



Silviculture

FORS 3347



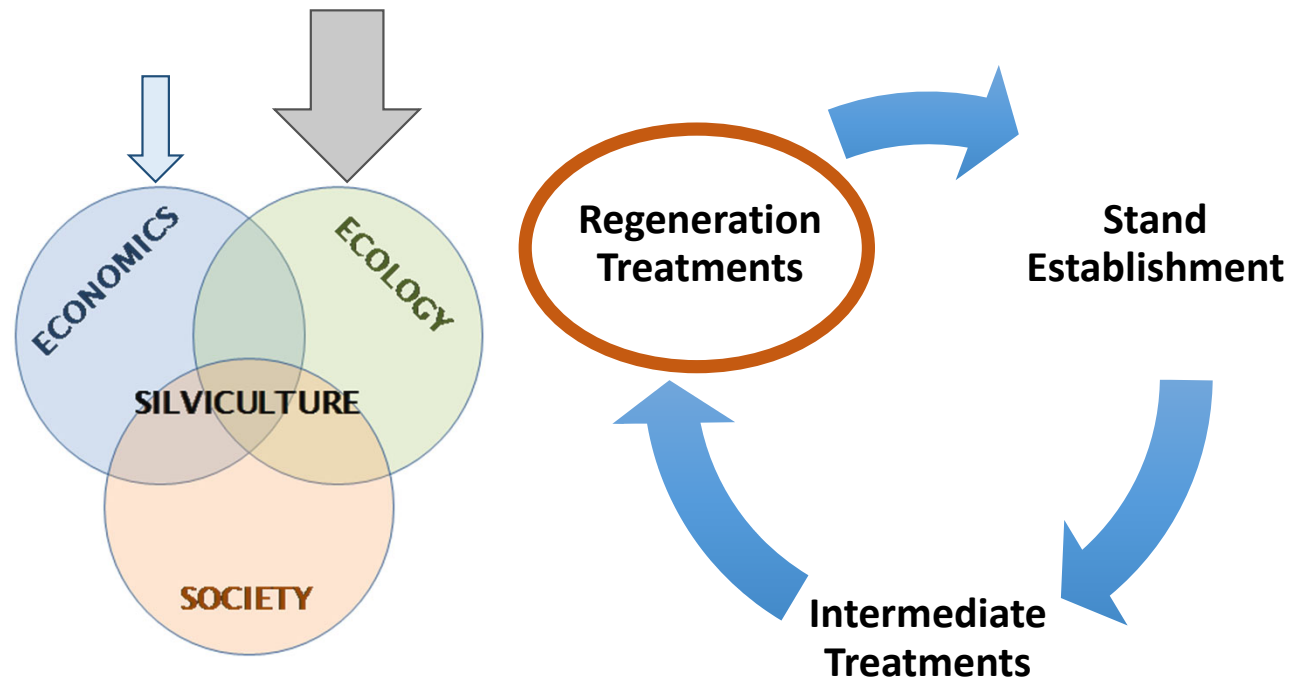
Instructor: Dr. Jeremy Stovall

Lecture 6:

Regeneration Methods – Seed-Tree



Context



Methods of Regeneration

Favors shade intolerant spp. ↔ *Favors shade tolerant spp.*

Even Aged

1. Clearcut

2. Seed-tree

3. Shelterwood

----- 4. + Deferment -----

Two Aged

----- 5. With reserves -----

Uneven Aged

6. Patch selection

7. Group selection

8. Single tree selection

Seed-Tree

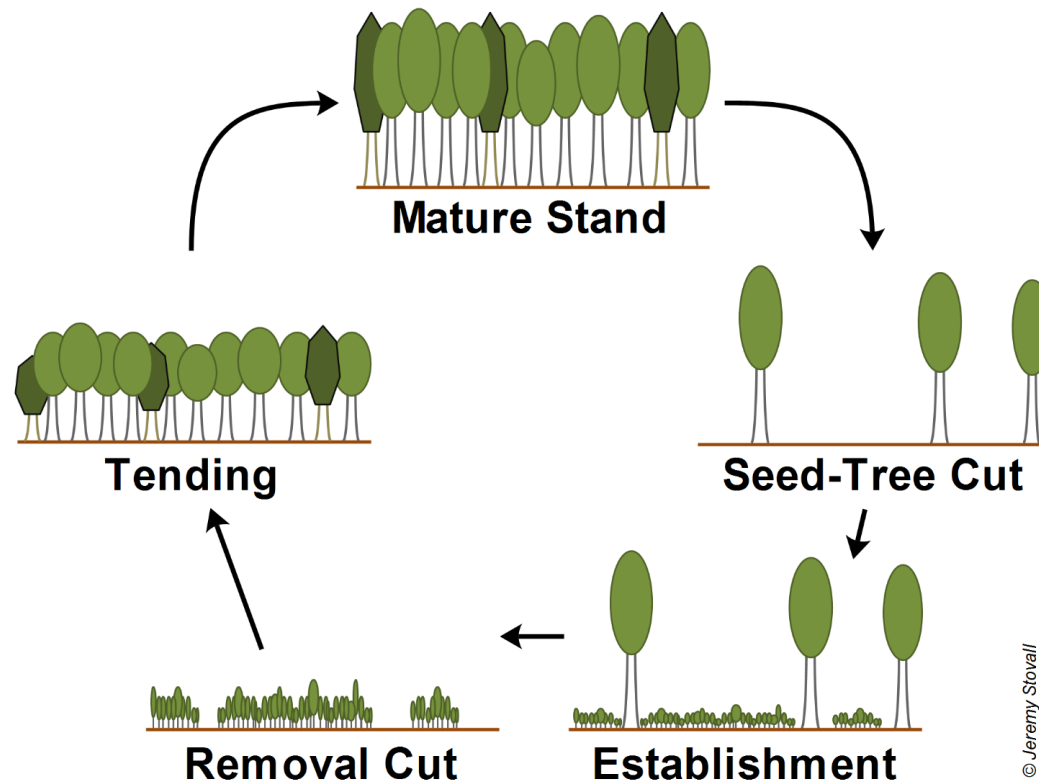
A method of regenerating an **even-aged stand**

- in which a new age class develops from **seeds**
- that germinate in **fully exposed microenvironments**
- after **removal** of all the previous stand **except a small number of trees left to provide seed.**
- **Seed trees are removed** after regeneration is established.



Adams, D. L., J. D. Hodges, D. L. Loftis, J. N. Long, R. S. Seymour, and J. A. Helms. 1994. Silviculture Terminology with Appendix of Draft Ecosystem Management Terms. Silviculture Instructors Subgroup of the Silviculture Working Group of the Society of American Foresters. Located at: http://oak.snr.missouri.edu/silviculture/silviculture_terminology.htm Accessed on: 7/29/2011.

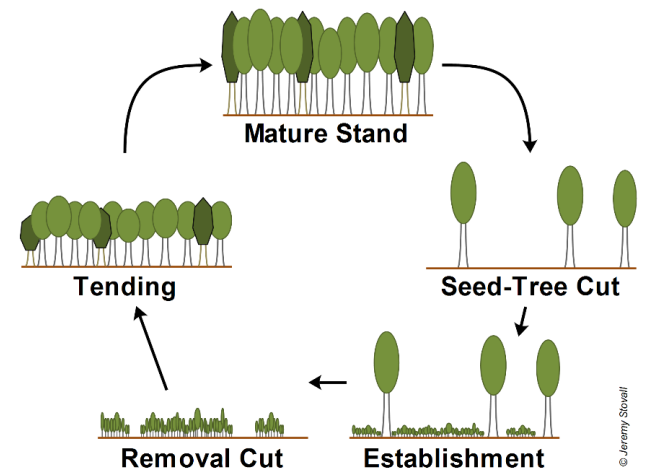
Harvests in a Seed-Tree Regen Method



Group Exercise

How Many Seed Trees?

- Assume
 - Stand is 100 foot tall loblolly, 85% of overstory BA
 - QMD = 18 inches
 - Level terrain
 - Moderate midstory density
 - Litter layer is 3 inches thick
- Figure out how many seed-trees to leave per acre
- Put your useful handouts packet away
- No one correct method/answer: BE CREATIVE



How Many Seed Trees are Needed?

Depends on **Effective Distance** of Seed Dispersal

- Species
- Size of trees
 - Height (2x-5x) and size of crown (Live Crown Ratio)
- Topography
- Wind direction
- Periodicity of seed crops (inter-annual variability)
- Seedbed characteristics
- Risk of loss of seed trees due to windthrow, lightning, insects, etc.

A Wind-Thrown Seed-Tree in Arkansas Shortleaf Pine



Recommended Number of Seed Trees

Recommended <u>minimum</u> number of seed trees for major southern pines, by DBH class. Number per acre. (Average distance between trees, in ft, shown in parentheses). Will provide value for commercial removal			
	Species		
DBH (inches)	Loblolly	Shortleaf	Slash
10	12 (60)	20 (47)	12 (60)
12	9 (69)	14 (56)	9 (69)
14	6 (85)	12 (60)	6 (85)
16+	4 (104)	12 (60)	4 (104)

Source: Natural Regeneration of Southern Pines. Alabama Job Sheet No. AL 612A. USDA Natural Resource Conservation Service. <http://efotg.sc.egov.usda.gov/references/public/AL/612A.pdf>

Cone Counting for Seed-Tree Regen



An example of cone counting for southern yellow pines. **Seeds / Acre** is what must be met for adequate regen, while **Trees / Acre** is the only variable under the silviculturalist's control. Cone counting can bridge the two, ensuring adequate regen.

	Longleaf	Shortleaf	Loblolly
<i>Seeds/Acre</i>	50,000	20,000	12,000
<i>Seeds/Cone</i>	50	25-40	150
<i>Cones/Tree</i>	35-50	50	10-15
<i>Cones/Acre</i>	1000	500-600	60-90
<i>Trees/Acre</i>	20-30	10-12	6

Cone Counting Math

- 50,000 seeds per acre are required for longleaf pine
- 50 seeds / cone in good year (risky estimate)
- 35 seeds / cone in average year (typical estimate)
- 15 seeds / cone in bad year (conservative estimate)

To estimate how many seed trees to leave:

$$\frac{\textit{Trees}}{\textit{Acre}} = \frac{\textit{Seeds}}{\textit{Acre}} \times \frac{1}{\textit{Cones/Tree}} \times \frac{1}{\textit{Seeds/Cone}}$$

To estimate seeding rate before a harvest:

$$\frac{\textit{Trees}}{\textit{Acre}} \times \frac{\textit{Cones}}{\textit{Tree}} \times \frac{\textit{Seeds}}{\textit{Cone}} = \frac{\textit{Seeds}}{\textit{Acre}}$$

Group Exercise - Cone Counting

- You count 13 cones per tree. How many TPA do you need to leave? Do you think this is a good year to regenerate?
- 50,000 seeds per acre are required for longleaf pine
- 35 seeds / cone in average year (typical estimate)

To estimate how many seed trees to leave:

$$\frac{\textit{Trees}}{\textit{Acre}} = \frac{\textit{Seeds}}{\textit{Acre}} \times \frac{1}{\textit{Cones/Tree}} \times \frac{1}{\textit{Seeds/Cone}}$$

To estimate seeding rate before a harvest:

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Seed-Tree



Seed-Tree



Seed-Tree



Loblolly Pine

Seed-Tree

16 ft²/acre; 15 TPA; 14 inch QMD



Seed-Tree

Douglas – Fir in Oregon

They often underplant these anyway just to ensure sufficient natural regeneration.

Using a seed-tree can meet aesthetic requirements more than regeneration requirements in this case.



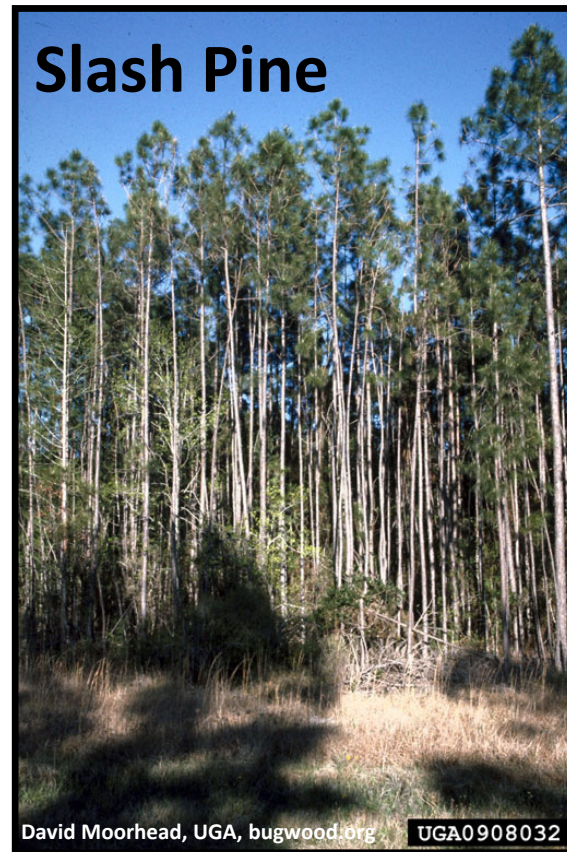
Example of Failed Seed-Tree



Other Treatment Considerations

Thinning

- Overstocked stands
- Unhealthy, low value
- Precommercial thinning
- 'Corridor' thin



Shortleaf Pine Seed-Tree After Precommercial Thin



**Ozark NF
Arkansas**

Minimum Status of Regeneration before Overstory Removal

- **Oak:** at least 400 to 600 well distributed saplings with minimum of 4.5 ft in height (applicable to shelterwood, not seed-tree)
- **Longleaf pine:** 6000 per acre. Normally, this requires three to six years
- **Western conifers:** seedlings should grow to 1.5-2.0 ft tall before overstory removal but not beyond 3.0 - 3.5 ft tall (smaller regen less susceptible to breakage or damage)

Seed-Tree & Regen Damage



Regen IS Damaged ... Some Data:

- Skid trails (16%) & haul roads (1%) in Northern Hardwoods
- 38-65% of seedlings dead or damaged following shelterwood harvest in Norway spruce (high but acceptable for regenerating a fully stocked stand)
- Inter-planting shown to be necessary in Douglas-fir following seed-tree on a steep site (cable)
- Longleaf: need 3000-6000 TPA with a final target of 1000 TPA
 - **So mortality of 67-83% is considered ACCEPTABLE**