Lessons Learned from Long-Term Fire Studies in Oak Forests

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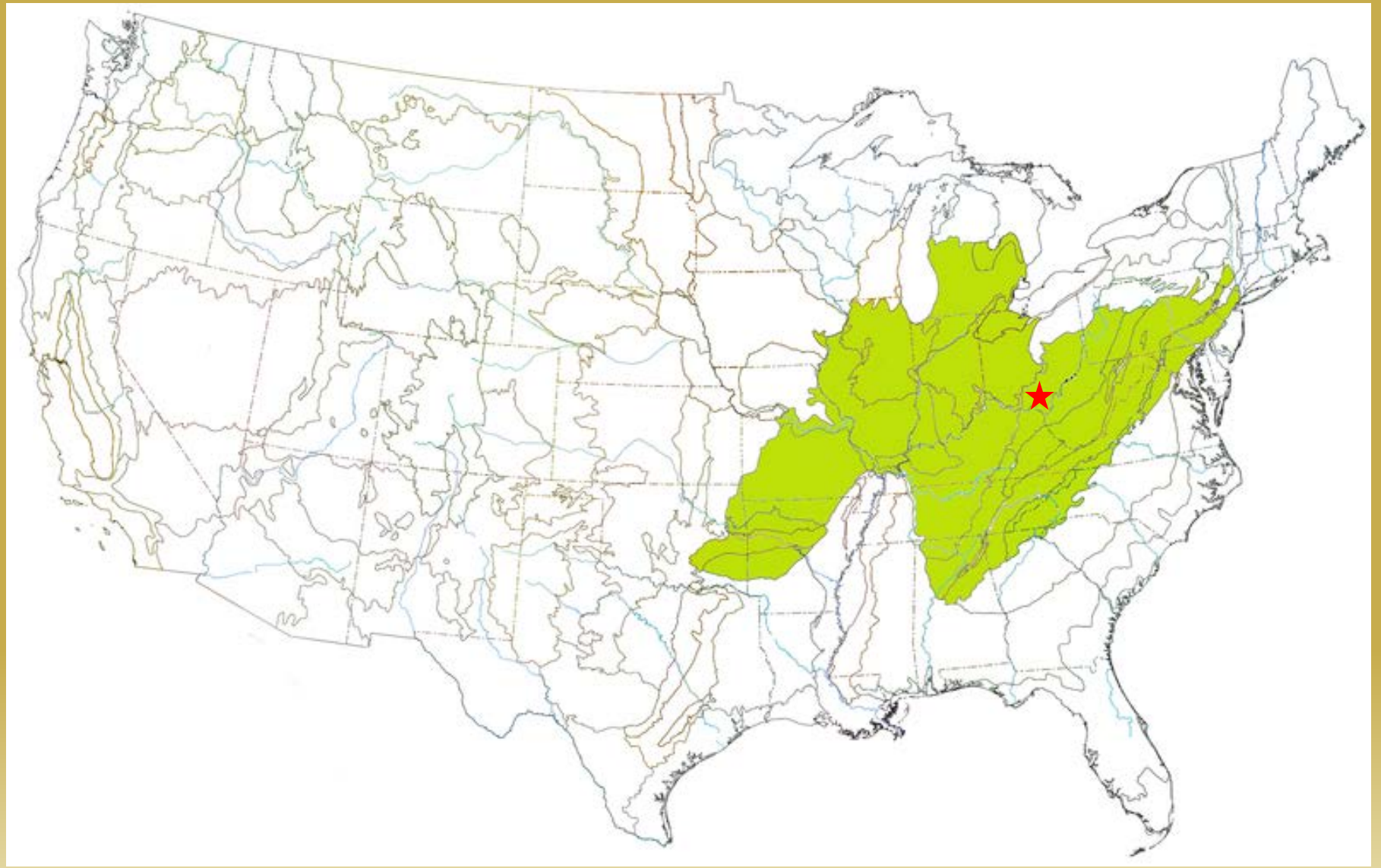
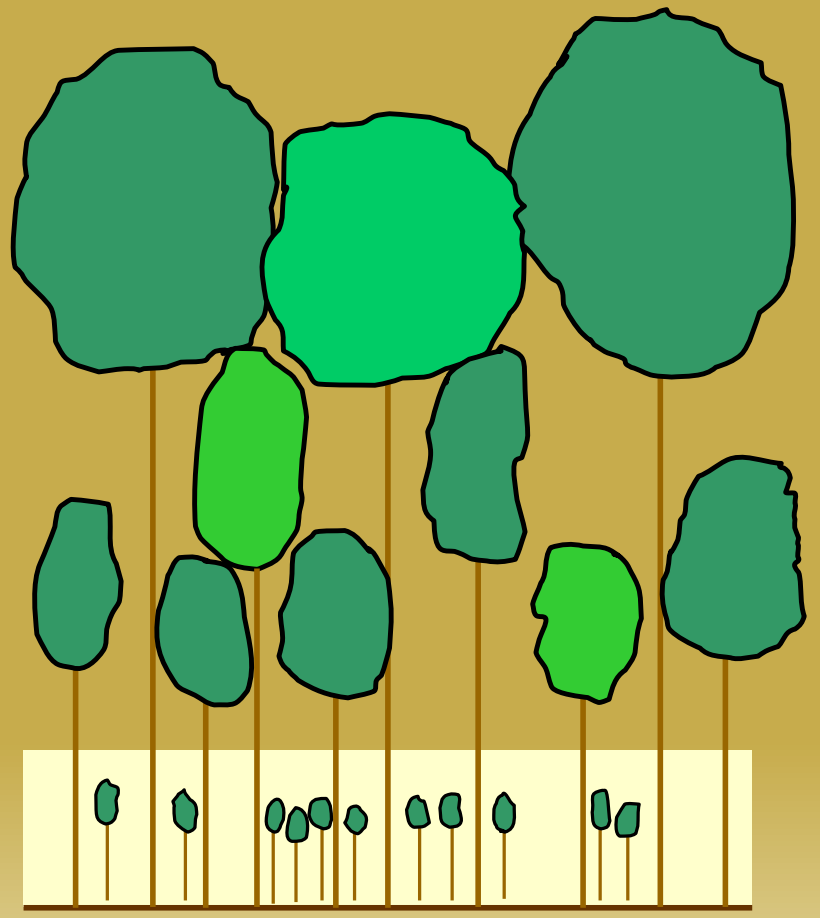
Central Hardwoods Forest Region



Forest Composition

- Overstory
  - White oak, *Quercus alba*
  - Chestnut oak, *Quercus montana*
  - Black oak, *Quercus velutina*
  - Hickories, *Carya* spp.
  - Scarlet oak, *Quercus coccinea*
  - Yellow poplar, *Liriodendron tulipifera*
- Midstory/Understory
  - Red maple, *Acer rubrum*
  - Sugar maple, *Acer saccharum*
  - Blackgum, *Nyssa sylvatica*
  - Beech, *Fagus grandifolia*
  - Sourwood, *Oxydendrum arboreum*

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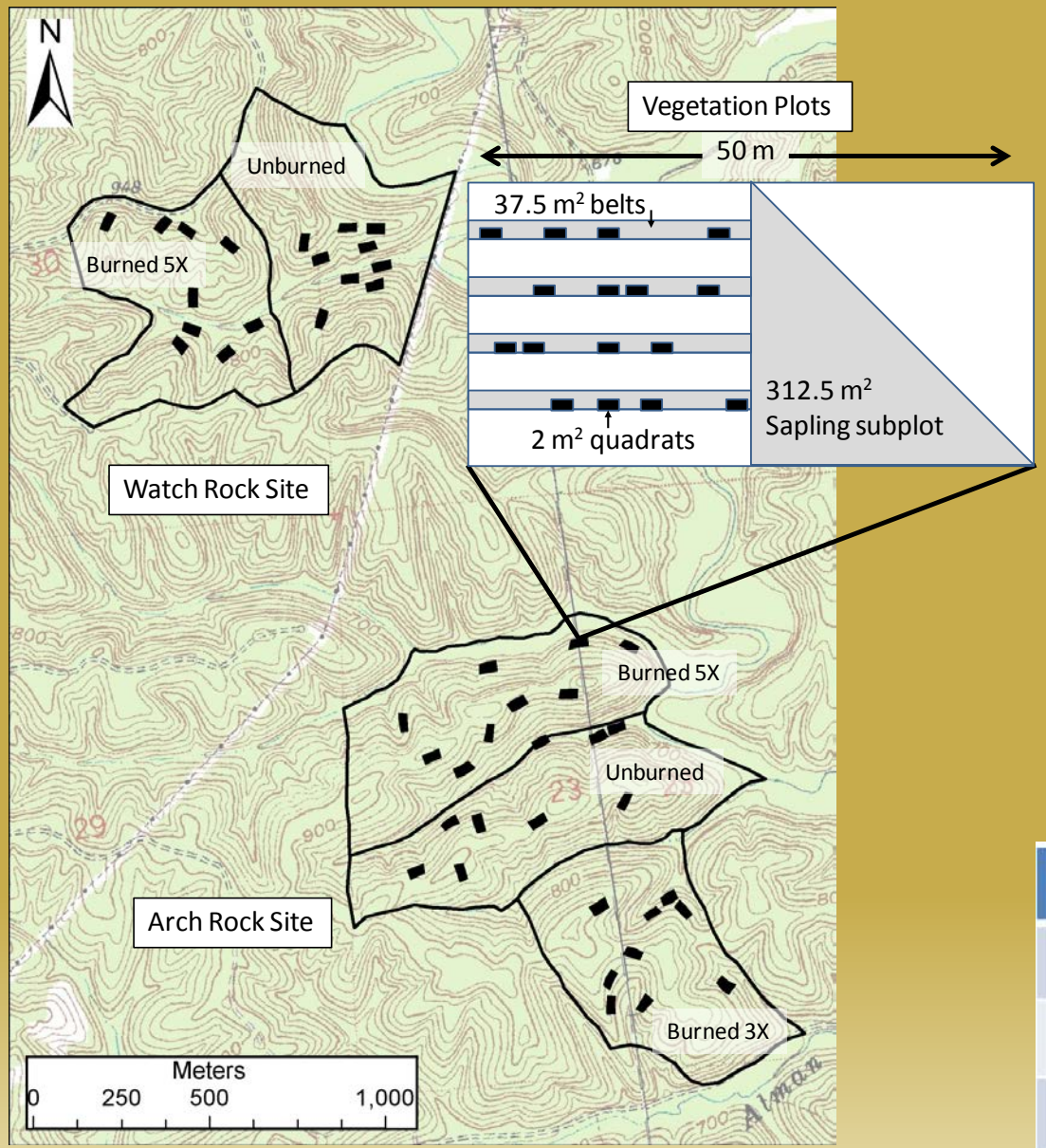
Oak (and hickory) fire adaptations

- Trees
  - Thick bark
  - Wound compartmentalization
- Seedlings
  - Root-centered growth
  - Location of dormant buds
  - Re-sprouting capacity

Ecosystem Management Fire Study, 1995-



Prescribed fires

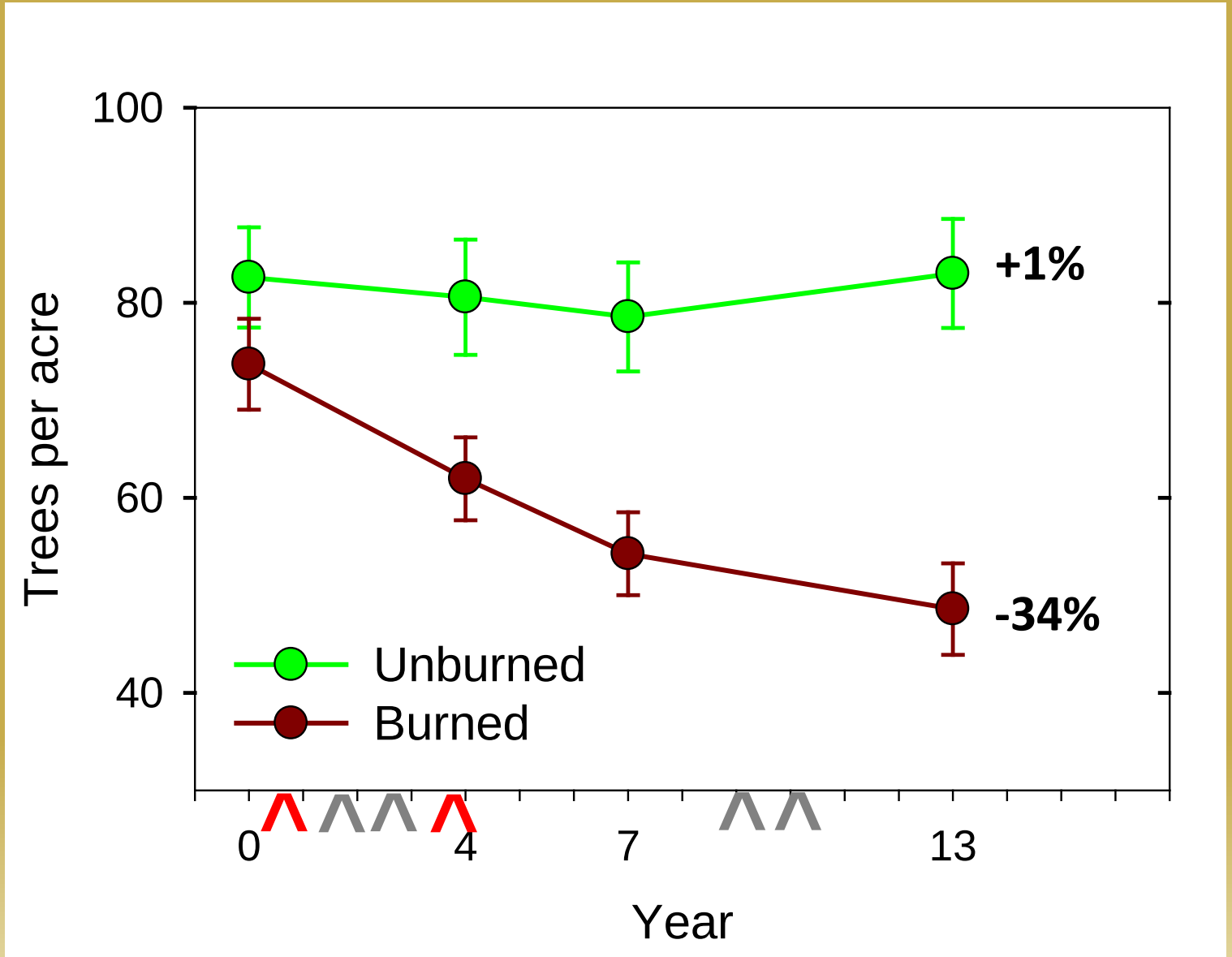
Stand	yr1	yr2	yr3	yr4	yr9	yr10
Arch Rock 5X	4/19	4/2	4/6	3/26	4/17	
Arch Rock 3X	4/18			3/26		4/15
Watch Rock 5X	4/21	4/3	4/6	3/27	11/9	


Year 0, pre-burn

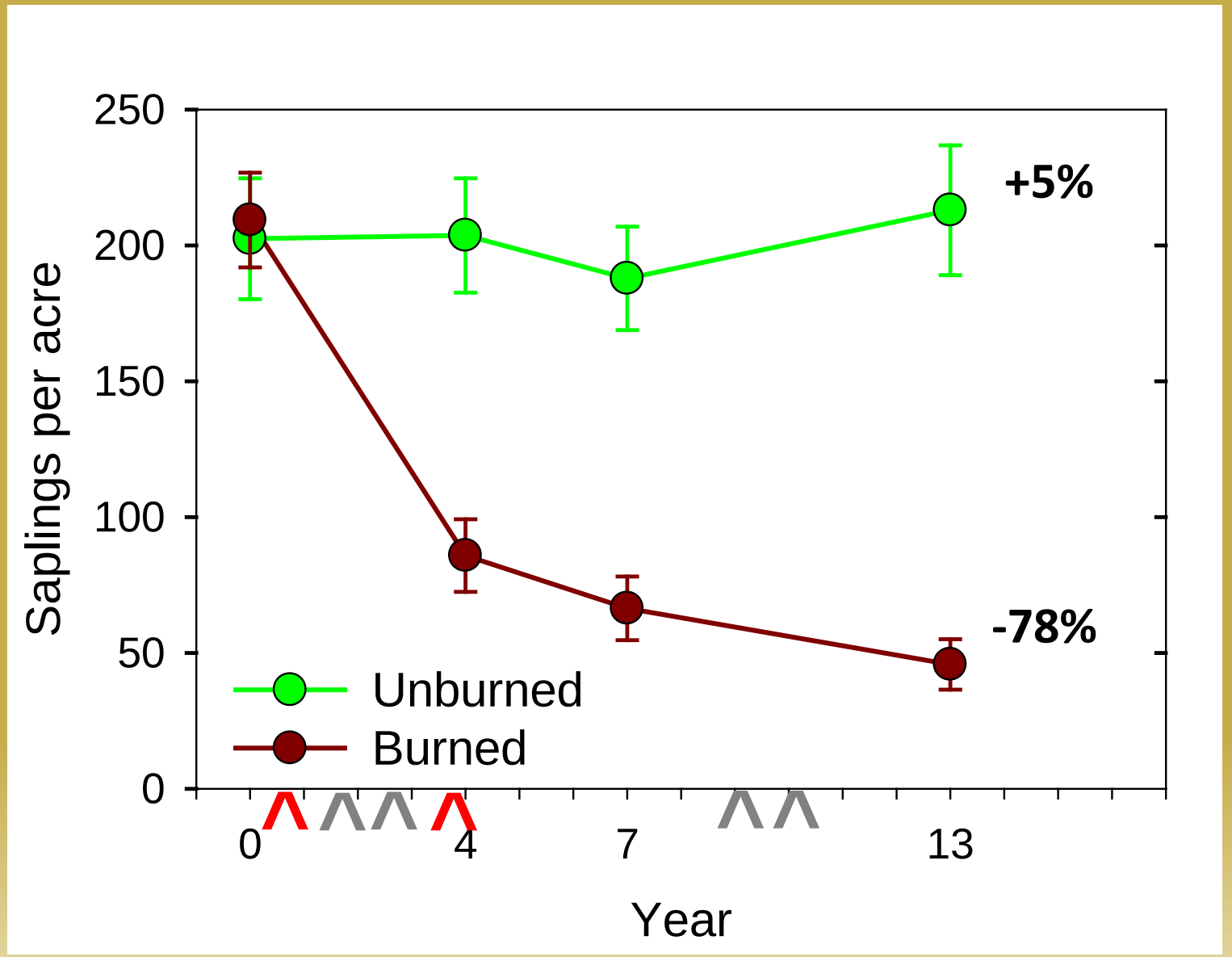

Year 4, 2 burns


Year 13, 3 burns

Midstory trees 4-10” DBH



Saplings 1-4” DBH



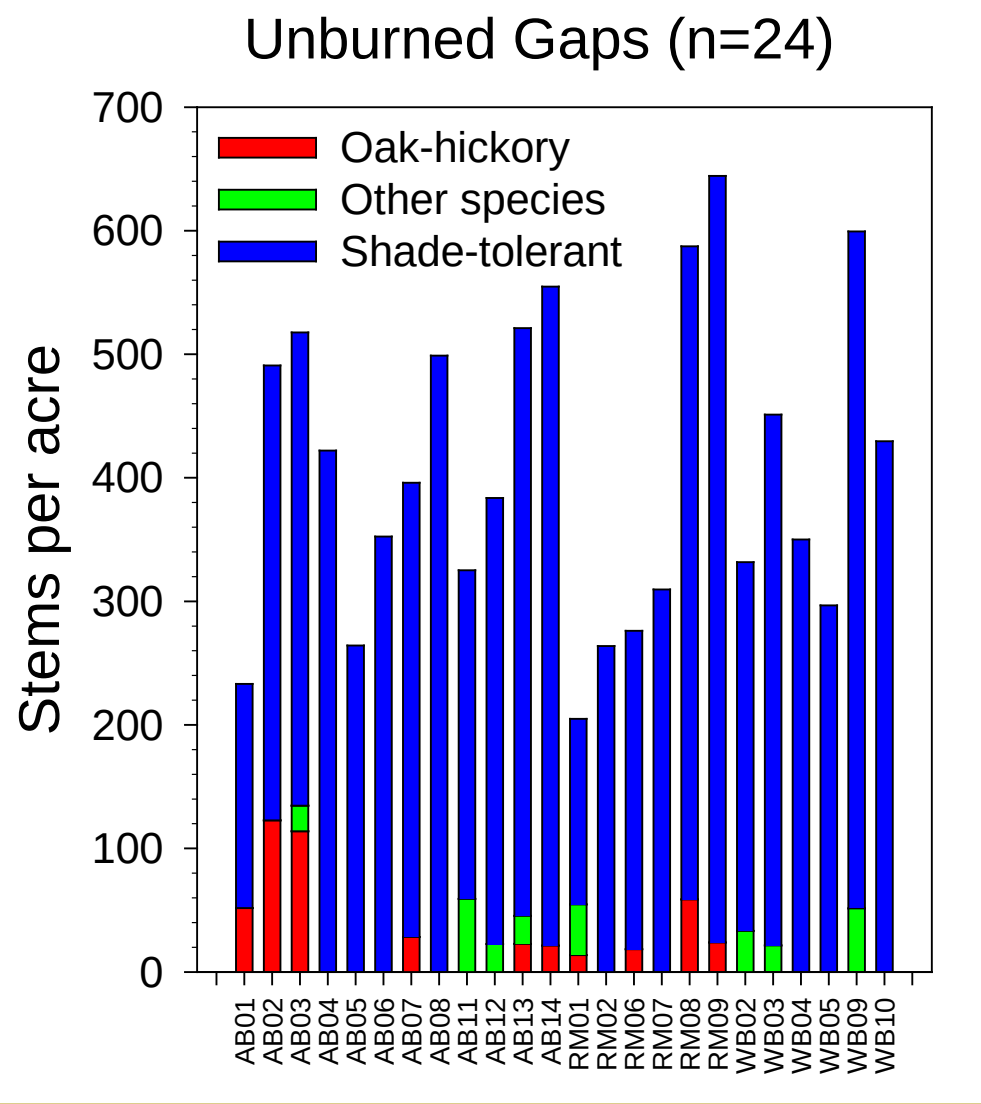
Fire effects oak seedlings

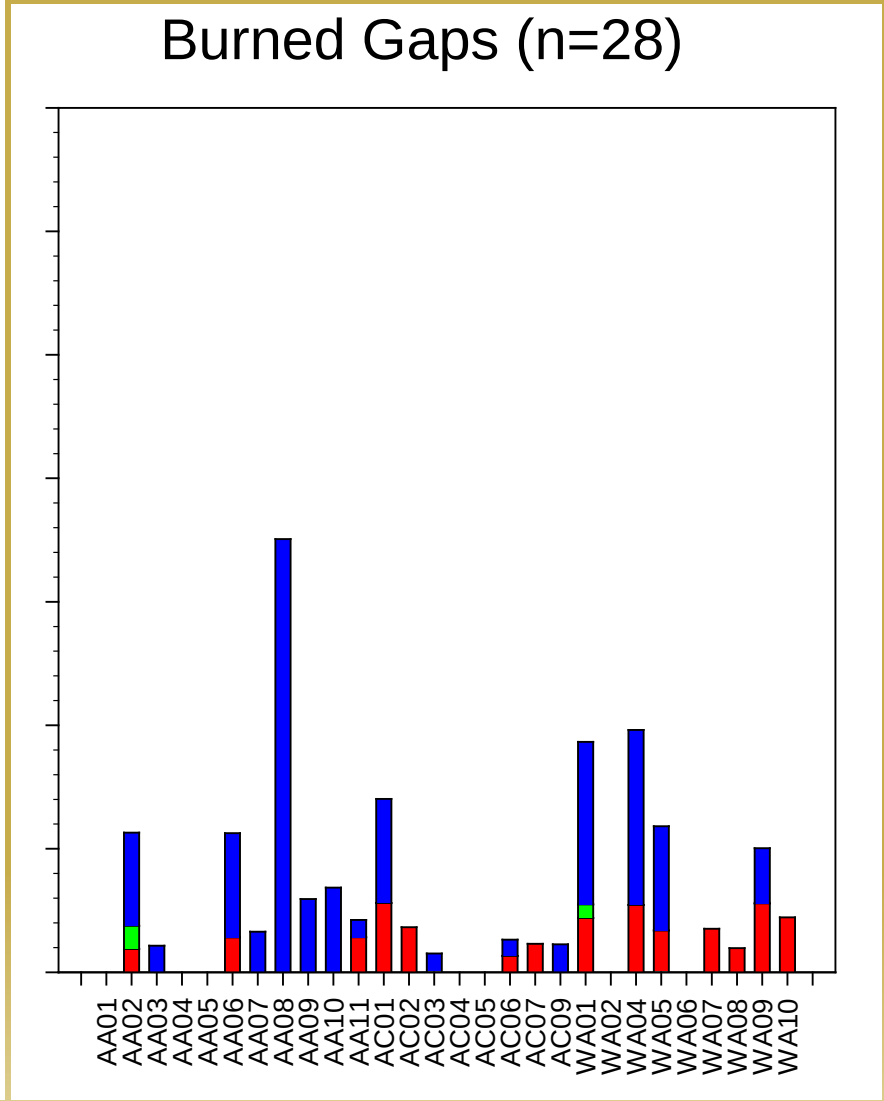
Years 8-10: White oak decline created canopy gaps

3 years since gap formed (year 11)

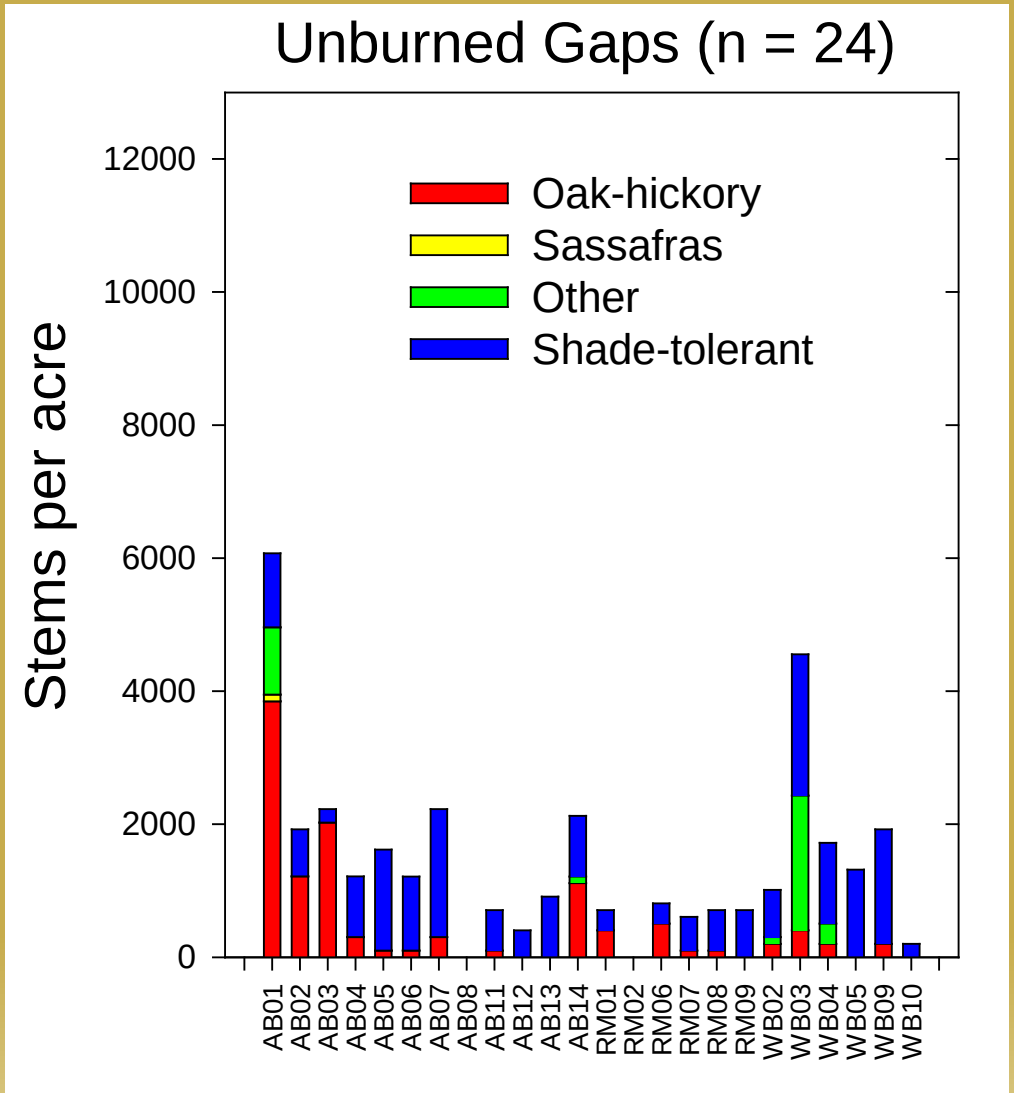
2 years after the last of five fires

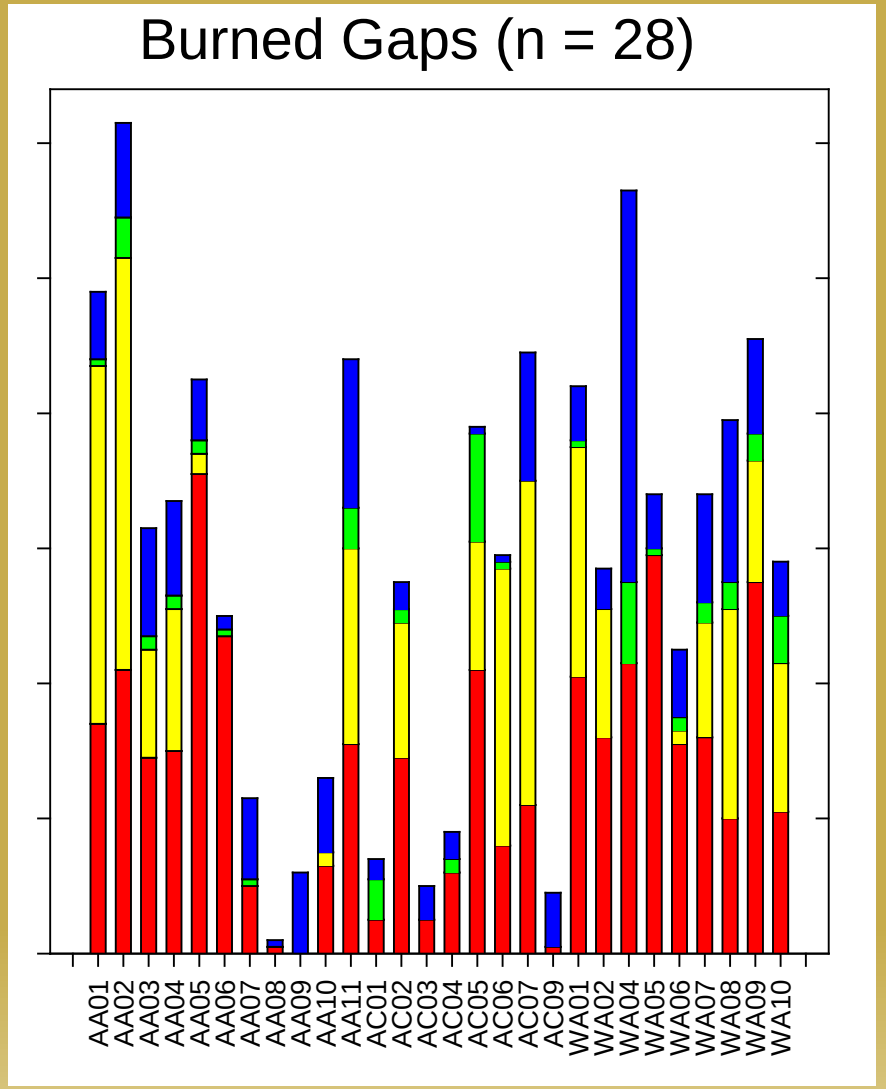
Saplings and poles, 1 to 8” DBH, year 13





Large advance regeneration (>2’ tall), year 13





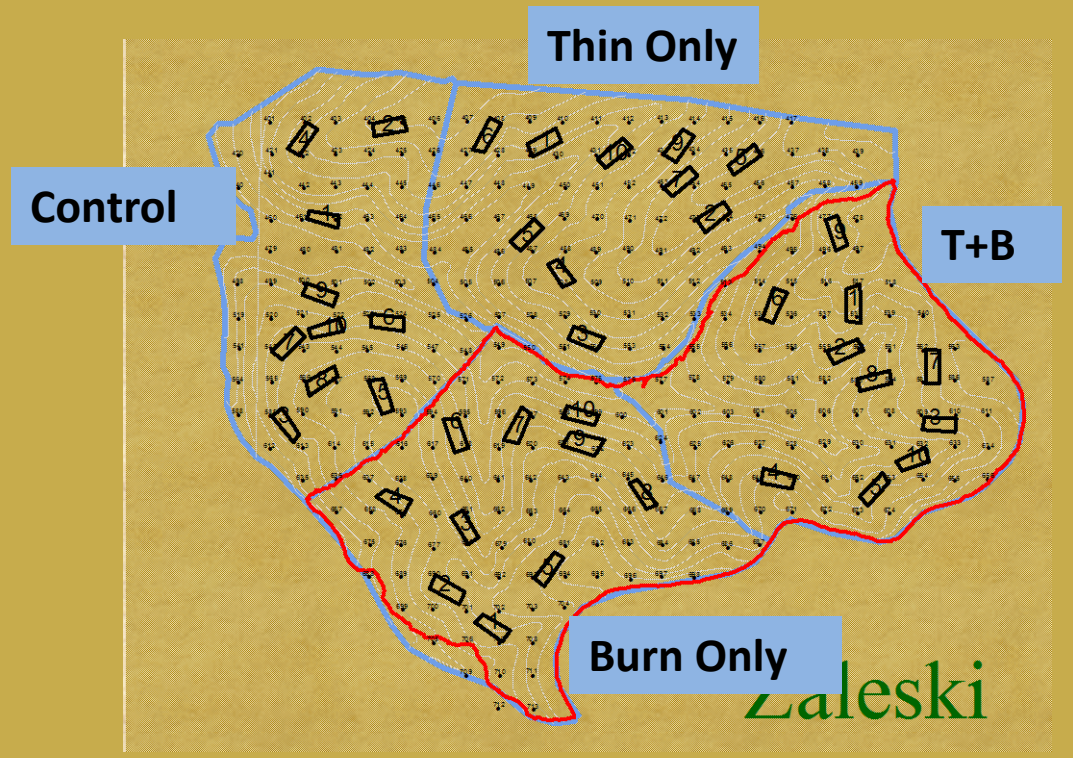
Oak-hickory : 468 per acre

Oak-hickory: 2798 per acre

Lessons learned, EM Study

1. Repeated low-intensity fires reduced sapling density (maples, blackgum, beech etc.)
2. Sapling re-sprouts grew slowly as the canopy remained closed.
3. More diffuse light favored oak seedling survival and root development.
4. Oak seedlings grew rapidly in gaps where fire had reduced competition.
5. Fire + gaps favored oak regeneration

The Fire and Fire Surrogates Study, 2000-

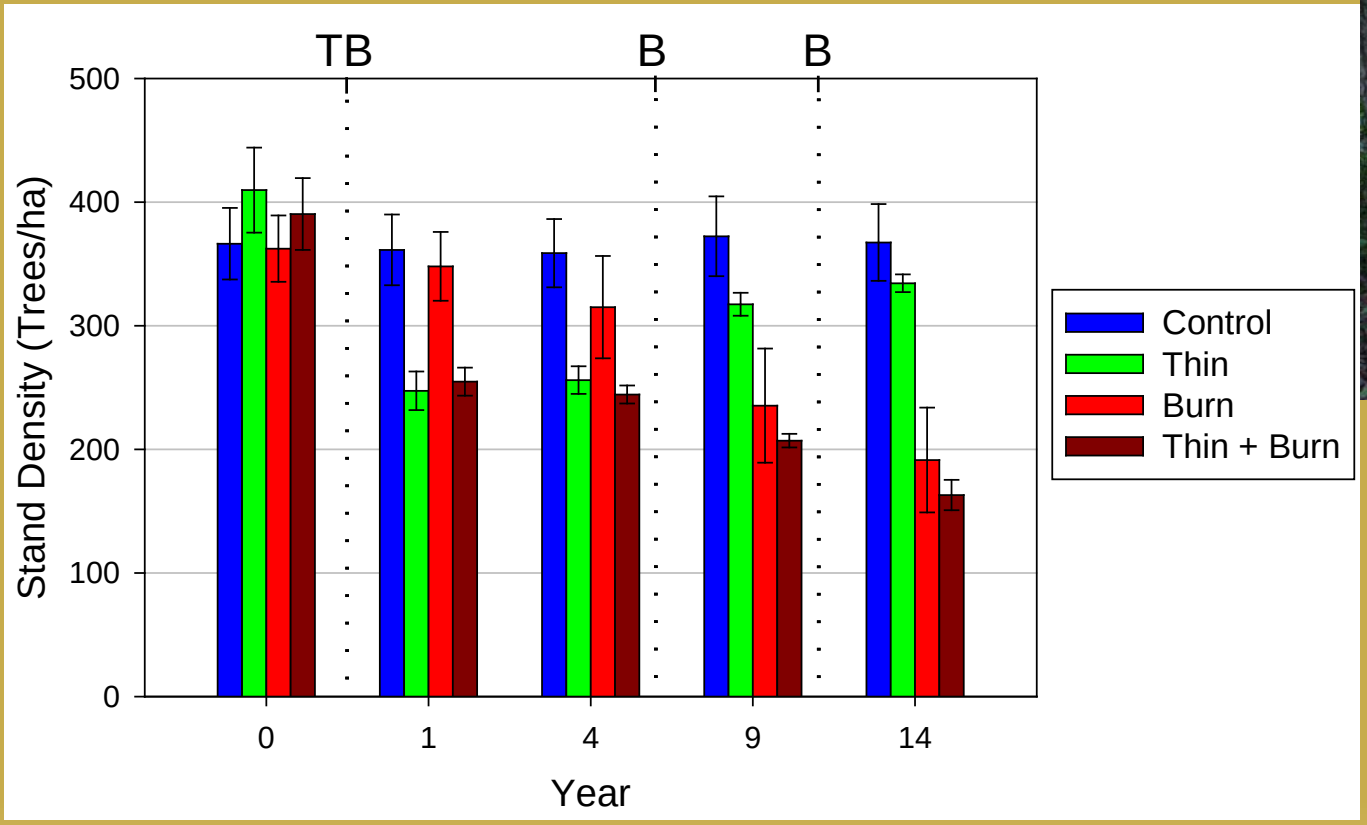


Thin

2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014

Burn Burn Burn

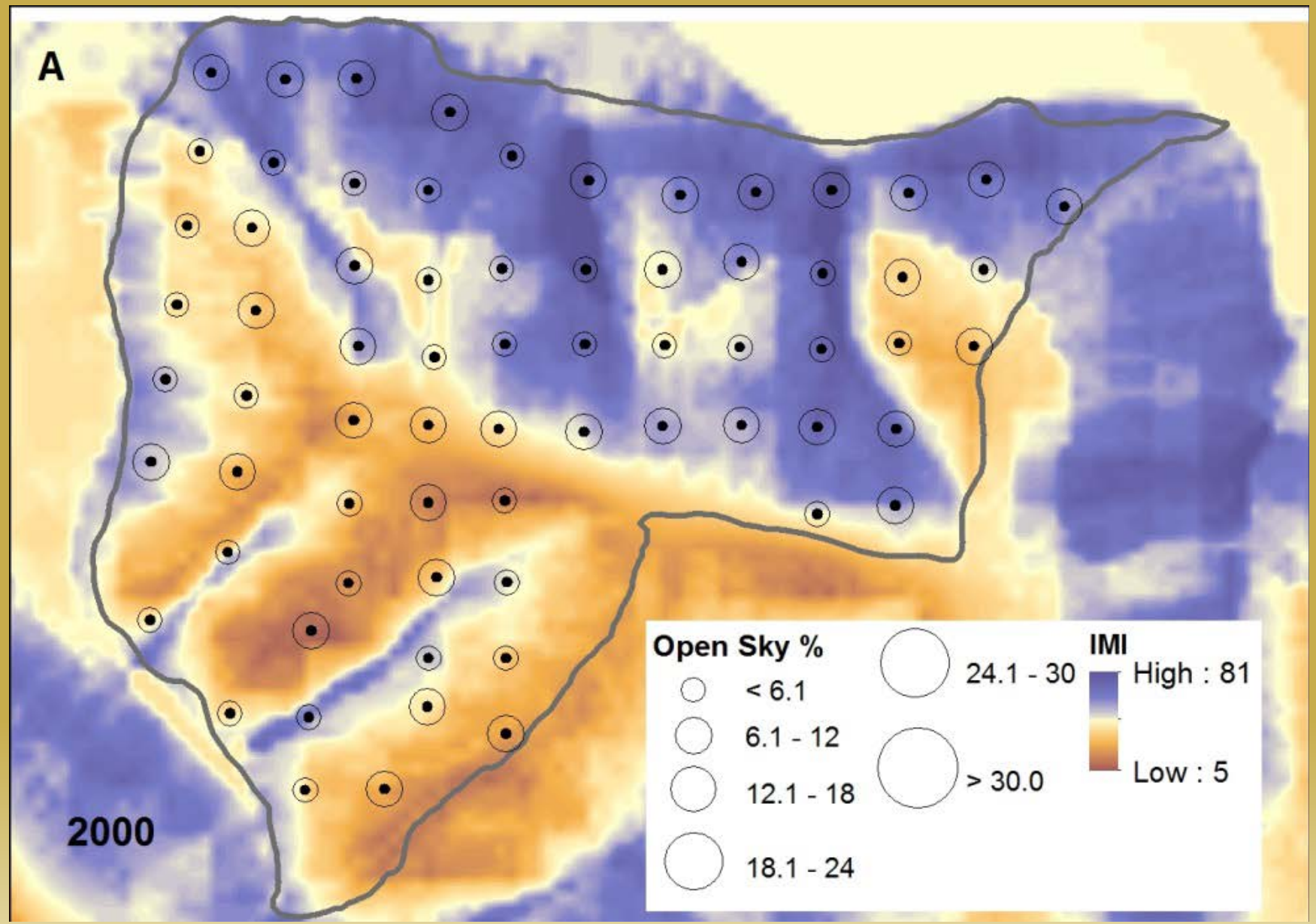
Stand density



Thin-only treatment

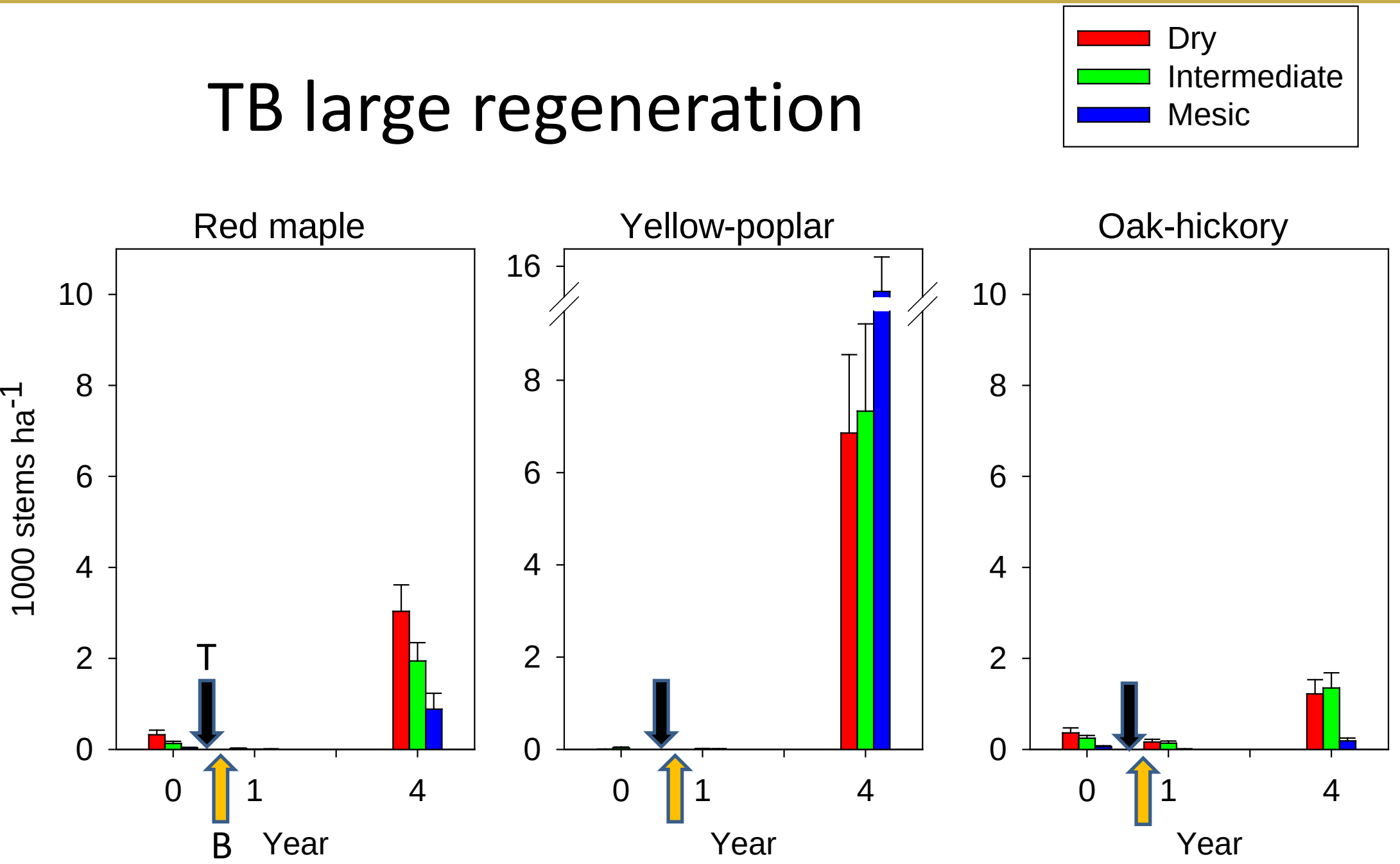
High-intensity fires

Topographic Effects: IMI

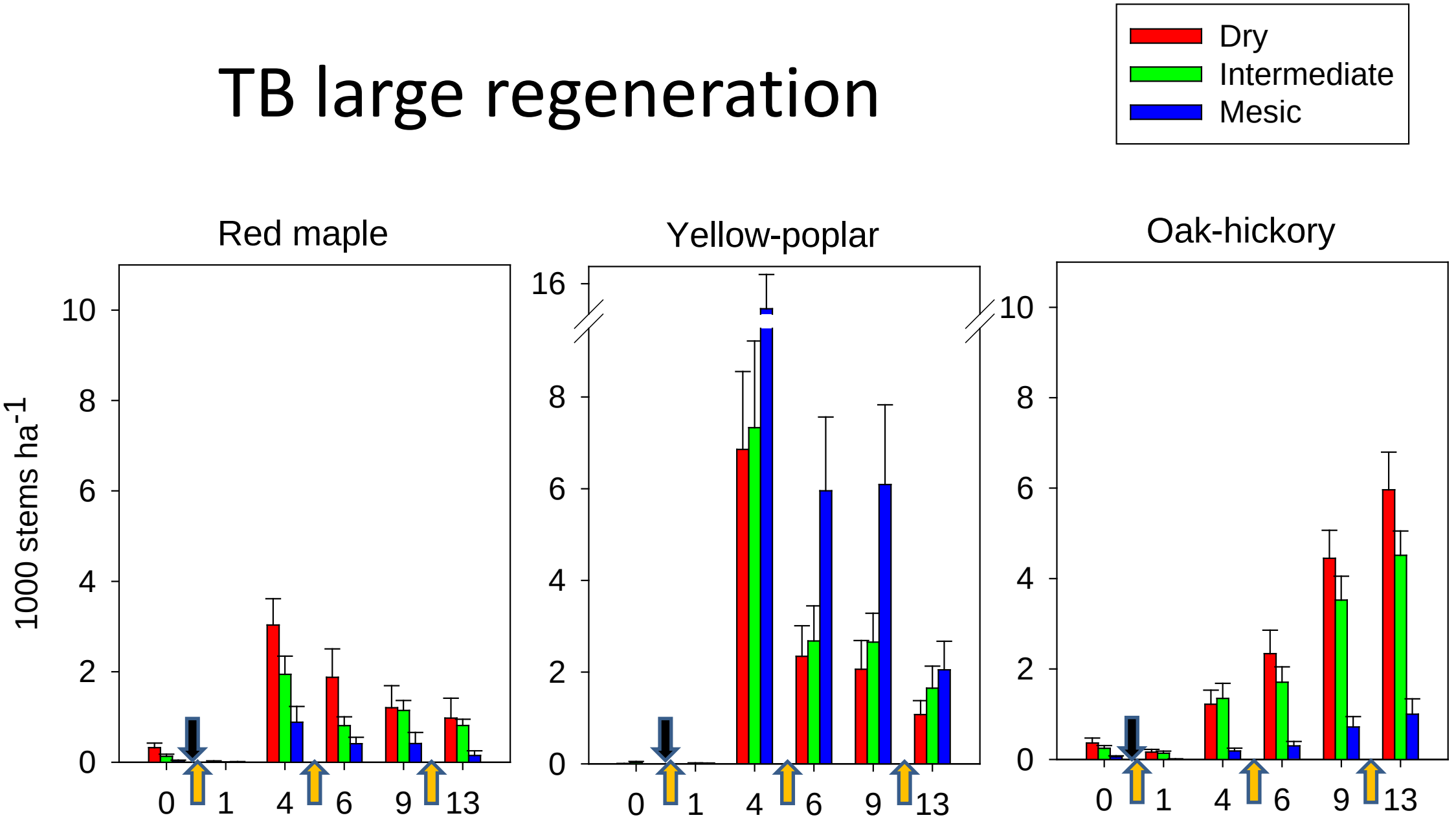


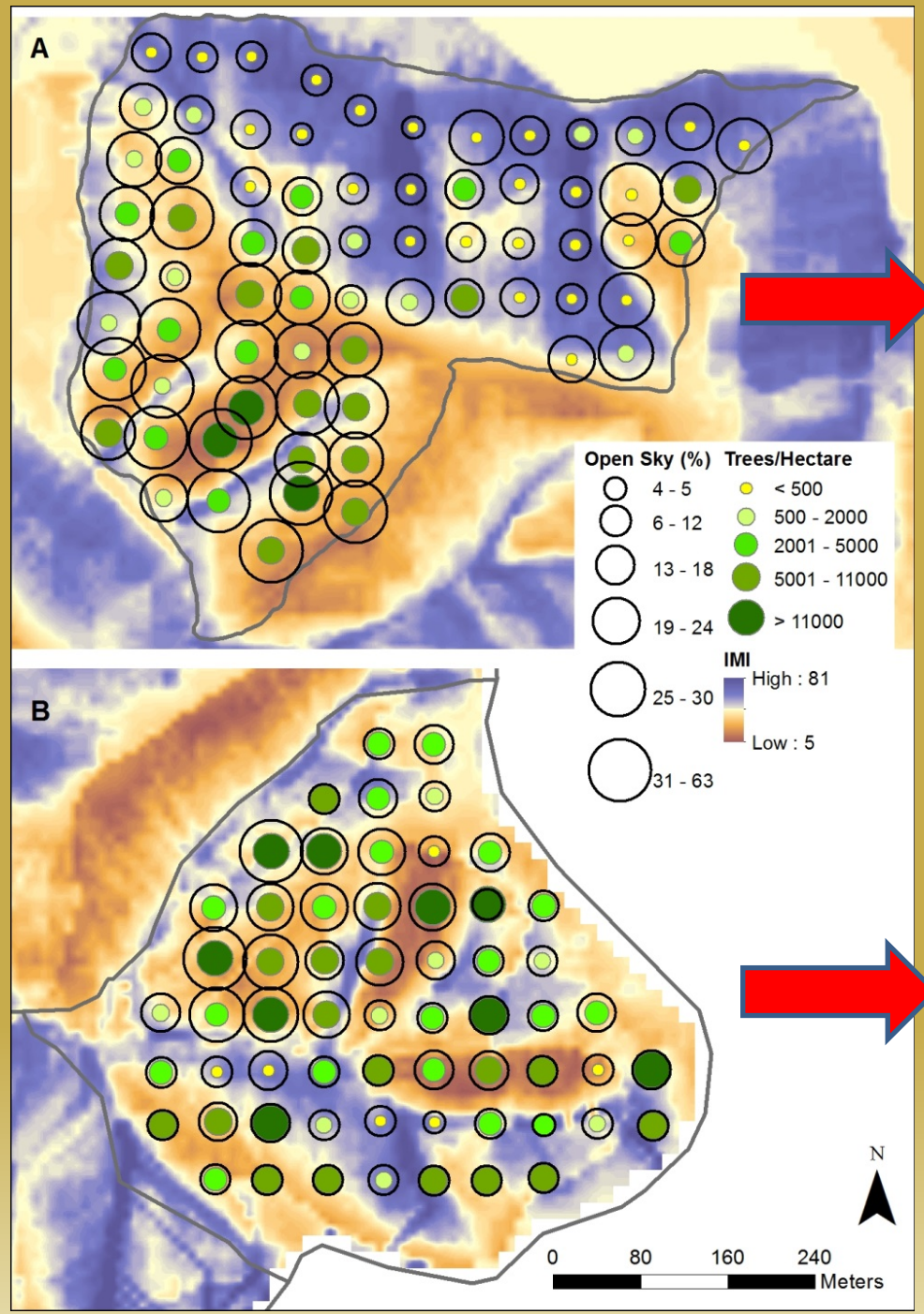
Iverson, Peters

TB large regeneration



TB large regeneration





REMA – High intensity fires

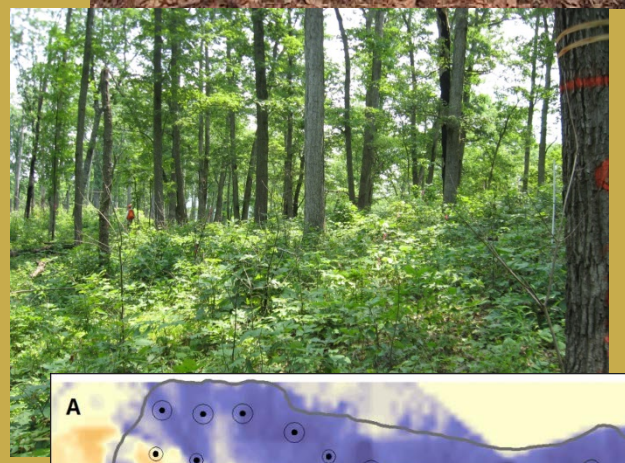
IMI	n	Open sky 2013	Large Oak-hickory 2013 Stems/ha
Dry	20	36%	4918
Intermediate	26	24%	3441
Mesic	25	14%	474

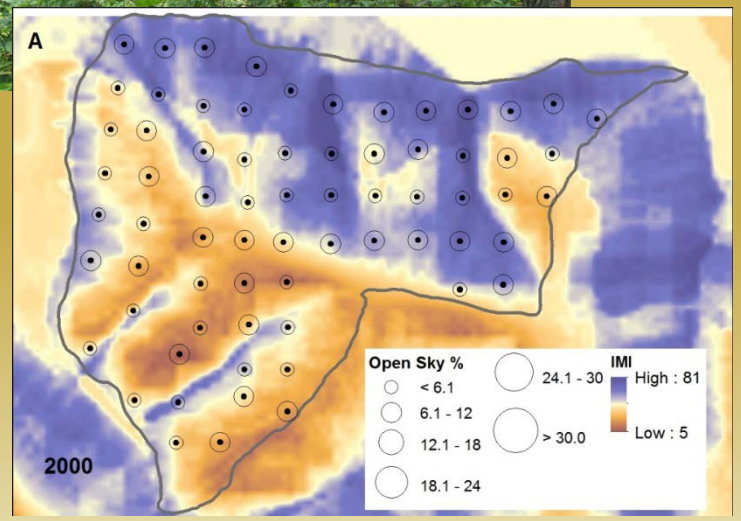
Zaleski – Low-moderate intensity fires

IMI	n	Open sky 2013	Large Oak-hickory 2013 Stems/ha
Dry	20	17%	6685
Intermediate	32	12%	5615
Mesic	8	8%	2653

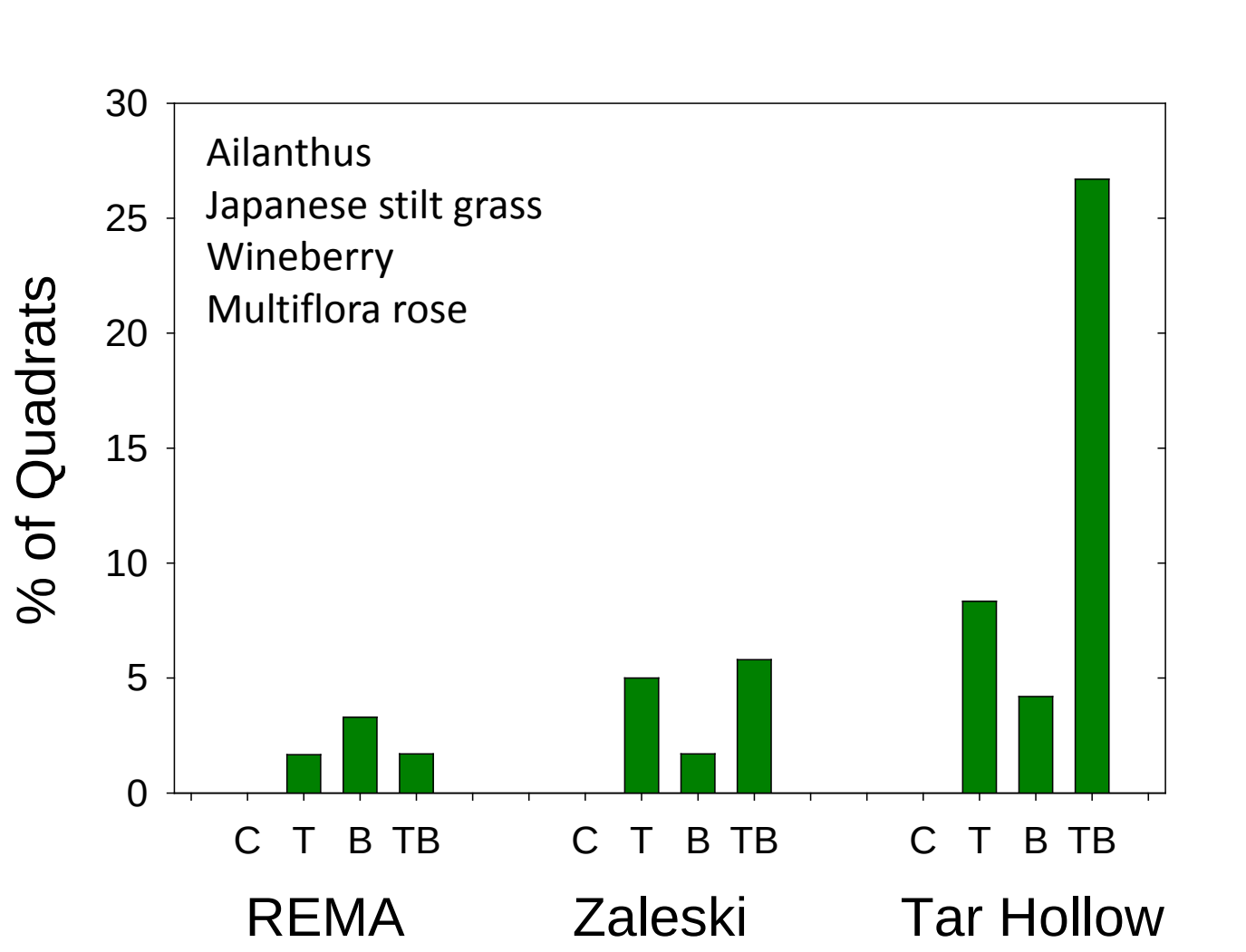
Lessons learned FFS Study

1. Rx burns can cause major overstory mortality in oak forests
2. Large topographic effects on fire intensity and vegetation response
3. After thinning, multiple burns favor oak regeneration
4. After thinning, low-moderate intensity fires were sufficient to develop large oak regeneration





NNIS: FFS Site and Treatment, Year 14

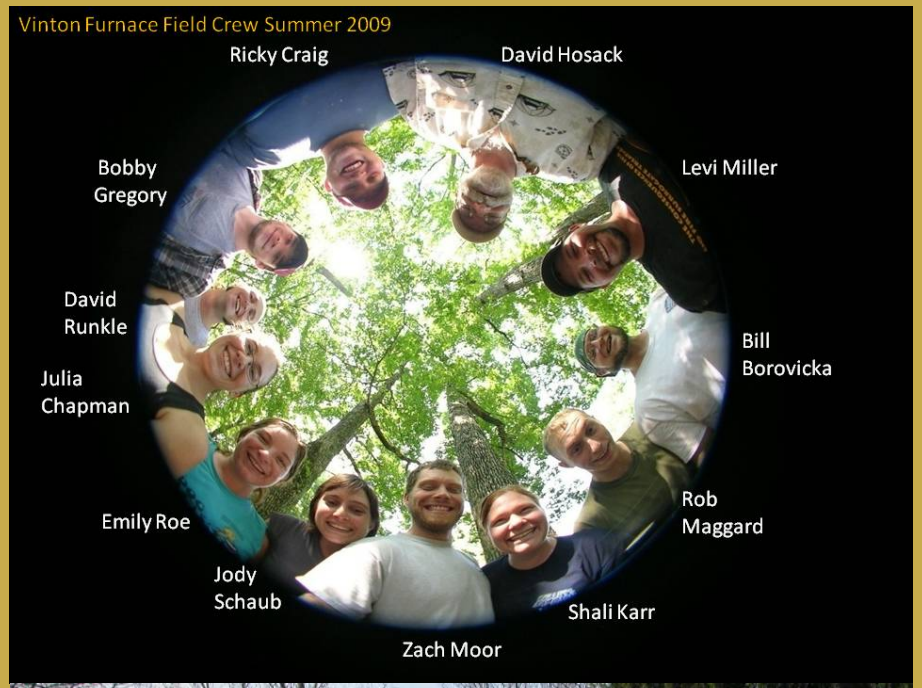


Fire season

Shelterwood-burn method

Brose and Van Lear 1998

May 6, 2008 burn, Ohio



Acknowledgements

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