Retention and Perpetuation of Biological Legacies and Green Trees (Eastern Washington)

Replaces: PR 14-006-091, Retention and Perpetuation of Legacy Trees, Snags and Downed Wood (Eastside)

Date: May 2011

Application: All forested state trust lands in Eastern Washington, excluding the Loomis State Forest[1].

Discussion

The purpose of this procedure is to provide direction integrating several requirements related to maintaining old trees and other ecologically important or rare forest structures across the landscape on Eastern Washington forested trust lands, excluding the Loomis State Forest.

The intent of the approach described is to integrate the following objectives:

1. **Conserve old trees (Legacy Trees) where they exist.**
2. **Provide for ongoing development of biological legacies (old trees, snags, down logs).**
3. **Maintain stand conditions conducive to good tree establishment and growth to support long-term generation of income for trust beneficiaries.**
4. **Avoid perpetuating forest health problems such as dwarf-mistletoe and root diseases.**
5. **Comply with trust lands Habitat Conservation Plan requirements in the affected areas of the east slopes of the Cascade Mountains.**
6. **Comply with Washington Forest Practice Act requirements concerning Wildlife Reserve Trees, Green Recruitment Trees, and down logs.**

[1] Direction for the Loomis State Forest is found in the *Loomis State Forest Final Landscape Plan*, June 1996.

Background

In Eastern Washington, steep environmental gradients support diverse forest types, ranging from low elevation, dry forests to high elevation moist and cold forests. Each forest type exists on a continuum of predominant but variable historic disturbance patterns that range from frequent low-intensity fires at the dry end of the spectrum to infrequent stand-replacing fires in the highest, moistest forest types. Forest types in between these extremes historically experienced a mixture of fire and endemic insect disturbances, resulting in patchy mortality and consequent patchy stand structure. However, all of these stands could, and did, occasionally burn at any severity.

Historically, dry forests types in Eastern Washington were dominated by large, old ponderosa pine, western larch and Douglas-fir trees, often in relatively open stands within a patchy mosaic of younger trees and open areas. These species develop thick fire-resistant bark as they age, that allowed them to survive frequent low-intensity fires. Such fires removed ground and ladder fuels and many younger trees, to maintain a relatively open forest condition. Moister forests with more episodic and severe fires were also mosaics of different forest conditions as a result of patchy fire-induced mortality, but tended toward greater stand density overall. On moister sites with mixed fire regimes, periods between fires were often measured in decades versus a few years on very dry sites.

In the last 150 years, suppression of wildfire has altered both the density and composition of dry eastside forests, jeopardizing forest health. Large, old trees now compete with younger, shade tolerant species in overstocked stands. Results of fire suppression include a decline in vigor of these older trees accompanied by uncharacteristic epidemics of insects and diseases. Surface and ladder fuels accumulate, contributing to severe risk of stand-replacement fire in many places.

Ecological health (especially relative to viable wildlife habitats) of both dry and moist forest types in Eastern Washington often depends on sufficient presence of older trees, snags, and the largest available down woody debris (with less emphasis on down woody debris in dry forest types).

Legal and Policy Influences

This procedure seeks to integrate requirements from several sources related to retaining trees, snags and down logs across the DNR-managed trust lands in Eastern Washington. Washington Forest Practice Rules (WAC 222-30-020 (11)) require retention of trees and down logs during harvesting activities. The Department's Trust Land Habitat Conservation Plan (HCP) contains tree, snag and down log retention requirements for areas of Eastern Washington covered by the HCP. The Department's Policy for Sustainable Forests (PSF) intends to ensure forest ecosystem health and productivity by actively managing species composition and stocking levels, developing fire and insect-resistant stands, and identifying and protecting special ecological features. The PSF also notes that the Washington Legislature directed DNR to inventory old-growth in eastern Washington, and states that additional policy regarding old trees may be developed as part of an Eastern Washington sustainable harvest calculation.

Actions:

1. Legacy Trees

- Leave all Legacy Trees as described in Appendix 1, Classes 2 and 3, Vigor Categories A and B. As an aid to determining whether a tree falls into these categories, use the rating systems in Appendix 2. Legacy Trees would be those keying out as "Mature tree ≥ 150 years." These classification systems are not precise, and the final decision for any individual tree will be the responsibility of region field foresters trained in the identification of old trees. The Forest Resources and Conservation Division staff will be responsible for assessment of overall compliance with this procedure.

- Legacy Trees may be felled for forest health or safety reasons (see TK 14-006-093, Forest Worker Safety and Operational Considerations for Leave Tree Locations). Such trees may be removed only when there is an imminent threat of theft or a condition of extreme fire hazard is evident. Legacy trees may also be girdled to address forest health concerns. Region manager approval is required in cases where Legacy Trees are felled and removed or girdled. Documentation of this approval will be in the form of a memo in the timber sale file, signed by the region manager, and will include the reasons why alternatives to felling or girdling were not viable. See Appendix 3 for a discussion of forest health considerations and alternatives to felling.

- In some stands with more than 12 Legacy Trees per acre, the number of legacy trees may negatively impact productivity and regeneration, limiting the viability of managing for a commercial cohort. In such stands, alternate management options may be developed with help from the region or division biologist, the region intensive management forester or division silviculturist, with the knowledge of the assistant division managers for Product Sales, Ecosystem Services, and Silviculture in the Forest Resources and Conservation Division. Site-specific approaches developed in this way will be approved by the Region Manager, and if they include harvest of old trees, be documented in the timber sale file in the form of a memo signed by the Region Manager, and described in the Special Features section of the prescription in Planning & Tracking. Such plans could defer harvesting and potentially result in alternative land use designations for the stand, or describe a site-specific harvest plan that balances conservation objectives with regeneration and stand productivity concerns. Unless there is a compelling forest health issue within the stand for which there is no other solution, the number of legacy trees will not be reduced below 12 per acre.

2. Wildlife Reserve Trees (snags & snag recruits)

- In accordance with WAC 222-30-020 (11), an average of at least two wildlife reserve trees per acre must be left. Legacy trees may be used to satisfy the requirement for Type 1 wildlife reserve trees. Only trees that are 10 or more feet in height and 10 or more inches dbh can be counted for this requirement. In NRF-designated management areas an average of at least 3 snags per acre must be left. Acre by acre densities may vary, provided averages are met on the FMU as a whole. Where available and where safety considerations allow, structurally sound snags (Type 2 Wildlife Reserve Trees) are preferred to meet this requirement. Safety requirements must be adhered to when designating Wildlife Reserve Trees (see TK 14-006-093). Strive to retain the largest diameter and cavity snags available of ponderosa pine, Douglas-fir, and western larch, and select hard snags with bark where available. If Legacy trees are girdled to address forest health concerns, those girdled trees may be counted as Type 2 Wildlife Reserve Trees.

3. Down Woody Debris

- In accordance with WAC 222-30-020 (11), an average of at least two down logs per acre must be left. Only down logs with a small end diameter greater than or equal to 12 inches and a length greater than or equal to 20 feet or equivalent volume can be counted toward this requirement. Large cull logs are preferred as down logs. In NRF-designated management areas, NRF habitat requires 5 percent of the ground to be covered with dead and down wood. Acre by acre densities may vary, provided averages are met on the FMU as a whole. If Legacy Trees are felled to address Forest Health concerns, those logs may be counted toward this requirement provided minimum sizes listed above are met.

4. Green Recruitment Trees

- Legacy Trees or Wildlife Reserve Trees may be present only in small numbers in many stands, and trees with these attributes must be developed over time by leaving Green Recruitment Trees at the time of harvest. These Green Recruitment Trees are intended to eventually develop the attributes of Legacy Trees and Wildlife Reserve Trees. The number of Green Recruitment Trees required varies with the number of trees left as Legacy Trees or live Wildlife Reserve Trees. The total number of live leave trees (Legacy + live Wildlife Reserve + Green Recruitment) must average at least 6 per acre. In NRF designated management areas, this total must average 10-12 trees per acre. Acre by acre densities may vary, provided averages are met on the FMU as a whole. Legacy trees may satisfy the requirement for Type 1 wildlife reserve trees where they are present in sufficient numbers.

- Green recruitment trees should be composed primarily of Douglas-fir, ponderosa pine, or western larch where they exist. If these species are absent or inappropriate for the site, other species may be selected. Where hardwoods are present, such as

quaking aspen, including a small percentage of hardwoods as a component of the recruitment trees is permitted because hardwoods provide a valuable wildlife habitat component. However, due to the shorter life span of hardwoods compared to conifers, the percentage of hardwoods counted as Green Recruitment Trees cannot exceed 5% of the total live leave trees in the FMU.

- Green recruitment trees can be left in a scattered arrangement or clumped, as long as the total number of live leave trees on the FMU is at least 6 per acre. If trees are clumped, clumps must be spaced so that the maximum distance between them does not exceed 400 feet. See Appendix 4 for a discussion of tradeoffs between clumping and scattering.

- When green recruitment trees are left in a dispersed arrangement, they should be selected from among the largest of each species. The choice of which individual trees to leave should also consider forest health issues, such as dwarf-mistletoe infections. When trees are left in an aggregated arrangement (clumped), they should typically be representative of the diameter distribution of the stand or larger. Exceptions may occur if clumps are left to protect specific ecological features. In some circumstances, the areas around these features may differ from the average of the stand as a whole. In cases where diameter of clumped trees is significantly different from the stand average for these reasons, document this fact and the ecological feature being protected in the Special Features section of the prescription in Planning and Tracking. Whether dispersed or clumped, only those trees 10 or more inches dbh and 10 feet or more in height may be counted toward the requirements.

APPROVED BY: _____

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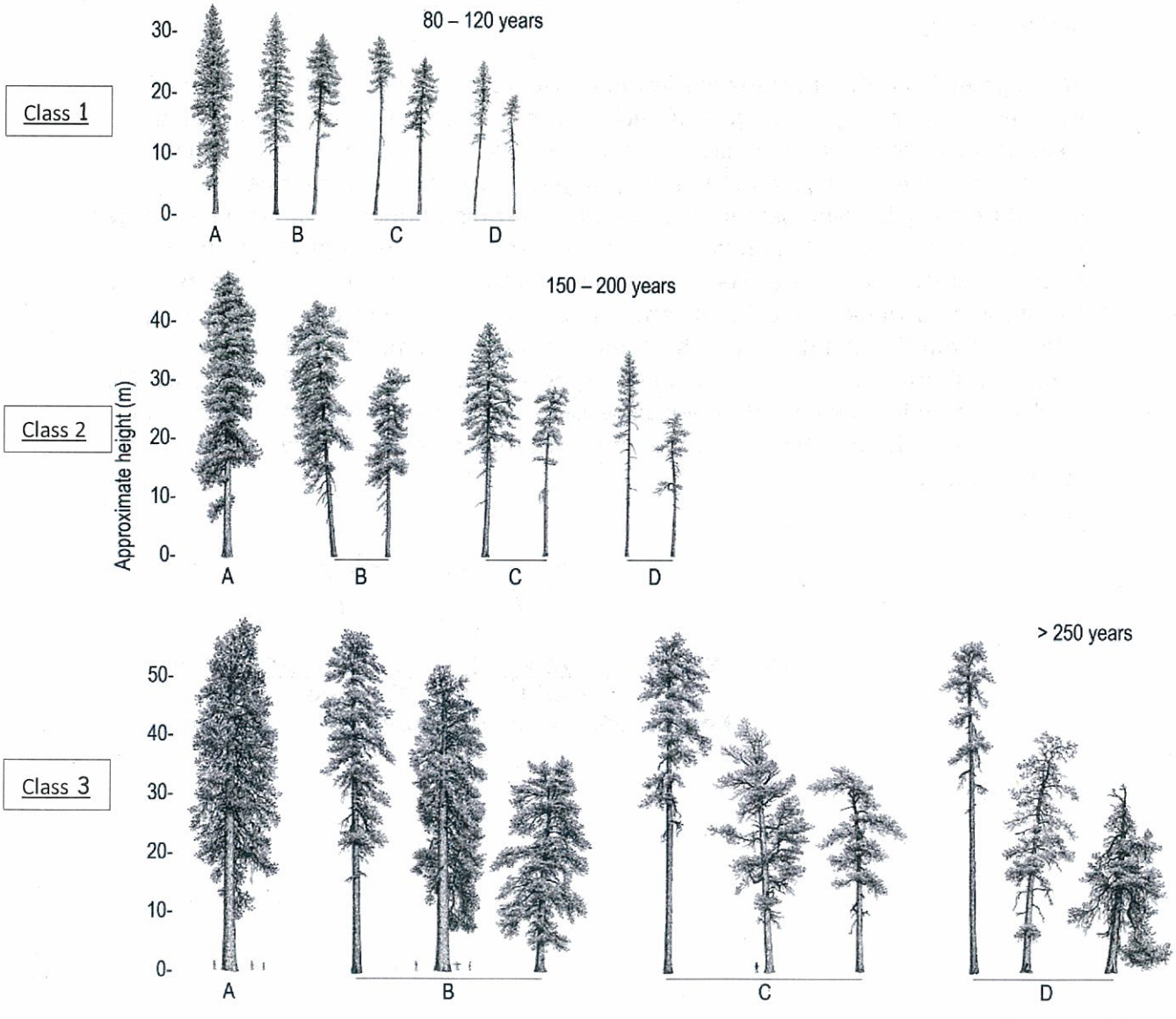
APPENDIX 1: Crown form and tree vigor profiles by species (from Van Pelt, 2008).

Ponderosa pine crown form and tree vigor in eastern Washington. Idealized forms represent three age classes and four vigor classes (A-high vigor to D-low vigor). Vigor is a function of site productivity and response to disturbance and environmental stress. More than one individual is shown vigor classes B-D to illustrate possible variations. Competition-based mortality usually ensures that most trees in vigor classes C and D do not survive to the next age class.

Legacy trees are defined as the second and third classes and vigor categories A and B. Age ranges may be used to help identify the classes but are not intended to serve as age requirements.



Van Pelt, 2008

Western Larch crown form and tree vigor in eastern Washington. Idealized forms represent three age classes and four vigor classes (A-high vigor to D-low vigor). Vigor is a function of site productivity and response to disturbance and environmental stress. More than one individual is shown vigor classes B-D to illustrate possible variations. Competition-based mortality usually ensures that most trees in vigor classes C and D do not survive to the next age class.

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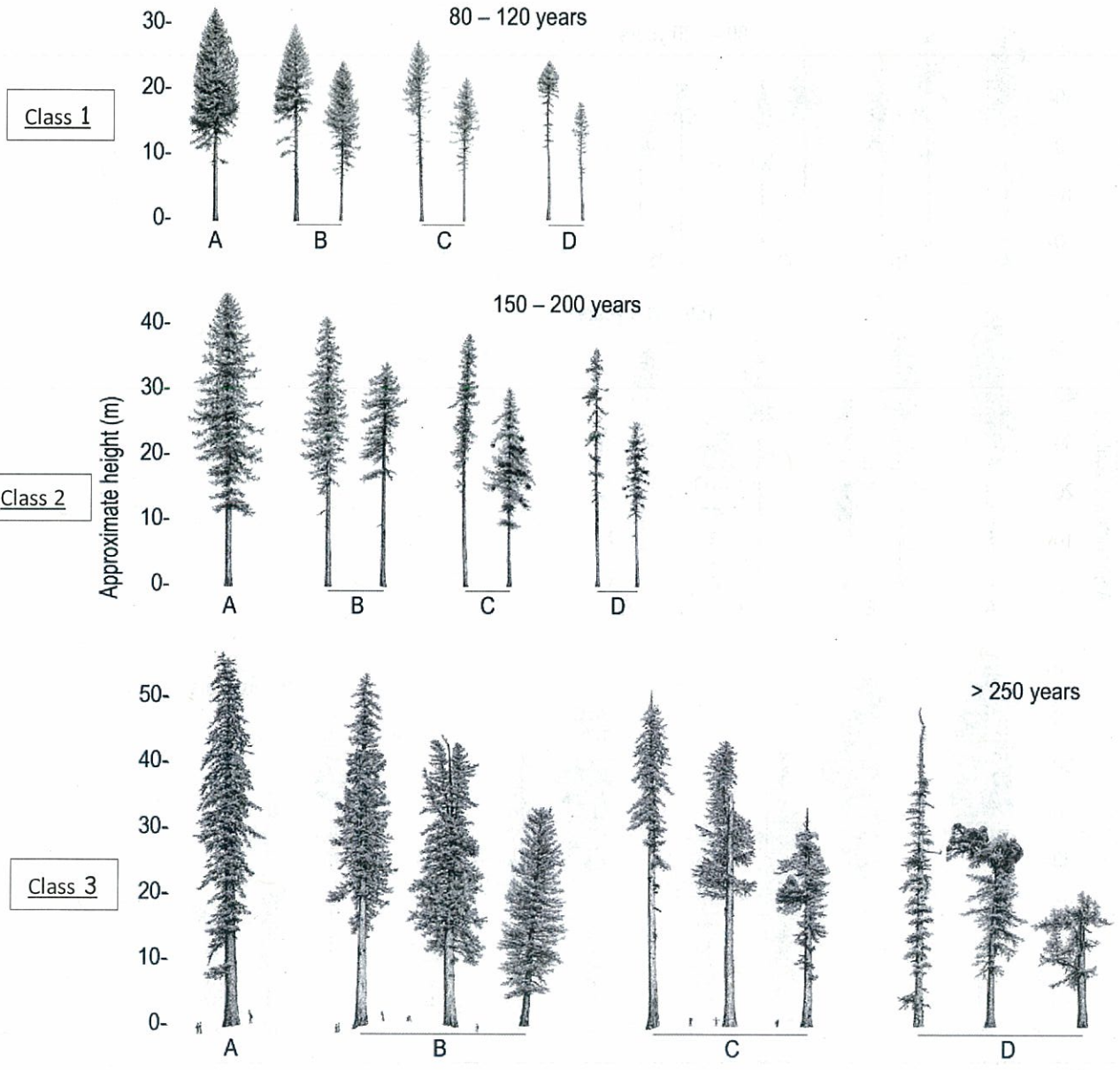
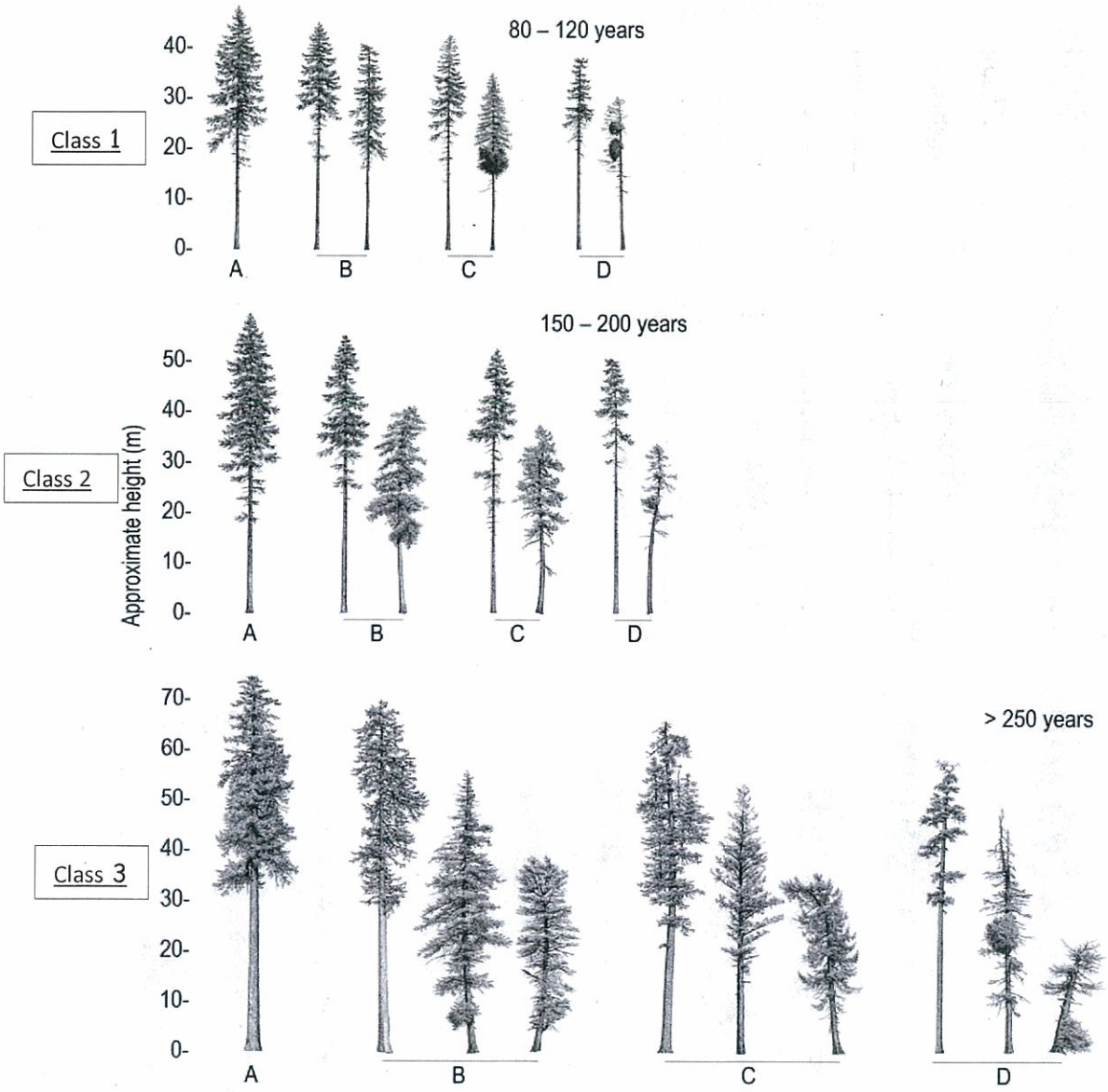


Van Pelt, 2008

Douglas fir crown form and tree vigor in eastern Washington. Idealized forms represent three age classes and four vigor classes (A-high vigor to D-low vigor). Vigor is a function of site productivity and response to disturbance and environmental stress. More than one individual is shown vigor classes B-D to illustrate possible variations. Competition-based mortality usually ensures that most trees in vigor classes C and D do not survive to the next age class.

Legacy trees are defined as the second and third classes and vigor categories A and B. Age ranges may be used to help identify the classes but are not intended to serve as age requirements.



Van Pelt, 2008

APPENDIX 2: Rating systems for determining the general age of Douglas-fir, ponderosa pine, and western larch trees. (From Van Pelt, 2008)

Within each species, choose one score from each category and sum scores to determine developmental stage based on scoring key at bottom.

Douglas-fir

Bark condition, lower one-third of tree	Score
Hard, bony bark with small fissures	0
Hard bark with moderately deep fissures (2-4 inches)	1
Deep fissures present (> 4 inches)	3

Knot indicators, lower one-third of tree	Score
Branch stubs present	0
Old knot/whorl indicators visible	1
No knot/whorl indicators visible	3

Lower crown indicators	Score
No epicormic branches	0
Small epicormic branches present	1
Large and/or gnarly epicormic branches present	3

Crown form (refer to Appendix 1: Douglas-fir crown form)	Score
Similar to a tree in top row	0
Similar to a tree in middle row	3
Similar to a tree in bottom row	5

Scoring Key:

<3	Young tree
3-6	Mature tree <150 years
7-10	Old tree ≥ 150 years
>10	Old tree ≥ 250 years

Ponderosa Pine

Lower trunk bark condition	Score
Dark bark with small fissures	0
Outermost bark ridge flakes reddish, fissures small	1
Colorful plates, width about equal to fissure widths	2
Maximum fissure to fissure plate width ≥ 6 inches and < 10 inches	3
Maximum fissure to fissure plate width ≥ 10 inches	5

Knot indicators on main trunk below crown	Score
Dead branches below main crown, whorl indicators extending nearly to tree base	0
Old knot/whorl indicators visible below main crown	1
No knot/whorl indicators visible	3

Crown form (refer to Appendix 1: Ponderosa pine crown form)	Score
Similar to a tree in top row	0
Similar to a tree in middle row	3
Similar to a tree in bottom row	5

Scoring Key:

<2	Young tree
2-5	Mature tree <150 years
6-10	Old tree ≥ 150 years
>10	Old tree ≥ 250 years

Western Larch

Bark condition, tree base	Score
Hard, bony bark with small fissures	0
Hard bark with moderately deep fissures (2-4 inches)	1
Deep fissures present (> 4 inches)	3
Maximum fissure to fissure plate width ≥ 6 inches	3

Knot indicators, lower one-third of tree	Score
Branch stubs present	0
Old knot/whorl indicators visible	1
No knot/whorl indicators visible	2

Lower crown indictors	Score
No epicormic branches	0
Small epicormic branches present	1
Large and/or gnarly epicormic branches present	2

Crown form (refer to Appendix 1: Western larch crown form)	Score
Similar to a tree in top row	0
Similar to a tree in middle row	3
Similar to a tree in bottom row	5

Scoring Key:

<3	Young tree
3-6	Mature tree <150 years
7-10	Old tree ≥ 150 years
>10	Old tree ≥ 250 years

APPENDIX 3: Balancing Legacy Tree Retention and forest health issues

In general, the procedure requires all Legacy Trees to be retained where they exist. However, there are situations where taking that approach would result in the perpetuation of serious forest health problems, with levels of infection that are uncharacteristically high. For that reason, the procedure allows for the cutting of Legacy Trees with the approval of the Region Manager when those situations are encountered. The purpose of this appendix is to discuss some of those situations and the alternatives that can be considered to address them.

Armillaria root disease

Armillaria is a common and serious disease affecting a large proportion of eastern Washington forests. From a practical standpoint, the only thing foresters can do about it is shift species composition to those species that are relatively less susceptible to the disease. Usually this is done by planting a more resistant species following harvest. Also, the most susceptible species are avoided when marking leave trees to reduce the potential seed source for perpetuating the species on that site. While shifts in leave tree species composition should not be a problem for selecting Wildlife Reserve Trees or Green Recruitment Trees, cutting Legacy Trees for this purpose is not typically necessary. There may be increased natural regeneration of susceptible species as a result of retaining the Legacy Trees, but seeding in from adjacent stands will likely occur anyway. And the problem of unwanted stocking from a susceptible species can be addressed with thinning.

Dwarf mistletoe

The dwarf mistletoes are common damaging parasites of conifer species in eastern Washington. Infected trees are most easily recognized by the presence of masses of abnormal branch and twig growth referred to as "witches' brooms". The combination of fire exclusion and selective harvesting has contributed to increased incidence of the parasite. Dwarf mistletoe is spread by seeds which shoot upward and outward from the infection site, landing as far as 45 feet from the tree. Light to medium levels of infection reduce tree growth, while severe infections can cause mortality. Trees with half or more of their crown infected often decline rapidly after they are exposed to full sunlight by thinning. The most dramatic effects are on regeneration, which is easily killed by infections that result from the presence of an infected overstory. It is nearly impossible to maintain long-term forest health or achieve good timber production in multi-storied, heavily infected stands.

Some level of dwarf-mistletoe infection is beneficial for wildlife habitat. The shoots and fruits serve as a food source for some species, and the witches brooms are used as shelter and nesting sites by both birds and mammals. The goal should be to reduce the incidence to a level that allows good stand growth and development, but maintains the dwarf-mistletoe as a component of the landscape. From a practical standpoint, this can be accomplished by addressing the moderate to severely infected trees. The remaining trees are almost certain to contain less obvious infections which will continue to develop and spread.

An important characteristic of dwarf mistletoes from the standpoint of management is their host specificity. For instance, the dwarf mistletoe that infects western larch will generally not affect Douglas-fir or ponderosa pine, and vice versa. An important exception is that lodgepole pine is frequently infected by larch dwarf mistletoe when growing near infected

western larch. On sites appropriate for several species, the problem of leaving infected trees in the overstory can be overcome by planting a different, non-susceptible species near the infected trees. Non-susceptible species should be planted for a radius of at least 50 feet from infected overstory trees. Another characteristic that is useful in some circumstances is that dwarf mistletoe requires a living host to survive. Although it may not be practical on a large scale, girdling infected trees may be a useful way of controlling the problem in situations where under planting with non-susceptible species is not practicable. On moist sites small numbers of heavily infected trees can also be retained by surrounding them in a clump of green recruitment trees. In this way, there will not be regeneration in the immediate area of the infected tree. Also, the surrounding trees, if they are a different species, can act somewhat as a barrier to the spread of the dwarf-mistletoe seed.

APPENDIX 4: Factors to consider when planning green tree retention patterns

Under this procedure, Green Recruitment Trees can be left scattered (dispersed) or clumped (aggregated). Either arrangement, or a combination, is acceptable, and the choice is left to the person designing the harvest unit. Below is a discussion of some of the factors that should be considered when choosing the arrangement of green recruitment trees.

Mimicking natural disturbance

Ecologists have long recommended that the spatial arrangements of trees left following harvest on a particular site type should mimic the spatial arrangement of a forest following the dominant disturbance patterns historically experienced by that site type, thus matching existing species adaptations and ecosystem resilience. Different forest types differ in the historical spatial distribution of large, old trees. Dry forest types, with frequent low-intensity fires would likely tend toward a dispersed distribution of large, old trees. The wetter forest types, where infrequent stand-replacing fires occurred would likely tend toward an aggregated arrangement, with groups of surviving large, old trees found in protected spots. This of course is a general rule, and it should be recognized that single trees often survived disturbance in stand replacement and mixed fire regime sites, just as groups of surviving trees helped create the fine-scale patchiness that characterized the historic dry ponderosa pine and dry mixed-conifer sites. Variation may in fact be the most important concept to keep in mind when planning the arrangement of Green Recruitment Trees. On a landscape scale, we do not want to be doing the exact same thing everywhere, because we wish to mimic nature, and nature specializes in variation.

Tree competition

Overstory trees exert a significant competitive influence around them, both above- and below-ground. When trees are scattered, there is little competition between overstory trees, and the total area influenced by overstory competition is maximized. When trees are clumped, there is significant competition between overstory trees, and the total area influenced by overstory competition is minimized. For these reasons, clumping will usually be more favorable to establishment and growth of regeneration, while scattering will usually be more favorable to more rapid growth of individual overstory trees. Exceptions to this generalization occur on harsh sites, where the regeneration advantages of shelter provided by scattered trees can outweigh the disadvantages of the competition they provide, at least until regeneration is well established.

Different site types and individual species needs

Specific needs of individual species may be met better by one type of retention than by another. For instance, in dry forests, birds with large home ranges such as the white-headed woodpecker depend on scattered trees for foraging, while birds with smaller home ranges such as the white-breasted nuthatch are more closely associated with clumps. Fire exclusion has reduced the amount of open forest condition in dry Eastside forests, and several species that are closely associated with open forest and large trees are in decline as a result of habitat loss, so dispersed retention may, in some dry areas, be disproportionately important. In moist forests, where clumping generally meets the needs of the broadest number of organisms, there are reports of advantages to bear cubs of scattered trees because scattering is more likely to provide a nearby tree if they need to

climb to escape predatory male bears. However, tree squirrels can more safely travel from crown to crown in a clump than if they have to travel on the ground between scattered trees. Among birds, there are some species that are adapted to forage within clumps and others that are adapted to forage in scattered trees. For neo-tropical bird species, scattered trees are extremely important for the establishment of male breeding territories. The maximum distance requirements applied to clumps exist in part to strike a balance between the structural advantages of large clumps and the proximity advantages of scattered trees.

A major objective of the retention requirements in this procedure is to help provide refugia for organisms that may not be able to survive in a harvested area without the retained structures, sometimes referred to as "lifeboating". The retention helps maintain organisms both by retaining structures required to meet specific habitat needs, such as foraging or nesting sites, and by moderating microclimate compared to a harvested area without retention. For the purpose of lifeboating on most sites, conditions needed to support the widest range of organisms are most likely to be provided when retention is clumped. This is because clumping allows the understory vegetation and the forest floor to remain undisturbed, maintaining those parts of habitat structure as well as the trees. Also, microclimates inside clumps of trees are more forest-like than microclimates beneath scattered trees. In the driest Eastside forests, bear in mind that fire exclusion has resulted in a much denser condition than was historically typical. On such sites, somewhat more emphasis should be placed on scattered trees; these are the "lifeboats" for many species associated with the dry, open condition. When trees are clumped on dry sites, consider ladder and ground fuels that could result in loss of the clump to fire.

Protection of snags and Legacy Trees

Clumping Green Recruitment Trees around snags or Legacy Trees can help protect those structures from damage during felling or yarding operations. Clumping may also allow snags to be retained that would otherwise have to be cut for safety reasons. On drier sites, such as ponderosa pine sites or dry mixed-conifer sites, younger trees should be removed from within and around single Legacy Trees or Legacy Tree clumps wherever practicable to reduce competition and risk of crown fires.

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