Tree and Ground Cover Establishment over Seven Years as Affected by Seeding and Fertilization Rate

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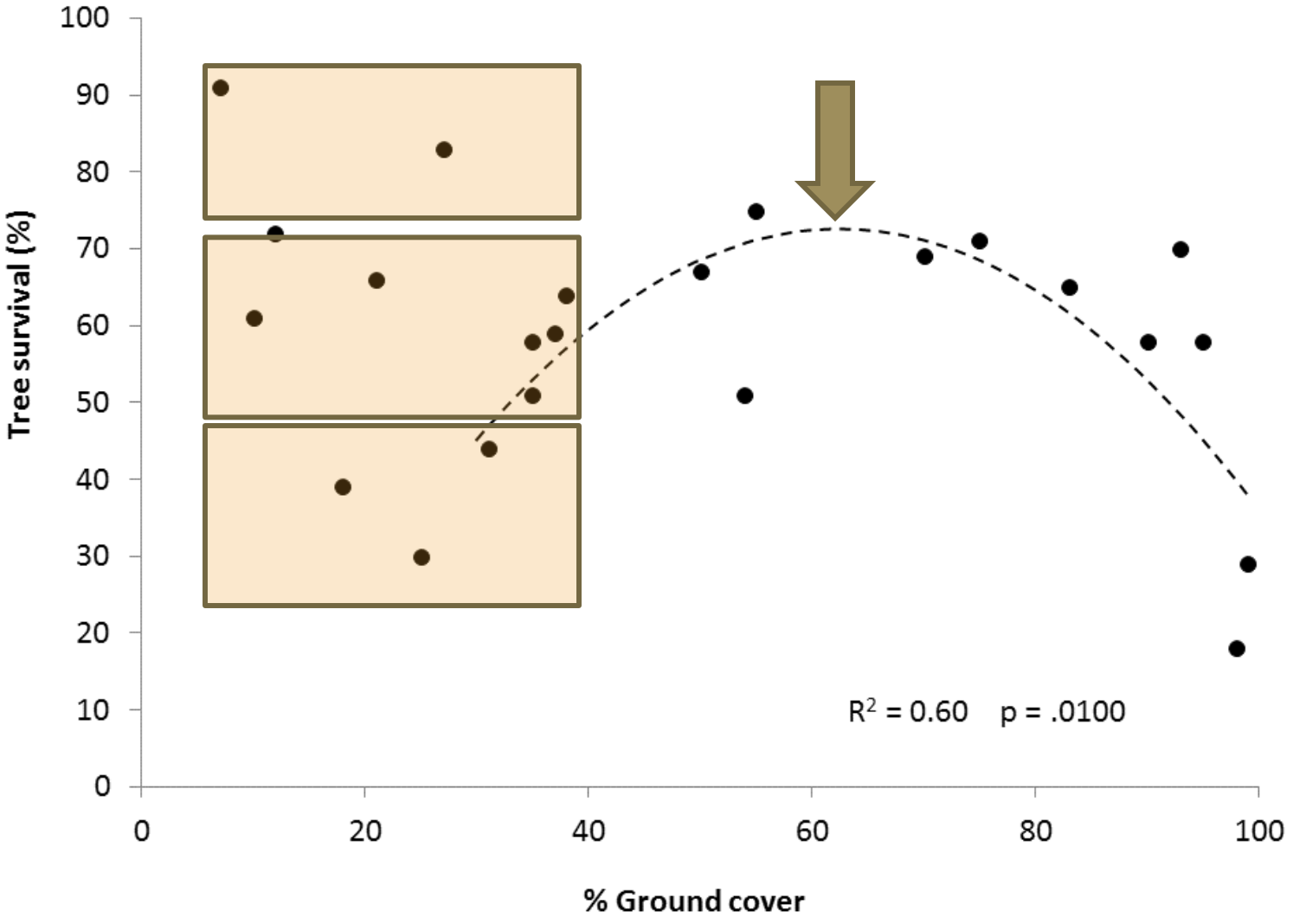
Challenges and questions

- Simultaneous establishment of trees and herbaceous cover is needed but challenging (Vogul, 1980).
- Dense, fast-growing herbaceous ground covers can reduce tree seedling growth and survival.
- Forestry reclamation approach (ARRI) recommends planting tree-compatible ground cover (Burger et al. 2005)

Herbaceous density



Challenges and questions

- Rapid development of herbaceous cover needed to prevent rill development
- Some states require >80% cover
- Barriers to use of native species: expense and risk

Research questions

1. Can we obtain an adequate vegetative cover of native grasses using reduced seeding rates?

2. How do ground cover, trees and fertility interact?

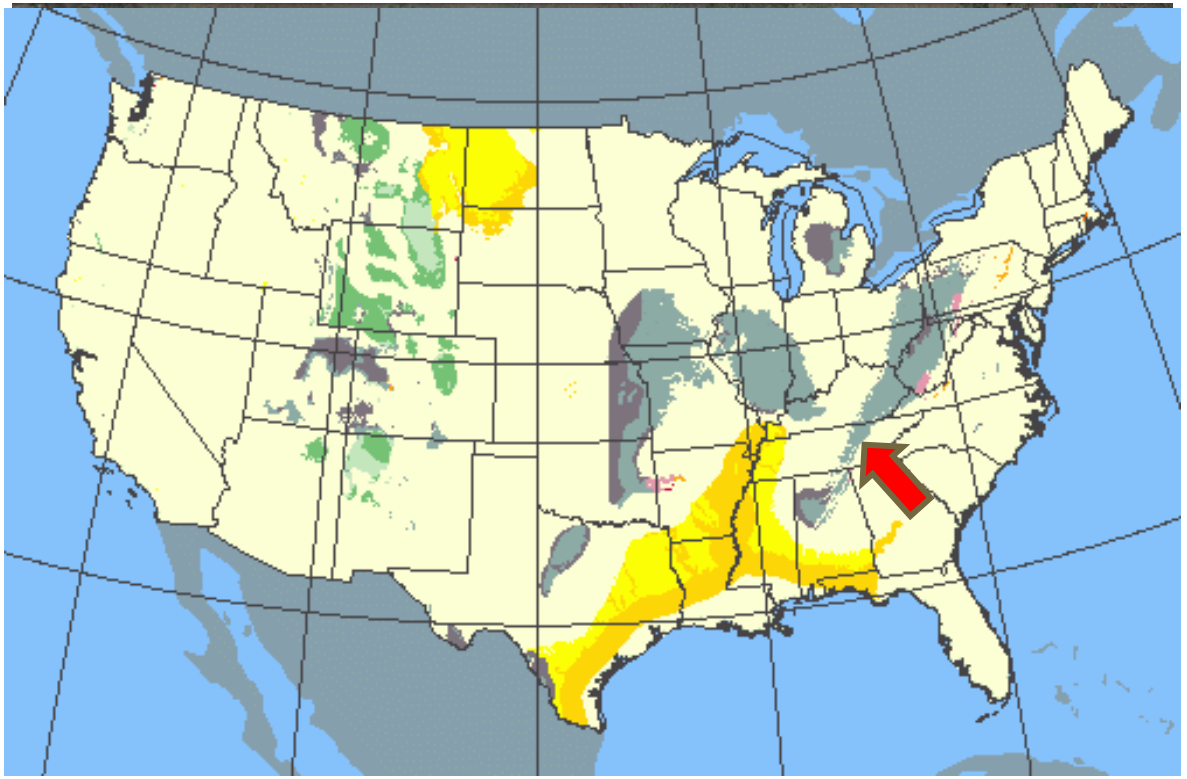
- If low rates of N are applied, can vegetation establish?

- If high rates of N are applied, does the resulting herbaceous growth negatively impact tree seedlings?

Study site

- Zeb Mountain, TN
- Precip. 135 cm/yr
- Elev. 610m (2000')
- Slopes 20-40%
- Sandstone/shale

- 3 plots 100x30m
- Each divided into 9 sub-plots



Methods

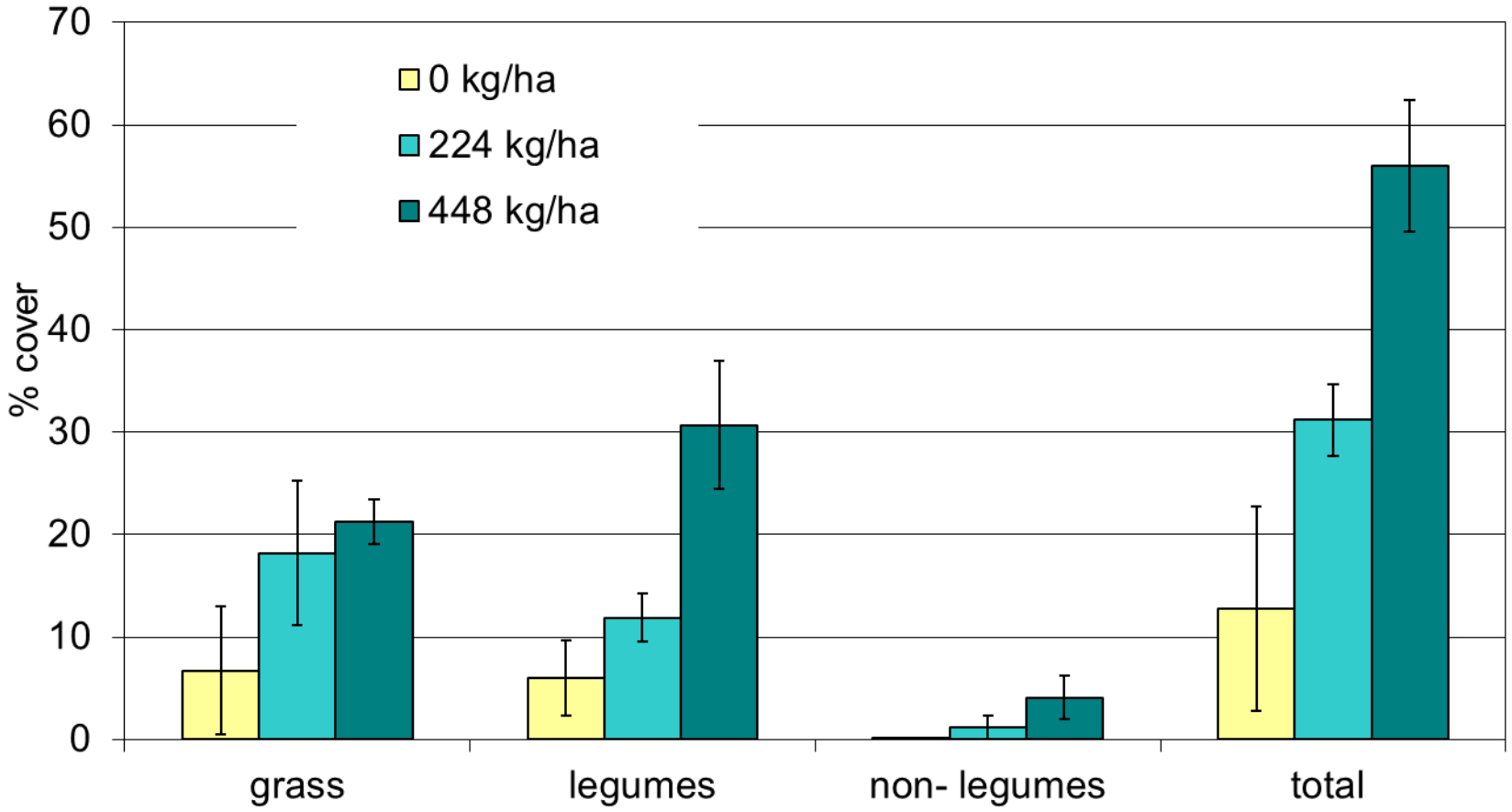
3 x 3 factorial with 3 replicates

Seeded with native warm-season grasses and legumes at 59.4 kg/ha
29.7 kg/ha
5.9 kg/ha

Fertilized with 10:20:20 at 448 kg/ha
224 kg/ha
0 kg/ha

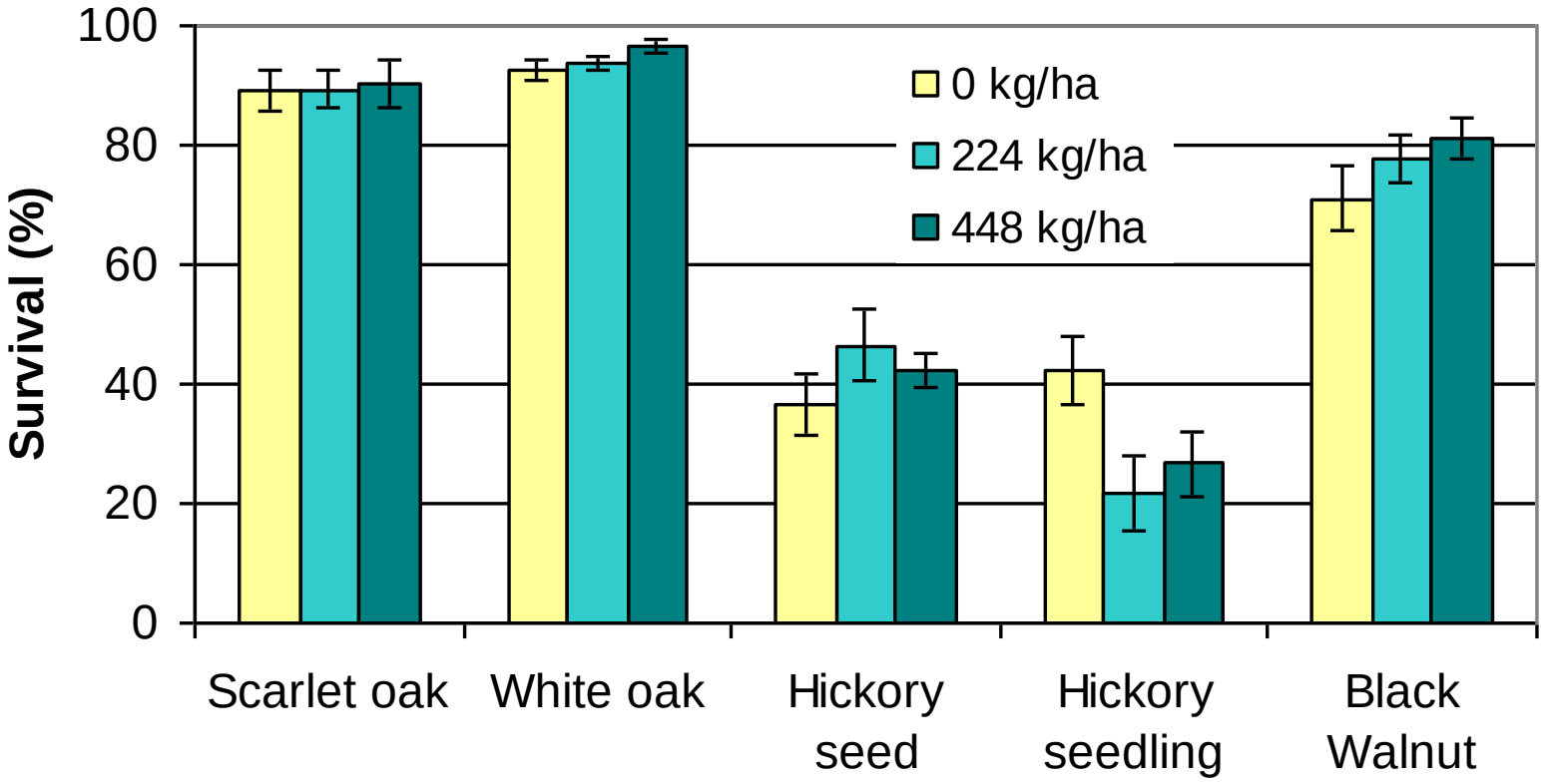
Planted white oak (*Quercus alba*)
scarlet oak (*Quercus coccinea*)
black walnut (*Juglans nigra*)
mockernut hickory (*Carya alba*)
Randomly on a 2 x 2 m spacing

Fall 2007 – 2 growing seasons



Vegetative cover on plot 1. All plots showed increasing cover with fertilization rate.

Fall 2007 – 2 growing seasons



No treatment effects on either survival or growth of planted trees.

Vegetative development

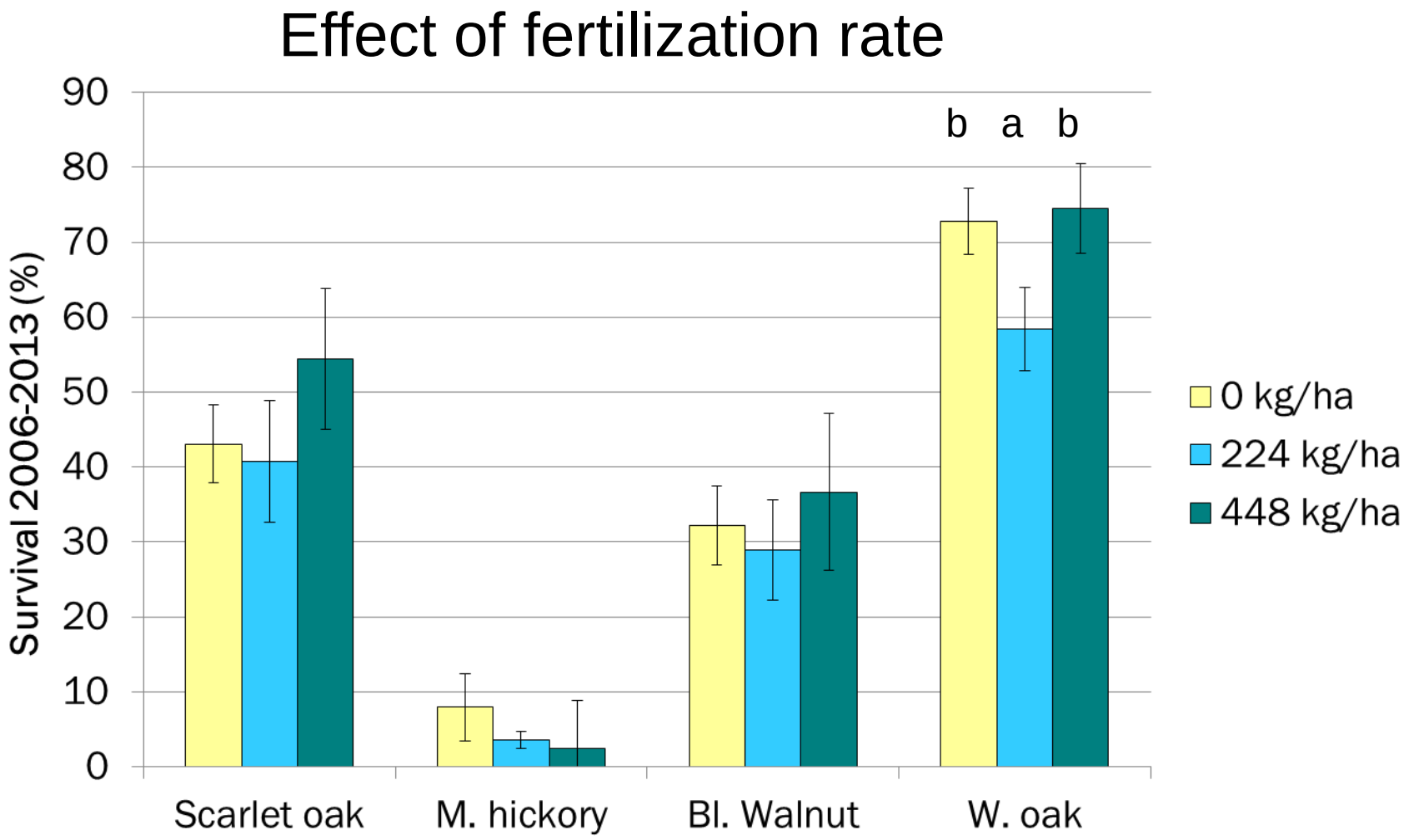
2006

2008

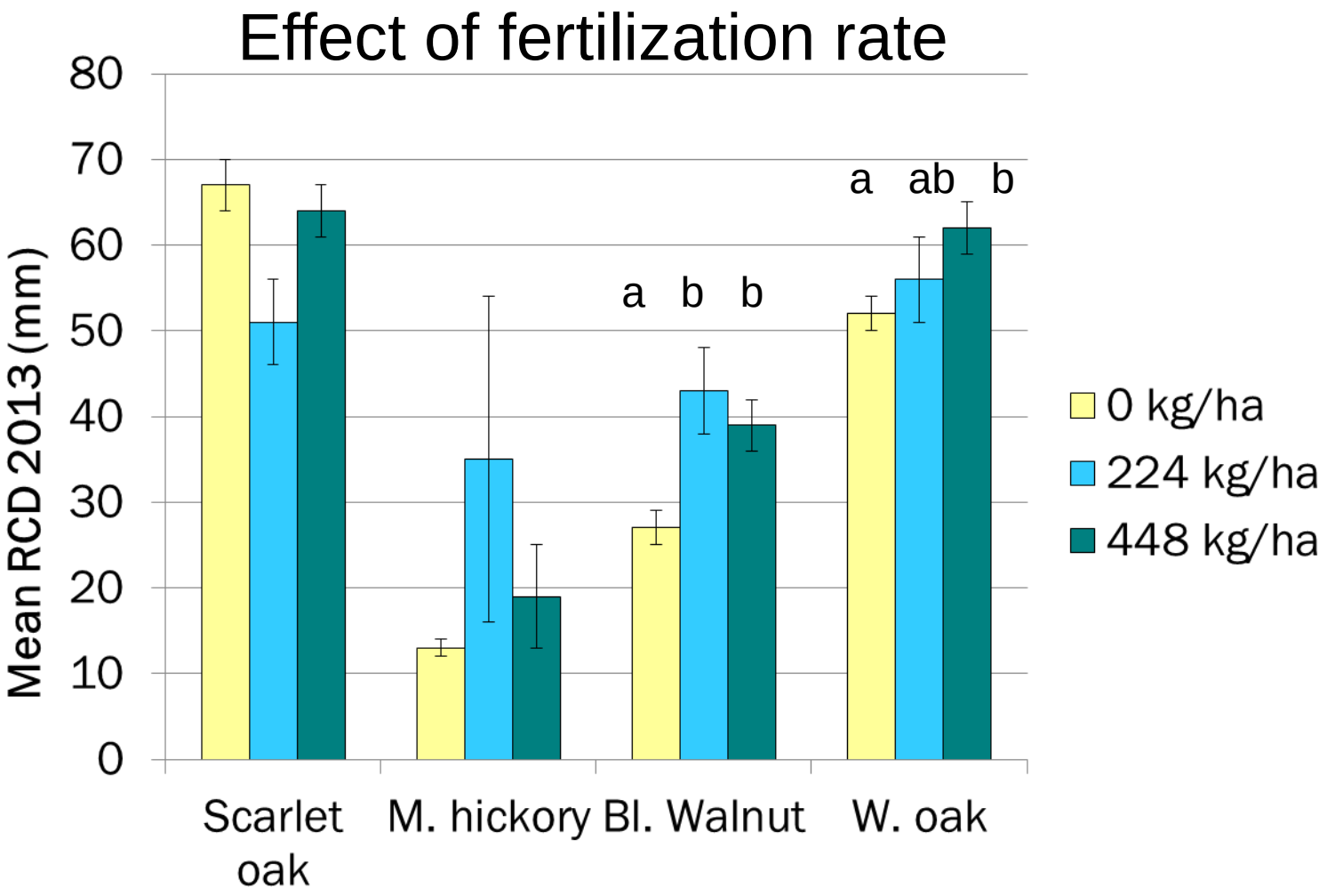
2013

Herbaceous cover
87-100%

Survival from planting (2006) - 2013

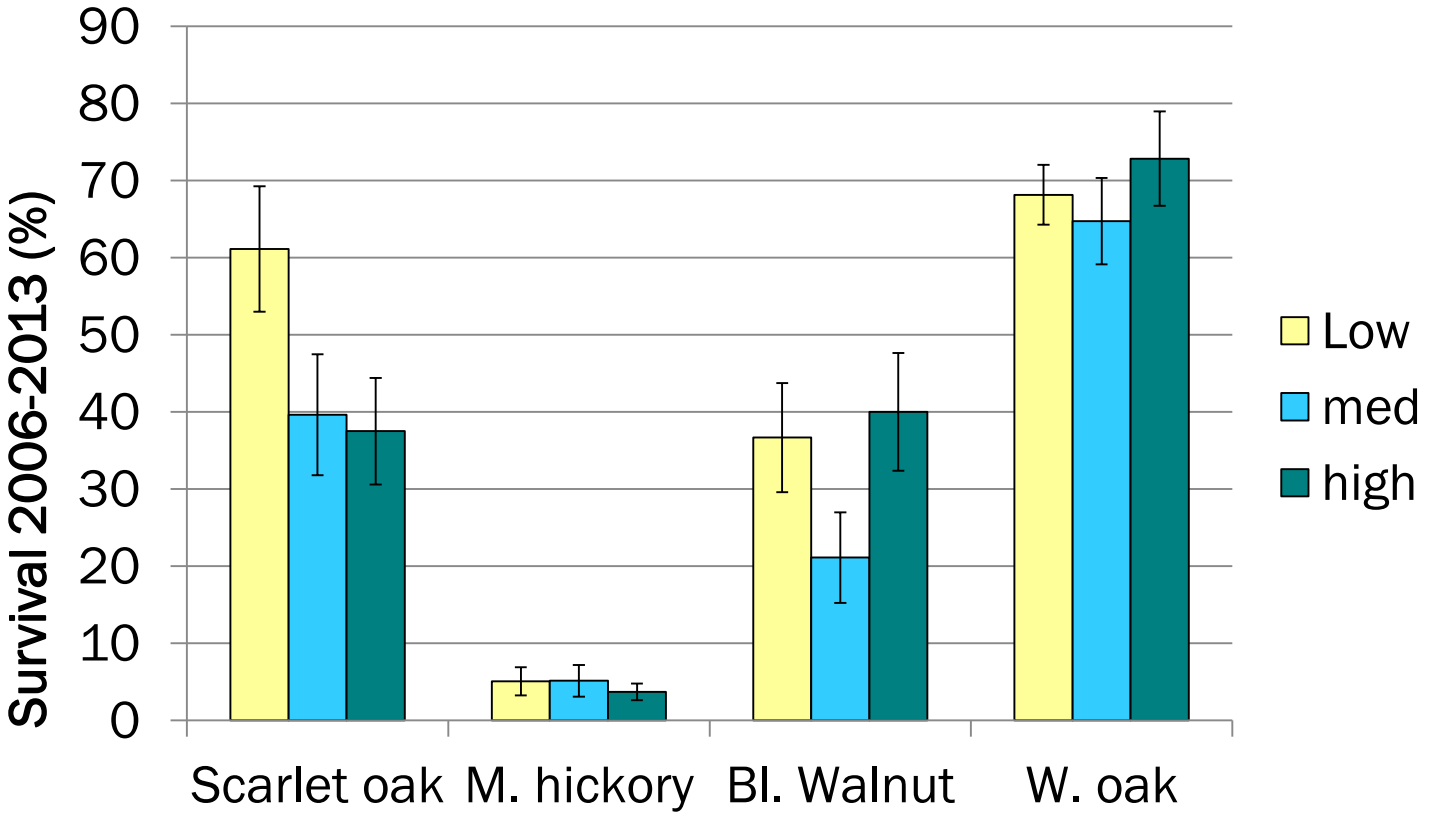


Root collar diameter- 2013



Survival from planting (2006) - 2013

Effect of seeding rate – not significant

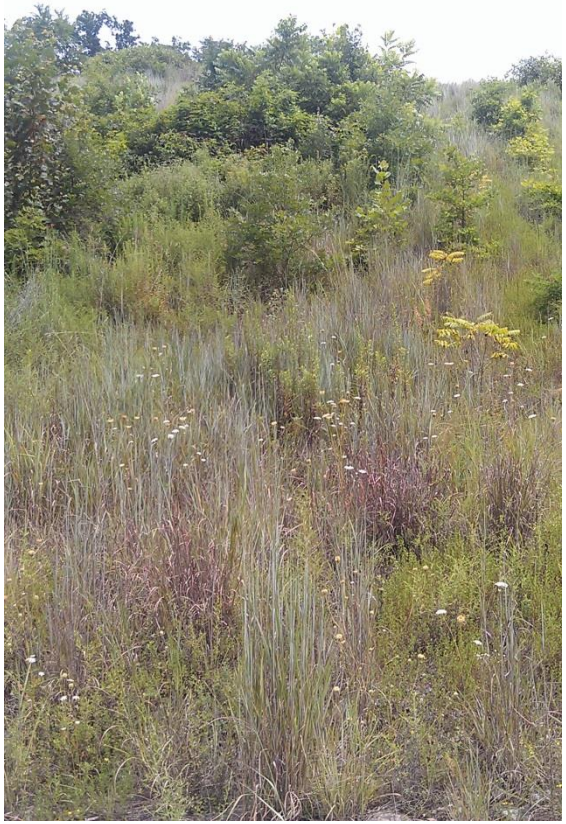


Vegetative development

low seed
no fert.

med seed
med fert.

high seed
high fert



Conclusion

- Fertilization increased cover of switchgrass but decreased the cover of Indian grass
- There was no significant influence of seeding rate or fertilization rate on total vegetative cover, or on the proportions of grass, legumes, and forbs present.

- **Conclusion: On steep reclaimed coal mines in Tennessee, the establishment of native trees and ground cover may be successful using reduced rates of seed and fertilizer application.**

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FORESTRY WILDLIFE FISHERIES

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