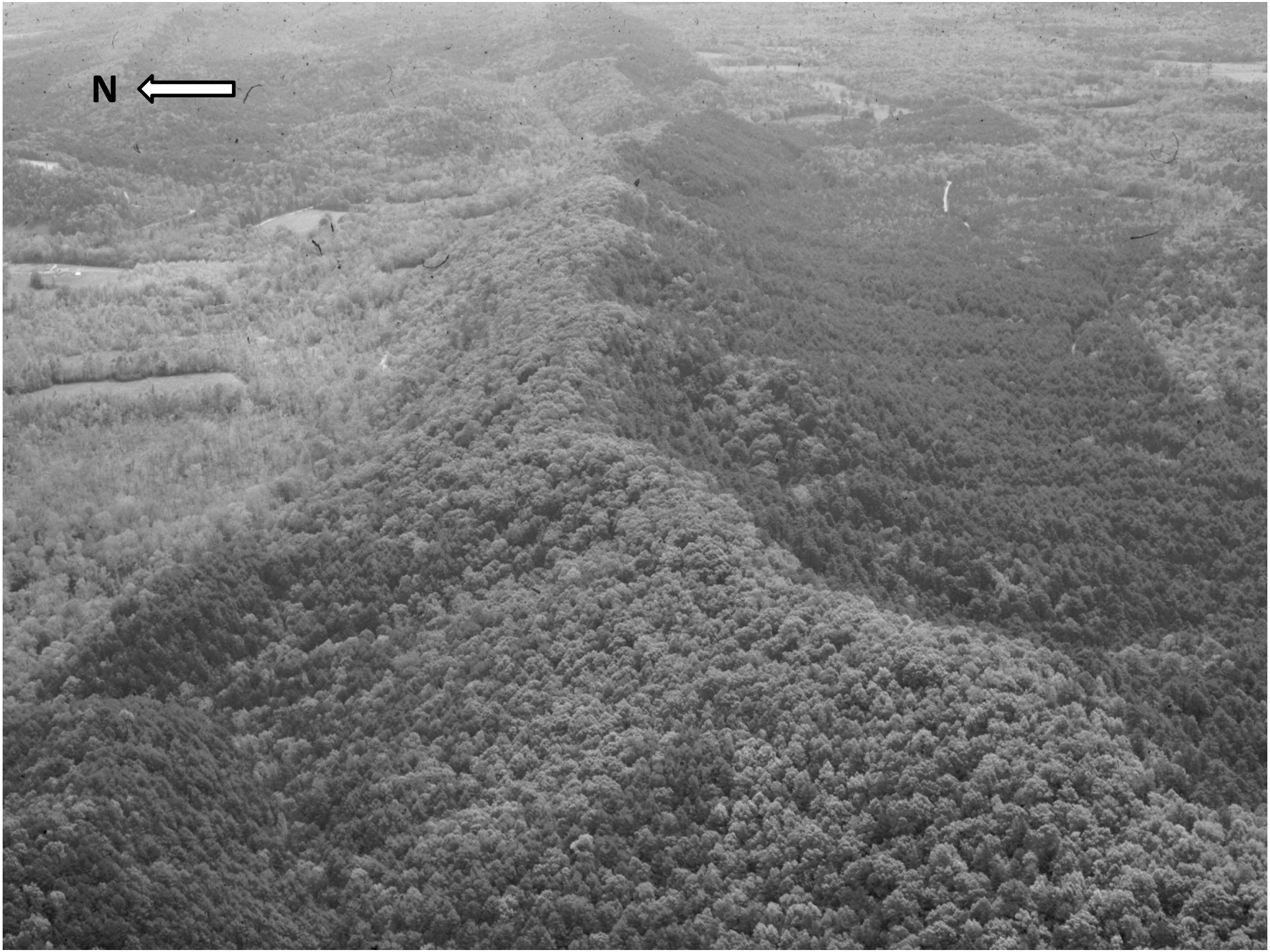
# Shortleaf Pine Restoration:
## Twenty Years of Science and Management in the Western Range

3rd Biennial Shortleaf Pine Conference

Pine-Oak Ecosystem Restoration Partnerships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# Woodland Systems

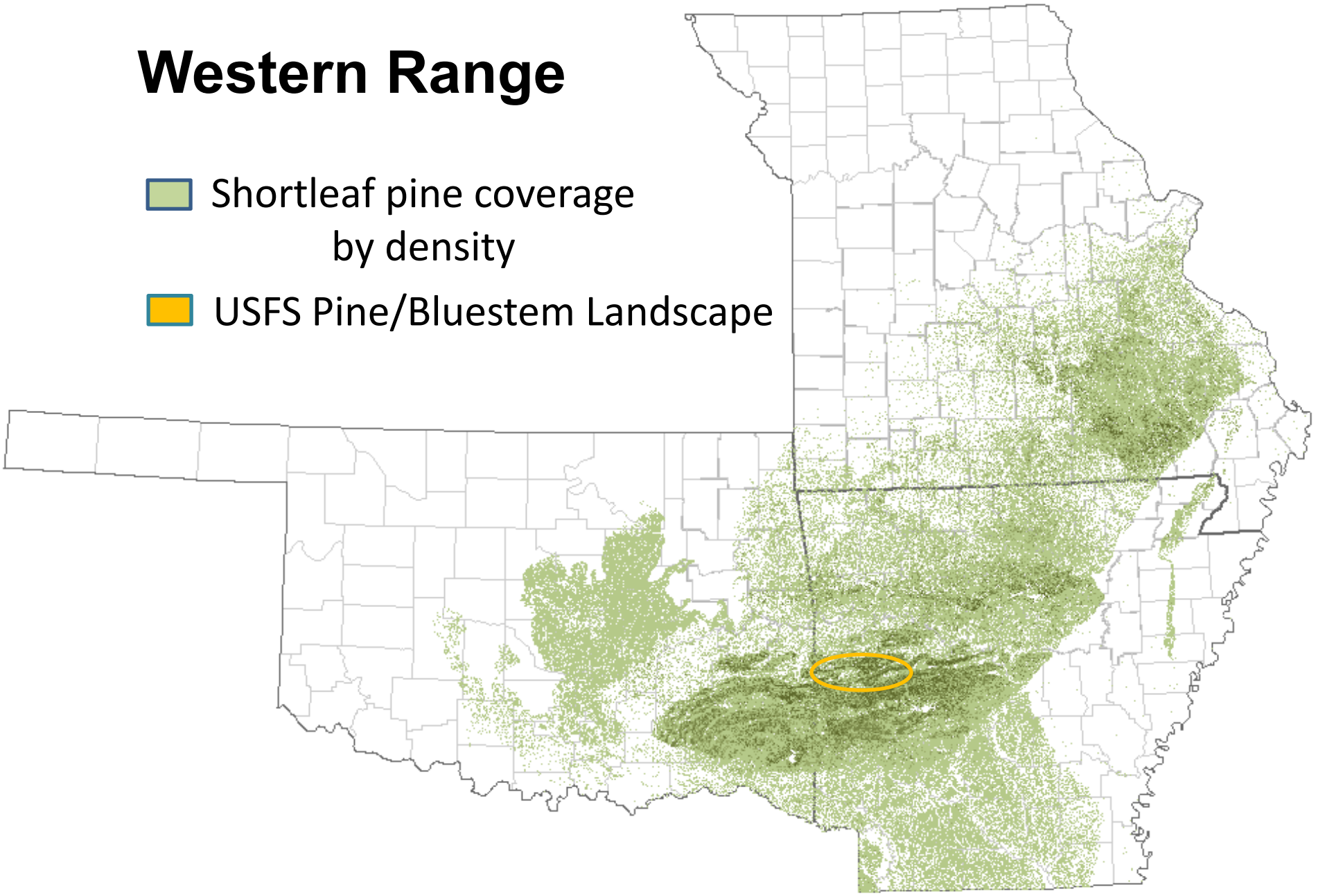
- Are fire-maintained forested communities
- Have an open canopy of trees
- Groundcover of grasses, forbs, legumes, sedges
- Lack a woody midstory and understory
- Were once common in the Interior Highlands
- Three SLP types in IH:
    - Shortleaf Pine - Bluestem
    - Shortleaf Pine - Dry Mesic Oak
    - Shortleaf Pine – Dry Oak

| | Canopy | BA* | Ave DBH |
|---|---|---|---|
| Savanna: | < 30% | 10-40 | > 14” |
| Woodlands: | 40-70% | 50-70 | > 8” |
| Forests: | > 70% | > 70 | NA |

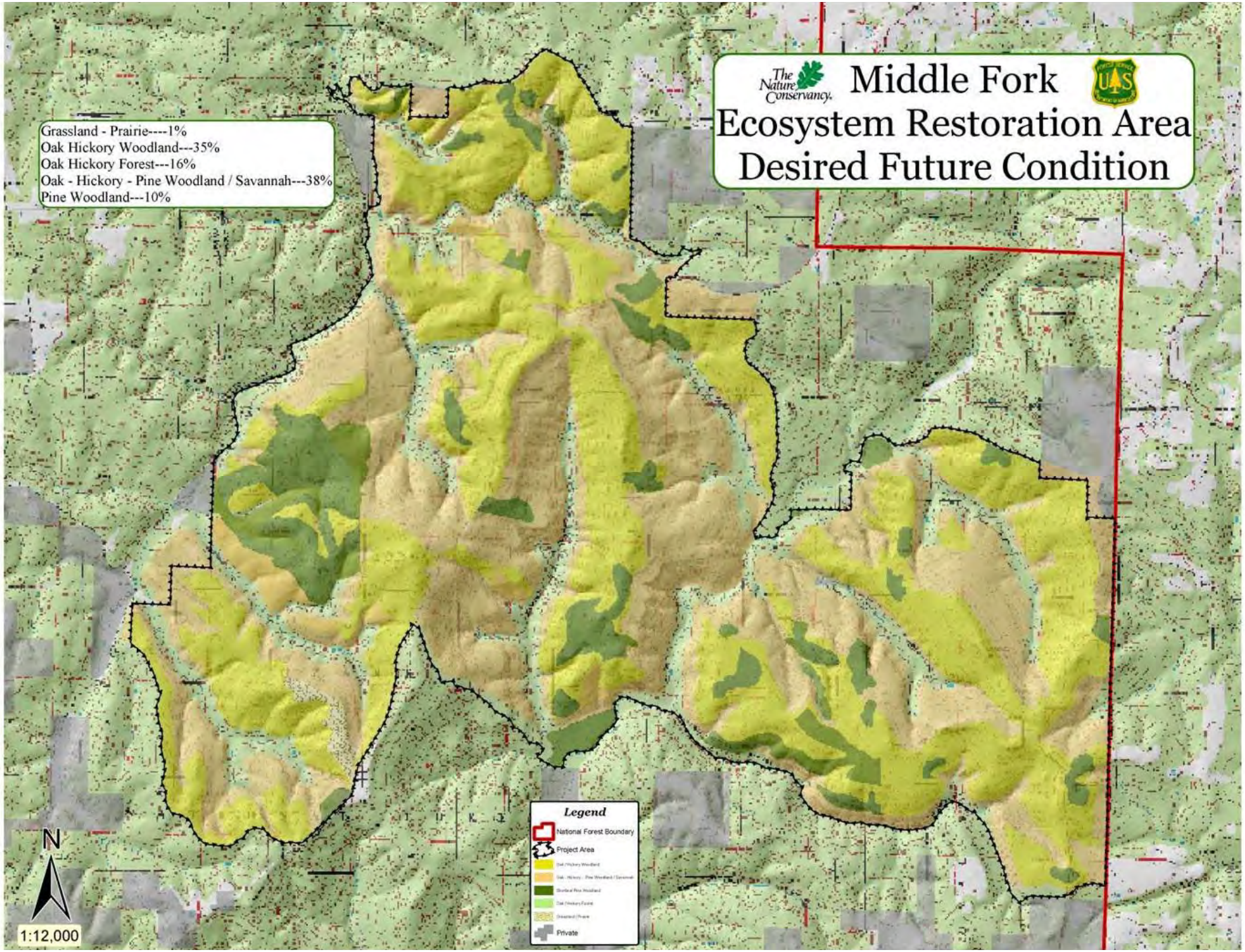
*** dependent upon average DBH and crown types of overstory species, use of Gingrich-type table required.**


Restoration Sites
in the Western Range

# Western Range




254,000 acre Management Area on the Ouachita National Forest: approx. 130,000 acres in stages of restoration.


The Nature Conservancy
Middle Fork
Ecosystem Restoration Area
Desired Future Condition
Grassland - Prairie----1%
Oak Hickory Woodland---35%
Oak Hickory Forest---16%
Oak - Hickory - Pine Woodland / Savannah---38%
Pine Woodland---10%
Legend
National Forest Boundary
Project Area
Private
N
1:12,000

# AR/MO DDCF GRANT

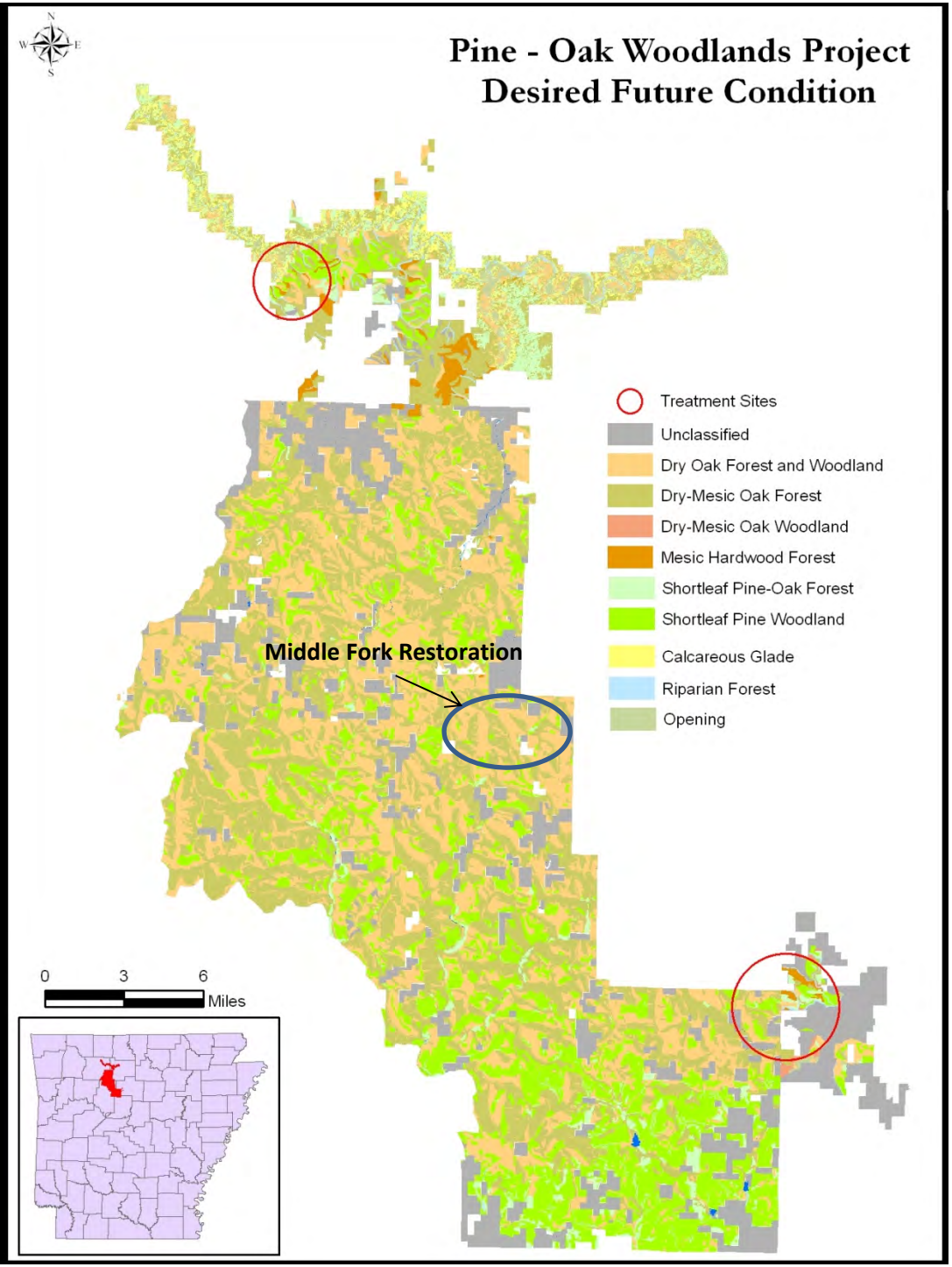
## Arkansas Project Area

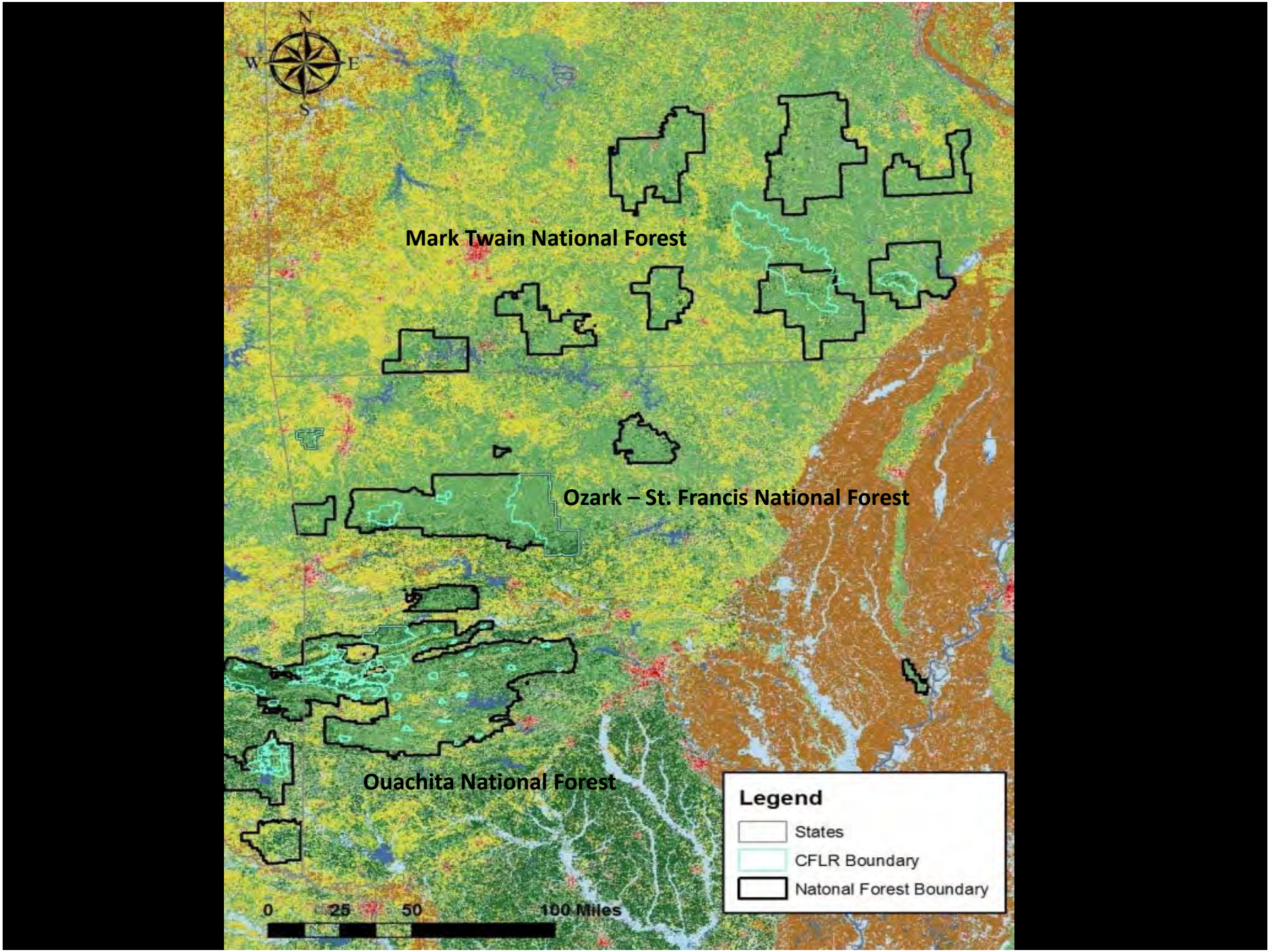
**Includes:** (portions of)

Buffalo National River
Gene Rush WMA
Ozark National Forest
Gulf Mountain WMA

**Project Area:**

320,000 acres




N
W
E
S
Mark Twain National Forest
Ozark – St. Francis National Forest
Ouachita National Forest
Legend
States
CFLR Boundary
Natonal Forest Boundary
0
25
50
100 Miles


Lessons Learned

# Lessons Learned

John Andre


John Andre

# Lessons Learned

- Is the site most likely **restorable?**
- In restoration, we should limit **burning without thinning**.
  No sunlight…fewer plants.
- During restoration phase, **do not miss a 3-year burn window**
  if there's anyway to help it.
- It's not hard to change a **natural pine stand to an oak-dominated** stand. It's magic!

# Lessons Learned

- **Merchantability** of forest products drives our ability to afford future treatments so,
  1) you need to have enough stocking to afford next thinning.
  2) unless there's a band saw mill around you can't sell trees over 20" dbh.

- And you should plan to lose 10 BA/ac. from **overstory mortality** with increased fire.

- Managers, watch out for **falling for "recipes".** Do not thin too much too early!

# Lessons Learned

## Afford the chemical

# The Restoration Prescription

(for mature SLP stands)

1) Use dormant-season burns to **reduce the litter layer**.

2) **Use herbicides** on all non-merchantable, midstory and understory woody growth (<8”).

3) **Burn again** while fuel (injected stems) is not yet available, reducing intensity.

# The Restoration Prescription

(for mature SLP stands)

4) Mark the necessary **overstory reduction** and all remaining midstory stems (you can save a few).

5) Conduct harvest, preferably whole-tree logging to **reduce on-site slash**.

6) Try to **stay** on 3-year burn rotation during restoration phase.


Desired Future Conditions

# Team Developed Desired Future Conditions for Three Systems:

- *Pine-bluestem:* Shortleaf pine communities in which warm season grasses/forbs are prominent on dissected plains.

- *Dry-Mesic Pine-Oak:* Shortleaf pine mixed with oak species (either can be dominant) on more deeply dissected hills, even on upper north-facing slopes.

- *Dry Pine-Oak:* SLP mixed with oak species on steep, south-facing upper slopes and ridge tops.

*(Incorporates 7 NatureServe Community Types)*

# Variables addressed in Regard to Desired Future Conditions

- *Available Sunlight:*

  *Canopy Cover %  2) Midstory %  3) Understory %*

- *Basal Area and Tree Density (surrogates)*

- *Desired herbaceous ground cover %*

- *Disturbance Regimes (*Consider frequency, intensity, and seasonality)

# Estimate canopy closure

# Desired future conditions for Shortleaf Pine forests based on available growing space was adapted from Rogers (1983)

| | Percent Canopy Closure for forest grown Shortleaf Pine Stands | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 10% | | 20% | | 25% | | 30% | | 40% | | 50% | | 60% | | 70% | | 80% | | 90% | | 100% | |
| DBH | #/ac | BA | #/ac | BA | #/ac | BA | #/ac | BA | #/ac | BA | #/ac | BA | #/ac | BA | #/ac | BA | #/ac | BA | #/ac | BA | #/ac | BA |
| 10 | 30 | 16 | 59 | 32 | 74 | 40 | 89 | 49 | 119 | 65 | 148 | 81 | 178 | 97 | 208 | 113 | 237 | 129 | 267 | 146 | 297 | 162 |
| 12 | 14 | 11 | 28 | 22 | 35 | 28 | 42 | 33 | 57 | 44 | 71 | 56 | 85 | 67 | 99 | 78 | 113 | 89 | 127 | 100 | 142 | 111 |
| 14 | 10 | 11 | 21 | 22 | 26 | 27 | 31 | 33 | 41 | 44 | 51 | 55 | 62 | 66 | 72 | 77 | 82 | 88 | 92 | 99 | 103 | 110 |
| 16 | 9 | 12 | 17 | 24 | 22 | 30 | 26 | 36 | 35 | 49 | 44 | 61 | 52 | 73 | 61 | 85 | 70 | 97 | 78 | 109 | 87 | 122 |
| 18 | 7 | 12 | 14 | 25 | 17 | 31 | 21 | 37 | 28 | 49 | 35 | 62 | 42 | 74 | 49 | 86 | 56 | 99 | 63 | 111 | 70 | 123 |
| 20 | 7 | 15 | 14 | 30 | 17 | 37 | 20 | 45 | 27 | 59 | 34 | 74 | 41 | 89 | 48 | 104 | 55 | 119 | 61 | 134 | 68 | 149 |
| 22 | 6 | 17 | 13 | 34 | 16 | 42 | 19 | 51 | 26 | 68 | 32 | 84 | 38 | 101 | 45 | 118 | 51 | 135 | 58 | 152 | 64 | 169 |
| 24 | 4 | 14 | 9 | 28 | 11 | 35 | 13 | 42 | 18 | 57 | 22 | 71 | 27 | 85 | 31 | 99 | 36 | 113 | 40 | 127 | 45 | 141 |

Range for Pine-Bluestem Woodland
(for 16” average stand DBH)

Range for SLP-Dry Oak Woodland
(for 16” average stand DBH)

Range for SLP-Dry Mesic Oak Woodland
(for 16” average stand DBH)

Rogers, R. 1983. Guides for Thinning Shortleaf Pine. Pp. 217-225. In: Jones, Earle P., [Editor] 1983. Proceedings of the Second Biennial Southern Silvicultural Research Station Conference, Atlanta, Georgia, November 4-5, 1982. Gen Tech Rep SE-24. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station. 526p.

# Overview of Range of Variables

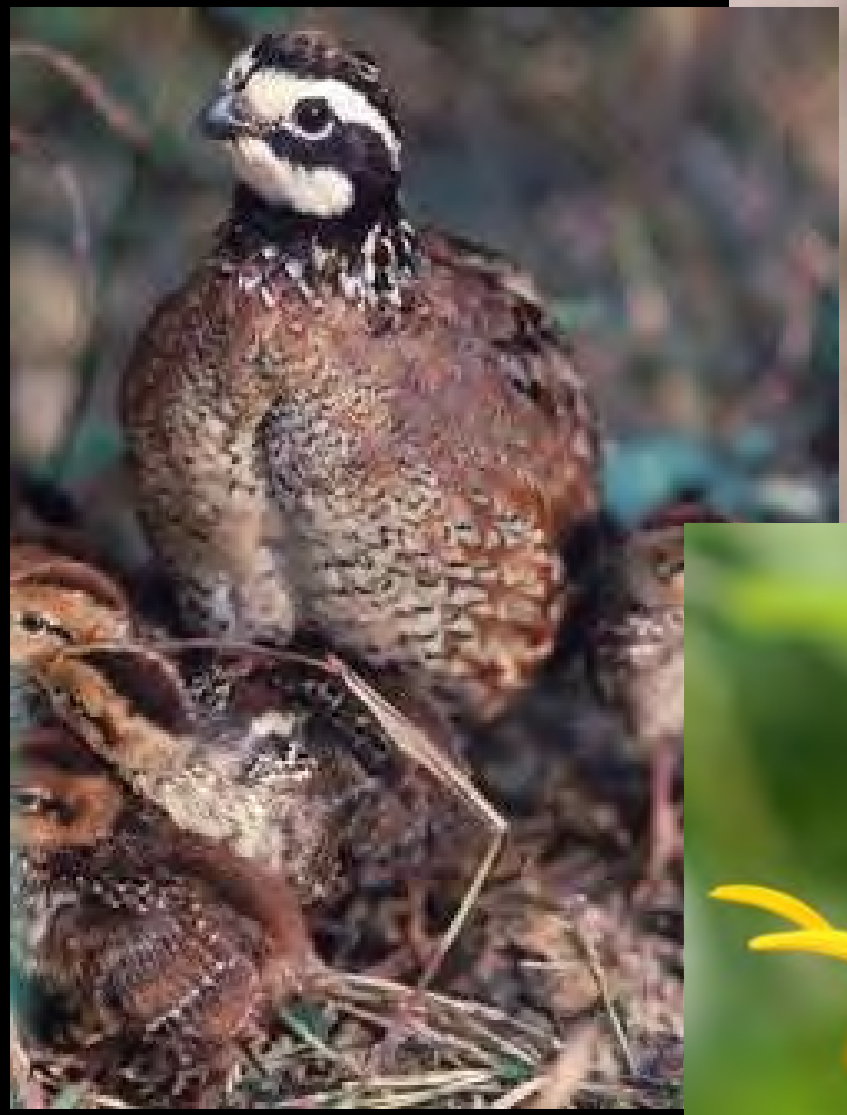
| Community Type | Canopy Closure (%) | Basal Area* ($ft^2/ac$) | Trees Per Acre* | Midstory Density (%) | Understory Cover (%) | Ground Layer Cover (%) |
|---|---|---|---|---|---|---|
| **Shortleaf Pine-Bluestem** | 30-60 | 35-70 | 26-52 | <10 | <10 | 80-100 |
| **Shortleaf Pine-Dry Mesic Oak Woodland** | 50-80 | 60-95 | 44-70 | <30 | <30 | 50-80 |
| **Shortleaf Pine-Dry Oak** | 30-50 | 35-60 | 26-44 | 15 | 20-80 North <30 South | 40-60 |
| ***Calculated Based on an average DBH of 16", will vary with average stand DBH see table 1 A** | | | | | | |

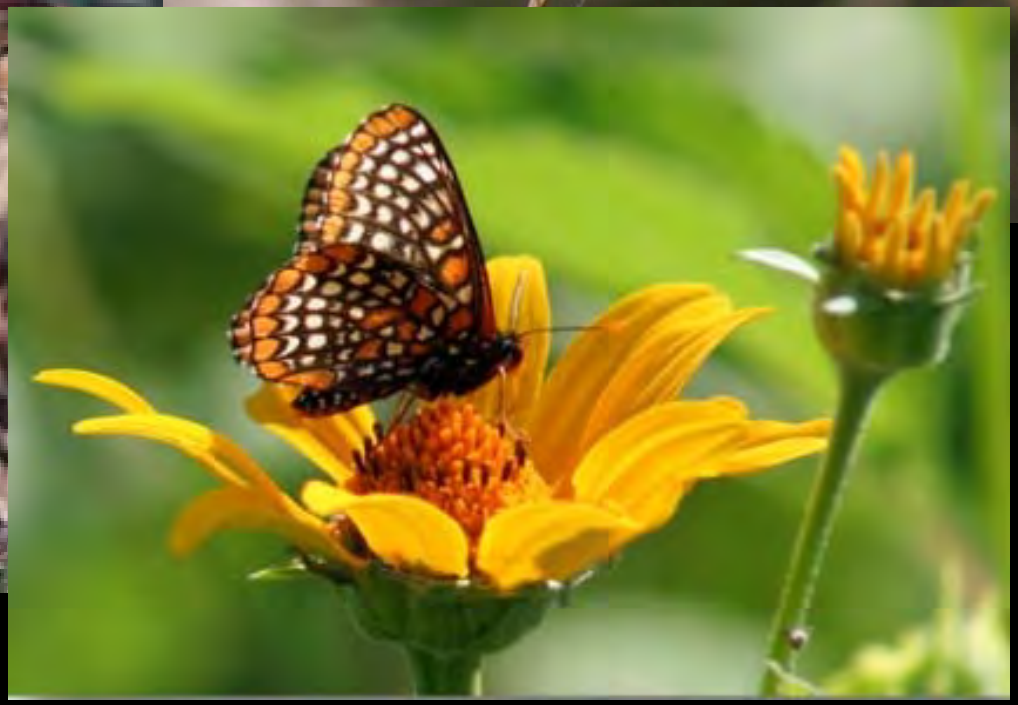
*Desired age and structural characteristics for canopy, mid- and under-story seral stages, and ground flora:*

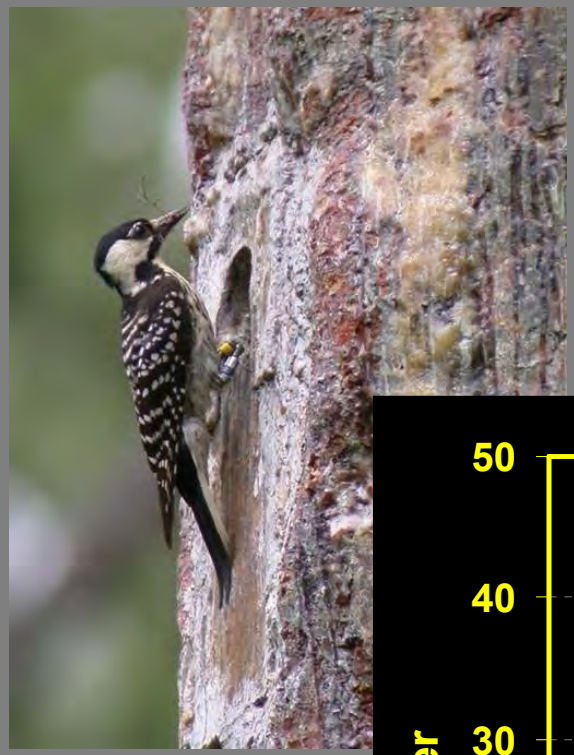
*Disturbance Regimes (*Consider frequency, intensity, and seasonality)


Effects of Restoration

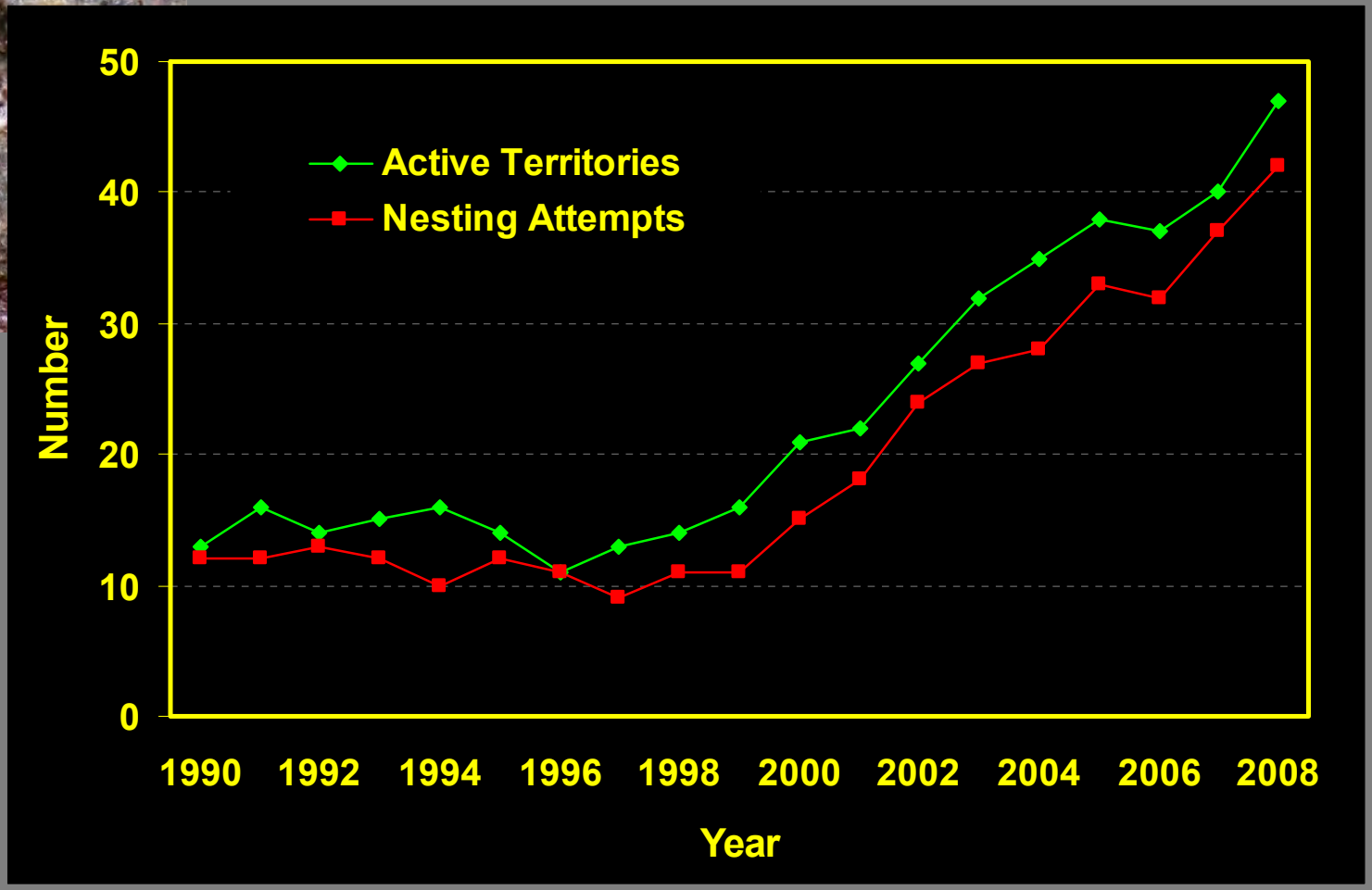
# Effects of Restoration







# Shortleaf Pine-Bluestem Restoration – Environmental Effects



# Shortleaf Pine-Bluestem Restoration – Environmental Effects

On butterfly fauna *(Thill et al. 2004)*
- Numbers of adult butterflies were lowest in the untreated controls and were highest in treated stands the first year after burning

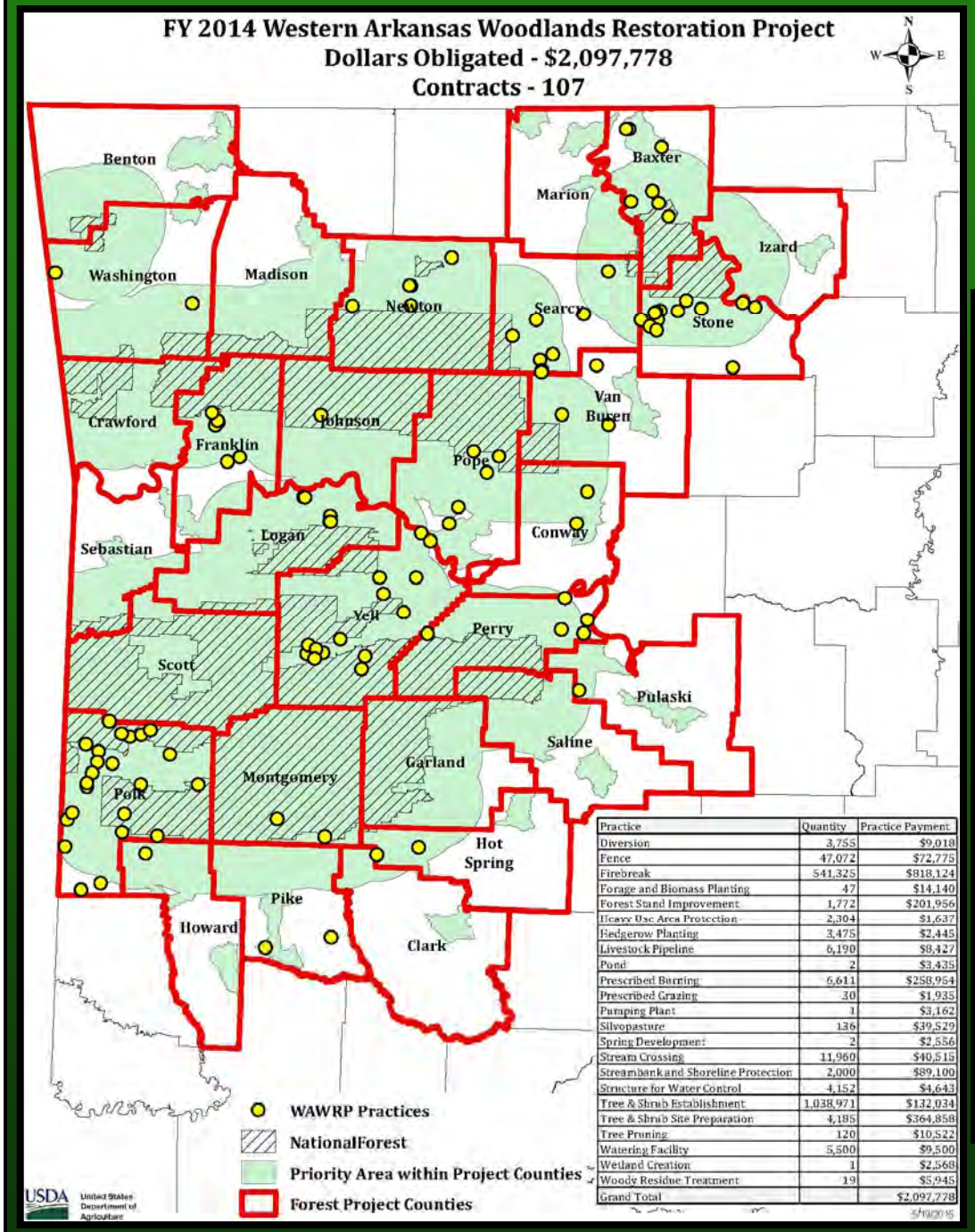
On bats *(Perry et al. 2007)*

- Big brown, Evening, Northern long-eared, Eastern red, and Seminole bats preferred to roost in thinned and burned mature stands

On small mammals *(Masters et al. 1998)*
- Abundance and diversity increased in restored stands.

On deer forage *(Masters et al. 1996)*
- A seven-fold increase in preferred forage in restored stands as compared to untreated controls.


Outreach to
Private Landowners




| Practice | Quantity | Practice Payment |
|---|---|---|
| Diversion | 3,755 | $9,018 |
| Fence | 47,072 | $72,775 |
| Firebreak | 541,325 | $818,124 |
| Forage and Biomass Planting | 47 | $14,140 |
| Forest Stand Improvement | 1,772 | $201,956 |
| Heavy Use Area Protection | 2,304 | $1,637 |
| Hedgerow Planting | 3,475 | $2,445 |
| Livestock Pipeline | 6,190 | $8,427 |
| Pond | 2 | $3,435 |
| Prescribed Burning | 6,611 | $258,954 |
| Prescribed Grazing | 30 | $1,935 |
| Pumping Plant | 1 | $3,162 |
| Silvopasture | 136 | $39,529 |
| Spring Development | 2 | $2,556 |
| Stream Crossing | 11,960 | $40,515 |
| Streambank and Shoreline Protection | 2,000 | $89,100 |
| Structure for Water Control | 4,152 | $4,643 |
| Tree & Shrub Establishment | 1,038,971 | $132,034 |
| Tree & Shrub Site Preparation | 4,185 | $364,858 |
| Tree Pruning | 120 | $10,522 |
| Watering Facility | 5,500 | $9,500 |
| Wetland Creation | 1 | $2,568 |
| Woody Residue Treatment | 19 | $5,945 |
| Grand Total | | $2,097,778 |

**WAWRP**

# FY 2014 FUNDING

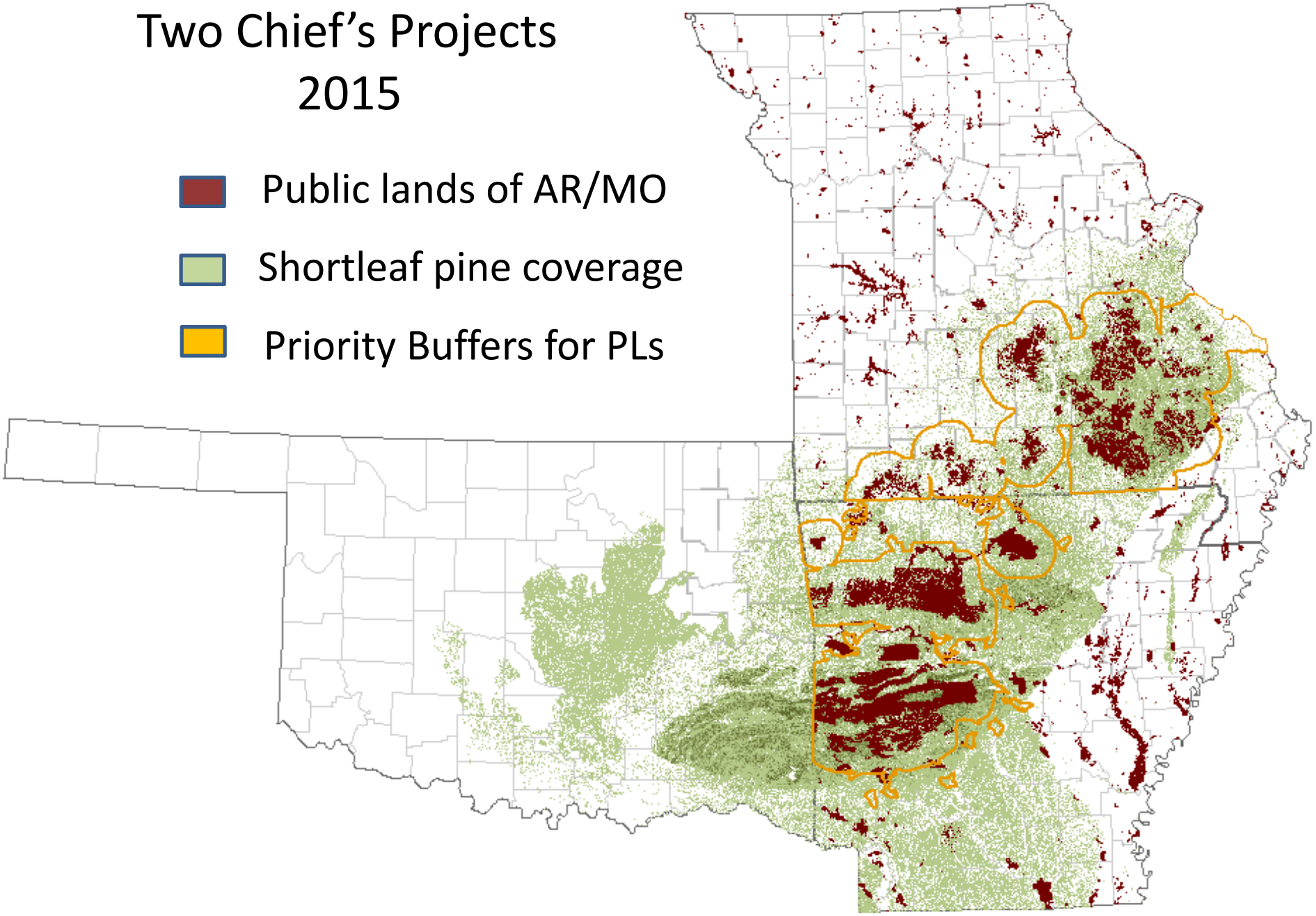
Ouachita and Ozark National Forests

$1.3 million

NRCS

$2.1 million

# Two Chief's Projects 2015




Questions?