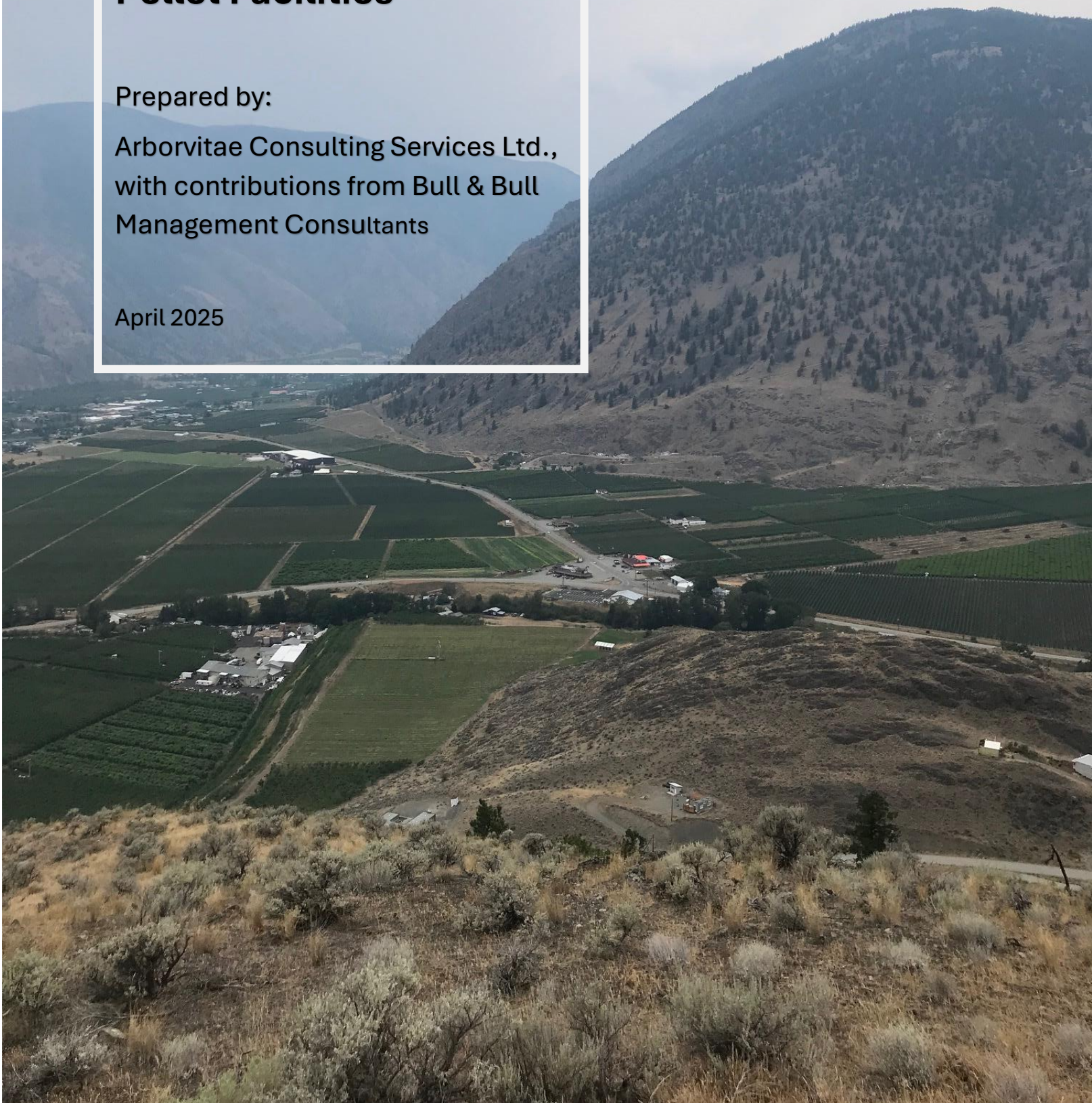


Okanagan Catchment Area Analysis: Drax's Princeton, Lavington and Armstrong Pellet Facilities

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The cover picture shows a view of the Similkameen Valley taken by Jeremy Williams.

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Executive Summary

Drax Group plc is a large energy company headquartered in the UK that generates increasingly decarbonized energy in the UK. Drax's portfolio of energy generation facilities includes biomass and power production; Drax both produces its own pellets and purchases pellets from other producers. Drax is committed to a zero-carbon future and aims to reach net-zero carbon by 2040. With this in mind, Drax wishes to ensure that the fibre procurement for the pellets it uses is not having a detrimental effect on forests, how they are managed, and on other aspects of the forest industry. This includes an interest in ensuring that fibre procurement contributes to its overall goal of becoming carbon neutral.

Drax commissioned this study to provide evidence on how it is meeting its sustainability commitments related to fibre procurement by its Princeton, Lavington and Armstrong pellet plants, located in the southern Interior region of British Columbia (BC). The catchment areas of the three mills, which are the areas where their fibre originates, overlap considerably and so this analysis evaluates the impacts of fibre procurement on the combined catchment area for all three mills.

The sawmills that supply the three pellet facilities draw most of their sawlogs from across the southern part of British Columbia, spanning from the Pacific Coast to as far east as Revelstoke. As a result, the catchment area (CA) consists of ten Timber Supply Areas (TSAs):

- Arrow
- Boundary
- Fraser
- Kamloops
- Kootenay Lake
- Lillooet
- Merritt
- Okanagan
- Revelstoke, and
- Soo.

The gross area of the CA is 14.2 million ha, representing 15% of BC. Provincial land comprises 90% of the CA; private and federal land were excluded from the analysis since they play very minor roles in the regional forest sector, accounting for 6% and 1% of the forested area in the CA, respectively. The treed area within the CA is 7.8 million ha but the

area available for timber harvesting is only 3.4 million ha, since much of the treed area is either non-productive forest, inoperable, or reserved from harvesting to maintain ecological, social or cultural values.

The climate, landscape, and forests within the CA are very diverse. The climate of the Pacific Coast is moderated by the Pacific Ocean and the coast receives very high levels of precipitation. This is a very productive region which holds what remains of the iconic old growth that BC is famous for. On the leeward sides of the Coast mountain ranges and on into the interior, the climate is very dry as the area is within the rain shadow of the coastal mountains. Much of the Interior is rugged and site conditions are variable with elevation, slope, soil condition, and aspect. The climate in the valley bottoms is relatively mild and dry, which has made Kelowna and Kamloops attractive places to live. Historically, the interior forests have been subject to repeated natural cycles of disturbance by fire and insect pests, followed by natural regeneration. The forest species are predominantly coniferous, with extensive fire-origin stands of interior Douglas-fir and pine in the lower elevations, and spruce and fir in higher elevation areas. Mixed stands are most common in the ecological transition zones.

Further east, in the Kootenays and Revelstoke TSAs, the CA extends into the Columbia Mountains. This area contains one of only two inland wet forest belts in the world, and supports extensive forests of large old timber, much of which has survived because it is difficult to access or operate in. Overall, the CA supports substantial amounts of old forest – 41% of the forest is 140 years of age or older; 140 years is the age that the provincial government considers Interior forests to be considered “old”. Old growth management is an important political issue in BC. The government is revising its approach to managing old growth and it has deferred harvesting in some 2.4 million ha across the province while the government, working with First Nations and industry, decides how to manage it.

This study covers the period from 2003 to 2053, representing a look at the past 20 years and several potential projections over the next 30 years. The retrospective assessment provided a detailed quantification of how the forest developed between 2003 and 2023, examining growth, shifts in age class and species distribution, and losses to insects and fire, harvesting and renewal. The projections examined how the forest could potentially develop from 2024 to 2053. The key variable for the projection was the future fire regime, about which there is a lot of uncertainty as climate change has begun to have a major influence on fire weather and wildfire in the catchment area. Through a review of recent literature and some discussion with experts, the consultants developed three scenarios for the future fire regime:

1. The area burned each year was the average area burned between 2000 and 2023. Approximately 0.37% of CA burned annually on average during this period. The fire regime changed in 2000 to become more active and conservatively it was kept constant in this scenario. Note that in 2021, ~4% of the CA burned but before that, the worst fire year was 2017 (when 0.7% of the CA burned);
2. Area burned from 2024 to 2053 increases linearly from 0.5% in 2024 to 1.0% in 2053. Note that a 1% burn rate implies an average age of 100 years, if every hectare burns once during a 100-year period; and
3. Area burned from 2024 to 2053 increases linearly from 0.5% at 2024 to 1.5% in 2053. Note that a 1.5% burn rate implies an average age of 67 years, if every hectare burns once during a 67-year period.

The consultants have not provided an opinion regarding which scenario is considered most likely – these are intended to be illustrative, as opposed to predictive, of the potential changes to the forest in the next three decades. The planned Annual Allowable Cuts (AACs) were used to set the target harvest levels in the projections, with adjustments based on recent performance and announced policy. Old growth areas that have been deferred from harvesting were assumed to be permanently unavailable for harvest.

The forest modelling over the fifty-year analysis period was undertaken using Patchworks, a spatial forest model. The output from the modelling was used as input for the Carbon Budget Model (developed and maintained by Natural Resources Canada), which analyzed the forest carbon balance between 2003 and 2053.

Historically, despite harvesting, fire and a mountain pine beetle outbreak in part of the CA, the amount of live growing stock in the CA forest has been very stable. In 2003, the growing stock stood at 1,233 million m³ and it ranged between 1,235 and 1,232 million m³ during the next 15 years. By 2023, due to widespread wildfires, the growing stock had declined to 1,225 million m³. Considering the extent of disturbance, the impact on growing stock volume was very minor.

Between 2003 and 2023, the volume of mature timber declined from 507 million m³ to 414 million m³, a decline of 18%. However, the volume of timber in old forest increased steadily from 648 million m³ to 730 million m³, a 13% increase that almost offset the reduction in mature timber volume.¹

¹ Mature timber is older than 100 years and younger than the age of old growth onset (150 years in the majority of the CA, 250 years in the Coastal forest), except for the ESSF BEC unit, where it is timber older than 120 years and below the age of old growth onset..

Between 2024 and 2053, the growing stock declines more significantly, with the largest declines associated with the most active fire regime. Under Scenario 1, the decline from 2023 to 2053 is only 2%, however it is 15% in Scenario 2 and 23% in Scenario 3. In Scenario 1, the amount of old forest growing stock actually increases over time but it declines in Scenarios 2 and 3 and the effect of the more active fire regimes exceeds the retention of old forest and the influx of aging mature stands into the old age class.

As of 2023, both the AACs and harvest levels have been declining during the previous decade, with future reductions already scheduled in some of the Timber Supply Reviews. As the supply has shrunk, some sawmills in the interior portion of the CA have closed. The reduced amount of residual fibre from sawmills has led Lavington to shift its fibre intake to a higher percentage of forest-based feedstock. Some of this feedstock is slash that is left at the landing after the primary harvest – it can be chipped or ground and brought to the pellet plant. The pellet facilities are also taking low-grade roundwood for which there is no other user – it is chipped at the pellet plant.

The full target harvest was achieved or almost achieved during the 2024-2033 period in all three Scenarios, but thereafter the actual harvest fell short of the target, as the forest could not supply enough timber to meet the target harvest. The worst results were obtained in Scenario 3, with the target harvest not being met in almost all TSAs after 2038.

The amount of carbon in the CA forest was essentially steady between 2003 and 2023, registering a decline of 0.25% during this period. Thereafter, the rate of decline increased, with more substantial declines associated with Scenarios 2 and 3. By 2053, forest carbon has declined since 2023 by 1.8% in Scenario 1; the declines were 5.5% and 7.9% in Scenarios 2 and 3, respectively. The scenarios did not specifically model the use of salvage timber by Drax, but clearly Drax could play a role in helping to facilitate the salvage of burned areas by taking the salvage wood that is below sawlog grade.

The relative stability of forest carbon in all three scenarios is largely due to the stability of forest carbon in the soil, and to a lesser extent the carbon content in the forest litter. However, the decline in live biomass was much more substantial. In Scenario 1, the aboveground biomass (AGB) pool loses 26.5 million tonnes C between 2023 and 2053 (4% of the 2023 amount). The carbon in the belowground biomass (BGB) decreases by a similar proportion. The forest loses more live biomass under Scenarios 2 and 3; between 2023 and 2053, the declines in live biomass are 16.6% and 25%, respectively. The loss in Scenario 3 is equivalent to the loss of one-quarter of the forest area. A change this substantial would visibly alter the landscape and would severely constrain the future timber harvest.

A summary of this report's key findings is provided in the tables below:

<i>Is there any evidence that bioenergy demand has caused the following?</i>	<i>Analysis Findings</i>
Deforestation?	<i>There is no evidence that bioenergy demand has caused deforestation.</i> The Canadian Forest Service reports that between 2001 and 2020, the area of forest in the Montane Cordillera ecozone, in which much of the CA lies, declined by a total of 63,560 ha, which is a 0.20% reduction of the forest area. ² During this period, 75% of the deforestation in the ecozone occurred because of conversion to mining (31%), agriculture (24%) and urban expansion (20%). The ownerships on which the deforestation occurred were not specified, however most of the conversion to agriculture and urban expansion would have occurred on private land. Forestry was also a meaningful contributor to deforestation (15%), primarily through the construction of forest roads. The consultants estimate that forestry led to the loss of 467 ha of forest per year in the ecozone. Moreover, the rate of deforestation from all sources, especially forestry, has been declining from 2001 to 2020. Because the catchment area is about half the size of the ecozone (which extends north through the Interior, north of Prince George), deforestation due to forest roads in the CA is estimated at between 200 and 250 ha/year. More detail is provided in Section 3.1. Other than forest road-building, forest managers must regenerate all harvested areas on Crown land. Drax has a policy of not taking wood from private land that is being cleared. For these reasons, bioenergy does not contribute to deforestation in the CA.
A change in management practices (e.g., rotation lengths, renewal, species change in forest)?	<i>There is no evidence that Drax's feedstock demand has resulted in changes to forest management practices, other than modestly reducing the amount of burning of slash and low-grade wood left at roadside after the harvested trees have been processed.</i>

² The Montane Cordillera ecozone has 31,138,000 ha of forest; in 2001 it would have had 31,203,000 ha of forest.

<i>Is there any evidence that bioenergy demand has caused the following?</i>	<i>Analysis Findings</i>
	In 2023, 90.7% of the feedstock obtained by Drax’ three pellet facilities in the CA was in the form of residuals from sawmills – primarily as chips, sawdust and bark. Drax’s use of this fibre has not influenced the harvest practices in the CA, since the timber is harvested by contractors employed by the sawmillers, whose needs have not changed. Similarly, the forest management practices in the CA have not changed as a result of fibre procurement by Drax. Drax has obtained some of its primary feedstock from post-fire salvage harvests, however the salvage occurred because sawmillers were able to harvest sufficient timber from the burned stand to make the salvage worthwhile. The presence of Drax as a consumer of the low-quality wood could sometimes be a factor that determined whether the salvage harvest would occur. However, the harvest practices employed were not influenced by Drax’s use of the timber. Drax’s use of roadside slash reduced the amount of slash pile burning to some extent. Where Drax obtained low-grade roundwood from the harvest site, the material destined for Drax was piled separately instead of being included in the burn piles. Other than influencing the log sort at the landing, Drax’ consumption did not change how the harvest operation was conducted, the amount of residual timber left in the cutblock, or the timing of the harvest. In conclusion, Drax’s procurement of feedstock has not changed how forests are managed
Diversion of wood fibre from other uses or markets?	<i>There is evidence that bioenergy demand has led to limited amounts of hog fuel and sawdust being diverted from other users however there is no evidence that the impacts on other users are material.</i> Timber markets are local, especially for low-valued timber that cannot profitably be transported far and pellet manufacturers use the lowest-quality fibre in the market. Between 2003 and 2023, the actual harvest level in BC, and in the CA, has been considerably less than the allowable level (See Figure 17 in the Forest in 2024 section), and this was especially so for the 2019-2023 period. This suggests that there was sufficient physically available wood for all production facilities.

<i>Is there any evidence that bioenergy demand has caused the following?</i>	<i>Analysis Findings</i>
	With the large volume of low-grade fibre available, there has been no need for Drax to compete for fibre with facilities that use the higher valued feedstocks, such as sawlogs, veneer logs, poles and posts. These facilities can always pay more for suitable wood than Drax can, or needs to. The Kamloops pulp mill does not compete with Drax for feedstock, since Drax needs little additional feedstock beyond the mill residuals it receives, and there is abundant low-grade material available in the CA. The other three pulp mills in the CA are so far away from the Drax plants that there is no competition. In conclusion, Drax's procurement has not drawn feedstock away from other mills because Drax cannot compete at the higher end and there is an over-abundance of low-grade wood available which means Drax is not diverting feedstock away from another potential user.
An abnormal increase in wood prices?	<i>There is no evidence that demand for bioenergy feedstock has raised local prices for wood products.</i> Sawmills, OSB, veneer and plywood manufacturers all produce much higher valued products than pellets and they can pay much more for feedstock than the pellet producers. Drax does not compete with any of these facilities and has no impact on prices for these types of timber. There are four pulp mills in the CA and three of these are so far away from the Drax plants that there is no competition. Kruger's mill in Kamloops is the only conceivable competitor to Drax, however because Drax's facilities are heavily reliant on sawmill residuals, and all three are adjacent to sawmills, there is no competition with the pulp mill. Timber prices in the catchment area have been most strongly influenced by lumber prices (which are influenced by US housing starts), the US-Canada exchange rate, and general economic conditions. Since 2020, the prices of lumber and composite products have been on a roller coaster, plunging in the March-May 2020 period before rising to record highs in September 2020, and even higher in May 2021 and March 2022. Lumber and composite prices declined significantly from March 2022 through to the end of that year and have remained at very low levels since then.

<i>Is there any evidence that bioenergy demand has caused the following?</i>	<i>Analysis Findings</i>
	During the 2019-2023 period, the harvest level has declined significantly from previous periods and it was well below the AAC. This indicates that there is an abundant physical supply of timber in the CA and there is no competition for the mill residuals and low-end primary feedstock that Drax's facilities use. Drax's feedstock procurement has not affected the prices of other wood products in the CA.
A reduction in the volume of timber in the forest?	<i>Figure 13 (In the Forest in 2024 section) shows that between 2004 and 2018, the amount of growing stock in the forest was stable, ranging between 1,232 and 1,235 million m3. The growing stock declined somewhat (by 0.8%) between 2019 and 2023, to 1,225 million m3, primarily due to the extensive wildfires that occurred during the period, particularly in 2021. Demand for feedstock for bioenergy was not a factor that reduced the amount of timber in the forest.</i> Growing stock is the forestry term for the volume of timber in a forest, and the provincial forest inventory and associated yield curves are the sources of the base data used to calculate the amount of growing stock present. The calculations for the CA show that the growing stock levels remained very steady from 2003 until the 2019 to 2023 composite period, when the impact of the 2021 wildfire season was manifested. Even then, the decline in growing stock was relatively slight. Furthermore, in the 2019-2023 period, 98% of the growing stock was live, indicating that the timber growth in the CA was almost sufficient to make up for the reductions in timber volume from the fires and of course from logging. In conclusion, there has been only a minor reduction in the amount of growing stock in the CA forest between 2003 and 2023, and that was primarily due to the impacts of wildfires in recent years. Feedstock procurement has not led to a reduction in growing stock.
A reduction in the rate of carbon sequestration?	<i>There is no evidence that bioenergy demand has affected carbon sequestration levels since the feedstock of the three pellet plants was not procured from live timber harvested for the purpose of manufacturing pellets.</i>

<i>Is there any evidence that bioenergy demand has caused the following?</i>	<i>Analysis Findings</i>
	Between 2003 and 2023, the major change in the catchment area affecting long-term sequestration capacity is that more land has been set aside for ecological and other reasons, so those areas will continue to add and store carbon until they are affected by a natural disturbance of some kind. Accordingly, the productive capacity of the land, and the long-term capacity of the forest to sequester carbon, has not changed. This stability has been borne out in the determination of the amount of carbon in the forest over time. The quantity of carbon in the live above and belowground biomass in the CA remained steady between 2003 and 2018 and declined by 1% during the 2019-2023 period, attributable to the wildfires that affected the CA during that period. Overall, the quantity of forest carbon declined by 0.8% between 2003 and 2023. Feedstock procurement by the pellet industry has not affected carbon sequestration levels in the forest, or the carbon balance for that matter. Drax's use of sawmill residuals does not impact the forest at all. Using logging waste material that is piled at the landing also has no impact on forest carbon, especially since the counterfactual is that the slash piles would be burned. Most of the low-grade logs used by Drax are already dead and, in any event, they were felled in the normal course of operations, because they were a hazard or in the way and could not be retained as residual. They are usually brought to the landing to be burned. Drax does not use logs that are already on the ground as they are rotten and unusable. In summary, the feedstock used by Drax does not impact carbon sequestration rates nor does it have any material impact on the amount of forest carbon.
An increase in harvesting above the sustainable yield capacity of the forest?	<i>Figure 12 (In the Forest in 2024 section) shows that between 2004 and 2023, the actual volume of timber harvested in the CA was well below the Annual Allowable Cut (AAC), which is set by the Chief Forester of British Columbia at a level that is sustainable over the long-term. Between 2004 and 2013, roughly 75% of the AAC was harvested; that percentage rose to almost 90% in 2014-2018, but in 2019-2023 only 57% of the AAC has been harvested.</i>

<i>Is there any evidence that bioenergy demand has caused the following?</i>	<i>Analysis Findings</i>
	In most of the Timber Supply Areas (TSAs) in the CA, the AAC drifted lower from 2003 to 2023; in 2003 the total AAC in the CA was 11.42 million m³ compared with 9.76 million m³ in 2023. However, in the early 2000's the Mountain Pine Beetle (MPB) outbreak began killing lodgepole pine, which was one of the most important commercial timber species in the Merritt, Kamloops and Okanagan TSAs. (Lodgepole pine was much less prevalent in the other TSAs and so no AAC adjustments were made.) The lodgepole mortality in these three TSAs was significant, and the Chief Forester authorized an increase in their AACs to support an intensive salvage operation of the dead and dying pine. Due to increases in the AACs for these three TSAs, the AAC for the CA rose to a peak of 15.3 million m³ in 2005 and 2006, before it started to gradually decline. (Appendix 3 contains a detailed discussion of AAC levels by individual TSA.) As Figure 12 shows, the actual periodic harvest was little changed between 2004 and 2018, but it declined significantly in the 2019-2023 period and was well within a sustainable range. In conclusion, the harvest levels in the CA have declined from 2003 to 2023 and the harvest has been well below the allowable level, especially in the 2019-2023 period. The harvest level in the CA is well within sustainable bounds as defined by the Chief Forester of BC, and pellet feedstock procurement did not lead to harvest levels exceeding the AAC.
The biodiversity within the catchment area has been described?	<i>The biodiversity within the CA has been described in terms of the range and distribution of ecosystems, as defined using Biogeoclimatic Ecosystem Classification (BEC) system of British Columbia, species at risk and old growth.</i> The CA is ecologically diverse and this report has described the primary ecosystems that are present across the CA landscape. In addition, the resources of the BC Conservation Data Centre were used to review red-listed and blue-listed species and ecosystems. Old growth also plays an important role in supporting biodiversity, and special attention was

<i>Is there any evidence that bioenergy demand has caused the following?</i>	<i>Analysis Findings</i>
	paid to it in this report. These topics provide a basic overview of the diversity within the CA.
Positive impacts to biodiversity. i.e., with utilization of specific fibre sources, or with the ability to conduct unique projects that require biomass recovery?	<i>Although Drax’s activities have a negligible impact on biodiversity, Drax’s ability to use low-grade fibre as feedstock for pellet production has enabled it to participate in projects in the CA to reduce fire risk by lowering fuel loading, which can improve forest health.</i> The range of forest management practices in the catchment area has expanded in recent years to include wildfire risk mitigation, habitat enhancements, fibre salvage and recovery, and the rehabilitation of degraded forest stands. A review of recent projects funded by the Forest Enhancement Society of BC (FESBC) shows numerous projects that are aimed at using uneconomic low-grade fibre (improving timber utilization and reduced open burning of logging slash piles) and mitigating the risk of wildfires. These practices create employment, avoid carbon emissions, and may have positive impacts on forest health. The surge in the amount of area burned by wildfire has led the province to spend substantial amounts of money on fuel and hazard reduction around communities. These activities typically involve thinning or other operations to reduce fuel loadings and they produce large amounts of low-value fibre that Drax has the ability to use, which supports these operations. In 2023, Drax did in fact obtain some of its primary feedstock from wildfire risk mitigation operations. In 2023, Drax also obtained some of its primary feedstock from timber salvaged from wildfires; the higher quality timber was used by sawmills while the lower quality timber that the sawmills did not want was sent to Drax. Salvage harvests permit burned area to be site prepared and planted to create a productive new forest. In summary, while Drax’s activities to date have had no impact on biodiversity, either positively or negatively, Drax’s use of low-grade fibre means it can enable projects such as fuel reduction and habitat restoration, improving forest health and potentially enhancing biodiversity.

<i>Is there any evidence that bioenergy demand has caused the following?</i>	<i>Analysis Findings</i>
Socio-economic impacts, i.e., on employment, etc.	<i>The use of feedstock for pellet production has not led to negative socio-economic impacts. Drax's facilities provide local employment, pay municipal taxes and purchase substantial supplies and services from within the region. Because the majority of feedstock is sawmill residuals, and the sawmills are located adjacent to the pellet plants, there is a very limited amount of employment associated with moving the residuals. However, as Lavington has increased its use of primary feedstock, additional employment has been created in the woods.</i> The socio-economic impacts of the pellet sector are not readily available. Data for the forest sector as a whole shows that harvesting 1,000 m3 of timber in the southern interior created significantly more economic value, employment and income than the same harvest would in the northern Interior. However, harvesting 1,000 m3 of timber in the Coast created more value and employment than in the southern Interior. Section 11 provides more detail. Drax commissioned a report that concluded Drax employs 2,330 people in BC and it procures 75% of its supplies and services from within the provinces where it operates. In 2025, Drax was recognized as one of BC's top employers. Besides the employment and economic benefits created through the operation of the pellet plants themselves, feedstock procurement has created some additional employment in both the woodlands and transporting sawmill residuals to the pellet facilities. Because the sawmills that supply most residuals are located adjacent to the pellet plant, there is only a small amount of employment associated with moving this feedstock to the pellet mill. However, all of the pellet mills have purchased some mill residuals from further afield, including Alberta and the US. The transportation required would support some added person-days of employment. During the last several years of the analysis period, Lavington has increased its use of low-grade feedstock derived from the forest. Some of this feedstock consists of chips or other forms of wood that have

<i>Is there any evidence that bioenergy demand has caused the following?</i>	<i>Analysis Findings</i>
	been chipped or ground up at roadside and transported to Lavington. In other cases, low-grade roundwood is brought to a chipper and then moved to the pellet facility. In all of these cases, there is employment created in the woodlands and trucking business. Whether these activities lead to new hires or provide more work for existing workers, there is a positive impact on employment and income. This is especially important as the forest industry is shrinking due to harvest declines – the pellet facilities and the associated employment may enable workers laid off at other facilities to stay in the area. There is no evidence that the employment created by the pellet plants has driven up local rents or housing prices. Pellet production provides a contribution to BC’s GDP. Most of BC’s pellet production is exported; in 2022, Japan overtook the UK as the top destination by weight shipped (52% of export quantity), followed by the UK (29%). Export volume has trended higher, reaching 2.5 million tonnes in 2022. In 2021, the value of pellet exports was \$378 million, a decline from \$426 million in 2020 as pellet prices fell. However, in 2022, the value of exports rose to \$470 million as prices increased substantially.
Lack of adherence to the principles of Free, Prior and Informed Consent (FPIC) and issues with local First Nations groups.	<i>Feedstock procurement has not undermined relations with First Nations in the catchment area or set back adherence to the principles of FPIC.</i> None of the First Nations with traditional territory in the catchment area signed historic treaties so that many if not all of these First Nations retain their full Aboriginal rights. BC has been more active than any other province in advancing reconciliation, including through measures taken to provide economic benefits in the forest sector. BC has also been providing tenure options and providing increasing opportunities to participate in decision-making related to forest management. In 2019, BC passed the Declaration on the Rights of Indigenous Peoples Act which establishes the UN Declaration on the Rights of Indigenous Peoples as the provincial framework for reconciliation. The UN

<i>Is there any evidence that bioenergy demand has caused the following?</i>	<i>Analysis Findings</i>
	Framework incorporates the principle of Free, Prior and Informed Consent (FPIC), such as in Article 19: <i>States shall consult and cooperate in good faith with the indigenous peoples concerned through their own representative institutions in order to obtain their free, prior and informed consent before adopting and implementing legislative or administrative measures that may affect them.</i> Because Drax does not have forest tenure or undertake forest planning, the activities of Drax do not affect how FPIC is being brought into these processes. The BC government has issued a small number of First Nations Woodland Licences (FNWLs) within the CA, with more under negotiation. As of March 2024, several small FNWLs were issued in the coast area and a larger licence has been issued to the NkMip First Nation near Osoyoos, with an AAC of 50,000 m³/year. Several other First Nations hold Community Forest Licences. Drax can obtain feedstock directly or indirectly from these licences, which supports the First Nations holding these licences. Drax has recently hired a First Nations ambassador to develop ties and relationships with the company throughout BC.

<i>Impact of bioenergy demand on:</i>	<i>Analysis Findings</i>
Volume of timber in the forest	Neutral. The amount of live growing stock in the CA forest has been very stable between 2003 and 2023. In 2003, at the start of the review period, the growing stock stood at 1,233 million m ³ . For the next 15 years, it ranged between 1,235 and 1,232 million, however it declined to 1,225 million m ³ by 2023. This most recent decline is mostly attributable to the fire losses that occurred in 2017 and especially in 2021. Bioenergy demand has meant that the timber which has been harvested is used more fully, and it has provided support to a small number of salvage harvest operations, but it has not led to an increase in overall harvest or increased the amount of live timber removed from a given harvest block.
Timber growth rates	Neutral. At the level of the individual stand, the removal of low-grade fibre for pellet production has not affected growth rates, since harvesting on Crown land and managed private land in BC is conducted in a manner that maintains site productivity. The primary feedstock that Drax uses comes from logging slash that is left behind after normal harvesting and processing at the landing – utilizing this has no impact on growth rates. Any increased removal of low-grade dead wood from within a block is constrained by provincial requirements to leave residual live and dead trees for wildlife and to not harm soil productivity. In conclusion, fibre procurement for pellet production has had no impact on forest growth rates.
Forest area	Neutral. The use of fibre for pellet production has had no impact on Crown or managed private forest area, on which forest managers are required to renew harvest areas. Drax does not procure fibre from land being cleared for conversion to other uses. The processing of roadside slash for use by Drax will free up a small amount of area for prompt renewal, and so by reducing the amount of area where the slash would have been left, there may be a marginal positive impact on future forested area.
Wood prices	Neutral. Drax does not compete for sawlogs, veneer logs, poles or other high quality timber products, and thus does not affect wood prices. Drax also does not bid for BC Timber Sales licences. The market for wood that is below sawlog

	quality is quite limited within the part of the catchment area near Drax's facilities. The Kamloops pulp mill does not compete with Drax for feedstock, since Drax needs little additional feedstock beyond the mill residuals it receives, and there is abundant low-grade material available in the CA. Moreover, the pulp mills can usually afford to pay higher prices than the pellet facilities so Drax's use of feedstock has not affected the prices of different wood products in the CA.
Markets for solid wood products	Positive. Drax' three pellet mills in the CA rely heavily on sawmill residuals for their furnish. If the pellet mills were not there, most of this residual fibre would have been otherwise burned or landfilled, representing a cost to the sawmills. By using this fibre and providing an additional revenue stream for sawmills, the pellet producers have helped to support the sawmills in the catchment area, especially during the last two years when lumber prices have been quite low.

1 Introduction

1.1 Background

The Drax Group is a British electrical power generation and supply company that operates Europe's largest biomass-fueled power station. It is the UK's largest decarbonisation project and it supplies 5% of the country's electrical needs.³ Drax is among the world's largest single-point consumers of wood fibre and has committed to sourcing wood responsibly.⁴

Drax has commissioned catchment area analyses (CAA) in many of the regions where its supplier pellet mills operate and these are publicly available on Drax's website. Each CAA reviews and assesses the trends in management and wood products markets within the catchment area (CA), providing an assessment of the sustainability of forests and forest values in the CA, as well as any impacts that Drax's procurement of feedstock may have had. This is the third CAA to be done in British Columbia – one of the previous studies examined the CA for pellet facilities in Houston and Burns Lake and the second considered the CA for the Williams Lake and Meadowbank pellet facilities.

This CAA considers the catchment area that provides feedstock to three pellet mills - Princeton, Lavington and Armstrong – located in south central British Columbia (BC). Drax acquired the Armstrong and Lavington facilities when it bought Pinnacle Renewable Energy in 2021 and it subsequently acquired the Princeton facility in 2022 from the Princeton Standard Pellet Corporation.⁵

The Lavington facility is the newest of the three; it was constructed and began operations in 2015 as a Pinnacle Renewable Energy facility. It was initiated as a partnership between Pinnacle and Tolko Industries, and this partnership continues today, with Lavington receiving most of its feedstock from the Tolko sawmill located across the road. This is one of the larger pellet manufacturing facilities in Canada, with an annual production capacity of 230,000 metric tonnes, as listed by the Wood Pellet Association of Canada (WPAC).

The Armstrong facility began operations in 2008 and is listed by WPAC as having a capacity of 72,000 metric tonnes of pellets/year. The oldest of the three facilities in the catchment

³ <https://www.drax.com/uk/about-us/our-sites-and-businesses/drax-power-station/>

⁴ <https://www.drax.com/sustainability/biomass-sourcing/>

⁵ Drax has retained Pinnacle Renewable Energy as a division of the Drax Group – for simplicity, this report will refer to activities and assets of the Pinnacle division as being undertaken /owned by Drax.

area is the Princeton mill, which was built in 1995 and has an annual capacity of 90,000 metric tonnes of pellets. It obtains most of its feedstock from a sawmill across the road owned by Weyerhaeuser. These three pellet facilities are the only wood pellet plants in or near the catchment area, however there is one other plant in the CA that uses biomass as feedstock. Pattern Energy's plant in Merritt BC (which is within the catchment area) uses woody biomass to produce electricity that is sold and distributed through the provincial grid.

1.2 Report Goal

The goal of this report is to understand the effects of Drax's use of biomass as a feedstock and to project how the forest might change and develop in the future. To do this, we examine the changes in the forest over the past 20 years (2004–20⁶23) and identify and assess the impacts that sourcing biomass for the three pellet plants has had on the forest, its management, and wood markets. This includes considering the impacts on timber inventory, forest growth, forest removals, wood prices, forest management practices, and local wood fibre markets. During this period, there were some large wildfires in the CA as well as a severe mountain pine beetle infestation in some parts of the CA. The review period covers the start-up and operation of the Armstrong and Lavington plants, and so spans the period of the most significant potential impacts of fibre procurement by the pellet facilities.

Current forest trends are supplemented by projections over the next 30 years of how the forest may change, the potential level of future disturbances, and what future harvest levels may be. The impacts of climate change have already had a substantial impact on the forests of the CA, and as the atmospheric concentration of CO₂ continues to rise, at least in the short and medium terms, there is a very high level of uncertainty as to how the forests will be affected. The consultants have selected three future fire regime scenarios to examine – these are considered to be plausible future outcomes, however they are not intended to be predictions or forecasts. The report will describe the impacts of future fire and harvesting on the forest, including examining the carbon balance within the forest, and the wood supply, as well as describing in general terms the biodiversity within the CA.

1.3 Report Structure

The report is organized as follows:

⁶ Note that this analysis starts with the forest as it was in 2023, and 2024 is the first year of activity. 2023 is considered to be year 0 in this study.

- **Description of the Catchment Area (Section 2):** The geographic and socio-economic characteristics of the catchment area are described. A brief history of the catchment area is also provided, along with a description of the climate.
- **Overview of the Forest (Section 3):** This section provides an overview of the forest in the catchment area.
- **Overview of Relevant Legislation (Section 4):** The Williams Lake and Meadowbank CAA provided a detailed discussion of British Columbia's legal framework for forest planning, management, and setting the conditions for the forest industry to operate. This is summarized, and forest policy updates are described in more detail. The status of old growth management and amendments to laws related to biodiversity are also described in this section.
- **First Nations (Section 5):** The First Nations in BC are a very important component of society in BC and in the catchment area, in which many First Nations communities are situated. The BC government has committed to reconciliation and First Nations are increasingly having their rights recognized and acting on them. They are playing an increasing role in forest management and in the forest sector, and the growth in their presence and influence is described.
- **Description of the Current Forest in the Catchment Area (Section 6):** This section describes the current state of the forest, both in area and volume terms, how harvesting is regulated, and how the forest has changed since 2004.
- **Forest Disturbances 2003 – 2023 (Section 7):** This section reviews the impacts of MPB, wildfire and harvesting between 2003 and 2023.
- **Future Fire Regime (Section 8):** The future fire regime is very uncertain, and this section describes recent research that indicates how the fire regime has changed and how it might develop in the future.
- **Forest Projection from 2024 to 2053 (Section 9):** The development of the forest is modelled over the next 30 years under three alternative fire regime scenarios. Harvest levels and carbon balance are also projected to 2053.
- **Forest Carbon Analysis (Section 10):** The analysis of the forest carbon balance between 2003 and 2053 is summarized in this section.
- **Markets and Pricing (Section 11):** The markets for wood fibre in and around the catchment area are profiled and product pricing trends are reviewed.
- **Appendix 1** provides a more detailed description of each of the Timber Supply Areas in the catchment area.
- **Appendix 2** lists the forest products facilities in the CA.

- Appendix 3 provides detailed analysis of future AACs for each TSA in the CA
- Appendix 4 provides data tables for Figures 25-27 and Figure 34
- Appendix 5 lists the Red and Blue-listed forested ecosystems within the CA

1.4 Project Consultants

Jeremy Williams, PhD, RPF (Ontario)

Dr. Jeremy Williams has extensive forest economics experience including reviews of timber markets, timber pricing including stumpage rates, timber product production costs, and rates charged by the Crown for property leases. Recent relevant experience includes reviewing forest management and timber markets in Nova Scotia, participating in the preparation of Regional Risk Assessments for BC, Alberta, New Brunswick and Nova Scotia against the SBP standard.

In addition to these projects, Jeremy has completed numerous business cases, economic evaluations and reviews. He is also very knowledgeable and experienced with respect to forest carbon pricing and accounting and has extensive experience working with and advising Indigenous communities and organizations.

Dr. Williams earned a B.Sc.F. from the University of Toronto's Faculty of Forestry (1979) and a Ph.D. from the same Faculty with a specialization in Forest Economics (1986). He is a principal of ArborVitae Environmental Services Ltd. and a Registered Professional Forester with the Ontario Professional Foresters Association.

Gary Bull, Ph.D.

Dr. Gary Bull has a background in commerce as well as three degrees in forestry, specializing in economics and policy. He has an interest in global forestry policy issues and is an expert on forest and timber markets in Asia and ecosystem services markets. In British Columbia, he has focused his efforts on working on sustainable business development with First Nations communities and sustainable fibre supply.

Dr. Bull worked for the Food and Agriculture Organization of the United Nations before moving back to Vancouver and joining the Faculty of Forestry at the University of British Columbia. Gary is currently a full professor and head of the Forest Resources Management Department at the Faculty. Gary's specialties include Aboriginal forestry, forest carbon finance, economics and international trade. Gary has been associated with SBP for several years and was selected to be a member of SBP's Standards Committee and Working Group on Carbon. He also sits on the External Review Panel of SFI and is a Director of Nature Bank.

Cosmin Man, Ph.D., RPF (BC)

Cosmin Man is a scientist, forester, and specialist in forest modeling and analysis. He brings a depth of database and modeling expertise that is grounded in operational forest management experience and understanding. This breadth of experience coupled with strong problem-solving skills allows Cosmin to provide meaningful support to a range of forest planning and analysis projects including timber supply, habitat supply, integrated resource planning, and forest carbon management. Some of the recent projects include Integrated Silviculture Strategies in BC Mackenzie (2016-2018), Cranbrook, and Invermere (2016-2019) TSAs, timber supply review for Sunshine Coast TSA (2020-2023), Weyerhaeuser Princeton tactical plan (2020 and 2022), and tree farm licence 52 forest carbon analysis (2021).

2 Catchment Area Description

2.1 Extent

A catchment area is the region from which a forest products mill sources its wood fibre. This assessment examines the catchment areas of three southern BC pellet mills owned by Drax Group PLC. The three pellet mills are situated in the communities of Armstrong, Lavington, and Princeton, which are in relatively close proximity to each other. Princeton is located roughly 80 km southwest of Kelowna as the crow flies but is 165 km by highway. Lavington and Armstrong are roughly 60 and 75 km northwest of Kelowna, and about 30 km apart. The catchment areas for these facilities are much broader than the Kelowna region, since they include the locations where the fibre that they receive as mill residuals originates. The sawmills that are the major providers of residuals obtain their fibre from a very extensive area that stretches from the south BC coastal zone to as far east as Revelstoke.

Table 1 shows the volume of feedstock by type by sourcing region for all three facilities combined in 2023 and Table 2 shows the breakdown for each facility separately. For all three plants, the majority of feedstock comes as residual by-products from sawmills; in aggregate roughly 99% of this came from British Columbia in 2023. A very small amount of fibre came to Lavington from Alberta, which also supplied de *minimis* amounts to Armstrong and Princeton (indicated by the asterisks in Table 2). Princeton received fibre from the US (Washington, Idaho and Montana), and Lavington also received a minor amount of fibre from the US that was too small to show up in the table.

Feedstock Type	British Columbia	Alberta	USA	Feedstock type %
Processing Residue	347.9	1.0	2.6	90.7 %
Forest Feedstock	36.2	0.0	0.0	9.3 %
SUM	384.1	1.0	2.6	

TABLE 1. FEEDSTOCK BY TYPE AND SOURCE LOCATION, SUMMED (THOUSAND ODT IN 2023).

Since 2020, Lavington has increased its use of forest-based feedstock (also known as primary feedstock) from almost none to its level in 2023 of 12.7%. In 2020, 2021, and 2022, 1.4%, 0.0%, and 5.2% of its feedstock was primary feedstock from the forest. In

contrast, Princeton did not use any forest-based feedstock in 2022 and hasn't used any yet this year, as of mid-November 2024. Only in 2023 did it use a minor amount. Armstrong is almost entirely supplied by processing residuals from BC.

Lavington and Princeton both received relatively small amounts of primary feedstock. All of Princeton's primary feedstock was in the form of bush grind. Of the forest-based feedstock used by Lavington in 2023, 60% came from low-grade roundwood brought to a chipping facility and broken down there. The remaining 40% was bush grind, which is derived from the wood that is left at the landing once the merchantable timber has been removed. This residual includes the treetops, branches, and rotten and broken pieces that are left over after the tree has been processed. This residual is usually piled and burned, however if it is close to a pellet plant, it is economical to chip or grind it in the bush and bring it to the pellet facility. In 2023, some of this fibre came from post-fire salvage harvests and some was sourced from fuel reduction programs (Firesmart) around nearby communities; Firesmart programs are intended to reduce the risk that wildfire enters the community. Because forest-based feedstock is a low-value product, it is not economic to transport it very far so that it likely came from the TSAs closest to each of the facilities, namely Merritt, Okanagan and Boundary.

Feedstock Type	British Columbia	Alberta	USA	Feedstock type %
Armstrong				
Processing Residue	56.6	0.0*	0.0	100%
Lavington				
Processing Residue	229.8	1.0	0.0*	87%
Forest Feedstock	33.6	0.0	0.0	13%
SUM	263.4	1.0	0.0	
Princeton				
Processing Residue	62.7	0.0*	2.4	96%

Forest Feedstock	2.6	0.0	0.0	4%
SUM	65.3	0.0	2.4	

TABLE 2. FEEDSTOCK BY TYPE AND SOURCE LOCATION (THOUSAND ODT IN 2023).

Drax's internal data showed that the feedstock for these three facilities originated from ten Timber Supply Areas in BC that span almost the entire southern portion of the province. Since the catchment areas of these pellet plants overlap extensively, this review treats the catchment areas of the mills as one large catchment area. The ten TSAs that constitute this aggregate CA are:

- Arrow
- Boundary
- Fraser
- Kamloops
- Kootenay Lake
- Lillooet
- Merrit
- Okanagan
- Revelstoke
- Soo

Figure 1 shows the locations of the individual TSAs in the catchment area. The CA extends all along the southern border of BC, with the Kamloops, Okanagan and Revelstoke TSAs extending into the central interior of the province. The communities of 100 Mile House and Williams Lake are situated west of the Kamloops TSA, outside of the CA – both communities are part of the CA for Drax's facilities in Williams Lake and Meadowbank, the subject of the previous CAA report.

The total area of each TSA, and the area by ownership, is shown in Table 3. There is a moderate amount of variability in the size of the TSAs but even the Kamloops TSA, which is the largest within the CA, is only a mid-sized TSA within BC. About 91% of the catchment area is Crown land, which is public land under provincial jurisdiction. First Nations groups in the area do not own substantial lands outright; 913 ha is under title to First Nations groups and an additional 665 ha is identified as a Land Claim Settlement area. However, First Nations and First Nations-owned companies do have significant forest management and timber harvesting rights on some areas.

OKANAGAN CATCHMENT AREA ANALYSIS

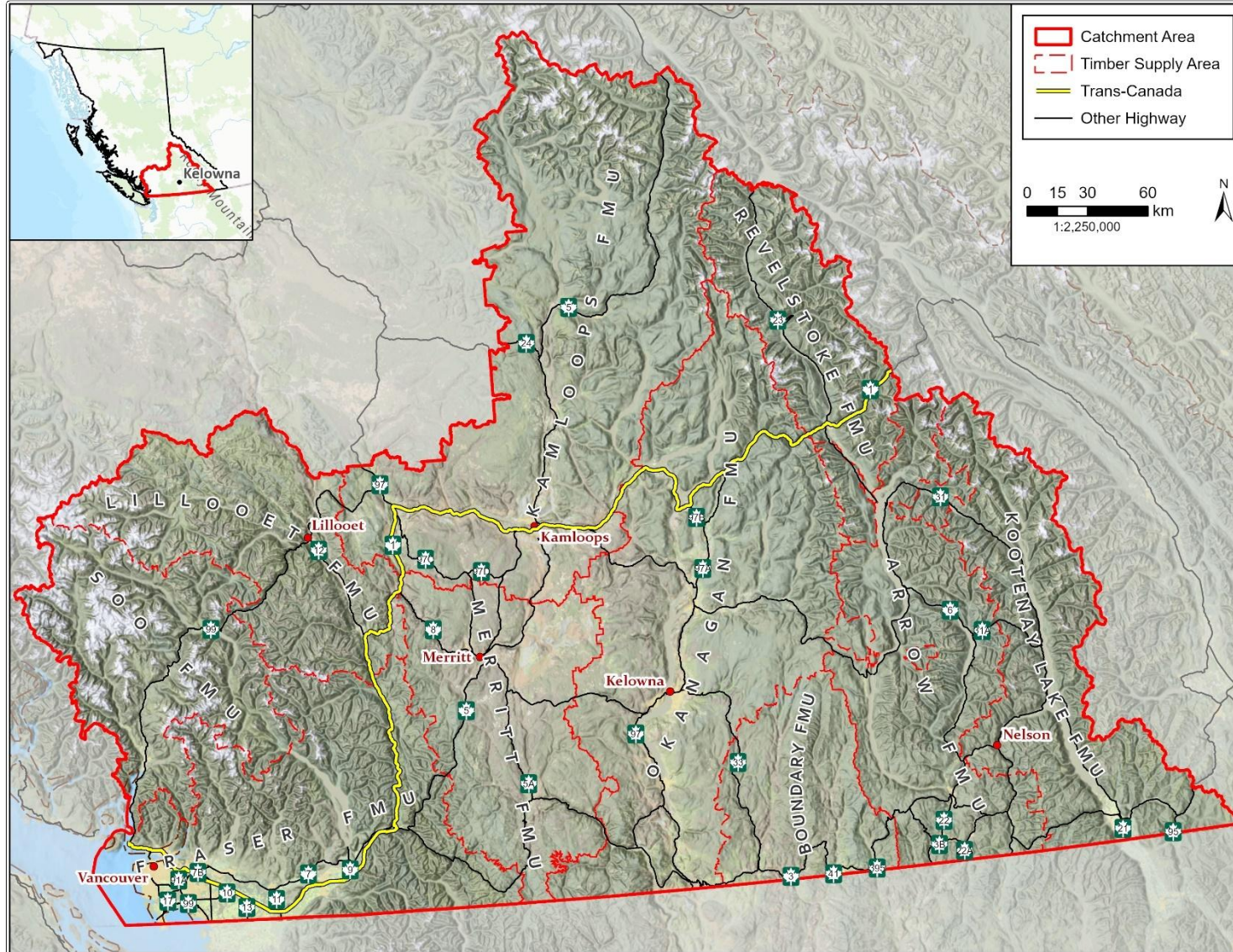


FIGURE 1. MAP OF CATCHMENT AREA.

OKANAGAN CATCHMENT AREA ANALYSIS

TSA	Total Area	Crown Land	Private Land	Federal land	Unknown
Arrow	1,285,626	1,177,579	106,153	192	1,703
Boundary	659,000	601,093	57,834	0	73
Fraser	1,648,747	1,334,459	193,750	20,258	100,282
Kamloops	2,769,474	2,563,259	167,298	37,256	1,664
Kootenay	1,240,902	1,123,526	58,730	3,344	55,303
Lillooet	1,125,024	1,080,688	22,468	21,148	721
Merritt	1,131,164	940,606	155,598	34,230	732
Okanagan	2,449,148	2,117,568	258,416	69,808	3,358
Revelstoke	758,443	714,111	17,910	26,386	37
Soo	1,098,894	1,066,350	16,758	6,997	8,789
TOTAL	14,166,422	12,719,239	1,054,915	219,619	172,662
Percentage		89.8 %	7.4%	1.6%	1.2%

TABLE 3. LAND OWNERSHIP STATISTICS FOR THE CATCHMENT AREA (HA).

The federal land in the CA includes Indian Reserves, military bases, and Mount Revelstoke and Kootenay National Parks. These lands usually have a negligible amount of harvesting and contribute little to the wood supply but they have high social and ecological values.

The area of private land shown in Table 3 includes urban and agricultural lands, which account for a significant proportion of the total private holdings. Privately owned forests contribute to the regional timber harvest. However, the forest inventory for these lands is not updated regularly for depletions, nor are there records of the amount of timber that originates from this ownership class. As a result, this study does not specifically consider these lands in the modelling analysis; the consultants estimate that the extent of their contribution to the catchment area harvest is between 3% and 4%. Activities on these lands do not affect the trends and conclusions identified in this report.

Crown land is designated for a wide variety of uses in order to provide a wide range of benefits to society; this includes large areas that are protected or subject to special management to conserve special ecological values. Table 4 shows the area in the major categories of Crown land designation. Almost 2 million ha (15.4% of the Crown land area) is protected, and an additional 848,004 ha is designated as caribou reserve. Some of these reserves have no timber harvesting while others allow modified harvesting. Another 2% of the land is dedicated to recreational use, including recreation reserves, forest recreation reserves and other smaller areas for public use.

There are four main types of area-based tenures in BC: Tree Farm Licences, Woodlot Licences, First Nation Woodland Licences and Community Forest Licences. While these licences all provide Crown timber, the allowable harvest levels on these licence type are determined as part of the management planning process for these areas. As a result, these licence areas are excluded from the Allowable Cut determination process conducted by BC's Chief Forester for each TSA. In total, 1,895,585 ha or 14.8% of the Crown land area is licensed under area-based tenures, which means that the total Crown timber allowable cut will be roughly 15% higher than the AAC from the volume-based tenures alone.

Designation	Area	% Crown
Conservancy Area, Ecological Reserve, Protected Area, Provincial Park	1,980,701	15.4%
Recreation Reserves etc.	241,129	1.9%
Various Caribou Reserves	848,004	6.6%
Tree Farm Licences	1,220,563	9.5%
Woodlot Licence	157,942	1.2%
First Nations Woodland Licence	175,374	1.4%
Community Forest Agreement Areas	341,706	2.7%
Misc Reserves etc.	1,456,334	11.3%
Forest Management Unit	6,470,135	50.2%

Total Crown Area	12,891,888	
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TABLE 4. CROWN LAND DESIGNATIONS (HA).

2.2 Socio-economic Overview of the CA

Technically, the largest city in the CA is Vancouver, however the Greater Vancouver Area (GVA) is not particularly representative of the CA and clearly has province-wide influence. More representative of the CA are its two most important regional cities, Kamloops and Kelowna, located more or less centrally within the CA. Perhaps even more significant to the CA than these two main cities are regions that have their own identities. The largest and most consequential region is the Okanagan Valley, where Kelowna, and Drax's Lavington facility are located. Armstrong is situated just to the north of the Okanagan, within the Spallumcheen Valley. Princeton is in the Similkameen Valley, which is west of the southern Okanagan Valley.

All of the best agricultural land in mainland BC is located within the CA. The Fraser River Valley and the Okanagan Valley are famous for their fruit production, especially peaches, cherries, and apples. In all, many different crops are grown in these regions. The Okanagan is also the largest and best-known wine-producing region in the province; the Similkameen Valley is also becoming a significant producer of high-quality wines. The Fraser valley is a cooler and wetter region, known for producing mainly white wines such as Chardonnay, Pinot Gris, and Gewürztraminer. Emerging wine-producing areas in the CA include the Kootenay and Shuswap Lake areas.

Tourism is a major economic driver in the Okanagan, with the region's wineries, large scenic lakes, and an abundance of special events attracting visitors year-round. Wine tours, festivals, and culinary tourism are central to the region's appeal, as well as resorts and lakeside activities. There are also numerous opportunities for outdoor recreational activities (hiking, biking, skiing). Major provincial parks such as EC Manning Park, an almost 83,000 ha park between Hope and Princeton that abuts the US border, offer a wide range of front and backcountry experiences. Other notable provincial parks include Cathedral, Okanagan Mountain, Kootenay Lake, and Skaha Bluffs parks.

The CA is also an important mining region. The Elk Valley is home to four major producing metallurgical coal mines (Elkview, Fording River, Line Creek and Greenhills) while there are several large mines in the vicinity of Kamloops (e.g. Highland Valley Mine (copper and molybdenum) and New Afton (copper, gold and silver)). Copper Mountain is a large open-

pit copper mine that also produces gold and silver, and Bralorne Gold Mine near Lillooet is an underground mine that began producing in 1932. It closed in 1971 but is being re-developed with the intention to resume mining.

Besides the Greater Vancouver Area, Kelowna is the largest city in the CA, with a population of 222,162 in the 2021 census. It remains one of the fastest growing cities in Canada; it expanded by 14% from 2016, when its population was 194,892. Kelowna is located in the heart of the Okanagan Valley, along Okanagan Lake, and is within the traditional territory of the Syilx (Okanagan) people. The Syilx have long relied on the lake and fertile valley for fishing, hunting, and agriculture.

With a 2021 population of 97,902, Kamloops is roughly half the size of Kelowna. It too is growing rapidly, recording a 9.4% increase between 2016 and 2021. Kamloops is situated at the confluence of the North and South Thompson Rivers, within the traditional lands of the Secwépemc (Shuswap) people, who inhabited the area for more than 10,000 years. They used the region as an important trade and gathering site due to its strategic location at the intersection of the two major rivers.

A substantial number of people in the CA identify as Indigenous in the national census, however specific data for the CA are not readily available. For BC as a whole, 5.9% of its 2021 population (290,210 people) identified as Indigenous. In Kelowna and Kamloops, Indigenous people made up 6.1% and 10.5% of the 2021 population, respectively. In some of the smaller communities, the Indigenous population is a much higher percentage (e.g. Lillooet (24.8%), Merritt (21.9%)).

Some of the secondary towns and smaller cities in the CA are:

- Chilliwack (93,203 in 2021, an 11.4% growth rate between 2016 and 2021, 7.9% Indigenous in 2021);
- Vernon (67,086 people, 9.4% increase, 7.7% Indigenous);
- Salmon Arm (16,065 people, 7.5% increase, 8% Indigenous);
- Trail (14,268 people, 0.5% increase, 8.6% Indigenous);
- Nelson (11,198 people, 5.0% increase, 5.5% Indigenous);
- Castlegar (8,338 people, 3.8% increase, 6.8% Indigenous);
- Revelstoke (8,275 people, 9.4% increase, 4.9% Indigenous); and
- Merritt (7,502 people, 1.2% decrease, 21.9% Indigenous).

The landscape in the CA is generally rugged, with rivers and long, linear lakes oriented in a general north-south direction. Transportation routes generally follow the valley bottoms,

which is where most settlements are located. However, the river valleys are separated by high-elevation ridges and ranges that have limited east-west travel and dictated the location of many of the regional highways. The main exception to this is the Fraser River, which traverses almost 1,400 km through central and southern BC. The Fraser flows almost due south from Prince George through Williams Lake, entering the CA at Lillooet. It continues flowing southward until the river makes a 90 degree turn at Hope, from where it flows west towards the Pacific Ocean. The Fraser Valley, from Hope to Vancouver, is extremely fertile and heavily populated; it also serves as a major rail and highway corridor.

Highway 1, the Trans-Canada Highway, runs along the Fraser Valley from Hope to Vancouver to the south of the Fraser River, whereas Highway 7 runs through the Fraser Valley to the north of the river (See Figure 1 **Error! Reference source not found.**). Past Hope, the Trans-Canada runs north partway to Lillooet before turning east; Highway 12 continues up to Lillooet. The Trans-Canada Highway meanwhile passes through Kamloops, Salmon Arm and Revelstoke. Highway 5 also starts near Hope, and it runs through Merritt to Kamloops and then north through the mountains to Prince George.

East of Hope, the Crowsnest is one of the main highways running east-west across the very southern part of the province, passing through EC Manning Park, Princeton, Castlegar, and further east. Highway 97 is another key route within the CA; it runs generally north-south from Osoyoos in the south, along the west side of Okanagan Lake (passing through Kelowna) then northwest to Kamloops.

Most secondary communities are connected by winding two-lane highways so that the distance between them by road can be substantially further than the direct distance.

2.3 The Forest Products Sector in the Catchment Area

Figure 2 shows the location of the main forest products mills in the catchment area. They are generally quite dispersed across the CA, with only Castlegar perhaps qualifying as having a forest products facility cluster. Where there are multiple mills of the same type in the same community, they are indicated by a single symbol (e.g., Castlegar). Table 5 lists the mills by type, company, location and capacity. These data were obtained from the Ministry of Forests.⁷ Large lumber mills are defined as those with a capacity greater than 40 million board feet. There are 49 mills in the CA that have a capacity of less than 40 million board feet, and of these, 31 are very small with a capacity below 5 million board

⁷ Ministry of Forests. 2020 Major Timber Processing Facilities in British Columbia. Forest Economics and Trade Branch, Ministry of Forests, BC. The 2020 Major Timber Processing Facility report has been updated to include retroactive data adjustments made by the pulp industry in November 2022.

feet. The mills with capacities between 5 and 40 million board feet are listed below but the smaller ones are not.

OKANAGAN CATCHMENT AREA ANALYSIS

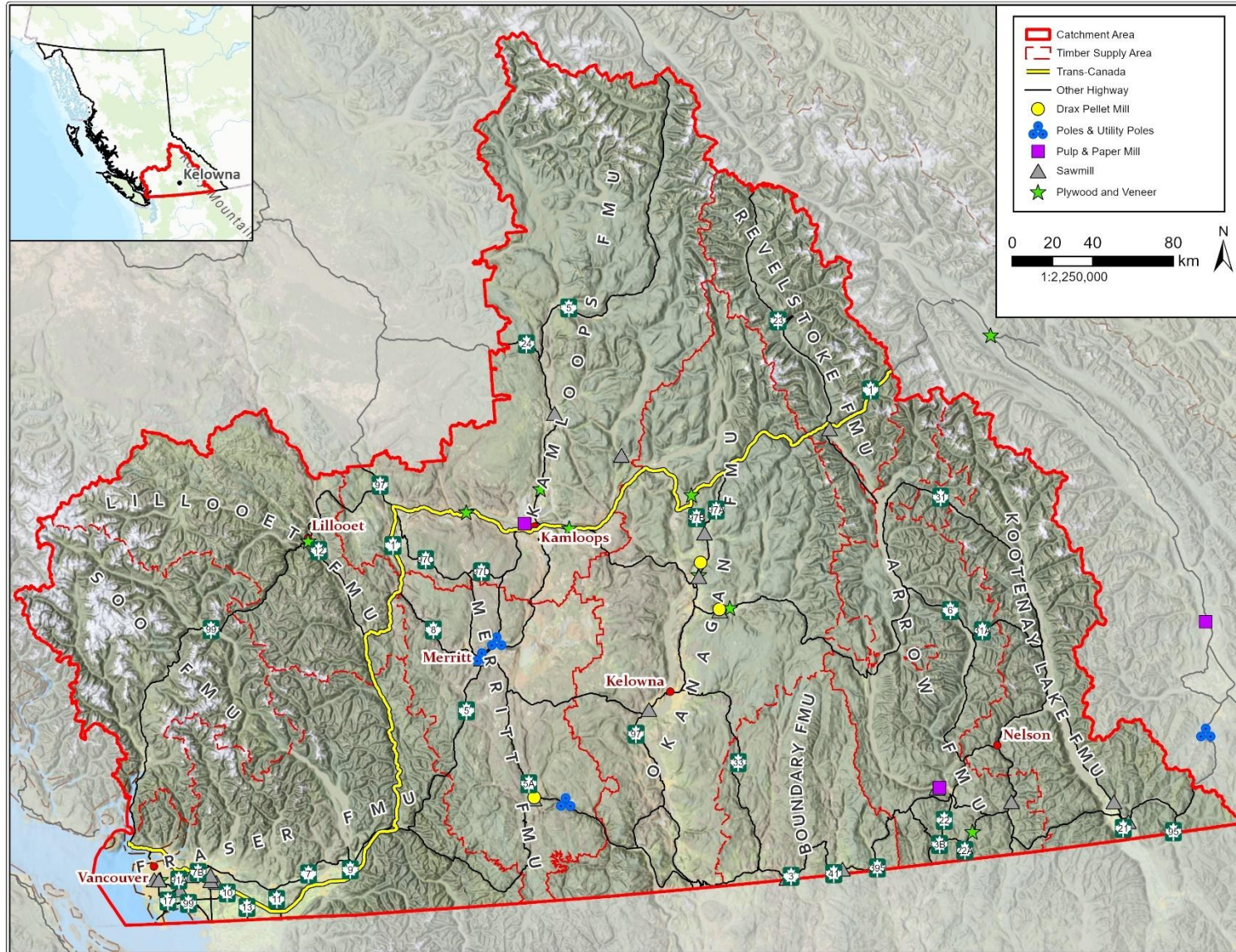


FIGURE 2. LOCATION OF MAJOR FOREST PRODUCTS MILLS IN THE CA.

Large Lumber Mills		Capacity (million board feet)
1 Aspen Planers Ltd	Merritt	192
2 Canadian Forest Products Ltd.	Wynndel	67 (N of Creston)
3 Delta Cedar Sawmill LP	Delta	52
4 Gilbert Smith Forest Product Ltd.	Barriere	71 (N of Kamloops)
5 Goldwood Industries Ltd.	Richmond	58
6 Gorman Brothers	Revelstoke	117
7 Gorman Bros (Downie Lumber)	Westbank	127 (Okanagan)
8 Halo Sawmill Mfg LP	Pitt Meadows	58
9 Interfor	Grand Forks	163 (just N of US border)
10 Interfor	Adams Lake	343 (NE of Kamloops)
11 Interfor	Castlegar	203 (N of Trail)
12 J. H. Huscroft Ltd.	Erickson	46 (just beyond Creston)
13 Kalesnikoff Lumber Co. Ltd.	Castlegar	85
14 Ledcor Forest Products Partnership	Chilliwack	71
15 North Enderby Timber Ltd. Salmon Arm)	Enderby	61 (E of Kamloops, S
16 Porcupine Wood Products Ltd.	Salmo	53 (E of Trail)
17 Riverside Forest Products	Surrey	69
18 S & R Sawmills Ltd.	Surrey	223
19 Teal-Jones Group (J.S. Jones)	Surrey	269
20 Teal-Jones Group (Stag Timber Ltd.)	Surrey	79
21 Terminal Forest Products Ltd.	Vancouver	52
22 Terminal Forest Products Ltd.	Richmond	245
23 Tolko Industries Ltd.	Lavington	245
24 Tolko Industries Ltd.	Armstrong	206

25 Vaagen Fibre Canada	Midway	144
26 Weyerhaeuser Company Ltd.	Princeton	245

Small Lumber Mills

Only the mills with capacity between 5 and 40 million board feet are listed below.

27 Andersen Pacific Forest Products Ltd	Ruskin	28.3
28 Galloway Lumber Co. Ltd.	Galloway	26.3
29 Woodco Industries Ltd	Barriere	21.6
30 Hyde Sawmill Ltd.	Sicamous	20.3
31 Schapol Logging Ltd.	Enderby	19.2
32 Gold Island Forest Products Ltd.	Slocan	16.8
33. Lakeside Timber (2007) Ltd.	Enderby	14.4
34 Joe Kozek Sawmills Ltd.	Revelstoke	9.6
35 Shannon Lumber Ltd.	Chilliwack	8.6
36 McDonald Ranch & Lumber Ltd.	Grasmere	6.7

Pulp and Paper Mills **Capacity (M tonnes)**

1 Domtar Group	Skookumchuk	255
2 Kruger Products LP	Kamloops	383
3 Mercer Celgar Limited Partnership	Castlegar	477
4 Kruger Products LP	New Westminster	63

OSB, Paperboard and Panel Mills **Capacity (M sq ft – 3/8 inch)**

1 Richmond Plywood Corporation	Richmond	169	Plywood
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2 CIPA Lumber Co. Ltd.	Annacis Island	216	Veneer
3 Tolko Industries Ltd.	Heffley Creek	169	Plywood
4 Louisiana Pacific Canada Ltd.	Golden	116	Plywood
5 Aspen Planers Ltd.	Savona	121	Plywood
6 Thompson River Veneer Products Ltd.	Kamloops	108	Plywood
7 Tolko Industries Ltd.	Armstrong	267	Plywood
8 Gorman Brothers	Canoe	137	Plywood
9 Atco Wood Products	Fruitvale	121	Veneer
10 Tolko Industries Ltd.	Armstrong	108	Veneer
11 Tolko Industries Ltd.	Heffley Creek	182	Veneer
12 Louisiana Pacific Canada Ltd.	Golden	138	Veneer
13 Tolko Industries Ltd.	Lumby	187	Veneer
14 Aspen Planers Ltd.	Lillooet	134	Veneer

Poles & Utility Poles	Capacity (M pieces)
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1 Aspen Planers Ltd.	Merritt	480
2 Nicola Post and Rail Ltd.	Merritt	720
3 Princeton Wood Preservers Ltd	Princeton	980
4 Panhandle Forest Products	Lumberton	360

TABLE 5. MILLS IN THE CA BY TYPE, LOCATION AND CAPACITY.

2.4 Overview of First Nations

The prevailing theory suggests that the ancestors of First Nations in Canada likely migrated from northeastern Asia across a land bridge known as Beringia, which connected Siberia and Alaska during the last Ice Age. This land bridge existed roughly between 30,000 and 10,000 years ago when lower sea levels exposed a broad swath of land across what is now

the Bering Strait. Archaeological evidence shows that people could have followed ice-free corridors or moved along coastal routes, arriving in North America in waves over thousands of years.

The prehistory of First Nations in British Columbia spans thousands of years, with archaeological evidence revealing deep-rooted and sophisticated cultures long before European contact. Indigenous peoples in BC have inhabited the region for over 10,000 years, as shown by findings from ancient settlements, tools, and artifacts. This period can be divided into four cultural periods, distinguished by technological, environmental, and social adaptations.

Paleo-Indian Period (c. 11,000–8,000 BCE): The earliest evidence of human activity, dating back to the end of the last Ice Age, shows hunter-gatherer groups using stone tools to hunt large megafauna like mammoths and bison. As glaciers receded, the population began spreading across BC and into the Interior, adapting to new environmental conditions.

Archaic Period (c. 8,000–5,000 BCE): The warming climate transformed the land, creating extensive forests and coastlines. Indigenous groups in BC began to diversify, with interior peoples focusing on hunting, fishing, and foraging in the mountains and plateaus, while coastal communities developed marine-oriented lifestyles. Archaeological evidence shows advancements in tools and fishing technologies, indicating adaptation to local resources.

Pacific Period (c. 5,000–1,500 BCE): This period saw a significant cultural shift as coastal peoples, including the ancestors of today's Coast Salish, Haida, and Nuuchah-nulth Nations, developed complex societies along the Pacific coastline. They began constructing large plank houses and expanding trade networks, as evidenced by materials like obsidian and shell ornaments found far from their origins. The inland Plateau cultures focused on salmon fishing along rivers like the Fraser and Columbia, developing semi-permanent settlements.

Late Period (c. 1,500 BCE–Contact): Societies grew more complex, especially along the coast. Distinct social hierarchies emerged, with wealth tied to resources like salmon, cedar, and shellfish. Art and cultural expressions flourished, including totem poles, carvings, and potlatch ceremonies, essential for social structure. The Salish, Gitksan, Nlaka'pamux, and many other nations had established distinct territories and trade networks by this time, with diverse languages, governance, and spiritual beliefs.

For thousands of years, the CA has supported a diverse society of First Nations. The productive valley bottoms provided for settlement and agriculture, rivers and lakes also

provided food as well as transportation, and the climate was relatively favourable. In particular, the Fraser River Valley was home to many Indigenous groups, including the Stó ō, Nlaka'pamux, Secwépemc, and Dakelh (Carrier) peoples. These groups developed intricate societies with deep connections to the river and its resources, relying on salmon fishing, hunting, and gathering as key components of their livelihoods. The Okanagan Valley and other valleys in the region also supported large and complex communities.

Today there are just over 200 First Nations throughout BC and there are many First Nations within the CA. Many have traditional territory that overlaps two or more TSAs or that is partially within the CA and partially outside of it. As a result, many First Nations can have an interest in an individual TSA. For example, the TSR documents report that 26 First Nations have traditional territory that overlaps with the Kamloops TSA and 28 First Nations have territories and areas of responsibility within the Okanagan TSA. Within the Fraser TSA, 34 First Nations bands and three nations/tribal councils have made territorial assertions and an additional 28 First Nations and six nations/tribal councils who are located outside the TSA have traditional territory that extends into the TSA.

A more detailed description of First Nations organizations and growing involvement in the forest sector is provided in Section 5.

2.5 Development of the CA Region

The first documented European contact with what is now British Columbia occurred in 1774 when the Spanish explorer Juan Pérez sailed along the northwest coast on the ship *Santiago* but did not make landfall. In the following year, Bruno de Heceta led another Spanish expedition and claimed the coast for Spain, but his crew's stay was brief, and they didn't establish a permanent presence.

In 1778, the British Captain James Cook reached the west coast of Vancouver Island at Nootka Sound, marking the first well-documented European landing in the region. Cook's arrival led to increased European interest. Later, in 1792, George Vancouver explored and mapped the coastal waters extensively, further establishing British claims. Meanwhile, expeditions launched by the fur trading companies progressed further westward across Canada. In 1793, Alexander Mackenzie, an explorer with the North West Company, became the first European to cross the continent overland, but he didn't follow the Fraser River to the coast. The first significant exploration of the Fraser River was conducted by Simon Fraser in 1808, who traveled down the river, confirming its potential as a route for trade.

The fur traders soon followed. Both the North West Company and the Hudson's Bay Company (HBC) established trading posts in the region. Fort Langley, established in 1827 by the HBC, became a key trading post on the lower Fraser River, facilitating trade between European settlers and local Indigenous groups. Fort Langley also undertook farming and fishing, helping to establish a colonial economy in the region. Kamloops also became a prominent hub for European trade and settlement; the Hudson's Bay Company established Fort Kamloops in 1812, which served as a key trading post in that region. The first European settlers began arriving in the Kamloops area in the mid-19th century, drawn to the fertile land in the valley bottoms.

The next big influxes of Europeans were drawn by gold. The Fraser River Gold Rush of 1858 was a transformative event as news of gold deposits in the Fraser River attracted over 30,000 miners, mostly from the United States, marking a massive influx of settlers and prospectors into British Columbia. This rush is often considered the catalyst for British Columbia's formal establishment as a British colony, as the British government sought to assert control over the area to manage the sudden arrival of foreigners. The influx of miners also caused significant tension between European settlers and Indigenous peoples, as the newcomers disrupted traditional land use and fishing grounds along the river.

Many of the prospectors traveled through Burrard Inlet, the body of water where modern Vancouver is located. This became a strategic and popular stopping point and by the early 1860s, small settlements began forming along the inlet, catering to the influx of people and trade. Timber was abundant, and logging became the region's first major industry. The first sawmill, Hastings Mill, opened in 1865 on Burrard Inlet, serving as an anchor for early settlement.

A few years later, in 1860, gold was discovered in the Cariboo region, sparking another gold rush. Kamloops, by then an established town, was an important stop for miners traveling north to the goldfields in the Cariboo region. The arrival of the Canadian Pacific Railway (CPR) in the 1880s was a pivotal event in Kamloops' growth, as it connected the area to larger markets, facilitating trade and migration. This was a period of rapid agricultural development, with ranching and farming becoming mainstays of the regional economy.

The decision to make Vancouver the western terminus of the CPR in the 1880s was a pivotal moment in the city's history. The CPR, completed in 1887, connected Vancouver to the rest of Canada, facilitating trade, migration, and economic growth. This transformed Vancouver from a small settlement into a bustling port city, as the railway made it a major shipping and transport hub.

Kelowna's development was slower than that of Vancouver and Kamloops in the early days, but it eventually gained momentum as farming and the fruit industry developed. By the late 19th and early 20th centuries, Kelowna had become one of British Columbia's prime agricultural regions, especially for fruit growing. Its development was assisted with the construction of a steamboat service on Okanagan Lake in the late 19th century, and then again with the introduction of rail service in the early 20th century, linking the Okanagan Valley to broader markets.

BC's abundant resources were key to its development, with furs, fish, gold and timber being exploited early in the province's development, as well as that of the CA. BC's forest industry was initially concentrated on the Coast, where the large old forests provided prime timber. However, by the late 19th and early 20th centuries, the forest industry grew in importance along the Fraser River Valley. The river itself was used to transport logs downstream to mills in cities like New Westminster and Vancouver, which developed into major industrial centres. However, a variety of forest products mills have been established throughout the CA, which supports numerous sawmills and a good number of veneer, plywood and OSB mills (Table 5le 5 for a detailed listing). However, there is no major cluster of forest products facilities within the CA. Of the 26 major sawmills listed in 2022 by the BC government within the CA (none of which appear to have closed in the meantime), eight are located within the Greater Vancouver Area. Castlegar probably comes closest to qualifying as supporting a cluster of forest products facilities, with 2 large sawmills and the largest pulp mill in the CA. The other three pulp mills are located in Skookumchuk, Kamloops and New Westminster.

Fishing, particularly the salmon industry, also played a major role in the development of the Fraser River Valley's economy. The river became the center of a large commercial fishery, with salmon canneries springing up along its banks. The Fraser River continues to be one of the most important salmon-producing rivers in the world, though industrial pollution, overfishing, and habitat destruction have caused significant ecological challenges

As mining diversified, agriculture flourished and the rivers were dammed to provide power, the CA's economy continues to be underpinned by resource extraction and agriculture. Recreation and tourism and the provision of government services in the regional centres, including health and education, have led to some diversification of the region's economy.

⁸ The BC government considers large sawmills to have the capacity to produce at least 40 million board feet annually.

2.6 Climate

The CA has a varied climate and topography, giving it a wide range of local climate conditions. However, BC's ecosystem classification system identifies eleven ecoprovinces, which are regions with consistent climatic processes, relief and regional landforms (Demarchi 2011). Parts of the CA lie within three ecoprovinces, meaning that there are three climate regions within the CA. The Coast and Mountain ecoprovince extends down the entire coast of BC, stretching from the Pacific to the peak elevations of the Coast range. This ecoprovince takes in the parts of the Soa and Fraser TSAs that are on the west-facing slopes of the Coast Mountains. The climate is strongly influenced by the Pacific Ocean, which moderates the temperature and produces high levels of rainfall, especially during the fall and winter months. Temperature varies with elevation – lower elevations receive little of the precipitation as snow, but the proportion of snowfall rises as the elevation increases. These climatic conditions create very productive growing conditions.

The mid-section of the CA, corresponding to the southern Interior of BC, constitutes the second ecoprovince, which is entirely contained within the CA. The Southern Interior Ecoprovince lies in the rain shadow of the Coast and Cascade mountains so that it contains some of the warmest and driest areas of the province. Air moving into the area has already lost most of its moisture on the west-facing slopes of the Coast Mountains, meaning there is little cloud cover or precipitation. This ecoprovince has some of the hottest temperatures and highest amounts of sunshine in Canada. In winter and early spring, cold, dense Arctic air sometimes flows into the region, as there is no effective barrier to the southward flow of Arctic air once it enters the interior plateaus of BC. This cold air can get trapped in the large basins once the eastward flow of moist air resumes, causing the valleys to be much cloudier than the uplands. When the cold air fills a valley and is subsequently capped with warmer more moist air, deep inversions and prolonged periods of cold weather at middle and low altitudes result.

Lillooet exemplifies the extremes of the southern Interior. Lillooet is one of the hottest and driest places in BC. Summers in Lillooet are hot and dry, with daytime highs commonly reaching 30–35°C and occasionally exceeding 40°C, making it one of the hottest places in Canada. Rainfall is minimal, and the area experiences low humidity. Winters in Lillooet are relatively mild compared to much of Canada, with average temperatures ranging from -3 to 5°C. Snowfall is light in the valleys, with nearby mountains receiving much more snow. Annually, Lillooet receives less than 300 mm (12 inches) of precipitation, with most falling in the winter months. The area receives over 2,000 hours of sunshine per year. Merritt has a very similar climate.

Kamloops and Kelowna are also known for their dry, mild climate, and both communities typically receive more than 2,000 hours of sunshine per year. Summers are hot and dry and winters are mild. Snow rarely stays long in these communities but much more snow falls at higher elevations and remains there all winter. Kamloops receives approximately 280–300 mm of precipitation annually, and Kelowna receives slightly more (typically 380 – 400 mm).

Lastly, the eastern section of the CA extends into the Southern Interior Mountains ecoprovince. Here, the elevation begins to rise and the ranges of the Columbia Mountains create a much wetter and cooler climate, leading to abundant snowfall. This area is sometimes known as BC’s Interior rainforest.

As an example within this ecoprovince, Nelson has a humid continental climate with significant precipitation and relatively mild winters. Summers are generally warm and dry, with daytime highs between 25–30°C in July and August. While temperatures can occasionally rise above 30°C, it’s less common than in the drier interior. Winters are moderately cold, with average temperatures ranging from -5 to 2°C. Nelson receives between 1,000 and 1,300 mm of precipitation annually, with much of it as snowfall as Nelson lies within the snow belt of the Selkirk Mountains.

Climate change has rendered the historical average temperatures obsolete. In 2024, it is expected that the global average temperature will have exceeded the pre-industrial level by at least 1.5°C, exceeding the primary “target” set in the Paris Climate Agreement.⁹ The summer of 2021 was extraordinarily hot in BC, with record high temperatures being set throughout the province. This was especially so during the week of June 25 – July 1, when a “heat dome” set up and remained in place for the week. On June 29, Kelowna set a record high temperature of 44.6°C, exceeding the previous record set in 1998 by almost four degrees. In 2021 BC also experienced its worst recorded forest fire year, triggered by a combination of high heat, wind, and drought. While not every year will be like 2021, it is clear that the historical climate averages will not apply in the future years.

3 Overview of the Forest

The CA is more extensive in the east-west direction than it is along the north-south gradient, even though the Kamloops TSA extends considerably north from the Canada-US boundary. The primary variation within the CA occurs as one moves along its east-west axis, due to the series of mountain ranges that run generally north-south. On the western-

⁹ https://www.carbonbrief.org/state-of-the-climate-2024-will-be-first-year-above-1-5c-of-global-warming/?utm_source=substack&utm_medium=email

facing slopes, rainfall is more plentiful, and the west side of the Coast mountains is part of the temperate rainforest. This is where the massive and iconic Douglas-fir, Sitka spruce and western red cedar flourish; the Fraser and Soo TSAs have most of the coastal forest type area within the CA.

The eastern TSAs in the CA lie within the Columbia Mountains, which are sub-divided into four subranges; from west to east, they are the Monashees, Selkirks, Purcells, and Cariboos. The Kootenay Lake TSA is in the Selkirk and Purcell ranges, the Arrow TSA is within the Selkirk range, and the Revelstoke TSA lies between the Monashee and Selkirk ranges – the town is close to where the Columbia River cuts through the Selkirks. The Boundary TSA lies primarily between the Monashees and the Christina range, which is part of the Selkirks. All four of these easternmost TSAs have a substantial area on the west-facing slopes that are very wet and productive, supporting extensive stands dominated by cedar and hemlock. These forest areas are part of what is known as the Interior Wet Belt, one of only two inland temperate rainforests in the world. Okanagan and Kamloops TSAs also have some areas of this productive forest type. In contrast, the east-facing slopes are within the “rain shadows” of the mountain ranges – the climate is dry, and the forest types are very different, dominated by pine and spruce. In fact, much of the Merritt, Okanagan and Kamloops TSAs is in the rain shadow of the Coast Mountains.

At smaller scales, elevation, aspect, steepness and past disturbances all affect the forest cover so that there is a substantial amount of localized variation. Elevation and aspect are key differentiators. In the valley bottoms of the Interior, Bunchgrass and Ponderosa Pine are the main ecosystems. As one gains elevation, lodgepole pine and the interior Douglas-fir become the main species. At still higher elevations, spruce and fir are the primary species, with treeless alpine meadows and tundra at the highest elevations. Drier and sparser ponderosa pine and Douglas-fir are predominant on the drier east-facing slopes, spruce and fir prefer the west-facing slopes.

The 2023 provincial forest inventory is used to further describe and quantify the forests in the catchment area. Since the Catchment Area is very large, the imagery used in the provincial inventory has originated from a variety of assessments and projects conducted over the years. Most of the imagery has been obtained during the past five years – regardless of when it was obtained, the inventory is updated annually to account for growth as well as depletions due to logging and natural disturbances, especially fire and losses caused by the mountain pine beetle epidemic.

British Columbia’s forest inventory does extend to Tree Farm Licences (TFLs) and to private land, however the TFL inventories are owned by the TFL-holding company. Although TFLs comprise 9.5% of the catchment area, the consultants omitted them from consideration in

this analysis due to the challenges in obtaining up-to-date forest inventories. Private land accounts for 7.4% of the catchment area. A substantial amount of the private land in the CA is in agriculture; the private land forest inventory is generally not updated regularly, and the consultants have also omitted this ownership class from the analysis. The exclusion of the TFLs and private land will not affect the results and conclusions of this analysis, as the TFLs are managed for timber much like the volume-based tenures and some of the private land is also managed for timber.

The forest inventory sub-divides the landbase by cover type, including water. Figure 3 shows the area of the catchment area by main cover type and Table 6 provides this information for each TSA. While there are some large lakes in the CA, the topography lends itself to rivers, with the result that only 4.2% of the CA is covered in water. The Arrow and Merritt TSAs have the lowest percentage of water cover, at less than 2%. In contrast, 10.4% of the Fraser TSA is covered by water – the Fraser River is very wide and runs through the entire TSA. There is 1.3 million ha of alpine land, representing 8.9% of the CFLB. As Table 6 **Error! Reference source not found.** shows, one-third of this area is in the Soo TSA – the Revelstoke and Lillooet TSAs also have relatively high proportions of Alpine area within their boundaries. At the other extreme, less than 1% of the Merritt and Okanagan TSAs is Alpine. A substantial part of the CA is covered with rock, snow and ice – this unvegetated land represents 2.8% of the CFLB – these are non-forested and unproductive lands. Almost half of this area is in the Fraser TSA.

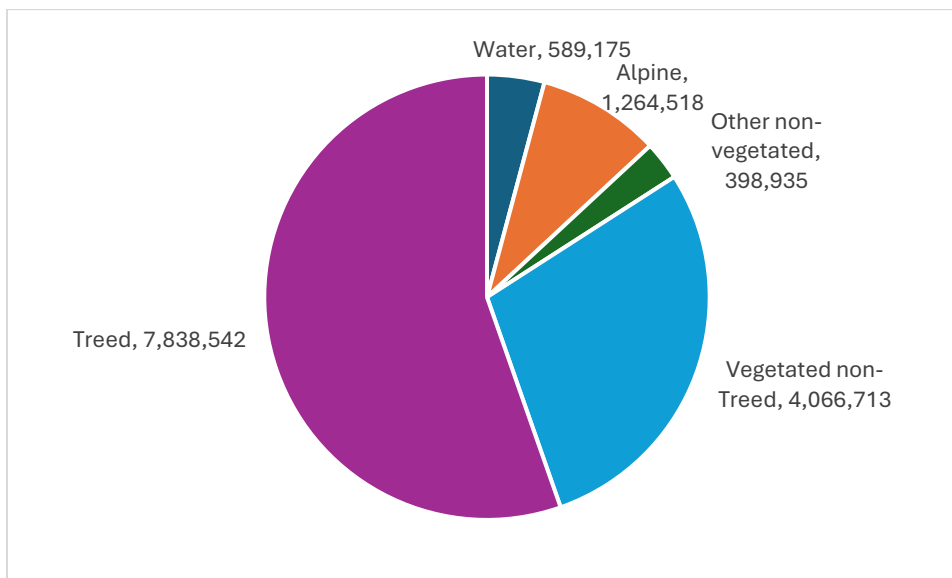


FIGURE 3. LAND COVER TYPES WITHIN THE CATCHMENT AREA (AREA FIGURES IN HA).

Approximately 28.7% of the land is vegetated but it is not considered forest (Vegetated Non-Treed in Table 6). Such areas include meadows and grasslands, wetlands, and dry savannah, which can have trees present, but they are too sparse to be considered forest. For example, the valley bottoms in the central part of the CA would fall into this cover class. More than 40% of the Arrow and Revelstoke TSA is in this cover class. The remaining 7.8 million ha is forested land, which includes protected areas and inoperable areas as well as land that is available for timber harvesting. The forested area represents 55.3% of the landbase. Merritt, with 72% of its area forested, is the most heavily forested TSA whereas the Revelstoke and Soo TSAs are least forested, with only about 1/3 of their area considered forest.

TSA	Not Typed	Water	Alpine	Oth Non- Veget'd	Vegetated Non-Treed	Treed	SUM
Arrow	2,914	61,029	45,893	47,649	540,730	587,411	1,285,626
Boundary	479	7,431	9,622	16,762	216,059	408,646	658,999
Fraser	2,072	170,911	66,756	156,024	417,979	835,004	1,648,746
Kamloops	727	95,569	234,705	26,040	739,954	1,672,478	2,769,473
Kootenay	31	58,549	143,368	19,956	270,919	748,080	1,240,903
Lillooet	13	21,730	197,065	18,742	256,344	631,129	1,125,023
Merritt	1	15,953	890	7,181	292,057	815,083	1,131,165
Okanagan	1,332	107,257	19,970	60,938	733,788	1,525,864	2,449,149
Revelstoke	202	22,839	107,647	25,964	339,179	262,613	758,444
Soo	769	27,907	438,602	19,679	259,704	352,233	1,098,894
TOTAL	8,540	589,175	1,264,518	398,935	4,066,713	7,838,541	14,166,422
Percent	0.06	4.16	8.93	2.82	27.81	55.33	100.00

TABLE 6. LAND COVER AREA IN ALL OWNERSHIPS WITHIN THE CATCHMENT AREA (HA).

In addition to mapping general categories of vegetation cover, the British Columbia forest inventory classifies area based on ecological characteristics. The biogeoclimatic (BEC)

classification system is a hierarchical system that uses climax vegetation communities to infer the combined ecological effects of climate and soil¹⁰. At the highest level, the regional level, the province is divided into 14 biogeoclimatic zones. These zones are large geographic areas with a relatively uniform climate. Zones are usually named after one, two or three of the dominant climax species. The names can also include another general distinguishing feature of the area such as geographic location (interior, coastal) or ecotone (subboreal, boreal, montane).¹¹

The catchment area is so large and varied that there is area in each of the 14 provincial BEC zones. Figure 4 shows the proportions of area in the BEC zones, some of the smaller of which have been combined so that the figure is more legible.

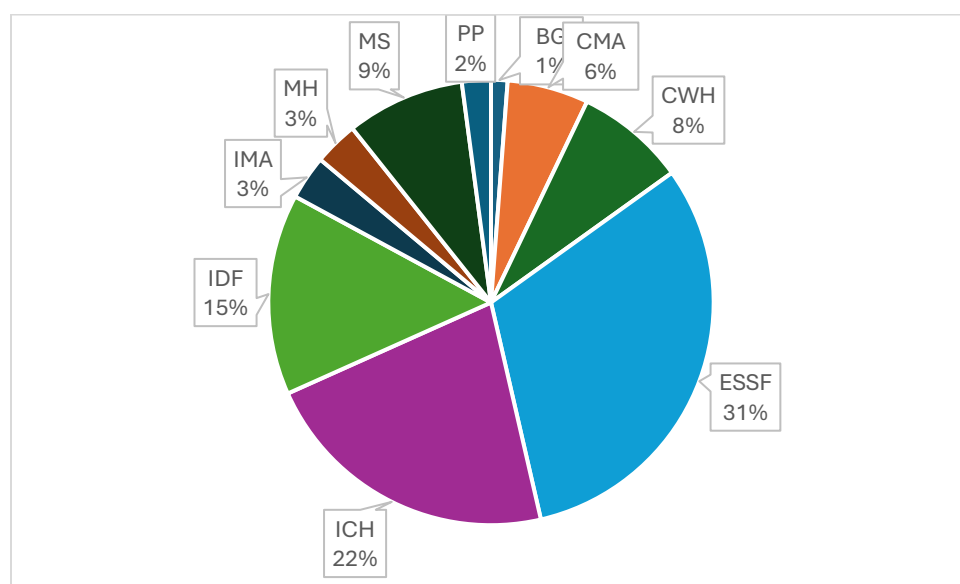


FIGURE 4. PROPORTION OF CATCHMENT AREA IN MAIN BEC ZONES.

Legend: BG = Bunchgrass, CMA = Coastal Mountain Heather Alpine; CWH = Coastal Western Hemlock; ESSF = Engelmann Spruce–Subalpine fir; ICH = Interior Cedar–Hemlock; IDF = Interior Douglas-fir; IMA = Interior Mountain Heather Alpine; MH = Mountain Hemlock; MS = Montane Spruce; PP = Ponderosa Pine.

The two largest zones are the ESSF (Engelmann Spruce–Subalpine fir – 31%) and Interior Cedar–Hemlock (ICH – 22%) zones. The small amount of area in the Coastal Douglas-fir zone (CDF) has been added to the CWH figure; these are both productive coastal forests. In addition, the SBPS (Sub-boreal Pine Spruce) and SBS (Sub-boreal Spruce) zones have

¹⁰ <https://cfcg.forestry.ubc.ca/resources/cataloguing-in-situ-genetic-resources/about-bec-and-bgc-units/>

¹¹ For more detailed information on the BEC system see the BC Ministry of Forest [BEC webpage](#) or Meidinger, D. and J. Pojar. 1991. Ecosystems of British Columbia. BC Ministry of Forests, Victoria, BC. 330 pp.

been added to the ESSF BEC zone since all three BEC zones have relatively harsh climates and are dominated by species more characteristic of more northern BC forests.

The ESSF forests tend to be located at the higher elevations on north and east-facing slopes, which are the cooler and drier sites. A substantial portion of this BEC type is inoperable as it is found on rugged, steep high ground.

The productive coastal BEC zones account for 8.0% of the CA and so, including the ICH, 30% of the CA is very productive forest land. Bunchgrass (BG) and Ponderosa Pine (PP) are characteristic of the southern interior valley bottoms and account for 3.3% of the CA area. Montane Spruce (MS) and Interior Douglas-fir (IDF) are characteristic of the lower and mid elevations in the Interior – both forests are found in relatively dry climates and these two BECs account for 23.2% of the area. These two zones, plus the BG and PP zones, make up roughly 25% of the CA area and represent the lower and mid-slopes of the interior valleys, for the most part.

A substantial portion of the catchment area (9.2%) is in the two alpine BEC zones, which have few if any trees present. Figure 5 shows the distribution of the BEC zones within the CA.

OKANAGAN CATCHMENT AREA ANALYSIS

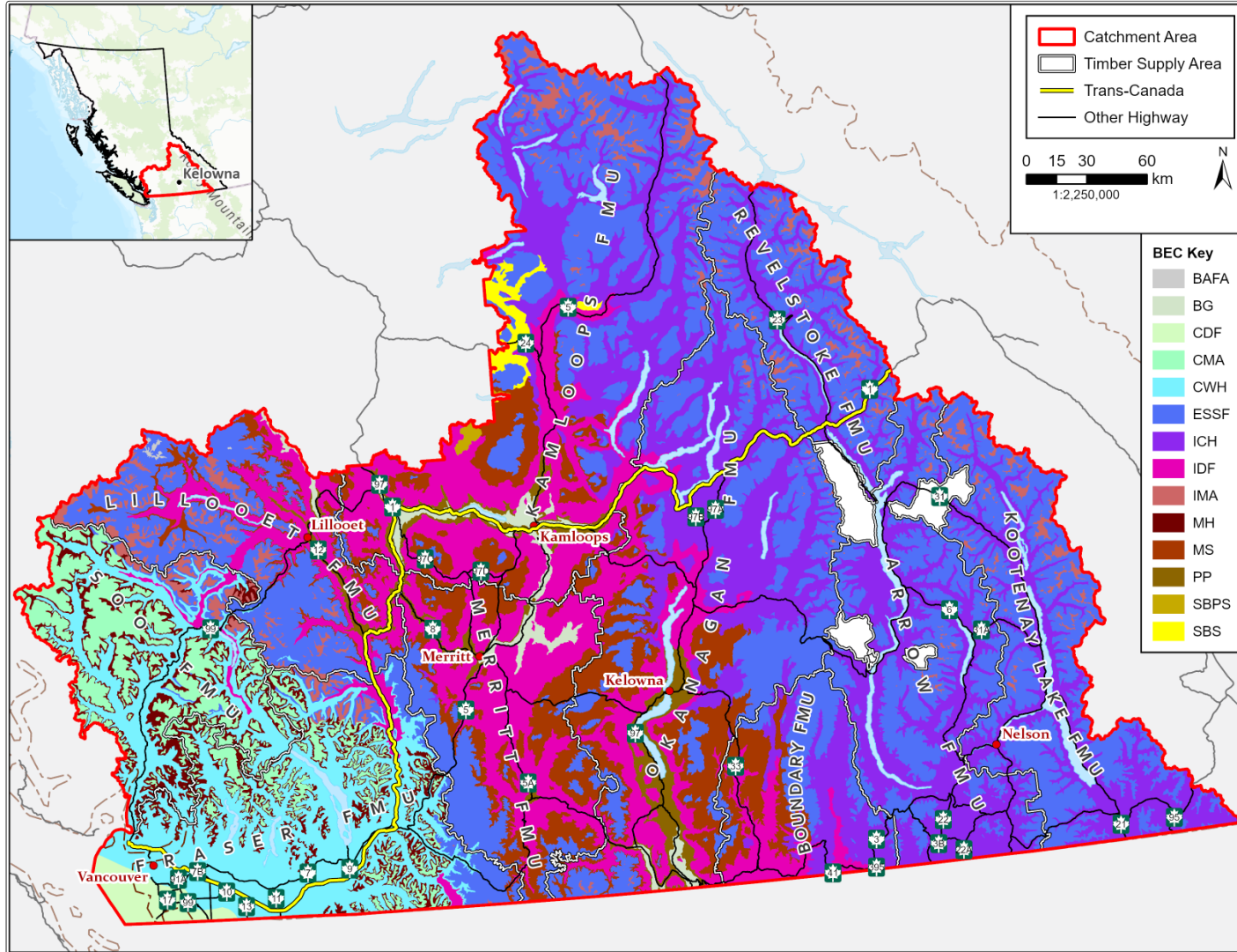


FIGURE 5. DISTRIBUTION OF THE BEC ZONES WITHIN THE CATCHMENT AREA.

The variation in climate and forest cover within the catchment area is evident from the distribution of BEC zone area among the ten TSAs, shown in Table 7. Usually all of the area in the three Coastal BEC zones can be found in the Fraser and Soho TSAs. Every TSA has some area in the Engelmann Spruce – Subalpine Fir (ESSF) BEC zone and all of the TSAs except Boundary have some area in the Interior Mountain Heather Alpine (IMA) zone (Merritt has a small area – 340 ha – which rounds down to zero thousand ha). Seven of the TSAs have area in the Interior Cedar-Hemlock (ICH) and Interior Douglas-fir (IDF) zones as well. In contrast, the CDF zone only appears in the Fraser TSA, the BAFA (Boreal Altai Fescue Alpine) zone (not shown) only appears in the Lillooet TSA, and the Sub-boreal Spruce (SBS) and Sub-boreal Pine Spruce (SBPS) BEC zones only appear in the Kamloops TSA).

	BG	CDF	CMA	CWH	ESSF	ICH	IDF	IMA	MH	MS	PP
Arrow					548	719		19			
Boundary					175	210	141			133	
Fraser		114	422	673	139		47	25	224	5	
Kamloops	86				883	658	630	106		252	75
Koot'ay					667	509		65			
Lillooet	14			2	547		285	111		120	40
Merritt	40			1	229	2	508	0		320	31
Okanag'n	24				689	753	427	16		391	149
Revelst.					443	256		60			
Soo			415	344	36		30	51	223		
SUM	165	114	836	1,021	4,356	3,107	2,068	453	447	1,222	295
%	1.7	1.2	8.6	10.5	0.0	31.9	21.2	4.7	4.6	12.6	3.0

TABLE 7. DISTRIBUTION OF BY AREA BY KEY BEC ZONE (THOUSAND HA)

Merritt is actually the most diverse TSA, with area from ten BEC zones – it has incidental amounts of area in the CMA, CWH, IMA and MH zones which do not all show up in Table 7. The Fraser, Kamloops and Lillooet TSAs have representation of eight BEC zones each, which also makes them quite diverse. In contrast, the Kootenay Lake and Revelstoke TSAs, which are both entirely within the Columbia Mountains, only have representation from three BEC zones.

The ICH zone has garnered a great deal of international attention from conservation organizations, as it is reputed to be one of only two interior rainforests in the world. The forest in this zone is very productive and many parts of the zone have little road access.

The CA takes in most of this interior rainforest zone, which is present in seven TSAs. The ICH accounts for 56% of the Arrow TSA forest area, more than 40% of the Kootenay Lake TSA and roughly a third in each of Boundary, Okanagan and Revelstoke TSAs.

As will be described in more detail below, the forests of the catchment area have been greatly affected by outbreaks of the Mountain Pine Beetle (MPB), an endemic pest that occasionally experiences population explosions that lead to severe outbreaks.

In 1999, an outbreak of mountain pine beetle (MPB) arose that spread rapidly throughout much of the interior of BC, causing extensive mortality of lodgepole pine, the principal host species of the MPB. The forests of the catchment area were affected, as overall, 27.4% of the timber volume in the Timber Harvesting Landbase (THLB) of the CA was pine. Most of the loss of pine occurred between 2005 and 2010 – however minor losses have continued. The volume of live pine in 1999 was almost 240 million m³ - by 2024, almost 30% or 72 million m³ of the pine that was present in 1999 has been killed.

The two TSAs in the Coastal Region – Fraser and Soo – had negligible amounts of pine to begin with in 1999 and so the actual volume lost was less than 1 % of the total 1999 growing stock of all species. In the west, the Revelstoke TSA also had very little pine and lost very little of that.

At the other extreme, half of the 1999 growing stock in the Merritt TSA was pine and 27% was lost by 2024. In the Kamloops TSA, 28% of the 1999 growing stock was pine but 49% was lost by 2024, representing the largest proportional loss of pine within the CA. Besides Revelstoke, the Boundary and Okanagan TSAs lost less than 20% of their pine while Merritt, Lillooet and Fraser TSAs lost 27-28% of their pine. In the Arrow TSA, 38% of the pine present in 1999 was killed by 2024.

The variability of the presence of pine and the severity of the infestation led to extensive salvage harvesting in much of the central CA, while the coast and western sections were largely unaffected.

3.1 Deforestation

Deforestation data were unavailable specifically for the catchment area and the consultants were not able to calculate reliable deforestation rates from the forest inventory. Deforestation involves a change in land use, such as the clearing of forest for agriculture. Harvesting timber with the intention to re-grow the forest is not deforestation, and neither are losses of forest cover due to wildfire, as long as the forest is expected to

grow back. One of the challenges of using the forest inventory to estimate deforestation is that in the inventory itself, marginally treed land can move in and out of being considered forest as the inventory is updated, depending on the choices made by the imagery evaluator and/or the algorithm. The second challenge is to be able to know the intent of the person cutting down the forest – whether they plan to renew it may not become evident from the imagery for a number of years.

Natural Resources Canada has a task team that tracks deforestation; however, the information is presented publicly by ecozone instead of by province. There is a high degree of sensitivity around the number. Natural Resources Canada does report on deforestation at the national level.¹² In 2020, Canada experienced a total deforestation of 49,352 ha, with the primary causes being:

- **Agriculture:** 22,378 hectares (45%)
- **Mining, oil, and gas:** 15,144 hectares (31%)
- **Built-up areas:** 9,637 hectares (20%)
- **Hydroelectric development:** 1,101 hectares (2%)
- **Forestry:** 1,092 hectares (2%)

The deforestation caused by forestry was primarily due to the construction of main forest roads (as opposed to operational or in-block roads, which are not considered deforestation since they are usually regenerated).

With the exception of the coastal part of the CA, which is in the Pacific Maritime ecozone, all of the catchment area is in the Montane Cordillera ecozone. Natural Resources Canada reports that the Montane Cordillera ecozone has 31,128,000 ha of forest, 580,000 ha of wooded land and 481,000 ha of “Other land with tree cover”. The area of Crown Forest Land in the catchment area is roughly 12.7 million ha, which is equivalent to 41% of the forested area in the Cordillera ecozone.

The Canadian Forest Service reports that between 2001 and 2020, the area of forest in the ecozone declined by a total of 63,560 ha, which is a 0.20% reduction of the forest area.

In their analysis, most deforestation in the ecozone during this period occurred because of conversion to agriculture (24%) and mining (31%); urban expansion (20%) was also an important contributing factor. The ownerships on which the deforestation occurred were not specified, however most of the conversion to agriculture and urban expansion would have occurred on private land. Forestry was also a meaningful contributor to deforestation (15%), primarily through the construction of forest roads. The consultants estimate that

¹² <https://cfs.nrcan.gc.ca/statsprofile/>

forest roads led to the loss of 467 ha of forest per year in the ecozone (0.00033% of the forest area in the ecozone). Moreover, the rate of deforestation from all sources, especially forestry, has been declining from 2001 to 2020. Because the catchment area is about half the size of the ecozone (which extends north through the Interior, north of Prince George), deforestation due to forest roads in the CA is estimated at between 200 and 250 ha/year.

This is similar to data reported by Statistics Canada,¹³ which reported that between 1990 and 2015, 87,100 ha of forest were converted to other uses. This is equivalent to an annual rate of loss of 3,484 ha. Agriculture (29%) and conversion to built up areas (24%) were the biggest drivers of forest loss; mining was responsible for 18% of the loss. In this report, forest road construction accounted for 21% of deforestation, or an average of 732 ha/year. Forestry did cause higher rates of deforestation in the 1990s, which explains why StatsCan reported a higher level of deforestation than NRCan.

The BC government's forest management requirements require that forest companies regenerate all of the area of public land that they harvest. Forest roads built to access harvest blocks and move around within the blocks are not considered deforestation under international and national definitions; in any case, many are regenerated as they have no purpose once the harvest has been completed. Primary forest roads, which are intended to be permanent and are used by a wide range of others to access the forest, are considered as deforestation however Drax' fibre procurement does not factor into decisions to build these roads.

Drax has a corporate policy not to source fibre from lands that are being deforested, whether it be private land being cleared for agriculture or public land being cleared to build infrastructure. Accordingly, Drax has taken steps to provide assurance that its pellet feedstock does not contain wood sourced from land clearing that is deforestation.

The European Union's Deforestation Regulation (EUDR) is intended to keep products that have contributed to deforestation out of the EU common market. Wood products, which are among those covered by the EUDR, can only enter the EU if they are:

- Deforestation free;
- Produced in compliance with the regulations of the source country; and
- Accompanied by a due diligence statement that indicates no more than a negligible risk of non-compliance.

The EUDR also requires that the timber harvest practices used do not degrade the forest. In general, British Columbia's management of public forests precludes practices that

¹³ <https://www150.statcan.gc.ca/n1/pub/16-201-x/2018001/sec-2-eng.htm>

would lead to forest degradation; the Regional Risk Assessment for British Columbia¹⁴, conducted on behalf of the Sustainable Biomass Program, found that 36 of the 38 indicators assessed were considered “Low Risk” on public land. However, the definitions of some key terms of the EUDR have yet to be resolved, generating extensive debate worldwide.

¹⁴ Sustainable Biomass Program. 2021, SBP-Endorsed Regional Risk Assessment for the Province of British Columbia, Canada. Version 1.0.

4 Overview of Relevant BC Legislation

4.1 Summary of BC Forest Legislation

This section summarizes provincial forestry legislation, which was described in detail in the Williams Lake Catchment Area Analysis report. The Williams Lake CAA was finalized in late 2023, however the description of provincial legislation was current to summer 2022. After a summary of the main pieces of legislation, updates to legislation since 2022 are described in Section 5.2.

In B.C., the core pieces of forestry legislation are the Forest Act and the Forest and Range Practices Act (FRPA). The Forest Act organizes forest management on Crown land by establishing guidelines for tenure, planning, timber measurement, and setting stumpage rates. The province is divided into 37 Timber Supply Areas (TSAs), each managed through various licence type, including licences that grant area-based tenure, such as Tree Farm Licences, Community Forest Licences, Woodlot Licences, and First Nations Woodland Licences, as well as licences that grant tenure on the basis of timber volume. The Forest Act also sets out the process that the Chief Forester must use to determine the Annual Allowable Cut for each TSA and major licence type. The FRPA and its regulations are crucial in scoping appropriate forestry practices, ensuring that Forest Stewardship Plans incorporate the protection of environmental and social values such as biodiversity, water resources, and cultural heritage.

In recent years, there has been significant pressure to revise forest management policies in British Columbia to place a higher priority on maintaining ecological values and reconciling with First Nations. This shift has led to legislative amendments aimed at introducing forest landscape planning, with First Nations playing a significant role in the decision-making process. The Forest and Range Practices Amendment Act 2019 and the Forest Statutes Amendment Act 2021 (Bill 23) have been instrumental in bringing about these changes, providing new frameworks for forest and wildfire management, improving transparency, and better aligning forest practices with Indigenous rights.

British Columbia's forests are noted for their rich biodiversity, with numerous species and ecosystems of provincial and global conservation concern. The federal Species at Risk Act (SARA) and the provincial Wildlife Act provide legal protections for species at risk, mandating the development of recovery plans and conservation strategies. These efforts underscore the importance of preserving biodiversity within the province.

Old growth forests, which are ecologically and culturally significant, as well as being a valuable source of timber, have become a focal point for conservation efforts. The

government has initiated measures to overhaul old growth management, including deferring harvesting in priority old growth areas and protecting exceptionally large trees. Studies have shown varying estimates of old growth coverage, highlighting the need for accurate data and ongoing stakeholder engagement to develop long-term management strategies. The status of the old growth management issue is described in Section 5.3.

4.2 Updates to Forest Legislation and Policy since 2022

The provincial government has continued to amend the key pieces of forest legislation since the Williams Lake CAA was prepared. In 2019 and 2021, the provincial government made a number of amendments to forest legislation, especially the Forest and Range Practices Act. These amendments were described in the Williams Lake CAA. Since then, there have been further amendments to legislation, including not only to forest laws but also the Wildlife Act, the Wildfire Act, and others. The recent amendments to forest-based legislation are described in this section; others that are relevant to forests but which are centred more broadly on biodiversity and wildlife were covered in Section 5.4.

The government has continued to amend existing legislation. On November 30, 2023, the Forest Statutes Amendment Act (Bill 41-2023) received royal assent. This bill made further amendments to the Forest Act, the Forest and Range Practices Act and the Wildfire Act and the government reports that the amendments were arrived at with extensive consultation with First Nations, communities, stakeholders and industry, and professional associations. Many of the changes to the Forest Act involve giving the Ministry of Forests more tools and options for compliance and enforcement. The amendments provide the government with specific criteria describing when the government may refuse to issue cutting permits and road permits. In many cases, a forest licence holder is required to make a map of planned operations publicly available – failure to do so may result in the withholding of the cutting or road permit.

Some amendments under Bill 41 require forest planners to engage with Indigenous communities. This includes formalizing Indigenous participation in land-use decisions, allowing for input into how forests are managed, and ensuring alignment with Indigenous rights and title.

Amendments to the *Government Actions Regulation* (GAR)¹⁵ introduce a new category of protections for specific ecological communities that are at risk. The new protected habitat category is known as Ecological Communities, which is designed to provide protection to rare habitats that support unique plants and species at risk, such as antelope-brush or

¹⁵ One of the regulations under the Forest and Range Practices Act.

needle-and-thread grass ecosystems, which only occur in the most southern portion of the Okanagan Valley.

The changes to the Wildfire Act were intended to facilitate the implementation of prescribed or cultural burning practices by Indigenous people. This was done by giving prescribed fire legal standing within the range of allowable forest practices in BC.

4.3 Update on status of old growth deferral areas

As described in the Williams Lake CAA, the BC government commissioned a two-person panel to review the state of old growth management in BC in July 2019. Nine months later, the panel submitted its report to the government, titled “*A New Future for Old Forests*”. The report identified a number of weaknesses in how old growth was managed and conserved in BC and tabled 14 recommendations. One of these recommendations was that the government immediately defer harvesting “in old forests that were at very high and near-term risk of irreversible biodiversity loss”.

In 2021, a Technical Advisory Panel (TAP) was formed to recommend priority areas for deferrals. The September 2021 report from TAP identified 2.6 million ha of old growth for deferral. The response to the report was mixed, and due to TAP’s use of outdated information, some of the areas identified had already been harvested and others had cutting permits issued for them.

Based on the TAP review and discussions with First Nations and stakeholders such as industry, the province began to select old growth areas to be deferred from harvesting and to designate “exceptionally large trees” for protection. As of May 2024, 2.44 million ha of old growth have been deferred from harvesting (including 1.23 million ha identified by the TAP).

The longer-term status of the deferred area is unlikely to be resolved any time soon. The government, First Nations and stakeholders are now in the process of deciding how to treat the deferred areas in a long-term stewardship context. The development of Forest Landscape Plans and a Modernized Land Use Planning Framework are seen as the key elements of deciding how to manage and protect old growth over the long-term.

There has also been progress in identifying funding sources for the work needed to complete the identification of priority old forest and determine how to protect it. The federal government has committed \$50 million from the Tripartite Framework Agreement on Nature Conservation. In addition, a new province-wide Conservation Financing Mechanism has been launched with a contribution by the Province of \$150 million and a matching commitment to secure \$150 million from the BC Parks Foundation. This

mechanism will fund new conservation measures to help the Province reach its goal to protect 30% of the land and water by 2030, and which will undoubtedly include a substantial area of old growth.

4.4 Updates to Biodiversity Legislation

In addition to the forestry-based legislative changes that will enhance sustainability and better protect biodiversity, there have also been amendments to acts that are more directly related to biodiversity.

However, perhaps the most important move by the government was to create a new department, the Ministry of Water, Land and Resource Stewardship (MWLRS) in April 2022. This new Ministry was given jurisdiction over the following legislative acts (in some cases only sections of the acts) that were previously the responsibility of the Ministry of Forests:

- Water Sustainability Act
- Land Act
- Wildlife Act
- 24 additional acts

The government explained that these changes will enable the Ministry of Forests to focus on transforming the forest sector and ensure British Columbians are supporting a resilient and sustainable land base and strengthening B.C.'s wildfire response and mitigation for the safety of the province and its people. The government also feels that this reorganization will advance its goals of working in partnership with First Nations, responding to climate change, supporting sustainable economic development, and ensuring B.C. resources benefit local communities and people.

The December 7, 2022, mandate letter for the Minister of WLRS indicates that the Ministry will be extensively involved in working with the Ministry of Forests to implement the recommendations of the Old Growth Strategic Review and steering the management of the Great Bear Rainforest. The new ministry leads on the protection of wildlife, including species at risk, and is to work with the Ministry of Forests and other government departments to develop a financing arrangement for protecting areas with high levels of biodiversity.

The Ministry also leads the government's initiative to protect 30% of the province by 2030, including Indigenous Protected and Conserved Areas.

In summary, the Ministry of Forests and the MWLRS will be working together on many initiatives, in conjunction with First Nations.

In 2022, the Wildlife Amendment Act (Bill 14) significantly amended BC's Wildlife Act for the first time since 1996. The primary focus of the amendments was the legal recognition of Indigenous knowledge and practices. The amendments stipulated that Indigenous knowledge needed to be recognized and included in wildlife stewardship decisions and that arrangements between First Nations over access to land for hunting were recognized.

In 2023, a further amendment was made to BC's Wildlife Act. Bill M217, Wildlife Amendment Act (no.2) established an independent funding model for wildlife and habitat management using the revenue from all fees, fines, and license revenues collected under the Act.

5 First Nations

There are approximately 204 First Nations in BC and most have never signed a treaty. One historic treaty, Treaty 8, covers the northeast region of BC; it was signed in 1899 and was intended to forestall issues related to miners taking part in the Klondike gold rush (BC Government 2023). There was also a series of treaties signed between 1850 and 1854, known as the Vancouver Island Treaties (alternately, as the Douglas Treaties). These treaties were signed between 14 First Nations on Vancouver Island and James Douglas of the Hudson's Bay Company, representing the British Crown. None of the First Nations in the CA have signed a historic treaty and so, like most of BC's First Nations, they did not ever cede rights or land.

Perhaps because of this, BC has been more active than any other province in advancing reconciliation, including through measures taken to enable First Nations to participate in forest management and obtain economic benefits from the forest sector. BC has also created specific tenures for First Nations and is increasing the level of First Nations' decision-making power in forest management planning. It is now widely recognized and accepted in BC that First Nations will play a major role in the forest sector as it evolves and changes in response to the current difficult environment. As an example, the BC Council of Forest Industries (COFI) has publicly advocated that advancing First Nations participation is a top priority.¹⁶

With the large number of Indigenous nations and tribal councils that have territory overlapping the CA, a detailed description of the individual nations and tribal councils is

¹⁶ <https://cofi.org/press-statement-bc-council-of-forest-industries-responds-to-latest-mill-closures/>

beyond the scope of this report. However, the importance of First Nations from a rights perspective and as actual and potential participants in the forest sector is evident.

This section is organized as follows: The main language groups and nations/tribal councils will be described, followed by a general discussion of the political organization of the nations and tribal councils. Most of the information presented in this section comes from Nation websites and from TSR documents.

The next section will provide an overview of the major recent provincial legislation of relevance, and key programs and frameworks. The provincial government of BC is one of the most active in Canada in moving forward with reconciliation, and there are many programs and initiatives in place, including in such priority areas as health and education. This section will focus on initiatives related to natural resources and forestry.

Following that, initiatives in the key focus areas – First Nations participation in the forest sector, tenure, and forest management – will be described, with some examples presented to indicate the approaches and level of progress that has been made.

It is of critical importance to recognize that there are significant differences between the priorities, opportunities, and capacity of individual First Nations. The examples of First Nations programs and initiatives presented here are intended to be illustrative only; what some First Nations have chosen to do may very well not be suitable or a priority for other First Nations. In many cases, there are foundational agreements between nations, the province and Canada that support relevant initiatives – often these are confidential which limits the ability of the consultants to provide detail.

5.1 Major First Nations language groups in the CA

Southern British Columbia is a region of immense cultural and historical significance, shaped profoundly by the diverse First Nations who have inhabited the area for thousands of years. This wide range of landscapes in the region has influenced the cultures and lifestyles of the First Nations.

The First Nations in southern British Columbia can be broadly categorized into several major cultural and linguistic groups, each with distinct traditions, governance structures, and historical contexts. Key among these groups are the Coast Salish, Interior Salish, and Kootenay-Ktunaxa peoples.

Coast Salish Peoples

Within the Fraser TSA, and likely the Soo TSA, the Coast Salish peoples, particularly the Stó ō Nation, were and still are predominant. The Stó ō, known as the "People of the River," have deep connections to the Fraser River, which plays a central role in their culture, economy, and spirituality. The Stó ō are organized into various bands and councils, such as the Stó ō Nation and the Stó ō Tribal Council, which coordinate cultural, social, and political activities.

The Ts'elxweyeqw Nation is a part of the Stó ō nation that is centred within the Chilliwack River watershed. The Anglicized version of Ts'elxweyeqw is Chilliwack. Upon the creation of the Indian Act, the Ts'elxweyeqw Nation was divided into seven Indian Act First Nation communities. The modern-day bands that constitute the Ts'elxweyeqw include: Āthelets (Aitchelitz), Sq'ewqéyl (Skowkale), Shxwhá:y, Th'ewá:li (Soowahlie), Sxwoyehálá (Squiala), Ch'íyáqtel (Tzeachten) and Yeqwyeqwí:ws (Yakwekwioose). The Ts'elxweyeqw Nation is found within the Fraser and Lillooet TSAs, as well as, in all likelihood, the Soo TSA.

Interior Salish Peoples

The Interior Salish peoples inhabit the south-central region of BC, which includes the areas surrounding Kamloops, Kelowna, Merritt, and Princeton. This ethnic group includes the Secwepemc (Shuswap), Syilx (Okanagan), and Nlaka'pamux (Thompson) Nations.

The Nlaka'pamux people, represented by the Nicola Tribal Association and other entities, have a historical presence in the Fraser Canyon and Nicola Valley and have member communities in the Lillooet, Merritt and Kamloops TSAs. The Syilx Nation, organized under the Okanagan Nation Alliance, has a significant presence in the Okanagan Valley and Similkameen regions, focusing on land stewardship and cultural revitalization. Syilx communities are located in the Merritt, Okanagan, Boundary, Arrow, Revelstoke and Kootenay Lake TSAs. To the northeast, the Secwepemc Nation, represented by bodies like the Secwepemc Nation Tribal Council, is present within the Okanagan, Kamloops, (includes Simpcw First Nation), and Kootenay Lake TSAs.

The Sinixt is another member nation of the Interior Salish ethnic group. The Sinixt are generally considered a separate Indigenous nation but have significant historical and cultural ties with the Okanagan Nation and they have sometimes been associated with the Okanagan Nation Alliance.

The Sinixt occupied territory on both sides of the present Canada-US border. Due to the formation of the border and their displacement, many Sinixt descendants are now members of the Colville Confederated Tribes in Washington State. In Canada, the Sinixt were declared "extinct" by the Canadian government in 1956—a designation that has been challenged and largely reversed in recent years.

Kootenay-Ktunaxa Peoples

In the southeastern part of the CA, including the Arrow, Revelstoke and Kootenay Lake TSAs, the Ktunaxa Nation has a significant cultural and territorial presence. The Ktunaxa people have a unique language and cultural practices that distinguish them from neighboring groups. They have traditionally inhabited the Kootenay and Columbia River valleys and the Ktunaxa Nation Council (KNC) represents four Ktunaxa First Nations with territory in the Kootenay Lake TSA: the ʔaḡam (St. Mary's Indian Band), ʔakisḡnuk (Columbia Lake), Yaḡit ʔa knuqli'it (Tobacco Plains) and Yaḡan Nuḡkiy (Lower Kootenay Band).

The KNC was very active in the 2024 Kootenay Lake TSR, meeting with the Chief Forester to describe how they would like to see the land managed and presenting a scenario of forest development and harvest based on the management approach that they advocated.

The KNC advocated greater protection for old growth and cultural areas, Ktunaxa mature areas, caribou core areas, grizzly bear high priority habitat, increased wildlife tree retention, additional riparian and road buffers, and reduced harvesting on steep slopes. Implementing this level of management would have resulted in an AAC of 325,000 m³/year, 41% lower than the AAC that was determined by the Chief Forester.¹⁷

5.2 Political Organization of the First Nations

British Columbia's First Nations are well-organized at the provincial, regional and local levels. The provincial organizations generally represent BC's First Nations in negotiations with the federal and provincial governments on matters that are national or provincial in scope. These organizations are also often active on the international stage.

Tribal Councils are organizations that represent a number of individual communities that belong to a culturally distinct group of Nations. First Nations politics is very complex and it is not uncommon for only some of a group of related First Nations to belong to a Tribal Council or similar organization. Some First Nations have not joined any regional association and represent themselves. Tribal Councils often represent their members in negotiations with the BC government and many have signed agreements or MOUs with the province regarding consultation and engagement, or as a basis for establishing regional processes with more specific goals. Some examples will be provided below.

¹⁷ BC Ministry of Forests. 2024. Kootenay Lakes Timber Supply Area. Rationale for Annual Allowable Cut (AAC) Determination. Effective June 4, 2024.

Finally, the individual First Nations work through the Tribal Council that they belong to on relevant issues, and directly with government and corporations on agreements with financial implications, such as resource revenue sharing agreements.

Key provincial level organizations are:

1. Union of British Columbia Indian Chiefs (UBCIC)

The UBCIC is a political organization that advocates for the recognition of Indigenous title and rights and works to protect Indigenous land and resources. Its website indicates that its “mandate is to work towards the implementation, exercise and recognition of our inherent Title, Rights and Treaty Rights and to protect our Lands and Waters, through the exercise, and implementation of our own laws and jurisdiction”. The UBCIC is a very active advocate, for example, on issues surrounding the Transmountain Pipeline, unmarked graves at residential schools, and old growth protection.

2. First Nations Summit (FNS)

The FNS represents First Nations involved in treaty negotiations with the governments of British Columbia and Canada. The organization’s website says that it “is comprised of a majority of First Nations and Tribal Councils in British Columbia and provides a forum for First Nations in BC to address issues related to Treaty negotiations as well as other issues of common concern”.

3. British Columbia Assembly of First Nations (BCAFN)

The BCAFN is a regional advocacy body that is part of the national Assembly of First Nations. The BCAFN represents the interests of First Nations in British Columbia at the provincial and federal levels. Its mandate, as posted on its website, is to:

- Advance the rights and interests of First Nations people in British Columbia;
- Restore and enhance the relationship among First Nations in British Columbia, the Crown and people of Canada;
- Develop and promote policies and resources for the benefit of First Nations in British Columbia including, but not limited to, governance, lands and resources, economic, environmental, social, education, health and cultural matters; and,
- Take direction from the Chiefs-in-Assembly according to the resolutions passed at Assemblies.

In addition to the three organizations mentioned above, a selection of representatives of the UBCIC, FNS and BCAFN make up the First Nations Leadership Council (FNLC), which

works on policy and advocacy issues that affect First Nations across the province. These provincial organizations each have numerous priority issues and initiatives that they are working on, and forestry is not among the high priorities.

High-level forestry matters are dealt with primarily by the First Nations Forestry Council (FNFC), which operates at the provincial level to support First Nations in the forestry sector. The FNFC, which sits under the FNLC, collaborates with governments, industry stakeholders, and other organizations to advance the meaningful participation of First Nations in the governance and management of forest lands and resources within their territories. The FNFC is active in initiatives for capacity-building, policy development, and advocating for greater participation of First Nations in forest management and decision-making processes. As an example, the FNFC has developed and is advancing a BC First Nations Forestry Workforce Strategy, which aims to double First Nations employment in the BC forest sector by 2027.

This high level of organization and capacity has enabled First Nations to successfully work with the provincial government on legislation and policy designed to advance reconciliation.

As mentioned above, there are a substantial number of Tribal Councils that represent member First Nations in dealing with the province. An example is the Ktunaxa Nation, which consists of the four individual First Nations mentioned above; all four are represented by the Ktunaxa Nation Council (KNC). In addition, the KNC sometimes also represents the Shuswap Indian Band, which is located within Ktunaxa territory, even though it is culturally of Secwepemc (Shuswap) heritage. A provincial government web-page¹⁸ lists the agreements that have been signed to date with the Ktunaxa. Some of these have been signed with the KNC, some with each of the First Nations. Forestry agreements include a consultation and resource revenue sharing agreement from 2017, with an appendix from 2018, previous agreements from 2011 onwards concern resource revenue sharing, agreements on MPB from 2009 and 2010 and earlier agreements on wildfire.

The Nlaka’pamux Nation Tribal Council (NNTC) has also been very active in forestry. The NNTC’s website states that the “NNTC works in diverse ways to protect and advance title and rights, from work on the ground such as running the fishery and doing archaeology, research and archival work, to arguing cases in the Supreme Court of Canada.” The organization asserts that there is “an inescapable economic component” to title and rights. The NNTC has forged its own path towards economic independence by creating

¹⁸ <https://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/consulting-with-first-nations/first-nations-negotiations/first-nations-a-z-listing/ktunaxa-nation>

ownership, partnership and procurement opportunities as well as employment. The NNTC's ventures are at various stages of development, and include activities in hydro, solar, forestry, telecommunications and construction.

The NNTC has developed its own resource and land-use decision-making policy and process. With respect to forest management, the NNTC was heavily involved in the 2023 Lillooet TSR. The NNTC and the BC government signed a shared decision-making agreement and initiated a pilot Shared-Decision Making Board (SDMB) to engage collaboratively with the provincial government in the TSR. A Technical Working Group consisting of NNTC and government representatives supported the SDMB, which prepared and presented its assessment report to the Chief Forester. During the later stages of the TSR, the NNTC and BC government signed a comprehensive forestry agreement to continue to develop their joint approach to forest relations. The Chief Forester did not mention specifically how the NNTC report affected the AAC decision; there was also considerable additional input provided by two Nlaka-pamux First Nations not represented by NNTC and by the St'at'imc Chiefs Council (the St'at'imc is another Nation in the Interior Salish peoples; they are also known as the Lillooet Nation). In the final decision, the Chief Forester made a 7% reduction in the AAC to address the concerns raised by the First Nations, which indicates that the Indigenous involvement was impactful.

The Okanagan Nation Alliance (ONA) represents seven Syilx (Okanagan) First Nations; in addition to dealing with matters related to rights, self-determination and governance, a considerable amount of its energy goes into fisheries and wildlife. Notable projects include participation in the negotiations between Canada and the US to modernize the Columbia River treaty, ONA's heavy involvement in the restoration of the Okanagan River and the re-introduction of sockeye salmon in the river. Most forestry matters are handled at the individual nation level.

Westbank First Nation, one of the ONA members, has a well-developed forestry program that includes forest management and a forest company named Nyityix LP. Westbank entities hold and manage two Crown licences; the landbase is divided into two zones – one is for older forest where there is little harvesting planned and the second zone is forest that will be harvested on a regular basis. Nyityix harvests the two Crown licences and has a staff of approximately 20 people,

5.3 Key Provincial Reconciliation / Forestry Legislation and Initiatives

The provincial government and BC First Nations are pursuing reconciliation through a wide range of initiatives, agreements and policies, including some directly related to forestry.

5.3.1 Modern Treaties

To address the absence of treaties or other types of agreements with First Nations, the government of British Columbia established a modern-day treaty process in 1992. It was initiated through the signing of the British Columbia Treaty Commission Agreement by the governments of Canada, British Columbia, and the First Nations Summit. The treaty process was formalized with the creation of the British Columbia Treaty Commission, which acts as an independent body to facilitate the negotiations between First Nations and the federal and provincial governments.

To date, four modern treaties have been signed (none cover communities within the CA):

1. **Nisga'a Final Agreement** (1998, outside the formal process but still modern).
2. **Tsawwassen First Nation Final Agreement** (effective 2009).
3. **Maa-nulth First Nations Final Agreement** (effective 2011), which includes:
 - Huu-ay-aht First Nations
 - Ka:'yu:'k't'h'/Che 'tles7et'h' First Nations
 - Toquaht Nation
 - Uchucklesaht Tribe
 - Ucluelet First Nation
4. **Tla'amin Nation Final Agreement** (effective 2016).

In addition, the T̓silhqot'in Nation has a significant framework agreement in place, following the Supreme Court's recognition of their Aboriginal title in 2014, though this is not a traditional "Final Agreement".

The modern treaties agreed upon in British Columbia are comprehensive and contain elements aimed at defining the future relationship between First Nations, the provincial government, and the federal government. These treaties often involve comprehensive land claims agreements. As an example, the most recent treaty, the Tla'amin Final Agreement, is 258 pages long and contains a 382-page Appendix.

This Agreement was made between the Tla'amin Nation, the Government of British Columbia, and the Government of Canada. It was signed in 2014 and came into effect on April 5, 2016. Key elements that are most relevant to the CA are summarized below:

1. Land Ownership and Rights

The Tla'amin Nation received ownership of 8,323 hectares of land, referred to as Tla'amin Lands, including former reserves and additional settlement lands. These lands are held in fee simple (and they are recorded as being in private ownership), meaning the Tla'amin Nation has full ownership and authority over the land, including the ability to govern land use and manage resources. In addition, the Tla'amin Nation retains specific rights to harvest resources on their land and in certain traditional territories beyond the settlement land, including hunting, fishing, and gathering.

2. Governance and Self-Government

The Tla'amin Nation has the authority to create and implement its own laws in areas such as education, health, and land management. The governance system includes a Tla'amin Government that operates independently from the Indian Act. This government is recognized by both provincial and federal authorities.

3. Financial Provisions

The Tla'amin Nation received a capital transfer of approximately \$33.9 million over a period of time plus additional funding for governance, economic development, and implementation of the treaty. Tla'amin Nation was also compensated for past grievances related to land and resource use by the Crown.

4. Resource Management and Fisheries

The Tla'amin Nation has rights to fish for food, social, and ceremonial purposes in specified areas, known as the Tla'amin Fishing Area, and this includes portions of the Strait of Georgia. The Tla'amin Nation is granted specific harvesting rights for commercial purposes, including for salmon, shellfish, and forestry resources. The agreement outlines the Tla'amin Nation's role in co-managing natural resources, including fisheries, wildlife, and forests, within their traditional territory.

5. Forestry and Resource Development

The Tla'amin Nation has exclusive rights to timber and other forest resources on Tla'amin Lands. The treaty also provides economic opportunities in forestry and other sectors, with the Tla'amin Nation playing a role in resource management in certain areas.

The Final Agreement also includes detailed provisions regarding taxation, health and social services, dispute resolution, consultation requirements, and extinguishes all outstanding claims or disputes over Crown land.

The content of other modern treaties is likely very similar to that of the Tla'amin Final Agreement. The BC Treaty Commission web-page reports that 33 self-determining First Nations, representing 57 current or former Indian Act bands, are active in the process.

5.3.2 Recent Broad Legislation and Policy

The release of the Truth and Reconciliation report in December 2015 served to accelerate the impetus towards reconciliation. In 2019, the province passed a foundational piece of provincial legislation that is intended to advance reconciliation: Bill 41, the Declaration on the Rights of Indigenous Peoples Act (DRIPA). This bill was developed jointly by the provincial government and provincial First Nations leadership. DRIPA formally declares the government's support for the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) and pledges to bring current laws into conformance with the principles of UNDRIP. Article 19 of the UN Framework incorporates the principle of Free, Prior and Informed Consent (FPIC):

States shall consult and cooperate in good faith with the indigenous peoples concerned through their own representative institutions in order to obtain their free, prior and informed consent before adopting and implementing legislative or administrative measures that may affect them.

In March 2022, the BC government released a five-year Declaration Act Action Plan that works towards the implementation of *DRIPA*. The Action Plan was also developed jointly with Indigenous leadership.

Key areas include:

- Self-government agreements and supporting First Nations' jurisdiction over lands, waters, and natural resources.
- Land use planning that incorporates Indigenous knowledge and priorities.
- Health, education, and child welfare reforms led by Indigenous peoples.
- Economic development, including opportunities in the forestry and resource sectors.

DRIPA also includes provisions for the BC government to enter into agreements for joint decision-making and consent with Indigenous Peoples, and in 2022, two major agreements were reached between the province and First Nations.

That same year, the Shared Priorities Framework between the Province of British Columbia and Members of the Alliance of BC Modern Treaty Nations was signed, which sets out BC

government commitments to implementing the treaties, including the provision of adequate resourcing. Also in 2022, the Reconciliation Agreement Funding Framework was released. The purpose of this agreement is to provide predictable and stable funding for First Nations to support the negotiation and implementation of reconciliation agreements. These agreements can include areas like governance, economic development, self-determination, land rights, and shared decision-making.

The two frameworks represent two components needed to advance reconciliation - the Shared Priorities Framework outlines the policy and collaborative goals, while the Reconciliation Agreement Funding Framework ensures the financial backing needed to realize these goals and support long-term reconciliation efforts.

Other broad changes that support greater First Nations control and involvement over forests and participation in the sector include:

Indigenous Self-Government Agreements: DRIPA has facilitated more self-government agreements between BC and First Nations. A significant example is the Wet'suwet'en Memorandum of Understanding (2020); this agreement recognizes Wet'suwet'en hereditary governance and starts the process of transferring jurisdiction over land and resources to the Wet'suwet'en.

Reconciliation Agreements: Several reconciliation agreements have been signed between BC and First Nations to address issues such as land rights, economic development, and cultural revitalization. An example is the BC-Blueberry River First Nations Agreement (2021): Following a landmark court ruling that found the province had infringed on treaty rights through excessive industrial development, BC and the Blueberry River First Nation negotiated a compensation and land management agreement.

Heritage Conservation Act Amendments: In 2022, BC amended the Heritage Conservation Act to give First Nations greater authority over the protection and management of cultural heritage sites. These changes support Indigenous control over sacred and culturally significant places.

Recognition of Indigenous Law and Governance: In several cases, BC has begun to formally recognize Indigenous law and governance systems. For example:

- The T̓silhqot'in Nation continues to engage with BC on land management and governance in its Aboriginal title lands, supported by the principles of DRIPA.
- The Haida Nation has strengthened its governance over resource management in Haida Gwaii.

These initiatives represent a significant shift toward reconciliation and recognition of First Nations' rights in British Columbia, promoting their increased participation in decision-making, land management, and resource control in alignment with UNDRIP.

5.3.3 Recent Forest-Focussed Legislation and Policy

BC's forest sector has been experiencing a confluence of substantial challenges during the past two decades which have placed tremendous pressure on the sector. The impacts of the mountain pine beetle and extensive wildfires in 2017, 2018, 2021 and 2023 have contributed to a significant decline in the sustainable harvest. Heightened international competition and the removal of land from the THLB to meet ecological, social and cultural values have also contributed to a reduced harvest. In addition, there is widespread support in BC for reconciliation and forests are an area where First Nations have a keen interest in expanding the exercise of their rights and participation.

BC recognized that its forest policy framework had become outdated and undertook extensive consultations to chart a new course. In 2021, the province released its forest policy intentions document, titled "Modernizing Forest Policy in BC".

The document identifies three principles which will underpin the development of a new policy regime:

- Increasing Forest Sector Participation;
- Enhancing Stewardship and Sustainability; and
- Strengthening the Social Contract

The government states that the modernization process will take some years however it has already made progress on its intentions, and this includes work that First Nations and government have been undertaking. Some of the relevant policy modifications were described in the Williams Lake CAA, and more recent ones are summarized below.

Significant recent modifications to forest legislation and government resource and timber policies intended to encourage and create opportunities for First Nations include:

- Seats at the table where decisions are being made regarding lands, resources, forests and wildlife. One example is the substantial participation and influence that First Nations are having on old growth management and the handling of the deferred areas. Essentially any viable decision will have substantial First Nations input and require their consent. The federal and provincial government are providing substantial funding to advance the management of old growth, as described in Section 5.3.

- Participation in large-scale planning initiatives, specifically the Forest Landscape Plans and the enhanced Land Use Planning process.
- In 2021, the Forestry Revitalization Initiative led to the redistribution of timber rights, aiming to increase First Nations' participation in the sector. Some First Nations received new or expanded forest tenures as part of this effort.
- Access to forest tenure, primarily through First Nations Woodland Licences (FNWLs), which have supplanted community forests and woodlots as the primary licence mechanism. First Nations Woodland Licences are awarded to First Nations and First Nations forestry enterprises and recognize First Nations' land and resource interests, including the protection of traditional-use practices and the management of non-timber forest products.
- As more FNWLs have been negotiated and issued, the size of the area under licence has been steadily increasing. One of the largest FNWLs in British Columbia is held by the Lheidli T'enneh First Nation. In 2022, they secured an expanded FNWL that covers approximately 217,312 hectares, increasing their allowable annual cut (AAC) from 25,000 cubic metres to as much as 380,573 cubic metres, making it the largest FNWL in the province by AAC.
- Increased resource revenue sharing. The May 2024 progress report on implementation of the recommendations from the Old Growth panel¹⁹ states that the share of forest revenue flowing to First Nations has doubled and an effort is underway to develop a new fiscal framework. Part of this increase has been driven by the expansion of Forest Consultation and Revenue Sharing Agreements, which provide First Nations communities with a portion of stumpage from timber harvested from traditional territories.

In addition, the government is increasingly willing to enter into co-management and co-governance agreements with First Nations. The province has created 16 Collaborative First Nations Stewardship Forums across BC, many of which are designing co-management and co-governance arrangements and shared management practices under new forest stewardship models. Relevant examples include:

- **Great Bear Rainforest Agreement:** Although pre-dating DRIPA, this model has been expanded post-DRIPA to incorporate more robust First Nations involvement in managing protected areas.

¹⁹ <https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/old-growth-forests>

- Stó ō Xwexwilmexw Treaty (2021): Focused on shared land and resource management within the Fraser Valley.

5.4 First Nations in the Forestry Sector

Many First Nations see the forest sector as a source of employment and many Nations, either through their Economic Development departments, or through individuals, have started their own forest-based businesses. Many of the businesses are in the more accessible parts of the sector, including road and bridge construction, timber harvesting, and trucking. Some First Nations companies are using drones to conduct surveys or are in the forest management business.

First Nations have been slower to own mills, in part because the sector is experiencing overcapacity, as the BC Intentions document explains. The lack of suitably large tenure opportunities is another constraint – the BC government recognizes that more opportunities need to be created for new entrants, including First Nations, and while the FNWLs are one pathway, not every TSA has sufficient available area to carve out a reasonably sized FNWL.

As an alternative, First Nations have been actively partnering with existing industry, and partnership agreements have been struck between traditional forest product companies and First Nations around existing tenures held by the companies.

What follows is a sample of First Nations located in the southern interior of British Columbia that are actively involved in the forestry sector, particularly in timber harvesting and processing, identified with the assistance of Chatgpt:

1. **Adams Lake Indian Band:** Part of the Secwepemc Nation, the Adams Lake Indian Band is a significant player in forestry. They are based near Chase, BC, and hold forest tenures, operating their own sawmill and engaging in timber harvesting.
2. **Okanagan Indian Band:** Located near Vernon, BC, the Okanagan Indian Band is involved in forestry through their partnerships and forest tenures. They focus on sustainable forest management practices while leveraging their land base for economic development.
3. **Splatsin First Nation:** Also part of the Secwepemc Nation, the Splatsin First Nation, located near Enderby, BC, has forestry operations and holds forest tenures. They are involved in logging and timber processing within their traditional territory.

4. **Nlaka'pamux Nation:** Several communities within the Nlaka'pamux Nation, particularly those near Merritt, are active in the forestry sector, holding forest tenures and engaging in timber harvesting.
5. **Simpcw First Nation:** Located north of Kamloops, the Simpcw First Nation has extensive involvement in forestry. They operate through Simpcw Resources Group, which focuses on forestry, logging, and environmental stewardship in their territory.
6. **Shuswap Indian Band:** Based near Invermere, the Shuswap Indian Band is part of the forestry industry in the Columbia Valley, holding forest tenures and engaging in timber harvesting operations.
7. **Coldwater Indian Band:** Near Merritt, BC, the Coldwater Indian Band is involved in the forestry sector, holding forest tenures and participating in timber harvesting in the surrounding areas.
8. **Westbank First Nation:** Located near Kelowna, the Westbank First Nation has been involved in forestry operations, holding forest tenures and collaborating with the forestry industry in the Okanagan region.

In Williams Lake, the largest harvest contractor, who supplies Drax's Williams Lake facility, among other mills, happens to be First Nation owned. First Nations are increasingly becoming involved in the forest sector and Drax increasingly does business with these companies and individuals, supporting them.

6 The Forest in 2024

This section of the report presents a discussion of the state of the forest in 2024. The analysis covers the area of Crown land with non-forest and non-productive land removed, and with land managed under area-based tenures (e.g. Tree Farm Licences) also removed. The Crown land that remains after these removals is the Analysis Forest Landbase (AFLB), which includes parks and reserves, wildlife habitat set-asides, and other areas managed for non-timber values, as well as forest areas that are available for timber harvesting. The forest on the AFLB is described in terms of species abundance and age class structure, followed by a discussion of the allowable cut levels and trends. The actual harvest levels will be compared with the AACs. The section also discusses the biodiversity in the forest, including old growth deferrals and species at risk.

6.1 Leading Species by Area

Table 8 Table 8 the growing stock volume within the AFLB of the CA by leading species. For example, a stand whose volume is composed of 50% Douglas-fir, 30% spruce and 20% pine would have its total volume listed under the Douglas-fir heading. The volumes in Table 8 Table 8 ore provide an approximation of the species composition of the forest in the CA.

It is clear that the forest is overwhelmingly coniferous in character, since deciduous leading stands account for only 2.2% of the total forest growing stock in the CA. The most common deciduous tree species are aspen, cottonwood, paper birch and alder.

Douglas-fir is the most prevalent species, by volume, which reflects its presence across the entire CA. On the coast, it is present in the rainforests of the Fraser and So0 TSAs, and it can be found across the Interior, where it is a much smaller tree than its coastal relatives. The largest volumes of Douglas-fir in any individual TSA occur in the Kamloops and Okanagan TSAs and it is also an important component of the Interior rainforests of the easternmost TSAs. It is followed in importance by the Firs (amabilis, sub-alpine and grand) at 23.3%; they are also widely distributed across the CA, reflecting in part the ubiquity of the ESSF BEC forest type.

The third most important species group is pine, which accounts for 18.9% of the CA volume. Included under the Pine heading are lodgepole, ponderosa, and whitebark pines, as well as western white pine. Of these, lodgepole pine is by far the most significant contributor to overall volume. Unlike Douglas-fir, firs and spruce, pine is not very evenly distributed across the CA – 89% of the pine volume is found in the five TSAs of the Interior: Boundary, Kamloops, Lillooet, Merritt, and Okanagan. Another important species that is also distributed unevenly is hemlock, which is somewhat surprising because it flourishes in wetter climates (the CWH BEC class) as well as in the mountains, as the Mountain Hemlock (MH) BEC class. However, almost half of the hemlock volume in the CA is found in the Fraser and So0 TSAs.

OKANAGAN CATCHMENT AREA ANALYSIS

TSA	Douglas-fir	Fir	Pine	Spruce	Hemlock	Cedar	Larch	Decid	SUM
Arrow	137	153	67	68	39	10	57	24	555
Boundary	75	42	170	34	3	4	73	6	407
Fraser	224	319	8	28	198	30	0	27	834
Kamloops	455	260	234	440	98	70	0	79	1636
Kootenay	101	250	77	117	50	16	71	10	692
Lillooet	211	189	152	68	1	0	0	3	624
Merritt	276	97	340	87	1	0	0	11	812
Okanagan	410	268	395	227	70	72	28	30	1500
Revelstoke	27	78	1	50	69	32	0	4	261
Soo	88	130	6	2	99	11	0	8	344
Total	2004	1786	1450	1121	628	245	229	202	7665
%	26.1%	23.3%	18.9%	14.6%	8.2%	3.2%	3.0%	2.6%	

TABLE 8. AFLB AREA BY LEADING SPECIES GROUP (THOUSAND HA).

Cedar and larch are minor components of the CA forest, accounting for 3.2 and 2.8% of the volume, respectively. Cedar is well distributed, being present in eight of the TSAs whereas larch is a leading species in only four TSAs.

Compared to other regions of BC, the CA forest is diverse, reflecting the variety of ecoregions and ecoprovinces present. Douglas-fir only makes up 26.1% of the forest, which is a much lower fraction of the total volume compared with the leading species in the Williams Lake CA, for example, where three species groups comprised 75% of the forest volume, and overall, there were only five species groups present in non-negligible amounts. In this CA, eight species groups are present in non-negligible amounts.

6.2 Area by Age Class

Figure 6 shows the area within the AFLB by leading species group by age class.

The most notable feature of Figure 6 is the large proportion of area in the 141-250 year age class. This age class stands out in part because it is a much wider age class than the younger ones, however it also indicates that the Interior forest is rather old. Fully 30.6% of the forest area is within the 141-250 year age class, which is significant because 140 years is the BC government's threshold for forest in the Interior to be considered "old". As most of the CA is within the Interior, most of this forest area would be considered old. Another 10.2% of the forest is greater than 250 years old – 250 years is the threshold for "old" forest in the Coast. Therefore, approximately 41% of the forest in the AFLB is considered old by provincial government standards.

The relatively advanced age of the forest occurs in part because a substantial portion of the older forest is in the parks and reserves, many of which were created to protect old forests. There is also a considerable amount of old forest in the higher elevations where logging is difficult, and the yields are lower. The coastal forest and the interior rainforest might be expected to be relatively old forests because they burn very infrequently and are generally not subject to other large-scale natural disturbances. The Interior forest is fire prone, however until recently BC's wildfire suppression program has been very successful in limiting the amount of area burned.

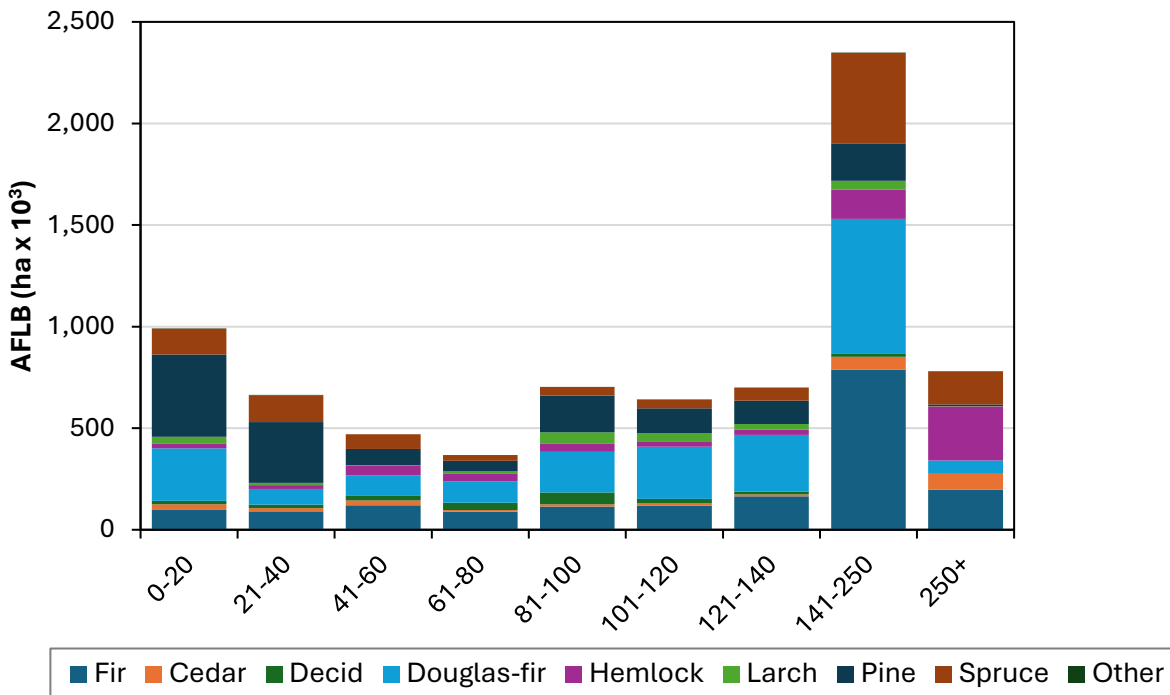


FIGURE 6. AFLB AREA X LEADING SPECIES X AGE CLASS

Figure 7 shows more clearly how the species composition varies with age. Early successional species such as pine and the deciduous are largely absent from forests older than 120 years; pine accounts for 40% of the area in the 0-20 and 21-40 year age classes. Part of the reason for this is that the MPB killed a substantial amount of lodgepole pine forest in the 1990s and 2000's, and new pine stands are now regenerating in those areas. Deciduous species are most prominent in the 61-80 and 81-100 year age classes. Douglas-fir is longer lived than the pine and deciduous, and it is most prominent in the forest aged between 101 and 140 years, accounting for almost 40% of the area in that age range. However, by 250 years it has faded to 8.2% of the forest area. In contrast, hemlock and cedar make up a much larger percentage of the very old forest (over 250 years) than they do of the forest as a whole. Together with fir and spruce, these four species groups comprise 90% of the very old forest. As mentioned, old ESSF stands account for a meaningful proportion of this area.

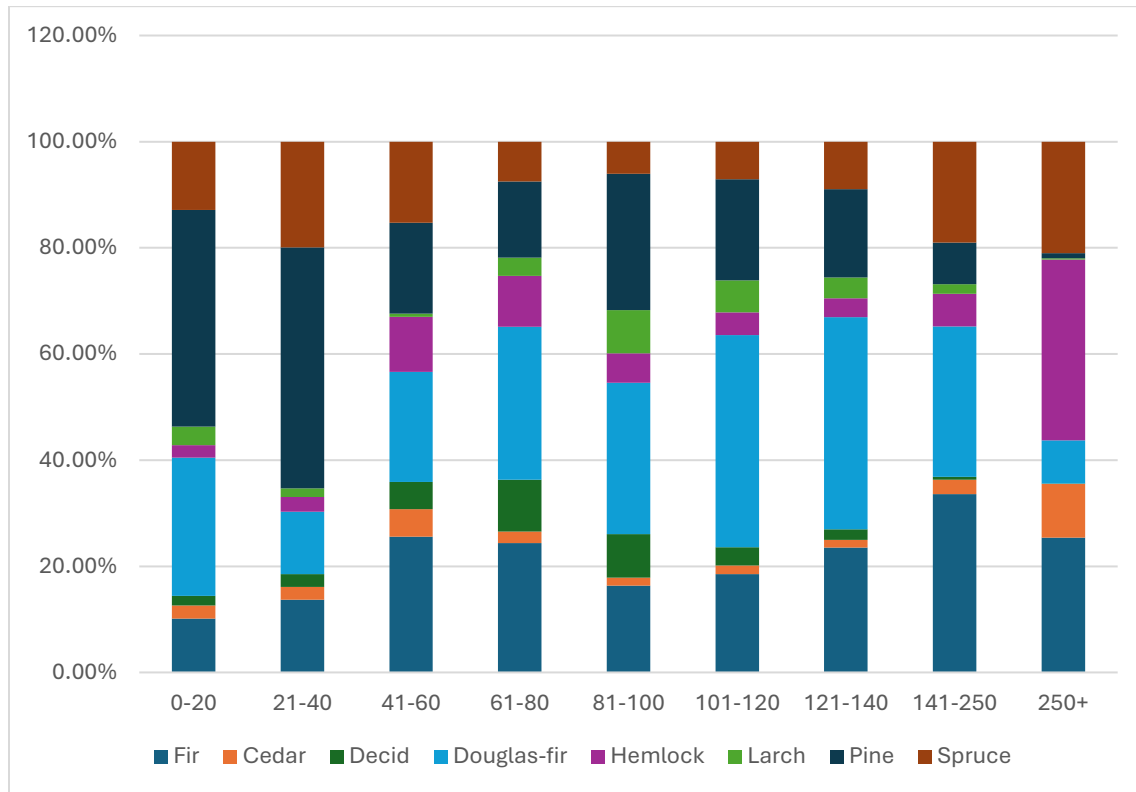


FIGURE 7. PERCENTAGE AFLB AREA X LEADING SPECIES X AGE CLASS.

6.3 Old Growth Deferrals in the Catchment Area

As described in section 4.3, the provincial government has deferred the harvest of a substantial area of old growth as it determines how these areas should be managed in the future. The deferred areas are distributed across the province and there are substantial areas in the CA. Table 9 shows the area of old growth harvest deferrals as of fall 2024. These areas are described by the BC government as “Priority Deferral Areas” (BC Government 2023b) and they represent 11.7% of the AFLB area shown in TablTable 8

The three types of old growth that have been deferred are as follows:

- i. Big-treed old growth is, as the name suggests, an area with the largest trees of each forest type, as measured by height and diameter. The BC government (2023b) notes that these stands are naturally rare as they have long been a priority for harvesting. The amount of area selected provincially in this class is intended to reach a minimum threshold of 30% of the naturally expected amount of old forest, which is a minimum required to maintain the biodiversity associated with old forests.

- ii. Ancient forest is extremely old forest, older than 400 years in ecosystems with rare stand-replacing disturbances (e.g. the Coast and the Interior Wet Belt) and older than 250 years in ecosystems with more frequent stand-replacing disturbance (such as the Interior).
- iii. Remnant old ecosystems are old forest ecosystems where less than 10% of the area in the ecosystem is classed as old, which in the majority of the BC Interior is area 140 years or older.

It will be evident from Table 9 that a number of deferred areas meet the criteria for two or even three of the old growth classes. Big-treed area accounts for 89% of the total deferred area, while 11% qualifies as ancient and 15% is remnant old ecosystems.

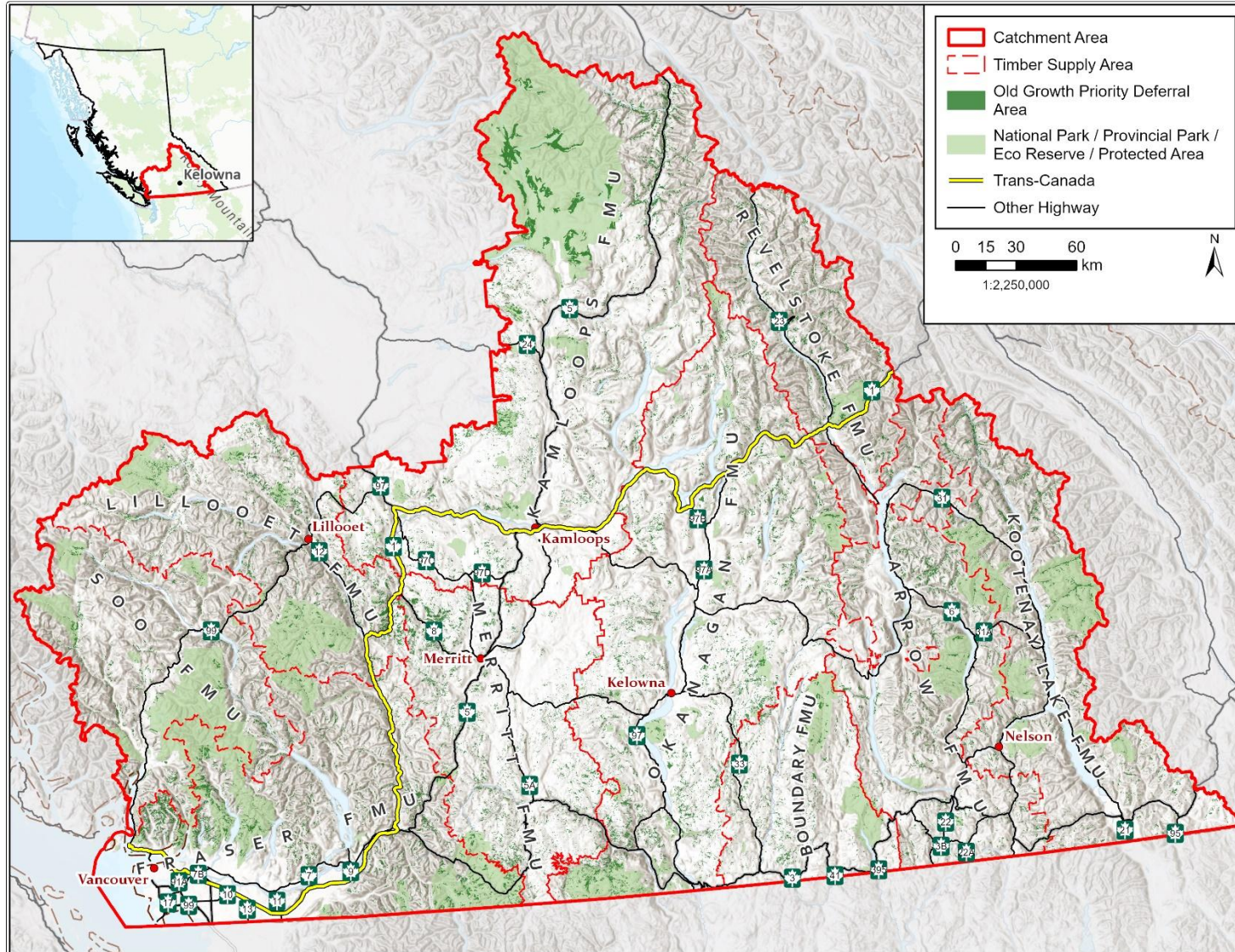


FIGURE 8. DEFERRED OLD GROWTH AREAS. .

BEC Zone	BEC Abbrev.	Big Treed	Ancient	Rem Old Eco'm	Total Area	% Tot Area	% BEC Area
Bunchgrass	BG	251	0	5	251	0.0%	0.2%
Coastal Western Hemlock	CWH	78,982	25,535	8,007	104,517	11.6%	11.0%
Engelmann Spruce–Subalpine fir	ESSF	177,792	30,253	35,369	208,045	23.1%	5.6%
Interior Cedar-Hemlock	ICH	243,133	15,393	57,396	258,526	28.8%	10.2%
Interior Douglas-fir	IDF	113,915	140	22,188	114,055	12.7%	6.6%
Mountain Hemlock	MH	26,788	11,403	0	38,192	4.2%	8.5%
Montane Spruce	MS	141,968	16,028	7,603	157,996	17.6%	13.6%
Ponderosa Pine	PP	7,738	4	566	7,741	0.9%	2.8%
Sub-boreal Pine – Spruce	SBPS	2,444	0	1,354	2,444	0.3%	5.8%
Sub-boreal Spruce	SBS	6,516	609	385	7,125	0.8%	62.6%
SUM		799,527	99,365	132,873	898,892		

TABLE 9. AREA OF DEFERRED OLD GROWTH BY BEC CLASS AND OLD GROWTH CLASS (HA).

The largest proportion of the deferred old growth (28.8%) is in the Interior Cedar-Hemlock (ICH) BEC class, which is the Interior Wet Belt found in the eastern part of the CA. It is not surprising that this BEC class contributes the largest area to the deferred old growth, since as Figure 7 showed, a disproportionately high percentage of the very old forest consisted of cedar and hemlock. Moreover, this area is both productive and rugged, so that a substantial amount of old forest with large trees has persisted. Altogether, 8.3% of the ICH area in the CA is deferred old growth.

Of the major BEC classes, the Montane Spruce (MS) BEC class is the most highly represented in the old growth deferral area, relative to its abundance on the landscape. The total area deferred represents 13.6% of the area in the MS BEC class. The Coastal Western Hemlock (CWH) BEC class is also well represented; the total area deferred represents 11 % of the total area in this BEC class (See Table 7). Of all BEC classes, Sub-boreal Spruce (SBS) is the most highly represented, with fully 63% of the area in the CA in deferred old growth areas. Because this BEC class has so little area in the CA, the deferrals account for a high proportion of the total area.

Spruce and fir were also identified as making up a high proportion of the very old forest and so it is not a surprise to see that a significant area in the ESSF BEC class is old forest deferred from harvesting. It may seem odd that the Bunchgrass (BG) BEC class would

have deferred old growth; these ecosystems are often mixed in with the Ponderosa Pine (PP) BEC class, and some BG areas have scattered large trees at a density that is insufficient to qualify as forest.

Interestingly, none of the area in the Coastal Douglas-fir (CDF) BEC class is deferred old growth, because, although this BEC class comprises only 1.2% of the CA forest area, it is known for producing very large old trees. The reason for this is likely that the old forest in this BEC has been harvested, since coastal Douglas-fir was a mainstay of the BC forest industry from its beginning.

As described above, the future management approach to each of the deferred old growth areas is being discussed by government, industry and First Nations. The process is moving slowly; some of the deferred areas are being released for harvesting while others are being protected. In the analysis that follows, the conservative assumption was made that all of these areas were excluded from commercial timber harvesting.

6.4 AACs for the Catchment Area

British Columbia has a well-established approach, known as a Timber Supply Review (TSR), to determining annual allowable cuts (AACs) for its TSAs and Tree Farm Licences (TFLs). The TSR process is led by the Chief Forester, who is required to follow the fairly detailed direction in the Forest Act regarding process and the factors to be considered.

In general, the AAC determination process starts with updating the forest inventory; then the landbase that can support commercial timber production is identified. This latter process, known as the “netdown”, involves removing areas that are unavailable for timber harvesting from the landbase. The first stage of the netdown involves removing non-Crown land, Crown land not included in the AAC (e.g., Community Forests), roads, and non-forest lands. What is left is known as the Analysis Forest Landbase (AFLB). (Until recently, the term Crown Forest Management Landbase (CFMLB) identified what is now essentially the AFLB). However, not all of the AFLB is available for commercial timber production, and the second stage of the netdown process begins. In this stage, areas that are netted out include, but are not limited to, unproductive forest areas, lands where timber harvesting is prohibited, such as parks and parts of ungulate winter ranges, areas that are inoperable due to topography or other factors, ecologically sensitive areas (such as Old Growth Management Areas or OGMA), riparian areas and important recreational areas. What remains is the Timber Harvesting Landbase (THLB), which is the landbase used to calculate the AAC.

Table 10 shows the gross area, AFLB, and THLB in each of the ten TSAs as determined in the most recently completed TSR.²⁰ Note that a TSR is in process for the Revelstoke TSA and the TSR has been deferred for the Soo TSA.

TSA	Year of TSR	Total Area	AFLB	THLB	% THLB
Arrow	2017	1,285,631	501,246	186,466	14.5
Boundary	2014	659,000	406,433	272,286	41.3
Fraser	2016	1,423,038	816,847	250,405	17.6
Kamloops	2016	2,769,436	1,686,363	931,373	33.6
Kootenay	2024	1,240,878	675,204	168,501	13.6
Lillooet	2023	1,125,019	513,869	163,040	14.5
Merritt	2016	1,131,178	805,857	592,687	52.4
Okanagan	2022	2,449,135	1,505,437	760,781	31.1
Revelstoke	2011	758,705	216,217	51,454	6.8
Soo	2011	909,000	254,000	71,468	7.9
TOTAL		13,751,020	6,706,944	3,448,461	25.1

TABLE 10. NETDOWNS FOR THE TSAs IN THE CATCHMENT AREA (HA).

It is evident that only a relatively small proportion of the landbase is available for harvesting in volume-based tenures. Note that the total area column in Table 10 includes the area in area-based tenures and private land, which are also harvested but which have been removed from the THLB used in the TSR process. So, the proportion of the total area that can be harvested is somewhat larger than shown in the right-hand column.) As will be described in more detail in Section 6.4, the proportion of the total area in the THLB reflects a myriad of factors, ranging from the amount of area that is private land, in area-based tenures, in parks and conservation reserves, and that is of low productivity or inoperable due to steep slopes or other physical constraints.

In Table 10, the year of TSR refers to the year when the most recent AAC determination was made by the BC Chief Forester, however the AAC has sometimes been adjusted since the determination was made. In some cases, the Chief Forester specifies a change five years after the initial determination (always a step down in AAC in recent years) and sometimes adjustments are made as new area-based licences are issued.

Table 11 shows the AACs for each of the ten TSAs in the CA from 2015 to 2024. The primary source of information for the AACs was the documents produced during the most recent

²⁰ The gross area in some of the TSR reports did not always correspond to the TSA area as identified in the forest inventory.

TSR. AAC reductions that have been made outside of the TSR process due to the issuance of a new area-based licence areas are not always capturedTable 11le 11, since they are not always readily trackable. The descriptions for each TSA will provide more detail regarding the AAC values showTable 11le 11.

OKANAGAN CATCHMENT AREA ANALYSIS

TSA	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Arrow	513,700	513,700	513,700	500,000	500,000	500,000	500,000	500,000	500,000	500,000
Boundary	700,000	700,000	670,142	670,142	670,142	670,142	670,142	670,142	670,142	670,142
Fraser	1,239,100	1,237,500	1,237,500	1,237,500	1,220,808	1,220,808	1,220,808	1,220,808	1,220,808	1,220,808
Kamloops	4,000,000	2,300,000	2,300,000	2,300,000	2,300,000	2,300,000	2,100,000	2,100,000	2,100,000	2,100,000
Kootenay	640,000	634,861	634,861	634,861	634,861	634,861	634,861	634,861	634,861	550,000
Lillooet	570,000	570,000	570,000	570,000	570,000	570,000	570,000	570,000	570,000	375,000
Merritt	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	1,200,000	1,200,000	1,200,000	1,200,000
Okanagan	3,100,000	3,100,000	3,100,000	3,100,000	3,100,000	3,100,000	3,100,000	2,462,800	2,462,800	2,462,800
Revelstoke	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000
Soo	475,000	475,000	475,000	463,000	463,000	456,000	456,000	456,000	368,276	368,276
SUM	13,864,815	12,158,077	12,128,220	12,102,521	12,085,830	12,078,831	10,678,832	10,041,633	9,953,910	9,674,050

TABLE 11. AACs FOR EACH OF THE TEN TSAs IN THE CA FROM 2015 TO 2024.

Figure 9 shows the total volume-based AAC in the CA between 1990 and 2024. The uplift in the AAC between 2004 and 2015 is clearly visible; the Chief Forester raised the AAC in the Merritt, Okanagan and Kamloops TSAs due to the desire to salvage as much timber killed by the MPB. The substantial drop from 2015 to 2016 is the result of TSRs for the Kamloops and Merritt TSAs that were completed in 2016 and resulted in AAC reductions of 1.7 million m³/year and 900,000 m³/year, respectively. These TSRs removed the last of the uplift; thereafter, the CA-wide AAC settled at a lower level than it was at prior to the MPB outbreak. It has continued to decline in the past decade, with the trend largely dependent on the timing of the completion of TSRs.

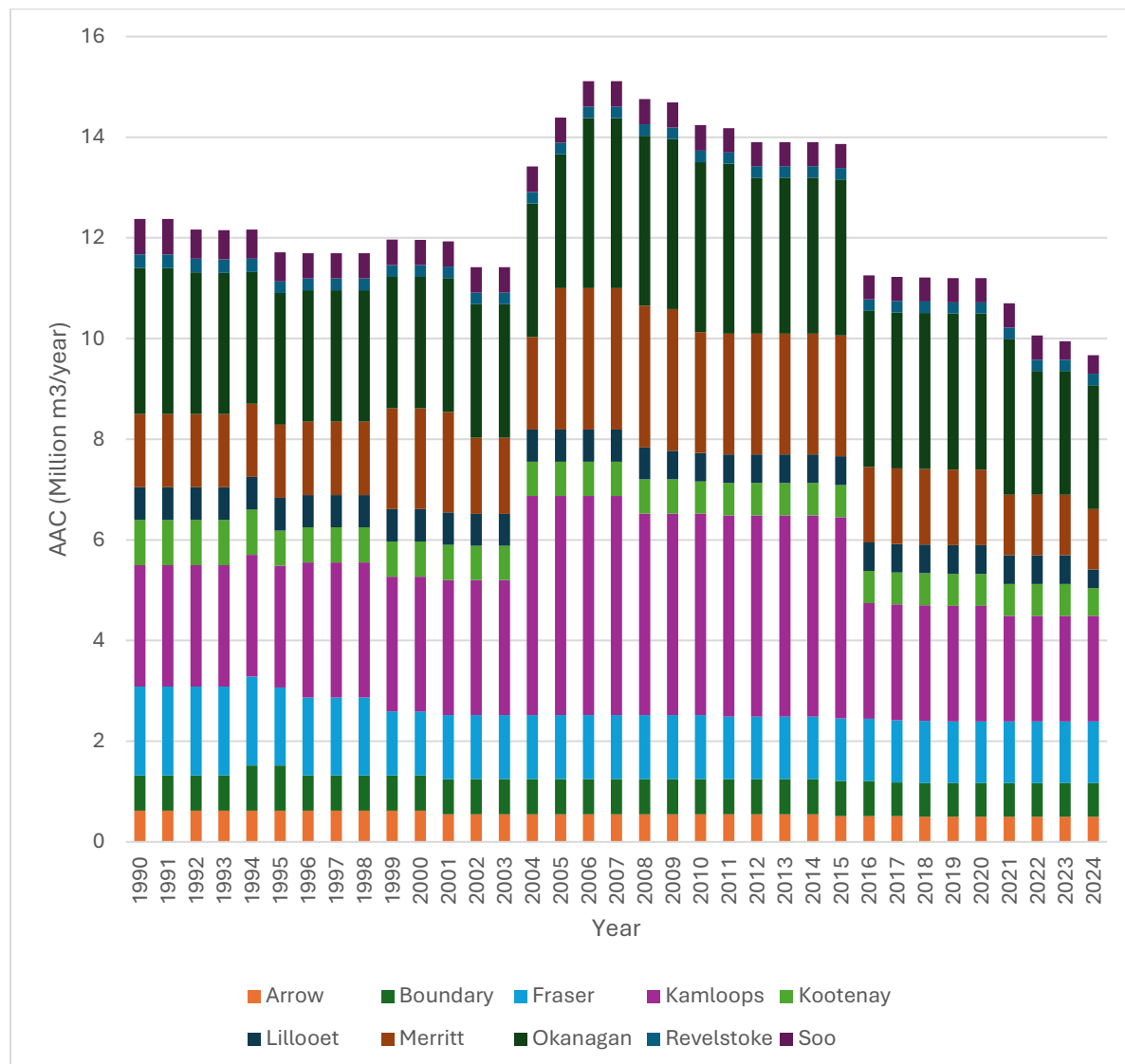


FIGURE 9. AAC HISTORY IN THE CATCHMENT AREA: 1990-2024.

In contrast, there was a steady decline in the AAC from 1990 to 2024 for the other seven TSAs in the CA. One common reason for the decline has been the formation of new area-based tenures on lands that were removed from the volume-based portion of the TSA. As new Community Forests were created, or existing ones enlarged, or as First Nations Woodland Licences were issued, the area in these new tenures was removed from the AFLB and THLB used to calculate the AAC for the volume-based portion of the management unit. A second reason for the decline in AACs is that over time, more area has been removed from commercial timber production in order to maintain or conserve ecological, recreational and culturally important values.

In TSAs such as the Boundary, Revelstoke and Arrow TSAs, the declines in AAC from 1990 to 2024 have been relatively modest, at 4.3 %, 16.4 % and 19.2%, respectively. Note that Revelstoke is presently in the midst of a TSR and the AAC may decline somewhat when the new determination is made by the Chief Forester.

The Fraser, Kootenay, Lillooet and Soo TSAs have experienced much larger reductions in AAC between 1990 and 2024, with declines of 30.9%, 38.9%, 42.3% and 47.8%, respectively. In the case of the Fraser TSA, the most significant declines were between 1990 and 1999, during which the AAC declined by 495,000 m³/year. The main drivers for the decline are unknown, however the TSA has spotted owl habitat and a large area of forest that is non-productive (312,650 ha which is 22% of the gross landbase) or inoperable (258,789 ha /18% of the landbase). The Kootenay TSA also experienced a substantial decline in AAC from 1990 to 1995; in 1995, the TSR reduced the AAC by 200,000 m³/year, or 22% of the AAC. The rationale for the reduction is unknown. Similarly, the AAC in the Soo TSA declined by 28% from 1990 to 1996. The primary rationale for this reduction is also unknown.

In contrast, the most abrupt reduction in the AAC on the Lillooet TSA occurred with the 2023 determination, which saw the AAC decline from 570,000 m³/year to 375,000 m³/year, a reduction of 34%. The Discussion Paper released in 2022 as part of the TSR noted that the THLB was 31% smaller than it was in the previous TSR. Key reductions are attributed to the exclusion of priority old growth areas and culturally significant areas, establishment of new wildlife habitat areas, and improved data on riparian areas (3.3% of the Analysis Forest Landbase) and low productivity sites. The reduction in the size of the THLB mirrors the reduction in AAC.

In addition, the Lillooet TSA experienced a loss of 4.5 million m³ of timber to the MPB between 2005 and 2017, as well as 44,450 ha burned by wildfire between 2009 and 2020. The 2021 wildfires burned an additional 25,959 ha. All of these factors have weighed on the AAC.

The AAC history of the Kamloops, Merritt, and Okanagan TSAs was more strongly influenced by the MPB as the Chief Forester authorized significant AAC uplifts in order to permit intensive salvage of the timber killed by the MPB. In 2004, the AAC for the Kamloops TSA was increased from 2.68 million m³ to 4.353 million m³, where it remained until 2008, when it was decreased somewhat to 4 million m³. In 2021, it was reduced by almost half to 2.1 million m³. The AAC in the Okanagan and Merritt TSAs was increased by a relatively modest amount in 1998 and 1999 to facilitate the salvage of a localized MPB outbreak, then lowered after four years. Subsequently, as the much more severe MPB outbreak got underway in the early 2000's, a more substantial uplift was authorized in each of the TSAs. Since then, the AACs have come down in each of the units.

In summary, the AAC is responsive to changes in the forest, and has been negatively affected by the losses due to MPB and wildfire. In addition, the creation of Community Forest tenures, First Nations Woodland Licences and, to a lesser extent woodlot licences, has resulted in a shift of the instrument by which the allowable harvest is determined. The creation of these area-based tenures moved some of the timber harvesting out of volume-based licences to area-based tenures, with little impact on the overall allowable harvest. However, because the TSR excludes the area-based tenures from the landbase used to determine an AAC, the allowable harvest appears to be declining more than it actually is.

In contrast, areas are being withdrawn from the harvesting landbase to maintain ecological, cultural and social values – these withdrawals do lower the overall allowable harvest level in the region.

6.5 Biodiversity in the Catchment Area

The scientific literature emphasizes that biodiversity encompasses the variety of life at multiple levels, including genetic diversity, species diversity within ecosystems, and ecosystem diversity across regions. Genetic diversity expresses itself as variations within species that enable it to adapt and show resilience to environmental changes. Species diversity, often expressed as the number of species present in a specified area (i.e., species richness) indicates both the complexity and resilience of ecosystems. Finally, ecosystem diversity expresses the range of different ecosystems and their interactions within a larger landscape.

The complexity of biodiversity makes it difficult to quantify. In addition to species richness, other common metrics for species diversity include species evenness (how evenly individuals are distributed among the species present) and indices that attempt to consolidate different metrics into a single index. Two of the better-known indices are Shannon's Index, which incorporates species richness and evenness, and Simpson's

index, which focuses on species dominance; it quantifies the probability that two individuals randomly selected from a community belong to the same species.

Estimating species evenness requires a great deal of detailed information, and is impractical to estimate for the CA. The values that come out of the two indices mentioned are non-intuitive for almost any reader and so do not provide readily accessible descriptive value. Accordingly, a descriptive approach will be employed to describe the biodiversity within the CA.

BC's forest management approach has become increasingly cognizant of biological diversity and as discussed in Section 5, the province has been making changes to the FRPA, the associated FPPR, and other legislation to better protect biodiversity.

The CA exhibits a high level of biodiversity, as one might expect given that all 14 of the provincial BEC zones are present within the CA. Some of the individual TSAs are also very diverse – the Merritt TSA has area in 10 of the BEC zones, and several others have eight BEC classes represented within their boundaries. In addition, the CA has area in three ecoprovinces, which is indicative of the wide variation in the climatic regimes that is present. Finally, the rugged topography and range of elevation that is present throughout the CA provides a wide range of habitats at a more local level. The CA has many characteristics that contribute to a high level of biodiversity.

As an example, the Arrow TSA has nearly all ungulate species present in BC, including bighorn sheep, white-tailed and mule deer, moose, mountain goat, elk, and caribou. There are other examples of very highly localized levels of high levels of biodiversity. Golden Ears Provincial Park, located 10 km north of the Fraser River and about 20 km east of Vancouver (within the Fraser TSA), contains three eco-sections—Eastern Pacific Ranges, Southern Pacific Ranges, and the Fraser Lowlands. Each eco-section supports diverse plant species, including ferns, trees, and wildflowers. Notably, over 85 red-listed species, such as the spotted owl, monarch butterfly, and sage thrasher (all of which are listed as endangered in Schedule 1 of the federal Species at Risk Act) have been documented as occurring in²¹ the park.

In the northwest corner of the Lillooet TSA, South Chilcotin Mountains Provincial Park hosts seven of BC's thirteen forested BEC zones, supporting over 125 endemic wildflower species. There are also diverse areas in the Interior. Just 10 km north of Kamloops, the Lac du Bois Grasslands Protected Area encompasses a unique mixed forest-grassland

²¹ In British Columbia, a red-listed species or ecosystem is one that is rare, threatened or has been extirpated. Blue-listed species and ecosystems are of special concern.

ecosystem. Studies have documented its diverse flora, including bluebunch wheatgrass and ponderosa pine, and fauna such as bighorn sheep and flammulated owls.

The Canadian Wildlife Service produced an inventory of sensitive sites in the Okanagan Region in 2003. The study area comprised the west side of Okanagan Lake and an area east of the lake, east of Kelowna. Twenty-five percent of the area was assessed as a sensitive ecosystem, with wetlands, grasslands, deciduous forests and old forests described as being “extremely rare”. Fire exclusion and selective harvesting were identified as factors that had degraded coniferous forests in the study area; somewhat ironically perhaps, much of this area was burned in 2021.

Another important area is the South Okanagan – Similkameen area, which contains Canada's only desert ecosystem and supports species that are rare or at their northernmost range, such as the Western rattlesnake, Pallid bat, and Behr's Hairstreak butterfly. Lastly, the Interior Wet Belt in the Columbia basin is a globally rare inland temperate rainforest, supporting numerous species of mosses, lichens, and fungi, as well as mountain caribou, grizzly bear, and many bird species.

The Okanagan Institute for Biodiversity, Resilience and Ecosystem Services, a UBC campus located in Kelowna, could be a useful resource for more detailed and up-to-date information about biodiversity in the southern Interior. The BC Conservation Data Centre (CDC) is also an excellent source of ecological information, especially for species and ecosystems at risk. The consultants accessed the CDC website and obtained lists of the red-listed and blue-listed species and ecosystems present in the CA area. Three Natural Resource administrative regions were examined – the South Coast, which includes the majority of the Fraser and So0 TSAs, as well as parts of the Lillooet TSA. The Merritt, Okanagan and Kamloops TSAs comprise the majority of the Thompson-Okanagan region, while the Arrow, Boundary, Kootenay Lake and southern Revelstoke TSAs constitute the Kootenay-Boundary region. A total of 363 red- and blue-listed species and ecosystems occur in the Kootenay-Boundary region, with 495 and 613 in the South Coast and Thompson-Okanagan region. Some of these species and ecosystems occur in two or three regions – removing the duplicates left 816 unique entries.

Red-listed mammals include the badger, the southern mountain caribou population, some sub-species of chipmunk and many bat species. In addition, two woodpeckers (Lewis' woodpecker, white-headed woodpecker), seven species of owls (northern pygmy owl, short-eared owl, spotted owl, western screech owl, barn owl, burrowing owl, flammulated owl) and four salamanders (Wandering, Western Tiger, Coastal Giant, and Coeur d'Alene salamanders) occur within the CA and are either red or blue-listed. Numerous other animals, plants, fish and insects are also listed.

Appendix 5 provides a listing of the red- and blue-listed forest ecosystems in the CA. Note that there are other listed ecosystems that are non-treed or have low growing woody vegetation that does not reach tree size; these are not shown as the focus of this report is on forests.

Within the catchment area, there are a variety of land designations in place that contribute to the conservation of biodiversity. Some of these relate to forest management planning requirements while others are external to the forest planning process. The main examples of the latter are protected areas that have been designated as provincial parks, reserves, protected areas and conservancies. These areas are an important part of the array of biodiversity conservation measures since unusual and/or very important areas are often designated as protected areas.

The old growth deferrals, described in Section 5.3, represent the government's most recent significant effort to conserve biodiversity. The panel recommended a paradigm shift in old-growth forest management, emphasizing ecosystem health, biodiversity, and Indigenous involvement over traditional industrial forestry priorities. Notably, the cultural importance of old forests was recognized as a key value for all BC residents, perhaps especially Indigenous people; one of the two Review Panel members was a senior Indigenous forester.

Quantifying the amount of area that is set aside for biodiversity protection is challenging because there is considerable overlap between the types of areas that are unavailable for harvesting. For example, inoperable areas are those forest areas that have trees of a merchantable size and species, but the terrain is too steep or rugged to permit logging. Ungulate winter range, parks and reserves, and old growth management areas may all contain inoperable area, so that using the gross areas will double or triple count individual hectares. Similarly, substantial areas are identified as uneconomic to harvest – they may be too far from existing roads or require an unacceptable road-building expense to reach them, or they may be forests of low productivity or of species for which there are no markets. Uneconomic areas also overlap with many of the areas set aside for ecological reasons.

Perhaps the best indications of the relative importance of biodiversity and its conservation are the decline in the AAC since 2003 (See preceding section), which has in part been driven by increased conservation measures, and the low proportion of area within each TSA that is available for commercial timber harvesting (See Table 10). Functionally, inoperable areas contribute to biodiversity conservation as much as parks and conservation areas – while the areas may not have outstanding ecological significance, they also experience little human presence.

7 Forest Disturbance and Growing Stock 2003-2023

The natural disturbances that occur in the wet forests of the coast and the interior wet belt are primarily gap disturbances, since fire is rare. The main natural disturbance agents, windstorms, insects and disease – as well as individual tree mortality, create openings that are usually filled over time by the existing understory and mid-story trees, which tend to be shade tolerant. Landslides also occur from time to time, creating larger openings that may be filled by a wider range of species, including deciduous ones. The rarity of stand-replacing disturbances has led to the formation of old, stable forests in these BEC classes, many of which have been harvested now, especially on the coast.

The Interior is a different story. The hot and dry conditions in the interior mean that fire is the primary natural disturbance, although the MPB outbreaks have also affected the forest. In fact, prior to 2017, MPB was the primary natural disturbance agent in the CA.

In 1999, an MPB outbreak arose that spread rapidly throughout much of the BC interior, causing extensive mortality of lodgepole pine, its principal host. The forests of the catchment area were affected, as overall, 27.4% of the timber volume in the Timber Harvesting Landbase (THLB) in 1999 was pine, mostly lodgepole pine. (The other species of pine in the Pine category are less attractive hosts for MPB.) A BC Forests Analysis calculated that in 1999 the volume of pine in the CA was almost 240 million m³. The Merritt TSA had the most pine volume, at 66 million m³, and the Okanagan and Kamloops TSAs each had about 58,000 m³; 77% of the pine volume in the CA was in these three BEC zones. Most of the pine mortality occurred between 2005 and 2011, by which time almost 30% or 72 million m³ of the pine that was present in the CA in 1999 had been killed.

Most of the mortality was in the three TSAs just mentioned. Half of the 1999 growing stock in the Merritt TSA was pine, and 27% was killed by 2011, with negligible losses afterwards. In the Kamloops TSA, 49% of the pine was lost by 2009, representing the largest proportional loss of pine within the CA. Okanagan, as well as other TSAs with lower volumes of pine (e.g. Boundary), lost less than 20% of their pine.

At the other extreme, the two TSAs in the Coastal Region – Fraser and Soo – had negligible amounts of pine to begin with in 1999 and experienced very little MPB mortality. In those two TSAs, the mortality was less than 1 % of the total growing stock of all species in 1999. In the east, the Kootenay Lake and Revelstoke TSAs had very little pine and lost little of it.

The infestation led to extensive salvage harvesting in the Merritt, Okanagan and Kamloops TSAs. MPB's impact on these three TSAs was to reduce both the average age of the forest and the volume of growing stock (especially of pine). However, the diversity of the forests

in these TSAs, and in the CA as a whole, limited the impact of the MPB mortality compared to areas further north in the Interior.

More recently, fire has become the chief natural disturbance agent. BC experienced record-breaking fire years in 2017, 2018 and 2021 – each of these years saw more area burned (1.2 million ha, 1.35 million ha and 863,000 ha, respectively) than had been experienced since record-keeping began in the 1920's. The record for area burned was obliterated in 2023, when 2.8 million hectares, or 4% of BC, burned.

The CA was relatively fortunate in that it only experienced large fire losses in 2021. The majority of the 2017 and 2018 fires occurred north of the CA, although in 2017 a large fire entered the Kamloops TSA. The CA was also fairly fortunate in 2023; Okanagan and Kamloops TSAs had 67,000 and 64,000 ha burned, respectively, but this only accounted for about 5% of the total area burned in the province. However, in all three TSAs, most of the area burned was outside of the THLB²², and within the fire perimeter, roughly half of the forest was killed, and the rest survived.

The CA got hit hardest in 2021, when most of the area burned in the province was in the CA, especially in the Kamloops, Lillooet, Merritt and Okanagan TSAs. The BC Ministry of Forests determined that roughly 139,000 ha were burned in Kamloops, 85,000 ha in Okanagan, 78,000 ha in Lillooet and 69,000 ha in Merritt. Two-thirds of the area burned in Kamloops was in the THLB, compared with half in both Merritt and Lillooet and 1/3 in the Okanagan TSA. These area burned figures are measured as the total area inside the fire perimeter, however not all of this area was consumed by the fire. Figure 10 shows the area within the fire perimeter that was killed versus what survived; Lillooet stands out as having the third most area killed within the fire perimeters (Sourced from Ministry of Forests. 2022. Impacts of 2021 Fires on Forests and Timber Supply in British Columbia. Forest Analysis and Inventory Branch, Office of the Chief Forester. April 2024.).

²² The THLB is the area that is both legally and economically available for harvest.

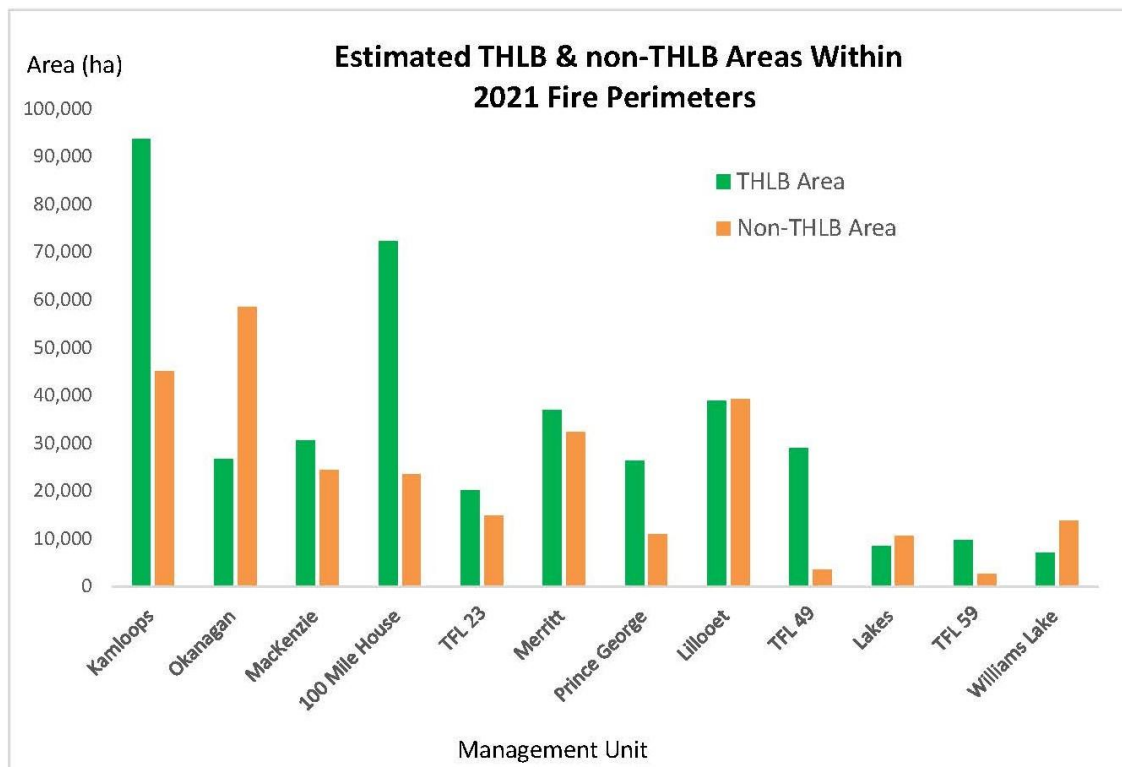


FIGURE 10. ESTIMATED THLB AND NON-THLB AREAS WITHIN 2021 FIRE PERIMETERS (HA).

The impacts of 2021 fires have caused downward pressure on the AACs for Okanagan and Lillooet and can be expected to do the same for the AACs in the Kamloops and Merritt TSAs since those TSAs each lost between 4.5 and 5% of their THLB. Losses were proportionally more severe in Lillooet, where the area burned represented almost 10% of the THLB. The most recent TSR for Lillooet was completed in October 2023, and the base case was developed using a forest inventory updated to 2022, so that it incorporated the 2021 fires. Fires in 2022 and 2023 burned an additional 55,300 ha in the TSA and the Chief Forester responded by adding a dead wood component to the AAC to encourage salvage operations.

Because more area inside Okanagan's fire perimeters survived than was killed, the area actually burned in that TSA amounted to approximately 2.5% of Okanagan's THLB. The Rationale document for the 2022 Okanagan TSR reported that the initial base case harvest scenario had overestimated the AAC by about 30,000 m³ (by under-estimating non-recoverable losses) and the Chief Forester felt that this new reduction was sufficient to account for the impact of fires.

Figure 11 compares the volume harvested by clearcutting, partial harvesting and salvage cutting and the volume of timber killed by wildfire for the entire CA, divided into four age classes:

Regen – Regenerating forest that is 1-19 years old;

Thrifty – Juvenile forest in the ages of rapid development, between 20 and 69 years old;

Mature – Forest that is continuing to grow but at a declining rate – forest in this class is desirable for harvesting and is aged 70 years to the old-growth threshold;

Old – Forest that has generally stopped growing and may be more or less static or is developing into a multi-age stand as the canopy trees die. The threshold age is 140 for most forest types – see Annex 2 for more detail.

The volumes are shown for the four five-year periods: year 0 is 2003; year 5 represents the 2004-2008 period, year 10 is 2009-2013, etc. The figure shows that the majority of the volume harvested was in the mature age class, and a substantial amount of old volume was also harvested. Figure 11 indicates that there was more than 5,000 ha harvested in the regen age class during the first period and some in the next two periods as well. This is likely overstated and can be attributed to inaccuracies in the forest inventory (the harvest boundary being not quite accurate and including some young forest) that were revealed during backcasting the 2023 inventory.

The chart also shows that in the first three periods, almost all of the harvest was by clearcut, and there was little salvage harvesting. Between 37,000 and 42,000 ha were cut annually, on average, during this period. The slight decline in period 2 represents the impact of the 2008-09 recession, which BC's forest sector was able to mitigate by increasing its exports to Asia, which was far less affected than North America. BC had already begun to diversify its export markets away from the US towards Asia, and China in particular. When the recession arrived, BC was able to expand on the linkages it had already created to largely maintain output.

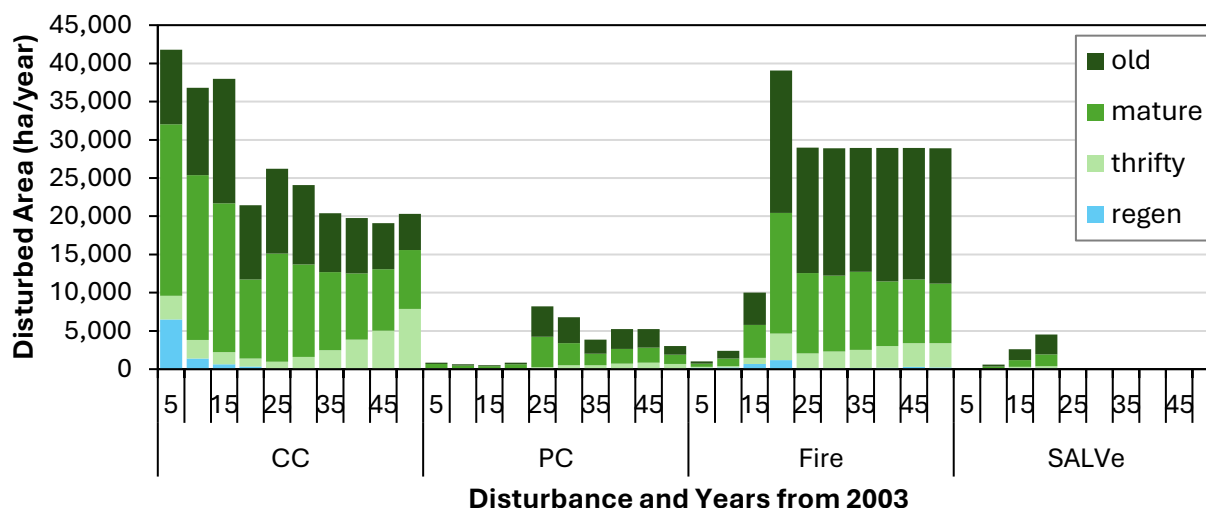


FIGURE 11. AREA AFFECTED BY DISTURBANCE (HA/YEAR) (CC = CLEARCUT, PC = PARTIAL HARVEST, FIRE = WILDFIRE, SALV = SALVAGE HARVEST)

However, the harvest level dropped substantially in period 4 (2019–2023). The decline is only partially due to a declining AAC (as FiFigure 11hows, there was a substantial undercut in period 4). Another factor is the harvest deferrals of old growth, the first of which were announced in September 2020, and have since been added to a number of times. These have not been reflected in AACs, and so the “interim” allowable cuts are lower than the official levels.

There were also some notable sawmill closures in 2019 that affected the CA. That year, West Fraser Timber closed its Chasm sawmill, in Clinton, which is just west of the Kamloops TSA and Canfor Corporation closed its sawmill in Vavenby, which is in the Kamloops TSA. Also in 2019, Interfor closed its Hammond sawmill, in Maple Ridge (which is in the Fraser River valley about 45 km east of Vancouver, and within the Fraser TSA). Finally, Tolko Industries announced in 2019 it was closing its sawmill in Kelowna, which ceased operations in January 2020. The closures were all attributed to the high cost of wood and challenging market conditions.

The pandemic pushed up lumber and composite board prices to records in the second half of 2020, and while prices fluctuated for the next two years, they reached very high peaks again in the spring of 2021 and February – March of 2022, before beginning a steady decline throughout the year. Product prices have been low in 2023 and 2024, and many mills have taken downtime during this period, contributing to the lower harvest.

Figure 12 compares the actual harvest against the AAC – the total height of each bar represents the average AAC during the period. The orange zones in the bars indicate the shortfall in the actual harvest compared with the AAC – the orange represents the unharvested AAC amount. Figure 12 shows that the AAC has been undercut throughout most of the past two decades; roughly 25% of the AAC went unharvested between 2004 and 2013 while only 57% of the AAC was cut between 2019 and 2023.

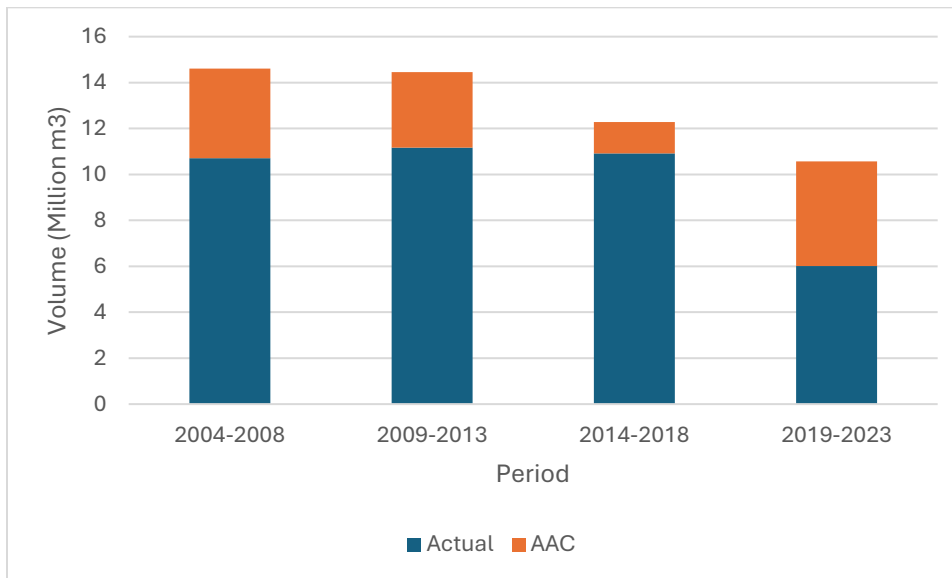


FIGURE 12. COMPARISON OF AAC VERSUS ACTUAL HARVEST VOLUME (MILLION M3/YEAR)

7.1 Growing Stock

Despite the harvesting, fire and MPB, the amount of live growing stock in the CA forest has been very stable between 2003 and 2023, as can be seen from Figure 13. In 2003, at the start of our analysis, the growing stock stood at 1,233 million m3. For the next 15 years, it ranged between 1,235 and 1,232 million, however it had declined to 1,225 million m3 by 2023. This most recent decline is likely attributable to the fire losses.

Between 2003 and 2023, the volume of mature timber declined from 507 million m3 to 414 million m3, a decline of 18%. However, the volume of old forest increased steadily from 648 million m3 to 730 million m3, a 13% increase that almost offset the reduction in mature timber volume. The volume of thrifty timber fell from 77 to 68 million between 2003 and 2008, likely due to the impact of the MPB, but then rose through to 2023 to reach 80 million m3.

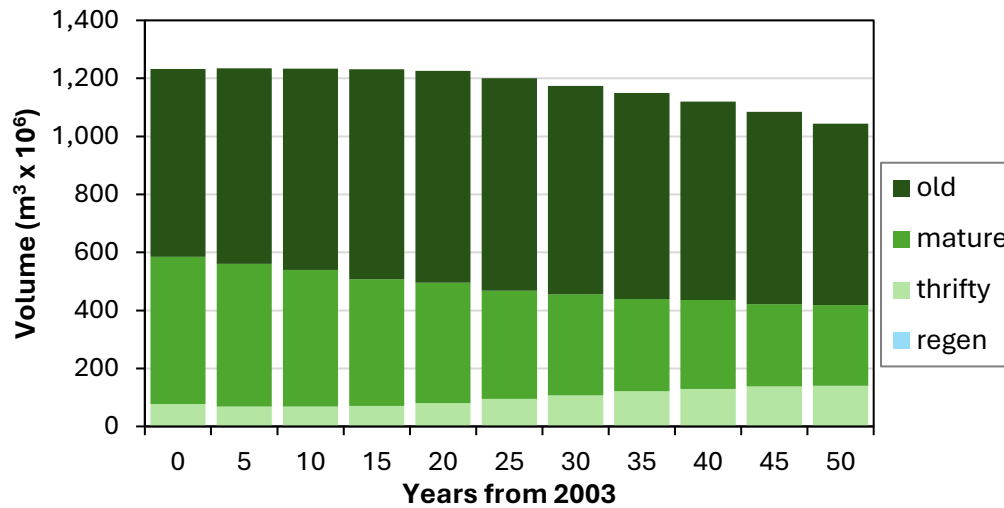


FIGURE 13. TOTAL GROWING STOCK (LIVE AND DEAD) BY AGE CLASS (2003-2023) (MILLION M3)

It is important to note that the volume of old forest has increased significantly throughout the past 20 years, evidently as mature forest ages into the old category.

In Figure 14, growing stock data are shown by species, with the volume of dead wood shown separately. Fir, Cedar, Deciduous, Douglas-fir, Hemlock and Larch have all gradually increased their volumes between 2003 and 2023. Spruce has decreased gradually by a total of 4% during this period, but the biggest declines have occurred in the volume of lodgepole pine, which has fallen by 25%, with most of the decline occurring in the first decade. MPB is the culprit here. Once again, however, the growth of the majority of the species has offset the lodgepole pine (and spruce) mortality.

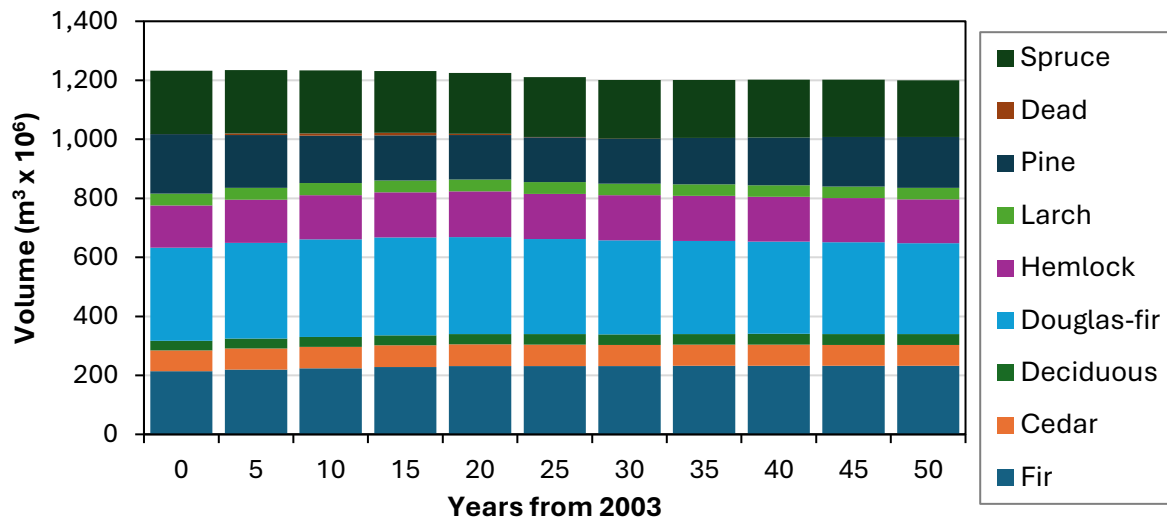


FIGURE 14. GROWING STOCK (2003-2023) BY LEADING SPECIES (MILLION M3)

Unlike the more northerly forests, the amount of dead wood in the forest has been low, peaking at 4% in 2018.

8 The Future Fire Regime

8.1 Introduction

In 2017, British Columbia experienced its worst recorded wildfire year, in terms of area burned, since record-keeping began in 1919. The 1.2 million ha burned that year was eight times the annual average of 142,000 ha. In 2018, this record was broken as 1.3 million ha burned. Another bad fire year followed in 2021, as 869,000 ha burned.²³

Most of the area burned in 2017 and 2018 was north of the catchment area, however in 2021, 54% of the area lost was in the Kamloops, Okanagan, Lillooet, Merritt and 100 Mile House TSAs (100 Mile House TSA is just to the north of the CA). Another 90,000 ha was burned in Tree Farm Licence 23 (primarily within the boundaries of the Arrow TSA) and in Tree Farm Licences 49 and 59 (both within the Okanagan TSA).

The fires of 2017, 2018 and 2021 were harbingers of what was to come in 2023, when 2.84 million ha burned in BC. Drought in the fall of 2022, a relatively low amount of snowfall

²³ <https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/wildfire-history/wildfire-season-summary>

during winter and the early onset of hot dry weather provided the ideal conditions for wildfires. The number of fires in 2023 was not exceptionally high, but there were several very large fires; notably the Donnie Creek Fire in the Prince George Fire Region, which burned 619,073 ha. This is the largest recorded single wildfire experienced in BC.

Climate change models have predicted increasingly active wildfire regimes and the effectiveness of fire suppression since the 1950's has led to high fuel loads in many forested areas, which have exacerbated fire severity. The relatively recent occurrence of record-breaking fire years creates many questions regarding future fire regimes. In the Williams Lake CAA, completed in 2023, the consultants modelled two fire regimes in the forest projections – in retrospect, these have proven to be far too conservative.

Accordingly, for this CA, the consultants conducted a more extensive review of recent literature and spoke with a variety of fire and forest projection experts to get a better understanding of the current thinking about where the fire regime was headed. Estimating what the future fire regime will be like remains the most challenging part of developing the forest development scenarios for the 2024-2053 period.

8.2 Summary of Recent Research

Seven recent research papers were found that were particularly relevant. Coogan et al. (2019) and Hanes et al. (2019) both provided a national perspective on fire regimes while Coogan et al. (2022) and Parisien et al. (2023) assessed fire regimes in the province of BC. Halofsky et al. (2020) examined fire regimes in the US Pacific Northwest, which included Washington and Idaho, which are just across the international border from the CA. Brookes et al. (2001) examined historic fire regimes in a 161 ha research area south of Williams Lake, in central BC. Baron et al. (2022) looked at the change in fire regimes in the East Kootenay region in south-east BC, located just to the east of the CA.

In all of these studies, there was agreement that fire regimes have become more active in the past couple of decades. The extent of the increase in fire activity varied by region, with some parts of BC, notably the Interior Cordillera, experiencing less fire activity.

The most commonly used metric to describe fire regimes is area burned, for this is the metric most often reported in fire records. Hanes et al. (2019) listed wildfire frequency, annual area burned, fire size, severity, intensity, seasonal length, type of fire (ground, surface or crown) and cause (human or lightning) as a set of metrics that more completely describe the fire regime. Frequency of fire, fire size, length of the fire season and cause are aspects that are also available, especially for more recent BC fire statistics and some of these metrics are included in the discussion that follows.

Hanes et al (2019) assessed the national wildfire trend between 1959-2015 and compared the results with an earlier study done in 2002 which used data from 1959 – 1997. Hanes et al. (2019) found that for all metrics examined, the values from 1959-2015 indicated a more active fire regime, indicating that the fire regime became more active between 1997 and 2015. For example, the average annual area burned (AB) between 1959-1997 was 1.82 million ha, whereas it increased to 1.95 million ha between 1959-2015. This suggests that the AB between 1998 and 2015 was 2.1 million, however the increase in AB did not happen continuously. Instead, the AB declined from 2000 to 2009, and then increased sharply in the 2010-2015 period. Nationally, the AB increased by 33,593 ha/yr between 1959 and 2015, and increased in all fire zones except the Interior Cordillera and two others.

Human-caused ignitions have generally declined since the 1950's, while the impact of lightning has grown. In particular, the AB, number of large fires and number of lightning-caused fires has increased in most of western Canada. Lightning caused 85% of large fires, accounting for 91% of AB in the current study. (In Stocks et al (2002), the respective figures were 72% and 85%.)

While humans cause the most fires, lightning-caused fires account for most of the area burned because the starts are often in remote locations and because lightning strikes occur in clusters which can overwhelm suppression efforts.

The importance of large fires has also increased. The fires that occur within the smallest size class (200-500 ha) account for 32% of the NOF but only 2.3 % of the AB. Fires between 500 and 10,000 ha accounted for 60% of the NOF and burned 49.7% of the AB; the very large fires greater than 10,000 ha burned 48% of the AB but represented 8% of the NOF. The trend analysis found that the 5th percentile of fire size (where 5% of the fires are smaller and 95% are larger than the percentile value) did not change significantly over time, whereas the change in the 50th-percentile fire size was significant – the area doubled from 1959 to 2015, increasing at a rate of 15 ha/year. Significant changes also occurred at the 95th percentile, where the average size of a 95th-percentile fire rose by 271 ha/year between 1959 and 2015, for an overall increase of 57%. In summary, the average fire size is getting larger, and a higher proportion of fires is reaching the large and very large size classes.

Finally, the length of the fire season is growing – on average across Canada, it is starting nine days earlier than it did in 1959 and ending seven days later.

These changes in the fire regime align well with the discussion by Coogan et al. (2019), which points out that for some time, fire scientists have been warning about the changes in fire regime we are now seeing. Looking forward, Coogan et al. (2019) cited projections of

area burned based on weather – fire danger relationships which show a 75%–120% increase in area burned in Canada by 2100. A separate 2010 study cited by Coogan et al. (2019) predicted an eight-fold increase in the AB in the Ontario forest management zone by the end of the century.

These results align well with the BC fire regime assessments done by Coogan et al. (2022) and Parisien et al. (2023).

Parisien et al. (2023) examined BC fire data from 1919 – 2021 and found that after a long period where the number of fires and area burned declined (from roughly 1950 – 2000), fire activity began increasing around the year 2000. Parisien et al. (2023) note that despite continued high levels of precipitation in the province, moisture deficits have increased due to rapid warming and increased evaporative demand. While total rainfall levels may not have changed much, there have been some extended droughty periods since 2005. When these combine with extended high-temperature events (e.g. heat domes), fire conditions are maximized. For example, during the heat dome of late June 2021, record high temperatures were set that were in some cases up to 7 or 8 degrees higher than the previous maxima – indicating that some kind of weather threshold had been crossed.

Parisien et al. (2023) report that on-going climate change can be expected to lead to increases in the number of fires, fire intensity (e.g. crown fires), fuel consumption, area burned and a longer fire season in many forested ecosystems across Canada. Wotton et al (2017) discuss the limits of fire suppression capability, stating that fire agencies will become increasingly challenged to maintain their current level of effectiveness, and the number of days when fire intensity exceeds suppression capabilities will increase substantially over the remainder of the century.

Parisien et al. (2023) note that the increased fire activity in BC is occurring decades sooner than forecast. Between 1919 and 2016, only three wildfire seasons surpassed 500,000 ha burned. In four of the past seven years, more than 900,000 ha has burned.

Coogan et al. (2022) examined the clustering of human-caused and lightning-caused fires in BC. Clustering of each type of fire was identified in BC, however as one might expect, the locations of the clusters differed by fire cause. Coogan et al. (2022) found that clusters of lightning-caused fires occurred throughout the CA, practically covering the entire CA area with clusters.

Human-caused fires tended to cluster where there was abundant wildland-urban interface area and were correlated with population centres and roads. Community size did not seem to correlate with cluster location. The analysis found many clusters located in the CA, especially in the region around Kamloops and Kelowna, which is well populated and

receives numerous tourists. Most human-caused fires were found to occur during April and May, and they have contributed to the lengthening of the fire season.

One of the most definitive studies was one published by Baron et al. in 2022 that examined fire trends in southeastern BC.

They identified three distinct fire periods – 1919-1939, 1940 – 2002, and 2003 – 2019. These periods were distinguished by differences in area burned, number of fires, and average fire size. The change in 2003/04 was attributed to an increased number of lightning-caused fires, sparked by an increase in the number of lightning strikes.

Baron et al. (2022) found that wildfires were quite active between 1919 and 1939, burning 838,000 ha or 38.1% of the area. The mean fire size was 1309 ha. Both human-caused and lightning-caused fires contributed to the fires. However, the extent of fires decreased significantly during the period between 1940 and 2002, when only 138,000 ha (8.5% of the landbase) burned. The average fire size was much smaller, at 281 ha. This decrease that started in the 1940s was correlated with reductions in the numbers of both human and lightning-caused ignitions. Baron et al. (2022) noted some additional factors that likely contributed to the decline in fire activity that began in the 1940s. Climate-wise, there was a Pacific oscillation during the 1940s that brought cool moist conditions. Additionally, many Indigenous communities were moved to reserves in the late 1930's /early 1940s, which eliminated the influence of Indigenous burning.

Starting in 2003, the fire regime changed again. Between 2003 and 2019, a total of 174,000 ha (7.9%) burned with an average fire size of 708 ha. Since 2003, the number of fires has increased by 29%, the mean burned area by 265%, and the mean fire size by 152%. During the 2003 to 2019 period, the annual burned area increased by an average of 1,920 ha/year.

Baron et al. (2022) reported on variation in the amount of lightning activity. They found that the relative importance of lightning as a cause of ignition was lowest in the 1970's (accounting for 15.3% of ignitions) and the 1980's (27.3%). However, by the 2000's, lightning-caused more than 50% of the fires and more than 80% in the 2010's.

Interestingly, Baron et al. (2022) report that the region remains in a fire deficit, and that the pre-European settlement fire regimes were much more active. Depending on the forest type, they estimate that the Kootenay region would have burned between 1 – 10 x in the past century, using conservative estimates. This is consistent with the results of Brookes et al. (2021), who conducted a dendrochronological study of a 161-ha area in a dry Douglas-fir forest in Central BC. They found that between 1619 and 1943, fires burned at an average interval of 10-30 years, primarily at low to moderate intensities. Contrary to the conventional wisdom, the majority of these were of low to moderate intensity and only

established new cohorts at very fine scales. Brookes et al. (2021) identified 1943 as a break point in the fire regime – there were no fires in the study area after that year (note that 2015 was the end point of the time series).

The final very relevant paper examined fire regime trends in the US Pacific Northwest, consisting of Washington, Oregon, Idaho and western Montana. Halofsky et al (2020) assessed the future fire risks for three broad ecosystem types in the Pacific NW (Washington, Oregon, Idaho and western Montana), based on the authors' assessment of the literature and experience in conducting climate risk assessments.

The risk ratings apply to the mid- to late-twenty-first century. A rating of a low likelihood indicates an estimated 0 – 33% probability, a moderate likelihood represents consequences that are as likely as not to arise (33 – 67%), and high likelihood represents consequences that are likely to very likely occur. Low confidence is characterized by low scientific agreement and limited evidence, whereas high degree of confidence reflects a high level of scientific agreement and robust evidence. A moderate level indicates that the degree of confidence is in the middle somewhere.

Fire-climate interaction	Magnitude of consequences	Likelihood of consequences	Confidence in Assessment
Wildfire frequency	Small increase	Low	High
Wildfire extent	Small increase	Low	Moderate
Wildfire severity	No change to small increase	Low	Moderate
Reburns	No change to small increase	Low	Moderate
Stress interactions	Small increase	Low to moderate	Moderate
Regeneration	No change to small increase	Low	Low

TABLE 12. WILDFIRE RISK RATINGS FOR MOIST CONIFEROUS FORESTS (LOW TO MID-ELEVATIONS).

Notes: Stress interactions are combinations of biotic and abiotic stressors or stress complexes that are likely to be major drivers of shifts in forest ecosystems. For example, a

warmer climate will directly increase the extent of soil moisture stress and indirectly through increased extent and severity of wildfire and insects. Regeneration is the risk of regeneration failure, through absence of seed source, mortality through drought, etc.

Fire-climate interaction	Magnitude of consequences	Likelihood of consequences	Confidence
Wildfire frequency	Large increase	High	High
Wildfire extent	Large increase	High	High
Wildfire severity	Large increase in areas with elevated fuel loading	High	High
Reburns	Moderate increase	Moderate	Moderate
Stress interactions	Large increase	High	High
Regeneration	Low to high decrease, depending on site	Moderate	Moderate

TABLE 13. WILDFIRE RISK RATINGS FOR DRY CONIFEROUS FORESTS AND WOODLANDS (LOW TO MID-ELEVATIONS, EAST OF THE CASCADE MTNS.)

Fire-climate interaction	Magnitude of consequences	Likelihood of consequences	Confidence
Wildfire frequency	Moderate increase	Moderate	High
Wildfire extent	Moderate increase	Moderate	Moderate
Wildfire severity	No change to small increase	Low	Moderate
Reburns	No change to small increase	Low	Moderate
Stress interactions	Small increase	Moderate	Moderate

Regeneration	Variable, depending on fire size	Moderate	Moderate
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TABLE 14. WILDFIRE RISK RATINGS FOR SUB-ALPINE CONIFEROUS FOREST AND WOODLAND (HIGH ELEVATIONS)

The catchment area includes all three forest types; however, most of the CA would be under the dry coniferous woodlands category. There are higher elevation areas throughout the CA that would correspond to Halofsky et al.'s (2020) sub-alpine coniferous forests and woodlands. Moist, coniferous forests occur on the western-facing slopes in the Fraser and Soo TSAs, and in the so-called "Inland Rainforest" in the Revelstoke TSA.

In addition to reviewing these research papers, the consultants had online interviews with Kelly Izzard and Mike D Flannigan, two recognized experts in forest planning and wildfire management, respectively.

Based on the review of literature and discussions with experts, there is no doubt that the fire regime is becoming more active. Climate change is the major driver, since it creates more extreme fire weather conditions more frequently than has been the case in the past. It is these episodes of severe fire weather that are responsible for the severe fire years. Even without climate change, the southern Interior tends to be dry, and higher temperatures lead to longer fire seasons, as well as more thunderstorms of higher intensity.

The average annual area burned, the number of large fires and the intensity of fires is on an increasing trend, and the literature as well as discussions with experts support the contention that a notable shift in fire regimes occurred in and around 2000.

There was also agreement that the fire regime varies by BEC class. The Ponderosa Pine – Bunchgrass BEC zone is very dry however it is more likely to have relatively frequent low intensity fires because the fuel loading and distribution do not lend themselves to severe fires. Large ponderosa pine trees are also very fire resistant and so the mortality of large trees is limited in a typical fire. The Montane Pine (MP) and Interior Douglas-fir (IDF) BEC zones are also quite dry but have a higher fuel loading than the PP BEC zone. Climate change is making fire regimes much more active in these two BEC zones.

The MP and IDF BEC classes are generally found at lower elevations, and when fires start in these forest types and burn upslope, they will often move into the BEC Zones typical of the mid-elevation, namely the ESSF BEC zone. As a result, an increased intensity of fire can be expected in this BEC zone in the future as well.

The key question concerned the rate of future fire increases. Opinions were divided on the extent to which the fire seasons of 2021 and 2023 were outliers. In the CA, the fires of 2021 burned almost 4% of the CA area, which is equivalent to a 25-year rotation. If fire continued at this rate, the forests would quickly change so dramatically that the consequences for the forest sector and the forest itself would be catastrophic. In 2023, 1.27% of the CA burned, equivalent to a 79-year rotation. Prior to 2021, the largest percentage of the CA that burned in a single year was 0.74% in 2017, equivalent to a 135-year rotation.

One expert felt that fuel management measures would be largely ineffective in limiting wildfire activity. A major reason is that fires can send burning embers 2–3 km away to start new fires. So, while some fuel management may be done around communities and key infrastructure (this should be coupled with the installation of sprinkler systems), it was felt that it is not worthwhile doing fuel management in other areas. As a result, the scenarios do not envisage a significant management response to reduce fire regimes.

The methodology for developing the future fire regimes to be modelled was devised by the consultants, based on their assessment of the research papers, fire data for the CA, and discussions with experts. The responsibility for the choices made rests with the consultants alone. Based on the reviews and discussions, three alternative scenarios were developed, effectively representing a low, medium and high future fire regime. The three scenarios are:

4. (FireHist Scenario) The area burned each year was the average area burned between 2000 and 2023. Approximately 0.37% of CA burned annually on average during this period. The fire regime changed in 2000 and conservatively it was kept constant in this scenario. Note that in 2021, ~4% of the CA burned but before that, the worst fire year was 2017 (0.74%).
5. (FireLinInc1pct Scenario) Area burned from 2024 to 2053 increased linearly from 0.5% in 2024 to 1.0% in 2053. Note that a 1% burn rate implies an average age of 100 years, if every hectare burns once during a 100-year period.
6. (FireLinInc1p5pct Scenario) Area burned from 2024 to 2053 increased linearly from 0.5% at 2024 to 1.5% in 2053. Note that a 1.5% burn rate implies an average age of 67 years, if every hectare burns once during a 67-year period.

We also modified the assumptions relating to salvage compared to the Williams Lake CAA. Based on discussions and a site visit with an experienced logger, the consultants saw that fires do not burn through to the wood of a tree unless there is a pre-existing scar or dead branch stub. Thus, there is potential for any mature burned forest to be salvaged. However, burned spruce deteriorates very rapidly – the bark begins to fall off after two to

three months and deterioration sets in thereafter, so the window for salvage is two to three months. In contrast, burned Douglas-fir retains its bark for as long as 18 months, providing a much longer window for salvage. As a result, we will assume that burned Douglas-fir can be salvaged whereas dead spruce cannot.

Lastly, there was agreement that young stands typically do not burn – we assumed that fires would not occur in stands 20 years old or younger.

9 Forest Projection 2024-2052

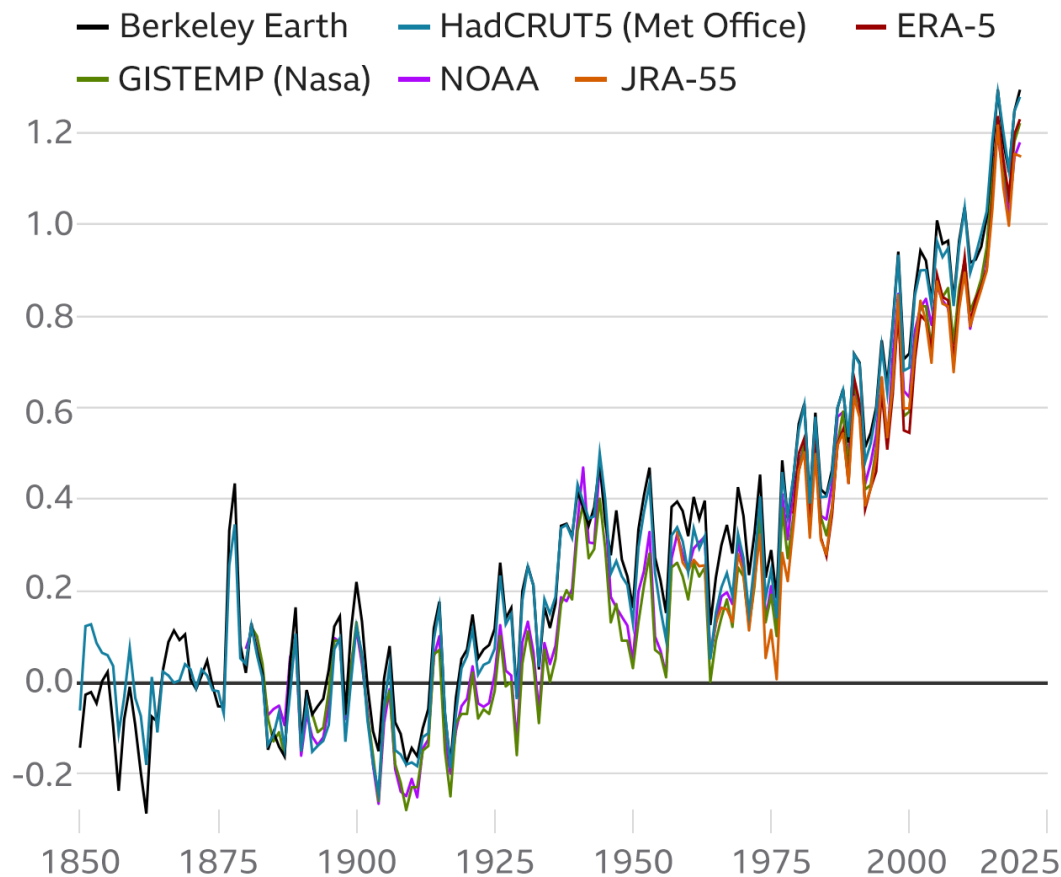
9.1 Methodology

It has become apparent that the global climate has changed significantly, not just from pre-industrial levels but also over the past 20 years. Figure 15 shows the global mean temperature change from 1850 to 2020, as measured by six atmospheric monitoring agencies.²⁴ This approach provides a greater degree of confidence in the chart, since datasets are highly correlated.

²⁴ <https://www.bbc.com/news/science-environment-58102953>

Temperature rise since 1850

Global mean temperature change from pre-industrial levels, °C



Source: Met Office

BBBC

FIGURE 15. GLOBAL MEAN ANNUAL TEMPERATURES 1850-2020; SIX DATASETS.

Temperatures have continued to rise and 2024 is highly likely to be the first year where the global average surface temperature will be more than 1.5° above pre-industrial levels.²⁵ Not only is this a record high, but it is also the first year when the global average exceeded the aspirational limit to warming established in the Paris Agreement.

BC, and the CA, have already experienced significant impacts of climate change. The extent and duration of the mountain pine beetle infestation can be attributed to climate change as can an increasingly active fire regime. As mentioned, BC has experienced a worsening fire regime during the past two decades, which, together with an increased probability of drought, flooding and other extreme weather events raises many questions

²⁵ https://www.carbonbrief.org/state-of-the-climate-2024-will-be-first-year-above-1-5c-of-global-warming/?utm_source=substack&utm_medium=email

about how the forest will be affected. There are likely to be significant impacts on the forest industry and this CAA included some forest projection modelling to examine potential future outcomes.

The projection analysis focussed on the fire regime, in part because it is perhaps more readily modelled than other climate changes. Another widespread MPB outbreak was considered relatively unlikely during the next 30 years, since the previous outbreak killed much of the MPB's host species, and time is needed for the MPB's food supply to replenish itself. Floods, droughts and windstorms are more difficult to predict, and their impacts have been much less well studied compared with the impacts of wildfire.

As discussed in Section 8, the consultants developed three scenarios differentiated by their fire regimes. Figure 16 shows the projected amount of area burned under each of these scenarios from 2024 onwards. Under Scenarios 2 and 3, the most extreme effects of fire occur late in the analysis; as a point of interest, the Scenario 2 burned area in 2053 is achieved under Scenario 3 around the year 2040.

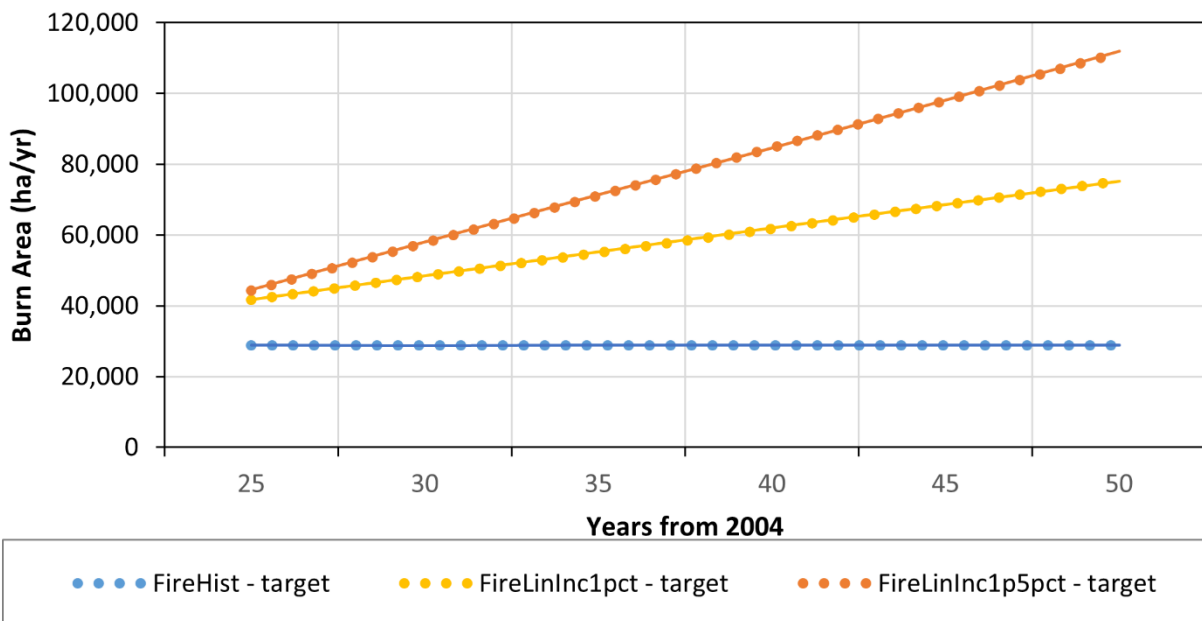


FIGURE 16. FIRE AREA TARGETS UNDER THE THREE SCENARIOS FROM 2024 TO 2053.

None of these represents a prediction on the part of the consultants; instead, the intention was to examine the impacts of alternative levels of fire in the CA during the next 30 years. The consultants recognize that there is a possibility that the government will initiate a management response to the increased risk of fire, perhaps by undertaking fuel management practices, putting in fire breaks, and enlarging its firefighting capability.

Indeed, some of these things are already happening, however several of the experts that we spoke with felt that these actions may have a local impact but are unlikely to have much effect on the regional fire regime.

Appendix II provides a detailed description of the data sources used in the modelling analysis, the assumptions made, and the treatment of other management directives. Only some of the most important assumptions will be summarized in this section.

9.2 Projected AACs and Harvest Levels

A critical element of the forest projections is being able to assess how the Annual Allowable Cut (AAC) will change within the CA. The estimation of future AACs draws on several sources of information.

Firstly, it is assumed that the AAC set in the most recent TSR will remain unchanged until the next TSR, which is always anticipated to take place ten years after the previous one. In some cases, where the Chief Forester has specified a step down in the AAC after five years, that change has been incorporated into the table. It is recognized that the next TSR updates may not be completed within ten years of the previous one – for example, the Soowahlie TSR has been deferred. However, any delays, even of a couple of years, are unlikely to materially impact the assessment.

The Discussion Papers produced during the TSR process include a base case scenario for the future AAC. In the past, it would have been safe to assume that the base case was a fair representation of the future path of AACs, since base cases often remained very consistent from one TSR to the next. Moreover, the Chief Forester used to set the AAC very close to the AAC in the base case. More recently, the forest management paradigm has shifted so that the base case provided only partial guidance for future AAC determinations.

It is anticipated that more protected area will be set aside in the CA and that the increasing presence of First Nations in driving forest management will also result in a reduced harvest level. Predicting how these changes will roll out, and at what level, is highly uncertain. There are many factors that might drive an increase in protected areas, including full reservation of priority old growth areas and more areas for wildlife habitat. However, the analysis has keyed in on the BC government's commitment to reach the goal of the 30 x 30 initiative, which is intended to have 30% of the landbase (and waters) protected by 2030. The additional protected area that is created to meet this goal may not completely prohibit forest harvesting, but it is expected that much of it will at least reduce the intensity of commercial timber harvesting. The 30% goal is a province wide goal, however the consultants have opted to model as though it was reached in each TSA. Current

percentages of protected areas range widely from 17 % in the Merritt and Fraser TSAs to 40% in Kootenay Lake TSA, resulting estimates of additional protected area ranging from 13% to zero. Any new protected area was assumed to be identified in the next TSR and result in a proportional reduction in the AAC.

The increasing presence of First Nations in driving forest management is also expected to result in a reduced harvest level. This would be consistent with the changes that have already been made by First Nations who have management authority. In many cases, First Nations are interested in leaving wider riparian buffers than are currently called for, greater in-block retention, and greater retention of older forest. In some cases, partial harvesting may be allowed in the outer zones of the riparian buffers, or if fire burns through an old forest area. The discussions in recent TSR reports indicate that the Chief Forester is beginning to make accommodations to First Nations. The consultant has estimated that there will be a 10% reduction in the AAC to implement First Nations values and this full netdown is assumed to be applied in the next TSR in almost all TSAs. In the TSAs that have had recent TSRs, some of the 10% reduction is assumed to have already been factored into the analysis, based on the discussion in the Chief Forester's rationale.

Another assumption that was made in all scenarios is that the areas where old growth harvesting was deferred would be permanently removed from the harvesting landbase. It may turn out that harvesting may be allowed in the future in some of these deferred areas, however the end point is not clear, and it is all but certain that a substantial portion of the old growth deferrals will not be logged.

Lastly, the projections include an estimate of the actual harvest level as a percentage of the AAC (See Appendix 2 for TSA-level detail). Where the TSR documents report on recent actual harvest levels, these have informed the future actual harvest level. For example, if the average harvest in the past five years has been 500,000 m³/year, if the future AAC is projected to decline below that level, the full AAC is expected to be harvested under the assumption that there will be intense competition for wood. There may also be mill closures, however making such projections is beyond the scope of this project. On the other hand, where current harvest levels are below future AACs, then the projected future harvest is expected to be below the AAC. Some interviewees, and some of the discussion in the Chief Forester's TSR Rationale documents highlighted the declining quality of remaining timber and the increased operational difficulty in accessing some of it. In particular, in TSAs with lots of steep land, a meaningful portion of the THLB may not be economically feasible to harvest.

The forest projection analysis was undertaken using a spatial forest model (Patchworks). The projection started with the 2024 forest inventory and was guided by the assumed

levels of wildfire and forest harvesting. Some salvage harvest was assumed in the burned areas. Patchworks analyzed the changes in the forest caused by the forecast depletion events as well as forest growth along appropriate yield curves and generated an output data set that could be used for the forest carbon analysis.

9.3 Projection Results

One of the key forest metrics is the amount of growing stock present – this is the amount of merchantable volume in the forest. If growing stock is increasing, it indicates that the forest is gaining biomass because its growth outweighs losses due to harvesting and disturbance. Figure 17 shows how the growing stock volume changes between 2003 and 2053 under Scenario 1, where the fire regime is at the average of the past 20 years. Figure 18 shows the growing stock changes under Scenario 2. Figure 19 shows how Scenario 3 affects the growing stock. Note that there is no difference in the growing stock levels between 2003 and 2023, as what is shown in the figures is how the growing stock actually behaved during that period.

The three figures show the amount of volume by age class, including dead merchantable volume (since that can potentially be salvaged).

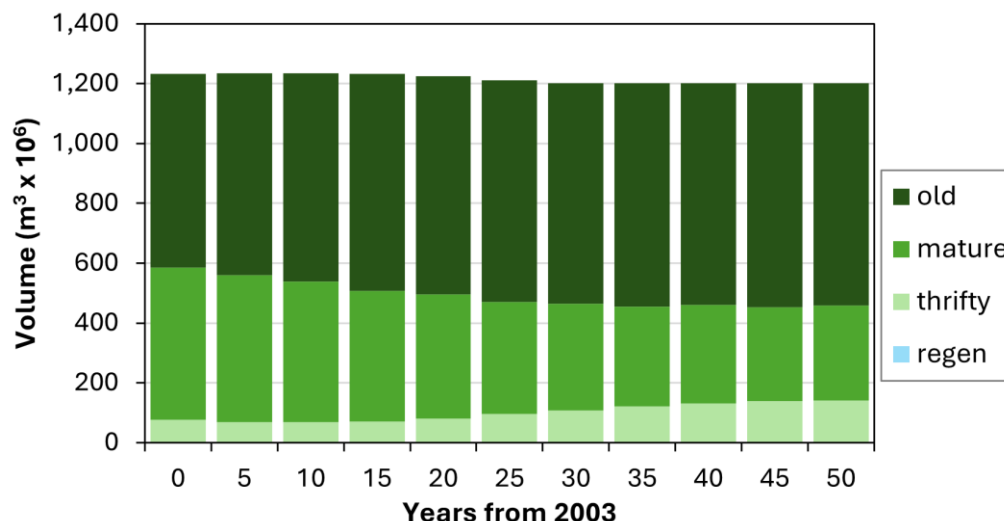


FIGURE 17. GROWING STOCK FROM 2003 TO 2053 IN SCENARIO 1 – THE “FIREHIST” SCENARIO.

Figure 17 shows that in the “FireHist” scenario, the amount of old volume increases from 648 million m³ in 2003 to 740 million m³ in 2028; thereafter it fluctuates between 737 and 750 million m³. In contrast, the amount of mature volume declines substantially, falling from 507 million m³ in 2003 to 414 million m³ in 2023 to 316 million m³ in 2053. The

amount of thrifty volume declined slightly over the first five years before beginning a steady increase thereafter. The amount of volume in the regen class is inconsequential, as most of the stands are too young to have any timber that is merchantable.

Under this scenario, the combined influence of harvesting and fire is sufficient to reduce the amount of timber in the Mature age class but the relatively lower level of disturbance in the Old forest, including the harvest deferrals, leads to an increase in the old forest growing stock. The area of old forest also increases gradually, and mostly continuously, during the 50-year analysis period, indicating that the amount of mature forest moving into the old age classes exceeds the losses of old forest to fire and harvesting.

In Scenario 2 (the “FireLinInc1pct” scenario), the growing stock begins to decline after 2023 as the higher, and increasing, levels of fire combined with harvest remove more volume than can be replaced by growth (Figure 18). In Scenario 2, the old growth volume is 16% less in Scenario 2 in 2053. The Mature growing stock also declines throughout the time period in this scenario; in 2053 it is 55% of the volume that was there in 2003. The amount of growing stock in the Thrifty age class is almost identical between Scenarios 1 and 2.

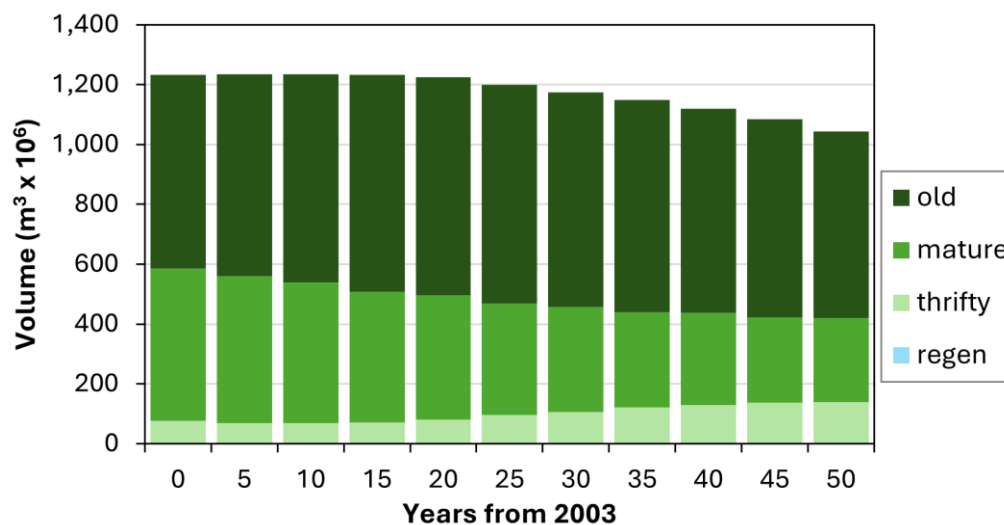


FIGURE 18. GROWING STOCK FROM 2003 TO 2053 IN SCENARIO 2 – THE “FIRELININC1PCT” SCENARIO

As one would expect, the reduction in growing stock is even greater in Scenario 3 (FireLinInc1p5pct Scenario). The total growing stock falls from 1,225 million m³ at year 20 to 935 million m³ at year 50, primarily because the loss of Old forest growing stock is much more in Scenario 3 compared with Scenario 2. This represents a decline of 23%, and the

overall decline between 2003 and 2053 is 24%. What doesn't show up in these figures is how much more area is in the Regen age class as there is more disturbance. At year 2053, 27% of the forest is in the Regen age class in 2053, compared with 13% under Scenario 1 and 21% under Scenario 2.

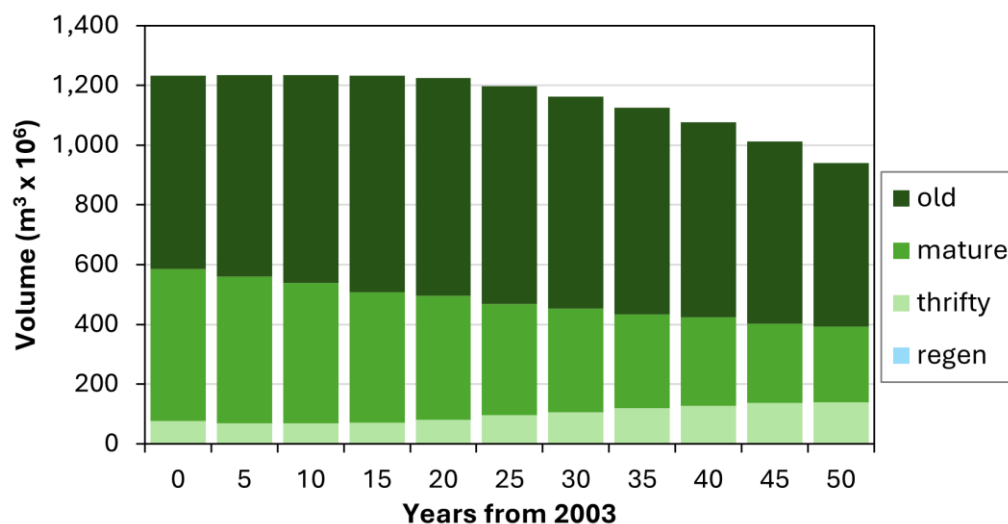


FIGURE 19. GROWING STOCK FROM 2003 TO 2053 IN SCENARIO 3 – THE “FIRELININC1P5PCT” SCENARIO

Figure 20 shows how well the expected (or target) harvest level was attained under the three scenarios. The target volume is not necessarily the AAC; instead, it is the expected amount of harvest that will actually occur, which was derived from examining past performance and the context of harvest in each TSA going forward.

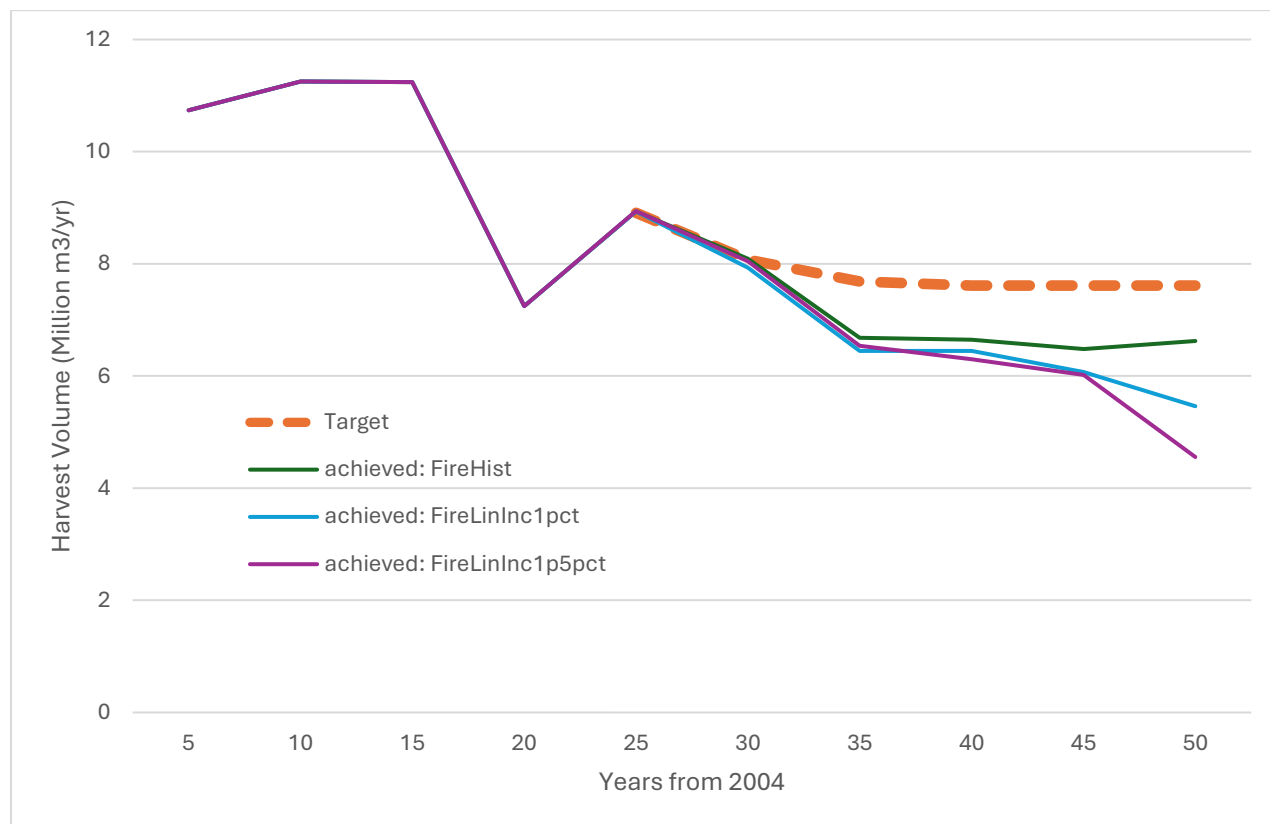


FIGURE 20. ACTUAL VS TARGET HARVEST VOLUMES UNDER THE THREE SCENARIOS.

The red dotted line represents the target harvest – the part of the line at zero in the first four periods should be disregarded as an artefact of graphing; the actual harvest is the only real value during those periods. The target harvest does decline as a result of AAC reductions during the first ten years of the projection beyond 2023; thereafter it is steady.

Figure 20 shows that the target harvest can be reached in all scenarios during the first projection period and is almost attained in all scenarios in the second five-year projection period. Thereafter, the target harvest cannot be obtained in any scenario – the shortfall in the third period is between 1 and 1.2 million m3, or between 13% and 16% of the target.

Interestingly, the model is able to achieve a similar level of harvest under each scenario until the last ten years, and in the final period there is a major divergence between the actual harvest level in all three scenarios.

Figure 21 shows the harvest volume by species throughout the analysis period for Scenario 1. The volume of dead timber is included; however, it is minimal, and it is distinct from the volume that is salvaged, which is meaningful. The projection clearly shows the dip in the

harvest volume that occurred between 2019 and 2023; the harvest is expected to increase somewhat above that level for the next decade.

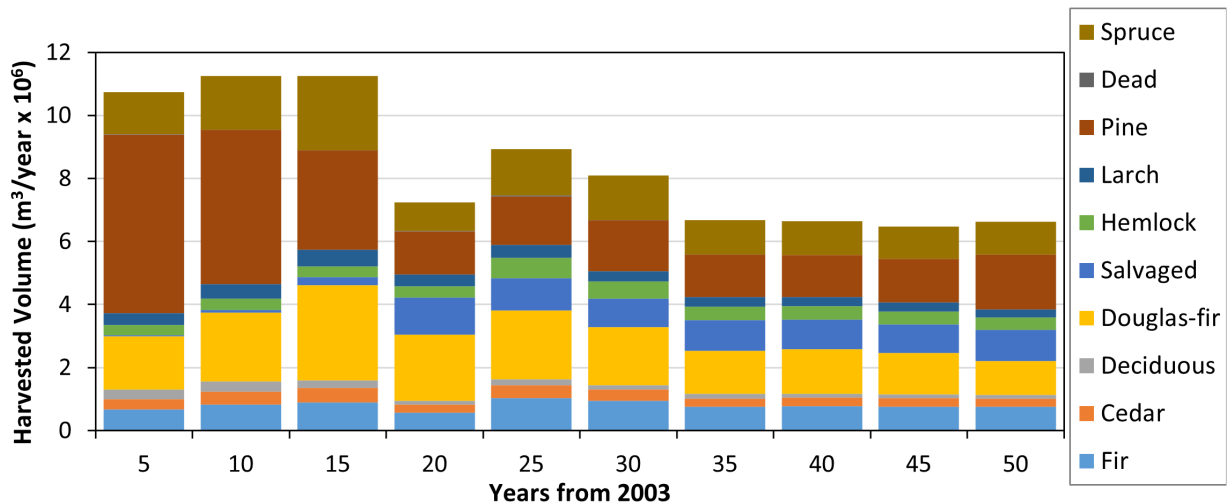


FIGURE 21. HARVEST VOLUME BY SPECIES UNDER THE “FIREHIST” SCENARIO.

There is a considerable amount of variation in the composition of the harvest over the analysis period. Pine constitutes 53% of the volume in the first five-year term but declines quickly to 19% of the harvest by period 4 (20 years after 2003). It stays at about 20% of the harvest for the remainder of the analysis. In contrast, Douglas-fir volume increases as a percentage of the cut during the first twenty years of the analysis; thereafter it falls back again to about 20% of the harvest for most of the analysis period. Fir and spruce both increase as a percentage of the harvest, with fir rising from 6 % in the first term to 11% in the last, and spruce rising unevenly from 12% in term 1 to 16% in the final term. Between 2019 and 2023, 16% of the harvest is salvage from wildfires. Thereafter, between 11 and 15% of the harvest is salvage.

Figure 22 shows the harvest volume by species in Scenario 2. The harvest data from 2003 to 2023 are the same in both figures – what stands out the most in later periods is a significant amount of salvage harvest volume. Salvage volume rises in both absolute amounts and as a percentage of the total harvest throughout the entire forecast period. In Period 5, in 2028, salvage is 16% of the harvest volume and it climbs to 37% in the 2053 period. With this amount of burning and salvage, all of the species groups decline as a percentage of the harvest after 2024, with the notable exception of pine. This is a notable contrast to Scenario 1 and indicates that Patchworks has identified a way to gradually increase the proportion of pine in the harvest from 2028 to 2053 as a way of getting as

close to the target harvest as possible. Proportionally, cedar, Douglas-fir and hemlock decline the most during the projection period (i.e. from 2028 to 2053).

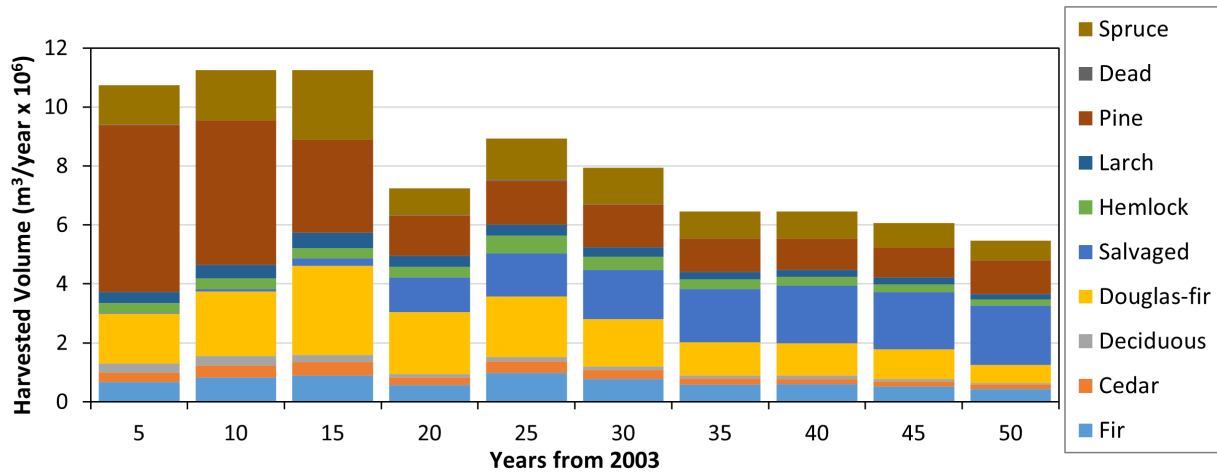


FIGURE 22. HARVEST VOLUME BY SPECIES UNDER THE “FIRELININC1PCT” SCENARIO.

Figure 23 shows that under Scenario 3, salvage harvesting makes up an even larger proportion of the harvest volume, reaching 55% in the final term. Pine, and to a lesser extent spruce, manage to maintain their share of the harvest volume during the projection period, however fir now declines significantly, from 11% of the harvest in 2028 to 5% in 2053.

The assumptions underlying Scenario 1 generate a substantial amount of salvage harvesting and there is much more available under Scenarios 2 and 3. In such a situation, Drax’s pellet facilities could play an important role in supporting salvage harvesting by using the non-sawlog timber that is produced in the operation. The consultants viewed a salvage operation near Kamloops this summer and observed that fire-killed spruce had a very short window of salvageability (less than six months) whereas the salvage window for Douglas-fir was more than a year. It is easy to see how a sawmill could take the Douglas-fir component while the spruce went to Drax, allowing for fuller utilization of the timber.

One of the questions associated with Scenarios 2 and 3 is whether it will be feasible to conduct as much salvage harvest as is projected in the analysis. Areas that are burned may be too small, remote or on terrain that is inoperable so that they cannot be salvaged. There may also not be enough harvest contractor capacity to salvage large amounts of volume.

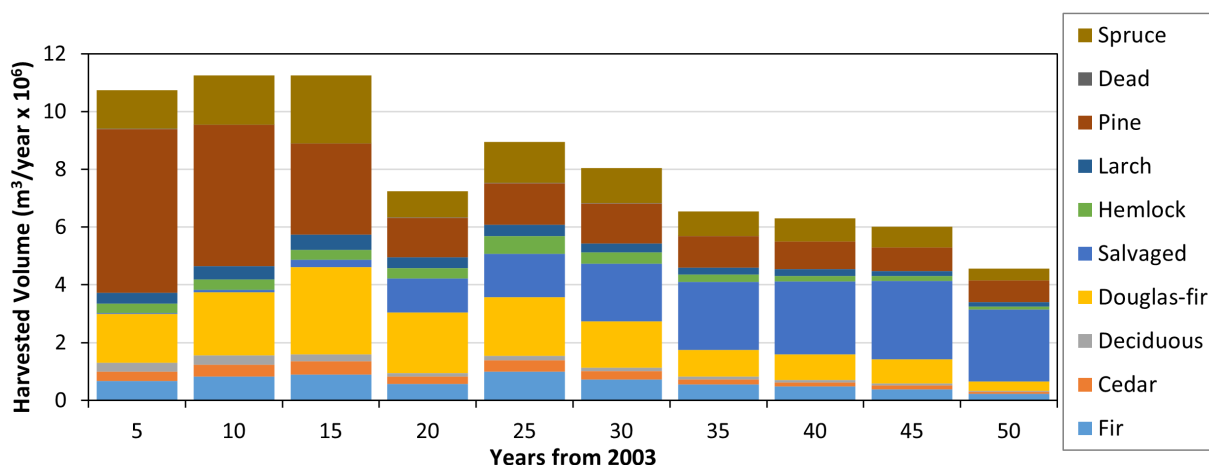


FIGURE 23. HARVEST VOLUME BY SPECIES UNDER THE “FIRELININC1P5PCT” SCENARIO.

10 Forest Carbon from 2003-2053

Drax’s website states that “Tackling climate change is at the heart of our purpose and we are committed to helping the UK and the wider world to achieve its climate change targets.” Drax has expressed its ambition to become carbon negative by 2030 and the company has a clear interest in examining the changes in forest carbon during the study period. This section describes the changes in forest carbon during the 2003 – 2053 analysis period under the three fire scenarios. The analysis is not intended to quantify how Drax affected the carbon balance in the catchment area however it does provide insight regarding potential future carbon levels in the CA forest.

10.1 Analysis Methodology

The analysis included both a retrospective analysis of the changes in forest carbon between 2003 and 2023 and the carbon impacts associated with the fire scenarios over the 2024-2053 period. The changes in forest carbon analyzed here include the impacts of growth, decay, natural disturbance, harvest removals and biotic and abiotic processes in the litter and soil.

The carbon analyses were done using the Carbon Budget Model (version CBM-CFS3), which has been developed by Natural Resources Canada (NRCAN). NRCAN began developing the original CBM more than 20 years ago and has worked continuously to improve it. The CBM can be applied to stand-level, regional- and national-scale analyses

that meet Tier-3 standards for international reporting (Shaw et al, 2014). The model is used for national-scale carbon accounting and reporting on the managed forest area of Canada (Stinson et al., 2011) through Canada's National Forest Carbon Monitoring, Accounting and Reporting system (Kurz and Apps, 2006). CBM analyses also contribute to Canada's national Greenhouse Gas inventory report submitted annually under the requirements of the United Nations Framework Convention on Climate Change (UNFCCC). The model is used by numerous countries and organizations around the world and is well-supported.

CBM functions by taking forest inventory data, growth and yield curves, and past or planned harvesting and other disturbance data to project the forest through time, modelling the carbon flows during the simulation. The yield curves used in the analysis are specific to each TSA. The model relies on parameters that define carbon flux rates between pools, emissions into the atmosphere and sequestration, as well as post-disturbance transitions. CBM has been parameterized by NRCan for all of Canada's forest regions however the default parameters can be adjusted by the user if more locally appropriate data are available. The User's Manual for the model is very detailed.²⁶ Section 7.4 of Annex 2 describes in more detail how CBM operates and the data used in this analysis.

CBM's default parameters have a generally high degree of accuracy. Shaw et al. (2014) published the results of a comparison between CBM estimates and sample plot data collected through Canada's National Forest Inventory. The results showed that the model's estimates of aboveground biomass and deadwood were generally accurate whereas the model's estimates of soil carbon had the greatest standard error associated with them. This is not surprising since soil carbon is difficult to measure in the field and not all of the pertinent soil characteristics are captured in the input data used by CBM (e.g. forest inventories).

The retrospective analysis was undertaken by running the actual harvest, fire and MPB depletions through a forest model (Patchworks), as described in Chapter 9. The 2003 inventory, used as the starting point for the analysis, was derived by backcasting from the 2023 Vegetation Resource Inventory (VRI), which is BC's forest inventory. Patchworks analyzed the changes in the forest caused by the actual depletion events that occurred between 2003 and 2023, and simulated the forest development, natural disturbance and harvesting over the next 30 years under the three scenarios to generate output data that could be accepted by CBM as an input file. Using these data, CBM was run for each scenario and each TSA to obtain the carbon results.

²⁶ Natural Resources Canada. 2019. Operational-scale Carbon Budget model of the Canadian Forest Sector (CFS-CBM3) Version 1.2: User's Guide. Canadian Forest Service, Northern Forestry Centre.

In this analysis, total forest carbon equals the sum of the carbon in the live aboveground biomass, live belowground biomass, dead aboveground biomass, forest litter and the forest soil. The live aboveground biomass consists of the living biomass in the trees, shrubs and forbs, and the live belowground biomass is the biomass in the live root systems. The dead aboveground biomass includes both standing and fallen deadwood that has not decayed/broken down to the point where it has become part of the litter layer. The litter layer includes dead leaves and biomass that are decaying and turning into soil; the soil pool includes the organic and inorganic carbon in the soil, including dead roots.

Carbon is continually moving between these pools. For example, as live branches and trees die, they move into the deadwood pool and, if they are not harvested or burned, they will decay and eventually move into the litter and soil pools. Carbon enters the forest ecosystem through the growth of the live vegetation and leaves either by being physically removed (e.g. as harvested timber) or being emitted into the atmosphere through respiration, burning and decay processes. All of these carbon fluxes are modelled in CBM when the relevant disturbance information is provided.

CBM calculates the proportion of the harvested timber that becomes forest products, and the consultants used a simplified analytical approach, based on the VERRA standard, to estimate the amount of C stored in HWP, the amount that moved to landfill over time, and the emissions from HWP in landfill. More detail on the methodology is provided in section 7.4.4 of Appendix 2. In brief, the consultants estimated the proportion of timber that goes into long-lived HWP, such as lumber, short-lived products such as paper and cardboard, and wood pellets (which are also short-lived but are burned). All products except pellets are assumed to be landfilled at the end of their use life. (Although a substantial percentage of newsprint, non-tissue paper and cardboard gets recycled, all paper and cardboard are assumed to be landfilled at the end of their use.)

Of the many variables associated with modelling the fate of forest products, the proportion of exports (which affects the fate of the products after use), is challenging to estimate. In this analysis, forest products sales data from 2017 to 2021 (BC Ministry of Forests, undated) were used to estimate that 23% of the wood products produced in BC were used domestically and 77% were exported. Of the total amount of timber harvested, 10% was estimated to be used to produce bioenergy. The bioenergy fraction includes not only wood pellet production but also the fibre used by mills to produce bioenergy. Sawmills use wood waste to generate heat, especially for drying kilns, and pulp mills use residues for generating steam and heat for use in the pulping and drying processes. There are also 2-3 stand-alone energy production facilities that burn wood to generate power. The many other producers of bioenergy in the catchment area mean that Drax does not account for a

particularly high proportion of the bioenergy generated in the CA; the absence of data on the total amount of wood fibre used to produce bioenergy limited the ability of this study to identify what proportion of the total bioenergy generation is produced by Drax.

10.2 Analysis Results

Clearcutting followed by slash pile burning is the default practice in the CA. There are exceptions – slash piles may not be burned when fire risk is high or when they are near communities that could be exposed to the smoke from the burning piles. The proportion of piles actually burned is unknown, since post slash pile burning assessments are not done in a rigorous manner. In the absence of better information, the consultants used the default assumption in CBM that all slash is burned with complete consumption of the piles.

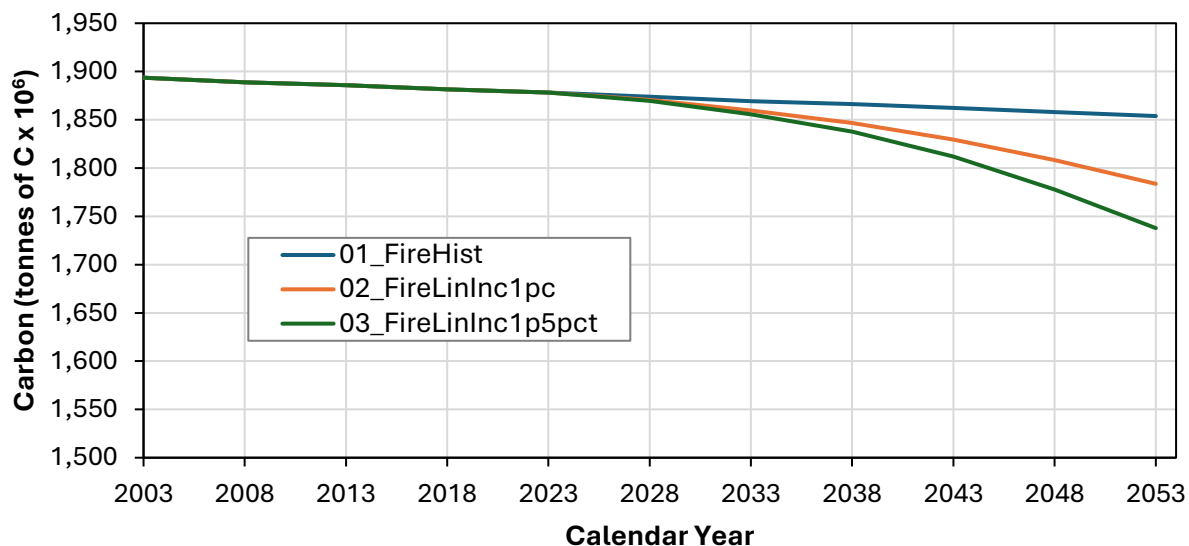


FIGURE 24. CHANGE IN FOREST CARBON IN TOTAL TONNES C (2003-2053).

Figure 24 shows the changes in forest carbon in the AFLB over the analysis period. Because events during 2003-2023 have already occurred, the three fire scenarios only come into force after 2023. The decline in forest carbon between 2003 and 2023 is slight, at 15 million tonnes C, representing a loss of 0.8%. Forest growth was almost enough to compensate for the losses from the fires, MPB infestation, and harvesting.

Trees killed by the MPB do not suddenly emit all of their carbon; instead, the above-ground live biomass moves into the deadwood pool and the below-ground live biomass moves into the soil pool. From there, the biomass follows the normal decay pathways. Many fires are not severe enough to be stand-replacing; killing only some of the forest within the burn

perimeter. Even most stand-replacing fires only kill the trees but do not consume them. Therefore, the immediate impact of these disturbances on the total amount of forest carbon was slight. For fires that occurred between 2015 and 2023, severity assessments were used to identify the proportion of the forest killed within the burned area. This severity information was used to estimate the severity of fires modelled between 2024 and 2053.

Figure 24 shows that forest carbon declines in all future scenarios, especially when the more active fire regimes are modelled. By 2053, forest carbon has declined by 1.3% since 2023 in Scenario 1; the declines were 5.0% and 7.5% in Scenarios 2 and 3, respectively. The data depicted in Figure 24 are shown expressed as tonnes C/ha in Figure 254.

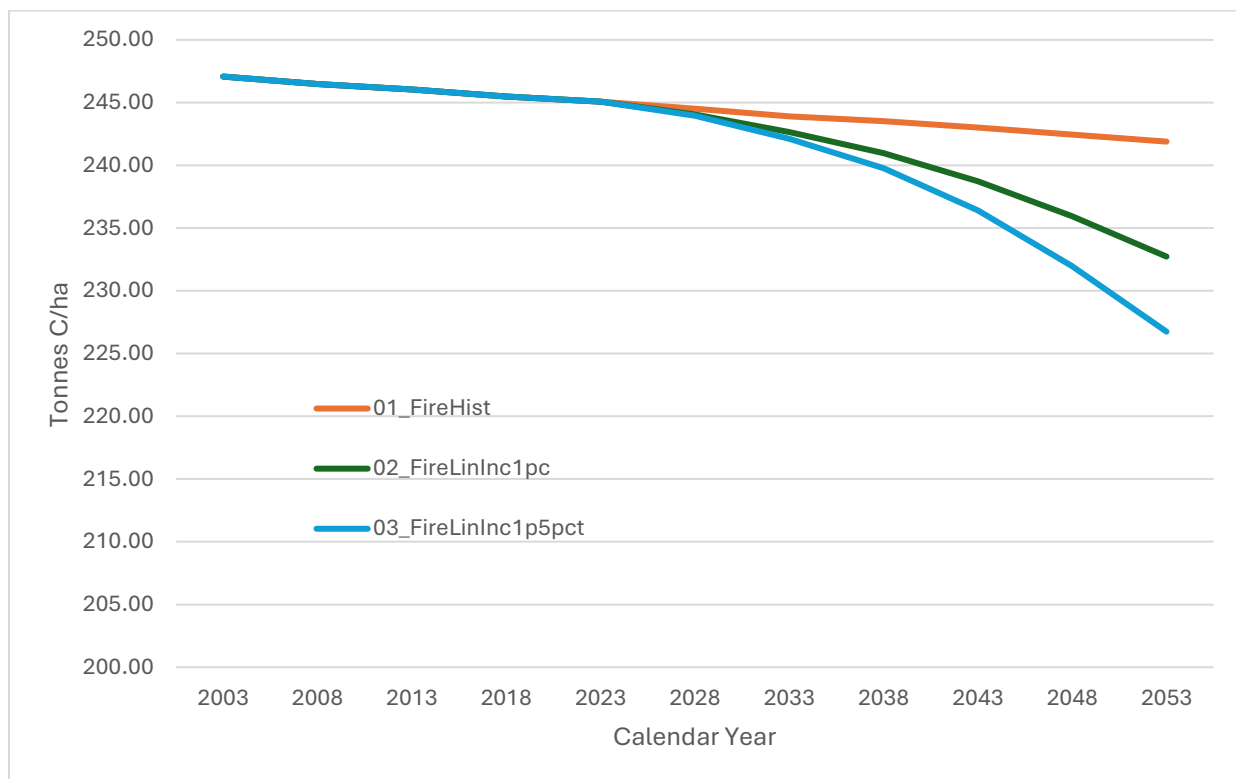


FIGURE 25. CHANGE IN FOREST CARBON IN TONNES C/HA (2003-2053).

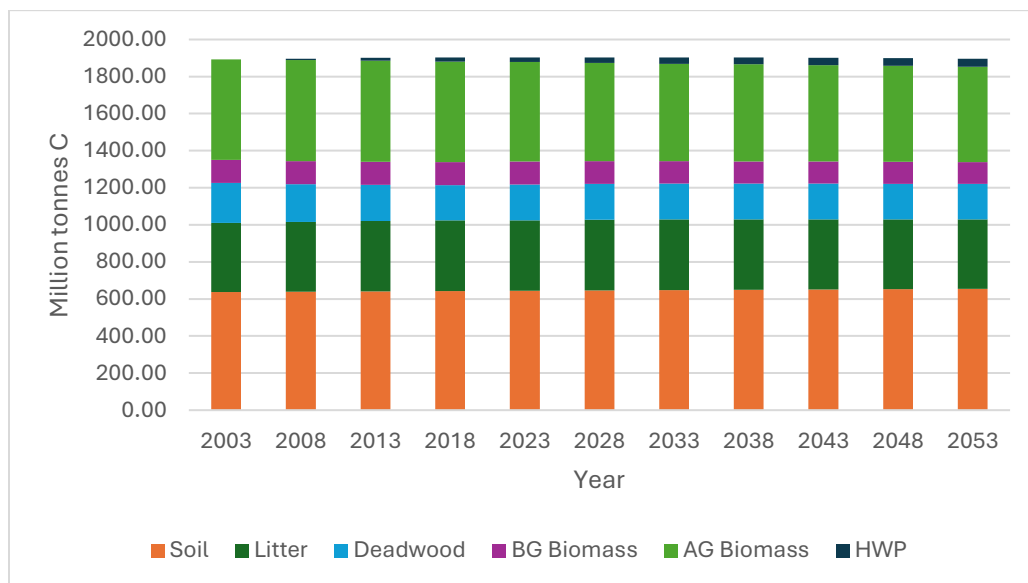


FIGURE 26. QUANTITY OF CARBON BY POOL – SCENARIO 1.

Figure 26 shows, for Scenario 1, the quantities of carbon in each of the forest carbon pools, as well as storage in harvested wood products (HWP). (Appendix 4 presents the data tables from which the figure is derived.) Figure 26 also shows that because so much of the timber harvested in the CA goes into lumber, the amount of carbon storage in HWP increases over time in these scenarios to become a minor but meaningful amount.

Overall, the amount of carbon in the forest is very stable between 2003 and 2053 under Scenario 1, with the carbon in HWP helping to offset some of the decline in forest carbon. Looking at the height of the bars and the distribution of carbon with each pool, it is difficult to see any changes over the analysis period.

Figure 27 shows the profile of the forest carbon pools plus HWP in Scenario 2, and a decline in total carbon is more discernible in the later years of the analysis period. A decline is even more pronounced in Figure 28, which shows the changes in the quantity of carbon in Scenario 3.

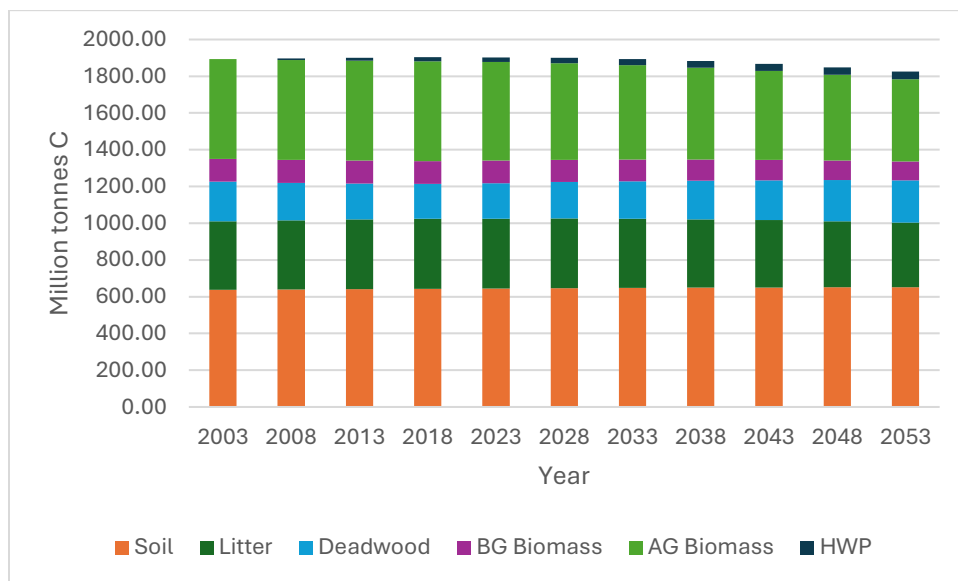


FIGURE 27. QUANTITY OF CARBON BY POOL – SCENARIO 2.

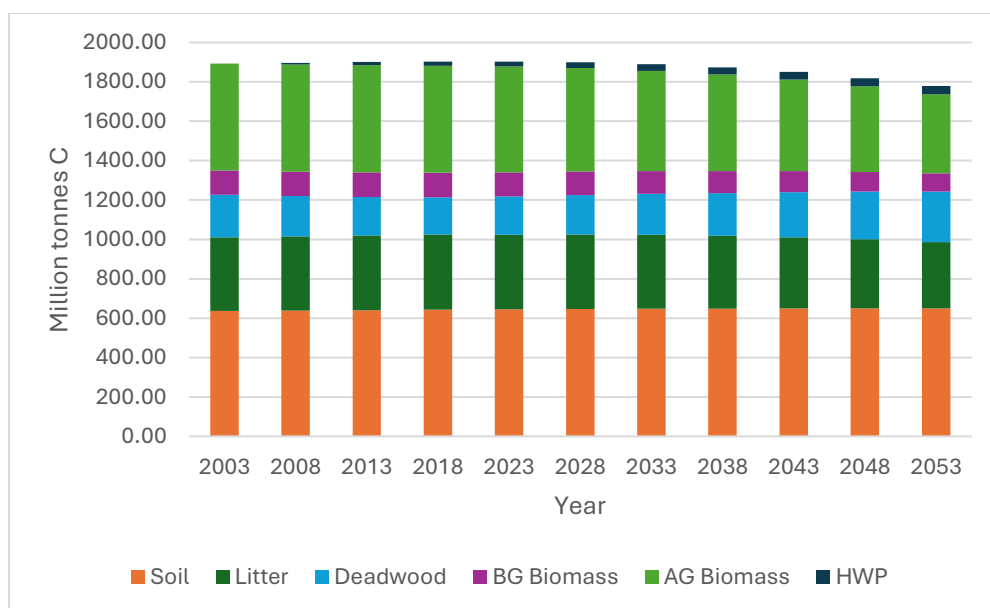


FIGURE 28. QUANTITY OF CARBON BY POOL – SCENARIO 3.

Part of the reason for the relative stability of total forest carbon is that the forest soil is the largest carbon pool in the system, containing 34% of forest carbon in 2023. This pool is barely responsive to the differences between the scenarios over the time period modelled. It may well be that the amount of carbon in the soil begins to decline more notably further out in time under a more active fire regime, but in 2053, the amount of carbon in the soil

pool under Scenario 3 is only 0.5% less than it is in Scenario 1. In all three scenarios, the carbon in forest soil is higher in 2053 than in 2003.

Rather surprisingly, the quantity of carbon in the forest litter is fairly stable over the duration of the analysis in each scenario. This is also a substantial pool, accounting for 20% of forest carbon (+HWP) in 2053. In Scenario 1, the carbon in the litter pool increases by 2% from 2003 to 2023, and then eases back to 2003 levels by 2053. In Scenario 2, the amount of carbon in the forest litter is 8% lower in 2053 than it was in 2023, while in Scenario 3, the decline is 12% from 2023. However, carbon in the forest litter still makes up 19% of the forest carbon in 2053 in Scenario 3.

The amount of carbon in the HWP pool is not materially different under any of the scenarios, and it increases throughout the analysis period as successive years of harvest add biomass to the HWP pool faster than HWPs complete their usage cycle. Because the HWP is initialized at zero in 2003, the amount of carbon in HWP builds up relatively rapidly at first, reaching 1% of forest carbon + HWP by 2018. Thereafter, as the harvest level declines and more of the HWP moves to landfill, the rate of increase slows so that by 2053, the carbon in the HWP is just over 2% of the Net C.

In contrast, the fire regime has a greater effect on the amount of carbon in the other pools compared to the soil, litter and HWP pools. Figure 29 shows the proportion of carbon in each pool in 2023. The significance of the soil carbon and litter pools is readily apparent, and the importance of the above-ground live biomass pool is also evident.

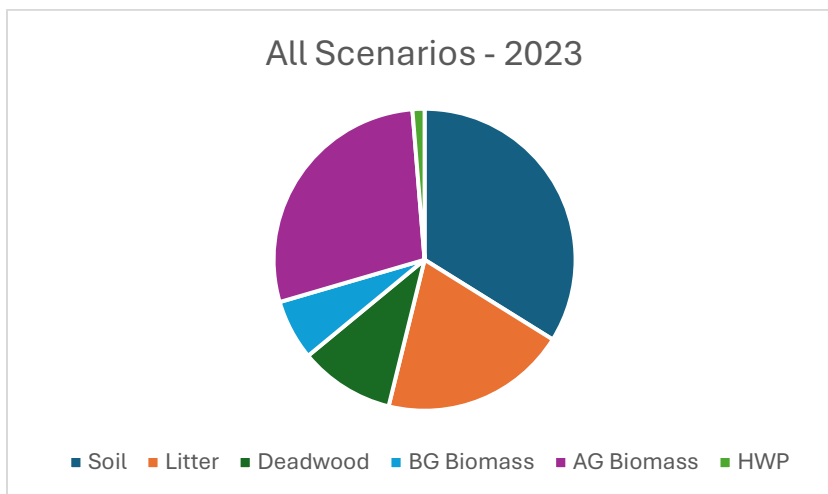


FIGURE 29. PROPORTION OF CARBON BY POOL IN 2023 (SAME IN ALL SCENARIOS).

In Figure 30, the proportions of carbon by pool are shown in 2053 under Scenario 1 (FireH1st). There is very little change from 2023 to 2053 – the largest change is that above-

ground live biomass goes from 28.2% in 2023 to 27.2% in 2053. Below-ground live biomass and deadwood hold 6.2% and 10.1% of the total carbon, respectively. These changes are so minor they are difficult to discern in the figures.

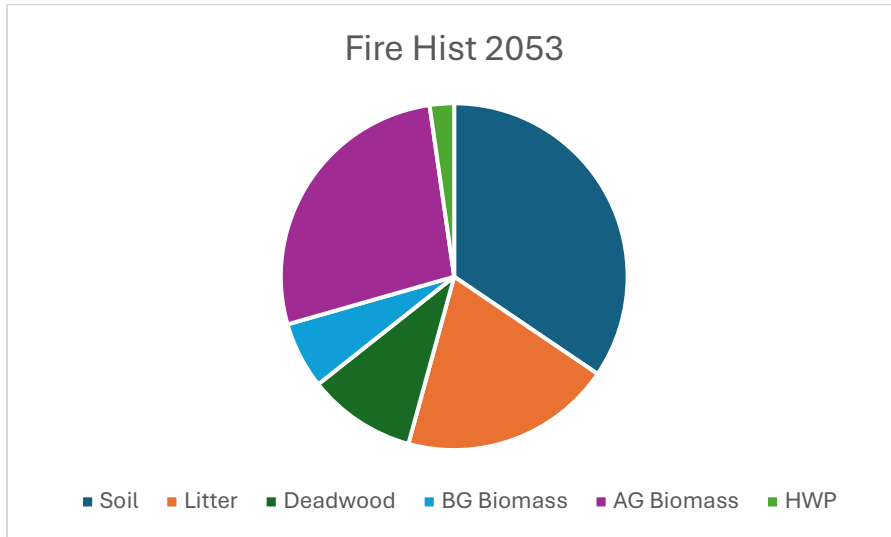


FIGURE 30. PROPORTION OF CARBON BY POOL IN 2053 (SCENARIO 1).

However, the more active fire regime in Scenario 2 (FireLinInc1pct) causes some noticeable shifts in the distribution of carbon among the pools in 2053, compared to 2023 and also compared to Scenario 1 in 2053. As Figure 31 shows, under Scenario 2 the above ground live biomass pool has shrunk from 28.2% of total carbon in 2023 to 24.5% in 2053. The below-ground live biomass pool is also reduced while the deadwood pool has become more prominent.

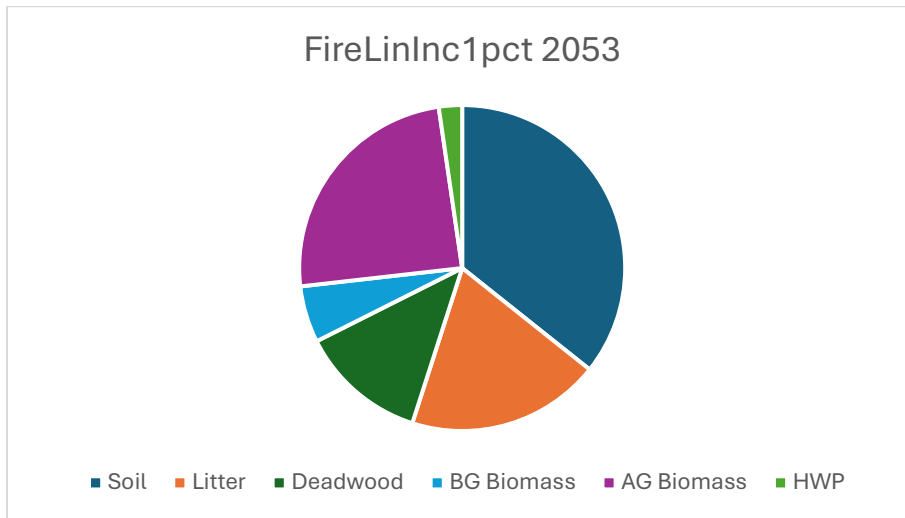


FIGURE 31. PROPORTION OF CARBON BY POOL IN 2053 (SCENARIO 2).

These shifts are even more pronounced in Scenario 3 (FireLinInc1p5pct), where the live above-ground biomass accounts for 22.5% of the forest carbon in 2053, and the below-ground biomass represents 5.2% (vs 6.5% in 2023). Deadwood has grown in importance to account for 14.5% of the forest carbon (vs 10.2% in 2023). In other words, the carbon in deadwood makes up 50% more of the total carbon in 2053 than in 2023. This means that there will be a lot more dead wood evident in the CA forests in 2053 should Scenario 3 come to pass.

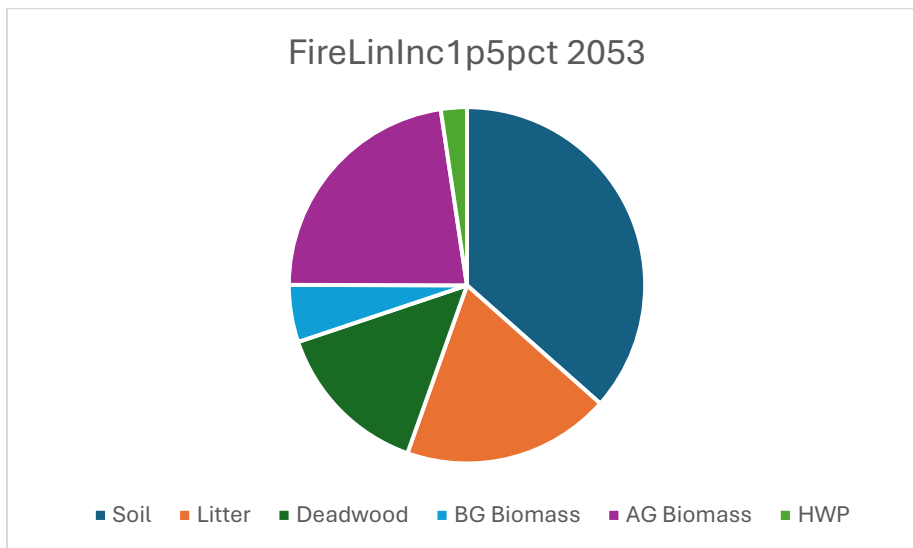


FIGURE 32. PROPORTION OF CARBON BY POOL IN 2053 (SCENARIO 3).

The trajectory of the carbon in the live above-ground and below-ground biomass pools is compared amongst the three scenarios in Figure 33. The above-ground and below-ground live biomass pools remain relatively stable for the first 20 years but then decline through to 2053. In Scenario 1, the aboveground biomass (AGB) pool loses 26.5 million tonnes C between 2023 and 2053 (4% of the 2023 amount). The carbon in the belowground biomass (BGB) decreases by a similar proportion.

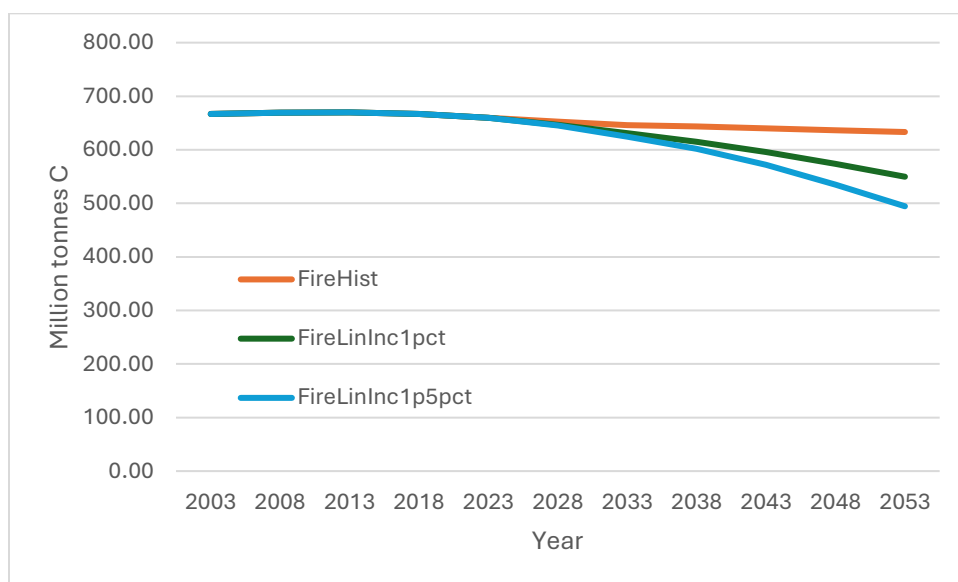


FIGURE 33. CARBON IN ABOVE AND BELOW GROUND LIVE BIOMASS.

The forest loses more live biomass under Scenario 2; the decline in both the AGB and BGB is 16.6% between 2023 and 2053. Live biomass losses in Scenario 3 are even more pronounced - between 2023 and 2053, the amount of live biomass falls by 25%. This is equivalent to the loss of one-quarter of the forest area, on an average basis. A change this substantial would visibly alter the landscape and would severely constrain the future timber harvest.

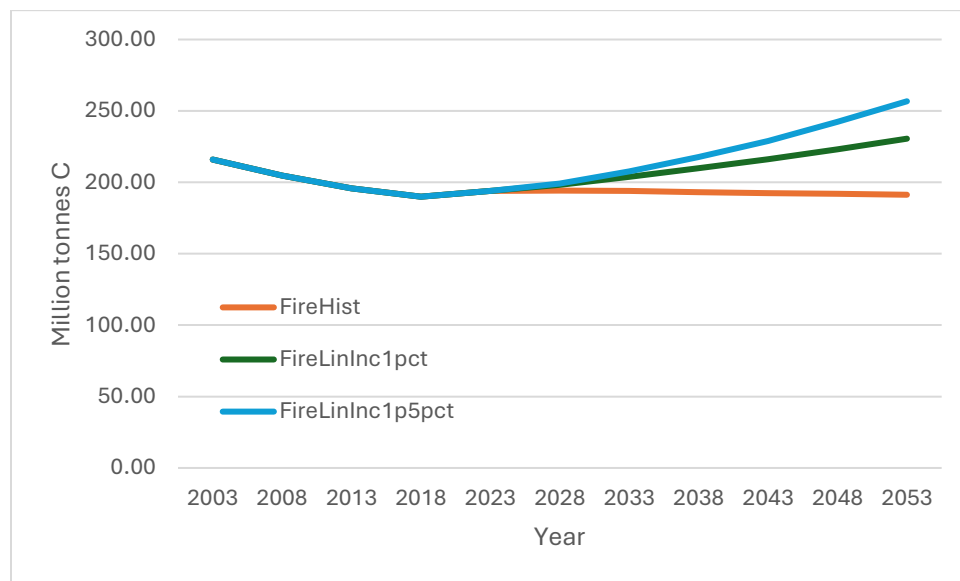


FIGURE 34. CARBON IN THE DEADWOOD POOL.

More fires lead to more deadwood in the forest – the amount of carbon in the deadwood pool rises between 2023 and 2053 from 194 million tonnes C to 257 million tonnes C under Scenario 3, a rise of 32%. Clearly, a substantial percentage of the burned forest moves into the deadwood carbon pool once it is burned and this will be visible to anyone traveling through the CA.

Lastly, Figure 35 shows the carbon emissions from the forest. Fires are the primary source of the emissions shown in the figure, with slash pile burning as a secondary contributor. Emissions from landfills are a very minor component that does not affect the emissions trajectory. While the amount of carbon emitted is not overly large, in comparison to the amount of carbon in the forest, emissions escalate rapidly under Scenario 2 and especially under Scenario 3. In contrast, fire activity in Scenario 1 between 2023 and 2053 never reaches the levels experienced in the 2018-2023 period (when emissions are equivalent to 1.7% of forest carbon), which is why the highest emissions occur during this period in Scenario 1.

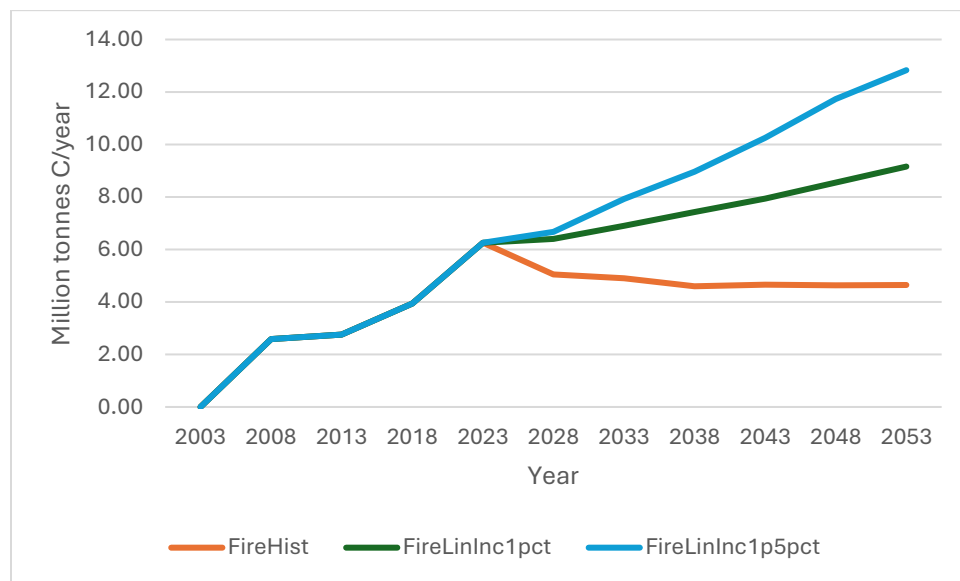


FIGURE 35. CARBON EMISSIONS.

The use of logging slash and otherwise unmerchantable logs is not captured well by either Patchworks or CBM, and so the use of this material by Drax is not reflected in the modelling. To accurately capture the impact of Drax's use of unmerchantable material from the forest, the location of each truckload of such material would need to be mapped and the amount of material removed subtracted from the estimated residual left at the landing. Moreover, emissions associated with the logging, processing and transporting to mill are not tracked in CBM.

11 Market Profile

11.1 Overview

The forest industry is a relatively minor and diminishing part of the economy in the catchment area based on employment statistics. However, its relatively low proportion of regional employment understates its importance, as it contributes high incomes, supports a number of service businesses, and helps to diversify the regional economy. BC Stats (2024) provides annual employment data by sector and region; the Thompson-Okanagan region is most representative of the CA.²⁷

In 2023, the Thompson-Okanagan region total employment level was 303,200 people and of this, 231,800 (76%) were employed in the services sector. This included 37,600 people in the recreation, accommodation and food services sectors (12.4%), which is a good

²⁷ <https://www2.gov.bc.ca/gov/content/data/statistics/economy/labour-market-statistics>

indicator of the importance of tourism and recreation to the region. In the same year, logging and field support services employed 1,900 people, wood products manufacturing had 5,700 employees and the pulp and paper sector less than 1,500 staff. Agriculture, also experiencing employment declines, reported 6,500 workers and mining employed 4,900 people.

The foundation of the forest products industry is the production of solid wood products, i.e., dimensional lumber manufactured in sawmills. Most of the timber harvested from the catchment area is processed by local mills and most of the finished products are exported. The US represents the largest market for BC forest products; about two-thirds of the lumber produced in BC is exported to the US. Due to its proximity to the US border, it is likely that the proportion of lumber produced in the CA and exported south exceeds the provincial average.

Approximately 55-60% of the volume of wood processed in sawmills is recovered as lumber, 35% as chips, and the remainder as sawdust, shavings, and hog fuel. An abundant supply of sawdust and shavings from sawmills, as well as chips and trim blocks, are the main supply of fibre for the three Drax pellet plants. More recently, some “hog fuel” from sawmills (miscellaneous waste fibre, mostly tree bark) is being used by pellet plants and biomass-powered generators.

The BC Ministry of Forests published regional multipliers that covered the 2018-2020 period. The report assessed a value of \$390,000 as the impact per 1,000 m³ harvested in the southern interior region. This greatly exceeds the comparable value for the northern Interior (\$240,000) but is well short of the analogous value in the Coast (\$565,000). The same ratios occurred with respect to contribution to GDP, employment and employment income. In the southern interior, harvesting 1,000 m³ created 0.85 direct jobs and 0.87 indirect and induced jobs.

The MPB strongly affected three of the ten TSAs in the CA – Kamloops, Merritt, and Okanagan. The infestation was essentially over by 2010 in this region and there was a temporary increase in the AACs for these three TSAs which was short-lived, expiring roughly 15 years ago. More recently, particularly in 2021, extensive fires in the Interior part of the CA have created salvage harvest opportunities while reducing the amount of live forest.

The MPB caused much higher levels of mortality in the Interior north of the CA, later than it did in the CA, so the salvage harvest there was more extensive and lasted until 2018 or 2019. The end of the salvage and reductions in AACs contributed to the closure of four

sawmills in the north part of the CA (or just north of it). This has been a key driver of a significant decline in the actual harvest in the CA between 2019 and 2023 (See Figure 12).

11.2 Employment

Provincial forest employment data show a significant downward trend. Provincial employment in Forestry and Logging, including support activities, declined from 26,900 in 2003 to 17,700 positions in 2022 (BC Statistics 2024)²⁸. The period saw considerable variation – a low of 13,300 jobs occurred in 2009 during the depth of the Great Recession, which was followed by a partial rebound to 21,500 in 2015. From there, there has been a fairly steady decline, however employment in this sub-sector dropped sharply in 2023 to 13,700 people. It is notable that British Columbia’s publication 2022 Economic State of the Forest Sector shows a high degree of stability in employment in Forestry and Logging with Support Activities, direct employment ranging between roughly 20,000 and 23,000, and sitting at 22,200 in 2022.

Employment in the mills (Wood Product Manufacturing) experienced a more pronounced decline, according to BC Statistics (2024). From 51,400 positions in 2003 to a low of 30,300 in 2009, there was a very muted increase to 35,300 positions in 2015. Since then, the amount of employment has dwindled to 22,900 in 2023, reflecting closures and increasing automation. The annual data are shown in Figure 36.

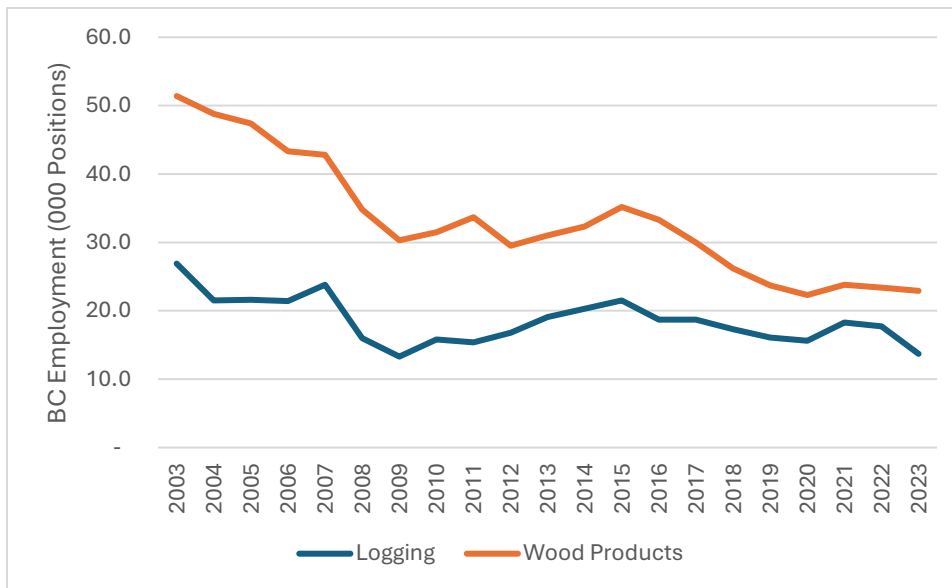


FIGURE 36. BC EMPLOYMENT IN FORESTRY AND LOGGING AND WOOD PRODUCTS MANUFACTURING (2003-23) BC STATISTICS 2024.

²⁸ British Columbia Employment by Detailed Industry, Annual Averages

Once again, the 2022 Economic State of the Forest Sector provides different figures, showing employment in the Wood Product Manufacturing sector rising from 27,300 in 2013 to a peak of 33,200 in 2017 and then declining back to 27,300 in 2022.

Employment in the forest sector has declined as a proportion of overall provincial employment. In 2003, wood product manufacturing represented 25% of provincial manufacturing employment; in 2023, it accounted for just 13.3% of manufacturing employment in BC. During the same 21-year time period, the share of provincial employment in logging and wood product manufacturing fell from 3.9 to 1.3%.

These broad provincial trends are reflected in regional data for the catchment area. From 2006 to 2023, employment in logging in the central part of the catchment area (the Thompson-Okanagan region) declined from 4,500 to 1,900 positions. Logging employment remained relatively strong in the region until 2018, when it was 4,000 positions. However, it fell to 2,100 people in 2019 and has fluctuated between 1,900 and 2,900 people from 2019 to 2023. Regional employment in wood product manufacturing recovered quite well from the 2008-09 recession, reaching a peak of 9,700 positions in 2015. From there it declined markedly to 4,600 people in 2018. Between 2019 and 2023, it has averaged 5,400 positions, fluctuating significantly between 7,100 people in 2021 and 3,400 employees in 2022.

These regional employment data may be underestimates to some degree. A 2024 study done for the BC Council of Forest Industries (COFI²⁹) reported that in the Thompson-Okanagan region, forestry and logging employed 5,800 people while Wood Products Manufacturing employed 11,400 people. One thousand people were reported as being employed in the pulp and paper sector. The data used for this study came from the 2021 census and the results are significantly higher than the BC Stats figures, which were derived from labour surveys. Drax commissioned a report that concluded Drax employs 2,330 people in BC, making it a significant employer.³⁰

Figure 37, based on data from BC Stats, shows wood products manufacturing employment declining from 36% of regional manufacturing employment in 2006 to 27% in 2023, while the proportion of overall regional employment in the logging and wood product manufacturing sectors slid from 5.3 to 2.6%.

²⁹ Council of Forest Industries. 2024. The Economic Impact of British Columbia's Forest Sector. Technical Report. April 2024.

³⁰ https://www.drax.com/ca/press_release/new-report-finds-drax-contributes-1-billion-to-canadian-economy/

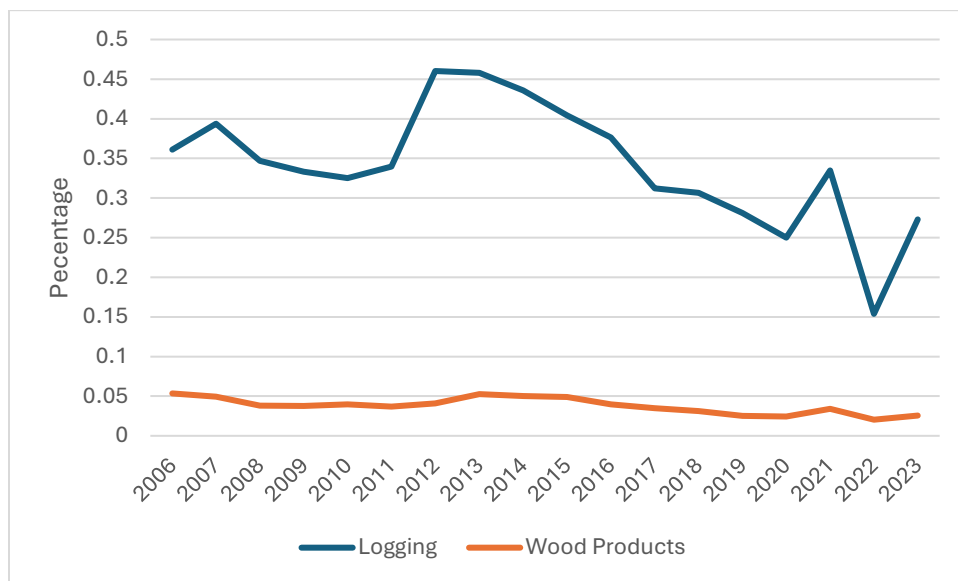


FIGURE 37. PROPORTIONAL EMPLOYMENT IN FORESTRY AND LOGGING AND WOOD PRODUCTS MANUFACTURING IN THE THOMPSON-OKANAGAN REGION (2006-2023).

The data above describe trends in direct employment in the forest industry. The sector also stimulates a considerable amount of indirect and induced employment. Indirect employment consists of jobs at companies that supply the forest sector while induced employment is that generated as a result of the expenditures by employees in the direct and indirect industries. The COFI study reported 9,300 direct forestry jobs in the Thompson-Okanagan region, 5,100 indirect jobs and 3,700 induced jobs, equivalent to multipliers of 0.55 and 0.40 for indirect and induced employment. A report commissioned by Drax found that Drax's purchases nearly 75% of its goods and services from suppliers based within the respective province of their operations. Of the purchases made from suppliers outside of the province, over 90% are from Canadian businesses³¹.

Within Drax, there is a corporate commitment to DEI which is seen as an integral part of company culture. Drax's website states that the CEO, Board and Executive Committee support this policy³². Drax was recognized as one of BC's top employers in 2025.³³

³¹ https://www.drax.com/ca/press_release/new-report-finds-drax-contributes-1-billion-to-canadian-economy/

³² <https://www.drax.com/careers/why-drax/diversity-equity-inclusion/>

³³ <https://www.canadastop100.com/bc/>

11.3 Log Market

The range of mills in the catchment area, and the range of products that they produce, ensures that there is an active wood fibre market in the CA. There are incentives within the system to have each log go to its highest-value use, starting with the role that BC Timber Sales plays. Roughly 25% of the harvest is overseen by BC Timber Sales (BCTS), an agency of the provincial government that has forest tenure. BCTS puts timber on the market via public auction, and the auction prices are used to set stumpage prices by log grade, size, and species on the remaining Crown timber. Most of the harvesting in the catchment area is done by contractors, and their business relies in part on maximizing their revenue from their harvest blocks.

BC's log grading system has five tiers, with grade 1 the highest and grade Z the lowest. The grade categories are summarized in Table 15.

grade 1: premium sawlog (large, good logs).
grade 2: sawlog (the log has 50-100% firmwood, little defect, generally good condition).
grade 4: lumber reject (the log has <50% firmwood and defects such as checks, spiral grain, etc.).
grade 6: undersize (less than 10 cm in diameter)
grade Z: firmwood reject (lots of rot, very poor form, etc.).

TABLE 15. BC GOVERNMENT LOG QUALITY CLASSES.

There are some grade 1 logs in the catchment area – grade 1 usually applies to logs from the coast, which is a small proportion of the CA. Grade 1 logs could also come from the Interior Wet Belt, which is a more substantial portion of the CA. However, most of the timber production is from the interior TSAs, which would mean that the majority of quality sawlogs in the catchment area fall into grade 2; these logs have little defect and at least 50% of the log is firmwood. (Firmwood excludes all rot, char, holes and missing wood; detailed grade specifications can be found in the BC Interior Scaling Manual.) Any defects that are present are minor.

Grade 4 timber has less than 50% firmwood and more significant defects, such as checks and spiral grain. Grade 6 timber is small-sized wood and Grade Z is the lowest quality of log. One of the limitations of this grading system is that it does not distinguish dry and green logs. Grades 4, 6 and Z are known collectively as low-grade wood; sawmills will

sometimes use Grade 4 sawlogs while Grades 6 and Z are usually used for hog fuel or left in the bush. The roundwood that Drax uses for feedstock comes from Grades 6 and Z, as well as the lower quality Grade 4 logs that do not meet the minimum specifications of sawmills.

Many of the lumber-producing companies operate log sorting yards that are somewhat distant from their sawmills, where all of the harvested timber is brought and sorted by grade, and potentially other factors such as species and size. The low-grade logs that they will not use are processed through a grinder for pelletizing.

During the 2010 – 2021 period, the price of lumber rose relatively steadily, as the industry recovered from the 2008-09 recession and US housing market crash (See Figure 38). As interest rates remained low, housing prices rose and demand for building materials was strong. Prices fell in 2019 as a flood of low-priced European timber entered the market as a result of a widespread spruce bark beetle outbreak.

Some closures were forestalled by the unprecedented boom in lumber and board prices, stimulated in 2020 and 2021 by effects from the pandemic. However, by the fall of 2022, lumber and board prices had dropped significantly and they have continued to stay low to the present (November 2024), leading many sawmills to curtail production.

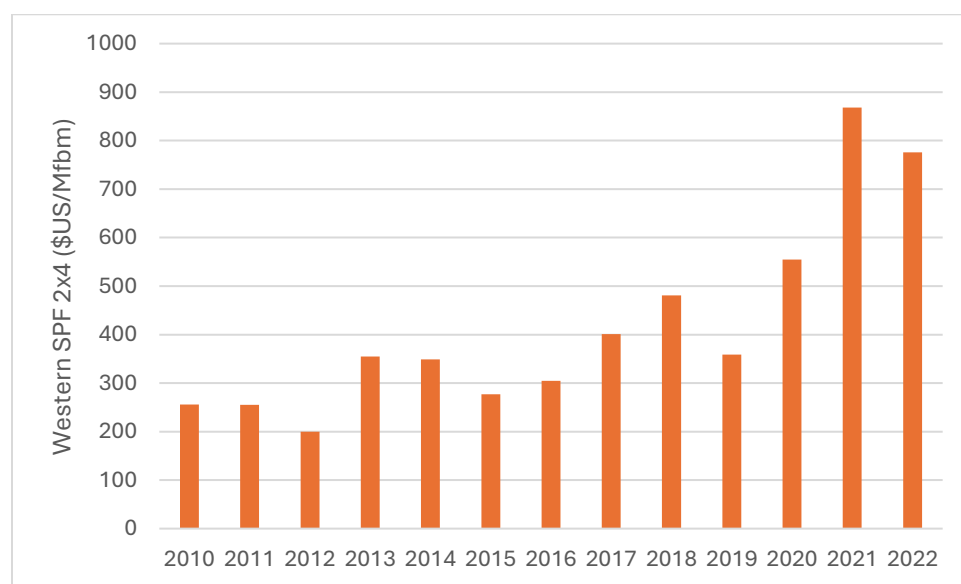


FIGURE 38. ANNUAL PRICE OF WESTERN SPF 2x4 #2 OR BETTER (US\$/MFBM).³⁴

³⁴ BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development. 2022 Economic State of British Columbia's Forest Sector. Economics and Trade Branch.

By 2019, sawmills had largely stopped using deadwood as it had deteriorated beyond the point where they could use it. This phenomenon occurred throughout the BC Interior; the substantial reduction in supply has caused three large sawmills in the catchment area to close since 2019, as well as a fourth sawmill located in Chasm, to the south of the catchment area. Many other sawmills have reduced the number of shifts or taken downtime. Girvan and Taylor (2020)³⁵ also pointed to longer hauls, steeper and more rugged logging blocks, and the tight wood supply leading to “overbidding” in the BCTS sales as contributing to price pressures on the lumber industry.

Product prices fell again between March – June 2020, when the initial wave of the COVID-19 pandemic caused a global slump in construction activity and some mills closed temporarily to avoid transmission of COVID-19. However, starting in June, lumber prices unexpectedly began to rise, and they have reached record prices since then. The first peak in prices occurred in September 2020, when western kiln-dried #2 or better SPF 2x4s reached \$US 960/mfbm, more than double the price in mid-June (\$US 378/mfbm). By the second half of 2020, stumpage prices reached \$70/m3 in the BC Interior.³⁶

A second and more dramatic peak was reached in May 2021, when western kiln-dried #2 or better SPF 2x4s soared to \$US 1640/mfbm, a price which was reached again in March 2022. During these booming markets, the surviving sawmills were at full production – however it is notable that previously closed mills did not reopen. Figure 38 shows that the average product price for 2022 was somewhat lower than in 2021 – this is because prices declined significantly throughout the year after the March surge. As interest rates, and mortgage rates, have remained elevated, lumber prices have ranged between \$US 329 and \$US 476 during 2023 and 2024 (to November).

³⁵ https://issuu.com/truckloggers/docs/truckloggerbc_fall_2020_final_lowres/s/11119030

³⁶ Taylor, Russ. 2021. A Perplexing Puzzle – Provincial Stumpage Rates in Canada.

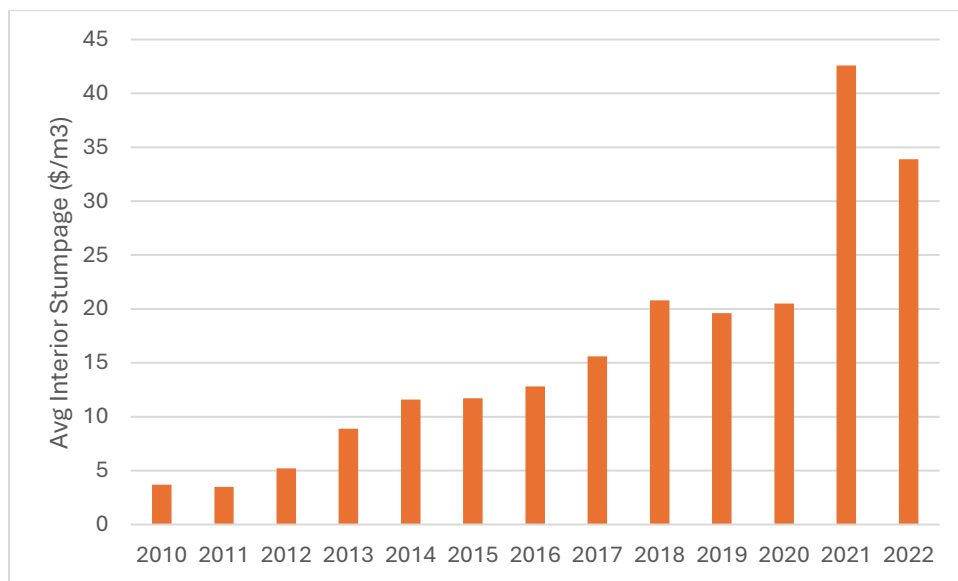


FIGURE 39. ANNUAL INTERIOR STUMPAGE PRICE (\$/M3).³⁷

As mentioned, BC Timber Sales pricing is used as a basis to set stumpage rates, and the BCTS prices closely track the prices of lumber. Figure 39 shows the average stumpage price in the Interior between 2010 and 2022. The recovery from the Great Recession can be seen in the very low average stumpage prices of 2010 and 2011, however as the economy and housing in particular began to recover, lumber prices rose as did stumpage rates. The windfall that the government received from stumpage in 2021 and 2022 is clearly visible, however 2023 and 2024 stumpage rates will be much lower.

³⁷ BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development. 2022 Economic State of British Columbia's Forest Sector. Economics and Trade Branch.