SILVICULTURE OF PURE, DOUBLE-COHORT STANDS

ESRM 323

Smith, et al. Chpt. 13, 14

DOUBLE-COHORT PURE STANDS

- Why?
  - Enhances scenic values; tempers visual impact of deliberate regeneration
  - Maintains essential habitat for certain plant (mainly non-tree) and animal species
  - Allows a portion of stand to grow to larger diameters for specialty purposes or products
  - May address special ecological or social needs consistent with management objectives

DOUBLE-COHORT PURE STANDS

- High-forest Methods
  - *Seed-tree Method*
  - *Shelterwood Method*
- Coppice-forest Method
  - *Coppice-with-standards System*

HIGH-FOREST METHODS

- *Seed-tree method* ➔ seed source
  - ✓ Removing most mature trees in one cut, to establish a new stand in which widely spaced residual trees serve as seed source (conceptual, not a set number of TPA)
- *Shelterwood method* ➔ seed source & shelter
  - ✓ Removing mature trees in two or more cuttings to establish a new stand under the protection of the older 'overwood'

Steps involved (some common):

1. Preparatory treatments
2. Establishment of seedlings cutting(s)
3. Removal cutting(s)

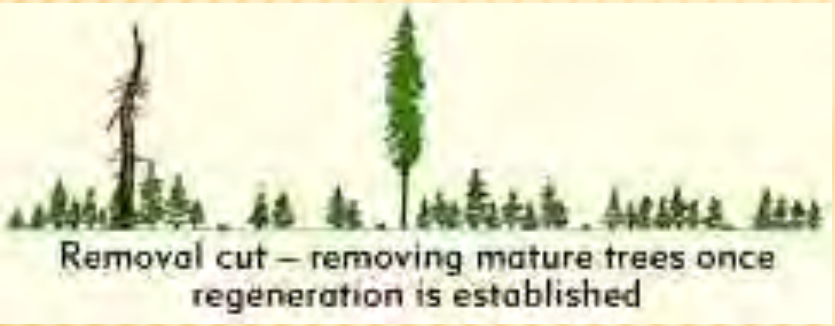
SEED TREE & SHELTERWOOD METHODS

Seed Tree method :-

-: Shelterwood method

SEEDTREE / SHELTERWOOD– STEPS

- *Shelterwood method* ➔ seed source & shelter



SEEDTREE / SHELTERWOOD– STEPS

Steps involved:

1. Preparatory treatments: sets the stage for regeneration
   a. Thinning conducted to improve the vigor and strength of the trees chosen to remain
   b. Preparation of the site (accelerate litter decomposition) and control of competing vegetation
   c. May fertilize seed trees prior to cutting
   d. *Seed-tree* method typically forgoes this step

SEEDTREE / SHELTERWOOD– STEPS

Steps involved:

2. Establishment of seedlings cutting(s): induce the establishment of seedlings; associated with site preparation treatments
   a. Characteristics of reserved trees
      - Dominant crown classes – wide and deep crowns, large crown ratios
      - Tapering boles (wind firmness, vigor, health)
      - Maturity
      - Good trees (dominants, straight, cone producers) vs. small or wildlife trees (fewer commercial values)

SEEDTREE / SHELTERWOOD – SEEDLING ESTAB.

2. Establishment of seedlings cutting:

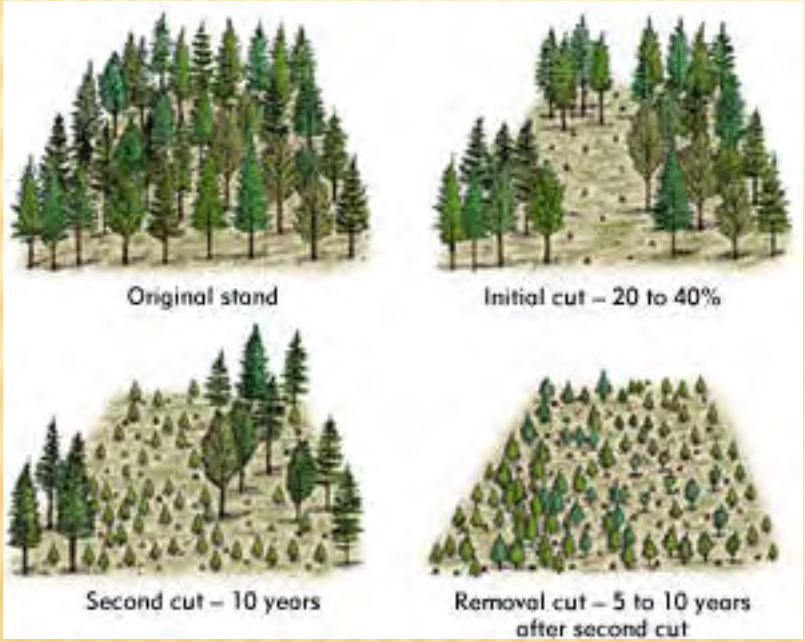
SEEDTREE / SHELTERWOOD – SEEDLING ESTAB.

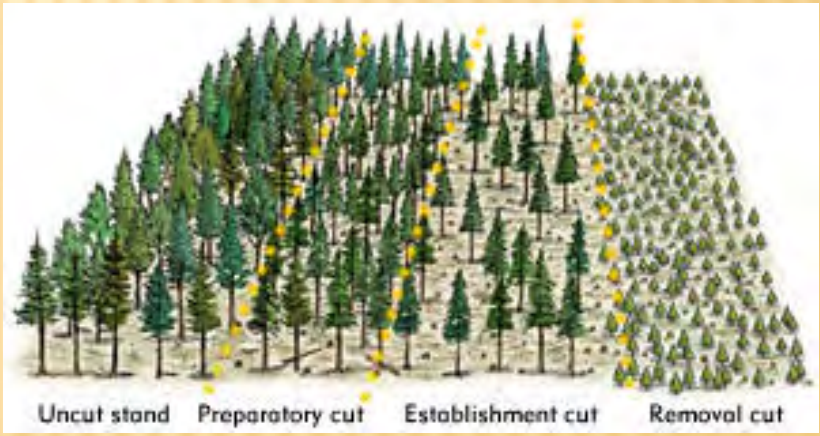
Steps involved:

2. Establishment of seedlings cutting(s) (cont.)
   b. Arrangement, number and distribution:
      - Knowledge of species
      - Seed production and dispersal
      - Isolated, uniform distribution of trees vs. groups, strips or rows
        - Protection to seedlings
        - Ease of harvesting
        - Increase cross-pollination
      - Seed-tree method (seed production/tree, prospective survival, number of sees required to establish the new stand) – intense genetic selection of parent trees

SEEDTREE / SHELTERWOOD – SEEDLING ESTAB.

2. Establishment of seedlings cutting:
   b. Arrangement, number and distribution:





SEEDTREE / SHELTERWOOD – SEEDLING ESTAB.

Steps involved:

2. Establishment of seedlings cuttings (cont.)
   c. Sporadic nature of seed crops
      - Cyclical nature of seed production (reserve enough seed to restock future stands)
   d. Severity of cutting
      - Adjusted to create the range of environmental conditions required (moisture, avoidance of heat injury, species' tolerances, undesirable species)
        - Desired seedling stocking required
        - Estimate seed losses prior to germination
        - Estimate survival rate
        - Total seeds needed fixes number of trees to leave

SEEDTREE / SHELTERWOOD – STEPS

Steps involved:

3. Removal cutting(s): release the established seedlings, make best use of remaining old trees (profit)
   a. *Seed-tree method*: final cutting
   b. *Shelterwood*: multiple cuttings with the objective of gradually filling the growing space and preventing the establishment of undesirable species

SEEDTREE / SHELTERWOOD – REMOVAL CUT

- *When???*
  - Watch for signs of poor seedling growth; unhealthy foliage, bending aside toward the light, lowered height growth rates, etc.
  - If natural regeneration from advanced growth is too dense, may choose to delay removal cutting until sapling heights differentiate.

SEEDTREE / SHELTERWOOD – concluding …

Variations in spatial patterns of stand structure

- Both natural (regenerative disturbances) and artificial spatial arrangement can cause different spatial patterns:
  - Groups, patches, strips, wedges, regular and irregular shapes
- If time intervals among regeneration events are short, stands are regarded as single-cohort; however if these intervals are longer we may develop multi-cohort stands.
- Think about seed tree and shelterwood methods conceptually rather than as strict spatial arrangements

SEEDTREE / SHELTERWOOD – SUMMARY

- *Seed-tree method* ➔ wind-disseminated species naturally adapted to become established after fires, provided that site preparation exists (attempted w/red pine, Douglas-fir, southern pines)

- *Shelterwood method* ➔ more variants and wider applications; species that have rapid height growth ***after*** highly developed deep root systems (preferred for red pine, best trees retained longer for growth to optimum size & quality)

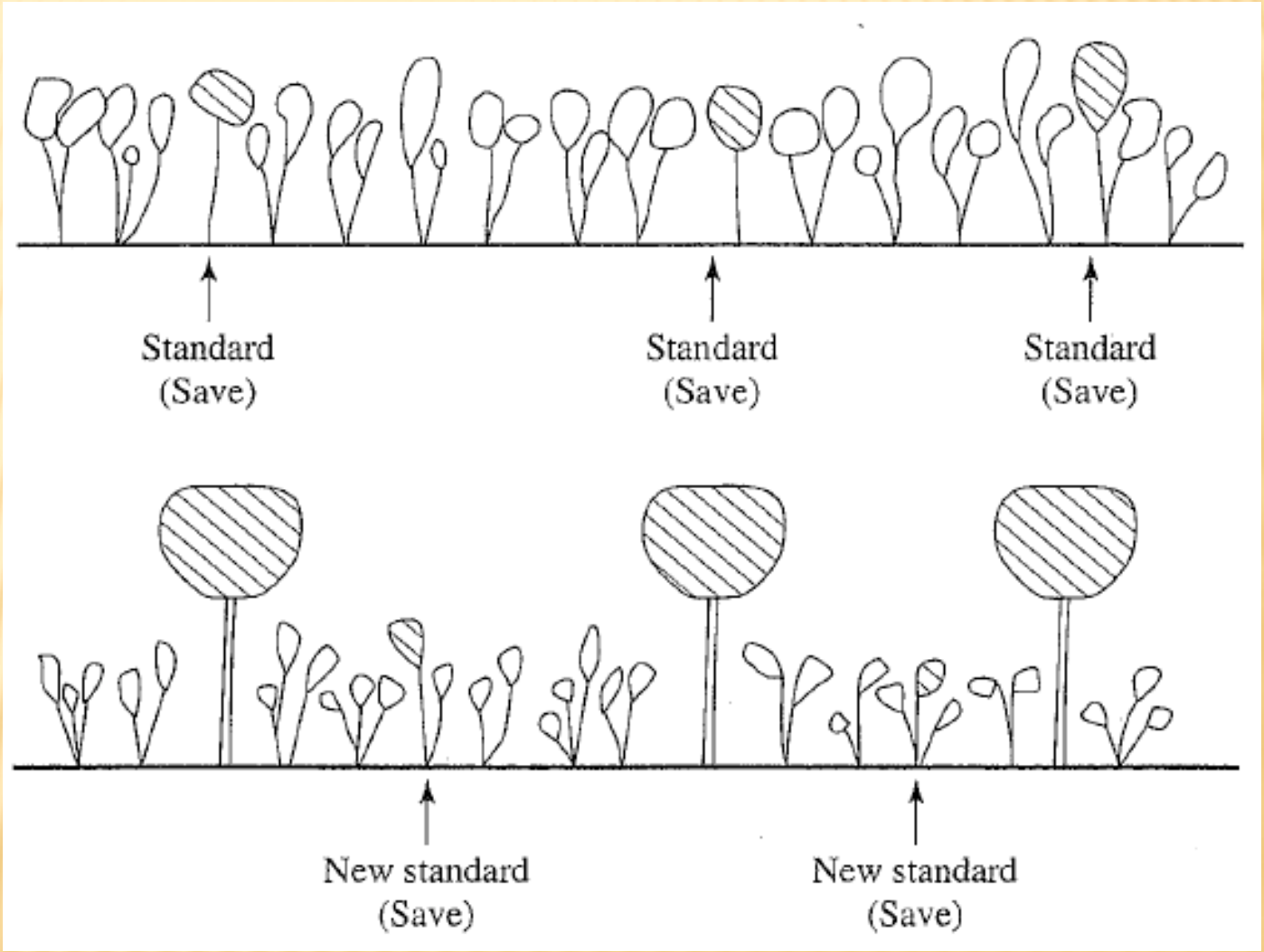
- Both methods aimed primarily at natural regeneration but can substitute or mix in artificial regeneration (artificial seeding, planting)

COPPICE-WITH-STANDARDS METHOD

- Small numbers of widely-spaced trees, or *standards*, are retained over sprouted stands for one or more rotations – may enhance recreational uses, maintain habitat, etc.
- Standards are frequently diff. species than coppiced stand, but can be same
- Standards can originate from seed or be recruited gradually from thinning sprouted clumps repeatedly

COPPICE-WITH-STANDARDS METHOD

- Recruiting standards from the coppice



COPPICE-WITH-STANDARDS METHOD

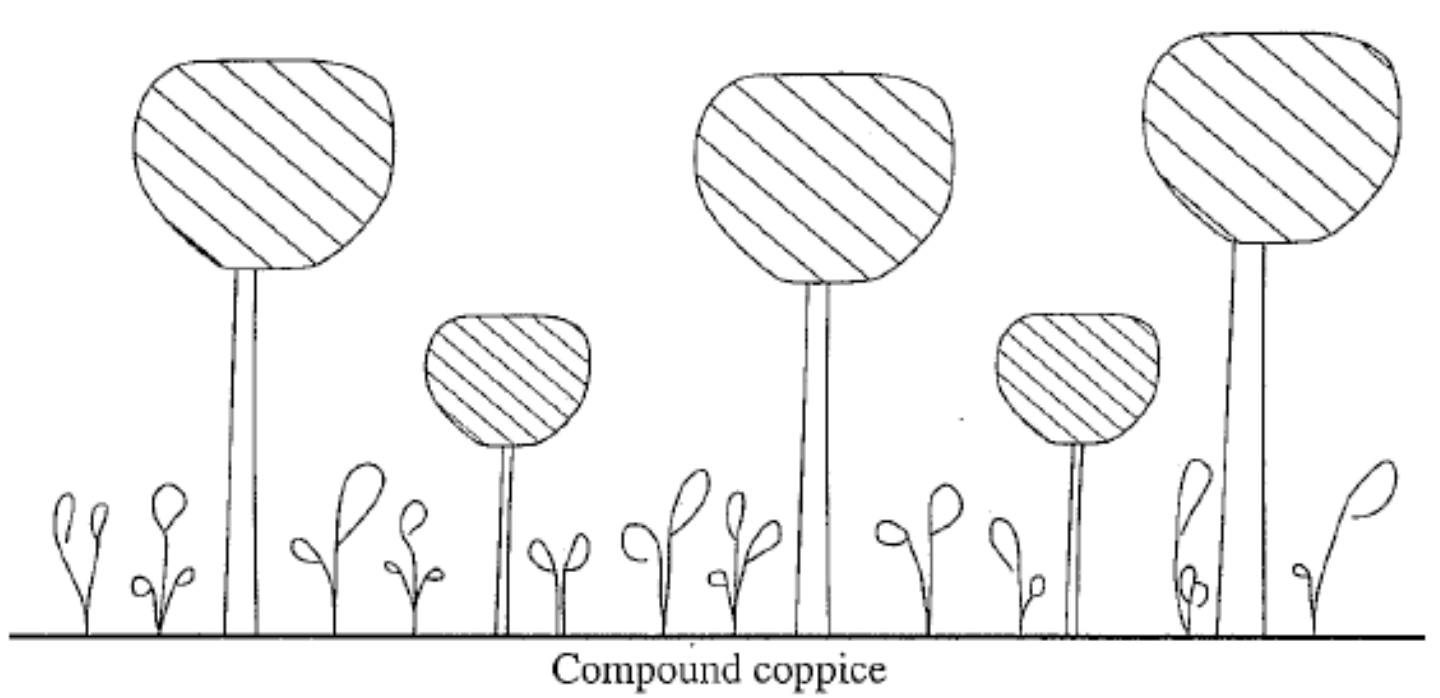
- Standards recruited from sprouts or seedling origin may have to undergo a cleaning to bring them up through rapidly growing shoots
- Intolerant species are usually favored for the standards
- Removal of the coppice may shed enough light on boles of standards to stimulate epicormic branching (depending on spp.)

COPPICE-WITH-STANDARDS METHOD

- Stumps of harvested standards may be too large to coppice – plant or recruit potential standards from smaller coppice
- Standards can serve as parents of seedlings to renew coppice growth periodically to make the system sustainable
- Standards can be species that cannot be coppiced, such as conifers, or those prone to early decay
- Reserving some standards over several coppice rotations results in the *compound coppice system*

COPPICE-WITH-STANDARDS METHOD

- Leaving standards for > 1 rotation, continual recruitment of new standards



COPPICE-WITH-STANDARDS – SUMMARY

- Advantages
  - Yields material of diff. sizes, larger trees have high value
  - Provides regular, freq. returns, ensuring periodic revenues from *each* stand
  - Dense coppice between standards prevents undesired species from gaining occupancy
  - Standards grow and increase in value at above avg. rates
  - Standards produce viable seed, allowing seed-origin stand
  - Standards enhance appearance of stand
  - More diverse array of species, age classes, and habitats

COPPICE-WITH-STANDARDS – SUMMARY

- Disadvantages
  - Complex: need to balance growing space between coppice and standards
  - Dense coppice obscures crowns of standards, making marking difficult
  - Shading may prevent intolerant species from entering coppice
  - If standards too widely spaced / exposed – risk of windthrow
  - Young trees slated for new standards need release (cleaning)
  - Branches on standards may tend to become too large / heavy if left alone – may need to prune them