

**Silviculture for Non-Foresters:  
Managing a Forest for Multiple Objectives**



Art & science of establishing & tending trees & forests

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**The Purpose of Silviculture**  
*Smith, Larson, Kelty and Ashton. Chapter 1*

In silviculture, natural processes are deliberately guided to produce forests that are more useful than those of nature, and to do so in less time.

- Control stand structure & process
- Control stand composition
- Control stand density
- Restock unproductive areas
- Protection & reduction of losses
- Control rotation length
- Facilitating harvest
- Conservation of site productivity

**Forest Management/ Forest Stewardship**  
Interaction of silviculture, ecology, landowner objectives, multiple resources, economics, marketing, regulation, societies' needs and a landowner's interests and time.

- Markets, plans, laws, harvesting, equipment, landowner, logger, forester, neighbors, trails, access

**Silviculture**  
is the set of site specific tools used in forest management

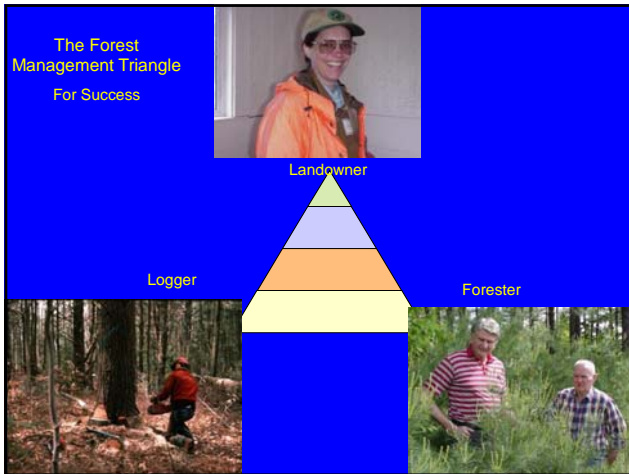
- weeding, thinning, pruning, improving, harvesting, regenerating, uneven-aged, even-aged, selection, shelterwood, clearcut

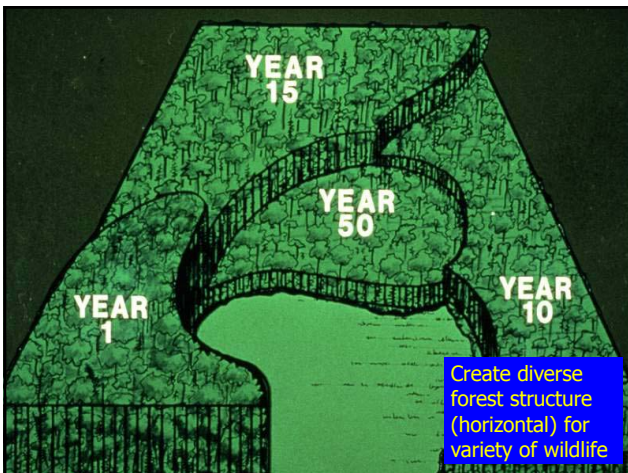
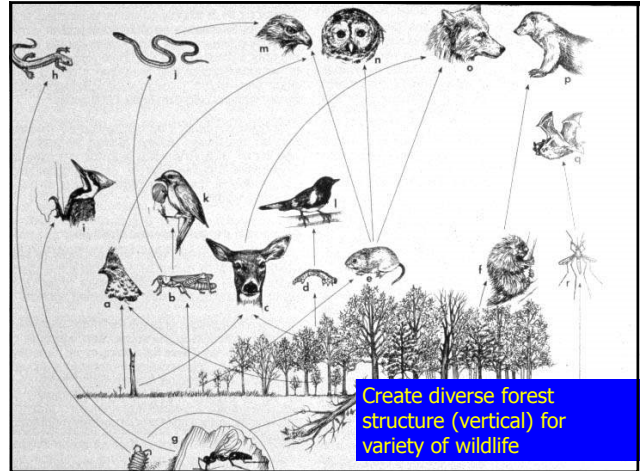
**Hallmarks of Good Forest Stewardship/ Management**

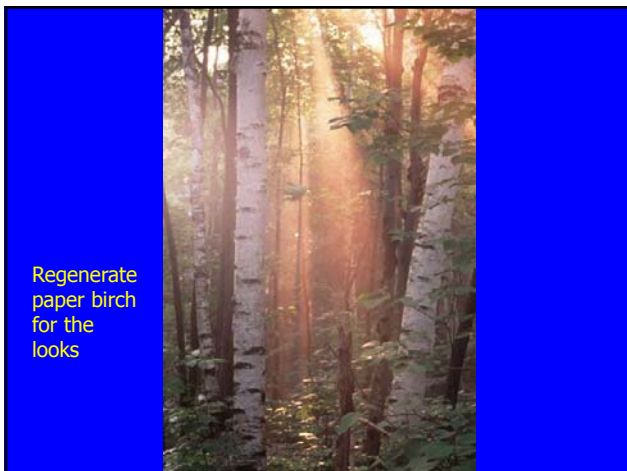
- Considers multiple resources
- Based on landowner objectives
- Uses best available practices
- Practices based on a plan
- Looks long term
- Uses professionals
- Uses best available science- SILVICULTURE



Presented by The Good Forestry in the Granite State Steering Committee







- ### Silviculture Actions Have Two Broad Outcomes
- Grow the trees that are already present
    - tending
  - Start new trees
    - regenerating
  - In practice, often accomplish both outcomes at once
  - Most common actions- cut trees or leave trees

Harvesting is the most common tool for conducting silviculture



Silviculture has limits

- Climate
- Soil/ Site
- Past human use
- Past natural disturbance
- Tree tolerance
- Successional stage and trends



## Succession

- The change in plant communities over time
  - as plants inhabit a site they change it making less suitable for selves more suitable for others
- Changing light conditions—more light to less light
- Soil temperature, nutrient and moisture regimes
- Not a neat path: differs by site, humans and natural disturbance
- As forest change food & shelter change and animal populations change

## Shade Tolerance

Tolerance is the ability of a tree to grow satisfactorily in the shade of another tree.

As a stand succeeds tolerant species replaces intolerant species.



## Tolerant vs. Intolerant

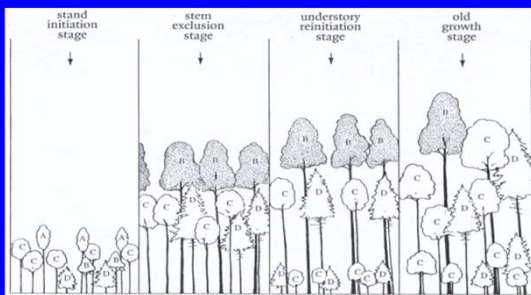
- Intolerant to shade
  - tends not to reproduce under self
  - “sun-loving”
  - tend to be light seeded, wind-dispersed
  - early successional species
- Tolerant to shade
  - reproduce under self
  - tend to be heavier seeded and moved by gravity or animals
  - later successional
- Intermediate

## Softwoods

## Hardwoods

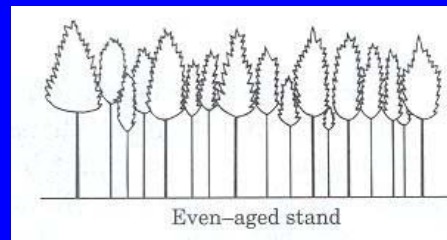
Extremely Tolerant	
balsam fir	American beech
eastern hemlock	sugar maple
Tolerant	
red spruce	white spruce
northern white cedar	red maple
Intermediate	
eastern white pine	white ash
	red oak
	yellow birch
Intolerant	
red pine	paper birch
Extremely Intolerant	
	aspen

## Stands proceed through each stage (unless disturbed)



By harvesting, we can alter stand composition and structure to encourage desired trees and habitat conditions

## Many of Our Stands Are Even-Aged



- Even-aged—trees started at same time after a disturbance
- Some trees in a stand are larger than others they occupied the site, captured the sun, overtopped others
- Crowns larger, diameter larger—yet trees are same age
- Large diameter trees aren't necessarily older—Diameter not a good predictor of age

## QUESTIONS?????

## Intermediate Activities (Tending)

- Release
- Thinning (weeding and thinning, crop tree release)
- Improvement Cutting
- Pruning



## Goal of Intermediate Practices

- Tending the crop
- Provide sunlight to the crown
- Young to "middle age" stands
- Improve the existing stand quality
- Provide money, products such as firewood
- Remove insect/diseased trees
- Limited effect structural diversity
- Regeneration not goal- openings too small to encourage germination and sustain seedling/sapling growth

## Thinning

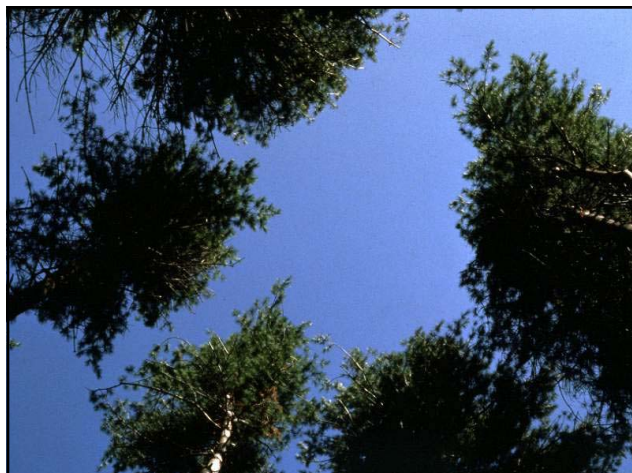
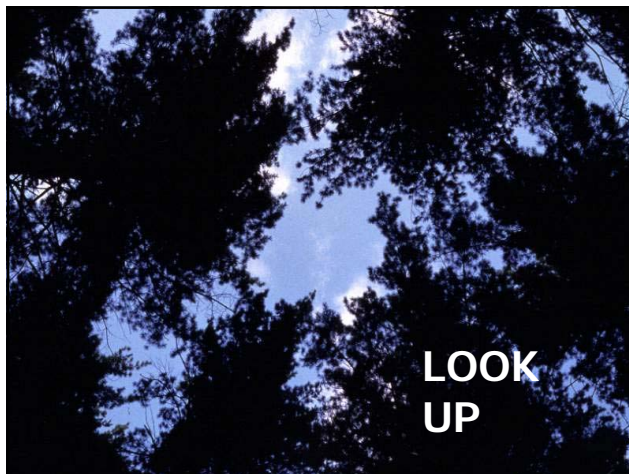
weeding and thinning, tsi or timberstand improvement, fsi or forest stand improvement

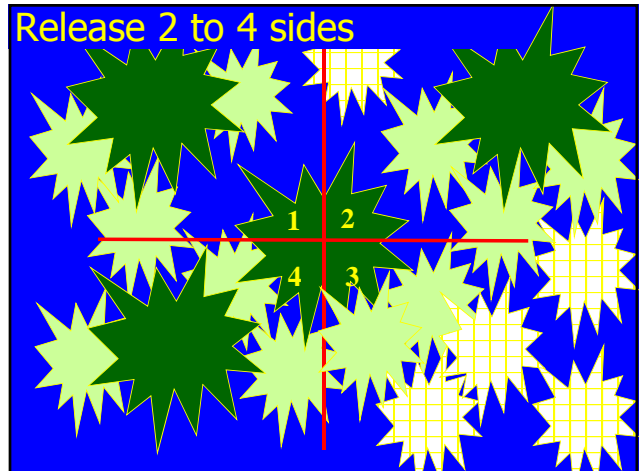
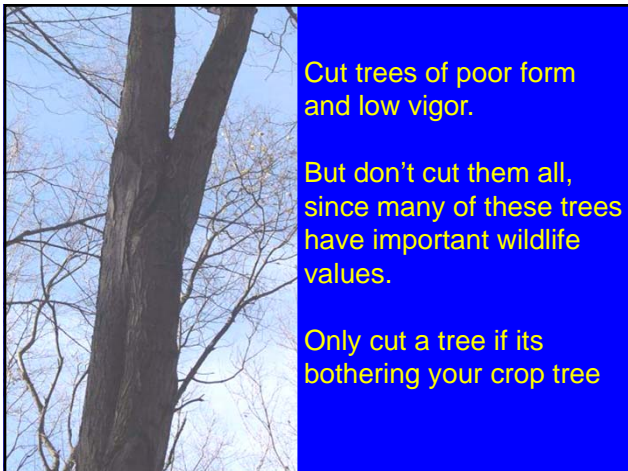
- Increase growth of specific trees (crop trees)
- Remove trees deemed less desirable
- 20-50+ years
- 4-10 inches DBH (pole size)
- 10- 16 inches DBH (small sawlog)
- Product firewood

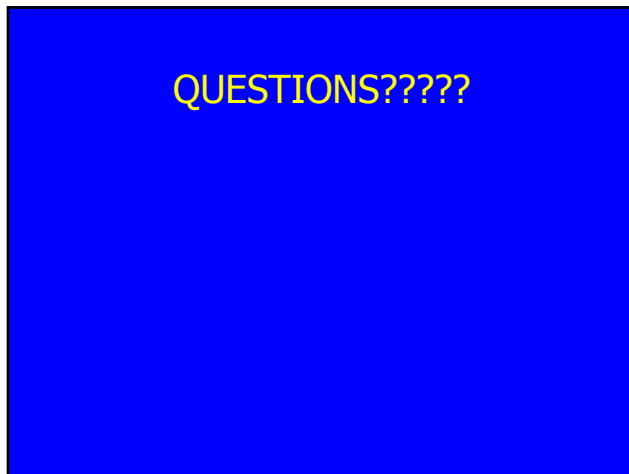


When thinning  
What I do when I choose trees to cut

- Look for the trees I want to grow
  - Species – Most valuable for timber- keep options open to cut for timber in the future
  - Healthy – look up at the top, trees with the largest tops relative to their neighbors
  - Relatively straight, with at least one log before trunk forks (maintains option to cut timber in the future)
- Remove trees touching their top
- Mark the trees to cut (or leave)







### Silvicultural Systems

Regeneration Techniques

<p><b>Uneven-aged</b></p> <ul style="list-style-type: none"> <li>- Single tree selection</li> <li>- Group selection</li> </ul>		<p><b>Less light</b></p> <ul style="list-style-type: none"> <li>- On ground</li> <li>- Tolerant trees</li> </ul>
<p><b>Even-Aged</b></p> <ul style="list-style-type: none"> <li>- Shelterwood</li> <li>- Seed tree</li> <li>- Clearcut</li> </ul>		<p><b>More light</b></p> <ul style="list-style-type: none"> <li>- On ground</li> <li>- Intolerant trees</li> </ul>

**Two age-** from a partial cutting scheme such as shelterwood or group selection. May be temporary.

### Regeneration (seedling or sprouts)

All about manipulating light

Timing of the harvest is important:

- In terms of the life of the stand- and-
- In terms of time of year
- In good seed years

Which silvicultural technique use depends on:

- species present
- species want
- site capability



### Planting after you cut trees?

**In New England- not usual**  
**Most of our forests regenerate rapidly after cutting**



### Sprouts

Most hardwood species stump sprout  
 especially important for regenerating red maple and red oak

Aspen and Beech root sucker/clone


Softwoods do neither and must be regenerated from seed



**Advanced regeneration**  
 -presence of seedlings/saplings  
 -red oak, white pine, red spruce, hemlock, balsam fir, sugar maple

### Scarification

Disturb the soil- not very deep- mix leaf litter with mineral soil  
 To create a seedbed for regeneration  
 Usually during logging  
 Absent snow, drier time of year  
 In the absence of advanced regen  
 In a good seed year  
 White pine, red oak, yellow birch, hemlock



**Remember tree tolerance: Opening size important in determining which species will regenerate.**



Opening size determines amount of light in the opening

**Small Openings**

If want to grow tolerant trees, use system casts less light on the ground

- hemlock
- balsam fir
- beech
- sugar maple

Shade tolerant species



**Larger openings**

If want to grow intolerant trees, use system casts more light on the ground



- birch
- aspens
- white pine
- red oak

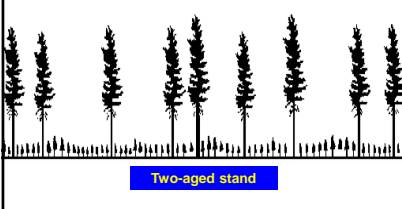
Shade intolerant (and mid-tolerant) species

**Site & Soil Suggest Species to Grow**

• white ash, sugar maple	➔	• moderate well drain & enriched fine texture
• beech	➔	• sandy tills
• red oak	➔	• sandy tills & outwash
• white pine	➔	• outwash & sandy tills
• red spruce, hemlock, balsam fir	➔	• shallow pan, poorly drained, outwash, shallow to bedrock

### Two-aged stands

Seed tree cuts, deferred shelterwoods, shelterwood with reserves, clearcuts with reserves can be considered two-aged stands as long as some of the original overstory trees remain in the stand



Enhances vertical and horizontal diversity

Common practice on private land to retain some of the overstory trees indefinitely for aesthetics, wildlife trees, future woody debris

### Single Tree Selection

Uneven-aged

- At least 3 distinct age classes free to grow
- Achieved by a series of harvests
- Mature and low quality trees cut in all sizes
- Regenerate tolerant species
- Maintains a mature canopy
- Maintains a closed canopy and vertical structure- a wall of green
- Beech, sugar maple, red spruce, balsam fir, hemlock
- Diameter limit cutting not advised

### Diameter Limit Cutting isn't Selection Harvesting

- Choosing trees to cut based primarily on a minimum diameter- cut larger trees
- Smaller diameter trees aren't necessarily younger
- More likely:
  - Less healthy because of genes
  - Never got enough sun to grow
  - Microsite inferior, so tree is smaller
  - Different species that grows slower

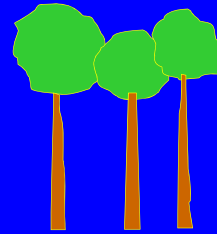


## Group Selection

Uneven-aged

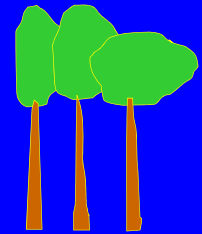
- 1/4 to 1/2 acre groups cut
  - Up to 2 acres
- Can think of approaching patch clearcuts
- For regenerating intermediate tolerant species (red oak, white pine, white ash, yellow birch)
- aspen and paper birch (groups approach 1 acre)

## Group Size Openings



Opening Size  
(diameter of circle)

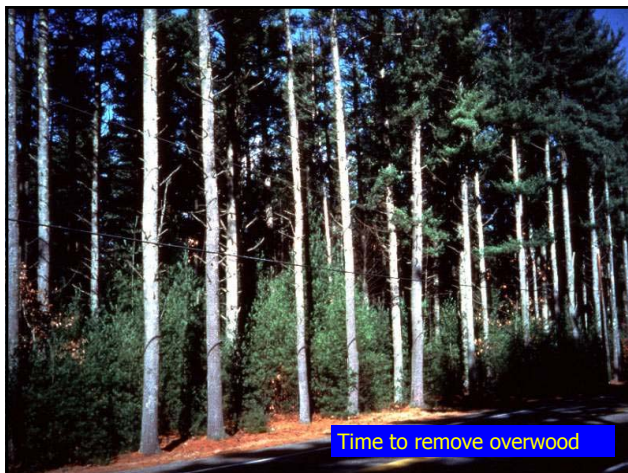
1/20 acre	----52 foot
1/10 acre	----75 foot
1/5 acre	----105 foot
1/4 acre	----117 foot
1/2 acre	----166 foot
2/3 acre	----200 foot
1 acre	----234 foot



## Shelterwood

Even-aged

- Series of harvests to regenerate
- Harvest removes smaller trees, leaving larger trees to provide correct light conditions and seed source
- Cutting can look light to heavy
- Heavier shade regenerates tolerant (red spruce or hemlock)
- Lower amounts of shade regenerates intermediate tolerant (red oak and white pine)
- Cut overstory when understory regenerated- may be in multiple stages





## Seed Tree

Even-aged

- Leave 5-10 desirable trees per acre
- For seed, visual relief
- Good source for future snags and super canopy trees
- May leave these for entire rotation



## Clearcut

Even-aged

- Cut everything 2" and greater
- Size depends on objectives and ownership
- Variations- patches and strips
- Regenerates
  - intolerant (paper birch, cherry, aspen/poplar)
  - intermediate (yellow birch and red oak)
  - tolerant with advanced regeneration

