

# Revisiting Landscape Level Fire in a Modern World



Charles Ruffner  
Professor of Forestry  
SIUC-School of Forestry and  
Horticulture  
Wisconsin Forestry Center  
Prescribed Fire for Forest  
Management Webinar Series  
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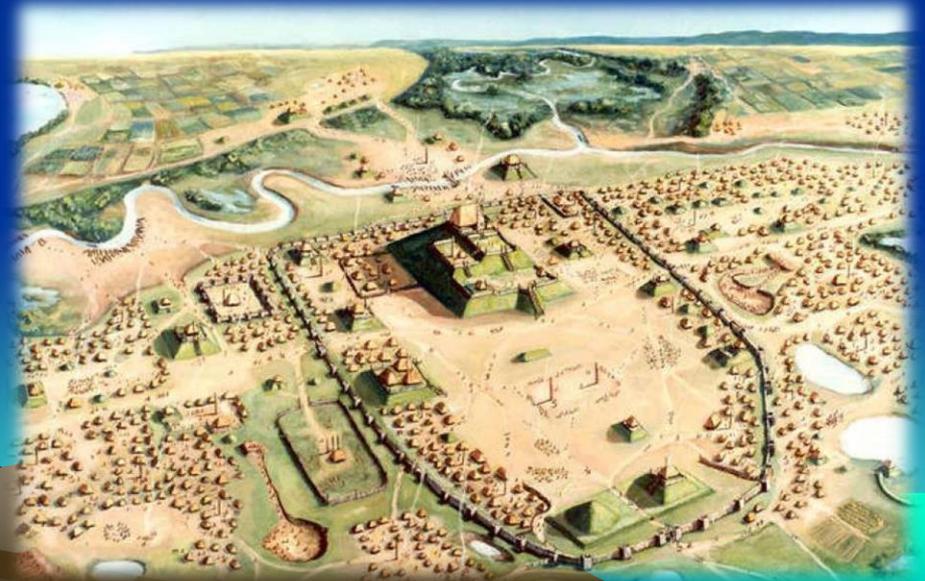
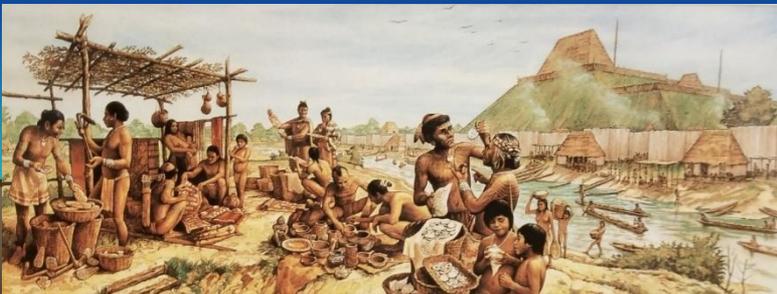
# Objectives

- Describe history of fire across Midwestern region
  - Historic role of fire
  - Modern uses of fire
- Major management issues
  - Enhancing oak forest health for wildlife dependent on hard mast acorns
  - Interagency coordination to increase mosaic
  - Restoring grassy woodlands for songbirds, insects, and biodiversity
  - Reducing spread of invasive species
  - Fostering Public Acceptance of Rx fire



# Introduction

- I speak to you from the prehistoric landscape known as the American Bottom
- Similar landscape all the way north into the Driftless area
- In the Midwestern US, many accept the role of pre-historic native fire in maintaining prairie and savanna woodland systems
- Nearly all early references to fire suggest native influence along with local edaphic factors influenced vegetation mosaic



## Native American Uses of Fire

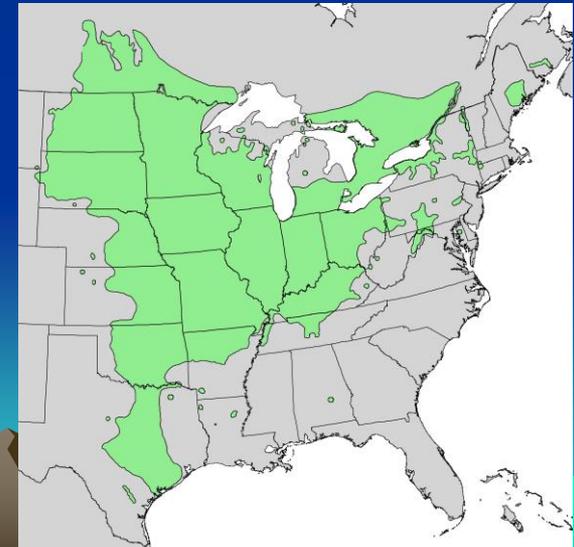
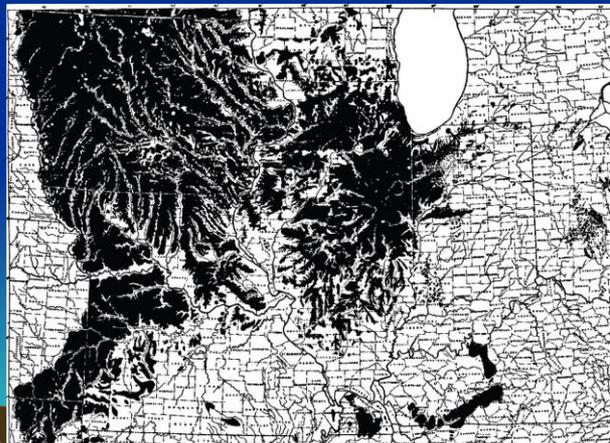
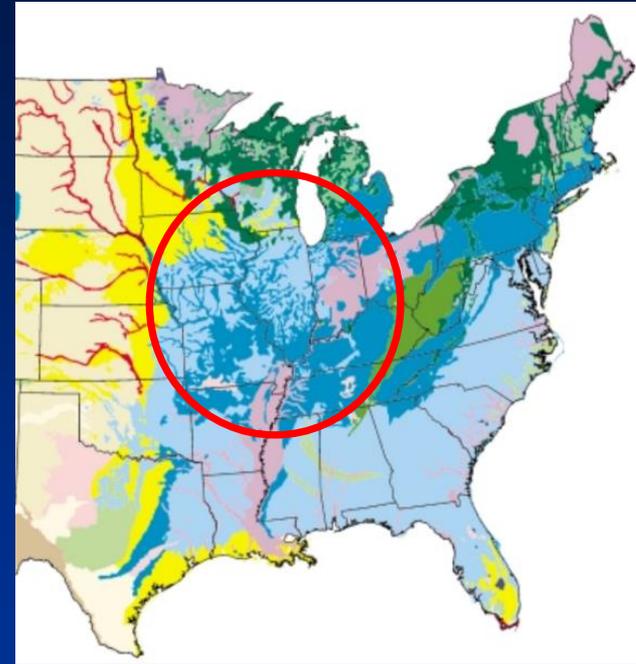


- 70-120 documented uses of fire in North American tribes
- Reduce rattlesnake populations
- Encourage berry and browse production
- Lure deer into hunting range
- Reduce understory debris to aid movement
- Expose acorns on ground for collection
- Drive game for hunting
- Clear and maintain living space & fields
- Encourage resprouting species
- Deny forage to other groups
- Reduce unwanted species
- Girdle trees for felling
- Warfare



Sources: Maxwell 1910, Day 1953, Doolittle 2004, McClain et al 2021

- Landscape Patterns
  - Central Hardwoods
  - Dry, exposed uplands
  - Moist, bottomlands
  - Prairie-forest ecotone
  - Frequent surface fires
- Historic Range of Variability
  - continuum from prairie-woodland - forest driven by topography, hydrology, and human fire effects



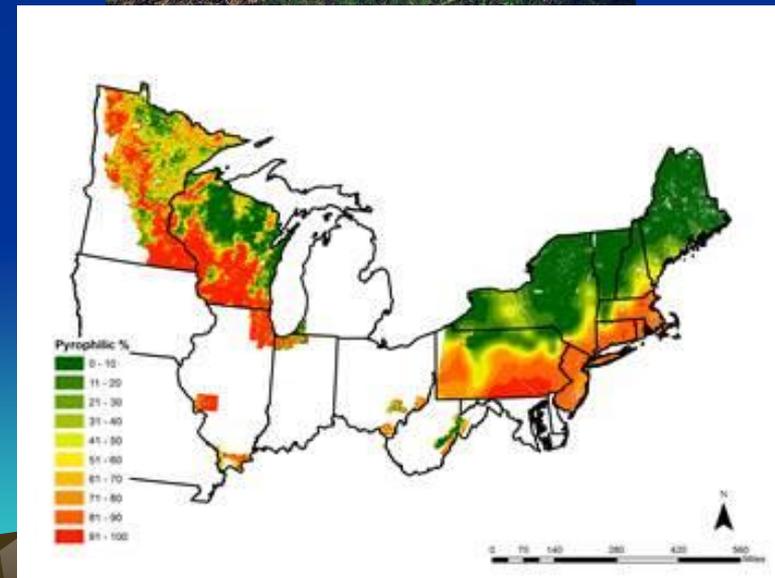
# Historic Midwestern Landscape

- Disturbance oriented vegetation
  - Shortleaf pine-oak forests across Ozarks
  - Glades, barrens, and savanna
  - Oak-hickory woodlands
- Human and natural disturbances
  - Diachronic Resource extraction
  - Low incidence of lightning fire
  - Glaze events & periodic drought
- Highly valued wildlife habitat
  - Multiple niches across continuum
  - Recognized diversity of ground flora



# Forests at Settlement

- **General Land Office Surveys**
  - Witness tree analysis suggests oak-hickory dominance w low maple density
  - Historic accounts attest to heavy, localized burning and clearing maintenance activities
- **Commonly used terms indicate open, burned over conditions:**
  - Fire blackened soil
  - Burnt timber or prairie
  - Indian cabins
  - Old fields
- “by the industry of the Indians (the land is) very open and clear of woods”
- “open in spacious plains”



# Oak Adaptations to fire and xeric sites

- Fire Adaptations

- Thick corky bark
- Resprouting ability
- Compartmentalization of scars
- Mineral soil exposed following fire excellent for acorn germination
- Later successional species reduced in number



- Drought Adaptations

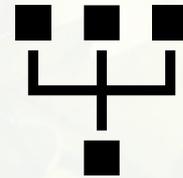
- Deep tap roots
- Xeromorphic leaves
- Osmotic adjustment of leaf potential



# Oak Regeneration Hypotheses



Fire-oak hypothesis  
(Abrams 1992 ; Arthur et al. 2012)



Multiple interacting ecosystem  
drivers hypothesis  
(McEwan et al. 2011)

# Forest Development History



- Disturbance Regime I (<1810)
  - Fire return interval ~15-35 y
- Disturbance Regime II (1810 – 1930)
  - Fire return interval ~8-15 y
  - Often as low as ~1-3.5 y
- Disturbance Regime III (1930>Present)
  - Near total Fire suppression
  - Fire free interval >85 yr



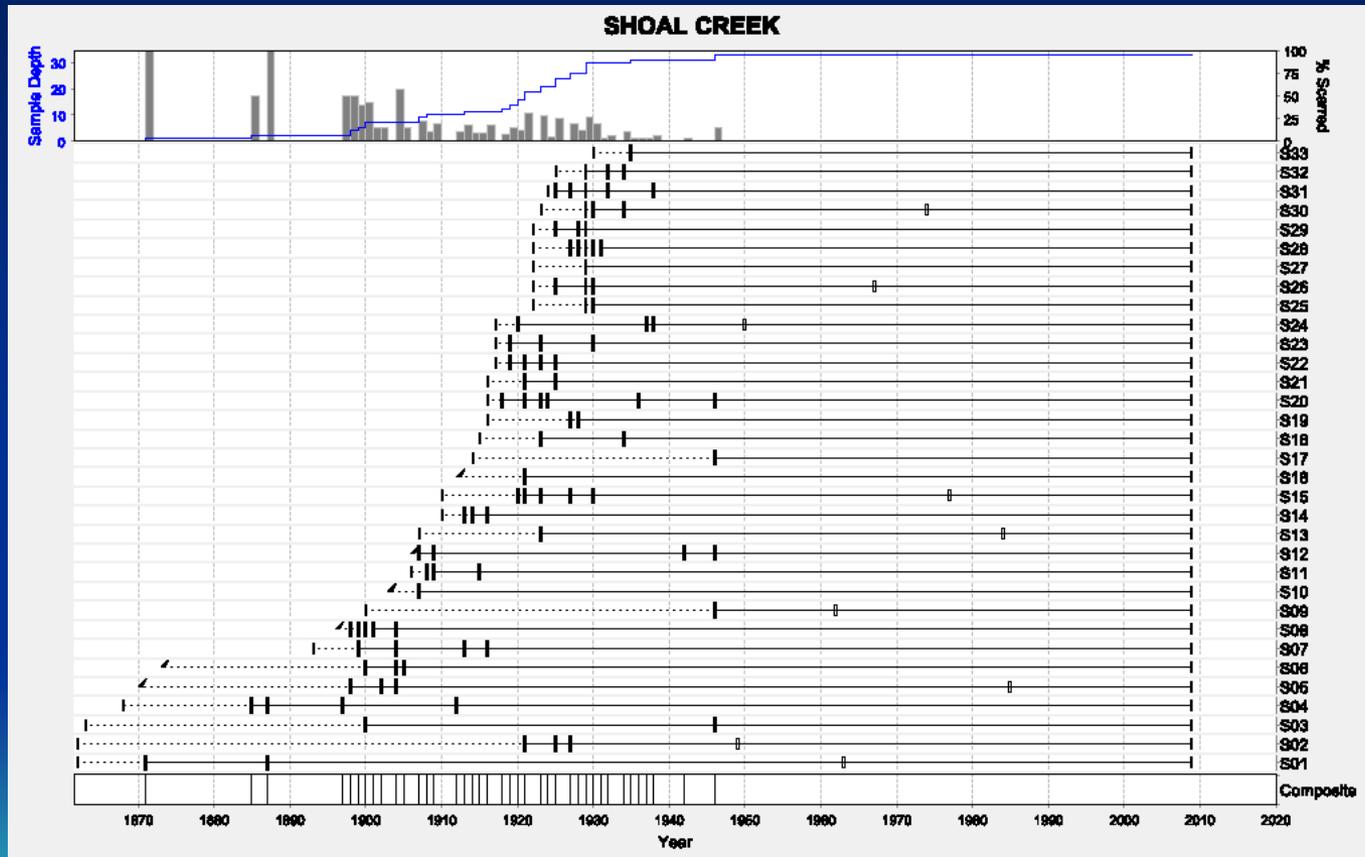
Fralish, JS and TG McArdle. 2009. Forest dynamics across three century-length disturbance regimes in the Illinois Ozark hills. *The American Midland Naturalist*. 162:418-449.

## Euro-American settlement: (1810-1930)



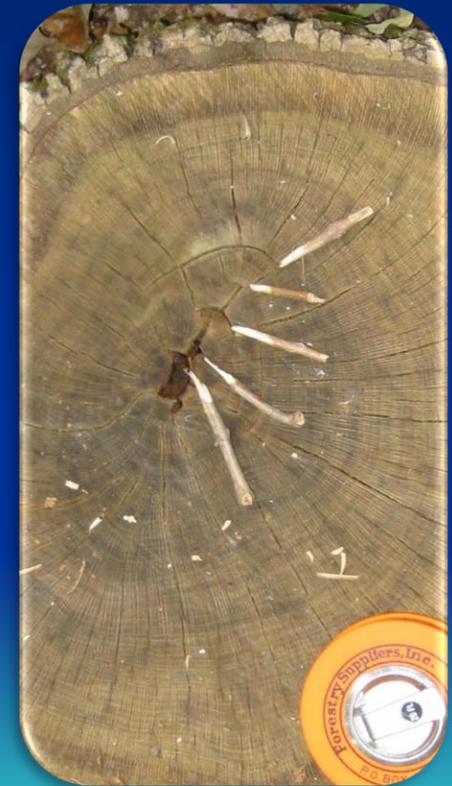
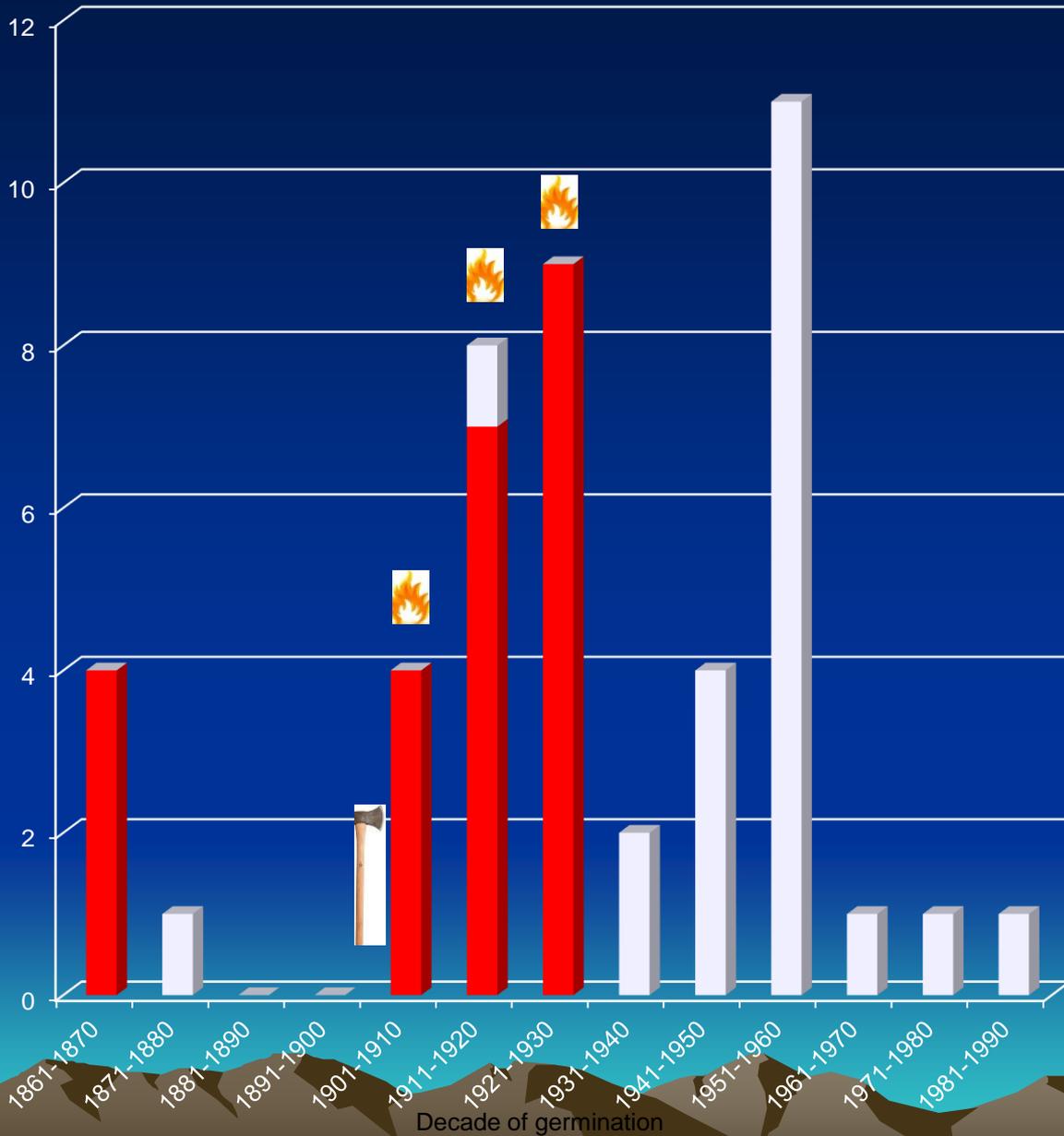
- Increased level of fire, grazing, and timber cutting
- Current forest overstory established from mid to late 19<sup>th</sup> century through early 20<sup>th</sup> century
- Oak-hickory increased on all slope positions

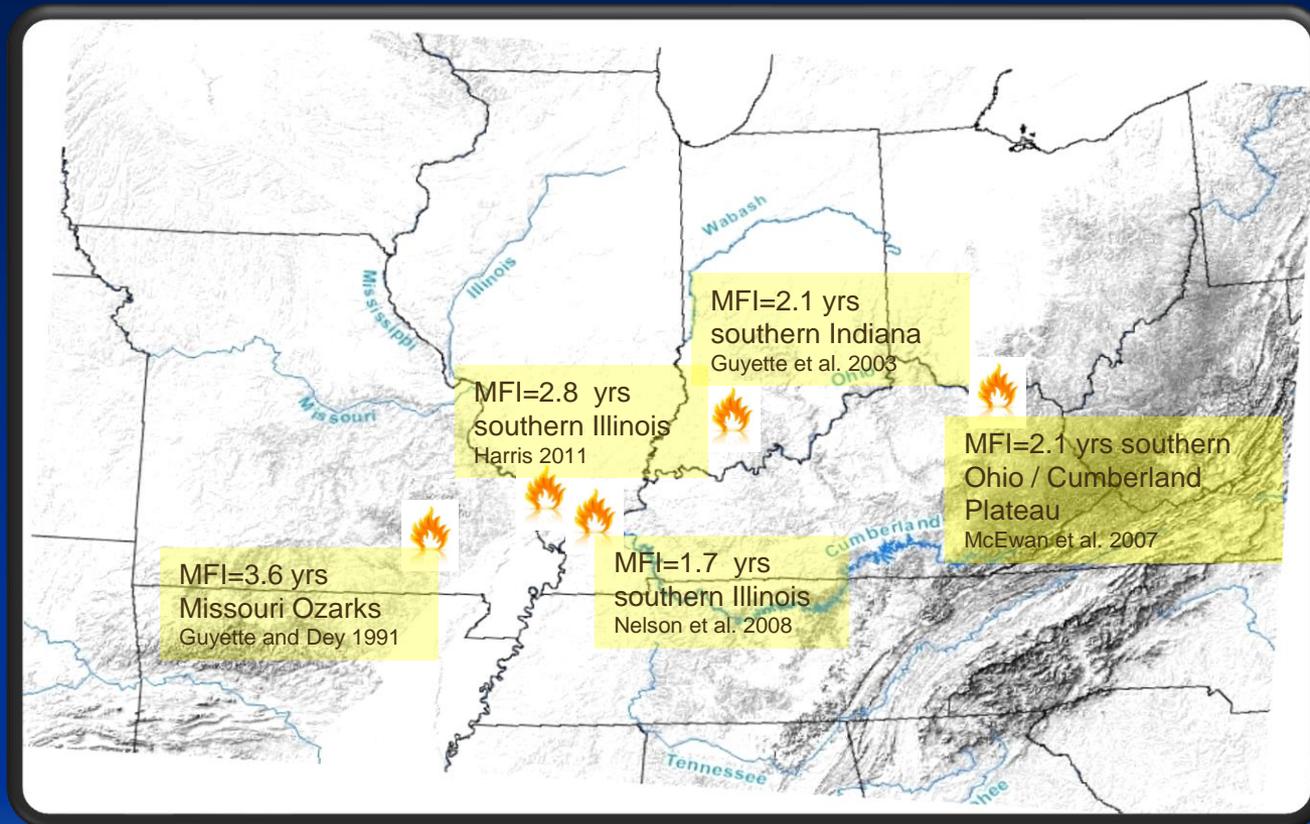
# Shoal Creek Composite Fire History



# SHOAL CREEK RECRUITMENT HISTORY

- NO. SHADE TOLERANT MAPLE-BEECH
- NO. SHADE INTOLERANT OAK-HICKORY

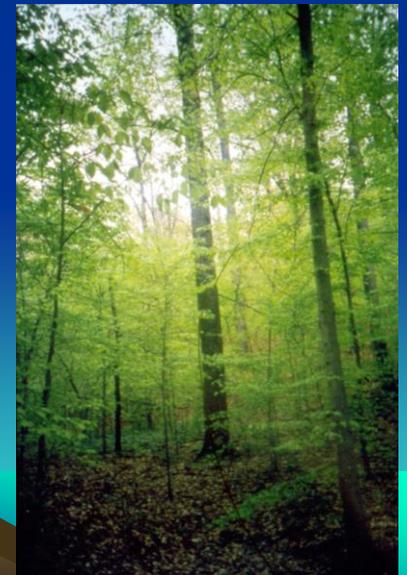
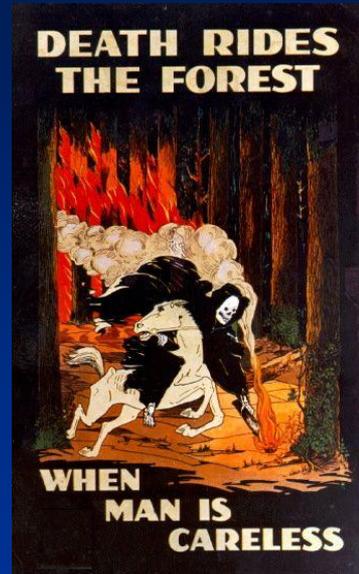




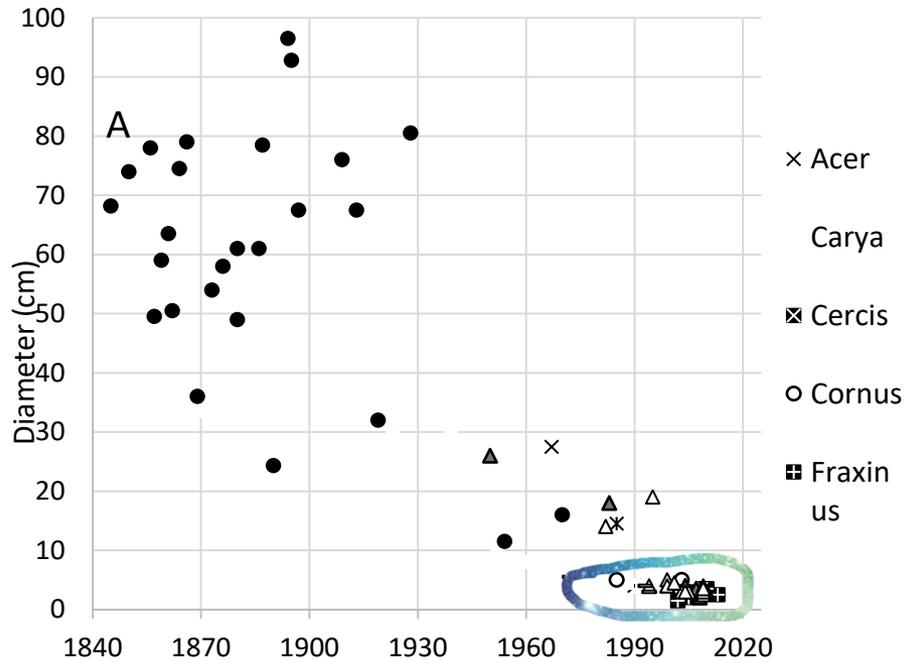
## Post-settlement Fire History of the Central Hardwood Region (1880-1940)

# Disturbance Regime III (Post 1930)

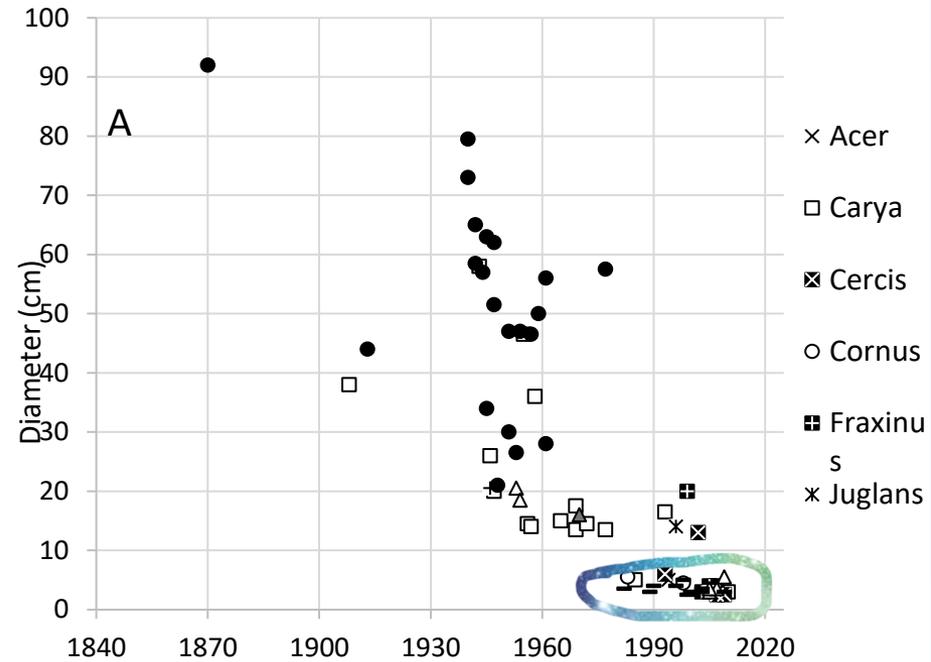
- Fire suppression
- Reduced cutting intensity
- Reduced grazing pressure
- ALL result in:
  - Greatly increased trees per acre~ stand density
  - Shift away from oak hickory to maple beech, elm and gum
  - Mesophication (Nowacki and Abrams 2008)



## Old-Growth Age-Diameter



## Second-Growth Age-Diameter



## Current Forest Composition

- $\pm 150$  yr mixed oak overstory
- 75 yr of woody encroachment
- Loss of
  - Open condition and high light dynamics
  - Grassy-herbaceous understory
  - Unique and valuable habitat
  - T & E species



# 2001 Pat Brose-Bringing Fire Back



# Historic Fire

# Modern Fire



# Modern Uses of Fire on the Landscape

- Woodland habitat management
- Prairie/pollinator maintenance
- Invasive species control
- Site preparation/clear understory
- Species composition control
  - Increasing oak's competitive status via reducing mesophytic stem density



# Oak Forest & Woodland

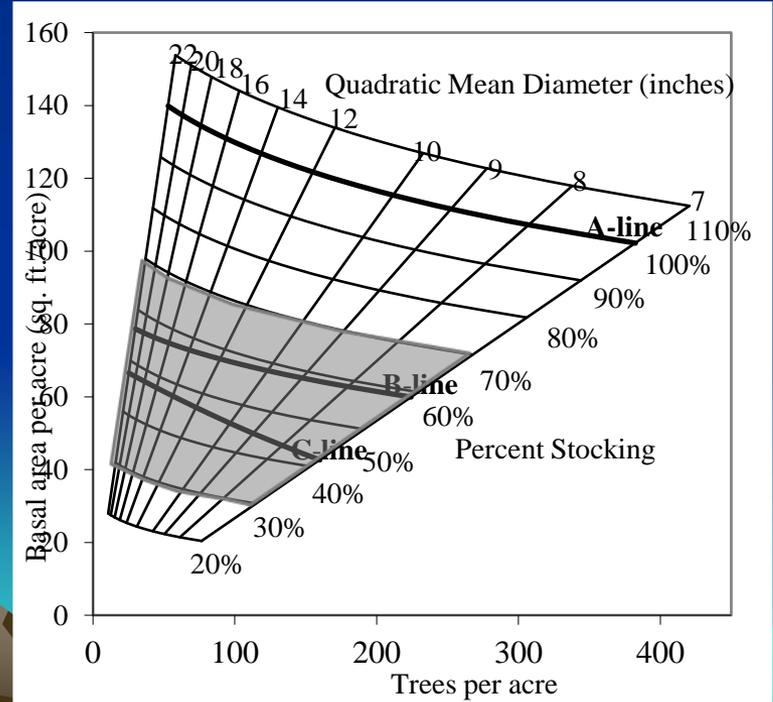
- Restoration and management of oak forest and woodland seem to have a lot of similarities
- Both often involve canopy reductions and the use of fire to develop and maintain more open conditions
- Reinvigorates ground layer-shrub components
- Increased cover and feeding areas for wildlife



- GLO data suggests thinning stands necessary to restore woodland structure
  - Forestry Summer Camp field exercises 2008-present
  - Students cut non oak-hickory stems (crop tree release)
  - Apply stump treatment to reduce stump sprouting
  - Use stocking guides to develop stand structure targets
    - 35-75 sq ft Basal Area with about 40-60% stocking
    - Average tree diameter  $\pm$  14-18"



Gingrich Stocking Guide



# Ground flora Response to Thinning and Burning



understory after thin & fire



Rattlesnake master



Big-bluestem



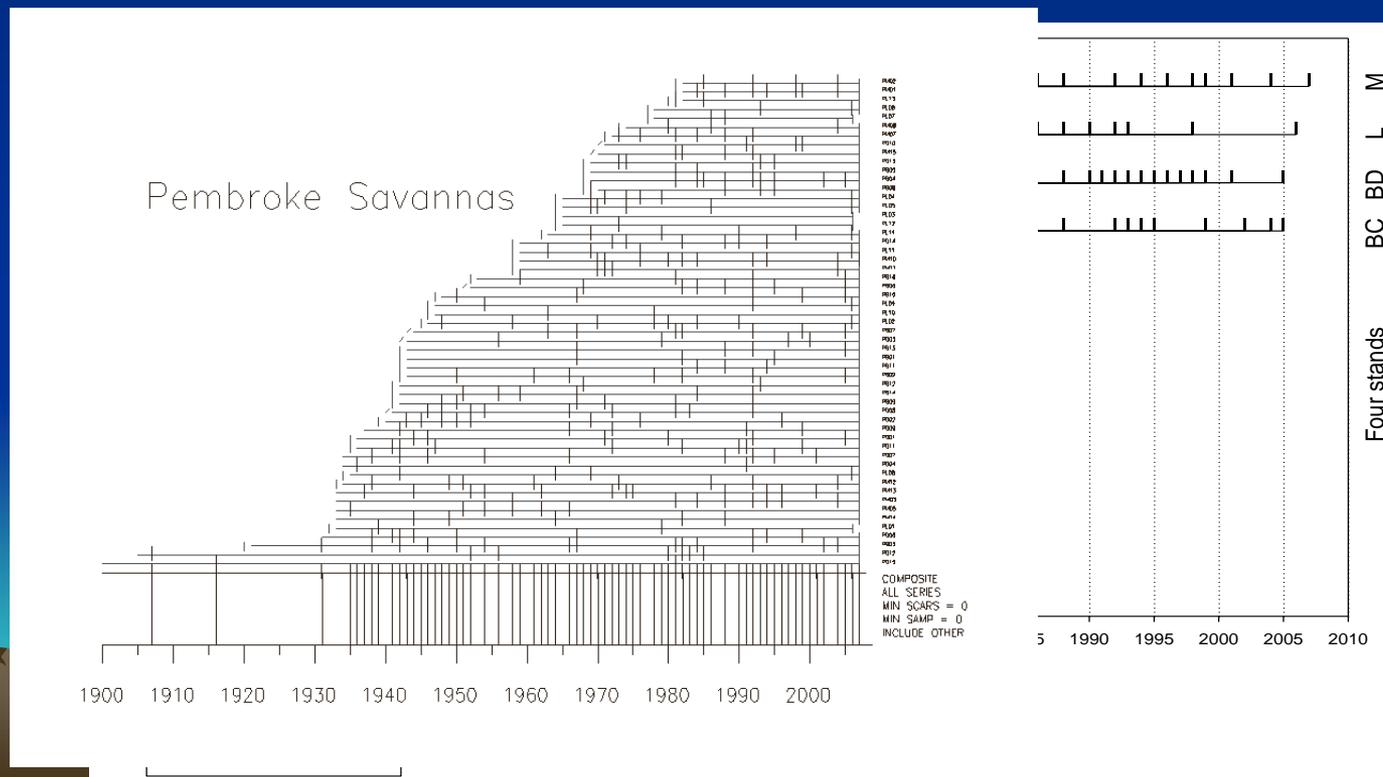
oak regeneration



Burning maintains oak grubs that must eventually be allowed to recruit into canopy strata via several fire free periods

- How often to burn?

- Burning >5 yrs woody encroachment becomes forest
- Burning <3-5 yrs becomes grassland
- Our century of fire data don't show enough long term pattern to understand regeneration dynamics
- But some fire free intervals are needed to establish regen cohorts



# Managing for Wildlife Habitat

- Crop tree release followed by understory burning to restore open conditions for rattlesnake populations
- Threatened and Endangered species management often tied to historic conditions





## Managing for Recreation @ Land Between the Lakes NRA

- Timber and Fire programs are instrumental in the Recreation program
- Homeplace *re-creates* 1860s landscape
  - Thinning from below to remove fire sensitive species
  - Encourage grasses and upland prairie species
  - Re-creating woodland habitat through active management for historic aesthetics
  - Increased wildlife values across trophic levels

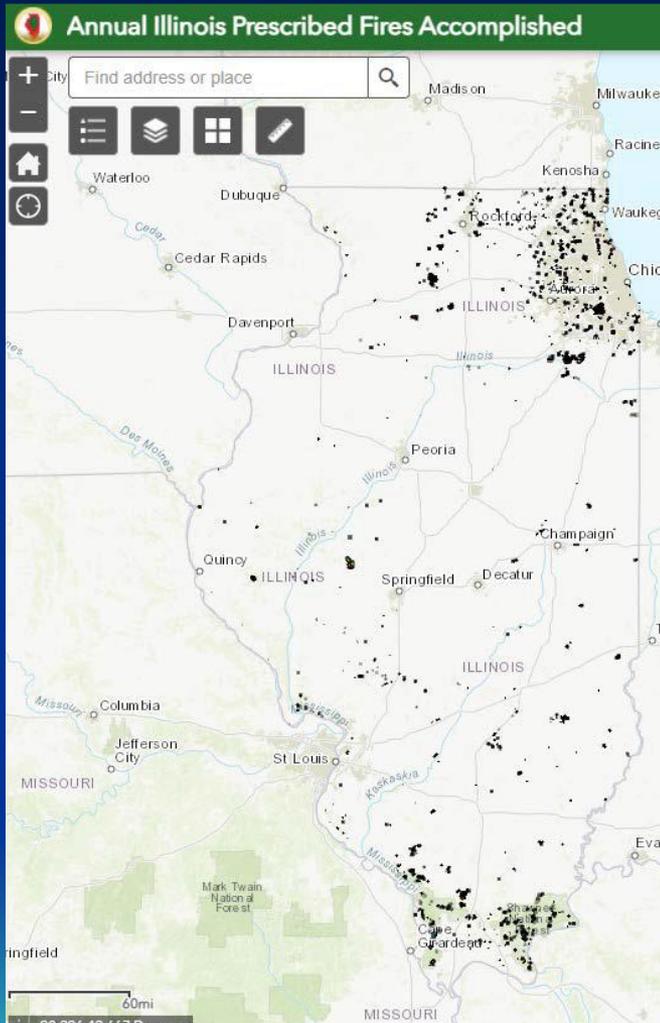




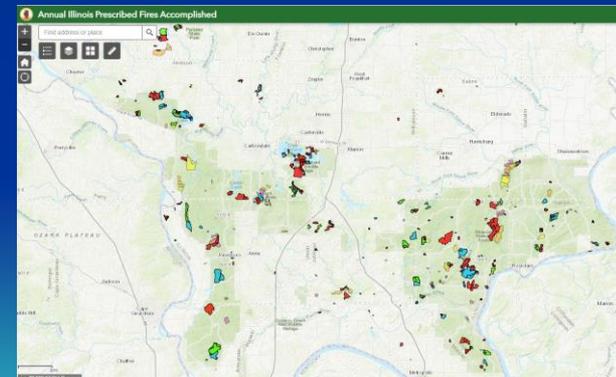
- The Joint Fire Science Program funds scientific research on wildland fire to help policymakers, fire managers, and practitioners make sound management decisions
- Regional Fire Consortia serve as clearinghouses of current fire knowledge and application materials
- [www.Oakfirescience.com](http://www.Oakfirescience.com)



**FIRESCIENCE**.GOV  
Research Supporting Sound Decisions



# IPFC Rx Fire Accomplishment maps



# Illinois Prescribed Fire Council



- Recent Fire Needs Assessment suggested:
- Of 1,049,000 acres reported, 790,000 (76%) are held in habitat acres, of which only 50,789 (6%) were managed with prescribed fire
- 213,000 more acres must burn annually in Illinois to effectively manage and restore target acreages
- 20% of conservation lands are too degraded to carry effective, healthy, needed fire
- Without committed and supported conservation efforts, these numbers will increase over time



# IDNR

- Certified Prescribed Burn manager program
  - Train more apprentices
- Burn 10K+ acres annually across multiple divisions
  - Unique area maintenance
  - Nature Preserves
  - Oak regeneration
  - Habitat management
  - Growing season burns
- Still, due to retirements, many lands go untreated



# Illinois Nature Preserves Commission

- The mission:
  - Assist private and public landowners in protecting high quality natural areas
  - Maintain habitats of endangered and threatened species; in perpetuity
  - Promote the conservation of these significant lands
  - Provide leadership in their stewardship, management and protection



# PBAs working with Private Landowners

- fostering a stewardship ethic
  - Involves them in actively managing where effects are noticeable over time
  - Provides satisfaction thru land enhancement and investing in future health and productivity across generations



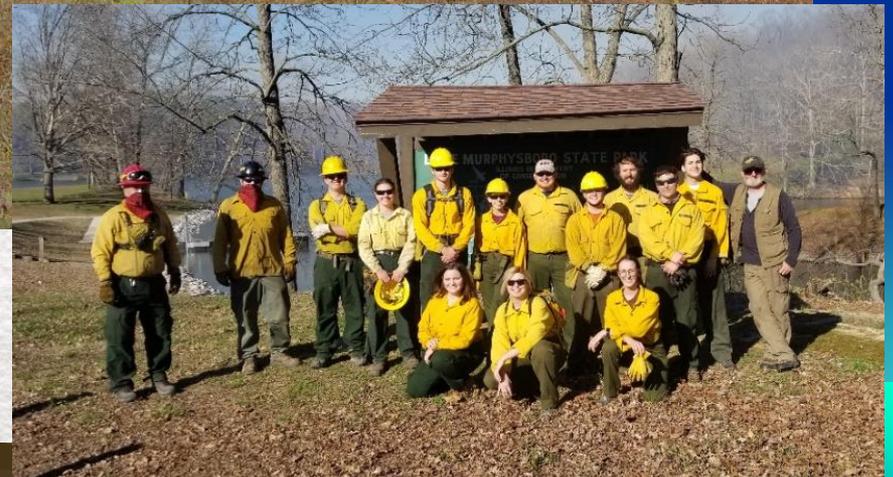
# Force Multipliers

- The Nature Conservancy
  - Great leadership
  - Women in Fire Apprentices
  - Augment many crews
- Clifftop, Land Institute, & other volunteer corps
  - Instrumental in building relationships among landowners



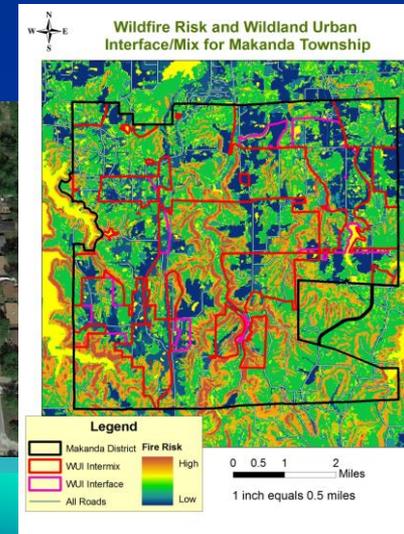
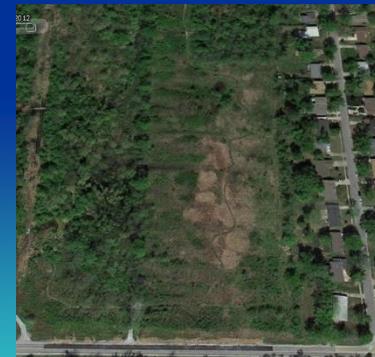
# Increasing Public Awareness and Education

- Public walk and talks
- IFA Oaktober workshops
- Professional Field trips
- Elder hostel exposure
- Demonstration Areas
- Training and Teaching Next Generation of Land Managers



# Work for Future

- Research Fire effects on Invasives and Herptofauna
- McCaffrey (2005) reported positive (80-90%) public acceptance of Rx fire
  - with reservations regarding smoke impacts, concerns of escape, and trust in burning crews
- Public outreach and acceptance of wildland urban interface in our region
- Expansion of training opportunities and professional services
- Inaction for “wildness” values equates to benign neglect



# Questions?

