



PROPOSED RULE MAKING

CR-102 (June 2004)

(Implements RCW 34.05.320)

Do NOT use for expedited rule making

Agency: Forest Practices Board

- Preproposal Statement of Inquiry was filed as WSR _____; or
- Expedited Rule Making--Proposed notice was filed as WSR _____; or
- Proposal is exempt under RCW 34.05.310(4).

- Original Notice
- Supplemental Notice to WSR _____
- Continuance of WSR 07-21-081

Title of rule and other identifying information: (Describe Subject)

Achieving Desired Future Conditions in Riparian Management Zones. This rule proposal amends WAC 222-30-021 to change timber harvest and leave tree requirements in riparian management zones adjacent to Type S and F Waters as defined in WAC 222-16-030. It pertains to forest lands in Western Washington.

Hearing location(s):

Holiday Inn
3105 Pine Street, Everett / 425.993.2000
Date: Thursday, October 16, 2008 Time: 6:00 p.m.

Natural Resources Building, Room 172
1111 Washington Street SE
Olympia / 360.902.1400
Date: Wednesday, October 8, 2008 Time: 6:00 p.m.

Submit written comments to:

Name: Patricia Anderson, DNR Forest Practices Division
Address: 1111 Washington Street SE
P.O. Box 47012
Olympia, WA 98504-7012
e-mail forest.practicesboard@dnr.wa.gov
fax (360) 902-1428 by October 17, 2008

Assistance for persons with disabilities: Contact

Forest Practices Division at (360) 902-1400 by September 30, 2008. TTY (360) 902-1125

Date of intended adoption: November 12, 2008

(Note: This is NOT the effective date)

Purpose of the proposal and its anticipated effects, including any changes in existing rules: WAC 222-30-021 provides prescriptions and options to harvesting trees in forested "riparian management zones" as defined in WAC 222-16-010.

Pursuant to RCW 76.09.370, the Forest Practices Board incorporates a scientific-based adaptive management process to determine the effectiveness of forest practices rules in aiding Washington's salmon recovery effort. Under this adaptive management process, a scientific study was completed by the Forest Practices Board's Cooperative Monitoring, Evaluation, and Research Committee. The study, entitled *Validation of the Western Washington Riparian Desired Future Condition (DFC) Performance Targets in the Washington State Forest Practices Rules with Data From Mature, Unmanaged, Conifer-Dominated Riparian Stands*. The study's findings were that basal areas per acre of mature, unmanaged conifer-dominated riparian stands are greater than the values used in the rule (see WAC 222-20-021(1) for values in existing rule).

The Board is considering two alternative rule amendments to respond to the study findings. The effects of both would increase the basal area retained in riparian management zones, thereby decreasing allowable harvest.

- The first would increase the target basal area per acre (325 sq. ft. for all site classes) that a forest stand is projected to reach at 140 years from the year of harvest in the riparian management zone.
- The second would increase the target basal area per acre the same as the first alternative rule amendment, and also change the methods of thinning trees in the inner zones – see WAC 222-30-021(1)(b)(ii)(B)(I) and (II)

Reasons supporting proposal: The proposed rule changes are based on recommendations resulting from the scientifically based adaptive management process outlined in WAC 222-12-045. Through this process, the Board has determined that the forest practices rules should be adjusted to ensure that appropriate riparian buffers are maintained on forest land covered by the Forest Practices Act.

Statutory authority for adoption:
RCW 76.09.040 and RCW 76.09.370(6)

Statute being implemented:
N/A

Is rule necessary because of a:

- Federal Law? Yes No
 - Federal Court Decision? Yes No
 - State Court Decision? Yes No
- If yes, CITATION:

DATE
December 14, 2007

NAME
Victoria Christiansen

SIGNATURE

TITLE
Chair

CODE REVISER USE ONLY

**OFFICE OF THE CODE REVISER
STATE OF WASHINGTON
FILED**

**DATE: January 04, 2008
TIME: 11:27 AM**

WSR 08-03-009

Agency comments or recommendations, if any, as to statutory language, implementation, enforcement, and fiscal matters:

Name of proponent: (person or organization)

Forest Practices Board

- Private
 Public
 Governmental

Name of agency personnel responsible for:

Name	Office Location	Phone
Drafting..... Marc Engel	1111 Washington Street SE, Olympia	(360) 902-1390
Implementation.... Gary Graves	1111 Washington Street SE, Olympia	(360) 902-1483
Enforcement..... Lenny Young	1111 Washington Street SE, Olympia	(360) 902-1744

Has a small business economic impact statement been prepared under chapter 19.85 RCW?

Yes. Attach copy of small business economic impact statement.

A copy of the statement may be obtained by contacting:

Name: Gretchen Robinson
Address: PO Box 47012
Olympia, WA 98504-7012

phone (360) 902-1705
fax (360)902-1428
e-mail gretchen.robinson@dnr.wa.gov

No. Explain why no statement was prepared.

Is a cost-benefit analysis required under RCW 34.05.328?

Yes A preliminary cost-benefit analysis may be obtained by contacting:

Name: Gretchen Robinson
Address: PO Box 47012
Olympia, WA 98504-7012

phone (360) 902-1705
fax (360)902-1428
e-mail gretchen.robinson@dnr.wa.gov

Note: The small business economic impact statement and the preliminary cost-benefit analysis are combined in the document, *Preliminary Economic Analysis, Forest Practices Rule Making, Affecting Timber Harvest in Riparian Zones in Western Washington*. This economic analysis was revised November 2007.

No: Please explain:

AMENDATORY SECTION (Amending WSR 05-12-119, filed 5/31/05, effective 7/1/05)

WAC 222-30-021 *Western Washington riparian management zones.

These rules apply to all typed waters on forest land in Western Washington, except as provided in WAC 222-30-023. RMZs are measured horizontally from the outer edge of the bankfull width or channel migration zone, whichever is greater, and extend to the limits as described in this section. See the board manual section 7 for riparian design and layout guidelines.

* (1) **Western Washington RMZs for Type S and F Waters** have three zones: The core zone is nearest to the water, the inner zone is the middle zone, and the outer zone is furthest from the water. (See definitions in WAC 222-16-010.) RMZ dimensions vary depending on the site class of the land, the management harvest option, and the bankfull width of the stream. See tables for management options 1 and 2 below.

None of the limitations on harvest in each of the three zones listed below will preclude or limit the construction and maintenance of roads for the purpose of crossing streams in WAC 222-24-030 and 222-24-050, or the creation and use of yarding corridors in WAC 222-30-060(1).

The shade requirements in WAC 222-30-040 must be met regardless of harvest opportunities provided in the inner zone RMZ rules. See the board manual section 1.

(a) **Core zones.** No timber harvest or construction is allowed in the core zone except operations related to forest roads as detailed in subsection (1) of this section. Any trees cut for or damaged by yarding corridors in the core zone must be left on the site. Any trees cut as a result of road construction to cross a stream may be removed from the site, unless used as part of a large woody debris placement strategy or as needed to reach stand requirements.

(b) **Inner zones.** Forest practices in the inner zone must be conducted in such a way as to meet or exceed stand requirements to achieve the goal in WAC 222-30-010(2). The width of the inner zone is determined by site class, bankfull width, and management option. Timber harvest in this zone must be consistent with the stand requirements in order to reach the desired future condition targets.

"Stand requirement" means a number of trees per acre, the basal area and the proportion of conifer in the combined inner zone and adjacent core zone so that the growth of the trees would meet desired future conditions. The following table defines basal area targets when the stand is 140 years old.

Site Class	Desired future condition target basal area per acre (at 140 years)
I	((285)) <u>325</u> sq. ft.
II	((275)) <u>325</u> sq. ft.
III	((258)) <u>325</u> sq. ft.
IV	((224)) <u>325</u> sq. ft.
V	((190)) <u>325</u> sq. ft.

Growth modeling is necessary to calculate whether a particular stand meets stand requirement and is on a trajectory towards these desired future condition basal area target. The appropriate growth model will be based on stand characteristics and will include at a minimum, the following components: The number of trees by diameter class, the percent of conifer and hardwood, and the age of the stand. See the board manual section 7.

(i) **Hardwood conversion in the inner zone.** When the existing stands in the combined core and inner zone do not meet stand requirements, no harvest is permitted in the inner zone, except in connection with hardwood conversion.

(A) The landowner may elect to convert hardwood-dominated stands in the **inner zone** to conifer-dominated stands. Harvesting and replanting shall be in accordance with the following limits:

(I) Conversion activities in the **inner zone** of any harvest unit are only allowed where all of the following are present:

- Existing stands in the combined core and inner zone do not meet stand requirements (WAC 222-30-021 (1)(b));
- There are fewer than 57 conifer trees per acre 8 inches or larger dbh in the conversion area;
- There are fewer than 100 conifer trees per acre larger than 4 inches dbh in the conversion area;
- There is evidence (such as conifer stumps, historical photos, or a conifer understory) that the conversion area can be successfully reforested with conifer and support the development of conifer stands;
- The landowner owns 500 feet upstream and 500 feet downstream of the harvest unit;
- The core and inner zones contain no stream adjacent parallel roads;
- Riparian areas contiguous to the proposed harvest unit are owned by the landowner proposing to conduct the conversion activities, and meet shade requirements of WAC 222-30-040 or have a 75-foot buffer with trees at least 40 feet tall on both sides of the stream for 500 feet upstream and 500 feet downstream of the proposed harvest unit (or the length of the stream, if less);
- If the landowner has previously converted hardwood-dominated stands, then post-harvest treatments must have been performed to the satisfaction of the department.

(II) In addition to the conditions set forth above, permitted conversion activities in the **inner zone** of any harvest unit are limited by the following:

- Each continuous conversion area is not more than 500 feet in length; two conversion areas will be considered "continuous"

unless the no-harvest area separating the two conversion areas is at least half the length of the larger of the two conversion areas.

- Type S and F (Type 1, 2, or 3) Water: Up to 50% of the inner zone area of the harvest unit on one side of the stream may be converted provided that:

- ◆ The landowner owns the opposite side of the stream and the landowner's riparian area on the opposite bank meets the shade requirements of WAC 222-30-040 or has a 75-foot buffer of trees at least 40 feet tall or:

- ◆ The landowner does not own land on the opposite side of the stream but the riparian area on the opposite bank meets the shade requirements of WAC 222-30-040 or has a 75-foot buffer of trees at least 40 feet tall.

- Not more than 25% of the inner zone of the harvest unit on both sides of a Type S or F Water may be converted if the landowner owns both sides.

(III) Where conversion is allowed in the **inner zone**, trees within the conversion area may be harvested except that:

- Conifer trees larger than 20 inches dbh shall not be harvested;

- Not more than 10% of the conifer stems greater than 8 inches dbh, exclusive of the conifer noted above, within the conversion area may be harvested; and

- The landowner must exercise reasonable care in the conduct of harvest activities to minimize damage to all residual conifer trees within the conversion area including conifer trees less than 8 inches dbh.

(IV) Following harvest in conversion areas, the landowner must:

- Reforest the conversion area with **conifer** tree species suitable to the site in accordance with the requirements of WAC 222-34-010; and

- Conduct post-harvest treatment of the site until the conifer trees necessary to meet acceptable stocking levels in WAC 222-34-010(2) have crowns above the brush or until the conversion area contains a minimum of 150 conifer trees greater than 8 inches dbh per acre.

- Notify the department in writing within three years of the approval of the forest practices application for hardwood conversion, if the hardwood conversion has been completed.

(V) **Tracking hardwood conversion.** The purpose of tracking hardwood conversion is to determine if hardwood conversion is resulting in adequate enhancement of riparian functions toward the desired future condition while minimizing the short term impacts on functions. The department will use existing or updated data bases developed in cooperation with the Washington Hardwoods Commission to identify watershed administrative units (WAUs) with a high percentage of hardwood-dominated riparian areas and, thus have the potential for excessive hardwood conversion under these rules. The department will track the rate of conversion of hardwoods in the riparian zone: (1) Through the application process on an annual basis; and (2) at a WAU scale on a biennial basis as per WAC 222-

30-120 through the adaptive management process which will develop thresholds of impact for hardwood conversion at the watershed scale.

(ii) **Harvest options.**

(A) No inner zone management. When the existing stands in the combined core and inner zone do not meet stand requirements, no harvest is permitted in the inner zone. When no harvest is permitted in the inner zone or the landowner chooses not to enter the inner zone, the width of core, inner and outer zones are as provided in the following table:

No inner zone management RMZ widths for Western Washington

Site Class	RMZ width	Core zone width (measured from outer edge of bankfull width or outer edge of CMZ of water)	Inner zone width (measured from outer edge of core zone)		Outer zone width (measured from outer edge of inner zone)	
			stream width ≤10'	stream width >10'	stream width ≤10'	stream width >10'
			I	200'	50'	83'
II	170'	50'	63'	78'	57'	42'
III	140'	50'	43'	55'	47'	35'
IV	110'	50'	23'	33'	37'	27'
V	90'	50'	10'	18'	30'	22'

(B) Inner zone management. If trees can be harvested and removed from the inner zone because of surplus basal area consistent with the stand requirement, the harvest and removal of the trees must be undertaken consistent with one of two options:

(I) **Option 1. Thinning from below.** The objective of thinning is to distribute stand requirement trees in such a way as to shorten the time required to meet large wood, fish habitat and water quality needs. This is achieved by increasing the potential for leave trees to grow larger than they otherwise would without thinning. Thinning harvest under option 1 must comply with the following:

- Residual trees left in the combined core and inner zones must meet stand requirements necessary to be on a trajectory to desired future condition. See board manual section 7 for guidelines.

- Thinning must be from below, meaning the smallest dbh trees are selected for harvest first, then progressing to successively larger diameters.

- Thinning cannot decrease the proportion of conifer in the stand.

- Shade retention to meet the shade rule must be confirmed by the landowner for any harvest inside of 75 feet from the outer edge of bankfull width or outer edge of CMZ, whichever is greater.

- The number of residual conifer trees per acre in the inner zone will equal or exceed 57.

Option 1. Thinning from below.

Site class	RMZ width	Core zone width (measured from outer edge of bankfull width or outer edge of CMZ of water)	Inner zone width (measured from outer edge of core zone)		Outer zone width (measured from outer edge of inner zone)	
			stream width ≤10'	stream width >10'	stream width ≤10'	stream width >10'
I	200'	50'	83'	100'	67'	50'
II	170'	50'	63'	78'	57'	42'
III	140'	50'	43'	55'	47'	35'
IV	110'	50'	23'	33'	37'	27'
V	90'	50'	10'	18'	30'	22'

(II) **Option 2. Leaving trees closest to the water.**

Management option 2 applies only to riparian management zones for site class I, II, and III on streams that are less than or equal to 10 feet wide and RMZs in site class I and II for streams greater than 10 feet wide. Harvest must comply with the following:

- Harvest is not permitted within 30 feet of the core zone for streams less than or equal to 10 feet wide and harvest is not permitted within 50 feet of the core zone for streams greater than 10 feet wide;

- Residual leave trees in the combined core and inner zone must meet stand requirements necessary to be on a trajectory to desired future condition. See board manual section 7 for calculating stand requirements;

- A minimum of 20 conifers per acre, with a minimum 12-inch dbh, will be retained in any portion of the inner zone where harvest occurs. These riparian leave trees will not be counted or considered towards meeting applicable stand requirements nor can the number be reduced below 20 for any reason.

- Trees are selected for harvest starting from the outer most portion of the inner zone first then progressively closer to the stream.

- If (II) of this subsection results in surplus basal area per the stand requirement, the landowner may take credit for the surplus by harvesting additional riparian leave trees required to be left in the adjacent outer zone on a basal area-for-basal area basis. The number of leave trees in the outer zone can be reduced only to a minimum of 10 trees per acre.

Option 2. Leaving trees closest to water.

Site class	RMZ width	Core zone width (measured from outer edge of bankfull width or outer edge of CMZ of water)	Inner zone width				Outer zone width (measured from outer edge of inner zone)	
			stream width ≤10'	stream width ≤10'	stream width >10'	stream width >10'	stream width ≤10'	stream width >10'
				minimum floor distance		minimum floor distance		
			(measured from outer edge of core zone)	(measured from outer edge of core zone)	(measured from outer edge of core zone)	(measured from outer edge of core zone)		
I	200'	50'	84'	30'	84'	50'	66'	66'
II	170'	50'	64'	30'	70'	50'	56'	50'
III	140'	50'	44'	30'	**	**	46'	**

**Option 2 for site class III on streams >10' is not permitted because of the minimum floor (100') constraint.

(iii) **Where the basal area components of the stand requirement cannot be met** within the sum of the areas in the inner and core zone due to the presence of a stream-adjacent parallel road in the inner or core zone, a determination must be made of the approximate basal area that would have been present in the inner and core zones if the road was not occupying space in the core or inner zone and the shortfall in the basal area component of the stand requirement. See definition of "stream-adjacent parallel road" in WAC 222-16-010.

(A) Trees containing basal area equal to the amount determined in (iii) of this subsection will be left elsewhere in the inner or outer zone, or if the zones contain insufficient riparian leave trees, substitute riparian leave trees will be left within the RMZ width of other Type S or F Waters in the same unit or along Type Np or Ns Waters in the same unit in addition to all other RMZ requirements on those same Type S, F, Np or Ns Waters.

(B) When the stream-adjacent road basal area calculated in (iii) of this subsection results in an excess in basal area (above stand requirement) then the landowner may receive credit for such excess which can be applied on a basal area-by-basal area basis against the landowner's obligation to leave trees in the outer zone of the RMZ of such stream or other waters within the same unit, provided that the number of trees per acre in the outer zone is not reduced to less than 10 trees per acre.

(C) When the basal area requirement cannot be met, as explained in (iii) of this subsection, the shortfall may be reduced through the implementation of an acceptable large woody debris placement plan. See board manual section 26 for guidelines.

(iv) If a harvest operation includes both yarding and harvest activities within the RMZ, all calculations of basal area for stand requirements will be determined as if the yarding corridors were constructed prior to any other harvest activities. If trees cut or damaged by yarding are taken from excess basal area, these trees may be removed from the inner zone. Trees cut or damaged by

yarding in a unit which does not meet the basal area target of the stand requirements cannot be removed from the inner zone. Any trees cut or damaged by yarding in the core zone may not be removed.

(c) **Outer zones.** Timber harvest in the outer zone must leave 20 riparian leave trees per acre after harvest. "**Outer zone riparian leave trees**" are trees that must be left after harvest in the outer zone in Western Washington. Riparian leave trees must be left uncut throughout all future harvests:

Outer zone riparian leave tree requirements

Application	Leave tree spacing	Tree species	Minimum dbh required
Outer zone	Dispersed	Conifer	12" dbh or greater
Outer zone	Clumped	Conifer	12" dbh or greater
Protection of sensitive features	Clumped	Trees representative of the overstory including both hardwood and conifer	8" dbh or greater

The 20 riparian leave trees to be left can be reduced in number under the circumstances delineated in (c)(iv) of this subsection. The riparian leave trees must be left on the landscape according to one of the following two strategies. A third strategy is available to landowners who agree to a LWD placement plan.

(i) **Dispersal strategy.** Riparian leave trees, which means conifer species with a diameter measured at breast height (dbh) of 12 inches or greater, must be left dispersed approximately evenly throughout the outer zone. If riparian leave trees of 12" dbh or greater are not available, then the next largest conifers must be left. If conifers are not present, riparian leave trees must be left according to the clumping strategy in subsection (ii) below.

(ii) **Clumping strategy.** Riparian leave trees must be left clumped in the following way:

(A) Clump trees in or around one or more of the following **sensitive features** to the extent available within the outer zone. When clumping around sensitive features, riparian leave trees must be 8 inches dbh or greater and representative of the overstory canopy trees in or around the sensitive feature and may include both hardwood and conifer species. Sensitive features are:

- (I) Seeps and springs;
- (II) Forested wetlands;
- (III) Topographic locations (and orientation) from which leave trees currently on the site will be delivered to the water;
- (IV) Areas where riparian leave trees may provide windthrow protection;
- (V) Small unstable, or potentially unstable, slopes not of sufficient area to be detected by other site evaluations. See WAC 222-16-050 (1)(d).
- (VI) Archeological or historical sites registered with the

Washington state (~~office~~) department of archeology and historic preservation. See WAC 222-16-050 (1)(g); or

(VII) Sites containing evidence of Native American cairns, graves or glyptic records. See WAC 222-16-050 (1)(f).

(B) If sensitive features are not present, then clumps must be well distributed throughout the outer zone and the leave trees must be of conifer species with a dbh of 12 inches or greater. When placing clumps, the applicant will consider operational and biological concerns. Tree counts must be satisfied regardless of the presence of stream-adjacent parallel roads in the outer zone.

(iii) **Large woody debris in-channel placement strategy.** A landowner may design a LWD placement plan in cooperation with the department of fish and wildlife. The plan must be consistent with guidelines in the board manual section 26. The landowner may reduce the number of trees required to be left in the outer zone to the extent provided in the approved LWD placement plan. Reduction of trees in the outer zone must not go below a minimum of 10 trees per acre. If this strategy is chosen, a complete forest practices application must include a copy of the WDFW approved hydraulics project approval (HPA) permit.

(iv) **Twenty riparian leave trees must be left after harvest** with the exception of the following:

(A) If a landowner agrees to implement a placement strategy, see (iii) of this subsection.

(B) If trees are left in an associated channel migration zone, the landowner may reduce the number of trees required to be left according to the following:

(I) Offsets will be measured on a basal area-for-basal area basis.

(II) Conifer in a CMZ equal to or greater than 6" dbh will offset conifer in the outer zone at a one-to-one ratio.

(III) Hardwood in a CMZ equal to or greater than 10" dbh will offset hardwood in the outer zone at a one-to-one ratio.

(IV) Hardwood in a CMZ equal to or greater than 10" dbh will offset conifer in the outer zone at a three-to-one ratio.

* (2) **Western Washington protection for Type Np and Ns Waters.**

(a) An **equipment limitation zone** is a 30-foot wide zone measured horizontally from the outer edge of the bankfull width of a Type Np or Ns Water where equipment use and other forest practices that are specifically limited by these rules. It applies to all perennial and seasonal streams.

(i) On-site mitigation is required if any of the following activities exposes the soil on more than 10% of the surface area of the zone:

(A) Ground based equipment;

(B) Skid trails;

(C) Stream crossings (other than existing roads); or

(D) Cabled logs that are partially suspended.

(ii) Mitigation must be designed to replace the equivalent of lost functions especially prevention of sediment delivery. Examples include water bars, grass seeding, mulching, etc.

(iii) Nothing in this subsection (2) reduces or eliminates the

department's authority to prevent actual or potential material damage to public resources under WAC 222-46-030 or 222-46-040 or any related authority to condition forest practices notifications or applications.

(b) **Sensitive site and RMZs protection along Type Np Waters.** Forest practices must be conducted to protect Type Np RMZs and sensitive sites as detailed below:

(i) A 50-foot, no-harvest buffer, measured horizontally from the outer edge of bankfull width, will be established along each side of the Type Np Water as follows:

Required no-harvest, 50-foot buffers on Type Np Waters.

Length of Type Np Water from the confluence of Type S or F Water	Length of 50' buffer required on Type Np Water (starting at the confluence of the Type Np and connecting water)
Greater than 1000'	500'
Greater than 300' but less than 1000'	Distance of the greater of 300' or 50% of the entire length of the Type Np Water
Less than or equal to 300'	The entire length of Type Np Water

(ii) No timber harvest is permitted in an area within 50 feet of the outer perimeter of a soil zone perennially saturated from a headwall seep.

(iii) No timber harvest is permitted in an area within 50 feet of the outer perimeter of a soil zone perennially saturated from a side-slope seep.

(iv) No timber harvest is permitted within a 56-foot radius buffer patch centered on the point of intersection of two or more Type Np Waters.

(v) No timber harvest is permitted within a 56-foot radius buffer patch centered on a headwater spring or, in the absence of a headwater spring, on a point at the upper most extent of a Type Np Water as defined in WAC 222-16-030(3) and 222-16-031.

(vi) No timber harvest is permitted within an alluvial fan.

(vii) At least 50% of a Type Np Waters' length must be protected by buffers on both sides of the stream (2-sided buffers). Buffered segments must be a minimum of 100 feet in length. If an operating area is located more than 500 feet upstream from the confluence of a Type S or F Water and the Type Np Water is more than 1,000 feet in length, then buffer the Type Np Water according to the following table. If the percentage is not met by protecting sensitive sites listed in (b) (i) through (vii) of this subsection, then additional buffers are required on the Type Np Water to meet the requirements listed in the table.

Minimum percent of length of Type Np Waters to be buffered when more than 500 feet upstream from the confluence of a Type S or F Water

Total length of a Type Np Water upstream from the confluence of a Type S or F Water	Percent of length of Type Np Water that must be protected with a 50 foot no harvest buffer more than 500 feet upstream from the confluence of a Type S or F Water
1000 feet or less	Refer to table in this subsection (i) above
1001 - 1300 feet	19%
1301 - 1600 feet	27%
1601 - 2000 feet	33%
2001 - 2500 feet	38%
2501 - 3500 feet	42%
3501 - 5000 feet	44%
Greater than 5000 feet	45%

The landowner must select the necessary priority areas for additional 2-sided buffers according to the following priorities:

- (A) Low gradient areas;
- (B) Perennial water reaches of nonsedimentary rock with gradients greater than 20% in the tailed frog habitat range;
- (C) Hyporheic and ground water influence zones; and
- (D) Areas downstream from other buffered areas.

Except for the construction and maintenance of road crossings and the creation and use of yarding corridors, no timber harvest will be allowed in the designated priority areas. Landowners must leave additional acres equal to the number of acres (including partial acres) occupied by an existing stream-adjacent parallel road within a designated priority area buffer.

(c) None of the limitations on harvest in or around Type Np Water RMZs or sensitive sites listed in (b) of this subsection will preclude or limit:

- (i) The construction and maintenance of roads for the purpose of crossing streams in WAC 222-24-030 and 222-24-050.
- (ii) The creation and use of yarding corridors in WAC 222-30-060(1).

To the extent reasonably practical, the operation will both avoid creating yarding corridors or road crossings through Type Np Water RMZ or sensitive sites and associated buffers, and avoid management activities which would result in soil compaction, the loss of protective vegetation or sedimentation in perennially moist areas.

Where yarding corridors or road crossings through Type Np Water RMZs or sensitive sites and their buffers cannot reasonably be avoided, the buffer area must be expanded to protect the sensitive site by an area equivalent to the disturbed area or by providing comparable functions through other management initiated

efforts.

Landowners must leave additional acres equal to the number of acres (including partial acres) occupied by an existing stream-adjacent parallel road within a Type Np Water RMZs or sensitive site buffer.

AMENDATORY SECTION (Amending WSR 05-12-119, filed 5/31/05, effective 7/1/05)

WAC 222-30-021 *Western Washington riparian management zones.

These rules apply to all typed waters on forest land in Western Washington, except as provided in WAC 222-30-023. RMZs are measured horizontally from the outer edge of the bankfull width or channel migration zone, whichever is greater, and extend to the limits as described in this section. See ~~((the))~~ board manual section 7 for riparian design and layout guidelines.

*(1) **Western Washington RMZs for Type S and F Waters** have three zones: The core zone is nearest to the water, the inner zone is the middle zone, and the outer zone is furthest from the water. (See definitions in WAC 222-16-010.) RMZ dimensions vary depending on the site class of the land, the management harvest option, and the bankfull width of the stream. See ~~((tables for))~~ management options 1 and 2 below.

None of the limitations on harvest in each of the three zones listed below will preclude or limit the construction and maintenance of roads for the purpose of crossing streams in WAC 222-24-030 and 222-24-050, or the creation and use of yarding corridors in WAC 222-30-060(1).

The shade requirements in WAC 222-30-040 must be met regardless of harvest opportunities provided in the ~~((inner zone))~~ RMZ rules. See ~~((the))~~ board manual section 1.

(a) **Core zones.** No timber harvest or construction is allowed ~~((in))~~ within the fifty-foot core zone except operations related to forest roads as detailed in subsection (1) of this section. Any trees cut for or damaged by yarding corridors in the core zone must be left on the site. Any trees cut as a result of road construction to cross a stream may be removed from the site, unless used as part of a large woody debris placement strategy or as needed to reach stand requirements.

(b) **Inner zones.** Forest practices in the inner zone must be conducted in such a way as to meet or exceed stand requirements to achieve the goal in WAC 222-30-010(2). The width of the inner zone is determined by site class, bankfull width, and management options as described in this section. Timber harvest in this zone must be consistent with the stand requirements in order to reach the desired future condition targets.

"Stand requirement" ~~((means a number of trees per acre, the basal area and the proportion of conifer in the combined inner zone and adjacent core zone so that the growth of the trees would meet desired future conditions. The following table defines basal area targets when the stand is 140 years old.~~

Site Class	Desired future condition target basal area per acre (at 140 years)
I	285 sq. ft.
II	275 sq. ft.
III	258 sq. ft.
IV	224 sq. ft.
V	190 sq. ft.

~~Growth modeling is necessary to calculate whether a particular stand meets stand requirement and is on a trajectory towards these desired future condition basal area target. The appropriate growth model will be based on stand characteristics and will include at a minimum, the following components: The number of trees by diameter class, the percent of conifer and hardwood, and the age of the stand. See the board manual section 7)) is the minimum size, number and proportion of conifer trees per acre as listed in the retention standards described in inner zone management options 1 and 2, and the desire future condition basal area target of three hundred twenty-five square feet per acre at age one hundred forty. The growth modeling program provided by the department must be used to calculate whether a particular stand meets the stand requirement and is on the trajectory towards the desired future condition basal area target.~~

The retention standard for option 1 is expressed as the minimum number of residual conifer trees per acre by average stand diameter class in the inner zone as provided in the table for option 1 located in (b)(ii)(B)(I) of this subsection. The core zone must have a conifer dominated overstory to use this option. Every ten years, the department shall evaluate and report to the board the effectiveness of the thinning guidelines in meeting the target stand characteristics of desired future condition.

The retention standard for option 2 is expressed as the minimum number and size of conifer trees in the combined core and inner zones required to meet the basal area target as calculated by the desired future condition growth modeling program. The growth model is based on the stand characteristics of a site: The number of trees by diameter class, the percentage of conifer trees in the stand, and the age of the stand. See board manual section 7 for guidance on the proper use of the growth model.

(i) **Hardwood conversion in the inner zone.** When the existing stands in the combined core and inner zone do not meet stand requirements, no harvest is permitted in the inner zone, except in connection with hardwood conversion.

(A) The landowner may elect to convert hardwood-dominated stands in the **inner zone** to conifer-dominated stands. Harvesting and replanting shall be in accordance with the following limits:

(I) Conversion activities in the **inner zone** of any harvest unit are only allowed where all of the following are present:

- Existing stands in the (~~combined core and~~) inner zone do not meet (~~stand requirements~~) retention standards listed in ((WAC 222-30-021 (1)) (b)(ii)(B)(I) of this subsection (option 1));

- There are fewer than ((57)) fifty-seven conifer trees per acre ((8)) eight inches or larger dbh in the conversion area;
- There are fewer than ((100)) one hundred conifer trees per acre larger than ((4)) four inches dbh in the conversion area;
- There is evidence (such as conifer stumps, historical photos, or a conifer understory) that the conversion area can be successfully reforested with conifer and support the development of conifer stands;
- The landowner owns ((500)) five hundred feet upstream and ((500)) five hundred feet downstream of the harvest unit;
- The core and inner zones contain no stream adjacent parallel roads;
- Riparian areas contiguous to the proposed harvest unit are owned by the landowner proposing to conduct the conversion activities, and meet shade requirements of WAC 222-30-040 or have a ((75)) seventy-five-foot buffer with trees at least ((40)) forty feet tall on both sides of the stream for ((500)) five hundred feet upstream and ((500)) five hundred feet downstream of the proposed harvest unit (or the length of the stream, if less);
- If the landowner has previously converted hardwood-dominated stands, then post-harvest treatments must have been performed to the satisfaction of the department.

(II) In addition to the conditions set forth above, permitted conversion activities in the **inner zone** of any harvest unit are limited by the following:

- Each continuous conversion area is not more than ((500)) five hundred feet in length; two conversion areas will be considered "continuous" unless the no-harvest area separating the two conversion areas is at least half the length of the larger of the two conversion areas.

- Type S and F (Type 1, 2, or 3) Water: Up to ((50%)) fifty percent of the inner zone area of the harvest unit on one side of the stream may be converted provided that:

- ◆ The landowner owns the opposite side of the stream and the landowner's riparian area on the opposite bank meets the shade requirements of WAC 222-30-040 or has a ((75)) seventy-five-foot buffer of trees at least ((40)) forty feet tall or:

- ◆ The landowner does not own land on the opposite side of the stream but the riparian area on the opposite bank meets the shade requirements of WAC 222-30-040 or has a ((75)) seventy-five-foot buffer of trees at least ((40)) forty feet tall.

- Not more than 25% of the inner zone of the harvest unit on both sides of a Type S or F Water may be converted if the landowner owns both sides.

(III) Where conversion is allowed in the **inner zone**, trees within the conversion area may be harvested except that:

- Conifer trees larger than ((20)) twenty inches dbh shall not be harvested;

- Not more than ((10%)) ten percent of the conifer stems greater than ((8)) eight inches dbh, exclusive of the conifer noted above, within the conversion area may be harvested; and

- The landowner must exercise reasonable care in the conduct

of harvest activities to minimize damage to all residual conifer trees within the conversion area including conifer trees less than ((8)) eight inches dbh.

(IV) Following harvest in conversion areas, the landowner must:

- Reforest the conversion area with **conifer** tree species suitable to the site in accordance with the requirements of WAC 222-34-010; and

- Conduct post-harvest treatment of the site until the conifer trees necessary to meet acceptable stocking levels in WAC 222-34-010(2) have crowns above the brush or until the conversion area contains a minimum of ((150)) one hundred fifty conifer trees greater than ((8)) eight inches dbh per acre.

- Notify the department in writing within three years of the approval of the forest practices application for hardwood conversion, if the hardwood conversion has been completed.

(V) **Tracking hardwood conversion.** The purpose of tracking hardwood conversion is to determine if hardwood conversion is resulting in adequate enhancement of riparian functions toward the desired future condition while minimizing the short term impacts on functions. The department will use existing or updated data bases developed in cooperation with the Washington Hardwoods Commission to identify watershed administrative units (WAUs) with a high percentage of hardwood-dominated riparian areas and, thus have the potential for excessive hardwood conversion under these rules. The department will track the rate of conversion of hardwoods in the riparian zone: (1) Through the application process on an annual basis; and (2) at a WAU scale on a biennial basis as per WAC 222-30-120 through the adaptive management process which will develop thresholds of impact for hardwood conversion at the watershed scale.

(ii) **Harvest options in the inner zone.**

(A) No inner zone management. When ((the existing stands in the combined core and inner zone do not meet stand requirements)) retention standards cannot be met by either option 1 or 2, no harvest is permitted in the inner zone. When no harvest is permitted in the inner zone or the landowner chooses not to enter the inner zone, the width of core, inner and outer zones are as provided in the following table:

No inner zone management RMZ widths for Western Washington

Site Class	Total RMZ width	((Core zone width (measured from outer edge of bankfull width or outer edge of CMZ of water)))	Combined core and inner zone width (measured from outer edge of ((core zone)) bankfull width or outer edge of CMZ)		Outer zone width (measured from outer edge of inner zone)	
			stream width ≤10'	stream width >10'	stream width ≤10'	stream width >10'
I	200'	((50'))	((83')) <u>133'</u>	((100')) <u>150'</u>	67'	50'
II	170'	((50'))	((63')) <u>113'</u>	((78')) <u>128'</u>	57'	42'
III	140'	((50'))	((43')) <u>93'</u>	((55')) <u>105'</u>	47'	35'

Site Class	Total RMZ width	((Core zone width (measured from outer edge of bankfull width or outer edge of CMZ of water)))	Combined core and inner zone width (measured from outer edge of ((core zone)) bankfull width or outer edge of CMZ)		Outer zone width (measured from outer edge of inner zone)	
			stream width ≤10'	stream width >10'	stream width ≤10'	stream width >10'
IV	110'	((50'))	((23')) 73'	((33')) 83'	37'	27'
V	90'	((50'))	((10')) 60'	((18')) 68'	30'	22'

(B) Inner zone management. (~~If trees can be harvested and removed from the inner zone because of surplus basal area consistent with the stand requirement, the harvest and removal of the trees must be undertaken consistent with one of two options:~~)

(I) **Option 1. ((Thinning from below.))** The objective of this thinning option is to distribute ((stand requirement)) trees in the inner zone in such a way as to shorten the time required to meet large wood, fish habitat and water quality needs. This is achieved by increasing the potential for leave trees to grow larger than they otherwise would without thinning. The total RMZ width under this option is one hundred fifty-three feet comprised of a fifty-foot wide no-harvest core zone, a sixty-foot wide inner zone and a forty-three foot wide outer zone. Thinning harvest under option 1 must ((comply with)) result in the following retention standards:

~~(• Residual trees left in the combined core and inner zones must meet stand requirements necessary to be on a trajectory to desired future condition. See board manual section 7 for guidelines.~~

~~• Thinning must be from below, meaning the smallest dbh trees are selected for harvest first, then progressing to successively larger diameters.~~

~~• Thinning cannot decrease the proportion of conifer in the stand.~~

~~• Shade retention to meet the shade rule must be confirmed by the landowner for any harvest inside of 75 feet from the outer edge of bankfull width or outer edge of CMZ, whichever is greater.~~

~~• The number of residual conifer trees per acre in the inner zone will equal or exceed 57.~~

Option 1. Thinning from below:

Site class	RMZ width	Core zone width (measured from outer edge of bankfull width or outer edge of CMZ of water)	Inner zone width (measured from outer edge of core zone)		Outer zone width (measured from outer edge of inner zone)	
			stream width ≤10'	stream width >10'	stream width ≤10'	stream width >10'
I	200'	50'	83'	100'	67'	50'
II	170'	50'	63'	78'	57'	42'
III	140'	50'	43'	55'	47'	35'

Site class	RMZ width	Core zone width <small>(measured from outer edge of bankfull width or outer edge of CMZ of water)</small>	Inner zone width <small>(measured from outer edge of core zone)</small>		Outer zone width <small>(measured from outer edge of inner zone)</small>	
			stream-width ≤10'	stream-width >10'	stream-width ≤10'	stream-width >10'
IV	110'	50'	23'	33'	37'	27'
V	90'	50'	10'	18'	30'	22'))

● A minimum number of residual conifer trees per acre greater than six inches dbh as shown in the table above for option 1.

Option 1. Residual Conifer Trees Per Acre

<u>Average Conifer Tree Diameter</u>	<u>Minimum Residual Conifer Trees Per Acre</u>
22" and greater	57
20"	60
18"	65
16"	70
14"	75
12"	80
10"	90
**8"	100

**Average tree conifer diameter is based on two-inch diameter classes. For example, the eight-inch diameter class represents an average diameter between 7.0 and 8.9 inches diameter at breast height.

● The average residual stand tree diameter is the same or larger than the average stand diameter before harvest.

● The distance between the residual conifer trees is no greater than fifty feet.

● The same proportion of conifer trees is present in the stand as before harvest.

In addition to the standards listed above, the landowner must confirm that shade retention is achieved according to WAC 222-30-040 for any harvest within seventy-five feet from the outer edge of bankfull width or the outer edge of the CMZ, whichever is greater.

Hardwoods may be harvested in the inner zone when the preharvest stand does not meet the retention standards listed in the table above for option 1 and contains the required stand conditions listed above in (b)(i) of this subsection regarding hardwood conversion in the inner zone.

(II) ~~Option 2. ((Leaving trees closest to the water. Management option 2 applies only to riparian management zones for site class I, II, and III on streams that are less than or equal to 10 feet wide and RMZs in site class I and II for streams greater than 10 feet wide. Harvest must comply with the following:~~

~~● Harvest is not permitted within 30 feet of the core zone for streams less than or equal to 10 feet wide and harvest is not permitted within 50 feet of the core zone for streams greater than 10 feet wide.~~

~~• Residual leave trees in the combined core and inner zone must meet stand requirements necessary to be on a trajectory to desired future condition. See board manual section 7 for calculating stand requirements;~~

~~• A minimum of 20 conifers per acre, with a minimum 12-inch dbh, will be retained in any portion of the inner zone where harvest occurs. These riparian leave trees will not be counted or considered towards meeting applicable stand requirements nor can the number be reduced below 20 for any reason.~~

~~• Trees are selected for harvest starting from the outer most portion of the inner zone first then progressively closer to the stream.~~

~~• If (II) of this subsection results in surplus basal area per the stand requirement, the landowner may take credit for the surplus by harvesting additional riparian leave trees required to be left in the adjacent outer zone on a basal area for basal area basis. The number of leave trees in the outer zone can be reduced only to a minimum of 10 trees per acre.) The objective of this option is to retain an RMZ width that will maintain current riparian functions. The retention standards in this option provide sufficient residual conifer trees in the combined core and inner zones to reach the target basal area of three hundred twenty-five square feet per acre at age one hundred forty.~~

Inner zone harvest may occur under option 2 if the projected future basal area within the combined width of the core and inner zones exceeds the target basal area. The combined core and inner zone width must be determined using the leaving trees closest to the water table below; the future basal area must then be calculated using the growth model program provided by the department. The model will produce a minimum inner zone floor width. (The minimum floor width extends outward from the outer edge of the fifty-foot core zone.) In the event the model produces a minimum floor width less than the minimums shown in the leaving trees closest to the water table, the appropriate widths shown in the table must be used.

Harvest is permitted under option 2 in the following order:

• If the projected basal area within the combined core and inner zones exceeds the target basal area, an even-age harvest may occur in the area between the outer edge of the minimum inner zone floor and the outer edge of the inner zone.

Harvest must start at the outermost portion of the inner zone and progress to the inner zone floor edge.

In any portion of the inner zone where an even-age harvest method occurs, at least twenty conifer trees with a minimum dbh of twelve inches must be retained. The basal area of these trees will be counted towards meeting applicable stand requirements.

• If the projected basal area within the combined core and inner zones still exceeds the target basal area, the surplus conifer may be harvested. Harvest must be accomplished sequentially as follows until either the surplus is exhausted or the limits on harvest are reached, whichever occurs first.

♦ Conifer trees otherwise required to be left in the outer zone may be harvested on a basal-area-for-basal-area basis;

however, only a maximum of ten conifer trees per acre may be harvested in the outer zone. (Tree counts, minimum size and placement of outer zone trees are specified below in (c) of this subsection.)

◆ If surplus conifer trees remain, inner zone trees may be thinned within the portion of the inner zone that is more than twenty-five feet from the outer edge of the core zone. Thinning must result in all of the following conditions:

The appropriate number of residual conifer trees per acre according to the inner zone thinning table for option 1, all greater than six inches dbh;

An average stand diameter equal to or greater than the average stand diameter before thinning; and

The distance between the residual conifer trees is no greater than fifty feet.

Option 2. ((Leaving trees closest to water-)) Riparian Management Zone Widths

Site class	Total RMZ width	((Core zone width (measured from outer edge of bankfull width or outer edge of CMZ of water)))	Combined core and inner zone width (measured from outer edge of bankfull width or outer edge of CMZ)				Outer zone width (measured from outer edge of inner zone)	
			stream width ≤10'	stream width ≤10'	stream width >10'	stream width >10'	stream width ≤10'	stream width >10'
			Core and inner zone width	minimum floor ((distance)) width	Core and inner zone width	minimum floor ((distance)) width		
		((measured from outer edge of core zone))	(measured from outer edge of core zone)	(measured from outer edge of core zone)	(measured from outer edge of core zone))			
I	200'	((50'))	((84')) 134'	((30')) 80'	((84')) 134'	((50')) 100'	66'	66'
II	170'	((50'))	((64')) 114'	((30')) 80'	((70')) 120'	((50')) 100'	56'	50'
III	140'	((50'))	((44')) 94'	((30')) 80'	((**)) 105'	((**)) 80'	46'	((**)) 35'
IV	110'		74'		83'	80'	36'	27'
V	90'		61'		68'		29'	22'

((**Option 2 for site class III on streams >10' is not permitted because of the minimum floor (100') constraint.))

(iii) Where the basal area components of the stand requirement cannot be met within the sum of the areas in the inner and core zone due to the presence of a stream-adjacent parallel road in the inner or core zone, a determination must be made of the approximate basal area that would have been present in the inner and core zones if the road was not occupying space in the core or inner zone and the shortfall in the basal area component of the stand requirement. See definition of "stream-adjacent parallel road" in WAC 222-16-010.

(A) Trees containing basal area equal to the amount determined in (iii) of this subsection will be left elsewhere in the inner or outer zone, or if the zones contain insufficient riparian leave

trees, substitute riparian leave trees will be left within the RMZ width of other Type S or F Waters in the same unit or along Type Np or Ns Waters in the same unit in addition to all other RMZ requirements on those same Type S, F, Np or Ns Waters.

(B) When the stream-adjacent road basal area calculated in (iii) of this subsection results in an excess in basal area (above stand requirement) then the landowner may receive credit for such excess which can be applied on a basal area-by-basal area basis against the landowner's obligation to leave trees in the outer zone of the RMZ of such stream or other waters within the same unit, provided that the number of trees per acre in the outer zone is not reduced to less than ((10)) ten trees per acre.

(C) When the basal area requirement cannot be met, as explained in (iii) of this subsection, the shortfall may be reduced through the implementation of an acceptable large woody debris placement plan. See board manual section 26 for guidelines.

(iv) If a harvest operation includes both yarding and harvest activities within the RMZ, all calculations of basal area for stand requirements will be determined as if the yarding corridors were constructed prior to any other harvest activities. If trees cut or damaged by yarding are taken from excess basal area, these trees may be removed from the inner zone. Trees cut or damaged by yarding in a unit which does not meet the basal area target of the stand requirements cannot be removed from the inner zone. Any trees cut or damaged by yarding in the core zone may not be removed.

(c) **Outer zones.** Timber harvest in the outer zone must leave ((20)) twenty riparian leave trees per acre after harvest. "**Outer zone riparian leave trees**" are trees that must be left after harvest in the outer zone in Western Washington. Riparian leave trees must be left uncut throughout all future harvests:

Outer zone riparian leave tree requirements

Application	Leave tree spacing	Tree species	Minimum dbh required
Outer zone	Dispersed	Conifer	12" dbh or greater
Outer zone	Clumped	Conifer	12" dbh or greater
Protection of sensitive features	Clumped	Trees representative of the overstory including both hardwood and conifer	8" dbh or greater

The ((20)) twenty riparian leave trees to be left can be reduced in number under the circumstances delineated in (c)(iv) of this subsection. The riparian leave trees must be left on the landscape according to one of the following two strategies. A third strategy is available to landowners who agree to a LWD placement plan.

(i) **Dispersal strategy.** Riparian leave trees, which means conifer species with a diameter measured at breast height (dbh) of ((12)) twelve inches or greater, must be left dispersed

approximately evenly throughout the outer zone. If riparian leave trees of (~~12"~~) twelve inches dbh or greater are not available, then the next largest conifers must be left. If conifers are not present, riparian leave trees must be left according to the clumping strategy in subsection (ii) below.

(ii) **Clumping strategy.** Riparian leave trees must be left clumped in the following way:

(A) Clump trees in or around one or more of the following **sensitive features** to the extent available within the outer zone. When clumping around sensitive features, riparian leave trees must be (~~8"~~) eight inches dbh or greater and representative of the overstory canopy trees in or around the sensitive feature and may include both hardwood and conifer species. Sensitive features are:

(I) Seeps and springs;

(II) Forested wetlands;

(III) Topographic locations (and orientation) from which leave trees currently on the site will be delivered to the water;

(IV) Areas where riparian leave trees may provide windthrow protection;

(V) Small unstable, or potentially unstable, slopes not of sufficient area to be detected by other site evaluations. See WAC 222-16-050 (1)(d).

(VI) Archeological or historical sites registered with the Washington state (~~office~~) department of archeology and historic preservation. See WAC 222-16-050 (1)(g); or

(VII) Sites containing evidence of Native American cairns, graves or glyptic records. See WAC 222-16-050 (1)(f).

(B) If sensitive features are not present, then clumps must be well distributed throughout the outer zone and the leave trees must be of conifer species with a dbh of 12 inches or greater. When placing clumps, the applicant will consider operational and biological concerns. Tree counts must be satisfied regardless of the presence of stream-adjacent parallel roads in the outer zone.

(iii) **Large woody debris in-channel placement strategy.** A landowner may design a LWD placement plan in cooperation with the department of fish and wildlife. The plan must be consistent with guidelines in (~~the~~) board manual section 26. The landowner may reduce the number of trees required to be left in the outer zone to the extent provided in the approved LWD placement plan. Reduction of trees in the outer zone must not go below a minimum of (~~10~~) ten trees per acre. If this strategy is chosen, a complete forest practices application must include a copy of the WDFW approved hydraulics project approval (HPA) permit.

(iv) **Twenty riparian leave trees must be left after harvest** with the exception of the following:

(A) If a landowner agrees to implement a placement strategy, see (iii) of this subsection.

(B) If trees are left in an associated channel migration zone, the landowner may reduce the number of trees required to be left according to the following:

(I) Offsets will be measured on a basal area-for-basal area basis.

(II) Conifer in a CMZ equal to or greater than ((6⁺)) six inches dbh will offset conifer in the outer zone at a one-to-one ratio.

(III) Hardwood in a CMZ equal to or greater than ((10⁺)) ten inches dbh will offset hardwood in the outer zone at a one-to-one ratio.

(IV) Hardwood in a CMZ equal to or greater than ((10⁺)) ten inches dbh will offset conifer in the outer zone at a three-to-one ratio.

*** (2) Western Washington protection for Type Np and Ns Waters.**

(a) An **equipment limitation zone** is a ((30)) thirty-foot wide zone measured horizontally from the outer edge of the bankfull width of a Type Np or Ns Water where equipment use and other forest practices that are specifically limited by these rules. It applies to all perennial and seasonal streams.

(i) On-site mitigation is required if any of the following activities exposes the soil on more than ((10%)) ten percent of the surface area of the zone:

- (A) Ground based equipment;
- (B) Skid trails;
- (C) Stream crossings (other than existing roads); or
- (D) Cabled logs that are partially suspended.

(ii) Mitigation must be designed to replace the equivalent of lost functions especially prevention of sediment delivery. Examples include water bars, grass seeding, mulching, etc.

(iii) Nothing in this subsection (2) reduces or eliminates the department's authority to prevent actual or potential material damage to public resources under WAC 222-46-030 or 222-46-040 or any related authority to condition forest practices notifications or applications.

(b) **Sensitive site and RMZs protection along Type Np Waters.** Forest practices must be conducted to protect Type Np RMZs and sensitive sites as detailed below:

(i) A 50-foot, no-harvest buffer, measured horizontally from the outer edge of bankfull width, will be established along each side of the Type Np Water as follows:

Required no-harvest, 50-foot buffers on Type Np Waters.

Length of Type Np Water from the confluence of Type S or F Water	Length of 50' buffer required on Type Np Water (starting at the confluence of the Type Np and connecting water)
Greater than 1000'	500'
Greater than 300' but less than 1000'	Distance of the greater of 300' or 50% of the entire length of the Type Np Water
Less than or equal to 300'	The entire length of Type Np Water

(ii) No timber harvest is permitted in an area within ~~((50))~~ fifty feet of the outer perimeter of a soil zone perennially saturated from a headwall seep.

(iii) No timber harvest is permitted in an area within ~~((50))~~ fifty feet of the outer perimeter of a soil zone perennially saturated from a side-slope seep.

(iv) No timber harvest is permitted within a ~~((56))~~ fifty-six-foot radius buffer patch centered on the point of intersection of two or more Type Np Waters.

(v) No timber harvest is permitted within a ~~((56))~~ fifty-six-foot radius buffer patch centered on a headwater spring or, in the absence of a headwater spring, on a point at the upper most extent of a Type Np Water as defined in WAC 222-16-030(3) and 222-16-031.

(vi) No timber harvest is permitted within an alluvial fan.

(vii) At least ~~((50%))~~ fifty percent of a Type Np Waters' length must be protected by buffers on both sides of the stream ~~((2))~~ two-sided buffers). Buffered segments must be a minimum of ~~((100))~~ one hundred feet in length. If an operating area is located more than ~~((500))~~ five hundred feet upstream from the confluence of a Type S or F Water and the Type Np Water is more than ~~((1,000))~~ one thousand feet in length, then buffer the Type Np Water according to the following table. If the percentage is not met by protecting sensitive sites listed in (b)(i) through (vii) of this subsection, then additional buffers are required on the Type Np Water to meet the requirements listed in the table.

Minimum percent of length of Type Np Waters to be buffered when more than 500 feet upstream from the confluence of a Type S or F Water

Total length of a Type Np Water upstream from the confluence of a Type S or F Water	Percent of length of Type Np Water that must be protected with a 50 foot no harvest buffer more than 500 feet upstream from the confluence of a Type S or F Water
1000 feet or less	Refer to table in this subsection (i) above
1001 - 1300 feet	19%
1301 - 1600 feet	27%
1601 - 2000 feet	33%
2001 - 2500 feet	38%
2501 - 3500 feet	42%
3501 - 5000 feet	44%
Greater than 5000 feet	45%

The landowner must select the necessary priority areas for additional 2-sided buffers according to the following priorities:

(A) Low gradient areas;

(B) Perennial water reaches of nonsedimentary rock with gradients greater than ~~((20%))~~ twenty percent in the tailed frog

habitat range;

(C) Hyporheic and ground water influence zones; and

(D) Areas downstream from other buffered areas.

Except for the construction and maintenance of road crossings and the creation and use of yarding corridors, no timber harvest will be allowed in the designated priority areas. Landowners must leave additional acres equal to the number of acres (including partial acres) occupied by an existing stream-adjacent parallel road within a designated priority area buffer.

(c) None of the limitations on harvest in or around Type Np Water RMZs or sensitive sites listed in (b) of this subsection will preclude or limit:

(i) The construction and maintenance of roads for the purpose of crossing streams in WAC 222-24-030 and 222-24-050.

(ii) The creation and use of yarding corridors in WAC 222-30-060(1).

To the extent reasonably practical, the operation will both avoid creating yarding corridors or road crossings through Type Np Water RMZ or sensitive sites and associated buffers, and avoid management activities which would result in soil compaction, the loss of protective vegetation or sedimentation in perennially moist areas.

Where yarding corridors or road crossings through Type Np Water RMZs or sensitive sites and their buffers cannot reasonably be avoided, the buffer area must be expanded to protect the sensitive site by an area equivalent to the disturbed area or by providing comparable functions through other management initiated efforts.

Landowners must leave additional acres equal to the number of acres (including partial acres) occupied by an existing stream-adjacent parallel road within a Type Np Water RMZs or sensitive site buffer.

REVISED PRELIMINARY ECONOMIC ANALYSIS
Forest Practices Board
Rule Making Affecting Timber Harvest in Riparian Management Zones in Washington
By Donald Krug, Economist, Department of Natural Resources
November 2007

OBJECTIVES

The Forest Practices Board is considering permanent rule making that will affect timber harvesting in riparian management zones (RMZs) in Washington. The objectives of this economic analysis are to determine whether the benefits of the proposed rules exceed the costs, and whether the compliance costs of the proposed rules will disproportionately affect the state's small businesses.

Prior to rule adoption, the Administrative Procedure Act (chapter RCW 34.05)¹ requires completion of a Cost-Benefit Analysis (CBA) that demonstrates that probable benefits of the proposal exceed its probable costs and that it is the most cost-effective means of achieving the goal of the rule change. A Small Business Economic Impact Statement (SBEIS) is required by the Regulatory Fairness Act (chapter RCW 19.85)² to consider the impacts of state administrative rules on small businesses, defined as those with 50 or fewer employees. An SBEIS compares the costs of compliance for small businesses with the cost of compliance for the ten percent of businesses that are the largest businesses required to comply with the proposed rules.

This economic analysis combines the SBEIS and the CBA and complies with the legislative requirements for these analyses as part of the rule making process.

HISTORICAL CONTEXT

The Forests and Fish negotiations resulted in rules that manage timber harvests in riparian zones; one of the objectives of which is to reach Desired Future Conditions (DFC). The DFC of a riparian forest is a timber stand that demonstrates the characteristics of mature, unmanaged riparian stands at age 140³. One of the metrics chosen to create these characteristics is a target basal area per acre at age 140 (hereinafter referred to as bapa-140), with targets varying by site class.

As part of the adaptive management process, the Riparian Scientific Advisory Group (RSAG) of the Cooperative Monitoring, Evaluation and Research Committee (CMER) commissioned a study of mature, unmanaged riparian forest stands in Western Washington (Schuett-Hames et al., 2005)⁴. One of the objectives of this study was to determine whether the bapa-140 targets in the forest practices rules were appropriate. The study concluded that the basal area targets are

¹ For CBA requirements, see [Chapter 34.05.328 RCW - The Washington State Legislature](#).

² For SBEIS requirements, see [Chapter 19.85.040 RCW - The Washington State Legislature](#).

³ See [Forest Practices Rules - Title 222 WAC](#) for details.

⁴ This study is available at http://www.dnr.wa.gov/forestpractices/adaptivemanagement/cmer/publications/CMER_05_507.pdf

incorrect, but did not provide alternative target values. The study also concluded that there is no statistical difference for basal area targets between site classes.

PROPOSED RULES SUMMARY

The proposed rule changes the DFC target basal area at year 140 (bapa-140). The Forest Practices Board is considering using one value for all site classes, and to use the median value for total live basal area per acre of the Schuett-Hames et al. study data, which is 325 square feet. The Board is also considering an alternative proposal that adjusts bapa-140 to 325 while modifying other rule provisions. Details are provided below.

ECONOMIC ANALYSIS

To comply with the Administrative Procedure Act and Regulatory Fairness Act this analysis identifies potentially affected industries, defines small and large businesses and determines if there is a disproportionate economic impact on small businesses. It also estimates the annual cost of compliance with the proposed rule changes.

Potentially Affected Industries. The rule-complying community affected by the proposal is businesses that own or control the cutting rights on forestland or those with the right to dispose of the timber.

Small Businesses versus Large Businesses. The Regulatory Fairness Act defines a “small business” as one with 50 or fewer employees. This definition does not lend itself to commercial forestry, because a growing proportion of Washington’s commercial forest acreage is owned by investment-oriented firms that employ few people. Forest ownership acreage and the volume of timber harvested on an annual basis are generally more appropriate metrics for characterizing small businesses in the timber industry. In order to better portray the effects of proposed rule changes on small business, this economic analysis defines small businesses as those meeting the state’s eligibility criteria for small forest landowner status in the Forestry Riparian Easement Program; generally those who harvest an average of less than two million board feet per year from their own land. All other private landowners are categorized as “large businesses” for purposes of this analysis.

Benefits and Costs Included in the Analysis. The costs of the rule change are measured as the potential loss of timber revenue, based on an estimate of the timber volume that is annually affected by the rule making. The intended benefits are related to the value of protecting and restoring habitat for fish and wildlife species that utilize riparian areas for all or part of their life cycles. These benefits cannot be quantified in this analysis because there is no known research applicable to Washington that quantifies the marginal benefits of protecting riparian habitat. Methodology and analysis are further discussed below.

Involvement of Concerned Stakeholders. This rule making is the result of the Forests and Fish adaptive management process described in WAC 222-12-045. It is a formal process involving scientists and policy makers who represent stakeholders of Washington forest practices: Landowners of large and small forest land acreage, environmental and conservation organizations, tribal organizations, federal and state natural resource agencies, and Washington counties.

In reaction to the findings of the Schuett-Hames report, Forests and Fish Policy petitioned the Forest Practices Board to consider rule making responsive to the findings of the study. DNR's Forest Practices Division held several stakeholder meetings starting in May 2006 to develop a rule proposal that would be responsive to the study results. By the Board's August 9, 2006 meeting, the participating stakeholders had not reached an agreement on appropriate changes to the basal area targets. At the August 9, 2006 meeting, the Board directed staff to distribute a notice pursuant to RCW 76.09.040(2) requesting comments from the Washington Department of Fish and Wildlife, counties and tribes on a proposal that would change the target basal areas listed in WAC 222-16-0021(1) to the study's median value of 325 square feet per acre for all site classes. The Board also instructed staff to specify on the notice that the Board intended to consider other options that would appropriately respond to the study.

Prior to the Board's June 11, 2007 meeting, the Washington Forest Protection Association forwarded another rule proposal to DNR, which was also intended to respond to the findings in the Schuett-Hames report. Since then DNR has facilitated several stakeholder meetings to further develop that proposal. The resulting rule proposal is referred in this analysis as "proposal 2."

METHODS OF ANALYSIS

This analysis includes the following:

- The effects of a change in bapa-140 targets to 325 (median value from Schuett-Hames report) for all site classes (proposal 1); and
- The effects of a proposal to change bapa-140 targets to 325 and modifying other provisions of existing rules (proposal 2).

Details of the Two Proposals. Current rules and both proposals offer two harvest options. Under current rules, option 1 is a thinning treatment with a minimum trees-per-acre requirement, and option 2 is a packing treatment that leaves trees closest to the water within no-cut floors. Under current rule, the basal area targets are applied to the combined core and inner riparian zones, such that the bapa-140 requirement in the inner zone will vary according to site class, core zone inventory and the rule-required sizes of the core and inner zones⁵. In addition, shade requirements must be met under both options. Proposal 1 changes the target bapa-140 to 325 for all site classes, but otherwise makes no changes to existing rules.

Proposal 2 changes the manner in which the harvest options are applied. Option 1 is a simplified thinning alternative that requires a minimum number of leave conifers in the inner zone, based on average diameter (dbh)⁶ of the stand's conifer inventory. These range from 57 trees per acre (tpa) (for 22-inch and greater average diameter) to 100 trees per acre (averaging 8 inches in diameter). Besides this, proposal 2 differs from existing regulations and from proposal 1 in the following ways:

- All site classes and stream widths have an RMZ width of 153 feet with a 50 foot core zone, a 60 foot inner zone and a 43 foot outer zone.

⁵ Refer to WAC 222-30-021(1)(b)(ii)(B)(I)(II), and Section 7 of the Forest Practices Board Manual for existing rules and information pertaining to riparian zone harvest.

⁶ Diameter at breast height. Measurements are taken 4.5 feet above ground level.

- Thinning does not have to be “from below”— the largest trees do not have to be left. Average stand dbh must be maintained, however.
- In order to use this option, more than half of the basal area in the core zone must be in conifers.

Unlike existing rules and proposal 1, the allowable thinning does not take into account the projected basal area in the core zone or current inventory in the inner zone, so long as the minimum dbh/tpa benchmark is reached and the core zone is conifer-dominated.

Option 2 is similar to current rule, except:

- The target basal area is changed to 325 square feet for all site classes.
- The 20 tpa conifers that must be left in the cut portion of the inner zone can be credited to meeting the bapa-140 target of 325.
- All harvest sites, regardless of stream size and site class, are eligible to use option 2.
- Additional harvesting may be permitted in cases where minimum no-cut floors result in bapa-140 greater than 325 (referred to in this report as “excess basal area.”) Excess basal area may be removed following these steps:
 - Outer zone leave trees may be removed down to 10 trees per acre.
 - Remaining excess basal area may be thinned in the inner zone area between 75 feet from the stream and the minimum no-cut floor (either 80 feet for small streams or 100 feet for large streams), following proposal 2’s option 1 thinning prescription.

Data inputs. The changes included in proposal 2 necessitate a more complicated approach to the analysis than would have been the case if proposed changes were limited to changing bapa-140 targets (as in proposal 1). This analysis estimates the amount of basal area that would be left in the inner and outer zones under existing rules as well as under the proposals outlined above.⁷ The effects on annual harvest in riparian zones for the two proposals can then be calculated using existing rules as the base case.

These estimates are based on a statewide extrapolation of the data set used by McConnell et al. in the 2007 FPA desktop analysis prepared for the Forests and Fish Cooperative Monitoring, Evaluation and Research Committee (CMER), *An Overview of the DFC Model and an Analysis of Westside Type F Riparian Prescriptions and Projected Stand Basal Area per Acre*⁸. The data set consists of 150 randomly selected Forest Practices Applications (FPAs) from 2003 and 2004 that proposed timber harvesting from within the inner portion of the riparian zone in Western Washington. The following data from McConnell’s data set was used in this economic analysis:

- Stand characteristics supplied by applicant: site class, stream size, major species (Douglas-fir or Western Hemlock), core and inner zone acreage, stand age
- Tree inventory data (softwoods and hardwoods)
- Stand characteristics calculated from these data: core and inner zone trees per acre (tpa), current basal area per acre (bapa), projected no-cut basal area per acre at age 140 (bapa-140), outer zone leave trees
- Attributes following model-generated prescription (reported for core and inner zones as appropriate): current bapa, bapa-140, size of first tree that may be cut (marginal tree dbh), tpa (option 1), no-cut floor (width of no-cut portion of inner zone, option 2).

⁷ Outer zone trees are included in the analyses to ensure the comparability of the scenarios.

⁸ See <http://www.dnr.wa.gov/forestpractices/adaptivemanagement/cmer/projects/>.

The DFC model determines the change in post-harvest basal area per acre from the time of harvest to year 140 based on the interaction of a number of stand factors, including stand age, species mix and percent conifer, trees per acre (tpa), current basal area, and site class. The model was designed using existing bapa-140 targets, and because these bapa-140 targets are hardwired into the model, it does not have the flexibility needed to change these bapa-140 targets for this analysis. Given these circumstances, this analysis estimates the effects of changing these targets by calculating the additional conifers that need to be left to meet DFC, assuming that the model's growth projections for post-harvest stands hold at higher bapa-140 targets.

Methodological approach. The basic unit of analysis is basal area. Basal area is used because it allows the comparison of prescriptions that differ within the RMZ area, i.e., zone configuration, zone treatments, average dbh, etc. The amount of basal area that will remain in the inner and outer zones is estimated for both harvest options under existing rules and each rule proposal as follows:

- For **existing rules options 1 and 2**, the remaining trees left following permitted treatments, as reported in McConnell's study, is recalculated as basal area.
- For **option 1 of proposal 1**, a growth factor must be applied in order to estimate the amount of basal area needed at the time of harvest to meet the target basal area of 325 at age 140. This basal area is calculated by comparing the bapa growth trajectories of a given stand with no inner zone timber harvest and the bapa-140 following the prescribed thinning in existing regulations.
- For **option 2 of proposal 1**, the no-cut floors are adjusted when necessary to meet the inner zone basal area requirement⁹.
- For **option 2 of proposal 2**, no cut floors are adjusted if necessary to account for the crediting of the 20 trees per acre in the cut portion of the inner zone to basal-area-per-acre requirements. If the minimum no-cut floor is farther out than the no-cut floor that would be in place in the absence of minimum no-cut floors, the basal area within this section is considered to be "excess basal area." The amount of excess basal area in outer zone trees that may be cut (down to 10 tpa) is then calculated, and if any excess basal area remains, the amount of basal area in the allowable thinning is calculated.

Calculating the amount of needed basal area for each proposal and harvest option is relatively straightforward except for option 1 of proposal 1. In this case, we need to make growth assumptions in order to determine the amount of basal area that stands must have to meet the bapa-140 target of 325. The methodology outlined above assumes that the relative growth trajectories from now until year 140 for inventory (no-cut), existing bapa-140 targets, and bapa-140 target of 325 follow similar patterns, such that if we know the trajectories of any two of these (in this case, inventory and existing rules), as well as the target bapa-140, we can calculate the third (in this case, basal area needed following harvest) by interpolating from the other two.

⁹ Under proposal 1's option 2, harvesters that are constrained by the minimum floor area may harvest up to one-half of the trees in the outer riparian zone on a basal area for basal area basis (maintaining a minimum of 10 trees per acre), reported as a basal area credit. Increasing bapa-140 targets will affect this credit, but since the model provides insufficient information to calculate this, these trees have been ignored for this analysis.

The DFC model and this analysis assume that conifer inventory is evenly spaced throughout the inner area of the riparian zone, and is therefore not sensitive to tree inventory distribution by dbh in the inner zone. The effects of shade requirements on harvest are discussed below, but not included in the leave basal area calculations presented in the tables.

Option 1 and option 2 reported separately. In existing rules, applications for harvest in riparian areas in Site Class 1, 2, or on small streams in Site Class 3 may use harvest options 1 or 2. Site classes 4, 5 and Site Class 3 on large streams may only use harvest option 1. Of the 150 FPAs in the data set, all 150 could harvest under option 1, and 108 could harvest under option 2. In practice, all but six of the 108 FPAs chose option 2 as their harvest regime. This appears to be a reflection of ease of operations, rather than maximizing the level of harvest, since option 2 generally results in leaving more basal area than option 1. For this reason, this analysis does not attempt to choose the option that results in the largest inner-zone harvest for each FPA. The analyses for harvest options 1 and option 2 are reported separately. Although under existing rules applicants overwhelmingly choose harvest option 2 over option 1, proposal 2 may result in a greater proportion choosing harvest option 1.

Estimating the value of the additional trees that need to be left in order to meet higher bapa-140 targets. Basal area estimates from McConnell's data set are extrapolated statewide based on FPA activity. Basal area was then converted into timber volume based on average stand characteristics of the 150 stands in the data set. Timber volume was converted to stumpage values using 2007 DNR timber sales data for Western Washington.

EFFECTS OF PROPOSALS ON BASAL AREA LEAVE REQUIREMENTS

Estimating the number of FPAs that are affected by existing rules and proposed rule changes. The effects of the proposed rule changes on individual FPAs vary, reflecting the wide variability in stand attributes. The effects of existing rules on FPAs are covered in depth in McConnell et al. Table 1 compares the constraints among the proposals for the two options.

For option 1:

- As reported in McConnell et al., under existing rules, only 8 of the 150 FPAs in the data set are constrained by basal area; the others are constrained by the requirement to leave 57 trees per acre (tpa) in the inner zone after thinning. No FPAs are precluded from thinning under existing rules.
- Raising the bapa-140 target to 325 (proposal 1) results in almost half of the FPAs being constrained by bapa-140. The remaining 79 FPAs remain constrained by the 57 tpa requirement and are therefore not affected by the proposed rule change.
- 20 of the FPAs do not have sufficient inner zone conifer inventory to thin under proposal 1.
- Five of the 150 FPAs cannot meet the appropriate tpa benchmark for proposal 2, and an additional nine FPAs do not have conifer-dominated core zones. These 14 FPAs cannot use option 1. For the others, once these benchmarks are met there are no basal area constraints to inner zone harvest beyond the leave trees per acre requirements.

For option 2:

- As reported in McConnell et al., 40 of the 108 FPAs in the data set that are permitted to harvest under option 2 are constrained by basal area under existing rules; the others are constrained by minimum no-cut floors. One FPA has insufficient basal area to harvest under existing rules.
- Minimum no-cut floors constrain only 22 FPAs when bapa-140 targets are raised to 325 (proposal 1).
- Sixteen of the 108 FPAs cannot harvest under option 2 of proposal 1.
- 17 percent of the FPAs would not be able to harvest conifers in the inner zone under proposal 2's option 2, similar to the rate for proposal 1.

Care must be taken in comparing the two proposals. While option 2 under proposal 2 is available to all site class/stream size combinations, option 2 under proposal 1 is limited to site classes 1 and 2, and site class 3-large streams.

Table 1
Forest Practices Applications Constraints on Harvest

Number of Forest Practices Applications (FPAs)	Option 1			Option 2		
	Existing rules	Proposal 1	Proposal 2	Existing rules	Proposal 1	Proposal 2
Constrained by bapa-140	8/150	71/150	NA	40/108	86/108	NA
<i>Percent</i>	5%	47%	NA	37%	80%	NA
No conifers harvested in inner zone	0/150	20/150	14/150	1/108	16/108	25/150
<i>Percent</i>	0%	13%	9%	1%	15%	17%

Estimating basal area leave requirements in the inner and outer zones. Tables 2 and 3 summarize the basal area that would be left in the inner and outer zones in the 150 sample FPAs under existing rules and proposals 1 and 2.¹⁰ Because the total inner zone conifer basal area inventory varies among proposals and options (due to differences in inner zone widths and eligibility), comparisons are made based on percentage of basal area remaining after harvest.

Option 1. Under existing regulations, an average of 57 percent of conifer basal area is left in the inner zone after thinning. This increases to 69 percent under proposal 1. Proposal 2 leaves three-quarters of the basal area left under current rules, or 43 percent of the inner zone conifer inventory.

¹⁰ The effects of shade rule requirements are not included in the data provided in tables 2 and 3, but are discussed below.

The lower basal area left under proposal 2 is entirely the result of differences in average leave conifer diameter. Although the average inner zone width under proposal 2 is similar to the average inner zone width under existing rules, and the leave trees per acre requirements are higher, the average diameter of leave trees is lower under proposal 2 than current rules – 14 inches versus 20 inches. This is the result of differences in thinning prescriptions between proposal 2 and current rules. Proposal 2 requires that average diameter be maintained after thinning, whereas existing rules require “thinning from below” – that the largest trees are left. Basal area is calculated as the square of the diameter times a constant, such that a 20 inch conifer has double the basal area of a 14 inch conifer.

Slightly less basal area is left in the outer zone under proposal 2 because the average outer zone width of the 150 FPAs in the data set is 45 feet under existing rules, whereas proposal 2 has a uniform outer zone width of 43 feet.

Option 2. In the subset of 108 FPAs that are eligible to harvest under option 2, 69 percent of the basal area is left under current rules, increasing to 81 percent if bapa-140 is increased to 325 (proposal 1).

The magnitude of changes in proposal 2’s option 2 is significantly less than is the case with option 1. The differences between proposal 2’s option 2 and proposal 1 (outlined above) do not have much of an affect on leave basal area. Direct comparisons with existing rules and between proposals are difficult to make, because proposal 2 is available to all site class/stream size combinations. To facilitate comparison, tables 2 and 3 separate leave basal area for proposal 2 into two subgroups: “site class 1, 2, and 3-small”, which includes the FPAs eligible to use option 2 under existing rules and proposal 1, and “site class 3-large, 4 and 5”, which are ineligible to use option 2 except under proposal 2. The comparison “site class 1, 2, and 3-small” subgroup leaves about 2 percent less basal area under proposal 2 than the comparable group of FPAs under proposal 1 (79 percent versus 81 percent). Site class 3-large, 4 and 5 subgroup leaves more basal area inventory (84 percent) than the other subgroup.

Proposal 2 permits the harvest of excess basal area in two steps: a decrease in the outer leave tree requirement from 20 down to 10 trees per acre,¹¹ followed by a limited thinning. The effects of these prescriptions are presented in Table 4.¹¹

¹¹ Existing rules also allow for the harvest of 10 outer zone trees on a basal-area-by-basal-area basis.

Table 2
Basal area remaining after harvest in inner and outer zones.
Option 1 – Thinning

	Inner Zone conifer basal area (sq. ft.)												Outer Zone conifer basal area (sq. ft.)
	All FPAs				Site classes 1, 2, and 3 (small streams)				Site classes 3 (large streams), 4 and 5				
	# FPAs eligible*	Before harvest	After harvest	% left after harvest	# FPAs	Before harvest	After harvest	% left after harvest	# FPAs	Before harvest	After harvest	% left after harvest	After harvest
Existing rules	150	62,398	35,555	57%	108	43,725	25,385	58%	42	18,673	10,170	54%	3,383
Proposal 1	150	62,398	42,875	69%	108	43,725	28,996	66%	42	18,673	13,880	74%	3,383
Proposal 2	150	62,398	27,007	43%	108	43,725	16,729	38%	42	18,673	10,278	55%	3,293

* Forest Practices Applications included in McConnell et al. data set

Table 3
Basal area remaining after harvest in inner and outer zones.
Option 2 – Leaving trees closest to the stream

	Inner Zone conifer basal area (sq. ft.)												Outer Zone conifer basal area (sq. ft.)
	All FPAs				Site classes 1, 2, and 3 (small streams)				Site classes 3 (large streams), 4 and 5				
	# FPAs eligible*	Before harvest	After harvest	% left after harvest	# FPAs	Before harvest	After harvest	% left after harvest	# FPAs	Before harvest	After harvest	% left after harvest	After harvest
Existing rules	108	42,068	29,107	69%	108	42,068	29,107	69%	0	na	na	na	2,656
Proposal 1	108	42,068	34,201	81%	108	42,068	34,201	81%	0	na	na	na	2,656
Proposal 2	150	60,760	49,095	81%	108	42,068	33,336	79%	42	18,692	15,759	84%	3,161

* Forest Practices Applications included in McConnell et al. data set

Table 4
Effects of proposed rule provisions.
Option 2 – Proposal 2

	All FPAs	Site classes 1, 2, and 3 (small streams)	Site classes 3 (large streams), 4 and 5
<i>Number of FPAs</i>	150	108	42
Inner zone conifer basal area	60,760	42,068	18,692
Basal area left with minimum floors	49,844	33,815	16,029
Basal area left, no minimum floors	47,787	32,877	14,911
Excess basal area	2,057	938	1,118
<i>Number of FPAs with excess basal area</i>	27	23	4
Basal area of outer zone trees removed	278	245	33
Basal area of thinned conifers	749	479	270
Inner zone left after prescriptions	49,095	33,336	15,759
<i>Number of FPAs with excess basal area</i>	6	4	2
Excess basal area after credits	1,029	214	815

Basal area is in square feet.

Excess basal area is defined as the difference between the basal area left with and without minimum no-cut floors. For the entire data set, this amounts to 2,057 square feet, approximately four percent of the basal area left prior to adjustments. Of the 150 FPAs in the data set, 27 have excess basal area. The others are not constrained by minimum floors. This differs somewhat from the findings reported for proposal 1 because the basal area of the required 20 leave trees per acre in the cut portion of the inner zone is credited in the calculation of excess basal area.

The basal area of the 10 outer zone conifers per acre that may be harvested to mitigate excess basal area amounts to 278 square feet, and the allowable thinning accounts for an additional 749 square feet of basal area, freeing up 1,028 square feet of basal area for harvest. After these provisions are exhausted, 1,029 feet of excess basal area remains in six FPAs. These results are somewhat skewed by one FPA that accounts for more than 75 percent of the remaining excess basal area.¹²

The effects of shade rule requirements on leave basal area. Inner zone harvests must meet shade rule requirements within 75 feet of a stream under existing rules as well as the two proposals. Shade rule requirements are implicitly built into the minimum no-cut floor widths of option 2, but they may have an effect on option 1 thinning within the portion of inner zones between 50 and 75 feet from a stream. The effects would be greatest under option 1 of proposal 2, because this proposal results in the thinning of a greater number of large conifer trees than existing rules or proposal 1.

To estimate the magnitude of the effects of the shade rule, the leave basal area under option 1 of proposal 2 was recalculated assuming that the portion of the inner zone between 50 and 75 feet from the stream was left untouched, and the remaining inner zone (from 75 to 110 feet) was thinned within the confines of the proposed rule, which stipulates a 50 foot minimum distance between conifers. The adjusted leave basal area for option 1 of proposal 2 is 31,278 square feet, compared to 27,007 feet as reported in table 2. This is a conservative estimate, as it is likely that some level of harvest may be undertaken within 75 feet of a stream in most stands.

Statewide extrapolation. The data set used in McConnell et al. was randomly selected from all of the FPAs that included riparian inner-zone harvest in 2003 and 2004. The report describes the situations in which some FPAs were dropped. In cases where there was more than one stream segment, the first stream segment was chosen. For the purposes of extrapolation, these additional stream segments are the equivalent of additional FPAs. There are 348 stream segments in the 150 sample FPAs, or 2.32 stream segments per FPA. There were 391 FPAs that included riparian zone harvest in 2003, and 444 in 2004, for an average of 418. There are, therefore, an estimated 970 stream segments where inner zone harvest activity is proposed annually, approximately 6.5 times more riparian area harvest activity per year than is found in the 150 survey FPAs. Tables 5 and 6 adjust the findings in Tables 2 and 3 to a statewide extrapolation.

¹² This FPA includes a large (greater than 10 acre) riparian area with basal area per acre of greater than 500 in the core zone and 400 in the inner zone.

Table 5
Basal area remaining after harvest in inner and outer zones.
Statewide annual extrapolation, Option 1 – Thinning

	Inner Zone conifer basal area (sq. ft.)												Outer Zone conifer basal area (sq. ft.)
	All FPAs				Site classes 1, 2, and 3 (small streams)				Site classes 3 (large streams), 4 and 5				
	# FPAs eligible	Before harvest	After harvest	% left after harvest	# FPAs	Before harvest	After harvest	% left after harvest	# FPAs	Before harvest	After harvest	% left after harvest	After harvest
Existing rules	970	403,505	229,925	57%	698	282,755	164,159	58%	272	120,749	65,766	54%	21,874
Proposal 1	970	403,505	277,262	69%	698	282,755	187,506	66%	272	120,749	89,756	74%	21,874
Proposal 2	970	403,505	174,643	43%	698	282,755	108,181	38%	272	120,749	66,462	55%	21,295

Table 6
Basal area remaining after harvest in inner and outer zones.
Statewide annual extrapolation, Option 2 – Leaving trees closest to the stream

	Inner Zone conifer basal area (sq. ft.)												Outer Zone conifer basal area (sq. ft.)
	All FPAs				Site classes 1, 2, and 3 (small streams)				Site classes 3 (large streams), 4 and 5				
	# FPAs eligible	Before harvest	After harvest	% left after harvest	# FPAs	Before harvest	After harvest	% left after harvest	# FPAs	Before harvest	After harvest	% left after harvest	After harvest
Existing rules	698	272,042	188,225	69%	698	272,042	188,225	69%	0	na	na	na	17,167
Proposal 1	698	272,042	221,166	81%	698	272,042	221,166	81%	0	na	na	na	17,167
Proposal 2	970	392,917	317,479	81%	698	272,042	215,573	79%	272	120,875	101,908	84%	20,441

Calculating timber volume and stumpage value. The most accurate method to estimate timber volume would be to calculate basal area for each FPA based on diameter (dbh) of all leave trees as well as site characteristics (site class, stand age, and species). Given time constraints, a simpler approach was used in this analysis, based on the following tables in the USFS Foresters Field Handbook:

- Westside Douglas-fir 50-Year Site Index table (to estimate tree height from site index and stand age)
- Board foot volume table for young Douglas-fir Scribner Log Rule.

Although leave trees vary in average diameter among the various proposal/option combinations, the average conifer dbh of all of the trees in the data set – 14 inches – was used for this calculation.

The average tree height (119 feet) was estimated based on the average stand age (52) and average site index (116) of the data set. Volume was then calculated for a 14 inch dbh Douglas-fir of this height -- 218 board feet per tree. Stumpage value was calculated based on recent DNR timber sales results in western Washington. The stumpage price used was \$400 per thousand board feet (mbf), appropriate for 12 to 18 inch diameter trees.¹³ The result is a stumpage value of \$87.20 per tree.

Table 7 presents an estimate of the value of inner zone conifer inventory and the value of inner and outer zone conifers left, on an annual basis, to meet DFC for each scenario. Findings are reported separately for the stands that may harvest under either option under existing rules (site class 1, 2 and 3-small streams), and those that may only use option 1 (site class 3-large, 4 and 5).¹⁴ Under option 1, out of total inventory of \$32.9 million, \$18.8 million of stumpage value is left under existing rules, \$22.6 million under proposal 1, and \$14.2 million under proposal 2. Under option 2, total inventory of the site class 1, 2 and 3-small streams subset is \$22.2 million, of which \$15.4 million is left under existing rules and \$18.0 million under proposal 1. Inventory under proposal 2, which is available to all site class-stream size combinations, is \$32.1 million, and leave stumpage tree value is \$25.9 million.

¹³ Stumpage price is net of costs; costs are assumed to be \$150/mbf.

¹⁴ This is done in order to allow comparison among like groups; in this case, the subset of stands that may use either option 1 or option 2.

**Table 7
Stumpage Value
Statewide annual extrapolation (dollar values in millions)**

OPTION 1 – Thinning

	Inner Zone stumpage value												Outer Zone stumpage value
	All FPAs				Site classes 1,2 and 3 (small streams)				Site classes 3 (large streams), 4 and 5				
	# FPAs eligible	Before harvest	After harvest	% left after harvest	# FPAs	Before harvest	After harvest	% left after harvest	# FPAs	Before harvest	After harvest	% left after harvest	After harvest
Existing rules	970	\$32.9	\$18.8	57%	698	\$23.1	\$13.4	58%	272	\$9.8	\$5.4	\$0.5	\$1.8
Proposal 1	970	\$32.9	\$22.6	69%	698	\$23.1	\$15.3	66%	272	\$9.8	\$7.3	\$0.7	\$1.8
Proposal 2	970	\$32.9	\$14.2	43%	698	\$23.1	\$8.8	38%	272	\$9.8	\$5.4	\$0.6	\$1.7

OPTION 2 – Leaving trees closest to the stream

	Inner Zone stumpage value												Outer Zone stumpage value
	All FPAs				Site classes 1,2 and 3 (small streams)				Site classes 3 (large streams), 4 and 5				
	# FPAs eligible	Before harvest	After harvest	% left after harvest	# FPAs	Before harvest	After harvest	% left after harvest	# FPAs	Before harvest	After harvest	% left after harvest	After harvest
Existing rules	698	\$22.2	\$15.4	69%	698	\$22.2	\$15.4	69%	--	na	na	na	\$1.4
Proposal 1	698	\$22.2	\$18.0	81%	698	\$22.2	\$18.0	81%	--	na	Na	na	\$1.4
Proposal 2	970	\$32.1	\$25.9	81%	698	\$22.2	\$17.6	79%	272	\$9.9	\$8.3	\$0.8	\$1.7

COSTS OF PROPOSED RULE CHANGES

As previously mentioned, comparisons among some option/proposal combinations are difficult to make, because option 2 is only available to a subset of site class/stream width combinations under existing rules and proposal 1, and zone configurations vary. Comparisons based on percentage of basal area left can be made, but such comparisons are somewhat skewed because the site class 3-large, 4 and 5 subgroup leaves a higher percentage of basal area than the site class 1, 2 and 3-small subgroup under those scenarios that permit harvesting under all site class/stream size combinations (all option 1 scenarios and proposal 2 of option 2). Comparison data provided in Table 8 is thus presented by subgroup as well as in total.

Table 8
Annual costs of compliance and changes in costs from existing rules
(dollar values in millions)

OPTION 1 – Thinning

	Inner and outer zones	All inner zone	Inner zone site class 1, 2, and 3-small	Inner zone site class 3-large, 4 and 5	Outer zone
Existing rules	\$20.5	\$18.8	\$13.4	\$5.4	\$1.8
Proposal 1	\$24.4	\$22.6	\$15.3	\$7.3	\$1.8
Cost increase (decrease)	\$ 3.9	\$ 3.9	\$ 1.9	\$ 2.0	--
Proposal 2	\$16.0	\$14.2	\$ 8.8	\$ 5.4	\$ 1.7
Cost increase (decrease)	(\$4.6)	(\$4.5)	(\$4.6)	\$0.06	(\$0.05)

OPTION 2 – Leaving trees closest to the stream

	Inner and outer zones	All inner zone	Inner zone site class 1, 2, and 3-small	Inner zone site class 3-large, 4 and 5	Outer zone
Existing rules	\$16.8	\$15.4	\$15.4	--	\$1.4
Proposal 1	\$19.4	\$18.0	\$18.0	--	\$1.4
Cost increase (decrease)	\$ 2.7	\$ 2.7	\$ 2.7	--	--
Proposal 2	\$28.6	\$25.9	\$17.6	\$8.3	\$1.7
Cost increase (decrease)	na	na	\$ 2.2	na	\$ 0.3

Option 1 (thinning). Changing the basal area per acre at age 140 (bapa-140) target to 325 (proposal 1) increases the stumpage value of conifers left to meet DFC by \$3.9 million annually. Proposal 2, which proposes a series of changes to existing rules outlined in the Methods of Analysis section, results in annual savings of \$4.6 million.

Option 2 (leaving trees closest to the stream). Changing the basal area per acre at age 140 (bapa-140) target to 325 (proposal 1) increases the stumpage value of conifers left to meet DFC by \$2.7 million annually. For the subgroup of site class/stream size combinations that may currently use option 2, proposal 2 increases costs by \$2.2 million, but results in a savings of \$500,000 over

proposal 1. For the subgroup that may not currently use option 2, comparisons with other option 2 proposals cannot be made. Comparing the stumpage value of leave conifers in this subgroup with option 1 (existing rules) suggests an increase in annual costs of \$3 million, but a portion of this increase is due to the fact that option 2 generally results in more leave basal area than option 1, so the comparison cannot be readily made.

Small Business Impacts. The 150 FPAs in the sample were not identified as to Small Forest Landowner status. Anecdotal evidence suggests that non-industrial landowners are less likely to consider harvesting in riparian zones, due to the complicated nature of following the rules, such as the requirement to inventory each tree by two-inch diameter class. Those that choose to harvest may be more likely to utilize option 2, which is simpler to set up, in spite of the fact that option 1 usually allows more harvesting than option 2. Under these circumstances, we estimate that the effects on small business are similar to the industry as a whole for proposal 1 and option 2 of proposal 2.

However, if landowners were to use option 1 of proposal 2, the effects could be positive compared to existing rules because:

- The evaluation process to determine stand eligibility would be simpler than under existing rules;
- A greater number of trees would be allowed to be thinned in the inner zone; and
- It would be possible to select high value trees for thinning.

In general, the effects on small businesses appear to be similar to the industry as a whole for both proposals 1 and 2, and neither proposal appears to have disproportionate negative impacts on small forest landowners when compared to Washington timber industry businesses overall. The major tasks involved in timber sale planning would not change as a result of this rule making, and timber harvests within riparian management zones will continue to be a small percentage of the overall harvest unit. Therefore, it is improbable that this rule making would have an effect on small business employment in the state.

BENEFITS

The goal of the proposed rule making is to facilitate reaching desired future conditions conducive to healthy riparian ecology and function, and ultimately to improve water quality and habitat for fish and wildlife species that utilize riparian areas for all or part of their life cycle. The 1999 Forests and Fish Report, which initiated the current riparian strategies for forest practices rules, based recommendations for improving and maintaining “bank stability, recruitment of large woody debris, leaf litter fall, nutrients, sediment filtering, shade, and other riparian features that are important to both riparian forest and aquatic system conditions.”¹⁵ The report also initiated an adaptive management program through which adjustments in the rules would be made to achieve resource objectives. The proposed rule proposals are a manifestation of that program and are intended to provide enhanced benefits to water quality and fish and wildlife habitat.

The benefits of both proposal 1 and proposal 2 are difficult to analyze. The economic benefits of the proposed rule change cannot be reasonably estimated because they occur at the margin, and marginal benefits of protecting riparian areas haven’t been studied. Some general inferences can be made from

¹⁵ Forests and Fish Report, 1999. Appendix B (I)(b). This report may be accessed at <http://www.dnr.wa.gov/forestpractices/adaptivemanagement/>, under “Adaptive Management Links.”

the data set, however. In 20 of the 150 sample FPAs, bapa-140 increased after the prescribed option 1 thinning treatment under existing rules compared to bapa-140 without a thinning. On the other hand, none of the 108 eligible FPAs increased bapa-140 after an option 2 treatment. The fact that the vast majority (102 out of 108) of FPAs in the sample chose option 2 over option 1 even though more trees are left under option 2, and the large standard deviation in the mature stands reported by the Schuett-Hames study, suggest that the current structure may be counterproductive for stands that would benefit from thinning but cannot meet bapa-140 targets. Increasing bapa-140 targets may exacerbate the situation.

The benefits of proposal 2's option 1 are even more difficult to analyze. If the proposal meets bapa-140 targets, it offers improved efficiencies in doing so, and would be simpler to implement than option 1 in the existing rules. This may induce more thinning in inner zones, resulting in improved conditions. However, stands with relatively low core zone bapa may be unable to function ecologically, particularly in the short term.

CONCLUSIONS

This economic analysis estimates the costs of the proposed rule making on an annual basis. Costs are defined as the annual statewide decrease in timber harvest revenue resulting from the proposed rule change. These estimates are based on a statewide extrapolation of the data set used by McConnell et al. in the 2007 CMER report, *An Overview of the DFC Model and an Analysis of Westside Type F Riparian Prescriptions and Projected Stand Basal Area per Acre*.

The annual change from existing rules in stumpage value of trees not harvested under proposal 1 is \$3.9 million under option 1 and \$2.7 million under option 2. Compared with existing rules, proposal 2 allows the additional harvest of \$4.6 million of stumpage value annually under option 1,¹⁶ and option 2 results in an additional stumpage value of \$2.2 million left after harvest annually for the site class 1, 2 and 3-small subgroup of site class/stream size combinations that are currently permitted to harvest under option 2.¹⁷

As discussed in the McConnell et al. report, this analysis necessitated making a number of assumptions that were not field tested. These findings should therefore be considered at best as providing an indication of the scale of the effects of the proposed rule change. In addition, shade rule requirements may further limit harvest under option 1 for some stands.

The effects on small businesses appear to be similar to the industry as a whole for both proposals 1 and 2, and neither proposal appears to have disproportionate negative impacts on small forest landowners when compared to Washington timber industry businesses overall. The major tasks involved in timber sale planning would not change as a result of this rule making, and timber harvests within riparian management zones will continue to be a small percentage of the overall harvest unit. Therefore, it is improbable that this rule making would have an effect on small business employment in the state.

Benefits are identified as the value of achieving DFC in riparian areas, but are not quantified due to the lack of available relevant information.

¹⁶ Refer to the Methods of Analysis section for descriptions of the proposals and options.

¹⁷ Option 2 may be used for the site class 3-large, 4 and 5 subgroup under proposal 2 but may not be used under existing rules or proposal 1.

Consideration should also be given to the distribution of costs and benefits. While the benefits accrue generally, the costs are borne by a limited number of Forest Practices applicants. The effects on individual applications vary considerably. Using option 1, about half of the FPAs are unaffected by changing the bapa-140 target to 325 (proposal 1), because they have more than sufficient basal area, and would still be constrained by the 57 trees-per-acre requirement. On the other hand, as mentioned previously, 13 percent of the FPAs would be precluded from option 1 harvesting under proposal 1, because they are unable to meet bapa-140 in the core plus inner zones. Some of these stands might be more likely to meet DFC with an appropriate thinning. Proposal 2's option 1 is generally more favorable to higher site classes than existing regulations, due to decreases in inner zone widths for higher site classes, whereas the larger inner zones on lower site class stands (compared to existing rules) result in an increase in leave basal area for some stands.

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RESOURCES CITED

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