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

Jennifer Franklin and David Buckley

Presented at ASMR
Oklahoma City, June 16, 2014
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)
At > 60% cover, negative impact on trees

Franklin et al., 2012
Rapid development of herbaceous cover needed to prevent rill development

Some states require >80% cover

Barriers to use of native species: expense and risk
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.
No treatment effects on either survival or growth of planted trees.
Vegetative development

2006

2008

2013

Herbaceous cover
87-100%
Effect of fertilization rate

Survival 2006-2013 (%)

- Scarlet oak
- M. hickory
- Bl. Walnut
- W. oak

- 0 kg/ha
- 224 kg/ha
- 448 kg/ha
Effect of fertilization rate

Mean RCD 2013 (mm)

Scarlet oak  M. hickory  Bl. Walnut  W. oak

0 kg/ha  224 kg/ha  448 kg/ha

a  b  b  a  ab  b

0 kg/ha  224 kg/ha  448 kg/ha
Effect of seeding rate – not significant
Vegetative development

low seed
no fert.

med seed
med fert.

high seed
high fert.
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.
Many thanks to:

OSM Knoxville Field Office
National Coal
Students field assistants: Stuart Wilson, John Johnson, Cal McKinney