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The Need to Reform BC's *Private Managed Forest Land Act*

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Note

The content of this report is provided as legal information and should not be relied on as legal advice. This report does not specifically address the rights and title of Indigenous Peoples and is written without prejudice to those rights.

Private forest lands in British Columbia cannot be understood outside the site-specific history of colonial land grants enabling the privatization of large areas of Indigenous land. Private managed forest land is concentrated within the territory of a small number of Indigenous Nations largely as a result of historic land grants of unceded and collectively held Indigenous land in connection with the development of railways in British Columbia. For example, a series of 1880s grants to Robert Dunsmuir for the Esquimalt & Nanaimo Railway privatized 85% of Hul'qumi'num territory on Vancouver Island without consultation or consent. Today this means three forestry companies now own 60% of Vancouver Island Hul'qumi'num territory. These lands remain subject to ongoing treaty negotiations and s 35 Aboriginal rights and title claims. However, the designation of these lands as private managed forest land presents a significant obstacle in treaty negotiations and the ongoing the exercise of constitutionally protected section 35 Aboriginal rights. The regulatory gaps in the *Private Managed Forest Land Act* (PMFLA) outlined in this submission disproportionately impact the territories, economies, and social and cultural rights of these Indigenous Nations. Despite these impacts, Indigenous Nations have been excluded from decision-making activities under the PMFLA and have lost access to harvesting and spiritual sites and culturally significant resources. A renewed framework for private forest land requires collaborative governance with impacted Indigenous Nations, including direct participation in decision making about forestry activities and the development and enforcement of environmental and cultural heritage protections on private land.

Cover photo credit: Surge Narrows Forest Advisory Committee

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Summary

This report outlines the inadequacies of British Columbia's *Private Managed Forest Land Act* (PMFLA) and offers suggestions for law reform. Part 1 is an overview of the PMFLA, Part 2 offers specific examples of how logging on private managed forest land is causing harm to communities across BC, and Part 3 proposes eight recommendations for law reform.

The *Private Managed Forest Land Act* must be amended to include the following:

1. Authority for local governments to introduce and enforce bylaws to protect riparian areas, sensitive habitats and community watersheds from sub-standard logging practices on private land;
2. Requirements for public consultation with consideration for local governments, the Ministry of Environment, environmental organizations, community groups, and other groups whose interests may be affected;
3. Clear environmental standards that ensure private managed forests are logged sustainably. At a minimum, privately owned forests should be held to the same practice standards as crown forest land under the *Forest and Range Practices Act* and include biodiversity requirements at the stand or landscape level, visual quality objectives, general wildlife objectives, sustainable harvest objectives (i.e. annual allowable cuts), and cultural heritage protection;
4. A means to ensure the retention of private managed forests and generally prevent privately managed forests from being sold for urban development. This could be achieved by reinstating a Forest Land Reserve, which operated similarly to the Agricultural Land Reserve;
5. Consideration of cumulative effects and a comprehensive land management framework;
6. Independent oversight by the Ministry of Forests, Lands, Natural Resource Operations & Rural Development – and authority for the Forest Practices Board to conduct audits of private managed forest land to ensure public accountability; and
7. Penalties for violations in line with those in the *Forest and Range Practices Act* to ensure compliance with environmental protection legislation.
8. Collaborative governance with Indigenous Nations affected by private managed forest land, including direct participation in decision making about forestry activities and the development and enforcement of environmental and cultural heritage protections on private land.

Part 1: Introduction and Overview of the *Private Managed Forest Land Act*

For years, concerned citizens and environmental groups across British Columbia have been pointing out the inadequacies of the *Private Managed Forest Land Act* (PMFLA) and seeking reform.[1] Since the Forest Land Reserve system was replaced by the PMFLA in 2004, private forest land has been logged at unsustainable rates, without adequate protection of sensitive public resources. Private managed forest land is subject to an entirely different set of rules than crown forest land – and those private land rules are far weaker. Notably, the PMFLA has no requirement for sustainable long-term forest management. Logging activities on private land can have devastating impacts on public resources if not managed responsibly.

In British Columbia, approximately 5% of the land base is privately owned and 2% is private forest land.[2] About half of the private forest land, or 818,000 hectares, is classified as private managed forest land and subject to the PMFLA.[3] While this number may seem relatively small, the effects of logging on these lands are significant. In 2017, private managed forest land logging harvested 7% of BC's total timber harvest – and 28% of the harvest from the coast.[4] Private managed forest land is highly concentrated on Vancouver Island, the Kootenays, the southern coast, and the Okanagan-Shuswap.[5]

[1] *Private Managed Forest Land Act*, SBC 2003 c 80.
[2] Private Forest Landowners Association, "Managed Forest Land" (accessed June 16, 2019), online: <https://www.pfla.bc.ca/managed-forest-land/> [Private Forest Landowners Association].
[3] Managed Forest Council, Annual Report 2017/2018 (October 31, 2018), online: <http://mfcouncil.ca/wp-content/uploads/2018/11/2017-18-Annual-Report-1.pdf> [Council Annual Report 2017/18].
[4] Council Annual Report 2017/18, supra note 3
[5] Council Annual Report 2017/18, supra note 3. Some managed forest properties are as large as 166,000 hectares. Private Forest Landowners Association, supra note 2.

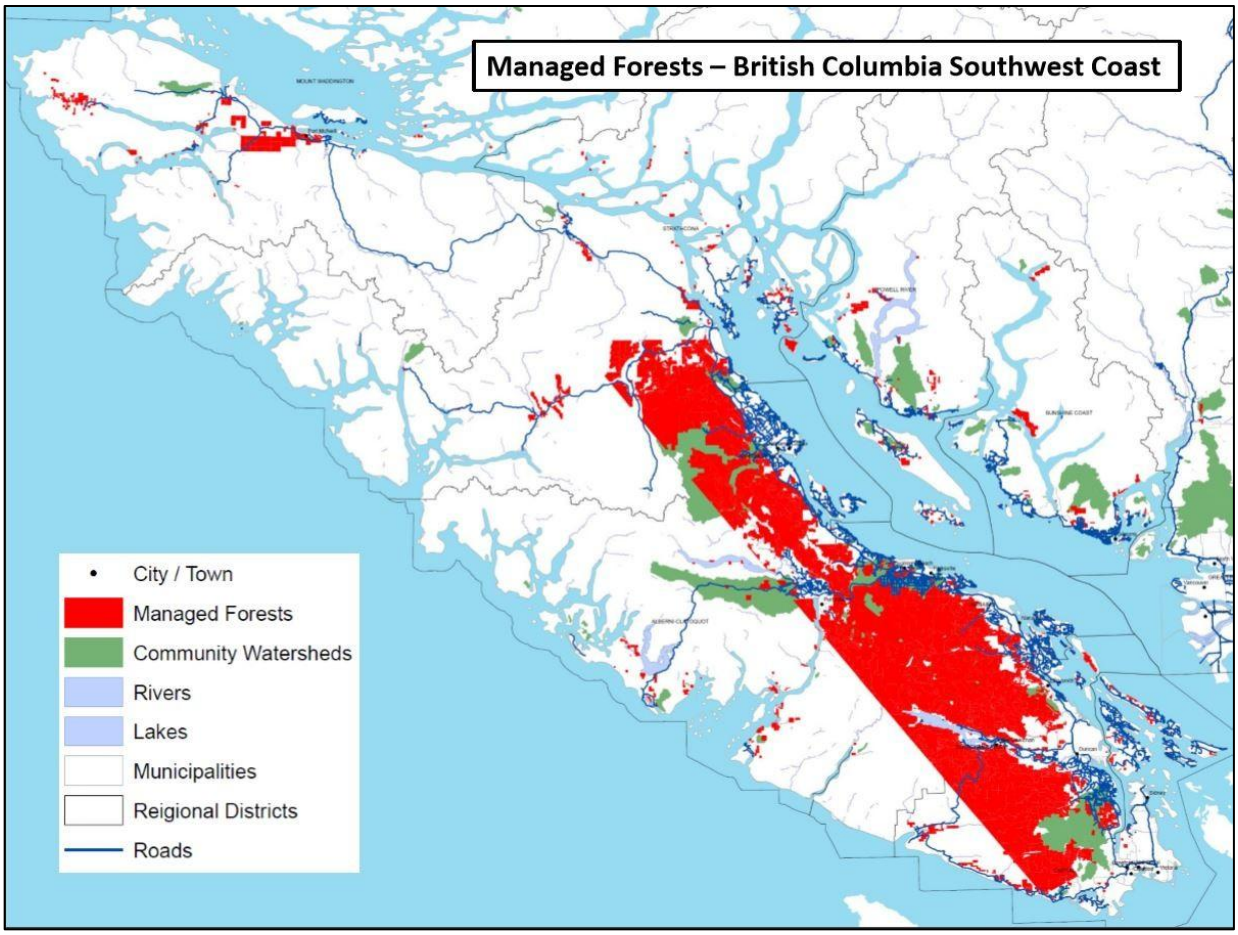

Figure 1 (Source: Managed Forest Council)[6]

The majority of private managed forest land is operated by large forestry corporations. Collectively, TimberWest and Island Timberlands hold one-fifth of Vancouver Island's total land area.[7] (Note that government first privatized the large area of private managed forest land on southern Vancouver Island in 1884 when the land was granted to a private company to build the E&N railway – a railway that no longer operates.[8])

The PMFLA establishes a rudimentary regime that requires land owners to meet just five management "objectives." These management objectives are broadly worded and lack clear prescriptive measures. The five objectives established in the PMFLA relate to soil conservation, water quality, fish habitat, critical wildlife habitat, and reforestation.

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[6] Managed Forest Council, "*Private Managed Forest Land Act*" (April 12, 2014; accessed June 16, 2019), online: <http://mfcouncil.ca/wp-content/uploads/2013/11/AVICC_2014_Presentation_PMFLC.pdf>.

[7] TimberWest has 325,400 hectares of private forest land. TimberWest, "Our lands and operations" (accessed June 16, 2019), online: <https://www.timberwest.com/our-lands-and-operations/>. In 2018, TimberWest and Island Timberlands entered into an affiliation agreement to share facilities and corporate services. TimberWest, "Affiliation of TimberWest and Island Timberlands to Allow for Shared Use of Facilities, Enhanced Forest Stewardship and Alignment of Best Practices" (announcement Nov 1, 2018; accessed June 16, 2019), online: <https://www.timberwest.com/affiliation/>.

[8] Will Horter, The Great Land Grab (November 23, 2008; accessed June 16, 2019), Dogwood online: <https://dogwoodbc.ca/news/the-great-land-grab/>; also see WA Taylor, Crown Land Grants: A History of the Esquimalt and Nanaimo Railway Land Grants, Ministry of Environment, Land and Parks (Victoria, BC: 1975), online: <https://www.for.gov.bc.ca/hfd/library/documents/bib73314.pdf>.

The regulations enacted pursuant to the PMFLA include specific forest management standards to support the broad objectives. However, the wording of these management objectives allows timber companies to claim their operations are regulated, while in reality the standards have little meaning.[9] As discussed below, the requirements are insufficient and do not adequately protect public resources from the potential environmental harms of logging.

PMFLA rules fall far short of the rules for crown land forestry found in the *Forest and Range Practices Act* regime. For example, the PMFLA rules do not require operators to consider important objectives that are mandatory for Crown land, such as:

- Biodiversity Objectives. Unlike crown forestry, the PMFL doesn't require:
    - Landscape and stand level biodiversity requirements in plans;
    - Wildlife Habitat Areas;
    - Old Growth Management Areas;
    - Wildlife tree retention requirements;
    - Ungulate Winter Range protection, with basal area retention requirements;
    - Grizzly corridors;
    - Maximum road density requirements to protect grizzly and other wildlife; or
    - Visual Quality Objectives.
- Wildlife Objectives. There are some protections for critical wildlife habitat designated by an administrator of the *Wildlife Act*, but since the adoption of the PMFLA in 2004, there has not been a designation of critical wildlife habitat.
- Sustainable harvest objectives (Maximum Annual Allowable Cuts).[10]

As will be discussed below, PMFLA riparian rules fall far short of crown forestry rules.[11]

[9] Carrie Saxifrage, Whoa Neighbour: How privately managed forest land owners broke the social contract, Silviculture Magazine (2013), online: <https://www.silviculturemagazine.com/articles/summer-2013/whoa-neighbour-how-privately-managed-forest-land-owners-broke-social-contract> [Whoa Neighbour].
[10] Rod Davis, Managed Forest Council chair (personal communication).
[11] See the extended discussion below on riparian rules.

Background and Policy Considerations

BC's economy is largely based on natural resource industries. A balance must be struck between current resource development and maintaining healthy and functional ecosystems to ensure that BC's natural resource industries are sustainable in the long-term.[12] Accordingly, forest management legislation should focus on the long-term sustainability of BC's forestry industry.

The PMFLA is profitable for private forest owners, notably the "big 3" forestry companies that are responsible for 80% of private logging in BC.[13] Private forest land owners get significant tax breaks and are held to lower environmental standards than those that apply on crown forest lands under the *Forest and Range Practices Act* (FRPA).

However, British Columbians have an interest in ensuring that BC's forestry industry can continue to operate for generations to come. Under the current law, private managed forest land is disappearing as owners are clearcutting and selling land to be re-developed for non-forestry uses. The logging that does happen on private managed forest land is done at unsustainable rates that do not support long-term job creation.[14] As well, there has been a significant loss in jobs in mills as a large number of private forestry companies export raw logs rather than process them locally.[15]

Unsustainable logging and clearcutting also threatens BC's critically important tourism industry. BC is a tourism destination, and healthy forests are integral to the industry.[16] In 2017, the tourism industry contributed $9 billion to BC's GDP and employed 137,800 people, while the forestry sector contributed $1.8 billion.[17] Unsustainable logging can also threaten jobs in other environment-dependent industries such as fishing.

Overcutting and clearcutting on private managed forest land threatens the Coastal Douglas Fir (CDF) ecosystem, which is the smallest of the classified ecosystems in British Columbia and is limited to Southern Vancouver Island and the Sunshine Coast.[18] CDF ecosystems are highly significant ecologically and host 10 of BC's provincially rare and endangered species.[19] The CDF ecosystem has been heavily reduced by human activities, including logging. Indeed, only about 1.2% of the original CDF ecosystem old forest remains on Vancouver Island.[20]

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[12] Bruce Fraser, Saving Place- Land Stewardship in the Age of Limits (2017), online: <https://engage.gov.bc.ca/app/uploads/sites/272/2017/12/Dr.-Bruce-Fraser-Saving-Place.pdf> [Saving Place] at 34.
[13] Ben Parfitt, Restoring the Public Good on Private Forestlands, Canadian Centre for Policy Alternatives BC (2008) <https://www.policyalternatives.ca/publications/reports/restoring-public-good-private-forestlands> [Restoring the Public Good on Private Forestlands] at 11.
[14] Restoring the Public Good on Private Forestlands, supra note 13 at 8.
[15] Restoring the Public Good on Private Forestlands, supra note 13.
[16] For example, see the Destination BC website, "Hello BC": <https://www.hellobc.com/>.
[17] Destination BC, Value of Tourism in 2017 (2019; accessed June 16, 2019), online: <https://www.destinationbc.ca/content/uploads/2019/02/Pages-from-2017-Value-of-Tourism_Snapshot_FINAL.pdf>.
[18] Capital Regional District, "Our Environment: Coastal Douglas Fir", online (accessed 25 Mar 19): <https://www.crd.bc.ca/education/our-environment/ecosystems/terrestrial/coastal-douglas-fir>.
[19] Ibid.
[20] Sierra Club BC, "State of British Columbia's Coastal Rainforest: Mapping the Gaps for Ecological Health and Climate Protection" (December 2009) at p. 18, online: https://sierraclub.bc.ca/wp-content/uploads/2015/08/CoastForestReport2009_print_corrected.pdf Coastal Douglas-Fir & Associated Ecosystems Conservation Partnership, "Why is the CDFCP Region at Risk", website (accessed March 25, 2019): <http://www.cdfcp.ca/index.php/about/why-is-the-cdf-at-risk>.

Despite this, the PMFLA provides no protection for CDF ecosystems. Logging and development on private managed forest land will likely significantly impact the remaining CDF ecosystem because of significant overlap between the CDF ecosystem and the large area of private managed forest land on southern Vancouver Island (*see Figure 1*).

Unlike the more encompassing Forest Land Reserve system, the PMFLA is a voluntary opt-in scheme.[21] Private forest owners can designate their land as private managed forest land under the *Assessment Act* and receive a significant tax break.[22] Under the PMFLA, a landowner makes a 15-year commitment to maintaining the land under the PMFLA. If a landowner exits the scheme early, they are required to pay a small penalty (equivalent to or less than the tax break they have received) on a sliding scale based on how many years their land has been designated. Beyond the small penalty, there is nothing stopping a landowner from exiting the private managed forest land scheme, clearcutting, and selling land off to developers.

Privately owned managed forest land was at one time automatically protected in a provincial Forest Land Reserve, much like the Agricultural Land Reserve. However, in 2002, the BC Liberal government replaced the mandatory Forest Land Reserve with the *Private Managed Forest Land Act*. Coincidentally, forest companies have been major financial supporters of the BC Liberal Party that brought in the voluntary PMFLA regime. The BC Liberal Party received over $835,000 in donations from three of the major private forest companies in BC between 2005 and 2017.[23]

Under the PMFLA, private managed forests are not subject to true public and fully independent oversight and governance. The PMFLA is administered by the Managed Forest Council ("Council"), an independent provincial corporation established by the PMFLA.[24] The Council's stated objective is "to encourage forest management practices on private managed forest land, taking into account the social, environmental and economic benefits of those practices."[25] However, the Council's structure is problematic. The Council is funded entirely by fees paid by private managed forest owners, and is insufficiently funded to carry out adequate enforcement. A key issue is that the Council has an inherent

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[21] Land classified as managed forest land under the *Assessment Act* when the *Forest Land Reserve Act* came into force was automatically included in the FLR (with some exceptions). West Coast Environmental Law, Guide to Forest Land Use Planning (2001) online: <https://www.wcel.org/sites/default/files/publications/Guide%20to%20Forest%20Land%20Use%20Planning%20-%20Updated%202001.pdf> [Guide to Forest Use Planning] at 4-6.

[22] For the purpose of assessing property taxes, BC Assessment assesses managed forest land using a two-step process. In Step One they assess the value of the bare land, without trees, by applying a schedule of regulated rates. Step Two involves assessing the value of timber cut from the land and adding this to the value of the bare land. The value of the timber harvested in any year is determined using the scale of the timber under the *Forest Act*, RSBC 1996, c 157, and added two years later to the property's assessed value. To do these assessments, BC Assessment utilizes schedules of value for land and timber contained within the Managed Forest Land and Cut Timber Values Regulation, BC Reg. 90/2000. Anecdotally, Carrie Saxifrage of Cortes Island has reported that while she paid about $62 in taxes for each of her 20 inland acres in 2011, Island Timberlands paid between $5 and $6 for each of its inland acres, Carrie Saxifrage, "Woah, Neighbour: How Privately Managed Forest Land Owners Broke the Social Contract" (2013) Silviculture Magazine, online: <https://www.silviculturemagazine.com/articles/summer-2013/whoa-neighbour-how-privately-managed-forest-land-owners-broke-social-contract>.

[23] Elections BC, Financial Reports and Political Contributions System, online: <https://contributions.electionsbc.gov.bc.ca/pcs/Welcome.aspx>. Western Forest Products donated $400,767 between 2005 and 2017, TimberWest donated $259,247 from 2005 to 2010, and Brookfield Asset Management (parent company of Island Timberlands) donated $176,400 between 2005 and 2017.

[24] *Private Managed Forest Land Act*, SBC 2003 c 80 s 4. The Council consists of five members: two of which are appointed by the provincial government, two members are elected by private managed forest landowners, and a chair is jointly appointed by the other four council members.

[25] *Private Managed Forest Land Act*, SBC 2003 c 80 s 5.

conflict of interest – it is tasked with both protecting the private interests of the forest owners and protecting public resources.

Local communities don't get any real say either. The PMFLA specifically provides that local governments cannot enact bylaws that will interfere with forest management activity on private managed forest land.[26]

Today – in the absence of a forest land reserve or any local government authority regarding private managed forest land – this industry-friendly act leaves commercial forestry companies free to determine for themselves what the "best" use of land is. This leads to a market-driven approach, rather than a decision-making process that includes objective consideration of public values and long-term sustainability. This may place at risk both ecological values and long-term maintenance of forests and forestry jobs.

[26] *Private Managed Forest Land Act*, SBC 2003 c 80 s 21.

Part 2: The *Private Managed Forest Land Act* in Practice

Logging on privately owned land has significant impacts on public resources. A 2008 report from the Canadian Centre for Policy Alternatives found that private managed forests were being logged at unsustainable rates, damaging streams and rivers, and contributing to biodiversity loss.[27] In some cases, private logging is done at twice the rate that can be sustained according to forest industry auditors.[28] Large volumes of privately logged wood are exported raw rather than being processed by mills in BC, and 62% of raw log exports from the coast are from private forests.[29] Managed forest land is also being sold to real estate developers, or to be used for other non-forestry purposes.[30]

There are numerous examples of private managed forest land activities across BC that highlight the environmental degradation occurring under the PMFLA.

Riparian Zones, Water Quality and Fish Habitat

Rick James has asserted in the *Comox Valley Record* that Comox Valley taxpayers had to pay half a million dollars for flood remediation in the Courtenay River due to damage from intensive PMFL logging along the rivers headwaters.[31]

Conservation of riparian areas is critical to the conservation of biodiversity.[32] Creating riparian buffers along lakes, rivers and streams can protect water quality, fish, aquatic biodiversity, riparian dependent plants, and reduce flooding.[33]

Current logging practices on private land can cause debris to enter streams, which damages fish habitat. A 2002 study of steelhead salmon habitat found that numerous salmon-bearing rivers on southern Vancouver Island were damaged by logging, including the Quondam River, Oyster River, Puntledge River, Trent River, Tsable River, Little Qualicum River, French Creek, Englishman River, Nanaimo River, Chemainus River, Cowichan River and Koksilah River.[34]

The *Private Managed Forest Land Council Regulations* (PMFLCR) do not adequately protect riparian zones and water quality. The problems arising from logging on private managed forest land are typically not caused by noncompliance with the rules, but rather are the result of weak regulations.

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[27] Restoring the Public Good on Private Forestlands, supra note 13 at 8.
[28] Ibid at 4.
[29] Ibid at 5.
[30] Ibid at 17-20.
[31] Rick James, "Opinion: Dreadful policy betrayed BC forests" (May 13, 2013), Comox Valley Record online: <https://www.comoxvalleyrecord.com/opinion/dreadful-policy-betrayed-b-c-forests/>.
[32] Robert J. Naiman et al, The Role of Riparian Corridors in Maintaining Regional Biodiversity, 3 Ecological Applications 209 (1993).
[33] George Wilhere and Timothy Quinn, How Wide is Wide Enough: Science, Values, and Law in Riparian Habitat Conservation, 58 Natural Resources J 279 (2018).
[34] Restoring the Public Good on Private Forestlands, supra note 13 at 9.

The PMFLA requires retention of trees adjacent to streams based on the width of the stream and whether it bears fish or is diverted by a licensed waterworks intake (the following table summarizes the tree retention requirements for each stream class).[35] There are no protections for lakes and wetlands.[36]

Riparian Stream Classes under the PMFLA

Stream Class	Channel Width (m)	Fish bearing and/or diverted by licensed waterworks intake	Requirement to retain large riparian trees	Requirement to retain understory vegetation
A	≥ 10	Yes	30 trees per 100 m	30 m buffer
B	≥ 3 to < 10	Yes	25 trees per 100 m	30 m buffer
C	≥ 1.5 to < 3	Yes	15 trees per 100 m	10 m buffer
D	< 1.5	Yes	N/A	10 m buffer
E	≥ 1.5 and a direct tributary to a class A, B, C or D stream	No	N/A	10 m buffer
Other	All other	No	N/A	N/A

Comparatively, the FRPA has more rigorous protection for riparian areas on crown lands than the PMFLA requires on private lands (see Appendix A for a full comparison between the PMFLA and FRPA standards). Both the width of protective buffers and the quantity of preserved trees are larger under the FRPA.[37] Under the FRPA there are riparian buffer zones not only for streams, but also for wetlands and lakes.[38]

The following table summarizes requirements for riparian area protections for streams under the FRPA for comparison. No tree cutting is permitted in riparian reserve zones; there must be up to 10-20% basal coverage of trees in riparian management zones, and there are restrictions on road building in riparian management areas.[39]

Riparian Stream Classes under the FRPA

Stream Class	Channel Width (m)	Fish bearing	Riparian Reserve Zone Width (m)	Riparian Management Zone Width (m)	Riparian Management Area Width (m)
S1a	>100	Yes	0	100	100
S1	20 – 100	Yes	50	20	70
S2	5 – 20	Yes	30	20	50
S3	1.5 – 5	Yes	20	20	40
S4	< 1.5	Yes	0	30	30
S5	> 1.5	No	0	30	30
S6	< 3	No	0	20	20

[35] *Private Managed Forest Land Regulations*, BC Reg 182/2007, s 27-30.
[36] Jon Davies, Private Managed Forest Land Council Five Year Review (November 2009) <http://mfcouncil.ca/wp-content/uploads/2014/09/PMFLC-5-Year-Review-final-report.pdf> [PMFLC Five Year Review] at 5.
[37] *Forest Planning and Practices Regulation*, BC Reg 262/2018 s 47, 50-52.
[38] *Forest Planning and Practices Regulation*, BC Reg 262/2018 s 48-49.
[39] *Forest Planning and Practices Regulation*, BC Reg 262/2018 s 50-52.

In 2012, the Managed Forest Council conducted an audit of private managed forest land to assess if the PMFLCR sufficiently met the five management objectives set in the PMFLA. The report by the Council concluded that the audited private managed forests were complying with, and often exceeding the tree retention requirements for riparian areas.[40] While it may be considered positive that private forest landowners are voluntarily maintaining standards well beyond the regulations, this flags a concern that the regulations themselves are too lax. The 2012 audit could not conclude whether the regulated minimums adequately protected streams because the audited streams were retaining significantly more trees than legally required by the PMFLA.

Indeed, the 2012 audit made a cautionary note that maintaining the bare minimum of trees for class A streams may not sufficiently protect fish habitat.[41] Additionally, the audit cautioned that the total lack of requirement for tree retention on class E streams could lead to channel instability and may not protect downstream fish and water resources.[42] The auditors also noted that sedimentation occurring in streams from roads could be "a problem" if there were multiple crossings on the same stream or within the same watershed.[43]

Drinking Water Issues on PMFLA Lands

Protecting drinking water is one of the most urgent objectives that forestry regulation must address. Clean drinking water is a fundamental human need recognized by the United Nations as a human right that is integral to the enjoyment of life and the realization of all other human rights [UN Resolution 64/292 (2010)]. In 2017, the Managed Forest Council initiated a study to assess if the PMFLA and regulations adequately meet the objective of protecting drinking water. The Council surveyed private managed forest landowners about their forest practices, and many of the surveyed landowners commented that the *Private Managed Forest Land Council Regulations* riparian retention requirements are too low.[44] Indeed, some of the surveyed landowners reported that they were voluntarily using FRPA standards.

The 2017 study also surveyed water license users whose water supplies were downstream from private managed forest land. Of those surveyed, about half reported a change to their water quality in the past 10 years, and half of those attributed the change (at least in part) to activities on adjacent private

[40] Managed Forest Council, Managed Forest Program: Effectiveness of the Council Regulation In Achieving the Forest Management Objectives of the *Private Managed Forest Land Act* (October 2013), online (accessed June 16, 2019): <http://mfcouncil.ca/wp-content/uploads/2014/09/pmflc_audit_report_2013_final_web.pdf> [PMFLC Effectiveness Audit 2013]. The audit found that all of the audited class A, B and C streams exceeded the minimum tree retention requirements. For class A streams, 9 of the 10 audited streams exceeded the minimum requirement by 100% or more. While there were no regulatory requirements to do so, 13 of the 15 audited class D, E, and unclassified streams retained large riparian trees.
[41] Ibid at 16.
[42] Ibid at 16.
[43] PMFLC Effectiveness Audit 2013, supra note 40 at 10. There were 524 kilometres of road constructed by private landowners from April 1 2017 to March 31 2018. Council Annual Report 2017/18, supra note 3. In 2017/18, the Managed Forest Council was notified by private forest owners of 14 debris flows into streams, Council Annual Report 2017/18, supra note 3 at 10. Such debris flows can create significant risk to fish and to the environment.
[44] Greg Rowe, Results of a Survey of Managed Forest Operations Protecting Drinking Water Quality (December 2016), online (accessed June 16, 2019): <http://mfcouncil.ca/wp-content/uploads/2017/07/MFC-Water-License-Survey-web.pdf>. One landowner found that in order to consider wind-throw risks, stand species and stand density, higher levels of retention along riparian areas are required (at 14).

managed forest land.[45] A "significant number" of those surveyed commented that there should be more tree retention required in riparian areas that supply drinking water.[46]

[Note that in July 2019, a new provision of the *Private Managed Forest Land Council Regulations* will come into effect, which will increase protection for drinking water supplies on private managed forest land.[47] Previously, the regulations under the PMFLA protected only licenced waterworks intakes, not individual water licenses. After the amendment, the regulations will extend protection to all drinking water licenses, as in crown forests.[48]

The Elk Valley

Logging on private managed forest land in the Elk Valley highlights the need for changes to the PMFLA regime. Canwel owns approximately 55,000 hectares of private managed forest land in the Elk Valley region, which makes up 1/8 of the valley.[49] Canwel is harvesting its private managed forests at heavy rates that suggest Canwel intends to use the land for short-term forest exploitation rather than long-term sustainable forestry. It has been estimated that Canwel's rate of harvest is approximately *eight times greater* than on crown forest land in the same area.[50]

The Elk Valley is a critical part of the Yellowstone to Yukon ecosystem and has a high conservation value due to its role connecting ecosystems and wildlife habitat – mismanagement of the land could fracture large carnivore habitat. There are a multitude of human activities placing stress on the Elk Valley, degrading important environmental resources and impacting grizzly bear populations. A comprehensive study of the valley found that private managed forest land is likely causing environmental degradation from high levels of timber harvesting and road building.[51]

Nearby, the town of Fernie has a large tourism industry and is known for its scenic mountain landscape. The community is worried about the impacts clear cutting will have on outdoor industries like skiing and mountain biking.[52]

Read Island

Island Timberlands owns approximately 370 hectares of land on Read Island and began logging activities without community consultation in 2017.[53] In January 2019, a group of Read Island residents prepared a report outlining the negative effects of Island Timberlands' logging on private managed forest land on

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[45] Ibid at 18.
[46] Ibid at 18.
[47] Managed Forest Council, "Regulatory Changes take Effect July 1, 2019" (announced April 15, 2019), online (accessed June 16, 2019) <http://mfcouncil.ca/regulatory-changes-july-2019/>.
[48] On crown forest land, the *Forest Planning and Practice Regulations* require forest operators not to damage licensed waterworks, which includes any water supply intakes licensed under the *Water Sustainability Act* and permits issued under the *Drinking Water Protection Act*, see *Forest Planning and Practices Regulation*, BC Reg 14/2004 s 1 and 60(1).
[49] Eddie Petryshen, "Canwel Brief Overview," Wildsight (unpublished).
[50] Crown forest land in the Elk Valley has an annual allowable cut of 1.3 million cubic metres for the 1.6 million ha of crown land. Canwel's forests are only 55,000 ha, but their annual cut ranges from 300,000 to 400,000 cubic metres. Eddie Petryshen, "Canwel Brief Overview," Wildsight (unpublished).
[51] Elk Valley Cumulative Effects Management Framework, "Old and Mature Forest Cumulative Effects Assessment Report," draft (May 4, 2018).
[52] In February 2019, 175 citizens attended a public meeting regarding private logging near Fernie. Phil McLachlan, "CanWel defends logging practices at Fernie public forum" (February 13, 2019; accessed June 16, 2019), Trail Times online: <https://www.trailtimes.ca/news/canwel-defends-logging-practices/>.
[53] Surge Narrows Forest Advisory Committee, Island Timberlands on Read Island: A year of broken promises and community distress, January 2019 (unpublished) [Read Island Community Report Card].

Read Island. For example: visual impacts to the landscape, harm to ecosystems, impacts on the tourism industry, and impacts on local property values.

The cumulative effects of decades of logging by multiple companies have led to large clearcut areas on Read Island. The community reports that there have been significant impacts on Fell Creek, a local creek that bears fish and supplies drinking water to residents. It is reported that Fell Creek now runs brown with mud when it rains and dries up in the summer.[54] Read Island residents have reported that Island Timberlands logged, built roads through, and drove machinery through wetlands.

Island Timberland's puncheon road in a wetland on Read Island[55]

Cottonwood Lake

Owners of private forest land who choose not to register under the PMFLA scheme have even fewer standards to comply with than private managed forest land. Residents of Cottonwood Lake, a community near Nelson, BC reported that they were horrified when they realized that 600 hectares of local forest was privately owned land and that the landowner planned to clearcut the woods without public notice or consultation.[56]

The forest in question is adjacent to a park, cross-country ski trails, and a lake. The forestland is steep and residents are concerned that clearcutting may cause landslides and flooding. Additionally, residents

[54] Ibid.
[55] Ibid.
[56] Judith Lavoie, "BC Community Raises $50k to save a beloved forest, but it may be too little, too late" (March 5, 2019; accessed June 16, 2019), The Narwhal online: <https://thenarwhal.ca/bc-community-raises-50k-to-save-beloved-forest-but-may-be-too-little-too-late/>.

are concerned about impacts to wildlife habitat since the wetlands at the head of Cottonwood Lake are a main migratory corridor for grizzly bear populations. Residents were quick to react to news that the lands were planned to be clearcut and raised $50,000 in one month to oppose the logging.[57]

Residents have accused the owner of these lands, Mike Jenks, of being in the "strip and flip business," of buying private land, clearcutting it, and selling the cleared land for development, since the 1990s.[58]

This situation shows the need to regulate all private land forestry, not just companies that have chosen to opt into the PMFLA regime.

Shawnigan Lake

Nearly 75% of the forest surrounding Shawnigan Lake is privately owned.[59] The largest two landowners in the Shawnigan Watershed are private forest companies: TimberWest and Island TimberLands. Since the early 2000s, an estimated 65% of the mature forest in the Shawnigan watershed has been harvested.[60] Shawnigan Lake residents have observed logging under the PMFLA and are concerned about impacts on their water supply.[61] For example, residents noticed a change in their water tables and septic systems for years after TimberWest and Weyerhaueser logged Mount Wood.[62]

A non-profit group, the Shawnigan Basin Society, is actively working to protect the Shawnigan Watershed and drinking water supply.[63] The Shawnigan Watershed has been impacted by private logging, gravel pits, contaminated soil dumping, and a loss of biodiversity. The Shawnigan Basin Society has recognized the need to address the cumulative effects of all of the activities impacting the watershed and wants to implement a watershed-based management plan.

In Shawnigan Lake, the private logging companies have agreed to cooperate with the Shawnigan Basin Society and work collaboratively on long-term resource management planning. While this is a positive example of a grassroots community group implementing change, the Shawnigan Basin Society was forced to take action to fill a legislative void. This demonstrates that there is a need for a local government body to have authority over private managed forest land activities and their effects on watersheds.

Port Alberni

Port Alberni has suffered from egregious logging practices on private managed forest land for over a decade. In 2004, the government permitted the removal of privately owned forest land from Tree Farm Licence (TFL) 44 near Port Alberni. Some 78,000 hectares of private land were removed from the TFL

[57] Ibid.
[58] Ibid. Jenks made the following comments to the media in response to the public outcry regarding the planned logging near Cottonwood Lake: "It's an emotional argument they use, not based in science. It's just trees growing back. When you plant your garden and have your peas and potatoes and carrots and if you don't harvest them when they are ripe, they just die and it's the same with the forest. It's just a crop that, if it's looked after and replanted, will just grow again and again and again."
[59] Mary Desmond, "Clearcut Logging Diminishes Shawnigan Lake Watershed" (August 22, 2012; accessed June 16, 2019), Watershed Sentinel online: <https://watershedsentinel.ca/articles/clearcut-logging-deminishes-shawnigan-lake-watershed/>.
[60] Ibid.
[61] Ibid.
[62] Ibid.
[63] Shawnigan Basin Society, "The Shawnigan Basin Society" (accessed June 19, 2019), website: <http://www.shawniganbasinsociety.org/about.html>.

and converted to private managed forest land.[64] When bundled with crown land in a TFL, the privately owned land had been subject to the stricter crown standards. Citizens of Port Alberni raised the following concerns about the removal of private land from the TFL:

- concern about the ease of log export from private managed forest lands permitted by federal regulations;
- concern about loss of access to trails and Crown assets resulting from the removal of private lands from TFL 44 and, more generally, the lack of established rights-of-way through large holdings of private forest lands;
- concern about environmental and forest management standards applicable to private managed forest lands.[65]

Since its removal from the TFL and conversion to private managed forest land, citizens and conservation groups have continued to voice concerns about the logging of McLaughlin Ridge, a Coastal Douglas Fir old growth forest near Port Alberni which is now owned by Island Timberlands.[66] McLaughlin Ridge is a critical habitat for wintering deer and endangered goshawks, and a part of the mere 1.2% of Coastal Douglas Fir ecosystem old forest that remains on Vancouver Island.[67] As well, it is the headwaters for the China Creek watershed, which is the drinking water supply for approximately 18,000 Port Alberni residents.[68] Despite its ecological significance and the importance of the watershed, Island Timberlands is free to clearcut the area under the PMFLA.[69]

The following photo was reportedly taken on the boundary of the Bainbridge watershed, a secondary water source for Port Alberni, and depicts logging done by Island Timberlands in 2016:

[64] Sierra Club BC, "Deception, Denial & Determination: The Alberni Valley Watershed Story" (accessed June 16, 2019) website: <https://sierraclub.bc.ca/deception-denial-determination-the-alberni-valley-watershed-story/> [Alberni Valley Watershed Story].
[65] Auditor General of BC, Removing Private Land from Tree Farm Licences 6, 19 & 25: Protecting the Public Interest? (2008) Office of the Auditor General of BC, 2008/2009 report 5 <http://www.bcauditor.com/sites/default/files/publications/2008/report5/report/removing-private-land-tree-farm-licences-6-19-25.pdf> [Auditor General Report 2008] at 53.
[66] Judith Lavoie, "Battle revealed over use of sensitive Island forest near Port Alberni" (September 21, 2012; accessed June 16, 2019), *Times Colonist* online: <https://www.timescolonist.com/news/battle-revealed-over-use-of-sensitive-island-forest-near-port-alberni-1.10365> [Battle revealed over use of sensitive Island forest near Port Alberni].
[67] Vancouver Island Big Trees, "McLaughlin Ridge Old Growth" (September 22, 2012; accessed June 16, 2019), online: <https://vancouverislandbigtrees.blogspot.com/2012/09/mclaughlin-ridge-old-growth.html>. Sierra Club BC, "State of British Columbia's Coastal Rainforest: Mapping the Gaps for Ecological Health and Climate Protection" (December 2009) at p. 18, online: <https://sierraclub.bc.ca/wp-content/uploads/2015/08/CoastForestReport2009_print_corrected.pdf>.
[68] Alberni Valley Watershed Story, supra note 64.
[69] Battle revealed over use of sensitive Island forest near Port Alberni, supra note 66.

Source: Chris Alemany[70]

A majority of the watersheds in the Alberni Valley are on private managed forest land.[71] Logging on private managed forest land in the Beaufort Range watershed within the Port Alberni valley sparked community protests in 2006.[72] Community members were concerned that logging in the Beaufort Range by Timberwest was causing water pollution, land erosion, road damage, and job loss.[73] The Beaufort Water Improvement District suffered from five boil water advisories, and Woodward Creek, a fish-bearing creek, was damaged from soil and sediment.[74]

In 2007, the BC government prepared an extensive report about the logging industry in Port Alberni.[75] The report recommended that the Managed Forest Council review forest practices on private managed

[70] Chris Alemany, "LETTER: Dec 20 storm proves Port Alberni's watershed needs protection" (January 16, 2019; accessed June 16, 2019) Alberni Valley News online: <https://www.chrisalemany.ca/2019/01/16/storm-proves-its-time-for-the-city-to-take-decisive-action-to-protect-our-watershed/>.

[71] Anita Francoeur, "Mapping Our Legacy", Save our Valley Alliance Public Education Committee (Port Alberni, BC, February 2011), online: <https://www.acrd.bc.ca/cms/wpattachments/wpID70atID1008.pdf> [Save our Valley Alliance] at 67.

[72] Quentin Dodd, "New War in Woods? Battle Front Shifts" (August 16, 2006; accessed 25 March 19), The Tyee online: <https://thetyee.ca/News/2006/08/16/NewWar/print.html>.

[73] Ibid.

[74] Ibid.

[75] Macauley & Associates Consulting, "Review of the Port Alberni Forest Industry" (April 30, 2007), BC Ministry of Forests and Range Operations Division, online: <https://www.portalberni.ca/sites/default/files/doc_library/Port%20Alberni%20Forest%20Industry%20Review.pdf>. While the report did not do a technical analysis of the impacts of private managed forest land on Port Alberni, it collected concerns raised by community members and made recommendations regarding the PMFLA. The community was not confident in the results-based approach of the PMFLA, and observed that the regulation of private forest land was insufficient compared with crown forest land. The visual impacts of private managed forest harvesting near Port Alberni was described as being "particularly unfortunate) (at 51).

forest land and make recommendations to enhance regulatory standards. The report commented that the results-based regulations under the PMFLA created "potential risks" to environmental values in situations where damage would not be easily remediable (for example, damage done to fish-bearing steams). Interviewed community members raised concerns that the size of cutblocks reduced biodiversity, and that over-harvesting was leading to reduced wildlife habitat, reduced tourism and recreation, and a potential future loss of employment.[76]

Logging in McLaughlin Ridge Source: Vancouver Island Big Trees[77]

Cumberland

The town of Cumberland located on Vancouver Island is surrounded by a mature Coastal Douglas Fir forest that includes wetlands, two watershed areas, and salmon bearing creeks. Much of the forest around the town is private managed forest land and slated for harvest. Since the PMFLA does not protect the valuable forest resources the community relies on, a group of citizens has taken it upon themselves to preserve the forest.[78] To the group, the surrounding forest is "worth more to [the] community standing than as timber."[79] The group has raised over $1 million to purchase areas of

[76] Ibid at 32.
[77] Vancouver Island Big Trees, "McLaughlin Ridge Old Growth" (September 22, 2012; accessed June 16, 2019), online: <https://vancouverislandbigtrees.blogspot.com/2012/09/mclaughlin-ridge-old-growth.html>.
[78] Cumberland Community Forest Society, "What We've Achieved" (accessed June 16, 2019), online: <https://www.cumberlandforest.com/what-weve-achieved/>.
[79] Ibid. The Cumberland Community Forest Society was formed with a mission to "purchase and protect the Cumberland Forest for its ecological, historical, economic and recreational values."

surrounding forest land, but are limited by money. In 2005, the group was unable to prevent logging of a 600-hectare forest on the border of Cumberland due to the $3.8 million price.[80]

2008 Auditor General Investigation

There was large public outcry following a decision of the Minister of Forests to approve the removal of 28,000 hectares of private forest land from three tree farm licences (TFLs) held by Western Forest Products in 2007. The Auditor General for BC reviewed the decision and concluded that the Minister did not adequately consider the public interest.[81]

The Auditor General's report highlights many of the key issues with the laws governing the management of private forest land in BC. When private land is bundled in a TFL along with crown land, the forestry practices on private land are subject to a detailed management plan.[82] Once removed from TFLs, private forest lands fall under the "less stringent requirements of the PMFLA" which "can have economic, environmental and social consequences."[83]

The Auditor General worked with the Ministry of the Environment to prepare a table that compares some of the legislative requirements of the FRPA and the PMFLA (see table below.)

[80] Andrew Findlay, "Private Forests: One Town's Clearcut Dilemma" (January 10, 2005; accessed June 16, 2019), The Tyee online: <https://thetyee.ca/News/2005/01/10/PrivateForestDilemma/print.html>.

[81] Auditor General Report 2008, supra note 65 at 7. The TFLs included some of the last tracts of private land remaining in TFLs on Vancouver Island. From 1999 to 2007, approximately 180,000 hectares of private land were removed from TFLs (Ibid at 20).

[82] Ibid at 1.

[83] Ibid at 53. In its report, the Auditor General listed some of the likely negative outcomes of removing the private forestlands from TFLs. While the Auditor General was commenting specifically on the impacts of the decision at issue, the concerns raised apply broadly and highlight some of the issues with how private managed forest land is managed. The concerns raised were that:

- individuals and organizations have expressed dissatisfaction with the process and the lack of opportunity for input;
- the Capital Regional District reacted to the decision with new bylaws in an attempt to prevent uses of the land that it deemed incompatible with its community plans for the area [Note, however, that local governments cannot regulate forestry];
- important and longstanding forestry research sites, some of which may not be replaceable, may be lost;
- populations of deer and other ungulates in the removed areas will likely decline;
- tourism and recreational opportunities may be lost;
- local residents are concerned by the potential for negative visual impacts and degraded water quality;
- First Nations are concerned because their asserted territories include some of the land involved in the decision and because the decision places more pressure on the crown land remaining in the TFLs. At least one First Nation group is taking legal action as a result of the decision; and other stakeholders see the decision as breaking a long-standing arrangement between the licensee and the province. Ibid at 2.

Examples of Forest Management Legislative Requirements on Crown and Private Forest Land[84]

Private Forest Land in a TFL and Crown Forest Land	Private Managed Forest Land
Objectives for soils • to conserve the productivity and the hydrologic function of soils (FPPR sec. 5)	• to protect soil productivity on harvested areas (PMFLA sec. 12)
Objectives for wildlife • to conserve sufficient wildlife habitat in terms of amount of area, distribution of areas and attributes of those areas, for • the survival of species at risk, • the survival of regionally important wildlife, and • the winter survival of specified ungulate species (FPPR sec. 7) • BC currently has 725 species designated as endangered or threatened (red listed).	• to facilitate the long term protection of critical wildlife habitat by fostering efforts of the government and the owners to enter into agreements for the protection of any critical wildlife habitat identified by the Ministry of Environment — Critical Wildlife Habitats (CWHs) may be established to protect species at risk if there is insufficient suitable habitat on Crown lands; must not exceed 1% of private land — 36 species at risk listed (PMFLA sec. 15 and PMFLR schedule C) • no CWHs have been designated as of March 2008
Objectives for wildlife and biodiversity — landscape level • harvest to resemble natural disturbance patterns (FPPR s.9)	• no equivalent private land requirement
Objectives for wildlife and biodiversity — stand level • to retain wildlife trees. (FPPR sec. 9.1)	• no equivalent private land requirement
Objectives for visual quality • visual quality objectives for harvesting (FPPR sec. 9.2)	• no equivalent private land requirement
Objectives for cultural heritage resources • traditional use by an Aboriginal people that is of continuing importance to that people and is not regulated under the Heritage Conservation Act (FPPR sec. 10)	• no equivalent private land requirement
Practice Requirements – landslides • primary forestry activities must not cause landslides (FPPR sec. 37)	• an owner must notify the council, within 24 hours of becoming aware that a landslide or debris flow has occurred on the owner's land, if the owner knows that the landslide or debris flow has deposited debris or sediment into a class A, B, C, D or E stream (PMFLCR sec. 26)
Practice Requirements – stream riparian classes • seven stream classes (S1A-S6) • riparian management area 20-100 metres • riparian reserve zone 0-50 metres (dependent on stream class) • riparian management zone 20-100 metres (dependent on stream class) (FPPR sec. 47)	• five stream classes (A-E) • 15-30 trees per 100 metres of stream bank (dependent on stream class) • retain non-commercial trees, understory vegetation – 10 to 30 metres (dependent on stream class) (PMFLCR secs. 27 to 30)
Practice requirements – restrictions in a riparian reserve zone (RRZ) • restricts activities in RRZ e.g. no harvesting up to 50 metres (FPPR sec. 51)	• no riparian reserve zones on private land

[84] Ibid at 69-70.

Practice requirements – restrictions in a riparian management zone (RMZ) • retention targets in RMZ e.g. retain 10% to 20%+ of standing trees up to 100 metres from stream (FPPR sec. 52)	• no riparian retention targets on private land other than as mentioned above
Practice requirements – temperature sensitive streams • prohibition on impacting temperature sensitive streams (FPPR sec. 53)	• no equivalent private land requirement except via the Fisheries Act
Practice requirements – fan destabilization • prohibition on fan (slope) destabilization (FPPR sec. 54)	• no equivalent private land requirement other than the general prohibition against introducing sediment to fish streams and streams with water licence intakes
Practice requirements – maximum cutblock size • cutblock not to exceed 40 to 60 hectares (FPPR sec. 64)	• no equivalent private land requirement

Note that the current chair of the Managed Forest Council disputes some of the above comparisons.[85]

[85] Rod Davis, Managed Forest Council chair raised concerns that the Auditor General's comparison table is "incomplete in a way that biases understanding of requirements to protect fisheries and drinking water streams on private managed forest land" and that is unclear whether the comparison is done based on the 2004 PMFLA regulations, or the "on the significant amendments made in 2007 which requires forest management activities to not have a material adverse effect on fish habitat or water that is diverted by a licensed waterworks intake" (personal communication, April 5, 2019).

Part 3: Recommendations for Reform

The law governing private forests should be changed to incorporate the following recommendations.

1) SET CLEAR AND ENFORCEABLE ENVIRONMENTAL STANDARDS

British Columbia needs new legislation that ensures forests are logged sustainably, without degrading water, riparian areas, wildlife habitat, and soil. The law should set out clear standards for forestry management.[86]

At a minimum, privately owned forests should be held to the same practice standards as crown forest land under the *Forest and Range Practices Act* (FRPA). In fact, when the *Forest Practices Code* was originally proposed in the 1990s, the Environment Minister Moe Sihota announced that private lands would be governed by the same rules as public lands.[87] The *Forest Practices Code* originally enabled cabinet to enact regulations for forest practices on private land, but cabinet did not exercise its authority to do so.[88] It is important to note that there are jurisdictions where one set of forest management regulations apply to both crown and private land – for example, our neighbouring jurisdiction of Washington State.[89] It is also important to note that the Union of BC Municipalities endorsed a resolution in 2018 which called on the province to amend the PMFLA to increase standards to match those on crown lands.[90]

It is particularly essential that the management objectives on private land be expanded to include all of the resource values identified by the FRPA including biodiversity, visual quality, wildlife, forage and plant communities, and cultural heritage. While the FRPA has ten management objectives, the PMFLA has only five.[91] As mentioned, the PMFLA does not include objectives for:

- Biodiversity requirements at the stand or landscape level, such as
    - Wildlife habitat areas,
    - Old growth management areas,
    - Wildlife tree retention requirements,
    - Ungulate winter range protection with basal area retention requirements,
    - Grizzly corridors, or
    - Maximum road density requirements to protect grizzly bears and other wildlife;
- Visual quality objectives;
- General wildlife objectives (the PMFLA accords limited protection to designated critical habitat for endangered species);

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[86] When assessing how effective a law is at protecting the environment from a policy perspective, 3 factors should be considered: scope, prescriptiveness, and the specific policy settings (i.e. in terms of qualitative/quantitative performance required). Devi Judge-Lord, Constance McDermott and Benjamin Cashore, "Do Private Regulations 'Ratchet Up'? A comparative classification framework (2019), Organization and Environment online: <https://apw.polisci.wisc.edu/APW_Papers/JudgeLord%20APW%20Private%20Regulation.pdf>.

[87] Mark Haddock, general counsel with the Forest Practices Board (personal email communication).

[88] Guide to Forest Use Planning, supra note 21 at 4-5.

[89] Washington State Department of Natural Resources, Forest Practices Illustrated: A Simplified Guide to Forest Practices Rules in Washington State (2009), online: <http://courses.washington.edu/fm323/NotesNotes/fp_fpi_complete.pdf> at 11.

[90] 2018 Union of BC Municipalities Resolution B41, *Private Managed Forest Land Act* Amendment, UBCM 2018 Resolutions Book at 123 [2018 Union of BC Municipalities Resolution B41].

[91] Forest Planning and Practices Regulation, BC Reg 14/2004 s 5-10.

- Sustainable harvest objectives (i.e. annual allowable cuts); or
- Cultural heritage protection.[92]

Problems with environmental degradation from forestry activities aren't isolated to private managed forest land – for many scientists, the FRPA crown land regime also does not accord sufficient protection to ensure that forestry activity in BC is conducted sustainably. However, the FRPA is clearly superior to the PMFLA.

Even better would be to incorporate the superior environmental standards from the Forest Stewardship Council – or from the province's repealed *Forest Practices Code*.

In addition to improved objectives, there must be corresponding prescribed *standards*. In forestry, performance based regulations based on vague "objectives" aren't effective at protecting things like water quality – because it is difficult to prove that a specific forest practice caused a particular violation in a given body of water.[93] Further, experts note that it is often not possible to adequately monitor and enforce water quality objectives.[94]

There may be concerns that stricter forestry regulations on private land would pose a burden on small forest operators. These concerns could be alleviated by following the example of Washington State, which has comprehensive forestry standards that apply equally to public and private lands, but specifically provides support and exceptions for small private forest owners.[95]

See Appendix A for a comparison of the management standards for the PMFLA, the FRPA, the Forest Stewardship Council, and Washington State's *Forest Practices Act*.

2) ENSURE RETENTION OF FORESTS – SUBDIVISION PAVEMENT IS THE LAND'S LAST CROP

One key goal of the PMFLA regime should be to ensure long-term sustainable forestry and discourage urban sprawl into the managed forest land base. This goal is particularly critical in the new climate emergency era, where wildfire danger means that forests should not generally be developed and urbanized. Thus, the PMFLA regime must ensure that BC's forest lands are not lost to non-forestry purposes (so-called "higher and better uses"). Under the current regime, the only mechanism to encourage private forest owners to maintain their land as forest is a tax incentive. If the environmental standards under the PMFLA are increased and nothing else changes, it could have the unintended effect of incentivizing forestry companies to convert their private managed forest land to non-forestry uses. Therefore, a law reform solution must be mindful of dueling needs: there must be increased

[92] Rod Davis, Managed Forest Council chair (Personal communications, October 15, 2018).
[93] Julie Williams, The Design of Performance-Based Natural Resource Regulation: Lessons from the B.C. Experience (2005) 18:1 Canadian Journal of Administrative Law & Practice 61-88 <https://search.proquest.com/docview/220302406?pq-origsite=gscholar>.
[94] Ibid. To do so effectively, continuous monitoring would be required to account for natural changes in water quality over time and be able to establish a link between a forestry activity and a breach of the water quality objectives.
[95] In Washington, there are simplified rules that apply to landowners with less than 80 acres of forest, or those who harvest less than 2 million board feet of wood per year. Washington has a Small Forest Landowner Office that acts as a resource for small landowners. For example, there is free technical assistance available for those who need help understanding and applying the Forest Practices Rules. As well, there is a cost-sharing program which provides funding to small forest owners to repair infrastructure to support fish. Washington State Department of Natural Resources, "Forest Practices Illustrated" (2017), online: <https://www.dnr.wa.gov/forest-practices-illustrated>; Washington State Department of Natural Resources, "The Family Forest Fish Passage Program", online (accessed June 16, 2019) <https://www.dnr.wa.gov/fffpp>.

environmental management standards to ensure private logging practices are done sustainably, and there must be an incentive for private landowners to maintain their land as private managed forest land.

One method to ensure that privately owned forests are protected from being developed into urban sprawl would be to reinstate a Forest Land Reserve (FLR). Under the *Forest Land Reserve Act*, designated crown and private forest lands were protected in a Forest Land Reserve, similar to the Agricultural Land Reserve.[96] Land classified as managed forest land under the *Assessment Act* when the *Forest Land Reserve Act* came into force was automatically included in the FLR (with some exceptions).[97]

The FLR was developed to address concerns that large areas of private forest land were being subdivided and sold as real estate.[98] Additionally, the FLR sought to offer certainty to forestry workers that certain land areas were dedicated to forestry purposes.[99] Private forest land in the FLR could only be removed upon application to the commission, and the commission could only approve the removal of land if satisfied that removal was in the public interest.[100] The commission was required to consider any recommendations made by local government regarding the removal, as well as the effect of removal on adjacent forest reserve land.[101] Additionally, the commission could elect to consult with First Nation groups, and affected community groups to determine if removal was in the public interest.[102]

An alternate to restoring the Forest Land Reserve could be to incentivize landowners to designate their privately owned land as managed forest land by:

- increasing the tax deduction available under the PMFLA; and
- increasing the penalty for exiting the private managed forest land designation.

For example, the State of California has a model to preserve agricultural land that imposes a penalty of up to 25% of the improved sales value of the land and 25% of the value of the improvements to the land for landowners who redevelop land for a non-farming use before the end of their contract.[103] Under the PMFLA, landowners who exit the scheme before the 15 years mark pay a fee that is *at most* equivalent to the property tax they would have paid had their land not been designated as private managed forest land.[104]

The province could use other schemes, such as entering conservation agreements or easements with private landowners to conserve forested areas with high ecological or social value. For example, Washington State has a Forestry Riparian Easement Program that reimburses small forest landowners for the value of trees on their lot in riparian areas in exchange for signing a 50-year conservation easement.[105] The Vancouver Island Water Watch Coalition suggests that the BC government create a

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[96] *Forest Land Reserve Act* (repealed), RSBC 1996 c 158.

[97] In 2001, the FLR held 920,000 hectares of private land and 15,000,000 hectares of crown land. The FLR was administered by the Land Reserve Commission, a public commission established under the *Agricultural Land Commission Act*. Guide to Forest Use Planning, supra note 21 at 4-4, 4-6.

[98] Guide to Forest Use Planning, supra note 21 at 4-4.

[99] Ibid at 4-4.

[100] *Forest Land Reserve Act* (repealed), RSBC 1996 c 158 s 18 and 19(1).

[101] *Forest Land Reserve Act* (repealed), RSBC 1996 c 158 s 19(1)(a).

[102] *Forest Land Reserve Act* (repealed), RSBC 1996 c 158 s 27.

[103] Restoring the Public Good on Private Forestlands, supra note 13 at 28.

[104] The fee varies depending on the number of years the property was part of the scheme. The longer land is designated under the act, the smaller the fee is. If land is designated for 5 or less years, then the exit fee is equivalent to the tax savings received. Private Managed Forest Land Regulation, BC Reg 371/2004 s 2.

[105] Small Forest Landowner Forestry Riparian Easement Program, WAC 222-21. The program applies to trees adjacent to streams, wetlands, lakes, ponds, or unstable slopes.

Community Drinking Watershed Investment Fund to purchase private managed forest land within watersheds to protect drinking water supplies.[106] The Canadian Centre for Policy Alternatives has suggested that landowners who sell private forestland be required to return a portion of public forest holdings to the province for conservation purposes.[107]

3) ENSURE ADEQUATE CONSIDERATION OF CUMULATIVE EFFECTS – AND COMPREHENSIVE LAND MANAGEMENT

The PMFLA does not adequately consider the impacts of cumulative effects on affected landscapes.[108] According to the Auditor General for BC, "managing the cumulative effects of human activities is important because the ability to derive long-term benefits from the land requires an underlying natural resource system that is healthy and sustainable."[109] Inadequate consideration of cumulative effects is an issue that is pervasive among the natural resource sectors across BC and their respective government authorities.

To properly manage cumulative effects, the province should implement a comprehensive land management framework.[110] In a 2011 study, the Forest Practices Board found that cumulative effects from natural resource development are not managed or adequately considered on crown land in Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD) decisions because there are no legal requirements to assess cumulative effects for minor activities.[111]

The BC government has recognized the importance of considering cumulative effects and is currently developing and implementing a Cumulative Effects Framework in an attempt to manage cumulative effects across natural resource sectors.[112] The Cumulative Effects Framework has the potential to improve cumulative effects management, but the BC government must clearly establish how the

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[106] Vancouver Island Water Watch Coalition, "Vancouver Island Water Watch Coalition Response to Minister" (October 22, 2018; accessed June 16, 2019) <http://www.vancouverislandwaterwatchcoalition.ca/show3133a/Vancouver_Island_Water_Watch_Coalition_Response_to_Minister>.

[107] Restoring the Public Good on Private Forestlands, supra note 13 at 30.

[108] One specific example of how the PMFLA fails to consider cumulative effects is that road building practices allowed on private managed forest land may not cause harm in isolation, but there could be water quality issues if there are multiple stream crossings in the same watershed. PMFLC Effectiveness Audit 2013, supra note 30 at 10

[109] In 2015, BC's Auditor General investigated how FLNRORD addresses cumulative effects in its decision-making process. The Auditor General concluded that FLNRORD was not adequately considering cumulative effects in its decision making regarding natural resources. At the time of the investigation, the BC Government hadn't provided FLNRORD with the direction or authority required to manage cumulative effects. Auditor General of BC, Managing the Cumulative Effects of Natural Resource Development in BC (2015) <https://www.bcauditor.com/sites/default/files/publications/reports/OAGBC%20Cumulative%20Effects%20FINAL.pdf> [Managing Cumulative Effects of Natural Resource Development in BC] at 5 and 25.

[110] Ibid at 1.

[111] BC Forest Practices Board, Cumulative Effects: From Assessment Towards Management (2011) FPB/SR/39 <https://www.bcfpb.ca/wp-content/uploads/2016/04/SR39-Cumulative-Effects.pdf> at 1. The Forest Practices Board found that a land management framework must be designed carefully, and would require the government to set measurable objectives to guide land use decision making, based on public values (Ibid at 2).

[112] British Columbia, "Overview of the BC Cumulative Effects Framework" (November 2017) <https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/cumulative-effects/cef_overview_for_web_final.pdf>. The framework does not introduce new legislation. It is a set of policies, procedures, and directives to aid government bodies exercise their existing decision-making processes.

cumulative effects assessments will inform natural resource decisions.[113] A cumulative effects framework should be incorporated into the laws governing private managed forest land.

4) ENSURE INDEPENDENT OVERSIGHT – WITHOUT A CONFLICT OF INTEREST

The private forest rules should be enforced by the Ministry of FLNRORD – and subject to audits by the Forest Practices Board to ensure public accountability.[114] The Managed Forest Council (Council) has a fundamental conflict of interest. It is tasked with protecting both the private interests of private forest owners and the public values on private forest land. These interests are often at odds with each other. A 2009 independent audit of the Managed Forest Council found that "there is an ongoing need to fine-tune and improve the model to increase the likelihood that the public finds it a credible model."[115]

The current Council has the ability to initiate audits, inspections, and investigations to assess compliance with the private managed forest regulations.[116] However, the Managed Forest Council is funded entirely by fees paid by private forest land owners. Under this model, the Council is limited in its capacity to conduct thorough inspections. [117] The 2009 review of Council found that, because investigations pertain to upholding public values, there should be government funding for investigations.[118]

5) RESPECT COMMUNITIES: ENHANCE LOCAL GOVERNMENT AUTHORITY

Local governments have an enormous stake in logging within and around their communities. However, the PMFLA expressly restricts local governments from adopting bylaws or issuing permits that would have the effect of restricting a forest management activity on private managed forest land.[119] Even bylaws or permits that don't apply to private managed forest land directly but would have an indirect effect on private managed forest land activities are prohibited under the PMFLA.[120]

Local governments should be enabled to enact bylaws that affect private managed forest land operations – for example, to require public consultation prior to logging. Local governments are responsible for "[managing] assets that support the value of their communities which include sight line,

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[113] Managing Cumulative Effects of Natural Resource Development in BC, supra note 109 at 32.
[114] Marty Osberg and Brian Murphy, "British Columbia forest practices code", BC Ministry of Forests (accessed June 16, 2019) <http://www.fao.org/docrep/W3646E/w3646e0a.htm>; [BC forest practices code report] Restoring the Public Good on Private Forestlands, supra note 13.
[115] PMFLC Five Year Review, supra note 36 at 4.
[116] Council has a policy of inspecting each managed forest once every five years. Council Annual Report 2017/18, supra note 3 at 9. If there is potential non-compliance discovered upon inspection, Council may conduct an investigation. Managed Forest Council, "Compliance Inspections and Investigations Procedure Manual" (November 2016, version 2.0) <http://mfcouncil.ca/wp-content/uploads/2014/09/Compliance-Inspections_Investigations-Procedure-Manual_nov2016.pdf> at 5.
[117] In 2017/18, Council conducted 21 investigations. Of those, 14 were debris flow into streams reported by land owners. Of the 14, the council did not conduct a site visit or require follow up action for 13. Council Annual Report 2017/18, supra note 3 at 10.
[118] PMFLC Five Year Review, supra note 36 at 9.
[119] *Private Managed Forest Land Act*, SBC 2003 c 80 s 21,
[120] *Private Managed Forest Land Act*, SBC 2003 c 80 s 21(2). Local government authority is further limited because "forest management activity" is defined broadly. See *Private Managed Forest Land Regulations*, BC Reg 371/2004 s 1(2). Additionally, the prescribed list of "forest management activities" is defined broadly. See Private *Managed Forest Land Regulations*, BC Reg 371/2004 Schedule A.

municipal infrastructure, slop stability of land, and watersheds."[121] Yet, local governments lack authority to fulfill this duty when it comes to impacts on their community from nearby private forest lands. In 2018, the Union of BC Municipalities (UBCM) endorsed a resolution asking the BC government to amend the PMFLA to give local governments authority to require public consultation regarding private logging operations, and to bring the PMFLA standards in line with crown FRPA standards.[122]

The resolution states:

> *Whereas Section 21 of the Private Managed Forest Land Act is an unacceptable restriction on the authority of local governments to regulate activities on private managed forest land (PMFL);*
>
> *And whereas local governments and communities would benefit significantly from PMFL owners sharing their management commitment, operations maps, harvesting plans and supporting assessments and long-term disposition or development intentions for their land;*
>
> *And whereas PMFL regulations are not equivalent to forestry regulations that apply to Crown forest land:*
>
> *Therefore be it resolved that UBCM call on the Province to amend the Private Managed Forest Land Act and Regulations to provide local government more authority to regulate activities on PMFL; require the owners of PMFL to undertake annual consultation and sharing of management commitments, operations maps, harvesting plans and supporting assessments and long-term disposition or development intentions for land within municipal UBCM 2018 Resolutions Book 123 boundaries; and amend the Private Managed Forest Land Act and Regulations to standards that are equivalent to Crown forest land regulations.123*

Local governments have demonstrated that they are affected by and concerned with the management of private managed forest land, as is evident from their ongoing endorsement of resolutions pertaining to the PMFLA. The UBCM has previously endorsed:

- resolutions 2011-B50 and 2008-B34, which "sought to revise the Private Managed Forest Land Act and related regulations to improve forestry practices on private managed forest lands to a standard equivalent or better than Crown forest land regulations."[124]
- resolution 2010-B26, which "asked the Province to amend the PMFL Act to ensure riparian area protection."[125]

[121] Riley Wilcox, "City seeks change to private land logging regulations" (February 27, 2019) East Kootenay News Online Weekly: <https://www.e-know.ca/regions/elk-valley/fernie/city-seeks-change-to-private-land-logging-regulations/>.
[122] Ibid
[123] 2018 Union of BC Municipalities Resolution B41, supra note 90.
[124] Ibid.
[125] Ibid.

- resolution 2005-B27, which "asked the Province to establish a transparent and open mechanism for regular inspection and monitoring of forestry operations on private lands where such operations occur in community watersheds."[126]

6) ENSURE PUBLIC CONSULTATION

Under the PMFLA, there is no requirement for private forest companies to consult with communities prior to logging. Some community groups have taken initiative to liaise with private forestry companies, but with limited success. For example, on Read Island, Island Timberlands met with the local community and agreed to leave a tree buffer above a road beside a fish-bearing stream. However, in practice, Read Island residents claim that Island Timberlands reduced the buffer to half of the agreed width without informing the community.[127]

It is significant that the BC Auditor General has recognized that certain important decisions regarding private logging activities should be subject to public consultation, with consideration for Indigenous groups, local governments, the Ministry of Environment, environmental organizations, community groups, and other groups whose interests may be affected.[128]

7) ENACT ADEQUATE PENALTY PROVISIONS

The law should reward landowners who maintain responsible forestry practices and sufficiently penalize those who do not comply with the rules.[129] Under the PMFLA, the maximum penalty the Managed Forest Council may issue for a contravention is $25,000.[130] This is totally inadequate and out of proportion to the key public values that can be destroyed by bad private forestry practices.

In contrast to the small PMFLA penalty provisions, under the *Forest and Range Practices Act* there are fines up to $1 million dollars or imprisonment for 3 years for contraventions of environmental standards.[131] Under the repealed *BC Forest Practices Code*, there were fines up to $1 million for a first offence and $2 million for a repeat offence. Under the repealed *Forest Land Reserve Act*, a private landowner who contravened the environmental requirements was liable to pay a fine up to $1 million, or to 6 months of imprisonment.[132]

8) INDIGENOUS GOVERNANCE

A renewed framework for the PMFLA requires collaborative governance with Indigenous Nations affected by private managed forest land, including direct participation in decision making about forestry

[126] Ibid.
[127] Read Island Community Report Card, supra note 53
[128] Auditor General Report 2008, supra note 65 at 42-51. The Auditor General's 2008 report regarding TFLs found that the Minister of FLNRORD's decision to remove private land from the TFLs would affect many groups, these groups should have been consulted to determine how the decision would affect the public interest.
[129] BC forest practices code report, supra note 114.
[130] *Private Managed Forest Land Act*, SBC 2003 c 80 s 26.
[131] *Forest and Range Practices Act* s 87.
[132] *Forest Land Reserve Act* (repealed), RSBC 1996 c 158 s 29.81.

activities and the development and enforcement of environmental and cultural heritage protections on private land.

The Province of BC should establish government-to-government agreements with Indigenous Nations, which should apply to private managed forest land within the traditional territories of the Indigenous Nations. Indigenous Nations and the Province of BC have entered into government-to-government agreements for over a decade. [133] These agreements establish processes to be used by the Province of BC and an Indigenous Nation in future decision-making, either in a designated area or about a certain subject. Typically, government-to-government agreements "address enhanced decision making through consultation or joint management boards, ecosystem-based management, land and water use planning, management objectives, forestry, revenue sharing, and dispute resolution." [134]

[133] For example, see the Province of BC's list of Reconciliation and Other Agreements: <https://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/consulting-with- first-nations/first-nations-negotiations/reconciliation-other-agreements>.

[134] BC Mining Law Reform, *Indigenous Governance & Mining,* online: <https://reformbcmining.ca/wp-content/uploads/2019/05/BCMLR-Indigenous-Governance-and-Mining.pdf> at 7; "Most Indigenous peoples in British Columbia have never ceded or surrendered their traditional territories. Their inherent rights to self-government and self-determination are expressed through their laws and customs, and are dictated through oral histories and acts of governance. Since 1982, the Canadian Constitution has acknowledged and affirmed aboriginal and treaty rights, and the Truth and Reconciliation Commission of Canada made 94 Calls to Action, largely aimed at state governments, for decolonizing Canadian society. From international law, the United Nations Declaration on the Rights of Indigenous Peoples affirms the rights of Indigenous peoples to participate in decision making about their traditional territories, and be entitled to give free, prior and informed consent before development can occur." (BC Mining Law Reform, *Indigenous Governance & Mining* at 3). For further discussion about government-to-government agreements, see the full BC Mining Law Reform report.

Conclusion

British Columbia's *Private Managed Forest Land Act* must be changed to adequately protect valuable public resources that are threatened by unsustainable logging practices on private managed forest land. The new law should eliminate the existing two-tiered system and hold private forest land operations to the same management standards as crown forest land. While forest land dwindles, drinking water supplies are contaminated, valuable wildlife habitat and biodiversity are lost and BC's tourism industry is threatened, a few large forestry corporations – who have donated hundreds of thousands of dollars to the BC Liberals – profit and thrive. It's time for law reform that encourages sustainable forestry practices and recognizes the invaluable public values that are affected by private forest operations.

See the attached Appendix for a comparison of how different jurisdictions and regimes regulate private forest lands.

Appendices

Appendix A

This document compares the Forest Practices rules that apply to BC Crown forests, BC Private Managed Forest Land, the BC Standards for Forest Stewardship Council (FSC) certification, and the Washington State *Forest Practices Act* which applies to both state-owned and privately owned forest.

Note to Reader: This table broadly compares the specific provisions applicable under each regime and is meant to be a comparative aid that highlights the shortcomings of the PMFLA when compared to other regimes. However, some of the provisions across the regimes are inherently difficult or impossible to compare, due to different management schemes. For instance, there may be different standards for road building to achieve objectives relating to soil stability, water quality, fish habitat protection, etc, and each act may address such issues differently. This table attempts to categorize the regulations, but comparisons in each section of the table are not necessarily complete.

The BC FSC Standards have a focus on landscape-level management and planning that considers overlapping environmental impacts on a broad scale. Therefore, some of the categorizations of the FSC standards may overlap, or apply fairly broadly. Additionally, the FSC requirements for riparian management are particularly specific and variable dependent. Therefore, the riparian requirements for FSC have been attached as Appendix B. The Washington State Forest Practices Act also has a very comprehensive manual to guide riparian area management. This document has been attached as Appendix C.

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Applicable Statutes, Regulations and Codes

BC Crown Forest	BC Private Managed Forest Land	BC Forest Stewardship Council (FSC)	Washington Forest Practices Act
• Forest Range Practices Act (FRPA) • Forest Planning And Practices Regulation (FPPR) • Government Actions Regulation (GAR)	• Private Managed Forest Land Act (PMFLA) • Private Managed Forest Land Council Regulation (PMFLCR) • Private Managed Forest Land Regulation (PMFLR) • Private Managed Forest Land Council Matters Regulation (PMFLCMR)	• BC FSC Practice standards guide Note to reader: there are detailed explanations of intention and verification means for the FSC standards (see BC FSC Standards pdf)	• Forest Practices Act • Forest Practices Rules carry out the objectives of the Forest Practices Act (approved by the Forest Practices Board)

Overarching Objectives

BC Crown Forest	BC Private Managed Forest Land	BC Forest Stewardship Council	Washington Forest Practices Act
11 resource values are identified under the FRPA: 1. Biodiversity 2. Cultural Heritage 3. Fish / Riparian 4. Forage & Associated Plant Communities 5. Recreation 6. Resource Features (for example, karst, culturally modified trees, trees that provide nest habitat) 7. Soils 8. Timber 9. Visual Quality 10. Water Quality 11. Wildlife	There are 5 environmental objectives under the PMFLA Soil Conservation: To protect soil productivity Water Quality: To protect human drinking water, both during and after harvest Fish Habitat: To retain sufficient streamside mature trees and understory vegetation both during and after harvesting to protect fish habitat Critical Wildlife Habitat: To facilitate the long-term protection of that habitat Reforestation: To promptly regenerate the areas with a healthy commercially valuable stand of trees that are not impeded by vegetative competition	Principle 6: Environmental Impacts Forest management shall conserve biological diversity and its associated values, water resources, soils, and unique and fragile ecosystems and landscapes, and, by so doing, maintain the ecological functions and the integrity of the forest. 6.1 Assessment of environmental impacts shall be completed - appropriate to the scale, intensity of forest management and the uniqueness of the affected resources - and adequately integrated into management systems. Assessments shall include landscape level considerations as well as the impacts of on-site processing facilities. Environmental impacts shall be assessed prior to commencement of site-disturbing operations.	(1) The legislature hereby finds and declares that the forestland resources are among the most valuable of all resources in the state; that a viable forest products industry is of prime importance to the state's economy; that it is in the public interest for public and private commercial forestlands to be managed consistent with sound policies of natural resource protection; that coincident with maintenance of a viable forest products industry, it is important to afford protection to forest soils, fisheries, wildlife, water quantity and quality, air quality, recreation, and scenic beauty. (2) The legislature further finds and declares it to be in the public interest of this state to create and maintain through the adoption of this chapter a comprehensive statewide system of laws and forest practices rules which will achieve the following purposes and policies: (a) Afford protection to, promote, foster and encourage timber growth, and require such minimum reforestation of commercial tree species on forestlands as will reasonably utilize the timber growing capacity of the soil following current timber harvest; (b) Afford protection to forest soils and public resources by utilizing all reasonable methods of technology in conducting forest practices; (c) Recognize both the public and private interest in the profitable growing and harvesting of timber; (d) Promote efficiency by permitting maximum operating freedom consistent with the other purposes and policies

			stated herein; (e) Provide for regulation of forest practices so as to avoid unnecessary duplication in such rules; (f) Provide for interagency input and intergovernmental and tribal coordination and cooperation; (g) Achieve compliance with all applicable requirements of federal and state law with respect to nonpoint sources of water pollution from forest practices; (h) To consider reasonable land use planning goals and concepts contained in local comprehensive plans and zoning regulations; (i) Foster cooperation among managers of public resources, forest landowners, Indian tribes and the citizens of the state; (j) Develop a watershed analysis system that addresses the cumulative effect of forest practices on, at a minimum, the public resources of fish, water, and public capital improvements of the state and its political subdivisions; and (k) Assist forest landowners in accessing market capital and financing for the ecosystem services provided to the public as a result of the protection of public resources. (3) The legislature further finds and declares that it is also in the public interest of the state to encourage forest landowners to undertake corrective and remedial action to reduce the impact of mass earth movements and fluvial processes.

Soil Conservation

BC Crown Forest	BC Private Managed Forest Land	BC Forest Stewardship Council	Washington Forest Practices Act
FPPA s. 5 5 The objective set by government for soils is, without unduly reducing the supply of timber from British Columbia's forests, to conserve the productivity and the hydrologic function of soils. FPPA s. 35 Soil disturbance limits (3) An agreement holder other than a holder of a minor tenure or a fibre supply licence to cut, which holder is carrying out timber harvesting, must not cause the amount of soil disturbance on the net area to be reforested to exceed the following limits: (a) if the standards unit is predominantly comprised of sensitive soils, 5% of the area covered by the standards unit, excluding any area covered by a roadside work area; (b) if the standards unit not is not predominantly comprised of sensitive soils, 10% of the area covered by the standards unit, excluding any area covered by a roadside work area; (c) 25% of the area covered by a roadside work area. (4) An agreement holder may cause soil disturbance that exceeds the limits specified in subsection (3) if the holder (a) is removing infected stumps or salvaging windthrow and the additional disturbance is the minimum necessary, or (b) is constructing a temporary access structure and both of the following apply: (i) the limit set out in subsection (3) (a) or (b), as applicable, is not exceeded by more than 5% of the area covered by the standards unit, excluding the area covered by a roadside work area; (ii) before the regeneration date, a sufficient amount of the area within the standards unit is rehabilitated such	PMFLA s. 12 12 The forest management objective for private managed forest land with respect to conservation of soil for areas where harvesting has been carried out is to protect soil productivity on those areas by minimizing the amount of area occupied by permanent roads, landings and excavated or bladed trails. PMFLCR s. 13, 14 Limits on areas that may be occupied by roads 13 An owner or a contractor, employee or agent of the owner who carries out timber harvesting in a cutblock must restrict the amount of productive forest land within the cutblock that is converted to roads to the minimum necessary for the safe and efficient conduct of timber harvesting operations. Limits on areas that may be occupied by logging trails 14 (1) An owner or a contractor, employee or agent of the owner who carries out timber harvesting in a cutblock must restrict the amount of productive forest land within the cutblock that is converted to logging trails to the minimum necessary for the safe and efficient conduct of the timber harvesting operations. (2) Subject to subsection (3), an owner or a contractor, employee or agent of the owner who constructs logging trails when carrying out timber harvesting in a cutblock must rehabilitate the logging trails to the extent necessary to meet any reforestation requirements under section 31 for the cutblock. (3) Subsection (2) does not apply to logging trails that, at the time of the construction of the logging trail, are reasonably expected to provide access for timber harvesting and other activities that are not wholly contained in the cutblock.	6.3.14 Forest management maintains soil fertility and natural soil processes by: a) limiting detrimental soil disturbance to less than 7% of the timber harvesting landbase, or b) limiting detrimental soil disturbance to less than 10% of the timber harvesting landbase, where there are off-setting environmental, cultural or other non-economic benefits for the increases over 7%, and the benefits are explained in a written rationale. 6.3.15 Measures are being implemented to promptly rehabilitate (less than 5 years) temporary access structures and unplanned detrimental soil disturbance, including any detrimental soil disturbance that exceeds the levels in Indicator 6.3.14. 6.3.16 Where fertilizers or other soil amendments (e.g., pulp sludge, manure) are used, preference is given to non-chemical alternatives that are of equivalent effectiveness, and the manager verifies that the chemical composition of the fertilizers or soil amendments (including inert ingredients) are not in contravention of FSC requirements (See also Criterion 6.6 and Indicator 4.2.1). 6.3.17 When fertilizers or soil amendments are used, measures are employed to avoid contamination of surface and ground waters, protect non-timber forest values and maintain long-term soil health (e.g., maintenance of soil organic matter, pH balance). 6.1.5 - Where road construction or timber harvesting is proposed for areas rated with a moderate or high likelihood of landslides, areas rated as high or very high erosion potential, areas upslope of such hazardous areas (i.e. "gentle over steep"), or recharge areas for springs with domestic or irrigation water users; detailed terrain assessments and/or detailed hydrologic assessments are completed to assess the risks to the environment and provide recommendations on mitigation or other measures to reduce risk (e.g., drainage plans).	No specific section about soil productivity conservation. However, it is a factor considered holistically throughout other sections of the act (i.e. related to road building, riparian areas, etc)

that the agreement holder is in compliance with the limits set out in subsection (3). (5) The minister may require an agreement holder to rehabilitate an area of compacted soil if all of the following apply: (a) the area of compacted soil (i) was created by activities of the holder, (ii) is within the net area to be reforested, and (iii) is a minimum of 1 ha in size; (b) the holder has not exceeded the limits described in subsection (3) or the holders have not exceeded the limit described in subsection (4.1), as applicable; (c) rehabilitation would, in the opinion of the minister, (i) materially improve the productivity and the hydrologic function of the soil within the area, and (ii) not create an unacceptable risk of further damage or harm to, or impairment of, forest resource values related to one or more of the subjects listed in section 149 (1) of the Act. (6) An agreement holder who rehabilitates an area under subsection (4) or (5) must (a) remove or redistribute woody materials that are exposed on the surface of the area and are concentrating subsurface moisture, to the extent necessary to limit the concentration of subsurface moisture on the area, (b) de-compact compacted soils, and (c) return displaced surface soils, retrievable side-cast and berm materials. (7) If an agreement holder rehabilitates an area under subsection (4) or (5) and erosion of exposed soil from the area would cause sediment to enter a stream, wetland or lake, or a material adverse effect in relation to one or more of the subjects listed in section 149 (1) of the Act, the agreement holder, unless placing debris or revegetation would not materially reduce the likelihood of erosion, must (a) place woody debris on the exposed soils, or			

(b) revegetate the exposed mineral soils. Permanent access structure limits 36 (1) An agreement holder must ensure that the area in a cutblock that is occupied by permanent access structures built by the holder or used by the holder does not exceed 7% of the cutblock, unless (a) there is no other practicable option on that cutblock, having regard to (i) the size, topography and engineering constraints of the cutblock, (ii) in the case of a road, the safety of road users, or (iii) the requirement in selection harvesting systems for excavated or bladed trails or other logging trails, or (b) additional permanent access structures are necessary to provide access beyond the cutblock. (2) If an agreement holder exceeds the limit for permanent access structures described in subsection (1) for either of the reasons set out in that subsection, the holder must ensure that the limit is exceeded as little as practicable. (3) An agreement holder may rehabilitate an area occupied by permanent access structures in accordance with the results or strategies specified in the forest stewardship plan or by (a) removing or redistributing woody materials that are exposed on the surface of the area and are concentrating subsurface moisture, as necessary to limit the concentration of subsurface moisture on the area, (b) de-compacting compacted soils, and (c) returning displaced surface soils, retrievable side-cast and berm materials. (4) If an agreement holder rehabilitates an area under subsection (3) (a) and erosion of exposed soil from the area would cause sediment to enter a stream, wetland or lake, or a material adverse effect in relation to one or more of the subjects listed in section 149 (1) of the Act, the agreement holder, unless placing debris or revegetation would not materially reduce the likelihood of erosion, must			

(a) place woody debris on the exposed soils, or (b) revegetate the exposed mineral soils.			

Landscape Level Considerations

BC Crown Forest	BC Private Managed Forest Land	BC Forest Stewardship Council	Washington Forest Practices Act
FPPR s. 9 Objectives for wildlife and biodiversity — landscape level 9 The objective set by government for wildlife and biodiversity at the landscape level is, without unduly reducing the supply of timber from British Columbia's forests and to the extent practicable, to design areas on which timber harvesting is to be carried out that resemble, both spatially and temporally, the patterns of natural disturbance that occur within the landscape.	n/a	Principle 6.1 Assessment of environmental impacts shall be completed - appropriate to the scale, intensity of forest management and the uniqueness of the affected resources - and adequately integrated into management systems. Assessments shall include landscape level considerations as well as the impacts of on-site processing facilities. Environmental impacts shall be assessed prior to commencement of site-disturbing operations. 6.1.1 Based on the best available information, the manager assembles relevant inventory data to establish the regional and landscape level context for environmental impact assessment (see *FSC BC Guidance*), including at a minimum: a) biogeoclimatic ecosystem classification (BEC) mapping to the variant level for all ecosections which occur within the management unit; b) percentage of Protected Areas by BEC variant and ecosection for the BEC units and ecosections that occur within the management unit (to a level below BEC variant where available); and, c) extent and intensity of land use in surrounding portions of relevant BEC variants and ecosections. 6.1.2 The manager collects and/or assembles reconnaissance level inventory information appropriate for landscape level planning and completion of a management plan for the management unit as a whole, including at a minimum: a) natural disturbance regime; b) list of potentially occurring native species (including at a minimum indicator plants, focal species, and other species of concern); and, c) mapping of forest cover, BEC units to the variant level, hydrologic features, reconnaissance terrain stability mapping, cultural features, visual sensitivity, land use and other tenures. 6.1.3 As part of the operational management planning process for landscapes and/or watersheds in which road-building or timber harvesting is proposed over the next five years, inventories, assessments	No specific provision, but landscape-level considerations are taken into account in other sections of the Forest Practices Guide (i.e. related to wetland landscape) One example is related to landslides: When assessing the potential runout distance of a deep-seated landslide, it is important to examine not only the immediate vicinity but also the larger landscape (at least at 1:24,000 scale) for evidence of past landslide deposits.

		and/or information databases of ecosystem characteristics, resources and environmental values are completed and/or assembled *Landscape and Ecosystem Level Issues* 6.3.10 Forest management maintains or restores a distribution of seral stages, patch sizes and interior habitat that are compatible with the range of natural variability. 6.3.11 The manager has wildlife and/or landscape level objectives for landscape connectivity, consistent with the long-term persistence of naturally occurring species, and is implementing management strategies that include connectivity corridor mapping and maintenance of mature and old forest landscape connectivity between various landscape components, stand types and key habitats, appropriate to the size and context of the management unit 6.3.12 Access management measures are implemented where required to meet non-timber objectives (e.g., to minimize displacement of access-sensitive species such as grizzly bears, to prevent human contamination of domestic watersheds, to protect cultural sites). The measures are consistent with the recommendations from assessments for access-sensitive species (See 6.1.3 g) and other recommendations by qualified specialists (e.g., wildlife biologists, health officials). 6.3.13 Where they occur on a management unit, unique ecosystems (e.g., antique forests, rare site series), unique ecosystem features (e.g., caves, mistletoe platforms, mineral licks) and nonforest ecosystems (e.g., wetlands, grasslands, rock outcrops) are maintained or restored. 6.4.1 A network of protected reserves is established at multiple scales and managed within the management unit. (…) 6.4.2 The design and management of the reserve network contributes to the maintenance and/or restoration of ecological integrity by including at a minimum, areas whose size and distribution are sufficient to meet the following objectives: a) includes representation of ecosystem variation within the management unit at a level more detailed than the BEC variant, using characteristics appropriate to the	

		management unit b) habitat requirements for naturally occurring species that are not provided for in a suitable condition in other parts of the management unit, c) connectivity at the landscape and regional levels, d) protection of rare and endangered ecosystems and ecosystem conditions that are or are predicted to be at risk (e.g., interior forest conditions, old seral conditions), and e) scientific reference areas. 6.4.3 All protected reserves within Natural Disturbance Types 1 and 2 are permanent designations with fixed locations. Where the manager has identified ecological benefits for management treatments that mimic natural disturbances in NDTs 3 or 4, up to a maximum of 50% of the area of protected reserves in those NDTs can be managed as dynamic reserves (a minimum of 50% must remain permanent reserves). 6.4.4 Management treatments in dynamic reserves that are intended to mimic stand-replacing natural disturbances: a) are employed on a frequency (i.e. rotation age) that is at least 1.2 times the estimated average return interval for those disturbances; b) include stand level retention significantly above the estimated average natural retention levels for those disturbances; c) use natural regeneration; and d) allow for natural stand development. 6.4.5 Management activities within protected reserves are limited to low impact activities compatible with the protected reserve objectives, except under the following circumstances: a) harvesting activities only where they are necessary to restore or create habitat to meet the objectives of the protected reserve, or to mitigate conditions that interfere with achieving the reserve objectives, or b) road-building only where it is documented that it will contribute to the minimization of the overall environmental impacts within the management unit and will not jeopardize the purpose for which the reserve was designated.	

Riparian Protection and Fish Habitat

	BC Crown Forest	BC Private Managed Forest Land	BC Forest Stewardship Council	Washington Forest Practices Act
General Objectives	FPPR s. 8 – 8.1 Objectives set by government for water, fish, wildlife and biodiversity within riparian areas 8 The objective set by government for water, fish, wildlife and biodiversity within riparian areas is, without unduly reducing the supply of timber from British Columbia's forests, to conserve, at the landscape level, the water quality, fish habitat, wildlife habitat and biodiversity associated with those riparian areas. Objectives set by government for fish habitat in fisheries sensitive watersheds 8.1 (1) In this section, "fisheries sensitive watershed" means an area identified in Schedule 2 of this regulation (a) with significant downstream fisheries values continued under section 180 (f) of the Act and significant watershed sensitivity continued under section 180 (g) of the Act, and (b) for which there is no fisheries sensitive watershed objective. (2) Until December 31, 2005 the objective set by government for fish habitat in fisheries sensitive watersheds is to prevent to the extent described in subsection (3) the cumulative hydrological effects of primary forest activities in the fisheries sensitive watershed from resulting in a material adverse impact on the habitat of the fish species for which the fisheries sensitive watershed was established. (3) The objective set by government under subsection (2) applies only to the extent that it does not unduly reduce the supply of timber from British Columbia's forests. (4) If satisfied that the objective set out in subsection (2) is not required to provide special management, the minister responsible for the Wildlife Act must	PMFLA s. 14 – Fish Habitat 14 (1) The forest management objective for private managed forest land with respect to the protection of fish habitat, both during and after harvesting, is to retain sufficient streamside mature trees and understory vegetation to protect all of the following: (a) a natural variation in water temperatures; (b) sufficient cover for fish; (c) a continual source of large woody debris for stream channel stability purposes; (d) a vigorous mass of roots capable of controlling stream bank erosion; (e) a filter to prevent the transport of sediment into stream channels; (f) woody debris sufficient for in-stream habitat; (g) a source of nutrients to the stream through litter fall. (2) Nothing in subsection (1) requires an owner to retain additional streamside trees or additional understory vegetation to address problems with fish habitat that originate outside of the owner's private managed forest land.	6.5bis Riparian ecosystems and all their functions shall be maintained orrestored. 6.5.bis1 The manager maintains and/or restores riparian functions along rivers, streams, wetlands, lakeshores and marine shores by: a) completing an integrated riparian assessment for the management unit, or each riparian assessment unit within the management unit, according to the framework found in Appendix B (Requirements for Riparian Management), or if not, in a manner that meets the intent and addresses all the issues raised in the framework; and, b) implementing a riparian management regime that is consistent with the results of the assessment and meets or exceeds the retention budgets for Reserve Zones and Management Zones specified in Table 3 of Appendix B (Requirements for Riparian Management). 6.5.5 The manager implements measures to maintain the ecological integrity of aquatic ecosystems, including at a minimum: a) planning of road locations to minimize stream crossings and construction of roads within riparian management areas, b) stream crossing construction measures to minimize disturbance to riparian areas, stream banks and stream channels, c) timing of stream crossing construction to avoid fisheries sensitive seasons (e.g. spawning), d) locating and constructing landings in ways that avoid riparian management areas and detrimental impacts on hydrologic features, e) locating and constructing roads, landings, backspar trails and skidroads in ways that minimize disruption of natural drainage patterns (e.g., drainage systems are planned and constructed to avoid diversion of surface waters; road widths are minimized to limit the interception of subsurface water), f) employing yarding techniques that do not disturb stream channels,	WAC 222-22-010 (3) The long-term objective of this rule is to protect and restore these public and cultural resources and the productive capacity of fish habitat adversely affected by forest practices while maintaining a viable forest products industry. For public resources, the board intends that this be accomplished through prescriptions designed to protect and allow the recovery of fish, water, and capital improvements of the state or its political subdivisions, through enforcement against noncompliance of the forest practices rules in this Title 222 WAC, and through voluntary mitigation measures.

	exempt a person from the requirement to specify a result or strategy in relation to the objective. (5) If satisfied that the objective set out in subsection (2) is addressed, in whole or in part, by an enactment, the minister responsible for the Wildlife Act must exempt a person from the requirement to specify a result or strategy in relation to the objective set out in subsection (2) to the extent that the objective is already addressed.		g) where stream temperature is critical, maintaining sufficient cover adjacent to those streams to ensure aquatic ecosystems are not detrimentally impacted from temperature changes, and h) where channel assessments indicate decreasing stability, halting road construction and harvesting in relevant portions of watersheds, unless it can be shown that further development will not slow channel recovery or contribute to further channel instability. The FSC Guidelines include an assessment framework: Step 1. Inventory and Classification of Hydrologic Features. Step 2. Identification of *Riparian Assessment Unit(s)* and Riparian Issues. Step 3. Obtain relevant *Riparian Assessment Unit* characteristics from inventory information. Step 4. Complete riparian assessments and rank riparian areas for potential management strategies. Step 5. Develop riparian management strategies and implement specific riparian management measures. Step 6. Monitor effectiveness and revise design as required (see also Principle 8).	
Stream Classification and Riparian Zones	Stream Classes FPPR s. 47 • seven stream classes (S1A-S6) • riparian management area 20-100 metres • riparian reserve zone 0-50 metres (dependent on stream class) • riparian management zone 20-100 m (dependent on stream class) Restrictions in a riparian reserve zone 51(1) An agreement holder must not cut, modify or remove trees in a riparian reserve zone, except for the following purposes: (a) felling or modifying a tree that is a safety hazard, if there is no other practicable option for addressing the safety hazard; (b) topping or pruning a tree that is not wind firm; (c) constructing a stream crossing; (d) creating a corridor for full suspension yarding; (e) creating guyline tiebacks; (f) carrying out a sanitation treatment; (g) felling or modifying a tree that has been windthrown or has been damaged by fire, insects,	Stream Classes PMFLCR s. 27 – 30 PMFCLR Schedule I 1 (1) A portion of a stream that is a fish stream or is located upstream of the point where water is diverted by a licensed waterworks intake has the following riparian class: (a) A, if the stream channel width is 10 m or wider; (b) B, if the stream channel width is 3 m or wider but narrower than 10 m; (c) C, if the stream channel width is 1.5 m or wider but narrower than 3 m; (d) D, if the stream channel width is narrower than 1.5 m. (2) A portion of a stream has a riparian class E if the portion of the stream (a) has a stream channel width of 1.5 m or wider, and (b) is a direct tributary to a class A, B, C or D stream.	Planning to maintain riparian values should be undertaken within the broader framework of conservation design and ecosystem-based management as presented in *FSC BC Guidance – A companion document to the FSC Regional Standards for BC* – Guidance on Planning. There are detailed requirements for Riparian Management under the FSC. See Appendix B of the FSC Regional Standards Document 6.5.6 Machine-free zones are established on all streams, lakes, wetlands and marine shorelines. The machine-free zones are: a) at least 7 m in width; b) not entered by machinery, except where required for construction of crossings or other approved infrastructure, or restoration of riparian or stream channel functions, and only if it can be demonstrated that no significant environmental damage will result; and c) areas within which, if harvesting occurs, non-commercial trees and understory vegetation are	Stream Classes S – shorelines of the State, usually large named rivers or c reeks. If forest is within 200 feet, contact county planning department F – streams, lakes, and ponds used by fish, amphibians, wildlife, and drinking water. Buffer required Np – perennial stream. Buffer required (to protect downstream quality) Ns – seasonal stream. Connects to S, F, or Np stream. No buffer required, but if it connects to fish habitat or drinking water, use of heavy equipment Is limited to 30 feet WAC 222-30-021 Western Washington RMZ rules Harvest is permitted within the inner zone of an RMZ adjacent to a Type S or F Water in Western Washington only if the timber stand exceeds the “stand requirement” described in WAC 222-30-021(1): *“Stand requirement” means a number of trees per acre, the basal area and the proportion of conifer in the combined inner zone and adjacent core zone so*

	disease or other causes, if the felling or modifying will not have a material adverse impact on the riparian reserve zone; (h) felling or modifying a tree under an occupant licence to cut, master licence to cut or free use permit issued in respect of an area that is subject to a licence, permit, or other form of tenure issued under the Land Act, Coal Act, Geothermal Resources Act, Mines Act, Mineral Tenure Act, Mining Right of Way Act, Ministry of Lands, Parks and Housing Act or Petroleum and Natural Gas Act, if the felling or modification is for a purpose expressly authorized under that licence, permit or tenure; (i) felling or modifying a tree for the purpose of establishing or maintaining an interpretive forest site, recreation site, recreation facility or recreation trail. (2) An agreement holder who fells, tops, prunes or modifies a tree under subsection (1) may remove the tree only if the removal will not have a material adverse effect on the riparian reserve zone. (3) An agreement holder must not carry out the following silviculture treatments in a riparian reserve zone: (a) grazing or broadcast herbicide applications for the purpose of brushing; (b) mechanized site preparation or broadcast burning for the purpose of site preparation; (c) spacing or thinning. Restrictions in a riparian management zone 52(1) A holder of a minor tenure who fells trees in a cutblock within a riparian management zone of a class described in Column 1 must ensure that (a) the percentage of the total basal area within the riparian management zone specified in Column 2 is left as standing trees, and (b) the standing trees are reasonably representative of the physical structure of the riparian management zone, as it was before harvesting: Basal Area to be Retained Within Riparian Management Zone S1-A or S1-B stream: >20% S2 stream: >20%	PMFLCR s. 27 – 29: retention requirements Class A – 30 trees per 100 m of stream Class B – 25 trees per 100 m of stream Class C – 15 trees per 100 m of stream Retaining non-commercial trees and understory vegetation 30 (1) An owner or a contractor, employee or agent of the owner carrying out a primary forest activity must retain all non-commercial trees and understory vegetation within (a) 30 m of a class A stream, (b) 30 m of a class B stream, (c) 10 m of a class C stream, (d) 10 m of a class D stream, and (e) 10 m of a class E stream. (2) Despite subsection (1), an owner or a contractor, employee or agent of the owner may (a) fall and remove non-commercial trees, or (b) disturb understory vegetation if the falling and removal of the trees or the disturbance of the vegetation (c) is necessary to enable the owner or a contractor, employee or agent of the owner to comply with section 31, (d) is associated with a road constructed under section 16 or 17, (e) is associated with a logging trail constructed under section 17, or (f) will not cause a material adverse effect on fish habitat or water that is diverted by a licensed waterworks intake.	retained for protection of riparian functions. S1a – fish or community watershed, >100 m wide	*that the growth of trees would meet desired future conditions.* The basal area target for a 140 year old stand is 325 square feet per acre. WAC 222-30-022. Eastern Washington RMZ rules The inner zone width for forest land adjacent to streams ≤ 15 feet wide is 45 feet, and for forest land adjacent to streams > 15 feet wide is 70 feet, in addition to the 30-foot core zone. Timber harvest rules for Eastern Washington RMZs vary by timber habitat type (Ponderosa pine, mixed conifer, and high elevation), and by site index in the case of the mixed conifer habitat type. For the high elevation timber habitat type (≥ 5,000 feet elevation) the stand must exceed 325 square feet per acre for all site classes in the combined core and inner zone. Additional “RMZ rules” are attached as “Appendix C” For Fish Bearing Streams: • Three zones- core, inner, outer • Core: No harvest except for road construction and yarding • Western WA: 50’ • Eastern WA: 30’ • Inner: Buffers 10-100 feet from core, • Basal area of core + inner zone must meet DFC target at 140 years (190-285 sq ft/acre). Can manage by thinning from below or leaving trees closest to the water (pack and whack, which is prevalent). • Outer: 22-67 foot width from inner buffer. Leave 20 TPA dispersed or clumped • Meet shade requirements depending on stream size and site potential. Non-fish bearing: • Type Np & Ns waters- • 30’ ELZ, mitigation required if > 10% of surface area is disturbed • Western WA: Np RMZ- 50’ no-harvest buffer on first 300-500’ from confluence with Type F or S stream, 19-45% of length above 500’ must be buffered, depending

	S3 stream: >20% S4 stream: >10% S5 stream: >10% S6 stream: Not applicable All classes of wetlands or lakes: >10% (2) An authorized person who cuts, modifies or removes trees in a riparian management zone for an S4, S5 or S6 stream that has trees that contribute significantly to the maintenance of stream bank or channel stability must retain enough trees adjacent to the stream to maintain the stream bank or channel stability, if the stream (a) is a direct tributary to an S1, S2 or S3 stream, (b) flows directly into the ocean, at a point near to or where one or more of the following is located: (i) a herring spawning area; (ii) a shellfish bed; (iii) a saltwater marsh area; (iv) an aquaculture site; (v) a juvenile salmonid rearing area or an adult salmon holding area, or (c) flows directly into the ocean at a point near to the location of an area referred to in paragraph (b) and failure to maintain stream bank or channel stability will have a material adverse impact on that area. Temperature sensitive streams 53 An authorized person who fells, modifies or removes trees in a riparian management area adjacent to a temperature sensitive stream, or a stream that is a direct tributary to a temperature sensitive stream, must retain either or both of the following in an amount sufficient to prevent the temperature of the temperature sensitive stream from increasing to an extent that would have a material adverse impact on fish: (a) streamside trees whose crowns provide shade to the stream; (b) understory vegetation that provides shade to the stream. Fan destabilization 54 An authorized person who carries out a primary forest activity on the Coast must ensure that the primary forest activity does not cause fan			on length of Np stream. Other buffered areas: headwall seeps, side-slope seeps, confluence of Np streams, headwater springs WAC 222-30-040 Shade requirements to maintain water temperature. *(1) Within the bull trout overlay, all available shade will be retained within 75 feet from the edge of the bankfull width or the outer edge of the CMZ (whichever is greater) along Type S or F Waters. (…)

	destabilization that has a material adverse effect in relation to one or more of the subjects listed in section 149 (1) of the Act.			
Roads in riparian areas	Restrictions in a riparian management area 50 (1) A person must not construct a road in a riparian management area, unless one of the following applies: (a) locating the road outside the riparian management area would create a higher risk of sediment delivery to the stream, wetland or lake to which the riparian management area applies; (b) there is no other practicable option for locating the road; (c) the road is required as part of a stream crossing. (2) If a road is constructed within a riparian management area, a person must not carry out road maintenance activities beyond the clearing width of the road, except as necessary to maintain a stream crossing. (3) A person who is authorized in respect of a road must not remove gravel or other fill from within a riparian management area in the process of constructing, maintaining or deactivating a road, unless (a) the gravel or fill is within a road prism, (b) the gravel or fill is at a stream crossing, or (c) there is no other practicable option.	PMFCLR s 16 Roads adjacent to streams Roads adjacent to streams 16 An owner or a contractor, employee or agent of the owner must not construct a road within (a) 30 m of a class A stream, (b) 30 m of a class B stream, (c) 10 m of a class C stream, (d) 10 m of a class D stream, or (e) 10 m of a class E stream unless one or more of the following applies: (f) complying with paragraphs (a) to (e) would create a higher risk of sediment delivery to the stream than not complying with paragraphs (a) to (e); (g) there is no other practicable option for locating the road; (h) the road construction is part of a stream crossing.	See Appendix B of the FSC Regional Standards Document	Some protections accorded in below section “Roads”
Stream Crossings	FPPR s 55 Stream crossings 55 (1) An authorized person who builds a stream crossing as part of a road, a temporary access structure or permanent access structure must locate, build and use the crossing in a manner that (a) protects the stream channel and stream bank immediately above and below the stream crossing, and (b) mitigates disturbance to the stream channel and stream bank at the crossing. (2) An authorized person who builds a stream crossing as part of a temporary access structure must remove the crossing when it is no longer required by the person.	PMFCLR s 17 Stream Crossings 17(1) An owner or a contractor, employee or agent of the owner who builds a stream crossing as part of a road or logging trail must locate, build and use the crossing in a manner that (a) protects the stream channel and stream bank immediately above and below the stream crossing, and (b) mitigates disturbance to the stream channel and stream bank at the crossing to the extent necessary to avoid causing a material adverse effect on fish habitat or water that is diverted by a licensed waterworks intake. (2) An owner or a contractor, employee or agent of the owner who builds a stream crossing as part of a logging trail must remove the crossing when it is no longer required by the owner.	See Appendix B of the FSC Regional Standards Document	There are specific requirements for sizing and locating stream crossing structures (bridges, culverts, arches, or fords). Additional “RMZ rules” are attached as “Appendix C” Over fish-bearing streams, must allow for fish passage at all stages of life, control erosion, and ensure long term integrity of structure. For non-fish-bearing streams, must be designed to withstand a 100-year floor event
Landslides	FPPR s 37	PMFLCR s 26	6.1.5 Where road construction or timber harvesting	4.3 Erosion Control

and Erosion	37 An authorized person who carries out a primary forest activity must ensure that the primary forest activity does not cause a landslide that has a material adverse effect in relation to one or more of the subjects listed in section 149 (1) of the Act.	26 An owner or a contractor, employee or agent of an owner must notify the council within 24 hours of becoming aware that a landslide or debris flow has occurred on the owner's land, if the owner or a contractor, employee or agent of an owner knows that the landslide or debris flow has deposited debris or sediment into a class A stream, class B stream, class C stream, class D stream or class E stream.	is proposed for areas rated with a moderate or high likelihood of landslides, areas rated as high or very high erosion potential, areas upslope of such hazardous areas (i.e. "gentle over steep"), or recharge areas for springs with domestic or irrigation water users; detailed terrain assessments and/or detailed hydrologic assessments are completed to assess the risks to the environment and provide recommendations on mitigation or other measures to reduce risk (e.g., drainage plans). *6.5 Written guidelines shall be prepared and implemented to: control erosion; minimize forest damage during harvesting, road construction, and all other mechanical disturbances; and protect water resources.* 6.5.1 Measures are implemented to ensure that occurrence rates of landslides, snow avalanches, waterborne erosion and sedimentation are not increased, due to road construction or forest harvesting, beyond the natural rates described in the description of the range of natural variation 6.5.2 Road construction and forest harvesting do not occur on areas with a high likelihood of landslide initiation, or areas with a very high potential for snow avalanche initiation. 6.5.3 Road construction and forest harvesting do not occur on the following high risk areas, unless measures are implemented that reduce the risk of landslide or snow avalanche initiation, or prevent erosion and sedimentation: a) areas of moderate likelihood of landslide initiation and high or very high landslide induced stream sedimentation hazard; b) areas of moderate likelihood of landslide initiation and a high to very high likelihood of the landslide reaching areas of human habitation; c) areas with a high potential for snow avalanche initiation; and d) areas of high or very high road/ditch/surface erosion hazard and high or very high sediment delivery. 6.5.4 Harvesting within or adjacent to areas with a high or moderate likelihood of landslide initiation does not significantly increase windthrow hazards in those areas.	Erosion control measures are necessary if exposed soils can deliver sediment to typed waters. The key to controlling sediment is to control erosion. WAC 222-24-030*(4) Stabilize soils. Erodible soil disturbed during road construction and located where it could reasonably be expected to enter the stream network must be seeded with noninvasive plant species. The use of local area native species, adapted for rapid revegetation is preferred. Treatment with other erosion control measures may be approved by the department

Other Practice Requirements within Riparian Areas	FPPR s 39 Natural surface drainage patterns 39 (1) If an authorized person constructs a road, a temporary access structure or a permanent access structure on an area, the person must maintain natural surface drainage patterns on the area both during and after construction. (2) Despite subsection (1), if it is not practicable for an authorized person to maintain natural surface drainage patterns during the construction of a road, a temporary access structure or permanent access structure, the person must ensure that the altered surface drainage pattern is compatible with the original natural surface drainage pattern by the earlier of (a) the end of the construction, and (b) the next freshet.	PMFLCR s 15 Sediment transport or deposition 15 An owner or a contractor, employee or agent of the owner carrying out a primary forest activity must not cause sediment or other material to be transported to, or deposited in, a stream if that sediment or material will have a material adverse effect on (a) fish habitat, or (b) water that is diverted by a licensed waterworks intake. PMFLCR s 18 Natural surface drainage patterns 18 (1) An owner or a contractor, employee or agent of the owner who constructs a road or logging trail must maintain natural surface drainage patterns in the surrounding area both during and after the construction to the extent necessary to avoid causing a material adverse effect on fish habitat or water that is diverted by a licensed waterworks intake. (2) If it is not practicable for an owner or a contractor, employee or agent of the owner to comply with subsection (1), the owner or a contractor, employee or agent of the owner must make the altered surface drainage pattern compatible with the original natural surface drainage pattern, to the extent necessary to avoid causing a material adverse effect on fish habitat or water that is diverted by a licensed waterworks intake, by the earlier of (a) the end of the construction, or (b) the next freshet.	6.5.7 Active roads and other potential sediment sources are identified and monitored for sediment production on a regular basis. Deactivation, rehabilitation and/or restoration plans are prepared and implemented to control all significant human-induced sediment sources. 6.5.8 The manager employs measures to control increases in peak flow resulting from management activities, including in snowmelt-dominated watersheds, maintaining weighted equivalent clearcut area (ECA) to less than 25%, unless recommended otherwise by a publicly available hydrologic assessment. 6.5.5 The manager implements measures to maintain the ecological integrity of aquatic ecosystems, including at a minimum: e) locating and constructing roads, landings, backspar trails and skidroads in ways that minimize disruption of natural drainage patterns (e.g., drainage systems are planned and constructed to avoid diversion of surface waters; road widths are minimized to limit the interception of subsurface water)	Additional “RMZ rules” are attached as “Appendix C” Sensitive sites have additional protection (Headwater spring, intersection of Np streams, saturated side-slope seep)
Wetland Management Zones	Wetland riparian classes 48(1) Wetlands have the following riparian classes: (a) W1, if the wetland is greater than 5 ha in size; (b) W2, if the wetland is not less than 1 ha and not more than 5 ha in size and is in one of the following biogeoclimatic zones or subzones: (i) Ponderosa Pine; (ii) Bunch Grass; (iii) Interior Douglas-fir, very dry hot, very dry warm or very dry mild;	No wetland protections	Wetlands have riparian management zones and riparian reserve zones, depending on their classification. Class 1-5 Definition: Wetlands >1 ha, wetlands 0.25-1 ha in selected BEC variants, wetland complexes and other wetlands with fish Minimum budgets for wetlands in this class: RRZ – 2 ha/km of wetland perimeter RMZ – 1.5 ha/km with 30% BA retention	Wetland Management Zone buffers or protections are required depending on type of wetland Type A – ½ acre or more covered by open water seven consecutive days bw Apr 1 – Oct 1. Includes bogs greater than a ¼ acre Type B – open area of ¼ acre or more vegetated with water-tolerant plants Forested wetland – wetland with tree crown closure

(iv) Coastal Douglas-fir;
(v) Coastal Western Hemlock, very dry maritime, dry maritime or dry submaritime;
(c) W3, if the wetland is not less than 1 ha and not more than 5 ha in size and is in a biogeoclimatic zone or subzone other than one referred to in paragraph (b);
(d) W4, if the wetland is
(i) not less than 0.25 ha and less than 1 ha in size and is in a biogeoclimatic zone or subzone referred to in paragraph (b) (i), (ii) or (iii), or
(ii) not less than 0.5 ha and less than 1 ha in size and is in a biogeoclimatic zone or subzone referred to in paragraph (b) (iv) or (v).

(2) Despite subsection (1), an area is to be treated as a single wetland with a riparian class of W5 if
(a) the area contains
(i) two or more W1 wetlands located within 100 m of each other,
(ii) a W1 wetland and one or more non-W1 wetlands, all of which are within 80 m of each other, or
(iii) two or more non-W1 wetlands located within 60 m of each other, and
(b) the combined size of the wetlands, excluding the upland areas, is 5 ha or larger.

(3) Subject to subsections (4) and (5), for each riparian class of wetland, the minimum riparian management area width, riparian reserve zone width and riparian management zone width for the wetland are as follows:

Class	RMA (m)	RRZ (m)	RMZ (m)
W1	50	10	40
W2	30	10	20
W3	30	0	30
W4	30	0	30
W5	50	10	40

(4) No riparian reserve zone or riparian management zone extends onto any enclosed upland areas in a W1 wetland if the wetland is
(a) located in a boreal, subboreal or hyper-maritime climate, and
(b) greater than 1 000 ha in size.

Other (unclassified wetlands without fish)
Minimum budgets for wetlands in this class:
RMZ – 1.5 ha/km with 30% BA retention

of 30% or more if trees are mature

WMZ varies from 25 feet to 200 feet depending on wetland type and size

Ground-based equipment cannot be used in WMZ without written permission from DNR

See WAC 222-30 for more details

	(5) If the minister considers it necessary for a riparian reserve zone or riparian management zone to extend onto an enclosed upland area, the minister may require either or both of the following: (a) a riparian reserve zone of a width of 10 m or less; (b) a riparian management zone of a width of 40 m or less. (6) The riparian reserve zone for a wetland begins at the edge of the wetland and extends to the width described in subsection (3) or (5). (7) The riparian management zone for a wetland begins at (a) the outer edge of the riparian reserve zone, or (b) if there is no riparian reserve zone, the edge of the wetland, and extends to the width described in subsection (3) or (5).			
Lake riparian zones	Lake riparian classes 49(1) Lakes have the following riparian classes: (a) L1-A, if the lake is 1 000 ha or greater in size; (b) L1-B, if (i) the lake is greater than 5 ha but less than 1 000 ha in size, or (ii) the minister designates the lake as L1-B; (c) L2, if the lake is not less than 1 ha and not more than 5 ha in size and is located in a biogeoclimatic zones or subzone that is (i) Ponderosa Pine, (ii) Bunch Grass, (iii) Interior Douglas-fir, very dry hot, very dry warm or very dry mild, (iv) Coastal Douglas-fir, or (v) Coastal Western Hemlock, very dry maritime, dry maritime or dry submaritime; (d) L3, if the lake is not less than 1 ha and not more than 5 ha in size and is in a biogeoclimatic zone or subzone other than one referred to in paragraph (c); (e) L4, if the lake is (i) not less than 0.25 ha and not more than 1 ha in size and is in a biogeoclimatic zone or subzone referred to in paragraph (c) (i), (ii) or (iii), or (ii) not less than 0.5 ha and not more than 1 ha in size and is in a biogeoclimatic zone or subzone referred to in paragraph (c) (iv) or (v). (2) Subject to subsection (3), for each riparian class of lake, the minimum riparian management area	No lake riparian zones	Class L1-4 Lakes: Lakes >1 ha, lakes 0.25-1 ha in selected BEC variants and other lakes with fish Minimum budgets for lakes in this class: LRZ – 1.5 ha/km of lakeshore LMZ – 1.5 ha/km with 30% BA retention Other Lakes (unclassified lakes without fish) Minimum budgets for lakes in this class: LMZ – 1.5 ha/km with 30% BA retention	The general riparian area protections include both streams and lakes (i.e. the definition of a “stream” includes lakes and ponds).

	width, riparian reserve zone width and riparian management zone width are as follows: (3) If the minister considers it necessary, the minister may specify a riparian management area and a riparian reserve zone for a lake with a riparian class of L1-A. (4) The riparian reserve zone for a lake begins at the edge of the lake and extends to the width described in subsection (2) or (3). (5) The riparian management zone for a lake begins at (a) the outer edge of the riparian reserve zone, or (b) if there is no riparian reserve zone, the edge of the lake, and extends to the width described in subsection (2) or (3).			

Class	RMA (m)	RRZ (m)	RMZ (m)
L1-A	0	0	0
L1-B	10	10	0
L2	30	10	20
L3	30	0	30
L4	30	0	30

Riparian Zones Comparison

BC Private Managed Forest (PMFLA):

Stream Class	Channel Width (m)	Fish bearing and/or diverted by licensed waterworks intake	Requirement to retain large riparian trees	Requirement to retain understory vegetation
A	≥ 10	Yes	30 trees per 100 m	30 m buffer
B	≥ 3 to < 10	Yes	25 trees per 100 m	30 m buffer
C	≥ 1.5 to < 3	Yes	15 trees per 100 m	10 m buffer
D	< 1.5	Yes	N/A	10 m buffer
E	≥ 1.5 and a direct tributary to a class A, B, C or D stream	No	N/A	10 m buffer
Other	All other	No	N/A	N/A

BC Crown Forest (FRPA):

Stream Class	Channel Width (m)	Fish bearing	Riparian Reserve Zone Width (m) [no cut]	Riparian Management Zone	Riparian Management Area Width (m) [restricted road building]
S1a	>100	Yes	0	100 m, 20% BA retention	100
S1b	20 – 100	Yes	50	20 m, 20% BA retention	70
S2	5 – 20	Yes	30	20 m, 20% BA retention	50
S3	1.5 – 5	Yes	20	20 m, 20% BA retention	40
S4	< 1.5	Yes	0	30, 10% BA retention	30
S5	> 1.5	No	0	30, 10% BA retention	30
S6	< 3	No	0	20 – no BA retention required, but some requirements to maintain bank stability	20

BC FSC:

	Channel Width (m)	Fish present or community watershed	RRZ [no cut]	RMZ	Example
S1a	>100	Y	6 ha/km	8 ha/km with 65% BA retention	30 m RRZ and 40 m 65% RMZ or equivalent
S1b	20-100	Y			
S2	5-20	Y			
S3	1.5-5	Y	6 ha/km	4 ha/km with 65% BA retention	30 m RRZ and 20 m 65% RMZ or equivalent
S4	<1.5	Y			
S5a	>3	N	4 ha/km	4 ha/km with 65% BA retention	20 m RRZ and 20 m 65% RMZ or equivalent
S6a	0.5-3 (interior) 1-3 (coast)	N – *and* in a domestic watershed or <250 m upstream of fish bearing stream			
S5b	3-10	N – *and* in a non-domestic watershed *and* >500 m upstream of fish bearing stream	n/a	NDT 1, 2, 4: 3 ha/km with 30% BA retention NDT 3: 3 ha/km with 10% BA retention	15 m RMZ 30% or 10% retention or equivalent
S6b	0.5-3	N – *and* not in a domestic watershed and >250 m upstream of fish bearing stream			
	<0.5 (interior) <1 (coast)	N			

Washington Forest Practices Code:

The Washington riparian rules are not prescriptive, and do not lend themselves to easily being compared in a table. The following Washington State Department of Natural Resources publication offers many pages of detail about the different management options available:
https://www.dnr.wa.gov/forest-practices-illustrated

Streams are classified using four factors:

1. Stream Type (table below)
2. Site Class (determined by soil type)
3. Stream width
4. Location: Eastern Washington or Western Washington

Based on the four factors, a landowner may select from a range of management options to abide by the riparian rules.

All stream classifications must be verified by Forest Practices foresters.

Stream Type	Characteristics	General Requirements
S	"Shorelines of the State" – usually large named rivers or creeks.	Some counties require permits for forestry adjacent to type S.
F	Streams, lakes and ponds used by fish, amphibians, wildlife, and for drinking water.	Buffers required.
Np	Year-round flow, no fish habitat.	Buffers required to protect amphibians and downstream fish habitat/water quality.
Ns	Season streams that connect to a type S, F, or Np stream.	No buffers required, but use of heavy equipment is limited (30 ft "no machine" zone)

For example, here are a few tables that summarize three management options for Type S or F (Fish Habitat) streams.

Option1: "No harvest" Inner Zone

Stream Type	Location	Stream Width (ft)	Core Zone (ft)	Inner Zone (ft)	Outer Zone (ft)
			No harvest	**No harvest**	**20 trees/acre retention**
S and F	Western	<10	50	10 – 83	30 – 67
S and F	Western	> 10	50	18 – 100	22 - 50
S and F	Eastern	<15	30	45	0 – 55
S and F	Eastern	>15	30	70	0 – 30

Option 2: "Thinning from below" in Inner Zone

Stream Type	Location	Stream Width (ft)	Core Zone (ft)	Inner Zone (ft)	Outer Zone (ft)
			No harvest	**Harvest smallest trees with 57**	**20 trees/acre retention**

				trees/acre retention	
S and F	Western	<10	50	10 – 83	30 – 67
S and F	Western	> 10	50	18 – 100	20 – 50

Option 3: "Leaving trees closest to water"

Stream Type	**Location**	**Stream Width (ft)**	**Core Zone (ft)**	**Inner Zone (ft)**	**Outer Zone (ft)**
			No harvest	**Partial no harvest zone, partially harvested with 20 tree/acre retention**	**20 trees/acre retention**
S and F	Western	<10	50	30 ft no harvest, 14 – 54 ft with 20 trees/acre retention	46 – 66
S and F	Western	> 10	50	50 ft no harvest, 20 – 54 ft with 20 trees/acre retention	50 – 66

Wildlife

BC Crown Forest	BC Private Managed Forest Land	BC Forest Stewardship Council	Washington Forest Practices Act
FPPR Objectives for wildlife 7 (1) The objective set by government for wildlife is, without unduly reducing the supply of timber from British Columbia's forests, to conserve sufficient wildlife habitat in terms of amount of area, distribution of areas and attributes of those areas, for (a) the survival of species at risk, (b) the survival of regionally important wildlife, and (c) the winter survival of specified ungulate species. (2) A person required to prepare a forest stewardship plan must specify a result or strategy in respect of the objective stated under subsection (1) only if the minister responsible for the Wildlife Act gives notice to the person of the applicable (a) species referred to in subsection (1), and (b) indicators of the amount, distribution and attributes of wildlife habitat described in subsection (1). (3) If satisfied that the objective set out in subsection (1) is addressed, in whole or in part, by an objective in relation to a wildlife habitat area or an ungulate winter range, a general wildlife measure, or a wildlife habitat feature, the minister responsible for the Wildlife Act must exempt a person from the obligation to specify a result or strategy in relation to the objective set out in subsection (1) to the extent that the objective is already addressed. (4) On or after December 31, 2004, a notice described in subsection (2) must be given at least 4 months before the forest stewardship plan is submitted for approval. Objectives set by government for wildlife and biodiversity — landscape level 9 The objective set by government for wildlife and biodiversity at the landscape level is, without unduly reducing the supply of timber from British Columbia's forests and to the extent practicable, to design areas on which timber harvesting is to be carried out that resemble, both spatially and temporally, the patterns of	PMFLA s. 15 15 The forest management objective for private managed forest land with respect to critical wildlife habitat is to facilitate the long term protection of that habitat by (a) providing a reasonable opportunity for a person designated in writing by the deputy minister to the minister responsible for the administration of the Wildlife Act to assess whether critical wildlife habitat is present on private managed forest land, and (b) fostering efforts of the government and the owners to enter into agreements for the protection of any critical wildlife habitat identified under paragraph (a).	6.2 Safeguards shall exist which protect rare, threatened and endangered species and their habitats (e.g. nesting and feeding areas). Conservation zones and protection areas shall be established, appropriate to the scale and intensity of forest management and the uniqueness of the affected resources. Inappropriate hunting, fishing, trapping and collecting shall be controlled.	76.09.063 Forest practices permit—Habitat incentives agreement. When a private landowner is applying for a forest practices permit under this chapter and that landowner has entered into a habitat incentives agreement with the department and the department of fish and wildlife as provided in *RCW 77.55.300, the department shall comply with the terms of that agreement when evaluating the permit application. WAC 222-23-010 (1) Policy. The legislature determined that it is in the public interest to acquire (by purchase or donation) conservation easements on forest lands within unconfined channel migration zones and forest lands containing a critical habitat for threatened or endangered species as designated by the board. The rivers and habitat open space program (formerly known as the riparian open space program), established in RCW 76.09.040, is for these forest lands voluntarily enrolled by the landowner. The department may acquire a permanent conservation easement over such lands. The purpose of this program, which will be administered by the department, is to provide for ecological protection and fisheries and wildlife enhancement.

natural disturbance that occur within the landscape. Objectives for wildlife and biodiversity — stand level 9.1 The objective set by government for wildlife and biodiversity at the stand level is, without unduly reducing the supply of timber from British Columbia's forests, to retain wildlife trees.			
FPPR s. 69 – 70 General wildlife measures 69 An authorized person who carries out primary forest activities on an area must comply with each general wildlife measure that applies to the area. Resource features and wildlife habitat features 70 (1) An authorized person who carries out a primary forest activity must ensure that the primary forest activity does not damage or render ineffective a resource feature. (2) An authorized person who carries out a primary forest activity must ensure that the primary forest activity does not damage or render ineffective a wildlife habitat feature. Description of Wildlife measures (<u>which can be taken by the minister of the *Wildlife Act*</u>) Government Actions Regulation (Under FRPA): General wildlife measures 9 (1) The minister responsible for the Wildlife Act by order may establish a general wildlife measure, to be applied to a specified area, for a category of species at risk, regionally important wildlife or specified ungulate species, if satisfied that (a) the measure is necessary to protect or conserve the species in the category in the area to which the measure relates, and (b) this regulation or another enactment does not otherwise provide for that protection or conservation. (2) The minister responsible for the Wildlife Act by order may establish a general wildlife measure for a wildlife habitat area or an ungulate winter range if satisfied that	PMFLR s. 5 - 8 Critical wildlife habitat 5 (1) The wildlife minister, in accordance with section 7, may (a) establish or vary an area of private managed forest land as critical wildlife habitat if (i) the habitat of one or more species at risk is located on the land, and (ii) the habitat on the land is required for the survival of one or more of the species at risk because there is insufficient suitable habitat found on Crown lands within that ecoregion, or (b) cancel the establishment of an area as critical wildlife habitat. (2) Within an area of critical wildlife habitat, an owner must carry out any timber harvesting and related activities, and any road construction, in accordance with the requirements of the notice given or amended under section 7. An owner may be required to provide information 6 (1) If the wildlife minister has reasonable cause to believe that there may be an area of private managed forest land that qualifies for establishment as critical wildlife habitat, the wildlife minister, in writing, may notify the owner that an area of the owner's private managed forest land may qualify for establishment as critical wildlife habitat. (2) An owner who receives a notice under subsection (1) must give the wildlife minister information respecting any road construction or timber harvesting and related activities that the owner is proposing for the area during the 30 day period immediately following receipt of the notice.	6.2.1 Habitats of red- and blue-listed species and plant communities (as defined by the BC Conservation Data Centre) and threatened species and endangered species, and species of special concern (as defined by the Committee on the Status of Endangered Wildlife in Canada) within a management unit are identified by field surveys or other means, and delineated on maps, subject to confidentiality requirements (see 7.4.1). 6.2.2 Where there are existing or potential habitats of red-listed, blue-listed, endangered or threatened species, or species of special concern, or red- or blue-listed plant communities present on the management unit, the manager demonstrates measures are in place on the management unit to minimize risk to the long-term persistence of those species and/or plant communities, by: a) protecting those habitats and/or plant communities by including them in the protected reserve network; b) avoiding habitat alteration that may result in increased risk to those species' and/or plant communities' long-term persistence; and/or, c) where necessary, restoring those habitats and/or plant communities to a suitable condition. 6.2.3 Where a government recovery plan or species management plan has been prepared for a red- or blue-listed, threatened or endangered species, species of special concern or red- or blue-listed plant community whose habitat occurs within a management unit, the manager is implementing the recovery or species management plan. While recovery or species management plans are under development, the manager takes steps that are within his or her control to facilitate survival and recovery of the species or plant community.	Wildlife protection is done by Washington's State Environmental Protection Act. Requirement for wildlife reserve trees: Western WA: 3 wildlife reserve trees (if available), 2 green recruitment trees, 2 down logs per acre. Eastern WA: 2 wildlife reserve trees (if available), 2 green recruitment trees, 2 down logs per acre. Wildlife trees- > 10 feet tall, 10-12 inches dbh, leave largest Green trees- >30 feet tall, >10 inches dbh. Down logs: > 20 feet long, min 12 inches

(a) the measure is necessary to protect or conserve the wildlife habitat area or ungulate winter range, and (b) this regulation or another enactment does not otherwise provide for that protection or conservation. Wildlife habitat areas and objectives 10 (1) The minister responsible for the Wildlife Act by order may establish an area as a wildlife habitat area if satisfied that the area is necessary to meet the habitat requirements of a category of species at risk or regionally important wildlife. (2) The minister responsible for the Wildlife Act by order may establish a wildlife habitat area objective for a wildlife habitat area if satisfied that the wildlife habitat area requires special management that has not otherwise been provided for under this regulation or another enactment. (3) Despite subsections (1) and (2), if the minister responsible for the Wildlife Act reasonably believes that a wildlife habitat area is sensitive to damage or disturbance, he or she (a) must not disclose the location of the wildlife habitat area in the order, (b) must provide written notice of the location of the wildlife habitat area to the holders of agreements under the Forest Act or the Range Act that will be affected by the order, and (c) may attach conditions to the order (i) prohibiting those holders from disclosing the location of the wildlife habitat area, or (ii) restricting the extent to which, or the persons to whom, those holders may disclose the location of the wildlife habitat area. (4) A person to whom a condition referred to in subsection (3) (c) applies must comply with the condition. Wildlife habitat features 11 (1) The minister responsible for the Wildlife Act by order may identify any or all of the following as a wildlife habitat feature: (a) a fisheries sensitive feature; (b) a marine sensitive feature; (c) a significant mineral lick or wallow; (d) a nest of	Requirements if critical wildlife habitat is determined to be present 7 (1) Before critical wildlife habitat is established or varied under section 5, the wildlife minister must give a notice in writing to the owner of the private managed forest land (a) describing the location, nature and extent of the critical wildlife habitat, (b) specifying the amount of habitat required for the survival of the affected species at risk, and (c) specifying the area within the critical wildlife habitat where road construction and timber harvesting and related activities must be modified and the extent of that modification. (2) Unless otherwise agreed to by the owner, an area referred to in subsection (1) (c) (a) must not have been previously described in a notice to the owner given or amended under this section, (b) must not exceed, in combination with any other areas identified in notices to the owner given or amended under this section, an amount of area that is the lesser of (i) 1% of all the land identified in that management commitment, or (ii) the area required for the survival of the species at risk, and (c) must not be subject to a period of modified operations exceeding one year from the date the notice is received by the owner. (3) The establishment of the area of critical wildlife habitat identified in the notice to the owner given or amended under this section becomes effective on the date the notice is received by the owner of the private managed forest land. (4) The requirements, if any, to modify road construction, timber harvesting and related activities on an area, specified in a notice to the owner given or amended under this section, becomes effective (a) subject to paragraph (b), 14 days after the notice is received by the owner, or	6.2.4 The manager has training programs, standard operating procedures and/or protocols that specify measures for dealing with unexpected encounters with red- and blue-listed, threatened and endangered species, and species of special concern, or their habitats during operational activities. Field staff are aware of these measures. When these species or habitats are encountered, prompt notification is made to personnel who are capable of implementing prescriptions and practices designed to protect and promote the survival and recovery of the species, and these practices are implemented. 6.2.5 The manager cooperates with the government authorities to prevent the harming, harassing, capturing or taking of red- or blue-listed species, threatened or endangered species, or species of special concern within the management unit.	

(i) a bald eagle, (ii) an osprey, (iii) a great blue heron, or (iv) a category of species at risk that is limited to birds; (e) any other localized feature that the minister responsible for the Wildlife Act considers to be a wildlife habitat feature; if satisfied that the wildlife habitat feature requires special management that has not otherwise been provided for under this regulation or another enactment. (2) Identification of a wildlife habitat feature under subsection (1) (a) may be by category or type, and may be restricted to a specified geographic location, and (b) must be sufficiently specific to enable a person affected by it to identify the wildlife habitat feature in the ordinary course of carrying out forest practices or range practices. (3) Despite subsections (1) and (2), if the minister responsible for the Wildlife Act reasonably believes that a wildlife habitat feature is sensitive to damage or disturbance, he or she (a) must not disclose the location of the feature in the order, (b) must provide written notice of the location of the feature to the holders of agreements under the Forest Act or the Range Act that will be affected by the order, and (c) may attach conditions to the order (i) prohibiting those holders from disclosing the location of the feature, or (ii) restricting the extent to which, or the persons to whom, those holders may disclose the location of the feature. (4) A person to whom a condition referred to in subsection (3) (c) applies must comply with the condition. Ungulate winter ranges and objectives 12 (1) The minister responsible for the Wildlife Act by order may establish an area as an ungulate winter range if satisfied that	(b) on a date specified by the minister. (5) The wildlife minister may, in writing, at any time after issuing a notice under subsection (1), (a) amend the content of the notice that is in effect provided that the content of the amended notice complies with the requirements of subsection (2), or (b) cancel the notice that is in effect. (6) An amendment or cancellation referred to in subsection (5) becomes effective on the date the notice is received by the owner. (7) If the wildlife minister determines, at any time after issuing a notice under subsection (1), that a portion of the area that is subject to the notice (a) is not required for the survival of the species at risk, or (b) is no longer critical wildlife habitat, the minister must immediately cancel the notice. Previously unrecognized critical wildlife habitat 8 (1) The ministry responsible for the administration of the Wildlife Act may publish, from time to time, a list of species at risk that specifies, by ecoregion, those species for which the wildlife minister determines there is insufficient suitable habitat on Crown lands within that ecoregion. (2) If an owner knows that there may be, on the owner's land, habitat for a species specified on the list referred to in subsection (1), the owner must (a) promptly notify the wildlife minister, and (b) refrain from carrying out any road construction or timber harvesting and related activities that could negatively impact the habitat until the earliest to occur of the following: (i) the expiry of 14 days from the time the wildlife minister receives the notice under paragraph (a); (ii) being advised by the wildlife minister that the activity may be carried out;		

(a) the area contains habitat that is necessary to meet the winter habitat requirements for a category of specified ungulate species, and (b) the habitat referred to in paragraph (a) requires special management that is not otherwise provided for under this regulation or another enactment. (2) The minister responsible for the Wildlife Act by order may establish an ungulate winter range objective for an ungulate winter range if satisfied that the ungulate winter range requires special management that is not otherwise provided for under this regulation or another enactment. Species at risk, regionally important wildlife and ungulate species 13 (1) The minister responsible for the Wildlife Act by order may establish one or more categories identifying species of wildlife as species at risk if satisfied that the species are endangered, threatened or vulnerable. (2) The minister responsible for the Wildlife Act by order may establish one or more categories identifying species of wildlife as regionally important wildlife if satisfied that the species (a) are important to a region of British Columbia, (b) rely on habitat that requires special management that is not otherwise provided for in this regulation or another enactment, and (c) may be adversely impacted by forest practices or range practices. (3) The minister responsible for the Wildlife Act by order may establish one or more categories identifying ungulate species for which an ungulate winter range is required if satisfied that the range is necessary for the winter survival of the identified species.	(iii) receiving a notice under section 7. (3) The wildlife minister may relieve the owner of a requirement to notify the wildlife minister under subsection (2) (a) with respect to one or more species at risk.		

Stand-level Biodiversity

BC Crown Forest	BC Private Managed Forest Land	BC Forest Stewardship Council	Washington Forest Practices Act
FPPR s. 9.1 The objective set by government for wildlife and biodiversity at the stand level is, without unduly reducing the supply of timber from British Columbia's forests, to retain wildlife trees.		6.3 Ecological functions and values shall be maintained intact, enhanced, or restored, including: a) Forest regeneration and succession. b) Genetic, species, and ecosystem diversity. c) Natural cycles that affect the productivity of the forest ecosystem. 6.4 Representative samples of existing ecosystems within the landscape shall be protected in their natural state and recorded on maps, appropriate to the scale and intensity of operations and the uniqueness of the affected resources.	

Forest Regeneration and Harvest Practices

BC Crown Forest	BC Private Managed Forest Land	BC Forest Stewardship Council	Washington Forest Practices Act
FPPR s. 16 Stocking Standards 16 (1) A person required to prepare a forest stewardship plan must ensure that the plan specifies the situations or circumstances that determine when section 44 (1) [free growing stands generally] or section 45 [free growing stands collectively across cutblocks] will apply to an area. (2) In specifying a stocking standard under this section, a person who prepares a forest stewardship plan may consider the factors set out in section 6 [factors relating to stocking standards] of Schedule 1. (3) A person required to prepare a forest stewardship plan must ensure that the plan specifies, for each of the situations or circumstances specified under subsection (1) where (a) section 44 (1) (a) will apply, the regeneration date and stocking standards, (b) section 44 (1) (b) will apply, the free growing height and stocking standards, (c) section 45 (1) will apply, the regeneration date and the stocking standards, and (d) section 45 (2) will apply, the free growing date and the stocking standards, as approved by the chief	PMFLA s. 16 16 The forest management objective for private managed forest land with respect to reforestation of areas where timber has been harvested or destroyed is to promptly regenerate the areas with a healthy, commercially valuable stand of trees that is not impeded by competition from plants or shrubs. PMFLCR s. 31 Reforestation of areas where timber harvested or destroyed 31(1) In this section: "completion of timber harvesting" means the date that timber harvesting within a cutblock is concluded and is determined by (a) the date the area is declared as a cutblock in an annual declaration, or (b) if an area is not included in a declaration, a date that does not exceed two consecutive operating seasons from the commencement of harvesting in the cutblock; "crop tree" means a tree that (a) is of a commercial species that is consistent with the species of trees specified in the management	6.3 Ecological functions and values shall be maintained intact, enhanced, or restored, including: a) Forest regeneration and succession. b) Genetic, species, and ecosystem diversity. c) Natural cycles that affect the productivity of the forest ecosystem. 5.5 Forest management operations shall recognize, maintain, and, where appropriate, enhance the value of forest services and resources such as watersheds and fisheries. 5.6 The rate of harvest of forest products shall not exceed levels which can be permanently sustained. 5.6.1 The rate of timber harvest for the management unit is based on a documented and comprehensive analysis, incorporating the following: a) the management objectives and strategies for the full range of forest resources as set out in the management plan, including those for restoration; b) practices employed to implement the strategies and operational approaches in the management plan, including those for restoration; c) up-to-date inventories and the best available growth-and-yield data and projections; d) land base reductions to account for areas that are reserved or unavailable for harvest due to economic or operational limitations;	WAC 222-34-010 (2) Reforestation standards (West of Cascades Summit). A harvested area is reforested when that area contains an average of 190 or more vigorous, undamaged commercial species seedlings per acre that have survived on the site for at least 1 growing season. Up to 20 percent of the harvested area may contain fewer than 190 seedlings per acre, but no portion of the harvested area with timber growing capacity may contain less than 150 seedlings per acre. The department may determine that less than an average of 190 seedlings per acre is acceptable if fewer seedlings will reasonably utilize the timber growing capacity of the site. WAC 222-34-020 (2) Reforestation standards (East of Cascades Summit) A harvest area is reforested when that area contains an average of 150 or more vigorous, undamaged commercial species seedlings per acre that have survived on the site for at least 1 growing season. Up to 20 percent of the harvested area may contain fewer than 150 seedlings per acre, but no portion of the harvested area with timber growing capacity may contain less than 120 seedlings per acre. The department may determine that less than an average of 150 seedlings per acre is acceptable if fewer seedlings will reasonably utilize the timber growing capacity of the site.

forester. (4) A person required to prepare a forest stewardship plan must ensure that the plan specifies stocking standards for areas referred to in section 44 (4), and the situations or circumstances that determine when the stocking standards will be applied. FPPR s. 64 – 70 64 Maximum Cutblock Size • Cutblock not to exceed 40 hectares or 60 hectares (based on region – see below) unless the harvesting retains 40% or more of basal area of stand) <u>40-Hectare Regions:</u> Coast Forest Region; Southern Interior Forest Region – Arrow Boundary Forest District; Cascades Forest District; Columbia Forest District; Headwaters Forest District, except the Robson Valley Timber Supply Area; Kamloops Forest District; Kootenay Lake Forest District; Okanagan Shuswap Forest District; Rocky Mountain Forest District. <u>60-Hectare Regions:</u> Northern Interior Forest Region; Southern Interior Forest Region — 100 Mile House Forest District; Central Cariboo Forest District; Chilcotin Forest District; The portion of the Headwaters Forest District that is in the Robson Valley Timber Supply Area; Quesnel Forest. 65 Harvesting adjacent to another cutblock A cutblock cannot be harvested unless all adjacent cutblocks meet specific criteria (i.e. be reforested to a certain extent) 66 Wildlife tree retention 66(1) If an agreement holder completes harvesting in one or more cutblocks during any 12 month period beginning on April 1 of any calendar year, the holder must ensure that, at the end of that 12 month period,	commitment for use in reforestation, and (b) is unencumbered by pathogens; "disturbed area" means all or part of private managed forest land where (a) timber harvesting has been completed within a cutblock, or (b) timber was destroyed but does not include an area occupied by roads referred to in section 13 or logging trails referred to in section 14 (1); "restock" means to establish a stand of trees that contains at least (a) 400 crop trees per hectare reasonably well distributed across the disturbed area if the stand is on the Coast, and (b) 600 crop trees per hectare reasonably well distributed across the disturbed area if the stand is in the Interior; "successfully regenerated stand" means a stand of trees (a) that contains at least (i) 400 crop trees per hectare reasonably well distributed across the disturbed area if the stand is on the Coast, and (ii) 600 crop trees per hectare reasonably well distributed across the disturbed area if the stand is in the Interior, and (b) where the crop trees exceed the height of competing vegetation within 1 m of the crop tree by (i) 50% if the area is on the Coast, and (ii) 25% if the area is in the Interior. (2) This section does not apply to an owner of a disturbed area if (a) the area where the timber was harvested or destroyed is a contiguous area that is under 1 ha in size, or (b) the trees remaining on the area meet the definition of a successfully regenerated stand. (3) If all or part of private managed forest land becomes a disturbed area after the area becomes an owner's land, the owner or a contractor, employee or agent of the owner must reforest the disturbed area by (a) restocking the disturbed area within 5 years of the	e) volume reductions to account for stand level retention and recruitment for ecosystem components such as snags, wildlife trees and coarse woody debris; f) non-recoverable losses such as those resulting from fires, insects and disease; and, g) reductions required to protect non-timber values and forest-dependent economic activities. 5.6.2 The rate of timber harvest is determined in a manner that adequately reflects reliability and uncertainty associated with inventory data, management assumptions, growth-and-yield projections, and analysis methodologies. 5.6.3 Where the manager harvests or has the ability to control the harvest of non-timber forest products, the manager assures that the rate of harvest reflects the best available inventory and productivity data, provides for sustainable production, and is adjusted when monitoring indicates over-harvesting. 5.6.4 The manager demonstrates that the average of the present and projected annual timber harvests over the next decade, and averages of projected timber harvests over all subsequent decades, do not exceed the projected long-term harvest rate, while meeting the FSC-BC Regional Standards over the long term. 5.6.5 After ten years of FSC certification, the manager demonstrates that the decadal averages of actual timber harvests in decades subsequent to FSC certification have not exceeded the projected long-term harvest rate. (Note: This indicator only applies in a Recertification) 5.6.6 Actual rate of timber harvest in any given year is no more than 25% above the projected longterm harvest rate, unless: a) the manager has harvested an equivalent amount below the projected long-term harvest level within the last ten years and subsequent to FSC certification; b) the management unit has a long-term annual harvest level less than 10,000 m3; or, c) the manager can demonstrate that an elevated harvest rate is planned to address catastrophic events within the management unit (e.g. – fire, insects,) and that the 5 year average cut does not exceed the projected long term harvest level. Such a temporary increase in the actual rate of timber harvest takes	Within 3 years of harvest, must establish 190 trees/acre in Western Washington and 150 trees/acre in Eastern Washington 76.09.070 Reforestation—Requirements—Procedures—Notification on sale or transfer. (1) After the completion of a logging operation, satisfactory reforestation, as defined by the rules and regulations promulgated by the board, shall be completed within three years. … (5) The forest practices regulations may provide alternatives to or limitations on the applicability of reforestation requirements with respect to forestlands being converted in whole or in part to another use which is compatible with timber growing. The forest practices regulations may identify classifications and/or areas of forestland that have the likelihood of future conversion to urban development within a ten year period. The reforestation requirements may be modified or eliminated on such lands. However, such identification and/or such conversion to urban development must be consistent with any local or regional land use plans or ordinances. Wildlife tree retention Western WA: 3 wildlife reserve trees (if available), 2 green recruitment trees, 2 down logs per acre. Eastern WA: 2 wildlife reserve trees (if available), 2 green recruitment trees, 2 down logs per acre. Wildlife trees- > 10 feet tall, 10-12 inches dbh, leave largest Green trees- >30 feet tall, >10 inches dbh. Down logs: > 20 feet long, min 12 inches Unit size & timing • Clearcuts over 240 acres prohibited • Identification team review is required for clearcuts over 120 acres. • Adjacency requirements: 30% >30 years or 60% > 15 years or 90% at least 5 years

the total area covered by wildlife tree retention areas that relate to the cutblocks is a minimum of 7% of the total area of the cutblocks. (2) An agreement holder who harvests timber in a cutblock must ensure that, at the completion of harvesting, the total amount of wildlife tree retention areas that relates to the cutblock is a minimum of 3.5% of the cutblock. (3) For the purposes of subsection (1) and (2), a wildlife tree retention area may relate to more than one cutblock if all of the cutblocks that relate to the wildlife tree retention area collectively meet the applicable requirements of this section. 67 Restriction on harvesting (re: wildlife tree retention) 67 An agreement holder must not harvest timber from a wildlife tree retention area unless the trees on the net area to be reforested of the cutblock to which the wildlife tree retention area relates have developed attributes that are consistent with a mature seral condition. 68 Coarse woody debris: On the Coast: must retain 4 logs/hectare that are a minimum 5m in length and 30 cm in diameter at one end In the Interior: must retain 4 logs/hectare that are a minimum 2m in length and 7.5 cm in diameter at one end	completion of timber harvesting activity on the cutblock, or the date the timber was destroyed, as applicable, and (b) establishing a successfully regenerated stand on the disturbed area within 15 years of the completion of timber harvesting activity on the cutblock, or the date the timber was destroyed, as applicable. (4) Subject to subsection (5), if all or part of private managed forest land became a disturbed area before the area became an owner's land, the owner or a contractor, employee or agent of the owner must reforest the disturbed area by (a) restocking the area within 10 years of the area becoming the owner's managed forest land, and (b) establishing a successfully regenerated stand on the area within 20 years of the area becoming the owner's managed forest land. (5) If, in relation to a disturbed area, the council determines that (a) the present owner is a corporation, (b) the previous owner is a corporation and was the owner of the area when the area became a disturbed area, and (c) the present owner is (i) a subsidiary of the previous owner, or (ii) has control of the previous owner, the council may order that the present owner reforest the disturbed area in accordance with subsection (3). (6) Nothing in this section requires an owner to reforest a disturbed area if the timber on the area was (a) destroyed and the disturbed area is not sufficiently productive to support a successfully regenerated stand, or (b) harvested or destroyed and the disturbed area becomes occupied by buildings or other structures or installations.	place only after public consultation specific to the increase has taken place and the manager has addressed the related interests of directly affected persons. 6.1.6 In areas proposed for timber harvesting, prior to preparing stand level prescriptions and selecting harvesting methods, inventories at the cutblock or stand level are completed, including at a minimum: a) stand structure, including occurrence of live wildlife trees and snags, and relative amounts of coarse woody debris ; b) presence of aquatic habitats, rare ecosystem features and/or other critical habitats identified at the site level; and, c) basic ecosystem and soil information. *Forest regeneration and succession* 6.3.2 Regeneration surveys confirm that successful and ecologically appropriate regeneration is occurring on disturbed forest lands. 6.3.3 When site preparation is utilized, the manager selects a site preparation method that takes into consideration and balances the following factors: effectiveness of achieving management objectives and minimization of negative environmental impacts (including soil degradation). 6.3.4 At the landscape and stand levels, the spatial extent, temporal longevity and structural characteristics of non-tree-dominated early seral stages (i.e., herb and shrub stages), are compatible with natural disturbance regimes and meet the needs of early-seral-dependent species and cultural uses. *Stand and Gene Level Issues* 6.3.5 Regeneration methods implemented by the manager maintain or enhance the structural and genetic diversity of forest stands by: a) showing a preference for natural regeneration; and/or b) using artificial regeneration methods (e.g., planting), with seed or stock produced from local provenances. 6.3.6 Seed trees, advanced regeneration or other sources of natural or artificial regeneration are selected to maintain species and genetic diversity. 6.3.7 Silvicultural treatments, including regeneration,	

		maintain a diversity of tree species and stand types compatible with the range of natural variability at the landscape level. 6.3.8 Silviculture and stand management prescriptions contain objectives and measures for the maintenance and/or restoration of stand structure to conditions compatible with the range of natural variability at the stand and landscape levels. Structural components, including at a minimum canopy complexity, live wildlife trees, snags and coarse woody debris are maintained or restored to quantities and distributions that are compatible with RONV.	

Water Quality

BC Crown Forest	BC Private Managed Forest Land	BC Forest Stewardship Council	Washington Forest Practices Act
FPPR s. 8.2 Objectives set by government for water in community watersheds 8.2 (1) In this section, "community watershed" means a community watershed (a) that is continued under section 180 (e) of the Act, and (b) for which a water quality objective has not been (i) continued under section 181 of the Act, or (ii) established under the Government Actions Regulation. (2) The objective set by government for water being diverted for human consumption through a licensed waterworks in a community watershed is to prevent to the extent described in subsection (3) the cumulative hydrological effects of primary forest activities within the community watershed from resulting in (a) a material adverse impact on the quantity of water or the timing of the flow of the water to the waterworks, or (b) the water from the waterworks having a material adverse impact on human health that cannot be addressed by water treatment required under	PMFLA s. 13 – Water Quality 13 (1) The forest management objective for private managed forest land with respect to water quality is to protect human drinking water, both during and after harvesting. (2) Nothing in subsection (1) requires an owner to retain additional streamside trees or additional understory vegetation to address problems with water quality that originate outside of the owner's private managed forest land. Private Managed Forest Land Council Matters Regulation, s. 2 Establishment of water quality objectives 2 (1) For the purpose of section 24 (3) (b) of the Private Managed Forest Land Council Regulation, the wildlife minister may establish water quality objectives for any part or all of a stream that is located upstream of a licensed waterworks intake. (2) Before establishing a water quality objective under subsection (1), the wildlife minister must consult with any affected owners. (3) If a water quality objective has been established under subsection (1), the wildlife minister may monitor to ascertain if the water quality in the stream is consistent with the water quality objective.	Considerations about water quality are incorporated into the extensive riparian areas requirements and assessment framework. See Appendix B of the FSC Regional Standards Document.	The *Standard Methodology for Conducting Watershed Analysis*, also known as the Watershed Analysis Manual, is a technical publication required by chapter 222-22 WAC. It is used by qualified scientists and experts to determine, at the watershed administrative unit (WAU) scale, conditions of selected public resources and cultural resources. Forest managers then develop site-specific prescriptions that further regulate forest practices to protect public resources and voluntary management strategies to protect cultural resources. The latest version of the Watershed Analysis Manual is available at http://www.dnr.wa.gov/watershed-analysis.

(i) an enactment, or (ii) the licence pertaining to the waterworks. (3) The objective set by government under subsection (2) applies only to the extent that it does not unduly reduce the supply of timber from British Columbia's forests. (4) If satisfied that the objective set out in subsection (2) is not required to provide special management the minister responsible for the Wildlife Act must exempt a person from the requirement to specify a result or strategy in relation to the objective. (5) If satisfied that the objective set out in subsection (2) is addressed, in whole or in part, by an enactment, the minister responsible for the Wildlife Act must exempt a person from the requirement to specify a result or strategy in relation to the objective set out in subsection (2) to the extent that the objective is already addressed.	(4) For the purposes of subsection (1) or (3), the wildlife minister may enter onto private managed forest land to access the stream. (5) The wildlife minister must notify the owner, in writing, at least 14 days before entering on land under subsection (4). (6) A water quality objective established under this section becomes effective on a date that is six months after the wildlife minister has notified the council that the water quality objective has been established.		

Roads

BC Crown Forest	BC Private Managed Forest Land	BC Forest Stewardship Council	Washington Forest Practices Act
FPPR s. 40 Revegetation 40 An authorized person who constructs or deactivates a road must ensure that soil exposed by the construction or deactivation is revegetated within two years after the construction or deactivation is completed if it is reasonably foreseeable that (a) the erosion of the soil would cause (i) sediment to enter a stream, wetland or lake, or (ii) a material adverse effect in relation to one or more of the subjects listed in section 149 (1) of the Act, and (b) revegetation would materially reduce the likelihood of erosion. Roads in a community watershed 62 (1) To prevent interference with the subsurface flow path of a drainage area that contributes to a spring	PMFLCR s. 21 Road maintenance 21 (1) An owner or a contractor, employee or agent of the owner who constructs or uses a road for a purpose related to timber harvesting must maintain the road in accordance with this section until the road is deactivated. (2) Despite subsection (1), if an owner or a contractor, employee or agent of the owner uses for timber harvesting purposes a portion of a road that was constructed under another enactment, the owner or a contractor, employee or agent of the owner must maintain that portion of the road in accordance with this section for the period that the owner or a contractor, employee or agent of the owner (a) uses the road for timber harvesting purposes, and (b) is the primary user of that portion of the road.	6.1.4 In areas proposed for road construction, timber harvesting, and/or other treatments that will likely affect water quality (e.g., fertilization) or stream channel integrity, detailed maps of hydrologic features, including riparian classification, are completed in advance of initiating management activities. The maps include identification of fish-bearing streams and domestic and irrigation water sources. 6.1.5 Where road construction or timber harvesting is proposed for areas rated with a moderate or high likelihood of landslides, areas rated as high or very high erosion potential, areas upslope of such hazardous areas (i.e. "gentle over steep"), or recharge areas for springs with domestic or irrigation water users; detailed terrain assessments and/or detailed hydrologic assessments are completed to assess the risks to the environment and provide recommendations on mitigation or other measures to reduce risk (e.g., drainage plans). *6.5 Written guidelines shall be prepared and*	Road Maintenance and Abandonment plan prepared by landowner and approved by DNR WAC 222-24-010 Policy *(1) A well designed, located, constructed, and maintained system of forest roads is essential to forest management and protection of the public resources. *(2) To protect water quality and riparian habitat, roads must be constructed and maintained in a manner that will prevent potential or actual damage to public resources. This will be accomplished by constructing and maintaining roads so as not to result in the delivery of sediment and surface water to any typed water in amounts, at times or by means, that preclude achieving desired fish habitat and water quality by: • Providing for fish passage at all life stages; • Preventing mass wasting; • Limiting delivery of sediment and surface runoff to all typed waters;

that is a source of water for a licensed waterworks, the minister may (a) identify a spring in a community watershed, (b) specify a distance from the spring within which a person who constructs a road must not locate the road, and (c) permit a person who constructs a road to locate the road closer to the spring than the distance specified under paragraph (b). (2) If the minister does not specify a distance under subsection (1) (b), a person who constructs a road must not locate the road closer than a 100 m radius upslope of the spring identified under subsection (1) (a), unless the construction does not interfere with the subsurface flow path of a drainage area that contributes to the spring. Notice — road in community watershed 84 At least 48 hours before commencement of road construction or deactivation in a community watershed, a person must notify affected water licensees or affected water purveyors.	(3) For the purposes of this section, an owner or a contractor, employee or agent of the owner must maintain (a) the structural integrity of the road prism and clearing width, and (b) the proper functioning of the drainage systems of the road to the extent necessary to avoid causing a material adverse effect on fish habitat or on water that is diverted by a licensed waterworks intake. Road deactivation 22 An owner or a contractor, employee or agent of the owner who no longer requires a road and who intends to cease maintaining it must (a) remove round-pipe stream culverts, and (b) remove any other culverts or bridges and stabilize the road prism, if doing so will reduce the likelihood of a material adverse effect in relation to fish habitat or water diverted by a licensed waterworks intake. Notice — roads located upstream of licensed waterworks intake 23 At least 48 hours before an owner or a contractor, employee or agent of the owner commences road construction or deactivation within 1 km upstream of a licensed waterworks intake, the owner or a contractor, employee or agent of the owner must notify the holder of a licence for the licensed waterworks intake of the pending construction or deactivation. Stream crossings 17 (1) An owner or a contractor, employee or agent of the owner who builds a stream crossing as part of a road or logging trail must locate, build and use the crossing in a manner that (a) protects the stream channel and stream bank immediately above and below the stream crossing, and (b) mitigates disturbance to the stream channel and stream bank at the crossing to the extent necessary to avoid causing a material	*implemented to: control erosion; minimize forest damage during harvesting, road construction, and all other mechanical disturbances; and protect water resources.* 6.5.1 Measures are implemented to ensure that occurrence rates of landslides, snow avalanches, waterborne erosion and sedimentation are not increased, due to road construction or forest harvesting, beyond the natural rates described in the description of the range of natural variation (see Indicator 6.1.7 and *FSC BC* Guidance - Guidance on RONV). 6.5.2 Road construction and forest harvesting do not occur on areas with a high likelihood of landslide initiation, or areas with a very high potential for snow avalanche initiation. 6.5.3 Road construction and forest harvesting do not occur on the following high risk areas, unless measures are implemented that reduce the risk of landslide or snow avalanche initiation, or prevent erosion and sedimentation: a) areas of moderate likelihood of landslide initiation and high or very high landslideinduced stream sedimentation hazard; b) areas of moderate likelihood of landslide initiation and a high to very high likelihood of the landslide reaching areas of human habitation; c) areas with a high potential for snow avalanche initiation; and d) areas of high or very high road/ditch/surface erosion hazard and high or very high sediment delivery.	• Avoiding capture and redirection of surface or groundwater. This includes retaining streams in their natural drainages and routing subsurface flow captured by roads and road ditches back onto the forest floor; • Diverting most road runoff to the forest floor; • Designing water crossing structures to the 100-year flood level to provide for the passage of bedload and some woody debris; • Protecting stream bank stability, the existing stream channel, and riparian vegetation; • Minimizing the construction of new roads; • Assuring no-net-loss of wetland function; and • Assuring no-net-loss of fish habitat. WAC 222-24-030 Road construction (1) Right of way timber shall be removed or decked in suitable locations where the decks will not be covered by fill material or act as support for the fill or embankment. *(2) In permanent road construction, do not bury: (a) Loose stumps, logs or chunks if they will contribute more than 5 cubic feet in the load-bearing portion of the road. (b) Any significant amount of organic debris within the top 2 feet of the load-bearing portion of the road. (c) Excessive accumulation of debris or slash in any part of the load-bearing portion of the road fill. (3) Compact fills. During road construction, fills or embankments shall be built up by layering. Each layer shall be compacted by operating the tractor or other construction equipment over the entire surface of the layer. Chemical compacting agents may be used in accordance with WAC 222-38-020. *(4) Stabilize soils. Erodible soil disturbed during road construction and located where it could reasonably be expected to enter the stream network must be seeded with noninvasive plant species. The use of local area native species, adapted for rapid revegetation is preferred. Treatment with other erosion control measures may be approved by the department. *(5) Channel clearance. Within 50 feet upstream from a culvert inlet clear stream channel of all debris and slash generated by the operations that reasonably may be expected to plug the culvert prior to the removal of equipment from the vicinity, or the winter season, whichever is first. (See the board manual, section 4 for debris removal guidelines.) *(6) Drainage.

	adverse effect on fish habitat or water that is diverted by a licensed waterworks intake. (2) An owner or a contractor, employee or agent of the owner who builds a stream crossing as part of a logging trail must remove the crossing when it is no longer required by the owner.		(a) All required ditches and drainage structures shall be installed concurrently with the construction of the roadway. (b) Uncompleted road construction to be left over the winter season or other extended periods of time shall be drained by outsloping or drainage structures. Water bars and/or dispersion ditches may also be used to minimize eroding of the construction area and stream siltation. Water movement within wetlands must be maintained. *(7) Moisture conditions. Construction shall be accomplished when moisture and soil conditions are not likely to result in excessive erosion and/or soil movement, so as to avoid damage to public resources. *(8) End haul/sidecasts. End haul or overhaul construction is required where significant amounts of sidecast material would rest below the 100-year flood level of any typed water, within the boundary of a Type A or Type B Wetland or wetland management zones or where the department determines there is a potential for mass soil failure from overloading on unstable slopes or from erosion of side cast material causing damage to the public resources. Additional Guidance manual on roads: https://www.dnr.wa.gov/publications/fp_board_manual_section03.pdf?yv81t5p

Cultural Heritage Resources

BC Crown Forest	BC Private Managed Forest Land	BC Forest Stewardship Council	Washington Forest Practices Act
FPPR s. 10 Objectives set by government for cultural heritage resources 10 The objective set by government for cultural heritage resources is to conserve, or, if necessary, protect cultural heritage resources that are (a) the focus of a traditional use by an aboriginal people that is of continuing importance to that people, and (b) not regulated under the Heritage Conservation Act. The *Forest Act* defines a cultural heritage resource as, "an object, a site or the location of a traditional societal practice that is of historical, cultural or archaeological significance to British Columbia, a community or an	Nothing	*3.3 Sites of special cultural, ecological, economic or religious significance to indigenous peoples shall be clearly identified in cooperation with such peoples, and recognised and protected by forest managers.* 3.3.1 Forest management activities within the management unit are planned and implemented in such a way as to protect sites of special cultural, ecological, economic, or religious significance to the First Nation(s) except in the following circumstances: a) the First Nation(s) are satisfied with measures to offset the loss or diminishment (e.g., restoration, replacement, monetary compensation, or other consideration); or, b) the First Nation(s) agree to accept the loss or diminishment. *3.4 Indigenous peoples shall be compensated for the*	WAC 222-20-120 (1) The department shall notify affected Indian tribes of all applications in geographic areas of interest that have been identified by such tribes, including those areas that may contain cultural resources. (2) Where an application is within a tribe's geographic area of interest and contains cultural resources the landowner, at the tribe's discretion, shall meet with the affected tribe(s) prior to the application decision due date with the objective of agreeing on a plan for protecting the archaeological or cultural value. Further detail: https://apps.leg.wa.gov/wac/default.aspx?cite=222-20-120

aboriginal people."		*application of their traditional knowledge regarding the use of forest species or management systems in forest operations. This compensation shall be formally agreed upon with their free and informed consent before forest operations commence.* 3.4.1 Where mutually agreed, the manager incorporates First Nation(s) traditional knowledge into the management plan and supporting operational plans and practices. 3.4.2 Parties have reached agreement on fair compensation where the manager has made use of the First Nation(s) traditional knowledge.	WAC 222-22-045 Cultural resources. (1) Any watershed analysis initiated after July 1, 2005, is not complete unless the analysis includes a completed cultural resource module.

Visual Quality

BC Crown Forest	BC Private Managed Forest Land	BC Forest Stewardship Council	Washington Forest Practices Act
FPPR s. 9.2 Objectives set by government for visual quality 9.2 (1) In this section: "scenic area" means an area of land established as a scenic area under the Forest Practices Code of British Columbia Act on or before October 24, 2002 and continued as a scenic area under section 180 (c) of the Act; "visual sensitivity class" means a visual sensitivity class established on or before October 24, 2002, particulars of which are publicly available in the Land and Resource Data Warehouse maintained by the minister responsible for the Land Act. (2) The objective set by government in relation to visual quality for a scenic area, that (a) was established on or before October 24, 2002, and (b) for which there is no visual quality objective is to ensure that the altered forest landscape for the scenic area (c) in visual sensitivity class 1 is in either the preservation or retention category,	Nothing.	"Visual Resources" must be accounted for in the Management Plan. *7.1 b) Description of the forest resources to be managed, environmental limitations, land use and ownership status, socio-economic conditions, and profile of adjacent lands.* 7.1.2 The management plan describes terrestrial and aquatic species and habitats and timber, nontimber, water, recreation, cultural and visual resources located within the management unit, with reference to applicable inventories	Nothing specific.

(d) in visual sensitivity class 2 is in either the retention or partial retention category, (e) in visual sensitivity class 3 is in either the partial retention or modification category, (f) in visual sensitivity class 4 is in either the partial retention or modification category, and (g) in visual sensitivity class 5 is in either the modification or maximum modification category.			

Appendix B: Requirements for Riparian Management

The following are FSC-BC Requirements for riparian management under Indicator 6.5*bis*.1.

Context

Planning to maintain riparian values should be undertaken within the broader framework of conservation design and ecosystem-based management as presented in *FSC BC Guidance – A companion document to the FSC Regional Standards for BC* – Guidance on Planning.

Introduction

Riparian areas are **ecosystems** that occur adjacent or in the immediate vicinity of **hydrologic features** (e.g., streams, lakes, wetlands, estuaries). Riparian areas are influenced by the hydrologic feature (e.g., flood plains), and/or have the potential to directly impact the hydrologic feature (e.g., steep gully walls that supply sediment). Riparian forests protect hydrologic features by stabilizing stream banks and shorelines, and by filtering sediment that may otherwise reach the water body. Riparian forests are also essential to maintaining aquatic habitat for fish and other aquatic life. Riparian forests supply large logs to the stream channel to create pools and other habitat, they provide shade to regulate water temperatures, and they supply food for aquatic life through litterfall. Riparian forests and associated flood channels and wetlands are also important habitat to many species, including amphibians (e.g., salamanders, frogs), mammals (e.g., bears, moose, beaver) and many bird species (e.g., great blue herons, wood ducks, songbirds). The intent of the riparian requirements is to ensure these riparian functions are maintained along all waterbodies (in a manner that is **compatible with the range of natural variability** – **RONV**, see the glossary and *FSC BC Guidance– A companion document to the FSC Regional Standards for BC* – Guidance on Applying RONV to Forest Management).

The following sections describe an approach for meeting the riparian conservation requirements of Criterion 6.5. The approach involves assessments by **qualified specialists** to determine riparian management requirements for each **riparian assessment unit** (e.g., a watershed, See also Glossary and Assessment Framework below). This approach also includes a minimum budget of reserves and management zones to provide consistency of application, to provide certifiers with a definitive threshold, and to guard against misuse of the flexibility offered.

Assessment Framework

This section provides a framework for assessments and analyses that can contribute to developing site specific riparian management strategies. Table 1 summarizes the range of inventory and data needs that may be required across a full spectrum of riparian values. Specific requirements for inventory and assessment will vary with the characteristics of any given **management unit**, and therefore, not all elements of the framework will be applicable to all watershed assessment units. Table 2 summarizes the range of assessments that may be required to determine riparian management strategies for maintaining a full suite of riparian functions in any given situation. Table 3 provides a summary of threshold riparian area budgets for meeting FSC-BC riparian management requirements under Criterion 6.5. Where assessments determine that maintenance of

riparian functions requires retention in excess of the threshold budgets, the direction of the assessments should be followed. Where the assessments indicate that riparian functions can be adequately maintained with less retention than the threshold budgets, the remaining budgets can be used to fulfill other terrestrial habitat requirements associated with riparian areas (e.g., Criteria 6.2, 6.3, 6.4 and 9.3). Use of the riparian assessment approach involves six steps as described below and as illustrated in Figure 1.

Step 1. Inventory and Classification of Hydrologic Features.

The first step in riparian management is to identify, map and classify the **hydrologic features** present on the **management unit**. The FSC-BC classification system for hydrologic features is based on the BC provincial government classification; however, it groups some government riparian classes and splits some others.

Under FSC-BC Criterion 6.1, inventory and classification includes determination of watershed and sub-basin boundaries, **H60 lines**, location of springs, location and width of stream reaches, location and extent of lakes and wetlands, and the location of domestic and irrigation water intakes. Stream classification for deployment of riparian management strategies also requires the determination of the presence of fish and aquatic habitat, the distance upstream from fish-bearing waters, and the presence of licensing for domestic water use.

Although ideally the **manager** would map and classify all hydrologic features and riparian areas at the strategic planning stage, this is NOT a requirement of this approach. At the strategic planning stage the **manager** is only required to use existing information (e.g., TRIM maps, existing fish inventories, airphotos) to estimate amount and location of various hydrologic features. Actual field mapping and classification of waterbodies and riparian areas can be finalized at the operational level during road and cutblock layout. As more detailed operational information becomes available, it can be used to update the strategic information.

The classification for streams, wetlands, lakeshores and marine shorelines is provided in Table 1. These are adapted from the BC Forest Practices Code Guidebooks for Riparian and Lakeshore Management (BC MoF 1995a and 1995b) and the Clayoquot Sound Scientific Panel 1995. The definitions of S1a, S1b, S2, S3 and S4 classes are the same as the FPC; however, the specifications for riparian forest retention have been modified. FPC S5 and S6 stream classes have been subdivided to better account for streams potentially affecting fish-bearing reaches and those present in domestic watersheds, as follows:

- S5a streams include large non-fish-bearing streams, moderate-to-large streams likely to influence fish-bearing streams, and moderate-to-large streams in non-community domestic watersheds;
- S5b streams include moderate sized non-fish-bearing, non-community watershed streams that are: unlikely to influence fish-bearing streams, and not located in domestic watersheds;
- S6a streams include small non-fish-bearing, non-community watershed streams that are: likely to influence fish-bearing streams, or located in domestic watersheds.
- S6b streams include very small non-fish-bearing, non-community watershed streams, and small non-fish-bearing streams that are: not likely to influence fish-bearing streams, or not located in domestic watersheds.

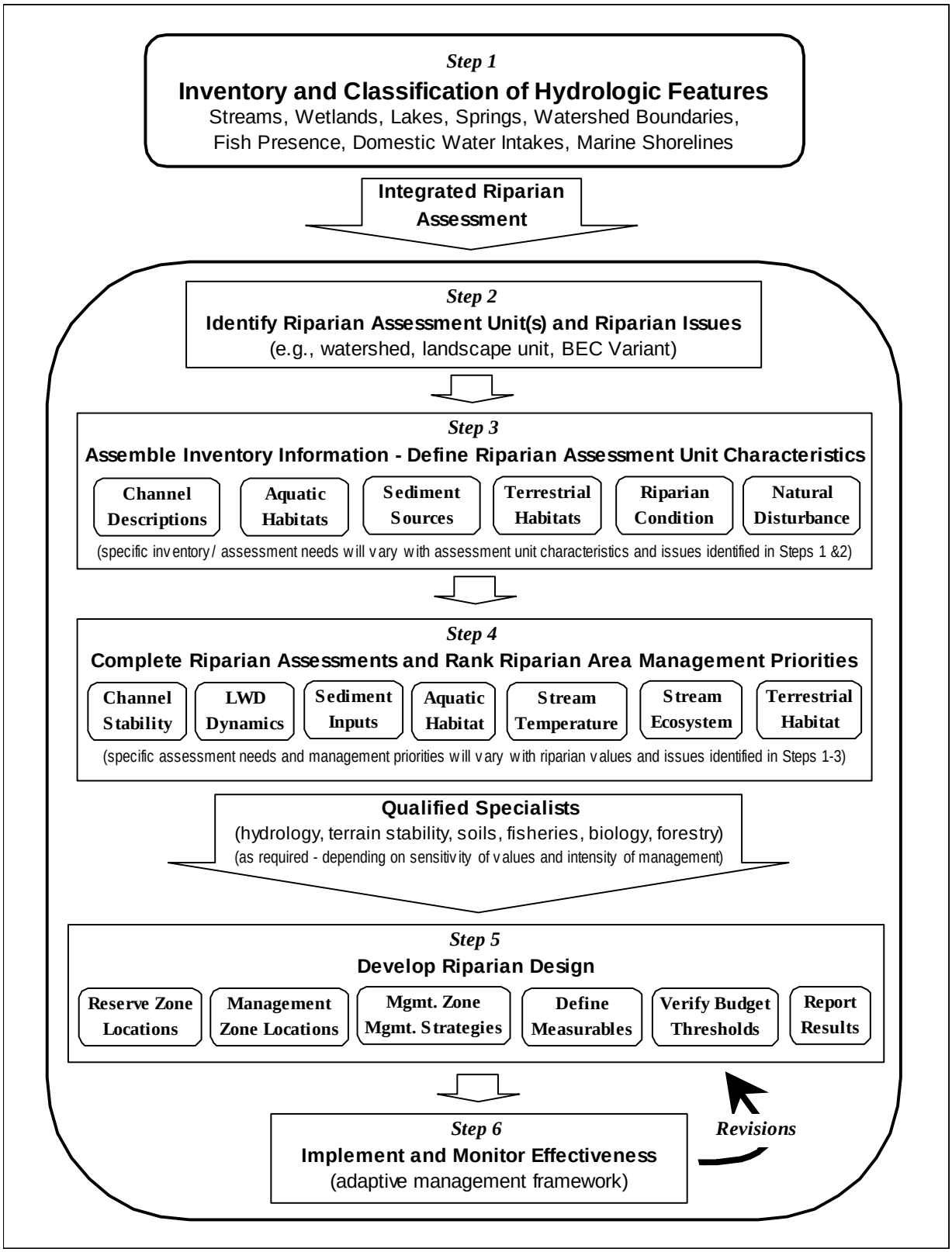

Figure 1. Schematic representation of the six steps necessary for application of the integrated riparian assessment procedure (aquatic habitat includes near-shore marine and littoral zones where applicable).

Step 2. Identification of *Riparian Assessment Unit(s)* and Riparian Issues.

Before commencing the assessment itself, an appropriate unit(s) for the assessment and application of the results must be selected. For stream channel riparian assessments the logical unit is usually a watershed or potentially a group of watersheds (e.g., on face units). For wetlands, lakeshore and/or marine shore riparian planning, or stream riparian planning on extensive plateaus or coastal plains, the unit may be a **landscape unit**, a BEC **variant** within an **ecosection** or possibly an **ecosection**. The appropriate size of assessment unit will vary depending on stream density, wetland and lake density, complexity of the marine shoreline, topography and other factors. In general, units should fall between 5,000 and 50,000 ha. Where appropriate units involve multiple **management unit**s, **manager**s and/or management agencies, as many as possible of the relevant parties should be involved in the assessment process. Where a **management unit** forms only a portion of the appropriate assessment unit, and an integrated assessment is not feasible, the **manager** can proceed with an assessment limited to the **management unit** (steps 2 through 4 below), but the assessment process must still define an appropriate assessment unit, and take into account the context of the whole assessment unit and the management regimes present in other parts of the assessment unit when developing a riparian management strategy for the **management unit** (step 5 below). Within each assessment unit, the types of hydrologic features present, known aquatic and terrestrial habitat use and sedimentation risks should be reviewed to identify the relevant riparian functions, potential riparian management issues, and what inventories and assessments may be required (see Tables 1 and 2).

Step 3. Obtain relevant *Riparian Assessment Unit* characteristics from inventory information.

This step focuses on using basic inventory information to identify important **ecosystem** and watershed processes, known sensitivities and specific critical or vulnerable sites (See Table 1). This step begins with identification and mapping of the spatial extent of the hydroriparian **ecosystem**, followed by assembly of more detailed information regarding various components of that **ecosystem**. Not all functions or inventory needs shown in Table 1 will necessarily be required in all assessment units. The recommended inventory and data sources, and interpretive requirements are built around the existing planning framework in British Columbia. Where information gaps exist, they may be filled through collection of additional inventory information, or through use of modelling and/or assumptions. All assumptions and their rationale should be clearly specified in the final riparian design report (prepared in step 5).

It is assumed here that many of the basic inventories are already available for many watersheds and other **Riparian Assessment Units**, especially Community Watersheds and High Value Fisheries Watersheds (See Table 1). Implementation of the Forest Practices Code and the Watershed Restoration Program has resulted in the completion of numerous relevant inventories including: **terrain and soil characteristics** and hazard interpretations, channel stability assessment and interpretation (including peak flow assessment), fish presence and aquatic habitat assessment, riparian condition, terrestrial **ecosystem** mapping, predictive **ecosystem** mapping and habitat capability mapping. The far right column of Table 1 indicates the type of information that must be extracted from these inventories to provide a basis for assessment of riparian management requirements.

Step 4. Complete riparian assessments and rank riparian areas for potential management strategies.

The riparian assessments shown in Table 2 are carried out with input from **qualified specialists** appropriate to the values and risks identified. The preliminary riparian functions and assessment needs identified in Steps 2 and 3 should guide the determination of what assessments are applicable for individual assessment units, and what specialists are appropriate. These assessments would normally include a multidisciplinary group of persons with expertise in hydrology, terrain/soils/geomorphology, fisheries habitat, wildlife biology, **landscape** ecology and forestry. These individuals may include many of the same people who conducted the inventories. In some situations the assessments may require focused expertise such as a specialist in amphibian biology, stand structure, windthrow management and/or salmon spawning habitat.

The goal of these assessments is to identify stream reaches and/or stream segments (i.e., sub-reaches) with aquatic habitat values, stream reaches that influence those values and stream reaches/segments that are vulnerable to riparian disturbance. Each assessment includes a ranking of vulnerable locations where greater riparian retention may be recommended and a description of the nature of the vulnerability and the potential constraint it poses on the management of riparian vegetation. All assumptions must be clearly identified. It is preferable that these assessments be carried out with interaction and exchange between the assessors as implied by Figure 1.

The array of potential riparian values, functions and vulnerabilities is reviewed on an analysis-unit basis (as indicated in Step 2), to develop a ranking of stream reaches for which riparian conservation measures are required. Riparian retention for terrestrial habitat forms an integral part of this step.

Step 5. Develop riparian management strategies and implement specific riparian management measures.

The **manager** should use his/her **local** knowledge and experience to develop riparian management measures. If they are available, the **manager** should also consult other studies such as riparian or watershed or channel assessments, fisheries or wildlife habitat surveys, TEM/PEM mapping, windthrow assessments or terrain stability mapping. The EBM Hydroriparian Planning Guide[1] and the Clayoquot Sound Scientific Panel report offer other compatible approaches to riparian management (especially for coastal areas). If the **manager** is uncertain regarding the identification of specific riparian values, risks to aquatic values or measures necessary to protect hydrologic features, the **manager** should consult with qualified specialists for further guidance.

Based on the compilation and integration of the various riparian values, functions and vulnerabilities, a riparian management design is developed that provides the temporal and spatial layout of forest reserve zones and management zones for riparian areas. The design should clearly indicate how and where the identified riparian components and functions have been addressed: e.g., channel stability (including bank stability and large woody debris), sediment control, aquatic habitat (including temperature and nutrient needs), floodplain functions (e.g., water storage, sediment accumulation), groundwater functions, terrestrial habitat functions of riparian areas and **landscape connectivity**. The riparian management regime should include long-term projections of riparian condition, and incorporate sufficient flexibility to accommodate stochastic disturbances and future revisions necessitated by monitoring results. The design should be mapped and summarized in the **management plan**. Supporting information should be compiled that include a rationale for the design, and data demonstrating that it meets or exceeds the minimum budgets set out in Table 3. The strategies and measures should also be reflected in assumptions for timber supply analyses and calculation of allowable annual cuts.

[1] Suggest sources of information and how to obtain them are listed in the references at the end of the Annex.

The riparian management budget minimums specified in Table 3 anticipate the utilization of both **riparian reserve zones** and **riparian management** zones. Because the width, distribution and potential importance of riparian areas vary from waterbody to waterbody, using a single width or retention level for all situations is inappropriate. Where streams are deeply incised in gullies or canyons, the riparian area may be relatively narrow, while streams that are in broad u-shaped valleys may have wide floodplains and the riparian areas may coalesce with valley bottom wetlands. In drier areas, coarse textured glaciofluvial terraces may extend right up to lakeshores or wetlands, leaving essentially no riparian areas on one side, while there may be a wide zone of wet soils and riparian vegetation on the other side. However, on average, a minimum level of retention will likely be required to maintain riparian values across a landscape, and this is the approach presented in Table 3.

The minimum requirements provided in Table 3 are intended to be applied by the **manager** in a manner that reflects the distribution of riparian values and risks to those values within the **management unit**. There is flexibility to utilize whatever combination of reserve zones and management zones that are appropriate to protecting the values present, as long as the average overall retention levels are equivalent to meeting or exceeding the minimum retention levels specified in Table 3. When applying riparian management measures, the **manager** should consider the riparian functions listed in column two of Table 2 and factors such as:

- channel and bank stability,
- terrain stability and other sediment sources,
- supply of large logs to stream channels,
- fish habitat,
- stream temperature requirements,
- the supply of nutrients from litterfall, windthrow,
- windthrow hazard,
- riparian habitat for other species, and
- other natural disturbance factors in the riparian area.

For example, deployment may include wide **riparian reserve zone**s along salmon spawning stream reaches or wide floodplains, and partial cutting management zones in wetter riparian areas without flooding, while canyons or dry terraces may have little or no reserve or management zones (see example in Figure 2). The riparian retention budgets in Table 3 are minimums – where risks to aquatic **ecosystem** values are high (e.g., unstable terrain in a community watershed), or riparian values are critical (e.g., high value salmon spawning habitat or red-listed species habitat), riparian protection may have to exceed the minimum budgets to adequately protect the values present.

Where a regional windthrow hazard assessment has suggested potential problems with the stability of specific riparian reserves or management zones, **local** windthrow hazard assessments are carried out and integrated with terrain stability information. The riparian design must be made consistent with the recommendations of these site-specific assessments, while also meeting objectives for the maintenance and/or restoration of riparian functions.

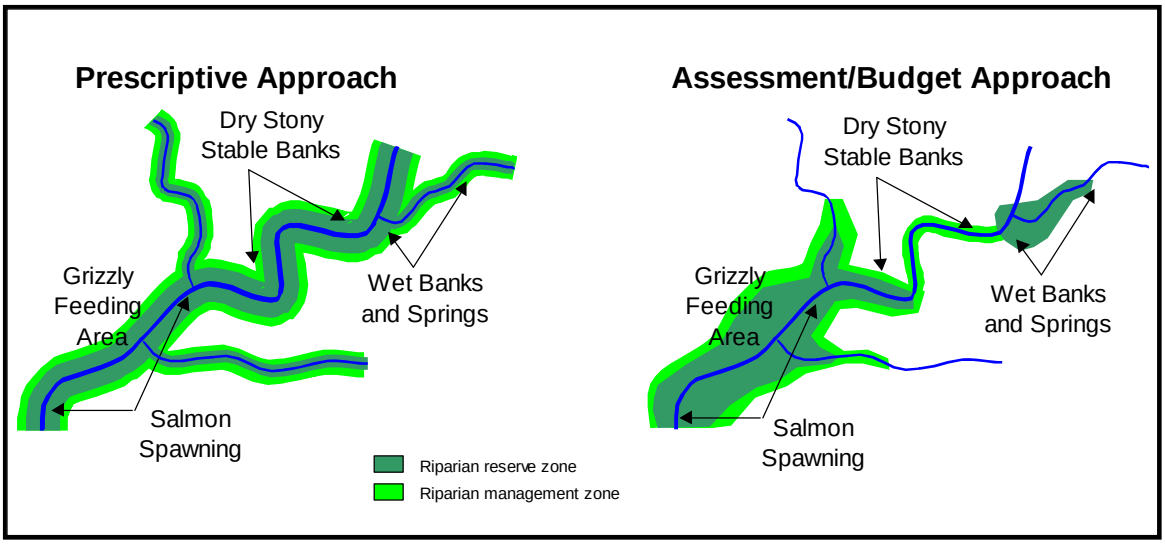

Figure 2. Schematic diagram of **riparian reserve zone** and management zone deployment under the FSC-BC approach – note that reserve and management zones vary in width depending on need, and may be zero in some stream reaches, as long as the minimum budgets are met within a watershed assessment unit, and they maintain or restore riparian functions and values.

Step 6. Monitor effectiveness and revise design as required (see also Principle 8).

This step involves three components.

a) Set objectives.

The monitoring and revision step begins with establishing monitoring objectives that address the following questions:

- What are the key cause-and-effect linkages between management and riparian function?
- What relevant trends are expected to be present?
- What physical conditions (aquatic/terrestrial) are desirable to maintain riparian integrity?

Prioritize the objectives. Make them focused and efficient. Include explicit consideration of natural variability.

b) Select appropriate variables and collect data.

For the objectives established in (a), selection of monitoring parameters is carried out with attention to the following:

- identify, evaluate, and prioritize options available to meet the objectives
- identify critical uncertainties in associated knowledge
- monitor over temporal and spatial scales appropriate to the objectives
- choose *measurable* variables
- tailor the monitoring plan to watershed-specific conditions and concerns
- make use of available data to extend the monitoring period

Examples of potential measurable variables include large woody debris pieces (minimum size) per 100 m, riparian stand characteristics (tree size, density, and species), change in stream temperature (over specific segments), percentage of stream with full shade, percentage of bank with active erosion, distribution of canopy closure over stream segments, percentage of pools, etc. Although monitoring of overall resource condition/change (e.g., fish populations) can be useful, this would not be considered part of a riparian monitoring design.

For each objective, a hypothesis should be established which expresses why the measurable variables are selected (rationale) and how they are expected to change in relation to resource trend.

Sampling design should include sampling locations, intensity, methods and schedule, and include identification of how quality assurance will be achieved. These details should be included in a summary report along with expected data analysis needs.

c) Analyze data and revise design.

As monitoring results become available, the objectives are evaluated in light of the following:

- compare outcome with established targets
- assess the effectiveness of the prescriptions in achieving the targets
- are resources responding as expected?
- assess the effectiveness of the targets in maintaining riparian functions – in terms of both the target values and the target parameters
- justification of the chosen monitoring parameters and the associated established targets
- effectiveness monitoring to assess level of success in reaching targets established in Step 4

The riparian design is then revised based on an analysis of the monitoring results.

Table 1. Inventory information and required interpretations for riparian assessments (inventory needs will vary between assessment units).

#	Inventory Information	Associated Riparian Functions[1]	Sources of Information	Inventory Data Interpretations Required for Riparian Assessments
1	Channel Descriptions	LWD recruitment Bank integrity	**Channel assessment**s (from IWAP/CWAP and/or Watershed Restoration Program); for small stream assessment methods see Carver and Putt 1999.	▪ Dominant processes maintaining channel stability/morphology and water quality. ▪ Specific locations where LWD is important/depleted in relation to channel stability/morphology. ▪ Location of channel migration zones and their activity level. ▪ Condition of banks and locations where trees are important to maintaining bank integrity.
2	Sediment Sources (existing and potential)	Sediment moderation	IWAP/CWAP Sediment Source Surveys; Level A & D **Terrain stability mapping**/Assessments; Level B & C Terrain/Soils Mapping and interpretations for TS, LISS, SE, RDE, SD	▪ Dominant processes creating stream sediment sources, and natural range of variability. ▪ Existing sediment sources (natural and development-related). ▪ Location of unstable terrain with potential for sediment delivery to streams. ▪ Location of sites with potential for sediment delivery due to surface erosion processes, especially those associated with road and ditchline erosion.
3	Aquatic Habitat (existing & potential with restoration)	LWD recruitment Stream temperature moderation Litterfall and nutrient dynamics	Stream classification surveys; MELP Regional Fisheries Information; DFO Fisheries Atlas; Fish Habitat Assessments; Fish Wizard website	▪ Dominant habitat-forming processes (including importance of LWD to aquatic habitat). ▪ Aquatic species diversity (fish, amphibians, benthic assemblages). ▪ Location of **critical habitat** sites and their vulnerability. ▪ Description of sediment sensitivity, temperature sensitivity and nutrient needs of aquatic species.
4	Terrestrial Habitats	Provision of Terrestrial Habitats	Wildlife and biodiversity surveys; Terrestrial **Ecosystem** Mapping; Predictive **Ecosystem** Mapping; Wildlife Capability maps; nutrient transfer research studies; airphotos with field verification	▪ Terrestrial species using or potentially using riparian areas (birds, mammals, herptiles). ▪ Riparian habitat types and features required to support terrestrial species present. ▪ Plant communities dependent on proximity to water (i.e. extent of hydroriparian **ecosystem**). ▪ Locations of riparian sites significant to terrestrial species. ▪ Role of riparian areas in landscape **connectivity**, patch sizes , seral stage distribution and transfer of marine/lake-derived nutrients from stream to forest (e.g. salmon carcasses).
5	Natural Disturbance Patterns of Riparian Areas	All	Windthrow hazard mapping; studies on the **range of natural variability** (fire regimes; insect/disease risks etc.)	▪ Role and effect of natural disturbance (fire, windthrow, etc.) in modifying the riparian areas. ▪ Expected past and projected riparian condition based on only natural disturbance patterns. ▪ Regional windthrow hazards in relation to riparian areas.
6	Riparian Condition (existing and projected)	All	IWAPs/CWAPs; Forest Cover mapping; FDPs; TRIM maps; Access **Management Plans;** Spatial Modeling for Timber/ Habitat Supply	▪ Existing riparian condition including identification of the cumulative effects of development. ▪ Restoration requirements to reestablish riparian function and aquatic **ecosystem integrity**. ▪ Projected riparian condition over next 250 years, incorporating planned development and the results of sensitivity analyses (including consideration of stochastic events, the **range of natural variability** and projected harvesting, roads and other development).

[1] Refer to Carver (2001) for explanation of riparian functions.

Table 2. Integrated riparian assessments to support selection of detailed riparian design (not all assessment units will require all assessments).

#	Assessment Type	Associated Riparian Functions[1]	Elements of the Assessments	Minimum Factors to be Considered
1	Channel Morphology, Condition, and Stability	LWD recruitment Bank integrity Moderation of sediment yield	Describe and classify all stream reaches. ▪ Develop generalized classes (and corresponding spatial layout) of stream behaviour and identify dominant processes of each type2. Establish relative importance and management needs of channel migration zones. Rank stream reaches or reach segments according to their sensitivity to changes in LWD recruitment, sediment inputs, and flow regime. Establish riparian management requirements for each class of stream behaviour2.	Stream channel characteristics: width, gradient, entrenchment, LWD requirement, presence/absence of fish and consumptive-use status Channel disturbance history (natural and development related) Channel sensitivity to riparian disturbance Aquatic habitat values Potential for flooding and/or channel-migration impacts on downstream human habitation and other infrastructure **Natural disturbance regime**s
2	LWD Dynamics	LWD recruitment Bank integrity Moderation of sediment yield	▪ Identify LWD recruitment rates (including size ranges) required to support channel morphology/stability and relevant **aquatic habitats**. ▪ Model LWD recruitment through time (including upslope sources). ▪ Rate priorities of stream reaches (or reach segments) for LWD recruitment requirements.	LWD recruitment factors (bank-erosion, windthrow, growth rates, species and size requirements etc.) Potential for reserve zones and/or management zones to meet identified LWD recruitment needs (e.g., RRZ widths, RMZ silvicultural systems).
3	Sediment Inputs	Moderation of sediment yield	▪ Identify stream reaches or reach segments with significant existing and potential for sediment sources or where sediment delivery to the stream channel could be reduced with increased riparian stand retention. ▪ Determine the location of riparian sites vulnerable to being deforested due to mass movements. ▪ Rate priorities of stream reaches (or reach segments) for riparian reserves for moderation of sediment inputs (include consideration of upslope management regimes).	Location and input rates of existing sediment sources. Location and extent of Class IV and V terrain-stability map polygons with a high hazard for Landslide Induced Stream Sedimentation. Location and extent of map polygons with a high hazard for Surface Soil Erosion and/or Road and Ditchline Erosion and a high hazard for Sediment Delivery. Development plans for roads and forest harvesting.

[1] Refer to Carver (2001) for explanation of riparian functions.

[2] An example application of this objective is found in the Channel Guild Concept (e.g., Plum Creek Timber Company) – other examples with suitable rationale may also be appropriate.

(table continued on next page)

Table 2 (cont'd). Integrated riparian assessments to support selection of detailed riparian design.

#	Assessment Type	Associated Riparian Functions[1]	Elements of Assessment	Minimum Factors to be Considered
4	**Aquatic habitats**	LWD recruitment Moderation of sediment yield	▪ Identify and describe all stream reaches (or reach segments) with significant **aquatic habitats** (fish, herptiles, benthics etc.). ▪ Identify non-fish-bearing reaches (or reach segments) with potential influence on downstream fish-bearing reaches (temperature, LWD, sediment delivery, organic material, etc.). ▪ Identify stream reaches or reach segments with aquatic habitat requirements for LWD that are above basic channel stability requirements. ▪ Rate priorities of stream reaches (or reach segments) for riparian reserve and management zones to maintain the integrity of **aquatic habitats**.	Fish species present including their diversity, abundance, and species sensitivities. **Aquatic habitats** for fish spawning, rearing, and migration. **Aquatic habitats** for other species. Habitat sensitivities to changes resulting from riparian-stand modifications (LWD, stream temperature, shading, nutrient inputs, etc.).
5	Stream Temperature	Moderation of stream temperature	▪ Identify temperature-sensitive species and values (including benthic assemblages); define appropriate target temperature ranges, and canopy requirements to achieve the temperature targets. ▪ Identify temperature-sensitive stream reaches (aquatic habitat areas and upstream reaches with potential influence on habitat areas). ▪ Rate priorities of stream reaches for riparian reserve and management zones to maintain stream temperatures within target ranges.	Types and locations of temperature sensitive species and values. Type, density, size of riparian vegetation necessary to maintain stream temperatures. Natural riparian disturbance patterns.
6	Stream **Ecosystem**	Litterfall and nutrient dynamics	▪ Identify nutrient sources and pathways in relation to aquatic values/species, and define the role of riparian vegetation in those pathways. ▪ Identify targets defined both spatially and temporally. ▪ Rate priorities of stream reaches for riparian reserve/management zones to maintain stream temperatures within the target ranges.	Types, rates and significance of litterfall to benthic communities, and other aquatic species.
7	Terrestrial Habitats	Provision of Terrestrial Habitats	▪ Identify riparian habitat needs of relevant terrestrial species and hydroriparian plant communities (including hydrophytic plant communities, rare **ecosystem**s and stand structural features such as CWD). ▪ Identify riparian area role in horizontal transfer of marine/lake derived nutrients from stream to forest. ▪ Identify riparian requirements for landscape **connectivity**. ▪ Rate priorities of stream reaches for riparian reserve and management zones to meet the habitat needs of terrestrial species and maintain rare **ecosystems**.	Riparian terrestrial habitat requirements particularly for microclimate, specialized vegetation (e.g., plant communities dependent on proximity to water) and stand structure (including invertebrates, reptiles, amphibians, birds, small mammals and large mammals); riparian role in providing habitat for species that transfer nutrients between terrestrial and aquatic **ecosystem** components (e.g., grizzly bears and salmon).

[1] Refer to Carver (2001) for explanation of riparian functions.

[2] An example application of this objective is found in the Channel Guild Concept (e.g., Plum Creek Timber Company) – other examples with suitable rationale may also be appropriate.

Table 3. *Minimum* budgets to be deployed during implementation of integrated riparian assessments. Budgets are to be applied at the *Riparian Assessment Unit* level.

Stream Class.[1]	Definition (fish presence, watershed status, stream width, stream class[1])	Riparian budget minimums[2,4] (RRZ/RMZ[3] widths and retention levels will vary depending on deployment)
S1a	Fish present or community watershed, >100 m wide	Minimum budgets for streams in these classes: RRZ – 6 ha/km RMZ – 8 ha/km with 65% BA retention (30 m reserve and 40 m 65% retention mgmt. zone or other combinations that result in equivalent retention)
S1b	Fish present or community watershed, 20-100 m wide	
S2	Fish present or community watershed, 5-20 m wide	
S3	Fish present or community watershed, 1.5-5 m wide	Minimum budgets for streams in these classes: RRZ – 6 ha/km RMZ – 4 ha/km with 65% BA retention (30 m reserve and 20 m 65% retention mgmt. zone, or other combinations that result in equivalent retention)
S4	Fish present or community watershed, <1.5 m wide	
S5a	Fish absent, not in community watershed, >3 m wide, and: a) in a domestic watershed, and/or b) ≤500 m upstream of fish-bearing stream, and/or c) >10 m wide	Minimum budgets for streams in this class: RRZ – 4 ha/km RMZ – 4 ha/km with 65% BA retention (20 m reserve and 20 m 65% retention mgmt. zone or other combinations that result in equivalent retention)
S6a	Fish absent, not in community watershed, 0.5-3 m wide in the interior (1-3 m on the coast), and: a) in a domestic watershed, and/or b) ≤250 m upstream of fish-bearing stream	
S5b	Fish absent, not in community watershed, 3-10 m wide, non domestic watershed, and >500 m upstream of fish-bearing stream	Minimum budgets for streams in this class: **NDT**s 1,2 and 4: RMZ – 3 ha/km with 30% BA retention **NDT** 3 RMZ – 3 ha/km with 10% BA retention (15 m mgmt. zones with 30% and 10% retention respectively or other combinations that result in equivalent retention)
S6b	Fish absent, not in community watershed, and: a) 0.5-3 m wide and not in a domestic watershed and >250 m up-stream of fish-bearing stream, or b) < 0.5 m wide in the interior (< 1 m in the coast)o	

[1] S1 – S4, W1 – W5, L1 – L4: classification according to BC Forest Practices Code **Riparian Management Area** Guidebook 1995; S5a, S5b, S6a and S6b as defined above.

[2] Riparian budgets are applied at the level of a **riparian assessment unit** (generally watersheds or other **landscape level** ecological units of 5,000 – 50,000 ha), budgets and stream lengths are calculated and applied to forested portions of the **management unit** (i.e. not in AT or ESSF parkland); where stream densities are high and there is overlap between RRZs or RMZs, the budgets should be reduced by an amount equivalent to the degree of the overlap (e.g., on wet portions of the coast).

[3] RRZ – **riparian reserve zone**; RMZ – **riparian management zone**.

[4] Budget equivalencies for streams can be calculated by multiplying the ha/km by 5 to get the equivalent width of zone in metres (e.g., 6 ha/km ~ 30 m on each side of a stream). The intent of the flexibility is also to allow limited trade-off between the reserve and management zones and between classes, as long as the "equivalent total retention" is comparable (e.g., 10m of reserve zone is equivalent to 20m of management zone at 50% retention); however, total reserve zone area should never be below 80% of the budget for any specific class (i.e. conversion of all reserves zones to management zones is not acceptable).

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Table 3 (cont'd). *Minimum* budgets to be deployed during implementation of integrated riparian assessments. Budgets are to be applied at the *Riparian Assessment Unit* level.

Wetland Class[1]	Definition (wetland type, wetland class[1])	Wetland Riparian Budget Minimums[2,4] (RRZ/RMZ[3] widths and retention levels will vary depending on deployment)
W1-5	Wetlands >1 ha, wetlands 0.25-1 ha in selected BEC **variant**s, wetland complexes and other wetlands with fish	Minimum budgets for wetlands in this class: RRZ – 2 ha/km of wetland perimeter RMZ – 1.5 ha/km with 30% BA retention
Other Wetlands	Unclassified wetlands without fish	Minimum budgets for wetlands in this class: RMZ – 1.5 ha/km with 30% BA retention
Lakeshore Class[1]	**Definition (lake size and type, lakeshore class[1])**	**Lakeshore Riparian Budget Minimums[2,4] (RRZ/RMZ[3] widths and retention levels will vary depending on deployment)**
L1-4	Lakes >1 ha, lakes 0.25-1 ha in selected BEC **variant**s and other lakes with fish	Minimum budgets for lakes in this class: LRZ – 1.5 ha/km of lakeshore LMZ – 1.5 ha/km with 30% BA retention
Other Lakeshores	Unclassified lakes without fish	Minimum budgets for lakes in this class: LMZ – 1.5 ha/km with 30% BA retention
Marine Shoreline Class[1]	**Definition (marine shoreline class[1])**	**Marine Shoreline Riparian Budget Minimums[2,4] (RRZ/RMZ[3] widths and retention levels will vary depending on deployment)**
Open water beaches and low shorelines	Shores with beaches (e.g., shores of unconsolidated cobbles or sand) or low shores without beaches (bluffs < 5m) adjacent to open waters	Minimum budgets for marine shorelines in this class: MRZ – 5 ha/km of marine shore MMZ – 3 ha/km with 50% BA retention
Open water bluffs and cliffs	Shores without beaches and with bluffs >5m or steep bedrock cliffs adjacent to open waters	Minimum budgets for marine shorelines in this class: MRZ – 2 ha/km of marine shore MMZ – 1.5 ha/km with 50% BA retention
Protected waters	Protected water lagoons or estuaries	Minimum budgets for marine shorelines in this class: MRZ – 4 ha/km of marine shore MMZ – 1.5 ha/km with 50% BA retention

[1] Riparian wetland classes (W1-5) and riparian lakeshore classes (L1-4) are based on FPC classes as defined in the BC Forest Practices Code **Riparian Management Area** Guidebook 1995; marine shoreline classes adapted from Clayoquot Sound Scientific Panel 1995.

[2] Riparian budgets are applied at the level of a **riparian assessment unit** (generally watersheds or other **landscape level** ecological units of 5,000 – 50,000 ha), budgets and wetland edges, lakeshores and marine shoreline lengths are calculated and applied to forested portions of the **management unit** (i.e. not in AT or ESSF parkland); where hydrologic feature densities are high and there is overlap between RRZs or RMZs between features, the budgets should be reduced by an amount equivalent to the degree of the overlap (e.g., on wet portions of the coast).

[3] RRZ: **riparian reserve zone**; RMZ: **riparian management zone**; LRZ: **Lakeshore Reserve Zone**, LMZ: **lakeshore management zone**; MRZ: **marine shore reserve zone**, MMZ: **marine shore management zone**. Marine shores are defined as the seaward edge of forest vegetation, and MRZs and MMZs are measured inland from that point.

[4] Budget equivalencies for wetlands, lakeshores and marine shorelines can be calculated by multiplying the ha/km by 10 to get the equivalent width of zone in metres (e.g., 2 ha/km ~ 20 m along the edge of the feature). The intent of the flexibility is also to allow limited trade-off between the reserve and management zones and between classes, as long as the "equivalent total retention" is comparable (e.g., 10m of reserve zone is equivalent to 20m of management zone at 50% retention); however, total reserve zone area should never be below 80% of the budget for any specific class (i.e. conversion of all reserves zones to management zones is not acceptable).

Sources of Further Information:

FPC Guidebooks – available at:
http://www.for.gov.bc.ca/tasb/legsregs/fpc/FPCGUIDE/Guidetoc.htm

BC Ministry of Forests and BC Ministry of Environment, Lands and Parks. 1995. The **Riparian Management Area** Guidebook. MoF and MELP. Victoria, BC.

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Other References

BC Ministry of Forests and BC Ministry of Environment, Lands and Parks. 1998. Riparian assessment and prescription procedures. Watershed Restoration Program Tech. Circular No. 6. MoF and MELP. Victoria, BC

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Carver, M. 2001. Riparian Forest Management for Protection of Aquatic Values: Literature Review and Synthesis. Unpubl. report for FSC-BC. Nelson, BC. 48 pp.

Clayoquot Sound Scientific Panel. 1995. Sustainable Ecosystem Management in Clayoquot Sound: Planning and Practices. Report 5, Province of BC. Victoria, BC. 296pp. Appds.

Section 7
Guidelines for Riparian Management Zones

This manual contains guidance for planning forest practices management in riparian management zones adjacent to Type S and F Waters and near sensitive sites associated with Type Np Waters. The guidance supplements WAC 222-30-021 and WAC 222-30-022, the rules that regulate forest practices in forest lands adjacent to water for Western Washington and Eastern Washington riparian management zones. The manual uses the term "RMZ rules" to describe those rules.

There are terms in this manual that are familiar to people who routinely work in Washington State's forest practices, but are unfamiliar to others. Examples are the water types, ("Type S", "Type F", "Type Np"), "bankfull width", "channel migration zone", "core zone", and "inner zone." Please refer to definitions in chapter 222-16 WAC for these and other forest practices terms used in this manual.

PART 1. IMPLEMENTING THE WESTERN WASHINGTON RMZ RULES

1.1 Introduction

The Western Washington RMZ rules are in WAC 222-30-021. Harvest is permitted within the inner zone of an RMZ adjacent to a Type S or F Water in Western Washington only if the timber stand exceeds the "stand requirement" described in WAC 222-30-021(1):

> *"Stand requirement" means a number of trees per acre, the basal area and the proportion of conifer in the combined inner zone and adjacent core zone so that the growth of trees would meet desired future conditions.*

The basal area target for a 140 year old stand is 325 square feet per acre. To find out if your timber stand exceeds the stand requirement (and if you will be permitted to harvest trees within the inner zone of the RMZ) you must collect information on all of the trees in the core and inner zones of your harvest unit and enter it into a web-based Desired Future Condition Worksheet.
Please note:

- Shade must be provided as described in WAC 222-30-040 regardless of harvest opportunities in the RMZ inner and outer zones. Shade requirements apply within the first 75 feet from the outer edge of the bankfull width or channel migration zone, in addition to the RMZ rules. For guidance, see Board Manual Section 1 for determining adequate shade.
- Forest lands in the high elevation timber habitat type in Eastern Washington are subject to the same stand requirements as for Western Washington riparian management zones. You should follow this part (Part 2) of the manual if your harvest unit is in this timber habitat type.

1.2 Western Washington RMZs for Type S and F Waters: Instructions for completing a stand analysis and harvest option evaluation.

Harvest is permitted in the inner zone of the RMZ only if a stand exceeds the "stand requirement" described in WAC 222-30-021(1).[1] Riparian prescriptions are dependent on site productivity, stand composition (percent conifer, trees per acre, and basal area per acre) and stand age.

To determine your inner zone harvest opportunity, you will use the Department of Natural Resources' web-based computer program to enter your tree data. The program will calculate and report if your stand exceeds the stand requirement, whether you will be permitted to harvest in the inner zone, and what your harvest options are.

Appendix B contains images you will see when working in the web-based Desired Future Condition Worksheet. After you enter site information and tree data, the program will provide several DFC summary pages showing your harvest options.

What you will need to do before data entry.

You will need to measure the diameters of the trees and count all trees in the core zone and inner zone in the 6-inch diameter class and larger. You may use the Tree Data Collection Form in Appendix A to gather your tree information.

To gather your tree information:

- Count trees by diameter class in the **50-foot core zone**; and

1 If your stand does not exceed the stand requirement, harvest will still be allowed in the outer zone as long as the required leave trees specified in WAC 222-30-021(1)(c) are left and the appropriate zone widths are used. The zone widths are specified in the table labeled "No inner zone management RMZ widths for Western Washington" in WAC 222-30-021(1)(b).

- Count trees by diameter class in an **inner zone of the following width** (in feet) according to your harvest unit's site class and stream size:

site class	small streams (≤ 10 feet)	large streams (>10 feet)
I	84	100
II	64	78
III	44	55
IV	23	33
V	10	18

In addition to gathering your tree information, you will need the following information at hand for data entry into the Desired Future Condition Worksheet. (Additional instructions for data entry are available on the worksheet by clicking on "Getting Started" in the upper left of the area of the screen.)

- The legal description.
- Site class. To determine site class, download a Forest Practices Application/ Notification activity map for your area and activate the site class layer. Go to http://www.dnr.wa.gov/BusinessPermits/Topics/ForestPracticesApplications/Pages/fp_forms.aspx, and under the heading, "Forest Practices Application/Notification", click on "Print an activity map." After navigating to the location of your activity, in the left corner under the "Select a map" button, choose Site Class Map. In the upper right corner, click on the "Legend" button to find the site class of your activity.
- Major species. This refers to conifer species and is determined by stem count. If there are more Douglas fir stems than other conifer tree species, choose Douglas fir. If there are fewer Douglas fir stems than other conifer species, choose western hemlock.
- Stream size. Choose "small" for a stream with an average bankfull width of ≤10 feet, and "large" for a stream with an average bankfull width >10 feet. If you need guidance on determining bankfull width, please refer to Board Manual Section 2.
- RMZ length.
- DBH class. Tree data is to be entered for each 2-inch diameter class, no smaller than the 6-inch diameter class.
- DBH classes total. This is the total number of diameter classes entered for each zone. For example, if you enter tree data for DBH classes 6, 8, 10, 18, and 20, the DBH classes total is 5.
- Stand age. Stand age is the average age of the dominant conifer trees in a stand. Stand age can be estimated by increment boring. Bore the dominant conifer trees within the riparian zone and average the growth ring counts. Increment boring shall be made at 4.5 feet above the ground on the uphill side of the tree. Add five years to the growth ring count to account for growth up to boring height. Stand age can also be determined from a landowner inventory or stand history if available.

You must complete a separate Desired Future Condition Worksheet for each stream or stream segment within your project, and attach DFC summary pages for each stream or stream segment to your forest practices application.

How to access the Department of Natural Resources' web-based Desired Future Condition Worksheet.

Now that you have gathered all of your stand information, you can easily enter it into the Desired

Future Condition Worksheet. Access the worksheet at http://fortress.wa.gov/dnr/dfc/ , or go to http://www.dnr.wa.gov, and navigate as follows:
Under Business & Permits, click on Forest Practices;
Under Topics, click on Forest Practices Forms and Instructions;
Scroll down to and click on DFC Worksheet Version 3.0.

You may click on "Getting Started" for instructions on the appropriate data to be entered into each field and for information on evaluating your harvest options.

PART 2. IMPLEMENTING THE EASTERN WASHINGTON RMZ RULES

2.1 Introduction

The Eastern Washington RMZ rules are in WAC 222-30-022. The zone widths are shown in the beginning of the rule. The inner zone width for forest land adjacent to streams ≤ 15 feet wide is 45 feet, and for forest land adjacent to streams > 15 feet wide is 70 feet, in addition to the 30-foot core zone. Timber harvest rules for Eastern Washington RMZs vary by timber habitat type (Ponderosa pine, mixed conifer, and high elevation), and by site index in the case of the mixed conifer habitat type.

For the high elevation timber habitat type (≥ 5,000 feet elevation) the stand must exceed 325 square feet per acre for all site classes in the combined core and inner zone. This stand requirement is the same as for Western Washington Type S and F Waters, and the guidelines in Part 1 should be followed for this timber habitat type.

Please note: Shade must be provided as described in WAC 222-30-040 regardless of harvest opportunities in the RMZ inner and outer zones. Shade requirements apply within the first 75 feet from the outer edge of the bankfull width or channel migration zone, in addition to the RMZ rules. For guidance, see Board Manual Section 1 for determining adequate shade.

2.2 Eastern Washington RMZs for Type S and F Waters: Instructions for completing a stand analysis and determining leave trees.

This manual offers two tools to help you to determine whether harvest is likely to be permitted in the inner zone of your Ponderosa pine or mixed conifer habitat type - and if so, the trees that must be left after harvest.

- Appendix C contains a set of tables specific to each timber habitat and stream type that give stand requirement and leave tree estimates for a variety of stream RMZ lengths. You may compare these estimates with your stand characteristics to get a general idea whether harvest is likely to be allowed in your stand. This is optional.

- Appendix D contains step-by-step guidelines to conduct a stand analysis and determine your harvest opportunity and leave tree requirements.

PART 3. IDENTIFYING SENSITIVE SITES ALONG TYPE NP WATERS IN WESTERN AND EASTERN WASHINGTON

The rules for protecting sensitive sites for Western Washington and for Eastern Washington are in WAC 222-222-30-021(2)(b) and WAC 222-30-022(2)(b)(ii), respectively. Sensitive sites are areas near or adjacent to Type Np Waters that are protected from forestry-related activities because they provide important habitat and function for aquatic resources. They are:

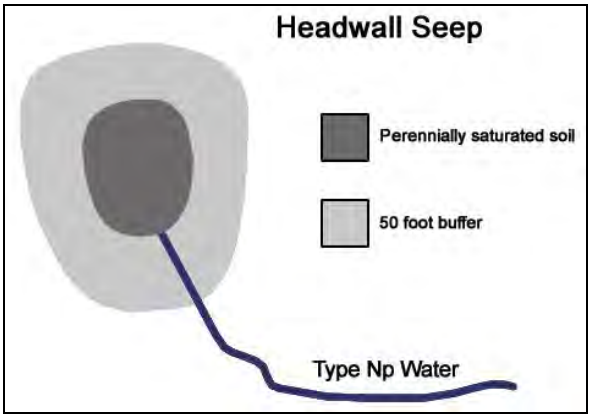
- headwall seeps
- side-slope seeps
- headwater springs
- Type Np intersections
- alluvial fans

Each of these features is defined under "sensitive sites" in WAC 222-16-010; however, their characteristics are described in more detail below to help you identify and protect them.

3.1 Headwall Seeps

Timber harvest is not allowed within 50 feet of the outer perimeter of soil perennially saturated from a headwall seep in Western Washington and under the clearcut harvest strategy in Eastern Washington. Headwall seeps are wetted areas located at the base of cliffs or other steep areas, and where present are found at the head of Type Np Waters. Headwall seeps connect to the stream channel via overland flow, and are often characterized by loose substrate or fractured bedrock. Water occurs at or near the surface of headwall seeps year-round. Headwall seeps that are associated with the spray from falling water may be especially important to amphibians.

The vegetation communities associated with headwall seeps are similar to those of wetlands, and may contain some or all of the following taxa: sedges, rushes, horsetails, willows, devils club, salmonberry, skunk cabbage, piggyback plant, lady fern, leafy liverwort, black cottonwood, Oregon ash, or red alder. Headwall seeps may have tree canopy gaps that may be visible from aerial photos, although the presence or absence of seeps must be confirmed using ground-based observation.

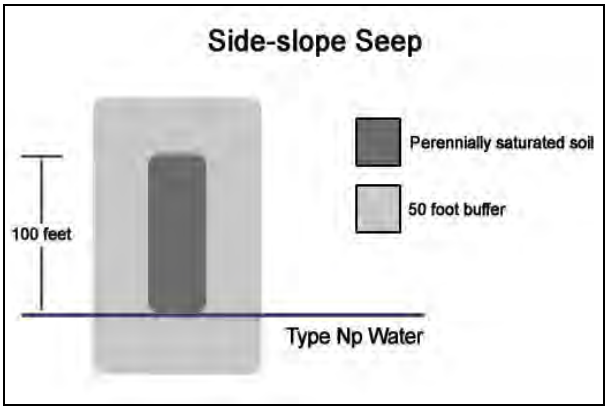


3.2 Side-slope Seeps

Timber harvest is not allowed within 50 feet of the outer perimeter of soil perennially saturated from a side-slope seep in Western Washington and under the clearcut harvest strategy in Eastern Washington. Under the partial cut harvest strategy in Eastern Washington, side-slope seeps must be protected with a 50-foot partial cut buffer that meets the basal area and leave tree requirements listed in WAC 222-30-022(2)(b)(i), subsections (A), (B), and (C).

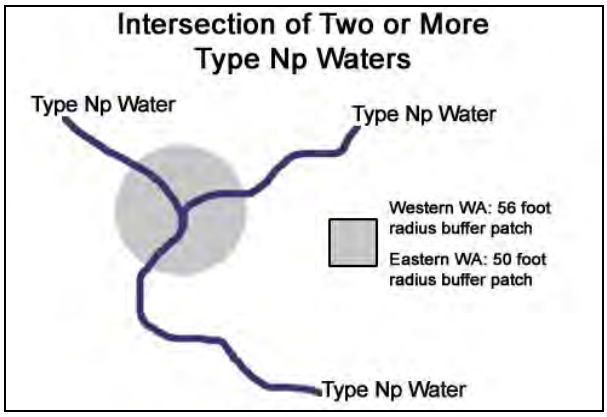
Side-slope seeps are wetted areas adjacent to Type Np Waters. For the purposes of the Forest Practices rules, and where present, side-slope seeps originate within 100 feet of the stream channel and flow without a defined channel. Side-slope seeps exist where valley slopes exceed 20%. Like headwall seeps, side-slope seeps may be characterized by loose substrate or fractured bedrock with water present at or near the surface year-round. Delivery of water from side-slope seeps to the stream channel is visible by someone standing at or near the stream. Side-slope seeps that are associated with the spray from falling water may be especially important to amphibians.

The vegetation communities associated with side-slope seeps are similar to those of wetlands, and may contain some or all of the following taxa: sedges, rushes, horsetails, willows, devils club, salmonberry, skunk cabbage, piggyback plant, lady fern, leafy liverwort, black cottonwood, Oregon ash, or red alder. Side-slope seeps may have tree canopy gaps that may be visible from aerial photos, although the presence or absence of seeps must be confirmed using ground-based observation.



3.3 Type Np Intersections

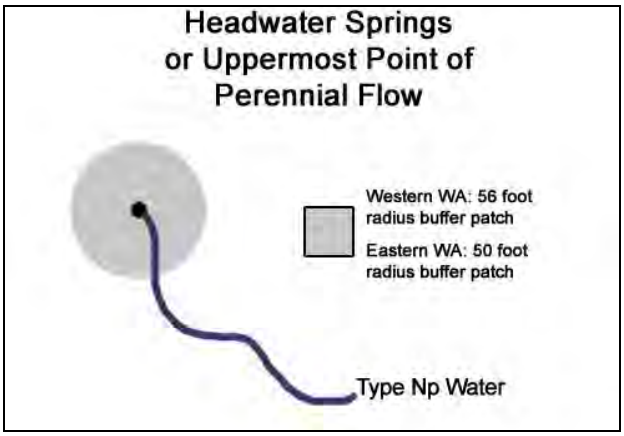
Timber harvest is not allowed within a 56-foot radius in Western Washington or a 50-foot radius in Eastern Washington, centered on the intersection of two or more Type Np Waters. Type Np intersections occur where two Type Np streams join.



3.4 Headwater Springs

Timber harvest is not allowed within a 56-foot radius patch of a headwater spring in Western Washington, or within a 50-foot radius patch of a headwater spring in Eastern Washington. The radius patch is centered on the initiation point of perennial flow of a headwater spring, or in the absence of a spring, the uppermost point of perennial flow.

Headwater springs are permanent springs that are located at the head of perennial channels where present and form the upper extent of a Type Np Water. Where these springs are present, they provide especially important amphibian habitat. During low flow periods, they are often observed as an abrupt small pool or riffle with flow where the channel is immediately and persistently dry above. Vegetation characteristics may not differ markedly from the taxa upstream and downstream. However, vegetation similar to that of headwall seeps and side-slope seeps may be present.



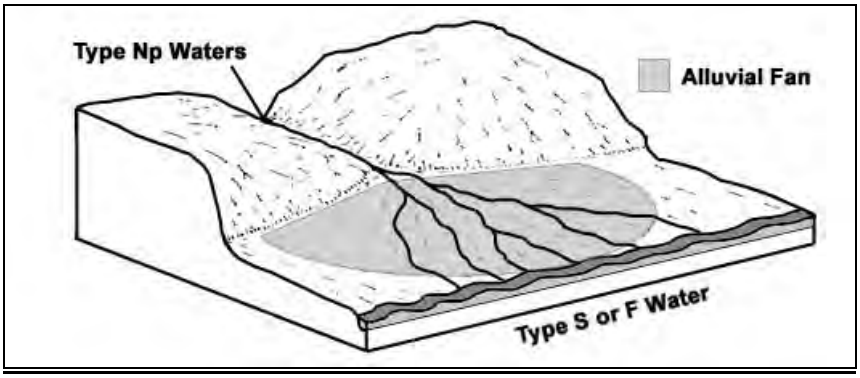
3.5 Alluvial Fans

Timber harvest is not allowed on alluvial fans in Western Washington, or within 50 feet of an alluvial fan in Eastern Washington under the clearcut harvest strategy. An alluvial fan is defined as, "A low, outspread flat to gently sloping mass of loose rock material, shaped like an open fan…, deposited by a stream at the place where it issues from a narrow mountain valley or gorge

upon a plain or broad valley…" (Jackson 1997).[2] An alluvial fan will form as a result of a change in slope at the mouth of a stream. As the stream issues onto a plain or broad valley it spreads out and slows down. Any solids entrained in the stream tend to settle out onto the gentle slopes of the plain or broad valley. These solids block the flow of the stream and cause the flow to change course. Therefore, due to the gentle topography on the plain or in the broad valley, alluvial fans are susceptible to stream channel migration. The fan shape forms by radial spreading as the stream migrates back and forth on the gentle slope and solid material is deposited in equal layers. These deposits gradually build up the surface of the fan.

As a landform, alluvial fans are steepest at their high point (or apex) at the mouth of the narrow mountain valley or gorge from which the stream issues, and slope gently in a slightly mounded manner outward with gradually decreasing grade. Stream channels on a fan can vary and change without notice vacating established channels or scouring out new ones. A landslide in a narrow stream channel at or above the apex can influence the stream course by pre-depositional erosion and downcutting. It is the deposition of solids that most influences the direction a stream will take on the body of a fan. When a channel is blocked by deposition, the stream will change direction. For this reason, braided channels are common on alluvial fans.

Alluvial fans may build up over thousands of years and be covered by trees. The roots of these trees can serve to stabilize fan channels.



2 Jackson, J. A., 1997, *Glossary of Geology, 4th Edition, American Geological Institute, Alexandria, Virginia,* 769 pp..

APPENDIX A TREE DATA COLLECTION FORM

Western Washington RMZs, Type S and F Waters

This form is provided for your convenience to record core zone and inner zone tree data in preparation for entering data in the web-based Desired Future Condition Worksheet.

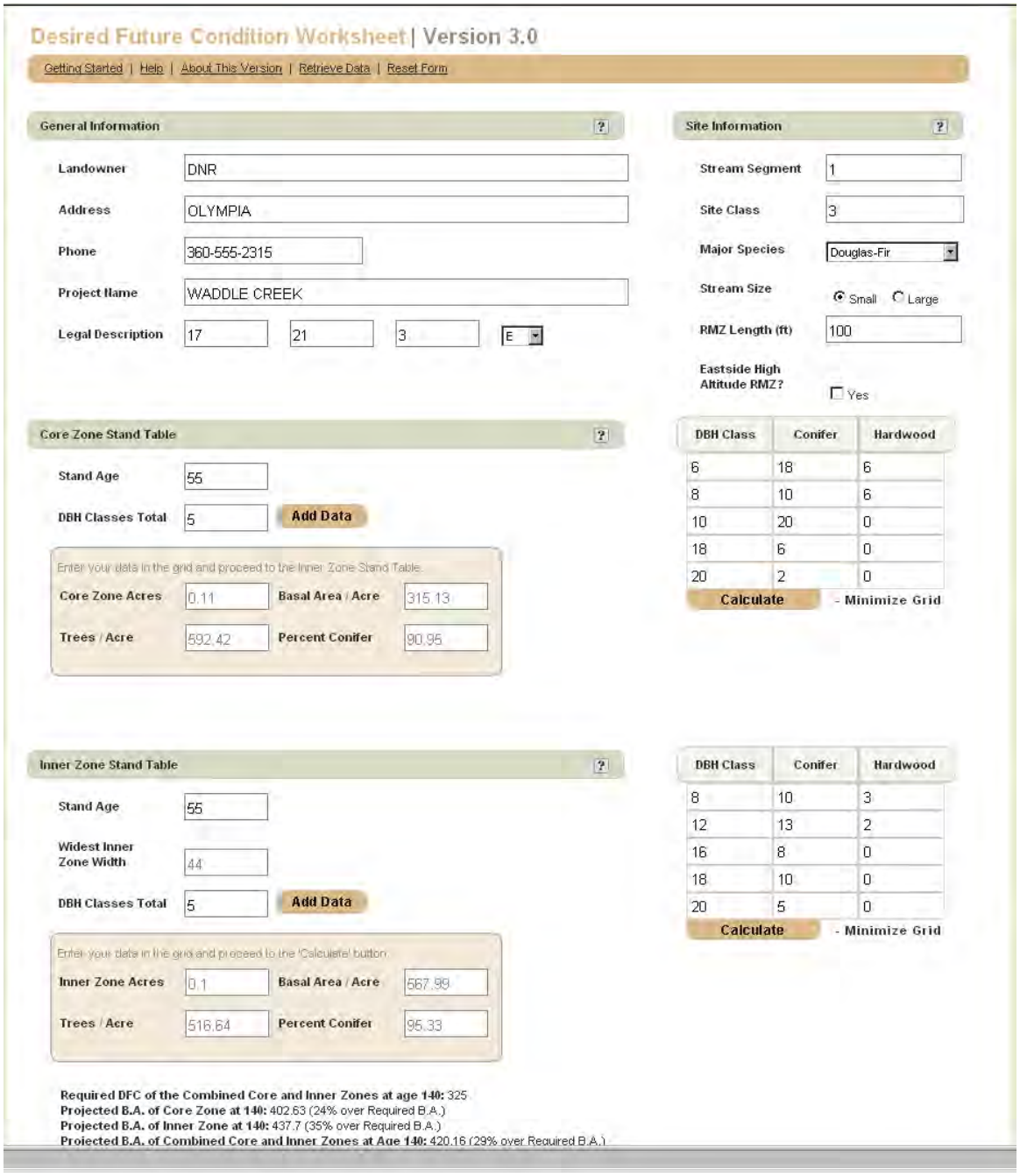
- Count all trees in the core and inner zones for each 2-inch diameter class, no smaller than the 6-inch diameter class.
- You will need enough copies to compile tree data for each stream and stream segment.

Tree Data Collection Form for Western Washington RMZs
Preparation for entering stand data in the web-based DFC Worksheet.

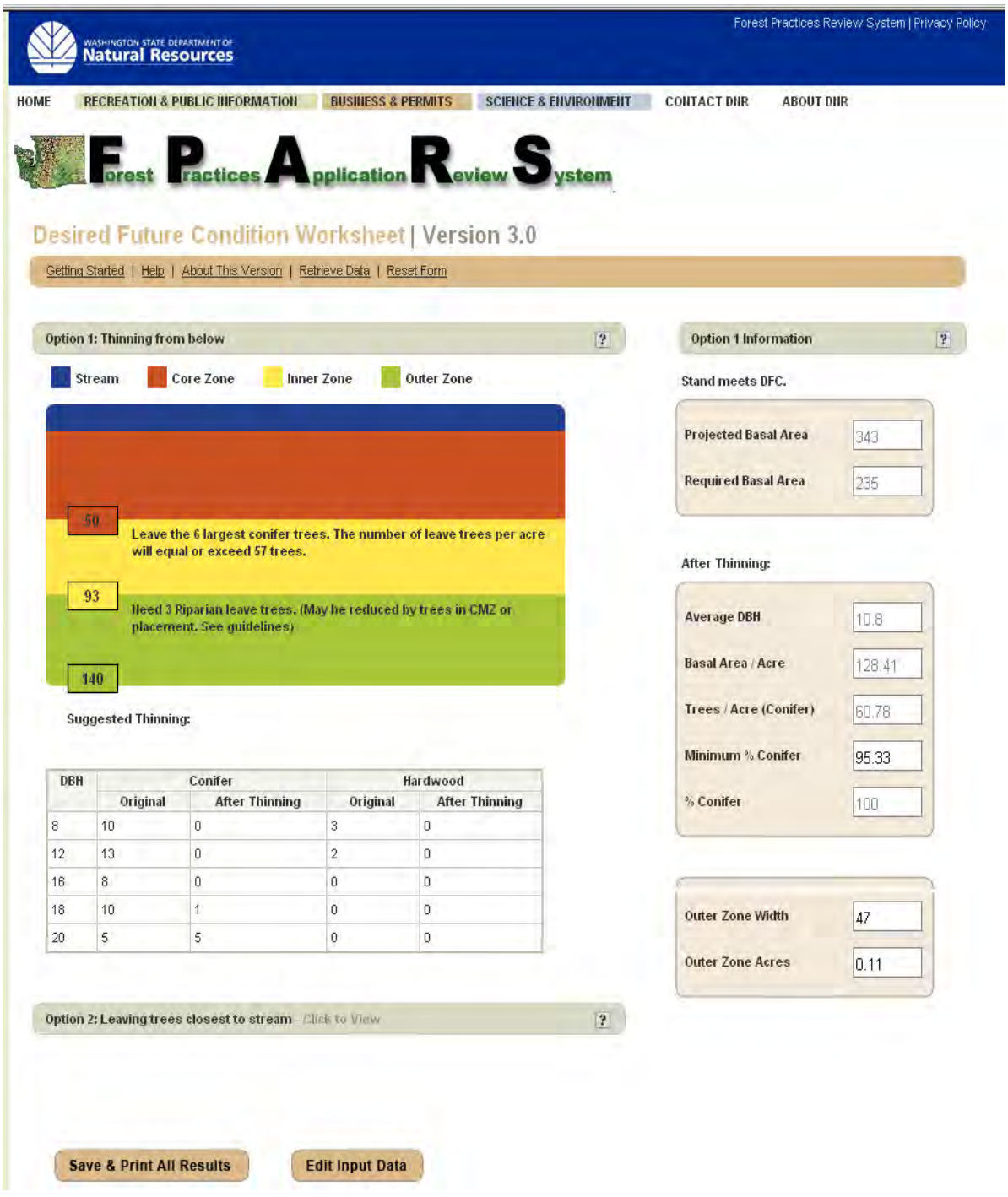
Diameter class diameter measured at breast height (dbh)	CORE ZONE		INNER ZONE	
	Number of conifers per dbh class	**Number of hardwoods per dbh class**	**Number of conifers per dbh class**	**Number of hardwoods per dbh class**
6 (5 - 6.9 inches)				
8 (7 - 8.9 inches)				
10 (9 - 10.9 inches)				
12 (11 - 12.9 inches)				
14 (13 - 14.9 inches)				
16 (15 - 16.9 inches)				
18 (17 - 18.9 inches)				
20 (19 - 20.9 inches)				
22 (21 - 22.9 inches)				
24 (23 - 24.9 inches)				
26 (25 - 26.9 inches)				
28 (27 - 28.9 inches)				
30 (29 - 30.9 inches)				
32 (31 - 32.9 inches)				
34 (33 - 34.9 inches)				
36 (35 - 36.9 inches)				
38 (37 – 38.9 inches)				
40 (39 - 40.9 inches)				
42 (41 - 42.9 inches)				
44 (43 - 44.9 inches)				
46 (45 - 46.9 inches)				
48 (47 - 48.9 inches)				
50 (49 - 50.9 inches)				
52 (51 - 52.9 inches)				
54 (53 - 54.9 inches)				
56 (55 - 56.9 inches)				
58 (57 - 58.9 inches)				
60 (59 - 60.9 inches)				

APPENDIX B EXAMPLE OF DESIRED FUTURE CONDITION WORKSHEET DATA ENTRY PAGE AND SUMMARY PAGES

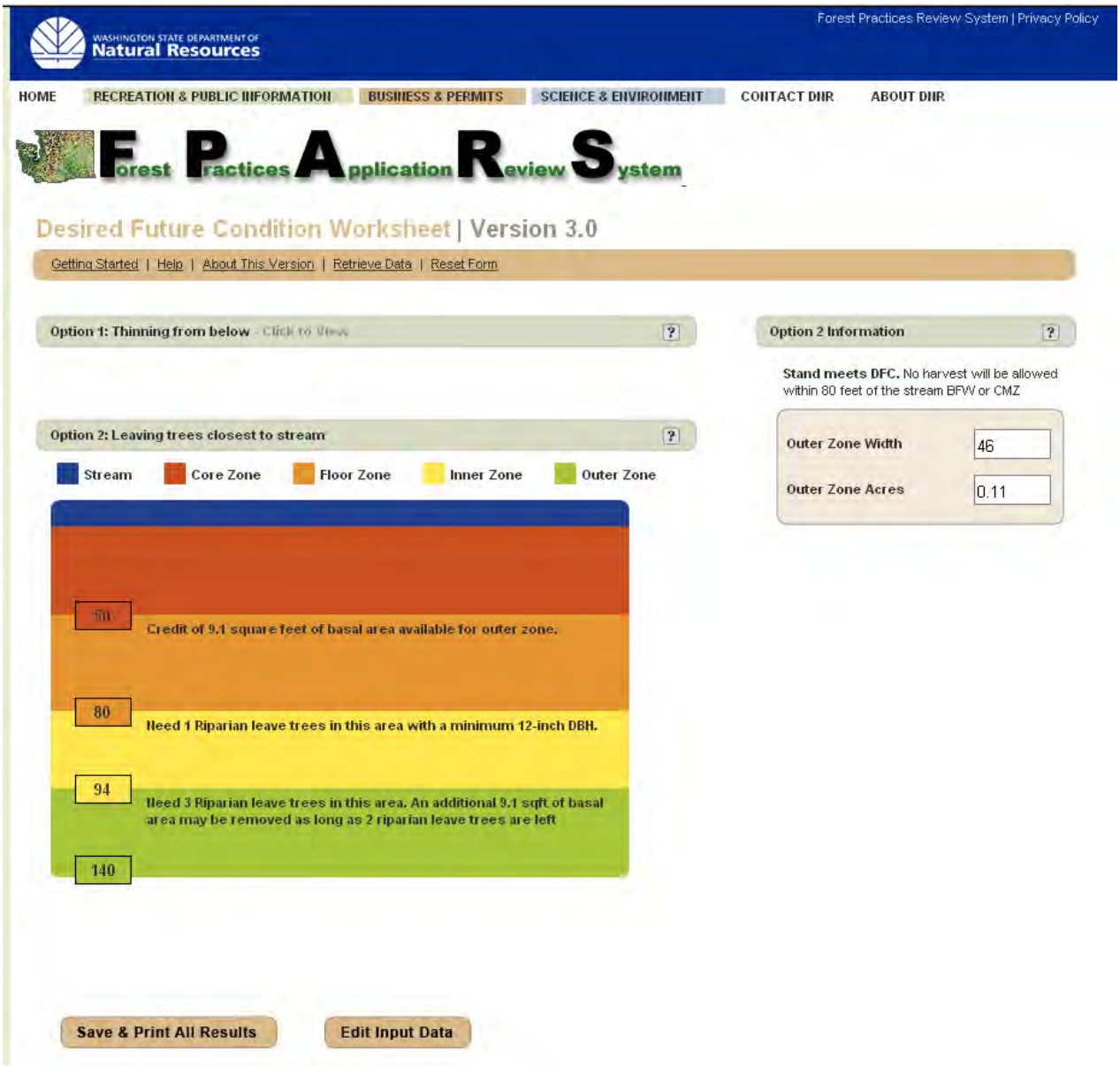
Desired Future Condition Worksheet Data Entry Page
Example: A 100-foot RMZ length on a site class III harvest unit, small stream



Example
Screen image after data entry: Option 1



Example
Screen image after data entry: Option 2



Example
DFC Summary Printout Pages

DFC Summary Page

DFC Program Version 3.0

DFC Run Number: 1301
Landowner: DNR
Address: OLYMPIA
Phone: 360-555-2315

Project Name: WADDLE CREEK
Stream Segment: 1
Legal Desc: Section: 17 Township: 21 Range: 3 East

Stream Size: SMALL
Site Class: 3
Major Species: DOUGLAS FIR
RMZ Length: 100
Eastside Option: NO

Core Pre-Harvest Zone Summary

Acres: 0.11
Total Age of Overstory: 55
Trees / Acre: 592.42
Basal Area Acre: 315.13
Percent Conifer: 90.95

Inner Zone Pre-Harvest Summary

Acres (Option 1): 0.1
Total Age of Overstory: 55
Trees / Acre: 516.64
Basal Area Acre: 567.99
Percent Conifer: 95.33

Core Zone Stand Table

DBH	Conifer	Hardwood
6	18	6
8	10	6
10	20	0
18	6	0
20	2	0

Inner Zone Stand Table

DBH	Conifer	Hardwood
8	10	3
12	13	2
16	8	0
18	10	0
20	5	0

Required DFC of the Combined Core and Inner Zones at age 140: 325
Projected B.A. of Core Zone at 140 as a % of DFC: 402.63 (24% over Required B.A.)
Projected B.A. of Inner Zone at 140 as a % of DFC: 437.7 (35% over Required B.A.)
Projected B.A. of Combined Core and Inner Zones at Age 140: 420.16 (29% over Required B.A.)

Example
DFC Summary Printout Pages, continued – Option 1

Option 1

DFC Program Version

Landowner: DNR
Address: OLYMPIA
Phone: 360-555-2315

Project Name: WADDLE CREEK
Stream Segment: 1
Legal Desc: Section: 17 Township: 21 Range: 3 East

Inner Zone post-thinning Statistics

Trees / Acre: 60.78
Basal Area / Acre: 128.41
Percent Conifer: 95.33
Required Basal Area of Thinned Inner Zone at age 140 must be at least 234.74 Sq. Ft / Acre at age 140.
Projected Basal Area of Thinned Inner Zone at age 140 will be at least 343.21 Sq. Ft / Acre at age 140.

The inner zone for Option 1 is from 50 to 93 feet.

Inner Zone Stand Table

DBH	Conifers: Can Be Cut	Required Leave Trees	Hardwood: Can Cut All	Required Leave Trees	Conifer BA Cut	Conifer BA Leave
8	10	0	3	0	3.49	0
12	13	0	2	0	10.21	0
16	8	0	0	0	11.17	0
18	9	1	0	0	15.9	1.77
20	0	5	0	0	0	10.91
				Totals	40.78	12.68

Option 1 Outer Zone Width: 47
Option 1 Outer Zone Acres: 0.11

Example
DFC Summary Printout Pages, continued – Option 2

Option 2

DFC Program Version

Landowner: DNR
Address: OLYMPIA
Phone: 360-555-2315

Project Name: WADDLE CREEK
Stream Segment: 1
Legal Desc: Section: 17 Township: 21 Range: 3 East

Inner Zone Floor: 50 to 80 feet, no harvesting allowed.
ClearCut Inner Zone : 80 to 94 feet, Need 1 Riparian leave trees in this area. Leave trees must be at least 12 inches at DBH.
Outer Zone: 94 to 140 feet, Need 3 Riparian leave trees in this area.
Note: An additional 9.1 Sq. Ft. of basal area may be removed from the Outer Zone as long as 2 riparian leave trees are left.

Option 2 Outer Zone Width: 46
Option 2 Outer Zone Acres: 0.11

APPENDIX C EASTERN WASHINGTON BASAL AREA AND LEAVE TREE TABLES

This appendix contains a set of tables specific to each timber habitat and stream type. The tables provide basal area thresholds and leave tree estimates for a variety of RMZ lengths. You may compare these estimates with your stand characteristics to get a general idea whether harvest is likely to be allowed in your stand.

Inner zone acreage calculations in the tables are rounded to the nearest hundredth (0.01) and tree and basal area counts are rounded to the nearest whole number. Numbers greater than or equal to 0.5 are rounded up, numbers less than or equal to 0.4 are rounded down.

A. Type S and F Waters: Tables for Small Streams (streams ≤ 15 feet in bankfull width)

- Inner zone width is 45 feet.
- 1000 feet RMZ length = approximately 1.03 acre

Table A1. Ponderosa pine (elevation ≤ 2500 feet)

Length of RMZ (feet)	**1000**	**900**	**800**	**700**	**600**	**500**	**400**	**300**	**200**	**100**
Approximate inner zone acres	1.03	0.93	0.82	0.72	0.62	0.52	0.41	0.31	0.21	0.10
21 largest leave trees per acre	22	20	17	15	13	11	9	7	4	2
29 additional trees ≥ 10" dbh	30	27	24	21	18	15	12	9	6	3
Required leave trees basal area per acre (square feet)	62	56	49	43	37	31	25	19	13	6
Basal area upper threshold (square feet)	113	102	90	79	68	57	45	34	23	11

Table A2. Mixed conifer (elevation 2,500 to 5,000 feet) - Low site index (less than 90)

Length of RMZ (feet)	**1000**	**900**	**800**	**700**	**600**	**500**	**400**	**300**	**200**	**100**
Approximate inner zone acres	1.03	0.93	0.82	0.72	0.62	0.52	0.41	0.31	0.21	0.10
21 largest leave trees per acre	22	20	17	15	13	11	9	7	4	2
29 additional trees ≥ 10" dbh	30	27	24	21	18	15	12	9	6	3
Required leave trees basal area per acre (square feet)	72	65	57	50	43	36	29	22	15	7
Basal area upper threshold (square feet)	113	102	90	79	68	57	45	34	23	11

Table A3. Mixed conifer (elevation 2,500 to 5,000 feet) - Medium site index (90-110)

Length of RMZ (feet)	**1000**	**900**	**800**	**700**	**600**	**500**	**400**	**300**	**200**	**100**
Approximate inner zone acres	1.03	0.93	0.82	0.72	0.62	0.52	0.41	0.31	0.21	0.10
21 largest leave trees per acre	22	20	17	15	13	11	9	7	4	2
29 additional trees ≥ 10" dbh	30	27	24	21	18	15	12	9	6	3
Required leave trees basal area per acre (square feet)	93	84	74	65	56	47	37	28	19	9
Basal area upper threshold (square feet)	134	121	107	94	81	68	53	40	27	13

Table A4. Mixed conifer (elevation 2,500 to 5,000 feet) - High site index (greater than 110)

Length of RMZ (feet)	**1000**	**900**	**800**	**700**	**600**	**500**	**400**	**300**	**200**	**100**
Approximate inner zone acres	1.03	0.93	0.82	0.72	0.62	0.52	0.41	0.31	0.21	0.10
21 largest leave trees per acre	22	20	17	15	13	11	9	7	4	2
29 additional trees ≥ 10" dbh	30	27	24	21	18	15	12	9	6	3
Required leave trees basal area per acre (square feet)	93	84	74	65	56	47	37	28	19	9
Basal area upper threshold (square feet)	155	140	123	108	93	78	62	47	32	15

B. Type S and F Waters: Tables for Large Streams (>15 feet in bankfull width)

- Inner zone width is 70 feet.
- 1000 feet = 1.61 acres

Table B1. Ponderosa pine (elevation ≤ 2500 feet)

Length of RMZ (feet)	**1000**	**900**	**800**	**700**	**600**	**500**	**400**	**300**	**200**	**100**
Approximate inner zone acres	1.61	1.45	1.29	1.13	0.97	0.81	0.64	0.48	0.32	0.16
21 largest leave trees per acre	34	30	27	24	20	17	13	10	7	3
29 additional trees ≥ 10" dbh	47	42	37	33	28	23	19	14	9	5
Required leave trees basal area per acre (square feet)	97	87	77	68	58	49	38	29	19	10
Basal area upper threshold (square feet)	177	160	142	124	107	89	70	53	35	18

Table B2. Mixed conifer (elevation 2,500 to 5,000 feet) - Low site index (less than 90)

Length of RMZ (feet)	**1000**	**900**	**800**	**700**	**600**	**500**	**400**	**300**	**200**	**100**
Approximate inner zone acres	1.61	1.45	1.29	1.13	0.97	0.81	0.64	0.48	0.32	0.16
21 largest leave trees per acre	34	30	27	24	20	17	13	10	7	3
29 additional trees ≥ 10" dbh	47	42	37	33	28	23	19	14	9	5
Required leave trees basal area per acre (square feet)	113	102	90	79	68	57	45	34	22	11
Basal area upper threshold (square feet)	177	160	142	124	107	89	70	53	35	18

Table B3. Mixed conifer (elevation 2,500 to 5,000 feet) - Medium site index (90-110)

Length of RMZ (feet)	**1000**	**900**	**800**	**700**	**600**	**500**	**400**	**300**	**200**	**100**
Approximate inner zone acres	1.61	1.45	1.29	1.13	0.97	0.81	0.64	0.48	0.32	0.16
21 largest leave trees per acre	34	30	27	24	20	17	13	10	7	3
29 additional trees ≥ 10" dbh	47	42	37	33	28	23	19	14	9	5
Required leave trees basal area per acre (square feet)	145	131	116	102	87	73	58	43	29	14
Basal area upper threshold (square feet)	209	189	168	147	126	105	83	62	42	21

Table B4. Mixed conifer (elevation 2,500 to 5,000 feet) - High site index (greater than 110)

Length of RMZ (feet)	**1000**	**900**	**800**	**700**	**600**	**500**	**400**	**300**	**200**	**100**
Approximate inner zone acres	1.61	1.45	1.29	1.13	0.97	0.81	0.64	0.48	0.32	0.16
21 largest leave trees per acre	34	30	27	24	20	17	13	10	7	3
29 additional trees ≥ 10" dbh	47	42	37	33	28	23	19	14	9	5
Required leave trees basal area per acre (square feet)	145	131	116	102	87	73	58	43	29	14
Basal area upper threshold (square feet)	242	218	194	170	146	122	96	72	48	24

C. Type Np Waters

- Inner zone width is 50 feet.
- 1000 feet = approximately 1.15 acres

Table C1. Ponderosa pine (elevation ≤ 2500 feet)

Length of RMZ (feet)	1000	900	800	700	600	500	400	300	200	100
Approximate inner zone acres	1.15	1.04	0.92	0.81	0.69	0.58	0.46	0.35	0.23	0.12
10 largest leave trees per acre	12	10	9	8	7	6	5	4	2	1
40 additional trees ≥ 10" dbh	46	42	37	32	28	23	18	14	9	5
Required leave trees basal area per acre (square feet)	69	62	55	49	41	35	28	21	14	7
Basal area upper threshold (square feet)	127	114	101	89	76	64	51	39	25	13

Table C.2. Mixed conifer (elevation 2,500 to 5,000 feet) - Low site index (less than 90)

Length of RMZ (feet)	1000	900	800	700	600	500	400	300	200	100
Approximate inner zone acres	1.15	1.04	0.92	0.81	0.69	0.58	0.46	0.35	0.23	0.12
10 largest leave trees per acre	12	10	9	8	7	6	5	4	2	1
40 additional trees ≥ 10" dbh	46	42	37	32	28	23	18	14	9	5
Required leave trees basal area per acre (square feet)	81	73	64	57	48	41	32	25	16	8
Basal area upper threshold (square feet)	127	114	101	89	76	64	51	39	25	13

Table C3. Mixed conifer (elevation 2,500 to 5,000 feet) - Medium site index (90-110)

Length of RMZ (feet)	1000	900	800	700	600	500	400	300	200	100
Approximate inner zone acres	1.15	1.04	0.92	0.81	0.69	0.58	0.46	0.35	0.23	0.1
10 largest leave trees per acre	12	10	9	8	7	6	5	4	2	1
40 additional trees ≥ 10" dbh	46	42	37	32	28	23	18	14	9	4
Required leave trees basal area per acre (square feet)	104	94	83	73	62	52	41	32	21	11
Basal area upper threshold (square feet)	150	135	120	105	90	75	60	46	30	16

Table C4. Mixed conifer (elevation 2,500 to 5,000 feet) - High site index (greater than 110)

Length of RMZ (feet)	**1000**	**900**	**800**	**700**	**600**	**500**	**400**	**300**	**200**	**100**
Approximate inner zone acres	1.15	1.04	0.92	0.81	0.69	0.58	0.46	0.35	0.23	0.1
10 largest leave trees per acre	12	10	9	8	7	6	5	4	2	1
40 additional trees ≥ 10" dbh	46	42	37	32	28	23	18	14	9	4
Required leave trees basal area per acre (square feet)	104	94	83	73	62	52	41	32	21	11
Basal area upper threshold (square feet)	173	156	138	122	104	87	69	53	35	18

APPENDIX D EASTERN WASHINGTON RMZS, TYPE S AND F WATERS

This appendix contains guidelines for assessing the inner zone timber and associated basal areas for Eastern Washington RMZs adjacent to Type S and F Waters. The rules for Eastern Washington RMZs vary by timber habitat type:

- Ponderosa pine timber habitat type (stands below 2,500 feet in elevation);
- Mixed conifer timber habitat type (stands 2,500 to 5,000 feet in elevation); and
- High elevation timber habitat type (stands above 5,000 feet).

The guidelines in this appendix are for the Ponderosa pine and mixed conifer types. For the high elevation timber habitat type, the stand requirement is the same as for Western Washington Type S and F Waters; therefore, the Western Washington guidelines (Part 2 of this manual) should be followed.

Section 1 is provided to help you calculate the basal area per acre in your stand. Harvest in the inner zone is allowed if the inner zone basal area per acre exceeds a basal area requirement. The result of your calculation in Section 1 can be compared with the basal area requirement from the rules, which you will find in Section 2 of this appendix. Comparing the basal area of the trees in your stand with the basal area requirement will help you to determine if harvest will be allowed in your stand. If so, you can refer to Section 2 to find your leave tree requirements. Then you can use Section 3 for calculating your leave trees. Section 4 provides an example of calculations for a two-acre inner zone to demonstrate how to calculate leave trees.

Section 1. Inner zone assessment.

You may use Table 1 on the following page to collect tree data that will help assess whether harvest will be allowed in the inner zone.

Table 1
Inner Zone Assessment
Collect tree data for trees in each 2-inch diameter class, no smaller than the 6-inch diameter class.

A	B	C	D
Diameter class diameter measured at breast height (dbh)	**Basal area per tree** (square feet)	**Number of trees in the inner zone**	**Basal area per dbh class** (square feet) (multiply numbers in columns B and C)
32 (31 - 32.9 inches)	5.6		
30 (29 - 30.9 inches)	4.9		
28 (27 - 28.9 inches)	4.3		
26 (25 - 26.9 inches)	3.7		
24 (23 - 24.9 inches)	3.1		
22 (21 - 22.9 inches)	2.6		
20 (19 - 20.9 inches)	2.2		
18 (17 - 18.9 inches)	1.8		
16 (15 - 16.9 inches)	1.4		
14 (13 - 14.9 inches)	1.1		
12 (11 - 12.9 inches)	0.79		
10 (9 - 10.9 inches)	0.55		
8 (7 - 8.9 inches)	0.35		
6 (5 - 6.9 inches)	0.20		

If your harvest unit contains more than one stream or stream segment, this analysis should be done separately for each segment.

Calculate the basal area per acre in the inner zone.
Add the basal areas in column D for a total basal area in the inner zone. _____ sq. ft.

Divide the total basal area by the acres in the inner zone.[3]
Total basal area _____sq. ft. ÷ _____ acres = _____ Basal area per acre

Calculate trees per acre in the inner zone.
Add the number of trees in column C. _____ total trees

3 To calculate inner zone acres, multiply the inner zone width (45 feet for streams ≤ 15 feet, or 70 feet for streams >15 feet) by the inner zone length, then divide by 43,560: Inner zone acres = width _____ feet X length _____ feet ÷ 43,560.

Divide the total trees by acres in the inner zone.
Total trees _____ trees ÷ _____ acres = _____ trees per acre

Next, compare your inner zone basal area and trees per acre with the requirements for your timber habitat type shown in Section 2. Then use Section 3 for help in determining your leave tree requirement.

Section 2. Basal area and leave tree requirements.

Ponderosa pine timber habitat type (stands below 2,500 feet in elevation).

1. Stands with high basal area.

Basal area requirement. Harvest is allowed if the basal area is more than 110 square feet per acre for all tree species equal to or greater than 6 inches dbh in the inner zone.

Leave tree requirements. Harvest must leave at least 50 trees per acre and a basal area of at least 60 sq. ft./ac. You must select leave trees as follows:

- 21 largest trees per acre; and
- An additional 29 trees per acre that are ≥ 10 inches dbh
  - If there are fewer than 29 ≥ 10-inch dbh trees per acre, leave the 29 largest trees.
  - If there are more than 29 ≥ 10-inch dbh trees per acre, leave 29 ≥ 10-inch dbh trees per acre based on the following priority order:
    Trees that provide shade to water;
    Trees that lean towards the water;
    Trees of the preferred species as defined in WAC 222-16-010;
    Trees that are evenly distributed across the inner zone.

If more than 50 trees per acre are needed to meet the minimum leave tree basal area of 60 square feet per acre, then additional trees ≥ 6 inches dbh must be left. If the minimum basal area cannot be met with fewer than 100 trees that are ≥ 6 inches dbh, then no more than 100 trees per acre of the largest remaining trees are required to be left regardless of basal area.

2. Stands with low basal area and high density.

Basal area and density requirements. Thinning is permitted if the basal area of all species is less than 60 square feet per acre AND there are more than 100 trees per acre.

Leave tree requirements.
Thinning in low basal area and high density stands must leave a minimum of 100 trees per acre. The trees to be left shall be selected as follows:

- The 50 largest trees per acre; and
- An additional 50 trees per acre in the 6-inch diameter class or larger. If there are not 50 trees per acre in the 6-inch diameter class or larger, then all trees in the 6-inch diameter class or larger per acre must be left, plus the largest remaining trees to equal 50 trees per acre. Select the additional 50 trees per acre based on the following priority order:
  Trees that provide shade to water;
  Trees that lean towards the water;
  Trees of the preferred species as defined in WAC 222-16-010;

Trees that are evenly distributed across the inner zone.

Mixed conifer timber habitat type (stands 2,500 to 5,000 feet in elevation).

The rules for the mixed conifer timber habitat type require knowledge of the site index of a harvest unit. For purposes of carrying out the RMZ rules, site indices are reported in the *Washington State Department of Natural Resources State Soil Survey* and detailed in the associated forest soil summary sheets. Contact a Department of Natural Resources (DNR) region office for site index information. If the soil survey does not report a site index for your location or it indicates noncommercial or marginal forest land, then see (3) of the definition of "site class" in WAC 222-16-010 for guidance.

1. Stands with high basal area.

Basal area requirement. Harvest is allowed if the total basal area of all species greater than 6 inches dbh in the inner zone is more than:
100 sq. ft./ac. on low site index (< 90)
130 sq. ft./ac. on medium site index (90 to ≤ 110)
150 sq. ft./ac. on high site index (> 110)

Leave tree requirements. Harvest must leave at least 50 trees per acre AND a basal area of at least:
70 sq. ft./ac. on low site index (< 90)
90 sq. ft./ac. on medium site index (90 to ≤ 110)
110 sq. ft./ac. on high site index (> 110)

The trees to be left shall be selected as followed:

- 21 largest trees per acre
- An additional 29 trees per acre that are ≥ 10 inches dbh
  - If there are fewer than 29 ≥ 10-inch trees per acre, leave the 29 largest trees.
  - If there are more than 29 ≥ 10-inch trees per acre, leave 29 ≥ 10-inch dbh trees per acre based on the following priority order:
    Trees that provide shade to water;
    Trees that lean towards the water;
    Trees of the preferred species as defined in WAC 222-16-010;
    Trees that are evenly distributed across the inner zone.

If more than 50 trees per acre are needed to meet the minimum leave tree basal area for the applicable site index, then additional trees ≥ 6 inches dbh must be left. If the minimum basal area cannot be met with fewer than 100 trees that are ≥ 6 inches dbh, then no more than 100 trees per acre of the largest remaining trees are required to be left regardless of basal area.

2. Stands with low basal area and high density.

Basal area and density requirements. Thinning is permitted if the basal area of all species in the inner zone is less than the minimum requirements for the site index (as shown below) AND there are more than 120 trees per acre:

70 sq. ft./ac. on low site index (< 90)
90 sq. ft./ac. on medium site index (90 to ≤ 110)
110 sq. ft./ac. on high site index (> 110)

Leave tree requirements. Thinning in low basal area and high density stands must leave a minimum of 120 trees per acre. The trees to be left shall be selected as follows:

- The 50 largest trees per acre; and
- An additional 70 trees per acre in the 6-inch diameter class or larger. If there are not 70 trees per acre in the 6-inch diameter class or larger, then all trees in the 6-inch diameter class or larger per acre must be left, plus the largest remaining trees to equal 70 trees per acre. Select the additional 70 trees per acre based on the following priority order:
  Trees that provide shade to water;
  Trees that lean towards the water;
  Trees of the preferred species as defined in WAC 222-16-010;
  Trees that are evenly distributed across the inner zone.

Additional Leave Tree Requirements.

The 21 largest trees do not have to be evenly spaced.
The 29 additional ≥ 10-inch dbh trees per acre should be selected based on the following priority order:

- Trees that provide shade to water.
- Trees that lean toward the water.
- Trees of the preferred species:
  Ponderosa pine habitat type All hardwoods, Ponderosa pine, western larch, Douglas-fir, western red cedar
  Mixed conifer habitat type All hardwoods, western larch, Ponderosa pine, western red cedar, western white pine, Douglas-fir, lodgepole pine
- Trees that are evenly spaced across the inner zone.

Section 3. Leave tree calculations.

This is a worksheet for calculating leave trees on **stands with high basal area**. It will help to determine your 21 largest leave trees per acre, the additional 29 leave trees per acre, and the basal areas of those leave trees.

To determine how many of the largest trees are you are required to leave in the inner zone, multiply 21 by inner zone acres.
21 trees X _____ acres = _____ trees

Calculate the basal area per acre of the **21 largest leave trees per acre**:

- Transfer the information you collected in Section 1 Table 1 to Table 3.1 below, starting with the largest trees and proceeding in descending order until you reach the number of the largest trees you calculated above.

Table 3.1 **21 Largest Leave Trees Per Acre**			
A	B	C	D
Diameter class diameter measured at breast height (dbh)	**Basal area per tree** (square feet)	**Number of trees in the inner zone**	**Basal area per dbh class** (square feet) (multiply numbers in columns B and C)

- Total the numbers in column D. _____ sq. ft. total basal area.
- Divide the total basal area by inner zone acres.
  _____sq. ft. ÷ _____ acres = _____ sq. ft. basal area per acre (BA/ac.).

Next, determine the **29 additional leave trees per acre** you are required to leave in the inner zone that are ≥ 10 inches dbh: Multiply 29 by inner zone acres.
29 trees X _____ acres = _____ trees

Calculate the basal area per acre of the **additional 29 leave trees per acre**.

- Transfer information you collected in Section 1 Table 1 to Table 3.2 below, starting with the 10-inch dbh class and proceeding in ascending order until you reach the number of additional trees you calculated above.

  If there are fewer than 29 trees per acre ≥ 10 inches dbh in your stand, include the 29 next largest additional trees in this calculation.

Table 3.2 **Additional 29 Leave Trees Per Acre**			
A	B	C	D
Diameter class diameter measured at breast height (dbh)	**Basal area per tree** (square feet)	**Number of trees in the inner zone**	**Basal area per dbh class (**square feet) (multiply numbers in columns B and C)

- Total the numbers in column D. _____ sq. ft. total basal area.
- Divide the total basal area by inner zone acres.
  _____sq. ft. ÷ _____ acres = _____ sq. ft. basal area per acre (BA/ac.).

Now calculate the total basal area per acre of all leave trees.

BA/ac. of largest trees_____ + BA/ac. of additional trees_____ =_____total sq. ft. BA/ac.

Compare this total with the basal area requirement for your stand habitat type. If more than 50 trees per acre are needed to meet the minimum leave tree basal area for the applicable site index, then additional trees ≥ 6 inches dbh must be left. If the minimum basal area cannot be met with fewer than 100 trees that are ≥ 6 inches dbh, then no more than 100 trees per acre of the largest remaining trees are required to left regardless of basal area.

Section 4. EXAMPLE for a 2-acre inner zone in the Ponderosa pine timber habitat type.

Table 1
Inner Zone Assessment
Collect tree data for trees in each 2-inch diameter class, no smaller than the 6-inch diameter class.

A	B	C	D
Diameter class diameter measured at breast height (dbh)	**Basal area per tree** (square feet)	**Number of trees in the inner zone**	**Basal area per dbh class** (square feet) (multiply numbers in columns B and C)
32 (31 - 32.9 inches)	5.6		
30 (29 - 30.9 inches)	4.9		
28 (27 - 28.9 inches)	4.3		
26 (25 - 26.9 inches)	3.7	8	29.6
24 (23 - 24.9 inches)	3.1	8	24.8
22 (21 - 22.9 inches)	2.6	10	26
20 (19 - 20.9 inches)	2.2	20	44
18 (17 - 18.9 inches)	1.8	20	36
16 (15 - 16.9 inches)	1.4	15	21
14 (13 - 14.9 inches)	1.1	30	33
12 (11 - 12.9 inches)	0.79	40	31.6
10 (9 - 10.9 inches)	0.55	40	22
8 (7 - 8.9 inches)	0.35	50	17.5
6 (5 - 6.9 inches)	0.20	60	12

Calculate the basal area per acre (BA/ac.) in the inner zone.
Add the basal areas in column D for a total basal area in the inner zone: 297.5 sq. ft.

Divide the total basal area by the acres in the inner zone: 297.5 sq. ft. ÷ 2 acres = 148.8 sq. ft. BA/ac.

Calculate trees per acre in the inner zone.
Add the number of trees in column C: 301 total trees
Divide the total trees by acres in the inner zone: 301 trees ÷ 2 acres = 150.5 trees per acre

In this example, harvest is allowed in the inner zone because the basal area per acre in this 2-acre inner zone exceeds the requirement of 110 sq. ft. per acre for the Ponderosa pine timber habitat type. It is also evident that the number of trees per acre in the stand exceeds the minimum leave tree requirement of 50 trees per acre. Now the leave trees will be identified.

Determine the number of largest trees to be left: 21 trees X 2 acres = 42 trees

Table 3.1
21 Largest Leave Trees Per Acre

A	B	C	D
Diameter class diameter measured at breast height (dbh)	**Basal area per tree** (square feet)	**Number of trees in the inner zone**	**Basal area per dbh class** (square feet) (multiply numbers in columns B and C)
26	3.7	8	29.6
24	3.1	8	24.8
22	2.6	10	26.0
20	2.2	16	35.2

Total the numbers in column D. 115.6 sq. ft. basal area

Divide the total basal area by inner zone acres: 115.6 sq. ft. ÷ 2 acres = 57.8 sq. ft. BA/ac.

Calculate the number of additional trees ≥ 10 inches dbh to be left: 29 trees X 2 acres = 58 trees

Table 3.2 **Additional 29 Leave Trees Per Acre**			
A	B	C	D
Diameter class diameter measured at breast height (dbh)	**Basal area per tree** (square feet)	**Number of trees in the inner zone**	**Basal area per dbh class (square feet)** (multiply numbers in columns B and C)
10	.55	40	22.0
12	.79	18	14.2

Total the numbers in column D. 36.2 sq. ft. basal area

Divide the total basal area by inner zone acres: 36.2 sq. ft. ÷ 2 acres = 18.2 sq. ft. BA/ac.

Total the basal area per acre of the 21 largest trees per acre plus the 29 additional leave trees per acre: BA/ac. of 21 largest trees per acre 57.8 + BA/ac. of additional 29 trees per acre 18.2 = 76 sq. ft. total BA/ac.

In this example, the total basal area per acre of the 50 required leave trees per acre is 76 sq. ft. This meets the leave tree requirement for a stand with high basal area in the Ponderosa pine timber habitat type.