WE CAN'T SEE THE FOREST FOR THE TREES

Exposing the strategic myopia guiding our forest sector for nearly a century

Was the correct decision made in 1945 to adopt the "sustained yield" model of forestry?

Morris, Mike MLA
Prince George- Mackenzie

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Executive Summary

British Columbia's new normal should not be wildfires and widespread flooding threatening the lives and safety of our citizens. It should not be the extirpated wildlife populations or depleted salmon and steelhead runs. It should not be the loss of hundreds of thousands of songbirds every year.

The state of our provincial forests, which has contributed to these destructive forces, is directly related to a strategic myopia that has remained focused solely on a sustainable yield forestry model adopted by British Columbia in 1945. This strategy so focused on wood, that it ignored every other value on the land.

Almost 200 years of commercial timber harvesting and lumber manufacturing has lead us to where we are today, with most of our 52 million hectares of provincial forests being impacted. The rich biodiversity British Columbia has lost will take generations to replace. Some species may never recover.

It was once believed that British Columbia had an inexhaustible supply of mature timber. Today, we are faced with millions of hectares of immature and densely planted monoculture conifer plantations bereft of deciduous growth, bereft of habitat critical to the survival of all wildlife species.

Forestry, until recent times, has been the cornerstone of economic activity in British Columbia, once making double digit contributions to our provincial GDP. Those contributions diminished to 2% in 2018 and are expected to be less than 1% moving forward. The simple reason for this economic decline in forestry is that British Columbia has liquidated our mature timber at an unsustainable rate. We have run out of economically harvestable timber.

There is a solution! The time has come to change a paradigm premised upon a 1945 strategy and incorporate all we have learned in the years since. British Columbia must eliminate our current volume-based model and develop an ecologically-based forest industry lead by a Chief Ecologist rather than a Chief Forester. The forest industry must include the entire forest. It must consider all the values on the land. It must consider the future generations of British Columbians!

We Can't See the Forests for the Trees?

British Columbia covers over 94 million hectares and is Canada's most ecologically diverse province. With 5 million hectares of wetlands, lakes, rivers and streams, over 36 million hectares of alpine meadows, mountains, rock and barren ground and the remainder covered in vegetation, British Columbia can also boast it is the most biologically diverse province, home to more than half of the fish and wildlife species[1] indigenous to Canada. Many species are found nowhere else in Canada, and over 162 species of birds breed only in B.C. In 2007, the B.C. Conservation Data Centre listed 490 species on the provincial red list of species most at risk. The greatest threat to most (86%) species currently listed at risk is loss of habitat due to human activities. A comprehensive report entitled "*Environmental Trends in British Columbia: 2007*"[2] provides a very good review of environmental issues in British Columbia up to that year.

Today, our forest industry is in crisis, our fish and wildlife populations are in serious decline, there is increased pressure on our land base from resource development, and there is increased public use of wilderness areas as the population in our urban centers increases. This discussion paper documents the transition from uncontrolled forest harvesting practices in the 1800's to today's highly regulated regime. Are we experiencing the results that were envisioned after the various royal commissions on forestry? Did legislators understand their decisions would transform British Columbia into a massive conifer plantation forever changing the ecology of the Province?

Figure 1: 2018 Google Earth view of provincial forests just north of Prince George.

[1] https://ibis.geog.ubc.ca/biodiversity/efauna/documents/MammalsofBCChecklist.pdf
[2] https://www2.gov.bc.ca/assets/gov/environment/research-monitoring-and-reporting/reporting/envreportbc/archived-reports/et2007/environmentaltrendsbc_2007_fullreport.pdf

Our Path to Where We Are Today

The first mechanized sawmill was established in 1848 near Victoria followed by several others on Vancouver Island and Burrard Inlet. The Moodyville sawmill, depicted below, was established in 1863, and according to records maintained by the North Vancouver Museum, produced over 100,000 board feet per day until all the timber in the area was depleted and, like other mills, were forced to shut down in 1901.

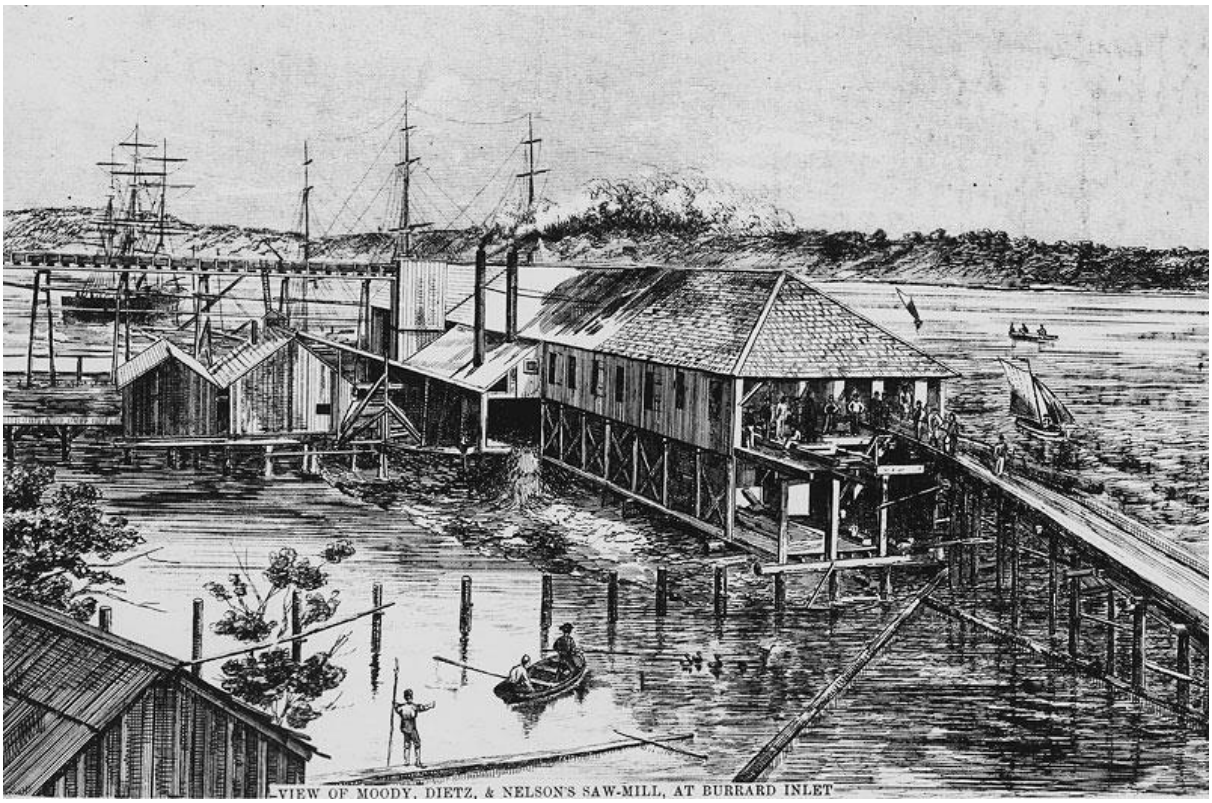

Figure 2 an engraving made from an actual photograph taken in 1897

British Columbia was entrusted with the stewardship of our forests when Canada vested ownership to BC, of all forested lands when we entered Confederation. With few exceptions up to around 1900, all successive governments deliberately retained Crown ownership by issuing licenses and leases over Crown lands to authorize timber extraction. As British Columbia entered the 20th century, logging activity increased exponentially. Around 1904, licenses issued to harvest timber rose at an alarming rate from 1500 to over 15000, resulting in government appointing the first Royal Commission into forest policy[3]. The *Fulton Report 1910* resulted in the first Forest Act in 1912, the beginning of the provincial Forest Service, and a focus on forest management and protection.

[3] https://www.for.gov.bc.ca/hfd/pubs/Docs/Mr/Rc/Rc002/Rc002.pdf

Figure 3 North Vancouver - Frederick Road, circa 1900

In 1943 the second Royal Commission on forestry commenced resulting in the Sloan report "*The Forest Resources of British Columbia 1945*"[4]. The impetus for this Commission was the irregular increase in timber production on private land that had been granted in aid of railway construction on Vancouver Island, and a myriad of leases and licenses issued prior to 1907 on the south coast. Timber harvesting was largely unplanned, leading to industry concerns for future continuity. A major concern for industry at that time was that the licensing and lease arrangements were inadequate in providing a dependable source of logs needed to secure investment. For the first half of the 20th century, logging and forestry activities were primarily confined to Vancouver Island and the south coast with limited logging taking place along transportation corridors into the interior. The take away from this Commission was the origin of the "sustainable yield" policy. Justice Sloan states at page 127 in his report:

> *A sustained-yield policy has, as one objective, the maintenance of forest cover and growth, thus ensuring a perpetual supply of raw material for forest industries with consequent stability of industrial communities and assurance of permanent pay-rolls.*
>
> *A no less important objective is the perpetuation of the forest-cover to assure the continuance of the many direct and indirect benefits which flow therefrom in addition to the mere growing of wood. In my view, however, none of these factors is a necessary or essential ingredient of the definitions to be applied to the term "sustained yield* (my emphasis).

In defining sustained yield, the commission determined the other values on the land were inconsequential to growing and harvesting trees. Other important outcomes from the 1945 Sloan Commission were increased investments in fire protection, intensified

[4] https://www.for.gov.bc.ca/hfd/pubs/Docs/Mr/Rc/Rc003/Rc003.pdf

silviculture and forestry research. A second Royal Commission by Justice Sloan in 1955 focused on administrative changes to forest management as the sustained yield policy continued to evolve.

Until the early 1960's, forest companies were focused on "intermediate utilization", only taking trees considered suitable for making lumber. It was often referred to as "select" logging, and any tree smaller than a 12" diameter at breast height was left standing. The length of time to regrow forests after logging during the first half of the 20th century was considered to be 120 years in the interior, and 80 years on Vancouver Island and the south coast.

With the expansion of the pulp industry in the mid-sixties, forest companies were required to adopt the "close utilization" standard to log all the trees on the block including, for the first time, pine and hemlock which until now, were regarded more as weed trees. Trees unsuitable for saw logs were chipped and sent to the 9 pulp mills that appeared during this period. As a result of the change to close utilization, existing volume based licenses increased by 30% in the interior and doubled on the coast and Vancouver Island.

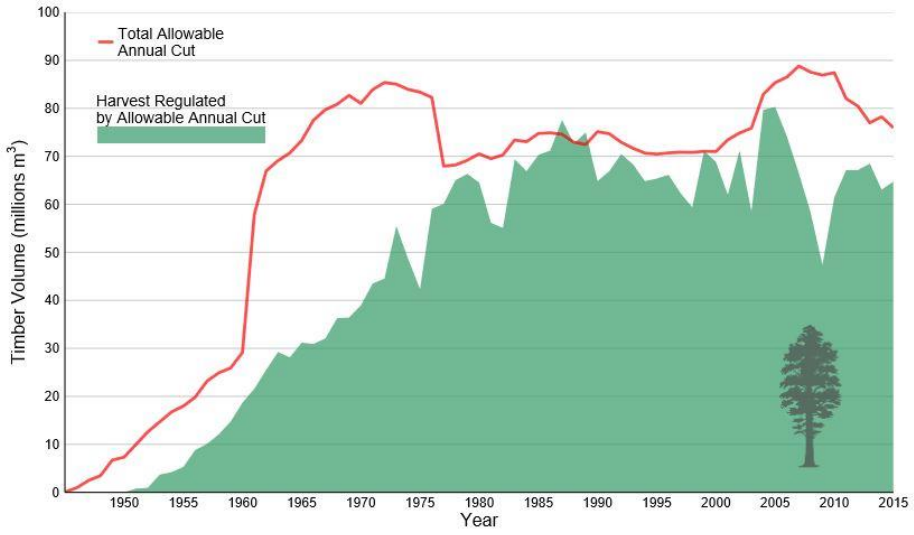

Figure 4 Annual Allowable Cut doubled in early 1960's because of "close utilization" policy[5]

Forestry in British Columbia transitioned through three distinct eras of development from the time of Confederation until approximately 1980. The initial focus was on bringing control to early harvesting and milling while maintaining crown ownership over forested lands. The second stage was expanding access through increased licensing and leasing opportunities, and the third stage was to implement the "sustainable yield" policy.

[5] http://www.env.gov.bc.ca/soe/indicators/land/timber-harvest.html

It wasn't until the next Royal Commission on Forestry in 1976[6] before values other than trees were mentioned in any meaningful way. Commissioner Pearce wrote at page 5:

> "*In short, while forest managers have by no means completed the task begun three decades ago of designing methods of managing the province's forest for continuous timber yields, their most pressing challenge today is to develop effective means of reconciling industrial forestry with other forest uses and social objectives to realize the full range of potential values."*

Pearce also provided his thoughts under the heading "Foreseeable Trends", and I paraphrase these as follows:

1. Harmonizing forest operations and silviculture with the integrity of the natural environment. There is every reason to expect the demands for outdoor recreation, protection of fish and wildlife, and the preservation of the aesthetic quality of the natural landscape to increase.
2. Closing the gap between the rate of harvesting and the sustainable timber supply. Until increased growth can be realized through intensive silviculture, there will be heavy strains on the available timber supply.
3. Making the inevitable adjustment to second growth harvesting. Our strength has been almost entirely in the quality of our virgin timber stock, an advantage that will inexorably decline as the stock is liquidated.
4. Increased governmental and public interest in the pattern of development of the forest industry associated to growing concern for the viability of smaller firms, opportunities for new enterprises, for competition for timber, for the geographic dispersion of economic activity, and for the stability of smaller communities.
5. There will be a growing need for an expert and efficient public forest administration as the forest service had been relegated to administrative surveillance from a distance, and other provincial resources were incapable of providing adequate assistance in coping with the impacts of forestry on resource use other than forestry.

What followed over the next twenty years was a series of legislative and policy changes that can best be described as voluntary guidelines to support multiple forest use practices. The public became more and more disenchanted with the impacts to the environment and the "war in the woods" escalated. Attempts were made to mesh land use planning with the annual allowable cut determination but the process became bogged down and very few determinations were made.

In the early 1990's, government conducted a review of harvest regulations and determined that timber supply analyses were not keeping pace with the changes to integrated forest management objectives. In his address to the UBC Faculty of Forestry in 2003, the Chief Forester for the province stated:

[6] https://ojs.library.ubc.ca/index.php/bcstudies/article/download/1010/1048/

> *"…before the Timber Supply Review, AAC's were calculated using Hanzlik's formula and area-volume allotment checks. In this era it was assumed that most, if not all, the forest land in a unit would be available for timber-harvesting, and timber supply was calculated over one rotation only.* ***Such recent notions as protected areas, biodiversity, riparian areas, and wildlife habitats were not factored into these AAC's."*** (My emphasis)

The first Timber Supply Review in BC took place in 1992, well over 100 years after timber harvesting began. (The first wood exported out of BC dates back to the 1780's). Based on the Chief Forester's comments, protected areas, biodiversity, riparian areas, and wildlife habitats were never considered in determining how much forest was harvested until well into the late 1990's. Between 1912 (first recorded harvest levels) and 1990, over 2.8 billion cubic meters of timber was harvested[7]. Considering that timber harvesting had already been taking place for 100 years or more prior to 1912, one can assume the total harvest to be in excess of 3 billion cubic meters. This equates to an estimated 10 to 15 million hectares of land disturbed by logging activity up to the 1990's, with no considerations to other values on the land. Much of the area logged is now metro Vancouver, the Capital regional district and the vast productive farm land we see in the lower mainland and southern Vancouver Island.

Most of the harvest during the last century however, has occurred since 1960. As I referenced above, up until the late '50's early '60's, harvest practices only targeted timber suitable for sawmilling – anything less than 12" diameter at breast height was left. Pine and hemlock were considered weed species and were for the most part, left standing. Between 1955 and 1990 records indicate that just over 2 billion cubic meters were harvested from 6.6 million hectares (estimated at 300m^3 per hectare). 6.6 million hectares of clear cut logging was done with little or no consideration to wildlife, riparian areas or any other values on the land.

As we entered the 1990's, increased environmental concerns over logging practices resulted in the implementation of strict legislation under the Forest Practices Code[8], with a new policy focus on "sustainable forest management". This legislation was described as "the epitome of command and control legislation" by some critics, and was widely criticized for being overly prescriptive, stifling to innovation, and exacting high transactional costs on industry[9]. It was relatively short lived legislation, being replaced by the Forest and Range Practices Act (FRPA) in 2004.

Continuing with the "sustainable forest management" policy direction, from 1990 until 2015, 1.8 billion m^3 was harvested in British Columbia resulting in 6 million hectares of clear cut logging (estimated at 300m^3 per hectare). Total hectares logged in British Columbia over the past one hundred years is approximately 20 million hectares. This

[7] https://catalogue.data.gov.bc.ca/dataset/indicator-summary-data-trends-in-timber-harvesting-in-bc/resource/d62e461d-50b5-497c-af7c-fb143cda581f
[8] https://www.for.gov.bc.ca/hfp/publications/00222/
[9] https://open.library.ubc.ca/media/download/pdf/24/1.0075357/1

total does not include hectares logged under Tree Farm Licenses, Wood Lot Licenses, Community Forests or private wood lots. It also does not factor in any forests disturbed by forest fires (3,704,851 hectares since 1990),[10] any of the 700,000 kilometers of resource roads constructed across the province, or the thousands of hectares consumed by several large hydro reservoirs developed throughout the 20th century.

The Timber Supply Reviews that commenced in the late 1990's determined the Timber Harvesting Land Base (THLB) in BC to be 22 million hectares. Today, in 2020, based on harvest levels, 90% of the THLB has already been logged at least once. Excluding any of the THLB in remote locations in the northeast and northwest parts of the province, one can reasonably conclude that most of the THLB in the rest of the province has been harvested. Readers can link directly to this website https://earthengine.google.com/timelapse/ to see the extent of clear cut logging in British Columbia from 1984 until 2018, simply by typing a BC location into the query box in the top left corner.

A significant factor overlooked for well over a century, was the hydrological changes resulting from forest cover removal. The interception of rain/snow, evaporation rates and absorption rates of mature timber were never taken into consideration: hundreds of thousands of liters of water absorbed by mature forests on a daily basis. It wasn't until the 1990's that British Columbia adopted a method referred to as the "Equivalent Clear-cut Area" or "ECA" to determine the hydrological effects of logging. In a document[11] dated January 2017, it states on page 2;

> *(B.C. Ministry of Forests 1992) set ECA thresholds of 20% in community watersheds, 25% in fisheries- sensitive watershed, and 30% in all other watersheds."*

There are numerous watersheds across the province where the ECA values have exceeded 50% and greater, leading to rapid snow melting and downstream flooding. The lack of forest cover has also lead to increased temperatures on the land accompanied by the inability of the land in many cases, to retain moisture.

Although some reforestation began in the 1930's, British Columbia relied mostly upon natural regeneration until the rapid rise in harvest in the 1950's and 60's. By the 1970's, despite ongoing replanting efforts, significant portions of the province were designated as "not sufficiently restocked". Federal and provincial programs initiated an aggressive replanting program[12], planting millions of trees. Lodgepole pine was the species of choice to plant because it was a faster growing tree, becoming harvestable after 60 years. In order to enhance growth and yield, the province increased the density of new

[10] https://cfs.nrcan.gc.ca/statsprofile/disturbance/bc
[11] https://www.for.gov.bc.ca/hfd/pubs/docs/en/EN118.pdf
[12] https://www.for.gov.bc.ca/hfd/pubs/Docs/Misc/Misc094.pdf

forests by planting 1000 to 2500 trees per hectare, far greater than the average mature forest of between 100 and 300 trees per hectare.

With the primary focus on growth and yield, major changes to biodiversity have taken place at the landscape level. The following paragraph is quoted from a "Compendium of Environmental and Resource Information" on the Royal BC Museums website[13]

> "It is important to recognize that terms such as "reforestation" and "forest renewal" do not equate to restoration of natural forest, with all of their structural and biological attributes. Replanting selected species and harvesting at rotations of 60 (lodgepole pine) and 80 (other coniferous forest) years cannot allow the renewal of habitats required by old-growth dependent species, nor is it enough time for more slowly dispersing species, such as some plants, fungi and insects, to recolonize the harvested area. Once timber has been harvested by clear cutting, the land replanted, and harvested again in currently planned rotations, the natural forest and some of its non-timber values are lost forever. For this reason, modern industrial forestry cannot be considered "sustainable" in the sense of maintaining all options for future generations, even though timber harvest, per se, is sustainable."

Commencing in the late 1990's, the most recent mountain pine beetle infestation affected over 18 million hectares – an area five times the size of Vancouver Island, and killed over 50% of the volume of harvestable lodgepole pine in the province. Although the pine beetles were initially attracted to mature growth, once these were gone they attacked younger stands, killing thousands of hectares of immature stands planted in the 70's and 80's. The central interior areas of the province saw significant increases in harvest levels to process dead pine before it deteriorated.

Over the past century there were many incidents of spruce beetle outbreaks, one of the most significant in the 1970's occurring in the Bowron River area near Prince George affecting over 175,000 hectares (over 2/3 the size of the Greater Vancouver Regional District) and killing 60% of the mature spruce trees. Over 5 million m^3 of timber was harvested resulting in a massive clear cut that could be seen from outer space. Currently, the Omineca region in the central interior of the province has seen nearly 1 million hectares (4 times the size of the GVRD) of mature spruce killed by spruce beetle since 2015.

Over 3.5 million hectares of BC forests have been consumed by wildfires since the 1990's, much of these fires destroying young plantations. The densities of forest plantations have contributed to the intensity of these fires in many respects. In examining other jurisdictions outside of Canada experiencing increased incidence of wildfires, many identified the increased forest densities as a major contributing factor. San Bernardino County[14] is one such area taking aggressive steps to thin forests that

[13] https://royalbcmuseum.bc.ca/exhibits/living-landscapes/cbasin/history/reforestation.htm
[14] http://www.sbcounty.gov/calmast/sbc/html/healthy_forest.asp

have increased over time because of forestry practices and lack of controlled burning. They are also re-establishing indigenous deciduous growth – broadleaf trees that may have no commercial value as sawtimber -- to mitigate the spread of wildfires.

Considering Other Values On The Land…….Or Not?

The focus on forestry for well over 150 years has been exclusively on expanding the industry and harvesting trees with little to no attention to other values on the land until the late 1990's. With the coming into force of FRPA in 2004, forest companies were required to submit forest stewardship plans that addressed specified objectives set by government[15]. These legislated objectives were to address soils, visual quality, timber, forage, water, fish, wildlife, biodiversity, resource features and cultural heritage resources.

Accompanying FRPA were the Forest Planning and Practices Regulations defining the objectives set by government that were required to be included in all Forest Stewardship Plans. The following sections (with my emphasis) are from these regulations, and list the government's environmental objectives;

> 5 The objectives set by government for soils is, **without unduly reducing the supply of timber from British Columbia's forests,** to conserve the productivity and the hydrologic function of soils.
>
> 7.1 The objectives set by government for wildlife is, **without unduly reducing the supply of timber from British Columbia's forest,** to conserve sufficient wildlife habitat in terms of amount of area, distribution of areas and attributes of those areas, for
>
> (a) the survival of species at risk,
>
> (b) the survival of regionally important wildlife[16], and
>
> (c) the winter survival of specified ungulate species.
>
> 8 The objectives set by government for water, fish, wildlife and biodiversity within riparian areas is, **without unduly reducing the supply of timber from British Columbia's forests,** to conserve, at the landscape level, the water quality, fish habitat, wildlife habitat and biodiversity associated with those riparian areas.
>
> 9 The objectives set by government for wildlife and biodiversity at the landscape level is, **without unduly reducing the supply of timber from British Columbia's forests** and to the extent practicable, to design areas on which timber harvesting is to be carried out that resemble, both spatially and temporally, the patterns of natural disturbance that occur within the landscape.

[15] Section 5(2) Forest and Range Practices Act

[16] To date, the Province has not defined what Regionally Important Wildlife is.

> 9.1 the objectives set by government for wildlife and biodiversity at the stand level is, **without unduly reducing the supply of timber from British Columbia's forests,** to retain wildlife trees.

It becomes abundantly clear that harvesting timber is still a priority objective for the province by virtue of the phrase "without unduly reducing the supply of timber from British Columbia's forests". A thesis written by a UBC masters student in 2011 "A Preliminary Evaluation of the Results Based Forest and Range Practices Act"[17] provides some metrics with respect to this issue. At page 36;

> "Most of the objectives set within FRPA and enabled by FRPA are constrained by a requirement to not "unduly reduce the supply of timber from British Columbia's forests." The FRPA legislation does not define what it means to "unduly reduce the supply of timber" nor has this been subsequently interpreted or defined by the Courts. According to Reader (2006), the inclusion of this clause in each objective effectively compels tenure holders who are preparing Forest Stewardship Plans to identify results and strategies that minimize impacts to timber supply. In addition, the forest practices standards that are provided as default practices in the FRPA framework were originally designed under the FPC based on an assumption that they would not exceed 6% impact to provincial timber supply levels (MoF, 1996). Standards for wildlife habitat retention and old growth forest retention specifically are based on estimated maximum timber supply impact targets of 1% and 2.3% respectively (MoF, 1996; MoF 2006)."

Readers may find it beneficial to read the entire thesis for background and content. It appears that government made the decision in 1996, that only 1% retention of wildlife habitat and 2.3% of old growth forest was necessary for maintenance and preservation of biodiversity. This determination was also recognized in 2013 "An Audit of Biodiversity in BC"[18] where on page 13 the Auditor General states;

> "Under the *Forest and Range Practices Act,* the minister can list endangered, threatened, or vulnerable vertebrate and invertebrate species and endangered or threatened plants and plant communities that might be negatively affected by forest or range management on Crown land. To Date 85 species and plant communities have been identified. Government's objective for these species is "to conserve sufficient wildlife habitat" but "without unduly reducing the supply of timber from British Columbia's forests". So, for example, government limits the amount of area that can be designated as wildlife habitat to 1 percent impact on the provincial land base for forest and range activities. We found no scientific rationale for this policy."

It appears that forest legislation and policy has been purposefully designed to provide significant flexibility in granting forest companies access to timber.

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[17] https://open.library.ubc.ca/collections/ubctheses/24/items/1.0075357

[18] https://www.bcauditor.com/pubs/2013/report10/audit-biodiversity-bc-assessing-effectiveness-key-tools

An Incomplete View of Sustainability?

Since the early 1990's, British Columbian forest companies have aggressively pursued forest management certification, and now claim they are certified as having the most sustainably managed forests in the world. A recent year-end status report for 2018 [19] published by the Forest Products Association of Canada, claims that forest companies in British Columbia have over 50 million hectares of forests certified as sustainably managed. This certification is administered by three certification bodies, Canadian Standards Association (CSA), the Forest Stewardship Council (FSC) and the Sustainable Forestry Initiative (SFI). The report indicates that SFI alone has certified nearly 30 million hectares. These are interesting numbers because the province, as confirmed by the chief forester, has only 22 million hectares in the timber harvest land base.

One can read about sustainable forest certification in Canada at this website[20], and after reviewing each of the three certification entities, each pretty much share similar criteria. Basically, forest companies (supported by these entities) define sustainable as growing and harvesting trees, period! One common thread amongst all three programs is to ensure forest companies are in compliance with all applicable federal, provincial and regional or municipal laws. One very significant area of law that appears to have been purposefully overlooked or avoided is the disturbance of nests or eggs. Under Canada's Migratory Bird Convention Act and applicable regulations, it is an offence to disturb or destroy a nest or eggs.[21]

> **6** Subject to subsection 5(9), no person shall
>
> **(a)** disturb, destroy or take a nest, egg, nest shelter, eider duck shelter or duck box of a migratory bird, or
>
> **(b)** have in his possession a live migratory bird, or a carcass, skin, nest or egg of a migratory bird except under authority of a permit therefor.

Under the BC Wildlife Act[22];

> **Birds, nests and eggs**
> **34** A person commits an offence if the person, except as provided by regulation, possesses, takes, injures, molests or destroys
> (a) a bird or its egg,

[19] http://certificationcanada.org/wp-content/uploads/2019/02/2018-Yearend-SFM-Certification-Detailed-Report-BC.pdf
[20] https://www.nrcan.gc.ca/our-natural-resources/forests-forestry/sustainable-forest-management/forest-certification-canada/17474
[21] https://laws.justice.gc.ca/eng/regulations/C.R.C.,_c._1035/page-3.html#docCont
[22] http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_96488_01#section34

(b) the nest of an eagle, peregrine falcon, gyrfalcon, osprey, heron or burrowing owl, or
(c) the nest of a bird not referred to in paragraph (b) when the nest is occupied by a bird or its egg.

These particular sections are strictly enforced in the development of mining, oil and gas, hydro, pipeline and associated right-of-way and other construction projects in and around the province, but are entirely overlooked in all aspects of forest harvesting.

A paper published in 2013 "An Estimate of Nest Loss in Canada Due to Industrial Forestry Operations"[23] examined the impact on birds from industrial forest harvesting across Canada. The researchers found the data available in British Columbia was extensive, and examined BC separately from the rest of Canada. Using the BC harvest billing system (HBS), they were able to extrapolate the volume harvested during the bird breeding season, and conclusions based on their modeling determined that over 400,000 nests are lost to logging in BC on an annual basis, preventing over 300,000 birds from entering the adult population each year.

During the time birds are nesting and breeding, mammals from mice to moose are giving birth and raising their young. Nesting and denning sites are lined with grasses, leaves and other plant matter. There are over 65 species of BC wildlife that use tree cavities for denning and nesting purposes. Considering that most tree cavities don't start developing until a tree is 75 to 100 years old, rotations under this age will eliminate these species from BC forests.
Forest silviculture practices began spraying glyphosate herbicide in the early 1980's and have sprayed hundreds of thousands of hectares across the province, with nearly a third of that applied in the Prince George Timber Supply Area, eliminating the grasses, leaves, berries and seeds so many mammals depend on for survival. These are all factors taken into consideration in the environmental approval stages of every resource development project other than forestry.

A recent study from 2018[24] "Moose population dynamics during 20 years of declining harvest in British Columbia" indicates licensed harvest of moose declined by 50% from 1996 to 2015. The study indicated that moose populations declined in 7 game management zones by 23% between 1996 and 2005, and 71% from 2005 until 2015 in 22 game management zones, most declines occurring in Omineca and central interior of the province.

[23] https://pdfs.semanticscholar.org/abcd/06b0095b8a298f039671940a01ff9dcdcd07.pdf
[24] https://alcesjournal.org/index.php/alces/article/view/240

In October 2019, Dr. Jeff Werner, a BC government biologist presented "The Abundance of Scarcity: Landscape Change, Protein Limitation, and Moose Population Dynamics in North-Central BC." at the University of Northern BC. His presentation[25] can be viewed in the link attached to the footnote. His research indicates that moose in his study area are starving to death because of the lack of protein in their food supply. The reduced plant protein (in the plant species preferred for browsing) is believed to be caused by over-exposure to sunlight stemming from large clear cuts. This research follows a recent moose collaring project to determine the cause of moose mortality in three locations in the interior where starvation was found to be a major factor.

Ungulate populations (moose, mule deer, caribou, etc.), fur bearers, birds and fish populations (steelhead, salmon) have decreased significantly across the province over the past twenty years. As noted above, ungulate starvation is a major contributing factor as are predators, but the overarching factor behind all species declines is the loss of habitat.

Does Biodiversity Have An Extrinsic Value?

According to the Chief Forester[26], many factors are considered in determining provincial timber harvest levels. Economic considerations and other values on the land, supposedly play a significant role. However, the "valuation" of the "other values on the land", has never been undertaken. There was an interesting case[27] where the Province was attempting to claim damages to biodiversity from a forest fire, which went to the Supreme Court of Canada in 2004. The Province, in its factum to the court, presented some areas of consideration for valuating biodiversity. At paragraph 141:

- The nature of the wildlife, plants and other organisms protected by the environmental resource in question, and in particular whether rare or commercially valuable species are put at risk by damage or destruction of the ecosystem.
- The uniqueness of the ecosystem from a biological perspective.
- The environmental services provided by the resource, such as water quality and erosion control
- The recreational opportunities afforded by the resource.

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25 https://video.unbc.ca/media/The+abundance+of+scarcityA+landscape+change%2C+protein+limitation%2C+and+moose+population+dynamics+in+north-central+BC.+Dr.+Jeff+Werner%2C+BC+Ministry+of+Forests%2C+Lands%2C+Natural+Resource+Operations%2C+and+Rural+Development+-+October+18+2019/0_pbu2wpdw/19801

26 https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/silviculture/timbergoalsobjectives2017apr05_revised.pdf

27 https://scc-csc.lexum.com/scc-csc/scc-csc/en/item/2152/index.do

- The subjective or emotional attachment of the public to the damaged or destroyed area,

Since this court decision, there has been no progress on valuating these considerations, which quite frankly, represent but a fraction of the true value of biodiversity. If one were to consider the protein value of all the ungulates, fish and fowl on the land and the fact this protein is renewable every year, the extrinsic value of fruits, mushrooms and other edible plants on the landscape – again, with new production on an annual basis as well as the intrinsic considerations presented to the court, a different vision for our landscape would surely emerge.

Can Our Conifer Industry Ever Be Competitive On The World Stage?

The forest sector has for many years now, raised concerns over its inability to compete in the world market, citing lack of certainty on the land base to secure investment, timber pricing systems, tax structure and government legislation and policies as contributing factors. Industry has done its part over the years to become more competitive through innovation and technology in logging larger volumes more quickly and efficiently, moving from 5 axle logging trucks to 9 and 10 axle trucks, and developing increasingly automated manufacturing systems that produce dimension lumber and other products at a faster and more productive rate. These increases in efficiencies are believed to be responsible for a reduction of 45,000 jobs in the forest sector over the past 15 years, with virtually no decrease in output. An editorial from the 2017 fall edition of the BC Truck Loggers Association magazine explains this quite well, separating the data into job losses associated to logging, pulp and paper, forestry support and wood product manufacturing[28].

[28] https://www.tla.ca/wp-content/uploads/2019/09/2017fall_truckloggerbc_settingtherecord_tlaeditorial.pdf

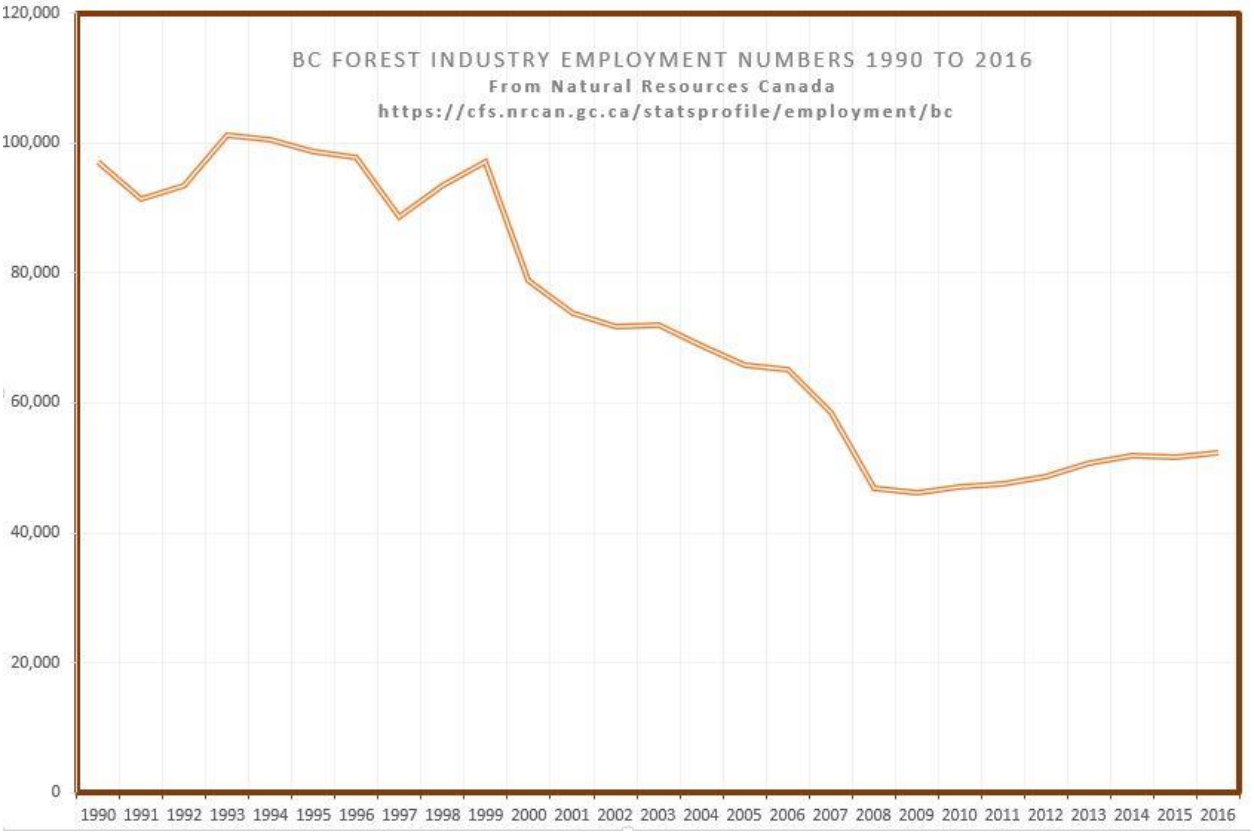

Figure 5 decrease in forestry and forest related jobs since 1990

British Columbia adopted the lodgepole pine as the conifer species of choice in the 1970's because of its ability to reach harvest maturity in around 60 years. According to information published by the US Forest Service[29], the state of Georgia grows pines to harvest levels within 14 years and in Florida, within 20 years. Collectively, the southern United States has over 13 million hectares of intensely managed pine plantations, a factor that has not gone unnoticed by BC-based forest products companies, which have migrated to these areas and purchased numerous existing mills and upgraded them with proven technology from BC. In addition to the southern United States, there are numerous other jurisdictions that can harvest pine in less than 25 year cycles, particularly in the global South (Chile, New Zealand, etc.).

Is It Time For A "Complete" Forest Strategy?

I return to the Pearce report[30] from the 1976 Royal Commission on Forest Resources where Commissioner Pearce states on page 6;

[29] https://www.srs.fs.usda.gov/pubs/gtr/gtr_srs075/gtr_srs075-fox002.pdf

[30] Ibid – Timber Rights and Forest Policy in British Columbia, report of the Royal Commission on Forest Resources

> "*The old-growth timber on which our industry has been built was often of exceptionally high quality, capable of manufacture into products that command premium prices in world markets. As this stock is depleted (and it is appropriate to refer to it as stock, since it is not reproducible within any meaningful planning horizon), much of the special advantage this province's timber has enjoyed will be lost."*

Perhaps we reached that point several decades ago – where we lost our competitive advantage because we depleted our "stock" of high quality old growth timber. Did the Royal Commission in 1945 envision the "sustainable yield" policy as transforming 22 million hectares of forests into commercial forests (referred to as "working forests" by industry) focused on yield and growth only, with no considerations for the other values on the land? Did they envision an automated forest industry employing a fraction of the population that it once did, and a forest industry taking profits from harvesting British Columbia's forests and investing in competing jurisdictions?

British Columbia is different than other jurisdictions, geographically, bio-climatically, ecologically and demographically. Another major difference that separates us from most jurisdictions around the world is that BC has retained crown ownership of 92% of its land base.

Had Justice Sloan[31] determined in 1945, that the "*perpetuation of forest-cover to assure the continuance of the many direct and indirect benefits which flow therefrom in addition to the mere growing of wood"* was an essential ingredient in the definition of "sustained yield", would we be facing the dire consequences we are facing today? Is wall to wall manicured tree farms what the Sloan Commission had in mind in 1945, or what the successive Hart, Johnson, and Bennett governments envisioned when implementing the sustained yield policy?" If they did, it is now clear that this policy no longer fits the biodiversity, watershed, wildlife, fire protection, and climate change priorities of the 21st century. Such a vision certainly doesn't match the tourism marketing brand of "Supernatural British Columbia."

A bold new strategy recognizing the entire forest, not just the trees, is required to sustain our province into the future. Is an "ecologically focused" public control of forests, a strategy out of reach?

[31] Ibid – 1945 Royal Commission Report

A Bold New Strategy – Ecologically Focused Forest Management

Over the past century, the strategic myopia on the growth and yield of BC forests, has produced catastrophic results to BC's ecological footprint. The depletion of harvestable timber has changed the dynamics of our province's economy, where forestry is no longer the mainstay of our resource economy and now contributes less than 2% to our provincial GDP. This is expected to shrink even more over the coming years. Forestry in British Columbia has negatively impacted our ecology more than all other resource sectors combined, and our practices of replanting dense conifer stands and eliminating aspen and broadleaf understory has destroyed vital habitat necessary for indigenous flora and fauna as well as decreasing the forests natural ability to resist wildfires. We lost sight of the fact that we only have one forest for all values, not individual forests for each value. This myopic view has, for the last century, focused on the mere value of wood while ignoring the greater values in our forests.

Aldo Leopold[32] said this in his book "A Sand County Almanac", first published in 1949;

> *"a system of conservation based solely on economic self-interest is hopelessly lopsided. It tends to ignore, and thus eventually to eliminate, many elements in the land community that lack commercial value, but that are (as far as we know) essential to its healthy functioning. It assumes falsely, I think, that the economic parts of the biotic clock will function without the uneconomic parts. It tends to relegate to government many functions eventually too large, too complex, or too widely dispersed to be performed by* government*"*

I think science has evolved significantly since the period in which Leopold wrote this and we can now confidently remove "as far as we know" from his message. A guiding principle we should instead, be focused on, is that "the parts affect the whole, and the whole affect the parts".

The ecology of British Columbia is not conducive to growing trees in 60 year cycles. Research indicates that it takes 150 to 250 years for a forest to recover after harvesting. The vast majority of our forests have been harvested over the past 70

[32] Aldo Leopold, Author, Philosopher, Forester, Ecologist, Conservationist 1887-1948

years, most within the last 40 years. In order to restore and preserve British Columbia's ecological wealth, we need to stop making the mistakes that have created the need for restoration.

A positive legacy, held steadfast since confederation, has been the public retention of most of British Columbia's land base. This is the foundation that the government of British Columbia, entrusted to keep and maintain our ecological resources in perpetuity, must build upon. After learning from, and experiencing, 75 years of results under the "sustained yield" policy and its more recent renditions of "sustainable forest management", the time has come to focus on a broader, ecologically based, complete forest management strategy.

Recommendations to Achieve Ecologically Focused Public Control of BC Forests

The following elements would be necessary to ensure that the ecological integrity of our forests becomes our first priority;

1. The creation of one ministry to provide a holistic approach to ecology and biodiversity in the management of sustainable resource development.
2. Create a single statute that addresses sustainable resource development thru an ecological lens while recognizing all the biodiversity values on the land base.
3. Establish a provincial "Chief Ecologist" rather than a "Chief Forester"
4. Eliminate the volume-based tenure system and introduce practices that focus on forest health, climate change and ecosystem restoration as the basis for harvest determinations.
5. Establish community-based forest councils who would play an integral role in landscape level planning for resource development.
6. Capture the intrinsic and extrinsic value of biodiversity to establish revenue streams for government.

The time for transition is now. The depletion of harvestable fiber will take decades to regenerate leading to further unavoidable closures of mills and processing facilities. At the same time, opportunities for further diversification of our resource sector such

as a new petro-chemical industry, increased mining opportunities and wilderness tourism will fill the employment and economic gap forestry leaves behind.

Because the greater population resides in an urban environment, the majority of the British Columbian public is not yet fully aware of the impacts of current forest policies and practices on biodiversity. The conversion of our natural forests to managed plantations of densely planted monoculture conifers bereft of deciduous growth and wildlife, has for the most part, gone unnoticed. The public is demanding an environment that is natural, providing clean air and clean water along with robust fish and wildlife populations and natural vegetation. A natural forest, managed from an ecological perspective will provide greater value and benefits to British Columbia and world visitors for centuries to come.