
4b. Riparian Strategy

The protection measures included in the FPHCP are presented in two separate but related strategies. The Riparian Strategy—described in this section—includes protection measures that apply to surface waters, wetlands and adjacent areas. These measures are designed to restore and maintain riparian processes that create aquatic habitat, with particular emphasis on LWD recruitment and shade retention. The Upland Strategy, which is described in Section 4c, includes measures that apply to upslope areas generally located outside the aquatic and riparian environments. These measures are designed to restore and maintain upslope processes that affect aquatic habitat such as erosion and hydrology.

The Riparian Strategy includes aquatic and riparian-related forest practices rules and Board Manual guidance that protect the habitats of species covered under the FPHCP. Additional guidance developed and issued by the DNR Forest Practices Division for riparian-related forest practices rule and/or Board Manual implementation is also part of the Riparian Strategy.

From a biological perspective, the protection measures represent the level of habitat conservation for species covered under the FPHCP. From a regulatory perspective, they represent the performance standards with which forest practices must comply. Protection measures, together with the administrative framework described in Section 4a, make up the Forest Practices program that is the basis of the FPHCP (Figure 4.1).

Because many protection measures are fairly lengthy, the FPHCP provides a summary—rather than a complete detailing—of some Riparian Strategy components. Where additional protection measure requirements apply, the text directs the reader to the applicable WAC chapter and/or forest practices Board Manual section. To the extent protection measures in the Riparian Strategy differ from the applicable WAC and/or Board Manual section, the requirements in the WAC and/or Board Manual take precedence. Furthermore, WAC 222-50-040 states the forest practices rules contained in chapters 222-24 through 222-38 WAC—road construction & maintenance, timber harvesting, reforestation and application of forest chemicals—are automatically superseded if they are inconsistent with any applicable safety regulations, or with any orders or directives having the force of law and based on any applicable safety regulations (i.e., hazard tree removal).

Conservation Objective

The conservation objective of the Riparian Strategy is to restore riparian function to high levels on lands covered by the FPHCP and to maintain those levels once they are attained (WAC 222-30-010(2); Forests and Fish Report, (Appendix B); Schedule L-1 (Appendix N). Schedule L-1, in particular, serves as a guide for both the riparian and upland strategies and is the foundation for the Adaptive Management program. It identifies functional objectives for key aquatic conditions and processes potentially impacted by forest practices. In addition, Schedule L-1 establishes performance targets for specific forest conditions and watershed processes. The Riparian Strategy supports the overall performance goals established in the Forests and Fish Report, in Schedule L-1 and later adopted in rule (WAC 222-12-045(2)(a)), which states

that forest practices – either singularly or cumulatively – are intended to be conducted in a manner that will not significantly impair the capacity of aquatic habitat to:

1. support harvestable levels of salmonids,
2. support the long-term viability of other covered species, and
3. meet or exceed water quality standards (including protection of designated uses, narrative and numeric criteria and antidegradation).

Riparian functions include large woody debris recruitment, sediment filtration, stream bank stability, shade, litterfall and nutrients, in addition to other processes important to riparian and aquatic systems. The approach to restoring riparian function differs for different parts of the state:

- In western Washington, protection measures are designed to place riparian forests on growth trajectories toward a “desired future condition” (DFC). DFC is defined as the condition of a riparian forest stand at 140 years of age. This age is assumed to be representative of a mature forest stand that provides the full range of ecological functions important for the survival and recovery of covered species.
- In eastern Washington, protection measures are intended to provide for stand conditions that vary over time. Varying stand conditions are designed to mimic natural disturbance regimes within a range that meets resource objectives and maintains general forest health.

Classification of Surface Waters and Wetlands

The Riparian Strategy includes two separate systems for classifying aquatic habitats. The first is a “water typing” system that classifies surface waters, including rivers, streams, lakes, ponds, impoundments and tidal waters. The second is a “wetland typing” system that applies to both forested and non-forested wetlands, including bogs. The water or wetland type governs the level of protection for FPHCP-covered species and their habitats. These typing systems are the foundation for many riparian-related protection measures, some of which include riparian and wetland management zones, channel migration zones, equipment limitation zones, and operational restrictions to minimize soil, channel and stream bank disturbance.

These and other riparian protection measures are described below. A discussion of the rationale behind the Riparian Strategy is included in Section 4d.

4b-1 Water typing systems

As of the writing of this document, the permanent water typing system described in the FFR and forest practices rules is still under development. Until that system is completed and adopted by the Board, forest practices are regulated under a modified interim water typing system. At the February 2005 Forest Practices Board meeting, the Board agreed to continue to follow the provisions of the original interim rule (WAC 222-16-031) while using new water type maps (based on the permanent water typing system - Type S, Type F, Type Np and Type Ns streams. See Section 4b-1.2). The new maps for western

Washington were put into operation on March 1, 2005. DNR is in the process of developing new water type maps for eastern Washington, and plans to implement the new maps in March 2006. Until then, water type maps for eastern Washington continue to use the traditional water typing system (Type 1, Type 2, Type 3, Type 4 and Type 5 streams). Descriptions of both systems are included in this plan, but riparian protection measures are described in relation to the permanent water typing system.

The interim water typing system relies on a physical channel measurement commonly known as “bankfull width” to help define some water types. In addition, some protection measures use bankfull width to guide forest practices rule implementation.

Forest practices rules define “bankfull width” as the lateral extent of the water surface elevation perpendicular to the channel at bankfull depth. “Bankfull depth” is the average vertical distance between the channel bed and the water surface elevation required to completely fill the channel to a point where water would spill onto the floodplain or intersect a terrace or hillslope. When applied to lakes, ponds or impoundments, bankfull width is the line of mean high water. When applied to tidal waters, bankfull width is the line of mean high tide. More information on bankfull width and bankfull depth can be found in WAC 222-16-010.

4b-1.1 Interim Water Typing System

The interim water typing system is a numeric, five-class system. Surface waters are assigned a numeric “type” that gives an indication of the waters’ beneficial use and importance to fish, wildlife and humans (WAC 222-16-031). Waters are referred to as “Type 1,” “Type 2,” “Type 3,” “Type 4,” or “Type 5.” Generally, the lower the numeric value, the greater the beneficial use. Therefore, Type 1 and Type 2 waters have more fish, wildlife and human use than do Type 4 and Type 5 waters.

- **Type 1 waters** are all waters within their ordinary high water marks that have been inventoried as “shorelines of the state” under chapter 90.58 RCW (Shoreline Management Act) and the rules promulgated pursuant to that chapter. However, Type 1 waters do not include those waters’ associated wetlands as defined in chapter 90.58 RCW. Generally, “shorelines of the state” include larger lakes and rivers, as well as tidally influenced areas along Washington’s western coast and within the Strait of Juan de Fuca and Puget Sound. More detail on “shorelines of the state” and “shorelines of statewide significance” can be found in RCW 90.58.030(2).
- **Type 2 waters** are segments of natural waters and periodically inundated areas of their associated wetlands that are not classified as Type 1 waters and that have high fish, wildlife or human use. Under the interim water typing system, “natural waters” excludes water conveyance systems that are artificially constructed and actively maintained for irrigation. Type 2 waters include those diverted for substantial domestic use, used by fish hatcheries, located within campgrounds or used by fish for spawning, rearing, migration or as off-channel habitat. Off-channel habitat includes areas connected to a fish-bearing stream through a

drainage way that has a gradient of less than five percent and that is accessible during some period of the year.

Waters presumed to have highly significant fish populations—and therefore Type 2 status—include:

1. Streams with bankfull widths of at least 20 feet and gradients of less than four percent.
2. Lakes, ponds or impoundments that have surface areas of at least one acre at seasonal low water.

More detail on Type 2 waters can be found in WAC 222-16-031(2).

- **Type 3 waters** are segments of natural waters and periodically inundated areas of their associated wetlands that are not classified as Type 1 or Type 2 waters and have moderate to slight fish, wildlife or human use. Type 3 waters include those diverted for minor domestic use and those used by fish for spawning, rearing or migration. In cases where fish use has not been evaluated, waters with the following characteristics are presumed to have fish:

1. Defined stream channels with a bankfull width of at least two feet in western Washington or three feet in eastern Washington and a gradient of 16 percent or less
2. Defined stream channels with a bankfull width of at least two feet in western Washington or three feet in eastern Washington, a gradient greater than 16 percent and less than or equal to 20 percent and a contributing basin size of more than 50 acres in western Washington and more than 175 acres in eastern Washington
3. Ponds or impoundments having a surface area of less than one acre at seasonal low water and having an outlet to a fish-bearing stream
4. Ponds or impoundments having a surface area greater than 0.5 acre at seasonal low water

More detail on Type 3 waters can be found in WAC 222-16-031(3).

- **Type 4 waters** are segments of natural waters within the bankfull width of defined channels that are not fish habitat and are perennial. Perennial means waters that do not go dry at any time during a year of normal rainfall. However, Type 4 waters include the intermittently dry portions of a channel below the uppermost point of perennial flow. In cases where the uppermost point of perennial flow cannot be identified using simple, non-technical observations, Type 4 designation begins at a point along the channel where the contributing basin size is:

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1. At least 13 acres in the western Washington coastal zone (i.e., the Sitka spruce zone as defined by Franklin and Dryness 1973)
 2. At least 52 acres in other locations in western Washington
 3. At least 300 acres in eastern Washington
- **Type 5 waters** are segments of natural waters within the bankfull width of defined channels that are not Type 1, Type 2, Type 3, or Type 4 waters. These are seasonal, non-fish habitat waters where surface flow is not present for at least some portion of a year of normal rainfall and are not located downstream from any stream reach that is classified as a Type 4 water. Type 5 waters must be physically connected to Type 1, Type 2, Type 3, or Type 4 waters by an above-ground channel.

In cases where a dispute arises over a water type, DNR is required to make informal conferences available to the WDFW and Ecology, affected tribes and those contesting the adopted water type. Informal conference procedures are described in Section 4a-3.1.3 (Compliance and Enforcement).

4b-1.2 Permanent Water Typing System

The permanent water typing system described in the FFR and forest practices rules is similar to the interim water typing system in that water types are largely based on beneficial use. However, unlike the interim system that has five classes, the permanent water typing system has four classes: Type S, Type F, Type Np, and Type Ns (WAC 222-16-030):

- Type S includes “shorelines of the state”
- Type F includes “fish habitat” waters
- Type Np includes “non-fish, perennial” waters
- Type Ns includes “non-fish, seasonal” waters

These four classes are related to the five classes of the interim system in that Type S waters closely coincide with Type 1 waters, the Type F class includes both Type 2 and Type 3 waters and Type Np and Type Ns waters are the same as Type 4 and Type 5 waters, respectively. The forest practices rules direct DNR to work cooperatively with WDFW and Ecology and to consult with affected tribes when classifying streams, lakes and ponds throughout the state.

- **Type S waters** are all waters—within their bankfull width—inventoried as “shorelines of the state” under chapter 90.58 RCW and the rules promulgated pursuant to chapter 90.58 RCW. Type S waters also include periodically inundated areas of associated wetlands. Generally, “shorelines of the state” include larger lakes and rivers as well as tidally influenced areas along Washington’s western coast and within the Strait of Juan de Fuca and Puget Sound. More detail on “shorelines of the state” can be found in RCW 90.58.030(2).

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- **Type F waters** are segments of natural waters other than Type S waters, within the bankfull widths of defined channels and periodically inundated areas of associated wetlands or within lakes, ponds or impoundments having a surface area of 0.5 acre or greater at seasonal low water and which in any case contain fish habitat or are diverted for domestic use, use by fish hatcheries, are located within campgrounds or serve as off-channel fish habitat. More detail on Type F waters can be found in WAC 222-16-030(2).

 - **Type Np waters** are segments of natural waters within the bankfull width of defined channels that are not fish habitat, but are perennial. Perennial means waters that do not go dry at any time during a year of normal rainfall. However, Type Np waters include the intermittently dry portions of the channel below the uppermost point of perennial flow. In cases where the uppermost point of perennial flow cannot be reliably identified using simple, non-technical observations, Type Np designation begins at a point along the channel where the contributing basin size is:
 1. At least 13 acres in the western Washington coastal zone (i.e., the Sitka spruce zone as defined by Franklin and Dryness 1973)
 2. At least 52 acres in other locations in western Washington
 3. At least 300 acres in eastern Washington

 - **Type Ns waters** are segments of natural waters within the bankfull width of defined channels that are not Type S, Type F or Type Np waters. These are seasonal, non-fish habitat waters where surface flow is not present for at least some portion of a year of normal rainfall and are not located downstream from any stream reach that is classified as Type Np water. Type Ns waters must be physically connected to Type S, Type F or Type Np waters by an aboveground channel.

The forest practices rules direct DNR to prepare water type maps showing the location of Type S, Type F, Type Np and Type Ns waters within non-Federal and non-tribal forested areas of the state. The maps must be produced using a GIS-based, multi-parameter, field-verified logistic regression model. The model must be designed to distinguish waters that contain fish habitat (Type F) from those that do not (Type Np and Type Ns) using physical parameters such as basin size, gradient, elevation and other factors.

The original intent from FFR was that once produced, the water type maps would be updated every five years where necessary to better reflect observed field conditions or to further refine the accuracy and reliability of the model. Except for these periodic revisions, on-ground observations of fish or habitat characteristics will generally not be used to adjust mapped water types. However, if an on-site interdisciplinary team using non-lethal methods identifies fish, or finds that habitat is not accessible due to naturally occurring conditions and no fish reside above the blockage, the water type will be changed to reflect the findings of the interdisciplinary team. Field procedures that will be used when investigating water types are currently under development and will be included in the Board Manual as Section 23. In cases where a dispute arises over a mapped water type, DNR is obligated to make informal conferences available to the WDFW and Ecology, affected tribes and those contesting the adopted water type.

Informal conference procedures are described in Section 4a-3.1.3 (Compliance and Enforcement). In light of some ongoing stakeholder concerns about the model produced maps meeting the desired resource protection objective, FF Policy will be considering available options to meet this objective with implementation of the permanent water typing system.

4b-2 Channel migration zones

Interactions between sediment, water and woody debris sometimes cause river or stream channels to move or migrate within their valleys. Such channel migration often leaves behind complex habitats that have high ecological value for fish and other aquatic and riparian species. The Riparian Strategy recognizes the importance of these habitats to the long-term conservation of species covered by the FPHCP, and it protects areas of likely channel movement through designated channel migration zones.

A channel migration zone is an area where the active channel of a stream or river is prone to move and the movement results in a potential near-term loss of riparian function and associated habitat adjacent to the stream (WAC 222-16-010). “Near-term” in this context means the time required to grow a mature forest. CMZs apply to all fish-bearing waters (including Type 1, Type 2, and Type 3 waters under the interim water typing system and Type S and Type F waters under the permanent water typing system) and most often are associated with low-gradient, unconfined channels that have well-developed floodplains. Section 2 of the Board Manual provides guidance for identifying and delineating CMZs.

No timber harvest, road construction or salvage is permitted within CMZs except for the construction and maintenance of road crossings and the creation and use of yarding corridors in accordance with applicable rules (WAC 222-30-020(12)).

4b-3 Riparian protection measures for typed waters

Riparian areas directly influence the quality and quantity of habitat available to aquatic and riparian-dependent species (Gregory et al. 1987). The physical and biological attributes of riparian landforms, soils and vegetation shape—and are shaped by—the geomorphic processes at work within a watershed (Sullivan et al. 1987; Featherston et al. 1995). Forest practices activities such as timber harvesting and road construction may alter these processes, potentially affecting the character of riparian and in-stream habitat (Gregory and Bisson 1997).

The Riparian Strategy recognizes that certain ecological functions, such as providing LWD and shade, are important for creating, restoring and maintaining aquatic and riparian habitats. The strategy protects these and other functions along typed waters by restricting forest practices activities from the most sensitive parts of riparian areas and by limiting activities in other areas.

Riparian management zones (RMZs) and equipment limitation zones (ELZs) are the primary riparian protection measures for typed waters. RMZs are areas adjacent to Type S, Type F and Type Np waters where trees are retained so that ecological functions such as LWD recruitment, shade, litterfall and nutrient cycling are maintained. ELZs apply to Type Np and Type Ns waters and are areas where equipment use is limited so that forest practices-related erosion and sedimentation are minimized. Other riparian protection measures that apply to typed waters include restrictions on the salvage of down woody debris and the disturbance of stream banks.

4b-3.1 Riparian Protection for Typed Waters in Western Washington

Strong climatic gradients across Washington produce riparian forests west and east of the Cascade crest that differ in their structure and composition. These differences produce subtle but important variations in how riparian areas influence adjacent aquatic environments. Riparian protection measures have been developed with these variations in mind. As a result, some riparian requirements differ between western and eastern Washington.

Protection measures for typed waters in western Washington include establishing riparian management zones along Type S, Type F and Type Np waters; retaining no-harvest buffers adjacent to Type Np-associated sensitive sites; and establishing equipment limitation zones along Type Np and Type Ns waters (WAC 222-30-021).

4b-3.1.1 TYPE S AND TYPE F WATERS IN WESTERN WASHINGTON

Riparian management zones associated with Type S and Type F waters in western Washington are made up of three sub-zones: the “core zone,” the “inner zone” and the “outer zone.” The core zone is closest to the water, the inner zone is the middle zone and the outer zone is farthest from the water (Figure 4.5).

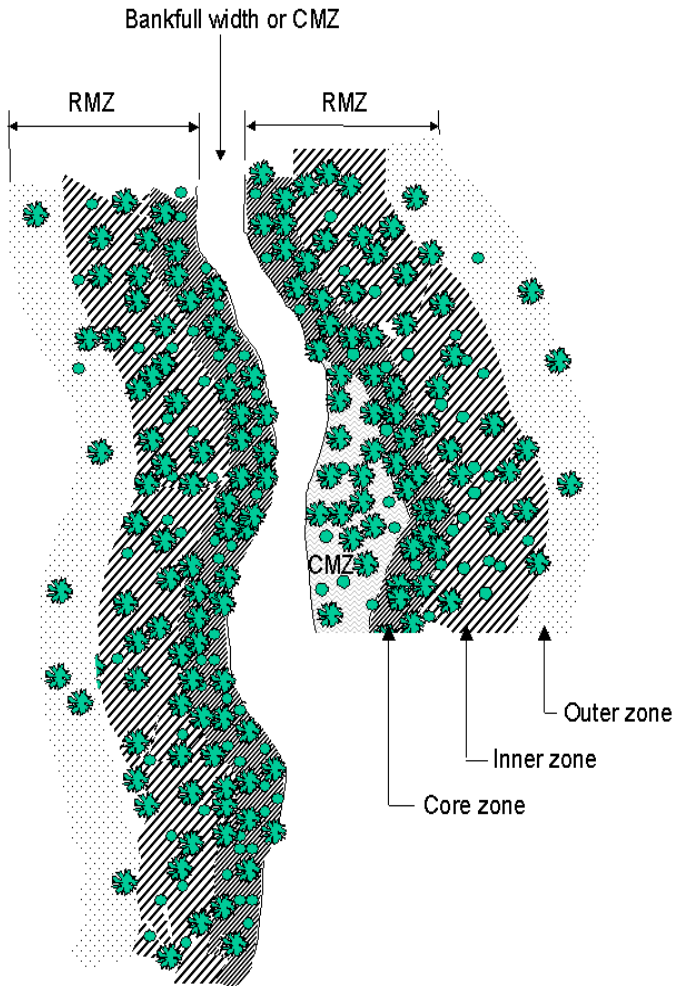
Core Zone in Western Washington

The core zone begins at the bankfull or channel migration zone edge and is 50 feet wide. No timber harvest or road construction is allowed in the core zone except for the construction and maintenance of road crossings and the creation and use of yarding corridors in accordance with applicable rules. Any trees cut for or damaged by yarding corridors in the core zone must be left on-site. Any trees cut as a result of road construction to cross a stream may be removed from the site unless they are to be used as part of an LWD replacement strategy or are needed to meet stand requirements (see Inner Zone discussion below).

Inner Zone in Western Washington

The inner zone begins at the outside edge of the core zone, and its width depends on site class, bankfull width and the management option selected by the landowner. Management options in the inner zone include: 1) no harvest, 2) hardwood conversion, 3) thinning from below and 4) leaving trees closest to the water. Timber harvest is allowed within the inner zone if *stand requirements* are met. Stand requirements apply to the combined core and inner zones, and are minimum values for the following parameters: 1) the number of trees per acre, 2) the basal area per acre, and 3) the proportion of conifer.

Figure 4.5 Schematic of the core, inner and outer zones within riparian management zones.



Riparian Management Zone (RMZ)

The riparian management zone (RMZ) is measured from the outer edge of the bankfull width or channel migration zone (CMZ).

The RMZ for Type S and Type F waters is composed of a core, inner and outer zone, with less management permitted closer to the water body and more management permitted further away.

Note: These diagrams are not to scale and are conceptual only. They do not depict actual zone widths or size, or spacing and placement of trees within the zones.

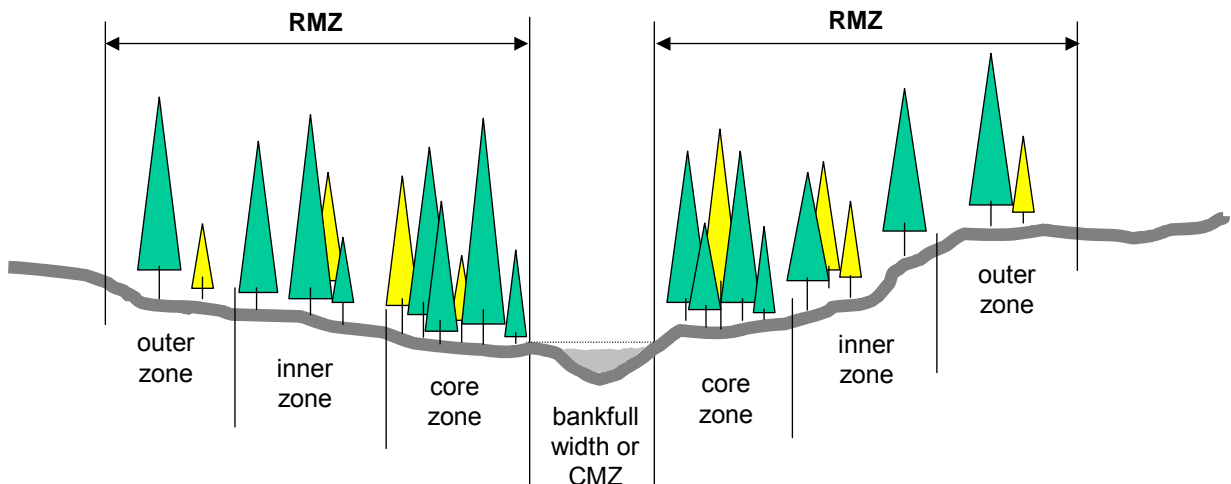


Table 4.5 Western Washington riparian management zone widths for western Washington Type S and Type F waters where no harvesting occurs in the inner zone

Site Class	RMZ width	Core zone width (measured from bankfull or CMZ edge)	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'

If stand requirements are met, the combined core and inner zones are capable of attaining a target condition known as “desired future condition.” DFC is the condition of a mature riparian forest stand at 140 years of age and is based on basal area. DFC basal area targets have been developed for five site classes in western Washington.

Growth modeling is used to determine if a particular stand meets the DFC basal area target. Stand attribute data are collected and input to a model that “grows” the stand to 140 years of age. If, at age 140, the estimated basal area exceeds the DFC target, harvesting may occur within the inner zone in accordance with applicable rules. In these cases, only the “surplus” basal area (i.e., basal area beyond that needed to meet the DFC basal area target) may be harvested. If the DFC basal area target is not met, no harvest is allowed within the inner zone except in cases where the landowner chooses the hardwood conversion management option. Each inner zone management option is described below.

No Inner Zone Harvest

When the combined core and inner zones for a particular riparian stand do not meet the DFC stand requirements, no harvest is allowed in the inner zone. When no harvest is permitted in the inner zone, or the landowner elects to forego harvesting in the zone, the width of the core, inner and outer zones follow the requirements in Table 4.5.

Hardwood Conversion in the Inner Zone

If the combined core and inner zones for a particular riparian stand do not meet stand requirements, but the landowner wants to convert a hardwood-dominated inner zone to one that is dominated by conifers, inner zone harvest may be permissible. To be eligible for the hardwood conversion option, the site must meet certain minimum requirements. The requirements include, but are not limited to: 1) evidence that the site can be

successfully converted to conifer, 2) a maximum number and size of existing conifers, and 3) contiguous ownership upstream and downstream of the site. All requirements are described in WAC 222-30-021(1)(b)(i)(A).

If a site meets the minimum requirements, the spatial extent of conversion and the number and type of trees that can be harvested are limited. Harvested inner zones must be reforested with conifer species suitable to the site and must be maintained in order to ensure acceptable stocking levels are achieved. The forest practices rules also require DNR to track hardwood conversion activities and identify watershed administrative units (WAU) with high percentages of hardwood-dominated riparian areas that may be susceptible to high rates of conversion. More information on hardwood conversion within the inner zone of Type S and Type F RMZs is contained in WAC 222-30-021(1)(b)(i).

Inner Zone Harvest

Harvesting in the inner zone is allowed when basal area beyond that needed to meet the DFC target is present (i.e., “surplus” basal area). Harvesting in the inner zone must be carried out in accordance with one of two options: 1) thinning from below, or 2) leaving trees closest to the water (WAC 222-30-021(1)(b)(ii)).

Thinning From Below – Under this option, harvesting focuses on those trees that occupy subordinate canopy positions. The removal of surplus basal area begins with suppressed and intermediate trees and progresses towards co-dominant trees until the surplus is exhausted. Typically, this results in the retention of most co-dominant and all dominant trees in the stand. Larger trees generally provide greater ecological benefits, particularly in terms of LWD recruitment and shade.

Under the “thinning from below” option, the width of the core, inner and outer zones must follow the requirements in Table 4.6. In addition, inner zone harvest must comply with all of the following:

- Harvesting cannot decrease the proportion of conifers in the stand
- Any harvest within 75 feet of the bankfull edge or CMZ edge must meet minimum shade requirements described in WAC 222-30-040
- Following harvest, there must be at least 57 conifer trees per acre in the inner zone

Leaving Trees Closest To The Water – Generally, trees closer to the water influence the aquatic environment to a greater degree than trees farther away. Therefore, concentrating required leave trees in that portion of the inner zone closest to the water may, in some cases, provide equal or greater ecological benefit than other management options. The “leaving trees closest to the water” management option is based on this concept.

When “leaving trees closest to the water,” the width of the core, inner and outer zones must follow the requirements in Table 4.7. This option only applies to Site Class I, Site Class II, and Site Class III RMZs on streams less than or equal to ten feet bankfull width and to Site Class I and Site Class II RMZs on streams greater than ten feet bankfull width. In addition, inner zone harvest must comply with all of the following:

Table 4.6 Western Washington riparian management zone widths for Type S and Type F waters when employing the “thinning from below” harvest option

Site class	RMZ width	Core zone width (measured from bankfull or CMZ edge)	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'

Table 4.7 Western Washington riparian management zone widths for Type S and Type F waters when employing the “leaving trees closest to the water” harvest option.

Site class	RMZ width	Core zone width (measured from bankfull or CMZ edge)	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 constraint.

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- 1) Harvest is not permitted within 30 feet of the outer edge of the core zone for streams that are no more than ten feet bankfull width and within 50 feet of the outer edge of the core zone for streams greater than ten feet bankfull width.
 - 2) A minimum of 20 conifer trees per acre—each with a minimum 12-inch diameter at breast height (dbh)—must be retained in all portions of the inner zone where harvest occurs. These trees cannot be counted towards applicable stand requirements.
 - 3) Selection of trees for harvest must begin in the outermost portion of the inner zone and progress toward the core zone.

If compliance with 1) through 3) above requires a landowner to retain basal area beyond the DFC target, the excess or “surplus” basal area may be used as a credit toward harvest in the outer zone. Surplus inner zone basal area may be applied, on a basal area-for-basal area basis, toward trees in the outer zone that the landowner would otherwise be required to retain (see discussion of outer zone requirements later in this section). In any case, the number of leave trees in the outer zone cannot be reduced below ten trees per acre.

Stream-Adjacent Parallel Roads

When the basal area component of the stand requirements cannot be met due to the presence of a stream-adjacent parallel road in the core and/or inner zones, two parameters must be estimated: 1) the basal area that would have been present if the road was not occupying the space, and 2) the corresponding shortfall in the basal area component of the stand requirements.

The total basal area equivalent to the shortfall must be retained elsewhere in the inner and/or outer zones as mitigation. If the inner and/or outer zones contain insufficient trees to address the shortfall, trees within the RMZ of other Type S or Type F waters in the same harvest unit or along Type Np or Type Ns waters in the same harvest unit must be retained as mitigation. In cases where other in-unit RMZs are unavailable, the landowner may implement an LWD placement strategy to address the shortfall in basal area (See Board Manual Section 26 for guidelines). More information on stream-adjacent parallel roads is contained in WAC 222-30-021(1)(b)(iii).

Yarding Corridors in Core and Inner Zones

When yarding corridors are necessary to facilitate harvesting within RMZs, all calculations of the basal area component of the stand requirements are to be made as if the corridors were established prior to any other harvest activity. Inner zone trees cut or damaged by yarding may be removed if they represent surplus basal area. Trees cut or damaged by yarding in a unit that does not meet the DFC basal area target may not be removed from the site. More information on yarding corridors in RMZs is contained in WAC 222-30-021(1)(b)(iv).

Outer Zone in Western Washington

The outer zone begins at the outside edge of the inner zone and—like the inner zone—its width is dependent on site class, bankfull width and management option selected by the landowner (see Tables 4.2 through 4.4). Timber harvest is allowed in the outer zone; however, 20 riparian leave trees per acre must be retained following harvest (WAC 222-30-021(1)(c)).

Outer zone riparian leave trees must be retained according to one of two strategies, selected and identified by the landowner at the time he/she submits a forest practices application. The strategies are known as the “dispersal” strategy and the “clumping” strategy. Under the dispersal strategy, leave trees must be distributed approximately evenly throughout the outer zone. Leave trees must be conifer with a minimum dbh of 12 inches, if available. If conifers at least 12 inches dbh are not available, then the next largest conifers must be retained. If conifers are not present, leave trees must be retained according to the clumping strategy.

Under the clumping strategy, leave trees must be grouped around sensitive features to the extent the features are present in the outer zone. Sensitive features include seeps and springs; forested wetlands; locations where leave trees will be recruited to the water; areas where the leave trees may provide windthrow protection; small, unstable or potentially unstable slopes; registered archaeological or historical sites and sites with evidence of Native American cairns, graves or glyptic records. When clumping trees around sensitive features, leave trees must be at least eight inches dbh and representative of the overstory canopy in or around the sensitive feature. Clumped leave trees may include both hardwood and conifer species. If sensitive features are not present, then clumps must be distributed throughout the outer zone and the leave trees must be conifers with a minimum dbh of 12 inches.

The outer zone riparian leave tree requirement of 20 trees per acre may be reduced in cases where surplus basal area exists as a result of “leaving trees closest to the water” or surplus basal area retention is required due to the presence of a stream-adjacent parallel road, where trees are retained in CMZs, or where a landowner implements an LWD placement strategy. An LWD placement strategy involves the voluntary placement of woody debris in stream channels by forest landowners. The intent of the strategy is to enhance fish habitat in streams on managed forestlands by creating incentives for landowners to place wood. Guidance for placing woody debris in streams is found in Section 26 of the Board Manual. Wood placement projects require an HPA permit from WDFW and are subject to additional requirements under the state’s Hydraulic Code (WAC 220-110-030(17)).

More information on outer zone riparian leave tree requirements is contained in WAC 222-30-021(1)(b)(ii)(B)(II), WAC 222-30-021(1)(b)(iii)(B), and WAC 222-30-021(1)(c)(iii) and (iv).

4b-3.1.2 TYPE NP AND TYPE NS WATERS IN WESTERN WASHINGTON

Protection measures for non-fish bearing waters in western Washington include the establishment of equipment limitation zones adjacent to Type Np and Type Ns waters and the establishment of RMZs adjacent to Type Np waters and associated sensitive sites (WAC 222-30-021(2)).

Equipment Limitation Zones in Western Washington

An equipment limitation zone is an area where equipment use is limited in order to minimize ground and soil disturbance and thus protect stream bank integrity and prevent sediment delivery to non-fish-bearing waters. ELZs apply to all Type Np and Type Ns waters, are 30 feet wide and are measured from the bankfull width.

Mitigation is required if equipment use exposes soil on more than ten percent of the surface area of the ELZ. These activities include operating ground-based equipment, constructing and using skid trails and stream crossings, and yarding partially suspended, cabled logs.

Mitigation must be designed to replace the equivalent lost function, particularly as it relates to the prevention of sediment delivery. Mitigation measures include—but are not limited to—water bars, grass seeding and mulching. These requirements do not reduce or eliminate DNR’s authority to prevent actual or potential material damage to public resources under WAC 222-46-030 (notice to comply) or WAC 222-46-040 (stop work order) or any related authority to condition forest practices notifications or applications. More information on ELZs is contained in WAC 222-30-021(2)(a).

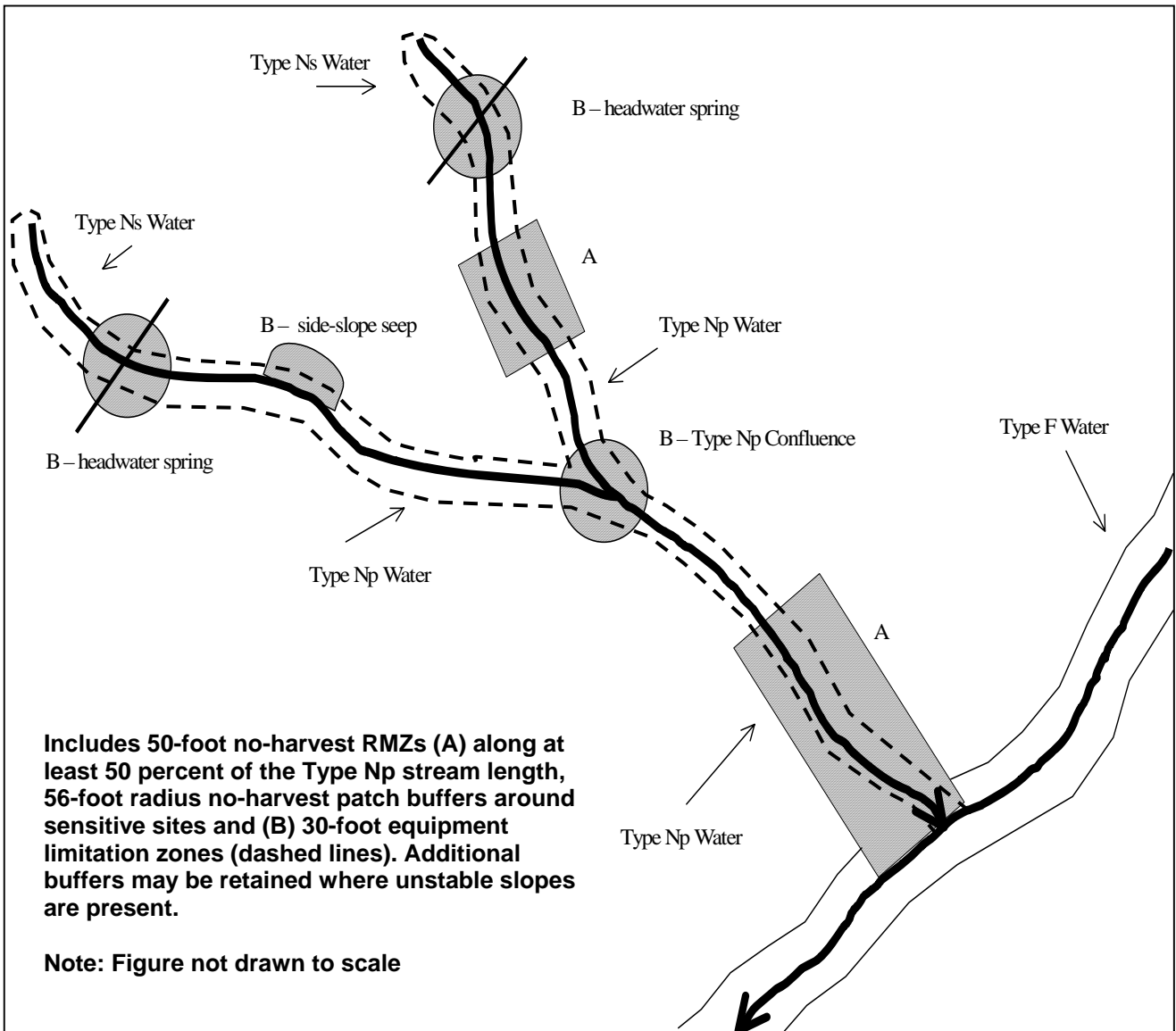
Riparian Management Zones for Type Np Waters and Associated Sensitive Sites in Western Washington

Protection of Type Np waters includes the establishment of RMZs along portions of Type Np waters and around all sensitive sites. The RMZs are either 50 or 56 feet in width (depending on the feature being protected) and no harvesting is allowed within the buffer. Requirements ensure that two-sided RMZs are established along at least 50 percent of the Type Np water length. The approach targets the most ecologically sensitive parts of Type Np waters, resulting in a discontinuous network of buffers that protects areas most important to aquatic resources (Figure 4.6).

High priority areas for RMZ protection include the lower reaches of Type Np waters immediately above the confluence with Type S or Type F waters and designated sensitive sites including seeps, springs, Type Np confluences, Type Np initiation points and alluvial fans (see WAC 222-16-010 for detailed definitions of sensitive sites). If RMZ establishment adjacent to these areas does not protect 50 percent of the Type Np water length, additional buffers must be left along other priority areas, including low gradient stream reaches, tailed frog habitat, groundwater influence zones and areas downstream from other buffered reaches.

The width of RMZs adjacent to sensitive sites varies according to the type of sensitive site. Headwall and side-slope seep RMZs are measured from the perennially saturated soil edge and are 50 feet wide. RMZs associated with Type Np confluences, headwater springs and Type Np initiation points are measured from the center of the feature or point of confluence, are circular in shape and are 56 feet wide (i.e., have a radius of 56 feet). No-harvest RMZs along areas not designated as sensitive sites are measured from the bankfull edge and are 50 feet wide. The full extent of alluvial fans—irrespective of shape or size—receives no-harvest protection. More information on RMZs for Type Np waters is contained in WAC 222-30-021(2)(b).

Figure 4.6. Type Np protection measures for western Washington.



4b-3.1.3 EXEMPT 20-ACRE PARCELS - WESTERN WASHINGTON

In 1999, Washington’s legislature exempted certain forestland parcels from some riparian protection measure requirements recommended in the FFR and later adopted by the Board as rules. Exempt parcels include those that are 20 contiguous acres or less and are owned by individuals whose total ownership is less than 80 forested acres statewide. These parcels are commonly referred to as “exempt 20-acre parcels.”

While not subject to some Forests and Fish riparian requirements, exempt 20-acre parcels must still provide protection for public resources in accordance with the Act. Like Forests and Fish-related measures, public resource protection on exempt parcels occurs through the establishment of RMZs for Type S and Type F waters (WAC 222-30-023(1)). The RMZ is measured horizontally from the bankfull channel edge, and extends to the point where vegetation changes from wetland to upland plant community, or the point necessary to retain shade sufficient to meet the requirements of WAC 222-30-040, whichever is farther from the edge. In any case, the RMZ width cannot be less than 29 feet or more than the maximum widths listed in Table 4.8 for exempt 20-acre parcels in western Washington. When the RMZ overlaps a Type A or Type B wetland or wetland management zone (See Section 4b-4), the measure that best protects public resources must be applied.

Leave tree requirements for Type S and Type F waters on exempt 20-acre parcels in western Washington are listed in Table 4.8. The required ratio of conifer to deciduous leave trees—and the number and minimum diameters of leave trees—varies with water type and bankfull width. The number of leave trees also differs between gravel/cobble-bedded channels and boulder/bedrock channels.

Along Type Np waters, DNR can require tree retention on exempt 20-acre parcels where necessary to protect public resources. Forest practices rules authorize DNR to require the retention of 29 trees, at least six inches dbh, on each side of every 1,000 feet of stream length within 29 feet of the stream. More information on riparian protection on exempt 20-acre parcels in western Washington is contained in WAC 222-30-023(1).

4b-3.2 Riparian Protection for Typed Waters in Eastern Washington

Riparian management in eastern Washington is intended to produce stand conditions that vary over time. Management practices are designed to mimic natural disturbance regimes within a range that achieves functional conditions and maintains general forest health. Protection measures for eastern Washington waters include the establishment of riparian management zones along Type S, Type F and Type Np waters, the protection of Type Np-associated sensitive sites and the establishment of equipment limitation zones adjacent to Type Np and Type Ns waters (WAC 222-30-022).

4b-3.2.1 TYPE S AND TYPE F WATERS IN EASTERN WASHINGTON

Riparian management zones associated with Type S and Type F waters in eastern Washington are made up of three sub-zones; the “core” zone, the “inner” zone, and the “outer” zone. The core zone is closest to the water, the inner zone is the middle zone and the outer zone is farthest from the water (Figure 4.5).

Table 4.8 Riparian management zone widths and leave tree requirements for exempt 20-acre parcels in western Washington.

Water Type and Bankfull Width	RMZ Maximum Width	Ratio of Conifer to Deciduous/ Minimum Size Leave Trees	# Trees per 1,000 feet of Stream Length (each side)	
			Gravel/Cobble <10" Diameter	Boulder/Bedrock
S or F Water 75' & over	115'	representative of stand	58 trees	29 trees
S or F Water under 75'	86'	representative of stand	115 trees	60 trees
F Water 5' & over	58'	2 to 1; 12" or next largest available.*	86 trees	29 trees
F Water less than 5'	29'	1 to 1; 6" or next largest available.*	29 trees	29 trees

*"Or next largest available" requires that the next largest trees to those specified in the rule be left standing when those available are smaller than the sizes specified.

Core Zone in Eastern Washington

The core zone begins at the bankfull edge or channel migration zone edge and is 30 feet wide. No timber harvest or road construction is allowed in the core zone except for the construction and maintenance of road crossings and the creation and use of yarding corridors in accordance with applicable rules. Any trees cut for or damaged by yarding corridors in the core zone must be left on-site. Any trees cut as a result of road construction to cross a stream may be removed from the site unless they are to be used as part of an on-site large woody debris placement project (See Board Manual Section 26). LWD placement projects are required in cases where a landowner wants to reduce the number of outer zone leave trees below the standard requirement (see description of outer zone below).

Inner Zone in Eastern Washington

The inner zone begins at the outside edge of the core zone and its width depends on bankfull width (Tables 4.6 and 4.7). The inner zone width is 45 feet for waters with bankfull widths of 15 feet or less. For waters with bankfull widths that exceed 15 feet, the inner zone width is 70 feet.

Table 4.9 Eastern Washington riparian management zone widths for Type S and Type F waters less than or equal to 15 feet bankfull width

Site Class	Total RMZ Width	Core Zone Width from Bankfull or CMZ edge	Inner Zone Width	Outer Zone Width
I	130'	30'	45'	55'
II	110'	30'	45'	35'
III	90'	30'	45'	15'
IV	75'	30'	45'	0'
V	75'	30'	45'	0'

Table 4.10 Eastern Washington riparian management zone widths for Type S and Type F waters greater than 15 feet bankfull width

Site Class	Total RMZ Width	Core Zone Width from Bankfull or CMZ Edge	Inner Zone Width	Outer Zone Width
I	130'	30'	70'	30'
II	110'	30'	70'	10'
III	100'	30'	70'	0'
IV	100'	30'	70'	0'
V	100'	30'	70'	0'

Harvest within the inner zone must retain a minimum number of leave trees, and leave tree requirements vary by timber habitat type. Three timber habitat types are recognized: 1) ponderosa pine, 2) mixed conifer and 3) high elevation. The ponderosa pine timber habitat type is 2,500 feet or lower in elevation, the mixed conifer timber habitat type is 2,501 to 5,000 feet in elevation and the high elevation timber habitat type is above 5,000 feet (WAC 222-16-010). Inner zone leave tree requirements for each timber habitat type are described below.

Ponderosa Pine Timber Habitat Type in Eastern Washington

Forest practices rules divide stands in the ponderosa pine timber habitat type into two classes: 1) stands with high basal areas, and 2) stands with low basal areas and high densities. Inner zone leave tree requirements differ between these two stand classes. The requirements for each are described below.

- **Stands With High Basal Area** – Harvest is allowed in the inner zone of RMZs in the ponderosa pine timber habitat type if the combined conifer and hardwood basal area in the inner zone is greater than 110 square feet per acre for trees at least six inches dbh. At least 50 trees per acre and at least 60 square feet of basal area per acre must be retained following harvest. The trees to be retained must be selected according to priorities listed in WAC 222-30-022(1)(b)(i)(C).
- **Stands With Low Basal Area and High Density** – Harvest is allowed in the inner zone of RMZs in the ponderosa pine timber habitat type if the combined conifer and hardwood basal area is less than 60 square feet per acre and there are more than 100 trees per acre. At least 100 trees per acre must remain following harvest. The trees to be retained must be selected according to priorities listed in WAC 222-30-022(1)(b)(i)(D).

To the extent down wood is available on-site prior to harvest, at least 12 tons of down wood per acre must be left following harvest. Where available, at least six pieces greater than 16 inches diameter and 20 feet in length and four pieces greater than six inches diameter and 20 feet in length must be left. These requirements apply both to stands with high basal area and stands with low basal area and high density.

Mixed Conifer Timber Habitat Type in Eastern Washington

Forest practices rules divide stands in the mixed conifer timber habitat type into two classes: 1) stands with high basal areas, and 2) stands with low basal areas and high densities. Inner zone leave tree requirements differ between the two stand classes. The requirements for each are described below.

- **Stands With High Basal Area** – Harvest is allowed in the inner zone of RMZs in the mixed conifer timber habitat type if the combined conifer and hardwood basal area for trees greater than six inches dbh is:
 1. Greater than 110 square feet per acre on sites with a site index less than 90
 2. Greater than 130 square feet per acre on sites with a site index between 90 and 110

-
3. Greater than 150 square feet per acre on sites with a site index greater than 110

Harvesting must retain at least 50 trees per acre and a basal area of at least:

1. 70 square feet per acre on sites with a site index less than 90
2. 90 square feet per acre on sites with a site index between 90 and 110
3. 110 square feet per acre on sites with a site index greater than 110

Residual trees must be retained according to priorities listed in WAC 222-30-022(1)(b)(ii)(E).

- **Stands With Low Basal Area and High Density** – Harvest is allowed in the inner zone of RMZs in the mixed conifer timber habitat type if the combined conifer and hardwood basal area for trees greater than six inches dbh is less than the minimum requirements for the site index described above and there are more than 120 trees per acre. Following thinning, at least 120 trees per acre must be retained according to the priorities listed in WAC 222-30-022(1)(b)(ii)(D).

To the extent down wood is available on-site prior to harvest, at least 20 tons of down wood per acre must be left following harvest. Where available, at least eight pieces greater than 16 inches diameter and 20 feet in length and eight pieces greater than six inches diameter and 20 feet in length must be left. These requirements apply to stands with high basal area and stands with high basal area and high density.

High Elevation Timber Habitat Type in Eastern Washington

Harvesting in the inner zone of RMZs in the high elevation timber habitat type is allowed if stand requirements can be met. Stand requirements and harvest rules are the same that apply to inner zone harvest for western Washington RMZs for Type S and Type F waters (See Section 4b-3.1 and WAC 222-30-021(1)(b)).

To the extent down wood is available on-site prior to harvest, at least 30 tons of down wood per acre must be left following harvest. Where available, at least eight pieces greater than 16 inches diameter and 20 feet in length and eight pieces greater than six inches diameter and 20 feet in length must be left.

Stream-Adjacent Parallel Roads in All Timber Habitat Types in Eastern Washington

Where a stream-adjacent parallel road in the inner zone of an RMZ limits the capacity of the site to meet the minimum required basal area, the allowable harvest is determined by the bankfull width and proximity of the road to the outer edge of the bankfull width or CMZ.

In all cases, no harvesting is allowed in that portion of the inner zone located between the road and water. When the edge of the road closest to the water is located within 75 feet (for waters with a bankfull width of more than 15 feet) or 50 feet (for waters with a bankfull width of less than 15 feet) of the outer edge of the bankfull width or CMZ, additional leave trees equaling the total basal area of trees absent due to the road must be left near streams in or adjacent to the unit to be harvested. Where additional leave trees are determined to be unavailable or not practical by DNR, landowners and operators may

employ site-specific management strategies to replace lost riparian functions. Such management strategies may include placement of LWD in streams.

More information on mitigating the effects of stream-adjacent parallel roads in inner zones of eastern Washington RMZs is contained in WAC 222-30-022(1)(b)(iv). Forest practices Board Manual Section 7 contains guidance for locating riparian leave trees and developing site-specific management strategies to replace riparian functions lost due to stream-adjacent parallel roads.

Outer Zone in Eastern Washington

The outer zone begins at the outside edge of the inner zone and its width depends on site class and bankfull width (See Tables 4.6 and 4.7). Timber harvest is allowed in the outer zone; however, a minimum number of riparian leave trees must be retained. The number of riparian leave trees varies with timber habitat type:

- 1) In the ponderosa pine timber habitat type, a minimum of ten dominant or co-dominant trees per acre must be retained.
- 2) In the mixed conifer timber habitat type, a minimum of 15 dominant or co-dominant trees per acre must be retained.
- 3) Outer zone leave tree requirements in the high elevation timber habitat type follow those for western Washington RMZs for Type S and Type F waters (See Section 4b-3.1 and WAC 222-30-021(1)(c)).

Minimum tree counts must be met regardless of stream-adjacent parallel road presence. Outer zone leave tree requirements for eastern Washington RMZs for Type S and Type F waters may be reduced to five trees per acre in the ponderosa pine timber habitat type, eight trees per acre in the mixed conifer timber habitat type and 10 trees per acre in the high elevation timber habitat type if the landowner implements a large woody debris placement plan consistent with guidance contained in Board Manual Section 26. Wood placement projects require an HPA permit from WDFW and are subject to additional requirements under the state's Hydraulic Code (WAC 220-110-030(17)).

4b-3.2.2 TYPE NP AND TYPE NS WATERS IN EASTERN WASHINGTON

Protection measures for non-fish-bearing waters in eastern Washington include establishing equipment limitation zones adjacent to Type Np and Type Ns waters, establishing RMZs adjacent to Type Np waters and mitigating the effects of stream-adjacent parallel roads within RMZs of Type Np waters (WAC 222-30-022(2)).

Equipment Limitation Zones in Eastern Washington

An equipment limitation zone is an area where equipment use is limited in order to protect stream bank integrity, minimize soil disturbance and prevent sediment delivery to non-fish-bearing waters. ELZs apply to all Type Np and Type Ns waters, are 30 feet wide and are measured from the bankfull width.

Mitigation is required if forest practices activities expose soil on more than ten percent of the surface area of the ELZ. These activities include the operation of ground-based equipment, the construction and use of skid trails and stream crossings and the yarding of partially suspended, cabled logs.

Mitigation must be designed to replace the equivalent lost riparian function, particularly as it relates to the prevention of sediment delivery. Mitigation measures include—but are not limited to—water bars, grass seeding and mulching. These requirements do not reduce or eliminate DNR’s authority to prevent actual or potential material damage to public resources under WAC 222-46-030 (notice to comply) or WAC 222-46-040 (stop work order) or any related authority to condition forest practices notifications or applications.

Riparian Management Zones for Type Np Waters in Eastern Washington

A 50-foot wide RMZ must be established on each side of all Type Np waters in eastern Washington. Within the RMZ, the landowner may implement either a partial cut or a clearcut management strategy. Partial cutting is defined as the removal of a portion of the merchantable volume in a stand of timber so as to leave an uneven-aged stand of well-distributed, residual, healthy trees that will reasonably utilize the productivity of the soil. Partial cutting does not include seedtree, shelterwood or other types of regeneration harvesting (WAC 222-16-010). Once approved by DNR, the management strategy will remain in effect until July 1, 2051. If the landowner transfers title to the harvested property, he/she must provide written notice of this continuing obligation to the new owner and send a copy to DNR (WAC 222-20-055). The requirements for the partial cut and clearcut management strategies are described below.

Partial Cut Management Strategy

Where the partial cut management strategy is implemented within Type Np RMZs, trees must be retained in accordance with the basal area requirements for eastern Washington Type S and Type F RMZs (see Section 4b-3.2.1). These basal area requirements apply to the full length of the Type Np water within the harvest unit. The basal area requirement must be met regardless of stream-adjacent parallel road presence. Trees left to meet the basal area requirement must be retained according to priorities listed in WAC 222-30-022(2)(b)(i).

Clearcut Management Strategy

Implementation of the clearcut management strategy requires that the landowner designate a two-sided RMZ that is 50 feet wide along each side of a stream reach in the harvest unit. No harvest is allowed within the RMZ. The RMZ length must equal or exceed 70 percent of the Type Np stream length within the harvest unit. It also must meet the upper end of the basal area requirement for the RMZ inner zone for Type S and Type F waters in the corresponding timber habitat type. Additional requirements apply to the length and location of streamside clearcut boundaries. These requirements are located in WAC 222-30-022(2)(b)(ii).

Stream-Adjacent Parallel Roads within Type Np Riparian Management Zones in Eastern Washington

Where a stream-adjacent parallel road in the inner zone of an RMZ for a Type Np water limits the capacity of the site to meet the minimum required basal area, the proximity of the road to the outer edge of the bankfull width determines the allowable harvest.

If the edge of the road closest to the water is between 30 feet and 49 feet from the outer edge of the bankfull width, an RMZ 50 feet wide on each side of the stream must be retained in a manner that provides maximum function to the Type Np water. If harvest is occurring on only one side of the water, an RMZ 50 feet wide must be retained that does

not include the width of the stream-adjacent parallel road. The configuration of RMZ leave trees must adhere to the priorities listed in WAC 222-30-022(2)(c)(i).

If the edge of the road closest to the water is less than 30 feet from the outer edge of the bankfull width, not only must the requirements of the preceding paragraph must be met, but all trees between the water and the edge of the road closest to the water must also be retained. More information on stream-adjacent parallel roads in eastern Washington is contained in WAC 222-30-022(2)(c).

4b-3.2.3 EXEMPT 20-ACRE PARCELS - EASTERN WASHINGTON

In 1999, Washington’s legislature exempted certain forestland parcels from some riparian protection measure requirements recommended in the FFR and later adopted by the Board as rules. Exempt parcels include those that are 20 contiguous acres or less and are owned by individuals whose total ownership is less than 80 forested acres statewide. These parcels are commonly referred to as “exempt 20-acre parcels.”

While not subject to some Forests and Fish riparian requirements, exempt 20-acre parcels must still provide protection for public resources in accordance with the Act. Like Forests and Fish-related measures, public resource protection on exempt parcels occurs through the establishment of RMZs for Type S and Type F waters (WAC 222-30-023(1)). The RMZ is measured horizontally from the bankfull channel edge, and extends to the point where vegetation changes from wetland to upland plant community, or the point necessary to retain shade sufficient to meet the requirements of WAC 222-30-040, whichever is farther from the edge. In any case, the RMZ width cannot be less than 35 feet or more than 58 feet (for partial cuts) or 345 feet (for other harvest types). Leave tree requirements that apply to these zones are listed in WAC 222-30-023(2)(c)(ii) and (iii). When the RMZ overlaps a Type A or Type B wetland or wetland management zone (See Section 4b-4), the measure that best protects public resources must be applied.

Along Type Np waters, DNR can require tree retention on exempt 20-acre parcels where necessary to protect public resources. Forest practices rules authorize DNR to require the retention of 29 trees of at least six inches dbh on each side of every 1,000 feet of stream length within 29 feet of the stream.

4b-3.3 Statewide Requirements

In addition to the riparian protection measures described above that are specific to western and eastern Washington, forest practices rules include riparian requirements that apply throughout the state. These include requirements for the retention of shade along Type S and Type F waters, restrictions on the salvage of down trees and woody debris and requirements for the maintenance of stream bank stability. Each set of protection measures is described below.

4b-3.3.1 SHADE REQUIREMENTS FOR TYPE S AND TYPE F WATERS

In addition to meeting the riparian management zone requirements for Type S and Type F waters (described in Section 4b-3), landowners must satisfy shade requirements

to maintain water temperature (WAC 222-30-040). Shade requirements must be met regardless of harvest opportunities that may exist under the RMZ inner zone rules.

Shade requirements differ for forestlands within the bull trout overlay (BTO) and lands outside the BTO. The BTO includes portions of eastern Washington streams containing bull trout habitat as identified on the WDFW bull trout map (Figure 4.7). The BTO is a “living” document and may be modified using current data, field knowledge and best professional judgment (WAC 222-16-010). RMZs for Type S and Type F waters on exempt 20-acre parcels must also meet shade requirements (WAC 222-30-023). Shade requirements are detailed below.

Covered Lands Within the Bull Trout Overlay

Within the BTO, all available shade must be retained within 75 feet of the bankfull edge or channel migration zone edge, whichever is greater, along Type S and Type F waters (WAC 222-30-040(1)). Section 1 of the Board Manual describes the method for identifying all available shade.

Covered Lands Outside the Bull Trout Overlay

A temperature prediction method must be used to determine shade requirements for Type S and Type F waters outside the BTO (WAC 222-30-040(2)). The temperature prediction method relies on the waters’ location within the state (western vs. eastern Washington), elevation and water quality temperature classification (Class A or Class AA as designated by Ecology; refer to WAC 173-201A). This information is used to establish the shade level necessary to meet the temperature standard. Section 1 of the Board Manual describes the temperature prediction method and its application.

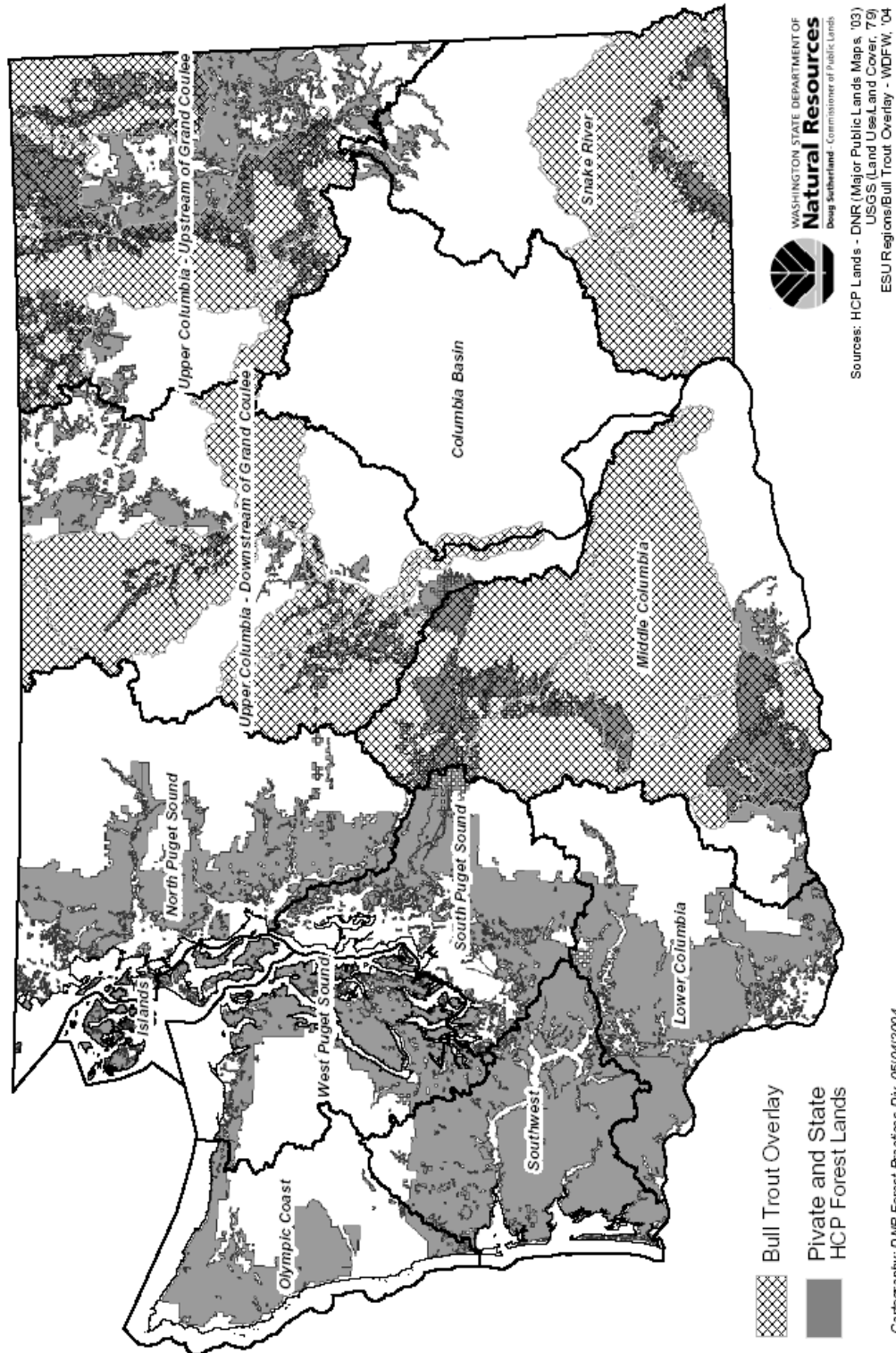
If pre-harvest shade levels do not meet the shade requirement, no harvest is allowed within 75 feet of the bankfull edge or CMZ edge. If pre-harvest shade levels exceed the shade requirement, harvest in the RMZ inner zone is allowed provided that shade levels are not reduced below the minimum required and that all other applicable rules are met. Using the methods in Board Manual Section 1, landowners are required to demonstrate that the removal of trees within the inner zone will not reduce shade below the requirement.

Shade requirements must be satisfied regardless of whether or not a stream-adjacent parallel road is present (WAC 222-30-040(5)). However, shade rules do not preclude or limit the harvest of trees that provide shade in connection with the construction or maintenance of road crossings or the creation and use of yarding corridors (WAC 222-30-060(1)).

4b-3.3.2 SALVAGE LOGGING

Down LWD, including the boles and larger branches of trees, provides a range of ecological functions in aquatic and riparian systems. Down woody debris in streams and rivers stores sediment, creates pool habitat, dissipates stream energy, provides cover and serves as a food source for macroinvertebrates. In riparian areas, down wood serves as habitat for amphibians, reduces the erosive power of overbank flows and creates microsites for seedling growth. Removal of down wood in these areas reduces the quality and quantity of habitat available for many species covered by the FPHCP. Forest practices rules protect these ecological functions and associated habitats by restricting

Figure 4.7 Bull Trout Overlay



¹ Lands managed under existing HCPs are shown along with covered lands. These are not part of the FPHCP. See FPHCP Section 1-5 for a detailed description of covered lands.

salvage of down wood in typed waters, channel migration zones and riparian management zones.

Salvage logging is not allowed within the bankfull width of any typed water or within a channel migration zone, including salvage logging of any portion of a tree that may have fallen outside the zone.

Salvage logging within an RMZ for a Type S or Type F water is based on the sub-zone (core, inner and outer zones) from which the tree originated, applicable stand requirements and extent of previous harvest activity in the zone (Table 4.11; WAC 222-30-045). Salvage logging is not allowed within an RMZ for a Type Np water or associated sensitive site, but may occur adjacent to Type Ns waters.

Table 4.11 Restrictions on salvage logging within RMZs for Type F and Type S waters

RMZ sub-zone	Restrictions on Salvage Logging
Core Zone	Salvage logging is not allowed, including salvage logging of any portion of a tree that originated in the core zone but has fallen outside the zone.
Inner Zone	Salvage logging is not allowed if stand requirements cannot be met by the residual stand. If the proposed salvage involves down trees that originated from the inner zone, salvage of down wood is only allowed if the down wood was not needed to meet stand requirements. Salvage of any existing down wood is not allowed if the residual balance of down wood is insufficient to meet regional down wood guidelines in WAC 222-30-045(3)(a) (western Washington) and WAC 222-30-022 (eastern Washington). Salvage within the inner zone must be conducted in a manner that protects residual trees.
Outer Zone	Salvage logging is not allowed if the riparian leave tree requirements cannot be met by the residual standing or down trees. If the proposed salvage involves down trees that originated from the outer zone, salvage is allowed only if the down wood was not needed to meet riparian leave tree requirements in the outer zone.

4b-3.3.3 STREAMBANK INTEGRITY

The margins—or banks—of stream and river channels represent the interface between the aquatic and riparian environments. Their structure and composition often reflects the three main geomorphic elements of forest watersheds: wood, water and sediment. As such, they provide important habitats for both aquatic and riparian-dependent species. Forest practices can negatively affect these habitats by altering the character of stream banks. Timber harvesting can reduce stream bank rooting strength and log yarding can disturb stream bank structure. Both impacts can lead to accelerated erosion and sedimentation (Rashin et al. 1999).

Forest practices activities in the RMZ core zone for Type S and Type F waters and in RMZs for Type Np waters must be conducted in a manner that maintains stream bank

integrity (WAC 222-30-030). Activities must avoid disturbing stumps, root systems and any logs embedded in the stream bank, as well as brush and other similar understory vegetation. Where necessary, high stumps must be left to prevent felled and bucked timber from entering the water. Trees with large root systems embedded in the stream bank must also be left. In addition to these requirements, activities that affect stream bank integrity such as road construction or log yarding may require an HPA permit from WDFW. Activities that require an HPA are subject to additional conditions under the state's Hydraulic Code (WAC 220-110-030(17)).

4b-4 Wetland protection measures

Wetlands are areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support—and under normal circumstances do support—a prevalence of vegetation typically adapted for life in saturated soil conditions, such as swamps, bogs, fens and similar areas. This includes wetlands created, restored or enhanced as part of a mitigation procedure. This does not include constructed wetlands voluntarily developed by a landowner. It also does not include the following surface waters of the state intentionally constructed from wetland sites: irrigation and drainage ditches, grass-lined swales, canals, agricultural detention facilities, farm ponds and landscape amenities.

Like surface waters such as streams, rivers, lakes and ponds, wetlands provide important habitat for many species covered under the FPHCP. The FPHCP recognizes wetlands as important to the conservation of covered species, and it includes measures to prevent, minimize and mitigate forest practices-related impacts to wetland habitats. Measures are intended to protect important ecological functions such as LWD recruitment, shade retention, sediment filtration and the maintenance of surface and shallow subsurface hydrology. Protection measures include a wetland typing system, wetland management zones (WMZ) adjacent to Type A and Type B wetlands, and the use of low-impact harvest systems in forested wetlands. Unlike riparian protection measures, wetland protection measures do not vary by geographic region.

Wetland Typing System

The wetland typing system recognizes two broad categories of wetlands: forested wetlands and non-forested wetlands (WAC 222-16-035).

Forested wetlands include any wetland or portion thereof that has—or if the trees present were mature would have—at least 30 percent canopy closure. The only exception involves forested bogs greater than 0.25 acre in size, which are categorized as Type A wetlands (see Type A wetland definition below). More information on wetland typing can be found in WAC 222-16-035.

Non-forested wetlands include any wetland or portion thereof that has—or if the trees present were mature, would have—less than 30 percent canopy closure. Non-forested wetlands are classified as either Type A or Type B. Type A wetlands include all non-forested wetlands that:

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- Are greater than 0.5 acre in size, including any acreage of open water where the water is completely surrounded by the wetland, and
 - Are associated with at least 0.5 acre of ponded or standing open water (the open water must be present on the site for at least seven consecutive days between April 1 and October 1), or
 - Are bogs greater than 0.25 acre in size.

Type B wetlands include all other non-forested wetlands greater than 0.25 acre in size.

Section 8 of the Board Manual provides guidance for delineating wetlands. The section includes technical criteria that define wetlands, field indicators used to satisfy the technical criteria, methods for identifying wetlands and delineating their boundaries and guidance for bog identification. Also, WAC 222-16-036 describes wetland mapping requirements under the forest practices application and notification review process.

4b-4.1 Protection Measures for Forested Wetlands

A forested wetland includes any wetland or portion thereof that has—or if the trees present were mature would have—at least 30 percent canopy closure. Harvesting is allowed in forested wetlands, but it is limited to low-impact harvest systems in order to minimize effects on soils and hydrology (WAC 222-30-020(6)). Low-impact harvest systems generally include ground-based equipment with tracks (e.g., shovel), cable yarding machines, helicopters and balloons. Also, when yarding logs, operators must keep at least one end of the log suspended when feasible.

When forested wetlands lie within a proposed harvest unit, landowners are encouraged to leave 30 to 70 percent of the required wildlife reserve trees within the wetland. Wildlife reserve trees are defective, dead, damaged or dying trees that provide or have the potential to provide habitat for wildlife species dependent on standing trees. In western Washington, forest practices rules require the retention of three wildlife reserve trees and two green recruitment trees (i.e., trees left for the purpose of becoming future wildlife reserve trees) for each acre harvested. In eastern Washington, two wildlife reserve trees and two green recruitment trees must be retained for each acre harvested. More information about wildlife reserve trees and green recruitment trees can be found in WAC 222-16-010 and WAC 222-30-020(11). While not designed specifically for the protection of aquatic or riparian habitats, wildlife reserve trees provide indirect benefits for species covered under the FPHCP.

In order to retain undisturbed habitat within forested wetlands, wildlife reserve trees should be left in clumps. Where possible, clumped leave trees should be left next to typed waters, riparian management zones or wetland management zones. Green recruitment trees should be representative of trees found within the wetland, and non-merchantable trees should be left standing when DNR determines it is feasible to do so.

Also, DNR is required to consult with WDFW and affected tribes about site-specific impacts of forest practices on wetland-sensitive plant and animal species in forested wetlands.

4b-4.2 Protection Measures for Non-Forested (Type A and Type B) Wetlands

Protection measures for Type A and Type B wetlands include limitations on harvesting in the wetlands (WAC 222-30-020(8)):

- Harvest is not allowed in a Type A wetland that meets the definition of a bog (see Board Manual Section 8 for bog definition and delineation).
- Individual trees or forested wetlands less than 0.5 acre in size may occur within a non-forested wetland. These trees must be retained; however, they may be counted toward the WMZ leave tree requirement (see below).
- Harvest of upland areas or forested wetlands surrounded by a Type A or Type B wetland must be conducted in accordance with a plan that has been approved by DNR in writing.
- No trees can be felled into or yarded across a Type A or Type B wetland without written approval from DNR.

Non-forested wetlands are also protected through wetland management zones. WMZs must be established adjacent to all Type A and Type B wetlands. They are measured horizontally from the wetland edge or the point where the non-forested wetland becomes a forested wetland (See Board Manual Section 8 for delineation procedures). The required WMZ width depends on the wetland type and size (Table 4.12). The average WMZ width must meet the requirement listed in Table 4.12. To meet the average width, the WMZ can vary from the minimum width to the maximum width listed in Table 4.12. When a WMZ overlaps an RMZ, the requirement that best protects public resources must be applied.

Harvest is allowed within WMZs under the following conditions (WAC 222-30-020(7)):

- 1) At least 75 trees per acre must be retained.
- 2) Wildlife reserve trees should be located within the WMZ where feasible.
- 3) Partial cutting or removal of groups of trees within the WMZ is acceptable.
- 4) Tractors, wheeled skidders or other ground-based harvest equipment is not allowed within the minimum WMZ width without written approval from DNR.
- 5) When at least ten percent of a harvest unit lies within a WMZ, at least 50 percent of the trees required under 1) must be retained.

Additional requirements for harvest in Type A and Type B wetland management zones are listed in WAC 222-30-020(7).

Table 4.12 Wetland management zone widths for Type A and Type B wetlands

Wetland Type	Acres of Nonforested Wetland*	Maximum WMZ Width	Average WMZ Width	Minimum WMZ Width
A (including bogs)	Greater than 5	200 feet	100 feet	50 feet
A (including bogs)	0.5 to 5	100 feet	50 feet	25 feet
A (bogs only)	0.25 to 0.5	100 feet	50 feet	25 feet
B	Greater than 5	100 feet	50 feet	25 feet
B	0.5 to 5	N/A	N/A	25 feet
B	0.25 to 0.5	No WMZ required	No WMZ required	No WMZ required

*For bogs, both forested and non-forested acres are included.

4b-5 Logging practices

Thus far, most riparian and wetland protection measures have focused on the location and degree of allowable harvest near typed waters and wetlands. The FPHCP also includes protection measures that regulate the methods of harvest in these areas. These protection measures include limits on the felling and bucking of timber, the use of ground-based equipment and cable yarding. Many of these measures are designed to minimize soil disturbance and reduce the potential for erosion and sedimentation; however, other ecological functions are also maintained as a result of these restrictions. Each set of protection measures is described below.

4b-5.1 Felling and Bucking

The felling of trees and bucking of logs in or adjacent to typed waters and RMZs must be conducted in a manner that protects riparian and in-stream habitat and water quality (WAC 222-30-050). Protection measures are designed to minimize soil disturbance, damage to residual trees and delivery of slash to typed waters.

Limitations on felling:

- No trees may be felled into the RMZ core zone of Type S or Type F waters; sensitive sites; or Type A or Type B wetlands, except trees that cannot be practically and safely felled outside those areas with commonly used techniques.

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- Within the RMZ inner and outer zones of Type S and Type F waters, and within wetland management zones, trees must be felled in a manner that facilitates yarding away from typed waters. This includes the use of directional falling, lining, jacking or staged falling.
 - Trees may be felled into Type Np waters, but logs must be removed as soon as practical. Slash introduced to the Type Np water as a result of the falling must be removed in accordance with guidelines in Board Manual Section 4.
 - Reasonable care must be taken to avoid felling trees into RMZs, WMZs and areas outside the harvest unit. When thinning or partial cutting, reasonable care must be taken to fall trees in directions that minimize damage to residual trees.

Bucking or limbing of any portion of a tree lying within the bankfull width of a Type S, Type F or Type Np water; in the core zone of RMZs; in sensitive sites; or in open water areas of Type A or Type B wetlands is not allowed.

4b-5.2 Ground-Based Equipment Use

Ground-based equipment is commonly used to fall and yard timber and to construct, maintain and abandon roads and skid trails. Ground-based equipment use is regulated to limit direct physical impacts to waters and wetlands and to minimize indirect impacts such as soil disturbance and associated erosion and sedimentation (WAC 222-30-070). Protection measures vary with local conditions and address typed waters, wetlands, RMZs, WMZs, soil moisture, residual trees, skid trails and slope restrictions.

Typed Waters

Ground-based equipment is not allowed in Type S or Type F waters except with approval by DNR and with an HPA issued by WDFW. Ground-based transport of logs across Type Np and Type Ns waters must minimize the potential for damage to public resources. See WAC 222-30-070(1)(b) and (e) for additional restrictions related to yarding across Type Np and Type Ns waters.

Type A and Type B Wetlands

In order to maintain wetland water movement and water quality and to prevent soil compaction, ground-based equipment is not allowed in Type A or Type B wetlands. Where harvest occurs in non-forested wetlands, ground-based logging is limited to low impact harvest systems. Ground-based equipment operating in wetlands is only allowed during periods of low soil moisture or frozen soil conditions.

Riparian Management Zones

Harvest is allowed within RMZs subject to RMZ protections described in Section 4b-3 and detailed in chapter 222-30 WAC. However, any use of ground-based equipment within an RMZ must be as described in an approved forest practices application or otherwise approved in writing by DNR. When yarding logs in or through an RMZ with ground-based equipment, the number of routes through the zone must be minimized. Logs must be yarded to minimize damage to leave trees and vegetation in the RMZ.

Wetland Management Zones

Harvest is allowed in WMZs subject to WMZ protections listed in Section 4b-4.2 and detailed in WAC 222-30-020(7). Ground-based equipment is not allowed within the

minimum WMZ width unless described in an approved forest practices application or otherwise approved in writing by DNR. Where feasible, logs must be skidded with at least one end suspended to minimize soil disturbance and damage to leave trees and vegetation in the WMZ.

Soil Moisture Conditions

Ground-based harvest equipment is not allowed on exposed erodible soils or saturated soils if sediment delivery is likely to impact a wetland, stream, lake or pond. When soil moisture is high, and unrestricted operation of ground-based equipment would result in unreasonable soil compaction, operations are restricted to methods that minimize widespread soil compaction. Operations may be postponed until site conditions improve such that yarding may proceed without causing unreasonable soil compaction and long-term impacts to soil productivity and infiltration capacity.

Protection of Residual Trees

Reasonable care must be taken to minimize skidding damage to the stems and root systems of residual trees, including saplings.

Skid Trails

Skid trail width must be kept to a minimum, and reasonable care must be taken to minimize the amount of sidecast required. Sidecast material must be deposited above the 100-year flood level. Skid trails must be outsloped where practical, but must be insloped where necessary to prevent logs from sliding or rolling downhill off the skid trail. Skid trails running parallel or near parallel to waters must be located outside the no-harvest portions of RMZs and at least 30 feet from the bankfull edge of unbuffered portions of Type Np or Ns waters, unless approved in writing by DNR. Skid trails must cross the drainage point of swales at an angle that minimizes the potential for delivering sediment to typed waters or where channelization is likely to occur.

When a skid trail on a slope in exposed soils is no longer going to be used—permanently or for the season—water bars must be placed on the trail where necessary to prevent soil erosion. Skid trails located within 200 feet of any typed water that directly deliver to the stream network must have water bars, grade breaks and/or slash to minimize sediment delivery. Water bars must be placed at a frequency that minimizes gulying and soil erosion. In addition to water barring, skid trails with exposed, erodible soil that may be reasonably expected to cause damage to a public resource must be seeded with a non-invasive plant species (preferably native to the state) and adapted for rapid revegetation of disturbed soil, or be treated with other erosion control measures acceptable to DNR.

Slope Restrictions

Ground-based harvest systems may not be used on slopes where, in the opinion of DNR, this method of operation would cause actual or potential material damage to a public resource.

4b-5.3 Cable Yarding

Limitations on cable yarding in and across typed waters and wetlands are intended to minimize soil disturbance and impacts to their beds and banks (WAC 222-30-060).

Type S and Type F Waters

Cable yarding of logs in or across Type S or Type F waters is not allowed, except where logs will not materially damage the bed of waters, banks of sensitive sites or riparian management zones. If yarding across Type S or Type F waters is permitted, yarding is limited to cable or other aerial logging methods. Yarding operations in or above Type S or Type F waters require an HPA permit from WDFW. Operations that require an HPA are subject to additional conditions under the state's Hydraulic Code (WAC 220-110-030(17)).

When it is necessary to create yarding corridors through the RMZ of a Type S or Type F water, the corridors must be no wider or more numerous than necessary to accommodate safe and efficient transport of logs. Generally, yarding corridors should be located at least 150 feet apart (measured edge to edge), and each should be no wider than 30 feet. Total openings resulting from yarding corridors must not exceed 20 percent of the stream length associated with the forest practices application. When changing cable locations, care must be taken to move cables around or clear of the riparian vegetation to avoid damage.

Type A and Type B Wetlands

Cable yarding of logs in or across Type A or Type B wetlands is not allowed without written approval from DNR and may require an HPA from WDFW.

Residual Vegetation

Where logs are yarded from or across a sensitive site; an RMZ for a Type S, Type F or Type Np water; or a wetland management zone, reasonable care must be taken to minimize damage to the vegetation that provides shade to the water, and to minimize disturbance to understory vegetation, stumps and root systems. Where practical and consistent with good safety practices, logs must be yarded in the direction in which they lie and away from Type S, Type F or Type Np waters and Type A or Type B wetlands until clear of the riparian management zone or wetland management zone.

Yarding Direction

Uphill yarding is preferred. Where downhill yarding is used, reasonable care must be taken to lift the leading end of the log to minimize downhill movement of slash and soil. When yarding parallel to a Type S or Type F water, and below the 100-year flood level or within the riparian management zone, reasonable care must be taken to minimize soil disturbance and to prevent logs from rolling into the water or riparian management zone.

4b-6 Conservation easement/acquisition programs

The FPHCP includes two programs that provide for the long-term conservation of riparian and aquatic habitats. The Forestry Riparian Easement Program (FREP) and the Riparian Open Space Program were established to acquire, through purchase or easement, the most ecologically important habitats for species covered under the FPHCP. Unlike most FPHCP protection measures, the FREP and ROSP are voluntary programs that complement the mandatory requirements of the Act and rules. As part of the complete set of protection measures, these voluntary programs will help ensure that the Forest Practices program meets its goals, resource objectives and performance targets.

4b-6.1 Forestry Riparian Easement Program

The FREP was established by the legislature in 1999 as part of the Forests and Fish Law (Engrossed Substitute House Bill 2091), codified in chapter 76.13 RCW and adopted as a rule in chapter 222-21 WAC. FREP is administered through DNR's Small Forest Landowner Office.

FREP provides long-term protection for aquatic resources by acquiring easements from small forest landowners in riparian areas and other ecologically important areas. Easement areas typically include channel migration zones, riparian management zones and wetland management zones, but may also include other areas, such as unstable slopes. Landowners interested in participating in FREP must meet the definition of a "small forest landowner," which is related to his/her prior three-year average harvest level (WAC 222-21-010(12)).

FREP easements apply to "qualifying timber" and not the land on which the trees grow. "Qualifying timber" is trees that are covered by a forest practices application and that the small forest landowner is required to leave unharvested according to rules adopted under RCW 76.09.055 or 76.09.370 (consistent with FFR), or that are made uneconomic to harvest by those rules (WAC 222-21-010(9)). Landowners are compensated for between 50 and 100 percent of the value of the qualifying timber. Qualifying timber must be left unharvested for the duration of the easement (i.e., 50 years) and the easement area must be maintained in a condition compatible with growing timber.

4b-6.2 Riparian Open Space Program

Like the FREP, ROSP was a product of the 1999 Forests and Fish Law (Engrossed Substitute House Bill 2091). It has been codified in the Forest Practices Act (chapter 76.09 RCW) and adopted as a rule in chapter 222-23 WAC. ROSP is administered through DNR Asset Management and Protection Division.

ROSP ensures the long-term conservation of aquatic resources by acquiring a fee interest in, or easement on, lands and timber within a specific type of channel migration zone known as an "unconfined avulsing CMZ." Unconfined avulsing CMZs are areas where abrupt shifts in stream or river location occur, resulting in a complex floodplain environment (see also channel migration zone definition in Section 4b-2). These areas typically have very high ecological value as spawning and rearing habitat for salmon and other fish species.

Under the forest practices rules, no timber harvesting or road construction may occur within CMZs due to their ecological importance. ROSP provides financial compensation for owners of unconfined avulsing CMZs who voluntarily sell the land to DNR or place a permanent conservation easement on the trees, land or both. DNR screens applications, prioritizes qualifying applications and acquires lands based on available funding. Applications are prioritized based on the order received, the ecological value of the land(s) and the immediacy of need on the part of the landowner.

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