Facilitating Natural Succession in Heavily Invaded Ecosystems

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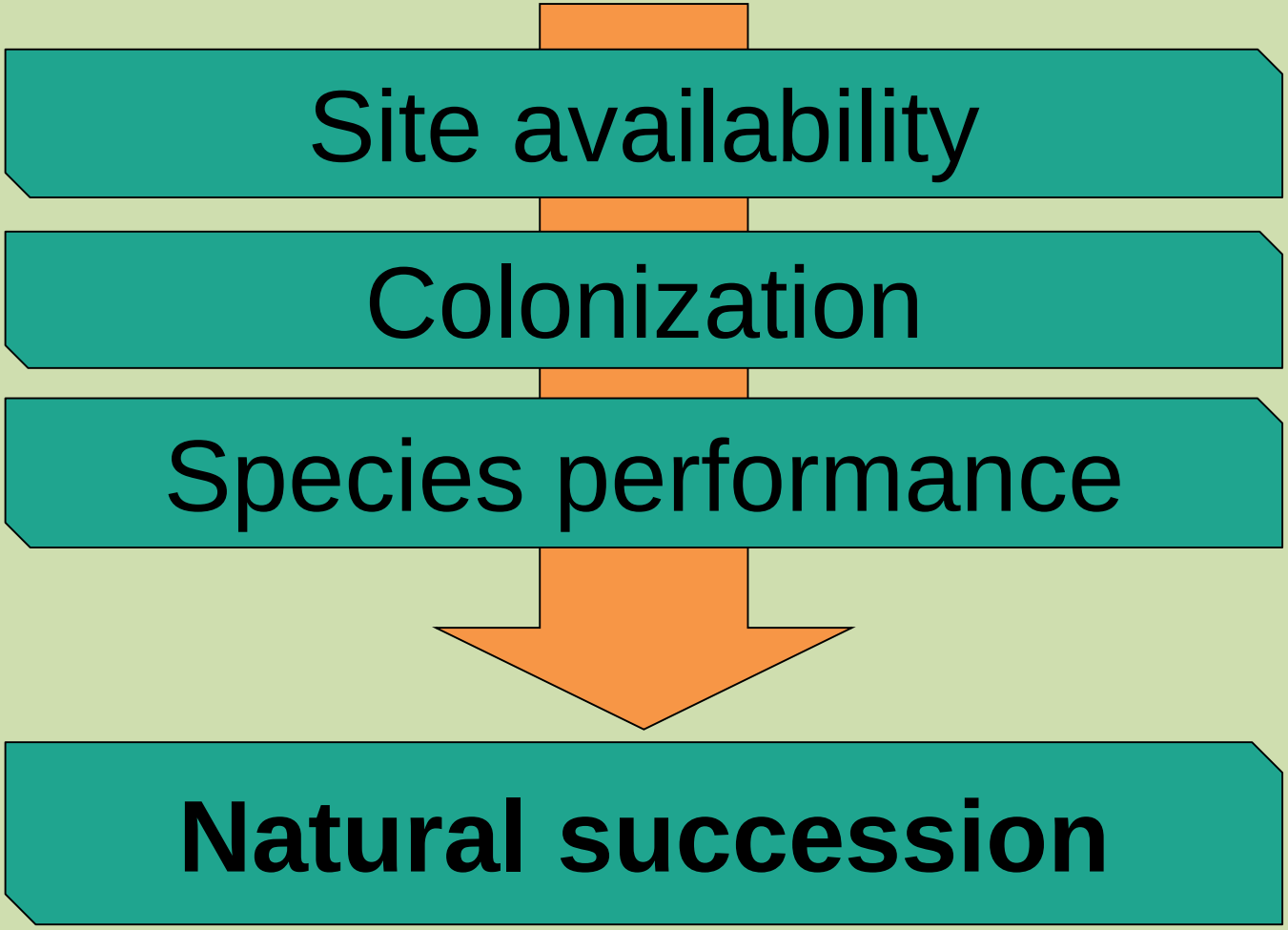
3 main drivers of natural succession:



Heavily invaded ecosystems can reach an alternative stable state.

- Successional factors no longer function.

"Wisconsin's **most extensive** wetland plant invader"

-Hatch and Bernthal 2008

"One of the **most aggressive** species of North American wetlands"

-Lavergne and Molofsky 2004

"The **most widespread and problematic** invasive plant in Wisconsin wetlands"

-Reinartz 2003

https://hancockseed.com/images/Reed%20Canary%20Grass%20Seed.jpg

RCG distribution in Wisconsin

- ~10% of WI wetlands dominated by RCG
- Previously restored prairie potholes: 66% were dominated by RCG ten years later

Photo: Meredith Thomsen

RCG: Invader Extraordinaire

- Excellent competitor
- Highly reproductive
- Tolerant of wide range of conditions and extremely adaptable

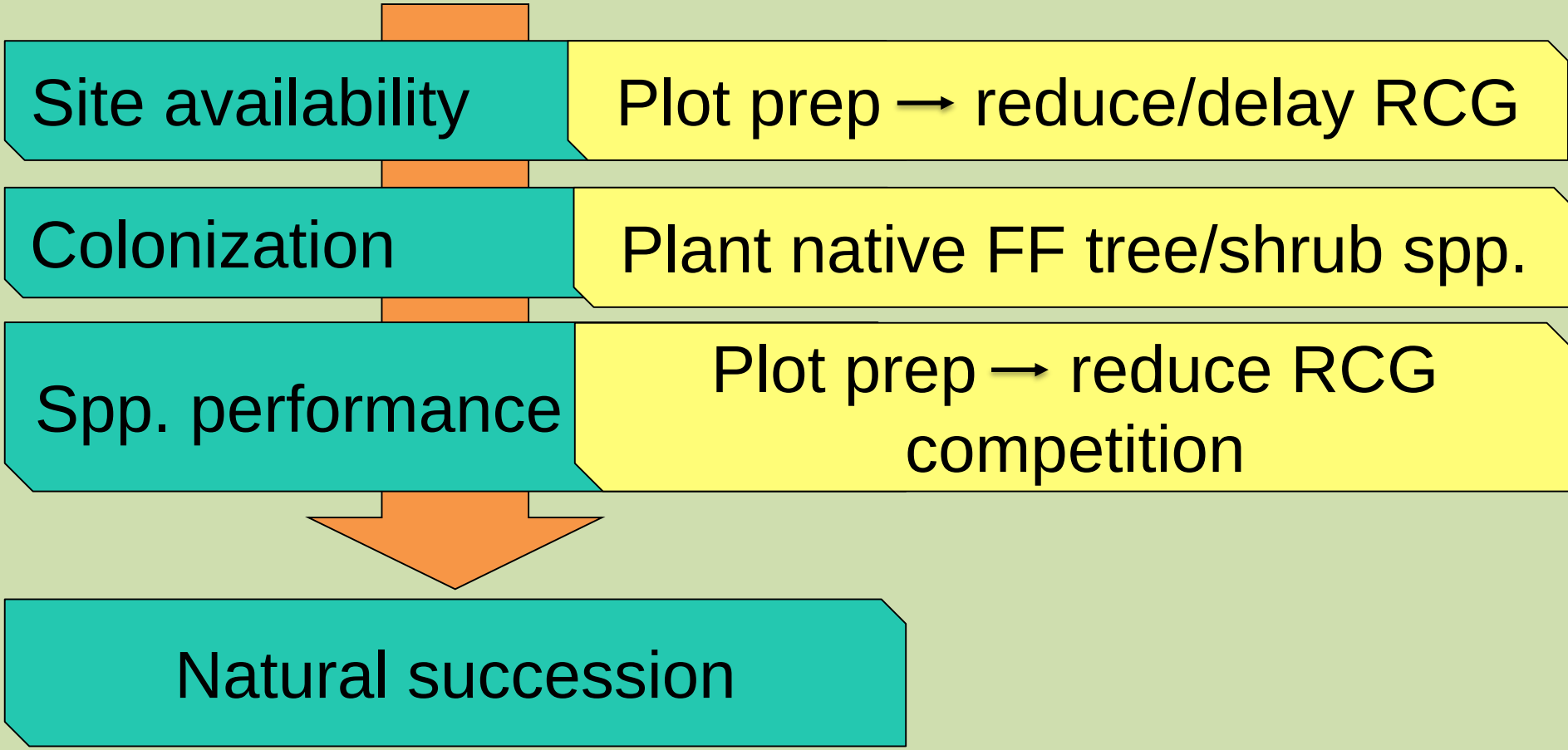
RCG: Invader Extraordinaire

- RCG grows early, fast, and dense
- Outcompetes native trees/shrubs
- Monotype persists indefinitely

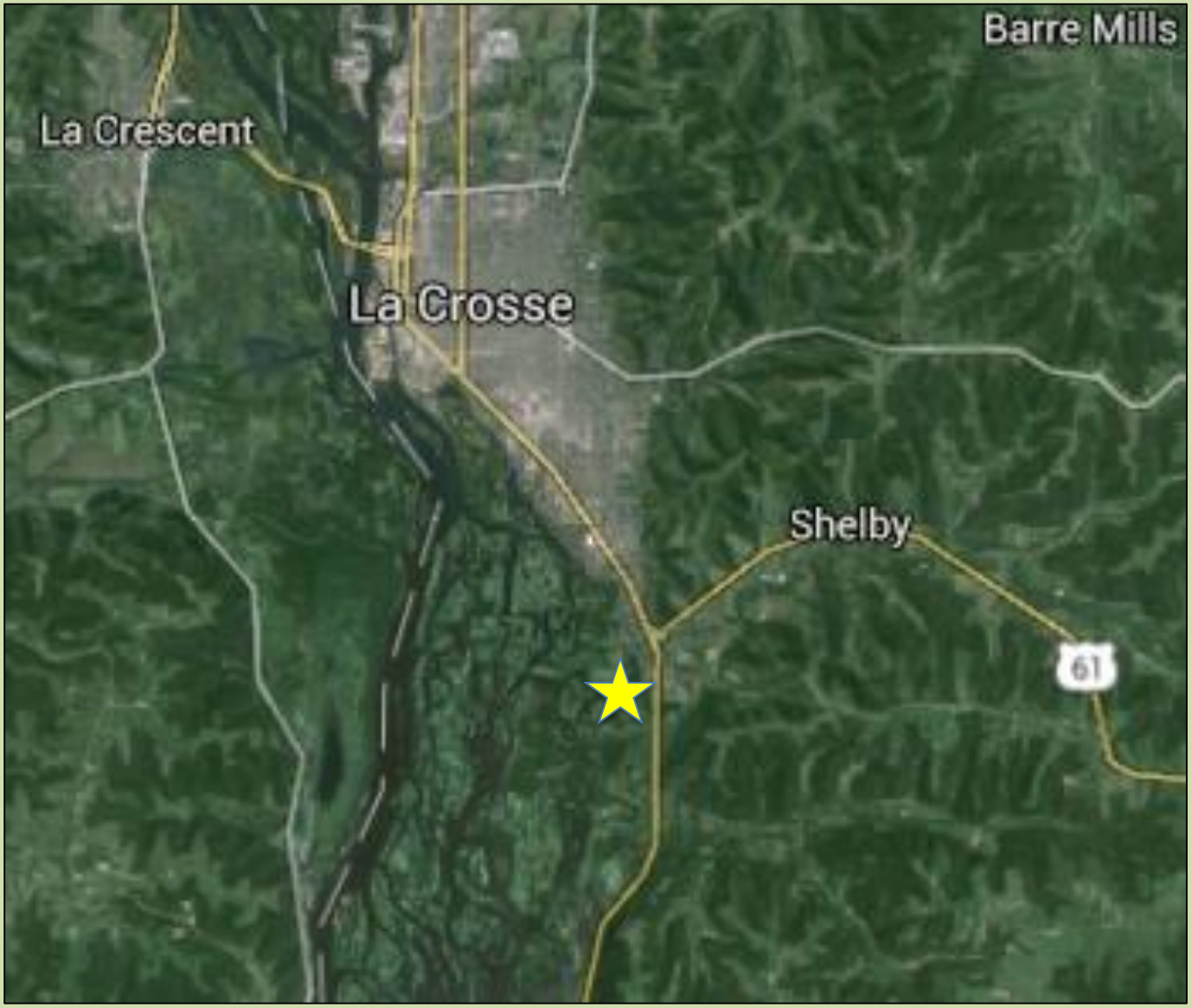
RCG vs. Shade

- Shading reduces RCG total biomass
- Limits RCG seed germination/ vegetative establishment

Objectives


Site availability
Plot prep → reduce/delay RCG
Colonization
Plant native FF tree/shrub spp.
Spp. performance
Plot prep → reduce RCG competition
Natural succession

Site Location



Site Location

Factorial Study Design

	Density 1 (Lo tree/ no seeds)	Density 2 (Lo tree/ lo seed)	Density 3 (Hi tree/ hi seed)
Plot Prep 1 (Rodeo®)	Treatment A x 8	Treatment B x 8	Treatment C x 8
Plot Prep 2 (Fecon + Oust®)	Treatment D x 8	Treatment E x 8	Treatment F x 8

Plot Preparation #1

- October 2014
- Rodeo®
  - Glyphosate
  - 5% solution

Plot Preparation #2

- October 2014
- Fecon forestry mulcher
- Oust®
  - Sulfometuron methyl
  - 0.5 oz. per acre

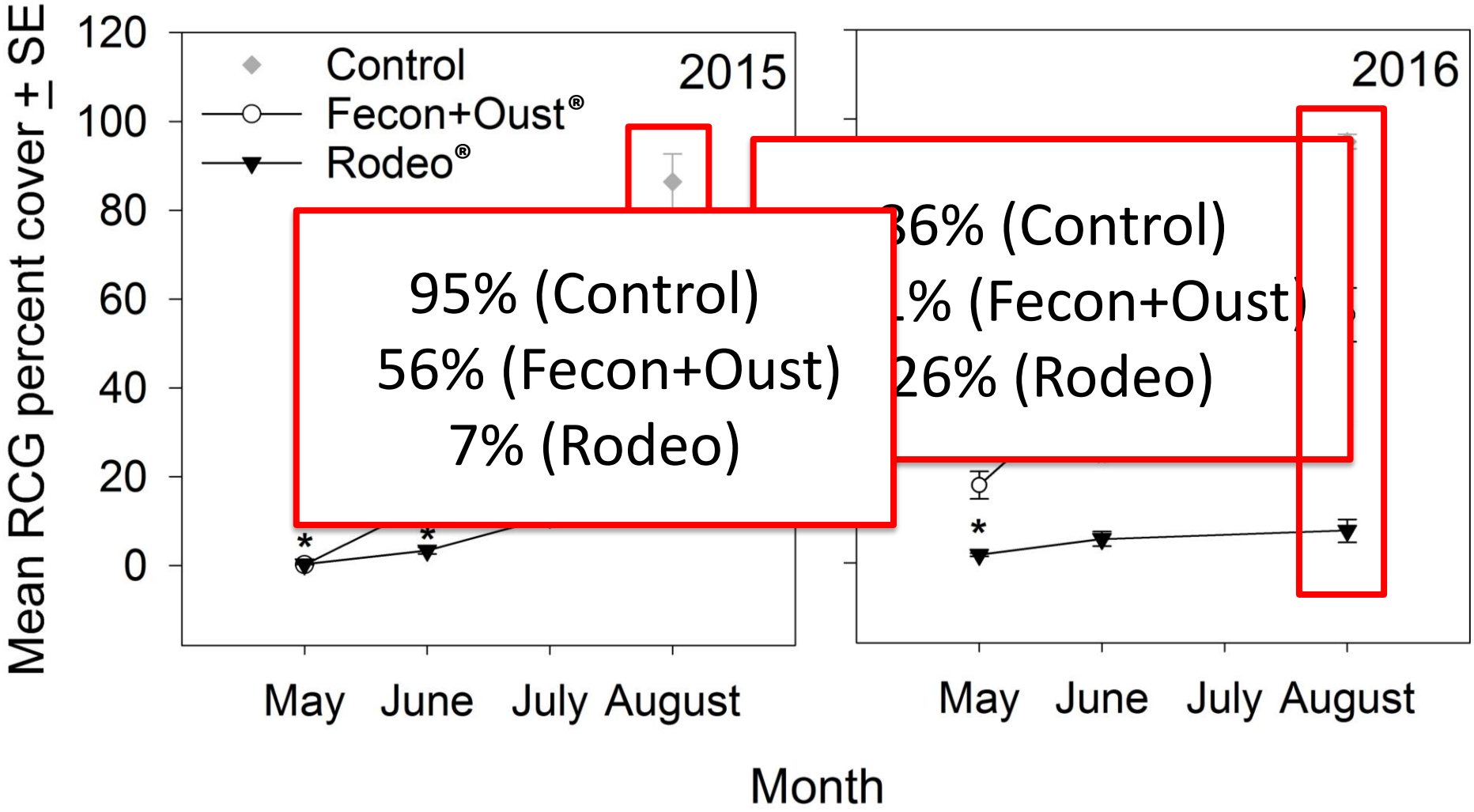
Fecon+Oust® = total removal of RCG biomass/thatch

Species Planted April 2015

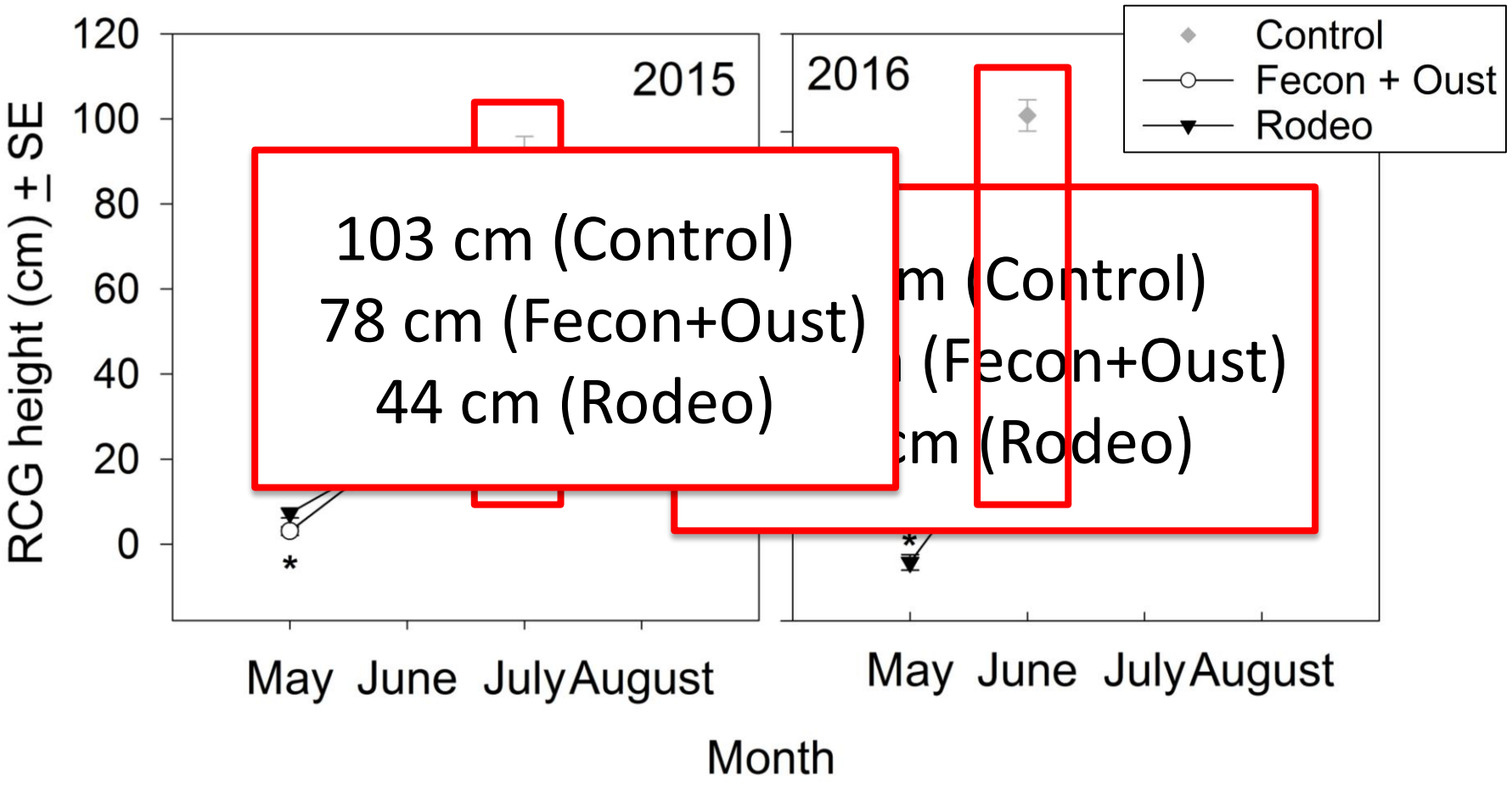
- Cottonwood
- American elm (Dutch elm disease-resistant)
- Hackberry
- River birch
- Sandbar willow
- Silver maple
- Swamp white oak

Both herbicides were re-applied in October 2015

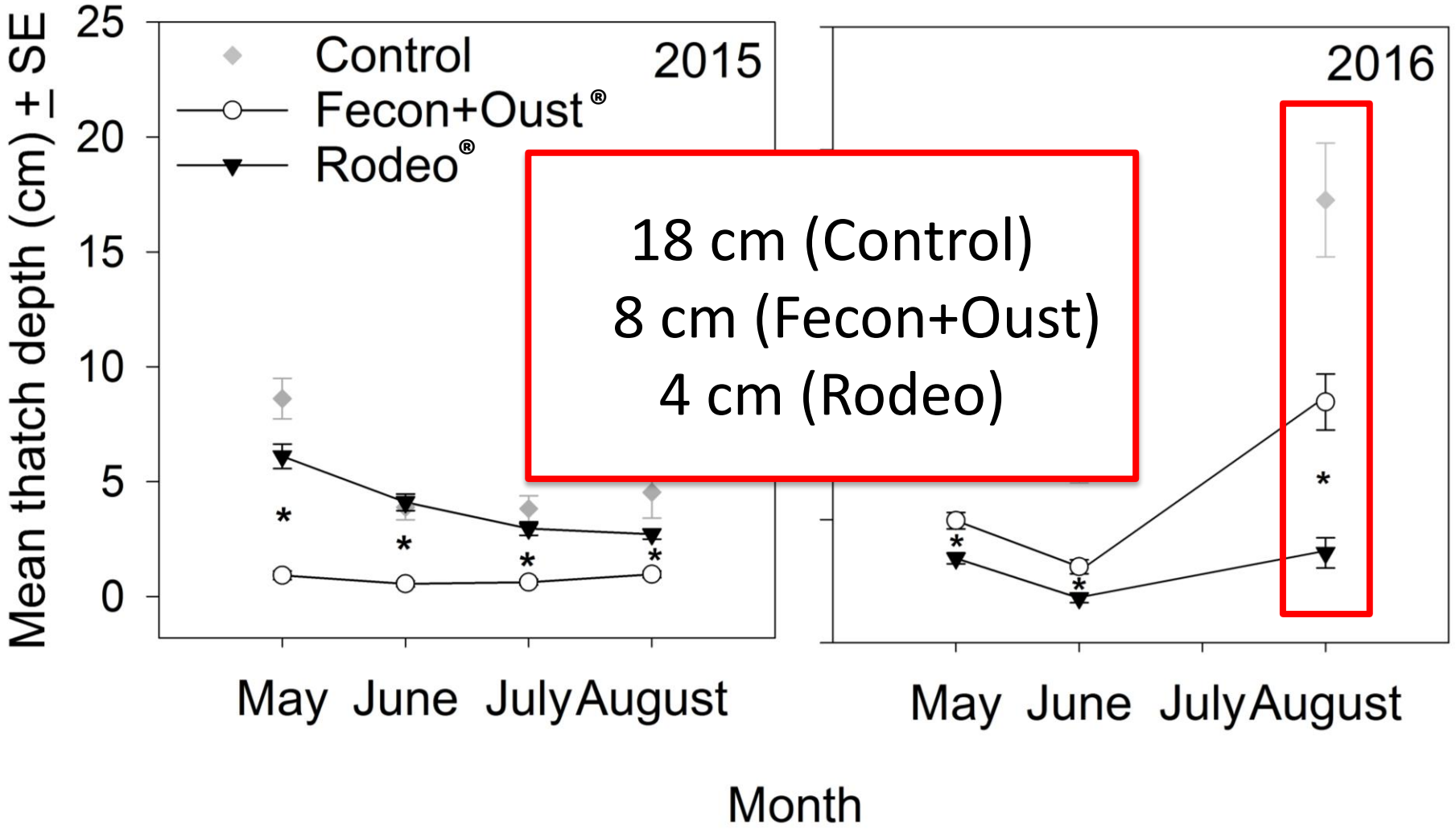
Mean RCG cover by plot preparation



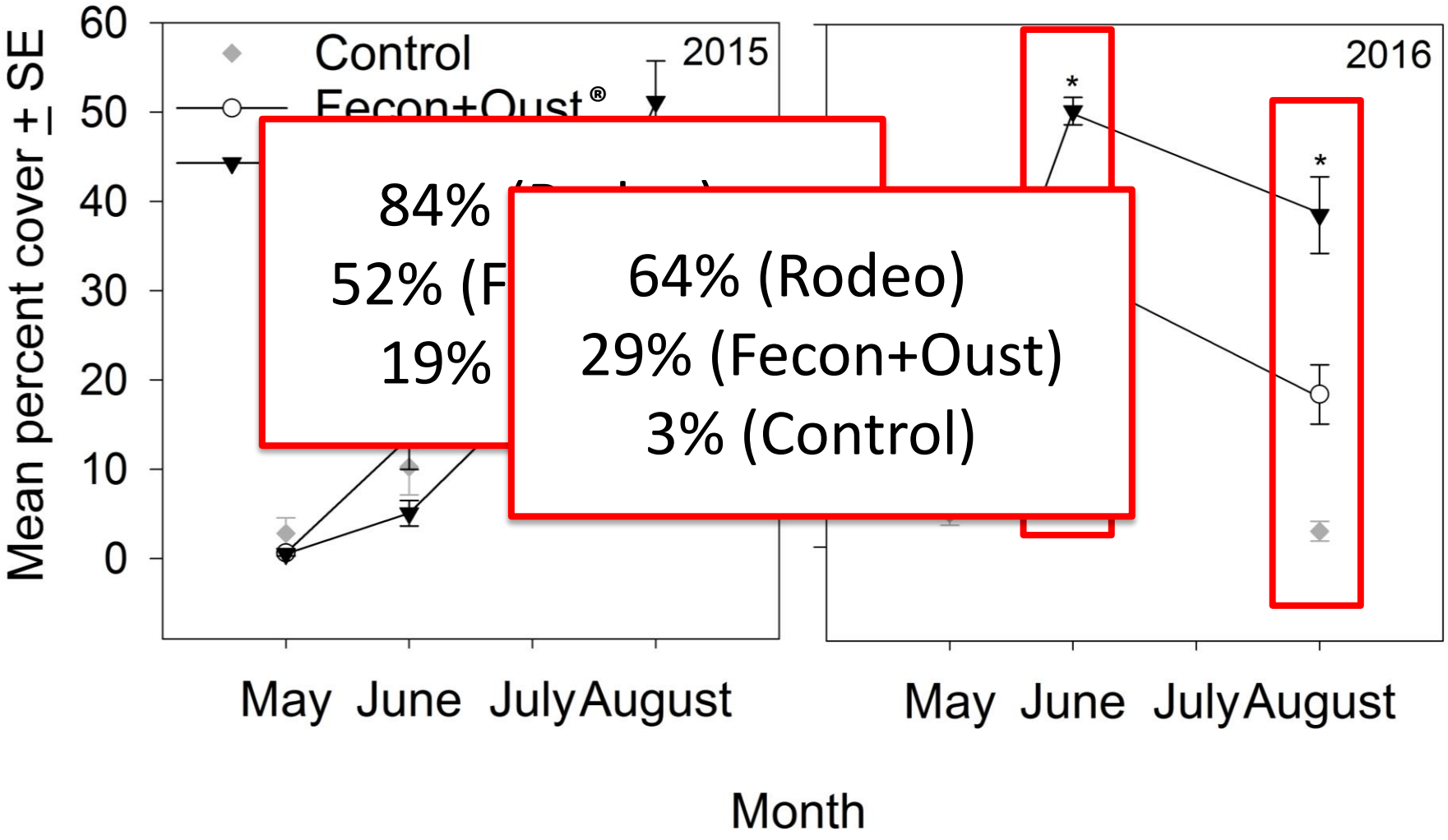
Mean RCG height by plot preparation



Mean thatch depth by plot preparation

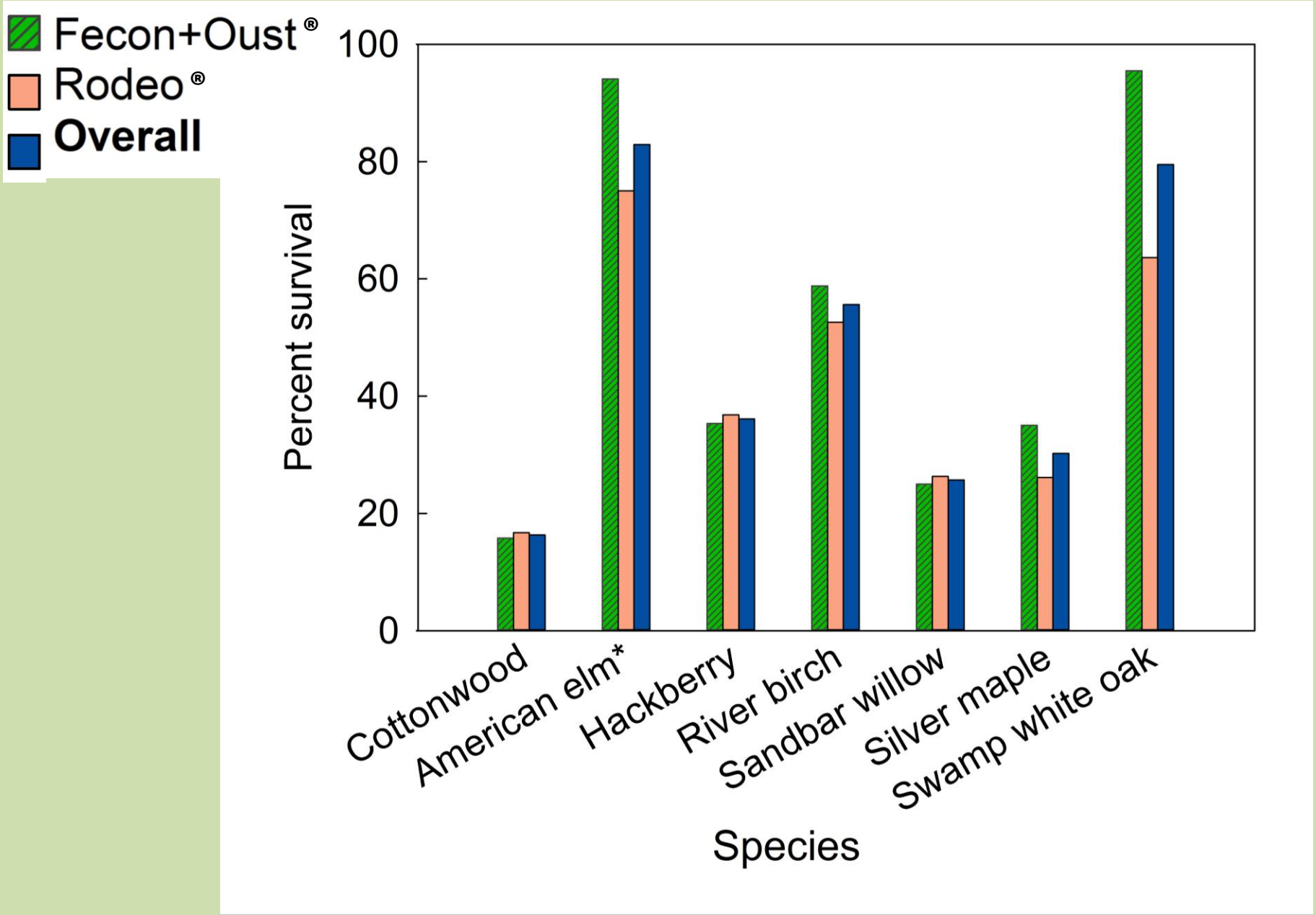


Mean herbaceous* cover by plot prep



* Excluding RCG

Tree survival by species and plot prep



Deer browsing also impacted tree survival.

2015

Cottonwood*
American elm*

Sandbar willow
Swamp white oak
Hackberry

Silver maple*

River birch

Deer browsing also impacted tree survival.

2016

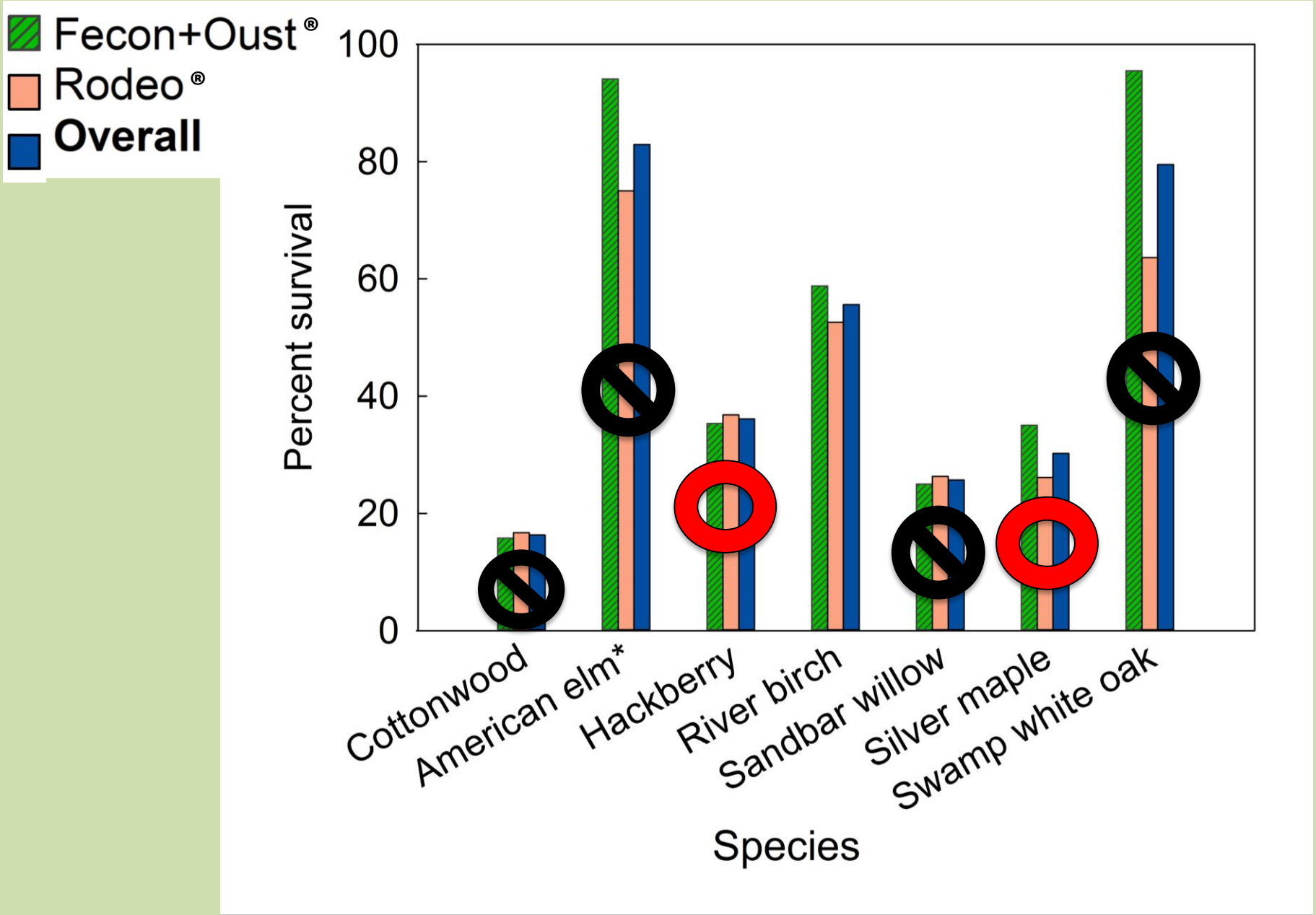
Cottonwood*
Sandbar willow *
Swamp white oak*

American elm

Silver maple*
Hackberry*

River birch

Tree survival by species and electivity



Rodeo® works better than Fecon+Oust

- Less RCG cover
- Shorter RCG
- Greater cover of other herbaceous species

Canada thistle invasion was problematic in many plots

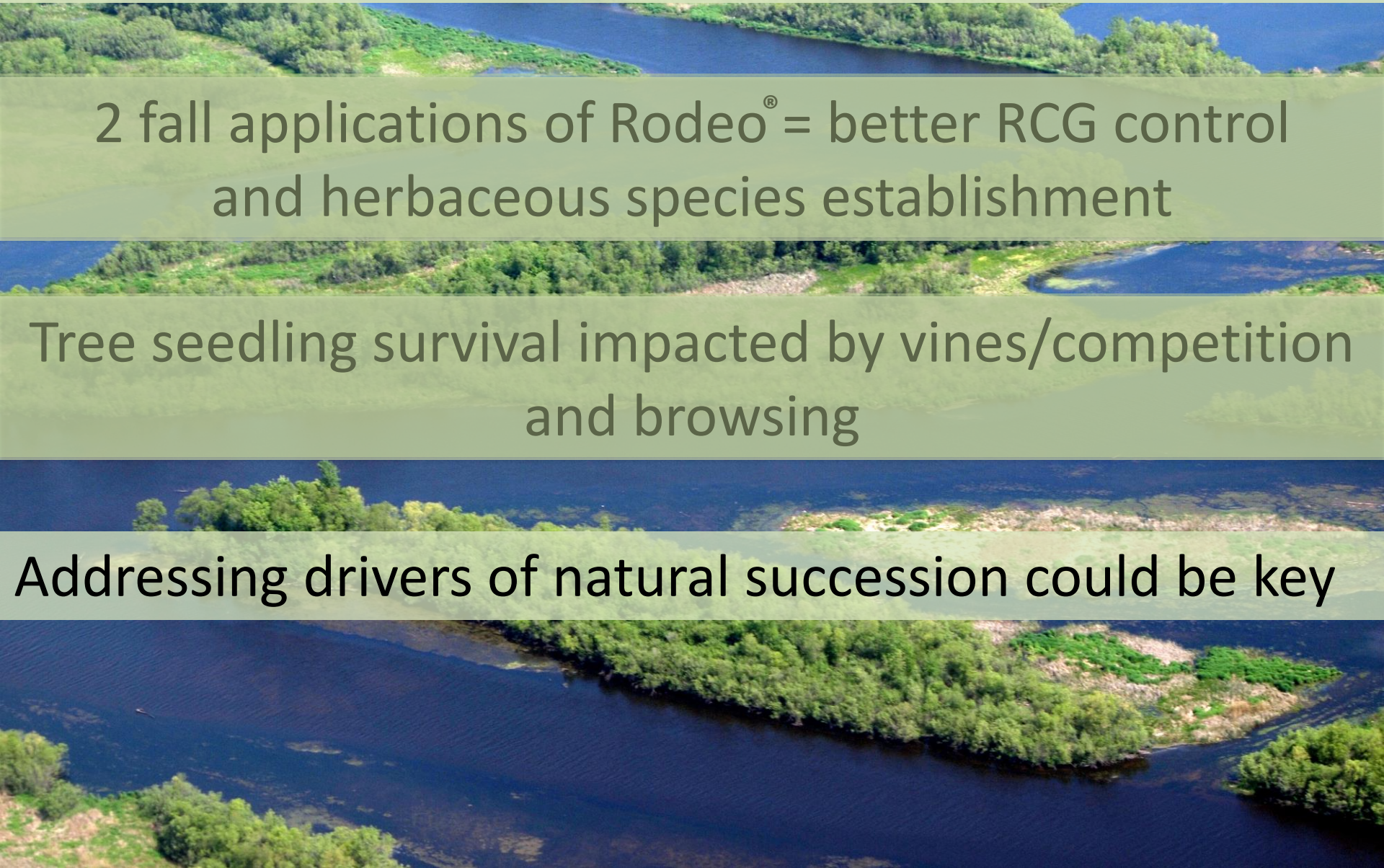
Hog peanut and bindweed were also abundant in many plots.

https://www.minnesotawildflowers.info/data/cache/dp230_purple/amphicarpaea-bracteata-hog-peanut_0820_162219.jpg

Vines often grew around seedlings and likely contributed to some tree mortality.

Although low tree survival is not ideal, many desirable natives are now present.

Preliminary conclusions



2 fall applications of Rodeo® = better RCG control and herbaceous species establishment

Tree seedling survival impacted by vines/competition and browsing

Addressing drivers of natural succession could be key

Acknowledgements

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    - Any opinion, findings, and conclusions or recommendations expressed in this material are those of the author and do not necessarily reflect the views of NSF.

Questions?

- Hog peanut (*Amphicarpaea bracteata)*
- Field bindweed (*Convolvulus arvensis*)