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Little Rock, AR 72206

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13. ABSTRACT (Maximum 200 Words) Fire is an important ecological process in the southern United States. Many animal and plant species evolved in the presence of fire, and many vegetation types thrive best in the presence of fire. Fire-dependent biota are declining because of fire suppression and landscape-scale changes. Pine Bluff Arsenal has been working to restore pine savanna, a declining habitat, by reintroducing prescribed burns on part of the Arsenal. The report contains information on fire ecology, history and prescribed fire at Pine Bluff Arsenal; fire effects monitoring reports; and the phase II report on herpetological diversity and abundance in relation to fire management.				
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INTRODUCTION:

Fire is an important ecological process in the southern United States, and elsewhere in the country. Many animal and plant species evolved in the presence of fire, and many vegetation types are maintained by fire. In the past 75 years, with modern fire suppression efforts, as well as expanding roads and development, fire is occurring much less frequently. Fire-dependent biota and communities are threatened and declining as a consequence. Pine Bluff Arsenal (PBA) has been working to restore pine savanna, a habitat particularly in need of management, by re-introducing prescribed fire on parts of the Arsenal.

The following annual report describes the ecology and history of fire at PBA and lists specific biota and communities being restored by fire. In FY 2003, The Nature Conservancy initiated the first year of a two-year survey of the herpetofauna at PBA to determine if natural resource management activities associated with pine savanna restoration are affecting amphibian and reptile species, and to add any new species to the inventory list. The FY 04 phase II report "Effects of Savanna Restoration on Abundance and Diversity of the Amphibians and Reptiles at Pine Bluff Arsenal" is submitted. Fire effects monitoring reports from FY 04 are also submitted.

BODY:

In FY 2000, an Agreement and scope of work were initiated by the Pine Bluff Arsenal and The Nature Conservancy, initiating a pine savanna restoration plan and plant community monitoring at Pine Bluff Arsenal. The purpose of the scope of work was to describe the requirements associated with plant community monitoring, the quantitative descriptive assessment of the changes in vegetation overtime, and the development of a pine savanna restoration plan at selected areas of Pine Bluff Arsenal.

The following tasks were developed and completed by the Pine Bluff Arsenal Natural Resources staff and the Conservancy.

- A. Develop a plant community monitoring plan for plant communities at three selected Old Growth and Pine Savanna restoration sites.
- B. Implement first year baseline plant community monitoring at the sites selected.
- C. Develop a pine savanna restoration plan for selected sites.

Results of above three tasks were submitted at the end of FY 00: and are found at Department of Defense reference number ADA400479.

The Agreement was extended annually for four years, FY 2001 through 2004, to implement the pine savanna restoration plan for selected sites on Pine Bluff Arsenal, as developed in FY 2000. The annual scope of work for FY 2001 through 2003 included

savanna restoration, by returning ecological fire to the locations selected in the plan. Some three to five units were identified each year for fire management, working with Pine Bluff Arsenal. Fire management was followed by the application of a standard set of Nature Conservancy monitoring procedures to track, measure and report the ecological effects of fire. Two submittals are described in the scope of work, as follows:

A. Rationale for Fire Management. The Conservancy shall submit a revised Rationale for Fire Management that includes a general description of Arsenal habitats, important elements of concern, goals of fire management, burn timing and frequency, constraints, and references.

B. Fire Summary Report and Post Burn Evaluation. The Conservancy shall provide a post burn reports that describes weather conditions, fire narrative, immediate post burn effects, analysis of ecological objectives, and recommendations, for all units burned.

Results of above two tasks were submitted at the end of each year from FY 2001 through 2003, and are found at Department of Defense reference number ADA400479.

For FY 2004, the last year of the Agreement, the scope of work included savanna restoration through fire management, as well as continued updating the Rationale for Fire Management, and compiling the Fire Summary Reports and Post Burn Evaluations, as in previous years. One new task, a two-year Herpetological Baseline Inventory was added, as described in the scope of work:

The Conservancy will complete the two-year assessment of the impact of pine savanna restoration activities on the herpetofauna of the Pine Bluff Arsenal, and add species to the baseline data. Collection and observation will be concentrated in three (3) "zones" of the Pine Bluff Arsenal where recent (~1-2 years) pine savanna restoration management, predominately prescribed fire and selective timber harvest, has occurred. These sites will also have a "control" study area, where no savanna restoration activities have occurred in the recent past, or are planned to occur in the near future. The sites will also have a third area where one form of management has occurred, but not the other (i.e. site has been selectively harvested but not burned or vice-versa), with additional management planned in the next one to two years.

Using this method of study, one to three drift-fence/pit-fall trap and funnel trap arrays will be placed in each study area within its respective zone, with traps in the active management area, the control area, and the future management area. The traps will be checked at least every other day, while open, to prevent mortality to the trapped specimens. When the study is inactive, lids or boards will be placed over the pitfall traps, and the funnel traps will be turned on their ends. The drift fences will be constructed from silt fencing stapled to wooden stakes, the pit-fall traps will be plastic 5-gallon buckets, and the funnel traps will be made from aluminum window screening. Other materials needed will be seines, snake sticks, potato rakes, aquatic dip nets, binoculars, digital camera, and various other miscellaneous items related to the collection of data.

During the study periods, opportunistic sightings of specimens and "dead-on-the-road" specimens will be recorded, and searches of other important habitats, as recommended by the Pine Bluff Arsenal personnel, will be conducted.

The revised Rationale for Fire Management, three Fire Summary Reports and Post Burn Evaluations, and the final report on the Herpetological Baseline Inventory are attached as submittals in pdf format.

KEY RESEARCH ACCOMPLISHMENTS:

Year one:

Develop a plant community monitoring plan for plant communities at three selected Old Growth and Pine Savanna restoration sites.

Implement first year baseline plant community monitoring at the sites selected.

Develop a pine savanna restoration plan for selected sites.

Year two through four:

Annual implementation of savanna restoration plan, through fire management of three to five units each year; with revised Rationale for Fire Management; and three to five Fire Summary Reports and Post Burn Evaluations.

Year five:

Annual implementation of savanna restoration plan, through fire management of three to five units each year; with revised Rationale for Fire Management; and three to five Fire Summary Reports and Post Burn Evaluations. The final report on the two year long Herpetological Baseline Inventory was completed and submitted.

REPORTABLE OUTCOMES:

A science-based savanna restoration plan for Pine Bluff Arsenal, supported by baseline plant community monitoring protocols and transects.

Five years of savanna restoration fire management data.

Two years of baseline data on Pine Bluff Arsenal herpetofauna, based on nine drift fence transects. The main goal of this study is to monitor ecosystem response (amphibians and reptiles) at selected restoration areas. The drift fence arrays used during this survey will be left in place to allow for future herpetological sampling, following continued restoration efforts.

CONCLUSIONS:

The conservation of the full range of biodiversity is a land management goal for Pine Bluff Arsenal. The five year effort to restore a pine savanna ecosystem has greatly enhanced the diversity of the installation's habitats. Pine savanna management at the Arsenal was conducted with landscape-scale land management considerations taken into account. It is vital for biodiversity conservation that the Department of Defense land managers take into account the management activities of adjoining lands.

RATIONALE FOR FIRE MANAGEMENT AND SAVANNA RESTORATION

Site: Pine Bluff Arsenal Old Growth and Pine Savanna Restoration Areas: ~2500 acres.

Location: Sections 18, 22, and 24, R10W T5S; Sections 13 and 14, R10W T5S; Jefferson County, Arkansas.

Ownership: Department of Defense; TNC - Fire Management Contract.

Update: March 8, 2002; Lance Peacock and Scott Simon.

General Site Description:

The 15,000 acre Pine Bluff Arsenal landscape is a mix of arsenal facilities, urbanized areas, second growth upland forest (11,000 acres), old fields and rights-of-way maintained by mowing and fire, bayous with riparian forest, lakes, swamps, and ponds. The arsenal is located on the West Gulf Coastal Plain along the Arkansas River. The geologic formations are deep alluvial deposits composed of sand and silt with embedded clay and gravel layers and wind deposited loess. The landscape is generally flat with little relief except where small creeks and streams have formed deeply incised ravines as they penetrate steep (to 100% slopes) Arkansas River bluffs. The elevation ranges from 195 feet above msl at the Arkansas River to 240 feet above msl at the top of the Arkansas River bluff and to 340 feet above msl at the northwest corner of the base.

The arsenal contains most of the forest communities found on the West Gulf Coastal Plain except the most xeric. Hydric bald cypress strands, mesic riparian forests, mesic to dry pine-oak forests, seeps, grasslands, and dry oak woodlands are extant. Quality ranges from low to high with the bulk of the forested area of medium quality. Many sensitive plants and animals, as well as a wide diversity of common species find suitable habitat on the arsenal. PBA has an active wildlife and timber management program. Five sites on the arsenal have been delineated due to their ecological quality and representativeness and three of these areas have a designated old growth forest components. Additional sites on PBA may be identified for biodiversity management due to continuing ecological assessment and biological inventory.

Refuge Woods: The Refuge woods comprise a spectrum of forest communities ranging from poorly drained hardwood bottoms to moderately well-drained pine-oak uplands. The bottoms are relatively open oak, hickory, sweetgum forests with scattered loblolly pine, and bald cypress in depressions. The trees are tall (70'-80') with 2' dbh common. The understory is mostly deep duff and leaf litter. Small patches of cane, seeps with dense ferns, and vine tangles are extant. The soil is usually moist with standing water in the late winter and spring. In the better drained upland areas the pine component increases with more grasses and areas of thick vine tangles. The litter and duff layers contain pine needles, and are more volatile. Due to small pine beetle infestation, several areas have been heavily thinned and represent pine savanna with dense herbaceous layers. Large standing snags are extant. Two small draws that are brush hogged annually contain rattlesnake master (*Eryngium yuccifolium*) and its dependent rattlesnake master borer moth (*Papaipema eryngii*) an insect previously on the USFWS candidate list.

Eastwood Bayou: Eastwood Bayou comprises rich riparian forests and slopes along a stream that flows year round and adjacent dry upland oak-pine forests. Although the trees are not as tall or large as refuge woods the herbaceous layer is better developed with more grasses and forbs. The riparian understory contains scattered cane and seeps with ferns. The duff and litter (mostly oak leaves) layer is deep. The uplands are drier with a higher component of pine needles in the litter layer. Vine tangles and woody debris are extant. Several rare plants are known from Eastwood bayou. Much of this site contains munitions storage bunkers.

Triplets Bluff-Phillips Creek: This site contains the driest uplands on the base, as well as a deep ravine with a rich bottomland and slope forests of cherrybark oak and bald cypress. Philips Creek is a perennial stream with a elm-ash-sugarberry canopy over a rich plant community. The riparian area is often dense with cane and vines. The trees are large and the soils moist. The uplands are mesic to dry oak and oak-pine forests and woodlands. The trees in the uplands are relatively short (50' or less) and small (dbh 18"). Scattered grasses form the herbaceous layer with a mostly oak leaf litter. The duff layer is moderately deep. Several rare plants and the highest quality plant communities are located at this site. Much of this site is in a designated duded area.

Yellow Lake: (see TNC 1997) Not a fire maintained site.

Railroad Grassland: The railroad grassland is a long strip of grass dominated vegetation along the railroad right-of-way. The grassland is dominated by little bluestem, velvet panic grass, and a wide diversity of the forbs and grasses. Several rare plants are known from the railroad grassland. In places the site has become shrubby with small tress

Table 1. Plant Communities, Plant Species, and Animal Species of Conservation Concern occurring at PBA.

The following list is composed of plant communities and plant and animal species of conservation concern known from the Pine Bluff Arsenal. Not all plant communities and plant and animal species are known from the old growth areas. Recent biological inventories uncovered many species of insects that had not been recorded from Arkansas. Several are considered rare but have not been ranked and are not included in the following table.

Plant communities:		
mixed overstory- <i>Arundinaria gigantea</i> Riparian Forest	forested canebrake	G2 S1
mixed overstory- <i>Acer rubrum</i> var. <i>trilobum</i> -fern Forest	coastal plain seeps	G4 S2S3
<i>Pinus echinata</i> - <i>Quercus (stellata-falcata)</i> Woodland	dry shortleaf pine-oak woodland	G4 S4
<i>Pinus (taeda-echinata)</i> - <i>Quercus (velutina-falcata-alba)</i> Forest	submesic pine-oak forest	G3 S1
<i>Pinus taeda</i> - <i>Quercus (nigra-alba)</i> Forest	lowland pine-oak forest	G2 S1
<i>Pinus taeda</i> Savanna	pine savanna	G3 S1
<i>Quercus lyrata</i> Forest	overcup oak forest	G4 S3
<i>Quercus (nigra-alba)</i> - <i>Carya cordiformis</i> Forest	mesic oak forest	G4 S4
<i>Quercus (pagoda-alba)</i> - <i>Liquidambar styraciflua</i> Forest	lowland oak-sweetgum forest	G3G4 S1
<i>Quercus phellos</i> Forest	willow oak forest	G3 S2

<i>Quercus stellata-Quercus (velutina-marilandica)</i> Woodland	dry oak woodland	G3 S2
<i>Schizachyrium scoparium-Panicum anceps</i> Grassland	tallgrass prairie	G4 S4
<i>Taxodium distichum</i> Forest	bald cypress forested channel	G4 S3
<i>Ulmus americana-Fraxinus pensylvanica-Celtis laevigata</i> Forest	elm-ash-sugarberry forest	G5 S5
Plants:		
<i>Carex atlantica</i> subsp. <i>capillacea</i>	prickly bog sedge	G5T5 S2S3
<i>Chamaelirium luteum</i>	devil's bit	G5 S3
<i>Eleocharis flavescens</i>	pale spikesedge	G5 SU
<i>Eleocharis microcarpa</i>	small seeded spikesedge	G5 S2
<i>Eupatorium hyssopifolium</i> var. <i>hyssopifolium</i>	boneset	G5 S3
<i>Lycopodium appressum</i>	southern clubmoss	G5 S3
<i>Scleria pauciflora</i>	few flowered nutrush	G5 S3
Animals:		
<i>Alligator mississippiensis</i>	American alligator	G5 S3
<i>Buteo lineatus</i>	red-shouldered hawk	G5 S3
<i>Haliaeetus leucocephalus</i>	bald eagle	G4 S2
<i>Ixobrychus exilis</i>	least bittern	G5 S2
<i>Lophodytes cucullatus</i>	hooded merganser	G5 S2
<i>Macrocllemmys temmincki</i>	alligator snapping turtle	G3G4 SU
<i>Papaipema eryngii</i>	rattlesnake master borer moth	G1 S1
<i>Regina grahamii</i>	Graham's crayfish snake	G5 S2
<i>Speyeria diana</i>	diana fritillary	G3 S3
<i>Tachycineta bicolor</i>	tree swallow	G5 S4

Table 2. Land Birds of Regional Conservation Concern (*) and others that Require, or Extensively Use, Pine Savanna Habitats (Hamel 1992).

Many land bird species are stressed and declining because silvicultural and land use changes are reducing early successional habitats, such as grasslands and savannas, at a landscape scale. The following table lists bird conservation targets that use savanna habitats at Pine Bluff Arsenal.

Species quality habitat)	season of use	density (pairs per 40 acres - in high
Henslow's sparrow *	wintering	unknown
Bachman's sparrow *	breeding	10
Chuck-will's-widow*	breeding	7
Brown-headed nuthatch *	resident	12
Orchard oriole *	breeding	15
Eastern wood-pewee *	breeding	11
Northern bobwhite *	resident	12
Loggerhead shrike *	resident	5
Cooper's hawk	resident	1
Southeastern kestrel	resident	2
Wild turkey	resident	2
Great crested flycatcher	breeding	25 (must be snags present)
Eastern bluebird	resident	6
Pine warbler	resident	30
Summer tanager	breeding	22
Grasshopper sparrow	breeding	16

Role and History of Fire:

Fire in the pine, pine-oak, and oak dominated forests of the southeastern United States has been well documented by Pyne (1982) and others. An examination of Arkansas Forestry Commission records indicates a prevalence of naturally (lightening) ignited fires occurring from mid-July through October in the Interior Highlands and Gulf Coastal Plain with a shorter fire season in March and April. Anthropogenic fire could occur in any season but early records of aboriginal burning reference September through December. Periodic fire is essential to maintaining open forest structure and composition, as well as the herbaceous vegetation in pine, oak-pine, and oak forests and woodlands and associated grassland ecosystems of the Gulf Coastal Plain uplands. Fire also plays a role in maintaining open wetland and oak-dominated bottomland forest communities

Examination of GLO records of the site indicate a forest composition similar to today's but with a more open forest structure. Fire history reconstruction in the Ouachita Mountains show a wide range in frequencies, spatial coverage, and seasonally depending on location, community type, and aspect. Pine, oak, and pine-oak communities on ridges and south slopes with grassy herbaceous layers burned in the range of 1 - 7 year intervals. While north slope and ravine

forests burned at less frequent intervals. No fire reconstruction work has been done for Arkansas' Gulf Coastal Plain.

Project Rationale

Pine savanna plant communities are among Arkansas's rarest plant communities. No high quality pine savannas are known to exist on Arkansas's Gulf Coastal Plain. Pine savannas are plant communities with a sparse to moderate density of overstory pine trees and a dense grass and forb dominated herbaceous layer. Pine savannas are fire maintained. Without fire, pine savannas become pine-oak forests.

A suite of declining species, many occurring as small populations at PBA, need pine savanna habitat to complete their life cycles. Several of these declining species are area-sensitive. Small parcels will not provide enough habitat to maintain species populations. One of the more habitat sensitive declining species is the Bachman's sparrow. Each breeding pair of Bachman's sparrow needs four acres of suitable pine savanna habitat in a woodland – savanna matrix of 500 acres. To sustain a viable population (250 breeding pair) of Bachman's sparrow requires a minimum of 1000 acres of high quality pine savanna habitat. One thousand acres of pine savanna (high quality) would also provide enough habitat for viable populations of most other species, such as northern bobwhite (1000 acres pine savanna = 300 breeding pair), that utilize pine savanna habitats. Because not all habitat will be high quality all the time, the 1000 acres of proposed pine savanna was doubled to 2000 acres to provide habitat buffer.

The conservation of biodiversity is a PBA land management goal and the restoration of a Pine Savanna Ecosystem will move the installation in the right direction. PBA is an ideal location to restore this much reduced ecosystem. The resource management program is well established with both wildlife and timber management requiring prescribed burning to increase and maintain suitable habitats. Specifically, over the last five years the timber management program has worked to reduce southern pine beetle infestations by reducing tree density and creating potential Pine Savanna Ecosystem Restoration Areas and more healthy woodland conditions.

Several sites on PBA have been identified as having the potential for restoration of the Pine Savanna Ecosystem. Two of the pine savanna restoration sites monitored are in or directly adjacent to the Old Growth Areas designated in the Integrated Natural Resource Management Plan. The third monitored restoration site is located near Horseshoe Lake. Several other potential pine savanna sites have been identified (see Appendix B).

The baseline plant community monitoring was instituted to analyze past management activities and the current condition of sites that are approximating pine savanna in structure, composition, and density. The information gained can be used by land managers to select treatments that move the plant community towards Pine Savanna Ecosystem Restoration Goals (see this page). The baseline monitoring resulted in a series of recommendations under the Pine Savanna Ecosystem Restoration Plan on page 14.

Past Management:

Previous to the establishment of the arsenal in 1941 the area was a mix of farms and forest. The area was cutover for timber before 1920. The flat areas were cultivated and steeper area used as woodlots and grazing for cattle and hogs. Abandoned fields grew up in pine or in some cases were planted in pine during the 1930's. The burning of farm stubble and woodlands was a common practice in Arkansas throughout this time period.

The establishment of the arsenal began a long history of timber and wildlife management under various management philosophies ranging from neglect to active manipulation. Fires were suppressed during much of this time period.

For the last 15-20 years prescribed fire has been used to prevent wildfires along the railroad right-of-way and under pine forests to control the understory and to improve wildfire habitat. Some prescribed burning is carried out every year at PBA. Prescribed forest fires have been relatively cool winter burns and are not usually used in hardwood stands to protect timber value. With the more recent emphasis on biodiversity and ecosystem management attempts are being made to more closely imitate fires that maintain and enhance forest structure and composition.

Goals of Fire Management and savanna management:

1. The restoration and maintenance of a diverse herbaceous layer in all plant communities represented at PBA.
2. The restoration of a more open, large tree-grass structure in the designated old growth areas across forest types.
3. The restoration of pine savanna on ~ 2500 acres.
4. The maintenance and enhancement of fire-dependent rare species populations.
5. The provision of habitat for a suite of neotropical migratory, wintering, and resident land birds that are dependent on pine savanna habitat

Constraints:

Possible logistical constraints include restricted access to some burn units, nearby munitions storage, duded areas, smoke management, and base operations.

Damage from Fire:

None. Several rare plants, reptiles, birds, and insects are known from PBA. The species of concern are grassland remnant-dependent, fire-dependent, or fire-independent and are expected to increase or not be affected as fire is reintroduced.

Burn Units:

No permanent burn units are in place:

In 1999 three units were burned.

Refuge Woods: pond unit 185 acres. Completed 3/99.

Phillips Creek-Triplets Bluff (bombing mat): dud unit 103 acres. Completed 3/99.

Eastwood Bayou (CLA): bunker unit 98 acres. Completed 11/99

In 2000 one unit was burned and two units are scheduled.

Refuge woods: savanna unit 206 acres. Completed 3/00.

Yellow Lake: island unit – 75 acres.

Eastwood Bayou: pecan grove unit – 60 acres.

In 2001 four units were burned.

Yellow Lake, island unit – 75 acres. Completed 3/01.

Pine Savanna Restoration Area, hourglass unit – 36 acres. Completed 3/01.

Pine Savanna Restoration Area, horseshoe lake unit – 127 acres. Completed 3/01.

Triplett's Bluff, Nilo Pond unit – 183 acres. Completed 3/01.

In 2002 nine units were burned.

Pond unit – 185 acres. Completed 3/02

Tulley Lake unit – 15 acres. Completed 2/02

Bomb Storage units A-D, 1, 5, and 9 – 77 acres, seven units. Completed 2/02 and 3/02.

In 2003 three units were burned.

Horseshoe Pond Unit - 127 acres. Completed 3/04

Savanna Unit - 206 acres. Completed 3/04

Nilo Pond Unit – 183 acres. Completed 3/04

Burn Timing and Frequency:

Fire could burn in this landscape in any season. Most prescribed burning in Arkansas is carried out from September through April. Burning in any of these months is appropriate. Growing season (April - September) and pre/post drought burns have very beneficial effects in restoring ecosystem composition and structure.

Restoration burns are used to remove the heavy build up of litter and duff and reduce the density of woody stems in the smaller size classes. During the restoration phase short time intervals (annual to every 2 years) are desired, dependent on fuel conditions. During the maintenance phase longer time intervals may be desired.

Monitoring:

Post fire estimates of fire intensity (scorch height and class, char, understory burn severity, and litter consumption) will be taken. Permanent transects with photo points will be established to monitor and measure tree densities and plant composition. Observations of rare species reaction to fire management will be noted. The reaction of the rattlesnake borer moth to the timing, frequency, and intensity of burns will be noted.

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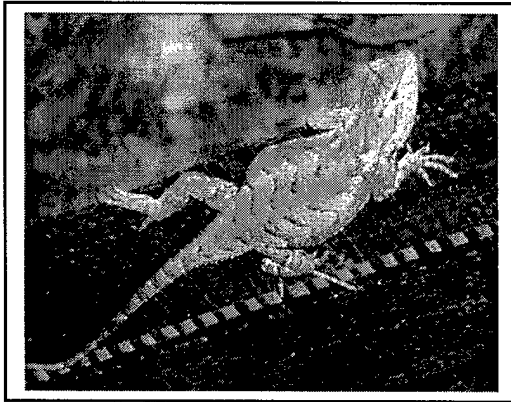
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**EFFECTS OF SAVANNA RESTORATION ON ABUNDANCE AND DIVERSITY OF
THE AMPHIBIANS AND REPTILES
AT PINE BLUFF ARSENAL**



Final Report
September 2004

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Cover photographs: top left, fence lizard photographed by David Gosse, The Nature Conservancy (TNC); top right, cricket frog photographed by David Gosse, TNC; bottom, copperheads photographed by Matt Lindsey, TNC.

SUMMARY

The Nature Conservancy-Arkansas Field Office (TNC-ARFO) conducted a two-year survey of the herpetofauna at Pine Bluff Arsenal (PBA), to determine if natural resource management activities associated with pine savanna restoration are impacting on amphibian and reptile species, and to add any new species to the inventory list. The goals of the project were:

- 1) to provide data for any changes in general species abundance/diversity from natural resource management activities (mechanical thinning, prescribed fire, and a combination of the two) in association with pine savanna restoration on PBA;
- 2) to make any additions to the species list from the baseline inventory;
- 3) to search for any taxa of amphibians and reptiles that are tracked in the data base of the Arkansas Natural Heritage Commission, and that are known from PBA or adjoining counties, and;
- 4) to report any findings for populations of threatened, endangered, or otherwise significant taxa occurring on PBA.

The principal methodology employed in this survey consisted of the placement of a series of drift fence arrays in three (3) areas of the PBA where recent (~1-2 years) pine savanna restoration management, predominately prescribed fire and selective timber harvest, has occurred. Other survey techniques included road cruising; pond, creek, and lake surveying with binoculars; and opportunistic leaf raking, log rolling, and debris searching.

A total of 43 amphibian and reptile taxa were observed or captured during the 2002-2003 survey period. Data were collected opportunistically, and from six drift fence arrays, during the periods of May 30 to June 7 and July 9 to July 18, 2002, and opportunistically and from nine drift fence arrays April 30 to May 25, 2003. During these periods a total of 503 amphibian and reptile captures, and 293 observations were recorded. Mortality due to fire ants, wolf spiders, shrews, raccoons, opossums, skunks and desiccation was recorded on 60 individuals (12% of total captures), predominately frogs and toads. One regionally unrecorded species, the mole salamander (*Ambystoma talpoideum*), was captured at drift fence array 5 in July of 2002.

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INTRODUCTION

At the request of natural resource managers at Pine Bluff Arsenal (PBA), The Nature Conservancy-Arkansas Field Office (TNC-ARFO) conducted a two-year survey of amphibians and reptiles on restoration areas at the arsenal. The goals of the project are:

- 1) to provide data for any changes in general species abundance/diversity from natural resource management activities (mechanical thinning, prescribed fire, and a combination of the two) in association with pine savanna restoration on PBA;
- 2) to make any additions to the species list from the baseline inventory;
- 3) to search for any taxa of amphibians and reptiles that are tracked in the database of the Arkansas Natural Heritage Commission, and that are known from PBA or adjoining counties, and;
- 4) to report any findings for populations of threatened, endangered, or otherwise significant taxa occurring on PBA.

Although a survey of amphibians and reptiles was conducted during 1997 (Robison 1997), no extensive herpetological inventorying had been conducted in the restoration areas of PBA.

PINE BLUFF ARSENAL

The Pine Bluff Arsenal is a 13,497-acre Army base owned and managed by the Department of Defense. TNC-ARFO has a fire management and monitoring contract with PBA, under which the herpetological survey is being conducted. Over 8,000 acres of the base are considered forested. The arsenal contains most of the forest communities found on the Upper West Gulf Coastal Plain, with the exception of the most xeric. Hydric bald cypress strands, mesic riparian forests, mesic to dry pine-oak forests, seeps, grasslands, and dry oak woodlands are extant. Quality ranges from low to high with the bulk of the forested area of medium quality. Many sensitive plants and animals, as well as a wide diversity of common species find suitable habitat on the arsenal (Peacock and Simon 2002).

PBA has active wildlife, timber, and fire management programs in place, with between 300 to over 1000 acres being burned annually on the base. Fire management, in conjunction with selective tree harvest, is being utilized to restore pine savanna on the base. Pine savanna in the coastal plain of Arkansas is characterized by widely scattered, relatively old loblolly or shortleaf pine with little to no midstory component and a diverse herbaceous understory.



Figure 1. Example of pine savanna restoration area near Horseshoe Pond.



Figure 2. Pine savanna restoration area in Refuge Woods at array 1.

The main goal of this study is to monitor ecosystem response (amphibians and reptiles) at selected restoration areas. It is important for managers to know what impacts these restoration activities are having on the herpetofauna, important components of natural communities, on PBA. The drift fence arrays used during this survey will be left in place to allow for future herpetological sampling, following continued restoration efforts.

Table 1. Elements of Conservation Concern: Pine Bluff Arsenal

Plant communities:		
mixed overstory- <i>Arundinaria gigantea</i> Riparian Forest	forested canebrake	G2 S1
mixed overstory- <i>Acer rubrum</i> var. <i>trilobum</i> -fern Forest	coastal plain seeps	G4 S2S3
<i>Pinus echinata-Quercus (stellata-falcata)</i> Woodland	dry shortleaf pine-oak woodland	G4 S4
<i>Pinus (taeda-echinata)-Quercus (velutina-falcata-alba)</i> Forest	submesic pine-oak forest	G3 S1
<i>Pinus taeda - Quercus (nigra-alba)</i> Forest	lowland pine-oak forest	G2 S1
<i>Pinus taeda</i> Savanna	pine savanna	G3 S1
<i>Quercus lyrata</i> Forest	overcup oak forest	G4 S3
<i>Quercus (nigra-alba) - Carya cordiformis</i> Forest	mesic oak forest	G4 S4
<i>Quercus (pagoda-alba) - Liquidambar styraciflua</i> Forest	lowland oak-sweetgum forest	G3G4 S1
<i>Quercus phellos</i> Forest	willow oak forest	G3 S2
<i>Quercus stellata-Quercus (velutina-marilandica)</i> Woodland	dry oak woodland	G3 S2
<i>Schizachyrium scoparium-Panicum anceps</i> Grassland	tallgrass prairie	G4 S4
<i>Taxodium distichum</i> Forest	bald cypress forested channel	G4 S3
<i>Ulmus americana-Fraxinus pensylvanica-Celtis laevigata</i> Forest	elm-ash-sugarberry forest	G5 S5
Plants:		
<i>Carex atlantica</i> subsp. <i>capillacea</i>	prickly bog sedge	G5T5 S2S3
<i>Chamaelirium luteum</i>	devil's bit	G5 S3
<i>Eleocharis flavescens</i>	pale spikesedge	G5 SU
<i>Eleocharis microcarpa</i>	small seeded spikesedge	G5 S2
<i>Eupatorium hyssopifolium</i> var. <i>hyssopifolium</i>	boneset	G5 S3
<i>Lycopodium appressum</i>	southern clubmoss	G5 S3
<i>Scleria pauciflora</i>	few flowered nutrush	G5 S3
Animals:		
<i>Alligator mississippiensis</i>	American alligator	G5 S3
<i>Buteo lineatus</i>	red-shouldered hawk	G5 S3
<i>Crotalus horridus</i>	timber rattlesnake	G4 S4
<i>Haliaeetus leucocephalus</i>	bald eagle	G4 S2
<i>Ixobrychus exilis</i>	least bittern	G5 S2
<i>Lophodytes cucullatus</i>	hooded merganser	G5 S2
<i>Macroclermys temmincki</i>	alligator snapping turtle	G3G4 SU
<i>Papaipema eryngii</i>	rattlesnake master borer moth	G1 S1
<i>Rana areolata</i>	crawfish frog	G4 S2
<i>Regina grahamii</i>	Graham's crayfish snake	G5 S2
<i>Speyeria diana</i>	diana fritillary	G3 S3
<i>Tachycineta bicolor</i>	tree swallow	G5 S4

MATERIALS AND METHODS

DRIFT FENCE/FUNNEL TRAP AND PITFALL TRAP ARRAY SURVEY

The principal methodology employed in this survey consisted of the placement of a series of drift fence arrays within three areas of PBA where recent (~1 to 2 years) pine savanna restoration management, predominately prescribed fire and selective timber harvest, has occurred. We also included a "control" array in each of the delineated areas to sample habitat that had not been exposed to any restoration efforts.

Site Selection

Aerial photographs from 2001 were obtained from Natural Resource Manager Charles Becker. U.S. Geological Survey (USGS) topographical maps, TNC-ARFO prescribed burn unit maps, and guidance from Mr. Becker were used to identify herpetological sampling sites on the arsenal. A preliminary visit to the arsenal was made in May by Melnechuk and Peacock, to discuss with Mr. Becker the scope of work and site selection for trap installation. Criteria for site selection included: prescribed burn history, mechanical thinning history, amount of canopy closure, and projected installation time. We then selected nine sites for drift fence arrays (Appendix A). Due to time constraints and budgetary limitations seven arrays were ultimately installed during 2002, with data being recorded for arrays 1-6 (Fig. 1-4). The final two arrays were installed in the spring of 2003, and data was recorded from arrays 1-9 during the 2003 survey period.

Installation

The drift fences were constructed from rolls of silt fencing measuring 61 cm wide by 30.5 m long. Pulaski axes and fire rakes were used to dig a shallow trench for fence installation, and chainsaws, brushcutters, and a bush-hog were utilized in heavier brush for clearing a path for the arrays. Fencing was staked in place and the bottom edge was covered with dirt and debris to prevent animals from crawling beneath the fence. All nine arrays were constructed in a "T" pattern (i.e., one 30.5-m section of fence adjoined at a central point with another 30.5-m section of fence at a 90-degree angle).

All drift fence arrays were fitted with one funnel trap at the end of each arm, and a pitfall trap in the middle of each arm, for a total of three funnel traps and three pitfall traps per array. The funnel traps were constructed of aluminum window screen and measured 100 cm long by 30 cm in diameter, and had a funnel opening at one end. The pitfall traps were 19-liter plastic buckets that were buried into the ground underneath the fence arms, with the open end of the bucket flush with the ground surface. Small holes were drilled into the lower side-walls of the buckets to drain water, and lids were placed onto the buckets when not active, to prevent mortality.

Data Collection

Traps were set at the drift fence arrays as soon as the arrays were installed. All traps were completely shaded with vegetation found at each site (e.g., grass, pine boughs, pine straw, etc.). Traps were checked at two-day intervals during the first part of the study. Due to some mortality from fire ants and desiccation, traps were then checked every day, and shut down whenever they could not be checked within two days. For each individual captured we recorded the location, date, species, and estimated age of the individual. Opportunistic observations were also recorded while travelling the roadways, from ditches, creeks, etc., and while walking into the array areas. A list of these observations is included in the herpetofaunal database under the heading "OBS" (Appendix C).

RESULTS

DRIFT FENCE SURVEY

Trapping efforts commenced as soon as each array was installed. Arrays 1 - 4 were installed May 30 and 31, 2002 and were set for 47 nights during June and July, 2002, and April and May, 2003. Arrays 5 - 7 were installed on July 2, 2002 and were set for 38 nights during 2002 and 2003. Data collected from array 7 was discontinued for the 2002 season as it was the only array set in the Triplett's Bluff area, with traps set for 26 nights during 2003. Arrays 8 and 9 were installed April 30, 2003 and were set for 26 nights in 2003.

Brief descriptions and representative photographs of the drift fence sites are as follows:

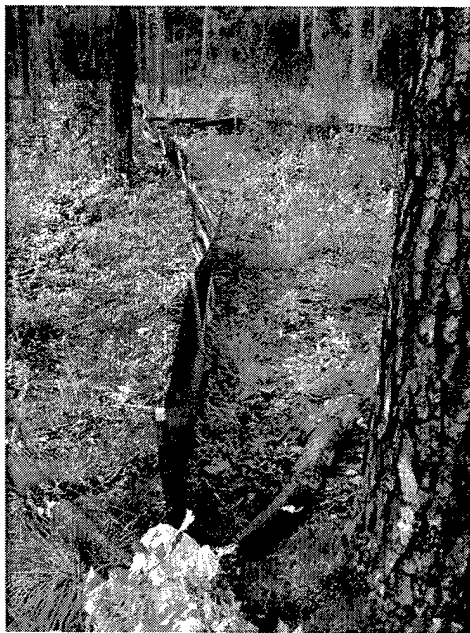


Figure 3. Array 1 - Pine savanna restoration area.

Array 1 – Pine savanna restoration area at the northwest corner of Refuge Woods site. About 30 acres of recently thinned loblolly and shortleaf pine. A recent (February, 2002) moderately-intense prescribed fire consumed much of the smaller downed woody debris, and top-killed most of the young hardwood shrubs. Larger pieces of downed woody debris remain. The herbaceous layer has responded well and is intact.



Figure 4. Array 2 – Hardwood restoration area.

Array 2 – Hardwood restoration area at the southeast corner of the base. A recent thinning operation has removed all of the larger pines and the midstory and left many of the older hardwoods, predominately *Quercus* spp. The ground cover has been somewhat disturbed, and there is much downed woody debris. The herbaceous layer is responding to the increased sunlight.



Figure 5. Array 3 – Control array.

Array 3 – Control array, located to the north of the hardwood restoration site. This area comprises unthinned and unburned, relatively old, second-growth pine-oak forest. There is a dense midstory. The understory is mostly deep duff and leaf litter, with no real herbaceous component. Many thick vine tangles are present.



Figure 6. Array 4 – Pine savanna restoration area.

Array 4 – Pine savanna restoration area located to the south of Horseshoe Pond. This area has been thinned leaving widely-spaced, mature loblolly pines with a primarily herbaceous and shrub component in the understory, and no midstory. A recent prescribed burn (March 2001) has top-killed many of the hardwood shrubs, although many are growing back.

Array 5 – Pine savanna restoration area located across the fireline from array 4. This area is similar in structure to array 4, but did not have the prescribed fire. The hardwood shrubs are a little more dense and taller than around array 4, with more leaf litter and duff on the ground.

Array 6 – Control array. Relatively open pine-oak flatwoods that have been neither burned nor thinned. The site is located off the road from Tulley Lake to Horseshoe Pond. Depending on rainfall, this site can range from almost hydric to dry, with the soil turning to hardpan in times of low rainfall. Mature loblolly pines are interspersed with willow oak and water oak. The midstory has relatively few shrubs with a pine needle and leaf litter ground cover.

Array 7 – Control array. Mature pine-oak forest located in the old-growth area northeast of Nilo Pond. The area has been neither burned nor thinned, with a deep duff layer. There is a dense midstory and understory, and no herbaceous component.

Array 8 – Pine savanna restoration area located just to the south of Nilo Pond. The area has been thinned, and a mild prescribed fire occurred in the spring of 2001. The shrub and vine component is still dense, with some herbaceous vegetation in gaps and at the edges of the restoration area.

Array 9 – Old growth area due east of Nilo Pond, that has been burned, but not thinned. The overstory is mature pine-oak forest similar to array 7, but with slightly less of a midstory component, and some herbaceous component in the understory vegetation.

During the drift fence surveys, 796 amphibians and reptiles representing 43 taxa were captured or observed (Table 2). One regionally unrecorded species, the mole salamander (*Ambystoma talpoideum*), was captured at array 5 on July 13, 2002. Mortality was recorded on 60 individuals (12% of total captures), predominately frogs and toads that were over-exposed to the heat, or were consumed by fire ants. Several shrew, mice, rat, vole, and insect species were also caught in the trapping process. The location(s) and method(s) of observation of all amphibian and reptile species documented during the survey are listed in Table 2.

Table 2. Amphibian and reptile species observed at Pine Bluff Arsenal during the 2002-2003 herpetological survey

Scientific name	Common name	Method of observation*	Capture arrays	# of captures/ observations
Crocodilians				
<i>Alligator mississippiensis</i>	American alligator	C		4
Turtles				
<i>Chelydra serpentina</i>	Snapping turtle	C		3
<i>Kinosternum subrubrum</i>	Mississippi mud turtle	C		1
<i>Pseuemyx concinna</i>	River cooter	C		1
<i>Sternotherus odoratus</i>	Common musk turtle	C		1
<i>Terrapene carolina</i>	Three-toed box turtle	A, B, C	1, 2, 9	87
<i>Trachemys scripta</i>	Red-eared slider	C		13
Lizards				
<i>Cnemidophorus sexlineatus</i>	Racerunner	C		8
<i>Eumeces anthracinus</i>	Southern coal skink	A, C	4, 5	3
<i>Eumeces fasciatus</i>	Five-lined skink	A, B, C	2, 3, 6, 7, 8, 9	24
<i>Eumeces laticeps</i>	Broadhead skink	A, B, C	2, 3, 6, 7	8
<i>Scincella lateralis</i>	Ground skink	A, B, C	1, 2, 3, 4, 6	31
<i>Sceloporus undulatus</i>	Northern fence lizard	A, B, C	1, 3, 4, 5, 6, 8	35
Snakes				
<i>Agkistrodon contortrix</i>	Southern copperhead	A, C	2, 8	5
<i>Agkistrodon piscivorus</i>	Western cottonmouth	A, C	6	5
<i>Coluber constrictor</i>	Southern black racer	A, C	1, 2, 5, 6, 8	33
<i>Diadophis punctatus</i>	Mississippi ringneck snake	A	1	1
<i>Elaphe obsoleta</i>	Black rat snake	A, C	1, 2	8
<i>Lampropeltis calligaster</i>	Prairie kingsnake	A	4	1
<i>Lampropeltis getula</i>	Speckled kingsnake	A, C	1, 2, 4	7
<i>Heterodon platirhinos</i>	Eastern hognose snake	A	4	1
<i>Nerodia erythrogaster</i>	Yellowbelly water snake	A, C	1, 4	9
<i>Nerodia fasciata</i>	Broad-banded water snake	A, C	2, 5	9
<i>Opheodrys aestivus</i>	Rough green snake	C		2
<i>Thamnophis proximus</i>	Western ribbon snake	A, C	3, 4, 5, 6, 7, 8	28
<i>Thamnophis sirtalis</i>	Eastern garter snake	A, C	2, 3, 9	12
<i>Virginia striatula</i>	Rough earth snake	A	2, 4	3
Salamanders				
<i>Ambystoma maculatum</i>	Spotted salamander	A	1, 2, 3	5
<i>Ambystoma opacum</i>	Marbled salamander	A, B, C	1, 2, 3, 4	35
<i>Ambystoma talpoideum</i>	Mole salamander	B	5	1
<i>Ambystoma texanum</i>	Smallmouth sal.	B	2, 3	4

<i>Notophthalmus viridescens</i>	Central newt	A, B	8, 9	7
Frogs and toads				
<i>Acris crepitans</i>	Northern cricket frog	A, B, C	1, 2, 4, 5, 8	35
<i>Bufo americanus charlesmithii</i>	Dwarf American toad	A, B, C	1, 2, 3, 6	17
<i>Bufo woodhousii fowleri</i>	Fowler's toad	A, B, C	1, 2, 3, 8	27
<i>Gastrophryne carolinensis</i>	Eastern narrowmouth toad	A, B	1, 2, 3, 4, 6, 8, 9	93
<i>Hyla chrysoscelis</i>	Gray treefrog	C		1
<i>Hyla cinerea</i>	Green treefrog	A	3	1
<i>Pseudacris crucifer</i>	Spring peeper	A	1	2
<i>Pseudacris triseriata feriarum</i>	Upland chorus frog	C		4
<i>Rana catesbeiana</i>	Bullfrog	A, C	5	15
<i>Rana clamitans</i>	Bronze frog	A, B, C	1, 2, 3, 8, 9	29
<i>Rana utricularia</i>	Southern leopard frog	A, B, C	1, 2, 3	128

* A = captured in funnel trap, B = captured in pit-fall trap, C = opportunistic observations

SUMMARY OF RESULTS

The results of the study can not be considered final at this point in time, as this will be an ongoing project, although they do provide some interesting insights even at this early juncture.

The most productive capture arrays were array 1 (pine savanna restoration area) and array 2 (hardwood restoration area), which together accounted for more taxa captured than the other four arrays combined. Amphibian species were well represented in the study, with eight species of frog, three toads, and five salamanders being documented. All amphibian species that were captured in traps were documented from restoration areas of some type (arrays 1, 2, 4, and 5), with the exception of a single green treefrog that was captured in array 3. Control array 3 provided seven species of amphibian, while control array 6 accounted for only one species of amphibian captured, the eastern narrowmouth toad (*Gastrophryne carolinensis*). Array 5 (pine savanna restoration area/thinned/unburned) provided the biggest surprise of the study, a mole salamander (*Ambystoma talpoideum*). This species has not previously been documented from PBA. According to present range maps for the species, it is not found within 100 miles of the base. The southern leopard frog (*Rana utricularia*), comprised almost one-quarter of the recorded captures for the study, and was particularly abundant in the hardwood restoration area (array 2) and the pine savanna restoration area at array 1.

Reptiles were also well represented in the study, with one crocodilian, six turtle, six lizard, and fourteen snake species being documented. All reptile species that were captured in traps were documented from restoration areas (arrays 1, 2, 4, 5, 8). Control array 3 captured five species of reptile, control array 6 captured seven species of reptile, and control array 7 captured only three. Four separate individuals of American alligator (*Alligator mississippiensis*) were documented during the study. Two individuals were found in Horseshoe Pond, a large adult (~3 meters long) and a smaller sub-adult (~1.75 meters long). One individual was documented in Tulley Creek, a small juvenile about 1.5 meters in length. A larger adult individual was also observed to be

residing in Clear Pond just to the south of Tulley Creek, whose size was estimated to be over 3 meters in length. The American alligator is federally listed as a threatened species due to similarity of appearance [to other crocodilians] (Federal Register 6 July 1987). The total taxa captured from each array is listed in Table 3.

Table 3. Total taxa captured by array

*Array#	1	2	3	4	5	6	7	8	9
Total taxa:	17	20	15	12	8	10	3	10	6
Snake species:	5	7	2	6	3	3	1	3	1
Lizard species:	2	3	3	3	2	4	2	2	1
Turtle species:	1	1	0	0	0	0	0	1	1
Anuran species:	7	6	6	2	2	2	0	4	2
Salamander species:	2	3	3	1	1	0	0	1	1

***Array Vegetation Compositions:**

Array 1 = pine savanna; thinned and burned

Array 2 = oak savanna; thinned and not burned

Array 3 = control array; unthinned/unburned pine-oak forest

Array 4 = pine savanna; thinned and burned

Array 5 = pine savanna; thinned but not burned

Array 6 = control array; unthinned/unburned willow oak-loblolly pine flatwoods

Array 7 = control array; unthinned/unburned old growth pine-oak forest

Array 8 = pine savanna; thinned and burned

Array 9 = old growth pine-oak forest; burned but not thinned

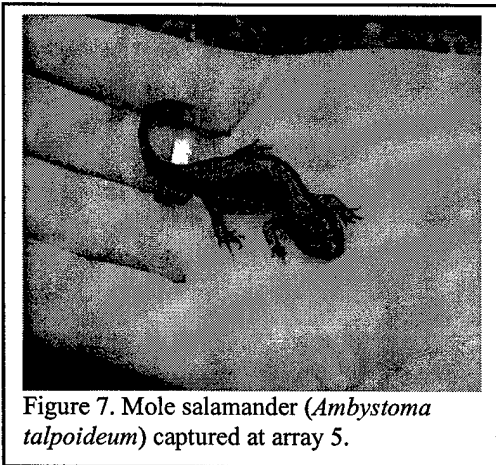
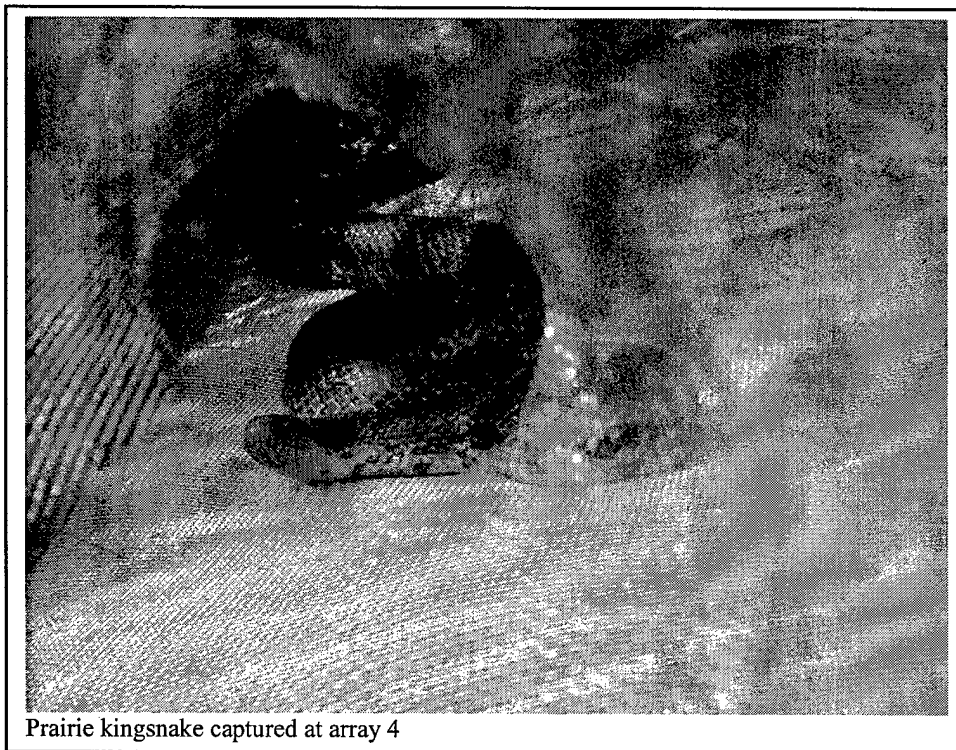


Figure 7. Mole salamander (*Ambystoma talpoideum*) captured at array 5.



Figure 8. American alligator (*Alligator mississippiensis*) in Horseshoe Pond.

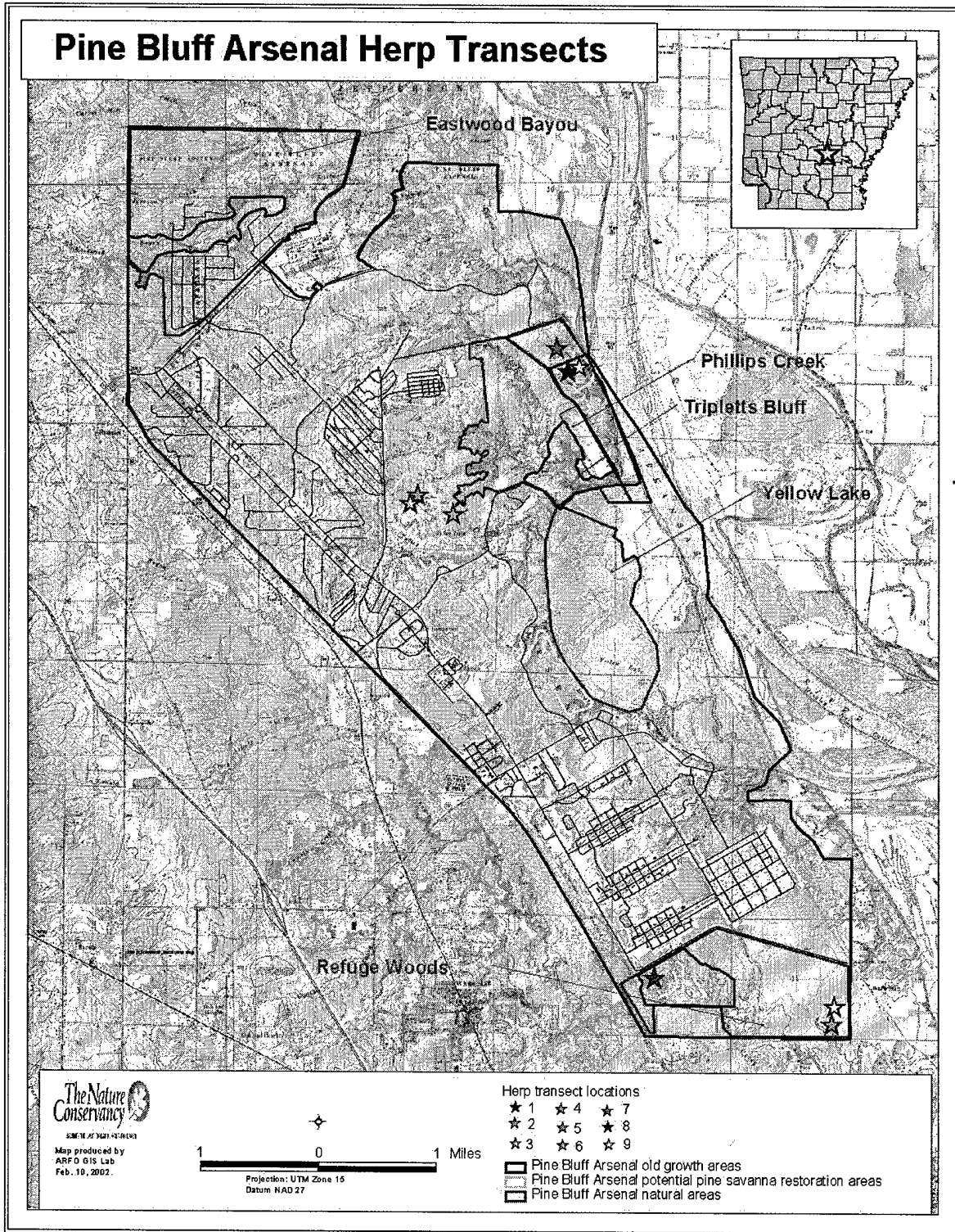
After two inventories, we can only make educated guesses on what the long-term impact that savanna restoration is having on the herpetofauna at PBA. Initial results look promising, in that the restoration activities such as thinning and prescribed fire appear to be having a positive impact on species diversity and abundance. This assumption is made evident by examining the locations where the majority of species were caught (thirty species in restoration areas versus nineteen species in the control areas), and the numbers of individual species captured in restoration areas (365 individuals captured in restoration areas versus 129 captured in control areas). These are preliminary observations. The study should continue for the next 5-10 years to better determine the relationship between herpetofauna and pine savanna restoration activities.



Prairie kingsnake captured at array 4

APPENDIX A.

Locations of drift fence arrays, restoration areas, and rare or significant species collected, 2002.



APPENDIX B.

Four-letter codes for amphibians and reptiles susceptible to capture from drift fence arrays at Pine Bluff Arsenal.

Code: Common and scientific names:

AMPHIBIANS**Anurans**

ACRE	Northern cricket frog (<i>Acris crepitans</i>)
BCHA	Dwarf American toad (<i>Bufo americanus charlesmithii</i>)
BFOU	Fowler's toad (<i>B. woodhousii fowleri</i>)
GCAR	Eastern narrowmouth toad (<i>Gastrophryne carolinensis</i>)
HAVI	Bird-voiced treefrog (<i>Hyla avivoca</i>)
HCHR	Cope's gray treefrog (<i>H. chrysoscelis</i>)
HCIN	Green treefrog (<i>H. cinerea</i>)
PCRU	Spring peeper (<i>Pseudacris crucifer</i>)
PSTR	Strecker's chorus frog (<i>P. streckeri</i>)
PTRI	Upland chorus frog (<i>P. triseriata feriarum</i>)
RARE	Crawfish frog (<i>Rana areolata</i>)
RCAT	Bullfrog (<i>R. catesbeiana</i>)
RCLA	Bronze frog (<i>R. clamitans</i>)
RPAL	Pickerel frog (<i>R. palustris</i>)
RUTR	Southern leopard frog (<i>R. utricularia</i>)
SHOL	Eastern spadefoot toad (<i>Scaphiopus holbrookii</i>)
SHUR	Hurter's spadefoot toad (<i>S. holbrookii hurterii</i>)

Salamanders

AMAC	Spotted salamander (<i>Ambystoma maculatum</i>)
AOPA	Marbled salamander (<i>A. opacum</i>)
ATAL	Mole salamander (<i>A. talpoideum</i>)
ATEX	Smallmouth salamander (<i>A. texanum</i>)
ATIG	Eastern tiger salamander (<i>A. tigrinum</i>)
ATRI	Three-toed amphiuma (<i>Amphiuma tridactylum</i>)
EQUA	Dwarf salamander (<i>Eurycea quadridigitata</i>)
HSCU	Four-toed salamander (<i>Hemidactylium scutatum</i>)
NMAC	Red River Mudpuppy (<i>Necturus maculosus</i>)
NVIR	Central newt (<i>Notophthalmus viridescens</i>)
PGLU	Western slimy salamander (<i>Plethodon glutinosus</i>)
SINT	Western lesser siren (<i>Siren intermedia</i>)

REPTILES**Crocodylians**

AMIS	American alligator (<i>Alligator mississippiensis</i>)
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Turtles

AMUT	Midland smooth softshell (<i>Apalone mutica</i>)
ASPI	Spiny softshell (<i>Apalone spinifera</i>)
CPIC	Southern painted turtle (<i>Chrysemys picta</i>)
CSER	Snapping turtle (<i>Chelydra serpentina</i>)
DRET	Western chicken turtle (<i>Deirochelys reticularia</i>)
GGEO	Common map turtle (<i>Graptemys geographica</i>)

Turtles

GKOH	Mississippi map turtle (<i>G. kohnii</i>)
GPSE	Ouachita map turtle (<i>G. pseudogeographica</i>)
KSUB	Mississippi mud turtle (<i>Kinosternon subrubrum</i>)
MTEM	Alligator snapping turtle (<i>Macroclemys temminckii</i>)
PCON	River cooter (<i>Pseuemys concinna</i>)
SCAR	Razorback musk turtle (<i>Sternotherus carinatus</i>)
SODO	Common musk turtle (<i>S. odoratus</i>)
TCAR	Three-toed box turtle (<i>Terrapene carolina</i>)
TORN	Ornate box turtle (<i>Terrapene ornata</i>)
TSCR	Red-eared slider (<i>Trachemys scripta</i>)

Lizards

ACAR	Green anole (<i>Anolis carolinensis</i>)
CSEX	Racerunner (<i>Cnemidophorus sexlineatus</i>)
EANT	Southern coal skink (<i>Eumeces anthracinus</i>)
EFAS	Five-lined skink (<i>E. fasciatus</i>)
ELAT	Broadhead skink (<i>E. laticeps</i>)
OATT	Western slender glass lizard (<i>Ophisaurus attenuatus</i>)
SLAT	Ground skink (<i>Scincella lateralis</i>)
SUND	Northern fence lizard (<i>Sceloporus undulatus</i>)

Snakes

ACON	Southern copperhead (<i>Agkistrodon contortrix</i>)
APIS	Western cottonmouth (<i>Agkistrodon piscivorus</i>)
CCOC	Northern scarlet snake (<i>Cemophora coccinea</i>)
CCON	Southern black racer (<i>Coluber constrictor</i>)
CHOR	Timber rattlesnake (<i>Crotalus horridus</i>)
CVER	Western worm snake (<i>Carphophis vermis</i>)
DPUN	Mississippi ringneck snake (<i>Diadophis punctatus</i>)
EGUT	Great plains rat snake/corn snake (<i>Elaphe guttata</i>)
EOBS	Black rat snake (<i>E. obsoleta</i>)
FABA	Western mud snake (<i>Farancia abacura</i>)
HPLA	Eastern hognose snake (<i>Heterodon platirhinos</i>)
LCAL	Prairie kingsnake (<i>Lampropeltis calligaster</i>)
LGET	Speckled kingsnake (<i>L. getula</i>)
LTRI	Red milk snake (<i>L. triangulum</i>)
MFLA	Eastern coachwhip (<i>Masticophis flagellum</i>)
MFUL	Texas coral snake (<i>Micrurus fulvius</i>)
NCYC	Mississippi green water snake (<i>Nerodia cyclopion</i>)
NERY	Yellowbelly water snake (<i>N. erythrogaster</i>)
NFAS	Broad-banded water snake (<i>N. fasciata</i>)
NRHO	Diamondback water snake (<i>N. rhombifer</i>)
NSIP	Midland water snake (<i>N. sipedon pleuralis</i>)
OAES	Rough green snake (<i>Opheodrys aestivus</i>)
RGRA	Graham's crayfish snake (<i>Regina grahamii</i>)
RRIG	Gulf crayfish snake (<i>R. rigida</i>)
SDEK	Midland brown snake (<i>Storeria dekayi</i>)
SMIL	Western pigmy rattlesnake (<i>Sistrurus miliarius</i>)
SOCC	Northern redbelly snake (<i>Storeria occipitomaculata</i>)
TGRA	Flathead snake (<i>Tantilla gracilis</i>)
TPRO	Western ribbon snake (<i>Thamnophis proximus</i>)
TSIR	Eastern garter snake (<i>T. sirtalis</i>)
VSTR	Rough earth snake (<i>Virginia striatula</i>)
VVAL	Western smooth earth snake (<i>V. valeriae</i>)

APPENDIX C.

Database records of species collections and observations, 2002 and 2003.

Entry No./Date	Array	Trap No.	Species	Age	Status	Notes
5/30/2002						
1	OBS		EOBS	A	DOR	Found on road
2	OBS		OAES	A	DOR	Found on road
3	OBS		EOBS	A	A	Observation near hardwood restoration area
4	OBS		NERY	SA	A	In waterhole near array#2
5	OBS		ACRE	J	A	Hardwood restoration area-near array#2
6	OBS		AMIS	SA	A	Horseshoe lake
7	OBS		AMIS	A	A	Horseshoe lake
8	OBS		TSCR	A	A	Melanistic form of red-eared slider-horseshoe lake
9	OBS		TCAR	A	A	pine restoration area-near array#1
10	OBS		SLAT	SA	A	near array#1
11	OBS		SLAT	A	A	near array#1
12	OBS		SLAT	A	A	near array#1
13	OBS		EANT	SA	A	near array#1
5/31/2002						
14	OBS		PCON	A	A	on road near incinerator
15	1	3	BFOW	A	A	large adult Fowler's toad
16	1	1	RCLA	A	A	
17	1	1	RUTR	SA	A	
18	1	2	ACRE	A	A	1 dead southeastern shrew-1 alive w.f. mouse-pf1
19	OBS		TCAR	A	A	along fence btwn.production area & refuge woods
20	OBS		TCAR	A	A	along fence btwn.production area & refuge woods
21	OBS		TCAR	A	A	along fence btwn.production area & refuge woods
22	OBS		TCAR	A	A	along fence btwn.production area & refuge woods
23	OBS		TCAR	A	A	along fence btwn.production area & refuge woods
24	OBS		TCAR	A	A	along fence btwn.production area & refuge woods
25	OBS		TCAR	A	A	along fence btwn.production area & refuge woods
26	OBS		TCAR	A	A	along fence btwn.production area & refuge woods
27	OBS		TCAR	A	A	along fence btwn.production area & refuge woods
28	OBS		TCAR	A	A	along fence btwn.production area & refuge woods
29	OBS		TCAR	A	A	near array#2
30	2	1	RUTR	J	A	
31	2	pf1	GCAR	A	A	
32	2	2	GCAR	A	A	
33	OBS		BCHA	SA	A	traveling along silt fence at array#2
34	3	1	EFAS	A	A	observed running into trap at array#3 during cons.
35	OBS		AOPA	SA	A	found during construction of array#3
36	1	pf3	SLAT	J	A	
37	OBS		PTRI	A	A	observed along silt fence at array#1
38	2	3	CCON	A	A	48" - large adult racer
39	OBS		CCON	J	DOR	found on road near Warbritton gate
40	OBS		TSCR	A	A	crossing dirt road near arrays#2&3
41	OBS		APIS	A	A	large adult cottonmouth near array#4
42	OBS		APIS	A	A	smaller adult cottonmouth near array#4

Entry No./Date	Array	Trap No.	Species	Age	Status	Notes
6/3/2002						
43	1	3	SUND	A	A	3" female
44	1	pf1	BCHA	J	D	
45	1	pf1	SLAT	A	A	
46	1	pf1	SLAT	A	A	
47	1	pf2	SLAT	A	A	
48	1	pf2	BFOW	A	A	also one live bark scorpion in pf2
49	1	pf2	RCLA	J	A	
50	1	pf2	BCHA	A	D	
51	1	pf2	UnDA	NK	D	UnDA=unidentified dead anuran;NK=not known
52	1	pf2	UnDA	NK	D	
53	1	1	GCAR	A	A	
54	1	1	GCAR	A	A	
55	1	pf3	ACRE	A	D	
56	1	pf3	UnDA	NK	D	
57	1	pf3	RCLA	NK	D	
58	1	pf3	RUTR	A	D	
59	1	pf3	RCLA	SA	D	
60	1	pf3	GCAR	A	D	
61	1	pf3	GCAR	A	D	
62	1	pf3	RCLA	A	D	
63	1	pf3	UnDA	NK	D	
64	1	pf3	SLAT	A	D	
65	1	pf3	SLAT	A	A	only survivor of pf3 from the weekend
66	1	2	ACRE	NK	D	
67	1	2	EOBS	A	D	
68	1	2	RUTR	SA	A	
69	1	2	RUTR	A	A	
70	1	2	RUTR	A	D	
71	1	2	RUTR	A	D	
72	1	2	RUTR	A	D	
73	1	2	RUTR	A	D	
74	1	2	RUTR	A	D	
75	OBS		SLAT	A	A	adjacent to array#1
76	OBS		TCAR	SA	A	along fence btwn.production area & refuge woods
77	OBS		TCAR	SA	A	along fence btwn.production area & refuge woods
78	OBS		TCAR	A	A	along fence btwn.production area & refuge woods
79	OBS		TCAR	A	A	along fence btwn.production area & refuge woods
80	OBS		TCAR	A	A	along fence btwn.production area & refuge woods
81	OBS		TCAR	A	A	along fence btwn.production area & refuge woods
82	3	1	RUTR	SA	D	mortality from fire ants
83	3	1	RUTR	SA	D	mortality from fire ants
84	3	1	RUTR	A	D	mortality from fire ants
85	3	1	RUTR	A	D	mortality from fire ants
86	3	1	RUTR	SA	A	
87	3	1	RUTR	A	A	
88	3	1	RUTR	A	A	
89	3	1	RUTR	A	A	
90	3	pf1	GCAR	A	A	

Entry No./Date	Array	Trap No.	Species	Age	Status	Notes
6/3/2002 (cont.)						
91	OBS		RUTR	A	A	traveling along silt fence at array#3
92	OBS		RUTR	A	A	traveling along silt fence at array#3
93	3	pf2	RUTR	SA	A	
94	3	pf2	SLAT	A	A	
95	3	pf3	GCAR	A	A	also one short-tail shrew in pf3-alive
96	3	3	RUTR	A	A	
97	3	3	RUTR	A	A	
98	3	3	RUTR	A	D	
99	3	3	RUTR	A	D	
100	2	1	SLAT	A	A	
101	2	1	SLAT	A	A	
102	2	1	RUTR	A	A	
103	2	1	RUTR	NK	D	
104	OBS		SUND	A	A	large male running on the silt fence at array#2
105	2	pf2	GCAR	NK	D	evidence of large wolf spider(s) predation
106	2	pf2	BCHA	NK	D	evidence of large wolf spider(s) predation
107	2	2	RUTR	A	A	
108	OBS		BFOV	A	A	large specimen on silt fence at array#2
109	2	pf3	AOPA	SA	A	first salamander caught by trap of the project
110	OBS		BFOV	SA	A	young specimen along silt fence at array#2
111	2	3	SLAT	A	A	
112	2	3	RUTR	NK	D	
113	4	pf2	GCAR	SA	A	
114	4	pf2	GCAR	A	A	also two dead southeastern shrews in pf2-array#4
115	OBS		SUND	A	A	resting on top of trap2-array#4
116	4	pf3	GCAR	A	A	also one dead southeastern shrew in pf3-array#4
117	OBS		TPRO	A	A	in waterholes along logging road to Tulley Lake
118	OBS		TPRO	SA	A	in waterholes along logging road to Tulley Lake
119	OBS		TPRO	A	A	in waterholes along logging road to Tulley Lake
120	OBS		TPRO	A	A	in waterholes along logging road to Tulley Lake
121	OBS		RCAT	SA	A	in waterholes along logging road to Tulley Lake
122	OBS		RCAT	SA	A	in waterholes along logging road to Tulley Lake
123	OBS		RCAT	SA	A	in waterholes along logging road to Tulley Lake
124	OBS		RCAT	SA	A	in waterholes along logging road to Tulley Lake
125	OBS		RCAT	SA	A	in waterholes along logging road to Tulley Lake
126	OBS		RCAT	SA	A	in waterholes along logging road to Tulley Lake
127	OBS		RCAT	SA	A	in waterholes along logging road to Tulley Lake
128	OBS		RCAT	SA	A	in waterholes along logging road to Tulley Lake
129	OBS		RCAT	SA	A	in waterholes along logging road to Tulley Lake
130	OBS		RCAT	SA	A	in waterholes along logging road to Tulley Lake
131	OBS		NERY	SA	A	in waterholes along logging road to Tulley Lake
6/4/2002						
132	OBS		TCAR	A	A	along McCoy Road
133	OBS		TCAR	A	A	along McCoy Road
134	OBS		TCAR	SA	A	along McCoy Road
135	1	pf3	BFOV	A	A	
136	1	3	RUTR	SA	A	
137	OBS		EFAS	SA	A	along silt fence of array#1

Entry No./Date	Array	Trap No.	Species	Age	Status	Notes
6/4/2002 (cont.)						
138	OBS		SUND	A	A	along silt fence of array#1
139	1	pf1	GCAR	A	A	
140	1	pf1	GCAR	A	A	
141	1	pf1	RCLA	SA	A	young bronze frog
142	1	pf1	SLAT	A	A	
143	1	1	RUTR	A	A	
144	1	1	RUTR	SA	A	
145	1	pf2	GCAR	SA	A	individual alive but stressed-put in shady wet spot
146	1	2	RUTR	SA	A	
147	1	2	RUTR	SA	A	
148	1	2	RUTR	SA	A	all young sub-adult so. Leopard frogs in this trap
149	OBS		ACRE	A	A	cricket frog on silt fence at array#1
150	OBS		EOBS	A	A	very large(~5')-on perimeter road by refuge ponds
151	OBS		TSCR	A	A	adult female egg-laying in sand on perimeter road
152	3	3	RUTR	A	A	
153	3	3	RUTR	NK	D	mortality from very large wolf spider in trap
154	OBS		RCLA	A	A	along silt fence at array#3
155	OBS		SUND	SA	A	on silt fence at array#3
156	3	3	RUTR	SA	A	
157	2	1	VSTR	A	A	8"-long rough earth snake
158	2	2	CCON	A	D	no explanation for mortality
159	2	2	GCAR	A	A	
160	2	2	RUTR	A	A	
161	2	2	RUTR	SA	A	
162	2	2	RUTR	A	A	
163	2	2	RUTR	A	A	
164	OBS		TCAR	A	A	along fence btwn. Production area & refuge woods
165	4	2	SUND	A	A	
166	OBS		CSEX	A	A	adult female on horseshoe lake peninsula
167	OBS		CSEX	A	A	adult male on horseshoe lake peninsula
168	OBS		CSEX	SA	A	younger specimen on horseshoe lake peninsula
169	OBS		AMIS	A	A	large adult in "bubbly fountain pond"
170	OBS		OAES	A	A	on logging road adjacent to Tulley Lake
171	OBS		TSCR	A	A	on Wise Road to Triplett's Bluff
172	OBS		CCON	A	A	adjacent to Nilo pond
173	OBS		RUTR	A	A	large brightly colored adult adjacent to Nilo pond
174	OBS		CSEX	A	A	adjacent to water well disturbance near Nilo pond
175	OBS		RCLA	A	A	along creek at fireline on Triplett's bluff
176	OBS		RCLA	A	A	along creek at fireline on Triplett's bluff
177	OBS		RCLA	A	A	along creek at fireline on Triplett's bluff
178	OBS		RCLA	A	A	along creek at fireline on Triplett's bluff
179	OBS		RCLA	A	A	along creek at fireline on Triplett's bluff
180	OBS		RCLA	A	A	along creek at fireline on Triplett's bluff
181	OBS		RCLA	A	A	along creek at fireline on Triplett's bluff
182	OBS		RUTR	SA	A	along creek at fireline on Triplett's bluff
183	OBS		RUTR	A	A	along creek at fireline on Triplett's bluff
184	OBS		RUTR	SA	A	along creek at fireline on Triplett's bluff
185	OBS		RUTR	SA	A	along creek at fireline on Triplett's bluff

Entry No./Date	Array	Trap No.	Species	Age	Status	Notes
6/4/2002 (cont.)						
186	OBS		RUTR	A	A	along creek at fireline on Triplett's bluff
187	OBS		RUTR	A	A	along creek at fireline on Triplett's bluff
188	OBS		PTRI	A	A	along creek at fireline on Triplett's bluff
189	OBS		PTRI	A	A	along creek at fireline on Triplett's bluff
190	OBS		PTRI	A	A	along creek at fireline on Triplett's bluff
191	OBS		ACRE	A	A	along creek at fireline on Triplett's bluff
6/6/2002						
192	1	3	LGET	A	A	3' speckled kingsnake
193	1	3	RUTR	A	A	
194	1	3	RUTR	SA	D	predation evident-viscera removed
195	1	3	RUTR	A	D	predation evident-viscera removed
196	1	3	RCLA	A	A	
197	1	pf3	BFOW	A	A	
198	1	1	GCAR	A	A	
199	1	1	GCAR	A	A	
200	1	2	RUTR	A	D	partially eaten-possibly from live harvest mouse
201	1	2	AMAC	A	A	first salamander caught in funnel trap of project
202	OBS		TCAR	A	A	mating along production area fence
203	OBS		TCAR	A	A	mating along production area fence
204	OBS		TCAR	A	D	recently (<2days) predated
205	3	1	RUTR	A	A	
206	3	1	RUTR	A	A	
207	3	1	RUTR	SA	A	
208	3	1	RUTR	A	A	
209	3	1	RUTR	A	A	
210	3	1	RUTR	A	A	
211	3	1	RUTR	SA	A	
212	3	1	RUTR	SA	A	
213	3	1	RUTR	A	A	
214	3	1	RUTR	A	A	
215	3	1	RUTR	A	A	
216	3	1	RUTR	SA	A	
217	3	1	RUTR	NK	D	mortality from very large wolf spider in trap
218	3	pf1	RUTR	NK	D	half-consumed-possibly from live s.t. shrew
219	OBS		RUTR	A	A	on silt fence at array#3
220	3	3	RUTR	A	A	
221	3	2	AOPA	A	A	
222	3	2	AOPA	A	A	
223	3	2	AMAC	J	A	
224	3	2	AMAC	A	A	
225	2	1	RUTR	A	A	
226	2	1	AMAC	A	A	
227	2	1	EFAS	SA	A	young five-lined skink still with bright blue tail
228	2	1	RUTR	A	A	
229	2	2	BFOW	A	A	
230	2	2	RUTR	A	A	
231	2	2	RUTR	A	A	
232	2	2	RUTR	A	A	

Entry No./Date	Array	Trap No.	Species	Age	Status	Notes
6/6/2002 (cont.)						
233	2	2	RUTR	A	A	
234	2	2	RUTR	A	A	
235	2	2	RUTR	A	A	
236	2	2	RUTR	A	A	
237	2	2	RUTR	A	A	
238	2	2	RUTR	A	A	
239	2	2	RUTR	A	A	
240	2	2	RUTR	A	A	
241	2	2	RUTR	A	D	
242	2	2	RUTR	A	D	
243	2	2	RUTR	A	D	
244	2	2	RUTR	J	A	
245	2	2	AMAC	SA	A	
246	4	2	VSTR	SA	A	young rough earth snake
247	4	pf3	GCAR	A	A	
248	4	3	SUND	A	A	fence lizard
6/7/2002						
249	1	pf1	SLAT	A	A	lost tail on release
250	1	pf1	GCAR	SA	A	
251	1	pf3	GCAR	A	A	
252	OBS		TCAR	A	A	production area fenceline
253	OBS		BCHA	A	D	found on road dead-near arrays 2/3
254	3	1	RUTR	A	A	
255	3	1	RUTR	A	A	
256	3	1	RUTR	A	A	
257	3	pf1	RCLA	A	A	
258	3	2	RUTR	A	D	predated by shrew in trap
259	3	2	RUTR	A	D	predated by shrew in trap
260	3	2	GCAR	A	A	
261	3	3	RUTR	A	A	
262	OBS		RUTR	A	A	
263	2	pf2	RUTR	A	A	
264	2	pf2	RUTR	A	A	
265	2	2	RUTR	A	A	
266	2	2	RUTR	A	A	
267	2	2	RUTR	A	A	
268	OBS		SUND	A	A	on silt fence at array#2
269	OBS		EFAS	A	A	on silt fence at array#2
270	2	3	RUTR	A	A	
271	OBS		SLAT	A	A	on trail between arrays 2 and 3
272	OBS		SLAT	A	A	on trail between arrays 2 and 3
273	4	2	NERY	J	A	first watersnake caught by trap of study
274	OBS		TSCR	A	A	in first of 2 drainage ponds near horseshoe pond
7/10/2002						
275	OBS		SUND	A	A	near array#1 on log
276	1	pf2	SLAT	A	A	
277	OBS		BCHA	J	A	very young
278	OBS		BCHA	A	D	near array#3-no evidence of predation

279	2	3	RCLA	A	A	
Entry No./Date	Array	Trap No.	Species	Age	Status	Notes
7/10/2002 (cont.)						
280	2	2	ACRE	A	A	
7/12/2002						
281	3	3	RUTR	A	D	killed by fire ants
282	3	pf3	EFAS	A	A	
283	3	pf3	EFAS	SA	A	
284	2	1	RUTR	SA	D	
285	2	3	RUTR	A	A	
286	2	3	BCHA	A	D	evidence of predation
287	2	3	RUTR	SA	D	
288	5	2	TPRO	A	A	western ribbon snake
289	4	2	LCAL	A	A	prairie kingsnake
290	6	pf1	EFAS	SA	A	
7/13/2002						
291	1	pf3	GCAR	A	A	
292	1	2	AOPA	A	A	
293	1	2	RUTR	A	A	
294	1	2	RUTR	SA	A	
295	1	2	PCRU	J	A	young spring peeper
296	1	pf1	GCAR	A	A	
297	1	pf1	BCHA	J	A	
298	1	3	BCHA	J	A	
299	1	3	BCHA	J	A	
300	1	3	BCHA	J	A	
301	1	3	GCAR	A	A	
302	1	3	GCAR	A	A	
303	1	3	RUTR	A	A	
304	1	3	GCAR	A	A	
305	1	3	BFOW	J	A	
306	1	3	GCAR	SA	A	
307	1	3	GCAR	J	A	
308	1	3	RUTR	A	A	
309	1	3	GCAR	A	A	
310	1	3	ACRE	J	A	
311	1	pf2	BFOW	J	A	
312	1	pf2	BFOW	J	A	
313	1	pf2	BFOW	J	A	
314	1	pf2	BFOW	J	A	
315	1	pf2	BFOW	J	A	
316	1	pf2	BFOW	J	A	
317	1	pf2	BFOW	J	A	
318	1	1	RUTR	A	A	
319	1	1	GCAR	A	A	
320	1	1	GCAR	A	A	
321	1	1	GCAR	A	A	
322	1	1	RUTR	A	A	
323	1	1	BFOW	A	A	
324	1	1	BFOW	A	A	
325	3	3	RUTR	A	A	

Entry No./Date	Array	Trap No.	Species	Age	Status	Notes
7/13/2002 (cont.)						
326	3	3	RUTR	A	A	
327	3	1	GCAR	SA	A	
328	3	2	RUTR	A	A	
329	3	pf3	BCHA	SA	A	
330	3	pf3	EFAS	J	A	
331	3	1	BFOW	J	A	
332	3	1	BFOW	J	A	
333	3	1	BFOW	J	A	
334	3	1	BFOW	J	A	
335	2	1	CCON	A	A	
336	2	1	CCON	A	A	
337	2	1	BFOW	J	A	
338	2	pf1	GCAR	SA	A	
339	2	pf1	GCAR	SA	A	
340	2	2	GCAR	J	A	
341	2	2	RUTR	A	A	
342	2	2	RUTR	A	A	
343	2	2	GCAR	A	A	
344	2	2	RUTR	SA	A	
345	2	2	RUTR	SA	A	
346	2	2	BFOW	J	A	
347	4	2	AOPA	A	A	
348	OBS		SUND	A	A	on trap at array#5
349	5	pf2	ATAL	A	A	**mole salamander-outside of listed range
350	6	3	TPRO	SA	A	
351	OBS		RUTR	A	A	by nilo pond
352	OBS		RUTR	A	A	by nilo pond
353	OBS		CSEX	A	A	by nilo pond
354	OBS		TPRO	SA	A	by nilo pond
7/17/2002						
355	1	3	SLAT	A	A	
356	3	3	GCAR	A	A	
357	3	3	RUTR	A	A	
358	OBS		TCAR	A	A	inside production area fenceline
7/18/2002						
359	1	2	PCRU	A	A	
360	1	pf1	GCAR	A	A	
361	1	3	RUTR	A	A	
362	1	3	BFOW	J	A	
363	1	3	RUTR	A	A	
364	1	3	BFOW	J	A	
365	1	3	RUTR	A	A	
366	1	3	ACRE	A	A	
367	1	3	ACRE	A	A	
368	1	1	GCAR	SA	A	
369	1	1	RUTR	A	A	
370	1	1	ACRE	J	A	
371	OBS		TPRO	A	A	along fenceline at array#3

372	3	2	RUTR	A	A	
Entry No./Date	Array	Trap No.	Species	Age	Status	Notes
7/18/2002 (cont.)						
373	2	1	RUTR	A	A	
374	2	3	RUTR	A	A	
375	2	3	RUTR	A	A	
376	2	2	RUTR	A	A	
377	2	2	RUTR	A	A	
378	OBS		TCAR	A	A	along production area fenceline
379	OBS		TCAR	A	A	along production area fenceline
380	OBS		AMIS	J	A	in Tulley Creek near horseshoe pond turnoff
381	OBS		TSCR	A	A	in Tulley Creek near horseshoe pond turnoff
382	5	2	ACRE	J	A	
383	5	2	ACRE	J	A	
384	4	1	ACRE	J	A	
385	OBS		RUTR	A	A	
386	OBS		TSCR	A	A	on road to array#6
387	6	1	GCAR	A	A	

Entry #	Date	Array	Trap #	Species	Age	Status	Notes
1	30-Apr.-03	OBS		TCAR	A	A	crossing McCoy Road
2	30-Apr.-03	OBS		ACRE	J	A	in waterholes by Array #3
3	30-Apr.-03	OBS		ACRE	J	A	in waterholes by Array #3
4	30-Apr.-03	OBS		ACRE	J	A	in waterholes by Array #3
5	30-Apr.-03	OBS		EFAS	J	A	on silt fence at Array #2
6	30-Apr.-03	OBS		EOBS	A	A	crossing road near Tulley Lake (5')
7	30-Apr.-03	OBS		ACRE	A	A	in waterholes between arrays 5 and 6
8	30-Apr.-03	OBS		ACRE	A	A	in waterholes between arrays 5 and 6
9	30-Apr.-03	OBS		ACRE	A	A	in waterholes between arrays 5 and 6
10	30-Apr.-03	OBS		ACRE	J	A	in waterholes between arrays 5 and 6
11	30-Apr.-03	OBS		ACRE	J	A	in waterholes between arrays 5 and 6
12	30-Apr.-03	OBS		ACRE	J	A	in waterholes between arrays 5 and 6
13	30-Apr.-03	OBS		ACRE	J	A	in waterholes between arrays 5 and 6
14	30-Apr.-03	OBS		ACRE	J	A	in waterholes between arrays 5 and 6
15	30-Apr.-03	OBS		ELAT	A	A	Broadhead skink, large adult
16	30-Apr.-03	OBS		ELAT	A	A	Broadhead skink, large adult
17	30-Apr.-03	OBS		RCAT	A	A	Bullfrog, large adult
18	1-May-03	1	1	NERY	A	A	large yellowbelly watersnake
19	1-May-03	1	1	CCON	A	A	racer in same trap with watersnake
20	1-May-03	2	1	ACON	A	A	first copperhead of study
21	1-May-03	OBS		LGET	A	A	speckled kingsnake
22	1-May-03	4	3	NERY	J	A	young yellowbelly watersnake
23	1-May-03	OBS		RCLA	A	A	bronze frog
24	1-May-03	OBS		ACRE	A	A	cricket frog
25	1-May-03	OBS		ACRE	A	A	
26	1-May-03	OBS		ACRE	A	A	
27	1-May-03	OBS		ACRE	A	A	
28	1-May-03	6	2	EFAS	J	A	five-lined skink

29	1-May-03	6	3	CCON	A	A	racer
30	1-May-03	OBS		TCAR	A	A	
31	1-May-03	OBS		CCON	A	A	eating unidentified frog
32	1-May-03	OBS		RUTR	A	A	southern leopard frog
33	1-May-03	8	2	ACON	A	A	very large adult copperhead
34	1-May-03	8	2	ACON	J	A	juvenile copperhead
35	1-May-03	9	2	TSIR	A	A	eastern garter snake
36	1-May-03	OBS		TSCR	A	A	red-eared slider in Yellow Lake
37	2-May-03	1	pf1	GCAR	A	A	
38	2-May-03	3	pf3	ATEX	J	A	smallmouth salamander
39	2-May-03	3	pf3	ATEX	J	A	
40	2-May-03	2	pf1	AOPA	J	A	marbled salamander
41	2-May-03	2	pf1	ATEX	J	A	
42	2-May-03	2	pf3	ATEX	J	A	
43	2-May-03	OBS		SUND	A	A	fence lizard near array#2
44	2-May-03	OBS		TCAR	A	A	on fence adjacent to production area
45	2-May-03	OBS		TCAR	A	A	on fence adjacent to production area
46	2-May-03	OBS		TCAR	A	A	on fence adjacent to production area
47	2-May-03	OBS		TCAR	A	A	on fence adjacent to production area
48	2-May-03	OBS		TCAR	A	A	on fence adjacent to production area
49	2-May-03	OBS		TCAR	A	A	on fence adjacent to production area
50	2-May-03	OBS		TSCR	A	A	on fence adjacent to production area
51	2-May-03	5	2	PTRI	J	A	upland chorus frog
52	2-May-03	4	1	EANT	A	A	coal skink
53	2-May-03	4	2	HPLA	A	A	large eastern hognose snake
54	2-May-03	OBS		CCON	A	A	on road between arrays 4 and 6
55	2-May-03	OBS		NFAS	SA	A	broad-banded watersnake
56	2-May-03	OBS		SUND	A	A	near array#8
57	2-May-03	8	1	ACRE	A	D	cricket frog eaten by fire ants
58	2-May-03	OBS		RCAT	A	A	large bullfrog in Nilo pond
59	2-May-03	OBS		NFAS	J	A	adjacent to Nilo pond
60	2-May-03	8	2	ACON	A	A	copperhead
61	2-May-03	OBS		SUND	A	A	near array#8
62	2-May-03	OBS		RCAT	J	A	near Nilo pond
63	2-May-03	OBS		RCAT	A	A	Phillips Creek at McCoy Road
64	2-May-03	OBS		TPRO	SA	A	Phillips Creek at McCoy Road
65	2-May-03	OBS		NFAS	SA	A	Phillips Creek at McCoy Road
66	2-May-03	OBS		NFAS	A	A	Phillips Creek at McCoy Road
67	2-May-03	OBS		PTRI	A	A	Phillips Creek at McCoy Road
68	2-May-03	OBS		PTRI	A	A	Phillips Creek at McCoy Road
69	2-May-03	OBS		PTRI	A	A	Phillips Creek at McCoy Road
70	2-May-03	OBS		PTRI	A	A	Phillips Creek at McCoy Road
71	2-May-03	OBS		PTRI	A	A	Phillips Creek at McCoy Road
72	2-May-03	OBS		TSCR	A	A	Phillips Creek at McCoy Road
73	3-May-03	1	1	SUND	A	A	
74	3-May-03	OBS		TCAR	A	A	
75	3-May-03	OBS		TCAR	A	A	
76	3-May-03	5	1	CCON	J	A	juvenile black racer

77	3-May-03	OBS		LGET	A	DOR	speckled kingsnake hit by car
78	3-May-03	OBS		SODO	A	A	crossing Webster Road near large pond
79	3-May-03	7	3	EFAS	A	A	very large five-lined skink
80	3-May-03	9	1	TSIR	SA	A	sub-adult eastern garter snake
81	3-May-03	OBS		ACON	A	DOR	copperhead hit by car on Webster Road
82	4-May-03	OBS		EOBS	SA	A	young black rat snake crossing refuge woods road
83	4-May-03	1	2	CCON	A	A	large racer
84	4-May-03	OBS		SUND	J	A	sunning on drift fence
85	4-May-03	1	pf1	SUND	A	A	
86	4-May-03	1	pf1	SLAT	A	A	
87	4-May-03	2	pf1	ACRE	J	A	
88	4-May-03	OBS		TSIR	A	A	on road between arrays 4 and 6
89	4-May-03	5	1	EANT	A	A	another coal skink
90	4-May-03	5	pf1	SUND	A	A	
91	4-May-03	OBS		TPRO	A	A	along drift fence at array#5
92	4-May-03	6	2	SUND	A	A	large adult fence lizard
93	4-May-03	OBS		CCON	A	A	on road by array#4
94	4-May-03	OBS		CSEX	A	A	near array#8
95	4-May-03	8	3	TPRO	A	A	large eastern ribbon snake
96	4-May-03	OBS		CCON	A	A	near Nilo pond
97	5-May-03	1	1	BCHA	A	A	dwarf American toad
98	5-May-03	1	pf2	TCAR	J	A	very small baby box turtle
99	5-May-03	1	3	DPUN	A	A	Mississippi ringneck snake
100	5-May-03	2	pf1	GCAR	A	A	eastern narrowmouth toad
101	5-May-03	2	pf3	GCAR	A	A	
102	5-May-03	OBS		SLAT	A	A	ground skink
103	5-May-03	5	2	RCAT	A	A	bullfrog in trap
104	5-May-03	OBS		TPRO	SA	A	by Nilo pond
105	5-May-03	OBS		TPRO	A	A	on trail by array#9
106	5-May-03	OBS		TCAR	A	A	crossing Wise Road
107	6-May-03	1	1	CCON	A	A	48" racer
108	6-May-03	1	2	SUND	J	A	missing tail
109	6-May-03	1	3	SLAT	A	A	
110	6-May-03	3	2	SLAT	A	A	
111	6-May-03	3	pf3	AOPA	A	A	dozen marbled salamanders in one pitfall trap
112	6-May-03	3	pf3	AOPA	A	A	dozen marbled salamanders in one pitfall trap
113	6-May-03	3	pf3	AOPA	A	A	dozen marbled salamanders in one pitfall trap
114	6-May-03	3	pf3	AOPA	A	A	dozen marbled salamanders in one pitfall trap
115	6-May-03	3	pf3	AOPA	A	A	dozen marbled salamanders in one pitfall trap
116	6-May-03	3	pf3	AOPA	A	A	dozen marbled salamanders in one pitfall trap
117	6-May-03	3	pf3	AOPA	A	A	dozen marbled salamanders in one pitfall trap
118	6-May-03	3	pf3	AOPA	A	A	dozen marbled salamanders in one pitfall trap
119	6-May-03	3	pf3	AOPA	A	A	dozen marbled salamanders in one pitfall trap
120	6-May-03	3	pf3	AOPA	A	A	dozen marbled salamanders in one pitfall trap
121	6-May-03	3	pf3	AOPA	A	A	dozen marbled salamanders in one pitfall trap
122	6-May-03	3	pf3	AOPA	A	A	dozen marbled salamanders in one pitfall trap
123	6-May-03	3	pf3	AOPA	A	A	dozen marbled salamanders in one pitfall trap

124	6-May-03	3	pf1	AOPA	A	A	more marbled salamanders
125	6-May-03	3	pf1	AOPA	A	A	more marbled salamanders
126	6-May-03	3	pf1	AOPA	A	A	more marbled salamanders
127	6-May-03	3	pf1	AOPA	A	A	more marbled salamanders
128	6-May-03	2	pf1	AOPA	A	A	more marbled salamanders
129	6-May-03	2	pf1	AOPA	A	A	more marbled salamanders
130	6-May-03	2	pf1	AOPA	A	A	more marbled salamanders
131	6-May-03	2	pf1	GCAR	A	A	eastern narrowmouth toad
132	6-May-03	2	pf2	AOPA	A	A	more marbled salamanders
133	6-May-03	2	pf2	AOPA	A	A	more marbled salamanders
134	6-May-03	2	2	GCAR	A	A	
135	6-May-03	OBS		SLAT	A	A	ground skink on drift fence at array#2
136	6-May-03	2	pf3	RUTR	J	D	drowned leopard frog
137	6-May-03	5	2	ACRE	J	A	cricket frog
138	6-May-03	8	1	RUTR	A	A	
139	6-May-03	OBS		TPRO	A	A	near array#7
140	7-May-03	1	pf1	GCAR	A	A	
141	7-May-03	1	pf1	GCAR	A	A	
142	7-May-03	1	pf1	BCHA	A	A	dwarf American toad
143	7-May-03	OBS		SLAT	A	A	near array#1
144	7-May-03	1	3	GCAR	A	A	
145	7-May-03	1	3	GCAR	A	A	
146	7-May-03	1	3	GCAR	A	A	
147	7-May-03	1	3	CCON	SA	A	small black racer
148	7-May-03	OBS		TCAR	A	A	production area fenceline
149	7-May-03	OBS		TCAR	A	A	production area fenceline
150	7-May-03	OBS		TCAR	A	A	production area fenceline
151	7-May-03	OBS		CCON	A	A	crossing road near Warbritton gate
152	7-May-03	3	1	RUTR	A	A	southern leopard frog
153	7-May-03	3	pf3	AOPA	A	A	marbled salamander
154	7-May-03	3	pf3	AOPA	A	A	
155	7-May-03	3	pf3	AOPA	A	A	
156	7-May-03	3	pf3	GCAR	A	A	
157	7-May-03	3	3	GCAR	A	A	
158	7-May-03	3	3	HCIN	A	A	first green treefrog of study
159	7-May-03	3	3	GCAR	J	A	
160	7-May-03	2	1	GCAR	J	A	
161	7-May-03	2	2	GCAR	A	A	
162	7-May-03	2	2	GCAR	A	A	
163	7-May-03	2	2	GCAR	A	A	
164	7-May-03	OBS		HCHR	A	A	gray treefrog on drift fence at array#5--first of study
165	7-May-03	5	3	NFAS	J	A	young broad-banded watersnake
166	7-May-03	OBS		TCAR	A	A	damaged carapace
167	7-May-03	7	3	TPRO	J	A	young ribbon snake
168	7-May-03	9	pf3	GCAR	A	A	
169	7-May-03	9	pf3	GCAR	A	A	
170	7-May-03	9	pf3	GCAR	A	A	
171	7-May-03	6	3	BCHA	A	A	

172	8-May-03	1	1	SUND	A	A	
173	8-May-03	1	pf1	GCAR	A	A	
174	8-May-03	1	pf1	GCAR	A	A	
175	8-May-03	1	pf2	BFOV	J	A	juvenile Fowler's toad
176	8-May-03	1	2	CCON	A	A	large racer
177	8-May-03	1	pf3	GCAR	A	A	
178	8-May-03	1	pf3	GCAR	A	A	
179	8-May-03	1	pf3	GCAR	A	A	
180	8-May-03	1	pf3	GCAR	A	A	
181	8-May-03	1	pf3	GCAR	A	A	
182	8-May-03	1	pf3	GCAR	A	A	
183	8-May-03	1	3	GCAR	A	A	
184	8-May-03	OBS		TSCR	A	A	near refuge ponds on road
185	8-May-03	3	1	ELAT	A	A	very large male broadhead skink
186	8-May-03	2	1	AOPA	J	A	young marbled salamander
187	8-May-03	2	1	GCAR	A	A	
188	8-May-03	2	3	TSIR	J	A	young garter snake
189	8-May-03	OBS		TSCR	A	A	on road to Horseshoe pond
190	8-May-03	OBS		CCON	A	A	near array#5 in a sweetgum shrub
191	8-May-03	OBS		CCON	A	A	adjacent to other racer but on the ground
192	8-May-03	OBS		TPRO	A	A	on road between arrays 4 and 5
193	8-May-03	OBS		APIS	A	A	42" very large cottonmouth in mudhole near array#4
194	8-May-03	OBS		TPRO	A	A	ribbon snake on road between arrays 4 and 6
195	8-May-03	OBS		NFAS	J	A	baby broad-banded watersnake
196	8-May-03	OBS		NFAS	J	A	next to Nilo pond
197	8-May-03	OBS		CSEK	SA	A	relatively small snapping turtle near Nilo pond
198	8-May-03	OBS		CCON	A	A	racer on trail between arrays 7 and 9
199	8-May-03	9	2	GCAR	A	A	
200	8-May-03	9	pf3	GCAR	A	D	narrowmouth toad-drowned in bucket
201	8-May-03	OBS		CCON	A	A	observed mating next to Nilo pond
202	8-May-03	OBS		CCON	A	A	observed mating next to Nilo pond
203	8-May-03	OBS		CSEX	A	A	racerunner taking shelter under our truck
204	8-May-03	OBS		NERY	A	A	yellowbelly watersnake crossing Doolittle road
205	9-May-03	2	1	CCON	A	A	
206	9-May-03	2	1	TCAR	J	A	baby three-toed box turtle
207	9-May-03	2	pf2	GCAR	A	A	
208	9-May-03	2	3	LGET	J	A	young speckled kingsnake
209	9-May-03	2	3	EOBS	A	A	large black rat snake
210	9-May-03	OBS		CCON	SA	A	on road near array#3
211	9-May-03	5	2	TPRO	A	A	
212	9-May-03	4	2	TPRO	A	A	
213	9-May-03	OBS		CCON	A	DOR	DOR on Doolittle Road
214	9-May-03	OBS		TPRO	A	A	on road to array#6
215	9-May-03	OBS		SUND	A	A	on drift fence at array#6
216	9-May-03	OBS		EFAS	A	A	on road to array#8
217	9-May-03	OBS		RUTR	A	A	leopard frog near array#8
218	9-May-03	8	1	BFOV	A	A	
219	9-May-03	OBS		EFAS	A	A	on drift fence at array#8
220	9-May-03	OBS		EFAS	SA	A	near array#8

221	9-May-03	9	pf2	GCAR	A	A	
222	11-May-03	OBS		EFAS	A	A	on drift fence at array#1
223	11-May-03	3	1	RUTR	A	A	
224	11-May-03	3	1	AOPA	J	A	juvenile marbled salamander
225	11-May-03	3	1	GCAR	A	A	
226	11-May-03	3	1	AOPA	J	A	another juvenile marbled salamander
227	11-May-03	3	3	ELAT	A	A	large male broadhead skink
228	11-May-03	3	3	TSIR	A	A	eastern garter snake
229	11-May-03	2	2	GCAR	A	D	drowned in bucket
230	11-May-03	2	2	GCAR	A	D	drowned in bucket
231	11-May-03	2	2	GCAR	A	D	drowned in bucket
232	11-May-03	OBS		CSER	J	A	very small baby snapping turtle
233	11-May-03	OBS		RCLA	A	A	bronze frog
234	11-May-03	OBS		TSIR	A	A	on road to array#6
235	11-May-03	6	1	EFAS	A	A	
236	11-May-03	6	2	ELAT	A	A	giant male broadhead skink (~11")
237	11-May-03	6	3	EFAS	A	A	
238	11-May-03	OBS		TSIR	SA	A	young garter snake on road between arrays 4 and 6
239	11-May-03	OBS		TSIR	SA	A	another young garter snake
240	11-May-03	OBS		TPRO	A	A	ribbon snake on road between arrays 4 and 6
241	11-May-03	8	1	EFAS	A	A	
242	11-May-03	OBS		RCLA	A	A	between arrays 7 and 8
243	11-May-03	7	1	TPRO	SA	A	
244	11-May-03	9	pf2	GCAR	A	A	
245	11-May-03	9	2	RUTR	A	D	dessicated
246	11-May-03	OBS		RUTR	A	A	creek on Triplett's Bluff
247	11-May-03	OBS		NERY	SA	A	creek on Triplett's Bluff
248	11-May-03	OBS		EFAS	A	A	Triplett's Bluff
249	11-May-03	OBS		EFAS	A	A	Triplett's Bluff
250	11-May-03	OBS		EFAS	A	A	Triplett's Bluff
251	11-May-03	OBS		RUTR	A	A	Nilo pond
252	11-May-03	OBS		RUTR	A	A	Nilo pond
253	11-May-03	OBS		CCON	A	A	Wise Road
254	12-May-03	3	3	TPRO	A	A	
255	12-May-03	2	1	VSTR	J	A	young rough earth snake
256	12-May-03	OBS		TCAR	A	A	production area fenceline
257	12-May-03	OBS		CCON	A	DOR	DOR on Siebert Road
258	12-May-03	5	2	ACRE	SA	A	
259	12-May-03	4	2	LGET	A	A	large speckled kingsnake
260	12-May-03	4	3	SLAT	A	A	ground skink
261	12-May-03	OBS		RUTR	A	A	near Nilo pond
262	12-May-03	OBS		SUND	A	A	near Nilo pond
263	12-May-03	8	1	CCON	A	A	large racer
264	12-May-03	8	pf3	TCAR	A	D	drowned in pitfall trap
265	12-May-03	8	3	CCON	J	A	young racer
266	12-May-03	OBS		CSEX			on trail by Nilo pond
267	13-May-03	1	pf1	SUND	A	A	fence lizard

268	13-May-03	1	pf1	SUND	A	A	fence lizard
269	13-May-03	3	3	TPRO	A	A	ribbon snake
270	13-May-03	2	1	ELAT	A	A	large broadhead skink
271	13-May-03	2	pf2	EFAS	A	A	five-lined skink
272	13-May-03	OBS		TCAR	A	A	production area fenceline
273	13-May-03	OBS		TCAR	A	A	production area fenceline
274	13-May-03	OBS		CCON	A	A	between arrays 7 and 8
275	14-May-03	OBS		TCAR	A	A	production area fenceline
276	14-May-03	2	2	ELAT	A	A	
277	14-May-03	2	pf2	GCAR	A	A	
278	14-May-03	8	pf2	GCAR	A	A	
279	14-May-03	9	1	NVIR	SA	A	Central newt eft
280	14-May-03	9	1	NVIR	SA	A	Central newt eft
281	14-May-03	9	pf1	NVIR	SA	D	Central newt eft
282	15-May-03	1	3	GCAR	A	A	
283	15-May-03	1	2	ACRE	A	A	production area fenceline
284	15-May-03	OBS		TCAR	A	A	production area fenceline
285	15-May-03	OBS		TCAR	A	A	production area fenceline
286	15-May-03	OBS		TCAR	A	A	production area fenceline
287	15-May-03	OBS		TCAR	A	A	production area fenceline
288	15-May-03	OBS		TCAR	A	A	production area fenceline
289	15-May-03	OBS		TSCR	A	A	on road by refuge ponds
290	15-May-03	9	3	GCAR	A	A	
291	16-May-03	OBS		TCAR	A	A	by refuge ponds
292	16-May-03	2	1	BCHA	A	A	
293	16-May-03	OBS		EFAS	A	A	on drift fence at array#2
294	16-May-03	OBS		TCAR	A	A	crossing road at fire station
295	16-May-03	OBS		TCAR	A	A	crossing Atkisson Road
296	16-May-03	OBS		SUND	A	A	on drift fence at array#4
297	16-May-03	4	3	SUND	A	A	
298	16-May-03	4	3	GCAR	A	A	
299	16-May-03	6	pf2	EFAS	A	A	
300	16-May-03	8	4	RCLA	A	A	
301	16-May-03	9	1	EFAS	A	A	
302	16-May-03	9	3	EFAS	A	A	giant male five-lined skink(~9")
303	16-May-03	OBS		RUTR	A	A	near Nilo pond
304	16-May-03	OBS		NFAS	A	A	near Nilo pond
305	18-May-03	1	3	RCLA	J	A	juvenile bronze frog
306	18-May-03	1	3	RUTR	J	A	juvenile leopard frog
307	18-May-03	1	2	GCAR	A	A	
308	18-May-03	1	2	GCAR	A	A	
309	18-May-03	OBS		CCON	A	A	large racer by array#1
310	18-May-03	OBS		TPRO	A	A	on road by refuge ponds
311	18-May-03	OBS		KSUB	A	A	Mississippi mud turtle on road by refuge ponds
312	18-May-03	OBS		APIS	A	DOR	DOR on road adjacent to refuge ponds
313	18-May-03	3	1	RUTR	SA	A	

314	18-May-03	3	2	GCAR	A	A	
315	18-May-03	3	3	SLAT	A	A	
316	18-May-03	2	2	NFAS	SA	A	young broad-banded watersnake
317	18-May-03	2	2	TSIR	SA	A	young eastern garter snake
318	18-May-03	2	2	GCAR	A	A	narrowmouth toad
319	18-May-03	2	3	SLAT	A	A	
320	18-May-03	OBS		TCAR	A	A	crossing Siebert Road
321	18-May-03	5	pf2	SUND	A	D	drowned in pitfall trap
322	18-May-03	OBS		SUND	A	A	on drift fence at array#5
323	18-May-03	OBS		NERY	J	A	crossing road near Horseshoe pond
324	18-May-03	OBS		TPRO	A	A	crossing road near Horseshoe pond
325	18-May-03	8	4	RCLA	A	A	large bronze frog
326	18-May-03	8	3	RUTR	A	A	
327	18-May-03	9	1	NVIR	SA	A	central newt eft
328	18-May-03	9	1	GCAR	A	A	
329	18-May-03	OBS		TPRO	A	A	along Doolittle Road
330	18-May-03	OBS		RUTR	A	A	near Nilo pond
331	18-May-03	OBS		RCLA	A	A	in puddle along trail to arrays 7 and 9
332	18-May-03	6	1	APIS	J	A	young cottonmouth
333	18-May-03	6	3	SLAT	A	A	
334	19-May-03	1	1	RCLA	A	A	
335	19-May-03	1	1	SUND	A	A	
336	19-May-03	3	pf3	GCAR	A	A	
337	19-May-03	OBS		TCAR	A	A	production area fenceline
338	19-May-03	OBS		TCAR	A	A	production area fenceline
339	19-May-03	OBS		TCAR	A	A	production area fenceline
340	19-May-03	OBS		TCAR	A	A	production area fenceline
341	19-May-03	OBS		TCAR	A	A	production area fenceline
342	19-May-03	OBS		TCAR	A	A	production area fenceline
343	19-May-03	OBS		TCAR	A	A	production area fenceline
344	19-May-03	OBS		TCAR	A	A	production area fenceline
345	19-May-03	OBS		SUND	A	A	next to Horseshoe pond
346	19-May-03	OBS		TPRO	A	A	road to array#6
347	19-May-03	OBS		NERY	J	A	road to array#6
348	21-May-03	1	1	RUTR	A	A	
349	21-May-03	1	pf2	RUTR	A	D	predated
350	21-May-03	1	3	LGET	A	A	speckled kingsnake
351	21-May-03	3	3	EFAS	A	A	
352	21-May-03	2	1	ACRE	A	D	partially eaten
353	21-May-03	2	3	TSIR	A	A	eastern garter snake
354	21-May-03	2	3	EOBS	J	A	juvenile black rat snake
355	21-May-03	2	2	TSIR	A	A	eastern garter snake
356	21-May-03	OBS		TCAR	A	A	production area fenceline
357	21-May-03	OBS		TCAR	A	A	production area fenceline
358	21-May-03	OBS		TCAR	A	A	production area fenceline
359	21-May-03	OBS		TCAR	A	A	production area fenceline
360	21-May-03	OBS		TCAR	A	A	production area fenceline
361	21-May-03	OBS		TCAR	A	A	production area fenceline

362	21-May-03	5	2	SUND	A	A	
363	21-May-03	7	pf1	ELAT	A	A	
364	21-May-03	9	1	NVIR	SA	A	central newt eft
365	21-May-03	9	2	TCAR	J	A	very small baby three-toed box turtle
366	22-May-03	1	1	RUTR	J	A	
367	22-May-03	1	3	RUTR	J	A	
368	22-May-03	OBS		TCAR	A	A	production area fenceline
369	22-May-03	OBS		TCAR	A	A	production area fenceline
370	22-May-03	OBS		TCAR	A	A	production area fenceline
371	22-May-03	OBS		TCAR	A	A	production area fenceline
372	22-May-03	OBS		TCAR	A	A	production area fenceline
373	22-May-03	OBS		TCAR	A	A	production area fenceline
374	22-May-03	4	1	SUND	A	A	
375	22-May-03	8	1	SUND	A	A	
376	23-May-03	1	2	SUND	J	A	missing tail
377	23-May-03	3	pf1	SUND	SA	A	young fence lizard
378	23-May-03	OBS		TCAR	A	A	production area fenceline
379	23-May-03	OBS		TCAR	A	A	production area fenceline
380	23-May-03	OBS		TSCR	A	A	production area fenceline
381	23-May-03	4	3	SLAT	A	A	ground skink
382	23-May-03	OBS		TCAR	A	A	on road between arrays 5 and 6
383	25-May-03	1	1	RUTR	SA	A	
384	25-May-03	1	1	RUTR	SA	A	
385	25-May-03	1	1	RUTR	SA	A	
386	25-May-03	1	2	RUTR	SA	A	
387	25-May-03	1	2	RUTR	SA	A	
388	25-May-03	1	2	GCAR	A	A	
389	25-May-03	1	3	Unda		D	
390	25-May-03	3	1	RUTR	SA	A	
391	25-May-03	3	1	RUTR	SA	A	
392	25-May-03	2	2	LGET	J	A	juvenile speckled kingsnake
393	25-May-03	OBS		TCAR	A	A	production area fenceline
394	25-May-03	OBS		TCAR	A	A	production area fenceline
395	25-May-03	OBS		TCAR	A	A	production area fenceline
396	25-May-03	5	1	SUND	A	A	
397	25-May-03	6	pf1	EFAS	J	A	
398	25-May-03	8	1	RCLA	J	A	
399	25-May-03	8	3	NVIR	SA	A	central newt eft
400	25-May-03	8	3	RCLA	SA	A	
401	25-May-03	8	3	RCLA	SA	A	
402	25-May-03	7	2	TPRO	J	A	
403	25-May-03	9	1	NVIR	SA	A	central newt eft
404	25-May-03	9	3	RCLA	J	A	

Array = array number species was collected or OBS = opportunistic observation

Trap No. = funnel trap (1-3) or pitfall trap (pf 1-3) that species was captured

Species = four-letter code for species captured/observed (Appendix B)

Age = estimated age of individual captured/observed (A = adult, J = juvenile, SA = sub-adult,
NK = age not known)

Status = condition of individual (A = alive, D = dead, DOR = dead on road)

APPENDIX D.

POTENTIAL RARE AND SIGNIFICANT REPTILES AND AMPHIBIANS AT PINE BLUFF
ARSENAL AND GENERAL CONSERVATION INFORMATION

Scientific name	Common name	Conservation status*	Documented from PBA	Documented from 2002-2003 study
AMPHIBIANS				
<i>Ambystoma talpoideum</i>	Mole salamander	G4 S?	No	Yes
<i>Hyla avivoca</i>	Bird-voiced treefrog	G5 S2?	No	No
<i>Scaphiopus holbrookii</i>	Eastern spadefoot toad	G5 S?	No	No
<i>Rana areolata circulosa</i>	Northern crawfish frog	G4 S2	No	No
REPTILES				
<i>Alligator mississippiensis</i>	American alligator	G5 S3	Yes	Yes
<i>Crotalus horridus</i>	Timber rattlesnake	G4 S4	?	No
<i>Deirochelys reticularia</i>	Western chicken turtle	G5T5 S2?	No	No
<i>Elaphe obsoleta spiloides</i>	Gray rat snake	G5T5 S2?	No?	No
<i>Lampropeltis triangulum amaura</i>	Louisiana milk snake	G5T4 S1?	No	No
<i>Macrolemmys temmincki</i>	Alligator snapping turtle	G3G4 SU	Yes	No
<i>Regina grahamii</i>	Graham's crayfish snake	G5 S2?	Yes	No
<i>Regina rigida sinicola</i>	Gulf crayfish snake	G5T5 S2?	No	No
<i>Terrapene ornata ornata</i>	Ornate box turtle	G5T5 S2	No	No

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****This list consists of publications that assisted the principal investigator in varying degrees, in respect to positive species identification, range maps, and life history information.**

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**THE NATURE CONSERVANCY
FIRE SUMMARY REPORT AND POST BURN EVALUATION**

Site: Pine Bluff Arsenal.
Unit: Horseshoe Pond Unit - 127 acres.

Date Burned: 31 March 2004.
Date Evaluated: 12 April 2004.
Reported By: Mike Melnechuk and Matt Lindsey.

Fire Weather Forecast

Date:	31 March 2004
Time:	0900
Humidity (low):	30%
Temperature (high):	65°
Wind speed:	8-10 mph
Wind direction:	northwest/north
Sky:	partly cloudy
KBDI:	~375

On-site Weather

Time:	1150
Location:	NW corner
By:	Meryl Hattenbach
Dry Bulb:	59°F
Wet Bulb:	47°F
Humidity:	38%
Wind speed:	2-4 mph
Wind direction:	NW
Sky:	partly cloudy
Comments:	2 days since rain

Crew Organization:

Burn Boss: Mike Melnechuk

Division A: Mike Melnechuk - division leader/holding (water and rake) with Mickey Matthews – igniter (drip torch) and Dan Collins – holding (ATV with water, rake, pulaski, flapper, DT, and DT fuel).

Division B: Matt Lindsey – division leader/holding (water and rake) with Meryl Hattenbach – igniter (drip torch), and Josh Duzan - holding (ATV with water, rake, flapper, pulaski, DT, and DT fuel).

Interior Ignition Specialist: Nathan White – interior ignition (drip torch)

Burn Duration:

Ignition begun:	1215
Perimeter rung:	1320
Interior ignition completed:	1420
Interior burnout	1500 (surface fire).

Fire Narrative:

The crew prepared the firelines several weeks prior to the burn. The firelines were re-blown the week before the burn, and any remaining snags were raked along the north line. The north line was a 12'-wide dirt track adjacent to FM7, FM2, and FM9. The east line was a 10' wide two-track through FM7. The east ½ of the south line was Tulley Lake. The west ½ of the south line was a 5' – 8' wide cut, mown, raked, and leaf-blown line through a powerline corridor, and adjacent to FM3, FM8, and FM9. The west fireline was Atkisson Road, a 25' wide paved road, with large mown right-of-ways on each side (FM1).

Water was obtained from ARFO the morning of the burn. The ARFO East Type 6 engine with water, flapper, pulaski, waterpack, DT, DT fuel, chainsaw, and rake was staged at the large cleared area adjacent to the NW corner. Two ATV's were staged with rake, waterpack, DT, DT fuel, and pulaski, and used by holding personnel for patrol. Melnechuk made all official notifications the morning of the burn and obtained a weather forecast. Hattenbach took on-site weather. A crew briefing was held at 1200 at the staging area (NW corner).

A test fire was lit at 1215 at the SE corner. After five minutes of test fire the wind was as expected and the fire was backing well into the unit through FM7/FM2 sweetgum-pine regeneration/pine savanna. Division A proceeded north along the east line at a moderate pace with Matthews igniting backfire off the pine-hardwood regeneration along the fireline. Division B moved slowly north and west along the south line, getting a mix of flanking and backfire. Once Division A ignition reached the NE corner they began to get headfire, and White was sent to ignite along the lakeshore and Tulley Creek, and ultimately tying-in with Division B ignition along the south line. Division A continued to ignite headfire west down the north line. Division B soon rounded the SW corner where the powerline ROW meets Atkisson Road and began to ignite headfire into the pine savanna. The two crews soon met at the cleared area between Horseshoe Pond and Atkisson Road. The unit was rung at 1320. Interior ignition continued on as White, Matthews and Duzan ignited any unburned patches of fuel for about an hour. Interior ignition was complete at 1420, and burnout occurred soon afterwards at 1500. Collins, Hattenbach, Lindsey, and Melnechuk patrolled the lines until ignition was complete. Melnechuk made a final patrol around the unit and deemed it secure at 1515.

A debriefing was held at 1530 and the crew left the unit at about 1600. Melnechuk and Lindsey stayed at the unit for another hour until the smoke had dissipated, and then left the site at 1700, with only a couple of large downed woody debris piles still smoldering.

There were no holding problems on any of the lines. Flame lengths ranged from 2' along the backfired north line to 15' where headfire was going through the thinned areas of FM7 and up to 20' in the grassier pine savanna areas. Flanking fire flamelengths were from 1' to 2.5' in the FM9, to 4' in the drier, piney areas.

Headfire flamelengths overall averaged 3'-5' flaring to 15' where flaming fronts drew together in the middle of the unit.

IMMEDIATE POST BURN EFFECTS

Overall unit	pine-oak forest; pine savanna
Unit coverage	94%
Burn severity organic substrate	1.6 (moderately burned)
Burn severity understory	2.3 (moderately burned)
Char height	1.3 (5' - 10')
Char degree	1.0 (light)
Midstory scorch percent	2.9 (50% to 75%)
Overstory scorch percent	0.5 (less than 25% of live crowns)
Scorch height	2.0 (10' to 20')

By natural community	pine-oak forest	pine savanna
Fuel models	9	2
Coverage	92%	96%
Organic substrate	1.7 (moderate)	1.4 (light)
Understory	2.2 (moderate)	2.2 (moderate)
Char height	1.2 (~5')	1.5 (5'-10')
Char degree	1.0 (light)	1.0 (light)
Midstory scorch percent	2.8 (~50%)	3.4 (50%-75%)
Overstory scorch percent	0.0 (no overstory scorch)	1.3 (less than 25%)
Scorch height	1.6 (10'-20')	2.6 (20'-50')

ECOLOGICAL OBJECTIVES

1. 70% - 90% unit coverage. The unit was 94% burned. Unburned areas included small wet areas and riparian zones in the pine-oak forest and skidder depressions and ditches in the pine savanna. The burn coverage in the pine-oak forest and pine savanna was virtually complete with small skips in the depressions some with standing water. Some thicker areas of sweetgum regeneration in the eastern block of thinned pine was unburned as well.
2. Organic substrate burn severity class = 1.0 - 3.0. Overall substrate burn severity = 1.6 (moderately burned) and ranged from 0.0 to 2.0. Most of the litter layer and the top layer of duff was eliminated. Bare soil will be exposed throughout the unit. Large woody debris was again much reduced with some slash piles, large logs, and old stumps burning to ash during the next several days of dry weather.
3. Understory burn severity class = 1.0 - 3.0. Overall understory burn severity = 2.3 (moderately burned) and ranged from 0.0 to 4.0. Small stems and vines were mostly consumed. Woody stems smaller than 2.5"

diameter at the base were top-killed in most areas. Most of the pine reproduction in the woodlands of the unit was killed, and much of the sweetgum/pine reproduction in the pine savanna will be set-back or top-killed. Larger stems of fire-sensitive species will experience delayed mortality.

4. Overstory char height class = 0.5 – 1.5. Overall overstory char = 1.3 (5' – 10'). Overstory pine trees in the savanna areas were commonly charred from 6' – 10' high and sporadically to 20' near slash piles or in areas where the fire came together. Overstory hardwoods and pine in the woodlands were generally charred less, from 2' – 4' high. This height of char will not effect overstory trees. Small diameter (less than 6") mid-story hardwoods and larger fire-sensitive species (mostly sweetgum) should experience delayed mortality.
5. Overstory char degree = 0.5 – 1.5. Overall overstory char degree = 1.0 (medium). Minor reductions in bark thickness were noted on overstory pine and scattered hardwoods. This level of char will not affect overstory pine and the oak trees generally experienced significantly less char. In the pine savanna areas, the light and flashy fuel matrix, coupled with fast rate of spread kept char degree to a minimum. Smaller fire-sensitive species will show delayed mortality. Scattered trees near brush-piles or old log decks experienced a greater degree of char.
6. Midstory scorch percent class = 1.0 – 4.0. Overall midstory scorch percent = 2.9 (~50%). Midstory scorch was recorded throughout the unit, with most midstory vegetation having been scorched to at least 25%, and up to 100% in the pine savanna areas. Scorch was heavy in the pine savanna areas, and moderate in the woodlands. Much of the young, fire-intolerant species will be impacted by this level of scorch, and taller midstory vegetation will lose their lower branches.
7. Overstory scorch percent class = 0.5 – 2.0. Overall overstory scorch percent = 0.5 (less than 25% of live crowns). The pine-oak forest is quite tall and the scorch line was usually level with the lower branches. There was significantly more overstory scorch in the pine savanna areas, where fire intensity and flame lengths were generally greater. Several overstory pines in the savanna were scorched over 50' in height, although not scorched enough to cause mortality. No overstory scorch was recorded in the woodlands, with the scorch line generally below 20' in those areas.
8. Overstory scorch height class = 0.5 – 1.5. Overall overstory height class = 2.0 (10' - 20'). The scorch line in pine-oak forest ranged 20' – 30'. Few overstory trees will be affected by this level of scorch. The scorch line in the thinned pine was 12' – 20'. Shorter, suppressed, and fire-sensitive species in the overstory may show delayed mortality.

All ecological goals were met by this second prescribed burn. Coverage and fire effects were much better than anticipated with the unit being rained on 2 days prior. The fire burned through most of the regeneration in the pine savanna, reducing the shrub layer, pine reduction, vines, and downed woody debris. The native grass and forb component in the savanna should increase from this burn, and the seasonality of the fire should have excellent impacts on the sweetgum regeneration in the savanna. In the pine-oak forest the shrub layer and understory was much reduced and the mid-story will show some mortality. Litter was removed and the duff layer greatly reduced throughout the unit. Bare soil was exposed in some locations. The amount of large woody debris from past thinnings was further reduced. One yellowbelly water snake was found killed by the fire.

**THE NATURE CONSERVANCY
FIRE SUMMARY REPORT AND POST BURN EVALUATION**

Site: Pine Bluff Arsenal.
Unit: Savanna Unit - 206 acres.

Date Burned: 23 March 2004.
Date Evaluated: 25 March 2004.
Reported By: Mike Melnechuk and Matt Lindsey.

Fire Weather Forecast

Date:	23 March 2004
Time:	0900
Humidity (low):	30%
Temperature (high):	73°
Wind speed:	8-12 mph
Wind direction:	southeast
Sky:	partly cloudy
KBDI:	~375

On-site Weather

Time:	1140
Location:	NE corner
By:	Toni Aguilar
Dry Bulb:	69°F
Wet Bulb:	53°F
Humidity:	32%
Wind speed:	0-4 mph
Wind direction:	SE-SW
Sky:	partly cloudy
Comments:	The lower areas were wet in the flatwoods

Crew Organization:

Burn Boss: Mike Melnechuk

Division A: Mike Melnechuk - division leader/holding (water and rake/GMC truck with water, rake, DT, DT fuel, flapper, chainsaw) with Meryl Hattenbach - igniter (drip torch), Josh Duzan - secondary igniter (drip torch), and Mickey Matthews - holding (ARFO East Type-6 engine with water, rake, flapper, pulaski, DT, DT fuel, and chainsaw).

Division B: Matt Lindsey – division leader/holding (water and rake) with Dan Collins – igniter (drip torch), and Toni Aguilar - holding (ATV with water, rake, flapper, pulaski, DT, and DT fuel).

Burn Duration:

Ignition begun:	1235
Perimeter rung:	1450
Interior ignition completed:	1720
Interior burnout	1800 (surface fire).

Fire Narrative:

The crew prepared the firelines in December of 2003. Gas mask training was not needed for this unit since it is located outside of the “one-percent lethality” zone. The firelines were re-blown the day of the burn, and any remaining snags were raked along the north line. The north line was a 25’-wide paved road adjacent to FM9 with a 10’-wide mowed right-of-way on the unit side and a 30’ mowed right-of-way on the north side. The east line was a 5’-8’ wide cut, raked, and leaf-blown line through FM9. The south line was a 12’ wide blown logging road adjacent to FM9, FM7, and FM11. Many snags and large piles of logging slash were extant within the unit, especially around the clearcut area.

Water was obtained from ARFO the morning of the burn. The ARFO East Type 6 engine with water, flapper, pulaski, waterpack, DT, DT fuel, chainsaw, and rake was staged at the ignition point during the test fire, and then used by Matthews for patrol along the north line. One ATV was staged with rake, waterpack, DT, DT fuel, and pulaski, and used by Division B for patrol. Melnechuk made all official notifications the morning of the burn and obtained a weather forecast. Aguilar took on-site weather. A crew briefing was held at 1225 at the staging area (NE corner).

A test fire was lit at 1235. After five minutes of test fire the wind was as expected and the fire was backing well into the unit through FM9 oak-pine litter. Division A proceeded east along the north line at a moderate pace with Hattenbach igniting backfire off the pine-hardwood regeneration along the berm, and Duzan igniting 5’ - 10’ strip headfires to ensure blackline was being established. Division B moved slowly south along the west line, getting a mix of flanking and headfire. Once Division A ignition had reached the large drainage, they had established 30’ of blackline, and Division B proceeded south at a faster pace. Division A continued to utilize two igniters and establish blackline along the north line, and soon reached the north east corner. The northeast corner was wet, so Hattenbach and Melnechuk bumped down the east line to the drier fuels and began lighting flanking fire that was moving into the unit well. Division B established black along the entire west line and then rounded the corner, getting headfire to move into the unit and proceeded with ignition east along the south line. Division A ignition rounded the southeast corner and began to ignite headfire into the unit, heading west along the south line. The two igniters met at the east boundary of the clearcut and the fire was rung at 1450.

Collins and Duzan immediately commenced interior ignition, with Duzan lighting long strip headfires east to west in the north portion of the unit, and Collins reigniting any areas wher the headfire went out in the southern portion of the unit. Matthews soon joined the interior ignition on the west side of the interior drainage. Aguilar continued to patrol the handlines and Melnechuk, Hattenbach, and Lindsey patrolled the north line. Interior ignition continued until 1720, and burnout occurred at about 1800. Aguilar and Melnechuk extinguished

several snags that had become engaged along the lines. Melnechuk made a final patrol around the unit and deemed it secure at 1815.

A debriefing was held at 1820 and the crew left the unit at about 1830 with hundreds of downed woody debris and stumps burning in the interior. The unit was checked daily for the next three days, and the high humidities put the large woody debris out over this course of time. The unit received .55 inches of rain a couple days later.

There were no holding problems, except along the southern portion of the west line, where the crew had to suppress a spot fire over the line, and fire intensity was greater due to the ladder fuels in the thinned pine area. All other lines held well. Flame lengths ranged from 2' along the backfired north line to 15' where headfire was going through the thinned areas of FM7 and the clear-cut regeneration. Flanking fire flamelengths were from 2' to 5' in the FM9, to 9' in the drier, piney areas. Headfire flamelengths averaged 5' flaring to 15' where flaming fronts drew together in the middle of the unit.

IMMEDIATE POST BURN EFFECTS

Overall unit	pine-oak forest; thinned pine, clear-cut, sweetgum bottoms
Unit coverage	93%
Burn severity organic substrate	1.3 (lightly burned)
Burn severity understory	1.7 (moderately burned)
Char height	1.2 (5' - 10')
Char degree	1.2 (medium)
Midstory scorch percent	1.6 (25% to 50%)
Overstory scorch percent	0.8 (less than 25% of live crowns)
Scorch height	1.5 (less than 25')

By natural community	pine-oak forest	thinned pine/clearcut	sweetgum bottoms
Fuel models	9	7	8
Coverage	94%	86%	100%(in transect)
Organic substrate	2.0 (moderate)	1.3 (light)	1.0 (light)
Understory	1.6 (moderate)	1.9 (moderate)	1.5 (moderate)
Char height	1.4 (5'-10')	1.3 (10' - 20')	1.0 (light)
Char degree	1.2 (medium)	1.2 (medium)	1.0 (light)
Midstory scorch percent	2.1 (25%-50%)	2.1 (25%-50%)	1.5 (moderate)
Overstory scorch percent	0.6 (less than 25%)	1.4 (less than 25%)	0.0 (0% live crowns)
Scorch height	1.9 (10'-20')	1.4 (10'-20')	1.0 (10')

ECOLOGICAL OBJECTIVES

1. 70% - 90% unit coverage. The unit was 93% burned. Unburned areas included small wet areas and riparian zones in the pine-oak forest and thinned pine and wet spots in the clear-cut. The burn coverage in the pine-oak forest and pine savanna was virtually complete with small skips in the depressions some with standing water. The extreme northeast portion of the unit did not burn in the oak-pine flatwoods where there was several areas of standing water.
2. Organic substrate burn severity class = 1.0 - 3.0. Overall substrate burn severity = 1.3 (lightly burned) and ranged from 0.0 to 2.0. Most of the litter layer and the top layer of duff was eliminated. Bare soil will be exposed throughout the unit. Large woody debris was again much reduced with some slash piles, large logs, and old stumps burning to ash over a three day period.
3. Understory burn severity class = 1.0 - 3.0. Overall understory burn severity = 1.7 (moderately burned) and ranged from 0.0 to 4.0. Small stems and vines were mostly consumed. Woody stems smaller than 2.5" diameter at the base were top-killed in most areas. Most of the pine reproduction in the woodlands of the unit was killed, and much of the sweetgum/pine reproduction in the thinned pine and clearcut areas will be set-back or top-killed. Larger stems of fire-sensitive species will experience delayed mortality.
4. Overstory char height class = 0.5 - 1.5. Overall overstory char = 1.2 (5' - 10'). Overstory pine trees were commonly charred from 6' - 10' high and sporadically to 20' near slash piles or in areas where the fire came together. Overstory hardwoods were generally charred from 2' - 4' high. This height of char will not effect overstory pines except where suppressed. Small diameter (less than 6") mid-story hardwoods and larger fire-sensitive species (mostly sweetgum) may experience delayed mortality.
5. Overstory char degree = 0.5 - 1.5. Overall overstory char degree = 1.2 (medium). Minor reductions in bark thickness were noted on overstory pine and scattered hardwoods. This level of char will not affect overstory pine and the oak trees generally experienced significantly less char. Smaller fire-sensitive species will show delayed mortality. Scattered trees near brush-piles experienced a greater degree of char and may show delayed mortality.
6. Midstory scorch percent class = 1.0 - 4.0. Overall midstory scorch percent = 1.6 (25%-50%). Midstory scorch was recorded throughout the unit, with most midstory vegetation having been scorched. Scorch was heavy in the pine-dominated woodlands and less prevalent in the sweetgum bottoms. Much of the young, fire-intolerant soecies will be impacted by this level of scorch, and taller midstory vegetation will lose their lower branches.
7. Overstory scorch percent class = 0.5 - 2.0. Overall overstory scorch percent = 0.8 (less than 25% of live crowns). The pine-oak forest is quite tall and the scorch line was usually level with the lower branches. Several overstory pines near the edge of the clear-cut were scorched over 50' in height, and were scorched enough to cause delayed mortality. In the thinned pine only smaller trees were scorched. Most overstory hardwood trees were still dormant, where leafed out the young succulent leaves lower than 25' were scorched.
8. Overstory scorch height class = 0.5 - 1.5. Overall overstory height class = 1.5 (less than 25'). The scorch line in pine-oak forest ranged 20' - 30'. Few overstory trees will be affected by this level of scorch. The scorch line in the thinned pine was 12' - 20'. Shorter, suppressed, and fire-sensitive species in the overstory may show delayed mortality.

All ecological goals were met by this second prescribed burn. Coverage and fire effects were much better than anticipated with the wet conditions. The fire burned through the regeneration in the thinned pine, reducing the shrub layer, pine reduction, vines (much *Lonicera japonica*), and downed woody debris. Much of the clear-cut regeneration was burned with good reductions in pine reproduction, sweetgum, vines and woody debris. In the pine-oak forest the shrub layer was much reduced and the mid-story will show some mortality. Litter was removed and the duff layer greatly reduced throughout the unit. Bare soil was exposed in some locations. The amount of large woody debris along the right-of-ways was further reduced. This was an excellent burn. One box turtle was killed.

**THE NATURE CONSERVANCY
FIRE SUMMARY REPORT AND POST BURN EVALUATION**

Site: Pine Bluff Arsenal; Triplets Bluff.

Unit: Nilo Pond Unit – 183 acres.

Date burned: 26 March 2004

Date evaluated: 29 March 2004

Reported by: Mike Melnechuk, Matt Lindsey, Dan Collins, Josh Duzan.

Fire Weather Forecast:

Date:	26 March 2004
Time:	0900
Humidity (low):	50%
Temperature (high):	80°F
Wind Speed:	5-10 mph
Wind Direction:	south/southwest transport
Sky:	partly cloudy

On-site Weather:

Time:	1100
Location:	NW corner
By:	Josh Duzan
Dry Bulb:	74°F
Wet Bulb:	64°F
Humidity:	58%
Wind Speed:	light
Wind Direction:	variable
Sky:	partly cloudy
KBDI:	375
Comments:	winds picked up a little, out of the SW.

Crew Organization:

Burn Boss: Mike Melnechuk (ATV with waterpack, rake, Pulaski, DT, and DT fuel) with Toni Aguilar – igniter (drip torch), Mickey Matthews – igniter/interior ignition (drip torch), Matt Lindsey – holding (ATV with waterpack, rake, Pulaski, DT, and DT fuel), Dan Collins – holding (ARFO East Type-6 engine with water, rake, Pulaski, flapper, DT, DT fuel, and chainsaw), and Josh Duzan – holding (ARFO East Type-6 engine)

Burn Duration:

Ignition begun: 1140, NE corner.
Perimeter rung: N/A, near SE corner (tied into slough at 1305)
Interior ignition complete: 1500
Interior burnout: 1630

Fire Narrative:

The burn unit is a 183 acre rectangle of mainly FM9, with some FM2, FM7, and FM8, running parallel along Triplett Bluff and the Arkansas River. The firelines were installed in August 2003, and 2 days prior to the burn. The north fireline is a 10'-wide blown and raked ATV trail that is adjacent to FM9, FM7, and FM2. The west line is a 20'-wide gravel road, with an additional 15' wide mown rights-of-way on either side of the road, adjacent to FM9, FM2, FM1, and FM3. The south line is a 12'-wide gravel road adjacent to FM9, FM8, and FM3 towards the east, and ties into a slough adjacent to FM8 that ultimately drains to the Arkansas River near the SE corner. The northern ¼ of the east line is a 15'-wide gravel road and an 8'-wide, 45' long handline connecting to the Arkansas River. The rest of the east line was the Arkansas River.

Melnechuk made all official notifications the morning of the burn and acquired a weather forecast from AFC at 0900. The crew filled the ARFO East Type-6 engine at ARFO prior to going to the site. The crew staged the ATV's with equipment for the burn at the site.

The ARFO East Type-6 engine was staged with water, pulaski, flapper, rake, DT, DT fuel, and chainsaw. Both ATV's were staged with pulaski, rake, waterpack, DT, and DT fuel. The ARFO Chevy pumper was staged with 300 gallons of water, pulaski, rake, flapper, and chainsaw. Reserve drip torches were staged in the GMC truck.

The crew briefing was held at 1125 at staging (NW corner) and a test fire was lit at the NE corner at 1140. After 5 minutes of test fire, the wind and fire behavior was acceptable and the fire was pronounced a go. The igniters started to burn out the NE corner with the fire backing well into the unit. Melnechuk sent Aguilar south down the east line to tie into the river, and Matthews ignited west along the north line. The ignition had soon reached the thinned pine area of the north line, and Melnechuk bumped up to refill Matthews drip torch. Aguilar had established black along the north portion of the east line, with about 30' of blackline and the fire backing into the unit at a good pace. Matthews lit around Nilo Pond and proceeded with ignition around the NW corner, with the fire now heading into the unit at 4' - 9' flame lengths through the mixture of FM2/FM7 in the thinned pine. Aguilar then lit a 20' strip headfire down the north line, with Lindsey patrolling. Collins and Duzan stayed on the east line until the fire had backed in to 50', and then moved their patrol to the west line. Once the ignition had made it to McCoy Road and the monitoring station, Aguilar had ignited to the pond, and Melnechuk sent Matthews interior and Aguilar took over line ignition along the west line. Ignition soon made it to the SW corner, and then proceeded to the slough along the south line. Once the fire was tied into the slough, Melnechuk sent Aguilar and Collins to assist in the interior ignition, with Matthews taking the north section, Aguilar the central section, and Collins the south section of the unit. Interior ignition went on until around 1500. Matthews and the crew utilized the flare gun to try and burn out the clear cut, which was green, with some success. Melnechuk and Lindsey mopped-up a couple of small snags and stumpholes along the north line. Collins and Duzan extinguished two snags along the west line that had become engaged from the radiant heat. The crew then debriefed, de-staged, and departed the unit at 1630, after Melnechuk made a final patrol and deemed the unit secure.

Headfire flame lengths in FM9 were from 1.5' to 6', with the latter occurring in areas where fires were drawing off of each other, on the slopes of some ravines, and off of the west line. Headfire flame lengths averaged around 3' in the FM9. Some torching pines were observed to jackpot up to 25'. The fire crept around in the FM8 with around 6" flame lengths. The FM2/FM7 headfire flame lengths were a little higher because of the grass component and the fuels being unsheltered ranging from 4' - 9', with much slash and woody debris becoming engaged that did not burn in the last fire.

Immediate Post Burn Effects

Overall unit:	oak-pine - woodland, oak bottoms, pine savanna
Percent coverage:	83%
Burn severity organic substrate:	2.0 (lightly burned)
Burn severity understory (3' or less):	1.4 (lightly burned)
Overstory char height class:	1.4 (5'-10')
Overstory char degree class:	1.2 (medium)
Midstory scorch percent class:	1.4 (25%-50%)
Overstory scorch percent class:	0.2 (less than 25% of live crowns)
Scorch height class:	1.3 (10'-20')

Natural community:	oak-pine woodland	pine savanna	oak bottoms
Percent coverage:	95%	89%	47%
Burn severity organic substrate:	2.1 (moderate)	2.3 (moderate)	1.6 (light)
Burn severity understory:	1.5 (light)	1.8 (light)	1.0 (scorched)
Overstory char height class:	1.5 (5'-10')	1.5 (5'-10')	1.0 (less than 5')
Overstory char degree class:	1.3 (medium)	1.0 (light)	1.0 (light)
Midstory scorch percent class:	1.7 (25%-50%)	n/a	0.5 (less than 25%)
Overstory scorch percent class:	0.2 (less than 25%)	0.9 (less than 25%)	0.0 (no scorch)
Scorch height class:	1.4 (10'-20')	1.8 (10'-20')	0.9 (less than 10')

Ecological Objectives

1. 70% - 90% unit coverage. The unit was 83% burned. Scattered unburned areas remained in the lower portions of the oak-pine woodland and pine savanna that had standing water. The oak bottoms were partly flooded and coverage was low at the southeast corner of the unit.
2. Organic substrate burn severity class = 1.0 - 3.0. Substrate burn severity = 2.0 (lightly burned) and ranged from 1.6 (light) in the oak bottoms to 2.3 (moderate) in the pine savanna. The upper litter layer was mostly removed throughout the unit. In the pine savanna abundant bare soil was exposed, especially where logging debris ignited and burned to ash. Litter was removed and bare soil was exposed in the drier portion of the oak-pine woodland. Where the oak bottoms burned the litter layer was removed to duff, rarely to bare soil.

The duff was generally not impacted by the burn in the moister areas of the unit. Scattered piles and other large woody debris downed due to the ice storm were burned throughout the oak – pine woodland.

3. Understory burn severity class (less than 3') = 1.0 - 3.0. Understory burn severity = 1.4 (lightly burned) and ranged from 1.3 to 1.5. Small stems (less than 0.5" basal diameter) were top-killed but not consumed. Pine reproduction smaller than 3' was killed. Pine reproduction larger than 3' was heavily scorched but is likely to survive. Almost all sprouts in the pine savanna were top-killed. Most vines and small understory brush was top-killed in the oak – pine woodland. Two cane stands in the oak bottoms were burned.
4. Overstory char height class = 0.5 – 1.5. Overstory char = 1.4 (5'-10') and ranged from 1.0 (less than 5') in the oak bottoms to 1.5 (5' – 10') in the pine savanna and oak – pine woodland. On overstory pine, bark char was commonly over 5' on the boles. On overstory oak, char was usually less than 3' on the boles. This height of char will not effect overstory trees. Small diameter (less than 5" dbh) saplings and shrubs were top-killed.
5. Overstory char degree = 0.5 – 1.5. Overstory char degree = 1.2 (medium) and ranged from 1.0 (light) to 1.2 (medium). In general, char was light and spotty on pine with minor reductions in bark thickness on hardwoods. This level of char will not affect the overstory. Where scattered or piled woody debris were close to the boles of overstory trees the fire was more intense. Fire scars were created on scattered overstory oaks adjacent to downed woody debris but little overstory mortality is expected.
6. Midstory scorch percent class = 1.0 – 3.5. Midstory scorch percent = 1.4 (25% - 50% of live crowns) and ranged from 0.5 (less than 25% of live crowns) in the oak bottoms to 1.7 (25%-50%) in the oak – pine woodland. There is no midstory in the pine savanna. This level of scorch is unlikely to impact the midstory of the oak bottoms. In the oak - pine woodlands this level of scorch will kill fire-sensitive saplings and top-kill most shrubs.
7. Overstory scorch percent class = 0.5 – 2.0. Overstory scorch percent = 0.2 (less than 25% of live crowns) and ranged form 0.0 (no scorch) in the oak bottoms to 0.9 (less than 25% of live crowns) in the pine savanna. The overstory trees are tall with their lower branches well above the scorch line. Where scorch was evident is was due to the ignition of piles of downed woody debris which burned more intensely.
8. Overstory scorch height = 0.5 – 1.5. Overstory scorch height = 1.3 (10'-20') and ranged from 0.9 (less than 10') in the oak bottoms to 1.8 (10'-20') in the pine savanna. The scorch line was 10' in the oak – pine woodland and 12' in the pine savanna, except where piles of downed woody debris burned intensely and scorched nearby overstory trees. This level of scorch will not impact the overstory. Short, midstory pine reproduction and shrubs and saplings of fire-sensitive species will show scattered mortality and top-kill.

All ecological goals were met by this burn. Burn coverage was excellent even into the oak bottoms and cane stands. The litter layer was much reduced, often to bare soil. Much of the woody debris from logging operations and the recent ice storm was burned to ash, although abundant debris remains in the unit. The pine reproduction and shrubs were killed or top-killed throughout the unit. As planned, the overstory of the pine savanna was mildly impacted by the burn. The overstory of the oak – pine woodlands was minimally impacted.