Landowner Guide to Tree Planting Success

Dave Jackson
Forest Resources Educator
Penn State Extension

What We'll Cover

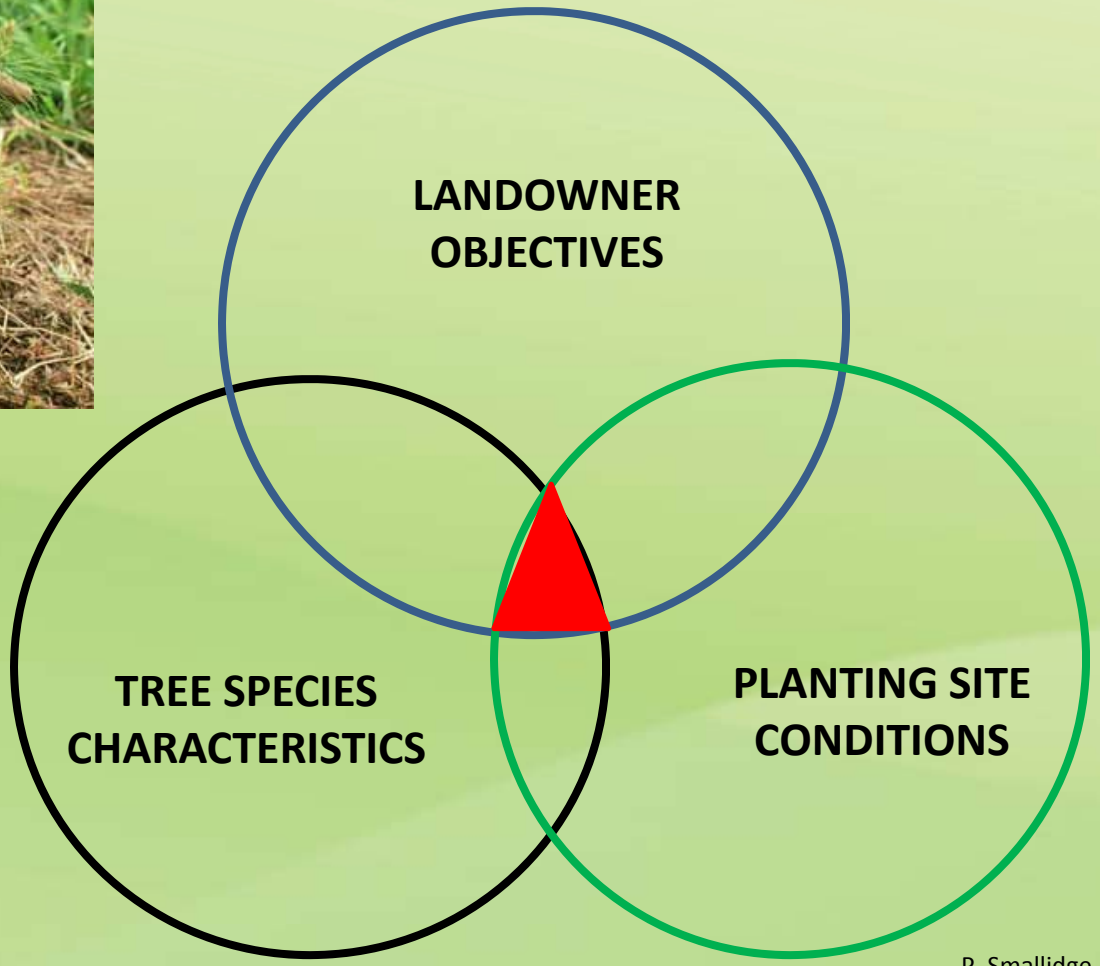
- Species Selection
- Planting Objectives
- The Planting Site
- Ordering Trees
- Site Preparation
- Planting
- Protection
- Maintenance

How do I determine what species of trees to plant?

<u>Goal</u>:

- **Plant the right trees**
  .....trees that will meet your objectives
- **in the right spot**
  .....trees that will grow well on that site.

Tree Species Selection



P. Smallidge

Tree Planting Objectives

- **What do you want out of your planting?**
  - Improve wildlife habitat-food and cover
  - Produce future timber/investment
  - Provide a privacy screen or windbreak
  - Restore a woodland
  - Re-introduce a tree species
  - Control erosion/improve water quality
  - Reforest an old field
  - Special uses: Christmas trees, sugarbush, nuts, energy crop

Site Assessment

- Not all trees are suited to all sites on your property
- Observe your site the summer **before** you plan to plant trees
- Take into account:
  - Soil moisture
  - Soil fertility
  - Available sunlight
  - Periodic flooding
  - Exposure/Aspect

Looking at Your Planting Site

Primary Limiting Factors:

- Soils
  - Drainage – “well drained” to “poorly drained”
- Existing Vegetation
  - Grasses, weeds, and invasive plants
- Exposure/Aspect
  - Wind, Sun, and Shade
- Wildlife
  - Deer, bear, voles, and other small mammals

Determining Soil Type

- Soil Survey Maps
  - *Soil interpretations for woodland table*
    - Equipment limitations
    - Plant competition
    - Species suitable
      - For existing stands
      - For planting
    - Site quality rating
- http://soils.usda.gov/
- Contact: Conservation District, DCNR Bureau of Forestry, and Penn State Extension

Soil Map

Woodland Table

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Trees to plant
UnB---- Unadilla	2o	Slight	Slight	Slight	Slight	Sugar maple----	70	Eastern white pine, Norway spruce, black cherry, Japanese larch, red pine, white spruce.
						Eastern white pine--	85	
						Northern red oak----	80	
						Black cherry----	80	
						White ash----	95	
UnC---- Unadilla	2r	Moderate	Slight	Slight	Slight	Sugar maple----	70	Eastern white pine, Norway spruce, black cherry, Japanese larch, red pine, white spruce.
						Eastern white pine--	85	
						Northern red oak----	80	
						Black cherry----	80	
						White ash----	95	
VoB, VoC---- Volusia	3w	Slight	Moderate	Moderate	Moderate	Northern red oak----	70	Eastern white pine, Norway spruce, Japanese larch, white spruce, black cherry.
						Sugar maple----	64	
						White ash----	75	
VoD---- Volusia	3r	Moderate	Moderate	Moderate	Moderate	Northern red oak----	70	Eastern white pine, Norway spruce, Japanese larch, white spruce, black cherry.
						Sugar maple----	64	
						White ash----	75	
VsB, VsD---- Volusia	3w	Slight	Moderate	Moderate	Moderate	Northern red oak----	70	Eastern white pine, Norway spruce, Japanese larch, white spruce, black cherry.
						Sugar maple----	64	
						White ash----	75	
WbB, WbC---- Wellsboro	2o	Slight	Slight	Slight	Slight	Northern red oak----	78	Norway spruce, eastern white pine, red pine, black cherry, Japanese larch.
						Sugar maple----	70	
WbD---- Wellsboro	2r	Slight	Moderate	Slight	Slight	Northern red oak----	78	Norway spruce, eastern white pine, red pine, black cherry, Japanese larch.
						Sugar maple----	70	
WgB---- Wellsboro	2o	Slight	Slight	Slight	Slight	Northern red oak----	78	Norway spruce, eastern white pine, red pine, black cherry.
						Sugar maple----	70	
WgD---- Wellsboro	2r	Slight	Moderate	Slight	Slight	Northern red oak----	78	Norway spruce, eastern white pine, red pine, black cherry.
						Sugar maple----	70	
WmB, WmC---- Wyoming	4f	Slight	Slight	Severe	Slight	Northern red oak----	55	Eastern white pine, red pine, Virginia pine.
WmD---- Wyoming	4f	Slight	Moderate	Severe	Slight	Northern red oak----	55	Eastern white pine, red pine, Virginia pine.
WmF---- Wyoming	4f	Moderate	Severe	Severe	Slight	Northern red oak----	55	Eastern white pine, red pine, Virginia pine.
WoC---- Wyoming	4f	Slight	Slight	Severe	Slight	Northern red oak----	55	Eastern white pine, red pine, Virginia pine.

* See description of the map unit for composition and behavior characteristics of the map unit.

Selecting Your Trees

- Choose native species
- Insect and disease resistance
- Plant a diversity of species
- Adapted to the region and site conditions
- Will meet your objectives!!

Tree Selection Charts

  - Primary reason for planting
  - Soil and site conditions
  - Compile a list all species that could be used

Ordering the Seedlings

- Plan to order trees 5-6 months in advance
- Avoid ordering from nurseries more than 100 miles south and west of the state line

Pennsylvania Nurseries

- Penn Nursery - DCNR Bureau of Forestry
- Howard Nursery - PA Game Commission
- Private Nurseries
  - http://www.findnurseries.com/
  - http://www.plantnative.com/

Types of Seedlings

Bare-root

Containerized/ Tubling

University of Minnesota

Bare-root Seedling Designation

- **Seedlings** (1-3 years old)
  - Example: 2-0 = Two year old seedling grown in the same seedbed for two years
- **Transplants** (3-5 years old)
  - Example: 2-1 = Three year old seedling grown 2 years in the seedbed and one year in a transplant bed
  - Transplanting improves branch and root development

Planting Densities

- **Spacing**

Timber Production

- Generally higher densities
  - 400-800 trees per acre
- "Trainer" trees to promote form and quality
  - Reduced need for corrective pruning
- Reduced need for weed control
  - Closed canopy sooner

Conservation/Wildlife Plantings

- 250-600 trees per acre
- Random planting design

Spacing (ft)	Trees per acre
4×4	2,722
5×5	1,742
6×6	1,210
7×7	890
8×8	680
9×9	538
10×10	436
11×11	368
12×12	303

43,560 = 545 TREES PER ACRE
8×10

Planting Arrangement

Mixed Planting of Conifers and Hardwoods

Prepare the Site

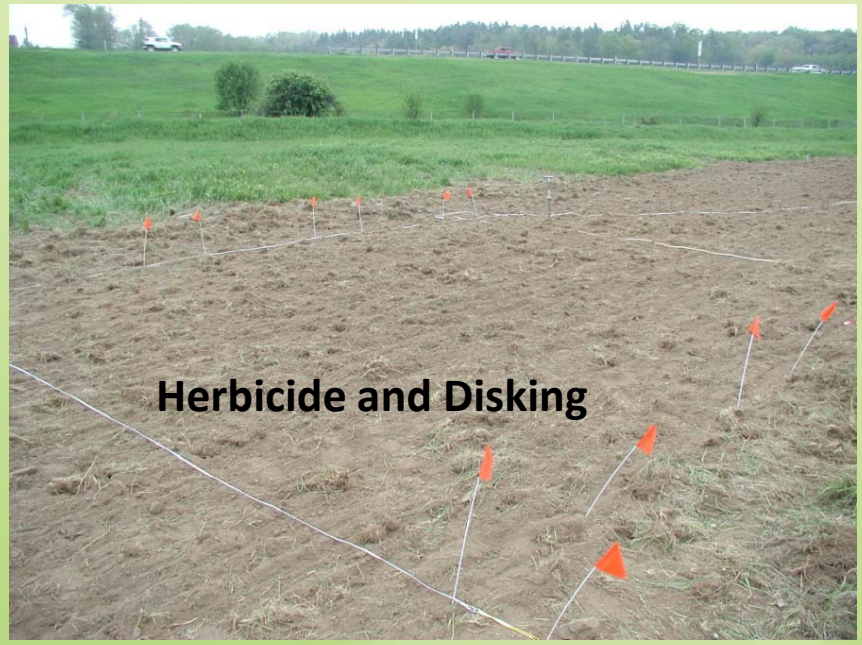
- Essential!!! Especially when planting hardwoods.
- Weeds, grasses, undesirable brush, and invasive exotic plants must be controlled prior to planting

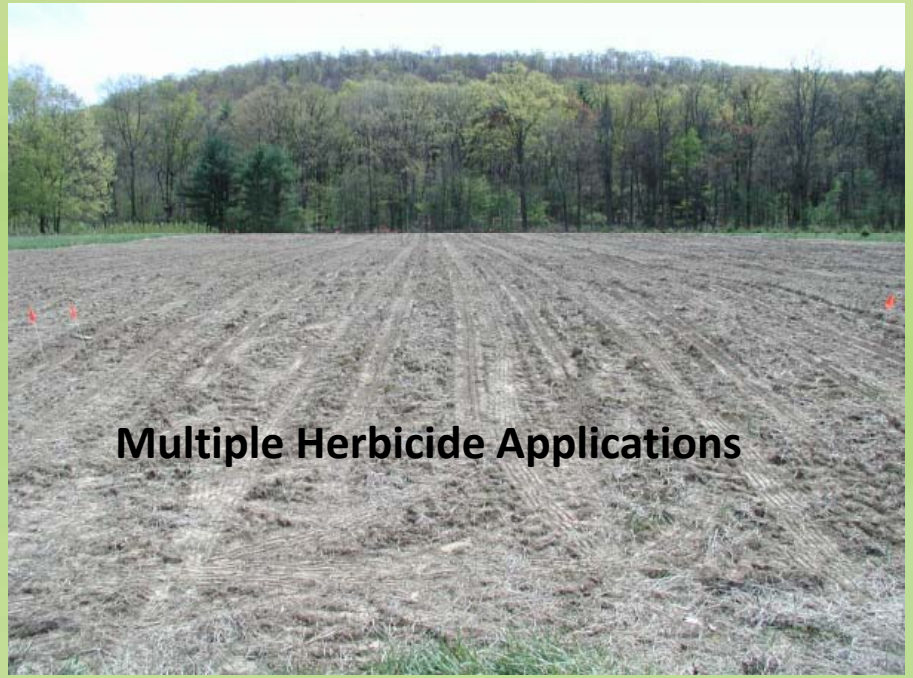
Japanese Knotweed

Canada Thistle

Prepare the Year Prior to Planting

- Mechanical
- Chemical
- Combination





Preparing Old Field Sites

Year prior to planting:

- Mow site in mid-July and again in mid-August
- Apply a glyphosate herbicide in early fall

Site Prepared by Mowing Only

Site Prepared by Disking Rows

Disking Planting Rows

Preparing Row Crop Sites

- Generally need little or no site preparation
- If soil is compacted then disk site several months before planting or previous fall.

Preparing Existing Timber Stands

Enrichment Plantings

- Introduce genetically improved varieties - A. chestnut
- Species known to be difficult to regenerate - oak

- **Create "Regeneration Openings"**
  - Cut and control remaining undesirable vegetation, trees, and shrubs in openings to be planted


Chemically treated stump


Spraying fern


Planted “Regeneration Opening”

Seedling Care and Handling

- Plant seedlings as soon as possible after arrival….preferably within one week
- Store in cool moist environment in original packaging, protect from freezing
- Protect seedlings from sun, wind and excessive drying during transport to site
- At site cover with reflective tarp and store in shade
- Only take what can be planted in one day from storage

Planting Time

- Late winter – early spring: March 1 - May 7
  - Once frost leaves the ground and prior to bud break……..When seedlings are dormant

Essential that seedlings be planted before their new growth starts to emerge!

Soldner Tree Farm

Planting 101

- **Hand Planting**
  - Shovel
  - Planting bar
  - Mattock or hodad
  - Power auger

Machine Planting

"It is better not to have planted, than to have planted incorrectly."

Tree Farmer 2011

When Planting…….

1. Keep seedlings shaded and cool
2. Protect the roots – avoid drying sun and wind
3. Carry in bucket or planting bag with wet towels or burlap
4. Never carry bundles of seedlings exposed to air or immersed in water
5. Avoid damaging the buds and stem
6. Prune long lateral roots to aid in planting

Plant trees only as deep as the root collar.

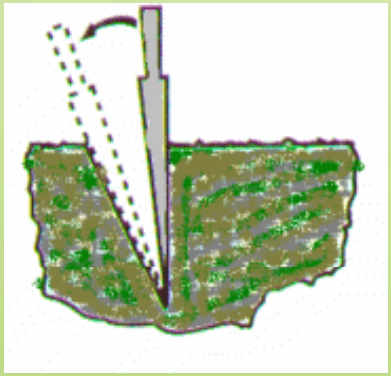
New soil line should be at the existing line from when it grew at the nursery.

Proper Planting Equals Successful Seedling Establishment

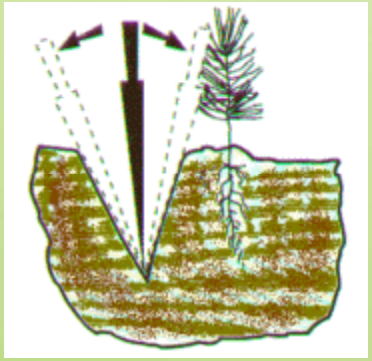
Planted Properly | Too Deep | Too Shallow | Air Pocket | Root Bent

Purdue Extension

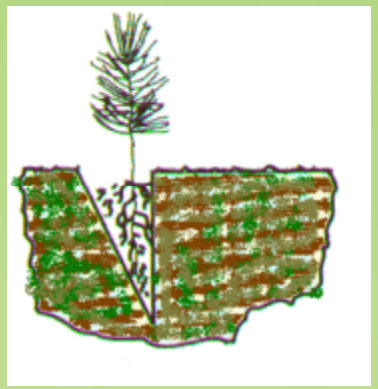
Using a Tree Planting Bar



1. Push blade vertically into soil; pull handle toward you to open hole.



3. Push blade into soil just behind the planting hole; pull handle back to close bottom of hole, push forward to close the top.



2. Set seedling at same depth it grew in nursery; roots should be straight.

4. Pack soil firmly with your heel.

South Carolina Forestry Commission

Protecting Your Investment

Deer…Rodents…Wind…Weeds

Penn State **Extension**

Protect Your Investment Using…


Tree Pro

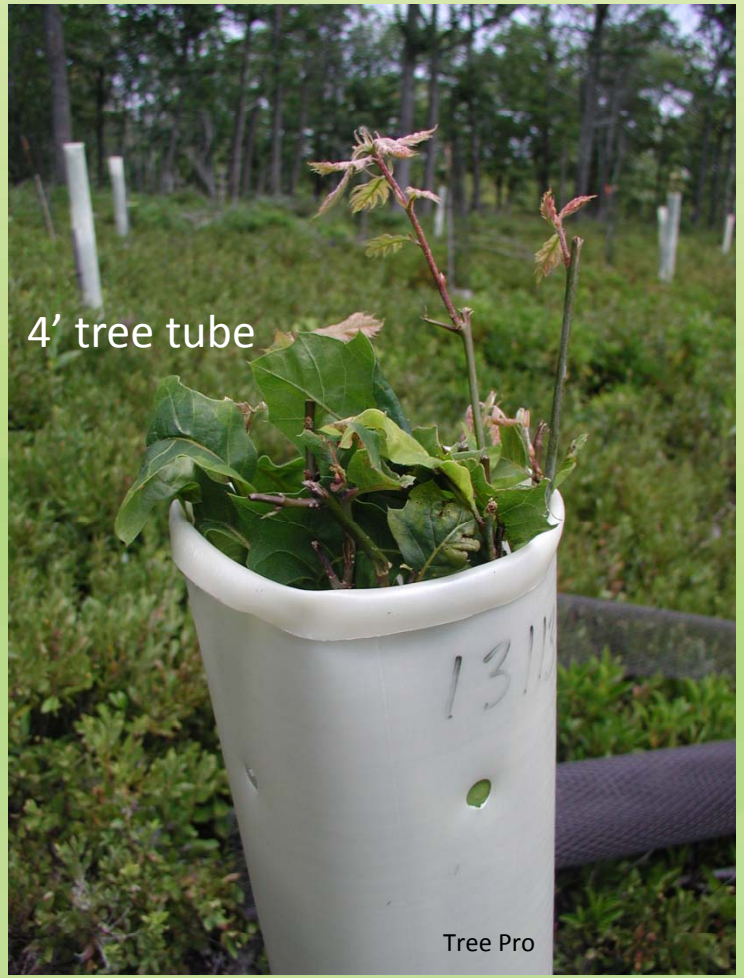

Tree Sentry

Tree Shelters/Protectors

Protection From Deer Browsing and Rubbing

Browse Protection

- How tall is tall enough?



Buck Rub Protection

Netting

Cages

Plastic Wraps or Tubes

Rodent Damage

Meadow Vole

Vole Damage

Vole Nests in Tree Shelters

Make sure shelters are tight to ground

Bear Damage

The Nature Conservancy

Maintenance…Maintenance and more Maintenance…..

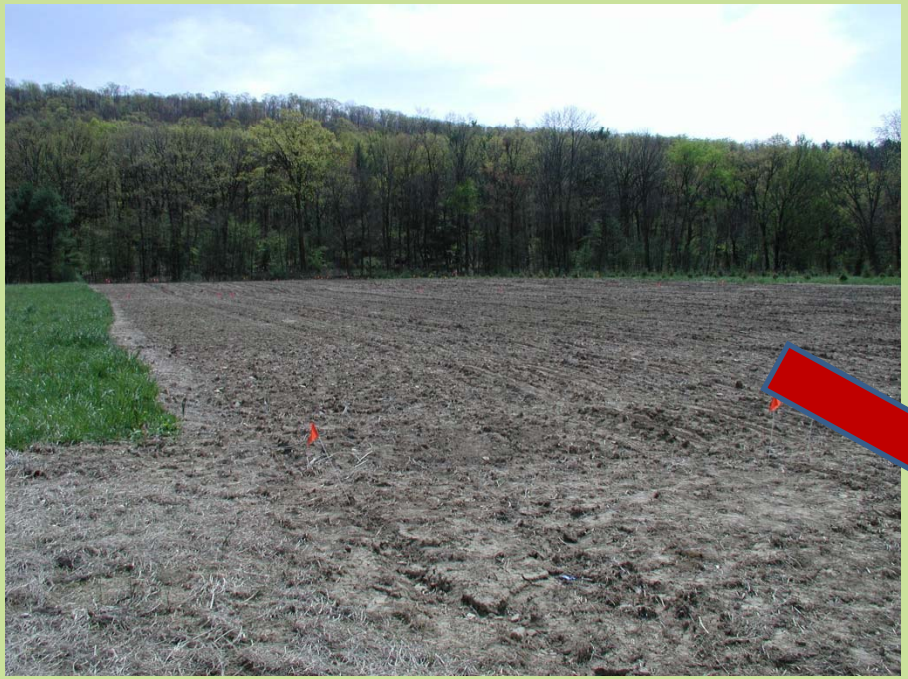
- Plantings require periodic inspection
- Check at least twice per year
  - Weed control
    - herbicide applications
  - Tree shelter and stake replacement
  - Corrective pruning
  - Thinning

Maintenance: Key to Success

Not Maintained **Maintained**

Weed Competition

May



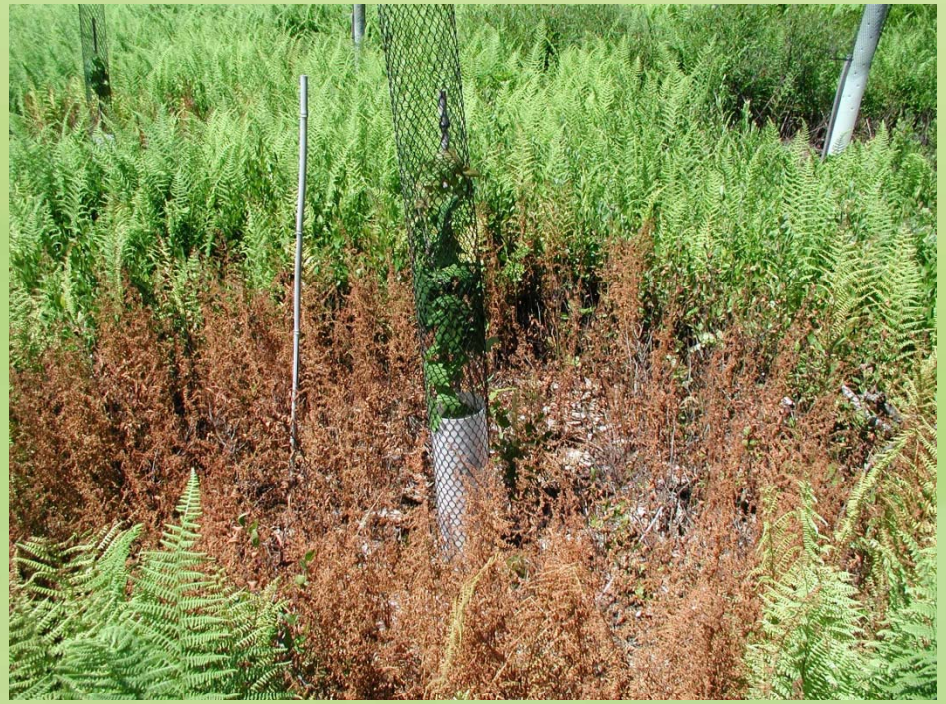
Herbicide Prepared Site

3 Months Later

August

Herbicide Applications

- Treat around shelters at least twice per year
- Use a broad spectrum glyphosate herbicide



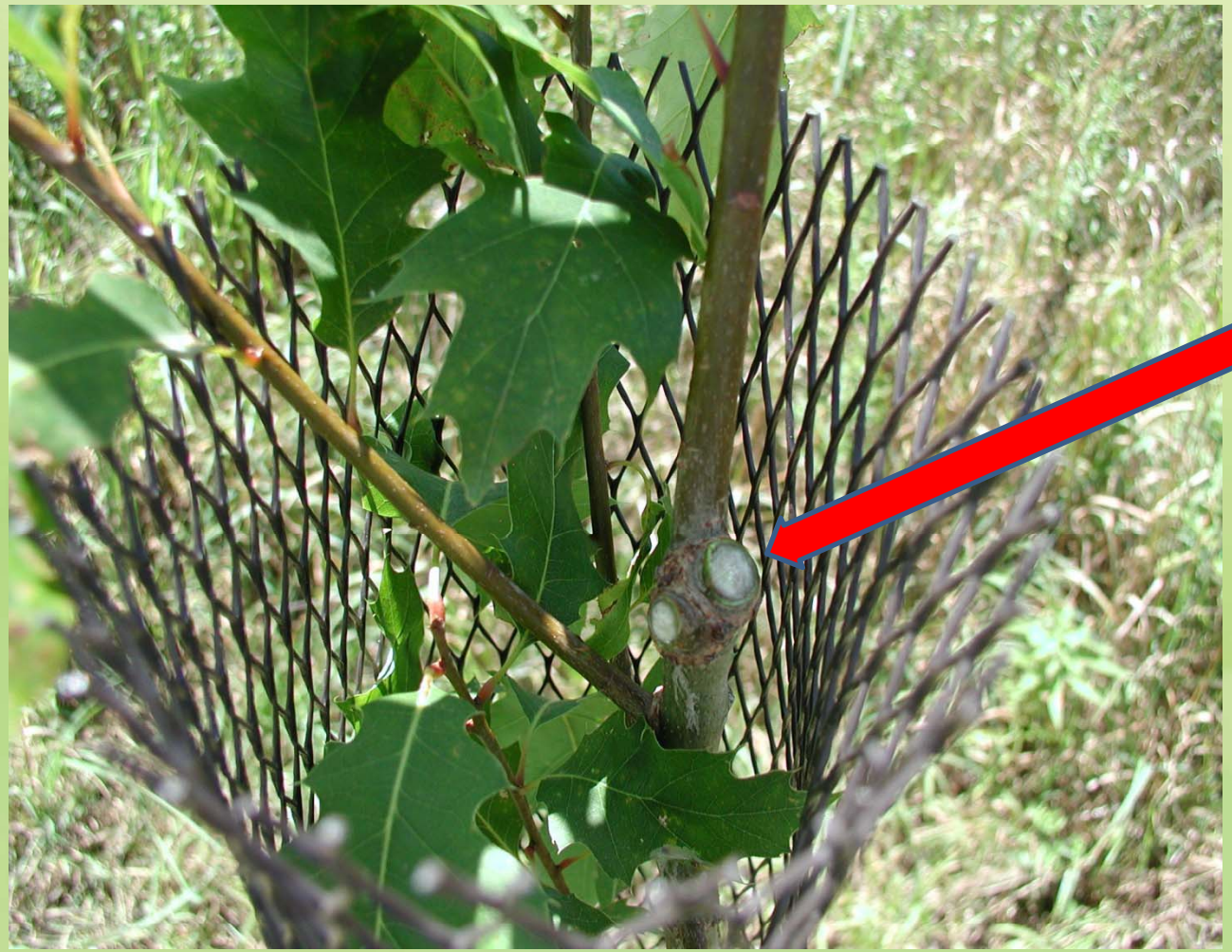
Weed Control

- Apply herbicide to 3-4 foot spot around each tree
- Do not mow rows unless you have a severe small rodent problem
- By not mowing natural tree seedlings will become established.

Naturally established walnut seedling

Weed Control

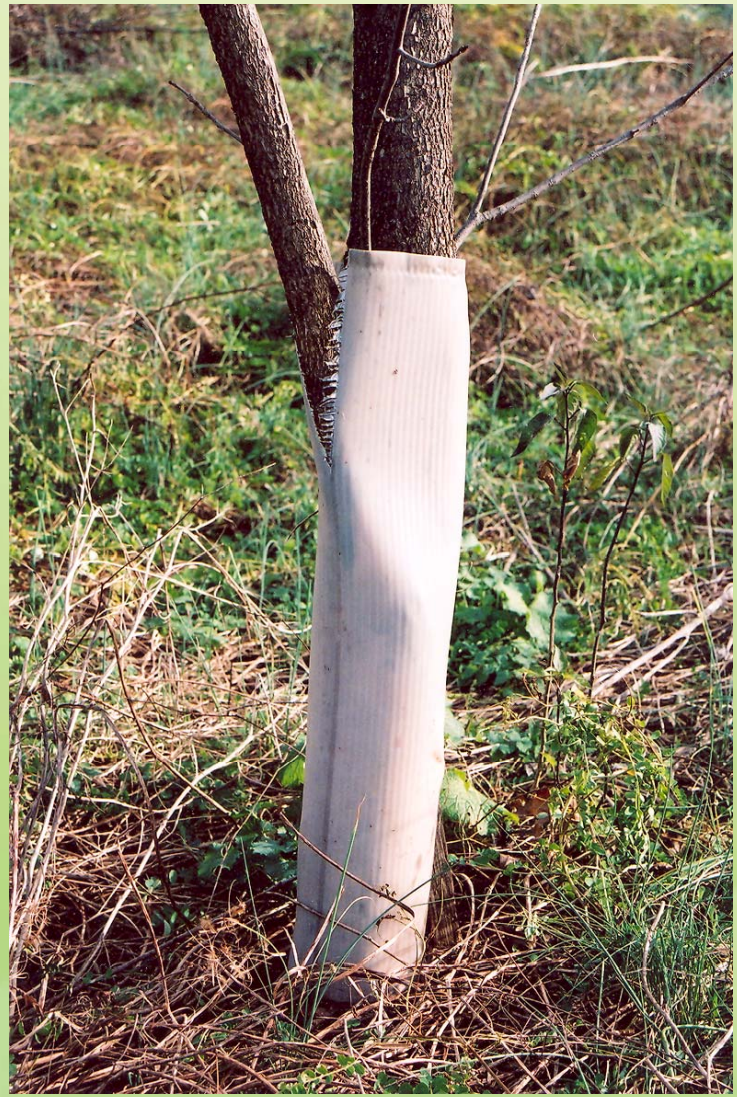
Corrective Pruning



Pruning Cuts

By-pass hand pruners

Shelter Removal



Leave on for 5-6 years – until tree is firmly established

Steps to Tree Planting Success

1. The Year **Prior to** Planting:
   - **April-May**
     - Review and identify planting objectives
     - Determine is assistance money is available
     - Request tree seedling flyers from nurseries
   - **May-July**
     - Walk through site with natural resource professional
     - Assess soil moisture and competing weeds
   - **August-December**
     - Prepare the site - control vegetation
     - Calculate acres, lay out spacing, determine numbers of trees

Steps to Tree Planting Success

2. The Year **of** Planting:
   - **January-March**
     - Place tree seedling order: note delivery date
     - Schedule time and planting labor
   - **March-April**
     - Receive trees and plant immediately
     - Install tree protectors/shelters
   - **June-October**
     - Inspect seedlings monthly, maintain protectors
     - Herbicide competing vegetation

Steps to Tree Planting Success

3. Year **Following** Planting:
   - **February-March**
     - Check tree shelters/protectors
       - Fix/replace any downed, damaged, or leaning protectors
       - Replace broken or rotten stakes
       - Remove any wasps nests
     - Mark any missing or dead trees
   - **April-May**
     - Replant if necessary
   - **May-June and August-September**
     - Herbicide weed control applications

Steps to Tree Planting Success

4. Three-five Years **Following** Planting:
   - **February-March**
     - Maintain tree shelters/protectors and stakes
     - Prune as necessary to promote strong form
       - Remove shelters once trees begin to reach shelter diameter, 2-3 inches
       - Consider the risks when removing shelters
   - **May-June and August-September**
     - Herbicide weed control applications (2 applications per year)

Questions?

Dave Jackson
drj11@psu.edu
814-355-4897

7 Year Old Mixed Hardwood Planting