

# Silviculture-related issues in upland hardwood forests



# Issues/concerns

- ▶ Oak regeneration
  - ▶ Traditional and novel silviculture methods
  - ▶ Artificial regeneration
  - ▶ Costs
- ▶ Ecological consequences of burning in upland hardwood forests
  - ▶ Does burning affect oak regeneration potential?
  - ▶ How do the effects of burning vary with season of burn?
  - ▶ What are the effects of repeated burning on timber quality?
  - ▶ How does burning affect wildlife habitat?



# Oak regeneration

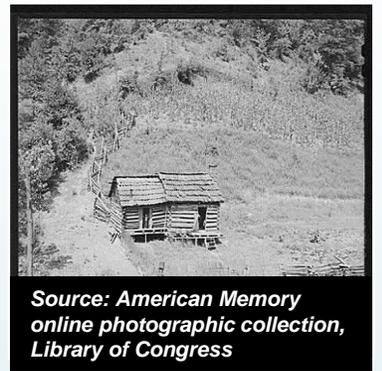
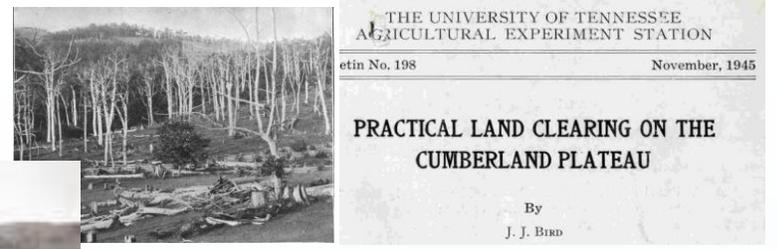
The problem continues.....

# Forests shaped by humans

Loss of American chestnut

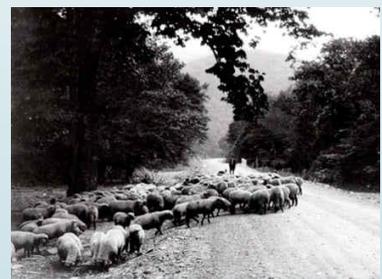


European settlement - land clearing for pasture & agriculture, continued use of fire



Subsistence living

Fire suppression/exclusion



Grazing



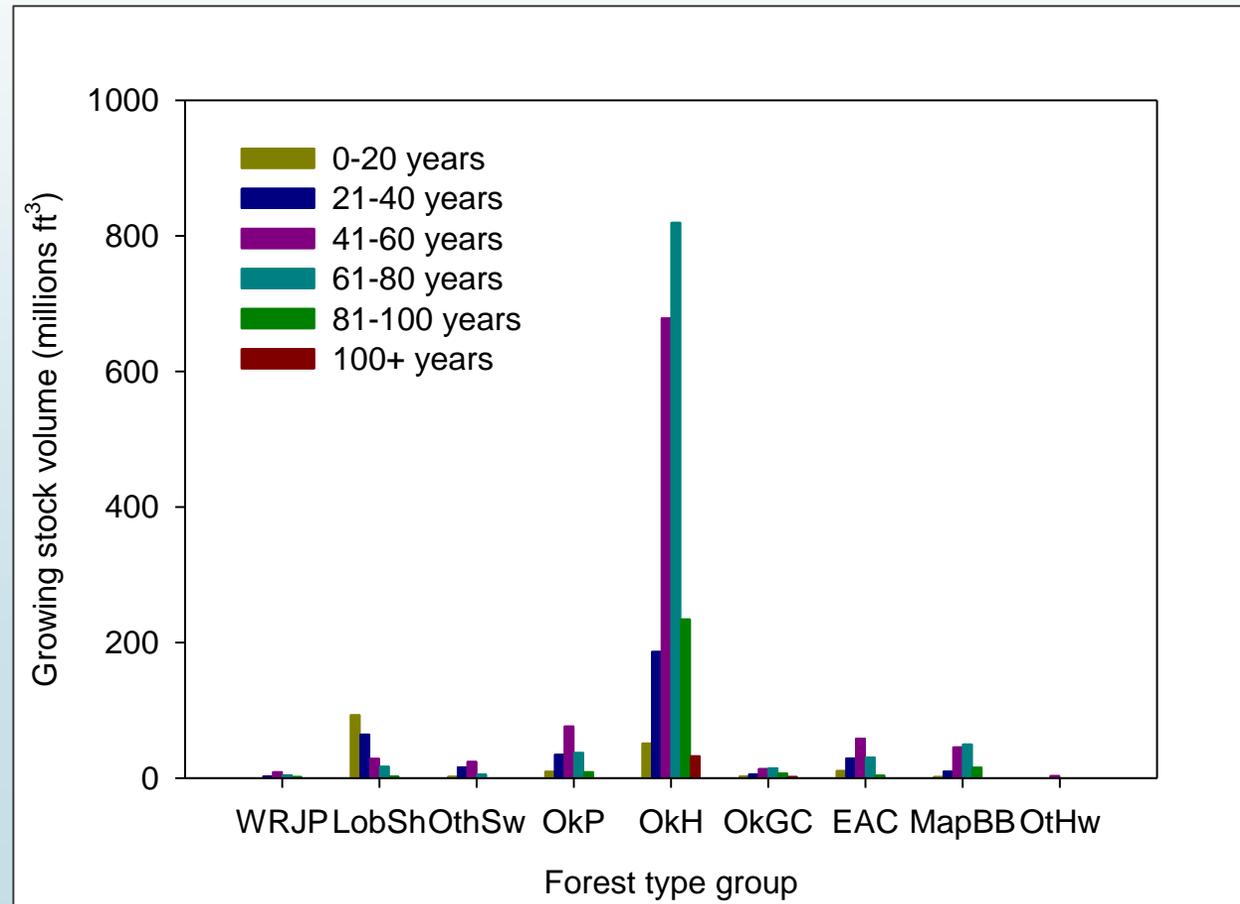
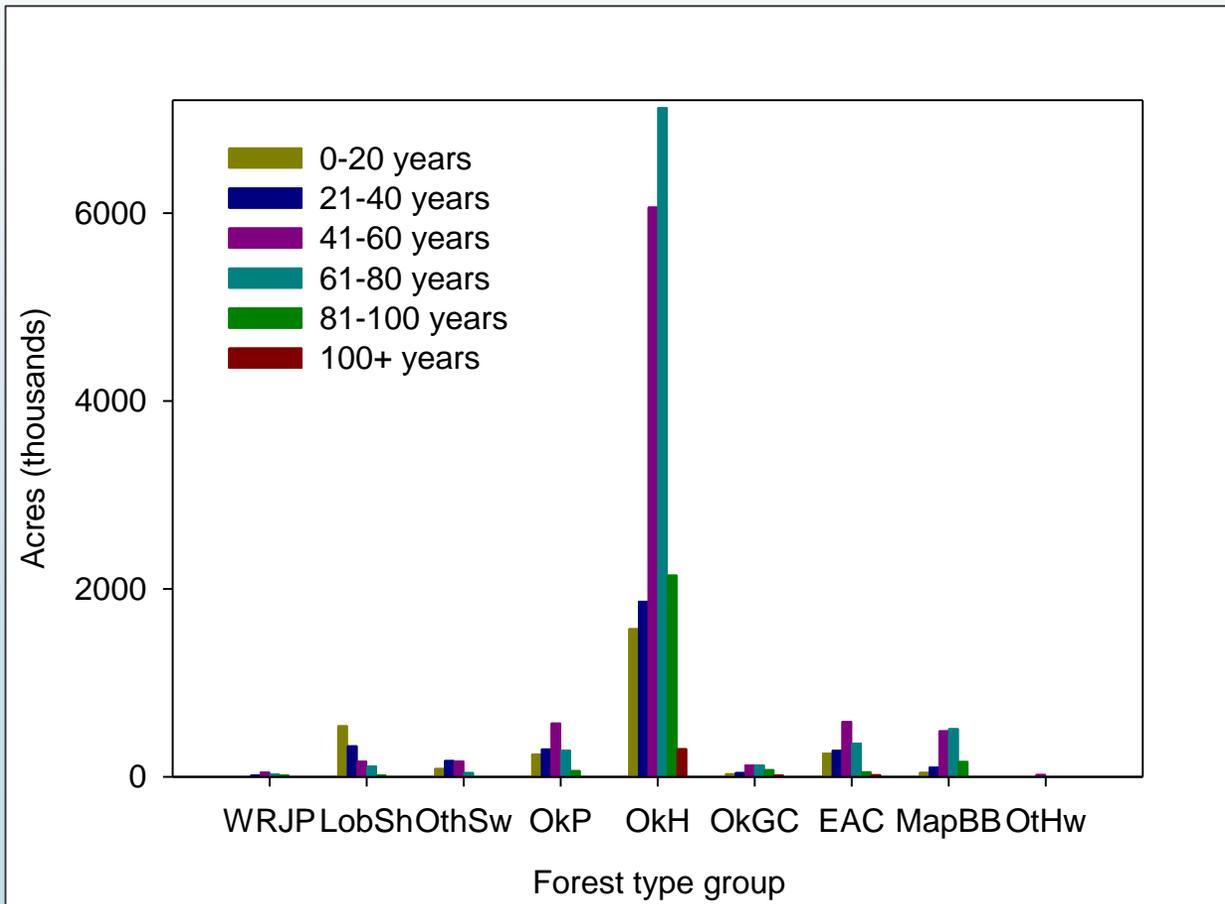
Land abandonment

Intensive resource extraction

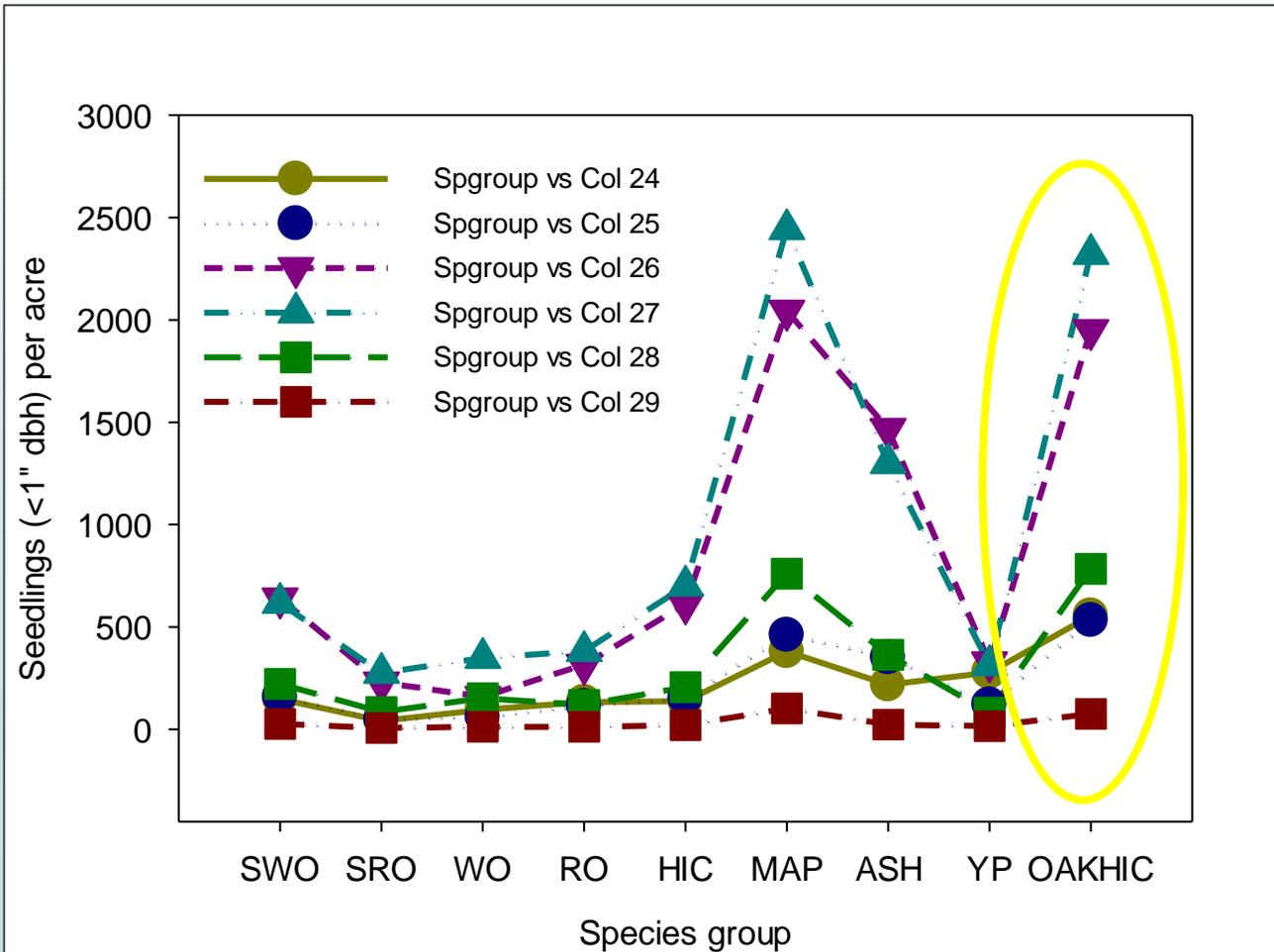
Photo: Southern Appalachian brook trout foundation



# Importance of Oak-Hickory in KY & TN (FIA data)



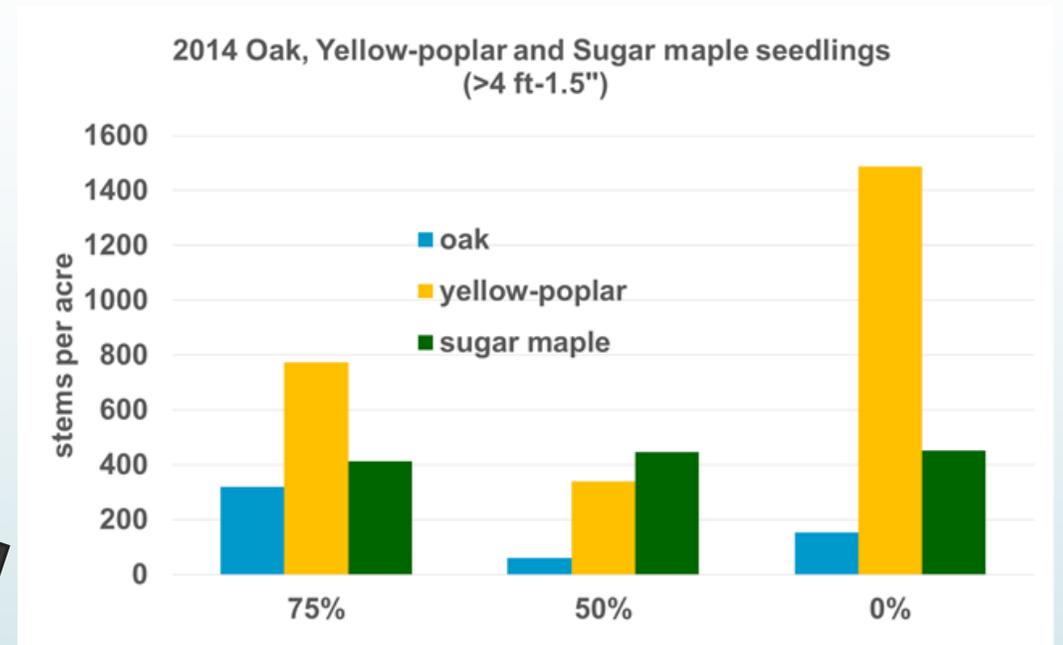
# Regeneration potential in mature oak-hickory forests in KY & TN (FIA data)



- Given the aging oak-hickory component, what is the regeneration potential at broad spatial scales?
- Unfortunately, we are unable to assess the regeneration potential of desirable species (e.g., oak and hickory) at landscape or regional scales
  - B/c the success of desirable species is related to the **SIZE** as well as abundance of advance reproduction

# Latest and greatest from the world of oak silviculture

- ▶ Regional oak study (Keyser, Dey (NRS), Schweitzer, Greenberg)
  - ▶ How does the success of three silvicultural treatments vary across distinct physiographic provinces of the CHR?
    - ▶ Traditional oak shelterwood (AKA, Loftis method)
    - ▶ Repeated Rx fire following by regeneration harvest
    - ▶ Shelterwood/burn (AKA, Brose method)
- ▶ Shelterwood study (Schweitzer)



- Long-term study examines shelterwoods to regenerate oak on productive sites in the Cumberland Plateau region.
- Four years after final harvest, oak regeneration appears subordinate to yellow-poplar and sugar maple.

# What to do?

- ▶ Think outside the traditional oak silviculture box!
  - ▶ Implement novel or non-traditional silvicultural systems
    - ▶ Appalachian *Femelschlag* (Keyser)
  - ▶ Modify/adjust current silvicultural systems so prescriptions incorporate the ecological and biological requirements of the species of interest
  - ▶ Understand the commitment required to sustain the oak component in upland hardwood forests (repeated entries/treatments)
- ▶ Redefine success





# Burning upland hardwoods

Effects on regeneration, timber quality, and wildlife habitat

# Why burn?



- Increase wildlife habitat diversity
- Increase resilience to forecasted increases in fire hazard/hazardous fuels reduction (NFS)
- Restore historic disturbance
- Increase structural heterogeneity
- Restore fire-adapted communities
- Promote the development and recruitment of fire-adapted oak and hickory species





# Current prescribed burning studies

1. Long-term effects of fire frequency on structure and composition of Appalachian hardwood stands in eastern KY (Keyser, Arthur, Loftis, Alexander)
2. Thinning and fire effects on vegetation structure and composition in mixed pine/hardwood forests of northern Alabama (Schweitzer)
3. Creation and maintenance of oak woodland structures (Schweitzer and Clark)
4. Effects of season of burn on structure and composition of Appalachian hardwood stands (Keyser, Greenberg, McNab)
5. Fire and Fire Surrogates study
6. Predictive fire-mortality equations for species in the CHR (Keyser and McDaniel)

# Where does fire fit into the oak regeneration process??

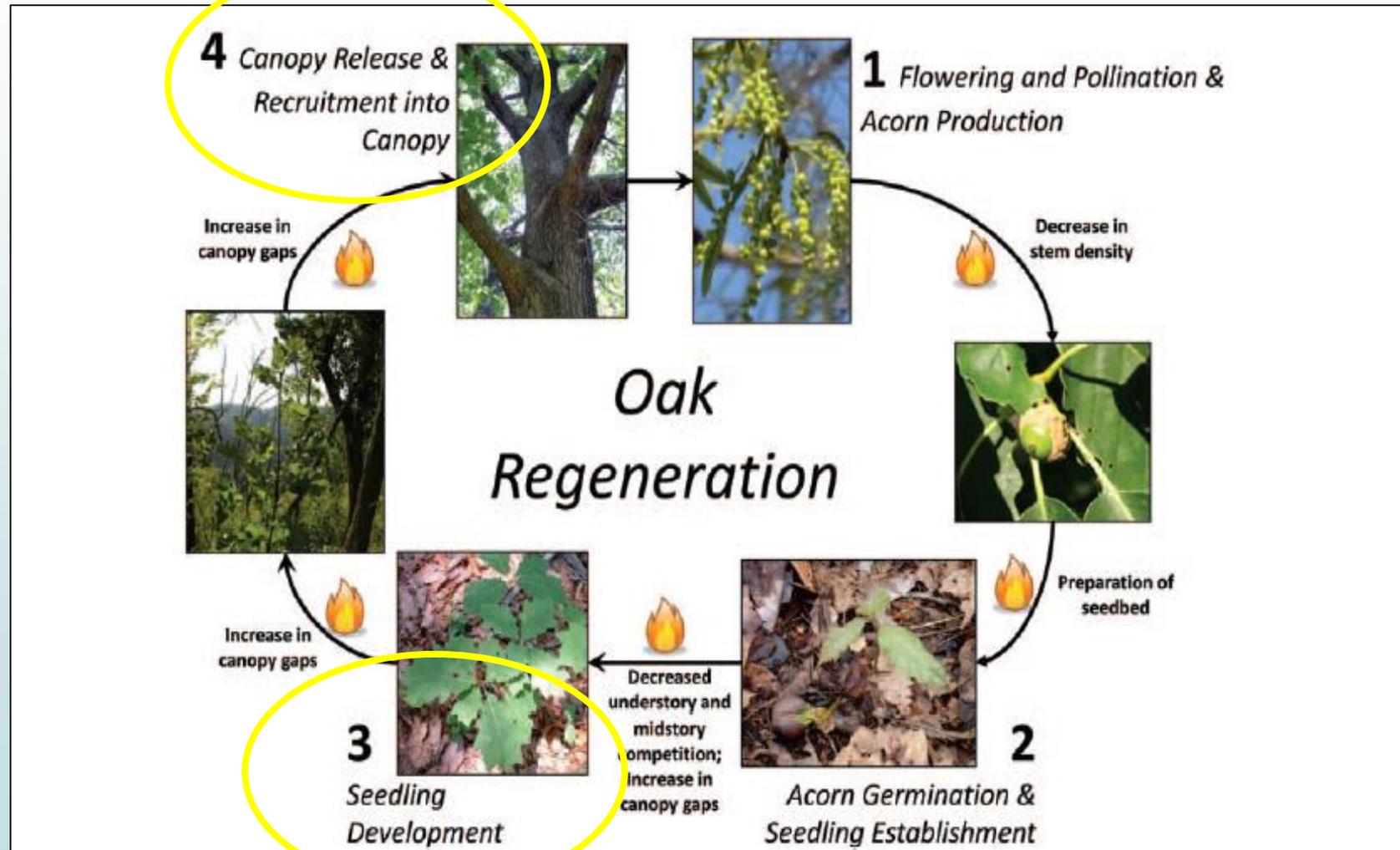
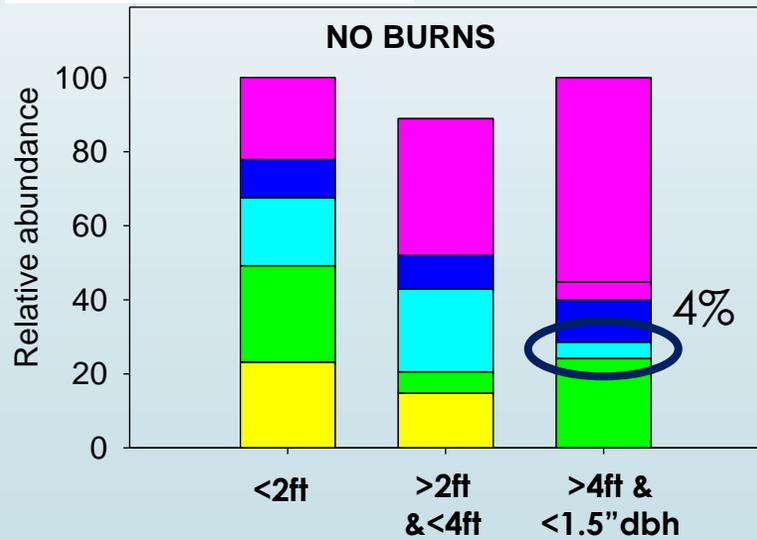


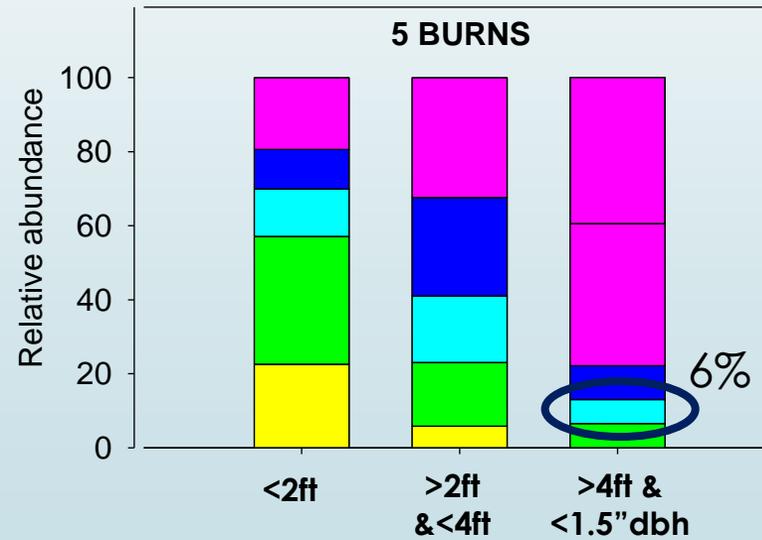
Figure from Arthur et al. (2012)

# Long-term effects on the composition and size distribution of the regeneration layer

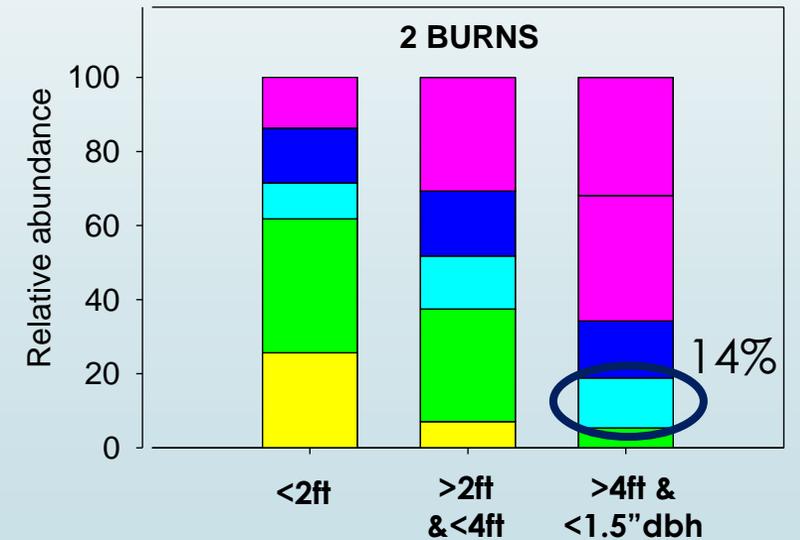
- Maple
- OakHickory
- Other
- Sassafras
- Tolerant



2003, 2004, 2006, 2008, 2011



2003 & 2009





# Fire & oak/hickory regeneration

- ▶ Many questions remain – difficult to reach any solid conclusions regarding the ability of fire to consistently promote oak/hickory regeneration
- ▶ Short-term (3-yrs) results do not necessarily translate into treatment efficacy
- ▶ Understanding and quantifying differential fire effects at stand vs. landscape-levels
- ▶ Variability of fire behavior and resultant fire effects across multiple burns – **Can fire be used consistently to achieve objectives?**
- ▶ Fire effects on timber quality, loss of volume – *requires partnership with forest products researchers*



# Questions

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