

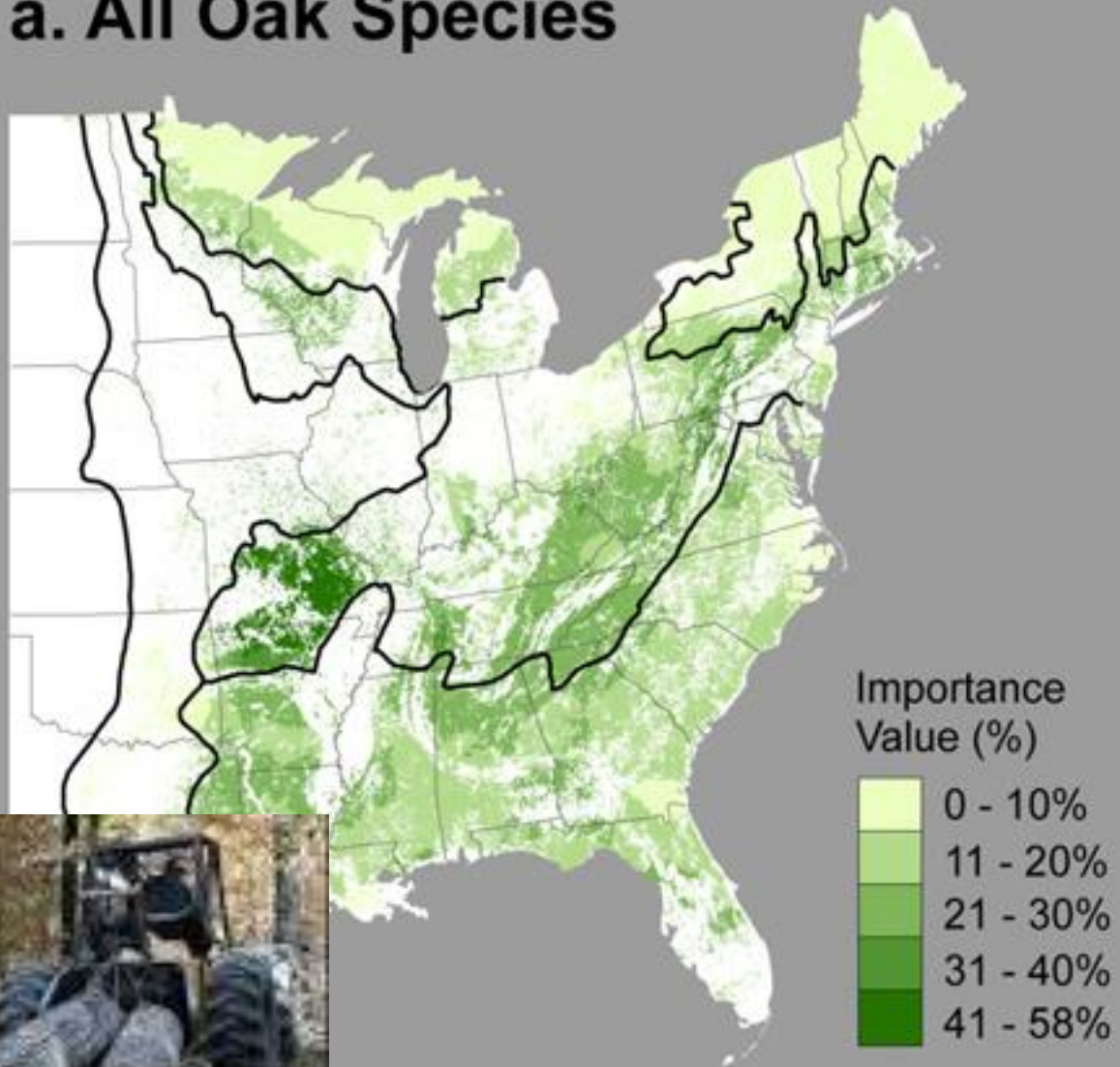
TRADITIONAL AND FIRE- RELATED SILVICULTURAL TECHNIQUES TO REGENERATE OAK

**RESULTS
FROM NC SITE
OF “THE
REGIONAL
OAK STUDY”**

BACKGROUND

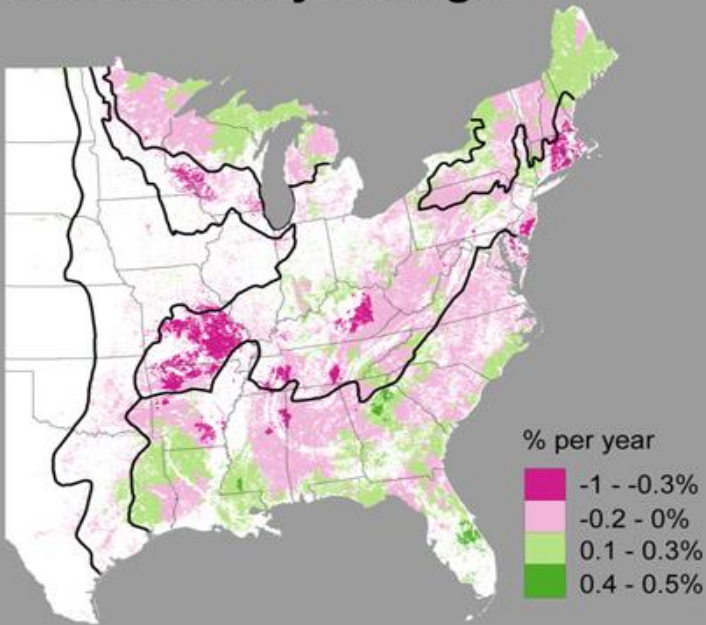
- Difficulty in regenerating oak has been identified by many resource practitioners as a key land management issue that spans across private, state, and federal land
- Oak regeneration failure, oak decline events, and altered disturbance regimes have resulted in decreased oak throughout the Central Hardwood Region (Fei et al., 2011)
- Problems associated with the regeneration of mixed species stands – oaks, in particular, are not new
- On mesic sites in the southern Appalachian, stands originating prior to 1930 tend to be of mixed-species composition (oak) while stands originating after 1930 tend to be dominated by yellow-poplar and red (or sugar) maple (Lorimer, 1983)

a. All Oak Species

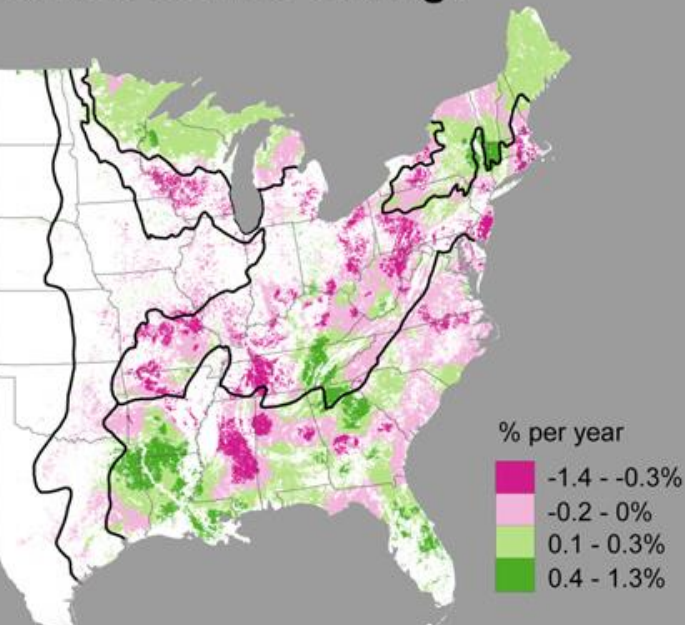


Fei and others (2011)

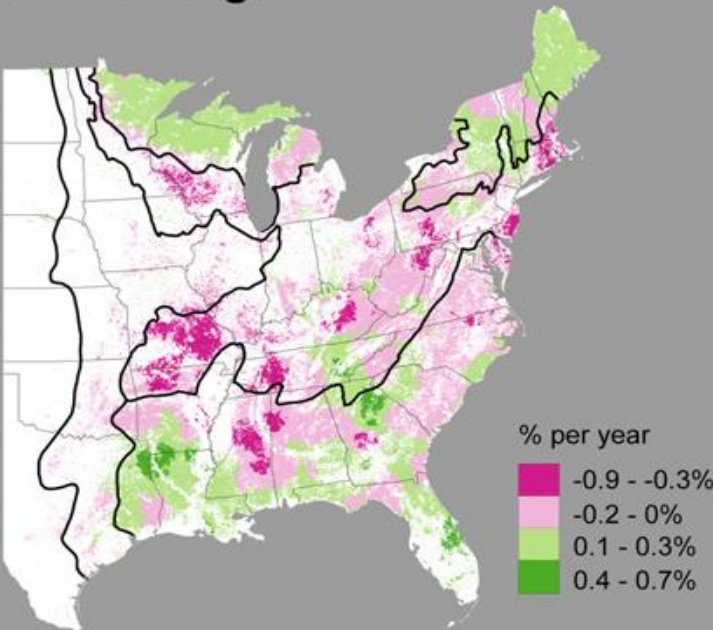
a. Rel. Density Change



b. Rel. Volume Change



c. IV Change



BACKGROUND

- Securing adequate oak regeneration is not problematic across the landscape
 - Regeneration is more problematic on higher than lower quality sites
- Differences in regeneration potential, competition, and site quality across the Central Hardwood Region impedes the development of techniques and guidelines for sustaining oak as a major component of upland ecosystems
- Given the ongoing oak regeneration problem and the high ecological and economic value of oak across the Central Hardwood Region, the NCWRC and BCEF agreed to partner on a study focusing on oak regeneration in the southern Appalachians
- The problems regenerating oak throughout the Central Hardwoods coupled with silvicultural expertise within SRS and NRS presented an opportunity to expand our research to answer questions on regional basis

THE REGIONAL OAK STUDY: A COOPERATIVE EFFORT

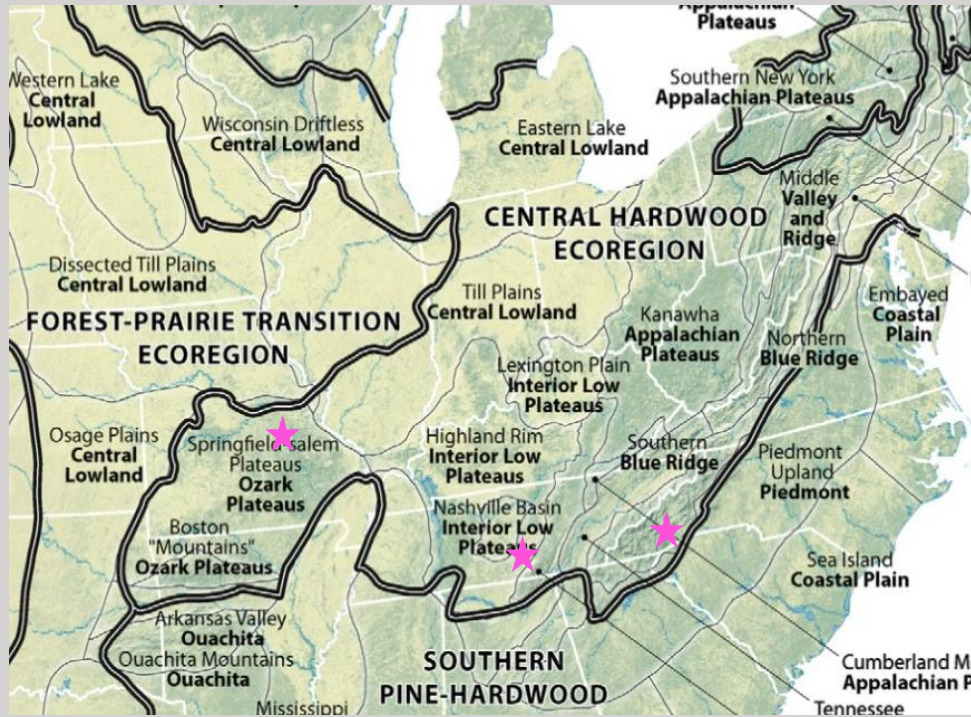


Figure from Fei et al., (2011)

- **NC:** USFS-SRS, NCWRC, NC State, and University of Texas-San Antonio
- **TN:** USFS-SRS, Stevenson Land Company, and Alabama A&M University
- **MO:** USFS-NRS, USFS-Mark Twain NF, and University of Missouri

THE REGIONAL OAK STUDY: A COOPERATIVE EFFORT

- Ecosystem response to 3 (plus control) recommended – but not widely tested treatments that alter light and hardwood competition to enhance oak regeneration
- Across 3 physiographic regions of the Central Hardwood Region
 1. Southern Blue Ridge Mountains – mesic, high quality
 2. Cumberland Plateau – submesic – subxeric, intermediate quality
 3. Ozark Highlands – xeric, lower quality

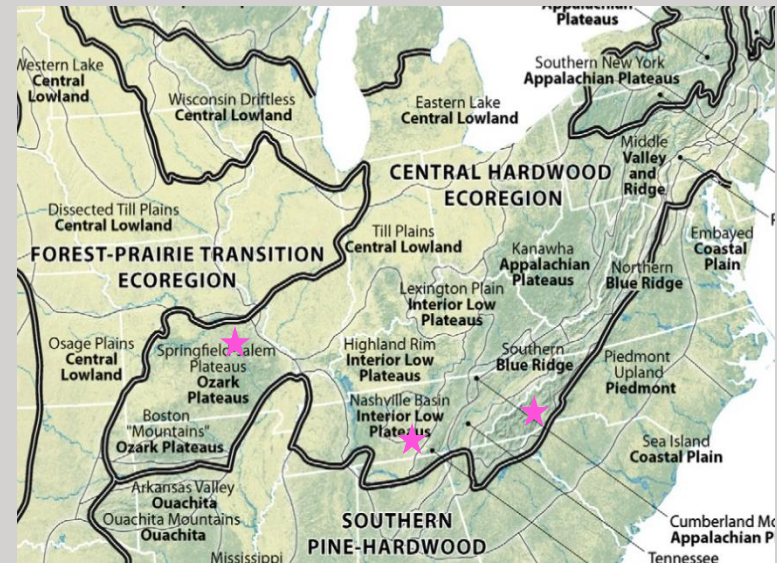


Figure from Fei et al., (2011)

TREATMENTS

1. Control
2. Oak Shelterwood
(Loftis 1990)
3. Shelterwood/Burn
(Brose et al., 1999)
4. Repeated Rx fire



ECOSYSTEM COMPONENTS OF INTEREST

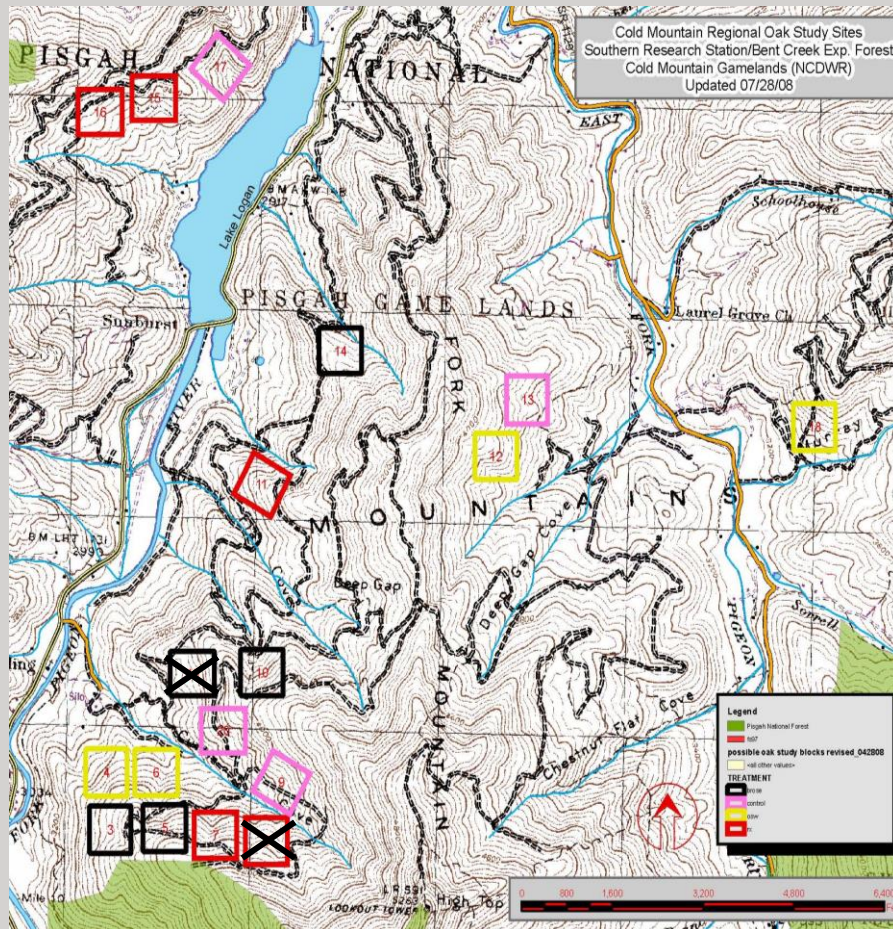
■ All locations will address:

- Structure and composition of the forest overstory
- Regeneration dynamics of oak and other commercial and noncommercial tree species
- Understory plant diversity
- Surface fuel loading

■ Some locations will address:

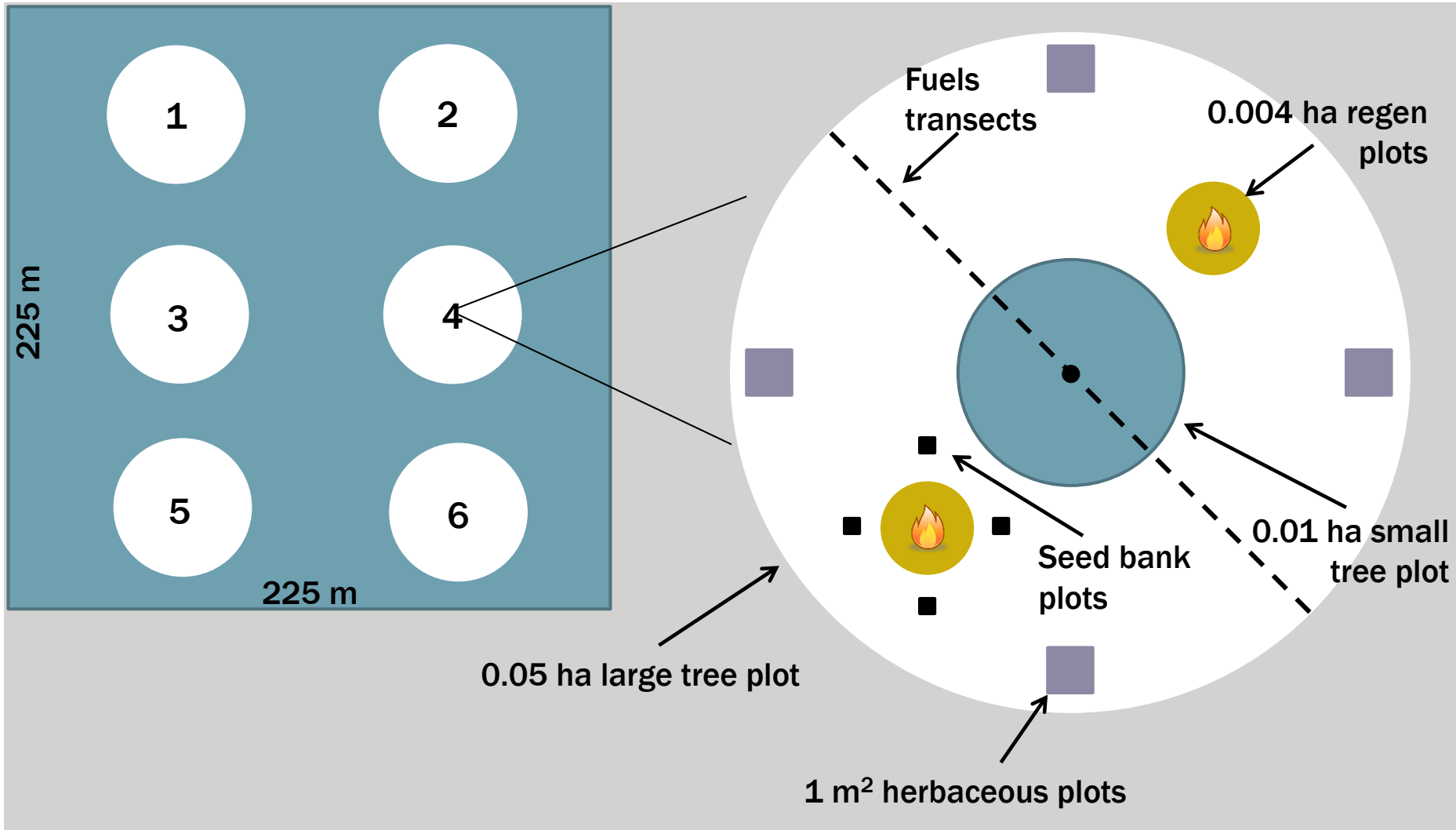
- Wildlife habitat
- Seed bank
- Bats and small mammals
- Reptiles and amphibians
- Insect abundance and diversity
- Breeding birds
- Artificial oak regeneration

NC EXPERIMENTAL DESIGN



- 16 – 5 ha (~12 acre) units
- Mature, mixed-hardwood forest stands, with oak/hickory comprising ~56% of BA
- Site index (oak_{50}) varies b/t 76 ft (23.1 m) and 100 ft (30.5 m)

DATA COLLECTION



TREATMENT STATUS

- Oak shelterwood
 - All four reps are 6 yrs post herbicide trt
- Shelterwood/burn (Brose)
 - Two units are 5 yrs post-harvest
 - Two units are 4 yrs post-harvest

} (Hopefully) all four units will be burned
Fall, 2014
- Prescribed fire only
 - Two units are 5 yrs post 1st of 3 planned Rx fires
 - Will (hopefully) receive the 2nd of 3 planned fires in the dormant season, 2014-2015
 - Two units are 1 yr post the 2nd of 3 planned Rx fires

1ST OF 3 PLANNED PRESCRIBED FIRES (5YR RETURN INTERVAL)

■ Dormant season fires (2/24/2009 & 4/1/2010)

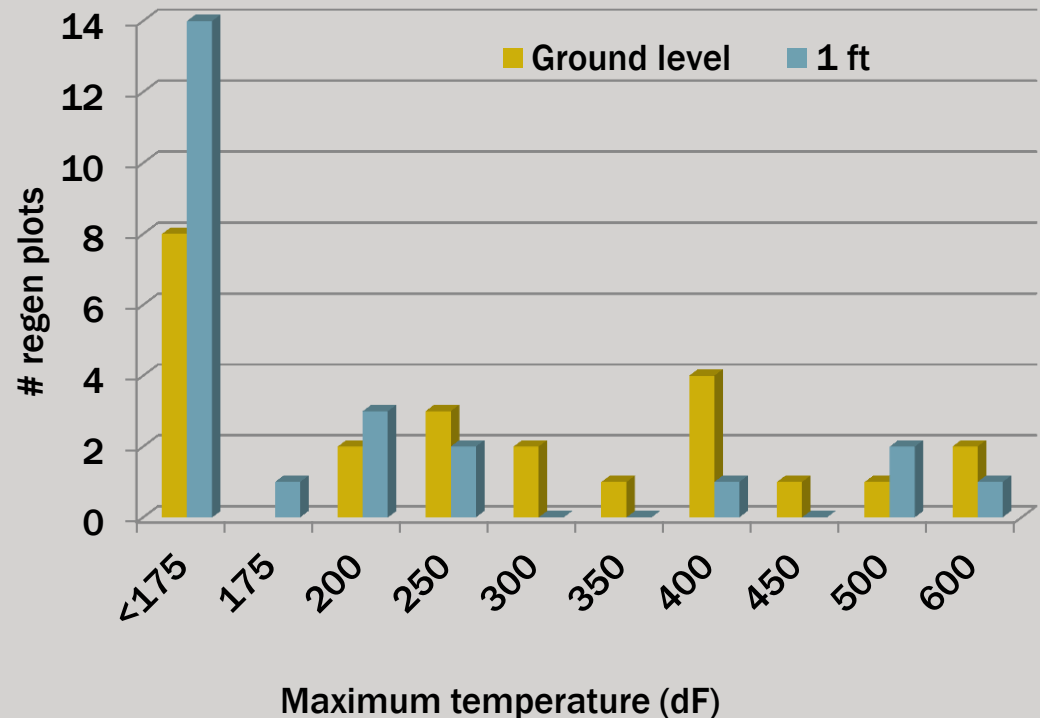
- Cool backing fires (short strip lighting and flanking strip lighting)
- 10hr: 9 and 11%
- RH: 20 and 40%
- Wind speed: <7 mph

■ Scorch height

- Mean: 2.0 ft
- Min: 0 ft
- Max: 30.8 ft

■ Litter consumption

- Pre-fire: 2.2 in
- Post-fire: 0.6 in





2ND OF 3 PLANNED PRESCRIBED FIRES

(5YR RETURN INTERVAL)

■ Dormant season fire (4/2/2014)

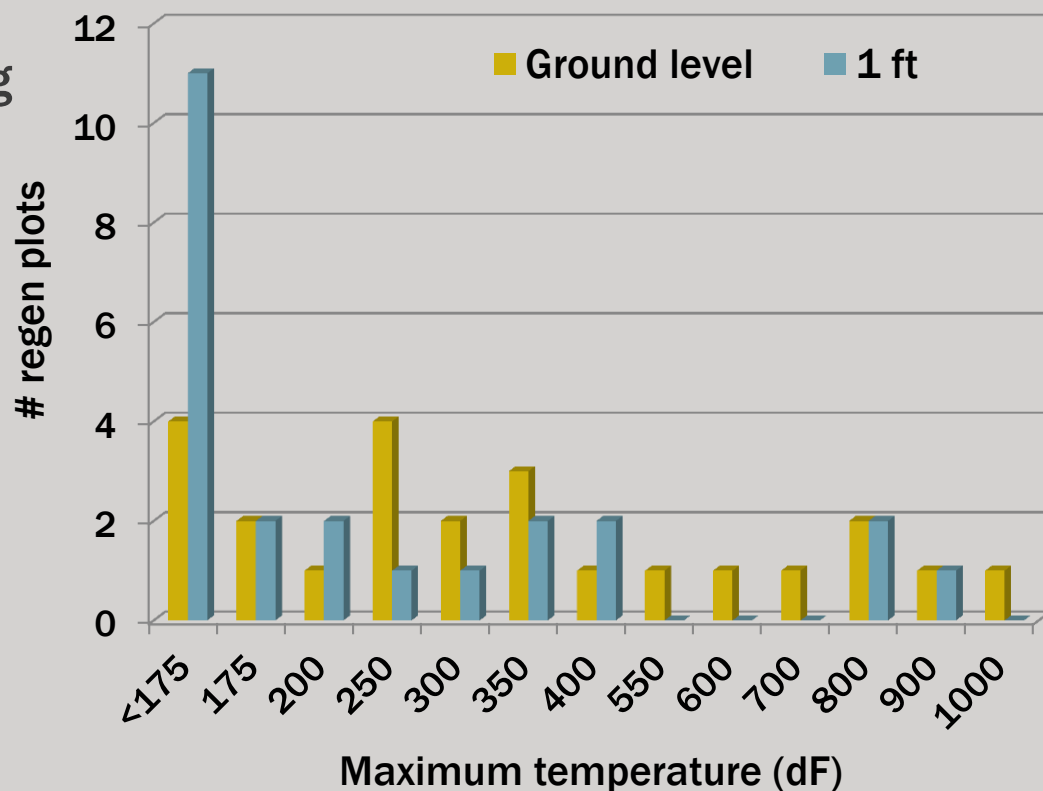
- Cool backing fires (short strip lighting and flanking strip lighting)
- 10hr: 6 - 8%
- RH: 20 - 37%
- Wind speed: 3 - 8 mph

■ Scorch height

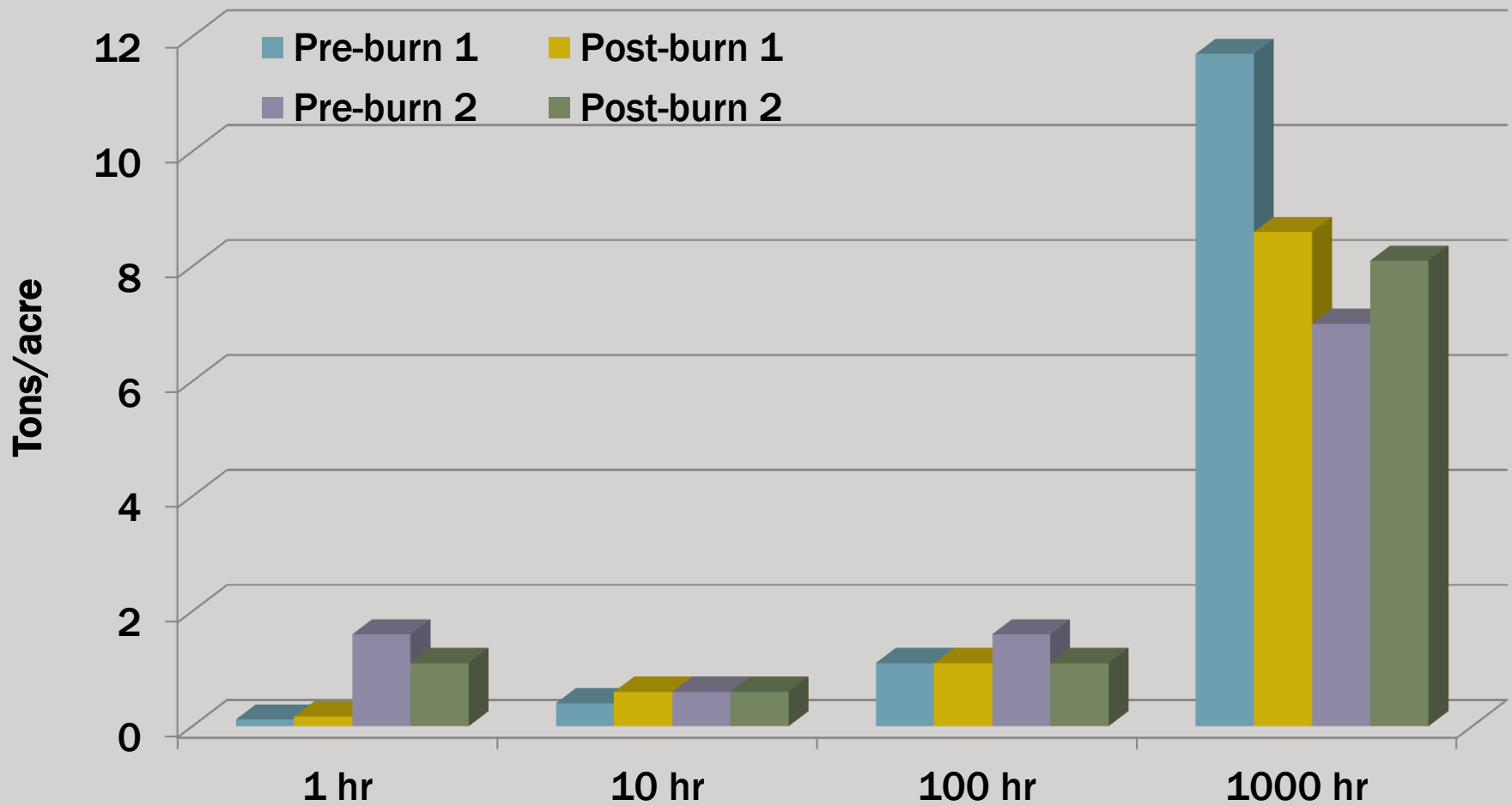
- Mean: 4.6 ft
- Min: 0 ft
- Max: 49.9 ft

■ Litter consumption

- Pre-fire: 2.3 in
- Post-fire: 0.1 in

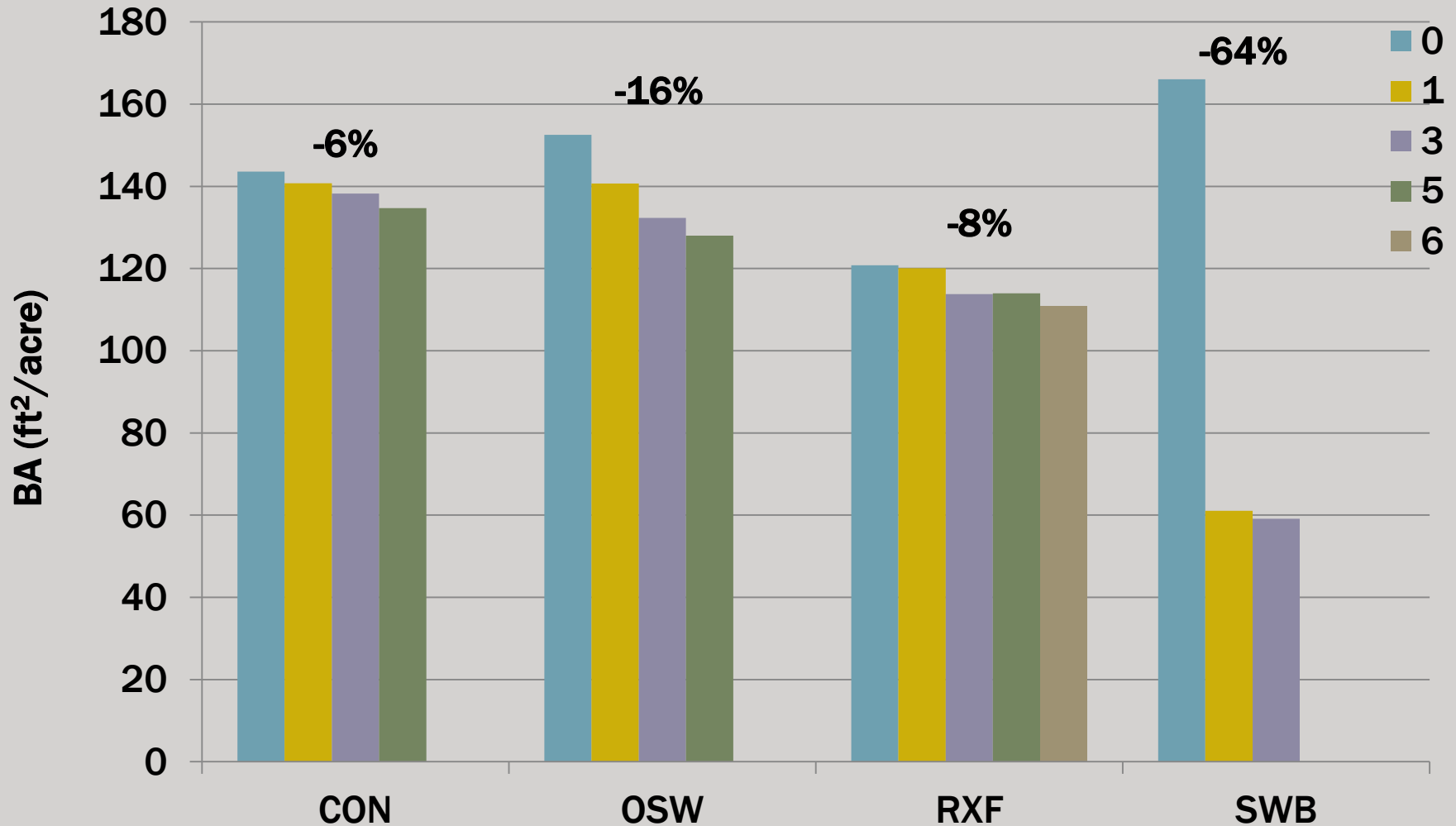


FUELS

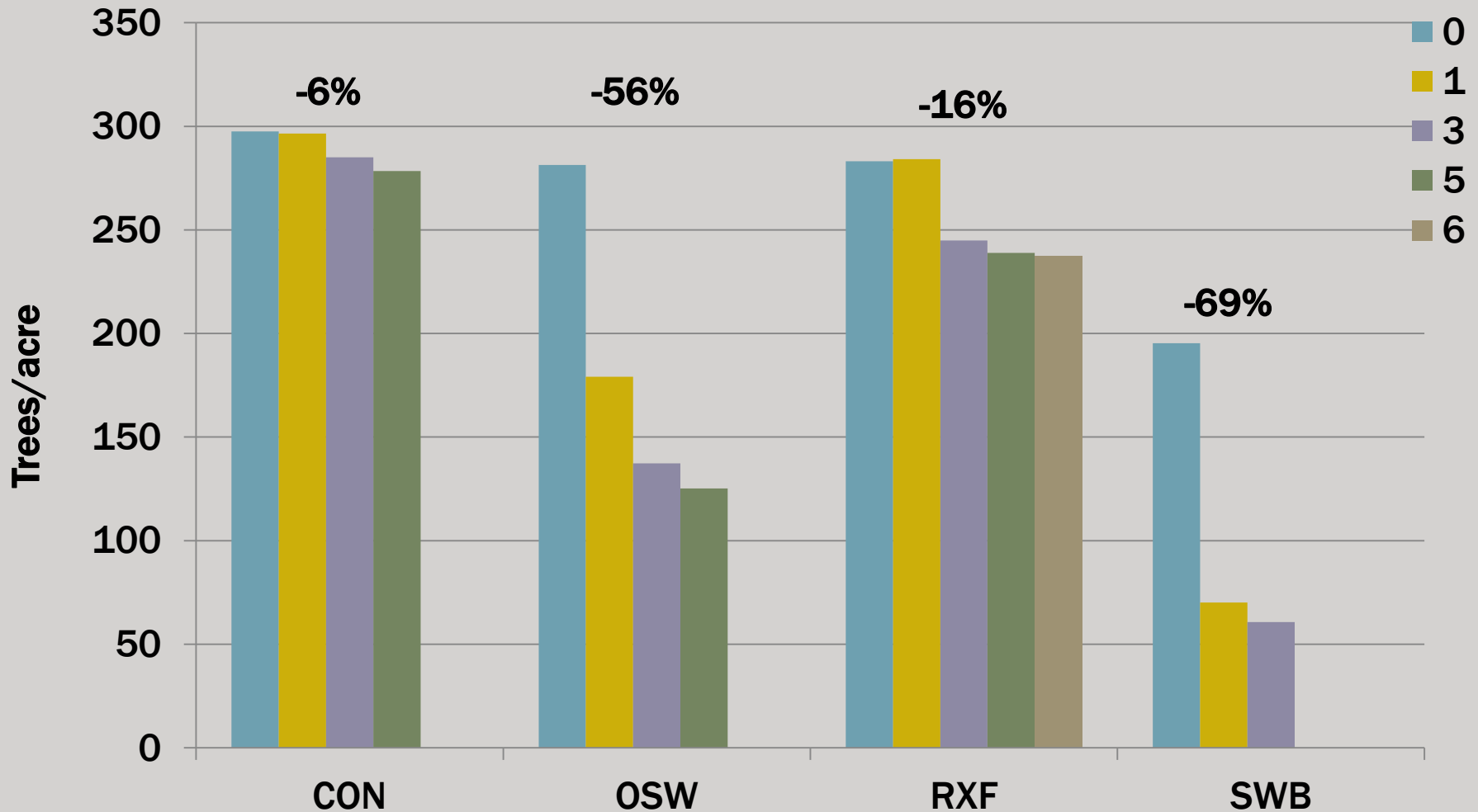


VEGETATION RESPONSE: OVERSTORY/MIDSTORY LAYERS

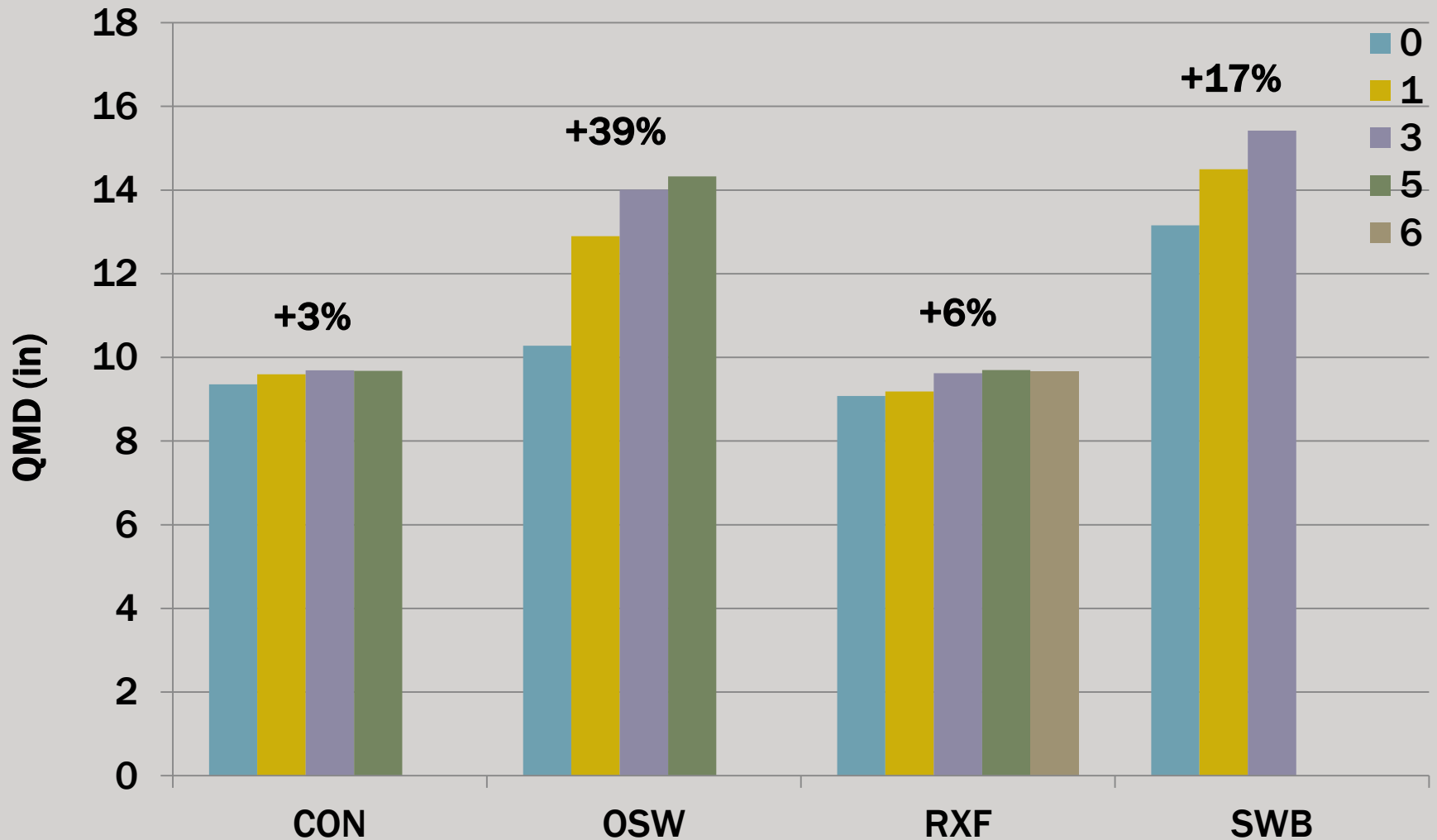
STRUCTURE – BASAL AREA



STRUCTURE – TREES/ACRE



STRUCTURE – TREE SIZE



VEGETATION RESPONSE: REGENERATION LAYER

SPECIES GROUPS

1. Canopy

- sweet birch, fraser magnolia, cucumber, white ash, basswood, black walnut, black locust, buckeye, yellow birch

2. Hickory

- pignut, mockernut, bitternut, red hickory

3. Midstory

- dogwood, sourwood, silverbell, striped maple, beech, serviceberry, ilex spp., musclewood, ironwood, American chestnut

4. Maple

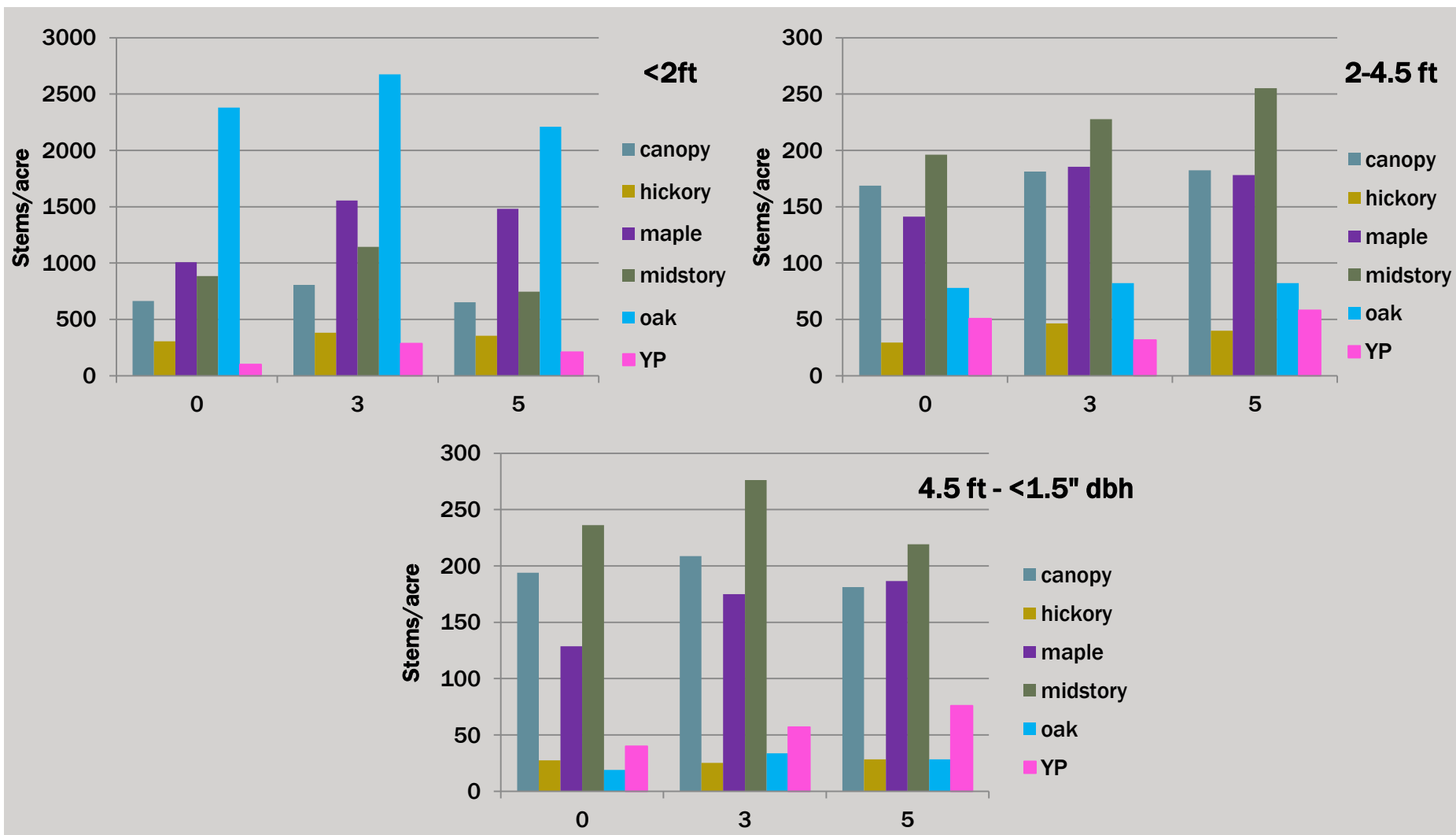
- red and sugar maple

5. Oak

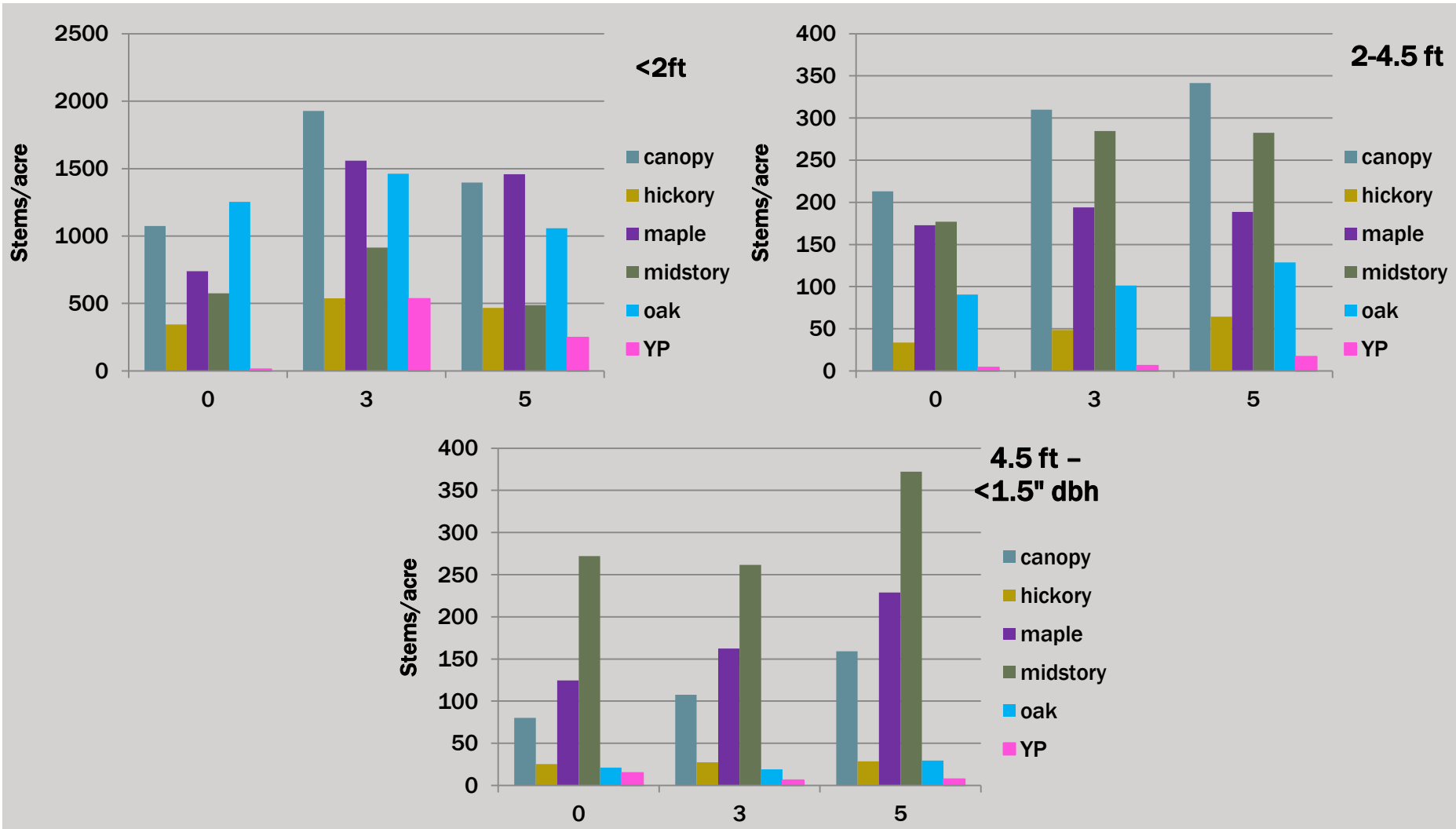
- northern red oak, southern red oak, black oak, scarlet oak, chestnut oak, white oak

6. Yellow-poplar

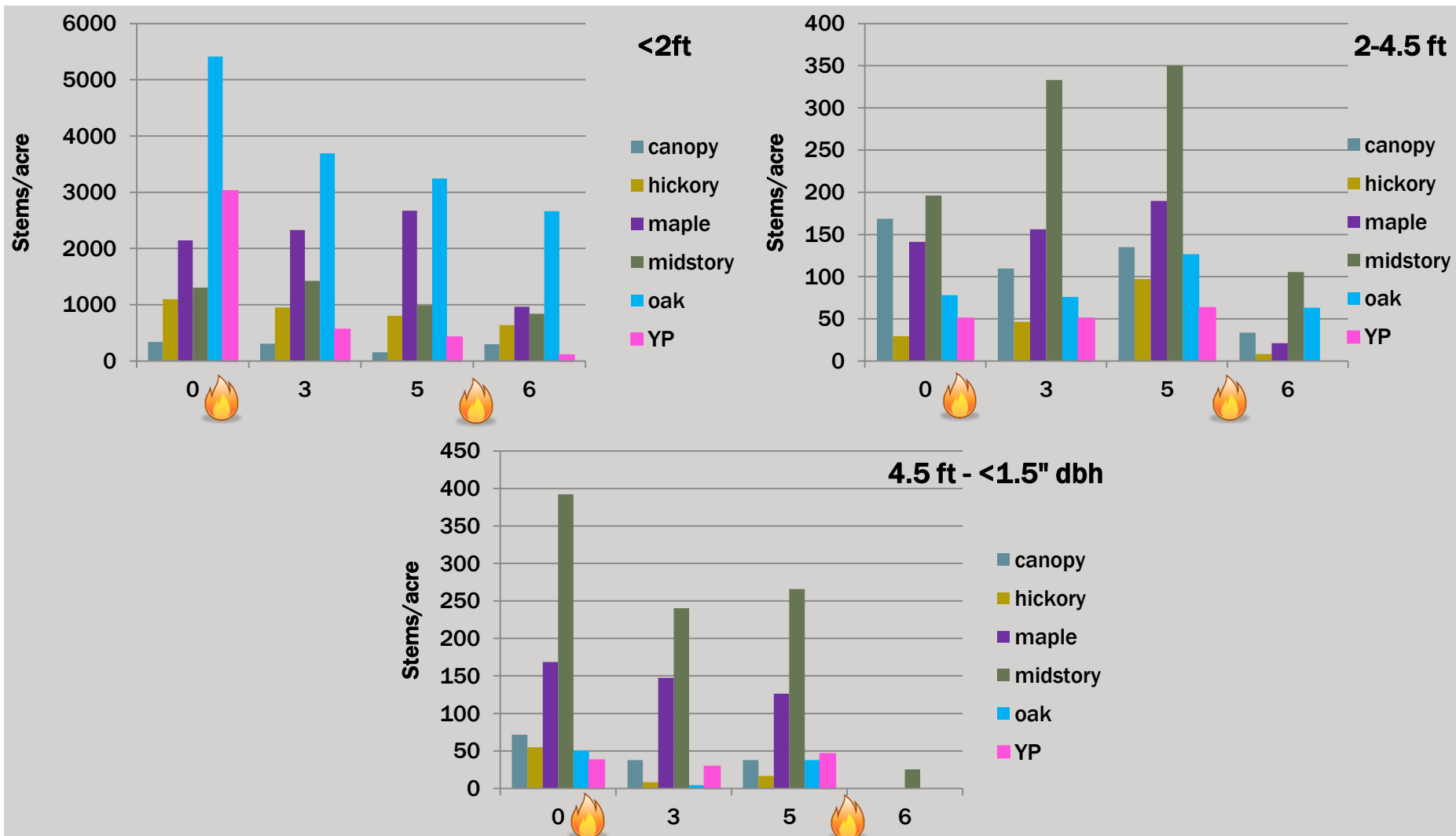
CONTROL



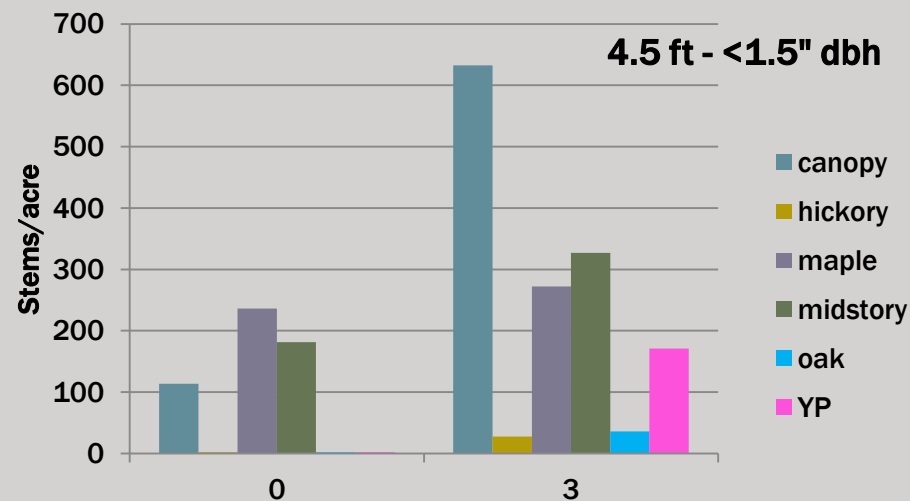
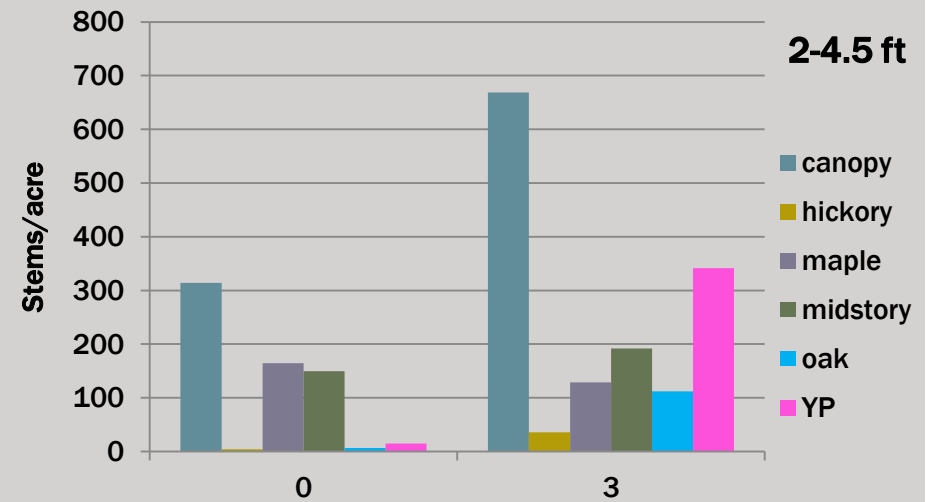
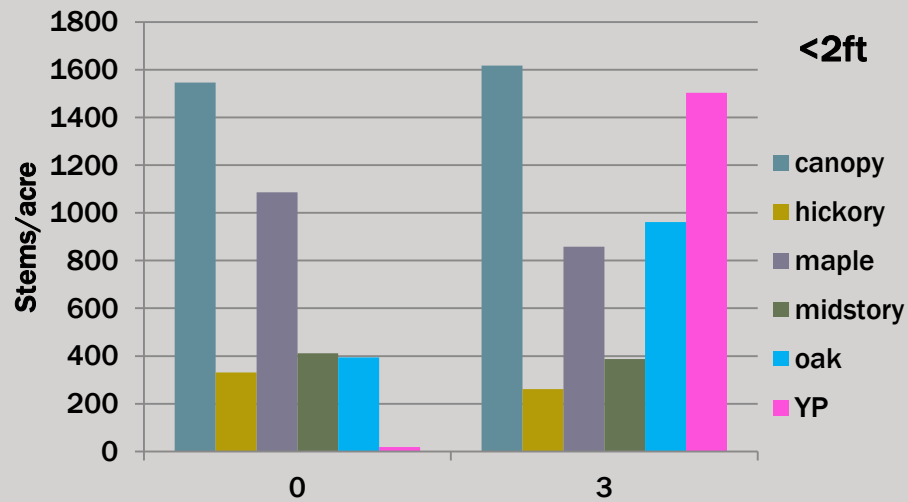
OAK SHELTERWOOD



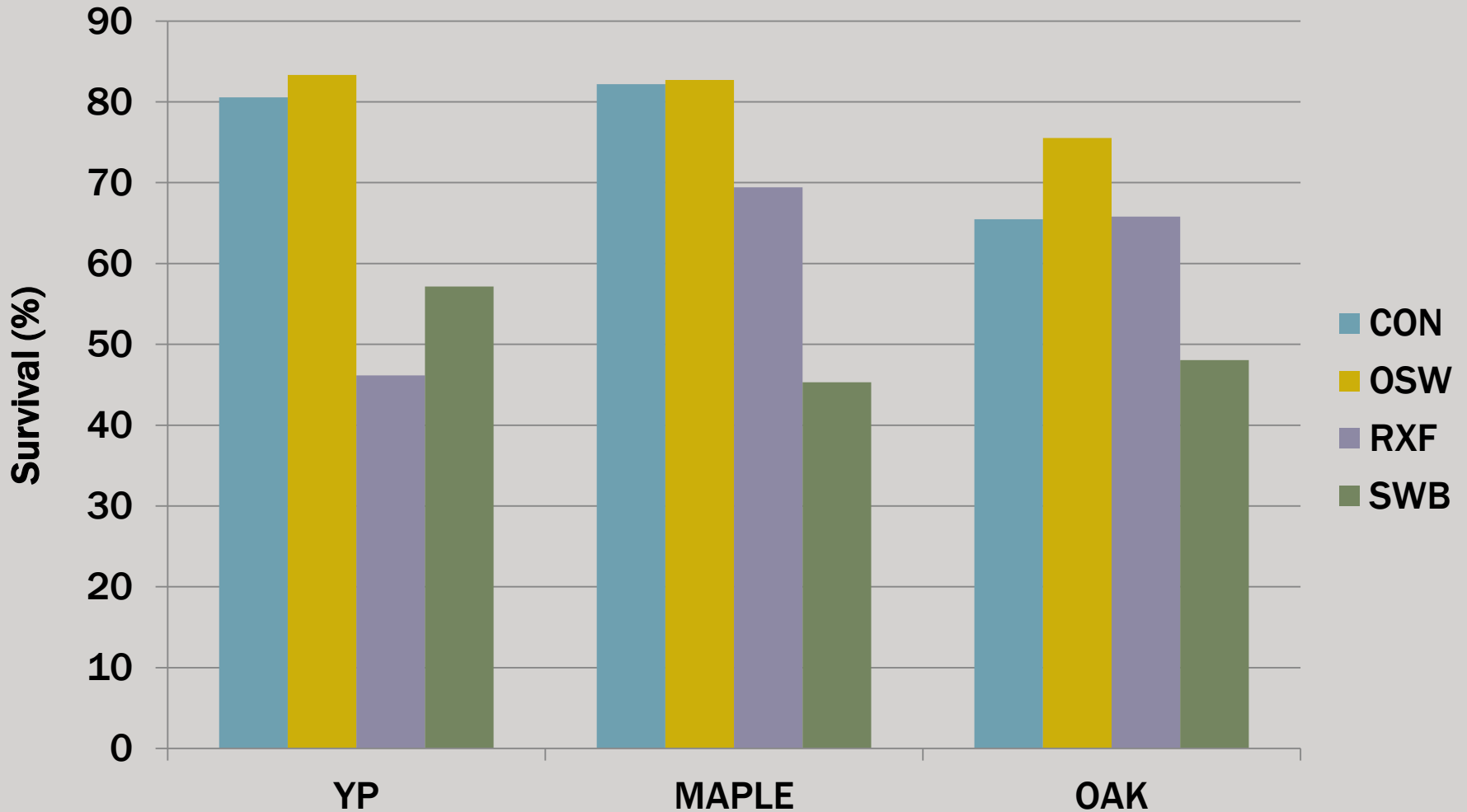
RX FIRE



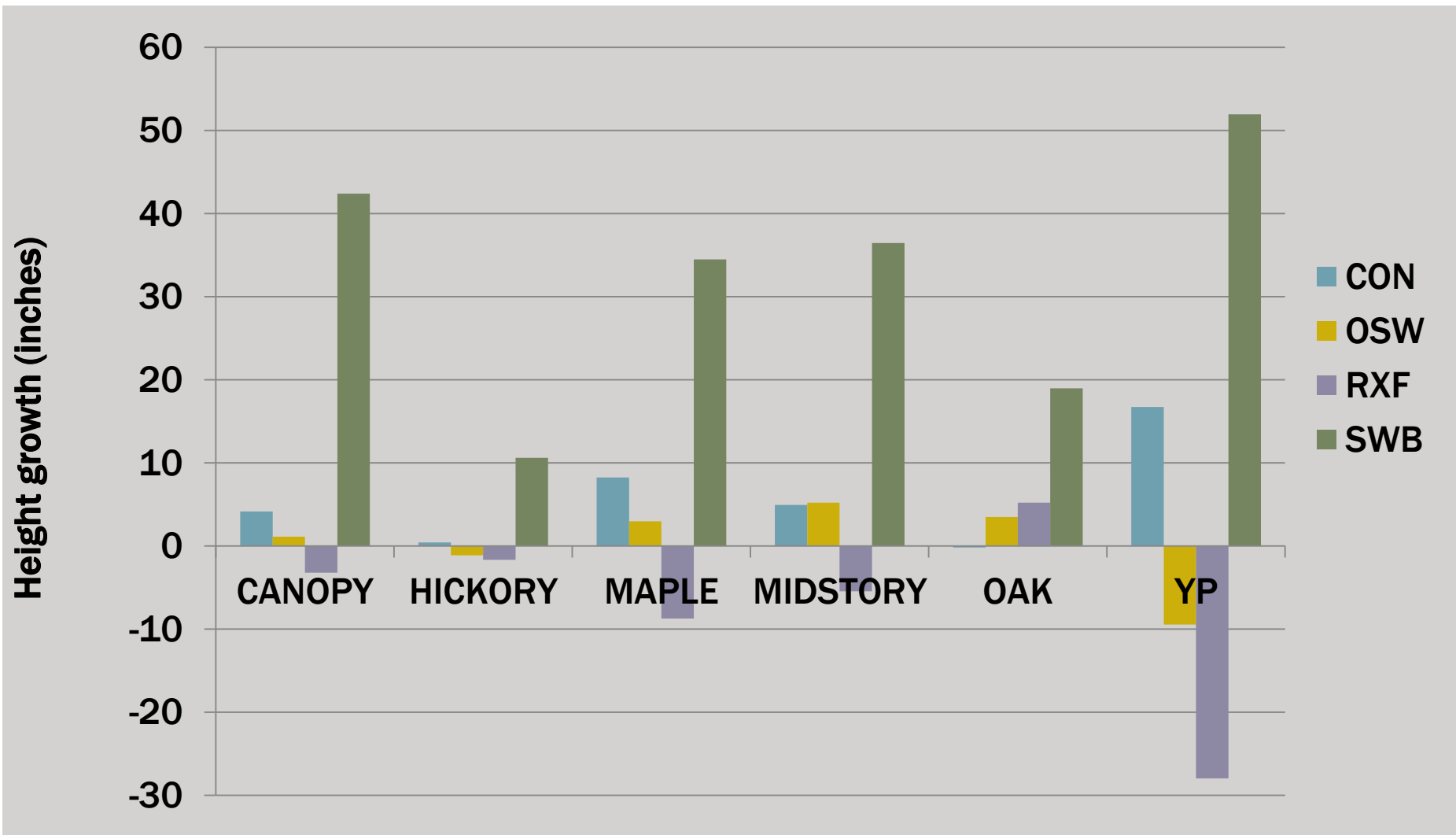
SHELTERWOOD/BURN



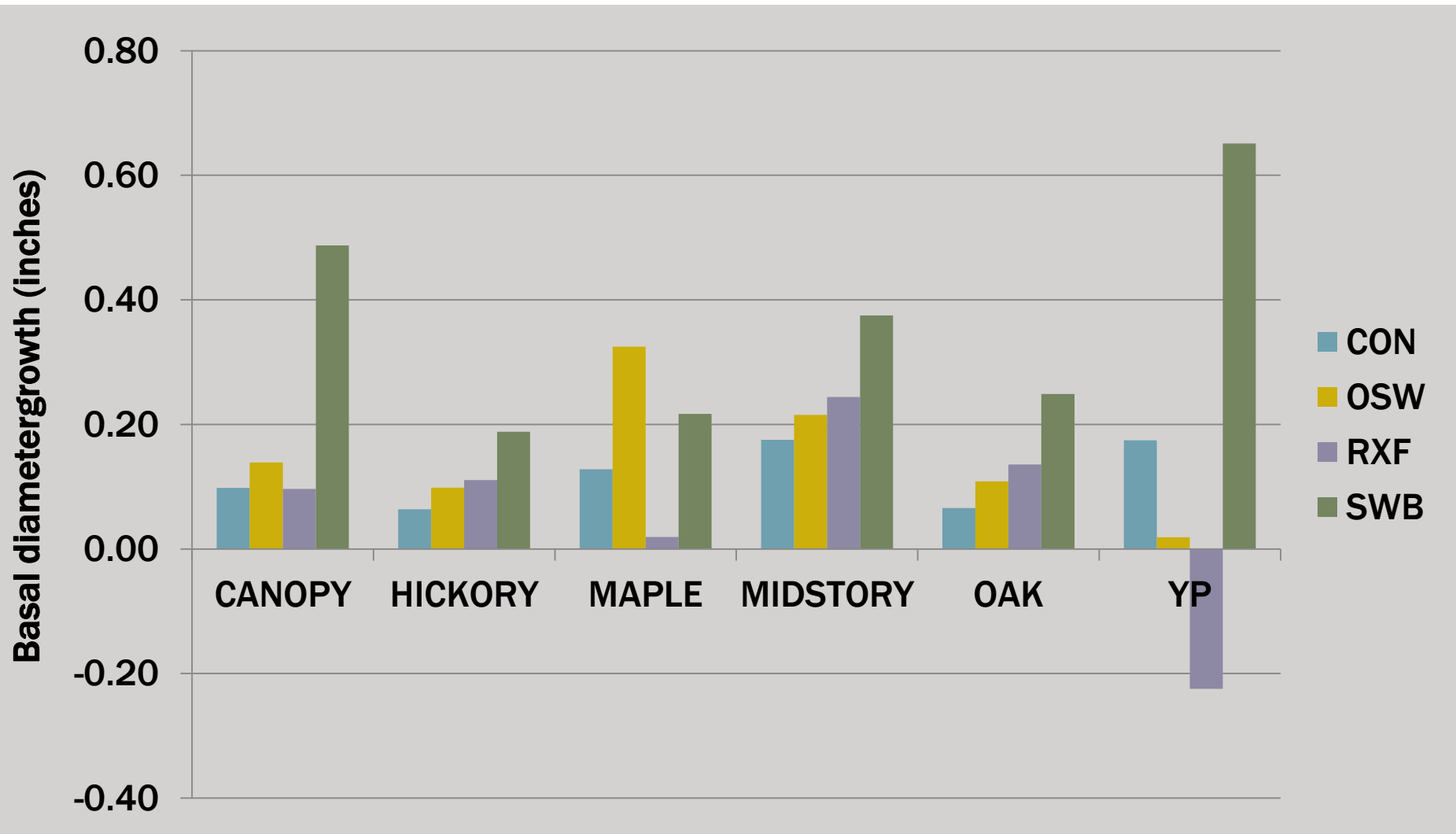
POPULATION DYNAMICS - SURVIVAL



POPULATION DYNAMICS – HEIGHT GROWTH



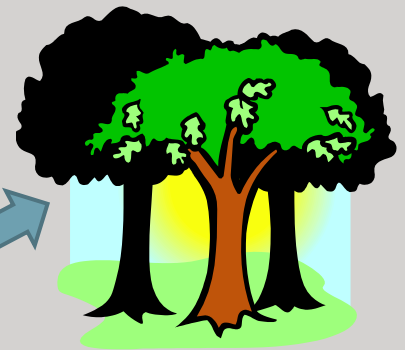
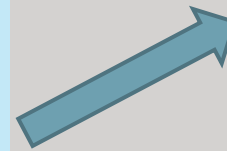
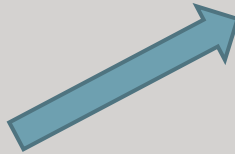
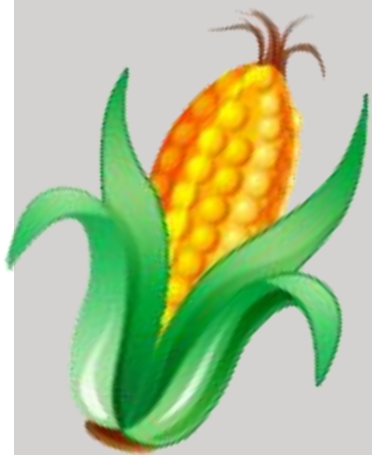
POPULATION DYNAMICS – BASAL DIAMETER GROWTH



WRAP-UP

CONCLUSIONS

- Conclusions regarding the efficacy of treatments cannot be made at this time - treatments have not been fully implemented
 - Unfortunately, ecological and forestry-related research (silviculture, in particular) is a long-term endeavor
 - Applicable results often requiring 10+ years of data collection



Purposeful burning
by Native Peoples

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

Structure &
composition

Silvicultural
systems

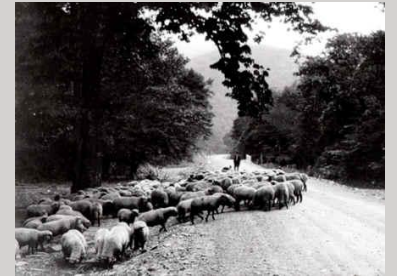
Fire suppression

Domestic grazing

Wood
utilization
associated
with
subsistence
living

Photo: Southern Appalachian brook
trout foundation

Source: American Memory
online photographic collection,
Library of Congress



ROS LITERATURE

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QUESTIONS??????????