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

Project Summary:
This project addresses the need for pine woodland habitat restoration in the Upper West Gulf Coastal Plain using prescribed fire and timber management. The primary goal at project sites is to restore woodland habitat structure and composition and to establish baseline monitoring for plant communities, birds, reptiles, and amphibians. These data will allow managers to measure progress toward desired ecological conditions. A variety of species will be benefited by restoration activities, including wintering and breeding grassland bird species of conservation concern.

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Project Partners: Arkansas Natural Heritage Commission, Arkansas Game and Fish Commission, Potlatch, Weyerhaeuser

Total Project Cost: 75,000

Request: $37,500

Matching funds from a Weyerhaeuser Corporation gift: $37,500

FUNDING PRIORITY ADDRESSED BY PROPOSAL

This proposal addresses the implementation need for pine woodland habitat restoration in the Upper West Gulf Coastal Plain using prescribed fire and timber management. Completion of the project will take two years.

ECOREGION WHERE PROJECT WILL BE CONDUCTED

The project presented in this proposal will be conducted in the Upper West Gulf Coastal Plain ecoregion, specifically at the Moro-Big Pine Wildlife Management Area and the Blackland Prairie and Woodland Conservation Project.

CONSERVATION PRIORITY ADDRESSED BY PROPOSAL

This project will address the restoration of pine woodland habitats using prescribed fire and timber management and falls under the Arkansas Fire and Forest Ecology Initiative. A variety of species will be benefited by restoration activities, including wintering and breeding grassland bird species of conservation concern. This project will establish baseline monitoring for plant communities, birds, reptiles, and amphibians. These data will allow managers to measure progress toward desired ecological conditions.

BACKGROUND

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

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

The Blackland Prairie and Woodland Conservation Project site, located in southern Howard County, is a cooperative project between The Nature Conservancy and Weyerhaeuser Corporation. The site contains some of the highest quality limestone glades (blacklands) in the Upper West Gulf Coastal Plain ecoregion and is adjacent to Stone Road Glade Natural Area owned by The Arkansas Natural Heritage Commission. Ecologically the area is a mix of limestone glades with a high pH, and dry blackland prairie flora, dry-mesic woodland, dry-mesic calcareous blackland woodland, mesic blackland riparian forest and large expanses of pine plantation. The flora in the glades is considered to be similar to the blackland prairies due to the similarity of the alkaline soils. The unplanted and fire-maintained sections of the woodland communities consist of large remnant shortleaf pine (*Pinus echinata*), post oak (*Quercus stellata*), Shumard's oak (*Quercus shumardii*), and black oak (*Quercus velutina*).

Maps of both sites are included in Appendix B.

GOALS AND OBJECTIVES

The primary goal of both projects is to restore woodland habitat structure for a variety of species of conservation concern as identified by the 2007 State Wildlife Action Plan Steering Committee and measure progress toward desired ecological conditions.

Objectives:

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

METHODS

Open Pine Woodland Structure – Objectives 1& 2

Forested land will be restored to a woodland structure of 50-75 basal area/acre through the application of prescribed fire and thinning. Prescribed burns will take place according to a burn prescription. Widely spaced plantations and extended rotation two-aged management will be employed to provide an overstory of older aged pine trees, another aged class of trees in the stand, and open conditions to allow for herbaceous groundcover. Two other management systems, irregular shelterwood and modified seed-tree cuts, may also be used, depending on the stand conditions. Timber stand management will be conducted by Potlatch and Weyerhaeuser Corporations.

Baseline Monitoring – Objectives 3&4

Baseline assessments across multiple forest community types will be conducted. Biodiversity attributes to be monitored at both sites are plants, plant communities and birds. The monitoring will evaluate the biological effects of conservation forestry on biodiversity attributes and progress toward the desired ecological conditions.

At both sites, plant communities will be monitored using permanent nested macroplots. A total of 100-150 plots will be installed. All plant species occurring within the macroplots will be identified and recorded. All bird species occurring within a system of permanent plots will be identified and recorded using standard breeding survey protocol (Appendix A).

Monitoring methodology*:*

To determine if the goals are being met by project activities, six success criteria are listed:

1. The density and diversity of overstory and understory woody species is within (and representative of) the historic range of variation as described in each plant community conservation target description (attached).
2. Regeneration of plant community/forest type (site – appropriate) overstory tree species is sufficient to maintain forest type.
3. Understory native herbaceous level community diversity and coverage is within (and representative of) the historic range of variation as described in each plant community conservation target description (attached).
4. Eleven selected area-dependent bird species of concern exist as viable breeding populations:

    A. Bachman's Sparrow (*Aimophila aestivalis*)
    B. Prairie Warbler (*Dendroica discolor*)
    C. Brown-headed Nuthatch (*Sitta pusilla*)
    D. Northern Bobwhite (*Colinus virginianus*)
    E. Eastern Wood-pewee (*Contopus virens)*
    F. Loggerhead Shrike (*Lanius ludovicianus migrans*)

G. Summer Tanager (*Piranga rubra*)
H. Mississippi Kite (*Ictinia misisippiensis)*
I. Yellow-billed Cuckoo (*Coccyzus americanus*)
J. Henslow's Sparrow (*Ammodramus* henslowii, wintering populations)

5. Fire is maintained within a range of variation that maintains conservation targets as described in each plant community conservation target description (attached; approximately 1-4 year frequency in prairies/glades, 2-5 year rotation in savannas/woodlands, 4-15 year rotation in forests) with 75% burn unit coverage and average moderate severity. .

6. Non-native species comprise less than 10% of any plant community (or forest types) and non-native community types comprise less than 2% of the project area.

Monitoring Protocols
To determine attainment of these success criteria and project goals, seven monitoring protocols are listed below and described in Appendix A:

1. *Plant community monitoring* to quantify the structure, diversity, regeneration of plant communities (forest type groups), and ratio of native/non-native species.

2. *Avian monitoring* to quantify populations of selected area- or habitat-dependent birds.

3. *Herpetological monitoring* to quantify general populations of reptiles and amphibians in the project areas.

4. *Fire regime condition class (FRCC) monitoring* to track attainment of the historic fire regime.

5. *Post-burn assessments* to determine individual unit coverage and post burn severity.

6. *Photo-monitoring* to qualitatively document and communicate restoration progress.

7. *Program accomplishments*. Acres burned, thinned, and project costs.

Macroplot Sampling
To maintain monitoring efficiency, approximately 50 permanent macroplots will be established in the two restoration areas. Macroplots will be randomized using existing forest roads. Much of the project monitoring will be included in these macroplots including plant community, avian, herpetological, FRCC and photo-monitoring. Macroplots should be wholly within only one forest type group and evenly distributed in each covertype and treatment area.

All the macro-plots together will be representative of the forest type groups in the project area. The dimensions of each macro plot will be permanently marked with fenceposts and documented with global positioning system coordinates.

EXPECTED BENEFITS
The reintroduction of fire and appropriate timber management at both sites will decrease the woody component of the grasslands, favor native warm season grasses, increase the size and connectedness of the prairie openings, restore structure to the degraded woodlands, and reinvigorate the forest-woodland understory and prairie-woodland ecotone. Such open and frequently-burned pine woods will be beneficial to wild turkeys, bobwhite quail, white-tailed deer, and a host of non-game birds, such as Henslow's and Bachman's sparrows, brown-headed nuthatches, pine warblers, and prairie warblers.

PRODUCTS AND OUTCOMES

- Conduct baseline plant community monitoring and submit report (Months 1-20)
- Conduct baseline bird inventory and submit report (Months 1-20)
- Conduct baseline herp survey and submit report (Months 1-20)
- Write burn plans and thinning prescriptions for treatment areas (Months 1- 12);
- Install fire lines around burn units (Months 1-22) ;
- Implement conservation forestry treatments (prescribed burning, thinning, or both burning and thinning) on 4,000 acres (Months 3-23);
- Complete post-fire effects / thinning monitoring and operational reports after each treatment (Months 3-24);
- Enter monitoring methodology in the Natural Resources Monitoring Partnership database (Months 1-3);
- Update Comprehensive Wildlife Conservation Strategy database (Month 24);
- Update scientific community on conservation action outcomes (Fall 2007 and 2009);
- Inform public via through The Nature Conservancy's website, the Arkansas Field Office newsletter, and newspaper media. (Months 1- 24).

BUDGET

The total cost for this project will be $75,000 over two years. The Nature Conservancy respectfully requests $37,500 (50%) from the Arkansas Game & Fish Commission through the State Wildlife Grant and will provide $37,500 (50%) as match. Because the matching funds are coming to TNC from a restricted Weyerhaeuser gift, our deliverables will be invoiced according to the following schedule. In some instances TNC or AGFC's share of each deliverable may not equal 50%. However, TNC's total share of the final costs will equal 50% by the end of the grant period.

This will be a fixed-price agreement. TNC will submit invoices for completed tasks on a quarterly basis. The following types of expenses are included in the fixed-price budget: Salary and fringe benefits (overtime may be required); Operational Expenses such as Travel (mileage, lodging, meals, etc); Supplies such as drip torch fuel, batteries, monitoring tapes, etc; Contractual expenses such as forestry consulting fees and contract fire break construction; Equipment expenses such as data recorders, GPS units, etc.; and Other project related expenses.

	Deliverable	**Timeframe**	**AGFC Cost**	**TNC Match**	**Total Cost**
1	Baseline plant monitoring report	Months 1-20	$17,000	$1,000	$18,000
2	Baseline bird inventory report	Months 1-20	$5,000	$1,000	$6,000
3	Baseline herp report	Months 1-20	$5,000	$1,000	$6,000
4	Burn plans and thinning prescriptions	Months 1-12	$2,075	$2,175	$4,250
5	Fireline construction/unit prep	Months 1-22	$4,750	$1,000	$5,750
6	Conservation forestry treatments (thinning/prescribed burns)	Months 3-23	$0	$30,000	$30,000
8	Immediate Post Treatment Effects Monitoring	Months 3-24	$3,000	$1,000	$4,000
9	Enter methodology into NRMP database	Months 1-3	$62.50	$62.50	$125
10	Update CWCS database	Month 24	$62.50	$62.50	$125
11	Update public/scientific community (Fall 2009)	Months 1-24	$550	$200	$750
		TOTAL	**$37,500**	**$37,500**	**$75,000**

The Nature Conservancy has a current 25% Negotiated Indirect Cost Rate (NICRA) that is accepted by USFWS

PROJECT LEADS

Bill Holimon: Bill Holimon is an Ornithologist and is Chief of Research for the Arkansas Natural Heritage Commission. Bill received a B.S. in biology from the University of Arkansas at Little Rock and an M.S. in biology from New Mexico State University. Bill previously worked for The Nature Conservancy in Texas on conservation of two federally listed endangered bird species, the Golden-cheeked Warbler (*Dendroica chrysoparia*) and Black-capped Vireo (*Vireo atricapilla*). In addition, he has conducted extensive work on various taxa of Red Crossbills (*Loxia curvirostra*) throughout North America. Bill is a native Arkansan who has published three scientific papers on rare birds of Arkansas; two on grassland birds and the third on the endangered Red-cockaded Woodpecker (*Picoides borealis*).

Maria Melnechuk: Maria Melnechuk is the Terrestrial Ecologist for the Arkansas Field Office. She has worked with The Nature Conservancy in Arkansas for eight years. Her responsibilities include conducting ecological assessments, writing stewardship plans, and performing plant community monitoring, rare plant monitoring and post-fire assessments. Maria also assists with the implementation of fire management activities as well as stewardship and restoration activities throughout the state. She has a Bachelor of Science degree in Biology from Hendrix College and is completing a Master of Science in Biology from the University of Arkansas at Little Rock.

Mike Melnechuk: Mike Melnechuk is the Assistant Director of Stewardship for the Arkansas Field Office and Fire Manager for both Arkansas and Louisiana Field Offices. Mike has been working with the Conservancy for 10 years. His responsibilities include leading the implementation of fire management activities in Arkansas as well as stewardship and restoration activities on the various preserves for TNC, the Arkansas Natural Heritage Commission, and occasionally military installations. Mike is also involved with ecological monitoring and herpetological surveys. He has a Bachelor of Science degree in Geography/Natural Resource Management from Western Michigan University.

Douglas Zollner: Douglas Zollner is an ecologist currently serving as the Director of Conservation Science for the Arkansas Field Office. Douglas also serves as the Conservancy's National Fire Restoration Coordinator, coordinating Conservancy efforts to reduce the threat of altered fire regimes to biodiversity across ownerships at landscapes in the US and Mexico. He has over 25 years of working experience with ecological assessments and conservation planning, woodland and watershed restoration, fire ecology, ecological modeling, and developing and implementing measures of conservation success in an adaptive management context. He received a Bachelor of Science from the University of Arizona in Watershed Management and a Master of Science from Texas Tech University in the Ecology of Arid Lands. He spent the 1980's working on conservation projects overseas, mostly in eastern and southern Africa.

APPENDIX A. MONITORING PROTOCOLS

Plant Community Monitoring

Sampling structure: Nested quadrat method located within each macro-plot.

Sampling Unit: Four, 1 m x 1 m herbaceous, two 11.7 foot radius shrub and one 10 m radius tree nested quadrats.

Pre-monitoring background work: Identify number of herbaceous and woody vegetation plots needed using species-area curve to adequately characterize plant communities and detect change in community composition over time.

Placement of Plots: 4 herbaceous plots, 2 shrub plots and 1 tree plot will be established in each macro-plot. Herbaceous plots will be located at southern portion of plot circle at 135, 180, 225, 270 degrees off the macroplot center. Shrub plots will be located at northern portion of plot circle at 0 and 45 degrees off the macroplot center. The center point of the tree plot will be marked by a fencepost. The herbaceous and shrub plots will be marked by a bent rebar 6" above the ground.

Data Collected: Within each herbaceous plot, all herbaceous plant species and all woody species < 3 feet tall rooted within the plot will be identified to species, recorded and assigned a modified Daubenmire cover class. Within each shrub plot, all woody species > 3 m tall and < 2 cm diameter breast height will be identified to species and recorded. Within each tree plot, all woody species > 2 cm diameter breast height will be identified to species, measured, and recorded. Snags will also be measured and recorded from tree plots.

Table 1. Cover classes, class ranges, and class midpoints used in herbaceous vegetation sampling.

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

Frequency of Collection: Prior to project activities, year two, year five, and then every five years.

Time of Collection: Early-June to Middle July.

Data analysis: Species and range mid points will be entered in excel spreadsheets. First year sampling results will be summarized in tables by site, management unit and/or plant community. The species identified will be ranked by importance value [Importance Value = (relative frequency + relative cover)/ 2 for herbs; relative frequency + relative density)/ 2 for shrubs; Importance Value = (relative frequency + relative density + relative basal area)/ 3 for trees]. Future plant community sampling will be compared to previous year's sampling to identify changes in species diversity and abundance. Changes in species abundance will be compared to identified environmental factors or management actions.

Fire regime condition class

The project scale Fire Regime and Condition Class (FRCC) form is used to describe general characteristics of a project area that can be used to calculate and classify FRCC when combined with estimates of the natural fire regime reference conditions. The FRCC data characterize the size of the project, geographic reference point from a location, photographs, composition of dominant biophysical land units, their landform and topographical setting, fire regime reference conditions, vegetation-fuel class current composition, current fire frequency, and current upper layer vegetation fire severity. This method provides the ecological information that can be used to classify the project fire regime and determine similarity, departure, ecological sustainability risks, and abundance of vegetation-fuel classes, and the fire regime group and condition class for the project or the stratifications.

Avian Monitoring

These procedures are suggested as standards for counts in the Southeast; they are based upon the standard protocol of Ralph and others (in press) as modified by the experience of Smith and others (1993) in the Mississippi Alluvial Valley. The instructions of the Breeding Bird Survey (U. S. Department of the Interior, Fish Wildlife Service n.d.) are useful as well.

Steps for conducting the actual point counts in the field are as follows:

1. Approach the location of the macro plot center, noting any birds within 50m (164 ft) of the counting station that are flushed, fly away, or retreat. Mark these birds in the appropriate distance band on the bullseye data sheet. Circles on the data sheet indicate distances of 25 m (82 ft) and 50 m (164 ft).

2. Orient the bullseye data sheet to a fixed direction, record the macro plot number, wind and sky conditions, date, time, and observer.

3. Set the thermometer in the shade.

4. As soon as possible start the count. Use a pocket timer or watch to keep track of the time.

5. Record each bird seen or heard with the appropriate species code. Count family groups of juveniles with a single adult as a single bird.

6. Mark birds on the data sheet in the appropriate distance band and appropriate azimuth; i.e., use the bullseye data sheet as a map of the count station and a compass to determine the approximate azimuth.

7. Record data for the different time intervals of the count in different ways.

8. Holding the sheet in a fixed position, spend part of the time facing in each of the cardinal directions in order to better detect birds in each.

9. Mark each bird once, using the mapped location to judge whether subsequent songs are from new or already mapped individuals. All flyovers are recorded outside the second circle, underneath the word "Flyover".

10. Record birds observed in the different time intervals separately. Mark the birds encountered in the final 5 minutes separately, such as by using a second color, underlining those observations, or otherwise distinguishing them. Be sure to note the chosen method of distinguishing these different time periods on the bullseye data sheet.

11. Do not record any birds believed to have been counted at previous stations.

12. At the end of 10 minutes, stop recording bird observations. Do not record any new birds seen or heard after the 10 minutes have passed.

13. Record the temperature.

14. Point count is complete.

Herpetological Monitoring

Herpetological surveys will be conducted using visual encounter surveys (as formalized by Campbell and Christman (1982) and Corn and Bury (1990)) around the macroplot locations. Visual Encounter Surveys are used to document the presence of amphibians and are effective in most habitats and for most species that breed in lentic (non-flowing) water. There are a number of assumptions inherent in VES that should be considered when designing a program using this technique. In brief, the assumptions are: 1) equal observability among species and among individuals, 2) no between-sampling visit effects e.g. there is an equal likelihood of being observed for each species for each sampling visit, 3) individuals are recorded only once per survey, and 4) no observer related effects.

Visual encounter surveys are conducted by observers walking through a designated area for a prescribed time, visually searching (in a systematic way, e.g. transects), for animals. The number of animals encountered are noted along with time elapsed during the survey.

Visual encounter surveys can determine species richness, provide information for compilation of a species list, and provide data used to estimate proportion of area surveyed that is occupied by target species. Data collected yields information on the presence of a species but does not establish absence, nor does it give reliable estimates of abundance.

Visual encounter surveys may be supplemented with dipnetting and aural identification where appropriate. More than one person can participate, number of minutes searching is always the number of minutes searched multiplied by the number of people searching. Ancillary data such as air and water temperatures, weather conditions, date, and time of survey should also be recorded. Minimum data collected includes, number of each species encountered, size (e.g. length or acreage) of the area searched and total search time.

Opportunistic observations will also be recorded by habitat type.

References on data collection and design:

Crump, M.A. and N.J. Scott Jr., 1994. Visual Encounter Surveys. In: Heyer, W.R., M.A. Donnelly, R.W. McDiarmid, L.C. Hayek and M.S. Foster (Eds). 1994. Measuring and monitoring biological diversity: standard methods for amphibians. Smithsonian Institution Press, Washington. Pp 84-92.

Olson, D. H., W.P. Leopnard, and R.B. Bury. 1997. Standardized survey methodologies for pond breeding amphibians in the Pacific Northwest including methods, design and suppliers.

Heyer, W.R., M.A. Donnelly, R.W. McDiarmid, L.C. Hayek and M.S. Foster (Eds). 1994. Measuring and monitoring biological diversity: standard methods for amphibians. Smithsonian Institution Press, Washington. Pp 364.

Post –Burn Assessment

Sampling structure: Burn severity information collected from points located every 50 meters along 1-2 transects within burn units and also recorded from macro plot if one is located in burn unit.

Sampling Unit: Point

Pre-monitoring background work: The transects will be oriented to include the greatest variety of plant communities, fuel models, and topography. The transects should probably not be parallel unless that is the best way to capture the greatest variation in the burn unit. Before going into the field calibrate your pace so that you know how many of your paces equal 50 meters. Do this by stretching a meter tape in the parking lot (or somewhere else on flat terrain) and walk at a normal, comfortable pace for 50m while counting your paces (1 pace=2 steps). Count your paces several times and then average the results.

Data Collected: At each point visually define a circular plot with a radius of 10m and record observations on scorch percent for the over- and midstory, scorch height, and char height, and degree in the overstory. Within a 5m radius record burn severity of the organic substrate and vegetation (see Tables 2-7 and Figure 1 on the Post Burn Evaluation worksheet). Greater distances between points may be desirable in some cases such as in prairies where it is easy to estimate the fire effects in a larger circle.

Use additional worksheets if more than 20 points/transect or more than two transects are required. All points in one table should be collected in the same natural community and fuel model. Therefore, when you enter a different natural community, record the data in another table.

Frequency of Collection: Once after each burn.

Time of Collection: Post burn evaluations should be conducted within one week after the burn to ensure that sufficient time has elapsed after the fire to allow leaf scorch to appear but before resprouting occurs.

Data analysis: Average the observations at the bottom of the worksheet and enter these averages into an overall burn unit table and then into a table by natural community. The ecological objectives of the burn should be listed and accompanied by numerical and narrative results. These objectives should be included in each burn plan. An overall summary of the effects of the burn should conclude the report.

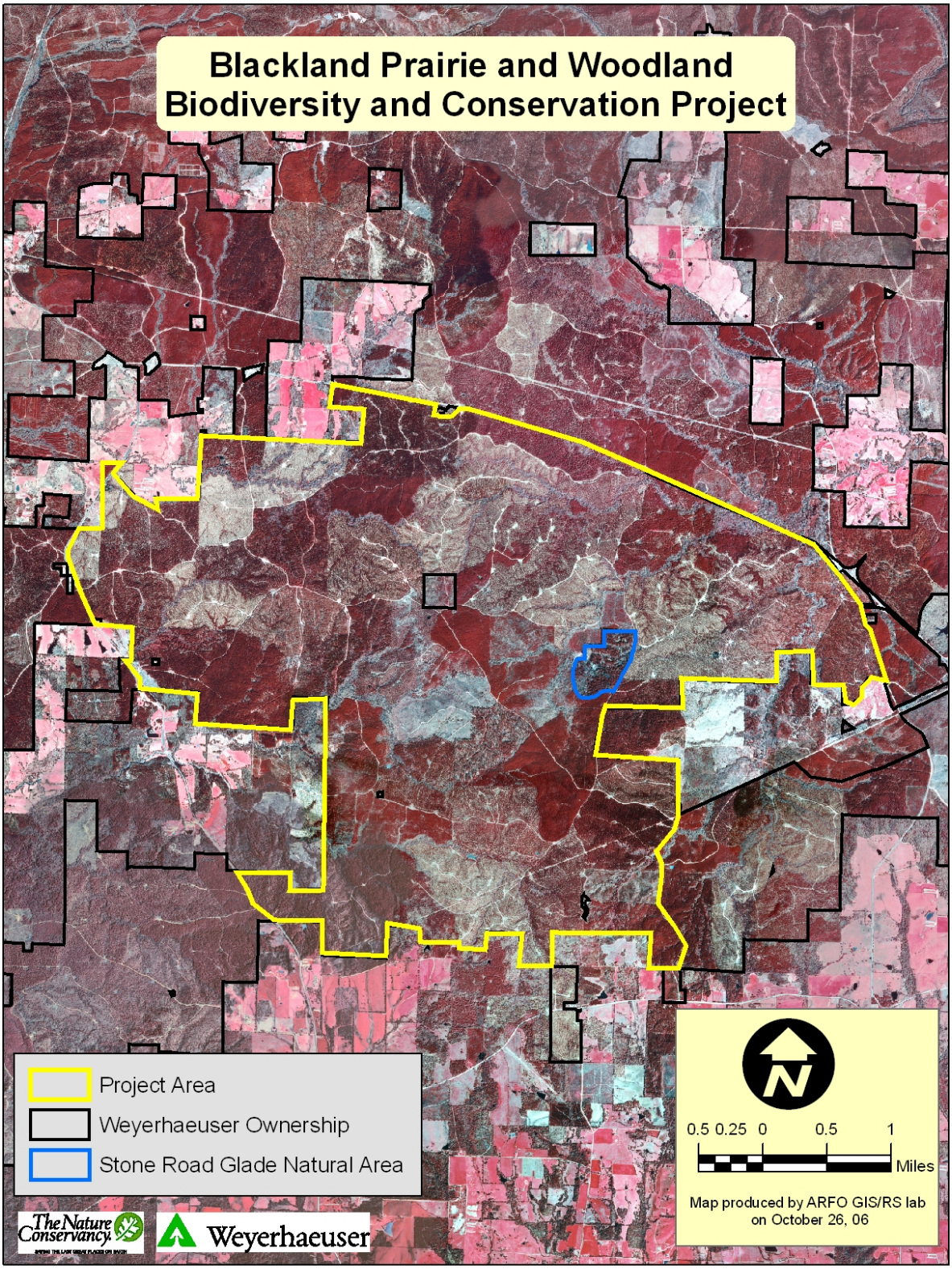
Photomonitoring

Digital photos will be taken from two opposite corners into the macro-plot. The photopoint project area, macroplot location, corner location, azimuth, date, and photographer should be recorded on the resulting jpg file.

Project Accomplishments

Project success will be measured by reviewing the total impact of management actions on the indicators (tracked by afore mentioned protocols). Progress toward goals will also be measured by quantifying the total acres burned and thinned as well as total project costs.

APPENDIX B. PROJECT SITE MAPS




Moro Big Pine Project Area
172
167
Calhoun County
Ouachita River
N
0
1
2 Miles
Moro Big Pine Project Area