

# Old Growth Forests in British Columbia

## Cumulative Effects Assessment Backgrounder

January 2024



Ministry of  
Water, Land and  
Resource Stewardship

**CEF** Cumulative  
Effects  
Framework



## Purpose

This backgrounder was prepared to provide readers with information and context about old growth forest current condition assessment and current condition reports released under the provincial Cumulative Effects Framework (CEF). It provides the following information:

- Background on old growth forests as a CEF value and how cumulative effects may impact them;
- Key elements of the old growth forest provincial CEF value assessment methodology, including the assumptions and limitations; and,
- A summary of data inputs used in the CEF value assessment.

This backgrounder is intended for use by both technical and non-technical users, including First Nation governments, interested members of public, industry representatives, non-governmental organizations, and provincial government staff.

An important note: B.C. is in a transition period as we work towards transforming the management and stewardship of our waters, lands, and resources together with First Nations. The Province acknowledges that the initial cumulative effect assessments were not developed in partnership with First Nations and therefore do not represent Indigenous views. It provides the best western science information currently available to the Province of B.C., and can be one piece of information used to support land stewardship in collaboration with First Nations. The information presented is intended to be a starting point in supporting and informing future work and collaboration between the Province and First Nations on the management of cumulative effects. The Province also looks forward to engaging with affected stakeholders to ensure that cumulative effects are identified, considered, and managed appropriately.

This document should be read in conjunction with the *Old Growth Forest Management in British Columbia: Provincial Backgrounder* (WLRS, 2023), the *Interim Assessment Protocol for Old Growth Forest in British Columbia* (FLNRORD, 2017), and the *Cumulative Effects Framework Interim Policy for the Natural Resource Sector* (Province of B.C., 2016).

## Acknowledgements

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# List of Acronyms

<b>AAC</b>	Allowable Annual Cut
<b>AU</b>	Assessment Unit
<b>B.C.</b>	British Columbia
<b>BCGW</b>	B.C. Geographic Warehouse
<b>BEC</b>	Biogeoclimatic Ecosystem Classification
<b>BEO</b>	Biodiversity Emphasis Option
<b>CEF</b>	Cumulative Effects Framework
<b>CFLB</b>	Crown Forested Land Base
<b>CE-CFLB</b>	Cumulative Effects Crown Forested Land Base
<b>DRA</b>	Digital Road Atlas
<b>FAIB</b>	Forest Analysis Inventory Branch
<b>FMLB</b>	Forest Management Land Base
<b>GIS</b>	Geographic Information Systems
<b>LU</b>	Landscape Unit
<b>LUPG</b>	Landscape Unit Planning Guide
<b>NDT</b>	Natural Disturbance Type
<b>NRD</b>	Natural Resource District
<b>OGMA</b>	Old Growth Management Area
<b>PNOGO</b>	Provincial Non-Spatial Old Growth Order
<b>RESULTS</b>	Reporting Silviculture Updates and Land Status Tracking System
<b>TSR</b>	Timber Supply Review
<b>VRI</b>	Vegetation Resources Inventory
<b>WLRS</b>	Ministry of Water, Land and Resource Stewardship

# Glossary

Glossary terms are bolded throughout the report to provide easy reference for readers.

<b>Assessment Unit (AU)</b>	Assessment units (AUs) are used to describe the current state of old growth forests on the CE-CFLB in Cumulative Effects Framework reporting. Assessment Units are based on the combinations of LU, NDT, BEO, and BEC subzone and/or variant.
<b>Biodiversity Emphasis Option (BEO)</b>	A range of management alternatives that emphasize different levels of natural biodiversity within forested landscapes. There are three options for emphasizing biodiversity at the landscape level: high, intermediate, and low. Each option is designed to establish a level of natural biodiversity and a different risk of losing elements of natural biodiversity (Province of B.C., 1995). Overall, the BEO informs the amount of old growth to be retained.
<b>Biogeoclimatic Ecosystem Classification (BEC) system (zone/subzone/variant)</b>	<p>A multi-scaled, hierarchical, ecosystem-based classification system that groups ecologically similar sites based on climate, site, soils, and vegetation, and is widely used as a framework for resource management and scientific research in B.C.</p> <p>BEC zones have similar patterns of energy flow, vegetation, and soils as a result of a broadly homogeneous macroclimate. There are 16 zones in B.C. which are subdivided into subzones and variants (see List of Acronyms). Subzones reflect differences in regional climate, while variants recognize sub-regional variation (e.g., areas that are slightly drier, wetter, snowier, warmer, or colder than other areas in the subzone) (MFR, 2008).</p>
<b>Component</b>	Features and attributes of a value that should be measured and managed to meet objectives associated with values (Province of B.C., 2016).
<b>Crown Forested Land Base (CFLB)</b>	The forested area that the provincial government manages for a variety of natural resources values. This excludes non-vegetated areas (e.g., water, rock, ice), non-forested ecosystems (e.g., grasslands, wetlands), non-productive forest (e.g., alpine, areas with very low productivity), and non-commercial forest (e.g., shrub/brush areas). The CFLB includes provincially and federally protected areas (e.g., provincial and national parks), conservancies, wildlife habitat areas, wildlife management areas, etc., because of their contribution to biodiversity.
<b>Crown Land</b>	Land, whether it is covered by water or not, or an interest in land, recognized in Canadian law as vested in the provincial government of B.C. In B.C., all land categorized as Crown land is also the traditional territory of one or more First Nations (Land Act, RSBC, 1996).
<b>Cumulative Effects</b>	Changes to environmental, social, and economic values caused by the combined effect of past, present, and potential future human activities and natural processes (Province of B.C., 2016).
<b>Cumulative Effects Crown Forested Land Base (CE-CFLB)</b>	Provincial Crown land with forest cover that is managed for timber supply or other forest management objectives. This layer includes all forested Crown land, including Crown Land in area-based tenures (e.g., tree farm licenses, woodlots, community forests, First Nations woodland licenses), and all forested portions of provincial parks, protected areas, ecological reserves, and federal parks that contribute to the current state of old growth forest. See Crown Forested Land Base (CFLB) above.

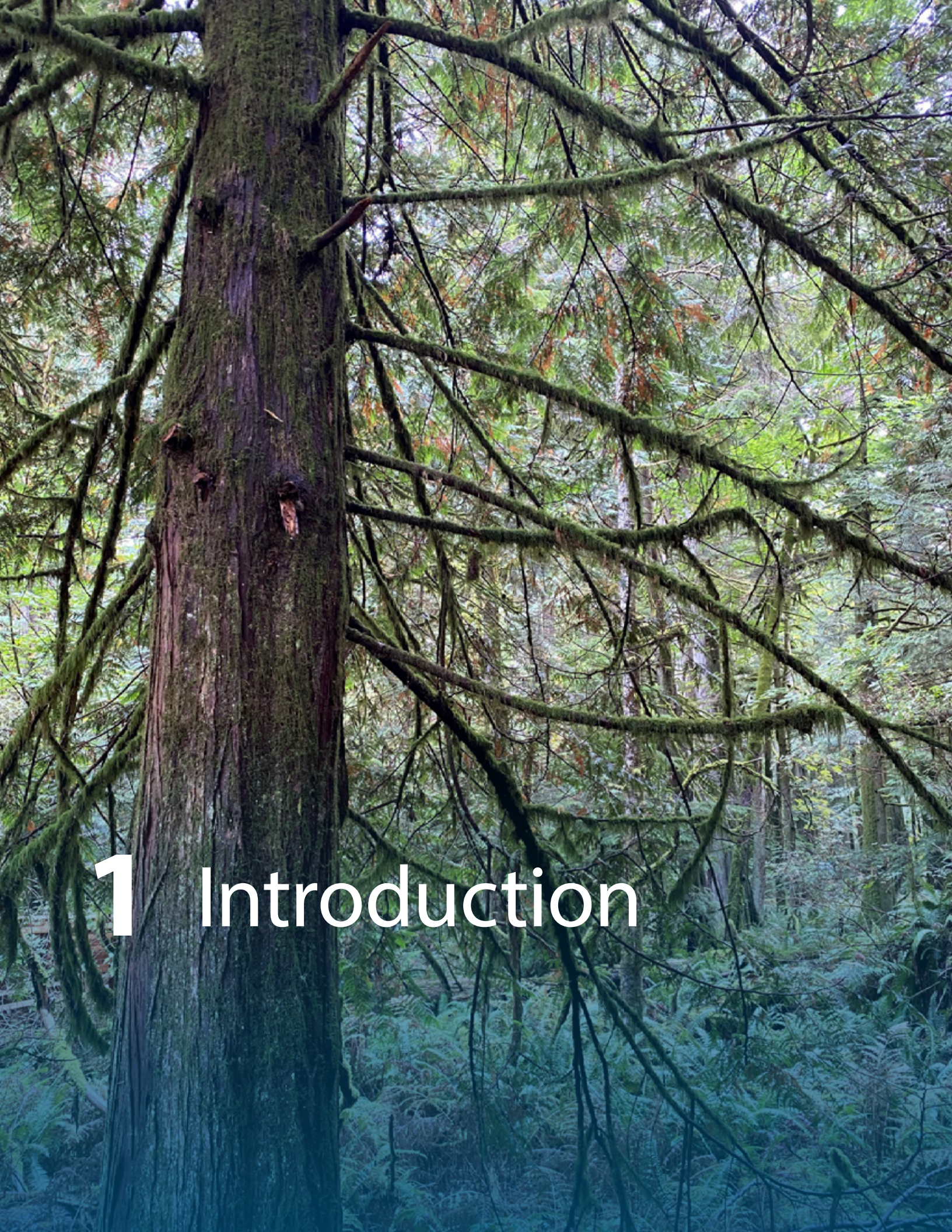
<b>Cumulative Effects Framework (CEF)</b>	A set of policies, procedures, and decision-support tools that help identify and manage cumulative effects consistently and transparently across B.C.'s natural resource sector (Province of B.C., 2016).
<b>Current Condition Assessment/Report</b>	An assessment/report on the current state or condition of individual CEF values in relation to selected state or pressure indicators (Province of B.C., 2016).
<b>Edge Effect</b>	The changes in populations or communities along the boundary or edge of an existing habitat.
<b>Forest Management Land Base (FMLB) Indicator</b>	An attribute field in the Vegetation Resources Inventory (VRI) that indicates whether an inventory polygon is currently forested (or has been forested) and is capable of producing a stand of trees. The FMLB is a coarse-scale indicator of forested areas, whereas the CFLB is a finer-scale management tool (see CFLB definition above).
<b>Fragmentation</b>	The process of transforming large contiguous patches of forest into smaller and isolated patches surrounded by disturbed areas, either through human activities (e.g., roads, forestry cutblocks) or natural disturbances. Fragmentation may lead to a decline in biodiversity through loss of habitat (conversion of forests from natural to managed stands), increase in microclimatic and forest edge effects, and increase in isolation of the remaining forest patches (Province of B.C., 1995).
<b>Gap Dynamics</b>	The change in the pattern, frequency, size, and successional processes of forest canopy gaps caused by the fall or death of one or more canopy trees (MFR, 2008).
<b>Incursion</b>	Anthropogenic (human-caused) disturbance footprints within old growth management areas from resource development activities such as forest harvesting, road construction, or mining. It does not include impacts from natural disturbance, such as forest fires or insects.
<b>Indicator(s)</b>	The metrics used to measure and report on the condition and trend of a component. There are two main types of indicators: state indicators and pressure indicators. State indicators that directly measure and report on the condition of a component, and pressure indicators that measure and report on the processes that act upon or influence the condition of a component (Province of B.C., 2016).
<b>Landscape Unit (LU)</b>	An area used for long-term planning and monitoring of resource management activities. These units contain land and water and are typically at the scale of a watershed or a group of watersheds, with areas ranging from 5,000 to 400,000 hectares (MFR, 2008).
<b>Landscape Unit Planning Guide (LUPG)</b>	A guidance document published by the Ministry of Forests and Ministry of Environment, Lands and Parks (1999) that outlines procedures to implement landscape unit planning throughout B.C. (including the development of objectives and strategies). The guide focuses on the priority of forest biodiversity including the retention of old growth forest and guidance for stand-level biodiversity management through wildlife tree retention.
<b>Mature Forest</b>	<p>Stands that have progressed through successional development stages including natural thinning. Vertical structure has developed, but stands lack the complex structure typical of old growth forests.</p> <p>The time required for mature forests to develop varies by ecosystem. In B.C., the minimum age of mature forests is 80 years in productive coastal and cool, northern boreal forests, 120 years in high elevation forests, and 100 years in the remaining forests. Mature forest ages are determined by NDT and BEC zone.</p>



<b>Mature-plus-Old Forest</b>	Biodiversity objectives for mature forest retention are set as a minimum requirement for mature-plus-old forest, meaning that retention targets include the minimum requirements for old growth forests plus additional targets that can be met by mature and/or old forest (Province of B.C., 1995). The additional targets for mature-plus-old forest can be met using mature and/or old forest, but the old forest portion of the target must be met using old growth forest (where available). When the mature-plus-old forest target is the same as the old growth forest target, there are no additional requirements for mature forest area. Mature-plus-old targets are specified in the Biodiversity Guidebook but are not required in many regional land use orders, including the Provincial Non-spatial Old Growth Order.
<b>Natural Disturbance Type (NDT)</b>	A coarse-level classification system that broadly describes disturbance regimes across B.C. based on the long-term average frequency of stand-initiating disturbances such as wildfires, insects, or wind. Five NDT categories form the basis for the old growth forest targets in the Biodiversity Guidebook (Province of B.C., 1995).
<b>Non-Spatial Old Growth Management</b>	The percentage or amount (in hectares) of old growth forest to be retained within a specified area (i.e., by BEC subzone/variant in a landscape unit) as an alternative management approach from establishing spatial OGMAs. The amount of old growth forest present in forest stands may be noted by stand age using vegetation inventories, but patches of old growth are not delineated and mapped (FPB, 2012). Non-spatial is also referred to as aspatial.
<b>Old Growth Forest</b>	<p>The Province of B.C. defines old growth forest based on age. Minimum ages for old growth forests are greater than 250 years old in ecosystems with infrequent stand-initiating disturbance (coastal, interior wet and moist climates, and dry, fire-maintained ecosystems; NDT 1, 2, 4) and greater than 140 years old in drier forests with frequent stand-initiating disturbance (NDT 3).</p> <p>These age definitions are intended to capture forests dominated by old trees. Ecologically, old growth forests contain live and dead trees that vary by size, species, composition, and age class structure, which varies significantly by forest type and by BEC unit (Province of B.C., 1995). They are communities of trees, plants, fungi, animals, and microbes that have lived together long enough to develop complex, interconnected relationships (Old Growth Technical Advisory Panel, 2021). Old growth characteristics vary by ecosystem and tree species, and typically have more large trees with unique characteristics such as forked, dead, or broken tops, cavities, or large lateral branches, and more large standing dead trees (snags) and decomposing wood than younger forests (FLNRORD, 2017). Trees are large for the ecosystem, and the forest canopy is often layered with openings that allow light and encourage the growth of understory vegetation.</p> <p>For the purposes of the CEF, the term “old growth forests” is used to describe these ecosystems more broadly (i.e., considering stand attributes), with the awareness that it includes the “old forest” age-based definition currently used in forest management practices.</p>

<b>Old Growth Management Area (OGMA)</b>	<p>Defined areas that contain (or are managed to attain) specific structural old growth forest attributes. These are delineated and mapped as fixed areas (FPB, 2012). An OGMA may be defined as a legal OGMA or a draft (non-legal) OGMA:</p> <p>Legal OGMA-OGMAs that have been declared in an old growth Ministerial Order. Forest licensees must incorporate the legal OGMAs into Forest Stewardship Plans (FSPs).</p> <p>Draft (non-legal) OGMA-OGMAs that have been mapped but not declared in an old growth order. Forest licensees may choose to incorporate the non-legal OGMAs into FSPs as a way of achieving the non-spatial order that is in effect in the management area where they operate (FPB, 2012).</p>
<b>Recruitment</b>	<p>The act of identifying stands (either spatially or non-spatially) that do not currently meet the requisite old growth characteristics but are intended to develop those characteristics in the future. In some circumstances, recruitment areas can contribute to old growth targets in landscapes where there is not enough old growth forest to meet targets.</p>
<b>Seral Stage</b>	<p>Represents the different stages in the sequence of forest development, from early to mid, mature, and old forests, including successional shifts in species composition and vegetation structure (e.g., see definitions for mature forest and old growth forest above). Stand age, as reported in the provincial Vegetation Resources Inventory, is used to estimate seral stage.</p>
<b>Spatial Old Growth Management</b>	<p>The process of identifying and delineating areas containing old growth forest attributes. Spatially identifying (i.e., mapping) these areas can lead to their designation as legal or non-legal OGMAs (FPB, 2012).</p>
<b>Stand-Initiating Disturbance</b>	<p>Disturbances that significantly alter the ecosystem and largely terminate the existing forest stand and initiate secondary succession to produce a new stand. This may occur through wildfires, windstorms, insects, and landslides (Province of B.C., 1995).</p>
<b>Stand-Maintaining Disturbance</b>	<p>Fairly frequent disturbances that maintain an ecosystem and keep successional processes stable. This typically occurs through understory surface fires that remove some but not all trees and maintain open forests of old trees (Province of B.C., 1995).</p>
<b>Timber Supply Review (TSR)</b>	<p>A process that evaluates all forests within a timber supply area for their contribution to the THLB. At the end of the TSR process, the Chief Forester determines an allowable annual cut (AAC) (i.e., the harvest volume appropriate for an area) based on the amount of timber that is forecast to be available for harvesting over a specified time and under a particular management regime.</p>
<b>Values</b>	<p>The things that the people and government of British Columbia care about and see as important for assuring the integrity and well-being of the province's people and communities, economies, and ecological systems, defined in policy, legislation, or agreements with First Nations (Province of B.C., 2016).</p>





# 1 Introduction



# 1 Introduction

**Old growth forests** are a **value** that is assessed under B.C.'s **Cumulative Effects Framework (CEF)**. The CEF aims to assess **cumulative effects** from human activities and natural processes. Results from cumulative effects assessments are incorporated into decision-making processes to help maintain or improve the condition of values over time. The assessment and management of cumulative effects is a critical component of sustainable natural resource management in B.C. and is an important foundation for addressing Indigenous rights, title, and interests.

**Current condition assessments**<sup>1</sup> form the basis of the CEF as they assess and report on the current condition of individual CEF values. Current condition assessments for old growth forests are guided by the *Interim Assessment Protocol for Old Growth Forest in British Columbia* (the Protocol) (FLNRORD, 2017), which provides a standard methodology for assessing the current condition of old growth and mature-plus-old forests across the province. Results from current condition assessments are reported through **current condition reports (CCRs)**.

Findings from these current condition assessments are reported through old growth forest current condition reports. These reports provide information on the current status of old growth and mature-plus-old forests relative to legally defined management objectives, as outlined in old growth orders, and policy direction from the Biodiversity Guidebook (Province of B.C., 1995). The **indicators**<sup>2</sup> used for old growth forest current condition reporting include:

- the current amount of old growth forest and mature-plus-old forest relative to legally established targets. The sources for comparison to a target are from the Provincial Non-Spatial Old Growth Order (PNOGO) (Province of B.C., 2004), regionally specific Land Use Orders, or policy targets from the Biodiversity Guidebook;
- **incursions** into **Old Growth Management Areas (OGMAs)** relative to accepted levels of incursion thresholds defined by the legal orders and/or regional policy; and,
- the current amount of old growth forest in OGMAs.

It is important to note that current condition reports do not consider whether current objectives are effective at conserving old growth forest to maintain biodiversity, nor do these reports determine if the area being assessed is in compliance with the legal orders and targets. Additionally, these current condition assessments are computer-based and use geographic information systems (GIS) data that is publicly available from the B.C. Geographic Warehouse (BCGW). Where concerns or at-risk areas are identified through the assessment process, further monitoring and regional investigation may be required to fully understand cumulative effects on the value.

Overall, this document aims to provide general background information on the CEF current condition assessments for old growth forests. The background information contained in this document should be used to enhance understanding of the current condition reports for old growth forest released under the CEF.

<sup>1</sup> Current condition assessments aim to assess and report only on the current state of individual CEF values. This captures historic and current human activities only. This differs from cumulative effects assessments which aim to assess and report on the historic, current, and future state of individual CEF values, including natural disturbance. As of 2023, current condition assessments have only been run for the old growth forest value. Cumulative effects assessments will be completed in the future to provide a more fulsome assessment of the value.

<sup>2</sup> Variation across the province may result in additional indicators being used for regional reporting.





A photograph of an old-growth forest. In the foreground, a large, textured tree trunk stands vertically. The background is a steep, moss-covered slope with various ferns and other vegetation. The lighting is soft, creating a lush, green atmosphere.

# 2 Old Growth Forests



## 2 Old Growth Forests

### 2.1 Old Growth Forests as a Value

Old growth forests are characterized by complex compositional, structural, and functional attributes, including large standing and fallen dead trees, layered canopies, and openings that allow understory growth (WLRS, 2023). Old growth forests are found across various forested ecosystems including temperate rainforests on the coast, to dry forests in the interior, to alpine forests across the province.

Old growth forests are a value that is assessed under the CEF. They are highly valued by British Columbians as they have iconic natural beauty as well as ecological, economic, cultural, and spiritual importance. They play a critical role in supporting and maintaining biodiversity by providing a habitat for a wide range of plant and animal species. They also support rare, threatened, and endangered species, many of which rely on specific conditions only found in old growth forests. Old growth forests also contribute to soil fertility and nutrient cycling that sustains the complex interactions with the ecosystem and supports the long-term health of the soil and the microorganisms, fungi, and plants that rely on it.

Old growth forests are also effective in mitigating climate change, as they capture and store carbon dioxide from the atmosphere through photosynthesis. If left undisturbed, old growth forests can sequester carbon for centuries. Additionally, old growth forests are important for watershed protection as they aid in regulating water flow, filtering water, preventing erosion, and reducing flood risks.

Beyond their ecological importance, old growth forests have cultural and spiritual value, especially for First Nations. They are important for traditional resource use, providing First Nations with many resources including wildlife, plant foods, and medicines. Old growth forests also have economic importance, not only for valuable timber, but also for recreation and tourism activities.

Mature forests are an important component of old growth forest management as they are developing the structural and compositional features of old growth forests to become the next cohort of old growth habitat. Mature forests have not yet reached the structural and functional complexity of old growth forests, but will over time as trees grow, age, die, and decompose. Mature forests can be used to recruit areas for old growth forest and can contribute towards forest biodiversity objectives to improve the management of forest diversity across the province.



*Old growth forest stand at Taylor River. Photo credit: Travis Heckford.*



## 2.2 Age Definitions

Old growth forests are managed based on age classifications, and these vary across the province based on **natural disturbance types (NDT)**. Age-based definitions are designed to identify the age at which most forests in an ecosystem have characteristics of old growth forests (e.g., structure, function, composition).

In ecosystems with rare or infrequent **stand-initiating disturbances** (e.g., coastal and moister interior ecosystems) or ecosystems with rare or infrequent **stand-maintaining disturbances** (e.g., dry, open-forested ecosystems), old growth forests are defined as greater than 250 years old. In ecosystems with frequent stand-initiating disturbances (e.g., drier ecosystems in the interior), forests that are greater than 140 years old are defined as old growth forests. In some regions, these age-based definitions may vary.

The specific age at which a stand is considered old or mature is dependent on the combination of **Biogeoclimatic Ecosystem Classification (BEC)** zone and NDT for the stand as described in the Biodiversity Guidebook. Age thresholds for mature forests are defined as greater than 80 years old in coastal (CWH/CDF) and boreal (BWBS) ecosystems, greater than 120 years old in high elevation (ESSF/MH) and shrub-dominated boreal (SWB) ecosystems, and greater than 100 years old in the remaining ecosystems (BG, ICH, IDF, MS, PP, SBS, SBPS).

### Old Growth Forest & Forest Biodiversity Values

The old growth forest value is closely linked to the CEF's forest biodiversity value. The forest biodiversity value describes the ecological current condition of forest biodiversity of the landscape (e.g., natural range of variability, patch size). When old growth and forest biodiversity assessments are considered together, users will have a more fulsome and comprehensive understanding of the current condition of biodiversity of forested landscapes in the province. Old growth and forest biodiversity assessment reports will be posted on the CEF website along with a forest biodiversity assessment background, when available.



Caribou- Hart Ranges. Photo Credit: Michael Klaczek.



## 2.3 Cumulative Effects on Old Growth Forests

Cumulative effects from past and present human activities such as forestry, road development, **Crown land** conversion, and private land ownership have impacted old growth and mature forests and may continue to impact them in the future if not managed appropriately. Additionally, natural disturbance events such as droughts, wildfires, extreme weather events, and insect or pest outbreaks have also impacted forests and are expected to reoccur. In the future, these effects may become more pronounced with the effects of climate change (Regional District North Okanagan et al., 2020, Fraser Basin Council, 2019). Cumulative effects on old growth forests are discussed below.

### 2.3.1 Natural Disturbances

Natural ecosystems continually go through the process of establishment, aging, disturbance, and regeneration. The type, frequency, and severity of natural disturbances will vary by ecosystem, geography, and local conditions (Franklin et al., 2002). However, it is important to note that these events are naturally occurring and facilitate ecosystem development over time. Many species and ecosystems depend on these disturbances for survival and germination. For example, many ecosystems in the interior of B.C. are influenced by wildfire and insect infestations. These events can cause numerous changes across the landscape including large-scale shifts in age class distribution and ecosystem composition, all of which influences the structural complexity within old growth forests.

Impacts to old growth forests depend on the disturbance type, size, and severity. Some disturbances may create canopy gaps that enable understory regeneration. Other disturbances may produce large standing or downed trees that contribute to coarse woody debris and overall biodiversity objectives. Intense or severe disturbances may completely impact a forested ecosystem resulting in a large area being reset to early stages of succession, ultimately shifting the old growth forest values that were present in that stand. In many cases, however, the threat to old growth forest is the current management response to the natural disturbance that is often focused on minimizing the socio-economic loss of the impacted stands (e.g., salvage harvesting).



### 2.3.2 Forest Harvesting

Harvesting timber in forested stands adjacent to old growth forests can have direct and indirect impacts on the structure and function of those old growth forests. Removal of forest cover adjacent to old growth stands influences **gap dynamics** and **interior forest conditions** by increasing the amount of disturbed edge around those openings, thereby increasing **edge effect** and altering the ecological communities within the surrounding area. The pattern and size of adjacent harvesting can also influence the severity of edge effects. In addition, harvesting activities can result in fragmentation and isolation of old growth forest on the landscape, reducing connectivity between areas of high biodiversity (e.g., wetland complexes). This can reduce the resilience of these old growth ecosystems against natural disturbances in the near term as well as impact the long-term resiliency of the forest in response to climate change.



Changes in disturbance type, frequency, and severity due to forest harvesting practices may considerably alter the structure, composition, and functioning of forested landscapes. Live and dead legacy trees are an important component of ecological resilience and can alter how a stand recovers, highlighting the importance of effective retention strategies. Additionally, it is important to acknowledge that the forestry industry has largely focused on harvesting mature or older stands based on the current economic models to achieve their AAC.

### 2.3.3 Land Use

Old growth forests are often impacted by multiple resource development activities and natural disturbance events, making them subject to cumulative effects. Across B.C., there are several types of land use including but not limited to: forestry, mining and mineral exploration, oil and gas extraction, range and agriculture, manufacturing, tourism and recreation, and renewable energy developments. These various types of land use may impact old growth and mature forests in several ways.

In some areas, Crown land has been converted to private land (or other types of long-term leases), which changes the land use of these areas. This shift in land ownership and land use is important as it may reduce or change how old and mature forest stands are managed over time. This shift in land use also impacts the management of wildfire (e.g., managing risks within the wildland urban interface) and wildlife (e.g., movement corridors, impacts to habitat), and may lead to other potential impacts on old growth forests due to different management regimes. Notably, areas that are converted from Crown land to private land, or another long-term lease, are most often located close to communities to remain accessible to humans. The accessibility of these areas allows humans to move into and develop within these areas, often leading to **fragmentation** or loss of old growth forest on the land base. All land use activities and impacts from human-caused disturbances have the potential to impact old growth forest biodiversity values.





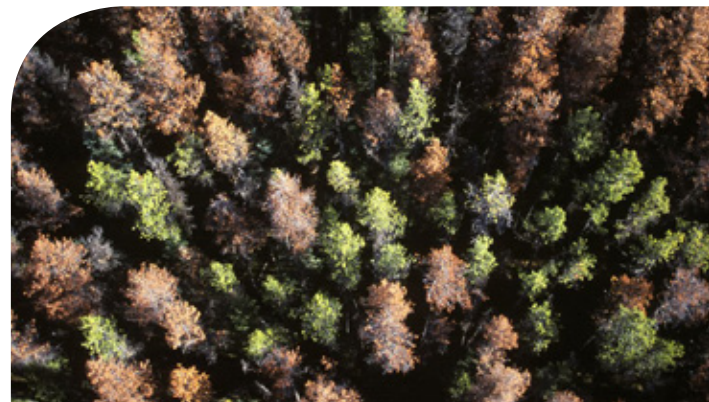
### 2.3.4 Climate Change

There are many uncertainties that exist regarding climate change and how it may impact old growth forests over time. Throughout recent years, the climate across the province has changed and is projected to continue to change into the future. Despite local variations in projections, there is a general trend of warming temperatures across all seasons, shifts in timing and amount of precipitation, and changes to the frequency and intensity of extreme weather events such as wildfires, droughts, and floods (Price & Daust, n.d.). As a result, the location, distribution, and abundance of ecosystems and species may shift, potentially creating novel ecosystems that have not been observed in the historical record (CCFM, 2009). The climate is currently changing at a faster rate than tree species can mitigate or adapt to, and most tree species will be unable to migrate quickly enough to follow changing climate envelopes (NRCan, 2021; CCFM, 2009).

The most profound changes to forested ecosystems will be due to more frequent and severe natural disturbances due to drought, wildfire, and insects. This often causes a cascading effect; drought stressed trees are more susceptible to other disturbances, like insects and disease, which increases tree mortality and creates more open stands with ladder fuels that support larger wildfires (Halofsky et al., 2020). In addition, drier and hotter summers with increased drought conditions will also increase the risk of wildfires, which are also projected to be larger, more intense, and more frequent (Boulanger et al., 2014). However, the increased prevalence of disturbances varies by region, elevation, and forest types.

The impacts of climate change are further exacerbated due to past human activities that have resulted in degraded and fragmented habitat, such as the response to the mountain pine beetle epidemic. This resulted in large scale salvage harvesting operations that altered broad landscapes, such as the loss of mature pine forested stands and subsequent conversion to younger forests, as well as the increased wildfire risk due to extensive stand mortality. Old growth forests are likely to be impacted from increased natural and anthropogenic disturbances, and may threaten the associated species and the structure and composition of these ecosystems. With disturbances projected to increase in frequency and severity, the overall age class distribution on the land base will shift towards younger stands. The loss of vegetation from all disturbances combined with climate change will cause cumulative effects that are difficult to predict.

Old growth forests are of critical value to ensure that carbon remains in storage for the foreseeable future. Forests continue to store megatons of carbon as long as there are trees on site, both live and dead. Due to the long-term accumulation of carbon in old growth forests, when these forests are logged there is a net release of carbon to the atmosphere for decades or longer, reducing the total carbon storage of that forest for centuries. In addition, the loss of forest structure from land conversion removes the opportunity for climate change mitigation as these areas are no longer acting as carbon sinks, and potentially compromises ecosystem resiliency by removing old growth biodiversity from the landscape.







# 3 Current Condition Assessment Methodology

# 3 Current Condition Assessment Methodology

The *CEF Assessment Protocol for Old Growth in B.C. (2017)* (the Protocol) provides a foundation for a provincially consistent approach to assessing the current condition of old growth forests and mature-plus-old forests across B.C. The components and indicators used in the assessment are described in this section along with a brief overview of the assessment methodology and the assumptions and limitations of the old growth forest current condition assessments. For full documentation on the assessment methodology and data sources, refer to Appendix 2.

The indicators for old growth and mature-plus-old forests are used in a spatial assessment to produce quantitative results that highlight the current condition of old growth forests compared to legal or policy targets. The non-spatial area (hectares, ha) of old growth forest is a numerical reporting that does not reflect the ecological integrity of the old growth forest biodiversity in the **Assessment Unit (AU)** (see section 3.3 for further discussion on Assessment Units).

To support the non-spatial assessments, **seral stage** ages are derived from the provincial Vegetation Resources Inventory (VRI). Seral stages and the associated ranges of tree age (Table 1) are technical definitions required for the assessment of inventory data related to old growth forest biodiversity. In the current condition reports, seral stage categories are referred to in short-hand (i.e., old, mature, mid-age, and early forests).

Overall, the old growth forest current condition assessments highlight areas where the old growth indicator may (or may not) be meeting a legal or policy target. This information is meant to “flag” areas where further investigation is required to understand factors contributing to that condition, consider potential mitigation of management responses to address areas of concern, and provide valuable information to decision-makers for consideration of the CE assessment information in resource management.



**Table 1.** Seral stage definitions used in current condition reporting for old and mature-plus-old assessments.

Seral Stage	Age range)
Early (<40 years)	0-40
Mid (40-80 years)	41-80
Mature (81-139 years or 81-249 years)	81-139 or 81-249
Old (140 + or 250 + years)	140+ or 250+

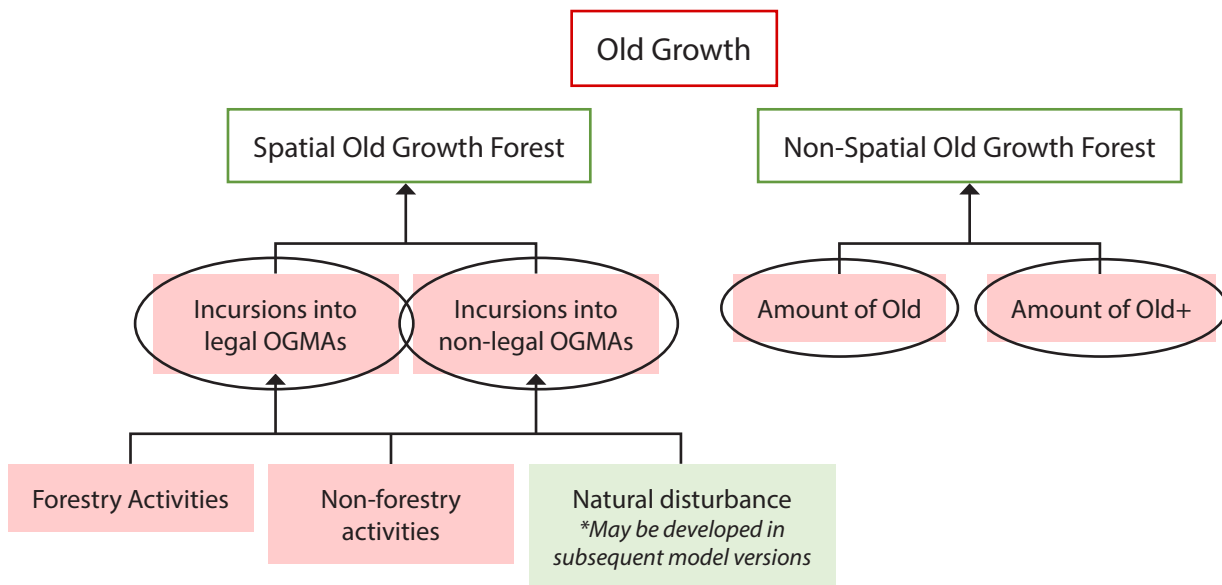
## 3.1 Conceptual Model

The conceptual model for old growth forest current condition assessments is focused on two key components: 1) **non-spatial** old growth forest through retention of old and mature forests, and 2) **spatial** old growth forest through the establishment and retention of OGMA. These components are assessed through the following indicators developed for the CEF for the old growth forest value:

1. Amount of old growth forest relative to the established legal targets,
2. Amount of mature-plus-old growth forest relative to the policy targets,
3. Incursions into legal and non-legal OGMA relative to the legal objectives and/or regional policy, and,
4. The amount of old growth forest in legal and non-legal OGMA (additional indicator).

To enhance the current condition reporting from these assessments, an additional indicator (indicator 4) is included to assess the amount of old growth forests and mature-plus-old forests in OGMA and the proportion of these forests that meet the PNOGO target.

The relationship between assessment components and indicators is illustrated in Figure 1. The green boxes are the components of the value that are managed under legal or policy objectives. The black ovals identify the indicators that directly measure and report on the condition of the components (e.g., amount of old growth forest as compared to legal objectives).



**Figure 1.** Conceptual cumulative effects model for old growth forest.

## 3.2 Assessment Units

Assessment Units (AUs) are used to describe the current state of old growth forests on the **Cumulative Effects Crown Forested Land Base (CE-CFLB)** and are reported at multiple scales and are generally combinations of **Landscape Unit (LU)**, **Biodiversity Emphasis Option (BEO)**, NDT, and BEC subzone and/or variant. This information is based on standard data layers from the BCGW, including the VRI and BEC, which is then intersected with the CE-CFLB.

A gradient colour scale is used to illustrate the condition of the old growth forest and mature-plus-old forest indicators (Table 2). Different colour scales are used depending on if the assessment is against a legal target (red to green scale) or a policy target (blue to green scale).

**Table 2.** Colour scale for interpreting current condition maps and old growth and mature-plus-old forest target status categories as a percentage of legal or policy targets met. Anything less than 100% of the target met is considered to be in deficit.

Gradient Scale for Old Growth Forest Indicator: Legal Targets	Gradient Scale for Mature-plus-Old Forest Indicator: Policy Targets	Indicator Condition Interpretation	Current Condition Status (% of Target Met with Old or Mature-plus-Old Forest)	Analysis Definition (% of Target Met with Old or Mature-plus-Old Forest)
Red	Dark Blue	Below Target	0 – 30%	0 – 29.99%
Orange	Medium Blue	Below Target	30 – 50%	30 – 49.99%
Yellow-Orange	Light Blue	Below Target	50 – 75%	50 – 74.99%
Yellow	Light Blue	Below Target	75 – 100%	75 – 99.99%
Light Green	Light Green	Target Met	100 – 110%	100 – 109.99%
Medium Green	Medium Green	Above Target	110 – 125%	110 – 124.99%
Dark Green	Dark Green	Above Target	125+%	125+%

Note: Some Regions may adopt additional or different colour scales than presented here based on local discussions.

## 3.3 Indicators

Old growth forest current condition assessments provide a high-level overview of the assessment results for each indicator. The assessment results for each indicator are presented in tabular reporting, maps, figures, and written discussion supported by regional knowledge. The commentary and discussion identify relevant contributing or causal factors, and aims to clarify any limitations of the assessment.

The indicators that are used in the old growth forest current condition assessments are described below and summarized in Table 3.

**Table 3.** A summary of the indicators used in current condition reporting for old growth forests. The information is reported by Assessment Unit (AU).

Indicator	Assessment Questions
<b>Current Condition of Old Growth Forest Retention</b>	
Amount of Old Growth Forest	<p>What is the current amount of old growth forest in the CE-CFLB? Where is old growth forest located on the land base?</p> <p>Which AUs meet the targets for old forest?</p> <p>Which AUs are flagged for further consideration?</p> <p>What are some of the possible reasons for the current condition?</p>
Amount of Mature-plus-Old Forest	<p>What is the current amount of mature-plus-old forest in the CE-CFLB? Where is mature-plus-old forest located on the land base?</p> <p>Which AUs meet the policy targets with mature-plus-old forest?</p> <p>Which AUs are flagged for further consideration?</p> <p>What are some of the possible reasons for the current condition?</p>
<b>Incursions into Old Growth Management Areas (OGMAs)</b>	
Incursions into Legal OGMAs and Non-legal OGMAs	<p>Are there anthropogenic incursions in OGMAs? What is the current amount of incursion into OGMAs in the CE-CFLB?</p> <p>Do incursions exceed the legal or policy threshold?</p> <p>What is the type of incursion into OGMAs?</p> <p>What is the magnitude of incursions into OGMAs (total % incurred)?</p>
<b>Current Condition of Old Growth Management Areas (OGMAs) – additional indicator</b>	
Amount of Old Growth Forest in Legal and Non-legal OGMAs	<p>What is the current amount of old growth forest in OGMAs in the CE-CFLB?</p> <p>Which OGMAs meet and do not meet PNOGO targets by BEC subzone and/or variant within each LU?</p>



### 3.3.1 Amount of Old Growth Forest

This indicator compares the amount of old growth forest in the CE-CFLB in relation to legal old growth forest targets within an AU. Legal old growth forest targets come from the [Provincial Non-Spatial Old Growth Order \(PNOGO\)](#) or regionally specific legal orders. The results for this assessment are reported by the total amount of old growth forest in the CE Crown Forested Land Base (CE-CFLB) (see section 3.5.1 and Appendix 2).

### 3.3.2 Amount of Mature-Plus-Old Forest

This indicator determines the current amount of mature-plus-old forest in the CE-CFLB within AUs in relation to the targets for mature-plus-old forest. In the absence of legal orders for mature-plus-old forest, the [Biodiversity Guidebook](#) provides policy guidance for age and targets that are used in the CE assessment.

### 3.3.3 Incursions into Legal and Non-Legal OGMAS

This indicator compares the area of human-caused disturbance (incursions) in **old growth management areas (OGMAs)** relative to allowable incursions that are specified in legal order or regional policy. It is common practice for OGMA orders to include objectives that define maximum allowable thresholds of disturbance levels within an OGMA.

As non-legal OGMAs are not declared under an order and are designated through other processes, there are no legal objectives for allowable incursion thresholds, unless regional policy is provided for guidance.

For the purposes of this assessment, incursions into OGMAs are defined as anthropogenic disturbance footprints resulting from resource development activities (e.g., forest harvesting, roads, oil and gas activity/pipelines) that alter or modify old growth stands to an early seral stage.

It is important to note that incursions only include current developments on the land base and do not consider proposed or future activities or projects. Additionally, this indicator does not include natural disturbance like forest fires and insect infestations (e.g., pine beetle, spruce beetle, etc.) that have occurred in the OGMA.

### 3.3.4 Amount of Old Growth Forests in OGMAs

OGMAs are one of the implementation strategies used to meet legal old growth forest targets. Identifying how much old growth forest exists within legal and non-legal OGMAs relative to the legal targets can assess whether OGMAs are currently achieving old growth forest retention targets on the CE-CFLB. In addition, identifying how much mature forest exists within legal and non-legal OGMAs can assess the amount of stands available for future **recruitment** in achievement of old forest objectives.

This indicator compares the amount of old growth forests in OGMAs to the old growth retention targets in the PNOGO.<sup>3</sup> In addition, the contribution of other designated areas (e.g., Ungulate Winter Range) in meeting old growth retention targets (as described in section 3.1.2) is not reported as part of this indicator. Therefore, this indicator looks only at whether old growth retention targets are met with OGMAs, not whether they are met with other spatially designated areas. Where OGMAs or the amount of old growth forest in OGMAs is below the old growth forest retention targets, additional layers of consideration, guidance, and policy must be applied when interpreting these results. The CE assessment is intended to provide a starting point for further investigative analysis to examine how spatial designations are meeting old growth forest retention targets.

<sup>3</sup> The assessment does not consider the 2/3 drawdown allowed for Low BEOs as described in the PNOGO.

## 3.4 Reporting Scale

Old growth forest current condition assessments use the CE-CFLB as the denominator to calculate if targets for old growth forests and mature-plus-old forests are being achieved. The assessment results are reported by AU's contained within specific administrative boundaries like Timber Supply Areas (TSAs), Natural Resource Districts (NRDs), or other resource planning areas like Land and Resource Management Plans (LRMPs). The reporting scale for assessments are usually referenced in the legal orders and/or policy.

## 3.5 Definitions and Data

Old growth forest current condition assessments have been developed using best available data from publicly accessible data sources from the BCGW, Forest Inventory and Analysis Branch (FAIB), and regional datasets where available. Specific definitions and datasets were developed to assess cumulative effects including defining a specific CE-CFLB layer and developing the CEF Human Disturbance dataset and the CEF Integrated Roads dataset. These data layers are briefly discussed below.

### 3.5.1 Defining the Cumulative Effects Crown Forested Land Base (CE-CFLB)

The basic definition of the **Cumulative Effects Crown Forested Land Base (CFLB)** for CE assessments is the area of Crown land that is managed for natural resource values and excludes land ownership (e.g., private land). However, the definition of CFLB can differ across the province and from one provincial initiative to another as there is an absence of a Provincial standard and definition for consistent application. For example, the CFLB used in **Timber Supply Reviews (TSRs)** is different than the definition used for these current condition assessments under the CEF as the objectives for the CFLB have different purposes. As such, the amount of area reported by different provincial initiatives and spatial extent of the area associated with each CFLB definition will vary.

Old growth forest current condition assessments use the CE-CFLB as the denominator to calculate the amount of old growth forest relative to the targets. The **Forest Management Land Base (FMLB)** is the foundation to developing the CE-CFLB and is an attribute of the VRI<sup>4</sup> that identifies whether a polygon is currently forested or is capable of producing a stand of trees. All area-based tenures remain in the CE-CFLB (e.g., Tree Farm Licenses), with the exception of Woodlots and Community Forests that are less than 600 ha which are removed from the CE-CFLB as specified in the PNOGO and/or Regional Orders. All forested portions of parks, protected areas, ecological reserves, and federal parks contribute to the current state of old growth forest and are included in the CE-CFLB.

<sup>4</sup> It is understood that there are challenges with some VRI attributes that may introduce uncertainty into the CE-CFLB. It is out of scope for the old growth forest current condition assessments and methodology to address these challenges in the VRI or the variations of CFLB definitions used in various provincial programs. Addressing these challenges will require direction, resources, and input from broader government and data management teams beyond the CEF.

### 3.5.2 Consolidated Disturbance Layer Datasets

Consolidating all anthropogenic (i.e., human-caused) resource development that may impact old growth forests is critical and necessary to assess the current condition across the landscape. As such, consolidated disturbance layers were developed specifically to address cumulative effects on all CEF values, including old growth forests.

The old growth forest current condition assessments use [B.C. Cumulative Effects Framework Human Disturbance dataset \(2021\)](#) (CEF Human Disturbance dataset) and the [B.C. Cumulative Effects Integrated Roads dataset](#) (CEF Integrated Roads dataset). The CEF Human Disturbance dataset was developed to spatially define cumulative human disturbance on the land base for all CEF assessments. This dataset consists of anthropogenic disturbance footprints from resource development activities including (but not limited to) forestry cutblocks, oil and gas tenures, mines tenures, urban development, land tenures, rail, agriculture, and wildfire guards. Natural disturbances, including wildfires and pests, are not included in the disturbance dataset at the time of this publication (Lees & Oostlander, 2022).

The CEF Integrated Roads dataset is a combination of various publicly accessible road line data sources into a single dataset for use in current condition assessments and other resource management analyses. The CEF Integrated Roads dataset is developed from several sources, including the GeoBC's Digital Road Atlas (DRA),<sup>5</sup> Forest Tenures Roads (FTEN Roads), and in-cutblock roads from the Reporting Silviculture Updates and Land Status Tracking System (RESULTS), but does not include recreation trails from the BC Recreation Sites and Trails dataset.<sup>6</sup> The CEF Integrated Roads dataset is a combination of various publicly accessible road line data sources into a single dataset for use in current condition assessments and other resource management analyses.

The input data, assumptions, and limitations associated with the CEF Human Disturbance dataset and the CEF Integrated Roads dataset are outlined in Appendix 1 and 2.



## 3.6 Assessment Assumptions and Limitations

Various assumptions and limitations exist with the old growth forest current condition assessments. These are largely related to the accuracy of data used in the assessment and the scope of the assessment indicators that limits what can and cannot be reported on regarding the current condition of old growth forests. Assumptions, limitations, and scope considerations are listed below and apply across all old growth forest current condition assessments developed under the CEF.

<sup>5</sup> See the [DRA website](#) for more information about its data sources.

<sup>6</sup> Some trails may have been included in the CEF Integrated Road dataset if the trails exist in the DRA.

### 3.6.1 Data Currency and Accuracy

Old growth forest current condition assessments have been created using the best available data from publicly accessible data sources, including the BCGW and regional datasets (when made available), to ensure data transparency. However, it is important to acknowledge these datasets have assumptions and limitations that may influence the outcome of the assessment. These include:

- **Missed datasets and/or information:** It is possible that regionally specific datasets or information may be missed at the time of the assessment, especially if this information was not publicly available at the time of development.
- **Age class uncertainty in the VRI:** The provincial VRI dataset has some uncertainty in age class definition, particularly in discriminating between age class 8 and 9, which may underestimate the age of forests that are older than 250 years (especially if growing in low productivity sites).
- **OGMA delineation and incursions:** Incursions into OGMA may have been present before the OGMA was delineated, therefore the disturbance may have been known and considered acceptable at the time. For example, many OGMA were delineated with roads within them that existed prior to OGMA establishment.
- **Continuous updates of BEC data and BCGW data:** The BEC datasets are continuously updated producing several version iterations over time that can present challenges with assessment reporting. For example, the PNOGO targets were established based on BEC version 5 (2004) and current BEC in the BCGW at the time of publishing is BEC version 12. There may also be a time lag in updating the BCGW with replacement OGMA information and amended OGMA boundaries, thus incursions may show up in this analysis that have already been replaced.

### 3.6.2 Natural Disturbance

This old growth assessment uses age estimations from the VRI to determine the seral stage of a forest stand (e.g., young, mature, old). Natural disturbance that results in a change from old to younger aged stands is only captured in this assessment where that has been reflected in the VRI. In the VRI, the initial age assignment for a stand is based on air photo interpretation. Age is then projected from that initial assessment in the annual VRI update (i.e., aged by one year each year). These annual projections do not consider whether there has been a natural disturbance (e.g., fire or insect kill). Resetting of the stand age to a younger age only occurs once the area is re-inventoried (i.e., re-analyzed based on air photos), or has other forest management activity occur on the land base (e.g., harvesting or replanting). The priority in which any given area is re-inventoried is based on many factors and some areas may not be re-inventoried for 10, 20 or 30+ years. (e.g., Kamloops TSA was last inventoried in 2009). Age adjustments from other forest activity can occur in the years immediately following a fire but would happen over smaller areas within the larger fire perimeter.

Since changes in stand age due to natural disturbances are not immediately reflected in the VRI, or may not be reflected even after many years, the amount of old growth forest (or mature-plus-old forest) within an area may be over-estimated. It is important to note that areas where salvage harvesting has occurred would then be reflected as early seral in the VRI and this assessment.

At this time, there is no Provincial standard or guidance on adjusting stand age based on natural disturbance. Since this CE assessment is reporting the amount of old growth against legal and policy targets, it does not attempt to make a determination on age adjustment and uses the stand ages from the VRI.

### 3.6.3 Assessment Scope

- **Does not determine compliance or non-compliance with legal orders:** The results of the old growth forest current condition assessments is not a determination or judgement of compliance or non-compliance with legal orders. These assessments are providing an interpretative reporting of current condition based on indicators and thresholds as guided by legal orders or policy. With the limitations of the assessment, it is possible that the amount of old growth for an AU could be overestimated or underestimated.
- **Does not determine if old growth targets are effective at maintaining forest biodiversity:** These assessments do not evaluate and address whether old growth forest targets are sufficient and effective at maintaining old growth forest biodiversity given the ecological function and complexity of old growth forests. Old growth forest targets are generally low percentages (e.g., between 7 and 19% in Low and Intermediate BEOs) and therefore are relatively easy to achieve with old growth forest that is remaining on the land base. It is possible that this assessment could be reporting a surplus of old growth forest compared to the targets with relatively low amounts of old growth forest remaining across the AU.
- **Does not determine if mature-plus-old targets are effective at maintaining forest biodiversity:** These assessments do not evaluate and address whether mature-plus-old forest policy targets are sufficient and effective at maintaining old growth forest biodiversity given the ecological function and complexity of old growth forests. Similar to the old growth forest indicator, targets applied to BEC subzones or variants cannot assess the nuances occurring at the site series and stand level across a region or the province.
- **Potential unintended outcomes to biodiversity as a result of provincial policy implementation:** The LUPG provided the direction for OGMA delineation based on a rigorous rules-based approach that focused on ensuring the impacts to timber supply from biodiversity conservation was within an acceptable limit (i.e., no more than a 4% impact to timber supply). As a result, this approach may have had unintended outcomes to biodiversity objectives and old growth forest management. The effectiveness and how OGMA's were designed and implemented as per provincial policy or guidance is outside the scope of this assessment.
- **Implications of a coarse-scale assessment:** The management of old growth forest under PNOGO is a coarse-scale assessment approach. The targets applied to BEC subzone or variants cannot assess the nuances occurring at the stand level in relation to ecosystem type, productivity, and representation. Therefore, applying targets to BEC subzones/ variants does not assess the nuances occurring at the site series and stand levels.



A photograph of an interior spruce old growth forest. The image shows a dense stand of tall, mature spruce trees with thick, textured bark and lush green needles. The forest floor is covered in a thick layer of moss and ferns. The lighting is soft and dappled, creating a serene and ancient atmosphere. The text "4 Conclusion" is overlaid in white on the lower left side of the image.

# 4 Conclusion



## 4 Conclusion

Old growth forests are an important value to British Columbians and will continue to be assessed under the CEF. Results from these assessments will be presented in current condition reports to help inform old growth forest management across the province. The CEF aims to continuously improve information on the old growth forest value by refining the assessment methodology over time and incorporating new information as it becomes available. B.C. is committed to ongoing old growth and forest biodiversity assessments, and it is known that the way ecosystems are assessed, and the data and information generated is evolving as the Province seeks to do this work in partnership with First Nations. Ongoing discussions will help refine these assessments to ensure they are reflective of values and views.

Old growth forest current condition reports and online applications showing old growth forest current condition assessment results will be posted on the [Cumulative Effects Framework website](#) when available.

For information on how old growth forests and mature forests are managed in B.C., please refer to the *Old Growth Forest Management in British Columbia: Provincial Backgrounder* (WLRS, 2023) and the provincial government's dedicated [Old Growth Forest website](#).





A photograph of a dense forest of evergreen trees. In the center, a prominent, dead, charred tree trunk stands vertically, showing signs of fire damage. The surrounding trees are lush green, and the foreground is filled with dense, bright green foliage. The text "5 References" is overlaid in white at the bottom left.

# 5 References



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A photograph of a forest scene. The foreground is dominated by several large, dark, weathered tree branches that are heavily covered in bright green moss. The branches are thick and gnarled, with some showing signs of decay. The background is a dense forest of evergreen trees, with some lighter green foliage visible in the lower right. The overall atmosphere is serene and natural.

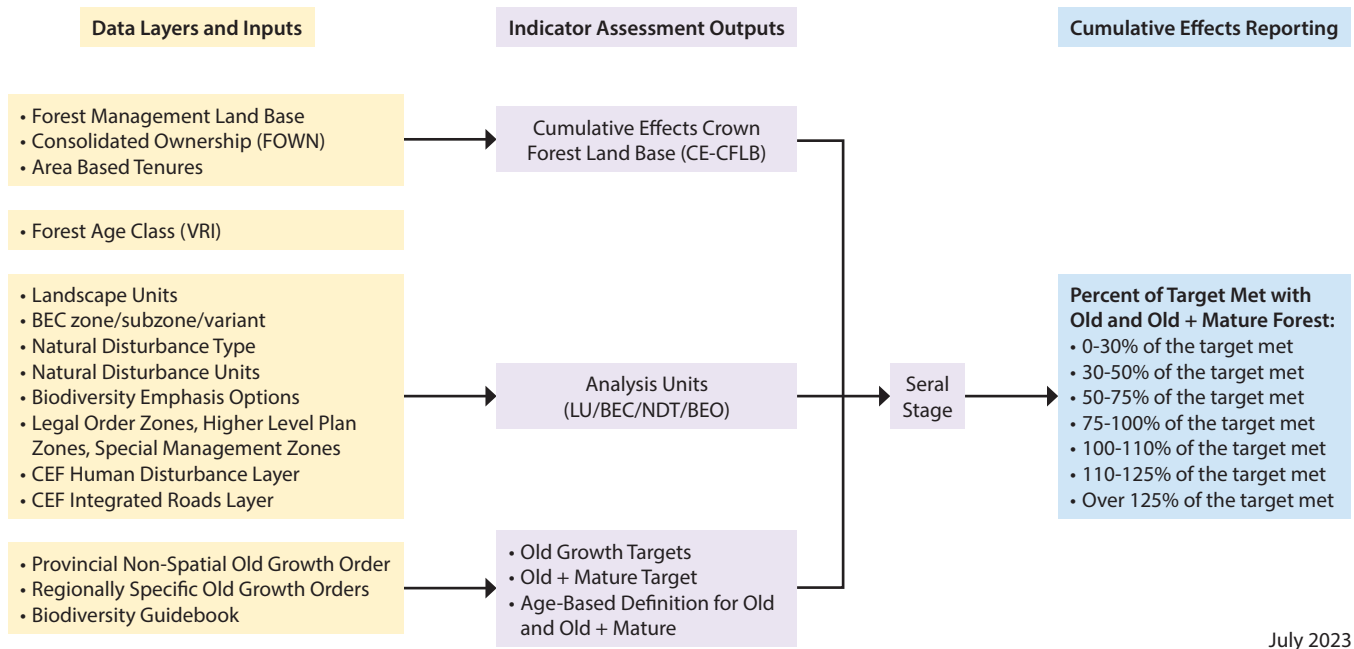
# 6 Appendices



# 6 Appendices

## Appendix 1 – Data Inputs to assess Old Growth Cumulative Effects

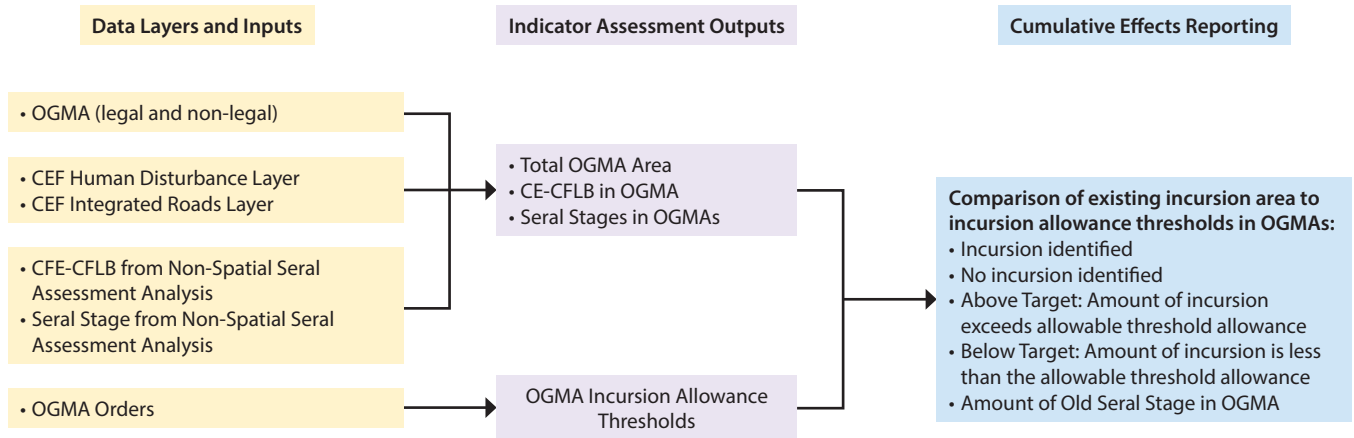
### Interim Assessment Protocol for Old Growth Forests in British Columbia: Development Model for the Assessment of Non-Spatial Indicators



July 2023

**Figure 2.** Model for the assessment of old growth forest and mature-plus-old forest indicators.

### Interim Assessment Protocol for Old Growth Forests in British Columbia: Development Model for the Assessment of Old Growth Management Areas (OGMAs) Indicators



July 2023

**Figure 3.** Model for the assessment of OGMA indicators.



## Appendix 2 – Data Assumptions, Scripting, and Methodology

This appendix provides the technical assumptions, methods, and data sources used to develop the Cumulative Effects Crown Forested Land Base (CE-CFLB) and subsequent current condition assessment reporting for the old growth forest value. This information is being provided to ensure transparency and to facilitate the ability to repeat the assessment in future analysis.

The *Interim Assessment Protocol for Old Growth Forest in British Columbia* (FLNRORD, 2017) conceptual model is based on completing analysis for the following components:

- Non-spatial assessment for the amount of old growth forest and mature-plus-old forest in each AU ( a combination of LU, BEO, NDT, and BEC subzone/variant) relative to legal orders and Provincial policy targets;
- The amount of incursions into legal and non-legal OGMAs based on legal order objectives or provided through regional or provincial policy; and,
- The amount of old growth forest in legal and non-legal OGMAs.

### 6.1.1 Non-Spatial Old Growth Forest Assessment: Input Datasets

The non-spatial analysis is completed using the input datasets outlined in Table 4.

**Table 4.** List of datasets used in the non-spatial assessment of old growth and mature-plus-old forest as per the *Cumulative Effects Old Growth Forest Protocol (2017)*. All input datasets are publicly available from the BC Data Catalogue.

Name	Source Data
<b>Vegetation Resource Inventory (VRI)</b>	WHSE_FOREST_VEGETATION.VEG_COMP_LYR_R1_POLY
<b>Biogeoclimatic Ecosystem Classification (BEC)</b>	WHSE_FOREST_VEGETATION.BEC_BIOGEOCLIMATIC_POLY
<b>Generalized Ownership</b>	WHSE_FOREST_VEGETATION.F_OWN
<b>Landscape Unit (LU) Boundaries</b>	WHSE_LAND_USE_PLANNING.RMP_LANDSCAPE_UNIT_SVW
<b>Natural Disturbance Units</b>	REG_LAND_AND_NATURAL_RESOURCE.NATURAL_DIST_UNITS_RPG_POLY
<b>CEF Human Disturbance (2021)</b>	Custom dataset created for the Provincial Cumulative Effects Framework <a href="https://catalogue.data.gov.bc.ca/dataset/577cba93-9b20-48bb-83b8-1e077e9e8a04">https://catalogue.data.gov.bc.ca/dataset/577cba93-9b20-48bb-83b8-1e077e9e8a04</a>
<b>CEF Integrated Roads (2021)</b>	Custom dataset created for the Provincial Cumulative Effects Framework <a href="https://catalogue.data.gov.bc.ca/dataset/9568a219-819d-417a-be68-8431b6fb5de0">https://catalogue.data.gov.bc.ca/dataset/9568a219-819d-417a-be68-8431b6fb5de0</a>
<b>Legal Land Use Planning</b>	WHSE_LAND_USE_PLANNING.RMP_PLAN_LEGAL_POLY_SVW
<b>Non-Legal Land Use Planning</b>	WHSE_LAND_USE_PLANNING.RMP_PLAN_NON_LEGAL_POLY_SVW
<b>Woodlots/Community Forests</b>	WHSE_FOREST_TENURE.FTEN_MANAGED_LICENCE_POLY_SVW

The analysis is done one reporting area (i.e., Timber Supply Area, Natural Resource District) at a time by:

- Determining the Cumulative Effects Crown Forested Land Base (CE-CFLB);
- Determining seral stage;
- Calculating the current amount of old growth forest and mature-plus-old forests as a percentage of the CE-CFLB; and,
- Comparing the existing percentages to legal orders (for old growth forest) and Biodiversity Guidebook policy targets (for mature-plus-old forest).

The generalized Forest Cover Ownership (F\_OWN) from the BCGW was customized to create four types of ownership: 1) Crown\_Forest, 2) Protected, 3) Federal, and 4) Private, as outlined in Table 5.

**Table 5. Generalized forest cover ownership categories to develop the CE-CFLB.**

Crown_Forest	Protected	Federal	Private
62C: Crown – Forest Management Unit	60: Crown Conservancy Area, Ecological Reserve, Protected Area, Provincial Park	50: Federal Reserve	40: Private
70C: Crown – Active Timber License in TFL	61: Crown UREP (Use, Recreation and Enjoyment of the Public Reserves)	51: National Park	41: Land Settlement Claim Area
70N: Crown – Active Timber License in TSA	63: Crown Biodiversity, Mining, Tourism Area	52: Indian Reserve	
72A: Private – Schedule A Land TFL	64: Crown Special Forest Management Area	53: Military Reserve	
72B: Private – Schedule B Land TFL	65: Crown Wildlife Management Area	54: Dominion Government Block	
74N: Crown – Timber Alienated Watershed	66: Crown Recreation Area		
75N: Crown – Christmas Tree Permit	67: Crown Heritage Site		
77A: Crown – Woodlot License, Schedule A	68: Crown Forest Recreation Reserves		
77B: Crown – Woodlot License, Schedule B	69: Crown Misc. Reserve		
79A: Crown – Community Forest, Schedule A			
79B: Crown – Community Forest, Schedule B			
99N: Crown – misc. lease			
78: Crown – First Nations Woodland License			
91N: Unknown			
99: Crown – misc. lease			

To develop the Cumulative Effects Crown Forested Landbase (CE-CFLB), the categories in the Crown\_Forest and Protected columns are included in the CE-CFLB, except for Woodlot Licenses less than 600 ha. The area (ha) of Woodlot licenses is excluded from the CE-CFLB to be consistent with provincial policy and legal orders for old growth forest management.

The ownership categories in the Federal and Private columns are excluded from the CE-CFLB. The area (ha) of Federal parks is included in the CE-CFLB to be consistent with provincial policy for the management of old growth forests.

There are circumstances where the larger provincial parks (e.g., Mt. Robson) are an entire LU. These LUs would not be assigned a BEO, which means there is no old growth forest and mature-plus-old forest targets to compare against in seral assessment results. As such, these LUs would be assigned as “No Target” in assessment mapping and reporting results.<sup>7</sup>

The foundation to developing the CE-CFLB is using the Forest Management Land Base (FMLB) Indicator from the VRI. Where the FMLB as attribute is assigned “yes” it is included in the CE-CFLB.

<sup>7</sup> In the circumstances where the old growth forest legal orders are by LU and there are LUs that are designated entirely as a Provincial Park, it is recommended that future old growth forest current condition reporting should default this LU to High BEO as to include these LU’s in seral assessment current condition reporting.

## 6.1.2 Non-Spatial Old Growth Forest Assessment: Methodology

**Union Datasets:** The input datasets are clipped by LU and then unioned in ArcGIS to create the Assessment Units.

1. **Calculate CE-CFLB:** The CE-CFLB is determined by ownership type (F\_OWN) and FMLB (VRI). CE-CFLB is calculated by selecting "Crown" land (F\_OWN in (51, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 72, 74, 75, 77, 78, 79, 80, 81, 91, 99)) within the FMLB (FOR\_MGMT\_LAND\_BASE\_IND = 'Y').
2. **Adjust for Human Disturbance:** Where the CEF Human Disturbance layer indicates the land has been disturbed, the forest age is revised to 0 years and seral stage reset to young. This includes buffering of roads and other linear features.
3. **Calculate Seral Stage for Old, Mature, Mid, and Early:** Seral stage is determined by comparing the forest age in the VRI to the thresholds which are defined in the legal orders and Biodiversity Guidebook by NDT, BEC zone. For example, in a NDT1 CWH ecosystem, seral stage is defined as:
  - Early Seral 0-39 years
  - Mid Seral 40-80 years
  - Mature Seral 81-250 years
  - Old Seral > 250 year
4. **Results Calculation:** The total CE-CFLB area of each seral stage by Landscape Unit and BEC subzone/variant is calculated. The percentage of old growth forest and mature-plus-old forest in the CE-CFLB is then calculated. The area of old growth forest required to meet the target is calculated based on the total CE-CFLB area and the percentage target.
5. **Current Condition Status Calculation:** The Old Growth Forest Status and Mature-plus-Old Status are calculated by comparing the existing percentages to the target percentages in the CE-CFLB. The existing percentage old growth forest and mature-plus-old forest is then compared to the targets defined in the legal order and the Biodiversity Guidebook and assigned a category for current condition status. These categories are based on the percent of target met with old growth forest (and mature-plus-old) by LU and BEC subzone/variant:
  - 0-30% of target met
  - 30-50% of target met
  - 50-75% of target met
  - 75-100% of target met
  - 100-110% of target met
  - 110-125% of target met
  - Over 125% of target met
  - N/A



### 6.1.3 Additional Notes on the CE-CFLB

- The area (polygons) included in the CE Human Disturbance and CE Integrated Road data remain as part of the CE-CFLB. These areas are not removed from the CE-CFLB like they are in the Timber Supply Review process.
- The CE Human Disturbance and CE Integrated Road datasets are intersected into the aspatial and OGMA CE-CFLB assessment datasets, and the seral stage is reset to early in areas disturbed by human activity (e.g., the area under the road buffer would be reset to an early seral stage or age of 0 years).
- The CE-CFLB is based on a simplified definition of FMLB= Y and ownership removals (private land, Indian Reserves, etc.). All area-based tenures remain in the CE-CFLB, with the exception of Woodlots and Community Forests that are less than 600 ha which are removed from the CE-CFLB as specified in the PNOGO and/or Regional Orders. This simplified approach is to accommodate standardisation between all the CEF values (e.g., Forest Biodiversity, Grizzly Bear, Moose, Riparian) and provide consistency in current condition reporting.
- Assessment Units that are less than 0.1 ha are considered slivers and removed from the assessment reporting.

### 6.1.4 Spatial OGMA Assessment: Input Datasets

The data input layers used in the spatial OGMA analysis are outlined in Table 6. The dates for these datasets are updated over time, and corresponding old growth forest current condition assessments will use the latest version of the datasets for future analysis.

**Table 6.** Datasets for the spatial OGMA analysis.

Name	Source
<b>Legal OGMA</b>	WHSE_LAND_USE_PLANNING.RMP_OGMA_LEGAL_CURRENT_SVW
<b>Non-legal OGMA</b>	WHSE_LAND_USE_PLANNING.RMP_OGMA_NON_LEGAL_CURRENT_SVW
<b>CEF Human Disturbance (2021)</b>	Custom dataset created for the Provincial Cumulative Effects Framework <a href="https://catalogue.data.gov.bc.ca/dataset/577cba93-9b20-48bb-83b8-1e077e9e8a04">https://catalogue.data.gov.bc.ca/dataset/577cba93-9b20-48bb-83b8-1e077e9e8a04</a>
<b>CEF Integrated Roads (2021)</b>	Custom dataset created for the Provincial Cumulative Effects Framework <a href="https://catalogue.data.gov.bc.ca/dataset/9568a219-819d-417a-be68-8431b6fb5de0">https://catalogue.data.gov.bc.ca/dataset/9568a219-819d-417a-be68-8431b6fb5de0</a>

## 6.1.5 Spatial OGMA Assessment: Methodology

### **Total Incursions**

Incursions are assessed in three steps:

1. **Cutblocks:** The harvesting data for the cut block is compared with the establishment date for the OGMA. Cut blocks that pre-date OGMA establishment are not considered to be incursions. Wildlife Tree Patches within a cut block are not considered to be incursions
2. **Roads:** Road buffers that overlaps OGMA are considered to be incursions. Unfortunately, there is a lack of data to determine whether a road predates the establishment of the OGMA
3. **Remaining Development Layer types:** Many of these layers lack the information to compare against the OGMA establishment date. All these layers are considered to be incursions into OGMA.

The combination of the above is used to calculate the area of incursion by total area and CE-CFLB. The disturbance type is retained in the resultant to facilitate reporting by incursion type should an OGMA have several different incursions.

### **CE-CFLB Incursion**

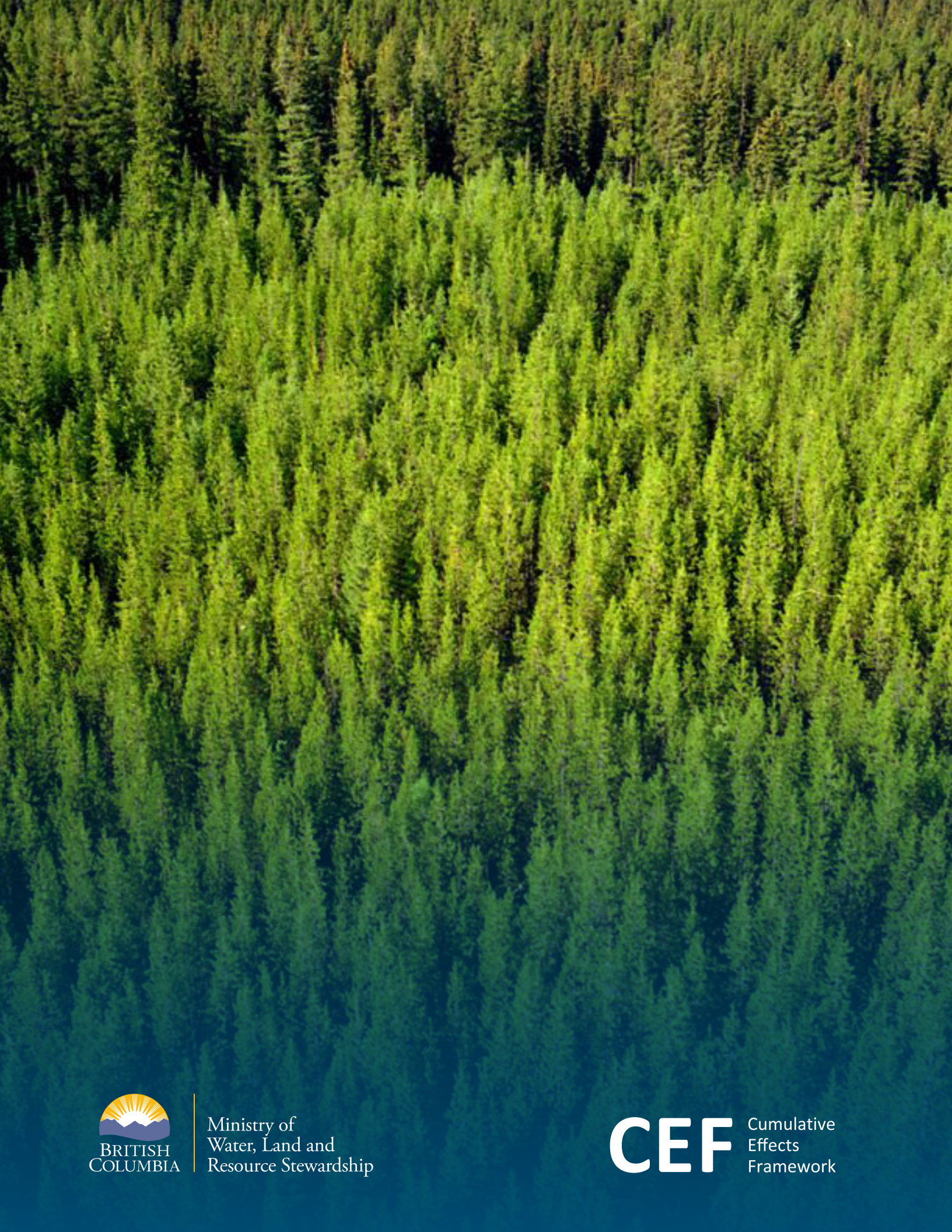
The CE-CFLB from the non-spatial analysis is used to determine the area of CE-CFLB within the OGMA and then the same analysis as above is done to calculate the amount of incursion into the CE-CFLB portion of the OGMA.

### **Comparison to Allowable Incursion Thresholds Targets**

The amount of total incursion is compared to the OGMA incursion allowance threshold to determine whether the target is exceeded or not. Where there are no targets (ie non-Legal OGMA) the incursion allowance threshold is set to 0. Total incursions or the type of incursions in OGMA that are less than 0.01 ha are considered to be data errors and would not be counted as an incursion.

For additional information on the assessment methodology, see the [Interim Assessment Protocol for Old Growth Forests in British Columbia \(FLNRORD, 2017\)](#).





Ministry of  
Water, Land and  
Resource Stewardship

**CEF** Cumulative  
Effects  
Framework