Oak, Pine & Hemlock Silviculture

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Some Standard Silvicultural Methods

- 1. Single-tree selection
- 2. Group \patch: includes group release and shelterwood groups
- 3. Clearcutting
- 4. Overstory removal
- 5. Standard shelterwood
- 6. Low-density shelterwood
- 7. Deferred shelterwood
- 8. Irregular shelterwood
- 9.Precommercial thinning
- 10. Commercial thinning
- 11. Stand improvement
- 12. Rehabilitation
- 13. Ecological forestry
- 14. Natural disturbance silviculture

App. Percent Cu. Vol. and Sapling Numbers In New Hampshire

Species	Vol. %	Sapling %
Red oak	8.9	3.2
White Pine	20.2	3.4
Red Maple	14.6	11.9

Major Oak/Pine Silvi Problems

- Regen
- Regen
- Regen

Sources of Regen Problems

- Seed supply?
- Seed losses?
- Germination?
- Browsing?
- Competition?
- All of the above!!

Where Does Oak/Pine/Hemlock Like to Grow?

Dry Sites:

- Outwash
- Shallow Bedrock
- Sandy Tills

Hemlock: also on shallow, wet pan

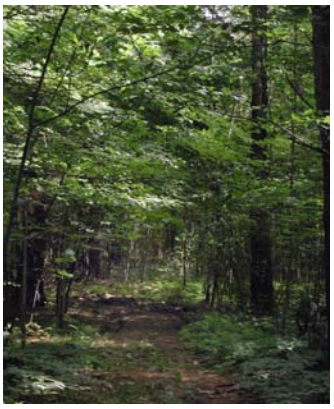
Also: Old-Field Pine

A long history of white pine invasion of abandoned old-fields on a variety of soils!

Why?? Pine can handle eroded soils and grass/hay competition.

Then…..After the Pine Harvest

- Understory oak (a wildlife influence?) develops into a fine stand. Some of our best oak stands developed after pine (McKinnon 1935, Harv. Bull. 18).
- But even after a careful oak shelterwood, the oak does not readily regenerate.
- On some sites (e.g. sandy), pine regenerates under the oak – possibly another wildlife influence.



The Oak/Pine Regeneration Process

- Develops best from advanced regen.
- Advanced oak/pine regen should be 1-foot-plus tall with sizeable root collar diameter. Ready for release!
- Look for 500-2000 advanced stems/acre.
- May be patchy; think about group/patch release.

No Advanced Oak/Pine???

- Advanced oak/pine does not seem to develop under heavy hardwood (e.g. beech) understories.
  Try light harvest/shelterwood from below after good acorn/pine crop (we're trying to bury the acorns/seed). Heavy ground disturbance.
- Once you have 1-foot-plus tall advanced oak/pine, release it through one or two overstory removals. Some suggest a second partial harvest that flattens oak regen will produce more vigorous oak sprouts. WP weevil discouraged by light shade.
- Some may try to experiment with chemicals or fire. With a very mixed understory(beech,invasives,sprouts), a hot fire should kill back everything – but the oak will sprout.

Alternative to Shelterwood

- In patchy stands: instead of a shelterwood, try small groups with intensive ground disturbance – again to bury the seed, eliminate unwanted understory, and maintain some level of shade. These will probably have a hardwood component that will moderate sno-damage and weevil???

Seed Supply

- 1. Medium or better oak crops every 2nd or 3rd year (with exceptions). Pine: every 3-5-7 years.
- 2. Best production from seed trees 18 in. plus.
- 3. Half the oak crop "lost" from insects*, birds, mammals – before the acorns hit the ground.
- 4. On the ground surface, 98% of the acorns are eaten or destroyed; buried: 50%.
- 5. Bottom line: bury the acorns thru' logging activity. Probably pine as well.

W. Pine Seed Production (Graber 1970)
80 Year Old Stand – Massabesic, Me

Ba/Acre	Av. DBH	Good Seed Year (M seed)	Poor Seed Year (M seed)
187	17.1	1,140	298
120	18.0	1,793	409
80	18.4	1,254	298

- (Check for 1-year-old cones to predict seed crops).

How About Oak Sprouts??

(from Brose etal, GTR NRS -33)

Dbh	Percent Sprouting
2-5	100
6-11	60
12-16	45
17+	30

Red Maple Sprouts

- 1. These can persist and dominate the regeneration.
- 2. How about retaining some/all of the red maple in a low/medium density shelterwood cut.
- 3. After the oak/pine regen is well-established, then harvest the red maple.
- 4. The alternative is chemical stump treatment.

After the Regen Stage

- 1. Precommercial crop-tree thinning works well. Oak responds well. Watch for epicormics.
- Pine, with pruning, also a good option.
- 2. Commercial thinning (residual 60-80 sq.ft./acre—or more with pine??). Responds well. Watch for epicormics in oak.

3. Mixed stands work well—oaks have large, spreading crowns.

Annual dbh growth (inches, 4-year period) of sapling red oak by crown class and percent release (Ward 1995)

Percent Release	Dominant	Codominant	Intermediate
0-24	.25	.17	.08
25-49	.31	.18	.11
50-74	--	.12	.10
75-100	.37	.29	.20

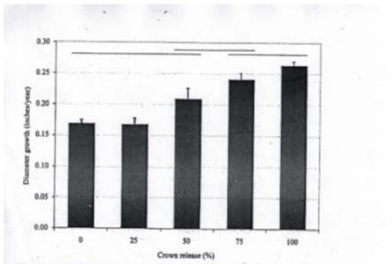


Figure 2. Annual diameter growth (standard error) by amount of crown release in a sawtimber oak crop tree study in southern New England. Release levels linked by horizontal lines above bars were not found significantly different using Tukey's HSD test at the $P < 0.05$.

SUMMARY OF GROWTH RATES AND YIELDS OF COMMON NEW HAMPSHIRE FOREST TYPES

Table 1. Very general growth and volume estimates for sawtimber stands in forest types of New Hampshire. Growth and volumes vary widely depending on site conditions, stand age, management intensity, species composition and stocking. Volume estimates also vary with product specifications, especially for softwood species. For additional information, use the references listed below the table.

Growth Measure	Northern Hardwood	Red Oak	White Pine	Hemlock	Spruce-fir
Annual Basal Area Growth/acre (sq.ft.)	1.0-2.2	1.0-2.5	1.5-3.5	2.0-2.7	2.0-3.0
Annual Board-foot growth/acre	100-275	150-400	300-1,200	150-250	150-250
Annual cubic-foot growth/acre	25-55	30-60	50-90	40-65	40-65
Annual diameter growth (inches)	0.05-0.20	0.10-0.25	0.10-0.40	0.10-0.30	0.10-0.20
Mature* gross standing volume (board feet)	10,000-15,000	5,000-15,000	10,000-50,000	15,000-20,000	15,000-30,000
Mature* gross standing volume (cubic feet)	2,500-4,000	3,000-5,000	6,000-9,000	4,500-5,500	4,000-6,000

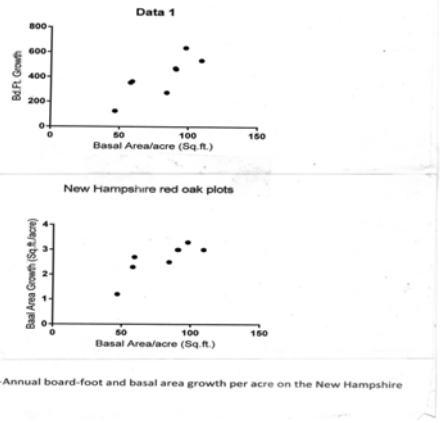


Fig. 5.—Annual board-foot and basal area growth per acre on the New Hampshire plots.

MEF Low –Density Pine Thinning

Treatment	BA	BA GRO	DbhGro/yr
Low	32	1.08	.21
Medium	60	2.74	.25
Control	148	---	.10

What Good is Hemlock?

- 1. Wildlife benefits: deer, hare and those that prey on hare: fisher, bobcat, fox, etc
- 2. Hemlock midstory produces natural pruning in white pine (and probably other species).
- 3. Timbers…

Regenerating Hemlock/Softwood

- Our best luck has been by releasing well-established advance regen.
- Advanced regen often found naturally in group/patch arrangement.
- OR. Use understory harvest with lots of ground disturbance. (Recall how hemlock is found in old understory skid trails!)

WHAT TO DO ABOUT BROWSING!!!

- 1. Herd control.
- 2. Larger cuts or more numerous smaller openings.
- 3. Brush/tops in and surrounding the cut.
- 4. Complete release of advanced regen for rapid height growth.
- 5. Mixed species, sweet birch esp.