Low Impact Conifer Thinning Prescription for Western Washington
For Small Forest Landowners
August 20, 2024

Overview

The following is an experimental low impact alternate harvest prescription being offered only to small forest landowners (http://app.leg.wa.gov/WAC/default.aspx?cite=222-16-010) for thinning of conifer dominated riparian forests in western Washington. The intent of this prescription is to improve the long-term riparian function of crowded riparian forest stands which demonstrate the potential for substantial suppression of tree growth if no thinning occurs. By allowing a light to moderate thinning of the trees, these forested riparian areas can be managed in a manner that will encourage growth of understory vegetation and achieve larger tree diameters of the residual stands helping them meet the desired future condition goals of the forest practices rules faster than would have occurred under a no-thinning option. This prescription is intended to be used in riparian forest stands with an existing stocking level of less than 300 conifer trees per acre (TPA). Landowners who intend to thin younger riparian forest stands that exceed this stocking level should use the Overstocked Stand Template (https://www.dnr.wa.gov/publications/fp_form_overstock.pdf).

The riparian management zone (RMZ) for this prescription includes a No-Cut Zone and an adjacent Thinning Zone. The prescription is designed to:

- Meet or exceed the stand requirements needed to "protect aquatic resources and related habitat to achieve restoration of riparian function; and the maintenance of these resources once they are restored." (WAC 222-30-010(2)); and
- Provides allowances to specifically help offset the costs for small forest landowners to conduct a restoration thinning of the riparian area.

Though this prescription may result in some short-term loss in the availability of large woody debris and shade, by retaining a No-Cut zone adjacent to the stream and by conditioning the allowable thinning based on site class and average stand diameter, the prescription is designed to address potential wind-throw and maintain rule required in-stream functions (large wood, shade, bank stability, sediment filtering, leaf litter and nutrient processes) that are expected to improve over time.

This experimental prescription has been developed as a package and, as such, the individual prescription elements are not intended to be simply inserted into other alternate plans. The response of the remaining riparian forest after the application of this experimental prescription is being monitored to determine if the prescription elements are meeting the goals of the prescription, or if they can be changed to better address the protection of riparian functions or costs to the landowner.

This experimental prescription is to be applied to RMZ's adjacent to Type F and S waters and cannot occur within any rule identified sensitive sites (http://app.leg.wa.gov/WAC/default.aspx?cite=222-16-010) or unstable slope buffers.

Process

An appropriate experimental low impact alternate harvest prescription form, available from DNR, must be included with the landowner's forest practices application (FPA). The form documents the details of the landowner's plan and site conditions and must be included with the FPA.

While an Interdisciplinary (ID) Team of specialists may be called to review the proposed harvest (WAC 222-12-0401(5)), by following the provisions in this prescription the need for an ID Team will typically be necessary only if specific issues related to site eligibility arise, although ID Team review may be necessary in other situations.

Difference from Standard Riparian Management Zone Rules

This prescription differs from standard rules (WAC 222-30-21-(1)(ii)(A) and (B)) by:

- Providing an opportunity to use narrower RMZ and No-cut Zone widths,
- Allowing conifer thinning without needing to conduct a full inventory of all of the trees in the stand or to run the Desired Future Conditions (DFC) model to determine eligibility and to identify which trees can be harvested,
- Eliminating the outer zone leave tree requirement,
- Eliminating the documentation that harvest meets the shade requirements in Board Manual, and
- Establishing a simplified prescription which will allow a landowner to mark their own leave-trees without the assistance of a consultant, if desired.

Eligibility Requirements

Qualifying stands must meet all of the following:

- Owned by a Small Forest Landowner;
- Located adjacent to fish-bearing (Type S/F) waters;
- Containing more than 70% conifer trees per acre;
- Containing less than 300 conifer trees per acre greater than 6 inches diameter at breast height (DBH);
- Eligibility for this prescription is limited to heavily stocked stands exhibiting signs of significant loss in growth potential. This is best determined using the conifer live crown ratios (height of live green branches compared to total tree height) of leave trees sufficient for these leave trees to release and stimulate height, diameter and crown growth response; generally, this requires that leave trees following thinning retain at least 33% (preferably 40-50%) of total tree height in live crown (see Figure 1 illustration and Crown Classification Descriptions in Appendix A.)
- Meeting the tree retention requirements as described in this document.

Harvest Prescriptions

The Riparian Management Zone (RMZ) for this prescription:

1) The Riparian Management Zone (RMZ) prescription is separated into two management zones:

***a) No-Cut Zone**:* The width of the No-Cut Zone (Core) is 30 feet measured horizontally from the outer edge of BFW or the CMZ per Table 1.

b) Thinning Zone: The Thinning Zone extends beyond the No-Cut Zone (Core) the appropriate Thinning Zone distance is determined by the Site Class (See Tables 1).

The width of the Thinning Zone is dependent upon site class and is shown below in Table 1:

Table 1 RMZ zone widths for use with a 30-foot No-Cut zone.

Site Class	No-Cut Zone Width (Feet)	Thinning Zone Width (Feet)	Total RMZ Width (Feet)
I	30	115	145
II	30	88	118
III	30	71	101
IV	30	52	82
V	30	45	75

Tree Retention Requirements

The harvesting strategy for the thinning zone is to "thin from below". Thinning from below removes trees **from the lower crown classes (suppressed, intermediate and co-dominant crown classes) to favor those in the upper crown classes (dominant, co-dominant and residual trees) (see Figure 1.).**

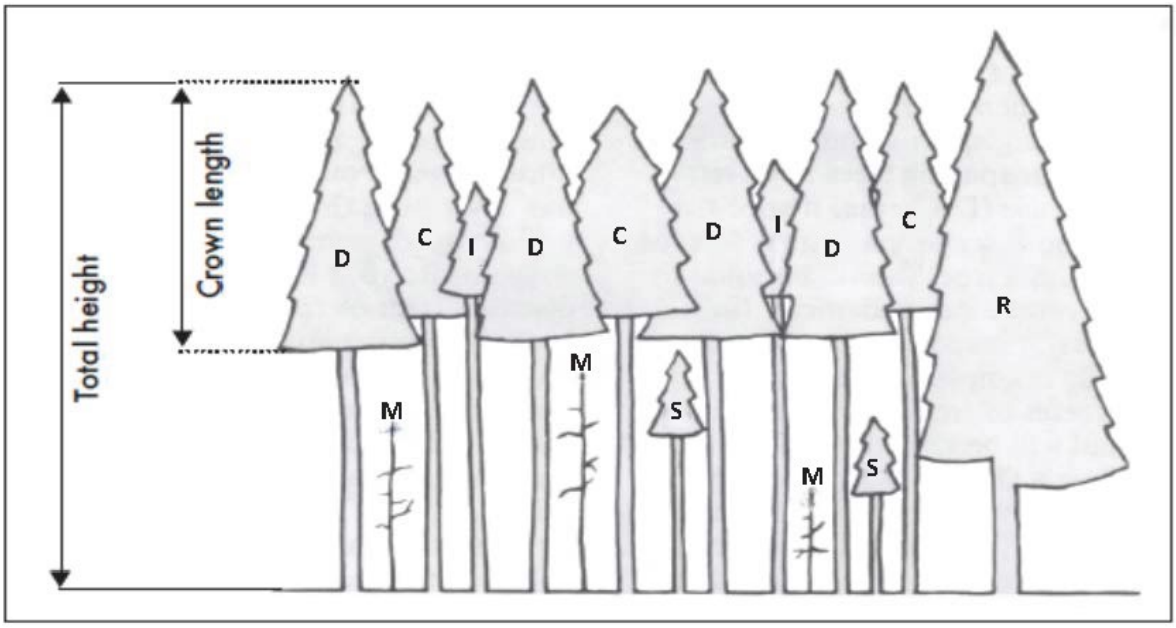

Figure 1. *Crown type classifications of trees in even-age stands. D = Dominant, C = Codominant, I = Intermediate, S = Suppressed, M = Mortality and R = Residual Trees. The "crown ratio" is the proportion of total tree height that is occupied by live crown. In this illustration, the dominants*

have a 50 percent crown ratio; the residual tree has an 80 percent crown ratio. See Appendix A for Crown Classification Descriptions.

After completion of a "thinning from below" harvest, the quadratic mean diameter (roughly equivalent to the average stand diameter) will be the same or larger than the quadratic mean diameter before harvest. The guideline for a thinning from below is to produce a d/D ratio of less than (<) 1.

Average diameter of a stand of trees, expressed as "DBH" (diameter at breast height) is a widely used tree stand statistic in forestry. To most people, "average' is synonymous with the arithmetic mean, where all individual measurements (such as all measured tree diameters from a stand) are summed and divided by the total number of measurements. Unfortunately, the expression of average stand diameter conventionally used in forestry is not the arithmetic mean of diameters, but the quadratic mean. The distinction between arithmetic and quadratic means are not important for you to understand; the important part is that you need to take a sample of tree diameters within the planned Thinning Zone in order for you and your thinning operator to know the number of leave trees required following your thinning operation. How many trees you need to measure for diameter and what to do with those measurements will be explained later in this section.

To determine d/D ratio, first calculate the quadratic mean diameter (QMD) of the trees to be cut (d), next calculate the quadratic mean diameter of the stand prior to thinning (D), then compare the ratio of d/D to assure the value is less than one. **Both of these calculations of quadratic mean diameter will be performed by entering your tree diameter measurements into a smartphone or computer application, to be explained later in this section.**

The tree retention requirements (leave tree stocking levels by diameter class) are determined by the (QMD) of the conifer trees in your Thinning Zone(s) and by knowing the dominant conifer species group (Douglas fir or Western hemlock) within the Thinning Zone. The QMD method works well in even-aged stands where the dominant and codominant trees are of uniform diameter.

Dominant conifer species group: Dominant conifer species group is determined by stem count. If there are more Douglas fir stems than other conifer tree species, choose Douglas fir as the dominant conifer species group and use the Douglas fir "Modified Curtis Relative Density Calculator RD 40" table. If there are fewer Douglas fir stems than other conifer species, choose western hemlock as the dominant conifer species group and Western Hemlock "Modified Curtis Relative Density Calculator RD 50"

The QMD of conifer trees in the Thinning Zone will be calculated by measuring DBH for a sample of trees using a strip cruise methodology or utilizing tree diameter data from plots located within the Thinning Zone during a total stand cruise (whichever method works best for your site) and inputting those measured tree diameters into a smartphone or computer "QMD calculator" application . The sample size of trees for the strip cruise to calculate conifer QMD will be roughly 10% of the conifer trees within the Thinning Zone (see Appendix B). The QMD is only determined from the conifer trees in the Thinning Zone itself, so trees in the No-Cut zone (core) are not used for this calculation. Residual trees in the Thinning Zone will be noted during the cruise sample but not included in the calculation of QMD. Once the QMD is determined and the dominant conifer species group, use the appropriate "Modified Curtis Relative Density Calculator RD 40" table below to determine the appropriate leave tree stocking level for your stand.

In most conifer-dominated even-aged stands (those with a relatively narrow range of tree diameters), the calculated QMD alone can be applied to guide the appropriate tree spacing (see tree spacing per QMD diameter class in the two "Modified Curtis Relative Density Calculator" tables below) to achieve a well distributed stand condition. However, the largest conifer trees must be retained regardless of this tree spacing guidance.

Conifer-dominated even-aged stands occasionally contain large residual conifer trees (scattered large residuals left unharvested during a prior harvest, small trees that were un-merchantable at the time of past harvest activity but are now years older and larger than the current even-aged component of the stand, trees that survived previous wind / blowdown events, etc.). These types of stands that do not lend themselves to the standard QMD calculation method, since including the diameters of any such large residual conifer trees will skew the calculated QMD to something not representative of the predominant even-aged stand condition. These are not uneven-aged stands but even-aged stands with a small but significant component of older, larger residual trees. In this type of even-aged stand, the diameters of these residual conifer trees will not be included in the QMD calculation but all residual conifer trees within the Thinning Zone must be marked for leave; for these types of stands, QMD will only be determined from the actual even-aged conifer trees in the stand. Additionally, average tree spacing is a lesser concern in these stands as the large residual trees will drive leave tree distribution.

Add another informational box here. *This box should show picture and a figure with a typical, even-aged plantation stand where straight-forward QMD calculation is simple and reliable. It should also depict another stand with scattered, large residual trees amongst the "plantation-sized" trees and indicate that the large, residual trees must be marked first for leave and they don't count in the QMD calculation.*

Include informational box describing how to determine largest residual trees

Modified Curtis Relative Density Calculator for Douglas Fir (RD 40) for conifer thinning

QMD Quadratic Mean Diameter	Leave Trees/Acre (Minimum)	Average Tree Spacing (Feet)
29	47	34
28	50	33
27	52	33
26	55	32
25	59	31
24	62	30
23	66	29
22	71	28
21	76	27
20	82	26
19	89	25
18	96	24
17	105	23
16	115	22
15	126	21
14	140	20
13	156	19
12	176	18
11	201	17
10	232	15

Modified Curtis Relative Density Calculator for Western Hemlock (RD 50) for conifer thinning

QMD Quadratic Mean Diameter	Leave Trees/Acre (Minimum)	Average Tree Spacing (Feet)
29	65	29
28	68	29
27	72	28
26	76	27
25	81	26
24	86	25
23	91	25
22	98	24
21	105	23
20	113	22
19	122	21
18	132	21
17	144	20
16	158	19
15	174	18
14	193	17
13	215	16
12	243	15

These two tables incorporate Relative Density (RD) as a reasonable approach that is intended to address stand mortality, windthrow, shade and LWD recruitment to ensure sufficient stocking is available to improve riparian function over time.

Additional Preparation and Harvest Requirements:

- A pre-application review is recommended to determine eligibility before the FPA is submitted.
- Leave trees must be marked prior to harvest and before the FPA is submitted.
- Reasonable care shall be taken to avoid damage to the stems and root systems of all residual trees within the Thinning Zone from falling, skidding or yarding. Any residual leave trees damaged must remain on site and do not count toward the residual conifer retention requirements.
- Trees with observable lean toward the stream are to be retained where possible for future LWD recruitment.
- Harvesting must not occur within any Type Np sensitive site buffers. The width of RMZ buffers adjacent to sensitive sites varies by the type of sensitive sites. Headwall and side-slope seep RMZs are measured from the perennially saturated soil edge and are 50 feet wide. RMZs associated with Type Np confluences, headwater springs and Type Np initiation points are measured from the center of

the feature or point of confluence, are circular in shape and are 56 feet wide (i.e. have a radius of 56 feet). No timber harvest is permitted within an alluvial fan – irrespective of shape or size.

- Within the Thinning Zone, ground-based systems shall not be used on slopes where in the opinion of the department, this method of operation would cause actual or potential material damage to a public resource. When transporting logs in or through the Thinning Zone with ground-based equipment, the number of routes through the zone shall be minimized. Logs shall be transported so as to minimize damage to leave trees and vegetation in the Thinning Zone, to the extent practical and consistent with good safety practices.
- Cable yarding within the Thinning Zone is subject to requirements listed in WAC 222-30-060 Cable Yarding.
- Salvage logging is subject to requirements listed in WAC 222-30-045 Salvage logging within riparian management zones.

Hardwoods in the Thinning Zone

As a conifer thinning prescription in conifer-dominated stands, removal of hardwood trees shall be avoided in order to maintain the biodiversity of the stand. If incidental damage to hardwood trees occurs, they shall remain in place.

Simplified Guidance for Conducting Thinning

1. Determine the outer edge of bankfull width (BFW) or the channel migration zone (CMZ), see Board Manual Section 2.

Field determination of the bankfull channel edge generally relies on two or more of the following:

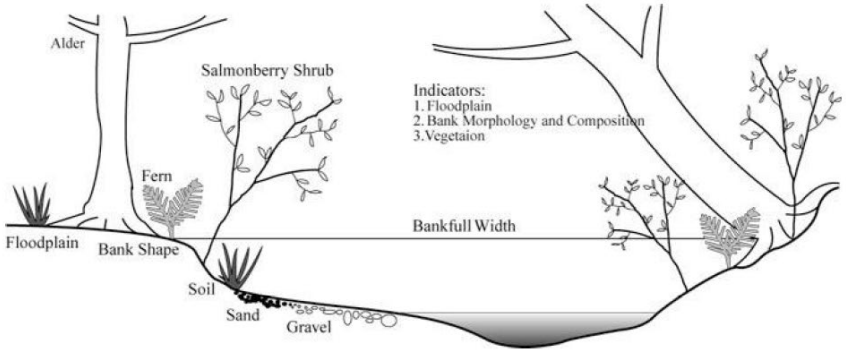

***Figure 2**. Indicators for determining bankfull width (adapted from Pleus and Schuett-Hames, 1998.*

2. Determine the site class for the RMZ adjacent to the stream. To determine site class, download a Forest Practices Application/Notification activity map for your area and activate the site class layer. Go to https://www.dnr.wa.gov/programs-and-services/forest-practices/review-applications-fpars/forest-practices-forms-and, and under the heading, "Forest Practices Application/Notification", click on "Print an activity map." After

navigating to the location of your activity, in the upper left corner under the "Themes" button, choose Site Class Map. Directly under the "Table of Contents" window header, click the right arrow to navigate to the Legend.

3. Establish the 30-foot wide No-Cut Zone (or multiple No-Cut Zones if you have more than one thinning buffer zone segment within your harvest unit) on the ground by measuring horizontally from the outer edge of BFW or the CMZ, whichever is greater; mark the outer edge of the No-Cut Zone(s) with flagging or tags.
4. Determine the Thinning Zone width using Table 1.
5. Establish the Thinning Zone (or multiple Thinning Zones if you have more than one thinning zone buffers within your harvest unit) on the ground by measuring horizontally from the outer edge of the No-Cut Zone, using the width determined in Step 4; mark the outer edge of the Thinning Zone(s) with different colored flagging or tags than used to mark the edge of the No-Cut Zone.
6. Establish the strip cruise plot centerline for your Thinning Zone (or for each individual Thinning Zone if you have more than one thinning zone buffer within your harvest unit) following the procedure described in Appendix B.
7. Once the strip cruise plot centerline has been established, measure the DBH (diameter at breast height, i.e. 4.5 feet above the ground) and note the conifer species group (see "Dominant conifer species group" information box on Page 4) of each conifer tree that falls within your strip cruise plot. Determine for each conifer tree you have measured whether it is a residual tree (see description in Appendix A) or not a residual tree. The vast majority of eligible Thinning Zone stands will truly be even-aged and have no or very few residual trees, but identifying which trees are residuals is critically important to the proper calculation of QMD and what trees need to be left in the Thinning Zone. Do not measure the diameters of any hardwood trees within your Thinning Zone(s).
8. As you measure each conifer tree, either a) directly enter the diameter and conifer species group you have measured into the appropriate category ("Residual" tree category or "Non-Residual" tree category) in the "QMD Calculator" smartphone application (to be provided) or b) record (on any paper form of your choice) the diameter and conifer species group of each measured conifer tree, again making sure to note whether the tree is a Residual or Non-Residual and then input your data into the "QMD Calculator" computer application (to be provided).
9. The QMD Calculator will provide the calculated QMD for the Non-Residual trees within your Thinning Zone stand(s), as well as the estimated number of Residual trees within your Thinning Zone(s), based on your strip cruise measurements. It will also provide the "Dominant conifer species group", either Douglas fir or Western Hemlock.
10. Use the identified "Dominant conifer species group" category to determine which Modified Curtis Relative Density Calculator" table you should use (either Douglas fir or Western Hemlock). Using the appropriate species table and the calculated Non-Residual QMD for your Thinning Zone, find the stand QMD in the table and determine the calculated number of conifer "Leave Trees/Acre (Minimum)" to retain after thinning.
11. Use this calculated minimum number of leave conifer trees per acre to determine the actual conifer trees you must retain within your Thinning Zone. **If there are no residual conifer trees within your Thinning Zone**, merely use this calculated minimum number of leave conifer trees per acre for your field layout of conifer leave trees within your Thinning Zone, using the appropriate "Average Tree Spacing (Feet)" figure from the

table as a guide. **If, however, you have any residual conifer trees within your Thinning Zone**, all such residual conifer trees within your Thinning Zone must be identified for leave. Once these residual conifer trees have been identified for leave, the remaining minimum number of conifer trees per acre to leave within the Thinning Zone should be calculated and then those remaining leave conifer trees must be identified for leave during field layout. Remember all hardwood trees must also be left and conifer trees that lean toward the stream(s) should be preferentially identified for leave. Strive to maintain pre-harvest levels of conifer diversity.

12. Mark leave trees, as appropriate, as specified under the "**Additional Preparation and Harvest Requirements**" section.

NOTE: A basic understanding of silviculture and stand dynamics is necessary to meet these requirements. Applicants will be required to provide documentation that the proposed harvest unit meets the eligibility requirements and / or sampling of trees within the Thinning Zone for this prescription (strip cruise data, stand survey, etc.). Technical assistance from a professional forester or local DNR Small Forest Landowner Regulation Assistance Forester may be necessary to provide this stand survey documentation.

Monitoring

This is an experimental harvest prescription. By choosing this prescription, the landowner is providing DNR, in concert with other review and monitoring team members, permission to access the experimental harvest site to review the proposed harvest and to conduct specific effectiveness and response monitoring activities, such as measurement of pre and post-harvest stand conditions and evaluation of the success of the experimental harvest prescription.

This access permission is only associated with site visits by DNR and other review and monitoring team participants (and not enforcement or compliance monitoring).

This access and right-of-entry must remain in place throughout the monitoring period (to be determined), even in the case of a change in ownership of the property on which the experimental harvest occurs.

DNR will provide advanced notice to the landowner at least one week prior to monitoring visits.

The landowner will be required to notify DNR of any change in ownership of the property involving the experimental harvest site and of any significant weather events (windthrow, fire, snow-break events, etc.).

See Appendix C, the current Experimental Alternate Harvest Prescriptions Monitoring Scoping document.

DNR Review of this Experimental Prescription

This experimental prescription will be reviewed in 5-year cycles by DNR to assure the prescription is meeting the goals to protect level of riparian function and stimulate growth of

conifer stand, and as sufficient data is collected the prescription will either be adjusted as needed to ensure it meets the intended level of riparian functions, or validated and converted to either a rule or an alternate plan template. Results could help inform potential future study recommendations but not intended to directly inform rule making.

APPENDIX A: CROWN CLASSIFICATION

A tree crown classification system is useful in discussing stand development. Figure 1. illustrates a commonly used system, which has the following six classes:

1. Dominant. Trees with the crown extending above the general level of the crown canopy receive full sunlight from above and some from the sides. The sides of the crowns are well developed but (possibly) somewhat crowded. Live crown ratios generally greater than 50%.

2. Codominant. Trees with crowns forming the general level of the crown cover receive full light from above but little from the sides. The tree crowns are medium size and more crowded on the sides than are dominant crowns. Live crown ratios generally greater than 40%,

3. Intermediate. These trees usually are shorter than those in the two preceding classes. They have small, crowded sides. The crowns extend into the canopy formed by dominant and codominant trees; they receive a little direct light from above but none from the sides. Live crown ratios generally below 40%.

4. Suppressed (overtopped). The crowns on these trees are below the level of the crown canopy. They receive no direct light from above or from the sides. Live crown ratios generally less than 33%.

5. Residual trees. These trees developed and grew in the open or trees not harvested during previous harvest(s). Their diameters are generally significantly larger than the diameters of the rest of the stand. They often have full crowns on all sides, with branches well above or below the general canopy level of the rest of the stand. The crowns are uncrowded on two or more sides and receive full light from above and well down on two or more sides. Live crown ratios often exceed 75%.

6. Mortality. These are dead trees within the stand. Suppressed trees usually die, and trees of any crown class may die from disease or insect attack.

Adapted from: W.H. Emmingham and N.E. Elwood_1983 “Thinning: An Important Timber Management Tool”, Oregon State University, PNW 184

Determining Crown Class

1. Crown class identification is somewhat subjective, so it is important to try to stick to the definitions and be consistent. Certainly, there will be many trees that do not fit neatly into the classification scheme, so expect some challenges and assign the crown class that most clearly illustrates the condition of each tree or its place in the stand.

2. This is particularly true when it comes to “suppressed” trees. They are still part of the canopy; they do not make up a second layer. Therefore, they do not have to have their entire crowns

below the lowest branches of the tree canopy. Figure 3 illustrates a realistic interpretation of the definition.

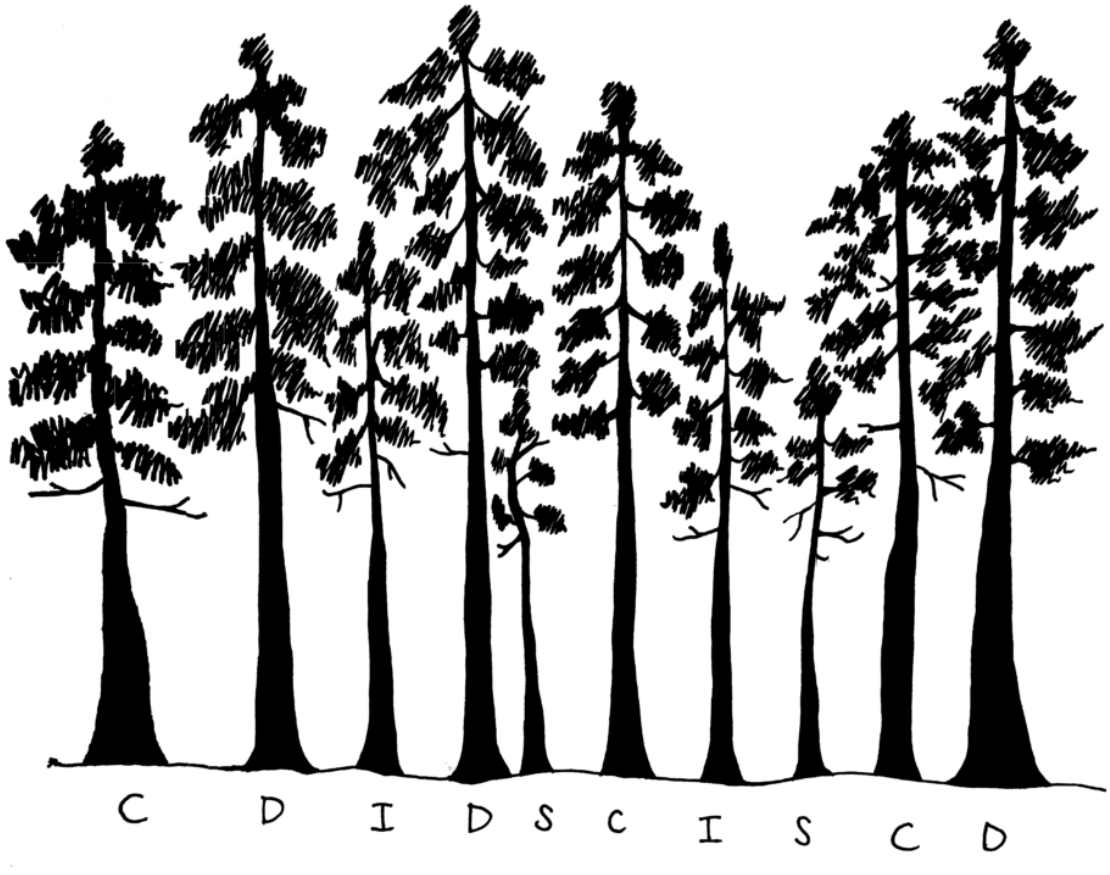

Figure 3. *A simplified view of trees in different crown classes in an evenaged pure stand. The letters D, C, I and S denote dominant, codominant, intermediate, and suppressed respectively.*

Note that the suppressed trees extend into the canopy – after all they are in the same cohort or are the same age as the others; they just do not receive any direct light. The low vigor and poor crown condition of a suppressed shade intolerant tree will be very different from that of an intermediate and should be documented as such.

Determining Live Crown Ratio

1. Never "eyeball" LCR without measuring. You will underestimate the crown ratio. Standing on the ground looking up results in a foreshortened view of the crown; it will look shorter than it really is. The closer one is to the tree, and the taller the tree, the more your eye is tricked. In fact, it is an interesting exercise to guess what you think the LCR will be, then measure it, and see how close you are.

2. Determine length of crown using the same measuring techniques and equipment that you use to estimate total height.

3. It is sometimes difficult to determine where the base of the crown is. Brush or limbs from other trees may obscure it, or one side of the tree may have limbs lower than the other side. Try to get to a spot where you can see the tree to take care of the first problem. The standard for handling an uneven tree base is to sight on a spot halfway between the lowest branches on each side of the tree – "split the difference" so to speak (Figure 4).

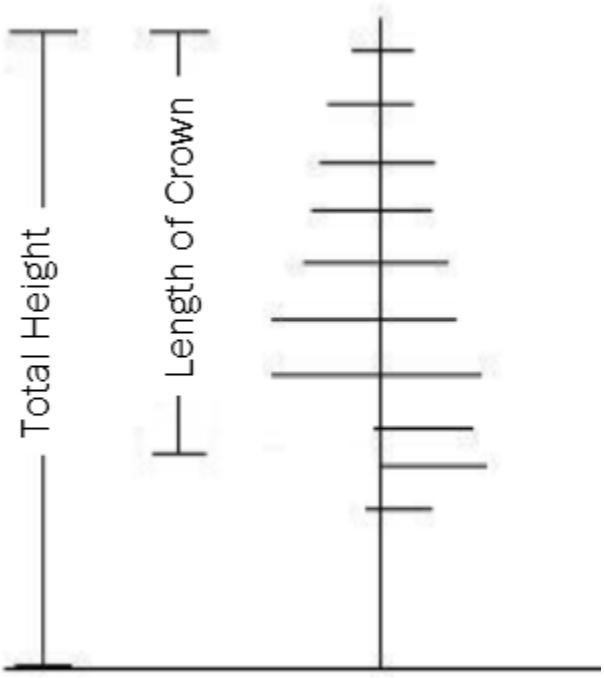

Figure 4. *Estimating LCR when crown base is uneven. Measure the base halfway between the lowest significant branches on each side of the tree.*

4. Ignore a lone live branch low on the tree that is clearly not part of the overall crown.

5. Live crown ratio is generally recorded as a whole number (%), not as a fraction in decimal form. Always record to the precision of the instrument used. Note that measures cannot be accurately made to a tenth of a percentage. So, for example, if the calculator reads 53.6, then record LCR as 54.

APPENDIX B: Preferred Strip Cruise Plot Layout and Cruise Procedure

Once the No-Cut Zone(s) and Thinning Zone(s) have been delineated (marked) in the field, follow the following steps to layout the strip cruise plot for each Thinning Zone:

1. Using the site class identified under Step 2 of the "Simplified Guidance for Conducting Thinning" section above, determine the "Thinning Zone Width (Feet)" for your Thinning Zone from Table 1.

2. Divide by 2 the "Thinning Zone Width (Feet)" identified in Step 1 above. Example: The "Thinning Zone Width (Feet)" for Site Class II in Table 1 is 88 feet; dividing by 2 equals 44 feet.

3. Locate one of the two end points of the common line between your No-Cut and Thinning Zones. Using a compass, determine the rough compass bearing from this end point along the common line between these two zones back toward the other endpoint. Note or remember this compass bearing.

4. Move halfway up the side edge of your Thinning Zone from one of these two end points; in our example, move 44 feet up the side edge of your Thinning Zone. Hang a flag here; use a different color of flagging than you used previously to delineate the No-Cut and Thinning Zones. This flag is the starting point for layout of your strip cruise plot and the eventual end point of your strip cruise plot.

5. Establish the centerline of your strip cruise by following the compass bearing you determined in Step 3 above, to the opposite side edge of your Thinning Zone. Hang flagging intervisible (in sight of each other) along this compass line, as the centerline of your strip cruise plot. Hang your last flag where your compass line meets this opposite edge of your Thinning Zone.

6. Once you have completed flagging this centerline of your strip cruise plot, turn around. This last flag that you hung in Step 5 is the actual starting point for of your strip cruise.

7. As noted earlier in this document, to calculate conifer QMD within the Thinning Zone, roughly 10% of the conifer trees will be measured within the Thinning Zone. Since the Thinning Zone Width varies by site class, the total strip cruise plot width will also vary by site class, as follows:
   - Site Class I: ten (10) feet total plot width, five (5) feet on either side of plot centerline
   - Site Class II: seven (7) feet total plot width, three and one-half (3.5) feet on either side of plot centerline
   - Site Class III: five (5) feet total plot width, two and one-half (2.5) feet on either side of plot centerline
   - Site IV: three (3) feet total plot width, one and one-half (1.5) feet on either side of plot centerline
   - Site V: two (2) feet total plot width, one (1) feet on either side of plot centerline

8. Start your strip cruise at the last flag you hung in Step 5 and referenced again in Step 6, using the flagged centerline you established in Step 5 above and the total plot width appropriate for your specific Thinning Zone. In our example, Site Class II will use a seven (7) foot total plot width, three and one-half feet on either side of plot centerline. A pole or rod five (5) feet in total length and marked with the five exact half-plot widths identified in Step 7 may be a valuable tool to determine which trees are "in" your strip cruise plot.

9. Measure the DBH (diameter at breast height, i.e. 4.5 feet above the ground on the uphill side) and determine the conifer species group (see "Dominant conifer species group" information box on Page 4) of each conifer tree that falls within your strip cruise plot. Trees are considered within your strip cruise plot (and should be measured) if at least half of the tree bole falls within the total plot widths identified in Step 7. Determine for each conifer tree you have measured whether it is a residual tree (see description in Appendix A) or not a residual tree. The vast majority of eligible Thinning Zone stands will truly be even-aged and have no or very few residual trees, but identifying which trees are residuals is critically important to the proper calculation of QMD and what trees need to be left in the Thinning Zone. Do not measure the diameters of any hardwood trees that fall within your strip cruise plot.

10. As you measure each conifer tree, either a) directly enter the diameter and conifer species group you have measured into the appropriate category ("Residual" tree category or "Non-Residual" tree category) in the "QMD Calculator" smartphone application (to be provided) or b) record (on any paper form of your choice) the diameter and conifer species group of each measured conifer tree, again making sure to note whether the tree is a Residual or Non-Residual and then input your data into the "QMD Calculator" computer application (to be provided).

11. Continue collecting all required information for each conifer tree within your strip cruise plot until you reach the end of the plot as identified in Step 4.

12. The QMD Calculator will provide the calculated QMD for the Non-Residual trees within your Thinning Zone stand(s), as well as the estimated number of Residual trees within your Thinning Zone(s), based on your strip cruise measurements. It will also provide the "Dominant conifer species group", either Douglas fir or Western Hemlock.

Appendix C Experimental Alternate Harvest Prescription Monitoring Scoping

In development