

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE SPECIFICATION**

FOREST STAND IMPROVEMENT

(Acre)

CODE 666

GENERAL SPECIFICATION

Procedures, technical details and other information listed below provide additional guidance for carrying out selected practice components. This material supplements the requirements and considerations listed in the conservation practice standard.

Planning Considerations

On forest and woodlands in Colorado, Colorado State Forest Service provides technical assistance through the local district foresters. The local district forester maintains a list of state certified consultant foresters. Forest Stand Improvement is usually an integral component of a forest and woodland management plan. Always check with the local district forester when making site-specific specifications on forestland.

CONDITIONS WHERE PRACTICE APPLIES

On all forestland where manipulation of vegetation is needed.

CRITERIA

General Criteria Applicable to all Purposes

The harvest-regeneration strategy will be identified for all planned forest improvement harvesting:

- ◆ Uneven-aged management systems (single-tree selection, group selection, coppice selection)
- ◆ Even-aged management (clear-cut, seed-tree, shelterwood, coppice)

The extent or size of treatment area shall achieve the intended purpose and minimize adverse impacts to associated resource values.

Preferred tree and understory species of appropriate quality are identified and retained to achieve all planned purposes.

Spacing, density, size class, number, and amount of trees and understory species to be retained will follow established guidelines for the intended purposes. The method, felling direction, and timing of tree cutting for harvesting shall facilitate efficient and safe tree removal and protect sensitive areas such as vernal pools, riparian zones, cultural resources, and structures.

Forest stand improvement activities will not cause excessive soil erosion, compaction or rutting.

Minimize hydrologic alterations and damage to remaining vegetation.

Slash and debris left on the site after treatment will not present an unacceptable fire, safety, environmental or pest hazard. Such material will not interfere with the intended purpose or other management activities.

Comply with applicable laws and regulations and follow Best Management Practices (BMPs) for Colorado.

Criteria Applicable to Thinning or Intermediate Harvest Purposes

Where usable or salable by-products (ties, posts, poles or Christmas trees) of thinning or intermediate harvest are cut, they should be selected so that the forest stand remaining is improved.

In selecting trees to remain, favor the most valuable species and those best adapted to the site. Only the best formed disease free trees with good growth and form will be retained for future

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resource Conservation Service.

SPECIFICATION - 666 - 2

crop trees. Thin the highest site index stands with flatter slopes first. Because of the cost of thinning, normally only one thinning operation is applied before a stand reaches merchantability. The spacing distance between trees that are left is based upon maintaining a basal area that reduces competition until the stand reaches a merchantable size. Merchantable size varies by the product i.e. fuelwood, pulp, poles or sawlogs.

Crop trees will be spaced at about D+8 to D+12 depending on site index.

Crop trees will be of the species best adapted to that site.

Intermediate cuts will be made when the stand has grown two inches average stem diameter since the last cut.

Where woodland grazing is important, the trees will be spaced one or two feet wider than normal. (D+9 or D+10 instead of D+8, etc.).

The natural beauty of the site will be considered during logging. If needed, natural screens may be left to cover unsightly areas.

Slash will be lopped and scattered or piled and burned to reduce fire hazard.

Criteria Applicable to Final Harvest Purposes

Stumps will be less than one foot high.

Trees will be utilized to the smallest top diameter acceptable to the buyer.

Harvesting will be done to remove:

Over-mature trees.

Trees of poor form or condition.

Economically mature trees.

Provision will be made for regeneration:

Ponderosa pine - two or three large well-formed seed trees will be left per acre. (If this is a seed tree regeneration cutting)

Spruce-fir - where strip or block cutting is feasible, the strips will not be over 200 feet wide and the blocks not over 40 acres in size, with equal areas left until reproduction is well established in cut over areas. Seed trees will be left if strip or block cutting is not practiced.

Care will be taken not to damage seed trees during falling and skidding operations.

Grazing will be controlled if necessary to protect regeneration.

Lop and scatter or pile and burn all slash after harvesting is complete.

Criteria Applicable to Slash (Woody Debris) Disposal

Slash is the accumulation of branches, tree tops, and other woody debris usually associated with the removal of trees.

Slash can be beneficial or detrimental, depending on the landowners objectives. Benefits include conserving soil moisture-, slowly increasing organic matter in the soil, and protecting young tree, grass and shrub species. Disadvantages include restriction in movement of grazing animals, creating opportunities for build-ups of insect populations, it is unsightly, it is a potential forest fire fuel and can restrict the construction of fuel and firebreaks.

Slash disposal is intended to reduce the serious build-up of insects by removing their breeding areas.

Reduction of the threat of fire is a major reason for the treatment of slash. Slash disposal should be considered and planned.

The amount of slash left along roadways and near populated areas should be reduced to a minimum to maintain visual aesthetics.

The closer the slash is to the ground and the smaller the pieces, the faster it decomposes. Due to the lack of air space and chimney effect, fire does not burn as well when the slash is close to the ground.

There are several ways to treat slash. Each method and its advantages and disadvantages should be considered. Often a combination of methods is used to treat slash. Contact your CO district forester for treatment recommendations.

CONSIDERATIONS

Silvicultural objectives and harvest-regeneration strategies may change over time and may be limited by prior management.

Successful regeneration of desirable species is usually dependent upon timely application of forest stand improvement and other practices, e.g., prescribed burning, site preparation, tree and shrub establishment, prescribed grazing, and use exclusion.

Adjust the extent, timing, size of treatment area or the intensity of the practice to minimize cumulative effects (on-site and off-site), e.g., hydrologic and stream alteration, habitat fragmentation, nutrient cycling, biodiversity, and visual resources.

Assess potential landowner and operator liability before forest stand improvement activities begin.

Time the practice to least disturb seasonal wildlife activities. Wildlife food and cover can be retained by minimal modifications to composition and spacing. Retention of selected dead and dying trees, including down material, will enhance wildlife habitat values and nutrient cycling.

The chosen method should be cost effective and protect cultural resources, wildlife habitat, water and soil resources and identified unique areas.

Considerations Applicable to Recreation Area Purposes

In areas with recreation values, either denser or more open stands may be desired. For aesthetics, it may be desirable to leave some large picturesque hardwoods or an occasional misshapen conifer. In these areas, girdling or poisoning would not be recommended because of the danger of falling snags.

Considerations Applicable to Wildlife Habitat Purposes

Hardwoods and herbaceous ground cover plants have a high food value for wildlife. Hardwood trees that are not interfering or are only interfering with one or two conifers should be left. Hollow trees or snags should be left for wildlife at two per acre. These should not be left if they are a hazard to either animals or people or if they are a severe fire hazard.

Considerations Applicable to Harvesting or Thinning Western Spruce Budworm Infected Stands

The susceptibility of a stand to western spruce budworm must be considered. To know if spruce budworm is a potential problem, contact the District Forester.

Budworm larvae feed on all age classes of Douglas-fir, white fir, and Engelmann spruce. Occasionally, Colorado blue spruce, cork bark and sub alpine fir are hosts. To reduce stand susceptibility, stands

should be managed as well-spaced, even-aged patches. Besides striving for well-spaced, even-aged patches, leaving a lower percentage of budworm host species (i.e., favor pines as leave trees and take out firs) in the stand aids in controlling the spread of budworm.

Considerations Applicable to Disease Management Purposes

Pines, Douglas-fir and Engelmann spruce are very susceptible to diseases such as dwarf mistletoes, rusts, red ring rot and root diseases. One way of entry for spores is due to broken limbs and bark damage during cultural operations. Care must be taken when thinning not to injure the residual trees.

Ponderosa, lodgepole, limber, and pinyon pines and Douglas-fir may be infected with dwarf mistletoe. Control of dwarf mistletoe in heavily infected stands by thinning is not recommended. Infected areas of the forest can be isolated by cleared buffer strips, 1.5 times tree height in width.

Considerations Applicable to Bark Beetle Management Purposes

Mountain pine beetle is one of the most aggressive and destructive killers of mature ponderosa and lodgepole pines.

During epidemic conditions, it may also kill younger trees (6-8 inches d.b.h.). Thinning young stands to remove poor quality and low vigor trees, and to increase between-tree spacing is the best method of prevention.

Ips beetles (several species) attack young pines. These beetles prefer fresh slash or injured trees. Cultural controls consist of prompt treatment of slash over two inches outside-bark diameter. Most damaging outbreaks occur as a direct result of drought or forest management practices that weaken trees or create large amounts of slash, respectively.

If bark beetles are considered a potential problem, the following methods of prevention and control will be used:

Utilization. Ensure all material exceeding two inches diameter outside bark is utilized.

Thinning. Green tree cutting and slash creation that occurs during the potential flight period of these beetles (July to September for mountain pine

SPECIFICATION - 666 - 4

beetle, and late March to early November for ips) may attract beetles to the cutting area. Cutting operations that occur during these time periods should anticipate attacks on the residual live trees at the site and include follow-up monitoring. (See below for management of the slash and other green wood created by the thinning.)

Rotate cutting areas. Cut in adjacent areas every other year. Maintain a three to five mile buffer area between cutting areas.

Slash disposal:

Piling and burning. All slash exceeding two inches in diameter outside-bark diameter will be piled and burned.

Lopping. All slash exceeding two inches outside-bark diameter will be cut into pieces no longer than two feet.

Piling and covering with clear plastic. Prior to June 1 trunkwood currently infested by mountain pine beetle will be placed in piles no higher than one to two logs high and covered with clear plastic six mil. minimum thickness, and the edges sealed with soil. (Note, this method is not recommended for use with ips beetles because of their short development time.)

Chipping. All slash exceeding two inches in outside-bark diameter will be chipped.

Debarking. All slash and infested wood exceeding two inches outside-bark diameter will be debarked. In the case of infested wood, this should be done at least two weeks prior to the beginning of expected beetle flight from this material.

For situations involving other bark beetles or special circumstances not covered above, see a local professional forester for guidance.

Considerations Applicable to Snow Load, Tip Over (Windthrow/Blowdown) Management Purposes

Very dense stands of young ponderosa pine trees are susceptible to bending, breaking or tip over due to heavy wet snows and/or strong winds. Areas suffering blow down usually have shallow soils. Most damage occurs in the first five years after thinning or harvest. When stands are fully stocked or overstocked and the average diameter is one-

inch to four inches the height to diameter ratio will exceed 90. One-third more trees per acre should be left following thinning or harvest to allow for snow and wind damage that will follow thinning.

Example: A Ponderosa pine site with an index of = 76. An average diameter = 3.4 inches an avg. height of 28 feet, stand age 28 years. BA/ac = 138 square feet

28 feet tall X 12 inches per foot = 336 inches / 3.4 inches = 98.82 height to diameter ratio, therefore increase trees per acre remaining after thinning by 1/3 over the standard recommendation. If the standard recommendation is 360 trees per acre then $360 \times 1.33 = 479$ trees per acre.

Spacing = $\frac{43,560 \text{ sq. ft./ac}}{479 \text{ trees/acre}} = 9.5$ feet between trees on average.

Considerations Applicable to Aspen Management Purposes

Aspen will be thinned based on the desired product (pulp or sawlog) and the site index.

Site index will only be taken on those trees having at least 30 rings at d.b.h. and no more than 80 rings. It is more accurate if the tree has 40 rings or more at d.b.h.

Only those stands with a site index greater than 60 (Baker) should be considered for thinning. Two alternatives are available for thinning when the site index exceeds 75.

Spacing:

<u>Site Index</u>	<u>No. of trees per acre to leave</u>	<u>Average spacing between trees</u>
60+	650-700	8' x 8'

Thin when the stand averages two to three inches at d.b.h. and dominants are 25 feet tall.

<u>Site Index</u>	<u>Average Diameter</u>	<u>No. of trees per acre to leave</u>	<u>Average spacing between trees</u>
75+			
1 st thin	--	1400-180	5' x 5'
2 nd thin	4 inches	185-225	15' x 15'

The first thinning shall be when the dominants average 15 foot in height.

Method: Trees may be felled with axes, saws or loppers. Chemical injection methods will not be used as Aspen share a common root system. Care must be taken to not injure the residual trees by scrapping the bark or breaking limbs. Stumps will be less than six inches in height.

Time of year: If elk are not a consideration, thinning may be done at any time. If elk are a consideration, operations will not be carried out during the period June 1 to July 15.

Slash Disposal: Cut the stems into lengths that will keep the slash on the ground. Overall slash height will not exceed 24 inches.

Considerations Applicable to Pinyon-Juniper Management Purposes

Both species-will be given equal consideration for selection. Trees to be left will be selected on size, form, location and limb development, and insect and disease damage or susceptibility.

Post thinning spacing will be determined from measured stand diameter and site index data.

Stands with average diameters exceeding five inches in diameter or stands with an average diameter less than five inches that will be managed for Christmas trees, fence stays, latillas, and ball and burlap stock. **Spacing** will be as follows:

Site Index	Spacing
Less than 35	D+15
36-50	D+13
51-99	D+11
100+	D+9

Re-thin when the D+ X spacing is as follows:

Site Index	Spacing
Less than 35	D+12
36-50	D+10
51-99	D+8
100+	D+7

Stands with average diameter from one to 4.5 inches that will only be managed for its fuelwood potential will be spaced as follows:

Site Index	Spacing
Less than 35	17ft.
35-50	15ft.
51-99	13ft.
100+	11ft.

The spacing for stands exceeding five inches in diameter will be used when the stand exceeds five inches average diameter.

Method: Trees may be thinned by cutting or the use of chemicals. When thinned by cutting, care will be taken to cut the tree below the lower most limb. Stumps will be less than one foot high.

Slash Disposal: (Current Pinyon-juniper utilization standards are to the two inch outside bark diameter.

The following methods may be used individually or in combination:

Lopping. Slash will be lopped into pieces no longer than four feet and evenly scattered to less than two feet in depth.

Windrowing. Windrows of green slash will not be more than 4 feet wide at the base and 3 feet high. They will be placed on the contour. Each windrow will be comprised of slash no longer than 25 feet. At each end a 15 foot space with no slash will separate the windrows. Windrows will be spaced a minimum of 50 feet apart on the contour. Windrows will not be burned.

Piling. Green slash will be piled in open areas so they will receive full sunlight. Piles will not exceed six feet in diameter by five feet in height.

Piling and Burning. Green slash will be placed in piles no larger than six feet in diameter and three feet high. These piles will be located away from leave trees. A burn plan will be prepared (Contact District Forester) and a burn permit will be required.

Considerations Applicable to Ponderosa Pine Management

Spacing

Site Index (Meyer)	Spacing
Less than 49	D+12
50 - 59	D+10

SPECIFICATION - 666 - 6

Site Index 60 - 75

Average diameter exceeding five inches use D + 9 spacing.

Average diameter less than five inches:

d.b.h.	No. of trees per acre to leave	Average spacing between trees
1 inch	680	8' x 8'
2 inch	325	11.5' x 11.5'
3 inch	279	12.5' x 12.5'
4 inch	239	13.5" x 13.5"

Site Index 76 - 105

Average diameter exceeding five inches use D + 8 spacing.

Average diameter less than five inches:

d.b.h.	No. of trees per acre to leave	Average spacing between trees
1 inch	890	7' x 7'
2 inch	436	10' x 10'
3 inch	360	11' x 11'
4 inch	303	12" x 12"

Site Index 106+

Average diameter exceeding five inches = D + 7 spacing.

Average diameter less than five inches:

d.b.h.	No. of trees per acre to leave	Average spacing between trees
1 inch	890	7' x 7'
2 inch	483	9.5' x 9.5'
3 inch	395	10.5' x 10.5'
4 inch	360	11" x 11"

Considerations Applicable to Douglas Fir Management

Initially thin to D + 7 spacing. Follow-up practices will be scheduled when the stand is at a D + 2 or D + 3 spacing.

Considerations Applicable to Mixed Conifer Management

Mixed conifer is defined as two (2) to as many as eight (8) species in association with each other.

Initially thin to D + 6 spacing. Follow-up practices will be scheduled when the stand is at D + 2 spacing.

Considerations Applicable to White Fir Management

Initially thin to D + 6 spacing. Follow-up practices will be scheduled when the stand is at D + 2 to D + 3 spacing.

Considerations Applicable to Spruce-Fir Management

Site Index	Initial Spacing	Follow-up Spacing
Less than 55	D + 6	D + 2
56-80	D + 4	D + 1
80+	D + 3	D + 0

PLANS AND SPECIFICATIONS

Specifications for applying this practice and protection of the site shall be prepared and recorded using approved specification sheets, job sheets, technical notes, and narrative statements in the conservation plan or other acceptable documentation.

OPERATION AND MAINTENANCE

Detailed operation and maintenance requirements are addressed in the specification for this practice.

Periodic inspections during treatment activities are necessary to ensure that objectives are achieved and resource damage is minimized. Contact the local NRCS conservationist immediately when unexpected problems, questions arise during practice installation.

REFERENCES

Colorado State Forest Service, Colorado Forest Stewardship Guidelines to Protect Water Quality, Best Management Practices (BMPs) for Colorado, Fort Collins, Colorado, February, 1998