



**Oriental Bittersweet Invasion,  
Prescribed Fire,  
and the Degradation of  
Oak Savannas at Indiana Dunes  
National Lakeshore**

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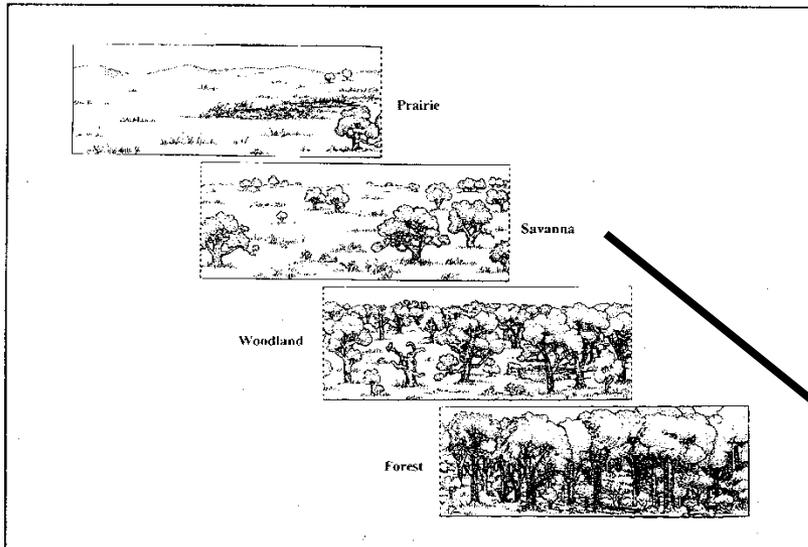


Figure 2. The prairie-forest continuum is characterized by continuous char density and canopy closure from the nearly treeless prairie through the t savanna to closed-canopied forest. (Adapted from Packard and Mutel 1997 ar with permission from *The Tallgrass Restoration Handbook*, Stephen Packard an Mutel, eds., © 1997 The Society for Ecological Restoration. Published by Isl Washington, D.C. and Covelo, CA.)

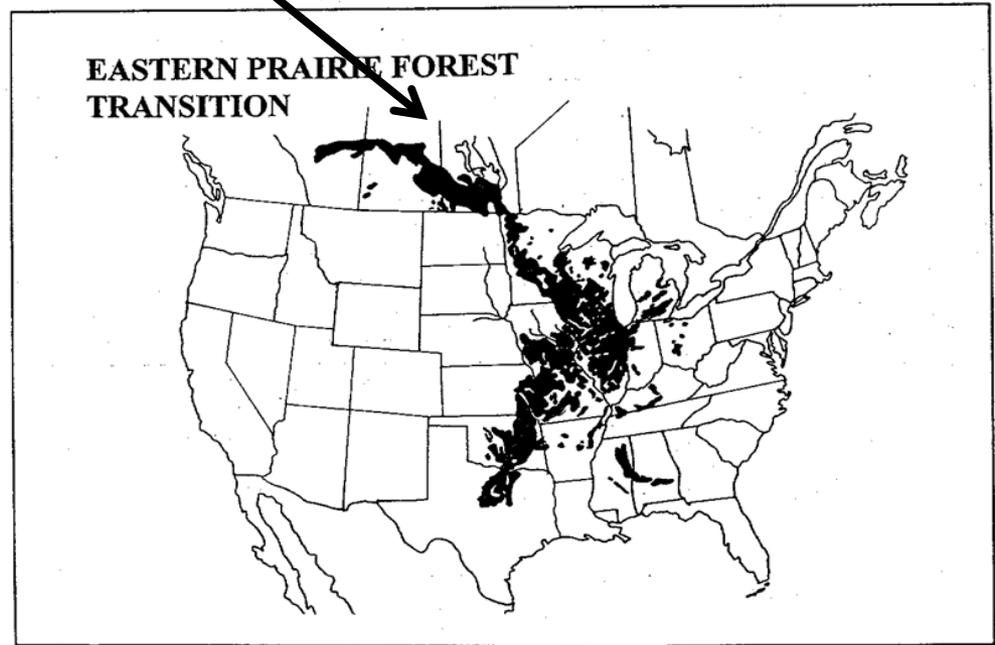


Figure 1. The eastern-prairie-forest transition extended as a broad arc along the eastern edge of the tallgrass prairie and was a mosaic of prairie, forest, and savanna (adapted from Anderson 1983 and Nuzzo 1986).

# FIRE AS A DISTURBANCE

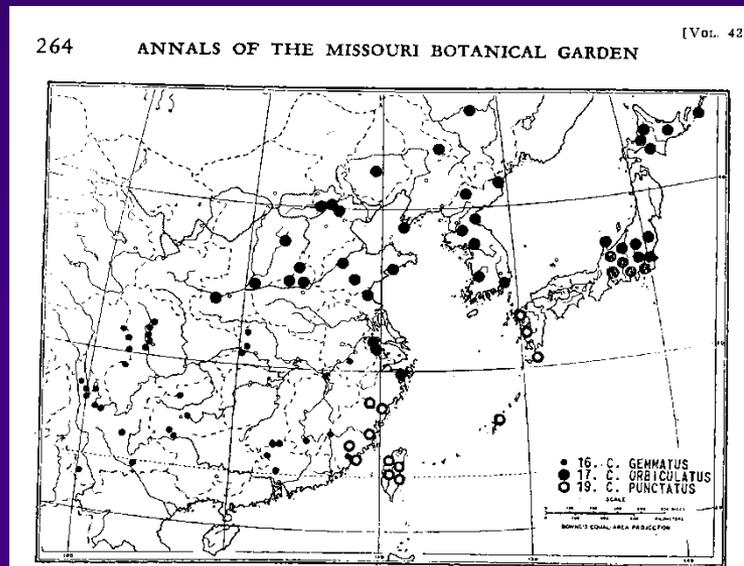


# THREATS TO OAK SAVANNA

- Fire suppression
- Fragmentation
- **Invasive species**
- Canopy closure
- Pollution
- Over harvesting
- Loss of species diversity

# Species Background

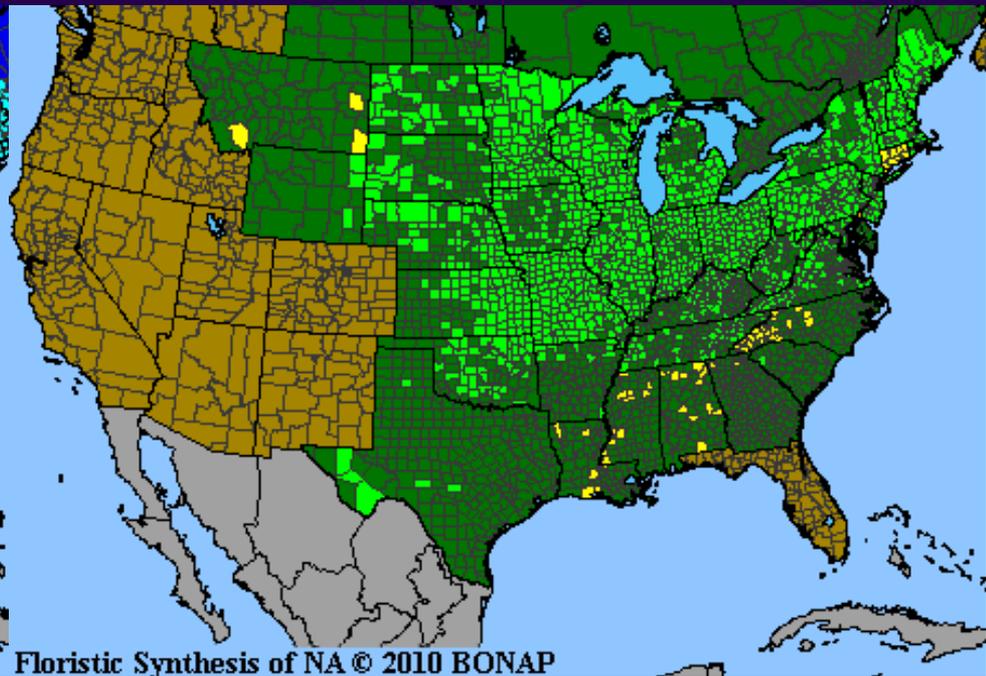
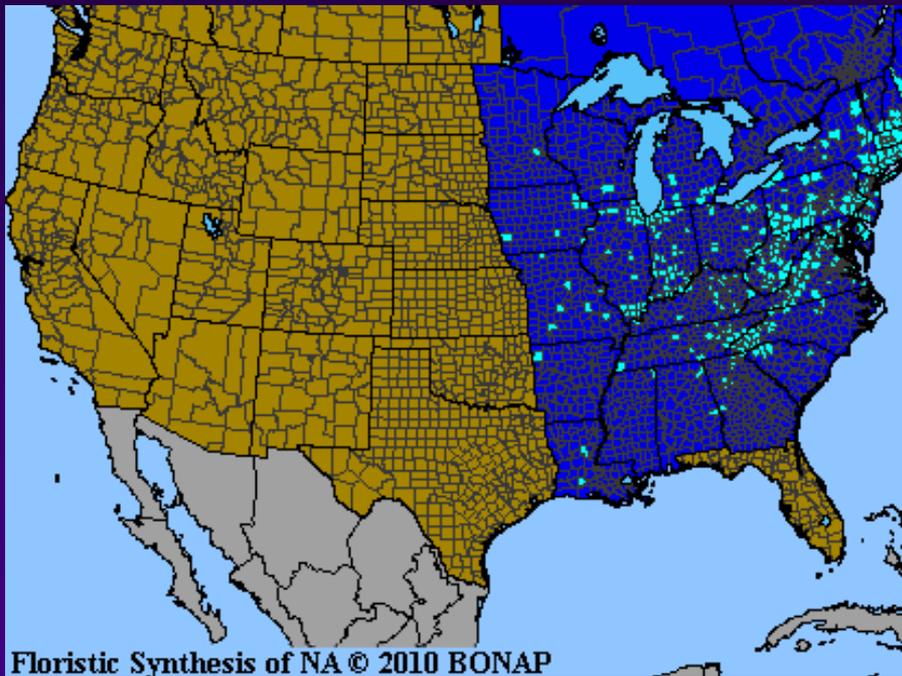
- Oriental bittersweet (*Celastrus orbiculatus*) was introduced as a horticultural plant from East Asia in the 1860s
- Was planted widely on the East Coast
- Started to be noticed as highly invasive in the mid 1900s



# North American Distribution

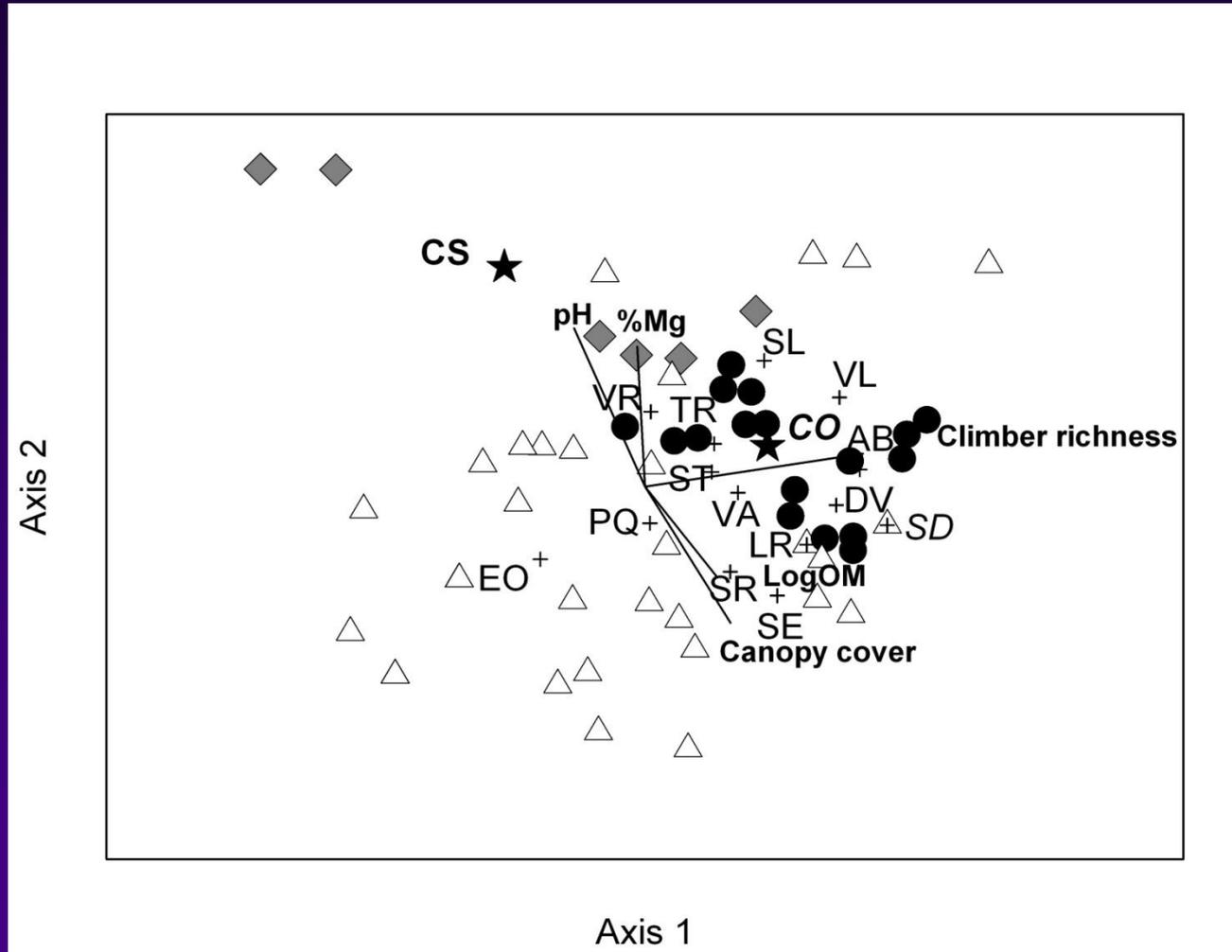
oriental

American





# Habitat Segregation of *Celastrus*



# Liana Study

- ***C. orbiculatus* has the ability to invade mature forests**
  - **Common in the understory**
  - **Pressure from edge**
- **Events such as windthrow can create opportunities for invasion**
- ***C. scandens* is more of a specialist of the dune/forest ecotone, but the two species can interact in this region**

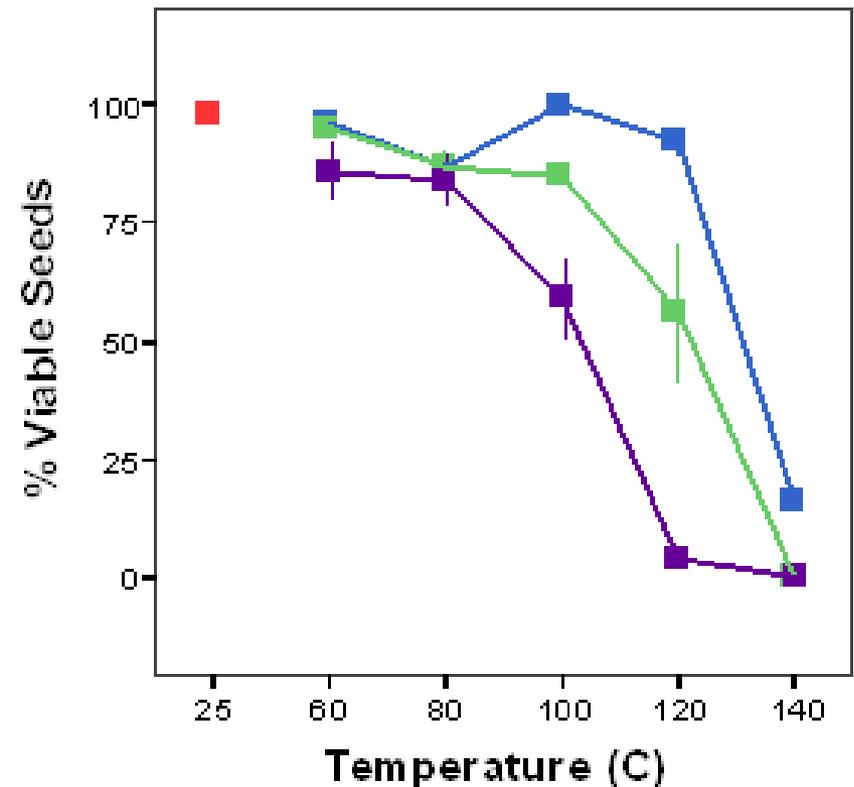
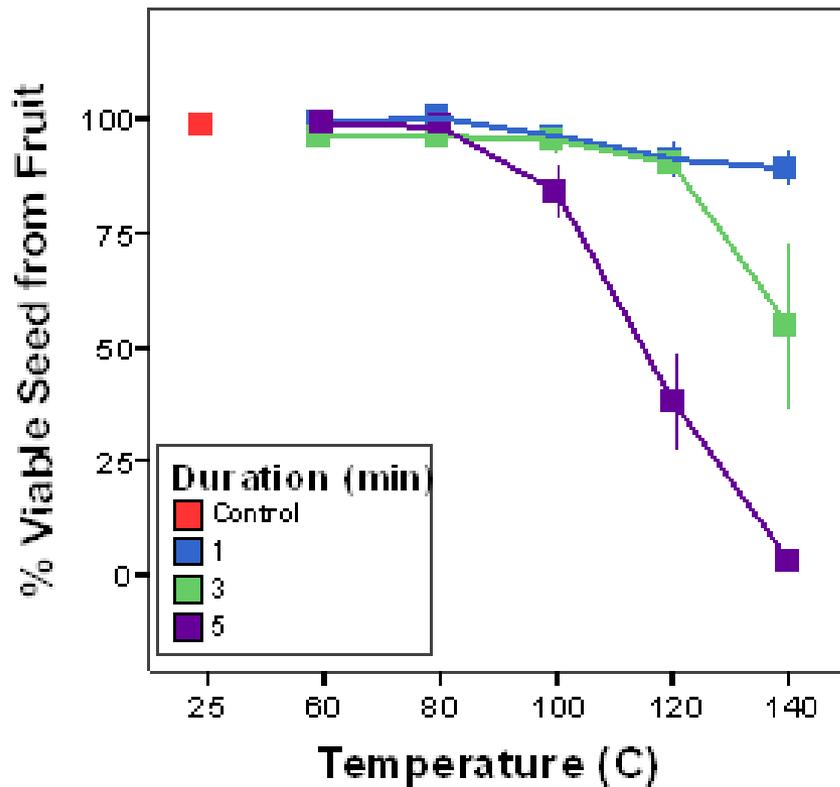
# **To Burn or Not to Burn Oriental Bittersweet?: A Fire Manager's Conundrum**

- **Fire effects on seed viability**
- **Post fire effects on establishment**
- **Fire effects on established plants**
- **Fire effects on bittersweet at the landscape scale**

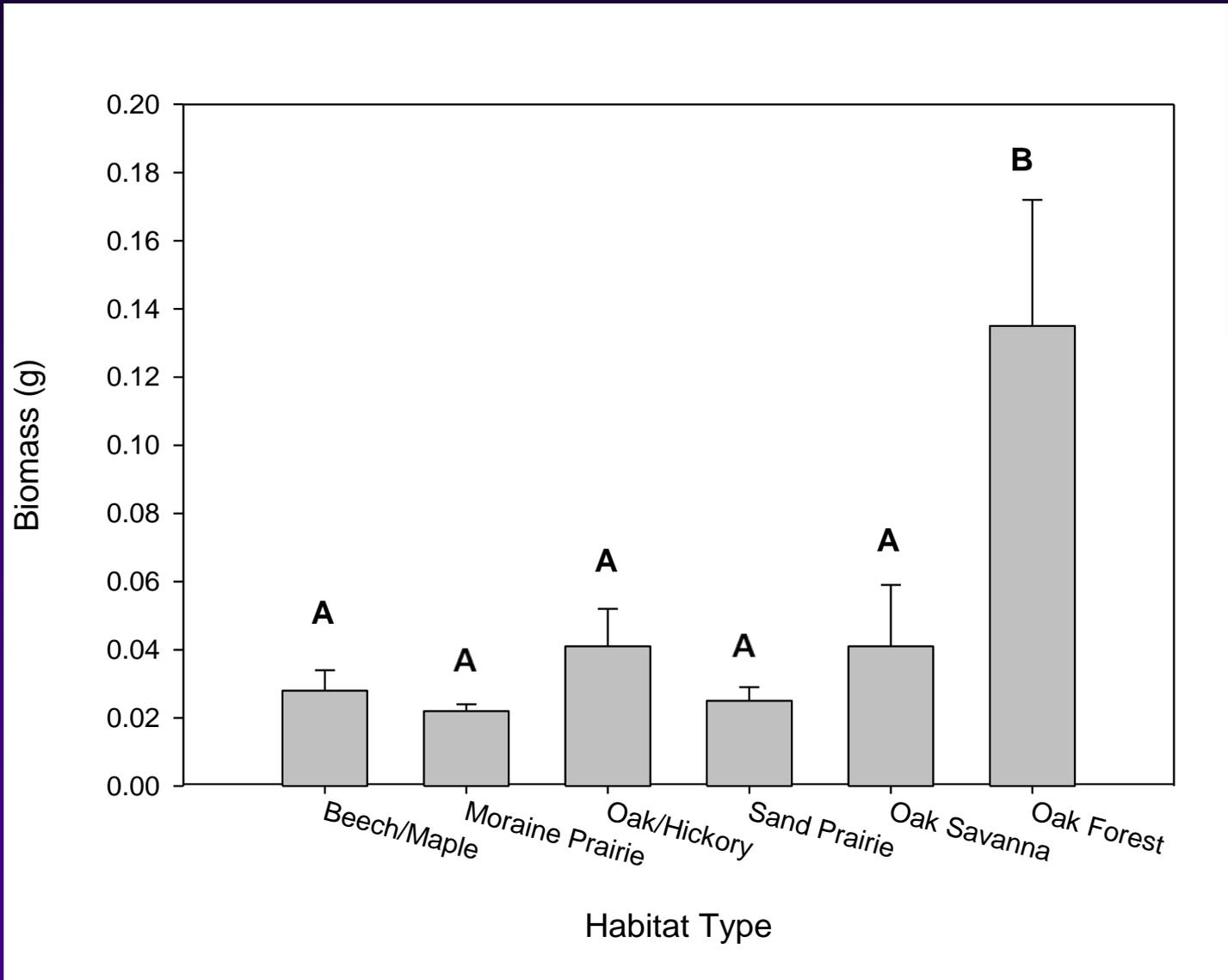
# Dry heat

## Seeds in fruit

## Seeds



# Seedling biomass



# Treatments

**2009-2011**

- **Spring series**
  - **Control**
  - **Burn**
  - **Cut**
  - **Cut and burn**
  - **Cut in early July**

**2010-2012**

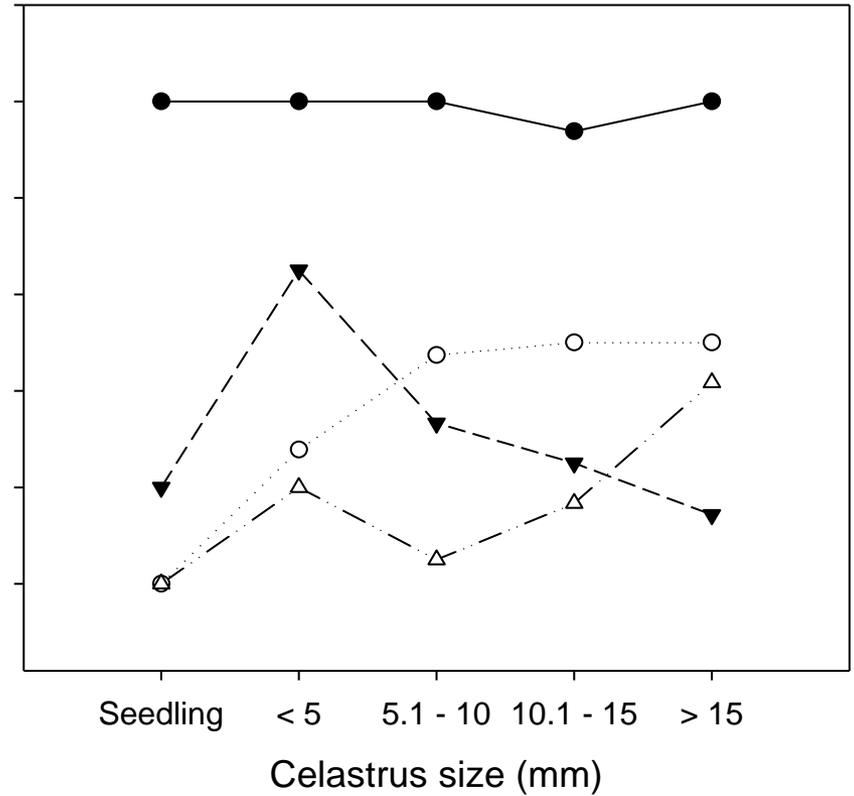
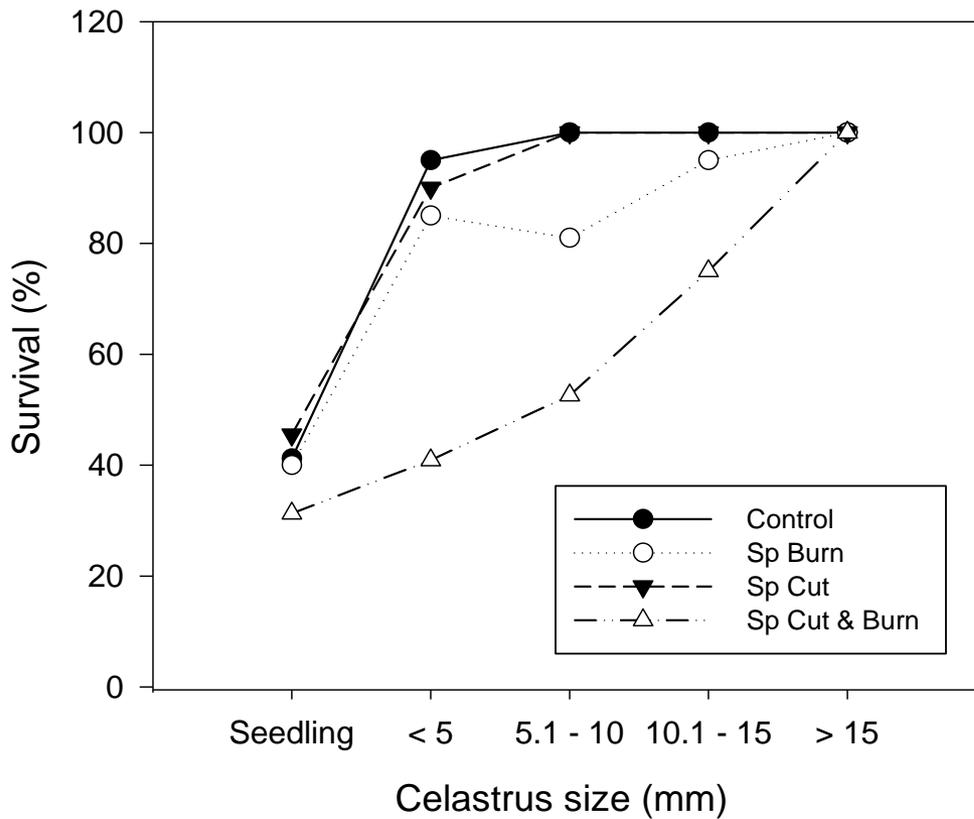
- **Fall series**
  - **Control**
  - **Burn**
  - **Cut**
  - **Cut and burn**
  - **Herbicide**

**Ancillary = July cut and herbicide**

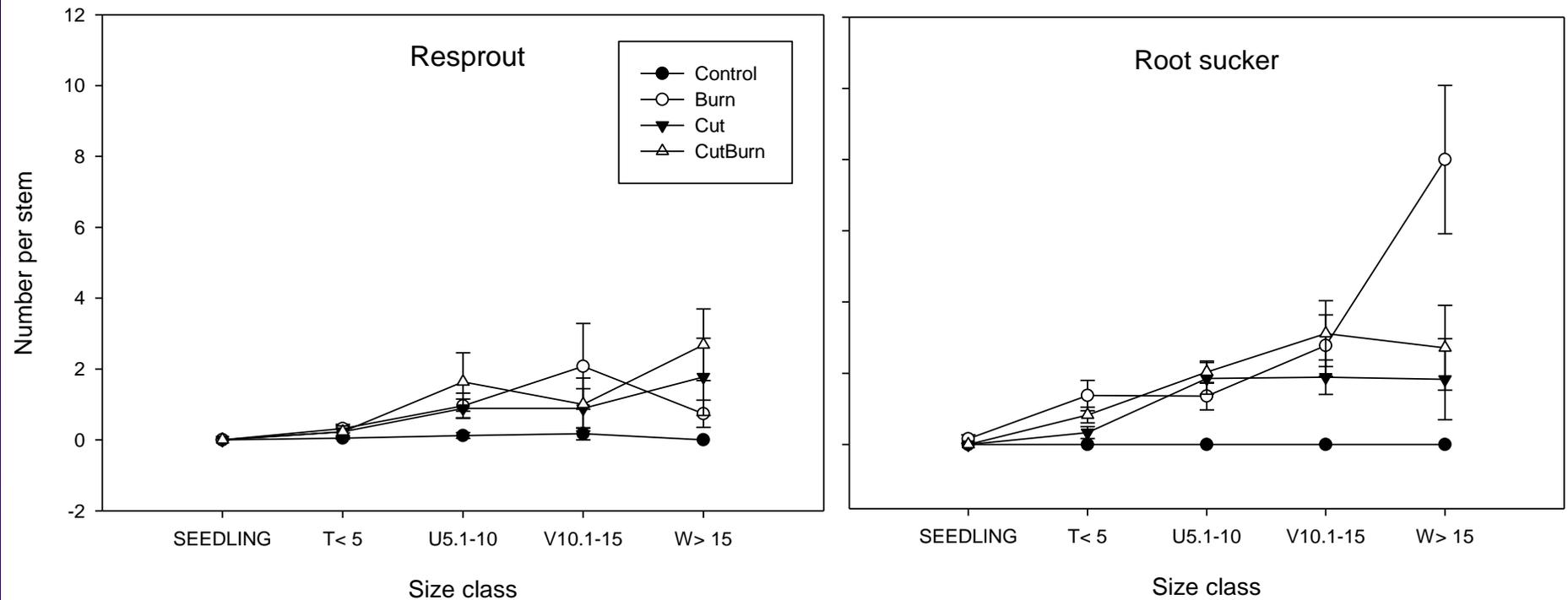
# Survival: size class\*soil type\*treatment

Moraine

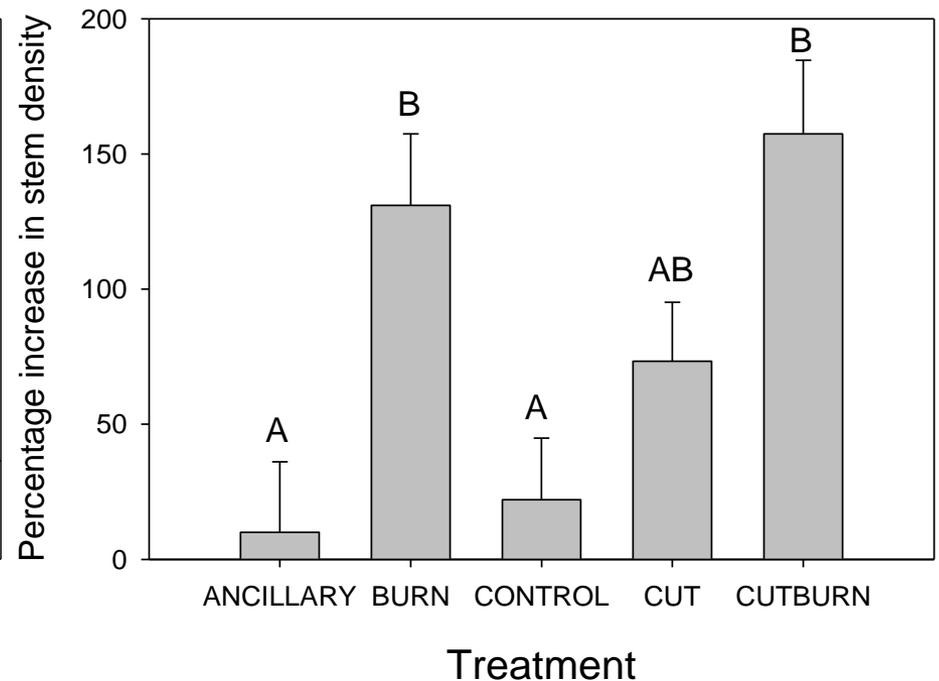
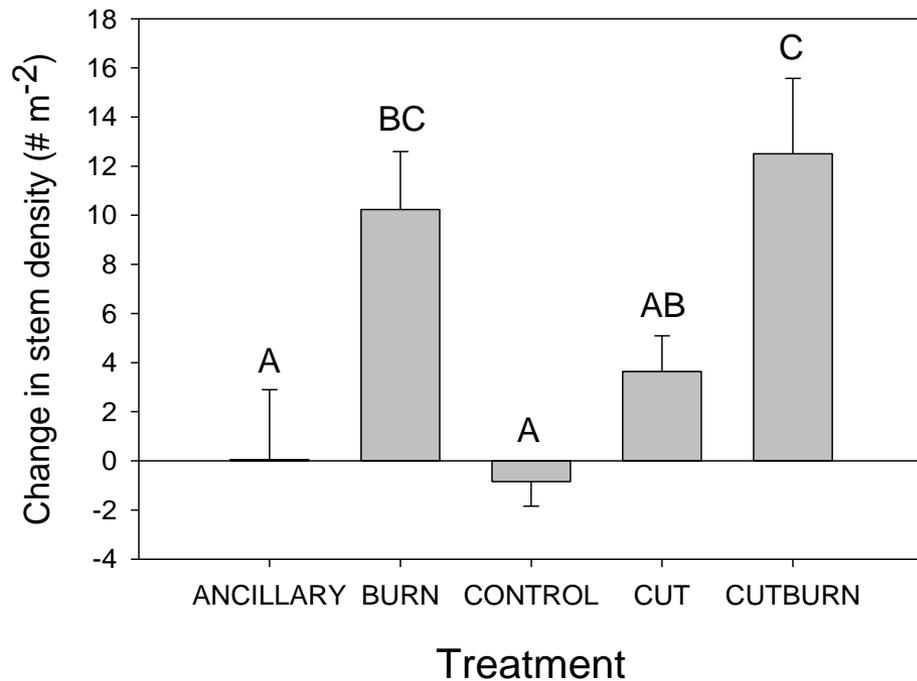
Sand



# Resprouts and root suckers by size class and treatment



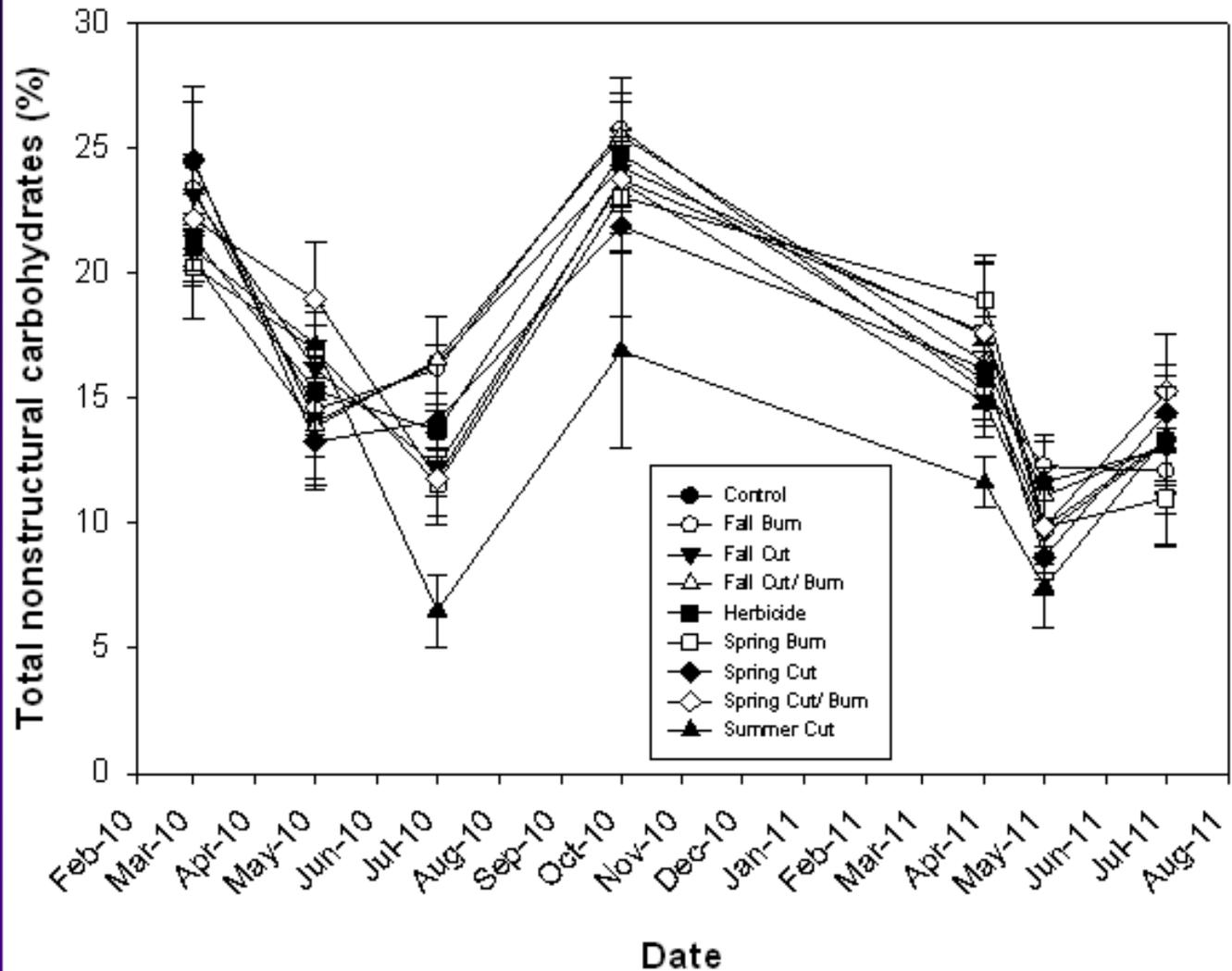
# Change in total stem density and relative change in stem density



# Root suckering



# Total nonstructural carbohydrates



# Marquette Trail: Control



# Marquette Trail: Fall Cut and Burn

2009



2010



2011



2012



# To Burn or Not to Burn



# Strategies for control

- If flowering or fruiting, cut and herbicide to eliminate seed source.
- If cutting, best to do it in late June – early July. Herbicide the stumps. Any resprouting will reduce TNC in the roots.
- If burning, best to cut and herbicide prior to burning.
- Late winter burns would be the best to kill seeds.
- Fall burns will kill seedlings.