Silviculture Perspectives in Bottomland Planting

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Free Man

Managing Floodplain Forests:

Why you may want to plant oaks

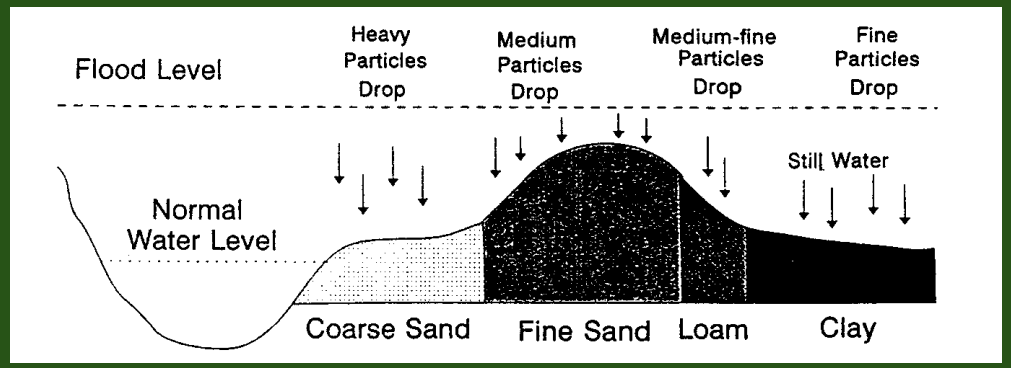
There are oak species capable of growing in floodplains

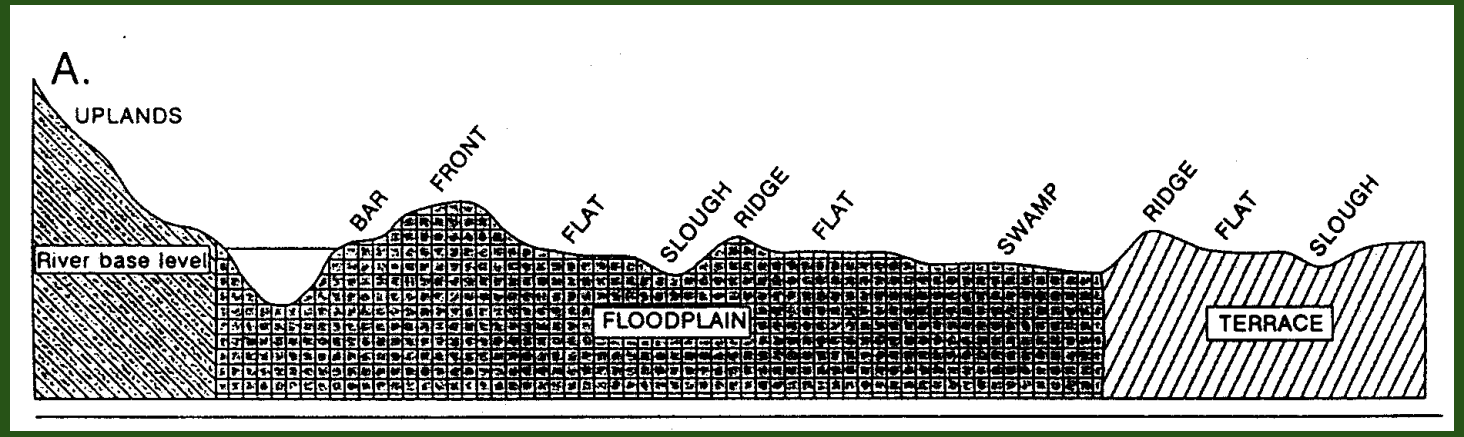
The diversity of bottomland oaks is greatest in the south

Afforestation of agricultural fields

Supplemental planting in native forests

Managing for Success:
Floodplains are complex & diverse - matching species to hydrology & soil moisture regime





Flood tolerant ⟷ **Flood intolerant**

Microtopography & Soil types

cottonwood — pecan — swamp white oak — bur oak — pin oak — black walnut

Flood Tolerance Depends

Developmental stage
- seedling – mature tree

Flood
- duration
- season
- depth
- frequency
- stagnant, moving

Site
- soil type
- elevation

	Teskey & Hinckley 1977	Whitlow & Harris 1977	Allen et al. 2001 Haynes et al. 1988
Black walnut	Intolerant	Intolerant	Weakly tolerant
Pecan	Intermediately intolerant	Tolerant to very tolerant	Weakly tolerant
Bur oak	Tolerant	Somewhat tolerant	Intolerant
Pin oak	Intermediately intolerant	Tolerant	Moderately tolerant
Swamp white oak	Tolerant	Somewhat tolerant	Moderately tolerant
Eastern cottonwood	Very tolerant	Tolerant	Weakly tolerant to moderately tolerant

Managing for Success:
Soil conditions: high pH in alluvial soils




Tolerates high pH

- Bur oak
- Shumard oak
- Sycamore
- Green ash

Sensitive to high pH

- Nuttall oak
- Cherrybark oak
- Pin oak
- Water oak

Match species to soil conditions

Managing for Success:
Soil conditions: directed fertilization

Slow release ammonium nitrate
19-6-9

Slow release urea
20-10-10

Ammonium sulfate

Native Legumes -
False indigo

Managing for Success:
Soil conditions: improving drainage and aeration

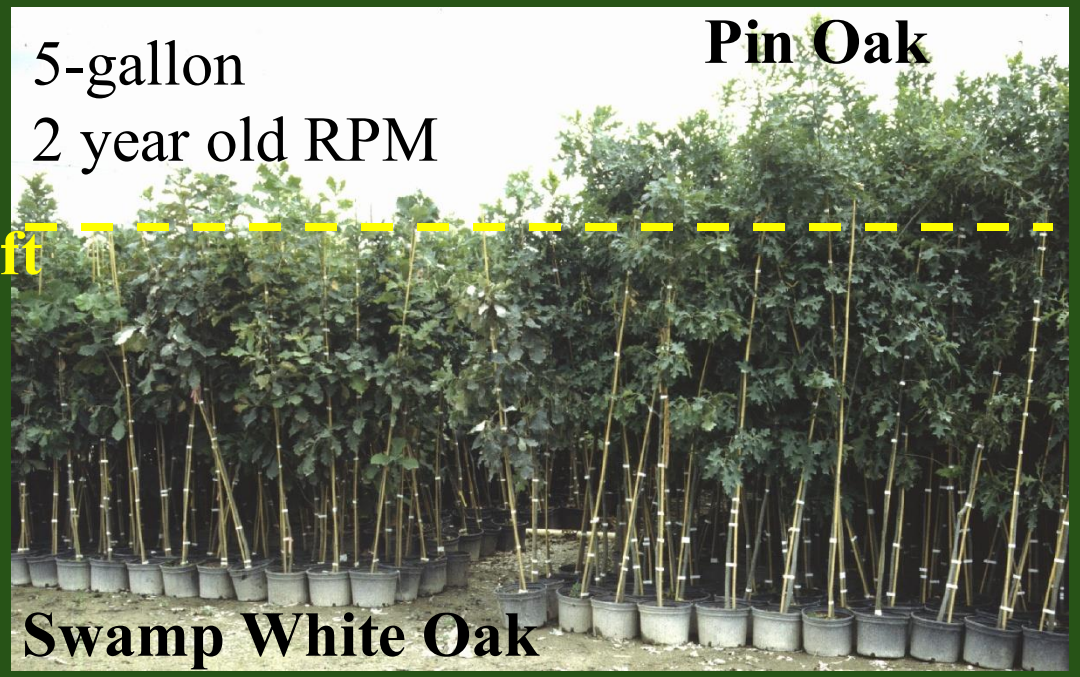
Managing for Success:
Soil conditions: improving drainage and aeration on heavy clay soils

Ripping, Disking, Chiseling

Sharkey clay

Managing for Success: variety of nursery products

1-0 Nuttall Oak
Georgia Nursery



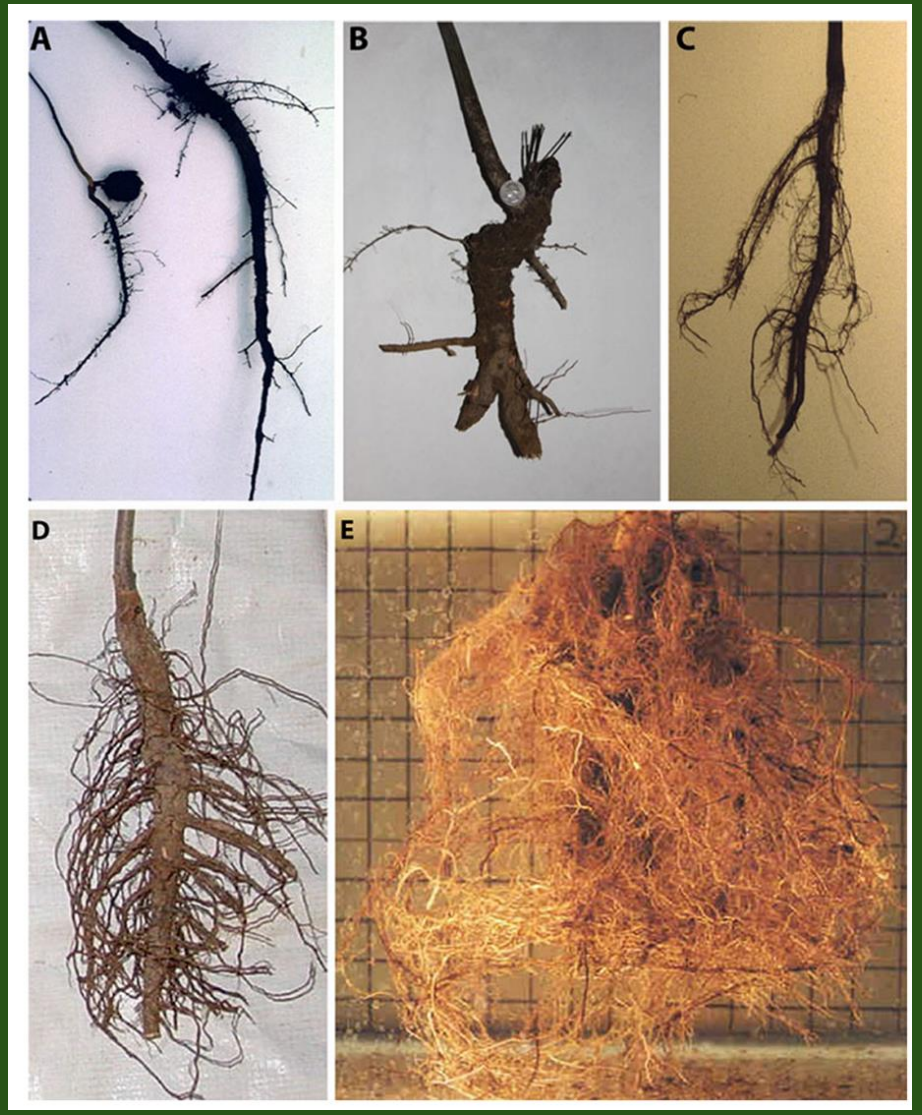
1-0 Bareroot

Air pruned
Root bag
Bur oak
2 yr old
1” basal dia.
6.5’ tall

Bigger Root Systems = increased competitiveness

1 and 3 year old natural
Northern red oak
Advance repro
Mature fully stocked
Northern hardwood stand

Older black oak old field sprout



1-0 bareroot

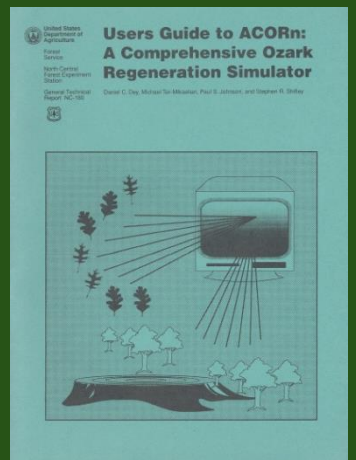
1-0 cherrybark oak
Intensive irrigation, fertilization
Low seedbed density
Georgia State Nursery

1 yr old RPM Container

Assessing the need for Artificial Regeneration

Determine the contribution of
Oak Advance Reproduction
&
Stump Sprouts
to stand regeneration

What is desired oak stocking at maturity?

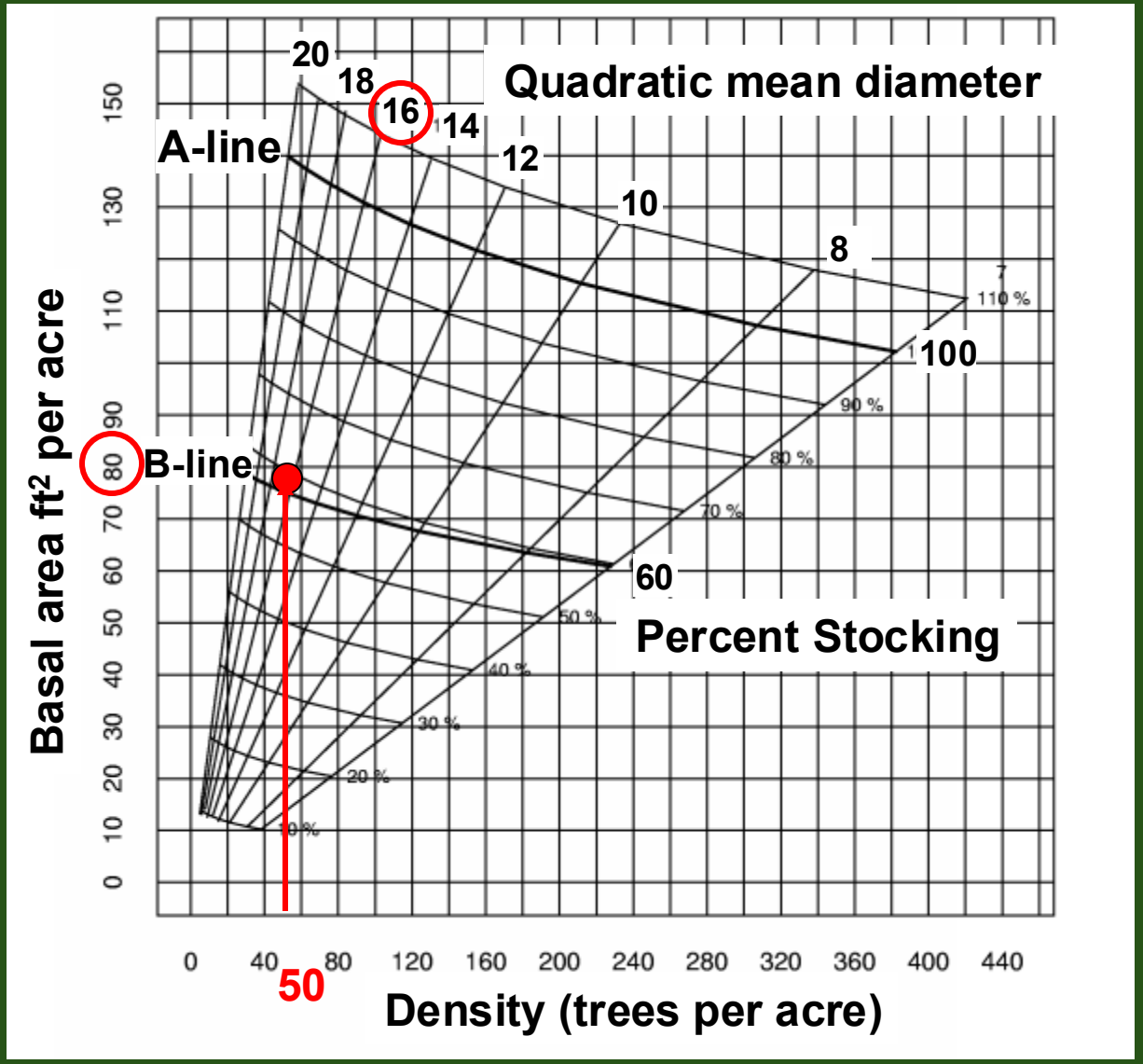


How many trees do you need?

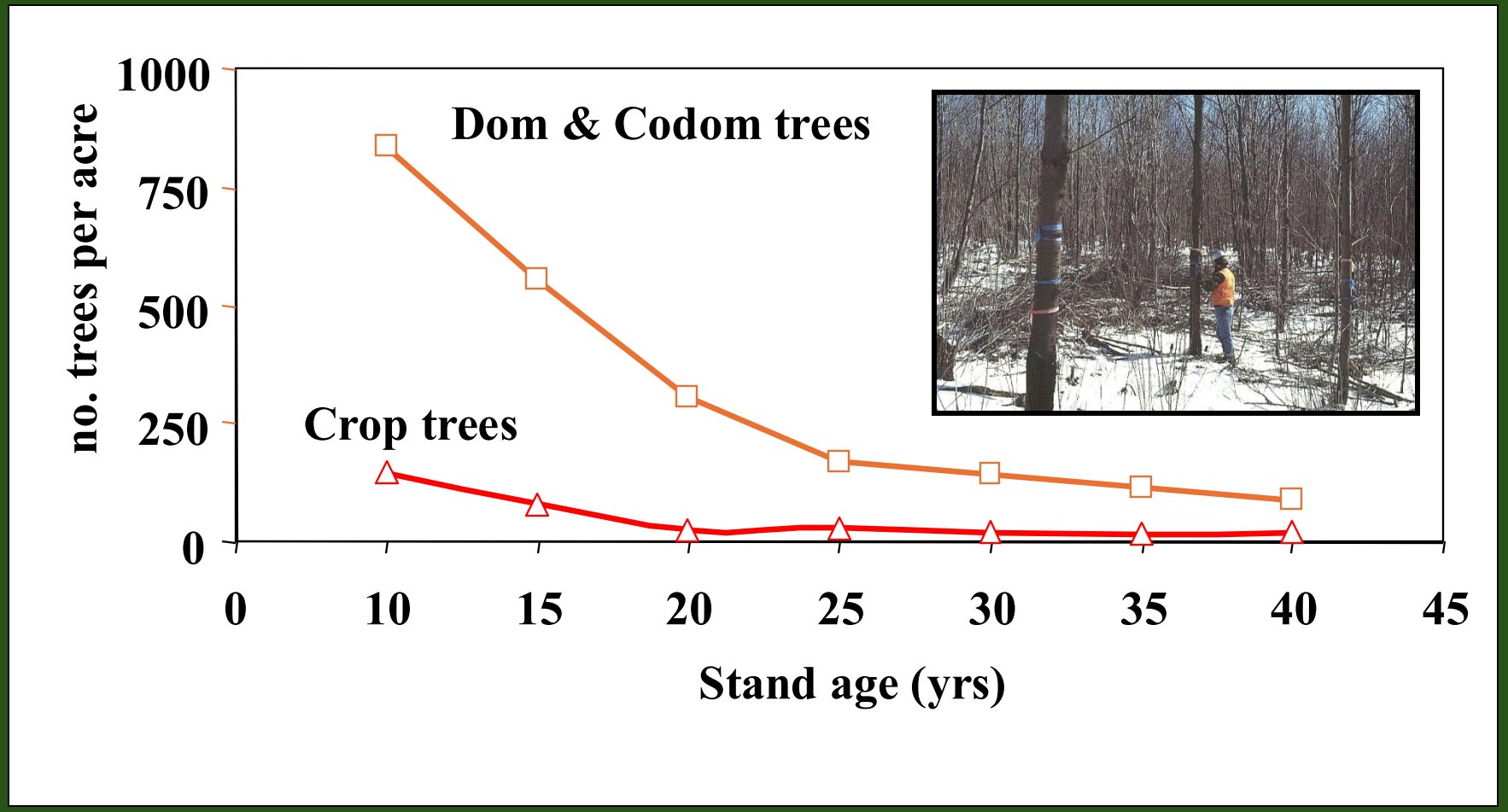
Oak Dominated Stands

relatively few trees per acre
in dominant and codominant crown class

Minimum tree density for full stocking at maturity



Manage Early for Oak Dominance

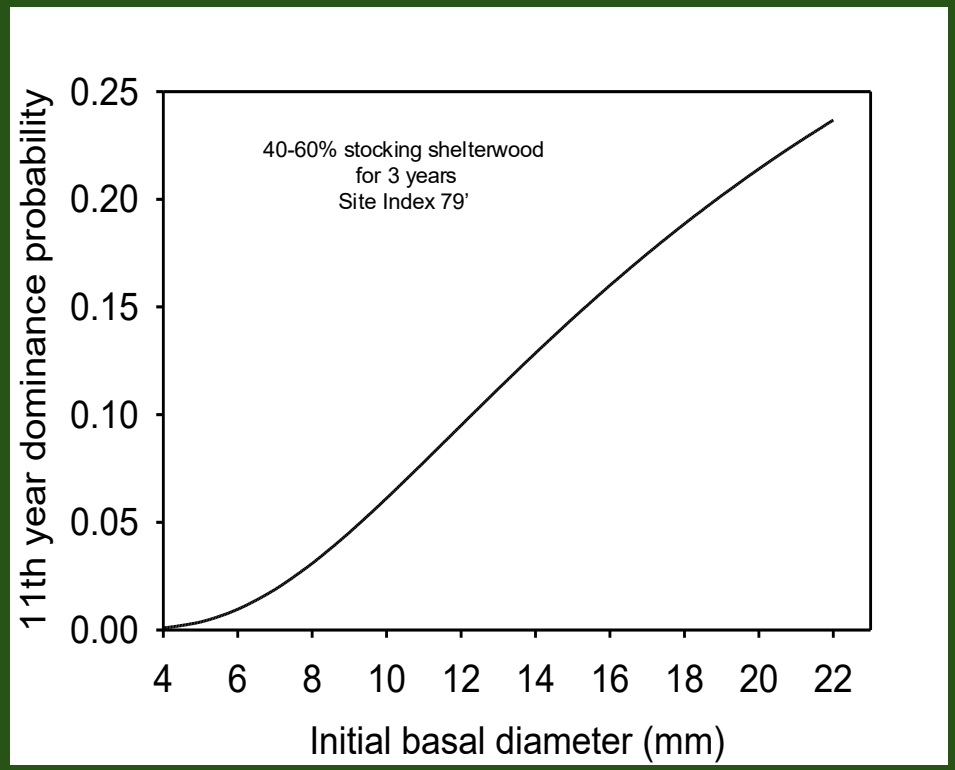


Miller – West Virginia thinning study

Dominance or Success Probability = planting density

If Probability = 0.01 for a 6 mm basal diameter tree

Then 1 ÷ 0.01 = 100 trees needed to produce 1 success



If Probability = 0.24 for a 22 mm basal diameter tree

Then 1 ÷ 0.24 = 4.2 trees needed to produce 1 success

Afforestation:

Managing competing vegetation

Simulating Succession:

Using early successional species (cottonwood) as a nurse crop for Nuttall oak underplanting

A = Year 0 – site prep and plant cottonwood cuttings

B = 1 year old cottonwood cuttings

C = spring year 3 plant 1-0 Nuttall oak bareroot

D = Nuttall oak develops under nurse crop
30% full sunlight and reduced competing veg

E = 7 year old Nuttall oak saplings
well established & dominant

F = year 10 harvest cottonwood for pulp

Managing for Success: Competing vegetation
midstory removal in native forests

Shelterwood Method is very useful

1% full sunlight
96% crown cover
144 ft² per ac

49% full sunlight
50% crown cover
22 ft² per ac

27% full sunlight
80% crown cover
70 ft² per ac

Competition Control in Forests

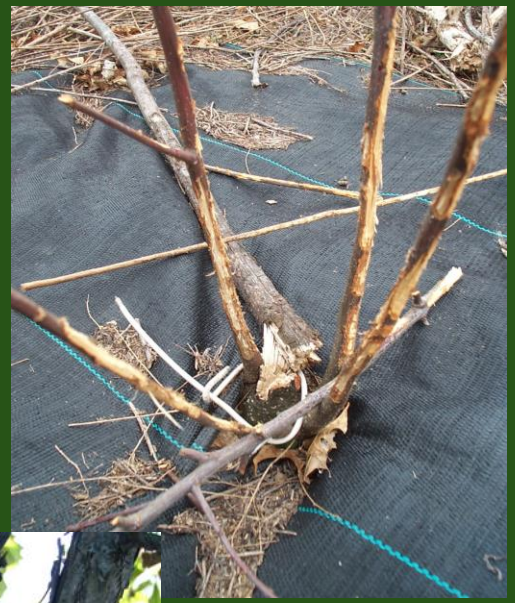
Herbicide

Prescribed Fire

Penn State Univ. Pub. UH174

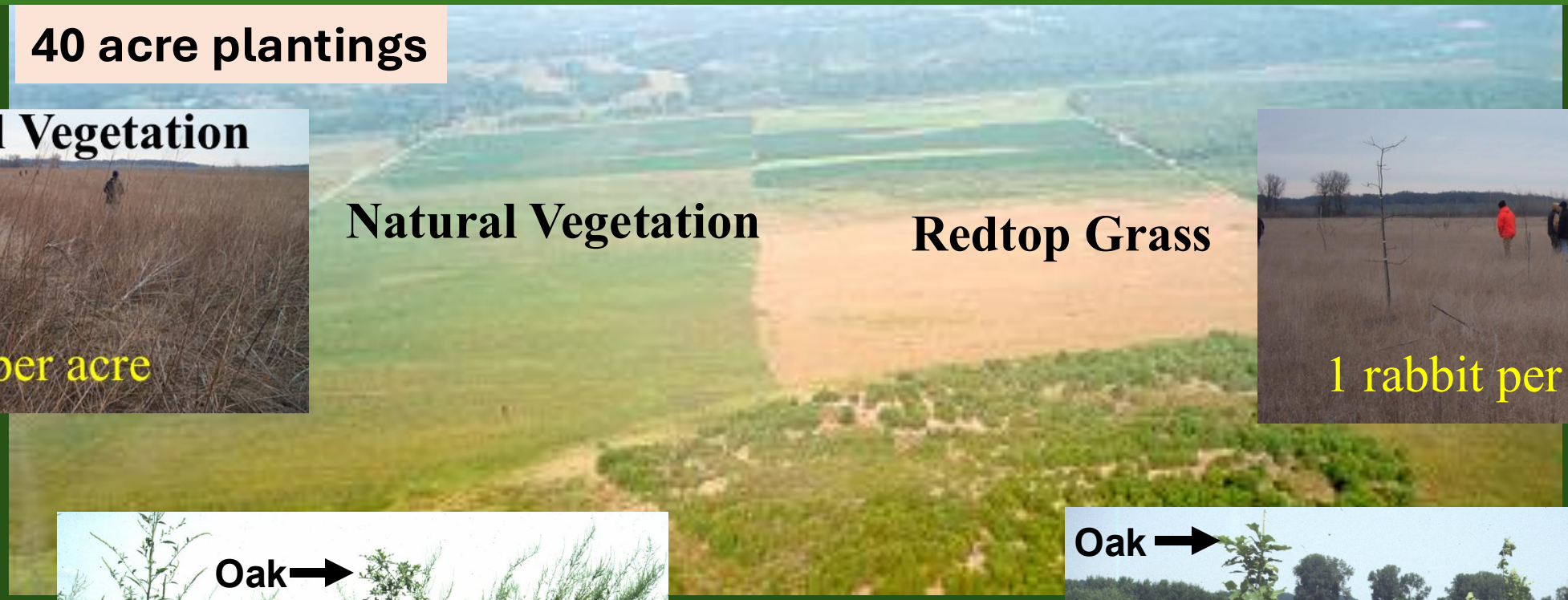
Managing for Success: Animal damage

habitat mgmt or tree protection



Managing for Success: Cover crops
competition & animal control

40 acre plantings



Natural Vegetation

Redtop grass

Mixed Species Plantings have Advantages

A = pure cherrybark oak planting

B = cherrybark and sweetgum

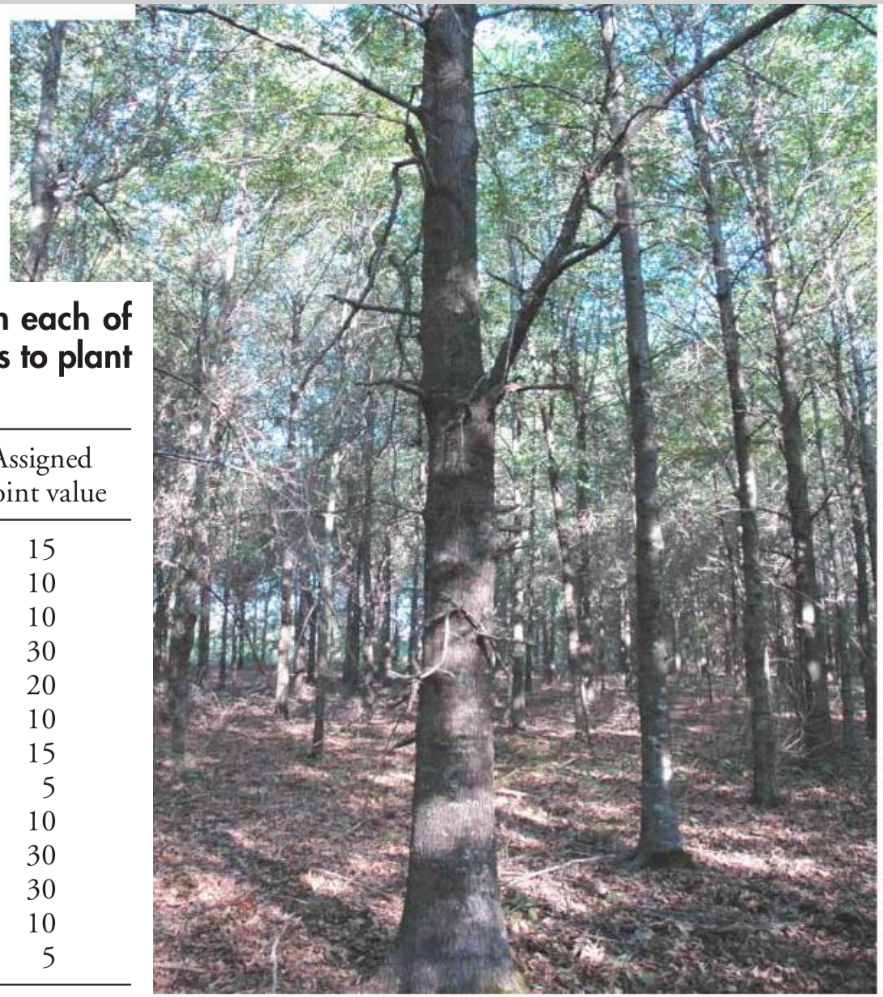


Table 3. Point values assigned to specific properties in each of five categories used to determine potential nonoak species to plant in mixtures with oak species.

Category	Characteristic	Assigned point value
Tree form	Excurrent	15
	Decurrent	10
Early height growth pattern	Rapid	10
	Fast	30
	Medium	20
	Slow	10
Branching pattern	Alternate	15
	Opposite	5
Relative twig diameter and Durability	Large	10
	Medium	30
	Small	30
Shoot type	Indeterminate	10
	Determinate	5

Lockhart et al. 2008

Sweetgum ideal companion species
Max Score 100
Other species close to 100 are good options

Consider companion floodplain shrubs too

Economic Efficiency

- Pre-planting costs – vegetation mgmt, site prep
- Establishment cost – stock, planting
- Post-planting treatments to control vegetation and animal damage
- Seedling performance as judged by definition of success

Per successful