

**Silviculture**  
**FORS 3347**  
 Instructor: Dr. Jeremy Stovall  
 Lecture 6:  
 Regeneration Methods – Seed-Tree

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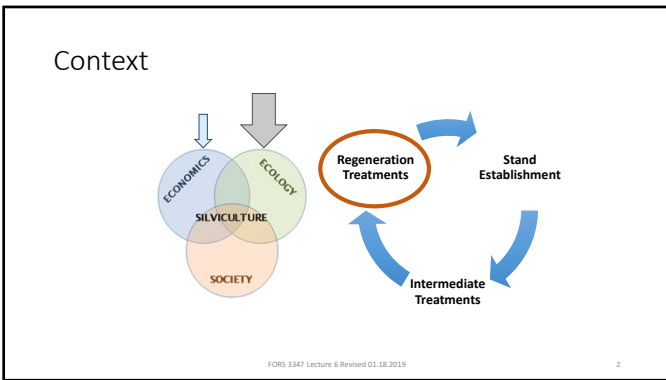
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Methods of Regeneration

*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

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### 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. Griffin, L. N. Long, R. S. Seymour, and J. A. Holm. 1994. Silviculture Terminology with Appendix of Draft Ecosystem Management Terms. Silviculture Instructional Subgroup of the Silviculture Working Group of the Society of American Foresters. Located at: [http://fore.oregonstate.edu/silviculture/silviculture\\_terminology.html](http://fore.oregonstate.edu/silviculture/silviculture_terminology.html). Accessed on: 1/20/2021.

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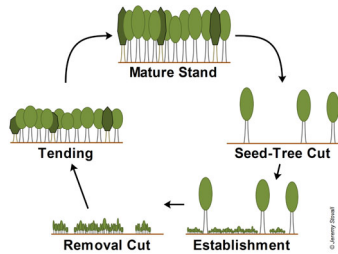
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### Harvests in a Seed-Tree Regen Method



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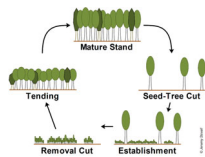
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### Group Exercise How Many Seed Trees?

- 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 away
- No one correct method/answer: BE CREATIVE



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### 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.

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### A Wind-Thrown Seed-Tree in Arkansas Shortleaf Pine



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### Recommended Number of Seed Trees

Recommended minimum 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

DBH (inches)	Species		
	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://nrc.srs.gov/ftp/pub/nc162a.pdf>

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### 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
Seeds/Acre	50,000	20,000	12,000
Seeds/Cone	50	25-40	150
Cones/Tree	35-50	50	10-15
Cones/Acre	1000	500-600	60-90
Trees/Acre	20-30	10-12	6

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### 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:

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

To estimate seeding rate before a harvest:

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

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### 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:

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

To estimate seeding rate before a harvest:

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

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Seed-Tree



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Seed-Tree



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Seed-Tree



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Seed-Tree

16 ft<sup>2</sup>/acre; 15 TPA; 14 inch QMD



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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.



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Example of Failed Seed-Tree



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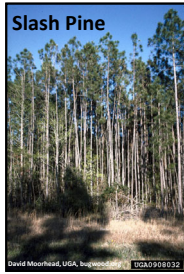
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### Other Treatment Considerations

Thinning

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



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### Shortleaf Pine Seed-Tree After Precommercial Thin



Ozark NF  
Arkansas

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### 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)

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### Seed-Tree & Regen Damage



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### 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

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