



# Department of Defense Legacy Resource Management Program

PROJECT 05-272

## **IMPLEMENTATION OF THE ECOREGIONAL CONSERVATION PLAN FOR THE UPPER WEST GULF COASTAL PLAIN**

By Joe Fox

OCTOBER 26, 2007



# **Implementation of the Ecoregional Conservation Plan for the Upper West Gulf Coastal Plain**

## **CONSERVATION FORESTRY TRAINING ACTIVITIES REPORT**

DoD Legacy Program Cooperative Agreement #DACA87-05-H-0013

The Nature Conservancy (TNC) #1040533813– Arkansas Field Office

### **OVERVIEW**

The Department of Defense and The Nature Conservancy contracted for the “Implementation of the Ecoregional Conservation Plan for the Upper West Gulf Coastal Plain” project in May of 2005. The project called for conservation area assessments or action plans and conservation forestry workshops for landowners at three sites: Pine Bluff Arsenal, Red River Army Depot and Fort Polk. The project objective was to compliment the Army Compatible Use Buffer (ACUB) program by assessing the three sites for ecological attributes and delivering possible strategies to protect those attributes to nearby landowners, foresters and loggers through the workshops.

Conservation Area assessments were completed at Pine Bluff Arsenal and Red River Army Depot. At Fort Polk, where much assessment work was already completed and initial buffer protection strategies were in place, identification of priority tracts, landowner contacts, and refinement of boundaries for tracts to be included into ACUB were the main scope of work and were completed. Conservation forestry workshops were held at Pine Bluff, Arkansas, Texarkana, Texas and Leesville, Louisiana to deliver the findings of the assessments and strategies that private landowners might use to sustain the ecological attributes of their land while maintaining economic value of their forests.

### **ACTIVITIES**

#### Pine Bluff Arsenal

The Pine Bluff Arsenal Conservation Action Plan (CAP) report was completed by The Nature Conservancy’s (TNC) staff after consultation with stakeholders and area experts. TNC objectives are to implement conservation by working directly with Pine Bluff Arsenal – first, to prepare data for Army Compatible Use Buffer (ACUB) plans and equivalent plans for Air Force installations; and second, to hold conservation forestry workshops to transmit management workbooks and other tools to participating landowners. Conservation forestry offers silvicultural and management guidance to the owners of priority buffer forested tracts. Appendix B is a summary of the PBA ecological systems, stresses, sources of stress, strategies to abate the stress, and measures of success. Staff and experts used the workbook to organize and summarize their finding into the plan.

The CAP findings were presented at the conservation forestry workshop held on February 20, 2007 at PBA. TNC staff and Charles Becker, Natural Resources Specialist at PBA, working

with Arkansas Forestry Association staff planned and implemented the workshop for interested private landowners in the area. Twenty-eight people, including landowners, foresters, and loggers, attended the workshop. The morning session included greetings from each sponsor and presentations on Conservation Forestry, the PBA CAP, Industrial Conservation Forestry (Plum Creek Timber Company), and the PBA Conservation Management Plan and some of its practices. Forestry related brochures were given to the participants. One brochure, Conservation Forestry, was printed especially for the workshop and distributed. It was used in the Louisiana and Texas workshops, and will be used in other appropriate forest landowner meetings in the UWGCP ecoregion. A lunch was provided for attendees that included a presentation titled "Conservation Tools for Private Landowners". The afternoon session was a guided bus tour of the PBA areas that have been treated with Conservation Forestry practices.



Conservation Forestry workshop at Pine Bluff, AR (Pine Bluff Arsenal).

### Ft. Polk

Approval was obtained for a change in scope of work and movement of that work to Ft. Polk in Louisiana. The new scope deliverables is outlined below:

1. Continued work to develop the final ACUB plan (Appendix C, D).
2. Identification of priority tracts for inclusion in the Fort Polk ACUB.
3. Initiating landowner contact with owners of priority tracts to determine support for ACUB program and willingness to consider land sale.
4. Environmental site assessment to refine priority tracts and acquisition boundaries.

A Conservation Forestry workshop was held in Leesville, Louisiana on August 25, 2007 to apprise members of the Vernon Parish Landowners' Association of the ACUB process for Ft. Polk and forest management practices they could use that would protect red-cockaded woodpecker and Louisiana pine snake habitats. A total of 18 landowners and foresters attended the workshop. Presentations included: definition of Conservation Forestry (TNC), Fundamentals of Conservation Forestry (USFS, Guldin), Conservation Forestry in the West Gulf Coastal Plain (TNC), Fort Polk ACUB (DoD), Industrial Conservation Forestry (Temple-Inland), Managing

longleaf pine for wildlife, recreation, and timber (LSU AgCenter), and Government incentive programs available to private landowners (NRCS).



Conservation Forestry workshop at Leesville, LA (Ft. Polk).

### Red River Army Depot

All survey work at Red River Army Depot and Lone Star Army Ammunition Plant was completed and reported in 2006 (floristic surveys and American Burying beetle survey). See Appendix E for the final Red River Army Depot Conservation Report

The Conservation Report findings were presented at the conservation forestry workshop held on August 24, 2007 at Texas A&M, Texarkana. TNC staff and Red River Army Depot staff worked with Dr. Jim Guldin of the US Forest Service to plan and present the morning workshop and afternoon tour. The morning session included presentations: Definition of Conservation Forestry (TNC), Overview of the Forests of East Texas (TNC), Findings of the species surveys at RRAD (TNC), Red River Army Depot-History, Wildlife, Forestry (DoD staff), Fundamentals of Conservation Forestry (USFS), Conservation Forestry (Industrial Perspective, TimberStar), Conservation Forestry (private landowner perspective, Ernest Lovett), and cost share programs-Forest Health in Texas (Texas Forest Service). In the afternoon, a tour of the Red River Army Depot highlighted the forest practices employed on the depot. A total of 24 landowners, foresters and loggers attended the workshop. Forestry conservation training presentations are included in Appendix A.



Conservation Forestry workshop at Texarkana, TX (Red River Army Depot).

## **Fort Polk ACUB Plan Development and Implementation Status Report**

### **Overview:**

Fort Polk is implementing a comprehensive Army Compatible Use Buffer (ACUB) program to reduce or avoid restrictions on range and training land use resulting from endangered and candidate species management requirements and to prevent incompatible development adjacent to its boundaries.

The Nature Conservancy (TNC) has agreed to serve as the Army's primary partner in this effort. In this capacity we proposed to accomplish the following tasks with the support of the DoD Legacy Resource Management Program funds:

5. Continued work to develop the final ACUB plan.
6. Identification of priority tracts for inclusion in the Fort Polk ACUB.
7. Initiating landowner contact with owners of priority tracts to determine support for ACUB program and willingness to consider land sale.
8. Environmental site assessment to refine priority tracts and acquisition boundaries.

A discussion of accomplishments on each deliverable under the grant is described below:

### **1. Develop final ACUB plan**

The Fort Polk ACUB program includes three key strategies:

- purchase of conservation easements or fee acquisition of adjacent private lands to expand the land base for red-cockaded woodpecker (RCW) population recovery and longleaf pine ecosystem restoration and maintenance.
- purchase of private development rights for private properties adjacent to key range and training facilities.
- purchase of conservation easements or fee acquisition of key Louisiana pine snake (LPS) habitat to support the viability of the species.

In furtherance of these objectives, we have worked with Fort Polk staff to develop a comprehensive Cooperative Agreement (CA) between Department of Defense and TNC. This agreement defines the scope of work for implementing the Fort Polk ACUB project. It is tailored to the training needs of the Army while advancing conservation of important species and natural communities. The CA describes the purpose and objectives of the cooperative endeavor, how costs will be shared, the tasks of each party, deliverables, and funding and payment procedures. As such, this CA forms the blueprint for on-the-ground implementation of the Fort Polk ACUB project for many years to come.

The CA was signed by Department of Defense and TNC in May 2007.

Please see Fort Polk ACUB CA and related newspaper articles attached.

## **2. Identify priority tracts for acquisition**

The broad priority acquisition areas for the Fort Polk ACUB are described in the ACUB proposal submitted by Fort Polk to DoD for initial approval of the project. Within these priority acquisition areas, we have worked with Fort Polk staff and key landowners to identify and prioritize specific tracts for initial acquisition. We identified a block of approximately 3,387 acres owned by a private landowner as the number one priority for acquisition under this ACUB program. This collection of tracts is in close proximity to the installation boundary, contains high-quality RCW habitat, and supports established RCW populations. Depending on federal appropriations, we expect these tracts to constitute the first one or two years of Fort Polk ACUB acquisitions. We also identified a collection of secondary priority tracts for future years, comprising approximately 21,882 acres. Together, the primary and secondary tracts total approximately 25,269 acres targeted for RCW habitat acquisitions (see figure below).

After further discussions with the landowner and with Fort Polk staff, these tracts are well-accepted by all as the priority tracts for acquisition under the Fort Polk ACUB program.



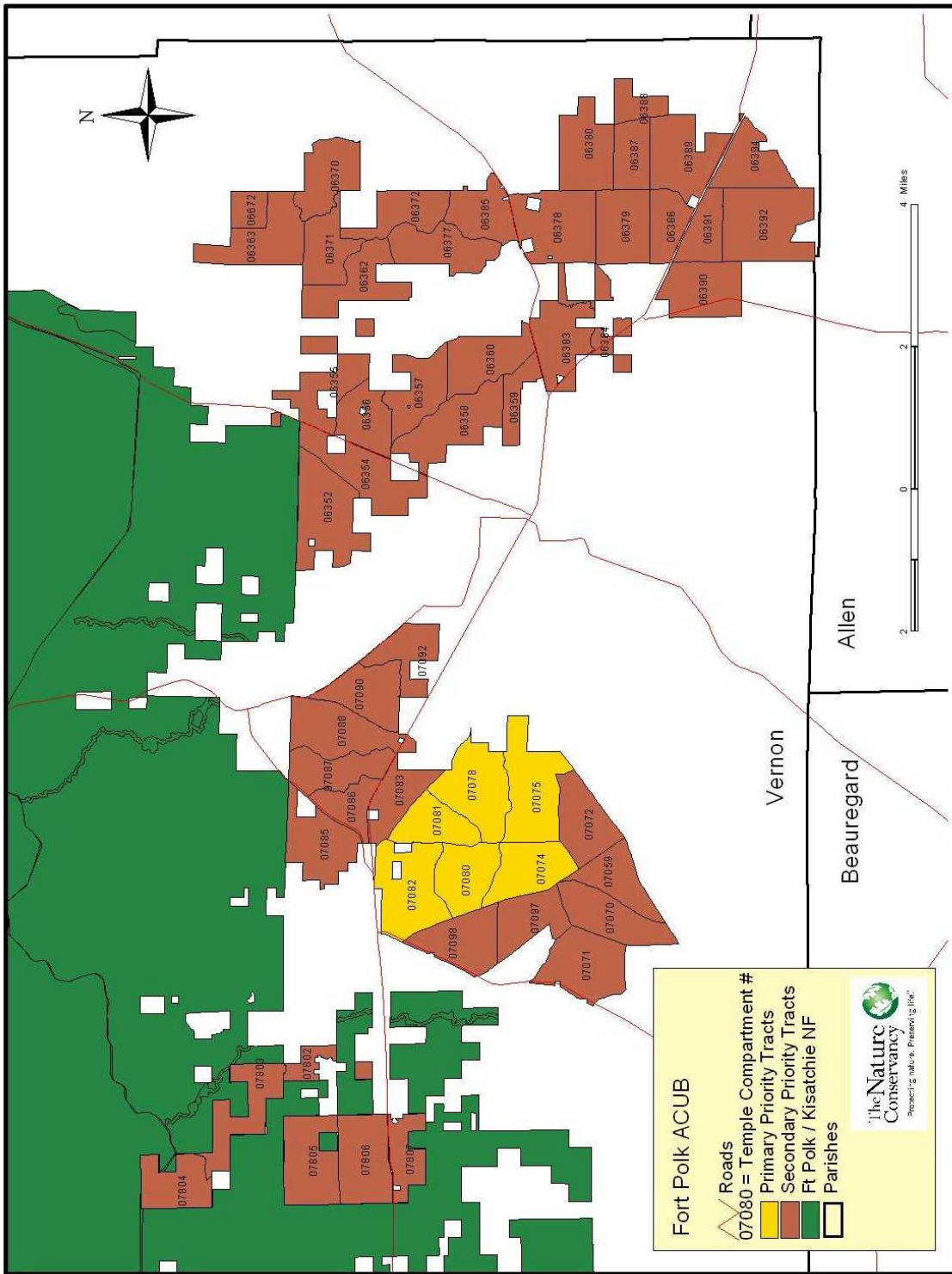


Figure 1. Priority Tract Map

### **3. Initiate landowner contacts**

TNC made initial contact with key landowners in the ACUB acquisition areas in early 2006, and continues to hold discussions with those landowners. These landowners represent all of the land contained within the priority acquisition plan described above, and they have responded favorably to proposals for transfer of property interest. In these discussions we have described the objectives of the Fort Polk ACUB program, expressed the conservation objectives of TNC, and worked to identify ways in which the landowner could benefit by participation in the ACUB program.

Approximately 11,889 acres, including the primary priority tracts, are owned by Crosby Land and Resources, Inc. (Crosby) and are encumbered by a long-term lease of timber rights. Temple-Inland Inc. (Temple), a Texas-based forest products company, currently holds the timber lease but is scheduled to sell the lease interest to The Campbell Group LLC (Campbell), an Oregon timber management organization, in the 4<sup>th</sup> quarter of 2007. The sale is part of Temple's divestiture of assets that was announced in late February 2007.

The remaining 13,380 acres are owned in fee by Temple, and are also included in Temple's divestiture plan. Thus, ownership of these tracts will transfer to Campbell in 4<sup>th</sup> quarter 2007.

Please see the figure below for a map of key ACUB landowners.

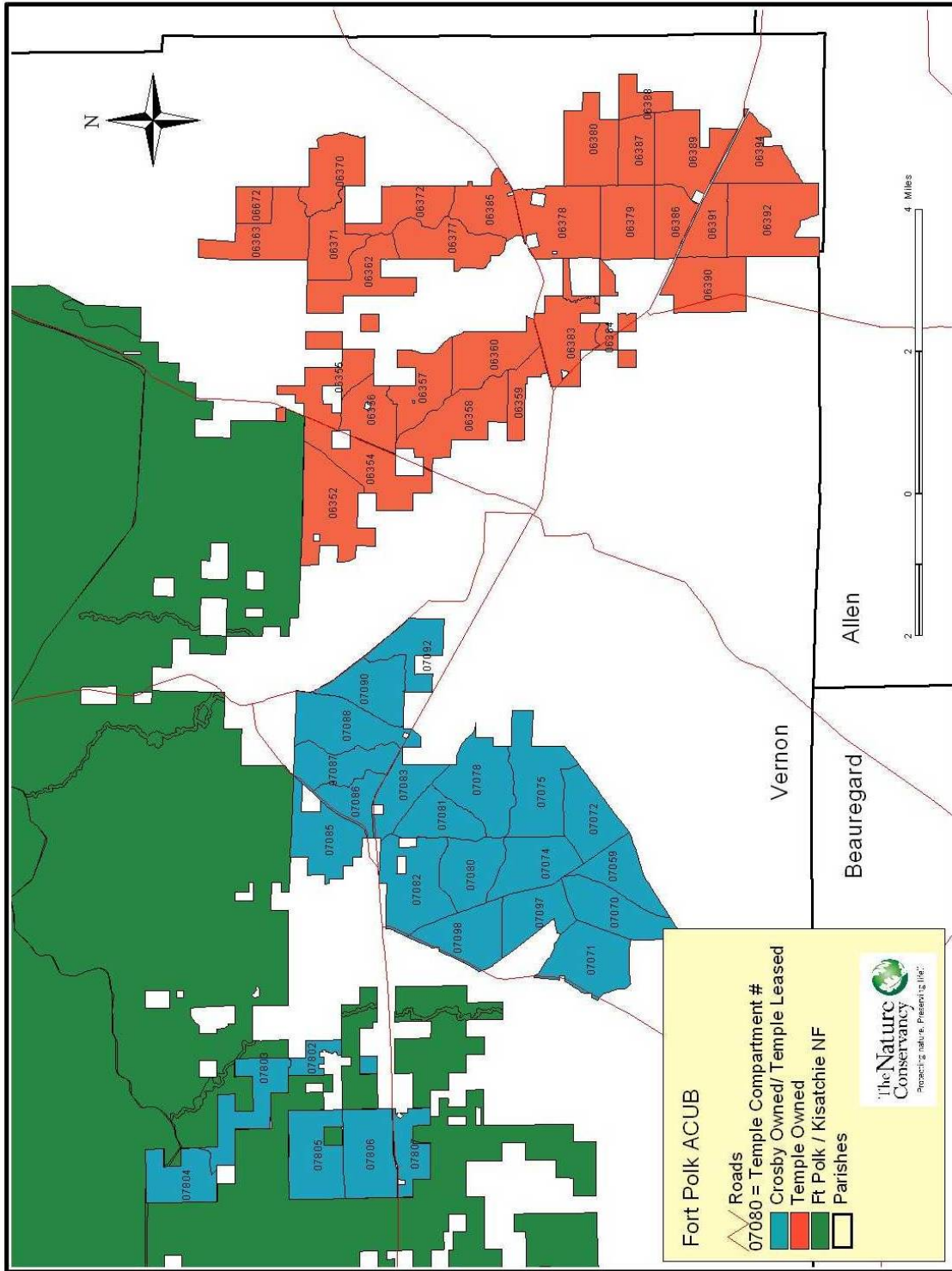


Figure 2. Ownership Map.

We also conducted a conservation forestry workshop held in August 2007 in the Fort Polk area. This workshop targeted local landowners to convey information about the ACUB program and discuss ecologically compatible forestry practices from a variety of landowner perspectives.

Please see workshop agenda and list of attendees attached.

#### **4. Refine priority areas and acquisition boundaries**

TNC has participated in site visits to approximately 8,000 acres of the priority tracts described above, including many of the highest priority parcels. These visits included Fort Polk personnel, TNC staff, and landowner representatives. The purpose of these inspections was to visually assess the ecological condition of the tracts relative to ACUB objectives, collect photos of representative stands, and consider the landscape context of the tracts.

The following photos are representative of the habitats and species targeted in this project.



**Figure 3. Longleaf Savanna.**



**Figure 4. Old-Growth Longleaf Pine.**



**Figure 5. Red-cockaded Woodpecker.**

Subsequently we requested and obtained additional stand information from the landowner. These data allowed us to further evaluate habitat quality, suitability for acquisition, and acquisition sequencing. The result of this analysis is a comprehensive acquisition sequencing plan for the primary and secondary tracts, prioritized according to RCW foraging habitat quality, proximity to existing RCW populations, and contribution to mission success (see figure below). The tracts were sequenced in a step-wise acquisition plan that should allow blocks of land to be aggregated and purchased by priority as funds become available each year (see table below).

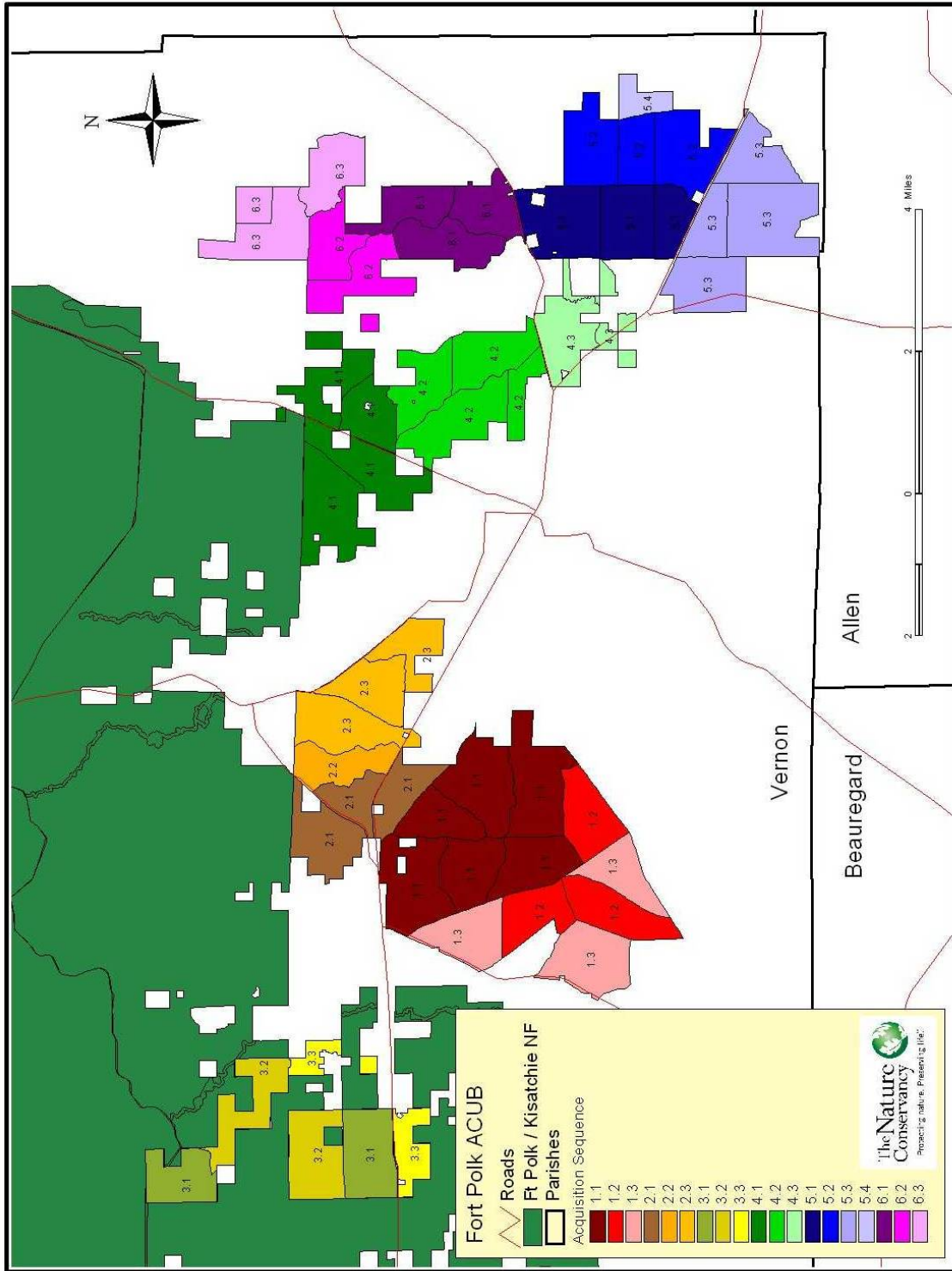


Figure 6. Acquisition Sequence Map

**Table 1. List of Acquisition Blocks**

Acquisition Block	Acres
1.1	3,387
1.2	1,400
1.3	1,492
2.1	1,185
2.2	424
2.3	1,441
3.1	1,000
3.2	1,077
3.3	483
4.1	2,153
4.2	1,801
4.3	772
5.1	1,491
5.2	1,457
5.3	2,068
5.4	198
6.1	1,292
6.2	941
6.3	1,207
Total	25,269





# **Implementation of the Ecoregional Conservation Plan for the Upper West Gulf Coastal Plain**

## **CONSERVATION FOREST TRAINING ACTIVITIES REPORT**

DoD Legacy Program Cooperative Agreement #DACA87-05-H-0013

The Nature Conservancy (TNC) #1040533813– Arkansas Field Office

### **OVERVIEW**

The Department of Defense and The Nature Conservancy contracted for the “Implementation of the Ecoregional Conservation Plan for the Upper West Gulf Coastal Plain” project in May of 2005. The project called for conservation area assessments or action plans and conservation forestry workshops for landowners at three sites: Pine Bluff Arsenal, Red River Army Depot and Fort Polk. The project objective was to compliment the Army Compatible Use Buffer (ACUB) program by assessing the three sites for ecological attributes and delivering possible strategies to protect those attributes to nearby landowners, foresters and loggers through the workshops.

Conservation Area assessments were completed at Pine Bluff Arsenal and Red River Army Depot. At Fort Polk, where much assessment work was already completed and initial buffer protection strategies were in place, identification of priority tracts, landowner contacts, and refinement of boundaries for tracts to be included into ACUB were the main scope of work and were completed. Conservation forestry workshops were held at Pine Bluff, Arkansas, Texarkana, Texas and Leesville, Louisiana to deliver the findings of the assessments and strategies that private landowners might use to sustain the ecological attributes of their land while maintaining economic value of their forests.

### **ACTIVITIES**

#### Pine Bluff Arsenal

The Pine Bluff Arsenal Conservation Action Plan (CAP) report was completed by The Nature Conservancy’s (TNC) staff after consultation with stakeholders and area experts. TNC objectives are to implement conservation by working directly with Pine Bluff Arsenal – first, to prepare data for Army Compatible Use Buffer (ACUB) plans and equivalent plans for Air Force installations; and second, to hold conservation forestry workshops to transmit management workbooks and other tools to participating landowners. Conservation forestry offers silvicultural and management guidance to the owners of priority buffer forested tracts. Appendix B is a summary of the PBA ecological systems, stresses, sources of stress, strategies to abate the stress, and measures of success. Staff and experts used the workbook to organize and summarize their finding into the plan.

The CAP findings were presented at the conservation forestry workshop held on February 20, 2007 at PBA. TNC staff and Charles Becker, Natural Resources Specialist at PBA, working

with Arkansas Forestry Association staff planned and implemented the workshop for interested private landowners in the area. Twenty-eight people, including landowners, foresters, and loggers, attended the workshop. The morning session included greetings from each sponsor and presentations on Conservation Forestry, the PBA CAP, Industrial Conservation Forestry (Plum Creek Timber Company), and the PBA Conservation Management Plan and some of its practices. Forestry related brochures were given to the participants. One brochure, Conservation Forestry, was printed especially for the workshop and distributed. It was used in the Louisiana and Texas workshops, and will be used in other appropriate forest landowner meetings in the UWGCP ecoregion. A lunch was provided for attendees that included a presentation titled “Conservation Tools for Private Landowners”. The afternoon session was a guided bus tour of the PBA areas that have been treated with Conservation Forestry practices.



Conservation Forestry workshop at Pine Bluff, AR (Pine Bluff Arsenal).

### Ft. Polk

Approval was obtained for a change in scope of work and movement of that work to Ft. Polk in Louisiana. The new scope deliverables is outlined below:

1. Continued work to develop the final ACUB plan (Appendix C, D).
2. Identification of priority tracts for inclusion in the Fort Polk ACUB.
3. Initiating landowner contact with owners of priority tracts to determine support for ACUB program and willingness to consider land sale.
4. Environmental site assessment to refine priority tracts and acquisition boundaries.

A Conservation Forestry workshop was held in Leesville, Louisiana on August 25, 2007 to apprise members of the Vernon Parish Landowners’ Association of the ACUB process for Ft. Polk and forest management practices they could use that would protect red-cockaded woodpecker and Louisiana pine snake habitats. A total of 18 landowners and foresters attended the workshop. Presentations included: definition of Conservation Forestry (TNC), Fundamentals of Conservation Forestry (USFS, Guldin), Conservation Forestry in the West Gulf Coastal Plain (TNC), Fort Polk ACUB (DoD), Industrial Conservation Forestry (Temple-Inland), Managing

longleaf pine for wildlife, recreation, and timber (LSU AgCenter), and Government incentive programs available to private landowners (NRCS).



Conservation Forestry workshop at Leesville, LA (Ft. Polk).

### Red River Army Depot

All survey work at Red River Army Depot and Lone Star Army Ammunition Plant was completed and reported in 2006 (floristic surveys and American Burying beetle survey). See Appendix E for the final Red River Army Depot Conservation Report

The Conservation Report findings were presented at the conservation forestry workshop held on August 24, 2007 at Texas A&M, Texarkana. TNC staff and Red River Army Depot staff worked with Dr. Jim Guldin of the US Forest Service to plan and present the morning workshop and afternoon tour. The morning session included presentations: Definition of Conservation Forestry (TNC), Overview of the Forests of East Texas (TNC), Findings of the species surveys at RRAD (TNC), Red River Army Depot-History, Wildlife, Forestry (DoD staff), Fundamentals of Conservation Forestry (USFS), Conservation Forestry (Industrial Perspective, TimberStar), Conservation Forestry (private landowner perspective, Ernest Lovett), and cost share programs-Forest Health in Texas (Texas Forest Service). In the afternoon, a tour of the Red River Army Depot highlighted the forest practices employed on the depot. A total of 24 landowners, foresters and loggers attended the workshop. Forestry conservation training presentations are included in Appendix A.



Conservation Forestry workshop at Texarkana, TX (Red River Army Depot).

# TimberStar – Who are we?

- Founded in 2005 for purpose of acquiring productive forestlands and managing for long term production.
- In October, 2006 purchased 900M acres from IP.
- Company office in Shreveport w/3 separate Forests.
- Will manage forestlands sustainably for timber and other non-timber values.
- Will continue to be 3<sup>rd</sup> party certified to the SFI standard.

# Sustainable Forestry Initiative

- Based on premise that responsible environmental behavior and sound business decisions can coexist
- Founded in 1994 by AFPA
- Audit process to become 3<sup>rd</sup> party SFI certified
- Jan.1, 2007 became fully independent
- Multi-stakeholder Board of Directors is sole governing body
- To protect the economic, environmental, and social needs of our forests and communities

# **SFI Principles for Sustainable Forestry**

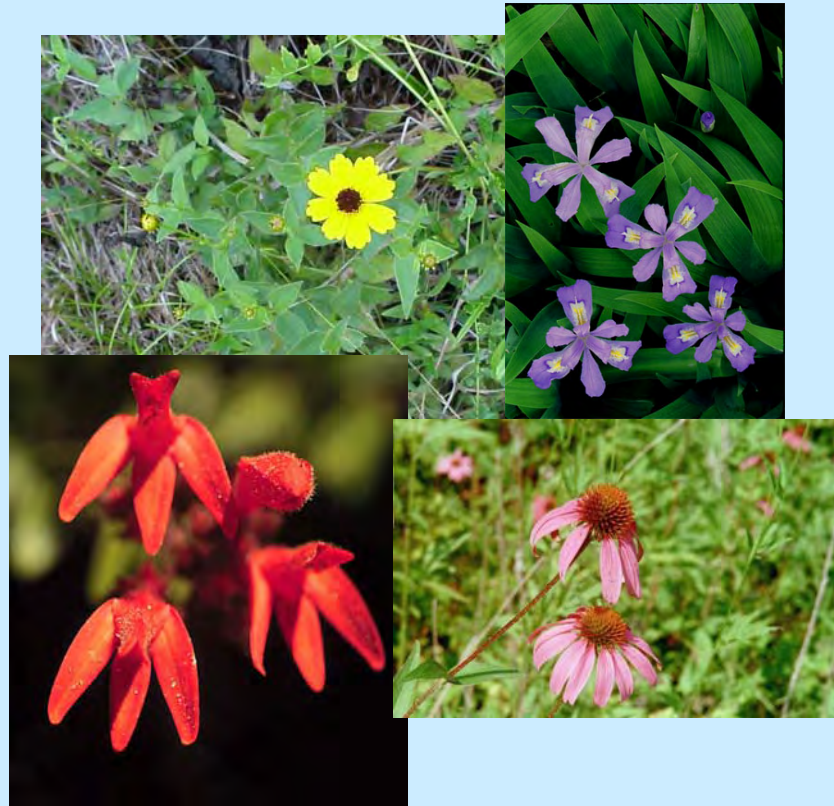
- 1. To meet the needs of the present generation without compromising the opportunities of future generations to meet their needs.**
- 2. To use and promote sustainable forestry practices.**
- 3. To provide for regeneration and maintain productive capacity.**
- 4. To protect forests from wildfire, pests and diseases, and to maintain and improve long term forest health and productivity.**
- 5. To protect and maintain long-term forest and soil productivity.**
- 6. To protect water bodies and riparian zones.**
- 7. To protect and manage sites of ecological, geological or historical significance consistent with their unique qualities.**
- 8. To comply with applicable laws, statues, and regulations.**
- 9. To continually improve the practice of forestry and to monitor, measure and report performance in achieving sustainable forestry.**



# Sustainable Forestry Initiative Objectives

1. Broaden practice of sustainable forestry
2. Ensure long-term forest productivity (includes prompt reforestation)
3. **Protection of water quality**
4. Enhance quality of wildlife habitat (promote habitat diversity)
5. Manage visual impact
6. **Manage lands of special qualities**
7. Promote efficient use of forest resources
8. Share sustainable forestry practices
9. Improve forestry research
10. Improve sustainable forest management through training.
11. Commit to comply with laws and regulations
12. Encourage public to participate in commitment to sustainable forestry
13. Promote continual improvement

# Special Places in the Forest



These sites include:

- Endangered or rare plants or animals
- Unique or scenic hydrology
- Unique physical characteristics such as bluffs or outcrops
- Scenic vistas

# Special Places in the Forest



## Tiers of Importance

- Tier One Sites (T&E species habitats, archaeological sites, unique ecological areas)
  - Written management plan
  - Visited & evaluated in writing annually
  - Mapped and/or marked on the ground
  - Site is of significant value
- Tier Two Sites (cemeteries)
  - Mapped and/or marked on the ground
  - Site is of value

# Timber Hill Archaeological Site-Tier 1



# Timber Hill Archaeological Site-Tier 1

- 1227 acre site was the village of the Kadohadocha Caddo Indians between 1800-1842.
- Working with Texas Historical Commission to identify all hamlet locations. THC to supervise excavation of hamlets.
- Maintain hamlet areas in a grass cover.
- No subsoiling activities on tract.
- Do not allow location of the site to become public until all parties agree it is safe to do so.

# Alley's Mills- Tier 1

- 15 acre site of sawmill town in settled in 1838
- Site includes foundations, water well, evidence of mill pond, and old road bed
- Designated Texas State Archaeological Landmark
- Protection of features for future archaeological investigations.

# Louisiana Pine Snake-Tier 1



# Louisiana Pine Snake-Tier 1

- Is listed as a candidate species by the USFWS
- 30,000 fee acres in Bienville Parish, LA of suitable habitat.
- 1,700 acres in core area
- Largest known population of snake
- Lives in pocket gopher burrows and feeds on them
- Longleaf restoration, prescribed burning, banded HWC
- Working with USFWS, Louisiana Dept. of Wildlife and Fisheries, USFS, and Memphis Zoo.



# Re-establishment of Longleaf pine



# Heron Rookery



# Oil Springs-Nacogdoches, TX



# Oil Springs-Nacogdoches, TX

- Site of first oil well in Texas-summer of 1866
- First pipeline to Nacogdoches
- Has a spring where oil type water flows
- Fenced off area from vehicular traffic
- Working with Texas Historical Commission to restore site

## Cemeteries-Tier 2



# Forestry BMP's

- All about conserving our water quality
- Guidelines intended to cover all forestry activities on land
- Important practices which prevent or greatly reduce the amount of non point source pollution of water bodies
- Also protect soil resources and productivity
- Are voluntary, but strongly encouraged to comply

# **Timber Harvest Area Size, Shape and Residual Debris Are Managed to Lessen Visual Impacts**



# DeGray Lake- Use of BMP's





# Principles of Conservation Forestry

James M. Guldin, Ph.D., R.F.  
[jguldin@fs.fed.us](mailto:jguldin@fs.fed.us)

Center for Ecology and Mgmt of Southern Pines  
Southern Research Station  
US Forest Service  
Hot Springs AR 71902

# Fundamentals of conservation forestry

## Goals:

- Manage for forest health, diversity, sustainability
- Maintain aesthetics, wildlife, water



Even-aged loblolly-shortleaf pine,  
with fire



Uneven-aged loblolly-shortleaf pine,  
no fire



Even-aged mature loblolly-shortleaf pine stand  
Stephen F. Austin EF, Nacogdoches TX

## Fundamentals of conservation forestry

Objectives:

- Manage tree species native to the area



Reynolds Research  
Natural Area

Crossett  
Experimental Forest

Ashley County, AR

Illustrates the two  
native pines in the  
upper West Gulf  
Coastal Plain—

Shortleaf pine (L),  
and loblolly pine (R)

# Fundamentals of conservation forestry

## Objectives:

- Manage tree species native to the area
- Apply practices that restore ecosystems—  
thinning, prescribed burning

Pine ecosystems burned historically

Using prescribed fire brings back ecosystem values absent for the past 80 years







Thinning mimics natural mortality...

...and increases the vigor of the trees that remain

## Fundamentals of conservation forestry

### Objectives:

- Manage tree species native to the area
- Apply practices that restore ecosystems—  
thinning, prescribed burning
- Grow large trees to old age and high value



The timber goal in conservation forestry—trees of large size and high quality



Income from conservation-based sustainable management increases the alternatives available for the landowner

Five-year partial cutting harvest brings \$600/ac, Crossett EF

## Fundamentals of conservation forestry

### Objectives:

- Manage tree species native to the area
- Apply practices that restore ecosystems—  
thinning, prescribed burning
- Grow large trees to old age and high value
- Harvest the worst trees and leave the best



Cut the worst trees  
and leave the best—

Continually improves  
forest conditions

## Fundamentals of conservation forestry

### Objectives:

- Manage tree species native to the area
- Apply practices that restore ecosystems—  
thinning, prescribed burning
- Grow large trees to old age and high value
- Harvest the worst trees and leave the best
- Minimize intensive activities and cash spent on  
treatments



KG blade on a D-6 bulldozer for shearing residual vegetation during site preparation, ~\$200/ac

The more that tools like this are used in forestry operations, the greater the impacts on the soil

The more intensive the treatments conducted with tools like this, the greater the impacts on the native vegetation



## Fundamentals of conservation forestry

### Objectives:

- Manage tree species native to the area
- Apply practices that restore ecosystems—  
thinning, prescribed burning
- Grow large trees to old age and high value
- Harvest the worst trees and leave the best
- Minimize intensive activities and cash spent on  
treatments
- Minimize or eliminate use of herbicides and  
fertilizers; when used, used at low rates and  
selective application

Routine use of these tools is to be avoided, but--  
selective use can meet ecological goals



## Silvicultural practices for conservation forestry

Regeneration (Establish new stands)

Intermediate treatments (Manage immature stands)

Reproduction cutting (Manage and regenerate old stands)

Lifelong forestry

# I. Regeneration

Rule #1: Seedlings are the future!  
When a mature tree is cut,  
a new tree must replace it

-use natural seedfall whenever possible



Natural seedfall—

From parent trees on  
or near the open area  
where seedlings are  
needed



Loblolly-shortleaf pine in the West Gulf region—  
Adequate or better seedfall 4 years in 5, >1 million seed/ac max



Resprouting is related to this characteristic crook in the root



Fire prepares the forest floor to catch new seedlings





Shortleaf pine seedlings resprouting when topkilled by fire

# I. Regeneration

Rule #2:            If land is not forested,  
re-forest by planting



“Planting a pine is an act of creation”—Aldo Leopold, *A Sand County Almanac* (1949)  
40-yr-old pine planted on old cotton field, Ashley County AR





Containerized longleaf pine seedlings—  
the best way to plant longleaf or shortleaf

## II. Intermediate treatments

Rule #3: Thinning reduces overcrowding,  
and makes weak trees strong!



The goal of thinning in young stands—

density reduction,  
mostly, rather than  
selection for quality



**In older stands—thinning reduces overcrowding  
and promotes individual tree vigor and health**

Thinned longleaf pine stand, Sam Houston NF, New Waverly TX

## II. Intermediate treatments

Rule #4: Prescribed fire is a huge benefit to southern pines





Burning meets ecological goals of management in pine stands  
Prescribed fire ignition, Ouachita NF, Scott County AR



Burning opens midstory, restores vegetation on the forest floor  
Recent burn in immature shortleaf pine stands, Ouachita NF, Scott County AR



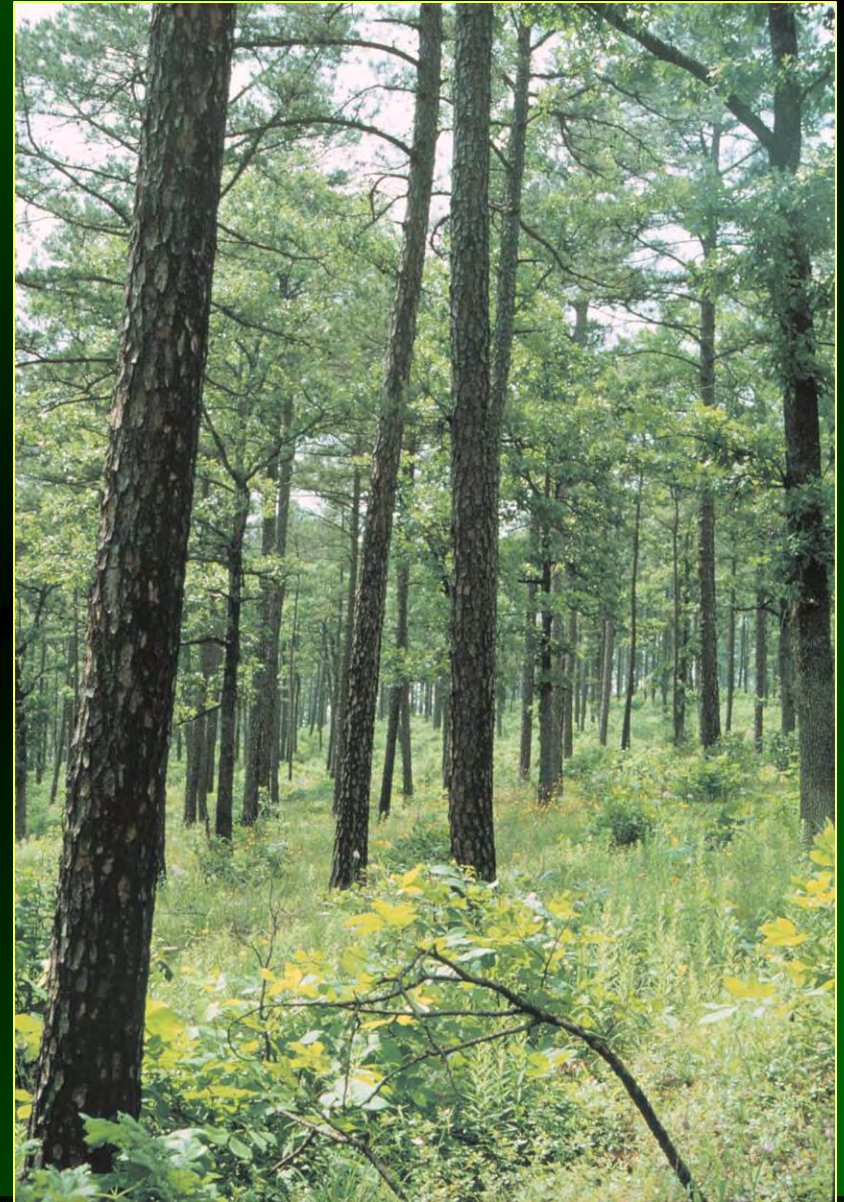
**Burning develops prairie flora underrepresented on the land**  
Recent burn in immature longleaf pine stands, Sam Houston NF, New Waverly TX

## II. Intermediate treatments

Rule #5: Midstory hardwoods in pine stands—  
some are OK, too many is not natural



Too many hardwoods clog up the understory  
Herbicide demonstration, Crossett EF, Ashley County AR



Before---Midstory removal and burning---After  
Shortleaf pine-bluestem restoration area, Ouachita NF, Scott County AR

### III Reproduction cutting

Rule #6:            Grow trees to large size using a simple cutting rule:

Cut the worst trees,  
and leave the best



The best control of the harvest occurs when:

- a forester marks the stand for the loggers to cut

- the marked timber is sold under competitive bid





Sustainable harvest—trees cut from background stand  
Good Forty harvest in 1956, Crossett EF, Ashley County AR

### III Reproduction cutting

Rule #7: You do not have to clearcut to obtain a new stand! Maintain continuous cover using partial cutting:

Even-aged stands

Seed tree

Shelterwood

Uneven-aged stands

Group selection

Single-tree selection



Even-aged method:

The seed-tree method

The trees that remain  
will re-seed the stand



Even-aged method:

The seed-tree method

Leave good seed trees—so the seedlings have good genes

Too many trees is easy to fix! Too few is not.



Even-aged method: The shelterwood method  
The trees that remain will re-seed the stand

# Uneven-aged method: The single-tree selection method

## Continuous growth, yield, and canopy cover





Uneven-aged method: The group selection method  
Continuous growth, yield, and canopy cover

## IV Lifelong forestry

Rule #8:            Avoid intensive treatments  
                          and chemical amendments

Exception—to meet a specific ecological need





Intensive treatments disrupt soil conditions and cost \$



But you may have a problem that needs herbicide...

## IV Lifelong forestry

Rule #9: In all your forestry operations,  
remember your BMPs!



For example—

Consider restrictions on logging when soils are too wet to support logging equipment

## IV Lifelong forestry

Rule #10: When nature gives you lemons,  
make lemonade!

Coping with natural catastrophes—  
manage what you have, or start over

# Longleaf pine stand only partially destroyed by Hurricane Katrina Manage what remains



Manageable stand remains after December 2000 ice storm  
Shortleaf pine, Ouachita NF, Montgomery County AR



# SUMMARY

Conservation forestry—

A philosophy, not a textbook

Manages with nature rather than against her

Requires active management, not passive neglect

Recognizes values that bring \$\$, and values that bring appreciation



Larson & McGowin, Inc.

CONSERVATION  
FORESTRY  
WORKSHOP

August 24, 2007

Texas A&M Texarkana  
Red River Army Depot

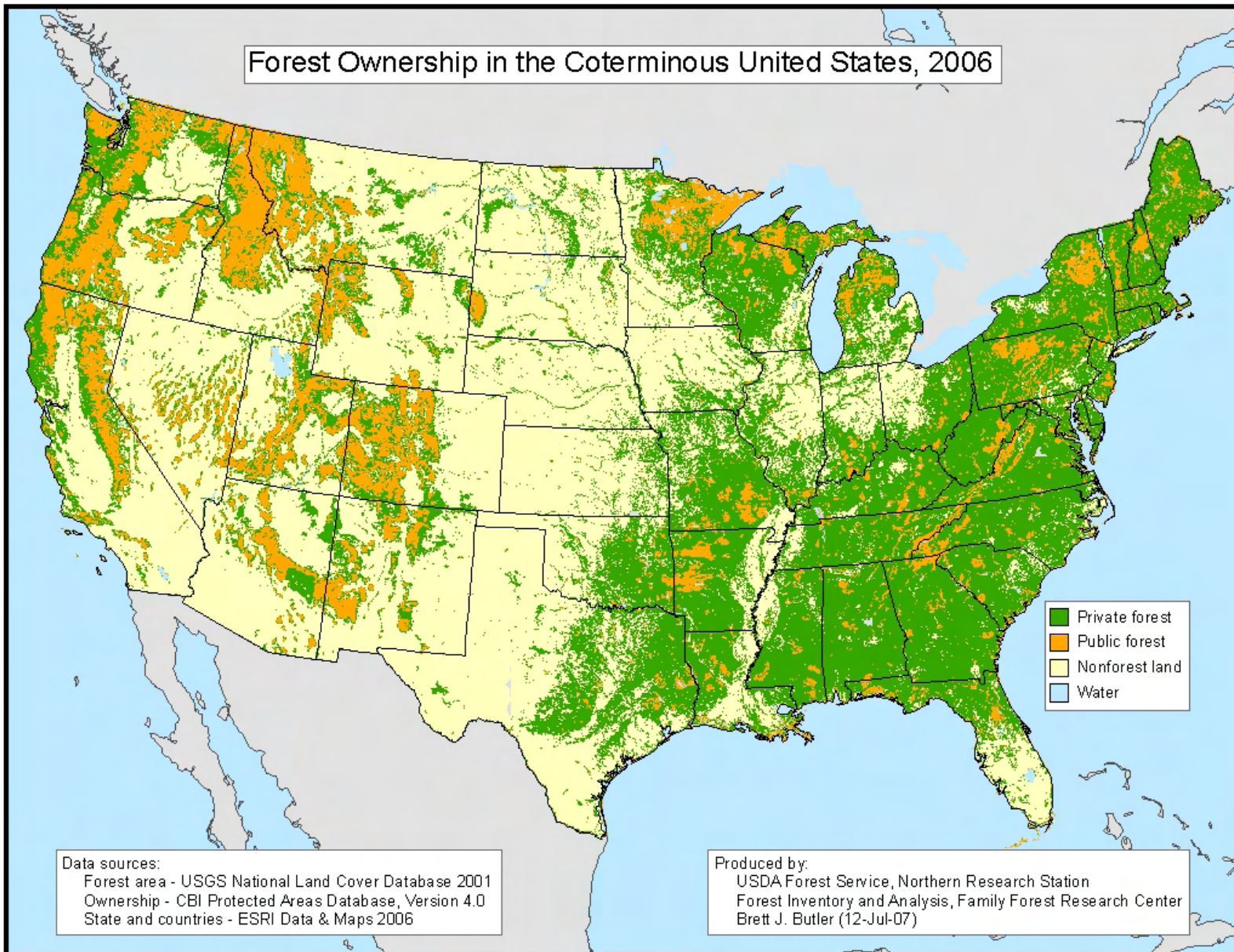
Ernest Lovett

Conservation Forestry  
From a Private Landowner  
Perspective

## About Private Landowners

- Me, too
- In the U.S.
  - 11 Million private woodland landowners
  - 421 million acres (56% of U.S. forestland)
  - 44% of nation's private forests & owners are in the south
  - States with largest private ownership (each with over 15 million acres) are Alaska, Georgia, Alabama, Mississippi, Maine, Texas, North Carolina, and Arkansas

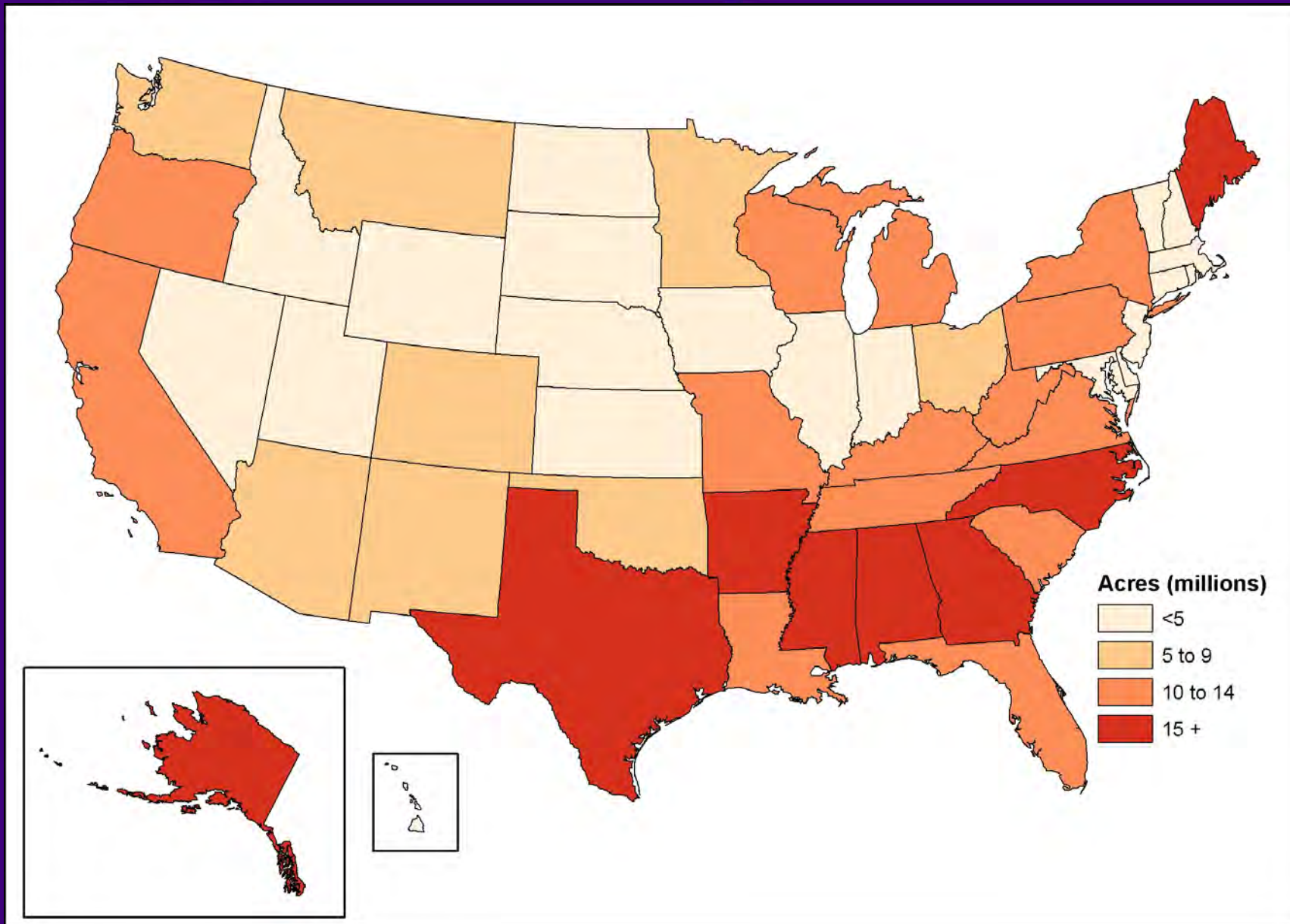
# Larson & McGowin, Inc.



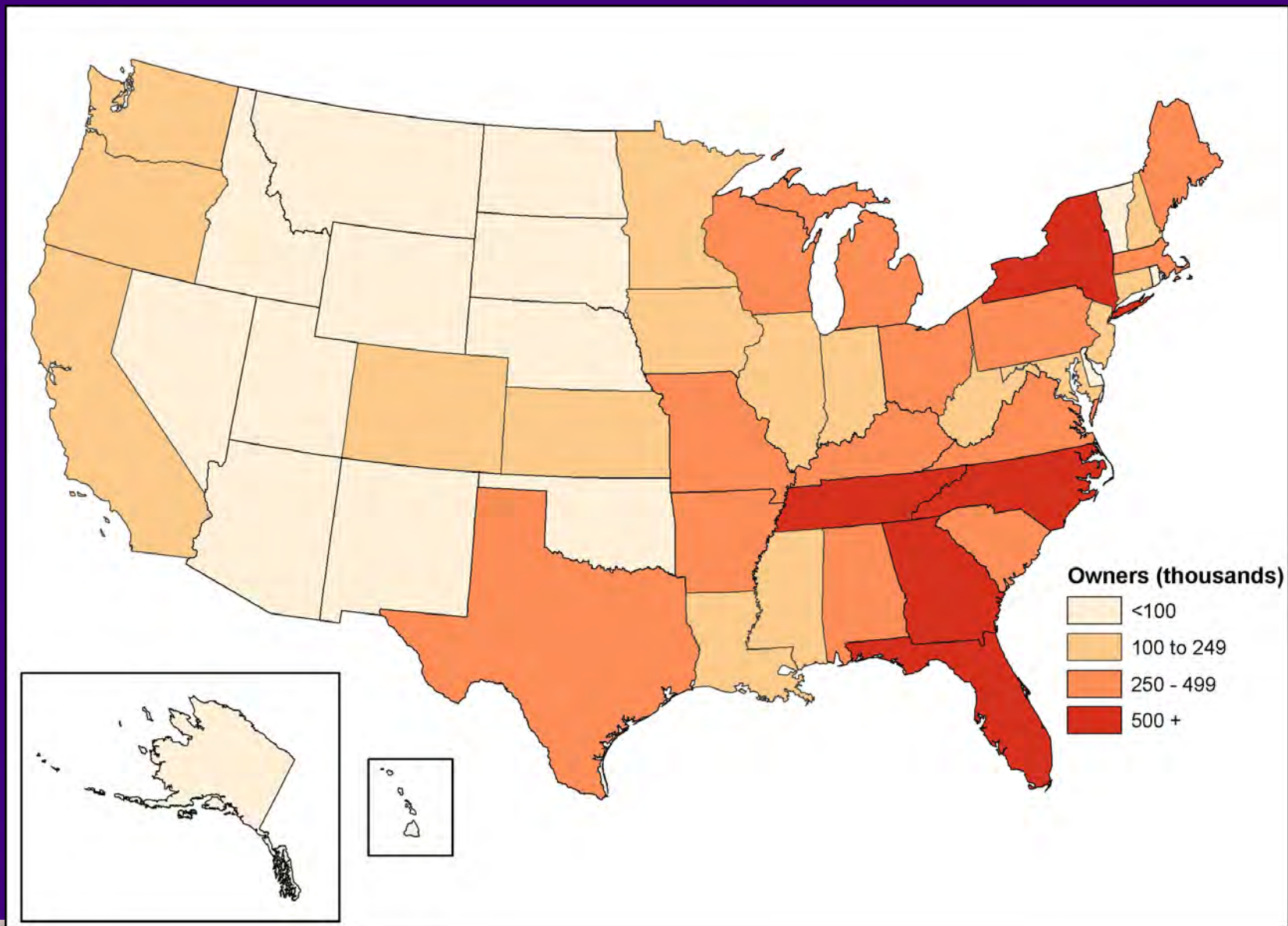
## About Private Landowners

- In the South
  - 1% Local
  - 3% State
  - 9% Federal
  - 26% Other private lands
  - 59% Family

# Larson & McGowin, Inc.



# Larson & McGowin, Inc.

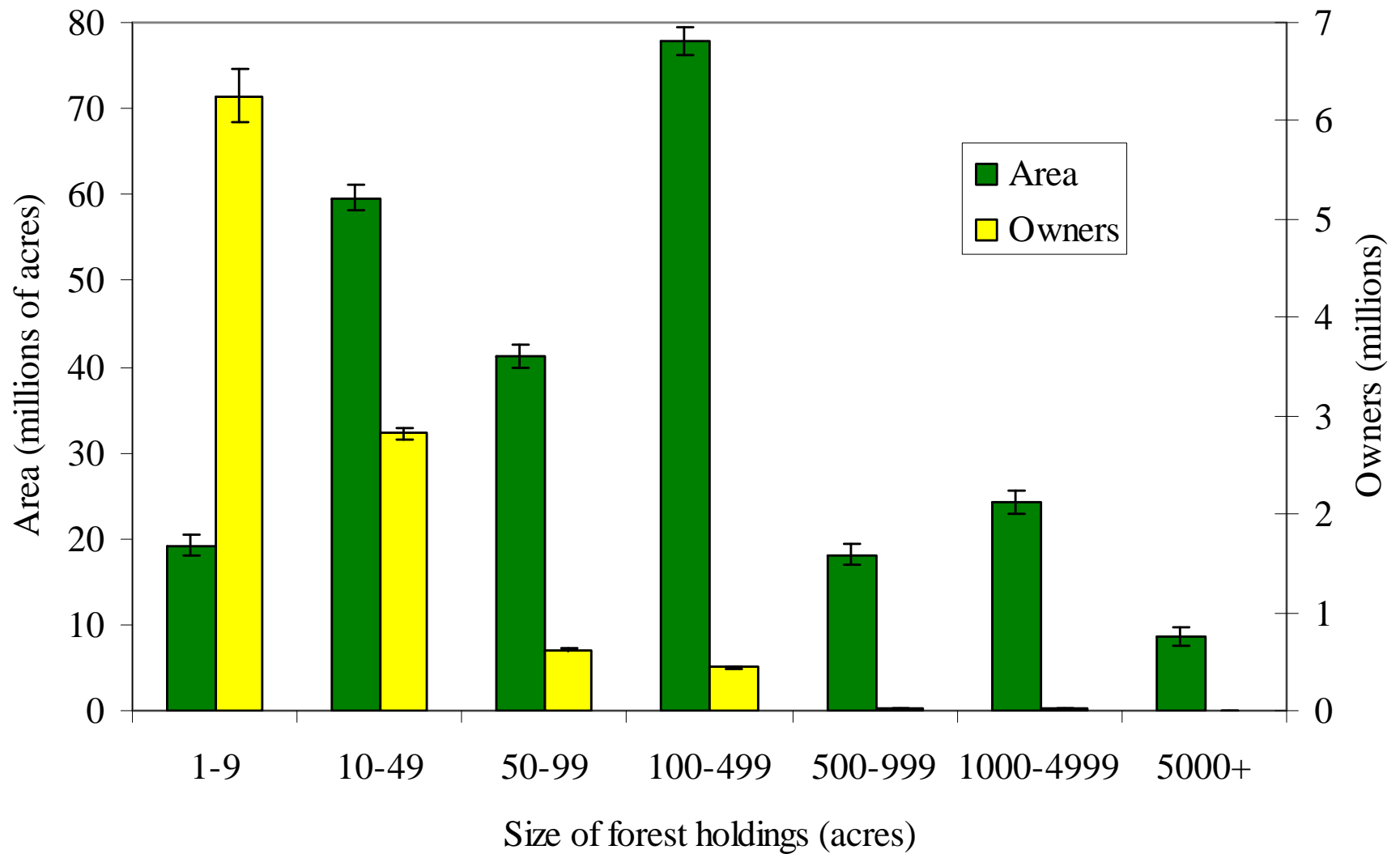


# Private Family Landowners

- New Info from the August 2007 Southern Journal of Applied Forestry
  - Family forest owners own about 42% of all U.S. forestland
  - About half the family area is owned by 100 – 500 acre ownerships



# Larson & McGowin, Inc.



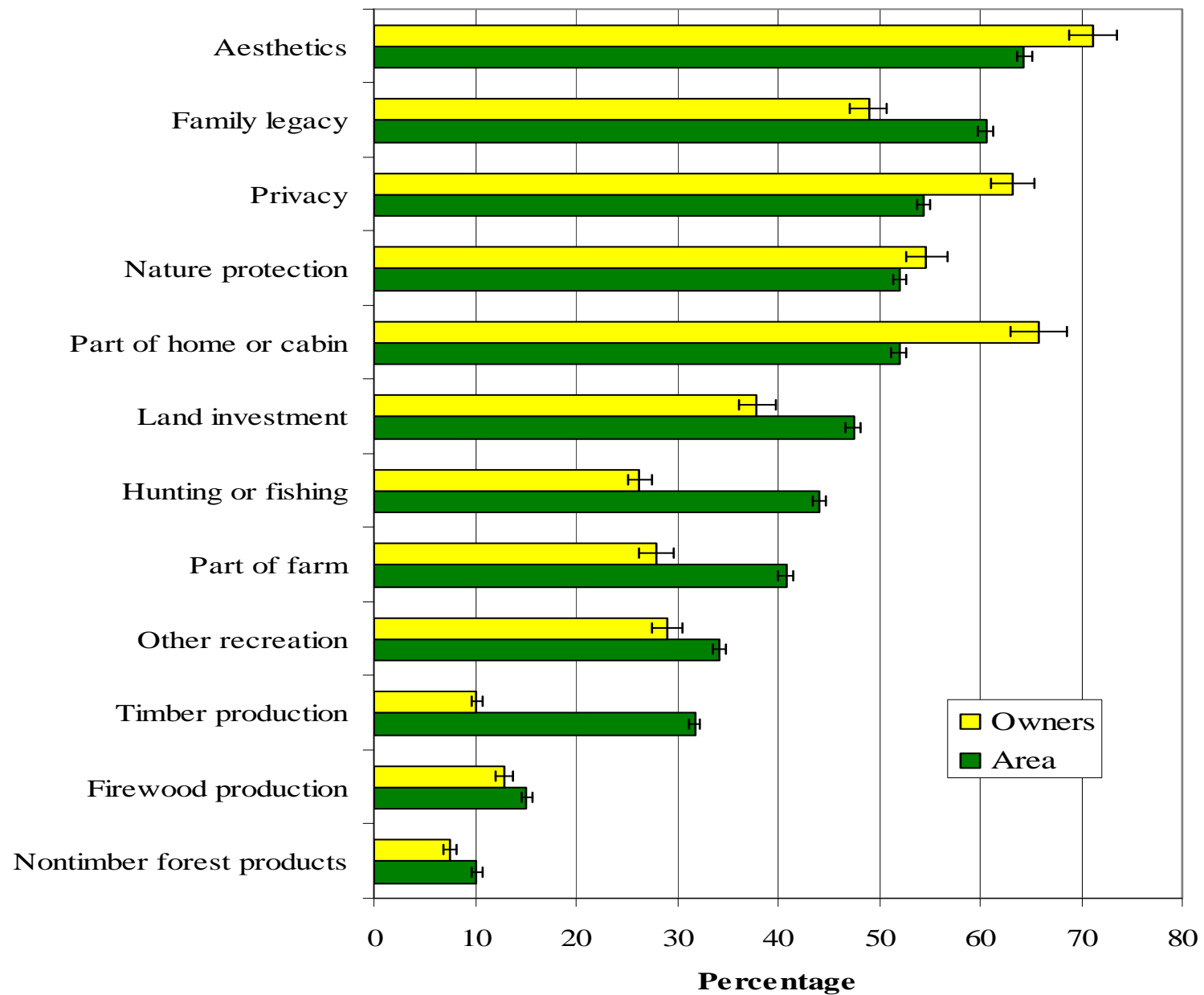
## About Private Landowners

- Nationally
  - Since 1993 a 12% increase in owners
  - A 7% increase in area of private forest land
  - Average parcel size of about 40 acres

## Private Landowner's Goals

- Mostly multiple use
- Timber production is more of a goal in the south
- Owning forestland for investment (nationally) was very important for 38% of family owners who own 47% of the family forest land area

# Larson & McGowin, Inc.



# Private Landowner Conservation Forestry

- Define it???
  - “retention of existing forests and creation of new forests as prescribed by state and federal law” .....
  - “sustainable forestry” (now, define that)
  - “nationally significant concentrations of biodiversity values”
  - A diverse ecological habitat based on native species

## What is Conservation Forestry to most Family Forestland owners?

- **TIMBER HARVESTING** , a tool to meet multiple goals. (46% of owners who own 69% of family land have harvested trees)
  - To increase aesthetics
  - To promote wildlife and recreation goals
  - For timber production and income

## Conservation Forestry For Most Family Landowners

- **RECREATION w/ AESTHETICS:**
  - Use by owners, friends and family
  - Leasing for non-timber income and stewardship of lessees
  - Investment in modified silvicultural treatment
  - Specific or multiple flora and fauna promotion
  - Increase “corridor” and landscape thinking with migratory song birds, etc.

## Conservation Forestry to Most Family Landowners

- **HELPING THE ENVIRONMENT**
  - Carbon sequestration (A BIG NEW ONE)
    - CCX
    - \$\$ PER ACRE PER YEAR
  - Bio-Fuels
    - Possibly HUGE: Cellulosic ethanol



## Non-Timber Income

- Recreational Leasing:
  - Hunting, fishing, other
- **CARBON CREDITS**
  - Pilot Program
  - Future upside
- Conservation easements (Govt., TNC)
- **BIO FUELS**

## Conservation Forestry to Most Family Landowners

- Other uses
  - Living on and enjoying the property

– *Bear Farming*

# Larson & McGowin, Inc.



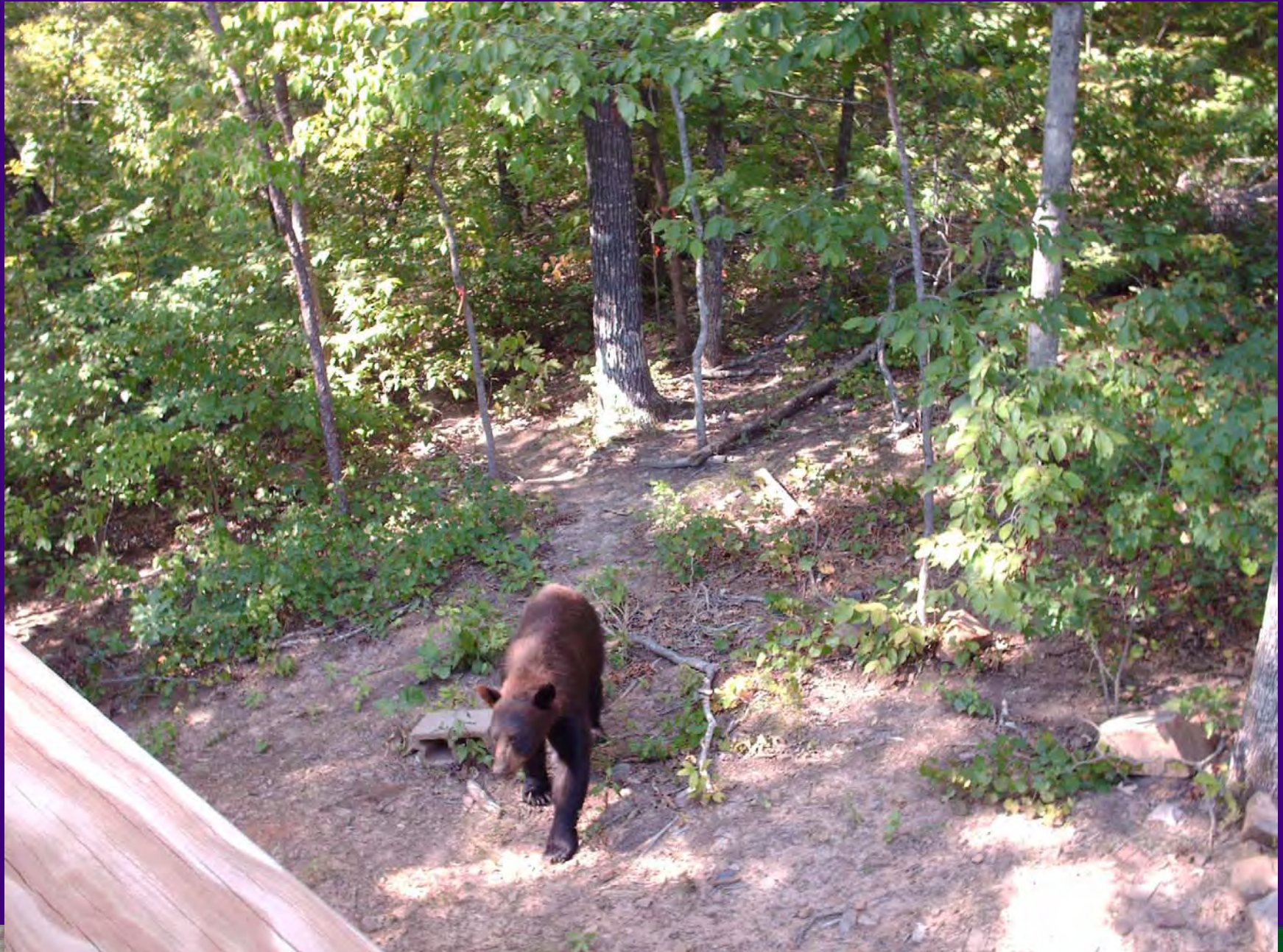
# Larson & McGowin, Inc.



# Larson & McGowin, Inc.



# Larson & McGowin, Inc.



# Larson & McGowin, Inc.



# Larson & McGowin, Inc.





Larson & McGowin, Inc.



# Larson & McGowin, Inc.



## How To?

- Must work with what you have
- If you're blessed, use natural regeneration management, if not – plant and move forward
- If starting from scratch (cut-over or pre-merchantable pine), manage for diversity through well thought out management plans
- Get professional help

# Timber Management

- Hardwood management (upland and bottomland) is for another time
- Longleaf and Slash pine management is also another topic
- Let's look at Loblolly Pine which is common naturally across much of the south

# Pretty Good Timber Management Guidance

- USFS SRS General Technical Report SO-118, UNEVEN-AGED SILVICULTURE FOR THE LOBLOLLY AND SHORTLEAF PINE FOREST COVER

TYPES by Baker, Cain, Guldin,  
Murphy, Shelton

# Larson & McGowin, Inc.



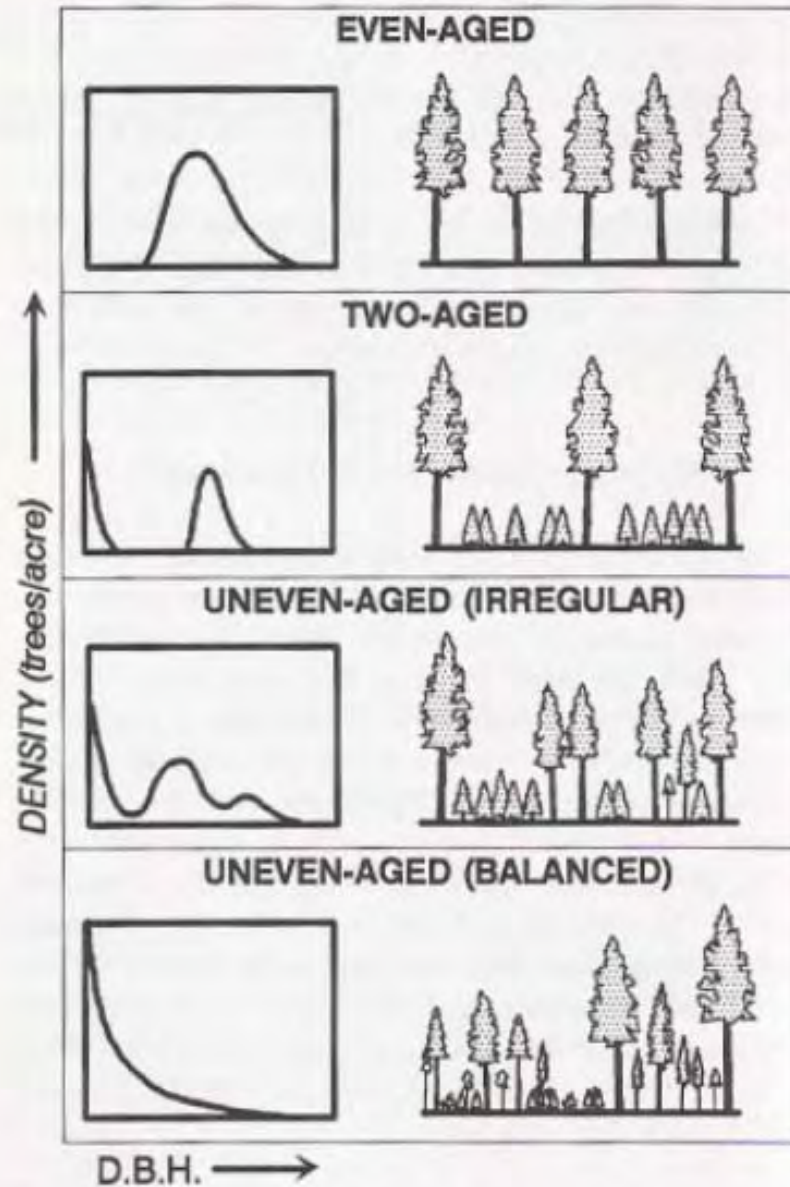
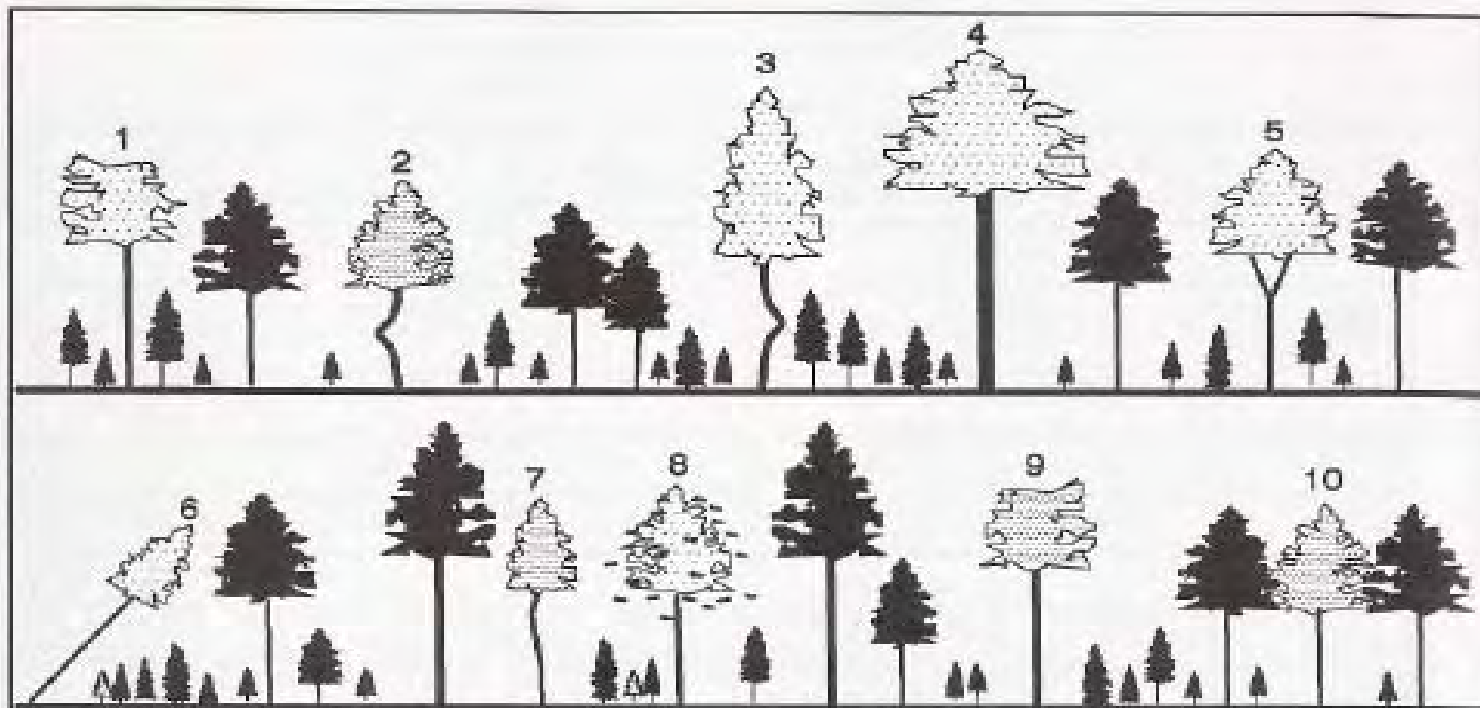


Figure 2.1.—Diameter distributions and canopy profiles occurring in stands with different types of age structure.



**Cutters**



**Thinners**



**Growers**

- 1 = Cutter: poor quality (damaged top), suppressing growers.
- 2 = Thinner: poor form (stem crook), not suppressing growers.
- 3 = Cutter: poor form (stem crook), suppressing growers.
- 4 = Cutter: exceeds maximum diameter and not needed to maintain prescribed basal area.
- 5 = Cutter: poor form (main stem forked), competing with growers.
- 6 = Cutter: poor form (severe lean).
- 7 = Thinner: minor stem crook, not competing with growers.
- 8 = Cutter: insect infestation, not expected to survive through next cutting cycle.
- 9 = Thinner: damaged top, not severely competing with growers.
- 10 = Thinner: density control, competing with growers.

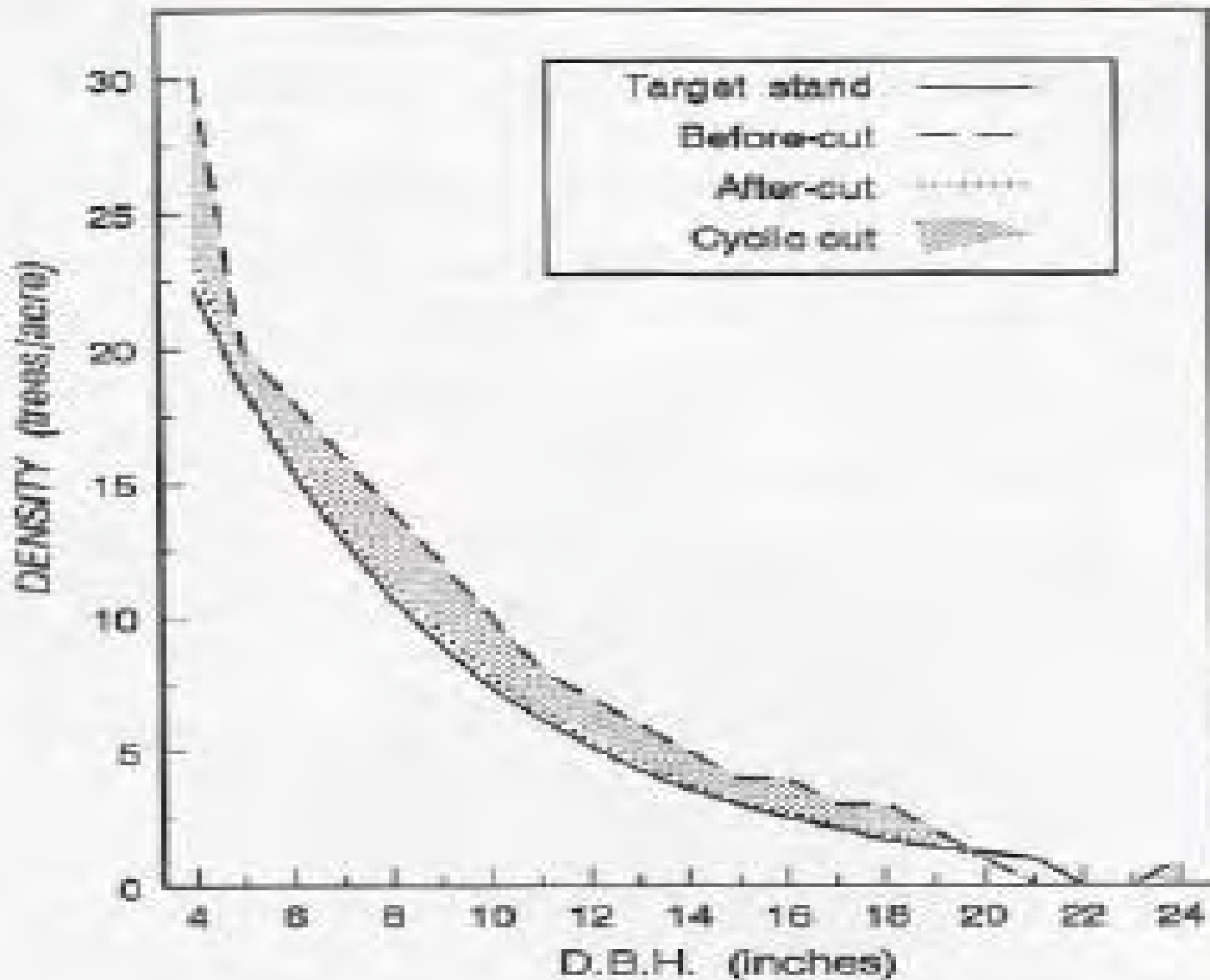


# Larson & McGowin, Inc.

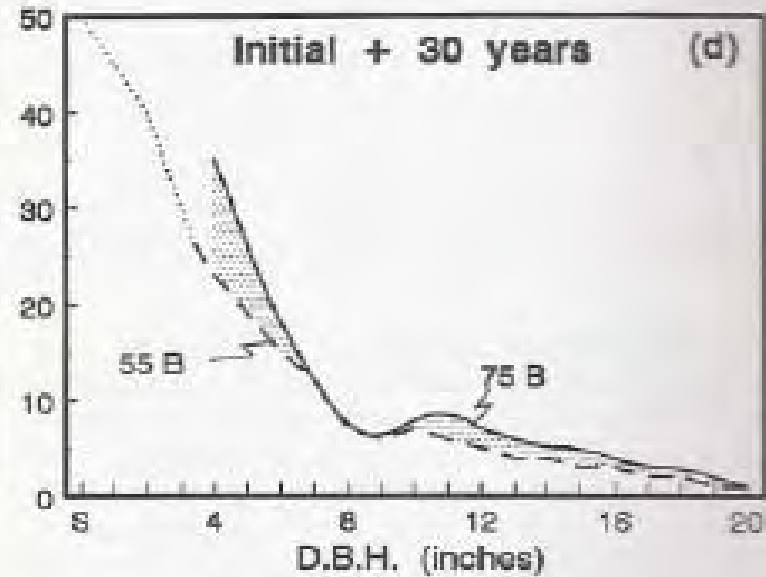
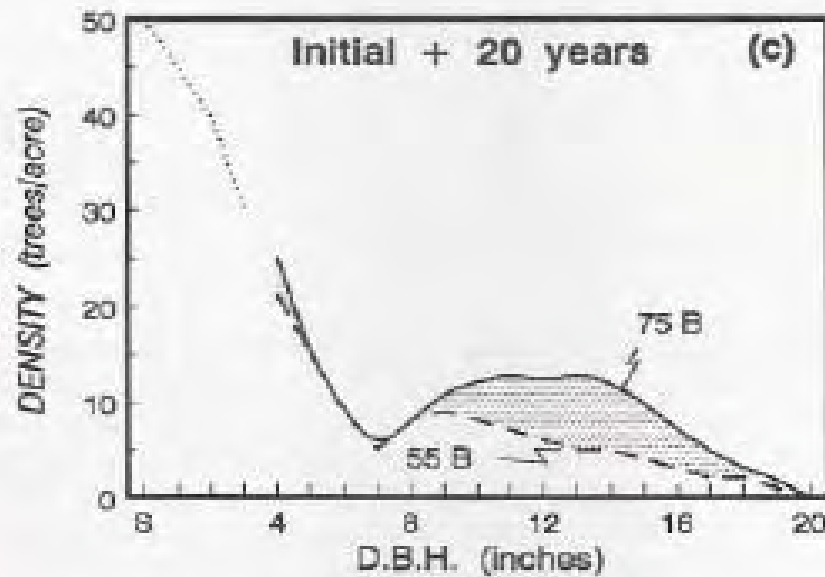
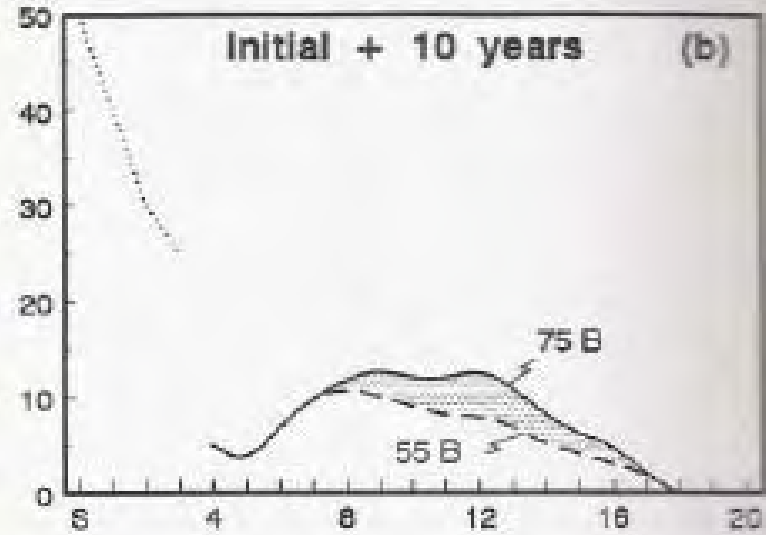
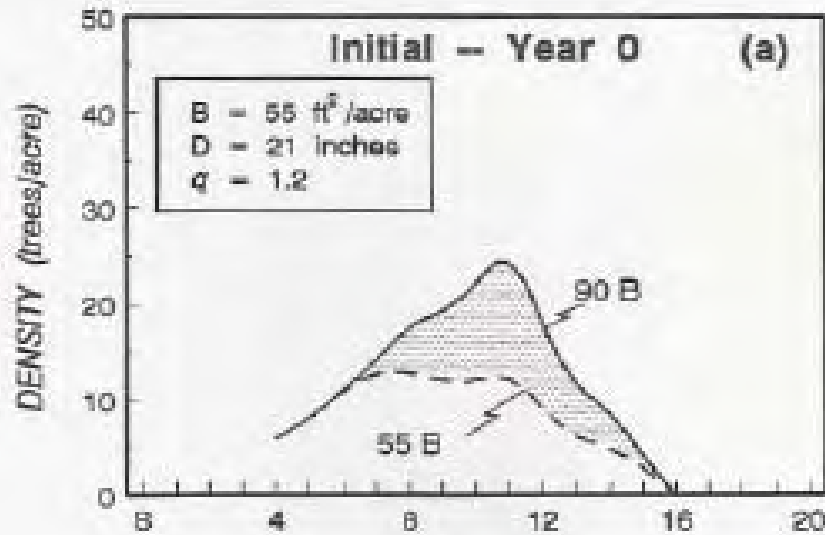


# Larson & McGowin, Inc.





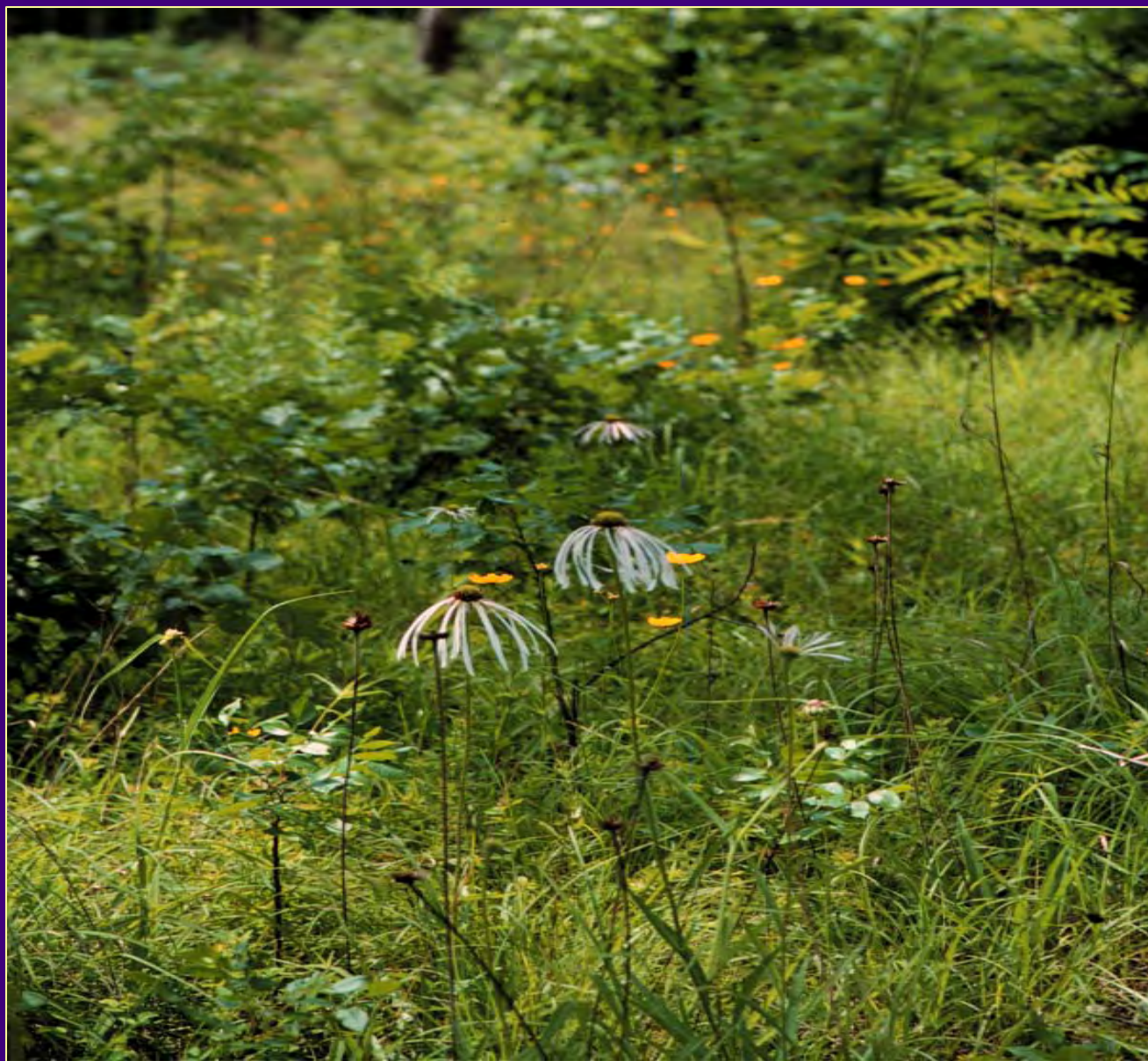
# Larson & McGowin, Inc.



# Larson & McGowin, Inc.



# Larson & McGowin, Inc.



## Have You Cake ....

- Natural regeneration techniques allows a continuing forest appearance
- Predictable regular income streams
- Resultant wildlife and recreational responses for non-timber values

The Nature  
Conservancy



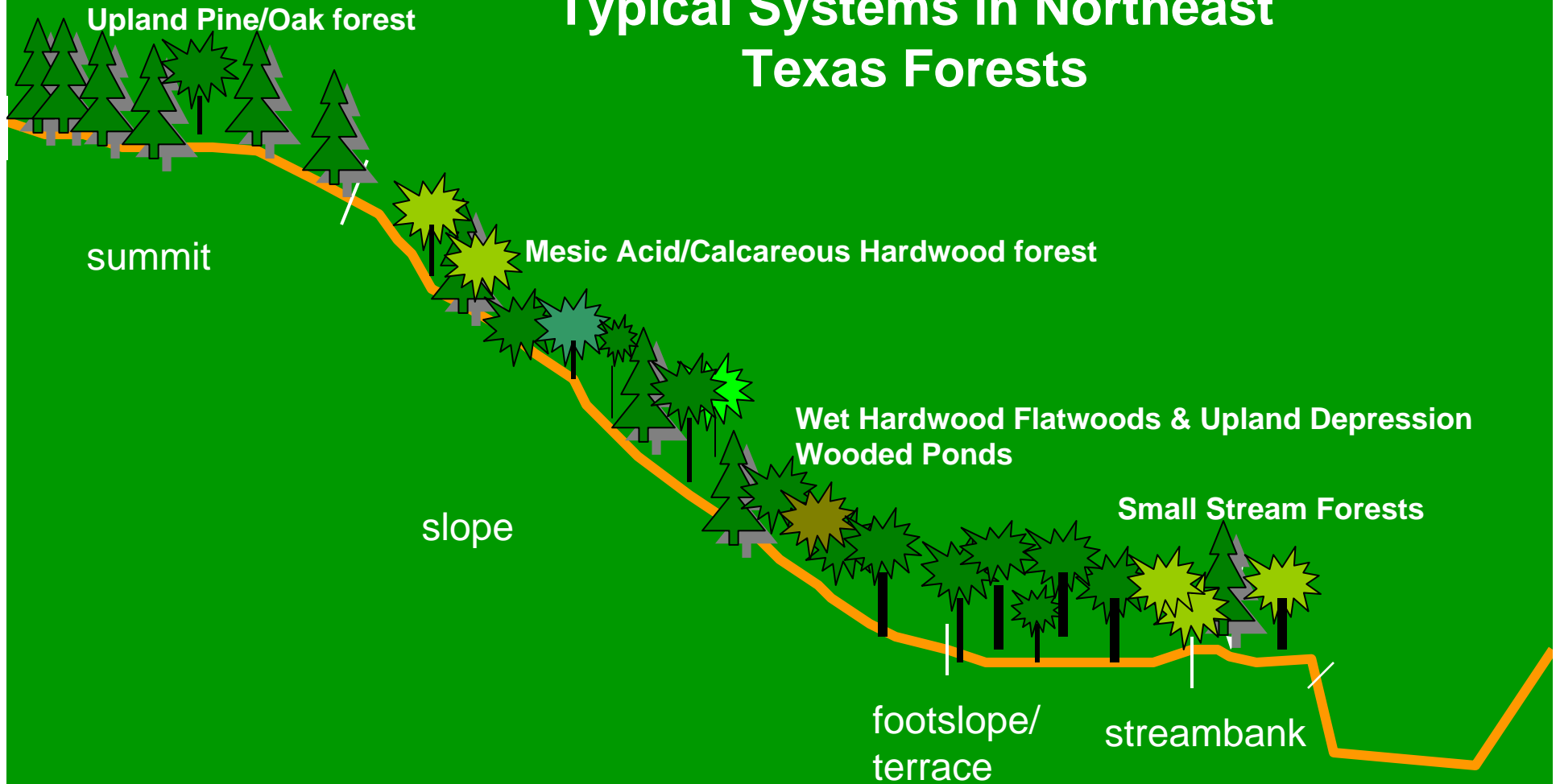
Protecting nature. Preserving life.™

# An Overview of the Forests of Northeast Texas

*Jim Eidson, The Nature  
Conservancy  
jeidson@tnc.org*



# Typical Systems in Northeast Texas Forests



# Northeast Texas Forests Overview

## *Upland Pine and Pine- Hardwood Forests*

Shortleaf pine forest and savanna made up a majority of the upland matrix vegetation. Over-harvest, and conversion to pasture and farmland has replaced much of the historic cover. Fire suppression may lead to an increase in Loblolly pine, which occurs as a minor associate. In some remnant stands, loblolly is increasing and displacing shortleaf. Sites are generally underlain by loamy soils to fine textured soils of variable depth.



# Northeast Texas Forests Overview

## *Xeric Sandhills*

Droughty sands and rocky barrens imbedded within the shortleaf pine matrix support arid sandhill communities. Rare species, including Arkansas oak, sanguine purple coneflower and Soxmans milkvetch occur here.



# Northeast Texas Forests Overview

## *Upland Mesic Hardwood Forests*

Upland mesic hardwood forests are typical of midslopes and narrow ridges isolated from typically fire-prone shortleaf uplands. Soils are coarse to loamy and acidic. Tree and shrub species may include American beech, white oak, and American holly, though scattered large diameter pines are sometimes present.



# Northeast Texas Forests Overview

## *Wet Hardwood Flatwoods*

This system is composed of a series of ridges and swales on terraces. Swales are seasonally flooded and support willow-oak and water oak. Ridges may support loblolly pine, white oak and viburnum.



# Northeast Texas Forests Overview

## *Upland Depression Wooded Ponds*

This system occurs on poorly drained- usually fine-textured soils- and receive moisture from precipitation, rather than flooding. They are similar to the Hardwood Flatwoods, but can range from an open aspect to dense saplings and small trees. Typical species might include willow-oak, pop ash, and mayhaws.



# Northeast Texas Forests Overview

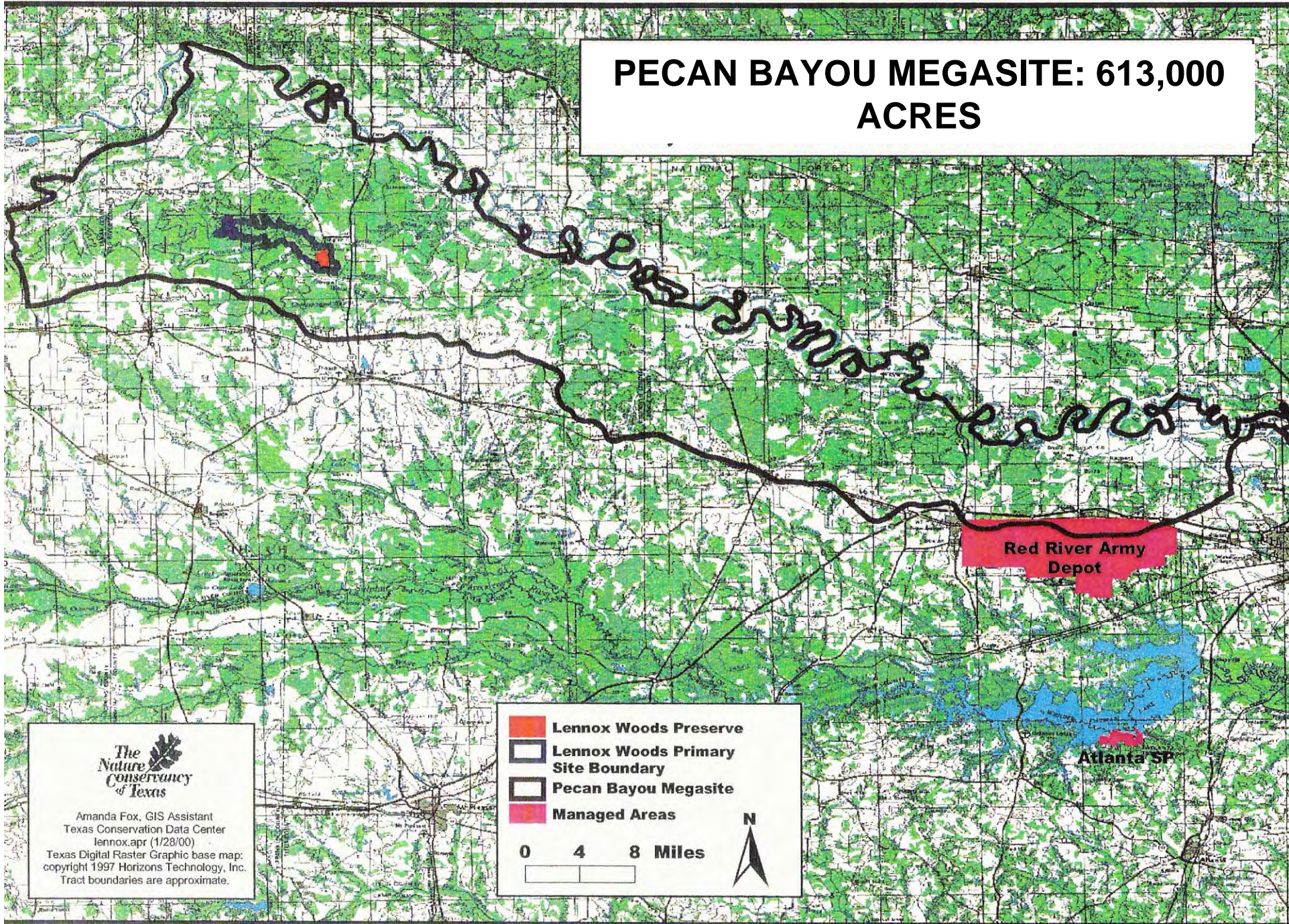
## *Small Stream Forests*

This system occurs in fairly small, linear patches along perennial stream courses.

Flooding is infrequent and brief. Characteristic trees include white oak, sweetgum, and loblolly pine.







# PECAN BAYOU MEGASITE: 613,000 ACRES




Red River Army Depot

Atlanta SP

**The Nature Conservancy of Texas**  
Amanda Fox, GIS Assistant  
Texas Conservation Data Center  
lennox.apr (1/28/00)  
Texas Digital Raster Graphic base map:  
copyright 1997 Horizons Technology, Inc.  
Tract boundaries are approximate.

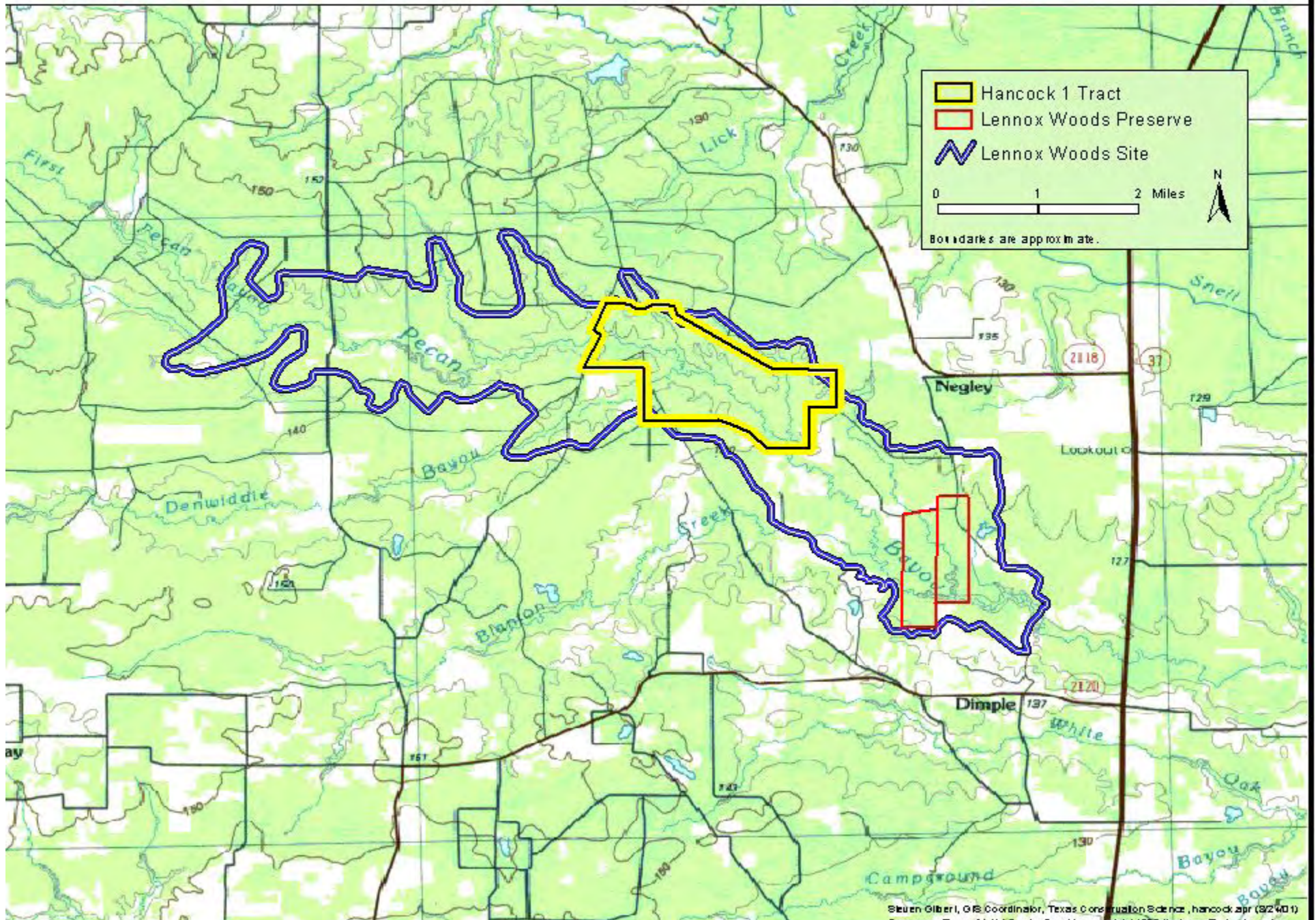
-  Lennox Woods Preserve
-  Lennox Woods Primary Site Boundary
-  Pecan Bayou Megasite
-  Managed Areas

0 4 8 Miles





**PROJECT: LENNOX WOODS (HANCOCK 1)**  
**SITE BOUNDARY: LENNOX WOODS**



# Lennox Woods, Red River County

- Old Growth Shortleaf Pine-Oak Forest
- Old growth and mature bottomland Hardwood forest
- Rare herbaceous species
- American burying beetle
- Portions under conservation forestry
- Fire management



Arkansas meadowrue (right) and yellow lady's slipper orchid (below right) occur in abundance at Lennox Woods. Further, recent study has confirmed the presence of the federally-listed American burying beetle (below).

Arkansas meadow-rue



Photo by: Doug Blacklund

Southern Lady's-slipper Orchid



Natural  
immigration  
Of black  
bears is  
being  
studied by  
TPWD and  
SFA within  
the Lennox  
Woods site.



04/30/07 19:27 1

## Fire Regime Objectives:

- Fuel Reduction
- Hardwood suppression
- Shortleaf pine release
- Increase in herbaceous diversity

*Restore natural processes*



**Using techniques such as assisted natural recovery, our objective is to move our loblolly pine plantations to shortleaf pine-oak forest and savanna.**



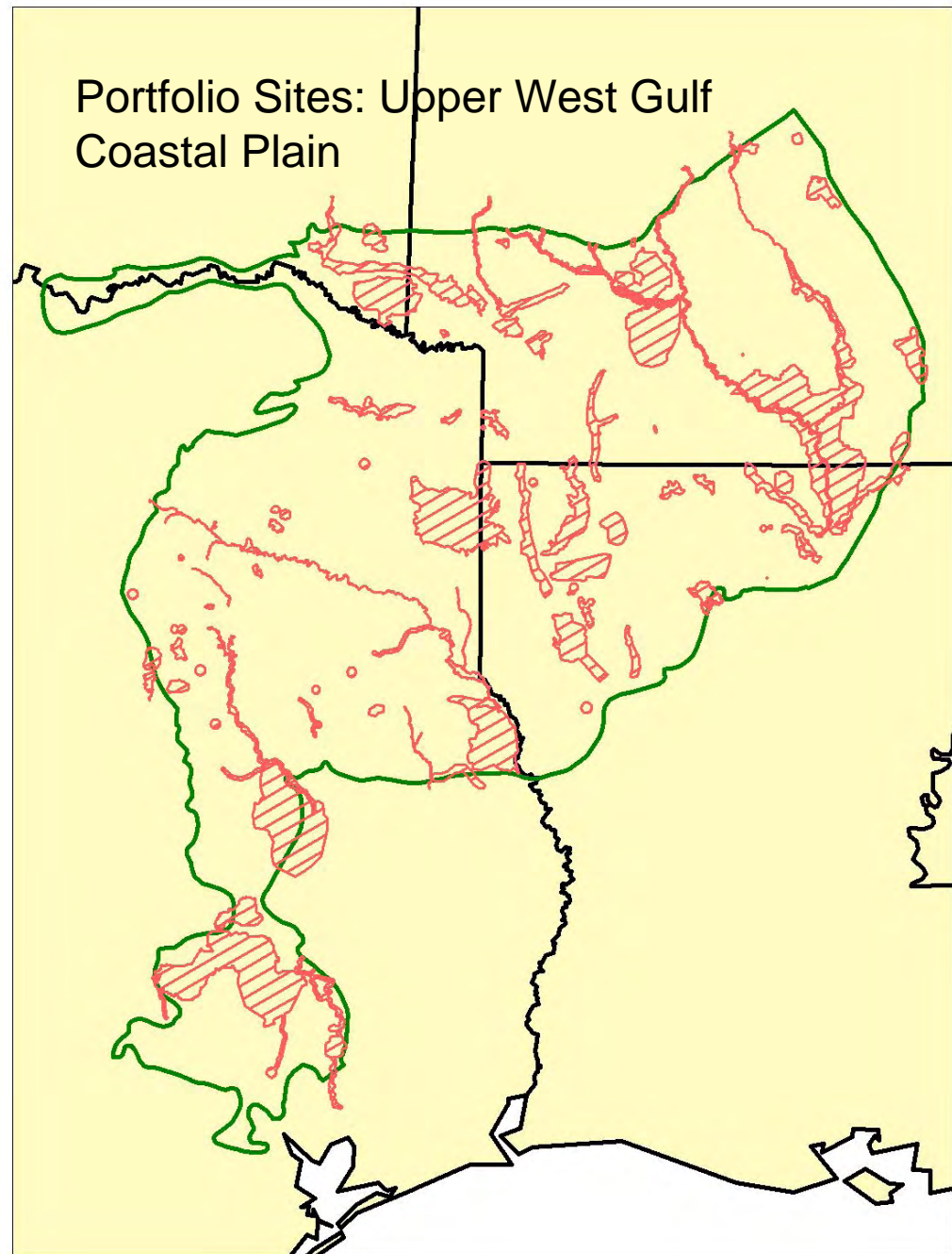
The Nature  
Conservancy



Protecting nature. Preserving life.™

# Contribution of Red River and Lone Star to Ecoregional Biodiversity

**Data Gaps are one of the great challenges in assembling ecoregional assessments. Projects such as those supported by Legacy Grants helps the Conservancy get a better understanding of the resources of the region.**





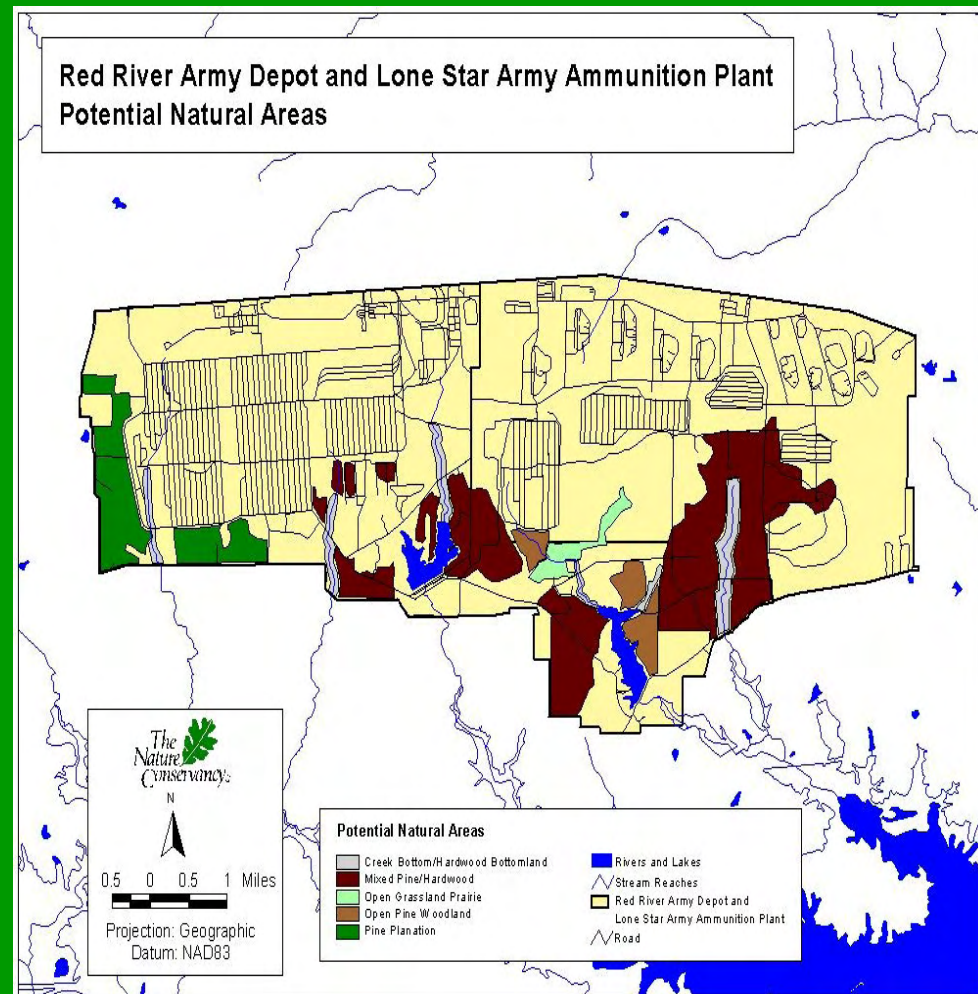
## Previous inventory work (Tetra Tech, 2002)

- 104 plant species
- 24 mammal species
- 65 bird species
- 25 fish species
- 33 herpetofaunal species
- Elements of Conservation interest included:
  - Crawfish frog (*Rana areolata* G4 S3)
  - Alligator snapping turtle (*Macrochelys temminickii* G3 S2S3 ST)
  - 8 ecological systems targets, ranging from upland shortleaf pine forest to bottomland hardwood forest.

Conservancy staff and contractor, Dr. Guy Nesom of the Botanical Research Institute of Texas, surveyed for 16 plant species of conservation interest during April, May and October.

Of the 16 species surveyed for, Sanguine purple coneflower (*Echinacea sanguinea*) and Arkansas oak (*Quercus arkansana*) were found.

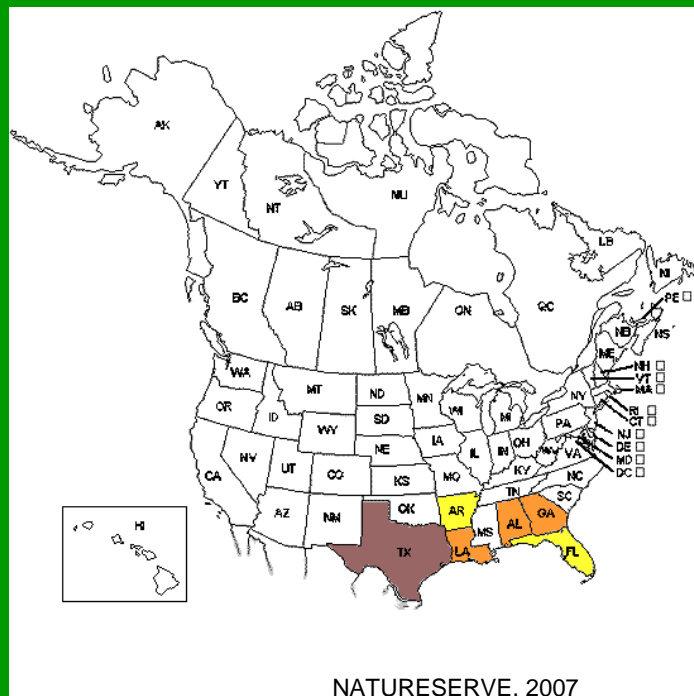
Other plant species of note were recorded, including pale purple coneflower (*Echinacea pallida*), white heath aster (*Symphyotrichum pilosum*), and Nuttall's wild indigo.



# Arkansas Oak

(*Q. arkansana* G3)

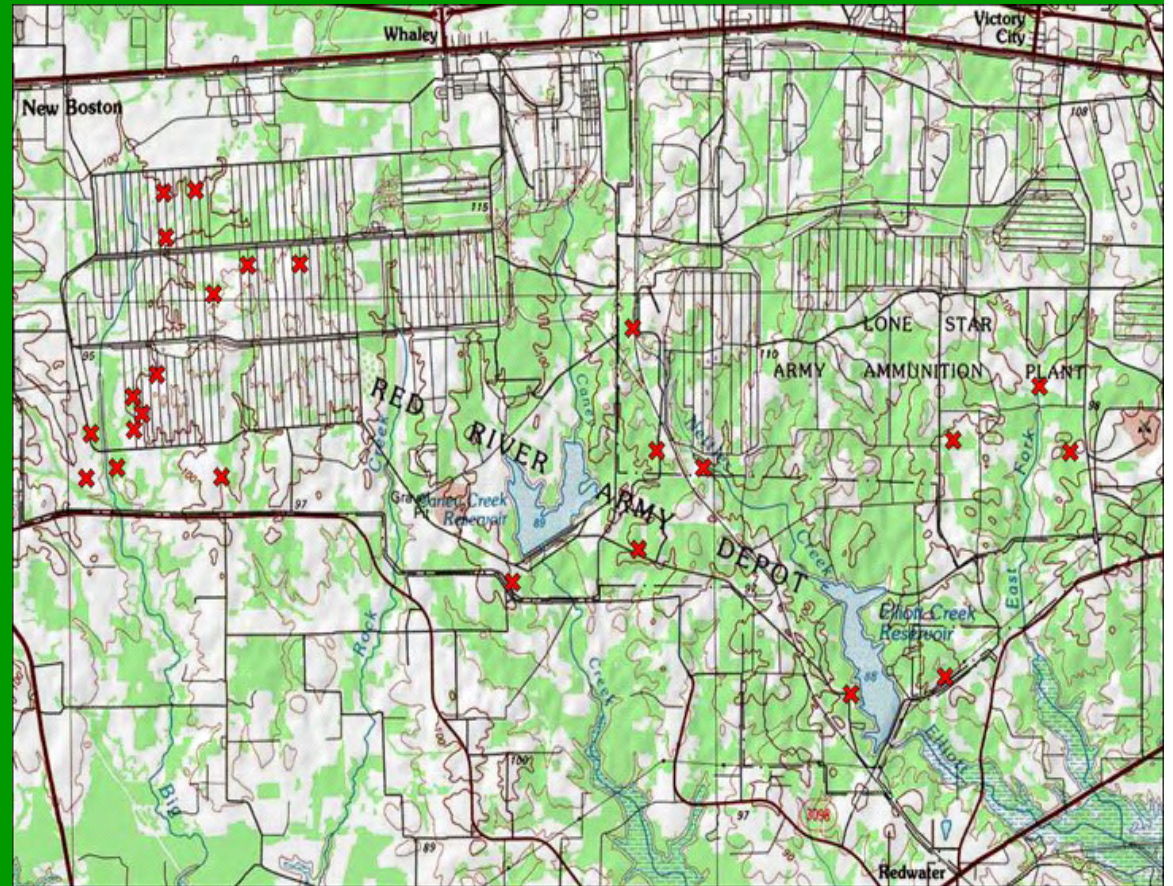
Adapted to sandy stream-cut topography. Distribution is spotty throughout its range. Primary threat is conversion of habitat to pine plantation. However, in Arkansas, where it is most abundant, it is a common understory species on pine plantations.



NATURESERVE, 2007

Arkansas oak is found in sandy upland areas over much of the installation. It occurs at the edges of clearings and roadside edges with other more common oak species and shortleaf pine.

Arkansas oak had been previously documented in Texas on a single Cass County site.



Locations for Arkansas Oak



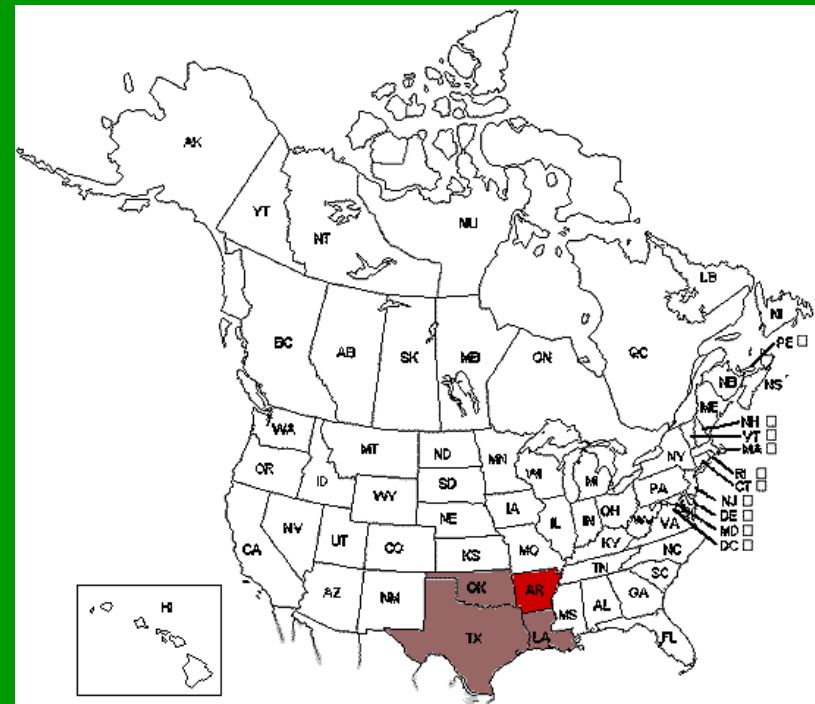
© Thomas G. Barnes

# Sanguine Purple Coneflower

*(Echinacea sanguinea G3-G5)*

Adapted to sandy acidic open pine woodland. Primary threat is habitat loss through logging operation, with some potential for root collection.

Species is considered imperiled in Arkansas, status is not well documented in Texas or Louisiana.



NATURESERVE, 2007

At the installations, sanguine coneflower occurred along sandy roadsides and within powerline rights-of-way. In these locations, mowing prior to seed set may be a potential threat.



Map created with TOPO!® ©2003 National Geographic ([www.nationalgeographic.com/topo](http://www.nationalgeographic.com/topo))

Map showing Larger populations of sanguine coneflower

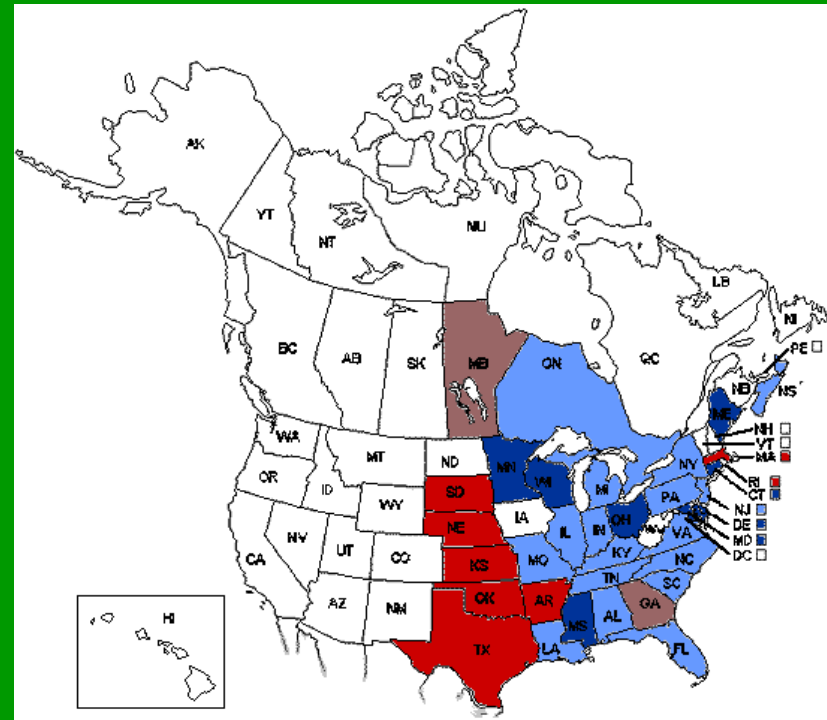


## American Burying Beetle

(*Nicrophorus americanus* G2 LE)

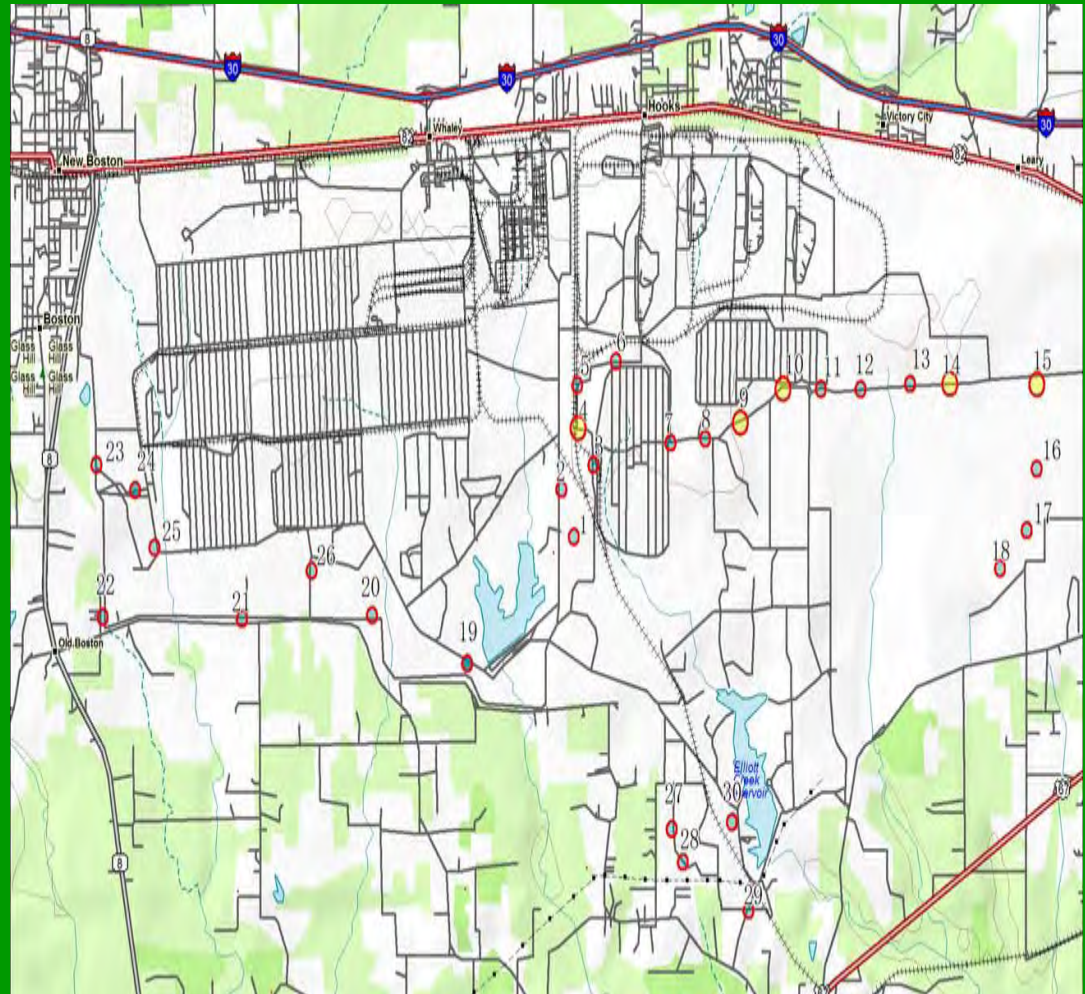
Until its discovery in Lamar County in 2003, the beetle was not thought to occur in Texas. Habitat loss, alteration and degradation have been attributed to the species' decline.

American burying beetles lay eggs on carrion, which is then buried. Both sexes care for larvae, a rare occurrence among insects.



**Dr. William Godwin of Stephen F. Austin University was contracted to survey for the American burying beetle. Survey methods used abided by guidelines set out in the USFWS recovery plan. Pitfall traps (right) were established in June, 2006 in an east to west transect across the installation.**

**The American burying beetle was not found on the installation. This may be because of factors such as heavy soils, dense forest cover, possible absence of large carrion items, and temperature extremes during the survey period.**





## Findings and Implications

Since 2002, ten ecoregional conservation targets have been found on Red River and Lone Star:

- 8 natural communities,
- 2 amphibians
- 2 floral species.

## Findings and Implications

While the systems and species contained on Red River and Lone Star are not extremely rare, the installation supports a diverse fauna and flora at a large scale uncommon within the region. Many species known from Bowie County are not common outside the boundaries of the installation.

*The natural lands here have conservation value. The ecosystem management approach applied at Red River and Lone Star has benefited the natural areas supported there.*

## Appendix B: Target Viability: Pine Bluff Arsenal Legacy

Conservation Target		Category	Key Attribute	Indicator	Poor	Fair	Good	Very Good	Current Indicator Status	Current Rating	Desired Rating	Date of Current Rating	Date for Desired Rating
1	Pine-hardwood Flatwoods (dry and wet)	Landscape Context	Fire regime - (timing, frequency, intensity, extent)	Fire Regime Condition Class (FRCC)	<b>Public Land: FRCC3; Private Land: FRCC3</b>	Public Land: FRCC2; Private Land: FRCC3	<i>Public Land: FRCC1; Private Land: FRCC2</i>	Public Land: FRCC1; Private Land: FRCC1	Private Land: FRCC3; Public Land FRCC3	Poor	Good	Jan-06	Jan-26
1	Pine-hardwood Flatwoods (dry and wet)	Landscape Context	Hydrologic regime - (timing, duration, frequency, extent)	% Bedding	Public Land: 15%; Private Land: 75%	<b>Public Land: 5%; Private Land: 50%</b>	<i>Public Land: 0%; Private Land: 10%</i>	Public Land: 0%; Private Land: 5%		Fair	Good	Jan-06	Feb-16
1	Pine-hardwood Flatwoods (dry and wet)	Landscape Context	Landscape pattern (mosaic) & structure	Fragmentation	4 miles of road per square mile	<b>3 miles of road per square mile</b>	<i>2 miles of road per square mile</i>	1 mile of road per square mile		Fair	Good	Jan-06	Feb-16
1	Pine-hardwood Flatwoods (dry and wet)	Condition	Species composition / dominance	Overstory Composition	Public Land: 65% more than 90% pine; 15% less than 10% pine; 20% mixed pine hardwood; Private Land: 5% mixed; 95% more than 90% pine	<b>Public Land: 40% more than 90% pine; 15% less than 10% pine; 45% mixed pine hardwood; Private Land: 30% mixed; 70% more than 90% pine</b>	<i>Public Land: 15% more than 90% pine; 15% less than 10% pine; 70% mixed pine hardwood; Private Land: 50% mixed; 50% more than 90% pine</i>	Natural mosaic of pine and oak		Fair	Good	Jan-06	Feb-26
1	Pine-hardwood Flatwoods (dry and wet)	Size	Presence of key communities or seral stages	percentage of each seral stage	Early seral: 20%; Mid-closed: 65%; Mid-open: 5%; Late-open: 5%; Late-closed 5%	<b>Early seral: 20%; Mid-closed: 45%; Mid-open: 10%; Late-open: 10%; Late-closed 15%</b>	<i>Early seral: 20%; Mid-closed: 20%; Mid-open: 25%; Late-open: 25%; Late-closed 10%</i>	<i>Early seral: 20%; Mid-closed: 5%; Mid-open: 25%; Late-open: 45%; Late-closed 5%</i>		Fair	Very Good	Dec-05	
1	Pine-hardwood Flatwoods (dry and wet)	Size	Size / extent of characteristic communities / ecosystems	Acres	100 acres	<b>500 acres</b>	<i>1000 acres</i>	1500 acres		Fair	Good	Jan-06	Jan-26
2	Upland Pine-oak woodland	Landscape Context	Fire regime - (timing, frequency, intensity, extent)	Fire Regime Condition Class (FRCC)	<b>Public Land: FRCC3; Private Land: FRCC3</b>	Public Land: FRCC2; Private Land: FRCC3	<i>Public Land: FRCC1; Private Land: FRCC2</i>	Public Land: FRCC1; Private Land: FRCC1	Private Land: FRCC3; Public Land FRCC3	Poor	Good	Jan-06	
2	Upland Pine-oak woodland	Landscape Context	Landscape pattern (mosaic) & structure	Connectivity	No corridors between blocks of land	<b>Highly fragmented blocks of land with little connection to base</b>	<i>All blocks of land interconnected with access to base</i>	Multiple corridors between blocks of land in conservation area and PBA		Fair	Good	Jan-06	Jan-16
2	Upland Pine-oak woodland	Condition	Species composition / dominance	Overstory Composition	Public Land: 75% more than 90% pine; 15% less than 10% pine; 10% mixed pine hardwood; Private Land: 5% mixed; 95% more than 90% pine	<b>Public Land: 40% more than 90% pine; 15% less than 10% pine; 45% mixed pine hardwood; Private Land: 30% mixed; 70% more than 90% pine</b>	<i>Public Land: 15% more than 90% pine; 15% less than 10% pine; 70% mixed pine hardwood; Private Land: 50% mixed; 50% more than</i>	Natural mosaic of pine and oak		Fair	Good	Jan-06	Feb-26

## Appendix B: Target Viability: Pine Bluff Arsenal Legacy

Conservation Target	Category	Key Attribute	Indicator	Poor	Fair	Good	Very Good	Current Indicator Status	Current Rating	Desired Rating	Date of Current Rating	Date for Desired Rating	
							90% pine						
2	Upland Pine-oak woodland	Size	Presence of key communities or seral stages	percentage of each seral stage	Early seral: 20%; Mid-closed: 65%; Mid-open: 5%; Late-open: 5%; Late-closed 5%	<b>Early seral: 20%; Mid-closed: 45%; Mid-open: 10%; Late-open: 10%; Late-closed 15%</b>	Early seral: 20%; Mid-closed: 20%; Mid-open: 25%; Late-open: 25%; Late-closed 10%	<i>Early seral: 20%; Mid-closed: 5%; Mid-open: 25%; Late-open: 45%; Late-closed 5%</i>	Fair	Very Good	Dec-05		
2	Upland Pine-oak woodland	Size	Size / extent of characteristic communities / ecosystems	Acres	1,500 fragmented acres	<b>5,000 acres of connected land in 200 acre blocks</b>	10,000 connected acres with minimum blocks of 200 acres	15,000 acres with minimum 500 acres blocks	Fair	Good	Jan-06	Jan-26	
3	Mesic Hardwoods and Small Stream Forest	Landscape Context	Fire regime - (timing, frequency, intensity, extent)	Fire Regime Condition Class (FRCC)	<b>Public Land: FRCC3; Private Land: FRCC3</b>	Public Land: FRCC2; Private Land: FRCC3	<i>Public Land: FRCC1; Private Land: FRCC2</i>	Public Land: FRCC1; Private Land: FRCC1	Private Land: FRCC3; Public Land FRCC3	Poor	Good	Jan-06	Jan-26
3	Mesic Hardwoods and Small Stream Forest	Landscape Context	Hydrologic regime - (timing, duration, frequency, extent)	Conversion	Public Land: 5% conversion; Private Land: No SMZs	<b>Public Land: 5% conversion; Private Land: SMZs only</b>	<i>Public Land: No conversion; Private Land: SMZs with 65' basal area and 35' ft buffer either side of streams</i>	No conversion in stream forest and natural ecotones functioning and protected	Fair	Good			
3	Mesic Hardwoods and Small Stream Forest	Landscape Context	Landscape pattern (mosaic) & structure	Connectivity	Highly fragmented riparian area	<b>50% Connectivity</b>	75% Connectivity	No riparian gaps	5% Connectivity	Fair	Good	Jan-06	Jan-16
3	Mesic Hardwoods and Small Stream Forest	Condition	Species composition / dominance	Overstory Composition	Public Land: 50% Hardwood and 50% Pine; Private Land: 80% Pine and 20% Hardwood	<b>Public Land: 65% Hardwood 35% Pine; Private Land: 80% Pine and 20% Hardwood</b>	<i>Public Land: 80% Hardwood and 20% Pine; Private Land: 40% Hardwood and 60% Pine</i>	Natural mosaic of oak spp.	Fair	Good	Jan-06	Feb-26	
3	Mesic Hardwoods and Small Stream Forest	Size	Presence of key communities or seral stages	percentage of each seral stage	Early seral: 20%; Mid-closed: 65%; Mid-open: 5%; Late-open: 5%; Late-closed 5%	<b>Early seral: 20%; Mid-closed: 45%; Mid-open: 10%; Late-open: 10%; Late-closed 15%</b>	<i>Early seral: 20%; Mid-closed: 20%; Mid-open: 25%; Late-open: 10%; Late-closed 25%</i>	Early seral: 20%; Mid-closed: 5%; Mid-open: 25%; Late-open: 25%; Late-closed 25%	Fair	Good	Jan-06	Jan-30	
4	Remnant dependant insects	Landscape Context	Landscape pattern (mosaic) & structure	Extent of herbaceous cover	Loss of grassland habitat	<b>Fragmented blocks of grasslands</b>	<i>Small connected blocks of grasslands</i>	Large blocks natural habitat that with grassy understory	Fair	Good		May-16	
4	Remnant dependant insects	Condition	Abundance of food resources	Rattle Snake Master Population	Rare	<b>Uncommon</b>	<i>Common</i>	Abundant	Fair	Good	Jan-06	Jan-16	

## Appendix B: Target Viability: Pine Bluff Arsenal Legacy

Conservation Target	Category	Key Attribute	Indicator	Poor	Fair	Good	Very Good	Current Indicator Status	Current Rating	Desired Rating	Date of Current Rating	Date for Desired Rating	
4	Remnant dependant insects	Size	Population size & dynamics	Number of Moths	Rare	Uncommon	Common	Abundant	G1S1	Fair	Good	Jan-06	Jan-16
5	Seepage Swamp and Baygall	Landscape Context	Hydrologic regime - (timing, duration, frequency, extent)	Man-caused soil disturbance (roads, plow lines, bedding)	None w/ unaltered hydrology	1-5 w/ unaltered hydrology	6-9 w/ unaltered hydrology	>=10 w/ unaltered hydrology	Unknown	Poor	Very Good	May-06	
5	Seepage Swamp and Baygall	Landscape Context	Landscape pattern (mosaic) & structure	>=5 acres each embedded within larger system with >=fair current rating	none	1-5	6-9	>=10	Unknown	Poor	Very Good	May-06	

Conservation Targets		Landscape Context	Condition	Size	Viability Rank
		Grade	Grade	Grade	Rank
1	Pine-hardwood Flatwoods (dry and wet)	Poor	Fair	Fair	Fair
2	Upland Pine-oak woodland	Poor	Fair	Fair	Fair
3	Mesic Hardwoods and Small Stream Forest	Poor	Fair	Fair	Fair
4	Remnant dependant insects	Fair	Fair	Fair	Fair
5	Seepage Swamp and Baygall	Poor	-	-	Poor
<b>Project Biodiversity Health Rank</b>					<b>Fair</b>

## Appendix B: Stresses and Threats: Pine Bluff Arsenal Legacy

1	Pine-hardwood Flatwoods (dry and wet)
---	---------------------------------------

Stresses		Severity	Scope	Stress Rank	User Override
1	Fire regime - (timing, frequency, intensity, extent)	High	Medium	Medium	
2	Landscape pattern (mosaic) & structure	Very High	High	High	
3	Hydrologic regime - (timing, duration, frequency, extent)	Very High	High	High	
4	Species composition / dominance	High	High	High	
5	Presence of key communities or seral stages	Very High	High	High	
6	Size / extent of characteristic communities / ecosystems	Medium	Medium	Medium	

## Appendix B: Stresses and Threats: Pine Bluff Arsenal Legacy

### 1. Pine-hardwood Flatwoods (dry and wet)

Threats - Sources of Stress	Fire regime - (timing, frequency, intensity, extent)	Landscape pattern (mosaic) & structure	Hydrologic regime - (timing, duration, frequency, extent)	Species composition / dominance	Presence of key communities or seral stages	Size / extent of characteristic communities / ecosystems
Stresses #..	1	2	3	4	5	6
Rank..	Medium	High	High	High	High	Medium

#### 1. Altered Fire Regime ( )

Threat to Target Rank: Medium

Contribution	Very High	Low	Low	High	High	Medium
Irreversibility	Medium	Medium	Low	Medium	Medium	Medium
Threat Rank (override)						
Threat Rank	Medium	Low	Low	Medium	Medium	Low

#### 2. Altered Hydrologic Regime ( )

Threat to Target Rank: High

Contribution	Medium	High	High	High	Medium	Medium
Irreversibility	Medium	High	High	Medium	Medium	Medium
Threat Rank (override)						
Threat Rank	Low	High	High	Medium	Medium	Low

#### 3. Invasive Species ( )

Threat to Target Rank: Medium

Contribution	Low	Low	Medium	Low	Low	Low
Irreversibility	Medium	Medium	Medium	Medium	Medium	Medium
Threat Rank (override)						
Threat Rank	Low	Low	Medium	Low	Low	Low

## Appendix B: Stresses and Threats: Pine Bluff Arsenal Legacy

### 1. Pine-hardwood Flatwoods (dry and wet)

Threats - Sources of Stress	Fire regime - (timing, frequency, intensity, extent)	Landscape pattern (mosaic) & structure	Hydrologic regime - (timing, duration, frequency, extent)	Species composition / dominance	Presence of key communities or seral stages	Size / extent of characteristic communities / ecosystems
Stresses #..	1	2	3	4	5	6
Rank..	Medium	High	High	High	High	Medium

### 4. Non-plantation timber management ()

Threat to Target Rank: Medium

Contribution	Low	Medium	Medium	Medium	Medium	Low
Irreversibility	Medium	Medium	Medium	Medium	Medium	Medium
Threat Rank (override)						
Threat Rank	Low	Medium	Medium	Medium	Medium	Low

### 5. Military Activities ()

Threat to Target Rank: Low

Contribution	Low	Medium	Medium	Medium	Medium	Medium
Irreversibility	Low	Low	Low	Low	Low	Low
Threat Rank (override)						
Threat Rank	Low	Low	Low	Low	Low	Low

### 6. Roads ()

Threat to Target Rank: High

Contribution	Medium	High	High	Medium	Low	Low
Irreversibility	Medium	Medium	High	Medium	Medium	Medium
Threat Rank (override)						
Threat Rank	Low	Medium	High	Medium	Low	Low



## Appendix B: Stresses and Threats: Pine Bluff Arsenal Legacy

### 1. Pine-hardwood Flatwoods (dry and wet)

Threats - Sources of Stress	Fire regime - (timing, frequency, intensity, extent)	Landscape pattern (mosaic) & structure	Hydrologic regime - (timing, duration, frequency, extent)	Species composition / dominance	Presence of key communities or seral stages	Size / extent of characteristic communities / ecosystems
Stresses #..	1	2	3	4	5	6
Rank..	Medium	High	High	High	High	Medium

### 7. Housing & Urban Development ( )

Threat to Target Rank: Very High

Contribution	Medium	High	High	High	Medium	High
Irreversibility	Very High	Very High	Very High	Very High	Very High	Very High
Threat Rank (override)						
Threat Rank	Medium	High	High	High	High	Medium

### 8. Intensive Silviculture (Pine Plantation) ( )

Threat to Target Rank: High

Contribution	Very High	High	High	Very High	Very High	High
Irreversibility	Medium	Medium	Medium	Medium	Medium	Medium
Threat Rank (override)						
Threat Rank	Medium	Medium	Medium	High	High	Low

### 9. Farms & Ranches ( )

Threat to Target Rank: Medium

Contribution	Medium	Medium	Medium	Medium	Medium	Medium
Irreversibility	Medium	High	Medium	Medium	Medium	Medium
Threat Rank (override)						
Threat Rank	Low	Medium	Medium	Medium	Medium	Low

## Appendix B: Stresses and Threats: Pine Bluff Arsenal Legacy

2	Upland Pine-oak woodland
---	--------------------------

Stresses		Severity	Scope	Stress Rank	User Override
1	Fire regime - (timing, frequency, intensity, extent)	Very High	High	High	
2	Landscape pattern (mosaic) & structure	Very High	High	High	
3	Presence of key communities or seral stages	Very High	High	High	
4	Species composition / dominance	High	High	High	
5	Size / extent of characteristic communities / ecosystems	Very High	High	High	

## Appendix B: Stresses and Threats: Pine Bluff Arsenal Legacy

### 2. Upland Pine-oak woodland

Threats - Sources of Stress	Fire regime - (timing, frequency, intensity, extent)	Landscape pattern (mosaic) & structure	Presence of key communities or seral stages	Species composition / dominance	Size / extent of characteristic communities / ecosystems
Stresses #..	1	2	3	4	5
Rank..	High	High	High	High	High

#### 1. Altered Fire Regime () Threat to Target Rank: Very High

Contribution	Very High	Low	Very High	Very High	High
Irreversibility	Medium	Medium	Medium	Medium	Medium
Threat Rank (override)					
Threat Rank	High	Low	High	High	Medium

#### 2. Invasive Species () Threat to Target Rank: Medium

Contribution	Low	Low	Low	Medium	Medium
Irreversibility	Medium	Medium	Medium	Medium	Medium
Threat Rank (override)					
Threat Rank	Low	Low	Low	Medium	Medium

#### 3. Non-plantation timber management () Threat to Target Rank: High

Contribution	Very High	High	High	High	High
Irreversibility	Medium	Medium	Medium	Medium	Medium
Threat Rank (override)					
Threat Rank	High	Medium	Medium	Medium	Medium

## Appendix B: Stresses and Threats: Pine Bluff Arsenal Legacy

### 2. Upland Pine-oak woodland

Threats - Sources of Stress	Fire regime - (timing, frequency, intensity, extent)	Landscape pattern (mosaic) & structure	Presence of key communities or seral stages	Species composition / dominance	Size / extent of characteristic communities / ecosystems
Stresses #..	1	2	3	4	5
Rank..	High	High	High	High	High

### 4. Military Activities ()

Threat to Target Rank: Low

Contribution	Medium	Medium	Medium	Medium	Medium
Irreversibility	Low	Low	Low	Low	Low
Threat Rank (override)					
Threat Rank	Low	Low	Low	Low	Low

### 5. Roads ()

Threat to Target Rank: Medium

Contribution	Low	High	Low	Medium	Low
Irreversibility	Medium	Medium	Medium	Medium	Medium
Threat Rank (override)					
Threat Rank	Low	Medium	Low	Medium	Low

### 6. Housing & Urban Development ()

Threat to Target Rank: Very High

Contribution	Medium	High	High	Medium	High
Irreversibility	Very High	Very High	Very High	Very High	Very High
Threat Rank (override)					
Threat Rank	High	High	High	High	High

## Appendix B: Stresses and Threats: Pine Bluff Arsenal Legacy

### 2. Upland Pine-oak woodland

Threats - Sources of Stress	Fire regime - (timing, frequency, intensity, extent)	Landscape pattern (mosaic) & structure	Presence of key communities or seral stages	Species composition / dominance	Size / extent of characteristic communities / ecosystems
Stresses #..	1	2	3	4	5
Rank..	High	High	High	High	High

### 7. Intensive Silviculture (Pine Plantation) () Threat to Target Rank: Very High

Contribution	Very High	High	High	Very High	Very High
Irreversibility	Medium	Medium	Medium	Medium	Medium
Threat Rank (override)					
Threat Rank	High	Medium	Medium	High	High

### 8. Farms & Ranches () Threat to Target Rank: High

Contribution	Medium	Medium	Medium	Medium	Medium
Irreversibility	Medium	Medium	Medium	Medium	Medium
Threat Rank (override)					
Threat Rank	Medium	Medium	Medium	Medium	Medium

## Appendix B: Stresses and Threats: Pine Bluff Arsenal Legacy

3	Mesic Hardwoods and Small Stream Forest
---	---

Stresses		Severity	Scope	Stress Rank	User Override
1	Fire regime - (timing, frequency, intensity, extent)	Medium	High	Medium	
2	Landscape pattern (mosaic) & structure	Medium	Medium	Medium	
3	Hydrologic regime - (timing, duration, frequency, extent)	High	High	High	
4	Species composition / dominance	High	High	High	
5	Presence of key communities or seral stages	High	High	High	
6	Size / extent of characteristic communities / ecosystems	Medium	Medium	Medium	

## Appendix B: Stresses and Threats: Pine Bluff Arsenal Legacy

### 3. Mesic Hardwoods and Small Stream Forest

Threats - Sources of Stress	Fire regime - (timing, frequency, intensity, extent)	Landscape pattern (mosaic) & structure	Hydrologic regime - (timing, duration, frequency, extent)	Species composition / dominance	Presence of key communities or seral stages	Size / extent of characteristic communities / ecosystems
Stresses #..	1	2	3	4	5	6
Rank..	Medium	Medium	High	High	High	Medium

#### 1. Altered Fire Regime ( )

Threat to Target Rank: Medium

Contribution	High	Medium	Low	Medium	Medium	Low
Irreversibility	Medium	Medium	Medium	Medium	Medium	Medium
Threat Rank (override)						
Threat Rank	Low	Low	Low	Medium	Medium	Low

#### 2. Altered Hydrologic Regime ( )

Threat to Target Rank: Medium

Contribution	Low	Low	High	High	High	High
Irreversibility	Medium	Medium	Medium	Medium	Medium	Medium
Threat Rank (override)						
Threat Rank	Low	Low	Medium	Medium	Medium	Low

#### 3. Invasive Species ( )

Threat to Target Rank: Medium

Contribution	Low	Low	Low	Medium	Medium	Low
Irreversibility	Medium	Medium	Medium	Medium	Medium	Medium
Threat Rank (override)						
Threat Rank	Low	Low	Low	Medium	Medium	Low

## Appendix B: Stresses and Threats: Pine Bluff Arsenal Legacy

### 3. Mesic Hardwoods and Small Stream Forest

Threats - Sources of Stress	Fire regime - (timing, frequency, intensity, extent)	Landscape pattern (mosaic) & structure	Hydrologic regime - (timing, duration, frequency, extent)	Species composition / dominance	Presence of key communities or seral stages	Size / extent of characteristic communities / ecosystems
Stresses #..	1	2	3	4	5	6
Rank..	Medium	Medium	High	High	High	Medium

### 4. Non-plantation timber management ()

Threat to Target Rank: Medium

Contribution	Low	Low	Medium	Medium	Medium	Low
Irreversibility	Medium	Medium	Medium	Medium	Medium	Medium
Threat Rank (override)						
Threat Rank	Low	Low	Medium	Medium	Medium	Low

### 5. Military Activities ()

Threat to Target Rank: Low

Contribution	Low	Medium	Medium	Medium	Medium	Medium
Irreversibility	Low	Low	Low	Low	Low	Low
Threat Rank (override)						
Threat Rank	Low	Low	Low	Low	Low	Low

### 6. Roads ()

Threat to Target Rank: High

Contribution	Medium	Medium	High	Medium	Medium	Medium
Irreversibility	Medium	High	High	Medium	Medium	Medium
Threat Rank (override)						
Threat Rank	Low	Low	High	Medium	Medium	Low



## Appendix B: Stresses and Threats: Pine Bluff Arsenal Legacy

### 3. Mesic Hardwoods and Small Stream Forest

Threats - Sources of Stress	Fire regime - (timing, frequency, intensity, extent)	Landscape pattern (mosaic) & structure	Hydrologic regime - (timing, duration, frequency, extent)	Species composition / dominance	Presence of key communities or seral stages	Size / extent of characteristic communities / ecosystems
Stresses #..	1	2	3	4	5	6
Rank..	Medium	Medium	High	High	High	Medium

### 7. Housing & Urban Development ( )

Threat to Target Rank: Very High

Contribution	Medium	High	Medium	Medium	Medium	Medium
Irreversibility	Very High	Very High	Very High	Very High	Very High	Very High
Threat Rank (override)						
Threat Rank	Medium	Medium	High	High	High	Medium

### 8. Intensive Silviculture (Pine Plantation) ( )

Threat to Target Rank: Medium

Contribution	High	High	High	High	High	High
Irreversibility	Medium	Medium	Medium	Medium	Medium	Medium
Threat Rank (override)						
Threat Rank	Low	Low	Medium	Medium	Medium	Low

### 9. Farms & Ranches ( )

Threat to Target Rank: Medium

Contribution	Medium	Medium	Medium	Medium	Medium	Medium
Irreversibility	Medium	Medium	Medium	Medium	Medium	Medium
Threat Rank (override)						
Threat Rank	Low	Low	Medium	Medium	Medium	Low

## Appendix B: Stresses and Threats: Pine Bluff Arsenal Legacy

4	Remnant dependant insects
---	---------------------------

Stresses		Severity	Scope	Stress Rank	User Override
1	Abundance of food resources	High	Very High	High	
2	Population size & dynamics	Very High	Very High	Very High	
3	Landscape pattern (mosaic) & structure	High	Very High	High	

## Appendix B: Stresses and Threats: Pine Bluff Arsenal Legacy

### 4. Remnant dependant insects

Threats - Sources of Stress	Abundance of food resources	Population size & dynamics	Landscape pattern (mosaic) & structure
Stresses #..	1	2	3
Rank..	High	Very High	High

#### 1. Altered Fire Regime ( ) Threat to Target Rank: Very High

Contribution	Very High	Very High	High
Irreversibility	Medium	Medium	Medium
Threat Rank (override)			
Threat Rank	High	Very High	Medium

#### 2. Altered Hydrologic Regime ( ) Threat to Target Rank: Medium

Contribution	Low	Low	Low
Irreversibility	Medium	Medium	Medium
Threat Rank (override)			
Threat Rank	Low	Medium	Low

#### 3. Invasive Species ( ) Threat to Target Rank: Medium

Contribution	Medium	Low	Medium
Irreversibility	Medium	Medium	Medium
Threat Rank (override)			
Threat Rank	Medium	Medium	Medium

## Appendix B: Stresses and Threats: Pine Bluff Arsenal Legacy

### 4. Remnant dependant insects

Threats - Sources of Stress	Abundance of food resources	Population size & dynamics	Landscape pattern (mosaic) & structure
Stresses #..	1	2	3
Rank..	High	Very High	High

### 4. Non-plantation timber management () Threat to Target Rank: Medium

Contribution	Medium	Medium	Medium
Irreversibility	Low	Low	Low
Threat Rank (override)			
Threat Rank	Low	Medium	Low

### 5. Housing & Urban Development () Threat to Target Rank: Very High

Contribution	Very High	Very High	Very High
Irreversibility	Very High	Very High	Very High
Threat Rank (override)			
Threat Rank	High	Very High	High

### 6. Intensive Silviculture (Pine Plantation) () Threat to Target Rank: High

Contribution	High	High	Very High
Irreversibility	Medium	Medium	Medium
Threat Rank (override)			
Threat Rank	Medium	High	High

## Appendix B: Stresses and Threats: Pine Bluff Arsenal Legacy

### 4. Remnant dependant insects

Threats - Sources of Stress	Abundance of food resources	Population size & dynamics	Landscape pattern (mosaic) & structure
Stresses #..	1	2	3
Rank..	High	Very High	High

### 7. Farms & Ranches () Threat to Target Rank: High

Contribution	Medium	Medium	Medium
Irreversibility	Medium	Medium	Medium
Threat Rank (override)			
Threat Rank	Medium	High	Medium

## Appendix B: Stresses and Threats: Pine Bluff Arsenal Legacy

5	Seepage Swamp and Baygall
---	---------------------------

Stresses		Severity	Scope	Stress Rank	User Override
1	Fire regime - (timing, frequency, intensity, extent)	High	High	High	
2	Hydrologic regime - (timing, duration, frequency, extent)	Medium	High	Medium	
3	Landscape pattern (mosaic) & structure	High	High	High	
4	Presence of key communities or seral stages	High	High	High	
5	Size / extent of characteristic communities / ecosystems	High	High	High	
6	Species composition / dominance	High	High	High	

## Appendix B: Stresses and Threats: Pine Bluff Arsenal Legacy

### 5. Seepage Swamp and Baygall

Threats - Sources of Stress	Fire regime - (timing, frequency, intensity, extent)	Hydrologic regime - (timing, duration, frequency, extent)	Landscape pattern (mosaic) & structure	Presence of key communities or seral stages	Size / extent of characteristic communities / ecosystems	Species composition / dominance
Stresses #..	1	2	3	4	5	6
Rank..	High	Medium	High	High	High	High

#### 1. Altered Fire Regime ( )

Threat to Target Rank: Medium

Contribution	High	Low	Medium	Medium	Low	Medium
Irreversibility	Medium	Low	Medium	Medium	Medium	Medium
Threat Rank (override)						
Threat Rank	Medium	Low	Medium	Medium	Low	Medium

#### 2. Altered Hydrologic Regime ( )

Threat to Target Rank: Very High

Contribution	Medium	Very High	High	High	High	High
Irreversibility	High	High	High	High	High	High
Threat Rank (override)						
Threat Rank	Medium	Medium	High	High	High	High

#### 3. Invasive Species ( )

Threat to Target Rank: High

Contribution	Medium	Low	Medium	Medium	Medium	Medium
Irreversibility	Medium	Medium	Medium	Medium	Medium	Medium
Threat Rank (override)						
Threat Rank	Medium	Low	Medium	Medium	Medium	Medium

## Appendix B: Stresses and Threats: Pine Bluff Arsenal Legacy

### 5. Seepage Swamp and Baygall

Threats - Sources of Stress	Fire regime - (timing, frequency, intensity, extent)	Hydrologic regime - (timing, duration, frequency, extent)	Landscape pattern (mosaic) & structure	Presence of key communities or seral stages	Size / extent of characteristic communities / ecosystems	Species composition / dominance
Stresses #..	1	2	3	4	5	6
Rank..	High	Medium	High	High	High	High

### 4. Non-plantation timber management ()

Threat to Target Rank: High

Contribution	High	Medium	Medium	Medium	Medium	Medium
Irreversibility	Medium	High	Medium	Medium	Medium	Medium
Threat Rank (override)						
Threat Rank	Medium	Low	Medium	Medium	Medium	Medium

### 5. Military Activities ()

Threat to Target Rank: Low

Contribution	Low	Low	Low	Low	Low	Low
Irreversibility	Low	High	Low	Low	Low	Low
Threat Rank (override)						
Threat Rank	Low	Low	Low	Low	Low	Low

### 6. Roads ()

Threat to Target Rank: Very High

Contribution	Medium	High	High	High	High	High
Irreversibility	Low	Very High	High	High	High	High
Threat Rank (override)						
Threat Rank	Low	Medium	High	High	High	High



## Appendix B: Stresses and Threats: Pine Bluff Arsenal Legacy

### 5. Seepage Swamp and Baygall

Threats - Sources of Stress	Fire regime - (timing, frequency, intensity, extent)	Hydrologic regime - (timing, duration, frequency, extent)	Landscape pattern (mosaic) & structure	Presence of key communities or seral stages	Size / extent of characteristic communities / ecosystems	Species composition / dominance
Stresses #..	1	2	3	4	5	6
Rank..	High	Medium	High	High	High	High

### 7. Housing & Urban Development ( )

Threat to Target Rank: Very High

Contribution	Very High	Very High	Very High	Very High	Very High	Very High
Irreversibility	Very High	Very High	Very High	Very High	Very High	Very High
Threat Rank (override)						
Threat Rank	High	Medium	High	High	High	High

### 8. Intensive Silviculture (Pine Plantation) ( )

Threat to Target Rank: Very High

Contribution	High	High	High	High	High	High
Irreversibility	Medium	High	High	High	High	High
Threat Rank (override)						
Threat Rank	Medium	Medium	High	High	High	High

### 9. Farms & Ranches ( )

Threat to Target Rank: High

Contribution	Medium	Medium	Medium	Medium	Medium	Medium
Irreversibility	Medium	High	Medium	Medium	Medium	Medium
Threat Rank (override)						
Threat Rank	Medium	Low	Medium	Medium	Medium	Medium

## Stresses and Threats: Pine Bluff Arsenal Legacy

Threats Across Targets		Pine-hardwood Flatwoods (dry and wet)	Upland Pine-oak woodland	Mesic Hardwoods and Small Stream Forest	Remnant dependant insects	Seepage Swamp and Baygall	Overall Threat Rank
Project-specific threats		1	2	3	4	5	
1	Housing & Urban Development	Very High	Very High	Very High	Very High	Very High	Very High
2	Intensive Silviculture (Pine Plantation)	High	Very High	Medium	High	Very High	Very High
3	Altered Fire Regime	Medium	Very High	Medium	Very High	Medium	Very High
4	Roads	High	Medium	High	-	Very High	High
5	Altered Hydrologic Regime	High	-	Medium	Medium	Very High	High
6	Farms & Ranches	Medium	High	Medium	High	High	High
7	Non-plantation timber management	Medium	High	Medium	Medium	High	High
8	Invasive Species	Medium	Medium	Medium	Medium	High	Medium
9	Military Activities	Low	Low	Low	-	Low	Low
<b>Threat Status for Targets and Project</b>		Very High	Very High	High	Very High	Very High	Very High

## Appendix B: Stresses and Threats: Pine Bluff Arsenal Legacy

Threats Across Targets		Overall Threat Rank	Strategic Actions addressing each threat First column: Qty Other columns: Index											
Project-specific threats														
1	Housing & Urban Development	Very High	3	10	11	1								
2	Intensive Silviculture (Pine Plantation)	Very High	5	7	9	11	12	8						
3	Altered Fire Regime	Very High	9	2	6	7	8	9	10	11	13	4		
4	Roads	High	2	6	8									
5	Altered Hydrologic Regime	High	4	6	7	8	12							
6	Farms & Ranches	High	1	4										
7	Non-plantation timber management	High	4	4	8	12	13							
8	Invasive Species	Medium	1	3										
9	Military Activities	Low	1	13										
<b>Threat Status for Targets and Project</b>		Very High	<b>Strategic Action Index</b>											

### Strategic Action Index (sorted alphabetically)

1. Build protection capacity within 6 months – 1 year.
2. Develop and implement a comprehensive fire management plan for the project area
3. Develop early warning and response system for aggressive invasive species
4. Develop or use existing private-landowner conservation programs
5. Identify and map high priority tracts within one year (protection plan)
6. Identify and remediate high priority roads
7. Implement Conservation Forestry on private lands in the project area over the next 5 years.
8. Implement list of CF practices (e.g., no bedding or wet weather logging and wide SMZs) that rank high for conservation impact.
9. Increase capacity of state/federal/private land managers
10. Track availability of and protect identified tracts
11. Use GIS analysis to identify unique/critical areas to be conserved
12. Use PBA as demonstration site for Conservation Forestry practices
13. Work with PBA natural resource department to increase fire management on priority sites within the base

## Appendix B: Strategies and Objectives: Pine Bluff Arsenal Legacy

#	Objectives, Strategic Actions and Action Steps
<b>Objective</b>	<b>Protection through fee title, conservation easement or other long-term agreements on 50-75% of high priority conservation tracts within five years.</b>
Strategic action	Build protection capacity within 6 months – 1 year.
Action step #1	Assign a project manager for this site.
Action step #2	Develop a budget through grants and philanthropy to fund land acquisition and management.
Strategic action	Track availability of and protect identified tracts
Action step #1	Create landowner database
Action step #2	Develop/maintain local contacts
Strategic action	Use GIS analysis to identify unique/critical areas to be conserved
<b>Objective</b>	<b>Improve the condition of focal targets on private lands by one rank in 10 years.</b>
Strategic action	Use PBA as demonstration site for Conservation Forestry practices

## Appendix B: Strategies and Objectives: Pine Bluff Arsenal Legacy

#	Objectives, Strategic Actions and Action Steps
Action step #1	Coordinate w/ PBA natural resource dept. to arrange private lands tour group.
Action step #2	Create landowner information packet about conservation forestry at PBA.
Action step #3	Schedule educational field trips.
Strategic action	Increase capacity of state/federal/private land managers
Action step #1	Explore fire and land management education opportunities
Action step #2	Hold Conservation Forestry Workshop
Strategic action	Implement Conservation Forestry on private lands in the project area over the next 5 years.
Action step #1	Develop an informational packet about conservation forestry practices
Action step #2	Track landowner participation in conservation forestry practices
Strategic action	Develop or use existing private-landowner conservation programs
<b>Objective</b>	<b>Restore appropriate fire regime on 90% of conservation lands and 5% of priority lands in project area within 10 years.</b>

## Appendix B: Strategies and Objectives: Pine Bluff Arsenal Legacy

#	Objectives, Strategic Actions and Action Steps
Strategic action	Develop and implement a comprehensive fire management plan for the project area
Action step #1	Initiate fire management on newly acquired lands and private lands
Strategic action	Increase capacity of state/federal/private land managers
Action step #1	Explore fire and land management education opportunities
Action step #2	Hold Conservation Forestry Workshop
Strategic action	Develop or use existing private-landowner conservation programs
Strategic action	Work with PBA natural resource department to increase fire management on priority sites within the base
<b>Objective</b>	<b>Improve or maintain hydrologic regime of focal targets within ten years</b>
Strategic action	Implement list of CF practices (e.g., no bedding or wet weather logging and wide SMZs) that rank high for conservation impact.
Action step #1	Rank conservation forestry practices based on conservation impact
Strategic action	Identify and remediate high priority roads

## Appendix B: Strategies and Objectives: Pine Bluff Arsenal Legacy

#	Objectives, Strategic Actions and Action Steps
Action step #1	Conduct roads survey
Action step #2	Close/repair roads identified during survey
<b>Objective</b>	<b>Prevent establishment of aggressive invasive nonnative species</b>
Strategic action	Develop early warning and response system for aggressive invasive species
Action step #1	Identify invasive species threats in neighboring regions.
Action step #2	Map invasive species threats.

## Appendix B: Strategies and Objectives: Pine Bluff Arsenal Legacy

	Strategic Actions	Overall Rank	Benefits	Feasibility	Cost	Selected for Action?
1	Develop and implement a comprehensive fire management plan for the project area	Very High	Very High	Medium	Medium	Yes
2	Identify and map high priority tracts within one year (protection plan)	Very High	Medium	Very High	Low	Yes
3	Implement Conservation Forestry on private lands in the project area over the next 5 years.	Very High	Very High	Medium	Medium	Yes
4	Track availability of and protect identified tracts	Very High	Very High	Medium	Medium	Yes
5	Use GIS analysis to identify unique/critical areas to be conserved	Very High	High	Very High	Low	Yes
6	Utilize currently existing programs or develop new ones to encourage and fund conservation of focal targets on priority areas	Very High	Very High	Medium	Medium	Yes
7	Work with PBA natural resource department to increase fire management on priority sites within the base	Very High	Very High	High	Medium	Yes



## Appendix B: Strategies and Objectives: Pine Bluff Arsenal Legacy

8	Develop early warning and response system for aggressive invasive species	High	High	Medium	Medium	Yes
9	Develop or use existing private-landowner conservation programs	High	High	Medium	Medium	Yes
10	Identify and remediate high priority roads	High	Very High	Low	Medium	Yes
11	Implement list of CF practices (e.g., no bedding or wet weather logging and wide SMZs) that rank high for conservation impact.	High	High	Medium	Medium	Yes
12	Increase capacity of state/federal/private land managers	High	High	Medium	Medium	Yes
13	Build protection capacity within 6 months – 1 year.	Medium	Medium	High	Medium	Yes
14	Use PBA as demonstration site for Conservation Forestry practices	Medium	Medium	High	Medium	Yes

## **Fort Polk ACUB Plan Development and Implementation Status Report**

### **Overview:**

Fort Polk is implementing a comprehensive Army Compatible Use Buffer (ACUB) program to reduce or avoid restrictions on range and training land use resulting from endangered and candidate species management requirements and to prevent incompatible development adjacent to its boundaries.

The Nature Conservancy (TNC) has agreed to serve as the Army's primary partner in this effort. In this capacity we proposed to accomplish the following tasks with the support of the DoD Legacy Resource Management Program funds:

5. Continued work to develop the final ACUB plan.
6. Identification of priority tracts for inclusion in the Fort Polk ACUB.
7. Initiating landowner contact with owners of priority tracts to determine support for ACUB program and willingness to consider land sale.
8. Environmental site assessment to refine priority tracts and acquisition boundaries.

A discussion of accomplishments on each deliverable under the grant is described below:

### **1. Develop final ACUB plan**

The Fort Polk ACUB program includes three key strategies:

- purchase of conservation easements or fee acquisition of adjacent private lands to expand the land base for red-cockaded woodpecker (RCW) population recovery and longleaf pine ecosystem restoration and maintenance.
- purchase of private development rights for private properties adjacent to key range and training facilities.
- purchase of conservation easements or fee acquisition of key Louisiana pine snake (LPS) habitat to support the viability of the species.

In furtherance of these objectives, we have worked with Fort Polk staff to develop a comprehensive Cooperative Agreement (CA) between Department of Defense and TNC. This agreement defines the scope of work for implementing the Fort Polk ACUB project. It is tailored to the training needs of the Army while advancing conservation of important species and natural communities. The CA describes the purpose and objectives of the cooperative endeavor, how costs will be shared, the tasks of each party, deliverables, and funding and payment procedures. As such, this CA forms the blueprint for on-the-ground implementation of the Fort Polk ACUB project for many years to come.

The CA was signed by Department of Defense and TNC in May 2007.

Please see Fort Polk ACUB CA and related newspaper articles attached.

## **2. Identify priority tracts for acquisition**

The broad priority acquisition areas for the Fort Polk ACUB are described in the ACUB proposal submitted by Fort Polk to DoD for initial approval of the project. Within these priority acquisition areas, we have worked with Fort Polk staff and key landowners to identify and prioritize specific tracts for initial acquisition. We identified a block of approximately 3,387 acres owned by a private landowner as the number one priority for acquisition under this ACUB program. This collection of tracts is in close proximity to the installation boundary, contains high-quality RCW habitat, and supports established RCW populations. Depending on federal appropriations, we expect these tracts to constitute the first one or two years of Fort Polk ACUB acquisitions. We also identified a collection of secondary priority tracts for future years, comprising approximately 21,882 acres. Together, the primary and secondary tracts total approximately 25,269 acres targeted for RCW habitat acquisitions (see figure below).

After further discussions with the landowner and with Fort Polk staff, these tracts are well-accepted by all as the priority tracts for acquisition under the Fort Polk ACUB program.



### **3. Initiate landowner contacts**

TNC made initial contact with key landowners in the ACUB acquisition areas in early 2006, and continues to hold discussions with those landowners. These landowners represent all of the land contained within the priority acquisition plan described above, and they have responded favorably to proposals for transfer of property interest. In these discussions we have described the objectives of the Fort Polk ACUB program, expressed the conservation objectives of TNC, and worked to identify ways in which the landowner could benefit by participation in the ACUB program.

Approximately 11,889 acres, including the primary priority tracts, are owned by Crosby Land and Resources, Inc. (Crosby) and are encumbered by a long-term lease of timber rights. Temple-Inland Inc. (Temple), a Texas-based forest products company, currently holds the timber lease but is scheduled to sell the lease interest to The Campbell Group LLC (Campbell), an Oregon timber management organization, in the 4<sup>th</sup> quarter of 2007. The sale is part of Temple's divestiture of assets that was announced in late February 2007.

The remaining 13,380 acres are owned in fee by Temple, and are also included in Temple's divestiture plan. Thus, ownership of these tracts will transfer to Campbell in 4<sup>th</sup> quarter 2007.

Please see the figure below for a map of key ACUB landowners.

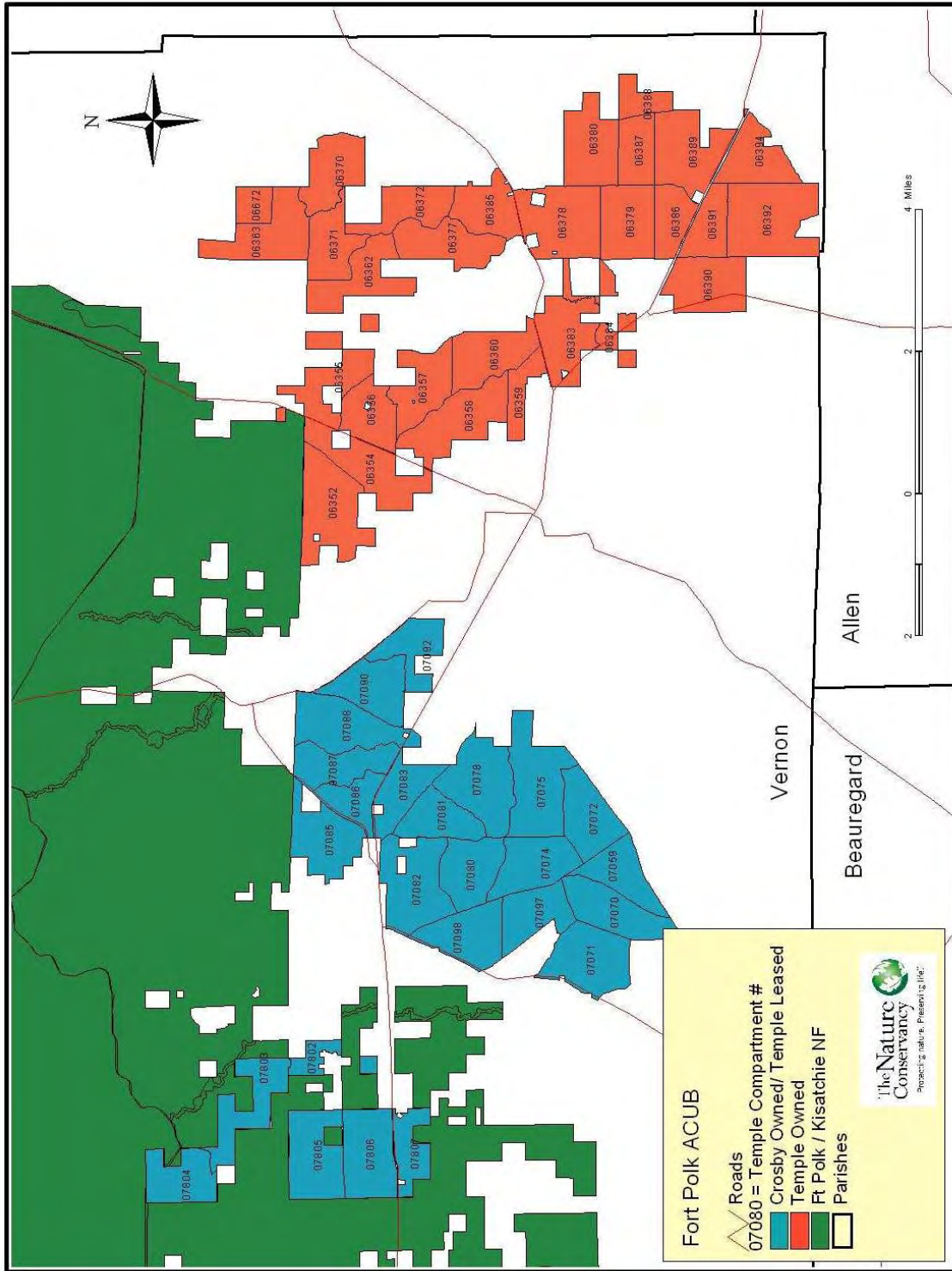


Figure 2. Ownership Map.

We also conducted a conservation forestry workshop held in August 2007 in the Fort Polk area. This workshop targeted local landowners to convey information about the ACUB program and discuss ecologically compatible forestry practices from a variety of landowner perspectives.

Please see workshop agenda and list of attendees attached.

#### **4. Refine priority areas and acquisition boundaries**

TNC has participated in site visits to approximately 8,000 acres of the priority tracts described above, including many of the highest priority parcels. These visits included Fort Polk personnel, TNC staff, and landowner representatives. The purpose of these inspections was to visually assess the ecological condition of the tracts relative to ACUB objectives, collect photos of representative stands, and consider the landscape context of the tracts.

The following photos are representative of the habitats and species targeted in this project.



**Figure 3. Longleaf Savanna.**



**Figure 4. Old-Growth Longleaf Pine.**





**Figure 5. Red-cockaded Woodpecker.**

Subsequently we requested and obtained additional stand information from the landowner. These data allowed us to further evaluate habitat quality, suitability for acquisition, and acquisition sequencing. The result of this analysis is a comprehensive acquisition sequencing plan for the primary and secondary tracts, prioritized according to RCW foraging habitat quality, proximity to existing RCW populations, and contribution to mission success (see figure below). The tracts were sequenced in a step-wise acquisition plan that should allow blocks of land to be aggregated and purchased by priority as funds become available each year (see table below).

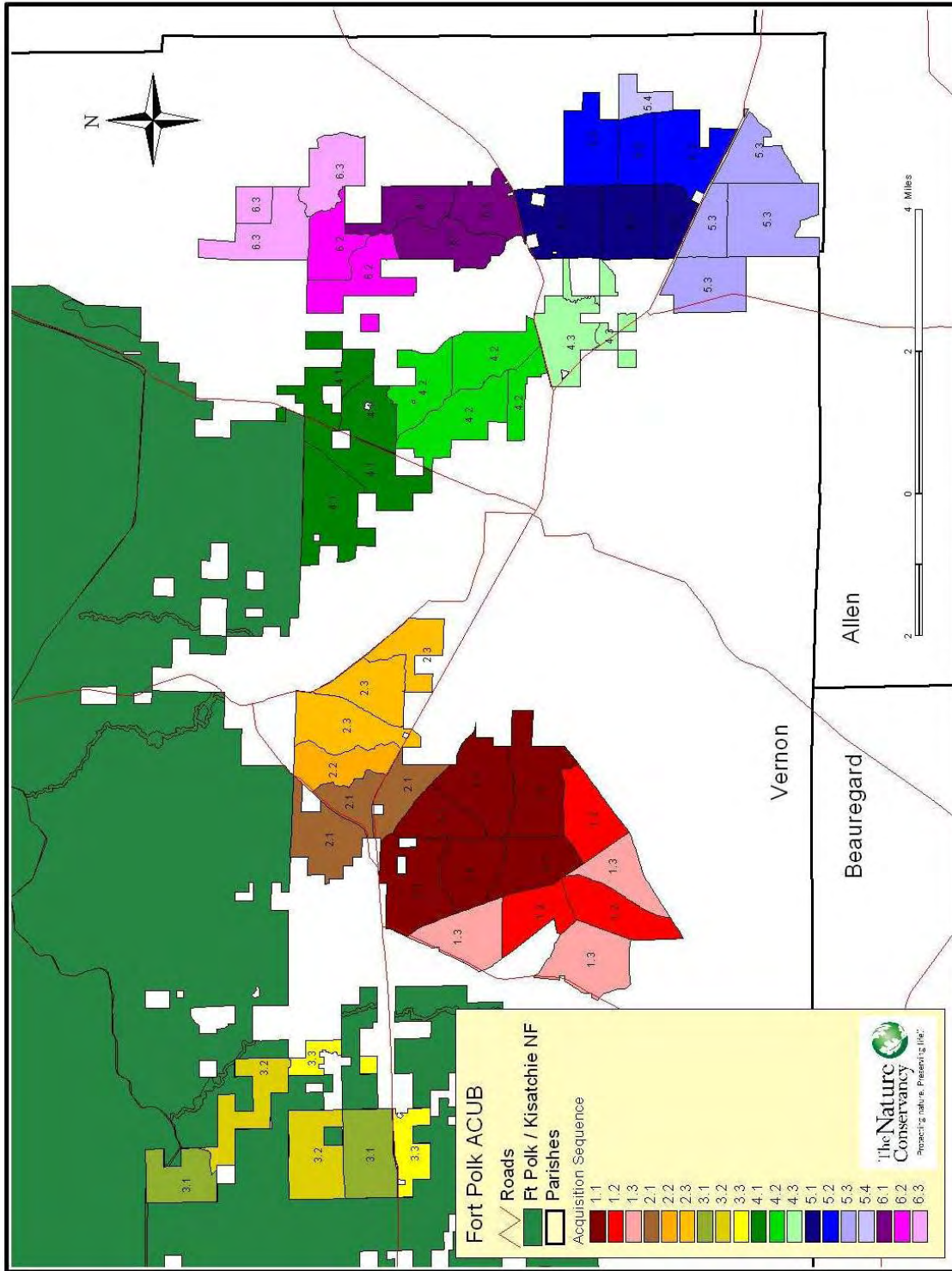


Figure 6. Acquisition Sequence Map

**Table 1. List of Acquisition Blocks**

Acquisition Block	Acres
1.1	3,387
1.2	1,400
1.3	1,492
2.1	1,185
2.2	424
2.3	1,441
3.1	1,000
3.2	1,077
3.3	483
4.1	2,153
4.2	1,801
4.3	772
5.1	1,491
5.2	1,457
5.3	2,068
5.4	198
6.1	1,292
6.2	941
6.3	1,207
Total	25,269

<b>AWARD/CONTRACT</b>		1. THIS CONTRACT IS A RATED ORDER UNDER DPAS (15 CFR 350)			RATING	PAGE OF PAGES 1   23	
2. CONTRACT (Proc. Inst. Ident.) NO. W911SR-07-2-0001		3. EFFECTIVE DATE		4. REQUISITION/PURCHASE REQUEST/PROJECT NO.			
5. ISSUED BY US ARMY RDECOM ACQ. CTR. - W911SR EDGEWOOD CONTRACTING DIVISION ATTN: AMSRD-ACC-E/BLDG E4455 E5179 HOADLEY ROAD ABERDEEN PROVING GROUND MD 21010-5401		CODE W911SR	6. ADMINISTERED BY (If other than Item 5)			CODE	
7. NAME AND ADDRESS OF CONTRACTOR (No., street, city, county, state and zip code) THE NATURE CONSERVANCY 4245 FAIRFAX DR STE 100 ARLINGTON VA 22203-1637		<b>See Item 5</b>			8. DELIVERY [ ] FOB ORIGIN [ ] OTHER (See below)		
					9. DISCOUNT FOR PROMPT PAYMENT		
					10. SUBMIT INVOICES 2 (4 copies unless otherwise specified) TO THE ADDRESS SHOWN IN:		ITEM HQ0303
CODE OPR44		FACILITY CODE		11. SHIP TO/MARK FOR CODE			12. PAYMENT WILL BE MADE BY CODE DFAS ROCK ISLAND OPERATING LOC - HQ0303 1 ROCK ISLAND ARSENAL BLDG 68 ROCK ISLAND IL 61299-8000
<b>See Schedule</b>							
13. AUTHORITY FOR USING OTHER THAN FULL AND OPEN COMPETITION: [ ] 10 U.S.C. 2304(e)( ) [ ] 41 U.S.C. 253(e)( )				14. ACCOUNTING AND APPROPRIATION DATA			
15A. ITEM NO.	15B. SUPPLIES/ SERVICES		15C. QUANTITY	15D. UNIT	15E. UNIT PRICE	15F. AMOUNT	
<b>SEE SCHEDULE</b>							
<b>15G. TOTAL AMOUNT OF CONTRACT</b>						<b>\$0.00</b>	
16. TABLE OF CONTENTS							
(X)	SEC.	DESCRIPTION	PAGE(S)	(X)	SEC.	DESCRIPTION	PAGE(S)
<b>PART I - THE SCHEDULE</b>				<b>PART II - CONTRACT CLAUSES</b>			
X	A	SOLICITATION/ CONTRACT FORM	1	I		CONTRACT CLAUSES	
X	B	SUPPLIES OR SERVICES AND PRICES/ COSTS	2 - 22	<b>PART III - LIST OF DOCUMENTS, EXHIBITS AND OTHER ATTACHMENTS</b>			
	C	DESCRIPTION/ SPECS./ WORK STATEMENT		J		LIST OF ATTACHMENTS	
	D	PACKAGING AND MARKING		<b>PART IV - REPRESENTATIONS AND INSTRUCTIONS</b>			
	E	INSPECTION AND ACCEPTANCE		K	REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS OF OFFERORS		
	F	DELIVERIES OR PERFORMANCE			L	INSTRS., CONDS., AND NOTICES TO OFFERORS	
	G	CONTRACT ADMINISTRATION DATA		M	EVALUATION FACTORS FOR AWARD		
	H	SPECIAL CONTRACT REQUIREMENTS					
<b>CONTRACTING OFFICER WILL COMPLETE ITEM 17 OR 18 AS APPLICABLE</b>							
17. [X] CONTRACTOR'S NEGOTIATED AGREEMENT (Contractor is required to sign this document and return 2 copies to issuing office.) Contractor agrees to furnish and deliver all items or perform all the services set forth or otherwise identified above and on any continuation sheets for the consideration stated herein. The rights and obligations of the parties to this contract shall be subject to and governed by the following documents: (a) this award/contract, (b) the solicitation, if any, and (c) such provisions, representations, certifications, and specifications, as are attached or incorporated by reference herein. (Attachments are listed herein.)				18. [ ] AWARD (Contractor is not required to sign this document.) Your offer on Solicitation Number _____ including the additions or changes made by you which additions or changes are set forth in full above, is hereby accepted as to the items listed above and on any continuation sheets. This award consummates the contract which consists of the following documents: (a) the Government's solicitation and your offer, and (b) this award/contract. No further contractual document is necessary.			
19A. NAME AND TITLE OF SIGNER (Type or print)				20A. NAME AND TITLE OF CONTRACTING OFFICER			
				TEL: _____ EMAIL: _____			
19B. NAME OF CONTRACTOR		19C. DATE SIGNED		20B. UNITED STATES OF AMERICA		20C. DATE SIGNED	
BY _____ (Signature of person authorized to sign)				BY _____ (Signature of Contracting Officer)			

Section B – Supplies or Services and Prices

COOPERATIVE AGREEMENT

BETWEEN

The Nature Conservancy

AND

U.S. Army Research Development and Environmental Command

ON BEHALF OF

U.S. Army Environmental Center

CONCERNING

**Army Compatible Use Buffers (ACUBs) in the vicinity of Fort Polk Military Installation**

Agreement No. W911SR-06-2-0010

Total Estimated Amount of the Agreement: \$58,900,000.00

Total Estimated Government Funding of the Agreement: \$44,200,000.00

Government Funds Obligated: \$500,000

Authority: 10 U.S.C. 2684a and 16 USC 670c-1(a)

CLIN 0001 is hereby established in the amount of \$500,000

Accounting and Appropriation Data:

217202000007223400131053230003230VENN00MIPR7DDAT480457V2026S1800123008VCSCC789000

ACRN AA;

Appropriation No:

ACRN: AA

Amount: \$ 500,000

This Agreement is entered into between the United States of America, hereinafter called the Government, represented by the U.S. Army Research Development and Engineering Command (RDECOM) and the Nature Conservancy, hereinafter referred to as the Recipient, pursuant to and under U.S. Federal Law.

Table of Contents

ARTICLES

Article 1	Scope of the Agreement
Article 2	General Definitions
Article 3	Program Management
Article 4	Costs
Article 5	Services
Article 6	Funding
Article 7	Payment
Article 8	General Provisions
Article 9	Agreement Administration
Article 10	Term of the Agreement, Suspension, and Termination
Article 11	Administrative Responsibility
Article 12	Entire Agreement
Article 13	Governing Law/Order of Precedence
Article 14	Waiver of Rights
Article 15	Liability
Article 16	Non-Assignment
Article 17	Severability
Article 18	Force Majeure
Article 19	Notices

ATTACHMENTS

Attachment 1	Standard Terms and Conditions for Institutions of Higher Education, Hospitals, and other Non-Profit Organizations
Attachment 2	Other Certifications

## ARTICLE 1 – SCOPE OF THE AGREEMENT

### STATEMENT OF WORK FOR COOPERATIVE AGREEMENT

#### 1.1 INTRODUCTION

1.1.1 Fort Polk (FTPK) is home to the Joint Readiness Training Center (JRTC), the 4<sup>th</sup> Brigade of the 10<sup>th</sup> Mountain Division Brigade Combat Team/Unit of Action, and the Warrior Brigade, which contains a military police battalion and several combat support units. Endangered species population recovery and habitat management requirements for the red-cockaded woodpecker (RCW) increasingly constrain the ability of the installation to develop training facilities on its lands to meet future mission requirements. RCW habitat management requirements similarly constrain the use and development of adjacent Kisatchie National Forest (KNF) lands used for training under a long-term permit agreement. In addition, the Louisiana pine snake (LPS), a candidate for listing under the Endangered Species Act, is known to occur on FTPK and KNF permitted-use lands. Should the LPS be listed under the Endangered Species Act, significant regulatory restrictions on training operations and land use could be imposed. Additional development on private properties within the Limited Use Area of the KNF or adjacent to FTPK's boundaries could also impact future training and range operations.

1.1.2 FTPK and KNF permitted-use lands are important regional conservation lands for the RCW, LPS and other floral and faunal species native to the longleaf pine ecosystem. The conservation value of these federal lands has increased because of the changes in industrial forestry practices within the last thirty (30) years. FTPK is largely surrounded by industrial timberlands, and intensive timber management regimes on these lands have significantly reduced their ecological value. As a result, an increasing burden for the conservation of ecological systems and species of concern has fallen to the federal properties. The situation could be further exacerbated by a recent trend toward the transfer of large blocks of forested land between industrial companies, and in some notable cases, out of industrial ownership. Within the past 5 to 10 years, several large timber companies in the southeastern U.S. have begun divesting their interests in land holdings.

1.1.3 The trend toward divestiture of land holdings by industrial timber companies may have important implications for FTPK, as well as significant ecological implications for the future. When these large forested land holdings are purchased by timberland investment management organizations (TIMOs), the land is likely to be sold, potentially to new owners who are not in the forestry business. When this occurs, the land is more likely to be subdivided and converted from forested lands to other land uses. Sale and fragmentation of forestlands has the potential to impact FTPK by increasing pressure for ecological management of Army fee-owned land, as more species become dependent solely on federal lands in the region. Without conservation of RCW and LPS habitat on private lands, pressures for conservation and recovery of these species on federal lands will only increase, resulting in greater encroachment on FTPK's ability to achieve its mission

1.1.4 Another significant and necessary element of ensuring the sustainability of Army training lands is the avoidance of incompatible development of adjacent lands. Incompatible development has been recognized as having significant effect on the ability of several military installations to fully support current and/or additional training missions due to noise complaints, safety concerns, traffic congestion, air space conflicts, water quality and air quality considerations. Additional development of land within the Limited Use Area or near the boundaries of the Peason Ridge Training Area would likely result in these types of conflicts regarding maneuver and live fire training activities at the installation.

1.1.5 To maintain its ability to effectively train soldiers into the future, the Government must develop ways to reduce or avoid restrictions on range and training land use resulting from endangered and candidate species management requirements and prevent incompatible development adjacent to its boundaries. Unless addressed directly and mitigated through a comprehensive and effective conservation and compatible use buffer strategy, FTPK's obligations under the ESA and conflicts between FTPK and neighboring private landowners will ultimately degrade its capabilities to meet current and future mission requirements. The threats posed by endangered and

candidate species management requirements and incompatible development to FTPK's training environment represents the impetus for this Cooperative Agreement (CA).

## 1.2 PURPOSE AND OBJECTIVES

1.2.1 The primary purpose of this CA is to support and sustain the military training mission at FTPK by avoiding land use conflicts, encouraging conservation of natural resources on private property in the vicinity of, or ecologically related to, FTPK and enhancing relationships with affected civilian communities. The CA is also designed to produce lasting collaborations with the Government at FTPK, The Nature Conservancy (TNC), and other non-profit organizations, public agencies, and local communities to identify conservation opportunities that will assist in long-term sustained Army training on the installation.

1.2.2 The Government has determined that it is in the best interest of the FTPK installation to take steps necessary to provide for regional land conservation planning and action in the vicinity of, or ecologically related to, Army lands at FTPK. Such planning will result in the identification of priority parcels of privately-owned real estate that should be conserved through fee simple or conservation servitude acquisition and management for conservation purposes. The objectives of acquisition and conservation of lands in the vicinity of, or ecologically related to, Army lands at FTPK include:

1.2.2.1 Ensuring the Government's ability to support current and future military training missions at FTPK on a long-term sustained basis by avoiding or limiting environmental restrictions that might impede or interfere with military training or other military activities at FTPK.

1.2.2.2 Encouraging effective conservation of natural resources on and around FTPK, especially as it pertains to the recovery of threatened and endangered species and preventing the listing of additional species.

1.2.2.3 Improving the Army's relationship with local communities by demonstrating its continued commitment to regional conservation and recognition of important community interests.

1.2.3 Effective land protection, conservation planning, and management around FTPK will reduce the likelihood of development that is incompatible with military training and will enhance natural resource conservation.

1.2.4 The mission of TNC is to preserve the plants, animals and natural communities that represent the diversity of life on Earth by protecting the land and water they need to survive. Therefore, TNC is an "eligible entity" for agreements entered into under the authority of 10 USC 2684a and 16 USC 670c-1(a). TNC has proven and recognized expertise with conservation real estate transactions, including both fee simple acquisition and conservation servitudes. TNC also has a successful track record of working with federal and state agencies and private landowners to create and implement management plans that provide for land uses that are consistent with the long-term protection of those lands' natural resources and ecological integrity.

1.2.5 TNC has identified FTPK and the adjoining KNF training lands as Terrestrial Conservation Areas or areas of high importance for protection of the biodiversity of the ecoregion. Likewise, the Louisiana Natural Heritage Program (LNHP) has identified several habitats that occur on FTPK and the adjoining KNF training lands as Tier 1 conservation priority habitats, or habitats on which species of conservation concern experiencing the greatest population declines depend. These Tier 1 habitats are Western upland longleaf pine forest and Western longleaf pine savannah, which dominate the training landscape, and smaller sandstone glades/barrens and Western hillside seepage bogs.

1.2.6 FTPK and the adjoining KNF training lands also provide habitat for two RCW populations, one of which has been designated as a "primary core population" by the U.S. Fish and Wildlife Service and is critical to species recovery. There is considerable conservation value in protecting these critical areas on the installation and those lands that are either adjacent to the installation and/or environmentally-related through shared watersheds, wildlife corridors, contiguous forests, and other ecologically unifying factors.



1.2.7 TNC is committed to working with the Government at FTPK to preserve, manage, and enhance natural resources on a regional scale. The success of these efforts will in turn support the sustainability of military training at the installation.

1.2.8 The Government and TNC acknowledge that the Principal Assistant Responsible for Contracting (PARC) for US Army Research, Development and Engineering Command (RDECOM) is the Government official for the U.S. Department of the Army authorized to negotiate, sign and execute CAs under 10 USC 2684a and 16 USC 607c-1(a). This Statement of Work (SOW), therefore, represents an agreement in principle between TNC and the Government through RDECOM for FTPK (the "Parties") with the understanding that it may be subject to change through negotiation and will not bind either Party until signed by the PARC and TNC's authorized representative.

1.2.9 TNC, State and Federal agencies have been working cooperatively for years to conserve natural resources in the vicinity of and ecologically related to FTPK and KNF-permitted use lands. They will continue to work cooperatively to accomplish mutual conservation goals. In particular, the Parties will work together under this CA as authorized by 10 USC 2684a to establish an Army Compatible Use Buffer (ACUB) project.

1.2.10 The Government and TNC have identified five (5) landscape-scale areas (hereafter referred to as the "Project Area") in the vicinity of or ecologically related to FTPK that contain those lands that, if managed for conservation, would help accomplish the purposes of this CA as authorized by 16 USC 670c-1(a). The Project Area is substantially represented in Map 1 in Appendix A, and targeted conservation "Priority Areas" are numbered 1 through 5.

1.2.11 The Parties will work together to protect and conserve lands in the Priority Areas through the voluntary acquisition of appropriate real property interests before incompatible development or land use occurs. The Parties will, to the extent possible, concentrate their conservation efforts within the Priority Areas. Established Priority Areas notwithstanding, the Parties agree that the protection or conservation management of all undeveloped tracts located in the Project Area and containing valuable natural areas and/or lands important to TNC and on which intensive timber management or development would likely create conflicts with FTPK's training environment would further the overall purpose of this CA.

### **1.3 AUTHORITY**

1.3.1 The Government is authorized to enter into a CA under authority of Section 2811 of the National Defense Authorization Act for Fiscal Year 2003, codified at 10 USC 2684a, as amended by Section 2822 of the National Defense Authorization Act for Fiscal Year 2006, with TNC as an "eligible entity". This agreement is intended to accomplish the established statutory purposes. In particular, this agreement is intended by the Government: (1) to limit the development or use of real property that would be incompatible with the mission of FTPK; and (2) to preserve habitat on the property in a manner that: (A) is compatible with environmental requirements; and (B) may eliminate or relieve current or anticipated environmental restrictions that would or might otherwise restrict, impede, or otherwise interfere, whether directly or indirectly, with current or anticipated military training, testing, or operations on the installation.

1.3.2 In addition, the Government is authorized to enter this agreement under authority of the Sikes Act, 16 USC 670c-1(a). The Sikes Act authorizes the Secretary of the Army, through his authorized representative to enter into cooperative agreements with States, local governments and private organizations for the purpose of benefiting natural resources on military installations. The acquisition and management of interests in real property in the vicinity of Fort Polk and ecologically connected to natural resources and systems on-post will benefit natural resources on Fort Polk. The synergistic relationship between many of the parcels depicted on Map 1, Appendix A and natural resources on Fort Polk is explained above in paragraphs 1.2.6 through 1.2.11.

1.3.3 Prior to acquisition of any parcel, on a case-by-case basis, under the authority of 10 U.S.C. 2684a, the Parties contributing funds and/or services to the specified parcel will decide on the terms of the conservation servitude or deed restriction. This statute does not provide authority for the Government to acquire land, or any interest in land, to conduct military training and operations. Land transaction documents, including deeds of

conservation servitude, may identify such activities as prohibited inconsistent uses of the property, or may allow limited compatible training where the landowner allows and only after proper authorization.

1.3.4 In accordance with the definitions and requirements of the Department of Defense Grant and Agreement Regulations (DoDGARs), a cooperative agreement, as opposed to a procurement contract or grant, is the appropriate instrument for the proposed action since the established purpose and objective is to provide assistance to TNC to **stimulate and support a public purpose and the Government intends to participate substantially in the effort**. In particular, the Government will remain instrumental in working with TNC to structure the acquisition, protection and management of the property interests acquired under this agreement.

## 1.4 Cost Sharing

1.4.1 This CA has no cost matching requirements; provided, however, that the portion of the acquisition costs borne by the Government may not exceed the amount allowable under 10 USC 2684a. This CA is a cost-share agreement, although no specific cost-share ratio is required. TNC may contribute and the Government may accept as cost-share from TNC funding, in-kind services, and/or the donation of interests in real property. This is a best efforts agreement wherein all Parties shall make good faith efforts to obtain funding and other resources that may be combined and leveraged to accomplish the public purposes of the CA.

1.4.2 Army: Expenditures by the Army under this CA are subject to the availability of funds. If funds are available, the Army will pay for an agreed upon share of the direct and indirect cost of acquisition of any particular real property interest acquired under this agreement. The Army will also pay for an agreed-upon share of post-acquisition stewardship and management costs to the extent permitted by law. However, the Army will commence work towards implementation of tasks listed below upon execution of this agreement.

1.4.3 TNC: Expenditures by TNC under this CA are also subject to the availability of funds. If funds are available, TNC will pay for an agreed upon share of direct and indirect costs of the acquisition of any particular real property interest acquired under this agreement and/or TNC may pay for an agreed upon share of post-acquisition stewardship and management costs. In any event, however, in the alternative, TNC may choose to (i) provide in-kind services (including services related to pre-acquisition, acquisition and/or post-acquisition stewardship and management of the real property interest acquired.), and/or (ii) exchange or donate an interest in real property

1.4.3.1 If TNC chooses to provide in-kind services, the value of these services may be counted towards the cost-sharing requirement if those services are reasonably related to the pre-acquisition, acquisition or post-acquisition stewardship and management of an interest in real property agreed to under this CA. Services may include, without limitation: staff time to accomplish tasks (including, without limitation, maintaining resource and parcel data relevant to ACUB, monitoring land transactions, landowner outreach, monitoring and enforcement of servitudes and/or restrictions on real property interests acquired, acquisitions of land interests through donation, etc.); legal services in connection with its efforts to acquire the property; and overhead costs specifically associated with working on acquisitions under this CA.

1.4.3.2 TNC may solicit funds from third party sources to leverage the Army's contributions and support the purposes of this agreement. All funds solicited and obtained by TNC from any third party source outside the Department of Defense (DoD) (including non-DoD federal or state programs, donors and other non-governmental organizations) may be attributed to TNC as part of its agreed upon share of costs for specific interests in real property under this CA.

1.4.4 Direct and Indirect Costs of Acquisition of an interest in real property under this agreement includes, without limitation: (i) the purchase price of the property interest, as well as any down payment and option consideration if not included in the purchase price; (ii) pre-acquisition requirements such as contact and negotiation with landowners, drafting of purchase and sale agreements, boundary surveys, title reviews, appraisals, due diligence (e.g. environmental site assessments), preparation of deeds for transfer, legal expenses and travel costs; (iii) acquisition requirements, including the costs to close the transaction, taxes paid or triggered at purchase or sale (such as real property taxes paid at closing, compensating taxes, excise taxes, transfer taxes, documentary stamps, and taxes resulting from change in use), title insurance, escrow fees and recordation fees and other similar expenses

that are attributed to the specific real estate acquisition; (iv) TNC holding costs prior to reimbursement by the Government of the Government's cost-share, including interest charged to the TNC Louisiana Chapter for funds borrowed from its internal Land Preservation Fund, subject to prior approval by the Government, and, (v) the direct and indirect cost of staff time to perform foregoing tasks.

1.4.5 Post-acquisition Stewardship and Management Costs under this agreement include without limitation: (i) the cost of periodic monitoring, and, if necessary, enforcement of conservation servitudes acquired under this agreement; and (ii) the cost of managing or restoring natural resources to meet the purposes of this agreement.

1.4.6 The agreed upon share that the Army and TNC will fund under this CA will be determined separately for each real estate interest that is acquired based on negotiations among the Parties to this CA. These negotiations will consider the available Army funding, contributions from non-Army sources, and the overall terms of the purchase agreement with the real property owner, as well as such other factors as the Parties deem relevant (including, but not limited to, the value of real property interests obtained by TNC or its partners without funding under this CA which forward the goals of this CA and acquisitions costs thereof).

1.4.7 The Parties acknowledge that all transaction contemplated pursuant to this agreement is subject to TNC's internal approvals, policies and standard operating procedures relating to such transactions, as well as the applicable local, state and federal regulations governing real property acquisitions.

## **1.5 Project Tasks**

### **1.5.1 Army Project Tasks**

1.5.1.1 FTPK staff will coordinate with TNC and provide necessary notices, concurrences and other information in order for TNC to carry out project tasks set forth below. In particular, the FTPK staff will:

1.5.1.1.1 Coordinate with all interested parties to establish Priority Areas and Listed Parcels (see par. 1.5.2.1 below);

1.5.1.1.2 Notify TNC when FTPK will be the lead cooperator in negotiating an agreement with the landowner of a specific parcel;

1.5.1.1.3 Negotiate the cost-share between the Parties on a transaction-by-transaction basis;

1.5.1.1.4 Provide TNC with a notice to proceed with negotiation ("Notice to Proceed") of an agreement for purchase and sale of an interest in real property, including options. The Notice to Proceed on any specific parcel, shall be given based on the extent of funding available to FTPK and shall only be given once FTPK and TNC have agreed to the relative share of direct and indirect acquisitions costs and post-acquisition management and stewardship costs, to be paid by the parties.

1.5.1.1.5 Provide TNC with the Army's determination of the minimum property or interest in any specific parcel that is necessary to ensure that the property concerned is developed and used in a manner appropriate for purposes of this CA in accordance with 10 USC 2684a (the "Interest Determination"). The Army's Interest Determination shall be included in the Notice to Proceed.

1.5.1.1.5 Authorize TNC to finalize purchase and sale agreements and proceed to closing;

1.5.1.1.6 Work in cooperation with TNC to develop language for deeds of transfer, including deeds of conservation servitude, to include Army contingent rights.

1.5.1.2 FTPK will coordinate with other interested parties including other cooperators, State and Federal agencies and other non-profit organizations working to conserve land in the vicinity of or ecologically related to FTPK.

1.5.1.3 All reviews by FTPK of appraisals, due diligence and other matters, will be completed in a timely manner and, at a minimum, as required under the terms and conditions of any acquisition agreement approved under this CA. FTPK will work cooperatively with TNC to provide written notice within such time frames of its approval of matters or, if unacceptable, the matters which require cure or further investigation.

1.5.1.4 FTPK will provide TNC with a written funding commitment (Funding Commitment) that specifies the Army's total funding obligation in connection with any acquisition approved hereunder prior to the time required for such financial commitment to be made by TNC under the terms and conditions of any acquisition agreement approved or contemplated under this CA. Each Funding Commitment will specify the date by which the funding will be available for application to the acquisition. Subsequent to delivery of the Funding Commitment, FTPK will coordinate with the Cooperative Agreement Manager to provide for payment of agreed upon costs in accordance with the procedures for payment and/or reimbursement in this agreement, within the time required by such approved acquisition agreement.

1.5.1.5 FTPK will arrange for an authorized representative of the Army to accept the contingent rights of the Army in writing and provide for the written acceptance to be recorded with any deed of transfer. The Army will prepare and sign an instrument accepting its contingent rights in any deed of transfer and assure that such signed document is available prior to closing on any transaction.

#### 1.5.2 TNC Project Tasks:

1.5.2.1 Upon execution of this agreement, TNC shall begin work to develop, in coordination with the FTPK staff and other interested parties, a prioritized list of parcels within the Priority Areas to target for protection through acquisition of fee interest, conservation or non-development servitude or similar instrument and seek the Army's concurrence. Once FTPK has concurred with this list it shall be referred to as the "Listed Parcels." The Listed Parcels shall be reviewed periodically by TNC to determine if it needs amendment. General priorities for land protection efforts under this CA shall be as follows:

1.5.2.1.1 Large tracts of land are more desirable than small tracts.

1.5.2.1.2 Land with existing populations of species of concern or candidate species or containing critical, extensive, or especially intact habitats is more desirable than land lacking those characteristics.

1.5.2.1.3 Land adjacent to FTPK is more desirable than land not adjacent, and contiguous tracts are more desirable than tracts that are not contiguous.

1.5.2.2 This agreement may be modified by mutual written agreement and through the Parties' authorized representatives to reflect changes in the Project Area and Priority Areas based on unforeseen conditions, changed circumstances or land protection opportunities.

1.5.2.3 Upon its execution TNC shall, without reimbursement under this CA, establish contact with owners of parcels of interest within the Project Area, with higher priority placed on parcels within the designated Priority Areas and highest priority placed on the Listed Parcels as referenced in Paragraph 1.5.2.1. TNC shall then develop a list of willing landowners who have an interest in selling an interest in real property. All costs associated with the tasks in this sub-paragraph 1.5.2.3 shall be included in TNC's cost-share.

1.5.2.4 Upon receipt of a Notice to Proceed and Interest Determination from FTPK as to an individual parcel, TNC shall obtain an appraisal of the property interest desired to be acquired to establish Fair Market Value using methods and standards substantially equivalent to 42 U.S.C. 4651. To the extent that the interest desired to be acquired materially changes as a result of subsequent landowner negotiations, the appraisal shall be updated as necessary. Notwithstanding anything contained herein, TNC may enter into

an option or other purchase agreement under this CA prior to the completion of the appraisal provided such agreement is otherwise in compliance with the terms and conditions of this CA.

1.5.2.5 Prior to making an offer to the landowner, TNC shall provide the landowner/seller with the appropriate notifications in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970.

1.5.2.6 TNC shall coordinate with FTPK concerning the terms and conditions of the proposed purchase or option agreement. FTPK will concur with the terms of the purchase and sale agreement or option, indicate necessary changes before the agreement is acceptable, or decline to participate in the transaction.

1.5.2.7 If FTPK agrees with the terms of the purchase and sale agreement or option, it will authorize TNC to finalize a purchase and sale agreement or secure an option in accordance with the terms agreed upon with FTPK. Subject to TNC's internal approvals, policies and standard operating procedures and availability of funding, TNC shall proceed to negotiate a final agreement with the landowner. TNC will be authorized to indicate the Army's contribution of available funding up to the agreed upon share of acquisition cost in order to demonstrate good faith. TNC shall include in the purchase and sale contract a condition that closing is subject to the property being in suitable condition for transfer and the title being clear of any defects and where appropriate, that an acceptable appraisal is obtained.

1.5.2.8 If TNC secures an option to purchase a property interest or otherwise reaches an agreement for the purchase of a property interest under this CA, it shall perform additional due diligence. Additional due diligence will include, at a minimum:

1.5.2.8.1 An environmental site assessment (ESA). TNC shall comply with (or instruct the contractor performing the ESA to comply with) the requirements of 42 U.S.C. 9601(35) (B) (i) (I) and use methodologies consistent with the latest ASTM Standard E-1527 and E-1528. Based on this assessment, TNC and FTPK will determine whether additional field investigations of soil, sediment, surface water, and other environmental media are warranted.

1.5.2.8.2 A boundary survey of the property interest being acquired, as determined to be necessary by TNC and FTPK.

1.5.2.8.3 A title examination of the property to determine all possible flaws in title that will have to be corrected by the owner, or any other title matters that may be revealed that are inconsistent with the intended purpose and use of the property to be acquired.

1.5.2.9 Once the due diligence is completed and TNC and FTPK are satisfied: (i) that the acquisition can occur at, less than, or within a reasonable range of the appraised fair market value, (ii) that no environmental hazards requiring remediation have been discovered by a professional environmental assessment on the site, and (iii) that the title examination and associated due diligence reveal no issues that must be cleared, TNC shall notify FTPK and arrange for closing of the transaction.

1.5.2.10 TNC, prior to the closing date, shall work with FTPK in the development of any conservation servitude, deed of conveyance, or other real property transfer documents and obtain the Army's concurrence before finalizing any transaction. The applicable deed shall include contingent rights for the Army to protect its interests as required by 10 USC 2684a(d)(4) in accordance with the Special Conditions in paragraph 1.7.2 below.

1.5.2.11 TNC shall not be obligated to exercise any purchase and sale option or execute a purchase and sale agreement or otherwise bind itself to purchase an interest in real property under this CA until i) FTPK has provided the Funding Commitment pursuant to paragraph 1.5.1.3 above, ii) TNC has sufficient funds available to it to pay any costs not covered by the Funding Commitment, iii) TNC is satisfied, in its sole discretion, with all due diligence obtained in connection with the real property or TNC is satisfied, in its sole discretion, that it will have adequate opportunity to review due diligence prior to closing without being

at risk for default, and iv) all internal approvals have been obtained, and such acquisition is otherwise in compliance with all of TNC's policies and procedures.

1.5.2.12 Upon closing, TNC shall record all deeds of transfer including conservation servitude and any other agreed-upon notices in the local land records in accordance with the requirements of the law of the state in which the land is located.

1.5.2.13 TNC will seek reimbursement of costs and/or request payment in accordance with the procedures set forth in this agreement.

1.5.2.14 TNC agrees to work cooperatively with the Army when contacting landowners, discussing acquisition of property interests, conducting due diligence, and finalizing land transactions. Specifically, TNC agrees to communicate and share information with the Army as appropriate to improve the efficiency and effectiveness of project implementation.

## **1.6 Deliverables**

1.6.1 TNC agrees to provide to the Army all data, reports, investigations or determinations to the extent that (i) such documentation has been obtained pursuant to this CA and in compliance with Section 1.7.1 below, (ii) the documentation is relevant to any real property interest being considered for acquisition under this CA, and (iii) the costs for such documentation are or will be attributed to this CA. Said documentation shall be free of any disclosure restriction unless required by the real property owner to be held in confidence in order to gain access to the property and then only to the extent necessary to protect data and information only obtainable on the real property itself. The confidential nature of any information shall not prevent its delivery to the Army for use within the U.S. government (unless otherwise restricted by the real property owner, in which case the costs associated with obtaining such information shall not be attributed to this CA). Such confidential information shall be deemed to be subject to the Trade Secrets Act, 18 USC 1905, which makes its improper release by a government employee a criminal offense. Confidential information directly concerning the real property will be free of any restriction if the owner sells a fee simple interest pursuant to the goals of this CA.

1.6.2 TNC shall provide annual financial (SF 269) and programmatic reports as directed by the Grants Officer (hereinafter defined) providing information on how TNC expended funds during the reporting period. These annual reports shall include information that the Grants Officer and the Army need to properly promote and manage this CA. Such information should include a map with the parcels acquired or to be acquired under the CA and a table that lists: the acquisition name, nature of realty interest acquired, acreage, costs, source of funds, management status (i.e., who will own and manage the property long-term), and a list of any agreements or management plans for the parcel. These annual reports shall also include a brief narrative of key project accomplishments, lessons learned, and possible follow-up work. TNC shall submit annual reports within thirty (30) days of the anniversary of the award.

1.6.3 TNC shall provide the Cooperative Agreement Manager (US Army Environmental Center) and Associate Cooperative Agreement Manager (FTPK) points of contact with copies of any final closing documents related to the tasks performed under this agreement, including but not limited to contracts for purchase and sale; appraisals; real property transfer documents (ex., deeds, conservation servitudes); and environmental site assessments.

1.6.4 TNC shall, upon completion of this agreement pursuant to paragraph 9.0, provide to the Grants Officer and the Associate Cooperative Agreement Manager a collective final report detailing the overall project accomplishments and summarizing the expenditures required to accomplish the conservation projects pursuant to the CA.

1.6.5 The Army shall prepare and sign an instrument accepting its contingent rights in any deed of transfer and assure that such signed document is available prior to closing on any transaction.

## **1.7 Special Conditions**

1.7.1 TNC shall not enter non-federal real property for the purpose of collecting information regarding the property unless the owner has given consent in writing to the entry and has been provided notice of the entry.

1.7.2 Any property interest acquired pursuant to this CA shall be held by TNC or another eligible entity (i.e. 501(c)(3) nonprofit conservation organization or public agency) approved in writing by the Army and TNC to participate in a project pursuant to this CA, and shall be an “eligible entity” under 10 USC 2684a. In addition, TNC shall carry out the following commitments that shall survive termination of the CA.

1.7.2.1 TNC or other eligible entity who holds the property interest, as the case may be, shall record in the local land records by an appropriate instrument acceptable under State law the Army’s rights under 10 U.S.C. § 2684a(d)(3) and the CA. The instrument shall be effective to put prospective transferees on notice of the Army’s rights and interests in the real property or interest therein owned by TNC or such other eligible entity.

1.7.2.2 Any conservation servitude acquired pursuant to this CA shall include provisions for its monitoring and enforcement to ensure that the parcel is not developed or used in a manner inconsistent with the terms of the conservation servitude. If a conservation servitude is intended to be acquired, but TNC chooses not to be the holder of the conservation servitude, TNC, at the Army’s instruction, shall have the conservation servitude conveyed to the Army or an entity or organization identified by the Army.

1.7.2.3 If TNC or other eligible entity acquires fee interest or a conservation servitude in a parcel and proposes to transfer that interest, it shall first notify the Army – in which case the Army will have the following options:

1.7.2.3.1 Approve of the transfer subject to TNC’s commitment to transfer the interest subject to the Army’s rights under 10 U.S.C. § 2684a(d)(4);

1.7.2.3.2 Exercise its rights under 10 U.S.C. § 2684(a)(d)(4) and direct TNC to convey to the Army an interest in real property sufficient to ensure that the property is not used or developed for purposes inconsistent with the purposes of the CA;

1.7.2.3.3 Direct TNC or other eligible entity to transfer an interest in real property sufficient to ensure that the property is not used or developed for purposes inconsistent with the purposes of the CA to another entity or organization.

1.7.3 Should TNC or other eligible entity resell any real property interest, including but not limited to fee simple title or deed of conservation servitude, purchased in whole or part with funds committed under this CA, it shall dedicate the proceeds of such sale, in sufficient amount to replace those funds, to carry out other, future purposes and tasks of this CA, or as otherwise in accordance with DoDGARs. If such a resale occurs after the termination or completion of this agreement, the proceeds of such a sale shall still be used to support the original purposes of this agreement.

1.7.4 Notwithstanding any other provision in this CA, TNC or other eligible entity shall transfer to the Army, upon the request of the Secretary of the Army, in accordance with and under conditions specified in 10 U.S.C. § 2684a(d)(4), an interest in the real estate acquired hereunder sufficient to ensure that the property is not developed and used in a manner inconsistent with the purposes of this CA.

## **1.8 Period Of Performance**

1.8.1 The CA shall be in effect for a period of five (5) years from the date of its execution, unless extended by mutual agreement of the Parties or earlier terminated pursuant to the terms hereof.

1.8.2 The CA can be amended by the mutual consent of the Parties. Amendments shall be executed in writing and signed by each party to this CA.

## **1.9 Contacts**

1.9.1 The Nature Conservancy of Louisiana  
Mr. Rick Jacob  
122 Williamsburg St.  
Lake Charles, LA 70605  
(337) 480-9393 phone/fax

Eric Hunter, Grants Specialist  
The Nature Conservancy  
Georgia Operating Unit  
1330 West Peachtree St, Suite 410  
Atlanta GA 30309  
(404) 253-7202  
[ehunter@tnc.org](mailto:ehunter@tnc.org)

1.9.2 JRTC and Fort Polk  
Ms. Stephanie Stephens  
Environmental and Natural Resources Management Division  
1647 23rd Street  
Fort Polk, LA 71459  
337-531-6088

1.9.3 USAEC  
Ms. Cynthia Bauer  
US Army Environmental Center  
5179 Hoadley Road  
Bldg E4435  
Aberdeen Proving Ground, MD 21010-5401  
410-436-6464

## **ARTICLE 2 – GENERAL DEFINITIONS**

2.1 Recipient – A Recipient is an organization or other entity receiving assistance by grant or CA from a DoD Component. For purposes of this Agreement, the Recipient is TNC.

2.2 Parties – For purposes of this Agreement, the parties are RDECOM on behalf of USAEC and the Recipient.

2.3 Cooperative Agreement Manager (CAM) – The CAM is the Government’s technical representative from USAEC charged with the overall responsibility of management and guidance of the CA (Listed in Article 3.1).

2.4 Associate Cooperative Agreement Manager (ACAM) – The ACAM is the Government’s technical representatives from US Garrison – Fort Polk and USAEC charged with advising and updating the CAM on the Army Compatible Use Buffer (ACUB) project at Fort Polk (Listed in Article 3.2).

2.5 Grants Officer – The Grants Officer is the Government’s principal point of contact for all administrative, financial or other non-technical issues arising under the Agreement (Listed in Article 11.1).



2.6 Agreement Administrator – The Agreement Administrator has authority to administer CA’s and, in coordination with the Grants Officer, make determination and findings related to delegated administrative functions (Listed in 11.1).

2.7 Recipient Program Manager (RPM) – The RPM is the Recipient’s official charged with the overall responsibility of management and guidance of the CA (Listed in Article 3.3).

2.8 Annual Report – The document which summarizes project progress, to include lessons learned and possible follow-on work, and provides an accounting of funding and disbursements under the CA for each fiscal year.

### **ARTICLE 3 – PROGRAM MANAGEMENT**

3.1 The Cooperative Agreement Manager (CAM) is:

MS. Cynthia Bauer  
U.S. Army Environmental Center  
ATTN: SFIM-AEC-TSR  
5179 Hoadley Road  
Building E4430  
Aberdeen Proving Ground, MD 21010-5401  
Phone: (410) 436-6464

3.2 The Associate Cooperative Agreement Manager (ACAM) is:

Ms. Stephanie Stephens  
Environmental and Natural Resources Management Division  
1647 23<sup>rd</sup> Street  
Fort Polk, LA 71459  
Phone: (337) 531-6088

3.3 Recipient Program Manager (RPM) IS:

Mr. Rick Jacob  
The Nature Conservancy of Louisiana  
122 Williamsburg St.  
Lake Charles, LA 70605  
Telephone: (337) 480-9393

3.4 Cooperative Agreement Management Committee (CAMC) – The CAMC is responsible for the overall management and guidance of the CA. The CAM, ACAM, and the RPM will form the Cooperative Agreement Management Committee (CAMC). Other advisory members may be added by the CAM, ACAM, or the RPM, by mutual agreement, when their presence will prove beneficial to the program.

### **ARTICLE 4 – COSTS**

4.1 General

4.1.1 AEC shall make best efforts to make available Fiscal Year 2007 (FY07) funds toward the cost of acquiring real estate interests in land parcels identified in Paragraphs 1.5.2.1 and 1.5.2.2 of this CA, as well as for post acquisition stewardship and management costs to the extent permitted by law.

4.1.2 Future funding will depend upon availability of Federal funds.

4.2 Cost Sharing - This CA is a cost-share agreement and has no matching requirement. There is no precise cost-share ration required by this agreement or statute. The Army’s contribution to land acquisition is limited in

accordance with Federal law. This is a best efforts agreement wherein TNC shall leverage Army funds with all available sources of funding to accomplish the purposes of the Cooperative Agreement.

4.3 Cost Reporting – See Article 1, Paragraph 1.6.0 and its subparagraphs for financial reporting requirements.

#### **ARTICLE 5 - SERVICES**

In the absence of funding, each party, to the extent possible, will commence work towards accomplishment of project tasks using available resources upon the date of execution of this agreement and continue to do so for the duration of the period of performance, if a party to this agreement is unable to provide such services in the absence of funding it shall notify the other party to determine whether there is a need to modify or amend this agreement.

#### **ARTICLE 6 – FUNDING**

##### 6.1 Funding Limitation

6.1.1 The maximum funding limitation for the Army for FY07 funds obligated to date is an amount not to exceed \$500,000.

6.1.2 Additional funding for FY07 and subsequent fiscal years will be accomplished through individual amendments to this CA.

6.1.3 Future federal funding is dependent upon the lawful appropriation, availability, and obligation of funds via individual amendments to this CA.

6.2 Funding Allocation – Funding allocations to TNC will be made by amendment to this CA, which amendment shall allocate Army funding to TNC, as appropriate. Each amendment shall be signed by the authorized representative of each of the parties to this agreement, subject to TNC's internal approvals.

##### 6.3 Receipt of Funds Methods:

6.3.1 Advance Funds – TNC must request advance funds at least 60 days prior to the date needed for closing on real property interests under this CA. The request for funds will include documentation supporting the request to include: closing date, acreage, location, appraised value of parcel or easement, amount of Army funding requested, and nature or interest being acquired. TNC acknowledges that respecting the property interests subject to the CA, if successfully negotiated for acquisition by TNC they can make no binding commitment dependent on Army funds until funds are obligated against the CA and the Army has authorized expenditure of such funds for the specific property interests to be acquired.

6.3.2 Reimbursement of Expenditures – The Army will reimburse the recipient for expenses incurred within 60 days of invoice receipt for approved project costs.

6.3.3 All Army funds to be contributed through this CA shall be considered obligated upon signature of the Grants Officer.

6.4 The Statement of Work (SOW) in Article 1 defines the needs of this CA and constitutes initiation of action on all parcels identified therein as desirable for acquisition of interests under the ACUB program.

#### **ARTICLE 7 - PAYMENT**

##### 7.1 Payment in Advance:

7.1.1 The recipient may receive advance payments under this CA. The advance payment shall be made according to procedure established by the Defense Finance and Accounting Service subsequent to a request IAW paragraph 6.3 above. To execute an acquisition under this agreement, which is to be funded in whole or in

part by the Army, the recipient shall submit an original and two (2) copies of a Standard Form 270 (SF 270) "Request for Advance or Reimbursement invoice to the Cooperative Agreement Manager. The recipient must request advance funds at least 60 days prior to the date needed for closing on parcels. The request for funds will include documentation supporting the request to include: estimated closing date, acreage, location, appraised value of parcel or easement, amount of Army funding requested, and nature of interest being acquired.

7.1.2 All advance payments shall be deposited in interest bearing accounts and interest earned over \$250.00 shall be remitted annually to the Department of Health and Human Services, Division of Payment Management, P.O. Box 6021, Rockville, MD 20852. A copy of the transmittal letter stating the amount of interest remitted shall be sent to U.S. Army RDECOM Acquisition Center, Edgewood Contracting Division, Edgewood Division, ATTN: AMSRD-ACC-E (Carol Edmead), E4455, Aberdeen Proving Ground, MD 21010.

7.1.3 The funds provided to recipients by advance are to be used solely for the items of allowable acquisition costs incurred in the performance of this CA as set forth in the SOW.

7.1.4 The recipient agrees to minimize, to the extent possible, the time elapsing between the transfer of funds from the U.S. Treasury and the use of those funds by the recipient for approved purposes under this CA.

7.1.5 The recipient shall make records and accounts pertaining to this CA available for inspection by auditors and other authorized Federal Government officials as required, for a period not to exceed three (3) years after expiration of the term of the agreement.

## 7.2 Reimbursable Payments:

7.2.1 The recipient may receive payments via reimbursement under this CA. To receive reimbursement under this agreement for expenses to be funded in whole or part by the Army, the recipient shall submit an original and two (2) copies of a SF 270 "Request for Advance or Reimbursement invoice to the CAM. After verification of progress by the CAM, the SF 270 vouchers will be forwarded to the Agreements Administrator listed in 11.1. The AA will ensure the SF 270 is complete and all accounting and appropriation data is included, and prepare the cover sheet for Grants Officer approval of the payment. He/she will then forward the relevant data to DFAS for payment within ten (10) calendar days of receipt of the voucher. Payments will be made via EFT by the Payment Office listed in Article 11, Paragraph 11.3 within 30 calendar days of receipt of transmittal.

7.2.2 The Recipient shall not voucher for reimbursable payments until the Grants Officer has designated which accounting classification will be designated on the voucher. This procedure does not apply to advance payments.

7.2.3 Supporting documentation, including vouchers, deed documents or closing statements, for actual expenditures shall be submitted to the Program Management Office for all reimbursable expenses, including those originally made as advance payments.

## 7.3 Financial Status Reports

7.3.1 The Recipient(s) shall submit a Standard Form 269, Financial Status Report, to the Agreements Office on an annual basis, within 30 days of the anniversary of this CA.

7.3.2 If applicable, the Recipient(s) shall submit a Standard Form 272, Report of Federal Cash Transactions, to the Agreements Office on an annual basis, within 30 days of the anniversary of this CA.

7.4 Audit Procedures. The Recipient shall ensure that an audit of all activities under this Agreement shall be conducted annually in accordance with the following subparagraphs and 32 CFR 32.26. Copies of all audit reports shall be provided to the Agreements Administrator listed in 11.1.

7.4.1 Selection of Auditors, Scope of Audit, and Audit Objectives. An independent auditor, herein defined as a public accountant or government auditor who meets the standards specified in the Government

Auditing Standards issued by the U.S. Comptroller General, shall review and report Recipient expenditures of federal funds. The auditor shall determine whether: (1) The financial statements of the Recipient present fairly its financial position and the results of its operations in accordance with generally accepted accounting principles; (2) The Recipient has an internal control structure to provide reasonable assurance that it is managing Federal awards in compliance with applicable laws and regulations, and has in place adequate controls to ensure compliance with the laws and regulations that could have a material impact on the financial statements; (3) The Recipient has complied with laws and regulations that may have a direct and material effect on its financial statements on each major Federal program; and (4) The Recipient is operating in compliance with its established policies and procedures.

7.4.2 Records. The Recipient shall maintain adequate records to account for Federal funds received, as well as cost share elements, under this Agreement. Upon completion or termination, whichever occurs earlier, the Recipient shall furnish to the Agreement Administrator a copy of the final financial report. The Recipient's relevant financial records are subject to examination or audit by the Government for a period not to exceed three (3) years after expiration of the term of this Agreement. The Agreement Administrator or designee shall have direct access to sufficient records and information of the Recipient, to ensure full accountability for all funding under this Agreement. Upon prior written notice such audit, examination, or access shall be performed during business hours on business days and shall be subject to the security requirements of the audited party.

## ARTICLE 8 - GENERAL PROVISIONS

8.1 Successors and Assigns – This CA may not be assigned by a party without the express written consent of the other Parties. All covenants made under this CA shall bind and inure to the benefit of any successors and assigns of the Parties whether or not expressly assumed or acknowledged by such successors or assigns.

8.2 Execution – This CA can be executed upon a duly authorized representative of all the Parties signing the CA. This CA may be executed in several counterparts, each of which shall be deemed an original.

### 8.3 Administration and Cost Principles

8.3.1 The following Administrative and Cost Principles, as applicable, effective the earlier of a) the start date of this cooperative agreement, or b) the date on which the recipient incurs costs to be assessed by the CA, are incorporated as part of this CA by reference:

8.3.1.1 2 CFR 215 (formerly OMB Circular A-110), “Uniform Administrative Requirements for Grants and Agreements with Institutions of Higher Education, Hospitals, and Other Nonprofit Organizations.”

8.3.1.2 OMB Circular A-102, “Uniform Administrative Requirements for Grants and Agreements with State, Local Governments and Indian Tribal Governments”.

8.3.1.3 OMB Circular A-122, “Cost Principles for Nonprofit Organizations.”

8.3.1.4 OMB Circular A-133, “Audits of States, Local Governments, and Nonprofit Organizations.”

8.3.1.5 DoD Grant and Agreement Regulations (DoD 3210. 6-R): Applicable to this Agreement, and incorporated herein by reference, are the Uniform Policies and Procedures for all Grants and CA's awarded by DoD components.

8.3.2 Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended by the Surface Transportation and Uniform Relocation Act of 1987: Applicable to this agreement, and incorporated herein by reference.

8.3.3 Retention and Examination of Records: Financial records, supporting documents, statistical records and all other records or microfilm copies pertinent to this Agreement shall be retained for a period of three (3) years.

8.4 National Policy Requirements – By signing this CA, the Recipients assure that they will comply with applicable provisions of the following national policy requirements:

8.4.1 Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d, et seq.), as implemented by DoD regulations at 32 CFR part 195.

8.4.2 Age Discrimination Act of 1975 (42 U.S.C. § 6101, et seq.), as implemented by Department of Health and Human Services regulations at 45 CFR part 90.

8.4.3 Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. § 794), as implemented by Department of Justice regulations at 28 CFR part 41 and DoD regulations at 32 CFR part 56.

8.4.4 Clean Air Act (42 U.S.C. § 7401, et. Seq.) and Clean Water Act (33 U.S.C. § 1251, et. seq.), as implemented by Executive Order 11783 [3 CFR, 1971-1075 Comp., p. 799] and Environmental Protection Agency rules at 40 CFR part 15.

8.4.5 National Environmental Policy Act (NEPA, at 42 U.S.C. § 4231, et. seq.). In such cases, the recipient agrees to take no action that will have an adverse environmental impact (e.g., physical disturbance of a site such as breaking of ground) until the agency provides written notification of compliance with the environmental impact analysis process.

8.4.6 National Flood Insurance Act of 1968 and Flood Disaster Protection Act of 1973 (42 U.S.C. 4001, et. seq.).

8.4.7 Officials Not To Benefit – No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this Agreement or to any benefit arising from it, in accordance with 41 U.S.C. § 22.

8.5 Certifications: By signing this Agreement, Recipients will provide the following certifications: Appendix A to 32 CFR Part 25 regarding debarment, suspension and other responsibility matters; Appendix C to 32 CFR Part 25 regarding drug free workplace requirements; Appendix A to 32 CFR Part 28 regarding lobbying. The above Certifications do not apply to transactions in real property interests. They apply only to any other contracts written as a result of this agreement, which are funded with federal funds obligated under this agreement.

8.6 Change of Circumstances – Each party shall promptly notify the other party of any legal impediment, change of circumstances, pending litigation, or any other event or condition that may adversely affect the party's ability to carry out any of its obligations under this CA.

8.7 Program Income: Program income earned during the term of this Agreement (other than interest or Army contributed funding) shall be used to further eligible project or program objectives as part of Recipient's cost share.

#### **ARTICLE 9 – AGREEMENT ADMINISTRATION**

Amendments to this Agreement – Any Party who wishes to amend this Agreement shall, upon reasonable notice of the proposed amendment to the other Parties, confer in good faith with the other Parties to determine the desirability of the proposed amendment. Amendments shall not be effective until a written amendment is signed by the Agreement signatories, or their successors. Administrative amendments may be unilaterally executed by the Grants Officer or by the Agreements Administrator.

#### **ARTICLE 10 – TERM OF THE AGREEMENT, SUSPENSION, & TERMINATION**

10.1 Term of the Agreement – The term of this Agreement shall commence upon the effective date of this agreement and continue sixty (60) months, subject to the availability of funds. 32 CFR 32.61 and 32.62 address the suspension and termination of this agreement.

10.2 Disputes – Disagreements regarding issues concerning assistance agreements between the Recipients and the Grants Officer shall, to the maximum extent possible, be resolved by negotiation and mutual agreement at the Grants Officer level. If agreement cannot be reached, it is our policy to use alternative dispute resolution (ADR) procedures that may either be agreed upon by the Government and the Recipients in advance of the award or may be agreed upon at the time the parties determine to use ADR procedures. If the parties cannot agree on the use of ADR procedures, the Recipients can submit, in writing, a disputed claim or issue to the Grants Officer. The Grants Officer will consider the claim or disputed issue and prepare a written decision within 60 days of receipt. The Grants Officer's decision will be final. The Recipients may appeal the decision within 90 days after receipt of such notification. Appeals will be resolved by the Head of the Contracting Activity. The decision by the Head of the Contracting Activity will be final and not subject to further administrative appeal. However, the Recipients do not waive any legal remedy, such as formal claims, under Title 28 United States Code 1492, by agreeing to this.

#### **ARTICLE 11 - ADMINISTRATIVE RESPONSIBILITY**

##### 11.1 The Agreements Office:

U.S. Army Research Development Engineering Command  
Edgewood Contracting Division  
ATTN: AMSRD-ACC-E, Carol Edmead  
E4455  
Aberdeen Proving Ground, MD 21010

Grants Officer: James K. Warrington  
Phone: (410) 278-0841  
Fax: (410) 306-3760  
Email: [james.warrington@us.army.mil](mailto:james.warrington@us.army.mil)

Agreement Administrator Carol Edmead  
Phone: (410) 436-4388  
Fax: (410) 306- 3882  
Email: [carol.edmead@us.army.mil](mailto:carol.edmead@us.army.mil)

##### 11.2 The Recipient's Addresses and Points of Contact – Listed under Article 3, Paragraph 3.3.

##### 11.3 The Payment Office

Defense Finance Accounting Service  
DFAS-RI  
Rock Island Operating Location  
Building 68  
ATTN: DFAS-RI-AOV  
Rock Island, IL 61299-8401

##### 11.4 Addresses of Payees –

The Nature Conservancy  
4245 Fairfax Drive  
Suite 100  
Arlington, VA 22203-1606

#### **ARTICLE 12 – ENTIRE AGREEMENT**

This Agreement along with all Attachments constitutes the entire agreement between the parties concerning the subject matter hereof and supersedes any prior understandings or written or oral agreement relative to said matter.

In the event of a conflict between the terms of the Agreement and its attachments, the terms of the Agreement shall govern.

#### **ARTICLE 13 – GOVERNING LAW/ORDER OF PRECEDENCE**

The Agreement shall be enforced in accordance with applicable federal law and regulations, directives, circulars or other guidance as specified in this Agreement. When signed, this Agreement shall become binding on the Recipient and the Government to be administered in accordance with the DoD Grant and Agreement Regulations as they apply to the particular recipient or sub-recipient concerned. In the event a conflict exists between the provisions of this Agreement and the applicable law or mandatory provisions of applicable regulations, directives, circulars or other guidance, the Agreement provisions are subordinate.

#### **ARTICLE 14 – WAIVER OF RIGHTS**

Any waiver of any requirement contained in this Agreement shall be by mutual agreement of the parties hereto. Any waiver shall be reduced to writing and a copy of the waiver shall be provided to each Party. Failure to insist upon strict performance of any of the terms and conditions hereof, or failure or delay to exercise any rights provided herein or by law, shall not be deemed a waiver of any rights of any Party hereto.

#### **ARTICLE 15 - LIABILITY**

No Party to this Agreement shall be liable to any other Party for any property of that other Party consumed, damaged, or destroyed in the performance of this Agreement, unless it is due to the negligence or misconduct of the Party or an employee or agent of the Party.

#### **ARTICLE 16 - SEVERABILITY**

If any clause, provision or section of this Agreement shall be held illegal or invalid by any court, the invalidity of such clause, provision or section shall not affect any of the remaining clauses, provisions or sections herein and this Agreement shall be construed and enforced as if such illegal or invalid clause, provision or section had not been contained herein.

#### **ARTICLE 17- FORCE MAJEURE**

Neither Party shall be in breach of this Agreement for any failure of performance caused by any event beyond its reasonable control and not caused by the fault or negligence of that Party. In the event such a force majeure event occurs, the Party unable to perform shall promptly notify the other Party and shall in good faith maintain such partial performance as is reasonably possible and shall resume full performance as soon as is reasonably possible.

#### **ARTICLE 18 - NOTICES**

All notices and prior approvals required hereunder shall be in writing and shall be addressed to the parties identified in Articles 3 and 11.

RECIPIENT  
Name and Title of Signer

\_\_\_\_\_  
\_\_\_\_\_

By \_\_\_\_\_

Date \_\_\_\_\_

GRANTS OFFICER

JAMES K. WARRINGTON

By \_\_\_\_\_

Date \_\_\_\_\_



## **ATTACHMENT 1**

### **Terms and Conditions**

#### 32 CFR 32.1 (d) Subawards

The Recipient shall comply with the provisions of this part.

#### 32 CFR 32.21 Standards for Financial Management

The Recipient shall comply with reporting requirements set forth in 32.52.

#### 32 CFR 32.27 and 32.28 Allowable Costs

The Recipient shall comply with the cost principles contained in the OMB Circular A-122.

#### 32 CFR 32.26 Audit

Non-Profit entities shall submit a copy of the OMB Circular A-133 audit reports to the DoD Inspector General and to the Grants Officer.

#### 32 CFR 32.40 Purpose of Procurement Standards

The Recipient shall comply with the procurement standards set forth in sections 32.41 through 32.48.

## **ATTACHMENT 2**

### **Other Certifications**

The following Certifications, which have been executed by the Recipient prior to award of this Agreement are on file with the issuing office, and are hereby incorporated herein by reference:

- a. Certification at Appendix A to 32 CFR Part 28 Regarding Lobbying
- b. Certification at Appendix A to 32 CFR Part 25 Regarding Debarment, Suspension, and Other Responsibility Matters
- c. Certification at Appendix C to 32 CFR Part 25 Regarding Drug-Free Workplace Requirements

## **Appendix E: Conservation Report for Red River Army Depot and Lone Star Army Ammunition Depot**

November 1, 2006, The Nature Conservancy, Prepared under a grant from the Department of Defense Legacy Resource Management Program, DACA87-05-H-0013

# Table of Contents

<b>I. PROJECT OVERVIEW.....</b>	<b>3</b>
INTRODUCTION .....	3
PROJECT APPROACH .....	3
<b>II. ECOLOGICAL OVERVIEW .....</b>	<b>5</b>
ECOREGIONAL CONTEXT .....	5
INSTALLATION USE.....	5
<b>III. CONTRIBUTION OF RED RIVER AND LONE STAR TO ECOREGIONAL BIODIVERSITY.....</b>	<b>7</b>
CATALOGUING ECOREGIONAL BIODIVERSITY .....	7
PREVIOUSLY DOCUMENTED ECOREGIONAL CONSERVATION TARGETS .....	7
SPECIES OF CONSERVATION CONCERN DOCUMENTED IN 2006 SURVEYS .....	10
<i>Floristic Surveys</i> .....	10
<i>American Burying Beetle Surveys</i> .....	12
<b>IV. MAJOR FINDINGS AND IMPLICATIONS .....</b>	<b>15</b>
<b>REFERENCES AND LITERATURE CITED.....</b>	<b>16</b>
<b>APPENDIX A: CROSSWALK OF ECOLOGICAL GROUP TARGETS IN THE UPPER WEST GULF COAST ECOREGIONAL PLAN TO ALLIANCES DOCUMENTED FROM RED RIVER ARMY DEPOT AND LONE STAR ARMY AMMUNITION PLANT .....</b>	<b>18</b>
<b>APPENDIX B: FULL LIST OF FLORA SEARCHED FOR IN 2006.....</b>	<b>23</b>
<b>APPENDIX C: SUBLOCALITIES FOR ECHINACEA SANGUINA (SPRING 2006).....</b>	<b>27</b>
<b>APPENDIX D: HERITAGE RANKING SYSTEM AND FEDERAL/STATE STATUS SYMBOLS .....</b>	<b>28</b>
<b>GLOSSARY .....</b>	<b>29</b>

# I. Project Overview

## Introduction

The Upper West Gulf Coastal Plain ecoregion spans parts of Arkansas, Louisiana, Texas, and a small portion of Oklahoma. This ecoregion encompasses superlative aquatic and terrestrial biodiversity. The Nature Conservancy is implementing conservation here based on the results of the ecoregional plan completed previously with the support of the Department of Defense Legacy Program (The Nature Conservancy 2002). That plan identified more than 70 high-biodiversity sites (a.k.a. portfolio sites), and called for the development and application of multiple-site strategies necessary to perpetuate ecoregional conservation targets.

The analyses used to select high-biodiversity sites revealed significant data gaps throughout the ecoregion. Areas lacking data were not included as portfolio sites; however, one important multi-site conservation strategy that resulted from this finding was to investigate promising but data-poor areas. One such area includes Red River Army Depot and Lone Star Army Ammunition Plant.

Another multi-site strategy identified in the ecoregional plan was to promote conservation forestry. Conservation forestry is forest and timber management designed to protect the long-term ecological and social values of a forest, while generating economic profit. The active forestry program on Red River and Lone Star, along with the abundance of small-private forest ownerships nearby, makes the local promotion of conservation forestry a strategic pursuit for The Nature Conservancy. A sustainable forestry workshop is planned for landowners in the area surrounding Red River Army Depot and Lone Star Army Ammunition Plant.

The Nature Conservancy's objectives in this project were to advance conservation by working with Department of Defense (DoD) facilities in the three primary states within the ecoregion. The Nature Conservancy collaborated with Red River Army Depot in Texas, Pine Bluff Arsenal in Arkansas, and Minden/Barksdale in Louisiana - first, to prepare data for use in addressing natural resources and encroachment issues; and second; to hold conservation forestry workshops, to transmit management tools to participating landowners. The Nature Conservancy (the Conservancy) is organized by state chapters; therefore, under this Legacy cooperative agreement, each covered chapter (Texas, Arkansas, Louisiana) worked with the DoD facility located in their respective state. This Texas report covers work done by the Conservancy on Red River Army Depot and the Lone Star Army Ammunition Plant (the latter facility was included in this project because of the integration of resource management across installations and because the facilities are contiguous).

## Project Approach

The project at Red River Army Depot/Lone Star Army Ammunition Plant has been modified slightly from its original scope to accommodate changing circumstances at the facilities. These changes came to light after the agreement was awarded and necessitated considerable adaptation. The 15,045-acre Lone Star Ammunition Depot, adjacent to Red River Army Depot, has been slated for closure and transfer to the Red River Redevelopment Authority as early as summer 2007 (Dennis Lewis, Business Management Office, Red River Army Depot, personal communication 2006). Likewise, about 3,800 acres on the west side of Red River Army Depot

are slated for transfer to the Red River Redevelopment Authority at the same time. At present, the most likely use of these lands is for industrial and commercial parks. In light of these developments, the main concern related to encroachment is noise disturbance from test firing and detonation activities at Red River Army Depot (Red River). Noise management guidance is being pursued by Red River personnel and will thus not be addressed here. Landowner data for tracts south of the installations was collected several years ago, and it is expected that a single landowner will be found for the western and eastern tracts scheduled for transfer. Noise management will be addressed as appropriate with the new landowner, potentially through deed restrictions or similar agreements. Therefore, officials at Red River determined that a traditional Army Compatible Use Buffer plan (ACUB) was not the most effective product. Instead, this report will summarize the conservation importance of this area and the relevance of conservation to development of the transferred portions of Lone Star and Red River.

## **II. Ecological Overview**

### **Ecoregional Context**

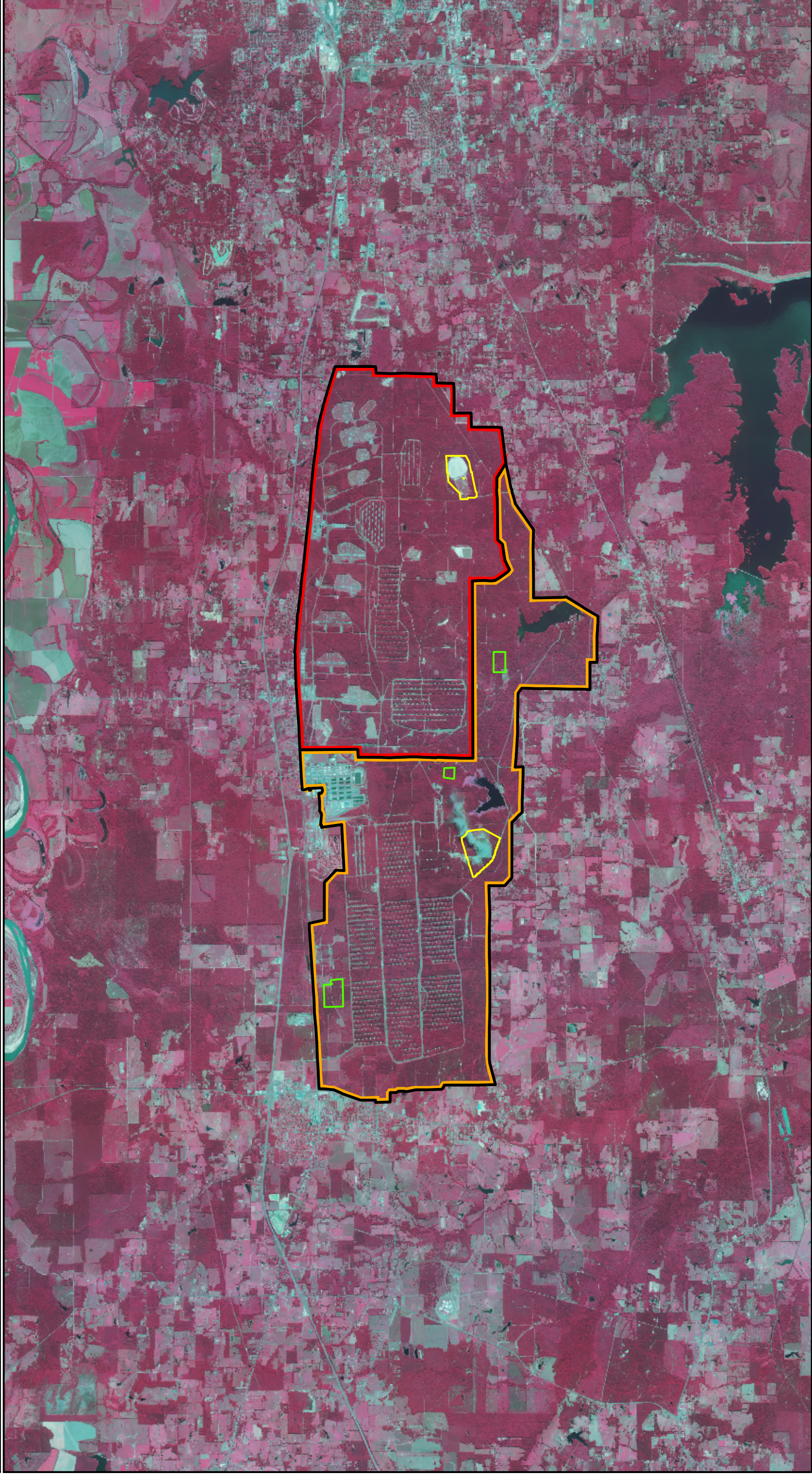
The Upper West Gulf Coastal Plain ecoregion spans about 41,400 square miles, extending from Little Rock, Arkansas to Shreveport, Louisiana, southwest to Houston and northwest to near the Dallas/Fort Worth area. The Upper West Gulf Coastal Plain soils are mainly clays, sand, marl, gravels, bedded gravels and clays, and marine sediments of the Cretaceous period. The Upper West Gulf Coastal Plain is bounded by the Mississippi River Alluvial Plain to the east, the Ouachita Mountains to the north, the Crosstimbers and Southern Tallgrass Prairies to the west, and the West Gulf Coastal Plain to the south. The division between the Upper West and West Gulf Coastal Plain is the northern extent of the southern longleaf pine system.

Red River Army Depot and Lone Star Army Ammunition Plant are located in Bowie County, Texas. Red River is the western facility, about 19,081 acres in size, and Lone Star encompasses about 15,045 acres (Fig. 1). The northern third of the installation lies in the Red River drainage basin, while the rest drains into the Sulphur River basin. There are numerous creeks and two reservoirs (Caney Creek and Elliott Creek Reservoirs) on site. Across the site are also found small depression ponds (a result of the reservoir dams), second-growth bottomland hardwood forests, upland mixed hardwood forests, mixed pine/hardwood forests, and pine plantations. Timber management and harvest is ongoing, and includes a prescribed burn program.

### **Installation Use**

Red River continues to operate as an ammunition storage and testing facility, the purpose for which it was originally created in 1942. Red River also has a large industrial and manufacturing complex not associated with the ammunition storage and testing. About 1,400 buildings exist on the installation. Between and surrounding these is an extensive network of natural communities, providing quality native habitat. Much of this habitat falls within timber management areas. Lone Star, opened in 1942 and recently decommissioned, still houses about 1,180 buildings. Like Red River, considerable natural space lies among and between developed areas. Forested areas serve an important protective function, serving as safety-zones around ammunition storage areas, test ranges, and demolition sites (Tetra Tech, EM 2005). These areas also provide essential noise buffers for off-post residents and businesses. Red River Natural Resources Division personnel are charged with managing forests on Lone Star, at least until these lands are disposed of. Lone Star and Red River forests are currently managed as one unit, under an ecosystem-based approach that seeks to produce timber and preserve ecological function and an array of native plants and animals (Tetra Tech EM, 2005). In fact, most natural areas on the installations are managed for multiple ecological benefits in some respect. This has helped maintain natural and semi-natural plant communities here, which might harbor species of conservation concern. In addition to timber management, wildlife and fish stocks are actively managed, mainly for recreational use but also with an eye to ecosystem health (Tetra Tech EM, 2005).

# Red River Army Depot and Lone Star Army Ammunition Plant



### **III. Contribution of Red River and Lone Star to Ecoregional Biodiversity**

#### **Cataloguing Ecoregional Biodiversity**

The goal of ecoregional plans is to determine which species, communities, and ecological systems (see glossary) represent the array of native biodiversity in an ecoregion, and to determine the numbers and distribution required to maintain these species, communities and systems on the landscape. Because it is impractical to plan for *all* the species, communities and systems in an ecoregion, a representative subset is selected. These are called *conservation targets*. Conservation targets are chosen in their own right and to act as umbrellas or representatives for other elements of biodiversity (e.g., a bottomland hardwood forest may include rare plant species, and its conservation can be assumed to preserve those rare plants also, or a bird assemblage may become a target, representing all its component species). Conservation target selection also factors in aspects of rarity, endemism, and rates of decline.

The Nature Conservancy's ecoregional plans are assessments of the species, communities, and systems of highest conservation concern (conservation targets), along with a spatial representation of their known occurrences across the landscape (portfolio sites, or action sites). Known occurrences are those targets for which locational data exist in the Natural Heritage Database (Appendix D). At the writing of the ecoregional assessment, no Heritage data existed for Red River and Lone Star; therefore, these areas were not included as portfolio sites. However, it is always possible that areas for which the Conservancy has no data may harbor viable conservation targets; such areas often merit further study.

#### **Previously Documented Ecoregional Conservation Targets**

Material provided by Red River personnel showed that biological surveys had been conducted on both installations, notably by Tetra Tech EM (2002). Numerous species and communities have been documented, although few of these are rare<sup>1</sup>. The Tetra Tech surveys, conducted during a drought, nonetheless resulted in documentation of 104 plant species (38 herbaceous, 34 trees, 19 shrubs, 13 vines) (Tetra Tech EM, 2002). Twenty-four mammal species were documented, including 14 small mammal species. No rare mammals were found. Again, despite drought conditions, sixty-five bird species were observed. Tetra Tech staff observed 33 herpetofaunal species, including the state-listed threatened alligator snapping turtle (*Macrochelys temminickii* G3 S2S3 ST). Twenty-five fish species were collected. Tetra Tech did not sample for invertebrates at Red River or Lone Star. Based on their ranges and habitat needs, a variety of species of conservation concern might be found here at least seasonally (Tetra Tech EM 2002); however these have not been documented to date.

A handful of ecoregional conservation targets were found during the Tetra Tech surveys, mainly natural communities. Two faunal species targets were found: crawfish frog (*Rana areolata* G4 S3) and alligator snapping turtle (*Macrochelys temminickii* G3 S2S3 ST).

---

<sup>1</sup> As determined by Heritage Ranks, rare generally considered as being ranked G3-G1. For details on Heritage Ranks, see Appendix B.



The classification system employed by Tetra Tech to describe vegetation communities was established by the Conservancy and NatureServe. This classification system is hierarchical, and nests levels of ecological organization, from alliance through association, to ecological group or system (see glossary). Tetra Tech described vegetation communities at the alliance level. Alliances are useful conceptual descriptions, but do not always represent actual communities on the landscape very closely. Associations and ecological systems generally translate better for field identification. For that reason, the Upper West Gulf Coastal Plain Ecoregional Plan did not use alliances as conservation targets. With respect to associations, there is significant variation in associations across the ecoregion, making classification at the association level difficult--because of variations in plant species dominance, and/or the presence of minor species components. Therefore, community conservation targets in the Upper West Gulf Coastal Plain ecoregion were presented at the higher level of ecological group or system.

This report attempts to crosswalk alliances documented from Red River and Lone Star to the ecological system targets from the ecoregional plan; the crosswalk shows the presence of 8 system targets. A brief accounting is below; details (including the grouping of alliances under each system) can be found in Appendix A. The recognized classification of ecological systems has been refined since the completion of the Upper West Gulf Coastal Plain Ecoregional Plan in 2002; therefore, current system names in NatureServe ([www.natureserve.org](http://www.natureserve.org)) may not correlate directly with the systems as listed here.

### **Ecological Systems**

#### Gulf Coastal Plain Upland Pine & Pine-Hardwood Forests (CEGR030550), and Southeastern Coastal Plain Dry-mesic Loblolly Pine / Hardwood Forests (CEGR030560)

These ecological systems were part of the historical matrix type for the ecoregion, and were present on nearly all uplands except the most edaphically limited sites (droughty sands, calcareous clays, and shallow soil barrens/rock outcrops). These sites are underlain by loamy to fine textured soils of variable depths on ridge tops and adjacent sideslopes, with moderate fertility and moisture retention. Vegetation indicators are shortleaf pine (*Pinus echinata*) and, to a lesser extent, loblolly pine (*Pinus taeda*). Both may occur in combination with a host of dry to dry-mesic site hardwood species. There are no known herbaceous species restricted to the habitat, and this system supports relatively low levels of vascular plant species diversity overall. This system has undergone major transformations since European settlement.

#### Southeastern Coastal Plain Upland Mesic Hardwood Forests and Hammocks (CEGR031010)

This ecological system is found in limited upland areas (especially sideslopes and narrow ridgetops) which are topographically isolated from historically fire-prone, pine dominated uplands. Sites are often found along slopes above perennial streams in the region. Soils range from coarse to loamy in surface texture, although all are acidic. These areas have moderate to high fertility and moisture retention. Vegetation indicators are mesic hardwoods such as American beech (*Fagus grandifolia*), white oak (*Quercus alba*), and American holly (*Ilex opaca*), although scattered, large diameter pines are also often present. Spring blooming herbaceous species are typical in the understory. This system is not known to support any localized endemic or globally rare plant species.

#### Southeastern Coastal Plain Upland Calcareous Mixed Hardwood Forests (CEGR031020)

This system is analogous to Mesic Acid Hardwood Forests and is found in related topographic settings. However, this system is found on soils which exhibit somewhat higher surface soil pH reactions. Consequently, the vegetation may include chalk maple (*Acer leucoderme*), southern sugar maple (*Acer barbatum*), Carolina basswood (*Tilia americana* va. *caroliniana*), hop hornbeam (*Ostrya virginiana*) and others with calciphilic tendencies. A rich understory of herbaceous species may also be present, but this system is not known to support any localized endemic or globally rare plant species.

#### Southeastern Coastal Plain Wet Hardwood Flatwoods (CEGR033040)

These flatwoods are usually found on non-riverine, Pleistocene high terraces. Soils are fine textured and may be saturated for lengthy periods. Saturation occurs typically whenever precipitation events occur, especially when evapotranspiration is low (primarily late fall through early spring). This ecological system occurs in a complex of ridge and swale topography. Ridges support loblolly pine, white oak, and other mesic species such as sweetleaf (*Symplocos tinctoria*), and viburnum (*Viburnum dentatum*). Swales are heavily oak dominated with species tolerant of some inundation such as willow oak (*Quercus phellos*) and laurel oak (*Quercus laurifolia*), with sparse coverage of wetland herbs such as *Carex glaucescens*. This system is not known to support any localized endemic or globally rare plant species.

#### Southeastern Coastal Plain Upland Depression Wooded Ponds (CEGR034010)

This system occurs in upland depressions on poorly drained, often fine textured soils. Much like swales in flatwoods, these areas typically receive moisture from precipitation instead of overbank flooding. These areas retain water for short durations and consequently develop woody vegetation layers. These areas can range in appearance from fairly open aspects with widely scattered trees to quite densely stocked with small diameter saplings and small trees. Typical woody species include willow oak (*Quercus phellos*), bottomland post oak (*Quercus similis*), pop ash (*Fraxinus caroliniana*), and mayhaws (*Crataegus spp*). This system is not known to support any localized endemic or globally rare plant species.

#### Southeastern Coastal Plain Small Stream Forests (365 series)

This ecological system occurs in fairly small, mostly linear patches across the ecoregion, wherever small to intermediate sized perennial streams bisect the landscape. These areas have minor floodplains and valleys associated with well-developed channels. Flooding is infrequent and brief, although soil moisture and nutrient availability is usually high. Small areas of groundwater seepage support obligate wetland plants, but overall, vegetation closely resembles that of Pine and Pine-Hardwood Forests. Characteristic trees include white oak (*Quercus alba*), sweetgum (*Liquidambar styraciflua*), and loblolly pine (*Pinus taeda*). Well developed examples may exhibit a great degree of similarity to Mesic Acid Upland Hardwood Forests, with species such American holly (*Ilex opaca*) and American beech (*Fagus grandifolia*).

#### Southeastern Coastal Plain Riverfront and Levee Bottomland Forests (CEGR038530)

These hardwood forests are found within the active floodplains of large and small rivers of

the ecoregion, along riverfronts and leveed areas. Local microtopography and location within the floodplain greatly influence the hydrologic regime, as does the presence of man-made structures. Deciduous hardwoods, often attaining large sizes, characterize forests in this system, with oak species being most characteristic. Characteristic species include water oak (*Quercus nigra*), willow oak (*Quercus phellos*), laurel oak (*Quercus laurifolia*), swamp chestnut oak (*Quercus michauxii*), and overcup oak (*Quercus lyrata*) are commonly encountered. This system is not known to support any localized endemic or globally rare plant species.

### Species of Conservation Concern Documented in 2006 Surveys

The Upper West Gulf Coastal Plain Ecoregional Plan focused on ecological groups/systems as coarse filter, or umbrella targets, that if conserved, provide *de facto* protection of species embedded within them. Therefore, few species targets are explicitly listed in the ecoregional plan. In planning for the 2006 surveys, the Conservancy searched for explicit species targets from the ecoregional plan and other species embedded in ecological system targets that were documented or likely to occur here. Searches of the Conservancy’s database, the scientific literature, and documentation from Red River yielded a list of 16 plant species of conservation concern (Table 1) likely to occur but not documented, and one federally-listed endangered invertebrate, the American burying beetle (*Nicrophorus americanus*). To make the most efficient use of resources, fieldwork concentrated on these species. Results follow. The botanical and invertebrate results are excerpted from the reports of the respective principal investigators: Dr. Guy Nesom (2006) and Dr. Will Godwin (2006).

**Table 1. Plant species of conservation concern surveyed for at Red River and Lone Star**

Habitats	Species
Sandhills and sandy prairies	<i>Astragalus soxmaniorum</i> , <i>Coreopsis intermedia</i> , <i>Cyperus grayioides</i> , <i>Quercus arkansana</i> , <i>Echinacea atrorubens</i> , <i>Echinacea sanguinea</i>
Low rich woods and rich slopes	<i>Cypripedium kentuckiense</i> , <i>Prenanthes barbata</i> , <i>Thalictrum arkansanum</i> , <i>Trillium pusillum</i> var. <i>texanum</i>
Iron-rich soils	<i>Crataegus warneri</i> , <i>Valerianella florifera</i>
Limestone glades, outcrops	<i>Physaria angustifolia</i>
Deep acid woodlands, seepy areas, lake shores and swamps, creek banks and roadside ditches	<i>Amorpha laevigata</i> , <i>Amorpha paniculata</i> , <i>Carex lupuliformis</i>

### Floristic Surveys

Searches were made on 12 and 13 April, on 17, 18, and 19 May, 2006, and on 10, 11, and 12 October, 2006. Of those plant species of ecoregional conservation concern (Table 1), only sanguin coneflower (*Echinacea sanguinea*) and Arkansas oak (*Quercus arkansana*) were found. Many other species of note were found, however; these were often common on Red River and Lone Star but are rare in Bowie County and the rest of east Texas, mainly because of loss of habitat. The complete list of these species are described in Appendix B, and some examples follow here: White heath aster (*Symphyotrichum pilosum*), abundant on Red River and Lone Star, has been known in Texas only from a single historic collection. Pale purple coneflower (*Echinacea pallida*) also occurs here and may be more rare in Texas than *E.*

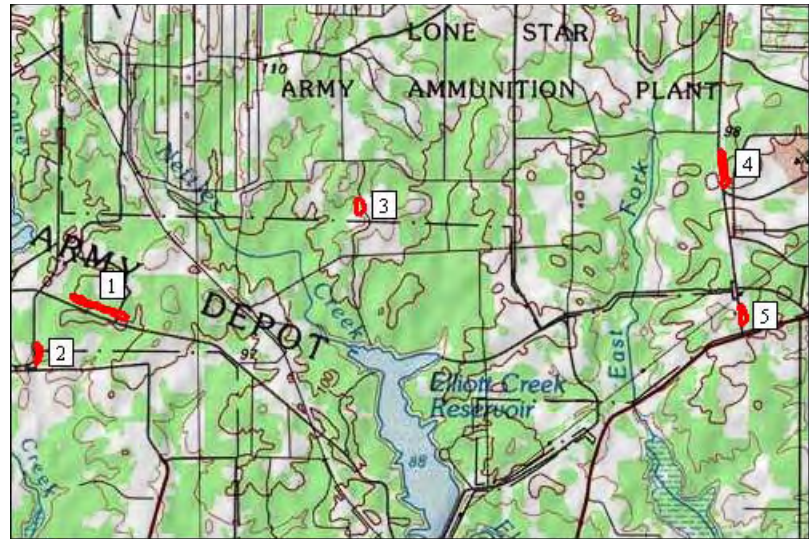
*sanguinea*. Nuttall's wild indigo (*Baptisia nuttalliana*) is an abundant roadside species within Red River and Lone Star but conspicuously absent outside the depot.

### Sanguin Coneflower (*Echinacea sanguinea*)

Sanguin coneflower (*Echinacea sanguinea*) occurs in Texas in sand and sandy clay in areas of pine-hardwood and oak-hickory woods; it characteristically is found along roadsides and fencerows and in openings. The species is locally common in sandy parts of Red River and Lone Star (larger populations marked in Fig. 2), where it occurs mostly along roadsides and in powerline rights-of-way (see also Appendix C). It apparently is restricted to sandy soil here. *Echinacea sanguinea* has sometimes been treated as *Echinacea pallida* var. *sanguinea*. Typical *E. pallida*, however, occurred abundantly at one clay-loamy site at the northwest corner of Red River in a small area of relict prairie (Godley Prairie), with *Liatris pycnostachya*, *Rudbeckia maxima*, *Silphium laciniatum*, and other prairie species. Discovery of the two *Echinacea* taxa, with distinct morphology and distinct habitats and growing in relatively close proximity, is good evidence that they are justifiably treated as separate species. Typical *Echinacea pallida* in Texas has been known only from six northeastern counties: it had previously been collected in Red River County, but the Red River/Lone Star collection is the first record from Bowie County and represents the easternmost locality known for the species in Texas.

**Figure 2. Sublocalities: larger populations of sanguin coneflower**

Sanguin coneflower plants appeared successfully reproductive and vigorous. The most serious factor in continued reproductive success is the timing and frequency of roadside mowing. Summer mowing before fruit maturity and dispersal will suspend reproduction. Plants are not colonial but generally tend to occur in clusters, perhaps indicating relatively limited area of seed dispersal from the parent plants. It seems likely that the abundance of *E.*



Map created with TOPO!® ©2003 National Geographic ([www.nationalgeographic.com/topo](http://www.nationalgeographic.com/topo))

*sanguinea* would increase with less frequent and/or better timed mowing. These plants probably originally occurred in openings and perhaps have increased in abundance with the construction of roads and concomitant maintenance of roadsides. In addition to the major sublocalities of plants, individuals occur rarely in scattered sites, perhaps indicating some connectivity of subpopulations. Maximum distance of pollination is not known.

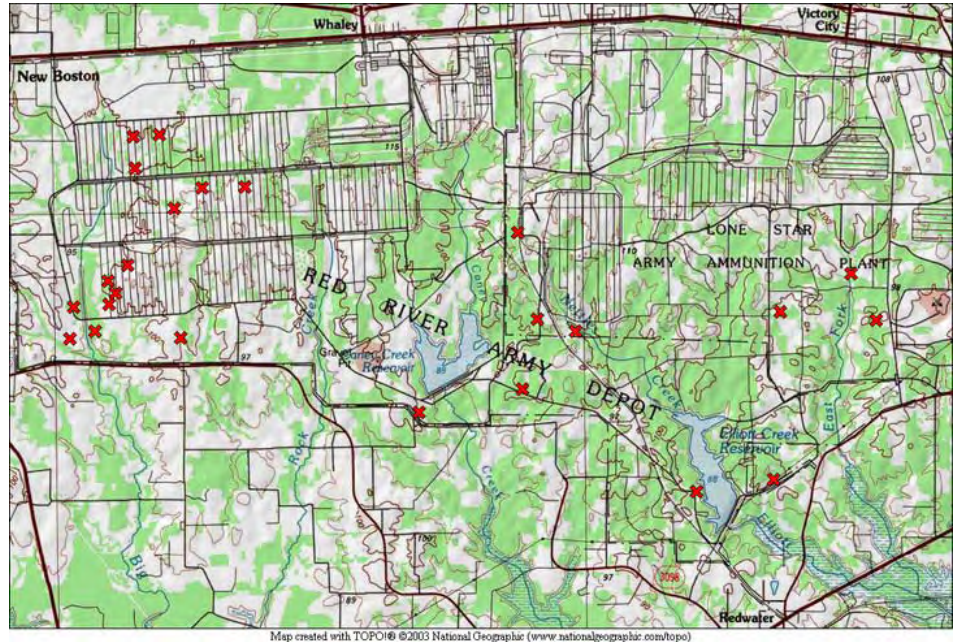
### Arkansas Oak (*Quercus arkansana*)

Arkansas oak (*Quercus arkansana*) is found in sandy upland areas over most of the installation (Fig. 3). It occurs at the edges of clearings and along roadside woods edges with a variety of relatively common tree species, including southern red oak (*Quercus falcata*), water oak (*Q. nigra*), post oak (*Q. stellata*), sand post oak (*Q. margaretta*), blackjack oak (*Q. marilandica*), black oak (*Q. velutina*), winged elm (*Ulmus alata*), shortleaf pine (*Pinus echinata*), loblolly

pine (*P. taeda*), black hickory (*Carya texana*), shagbark hickory (*C. ovata*), mockernut hickory (*C. tomentosa*), American sweetgum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), black cherry (*Prunus serotina*), common persimmon (*Diospyros virginiana*), and white ash (*Fraxinus americana*). White oak (*Quercus alba*) and black tupelo (*Nyssa sylvatica*) sometimes are nearby, but they generally are characteristic of more mesic sites, where *Q. arkansana* does not occur. *Quercus arkansana* occurs in Arkansas and northwestern Louisiana and previously has been documented in Texas only from a single site in Cass Co. (Hunt et al. 1995). The species has been noted to occur in rolling areas of mesic to well-drained sandy soils (Allen et al. 2002; Hunter 1989) as well as on sand ridges and more xeric sites.

**Figure 3. Locations of Arkansas oak: one or more individuals sampled at each point**

*Quercus arkansana* in Bowie County is similar to *Q. marilandica* in leaf morphology but is more similar in leaf shape to juvenile forms of *Q. falcata*. Both *Q. marilandica* and *Q. falcata* are distinct in bud morphology from *Q. arkansana*. Hunt (1986) noted evidence of hybridization between *Q. arkansana* and *Q.*



*nigra* in Georgia; however, on the Red River/Lone Star property there is no apparent evidence of hybridization with either *Q. nigra* or *Q. marilandica*, both of which are abundant and occur in close proximity to *Q. arkansana*.

Of note, the leaves of *Quercus arkansana* on Red River and Lone Star are more lobed than is characteristic of trees from the eastern portion of the species range (especially Florida, Georgia, and Alabama). The tendency for lobing also is noticeable in plants from Arkansas (the type locality of the species) and Louisiana. As part of the survey and comparative study of *Q. arkansana* on the depot, leaf and branch samples were collected from about 100 individuals field-identified as *Q. arkansana*. Representative samples also were taken from *Q. nigra*, *Q. marilandica*, *Q. falcata*, and *Q. velutina*. Collections of *Q. arkansana* will be added from pertinent herbaria and a detailed lab study will be conducted in the coming months (to be published in the journal *Sida*).

### **American Burying Beetle Surveys**

The American burying beetle (*Nicrophorus americanus*) has a shiny black body and wing covers (elytra), each with two scallop-shaped orange-red markings. The pronotum, or shield between the head and wings, sports the most diagnostic feature: a large orange-red marking on the raised portion. American burying beetles are nocturnal, live about one year, and generally

reproduce once. They feed and lay their eggs on carrion (Scott and Traniello, 1987). Males and females may cooperate in burying carrion, but individuals of both sexes are capable of burying a carcass alone (Kozol et al., 1988). The carrion is shaved, rolled into a ball and treated with anal and oral secretions. The female lays 10-30 eggs and within a few days larvae hatch (Ratcliffe 1996). The larvae are fed by both parents. Biparental care is extremely rare among the Insecta. Adult beetles over-winter in the soil. Nocturnal adult flight generally begins in the spring after nighttime temperatures have reached 15 °C (Bedick et al., 1999). Habitat loss, alteration, and degradation have been attributed to the species' decline. This beetle has been found in open fields, edge habitat, and a variety of wooded areas.

The American burying beetle was not thought to occur in Texas before 2003. In 2003, a single specimen was captured during the conduct of a planning level insect survey for the Texas Army National Guard at Camp Maxey in Lamar County, Texas. That record has since been the basis for U.S. Fish and Wildlife Service adding the American burying beetle to the list of endangered species known from Texas. In 2004, surveys conducted by Godwin, Rudolph and Minich resulted in 38 captures of the American burying beetle on Camp Maxey and one capture at The Nature Conservancy's property, Lennox Woods, in Red River County, Texas. In 2005, survey methodology was perfected and three weeks of field work at Camp Maxey resulted in 225 captures, 38 of which were recaptures.

The survey methods used abide by the guidelines set out in the U.S. Fish and Wildlife's American Burying Beetle Recovery Plan (1991). Dr. Will Godwin was contracted to perform surveys; he is currently permitted by the U.S. Fish and Wildlife Service to work with this endangered species. Field work began in May 31, 2006 and pit-fall traps were set in June across the entire facility and in an East/West transect (Fig. 4). No American burying beetles were caught in June, so the five localities with highest catch rates for dung beetles (*Deltochilum gibbosum*) were identified (Fig. 4). This species has habitat requirements very similar to those of *N. americanus*. Fall surveys then consisted of monitoring carrion bait at those localities.

No observations of American burying beetle (*N. americanus*) were made in 2006, and silphid abundance and diversity in general were lower than expected. Only two other species of the genus *Nicrophorus* were captured (48 *N. orbicollis* and 4 *N. pustulatus*). Neither of these carrion beetles were ever very abundant in the traps and their captures showed a bias toward the eastern half of the study area. Two other species that should have been encountered were never observed (*N. carolinensis*, *N. tomentosus*).

Several factors may explain the absence of American burying beetle during this survey. First, the heavy soils here may be unfavorable for overwintering adults. The western half of the depot is dominated by less permeable soils like Anona and Alusa soils, while the eastern half is dominated by more sandy, permeable soils like Sawyer Silt Loam and Annona Loam. This soil pattern might be an explanation for the east-west bias observed in collecting success for all classes of carrion feeding beetles (including the scarab *Deltochilum gibbosum*). Second, the dense forest cover here may be less desirable for American burying beetle. At Camp Maxey, the beetle shows a bias toward open grassland-savannah type habitat on uplands (Godwin in prep.). Third, the small number of *N. pustulatus* observed at RRAD might indicate a low level of large carrion items, making this suboptimal habitat for many carrion beetles. Lastly, drought conditions might have adversely affected *N. americanus* populations in 2006: Other 2006 work at Camp Maxey resulted in a much lower catch rate than in 2005. Also extreme temperature

fluctuations in March may have played a role. Temperature extremes for March 2006 ranged from early 90 degree days in early March, followed by a later than usual freezing the 24<sup>th</sup> and 25<sup>th</sup> (NOAA 2006).

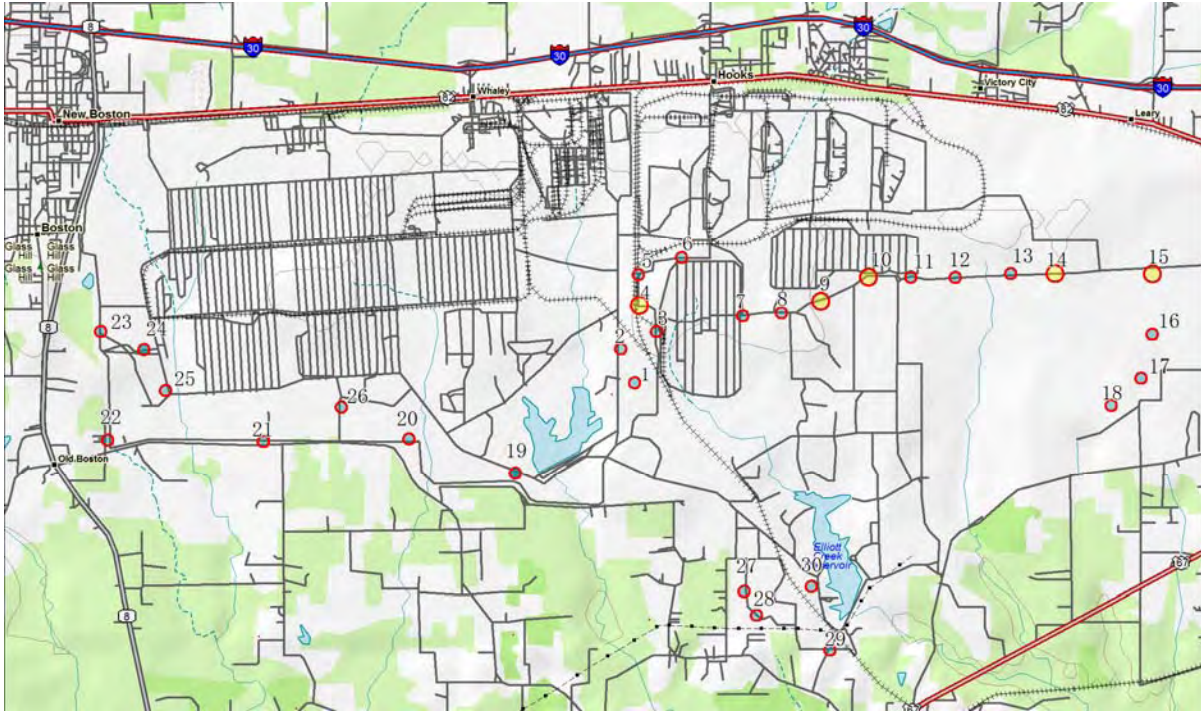


Figure 4. Locations of pitfall traps. Larger dots (4,9,10,14,15) are also bait station locations.

It is possible that American burying beetles might be found here in years with more favorable weather conditions. However, conditions here do not generally indicate that this site would be preferred by *N. americanus*: carrion beetle abundance and diversity in general are low, grassland habitat is rare (and grassland beetle species are absent), and beetle species that prefer large carrion items are also rare.

## IV. Major Findings and Implications

Since 2002, ten ecoregional conservation targets have been found on Red River and Lone Star: eight (8) natural communities and two amphibians (crawfish frog and state-listed threatened alligator snapping turtle). Two implied conservation target species--floral species embedded in ecological system targets--were also found: sanguine coneflower (*Echinacea sanguinea*) and Arkansas oak (*Quercus arkansansa*). The American burying beetle was thought likely to occur here, based on historic and current known locations; however this species was not found in 2006. Field surveys revealed that habitat characteristics were not generally favorable for American burying beetles, and it is unlikely that they would occur here. Some of these habitat factors would be considered fairly static (soil, carrion types); however, trapping in at least one non-drought year should be considered before a final conclusion of no presence is made.

The results of surveys to date indicate that Red River and Lone Star generally support a diverse flora and fauna. While not extremely rare, the systems and species here are important examples of the native biodiversity in this ecoregion. Many floral species of note are common on Red River and Lone Star but are rare in Bowie County and the rest of east Texas, mainly because of loss of habitat across the region. In some cases, communities at Red River and Lone Star support plant populations that are considered more robust than many others known from the county or the region (Appendix B). For instance, white heath aster (*Symphyotrichum pilosum*), abundant on Red River and Lone Star, has been known in Texas only from a single historic collection. Pale purple coneflower (*Echinacea pallida*) also occurs here and may be more rare in Texas than sanguine coneflower. Nuttall's wild indigo (*Baptisia nuttalliana*) is an abundant roadside species within Red River and Lone Star but conspicuously absent outside the depot.

The natural lands here have conservation merit. The size of represented habitats is unusual in this area, and is a significant contributor to species diversity here. The ecosystem management approach applied at Red River and Lone Star has also benefited natural areas and managed forests on the two properties. The conservation value of these lands are an asset locally and from a state perspective, and should be considered when planning alternative uses for transferred tracts.



## References and Literature Cited

- Allen, C.M., D.A. Newman, and H.H. Winters. 2002. Trees, shrubs, and woody vines of Louisiana. Allen's Native Ventures, LLC, Pitkin, Louisiana.
- Anderson, 1982. On the Decreasing Abundance of *Nicrophorus americanus* Olivier (Coleoptera: Silphidae) in Eastern North America. Coleopterists Bulletin 36(2):362-365.
- Bedick, J.C., B.C. Ratcliffe, W. W. Hoback and L. G. Highley. 1999. Distribution, ecology, and population dynamics of the American burying beetle, [*Nicrophorus americanus* Olivier (Coleoptera, Silphidae)] in south-central Nebraska, USA. Journal of Insect Conservation 3(3):171-181.
- Bedick, Jon C., Brett C. Ratcliffe, and Leon G. Higley. 2004. A New Sampling Protocol for the Endangered American Burying Beetle, *Nicrophorus americanus* Olivier (Coleoptera: Silphidae). The Coleopterists Bulletin, 58(1): 57-70.
- Channel, R. and Lomolino M. 2000. Dynamic biogeography and conservation of endangered species. Nature 403: 84-86.
- Creighton, J.C., C.C. Vaughn & B.R. Chapman. 1993. Habitat Preference of the Endangered American Burying Beetle (*Nicrophorus americanus*) in Oklahoma. Southwestern Naturalist 38(3):275-277.
- Fox, R. W. 1980. Soil Survey of Bowie County, Texas. USDA Soil Conservation Service.
- Gazey, W. J. 1986. Population estimation from mark-recapture experiments using a sequential Bayes algorithm. Ecology 67(4): 941-951.
- Godwin, W. 2006. Status of the American burying beetle, *Nicrophorus americanus* Olivier, (Coleoptera: Silphidae) at Red River Army Depot, Bowie County, Texas. Report prepared for The Nature Conservancy, under Department of Defense Legacy Resource Management Program grant, DACA87-05-H-0013
- Howden, H. F. 1952. Biology of *Deltochilum gibbosum* (Fab.) with a description of the larva. The Coleopterists Bulletin 6(4):53-57.
- Hunt, D.M. 1986. Distribution of *Quercus arkansana* in Georgia. Castanea 51:183-187.
- Hunt, D.M., M.H. McRoberts, and B.R. McRoberts. 1995. The status of *Quercus arkansana* Sarg. (Fagaceae) in Texas. Phytologia 79:22-24.
- Hunter, C.G. 1989. Trees, shrubs, and vines of Arkansas. Ozark Society Foundation, Little Rock, Arkansas.

Kozol, A. J., M. P. Scott and J. F. A. Traniello. 1989. The American burying beetle, *Nicrophorus americanus*: studies on the natural history of a declining species. *Psyche* 95:167-176.

Nesom, G. Targeted floristic survey: Red River and Lone Star Army Depots, Bowie County, Texas. 2006. Botanical Research Institute of Texas. Report prepared for The Nature Conservancy, under Department of Defense Legacy Resource Management Program grant, DACA87-05-H-0013

NOAA. 2006. March 2006 Weather in Review.  
<http://www.srh.noaa.gov/ewx/html/wxevent/2006/mar2006.htm> accessed Sept 28, 2006.

Raithel, C. 1991. American burying beetle (*Nicrophorus americanus*) recovery plan. U.S. Fish and Wildlife Service, Region 5. Newton Corner, MA. 80 pp.

Ratcliffe, B. C. 1996. The carrion beetles (Coleoptera: Silphidae) of Nebraska. *Bulletin of the University of Nebraska State Museum* 13:1-100.

Ratcliffe, B. C. and M. L. Jameson. 1992. New Nebraska occurrences of the endangered American burying beetle (Coleoptera: Silphidae). *Coleopterists Bulletin* 46:421-425.

Robertson, I. C. 1992. Relative abundance of *Nicrophorus pustulatus* (Coleoptera: Silphidae) in a burying beetle community, with notes on its reproductive behavior. *Psyche* 99:189-198.

Sikes, D.S. and C. J. Raithel. 2002. A review of hypotheses of decline of the endangered American burying beetle (Silphidae: *Nicrophorus americanus* Olivier). *Journal of Insect Conservation* 6:103-113.

Scott, M. P. and J. F. A. Traniello. 1989. Guardians of the underworld. *Natural History*, June 1989:32-37.

Tetra Tech, EM. 2002. Planning level survey report of fauna and vegetative communities. U.S. Army Material Command Red River Army Depot and Lone Star Army Ammunition Plant, Texarkana, Texas.

Tetra Tech, EM. 2005. Integrated Natural Resources Management Plan, Preliminary Draft. Red River Army Depot and Lone Star Army Ammunition Plant, Texarkana, Texas.

The Nature Conservancy. 2002. Upper West Gulf Coastal Plain Ecoregional Plan. The Nature Conservancy, Arlington, Virginia.

U.S. Fish and Wildlife Service. 1991. American Burying Beetle (*Nicrophorus americanus*) Recovery Plan. Newton Corner, Massachusetts. 80 pp.

## Appendix A: Crosswalk of Ecological Group Targets in the Upper West Gulf Coast Ecoregional Plan to Alliances Documented from Red River Army Depot and Lone Star Army Ammunition Plant<sup>2</sup>

<b>Key</b>
<b>Bold</b> , numbered items are systems
<u>Underlined</u> , numbered items are ecological groups
Shaded ecological groups/systems are conservation targets in the ecoregional plan
Green text shows alliances documented from Red River and/or Lonestar <sup>1</sup>

### 305. Southeastern Coastal Plain Xeric and Dry-mesic Forests and Woodlands

#### 305-60. Southeastern Coastal Plain Dry-mesic Loblolly Pine / Hardwood Forests

CEGL007528

Pinus taeda - (Pinus echinata) - Quercus falcata - Carya texana / Vaccinium arboreum Forest

Loblolly Pine - (Shortleaf Pine) - Southern Red Oak - Black Hickory / Farkleberry Forest

Alliance: PINUS TAEDA - QUERCUS (ALBA, FALCATA, STELLATA) FOREST ALLIANCE

GRANK: G4		PATTERN:	DISTRIBUTION:
STATES: AR SP	Pinus taeda-Quercus (phellos, stellata, falcata) Forest, in part (AR 1994)		
LA S?	Mixed Hardwood - Loblolly Pine Forest, in part (LA 1996)		
TX S?	Loblolly Pine-Oak Series, in part (TX 1993)		
USFS	231E:??, 232F:CC		
TNC Ecoregions:	40:C, 41:C, 43:?		

#### Acidic West Gulf Coastal Plain Mesic Mixed Hardwood Forest

CEGL007525

Pinus taeda - Quercus alba - Carya alba / Ilex opaca var. opaca / Callicarpa americana Forest

Loblolly Pine - White Oak - Mockernut Hickory / American Holly / Beautyberry Forest

Alliance: PINUS TAEDA - QUERCUS (ALBA, FALCATA, STELLATA) FOREST ALLIANCE

GRANK: G4		PATTERN:	DISTRIBUTION:
STATES: AR SP			
LA S?	Mixed Hardwood-Loblolly Pine Forest, in part (LA 1996)		
OK SP			
TX S?	Loblolly Pine-Oak Series, in part (TX 1993)		
USFS	231:C, 232F:CC		
TNC Ecoregions:	31:C, 40:C, 41:C		

#### West Gulf Coastal Plain Transition, Dry-Mesic Upland

CEGL007957

Pinus taeda - Quercus alba / Vitis palmata Sandy - Loam Upperslope Forest

Loblolly Pine - White Oak / Catbird Grape Sandy - Loam Upperslope Forest

Alliance: PINUS TAEDA - QUERCUS (ALBA, FALCATA, STELLATA) FOREST ALLIANCE

GRANK: G?		PATTERN:	DISTRIBUTION:
STATES: TX S?			
USFS			
TNC Ecoregions:	40:C		

#### Southern Loam Hills, Dry Upland

CEGL007948

Pinus taeda - Quercus falcata / Carya texana - Ostrya virginiana Forest

Loblolly Pine - Southern Red Oak / Black Hickory - Eastern Hop-hornbeam Forest

Alliance: PINUS TAEDA - QUERCUS (ALBA, FALCATA, STELLATA) FOREST ALLIANCE

<sup>2</sup> Tetra Tech EM, 2002

GRANK: G?  
STATES: TX S?  
TNC Ecoregions: 40:C

PATTERN: DISTRIBUTION:

### 310. Southeastern Coastal Plain Upland Mesic Hardwood Forests and Hammocks

#### Upper West Gulf Coastal Plain Mesic Ravine Forest

CEGL007971

Quercus alba - Quercus rubra - Fraxinus americana / Ostrya virginiana / Arundinaria gigantea / Cynoglossum virginianum - Arisaema dracontium - Cyrtopodium kentuckiense Mesic Calcareous Ravine Forest

White Oak - Northern Red Oak - White Ash / Eastern Hop-hornbeam / Giant Cane / Wild Comfrey - Green Dragon - Southern Yellow Lady's-slipper Mesic Calcareous Ravine Forest

Alliance: QUERCUS ALBA - (QUERCUS NIGRA) FOREST ALLIANCE

GRANK: G2G3  
STATES: AR S?  
LA SP

PATTERN: DISTRIBUTION: E

USFS 231Eb:CCC  
TNC Ecoregions: 40:C

### 310-20. Southeastern Coastal Plain Upland Calcareous Mixed Hardwood Forests

#### West Gulf Coastal Plain White Oak - Loblolly Pine Slope Forest

CEGL007524

Pinus taeda - (Pinus echinata) - Quercus alba - Carya alba / Acer leucoderme Forest  
Loblolly Pine - (Shortleaf Pine) - White Oak - Mockernut Hickory / Chalk Maple Forest

Alliance: PINUS TAEDA - QUERCUS (ALBA, FALCATA, STELLATA) FOREST ALLIANCE

GRANK: G2G3

PATTERN: DISTRIBUTION:

STATES: AR SP Pinus taeda-Quercus (phellos, stellata, falcata) Forest, in part (AR 1994)  
LA S? Calcareous Forest, in part; Mixed Hardwood-Loblolly Pine Forest, in part (LA 1996)  
OK SP  
TX S? Loblolly Pine - Oak Series, in part (TX 1993)

USFS 231Ea:CCC, 232Fa:CCC, 232Fe:CCC  
TNC Ecoregions: 40:C, 41:C

#### Southern Loam Hills, Calcareous Uplands and Slopes

CEGL007955

Pinus taeda - Quercus (nigra, spp.) / Ostrya virginiana - Sabal minor Calcareous West Gulf Coastal Plain Transition Sideslope Forest

Loblolly Pine - (Water Oak, Oak species) / Eastern Hop-hornbeam - Dwarf Palmetto Calcareous West Gulf Coastal Plain Transition Sideslope Forest

Alliance: PINUS TAEDA - QUERCUS (ALBA, FALCATA, STELLATA) FOREST ALLIANCE

GRANK: G2G3  
STATES: TX S?

PATTERN: DISTRIBUTION:

USFS 231E:CC  
TNC Ecoregions: 40:C

### 330. Southeastern Coastal Plain Wet Savannas and Flatwoods

#### 330-40. Southeastern Coastal Plain Wet Hardwood Flatwoods

CEGL007961

Quercus laurifolia - Quercus phellos - Quercus nigra / Viburnum dentatum - Sebastiania fruticosa Flatwoods Forest  
Diamondleaf Oak - Willow Oak - Water Oak / Southern Arrow-wood - Sebastianbush Flatwoods Forest

Alliance: QUERCUS (PHELLOS, NIGRA, LAURIFOLIA) TEMPORARILY FLOODED FOREST ALLIANCE

GRANK: G2G3Q

PATTERN: DISTRIBUTION:

STATES: TX S?  
USFS 231Eh:CCP, 231Ei:CCC, 232F:CC  
TNC Ecoregions: 40:C, 41:P

CEGL007371

Quercus phellos / Vaccinium virgatum / Chasmanthium laxum - Carex flaccosperma Forest  
Willow Oak / Southern Swamp Blueberry / Slender Spikegrass - Thin-fruit Sedge Forest

Alliance: QUERCUS (PHELLOS, NIGRA, LAURIFOLIA) TEMPORARILY FLOODED FOREST ALLIANCE

GRANK: G3G4  
STATES: AR S? Willow Oak Forest, in part (AR 1994)  
LA S?  
OK SP  
USFS 231E:CC  
TNC Ecoregions: 40:C, 41:P

PATTERN: DISTRIBUTION:

### 340. Southeastern Coastal Plain Wooded Depression Wetlands

#### 340-10. Southeastern Coastal Plain Upland Depression Wooded Ponds

##### West Gulf Coastal Plain Oak Depression Forest

CEGL007363

Quercus phellos - Quercus similis / Crataegus marshallii - Crataegus spathulata / Chasmanthium laxum Forest  
Willow Oak - Delta Post Oak / Parsleyleaf Haw - Littlehip Haw / Slender Spikegrass Forest  
Alliance: QUERCUS PHELLOS SEASONALLY FLOODED FOREST ALLIANCE

GRANK: G3? PATTERN: DISTRIBUTION:  
STATES: LA S?  
TX S?  
USFS 232F:CC  
TNC Ecoregions: 40:P, 41:C

### 365. Southeastern Coastal Plain Small Stream Forests

#### 365-10. Southeastern Coastal Plain Loblolly Pine – Hardwood Small Stream Forests

CEGL004911

Pinus taeda - Liquidambar styraciflua - Quercus (nigra, phellos) / Carpinus caroliniana - Crataegus marshallii Stream Bottom Forest

Loblolly Pine - Sweetgum - (Water Oak, Willow Oak) / Ironwood - Parsleyleaf Haw Stream Bottom Forest  
Alliance: PINUS TAEDA - QUERCUS (PHELLOS, NIGRA, LAURIFOLIA) TEMPORARILY FLOODED FOREST ALLIANCE

GRANK: G3 PATTERN: DISTRIBUTION:  
STATES: AR S?  
LA SP  
OK S? Pinus taeda - Liquidambar styraciflua forest association, in part; Pinus taeda - Fraxinus pennsylvanica - Ulmus americana / Chasmanthium sessiliflorum forest association, in part (OK 1997)  
TX S?  
USFS 231Eh:CCC, 231Ej:CCC, 232F:CC  
TNC Ecoregions: 40:C, 41:C

CEGL007910

Pinus taeda - Quercus phellos - Quercus nigra Forest  
Loblolly Pine - Willow Oak - Water Oak Forest

Alliance: PINUS TAEDA - QUERCUS (PHELLOS, NIGRA, LAURIFOLIA) TEMPORARILY FLOODED FOREST ALLIANCE

GRANK: G4 PATTERN: DISTRIBUTION:  
STATES: AR S?  
LA S?  
MS S?  
TX S?  
USFS 231:C, 232:C, 234:C  
TNC Ecoregions: 40:C, 41:C, 42:C

##### Southern Loam Hills, Floodplain Forest

CEGL007953

Quercus nigra - Ulmus alata / Ostrya virginiana Stream Terrace Forest  
Water Oak - Winged Elm / Eastern Hop-hornbeam Stream Terrace Forest  
Alliance: QUERCUS (PHELLOS, NIGRA, LAURIFOLIA) TEMPORARILY FLOODED FOREST ALLIANCE

GRANK: G? PATTERN: DISTRIBUTION:  
STATES: TX S?  
USFS  
TNC Ecoregions: 40:C

## 385. Southeastern Coastal Plain Riverine Forests, Shrublands

### 385-30. Southeastern Coastal Plain Riverfront and Levee Bottomland Forests

#### Upper West Gulf Coastal Plain Riverfront Forest

CEGL007983

Betula nigra - Platanus occidentalis / Berchemia scandens / (Arundinaria gigantea) - Boehmeria cylindrica Temporarily Flooded Riverfront Forest

River Birch - Sycamore / Supplejack / (Giant Cane) - False Nettle Temporarily Flooded Riverfront Forest

Alliance: **BETULA NIGRA - (PLATANUS OCCIDENTALIS) TEMPORARILY FLOODED FOREST ALLIANCE**

GRANK: G5 PATTERN: DISTRIBUTION:

STATES: AR S?  
LA SP  
OK SP

USFS

TNC Ecoregions: 40:C

CEGL007841

Liquidambar styraciflua - Quercus phellos - Quercus nigra - Quercus texana / Frangula caroliniana / Chasmanthium sessiliflorum Forest

Sweetgum - Willow Oak - Water Oak - Nuttall Oak / Carolina Buckthorn / Longleaf Spikegrass Forest

Alliance: **QUERCUS PHELLOS, NIGRA, LAURIFOLIA) TEMPORARILY FLOODED FOREST ALLIANCE**

GRANK: G3G4 PATTERN: DISTRIBUTION:

STATES: AR SP  
OK S?

USFS 232:C, M231:C

TNC Ecoregions: 40:C

CEGL007549

Quercus lyrata - Quercus phellos - Ulmus americana / Rhynchospora spp. Forest

Overcup Oak - Willow Oak - American Elm / Beaksedge species Forest

Alliance: **QUERCUS PHELLOS SEASONALLY FLOODED FOREST ALLIANCE**

GRANK: G2G3 PATTERN: DISTRIBUTION:

STATES: AR SP  
LA S?

USFS Flatwood Depression Forest (LA 1996)

USFS 231E:CC

TNC Ecoregions: 40:C

## 999. ECOLOGICAL GROUP NOT ASSIGNED

**NOTE: This alliance was crosswalked to the broad target of Gulf Coastal Plain Upland Pine & Pine-Hardwood Forests (CEGR030550) & (CEGR030560)**

Pinus (echinata, taeda) Forest

CEGL008410

(Shortleaf Pine, Loblolly Pine) Forest

Alliance: **PINUS TAEDA - PINUS ECHINATA FOREST ALLIANCE**

GRANK: G1 PATTERN: DISTRIBUTION:

STATES: AR S? Lowland Pine-Oak Forest, in part (AR 1994)  
LA S?  
OK S?  
TX S?

USFS 231E:CC

TNC Ecoregions: 40:C

---

### Complete List of Alliances Documented from Red River and Lone Star (Tetra Tech EM, 2002)

*PINUS TAEDA* TEMPORARILY FLOODED FOREST ALLIANCE, Loblolly pine Temporarily Flooded Forest Alliance

*PINUS TAEDA* – *PINUS ECHINATA* FOREST ALLIANCE, Loblolly pine – Shortleaf Pine Forest Alliance

*PINUS TAEDA* – *QUERCUS* (*PHELLOS*, *NIGRA*, *LAURIFOLIA*) TEMPORARILY FLOODED FOREST ALLIANCE, Loblolly Pine – (Willow Oak, Water Oak, Diamondleaf Oak) Temporarily Flooded Forest Alliance

*PINUS TAEDA* – *QUERCUS* (*ALBA*, *FALCATA*, *STELLATA*) FOREST ALLIANCE, Loblolly Pine – (White Oak, Southern Red Oak, Post Oak) Forest Alliance

*PINUS TAEDA* – *QUERCUS ALBA* – *CARYA ALBA* / *ILEX OPACA* VAR. *OPACA* / *CALLICARPA AMERICANA* FOREST, Loblolly Pine – White Oak – Mockernut Hickory / American Holly / Beautyberry Forest

*QUERCUS* (*PHELLOS*, *NIGRA*, *LAURIFOLIA*) TEMPORARILY FLOODED FOREST ALLIANCE, (Willow Oak, Water Oak, Diamondleaf Oak) Temporarily Flooded Forest Alliance

*BETULA NIGRA* – (*PLATANUS OCCIDENTALIS*) TEMPORARILY FLOODED FOREST ALLIANCE, River Birch – (Sycamore) Temporarily Flooded Forest Alliance

*BETULA NIGRA* – *LIQUIDAMBAR STYRACIFLUA* – *PLATANUS OCCIDENTALIS QUERCUS NIGRA* FOREST, River Birch – Sweetgum – Sycamore – Water Oak Forest

*QUERCUS PHELLOS* SEASONALLY FLOODED FOREST ALLIANCE , Willow Oak Seasonally Flooded Forest Alliance

*CEPHALANTHUS OCCIDENTALIS* / *CAREX* spp. – *LEMNA* spp. SOUTHERN SHRUBLAND, Buttonbush / sedge species – Duckweed species Southern Shrubland

*CEPHALANTHUS OCCIDENTALIS* SEMIPERMANENTLY FLOODED SHRUBLAND ALLIANCE, Buttonbush Semipermanently Flooded Shrubland Alliance

## Appendix B: Full List of Flora Searched for in 2006

(From: Targeted floristic survey: Red River and Lone Star Army Depots, Bowie County, Texas. 2006. Report from Dr. Guy Nesom, Botanical Research Institute of Texas. Produced under grant DACA87-05-H-0013)

### **Echinacea sanguinea**

*Echinacea sanguinea* occurs in Texas in sand and sandy clay in areas of pine-hardwood and oak-hickory woods; it characteristically is found along roadsides and fencerows and in openings. The species is locally common in sandy places in RRLSAD (larger populations marked on Map 2), where it occurs mostly along roadsides and in powerline rights-of-way. It apparently is restricted to sandy soil.

*Echinacea sanguinea* has sometimes been treated as *Echinacea pallida* var. *sanguinea*. We found typical *E. pallida*, however, occurring abundantly at one clay-loamy site at the northwest corner of RRLSAD in a small area of relict prairie (Godley Prairie), with *Liatris pycnostachya*, *Rudbeckia maxima*, *Silphium laciniatum*, and other prairie species. Discovery of the two *Echinacea* taxa, with distinct morphology and distinct habitats and growing in relatively close proximity, is good evidence that they are justifiably treated as separate species. Typical *Echinacea pallida* in Texas has been known only from six northeastern counties -- it had previously been collected in Red River Co., but the RRLSAD collection is the first record from Bowie Co. and represents the easternmost locality known for the species in Texas.

*Echinacea purpurea* is a more northern species known in Texas only from Bowie Co., where it has been collected from just north of Texarkana. It was not encountered in the RRLSAD survey.

### **Quercus arkansana**

We found *Quercus arkansana* in sandy upland areas over most of the RRLSAD area (representative points of observation and collection marked on Map 3). It occurs at the edges of clearings and along roadside woods edges with a variety of relatively common tree species, including *Quercus falcata*, *Q. nigra*, *Q. stellata*, *Q. margaretta*, *Q. marilandica*, *Q. velutina*, *Ulmus alata*, *Pinus echinata*, *P. taeda*, *Carya texana*, *C. ovata*, *C. tomentosa*, *Liquidambar styraciflua*, *Acer rubrum*, *Prunus serotina*, *Diospyros virginiana*, *Fraxinus americana*. *Quercus alba* and *Nyssa sylvatica* sometimes are nearby, but they generally are characteristic of more mesic sites, where *Q. arkansana* does not occur (see further comments below).

In May, we searched more mesic habitats of RRLSAD for *Quercus arkansana* -- particularly the sandy slopes of the stream-cut topography on the north and east sides of Elliott Creek Reservoir and other similar areas. *Quercus alba*, *Quercus nigra*, *Quercus falcata*, *Nyssa sylvatica*, *Ulmus alata*, *Carya texana*, and *Pinus echinata* (dominants), with *Quercus stellata*, *Quercus velutina*, *Carya ovata*, *Carya tomentosa*, *Liquidambar styraciflua*, *Morus rubra*, *Acer rubrum*, *Prunus serotina*, *Fraxinus americana*, and *Pinus taeda* are common canopy species on these slopes; *Cornus florida*, *Sassafras albidum*, *Aralia spinosa*, *Callicarpa americana*, *Rhamnus caroliniana*, *Castanea pumila*, *Aesculus pavia*, *Cercis canadensis*, *Myrica cerifera*, and *Vaccinium arboreum* are relatively common understory species. Immediately north of the entrance of Elliott Creek to the reservoir, we found numerous flowering individuals of *Tilia americana*, which otherwise was seen only along the road immediately east of the reservoir.



We encountered large individuals of *Quercus shumardii* on slopes along the east side of East Elliott Creek and in Area A of the ammunition depot. *Carpinus caroliniana*, *Ilex opaca*, *Quercus phellos*, *Quercus nigra*, and *Quercus texana* grow on the lower portions of these slopes. We did not find individuals of beech (*Fagus grandifolia*) on the depot.

### **Echinacea atrorubens**

*Echinacea atrorubens* occurs in open sites on limestone ridges and outcrops and blackland prairie. All known Texas localities are from west of Bowie Co. No suitable habitats occur within RRLSAD and no plants of the species were encountered.

### **Cypripedium kentuckiense**

*Cypripedium kentuckiense* grows in slope and ravine forests usually dominated (in east Texas and adjacent Louisiana) by *Fagus grandifolia* and *Quercus alba*. Common associates include *Cornus florida*, *Carpinus caroliniana*, *Ilex opaca*, *Acer rubrum*, *Aralia spinosa*, *Mitchella repens*, *Solidago auriculata*, *Polystichum acrostichoides*, *Vaccinium virgatum*, *Viola walteri*, *Trillium gracile*, and *Arisaema triphyllum*. We surveyed in areas that approached this habitat in connection with searches of rich sandy slopes for oak species. It seems probable, however, that communities that might once have harbored beech (*Fagus*) were flooded by construction of Elliott Creek Reservoir and perhaps Caney Creek Reservoir. We did not find plants of *Cypripedium kentuckiense*, nor did we observe plants of *Trillium pusillum* or *Thalictrum arkansanum* (in May these would have been fruiting or slightly post-fruiting), which would occur in habitats similar or close to those of the *Cypripedium*.

In low woods, slope bases, and creek edges, we encountered various species of ferns indicative of moist to wet conditions: *Polystichum acrostichoides*, *Onoclea sensibilis*, *Osmunda regalis*, *Woodwardia areolata*, *Athyrium filix-femina*, and *Thelypteris kunthii*. In seepage areas near the "bunker" (northwest of Elliott Creek Reservoir, near Nettles Creek), we observed *Osmunda regalis*, *Athyrium filix-femina*, *Thelypteris kunthii*, and *Sphagnum* sp. At the entrance of Elliott Creek to the reservoir and along creeks at other localities, we surveyed in wet sites with *Saururus cernuus*, *Triadenum walteri*, *Boehmeria cylindrica*, *Commelina virginica*, and *Mitchella repens*. Most of the creek sides are rather sharply cut, with a first terrace distinctly raised, and the low seepy habitats characteristic of *Trillium pusillum* do not appear to present on the RRLSAD property.

### **Crataegus warneri**

No individuals of *Crataegus warneri* were encountered on the depot. We found *C. marshallii*, *C. crus-galli* and *C. engelmannii* occurring together at one upland site, a clay-gravelly ridgetop with dominants *Pinus taeda*, *Liquidambar styraciflua*, *Ulmus alata*, *Myrica cerifera*, and *Vaccinium arboreum*. *Crataegus engelmannii* was seen only at this locality. *Crataegus marshallii* is more common and scattered in upland sites. Other species of hawthorn are relatively common in lower areas of the depot, especially in the northwest corner, where we encountered *Crataegus spathulata*, *C. viridis*, *C. opaca*, *C. crus-galli*, and *C. marshallii*.

### **Physaria (Lesquerella) angustifolia**

*Lesquerella angustifolia* occurs over limestone outcrops, in limestone soil over outcrops, and in blackland prairie. There are no apparent suitable habitats for this species on the RRLSAD property. We searched in two areas where relatively small outcrops of sandstone

occur. Two species of fern, *Woodsia obtusa* and *Asplenium platyneuron*, occur on these outcrops, but no obviously calciphilic species were found.

### **Coreopsis intermedia**

*Coreopsis intermedia* grows in areas of deep sand, characteristically in areas of scrub oak, along roadsides and edges of pine-oak. Sandy habitats are relatively common, but the most likely area for the occurrence of sand species is along the roadsides at the extreme southwestern corner of the depot, where *Cnidoscopus texanus* is common and conspicuous. We searched there and elsewhere, but we did not find *Coreopsis intermedia*. *Coreopsis grandiflora* is a common species on the depot; *Coreopsis lanceolata* also occurs but is not common.

Sandy sites on RRLSAD are characterized by the relatively common occurrence of *Quercus stellata*, *Quercus margaretta*, *Quercus arkansana*, *Quercus marilandica*, *Quercus velutina*, *Quercus falcata*, *Carya texana*, *Pinus echinata*, and *Ulmus alata*. Common herbaceous species are *Echinacea sanguinea*, *Baptisia nuttalliana*, *Stylosanthes biflora*, *Erigeron strigosus*, *Coreopsis grandiflora*, *Lobelia appendiculata*, *Linum medium*, *Liatrix pycnostachya*, *Helianthus angustifolius*, and *Solidago ludoviciana*.

### **Cyperus grayioides**

*Cyperus grayioides* characteristically occurs in xeric deep sand and sometimes co-occurs with *Coreopsis intermedia* (notes above). We did not find plants of *Cyperus grayioides*.

### **Amorpha paniculata**

*Amorpha paniculata* grows in sand and sandy clay, occurring in marsh edges, swampy woods, open wet areas, acid bog margins, sandy stream bottoms and ditches, and along roadsides, fencerows, and open pine woods. We surveyed in low woods, at numerous points along Elliott Creek (east and west branches), and along north margins of Elliott Creek Reservoir. *Carpinus caroliniana*, *Ulmus americana* and *Ulmus rubra*, *Betula nigra*, and *Acer negundo* were common trees at these sites. No plants of *Amorpha paniculata* were encountered.

### **Amorpha laevigata**

*Amorpha laevigata* is rare in Oklahoma and Louisiana and is recorded in Texas only from Morris Co. It usually grows in swamp forests, along river edges, and on moist sandy slopes. Presumably it grows in habitats similar those of its congener, *A. paniculata*. We did not encounter plants of either species of *Amorpha*.

### **Carex lupuliformis**

*Carex lupuliformis* occurs in floodplain and terrace forests, usually on clay soil and is known from only a few counties in east Texas. We searched various sites along Nettle Creek and Elliott Creek but did not find plants of this species.

### **Trillium pusillum** var. **texanum**

Early flowering (Mar-Apr) and searched for by Eidson. We did not find obviously suitable habitats for the *Trillium* in the later searches and survey of property. See notes above on *Cypripedium*.

### **Thalictrum arkansanum**

Early flowering (Mar-Apr[-May]) and searched for by Eidson. See notes above on *Cypripedium*.

**Astragalus soxmaniorum**

Early flowering (Mar-Apr) and searched for by Eidson.

**Valerianella florifera**

Early flowering (Mar-Apr) and searched for by Eidson.

## Appendix C: Sublocalities for *Echinacea sanguina* (Spring 2006)

### SUBLOCALITY 1

Hooks Quad (USGS 1:24,000)

Sandy roadside, north side of road, along generally E-W segment of Elliott Creek Reservoir Road, ca. 0.2 mi ESE of jct with Red River-Lone Star Boundary Road; plants scattered but abundant along ca. 1000 feet of roadside; 322–337 feet elevation. 17 May 2006.

**VOUCHER:** Nesom RRLS 1 (BRIT, TEX)

94° 18' 24.0 to 94° 18' 02.9 W

33° 24' 15.7 to 33° 24' 08.3 N

### SUBLOCALITY 2

Hooks Quad (USGS 1:24,000)

Sandy roadsides, both sides of road, along N-S segment of Red River-Lone Star Boundary Road, ca. 0.1 mi north of sharp bend in road to southern Red River Boundary Road; plants scattered along ca. 80 feet of roadside; 301–305 feet elevation. 19 May 2006.

94° 18' 35" W

33° 23' 58" to 33° 23' 60" N

### SUBLOCALITY 3

Hooks Quad (USGS 1:24,000)

Sandy roadside, both sides of road, NW-SE segment of mostly N-S Main Pit Road, west of Elliott Creek, just north of RRAD-LSAAP boundary; plants scattered along ca. 40 feet of roadside; 375–380 feet elevation. 18 May 2006. **VOUCHER:** Nesom RRLS 8 (BRIT, TEX)

33° 24' 47" to 33° 24' 51"

94° 16' 16" to 94° 16' 17"

### SUBLOCALITY 4

Leary Quad (USGS 1:24,000)

Sandy-gravelly roadside, east side of road, along mostly N-S segment of Central Avenue west of gravel pit area; plants scattered along ca. 60 feet of roadside; 328–331 feet elevation. 18 May 2006.

94° 13' 42" to 94° 13' 43" W

33° 24' 55" to 33° 24' 58" N

### SUBLOCALITY 5

Leary Quad (USGS 1:24,000)

Sandy-gravelly roadside, east side of road, along mostly N-S segment of Central Avenue just west of Bob Lane Cemetery; plants scattered along ca. 60 feet of roadside; 350–352 feet elevation. 18 May 2006.

94° 13' 36" to 94° 13' 38" W

33° 24' 19" to 33° 24' 36" N

## Appendix D: Heritage Ranking System and Federal/State Status Symbols

The conservation rank of an element within a given area is designated by a G (Global), N (National) or S (State) as appropriate and followed by a rank number, 1 to 5. Species of conservation concern usually are those with global (G-ranks) ranks of 1-3; however, some species with higher global ranks may be of conservation concern in a particular area due to national, state, or local conditions. The Heritage rank numbers have the following meaning:

- 1 = critically imperiled, less than 6 known occurrences of the species
- 2 = imperiled, 6-20 known occurrences
- 3 = vulnerable to extirpation or extinction, 21-100 known occurrences; species very rare and local throughout its range or found locally (even abundantly) in a restricted range
- 4 = apparently secure, though may be quite rare in parts of its range; over 100 known occurrences
- 5 = demonstrably widespread, abundant, and secure, though may be quite rare in parts of its range

*Rank numbers may be combined when there is uncertainty over the status (e.g., an element may be given an G-rank of G2G3, indicating global status is somewhere between imperiled and vulnerable).*

### *Other Rank Symbols*

- Q = Questionable taxonomy that may reduce conservation priority
- ? = Inexact numeric rank. May also be seen as a combination of numbers (G2G3).
- G? = unassessed global rank
- R = reported, not yet ranked
- X = presumed extirpated
- H = historic

### **Rank Criteria, Relationship to Other Status Designations**

Ranking is a qualitative process, with multiple factors going into rank decisions. For species elements, the following factors are applied: 1) total number and condition of occurrences (sighting/records) of that species, 2) population size, 3) range extent and area of occupancy, 4) short and long-term trends in the first three factors, 5) threats to the element, and 6) fragility of the element.

Heritage Ranks are often, but not always, comparable to statuses assigned by government agencies. For instance, the Heritage subnational ranking for an endangered species may not be S1. For this reason, Federal and State statuses are also given for species of conservation concern when possible.

### **Federal and State Listing**

The system used to indicate the status of a species is as follows:

- C = candidate species for federal imperiled status
- PT = proposed for listing as federally threatened
- PE = proposed for listing as federally endangered
- LT = federally threatened
- LE = federally endangered
- ST = state threatened
- SE = state endangered

For more information or to find heritage ranks for species and ecological communities, visit the NatureServe website: <http://www.natureserve.org/>

## Glossary

action site: a site where the Conservancy has chosen to focus attention and resources.

alliance: a grouping of plant communities that share a similar composition of plant species (alternative term: *plant community*).

association: a group of plant species with similar habitat requirements that are found growing together (alternative term: *plant community*).

biodiversity: the variety of life forms and ecological systems, the genetic variability they contain and the ecological processes that maintain them.

community, ecological community, ecological system: an interdependent assemblage of plant and animal species.

conservation status: a federal or state legal designation usually indicating some degree of threat or imperilment (see *endangered, threatened*). See Appendix B.

conservation target: A species, guild, community or assemblage of communities that has been selected by The Nature Conservancy as a priority for conservation planning or action.

ecoregion: a relatively large area of land and water characterized by similar climate, vegetation and geology, and other ecological and environmental patterns.

ecoregional planning: planning for long-term conservation goals within ecoregions.

element: plant or animal species, community or other entity of biodiversity; may serve as a focus for conservation efforts (see *conservation element*).

endangered: legal term, meaning at immediate risk of extinction, and probably unable to survive without direct human intervention. Indicates the species has been listed on federal or state endangered species list. **Note:** Even if the species is listed, it may be preferable to use the terms *rare, unusual* or *imperiled*.

endemic: found nowhere else, unique to a place.

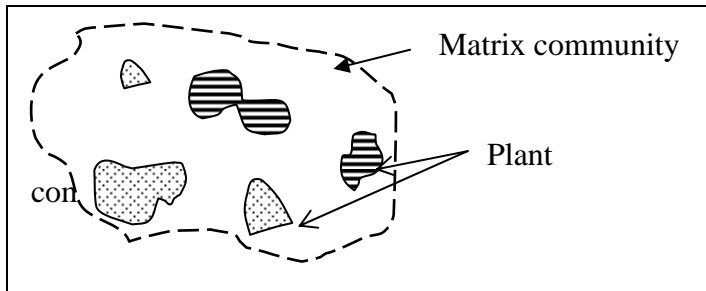
global ranks, G-ranks: The conservation rank of an element within a given area is designated by a G (Global) or S (Subnational) as appropriate and followed by a rank number, 1 to 5. See Appendix B.

landscape: a heterogeneous land area of interacting ecosystems that are repeated in similar form throughout.

large patch community: plant communities that form large (usually about 120 to 4,950 acres) areas of vegetation. Large patch communities depend on less specialized landscape formations than do small patch communities (see *small patch community*).

matrix community: an extensive plant community (usually about 4,950-1,235,000 acres) that encompasses islands of different plant community types and is (or was historically) dominant

across the landscape. Plant community types within the matrix community may be *large patch* or *small patch* (see illustration below).



prescribed burn: the skilled application of fire to forest or grassland fuels under predetermined conditions, used to reach specific conservation objectives.

riparian: forested or wooded streamside or riverside.

small patch community: plant communities that form small (usually about 2.5-120 acres), discrete areas of vegetation. Small patch communities often depend on specialized landscape formations or unusual microhabitats.

sustainable: allowing the continued use and viability of natural resources.

system: a collection of interdependent living and non-living elements and the natural processes that maintain them.

threatened: legal term, meaning species is 1) abundant in parts of its range but declining in overall numbers and at risk of extinction, or 2) present in low numbers across its range and at risk of extinction. Indicates the species has been listed on federal or state threatened species list.