FRA Step 3: Use Compatible Ground Covers

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FORESTRY RECLAMATION APPROACH

1. Create a suitable rooting medium for good tree growth that is no less than 4 feet deep and comprised of topsoil, weathered sandstone, and/or the best available material.

2. Loosely grade the topsoil or topsoil substitute established in step one to create a non-compacted growth medium.

3. Use ground covers that aid in growing trees.

4. Plant two types of trees – 1) early succession species for wildlife and soil stability, and 2) commercially valuable crop trees.

5. Use proper tree planting techniques.

FOREST RECLAMATION ADVISORY #6

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7/28/2015
Adjacent plants compete for:

1. Light
2. Water
3. Mineral nutrients
Herbicidal control: consistently increases tree growth and survival
Herbaceous density

At > 60% cover, negative impact on trees

Franklin et al., 2012

Graph showing the relationship between tree survival and ground cover percentage. The graph indicates that as ground cover increases, tree survival decreases significantly at >60% cover.

Equation: $R^2 = 0.60$, $p = 0.0100$
Tree-compatible ground covers:

- Are low-growing so sunlight reaches the tree seedlings.
- Withdraw water and nutrients from the soil slowly.
- Do not cover the ground rapidly or completely to allow native seed to colonize.
- Allows rapid establishment and growth of native trees which minimizes the invasion of exotics.
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![Graph showing chlorophyll content]
Alfalfa
*(Medicago sativa)*

Switchgrass
*(Panicum virgatum)*

Ryegrass
*(Lolium multiflorum)*

Native

Pierret, 2007

Weaver, 1926
Ground covers

Transpiration (cm s⁻¹)

Oak transpiration on 5/19/2010

Soil Moisture (%) on 5/19/2010

Study by Aubuchon and Klobucar, 2012
Roots of oak seedlings grown for 3 months with different ground covers

- alfalfa (*Medicago sativa*)
- bare ground
- rye grass (*Lolium multiflorum*)
- switchgrass (*Panicum virgatum*)
legume

Cercis canadensis

turf grass

native grass

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• Have low persistence in your area.

NOT THIS!
Low persistence
Alfalfa (orange)

Switchgrass (blue)

No planted ground cover
Maximizing seeding success: Stratify your site

Depending on how variable your materials and topography are, it may be helpful to delineate 2 or more zones across your landscape.

These are often based on material type, or moisture.
Soil testing

- Native plants grow best when soil chemistry is similar to native soils.
- Amendments often needed to adjust pH, and add nutrients.
- Site-specific amendments and ground covers needed to ensure success.
- Specify “Wildlife”, “Conservation”, or “Forestry” when sending soil to the lab.
Materials vary in chemistry- soil sample should include range of materials
Amendments

Soils for reforestation should be slightly acidic and have fewer nutrients than soils for grasslands.

Lime only when pH is below 5.5.

Organic matter improves soil conditions on many sites.

Even small amounts of topsoil can add beneficial soil organisms, but can also introduce unwanted species.
Fertilizer application

- Nitrogen (N) 50-75 lb/ac
- Phosphorus (as P) 80-100 lb/ac
- (as P2O5) 180-230 lb/ac

Density of herbaceous vegetation is closely related to soil fertility in our area, follow recommended rates.
Plant selection and seeding
Shade or sun?
Late successional species may not establish well. Choose sun-loving species.
Water availability

Climate
Depth to water table
Soil type:
  coarse soils low water
  Organic matter moister
North slopes moister
Topography
Classification by water requirements:
Upland, Mesic, Facultative wetland, Wetland
Soil pH

Many agronomics prefer pH 6.0-7.0

Find herbaceous species tolerant of your site, rather than adding lime to raise pH.
Other considerations:

- Native status
- Rate of spread or persistence
- Wildlife benefit
- Aesthetics
- Life form or size
- Ease of establishment
- Availability
- Cost
- Future management
Components of a seeding mix

- Annual – rapid cover to hold nutrients and improve site conditions
- Legumes – increase soil nitrogen
- Perennials – longer lasting cover
How many species to seed?

More species =
less chance of
cover dense
enough to
choke out
Growth over a
variety of
materials and
moisture

Diversity in all
seasons out
Diversity and density

• Optimal number of species is about 10
• Depends on potential for native dispersal onto the site – leave gaps
• Potential for invasive dispersal onto site – no gaps
Sites seeded with native warm season grasses are slow to establish, but result in a diverse mixture of grasses and forbs.

2006 2008
Conclusion: minimize competition through control of density and species composition

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50 year old native hardwood forest on former coal mine in Tennessee
Questions?

Now, select the proper tree species...