

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
June 2008

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 two alternative proposals that adjust 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 benefits of protecting additional 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 (proposals 2 and 3).

Details of the Three Proposals. Current rules and all three proposals offer two harvest options. Under current rules, option 1 is a thinning treatment with a minimum trees-per-acre (tpa) 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.

Option 1 provisions are the same for proposals 1, 2 and 3. The differences among proposals are under option 2. Like proposal 1, proposals 2 and 3 change the target bapa-140 to 325 for all site classes under option 2.

Option 2 of proposal 2 includes the following differences from existing rules:

- 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.

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.

- Additional harvesting may be permitted in the outer zone in cases where minimum no-cut floors result in bapa-140 greater than 325 (referred to in this report as “excess basal area.”) Outer zone leave trees may be removed down to 10 trees per acre, so long as the minimum ba-140 of 325 is met.

Option 2 of proposal 3 is similar to proposal 1. The differences from existing rules are:

- 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.

Data inputs. The changes included in proposals 2 and 3 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.⁶ 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*⁷. 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).

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.

⁶ Outer zone trees are included in the analyses to ensure the comparability of the scenarios.

⁷ See <http://www.dnr.wa.gov/forestpractices/adaptivemanagement/cmer/projects/>.

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 all three proposals**, 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 requirement⁸.
- For **option 2 of proposal 2**, no cut floors are calculated for the FPAs permitted to harvest under proposal 2 that are ineligible under existing rules and proposal 1 (site class 3-large streams and site classes 4 and 5.) No-cut floors on all FPAs 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.
- For **option 2 of proposal 3**, the no-cut floors are adjusted when necessary to meet the inner zone basal area requirement and 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.

Calculating the affects of option 1 necessitates making 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.

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.

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

⁸ 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.

FPA's in the data set, all 150 could harvest under option 1, and 108 could harvest under option 2. In practice, all but six of these 108 FPA's 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.

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 FPA's that are affected by existing rules and proposed rule changes. The effects of the proposed rule changes on individual FPA's vary, reflecting the wide variability in stand attributes. The effects of existing rules on FPA's 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 FPA's 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 FPA's are precluded from thinning under existing rules.
- Raising the bapa-140 target to 325 (proposals 1, 2 and 3) results in almost half (71) of the FPA's being constrained by bapa-140. The remaining 79 FPA's remain constrained by the 57 tpa requirement and are therefore not affected by the proposed rule change.
- 20 of the FPA's do not have sufficient inner zone conifer inventory to thin under proposals 1, 2 and 3.

For option 2:

- As reported in McConnell et al., 40 of the 108 FPA's 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 perform an option 2 harvest under existing rules.
- Minimum no-cut floors constrain only twenty percent of FPA's under proposals 1 and 2, and 21 % under proposal 3. Bapa-140 constrains the remainder.
- The percentage of FPA's that cannot harvest conifers in the inner zone is similar for the three proposals – 15%, 17%, and 15%, respectively.

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 proposals 1 and 3 are 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	Proposals 1, 2 and 3		Existing rules	Proposal 1	Proposal 2	Proposal 3
Constrained by bapa-140	8/150	71/150		40/108	86/108	120/150	85/108
<i>Percent</i>	5%	47%		37%	80%	80%	79%
No conifers harvested in inner zone	0/150	20/150		1/108	16/108	25/150	16/108
<i>Percent</i>	0%	13%		1%	15%	17%	15%

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 the three proposals.⁹ 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 the three proposals.

Option 2. For the subset of FPAs that are eligible for option 2 harvest under all three proposals, the differences in leave basal area among the three proposals is relatively minimal. The crediting of cut-area leave trees to basal area requirements under proposals 2 and 3 generally results in a shift of the no-cut floor by zero or one foot. **The most significant distinction among the three proposals is that proposal 2 allows option 2 harvest on 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 all three proposals, and “site class 3-large, 4 and 5”, which are ineligible to use option 2 except under proposal 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), and 80 percent under proposals 2 and 3. The subgroup that is ineligible to harvest under current rules leaves 86% of bapa-140 under proposal 2.

Proposal 2 permits the harvest of excess basal area via a decrease in the outer leave tree requirement from 20 down to 10 trees per acre. The effects of this prescription are presented in Table 4.¹⁰

⁹ The effects of shade rule requirements are not included in the data provided in tables 2 and 3, but are discussed below.

¹⁰ 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

DRAFT 16 June 2008

* 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>	<i>150</i>	<i>108</i>	<i>42</i>
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>	<i>27</i>	<i>23</i>	<i>4</i>
Basal area of outer zone trees removed	278	245	33
Inner zone left after prescriptions	49,566	33,570	15,996
<i>Number of FPAs with excess basal area</i>	<i>23</i>	<i>19</i>	<i>4</i>
Excess basal area after credits	1,779	694	1,085

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 leave 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, less than one half of one percent of the basal area inventory. For most FPAs, there is no difference in leave basal area requirements among the three proposals under option 2.

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.

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.¹¹ 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).¹² Under option 1, out of total inventory of \$32.9 million, \$18.8 million of stumpage value is left under existing rules, and \$22.6 million under the three proposals. 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, \$17.7 million, and \$17.8 million under proposals 1, 2 and 3 respectively. Inventory under proposal 2, which is available to all site class-stream size combinations, is \$32.1 million, and leave stumpage value is \$26.1 million.

¹¹ Stumpage price is net of costs; costs are assumed to be \$150/mbf.

¹² 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 proposals 1 and 3, 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 (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.

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 \$2.4 million, but results in a savings of \$300,000 over proposal 1. Additional costs under proposal 3 are \$2.5 million. 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 \$3.1 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. 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.”¹³ 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 the three proposals 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 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 rule 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. Furthermore, there are no provisions in the proposed rule to incentivize option 1 thinning treatments.

CONCLUSIONS

¹³ 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.”

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 (thinning) and \$2.7 million under option 2 (packing). Proposals 2 and 3 result in slightly more option 2 harvested stumpage than proposal 1. The significant difference amongst the proposals is that proposal 2 allows the packing option on all site class/stream size combinations.

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 none of the proposals appear 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.

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.

ACKNOWLEDGMENT

We would like to thank Steven B. McConnell, Upper Columbia United Tribes, for providing the data essential to this analysis, through both the CMER desktop analysis referenced throughout this document and his willingness to work with Department of Natural Resources staff during this analysis.

RESOURCES CITED

DRAFT 16 June 2008

McConnell, S. 2007. An Overview of the DFC Model and an Analysis of Westside Type F Riparian Prescriptions and Projected Stand Basal Area per Acre. Project Title: The FPA Desktop Analysis. Contract No. PSC 07-22.

Schuett-Hames, D., R. Conrad, A. Roorbach. 2005. Validation of the Western Washington Riparian Desired Future Condition Performance Targets in the Washington State Forest Practice Rules with Data from Mature, Unmanaged, Conifer-Dominated Riparian Stands. Northwest Indian Fisheries Commission, CMER No. 05-507.