Submission to
Old-Growth Strategic Review
by
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January 21, 2020

Introduction and Background

Old-growth forests are an essential part of healthy forest landscapes that possess natural ecological integrity. Old-growth forests provide irreplaceable ecological services that are either furnished in significantly diminished form, or not at all by less complex, diverse forest phases. These ecological services should not be confused with, nor relegated to a popularity contest between myriad human values. Intact, well-distributed old-growth forests are human needs.

Thus, from a human perspective, the discussion about old-growth forests is a discussion about whether we protect and maintain ecosystems that provide our *needs*, or place short-term human *wants* or values, like timber, mining and tourism ahead of our needs. The climate emergency is demonstrating to our species the folly of putting short-term human wants or values ahead of the need to protect ecological integrity, which includes the protection of old-growth forests.

We do not know how to grow or create the complex composition, structure, and function that comprise old-growth forests. Indeed, we have not even begun to unravel the complexity and processes that comprise old-growth forests.

There is little likelihood that we can "grow" old-growth forests, as our destruction of their composition and structure has probably extirpated organisms and relationships between organisms necessary for the development of the complexity and specialization found in an old-growth forest. Many of these "lost organisms" are likely to be found in the soil and include species of arthropods, fungi, and bacteria. The lesson to be drawn from this situation is that in order to protect old-growth forests, we need to protect the *natural composition, structure, and function* that we can see in order to protect that which we cannot see, or do not understand.

Thus, our approach to old-growth forests is not one of management. Systems of management that protect and maintain the integrity of ecosystems start with the assumption that we understand how the ecosystem in question works. We do not know how old-growth forests function. Thus, our approach to old-growth forests needs to be one of *protection* for essential ecosystem services, as well as the intrinsic worth of these amazing forest ecosystems. Protection of remaining old-growth forests in BC is particularly important given the dearth of old-growth due to more than a century of logging, cloaked as "sustainable forestry" that has removed most old-growth forests from the landscape.

Old-growth forests are an essential phase in the life of all forests, and were once found throughout the forest landscapes of BC. However, today these forests exist only in a very diminished extent, with many types of old-growth forests extirpated from the landscape, primarily by logging, but also by urban development and conflicting land uses, like ranching and

tourism. The rich site, valley-bottom old-growth forests, dominated by extremely large trees, many of which exceeded 100 m in height are distant memories. Such forests had the misfortune of being close to areas desirable for human settlement and served as early sources of resource exploitation that converted intact natural systems into ecologically degraded landscapes.

The remaining old-growth forests are largely found on less productive sites that, while possessing the character of natural primary, old-growth forests, are significantly different than the old-growth forests that once blanketed much of the rich, moist soils throughout BC's forest landscape. Understanding this situation alone leads to the conclusion that all remaining old-growth forests need to be protected, and active programs to assist natural processes to restore old-growth forests need to be put in place with the hope that over time the natural distribution and characteristics of old-growth forests will be reestablished. As I will explain below, these decisions are a matter of survival, not a matter of balancing narrow human values.

In: *The Exceptional value of intact forest ecosystems*, the authors state:

> *As the terrestrial human footprint continues to expand, the amount of native forest that is free from significant damaging human activities is in precipitous decline. There is emerging evidence that the remaining intact forest supports an exceptional confluence of globally significant environmental values relative to degraded forests, including imperiled biodiversity, carbon sequestration and storage, water provision, indigenous culture and maintenance of human health. Here we argue that maintaining and, where possible, restoring the integrity of dwindling intact forests is an urgent priority for current global efforts to halt the ongoing biodiversity crisis, slow rapid climate change and achieve sustainability goals. Retaining the integrity of intact forest ecosystems should be a central component of proactive global and national environmental strategies, alongside current efforts aimed at halting deforestation and promoting reforestation.* (Watson, James E.M. et al. 2018. *The Exceptional value of intact forest ecosystems* in Nature Ecology and Evolution. Vol 2. April, 2018.)

<u>What are Old-Growth Forests?</u>

The term "old growth" refers to two separate but related concepts:

1. a phase in the life cycle of all forests, and
2. a critical part of the functioning forest landscape.

The attributes of old-growth have been clearly defined and include:

- large, old trees for a particular site productivity and climate;
- multi-layered canopies with canopy gaps;
- high levels of "decadence," i.e. snags and fallen trees across the full range of decay classes; and
- a wide diversity of habitats needed by the majority of animals at some point in, or throughout their lives.

Important aspects of defining old-growth forests include the recognition that these old-growth attributes will look different in areas of different site productivity and climate, and are influenced by the type, frequency, and distribution of natural disturbance regimes. In other words, the attributes of old-growth forests are manifested in a range of tree ages, sizes, shapes, and distribution, along with accompanying non-tree vegetation. These different old-growth composition and structures in turn shape different habitat types in different old-growth areas.

For example, the attributes of an old-growth temperate rain forest on a rich soil valley bottom will look different and function differently than the same attributes of an old-growth temperate rain forest growing on a thin soil, moisture-stressed ridge in that rain forest. Similarly, the attributes of an old-growth boreal forest will look different than those of an old-growth temperate rain forest. Old-growth forests that develop in landscapes where stand replacing natural disturbances are infrequent, or do not occur tend to be characterized by larger older trees than old-growth forests found in landscapes where stand replacing disturbances are common.

The key here is to not get caught up in numbers and measurements, and to focus on the *attributes* that describe old-growth forests and their essential ecological services. Old-growth forests are an essential phase in the life of virtually all forests, and are needed to ensure both short and long-term ecological processes that human beings and most other beings depend upon for survival.

Old-growth forests' roles are particularly important in a landscape context. At the landscape scale, old-growth forests play important parts in regulating local and regional climate, and in providing critical habitat for species from dispersal limited species, like salamanders, to wide-ranging species, like grizzly bears and caribou. The landscape ecology functions of old-growth forests are irreplaceable roles, set old-growth forests apart from earlier forest phases, and are illustrative of the interdependence of the integrity of a landscape's ecology on the presence of old-growth forests.

The attributes of old-growth forests are described in more detail in the document entitled: *Old-Growth Literature Review* by Silva Ecosystem Consultants Ltd, 1992, which was provided to the Old-Growth Panel in an email of January 6, 2020.

<u>Some Vital Ecological Services of Old-Growth Forests</u>

As mentioned in the introduction old-growth forests provide essential ecosystem services. In other words, old-growth forests provide human *needs*, and therefore their fate should not be decided on arbitrary human values. Without providing the ecological foundations for our needs, and the needs of those beings whom we impact in both the short and long terms, we face a progressively degraded future.

Summarized below are some key ecological services of old-growth forests contrasted with current approaches to forest management/timber management:

Water

The highest quality water, provided in adequate and manageable quantities throughout an annual cycle is produced by old/old-growth forests. The multi-layered, large canopies, canopy gaps, and accumulations of decayed fallen trees provide for effective, natural water management that benefits forest ecosystems and aquatic ecosystems, and provides for human needs and safety. In short, old-growth forests are Nature's water storage and filtration system.

Conventional timber management, which focuses on clearcutting and tree plantations, produces negative impacts to water quality, quantity, and timing of flow. Clearcuts and tree plantations intercept significantly more snow and rain compared to older forests. This results in higher levels of spring runoff and/or storm runoff in intense rainstorms, often resulting in flooding, with lower headwaters water reserves in the summer and fall, often resulting in water shortages.

The water conservation functions of old-growth forests are vital to all life. Impacts to water are closely linked to climate change and the growing climate emergency. Protecting old, natural, intact forests is particularly necessary to conserve water in a world dominated by global heating. The stresses on water from climate disruption range from intense storms, high snow packs, erosion, and flooding to drought, water shortages, and wildfire.

Biological Diversity—Maintenance of Ecological Integrity

Biological diversity supports life. Scientific evaluations have modeled the number of species on Earth to range from 7.4 million to 10.0 million. No matter which estimate is correct, we have identified only about 10% of the species that support us and all other life forms.

The dearth of research in forest ecosystems, particularly old-growth forests in British Columbia, means that 10% may overestimate the number of species that we have identified and understand. Despite that lack of knowledge, forest professionals continue to manipulate the composition, structure, and function of forests in allegedly *sustainable* ways.

In "Sustaining Life: How Human Health Depends on Biodiversity," Oxford University Press, 2008, EO Wilson states in the Forward:

> *In myriad ways humanity is linked to the millions of other species on this planet. What concerns them equally concerns us. The more we ignore our common health and welfare, the greater are the many threats to our own species. The better we understand and <u>the more we rationally manage our relationship to the rest of life</u>, the greater the guarantee of our own safety and quality of life.* (Emphasis added).

A precautionary way to provide for "rational management of our relationship to the rest of life" is to ensure that our actions protect all the parts. In other words, to manifest the claims by forest professionals, timber companies, and government of *sustainable forest management*, we need to be sure that our activities maintain *all* of the natural composition, structure, and function that we can see and understand in the hopes that this decision will maintain the composition, structure, and function that we cannot see and/or do not understand.

Because of the stresses that the climate emergency is imposing on forest ecosystems and on the species that comprise these forests, protection of biological diversity in our use of forests is of utmost importance. Achieving this goal will require the protection of all remaining old-growth forests and other primary forests in BC.

I realize that this is a big change for forest professionals, timber companies, and government. However, this change is necessary to avoid transferring to future generations an even greater ecological debt than exists today from our forest management, and saddling future generations with more severe effects from global heating. At the end of this paper, I will briefly describe how this change may occur in inclusive ways that are likely to lead to better social and economic benefits from forest conservation and restoration. Without doubt, this change will provide for improved ecological services from forests, compared to today's degraded ecological condition of forests across BC.

Climate Emergency

Mitigating and adapting to the effects of the climate emergency and its associated climate disruption are the most important public interest, because they relate directly to public health and safety. Maintaining primary forests, particularly old-growth forests, provides for the highest levels of carbon sequestration and storage, thereby mitigating global heating. At the same time old-growth forests mitigate climate disruption by protecting biological diversity, providing for genetic diversity to assist ecosystems to adapt to the variable effects of global heating, and conserving water quality, quantity and timing of flow throughout the year (i.e. avoiding floods and droughts).

Carbon continues to accumulate as forests age, with old-growth forests continuing to show an increase in carbon stores, compared to younger forests. *The primary reason carbon stores are increasing in the region is that, on average, forests on federal lands are getting older and the number of large trees is increasing* ("Science Findings," April, 2017, Pacific Northwest Forest and Range Experiment Station, US Forest Service). Thus, conserving old-growth forests is an important aspect of mitigating the effects of, and adapting to climate disruption.

Clearcutting old-growth and other primary forests and replacing them with small planted trees is the single largest source of greenhouse gas emissions in BC. (See: *Hidden, ignored and growing: B.C.'s forest carbon emissions*, Sierra Club report prepared by Jens Wieting, January, 2019, and *Forestry and Carbon in BC*, Dr. Jim Pojar, February, 2019). These tree *plantations*, not to be confused with forests, are planned to be cut again on cycles of 40-70 years +/-. The lower levels of carbon sequestration and storage, coupled with the large loss of stored carbon in the logged trees, exposed soil, and damaged fallen trees mean that tree plantations function as carbon sources, compared to the natural primary forests, particularly old-growth forests that once occupied the forest landscape of BC. This problem is exacerbated by the management intent that these plantations will never be permitted to become old forests (150-250 years +), where carbon storage and sequestration begin to become optimal for protecting the public interest as it relates to the climate emergency.

Old-growth forests constitute the best terrestrial carbon sink in BC. (See: *Clearcut Carbon: Summary, A Sierra Club BC report on the future of forests in British Columbia*, Jens Wieting, December, 2019, and *Forestry and Carbon in BC*, Dr. Jim Pojar, February, 2019). This fact alone directs us to protect all remaining old-growth forests throughout BC.

An important point in considering forest management and its contribution to the climate emergency is that about 60% or more of each log removed during logging is back into the atmosphere within five years of cutting. This does not include losses from paper products or the large amount of wood products that occupy landfills across Canada. Thus, only a small portion of the trees cut in forestry end up storing carbon in long-term ways.

Intact, natural old-growth forests, as well as other primary forests are also needed to buffer the impacts of intense storms that have occurred and are projected to become more frequent with global heating. These old forests better stabilize steep slopes in intense storms because tree plantations lack the root mass and fallen trees found in old forests. Further, as the roots from the stumps of the old trees logged in a tree plantations decay, "water pipes" are created from cemented soil walls where the roots once existed. In a storm with high levels of water, these water pipes collect and concentrate water and contribute to mass movements, i.e. landslides.

The multi-layered canopies of large trees found in old-growth and natural old forests mitigate the impacts of intense storms catalyzed by the climate emergency. The complex canopies in these forests intercept precipitation, resulting in the evaporation or sublimation of significant amounts of precipitation, both snow and rain. This effect of old-growth forests has beneficial effects locally, regionally, and continentally. Locally, the amount of water that reaches the ground is reduced, lowering the chance of erosion, landslides, and flooding. This effect reduces the precipitation impacts from intense storms and winter snow packs. Regionally and locally, this function of old-growth forests moves water across large landscapes to distribute the life-giving benefits of water over regions and continents. These beneficial effects of old-growth and other primary forests are missing from tree plantations managed on short rotation periods.

As witnessed in British Columbia during the summers of 2017 & 2018, and now in Australia, extreme wildfires are a product of climate disruption from global heating. With their multi-layered canopies, canopy gaps, often thick-barked trees, and moist, often humid conditions furthered by decayed fallen trees, old-growth forests are the most fire resistant forests. (See: *Mixed-severity wildfire and habitat of an old-forest obligate*, Damon B. Lesmeister et al. Ecosphere. April. 2019. Volume 10(4). As we face a warmer, drier future across the forest landscapes of BC, protecting all remaining old-growth and near old-growth forests makes sense from the standpoint of prudent public policy to protect not only essential ecosystem services, but also human life and infrastructure.

In 1994, a group of scientists in the United States prepared the *Northwest Forest Plan.* The plan was catalyzed by applying the Endangered Species Act to protect the spotted owl through maintaining overall ecological integrity of forests. The plan prohibited further logging in federal forests comprised largely of old-growth forests, and established ecosystem based management as the norm for any forest plans and activities.

The document: *Northwest Forest Plan: Still the Best Science of the Day*, Dominick A. DellaSala, Geos Institute, April 15, 2015 summarizes the twenty-year results of the plan, and provides support for my discussion above of the vital ecological services of old-growth forests.

The document: *Intact Forests in the United States: Proforestation Mitigates Climate Change and Serves the Greatest Good*, Willam R. Moomaw et al, Frontiers in Forests and Global Change, Volume 2. Article 27. June, 2019 also provides support for my discussion above of the vital ecological services of old-growth forest, and urges protection of old-growth and primary forests as important aspects of mitigating the impacts of global heating.

The documents referred to in the previous two paragraphs were provided to the Panel in an email of January 6, 2020.

Here is an important statement from *Intact Forests in the United States* that applies directly to BC and the protection of old-growth forests:

> *Climate change and loss of biodiversity are widely recognized as the foremost environmental challenges of our time. Forests annually sequester large quantities of atmospheric carbon dioxide (CO2), and store carbon above and below ground for long periods of time. Intact forests — largely free from human intervention except primarily for trails and hazard removals — are the most carbon-dense and biodiverse terrestrial ecosystems, with additional benefits to society and the economy. Internationally, focus has been on preventing loss of tropical forests, yet US temperate and boreal forests remove sufficient atmospheric CO2 to reduce national and annual net emissions by 11%. US forests have the potential for much more rapid atmospheric CO2 removal rates and biological carbon sequestration by intact and/or older forests. The recent* 1.5 Degree Warming Report *by the Intergovernmental Panel on Climate Change identifies* reforestation *and* afforestation *as important strategies to increase negative emissions, but they face significant challenges:* afforestation *requires an enormous amount of additional land, and neither strategy can remove sufficient carbon by growing young trees during the critical next decades(s). In contrast, growing existing forests intact to their ecological potential — termed* proforestation*— is a more effective immediate and low-cost approach that could be mobilized across suitable forests of all types. Proforestation serves the greatest public good by maximizing co-benefits such as nature-based biological carbon sequestration and unparalleled ecosystem services such as biodiversity enhancement, water and air quality, flood and erosion control, public health benefits, low impact recreation, and scenic beauty.*

<u>The Northwest Forest Plan, BC's Privatized Public Forests, & Old-Growth Forests in BC</u>

Despite the warnings by timber interests that the Northwest Forest Plan would result in an economic calamity, the opposite occurred. Small town, local economies once virtually solely dependent upon the timber industry developed diverse economies that are more stable and resilient to change. From an ecological standpoint, biological diversity, water, and carbon sequestration and storage all improved under the auspices of the plan. Thus, the big lesson from the Northwest Forest Plan is that protecting old-growth forests will not only improve essential

ecological services, but also facilitate the development of more diverse, stable community economies.

When one considers the good ecological, social, and economic results that have emanated from the Northwest Forest Plan, one wonders why a similar approach has not been adopted here. The answer is rooted in the fact that *public forests in the US are planned, managed, and administered by the public* through agencies directly accountable under legislation and policy to the public. This strong public control of forests has led to the development of progressive legislation, like the Endangered Species Act, the National Forest Management Act, and the National Environmental Policy Act.

In stark contrast, British Columbia's "public" forests, are public in name only. The vast majority of BC's public forests have been given away to private timber interests in long-term tenures, replaceable or renewable at the discretion of the timber interest, but not at the discretion of the government. In other words, once a tenure is issued the government must provide a renewal or replacement of the tenure if requested by the timber interest. While there are provisions in law to cancel a tenure for mismanagement, no significant tenure has been cancelled to this point.

Through the years, private control of public forests in British Columbia has resulted in a strong timber biased lobby that has impacted all aspects of forest management, from education and research to legislation, policy, and on-the-ground operations. The success of this timber lobby is reflected in the fact that British Columbia has no legislation of comparable strength and coverage to that provided by the US Endangered Species Act, the National Forest Management Act, and the National Environmental Policy Act. The timber lobby, often supported by forest professionals and the body representing forest professionals has succeeded in putting in place regimes on public forests that have virtually no enforceable accountability to the public.

This strong private control of public forests was strengthened approximately sixteen years ago with the elimination of the BC Forest Service, the introduction of professional reliance, and the replacement of the Forest Practices Code Act with the Forest and Range Practices Act. The result of these changes has been to give timber companies and professionals in their employ virtually sole responsibility for determining how public forests are managed.

Across BC, old-growth forests and their essential ecosystem services have been one of the prime victims of privatization of public forests. Timber interests and forest professionals continue to give priority to logging old-growth forests, because they contain the highest volumes and highest quality of timber. This trend has continued despite the long understood importance of old-growth to supply essential ecosystem services. Short-term profits of timber companies are put ahead of the well-being of both forest workers and the ecosystem services that sustain us all.

Thus, if we are to protect and restore old-growth forests and other primary forests, control of public forests must be placed in the hands of an accountable, transparent, and inclusive public agency or agencies. The first priority of this public agency needs to be *principled* ecosystem-based or nature-based protection, restoration, and use of forests. Unlike today, where timber is seen as the primary focus of forests, timber will become a byproduct of protecting and restoring ecological integrity to maintain and build climate resilient forests.

The agency or agencies controlling public forests would be responsible for planning, management, and overall administration of forests. Along with a science and Indigenous knowledge-based definition of ecosystem-based or nature-based protection, restoration, and use of forests; accountability, transparency, and inclusivity also need to be defined in legislation, regulation and policy.

An attractive model for public control of forests provides central legislation and policy with regional community boards comprised of Indigenous and non-Indigenous people carrying out the requirements of law and policy. Community boards would be supported by a central information and research agency to provide technical and logistical support. The funding for central and community agencies would come from user fees collected for all forest uses from timber to tourism, stumpage revenue from timber sold through regional log sort-yards operated by community boards, and a tree carbon-biodiversity tax for timber cut. For places where timber cutting is sanctioned by ecosystem-based or nature-based plans, a carbon-biodiversity tax would be collected based on the size and age of the tree cut. The older and/or larger the tree cut, the higher the tax would be.

Moving to public control of forests will involve canceling existing tenure contracts that facilitate privatization of public forests. When these tenure contracts were established their rationale was a "social contract" to provide employment and financial security for local communities. This social contract has never been too well met through the years, and currently is in serious default through mechanization of logging and milling, and closure of many mills. Given that tenure holders were for all intents and purposes given exclusive access to public timber, have reaped large profits from public timber, and amortized their investments many times over; the climate emergency provides more than adequate social rationale to cancel these tenures.

Where cancellation of "forest" tenures necessitates monetary compensation, a corporate wealth tax may be employed to both offset compensation determinations and/or provide actual compensation.

The cancellation of tenures would occur over a reasonably short transition period to provide for phasing in new employment and financial benefits for local communities, while providing the private companies formerly holding tenures to adjust to a new role—entrepreneurial experts in developing businesses within rules that protect ecosystems and society. In theory, that is how a capitalistic system is supposed to function, as opposed to the subsidized "capitalism" found under the tenure system.

In the face of the climate emergency, there is now a more pressing and direct social need or social license to reestablish public control of public forests by cancelling forest tenures than when these tenures were initiated more than a half century ago. Public control of forests will enable protecting old-growth and other primary forests that comprise our best terrestrial carbon sinks, sources of biological diversity, water storage and filtration systems, air purification, and diverse opportunities for employment and community well-being. As well, the public control of forests and elimination of corporate tenure rights will end the ongoing, justified accusation by

the US that timber values in BC are subsidized, resulting in the end of countervail duties for wood products exported to the US.

Mark Carney, former head of the bank of Canada, in his new role with the UN has stated:

> *Up to half of developed oil reserves would likely be "stranded" in order to limit the effects of climate change. No industry—oil, gas, or other—will have the luxury of ignoring climate risks.*

Cancellation of "forest" tenures may be viewed as the socially responsible way to "strand" timber assets from old-growth and other primary forests, as well as from other intact, natural forests designated as carbon—biological diversity reserves. From floods and drought to wildfire, extreme storms, and landslides, getting public forests under the control of the public is an ecological, social, and economic necessity to protect both the present and the future from the growing challenges of climate disruption and to improve equity in society.

Privatization of public forests through the tenure system was allegedly established to develop community well-being. Reclaiming public control forests will occur for clear, urgently needed community well-being to reduce the impacts of the climate emergency and provide for equitable distribution of the many sources of wealth, both monetary and nonmonetary, from forests.

I have prepared a review of forest tenure in BC, which is in draft form. If the Panel would find this document useful, I would be pleased to provide it on a "not to circulate" basis. However, I think that my comments above offer a good synthesis of my discussion in my tenure review.

<u>Recommendations for How Much to Protect</u>

The starting point for how much to protect needs to be that old-growth is a part of all forests, and is essential to the development and long-term survival of healthy, intact forests and forest landscapes that provide essential ecological services. Thus, "how much to protect" is a question that needs to be answered on a landscape, forest ecosystem type basis by describing the *natural character* of the landscape and its component forest ecosystems, and contrasting that natural character with the *current condition* that has resulted from modification by industrial societies.

I have spent many years developing and applying a system of planning and management described as *Ecosystem-Based Conservation Planning* (EBCP), which I am now referring to as *Nature-based Planning.* A brief summary of the EBCP/NBP approach is found in: *Nature-Based Planning: a short definition*, Herb Hammond. Silva Forest Foundation. November, 2019, which was provided to the Panel in an email of January 6, 2020.

Three comprehensive references provide science-based support for the approaches employed in EBCP/NBP:

- *Conserving Forest Biodiversity: A Comprehensive Multiscaled Approach*. David B. Lindenmayer and Jerry F. Franklin. Island Press, 2002.
- *The Science of Open Spaces: Theory and Practice for Conserving Large Complex Systems*. Charles G. Curtin. Island Press. 2013.

- *Corridor Ecology: Linking Landscape for Biodiversity Conservation and Climate Adaptation*, Second Edition. Island Press. 2015.

EBCP/NBP is also being advocated in the scientific literature, for example *A Global Deal for Nature: Guiding principles, milestones, and targets*, E. Dinerstein et al. Science Advances. April, 2019.

For purposes of this submission, I would like to point out several recent recommendations regarding the amount of intact ecosystems necessary to protect, in order to mitigate the effects of climate disruption — the climate emergency. These recommendations are based primarily upon the need to provide for climate emergency resilient ecosystems, slow/prevent the rapid loss of biological diversity, conserve water, and provide for nature-based carbon sequestration and storage.

In his book, *Half-Earth: Our Planets Fight for Life*, renowned conservation biologist Edward O Wilson recommends that 50% of Earth needs to be in large protected areas in order for the biological diversity and ecosystem services we depend upon to survive.

On January 13, 2020 The United Nations Convention on Biological Diversity released a report recommending "protecting 30% of Earth to slow extinctions and climate change." (See UN Proposes Protecting 30% of Earth to Slow Extinctions and Climate Change, Phil McKenna, Inside Climate News, January 14, 2020 https://insideclimatenews.org)

Thus, we have science-based recommendations that we need to protect 30% to 50% of Earth to address the far-reaching impacts of the climate emergency.

The importance of protecting old-growth forests as a key aspect of mitigating the climate emergency has been well-established in this paper. Given the recommendations outlined above for how much to protect, there is a significant short-fall of protected old-growth forests in British Columbia. Thus, supported by these science-based recommendations for protection, we need to immediately protect all remaining old-growth and primary forests. If combined with reestablishing public control of public forests, this action will not only improve critical ecological services in the face of the climate emergency, but also provide social, and economic benefits for British Columbians.

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