Appendix E

SELECTION OF HARVEST CUTTING METHODS

APPENDIX E SELECTION OF HARVEST CUTTING METHODS

A. HARVEST CUTTING METHODS

The intent of this appendix is to display the rationale for selection of broad regeneration harvest cutting methods to be applied on the Forest. Site-specific regeneration harvest methods (such as clearcutting, seed tree cutting, or group selection) will be selected and identified in environmental assessments or in silvicultural prescriptions written or approved by certified silviculturists.

The methods of regeneration harvest cutting available with the even-aged silvicultural system are clearcutting, seed tree cutting, and shelterwood cutting Uneven-aged silvicultural systems include the individual tree selection method and the group selection method

B. A DISCUSSION OF EVEN-AGED VERSUS UNEVEN-AGED SELECTION CRITERIA

The criteria used for selection of harvest cutting methods were developed using selection criteria identified in the Regional Guide for the Pacific Northwest Region (1984) and direction provided in 36 CFR 219 27(b) A brief description of the criteria follows A more detailed discussion can be found in those documents

1. Selection Criteria From The Regional Guide

The selected harvest cutting method

a Must permit the production of a volume of marketable trees sufficient to utilize all trees that meet utilization standards and are designated for harvest

b Must permit the use of an available, acceptable logging method which can *remove designated trees without excessive damage to the residual stand while* meeting other established land management objectives Table 3-1 in the Regional *Guide displays the compatibility of logging systems with common harvest cutting* methods. Generally, ground-based logging methods, helicopters, and cable methods using slack-pulling carriages are appropriate for all harvest methods, while cable methods without slack-pulling carriages and balloons are appropriate only for clearcuts.

c Must be capable of providing special conditions that are required to meet resource management objectives Table 3-2 in the Regional Guide displays commonly used harvest methods which achieve desired forest character Generally, both even-aged and uneven-aged methods can meet desired forest character with the exception of a mosaic of forested area and openings and desired wildlife species diversity. In that case, uneven-aged methods are not appropriate

d. Must permit control of vegetation to establish desired numbers and rates-of-growth of trees as well as other vegetation needed to achieve special management objectives Tables 3-3 and 3-4 in the Regional Guide outline these harvest cutting methods Generally, both even-aged and uneven-aged methods can be used in vegetation zones occurring on the Forest, however, uneven-aged methods are not applicable for wildlife forage production or optimum tree seedling and sapling growth

e. Must promote a stand structure and species composition which minimizes serious risk from insects, disease, animal damage, and wildfire, and will allow treatment of existing insect, disease, and fuel conditions. Table 3-5 in the Regional Guide displays harvest cutting methods favorable to the reduction and treatment of these items. Generally, uneven-aged methods are not applicable where dwarf-mistletoe and root disease present serious risks.

f. Must meet multiple use management objectives identified in the Regional Guide and Forest Plan An exception occurs where harvest cutting methods are otherwise provided for by legislation or regulation.

2. Selection Criteria From 36 CFR 219.27(b)

The seven criteria identified in 36 CFR 219 27(b) which direct management prescriptions for the manipulation of tree cover are summarized below

The selected harvest cutting method must:

a. Be best suited to multiple use goals considering biological, environmental, engineering, economics, and other impacts

b. Assure that lands can be adequately restocked.

c Not be chosen primarily because of the greatest dollar return or timber output, although these factors should be considered.

d. Consider the potential impacts on residual trees and adjacent stands

e. Avoid permanent reduction of site productivity and ensure conservation of water and soil.

f. Provide the desired effects to meet special management objectives.

g. Be practical in terms of transportation and harvesting requirements and total costs of timber sale preparation, logging, and administration

3. Combined Selection Criteria

The criteria identified in the Regional Guide and in 36 CFR 219.27(b) were subsequently combined to eliminate duplication of intent and simplify the rationale for selecting the harvest cutting methods used to implement the Forest Plan These seven combined criteria are summarized below:

The selected harvest cutting method

a. Must produce a volume of marketable trees that meet utilization standards and are designated for harvest. (Regional Guide criterion 1.)

b. Must permit the use of an available and acceptable logging method. (Regional Guide· criterion 2; 36 CFR: criterion 4.)

c. Must be capable of meeting special management and multiple use objectives. (Regional Guide: criteria 3 and 6; 36 CFR: criteria 1 and 6)

d Must permit control of vegetation to establish desired species composition, density, and rates of growth (Regional Guide criterion 4; 36 CFR criteria 4 and 6)

e Must promote a stand structure and species composition which minimizes risks from insects, diseases, animal damage, and wildfire (Regional Guide criterion 5.)

f Must assure that lands can be adequately restocked (36 CFR criterion 2)

g Must be practical and economical in terms of transportation, harvesting, preparation, and administration of timber sales (36 CFR criterion 7)

h. Will not be,selected primarily because it will result in the greatest dollar return or provide the highest output of timber, or which permanently reduces site productivity, or could not assure conservation of the water and soil resources (36 CFR: criteria 3 and 5)

C. WORKING GROUPS AND MANAGEMENT AREAS

Both even-aged and uneven-aged harvest cutting methods were available and evaluated for selection within the Forest's species working groups and Management Area combinations The three working groups and their applicable Management Area combinations are summarized as follows

Working Group	Management Area Number(s)
Ponderosa Pine	1, 3A&B, 4A, 5, 13, 14, 20A&B, 21, 22
Mixed Conifer	1, 3A&B, 4A, 5, 13, 14, 20A&B, 21, 22
Lodgepole Pine	1, 3A&B, 4A, 13, 14, 20A&B, 21, 22

D. RATIONALE FOR SELECTION OF HARVEST CUTTING METHODS

The following analysis documents the rationale for selection of regeneration harvest cutting methods within each working group/Management Area based on those combined criteria which have a significant effect on the selection

1. Ponderosa Pine Working Group

a Ponderosa Pine/ Management Area 1

Lands within this Management Area will be managed for timber and forage production, wildlife habitat, dispersed motorized recreation, and visual quality Timber production will be based on the most productive and efficient silvicultural systems developed to their optimum potential Satisfactory tree growth-rates should be maintained and stands should be protected from insect, disease, animal, and wildfire damage Both even-aged and uneven-aged methods are biologically acceptable (Barrett, 1979; Burns, 1983). Even-aged methods generally provide enhanced forage production and may better optimize wildlife species diversity (combined criterion 3). Even-aged methods generally provide for enhanced seedling and sapling growth-rates because of the significant effect of mature or larger trees on height and diameter growth of the understory (Barrett, 1979) (combined criterion 4) For this reason, uneven-aged methods generally produce reduced timber volumes. Clearcutting and/or shelterwood cutting with interplanting allows the introduction of genetically improved stock Where dwarf-mistletoe and root diseases are present, uneven-aged methods are not applicable (combined criterion 5) Even-aged methods are more economical and practical in terms of transportation, harvesting, preparation, and administration (Barrett, 1979, Burns, 1983) (combined criterion 7) Within this working group, periodic use of

prescribed fire reduces fuel accumulations and eliminates undesirable competitive vegetation (Burns, 1983). Even-aged methods are more compatible with this treatment. Uneven-aged methods are biologically acceptable, they generally produce reduced big-game forage, reduced timber yields, increased risk of disease and wildfire, and a considerable increase in management costs and complexity Uneven-aged management can be used to meet special resource objectives in the Management Area (combined criterion 3) For these reasons, both even-aged and uneven-aged regeneration harvest cutting methods are selected for ponderosa pine/Management Area 1

b Ponderosa Pine/ Management Areas 3A and 3B

Lands within this Management Area will be managed for riparian habitat objectives and fisheries, wildlife, timber, and range production Providing vegetation to meet stream surface-shading requirements, water temperature standards, woody debris requirements, and instream habitat maintenance needs is required to meet resource management objectives Timber management, grazing systems, and visual quality objectives will be modified to meet these objectives Both even-aged and uneven-aged regeneration harvest cutting methods are biologically acceptable. Here, the special conditions required to meet management objectives take precedence over economic considerations or timber volume production (combined criterion 3). Uneven-aged methods can best provide for these special conditions by providing continuous site occupancy by vegetation (i e , trees). Tree growth-rates should be sufficient to produce the characteristic tree components needed for shade and large woody debris while maintaining acceptable stand vigor (combined criterion 4) In addition, trees should be managed to minimize risks from insect, disease, animal, and wildfire damage (combined criterion 5) Even-aged methods do not adequately provide for continuous site occupancy and are quite difficult to administer on-the-ground to meet the special conditions needed (combined criterion 7).

c Ponderosa Pine/ Management Areas 4A, 20A&B and 21

Within these Management Areas, the management objective will be to provide optimum and/or near-optimum habitat for big-game species while still producing timber volume, livestock forage, other wildlife habitat, and visual quality. Timber management and grazing systems, along with visual quality objectives, may be modified to meet big-game species objectives Special conditions required to meet the resource management objectives include providing hiding and/or thermal cover, as well as a vigorous forage base. Prescribed burning is often recommended for site preparation and forage enhancement Although both even-aged and uneven-aged regeneration harvest cutting methods are biologically acceptable, even-aged methods often best provide for the special conditions within these Management Areas (combined criterion 3). Uneven-aged methods are generally not applicable where the desired character is a mosaic of forest and openings. In addition, uneven-aged management generally reduces forage and may increase the risk of insect, disease, animal, and wildfire damage For these reasons, the even-aged methods are recommended, but not necessarily prescribed, for the ponderosa pine/Management Areas 4A, 20A&B, and 21.

d. Ponderosa Pine/ Management Area 5	Habitat management for bald eagles will emphasize large, overmature trees potentially useable as roost trees. Suitable trees should be available throughout time and should be widely distributed. A density of eight large trees per acre is satisfactory. Both even-aged and uneven-aged methods are biologically acceptable and can produce these small groups of large trees over time The selected harvest cutting methods must be capable of providing the special conditions which are required to meet the resource management objectives per the Pacific States Bald Eagle Recovery Plan, (combined criterion 3) Timber management systems will be designed to achieve these objectives and may not result in a system which maximizes present net value The selected method should be capable of developing large diameter ponderosa pine roost trees at the appropriate point in the rotation (combined criteria 3 and 4). Either even-aged or uneven-aged methods can be selected here The actual selection should be based on specific site and stand characteristics, and a silvicultural prescription will be developed and documented in an environmental analysis document No scheduled timber harvest activity will occur in this Management Area
e. Ponderosa Pine Management Area 13	Habitat management for old growth and old-growth replacement stands will emphasize large, overmature trees Suitable trees should be available throughout time and should be widely distributed across the Forest A density of 10 large trees per acre is satisfactory Both even-aged and uneven-aged methods are biologically acceptable and can produce large trees over time The selected harvest cutting methods must be capable of providing the special conditions which are required to meet the resource management objectives (combined criterion 3). Timber management systems will be designed to achieve these objectives and will not result in a system which maximizes present net value
f Ponderosa Pine/ Management Areas 14, 20A&B and scenic portions of 22	Ponderosa pine stands will be managed for visual quality, timber production, forage production, and wildlife habitats Management activities will provide a variety of species, snags, and size classes Large, old-growth trees will provide an important stand component in the foreground of the viewing area Both even-aged and uneven-aged regeneration harvest cutting methods are biologically applicable and can provide for the visual variety and maintenance of the large-tree component The special conditions required to meet visual management objectives are the primary consideration (combined criterion 3). While economic returns and timber volume production are also important, they will be modified to meet the visual quality levels of these Management Areas Tree growth-rates should be sufficient to produce the characteristic large-tree component within the rotation age and maintain trees in a healthy condition (combined criterion 4) In addition, trees should be managed to minimize risks from insect, disease, animal and wildfire damage (combined criterion 5) Either even-aged or uneven-aged methods may be selected here Uneven-aged methods may require artificial regeneration to maintain the appropriate species composition and may be restricted to sites where acceptable logging methods can be applied (combined criterion 2) Uneven-aged methods are not applicable where insect or disease conditions cannot maintain stands relatively free of risk (combined criterion 5). The actual selection should be based on specific stand and site characteristics, and a silvicultural prescription will be developed and identified in an environmental analysis document

The selected methods should be capable of producing large-diameter ponderosa pine trees at the appropriate point in the rotation (combined criteria 3 and 4) Either even-aged or uneven-aged methods can be selected here. The actual selection should be based on specific site and stand characteristics, and a silvicultural prescription will be developed and documented in an environmental analysis document. No scheduled timber harvest activity will occur in old-growth stands, but will occur in old-growth replacement stands.

2. Mixed Conifer Working Group

a. Mixed Conifer/ Management Area 1

Lands within this Management Area will be managed for timber and forage production, wildlife habitat, dispersed motorized recreation, and visual quality Timber production will be based on the most productive and efficient silvicultural systems developed to their optimum potential. Satisfactory growth rates should be maintained and stand species composition in this working group should be controlled to produce trees which can maintain satisfactory growth rates and be resistant to insect, disease, wildfire, and animal damage Both even-aged and uneven-aged methods are biologically acceptable. The selection decision is weighted heavily by successional trends and the relative shade tolerance of species present within the mixed conifer working group (Burns, 1983, Minore, 1979). Shade-intolerant species including ponderosa pine, Douglas-fir, western white pine, and western larch are considered more desirable and better meet management objectives for growth and resistance to insect, disease, and animal damage. Uneven-aged management can be used to meet special resource objectives in the Management Area (combined criterion 3). Even-aged management is most desirable to convert old-growth stands to vigorous stands of shade-intolerant species (Burns, 1983) (combined criteria 4 and 5). The even-aged methods are generally more practical and economical in terms of transportation, harvesting, preparation, and administration of timber sales (combined criterion 7). Both even-aged and uneven-aged methods are selected for the Mixed Conifer/Management Area 1.

b. Mixed Conifer/ Management Area 3A and 3B

Lands within these Management Areas will be managed for riparian habitat objectives and fisheries, wildlife, timber, and range production. Providing vegetation to meet stream surface-shading requirements, water temperature standards, woody debris requirements, and instream habitat maintenance needs is required to meet resource management objectives. Timber management, grazing systems, and visual quality objectives will be modified to meet these objectives Both even-aged and uneven-aged regeneration harvest cutting methods are biologically acceptable The special conditions required to meet management objectives take precedence over economic consideration or timber volume production (combined criterion 3) Uneven-aged methods can best provide for these special conditions through providing continuous site occupancy by vegetation (i.e , trees). Tree growth rates should be sufficient to produce the characteristic tree components needed for shade and large woody debris while maintaining acceptable stand vigor (combined criterion 4). In addition, trees should be managed to minimize risk from insect, disease, animal, and wildfire damage (combined criterion 5). Even-aged methods do not provide continuous site occupancy and are quite difficult to administer on the ground to meet the special condition called for (combined criterion 7). For these reasons, the uneven-aged methods are recommended for the Mixed Conifer/Management Area 3.

c. Mixed Conifer/ Management Areas 4A, 20A&B, and 21

Within these Management Areas, the primary management objective will be to provide optimum or near optimum habitat for big-game species while still producing timber volume, livestock forage, other wildlife habitat, and visual quality Timber management, grazing systems and visual quality objectives may be modified to meet big-game species objectives Special conditions required to meet the resource management objectives include providing hiding and/or thermal cover, as well as a vigorous forage base Prescribed burning is recommended for site preparation and forage enhancement Although both even-aged and uneven-aged harvest cutting methods are biologically acceptable, even-aged methods can best provide for the special conditions within this Management Area (combined criterion 3) Uneven-aged methods are generally not applicable where the desired character is a mosaic of forested areas and openings. In addition, uneven-aged management generally reduces forage and increases risk of insect, disease, animal, or wildfire damage. For these reasons, the even-aged methods are generally recommended for the Mixed Conifer/Management Areas 4A, 20A&B, and 21.

d Mixed Conifer/ Management Area 5

Habitat management for bald eagles will emphasize large, overmature trees potentially usable as roost trees Suitable trees should be available throughout time and should be widely distributed A density of eight large trees per acre is satisfactory Both even-aged and uneven-aged methods are biologically acceptable and can produce the small groups of large trees over time The selected harvest cutting methods must be capable of providing the special conditions which are required to meet the resource management objectives, per Pacific States Bald Eagle Recovery Plan (combined criterion 3) Timber management systems will be designed to achieve these objectives and may not result in a system which maximizes present net value

The selected methods should be capable of producing large-diameter ponderosa pine roost trees at the appropriate point in the rotation (combined criteria 3 and 4) Either even-aged or uneven-aged methods can be selected here. The actual selection should be based on specific site and stand characteristics, and a silvicultural prescription will be developed and documented in an environmental analysis document. No scheduled timber harvest activity will occur in this Management Area

e. Mixed Conifer/ Management Area 13

Habitat management for old growth and old-growth replacement stands will emphasize large, overmature trees. Suitable trees should be available throughout time and should be widely distributed across the Forest. A density of 15 large trees per acre is satisfactory. Both even-aged and uneven-aged methods are biologically acceptable and can produce large trees over time The selected harvest cutting methods must be capable of providing the special conditions which are required to meet the resource management objectives, per Pacific States Bald Eagle Recovery Plan (combined criterion 3) Timber management systems will be designed to achieve these objectives and may not result in a system which maximizes Present Net Value.

The selected methods would be capable of producing large-diameter Douglas-fir, white fir, or ponderosa pine trees at the appropriate point in the rotation (combined criteria 3 and 4) Either even-aged or uneven-aged methods can be selected here The actual selection should be based on specific site and stand characteristics, and a silvicultural prescription will be developed and identified in an environmental analysis document No scheduled timber harvest activity will occur in old-growth stands, but will occur in old-growth replacement stands

f. Mixed Conifer/ Management Areas 14, 20A&B and scenic portions of 22

Mixed conifer stands will be managed for visual quality, timber production, forage production, recreation, and wildlife habitat, with visual quality being the primary management objective Management activities will provide a variety of species, snags, and size classes. Large old-growth trees will provide an important stand component in the foreground of the viewing area Both even-aged and uneven-aged regeneration harvest cutting methods are biologically applicable and can provide for visual variety and maintenance of the large-tree component.

The special conditions required to meet visual management objectives are the primary consideration (combined criterion 3) While economic returns and timber volume production are also important, they will be modified to meet the visual objectives of this Management Area Tree growth-rates should be sufficient to produce the characteristic large-tree component within the rotation age and maintain trees in a healthy condition (combined criterion 4). In addition, trees should be managed to minimize risks from insect disease, animal, and wildfire damage (combined criterion 5). Either even-aged and uneven-aged methods may be selected. Uneven-aged methods may require artificial regeneration to maintain the appropriate species composition and may be restricted to sites where acceptable logging methods can be applied (combined criterion 2) Uneven-aged methods are not applicable where insect or disease conditions cannot maintain stands relatively free of risk (combined criterion 5) The ultimate selection should be based on specific stand and site characteristics, and a silvicultural prescription will be developed and documented in an environmental analysis document

3. Lodgepole Pine Working Group

a Lodgepole Pine/ Management Area 1

Lands within this Management Area will be managed for timber and forage production, wildlife habitat, dispersed motorized recreation, and visual quality Timber production will be based on the most productive and efficient silvicultural systems developed to their optimum potential Satisfactory growth-rates should be maintained and stands protected from insect, disease, animal, and wildfire damage. While some variation does occur, the lodgepole pine type is generally considered to be a pure, even-aged, single-storied, overly dense forest (Burns, 1983). This stand structure and condition have provided the setting for a catastrophic mountain pine beetle epidemic The mature infested and susceptible stands will be converted to less-susceptible, young stands within a 15- to 20-year period. Although both even-aged and uneven-aged regeneration harvest cutting methods are biologically acceptable (Burns, 1983), the current stand structure and catastrophic condition strongly favor even-aged methods

With an annual harvest program in lodgepole pine designed to change current susceptible stand structure and/or to salvage dead or dying lodgepole pine, strong consideration must be given to methods which are practical and economical in terms of transportation, harvesting, and timber sale preparation and administration (combined criterion 7). This is particularly significant in view of current, relatively low, stumpage values for lodgepole pine. Opportunities for forage production are generally more favorable using even-aged methods (combined criterion 3). Desired tree growth-rates and resistance to future mountain pine beetle epidemics can generally be maintained with greater success using even-aged methods (Schmidt and Alexander, 1985) (combined criterion 5). For these reasons, even-aged methods are recommended for the Lodgepole Pine/Management Area 1

b Lodgepole Pine/ Management Areas 3A and B

Lands within these Management Areas will be managed for riparian habitat needs and fisheries, wildlife, timber, and range production The lodgepole pine type is generally considered to be a pure, even-aged, single-storied, overly dense forest (Burns, 1983) Providing vegetation to meet stream surface-shading requirements, water temperature standards, woody debris requirements, and instream habitat maintenance needs is required to meet resource management objectives Timber management, grazing systems, and visual quality objectives will be modified to meet these objectives Both even-aged and uneven-aged harvest cutting methoo are biologically acceptable (Burns, 1983) The current stand structure and catastrophic mountain pine beetle epidemic conditions strongly favor even-aged methods Management will differ from timber production on the rest of the forest primarily in scale to meet special conditions and maintain healthy vigorous, manageable stands (combined criteria 3, 4, and 5) For these reasons, the uneven-aged and even-aged methods with reduced cutting unit size are recommended for the Lodgepole Pine/Management Areas 3A and 3B

c Lodgepole Pine/ Management Areas 4A&B, 20A&B, and 21

Within these Management Areas, the management objective will be to provide optimum and/or near-optimum habitat for big game species while still producing timber volume, livestock forage, other wildlife habitat, and visual quality levels Timber management, grazing systems, and visual quality objectives may be modified to meet big-game species objectives Special conditions required to meet the resource management objectives include providing hiding and/or thermal cover, as well as a vigorous forage base Prescribed burning is recommended for site preparation and forage enhancement Although both even-aged and uneven-aged regeneration harvest cutting methods are biologically acceptable, the current stand structure, catastrophic mountain pine beetle epidemic, and special conditions strongly favor even-aged methods (combined criteria 3 and 5) Uneven-aged methods are generally not applicable to lodgepole pine type or where the desired character of the landscape is a mosaic of forested lands and openings In addition, uneven-aged management generally produces reduced amounts of big-game forage and has an increased risk of insect, disease, animal, and wildfire damage The transportation system and entry frequency necessary for the management of uneven-aged lodgepole pine stands may be uneconomical due to the low value of the species (combined criterion 7) For these reasons, the even-aged methods are recommended for Lodgepole Pine/Management Areas 4A and 4B

d Lodgepole Pine/ Management Areas 14, 20A&B and scenic portions of 22

Lodgepole pine stands will be managed for their site-specific visual quality objectives, timber production, forage production, recreation opportunities, and wildlife habitat While economic returns and timber volume production are also important, they will be modified to meet the visual quality levels of this Management Area Lodgepole pine will be managed to increase species and size-class diversity and maintain stands in a healthy condition The stand structure and condition as well as operational constraints common to the timber Management Area will apply Although both even-aged and uneven-aged methods are biologically acceptable (Burns, 1983), the even-aged method is strongly favored Management will differ from the general forest primarily in scale Emphasis will be placed on retention of islands of healthy, immature lodgepole pine, trees of other species, and native ground vegetation Even-aged methods are selected to meet these special management objectives (combined criterion 4).

E. SITE-SPECIFIC HARVEST METHOD SELECTION CRITERIA

Site-specific regeneration harvest methods (such as clearcutting, seed tree cutting, shelterwood cutting, selection or group selection) will be selected and identified in environmental assessments or in silvicultural prescriptions written or approved by certified silviculturists Overall guidance will be provided by the FORPLAN solution for a given alternative Various rationale for selecting a particular site-specific silvicultural prescription are as follow·

1. General - Vegetation Management Practices

All vegetative Management Practices on forested lands will be preceded by a silvicultural examination, an on-the-ground analysis of the area, and a site-specific prescription written or reviewed by a certified silviculturist The prescription process considers direction and objectives set forth in this appendix, Chapters II and III, site-specific factors, and a review of the applicable technical and scientific literature, as well as practical experience The prescription will detail the actual vegetative manipulation to be implemented on a case-by-case basis. The standards for all silvicultural systems in the Pacific Northwest Regional Guide will also be used in determining the silvicultural system to be implemented.

The silvicultural prescription process is a concurrent activity with the interdisciplinary team process in preparing projects Prescriptions are formulated within Forest Plan guidance to achieve specific objectives of Management Areas The full range of silvicultural systems (individual tree selection to clearcut) are available for use on the Malheur National Forest The selected vegetative Management Practices for individual sites will comply with Management Requirements listed in 36 CFR 219 27(b)

2. Regeneration

The following paragraphs discuss regeneration harvest method criteria The reader should note that in this Final Environmental Impact Statement, no attempt has been made to distinguish between the grand fir (Abies grandis) and the white fir (Abies concolor) species mix White fir and grand fir hybrids are known to occur east of the Oregon Cascade Mountain Range (Zobel, 1973)

a. Clearcutting

Clearcutting, as a silvicultural system, will be employed to harvest timber under this plan This method is selected on the basis of physical and biological site factors, and existing timber types, as well as overall economics Clearcutting will be selected only when it is determined to be the optimal silvicultural system.

Clearcutting allows considerable flexibility in determining the character and composition of future timber stands The species, degree of stocking, etc. can be controlled with various silvicultural techniques This is especially useful in situations where existing stands are occupied by less valuable and undesirable species, or the current species composition is at high risk for losses due to insects or disease

The clearcutting method, in general, is the most economical regeneration harvest system to employ Since all merchantable timber is removed, the volume and value per acre treated and accessed is maximized

Fuels treatment and subsequent silvicultural treatments are also less costly than with other systems, since there is a residual stand to be protected

Clearcutting can be detrimental if applied to sites where physical conditions will change to extremes of heat and cold if the Forest cover is totally removed In these cases, regeneration efforts can be difficult and costly Clearcutting may also be the most effective harvest method to achieve the desired multiple use objectives of a stand. An example is a big-game winter range where clearcutting is the most successful system for maximizing growth of suitable browse vegetation

Following are general descriptions of sites and situations when clearcutting may be selected as the optimal harvesting method. Not all possible sites and situations are listed; however, since site-specific, on-the-ground analysis may identify situations where clearcutting may be the optimal method, and conditions do not meet those in the following descriptions, it is also probable that clearcutting may not be the optimal method for all the lands that fit these broad descriptions.

(1) The moisture and temperature regimes of the site, following clearing, will be favorable for regenerating the desired species In general, north and east aspects fit this category, but conditions can vary by geographic location

(2) The existing stand is stocked with species that are not desired in the regenerated stand because of disease or insect susceptibility, or the physiological condition of the existing overstory is such that natural regeneration is unlikely to occur

(3) The change in forested appearance created by the harvest opening does not conflict with objectives for visual management

(4) Management objectives for the area can be better achieved by clearing all other trees in one operation (e g , increasing browse and forage for wildlife or livestock)

Clearcutting is most likely to be prescribed for the mixed conifer plant communities and it will also be the predominant silvicultural system for regenerating lodgepole pine stands Examples of these plant communities include

white fir/big huckleberry (Abies grandis/Vaccinium membranaceum),
white fir/twinflower/forb (Abies grandis/Linnaea borealis/forb),
ponderosa pine/Douglas-fir/ninebark (Pinus ponderosa/Pseudotsuga menziesii/Physocarpus malvaceus),
mixed conifer/pinegrass (Pseudotsuga/Abies/Calamagrostis)

b. Shelterwood

The shelterwood silvicultural system will also be used to harvest timber under this plan In a shelterwood system, the basic objective is to have the second crop of trees started on a site before all of the standing timber is removed

Shelterwood systems are used in situations where the physical site conditions created by clearcutting would be too harsh for tree regeneration or would not be favorable to the establishment and growth of the desired species The residual stand provides protection from temperature extremes on the site and modifies the climatic factors in general The shelterwood system also offers that opportunity to reduce regeneration costs, if factors are suitable for establishing natural regeneration from the seed source provided by the residual stand

Shelterwood systems can also be the most effective means of achieving multiple use objectives in some instances. One example is those cases where visual quality objectives are retention or partial retention. In many cases the larger, more commercially valuable trees are left standing after the initial harvest entry. This reduces the volume and value per acre removed in the initial harvest entry, thereby increasing the unit costs of access and harvesting in many cases.

Once regeneration is established, removal of the residual stand requires careful harvest planning and implementation to protect the new crop of trees.

Following is a list of general factors that will be considered when determining whether or not the shelterwood system will be applied to a specific site. A site-specific silvicultural prescription may consider additional factors and timber sale conditions.

(1) The existing stand is stocked with species that are desired in the regenerated stand and the physiological condition of the trees is such that seed production and successful regeneration are likely to occur.

(2) The moisture regimes and temperatures on the site are such that without some shading and cover, conditions will become too harsh for tree regeneration. South and west aspects generally fit into this category, but conditions can vary by location

(3) Management objectives for the area can best be achieved by maintaining some tree cover on the site until regeneration is established.

Shelterwood harvesting is most likely to be prescribed on the warmer/drier ponderosa pine and Douglas-fir plant communities. Some examples of these plant communities include:

ponderosa pine/Douglas-fir/elk sedge (Pinus ponderosa/Pseudotsuga menziesii/Carex geyeri)
ponderosa pine/Douglas-fir/snowberry-ocean spray (Pinus ponderosa/Pseudotsuga menziesii/Symphoricarpos-Holodiscus discolor)
mixed conifer/pinegrass (Pseudotsuga/Abies/Calamagrostis) (Hall, 1973)

In prescribing shelterwood harvest methods, consideration will be given to future harvests required. The feasibility of removing the residual overstory from an established stand of seedlings, effectiveness of site preparation/slash treatment, and options such as artificial shading shall be considered when prescribing shelterwood harvests.

c. Selection Harvests

Individual tree and group selection harvest methods may be applicable to certain combinations of timber management and other resource objectives identified by the land assignments in the Plan. The most probable situations for implementing these silvicultural systems would be in riparian areas and in areas with visual quality objectives of retention or partial retention. Selection harvest methods should be evaluated when harvesting is scheduled in areas with these resource objectives.

3. Intermediate Harvests

Intermediate harvests such as commercial thinnings will generally be prescribed only in stands that have not reached the culmination of mean annual increment Salvage or sanitation harvest may be considered as intermediate treatments in stands that have already culminated in growth, but cannot be harvested and regenerated because of multiple use constraints on scheduling (maintaining wildlife cover). This treatment may be considered in lodgepole pine stands that are considered high risk for mountain pine beetle infestation.

F. REFERENCES CITED

The evaluation of harvest cutting methods is based on operational experience and research findings published in the following documents

Barrett, J. W. *Silviculture of ponderosa pine in the Pacific Northwest the* state of our knowledge. Gen. Tech. Rpt. PNW-92 Portland, Oregon *Pacific Northwest Forest and Range Experiment Station, Forest Service, U S* Department of Agriculture 1979. 106 pp

Burns, R. M., compiler. Silvicultural systems for the major forest types of the United States Agricultural Handbook 445 Washington, DC U S Department of Agriculture. 1983 191 pp

Fowells, H. A., compiler. Silvics of forest trees of the United States Agricultural Handbook 271 Washington, DC U S Department of Agriculture 1965 762 pp

Hall, F. C., plant ecologist. Plant Communities of the Blue Mountains in Eastern Oregon and Southeastern Washington Gen. Tech Rpt R6-8200-1 Pacific Northwest Region, U S Department of Agriculture 1973 47pp

Minore, D. Comparative autecological characteristics of northwestern tree species a literature review Gen. Tech Rpt PNW-87. Portland, Oregon Pacific Northwest Forest and Range Experiment Station, Forest Service, U S Department of Agriculture. 1979. 72 pp.

Schmidt, W. C. and Alexander, R. R Strategies for managing lodgepole pine. In Baumgartner, D M , ed Proceedings, Lodgepole pine the species and its management Pullman, Washington· Coop Extension, Wash State Univ. 1985. pp. 201-210.

Smith, D. *The practice of silviculture* New York John Wiley and Sons, Inc 1962. 578 pp.

Zobel, D.B. Local variation in intergrading Abies grandis - Abies concolor populations in the central Oregon Cascades: Needle morphology and periderm color 1979 Bot. Gaz. 134:209-220