Silviculture

Art & science of establishing & tending trees & forests

Karen Bennett, karen.bennett@unh.edu
Extension Forestry Professor & Specialist
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University of New Hampshire
Cooperative Extension

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

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

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

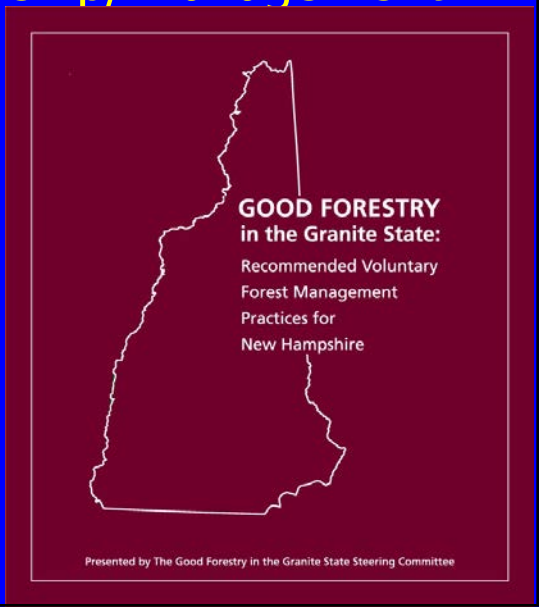
Silviculture

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

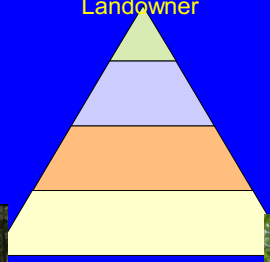
- Considers multiple resources
- Based on landowner objectives
- Uses best available practices
- Practices based on a plan
- Looks long term
- Uses professionals
- Uses best available science- SILVICULTURE



The Forest Management Triangle

For Success

Landowner



Logger

Forester

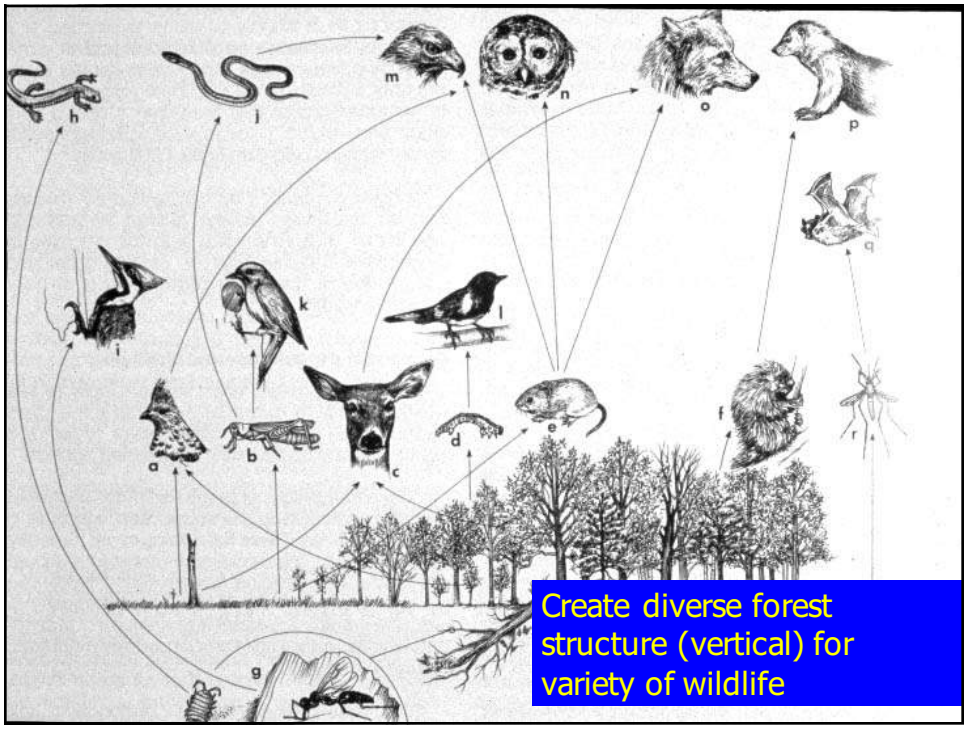
Silviculture can be used to create and maintain the kind of forest meets landowner objectives

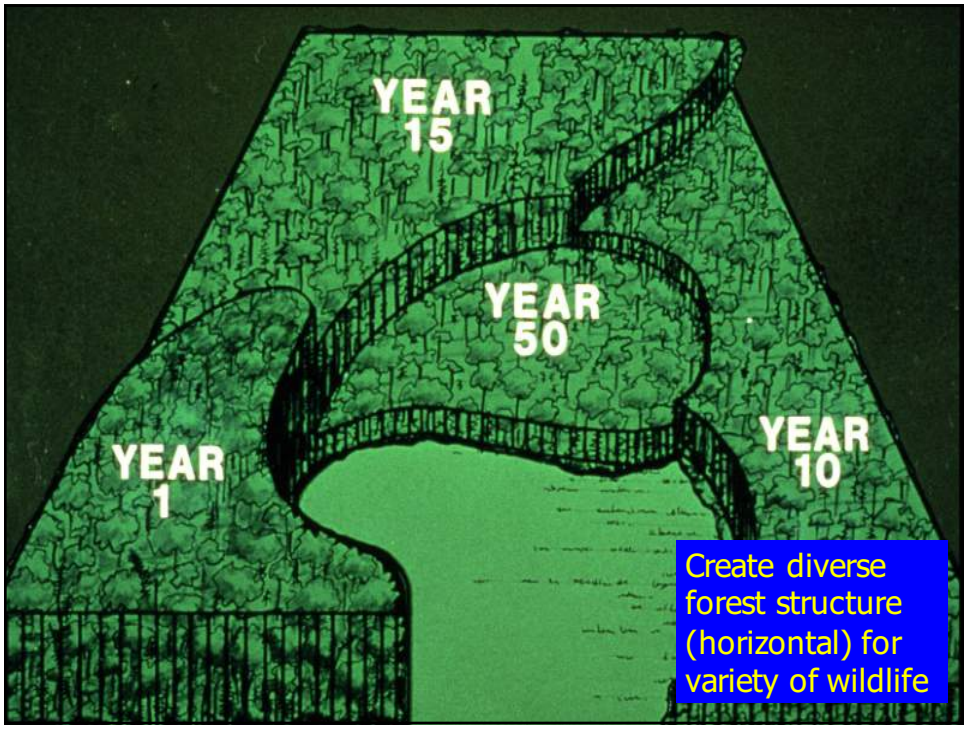
Can be single or multiple objectives


Grow big trees for beauty, wildlife, and timber for money to send the kids to college.


Create standing snags and down woody material


Create temporary wildlife openings


Create diverse forest structure (vertical) for variety of wildlife


YEAR
15
YEAR
50
YEAR
10
YEAR
1
Create diverse forest structure (horizontal) for variety of wildlife


Create Coverts of aspen "popple" for grouse

Grow red oak for hard mast and high quality timber

Develop sugar maples for beauty, snags, seed, and maple syrup

Regenerate paper birch for the looks

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 and disturbance history
- 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.

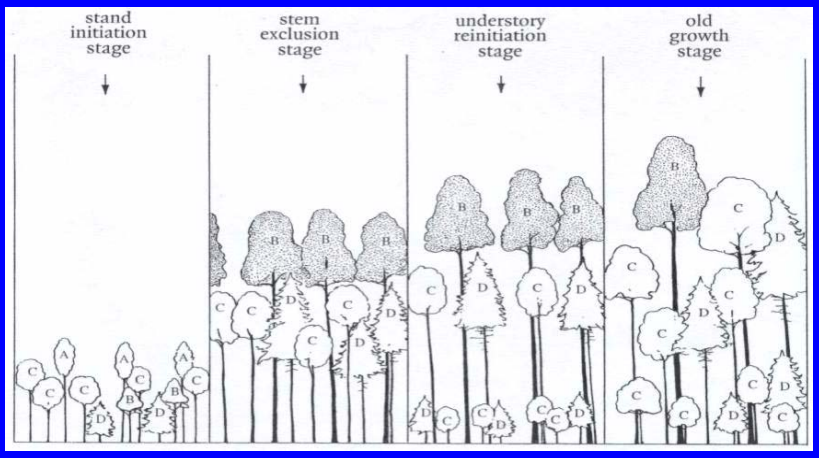
As a stand succeeds tolerant species replace intolerant species.

Tolerant vs. Intolerant

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

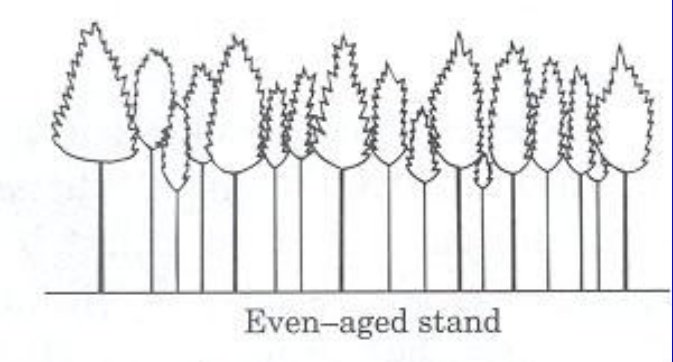
Softwoods	Hardwoods
Extremely Tolerant	
balsam fir	American beech
eastern hemlock	sugar maple
Tolerant	
red spruce, white spruce, northern white cedar	red maple
Intermediate	
eastern white pine	white ash, red oak, yellow birch
Intolerant	
red pine	paper birch
Extremely Intolerant	
	aspen

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

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

Intermediate Activities (Tending)

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

Release

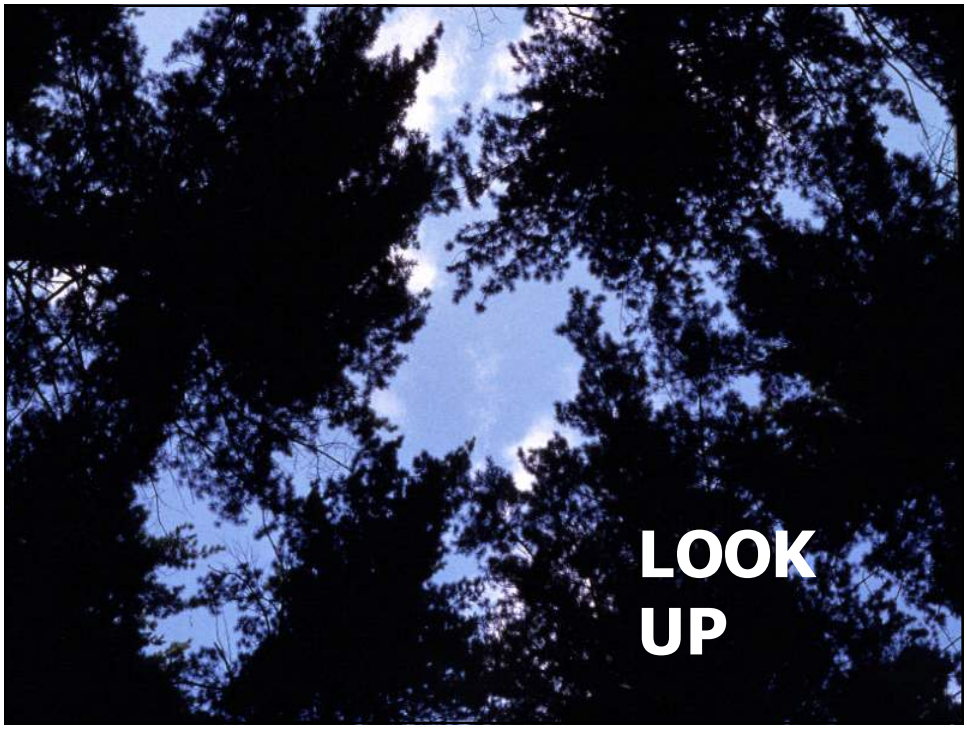
Thinning

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

- 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)
- Firewood, chips, sawlogs

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)


LOOK
UP

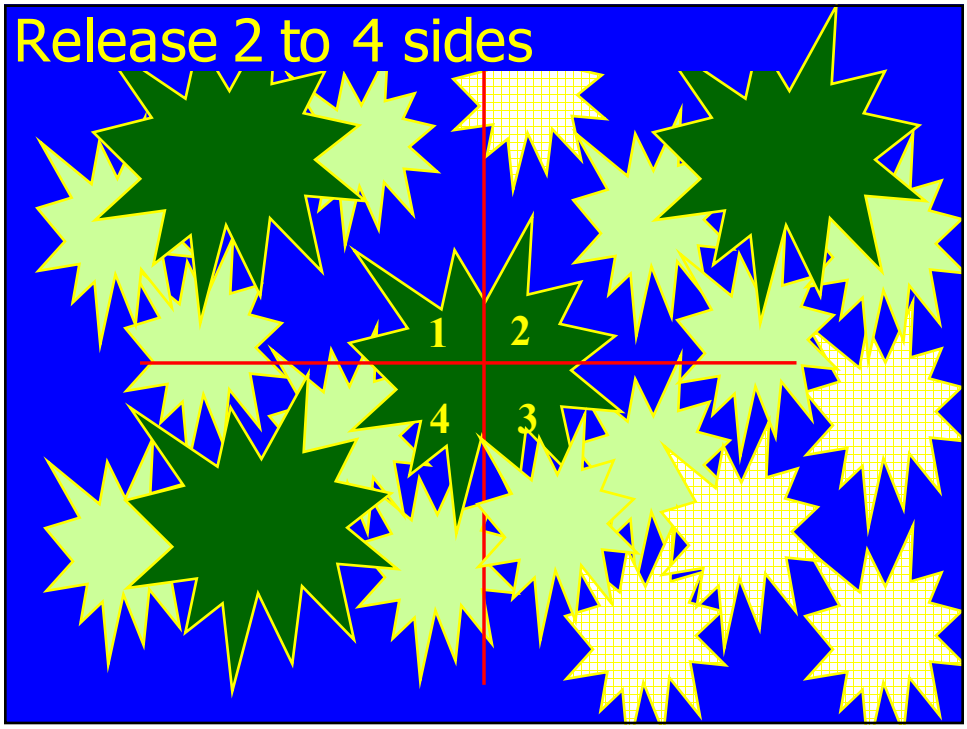
Leave trees with large, healthy tops.

Leave valuable crop trees: timber, mast, aesthetics

Cut trees of poor form and low vigor.

But don't cut them all, since many of these trees have important wildlife values.

Only cut a tree if its bothering your crop tree


Release 2 to 4 sides
1
2
4
3


Crop Trees Left to Grow
Crop Trees Cut
Leave Healthy Trees

Mark Your Trees to Cut and Leave

Regeneration Practices

Silvicultural Systems

Uneven-aged
- Single tree selection
- Group selection

→ **Less light**
- On ground
- Tolerant trees

Even-Aged
- Shelterwood
- Seed tree
- Clearcut

→ **More light**
- On ground
- Intolerant trees

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
- aspen
- white pine
- red oak

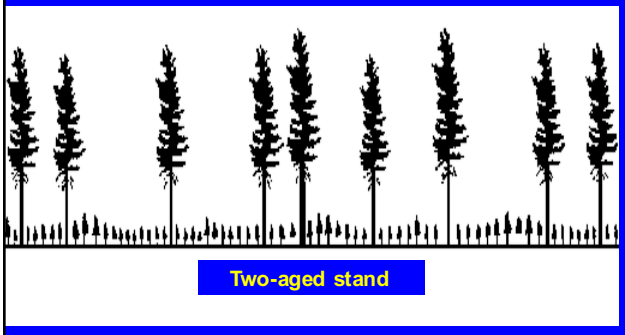
Shade intolerant (and mid-tolerant) species

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 material

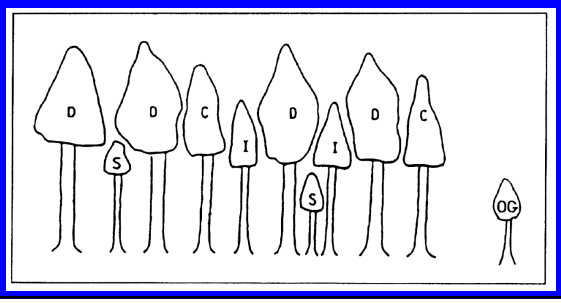
Single Tree Selection

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 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 never got enough sun to grow

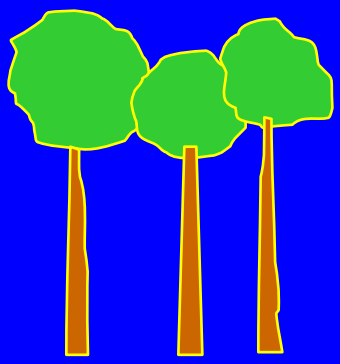


Group Selection

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)
- Better scarification

Group Size Openings



Opening Size

(diameter of circle)

1/20 acre----52 foot

1/10 acre---75 foot

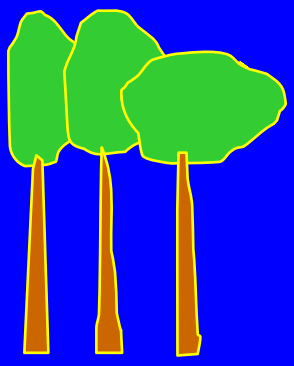
1/5 acre---- 105 foot

1/4 acre----117 foot

1/2 acre----166 foot

2/3 acre----200 foot

1 acre------234 foot



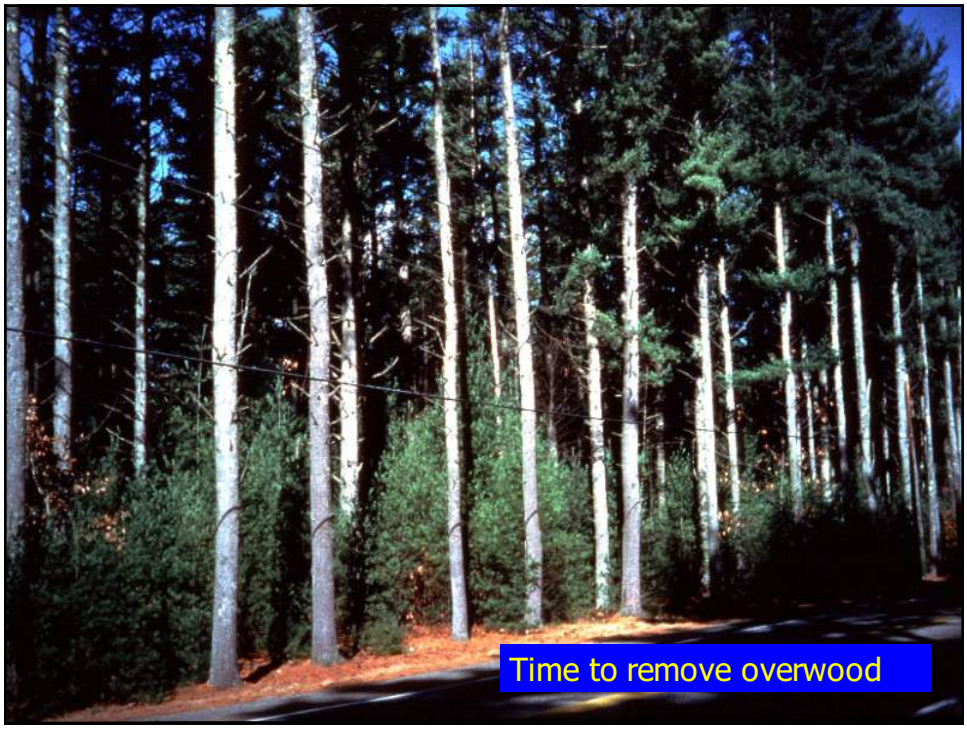
Shelterwood

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 tolerants (red spruce or hemlock)
- Lower amounts of shade regenerates intermediate tolerants (red oak and white pine)
- Cut overstory when understory regenerated- may be in multiple stages


First cut-
- no advanced regeneration
-leave overwood for shade and seed


Sometimes looks like selection- difference is timing of final cut of big trees


Time to remove overwood


Red oak
white pine
red spruce
balsam fir
hemlock

Seed Tree

Even-aged

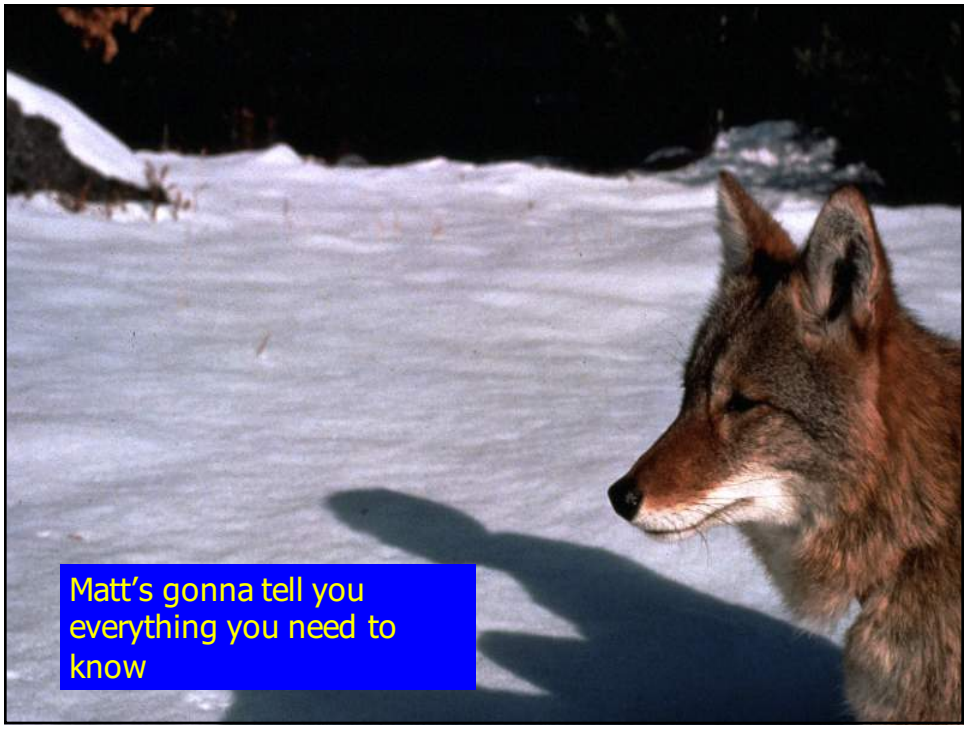
- Leave 5-10 desirable trees per acre
- For seed, visual relief
- Good source for future snags and super canopy trees
- May leave these for entire rotation

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)
  - tolerants with advanced regeneration


Stay tuned for applying these and other techniques to habitat management


Matt's gonna tell you everything you need to know


At least that's what he's been telling me