Shelterwood Method

**PPT Slide # (in red)**

1-2 Characteristics

A. Form --- Results in an even-aged stand and even-aged management, just like seed tree ands clearcut

B. Appearance --- Removal of mature crop in a series of partial cuttings, which could stimulate seed production (maybe), prepare the site for regeneration, and provide additional sunlight for regeneration. Simulates what happens in nature when old stands break up. However, the long time period would essentially make it an irregular un-even-aged stand, but under intensive management, the overstory is removed fast enough that even-aged stands result.

C. Versatility --- Extremely versatile as far as use with different species and under different conditions. Why? Wide range of environmental (primarily light) conditions can be created. Not only creating environment for regeneration, but also how long overhead remains on the areas for protection

D. Relation to Other Methods --- As opposed to clearcutting and seed tree method, the final harvest cut follows the establishment of regeneration rather than precedes it.

E. Protection of the site --- Compared to other even-aged methods, it gives protection to the site at all times since regeneration occurs under older trees before they are removed ---- continuous protection

F. Quality Growth --- Can get additional quality growth on trees left in the overstory for a few years. Can also be detrimental as trees can degrade too ---- example ---- white oak --- epicormics

3-4 Details of the Method ----

Treatments applied uniformly over the whole stand. The objective of the method is to secure establishment of a new stand, but Shelterwood provides protection for the young seedlings and with some species, this is a necessity. At some stage, the older trees start to interfere with growth of the new stand and must be removed. So in talking about the details of the method,
we are really describing sequences of harvest cuts used to secure regeneration, prepare the site, and then release the seedlings.

5-6 Cutting Sequence

1. Preparatory Cut ---- Designed to prepare the site to increase seed production, which may be marginal. Primarily prepare the site by speeding up decomposition of the humus layer

   Normally this type of cutting is not needed and not employed unless stand has been badly neglected. Fairly ineffective way to prepare the site, particularly if there is a heavy brush problem. Site prep techniques such as prescribed burning, herbicides and disking is more effective.

2. Seed Cutting --- Normally the first cutting used to initiate a shelterwood. Designed to open up the stand and create space for reproduction. Poorest trees are removed leaving the best for seed trees and to increase growth on overstory trees. Similar to a heavy thinning, but the reproduction would die if removal cuttings are not made later.

   Accomplished in one operation by removing 25 to 75% of the stand volume depending on species. This is the wide range of light environments that we talked about earlier. If working with a tolerant species, you would stay closer to 25%, if an intolerant species ranging toward 75% removal.

   Cutting usually done during a good seed year.

3. Removal Cutting --- 2 purposes ----- harvest of overstory trees and release of new regeneration

   Timing of removal will depend on species, usually 2 to 10 years after seedling establishment. In general, the more tolerant the species, the longer the shelterwood is left. Best for those intermediate species (middle of the range)

   With all species, some loss in growth of the young trees will occur after a period of time. The decision must be made as to whether or not to the increase in quality growth of residual overstory is enough to offset this loss
Number of Removal Cuttings --- Again depends somewhat on species and relative value of growth on old and young trees, but largest consideration may be economics of the logging operation ---- the volume in one cut as opposed to smaller volumes spread over several cuts. Can gradually release regeneration through a series (1-3) harvests, depending on volume removed.

Normal Procedure --- Could involve the 3 types of cutting, but normal procedure is a seed tree cutting and 1 or 2 removal cuttings. 2 or 3 cut shelterwood. Last cut is the final harvest cut.

Modification of the Method ----

2 or more shelterwood cuts spaced over more than one year, but short enough time span that stand remains essentially even-aged as compared to uniform method where cuts take place in one year.

a. Strip Shelterwood --- 2 Variations (a) stand is cut in strips over a period of years with each strip receiving different cuts described under the uniform system. Each strip could be considered a stand. (b) Clearcutting in strips where strips are very narrow (1/2 height of trees) and the timber on the sides give protection to the young seedlings

Several reasons for using strip shelterwood

1. Impossible or undesirable to cut large stand in one year
2. Less risk of wind damage --- intact stand acts as windbreak
3. Less direct sunlight on areas to be regenerated --- less desiccation and heating
4. Less damage to reproduction --- trees felled into uncut strips

b. Group Shelterwood --- Good stand of regeneration already present in patches in the stand. To take advantage of this, the overwood is harvested and patches enlarged by harvesting around them.

c. Irregular Shelterwood --- similar to reserve seed tree but more trees are left. Main objective is to produce quality
wood on selected trees. The leave trees will cause growth reduction in the young stand and you must decide if it is justified. Not truly even-aged because you have 2 age classes with overwood left indefinitely for purposes other than regeneration

8-9 Advantages of Shelterwood

1. Satisfactory reproduction is generally more certain than with any of the other even-aged methods, which depend on natural regeneration. This is because the main harvest cutting follows the establishment of reproduction and overwood serves to protect young seedlings.

2. Provides quality growth on best trees at same time reproduction is occurring. Trees removed in a seed tree are the poorest trees. On the leave trees, growth is faster and of better quality

3. Leaving of so many trees also means that the site is protected at all times.

4. Better or more complete utilization of the site (growing space better utilized) than with seed tree or clearcutting

5. Since no time is lost between rotations, the length of rotation may be shortened.

6. Aesthetically more pleasing than clearcut or seed tree

7. Possible to time cuttings when there is a good seed year

Disadvantages of Shelterwood

1. Often leads to overstocking

2. Cost of logging is greater than other even-aged methods. Do not remove as much material at any one time and in first operation, the smaller material is usually removed.

3. Takes more skill to apply than other even-aged methods
4. Site prep is difficult because large number of trees. Have fewer options as to the type of site prep

10 Use of Shelterwood in Different Forest Types

Quite versatile and can be used with many species. Has the advantage of creating an environment in which the young seedlings is protected, but allows for exposure as the seedling grows and demand more open conditions. **Depends on light tolerance**

1. Southern pine ---- all but longleaf
2. Western conifers ---- depends on light tolerance --- western hemlock
3. Hardwoods
4. Not used for species that are not windfirm ---- lodgepole, black spruce ---- and where soil moisture is not adequate ---- ponderosa in SW --- and serotinous cone habit too ---- jack and lodgepole pines

11-15 Shelterwood Regeneration Method for Oak

- Shelterwood, in theory would be beneficial for intermediate tolerance species, not those that are shade-tolerant or shade-intolerant ---- oaks and hickories

- Must have advance reproduction in place before shelterwood is implemented. Oak acorn crops are sporadic with a bumper seed year every 5 to 8 years. Without advance reproduction which gives oaks a head start in growth, other faster growing species from seed or sprouts will proliferate.

- Thus, the focus is on tending advance regeneration of oaks, not waiting on seed production. If advance regeneration is not present, then the shelterwood method of regeneration is a poor choice. Regulating the sunlight provides oaks with an advantage

- Usually a precommercial midstory removal is required to provide the filtered sunlight beneficial to oaks compared to other species. Midstory removal is a pre-commercial cost

- Too much light will regenerate shade-intolerant species. Too little light will regenerate shade-tolerant species. Must find that intermediate amount of light to support oaks. Research indicates removal of midstories usually gives you that in-between amount and intensity of sunlight.
• One prescribed burn does not seem to enhance oak seedlings. All species including oaks sprout. There is some thought that repeated burns (3 or more) over 10 years may support oaks more than other species. The issue is that it takes 10 years to setup the environment to benefit oaks ----- losing 10 years of growth.

• To be successful in regenerating oak with the shelterwood method, must have oak advance reproduction of sufficient size and number to favor oaks over other species. Remember the regeneration model lab!

• Thus must create environmental conditions to establish and develop oak advance reproduction. Then, will still probably need to control competing vegetation too at some point because some species will grow faster than the slower growth of oaks, even when released.

• Remember that site productivity does make a difference in success of regenerating oak. More difficult on the best sites, fairly easy on poorer sites (ridges), with more tending on the average sites.

16-18 Articles to Review to Re-emphasize Lecture Notes on Shelterwood and Two-Age (web addresses below and also on silviculture website).

Shelterwood:
https://extension.tennessee.edu/publications/Documents/SP676.pdf

Two-Age:

Two-Aged System

19-21

1. Deferment Cutting ---- Trees are left for a longer time period than a normal shelterwood for purposes other than regeneration.

2. Irregular Shelterwood ---- Trees are left indefinitely for the purpose of additional growth, not necessarily for regeneration.

Reference the comparisons of deferment cuts with 2-age and shelterwood in slide #20
Two-Age Characteristics

- Residual overstory trees are termed reserves or standards
- The limited number of reserve trees allows abundant light to reach the forest floor and provides for rapid growth of the understory and the development of two age classes. Each age class will be grown to rotation age.
- Comparison to clearcut --- Generally, the treated area is subjected to site prep treatments similar to what may be done in clearcuts. The reserves are left standing around the treated understory.
- Comparison to shelterwood --- reserve trees will be left standing for a second rotation thus maintaining 2 predominant age classes.
- The low basal area of reserves is necessary to ensure continued growth of the regenerating age class.

22,23 Two-Age provides

a. Maintenance of sexual reproduction throughout the rotation
b. Maintenance of advance reproduction development throughout the rotation
c. Reduced visual or aesthetic impact, especially compared to clearcutting
d. Development of large diameter, high value sawtimber or veneer trees
e. Development of a wide range of multiple products

Problems ----

- Some loss of production
- Influence of larger trees on regen
- Logging Damage --- avoiding the leave trees w/o damage during logging
- Knowing Species Differences / Growth Characteristics / Light Tolerances

24-25 Realize:

- Low basal area (< 15 sq. ft. per acre) does not inhibit regeneration
- Primary use is to alleviate visuals associated with a clearcut with a few larger trees
• Choose species to remain that have longevity in the older age class, usually one additional rotation period
• More risk and potential for degrade (loss of production) of leaving trees for a longer time period ---- an additional rotation
• Provides habitat diversity with older trees and early sucessional vegetation
• Usually do not retain the best or most valuable trees that may degrade with time. Retain those smaller diameter trees (14-16 inches) that have the potential to increase in value beyond their value now

REFER to PPT Presentation ----- no point in repeating the narrative that is encompassed by the slides

26 Advantages of Two Age
27 Disadvantages of Two Age
28 Requirements for Selecting Reserve Trees
29 Factors for Consideration
30-31 Guidelines for Reserve Tree Selection
32 Potential Harvest Damage

33-35 Refer to the “Lifeboating” explanation in the assigned publication. Without advance reproduction, oak will not be a component of the next regenerating stand. However, by leaving older trees on site with the capability of sexual reproduction, the stand in the following rotation (next rotation after this regenerating rotation) has the potential to develop oak advance reproduction.

36-40 Refer to PPT slides. Research Questions posed about 2-age (slide 36) and research answering those questions using white oak stands.

41-43 Summary of Two-Age System ----- already reiterated several times. Time element is difficult to assess because we are talking decades

Make sure to reference the Two-Age Publication referenced earlier.