Old Growth Protections in British Columbia: A Comparative Analysis

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Abstract

Old Growth forests play a crucial role in BC's multi-billion dollar logging industry. When left standing, Old Growth forests provide economic contributions through tourism, recreation, carbon storage, water conservation and filtration, recreational and commercial fisheries, and non-timber forest products. By preserving Old Growth forests, local communities across British Columbia can reap the benefits of long-term, sustainable revenues and employment opportunities.

The current Old Growth protections implemented by the BC Government do little to consider factors such as productivity or biogeoclimatic stratification resulting in protections that focus on high-elevation, low-productivity ecosystems. To address this issue, I have considered four policy options to address the limited protections for Old Growth. These options include Old Growth deferrals, the development of a sustainable Second-growth forestry industry, phasing out Old Growth logging, and implementing a Community-based management system.

Keywords: Old Growth; Harvesting; Protections; Forests; Conservation; Logging

Dedication

To those who bravely and tirelessly defend the natural beauty and ecological importance of these ancient forests. May the Old Growth forests of British Columbia continue to thrive for generations to come.

Acknowledgements

I would like to acknowledge that the land on which I am able to study and live has been home to the Coast Salish peoples, including the Musqueam, Squamish, and Tsleil-Waututh nations for thousands of years. I recognize their deep rooted connections to this land and its waterways, and am grateful for the opportunity to learn and grow here.

I'd also like to thank my friends, family and classmates for their patience, kindness and guidance throughout this program. Their support has been invaluable, and I'm thankful for the relationships that have fostered both new and old.

Finally, I want to acknowledge those who plant trees, knowing they may never sit in their shade. Their selfless actions remind us that we are all stewards of this land, and our responsibility extends beyond our own lifetime.

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List of Acronyms

AAC	Allowable Annual Cut
BC	British Columbia
BEC	Biogeoclimatic Ecosystem Classification
CBM	Community-based management
EBM	Eco-based Management
FEC	Forest Ecosystem Classification
FRPA	Forest and Range Practices Act
FSP	Forest Stewardship Plan
MCA	Multi-Criteria Analysis
MNRF	Ministry of Natural Resources and Forestry
OGMA	Old Growth Management Areas
SI	Site Index
TFL	Tree Farm License
THLB	Timber Harvesting Land Base
TSAI	Timber Supply Area
UWR	Ungulated Winter Ranges
VQO	Visual Quality Objectives
WHA	Wildlife Habitat Area
WMA	Wildlife Management Areas

Glossary

Biogeoclimatic zones	A geographic region characterized by a distinct set of ecological conditions, including climate, vegetation, and soil.
Disturbance regime	The pattern, frequency, and severity of natural disturbances, such as fires, floods, and droughts, that shape ecosystems over time.
Ecosites	A specific area within an ecosystem that has unique physical and biological characteristics.
Ecoregions	A large area of land or water that contains a geographically distinct assemblage of natural communities that share similar ecological conditions.
Forest succession	The process by which a new forest community develops over time in an area that has been disturbed or cleared of vegetation.
Forwarders	A type of forestry vehicle used to carry logs from the stump to a roadside landing for transportation to sawmills or other processing facilities.
Second-growth	Forest stands that have regrown after a previous stand has been harvested or disturbed.
Silviculture	The practice of controlling the growth, composition, and quality of forests to meet specific management objectives.
Skidders	Vehicles or machines used in logging operations to pull or drag felled trees from the forest to a landing or roadside for further processing and transportation.

Opening Image

Big Lonely Doug—the second largest Douglas-fir tree in Canada, and one of the last of its stand (The Canadian Press, 2019).

Chapter 1.

Introduction

The topic of Old Growth logging is one that stirs up debate due to the varying opinions surrounding its economic, environmental, and social ramifications. When considering the economic aspect, some argue that logging Old Growth forests leads to job creation and generates income for local communities and industries. However, from an environmental viewpoint, Old Growth logging is detrimental to biodiversity, carbon sequestration, and ecosystem services. Furthermore, from a social perspective, Old Growth logging has an impact on the cultural values and rights of Indigenous peoples (British Columbia, 2022b).

Old Growth forests are an essential part of Canada's natural heritage and play a critical role in maintaining biodiversity, sequestering carbon, and providing ecological services. In British Columbia (BC), the province is home to some of the most significant remaining Old Growth forests in the country, with over 2.6 million hectares of ancient forests still standing (British Columbia, 2022a). However, logging activities in these areas have become a contentious issue, with many critics concerned about the potential environmental and cultural impacts. The discussion surrounding Old Growth protections in Canada and BC is complex, as it involves balancing the economic benefits of logging with the ecological and social consequences of harvesting these forests. In this context, it is important to consider the nuanced perspectives of various stakeholders, including Indigenous communities, industry representatives, environmental groups, and government agencies. Through careful consideration and informed dialogue, it may be possible to develop policies that balance the needs of economic development, ecological conservation, and social justice, while protecting Canada's Old Growth forests for generations to come.

The decision to log Old Growth forests is a multifaceted issue that involves weighing various values and interests against each other. Finding the right balance

requires taking into account economic, social, and environmental considerations, as well as the unique qualities of each forest and the needs of the surrounding communities. The objective of this paper is to assess the effectiveness of the current Old Growth protection policies in British Columbia and identify opportunities for improvement. By analyzing the policies and their outcomes, this paper aims to contribute to the ongoing discussion about how to best manage Old Growth forests in a way that maximizes benefits while minimizing negative impacts.

Chapter 2.

Background

2.1. Defining Old Growth

The term "Old Growth" has multiple definitions, and the literature on its management is extensive and diverse. However, there is still no consensus on the most effective way to measure Old Growth stands (Hendrickson, 2003; Hilbert & Wiensczyk, 2007). Researchers generally agree that understanding Old Growth from an ecological perspective requires a multi-scale approach that considers individual trees, regions, and everything in between. While there will likely never be a single, definitive ecological definition of Old Growth, specific definitions can still be developed to aid in its management (Spies, 2004; Gorley & Merkey, 2020). The methodology used to define Old Growth can range from stand structure and development processes, genetics and ecosystem of a stand, and age of dominant tree species, to physical characteristics and ecological function (Spies, 1997; Hilbert & Wiensczyk, 2007; Gorley & Merkey, 2020).

The literature largely agrees that Old Growth definitions should be based on ecological information, with social, economic, and cultural considerations being secondary. Old Growth definitions that focus on multiple stand attributes are preferred, as their structures can depict their ecological function (Spies & Franklin, 1988; Marcot et al., 1991; Polar et al., 1992; Wells et al., 1998; Kneeshaw & Burton, 1998; Price et al., 2021). This consensus is relatively new, as the cultural foundation of the concept of Old Growth was originally rooted in its economic value. Traditionally, Old Growth stands were perceived as a high-priority target for harvesting due to their high standing crop of commercial timber, risk of deterioration through root rot or insect infestation, and the potential for the land to be used for more productive young, second-growth stands (Bragg, 1999; Burton et al., 1999; Arsenault, 2003; Hilbert & Wiensczyk, 2007). This belief was exemplified in British Columbia, where the Royal Commission on Forestry

stated that old forests should be harvested before they lose value due to rotting (Sloan, 1956; Arsenault, 2003; Hilbert & Wiensczyk, 2007).

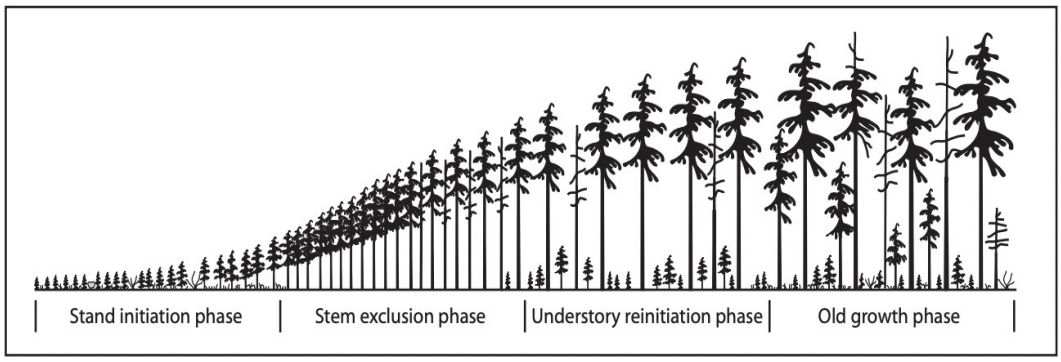

Figure 1. Forest Succession Process (Kimmins, 2003)

Due to the dynamic nature of the succession process, the age at which Old Growth develops the attributes that characterize and distinguish it varies widely. These values depend on "forest type, regional climate, site conditions and disturbance regimes" (Pojar, 1992, p.87). According to scholars, some of the ecological attributes used to describe Old Growth forests in Canada include:

- Multilayered canopies
- Species diversity
- Numerous large snags and downed trees
- Canopy gaps for future undergrowth development
- Large trees (Holt et al., 2008)

As mentioned above, the classification of what is Old Growth remains complex and in contention. Forest researchers reaffirm that forest inventory ages are not always accurate for older stands that are consistently shifting. Additionally, while the definition provides clear numbers on what is considered Old Growth, there are no considerable differences in the stands themselves on either side of the age threshold (Kimmins, 2003). While this is a general definition, as I will soon discuss, each province has its own working definition of Old Growth.

2.2. Importance of Old Growth

Formed over centuries, forests with old or ancient trees contain a unique combination of attributes that are unlikely to be replicable. Every Old Growth stand is unique to the species, plants, insects and stressors it has lived through, providing an invaluable resilient ecosystem, non-renewable in any reasonable time frame. This makes their protection and preservation fundamentally critical. Ecologically, the ecosystems fostered by Old Growth are beyond compare. Socially, these stands present powerful spiritual and intrinsic value. The wild—nature left to thrive under its own devices (Gorley & Merkey, 2020).

While Old Growth does provide economic value through timber production, tourism, fisheries and hunting—its ecological capacity to provide resilient ecosystems may be of more value to society (Hendrickson, 2003; Hilbert & Wiensczyk, 2007). The ecosystem services provided by Old Growth include "breathable air, pure water, carbon storage, regeneration of nutrients, maintenance of soils, pest control by insectivorous bats and insects, micro- and macro-climate control and the storage of a wide variety of genes" (Hilbert & Wiensczyk, 2007, p.22). The fallen branches and trunk aid in providing 20% of the species richness (Luyssaert et al., 2008; Nova Scotia Nature Trust 2002; Rankin, 2016).

According to Penaluna et al. (2016), their removal has ripple effects on both the forest and freshwater ecosystems throughout Canada. Forests, and particularly Old Growth forests, help to filter pollutants and sediments from runoff, which largely improve the quality of water in rivers and streams (Penaluna et al., 2016). These uneven grounds allow for the formation of pools, streams and runoffs to merge together and form natural spawning areas for salmon and other freshwater fish (Nova Scotia Nature Trust, 2002; Luyssaert et al., 2008). As Old Growth is a multi-stage succession process, the decaying wood from the exclusion phase provides key nutrients back into the soil for regenerative agriculture (Brookes 1996; Ferguson & Elkie, 2003; Hilbert & Wiensczyk, 2007). Additionally, many species particularly dependent on these forest stands, such as the spotted owl, mountain caribou (Stevenson et al., 2001; Hilbert & Wiensczyk, 2007),

and a variety of lichen (Carey et al., 1990; Goward, 1994; Arsenault, 2000; Selva, 2003; Hilbert & Wiensczyk, 2007).

The forest stands are structurally complex natural ecosystems. These complexities are fostered through the landscape's natural disturbance regime. Interestingly, in areas where natural disturbances are limited in occurrence, forests can be much older than the oldest tree in their stand as the forest is driven by the succession process and provides gap dynamics (Lertzman, 1992; Daniels & Gray, 2006; Price et al., 2021). Despite our need to maintain, retain and restore our Old Growth forests throughout Canada, many of the policies, definitions and guidelines vary both regionally and provincially.

2.3. Old Growth Jurisdictions

Canada is the third largest forested nation in the world, with 362 million hectares comprised of forested lands (Natural Resources Canada, 2018). This is split into three separate jurisdictions with few notable exceptions. According to Natural Resources Canada, 90% of the forested areas in Canada is under either provincial or territorial management, while 6% falls under private stewardship and 4% remains under federal jurisdiction (Natural Resources Canada, 2018). The portion of forest under federal Crown lands is generally geared towards National Parks unless specific agreements have been formed with stakeholder groups or Indigenous Nations. Despite the vast majority of lands falling within provincial/territorial jurisdictions, the differences in biogeoclimatic stratification, social context and local economy have led to varied methods of Old Growth protections.

2.4. The Economy and Old Growth

Old Growth forests can play an important role in the economy, in both direct and indirect ways. Directly, Old Growth forests provide valuable resources such as timber,

which can be used for a variety of purposes such as construction, furniture, and paper production. The logging and milling of these resources can create jobs and revenue for local communities and industries. In 2016, over 317,000 jobs had links to the forest industry (Government of Canada, 2015). Indirectly, Old Growth forests can also provide ecosystem services that support economic activities such as tourism, recreation, and fishing. These activities can generate additional jobs and revenue for local communities and Indigenous Nations. Old Growth forests can also play a role in climate regulation, carbon sequestration, water regulation, and biodiversity conservation, all of which have important economic implications. Either directly or indirectly, each of the industries has converging interests in either Old Growth extraction or conservation. Thus the wicked problem for each jurisdiction remains; how can they balance the economic needs of industry alongside conservation efforts?

2.5. Global Trade and Old Growth

The importance and role of Old Growth in global trade is highly significant. Old Growth provides a variety of raw materials, including timber, medicinal plants, wild game, and minerals, which are all essential in many industries. Through global trade, Old Growth forests can provide the world with an invaluable source of sustainable resources, while also safeguarding their delicate ecosystems.

Old Growth forests are now being recognized as an important source of renewable energy in the form of wood pellets, a trend that has been gaining momentum worldwide. The timber industry is the primary source of wood pellets, with the majority of production occurring in the United States, Canada, Europe, and China. In the United States, Old Growth forests are increasingly used to create wood pellets for use in the Southeast and Appalachia. Similarly, British Columbia has become a significant source of wood pellets in Canada, with the majority of production taking place in Old Growth forests. In Europe, Scotland and Ireland are among the main sources of wood pellets, with Old Growth forests playing a prominent role in production. China, too, relies on Old Growth forests to supply a significant portion of

their wood pellet needs. While the use of Old Growth forests for wood pellet production has been met with controversy, it remains an important source of renewable energy, requiring careful consideration of the ecological, economic, and social implications (Sterman et al., 2022).

Old Growth forests are highly sought after due to their high-density composition found within each tree, which is essential for creating pellets of superior quality. Furthermore, the proximity of many Old Growth forests to pellet mills makes them an attractive source of material. These forests are typically less affected by the impacts of climate change compared to younger forests, making them a highly desirable source of raw material for wood pellet production. While the harvesting of Old Growth forests for this purpose has sparked debate, it remains a significant factor in the production of renewable energy, requiring a careful balancing of ecological, economic, and social considerations (Malcolm et al., 2020).

Chapter 3.

Literature Review

3.1. Old Growth in Canada

One fourth of the world's Old Growth forests are be found in Canada. In total, 10% of the world's forests lands can be found in Canada (Howlett, 2001). Approximately 7% of these regions have some type of formal protected status, while only 5% are classified as Old Growth (Natural Resource Canada, 2019). These forested areas can be found in every province and are subdivided into eight distinct regions: the Boreal forest, the Acadian forest, the Great Lakes St Lawrence forest, the Carolinian forest, the Subalpine forest, the Columbia forest, the Montane forest and the Pacific Coastal forest (Natural Resources Canada, 2019).

3.2. Barriers to Old Growth Protections in Canada's Provinces

Canada's geography, characterized by vast forests and diverse ecosystems, has played a significant role in shaping the protections of Old Growth forests. The differences in environmental conditions, and tree compositions have led to the varying definitions and industry standards impacting Old Growth and its management. One example of this is how provinces group tree stands into large regions. Both Ontario and Nova Scotia use Ecosites and Ecoregions to group areas of similar climate and regional attributes together, while BC uses biogeoclimatic zones that focuses on the micro variation in climate (Berry et al., 2018; British Columbia, 2019a; Government of Nova Scotia, 2022).

As Old Growth forests cannot be contained within provincial boundaries, the inconsistent classification and management systems lead to further confusion and variation in the success of protecting Old Growth regionally. For example, Ontario defines Old Growth trees as those that have reached beyond maturity and have not

been altered by human activities. This definition leads to 59 separate classifications based on the ecosite. By contrast, Nova Scotia views Old Growth as trees over 125 years old (Berry et al., 2018; Government of Nova Scotia, 2022).

3.3. Old Growth Development

Old Growth has frequently been used as a generic term used to describe forests that contain old or tall trees. This is largely untrue as Old Growth stands can have various attributes depending on the ecosystem, and given site conditions. These stands are not static and must survive significant disturbance events such as fires, insects and diseases. The forests that continue to evolve past the disturbances do so in a process called succession which starts at the stand initiation phase, moves to the stem exclusion and understory reinitiation phase and is completed at the Old Growth phase (Banner et al., 2019; Kimmins, 2003).

The early days of forest succession —the stand initiation phase– can take a few decades to build sufficient growth and ecological diversity as the landscape transitions first by herbs, then shrubs and finally trees. In the stem exclusion phase, the tree stand begins to develop and create a tree canopy leaving shade-intolerant species to die off. Next, the forest enters a phase of gradual change as gaps, large snags and downed logs lead to new trees growing in the understory, leading into the Old Growth phase. While certain areas can remain in the Old Growth phase naturally for thousands of years such as in BC's wet coastal and temperate inland rainforests, the majority of forest land base is naturally adapted to large-scale disturbances such as wildfires or windstorms (Kimmins, 2003).

3.4. Role in Carbon Capture

Climate change is largely considered one of the greatest threats to our world. The release of sequestered carbon or Greenhouse gas emissions is primarily a result of human activities centering around fossil fuels, transportation or agriculture. This has

makes the re-capturing of these emissions vital to counteract climate change (Government of Canada, 2022). Forests, along with oceans and soil are naturally occurring carbon sinks which take CO2 out of the atmosphere and use the process of photosynthesis to convert CO2 to oxygen and glucose. The glucose is further manufactured into starches and cellulose within the tree which are key components for cell creation, growth and repair and are stored in their leaves, branches, stems, bark and roots (Johnson & Coburn, 2010; Nunes et al., 2020). This process is known as carbon sequestration.

By absorbing and storing carbon, trees help to mitigate the greenhouse effect and reduce the amount of CO2 in the atmosphere. The amount of carbon that a tree can sequester depends on a variety of factors, including its size, species, and location. Larger trees, for example, are generally able to sequester more carbon than smaller trees. In addition, some tree species are more efficient at sequestering carbon than others (Hui et al., 2017). It's worth mentioning that not all Old Growth has the same level of production. Old low productivity forests cannot support large old trees within their ecosystems, becoming instead "biodiversity hubs, carbon repositories, and climate change refugia" (Price et al., 2021). As I will show in the following sections conservation efforts seem to be geared toward protecting low-productivity habitats, while timber harvest largely targets higher-productivity stands (Venter et al., 2014; Polak et al., 2016; Price et al., 2021).

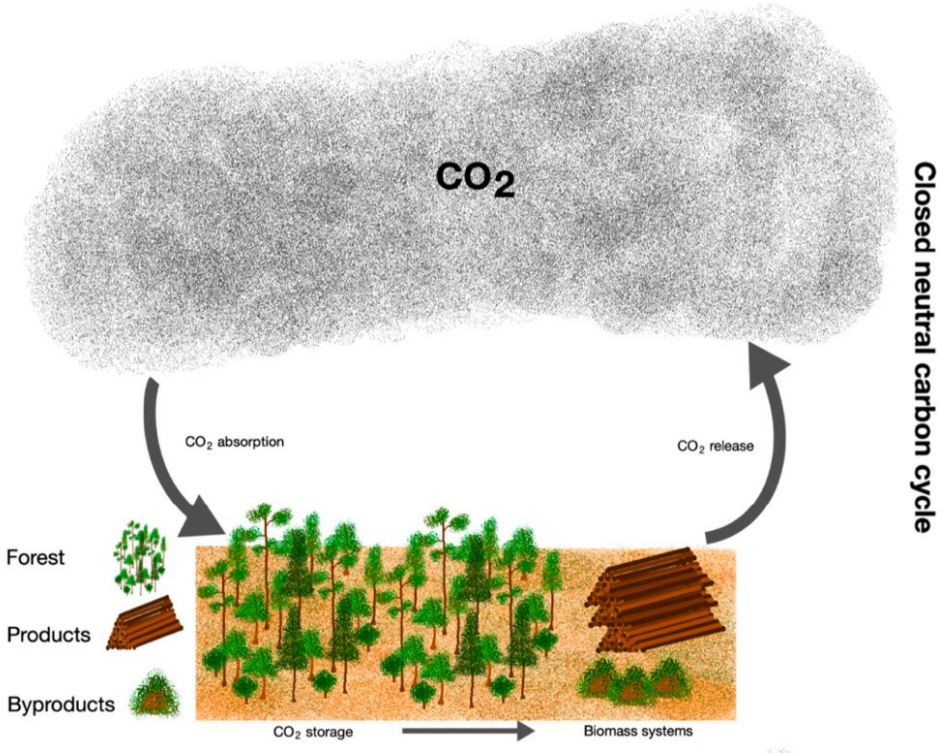

Figure 2. Forest Carbon Cycle (Nunes et al., 2020)

3.5. Harvesting Methods

Traditionally, clear-cutting was the main method of forest harvesting throughout Canada. This was done through a single harvesting operation in which all trees from one chosen area were removed and processed later off-site. In British Columbia, due to rising social concerns over forest management and sustainable forest practices, the average size of large clear-cuts decreased from 45 hectares in 1989 to 30 hectares in 2006 (Gorley & Merkey, 2020). In addition to decreasing cut sizes, silviculture systems began emerging in the early 1990s. According to the Province of British Columbia (2022), silvicultural system of forest management "is a planned program of treatments during the whole life of a stand designated to achieve specific stand structural objectives. This program of treatments integrates specific harvesting, regeneration, and stand trending methods to achieve a predictable yield of benefits from the stand over time" (British Columbia, 2022c, p.1).

The four methods of silvicultural systems primarily used today in Canada are:

1. Clearcut: The most common method, involves removing all trees in a designated area.
2. Selective Cutting: A more selective method, trees are chosen for harvest based on species, size, and quality.
3. Shelterwood Cutting: Trees are removed in stages, with new growth protected by remaining mature trees.
4. Seed-Tree Cutting: A few mature trees are left to provide seed for regeneration, while others are harvested (Environment Reporting BC, 2021).

The method chosen for use depends on the needs of the forest stand, the individual characteristic found within the site, and the forest management objectives (Environment Reporting BC, 2021). Clear cutting with a silvicultural system allows for small internal patches, individual trees, snags and woody debris to remain and mimic the stand-level structural diversity of an area disturbed by fire. This method helps to maintain natural diversity and provides wildlife habitats, nesting areas and den trees (Gorley & Merkey, 2020).

In 1995, commercial clearcutting for coastal harvesting was swapped for a system of variable retention (a form of silvicultural management). This method is twofold as it "distributes, where retained individual trees are distributed relatively evenly across the area; or aggregates, where groups of trees are retained to maintain structural diversity over the cutblock" (Gorley & Merkey, 2020, p.38). This method retains trees for at least one rotation in order to safeguard the structural complexities to maintain species, habitat diversity and forest-related values. These methods are often implemented in combination with modern technologies such as GPS mapping, skidders, and forwarders to improve efficiency and minimize environmental impact. In recent years, there has been increased focus on sustainable forestry practices to ensure the preservation of the forest ecosystem and wildlife habitat (Government of Nova Scotia, 2022).

Chapter 4.

Methodology

For the purpose of this capstone, I used a mixed-methodology approach to gather information to form an analysis. This includes a literature review, a jurisdiction scan, a case study and a multi-criteria analysis. Each of these sections will be explored further below and seeks to address the research questions identified in Chapter 1.

4.1. Literature Review

As part of the research conducted for this paper, a comprehensive review of existing literature on Old Growth protection was undertaken for British Columbia, Nova Scotia, Ontario, and the Federal Government. The literature search was conducted using various search engines, including Google, Google Scholar, and the online search engine of Simon Fraser University Library. Relevant search terms such as "Old Growth Protections," "Old Growth stands," "Old Growth forests," "Forest Carbon Capture," and "Old Growth Harvesting Practices" were used to locate relevant literature. The gathered information was used to identify significant barriers to the protection of Old Growth forests in British Columbia and to provide a more informed analysis.

4.2. Jurisdictional Scan

Canada is home to approximately 25% of the world's Old Growth forests, with the majority of these located in British Columbia, along with smaller Old Growth stands found in Nova Scotia, Ontario, and Quebec (Natural Resources Canada, 2018). In this paper, the focus is primarily on a comparative analysis of Old Growth protection policies in British Columbia, with a comparison to Nova Scotia and Ontario. Nova Scotia was chosen because of its recent change in policy approach. By contrast, Ontario's current policy, *Old Growth Policy for Ontario's Crown Forests* has seen no updates since 2013,

despite the increase in available research and knowledge. This comparison in my research will allow for an exploration of whether there have been significant differences in policy approaches over the past five decades to the present day.

4.3. Case Study

As part of the jurisdictional scan for British Columbia, a case study of the Great Bear Rainforest was examined as a form of Community-based management system. This section provides an in-depth analysis of the unique approach taken by the Great Bear Rainforest in managing Old Growth forests through a collaborative effort.

4.4. Multi Criteria Analysis

A multi-criteria analysis (MCA) is a decision-making tool used in public policy that involves evaluating and comparing various options or alternatives based on multiple criteria or factors. MCA considers different perspectives and values to arrive at a comprehensive and balanced decision. In this paper I will be examining four policy options; (1) Old Growth Deferral Areas; (2) Develop a Sustainable Second-Growth Forestry; (3) Phase-out Old Growth Logging; (4) Implementing a Community-based management system. These policy options will be assessed based on their effectiveness, cost, ease of implementation, political feasibility, sustainability, and stakeholder acceptance from both the industry and conservation perspectives. By evaluating each option based on a set of criteria and combining the obtained scores, I determine an overall score to rank each policy option.

4.5. Limitations

Due to the limited availability of accessible information, the scope of this study was restricted to definitions and secondary sources that were publicly available on governmental websites and databases. An additional constraint of this analysis is that

Canada's diverse geography yields notable discrepancies in forest regions throughout the country, with some areas spanning provincial boundaries. Distinct definitions of forest types and stands among different jurisdictions can result in the use of a non-uniform framework to define continuous tracts of forest land. For the purpose of this study, non-neighbouring provinces were chosen for further examination to limit any potential discrepancies.

Another limitation of this study is that the potential impact of forest fires in Old Growth forests was not thoroughly examined. Forest fires are a significant threat to Old Growth forests in BC, and their occurrence can result in the loss of large areas of Old Growth forests. However, due to the scope of this study, the impact of forest fires on Old Growth forests was not fully explored. Therefore, the findings of this study should be considered in light of this limitation, and further research should be conducted to investigate the potential impact of forest fires in relation to the proposed policies.

Chapter 5.

Jurisdictional Scan

5.1. British Columbia

5.1.1. Defining Old Growth in BC

In the province of British Columbia, Old Growth forests have different age thresholds depending on their location and estimates of historical disturbance regime. Old Growth has many variations across BC, depending on the species, location, climate and natural disturbances experiences over space and time throughout the ecosystem. The type and frequencies of disturbances such as wildfires, droughts, infestation and others will affect the typical range of the forest stand and determine how much Old Growth remains preserved. The wide rand of tree types, location and climate types translates into climate, many different types of Old Growth forests (Keane, 2013).

The Old Growth Strategy for British Columbia published in 1992 described Old Growth forests as “natural stands of old and young trees and their associated plants, animals, and ecological relationships which have remained essentially undisturbed by human activities” (BC Ministry of Forests, 1992, p.13). Moreover, to be classified as Old Growth, tree stands must be older than 250 years old in wetter ecosystems, 140 years old in drier and 120 years old in boreal ecosystems (BC Ministry of Forests, 1995). Forests above each of these age thresholds are not eligible for commercial harvesting and thus can be classified as primary forests in addition to Old Growth (Price et al., 2021).

5.1.2. Old Growth Situation in BC

95 million hectares make up the total area of British Columbia, and of that 60% (or 57 million hectares) of the land is forest (British Columbia, 2019a). Removing non-forested ecosystems such as shrub-dominated ecosystems or subalpine parklands

renders the true forested area of BC to 50 million hectares. According to the provincial database and definition, approximately 11.1 million hectares, or 12% of the entire province are considered Old Growth (or 20% of BC's forested land base). Of this, one-third is considered protected (British Columbia, 2022a). Additionally, parks and protected areas make up 15.4% of BC's total land value. These protected areas could be made up of wildlife habitat zones, wildland areas or other zoning specifications (Gorley & Merkey, 2020). Forests with mature trees that are not yet classified as Old Growth make up 46% of forested lands. Due to the biologically, ecological and climatically diverse regions in British Columbia, the distribution and representation of diverse types of forests are uneven throughout the province (Gorley & Merkey, 2020).

Out of the 4.5 million hectares of the province that is considered private lands, 818,00 hectares remain in the Private Managed Forest Land Program. This program, established in 1988, is a BC Assessment Authority land classification which works to encourage private land owners towards sustainable forest management practices (British Columbia, 2022d). While BC is comprised of 11.1 million hectares of Old Growth, 63% (7.4 million hectares) remains unprotected. This means that only 2.7 million hectares "is in parks, ecological reserves, ungulate winter range no-harvest areas, private conservation lands, regional water supply, wildlife management areas, OGMAs (legal and non-legal) and retention Visual Quality Objectives (VQOs)" to preserve the visual quality of a forest landscape (Gorley & Merkey, 2020, p.26). As per the BC Strategic Review Panel on Old Growth (2020), out of the Old Growth that remains unprotected, 62% is currently considered nonviable, while the remainder falls into the Timber Harvesting Land Base (THLB) (Gorley & Merkey, 2020).

Unceded Territory

Old Growth harvesting in British Columbia has caused significant damage to the unceded territory of Indigenous nations. The destruction of ancient forests and the degradation of traditional lands has caused an irreparable loss of habitat for many species, an increase in carbon emissions, and a loss of cultural and spiritual value for

Indigenous people. In addition to the environmental destruction, the development of Old Growth forests has pushed communities off their traditional lands and further marginalized Indigenous nations. Decades of colonialism and broken promises from the government have left Indigenous communities without access to the resources they need to live healthy and self-sufficient lives (Gorley & Merkey, 2020).

The immediate and long-term impacts of Old Growth harvesting in BC has caused Indigenous nations to call for the protection of their unceded territories. They have called for the recognition of their sovereignty and land rights, and the implementation of sustainable forestry and land management practices within their territories. Through advocacy, Indigenous nations are following their right to self-determination, and fighting for a future of mutual respect and partnership between settlers and Indigenous nations through both court cases and government partnerships (Alanna, 2023).

Biogeoclimatic Stratification and Productivity Stratification in BC

While it may be tempting to picture all Old Growth as big trees, it's important to remember that approximately "80% of the area of old forests consists of relatively small trees growing on lower productivity sites, such as Black Spruce bogs in the North, high elevation sub-alpine forests, or Cedar-Hemlock forests on the outer coast" (Gorley & Merkey, 2020, p.26). As mentioned above, Old Growth stands in BC have different classifications based on the biogeoclimatic zone they occupy.

Coastal temperate forests must be over 250 years old, as they generally include massive Coastal Western Hemlock rainforests and Coastal Douglas-Fir forests (Gavin et al., 2003; Price et al., 2021). Inland temperate rainforests consist primarily of Cedar and Hemlock stands. Research findings suggest that before industrial forestry began in the 1820's, both Coastal and Inland zones were primarily comprised of Old Growth stands, ranging from 50%-80% (Daniels & Gray, 2006; Price et al., 2021). The southern interior of BC contains Douglas Fir, Ponderosa Pine with High-elevation Engelmann Spruce, Subalpine Fir and Mountain Hemlock forests found in higher elevations. Lastly, in the

central interior plateau, young Sub-Boreal Spruce and Sub-Boreal Pine cover the majority of the landscape. In Boreal landscapes, older forest stands naturally seldom exceed 200-300 years old and exist in lower quantities (BC Ministry of Forests, 1995; Delong, 2011; Price et al., 2021).

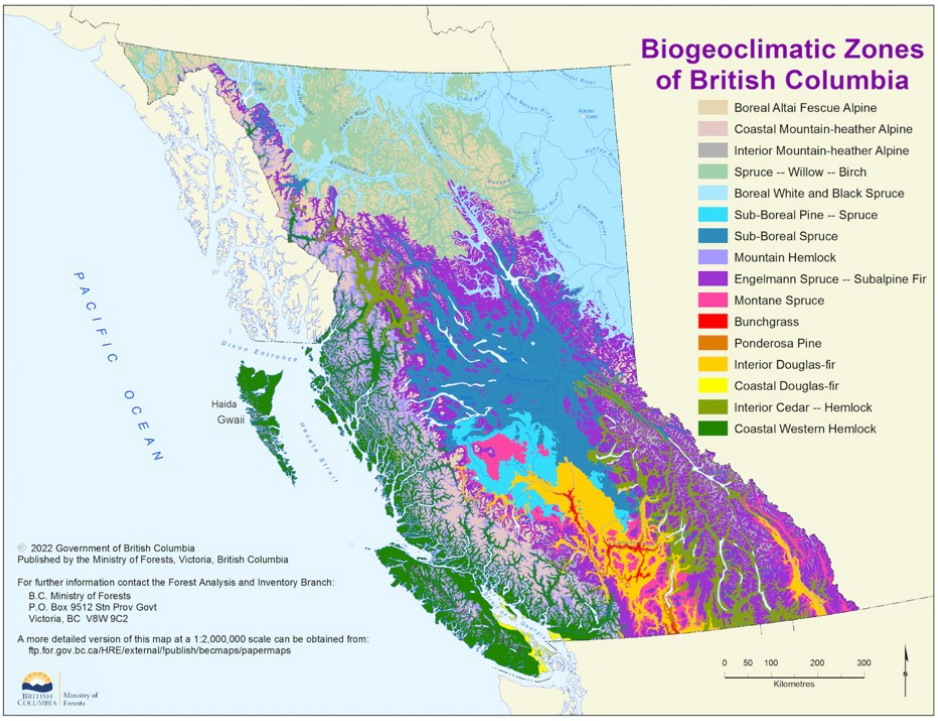

Figure 3. A Map of the Biogeoclimatic Zones in British Columbia (Government of BC, 2022a)

The tree variety varies in each biogeoclimatic zone, as do the differences in nutrient availability and soil moisture in each site series or stand. Each site series within a biogeoclimatic variant has a unique impact on the productivity of a forest. For example site series “found in valley-bottom floodplains, are highly productive, growing large trees quickly, while others, for example in bog and subalpine forests, are less productive, growing small trees slowly” (Price et al., 2021, p.744). In order to assess productivity, timber supply assessments measure the potential height (in meters) of the leading tree species when it reaches age 50 (Stearns-Smith, 2001; Price et al., 2021). A growth of less than 5m at 50 years old is considered a low-productivity ecosystem and is

therefore excluded from the forested land base. Trees that grew between 8-10m are considered slow and are rarely considered for forest harvesting. High-productive ecosystems have a site index (SI) of 20-25m and are found in the interior of BC, while coastal and inland forests are the most productive with a site index of 40m (Price et al., 2021).

5.1.3. Harvesting Old Growth in BC

Outside of parks and protected areas, most public forested areas are available for logging through various types of licenses issued by the Province. The license holders are responsible for planning where to log within the license area, subject to the constraints set out under the Forest and Range Practices Act (FRPA). However, other activities such as oil and gas development, mining, or tourism development are subject to different legislation and requirements. The current regulations governing forest licensees require them to design areas on which timber harvesting is to be carried out to resemble, both spatially and temporally, the patterns of natural disturbance that occur within the landscape, without unduly reducing the supply of timber from British Columbia's forests. At the stand level, licensees are required to retain wildlife trees, without unduly reducing the supply of timber. However, potential changes to FRPA that could remove this overall constraints are being considered by the Province (Gorley & Merkey, 2020).

To meet these objectives, forest licensees are required to submit a Forest Stewardship Plan (FSP), which describes how they will fulfill the objectives set by the government. Once the FSP is approved by the government, the harvesting of timber can be authorized, provided it is consistent with the plan and falls into the guidelines of the allowable annual cut (AAC). The allowable annual cut (AAC) for British Columbia is the amount of timber that can be harvested from Crown land each year without depleting the resource. The AAC is set by the Chief Forester of British Columbia based on a long-term sustainable forest management plan. Concerns have been raised about a lack of monitoring to ensure that these guidelines are being met and are effective. In cases

where monitoring has occurred, the commitments approved in the FSPs have been deemed too vague to enforce (Gorley & Merkey, 2020). Currently, the province of BC has reported that approximately 27% of the annual harvest (~200,000 hectares) comes from Old Growth (British Columbia, 2022a).

Economic Benefit

Harvesting timber has been an integral part of the provincial economy for over the last 100 years. A 2016 report from the Council of Forest Industries found that the timber harvest industry in BC "generates over 100,000 direct and indirect jobs, contributes $12.9 billion to provincial GDP, and generates over $2.5 billion to provincial tax revenues. Many of the jobs are spread across 140 forestry dependent communities and urban centres, including Vancouver and the lower mainland" (Gorley & Merkey, 2020, p.28). BC has a significant interest in the global and domestic trade of timber, pulp, and other wood products. These products undergo various processing stages, resulting in the production of diverse goods such as furniture, paper, and lumber. This process often creates regional interdependencies where trees harvested from one area are transported to another for further manufacturing.

It's worth noting that clear-cutting was the predominant method for harvesting public lands in BC between 1987-1996, covering 88% of the area. However, this percentage significantly decreased by 2012, with clear-cutting with reserves applied to 85% of the area harvested on public lands. Forest product exports have contributed to 30%-36% of BC's commodity export value since 2009, as reported by Statistics Canada (2018) and Gorley and Merkey (2020). This industry has created numerous employment opportunities in forest management, manufacturing, transportation, processing, and other sectors. The provincial government has benefited significantly from this industry through stumpage fees and taxes, which provide an essential revenue stream (Gorley & Merkey, 2020). According to a report from the British Columbia Ministry of Forests, Lands, Natural Resource Operations and Rural Development, the total revenue from stumpage fees in British Columbia was $872 million for the fiscal year 2019-2020 (Ministry of Finance, 2023).

Old Growth is largely considered the ideal timber, as they often contain large, mature trees that are highly valued for their wood. In contrast, Second-growth forest—trees that grow after the original tree stand was cut down—do not contain the same value as they are younger and have not yet reached maturity. While typical coastal Old Growth sites can yield approximately 1,500 to 1,8000 cubic meters per hectare, Second-growth sites yield a third of that. A study conducted by Brenner and Lertzman (2022) found that logging companies show a "tendency to log down the value chain when management choices are unconstrained and the potential of government policy to impose a greater stewardship ethic on harvesting behavior" (p.1). Their analysis further found this lack of ethical stewardship has left a reduction of forest value (Benner and Lertzman, 2022).

5.1.4. Old Growth Trade Impacts

Old Growth harvesting in British Columbia has had a variety of impacts on the local economy, both positive and negative. Positively, it has created jobs for forestry workers and allowed for the development of communities within British Columbia. However, there have been several negative impacts including the increasing use of Old Growth transitioning into a 'renewable energy source' through wood pellets. With rising demand for pellets and the need to combat climate change, the timber industry is looking to Old Growth forests to meet their growing needs (Duncombe et al., 2022).

Reports indicate that wood pellets are being produced in British Columbia from Old Growth trees, despite the forest industry's claims to the contrary (Simmons, 2020). Shockingly, the largest power station in the U.K., Drax, is sourcing wood pellets from BC's Old Growth forests as a means to generate electricity (Fortune et al., 2022). An investigative documentary broadcast on British television uncovered that the burning of wood pellets is massively subsidized by the British government (Connolly & Parfitt, 2023). In response, Conservation North and other environmental organizations are urging the BC government to safeguard primary forests from logging and establish legal protection for these vital ecosystems (Simmons, 2020).

A recent report by the Stand.earth Research Group has identified the companies responsible for the harvesting of Old Growth forests in British Columbia. The report revealed that the five largest companies, including Canfor, West Fraser, Western Forest Products, Tolko, and Interfor, account for 57% of the risk to the province's Old Growth forests. The top 10 companies ranked by risk include Sinclar Group, Weyerhaeuser, Gorman Group, Louisiana-Pacific, and Pacific Bioenergy, in addition to the previously mentioned five companies (Bulowski, 2023). The harvesting of Old Growth forests in British Columbia is primarily carried out by the government through its agency BC Timber Sales. BC Timber Sales controls approximately 20% of the cut on crown lands and plans cut blocks before auctioning them off to logging contractors (Coste, 2018). The report sheds light on the significant role played by corporations in the destruction of Old Growth forests, which are crucial ecosystems for biodiversity and climate resilience.

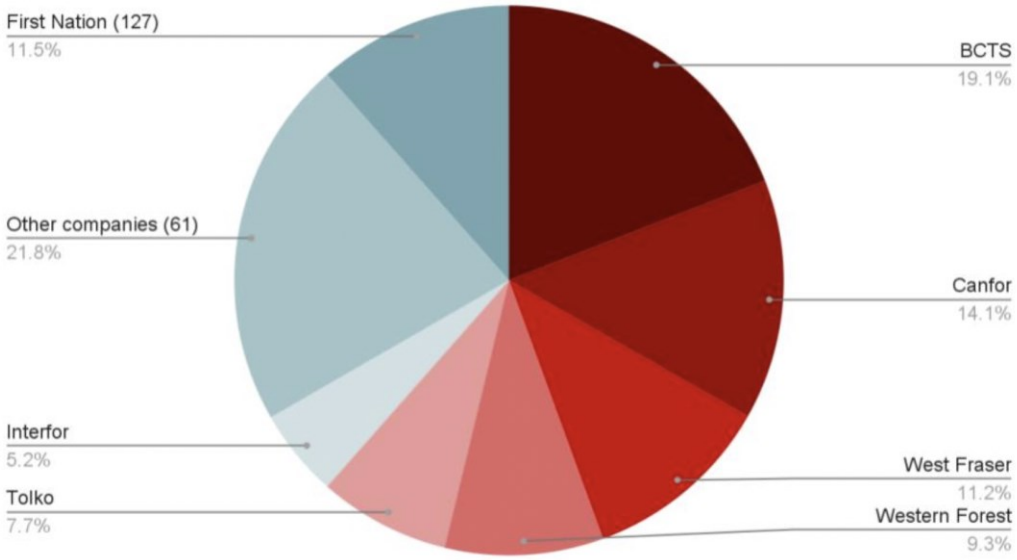

Figure 4. Breakdown of Old Growth Deferral Risk Across B.C (Bulowski, 2022)

5.1.5. Indigenous Impacts

Almost all of BC's forests are located in the unceded territories of BC's First Nations peoples. In the last several years, logging rights to Old Growth forests across the province were allocated to numerous First Nations communities, who had previously

been largely excluded from reaping the economic benefits of BC's forest industry. As a result, today most First Nations communities now generate significant employment and revenues from Old Growth logging – either directly through their own forestry operations or through employment and revenue sharing agreements with forestry companies operating within their territories. Many of these communities lack a range of alternative sustainable development opportunities that would support their local economies into the future and allow them to transition away from Old Growth logging, should they wish to (Gorley & Merkey, 2020).

Exacerbating this destruction is the lack of consultation with Indigenous communities before large-scale logging operations are approved. This has resulted in a lack of control over the destruction of Old Growth forests and a lack of compensation for losses. Consequently, many Indigenous communities feel disenfranchised and marginalized. Ultimately, the destruction of Old Growth forests in British Columbia has had a detrimental effect on the lives and livelihoods of Indigenous communities. It has resulted in the destruction of traditional uses of land, a decrease in revenue, and a lack of autonomy and control in decision-making. With an understanding and respect for Indigenous peoples' rights and concerns, this destruction can be minimized and the future of Old Growth forests secured (Gorley & Merkey, 2020).

5.1.6. Old Growth Protections in BC

As a large portion of BC is comprised of a forest-managed land base, planning toward sustainable management and biodiversity strategies has been key. This has led to many different avenues for Old Growth's protections in BC. In 1992, the BC government created *An Old Growth Strategy for British Columbia* which began to create a framework and management system of Old Growth forests in BC (BC Ministry, 1992). The *Forest Practices Code of British Columbia* (the *Code*) was the first-ever legislation passed that encompassed Old Growth protection based on supporting and retaining landscape biodiversity (British Columbia, 1994). Building on that legislation, the associated *Biodiversity Guidebook* was created in 1995 and was used to divide British

Columbia into five different natural disturbance types and provided recommendations on the number of forests needed in each stage of succession. Lastly, the *Landscape Unit Planning Guide* in 1999, created procedures for mapping Old Growth Management areas (OGMAs). However, these directives also had to balance the needs of commercial forestry as "a stated directive of government at the time was to ensure that landscape-unit biodiversity objective would not impact timber supply by more than 4%" (Environmental Law Center, 2002). The *Landscape-Unit Planning Guide* allocated a biodiversity emphasis (high, medium, low) to each different unit of the landscape. This was to ensure that all planning initiatives would be used to manage high diversity protection. Ultimately, they repositioned BC's forest management practices to manage the forest base for low levels of Old Growth retention for the sake of higher levels of risk to biodiversity (Environmental Law Center, 2002).

Together, these guides helped develop BC's forest management and conservation framework. Following that, the BC Government remained stagnant in their policy development until 2019, when they commissioned an Independent strategic review of Old Growth management. Entitled *A NEW FUTURE FOR OLD FORESTS: A Strategic Review of How British Columbia Manages for Old Forests Within its Ancient Ecosystems*, the review addressed public concerns (Gorley & Merkey, 2020). In the paragraphs below we'll begin to discuss the different levels of protection available for Old Growth forests in BC. It's important to note that while the Province commissioned the strategic review, few of the recommended policies have been fully implemented or moved forward towards the approval process.

A NEW FUTURE FOR OLD FORESTS: Deferrals

In 2019, the Government of British Columbia asked for an independent strategic review of the management of Old Growth forests in response to public concerns. Conducted by Al Gorley and Garry Merkel, *A New Future for Old Forests* summarized scientific studies, policy reviews, and conversations with British Columbians to provide 9 key observations and 14 recommendations that addressed the need for change, identified areas that require immediate action, and improving forest management for

an orderly transition. The review heard various definitions of Old Growth from different perspectives and beliefs. These variations lead to a lack of trust in information and statistics about Old Growth and forest management from all sources. This has led to further analysis and refinement on protection standards to be actioned by the federal and provincial governments. The overarching theme that emerged was that "the overall system of forest management has not supported the effective implementation or achievement of the stated and legislated public objectives for old forests" (Gorley & Merkey, 2020).

In September 2020, the BC government pledged to implement all 14 recommendations from the review, although Gorley, Merkel (2020), and others noted that a paradigm shift in forest management in BC would take time to achieve. One such way of doing so was with the implementation of Old Growth deferral areas. The purpose of deferral areas is to provide additional time for government officials to review the area's ecological and cultural values, engage with Indigenous communities, and identify long-term solutions for the management of Old Growth forests. As of September 2021, the government of British Columbia announced that it would defer logging in 1.7 million hectares of Old Growth forests across the province, including some areas that are considered at-risk. The deferral areas were established in response to public concerns about the pace of Old Growth logging and the need for more sustainable forest management practices. The government is currently working with Indigenous leaders and local communities to develop long-term solutions for the management of these areas (British Columbia, 2022b). However, as of February 2023, the BC Government has chosen to expand Old Growth logging deferrals to 2.1 million hectares, and work in collaboration with Indigenous Nations (Watson, 2023) .

Parks and Protected Areas

National and Provincial parks are one way that the province of British Columbia allocates significant areas of protected forests. BC is home to three National Park Reserves and six National Wildlife areas. In total, BC has 644 parks making it the largest provincial park system currently in Canada (British Columbia, 2021). In addition to our

abundant park system, BC also conserves land through 148 ecological reserves, 2 recreation areas, 84 protected areas and 158 conservancies. The province uses the *Ecological Reserve Act,* the *Protected Areas of British Colombia Act,* and the *Land Use Act* to protect important ecosystems and ensure their safeguard from resource development or use. Together, these acts alongside our park system provide significant protection for sustainable forest management (Gorley & Merkey, 2020).

Old Growth Orders and Old Growth Management Areas (OGMAs)

Old Growth Management Areas are legally established and spatially defined areas of Old Growth. As mentioned earlier, these areas are established in the landscape unit planning process and are used to achieve biodiversity targets. Each forest licensee is required to maintain and establish areas prior to pursuing a Forest Stewardship Plan (FSP). For areas that are not spatially defined, 'Non-Spatial Old Growth Orders' instead specify an overall percentage of Old Growth that is necessary for retention. It should be noted that OGMAs being identified does not always ensure that they are 'legalized.' This allows for four different variations of OGMAs as defined by Gorley & Merkey (2020):

- *Legally established OGMAs* — Area has been mapped and legalized by order
    - Must be included in licensees' stewardship plan
    - Area is protected and cannot be moved without significant administrative effort

- *Non-Legal OGMA* — Areas have been mapped but not formally legalized
    - Two variations:
        - May include commitments made in FSP that are binding and must be protected throughout duration of the plan
        - May include commitments not included in FSP to meet non-spatial Old Growth requirements but not binding
            - Not protected

- *OGMAs remaining unmapped*
    - Old Growth falls under non-spatial status and is tracked and modelled to meet landscape requirements (Environmental Law Center, 2002; Gorley & Merkey, 2020)

Special Tree Protection Regulations

This regulation which came into effect in September 2020, prohibits the cutting of various species of trees that fall under a certain diameter. This is to ensure the continued protection of large trees. The table below illustrates each species and the diameter requirements needed to ensure its protection (British Columbia, 2020).

Table 1. Special Tree Definitions by Diameter Requirement

Species	Diameter at Breast Height (cm)
Yellow Cedar (Cyprus)	265
Douglas-fir (coastal)	270
Douglas-fir (interior)	160
Ponderosa Pine	119
Western Red Cedar (coast)	385
Western Red Cedar (interior)	290
Sitka Spruce	283

(British Columbia, 2020)

Additional Old Growth Protections

Wildlife Act (BC)– Wildlife Management Areas account for approximately 260,000 hectares in BC. While these areas primary targets regionally or internationally significant fish, wildlife species, it also protects Old Growth as their potential habitat (British Columbia, 2019b).

Forest and Range Practice Act (BC)– Ungulated Winter Ranges (UWRs) provide habitat for ungulated species throughout the winter. Each area has different levels of protections attributed to it, but some zones have established no-harvesting and provide Old Growth protection. BC also established Wildlife Habitat Areas (WHAs) where 2,778,706 hectares of land base is protected from harvesting in areas of critical habitat loss (Ministry of Environment, 2019).

Clayoquot Sound, Haida Gwaii and the Great Bear Rainforest— Ecosystem-based management regimes (or Community-based management Systems) are currently in place for three specific regions; Clayoquot Sound, Haida Gwaii, and the Great Bear Rainforest. While we have been informed about some of the obstacles to implementing these management regimes, it is important to note that the conservation requirements for these ecosystems, which contain forests with Old Growth trees, are considerably more stringent than those for other parts of the province (Gorley & Merkey, 2020).

5.1.7. Community-based Management System

Community-based management (CBM) of Old Growth forests in BC has been gaining traction in recent years as a way to protect these vital ecosystems for future generations. This form of management involves collaboration between the provincial government, Indigenous communities, and local stakeholders to manage and protect Old Growth forests in a manner that aligns with community values and interests. CBM involves local communities taking responsibility for the stewardship of their Old Growth forests. This means that local community members are involved in the management of their forests, deciding how best to use and protect them. This system aims to empower local communities to have a greater say in how Old Growth forests are managed and to ensure that their ecological and cultural values are taken into account (McGregor, 2002).

CBM helps to ensure that local community members are closely involved in the decision-making process, and that their unique cultural and ecological values are respected. This collaboration helps to create a sense of ownership of the forest, which in turn can lead to a stronger commitment to conservation. CBM also helps to ensure that local economies and people benefit from the management of the forest, while still protecting environmental and cultural values (McGregor, 2002).

Case Study – The Great Bear Rainforest

The Great Bear Rainforest is a vast temperate rainforest located on the central coast of British Columbia, Canada, covering an area of approximately 6.4 million hectares (Raincoast Conservation Foundation, 2021). Comprised of long expanses of fjords and islands makes up the largest tract of coastal rainforest and is home to an expansive range of plant and animal species, including the iconic Spirit Bear (also known as the Kermode bear), the grizzly bear, the coastal gray wolf, Sitka deer, and the marbled murrelet, among others (Pacific Wild, n.d.; Curran, 2017). These ecologically rich lands also support the spawning of millions of salmon each year (Curran, 2017). Thus, the ecological significance of the Great Bear Rainforest is immense. The trees in the region absorb carbon dioxide from the atmosphere through photosynthesis and store it in their trunks, roots, and soil, helping to mitigate the effects of climate change.

These lands make up one of the world's most significant ecological regions due to its vast Old Growth forests. Old Growth forests are forests that have been left untouched and have not been significantly disturbed by humans for hundreds of years. The Great Bear Rainforest is estimated to contain about 2.3 million hectares of Old Growth forest, making it one of the largest remaining areas of intact coastal temperate rainforest on the planet (Dulvy et al., 2019). While all forests are important, Old Growth due to their characteristics of large trees, and complex canopy structures play a vital role in maintaining biodiversity and mitigating climate change. For instance, according to a study by the Sierra Club BC, the Old Growth forests in the Great Bear Rainforest store an estimated 1.1 billion metric tons of carbon, which they believe to be equivalent to 26 years' worth of Canada's entire carbon emissions (Sierra Club BC, 2019).

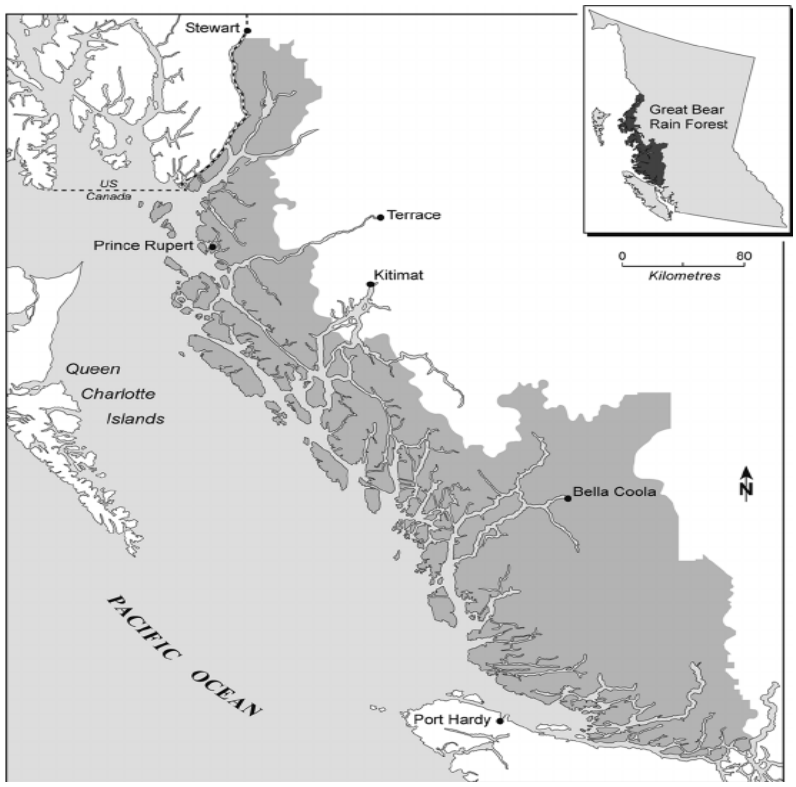

Figure 5. Map of Great Bear Rainforest Region (McGee et al., 2010)

Despite their obvious importance, the Old Growth forests in the Great Bear Rainforest have long been under threat from logging, pipelines and other forms of resource extraction. Historically, the logging industry has been the primary driver of deforestation in the region, with large areas of Old Growth forest being clearcut and replanted with monoculture tree plantations (Hilborn et al., 2017). This has had devastating impacts on the region's biodiversity and ecosystem services, including carbon storage and water regulation. Protecting these forests is essential for ensuring the region's long-term ecological sustainability and the well-being of its Indigenous communities. Thankfully, after many years of resistance and negotiations, the Great Bear Rainforest Agreement was created.

The Great Bear Rainforest Agreement was a result of decades of indigenous resistance, advocacy, international attention, negotiation and collaboration among First Nations, environmental groups, the forest industry and of course the province. This achievement represented a departure from the traditional practices that prioritized

economic development over environmental and cultural protections. It recognized the rights and sovereignty of Indigenous communities and recognized their meaningful contributions to the decision-making process related to land use and conversation practices.

The decision to protect 70% of the Old Growth forests in the region was a significant step towards this goal, and serves as an example of what can be achieved when different stakeholders work together to find solutions to complex environmental challenges (British Columbia, 2016). By involving local communities and First Nations in the management of the forest resources, CBM has helped to build trust and foster a sense of shared responsibility for the long-term health of the ecosystem (Saarikoski et al., 2013). The success of the Great Bear Rainforest conservation efforts serves as a model for how collaborative approaches to forest management can balance the needs of different stakeholders while also protecting the environment.

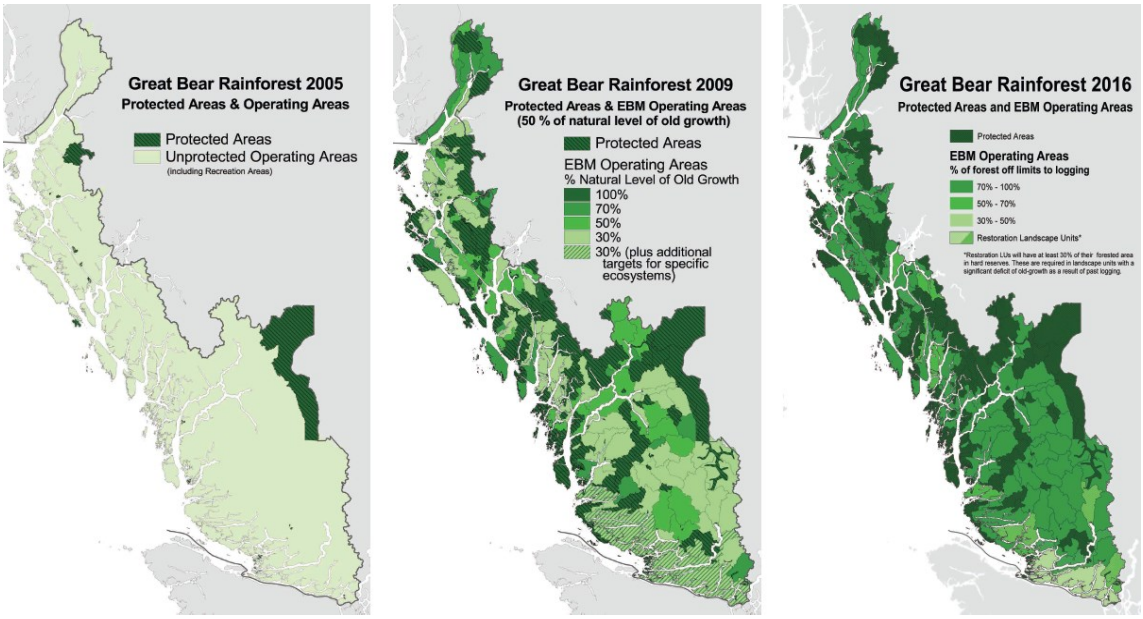

Figure 6. Maps of Protected Areas Before and After Agreement (Coast Fund, 2021)

The use of CBM is also significant as it recognizes the role of Indigenous communities as stewards of the land and the importance of their knowledge and expertise in guiding conservation efforts in the region. With respect to the Great Bear

Rainforest, this approach has been used to empower local Indigenous communities to take a leading role in managing their ancestral lands. Combined with the EBM, this worked to address some of the historical injustices and power imbalances found within resource management initiatives by promoting and uplifting indigenous voices in positions of power. This has been done through the establishment of co-management agreements between the government of British Columbia and the First Nations communities within the region (Thomson, 2019).

The Great Bear Rainforest Agreement is a significant conservation agreement that represents a shift towards a more collaborative and ecosystem-based approach to conservation in the region. By adopting an ecosystem-based approach to management and involving Indigenous communities in decision-making and management processes, the agreement seeks to promote the sustainable use of resources in the region while recognizing Indigenous rights and sovereignty over their traditional territories. The use of ecosystem-based management and Community-based management in the Great Bear Rainforest Agreement is significant as it recognizes the interconnectedness of human communities and the natural environment, however, it's not without its limitations (Berkes, 2010).

Despite all this, challenges remain. One such challenge is the continued influence of colonial structures and practices in the legal system and government decision-making processes. Curran (2017) argues that the "legalization" of the Great Bear Rainforest agreements, which involved passing laws to enshrine the agreements into provincial legislation, may be seen as a colonial adaptation to indigenous resistance and environmental activism. This process has the potential to reinforce existing power imbalances and may not fully address the concerns and priorities of indigenous communities. Instead, it can be seen as simply a continuation of colonial rule, as there is very little veto power awarded to Indigenous communities, if any.

Another challenge is the ongoing threats to the Great Bear Rainforest, including industrial projects such as pipelines and liquefied natural gas (LNG) facilities. Indigenous communities have been at the forefront of resistance to these projects, which pose

significant environmental and cultural risks to the region. However, as Curran (2017) notes, the legal and political frameworks that enable these projects to move forward often prioritize economic development over environmental and cultural protection. In addition as previously mentioned, Indigenous communities often lack a diverse range of alternative employment or development opportunities that would allow them to defer from participating in such projects should they wish (Gorley and Merkey, 2020).

5.1.8. Limitations of Protections

When skewing for the 20% of protected forested land based in BC to consider productivity and biogeoclimatic stratification, the finding is staggering. Only 10% of the land protected from the harvest is considered a high-productive ecosystem. Researchers have found that while 2.7 million hectares of low-productivity forest is protected, only 100, 000 hectares is Old Growth. Recently findings from Price et al., (2021) state that the remaining Old Growth found in BC is biased towards high-elevation and low-productivity ecosystems. The authors found that despite approximately a quarter of forests being Old Growth, less than 1% of forests in BC can support high-productivity Old Growth stands (415 000 hectares out of 50 million) (Ashcroft, 2010; Lindenmayer, 2012; Hauer et al., 2016; Price et al., 2021). Additionally, very high productivity Old Growth ecosystems are supported by less than 0.1% (Price et al., 2021). Lastly, the historic disturbance regime predicted 52% of sites that support high productivity would remain as Old Growth; currently, only 8% remain (Price et al., 2021). As illustrated in Figure 5 below, commercial “logging has disproportionately targeted high productivity forests (<1% of site index <10m, 19% of site index 10-20 m, and 50% of site index > 20m are recorded as logged)” (Price et al., 2021, p.745).

Although some of British Columbia's lands have been designated as "no-harvest" areas, it should be noted that not all of them are fully protected. While parks and other protected areas are legally safeguarded from industrial harvesting, certain conditions may allow for portions of the 1.4 million hectares of Old Growth management areas to be harvested. For instance, if a road needs to be constructed to reach timber on the

other side, or if the area is relocated, this could change the ecological value and function of these ecosystems (Price et al., 2021).

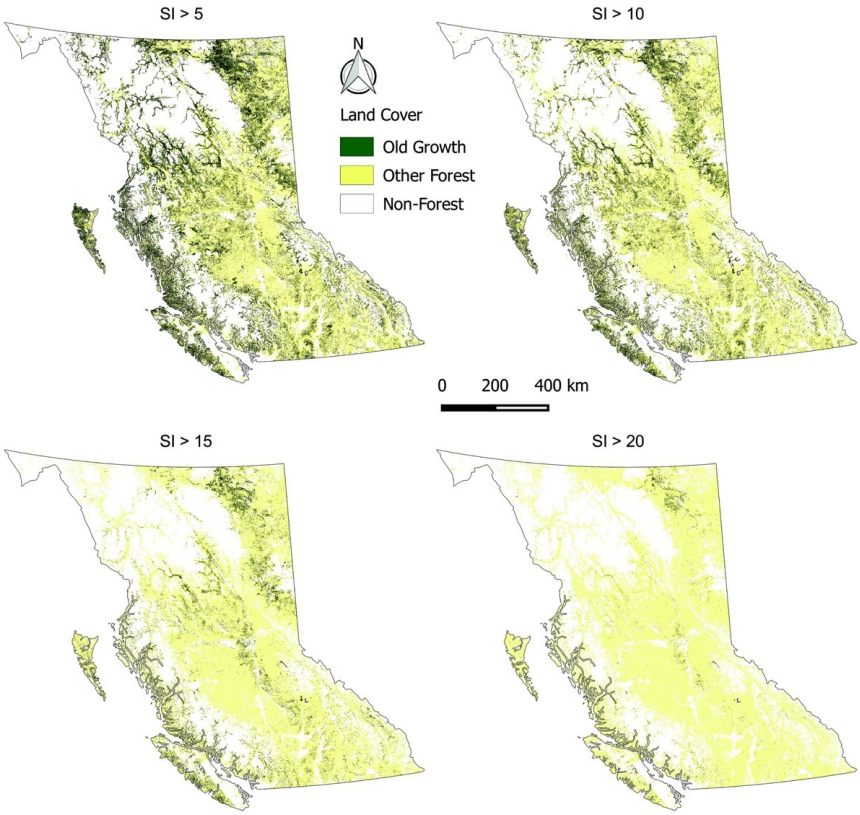

Figure 7. Current Old Growth by forest productivity (site index: potential height of a tree in meters at 50 years old). Old Growth greater than each SI cut-off is dark green; yellow shows all other forest (younger or lower SI); white is non-forested (Price et al., 2021)

5.2. Nova Scotia

5.2.1. Defining Old Growth

Similar to the BC context, the definition of Old Growth in Nova Scotia uses a forest ecosystem classification that requires different age thresholds for different forest regions. Conceptually, the Nova Scotia government defines Old Growth as an area of forest that has evolved through ecological continuity allowing for an unevenly-aged forest through the succession process (Neilet et al., 2013; Government of Nova Scotia, 2022). However, operationally, the Government further defines Old Growth as a forest

area “where 20% or more of the basal area is in trees greater than or equal to the reference age for that forest type” (Government of Nova Scotia, 2022, p.1). As this definition has a requirement of ecological continuity through limited human disturbance, areas post 1990 that are documented to have undergone a silviculture treatment are not considered Old Growth (Hunter and Schmieglow, 2011; Government of Nova Scotia, 2022).

Nova Scotia has a separate classification system for areas of forest restoration. These areas are identified to ensure equal and constant representation of Old Growth forests throughout both protected areas and Crown lands. The provincial government classifies them as “forest areas that meet the vegetation criterion of old-growth forest areas (Table 2) but are younger than the old-growth age-of-onset” (Government of Nova Scotia, 2022, p.1).

Table 2. Old Growth Forest Area Definitions

FEC Forest Group [a]	Old-Growth Minimum Tree Age [b]
Tolerant Hardwood	140
Spruce-Hemlock (red spruce dominant)	125
Spruce-Hemlock (hemlock dominant)	140
Mixedwood	125
Spruce-Pine	125
Wet Coniferous	100
Coastal (black spruce or balsam fir dominant)	100
Coastal (red spruce, white birch, or red maple dominant)	125
Highland (balsam fir or white spruce dominant)	100
Highland (yellow birch dominant)	140
Cedar [c]	100
Wet Deciduous	115
Floodplain	125
Karst	125

(a) Forest Ecosystem Classification (FEC) list of late succession forest types; b) Minimum age-threshold to qualify as Old Growth (Neily et al. 2013; Government of Nova Scotia, 2022)

5.2.2. Old Growth Situation in Nova Scotia

Known for its proximity to the Atlantic Ocean, Nova Scotia contains more than 13000 km of coastline that has provided coastal-influenced forests (MacLean, et al., 2022). The total land mass of the province is 5.3 million ha of which 28% is provincially owned (NSDR,1999; Stewart and Neily, 2008). Composed of 4.2 million ha of forest, approximately 75% of Nova Scotia is covered by forest stands. 55% of these forest stands are found on small private woodlots, while 35% remain on Federal and Provincial Crown lands, with the remaining 10% attributed to industrial lots (MacLean, et al., 2022; Government of Nova Scotia, 2022). With respect to both Old Growth forests and areas of Old Growth restoration, there are over 280,000 ha of forest in legally protected areas and over 30,000 ha on Crown lands. Thus, Old Growth represents 18.7% of both provincial and federal forested lands, and 7.6% of the total forested area in Nova Scotia (Government of Nova Scotia, 2022).

In Nova Scotia, the forest regions are fundamentally characterized by their differing climate, physiography, geology and similar flora structures. These characteristics have led to the emergence of two main forest regions: Acadian and Maritime boreal. These distinctions are largely based on location, with the Acadian forest stands found primarily on warmer, inland sites, and the Maritime boreal forest stands located along the coast in cool and moist climates. The trees found in the Acadian forest are described as “a patchy, multi-layered, multi-species canopy with trees of several age classes dominated by relatively large trees, occasional large snags and the presence of abundant large woody material on the ground at different stages of decay” (Government of Nova Scotia, 2022, p.6).

While each region has its own distinctions, they share the same stressors. Timber harvests from the past, and clear cutting methods in the present have left much of the forest ground in stark condition. Acid rain has become an increasing issue on the already acidic forest solid, eroding the availability of plant nutrients to the growing flora (Lahey,

2018). Additionally, “insects and diseases from other continents have found their way to Nova Scotia and wreaked havoc with some dominant tree species, such as elm and beech. New invasions of destructive species have started (e.g., hemlock woolly adelgid) or are imminent (e.g., emerald ash borer)” (Lahey, 2018, p.20). Together, this leaves the remaining forest in desperate needed of protection to avoid further degradation.

The Acadian Old Growth forest primarily contains shade-tolerant species of red spruce, eastern hemlock, white pine, yellow birch, sugar maple and American beech. Additionally, red maple, black spruce and red oak can be found at a less frequent rate. The Old Growth found in the Maritime Boreal forest is described as “a patchy canopy with trees of two or more age classes, frequent snags, and the presence of abundant woody material at numerous stages of decay” (Government of Nova Scotia, 2022, p.6). These forests predominately contain black spruce, balsam fir and white spruce which are all more inclined for short longevity (approximately <125 years (Government of Nova Scotia, 2022).

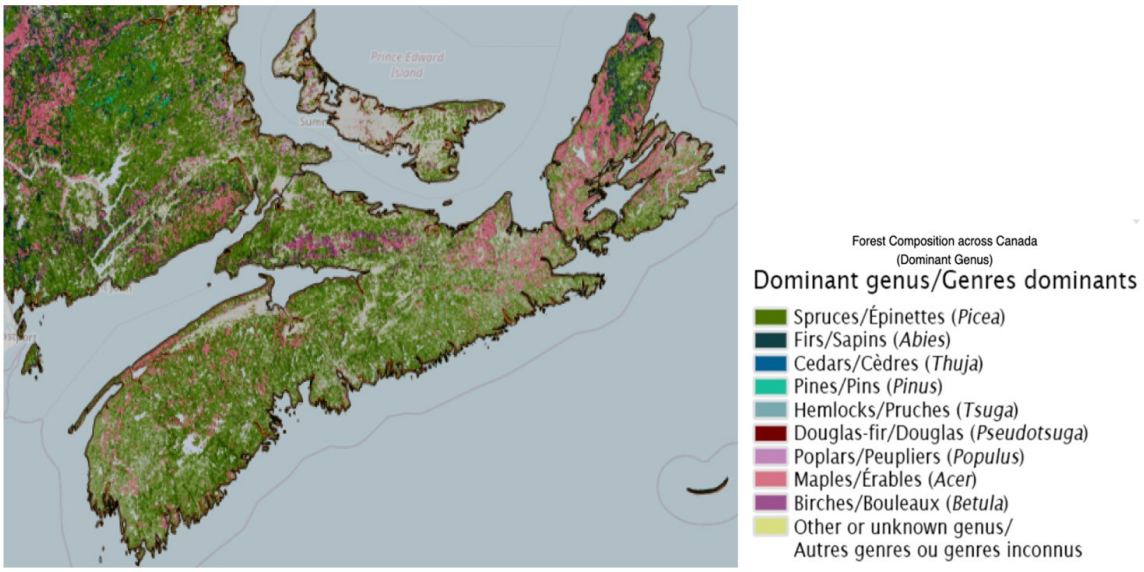

Figure 8. Forest Composition across Nova Scotia (Minister of Natural Resources and Renewables, 2023)

5.2.3. Old Growth Protections in Nova Scotia

Old Growth protection and policies in Nova Scotia have evolved over time in response to concerns about deforestation and the impact on the environment.

1. The Nova Scotia Crown Lands and Forests Act of 1867: First legislation to regulate the harvesting of trees in Nova Scotia, aimed to conserve and protect forests for future generations.
2. The Wilderness Areas Protection Act of 1994: Created protected areas in Nova Scotia, with a focus on preserving Old Growth forests, wildlife habitats, and other sensitive ecosystems.
3. Forest Stewardship Council (FSC) Certification: In response to increasing demand for responsibly sourced wood products, many forestry companies in Nova Scotia have voluntarily sought certification from the FSC, which sets standards for sustainable forest management.
4. Old Growth Management Area (OGMA) Program: Created by the government of Nova Scotia in 2001, the OGMA program protects Old Growth forests from industrial logging and provides opportunities for public access and recreation (Government of Nova Scotia, 2022).

These policies and programs have helped to conserve and protect Old Growth forests in Nova Scotia, but challenges still exist. There is ongoing debate about balancing the need for economic development with the importance of preserving sensitive ecosystems. These challenges led to the creation of the “An Old-Growth Forest Policy for Nova Scotia” in 2022 (Government of Nova Scotia, 2022).

This new policy seeks to approach forest protections in 3 different ways. The first method seeks to provide continued protection in legally protected areas such as parks, nature reserves. The second approach is to focus on areas that are not yet classified as Old Growth but are expected to be so classified in time and allow for restoration opportunities. Lastly, 63% of the forested region is held in private ownership, the provincial government seeks to encourage the act of conservation on private lands

through “mechanisms such as conservation easements, education, and other means that recognize and support the effort of private landowners” (Government of Nova Scotia, 2022, p.11).

5.3. Ontario

5.3.1. Defining Old Growth

In Ontario, Old Growth refers to forests that have reached a mature stage of development and have not been significantly altered by human activities such as logging or clearing. Old Growth forests typically contain trees that are several hundred years old, and they provide critical habitat for a diversity of plant and animal species. Old Growth forests in Ontario also have a unique structure, characterized by large, old trees, snags (standing dead trees), and a complex understory of shrubs, saplings, and mosses. The specific definition of Old Growth in Ontario may vary depending on the type of forest and regional context, but generally, it refers to forests that have reached a mature stage of development and are relatively undisturbed by human activities. These forests play an important role in maintaining ecological diversity and resilience, and they are considered valuable for their ecological, cultural, and economic significance (Government of Ontario, 2003).

5.3.2. Old Growth Situation in Ontario

The composition of Old Growth forests in Ontario is characterized by a mixture of tree species, ecological communities, and other vegetation types. In terms of ecological communities, Old Growth forests in Ontario can include a mix of deciduous, coniferous, and mixed-wood forests. These ecosystems support a diverse range of plant and animal species, many of which are threatened or at risk. The composition of Old Growth forests in Ontario is influenced by a variety of factors including the region's geology, climate, and history of human disturbance. These areas are characterized as

ecoregions: areas of land that share similar climate, geology, soil, vegetation, and wildlife characteristics. In Ontario, ecoregions are used to describe the province's diverse landscapes and the unique environmental conditions that exist in different regions. There are several different ecoregion classifications used to describe the geography of Ontario, but one commonly used system is the Level III Ecoregions of Canada, based on the biophysical characteristics of the land (Government of Ontario, 2003).

In Ontario, there are several Level III Ecoregions, including the Boreal Shield, Hudson Bay Lowland, Appalachian Mountains, Great Lakes Lowlands, and Lake Huron Lowlands. These ecoregions are further divided into subregions that have distinct characteristics and are recognized for their unique conservation values. The ecoregions of Ontario play an important role in determining the distribution and composition of Old Growth forests in the province. Old Growth forests are more common in certain ecoregions, such as the Boreal Shield and Hudson Bay Lowland, due to the presence of suitable climate and geological conditions for tree growth and the limited impact of human activities (Government of Ontario, 2003).

In the Boreal Shield ecoregion, for example, the cool, moist climate and acidic soils support the growth of mature coniferous forests, including white spruce, balsam fir, and black spruce, that can persist for centuries and eventually become Old Growth forests. Similarly, in the Hudson Bay Lowland ecoregion, the wet climate and poorly drained soils support the growth of mature deciduous and coniferous forests, including white birch, trembling aspen, and white spruce, that can persist for hundreds of years and eventually become Old Growth forests. In other ecoregions, such as the Appalachian Mountains and Great Lakes Lowlands, the warmer and drier climate, as well as the more intense human activities, limit the development and persistence of Old Growth forests (Government of Ontario, 2003).

5.3.3. Old Growth Protections in Ontario

In Ontario, there are several measures in place to protect Old Growth forests:

1. Protected Areas: Ontario has established several parks and protected areas that conserve Old Growth forests, such as Algonquin Provincial Park and the Kawartha Highlands Signature Site.
2. Forest Management Plans: The Ontario Ministry of Natural Resources and Forestry (MNRF) has developed forest management plans that aim to conserve and protect Old Growth forests while balancing economic, social, and environmental interests.
3. Endangered Species Act: The Endangered Species Act provides protection for species at risk, including those that depend on Old Growth forests for their habitat.
4. Public Engagement: The MNRF engages with the public and stakeholders to gather feedback and input on forest management practices, which helps to ensure that the needs and concerns of different groups are taken into consideration when developing policies to protect Old Growth forests.
5. Research and Monitoring: Ongoing research and monitoring efforts help to assess the status of Old Growth forests and the species that depend on them, and inform decision-making to ensure their protection and conservation (Government of Ontario, 2003).

According to the Ontario Ministry of Natural Resources and Forestry, Old Growth forests occupy a relatively small proportion of the province's total forested land base and are considered to be a threatened ecosystem in need of protection. In order to ensure the protection and conservation of Old Growth forests in Ontario, various measures have been put in place, including the establishment of parks and protected areas, forest management plans, endangered species legislation, and ongoing research and monitoring efforts. Despite these efforts, more work is needed

to ensure that a sufficient proportion of Ontario's Old Growth forests are protected for future generations. Despite these measures, Old Growth forests in Ontario continue to face threats such as logging, resource extraction, and climate change, and efforts to protect these valuable ecosystems must continue. The Ontario government and various organizations are working together to conserve and protect Old Growth forests for future generations (Government of Ontario, 2003).

5.4. Emerging themes

In Canada's provinces, protecting Old Growth forests faces several barriers. One of the most significant challenges is the economic pressures imposed by logging and resource extraction industries, which prioritize commercial interests over environmental protection. This creates conflicts and makes it difficult to implement protective measures for Old Growth forests. Additionally, protecting Old Growth forests can be a controversial issue, and political leaders may be hesitant to take action for fear of losing support from key constituents. Furthermore, there is often limited public awareness of the ecological significance of Old Growth forests, making it challenging to generate support for protective measures. Climate change is also a growing threat to Old Growth forests, and addressing this challenge within the current framework of environmental protection can be difficult. Conservation and protection efforts require significant resources, and limited funding and manpower can make it challenging to effectively implement protective measures. Lastly, Canada's forest management policies are complex, and navigating the various regulations and laws related to Old Growth forests can be challenging. Despite these obstacles, it is crucial to continue conservation efforts to protect these valuable ecosystems for future generations.

Chapter 6.

Multi Criteria Analysis

6.1. Policy Measures and Criteria

A multi-criteria analysis was conducted to evaluate potential policy options that address the policy problem: **the policy protections for Old Growth forest stands in British Columbia are too limited**. Five objectives, seven criteria, and twenty-one measures were determined through the above research and are summarized in Table 3. The criteria and measures will be presented in detail within this chapter to outline how the policy options were evaluated.

Table 3. Policy Criteria and Measures Summary

Objective	Criterion	Measure	Coding
Key: Effectiveness	Degree to which the policy effectively protects Old Growth forests stands	High ability to support effectiveness	Good (3)
		Moderate ability to support effectiveness	Moderate (2)
		Low ability to support effectiveness	Poor (1)
Cost	Cost to the provincial government	Low cost	Good (3)
		Moderate cost	Moderate (2)
		High cost	Poor (1)

Ease of Implementation	Complexity of implementing the policy	Low degree of complexity	Good (3)
		Moderate degree of complexity	Moderate (2)
		High degree of complexity	Poor (1)

Political Feasibility	Degree to which the policy is likely to be accepted by current provincial government	High ability to be accepted	Good (3)
		Moderate ability to be accepted	Moderate (2)
		Low ability to be accepted	Poor (1)

Sustainability	Degree to which the policy is provides restoration opportunists for future Old Growth stands	High ability to support restoration of Old Growth	Good (3)
		Moderate ability to support restoration of Old Growth	Moderate (2)
		Low ability to support restoration of Old Growth	Poor (1)

Stakeholder Acceptance	Degree of acceptability among resource extraction industry	High acceptability	Good (3)
		Moderate acceptability	Moderate (2)
		Low acceptability	Poor (1)

Stakeholder Acceptance	Degree of acceptability among conservation groups	High acceptability	Good (3)
		Moderate acceptability	Moderate (2)
		Low acceptability	Poor (1)

6.1.1. Key Objective: Effectiveness

The main objective of this research is to address the gaps in Old Growth protections within British Columbia. This measure of effectives seeks to assess the extent to which the various policy options address these gaps. A 'Good' score will be provided to policy options that increase the amount of Old Growth stands protected from deforestation and industry harvest.

6.1.2. Cost

This objective is directed towards the provincial government and addresses the cost of implementation, administration and operation of each policy proposal. Where possible, costs will be provided as a numeric value. A 'Good' score will be appointed to the policies with the lowest total cost. These values will be based on estimated assessments of the additional resources needed for implementation, management and monitoring.

6.1.3. Ease of Implementation

The ease of implementation seeks to address the administrative ease and complexities that may exist upon implementation. This criteria would assess the number and manner

of changes that current or future policies or programs would need make. Any policy that requires few or no changes would receive a ‘Good’ score.

6.1.4. Political Feasibility

Political Feasibility will measure how easily the policy option will be accepted by both the provincial government and the overall general public. In order for any policy option to be enacted and further implemented, it must first be politically acceptable. A ‘Good’ score will be appointed to the policies which have the lowest threshold for successful implementation by decision makers.

6.1.5. Sustainability

Sustainability will measure the ability of the policy to provide options for restoration opportunities for future Old Growth stands. A ‘Good’ score will indicate that the policy has the ability to provide protections and incentives to protect future Old Growth stands and continue to foster mature forests.

6.1.6. Stakeholder Acceptance (Industry)

To achieve this objective, it is essential to evaluate the level of support and acceptance with the forest industry as it is a significant contributor to the BC economy, and any policy that negatively impacts this sector may have ripple effects on the entire provincial economy. Therefore, policies that limit the effect on the forest industry and the forest/lumber economy will receive a 'Good' score in terms of stakeholder acceptance. The list of stakeholders who have a vested interest in the forest industry is extensive and includes not only large forest companies, but also Indigenous communities, forest industry unions, local communities, rural communities and the provincial government. Each stakeholder has unique concerns and interests, and it is essential to consider these factors when assessing stakeholder acceptance.

6.1.7. Stakeholder Acceptance (Conservation)

To ensure successful implementation of policies that prioritize forest conservation, stakeholder acceptance must be evaluated. This evaluation will consider the expected support and acceptance from groups that advocate for conservation and sustainable forest management. Policies that increase avenues of forest management while decreasing old-growth harvesting will receive a 'Good' score in terms of stakeholder acceptance.

The list of potential stakeholders in the conservation and sustainable forest management of BC's forests is diverse and includes local and Indigenous communities that may have land partnership agreements with the Provincial and Federal governments. Environmental organizations that work to protect forests and promote sustainable forest management; Eco-tourism companies that rely on the natural beauty of forests and the wilderness and, small forest companies that operate sustainably and prioritize conservation are also important stakeholders.

6.2. Policy Options:

Four policy options were derived from the research and are described in the following subsections. All four options aim to effectively address the gaps in Old Growth protections in British Columbia. Provided that the provincial government has sole jurisdiction over the forest management system, the policies are directed towards actions that the Government of British Columbia could implement or use to expand on existing policies or programs.

6.2.1. Policy Option 1: Old Growth Deferral Areas

As mentioned earlier, deferral areas in British Columbia refer to areas where forest harvesting is postponed or deferred for a specific period. Currently, the provincial standard for a deferral is three years. The purpose of deferral areas is to protect specific

forest values or resources, such as wildlife habitat, Old Growth forests, or cultural heritage sites that may otherwise be at risk due to industrialization or reproduce extraction projects. Deferral areas can also be established to address specific economic or social issues, such as preserving jobs or supporting local communities (British Columbia, 2023).

Part 13 of the Forest Act in British Columbia provides a legal framework for the creation and management of deferral areas. This part of the Act allows the provincial government to establish, maintain, and manage deferral areas through the creation of regulations or orders. Part 13 also provides a mechanism for public consultation and engagement in the establishment of deferral areas. The Forest Act defines two types of deferral areas: "special resource management zones" and "operational closed areas." Special resource management zones are established to protect specific resources or values, such as wildlife, water quality, or cultural heritage sites. Operational closed areas, on the other hand, are established for operational or economic reasons, such as to support local communities or to manage timber supply (British Columbia, 2023).

The establishment and management of deferral areas under Part 13 of the Forest Act in British Columbia involves a collaborative approach that includes government agencies, Indigenous communities, industry stakeholders, and local communities. The process of creating deferral areas involves identifying the specific resource or value to be protected, determining the appropriate boundaries and duration of the deferral, and developing a management plan for the area (British Columbia, 2023).

1. Under this policy option, Part 13 of the Forest Act can be utilized to implement a Ministerial Order (MP) and suspend direct activities in target areas as specified by Gorley and Merkley (2020), and would encompass the following:
    - Any Biogeoclimatic Ecosystem Classification (BEC) variation with less than 10% remaining old forest;

- Old forest in any BEC-Landscape Unit combination that presently contains less than 10% old forest;
- Ancient forests, such as forests older than 500 years on the coast and wet Interior Cedar Hemlock (ICH), as well as forests that are over 300 years old in ecosystems with more frequent disturbances;
- Regions with a high potential to enhance larger ecosystem resilience; and
- Regions with a Site Index of greater than 20m.

6.2.2. Policy Option 2: Develop Sustainable Second-Growth Forestry

In British Columbia, sustainable second-growth refers to the practice of harvesting timber from second-growth forests in a way that maintains the long-term productivity and health of the forest ecosystem. Second-growth forests are those that have regenerated naturally or through planting after previous harvests or disturbances, and they make up a significant portion of the province's forested land base. Sustainable second-growth harvesting practices involve careful planning, monitoring, and management to ensure that the forest continues to provide ecological, social, and economic benefits (Owens, 2021).

One way that the British Columbia government generates revenue from timber harvesting is through the collection of stumpage fees. Stumpage fees are charges levied on forest companies for the right to harvest timber from Crown-owned land. These fees are determined through a complex formula that takes into account a variety of factors, including market conditions, harvesting costs, and environmental considerations. The collection of stumpage fees is a significant source of revenue for the provincial government, with $872 million collected for the fiscal year 2019-2020 (Ministry of Finance, 2023).

The British Columbia government has utilized significant funds collected from stumpage fees on multiple high-profile trade missions to create markets for BC Old Growth lumber and raw logs in China. The trade missions involved promoting BC's forest products, including Old Growth lumber, to Chinese markets in order to increase exports

and generate economic benefits for the province. The government has also negotiated trade agreements with China that have facilitated the export of BC forest products, including lumber, pulp, and paper. Critics of the government's approach argue that the focus on exporting raw logs and Old Growth lumber to China undermines the sustainability of the province's forest industry by encouraging the depletion of high-value forest resources. They argue that the government should instead be promoting the use of sustainable second-growth timber to support the long-term health and productivity of BC's forests (Matas, 2011).

2. Therefore, instead of using stumpage fees to promote raw log and Old Growth export, the NDP government could allocate these stumpage fees towards promoting sustainable, value-added, and Forest Stewardship Council certified (FSC) second-growth forest products in several international markets, including the US, Japan, Western Europe, and other Canadian regions. This strategy would involve discontinuing the marketing of Old Growth and raw logs.

6.2.3. Policy Option 3: Phase Out Old Growth Logging

The Allowable Cut (AC) is the amount of timber that can be harvested in a given area over a specified period of time, typically ten years. In British Columbia, the AC is determined through a process that considers a range of factors, including forest inventory, forest health, wildlife habitat, and social and economic considerations. The AC is set for each of the province's Timber Supply Areas (TSAs) and Tree Farm Licenses (TFLs) based on a number of factors (Gorley & Merkey, 2020).

Currently, this process in British Columbia does not distinguish between the allocation of Old Growth and second-growth logging, which has led to concerns about the sustainability of Old Growth harvesting. To better manage Old Growth harvesting, the British Columbia government could divide the AC to distinguish between the allocation of Old Growth and second-growth logging. This would involve setting separate targets for the amount of Old Growth that can be harvested in a given area,

and ensuring that the harvesting of Old Growth is done in a sustainable and ecologically responsible manner. This approach would also allow for more targeted management of Old Growth forests, which are often located in isolated pockets of the province (Owen, 2021).

Additionally, the government would need to consider implementing a more robust system of monitoring and enforcement to ensure that Old Growth harvesting is done in accordance with sustainable forest management practices. This could involve greater involvement from Indigenous communities in forest management and greater transparency around the allocation of timber harvesting rights.

3. To better manage the pace of Old Growth harvesting, the British Columbia government should divide the Allowable Annual Cut to distinguish between the allocation of Old Growth and second-growth logging. This approach would allow for a gradual reduction and phase-out of Old Growth cutting, based on the conservation requirements outlined by the independent science panel.

6.2.4. Policy Option 4: Community-based management System

As seen in the case study, a Community-based management system (CMB) is a collaborative approach to managing natural resources that involves local communities in decision-making processes. This system empowers communities to take an active role in managing their natural resources and helps to ensure that local perspectives are taken into account in management decisions. In the context of Old Growth forest management in British Columbia, a community-based management system could be used to protect these forests by engaging local communities in the management process. This would involve working with Indigenous communities and other stakeholders to develop management plans that take into account the ecological, cultural, and social values of Old Growth forests (Thomson, 2019).

One example of a community-based management system in British Columbia is the Great Bear Rainforest. In 2006, an agreement was reached between the British

Columbia government, Indigenous communities, environmental groups, and the forest industry to protect the Great Bear Rainforest, which is home to a significant portion of the province's remaining Old Growth forests. This agreement established a new model of forest management that involved local communities in decision-making and emphasized ecological sustainability (Curran, 2017).

Under this model, the Great Bear Rainforest is managed through a network of ecosystem-based management areas that are designed to protect the ecological values of the area while also providing economic opportunities for local communities. The management of the Great Bear Rainforest is overseen by a joint management board that includes representatives from Indigenous communities, environmental groups, and the forest industry. This model of community-based management has been successful in protecting Old Growth forests in the Great Bear Rainforest and has been praised as a model for sustainable forest management. It has also provided economic opportunities for local communities, including opportunities for ecotourism and sustainable forestry practices (Curran, 2017).

4. Under a Community-based management system stakeholder collaboration and joint decision-making would ensure that diverse perspectives and values are considered in the management of the resource. CBMs under the government's management would support the long-term sustainability of Old Growth forests by encouraging more adaptive and participatory forest management practices. This can help to ensure that Old Growth forests are managed in a way that maintains their ecological values and benefits for future generations.

Chapter 7.

Analysis of Policy Options

Table 4. Analysis of Policy Options

Objective	Old Growth Deferrals	Sustainable Second-growth	Phase-out Old Growth Logging	Community-based management
Effectiveness	3 (Good)	2 (Moderate)	3 (Good)	2 (Moderate)
Cost	3 (Good)	1 (Low)	1 (Low)	1 (Low)
Ease of Implementation	3 (Good)	1 (Low)	1 (Low)	1 (Low)
Political Feasibility	2 (Moderate)	2 (Moderate)	1 (Low)	1 (Low)
Sustainability	2 (Moderate)	2 (Moderate)	3 (Good)	2 (Moderate)
Stakeholder Acceptance (Industry)	1 (Low)	2 (Moderate)	2 (Moderate)	2 (Moderate)
Stakeholder Acceptance (Conservation)	3 (Good)	2 (Moderate)	3 (Good)	3 (Good)
Total: 21	17	12	14	12

7.1. Policy Option 1. Old Growth Deferrals

7.1.1. Effectiveness: Good

Targeting Old Growth deferral areas based on specific criteria, such as the ones listed above, can help focus conservation efforts on areas that are most in need of protection

and have the highest ecological value. By prioritizing areas with low old forest cover, high potential for ecosystem resilience, and high site index, the effectiveness of Old Growth deferrals in conserving Old Growth forests in British Columbia could be significantly increased. Such targeted deferral areas can help ensure that the remaining Old Growth forests are protected and allowed to mature, while also preserving their ecological and cultural significance. This can contribute to the long-term conservation and preservation of Old Growth forests in British Columbia, as well as provide benefits for wildlife and local communities. It's important to note, however, that Old Growth deferrals are only one aspect of Old Growth conservation and management, and that additional measures, such as permanent protection, restoration, and sustainable management, may also be necessary to ensure the long-term survival and health of these forests.

7.1.2. Cost: Good

The cost will depend on several factors, such as the level of monitoring and enforcement required, the infrastructure needed for access, and any compensation that may be necessary for affected communities and industries. In general, the implementation of Old Growth deferrals may require additional resources, such as staff and funding, for government agencies responsible for managing forests, as well as for organizations involved in conservation and advocacy. However, as a similar program is currently being used in British Columbia, expanding it would likely cost less than an alternative program which would need to include the bureaucratic process.

7.1.3. Ease of Implementation: Good

One of the key recommendations that emerged from the province’s latest Old Growth strategic review was the idea to use deferral as a long term strategy to address any immediate threats to Old Growth canopies (Gorley & Merkey, 2020). As such, BC has started the process and has added 11 new areas to its deferral process, resulting in an

addition of 197,193 hectares of Old Growth being protected (British Columbia, 2023). It's worth noting that there is little information on the biogeoclimatic stratification of the deferred areas.

7.1.4. Political Feasibility: Moderate

In general, the political feasibility of implementing an Old Growth deferral act on a large scale would be both complex and contentious as it would require balancing the interests of conservation and environmental protections with those of economic development and resource extraction. As this policy was recommended based on findings presented in the Old Growth Strategic Review by Gorley & Merkey (2020), there is already much discussion and action surrounding it. While 11 small short term deferrals have been granted, there is much discussion left on the feasibility of larger long term deferrals (British Columbia, 2023). Large scale implementation would likely require significant resource coordination between, government agencies, Indigenous Nations, conservation organizations and industry members to effectively implement and enforce the deferrals.

7.1.5. Sustainability: Moderate

By prioritizing areas with a low percentage of remaining old growth forest, high potential for contributing to ecosystem resilience, and ancient forests, the government may be able to better protect these areas and ensure their preservation for future generations. This would facilitate the restoration of degraded or disturbed Old Growth ecosystems, as well as support the recovery of associated species and ecological processes. The sustainability of this policy would also depend on a number of factors, including the level of investment in restoration efforts, and the effectiveness of enforcement and compliance measures.

7.1.6. Stakeholder Acceptance (Industry): Low

The implementation of targeted Old Growth deferrals would likely face stakeholder opposition from those who view it as a restriction on resource development and economic growth. Industry stakeholders reliant on the use of Old Growth and its surrounding area would be concerned about reduced revenues, job losses and other economic impacts.

7.1.7. Stakeholder Acceptance (Conservation): Good

Old Growth deferrals that prioritize the preservation of key ecosystems and ancient forests may also offer opportunities for alternative resource-based industries, such as ecotourism, to grow and thrive. Additionally, the deferrals would provide protection for areas with high ecological significance, and conserve key habitats and species otherwise threatened. In this case, the deferrals could potentially provide benefits to local economies, as well as support the conservation of important ecological values.

7.2. Policy Option 2. Sustainable Second-growth

7.2.1. Effectiveness: Moderate

The effectiveness of developing a sustainable second-growth forest industry in relation to Old Growth will depend on a number of factors, including the specifics of the industry, the availability of second-growth forests, and the willingness of stakeholders to shift from Old Growth to second-growth resource. By developing a strong and sustainable second-growth forest industry, the demand for Old Growth forests could be reduced, allowing for better conservation and management of these valuable ecosystems. However, while this may promote a switch to the use of Second-growth forests for industry development, this policy does not provide additional protections for Old Growth forest.

7.2.2. Cost: Low

The cost of creating a Second-growth forest industry would likely be substantial and would require significant investment from the government and other stakeholders. While stumpage fees could expand the market, there are many factors that would influence the cost of developing a sustainable Second-growth forest industry, including the size and location of the forests, the costs of planting and growing trees, the costs of building and maintaining roads and infrastructure, the costs of monitoring and managing the forests, and the costs of marketing and selling the forest products. In addition, there may be costs associated with changing the management practices of existing forests, and there may also be costs associated with training and retraining workers and communities to support the new industry.

7.2.3. Ease of Implementation: Low

The ease of implementing a sustainable Second-growth forest industry in British Columbia depends on a number of factors, including the existing infrastructure and support for the forest sector, the political will to support the development of a new industry, and the availability of funding and other resources to support the development of the industry. Additionally, there may be significant challenges in developing, regulating and managing a new market for Second-growth forest products and expanding it globally.

7.2.4. Political Feasibility: Moderate

The political feasibility of this policy would depend on many factors such as public opinion, the views and interests of relevant stakeholders, and the economic and political priorities of the government. Stakeholders, such as conservation groups and Indigenous communities, may support a shift towards a sustainable Second-growth forest industry as a means of preserving Old Growth forests, while others, such as resource-dependent communities and industries, may resist such a change if it poses a

threat to their livelihoods. The level of investment required and the potential economic benefits of a sustainable Second-growth forest industry would also be important political considerations in determining its political feasibility.

7.2.5. Sustainability: Moderate

A sustainable Second-growth forest industry could be either beneficial to Old Growth restorations or disadvantageous. If a sustainable Second-growth forest industry is successful in providing economic benefits, it may reduce the pressure on Old Growth forests from resource extraction, potentially allowing for more of these areas to be protected for restoration and conservation purposes. On the other hand, if the focus on Second-growth forests leads to increased logging and resource extraction, it may contribute to further degradation of Old Growth forests.

7.2.6. Stakeholder Acceptance (Industry): Low

The implementation of the Second-growth forest industry would lead to many changes. Its implementation could provide economic benefits and reduce the demand for Old Growth forest use, leading to decline in the Old Growth forest industry. Further, if the Second-growth forest industry requires significant investments in infrastructure and technology and receives upgrades, it may increase the cost of production, making it more difficult for the Old Growth forest industry to compete. The introduction of a Second-growth forest industry may also lead to changes in the regulations and policies that govern forestry practices, which could have an impact on the current norms.

7.2.7. Stakeholder Acceptance (Conservation): Moderate

The implementation of a sustainable Second-growth forest industry in BC may affect the Old Growth conservation industry by reducing the demand for Old Growth resources and potentially leading to a reduction in the rate of Old Growth forest loss. However, the specifics of how the industry would be established and managed, and how it would

interact with the conservation industry, would play a significant role in determining its overall impact. Furthermore, this policy does not add new protections to current Old Growth areas and therefore does not address all areas of Old Growth management.

7.3. Policy Option 3. Phase out Old Growth Logging

7.3.1. Effectiveness: Good

Apportioning the Allowable Annual Cut (AAC) to distinguish between Old Growth and Second-growth cut allocations in order to phase out Old Growth cutting could be an effective method for conserving Old Growth in BC. This approach would ensure that a specified portion of the AAC is allocated to Second-growth forests, while the cutting of Old Growth forests is gradually reduced over time. This approach would help to balance the need for a viable forest industry with the conservation of Old Growth forests. However, the exact effectiveness of this approach would depend on several factors, including the implementation and enforcement of the AAC apportionment, the rate of scaling-down and phasing out of Old Growth cutting, and the ability of the Second-growth forest industry to meet the demands for forest products.

7.3.2. Cost: Low

The exact cost of developing a policy to apportion the Allowable Annual Cut in British Columbia would depend on various factors such as the scope of the policy, the resources required for research and development, the cost of implementing the policy, and the cost of monitoring and enforcing the policy. The cost would likely involve significant investment from the government, as well as from industry and other stakeholders, and would likely vary depending on the specifics of the policy. While providing industry licenses would generate income, the revenue would likely not cover the total amount of resources needed.

7.3.3. Ease of Implementation: Low

The ease of apportioning the Allowable Annual Cut to distinguish between Old Growth and Second-growth cut allocations would depend on several factors, including the market, the availability of data and resources, and the views of stakeholders involved. This process may also require investment in data collection and analysis, as well as consultation with stakeholders, which could increase the cost and time needed to implement the policy. Ultimately, the feasibility of this policy would require much consultation and for all pending allocations be approved on a case-by-case basis.

7.3.4. Political Feasibility: Low

The political feasibility of apportioning the Allowable Annual Cut to distinguish between Old Growth and Second-growth cut allocations and phasing out Old Growth cutting in British Columbia depends on public opinion, the political climate, and the interests of various stakeholders such as resource industries, conservation groups, and local communities. There may be disagreements over the best methods for defining and measuring Old Growth and Second-growth forests. It would likely require a significant effort by the government to engage with all relevant stakeholders, build consensus, and implement the policy effectively.

7.3.5. Sustainability: Good

This policy option would aid in Old Growth restoration by reducing the amount of Old Growth harvested each year and increasing the overall size of the Old Growth forest. This approach would aim to balance the need for continued forestry activities with the conservation of Old Growth forests. By setting aside a portion of the AAC for Old Growth forests, the government could ensure that these areas are not being overly exploited, which would allow them to recover and increase in size over time.

7.3.6. Stakeholder Acceptance (Industry) : Moderate

Reducing the cutting of Old Growth forests could lead to a decrease in the supply of Old Growth timber for the industry. This would likely result in a decrease in profits for companies that rely heavily on Old Growth timber and potentially lead to job losses in the sector. Alternatively, apportioning the AAC could encourage companies to transition to a more sustainable Second-growth forest industry. By phasing out Old Growth cutting, the BC government would be promoting the development of a more sustainable and long-term forest industry. This could result in a shift in investment towards the Second-growth industry and potentially lead to job creation and economic growth in the sector.

7.3.7. Stakeholder Acceptance (Conservation): Good

This policy would result in a reduction in the amount of Old Growth forests being cut, which would conserve the forests and their associated biodiversity and ecosystem services. The reduction of Old Growth cutting and the subsequent shift towards Second-growth harvesting would likely result in an increase in demand for services related to the management and restoration of Second-growth forests, as well as the creation of new business opportunities related to the development of a sustainable Second-growth forest industry. The exact effect on the Old Growth conservation industry would depend on the specific details and implementation of the policy, as well as factors such as market demand and government support for the development of a sustainable Second-growth forest industry.

7.4. Policy Option 4. Community-based management

7.4.1. Effectiveness: Moderate

The effectiveness of a Community-based management system in protecting Old Growth forests in British Columbia would depend on a range of factors, including the level of participation and engagement by local communities, the resources and support provided by the government, and the overall effectiveness of the management plans and monitoring and evaluation systems in place. If implemented effectively, a Community-based management system could help to ensure that local communities have a greater say in how Old Growth forests are managed, and that their ecological and cultural values are taken into account.

However, it's worth noting that Community-based management is not without its challenges and limitations. For example, there may be conflicting values and interests among different stakeholders, and not all communities may be interested in participating in Community-based management.

7.4.2. Cost: Low

Community-based management typically involves more decentralized decision-making and a greater degree of local involvement in management planning and implementation. This can lead to more effective and sustainable management of natural resources, but it can also be more resource-intensive and require more extensive community engagement. The costs of Community-based management would likely include the development of the management framework and plans, the cost of engaging with local communities and stakeholders, and the costs associated with ongoing monitoring and evaluation of management activities.

7.4.3. Ease of Implementation: Low

The implementation of a Community-based management system requires the support and participation by local communities. This may be difficult as some communities may be more interested and engaged in participating in forest management than others, and there may be differences in values and interests among different stakeholders. Additionally, the development of a Community-based management system would require the development of new management plans and strategies, as well as the provision of training, technical support, and resources to local communities to support their involvement in management. This would further require effective communication and collaboration among different stakeholders, including industry, local communities, and government agencies.

7.4.4. Political Feasibility: Low

The implementation of a CBM system would require the development of new policies and institutional arrangements, which can be politically challenging. The interests and values of different stakeholders, including industry, local communities, and environmental organizations, may need to be balanced, which can be difficult to achieve in practice.

The political feasibility of implementing a Community-based management system would also depend on the broader political climate in British Columbia. The level of public awareness and support for sustainable forest management, as well as the level of political will to address the concerns of local communities and other stakeholders, could influence the likelihood of success.

7.4.5. Sustainability: Moderate

A CBM system could prioritize sustainable forest management practices, involve local communities in planning and monitoring efforts, and build local capacity for

reforestation activities. Reforestation measures for Old Growth stands could be planned and prioritized through community involvement, ensuring that reforestation efforts align with the values and needs of local communities. Local communities could also be involved in monitoring and evaluating the success of reforestation efforts, helping to ensure that reforestation efforts are effective and adaptive to changing conditions. However, there is no certainty that this will be a priority amongst stakeholder groups.

7.4.6. Stakeholder Acceptance (Industry): Moderate

A CBM system could help to promote sustainable forest management practices, which could include measures to protect and preserve Old Growth forests. This could involve greater restrictions on forest harvesting activities in some areas, which could potentially reduce the amount of timber available for the forest harvesting industry. Alternatively, it could also provide opportunities for local communities to be more involved in decision-making around forest harvesting activities. This could potentially lead to more local input into how and where harvesting occurs, which could help to address some of the concerns around the impacts of forest harvesting on local communities and ecosystems.

7.4.7. Stakeholder Acceptance (Conservation): Good

The implementation of a CBM system would involve greater participation and decision-making power for local communities in the management of natural resources, including forests. This could result in more collaborative and participatory approaches to conservation, where local communities work together to protect and conserve the forests and other natural resources in their area. It may also create opportunities for local communities to engage in ecotourism and other sustainable economic activities that depend on healthy and intact ecosystems. This could include activities such as wildlife watching, birding, and eco-adventure tours, which could generate income for local communities while promoting conservation and sustainability.

Chapter 8.

Recommendations

Given the policy matrix and evaluation completed above in Chapter 6, this study recommends pursuing a mixed policy approach of Policy Option 1. and 3. Policy Option 1: Old Growth Deferral Areas, uses targeted deferral areas to protect the remaining Old Growth forests that are most at risk of being lost due to logging. By deferring logging in these areas, the BC government would help to ensure that those chosen areas are conserved and protected for future generations. This would help to maintain biodiversity and protect the ecological services that these Old Growth forests provide, such as carbon sequestration, soil stability, and water regulation. Additionally, deferring logging in these areas would help to support the restoration of Old Growth forests, by allowing natural processes to take place and promote the regrowth of Old Growth forests. However, it's important to note that Old Growth deferrals alone may not be sufficient to ensure the long-term conservation of these forests. Additional measures, such as permanent protection, reforestation, and sustainable management, may also be necessary to ensure the long-term survival and health of Old Growth forests.

Policy Option 1. would provide the most effective measure with the least amount of cost. As the province of British Columbia currently has an approach to Old Growth deferrals that uses Part 13 of the Forest Act. Under this Act, 11 new deferral areas have been created, leading to a total of 355,347 hectares of protected lands and 197, 193 hectares of Old Growth being protected (British Columbia, 2023). The province has recently declared that this program will be expanded to 2.1 million hectares, up from 1.7 million previously reported in spring. In addition, the provincial government is prepared to support eight regional forest landscape planning tables that include the participation of 50 First Nations (Watson, 2023). This policy option does have low industry stakeholder acceptance, as high fibre costs and softening lumber markets have already created unprecedent job losses in the forestry sector of BC, with more than

40,000 job losses since the 1990s (Watson, 2023). Despite this, the BC Council of Forest Industries (COFI) is optimistic that the new expansion will lead more sustainable practices that will support future forest development initiatives (Watson, 2023).

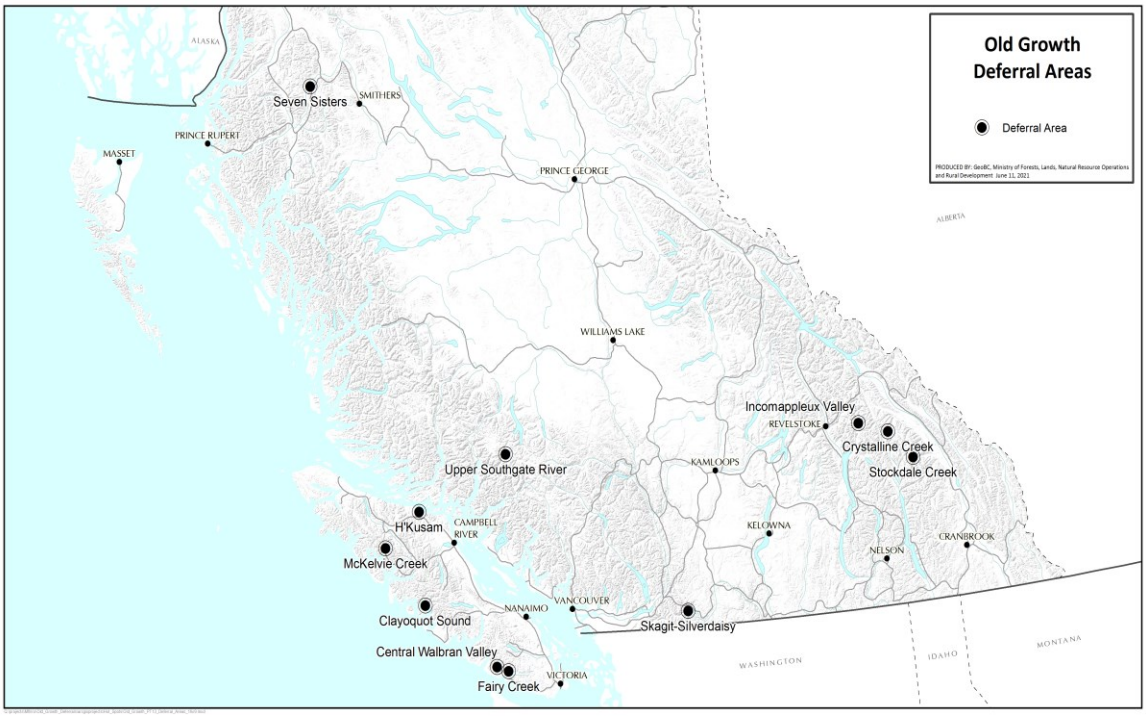

Figure 9. Map of Old Growth Deferral Areas in BC (British Columbia, 2023)

As reforestation is vitally important for the longevity of forest and ecosystem health, Policy Option 3. Phase Out Old Growth Logging seeks to differentiate between Old Growth and Second-growth and lower Allowable Annual Cut allocations. This approach would target areas excluded from deferral and ensure that a specified portion of the AAC is allocated to Second-growth forests, thus reducing the amount of Old Growth logging overtime. This approach would help to balance the need for a viable forest industry with the conservation of Old Growth forests, which are an important component of the ecosystem and have significant cultural, ecological, and economic values such as climate change mitigation, biodiversity conservation and reduce soil degradation.

8.1. Implementation Considerations

Protecting Old Growth forests is not just important for the sake of the environment, but also for future generations. Old Growth forests are a finite resource, and once they're depleted it would take hundreds of years to foster their re-development. While both policy options 1 and 3 would provide increasing support and protections for these forest stands, they will each take considerable time to enact the amount of protections necessary to avoid further destruction. Policy Option 1 is already an active approach but it seeks voluntary deferrals "where a licensee or tenure holder volunteers to avoid harvesting in areas for a period of time" (British Columbia, 2023).

It is important to note that under its current initiative, the current deferral areas approach is a temporary measure to prevent further irreversible damage to Old Growth and its accompanying biodiversity. These deferrals are only for a two year period before requiring re-evaluation, making them a short-term solution while other forest practices and initiatives can be created (Owen, 2022). Therefore a bundled-policy option approach is ideal. Policy option 3: Phase Out Old Growth Logging, would likely require a significant financial investment from the government as well as political and stakeholder acceptance.

Defining and measuring Old Growth and Second-growth forests may spark disagreements among stakeholders, which would necessitate a substantial effort from the government to engage with them, foster consensus, and successfully implement related policies. The provincial government has recently pledged, $25 million towards the new Forest Landscape Planning (FLP) whose directives include creating clear management objectives and outcomes of forest values in defined areas (Watson, 2023). Using these newly defined objectives, the provincial government would need to begin to develop and transition into phasing out Old Growth forest logging practices. The transition to a Second-growth forest industry would likely ease some of the financial burden on the forest industry and promote further development and investment towards building a sustainable sector.

Chapter 9.

Conclusion

Old Growth forests across Canada are under threat. Forest fires, climate change, industry development and deforestation have left much of BC's Old Growth forests at heightened risk. These forests are not only culturally significant for Indigenous peoples, who have relied on them for thousands of years for food, medicine, and materials for traditional practices, but they also have economic value for BC's forestry industry. However, unsustainable logging practices and other human activities have resulted in the loss of much of BC's Old Growth forests, making their conservation crucial for maintaining ecological and cultural integrity, as well as supporting sustainable economic development.

Despite the recommendations provided by Gorley and Merkel's (2020) commissioned study entitled *A New Future for Old Forests*, little action has been done. BC's current method to address Old Growth protections is through the expansion of deferral areas which protect specific plots of land for 2 years. While this program does protect high-risk areas in the short term, it does little to foster long-term protections and aid in the recovery of Second-growth areas. For this reason, through my extensive policy analysis I have proposed the transition towards phasing out Old Growth logging throughout BC. This would allow the provincial government to use the two year deferral timeline to work towards the policy implementation of the transition. To effectively implement this policy, the provincial government should incorporate the ideals of a Community-based management system that includes voices from local residents, Indigenous communities, industry representatives, and environmental organizations.

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