RESTORATION OF WOODLAND HABITATS AT THE MORO-BIG PINE AND BLACKLAND PRAIRIE AND WOODLAND CONSERVATION AREAS AND MEASURING PROGRESS TOWARDS DESIRED ECOLOGICAL CONDITIONS

The Nature Conservancy
Project Partners: Arkansas Natural Heritage Commission

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TABLE OF CONTENTS

III. Blackland Prairie and Woodland Conservation Project—Weyerhaeuser Co.

I. PROJECT OVERVIEW AND SUMMARY OF ACCOMPLISHMENTS

BACKGROUND

Conservation forestry is defined as a set of forest management practices that sustains ecological systems (biodiversity) while being economically profitable. This strategy is crucial for conservation in the Upper West Gulf Coastal Plain (UWGCP) ecoregion due to large acreages in both private and industrial timber management. Two projects in Arkansas that are implementing conservation forestry practices, including prescribed fire, are the Moro-Big Pine Wildlife Management Area and the Blackland Prairie and Woodland Conservation Project (see maps in Appendix A). Regular monitoring is a key strategy at both sites to determine the effects of conservation forestry practices and progress toward desired ecological conditions.

PROJECT RATIONALE

The work completed for this project addressed the need for pine woodland restoration in the UWGCP and established baseline data for vegetation, avian, and herptile communities. These data will allow managers to measure progress toward desired ecological conditions. The primary goal of this project was to restore woodland habitat structure using prescribed fire and timber management to benefit a variety of species of conservation concern as identified by the 2007 State Wildlife Action Plan Steering Committee and measure progress toward desired ecological conditions. Specific objectives were to:

- reintroduce prescribed fire to 4,000 acres
- create woodland structure (~ 50-75 basal area/acre) using mechanical thinning on 1,000 acres
- conduct baseline monitoring on plant communities
- conduct inventories for all bird species with specific attention to those using grassland habitats

PROJECT ACCOMPLISHMENTS

Over the 2-year course of the grant period, prescribed fire was restored 4260 acres, including 3352 acres at Moro Big Pine and 908 acres at the blackland conservation project site. Average burn intensity was light to moderate and burn unit coverage averaged 80%. This amount of coverage and intensity has created a more open structure in the woodlands and resulted in a more lush herbaceous layer to benefit both plant and wildlife populations.

In addition to prescribed fire, mechanical thinnings were completed at Moro Big Pine on approximately 703 acres. Thinning to create an open woodland structure (50-75 basal area) benefits many species of conservation concern (Red-cockaded Woodpecker, Northern Bobwhite, Bachman's Sparrow).

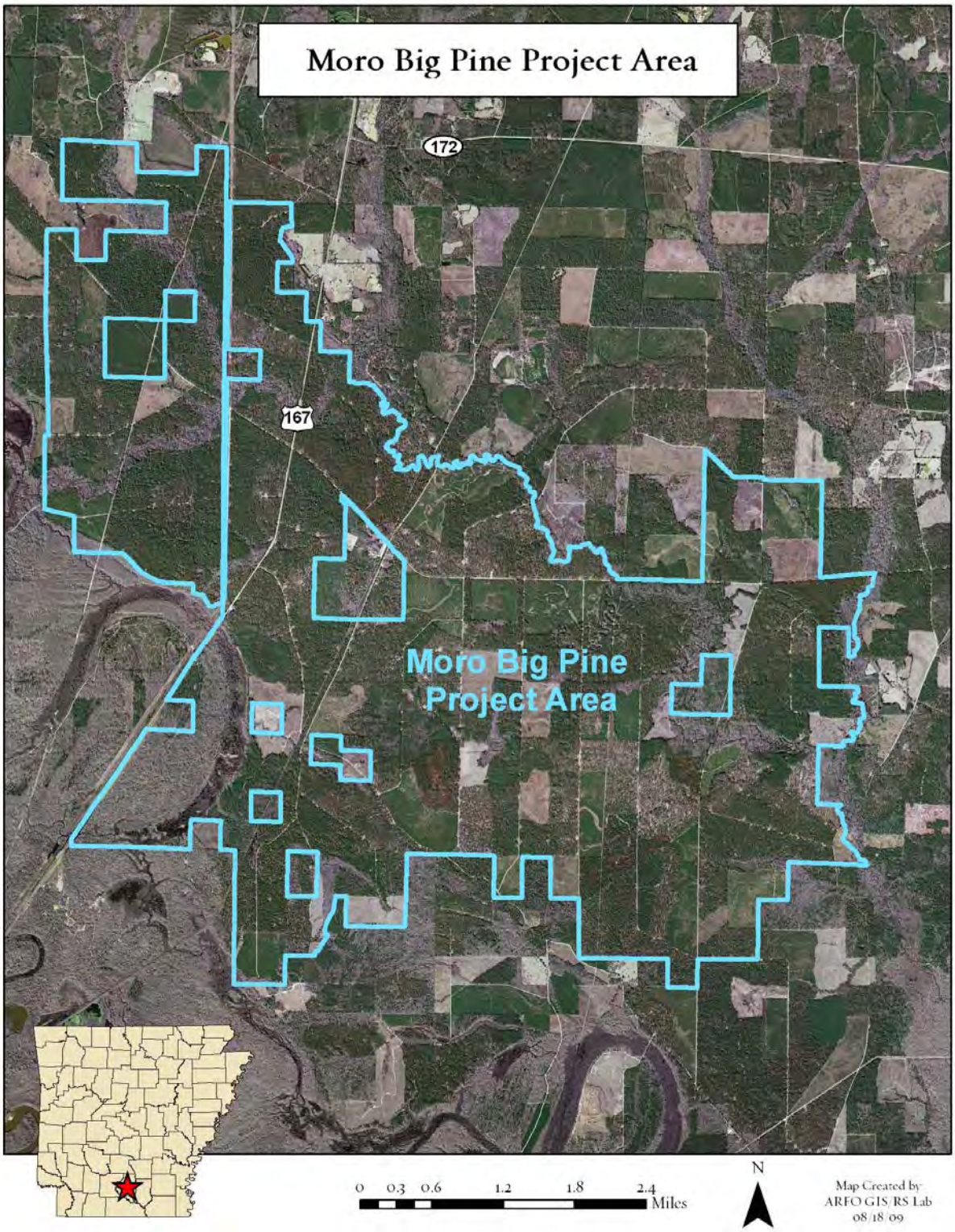
In order to assess the effectiveness of management activities, we completed monitoring on vegetation, avian, and herptile communities to establish a baseline. Detailed protocols were developed and are replicable so that these communities may be re-monitored in the future to determine effects of management. Species lists for vegetation, avian, and herpetofauna communities were created and elements of concern were recorded and reported where appropriate.

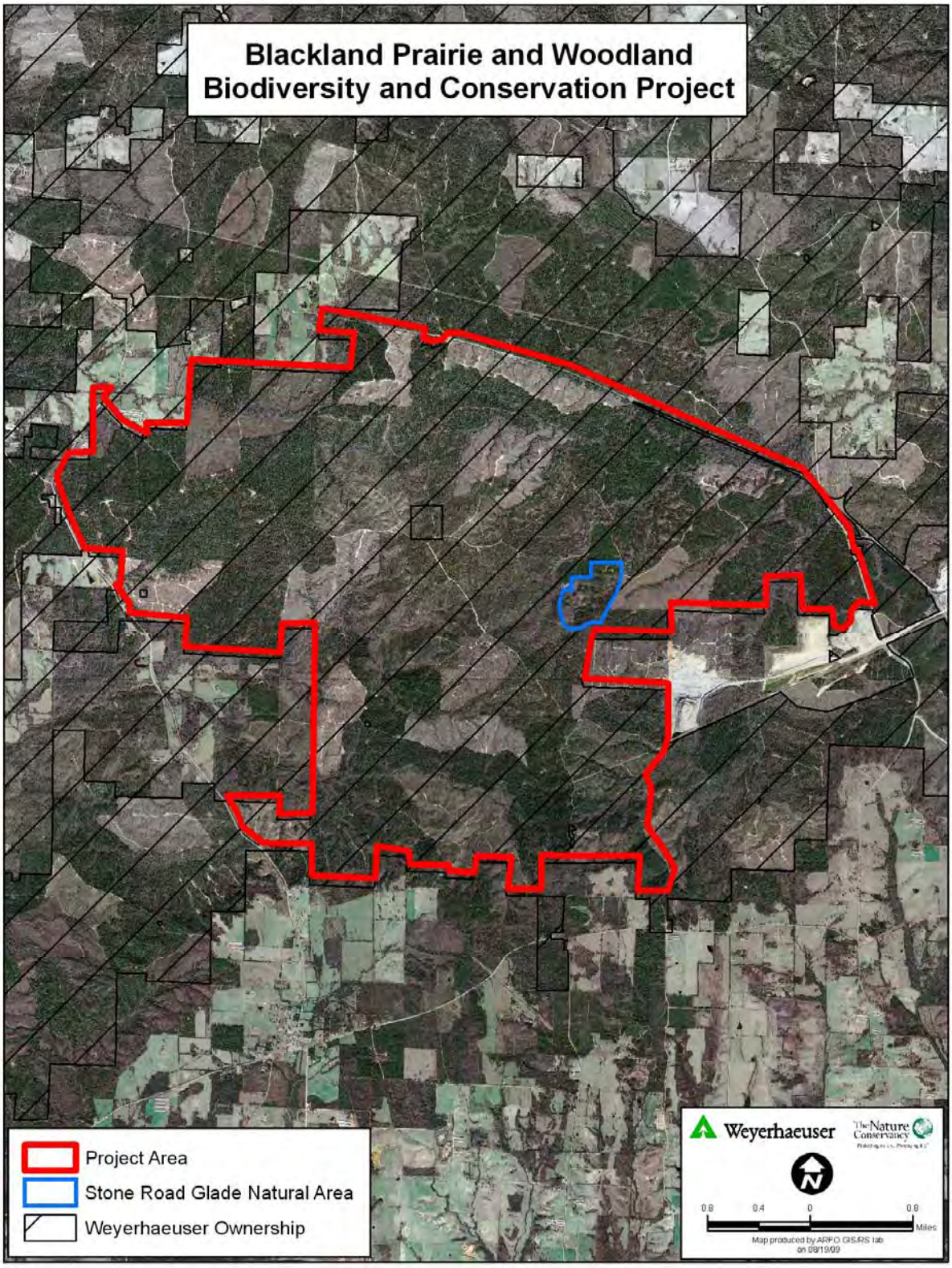
Monitoring data were used to measure current conditions to compare with reference conditions for the dominant communities that exist at each site. Evaluating the departure of current condition from reference conditions can help formulate desired ecological conditions and guide forest management.

The following sections provide a more detailed summarization of restoration activities, baseline monitoring methods and results, and evaluations of departure from reference conditions completed at both conservation sites. Because the conservation sites differ in their management

practices and objectives, we do not compare results between sites. Rather, each site is summarized individually with results and recommendations tailored for each conservation site.

APPENDIX A. SITE MAPS




Blackland Prairie and Woodland
Biodiversity and Conservation Project
Project Area
Stone Road Glade Natural Area
Weyerhaeuser Ownership
Weyerhaeuser
The Nature Conservancy
0.8
0.4
0
0.8
Miles
Map produced by ARFO GIS/RS lab
on 08/19/09

II. MORO BIG PINE WMA

BACKGROUND

The Moro-Big Pine Wildlife Management Area (MBPWMA), located eight miles south of Hampton in Calhoun County, Arkansas, is primarily a pine flatwoods with deciduous hardwood veins. Pine flatwoods are the least conserved forest type on the Gulf Coastal Plain. The Conservation Easement Area consists of 15,929 acres of managed timberland. The soil tends to be poorly-drained with a shallow fragipan that limits root penetration and can cause intense moisture stress. Conditions range from saturated with water in winter to concrete hard and dry in the summer. Forest and woodland structure and composition and the quality of the habitat to wildlife are directly correlated with disturbance, especially fire, and the amount of sunlight reaching the ground. In the presence of open forest structure and fire this diversity is very high.

HABITAT RESTORATION ACTIVITIES

Prescribed Fire

Prescribed fire was restored to 3353 acres. A map of burned areas is provided in Appendix A. Burns were conducted between August 2007 and May 2009. 1580.3 acres were burned in the fall and 1772.4 acres were burned in the spring. In order to determine fire effects, post-burn monitoring was conducted within 1-2 weeks after the burns. Post burn monitoring included tracking burn acreage, seasonality, and intensity. Intensity was calculated from point transects through the burn unit. Data were collected on substrate consumption, understory vegetation consumption, scorch height, crown scorch percent, char height, and char degree for each prescribed burn unit. Fuel models burned at Moro Big Pine include pine flatwoods (FM 9), bottomland hardwood (FM 8), young pine stands (FM 7), and pine flatwoods with heavy slash (FM 10).

Burn severity and intensity varied depending on fuel models and seasonality. On average, unit coverage was 90 percent and intensity ranged from light to moderate. The most intense fire behavior was in fuel model 10, which had heavy fuel loads. A summary of post-fire effects for all units is provided in Appendix B.

Timber thinnings

Ecological timber thinnings were completed on 701.3 acres in 2007 (see map Appendix A). Wet weather prevented any logging in 2008.

BASELINE MONITORING

Baseline monitoring was conducted utilizing permanent macroplots. We randomly established 50 macroplots across the area (see map, Appendix C). The first twenty-five plots were installed in April 2007 and the remaining twenty-five plots were installed in May 2008. The center-point of each macroplot was permanently marked with a metal fence post and documented with a global positioning system (GPS). Macroplots were used for baseline plant community monitoring and avian monitoring.

Plant Community Monitoring

Methods

Plant community monitoring was conducted on 17 and 18 July 2007 and 5 and 6 August 2008. A diagram of the macroplot design used for plant monitoring is provided in Appendix D. Within each macroplot, species at all forest levels (canopy, midstory, and understory) were recorded. All tree species within the macroplot (10 m-radius from plot center) were recorded and measured. Woody stems greater than 5 cm DBH were counted as trees. Herb species were measured using four herb plots (1 m^2) located 5m from plot center at azimuths of 0°, 120°, 180°, and 240°. Within each herb plot, all herbaceous species were recorded and a cover value was assigned to each species (cover class values are listed in Appendix D). Two nested circular

shrub plots (11.7 ft-radius) were located at azimuths of 60° and 300° and the center of each was 5 m from the macroplot center. Within each shrub plot, we recorded all shrub species, assigned each species a cover class value, and estimated a total cover value for the plot (cover class values are provided in Appendix D). Woody stems greater than 1 m tall and less than 2 cm DBH were counted as shrubs. Woody stems measuring less than 1 m tall were counted in the herb plots.

Monitoring information was compiled in two types of tables. The overview table, includes total number of species (herbs, trees and shrubs), average number of species per herbaceous plot, average herbaceous cover, average tree species per plot, average shrub cover, basal area per acre, and tree stems per acre (Table 3). Summary tables were created for each strata (tree, shrub, and herb) with the species sorted by importance value (Importance Value for herbs and shrubs = (relative frequency + relative cover)/ 2; Importance Value for trees = (relative frequency + relative cover + relative density)/3). Values for frequency, relative frequency, relative cover, relative density, and relative basal area were also listed for each species. Summary tables for each strata are located in Appendix E.

Results

Table 1. Plant community monitoring summary table by covertype for Moro Big Pine WMA/NA years 2007-08.	
Total # species recorded	202
Avg. # herbaceous species/plot	16.3
Total # species in ground layer	184
Average ground layer cover (%)	45.5%
Avg. # species in shrub layer per plot	4.1
Total # species in shrub layer	38
Average shrub layer cover (%)	23.9%
Total # tree species (>5 cm dbh)	23
Total # tree species (>20.5 cm dbh)	8
Avg. # tree species/plot	3.4
Woody stems/acre (> 5 cm dbh)	295.9
Woody stems/acre (> 20.5 cm dbh)	74.2
Basal area/acre (> 5 cm dbh)	97.5
Basal area/acre (> 20.5 cm dbh)	76.8

The overstory at Moro Big Pine is dominated by loblolly pine with an average of 177 stems/acre. Density of snags is also high. Other common species are red maple (*Acer rubrum*), winged elm (*Ulmus alata*), and sweetgum (*Liquidambar styraciflua*). There is an average of 296 stems per acre and an average basal area of 95.0 (trees over 5 cm dbh). There were a total of 23 species in the overstory layer and an average of 3.4 species per plot.

For overstory trees (>20.5 cm dbh), there are 8 species. The larger overstory trees are loblolly pine, black oak (*Quercus velutina*), willow oak (*Q. phellos*), and post oak (*Q. stellata*). There are 74.2 stems per acre and a basal area of 76.8.

The shrub layer has an average of 4.2 species per plot and a total of 38 species. Red maple is the dominant shrub. Other common shrubs are American beautyberry (*Callicarpa americana*), sweetgum, and willow oak. Average shrub cover is 23.9% per plot.

The herbaceous layer is diverse with an average of 16.3 species per plot and a total of 184 species. Average herbaceous cover per plot is 46%. Dominant species are roundleaf greenbriar (*Smilax rotundifolia*) and whitegrass (*Leersia virginica*) (Appendix E). Other important species are nodding beaksedge (*Rynchospora inexpansa*), rice cutgrass (*L. oryzoides*), and burnweed (*Erechtites hieraciifolia*).

Discussion

The larger trees in the overstory layer at Moro-Big Pine are loblolly pine and oaks. Smaller trees such as red maple, sweetgum, and winged elm are frequent. The shrub layer is somewhat diverse with 38 species recorded. Pine and oaks are high in importance value, indicating regeneration of these valuable species is sufficient. The relatively low shrub cover provides a more open structure to the woodland.

The ground layer is diverse with an average of 16.3 species per plot. The top ten important species is comprised of 3 woody vines, 2 woody stems, 4 grasses, and 5 forbs. The establishment of a regular fire regime will reduce the woody cover in the ground layer and promote grasses and forbs.

Reference Conditions

Monitoring data were used to compare current condition to a reference condition for the pine flatwoods community. Detailed community descriptions and reference conditions were developed and modeled by regional experts during LANDFIRE National Workshops. The reference landscape was modeled using state-and-transition modeling software called Vegetation Dynamics Development Tool (VDDT). Each state within the model is a seral stage. Seral stages are user defined based on the age and canopy closure of the stands and are assigned a letter A-E

(i.e., A = early seral; B = mid-seral closed; C = mid-seral open; D = late-seral open; E = late-seral closed). Detailed definitions of each seral stage are described below.

A: early seral = Opening with seedlings/saplings to 15' tall. Few canopy trees. Shrubs provide less than 30% cover. Opening can be semi-persistent with regular fire, seedlings/saplings less than 14 years old. Pine regeneration between 180-545 seedlings per acre and 180-250 saplings per acre. Basal area less than 14 square feet per acre. Ground cover varies from 30%-100%.

B: mid-seral closed = Crown cover greater than 80%, depauperate herbaceous layer, shrubs present to 30% cover. Pine and oak pole size trees from 20' to 75' tall. Ages range from 15-40 years. Basal area of overstory between 80-130 square feet per acre. Oak component less than 30% of basal area.

C: mid-seral open = Crown cover between 30-80%, herbaceous cover greater than 80%, shrubs few. Pine and oak pole size trees from 20' to 75' tall. Ages range from 15-40 years. Basal area of overstory between 50- 100 square feet per acre. Oak component less than 30% of basal area.

D: late-seral open = Crown cover from 41 to 80%, herbaceous cover greater than 80-100%, shrubs present to 30% cover. Diverse ground layer. Pine and oak trees greater than 33" dbh. Ages 41+ years. Overstory basal area from 30-90 square feet per acre. Hardwood component less than 30% of basal area. Limited midstory (30 basal area or less).

E: late-seral closed = Crown cover greater than 80%, herbaceous cover depauperate, vines and shrubs prominent. Large trees greater than 33" dbh. Ages 41+ years. Basal area greater than 100 square feet per acre. Oak component less than 50% of basal area.

Transition inputs were determined based on expert opinion and historical accounts. Reference plant community structure and composition strongly influenced by fire. Fire regime is an important set of inputs to the model. Other important disturbance types include insect and disease outbreaks, ice storms, and windthrow. The historical range of variation in fire regime is as follows.

a. frequency: 1-4 years
b. severity: mild to moderate
c. intensity: mile to moderate
d. seasonality: late spring, late summer, fall.
e. size/pattern: medium to large (100 - 5,000 acres), coverage 60%-90%.
f. type: surface

The outputs of the model represent the historic range of variation in structure and composition of the Upper West Gulf Coastal Plain Pine Flatwood plant community (Appendix F). One of the most useful outputs of the model is the percent of each seral stage across the reference landscape (Table 2).

Table 2. Percent of each seral stage across the landscape in the reference condition.

Seral Stage	Definition of each seral stage	Percent across the landscape
A	early seral	10% - 15%
B	mid-seral closed	10% - 15%
C	mid-seral open	15% - 20%
D	late seral open	50% - 70%
E	late seral closed	5% – 10%

Ecological Assessment—Departure of current conditions from reference conditions

Measuring departure of current conditions from reference conditions can help formulate desired ecological conditions and guide forest management. The results from the first year of plant community monitoring (25 plots) were used to determine the percentage of the Moro Big

Pine WMA in each landscape seral stage (A-E). These amounts were compared to the reference conditions from the VDDT model (Figure 1).

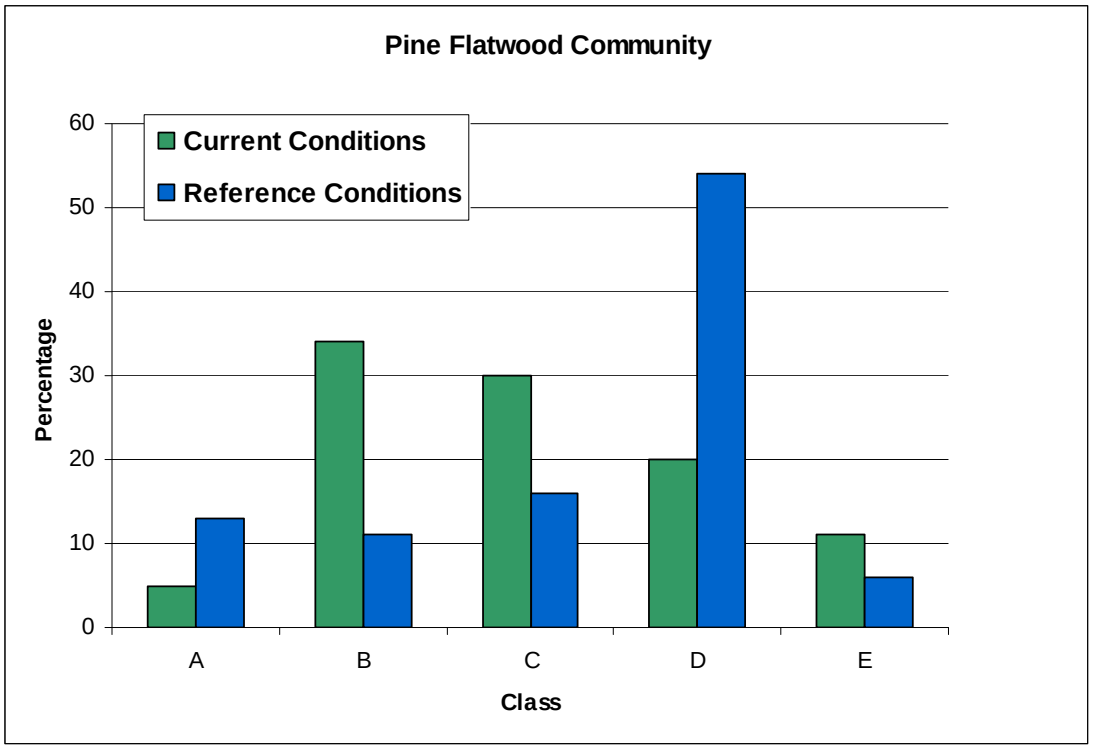


Figure 1. Comparison of current conditions and reference conditions in the West Gulf Coastal Plain Pine Flatwoods plant community.

Current forest canopy structure at Moro Big Pine WMA is dominated by mid-seral forests (classes B and C). The percentage of the landscape in the open-late seral stage (class D) is lower in current condition compared to reference condition. Closed-canopy forest cover is higher in current condition than reference conditions.

Current management decisions at Moro Big Pine WMA are driven by satisfying the habitat requirements of the federally listed threatened red-cockaded woodpecker. This involves managing naturally regenerating pine with a 2-aged management system. This creates a two-

layered woodland with a dominant loblolly pine overstory and a lush graminoid and forb dominated understory. Over time, with this management system and a regular fire regime in place, the mid-seral stands (classes B & C) will move to the open late-seral stage (class D). The desired ecological condition for the natural pine stands at Moro Big Pine consists of having a landscape comprised of 15% early seral stands, 30% mid-seral stands, and 60% late seral stands. Within each seral stage, an open canopy is favored because it provides the highest level of biodiversity.

Avian Monitoring

Methods

Birds were surveyed at 20 points randomly selected from the 50 established points used for plant community monitoring (map, Appendix G). Birds were surveyed using a modified point-count method. Bird presence was recorded by species in distance bands of 10 m intervals. Distance intervals began at 0-10 m and went through 90-100 m. Categories for species occurring over 100 m away within the stand type and for flyovers were also used to record species. Surveys were conducted between 06:00 am and 10:00 am to coincide with peak singing activity for the majority of bird species. Surveys were a 10 min period duration with an initial wait period of 3 min from time of arriving to the point to the beginning of recording to allow disturbed birds to return to normal behavior. All birds seen or heard during the survey were recorded. Points were surveyed on 30 May and 19 June 2008. Species richness and relative frequency of birds were calculated. Only birds observed within 100m were used for summaries and analyses.

Results

A total of 657 individuals representing 54 species were recorded. For data analysis, only individuals within 100 meters of the point were counted. This left a remaining 537 birds of 45 species for analysis. The most frequently encountered birds were Yellow-breasted Chat (*Icteria virens*), Pine Warbler (*Dendroica pinus*), and Common Yellowthroat (*Geothylpis trichas*) (Table 3). Several species of conservation concern, including 4 tracked species, were observed (Table 4).

Table 3. Number of individuals and relative frequency of avian species recorded during spring 2008 at Moro Big Pine Wildlife Management Area, Bradley County, Arkansas.

Common Name	Scientific Name	Number	Relative Frequency
Yellow-breasted Chat	*Icteria virens*	90	16.76
Pine Warbler	*Dendroica pinus*	68	12.66
Common Yellowthroat	*Geothlypis trichas*	49	9.12
White-eyed Vireo	*Vireo griseus*	33	6.15
Carolina Wren	*Thryothorus ludovicianus*	27	5.03
Indigo Bunting	*Passerina cyanea*	27	5.03
Northern Cardinal	*Cardinalis cardinalis*	21	3.91
Carolina Chickadee	*Poecile carolinensis*	20	3.72
Hooded Warbler	*Wilsonia citrina*	19	3.54
Eastern Wood-Pewee	*Contopus virens*	18	3.35
Kentucky Warbler	*Oporornis formosus*	17	3.17
Eastern Towhee	*Pipilo erythrophthalmus*	12	2.23
Blue Jay	*Cyanocitta cristata*	11	2.05
American Crow	*Corvus brachyrhynchos*	10	1.86
Tufted Titmouse	*Baeolophus bicolor*	9	1.68
Red-eyed Vireo	*Vireo olivaceous*	9	1.68
Brown-headed Nuthatch	*Sitta pusilla*	8	1.49
Pileated Woodpecker	*Dryocopus pileatus*	8	1.49
Acadian Flycatcher	*Empidonax virescens*	7	1.30
Blue-gray Gnatcatcher	*Polioptila caerulea*	7	1.30
Summer Tanager	*Piranga rubra*	7	1.30
Yellow-billed Cuckoo	*Coccyzus americanus*	7	1.30
Red-bellied Woodpecker	*Melanerpes carolinus*	6	1.12

Mourning Dove	*Zenaida macroura*	5	0.93
Northern Flicker	*Colaptes auratus*	5	0.93
Bachman's Sparrow	*Aimophila aestivalis*	4	0.74
Downy Woodpecker	*Picoides pubescens*	4	0.74
Worm-eating Warbler	*Helmitheros vermivorum*	4	0.74
Hairy Woodpecker	*Picoides villosus*	3	0.56
Wood Thrush	*Hylocichla mustelina*	3	0.56
American Robin	*Turdus migratorius*	2	0.37
Great-crested Flycatcher	*Myiarchus crinitus*	2	0.37
Red-cockaded Woodpecker	*Picoides borealis*	2	0.37
Red-headed Woodpecker	*Melanerpes erythrocephalus*	2	0.37
Black-and-white Warbler	*Mniotilta varia*	1	0.19
Chipping Sparrow	*Spizella passerina*	1	0.19
Eastern Bluebird	*Sialia sialis*	1	0.19
Eastern Kingbird	*Tyrannus tyrannus*	1	0.19
Eastern Phoebe	*Sayornis phoebe*	1	0.19
Louisiana Waterthrush	*Seiurus motacilla*	1	0.19
Mallard	*Anas platyrhynchos*	1	0.19
Northern Bobwhite	*Colinus virginianus*	1	0.19
White-breasted Nuthatch	*Sitta carolinensis*	1	0.19
Willow Flycatcher	*Empidonax traillii*	1	0.19
Yellow-throated Vireo	*Vireo flavifrons*	1	0.19

Table 4. Avian species of conservation concern observed at Moro Big Pine Wildlife Management Area, Bradley County, AR.

Species	Number of individuals	Number of locations observed
Northern Bobwhite	1	1
Yellow-billed Cuckoo	7	6
Bachman's Sparrow†	4	3
Red-headed Woodpecker†	2	2
Red-cockaded Woodpecker†	2	1
Wood Thrush	3	2
Eastern Towhee	12	8
Willow Flycatcher†	1	1
Hooded Warbler	19	11
Brown-headed Nuthatch	8	5
Kentucky Warbler	17	10

†Species tracked by Arkansas Natural Heritage Commission

Discussion

Overall, breeding bird populations seem healthy in the areas surveyed. The presence of savanna and open woodland – dependent species such as Pine Warbler, Brown-headed Nuthatch, Red-headed Woodpecker, Eastern Wood-Peewee, and Bachman's Sparrow is an indication that current management is creating appropriate habitat. Continued management of these areas should result in abundance of savanna and woodland dependent species.

Herpetofauna Surveys

Methods

Surveys for reptiles and amphibians were conducted by Ricky O'Neill of Potlatch Forest Holdings, Inc. Sampling plots were installed in Calhoun County, Arkansas, more specifically across the red-cockaded woodpecker "Conservation Area", Moro Big Pine WMA/NA and adjoining Potlatch Forest Holdings lands. Three stands were selected for cover type or management treatment. Three plots were established in each selected stand. During the second year of the project (2008), in each of the treatments, a pitfall and trap array was established for a total of 18 across the study area. Amphibians and reptiles were captured using area-constrained searches and cover boards during the first year of the project. Amphibians and reptiles were sampled once in April, twice in May, June, July and once in August. Captured animals were identified to species and appropriate biological information recorded.

Results/Discussion

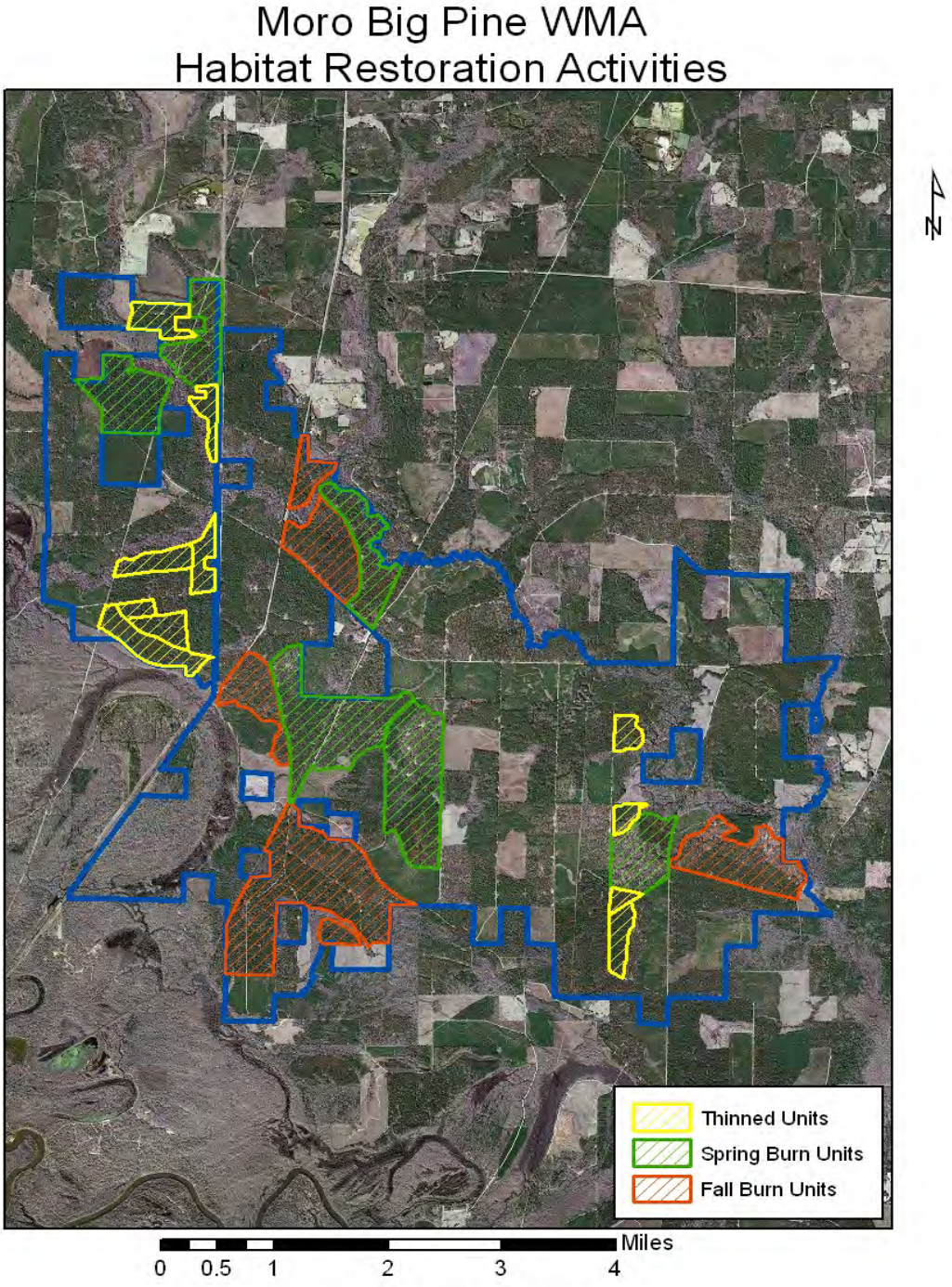
A total of 36 species were captured and/or observed (Table 5). Reptile and amphibian communities appear to be in good shape. One tracked species was observed, the Louisiana slimy salamander (*Plethodon kisatchie*). This species has a limited distribution in the coastal plain and

is primarily found in beech hardwood/pine forests. Protecting stands from harvesting and using prescribed fire for habitat improvements are important for the conservation of this salamander.

Table 5. List of Herp Species reported from Calhoun County, Arkansas. Occurrences in plots* and casual observations.

Scientific Name	Common Name
Ambystoma maculatum	spotted salamander
Ambystoma opacum	marbled salamander*
Plethodon kisatchie	Louisiana slimy salamander*
Notophthalmus viridescens louisianensis	central newt*
Bufo americanus	dwarf American toad*
Acris crepitans	northern cricket frog*
Hyla versicolor	gray treefrog
Pseudacris crucifer crucifer	northern spring peeper
Rana sphenocephala	southern leopard frog
Pseudacris triseriata	western chorus frog
Gastrophryne carolinensis	eastern narrowmouth toad*
Chelydra serpentina serpentina	common snapping turtle
Graptemys geographica	common map turtle
Terrapene carolina triunguis	three-toed box turtle
Trachemys scripta elegans	red-eared slider
Sternotherus odoratus	stinkpot
Sceloporus undulatus hyacinthinus	northern fence lizard
Anolis carolinensis	northern green anole
Eumeces fasciatus	five-lined skink*
Scincella lateralis	ground skink*
Eumeces laticeps	broadhead skink
Elaphe obsoleta	western rat snake*
Lampropeltis getula holbrooki	speckled kingsnake
Opheodrys aestivus	rough green snake
Nerodia fasciata confluens	broad-banded water snake
Nerodia rhombifer rhombifer	diamondback water snake
Nerodia sipedon pleuralis	midland water snake
Storeria dekayi wrightorum	midland brown snake
Thamnophis proximus proximus	western ribbon snake
Thamnophis sirtalis sirtalis	eastern garter snake
Agkistrodon contortrix contortrix	southern copperhead
Agkistrodon piscivorus leucostoma	western cottonmouth
Heterodon platirhinos	eastern hognose snake
Sistrurus miliarius	western pigmy rattlesnake*
Nerodia erythrogaster	yellowbelly water snake
Coluber constrictor	eastern racer

APPENDIX A.


Moro Big Pine WMA
Habitat Restoration Activities
N
Thinned Units
Spring Burn Units
Fall Burn Units
Miles
0 0.5 1 2 3 4

APPENDIX B. Summary of post-burn effects for all burn units.

Overall	pine flatwoods (FM 9), hardwood bottomland (FM8), young pine stands (FM 7), and pine flatwoods with heavy slash (FM10)
Burn coverage	90%
Burn severity organic substrate	1.6 (lightly burned)
Burn severity understory	1.6 (lightly burned)
Char height class	1.6 (less than 10')
Char degree	1.2 (light)
Midstory scorch percent class	1.7 (greater than 25% but less than 50%)
Overstory scorch percent class	0.6 (less than 25% of live crowns)
Overstory scorch height class	1.3 (greater than 10' but less than 20')

Community	pine flatwoods	hardwood bottomland	young pine stand	pine flatwoods with light slash
Fuel model	9	8	7	10
Coverage	95%	20% 90%	99%	
Organic substrate	1.5 (scorched to light)	1.0 (scorched)	1.3 (scorched)	2.5 (light to moderate)
Understory	1.5 (scorched to light)	1.0 (scorched)	1.3 (scorched)	2.8 light to moderate)
Char height	1.5 (>5 but ≤ 10')	1.0 (less than 5')	1.3 (>5 but ≤ 10')	2.3 (>5 but ≤ 20')
Char degree	1.2 (light)	1.0 (low)	1.0 (light)	1.6 (light to medium)
Midstory scorch	1.6 (>25 but ≤ 50%)	0	0.8 (less than 25%)	3.8 (> 50 but ≤ 75%)
Overstory scorch	0.4 (less than 25%)	0	0.3 (less than 25%)	2.3 (> 25 but ≤ 50%)
Scorch height	1.0 (≤ 10')	0	0.9 (less than 20')	3.7 (> 20 but ≤ 50')

ECOLOGICAL OBJECTIVES

1. 80% + unit coverage. The unit was 90% burned. Most of the FM9 woodlands burned, with 95% coverage. Unburned areas included wet spots along drainages and hardwood-dominated bottoms in FM 8. The stands in FM 7 had a dense understory of young pine, and these stands had good coverage and moderate fire behavior. The pine flatwoods with logging slash (FM 10) had the highest severity fire behavior and almost complete coverage.

2. Organic substrate burn severity class = 1.0 – 3.0. Organic substrate burn severity class = 1.6 (lightly burned). The upper litter and duff layers were removed in most all burned areas within the woodlands.

3. Understory burn severity class = 1.5 – 3.0. Understory burn severity class = 1.6 (lightly burned). The understory was lightly burned with most foliage being partially to completely consumed.

4. Overstory char height class = 0.5 – 2.0. Overstory char height class = 1.6 (less than 10'). The highest char was observed in the areas with heavy fuel loads and logging slash (FM 10). In these sites, char often exceeded 20 ft. Most char observed on pines in the flatwoods (FM 9) was 1'-6'. This level of char will have minimal impact.

5. Overstory char degree class = 0.5 – 2.0. Overstory char degree = 1.0 (light). The overstory trees were lightly charred. This level of char will have minimal impact on overstory trees.

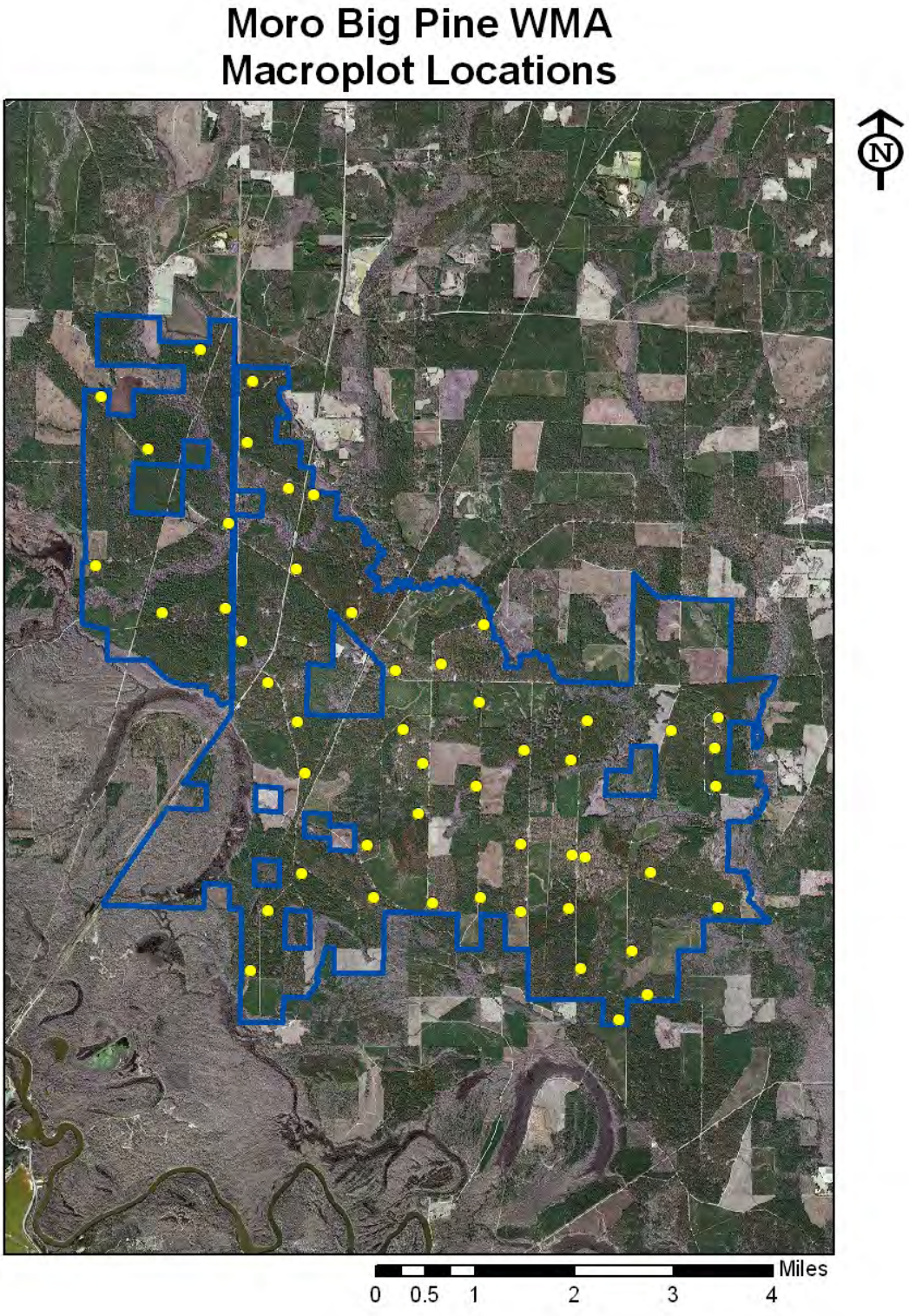
6. Midstory scorch percent class = 2.0 – 4.5. Midstory scorch percent class = 1.7 (>25 but <50%). The shrubs and small trees in all fuel models were scorched. Most trees and shrubs less than 2" diameter at breast height (dbh) will be top-killed or drop lower limbs.

7. Overstory scorch percent class = 0.5 – 2.0. Overstory scorch percent class = 0.6 (less than 25% of live crowns). Overstory scorch was minimal in all fuel models except FM 10. This level of scorch will have minimal impact on overstory trees.

8. Overstory scorch height class = 0.5 – 2.0. Overstory scorch height class = 1.3 (>10 but <20'). Scorch was usually less than 20'. In some areas within the pine flatwoods (FM 7, 9 and 10), scorch height did exceed 50 ft.

The ecological objectives of the burns at the Moro Big Pine WMANA are being met. Coverage was good in all fuel models except 8, which has low flammability. Continued burning is needed to create and maintain open wildlife habitat for species of concern in the pine flatwood community.

APPENDIX C.



APPENDIX D. PLANT COMMUNITY MONITORING MACROPLOT DESIGN

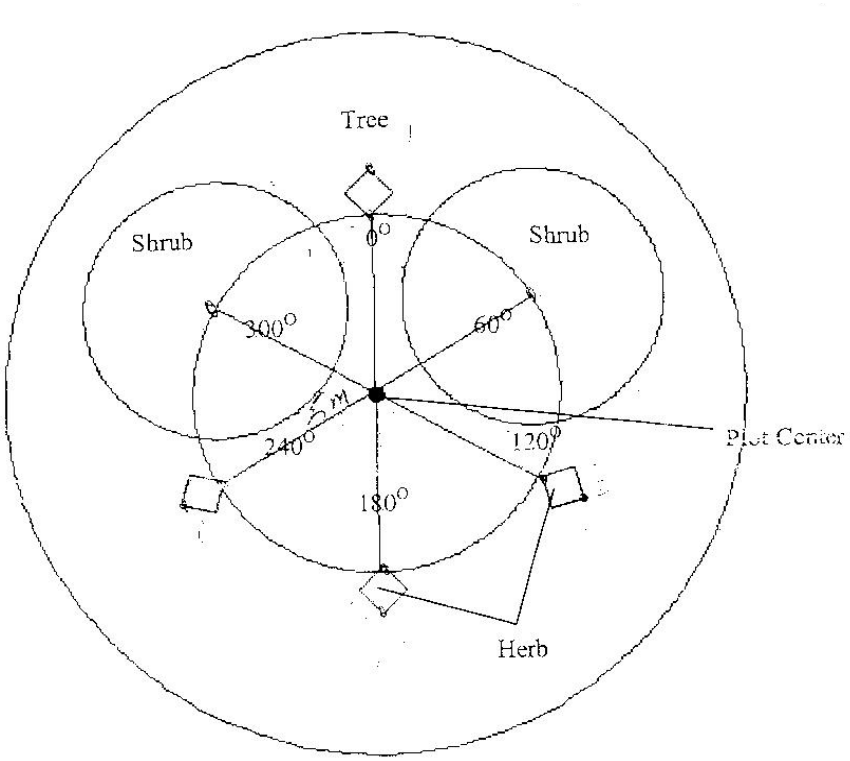


Table D1. Cover classes, class ranges, and class midpoints used in herbaceous vegetation sampling.

Cover Class	Cover range	Range midpoint
Class 1	0 - 1 %	0.5 %
Class 2	1 - 5%	3.0 %
Class 3	5 - 25%	15.0%
Class 4	25 - 50%	37.5%
Class 5	50 - 75%	62.5%
Class 6	75 - 95%	85%
Class 7	95 - 100%	97.5%

Table D2. Cover classes, class ranges, and class midpoints used for shrub layer data.

Cover Class	Cover range	Range midpoint
Class 1	0 - 25 %	12.5 %
Class 2	25-50%	37.5 %
Class 3	50 - 75%	62.5%
Class 4	75 - 100%	87.5%

APPENDIX E. Summary tables for vegetation data.

Table E2: Total cover, frequency, relative cover, relative frequency, and importance value of shrub layer plant species at Moro Big Pine WMA, Calhoun County, AR, 2007-08.

Species	Total Cover	Frequency	Relative Cover	Relative Frequency	Importance Value
Acer rubrum	1037.50	90.00	21.73	16.42	19.08
Callicarpa americana	450.00	52.00	9.42	9.49	9.46
Liquidambar styraciflua	362.50	54.00	7.59	9.85	8.72
Quercus phellos	337.50	54.00	7.07	9.85	8.46
Quercus falcata	350.00	36.00	7.33	6.57	6.95
Pinus taeda	362.50	34.00	7.59	6.20	6.90
Quercus pagodifolia	312.50	30.00	6.54	5.47	6.01
Ulmus alata	150.00	24.00	3.14	4.38	3.76
Diospyros virginiana	137.50	22.00	2.88	4.01	3.45
Quercus alba	125.00	16.00	2.62	2.92	2.77
Vaccinium arboreum	137.50	10.00	2.88	1.82	2.35
Quercus rubra	75.00	12.00	1.57	2.19	1.88
Quercus stellata	75.00	12.00	1.57	2.19	1.88
Vaccinium elliottii	87.50	10.00	1.83	1.82	1.83
Ilex opaca	62.50	10.00	1.31	1.82	1.57
Nyssa sylvatica	62.50	10.00	1.31	1.82	1.57
Rhus copallina	87.50	6.00	1.83	1.09	1.46
Quercus nigra	62.50	6.00	1.31	1.09	1.20
Baccharis halimifolia	50.00	4.00	1.05	0.73	0.89
Myrica cerifera	50.00	4.00	1.05	0.73	0.89
Vaccinium pallidum	50.00	4.00	1.05	0.73	0.89
Carpinus caroliniana	25.00	4.00	0.52	0.73	0.63
Carya tomentosa	25.00	4.00	0.52	0.73	0.63
Fraxinus pennsylvanica	25.00	4.00	0.52	0.73	0.63
Ilex decidua	25.00	4.00	0.52	0.73	0.63
Ostrya virginiana	25.00	4.00	0.52	0.73	0.63
Prunus serotina	25.00	4.00	0.52	0.73	0.63
Styrax americana	25.00	4.00	0.52	0.73	0.63
Cephalanthus occidentalis	37.50	2.00	0.79	0.36	0.58
Quercus laurifolia	37.50	2.00	0.79	0.36	0.58
Cornus foemina	12.50	2.00	0.26	0.36	0.31
Crataegus marshallii	12.50	2.00	0.26	0.36	0.31
Fraxinus americana	12.50	2.00	0.26	0.36	0.31
Hamamelis virginiana	12.50	2.00	0.26	0.36	0.31
Ilex vomitoria	12.50	2.00	0.26	0.36	0.31
Quercus velutina	12.50	2.00	0.26	0.36	0.31
Salix nigra	12.50	2.00	0.26	0.36	0.31
Sideroxylon lanuginosa	12.50	2.00	0.26	0.36	0.31
Totals	**4775.00**	**548.00**	**100.00**	**100.00**	**100.00**

Table E3: Frequency, relative frequency, stems/acre, basal area, basal area/acre, relative basal area, relative density, and importance value of tree species at Moro Big Pine WMA, 2007-08.								
Species	**Frequency**	**Relative Frequency**	**Stems/ Acre**	**Sum BA**	**Sum BA/Acre**	**Relative BA**	**Relative Density**	**Importance Value**
Pinus taeda	1.00	23.81	176.80	332.9	85.80	88.03	59.76	57.20
Snag	0.76	18.10	48.97	19.47	5.02	5.15	16.55	13.27
Acer rubrum	0.34	8.10	13.14	3.61	0.93	0.96	4.44	4.50
Ulmus alata	0.36	8.57	10.31	3.12	0.81	0.83	3.48	4.29
Liquidambar styraciflua	0.30	7.14	9.02	3.06	0.79	0.81	3.05	3.67
Quercus phellos	0.24	5.71	6.44	3.03	0.78	0.80	2.18	2.90
Ilex opaca	0.14	3.33	6.70	2.20	0.57	0.58	2.26	2.06
Nyssa sylvatica	0.18	4.29	3.35	0.86	0.22	0.23	1.13	1.88
Quercus falcata	0.16	3.81	3.61	1.45	0.37	0.38	1.22	1.80
Quercus pagoda	0.16	3.81	2.83	1.11	0.29	0.29	0.96	1.69
Quercus nigra	0.10	2.38	4.64	2.18	0.56	0.58	1.57	1.51
Quercus velutina	0.10	2.38	1.55	2.04	0.53	0.54	0.52	1.15
Quercus stellata	0.08	1.90	1.55	1.81	0.47	0.48	0.52	0.97
Quercus rubra	0.04	0.95	1.03	0.21	0.06	0.06	0.35	0.45
Diospyros virginiana	0.04	0.95	1.03	0.15	0.04	0.04	0.35	0.45
Quercus alba	0.04	0.95	0.52	0.11	0.03	0.03	0.17	0.39
Cornus florida	0.02	0.48	1.29	0.34	0.09	0.09	0.44	0.33
Ostrya virginiana	0.02	0.48	1.03	0.13	0.03	0.03	0.35	0.29
Carpinus caroliniana	0.02	0.48	0.77	0.13	0.03	0.03	0.26	0.26
Carya texana	0.02	0.48	0.26	0.07	0.02	0.02	0.09	0.19
Quercus laurifolia	0.02	0.48	0.26	0.05	0.01	0.01	0.09	0.19
Crataegus spathulata	0.02	0.48	0.26	0.04	0.01	0.01	0.09	0.19
Vaccinium arboreum	0.02	0.48	0.26	0.04	0.01	0.01	0.09	0.19
Crataegus marshallii	0.02	0.48	0.26	0.02	0.01	0.01	0.09	0.19
Totals	**4.20**	**100.00**	**295.87**	**378.2**	**97.46**	**100.00**	**100.00**	**100.00**

Table E4: Frequency, relative frequency, stems/acre, basal area, basal area/acre, relative basal area, relative density, and importance value of tree species (> 20.5 cm dbh) at Moro Big Pine WMA, 2007-08.								
Species	**Frequency**	**Relative Frequency**	**Stems/ Acre**	**Sum BA**	**Sum BA/Acre**	**Relative BA**	**Relative Density**	**Importance Value**
Pinus taeda	1.00	83.05	71.53	286.2	75.27	97.96	96.45	92.49
Quercus velutina	0.06	5.08	0.79	1.60	0.42	0.55	1.06	2.23
Quercus phellos	0.04	3.39	0.53	1.12	0.29	0.38	0.71	1.49
Quercus stellata	0.02	1.69	0.26	1.56	0.41	0.54	0.35	0.86
Quercus pagoda	0.02	1.69	0.26	0.53	0.14	0.18	0.35	0.74
Quercus falcata	0.02	1.69	0.26	0.41	0.11	0.14	0.35	0.73
Acer rubrum	0.02	1.69	0.26	0.37	0.10	0.13	0.35	0.73
Ilex opaca	0.02	1.69	0.26	0.36	0.09	0.12	0.35	0.72
Totals	**1.20**	**100.00**	**74.16**	**292.2**	**76.83**	**100.00**	**100.00**	**100.00**

APPENDIX F. REFRENCE CONDITION DESCRIPTION

441458
Gulf Coastal Plain Pine Flatwoods

Model Date: 01/25/07 Report Date: 4/23/07

Modelers		Reviewers	
Mike Melnechuk	mmelnechuk@tnc.org	Susan Hooks	shooks@fs.fed.us
Larry Threet	larry_threet@fws.gov	Betty Crump	bcrump@fs.fed.us
		Larry Hedrick	lhedrick@fs.fed.us

Vegetation Type
Forested

Map Zones
44, 37

Model Splits or Lumps
This BpS is lumped with: 1402

Geographic Range
This type lies in parts of Arkansas, Oklahoma, Louisiana, and Texas, especially in subsections 231Eb, 231Ec, 231Ee, 231Ek, and 231 Eo.

Biophysical Site Description
This BpS is situated on second and third Pleistocene Terraces above larger drainages. Lower levels are flooded at varying frequencies. These terraces are often topographically flat. Clayey subsoils lead to formation of permanent and semi-permanent wetlands. Mima mounds are also present in some situations. The Deweyville Terrace Pine Flatwoods (DPFW) also lie within this type. Pine flatwoods generally occur on the middle and highest Deweyville terraces in the study area, on Guyton and Pheba soils. The lower (and younger) Deweyville surfaces that occur below 26 m (87 ft.) mean sea level (msl) are subject to Ouachita or Saline River flooding at least once every ten years, on average, but their wetland character is primarily maintained by precipitation. Above 26 m msl, precipitation is the sole source of wetland hydrology in the pine flatwoods. Guyton soils occur in units of 10 to 400 ha. These soils are level and poorly drained. Guyton silt loam soils have water tables within 30 cm of the surface during the winter and early spring. Topographically lower areas of Guyton also experience periodic flooding during the winter and spring. On the higher Deweyville terraces, pine flatwoods occur primarily on Pheba silt loam, which has a seasonal water table perched above the fragipan during periods of high rainfall. The fragipan restricts water movement and root penetration. Since higher Deweyville sublevels are flatter and more poorly drained than the lower sublevels, they are marginal for pine flatwoods except on topographically higher rises of Pheba soil. This is in contrast to the Prairie Terrace Pine Flatwoods, where the higher sublevels are more dissected and better drained. Soils may be named or classified differently in Louisiana.

DPFW represent a transition from a pine-dominated terrace type to floodplain bottomland hardwood forest. The lower sublevels (the lowest and part of the next higher) are within the

current floodplain of the Ouachita River and are primarily bottomland hardwood forest (BLH), whereas the upper part of the second sublevel and the highest sublevel are outside the current floodplain and are dominantly pine or pine-hardwood. As a result many species occur on both the DPFW and the floodplain BLH communities. Delta post oak (Quercus similis) is much more common on the Deweyville than on the Prairie terrace here, as is dwarf palmetto (Sabal minor). The presence of laurel oak in vernal pools on the DPFW also indicates overlap between the DPFW and floodplain BLH. It is not uncommon to see loblolly pine, baldcypress (Taxodium distichum), overcup oak (Quercus lyrata), and dwarf palmetto growing side by side in DPFW.

Prairie Terrace Pine Flatwoods (PPFW)
PPFW are located on the lowest, youngest, and least dissected of the Prairie Terrace sublevels (which are much older than Deweyville terraces and occupy a higher landscape position). More dissected higher levels are naturally occupied by upland hardwood and pine-hardwood forest and woodland. The soils on the PPFW sites are Amy and Pheba silt loams. Amy map units are 10 to 400 ha in size. Pheba map units occur on slightly higher Prairie terrace surfaces, and are only 5 to 20 ha in size and occupy only a small portion of the total landscape.

Areas that are located on Amy silt loam soil are extremely wet, due to a seasonal high water table within 30 cm of the surface during the winter and spring. Areas that are located on Pheba silt loam have a seasonal water table that is perched above the fragipan during periods of high rainfall. The fragipan restricts water movement and root penetration and causes a hydroxeric alteration, as described before.

Vegetation Description
The typical dominant overstory species is loblolly pine with willow oak in wetter flats and southern red oak (Quercus falcata) and post oak (Quercus stellata) or Delta post oak (Quercus similis) on well-drained surfaces. Shortleaf pine (Pinus echinata) can occupy some part of the canopy and sub-canopy in the northern part of range, while longleaf pine (Pinus palustris) can occupy some part of the canopy and sub-canopy in the southern part of the range. In a few places, such as near Goldonna, Louisiana, these three pines will co-occupy the canopy. Depending on disturbance history, sub-canopy species can include recruitment species from the canopy, as well as mockernut hickory (Carya alba), black hickory (Carya texana), sweetgum (Liquidambar styraciflua), slippery elm (Ulmus rubra) sassafras (Sassafras albidum), white ash (Fraxinus americana), and black gum (Nyssa sylvatica). Mid-story and shrub species include those listed above as well as flowering dogwood (Cornus florida), red maple (Acer rubrum), Mexican plum (Prunus mexicana), wax myrtle (Myrica cerifera), French mulberry (Callicarpa americana), rusty blackhaw (Viburnum rufidulum), various hawthorns (Crataegus spp.), Male-berry (Lyonia ligustrina), various blueberries and huckleberries (Vaccinium spp.), various hollies (Ilex spp.), winged sumac (Rhus copallina), and sweetleaf (Symplocos tinctoria). Vines include poison ivy (Toxicodendron radicans), Virginia creeper (Parthenocissus quinquefolia), yellow jasmine (Gelsemium sempervirens), and greenbriars (Smilax spp.). The ground layer flora of the PPFW is dramatically different from that of the DPFW, with a large number of prairie species occurring only in PPFW. Frequency of herbs and graminoids is directly correlated with disturbance, especially fire. In the presence of fire this diverisity can be very high. Common herbs and grasses include little bluestem (Andropogon scoparius), broomsedge (Andropogon virginicus), big bluestem (Andropogon gerardi), split-beard bluestem (Andropogon ternarius), spangle-grasses (Chasmanthium laxum and C. sessiliflorum), three-awn grasses (Aristida spp.),

panic grasses (Dichanthelium acuminatum, D. boscii, D. commutatum, Panicum virgatum, P. anceps, D. rigidulum and others), sunflowers (Helianthus hirsutus, H. angustifolius, and others), goldenrods (Solidago rugosa, Solidago odora, and others), blazingstars (Liatris spicata, L. pycnostachya, L. squarrosa, L. squarrulosa, L. aspera and others), rosinweeds (Silphium integrifolium, S. asteriscus), partridge berry (Mitchella repens), beggarticks (Desmodium glutinosum, D. paniculatum, D. rotundifolium, D. marilandicum, D. viridiflorum and others), and Lespedeza (Lespedeza procumbens). The West Gulf Coastal Plain Saline Glade (1402) community is embedded within this BpS.

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
PITA	Pinus taeda	Loblolly pine
QUFA	Quercus falcata	Southern red oak
QUST	Quercus stellata	Post oak
QUNI	Quercus nigra	Water oak
QUPH	Quercus phellos	Willow oak
PIEC2	Pinus echinata	Shortleaf pine
PIPA2	Pinus palustris	Longleaf pine
ANTE2	Andropogon ternarius	Splitbeard bluestem

Disturbance Description

Naturally this system was dominated by frequent low to moderate intensity fire with occasional replacement fires associated with grassy fuels and cycles of moisture and drought. Fires would rarely alter species composition or structure. Insect outbreaks (southern pine beetle), ice storm damage and windthrow are also important disturbance factors. Drought and moist cycles play a strong role interacting with both fire frequency and intensity. Native ungulate grazing may have played a small role in maintaining the system.

VDDT Fire Frequency Results

Severity	Avg FI	Min FI	Max FI	Percent of All Fires
Replacement	175			3
Moderate (Mixed)	130			4
Low (Surface)	5			94
All Fires	**5**			**100**

Scale Description

Greater than 100,000 acres.

Non-Fire Disturbances

Insects/Disease
Wind/Weather/Stress
Other 1: Alternate succession

Adjacency or Identification Concerns

This system often occurs adjacent to and can be influenced by the West Gulf Coastal Plain Pine-Harwood Forest (1371) and the Gulf Coastal Plain Floodplain Systems (1473).

Issues or Problems

Native Uncharacteristic Conditions
Most of this system has been converted to pure loblolly pine plantations less than twenty five years of age.

Comments
Possible reviewers: Lake Lewis - Overflow NWR and Tom Foti
This model was adapted from a Rapid assessment model (R5GCPF) by David Moore and Tom Foti. (davemoore@fs.fed.us, tom@arkansasheritage.org)

Succession Classes

Class A 13% Early1 - PostRep

Structural Information
Upper Layer Lifeform: Tree
Upper Layer Canopy Cover: 0 - 100%
Upper Layer Canopy Height: Tree 0m - Tree 5m
Tree Size Class: Sapling >4.5ft; <5"DBH

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PITA	Pinus taeda	Loblolly pine	Mid-Upper
QUPH	Quercus phellos	Willow oak	Mid-Upper
QUFA	Quercus falcata	Southern red oak	Mid-Upper
QUNI	Quercus nigra	Water oak	False

Description
0-14 years. All sites, post-fire grass regrowth, grass seedlings, forbs and hardwood sprouting. Little bluestem, panic grasses, composites, oaks, red maple, black gum. Frequent surface fire (FRI = 5 years) or mixed fires (FRI = 25 years) maintain this class until it succeeds to C. If 13 years pass without fire, this class will succeed to B instead of C. Replacement events like fire and wind occur rarely (FRI = 150 years and catastrophic weather events = 100 year interval). Saline barrens, glades, prairies would be included in this class.

Class B 11% Mid1 - Closed

Structural Information
Upper Layer Lifeform: Tree
Upper Layer Canopy Cover: 80 - 100%
Upper Layer Canopy Height: Tree 5.1m - Tree 25m
Tree Size Class: Medium 9-21"DBH

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PITA	Pinus taeda	Loblolly pine	Mid-Upper
QUPH	Quercus phellos	Willow oak	Mid-Upper
QUFA	Quercus falcata	Southern red oak	Mid-Upper
QUNI	Quercus nigra	Water oak	False

Description

15-40 years. Dense, thick stands of loblolly pine poles intermixed with oaks and other hardwoods. Fuel loads high, with prominent ladder fuels and deep layers of needles on forest floor. Little herbaceous vegetation due to intense shading and thick layers of needles on forest floor. Surface fire is less frequent than in A at a 10-year FRI. Mixed fire and wind events (FRI = 20 years; wind interval = 100 years) will open the stand and transition B to C. Replacement events like fire and insect outbreaks occur rarely (FRI = 200 years and catastrophic insect or disease events = 100 year interval). B will succeed to E.

Class C 16% Mid1 - Open

Structural Information

Upper Layer Lifeform: Tree
Upper Layer Canopy Cover: 31 - 80%
Upper Layer Canopy Height: Tree 5.1m - Tree 25m
Tree Size Class: Medium 9-21"DBH

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PITA	Pinus taeda	Loblolly pine	Lower
QUST	Quercus stellata	Post oak	Lower
QUFA	Quercus falcata	Southern red oak	Lower
QUNI	Quercus nigra	Water oak	False

Description

15-40 years. A 2-layered open woodland (canopy and herbaceous) dominated by loblolly pine, with various hardwoods (oaks, red maple, black gum) present as shrubs or sprouts. Diverse ground layer composed of grasses and forbs. Ground layer becomes more diverse with transition to Class D as more sunlight reaches the ground layer.

Class D 54% Late1 - Open

Structural Information

Upper Layer Lifeform: Tree
Upper Layer Canopy Cover: 41 - 80%
Upper Layer Canopy Height: Tree 25.1m - Tree 50m
Tree Size Class: Very Large >33"DBH

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PITA	Pinus taeda	Loblolly pine	Lower
QUST	Quercus stellata	Post oak	Lower
QUFA	Quercus falcata	Southern red oak	Mid-Upper
PIEC2	Pinus echinata	Shortleaf pine	False

Description

> 41 years. 2-layered open woodland (canopy and herbaceous) dominated by loblolly pine, with various hardwoods (oaks, red maple, black gum) present as shrubs or sprouts. Very diverse ground layer composed of many species of grasses and forbs. Shortleaf pine becomes more abundant than loblolly pine with age of stand due to longer life span and greater fire tolerance. Frequent surface fire (FRI = 4 years) and insect outbreaks (300 years) maintain the openness this class. If 15 years pass without fire, this class will succeed to E. Replacement events like fire and wind occur rarely (FRI = 200 years and catastrophic weather events = 150 year interval).

Class E 6% Late1 - Closed

Structural Information

Upper Layer Lifeform: Tree
Upper Layer Canopy Cover: 80 - 100%
Upper Layer Canopy Height: Tree 25.1m - Tree 50m
Tree Size Class: Very Large >33"DBH

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PITA	Pinus taeda	Loblolly pine	Mid-Upper
QUST	Quercus stellata	Post oak	Mid-Upper
QUFA	Quercus falcata	Southern red oak	Mid-Upper
QUNI	Quercus nigra	Water oak	False

Description

>41 years. Dense, thick stands of mature loblolly pine intermixed with oaks and other hardwoods. Vines (especially Vitis rotundifolia and Gelsemium sempervirens) prominent. Mid canopy and shrub layer prominent. With prominent ladder fuels and deep layers of needles on forest floor. Little herbaceous vegetation due to intense shading and thick layers of needles on forest floor. Surface fire is less frequent than in D at a 10-year FRI. Mixed fire and wind events (FRI = 33 years; wind interval = 100 years) will open the stand and transition E to D. Replacement events like fire and insect outbreaks occur rarely (FRI = 200 years and catastrophic insect or disease events = 100 year interval).

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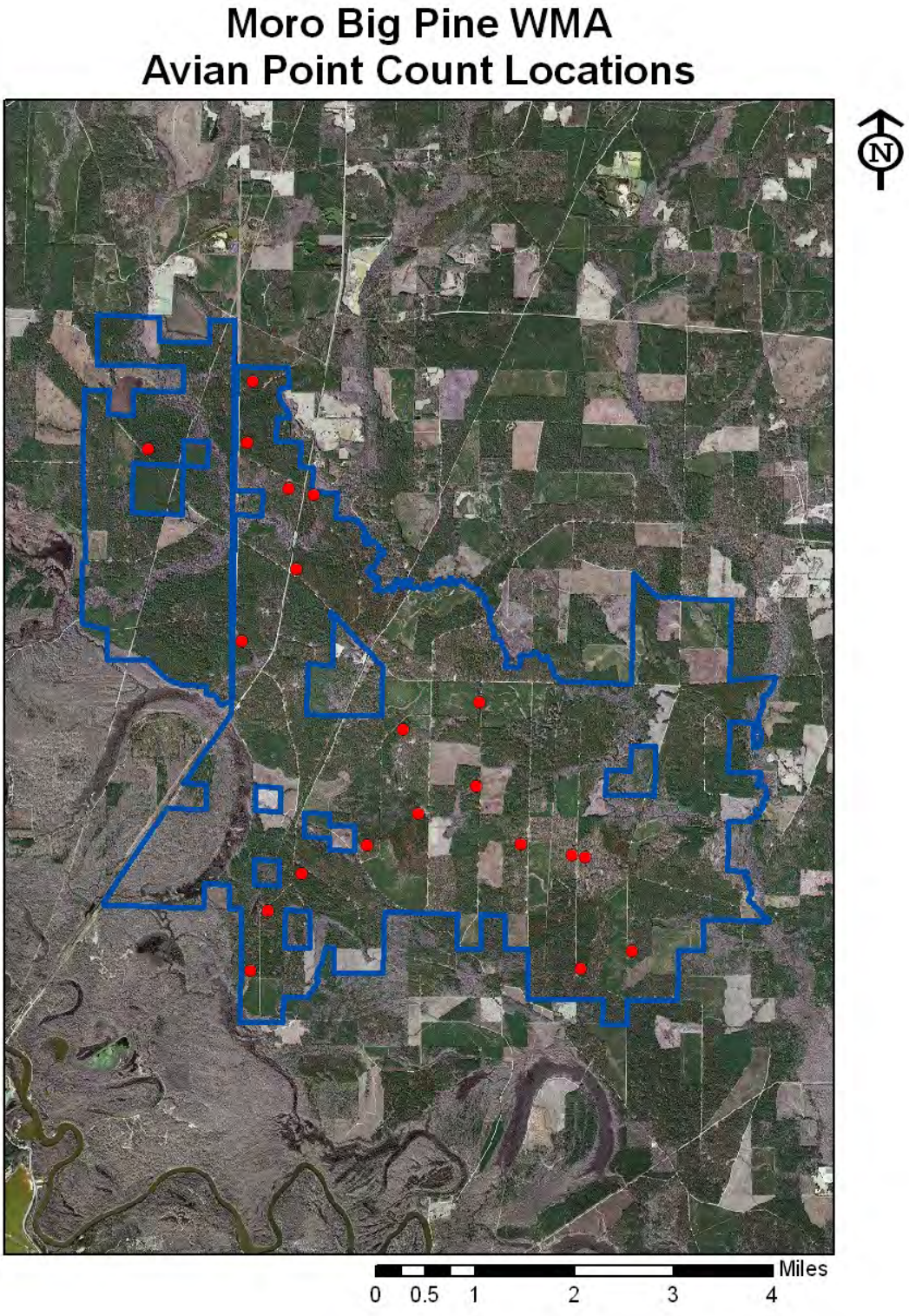
APPENDIX G.


Moro Big Pine WMA
Avian Point Count Locations
N
Miles
0 0.5 1 2 3 4

APPENDIX E. Plant community monitoring summary tables by strata.

Table E1: Total cover, frequency, relative cover, relative frequency, and importance value of ground layer plant species at Moro Big Pine WMA, Calhoun County, AR, 2007-08.

Species	Total Cover	Frequency	Relative Cover	Relative Frequency	Importance Value
Smilax rotundifolia	2043.00	280.00	22.64	10.55	16.59
Leersia virginica	1768.50	154.00	19.60	5.80	12.70
Rhynchospora inexpansa	428.50	68.00	4.75	2.56	3.66
Leersia oryzoides	382.50	64.00	4.24	2.41	3.32
Erechtites hieraciifolia	257.50	92.00	2.85	3.47	3.16
Chasmanthium sessiliflorum	263.00	84.00	2.91	3.17	3.04
Vitis rotundifolia	222.00	76.00	2.46	2.86	2.66
Acer rubrum	165.50	82.00	1.83	3.09	2.46
Pinus taeda	119.00	86.00	1.32	3.24	2.28
Rubus flagellaris	125.00	60.00	1.39	2.26	1.82
Rubus sp.	139.50	52.00	1.55	1.96	1.75
Rhexia mariana	145.00	48.00	1.61	1.81	1.71
Mecardonia acuminata	228.00	22.00	2.53	0.83	1.68
Callicarpa americana	131.00	44.00	1.45	1.66	1.55
Toxicodendron radicans	56.50	58.00	0.63	2.19	1.41
Croton willdenowii	89.00	42.00	0.99	1.58	1.28
Dichanthelium scoparium	100.00	34.00	1.11	1.28	1.19
Trachelospermum difforme	33.00	52.00	0.37	1.96	1.16
Parthenocissus quinquefolia	97.00	32.00	1.07	1.21	1.14
Steinchisma hians	129.50	18.00	1.43	0.68	1.06
Quercus phellos	60.00	34.00	0.66	1.28	0.97
Rhynchospora globularis	79.50	26.00	0.88	0.98	0.93
Berchemia scandens	43.50	36.00	0.48	1.36	0.92
Andropogon virginicus	73.00	26.00	0.81	0.98	0.89
Dichanthelium aciculare	100.00	16.00	1.11	0.60	0.86
Rhynchospora glomerata	75.50	20.00	0.84	0.75	0.80
Pycnanthemum albescens	88.00	16.00	0.98	0.60	0.79
Carex sp.	39.50	30.00	0.44	1.13	0.78
Vaccinium arboreum	61.50	22.00	0.68	0.83	0.76
Vaccinium elliottii	77.50	16.00	0.86	0.60	0.73
Acalypha gracilens	11.00	34.00	0.12	1.28	0.70
Vaccinium pallidum	62.50	14.00	0.69	0.53	0.61
Eupatorium capillifolium	46.50	18.00	0.52	0.68	0.60
Liquidambar styraciflua	52.50	16.00	0.58	0.60	0.59
Rhus copallina	30.00	22.00	0.33	0.83	0.58
Clitoria mariana	34.50	20.00	0.38	0.75	0.57
Dichanthelium dichotomum	41.00	18.00	0.45	0.68	0.57
Gelsemium sempervirens	13.50	24.00	0.15	0.90	0.53
Smilax glauca	24.50	20.00	0.27	0.75	0.51

Cyperus pseudovegetus	51.50	12.00	0.57	0.45	0.51
Scleria oligantha	13.00	22.00	0.14	0.83	0.49
Quercus falcata	39.50	12.00	0.44	0.45	0.44
Ilex opaca	19.00	18.00	0.21	0.68	0.44
Bignonia capreolata	17.00	18.00	0.19	0.68	0.43
Ulmus alata	17.00	18.00	0.19	0.68	0.43
Polypremum procumbens	10.00	20.00	0.11	0.75	0.43
Dichanthelium acuminatum	14.50	18.00	0.16	0.68	0.42
Eupatorium rugosum	21.00	16.00	0.23	0.60	0.42
Pluchea foetida	25.50	14.00	0.28	0.53	0.41
Myrica cerifera	44.00	8.00	0.49	0.30	0.39
Dichanthelium sp.	7.00	18.00	0.08	0.68	0.38
Bidens sp.	25.00	12.00	0.28	0.45	0.36
Ludwigia sp.	25.00	12.00	0.28	0.45	0.36
Lespedeza repens	22.50	12.00	0.25	0.45	0.35
Dichanthelium polyanthes	13.50	14.00	0.15	0.53	0.34
Leersia sp.	40.50	4.00	0.45	0.15	0.30
Hypericum crux-andreae	6.00	14.00	0.07	0.53	0.30
Ambrosia artemisiifolia	10.50	12.00	0.12	0.45	0.28
Nyssa sylvatica	10.50	12.00	0.12	0.45	0.28
Galium pilosum	8.00	12.00	0.09	0.45	0.27
Ludwigia linearis	21.50	8.00	0.24	0.30	0.27
Bidens aristosa	19.00	8.00	0.21	0.30	0.26
Sporobolus sp.	37.50	2.00	0.42	0.08	0.25
Panicum anceps	10.00	10.00	0.11	0.38	0.24
Desmodium nudiflorum	30.00	4.00	0.33	0.15	0.24
Quercus pagodifolia	30.00	4.00	0.33	0.15	0.24
Hypericum hypericoides	7.50	10.00	0.08	0.38	0.23
Pluchea sp.	7.50	10.00	0.08	0.38	0.23
Cyperus echinatus	21.00	6.00	0.23	0.23	0.23
Dioclea multiflora	12.00	8.00	0.13	0.30	0.22
Ruellia strepens	5.00	10.00	0.06	0.38	0.22
Scutellaria integrifolia	5.00	10.00	0.06	0.38	0.22
Ilex decidua	18.50	6.00	0.20	0.23	0.22
Quercus alba	18.50	6.00	0.20	0.23	0.22
Smilax bona-nox	18.50	6.00	0.20	0.23	0.22
Solidago sp.	18.50	6.00	0.20	0.23	0.22
Diospyros virginiana	9.50	8.00	0.11	0.30	0.20
Eleocharis sp.	9.50	8.00	0.11	0.30	0.20
Oxalis sp.	2.50	10.00	0.03	0.38	0.20
Boltonia diffusa	4.50	8.00	0.05	0.30	0.18
Diodia teres	4.50	8.00	0.05	0.30	0.18
Lonicera japonica	4.50	8.00	0.05	0.30	0.18
Symphyotrichum ericoides	4.50	8.00	0.05	0.30	0.18
Carex sp. 2	18.00	4.00	0.20	0.15	0.18

Paspalum setaceum	18.00	4.00	0.20	0.15	0.18
Baccharis halimifolia	9.00	6.00	0.10	0.23	0.16
Centrosema virginianum	2.00	8.00	0.02	0.30	0.16
Croton capitatus	2.00	8.00	0.02	0.30	0.16
Oxalis dillenii	2.00	8.00	0.02	0.30	0.16
Fraxinus americana	15.50	4.00	0.17	0.15	0.16
Galactia regularis	4.00	6.00	0.04	0.23	0.14
Linum striatum	4.00	6.00	0.04	0.23	0.14
Symphyotrichum sp.	4.00	6.00	0.04	0.23	0.14
Chamaecrista fasciculata	1.50	6.00	0.02	0.23	0.12
Elymus canadensis	1.50	6.00	0.02	0.23	0.12
Gnaphalium sp.	1.50	6.00	0.02	0.23	0.12
Juncus sp.	1.50	6.00	0.02	0.23	0.12
Sanguinaria canadensis	1.50	6.00	0.02	0.23	0.12
Stylosanthes biflora	1.50	6.00	0.02	0.23	0.12
Coelorachis rugosa	15.00	2.00	0.17	0.08	0.12
Dichanthelium linearifolium	15.00	2.00	0.17	0.08	0.12
Fimbristylis autumnalis	15.00	2.00	0.17	0.08	0.12
Helianthus divaricatus	15.00	2.00	0.17	0.08	0.12
Muhlenbergia schreberi	15.00	2.00	0.17	0.08	0.12
Woodsia sp.	15.00	2.00	0.17	0.08	0.12
Aralia spinosa	6.00	4.00	0.07	0.15	0.11
Elephantopus carolinianus	6.00	4.00	0.07	0.15	0.11
Juncus scirpoides	6.00	4.00	0.07	0.15	0.11
Scleria sp.	6.00	4.00	0.07	0.15	0.11
Dichanthelium commutatum	3.50	4.00	0.04	0.15	0.09
Elymus sp.	3.50	4.00	0.04	0.15	0.09
Eupatorium perfoliatum	3.50	4.00	0.04	0.15	0.09
Eupatorium serotinum	3.50	4.00	0.04	0.15	0.09
Juncus marginatus	3.50	4.00	0.04	0.15	0.09
Solanum carolinense	3.50	4.00	0.04	0.15	0.09
Solidago ulmifolia	3.50	4.00	0.04	0.15	0.09
Unknown sedge	3.50	4.00	0.04	0.15	0.09
Carya glabra	1.00	4.00	0.01	0.15	0.08
Galium sp.	1.00	4.00	0.01	0.15	0.08
Hypericum sp.	1.00	4.00	0.01	0.15	0.08
Lobelia puberula	1.00	4.00	0.01	0.15	0.08
Ludwigia alternifolia	1.00	4.00	0.01	0.15	0.08
Oxalis stricta	1.00	4.00	0.01	0.15	0.08
Polyganum sp.	1.00	4.00	0.01	0.15	0.08
Quercus sp.	1.00	4.00	0.01	0.15	0.08
Unknown herb	1.00	4.00	0.01	0.15	0.08
Carex flaccosperma	3.00	2.00	0.03	0.08	0.05
Danthonia spicata	3.00	2.00	0.03	0.08	0.05
Desmodium paniculatum	3.00	2.00	0.03	0.08	0.05

Desmodium sessilifolium	3.00	2.00	0.03	0.08	0.05
diospe	3.00	2.00	0.03	0.08	0.05
Diodia virginiana	3.00	2.00	0.03	0.08	0.05
Eleocharis tenuis	3.00	2.00	0.03	0.08	0.05
Eupatorium sp.	3.00	2.00	0.03	0.08	0.05
Hibiscus lasiocarpos	3.00	2.00	0.03	0.08	0.05
Lespedeza virginica	3.00	2.00	0.03	0.08	0.05
Lycopus virginicus	3.00	2.00	0.03	0.08	0.05
Paspalum laeve	3.00	2.00	0.03	0.08	0.05
Paspalum sp.	3.00	2.00	0.03	0.08	0.05
Phytolacca americana	3.00	2.00	0.03	0.08	0.05
Quercus nigra	3.00	2.00	0.03	0.08	0.05
Rhynchospora corniculata	3.00	2.00	0.03	0.08	0.05
Rhynchospora sp.	3.00	2.00	0.03	0.08	0.05
Rosa setigera	3.00	2.00	0.03	0.08	0.05
Saccharum sp.	3.00	2.00	0.03	0.08	0.05
Sideroxylon lanuginosa	3.00	2.00	0.03	0.08	0.05
Smilax herbacea	3.00	2.00	0.03	0.08	0.05
Unknown vine	3.00	2.00	0.03	0.08	0.05
Vitis aestivalis	3.00	2.00	0.03	0.08	0.05
Xyris sp.	3.00	2.00	0.03	0.08	0.05
Ampelopsis arborea	0.50	2.00	0.01	0.08	0.04
Cirsium sp.	0.50	2.00	0.01	0.08	0.04
Conyza canadensis	0.50	2.00	0.01	0.08	0.04
Cornus florida	0.50	2.00	0.01	0.08	0.04
Crataegus spathulata	0.50	2.00	0.01	0.08	0.04
Desmodium sp.	0.50	2.00	0.01	0.08	0.04
Desmodium perplexum	0.50	2.00	0.01	0.08	0.04
Desmodium rotundifolium	0.50	2.00	0.01	0.08	0.04
Dichanthelium boscii	0.50	2.00	0.01	0.08	0.04
Eryngium prostratum	0.50	2.00	0.01	0.08	0.04
Euonymus americanus	0.50	2.00	0.01	0.08	0.04
Eupatorium altissimum	0.50	2.00	0.01	0.08	0.04
Unknown grass	0.50	2.00	0.01	0.08	0.04
Helenium flexuosum	0.50	2.00	0.01	0.08	0.04
Hieracium sp.	0.50	2.00	0.01	0.08	0.04
Hypericum drummondii	0.50	2.00	0.01	0.08	0.04
Hypericum gentianoides	0.50	2.00	0.01	0.08	0.04
Hypericum gymnanthum	0.50	2.00	0.01	0.08	0.04
Hypericum prolificum	0.50	2.00	0.01	0.08	0.04
Juncus interior	0.50	2.00	0.01	0.08	0.04
Lobelia puberula var. *mineolana*	0.50	2.00	0.01	0.08	0.04
Lycopus sp.	0.50	2.00	0.01	0.08	0.04
Physalis sp.	0.50	2.00	0.01	0.08	0.04

Podophyllum peltatum	0.50	2.00	0.01	0.08	0.04
Pycnanthemum muticum	0.50	2.00	0.01	0.08	0.04
Quercus velutina	0.50	2.00	0.01	0.08	0.04
Scutellaria ovata	0.50	2.00	0.01	0.08	0.04
Symphyotrichum patens	0.50	2.00	0.01	0.08	0.04
Symphyotrichum pilosum	0.50	2.00	0.01	0.08	0.04
Symphyotrichum praealtum	0.50	2.00	0.01	0.08	0.04
Trepocarpus aethuse	0.50	2.00	0.01	0.08	0.04
Unknown herb 3	0.50	2.00	0.01	0.08	0.04
Vernonia missurica	0.50	2.00	0.01	0.08	0.04
Vitis sp.	0.50	2.00	0.01	0.08	0.04
Totals	**9024.50**	**2654.00**	**100.00**	**100.00**	**100.00**

III. Blackland Prairie and Woodland Conservation Project—Weyerhaeuser Co.

BACKGROUND

The Blackland Prairie and Woodland Conservation Project study site, located in Howard County, AR, contains the highest quality limestone glades (blacklands) in the Upper West Gulf Coastal Plain ecoregion. This site is 6,800 acres of industrial pine forests owned and managed by Weyerhaeuser Corporation. The site is a matrix of timber stands ranging in age from 0 to 34 years. The goals of the project were to 1) restore fire to communities to enhance habitat quality for species of greatest conservation need and 2) to assess the presence of target plant and animal species in certain forest communities on Weyerhaeuser land and their relationship to conservation forestry practices and Weyerhaeuser plantation management practices. This report summarizes the restoration of prescribed fire to the site and lists the current or baseline condition of the biodiversity attributes for pine plantation and glade cover types.

HABITAT RESTORATION ACTIVITES

PRESCRIBED FIRE

A total of 908 acres and six restoration units were burned between fall 2008 and spring 2009 (map, Appendix A). Prescribed fires were conducted by The Nature Conservancy prescribed fire crew with assistance on some burns by Weyerhaeuser staff. All burns followed a written burn plan. Firelines were installed prior to burning where needed by The Nature Conservancy prescribed fire crew with assistance from Weyerhaeuser staff. Average burn unit coverage was 71%. Burn severity was typically light to moderate. The amount of coverage and light intensity has had a positive effect in the understory layer of the woodland, reducing leaf litter and allowing more light to penetrate the forest floor. The result is an increase in the herbaceous layer which will be beneficial to wildlife.

Table 1: Summary of prescribed burns at Weyerhaeuser project site –October 2008 to April 2009.

Unit #	Covertype	Acres	Date (Season)	Coverage	Intensity	Burn boss (App.)
4	Glade	10	March 2009	50%	light	Melnechuk
10	16-25 yr	150	March 2009	80%	light/moderate	Melnechuk (Strable)
11	16-25 yr	300	March 2009	84%	light	Melnechuk
5	16-25 yr/ glade	150	April 2009	80%	light	Melnechuk
8a/8b	16-25 yr	190	December 2009	57%	light	Melnechuk
Stone Rd. Glade NA	Pine savanna /glade	108	October 2008	75%	light	Melnechuk
Total: 6 burns		**Total: 908 ac.**		**Average: 71%**		

BASELINE MONITORING

Using GIS and stand data, we stratified the major forest cover types and randomly placed permanent plots within each cover type. The forest cover types are listed below. A map of the macroplots is located in Appendix B.

- Open – Post regeneration harvest until newly planted stand closes canopy. Ages 0-9
- Closed immature – Prior to 1st thinning. Ages 10-15
- Open immature – After thinning and prune. Ages 16-25
- Mature – Older than 25 to final harvest
- Blackland glade community

The first 25 macroplots were installed in March and April 2007 and the remaining 25 plots were installed in March 2008. Plot centers were marked with T-posts and the locations were recorded using a global positioning system. The permanent macroplots were used for all

biodiversity attribute monitoring. A figure of the macroplot sampling design is provided in Appendix C.

Plant Community Monitoring

Methods

Plant community monitoring was conducted on 9-10 July and 16-17 July 2007 and on 21-23 July 2008. During monitoring, all plant species occurring in macroplots were identified and recorded. Five macroplots were placed in each cover type using stratified random sampling. Within each macroplot, species in all forest levels (canopy, midstory, and understory) were recorded. All tree species within the macroplot were recorded and measured. Trees were defined as woody stems greater than one meter tall and greater than five centimeters in diameter-at-breast-height (dbh). Shrub and herb species were measured using nested plots; within the plots, species were recorded and a cover value (Table C1) was assigned to each species. Shrubs were defined as woody stems greater than one meter tall and less than five centimeters dbh; all woody stems less than one meter tall were counted in herbaceous plots. Monitoring information was compiled in two types of tables. The overview table, organized by forest cover type, includes total number of species (herbs, trees and shrubs), average number of species per herbaceous plot, average herbaceous cover, average tree species per plot, average shrub cover, basal area per acre, and tree stems per acre (Table 2). Summary tables were created for each strata (tree, shrub, and herb) in each cover type with the species sorted by importance value (Importance Value for herbs and shrubs = (relative frequency + relative cover)/ 2; Importance Value for trees = (relative frequency + relative cover + relative density)/3). Values for frequency, relative frequency, relative cover, relative density, and relative basal area were also listed for each species. Plant community summary tables are located in Appendix D.

Results

Cover type: Open 0-9 Years

The 0-9 year old cover type had 136 species total in the herbaceous layer and averaged 27.8 herbaceous species/plot (Table 2). Northern dewberry (*Rubus flagellaris*) and Canadian horseweed (*Conyza canadensis*) dominate the understory in these young stands. Other common species in the understory of this type are tapered rosette grass (*Dichanthelium acuminatum*), broomsedge (*Andropogon virginicus*), and annual ragweed (*Ambrosia artemisiifolia*). There are four species in the canopy and 16 species in the shrub layer with an average of only one tree species/plot. Loblolly pine (*Pinus taeda*) is the dominant tree species in this cover type. The other overstory species are winged elm (*Ulmus alata*), American holly (*Ilex opaca*), and southern red oak (*Quercus falcata*). Snags are also common. The shrub layer is dominated by loblolly pine and American beautyberry (*Callicarpa americana*). Other common shrub species include southern red oak, red maple (*Acer rubrum*), and winged elm.

Average woody stem density was very low with 60.1 stems/acre (trees only) and a basal area of 5.90 ft^2/acre (trees only). This low average is the result of very low numbers of trees in the 0-3 year stands. Shrub cover was low with an average of 25 percent total cover.

0-9 year old stand

Table 2. Plant community monitoring summary table by covertype for Weyerhaeuser project site, Howard County, AR, years 2007-08.					
Stand Type	**0-9**	**10-15**	**16-25**	**25+**	**Glade**
Average # ground layer species/plot	27.8	15.1	19.0	14.3	32.4
Total # ground layer species	136	64	101	73	108
Average ground layer cover (%)	72.5%	19.9%	48.6%	29.7%	92.9%
Total # tree species	4	14	27	21	13
Average. # tree species/plot	0.9	4.1	6.9	6.1	3.3
Total # shrub species	16	35	34	26	19
Average shrub cover (%)	25%	66.1%	57.6%	50%	9.7%
Stems/acre	60.1	850.5	311.4	335.0	88.6
Basal area/acre	5.90	116.3	59.8	99.3	11.6

Cover type: Closed immature 10-15 Years

The 10-15 year old cover type had 64 species total in the herbaceous layer and averaged 15.1 species/plot. Poison ivy (*Toxicodendron radicans*) dominates the understory in these closed stands. Other common species in the understory of this type are Virginia creeper (*Parthenocissus quinquefolia*), caric sedges (*Carex* spp.), American beautyberry, and longleaf woodoats (*Chasmanthium sessiliflorum*).


10-15 year old stand type

There are 14 species in the canopy and 35 species in the shrub layer, with an average of 4.1 tree species/plot. Loblolly pine is the dominant tree species in this cover type. Other overstory species include sweetgum (*Liquidambar styraciflua*), eastern redbud (*Cercis canadensis*), and winged elm. The shrub layer is dominated by American beautyberry. Other common shrub species include winged elm, sweetgum, and southern red oak. Average woody stem density is high with 850.5 stems/acre (trees only) and a basal area of 116.3 ft^2/acre (trees only). Shrub cover is also high with an average of 66.1 percent total cover.

Cover type: Open immature 16-25 Years

The 16-25 year old cover type had 101 species total in the herbaceous layer and averaged 19 species/plot. Poison ivy, longleaf woodoats, and roundleaf greenbrier (*Smilax rotundifolia*) dominate the understory in these mid-age stands. There are 27 species in the canopy and 34 species in the shrub layer, with an average of 6.9 tree species/plot. Loblolly pine is the dominant tree species in this cover type. Other common overstory species include eastern redbud, hophornbeam (*Ostrya virginiana*), and winged elm. The shrub layer is dominated by American beautyberry. Other common shrub species include white ash (*Fraxinus americana*), winged elm, and hophornbeam. Average woody stem density is lower than the 10-15 year stands, with 311.4 stems/acre (trees only) and a basal area of 59.8 ft^2/acre (trees only). Shrub cover was high with an average of 58 percent total cover.

16-25 year old stand type

Cover type: Mature 25+ Years

The 25+ year old cover type had 73 species total in the herbaceous layer and averaged 14.3 species/plot. Roundleaf greenbrier, muscadine (*Vitis rotundifolia*), poison ivy, longleaf woodoats, and rattan vine (*Berchemia scandens*) dominate the understory in these late stands.

25+ year old stand type

There are 21 species in the canopy and 26 species in the shrub layer with an average of 6.1 tree species/plot. Loblolly pine is the dominant tree species in this cover type. Other common overstory species include sweetgum and winged elm. The shrub layer is dominated by American beautyberry. Other common shrub species include sweetgum, American holly, and southern red oak. Average woody stem density is high, with 335.4 stems/acre (trees only) and a basal area of 99.3 ft^2/acre (trees only). Shrub cover was high with an average of 50 percent total cover.

Cover type: Blackland glade

The glade cover type is diverse with an average of 32.4 species/plot and a total of 108 species herbaceous layer. Little bluestem (*Schizachyrium scoparium*) and Missouri orange coneflower (*Rudbeckia missouriensis*) dominate the understory in these open glades. Other common species in the understory are dropseed (*Sporobolus* spp.), purple prairie clover (*Dalea purpurea*), and pale purple coneflower (*Echinacea pallida*). There are 13 species in the canopy and 19 species in the shrub layer, with an average of 3.3 tree species/plot. Loblolly pine (*Pinus taeda*) is the dominant tree species in this cover type and is mainly present on the periphery of the glade complexes. Eastern red cedar (*Juniperus virginiana*) is frequent and encroaching. Other common overstory species within the glades are chinquapin oak (*Quercus muehlenbergii*), and eastern redbud. The shrub layer is dominated by eastern redbud and possumhaw (*Ilex decidua*). Other common shrub species include persimmon (*Diospyros virginiana*) and eastern red cedar. Average woody stem density was low with 88.6 stems/acre (trees only) and a basal area of 11.6

Glade community

ft^2/acre (trees only). Shrub cover was also low with an average of 9.7 percent total cover. Several species of conservation concern were identified in the glade community (Table 3).

Table 3. Plant species of conservation concern identified during community monitoring at Weyerhaeuser project site, Howard Co., AR. 2007-08.

Scientific name	Common name	Cover type
Andropogon gerardii	big bluestem	Glade
Carya myristiciformis	nutmeg hickory	16-25 year stand and glade
Echinacea pallida	pale purple coneflower	Glade
*Lithospermum tuberosum**	Tuberous stoneseed	10-15 year stand
Melica mutica	two-flowered melicgrass	0-9 year stand and glade
Silphium laciniatum	compass plant	Glade
Sorghastrum nutans	Indian grass	Glade

* species tracked by ANHC

Discussion

The 0-9 year old covertype has a high diversity in the ground layer, with a total of 136 species. These stands have very few trees and a low shrub cover, allowing more light to reach the ground. As the planted trees grow into the next age class, the canopy closes and the diversity in the ground layer diminishes significantly. The 10-15 year old covertype is the least diverse, with only 64 species recorded in the ground layer. These stands are very dense with a closed canopy and a high amount of shrub cover. The result is very low ground cover. The 16-25 year old stands have a more open canopy and a more diverse ground layer. As they proceed to the next age class, the canopy once again becomes more closed. The 25+ year old covertype has a low percentage of ground cover and a high percentage of shrub cover. Diversity in the ground layer is medium.

The glades are very diverse with an average of over 30 species per plot. The glades are being encroached by cedar and other woody stems. Continued fire and removal of cedar and other trees would increase the quality of the glades.

Reference Conditions

Monitoring data from the first year of sampling were used to compare current condition to a reference condition for the upland pine forest community. Detailed community descriptions and reference conditions were developed and modeled by regional experts during LANDFIRE National Workshops. The reference landscape was modeled using a state-and-transition modeling software called Vegetation Dynamics Development Tool (VDDT). Each state within the model is a seral stage. Seral stages are user defined based on the age and canopy closure of the stands and are assigned a letter A-E (i.e., A = early seral; B = mid-seral closed; C = mid-seral open; D = late-seral open; E = late-seral closed). Detailed definitions of each seral stage are described below.

A: early seral = Opening with herbaceous cover and/or seedling to 10' tall. Shrubs present and may provide up to 100% cover. Opening can be semi-persistent with regular fire, seedling less than 15 years old. Scattered old or large trees may be present, basal area less than 14 square feet per acre. Large snags present; 1-10 greater than 8" dbh per acre. Large downed woody debris present; 1-10 great than 8" dbh per acre. The glade community can resemble the early seral stage, but because the vegetation is largely edaphically controlled, especially with regular fire, glades can persist indefinitely.

B: mid-seral closed = Crown cover greater than 70%, depauperate herbaceous layer, shrubs few. Pine and oak saplings to pole size trees. Ages range from 15-40 years. Basal area greater than 100 square feet per acre. Oak component less than 70% of basal

area. Scattered older/large trees may be present, less than 14 BA. Snags few; less than 1 greater than 8" dbh. Large woody debris less than 1 greater than 8" dbh per acre.

C: mid-seral open = Crown cover less than 70%, herbaceous cover greater than 70%, shrubs present to 30% cover. Pine and oak saplings to pole size trees. Ages range from 15-25. Basal area less than 100 square feet per acre. Oak component less than 70% of basal area. Scattered older/large trees may be present, less than 14 BA. Snags present; 1-3 greater than 8" dbh. Large woody debris 1 - 3 greater than 8" dbh per acre.

D: late-seral open = Crown cover less than 70%, herbaceous cover greater than 70%, shrubs present to 30% cover. Pine and oak trees greater than 18" dbh; 10% of stems greater than 24" dbh. Ages range from 25-200+ years. Basal area less than 100 square feet per acre. Oak component less than 70% of basal area. Large pine emergent where oak present. No midstory. Scattered older/large trees present (greater than 30" dbh and/or 250 years old). Large snags present; 1-10 greater than 8" dbh per acre. Large downed woody debris present; 1-10 great than 8" dbh per acre.

E: late-seral closed = Crown cover greater than 70%, herbaceous cover depauperate, shrubs few. Pine and oak trees greater than 18" dbh; 10% of stems greater than 24" dbh. Ages range from 25-200+ years. Basal area greater than 100 square feet per acre. Oak component less than 70% of basal area. Large pine emergent where oak present. Midstory present. Scattered older/large trees present (greater than 30" dbh and/or 250 years old). Large snags present; 1-10 greater than 8" dbh per acre. Large downed woody debris present; 1-10 great than 8" dbh per acre.

Transition inputs were determined based on expert opinion and historical accounts. Reference plant community structure and composition strongly influenced by fire. Fire regime is an important set of inputs to the model. Other important disturbance types include insect and disease outbreaks, ice storms, and windthrow. The historical range of variation in fire regime is as follows.

a. frequency: 2-5 years
b. severity: mild to moderate
c. intensity: mile to moderate
d. seasonality: late spring, late summer, fall.
e. size/pattern: medium to large (1000 - 10,000 acres), coverage 60%-90%.
f. type: surface

The outputs of the model represent the historic range of variation in structure and composition of the Upper West Gulf Coastal Plain Upland Pine Forest plant community (Appendix E). One of the most useful outputs of the model is the percent of each seral stage across the reference landscape (Table 4).

Table 4. Percent of each seral stage across the landscape in the reference condition.

Seral Stage	Definition of each seral stage	Percent across the landscape
A	early seral	5% - 10%
B	mid-seral closed	5% - 10%
C	mid-seral open	20% - 25%
D	late seral open	50% - 70%
E	late seral closed	5% – 10%

Ecological Assessment—Departure of current conditions from reference conditions

Measuring departure of current conditions from reference conditions can help formulate desired ecological conditions and guide forest management. The results from the first year of plant community monitoring were used to determine the percentage of the Weyerhaeuser Blackland Restoration Area in each landscape seral stage (A-E). These amounts were compared

to the reference conditions from the VDDT model (Figure 1). The glades are not included in the comparison because they represent a different plant community.

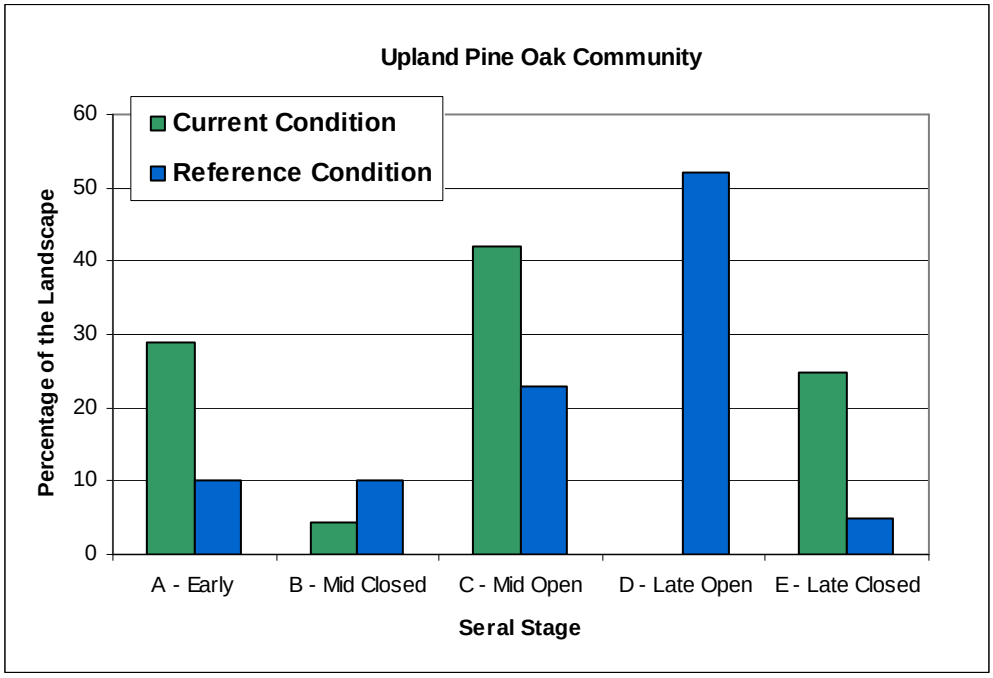


Figure 1. Comparison of current conditions and reference conditions in the Upper West Gulf Coastal Plain Upland Pine Forest plant community.

The current condition is dominated by mid-open seral (C), early seral (A), and late-closed seral stages (E). Conversely, the reference condition was dominated by open stages, with over 50% in late-open (D). These differences are the result of management practices. For example, Weyerhaeuser management is directed towards producing short rotation, sawlog timber. This management strategy employs the utilization of lower seedling densities than is normally used in southern pine plantations. The majority of southern pine plantations use planting densities that equates to 806 seedlings per acre. Weyerhaeuser is planting on a 10ft X 10ft seedling spacing that produces a normal seedling density of 436, much lower than the average southern pine plantation. The reduction in planting density combined with intensive site preparation and on-

going herbicide use throughout the rotation tends to direct the forest structure towards the mid-open seral stage (C).

The reference condition promotes the highest level of diversity (Table 5) because open canopy forest plots average a higher number of species than closed canopy plots, especially when combined with prescribed fire. The open canopy plots also contain a mix of grass and forb species (Table 6) and plant species of conservation concern in this community.

Table 5. Average number of herbaceous species per plot in open and closed forests.

Open	**Closed**
25	13

Table 6. Herbaceous composition of open and closed forests by importance value (IV).

Open	Importance Value	Closed	Importance Value
Chasmanthium sessiliflorum	9.4	*Vitis rotundifolia*	9.6
Toxicodendron radicans	6.2	*Toxicodendron radicans*	9.1
Carex cherokeensis	4.4	*Smilax rotundifolia*	5.8
Rubus flagellaris	4.4	*Callicarpa Americana*	4.9
Senecio obovatus	4.3	*Carex* sp.	4.6

Where conservation is an objective forestry practices that promote open canopy forests and prescribed burning are important for species diversity and habitat in the pine ecosystems of the Upper West Gulf Coastal Plain.

Avian Community Monitoring

Methods

Birds were surveyed using a modified point-count method. Bird presence was recorded by species in distance bands of 10 m intervals. Distance intervals began at 0-10 m and went through 90-100 m. Categories for species occurring over 100 m away within the stand type and for flyovers were also used to record species. Surveys were conducted between 06:00 and 10:00

h to coincide with peak singing activity for the majority of bird species. Surveys were a 10 min period duration with an initial wait period of three minutes from time of arriving to the point to the beginning of recording to allow disturbed birds to return to normal behavior. All birds seen or heard during the survey were recorded.

Birds were surveyed at the 50 established points used for plant community monitoring within all five cover types. Each point was surveyed twice per year. The first 25 points were surveyed on 17-18 May and 5-6 June 2007 and the remaining 25 points were surveyed on 29 May and 18 June 2008. Species richness, relative frequency, and diversity (Shannon index) of birds were calculated for each stand type. Only birds observed within 100m were used for community summaries and analyses.

Results

A total of 1,515 individuals of 72 species (including flyovers and species more than 100 m away) were detected over the 2 year period (Table 7). For all birds within 100 meters of the sampling point, a total of 1309 individuals of 63 species were observed. Species richness ranged from 34 species in the 10-15 year old stands to 44 species in the 0-9 year old stands (Table 8). Diversity (expressed as H′) was greatest in the 10-15 year old stand type. Three species observed are currently tracked by the Arkansas Natural Heritage Commission and several others are listed as species of greatest conservation need in the Arkansas Wildlife Action Plan (Table 9). A complete list of bird species for each community type is provided in Appendix F.

Glade community

A total of 170 individuals representing 35 species were recorded in the glade community. The most frequent species encountered was the Northern Cardinal (*Cardinalis cardinalis*), followed by the Yellow-breasted Chat (*Icteria virens*), and the Red-eyed Vireo (*Vireo*

olivaceous). Indigo buntings (*Passerina cyanea*) and White-eyed Vireos were also fairly common. Species of importance observed in the glade community were the Bewick's Wren (*Thryomanes bewickii*) and the Chestnut-sided Warbler (*Dendroica pensylvanica*). Both species are tracked by the Arkansas Natural Heritage Commission.

0-9 year old stand

A total of 387 individuals representing 44 species were recorded in the 0-9 year old stand. The most frequent species was the Yellow-breasted Chat, accounting for 17% of individuals. Other frequently encountered species were the Indigo Bunting (*Passerina cyanea*), the Prairie Warbler (*Dendroica discolor*), and the Common Yellowthroat (*Geothlypis trichas*). Species unique to the 0-9 year old stand type were the Red-headed Woodpecker (*Melanerpes erythrocephalus*), Blue-winged Warbler (*Vermivora pinus*), Grasshopper Sparrow (*Ammodramus savannarum*), and Painted Bunting (*Passerina ciris*).

10-15 old year stand

A total of 163 individuals representing 34 species were recorded in the 10-15 year old stand type. The most frequently encountered species was the Northern Cardinal, followed by the Yellow-breasted Chat, White-eyed Vireo, and Red-eyed Vireo. This covertype had the highest diversity of breeding birds and a high frequency of shrub-nesting birds.

16-25 year old stand

A total of 287 individuals representing 37 species were recorded in the 16-25 year old stand type. The most frequent species was the Yellow-breasted Chat, the Northern Cardinal, and the White-eyed Vireo. Species of conservation concern observed in this stand include the Northern Bobwhite, Wood Thrush, and Swainson's Warbler (Table 9).

25+ year stand

A total of 302 individuals representing 37 species were recorded in the 25+ year stands. The most common species was the Yellow-breasted Chat, followed by the Northern Cardinal, the White-eyed Vireo, and the Pine Warbler (*Dendroica pinus*). Species only observed in this stand type were the Ruby-throated Hummingbird (*Archilochus colubris*), the Northern Mockingbird (*Mimus polyglottos*), and the Warbling Vireo (*Vireo gilvus*).

Table 7. Number of individuals and relative frequency of avian species recorded during spring 2007 and 2008 at Weyerhaeuser Company project site, Howard County, Arkansas.

Common Name	Scientific Name	Number	Relative Frequency
Yellow-breasted Chat	*Icteria virens*	198	13.07
American Crow	*Corvus brachyrhynchos*	142	9.37
Northern Cardinal	*Cardinalis cardinalis*	133	8.78
Indigo Bunting	*Passerina cyanea*	117	7.72
White-eyed Vireo	*Vireo griseus*	93	6.14
Red-eyed Vireo	*Vireo olivaceous*	68	4.49
Prairie Warbler	*Dendroica discolor*	64	4.22
Mourning Dove	*Zenaida macroura*	60	3.96
Hooded Warbler	*Wilsonia citrina*	50	3.30
Pine Warbler	*Dendroica pinus*	50	3.30
Common Yellowthroat	*Geothlypis trichas*	47	3.10
Carolina Wren	*Thryothorus ludovicianus*	46	3.04
Kentucky Warbler	*Oporornis formosus*	42	2.77
Yellow-billed Cuckoo	*Coccyzus americanus*	33	2.18
Summer Tanager	*Piranga rubra*	31	2.05
Black-and-white Warbler	*Mniotilta varia*	23	1.52
Blue Jay	*Cyanocitta cristata*	23	1.52
Carolina Chickadee	*Poecile carolinensis*	23	1.52
Tufted Titmouse	*Baeolophus bicolor*	22	1.45
Blue-gray Gnatcatcher	*Polioptila caerulea*	20	1.32
Worm-eating Warbler	*Helmitheros vermivorum*	20	1.32
Field Sparrow	*Spizella pusilla*	17	1.12
Pileated Woodpecker	*Dryocopus pileatus*	17	1.12
Eastern Wood-Pewee	*Contopus virens*	14	0.92
Eastern Towhee	*Pipilo erythrophthalmus*	11	0.73
Great Crested Flycatcher	*Myiarchus crinitus*	11	0.73
Brown-headed Cowbird	*Molothrus ater*	10	0.66
Wood Thrush	*Hylocichla mustelina*	10	0.66

Acadian Flycatcher	*Empidonax virescens*	9	0.59
Blue Grosbeak	*Passerina caerulea*	8	0.53
Eastern Bluebird	*Sialia sialis*	8	0.53
Louisiana Waterthrush	*Seiurus motacilla*	8	0.53
Northern Bobwhite	*Colinus virginianus*	8	0.53
Cattle Egret*	*Bubulcus ibis*	7	0.46
Northern Parula	*Parula americana*	6	0.40
Red-bellied Woodpecker	*Melanerpes carolinus*	6	0.40
Northern Flicker	*Colaptes auratus*	5	0.33
Brown Thrasher	*Toxostoma rufum*	3	0.20
Fish Crow	*Corvus ossifragus*	3	0.20
Little Blue Heron	*Egretta caerulea*	3	0.20
Turkey Vulture	*Cathartes aura*	3	0.20
Wild Turkey	*Meleagris gallopavo*	3	0.20
Yellow-throated Vireo	*Vireo flavifrons*	3	0.20
Barn Swallow	*Hirundo rustica*	2	0.13
Brown-headed Nuthatch	*Sitta pusilla*	2	0.13
Chuck-will's-widow	*Caprimulgus carolinensis*	2	0.13
Eastern Phoebe	*Sayornis phoebe*	2	0.13
Gray Catbird	*Dumetella carolinensis*	2	0.13
Orchard Oriole	*Icterus spurius*	2	0.13
Red-shouldered Hawk**	*Buteo lineatus*	2	0.13
Ruby-throated Hummingbird	*Archilochus colubris*	2	0.13
Swainson's Warbler	*Limnothylpis swainsonii*	2	0.13
White-breasted Nuthatch	*Sitta carolinensis*	2	0.13
American Kestrel*	*Falco sparverius*	1	0.07
Barred Owl**	*Strix varia*	1	0.07
Bewick's Wren	*Thryomanes bewickii*	1	0.07
Broad-winged Hawk	*Buteo platypterus*	1	0.07
Blue-winged Warbler	*Vermivora pinus*	1	0.07
Chestnut-sided Warbler	*Dendroica pensylvanica*	1	0.07
Downy Woodpecker	*Picoides pubescens*	1	0.07
Grasshopper Sparrow	*Ammodramus savannarum*	1	0.07
Hairy Woodpecker	*Picoides villosus*	1	0.07
Northern Mockingbird	*Mimus polyglottos*	1	0.07
Painted Bunting	*Passerina ciris*	1	0.07
Red-headed Woodpecker	*Melanerpes erythrocephalus*	1	0.07
Red-tailed Hawk**	*Buteo jamaicensis*	1	0.07
Scissor-tailed Flycatcher	*Tyrannus forficatus*	1	0.07
Snowy Egret*	*Egretta thula*	1	0.07
Unidentified Warbler		1	0.07
Warbling Vireo	*Vireo gilvus*	1	0.07

*flyover
** >100m

Table 8. Species richness, number of individuals, and diversity of birds observed in five stand types at Weyerhaeuser Company project site, Howard County, Arkansas (includes only birds within 100 m of plot).

	Glade	0-9	10-15	16-25	25+
Number of points sampled	8	12	7	12	11
Species richness	35	44	34	37	37
Number of individuals	170	387	163	287	302
Diversity (H′)	3.09	2.99	3.22	3.03	3.12

Table 9. Avian species of conservation concern observed at Weyerhaeuser Company project site, Howard County, Arkansas during springs 2007-08.

Species	Glade	0-9	10-15	16-25	25+
Northern Bobwhite*				X	X
Yellow-billed Cuckoo*	X	X	X	X	X
Chuck-will's-widow*			X		
Red-headed Woodpecker*		X			
Bewick's Wren†*	X				
Wood Thrush*				X	X
Eastern Towhee*	X		X		X
Blue-winged Warbler*		X			
Prairie Warbler*	X	X	X	X	X
Chestnut-sided Warbler†	X				
Hooded Warbler*	X	X	X	X	X
Swainson's Warbler†*			X	X	
Kentucky Warbler*		X	X	X	X
Worm-eating Warbler*	X		X	X	X

†Species tracked by Arkansas Natural Heritage Commission

*Species deemed as species of greatest conservation need by Arkansas Wildlife Action Plan

Discussion

The matrix of forest covertypes at the project site provides habitat for a large variety of resident and breeding birds. Breeding bird populations at the site appear healthy. The highest number of species was recorded from the 0-9 year covertype. Birds in this covertype are more easily visible and auditory cues are less likely to be obstructed by dense vegetation, making the

probability of detection higher. Diversity was highest in the 10-15 year covertype. The 10-15 yr covertype is a dense thicket of pine, 10-20 feet in height, which provides ample cover and structure for breeding birds. The most frequent species in this covertype were shrub-nesters (N. Cardinal, White-eyed Vireo, Yellow-breasted Chat).

Several species of concern were observed across the project area. Swainson's Warblers were consistently observed at macroplots 48, 49, and 50. These 3 macroplots are located in the 16-25 yr stand type and are characterized by a pine overstory with a dense hardwood understory. A small amount of giant cane (*Arundinaria gigantea*), important as breeding cover for the species, was also present in the understory. In order to provide more suitable habitat for this declining species, the hardwood understory should be maintained. This would involve excluding these stands from herbicide applications. A selective thin would open the overstory and allow more light penetration to the understory and would increase the density and cover of cane, increasing available breeding cover.

Herpetofauna Community Surveys

Methods

Area-constrained searches for herpetofauna were conducted at a subset of macroplots during spring/summer 2007 and 2008. We systematically searched a 10 m radius circular perimeter around the plot center. All logs, rocks, etc. were carefully lifted and replaced during the searches.

Coverboards were installed on 31 March 2008 to increase our chances of detecting individuals. Coverboards were placed at a randomly selected subset of macroplots (20) for each stand type (map, Appendix G). Coverboards were made of 4' x 2' untreated plywood. Two coverboards were placed at each macroplot at randomly selected azimuths 15 m from the

macroplot center. One coverboard was placed directly on top of existing vegetation. The ground was cleared of vegetation for the second coverboard. This was done to attract both amphibians (cleared ground) and reptiles. Coverboards were checked on 28 May, 18 June, and 21 July 2008 and again on 22 and 23 July 2009. Captured herps were identified and released on site.

Opportunistic sightings of herps within plots during other monitoring (bird surveys, plant community) and during travel between plots were also recorded and applied to a species list and species richness data.

Results

We conducted area searches at a subset 20 macroplots during spring and summer of years 2007-08. A total of 18 individuals of 13 species were captured. Area searches resulted in the capture of 8 individuals (Table 10). Half of these were captured within the 0-9 yr old stand type.

Few herps were captured with the use of coverboards (n = 4). All 4 captures were ground skinks (*Scincella lateralis*) and all were captured in glade communities. Also, coverboard captures only occurred under coverboards that had been cleared of vegetation.


Three-toed box turtle


American toad

Table 10. Herptile species captured at Weyerhaeuser Company project site, Howard County, AR, during spring/summer 2007-2009.			
Species	**Month/Year**	**Macroplot #**	**Community**
AREA SEARCHES			
Western pigmy rattlesnake (*Sisturus miliarius streckeri*)	May 2008	32	0-9 yr stand
Black rat snake (*Elaphe obsoleta obsoleta*)	May 2008	32	0-9 yr stand
Black Racer (*Coluber constrictor*)	June 2008	8	glade
Fence Lizard (*Sceloporus undulatus*)	June 2008	40	0-9 yr stand
Three-toed box turtle (*Terrapene carolina triunguis*)	July 2009	8	glade
American Toad (*Bufo americanus*)	July 2008	39	0-9 yr stand
American Toad (*Bufo americanus*)	July 2009	48	16-25 yr stand
Upland chorus frog (*Pseudacris triseriata feriarum*)	July 2009	11	16-25 yr stand
COVERBOARDS			
Ground skink (*Scincella lateralis*)	May 2008	27	glade
Ground skink (*Scincella lateralis*)	June 2008	27	glade
Ground skink (*Scincella lateralis*)	June 2008	8	glade
Ground skink (*Scincella lateralis*)	July 2009	27	glade
OPPORTUNISTIC OBSERVATIONS			
Species	**Month/Year**	**Location**	
Western pigmy rattlesnake (*Sisturus miliarius streckeri*)	July 2008	On road, near macroplot 4	
Timber rattlesnake (*Crotalus horridus*)	July 2007	On road, near macroplot 30	
Western cottonmouth (*Agkistrodon piscivorus leucostoma*)	May 2007	Roadside ditch	
Three-toed box turtle (*Terrapene carolina triunguis*)	July 2009	Roadside	
Gray treefrog (*Hyla sp.*)	June 2007	Near macroplot 17	
Spring peeper (*Pseudacris crucifer*)	June 2007	Clearcut at N. end of unit	

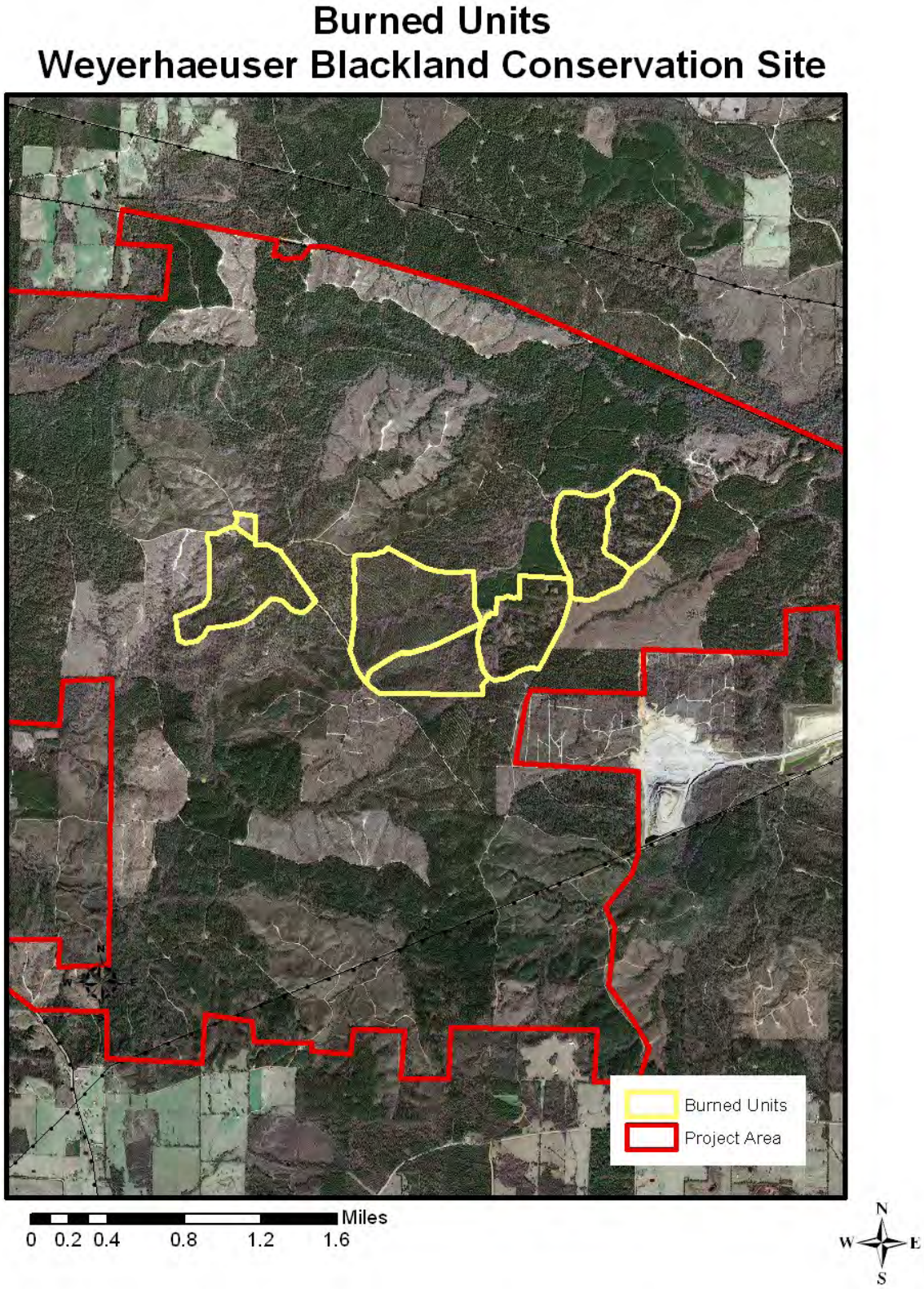
Discussion

Only a small number of species were detected across the project site, therefore conclusions cannot be made regarding the structure or health of herptile communities. The low capture rate is most likely due to the passive nature of the sampling techniques. Area searches were most successful in yielding captures (44% of captures). Coverboards were the least effective method. The majority of coverboards were infested with fire ants, scorpions, and

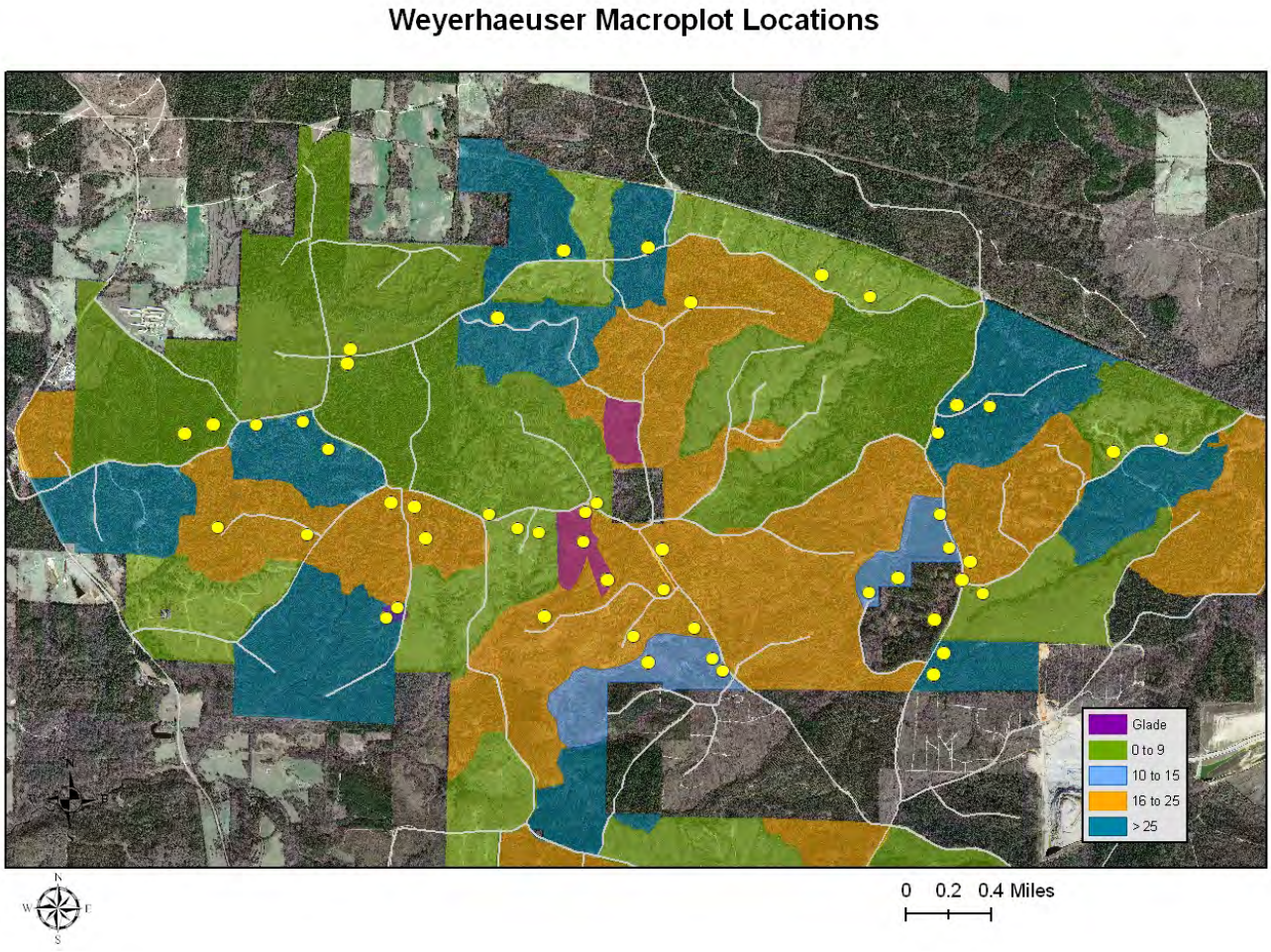
various species of spiders. Also, some coverboards were damaged by rodents and termites (Figure 2). A more intense search effort, utilizing drift fence and pitfall arrays, is needed characterize reptile and amphibian communities at the site.

Figure 2. Coverboard damage due to rodents and/or termites.

APPENDIX A.


Burned Units
Weyerhaeuser Blackland Conservation Site
Burned Units
Project Area
Miles
0 0.2 0.4 0.8 1.2 1.6
N
W
E
S

APPENDIX B. Map of macroplot locations used for monitoring at Weyerhaeuser Project Site, Howard County, AR.



APPENDIX C. PLANT COMMUNITY MONITORING MACROPLOT DESIGN

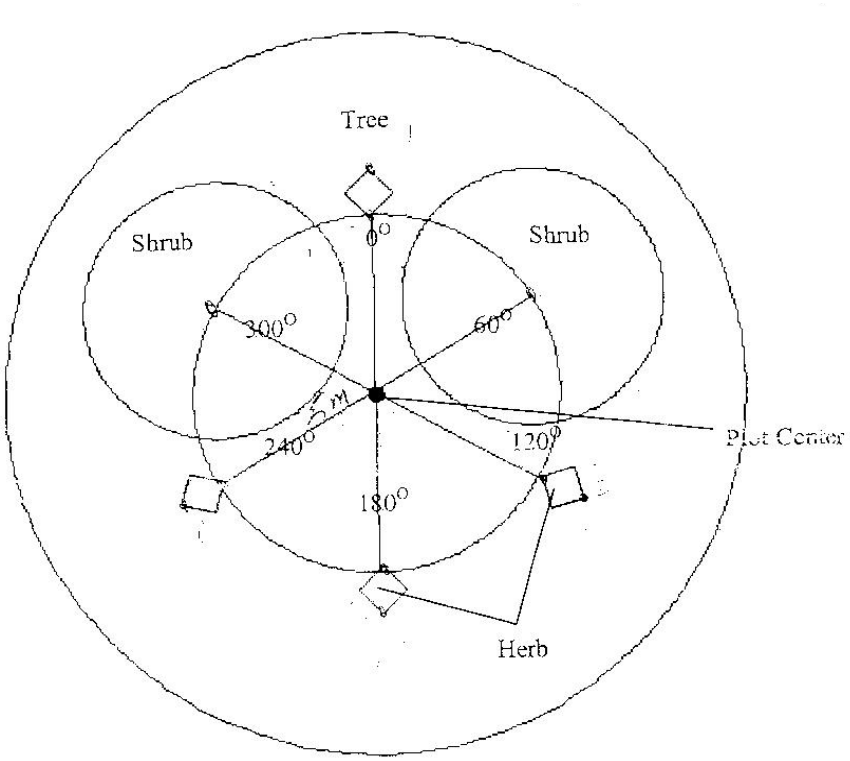


Table C1. Cover classes, class ranges, and class midpoints used in herbaceous vegetation sampling.

Cover Class	Cover range	Range midpoint
Class 1	0 - 1 %	0.5 %
Class 2	1 - 5%	3.0 %
Class 3	5 - 25%	15.0%
Class 4	25 - 50%	37.5%
Class 5	50 - 75%	62.5%
Class 6	75 - 95%	85%
Class 7	95 - 100%	97.5%

Table C2. Cover classes, class ranges, and class midpoints used for shrub layer data.

Cover Class	Cover range	Range midpoint
Class 1	0 - 25 %	12.5 %
Class 2	25-50%	37.5 %
Class 3	50 - 75%	62.5%
Class 4	75 - 100%	87.5%

APPENDIX D. Vegetation data by strata and community type for Weyerhaeuser project site, Howard Co., AR (non-native species in bold font).

Table D1: Total cover, frequency, relative cover, relative frequency, and importance value of ground layer plant species at Weyerhaeuser project site, 0-9 yr old covertype, 2007-08.

Species	Total Cover	Frequency	Relative Cover	Relative Frequency	Importance Value
Rubus flagellaris	362.00	191.67	10.40	4.63	7.51
Conyza canadensis	317.00	191.67	9.11	4.63	6.87
Dichanthelium acuminatum	213.00	141.67	6.12	3.42	4.77
Andropogon virginicus	195.50	150.00	5.62	3.62	4.62
Ambrosia artemisiifolia	175.00	133.33	5.03	3.22	4.12
Dichanthelium dichotomum	215.50	83.33	6.19	2.01	4.10
Dichanthelium laxiflorum	141.00	141.67	4.05	3.42	3.74
Dichanthelium scoparium	128.00	75.00	3.68	1.81	2.74
Scleria oligantha	51.50	125.00	1.48	3.02	2.25
Vitis rotundifolia	86.00	75.00	2.47	1.81	2.14
Solidago ulmifolia	118.00	33.33	3.39	0.80	2.10
Smilax rotundifolia	58.50	83.33	1.68	2.01	1.85
Callicarpa americana	72.50	66.67	2.08	1.61	1.85
Rudbeckia missouriensis	58.00	75.00	1.67	1.81	1.74
Dichanthelium acicular	81.50	41.67	2.34	1.01	1.67
Eupatorium serotinum	23.50	100.00	0.67	2.41	1.54
Galactia regularis	30.00	91.67	0.86	2.21	1.54
Phytolacca americana	85.50	16.67	2.46	0.40	1.43
Carex meadii	70.50	33.33	2.02	0.80	1.41
Lonicera japonica	70.50	33.33	2.02	0.80	1.41
Berchemia scandens	40.50	66.67	1.16	1.61	1.39
Chasmanthium sessiliflorum	49.00	50.00	1.41	1.21	1.31
Lespedeza repens	49.50	41.67	1.42	1.01	1.21
Carex sp.	40.00	50.00	1.15	1.21	1.18
Dichanthelium commutatum	39.50	50.00	1.13	1.21	1.17
Solanum carolinense	30.50	58.33	0.88	1.41	1.14
Dichanthelium polyanthes	14.00	66.67	0.40	1.61	1.01
Eupatorium perfoliatum	34.00	41.67	0.98	1.01	0.99
Pinus taeda	22.50	50.00	0.65	1.21	0.93
Parthenocissus quinquefolia	20.00	50.00	0.57	1.21	0.89
Schizachyrium scoparium	41.00	25.00	1.18	0.60	0.89
Solidago canadensis	24.50	41.67	0.70	1.01	0.85
Oxalis dillenii	6.00	58.33	0.17	1.41	0.79
Eragrostis sp.	40.50	16.67	1.16	0.40	0.78
Erechtites hieraciifolia	10.50	50.00	0.30	1.21	0.75
Helianthus divaricatus	24.00	33.33	0.69	0.80	0.75
Stenaria nigricans	38.00	16.67	1.09	0.40	0.75
Cirsium sp.	8.00	50.00	0.23	1.21	0.72
Clitoria mariana	7.50	41.67	0.22	1.01	0.61
Croton capitatus	5.00	41.67	0.14	1.01	0.57
Dichanthelium linearifolium	12.00	33.33	0.34	0.80	0.57
Hypericum hypericoides	18.50	25.00	0.53	0.60	0.57

Toxicodendron radicans	9.50	33.33	0.27	0.80	0.54
Diodia teres	4.50	33.33	0.13	0.80	0.47
Galium pilosum	4.50	33.33	0.13	0.80	0.47
Polypremum procumbens	4.50	33.33	0.13	0.80	0.47
Rubus trivialis	4.50	33.33	0.13	0.80	0.47
Smilax bona-nox	4.50	33.33	0.13	0.80	0.47
Rubus argutus	18.00	16.67	0.52	0.40	0.46
Gnaphalium sp.	2.00	33.33	0.06	0.80	0.43
Hypericum crux-andreae	2.00	33.33	0.06	0.80	0.43
Smilax glauca	2.00	33.33	0.06	0.80	0.43
Solidago sp.	15.50	16.67	0.45	0.40	0.42
Oxalis sp.	6.50	25.00	0.19	0.60	0.40
Salvia lyrata	6.50	25.00	0.19	0.60	0.40
Boltonia diffusa	4.00	25.00	0.11	0.60	0.36
Digitaria ischaemum	1.50	25.00	0.04	0.60	0.32
Conoclinium coelestinum	15.00	8.33	0.43	0.20	0.32
Dioscorea villosa	15.00	8.33	0.43	0.20	0.32
Juncus diffusissimus	15.00	8.33	0.43	0.20	0.32
Juncus scirpoides	15.00	8.33	0.43	0.20	0.32
Pycnanthemum tenuifolium	15.00	8.33	0.43	0.20	0.32
Rubus sp.	15.00	8.33	0.43	0.20	0.32
Vaccinium pallidum	15.00	8.33	0.43	0.20	0.32
Carex cherokeensis	6.00	16.67	0.17	0.40	0.29
Carya glabra	6.00	16.67	0.17	0.40	0.29
Chamaecrista fasciculata	6.00	16.67	0.17	0.40	0.29
Clematis sp.	6.00	16.67	0.17	0.40	0.29
Paspalum laeve	6.00	16.67	0.17	0.40	0.29
Quercus falcata	6.00	16.67	0.17	0.40	0.29
Tridens flavus	6.00	16.67	0.17	0.40	0.29
Helianthus angustifolius	3.50	16.67	0.10	0.40	0.25
Juncus coriaceus	3.50	16.67	0.10	0.40	0.25
Panicum anceps	3.50	16.67	0.10	0.40	0.25
Pteridium aquilinum	3.50	16.67	0.10	0.40	0.25
Setaria sp.	3.50	16.67	0.10	0.40	0.25
Smilax herbacea	3.50	16.67	0.10	0.40	0.25
Ulmus alata	3.50	16.67	0.10	0.40	0.25
Unknown grass	3.50	16.67	0.10	0.40	0.25
Vicia sp.	3.50	16.67	0.10	0.40	0.25
Viola sp.	3.50	16.67	0.10	0.40	0.25
Acalypha gracilens	1.00	16.67	0.03	0.40	0.22
Antennaria sp.	1.00	16.67	0.03	0.40	0.22
Croton glandulosus	1.00	16.67	0.03	0.40	0.22
Daucus carota	1.00	16.67	0.03	0.40	0.22
Gaura longiflora	1.00	16.67	0.03	0.40	0.22
Juncus dichotomus	1.00	16.67	0.03	0.40	0.22
Oxalis stricta	1.00	16.67	0.03	0.40	0.22
Rhynchospora sp.	1.00	16.67	0.03	0.40	0.22

Acer rubrum	3.00	8.33	0.09	0.20	0.14
Ambrosia bidentata	3.00	8.33	0.09	0.20	0.14
Baptisia bracteata	3.00	8.33	0.09	0.20	0.14
Bouteloua curtipendula	3.00	8.33	0.09	0.20	0.14
Carya tomentosa	3.00	8.33	0.09	0.20	0.14
Croton willdenowii	3.00	8.33	0.09	0.20	0.14
Cyperus sp.	3.00	8.33	0.09	0.20	0.14
Desmodium laevigatum	3.00	8.33	0.09	0.20	0.14
Desmodium nuttallii	3.00	8.33	0.09	0.20	0.14
Erianthis sp.	3.00	8.33	0.09	0.20	0.14
Galium circaezans	3.00	8.33	0.09	0.20	0.14
Helianthus silphioides	3.00	8.33	0.09	0.20	0.14
Lactuca floridana	3.00	8.33	0.09	0.20	0.14
Lespedeza virginica	3.00	8.33	0.09	0.20	0.14
Melica mutica	3.00	8.33	0.09	0.20	0.14
Mimosa quadrivalvis	3.00	8.33	0.09	0.20	0.14
Quercus nigra	3.00	8.33	0.09	0.20	0.14
Sanicula canadensis	3.00	8.33	0.09	0.20	0.14
Sassafras albidum	3.00	8.33	0.09	0.20	0.14
Symphyotrichum ericoides	3.00	8.33	0.09	0.20	0.14
Acalypha monococca	0.50	8.33	0.01	0.20	0.11
Amphicarpaea bracteata	0.50	8.33	0.01	0.20	0.11
Baccharis halimifolia	0.50	8.33	0.01	0.20	0.11
Carex complanata	0.50	8.33	0.01	0.20	0.11
Desmodium sp.	0.50	8.33	0.01	0.20	0.11
Dichanthelium spaerocarpon	0.50	8.33	0.01	0.20	0.11
Eryngium prostratum	0.50	8.33	0.01	0.20	0.11
Euphorbia cordifolia	0.50	8.33	0.01	0.20	0.11
Gnaphalium obtusifolium	0.50	8.33	0.01	0.20	0.11
Hypericum drummondii	0.50	8.33	0.01	0.20	0.11
Hypericum gentianoides	0.50	8.33	0.01	0.20	0.11
Ilex decidua	0.50	8.33	0.01	0.20	0.11
Iva annua	0.50	8.33	0.01	0.20	0.11
Juncus sp.	0.50	8.33	0.01	0.20	0.11
Kummerowia striata	0.50	8.33	0.01	0.20	0.11
Leersia sp.	0.50	8.33	0.01	0.20	0.11
Lespedeza sp.	0.50	8.33	0.01	0.20	0.11
Ludwigia alternifolia	0.50	8.33	0.01	0.20	0.11
Paspalum sp.	0.50	8.33	0.01	0.20	0.11
Physalis sp.	0.50	8.33	0.01	0.20	0.11
Potentilla simplex	0.50	8.33	0.01	0.20	0.11
Rhexia mariana	0.50	8.33	0.01	0.20	0.11
Rhynchospora glomerata	0.50	8.33	0.01	0.20	0.11
Rhynchospora inexpansa	0.50	8.33	0.01	0.20	0.11
Ruellia humilis	0.50	8.33	0.01	0.20	0.11
Ruellia sp.	0.50	8.33	0.01	0.20	0.11
Stylosanthes biflora	0.50	8.33	0.01	0.20	0.11
Totals	**3481.50**	**4141.67**	**100.00**	**100.00**	**100.00**

Table D2: Total cover, frequency, relative cover, relative frequency, and importance value of ground layer plant species at Weyerhaeuser project site, 10-15 yr old covertype, 2007-08.

Species	Total Cover	Frequency	Relative Cover	Relative Frequency	Importance Value
Toxicodendron radicans	211.00	200.00	37.88	9.03	23.46
Parthenocissus quinquefolia	31.50	128.57	5.66	5.81	5.73
Carex sp.	41.50	57.14	7.45	2.58	5.02
Callicarpa americana	25.50	100.00	4.58	4.52	4.55
Chasmanthium sessiliflorum	20.50	100.00	3.68	4.52	4.10
Berchemia scandens	13.50	100.00	2.42	4.52	3.47
Scleria oligantha	19.00	57.14	3.41	2.58	3.00
Rubus flagellaris	10.00	71.43	1.80	3.23	2.51
Trachelospermum difforme	7.50	71.43	1.35	3.23	2.29
Lonicera japonica	5.00	71.43	0.90	3.23	2.06
Smilax rotundifolia	5.00	71.43	0.90	3.23	2.06
Ambrosia artemisiifolia	15.50	28.57	2.78	1.29	2.04
Fraxinus americana	15.50	28.57	2.78	1.29	2.04
Vitis rotundifolia	15.50	28.57	2.78	1.29	2.04
Carex cherokeensis	9.00	42.86	1.62	1.94	1.78
Dichanthelium commutatum	4.50	57.14	0.81	2.58	1.69
Ulmus alata	4.50	57.14	0.81	2.58	1.69
Diodia virginiana	15.00	14.29	2.69	0.65	1.67
Bignonia capreolata	6.50	42.86	1.17	1.94	1.55
Desmodium nudiflorum	6.50	42.86	1.17	1.94	1.55
Smilax bona-nox	2.00	57.14	0.36	2.58	1.47
Dichanthelium laxiflorum	4.00	42.86	0.72	1.94	1.33
Rubus sp.	6.00	28.57	1.08	1.29	1.18
Oxalis sp.	1.50	42.86	0.27	1.94	1.10
Sanicula canadensis	1.50	42.86	0.27	1.94	1.10
Cercis canadensis	3.50	28.57	0.63	1.29	0.96
Galium pilosum	1.00	28.57	0.18	1.29	0.73
Mitchella repens	1.00	28.57	0.18	1.29	0.73
Smilax glauca	1.00	28.57	0.18	1.29	0.73
Woodsia obtusa	1.00	28.57	0.18	1.29	0.73
Andropogon virginicus	3.00	14.29	0.54	0.65	0.59
Baptisia bracteata	3.00	14.29	0.54	0.65	0.59
Carex leavenworthii	3.00	14.29	0.54	0.65	0.59
Carya tomentosa	3.00	14.29	0.54	0.65	0.59
Danthonia spicata	3.00	14.29	0.54	0.65	0.59
Desmodium paniculatum	3.00	14.29	0.54	0.65	0.59
Desmodium perplexum	3.00	14.29	0.54	0.65	0.59
Dichanthelium boscii	3.00	14.29	0.54	0.65	0.59
Erechtites hieraciifolia	3.00	14.29	0.54	0.65	0.59
Ilex opaca	3.00	14.29	0.54	0.65	0.59
Lithospermum tuberosum	3.00	14.29	0.54	0.65	0.59
Mimosa quadrivalvis	3.00	14.29	0.54	0.65	0.59
Quercus alba	3.00	14.29	0.54	0.65	0.59
Ruellia strepens	3.00	14.29	0.54	0.65	0.59
Acalypha gracilens	0.50	14.29	0.09	0.65	0.37

Acalypha virginica	0.50	14.29	0.09	0.65	0.37
Amelanchier arborea	0.50	14.29	0.09	0.65	0.37
Aristolochia serpentaria	0.50	14.29	0.09	0.65	0.37
Asplenium platyneuron	0.50	14.29	0.09	0.65	0.37
Calystegia sepium	0.50	14.29	0.09	0.65	0.37
Croton willdenowii	0.50	14.29	0.09	0.65	0.37
Fragaria virginiana	0.50	14.29	0.09	0.65	0.37
Galium circaezans	0.50	14.29	0.09	0.65	0.37
Galactia regularis	0.50	14.29	0.09	0.65	0.37
Hieracium sp.	0.50	14.29	0.09	0.65	0.37
Quercus falcata	0.50	14.29	0.09	0.65	0.37
Quercus sp.	0.50	14.29	0.09	0.65	0.37
Rhamnus caroliniana	0.50	14.29	0.09	0.65	0.37
Robinia pseudo-acacia	0.50	14.29	0.09	0.65	0.37
Senecio obovatus	0.50	14.29	0.09	0.65	0.37
Smilax laurifolia	0.50	14.29	0.09	0.65	0.37
Viola sp.	0.50	14.29	0.09	0.65	0.37
Viola pedata	0.50	14.29	0.09	0.65	0.37
Viola sororia	0.50	14.29	0.09	0.65	0.37
Totals	**557.00**	**2214.29**	**100.00**	**100.00**	**100.00**

Table D3: Total cover, frequency, relative cover, relative frequency, and importance value of ground layer plant species at Weyerhaeuser project site, 16-25 yr old covertype, 2007-08.

Species	Total Cover	Frequency	Relative Cover	Relative Frequency	Importance Value
Toxicodendron radicans	572.00	241.67	24.54	7.84	16.19
Chasmanthium sessiliflorum	345.00	250.00	14.80	8.11	11.45
Smilax rotundifolia	146.50	166.67	6.28	5.41	5.85
Rubus flagellaris	179.00	116.67	7.68	3.78	5.73
Scleria oligantha	63.00	150.00	2.70	4.86	3.78
Berchemia scandens	49.50	166.67	2.12	5.41	3.76
Parthenocissus quinquefolia	57.00	133.33	2.45	4.32	3.38
Vitis rotundifolia	89.50	66.67	3.84	2.16	3.00
Pteridium aquilinum	100.50	50.00	4.31	1.62	2.97
Callicarpa americana	57.50	66.67	2.47	2.16	2.31
Smilax bona-nox	52.50	66.67	2.25	2.16	2.21
Ptilimnium nuttallii	67.50	25.00	2.90	0.81	1.85
Carex cherokeensis	56.00	33.33	2.40	1.08	1.74
Pinus taeda	21.50	75.00	0.92	2.43	1.68
Senecio obovatus	44.50	41.67	1.91	1.35	1.63
Ulmus alata	34.00	41.67	1.46	1.35	1.40
Lonicera japonica	14.00	66.67	0.60	2.16	1.38
Lespedeza procumbens	40.50	16.67	1.74	0.54	1.14
Ambrosia artemisiifolia	19.50	41.67	0.84	1.35	1.09
Cercis canadensis	6.00	58.33	0.26	1.89	1.07
Mitchella repens	24.00	33.33	1.03	1.08	1.06

Carex sp.	8.00	50.00	0.34	1.62	0.98
Phytolacca americana	37.50	8.33	1.61	0.27	0.94
Lespedeza repens	30.00	16.67	1.29	0.54	0.91
Dichanthelium laxiflorum	4.50	33.33	0.19	1.08	0.64
Rhamnus caroliniana	4.50	33.33	0.19	1.08	0.64
Ruellia strepens	4.50	33.33	0.19	1.08	0.64
Dichanthelium acuminatum	15.50	16.67	0.66	0.54	0.60
Salvia lyrata	15.50	16.67	0.66	0.54	0.60
Carex complanata	9.00	25.00	0.39	0.81	0.60
Erechtites hieraciifolia	2.00	33.33	0.09	1.08	0.58
Dichanthelium boscii	6.50	25.00	0.28	0.81	0.54
Acalypha gracilens	4.00	25.00	0.17	0.81	0.49
Convolvulus sp.	4.00	25.00	0.17	0.81	0.49
Dichanthelium commutatum	4.00	25.00	0.17	0.81	0.49
Ostrya virginiana	4.00	25.00	0.17	0.81	0.49
Quercus velutina	4.00	25.00	0.17	0.81	0.49
Laportea canadensis	15.00	8.33	0.64	0.27	0.46
Rubus argutus	15.00	8.33	0.64	0.27	0.46
Vaccinium arboreum	15.00	8.33	0.64	0.27	0.46
Carya glabra	1.50	25.00	0.06	0.81	0.44
Menispermum canadense	1.50	25.00	0.06	0.81	0.44
Sanicula canadensis	1.50	25.00	0.06	0.81	0.44
Danthonia spicata	6.00	16.67	0.26	0.54	0.40
Heliotropium sp.	6.00	16.67	0.26	0.54	0.40
Aralia spinosa	3.50	16.67	0.15	0.54	0.35
Aster sp.	3.50	16.67	0.15	0.54	0.35
Morus rubra	3.50	16.67	0.15	0.54	0.35
Rosa setigera	3.50	16.67	0.15	0.54	0.35
Solidago sp.	3.50	16.67	0.15	0.54	0.35
Amphicarpaea bracteata	1.00	16.67	0.04	0.54	0.29
Calystegia sepium	1.00	16.67	0.04	0.54	0.29
Cardamine hirsuta	1.00	16.67	0.04	0.54	0.29
Cirsium sp.	1.00	16.67	0.04	0.54	0.29
Croton glandulosus	1.00	16.67	0.04	0.54	0.29
Croton willdenowii	1.00	16.67	0.04	0.54	0.29
Eupatorium sp.	1.00	16.67	0.04	0.54	0.29
Fragaria virginiana	1.00	16.67	0.04	0.54	0.29
Galactia regularis	1.00	16.67	0.04	0.54	0.29
Juniperus virginiana	1.00	16.67	0.04	0.54	0.29
Oxalis dillenii	1.00	16.67	0.04	0.54	0.29
Oxalis sp.	1.00	16.67	0.04	0.54	0.29
Rudbeckia missouriensis	1.00	16.67	0.04	0.54	0.29
Viola sororia	1.00	16.67	0.04	0.54	0.29
Amelanchier arborea	3.00	8.33	0.13	0.27	0.20
Carex microdonta	3.00	8.33	0.13	0.27	0.20
Carya myristiciformis	3.00	8.33	0.13	0.27	0.20
Desmodium nudiflorum	3.00	8.33	0.13	0.27	0.20
Euonymus americanus	3.00	8.33	0.13	0.27	0.20
Lysimachia lanceolata	3.00	8.33	0.13	0.27	0.20
Polystichum acrostichoides	3.00	8.33	0.13	0.27	0.20

Rubus sp.	3.00	8.33	0.13	0.27	0.20
Viola sp.	3.00	8.33	0.13	0.27	0.20
Acer rubrum	0.50	8.33	0.02	0.27	0.15
Baccharis halimifolia	0.50	8.33	0.02	0.27	0.15
Centrosema virginianum	0.50	8.33	0.02	0.27	0.15
Crotalaria sagittalis	0.50	8.33	0.02	0.27	0.15
Dichanthelium dichotomum	0.50	8.33	0.02	0.27	0.15
Dicanthelium sp.	0.50	8.33	0.02	0.27	0.15
Dicanthelium polyanthes	0.50	8.33	0.02	0.27	0.15
Diospyros virginiana	0.50	8.33	0.02	0.27	0.15
Elephantopus carolinianus	0.50	8.33	0.02	0.27	0.15
Fraxinus americana	0.50	8.33	0.02	0.27	0.15
Galium pilosum	0.50	8.33	0.02	0.27	0.15
Galium uniflorum	0.50	8.33	0.02	0.27	0.15
Hypericum hypericoides	0.50	8.33	0.02	0.27	0.15
Lactuca canadensis	0.50	8.33	0.02	0.27	0.15
Lespedeza sp.	0.50	8.33	0.02	0.27	0.15
Linum sulcatum	0.50	8.33	0.02	0.27	0.15
Melica mutica	0.50	8.33	0.02	0.27	0.15
Prunus mexicana	0.50	8.33	0.02	0.27	0.15
Quercus falcata	0.50	8.33	0.02	0.27	0.15
Quercus sp.	0.50	8.33	0.02	0.27	0.15
Quercus rubra	0.50	8.33	0.02	0.27	0.15
Sassafras albidum	0.50	8.33	0.02	0.27	0.15
Smilax glauca	0.50	8.33	0.02	0.27	0.15
Solidago canadensis	0.50	8.33	0.02	0.27	0.15
Solidago ulmifolia	0.50	8.33	0.02	0.27	0.15
Trachelospermum difforme	0.50	8.33	0.02	0.27	0.15
Vaccinium pallidum	0.50	8.33	0.02	0.27	0.15
Zizia aurea	0.50	8.33	0.02	0.27	0.15
Totals	**2331.00**	**3083.33**	**100.00**	**100.00**	**100.00**

Table D4: Total cover, frequency, relative cover, relative frequency, and importance value of ground layer plant species at Weyerhaeuser project site, 25+ yr old covertype, 2007-08.

Species	Total Cover	Frequency	Relative Cover	Relative Frequency	Importance Value
Smilax rotundifolia	366.00	181.82	27.98	8.58	18.28
Toxicodendron radicans	150.50	100.00	11.51	4.72	8.11
Chasmanthium sessiliflorum	81.00	127.27	6.19	6.01	6.10
Berchemia scandens	43.50	163.64	3.33	7.73	5.53
Parthenocissus quinquefolia	74.00	109.09	5.66	5.15	5.40
Lonicera japonica	59.00	127.27	4.51	6.01	5.26
Callicarpa americana	48.00	118.18	3.67	5.58	4.62
Vitis rotundifolia	72.50	54.55	5.54	2.58	4.06
Rubus flagellaris	17.00	81.82	1.30	3.86	2.58
Dichanthelium laxiflorum	27.50	54.55	2.10	2.58	2.34
Smilax glauca	11.50	72.73	0.88	3.43	2.16

Panicum anceps	38.00	18.18	2.91	0.86	1.88
Carex sp.	4.00	72.73	0.31	3.43	1.87
Juniperus virginiana	37.50	9.09	2.87	0.43	1.65
Myrica cerifera	37.50	9.09	2.87	0.43	1.65
Smilax bona-nox	7.50	45.45	0.57	2.15	1.36
Vaccinium arboreum	18.00	18.18	1.38	0.86	1.12
Acer rubrum	4.50	36.36	0.34	1.72	1.03
Pinus taeda	4.50	36.36	0.34	1.72	1.03
Scleria oligantha	4.50	36.36	0.34	1.72	1.03
Ilex opaca	15.50	18.18	1.19	0.86	1.02
Quercus velutina	15.50	18.18	1.19	0.86	1.02
Trachelospermum difforme	9.00	27.27	0.69	1.29	0.99
Erechtites hieraciifolia	4.00	27.27	0.31	1.29	0.80
Cornus drummondii	15.00	9.09	1.15	0.43	0.79
Dichanthelium polyanthes	15.00	9.09	1.15	0.43	0.79
Fraxinus americana	15.00	9.09	1.15	0.43	0.79
Rhamnus caroliniana	15.00	9.09	1.15	0.43	0.79
Sassafras albidum	15.00	9.09	1.15	0.43	0.79
Vaccinium pallidum	15.00	9.09	1.15	0.43	0.79
Mitchella repens	1.50	27.27	0.11	1.29	0.70
Crataegus marshallii	6.00	18.18	0.46	0.86	0.66
Nyssa sylvatica	6.00	18.18	0.46	0.86	0.66
Carex glaucodea	3.50	18.18	0.27	0.86	0.56
Desmodium rotundifolium	3.50	18.18	0.27	0.86	0.56
Dichanthelium commutatum	3.50	18.18	0.27	0.86	0.56
Polystichum acrostichoides	3.50	18.18	0.27	0.86	0.56
Carex complanata	1.00	18.18	0.08	0.86	0.47
Galactia regularis	1.00	18.18	0.08	0.86	0.47
Lespedeza procumbens	1.00	18.18	0.08	0.86	0.47
Stylosanthes biflora	1.00	18.18	0.08	0.86	0.47
Acalypha gracilens	3.00	9.09	0.23	0.43	0.33
Carex meadii	3.00	9.09	0.23	0.43	0.33
Desmodium perplexum	3.00	9.09	0.23	0.43	0.33
Quercus alba	3.00	9.09	0.23	0.43	0.33
Rosa setigera	3.00	9.09	0.23	0.43	0.33
Rubus trivialis	3.00	9.09	0.23	0.43	0.33
Solidago sp.	3.00	9.09	0.23	0.43	0.33
Tragia urticifolia	3.00	9.09	0.23	0.43	0.33
Amphicarpaea bracteata	0.50	9.09	0.04	0.43	0.23
Andropogon virginicus	0.50	9.09	0.04	0.43	0.23
Botrychium dissectum	0.50	9.09	0.04	0.43	0.23
Daucus carota	0.50	9.09	0.04	0.43	0.23
Centrosema virginianum	0.50	9.09	0.04	0.43	0.23
Conyza canadensis	0.50	9.09	0.04	0.43	0.23
Cornus florida	0.50	9.09	0.04	0.43	0.23
Cyperus sp.	0.50	9.09	0.04	0.43	0.23
Desmodium sp.	0.50	9.09	0.04	0.43	0.23
Dichanthelium acuminatum	0.50	9.09	0.04	0.43	0.23
Dichanthelium boscii	0.50	9.09	0.04	0.43	0.23
Euphorbia cordifolia	0.50	9.09	0.04	0.43	0.23

Eupatorium serotinum	0.50	9.09	0.04	0.43	0.23
Helianthus divaricatus	0.50	9.09	0.04	0.43	0.23
Hypericum sp.	0.50	9.09	0.04	0.43	0.23
Liquidambar styraciflua	0.50	9.09	0.04	0.43	0.23
Oxalis dillenii	0.50	9.09	0.04	0.43	0.23
Oxalis sp.	0.50	9.09	0.04	0.43	0.23
Panicum verrucosum	0.50	9.09	0.04	0.43	0.23
Prunus serotina	0.50	9.09	0.04	0.43	0.23
Quercus sp.	0.50	9.09	0.04	0.43	0.23
Sanguinaria canadensis	0.50	9.09	0.04	0.43	0.23
Sporbolus sp.	0.50	9.09	0.04	0.43	0.23
Ulmus sp.	0.50	9.09	0.04	0.43	0.23
Totals	**1308.00**	**2118.18**	**100.00**	**100.00**	**100.00**

Table D5: Total cover, frequency, relative cover, relative frequency, and importance value of ground layer plant species at Weyerhaeuser project site, glade covertype, 2007-08.

Species	Total Cover	Frequency	Relative Cover	Relative Frequency	Importance Value
Schizachyrium scoparium	633.00	300.00	21.29	5.57	13.43
Rudbeckia missouriensis	517.00	300.00	17.39	5.57	11.48
Sporbolus sp.	206.00	187.50	6.93	3.48	5.20
Dalea purpurea	91.00	200.00	3.06	3.71	3.39
Echinacea pallida	90.50	187.50	3.04	3.48	3.26
Stenaria nigricans	70.50	175.00	2.37	3.25	2.81
Salvia lyrata	77.00	162.50	2.59	3.02	2.80
Ruellia humilis	51.50	187.50	1.73	3.48	2.61
Scleria oligantha	65.00	162.50	2.19	3.02	2.60
Carex microdonta	74.50	137.50	2.51	2.55	2.53
Eleocharis sp.	97.50	62.50	3.28	1.16	2.22
Neptunia lutea	54.50	137.50	1.83	2.55	2.19
Croton willdenowii	26.50	175.00	0.89	3.25	2.07
Ambrosia artemisiifolia	53.00	87.50	1.78	1.62	1.70
Sorghastrum nutans	70.50	50.00	2.37	0.93	1.65
Smilax bona-nox	54.00	75.00	1.82	1.39	1.60
Pycnanthemum tenuifolium	77.50	25.00	2.61	0.46	1.54
Galactia regularis	8.50	150.00	0.29	2.78	1.54
Carex cherokeensis	51.00	62.50	1.72	1.16	1.44
Daucus carota	21.50	112.50	0.72	2.09	1.41
Pinus taeda	7.50	125.00	0.25	2.32	1.29
Sabatia angularis	7.50	125.00	0.25	2.32	1.29
Smilax rotundifolia	25.50	87.50	0.86	1.62	1.24
Symphyotrichum ericoides	21.00	87.50	0.71	1.62	1.17
Berchemia scandens	16.00	87.50	0.54	1.62	1.08
Silphium laciniatum	36.00	50.00	1.21	0.93	1.07
Rubus flagellaris	24.50	62.50	0.82	1.16	0.99
Toxicodendron radicans	24.50	62.50	0.82	1.16	0.99
Desmanthus illinoensis	22.00	62.50	0.74	1.16	0.95
Rosa setigera	13.00	75.00	0.44	1.39	0.91
Ratibida pinnata	24.00	50.00	0.81	0.93	0.87
Heliotropium tenellum	8.00	75.00	0.27	1.39	0.83
Panicum anceps	21.50	50.00	0.72	0.93	0.83
Conyza canadensis	37.50	12.50	1.26	0.23	0.75
Lespedeza cuneata	37.50	12.50	1.26	0.23	0.75
Symphyotrichum praealtum	7.50	62.50	0.25	1.16	0.71
Tridens flavus	9.50	50.00	0.32	0.93	0.62
Dichanthelium acuminatum	7.00	50.00	0.24	0.93	0.58
Aster sp.	4.50	50.00	0.15	0.93	0.54
Carex meadii	18.00	25.00	0.61	0.46	0.53
Chasmanthium sessiliflorum	18.00	25.00	0.61	0.46	0.53
Crataegus viridis	18.00	25.00	0.61	0.46	0.53
Ambrosia bidentata	6.50	37.50	0.22	0.70	0.46
Coreopsis lanceolata	6.50	37.50	0.22	0.70	0.46
Diospyros virginiana	6.50	37.50	0.22	0.70	0.46

Dichanthelium dichotomum	1.50	37.50	0.05	0.70	0.37
Polygala mariana	1.50	37.50	0.05	0.70	0.37
Andropogon gerardii	15.00	12.50	0.50	0.23	0.37
Lespedeza repens	15.00	12.50	0.50	0.23	0.37
Zizia aurea	15.00	12.50	0.50	0.23	0.37
Carex sp.	6.00	25.00	0.20	0.46	0.33
Paspalum setaceum	6.00	25.00	0.20	0.46	0.33
Symphyotrichum laeve	6.00	25.00	0.20	0.46	0.33
Celtis laevigata	3.50	25.00	0.12	0.46	0.29
Dichanthelium laxiflorum	3.50	25.00	0.12	0.46	0.29
Eupatorium altissimum	3.50	25.00	0.12	0.46	0.29
Euphorbia cordifolia	3.50	25.00	0.12	0.46	0.29
Oxalis sp.	3.50	25.00	0.12	0.46	0.29
Rhamnus caroliniana	3.50	25.00	0.12	0.46	0.29
Senecio obovatus	3.50	25.00	0.12	0.46	0.29
Agalinis viridis	1.00	25.00	0.03	0.46	0.25
Cercis canadensis	1.00	25.00	0.03	0.46	0.25
Polygonum virginianum	1.00	25.00	0.03	0.46	0.25
Setaria sp.	1.00	25.00	0.03	0.46	0.25
Tragia urticifolia	1.00	25.00	0.03	0.46	0.25
Boltonia diffusa	3.00	12.50	0.10	0.23	0.17
Bouteloua curtipendula	3.00	12.50	0.10	0.23	0.17
Echinacea purpurea	3.00	12.50	0.10	0.23	0.17
Lobelia spicata	3.00	12.50	0.10	0.23	0.17
Melica mutica	3.00	12.50	0.10	0.23	0.17
Parthenocissus quinquefolia	3.00	12.50	0.10	0.23	0.17
Paspalum sp.	3.00	12.50	0.10	0.23	0.17
Phyllanthus caroliniensis	3.00	12.50	0.10	0.23	0.17
Rhus aromatica	3.00	12.50	0.10	0.23	0.17
Setaria parviflora	3.00	12.50	0.10	0.23	0.17
Solidago ulmifolia	3.00	12.50	0.10	0.23	0.17
Ulmus alata	3.00	12.50	0.10	0.23	0.17
Ulmus sp.	3.00	12.50	0.10	0.23	0.17
Unknown herb 2	3.00	12.50	0.10	0.23	0.17
Vitis rotundifolia	3.00	12.50	0.10	0.23	0.17
Acalypha virginica	0.50	12.50	0.02	0.23	0.12
Asclepias viridiflora	0.50	12.50	0.02	0.23	0.12
Centrosema virginianum	0.50	12.50	0.02	0.23	0.12
Chamaecrista fasciculata	0.50	12.50	0.02	0.23	0.12
Croton capitatus	0.50	12.50	0.02	0.23	0.12
Croton glandulosus	0.50	12.50	0.02	0.23	0.12
Desmodium sp.	0.50	12.50	0.02	0.23	0.12
Dichanthelium sp.	0.50	12.50	0.02	0.23	0.12
Diodia teres	0.50	12.50	0.02	0.23	0.12
Gaura longiflora	0.50	12.50	0.02	0.23	0.12
Houstonia longifolia	0.50	12.50	0.02	0.23	0.12
Ilex decidua	0.50	12.50	0.02	0.23	0.12
Ilex opaca	0.50	12.50	0.02	0.23	0.12

Lactuca canadensis	0.50	12.50	0.02	0.23	0.12
Linum sulcatum	0.50	12.50	0.02	0.23	0.12
Lonicera japonica	0.50	12.50	0.02	0.23	0.12
Morus rubra	0.50	12.50	0.02	0.23	0.12
Oenothera linifolia	0.50	12.50	0.02	0.23	0.12
Penstemon digitalis	0.50	12.50	0.02	0.23	0.12
Physalis sp.	0.50	12.50	0.02	0.23	0.12
Quercus muehlenbergii	0.50	12.50	0.02	0.23	0.12
Quercus sp.	0.50	12.50	0.02	0.23	0.12
Quercus velutina	0.50	12.50	0.02	0.23	0.12
Smilax auriculata	0.50	12.50	0.02	0.23	0.12
Solidago sp.	0.50	12.50	0.02	0.23	0.12
Vernonia baldwinii	0.50	12.50	0.02	0.23	0.12
Verbena simplex	0.50	12.50	0.02	0.23	0.12
Viola sp.	0.50	12.50	0.02	0.23	0.12
Totals	**2976.00**	**5400.00**	**100.00**	**100.00**	**100.00**

Table D6: Total cover, frequency, relative cover, relative frequency, and importance value of shrub layer species at Weyerhaeuser project site, 0-9 yr old covertype, 2007-08.

Species	Total Cover	Frequency	Relative Cover	Relative Frequency	Importance Value
Pinus taeda	225.00	83.33	21.43	22.73	22.08
Callicarpa americana	287.50	58.33	27.38	15.91	21.65
Quercus falcata	125.00	33.33	11.90	9.09	10.50
Acer rubrum	75.00	33.33	7.14	9.09	8.12
Ulmus alata	75.00	33.33	7.14	9.09	8.12
Rhus copallina	62.50	8.33	5.95	2.27	4.11
Fraxinus americana	25.00	16.67	2.38	4.55	3.46
Liquidambar styraciflua	25.00	16.67	2.38	4.55	3.46
Quercus shumardii	25.00	16.67	2.38	4.55	3.46
Quercus velutina	25.00	16.67	2.38	4.55	3.46
Carya myristiciformis	37.50	8.33	3.57	2.27	2.92
Prunus serotina	12.50	8.33	1.19	2.27	1.73
Quercus alba	12.50	8.33	1.19	2.27	1.73
Quercus nigra	12.50	8.33	1.19	2.27	1.73
Totals	**1050.00**	**366.67**	**100.00**	**100.00**	**100.00**

Table D7: Total cover, frequency, relative cover, relative frequency, and importance value of shrub layer species at Weyerhaeuser project site, 10-15 yr old covertype, 2007-08.

Species	Total Cover	Frequency	Relative Cover	Relative Frequency	Importance Value
Callicarpa americana	375.00	114.29	19.61	9.20	14.40
Ulmus alata	250.00	114.29	13.07	9.20	11.13
Liquidambar styraciflua	187.50	71.43	9.80	5.75	7.78
Quercus falcata	112.50	71.43	5.88	5.75	5.81
Fraxinus americana	112.50	42.86	5.88	3.45	4.67
Ostrya virginiana	75.00	57.14	3.92	4.60	4.26
Pinus taeda	75.00	57.14	3.92	4.60	4.26
Cercis canadensis	87.50	42.86	4.58	3.45	4.01
Acer rubrum	50.00	57.14	2.61	4.60	3.61
Cornus florida	50.00	57.14	2.61	4.60	3.61
Juniperus virginiana	37.50	42.86	1.96	3.45	2.70
Nyssa sylvatica	37.50	42.86	1.96	3.45	2.70
Prunus serotina	37.50	42.86	1.96	3.45	2.70
Quercus nigra	37.50	42.86	1.96	3.45	2.70
Baccharis halimifolia	50.00	28.57	2.61	2.30	2.46
Rhamnus caroliniana	50.00	28.57	2.61	2.30	2.46
Diospyros virginiana	25.00	28.57	1.31	2.30	1.80
Frangula caroliniensis	25.00	28.57	1.31	2.30	1.80
Quercus alba	25.00	28.57	1.31	2.30	1.80
Quercus phellos	25.00	28.57	1.31	2.30	1.80

Aesculus pavia	12.50	14.29	0.65	1.15	0.90
Carya myristiciformis	12.50	14.29	0.65	1.15	0.90
Carya texana	12.50	14.29	0.65	1.15	0.90
Fraxinus pennsylvanica	12.50	14.29	0.65	1.15	0.90
Ilex decidua	12.50	14.29	0.65	1.15	0.90
Ilex opaca	12.50	14.29	0.65	1.15	0.90
Morus rubra	12.50	14.29	0.65	1.15	0.90
Myrica cerifera	12.50	14.29	0.65	1.15	0.90
Quercus muehlenbergii	12.50	14.29	0.65	1.15	0.90
Quercus shumardii	12.50	14.29	0.65	1.15	0.90
Quercus velutina	12.50	14.29	0.65	1.15	0.90
Rubus sp.	12.50	14.29	0.65	1.15	0.90
Sassafras albidum	12.50	14.29	0.65	1.15	0.90
Sideroxylon lanuginosa	12.50	14.29	0.65	1.15	0.90
Viburnum rufidulum	12.50	14.29	0.65	1.15	0.90
Totals	**1912.50**	**1242.86**	**100.00**	**100.00**	**100.00**

Table D8: Total cover, frequency, relative cover, relative frequency, and importance value of shrub layer species at Weyerhaeuser project site, 16-25 yr old covertype, 2007-08.

Species	Total Cover	Frequency	Relative Cover	Relative Frequency	Importance Value
Callicarpa americana	662.50	141.67	23.98	16.50	20.24
Fraxinus americana	225.00	83.33	8.14	9.71	8.93
Ulmus alata	275.00	66.67	9.95	7.77	8.86
Ostrya virginiana	287.50	58.33	10.41	6.80	8.60
Carya myristiciformis	150.00	66.67	5.43	7.77	6.60
Ilex opaca	175.00	50.00	6.33	5.83	6.08
Cercis canadensis	112.50	41.67	4.07	4.85	4.46
Liquidambar styraciflua	87.50	41.67	3.17	4.85	4.01
Acer rubrum	50.00	33.33	1.81	3.88	2.85
Quercus muehlenbergii	75.00	16.67	2.71	1.94	2.33
Quercus shumardii	75.00	16.67	2.71	1.94	2.33
Pinus taeda	50.00	16.67	1.81	1.94	1.88
Rhus aromatica	50.00	16.67	1.81	1.94	1.88
Myrica cerifera	62.50	8.33	2.26	0.97	1.62
Vaccinium arboreum	62.50	8.33	2.26	0.97	1.62
Celtis laevigata	25.00	16.67	0.90	1.94	1.42
Frangula caroliniana	25.00	16.67	0.90	1.94	1.42
Ilex decidua	25.00	16.67	0.90	1.94	1.42
Quercus alba	25.00	16.67	0.90	1.94	1.42
Crataegus marshallii	37.50	8.33	1.36	0.97	1.16
Prunus mexicana	37.50	8.33	1.36	0.97	1.16
Quercus falcata	37.50	8.33	1.36	0.97	1.16
Baccharis halimifolia	12.50	8.33	0.45	0.97	0.71
Carya texana	12.50	8.33	0.45	0.97	0.71
Carya tomentosa	12.50	8.33	0.45	0.97	0.71
Cornus florida	12.50	8.33	0.45	0.97	0.71
Ilex vomitoria	12.50	8.33	0.45	0.97	0.71
Prunus serotina	12.50	8.33	0.45	0.97	0.71
Quercus phellos	12.50	8.33	0.45	0.97	0.71
Quercus rubra	12.50	8.33	0.45	0.97	0.71
Quercus velutina	12.50	8.33	0.45	0.97	0.71
Rhus copallina	12.50	8.33	0.45	0.97	0.71
Sassafras albidum	12.50	8.33	0.45	0.97	0.71
Zanthoxylum americanum	12.50	8.33	0.45	0.97	0.71
Totals	**2762.50**	**858.33**	**100.00**	**100.00**	**100.00**

Table D9: Total cover, frequency, relative cover, relative frequency, and importance value of shrub layer species at Weyerhaeuser project site, 25+ yr old covertype, 2007-08.

Species	Total Cover	Frequency	Relative Cover	Relative Frequency	Importance Value
Callicarpa americana	437.50	100.00	19.89	14.47	17.18
Liquidambar styraciflua	375.00	72.73	17.05	10.53	13.79
Ilex opaca	237.50	81.82	10.80	11.84	11.32
Quercus falcata	262.50	63.64	11.93	9.21	10.57
Ulmus alata	150.00	72.73	6.82	10.53	8.67
Fraxinus americana	112.50	45.45	5.11	6.58	5.85
Acer rubrum	112.50	27.27	5.11	3.95	4.53
Quercus alba	37.50	27.27	1.70	3.95	2.83
Myrica cerifera	87.50	9.09	3.98	1.32	2.65
Prunus mexicana	50.00	18.18	2.27	2.63	2.45
Pinus taeda	25.00	18.18	1.14	2.63	1.88
Platanus occidentalis	25.00	18.18	1.14	2.63	1.88
Quercus velutina	25.00	18.18	1.14	2.63	1.88
Cornus florida	37.50	9.09	1.70	1.32	1.51
Frangula caroliniana	37.50	9.09	1.70	1.32	1.51
Rhus copallina	37.50	9.09	1.70	1.32	1.51
Vaccinium arboreum	37.50	9.09	1.70	1.32	1.51
Carya texana	12.50	9.09	0.57	1.32	0.94
Carya tomentosa	12.50	9.09	0.57	1.32	0.94
Crataegus spathulata	12.50	9.09	0.57	1.32	0.94
Diospyros virginiana	12.50	9.09	0.57	1.32	0.94
Juniperus virginiana	12.50	9.09	0.57	1.32	0.94
Nyssa sylvatica	12.50	9.09	0.57	1.32	0.94
Ostrya virginiana	12.50	9.09	0.57	1.32	0.94
Quercus shumardii	12.50	9.09	0.57	1.32	0.94
Sassafras albidum	12.50	9.09	0.57	1.32	0.94
Totals	**2200.00**	**690.91**	**100.00**	**100.00**	**100.00**

Table D10: Total cover, frequency, relative cover, relative frequency, and importance value of shrub layer species at Weyerhaeuser project site, glade covertype, 2007-08.

Species	Total Cover	Frequency	Relative Cover	Relative Frequency	Importance Value
Cercis canadensis	112.50	62.50	15.79	12.20	13.99
Ilex decidua	100.00	50.00	14.04	9.76	11.90
Diospyros virginiana	75.00	50.00	10.53	9.76	10.14
Juniperus virginiana	50.00	50.00	7.02	9.76	8.39
Fraxinus americana	37.50	37.50	5.26	7.32	6.29
Frangula caroliniana	37.50	37.50	5.26	7.32	6.29
Ulmus alata	37.50	37.50	5.26	7.32	6.29
Celtis laevigata	50.00	25.00	7.02	4.88	5.95
Sideroxylon lanuginosa	50.00	25.00	7.02	4.88	5.95
Rhus aromatica	25.00	25.00	3.51	4.88	4.19
Quercus stellata	37.50	12.50	5.26	2.44	3.85
Carya myristiciformis	12.50	12.50	1.75	2.44	2.10
Crataegus spatulata	12.50	12.50	1.75	2.44	2.10
Crataegus viridis	12.50	12.50	1.75	2.44	2.10
Gleditsia triacanthos	12.50	12.50	1.75	2.44	2.10
Ostrya virginiana	12.50	12.50	1.75	2.44	2.10
Quercus shumardii	12.50	12.50	1.75	2.44	2.10
Rhus glabra	12.50	12.50	1.75	2.44	2.10
Viburnum rufidulum	12.50	12.50	1.75	2.44	2.10
Totals	**712.50**	**512.50**	**100.00**	**100.00**	**100.00**

Table D11: Frequency, relative frequency, stems/acre, basal area, basal area/acre, relative basal area, relative density, and importance value of tree species at Weyerhaeuser property, 0-9 yr stand, 2007-08.

Species	Frequency	Relative Frequency	Stems/ Acre	Sum BA	Sum BA/Acre	Relative BA	Relative Density	Importance Value
Pinus taeda	0.25	33.33	51.54	4.58	4.91	83.34	85.71	67.46
Snag	0.17	22.22	4.30	0.41	0.44	7.50	7.14	12.29
Ulmus alata	0.17	22.22	2.15	0.07	0.08	1.30	3.57	9.03
Ilex opaca	0.08	11.11	1.07	0.34	0.36	6.16	1.79	6.35
Quercus falcata	0.08	11.11	1.07	0.09	0.10	1.70	1.79	4.86
Totals	**0.75**	**100.00**	**60.14**	**5.49**	**5.90**	**100.00**	**100.00**	**100.00**

Table D12: Frequency, relative frequency, stems/acre, basal area, basal area/acre, relative basal area, relative density, and importance value of tree species at Weyerhaeuser property, 10-15 yr stand, 2007-08.

Species	Frequency	Relative Frequency	Stems/ Acre	Sum BA	Sum BA/Acre	Relative BA	Relative Density	Importance Value
Pinus taeda	1.00	21.88	675.61	59.55	109.63	94.23	79.44	65.18
Liquidambar styraciflua	0.57	12.50	44.18	0.84	1.54	1.33	5.19	6.34
Cercis canadensis	0.43	9.38	49.70	0.65	1.20	1.03	5.84	5.42
Ulmus alata	0.43	9.38	11.05	0.33	0.60	0.51	1.30	3.73
Snag	0.43	9.38	7.36	0.21	0.39	0.33	0.87	3.52
Quercus velutina	0.29	6.25	9.20	0.21	0.39	0.33	1.08	2.56
Acer rubrum	0.29	6.25	9.20	0.16	0.29	0.25	1.08	2.53
Quercus alba	0.14	3.13	22.09	0.83	1.52	1.31	2.60	2.34
Quercus falcata	0.14	3.13	9.20	0.18	0.34	0.29	1.08	1.50
Ostrya virginiana	0.14	3.13	3.68	0.05	0.09	0.07	0.43	1.21
Albizia julibrissin	0.14	3.13	1.84	0.10	0.19	0.16	0.22	1.17
Quercus stellata	0.14	3.13	1.84	0.03	0.06	0.05	0.22	1.13
Juglans nigra	0.14	3.13	1.84	0.02	0.04	0.03	0.22	1.12
Juniperus virginiana	0.14	3.13	1.84	0.02	0.04	0.03	0.22	1.12
Platanus occidentalis	0.14	3.13	1.84	0.02	0.04	0.03	0.22	1.12
Totals	**4.57**	**100.00**	**850.49**	**63.20**	**116.34**	**100.00**	**100.00**	**100.00**

Table D13: Frequency, relative frequency, stems/acre, basal area, basal area/acre, relative basal area, relative density, and importance value of tree species at Weyerhaeuser property, 16-25 yr stand, 2007-08.

Species	Frequency	Relative Frequency	Stems/ Acre	Sum BA	Sum BA/Acre	Relative BA	Relative Density	Importance Value
Pinus taeda	1.00	13.64	71.95	44.08	47.33	79.18	23.10	38.64
Cercis canadensis	0.42	5.68	40.81	1.43	1.54	2.57	13.10	7.12
Ostrya virginiana	0.50	6.82	37.58	1.25	1.34	2.24	12.07	7.04
Ulmus alata	0.75	10.23	25.77	1.15	1.24	2.07	8.28	6.86
Liquidambar styraciflua	0.67	9.09	19.33	1.07	1.14	1.92	6.21	5.74
Fraxinus americana	0.50	6.82	19.33	0.82	0.89	1.48	6.21	4.84
Acer rubrum	0.25	3.41	25.77	1.32	1.41	2.36	8.28	4.68
Snag	0.42	5.68	8.59	0.78	0.84	1.40	2.76	3.28
Quercus alba	0.33	4.55	9.66	0.53	0.57	0.95	3.10	2.87
Carya myristiciformis	0.25	3.41	8.59	0.48	0.52	0.86	2.76	2.34
Juniperus virginiana	0.33	4.55	4.30	0.23	0.24	0.41	1.38	2.11
Frangula caroliniana	0.25	3.41	3.22	0.09	0.09	0.16	1.03	1.53
Ilex opaca	0.17	2.27	5.37	0.20	0.22	0.36	1.72	1.45
Celtis laevigata	0.17	2.27	4.30	0.20	0.21	0.36	1.38	1.34
Zanthoxylum clava-herculia	0.17	2.27	3.22	0.15	0.16	0.26	1.03	1.19
Quercus shumardii	0.17	2.27	2.15	0.09	0.10	0.16	0.69	1.04
Prunus mexicana	0.08	1.14	3.22	0.38	0.41	0.68	1.03	0.95
Zanthoxylum americanum	0.08	1.14	4.30	0.18	0.19	0.32	1.38	0.94
Prunus serotina	0.08	1.14	2.15	0.44	0.48	0.80	0.69	0.88
Quercus michauxii	0.08	1.14	1.07	0.45	0.48	0.80	0.34	0.76
Sideroxylon lanuginosum	0.08	1.14	2.15	0.08	0.09	0.15	0.69	0.66
Sassafras albidum	0.08	1.14	2.15	0.05	0.05	0.08	0.69	0.64
Quercus phellos	0.08	1.14	1.07	0.08	0.09	0.15	0.34	0.54
Platanus occidentalis	0.08	1.14	1.07	0.04	0.04	0.07	0.34	0.52
Ulmus americana	0.08	1.14	1.07	0.04	0.04	0.07	0.34	0.52
Nyssa sylvatica	0.08	1.14	1.07	0.03	0.03	0.05	0.34	0.51
Cornus florida	0.08	1.14	1.07	0.02	0.02	0.04	0.34	0.51
Rhus copallina	0.08	1.14	1.07	0.02	0.02	0.04	0.34	0.51
Totals	**7.33**	**100.00**	**311.42**	**55.67**	**59.78**	**100.00**	**100.00**	**100.00**

Table D14: Frequency, relative frequency, stems/acre, basal area, basal area/acre, relative basal area, relative density, and importance value of tree species at Weyerhaeuser property, 25+ yr stand, 2007-08.

Species	Frequency	Relative Frequency	Stems/ Acre	Sum BA	Sum BA/Acre	Relative BA	Relative Density	Importance Value
Pinus taeda	1.00	15.28	76.15	74.29	87.03	87.62	22.73	41.88
Liquidambar styraciflua	0.73	11.11	106.60	3.77	4.42	4.45	31.82	15.79
Ulmus alata	0.73	11.11	25.77	1.08	1.27	1.28	7.69	6.69
Acer rubrum	0.36	5.56	24.60	1.16	1.36	1.37	7.34	4.75
Quercus falcata	0.55	8.33	14.06	0.84	0.98	0.99	4.20	4.51
Snag	0.45	6.94	11.71	0.61	0.71	0.72	3.50	3.72
Ilex opaca	0.27	4.17	17.57	0.68	0.80	0.80	5.24	3.41
Quercus alba	0.27	4.17	9.37	0.39	0.46	0.46	2.80	2.48
Cornus florida	0.36	5.56	4.69	0.14	0.17	0.17	1.40	2.37
Quercus nigra	0.27	4.17	8.20	0.20	0.23	0.23	2.45	2.28
Fraxinus americana	0.27	4.17	7.03	0.45	0.53	0.53	2.10	2.26
Carya myristiciformis	0.18	2.78	8.20	0.29	0.34	0.34	2.45	1.86
Quercus velutina	0.18	2.78	4.69	0.31	0.36	0.36	1.40	1.51
Sassafras albidum	0.18	2.78	2.34	0.07	0.08	0.08	0.70	1.19
Juniperus virginiana	0.09	1.39	5.86	0.20	0.24	0.24	1.75	1.13
Carya tomentosa	0.09	1.39	1.17	0.08	0.10	0.10	0.35	0.61
Celtis laevigata	0.09	1.39	1.17	0.06	0.07	0.07	0.35	0.60
Nyssa sylvatica	0.09	1.39	1.17	0.04	0.05	0.05	0.35	0.60
Platanus occidentalis	0.09	1.39	1.17	0.03	0.04	0.04	0.35	0.59
Prunus serotina	0.09	1.39	1.17	0.03	0.04	0.04	0.35	0.59
Quercus marilandica	0.09	1.39	1.17	0.03	0.04	0.04	0.35	0.59
Ostrya virginiana	0.09	1.39	1.17	0.03	0.03	0.03	0.35	0.59
Totals	**6.55**	**100.00**	**335.04**	**84.79**	**99.32**	**100.00**	**100.00**	**100.00**

Table D15: Frequency, relative frequency, stems/acre, basal area, basal area/acre, relative basal area, relative density, and importance value of tree species at Weyerhaeuser property, glade community, 2007-08.

Species	Frequency	Relative Frequency	Stems/ Acre	Sum BA	Sum BA/Acre	Relative BA	Relative Density	Importance Value
Pinus taeda	0.75	25.00	27.38	4.51	7.27	62.92	30.91	39.61
Juniperus virginiana	0.50	16.67	16.11	1.38	2.21	19.18	18.18	18.01
Quercus muehlenbergii	0.25	8.33	9.66	0.24	0.39	3.38	10.91	7.54
Cercis canadensis	0.25	8.33	6.44	0.13	0.22	1.88	7.27	5.83
Quercus stellata	0.13	4.17	6.44	0.28	0.45	3.94	7.27	5.13
Ostrya virginiana	0.13	4.17	6.44	0.13	0.22	1.87	7.27	4.44
Carya myristiciformis	0.13	4.17	3.22	0.19	0.31	2.66	3.64	3.49
Quercus velutina	0.13	4.17	3.22	0.08	0.13	1.09	3.64	2.96
Celtis laevigata	0.13	4.17	1.61	0.07	0.11	0.96	1.82	2.31
Quercus shumardii	0.13	4.17	1.61	0.07	0.11	0.96	1.82	2.31
Diospyros virginiana	0.13	4.17	1.61	0.02	0.03	0.29	1.82	2.09
Fraxinus americana	0.13	4.17	1.61	0.02	0.03	0.29	1.82	2.09
Snag	0.13	4.17	1.61	0.02	0.03	0.29	1.82	2.09
Ulmus alata	0.13	4.17	1.61	0.02	0.03	0.29	1.82	2.09
Totals	**3.00**	**100.00**	**88.59**	**7.17**	**11.55**	**100.00**	**100.00**	**100.00**

APPENDIX E. Reference Condition Description

371371
West Gulf Coastal Plain Pine-Hardwood Woodland/Forest Upland

Model Date: 01/23/07 Report Date: 3/19/07

Modelers		Reviewers	
Larry Threet	larry_threet@fws.gov	Doug Zollner	dzollner@tnc.org
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Vegetation Type
Forested

Map Zones
37, 44, 45

Model Splits or Lumps
This BpS is lumped with: 1405

Geographic Range
This BpS lies in Arkansas, Louisiana, Texas, and SE Oklahoma. The West Gulf Coastal Plain Pine-Hardwood Forest type is found over a large area of the South Central model zone. It is the predominant vegetation system over most of the Upper West Gulf Coastal Plain ecoregion with smaller incursions into the southern Interior Highlands. (Ecological Classification CES203.378). Includes Section 231E and subsections 231Ea, 231Eg, 231Ef, 231Ek, 231Eb, 234Ec.

Biophysical Site Description
This BpS was historically present on nearly all uplands in the region except on the most edaphically limited sites (droughty sands, calcareous clays, and shallow soil barrens/rock outcrops). Such sites are underlain by loamy to fine-textured soils of variable depths. These are upland sites on ridgetops and adjacent side slopes, with moderate fertility and moisture retention. (Ecological Classification CES203.378).

Vegetation Description
This BpS consists of forests and woodlands dominated by shortleaf pin (*Pinus echinata*) and/or loblolly pine (*P. taeda*) in combination with a host of dry to dry-mesic site hardwood species at lesser prevalence (e.g., oak (*Quercus* spp.), sweetgum (*Liquidambar styraciflua*), hickory (*Carya* spp.)). Overall this system may have supported relatively low levels of vascular plant species diversity. This system has undergone major transformations since European settlement of the region (e.g., conversion of PNV to pine plantations) (Ecological Classification CES203.378).

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
PIEC2	Pinus echinata	Shortleaf pine
PITA	Pinus taeda	Loblolly pine
QUERC	Quercus	Oak
ANDRO2	Andropogon	Bluestem

Disturbance Description
This BpS is fire regime group 1. Naturally this system had frequent fire dominated by low intensity surface fire with occasional mixed fire in drought years and rare stand replacement fires in extreme dry years. Drought and moist cycles play a strong role interacting with both fire frequency and intensity. Other disturbance factors that played a smaller role included ice storms, wind events, and insect infestations.

VDDT Fire Frequency Results

Severity	Avg FI	Min FI	Max FI	Percent of All Fires
Replacement	130			3
Moderate (Mixed)	66			7
Low (Surface)	5			90
All Fires	**4**			**100**

Scale Description
Landscape is adequate in size to contain natural variation in vegetation and disturbance regime. Historically this BpS covered a very large and relatively contiguous area broken by smaller areas of pine flatwoods, bottomland sloughs and swamps, blackland prairies, saline barrens, and river systems (e.g., Red River, Ouachita River and Saline River floodplain).

Non-Fire Disturbances
Insects/Disease
Wind/Weather/Stress

Adjacency or Identification Concerns
The BpS meets the oak-hickory-pine type PNV along the southwestern edge of the Interior Highlands ecoregion (map zone 44), and there may be some integration of this type into the lower areas of the Ouachita Mountains. Along the eastern border, the BpS also integrates with the bottomland hardwood systems of the MSRAP ecoregion (map zone 45). Southern areas of the PNV have been reclassified as a separate longleaf pine (*P. palustris*)-dominated PNV. The West Gulf Coastal Plain Nepheline Syenite Glade system (CES203.371) is included within this BpS, and is limited to Pulaski and Saline County in Arkansas.

Issues or Problems

Native Uncharacteristic Conditions
Large areas of this type have been converted to pure loblolly pine plantations and/or have been harvested or eliminated to make room for homes, development, etc.

Comments
Tom Foti, Doug Zollner, Roger Fryar, Ron Masters

Succession Classes

Class A **10%** **Early1 - All Structures**

Structural Information
Upper Layer Lifeform: Shrub

Upper Layer Canopy Cover: 0 - 100%
Upper Layer Canopy Height: Shrub 0.6m - Shrub 1.0m
Tree Size Class: Sapling >4.5ft; <5"DBH

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PIEC2	Pinus echinata	Shortleaf pine	All
PITA	Pinus taeda	Loblolly pine	Middle
QUERC	Quercus	Oak	Lower
ANDRO2	Andropogon	Bluestem	False

Description
0-15 years. Pine/oak regeneration with grass/forb regrowth. *P. taeda*, *P. echinata*, *Quercus* spp., mixed hardwood shrubs, blackberry (*Rubus* spp.), various *Andropogon* spp., *Carex* spp., and forbs with weedy component. Frequent surface fires (FRI - 5 years) and occasional replacement fires (FRI - 50 years) are the disturbance factors in this class. Without fire for 10 years this class succeeds to Class B, otherwise it moves to Class C.

Class B 10% Mid1 - Closed

Structural Information
Upper Layer Lifeform: Tree
Upper Layer Canopy Cover: 71 - 100%
Upper Layer Canopy Height: Tree 10.1m - Tree 25m
Tree Size Class: Medium 9-21"DBH

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PIEC2	Pinus echinata	Shortleaf pine	All
PITA	Pinus taeda	Loblolly pine	Middle
QUERC	Quercus	Oak	None

Description
15-40 years. Mid-development class dominated by Pinus spp and mixed hardwood trees and shrubs. Dense overstory and midstory. Sparse understory with little to no herbaceous component. Frequent surface fires (FRI - 5 years) maintain the class. Occasional mixed fires (FRI - 25 years), insect outbreaks (50 year interval), and rare wind or ice storms (250 year interval) take the class to C. Rare replacement fires (FRI - 100 years) move the class back to A. Class B succeeds to E.

Class C 23% Mid1 - Open

Structural Information
Upper Layer Lifeform: Tree

Upper Layer Canopy Cover: 20 - 70%
Upper Layer Canopy Height: Tree 10.1m - Tree 25m
Tree Size Class: Medium 9-21"DBH

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PIEC2	Pinus echinata	Shortleaf pine	Upper
PITA	Pinus taeda	Loblolly pine	Mid-Upper
QUERC	Quercus	Oak	Lower
ANDRO2	Andropogon	Bluestem	False

Description
15-40 years. Open mid-development class. Open canopy dominated by Pinus spp and fire-tolerant oak species. Open overstory and limited midstory. Continuous herbaceous component. Frequent surface fires (FRI - 5 years) maintain the system at C until it succeeds to D. Rare replacement fires (FRI - 100 years) take the class back to A. Alternate succession (no fire for 10 years) will move the class to B.

Class D 52% Late1 - Open

Structural Information
Upper Layer Lifeform: Tree
Upper Layer Canopy Cover: 20 - 70%
Upper Layer Canopy Height: Tree 25.1m - Tree 50m
Tree Size Class: Very Large >33"DBH

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PIEC2	Pinus echinata	Shortleaf pine	Upper
PITA	Pinus taeda	Loblolly pine	Upper
QUERC	Quercus	Oak	Lower
ANDRO2	Andropogon	Bluestem	False

Description
40-500 years. Mature open canopy mixed pine/mixed hardwood woodland to savanna. Depending on soil properties, pine or oak may be dominant canopy species. Very limited midstory (mixed hardwoods, little pine regen). Well developed herbaceous understory governed by percent canopy closure. Made up of diverse grass and forb species. Frequent surface fires (FRI - 5 years) maintain the class at D. Occasional mixed fire (FRI - 50 years) will also maintain the class in D. Rare replacement fire (FRI - 200 years) will move the class back to A. Alternate succession (no fire for 20 years) will move this class to E.

Class E 5% Late1 - Closed

Structural Information
Upper Layer Lifeform: Tree
Upper Layer Canopy Cover: 71 - 100%
Upper Layer Canopy Height: Tree 25.1m - Tree 50m
Tree Size Class: Large 21-33"DBH

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PITA	Pinus taeda	Loblolly pine	Upper
QUAL	Quercus alba	White oak	Middle
CORNU	Cornus	Dogwood	Lower
CAREX	Carex	Sedge	False

Description
40-500 years. Mature closed canopy loblolly pine/mixed hardwood forest. Dense midstory (mixed hardwoods, with some pine regeneration). Sparse shade-tolerant herbaceous understory. Mesic, seepage, and swale areas. Frequent surface fires (FRI - 5 years) maintain the class at E. Occasional mixed fire (FRI - 50 years) and minor insect outbreaks (66 years) open the canopy and move the class to D. Rare replacement fire (FRI - 100 years) and major insect outbreaks (200 years) will take the class back to A.

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APPENDIX F. Avian species lists by stand type.

Table F1. Number of individuals and relative frequency of avian species recorded in the glade community at Weyerhaeuser Company project site, Howard County, Arkansas.

Common Name	Scientific Name	Number	Relative Frequency
Northern Cardinal	*Cardinalis cardinalis*	25	14.71
Yellow-breasted Chat	*Icteria virens*	24	14.12
Red-eyed Vireo	*Vireo olivaceous*	13	7.65
Indigo Bunting	*Passerina cyanea*	10	5.88
White-eyed Vireo	*Vireo griseus*	10	5.88
Pine Warbler	*Dendroica pinus*	8	4.71
Prairie Warbler	*Dendroica discolor*	6	3.53
American Crow	*Corvus brachyrhynchos*	5	2.94
Black-and-white Warbler	*Mniotilta varia*	5	2.94
Tufted Titmouse	*Baeolophus bicolor*	5	2.94
Acadian Flycatcher	*Empidonax virescens*	4	2.35
Black-and-white Warbler	*Mniotilta varia*	4	2.35
Carolina Wren	*Thryothorus ludovicianus*	4	2.35
Eastern Wood-Pewee	*Contopus virens*	4	2.35
Hooded Warbler	*Wilsonia citrina*	4	2.35
Mourning Dove	*Zenaida macroura*	4	2.35
Yellow-billed Cuckoo	*Coccyzus americanus*	4	2.35
Blue Grosbeak	*Passerina caerulea*	3	1.76
Blue Jay	*Cyanocitta cristata*	3	1.76
Great Crested Flycatcher	*Myiarchus crinitus*	3	1.76
Kentucky Warbler	*Oporornis formosus*	3	1.76
Northern Bobwhite	*Colinus virginianus*	3	1.76
Pileated Woodpecker	*Dryocopus pileatus*	3	1.76
Summer Tanager	*Piranga rubra*	3	1.76
Common Yellowthroat	*Geothlypis trichas*	2	1.18
Eastern Towhee	*Pipilo erythrophthalmus*	2	1.18
Worm-eating Warbler	*Helmitheros vermivorum*	2	1.18
Bewick's Wren	*Thryomanes bewickii*	1	0.59
Brown-headed Cowbird	*Molothrus ater*	1	0.59
Carolina chickadee	*Poecile carolinensis*	1	0.59
Chestnut-sided Warbler	*Dendroica pensylvanica*	1	0.59
Orchard Oriole	*Icterus spurius*	1	0.59
Red-bellied Woodpecker	*Melanerpes carolinus*	1	0.59
Wild Turkey	*Meleagris gallopavo*	1	0.59
Wood Thrush	*Hylocichla mustelina*	1	0.59

Table F2. Number of individuals and relative frequency of avian species recorded in the 0-9 yr stand type at Weyerhaeuser Company project site, Howard County, Arkansas.

Common Name	Scientific Name	Number	Relative Frequency
Yellow-breasted Chat	*Icteria virens*	67	17.31
Indigo Bunting	*Passerina cyanea*	55	14.21
Prairie Warbler	*Dendroica discolor*	36	9.30
Common Yellowthroat	*Geothlypis trichas*	35	9.04
American Crow	*Corvus brachyrhynchos*	22	5.68
Northern Cardinal	*Cardinalis cardinalis*	21	5.43
White-eyed Vireo	*Vireo griseus*	16	4.13
Carolina Wren	*Thryothorus ludovicianus*	13	3.36
Field Sparrow	*Spizella pusilla*	11	2.84
Kentucky Warbler	*Oporornis formosus*	9	2.33
Mourning Dove	*Zenaida macroura*	9	2.33
Summer Tanager	*Piranga rubra*	9	2.33
Eastern Bluebird	*Sialia sialis*	8	2.07
Blue-gray Gnatcatcher	*Polioptila caerulea*	7	1.81
Brown-headed Cowbird	*Molothrus ater*	5	1.29
Eastern Towhee	*Pipilo erythrophthalmus*	5	1.29
Great Crested Flycatcher	*Myiarchus crinitus*	5	1.29
Black-and-white Warbler	*Mniotilta varia*	4	1.03
Blue Grosbeak	*Passerina caerulea*	4	1.03
Carolina Chickadee	*Poecile carolinensis*	4	1.03
Eastern Wood-Pewee	*Contopus virens*	4	1.03
Hooded Warbler	*Wilsonia citrina*	3	0.78
Northern Flicker	*Colaptes auratus*	3	0.78
Tufted Titmouse	*Baeolophus bicolor*	3	0.78
Yellow-billed Cuckoo	*Coccyzus americanus*	3	0.78
Brown-headed Nuthatch	*Sitta pusilla*	2	0.52
Blue Jay	*Cyanocitta cristata*	2	0.52
Eastern Phoebe	*Sayornis phoebe*	2	0.52
Fish Crow	*Corvus ossifragus*	2	0.52
Northern Parula	*Parula americana*	2	0.52
Pine Warbler	*Dendroica pinus*	2	0.52
Red-eyed Vireo	*Vireo olivaceous*	2	0.52
Blue-winged Warbler	*Vermivora pinus*	1	0.26
Gray Catbird	*Dumetella carolinensis*	1	0.26
Grasshopper Sparrow	*Ammodramus savannarum*	1	0.26
Hairy Woodpecker	*Picoides villosus*	1	0.26
Little Blue Heron	*Egretta caerulea*	1	0.26
Orchard Oriole	*Icterus spurius*	1	0.26
Painted Bunting	*Passerina ciris*	1	0.26
Pileated Woodpecker	*Dryocopus pileatus*	1	0.26
Red-bellied Woodpecker	*Melanerpes carolinus*	1	0.26

Red-headed Woodpecker	*Melanerpes erythrocephalus*	1	0.26
Scissor-tailed Flycatcher	*Tyrannus forficatus*	1	0.26
Wood Thrush	*Hylocichla mustelina*	1	0.26

Table F3. Number of individuals and relative frequency of avian species recorded in the 10-15 yr stand type at Weyerhaeuser Company project site, Howard County, Arkansas.

Common Name	Scientific Name	Number	Relative Frequency
Northern Cardinal	*Cardinalis cardinalis*	19	11.88
Yellow-breasted Chat	*Icteria virens*	14	8.75
White-eyed Vireo	*Vireo griseus*	12	7.50
Red-eyed Vireo	*Vireo olivaceous*	11	6.88
American Crow	*Corvus brachyrhynchos*	9	5.63
Hooded Warbler	*Wilsonia citrina*	8	5.00
Indigo Bunting	*Passerina cyanea*	7	4.38
Black-and-white Warlber	*Mniotilta varia*	6	3.75
Blue Jay	*Cyanocitta cristata*	6	3.75
Prairie Warbler	*Dendroica discolor*	6	3.75
Carolina Chickadee	*Poecile carolinensis*	5	3.13
Mourning Dove	*Zenaida macroura*	5	3.13
Worm-eating Warbler	*Helmitheros vermivorum*	5	3.13
Carolina Wren	*Thryothorus ludovicianus*	4	2.50
Kentucky Warbler	*Oporornis formosus*	4	2.50
Louisiana Waterthrush	*Seiurus motacilla*	4	2.50
Pine Warbler	*Dendroica pinus*	4	2.50
Tufted Titmouse	*Baeolophus bicolor*	4	2.50
Blue-gray Gnatcatcher	*Polioptila caerulea*	3	1.88
Eastern Wood-Pewee	*Contopus virens*	3	1.88
Pileated Woodpecker	*Dryocopus pileatus*	3	1.88
Yellow-billed Cuckoo	*Coccyzus americanus*	3	1.88
Great Crested Flycatcher	*Myiarchus crinitus*	2	1.25
Northern Parula	*Parula americana*	2	1.25
Red-bellied Woodpecker	*Melanerpes carolinus*	2	1.25
Acadian Flycatcher	*Empidonax virescens*	1	0.63
Brown Thrasher	*Toxostoma rufum*	1	0.63
Common Yellowthroat	*Geothlypis trichas*	1	0.63
Chuck-will's-widow	*Caprimulgis carolinensis*	1	0.63
Eastern Towhee	*Pipilo erythrophthalmus*	1	0.63
Northern Flicker	*Colaptes auratus*	1	0.63
Summer Tanager	*Piranga rubra*	1	0.63
Swainson's Warbler	*Limnothlypis swainsonii*	1	0.63
Wild Turkey	*Melagris gallopavo*	1	0.63

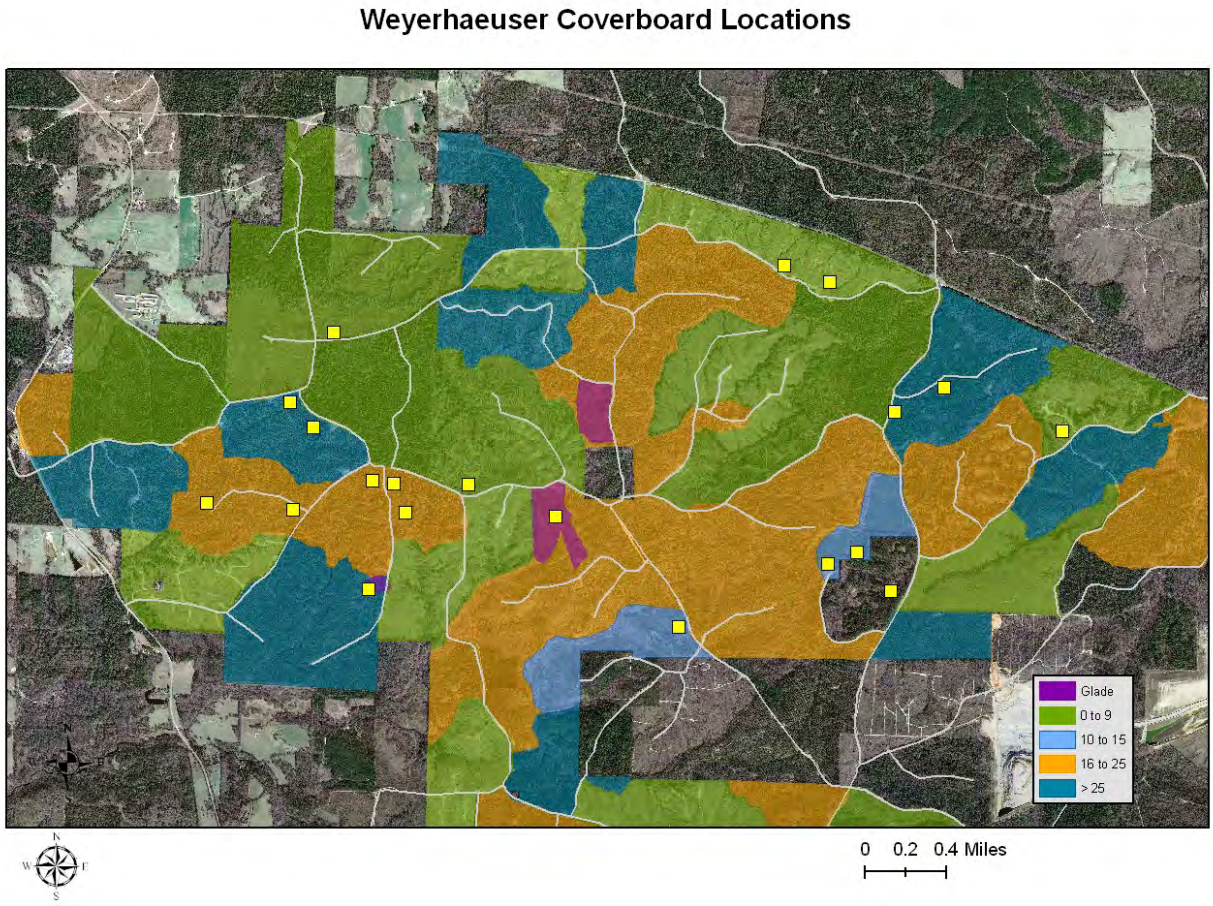
Table F4. Number of individuals and relative frequency of avian species recorded in the 16-25 yr stand type at Weyerhaeuser Company project site, Howard County, Arkansas.

Common Name	Scientific Name	Number	Relative Frequency
Yellow-breasted Chat	*Icteria virens*	45	15.68
Northern Cardinal	*Cardinalis cardinalis*	32	11.15
White-eyed Vireo	*Vireo griseus*	28	9.76
Red-eyed Vireo	*Vireo olivaceous*	21	7.32
Indigo Bunting	*Passerina cyanea*	19	6.62
American Crow	*Corvus brachyrhynchos*	13	4.53
Hooded Warbler	*Wilsonia citrina*	11	3.83
Yellow-billed Cuckoo	*Coccyzus americanus*	11	3.83
Kentucky Warbler	*Oporornis formosus*	10	3.48
Prairie Warbler	*Dendroica discolor*	10	3.48
Carolina Chickadee	*Poecile carolinensis*	9	3.14
Carolina Wren	*Thryothorus ludovicianus*	9	3.14
Pine Warbler	*Dendroica pinus*	9	3.14
Mourning Dove	*Zenaida macroura*	7	2.44
Blue-gray Gnatcatcher	*Polioptila caerulea*	6	2.09
Worm-eating Warbler	*Helmitheros vermivorum*	6	2.09
Blue Jay	*Cyanocitta cristata*	5	1.74
Black-and-white Warbler	*Mniotilta varia*	3	1.05
Brown-headed Cowbird	*Molothrus ater*	3	1.05
Common Yellowthroat	*Geothlypis trichas*	3	1.05
Tufted Titmouse	*Baeolophus bicolor*	3	1.05
Pileated Woodpecker	*Dryocopus pileatus*	3	1.05
Acadian Flycatcher	*Empidonax virescens*	2	0.70
Field Sparrow	*Spizella pusilla*	2	0.70
Louisiana Waterthrush	*Seiurus motacilla*	2	0.70
Northern Bobwhite	*Colinus virginianus*	2	0.70
Summer Tanager	*Piranga rubra*	2	0.70
Wood Thrush	*Hylocichla mustelina*	2	0.70
Broad-winged Hawk	*Buteo platypterus*	1	0.35
Downy Woodpecker	*Picoides pubescens*	1	0.35
Fish Crow	*Corvus ossifragus*	1	0.35
Great Crested Flycatcher	*Myiarchus crinitus*	1	0.35
Gray Catbird	*Dumetella carolinensis*	1	0.35
Swainson's Warbler	*Limnothlypis swainsonii*	1	0.35
Unidentified Warbler		1	0.35
White-breasted Nuthatch	*Sitta carolinensis*	1	0.35
Yellow-throated Vireo	*Vireo flavifrons*	1	0.35

Table F5. Number of individuals and relative frequency of avian species recorded in the 25+ yr stand type at Weyerhaeuser Company project site, Howard County, Arkansas.

Common Name	Scientific Name	Number	Relative Frequency
Yellow-breasted Chat	*Icteria virens*	29	21.28
Northern Cardinal	*Cardinalis cardinalis*	27	8.94
White-eyed Vireo	*Vireo griseus*	26	8.61
Pine Warbler	*Dendroica pinus*	24	7.95
Hooded Warbler	*Wilsonia citrina*	22	7.28
Red-eyed Vireo	*Vireo olivaceous*	21	6.95
Mourning Dove	*Zenaida macroura*	18	5.96
Kentucky Warbler	*Oporornis formosus*	16	5.30
Indigo Bunting	*Passerina cyanea*	13	4.30
Carolina Wren	*Thryothorus ludovicianus*	12	3.97
American Crow	*Corvus brachyrhynchos*	10	3.31
Summer Tanager	*Piranga rubra*	9	2.98
Yellow-billed Cuckoo	*Coccyzus americanus*	9	2.98
Tufted Titmouse	*Baeolophus bicolor*	8	2.65
Worm-eating Warbler	*Helmitheros vermivorum*	6	1.99
Black-and-white Warbler	*Mniotilta varia*	5	1.66
Common Yellowthroat	*Geothlypis trichas*	5	1.66
Prairie Warbler	*Dendroica discolor*	5	1.66
Blue-gray Gnatcatcher	*Polioptila caerulea*	4	1.32
Wood Thrush	*Hylocichla mustelina*	4	1.32
Blue Jay	*Cyanocitta cristata*	3	0.99
Carolina Chickadee	*Poecile carolinensis*	3	0.99
Eastern Towhee	*Pipilo erythrophthalmus*	3	0.99
Eastern Wood-Pewee	*Contopus virens*	3	0.99
Acadian Flycatcher	*Empidonax virescens*	2	0.66
Brown Thrasher	*Toxostoma rufum*	2	0.66
Northern Parula	*Parula americana*	2	0.66
Ruby-throated Hummingbird	*Archilochus colubris*	2	0.66
Brown-headed Cowbird	*Molothrus ater*	1	0.33
Blue Grosbeak	*Passerina caerulea*	1	0.33
Field Sparrow	*Spizella pusilla*	1	0.33
Louisiana Waterthrush	*Seiurus motacilla*	1	0.33
Northern Bobwhite	*Colinus virginianus*	1	0.33
Northern Mockingbird	*Mimus polyglottus*	1	0.33
Warbling Vireo	*Vireo gilvus*	1	0.33
White-breasted Nuthatch	*Sitta carolinensis*	1	0.33
Yellow-throated Vireo	*Vireo flavifrons*	1	0.33

APPENDIX G.


Weyerhaeuser Coverboard Locations
Glade
0 to 9
10 to 15
16 to 25
> 25
0 0.2 0.4 Miles