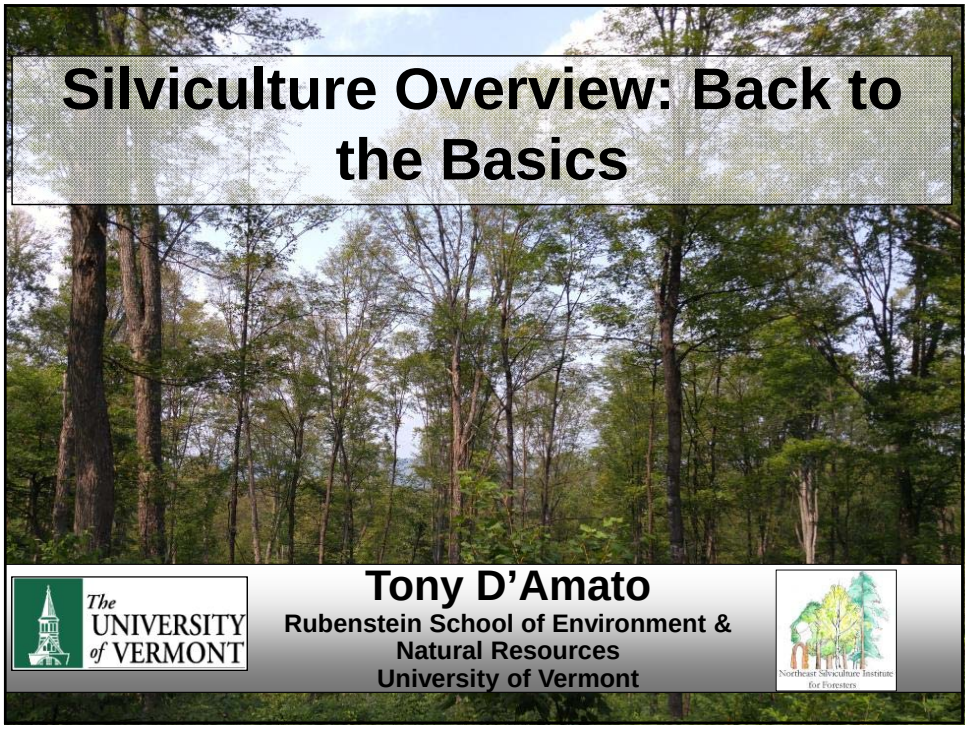
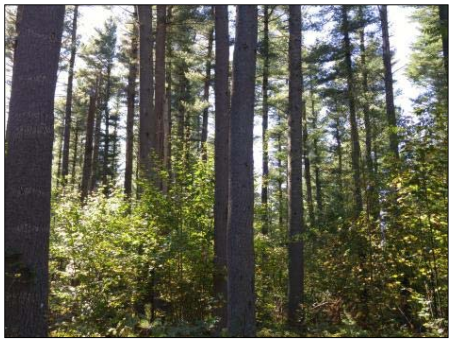


Outline

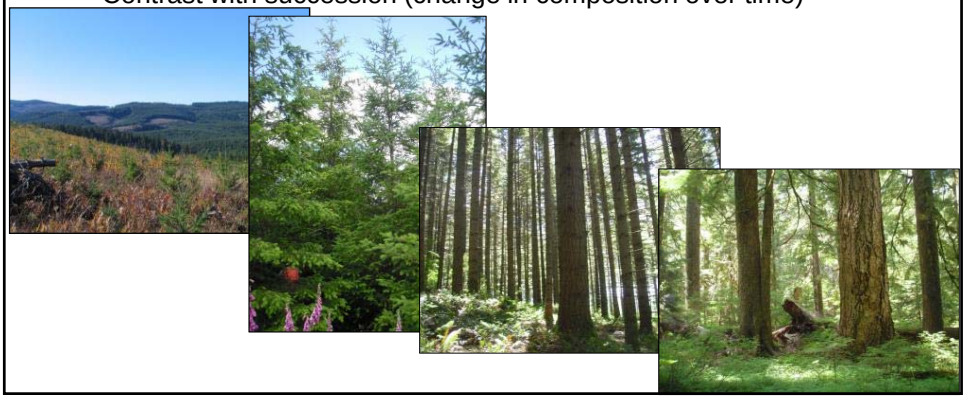
- Discussion of general patterns of stand dynamics for northeastern forests
- Review of common silvicultural treatments and terminology



Forest Stand Dynamics

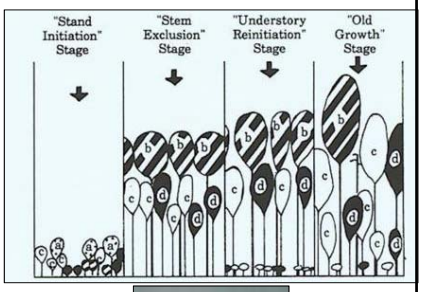
Forest Stand Dynamics

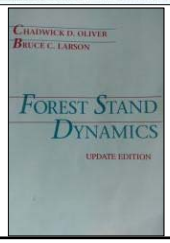
- Stand dynamics-the development of stands through time, including stand structure and stand behavior during and after disturbances
  - Emphasis is on process (e.g., disturbance, recruitment, growth, competition), based on the silvics of individual species and their interactions with their environment
  - Contrast with succession (change in composition over time)



Stages of Forest Development

- Trees of a <u>single age class</u> proceed through a sequence of four recognized developmental stages following stand-replacing disturbance (Oliver 1981; Oliver and Larson 1996)
  - Stand initiation
  - Stem exclusion
  - Understory reinitiation
  - Old growth





Stages of Forest Development

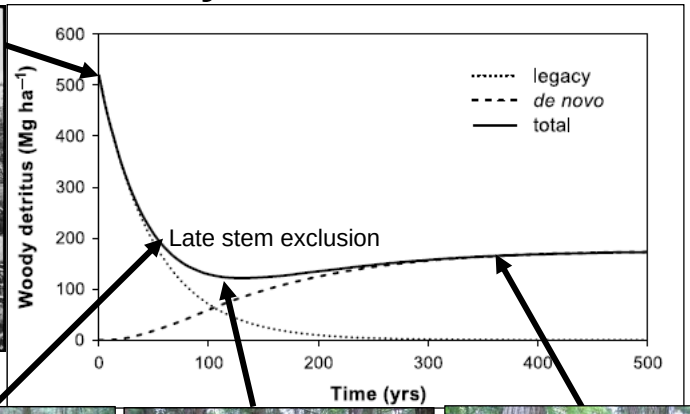
- <u>Stand initiation stage</u>
  - New individuals arrive (or are released) following disturbance
  - Proceeds until site is fully occupied by trees

Stages of Forest Development

- Stem exclusion stage
  - Canopy closure prevents new regeneration
  - Density-dependent mortality (weaker competitors die)
  - Canopy stratification (formation of canopy layers) and crown differentiation (formation of crown classes within layers)

- Lowest level of understory biomass during this stage

Coarse woody debris abundance



Stages of Forest Development

- Understory reinitiation stage
  - Density-independent mortality (death of canopy trees due to disturbance)
  - Redevelopment of advance regeneration, understory veg
  - Maturation of pioneer cohort

Stages of Forest Development

- Old-growth stage
  - Continued density-independent mortality, including large trees, and canopy gap expansion
  - Pioneer cohort loss
  - One or more cohorts developed in reinitiation stage are now in canopy


Stages of Forest Development

- Old-growth stage
  - Not to be confused with "virgin" forest or structural definitions of old growth

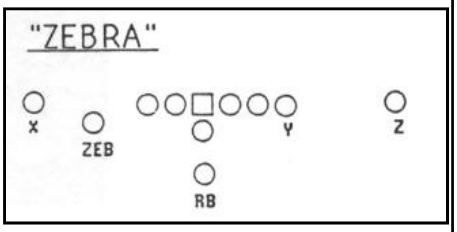

Stages of Forest Development

- Depending on management objectives, we may strive to perpetuate a given developmental stage

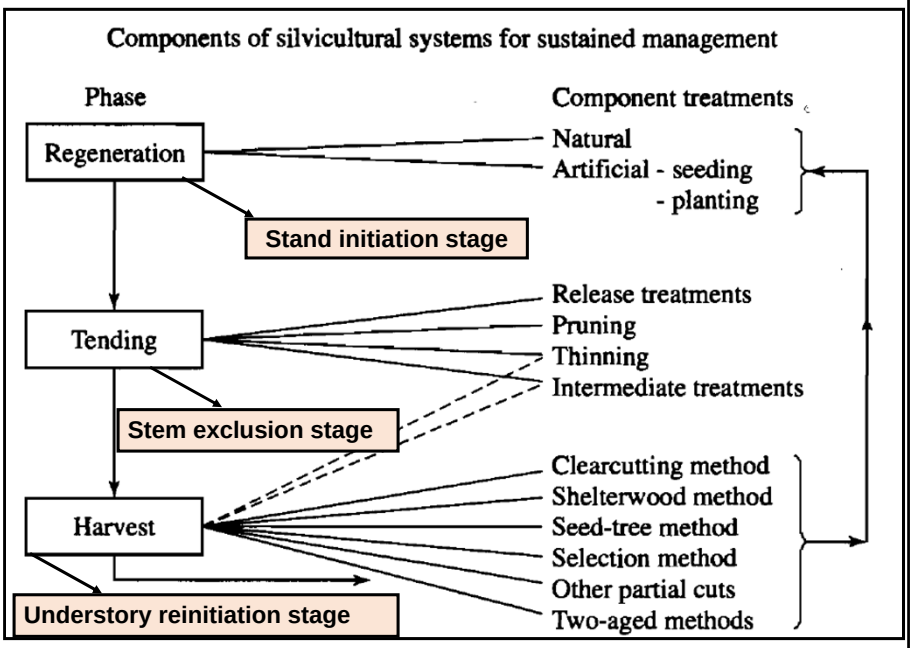
Review of Silviculture Terminology

Speaking a common language

- **<u>One RB, 1 TE, 3 WR</u>**
- 1997 Packers playbook
  - "Zebra"
- 1998 Vikings playbook
  - "Dot Left"
- 2004 Patriots playbook
  - "Zero Out Slot"



- Differences in naming were to maximize confusion from other teams/players
  - We want the opposite effect when communicating forest management decisions



From Nyland (1996)

Silvicultural systems

- Even-aged silvicultural system-a planned sequence of treatments designed to create or maintain a stand with predominantly one age class
- Two-aged silvicultural system-designed to create or maintain a stand with two age classes
- Uneven-aged silvicultural system-designed to create or maintain a stand with three or more age classes



"The silvicultural system is logically based on a **working hypothesis** and is altered as it becomes necessary to change the hypothesis." D.M. Smith 7th Edition (1962)

Even-aged regeneration methods

- Even-aged methods-entire community of mature trees is removed in one or more cuttings over a short interval of time to allocate growing space to a new, even-aged cohort
  - Even-aged=trees are within 20% of a given age relative to rotation length

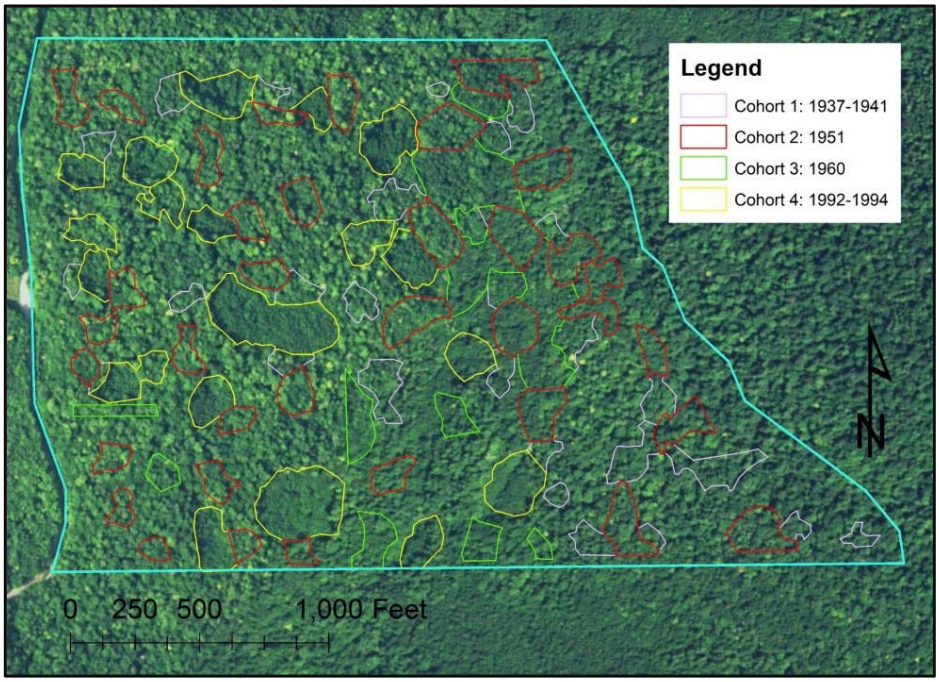

What is a patch cut?

Talk to your neighbor and share each other's opinion/definition of what a "patch cut" is?

What is a patch cut?

- **Patch clearcutting**: removal of all stems in small patches, usually 2-15 acres in size
  - Management unit or stand in which regeneration, growth, and yield are regulated consists of the individual clearcut stand
- **Patch selection (New England):** all trees, including advance regeneration, felled in small, fixed-size patches (0.2-2 acre)
  - Patches created over time within management unit (i.e., small-scale area regulation within uneven-aged stand)
- **Patch selection (outside New England)**–combination of single-tree and group selection methods in same management unit (larger groups for midtolerants)





Even-aged regeneration methods

- Clearcutting method-removal of entire stand in one cutting
  - Regeneration occurs after harvest from natural or artificial sources
    - Block (large, uniform areas), patch, strip

Even-aged regeneration methods

- Seed-tree method-removal of entire stand in one cutting, except for a small number of seed trees left singly or in small groups
  - Seed trees provide for establishment of advance regeneration
- Shelterwood method-removal of entire stand in a series of cuttings extending over a relatively short portion of the rotation
  - Encourages establishment of cohort of advance regeneration under partial shelter of overwood

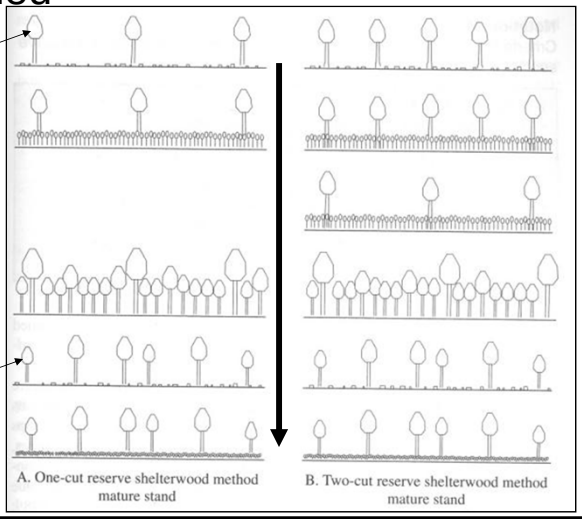

Two-aged regeneration methods

- Two-aged methods-methods in which widely spaced vigorous reserve trees are left singly or in groups to grow over a younger age-class for an extended number of years (> 20% of the new rotation)
  - Left for timber, wildlife, aesthetic, or biodiversity objectives
  - "with reserves" added to even-aged approaches
    - Clearcutting *with reserves*, shelterwood *with reserves*, seed-tree *with reserves*, coppice *with standards*


Irregular shelterwoods

Irregular shelterwoods

- Shelterwood system in which only a portion of the overwood is removed once the new age class is established



Irregular shelterwoods

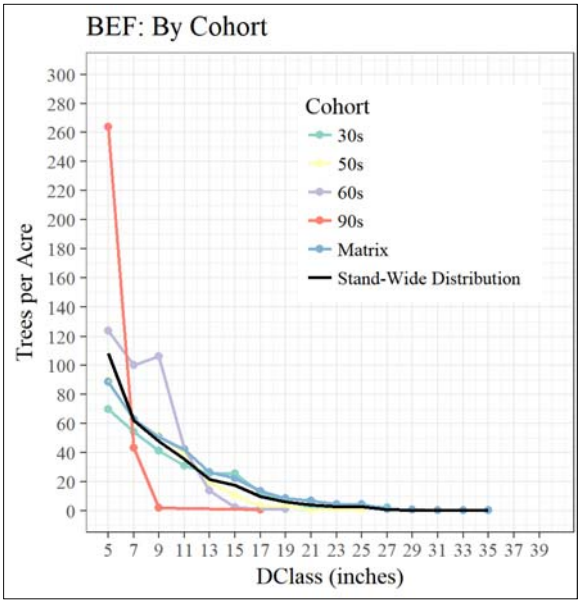
- "Irregular" refers to stands in which distribution of age classes is unbalanced
  - Irregular heights and spatial arrangement of trees
  - "Irregular" flow of harvested materials



Uneven-aged regeneration methods

- Uneven-aged methods-regenerate and maintain multi-aged structure by removing some mature trees at relatively short intervals to allocate space to new age classes
  - Methods seeking "balanced" structure
    - Single-tree selection-individual trees of all size classes removed more-or-less uniformly throughout stand to achieve desired stand structural characteristics
    - Group selection-trees are removed, and new age classes are established, in small groups. Maximum width is approximately twice height of mature trees
    - Patch selection (both definitions!)


DBH distribution across ~170 acres treated with patch selection since 1930s (46% of area regenerated)



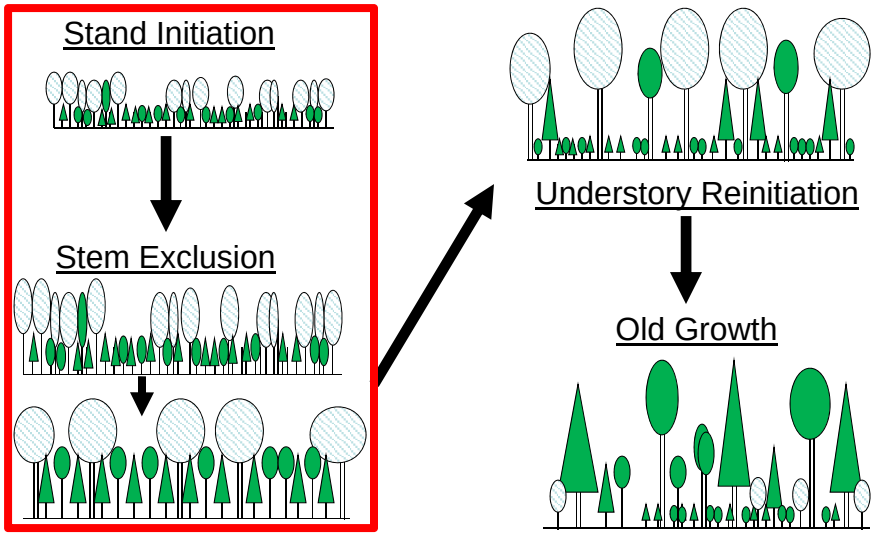
Intermediate Treatments

Intermediate Treatments

- Treatments applied to improve the existing stand, regulate its growth, and provide for early financial returns, ***without any effort directed at regeneration.***

Where do intermediate treatments fit in?

Stand Developmental Stages (Oliver and Larson 1996)



Intermediate treatments work with what is in stand in terms of species/stems following initiation (i.e., they do not deliberately encourage new regeneration)

Release Treatments

- Release treatments: freeing young desirable tre species not past **sapling** (5 inches DBH) stage from undesirable competing/overtopping vegetation

Types of Release Treatments

- Weeding: applied during seedling stage (up to 1 inch DBH) to eliminate or suppress mainly herbaceous plants or shrubs before they overtop or interfere with desired trees

Types of Release Treatments

- Cleaning: treatment applied during the sapling stage to free selected trees of better species and quality from overtopping trees of comparable age


Cleaning does not need to be complete

What's the difference between cleaning and pre-commercial thinning?


Pre-commercial thinning removes poorer formed and smaller trees to favor better formed, larger trees of the same species (generally dictated by desired spacing). Cleaning removes overtopping trees of a different species to favor the crop species of interest.

Thinning Treatments

Thinning methods

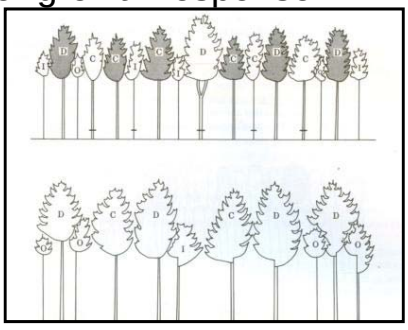
- Defined based on how individual trees are chosen for removal
  - Low, crown, dominant-crown classes removed/favored
  - Row (geometric)-spacing w/o regard for crown position or quality

Thinning methods

- Low (thinning from below)-Favors dominants and codominants through the removal of lower crown classes
  - Emulates natural development process
  - Easiest to mark, but hardest to sell
  - Lowest impact on residual tree growth

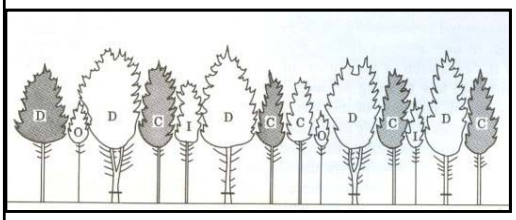

Thinning methods

- Crown (thinning from above, high)-Favor dominants and codominants by removing other dominants and codominants
  - Favoring best quality crop trees in stand
    - ~50 per acre in mature stands (100-200 in young)
  - Intentionally make holes in canopy around crop trees
    - Minimum of three sides for growth response

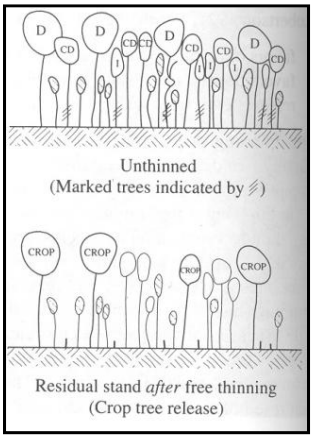
Thinning methods

- Dominant (selection thinning)-Removal of trees in dominant crown classes to favor lower crown classes
  - Relies on smaller trees to respond to open growing conditions (risk of windthrow, thinning shock)
  - Most appropriate as first thinning entry in stratified stands with shorter-lived dominant species (e.g., birch and aspen over northern hardwoods)



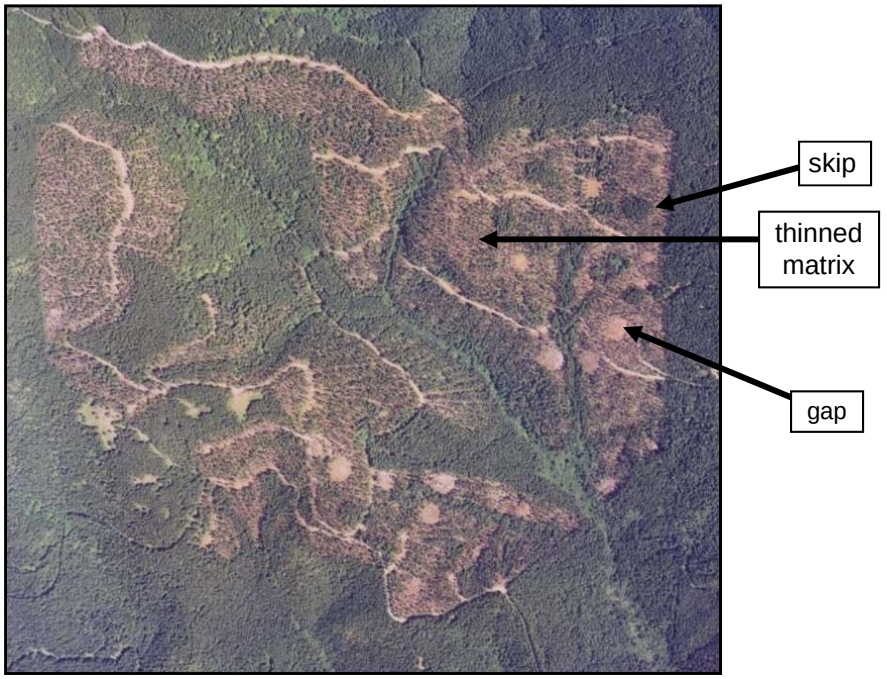
Thinning methods

- Free thinning-Application of combination of thinning methods in stand
  - Thin to improve stand structure in irregular stand
  - Favor best crop trees across crown classes



Muddying the Water

- Variable Density Thinning-thinning intensity and tree marking rules are varied within stand of interest to increase heterogeneity in density and canopy cover
  - Often called “thinning with skips-and-gaps”
    - Portions of stand left lightly or completely unthinned (“skips”)
    - Gaps created in other portions to encourage understory development ("gaps")
    - Remaining matrix is often thinned to intermediate levels (e.g., 60-70% stocking)



Final Point

- Silvicultural systems are an expression of your collective creativity in meeting a desired future condition
- Well-defined approaches exist; however, these methods should be applied with flexibility and creativity to meet ever-evolving objectives and circumstances
  - "Existing procedures should be constantly examined to determine whether they have outlived their time or become inconsistent with new information." (D.M. Smith 1962)