

Old-Growth Forests in British Columbia

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What Is Old Growth and Why Is It Important?

Old-growth forests are natural ecosystems dominated and distinguished by stands of old trees and their associated structures. Old growth emerges in the later stages of stand development (Fig. 1), as trees age, become large (for the species), often develop large crowns, and—as

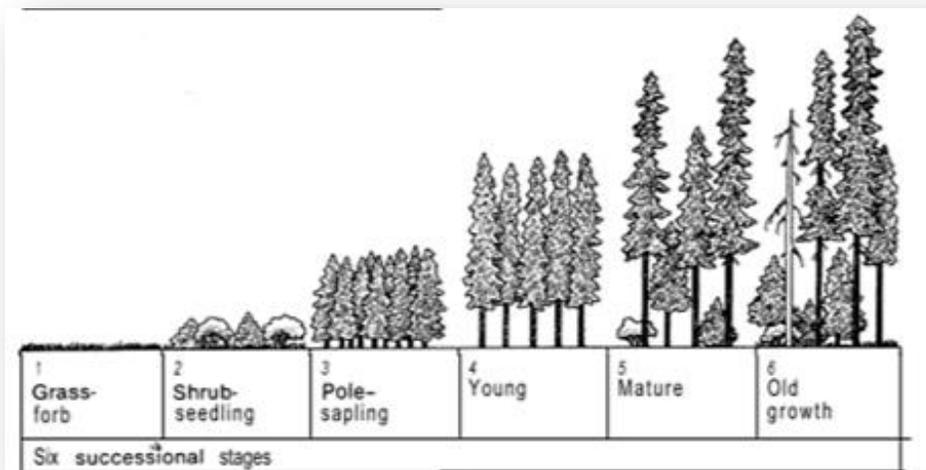


Figure 1. Successional stages in typical northwestern conifer forest.¹

some of them suffer damage or disease, or die—create canopy gaps that enable understory regeneration, and produce large, standing dead and fallen trees.² In western North America, old-growth forests became a focus of forest management and conservation in the 1980s, coincident with public controversies around the Spotted Owl (in the US Pacific Northwest) and Clayoquot Sound (in BC). The definition above is widely accepted among foresters and ecologists, and is now (ostensibly) part of the rubric of the BC government.^{3,4}

Working definitions for BC old growth are based on stand age, largely derived from age classes on forest cover maps. Forests on the Coast and in the Interior wet belt are considered old growth if their trees are more than 250 years old. In drier interior forests, where tree species are shorter-

¹ Thomas, J.W., tech. ed. 1979. Wildlife habitats in managed forests: the Blue Mountains of Oregon and Washington. Agric. Hand. No. 553. Washington, DC: USDA Forest Service. 512 p.

² Spies, T.A. and M.G. Turner. 1999. Dynamic forest mosaics. In M.L. Hunter Jr., editor. *Maintaining Biodiversity in Forest Ecosystems*. Cambridge University Press. pp. 95-160.

³ <https://www.for.gov.bc.ca/hfd/pubs/docs/mr/mr112/page14.htm>

⁴ <https://www.bcfpb.ca/reports-publications/reports/conserving-old-growth-forests-bc-implementation-old-growth-retention/>

lived and stand-replacing wildfires and insect outbreaks are more frequent, old growth is defined as older than 120 years for forests dominated by lodgepole pine, aspen, cottonwood/balsam poplar and birch, and older than 140 years for other forests dominated by spruces, subalpine fir, interior Douglas-fir, Ponderosa pine, and larches.⁵

But old growth is fundamentally an ecological concept. The simple working definition based on stand age—typically taken from forest cover maps that delineate stand types based on major tree species and their age, height, density and productivity class—does not evaluate stand structural and compositional attributes. “*Defining old growth without assessment of structure may consequently fail to identify the most biologically important areas of forest.*”⁶ Definitions should be based on multiple criteria, including stand age, tree age and size, disturbance pattern, forest structure and composition, minimum area.⁷

The age at which old growth develops and the specific ecological attributes that characterise old growth vary widely according to forest type, regional climate, site conditions, and disturbance regime. Old growth can be distinguished from younger growth by several structural and compositional attributes. Attributes used in ecological old-growth definitions include:

- large old trees
- wide range of tree sizes and ages
- a deep multilayered canopy
- numerous large snags and downed logs
- two or more tree species
- great (relatively) age of some trees
- canopy gaps
- hummocky microtopography of the forest floor
- complex structure (vertical layers, horizontal patchiness)
- wider tree spacing, and
- increased understory production.⁸

The key ecological values of old growth have been well studied in BC and are now widely recognised.^{9,10} Most significant are the contributions of these stands to a) maintaining biodiversity by providing habitat for the myriad organisms that live in the province’s forests; and

⁵ <https://www.for.gov.bc.ca/hfd/pubs/docs/mr/mr112/page14.htm>

⁶ Braumandl, T. and R. Holt. 2000. Redefining definitions of old growth to aid in locating old-growth forest reserves. In *Proceedings, From science to management and back: A science forum for southern interior ecosystems of British Columbia*. C. Hollstedt, K. Sutherland, T. Innes (eds). S. Int. For. Ext. & Res. Partnership. p. 41–44.

⁷ BC Ministry of Forests. 1990. *Old-growth forests: problem analysis*. Research Branch, Victoria, BC. 135 p. <https://www.for.gov.bc.ca/hfd/library/documents/bib95787.pdf>

⁸ Pojar, J., E. Hamilton, D. Meidinger, A. Nicholson. 1992. Old growth forests and biological diversity in British Columbia. In *Landscape approaches to wildlife and ecosystem management*. Proc. second symposium Canadian Society for Landscape Ecology & Management. G.B. Ingram & M.R. Moss (eds.). UBC, Vancouver, BC. pp. 85–97.

⁹ Hilbert, J., and A. Wiensczyk. 2007. Old-growth definitions and management: A literature review. *BC Journal of Ecosystems and Management* 8:15–31. http://www.forrex.org/publications/jem/ISS39/vol8_no1_art2.pdf

¹⁰ MacKinnon, A. 1998. Biodiversity and old-growth forests. In J. Voller and S. Harrison (eds.). *Conservation biology principles for forested landscapes*. UBC Press, Vancouver, British Columbia. pp. 146–184.

b) delivering crucial ecosystem services, including clean air and water, and carbon sequestration and storage. Over 400 species of plants and animals rely on BC's old-growth forests for at least a part of their life cycle.¹¹ Old-growth forests also have deep cultural and spiritual significance for humans,¹² and provide a vital cultural resource for First Nations.

Why Retain Old Growth?

Old-growth forests have great ecological and cultural values, they provide specialized habitats not found in younger forests, and in BC much of the original old growth has been logged, cleared, burnt by wildfires, attacked by bark beetles, or submerged in hydroelectric reservoirs. Retention of old-growth forest is supposed to be a key element of conservation in British Columbia.¹³ Land use plans enlist old growth as a way to protect biodiversity; the BC government used to regard protection of old growth as one of the most effective ways of conserving biodiversity at the landscape level; and old-growth forests are very important to the public, for ecological, spiritual, aesthetic, and other intrinsic values.¹⁴

Conservation of old growth is not just a provincial or regional issue. A recent review paper has emphasized the indispensable role of the world's dwindling intact forests in mitigating climate change (especially through carbon storage and uptake), regulating local climate and hydrology, conserving biodiversity, providing key ecosystem services, strengthening indigenous cultures, and supporting the maintenance of human health.¹⁵ Moreover large old, keystone trees¹⁶ are in trouble worldwide; their populations are plummeting in many ecosystems around the world.¹⁷

Not only is intact old-growth forest indispensable, it is in some respects irreplaceable. As BC's climate continues to warm, the young forests and regenerating cutblocks and clearings of today will **not** eventually replace the old-growth stands that have been logged or removed. Young secondary forests are quickly regrowing and some could become old. I cannot predict what their ultimate composition will be but I can say that future old forests will have a new mix of species and different soils and disturbance regimes compared to contemporary old-growth forests. Even if allowed (i.e., managed under extended rotations) to grow centuries old they will not recover to the primary condition. Recovery of old-growth forest has become an inappropriate concept, given rapid climate change, system unpredictability, and scientific uncertainty. Nowadays old-growth forest is effectively a non-renewable resource.

¹¹ Ministry of Forests, Mines and Lands. 2010. *The State of British Columbia's Forests, 3rd ed.* Forest Practices and Investment Branch, Victoria, B.C. www.for.gov.bc.ca/hfp/sof/index.htm#2010_report

¹² Rolston, H. III. 1989. Values deep in the woods. *Trumpeter* 6: 39-45.

¹³ https://www.for.gov.bc.ca/hfp/sof/2010/SOF_2010_Web.pdf

¹⁴ <https://www.bcfpb.ca/reports-publications/reports/conserving-old-growth-forests-bc-implementation-old-growth-retention/>

¹⁵ Watson, J.E.M. and many others. 2018. The exceptional value of intact forest ecosystems. *Nature Ecology & Evolution* 2: 599-610. doi:10.1038/s41559-018-0490-x

¹⁶ Lutz, J.A., A.J. Larson, J.A. Freund, M.E. Swanson, and K.J. Bible. 2013. The importance of large-diameter trees to forest structural heterogeneity. *PLoS ONE* 8(12): e82784. doi:10.1371/journal.pone.0082784.

¹⁷ Lindenmayer, D.B., W.F. Laurance, J.F. Franklin. 2012. Global decline in large old trees. *Science* 338: 1305-1306.

How Are We Doing in BC?

Much of the province's original old growth (and most of the productive, easily accessible primary forest) has already been logged and converted to managed fragmented forests; or cleared for agriculture and urbanisation, or burnt, or attacked by forest pests and diseases and then salvage-logged, or drowned by dams.

What's left is being managed poorly. The decades-old mantra of *'logging the decadent old forests and replacing them with thrifty young plantations'* still holds sway, but has been repurposed by industry, Natural Resources Canada, and the Province: *'Our forests will all soon burn up, fall to beetles, or blow down anyway. So we should quickly log much more, store the carbon in long-lasting wood products and landfills, use the logging debris for biofuel, and promptly reforest cutover areas to take up more carbon.'*

Maintaining the non-timber values of old-growth forests continues to be treated in timber supply analyses and AAC determinations as a management constraint rather than a goal. Landscape planning is beset by preoccupation with timber supply and by partisan, arbitrary, deficient, feckless designations or limits such as 'biodiversity emphasis options', 4% or 6% impact on cut, and Old Growth Management Areas.

Forest Stewardship Plans are flawed and inadequate. The FSP model is not up to the task of delivering contemporary resource stewardship and sustainable management. Dating back to the early 2000s and focussing on maintaining timber supply, the provincial government's objectives are narrow, in some cases inappropriate, and need updating.¹⁸

Consequently BC's old-growth forests have been reduced by industrial logging to a small fraction of their original extent. Levels of retention of old forest have fallen to low, ecologically unacceptable levels over large areas of the province. Very little of the vast area of secondary forest is being managed either to recruit old growth, or to mitigate its loss with silvicultural techniques¹⁹ that promote or maintain old-growth forest attributes. Indeed in some areas the prevailing silvicultural system is 'clearcut selection' highgrading, whereby all trees (including advance regeneration, cohorts of saplings, and wildlife trees) are mowed down, the sawlogs are selected and removed, the cull logs and everything else are stacked in mountainous slash piles, which are then burnt.

I am not reassured by the Province's claim that *"Currently, 55% of old-growth forests on Crown land in BC's coastal region are already protected from logging."*²⁰ The figure is inflated by including what I call 'disingenuous old growth', the old but boggy or stunted, low productivity

¹⁸ Forest Practices Board.. 2015. *Forest Stewardship Plans: Are they meeting expectations?* Special Investigation Report 44. <https://www.bcfpb.ca/wp-content/uploads/2016/04/SIR44-FSP-Are-They-Meeting-Expectations.pdf>

¹⁹ Bauhus, J., K. Puettman, C. Messier. 2009. Silviculture for old-growth attributes. *Forest Ecology and Management* 258: 525–537. doi:10.1016/j.foreco.2009.01.053

²⁰ <https://news.gov.bc.ca/releases/2019FLNR0189-001452>

forests widespread on the coast—on poorly drained lowlands, at high elevations, and in the system of protected areas. Nor does the launch²¹ of a program to protect 54 big trees with a 1 ha donut signify much other than a smokescreen, or a form of Potemkin village.

Recommendations

Immediately

Establish a logging moratorium over all intact forests (on unencumbered ‘Crown’ land) covering more than 70 ha, with main-canopy trees older than 250 years and taller than 40-m.

Protect more old-growth forest from logging.

- Especially old carbon-rich forests that have a good chance of being with us for decades and centuries to come (in other words, prioritized protection of productive and long-lived coastal, interior wetbelt, and wetter high-elevation forests).
- Specifically in BC’s globally rare and threatened coastal temperate rainforest²² and inland temperate rainforest/snowforest^{23,24} (CWH and wetter subzones of ICH), plus subalpine forests (MH and wetter subzones of ESSF). With particular focus on stands with monumental trees, especially redcedar and yellow-cedar. We already know where some of these old-growth reserves should be located.
- Remove these reserves from the Crown timber harvesting landbase.

Commission a Review/Investigation of BC Timber Sales: Mission, Core Values, Policy & Procedures; Practice, Performance & Behaviour wrt Old Growth

Perhaps by the Forest Practices Board, although it isn’t sufficiently arms-length.

²¹ <https://news.gov.bc.ca/releases/2019FLNR0189-001452>

²² Schoonmaker, P.K, B. von Hagen, E.C. Wolf. 1997. *The Rain Forests of Home: Profile of a North American Bioregion*. Island Press, Washington, DC.

²³ Stevenson S, Armleder H, Arsenault A, Coxson D, DeLong C, and Jull M. 2011. *British Columbia’s inland rainforest: Ecology, conservation and management*. UBC Press, Vancouver, BC. 432 p.

²⁴ Coxson, D., T. Goward, J.R. Werner. 2019. The inland temperate rainforest and interior wetbelt biomes of western North America. *Encyclopedia of the World’s Biomes*. Elsevier. <https://doi.org/10.1016/B978-0-12-409548-9.12055-X>

Within 12 Months

Draft and table an *Old Growth Protection Act*, along the lines of the proposal by the Environmental Law Centre Clinic.²⁵

Identify, delineate and map additional candidate areas for protection. Use existing inventory information and ground-truthing bolstered by state-of-the-art technology, including LiDAR and high-resolution imagery collected by drones.²⁶

- Focus on productive old-growth forests where the mature trees are older than 150 years and taller than 40 m. Also look for forests with long continuity (ancient forests).²⁷ Especially in valley bottoms where (against the odds) some old forest survives on river terraces, benches, older islands and toe slopes, as part of a riparian ecosystem complex. Riparian zones on river floodplains are “among the most productive and valuable of ecological systems” and considered a provincially key habitat component of biodiversity.²⁸ But that’s not all there is to say.

A recent review paper makes a strong case for the ecological importance of gravel-bed river floodplains in mountain landscapes, explaining how these systems disproportionately concentrate habitat diversity, nutrient cycling, productivity of biota, and species interactions among organisms from microbes and algae to vertebrates and trees. “*Gravel-bed rivers and their floodplains are the ecological focal point of habitat complexity and biodiversity in glaciated mountain landscapes and the ‘arena’ for ecological interactions between and among species. The gravel-bed river floodplain is the ecological nexus of regional biodiversity.*”²⁹

Moreover “*gravel-bed river floodplains serve as refugia and will be critically important under climate change and global warming for a variety of aquatic and terrestrial species.*”³⁰ Indeed the remaining intact valley-bottom forests are well-placed to serve as climate change refugia or sanctuaries. Climate refugia³¹ are habitats that components of

²⁵ Environmental Law Centre Clinic. 2013. An Old Growth Protection Act for British Columbia . <http://www.elc.uvic.ca/wordpress/wp-content/uploads/2015/01/An-Old-Growth-Protection-Act-for-BC-2013Apr.pdf>

²⁶ Watts, A., Andersen, H-E, Cook, B., Alonzo, M. 2019. Innovation in the Interior: How state-of-the-art remote sensing is helping to inventory Alaska’s last frontier. *Science Findings* 222. Portland, OR: USDA Forest Service, Pacific Northwest Research Station. <https://www.fs.fed.us/pnw/sciencef/scifi222.pdf>

²⁷ McMullin, R.T., Y.F. Wiersma. 2019. Out with OLD growth, in with ecological continNEWity: new perspectives on forest conservation. *Front Ecol Environ* 17: 176–181, doi:10.1002/fee.2016

²⁸ Holt, R. and T. Hadfield. 2007. Key Elements of Biodiversity in BC: Some Examples from Freshwater and Aquatic Realms. Technical Subcommittee Component Report for the Report on the Status of Biodiversity in BC. <http://www.biodiversitybc.org/>

²⁹ Hauer, F.R., H. Locke, V. J. Dreitz, M. Hebblewhite, W. H. Lowe, C. C. Muhlfeld, C. R. Nelson, M. F. Proctor, S. B. Rood. 2016. Gravel-bed river floodplains are the ecological nexus of glaciated mountain landscapes. *Science Advances* 2, e1600026.

³⁰ Hauer, F.R. and others. 2016. *Ibid.*

³¹ Ashcroft, M.B. 2010. Identifying refugia from climate change. *Journal of Biogeography* 37: 1407–1413.

biodiversity can retreat to, or persist in, under changing environmental conditions, areas where change could be ameliorated by such influences as topography (north aspects, moist toe slopes and river terraces), hydrology (cool tributary water plumes), or legacies of older ecosystems (large old trees).³²

Subsequently

An independent scientific panel ('western' science and indigenous knowledge) reviews and assesses the candidate areas.

Evaluation criteria would include tree age and size, stand productivity and connectivity, carbon stocks,³³ other natural capital and ecosystem services, forest continuity, habitat value for old-growth-associated species, potential to fill conservation gaps, and relative likelihood of persistence/vulnerability³⁴ to future stand-replacing disturbances. A shortlist of high-ranking areas would emerge.

Province demonstrates leadership and takes the shortlist to the people of BC for review and comment. Sets targets and timelines for 'getting to yes' for old-growth reserves.

Provincial government facilitates the transition to second-growth forest management.

- Phases out old-growth logging at a rate proportionate to the identified regional landscape risk.
- Moves from over-reliance on dimensional lumber from old primary forests to a greater range of higher value forest products and a focus on products that can be derived from second growth.³⁵
- Implements a second-growth management program that includes commercial thinning, silvicultural techniques to promote or maintain old-growth forest attributes, and spin-off economic benefits and additional employment.
- Subsidizes innovation in wood products and in non-solid-wood products derived from the basic constituents of wood; invests more in engineered wood products and explores the Scandinavian experience in bio-refineries.³⁶
- Provides tax credits to incentivise reducing logging waste in the bush and improving utilization of residual forest fibre. And **I Do Not** mean continuing to promote the unsustainable, climate-hostile, wood pellet export industry.

³² Stevens, V. 2007. Opportunities in a Changing Climate: British Columbia Parks and Protected Areas. Proceedings of the 2007 George Wright Society Conference: Protected Areas in a Changing World. pp. 251-256.

³³ Pojar, J. 2019. *Forestry and carbon in BC*. Report prepared for SkeenaWild Conservation Trust, Terrace, BC & Skeena Watershed Conservation Coalition, Hazelton, BC. 42 p.
http://skeenawild.org/images/uploads/docs/Pojar-7mythsfinal-2019_copy.pdf

³⁴ Buotte, P. C., B. E. Law, W. J. Ripple, and L. T. Berner. 2019. Carbon sequestration and biodiversity co-benefits of preserving forests in the western United States. *Ecological Applications* 00(00):e02039.

³⁵ <http://northwestinstitute.ca/images/uploads/john-innes-ppt-apr2019.pdf>

³⁶ Innes, J. 2018. The working forest - a view from British Columbia. *New Zealand Journal of Forestry* 63: 6–13.