

Exempt 20-Acre Parcel Riparian Management Zones: An Assessment of Riparian Function

Purpose and Need

The purpose of this paper is to characterize ecological functions provided by riparian management zones (RMZ) adjacent to Type S and Type F waters on exempt 20-acre parcels as defined by Washington's forest practices rules (WAC 222-30-023). The rule requirements were evaluated in light of available scientific literature to quantify the level of large wood recruitment and shade provided by RMZs adjacent to Type S and Type F waters on exempt 20-acre parcels. Large wood recruitment and shade were evaluated because they play an important role in maintaining the ecological health of aquatic systems and they are also sensitive to forest practices effects. This information will be incorporated into an Environmental Impact Statement currently being developed to support the Forest Practices Habitat Conservation Plan.

Introduction

The degree of riparian influence on the aquatic environment decreases with increasing distance from the water (FEMAT 1993). Therefore, in forests where trees are of similar height, trees closer to the water generally provide greater ecological benefit compared with those farther away. This relationship can be illustrated as a curve where the cumulative effectiveness of a given riparian function is related to distance from the stream or wetland edge (Figure 1). The relationship is function-specific and is often expressed as a proportion of tree height. Since species, age, and site productivity all affect tree height, the generalized function-distance relationships in Figure 1 change somewhat as forest stand characteristics vary across time and space.

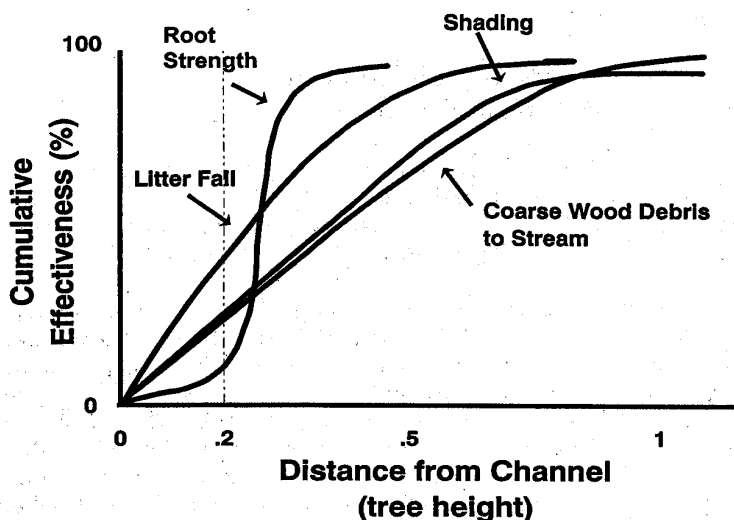


Figure 1. Relationship between cumulative effectiveness of various riparian functions and distance from the stream channel. Distance from channel is expressed as a proportion of tree height. From FEMAT (1993).

Part 1 - Large Wood Recruitment

Background

Recent research into woody debris recruitment has helped shape the generalized recruitment-distance relationship illustrated in Figure 1. In a study of first- through third-order streams in western Oregon and Washington, McDade et al. (1990) found that 70 percent of in-stream debris pieces recruited from mature conifer forests originated from within 50 feet of the streambank (Figure 2). Source distances of 66 and 100 feet corresponded with 80 and 90 percent total recruitment, respectively for debris from mature conifer forests (McDade et al. 1990). In cases where mature hardwoods dominated the riparian forest, McDade et al. (1990) found that 75 and 90 percent of in-stream debris pieces were recruited from 30 and 50 feet, respectively. In a similar study, Murphy and Koski (1989) found that 90 percent of in-stream debris recruited from old-growth forests in southeast Alaska had source distances of 50 feet or less from the stream edge (Figure 3).

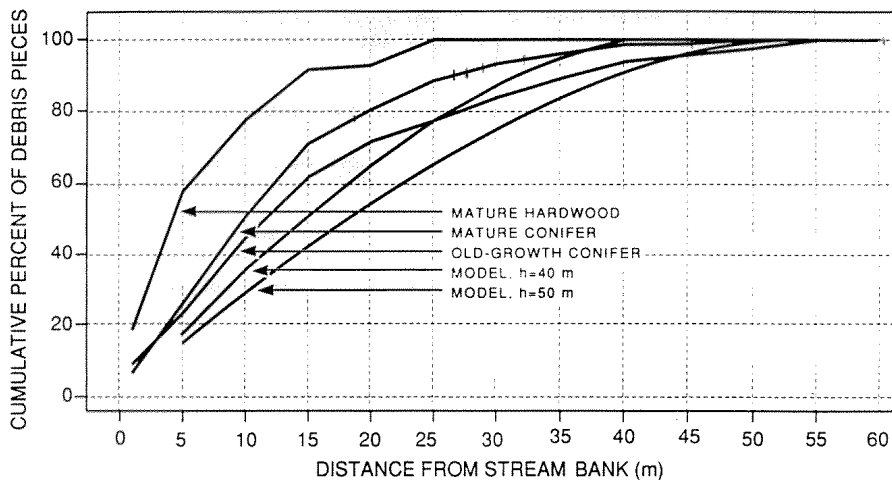


Figure 2. Distribution of source distances from origin to streambank for conifer large woody debris in old-growth stands and hardwood and conifer large woody debris in mature stands (as based on field observations) and for trees 40 and 50m tall (as calculated from a trigonometric model of debris delivery). From McDade et al. (1990).

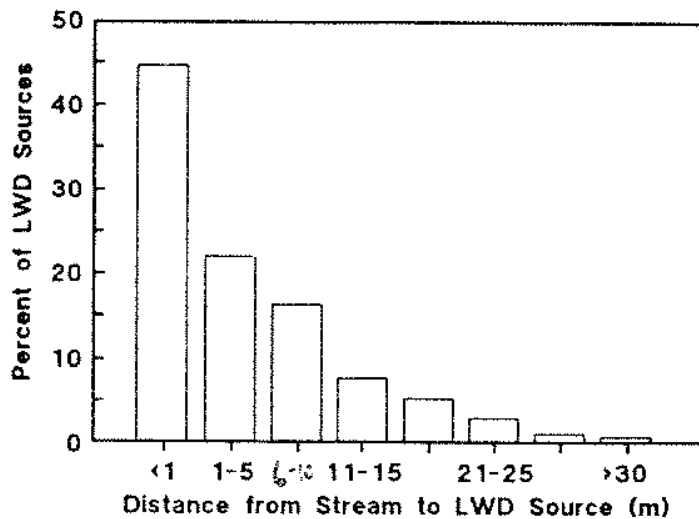


Figure 3. Distances from the stream to sources of large woody debris. Histogram bars show the percentage of all identified large woody debris sources (N = 861) at given distances from the stream for 32 stream reaches in old-growth forest in southeast Alaska. From Murphy and Koski (1989).

Variations in the source distance relationships in the aforementioned studies are largely attributable to differences in tree height and recruitment process. Younger second-growth forests or forests growing on less productive sites have shorter trees as compared to older forests or forests growing on highly productive sites. Riparian forests with shorter trees supply a larger proportion of the total in-stream wood load from a given source distance relative to riparian forests with taller trees (Robison and Beschta, 1990; Van Sickle and Gregory, 1990). The relative importance of recruitment processes such as bank erosion, chronic mortality, and mass wasting also affect the shape of source distance relationships. Source distance curves for channels dominated by bank erosion tend to be shifted upward and to the left (i.e., a larger proportion of the wood is recruited from close to the channel) relative to channels where wood is recruited via chronic mortality or mass wasting (Benda et al. 2003).

Forest Practices Rule Requirements

Data from the Forest Practices Application Review System (FPARS) showed that there were a total of 21,265 FPAs submitted to DNR during the period from 10/25/01 to 6/30/05. Out of the 21,265 FPAs, 440 were 20-acre exempt FPAs or two percent of the total. These 440 FPAs included approximately 11 Class II, 309 Class III and 120 Class IV-General FPAs. Forest landowners preparing for a forest practice on their land submit forest practices applications to the Department of Natural Resources. The FPAs are reviewed, classified, and when accepted, are input into a database called the Forest Practices Application Review System (FPARS). Forest practices fall into four different classes based on their potential impact to public resources. Class I forest practices have no direct potential to damage a public resource and do not require an FPA. Class II forest practices

have a less than ordinary potential to damage a public resource and do require an FPA. Class III forest practices have a higher potential to impact a public resource than Class II forest practices and require an FPA. Class IV forest practices have the potential for a substantial impact on the environment, require an FPA and go through a State Environmental Policy Act review (SEPA). Class IV forest practices are divided into Class IV-General and Class IV-Special. Class IV-General forest practices are those that are either immediately converting from forestry to a use other than forestry or have the likelihood of converting in the near future. Specifically, these include; land use conversions from forestry to a use other than forestry, timber harvest and road construction in urban growth areas and areas likely to convert from forestry (ALTCs), and lands that have been platted (by the county) with the assumption that they will be converted to a use other than forestry in the near future. Class IV-Special forest practices take place on lands remaining in forestry.

Data obtained from FPARS showed that the Class IV-General FPAs comprise 27 percent of the 20-acre exempt FPAs. These data also showed that 72 percent of the Class IV-General 20-acre exempt FPAs were immediate conversions to a use other than forestry (Table 1). The remaining 28 percent of Class IV-General FPAs occurred on lands not being converted immediately, rather were on platted lands which are assumed to have high likelihood of converting in the future.

Forest practices rules for exempt 20-acre parcels in western Washington require the retention of RMZs that are 29, 58 or 86 feet wide along Type F waters and 86 or 115 feet along Type S waters (bankfull width determines the RMZ width). In eastern Washington, exempt 20-acre parcel RMZ widths are 35 or 58 feet along Type S and Type F waters where the adjacent harvest unit is partial-cut (again, bankfull width determines the RMZ width). Where harvest units are clearcut in eastern Washington, exempt 20-acre parcel RMZs along Type S and Type F waters must average 58 feet in width with a minimum width of 35 feet and a maximum width of 345feet.

Harvest within exempt 20-acre parcel Type S and Type F RMZs is allowed if shade requirements are met. In western Washington, harvesting within RMZs must retain between 29 and 115 trees per 1,000 feet of stream length on each side of the stream. The bankfull width and channel substrate type determines the exact number of trees that must be retained (WAC 222-30-023). In eastern Washington, tree retention within RMZs is determined by the size and species composition of the riparian stand (WAC 222-30-023).

While harvesting to established minimums is allowed if shade requirements can be met, data from the DNR Forest Practices Division indicate harvesting within the RMZ is uncommon. In a statewide sample of 37 RMZs established on exempt 20-acre parcels during 2002/2003, 32 (or 86 percent) were treated as no-harvest areas and only two had 15 percent or more of the trees removed from the RMZ (Table 2; DNR Forest Practices Division, unpublished data, 2003). Further analysis of an additional 39 FPAs submitted to the Department of Natural Resources during 2004/2005 discovered the same trend. That is, little if any harvest has been occurring within RMZs on exempt 20-acre parcels. The 2004/2005 data showed that 90 percent of the harvested parcels reviewed were treated as

no-harvest areas in the RMZs. Only one had more than 15 percent harvest in the RMZ. (Table 3; DNR Forest Practices Division, unpublished data, 2005). Again, this appears to be associated with the requirements of the shade rule. The following steps were taken in an effort to obtain current information on 20-acre exempt FPAs. In July 2005, a random sample of 68 FPAs were chosen for review out of a total of 203 (33%) Class II and Class III 20-acre exempt FPAs submitted during the time period of 10/01/03 to 6/30/05. Out of those 68 FPAs, 39 had fish-bearing waters, 11 had non-fish-bearing waters, 12 had not yet been harvested and 6 could not provide usable data. Ultimately post-harvest data were collected on the 39 FPAs with fish-bearing waters. Table 2 shows that 90 percent of the FPAs observed were treated as no harvest RMZs and 97 percent of the FPAs observed left 90 percent or more of the trees in the RMZ unharvested.

While these data from both the 2002/2003 and 2004/2005 studies comprise only a sample of the 20-acre exempt FPAs. Anecdotal information from the DNR suggests they are representative of RMZ harvest practices since adoption of the Emergency Salmonid Rule (ESR) in 1998 (S. Casey; B. Anderson, WDNR, personal communication).

The low frequency of RMZ harvest is likely attributable to two factors. First, it is likely that many sites do not meet minimum shade requirements, eliminating RMZ harvest options. Many exempt 20-acre parcels are located at low elevations where minimum shade levels must equal or exceed 80 percent. Such high shade levels are difficult to attain, particularly for larger streams that have natural canopy openings over the channel. Legacy effects from past forest practices such as increased sediment deposition and resulting channel widening also restrict the capacity of some sites in attaining minimum shade requirements.

The second factor that affects RMZ harvest is the required shade analysis. A landowner planning to harvest within an RMZ must measure and document existing shade levels and compare those levels to required minimums. If "surplus" shade exists, the landowner must then identify (or mark) trees eligible for harvest under the shade rule. If "surplus" shade does not exist (i.e., existing shade is below the required minimum) no harvest is allowed. The time and/or costs associated with conducting the shade analysis often deters many landowners from pursuing RMZ harvest, particularly when there is no guarantee of surplus shade.

Estimated Recruitment from RMZs

Multiple factors affect wood recruitment potential from exempt 20-acre parcel RMZs. As noted earlier, recruitment under natural conditions is affected by tree height (which is a function of species and age) and the relative importance of various recruitment processes (i.e., bank erosion vs. chronic mortality vs. mass wasting). Under managed conditions, RMZ width (which varies with region, water type and bankfull width) and the level of tree retention within the RMZ affect wood recruitment. Given the many factors that influence wood delivery to streams, recruitment potential from exempt 20-acre parcel RMZs is likely to vary widely.

Wood recruitment potential from exempt 20-acre parcel RMZs is estimated to range from 45 to 95 percent and from 75 to 100 percent for mature conifer and mature hardwood forests, respectively. Where in the range a particular RMZ falls depends on the RMZ width. These conclusions are based primarily on the scientific literature described earlier (Murphy and Koski 1989; McDade et al. 1990) and are further supported by the DNR data related to exempt 20-acre parcel RMZs that indicates the vast majority of RMZs are left unharvested. Harvesting within RMZs will reduce these estimates; the degree of reduction will depend largely on the number of trees harvested and the location of the harvested trees with respect to the water.

Table 1. Proportion of Class IV-General 20-acre FPAs and Proportion of Conversions. For the time period 10/25/01-6/30/05. FPARS data provided on 11/3/05.

Region	Total # 20-ac FPAs	# Class IVG	Percent Class IVG/Total FPAs	# Conversions	Percent Conversions/# Class IVG
Pacific Cascade	177	35	20	29	83
South Puget	62	5	8	3	60
Olympic	29	9	31	4	44
Northwest	98	59	60	49	83
Northeast	66	10	15	0	0
Southeast	8	2	25	1	50
TOTAL	440	120	27	86	72

Table 2. Distribution of riparian management zones by tree retention level for exempt 20-acre parcels in Washington (n = 37); data from forest practices approved in 2003.

DNR Region	100% Retention	99% Retention	95% Retention	90% Retention	85% Retention	50% Retention
Central	5	0	0	0	0	1
South Puget	9	0	0	0	0	0
Olympic	1	0	1	1	0	0
Northwest	5	0	0	0	0	0
Southwest	7	1	0	0	0	0
Northeast	1	0	0	0	1	0
Southeast	4	0	0	0	0	0
TOTAL	32	1	1	1	1	1

Table 3. Distribution of riparian management zones by tree retention level for exempt 20-acre parcels in Washington (n=39) 10/1/03 –6/30/05

Region	Data	100%	99%	90%	50%
PC	11	10	1	0	0
SPS	4	4	0	0	0
Oly	7	6	0	0	1
NW	6	5	0	1	0
NE	9	8	0	1	0
SE	2	2	0	0	0
TOTAL	39	35	1	2	1

Part 2 – Shade

Background

Forest practices rules rely on shade, expressed as percent canopy cover, to ensure forest practices activities meet water temperature standards (WAC 222-30-040). The degree of shade provided by streamside buffers varies with the species, age, and density of riparian vegetation. Buffer strip width is also important, but by itself may not be a good predictor of stream shading (Sullivan et al. 1990). Studies of the relationship between buffer strip width and shade (expressed as angular canopy density or ACD) show a high degree of variability, particularly for buffers less than about 75 feet in width (Brazier and Brown 1973; Steinblums et al. 1984) (Figure 4). Nonetheless, ACD is positively correlated with buffer width; as buffer width increases, the level of riparian shade also increases. In the Oregon Coast Range, Brazier and Brown (1973) found buffers approximately 70 feet wide had ACDs similar to that of old-growth stands (Figure 4). Steinblums et al. (1984) found that buffers approximately 120 feet wide in the Oregon Cascades were necessary to achieve ACDs representative of old-growth (Figure 4).

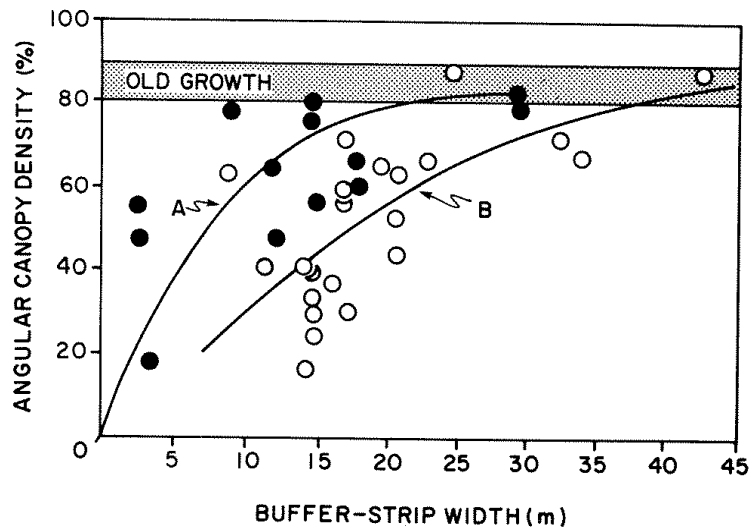


Figure 4. Relationship of angular canopy density (ACD) to buffer strip width in western Oregon. Data for (A) from Brazier and Brown (1973); data for (B) from Steinblums et al. (1984). From Beschta et al. (1987).

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Shade provided by exempt 20-acre parcel RMZs varies with RMZ width and the species, age, and density of riparian vegetation. Retention of RMZs that are 29 to 115 feet (9 to 35 meters) wide will likely provide between 25 and 85 percent shade or canopy cover. This conclusion is based on data from Brazier and Brown (1973) and Steinblums et al. (1984) (Figure 4) and is further supported by the DNR data related to exempt 20-acre parcel RMZs that indicates the vast majority of RMZs are left unharvested. Wider RMZs likely fall into the upper end of this range while narrower RMZs typically fall into the lower end. Generally, narrow RMZs are typically associated with smaller channels where shade requirements can be more easily met, while wide RMZs are typically associated with larger channels where shade requirements are more difficult to meet.

As noted earlier, forest practices rules allow for harvest within RMZs only if existing shade levels exceed minimum requirements. Only trees that provide “surplus” shade can be removed. In cases where existing shade does not meet minimum requirements, no RMZ harvest can occur. Data presented earlier indicate a majority of exempt 20-acre parcel RMZs is left unharvested, primarily due to shade rule requirements (see page 4). Therefore, even though one set of forest practices rules allow for harvesting within RMZs

(WAC 222-30-023), in most cases shade requirements (WAC 222-30-040) eliminate harvest opportunities.

Estimated Shade From RMZs

The RTI study and DNR review of RMZ characteristics indicate a low level of impact from 20-acre exempt parcels. Only two percent of FPAs submitted between 2001 and 2005 were FPAs associated with 20-acre exempt parcels. Two DNR reviews showed that of the 20-acre exempt parcels with fish bearing streams, 86 percent and 90 percent respectively were treated as no-harvest areas in the RMZs. In addition, both the RTI study and DNR review speak to the level of 20-acre exempt parcels that are likely to be converted from forestry to another use in the near future. In order to identify qualifying parcels RTI used existing geographic information system (GIS) data and county parcel tax codes to identify forested parcels and ownership information. This approach likely underestimated the number of exempt 20-acre parcels because some forested parcels were not identified by RTI as being forested because they were not taxed as “forestland”. For example, small, forested parcels are often taxed as “rural-residential” or “vacant” land due to their proximity to urban areas. While the RTI analysis may not have captured all of the 20-acre exempt parcels, the study assumed that those that were not captured are likely to be converted to a use other than forestry in the near future. This assumption was based on the fact that parcels classed with the forest tax class codes are taxed at a substantially lower tax rate than parcels with a residential or vacant land tax code. The assumption is that a landowner would choose to classify his/her land under a tax code with a lower tax rate if s/he did not plan to convert his/her land to a use other than forestry in the near future. The DNR review showed that statewide, 27 percent of the FPAs associated with 20-acre exempt parcels were classed as Class IV-General, which are lands being converted or likely to convert in the near future. The actual percent of Class IV-General FPAs ranged from eight percent in the lower Puget Sound area to 60 percent in the northwest (Table 1). These parcels will probably be converted to a non-forestry land use during the proposed 50-year life of the FPHCP. Once converted, these parcels are no longer subject to the State’s forest practices rules and would no longer be covered under the FPHCP.

The state will continue to monitor FPAs submitted, and forest practices activity on, 20-acre exempt FPAs. Included in this ongoing monitoring will be the total number of 20-acre exempt FPAs submitted annually by DNR administrative regions and by FPA class, as well as information on post-harvest RMZ characteristics. If the Services have concerns about effects to covered species on 20-acre exempt forest practices, those concerns may be addressed through the Adaptive Management program.

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