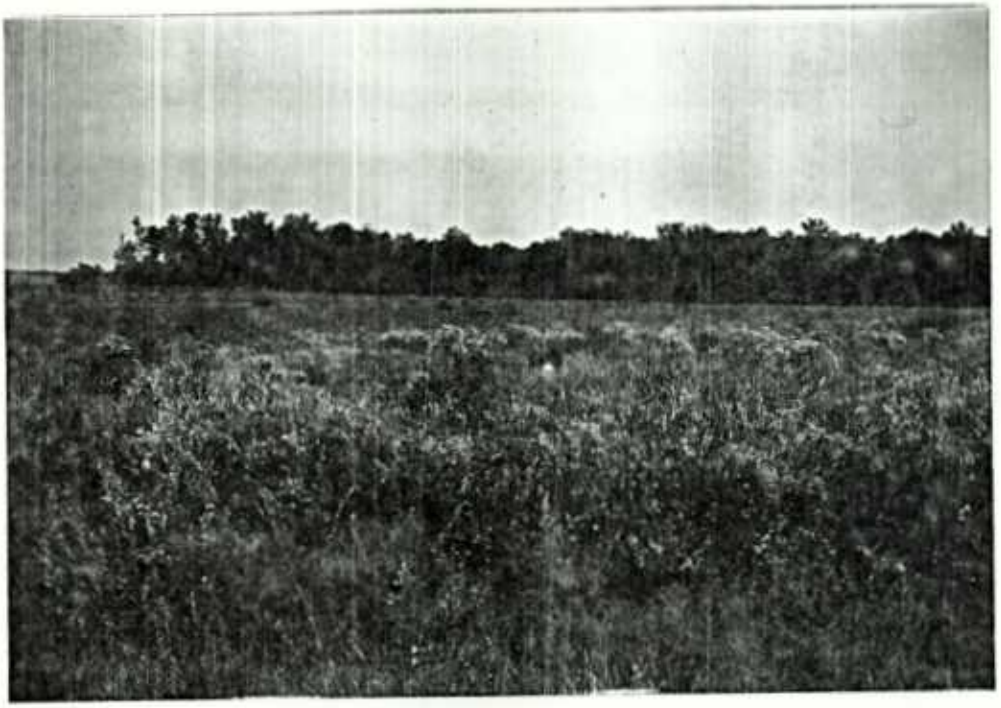
Unique wetland water tupelo type found in Panther Swamp Refuge.

As the nation's population increases, we can expect additional pressure to be placed on wildlife populations. As woodlands and other undeveloped acreages are withdrawn for agricultural, urban, water reservoirs, and numerous other purposes, it is imperative that the remaining land be managed more intensively to provide benefits for all to enjoy.

Every year more and more acres in the lower Mississippi Valley are being cleared for agricultural purposes. The clearing of this land has destroyed some of the most productive wildlife habitat in the United States. In an effort to preserve a small segment of our shrinking southern bottomland hardwood forest, Panther Swamp National Wildlife Refuge was created in 1978 which encompasses some 16,872 acres of bottomland hardwood.

Panther Swamp lands were predominantly purchased from McGraw-Curran Lumber Company. Thus all lands had been cut over to some extent during past years. Although some areas were severely cut, overall the area produces tons of desirable mast annually and provides adequate wintering and migration habitat for large numbers of waterfowl during late fall and winter months.

Panther Swamp NWR contains 944 acres suitable for agriculture. This area is being developed in cooperation with one co-op farmer as a multi-purpose area for wet soils managmenet, agricultural practices, and forest development.



C. Refuge Objectives

In managing the forest resource of Panther Swamp, a conscientious effort will be made to achieve the objectives outlined in 6 RM3 of the National Wildlife Refuge Manual

The main goal of forest management on refuges is to perpetuate the appropriate natural diversity of indigenous wildlife species.

Specific Objectives of the NWRS forest management program:

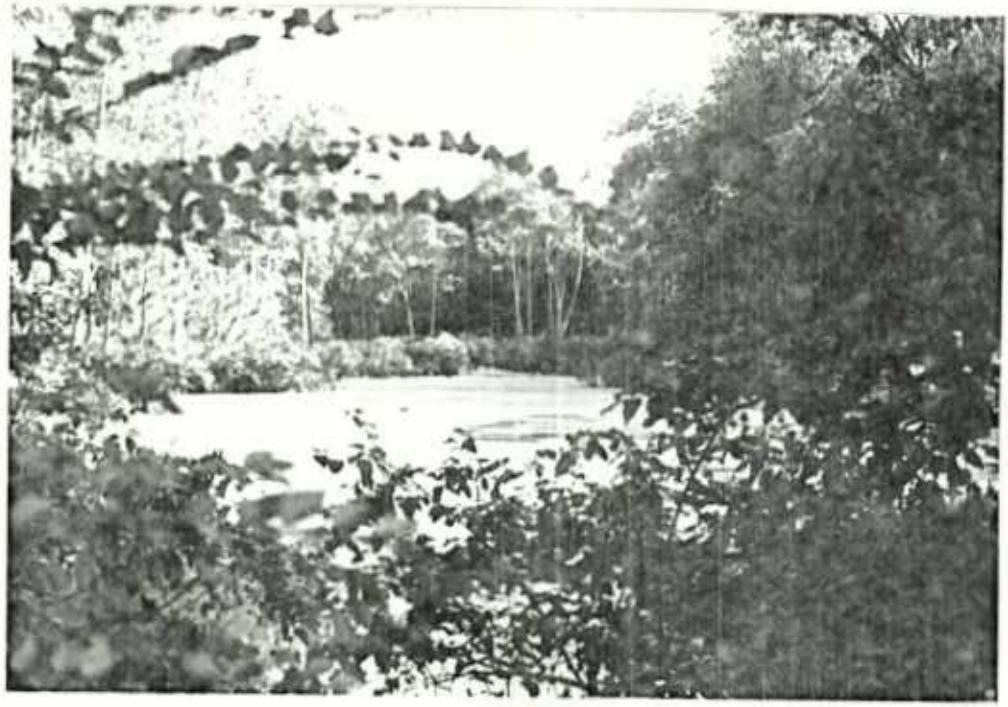
1. To provide habitat and protection for those species of plants and animals indigenous to the refuge which are officially listed by the Service as being threatened or endangered.

2. To provide habitat for waterfowl and other wildlife species.

3. To provide appropriate conditions for wildlife-oriented recreational, environmental education, and interpretive opportunities for people.

To date the objectives of Panther Swamp refuge have not been set. With Panther Swamp being surrounded by agricultural interest and with the decline in bottomland hardwoods, one of the primary objectives will be to preserve and perpetuate bottomland hardwoods, while providing over-wintering waterfowl habitat. With the exception of 994 acres, the entire refuge acreage is forested. With this in mind, it is apparent the limitations or success of any refuge objective will be controlled by the activities, scope, and success of timber management. Active management of the wildlife resource and its habitat is necessary to assure the continued well-being of the habitat and the wildlife dependant upon it. In a forested area such as Panther Swamp NWR almost all habitat management must be accomplished through forest management activities.

Management of the bottomland hardwood forest will consist of creating conditions necessary for specific species. Endangered species and waterfowl receive first priority in management. However, an intensive forest-wildlife management program will not only provide favorable habitat conditions for these and other wildlife species, but will also provide recreational opportunities for nature enthusiasts, bird watchers, photographers, etc.



Water tupelo brakes provide excellent habitat for overwintering waterfowl.

D. Obtaining Refuge Objectives

Timber management on Panther Swamp Refuge will promote wildlife and land management objectives by:

1. Leaving more than adequate present and potential wood duck nesting cavities. Promote the food supply along all waterways and feeding areas by creating conditions favorable for the maintenance and establishment of food producing plant species, particularly mast producing trees.

2. Will increase the amounts and variety of highly valued migratory duck foods by manipulating timber stand densities and species composition in areas subject to natural flooding.

3. Managing the forest so that optimum numbers of resident game and non-game species can be carried consistent with good wildlife management practices.

4. Providing well planned timber access roads that will aid in meeting recreational needs.

5. Manage the timber so as not to decrease the value of any soils, bodies of water or any natural resources already present. To elevate each timber type or site to its ultimate in the production of wildlife habitat and timber for which it is best suited.

6. An overmature age class will be presented so as to provide for those animals which prefer this age class condition.

E. Wildlife and Tree Species to be Favored

Some of the more desirable tree species to be favored due to mast production, denning or nest potential, and commercial value are:

Nuttall oak	-	Quercus nuttallii
Water oak	-	Quercus nigra
Willow oak	-	Quercus phellos
Overcup oak	-	Quercus lyrata
Bitter pecan	-	Carya aquatica
Green ash	-	Fraxinus pennsylvanica
Baldcypress	-	Taxodium distichum
Cedar elm	-	Ulmus crassifolia
American elm	-	Ulmus americana
Sweetgum	-	Liquidambar styraciflua
Sugarberry	-	Celtis laevigata
Sweet pecan	-	Carya illinoensis
Sycamore	-	Platanus occidentalis
Persimmon	-	Diospyros virginiana
Maple	-	Acer. spp.

Management of the refuge forest will be directed primarily by the habitat and life requirements of these animals:

All migratory ducks	
Forest dwelling non-game species, particularly song and cavity nesting birds.	
Wood Duck	Aix sponsa
White-tailed Deer	Odocoileus virginianus
Eastern Wild Turkey	Meleagris gallopavo silvestris
Gray Squirrel	Sciurus carolinensis
Fox Squirrel	Sciurus niger

The known resident threatened or endangered species on the Panther Swamp Refuge include the American alligator (Alligator mississippiensis). Special management considerations, wherever possible, will be given to this species to ensure that favorable habitat conditions are maintained to perpetuate their survival. Timber activities will not have any direct favorable or adverse impacts upon this species.

F. Glossary - see exhibit 1.

Part II. PROGRAM POLICIES AND ADMINISTRATIVE CONTROL

A. U.S. Fish and Wildlife Service Policy

The policy of the U.S. Fish and Wildife Service is to manage refuge forestlands primarily for the production of wildlife and wildlife-oriented output. No other agency has a better opportunity nor bears a greater responsibility of managing the nation's wildife and timber resources so that wildlife populations and high quality forests will be perpetuated for the use and enjoyment of future generations.

B. Timber Marking

The Scribner Decimal C log rule will be used for all saw log sales. The main reason for using this rule is that a local volume table is available. These tables cover both sound and defective volumes thus limiting human error during sale preparation. A copy of the volume tables are included in Exhibit 10.

Stems with 50% or more defect are considered to be cull and will not be marked for timber sale purposes. All timber offered for sale will be marked with two spots of tree marking paint. One spot will be at the base of the tree and the other will be above floodwater line when possible. The minimum size trees that will be marked for sawlog sales at present will be 13.6" or 14" diameter class. In the event of future markets the diameter are used in all phases of work. Trees are tallied by individual species or groups of species according to value. At present no pulpwood market exists. The following guidelines will be observed when marking timber for sale:

1. The entire basis for this plan is the improvement of wildlife conditions. In general, intolerant species provide the best habitat for wildlife and therefore are of the greatest importance. However, as plant succession advances, the intolerant trees are replaced by tolerant ones and overall wildlife values tend to decline. Other stand conditions such as density, species composition, size class, and available sunlight reaching the forest floor influences the production of wildlife and wildlife-oriented outputs. Through the forest management program, we will attempt to maintain and perpetuate the proper mix of these ingredients at all times. Vast amounts of wildlife foods are produced by maintaining crown densities that allow sunlight to penetrate to the forest floor and these foods are continually spaced by cutting cycles. Open areas created by log decks and secondary log roads provide excellent habitat conditions for edge dwelling non-game birds, overwintering waterfowl, brood and nesting habitat for turkeys, and produces added volume of browse for deer. Superior mast-producing species and their regeneration will be favored in all timber harvest activities with emphasis placed on individual species on individual sites.

2. Stands containing volume above optimum stocking should be thinned to the desirable basal area regardless of tree quality. The reservation of desirable mast-producing trees will receive top priority.

3. In addition to retaining optimum growing stock, trees containing suitable or potential cavities for nesting and denning will be reserved.

4. A three chain buffer zone will be left along wooded swamps, major waterways, and primary refuge roads. Management in these areas will place first priority on aesthetics.

5. Trees with suppressed crowns will be marked when future growth is questionable.

6. Poorly formed and defective trees should be marked to favor the growth of higher quality growing stock.

7. Trees which will not survive until the next cutting cycle and are excess to habitat requirements should be marked for salvage.

8. Thinnings, necessary to create conditions favorable for the growth of herbaceous vegetation, will be made on an individual basis.

9. From a wildlife standpoint, it is important to maintain a large part of the forest in stands that are in the upper half of the rotation age. Because of these considerations, the major thrust of this cutting cycle will be a combination stand improvement and sanitation cut utilizing individual tree selection. Individual and groups of overmature trees will be retained where necessary to balance habitat required for various wildlife species.

10. Within individual sale areas, consideration will also be given to identifying areas that have adequate reproduction where a sawlog overstory removal can be prescribed. No attempt will be made here to set the acres to receive such cuts due to the fact that each area and each acre will be examined as this cutting cycle progresses. Restrictions

governing the size and distribution patterns of these areas will assure the diversity of habitat conditions within home ranges of various species of wildlife now and as the forest age increases.

11. The purpose of thinning hardwood stands is to improve the residual stands, both for timber and wildlife. Three main characteristics to keep in mind when thinning stands are the vigor, quality, and species composition of the leave stand. Also, in many cases, potential den trees can be slected during early thinnings. Trees in a stand which have crowns of similar development and which occupy similar positions in the crown cover are grouped into crown classes.

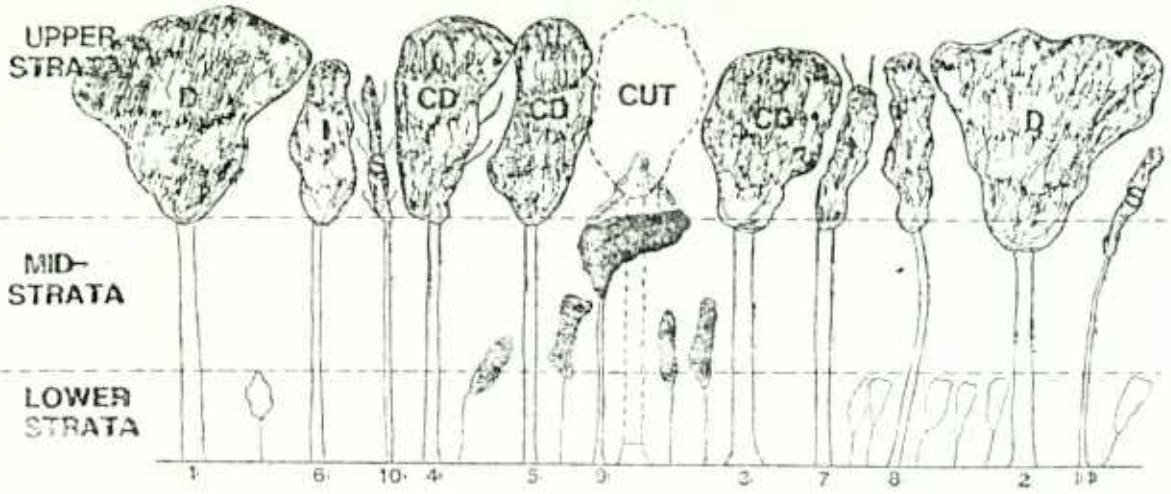
    In hardwoods crown class not only reflects position in the canopy but also fullness and condition of the crown relative to the tree's size. For example, a tree which has part of its crown above the crowns of surrounding trees may be downgraded to a codominant class because of the condition of the crown, e.g. lack of fullness or size relative to expected size for a tree that height and diameter. On the other hand, a tree which received little sunlight from above, and usually is classed as suppressed, might be classed as intermediate if the crown is in adequate condition. This situation usually reflects species tolerance.

The following definitions are given for crown classes of hardwoods. The definitions apply to trees of the main canopy.

	Crown Position	Crown Condition
Dominant	Trees with crown extending above the general level of the crown cover and receiving full light from above and almost full light from the sides.	Crown should be wide, deep, well shaped and relatively full. If crown is too small for the tree size or if crown deterioration has occurred the tree should be classed as codominant.
Codominant	Trees with crowns forming the general level of the crown cover and receiving practically full light from .	Crowns generally deep, well shaped and relatively full but may be somewhat lacking in density and spread. If

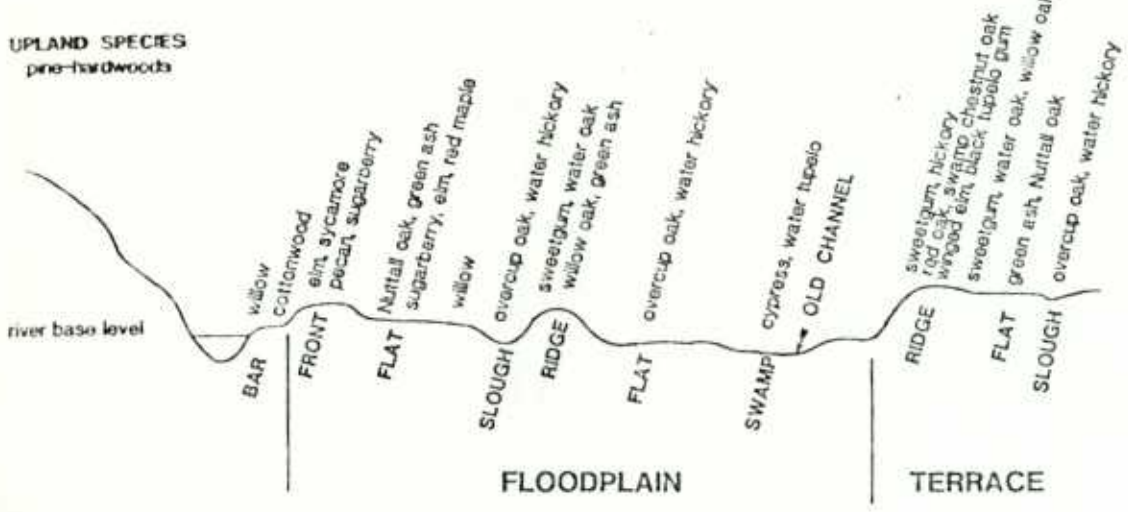
	above but only partial light from the sides.	crown is small for the tree size or if deterioration has occurred the tree may be classed as intermediate.
Intermediate	Trees usually shorter than the dominants and codominants but crowns sometimes extending into the crown cover formed by dominants and codominants. May receive some direct light from above but usually little from the sides.	Crowns usually small; may be dense and considerably crowded on the sides or relatively wide but lacking in density. Trees with crowns which show signs of past or present deterioration should be classed as suppressed.
Suppressed	Trees with crowns usually below the general level of the crown cover and almost all light received is diffused light.	Crowns usually small and sparse in foliage. Trees of tolerant species which have exceptionally well developed crowns may be classed as intermediate.

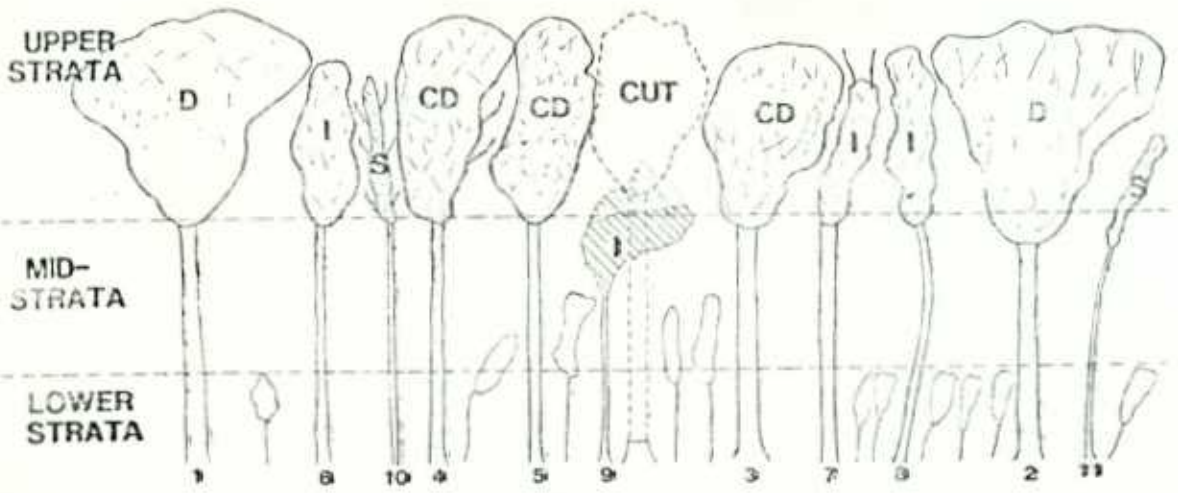
Natural forest provides excellent wildlife habitat



HARDWOOD CROWN CLASSES

DOMINANTS - 1 & 2
CODOMINANTS - 3,4 & 5
INTERMEDIATES - 6,7,8 & 9
SUPPRESSED - 10 & 11





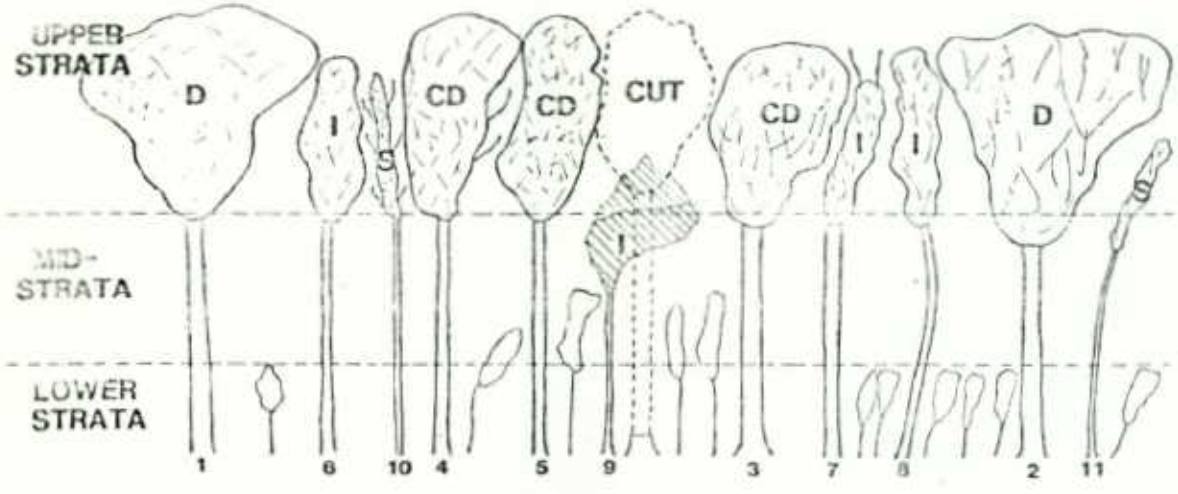
DOMINANT

- POSITION -

CROWNS EXTENDING ABOVE THE GENERAL LEVEL OF THE CROWN COVER AND RECEIVING FULL LIGHT FROM ABOVE AND ALMOST FULL FROM THE SIDES.

- CONDITION -

CROWN SHOULD BE WIDE, DEEP, WELL SHAPED AND RELATIVELY FULL. IF CROWN IS TOO SMALL FOR THE TREE SIZE OR IF CROWN DETERIORATION HAS OCCURRED, IT SHOULD BE CLASSED AS CODOMINANT.



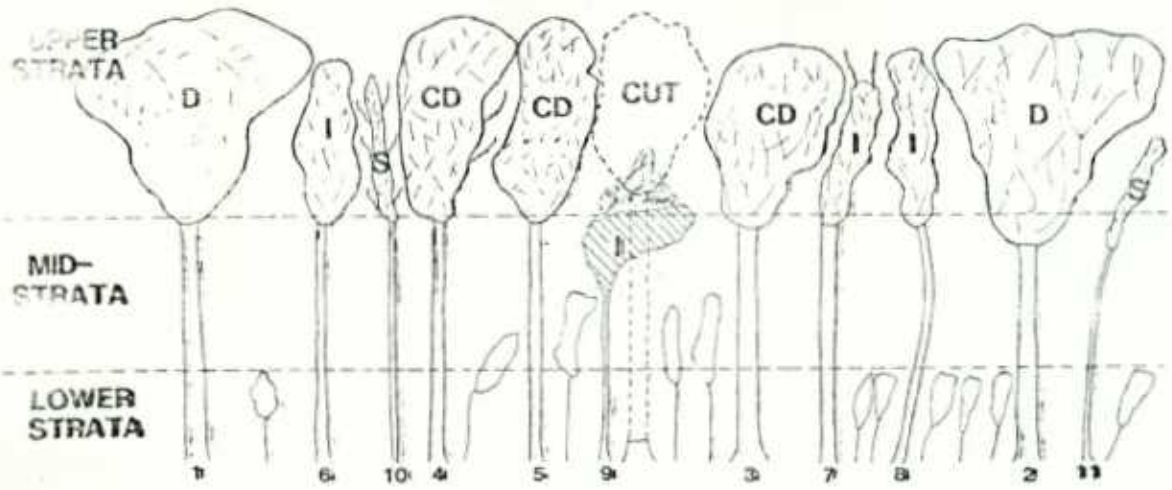
CODOMINANT

- POSITION -

CROWNS FORMING THE GENERAL LEVEL OF THE CROWN COVER AND RECEIVING PRACTICALLY FULL LIGHT FROM ABOVE BUT ONLY PARTIAL SIDE LIGHT.

- CONDITION -

CROWNS GENERALLY DEEP, WELL SHAPED AND RELATIVELY FULL BUT MAY BE SOMEWHAT LACKING IN DENSITY AND SPREAD (4). IF CROWN IS SMALL FOR THE TREE SIZE OR IF DETERIORATION HAS OCCURRED IT MAY BE CLASSED AS INTERMEDIATE (7).



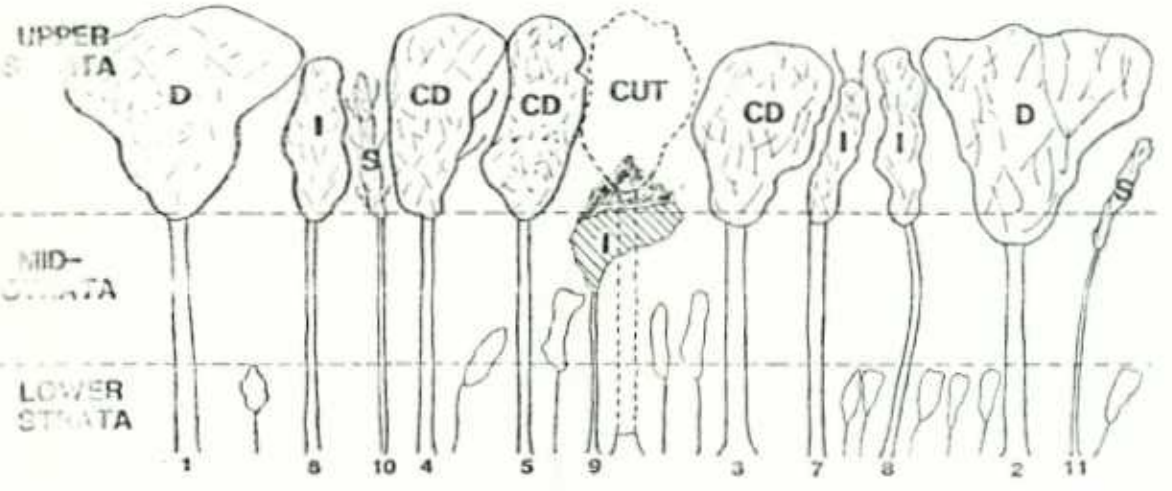
SUPPRESSED

- POSITION -

CROWNS USUALLY BELOW THE GENERAL LEVEL OF THE CROWN COVER. ALMOST ALL THE LIGHT RECEIVED IS DIFFUSED LIGHT (11).

- CONDITION -

CROWNS USUALLY SMALL AND SPARSE IN FOLIAGE (11). TREES OF TOLERANT SPECIES WHICH HAVE EXCEPTIONALLY DEVELOPED CROWNS MAY BE CLASSED AS IMMEDIATE (9).



INTERMEDIATE

- POSITION -

USUALLY SHORTER THAN THE DOMINANTS AND CODOMINANTS BUT CROWNS SOMETIMES EXTENDING INTO THE CROWN COVER FORMED BY DOMINANTS AND CODOMINANTS (8). MAY RECEIVE SOME DIRECT LIGHT FROM ABOVE BUT USUALLY LITTLE FROM THE SIDES (6).

- CONDITION -

CROWNS USUALLY SMALL, MAY BE DENSE AND CONSIDERABLY CROWDED ON THE SIDES OR RELATIVELY WIDE BUT LACKING IN DENSITY. CROWNS WHICH SHOW SIGNS OF PAST OR PRESENT DETERIORATION SHOULD BE CLASSED AS SUPPRESSED (10).

a. Thinning Methods

--Crown Thinning. This method removes trees from the upper canopy but still favors the development of the most promising dominant and codominant trees. It also removes all merchantable lower canopy trees.

--Leave Tree Thinning. This is a semi-mechanical thinning method; trees are left on a present grid spacing. However, selection of trees to be left is based on dominance class, vigor and spacing.

--Row Thinning. This is a mechanical method used only where special conditions prevail.

b. Thinning Procedures

Stands should be thinned to a basal area of 60-100 square feet depending on DBH. The smaller the DBH, the lower the leave BA. In checking basal area, include only trees which have a dominant or codominant position in the crown canopy.

Studies have shown that for a given diameter class and site quality a high vigor tree will produce five to six times more volume growth than a low vigor tree. Mast yield will also be higher. The best trees will be in the dominant or codominant position. Little can be gained from the release of trees in the intermediate or overtopped positions. Here are some of the noticeable differences between high and low vigor trees.

Vigor Comparison

High Vigor	Low Vigor
None or few epicormic branches	Much epicormic branching
Larger DBH than the crown class average	Lower DBH than the crown class average
Well-developed healthy crown. The crown is dense with no evidense of disease or injury.	Narrow to undeveloped crown. The crown may be open, with some dead or broken limbs, or thinly foliated.

In even-aged stands the larger trees are normally the same age as the smaller trees, but have grown at a faster rate and therefore have higher vigor rating. In diversified stands or stands of many age groups, crown class will be a better indicator than DBH.

In any case, crown class (which expresses the vigor of the trees manufacturing process) and relative DBH (which reflects the efficiency of the crown) are highly correlated and both reflect to an extent the toal competitive pressure of the surrounding stand density.

c. Leave Basal Area and Spacing Guidelines

The need for a thinning when basal area of the dominant and codominant trees in stands or groups of trees exceeds the leave basal area or spacing guidelines.

LEAVE BASAL AREA & SPACING GUIDELINES FOR HARDWOOD STANDS

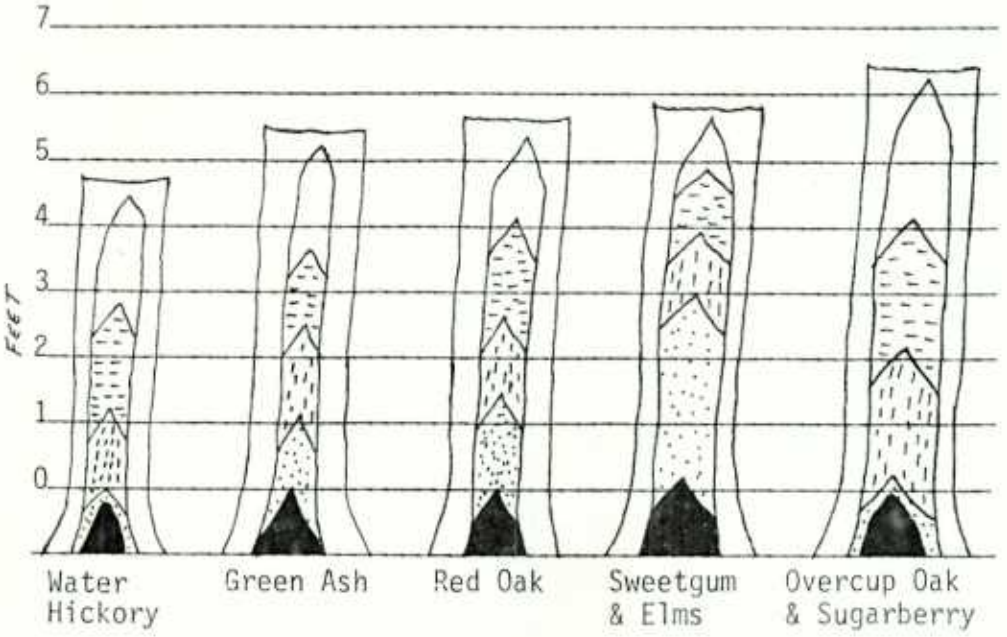
DBH	No. Trees Per Acre	BA	Spacing
5	300	59	12x12
7	227	61	14x14
8	183	64	16x16
9	151	67	17x17
10	127	69	19x19
11	109	72	20x20
12	94	74	21x21
13	82	75	23x23
14	72	77	25x25
15	63	77	26x26
16	57	80	28x28
17	50	80	29x29
18	45	80	31x31
19	41	80	33x33
20	37	80	35x35

This table is considered to be 60 percent of full stocking for a given DBH. If a desirable crop tree is not available, select and leave the best tree available to avoid creating a hole in the stand. Den trees will be considered as crop trees and should not exceed their recommended number per acre.

Judgements on whether a damaged tree should be marked often must be based on a predicted rate of spread for rot and damage. Exerpts from two publications are presented here as an aid in making such predictions.

From Decay After Fire Injury to Southern Bottomland Hardwoods
E. R. Toole USFS Technical Bulletin #1189: (Page 17)

> The average rate of verticle spread of established rot after the first decade was 2.0 feet per decade for overcup oak and sugarberry, 1.6 feet per decade for water hickory, 1.3 feet per decade for red oaks, 1.3 feet per decade for green ash, and 0.9 foot per for sweetgum and elm. However, the decay rates during the first 10 years after wounding did not conform to the later rates of spread.



Rot After 40 Years
Rot After 30 Years
Rot After 20 Years
Rot After 10 Years
Orignial Scar

This information can be used in routine timber marking as a guide in deciding whether to cut or leave a tree with rot already established. In judging the future value of a tree, however, still other considerations exist, such as (1) the best or most valuable part of the tree is rotting, (2) breakage may destroy the tree, and (3) degrade from stain and insect attack is often associated with rot.

Decay in Beaver-Damaged Southern Hardwoods E.R. Toole and R.M. Krinard Forest Science Sept. 1967: After studying the progression of rot on 201 sweet gum, ash, and sugarberry trees, the authors made the following recommendations: "To minimize loss, poor risk trees in beaver-damaged stands will have to be removed periodically. The data suggest that losses would not

be excessive if salvage cuts were made every 10 years. Trees with wounds extending more than one-fourth of the way around the circumference should be removed along with trees that have especially deep rot or low vigor. A 10-year salvage cycle would probably limit mortality to less than 1% per year, and rot to less than 2 inches in depth in most wounds."

The above applied to beaver damaged trees from partial girdling. Water damaged trees from beaver impoundments usually die quickly necessitating salvage in a short period of time.

C. Stand Improvement

Stand improvement work which consists of pre-commercial thinning, non-commercial thinning, and timber stand improvement may be needed in hardwood stands. Stand improvement work is most commonly needed in the following stand condition classes: (1) seedlings and saplings adequately stocked, and (2) immature poletimber stands.

Following identification of the stand to be featured in management (for at least the next 15 year cutting period) the need for any stand improvement work must be determined based on a complete inventory.

In sapling stands there must be at least 300 desirable, well-spaced, vigorous, free to grow stems 10'+ in height. If these minimums are not met, the need for one of the following stand improvement treatments is apparent.

1. Release and Weeding:

Where possible hard mast species will be favored over mast species and the red oak groups should be favored 3-1 over the white oaks. Unless needed for wildlife, cull or otherwise undesirable stems which are crowded or overtopping desirable trees should be killed or removed. In order to determine which trees to "release" and which stems to remove, the forest type to be featured and stand condition class must first be determined.

Only straight, vigrous, high quality potential crop trees should be released. Trees to be released should not be over the required number of crop trees per acre.

Release work may be accomplished using tree injectors, hypo-hatchets and chemicals, chain saws or other hand tools depending on the size and species being treated.

Tree injectors are metered to discharge various amounts of undiluted herbicide into each incision. Generally, the incisions should be made near the groundline. The amount of herbicide required to kill a tree varies by species, season of treatment, spacing of incision, site and tree size. Larger trees are more difficult to kill than small ones so dosages should be doubled for trees larger than 9" DBH.

For easy to kill species, incisions should be 2 inches apart, while on hard to kill species, the incisions should be edge to edge. The incisions must go through the bark and into the cambium. Some trees, such as larger hickories, have thick bark which requires an extra effort in order for the bit to penetrate to the cambium. 2,4-D Amine, is recommended to be used at the rate of 1 millimeter per injection. (Tordon 101 or 101-R should not be used on hardwood stand improvement).

2. Non-Commercial Thinning - Poletimber and Sawtimber

These are stands in need of thinning in which stems to be removed cannot be sold either due to a lack of market or because of unmerchantible quality or size. Crop or leave trees will be chosen as described in the commercial thinning section.

The primary purpose of thinning will be the removal of undesirable or cull material to allow desirable trees to more fully utilize the site. Species composition improvement in the younger stands may also be reason for thinning.

In thinning, select the crop trees as previously described in the commercial thinning section. Thin only around the selected crop trees in order that these trees are free to grow. Remove competing crowns that are 1/4 to 1/2 crown width of the leave tree crown. Crown width chosen will depend on the current crown size of the crop tree. Stands with higher basal area will have smaller crowns, therefore more trees must be removed to obtain proper spacing.

Removal of the unwanted trees may be by chain saws, injectors or hypohatchets using chemicals, other hand tools or by mechanical methods. See Exhibit 2 for Susceptibility Chart.

Normally, the first thinning will take place only after the crown canopy has closed and, if possible, after crown dominance has been expressed. The age at which this occurs will depend on how the stand originated and in some cases the degree of vine competition. Usually this thinning is necessary at the age of 5-15 years.

3. Regeneration

Damaged, sparse, low quality, and mature stands may at some time need regenerating.

Three methods of regeneration may be considered for use in hardwoods, release cuttings, shelterwood, and group selection.

a. Release cuttings - Thousands of young trees per acre will normally appear subsequent to release cutting hardwood stands. In a release cut, remove all merchantible stems (except those needed for den trees, aesthetics, or other purposes) in order that site preparation costs may be kept at a minimum. Before a release cut is made, at least the minimum number of seedlings must be present. Preferably 40% of these stems should be in the oaks. Sever or kill all trees two inches DBH or larger.

If there are 300 or more desirable sapling size stems (up to 25 feet tall) they may be managed as the new stand. However, these stems should be well-formed, free of damage or disease, and vigorous growers.

b. Shelterwood Cutting - The objective of this type cut is to establish advance regeneration by opening up the stand, thus creating favorable conditions for germination and growth of reproduction. This operation is then followed by a removal cut of the stand. Shelterwood cutting may be used particularly with oak species to regenerate hardwood stands where advance regeneration is lacking in the understory. The shelterwood cut should be made 8 - 10 years prior to the removal cut. The shelterwood overstory should be removed during the same cutting period if reproduction becomes established.

In many hardwood stands qualifying for regeneration, the understory may be almost void of desirable oak reproduction. In these cases the canopy of the stand must be opened up enough to allow oak reproduction to become established and survive until the regeneration cut is made 8 - 10 years later. A leave basal area of 45 - 60 square feet per acre is recommended for most stands. Stands on poorer sites should be reduced to the lower limit of this range while stands on better sites should be closer to the higher limit of the range.

If the stand scheduled to receive a shelterwood cut already has a fairly heavy understory of tolerant species, this understory or mid-story must be removed as it will prevent establishment of desirable reproduction.

Seedlings of many species, particularly oak, sugarberry, elm and ash are sometimes stored for many years in the understory. These trees will normally form the new stand. A few oaks may be developed by simply removing the overstory, but to favor oaks they must be established in the understory before removing the overstory. When the advanced regeneration has been established the overstory of the entire stand, except for needed den trees, should be removed.

c. Group Selection - This should be the most commonly used method at Panther Swamp NWR. The objective of this type cut is to establish advance regeneration followed by a release cut of the stand. Under this system "blocks" or "patches" 1/2 to 1 acre in size are clearcut throughout the stand. These blocks may consist of 10-15% of the entire stand and should be located in a manner to take advantage of desirable seed sources in adjacent, uncut areas. For example, in a stand with sweetgum-Nuttall-willow oak management types, these "blocks" should be arranged between or among clumps of sweetgum-Nuttall-willow oak species leaving these trees as a seed source.

Eight to ten years after the blocks have been treated they should be inventoried for adequate stocking.

In some instances a combination of the "Group Selection" and "Shelterwood" methods may be used on the same stand to encourge regeneration prior to the final harvest cut. Where this is done, the blocks to be cut are arranged in the most desirable locations throughout the stand. Following this operation, the remaining

area (usually 85 - 90% of the stand acreage) is thinned according to (B) shelterwood cutting above. When advance oak regeneration is established (usually 8-10 years) the remaining stems in the stand are clearcut and any cultural treatment needed is done. On some areas regenerated by the above methods it may be impossible to obtain the minimum initial oak component desired. In these situations the best decision will probably be to manage the new stand regardless of the species composition. Cultural treatments and thinning throughout the rotation should continue to favor oaks.

The following table shows the minimum number of desirable seedlings per acre considered necessary for successful regeneration of hardwood stands.

Number of Stems per Acre Necessary for Successful Regeneration

Size of Regeneration	Number Stems per Acre
Less than 1" DGL	5,000
5' - 10' Height	1,500
10'+ Height	300

4. Site Preparation - Site preparation in hardwood stands may be accomplished by injectors, hand tools, chain saws, heavy equipment, or a combination of these methods depending on the pre-treatment inventory.

In most cases hardwood stands will be regenerated by natural methods. Reproduction of the new stand may be from stump sprouts, root sprouts, or seedlings.

Following the decision to regenerate a stand with adequate advance regeneration and removal of the overstory, the following site preparation procedure should be used.

a. All desirable stems (desirable species necessary for future stand) 2"-6" in diameter at ground level should be severed with a chain saw or other hand tools. These stumps will create desirable sprouts and form the basis for the new stand.

b. All other stems larger than 2" DGL (with the exception of trees to be protected such as den trees) will be injected with 2,4-D Amine.

c. Whenever there is abundant desirable regeneration less than 2" DGL it will be unnecessary to sever desirable stems in the 2"-6" range from sprouting. The remaining stems to be eliminated should be injected. In some instances following a harvest cut it may be desirable to accomplish site preparation work by mechanical means. Mechanical methods may be selected when: (1) there is no apparent need to be selective with stems forming the new stand, (2) the site is large enough for efficient equipment operation, (3) the soil conditions are such that mechanical equipment can operate without undue damage in the area, and (4) the stand to be featured in management will not be damaged. Mechanical site preparation may be accomplished by chopping, shearing, "breakage" with a dozer, hydro-axe, bombadier, or similar type cutting equipment.

D. Policy and Administration of Sales

The necessary guidelines for making sales are fully covered in the Wildlife Refuge Manual. These regulations, found in sections 5 RM 17 and 6 RM 3 will be observed in all sales.

The disposal of forest products shall be validated by a properly executed contract. Special Use Permit Form 3-1303 will be used when fees are charged for forest products.

The sales or disposition of forest products shall be governed by open market rules or formal bid solicitation. Formal bid solicitation will be used to establish the market value of most sales of forest products where a reasonable demand and competition exist.

Relatively small timber sales of approximately 500-700 m board feet of saw timber and 500 cords of pulpwood will be made for the following reasons:

1. In most cases logging can be completed in a 12 month period.

2. Small sales will permit buyers and the Service to take advantage of fluctuating prices.

3. Unsuccessful bidders will have additional opportunities for timber purchases.

4. Small sales should stimulate the local economy by creating more jobs for workers.

5. Small sales will result in more sale areas dispersed throughout the refuge producing a diversity of wildlife habitat conditions.

Timber sales will not be absolutely restricted to the suggested size. Should the market or other conditions warrant, the size of the sales can be altered.

Once the timber has been prepared for sale, bid invitations will be sent to all prospective buyers. Bid invitations will include the following:

1. A bid form containing information pertinent to the timber sale.

2. A list of special conditions applicable to the timber harvesting permit.

3. A tally sheet showing tree species, number of trees and volume per diameter class, average volume per tree and acre, total trees, and acreage and volume of sale.

4. A compartment map showing the location of sale area.

The bid invitation will specify specific dates. Usually there will be two weeks lapse between the mailing date and the sale inspection date. A period of 10 to 15 days will be given between the inspection date and the bid opening date. During this period, prospective buyers are urged to cruise or inspect the sale area for timber quality and volume estimates. The bids are opened at a specific time, usually 10 a.m. in the refuge office.

Immediately prior to the actual bid opening, the sale is again discussed so there will be no confusion of the bidders. Bids received after the closing date specified in the invitation will not be considered. In the event of a tie, new bids will be solicited. The bid will be awarded to the highest bidder who will conduct his operation in the best interest of the government. The government reserves the right to reject any or all bids. The bid form will also specify the amount of the performance guarantee to be submitted with the bid invitation. Most sales will require a minimum $1,000 guarantee deposit; however, this sum can vary depending on the size and other conditions of the sale. Deposits submitted by unsuccessful bidders will be returned once the permittee has been determined. The deposit of the successful bidder will be retained to cover any damage or claim the government might have against the permittee.

Advance payments are required for all sales. Lump sum payments are preferred; however, in the event the size of a sale necessitates the partial payment method, the timber within a designated area must be paid for prior to its removal. All payments, including performance guarantee deposit, will be made payable to the U.S. Fish and Wildlife Service in the form of a certified check or bank draft. All bids, three copies of the Special Use Permit, and a copy of DSC Form 4 showing performance guarantee will be submitted to the Regional Office. The Regional Office will prepare the Special Use Permit Form 3-1383 and return them to the Refuge Forester who will have the permittee to sign all three copies.

Before a permittee begins operating on a sale, he must pay for the sale and meet with the refuge Forester for a pre-entry conference. This is to make all involved aware of permittee and refuge responsibility.

Bids will be solicited from two or more buyers when the sale is equal to or exceeds $2,000. Commercial timber sales of less than $2,000 are discouraged for economic reasons.

Inspections will be made by the refuge forester to insure harvest operations are conducted in a satisfactory manner. Timber harvesting operations can be stopped at any time when field inspections reveal justifiable reasons. Field inspection reports are to be filled out and retained in the sale file.

After all requirements of the permit have been completed, the refuge manager will certify that all requirements of the sale have been completed and request that the performance guarantee be returned to the permittee.

Information specifying compartment, sale number, date of sale, purchaser, type of sale, timber volumes, acres involved, and revenue will be recorded and filed for future reference.

E. Control Records

The primary purpose of records is to show progress made in fulfilling the plan objectives. These records will consist of:

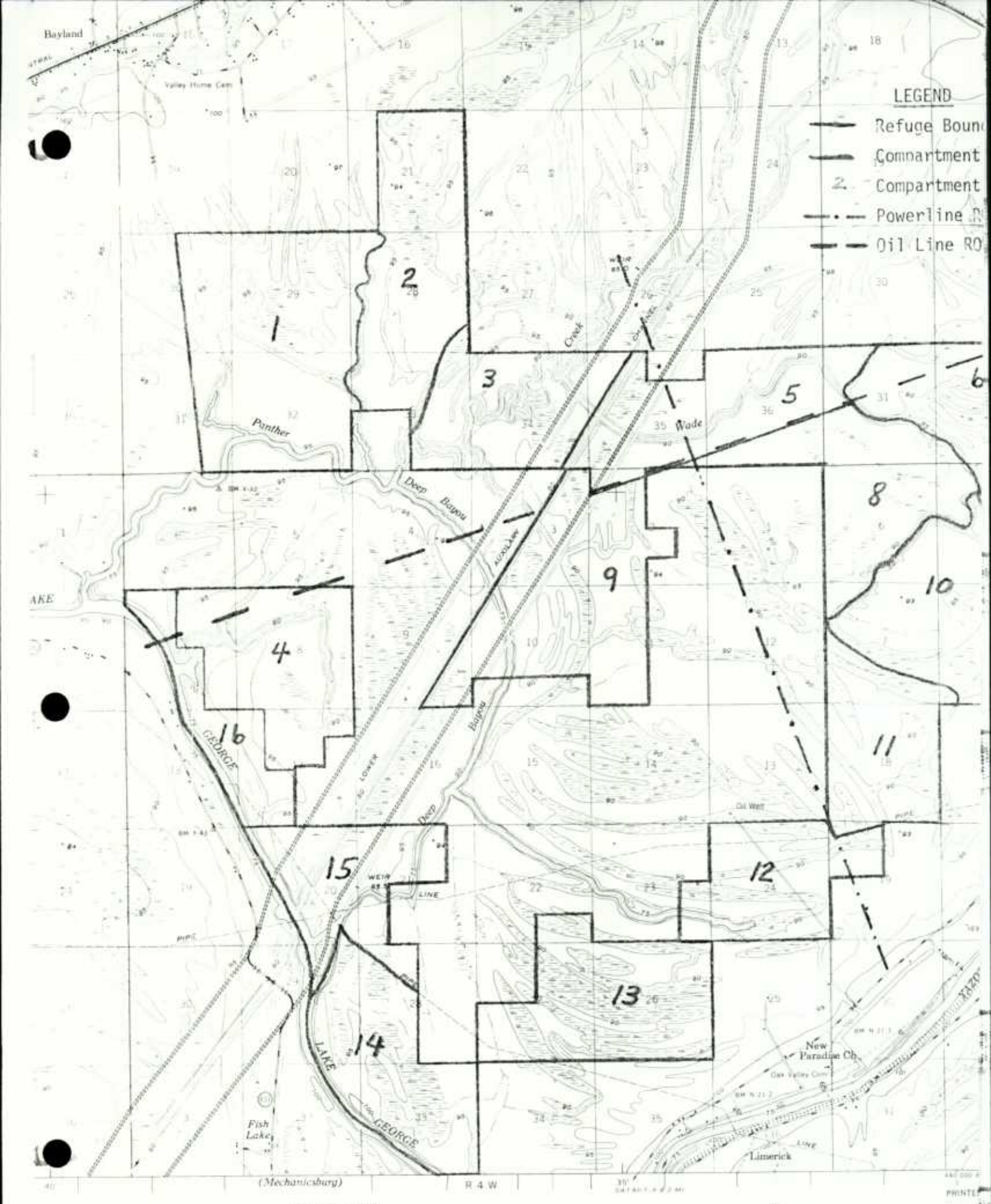
Compartment Folders
Order of Entry Plan and Progress Record
Compartment Map File
Individual Sale Folders

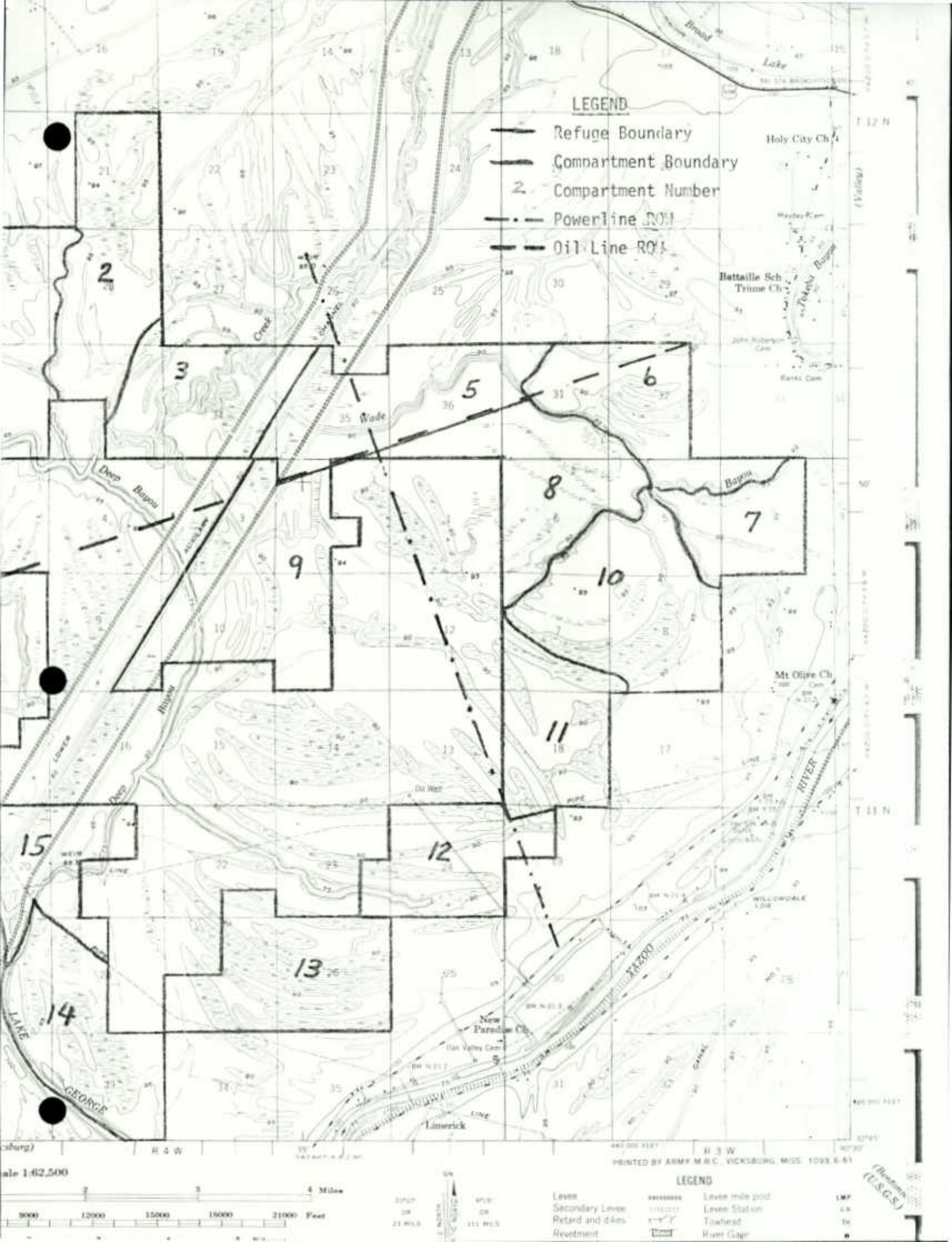
Such compartment folders will contain all essential records pertaining to a compartment. Included will be prescriptions, timber sale maps, and a sheet listing each sale showing date of sale, purchaser's name and volume by species.

The forestland has been divided into 16 compartments in order to facilitate record keeping and to provide definate areas small enough so that precise silvicultural work can be accomplished.

Order of Entry Plan & Record

Comp. #	FY Entered
10	1983
6	1984
9	1985
1	1986
5	1987
12	1988
13	1989
2	1990
3	1991
11	1992
4	1993
15	1994
7	1995
8	1996
16 & 14	1997


LEGEND
Refuge Boun
Compartment
Compartment
Powerline
Oil Line RO
Bayland
Valley Home Cem
Panther
Deep
Bayou
Auxiliary
Wade
Creek
Lake George
Fish Lake
New Paradise Ch
Limerick
(Mechanicsburg)
R 4 W
Scale 1:62,500
Miles
Feet
Kilometers
Levee
Secondary Levee
Retard and dikes
Revetment


LEGEND
Refuge Boundary
Compartment Boundary
2 Compartment Number
Powerline ROW
Oil Line ROW
2
3
5
6
7
8
9
10
11
12
13
14
15
Broad Lake
Holy City Ch
Battaille Sch
Triune Ch
Deep Bayou
Wade
Bayou
Mt Olive Ch
Oil Well
LINE
RIVER
YAZOO
WILLOWDALE LOG
New Paradise Ch
Limerick
LAKE GEORGE
T 12 N
T 11 N
R 4 W
R 3 W
PRINTED BY ARMY M.R.C. VICKSBURG, MISS. 1093.6-61
LEGEND
Levee
Secondary Levee
Retard and dikes
Revetment
Levee mile post
Levee Station
Toehead
River Gage

F. Compartment Prescriptions

Before any work is done in a compartment, a prescription will be written. This prescription will be written on the basis of cruise data gathered. During the cruise the following items will be noted:

1. The kind, size, age of reproduction present.
2. Species composition, age, and density of the overstory.
3. What is the stand's rate of growth? Is any TSI work needed such as pre-commercial thinning or correcting the species composition of the reproduction to retain a valuable wildlife timber type?
4. What is the condition of the stand from a wildlife standpoint? What are the wildlife species utilizing the area?
5. Are there any areas where beavers are causing problems that need to be corrected?
6. Other items of importance.

After the field work has been done, the prescription will be written summarizing all the items noted above.

Any prescribed treatment will be described and shown on a map which will be made a part of the prescription.

G. Stumpage Rates

Demand, accessibility, species, quality, and logging conditions will determine the stumpage value for all sales.

H. Funds

Timber management funds at the present time are programmed through the Migratory Bird Program. Expense for sales funds, programmed through Activity 6800, are used only for actual timber harvest costs such as salaries, equipment and supplies.

Part III. PROGRAM DESCRIPTION, PROBLEMS, AND SOLUTIONS

A. Scope of Forest Program

The U.S. Fish and Wildlife Service is responsible for the administration of the National Wildife Refuge System. The primary purpose for setting aside this network of lands and waters is for the protection and perpetuation of America's wildife resources.

The mission of Panther Swamp Habitat Management Program will be to create habitat conditions required for wildife, to provide wildlife-oriented recreational opportunities, and to exhibit to the public the proper stewardship of these public lands.

B. Description

1. Acreage: At the present time there are 16,872 net acres within Panther Swamp Refuge. 14,759 acres are in forestland (87%) and approximately 1,002 acres in agriculture or fields. Some of the forest acreage consists of roads, sloughs, powerline right-of-way, gas and oil line right-of-way, and beaver pond areas.

2. Topography: Panther Swmap Refuge is located 100% within the Mississippi Delta Region. Elevations range from a low of 75' msl to 97' msl.

Management of bottomland hardwoods species is dictated more by elevation than by any other single factor. With one foot change in elevation it might make the difference in managing for overcup oak-bitter pecan type to sugarberry, American elm, green ash type. Elevation is very critical to the Delta species, it controls both moisture regime and site index. It is of great importance to recognize a so called ridge in the Mississippi Delta as only a foot or two higher than the adjacent land. Also it is important to not that a slight change in elevation often has a greater influence on the species composition, quality, growth, kinds of forage, etc. than a 1,000 ft. change may have in the mountains.

3. Drainage: Drainage in Panther Swamp Refuge is primarily through Deep Bayou, Wade Bayou, Panther Creek and their tributaries. All drainge is into Lake George and the Sunflower River.

With the building of the Will Whittington Auxiliary Channel which traverses the refuge, all normal drainage into Panther Creek was stopped. All drainage east of the channel flows into a land site ditch along the channel then into Lake George. All tributaries west of the channel flow into Panther Creek then into Lake George and the Sunflower River.

Wade Bayou - Major drainage for East Side of Panther Swamp

With heavy rains during spring months, February through May, and the normal rise in the Mississippi River all lands east of the channel will flood. Lands west of the channel will normally flood only during abnormally high water from the Mississippi River. These floods occur normally every two years. These floods are beneficial for timber growth as long as the flooding is not for prolonged periods during hot spring and

summer months. The species found in annual flooding zones are exceptionally water tolerant. Drought periods are much more damaging to water tolerant species than excessively wet periods.

After flood waters have receded, the drainage, surface and internal, of any particular site is of much greater importance in influencing the growth and defects of a particular specie than any other factor. Areas of annual flooding but with good soil drainage produce the best species and grade of timber. Areas that retain surface water or where soil drainage is poor produce the least variety of valuable species and have the slowest growth and greatest defect of any timber.

4. Soils: Throughout Panther Swamp Refuge three major soil types are represented:
    a. Sharkey clay soils
    b. Sharkey Forestdale soils
    c. Sharkey clay, depressional

Sharkey and Forestdale Soils

These two dominant soils make up 90% of the refuge. Sharkey soils make up 60% and Forestdale makes up 30%. The poorly drained Sharkey soil is in nearly level areas and in depressions. It has a surface layer of dark grayish-brown clay about 4 inches thick. The subsoil is gray clay to a depth of 55 inches or more.

The Sharkey soil is very strongly acid in the upper part of the subsoil and becomes neutral to mildly alkaline at a depth of about 32 inches. Permeability is very slow, and the available water capacity is high. Runoff is slow. This soil is very plastic and sticky when wet. It shrinks and cracks when dry and swells when wet.

The poorly drained forestdale soil generally is on narrow to moderately wide ridges. The surface layer is brown silty clay loam about 4 inches

thick. The subsoil, to a depth of 32 inches, is light brownish-gray to gray silty clay. Below this is gray silty clay loam that is mottled with shades of brown.

Forestdale soil is medium acid to very strongly acid, and the available water capacity is high to very high. Permeability is very slow and runoff is slow.

Because they are wet for long periods, these soils are suited to wetland hardwoods.

Sharkey clay, depressional is a poorly drained soil in depressions. These depressions are 75 to 225 feet wide and as much as 2 miles long. Slopes are 1% or less.

This soil has a surface layer of dark grayish-brown clay about 3 inches thick. The subsoil, about 40 to 50 inches thick, is gray clay that is mottled with shades of brown. Permeability is very slow, and the available water capacity is high. Runoff is slow, and the hazard of erosion is slight. This soil is difficult to manage. It swells when wet and shrinks and cracks when dry. Flooding occurs in winter, spring, and during the growing season.

Capability units for these soils are:

Sharkey clay	IIIw-2, Woodland 2w6
Forestdale soils	Vw-1, Woodland 1w6
Sharkey clay, depressional	IVw-1, Woodland 3w6

See following chart for shade tolerance and soil drainage tolerance of individual species.

X = Shade tolerance of species

O = Tolerance of species to poor soil drainage

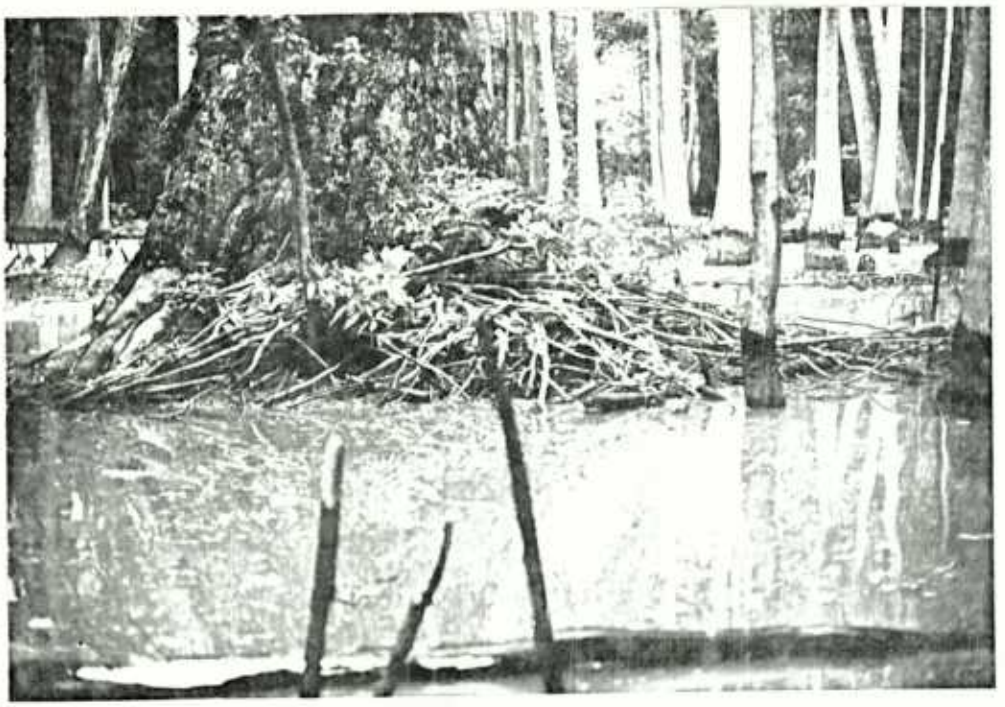
Species	Very Tolerant	Tolerant	Moderately Intolerant	Intolerant	Very Intolerant
Green ash		O		X	
White ash				X	O
Cottonwood				O	X
Bald cypress	O			X	
American elm		X	O		
Cedar elm		X	O		
Sweetgum				XO	
Black gum			X		O
Water tupelo	O			X	
Hackberry	X	O			
Hickories	X				O
Honey locust			O	X	
Water locust	O			X	
Box elder		X		O	
Red maple	X	O			
Black oak				X	O
Cherrybark oak				XO	
Nuttall oak		O		X	
Overcup oak	O		X		
Post oak				X	O
Shumard oak				XO	
Swamp chestnut oak			XO		
Southern red oak			X		O
Water oak				XO	
White oak			X		O
Willow oak			O	X	
Bitter pecan	O	X			
Sweet pecan		X		O	
Persimmon	XO				
Sycamore				O	X
Willow		O			X

5. Beavers: A major concern of preserving and perpetuating the bottomland hardwood forest resource is damage done by beavers. When Panther Swamp was acquired, some 2,000+ acres were under water caused by blocked drainage due to beavers. A control effort was started in the summer of 1979, which primarily consisted of blowing beaver dams with explosives. Although this reduces the amount of water damage, some form of animal control will have to be employed to reduce the amount of recurring damage. All dams which have been torn out have been done so during late spring to early summer, and the water level is dropped only to the point of normal slough capability.

Potential damage caused by drain blockage from beaver.

Complete timber loss due to beavers blocking drainage. Excellent wood duck brood habitat is provided in areas of this type.

All of the impoundments are not detrimental to the forest resource. Some of the areas existed for long periods before the land was acquired, and now is predominately dead timber. They provide excellent habitat conditions for wood ducks, furbearers, and wading birds. These ponds and sloughs provide adequate and needed habitat for those species listed. However, without intensified and continued control efforts, in the form of trapping, explosives, etc., extremely large acreages of bottomland hardwoods, in itself an "endangered species" which cannot be replaced for generations, will be lost.



Not all impoundments are detrimental as shown in this water tupelo type which provides numerous wildlife oriented values.

The Refuge Forester and Refuge Manager will review all beaver impoundments and decide which ones should be eliminated and which ones are to be left.

6. Timber Type Classification: During the periods of gathering base line data, a concerted effort was made to stand type the refuge. Although a small percentage cruise was used to gather this data, stand types were interpolated in order to better manage and know what forest types exist and in what condition class. Some stand types and boundaries will change during a more intensive cruise when prescriptions are made but for this management plan the existing stands as typed will be considered the best possible at this time.

In identifying the various timber types found at Panther Swamp Refuge, the publication, "Forest Cover Types of North America" published by

the Society of American Foresters was used. The following timber types are identified on Panther Swamp Forest cover type maps.

Type 92 - sweetgum, Nuttall, willow oak
Type 96 - overcup oak-bitter pecan
Type 93 - sugarberry-elm-ash
Type 101 - baldcypress
Type 102 - baldcypress-water tupelo

a. Type 92 - Sweetgum - Nuttall oak - Willow oak

Definition and composition - Nuttall oak and willow oak are the most common oaks in the type, but they should be considered only as indicator species. Nuttall oak is not always present. Willow oak may be predominant locally, but is superseded by water oak in the southernmost range of the type. Sweetgum is generally not as common as the oaks, although it may greatly predominate. The chief associates are sugarberry (hackberry), green ash, and American elm. Minor associates are overcup oak, pecan, water hickory, cedar elm, eastern cottonwood, laurel oak, red maple, honey locust, persimmon, and, rarely, baldcypress.

Nature and occurrence - Found throughout the Southern Forest, this type occupies the alluvial flood plains of the major rivers. Generally, it is in first bottoms except in deep sloughs, swamps, river fronts, and poorest flat sites. It is also found on terrace flats. The type is probably climax for these sites, but when heavily cut, it is usually succeeded by the sugarberry-American elm-green ash type. It is the most widely distributed bottomland type.

Transition forms and varients - The type becomes predominantly sweetgum on well drained first bottom ridges and previous silty clays on terrace flats. Predominantly it is willow oak and water oak on heavier soils on first bottom ridges and better drained flats, and on poorly

drained terrace flats. Nuttall oak dominates on well drained first bottom flats. Willow oak prevails on first bottom ridges and poorly drained terrace (pin oak) flats. Near the Gulf coast, laurel oak predominates. A cedar elm-water oak-willow oak variation occurs on poorly drained, impervious soils on low, indistinct or flattened first bottom ridges; it is also of minor importance on certain impervious terrace sites, amounting to high shallow flats.

b. Type 93 - Sugarberry - American Elm - Green Ash

Definition and composition - The type species, together with water hickory and willow oak are usually predominant. Commonly the associates are cedar elm, overcup oak, pecan, water oak, Nuttall oak, winged elm, blackgum, persimmon, honey locust, red maple, and boxelder. Hackberry replaces sugarberry in the northern part of the type range.

Nature and occurance - Found throughout the Southern Forest within the flood plains of the major rivers. It occupies low ridges, flats, and sloughs in first bottom and terrace flats and sloughs, and occasionally new lands or fronts, but rarely maltreated terrace ridges. It is a temporary type following very heavy or persistent cutting or fire in the sweetgum-Nuttal oak-willow oak type; or often succeeding cottonwood where it follows heavy cutting alone, when an understory of these tolerant species is present.

Transition forms and varients - Occasional small stands of pure green ash may occur almost anywhere within the type but most notably on moist flats or in shallow sloughs. Pure sugarberry (hackberry) stands occur occasionally on new land or front sites.

c. Type 96 - Overcup Oak - Water Hickory

Definition and composition - The type species, together or singly, are predominant. Commonly associated are willow oak, Nuttall oak, American elm, cedar elm, green ash, sugarberry (hackberry), waterlocust, persimmon, and red maple; rarely sweetgum.

Nature and occurrence - The type is found throughout the Southern Forest within the alluvial flood plains. The most extensive areas occupied are backwater basins of the principal rivers; these are low, poorly drained flats, usually with tight clay on silty clay soils. It occurs also in sloughs and lowest backwater basins and on low ridges with heavy soils that are subject to late spring inundation. It is the residual type after heavy cutting in certain phases of the sweetgum-Nuttall oak-willow oak type.

d. Type 102 - Baldcypress - Water Tupelo

Definition and composition - Baldcypress and water tupelo or swamp tupelo predominate. The most commonly associated species are black willow, swamp cottonwood, red maple, American elm, pumpkin ash, Carolina ash, water locust, persimmon, overcup oak, and water hickory. Sweetgum, Nuttall oak, laurel oak, and sweetbay may be present.

Nature and occurrence - The type is found throughout the Southern Forest within the swamps of the alluvial flood plains of the major rivers (where water tupelo occurs) and in the swamps of the coastal plains and river estuaries (where swamp tupelo occurs). It is restricted to very low, poorly drained flats, deep sloughs, and swamps wet most all year. Most extensive areas are in lower reaches and estuaries of major streams.

Transition forms and varients - Only small area of baldcypress remain scattered throughout the type, which often are not worth separate classification. Following heavy cutting of baldcypress the type reverts to water tupelo (or swamp tupelo), and because of uncertainty of regeneration of baldcypress, is likely to remain so for long periods, except localized patches and fringes.

7. Growth: Computations to determine growth were based on data gathered during the preliminary base line cruise. This data showed an average net annual growth rate of 4% refuge wide. Cores were taken from a wide variety of tree species and size classes.

C. Program Effect on Local Economy

The forest management program will have a favorable effect on the local economy by providing jobs associated with timber harvesting and other management operations.

D. Other Values

Slough Control Structures

At present the U.S. Army Corps of Engineers is studying the possibilities of building two slough control structures within Panther Swamp.

One is planned to be located in Brushy Lake Drain, south of Wade Bayou, Section 5 T11W R3W, this structure would provide approximately 1,120 acres of seasonally flooded timber land.

Number two structure is planned to be located in Section 34 T11N R4W. This structure will provide control over approximately 1,300 acres. Beaver control would be a major problem in maintaining both of these structures. The largest concentrations of beavers are in these areas.

Both structures would be in part mitigation for the Yazoo Backwater flood control project.

Once these structures are completed, the areas subject to flooding will be managed to maximize food and habitat requirements for migratory waterfowl.

Thinnings and small group selection areas will be made to enhance wildlife habitat. Stand densities may be lowered to enhance understory herbaceous vegetation growth.

Timber management emphasis will be placed on regenerating and releasing red oaks. TSI will be used intensively within the Brushy Lake Slough structure area. This area in Sections 7 & 8 has been severely cut-over. At present the overstory is made up of cull, defective suppressed trees. TSI should be used to improve stocking within this area and release existing poles and smaller regeneration.

Water will be removed from the green timber areas before the growing season to eliminate mortality. Water removal in both areas has become a problem due to increased beaver damage and activity.

Intensified efforts will be made to completely drain these reservoirs so that the overstory can be retained. If these efforts are not made, the value of these reservoirs as feeding areas for waterfowl will be reduced due to the loss of the mast-producing overstory.

Part IV. TIMBER MANAGEMENT COMPARTMENTS

A. General Program Units

Panther Swamp Refuge has been divided into 16 compartments for management purposes ranging in acreage from 513 to 1,847 acres and averaging 1,000 acres. The compartments utilize streams, roads, sloughs, or other man-made or natural features for boundaries.

Detailed treatments are not included here as each compartment will be examined separately and the prescription for the compartment will contain detailed management information. Each compartment will be described in general and the following data will be given for each in this management plan.

1. Volume/ac/species
2. Cubic feet/ac/species
3. Stand table by DBH by species/ac
4. Total stems/ac
5. Culls/ac
6. Total volume/ac
7. Total cubic feet/ac
8. Stand type maps
9. Stand summary sheet

B. Timber Management Compartments

LEGEND FOR COMPARTMENT MAPS

36	Section Number
	Stand Boundary
03	Stand Number
92	Sweetgum-Nuttall-Willow Oak Type
12	Immature Sawtimber
—·—	Creek

Legend for Stand Summary Sheet

Column 2-Land Class Codes

100 Water Area
110 Natural Lake
120 Reservoir
130 Estuary
140 River or Stream
200 Non-Forest Land
210 Public Parks and Cemetaries
220 Transmission Lines
230 Road and Railroad R/W
240 Special Uses
250 Greentree Reservoir
260 Agricultural Land
300 Reserved
310 Senic Area
320 Historical Area
330 Natural Area
340 Geological or Archaeological Area
350 Wilderness Area
500 Standard Forest
510 Key Area
520 Contains Key Area
600 Special
610 Special Timber Management Required
620 Special Study Area
700 Unregulated
701 Developed recreational site
702 Undeveloped recreational site
703 Administrative sites
704 Undeveloped Administrative site

Column 3-Forest Type

Type 92 - Sweetgum-Nuttall Oak-Willow Oak
Type 93 - Sugarberry-American Elm-Green Ash
Type 96 - Overcup Oak-Bitter Pecan
Type 101 - Baldcypress
Type 102 - Baldcypress-Water Tupelo

Column4-Stand Condition Class

Class	Code
In Regeneration	01
Damaged Poletimber	02
Damaged Sawtimber	03
Sparse Poletimber	05
Sparse Sawtimber	06
Low Quality Poletimber	07
Low Quality Sawtimber	08
Mature Poletimber	09
Mature Sawtimber	10
Immature Poleimber	11
Immature Sawtimber	12
Seedling and Sapling Adequately Stocked	13
Seedling and Sapling Inadequately Stocked	14
Non-Stocked	15

Column 6-Method of cut

Method	Code
No Cutting	1
Clearcutting	2
Seed-tree Cutting	3
Shelterwood Cutting	4
Thinning	5
Group Selection Cutting	6

Column 7-Operability

Operability	Code
Inoperable	01
Operable Pine	
Pole Timber	02
Small Sawtimber 1/	03
Large Sawtimber 2/	04
Operable Hardwood	
Pole Timber	05
Small Sawtimber 1/	06
Large Sawtimber 2/	07
Operable Multiple Products	
Pine and Hardwood Pole Timber	11
Pine and Hardwood Sawtimber	12
Mixed Pole Timber and Sawtimber	13
Hardwood Pole Timber and Hardwood Sawtimber	14
Pine Pole Timber and Pine Sawtimber	15

1/ Pine 9.0" DBH - 14.9" DBH
Hdw 13.0" DBH - 18.9" DBH

2/ Pine 15.0" DBH+
Hdw 19.0" DBH+

Column 9-Management Type Prefix

1st Digit

0 Convert this cutting cycle

1 Defer until merchantable or to rotation

2 Mgt. type now in place

2nd and 3rd Digit

92 - Sweetgum-Nuttall-Willow Oak

93 - Sugarberry-American Elm-Green Ash

96 - Overcup Oak-Bitter Pecan

101 - Baldcypress

102 - Baldcypress-Water Tupelo

Column 10-Site Index

1st and 2nd Digit equals Site Index

3rd Index

0 Tree Meets all Standards

1 Does Not Meet All Standards

2 Site Index Estimated or Equivalent Table Used

eg: Site Index 80 that meets all standards = 080

Site Index 100 that meets all Standards - 100

Column 11-Cultural Treatments Needs

First Digit	Code
None	0
Machine Planting	1
Hand Planting	2
Direct Seeding (Broadcast)	3
Row Seeding	4
Natural Regeneration	5
Release of Seedlings	6
Second Digit	**Code**
None	0
With Site Preparation or release by:	
Hand tools	1
Aerial spray	2
Ground spray	3
Mechanical, other	4
Bulldozer	5
Disc	6
Prescribed burning	7
Precommercial thinning	70
Rough Reduction Burning	71
CUS Burning	72
Pruning	73
Non-Commercial Thinning	74
Vine Control	75
Wildlife Prescribe Burn	76
Treatment of Key Area for Overstory Mast Develop.	77
Treatment of Key Areas for Understory Development	78
Establish Cover or Dens	79
Select and Develop Permanent Wildlife Opening	80
Re-examine for Waterfowl Development	81
Select and Develop Permanent Water Sources	82
Cull Removal	83

Compartment 1 - Compartment 1 is located on the northwest side of Panther Swamp Refuge. Bounded on the east by Compartment 2, south by Panther Creek Farms, west and north by private lands. All lands south, west, and north are in agriculture.

This compartment has the highest elevation (97') of Panther Swamp Refuge and seldom floods except under extreme conditions.

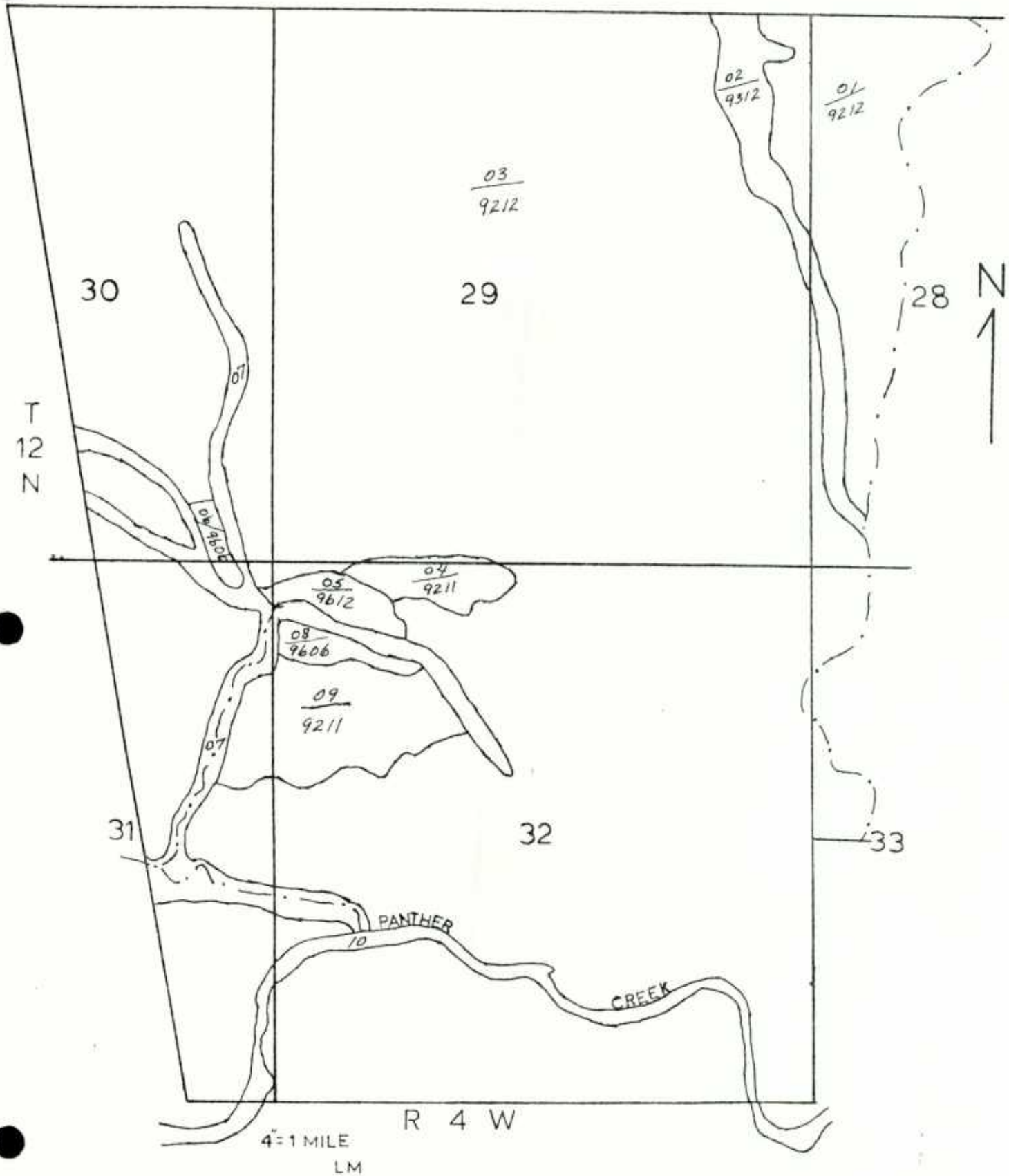
Forest types are predominantly sweetgum, Nuttall, willow oak with a large secondary component of cedar elm left during preceding harvest.

Compartment 1, 1,846 acres, contains the largest volumes per acre - 4,900 board feet and 2 cords per acre.

The major emphasis of habitat management in this compartment should be directed toward removal of numerous cull defective stems left after past cutting practices (5/ac.) with major emphasis on upgrading mast producing trees.

PANTHER SWAMP NWR

COMP. NO. 1



STAND SUMMARY DATA

Compt. 01

REFUGE Panther Swamp NWR COUNTY Yazoo

Std. No	Land Class	Forest Type	Stand Cond. Class	Acres	MOC	Oper.	Age Year	Mgt. Type	Site Index	Cult Need	Date Work	Cult Need	Date Work	Comments
01	500	92	12	101	1	01	916	292	090	83				
02	500	93	12	27	1	01	901	293	090	83				
03	500	92	12	1586	1	01	911	292	090	83				
04	500	92	11	11	1	01	942	292	080					
05	500	96	12	13	1	01	885	296	080	83				
06	500	96	06	4	1	01	885	296	080					
07	140			51										Slough
08	500	96	06	8	1	01	885	296	080					
09	500	92	11	19	1	01	942	292	090					
10	140			26										Panther Creek

Area Summary

Water Area 77

Non-forest Land 0

Forested Land 1769

Date 7-28-82

Photo Nos. 2, 3

Total Compt. Acres 1846

Compartment 2 - Compartment 2, made up of 1,219 acres, is bounded on the east and south by Panther Creek Farms, west by Compartment 1 and north by State-owned 16th section lands.

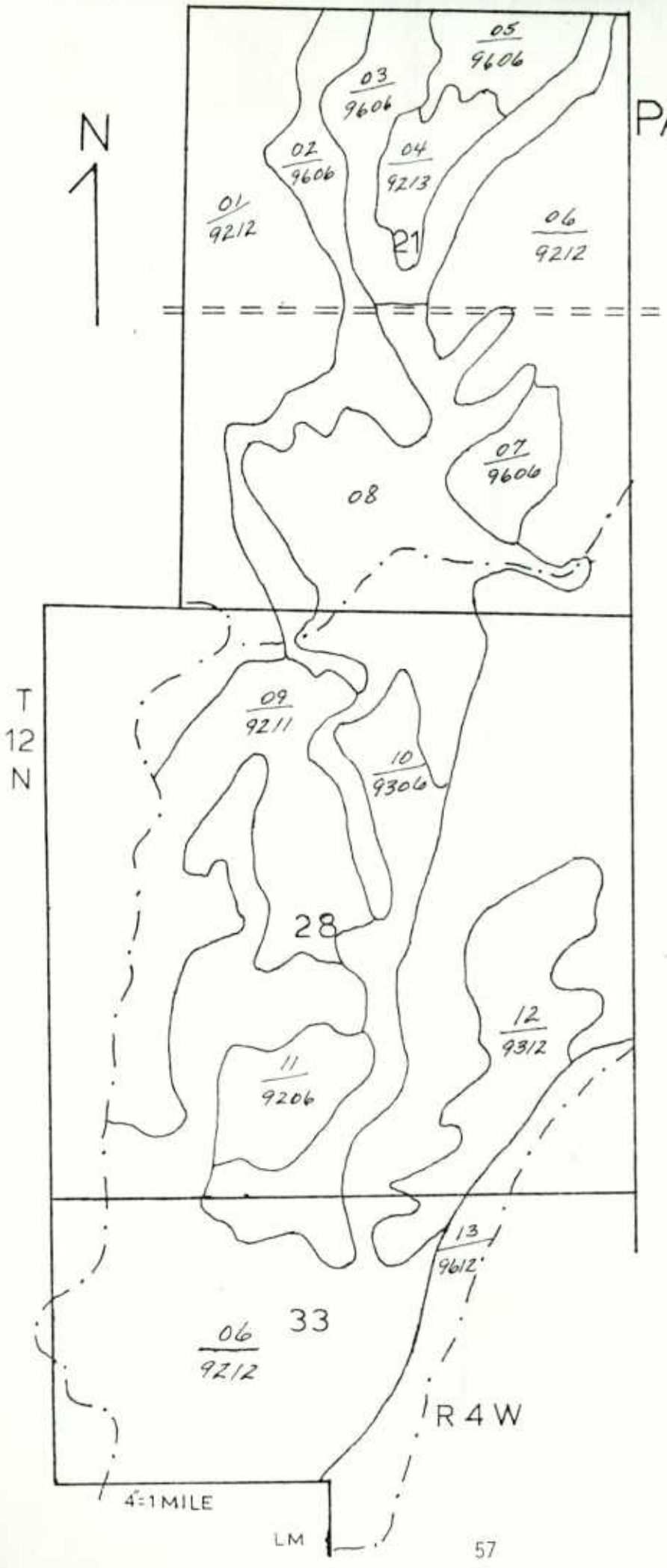
Compartment 2 has the highest migratory waterfowl use of any area within the refuge. This area known locally as Campbells Brake (130 acres) receives seasonal flooding from adjacent catfish ponds.

Major forest types are Nuttall oak, and green ash in the intermediate flats with sweetgum, and willow oak along adjacent ridges.

Excessive cull defective material, 11 per acre, is apparent throughout the compartment. Timber stand improvement in the form of cull removal should be employed to improve existing waterfowl and upland game habitat.

Existing volumes are 3,300 board feet per acre and 2 cords per acre.

Access to this compartment is poor, being surrounded by private lands. A right-of-way easement should be acquired in order to provide Service and public access.



PANTHER SWAMP NWR

COMP. NO. 2

STAND SUMMARY DATA

Compt. 02

REFUGE Panther Swamp NWR COUNTY Yazoo

Std. No	Land Class	Forest Type	Stand Cond. Class	Acres	MOC	Oper.	Age Year	Mgt. Type	Site Index	Cult Need	Date Work	Cult Need	Date Work	Comments
01	500	92	12	116	1	01	910	292	090	83				
02	500	96	06	62	1	01	900	296	080	83				
03	500	96	06	54	1	01	900	296	080					North End of Campbell Brake
04	500	92	13	19	1	01	966	292	090					
05	500	96	06	24	1	01	900	296	080	83				
06	500	92	12	489	1	01	910	292	090	83				
07	500	96	06	21	1	01	895	296	080					
08	140	102	12	130	1	01								Campbell Brake
09	500	92	11	98	1	01	936	292	090					
10	500	93	12	69	1	01	909	293	090	83				
11	500	92	06	31	1	01	906	292	090					
12	500	93	12	58	1	01	906	293	080					
13	500	96	12	48	1	01	900	296	080					

Area Summary

Water Area 130

Non-forest Land 0

Forested Land 1089

Date 7-28-82

Photo Nos. 18, 19

Total Compt. Acres 1,219

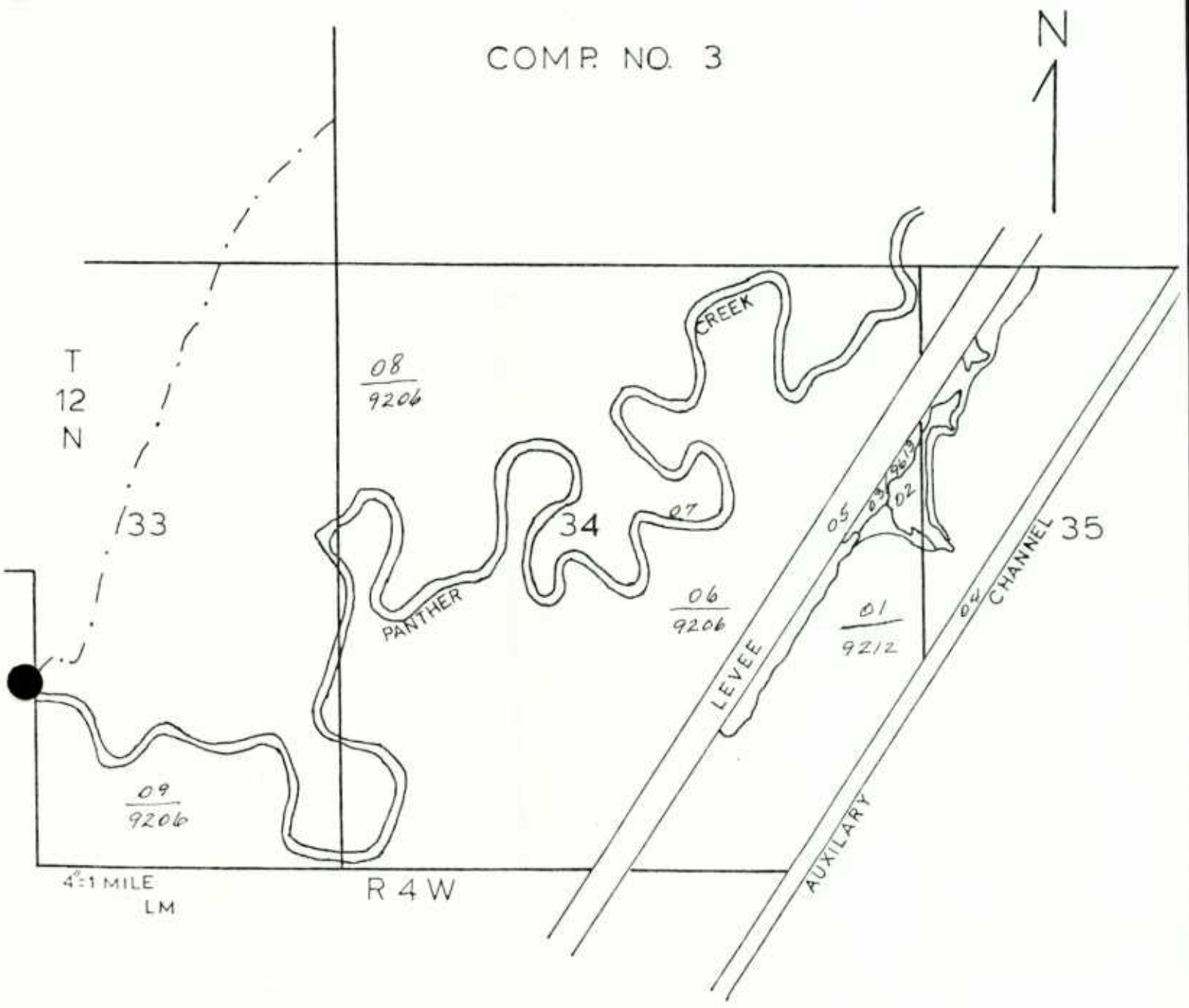
Compartment 3 - Compartment 3 is bounded on the west by compartment 2, east by the Lower Auxiliary Channel and north and south by Panther Creek Farms.

Panther Creek flows through the middle of this compartment and provides good to excellent waterfowl habitat.

Stocking in this compartment is good but contains large numbers of cull trees, 8 per acre, left during past harvest operations. At least half of these trees should be removed to provide adequate space for the development of the existing good quality mast-producing understory.

This 964 acre compartment contains 3,400 board feet per acre with 2.5 cords per acre.

PANTHER SWAMP NWR



Compt. 03

STAND SUMMARY DATA

REFUGE Panther Swamp NWR COUNTY Yazoo

Std. No	Land Class	Forest Type	Stand Cond. Class	Acres	MOC	Oper.	Age Year	Mgt. Type	Site Index	Cult Need	Date Work	Cult Need	Date Work	Comments
01	500	92	12	133	1	01	911	292	080					
02	140			26										Ponds along levee ROW
03	500	96	13	8	1	01	965	296	070					
04	140			16										Channel
05	230			33										Levee
06	500	92	06	239	1	01	910	292	080					
07	140			81										Panther Creek
08	500	92	06	381	1	01	910	292	090					
09	500	92	06	47	1	01	910	292	090					

Area Summary

Water Area 123

Non-forest Land 33

Forested Land 808

Date 7-28-82

Photo Nos. 17,22

Total Compt. Acres 964

Compartment 4 - Compartment 4 is comprised of 990 acres forestland, 45 acres open water, and 34 acres of flooded timber caused by beavers. Total compartment acreage is 1,069.

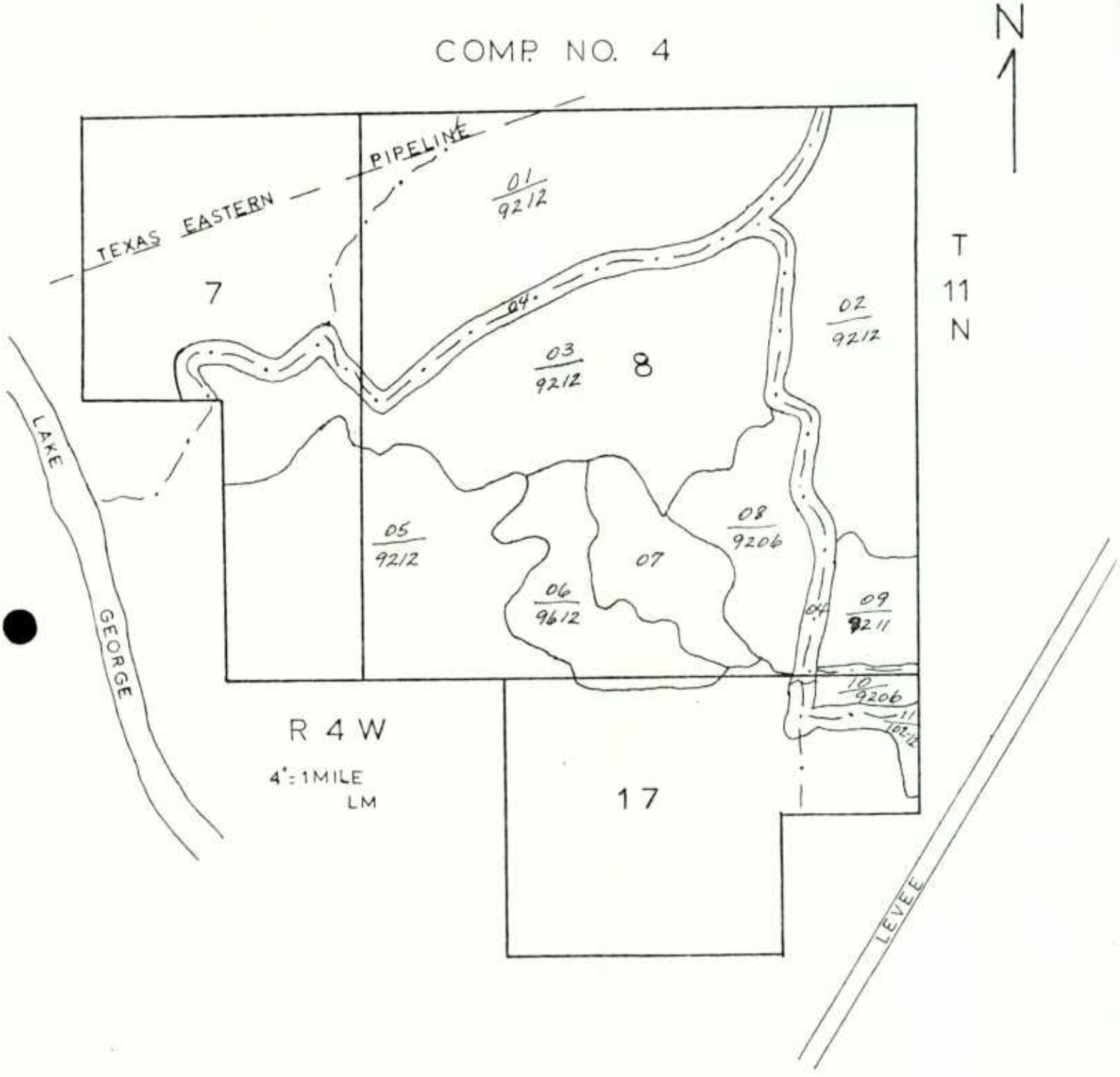
Timber quality in compartment 4 is poor. Past cutting practices and fire has been highly selective with the remaining stems of poor quality and form or defective. Silvicultural treatments in the form of TSI should improve the overall quality of this compartment and provide better quality mast-producing trees.

Volume estimates show 3,000 board feet per acre and 1.5 cords per acre.

During the cruise of this compartment, very little sign of wildlife was noted. Past hunting data shows very low hunter success rate within this compartment. This compartment should be looked at closer by widllife specialists to determine if there is a limiting factor.

PANTHER SWAMP NWR

COMP. NO. 4



STAND SUMMARY DATA

Compt. 04

REFUGE Panther Swamp NWR COUNTY Yazoo

Std. No	Land Class	Forest Type	Stand Cond. Class	Acres	MOC	Oper.	Age Year	Mgt. Type	Site Index	Cult Need	Date Work	Cult Need	Date Work	Comments
01	500	92	12	278	1	01	903	292	090	83				
02	500	92	12	114	1	01	903	292	090	83				Defective Sweetgum
03	500	92	12	159	1	01	906	292	090	83				
04	140			45										Slough
05	500	92	12	312	1	01	930	292	090					
06	500	96	12	40	1	01	901	296	080					
07	140			34										Beaver slough
08	500	92	06	44	1	01	905	292	080					
09	500	92	11	29	1	01	939	292	090					
10	500	92	06	12	1	01	910	292	090					
11	140	102	12	7	1	01								Tupelo Gum Slough

Area Summary

Water Area 86

Non-forest Land 0

Forested Land 983

Date 7-28-82

Photo Nos. 5, 14

Total Compt. Acres 1069

Compartment 5 - This 948 acre compartment has 882 acres of forestland with the remaining acres being in either water, powerlines, or oil line easements.

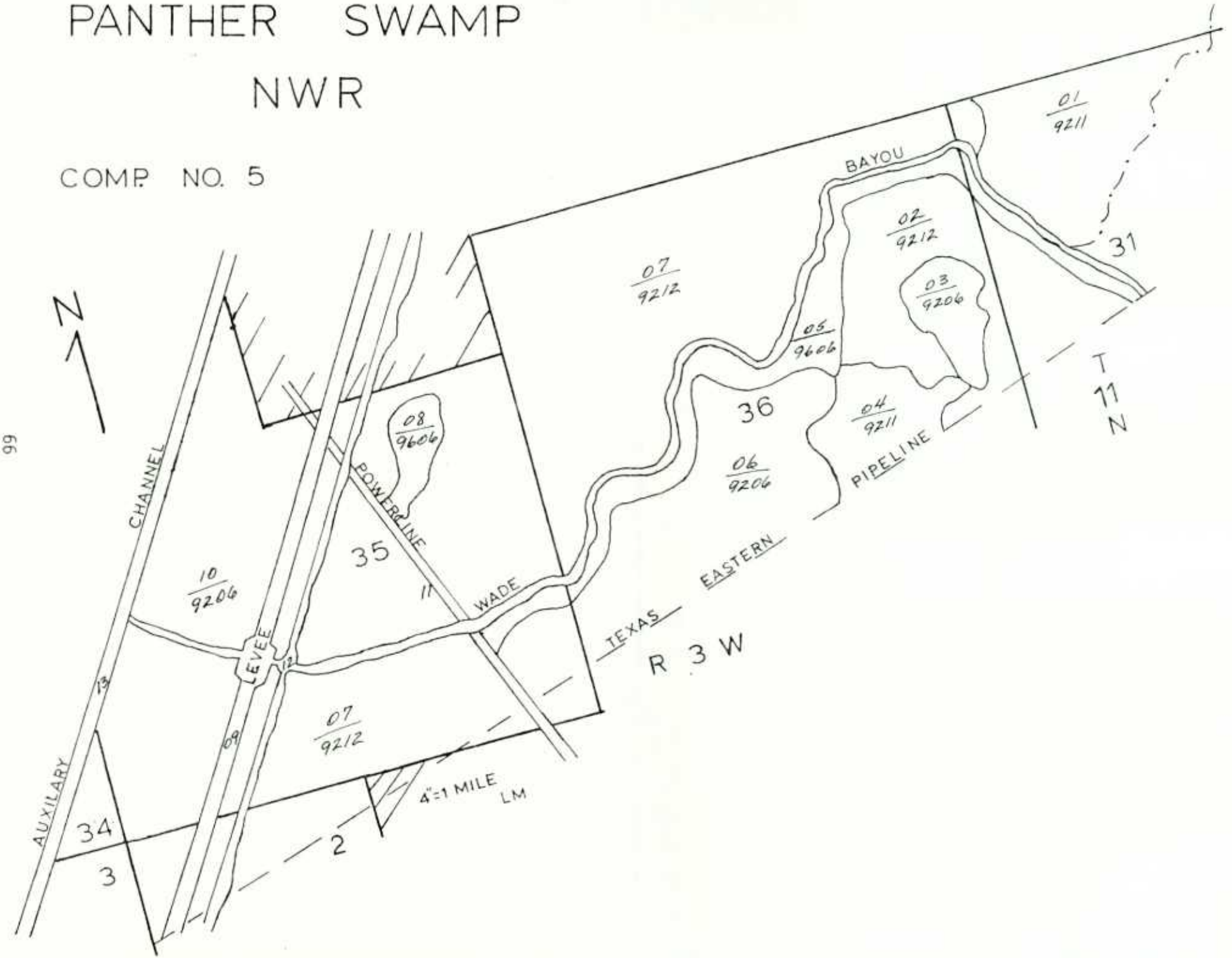
Wade Bayou traverses the middle of this compartment and provides some excellent wood duck brood habitat.

Timber quality in this compartment is poor with 16 large culls or defective trees per acre. This area has been heavily cut and should be one of the first to be considered for group selection and TSI work. Adequate regeneration is present in most sparse areas. Small group selection areas should improve diversity within this compartment and provide additional upland game habitat.

Volume estimates show 3,200 board feet per acre with 2 cords per acre.

PANTHER SWAMP NWR

COMP. NO. 5



STAND SUMMARY DATA

Compt. 05

REFUGE Panther Swamp NWR COUNTY Yazoo

Std. No	Land Class	Forest Type	Stand Cond. Class	Acres	MOC	Oper.	Age Year	Mgt. Type	Site Index	Cult Need	Date Work	Cult Need	Date Work	Comments
01	500	92	11	58	1	01	930	292	100					
02	500	92	12	73	1	01	906	292	090					Low BA
03	500	92	06	19	1	01	906	292	090					
04	500	92	11	28	1	01	930	292	090					
05	500	96	06	50	1	01	900	296	080					
06	500	92	06	112	1	01	906	292	080					
07	500	92	12	299	1	01	900	292	090	83				
08	500	96	06	13	1	01	900	296	080					
09	230			52										Levee
10	500	92	06	168	1	01	911	292	090					
11	220			10										Powerline ROW
12	140			54										Wade Bayou
13	140			12										Channel

Area Summary

Water Area 66

Non-forest Land 62

Forested Land 820

Date 7-28-82

Photo Nos. 38

Total Compt. Acres 948

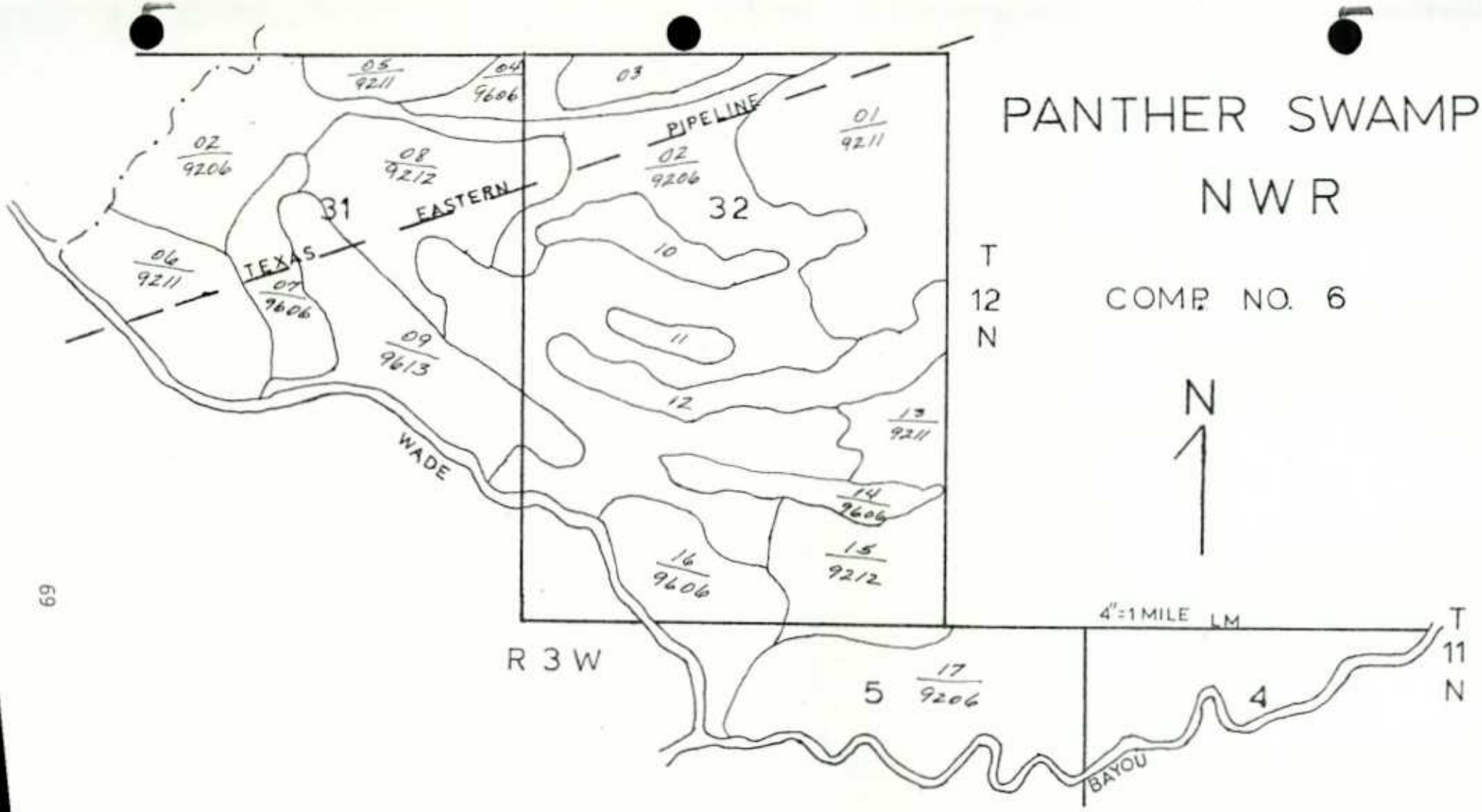
67

Compartment 6 - This 905 acre unit has 833 acres of forestland and 72 acres in permanent beaver ponds.

Compartment 6 along with compartment 10 represent the heaviest cutover areas. Compartment 6 consists primarily of large defective and cull trees - 10 per acre, which were non-merchantable during the last harvest made by McGraw-Curran Lumber Company.

Most sparse areas do support sufficient advanced reproduction. Silvicultural treatment in this compartment should consist of small group selection areas and TSI improvement.

Volume estimates are 1,900 board feet per acre and 1.5 cords per acre.


PANTHER SWAMP
NWR
COMP. NO. 6
N
05 9211
04 9606
03
PIPELINE
01 9211
02 9206
08 9212
02 9206
31
EASTERN
32
10
06 9211
TEXAS
07 9606
09 9613
11
12
13 9211
WADE
14 9606
16 9606
15 9212
T 12 N
R 3 W
4"=1 MILE LM
5
17 9206
4
T 11 N
BAYOU

Compt. 06

STAND SUMMARY DATA

REFUGE Panther Swamp NWR COUNTY Yazoo

Std. No	Land Class	Forest Type	Stand Cond. Class	Acres	MOC	Oper.	Age Year	Mgt. Type	Site Index	Cult Need	Date Work	Cult Need	Date Work	Comments
01	500	92	11	85	1	01	931	292	080					
02	500	92	06	241	1	01	903	292	080	83				Heavy cull
03	140	102	12	15	1	01								
04	500	96	06	19	1	01	901	296	080					
05	500	92	11	18	1	01	933	292	080					
06	500	92	11	47	1	01	933	292	080					
07	500	96	06	28	1	01	906	296	070	83				
08	500	92	12	59	1	01	903	292	080	83				
09	500	96	13	56	1	01	961	296	080					
10	140	102	12	18	1	01								
11	140	102	12	6	1	01								
12	140	102	12	33	1	01								
13	500	92	11	18	1	01	931	292	080					
14	500	92	06	13	1	01	901	292	080					
15	500	92	12	43	1	01	931	292	080	83				
16	500	96	06	41	1	01	911	296	080					
17	500	92	06	165	1	01	912	292	080	83				

Area Summary

Date 7-28-82

Photo Nos. 40

Water Area 72

Non-forest Land 0

Forested Land 833

Total Compt. Acres 905

70

Compartment 7 - This 584 acre compartment is all forestlands. Average volumes per acre are 1,800 board feet and 1.5 cords, with 8 culls per acre.

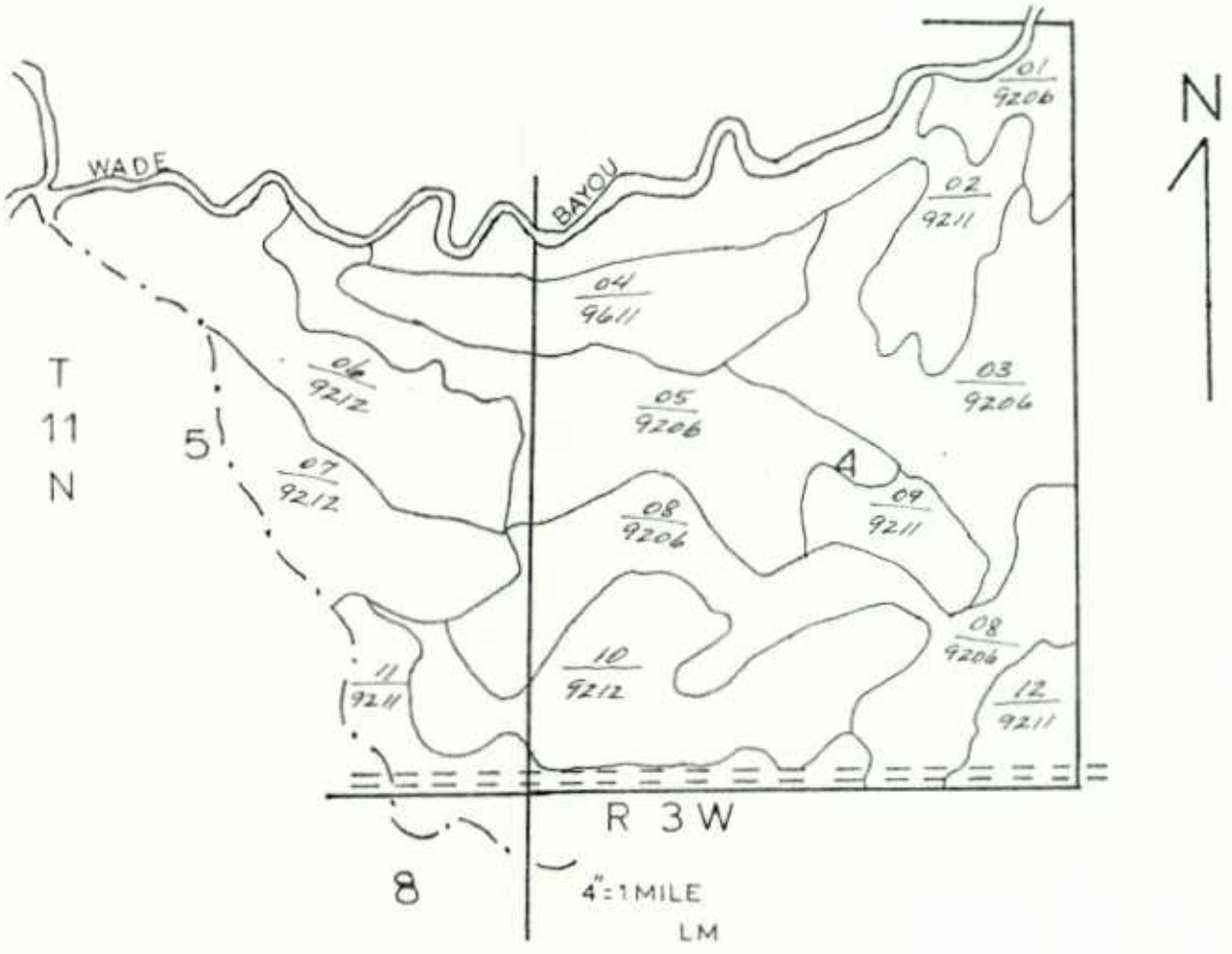
The majority of this compartment is in young 40 year old willow oak poles with an understory of palmetto.

The area south of the east-west road is predominantly heavy cutover and should receive some TSI work along with compartment 10.

Compartment 7 has been considered as part of a greentree reservoir which is being developed by the Army Corps of Engineers. Survey work is now in progress to determine the feasibility of this project.

PANTHER SWAMP NWR

COMP. NO. 7



Compt. 07

STAND SUMMARY DATA

REFUGE Panther Swamp NWR COUNTY Yazoo

Std. No	Land Class	Forest Type	Stand Cond. Class	Acres	MOC	Oper.	Age Year	Mgt. Type	Site Index	Cult Need	Date Work	Cult Need	Date Work	Comments
01	500	92	06	25	1	01	902	292	080	83				
02	500	92	11	58	1	01	935	292	080					
03	500	92	06	74	1	01	903	292	080	83				
04	500	96	11	50	1	01	936	296	080					
05	500	92	06	70	1	01	897	292	080	83				
06	500	92	12	64	1	01	904	292	090					
07	500	92	12	30	1	01	921	292	090					
08	500	92	06	73	1	01	920	292	090	83				
09	500	92	11	16	1	01	931	292	090					
10	500	92	12	73	1	01	910	292	080	83				
11	500	92	11	37	1	01	938	292	080					
12	500	92	11	14	1	01	938	292	080					

Area Summary

Water Area _____

Non-forest Land _____

Forested Land 584

Date 7-28-82

Photo Nos. 49

Total Compt. Acres 584

Compartment 8 - This 1,117 acre compartment is composed of 39 acres of water area and 1,078 acres of forestland.

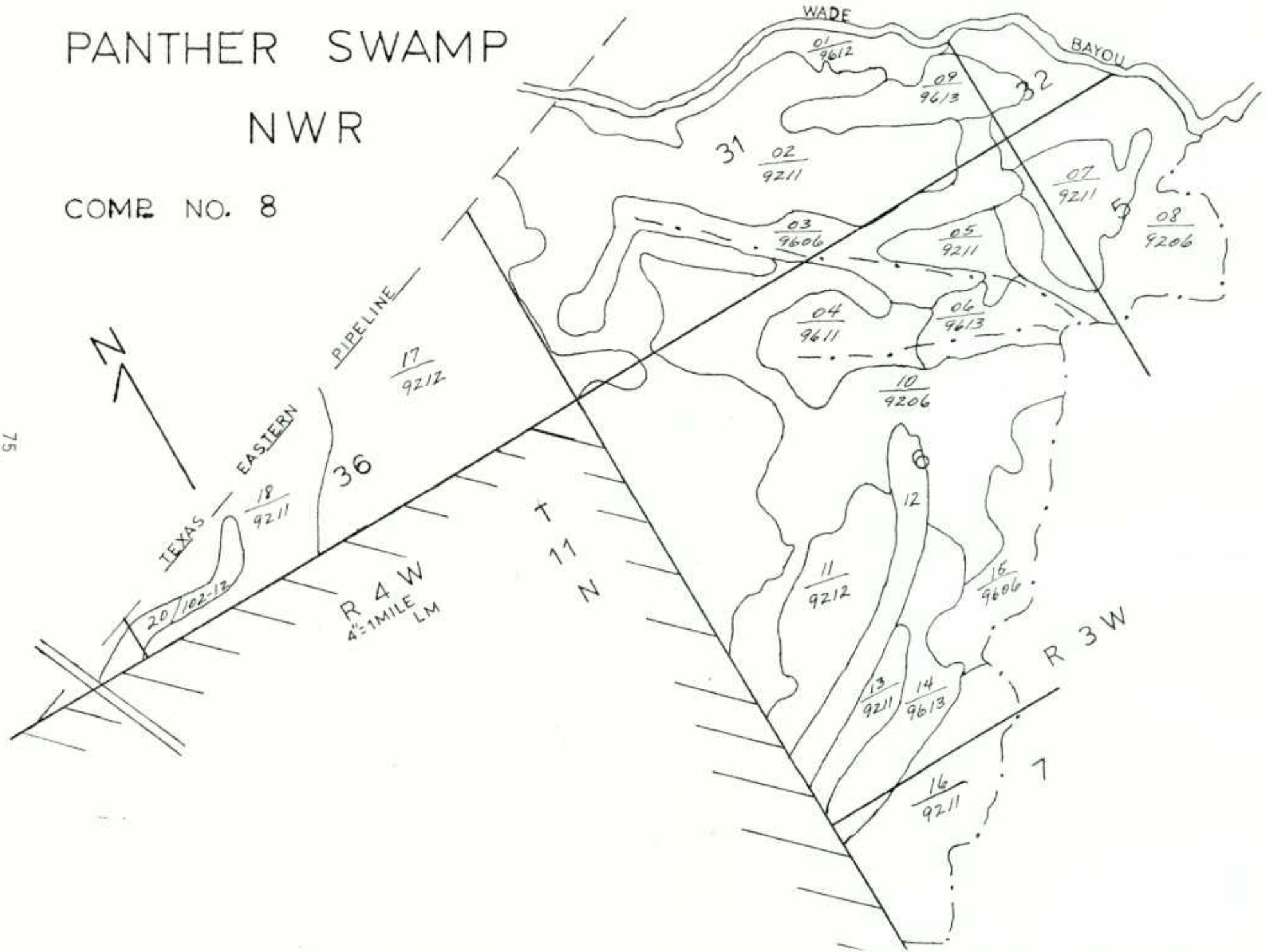
The compartment provides an array of habitat types with all 3 major forest types present thoughout.

Late winter waterfowl habitat in this compartment is excellent due to the seasonal flooding of the overcup oak-bitter pecan flats, and adjoining Nuttall-willow oak ridges. Waterfowl use is high throughout late winter and early spring months.

Volumes per acre are 1,600 board feet and 1.5 cords with 9 culls per acre.

PANTHER SWAMP NWR

COMP. NO. 8



STAND SUMMARY DATA

Compt. 08

REFUGE Panther Swamp NWR COUNTY Yazoo

Std. No	Land Class	Forest Type	Stand Cond. Class	Acres	MOC	Oper.	Age Year	Mgt. Type	Site Index	Cult Need	Date Work	Cult Need	Date Work	Comments
01	500	96	12	35	1	01	900	296	080					
02	500	92	11	208	1	01	933	292	090					
03	500	96	06	61	1	01	890	296	080	83				
04	500	96	11	33	1	01	925	296	080					
05	500	92	11	19	1	01	933	292	090					
06	500	96	13	23	1	01	960	296	080					
07	500	92	11	34	1	01	933	292	090					
08	500	92	06	94	1	01	900	292	090	83				
09	500	96	13	24	1	01	960	296	080					
10	500	92	06	157	1	01	890	292	090					
11	500	92	12	46	1	01	900	292	090	83				
12	140			26										Beaver Pond
13	500	92	11	11	1	01	940	292	090					
14	500	96	13	40	1	01	960	296	080					
15	500	96	06	41	1	01	880	296	080					Sparse
16	500	92	11	61	1	01	936	292	090					
17	500	92	12	133	1	01	900	292	090	83				
18	500	92	11	58	1	01	930	292	090					
19	140	102	12	13	1	01								Shed Brake

Area Summary

Water Area 39

Non-forest Land

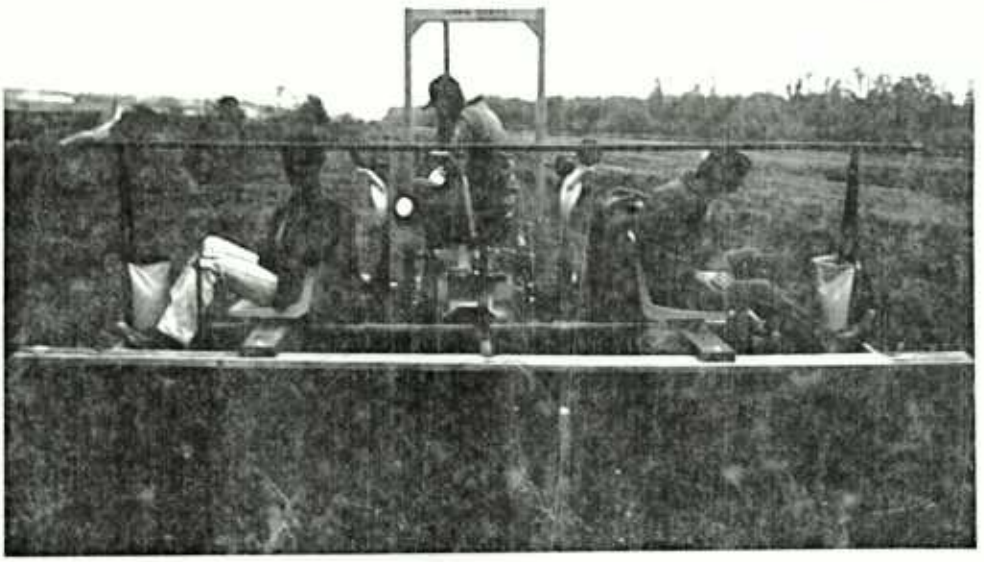
Forested Land 1078

Date 7-28-82

Photo Nos. 38, 41

Total Compt. Acres 1117

Compartment 9 - This 1,443 acre unit consist of 299 acres of forestland with 39 acres of this being converted in FY 82 by direct seeding of Nuttall-willow oak acorns.



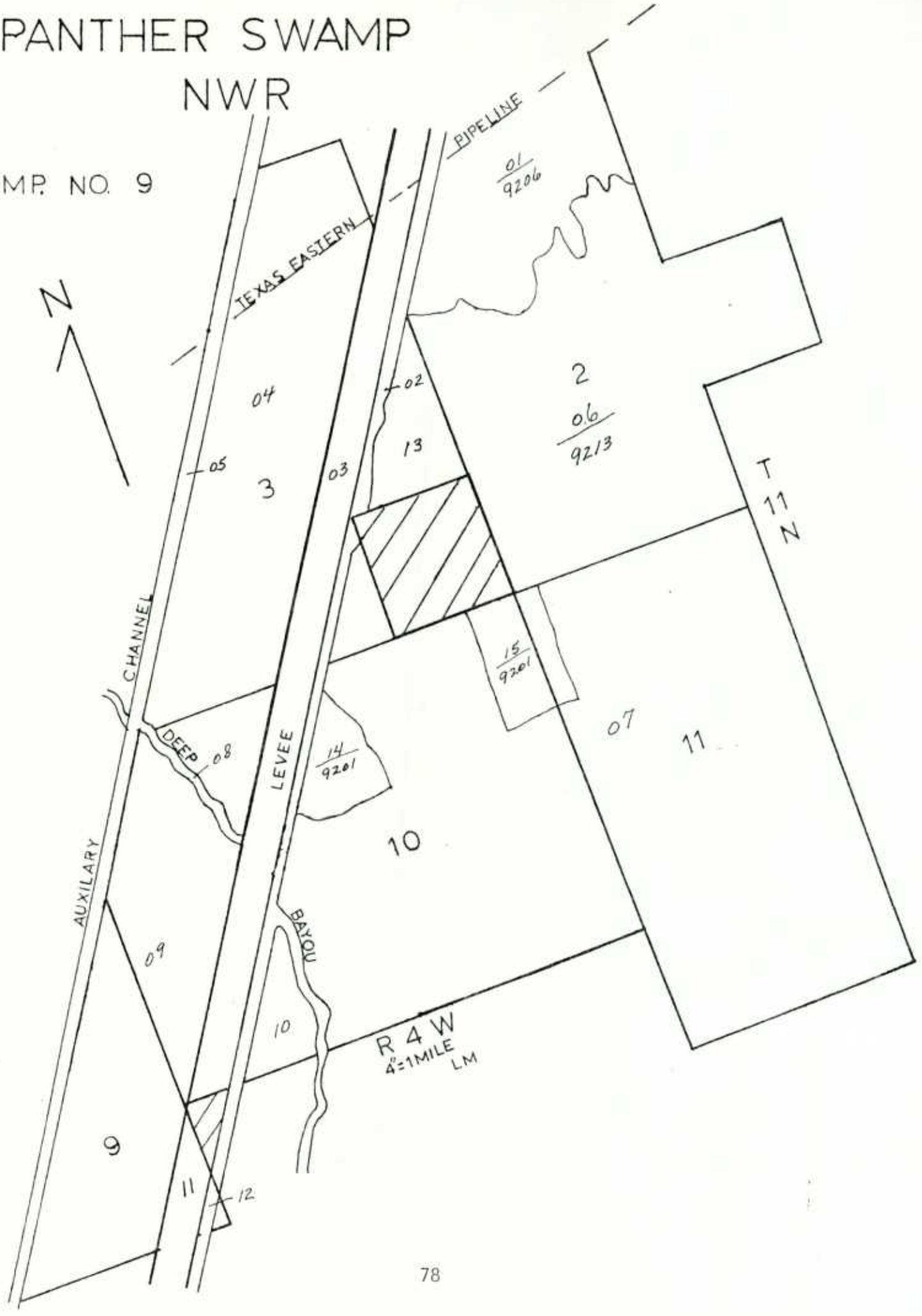
Regeneration of hardwoods by direct seeding. Fall, 1981.

This compartment provides excellent waterfowl habitat with its available hot foods provided by one coop farmer and additional wild foods available in the 177 acres of dewatered wet soil area.

The 299 acres of forestland is part of a clearcut area cut before it was purchased from McGraw-Curran Lumber Company. This area provides excellent diverse habitat with adequate advanced regeneration. Presently the entire stand needs excessive TSI to remove the cull overstory which is suppressing the growth and development of the seedlings and saplings. With this TSI the stand should be able to develop at its full potential and provide additional wildlife habitat.

PANTHER SWAMP NWR

COMP. NO. 9



STAND SUMMARY DATA

Compt. 09

REFUGE Panther Swamp NWR COUNTY Yazoo

Std. No	Land Class	Forest Type	Stand Cond. Class	Acres	MOC	Oper.	Age Year	Mgt. Type	Site Index	Cult Need	Date Work	Cult Need	Date Work	Comments
01	500	92	06	78	1	01	921	292	080					
02	140			35										Landside Ditch
03	230			76										Levee
04	260			136										
05	140			31										Channel
06	500	92	13	221	1	01	971	292	080	61				
07	260			602										
08	140			10										Deep Bayou
09	260			161										
10	260			16										
11	230			11										Levee
12	140			1										
13	260			29										
14	500	92	01	16	1	01	981	292	081					Acorn Plantings
15	500	92	01	20	1	01	981	292	081					Acorn Plantings

Area Summary

Water Area 77

Non-forest Land 1031

Forested Land 335

Date 7-28-82

Photo Nos. 24, 28

Total Compt. Acres 1443

Compartment 10 - This 1,347 acre compartment is all forestland. Of this 219 acres is tupelo gum-cypress brakes which provide excellent wood duck brood habitat and overwintering waterfowl habitat.

Compartment 10 is also being considered along with compartment 7 as a potential greentree reservoir.

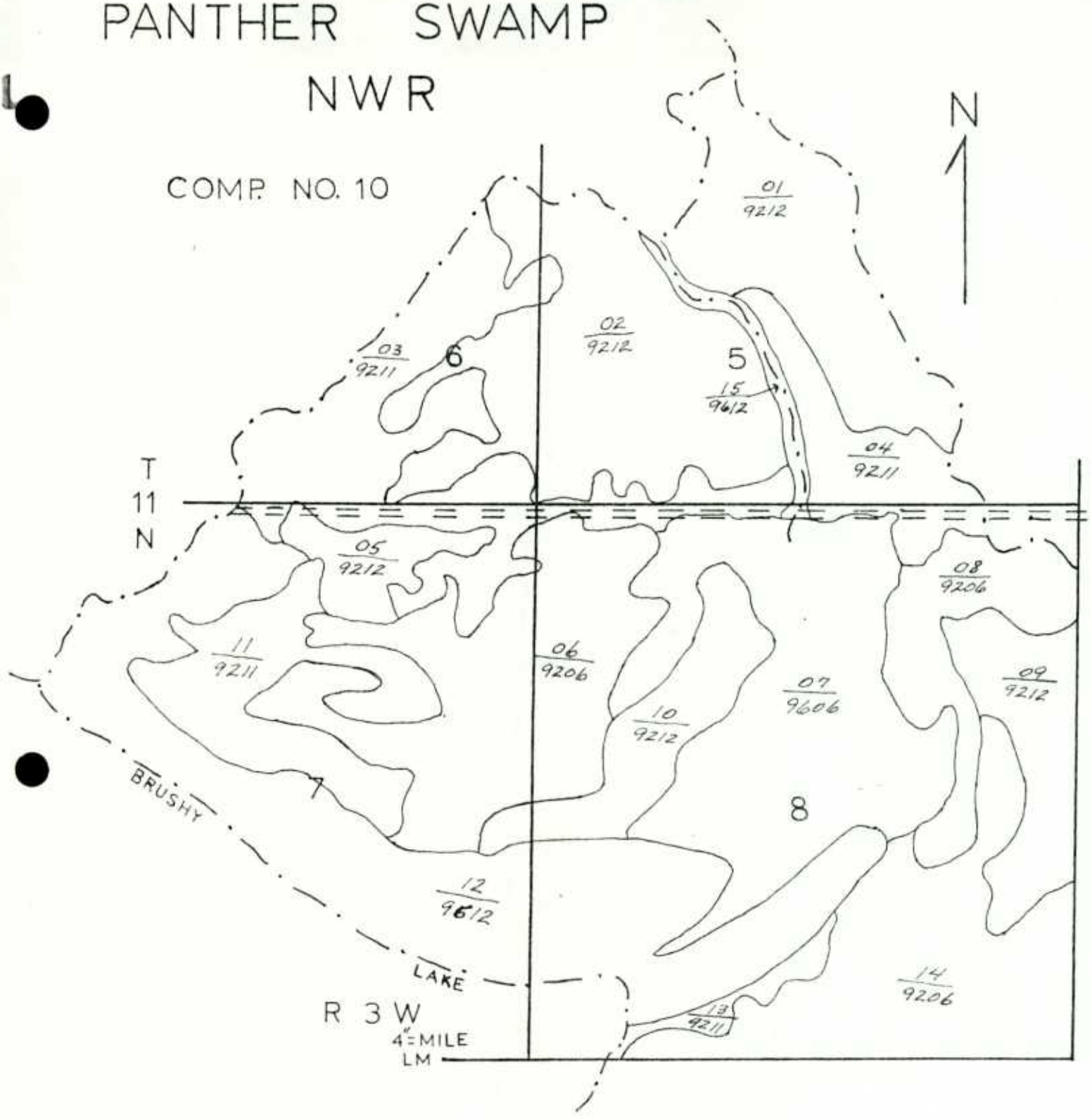
This area has received the heaviest and most recent cutting of any compartment within the refuge. The majority of the area is clearcut wth scattered cull overstory (13 culls/acre).

Silvicultural treatments in the form of TSI and small group selection areas should be used to remove the cull and defective overstory. Advanced reproduction is present and should be released before suppressed or stagnated.

The 219 acre tupelo gum-cypress brake known as Brushy Lake provides additional diversity within the compartment not only for overwintering waterfowl but as a unique ecosystem.

Volumes per acre are 1,800 board feet and 1 cord per acre.

PANTHER SWAMP NWR



STAND SUMMARY DATA

Compt. 10

REFUGE Panther Swamp NWR COUNTY Yazoo

Std. No	Land Class	Forest Type	Stand Cond. Class	Acres	MOC	Oper.	Age Year	Mgt. Type	Site Index	Cult Need	Date Work	Cult Need	Date Work	Comments
01	500	92	12	96	1	01	909	292	090	83				
02	500	92	12	147	1	01	909	292	090	83				
03	500	92	11	128	1	01	936	292	070					
04	500	92	11	44	1	01	936	292	070					
05	500	92	12	26	1	01	901	292	080	83				
06	500	92	06	137	1	01	900	292	080	83				
07	500	96	06	166	1	01	900	296	070	83				Defective, poor quality
08	500	92	06	56	1	01	906	292	080	83				
09	500	92	12	52	1	01	909	292	090	83				
10	500	92	12	52	1	01	909	292	080					
11	500	92	11	68	1	01	936	292	080					
12	140	96	12	219	1	01	880	296	080					Tupelo Gum mixed - Brushy Lake
13	500	92	11	18	1	01	940	292	080					
14	500	92	06	127	1	01	906	292	080	83				Heavy cull
15	500	96	12	11	1	01	900	296	080					

Area Summary

Water Area 219

Non-forest Land

Forested Land 1128

Date 7-28-82

Photo Nos. 42

Total Compt. Acres 1347

Compartments 11, 12, 13, 14, 15 - These compartments have been combined due to their similarity in management needs and existing forest types. Forest types present are predominantly overcup oak-bitter pecan in the low flats, Nuttall oak occurring in the intermediate flats and sweetgum-willow oak along the ridges.

All five compartments are composed of continuous stands of young 40 year old Nuttall oak just becoming mast-prodicing age. These stands occurred from past cutting practices or localized fire occurrence some 40-50 years past.

Compartments 11-15 provide the majority of Panther Swamp's waterfowl habitat due to the continuous tupelo gum-cypress brakes which hold water year round. Some beaver damage has occurred in past years along the edges of the sloughs but it has been held to a minimum since refuge acquisition.

The compartments compose some 4,856 acres of forestland. Of this acreage 933 acres is in some form of water, both open and cypress tupelo brakes.

This wide variety of habitat provides both excellent food sources for waterfowl and upland game species.

Average volume per acre range from 1,000 borad feet per acre in Compartment 11 to 3,900 board feet in Compartment 15.

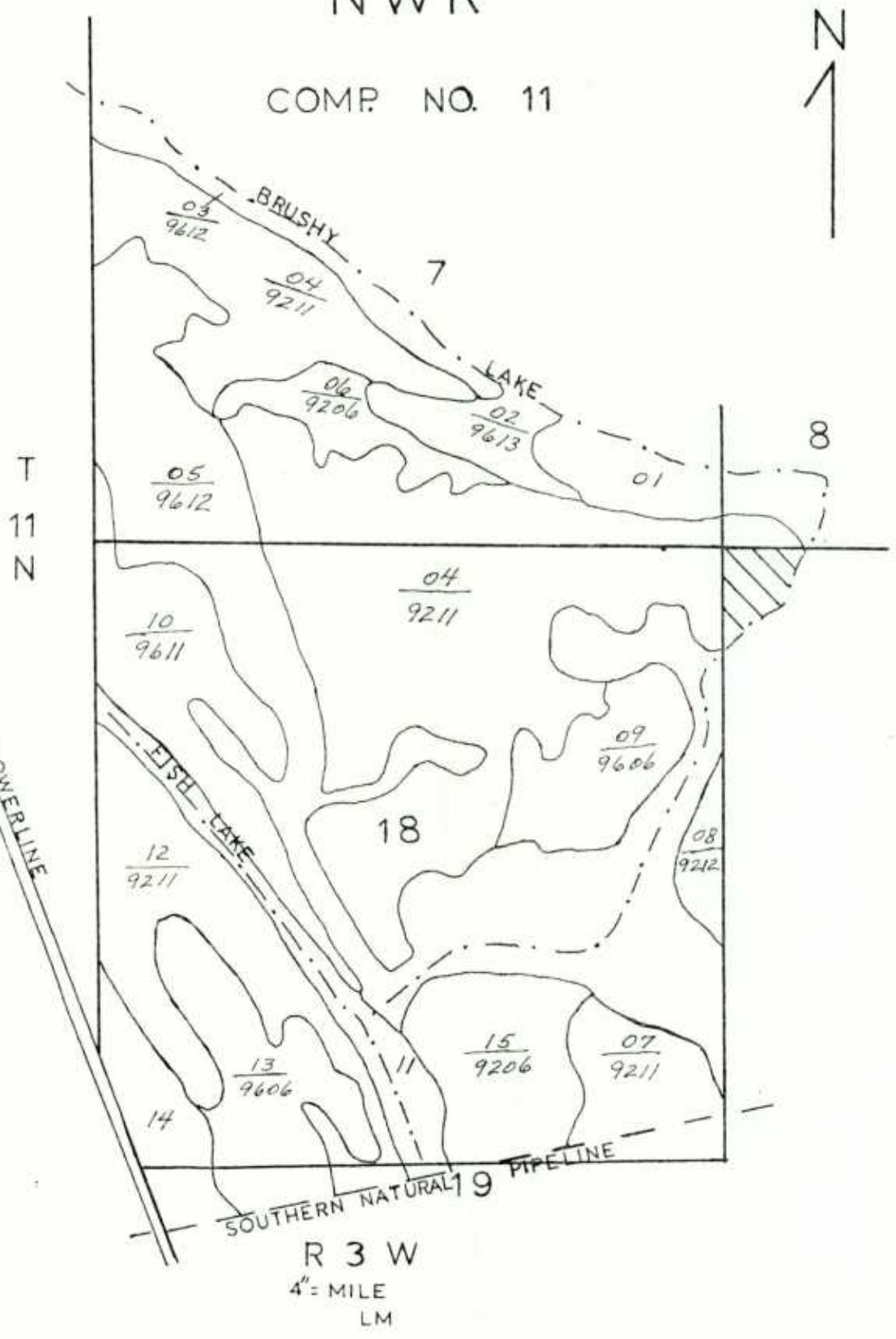
With the majority of these compartments being composed of young timber, ingrowth will be very evident in future volume inventories.

That portion east of the Eastern Auxillary Channel Levee of Compartment 15 and north of the Southern Natural Gas Pipeline has been set aside as a control area. This area will be used both as a demonstration area and as a development type area under a "no management" system.

This area, composed of some 250 acres, has a wide variety of stand types and condition classes. Both old age timber and intermediate size pole-timber is represented within this area.

PANTHER SWAMP

NWR



STAND SUMMARY DATA

Compt. 11

REFUGE Panther Swamp NWR COUNTY Yazoo

Std. No	Land Class	Forest Type	Stand Cond. Class	Acres	MOC	Oper.	Age Year	Mgt. Type	Site Index	Cult Need	Date Work	Cult Need	Date Work	Comments
01	140	102	12	29	1	01								Brushy Lake
02	500	96	13	15	1	01	966	296	070					
03	500	96	12	18	1	01	900	296	080					
04	500	92	11	271	1	01	940	292	080					
05	500	96	12	187	1	01	896	296	080					
06	500	92	06	24	1	01	900	292	080					
07	500	92	11	26	1	01	940	292	080					
08	500	92	12	12	1	01	901	292	080					
09	500	96	06	36	1	01	896	296	080	83				
10	500	96	11	55	1	01	931	296	070					
11	140	102	12	31	1	01								Fish Lake
12	500	92	11	74	1	01	935	292	080					
13	500	96	06	48	1	01	900	296	080					Beaver Damage
14	140			26										Beaver Pond
15	500	92	06	62	1	01	900	292	080	83				

Area Summary

Water Area 86

Non-forest Land

Forested Land 828

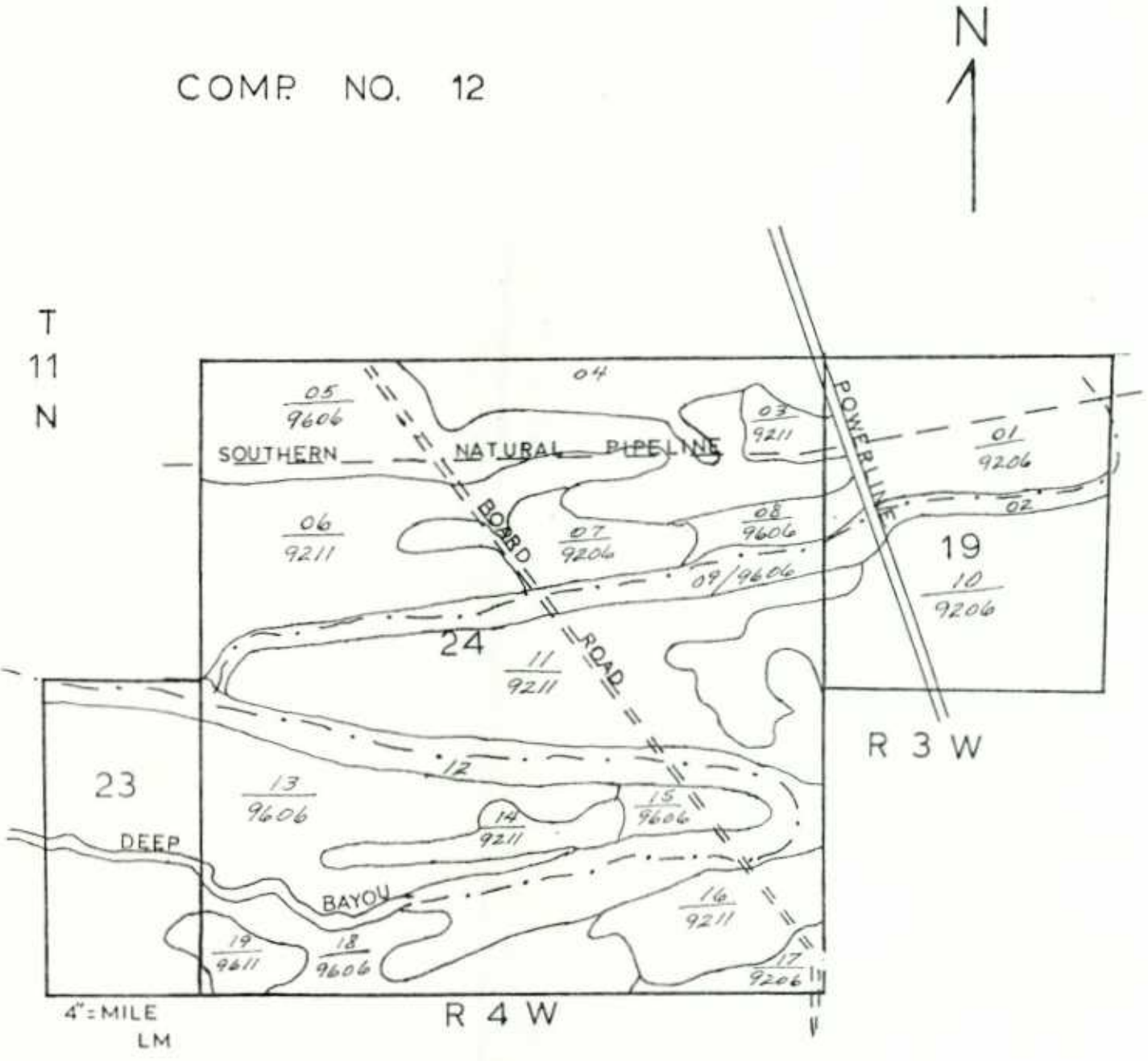
Date 7-28-82

Photo Nos. 43

Total Compt. Acres 914

PANTHER SWAMP NWR

COMP. NO. 12



STAND SUMMARY DATA

Compt. 12

REFUGE Panther Swamp NWR COUNTY Yazoo

Std. No	Land Class	Forest Type	Stand Cond. Class	Acres	MOC	Oper.	Age Year	Mgt. Type	Site Index	Cult Need	Date Work	Cult Need	Date Work	Comments
01	500	92	06	20	1	01	900	292	080	83				
02	140	102	12	10										Fish Lake
03	500	92	11	8	1	01	940	292	070					
04	140			30										Beaver Pond
05	500	96	06	78	1	01	900	296	070					
06	500	92	11	74	1	01	943	292	080					
07	500	92	06	24	1	01	906	292	080	83				
08	500	96	06	10	1	01	896	296	070					
09	500	96	06	24	1	01	896	296	080					Periodic Flooding
10	500	92	06	100	1	01	900	292	080	83				
11	500	92	11	110	1	01	945	292	080					Scattered Overstory
12	140			89										Deep Bayou
13	500	96	06	141	1	01	900	296	070	83				
14	500	92	11	16	1	01	945	292	080					
15	500	96	06	10	1	01	890	296	070					
16	500	92	11	28	1	01	945	292	080					
17	500	92	06	10	1	01	900	292	080					
18	500	96	06	58	1	01	900	296	070	83				
19	500	96	11	10	1	01	936	296	070					

Area Summary

Water Area 129

Non-forest Land

Forested Land 721

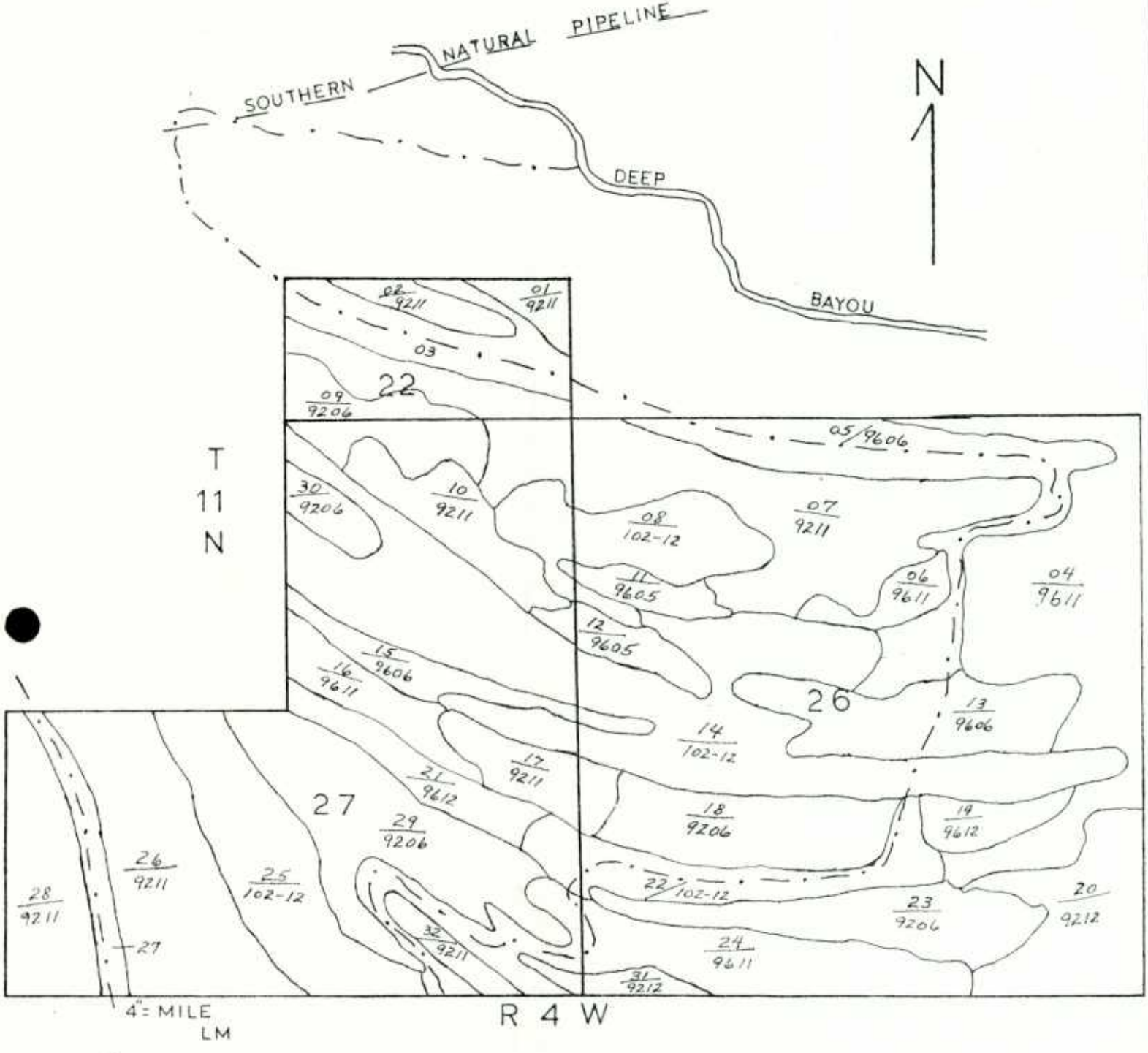
Date 7-28-82

Photo Nos. 33

Total Compt. Acres 850

PANTHER SWAMP NWR

COMP. NO. 13



STAND SUMMARY DATA

Compt. 13

REFUGE Pamther Swamp NWR COUNTY Yazoo

Std. No	Land Class	Forest Type	Stand Cond. Class	Acres	MOC	Oper.	Age Year	Mgt. Type	Site Index	Cult Need	Date Work	Cult Need	Date Work	Comments
01	500	92	11	7	1	01	940	292	080					
02	500	92	11	7	1	01	940	292	080					
03	140			40										Beaver Pond
04	500	96	11	101	1	01	931	296	070					
05	500	96	06	44	1	01	900	296	080					Periodic Flooding
06	500	96	11	13	1	01	935	296	070					
07	500	92	11	106	1	01	940	292	090					
08	500	96	05	35	1	01	935	296	070					Periodic Flooding
09	500	92	06	32	1	01	909	292	090	83				
10	500	92	11	26	1	01	940	292	090					
11	500	96	05	11	1	01	935	296	070					
12	500	96	05	15	1	01	935	296	070					
13	500	96	06	41	1	01	890	296	080	83				
14	140	102	12	151										Little Tupelo Brake
15	500	96	06	20	1	01	890	296	080					
16	500	96	11	17	1	01	935	296	070					
17	500	92	11	19	1	01	936	292	080					
18	500	92	06	33	1	01	901	292	080	83				
19	500	96	12	13	1	01	881	296	080	83				
20	500	92	12	50	1	01	895	292	090	83				
21	500	96	12	23	1	01	891	296	080					

Area Summary

Water Area _____

Non-forest Land _____

Forested Land _____

Date _____

Photo Nos. _____

_____

_____

Total Compt. Acres _____

STAND SUMMARY DATA

Compt. 13

REFUGE _____ COUNTY _____

Std. No	Land Class	Forest Type	Stand Cond. Class	Acres	MOC	Oper.	Age Year	Mgt. Type	Site Index	Cult Need	Date Work	Cult Need	Date Work	Comments
22	140	102	12	40										
23	500	92	06	41	1	01	895	292	090	83				Heavy Culls
24	500	96	11	64	1	01	936	296	070					
25	140	102	12	55										Little Tupelo Brake
26	500	92	11	66	1	01	936	292	090					
27	140			10										Beaver Pond
28	500	92	11	27	1	01	936	292	090					
29	500	92	06	63	1	01	895	292	090	83				
30	500	92	06	10	1	01	895	292	090					
31	500	92	12	10	1	01	901	292	080					
32	500	92	11	10	1	01	946	292	080					

Area Summary

Water Area 296

Non-forest Land 0

Forested Land 904

Date 7-29-82

Photo Nos. 27, 28

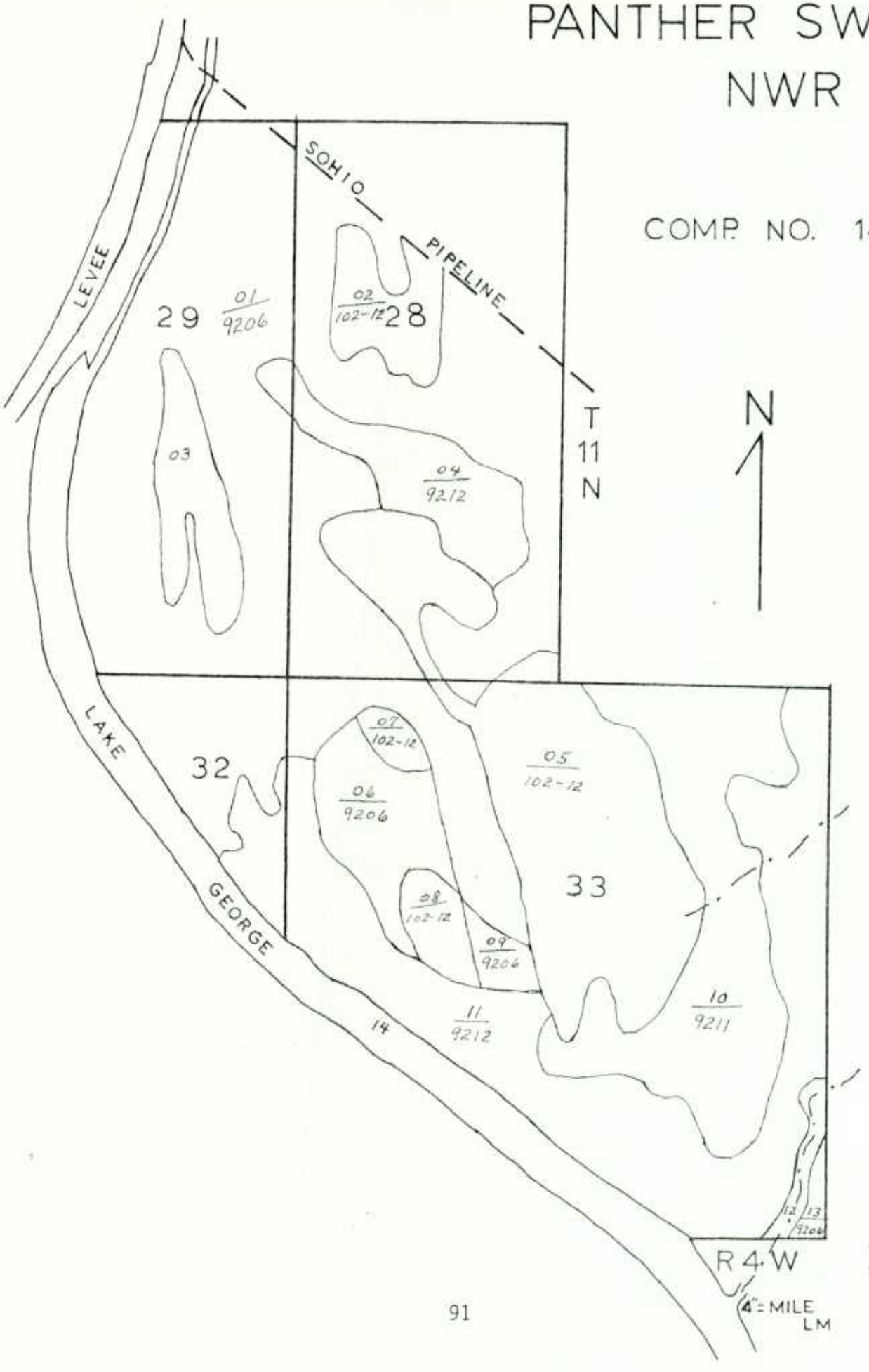
32

Total Compt. Acres 1200

90

PANTHER SWAMP NWR

COMP. NO. 14



STAND SUMMARY DATA

Compt. 14

REFUGE Panther Swamp NWR COUNTY Yazoo

Std. No	Land Class	Forest Type	Stand Cond. Class	Acres	MOC	Oper.	Age Year	Mgt. Type	Site Index	Cult Need	Date Work	Cult Need	Date Work	Comments
01	500	92	06	328	1	01	910	292	090	83				
02	140	102	12	26	1	01								
03	110			28										Lake
04	500	92	12	39	1	01	910	292	090					
05	140	102	12	146	1	01								Tupelo Brake
06	500	92	06	38	1	01	901	292	090					
07	140	102	12	7										
08	140	102	12	16										
09	500	92	06	10	1	01	901	292	080					Periodic Flooding
10	500	92	11	118	1	01	933	292	090					
11	500	92	12	203	1	01	906	292	090					
12	140			8										Lake George Drain
13	500	92	06	5	1	01	906	292	080					
14	140			58										Lake George

Area Summary

Water Area 289

Non-forest Land

Forested Land 741

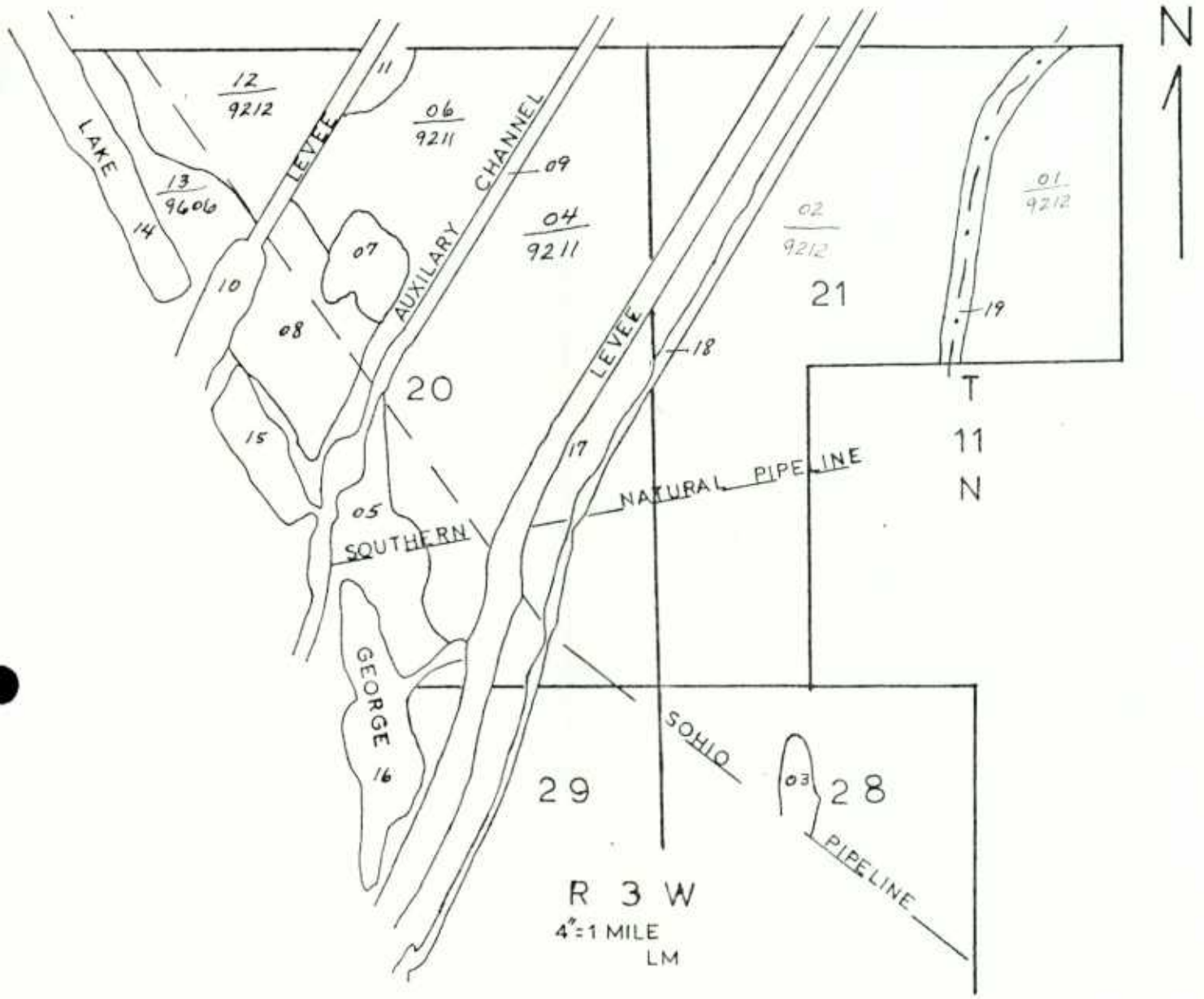
Date 7-29-82

Photo Nos. 10,11

Total Compt. Acres 1030

PANTHER SWAMP NWR

COMP. NO. 15



STAND SUMMARY DATA

Compt. 15

REFUGE Panther Swamp NWR COUNTY Yazoo

Std. No	Land Class	Forest Type	Stand Cond. Class	Acres	MOC	Oper.	Age Year	Mgt. Type	Site Index	Cult Need	Date Work	Cult Need	Date Work	Comments
01	500	92	12	63	1	01	903	292	090					
02	500	92	12	273	1	01	903	292	100	83				
03	140	102	12	5										
04	500	92	11	147	1	01	930	292	090					
05	260			28										Grass Field
06	500	92	11	64	1	01	930	292	090					Fire 2/27/82
07	110			9										
08	260			30										
09	140			29										Channel
10	230			16										West Levee
11	110			5										
12	500	92	12	38	1	01	903	292	090					Fire 2/27/81
13	500	96	06	18	1	01	896	296	080					
14	110			9										
15	110			6										
16	110			10										
17	230			76										East Levee
18	140			22										Landside Ditch
19	140	96	12	14	1	01	900	296	080					

Area Summary

Water Area 109

Non-forest Land 150

Forested Land 603

Date 7-29-82

Photo Nos. 12

Total Compt. Acres 862

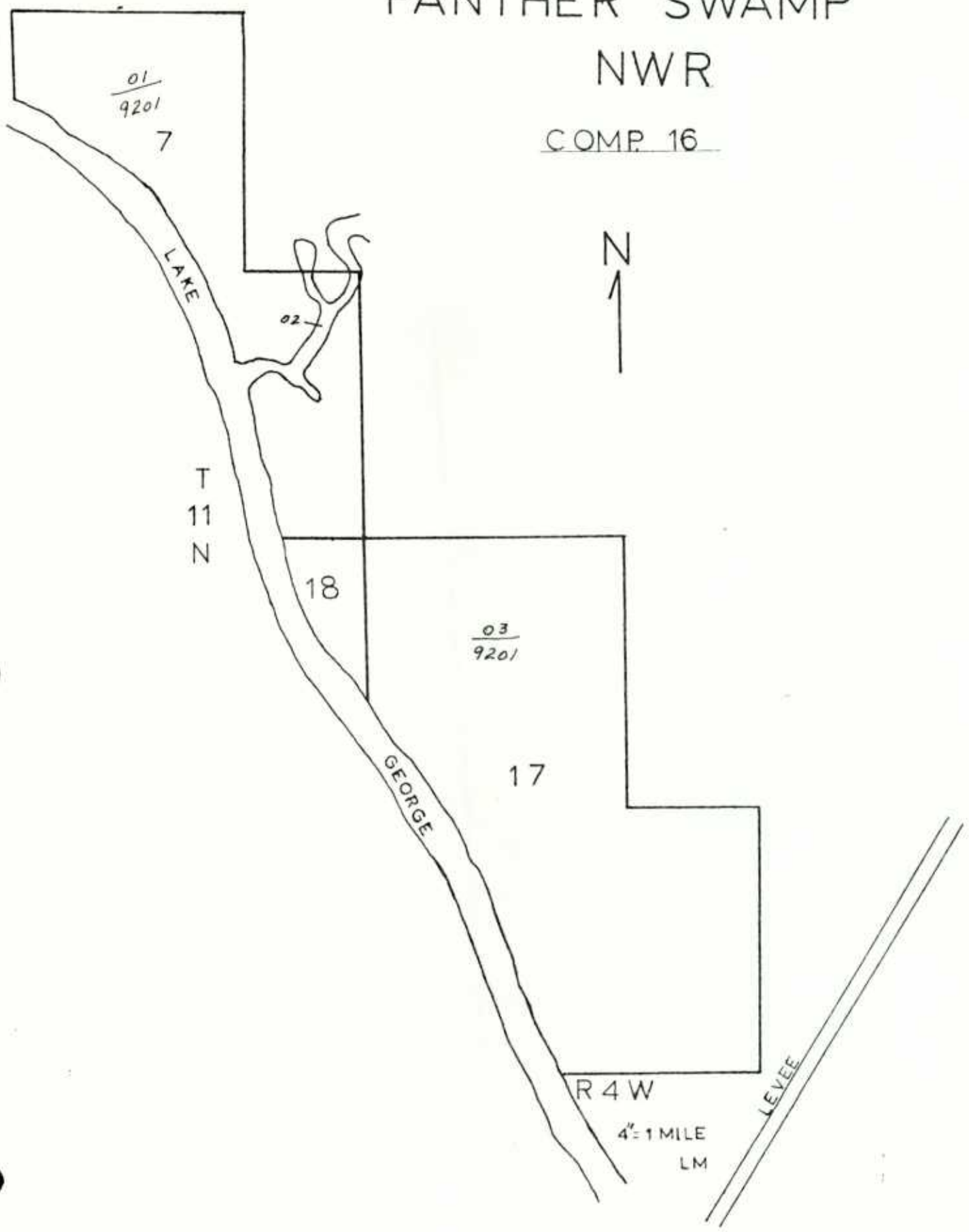
Compartment 16 - Compartment 16 is made up of the most recently purchased Gaddis Tract. This tract was purchased during the second quarter of FY 82.

All timber 12" at stump height and larger had been removed from this tract during 1981. Therefore this compartment made up of 574 acres is totally clearcut.

This compartment should receive some intensive silvicultural treatment to remove the remaining cull and defective stems so the existing reproduction can develop.

PANTHER SWAMP NWR

COMP 16



Compt. 16

STAND SUMMARY DATA

REFUGE Panther Swamp NWR COUNTY Yazoo

Std. No	Land Class	Forest Type	Stand Cond. Class	Acres	MOC	Oper.	Age Year	Mgt. Type	Site Index	Cult Need	Date Work	Cult Need	Date Work	Comments
01	500	92	01	99	1	01	981	292	090					Clearcut 1981 before purchased
02	120			10										
03	500	92	01	464	1	01	981	292	090					Clearcut 1981 before purchased

Area Summary

Water Area 10

Non-forest Land

Forested Land 564

Date 7-29-82

Photo Nos. 5, 14

Total Compt. Acres 574

Part V. PHYSICAL PLANT AND EQUIPMENT USE REQUIREMENTS

A. Roads

At present no roads are planned for construction within Panther Swamp. Existing roads will be utilized during timber sale operations and all woods roads will be leveled and disked after logging operations expire. Access to Panther Swamp is the major problem as it is surrounded by agricultural lands. There is a need to acquire additional access easements not only for harvest operations but for public access during controlled hunts and daily activities.

B. Miscellaneous Equipment

The vehicle type presently utilized by the staff is adequate at this time. This emcompasses one ½-ton pickup and one ATV 3-wheeler. Both vehicles were bought from refuge start-up funds and should be replaced when needed from 6800 funds.

C. Engineering Services

These services will not be needed during implementation of this plan.

Part VI. FUNDS AND MANPOWER REQUIREMENTS

The anticipated fund and manpower requirements based on present values necessary to carry out the forest management plan during this cutting cycle are:

	15 year period
1. Salaries (1 Forester GS-11 (1 Forest Technician GS-5)	$416,000
2. Operation Expense	30,000
3. Equipment Replacement	20,000
	$466,000

Part VII. PROGRAM DATA

A. Timber Cruise Data

A 1% line plot cruise was made of Panther Swamp forest during the summer of 1980.

In obtaining the cruise data, circular 1/5 acre plots were laid out on aerial photographs and field checked at 10 chain intervals (66' per chain) on lines spaced 20 chains apart. Information recorded at each plot and along cruise lines was utilized in determining forest cover types, stand condition, age classes, stand densities and timber volumes. The Scribner Decimal C log rule was used for computing sawtimber volumes. Pulpwood volumes were based on cubic feet volume tables dated 1971 for hardwoods provided by the U.S. Forest Service of which a copy is attached.

Sixteen compartment maps were drawn from aerial photographs taken in November 1979. Forest cover types, timber size classes and densities, agricultural land, open land, and water were delineated on the maps for management purposes.

B. Markets

The demand for high quality hardwood sawtimber is good, however, there is little demand at present for hardwood pulpwood. Factors such as logging conditions, timber quality, volume per acre to be harvested, access, etc. will determine the stumpage value and number of bids received. When sawtimber or pulpwood is to be sold, bid invitations should be sent to all reliable prospective buyers.

C. Refer to the following list of buyers when advertising timber for sale.

SAWTIMBER BUYERS

Beesley Timber Co., Inc.
P. O. Drawer 757
Port Gibson, MS 39150
Phone 437-8831

W.E. Parks, Co., Inc.
Box 309
Port Gibson, MS 39150
Phone 437-4926

Pickens Brothers Lumber Co.
Box 433
Port Gibson, MS 39150

Memphis Hardwood Flooring
Box 837
Grenada, MS 38901
Phone: 226-2441

Kitchens Brothers Mfg. Co.
Box 217
Utica, MS 39175
Phone: 885-6001

Memphis Hardwood Flooring Co.
Landrum Street
Durant, MS 39063
Phone: 653-6334
(Old Koppers Co., Inc. Mill)

S & G Lumber Company
Box 277
Tchula, MS 39169
Phone: 235-5326

Koppers Company, Inc.
Box 627
Monticello, MS 39654
Phone: 587-4001
(Koppers Co. has several mills around Miss.)

George Fisackerly Sawmill, Inc.
710 Shirley Avenue
Winona, MS 38967
Phone 283-4807

Pearson Brothers
Box 327
Winona, MS 38967
Phone 283-1461

Molpus Hardwood Co.
Box 59
Philadelphia, MS 39350
Phone: 656-3372

Tallahatchie Hardwood, Inc.
Box 70
Charleston, MS 38901
Phone: 647-5427

Bellgrade Lumber Co.
Box 437
Cary, MS 39054
Phone: 387-4023

Anderson-Tully Company
Box 38
Vicksburg, MS 39180
Phone: 636-3876

Chicago Mill & Lbr. Co.
Box 1019
Greenville, MS 38701
Phone: 378-2385

Cathey-Williford-Jones Lbr. Co.
Bentonia, MS 39040
Phone: 755-2962

McGraw-Curran Lumber Co.
Box 450
Yazoo City, MS 39194
Phone: 746-1661

Cut Rite Lumber & Tie Co.
Highway 49 E.
Yazoo City, MS 39194
Phone 746-2887

D. PULPWOOD DEALERS

T & W Wood Comapny
Box 1052
Yazoo City, MS 39194
Phone 746-2653

Anderson-Coleman Mfg. Co., Inc.
Highway 3 S.
Yazoo City, MS 39194
Phone:746-3795

E.W. Bain
746 E. Peace Street
Canton, MS 39046
Phone: 859-3731

L.A. Penn & Son, Inc.
Box 169
Canton, MS 39046
Phone: 859-1861

M.O. Stark
316 Boulevard Street
Lexington, MS 39095
Phone: 834-2735

Delta Pulpwood Co.
Onward, MS 39143
Phone: 873-4709

E. Tables, Exhibits, Maps

EXHIBIT 1 GLOSSARY

1. Age Class - Age intervals into which stands are divided. For the purpose of this plan, the interval will be 15 years.

2. All-aged Forest - A stand in which theoretically trees of all ages up to and including those of the felling age are found.

3. Uneven-aged Forest - A stand in which there are considerable difference in age of trees and in which 3 or more age classes are represented.

4. Basal Area - The area, usually expressed in square feet, of the cross section at breast height of a single or all trees in a stand.

5. Carrying Capacity - The number of animals that a habitat can maintain in a healthy, vigorous condition.

6. CCF - One hundred cubic feet of solid wood.

7. Clearcut - A cutting which removes all trees; (both large and small).

8. Compartment - An organization unit or small subdivision of forest area for purposes of orientation, administration, and silvicultural operations. A compartment may contain one or more subcompartments.

9. Cutting Cycle - The period of years between two consecutive scheduled harvest operations in a stand. For the purposes of this plan, the interval will be 15 years.

10. D.B.H. - Diameter of a tree trunk 4½ feet above the base of the tree.

11. Endangered Species - An animal that may become extinct because of loss or damage of habitat and other adverse factors.

12. Even-aged Stand - All trees are the same age or in the same age class. A stand is considered even-aged if the difference in the age between the oldest and youngest trees does not exceed 20 percent of the length of the rotation.

13. Forest Cover Type - A vegetative forest cover type occupying a respective site or unit of ground.

14. Green-tree Reservoir - Areas of live timber artificially flooded during non-growing season to provide waterfowl habitat.

15. Habitat - The abode, natural or otherwise, of a plant or animal, considered particularly in relation to all environmental influences affecting it. A suitable habitat is one in which the organism can maintain itself and perpetuate the species.

16. Intermediate Cutting - Any removal of trees from a stand between the time of its formation and the harvest cutting. Generally taken to include cleaning, thinning, liberation and improvement cutting, and sometimes salvage and sanitation cutting.

17. Intolerant - Shade Intolerant - The inability of a species to regenerate itself and grow in the shade of other trees.

18. Mast - The fruit and nuts of shrubs and trees.

19. Natural Regeneration - Natural establishment of a new crop of trees on an area following timber harvest by seed from trees left for that purpose or by hardwoods sprouting from existing roots.

20. Pre-commercial Thinning - Reduction of the number of trees to improve the growth rate and quality of the remaining trees on areas where trees are cut or do not have an economic value or market.

21. Prescription - A plan written for a subcompartment before any work is started stating what is to be done and why the treatment is necessary.

22. Regeneration - (a) Reproduction - The removal of a tree crop whether by natural or artificial means. (b) The young tree crop itself - seedlings and saplings.

23. Regeneration cut - The cut made at the end of each rotation for the purpose of releasing reproduction or to create conditions favorable for the establishment of reproduction.

24. Release Cutting - Freeing a tree or group of trees from more immediate competition by cutting, or otherwise elimination.

25. Rotation - The planned number of years between the regeneration of a crop of trees on an area and its final cutting at a specified stage of maturity.

26. Selection Cutting - Selective Cutting - The periodic removal of trees (particularly the mature), individually or in small groups from an uneven-aged forest, in order to establish a new crop of irregular constitution.

27. Silvicultural - The science and art of cultivating (i.e., growing and tending) the forest.

28. Site Index - A particular measure of site class based on the height of the dominant trees in a stand at an arbitrarily chosen age.

29. Slash - The forest residue left on the ground after felling and tending and/or accumulated as a result of storms or flooding.

30. Stand - A community of trees possessing sufficient uniformity in regard to species composition, age, and condition to be distinguishable from adjacent communities.

31. Stocking - The degree of occupancy of land by trees, measured by basal area and/or the number of trees in a stand by size or age and spacing, compared to the basal area and/or number of trees required to utilize the growth fully.

32. Tally - The procedure of recording volumes of trees marked to be sold.

33. Threatened Wildlife Species - Species threatened with extinction because of loss of habitat or other factors.

34. Tolerant - Shade Tolerant - The ability of a tree species to regenerate and grow in the shade of other trees.

EXHIBIT 2

RELATIVE SUSCEPTIBILITY OF HARDWOODS TO HERBICIDES 1/

Injection with 2,4-D amine

Susceptible	Intermediate	Resistant
Cherry, black	Beech	Ash, green
Cherry, fire	Blackgum	Ash, white
Cucumbertree	Elm, winged	Dogwood
Elm, American	Hawthorn	Hickory
Oak, black	Hornbeam, American	Holly
Oak, blackjack	Huckleberry	Locust, water
Oak, overcup	Locust, black	Maple, red
Oak, post	Oak, water	Oak, chestnut
Oak, scarlet	Pecan, bitter	Privet, swamp
Oak, southern red	Persimmon, eastern	
Oak, white	Sumac	Sourwood
Oak, willow	Sweetbay	
Sassafrass	Sweetgum	
Willow		
Witchhazel		
Yellow-poplar		

Injection with Picloram + 2,4-D (Tordon 101) 2/

Cherry, black	Blackgum	Ash
Hornbeam, American	Boxelder	Dogwood, rough leaf
Locust, black	Hickory	
Maple, red (expect when sap is flowing)	Persimmon, eastern	
Oak, black		
Oak, blackjack	Sourwood	
Oak, chestnut	Sweetbay	
Oak, post		
Oak, scarlet		
Oak, southern red		
Oak, white		

1/ Susceptibility of species varies with conditions at time of treatment.

2/ Do not use in pure hardwood stands due to root grafting.

EXHIBIT 3

FRUITING HABITS OF SOME IMPORTANT MAST TREES OF THE SOUTHEAST

Species		Initial Mast Production		Optimum Mast Production		Max. Age Mast Production (Pathological)	Remarks
		Age	DBH	Age	DBH	Age	
Beech		40		60-200			
Cherry,	Black	10		30-100		180	Some production yearly
Dogwood		4	2		4-8		Trees larger than 4" seldom fail
Gum,	Black						
	Tupelo						
Hickory,	Bitternut	30		50-125		175	Some production annually
	Mockernut	25		40-125		200	
	Shellbark	40		75-200			
	Shagbark	40		60-200		300	
	Water	20	8	40-75		125	
	Pignut	35	8	75-200		300	
Oak,	Bear	2					Seldom fail
	Black	20	6-8	40-80	10-30	100	
	Blackjack		6-8		10-24		
	Bur	35		75-150		400	Some production annually
	Cherrybark	25		50-80			Seldom fail
	Chestnut	20	6-8	50-100	12-24	150	Fail every other year
	Chinquapin						
	Champmans						
	Laurel	15		25-?			Seldom fail
	Live						Seldom fail
	Northern red	25	10	50-125	14-26	200	
	Nuttall	20					Some production yearly
	Overcup	25					
	Pin	15		25-60			
	Post	25	6	50-150	8-20	250	
	Sandjack		2		4-8		
	Scarlet	20	6-8	50-125	10-28	150	

continued

EXHIBIT 3

	Species	Initial Mast Production Age	Initial Mast Production DBH	Optimum Mast Production Age	Optimum Mast Production DBH	Max. Age Mast Production (Pathological) Age	Remarks
Oak,	Shumard	25		50-?			Some production yearly
	Southern red	25	10	50-75	20-30	125	
	Swamp Chestnut	25		40-?			Some production yearly
	Swmap White	35		75-200		300	Some production yearly
	Turkey			25-?	5-8		Fail about every third year
	Water	20	8-10	50-125	14-30	175	Seldom fail
	White	20	8-10	50-200	14-30	300	Fail every other year
	Willow	20	8-10	30-100	14-24	125	
Pecan		20		75-225		300	
Walnut,	Black	12		30-100			Seldom fail

EXHIBIT 4

EXPECTED ACORN YIELDS
POUNDS (AIR-DRIED) PER SQUARE FOOT OF BASAL AREA
AT INDICATED DIAMETER

DBH (BA)	Chestnut Oak	White Oak	Post Oak	Northern Red Oak	Southern Red Oak	Scarlet Oak	Black Oak	Water Oak	Blackjack Oak	Sandjack Oak
4 (.09)			1.2							6.1
6 (.20)			2.9							6.5
8 (.35)			3.0						.9	5.9
10 (.55)	1.8	1.3	2.8	.7	.6	4.5	2.0	.8	2.3	5.1
12 (.79)	3.7	1.9	2.5	2.8	1.0	4.9	2.2	2.6	2.9	
14 (1.10)	4.5	2.5	2.3	5.0	1.4	5.1	2.1	3.4	3.0	
16 (1.40)	4.5	3.1	2.1	7.1	2.0	5.7	2.0	5.1	3.3	
18 (1.80)	4.5	4.8	1.9	8.0	2.7	6.7	1.9	4.0	2.7	
20 (2.19)	4.0	4.8	1.8	7.2	3.6	6.8	1.8	4.0	2.7	
22 (2.64)	3.7	4.3	1.7	6.5	4.6	6.6	1.7	3.9	2.6	
24 (3.14)	3.2	4.0		4.9	5.8	5.7	1.7	3.8		
26 (3.69)	2.8	3.6		3.7	6.5	5.0	1.6			
28 (4.28)	2.5	3.0		2.9		4.3	1.5			
30 (4.91)	2.2	2.5		2.0		3.7	1.4			

continued

-Ten year average diameter growth rates for trees free to grow in undamaged stands on average bottomland sites.

Species	Diameter class			
	6-12 inches	14-18 inches	20-28 inches	30+ inches
	Inches	Inches	Inches	Inches
Sweetgum	2.80	2.85	3.05	2.30
Red oaks	3.60	4.30	4.45	3.25
White oaks	2.40	2.50	2.90	2.70
Ashes	2.05	2.30	2.85	2.65
Tupelos	2.85	3.15	3.25	3.00
Pecan	2.60	3.55	3.60	3.10
Cottonwood	6.30	5.85	6.30	4.65
Willow	3.80	5.45	5.50	4.20
Overcup oak	2.05	2.20	2.10	2.15
Water hickory	1.95	2.00	2.30	2.55
Baldcypress (second growth)	2.30	2.60	3.20	2.70
Miscellaneous rapid growers[1]	3.20	3.30	3.80	3.70
Miscellaneous slow growers[2]	2.00	2.10	2.50	2.30
Average	2.55	2.80	3.00	2.80

1 American elm, maples, American sycamore, honeylocust, waterlocust
2 Cedar elm, winged elm, black tupelo, hickories, sugarberry

EXHIBIT 5

FLORA OF PANTHER SWAMP REFUGE

Common names	Scientific names
Beggar Lice	Desmodium spp.
Birthworth	Aristolochia serpentaria
Blackberry	Rubus spp.
Black gum	Nyssa sylvatica
Boxelder	Acer negundo
Button Bush	Cephalanthus occidentalis
Cane	Arundinaria gigantea
Cardinal Flower	Lobelia cardinalis
Carolina Moonseed	Cocculus carolinus
Climbing Dogbane	Trachelospermum difforme
Cottonwood	Populus deltoides
Cut Grass	Leersia lenticularis
Dayflower	Commelina virginica
Deciduous Holly	Ilex decidua
Dewberry	Rubus spp.
Dioclea	Dioclea multiflora
Dock	Rumex spp.
Elm, American	Ulmus americana
Elm, Cedar (Rock Elm)	Ulmus crassifolia
False Nettle	Boehmeria cylindrica
Fungi	Basidiomycetes
Grape	Vitis spp.
Green Ash	Fraxinus pennsylvanica
Greenbrier, Bristly	Smilax tamnoides
Greenbrier, Common	Smilax rotundifolia
Greenbrier, Saw	Smilax bona-nox
Hawthorn	Crataegus spp.
Johnson Grass	Sorghum halepense
Ladies' Eardrops	Brunnichia cirrhosa
Leather Flower	Clematis crispa
Lizards' Tail	Saururus cernuus

continued

EXHIBIT 5

Common names	Scientific names
Lilly	*Lilium* soo.
Matelea	*Matelea* spp. (*Gonolobus* spp.)
Nightshade	*Solanum nigra*
Nut Grass	*Cyperus* spp.
Oak, Nuttall	*Quercus nuttallis*
Oak, Overcup	*Quercus lyrata*
Oak, Water	*Quercus nigra*
Oak, Willow	*Quercus phellos*
Palmetto	*Sabal minor*
Panic Grass	*Panicum* spp.
Passion Flower	*Passiflora lutea*
Pecan	*Carya illinoensis*
Pepper Vine	*Ampelopsis arborea*
Persimmon	*Diospyros virginiana*
Pigweed	*Amaranthus* spp.
Poison Ivy	*Rhus radicans*
Privet	*Forestiera americana*
Pokeweed	*Phytolacca americana*
Ragweed	*Ambrosia artemissiifolia*
Rattanvine	*Berchemia scandens*
Red Maple	*Acer rubrum*
Red Mulberry	*Morus rubra*
Sedge	*Carex* spp.
Sesbania	*Sesbania exaltata*
Smartweed	*Polygonum* spp.
Snakeroot	*Sanicula canadensis*
Storax	*Styrax american*
Sugarberry	*Celtis laevigata*
Sumpweed	*Iva ciliata*

continued

EXHIBIT 5

Common names	Scientific names
Swamp Dogwood	*Cornus stricta*
Sweetgum	*Liquidambar styraciflua*
Sycamore	*Platanus occidentalis*
Trumpet Vine	*Campsis radicans*
Violet	*Viola* spp.
Virginia Creeper	*Parthenocissus quinquefolia*
Water Hickory (Bitter Pecan)	*Carya aquatica*
Wild peas	*Apios americana*
Woodsorrel	*Oxalis* spp.

EXHIBIT 6

NATIONAL WILDLIFE REFUGE TIMBER SALE

FORMAL BID INVITATION

Formal (sealed) bids will be received in the office of the Refuge Manager of Panther Swamp National Wildlife Refuge, P. O. Box 107, 333 1/3 North Main, Yazoo City, Mississippi 39294, until _____ _____
(Time) (Date)
for the sale of _____ sawtimber contained in trees designated
(Species or kind)
for cutting on _____ of the
(Compartment No. or legal description)
Panther Swamp National Wildlife Refuge, Mississippi located _____
_____.
(Give location in relation to well known landmarks or nearby towns)

All bids must be securely sealed in a suitable envelope and plainly marked "TIMBER BID". Show date of opening and compartment number on envelope.

For the purpose of this invitation and sale of this timber formal bids are requested on the assumption that there are approximately _____ board feet of mixed bottomland hardwood on _____ acres sale area. The breakdown of the total volume as to species and volume of each species is attached to this invitation. The total volume and volumes of each species are indicated by tree measurement and are in no way guaranteed.

The timber offered for sale under this formal invitation was scaled in the tree by the Scribner Decimal C Log Rule and payments will be based on such scale. Utilization was a 12 inch top if merchantible and a No. 3 log.

The successful bidder will submit a statement demonstrating his financial ability and the ownership or control of necessary equipment to carry out the operation in the basis herein specified; also, the location of his plant, if any, and the number of employees he proposes to use in the operation.

The timber will be shown on _____. All interested parties meet at _____.

Operations msut be completed within a period of _____ months following date of submission of permit-agreement. No logging operations will be conducted in the Refuge between November 15 and April 30.

Each bidder will submit with his bid a deposit in the amount of $ _____ payable to the U.S. Fish and Wildlife Service in the form of a bank draft or certified check. The deposit of the successful bidder will be retained by the Government as a performance guarantee to cover any damages or claims the Government may have against the permittee as a result of this operation under the terms and conditions of the permit-agreement, the balance, if any to be returned to the permittee upon satisfactory completion of the operation. The deposits of the unsuccessful bidders will be returned after a determination has been made regarding the contractor who will be awarded the permit.

The successful permittee will also remit a bank draft or certified check for payment in full payable to the U.S. Fish and Wildlife Service before commencing operations under the permit-agreement.

A sample copy of the permit-agreement is available from the Refuge Manager at the above address.

The right to reject any or all bids hereunder is reserved.

Item 1. Sawtimber _____ B.F., more or less $ _____
(Total Bid)

If I am adjudged the successful applicant, I agree to accept the proferred permit agreement and to make payment in full within ten (10) days from the date of delivery of the permit-agreement to me, and make payment in full before commencing any operations, and to start cutting operations thereunder within _____ days ofter submission of the permit-agreement.

_____
Name of Bidder)

By _____

_____ _____
(Date) (Address of Bidder)

U.S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Bureau of Sport Fisheries and Wildlife

EQUAL EMPLOYMENT OPPORTUNITY CLAUSE

(Executive Order No. 11246, as amended October 13, 1967)

Equal Employment Opportunity. During the performance of this contract, the contractor agrees as follows:

1. The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of this Equal Employment Opportunity Clause.

2. The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex or national origin.

3. The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency contracting officer, advising the labor union or workers' representative of the contractor's commitments under Section 202, of Executive Order No. 11246, as amended, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

4. The contractor will comply with all provisions of Executive Order No. 11246, as amended, and the rules, regulations, and relevant orders of the Secretary of Labor.

5. The contractor will furnish all information and reports required by Executive Order No. 11246, as amended, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

6. In the event of the contractor's noncompliance with the Equal Employment Opportunity Clause of this contract or with any of the said rules, regulations, or orders, this contract may be cancelled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order No. 11246, as amended, and such other sanctions may be imposed and remedies invoked as provided in the said Executive Order or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

7. The contractor will include the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order No. 11246, as amended, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the contracting agency may direct as a means of enforcing such provisions, including the sanctions for noncompliance: Provided, however, that in the event the contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the contracting agency, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

3-176
(Revised April 1969)

U.S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Bureau of Sport Fisheries and Wildlife

CERTIFICATE OF INDEPENDENT PRICE DETERMINATION
(101-45.4926 Fed. Prop. Mgt. Reg.)

(a) By submission of this bid or proposal, each bidder or offeror certifies, and in the case of a joint bid or proposal each party thereto certifies as to its own organization, that in connection with this sale:

(1) The prices in this bid or proposal have been arrived at independently, without consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices, with any other bidder or offeror or with any competitor;

(2) Unless otherwise required by law, the prices which have been quoted in this bid or proposal have not been knowingly disclosed by the bidder or offeror and will not knowingly be disclosed by the bidder or offeror prior to opening, in the case of a bid, or prior to award, in the case of a proposal, directly or indirectly to any other bidder or offeror or to any competitor; and

(3) No attempt has been made or will be made by the bidder or offeror to induce any other person or firm to submit or not to submit a bid or proposal for the purpose of restricting competition.

(b) Each person signing this bid or proposal certifies that:

(1) He is the person in the bidder's or offeror's organization responsible within that organization for the decision as to the prices being bid or offered herein and that he has not participated, and will not participate, in any action contrary to (a) (1) through (a) (3), above; or

(2) (i) He is not the person in the bidder's or offeror's organization responsible within that organization for the decision as to the prices being bid or offered herein but that he has been authorized in writing to act as agent for the persons responsible for such decision in certifying that such persons have not participated, and will not participate, in any action contrary to (a) (1) through (a) (3), above, and as their agent does hereby so certify; and

(ii) He has not participated, and will not participate, in any action contrary to (a) (1) through (a) (3), above.

(c) This certification is not applicable to a foreign bidder or offeror submitting a bid or proposal for a contract which requires performance or delivery outside the United States, its possessions, and Puerto Rico.

(d) A bid or proposal will not be considered for award where (a) (1), (a) (3), or (b), above, has been deleted or modified. Where (a) (2), above, has been deleted or modified, the bid or proposal will not be considered for award unless the bidder or offeror furnishes with the bid or proposal a signed statement which sets forth in detail the circumstance of the disclosure and the head of the agency, or his designee, determines that such disclosure was not made for the purpose of restricting competition.

TABLE 1

Area Summary Table

Average Volume By Compartment

Compartment	Bd. ft. Avg Vol/ac.	Avg Cu.ft/ac.	Managed Forest Acres	Total Bd. ft.	Total Cu. ft.	Culls/ Acre
1	4948	252	1769	8,753,012	445,788	5
2	3298	220	1219	4,020,262	268,180	11
3	3428	329	808	2,769,824	265,832	7
4	3033	209	990	3,002,670	206,910	9
5	3256	252	820	2,669,920	206,640	16
6	1927	196	905	1,743,935	177,380	10
7	1873	195	584	1,093,832	113,980	8
8	1647	191	1091	1,796,877	208,381	9
9	500	128	335	167,500	42,880	-
10	1862	163	1347	2,508,114	219,561	13
11	1087	215	888	965,256	190,920	9
12	1652	341	731	1,207,612	249,271	7
13	1531	267	1150	1,760,650	307,050	16
14	2639	229	936	2,470,104	214,344	9
15	3889	364	622	2,418,958	226,408	11
16	-	100	564	-	56,400	5
Total				37,348,526	3,399,825	

TABLE 2

Acres by Habitat Type

Compartment	92	93	96	102	Water	ROW	Agric.	Total
1	1717	27	26		77			1,846
2	753	127	209	130				1,219
3	800		8		123	33		964
4	943		40	7	79			1,069
5	757		63		66	62		948
6	689		144	72				905
7	534		50					584
8	821		257	13	26			1,117
9	335				77	87	944	1,443
10	951		396					1,347
11	469		359	60	26			914
12	390		331	10	119			850
13	507		397	246	50			1,200
14	741			195	94			1,030
15	585		32	5	90	92	58	862
16	564				10			574
Total	11,556	154	2,311	738	837	274	1,002	16,872
%	68	.1	14	4.4	.5	1.6	6	100%

Type 92 - Sweetgum-Nuttall-Willow Oak
93 - American Elm-Green Ash-Sugarberry
96 - Overcup Oak-Bitter Pecan
102 - Baldcypress-Water Tupelo

TABLE 3

Stock Table

Average Volume/Acre by Compartment and Species

Species	Compartment 1		Compartment 2		Compartment 3		Compartment 4		Compartment 5		Compartment 6		Compartment 7		Compartment 8	
	Cu ft	Bd ft	Cu ft	Bd ft	Cu ft	Bd ft	Cu ft	Bd ft	Cu ft	Bd ft	Cu ft	Bd ft	Cu ft	Bd ft	Cu ft	Bd ft
Red Oak	140.5	2564	131.3	1576	167.5	1375	124.0	1657	129.9	1890	94.4	831	130.9	1540	135.4	848
Overcup Oak	19.6	650	26.5	668	14.0	409	8.9	378	3.6	500	16.6	453	25.6	173	22.8	529
Green Ash	22.0	52	4.2	34	18.0	51	3.8	7	13.2	-	1.7	-	6.2	-	5.4	-
Sweetgum	24.1	682	14.0	325	45.9	639	49.0	648	83.7	438	39.4	432	6.0	83	7.7	58
Water Hickory	11.7	94	18.4	62	17.3	166	8.2	12	9.0	53	25.0	21	10.0	15	8.1	52
American Elm	11.4	334	12.9	145	10.1	66	4.2	91	1.0	-	6.1	22	4.0	-	.6	-
Sugarberry	.3	-	-	-	5.6	8	-	-	1.1	19	-	-	-	-	1.0	-
Honey Locust	.5	27	.7	62	2.4	-	2.3	8	1.8	-	-	-	-	-	2.5	18
Red Maple	.3	15	-	-	.4	-	-	-	1.3	-	-	-	-	-	.5	-
Cedar Elm	12.7	518	7.7	418	30.9	714	7.3	224	6.2	357	8.5	107	12.7	64	4.0	46
Persimmon	8.6	12	3.2	8	16.1	-	1.6	11	1.7	-	-	-	-	-	2.1	63
Cottonwood	-	4	-	-	.7	-	-	-	-	-	-	-	-	-	-	-
Tupelo Gum	-	-	-	-	-	-	-	-	-	-	4.4	38	-	-	-	-
Cypress	-	-	-	-	-	-	-	-	-	-	-	24				33
Black Gum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.6	-
Total	251.7	4,952	219.5	3,298	328.9	3,428	209.3	3,033	252.5	3,256	196.1	1,927	195.4	1,875	190.7	1,647

Table 3

Stock Table

Average Volume/Acre by Compartment and Species

Species	Compartment 9		Compartment 10		Compartment 11		Compartment 12		Compartment 13		Compartment 14		Compartment 15		Compartment 16	
	Cu ft	Bd ft	Cu ft	Bd ft	Cu ft	Bd ft	Cu ft	Bd ft	Cu ft	Bd ft	Cu ft	Bd ft	Cu ft	Bd ft	Cu ft	Bd ft
Red Oak	128.0	500	97.3	1061	158.5	567	192.1	637	135.6	881	102.4	1565	210.4	2663	100.0	
Overcup Oak	-	-	33.5	625	38.9	415	105.8	878	91.4	562	12.5	328	18.2	250	-	-
Green Ash	-	-	3.6	2	-	4	.8	-	5.5	-	12.1	12	13.6	-	-	-
Sweetgum	-	-	10.9	21	2.0	-	1.5	-	4.5	-	50.9	444	67.6	744	-	-
Water Hickory	-	-	11.9	71	9.1	76	30.4	82	19.2	16	3.5	56	9.9	15	-	-
American Elm	-	-	-	-	.5	-	3.7	6	1.0	18	9.5	73	21.4	44	-	-
Sugarberry	-	-	-	-	-	-	.6	-	-	-	-	-	.5		-	-
Honey Locust	-	-	.8	7	.9	11	-	6	-	-	.8	-	-	42	-	-
Red Maple	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cedar Elm	-	-	.9	24	-	-	-	8	-	46	8.4	85	18.5	131	-	-
Persimmon	-	-	1.4	-	1.8	-	6.7	8	4.6	8	10.7	15	4.1	-	-	-
Cottonwood	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tupelo Gum	-	-	2.9	-	3.4	-	-	-	5.2	-	15.8	62	-	-	-	-
Cypress	-	-	-	21	-	13	-	29	-	-	2.7	-	-	-	-	-
Black Gum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Willow	-	-	-	30	-	-	-	-	-	-	-	-	-	-	-	-
Total	128.0	500	163.2	1,862	215.1	1,086	341.0	1,654	267.0	1,531	229.3	2,640	364.1	3,889	100.0	-

TABLE 4

Percent Volume by Species

Species	Percent Cu. Ft.	Percent Bd. Ft.
Red Oak	57	54
Overcup Oak	13	19
Green Ash	3	.5
Sweetgum	12	13
Water Hickory	6	2
American Elm	3	2
Sugarberry	.3	.07
Honeylocust	.4	.5
Red Maple	.07	.04
Cedar Elm	3	8
Persimmon	2	.4
Cottonwood	.02	.01
Tupelo Gum	.9	.2
Cypress	.08	.3
Blackgum	.02	-
Willow	-	.08
Total	100	100

Average cubic ft. volume/comp = 244.56/acre

Average board ft. volume/comp = 2577/acre

Compartment #1 84 Plots

Stand Table by Diameter by Species Trees/ac

DBH	RO	OO	Ash	SG	Pec	Am. Elm	SB	Cedar Elm	Maple	Pers	Cotton wood	Honey Locust	Trees/ Acre
6	1.8	.2	0	.3	0	0	0	0	0	.1		0	2.4
7	3.0	.2	.2	.3	.1	.1	0	.1	0	.2		0	4.2
8	4.8	.6	.8	.5	.4	.3	.1	.0	.1	.1		0	7.7
9	2.9	.2	.4	.4	0	.4	0	.2	0	.1		0	4.6
10	4.2	.9	.9	1.1	.7	.5	0	.4	0	.4		.1	9.2
11	1.8	.2	.3	.2	.1	.4	0	.2	0	.1		0	3.3
12	.8	.3	.2	.2	.1	0	0	.1	0	0		0	1.7
13	.5	.1	0	.1	0	.1	0	.1	0	.1		0	1.0
14	.1		.1	0	0	0	0	.2	0	.1		0	.5
16	.1												.1
20	.1												.1
Total	20.1	2.7	2.9	3.1	1.4	1.8	.1	1.3	.1	1.2		.1	34.8
14	3.2	.8	.4	1.2	.5	.8		.7	0	.1	.1	.1	7.9
16	1.7	1.0	.1	.6	.4	.3		.8	0	0	0	0	2.2
18	1.8	.5	.2	.7	.2	.2		.4	0	.1	0	0	4.1
20	1.8	.7	.2	.5	.2	.7		.9	0	0	0	0	5.0
22	1.9	.7	0	.7	.1	.1		.5	.1	0	0	0	4.1
24	1.1	.1	0	0	0	.1		.2	0	0	0	.1	1.6
26	.4	.1	.1	0	0	.1		.1	0	0	0	0	.8
28	.5	.1	0	0	0	.1		0	0	0	0	0	.7
30	.1	0	0	0	0	0		0	0	0	0	0	.1
32	.3	.1	0	0	0	0		0	0	0	0	0	.4
34	0	.1	0	0	0	0		0	0	0	0	0	.1
36	.1	0	0	0	.1	0		0	0	0	0	0	.2
Total	12.9	4.2	1.0	3.7	1.5	2.4		3.6	.1	.2	.1	.2	29.9
Grand Total	33.0	6.9	3.9	6.8	2.9	4.2	.1	4.9	.2	1.4	.1	.3	64.7

Culls 4.9/ac.
83

Compartment #2 44 Plots

Stand Table DBH by Specie/AC

DBH	RO	OO	Ash	SG	Pec	Pers	Cedar Elm	Am. Elm	Honey Locust	Total Acres
6	.8	0	0	.1	0	0	0	0		.9
7	1.1	.1	.1	.5	0	.2	0	0		2.0
8	3.4	1.1	.1	.7	.1	.1	.1	.1		5.7
9	1.8	.2	.2	.5	.5	0	0	.2		3.4
10	4.3	1.1	.1	.5	.8	.1	.5	1.4	.1	8.9
11	2.2	.6	.1	.1	.1	.1	.2	0		3.4
12	1.5	.3	0	.1	.2	0	0	.1		2.2
13	1.1	0	0	0	.2	0	.1	0		1.4
14	0	.1	0	0	.1	0	0	0		.2
Sub-Total	16.2	3.5	.6	2.5	2.0	.5	.9	1.8	.1	28.1
14	2.7	.8	.5	.7	.9	.1	.8	.3	0	6.8
16	1.7	1.8	.1	.5	.5		.1	.3	.1	5.1
18	1.0	.2	.1	.1	.3		.7	.2	.1	2.7
20	1.5	1.1	.1	.5			.7	.2		4.1
22	.6	1.0		.2			.3	.1		2.2
24	.9	.2		.1			.1		.1	1.4
26	.7	0		.1						.8
28	0	.1								.1
30	.1	.2								.3
32										
34										
36							.1			.1
Sub-Total	9.2	5.4	.8	2.2	1.7	.1	2.8	1.1	.3	23.6
Grand Total	25.4	8.9	1.4	4.7	3.7	.6	3.7	2.9	.4	51.7

Culls 10.5/ac
92

Compartment #3 30 Plots

Species by DBH Stand Table/ac.

DBH	RO	OO	Ash	SG	Pec	Cott	Am. Elm	Cedar Elm	Maple	Pers	SB	Honey Locust	Total
6	9.0	1.3	0	1.0	.2	0	.2	0	.2	.5	.2		12.6
7	3.3	.5	.2	.7	.2	.2	0	.2		.2	0		5.5
8	5.8	.3	0	.8	.3		.2	.5		.5	.2		8.6
9	3.6	.2	.3	.7	.2		.3	0		.2	0		5.5
10	3.2	.5	.2	.5	.5		.2	1.2		0	3		6.6
11	1.3	0	.2	.3	.2		.3	.8		.2	0		3.3
12	2.0	.2	.3	1.5	.7		.2	.3		.8	.2		6.2
13	.7		.5	.3				.5				.2	2.2
Total	28.9	3.0	1.7	5.8	2.3	.2	1.4	3.5	.2	2.4	.9	.2	50.5
14	1.5	.5	.7	1.2	.5		.5	1.3			.2		6.4
16	3.7	.3	0	.8	.2		.2	1.3					6.5
18	.8	.2	.2	1.0			0	1.2					3.4
20	.7	0	.2	.8			.3	.7					2.7
22	.7	.5		.5				.5					2.2
24	.5	.2						.2					.9
26	.2	.2											.4
28	.2	.3											.5
30	.2												.2
32					.2								.2
34								.2					.2
36	.2			.2									.4
38					.2								.2
Total	8.7	2.2	1.1	4.5	1.1		1.0	5.4			.2		24.2
Grand Total	37.6	5.2	2.8	10.3	3.4	.2	2.4	8.9	.2	2.4	1.1	.2	74.7

Culls 7.2/ac
43

Compartment #4 44 Plots

Stand Table by DBH and Species

DBH	RO	OO	Ash	SG	Pec	Honey Locust	Am. Elm	Pers	Cedar Elm	Total
6	1.3	.3	.1	.8	0		0		0	2.5
7	2.5	.1	.2	.2	0		.2		0	3.2
8	4.6	.2	0	1.5	.2		.2		.1	6.8
9	2.3	.2	.1	1.0	0		0		.1	3.7
10	3.6	.2	0	1.9	.1	.3	.2		0	6.3
11	1.5	.1	.2	.5	.6		.1	.1	.2	3.3
12	.6	.1		.3	0				.2	1.2
13	1.7			.6	.1				.1	2.5
14	.1									.1
15	.1									.1
16										0
17				.1						.1
Total	18.3	1.2	.6	6.9	1.0	.3	.7	.1	.7	29.8
14	2.3	.7	.1	.5	0	0	.3	0	.1	4.0
16	1.9	.6	.1	.6	.3	.1	.3	.1	.3	4.3
18	1.6	.6		.1			0		.6	2.9
20	1.6	.6		.9			.2		.5	3.8
22	1.3	.5		.7					.2	2.7
24	.9	.1		.2						1.2
26	.5	.1		.1						.7
28	.3			0						.3
30				.1						.1
Total	10.4	3.2	.2	3.2	.3	.1	.8	.1	1.7	20.0
Grand Total	28.7	4.4	.8	10.1	1.3	.4	1.5	.2	2.4	49.8

Culls 9.2/ac
81

Compartment #5 36 Plots

Stand Table DBH by Specie/Acre

DBH	RO	OO	Ash	SG	Pec	Am. Elm	Cedar Elm	Maple	SB	Honey Locust	Pers	Total
6	3.3	0	.1	0	.1			.1				3.6
7	2.9	0	0	.6	.3							3.8
8	3.9	.1	.1	1.8	.6					.1	.1	6.7
9	2.9	.3	0	1.8	.3					0	0	5.3
10	3.8	0	.7	2.2	0		.4		.1	.1	.1	7.4
11	2.8	0	.4	1.5	0	.1		.1				4.9
12	.7	.1	0	.6	.3		.3					2.0
13	.7		0	.6								1.3
14	.1		.1									.2
15												0
16						.1						.1
Total	21.1	.5	1.4	9.1	1.6	.2	.7	.2	.1	.2	.2	35.3
14	1.8	.1	0	.4	.1		.8					3.2
16	1.3	.6	.1	.8	.3		.7					3.8
18	1.7	.4		.6	.1		1.3					4.1
20	1.7	1.5		.8	.1		.3					4.4
22	1.9	.3		0	0		.1					2.3
24	1.1	.1		0	.1							1.3
26	.1			.1								.2
Total	9.6	3.0	.1	2.7	.7		3.2					19.3
Grand Total	30.7	3.5	1.5	11.8	2.3	.2	3.9	.2	.1	.2	.2	54.6

Culls 15.6/ac
112

Compartment # 6 40 Plots

Stand Table DBH by Species/ac.

DBH	RO	OO	Ash	SG	Pec	Am. Elm	Cedar Elm	TG	Pers	Cypress	Total
6	3.3	.1	.1	.1	.8	.3	0	0	.1		4.8
7	2.3	0	0	.3	.6	0	0	0	0		3.2
8	3.0	.6	0	.8	.8	0	0	0	.6		5.8
9	2.4	.6	0	.9	.8	0	.1	.1	.3		5.2
10	1.1	.3	.1	1.3	.6	.4	.1	.3	.5		4.7
11	1.5	.3		.6	.3	.1	.5	0	0		3.3
12	1.4	.4		.4	.1	.1	.1	.1	.1		2.7
13	.4	.1		.1	.1						.7
14	.1										.1
Total	15.5	2.4	.2	4.5	4.1	.9	.8	.5	1.6		30.5
14	1.9	1.4		.8	.5	.1	.5				5.2
16	1.5	.4		.4	.3	0	.3				2.9
18	.4	.3		.4		.1	.3	.5			2.0
20	1.4	.9		1.0			.1			.1	3.5
22	.1	.1		.3							.5
24	.6	.5									1.1
26	.1	.1									.2
28		.1									.1
30											
Total	6.0	3.8	0	2.9	.8	.2	1.2	.5	0	.1	15.5
Grand Total	21.5	6.2	.2	7.4	4.9	1.1	2.0	1.0	1.6	.1	46.0

Culls 9.6/ac.
77

Compartment #7 26 Plots

Stand Table DBH by Specie Trees/ac.

DBH	RO	OO	Ash	SG	Pec	Cedar Elm	Am. Elm	Total
6	3.1	0	.4	.2	.6		.2	4.5
7	2.9	.4	.2	0	.6			4.1
8	3.7	0	0	.2	0			3.9
9	2.1	1.0	0	0	.2			3.3
10	3.1	1.4	0	.6	.2	1.2		6.5
11	3.9	.4	.2		0	.4		4.9
12	.8	.2	0		.4		.2	1.6
13	.6	.2	0				.2	1.0
14			.2					.2
Total	20.2	3.6	1.0	1.0	2.0	1.6	.6	30.0
14	2.5	.4		.6	.2	.4		4.1
16	4.0	.2		.2	0	0		4.4
18	.8	.6		.2	0	0		1.6
20	2.7	.4			.2	.2		3.5
22	1.5	.2						1.7
24	.2							.2
26								
28								
30								
Total	11.7	1.8		1.0	.4	.6		15.5
Grand Total	31.9	5.4	1.0	2.0	2.4	2.2	.6	45.5

Culls 39 7.5/ac.

Compartment #8 44 Plots

Stand Table by DBH and Species

DBH	RO	OO	Ash	SG	Pec	Sugar Berry	Honey Locust	Am. Elm	Ced Elm	Blk Gum	Red Map.	Pers	Cyp	Total
6	2.1	.3	0	.1	.2	0	0							2.7
7	2.7	1.1	.3	.3	.2	0	0							4.6
8	5.6	1.7	.7	.3	.5	.2	.1		.1		.1	.1		9.4
9	4.3	.3	.2	0	0		.3	.1	0	.1				5.3
10	3.9	.8		.3	.5				.1			.2		5.8
11	2.6	.2		.1	0				0					2.9
12	.9	.1		.1	.1				.1					1.3
13	.7	.1							.1					.9
Total	22.8	4.6	1.2	1.2	1.5	.2	.4	.1	.4	.1	.1	.3		32.9
14	2.7	1.4		.2	.6							.2		5.1
16	.6	.5		.2	0		.1					.1		1.5
18	1.1	.5		.2	0		.1		.3			.1		2.3
20	.6	1.1			.3							.1		2.1
22	1.3	.6			.1								.1	2.1
24	.1	.3												.4
26	.1	.1												.2
28	.1	0												.1
30		0												0
32		.1												.1
Total	6.6	4.6		.6	1.0		.2		.3			.5	.1	13.9
Grand Total	29.4	9.2	1.2	1.8	2.5	.2	.6	.1	.7	.1	.1	.8	.1	46.8

Culls 78 8.9/ac.

Compartment #10 65 Plots

Stand Table DBH by Specie Trees/ac.

DBH	RO	OO	Ash	SG	Pec	Tup Gum	Honey Locust	Ced Elm	Pers	Willow	Cyp	Total
6	1.4	.3	0	.2	.3							2.2
7	1.5	.4	.1	.3	.2							2.5
8	2.8	.5	.3	.2	.5	.1	.1		.1			4.6
9	2.3	.7	0	.4	.3	.1	0	.1	0			3.9
10	3.5	1.2	.2	.2	.3	.2	.1	.1	.2			6.0
11	2.0	.7	0	0	.2	0						2.9
12	1.3	.3	.1	.2	.2	.1						2.2
13	.2	.3		.1	0							.6
14	.1	.2			.1							.4
Total	15.1	4.6	.7	1.6	2.1	.5	.2	.2	.3			25.3
14	2.3	.8	.1	.3	.3			.2			.1	4.1
16	1.8	1.5		.1	.6					.1	.1	4.2
18	1.8	.9			.5		.1	.2				3.5
20	1.7	1.2			.2						.1	3.2
22	.4	.6										1.0
24	.1	.2								.1		.4
26												
28												
30												
Total	8.1	5.2	.1	.4	1.6		.1	.4		.2	.3	16.4
Grand Total	23.2	9.8	.8	2.0	3.7	.5	.3	.6	.3	.2	.3	41.7

Culls 162 12.5/ac.

Compartment #11 44 Plots

Stand Table DBH by Species Trees/ac.

DBH	RO	OO	Ash	SG	Pec	Gum	Locust	Elm	Pers	Cyp.	Total
6	1.3	.9			.1						2.3
7	3.7	.8			.3		.1				4.9
8	8.6	1.0		.1	.3	.1	.1	.1	0		10.3
9	4.0	1.0			.1						5.1
10	4.6	1.0			.5	.1			.1		6.3
11	1.7	.3			0				.1		2.1
12	1.3	.8		.1	.2						2.4
13	1.5	.3									1.8
14		.2				.1					.3
15											0
16	.1										.1
Total	26.8	6.3		.2	1.5	.3	.2	.1	.2		35.6
14	1.7	1.3			.3						3.3
16	.7	1.1	.1		.8						2.7
18	1.0	.3			.2		.1				1.6
20	1.0	.7			.1					.1	1.9
22	.5	.2			.1						.8
24		.2									.2
26											0
28	.1										.1
30		.1									.1
Total	5.0	3.9	.1		1.5		.1			.1	10.7
Grand Total	31.8	10.2	.1	.2	3.0	.3	.3	.1	.2	.2	56.3

Culls 76 8.6/ac.

Compartment #12 43 Plots

Stand Table DBH by Species Trees/ac.

DBH	RO	OO	Ash	SG	Pec	Am. Elm	Cedar Elm	Pers	Cyp	HL	SB	Total
6	5.4	2.8			2.0	.4		.4				11.0
7	6.4	3.0		.1	1.3	.4		.1				11.3
8	5.6	1.9			.5	.1		.1				8.2
9	3.6	1.6	.1	.1	1.2	.1					.1	6.8
10	2.9	1.5			.6	.1		.1				5.2
11	1.7	.8						.1				2.6
12	2.0	1.7			.2			.1				4.0
13	1.3	1.6			.2							3.1
Total	28.9	14.9	.1	.2	6.0	1.1		.9			.1	52.2
14	1.4	1.5			.2	.1		.1		.1		3.4
16	.6	1.7			.5		.1					2.9
18	.2	1.1			.6							1.9
20	.4	.6			.2							1.2
22	.5	.8							.1			1.4
24	.1	.4										.5
26	.5	.2										.7
28	.1	.1										.2
30	.1											.1
32												0
34	.1											.1
Total S/L	4.0	6.4			1.5	.1	.1	.1	.1	.1		12.4
Grand Total	32.9	21.3	.1	.2	7.5	1.2	.1	1.0	.1	.1	.1	64.6

Culls 56 7/ac.

Compartment #13 44 Plots

Stand Table DBH by Specie

DBH	RO	OO	Ash	SG	Pec	Cedar Elm	Am. Elm	Pers	Tupelo Gum	Total
6	.7	.2		.2	.1					1.2
7	3.2	1.8			.6			.1	.1	5.8
8	3.1	3.8		.5	1.4					8.8
9	2.7	3.1	.1		.3			.1	.3	6.6
10	3.9	1.6	.2	.1	.7			.5	.2	7.2
11	3.0	1.7	.1	.1	.3					5.2
12	1.8	1.0	.2				.1		.1	3.2
13	1.0	1.3			.1					2.4
Total	19.4	14.5	.6	.9	3.5		.1	.7	.7	40.4
14	3.9	2.6			.2			.1		6.8
16	1.5	1.5			.2	.1				3.3
18	.7	.6				.3				1.6
20	.3	.7					.1			1.1
22	.7	.3								1.0
24	.5	.2								.7
26	.3									.3
36	.1									.1
Total	8.0	5.9			.4	.4	.1	.1		14.9
Grand Total	27.4	20.4	.6	.9	3.9	.4	.2	.8	.7	55.3

Compartment #14 40 Plots

Stand Table

DBH	RO	OO	Ash	SG	Pec	Cedar Elm	TG	Cyp	Honey Locust	Pers	Am. Elm	Total
6	1.1			.4						.1		1.6
7	1.1	.1	.1	1.0								2.3
8	2.0	.6		1.1		.3		.1		.1	.1	4.3
9	2.1	.3	.1	1.3		.1				.1	.1	4.1
10	4.1	.6	.5	1.4	.1	.3	.4		.1	.5	1.0	9.0
11	1.3	.3	.4	1.1	.1	.1					.1	3.4
12	1.5	.1	.3	.4	.1	.1	.3			.1		2.9
13	.6			.4		.3	.4	.1		.3		2.1
14							.3					.3
Total	13.8	2.0	1.4	7.1	.3	1.2	1.4	.2	.1	1.2	1.3	30.0
14	1.6	.3	.3	1.0	.4		.3			.1	.1	4.1
16	1.8	.1	.1	1.0	.3	.1	.3			.1	.3	4.1
18	1.8	.6		.6		.4	.1				.3	3.8
20	1.5	.5		.5	.3		.3				.1	3.2
22	1.3	.3		.5	.1	.1						2.3
24		.4		.1								.5
26	.9	.1										1.0
28	.1											.1
30	.1											.1
36	.1											.1
Total	9.2	2.3	.4	3.7	1.1	.6	1.0			.2	.8	19.3
Grand Total	23.0	4.3	1.8	10.8	1.4	1.8	2.4	.2	.1	1.4	2.1	49.3

Culls 75 9.4/ac.

Compartment #15 25 Plots

Stand Table

DBH	RO	OO	Ash	SG	Pec	Cedar Elm	Am. Elm	SB	Pers	Honey Locust	Total
6	2.8	.2	.2	.6				.2			4.0
7	3.8		.2	.2	.2				.2		4.6
8	6.8	.2		1.0	1.0	.4	.2		.2		9.8
9	3.8	.2	1.2	2.0		.2					7.4
10	4.0	.4	.2	2.6	.2	1.0	1.4				9.8
11	4.6	.4		1.4			.2				6.6
12	3.0	.6	.2	.2	.2	.8	.2		.2		5.4
13	1.4	.2					.6				2.2
Total	30.2	2.2	2.0	8.0	1.6	2.4	2.6	.2	.6		49.8
14	2.4	.4		2.4		.8	.6			.2	6.8
16	4.8	1.2		1.6	.2	.2	.2			.4	8.6
18	2.8	.4		1.2	.2						4.6
20	3.6			.8		.2					4.6
22	1.0	.4		.2							1.6
24	.4					.2					.6
26	.6										.6
28	.2			.2							.4
Total	15.8	2.4		6.4	.4	1.4	.8			.6	27.8
Grand Total	46.0	4.6	2.0	14.4	2.0	3.8	3.4	.2	.6	.6	77.6

Culls 56 11.2/ac

EXHIBIT 7

BOARD FEET VOLUME TABLE

RED OAK - SOUND

DBH	1.0	1.5	2.0	2.5	3.0	3.5	4.0
14	58	76	96	109	123		
16	82	109	137	158	180	195	
18	106	144	180	212	241	262	
20	135	183	232	271	311	339	
22	166	226	287	337	388	426	464
24	202	276	351	413	476	521	564
26	242	333	423	501	579	639	698
28	283	391	499	592	685	754	832
30	329	455	582	691	800	879	960
32	377	523	669	798	927	1024	1122
34	430	597	765	914	1064	1174	1287
36	486	681	874	1045	1217	1349	1480
38	544	761	979	1176	1375	1522	1671
40	606	851	1096	1317	1537	1708	1880
42			1215	1460	1702	1897	2091
44			1338	1610	1871	2090	2304

BOARD FEET VOLUME TABLE

RED OAK - DEFECTIVE

DBH	1.0	1.5	2.0	2.5	3.0	3.5	4.0
14	48	63	78	90	101		
16	67	90	112	130	148	160	
18	87	118	148	173	198	215	
20	110	150	190	222	254	278	
22	136	185	235	276	318	349	379
24	165	226	287	339	390	427	463
26	199	273	347	410	475	523	572
28	232	321	409	485	561	618	674
30	269	373	477	566	655	721	786
32	309	428	548	653	760	839	919
34	352	489	627	749	872	962	1054
36	398	557	716	857	998	1106	1213
38	446	624	802	964	1127	1247	1369
40	496	697	898	1079	1259	1400	1540
42			995	1196	1394	1554	1713
44			1097	1319	1533	1712	1887

BOARD FEET VOLUME TABLE

OVERCUP OAK - SOUND

DBH	1.0	1.5	2.0	2.5	3.0	3.5	4.0
14	51	67	83	94	106		
16	71	94	117	136	154	168	
18	93	126	157	182	207	224	
20	120	161	203	236	271	294	
22	149	201	255	298	343	375	408
24	178	243	308	364	418	457	495
26	214	293	373	439	506	556	607
28	250	344	438	518	599	657	715
30	291	402	512	607	701	770	840
32	337	466	596	707	820	905	988
34	381	528	676	807	937	1034	1130
36	432	603	772	922	1071	1183	1298
38	481	672	863	1036	1209	1336	1463
40	539	755	971	1164	1357	1506	1654
42		839	1082	1294	1507	1675	1852
44		923	1191	1423	1655	1846	2059

BOARD FEET VOLUME TABLE

OVERCUP OAK - DEFECTIVE

DBH	1.0	1.5	2.0	2.5	3.0	3.5	4.0
14	46	60	74	85	95		
16	64	85	105	122	138	150	
18	84	112	141	163	185	201	
20	107	144	181	212	243	264	
22	133	180	229	267	307	336	365
24	160	218	277	325	375	409	444
26	192	263	334	394	454	499	543
28	225	309	393	465	536	589	641
30	261	360	460	544	628	691	752
32	302	417	534	634	735	811	886
34	341	473	606	723	839	926	1013
36	388	539	692	826	960	1061	1163
38	432	603	773	928	1084	1197	1312
40	483	677	870	1043	1216	1349	1482
42		751	969	1160	1350	1502	1660
44		826	1068	1276	1483	1655	1845

BOARD FEET VOLUME TABLE

ASH - SOUND

DBH	1.0	1.5	2.0	2.5	3.0	3.5	4.0
14	27	35	42	47	52		
16	38	50	61	70	79	84	
18	51	67	83	95	107	115	
20	66	87	109	126	143	153	
22	81	109	137	159	181	196	211
24	99	134	169	197	225	241	259
26	118	160	202	237	270	294	319
28	140	189	239	281	323	352	381
30	162	221	279	329	378	412	446
32	187	255	323	383	442	484	526
34	213	291	370	438	507	556	606
36	240	332	423	502	581	638	695
38	270	373	476	568	661	725	789
40	301	418	536	639	741	816	891
42			597	712	829	910	995
44			662	787	918	1009	1107

BOARD FEET VOLUME TABLE

ASH - DEFECTIVE

DBH	1.0	1.5	2.0	2.5	3.0	3.5	4.0
16	35	45	55	63	71	76	
18	46	60	75	86	97	104	
20	59	79	98	114	129	138	148
22	73	98	123	143	163	176	190
24	89	121	152	178	203	219	234
26	106	145	182	213	245	266	289
28	126	171	216	254	292	318	344
30	146	199	253	297	342	372	403
32	168	230	293	346	399	437	475
34	192	263	335	396	458	502	547
36	217	300	382	454	525	576	627
38	244	337	430	513	597	655	713
40	272	378	484	577	670	738	805
42			539	642	749	822	899
44			598	711	829	911	999

BOARD FEET VOLUME TABLE

CYPRESS - SOUND

DBH	1.0	1.5	2.0	2.5	3.0	3.5	4.0
12	27	35	49	59	68		
14	48	62	76	86	95		
16	69	90	111	127	143	153	
18	90	119	148	170	193	209	
20	115	154	193	224	254	275	
22	144	194	245	286	326	354	382
24	173	234	296	346	397	431	465
26	207	282	357	419	481	527	573
28	243	332	420	494	569	622	676
30	284	389	494	583	672	734	797
32	327	450	572	678	784	862	939
34	372	512	653	776	898	986	1075
36	422	584	745	888	1030	1134	1237
38	472	654	837	1001	1165	1280	1396
40	526	733	940	1123	1306	1443	1580

BOARD FEET VOLUME TABLE

CYPRESS - DEFECTIVE

DBH	1.0	1.5	2.0	2.5	3.0	3.5	4.0
12	21	30	40	47	54		
14	34	43	53	60	67		
16	48	63	78	89	100	107	
18	63	83	104	119	135	146	
20	81	108	135	137	178	193	
22	101	136	172	200	228	248	267
24	121	164	207	242	278	302	325
26	145	197	250	293	337	369	401
28	170	232	294	346	398	435	473
30	199	272	346	408	470	514	558
32	229	315	400	475	549	603	657
34	260	358	457	543	629	690	752
36	295	409	522	622	721	794	865
38	330	458	586	701	816	896	977
40	368	513	658	786	914	1010	1106

BOARD FEET VOLUME TABLE

MISC. SPECIES - SOUND & DEFECTIVE

DBH	1.0	1.5	2.0	2.5	3.0	3.5	4.0
14	50	66	81	92	104		
16	70	92	115	133	151	164	
18	92	123	154	178	203	219	
20	117	158	199	231	265	288	
22	145	197	249	292	335	367	399
24	175	238	302	356	409	448	485
26	210	287	365	430	496	545	595
28	245	337	429	508	587	644	700
30	285	394	502	595	686	755	822
32	330	456	584	692	803	886	969
34	373	518	662	789	918	1013	1107
36	423	590	757	903	1049	1159	1271
38	472	659	845	1015	1184	1309	1434
40	528	739	951	1140	1330	1475	1620
42		821	1060	1267	1476	1641	1814
44		904	1167	1395	1621	1808	2017

BOARD FEET VOLUME TABLE

SWEETGUM - SOUND & DEFECTIVE

DBH	1.0	1.5	2.0	2.5	3.0	3.5	4.0
14	35	49	68	89	100		
16	50	71	98	124	141	152	
18	66	94	132	169	192	209	
20	85	121	169	220	251	274	
22	104	152	210	275	315	345	376
24	126	184	255	337	389	424	460
26	152	221	312	400	461	509	555
28	180	261	368	478	552	606	660
30	209	305	428	558	645	710	775
32	239	353	495	650	753	832	911
34	274	402	562	746	866	956	1046
36	312	458	647	842	978	1082	1186
38	348	513	725	953	1112	1229	1348
40	388	576	813	1069	1247	1383	1519
42		643	899	1198	1393	1539	1716
44		714	1001	1331	1550	1703	1928

BOARD FEET VOLUME TABLE

PECAN - SOUND & DEFECTIVE

DBH	1.0	1.5	2.0	2.5	3.0	3.5	4.0
14	23	30	37	42	47		
16	32	42	52	60	68	74	
18	41	55	70	81	92	92	
20	53	71	90	105	120	131	
22	66	89	112	132	152	166	181
24	79	108	137	161	185	202	219
26	95	130	165	195	224	247	269
28	111	152	194	230	265	291	317
30	129	178	227	269	311	342	372
32	149	206	264	313	363	401	438
34	169	234	299	357	415	458	501
36	192	267	342	408	474	525	575
38	213	298	382	459	536	592	648
40	239	335	430	516	602	667	733
42		372	479	573	668	743	821
44		409	528	631	734	818	913

Exhibit 8

CUBIC FEET VOLUME TABLE (PULPWOOD)

ALL HARDWOODS

DBH	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0
5	1.5	1.8	2.2	2.5	2.8							
6	2.3	2.8	3.2	3.7	4.2	4.6						
7	3.2	3.8	4.4	5.1	5.7	6.3	6.9					
8	4.2	5.0	5.8	6.6	7.4	8.2	9.0	9.9	10.7			
9	5.2	6.2	7.2	8.3	9.3	10.3	11.4	12.4	13.4	14.5	15.5	
10	6.3	7.6	8.8	10.1	11.4	12.7	13.9	15.2	16.5	17.7	19.0	20.3
11	7.5	9.0	10.6	12.1	13.6	15.2	16.7	18.2	19.8	21.3	22.9	24.4
12	8.7	10.6	12.4	14.2	16.1	17.9	19.7	21.6	23.4	25.2	27.0	28.9
13	10.1	12.2	14.4	16.5	18.7	20.8	23.0	25.1	27.3	29.4	31.6	33.7
14	11.5	14.0	16.5	19.0	21.5	23.9	26.4	28.9	31.4	33.9	36.4	38.9
15	13.0	15.8	18.7	21.6	24.4	27.3	30.1	33.0	35.9	38.7	41.6	44.4
16	14.5	17.8	21.1	24.3	27.6	30.8	34.1	37.3	40.6	43.8	47.1	50.3
17		19.9	23.5	27.2	30.9	34.6	38.2	41.9	45.6	49.3	52.9	56.6
18		22.0	26.1	30.3	34.4	38.5	42.6	46.7	50.9	55.0	59.1	63.2
19			28.9	33.5	38.1	42.6	47.2	51.8	56.4	61.0	65.6	70.2
20			31.7	36.8	41.9	47.0	52.1	57.2	62.3	67.3	72.4	77.5