

BC's Old Growth Forest: A Last Stand for Biodiversity

April 2020

Karen Price, Ph.D., Rachel F. Holt, Ph.D., R.P.Bio
and Dave Daust R.P.F., M.Sc.



Contents

6 Summary

12 Context

19 Analysis methods

22 Results

46 Conclusions

COVER PHOTO JAKOB DULISSE
REPORT DESIGN ERIKA RATHJE

Old forests meld light and dark; their structural complexity can include large old living trees, large standing dead snags, a multi-layered canopy

Summary



SEAN O'ROURKE FOR CONSERVATION NORTH

The Province has appointed a task force to investigate the state of BC's old growth forest. The panel will report to government in April 2020.

The old growth task force website[1] shows a map of the old growth forest in BC — and says "Based on government's working definition, old-growth forests comprise about 23% of forested areas, or about 13.2 million hectares".

We have written this report because old growth cannot be portrayed by a single number or map. Old forest comes in many forms.

We have used publicly available provincial data and definitions to examine the status of different types of old forest found across the province in different ecosystems (biogeoclimatic variants) and productivity classes. These distinctions matter because while all forms of old growth have inherent value, different types provide tremendously different habitat, functional, cultural, spiritual and timber values. BC's globally rare high productivity forests have particular value for their high biomass, structural complexity and stable carbon storage.

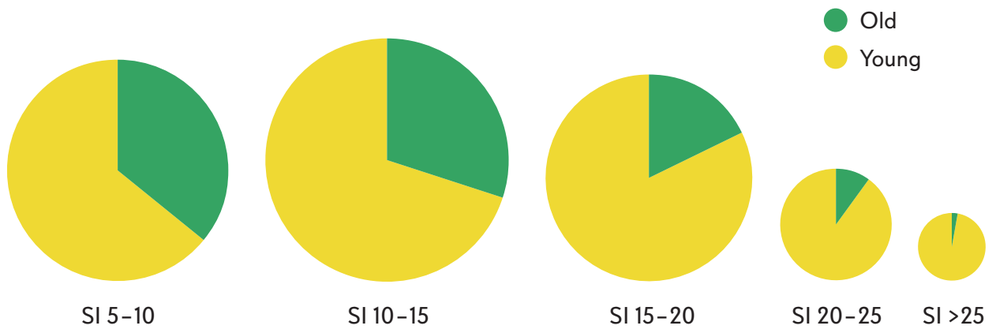
1 https://engage.gov.bc.ca/oldgrowth/how-much-old-growth-is-in-b-c/

Current old growth status

Our analysis concludes the following:

- The provincial total area of old forest (~13.2 million hectares) matches our total.
- The vast majority of this forest (80%) consists of small trees:
  - ~5.3 million hectares have site index[2] 5–10m; another ~5.3 million hectares have a site index 10–15m.
  - Small trees characterize many of BC's natural old forest types, including black spruce bog forests in the northeast, subalpine forests at high elevation, and low productivity western redcedar forests on the outer coast.
  - Large areas of this old forest type remain because the trees are too small to be worth harvesting (under today's prices).
- In contrast, only a tiny proportion of BC's remaining old forest (3%) supports large trees:
  - ~380,000 hectares have a site index 20–25m, and only ~35,000 hectares of old forest have a site index greater than 25m.
  - These types of forests match most people's vision of old growth. They provide unique habitats, structures, and spiritual values associated with large trees.
  - Productive old forests are naturally rare in BC. Sites with the potential to grow very large trees cover less than 3% of the province. Old forests on these sites have dwindled considerably due to intense harvest so that only 2.7% of this 3% is currently old (see pie chart). These ecosystems are effectively the white rhino of old growth forests. They are almost extinguished and will not recover from logging.
  - Over 85% of productive forest sites have less than 30% of the amount of old expected naturally, and nearly half of these ecosystems have less than 1% of the old forest expected naturally. This current status puts biodiversity, ecological integrity and resilience at high risk today.

Old Growth Amount by Productivity Class



2 Site index refers to the height of dominant or codominant trees at age 50; it is used as a measure of site productivity and to estimate tree growth over time. For example, a site index class of 5–10 means tree seedlings will grow between 5 and 10m tall in 50 years across the range of sites included in the class; similarly, a site index of 20–25 means trees are expected to grow between 20 and 25m tall in 50 years.

Old Growth Location



Province's map



All but tiny trees (SI >10m)



Projected future status of old growth

Projecting the effect of current policy increases risk to very high levels for almost all old forest in the province, due to very low targets, and the lack of spatial management in much of the province. Only areas where harvesting cannot occur due to economics will have lower risk than predicted, as these areas may not be harvested down to the minimal target levels. In most areas with productive forest in BC, risk will be higher than predicted in this analysis, due to the current lack of effective implementation of old forest policies.



Productive sites (SI >20)

Conclusions and recommendations

Productive old forest has almost vanished across BC, while large areas of low productivity inaccessible old forest remain in some forest types. Retention of mature forest is necessary in many ecosystems, particularly those with long harvest history, to recruit old forest for the future. **Forest policy in BC relies upon the old forest strategy to maintain biodiversity into the future—yet that policy fails to maintain ecosystem diversity, thus posing high risk to biodiversity and carbon storage now, and higher risk into the future.**

Current old forest retention targets provide a very low bar and implementation pushes effectiveness of old forest policy below even this bar. Priority actions to stop further loss, and increase retention of representative old forest must be taken immediately to reduce risk and maintain and restore values into the future.

The report includes a series of detailed recommendations (see main report) to prevent the loss of the last of the very rare and highly important productive old forest, and to manage the remainder of the old forest to a reduced risk level in future.

Key actions include the following:

- Immediately stop harvesting the rarest of the rare.
  - › Retain all old forest in any ecosystem with less than 10% old remaining in order to preserve opportunities to implement existing old forest targets effectively.
  - › Focus retention on higher productivity sites and irreplaceable very old/ ancient forests.
  - › Where little to no old remains today, focus retention on productive mature stands, particularly in places with a long harvest history.
- Develop and implement ecologically defensible targets for old forest (e.g., minimum of 30%).
- Improve implementation to ensure that old forest retention protects the last remaining productive old forests, and protects functional forests for the future.

In addition:

The transition from old forest harvest is imminent. Without immediate action we will lose these globally priceless values—and still have to deal with a volume-based industry that has not planned ahead for transition.

The provincial government must provide funding, commitment and management authority to ensure that staff can implement effective forest conservation. Little human effort is tasked with protecting old forest values, while much is focused on harvesting.

The details are complex, but the big picture answers are easy and clear. Immediate action is needed:

Stop the bleed. Immediately place a moratorium on logging in ecosystems and landscapes with very little old forest.

Reduce risk. Immediately remove the 2/3 drawdown to match minimum targets in Biodiversity Guidebook. Then revise targets based on science to lower future risk.

Implement intent properly. Design and revise spatial OGMAs to capture the best remaining old forest and ensure they maintain functional ecosystems.

JAKOB DULISSE

Forest policy in BC relies upon the old forest strategy to maintain biodiversity into the future — yet that policy fails to maintain ecosystem diversity, posing high risk to biodiversity and carbon storage

TAYLOR ROADES

Context

British Columbia's identity relies on its forests. BC has a world-famous coastal temperate rainforest, an almost unknown globally-unique inland temperate rainforest, plus expanses of interior forests as varied as conifer-deciduous mosaics in the northern boreal ecosystems, towering Douglas-fir and ponderosa pine trees scattered in open grasslands in the south and rugged mountainous forests.

Old forests provide cultural, social and economic values, support world-renowned biodiversity, and store huge amounts of carbon; yet the debate rages about how much old forest exists, what it looks like, and where and how much it should be protected.

This report will answer:

- What types of old forest exist in BC?
- How much old forest of each type exists in BC?
- What types of forest are at highest risk today?
- What actions should be a priority to maintain BC's old forest values?



JAKOB DULISSE

Why are old forests important?

Forests develop over centuries and millennia, shaped by disturbances that leave legacies. As they age, ecosystems change in structure, composition and function. Recently-disturbed forests are full of light, feeding fast development of herbs and shrubs; young naturally-disturbed forests are scattered with legacies from previous forests that add structure. In contrast, many mid-seral and mature forests are dense, dark and uniform with little understory; those initiated by forest harvesting are particularly simple in structure and composition. Old forests meld light and dark; their structural complexity can include large old living trees, large standing dead snags, long downed logs, a multi-layered canopy, horizontal patchiness with canopy gaps that allow understory growth, and hummocky micro-topography. The structural complexity creates myriad habitats that, given sufficient time, support diverse interacting communities of specialists and generalists — from a rich soil micro-fauna to unique canopy communities, from berry bushes to devil's club, from marten to caribou. These complex old growth forests play critical ecological functions in harnessing the sun's energy through photosynthesis, storing carbon in large live and dead trees, collecting, filtering, cooling and transporting water, gathering nutrients from the atmosphere (e.g., via epiphytic lichens), providing nurse logs for the next generation of trees, and building soil.

BC's biodiversity depends, in large part, on old growth forests. The structural diversity and long development period of old growth forests drive their ecological importance. Forest biodiversity and ecosystem function are inextricably intertwined. Functional ecosystems sustain viable populations of adapted species; in turn, natural biodiversity maintains ecosystem function and resilience.

Functioning old growth forests deliver ecosystem services valued by people, including food, water, fuel, medicines and timber, recreation and tourism opportunities, and cultural and spiritual values. Old growth is identified by First Nations' people as valued for traditional resource use and the ability to harvest old growth trees such as monumental cedar for cultural purposes, as well as for spiritual and other values. Large landscapes dominated by a distribution of natural ecosystems, including old forests, also improve the ability to practice treaty and aboriginal rights unencumbered by industrial footprint. People worldwide are sustained and nourished by the values found in standing old forests. And BC's forest industry has operated on the accumulated capital created over centuries and millennia, with old forest still being the primary type of forest being harvested in this province today.

What types of old forest exist in BC?

Old forests vary with climate, topography, nutrient and moisture availability, disturbance history and age. Forest types look and feel very different; they function differently and provide different habitats and cultural resources.

At the broadest scale, forest ecosystems in BC are defined by biogeoclimatic (BEC) zones. Wet and rich Coastal Western Hemlock (CWH) and Coastal Douglas Fir (CDF) forests on Vancouver Island grow massive trees over the millennia between natural disturbances such as large fire and windstorms. Interior Cedar Hemlock (ICH) forests that form the inland temperate rainforest include a high diversity of tree species that grow large on productive ground. Interior Douglas Fir (IDF) and Ponderosa Pine (PP) forests in the southern interior were once dominated by large, widely-spaced trees growing in meadows maintained through frequent ground fires. High elevation Engelmann Spruce — Subalpine Fir (ESSF) and Mountain Hemlock (MH) forests grow very old, but rarely reach the stature of their lower elevation neighbours. On the central interior plateau, Sub-boreal Spruce (SBS) forests blanket the landscape with relatively young forests dotted with relatively rare old lodgepole pine or spruce stands passed over by wildfire. Climatic variation overlaying landscape form drives variation in moisture and temperature within zones to create BEC variants. Combining these diverse forests into a single old forest statistic hides meaningful ecological patterns and trends.

Old forest can vary as much within single BEC variants as among different BEC variants, driven by differences in moisture and nutrient availability and defined by site series within BEC variants. Sites within a single BEC variant can be highly productive, growing large trees quickly, or unproductive, with small trees growing slowly. For example, on flat benches on eastern Vancouver Island, magnificent Douglas-firs grew up to 100m tall; nearby on rock bluffs, tiny, skinny trees eke out a living overlooking the ocean. Similarly, in northeast BC, large white spruce and cottonwoods growing along riparian corridors differ from the matrix of black spruce muskeg. These forests clearly provide different values, but are often classified within the same BEC variant. Even at high elevations, trees can be impressive in size on some sites and wizened on others. Combining these different forests into a single metric is very misleading.



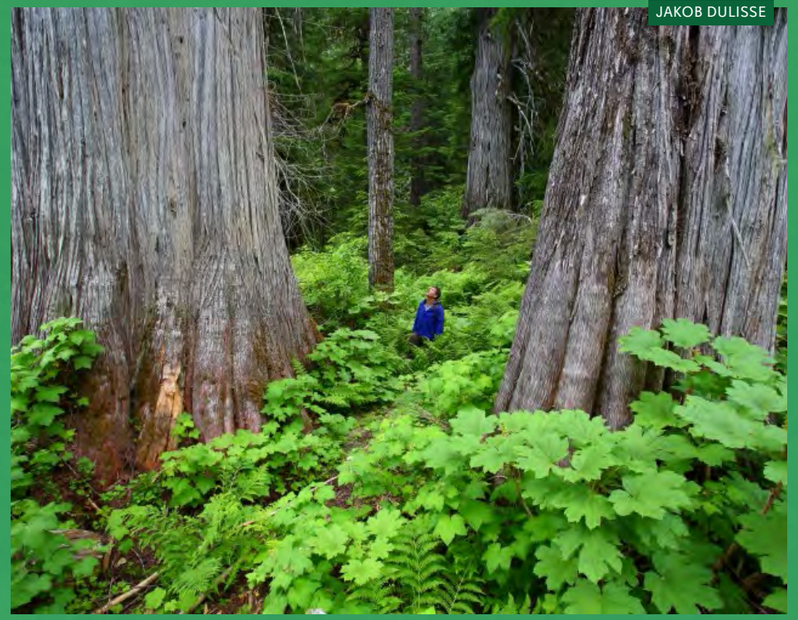
STEPHEN SHARNOFF

These photos are illustrative of a range of productivity in old forests. The low productivity site (SI 5–10m) shows an old coastal bog forest with small trees, while the high productivity site in the inland temperate rainforest (SI >25) features massive trees. Across this range — from low through medium to high productivity — all these old forests have value, but the biodiversity present, the structures and functions all differ vastly. The provincial government lumps all productivity types together in their descriptions and management of these forests.





Low productivity



High productivity

How to maintain important values?

Ecosystem representation is the scientific approach to sustaining ecological integrity by maintaining a sufficient area of each ecosystem type to support associated species, processes and functions. Because forest types support very different processes, functions and species, effective representation must include all types of forest. Maintaining ecosystem representation is the only practical approach to maintaining the diversity of habitats and ecosystem functions because knowledge is insufficient to maintain all species and functions individually — ecosystems are complex and interdependent and responses to management are uncertain and frequently non-linear.

High productivity forests matter. These forests have globally-significant structural complexity, allowing a large number of species, including culturally important animals such as grizzly bears and fur-bearers, to coexist. By accumulating biomass quickly and storing huge amounts of carbon, wet productive forests also play a critical role in climate mitigation. They tend to be extremely poorly represented in protected areas, and have been the focus of harvest pressure over the last century.

Rare forest types matter. Some forest ecosystems are common, widely spread over the province (e.g., high elevation ESSF), while others are very limited in extent and location (e.g., low elevation dry ponderosa pine dominated ecosystems). Within broad ecosystems, rare types are valuable; for example, a rare old moist spruce forest within a sea of younger lodgepole pine provides rare structural complexity of particular value to biodiversity in that landscape. High productivity forests are naturally relatively rare across the province. Targeted harvesting has made these forests unnaturally rare and at risk.

Low productivity forests matter. These forests provide habitat for a certain cross-section of biodiversity — caribou in the boreal, a diversity of plant species, cultural values. In general, low productivity forests are considerably less at risk due to their lower timber value, though in some parts of the province their condition is significantly reduced by other industrial disturbances such as fragmentation by gas development in the north-east.

What is an old growth forest?

Ecologically, old growth forests are natural ecosystems that have developed sufficiently to include the structural complexity and functional values designed by a landscape's natural disturbance regime. Where natural disturbances are rare, the whole forest can be much older than their oldest trees. These forests replace themselves over time as small gaps open and fill with new young trees, providing a dynamically stable environment for centuries.

Wet coastal and interior forests dominated by cedar and hemlock stands are good examples of ecosystems where forests can be many hundreds, if not thousands of years old, and where the natural amount of old forest is very high (50 — more than 90% of some landscapes). In ecosystems with more frequent disturbances, tree age is more uniform, with veteran trees representing legacies of past disturbances. Warm, dry forests in the interior of BC — typically dominated by lodgepole pine, Douglas-fir, spruce, are examples of forests where old forests naturally exist over a lower proportion of the landscape (25–60% of the landscape), and where the age of the oldest forest stands is rarely over 200–300 years in age.

In a forest management context, the province of British Columbia defines old growth forests by simple and somewhat arbitrary age criteria that vary across ecosystems based on estimates of historical disturbance regime. In general, wetter ecosystems are considered old when older than 250 years and drier ecosystems when older than 140 years. Age in provincial datasets is estimated from air photos. Using age to define old forest is a good start — but it fails to reflect variations in old growth structure and complexity. In addition, estimated age can be inaccurate, particularly for low productivity forests, where short old trees look younger. And defining old forests as older than 250 years ignores the important differences between old, very old, and ancient forests. In temperate rainforests, some forests are many thousands of years old with structural and species complexity and time for development far beyond 250 years.

Assessing ecological risk

Ecological risk assessment evaluates the chance that management activities (e.g., forest harvesting, road networks), in combination with natural disturbance (e.g., wildfire, insect outbreaks), will have important impacts on ecological function, biodiversity or focal species. While ecosystems have evolved to be resilient to natural disturbance, additional disturbance through industrial management can lead to cumulative effects that push ecosystems beyond their natural variability — so they no longer provide the range or amount of values and services they did previously.

Understanding how much old forest is 'needed' to maintain the wide range of associated values is a critical input into risk assessment, and British Columbia has embraced the scientific notion that managing forests in relation to their natural patterns is likely the most effective approach to minimize risk. The basic approach is that the level of risk to ecological function, biodiversity and resilience (i.e., the chance that ecological values will be lost) increases as the amount of old forest decreases relative to natural amounts.

Conservation science agrees that habitat loss leads to declines in populations and ultimately loss of species. In this case, 'habitat loss' is defined as changes to seral stage distribution, particularly because old forest is always reduced from the natural state by forest management. There is also evidence that changes in biodiversity and forest structure are linked to shifts in ecosystem function and resilience. Shifts in function mean that forest ecosystems can pass a point whereby a particular species may not be able to recover to former abundance even if habitat is subsequently increased, and/or that ecosystems are less able to withstand disturbance and they become less resilient. Both linear loss, and thresholds are therefore important to avoid before irreversible harm occurs.

Studies of habitat change suggest that risk to biodiversity and ecological function is low when more than 70% of natural forest remains, high when less than 30% remains, and moderate between (Figure 1). This "risk curve" is based on scientific literature from a wide range of ecosystems and species — from mites in moss mats to marten in boreal forest. For each particular species, the data summarise how much loss of 'habitat' leads to a threshold population response. Uncertainty about the shape of the relationship is highest in the middle of the range — as thresholds vary by ecosystem and species.



STEPHEN SHARNOFF

Applying the science to forested ecosystems involves asking how much change in old forest can occur before there is a population response across a range of species, likely linked to changes in ecological function and resilience. Because old forest has a diversity of special elements and provides long time periods for colonization, it is home to many specialist and 'fairly specialist' species. BC retains old forest to maintain biodiversity because it is associated with many species, because it provides many functions (e.g., cooling water, storing carbon) compared to younger forest, and because it is systematically reduced from forested landscapes so is inherently at risk. However, any seral stage type would show a similar pattern: losing a large amount relative to natural would lead to negative responses for organisms that specialize on these habitats. If forestry decreased the amount of young or mid-seral relative to natural, organisms that specialize on these seral stages would be at risk. However, forest management increases rather than decreasing these habitats. Some organisms depend on young natural seral stages (e.g., recently burned snags). The risk curve can be applied to this habitat too, suggesting that risk increases as naturally-disturbed stands are salvaged.

This risk relationship has been applied to BC's coastal forests.[3,4] Because the approach relates risk to the expected natural level of old forest in any ecosystem, there is no evidence to suggest that the low risk threshold would not apply similarly in different forest types. However, the high-risk threshold may be higher than 30% of natural levels for ecosystems where natural disturbance levels are high because the absolute level of forest may be very low in these ecosystems. The habitat change/threshold literature demonstrates that absolute amount of habitat matters, particularly at low amounts. This means that in ecosystems with naturally low amounts of old forest, dropping down to 30% of that small amount may lead to old forest being so scattered and patchy on the landscape that it does not provide all the functions expected from it—for example, security habitat for a species may be too scattered across the landscape to be functional if there is very little of it in total. In addition, the smaller the amount of old forest, the more important it is that that forest be found in functional patches—this is a weakness in this analysis, that only the amount, and not the condition of the remaining forest is assessed.

BC forest policy uses the concept of linking old forest targets to the natural amount of old forest for individual ecosystems, but does so in a way that allows a very large reduction from the natural amount of forest for most ecosystems in the province, and hence poses high risk to values. In addition, it does not set a bar on the condition of that old forest which in some areas may be a critical gap in potential effectiveness. See Policy Implications.

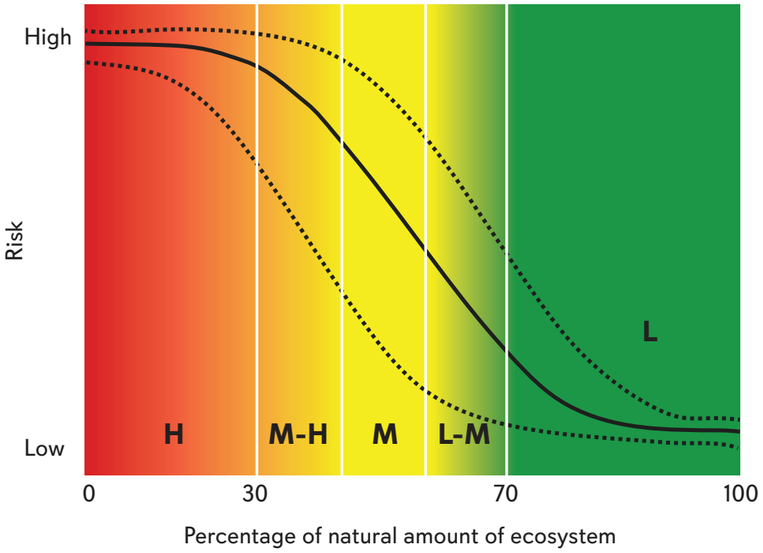


Figure 1. Risk to ecological function, biodiversity and resilience based on the amount of an ecosystem remaining relative to natural amounts. Colours show risk classes used on subsequent maps.

3 Price K, Roburn A, MacKinnon A 2009. Ecosystem-based management in the Great Bear Rainforest. Forest Ecology and Management 258:495–503.

4 Coast Information Team. Ecosystem-Based Management EBM Planning Handbook. 2004. https://www.for.gov.bc.ca/tasb/slrp/citbc/ebmplan.html

Analysis methods

We used publicly available provincial data to examine the amount of old forest in each ecosystem across the province, and compared this to the amount of old forest that would be expected under natural conditions.

Ideally, old forest representation analysis would examine individual ecosystems (represented best by site series within Biogeoclimatic (BEC) variants) to capture differences in forest type. At the provincial scale, such data are unavailable—and intractable. We therefore chose to analyse productivity classes within groups of BEC variants. This is an improvement for reflecting ecosystems over 'BEC only' data, and is an approach used provincially by the Chief Foresters' office to determine timber supply availability.

We used the most recent publicly available forest inventory data for all analyses.[5] We began with the forested landbase and excluded areas beyond provincial jurisdiction (private land). We also excluded primarily non-forested ecosystems including alpine, subalpine parkland, grassland and shrub dominated ecosystems.[6] We defined productivity using site index (potential tree height at age 50 based on Vegetation Resource Inventory data) and removed ecosystems with a site index of lower than 5m, as used by the Province of BC to define Crown Forest LandBase at the strategic scale.

To capture broad ecosystem type, we analysed data by biogeoclimatic variant, and lumped variants and subzones into groups based on moisture class for some analyses (e.g., SBSm includes SBSmc1, mc2, mh, mk1 etc). Other classifications would be possible; we chose this method

5 Data are available for some, but not all Tree Farm Licenses

6 Alpine zones (BAFA, CMA, IMA); parkland subzones (subzones ending with "p"); BG, SWB zones



About 400,000ha of remaining old forest have SI >20m, representing less than 1% of BC's total forest area of 50 million ha.

as simple and transparent. To capture differences in productivity within broad ecosystem, we analysed old forest by site index classes (SI >5, 5–10, 10–15, 15–20, 20–25, 25–30, >30), where SI represents potential height in metres at age 50. We combined classes to reach a total forest area of >5,000 ha within units to avoid misleading results due to small area. Our analysis units hence use site index groups within BEC groups, aiming to reduce combining forests with massively different form, function and human values, an approach very similar to that used provincially for timber supply analysis.

To improve geographic resolution, we analysed BEC variants by Landscape Units (areas defined by the provincial government as management units for old forest) to examine how the condition of old forest varies with geographic distribution within a BEC unit.

For each unit, we summed the current amount of old forest following provincial age-based definitions[7] for each biogeoclimatic variant (250+ years for wetter ecosystems, 140+ years for drier ecosystems). We examined both absolute amount of old forest and the proportion of each unit that is old. We also examined the proportion of each unit >140 years and >250 years for comparison, in part because of issues with age unreliability which is particularly apparent in some ecosystems (e.g., in some lower productivity areas at high elevation and along the coast there are known inventory issues because they are of lower interest for forest harvesting and sometimes have poor differentiation between mature and older aged forests).

To assess risk to biodiversity, we estimated the percent of old forest expected based on natural disturbance and expressed the amount of current old forest as a proportion of expected old. We used Biodiversity Guidebook 1995 age definitions for BEC variants, and disturbance rates for all ecosystems except those in the Great Bear Rainforest, where we used more current information on disturbance rates from the EBM Land Use Order.
In some cases, the age of old used here is younger than science now suggests, and often disturbance rates were over-estimated in the Biodiversity Guidebook (e.g. for wet ICH ecosystems). In all cases that we are aware of, these discrepancies will result in increased risk to ecosystems than our analysis suggests.

7 Biodiversity Guidebook. Province of BC, 1995.

TAYLOR ROADES

Results

How much and what types of old forest exist in BC?

The answer depends on the broad ecosystem, represented by BEC variant, and the type within different ecosystems, represented by productivity. We present results at three scales: the entire province, BEC zone and BEC variant. Within all scales, we divide forest into productivity classes.

Old forest at the provincial scale

- About half of the vast BC landbase, 50 of 95 million hectares, can grow trees that reach at least 5m tall in 50 years (SI>5), with decreasing proportions in the higher productivity classes (Figure 2).
- Of the 50 million hectares that grows trees: 30% is expected to grow very small trees (SI 5–10; generally not considered worth harvesting); of that 35% (~5.3 million hectares) is old today;
  - 35% is expected to grow small trees (SI 10–15); of that 29% (~5.26 million hectare) is old today;
  - 25% is expected to grow medium sized trees (SI 15–20); of that 18% (~2.3 million hectares) is old today;
  - 7% is expected to grow large trees (SI 20–25); of that 10% (~380,000 hectares) is old today;
  - 3% is expected to growth very large trees (SI >25); of that 2.7% (~35,000 hectares) is old today.

Overall, the proportion of old forest in each site index class decreases as forest productivity increases (Figure 3).

The Figure 4 maps (see page 24) show the distribution of old forest in different productivity classes (green over a yellow base showing all forest). The top left map shows old forest in all forested ecosystems (SI >5). Moving through the maps, the forest shown represents an increasingly high productivity range, with a decreasing total of old forest. The bottom right map shows the distribution of higher productivity (SI >20) old forest — with hardly any visible on the map. This corresponds to the relatively small proportion of land that can grow higher productivity stands, and the vanishingly small proportion of that land that remains old forest in this category (see Figure 3 and 4 together). Overall:

- There are large areas of low productivity old forest, with short, skinny trees, at high elevations along mountain ranges on the coast and interior and in the northeast (Figure 4).
- Very little old forest of any productivity class remains on the interior plateau or southern interior.
- There are scattered pockets of higher productivity old forest areas in areas of the mainland coast, some in the inland temperate rainforest and in valleys in the northeast. Most patches are too small to be visible at this provincial scale. **Overall, about 400,000ha of remaining old forest have SI >20m, representing less than 1% of BC's total forest area of 50 million ha. This productive old forest is therefore extremely rare in BC.**

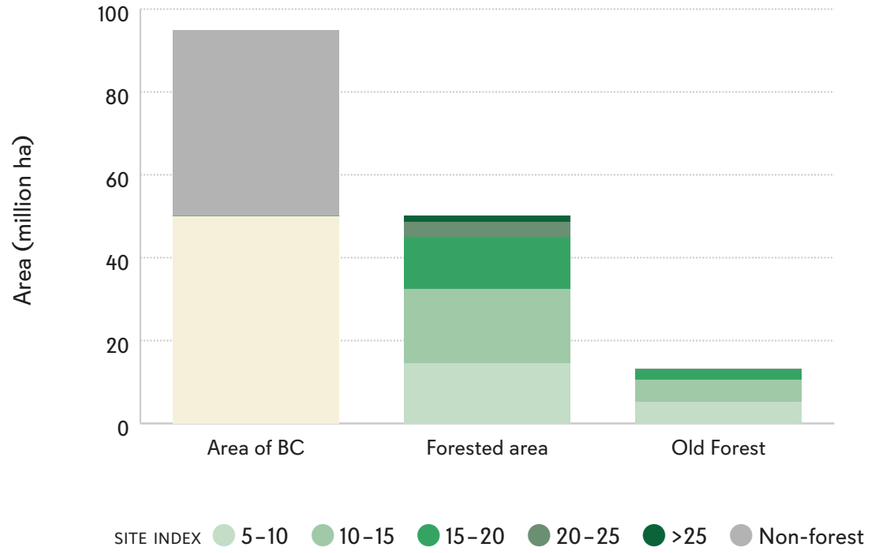


Figure 2. How much forest, and old forest exists in BC by productivity class as defined by Site Index groups.

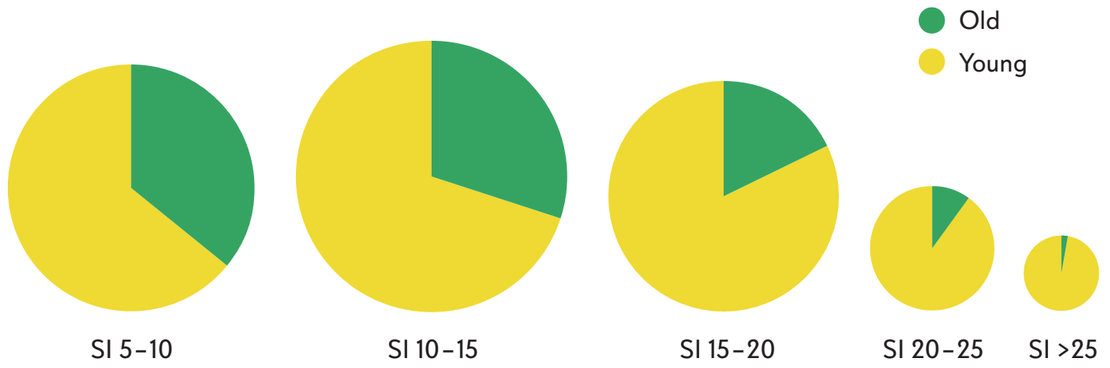


Figure 3. Proportion of BC's forest in each productivity class as defined by site index groups. Of the ~50 million ha of forest, the area in each SI group (e.g. 5–10; 10–15) is represented by the area of each circle, and the proportion of each SI group that is old is shown in green.

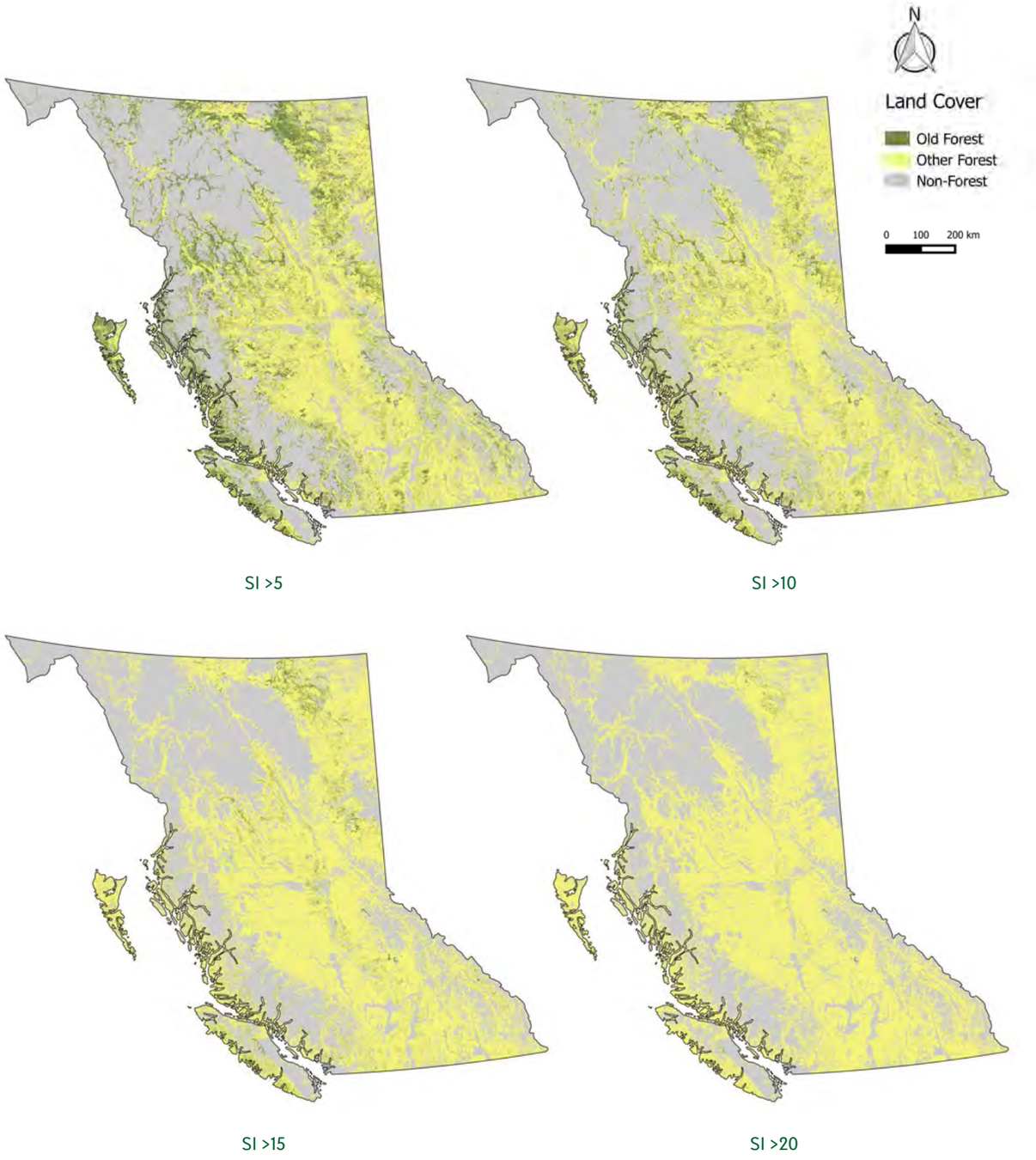


Figure 4. Where is current old forest by productivity class? Old definitions use provincial criteria. Old growth greater than each site index cut-off is shown in green. Yellow shows all other forest (younger or lower site index).

Old forest by BEC zone

The proportion of old forest varies by BEC zone (Figure 5).

- Most biogeoclimatic zones have a higher proportion of old forest on low productivity sites (Figure 5), and there is a decline in old forest with higher productivity.
- This pattern is particularly clear in coastal units; in the CWH and MH 40–55% of low productivity ecosystems (site index 5–15m) is old, whereas only 6% of high productivity sites (site index >20m) is old. Naturally, over 80% would be expected to be old.
- The drier ESSF zone and wetter ICH show a similar pattern, but proportion of old forest drops more rapidly between very low (site index <10m) and low (site index <15m) productivity sites.
- Old forest in any productivity class is very rare in the CDF, IDF and PP zones; these zones lie nearest to high human populations and are at low elevation. Many BECs have less than 5% old forest with others at <1% remaining.
- Only the BWBS in the northeast of BC has more than a quarter of productive sites that are old.
- All zones except for low productivity forests in the drier ESSF and BWBS forests have considerably less old forest than expected based on historic disturbance regimes (compare columns to lines in Figure 5).

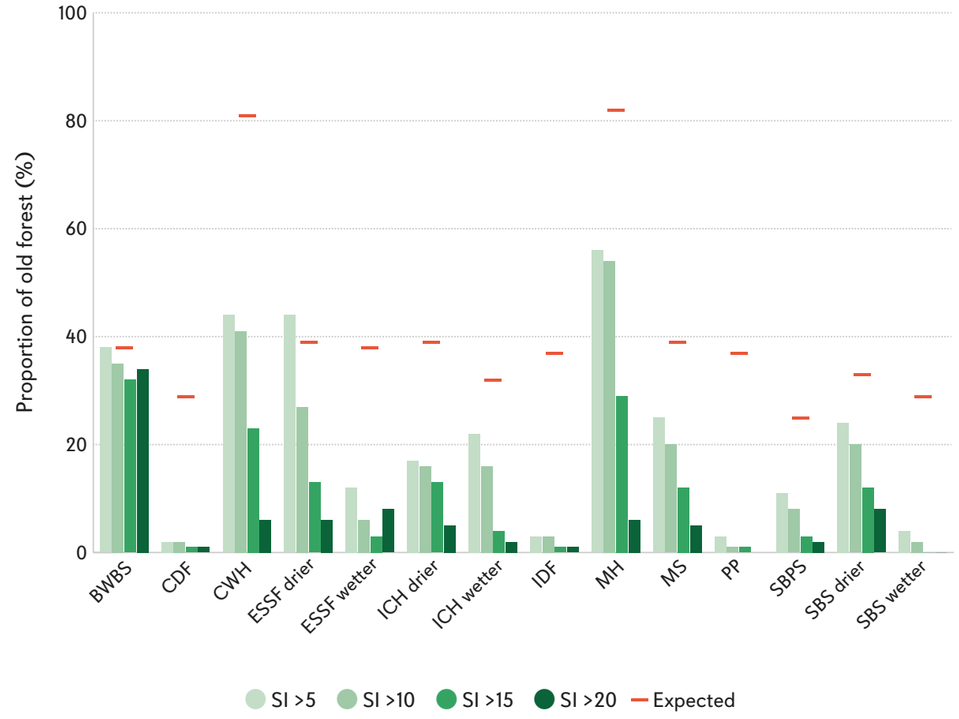
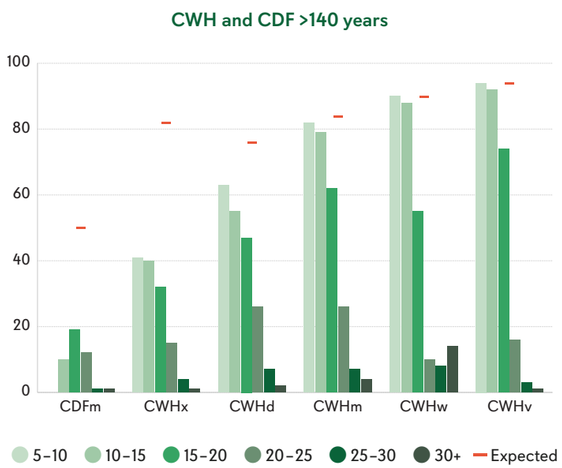
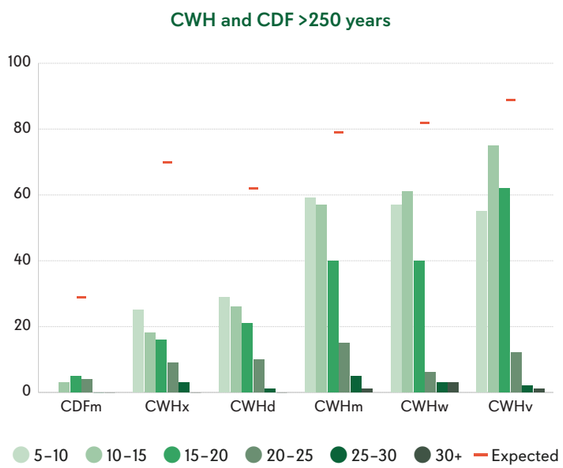
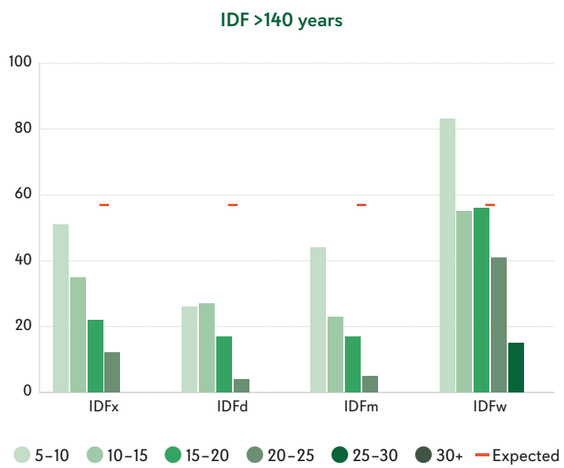
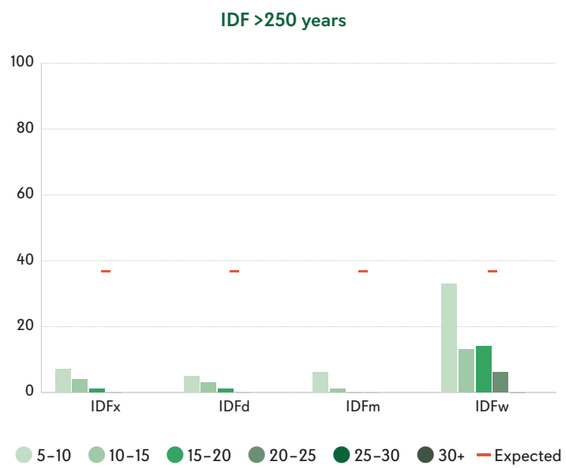


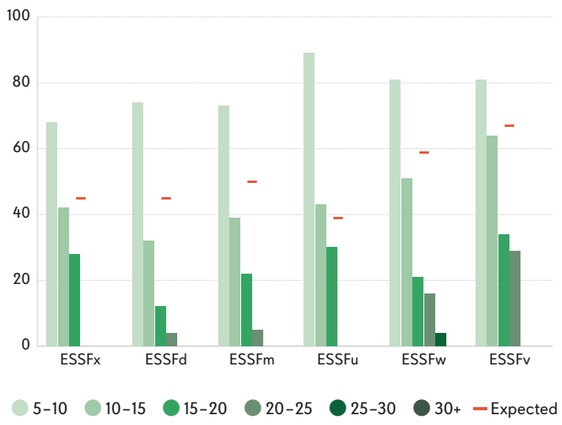
Figure 5. Amount of old forest in each productivity class within broad ecosystems (biogeoclimatic zone). Floating bars show the proportion expected to be "old" (provincial definitions) under natural disturbance; for example, ICH drier shows proportion >140 years and target for >140 years while ICH wetter shows proportion >250 years and target for >250 years.

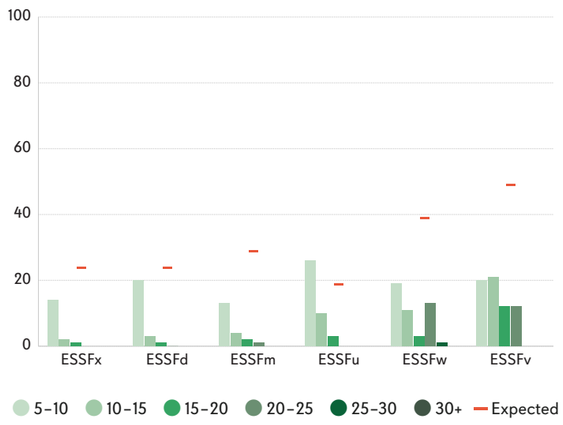


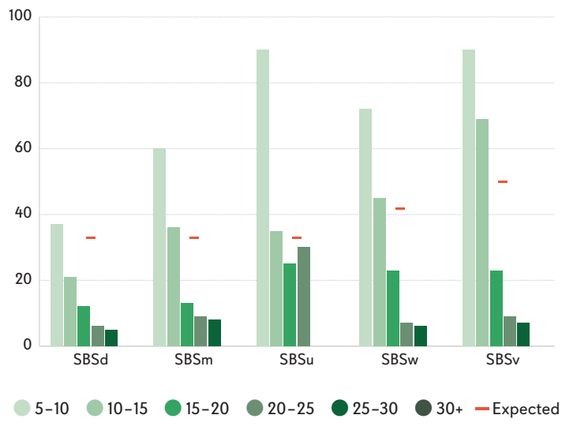


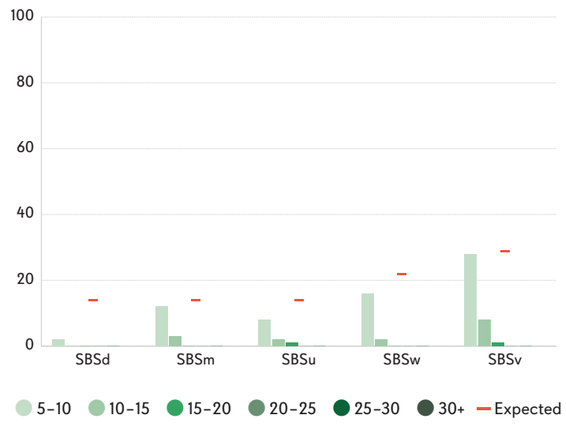


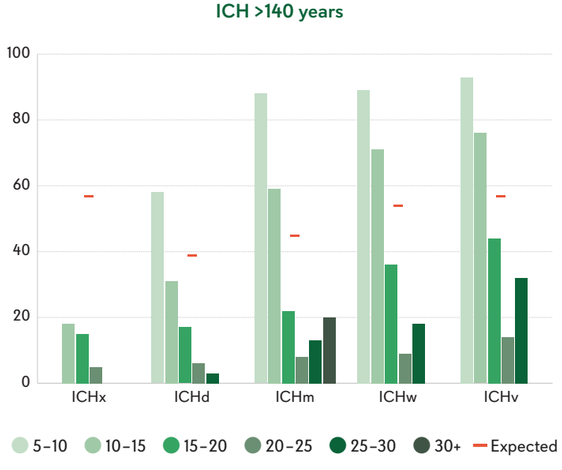












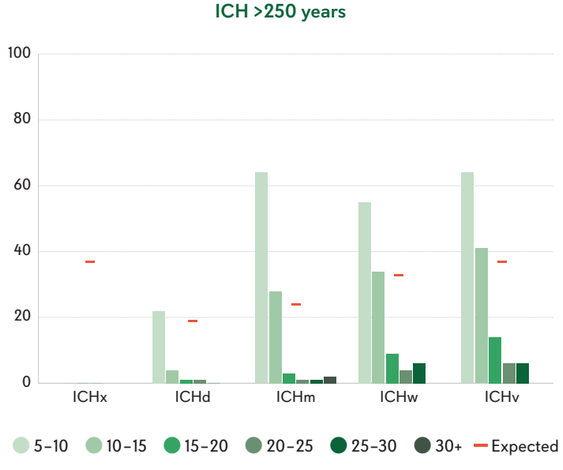


Figure 6. Proportion of each unit (site index class within biogeoclimatic variant group) that is old. Floating bars show the expected amount of old forest based on historical disturbance regimes.

Old forest by BEC variant

Within BEC zones, in general, dry and moist BEC variants have less old forest remaining than wet and very wet ecosystems (Figure 6 shows examples for 5 zones). Patterns vary across zones due to differing natural disturbance regimes and harvesting history. In the high elevation ESSF, all moisture classes have similar amounts of low productivity old forest (70–85%); these stands are not targeted for harvest and experience low natural disturbance. Conversely, wetter CWH variants have more old low productivity stands than drier variants, likely partly due to lower rates of natural disturbance in the wetter variants, and partly to higher harvest history. The amount of high productivity old forest varies by moisture class in some zones (e.g., ICH and ESSF have higher amounts in wet and very wet variants); other zones have uniformly low levels of high productivity old forest (e.g., CWH and SBS), likely reflecting harvest history.

The amount of old forest on low productivity sites is closer to the amount expected based on historical disturbance. Low productivity ecosystems have more old forest than expected in several zones. This pattern is due in part to fire suppression (particularly in the SBS) and in part to potential overestimation of disturbance regimes (particularly in the ESSF).[8]

Site index determined from old growth stands may not accurately represent the full productivity of a site into the future — and in fact the province bumps up the estimated productivity of a stand once it is harvested (this leads to an increased estimation of volume that can be harvested today; an assumption that may or may not be fulfilled in the future). However — although specific stand level Site Index may not be accurate, we have no reason to believe that the trends shown through this analysis are incorrect at a strategic level. Overall, old productive forest, particularly in dry and moist variants, is very very rare and is far below the level expected naturally almost everywhere in the province.

Risk to old forest biodiversity

The series of maps on page 29 show the distribution of risk geographically for ecosystems in different productivity classes, and coloured up for each LU/ BEC combination. Risk is shown in 5 classes (high to low) comparing the amount of old forest in each BEC and productivity type today with that expected naturally. If there is 70% of the natural amount of old forest, risk is low (green), and if <30% of the natural amount of old, risk is high (red), with three intermediate classes outlined below. Each map shows a different subset of the forested landbase — in the top left all forest >5 SI is shown. There is a range of risk levels:

- Risk to old forest biodiversity within forests sufficiently productive to grow commercial trees (site index >10m) is high in much of the southern interior, the central plateau, and Vancouver Island (Figure 7). These forests have been disturbed by cumulative effects of wildfire, insect disturbance and forest harvest.
- Low productivity ecosystems have sufficient old forest to pose low risk to biodiversity in most of the north of the province, much of the west including the Great Bear Rainforest, the west coast of Haida Gwaii, Clayoquot Sound, and in high elevation forests along mountain ranges (Figure 7).
- Higher productivity forests have been reduced sufficiently far from natural amounts that risk to biodiversity is high for most ecosystems and across most of the province.
- Even in areas with considerable low productivity forest (e.g., coastal mountains), the high productivity forests of the valleys have been harvested.
- Analyses exclude private land, much of which has been converted from forest to other uses (e.g., Lower Mainland and Peace Valley) or almost completely harvested (e.g., east of Vancouver Island).

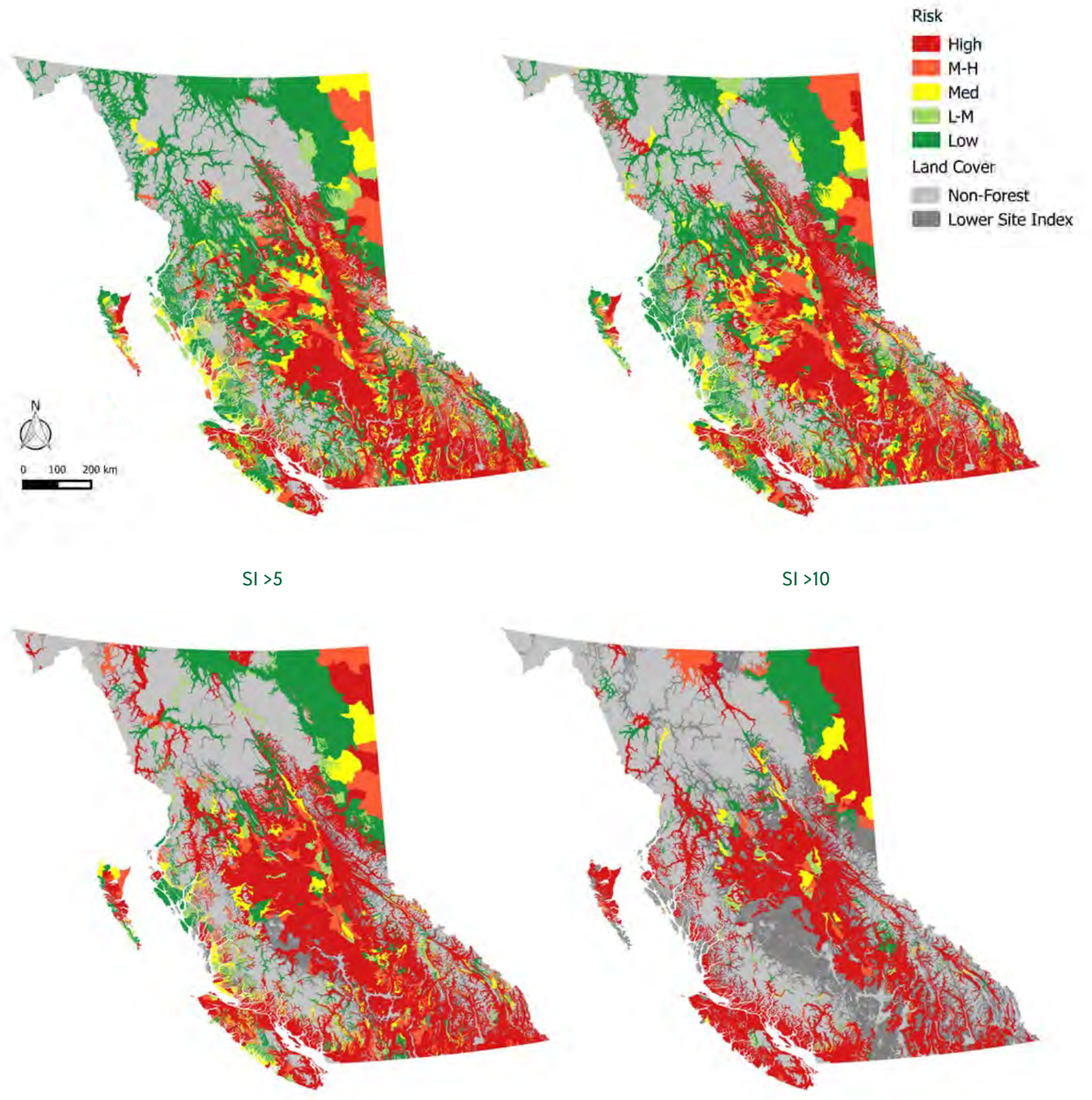


Figure 7. Risk to forest biodiversity calculated as the amount of each biogeoclimatic variant within a landscape unit that is old as a proportion of the amount expected based on historic disturbance regime. Risk classes: >70% of historic = Low; 58–70% = L–M; 44–57% = Med; 31–43% = M–H; <30% = High. Landscape units with no forests above a productivity level are coloured dark grey. Note that the maps show a decreasing amount of forest — the top left includes all forest >5 SI, whereas the bottom right includes only risk in LU's where there is forest with SI >20.

8 In many places, inventoried areas of old forest before harvest exceed estimates based on disturbance regimes, even in areas with low wildfire frequency.

Looking at LU / BEC combinations (the unit defined by the province to manage old forest), the number of units at low ecological risk declines from 32% (1,407/4,373 in forests with a site index of >5m, to 5% (80/1,583) in forests with a site index of >20m (Figure 8).

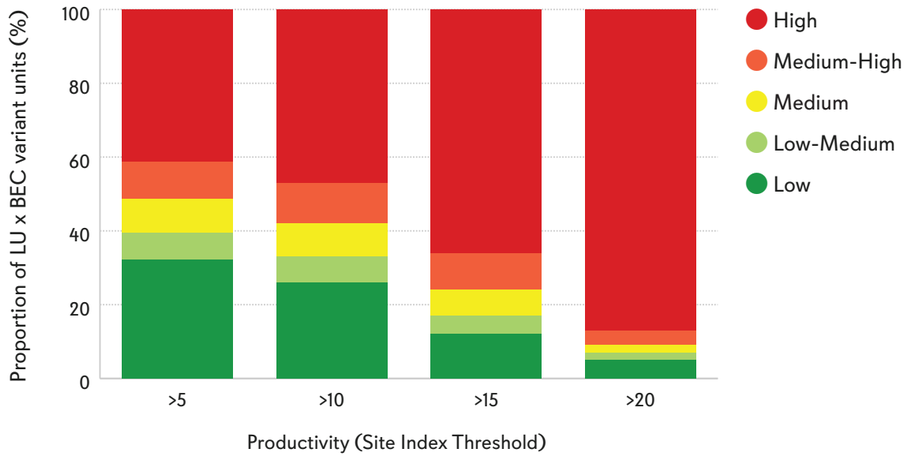


Figure 8. Proportion of biogeoclimatic variants within landscape units at each risk level.

Similarly, looking at LU / BEC combinations — many units have less than 10% of the amount of old forest expected naturally (Table 1). The proportion of units with less than 10% of natural old forest increases with productivity (reading down the <10% column in Table 1). In high productivity LU / BEC combinations, more than two-thirds of units (1090/1583 = 69%) have <10% of natural old, nearly half of units (682/1583 = 43%) have <1% of natural and more than one-third of units (569/1583 = 36%) have no old forest whatsoever (reading across the Site Index >20 row in Table 1).

All biogeoclimatic variant groups except the MHw (mountain hemlock wet) have landscape units with less than 10% of the amount of old forest expected naturally, and all but the MHw and MSm (montane spruce moist) have units with less than 1% of the amount expected under natural disturbance (Table 2). Some variant groups are at higher risk than others, including almost all CDF, IDF and PP variants, dry CWH, very dry and moist ICH, dry SBPS and wet SBS. Higher productivity stands within every LU / BEC combination are always at highest risk.

Table 1. Percent of units (BEC variant x LU) with very low amounts of old forest.

% OF NATURAL OLD FOREST				
SITE INDEX	NONE	<1%	<10%	TOTAL UNITS
>5	9%	11%	24%	4373
>10	13%	17%	30%	4016
>15	23%	27%	44%	2981
>20	36%	43%	69%	1583

How to read the table: For example, 71% of the LU / BEC combinations in the IDFx (very dry Interior Douglas Fir) have less than 10% of the natural levels of old forest.

Table 2. Proportion of landscape units within BEC variant groups with very low amounts of old forest relative to natural amounts. All cells with more than 0 units are at extremely high risk; colour shows cells with 1–32%, 33–66% and >67% of units with less than the specified amount (<10% or <1%) of natural old forest.

	<10 % OF NATURAL OLD FOREST				<1% OF NATURAL OLD FOREST			
	SI >5	SI >10	SI >15	SI >20	SI >5	SI >10	SI >15	SI >20
BWBSd	3	3	16	26	0	1	10	21
BWBSm	0	1	3	13	0	0	0	8
BWBSw	3	0	0	100	3	0	0	0
CDFm	88	88	88	94	88	88	88	88
CWHx	85	85	89	90	49	49	53	62
CWHd	38	38	45	64	5	6	8	18
CWHm	8	8	12	32	2	2	2	11
CWHw	3	5	15	77	0	0	5	35
CWHv	4	4	12	73	0	0	1	20
ESSFx	17	36	30	100	7	24	25	100
ESSFd	10	16	36	83	6	12	15	33
ESSFm	45	66	84	87	21	47	71	87
ESSFw	39	57	84	88	9	23	56	83
ESSFv	30	34	44		5	6	19	
ICHx	100	100	100	100	100	100	100	100
ICHd	4	4	14	66	0	0	0	20
ICHm	26	33	57	83	8	10	22	61
ICHw	6	10	35	73	2	1	8	44
ICHv	2	4	25	58	0	0	2	48
IDFx	71	71	90	100	42	44	70	100
IDFd	73	74	91	100	37	38	66	97
IDFm	94	94	94	100	78	81	91	100
IDFw	8	9	16	58	4	4	0	17
MHm	3	2	19	83	0	0	5	38
MHw	0	0			0	0		
MSx	3	10	46	100	0	2	37	60
MSd	4	6	20	67	1	2	2	31
MSm	7	7	0		0	0	0	
PPx	73	90	100		54	71	75	
SBPSx	17	30	80	100	4	4	67	100
SBPSd	24	33	80	100	0	0	40	100
SBPSm	13	17	50	67	0	2	24	33
SBSd	6	6	22	56	1	2	4	20
SBSm	2	3	27	45	0	0	5	28
SBSw	56	69	79	90	30	38	54	79
SBSv	44	50	88	100	13	18	50	94

Across BC, old forest makes up less than 10% of the total area of a BEC variant within a landscape unit in much of the interior (Figure 9). Coastal ecosystems generally have more area in old forest, although, as analyses above show, these are primarily on low productivity sites.

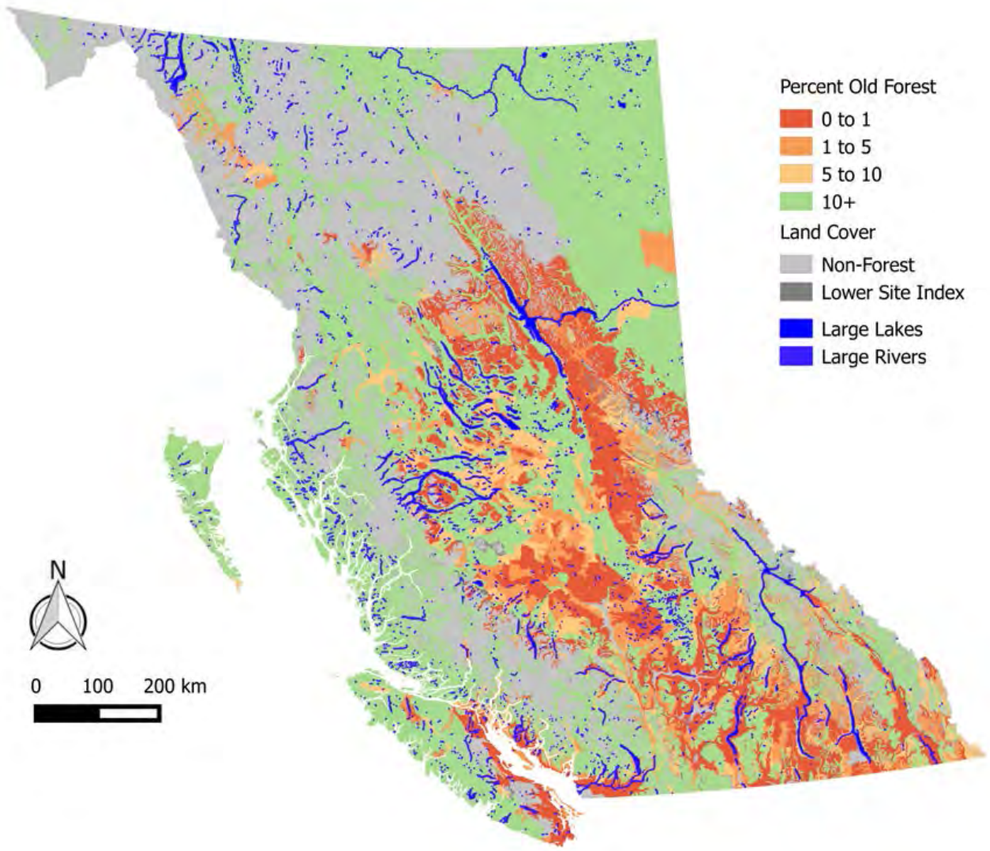
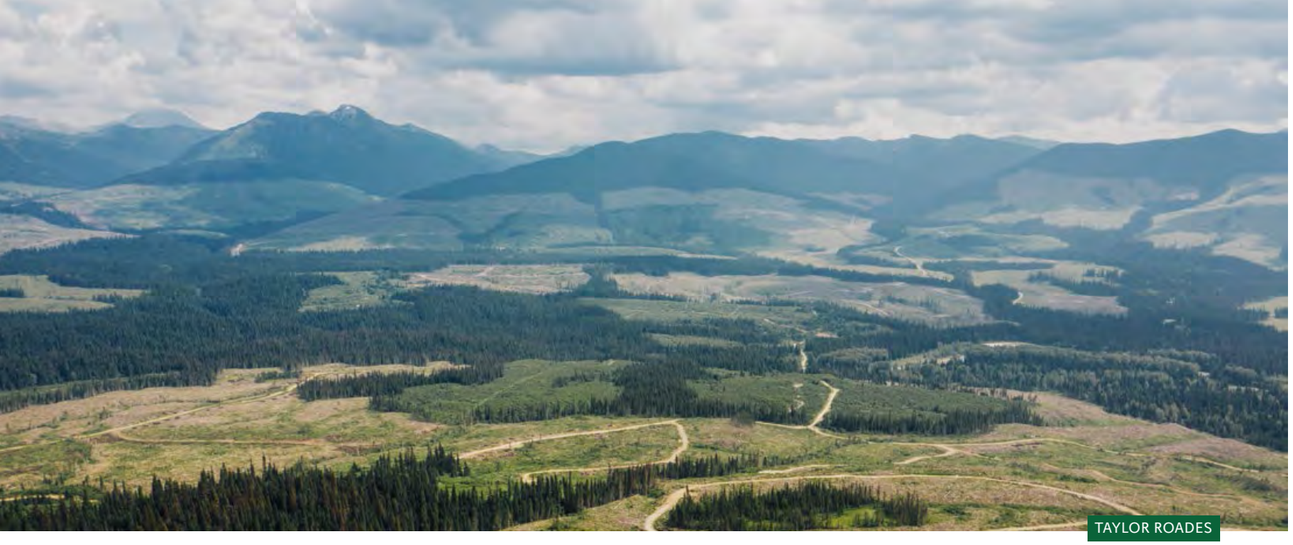


Figure 9. For all forest with SI >10m, BEC variants within landscape units that have less than 1%, 1–5% and 5–10% remaining in old in the LU / BEC combination. Note this is of the total area, not in relation to naturally expected levels.

Higher productivity forests have been reduced sufficiently far from natural amounts that risk to biodiversity is high for most ecosystems and across most of the province



TAYLOR ROADES

How much old forest will there be in the future — based on current BC policy?

BC has as a set of policies that are intended to 'protect' old growth across the province. In this exercise, we estimate the amount of old forest for each zone that will remain in the future - based on the current provincial policy that sets targets for old growth retention. Legal objectives for old growth retention apply to forested Crown land across BC, either as spatially-defined Old Growth Management Areas, or through aspatial landscape-level targets implemented within Forest Stewardship Plans. Targets were derived in the Biodiversity Guidebook (1995) and modified in the Landscape Unit Planning Guide (1999) for most of the Province. "Biodiversity Emphasis Options" define areas where the Province determined that 'acceptable risk' to biodiversity could be lower and higher. Based on current policy, about 10% of the province is expected to be managed with a high biodiversity emphasis, 45% with intermediate and 45% with low biodiversity emphasis, although in some areas of the province, much less than 10% of each zone has a high biodiversity emphasis option.[9] Old forest targets start with the expected amount of old forest under historic disturbance regimes, subtract a fixed area assumed to be in parks (12%), and reduce the result by a percentage based on biodiversity emphasis.[10] In addition, the concept of 'drawdown' was introduced — where only 1/3rd of the target in low BEO has to be met for three rotations (allowing the remaining forest to be all harvested and to grow back to old growth over 240 years). This leaves many units having a target of 3, or 4.7% for 45% of the landbase of BC.

We assessed future risk in two ways: first by projecting policies forward and second by assessing the amount of forest conserved within spatially defined areas including protected areas, legally defined OGMAs, no-harvest wildlife habitat areas and other similar zones. We considered two time periods: the short-term future (next few decades assuming that logging continues); and long-term future (>100 years, assuming that natural disturbance continues within conserved areas).

9 Actual intermediate and low emphasis areas can vary from 35–55% with restrictions.

10 For example, if historic disturbance regime is 250 years, 37% of the landscape is expected to be older than 250 years. Subtracting 12% for parks leaves 25%. High targets are 75% of 25% = 19%; intermediate are 50% of 25% = 13%; low targets are drawn down to 1/3 of intermediate targets, hence 17% of 25% = 4.3%.

Method 1: Provincial Targets

For the first method, we applied provincial targets, assuming that 10% of each variant would have retention targets based on high biodiversity emphasis, 45% on intermediate and 45% on low biodiversity emphasis. Although regional targets and implementation strategies vary, only the Great Bear Rainforest and Clayoquot Sound have significantly higher targets than those outlined in the Biodiversity Guidebook / Landscape Unit Planning Guide[11].

Rolling the targets forward in time shows that once applied, almost all BEC variants will have less than 10% of their area retained as old forest, with a total average retention target of 9% across BC (Figure 10) — and with 45% of the landbase at very high risk, where individual targets are down to 3%- 4.7% due to drawdown. This means that if the forest is harvestable — i.e., if it grows reasonably sized trees — then it will be harvested down to this low level of old forest leaving ecosystems at high risk in all zones, and at very high risk for many of the wetter ecosystems that naturally would have been dominated by old forest. This analysis does not apply to the Great Bear Rainforest, where risk should be lower, at least in some ecosystems, based on higher targets. However, there remain implementation issues here that may also fail to protect productive ecosystems.

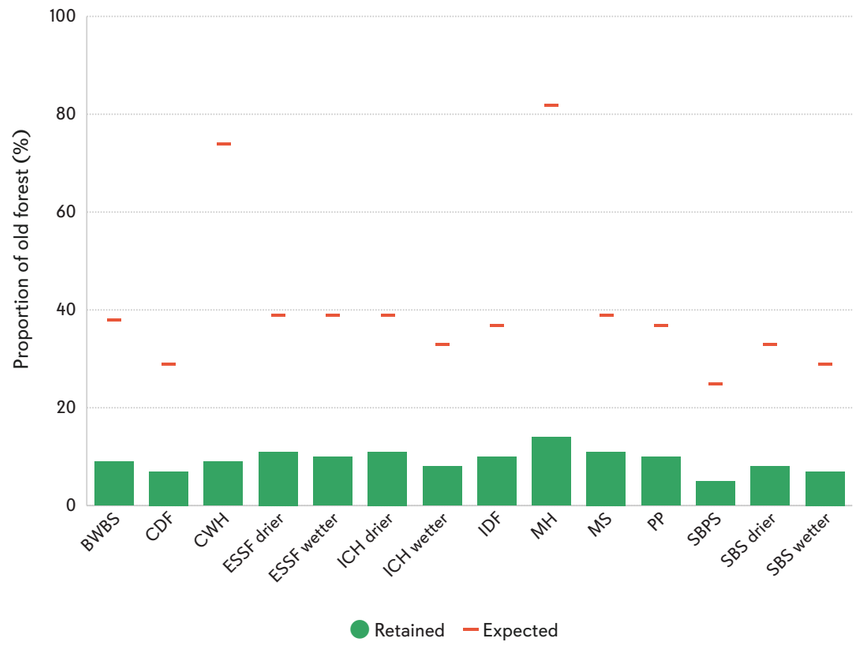


Figure 10. Amount of old forest projected into future based on targets taken from the Biodiversity Guidebook and Landscape Unit Planning Guide, compared to natural levels for each forest type. Regional targets will vary. Note this does not include Great Bear Rainforest EBM targets for site series. Note this reflects age of old as >140, or >250, so wetter variants (e.g. in the ICH) have a lower target of older aged forest than drier variants.

11 Note that due to complexity of application, we did not include GBR EBM targets in this analysis. We therefore over-estimate strategic level risk for the mainland coast GBR region. However, although the EBM targets are intended to be applied at site series level, in some cases, we are aware that this approach is failing to maintain representative old forest. Actual risk levels for the GBR ecosystem will depend upon how the targets are implemented and whether the intent of ecosystem representation is met or not.

In every biogeoclimatic zone, these policy targets represent considerably less than 30% of historic amounts of old forest and hence on their own, will pose high risk to biodiversity. Additionally, over time, natural disturbance will further reduce the amount of old forest, so that long-term projected old forest amount across BC may be as low as about 3%.

The province often suggests that the amount of old forest in the non-contributing landbase is a 'buffer' or a potential 'safe area' for old forest even if it is not protected by policy targets, noting that only a small proportion will ever be harvested. However, experience tells us that as we run out of large trees, then we will develop markets for smaller trees, and similarly as the economics of biofuels shifts, the areas traditionally considered unharvestable may be harvested in future. The province assumes that all forest will be harvested, if it is economic to harvest, unless it is protected. This assessment of policy targets makes the same assumption.

Method 2: Spatial Protection Areas

The second lens through which to assess the future of old forest protection is to examine spatially protected areas of forest, to understand its productivity and age. We mapped spatially-defined protection zones. The distribution of large protected areas is biased towards higher elevation and lower productivity ecosystems (Figure 11).

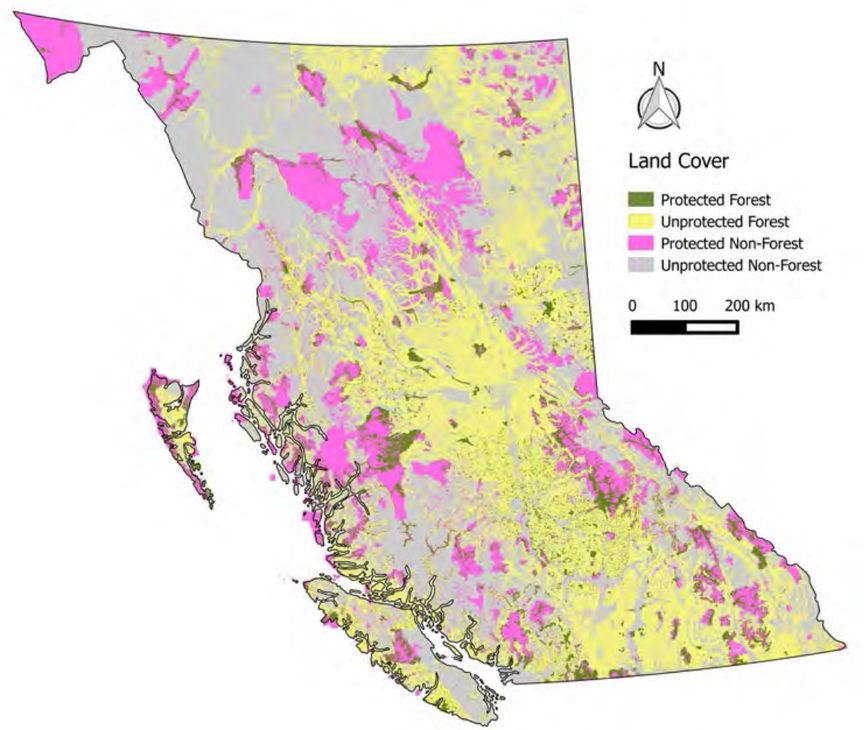


Figure 11. Conservation zoning applicable to old forest in BC. Includes parks and protected areas, conservancies, no-harvest wildlife habitat areas and legally-defined old growth management areas (the latter are difficult to see at this scale). Map shows all forest above site index 10m as green if protected and yellow if not. Pink areas are non-forested or have a site index of less than 10m. LU/BEC units smaller than 500 ha are not coloured by amount.

The combination of protected areas and old growth management areas include over 15% of most BEC zones, however, less than 5% is old forest except in the CWH and MH (Figure 12). This lack of protected old forest means that projected risk in the short-term future is high for most BEC variants (Figure 13). It is also important to understand that typically, this forest in protected areas (whether it is old or not) is used towards meeting old growth targets, so this area is very often double-counted[12] and not incremental to the base targets.

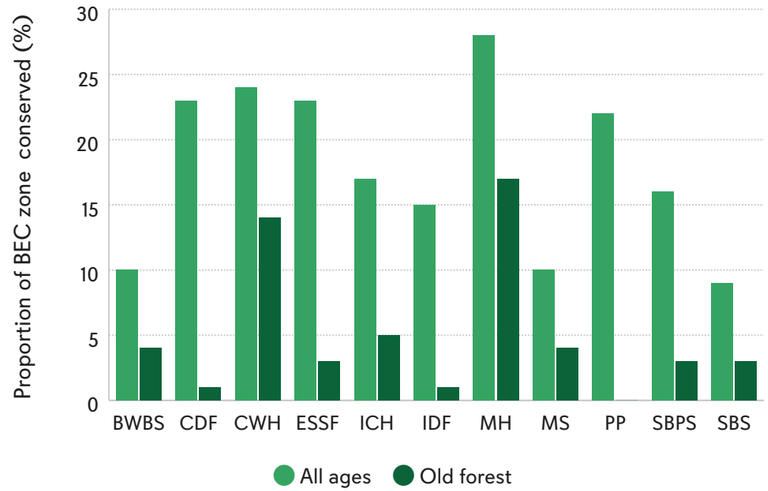


Figure 12. Proportion of each BEC zone in conservation zoning (including protected areas, no-harvest wildlife habitat areas and legally-defined spatial old growth management areas) of all ages and old forest. Note this analysis includes only crown land, and does not reflect high levels of conversion / private land in some ecosystems (e.g. CDF, PP, IDF).

12 12% is removed from old growth target calculation to account for area assumed to be protected elsewhere; then protected areas are often assumed to meet the target in implementation, whether or not they are old, effectively double-counting that land area.

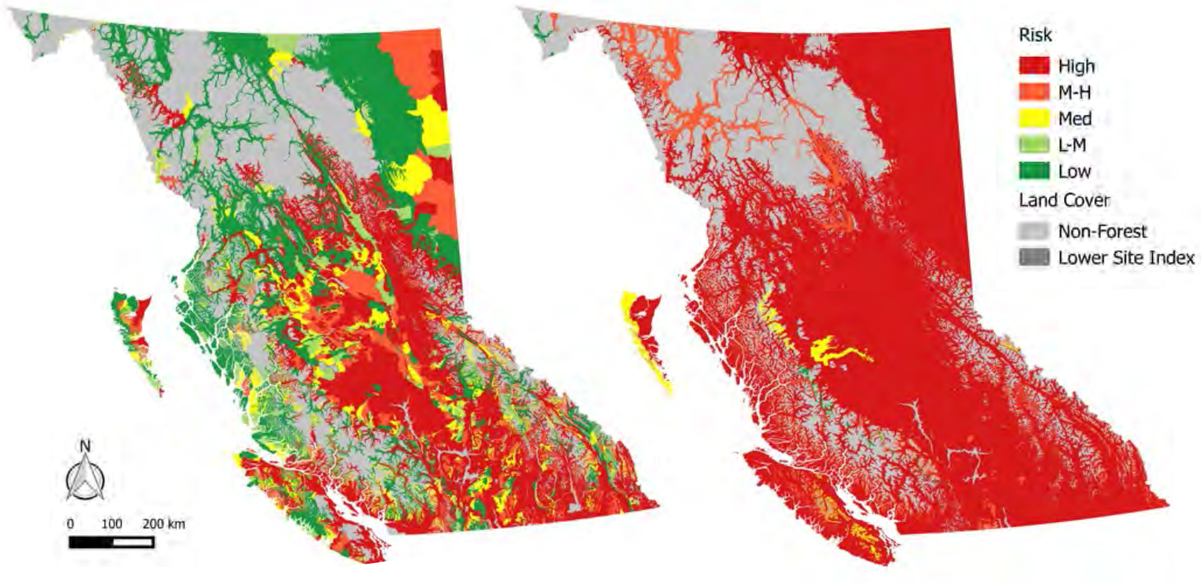


Figure 13. Current risk (duplicated from Figure 7) and projected future risk across BC for BEC variant for forest with a site index >10m, reflecting areas that are spatially set aside and protect old forest (including old forest in protected areas, no-harvest zones and legal old growth management areas. This map does not include Great Bear Rainforest objectives where some areas are intended to remain at low risk.

Analysis and interpretation limitations

These analyses use provincial data and approaches. The general trends observed have been identified within many local regions and there is no evidence to suggest that these broad trends are not a reflection of the current state of old forest in BC. However, there remain data and interpretation limitations, including:

- **Ancient forests ignored**. Age class (and age within the BC government data) does not allow old and ancient to be separately identified. On the coast and inland rainforests, where some forests are many thousands of years old and have completely different biodiversity values, these extremely rare forests are a further subset that are likely at considerably higher risk than old forests as defined by provincial age thresholds.
- **Mis-classified age**. Age class can be mis-classified, especially in low productivity and high elevation ecosystems where old trees may appear small. This presents a challenge to understand risk in these ecosystems; in particular, the amount of ESSF over 250 years old is likely underestimated in provincial data, leading to higher risk classification than warranted in some situations. An alternative approach to avoid this issue would be to use 140 years to assess ESSF risk. Note however, that the 'target' against which risk is assessed must then also be calculated based on using the same age criteria (i.e., it is simply wrong to use one age for a target and another for the amount of old). In general, this issue affects only a limited subset of ecosystems (ESSF and MH).
- **Inaccurate natural disturbance estimates.** Underestimated time between disturbance could partly explain the high amounts of lowest productivity forest. We have used improved estimates for coastal ecosystems where disturbance intervals are much longer than previously estimated. However, for some mixed severity ecosystems (in particular MS and IDF) our analysis of risk likely under-estimates actual risk in these ecosystems.
- **Missing data**. We had access to some, but not all Tree Farm License data. We suspect that patterns would not change as we analysed data before and after obtaining some TFL data and found little change.
- **Exclusion of Great Bear Rainforest objectives**. Analyses included updated return intervals estimated for the Great Bear Rainforest, but future projections did not include GBR objectives.
- **Forest condition ignored**. Our analyses did not consider the condition of remaining old forest, either within or outside Old Growth Management Areas. Regional analyses in various parts of BC have demonstrated that much of the remaining old forest is in small (many less than 2 ha) and fragmented patches, or impacted by a diverse industrial footprint (e.g., northeast BC) leaving old forest with very variable functional value. Considering the condition of remaining forest will generally result in an increased risk level over our analysis — because in most places in BC stand condition, interior forest and functionality are not key parts of deciding which old forest is used to meet provincial targets.
- **Poor policy implementation**. Understanding future risk based on current targets assumes that the targets will be met using actual old forest. However, local analyses have shown that in some regions less than 20% of the area within OGMAs is actually old forest, even when old forest exists in the landscape unit. In many areas, the targets themselves outlined in policy lead to high risk; poor implementation of this policy further exacerbates risk.
- **Uncertainty about aspatial implementation**. In about half of the province, 'aspatial targets' are used to meet old forest targets. In these areas, future risk is impossible to assess (outside protected areas), because the areas being used to meet the target are not even known, and cannot be evaluated (either in this analysis, nor in reality).





Recommended priority actions

The current condition of old forest for many forested ecosystems in BC is low, or very low today, leading to high or very high risk to ecological function, biodiversity and ecosystem services. It is expected to further deteriorate given current policy for protection of old forest and increased disturbance due to climate change.

The historic management approach has allowed the old growth situation to become a significant problem, and the situation will only get worse under current provincial policy. The entire management regime therefore requires a significant shift in order to fix the problem. Individual regions around the province are struggling with this issue—but a higher-level solution is needed.

Immediate Priorities

- Apply an immediate moratorium on harvest of old (and mature) forest **in any biogeoclimatic variant** with less than 10% old forest remaining today. These areas are at overall high risk—and in all of these areas, old forest is being harvested today. Opportunities are being lost daily for effective conservation in these zones.
  - CDFmm (all CDF)
  - CWHxm1,2, dm
  - ICHxw, mk3,4, mw1,2,3,4
  - IDFxc, xh1,2,4, xk, xm, xs, xx2, dc, dk1,2,3,4,5, dm1,2, mw1,2
  - PPxh1,2,3 (all PP)
  - SBPSmk
  - SBSwk1,2,3a
  - And possibly: ESSFxv2, dc1, mh, mv1,2,3,4, wc3,4, wh3, wk1, wm1,2,3,4 (note potential mis-classification of age in some of these units).
- Apply an immediate moratorium on harvest of any old and mature forest **in any BEC / Landscape Unit combination** that has less than 10% old remaining today, including existing cutblock permits.
  - Altogether, 478 LU x BEC units have less than 10% old forest remaining today, representing 12% of the total number of LU / BEC combinations.
  - Most of these areas lie within the BEC variants listed above; a number of others are on Vancouver Island and on the mainland coast.
- Focus retention on **higher productivity sites** due to their rarity, for their value for carbon storage, and to counter the loss of these ecosystems due to biased harvest.
  - Apply an immediate moratorium on harvest of any **very high productivity** (SI >20m, perhaps SI >25m in the Great Bear Rainforest) old and mature forest.
  - Where little to no old remains today, apply moratorium to ensure adequate productive mature stands are maintained, particularly in places with long harvest history.
- Apply an immediate moratorium to remaining intact areas with the potential for resilience (e.g., Walbran on Vancouver Island).
- Apply an immediate moratorium on harvest of all **irreplaceable old forest including ancient or very old forest**;
  - Appropriate age of very old/ancient forest should reflect natural disturbance regime and age of remaining stands, e.g. forests >500 years on the coast and wet ICH; forests >300 years in ecosystems with higher disturbance intervals.
  - Retain all trees and pockets of trees >300 years old in ecosystems with no old forest remaining e.g., dry CWH / dry CDF / dry ICH as wildlife tree patches with buffers to protect functionality; recruit the oldest available mature forest where no old forest remains.
- Ensure that **implementation of old forest conservation meets intent** in lower-risk areas like the Great Bear Rainforest and Clayoquot Sound.
- **Immediately remove the low Biodiversity Emphasis Option target "drawdown"** that reduces targets in low biodiversity emphasis option areas by two-thirds in all zones.
- **Fix arithmetic errors**.
  - Stop double-counting protected areas in old forest targets (either increase targets so that they are not reduced by the 12% assumed to be in parks or ensure that sufficient OGMAs to reach target are located outside parks).
  - Ensure that targets and inventoried old forest use the same age (i.e., if a target is for forest >140 years, then measure the amount of forest >140 years; if the amount of forest >120 years is measured, then redo the target for 120 years).
- Maintain all moratoria by region or forest district, until effective spatial planning is in place to ensure irreplaceable values are not lost.
- Place all existing cutblocks on hold in these areas and ensure they were granted legally.



The historic management approach has allowed the old growth situation to become a significant problem, and the situation will only get worse under current provincial policy

Mid-term Priorities (within 5 years)

- Update FRPA objectives and associated regulations and policy to ensure that biodiversity targets are based on best available science that considers resilience and carbon storage.
- Legally implement **minimum targets of 30%** protection by forest type throughout the province.
  - › Recognise that to maintain 30% of natural old forest amounts requires maintaining 30% of the total forested landscape because natural disturbance will continue.
  - › Prioritise protection strategies at the two ends of the risk spectrum of risk:
    - » in areas where irreplaceable old forest exists today in good condition
    - » in areas where very little old forest remains today to ensure very last old is not lost
  - › Identify effective recruitment strategy that meets old forest targets in the shortest time possible.
- Identify remaining **ancient forest** and include in OGMAs. Include as larger patches where needed to ensure future viability. Where single trees or small patches exist, retain as wildlife tree patches with buffers.
- Identify remaining **high productivity forest** and include in OGMAs. Include as larger patches to ensure future viability (e.g., add buffers of lower productivity forest or high productivity second growth to ensure interior conditions and connectivity).
- Ensure that OGMA target is met with old forest at all times where it is available. A very minimal level of younger forest (up to 5%?) could be 'filler' to improve patch size.
- **Map** all areas used to meet old forest targets (OGMAs) spatially.
  - › Do not allow OGMAs to be moved; if OGMA is disturbed naturally (e.g., wildfire), retain as "natural young area" and add additional area of old forest as new OGMA.
- Ensure that forest retained in OGMAs represents the **best old forest** available for each zone.
  - › Ensure that, at a minimum, OGMAs represent the full range of natural old forest types/productivity classes at all scales rather than forest with low timber value.
- Ensure OGMAs are **functional.**
  - › Ensure OGMAs are of sufficient size. For example, OGMAs should be >10ha minimum, with interior forest condition, and larger minimal areas in areas with high natural disturbance. Where old forest is currently in smaller patches, use these as cores and buffer with recruitment to meet the minimum.
  - › Do not allow harvest in OGMAs.
- Ensure recruitment of old forest uses the best available mature forest, to meet old forest targets in an effective way in a short timeframe.
- Ensure planning in lower productivity ecosystems is adequate to prevent the same high risk strategy being applied there, as forest harvesting pressure switches — as it inevitably will — to these lower productivity ecosystems.
- Prioritise provincial scale LiDAR to help identify patches of higher productivity trees to set aside.

Conclusions

Productive old forest has almost vanished across BC.

Low productivity inaccessible old forest remains in some forest types.

Forest policy in BC does not maintain the natural range of ecosystem diversity, thus posing high risk to biodiversity and long-term carbon storage.

Current old forest targets provide an ecologically risky low bar, and implementation succeeds in going below this bar due to loopholes, gaming, arithmetic errors and simple lack of monitoring.

Many existing OGMAs do not contain old forest.

Priority actions to increase effective retention of representative old forest must be taken immediately to reduce risk.

In many areas, mature forest must be recruited to bolster the dwindling ranks of old forest and to allow for ecological recovery over time.

Funding, commitment and management authority is required from the provincial government to ensure that staff are available to implement effective old forest conservation.

The transition from logging old forest to logging second growth is imminent. Without immediate action we will lose these globally priceless old forests — and still have to deal with a volume-based industry that has not planned for the transition.

If the provincial government continues to knowingly put the ecological integrity and values of old forest at risk, they should at the very least be clear about their intentions and stop pretending to protect the province's natural heritage.

