State of British Columbia's Coastal Rainforest

Mapping the Gaps for Ecological Health and Climate Protection

Sierra Club BC

December 2009

Photos on the cover

Starting from top left, clock wise:

1. Koksilah Douglas Firs, photo TJ Watt
2. Walbran stump, photo TJ Watt
3. Walbran stump, photo Jeremy Williams
4. Tolkien Cedar, photo TJ Watt
5. Nahmint hillside, photo TJ Watt
6. Maxine's tree, photo TJ Watt
7. Walbran stump, photo Jeremy Williams
8. Walbran clearcut, photo TJ Watt

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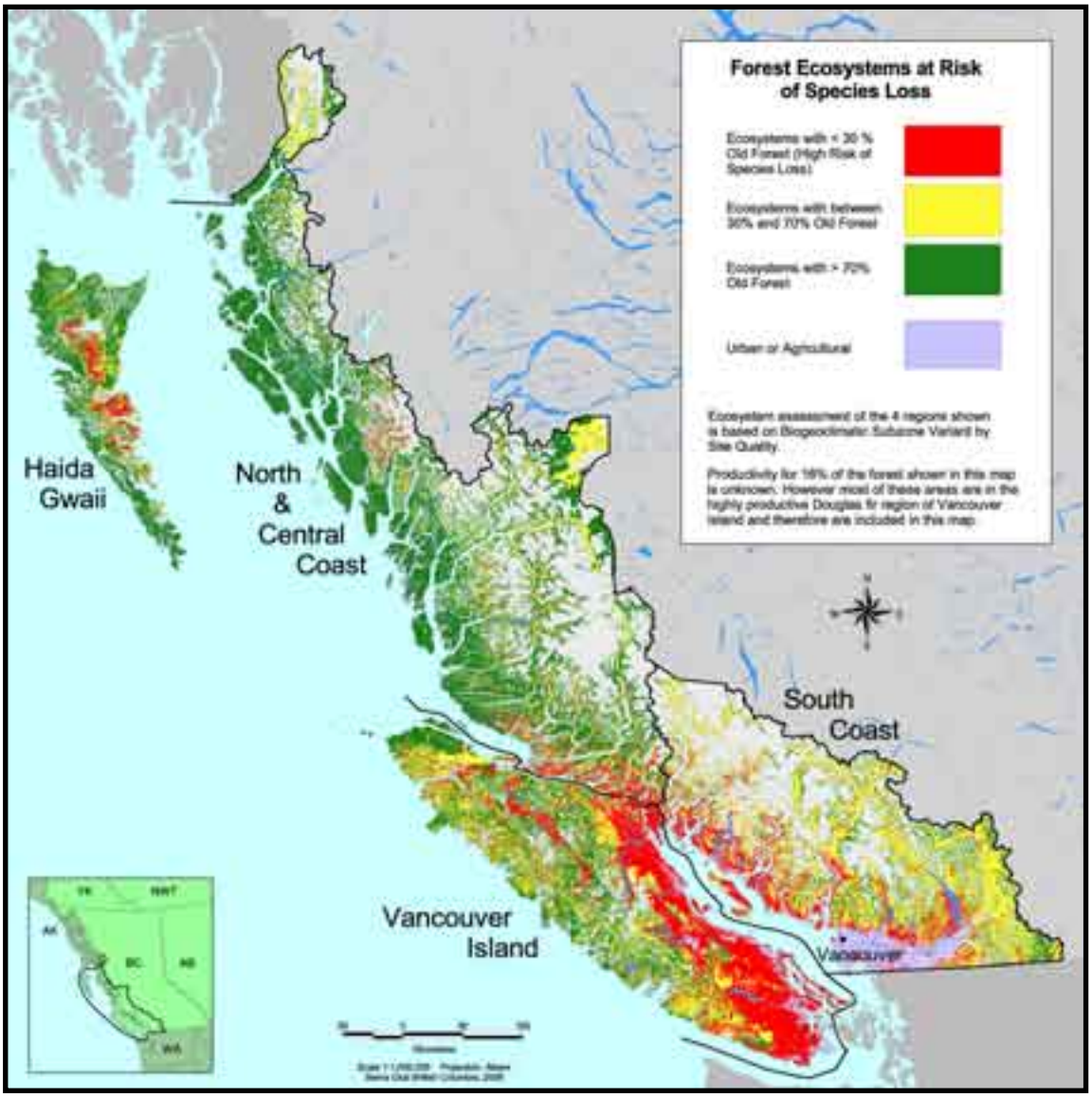
Map 1 – Remaining old growth rainforest and logged areas/second growth along British Columbia's Pacific Coast

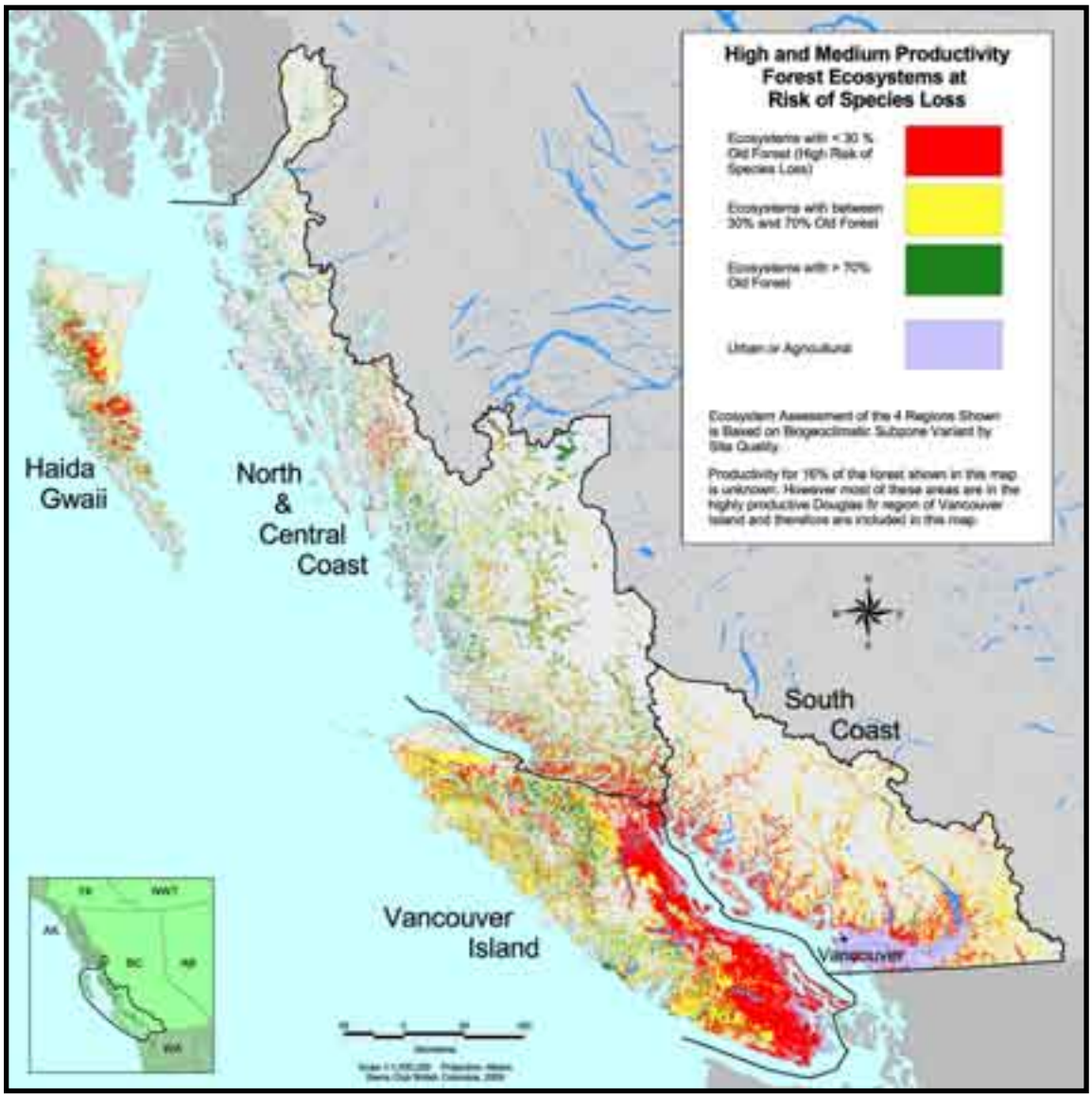


Map 2 – Forest Ecosystems at Risk of Species Loss

Map 2 – Forest Ecosystems at Risk of Species Loss – shows in red the extent of coastal rainforest ecosystems[1] that are below a critical limit of remaining old forest (less than 30 percent of the area covered by this ecosystem). This threshold has been identified as critical to avoid a high risk of species loss. Rainforest ecosystems that have between 30 and 70 percent of old forest left are shown in yellow: this corresponds to some level of risk for a number of species. Ecosystems that have above 70 percent of old forest (i.e. relatively close to the natural level of old growth for most types of coastal temperate rainforest, with no significant risk of species loss) are shown in green. The forest ecosystems in these maps are assessed as Biogeoclimatic Subzone Variant by site quality.[2] The percentages of remaining old forest for the different ecosystems are given for each of the four sub-regions shown in the map (Haida Gwaii, North and Central Coast, Vancouver Island and South Coast).

1 These maps show how much old growth remains in groups of ecosystems defined by using a combination of site productivity and climatic units (Biogeoclimatic Ecosystem Classification - BEC – variant, see footnote 2). Despite the fact that we refer to forest ecosystems in this report, the unit of analysis is not an ecosystem (which is defined by a unique combination of soils/productivity, species, and climate), but a group of ecosystems that share the same climate conditions and site productivity class. We did not have the data to complete a coast-wide analysis on a finer scale, but our analysis does capture the main trends and highlights areas where ecosystems are most at risk. It is important to note that within the Great Bear Rainforest (North and Central Coast), legal requirements for old growth representation apply representation targets by ecosystem unit (site series or surrogate). The maps in this report were developed to show trends, not for the purpose of implementing logging regulations, which would require a finer scale of analysis.

2 A biogeoclimatic zone is a geographic area with similar patterns of energy flow, vegetation, and soils as a result of a broadly homogeneous macroclimate. A biogeoclimatic variant is a subdivision of a biogeoclimatic subzone. Variants reflect further differences in regional climate and are generally recognized for areas slightly drier, wetter, snowier, warmer, or colder than other areas in the subzone. http://www.for.gov.bc.ca/hfd/library/documents/glossary/Glossary.pdf



Map 3 – Good and Medium Productivity Forest Ecosystems at Risk of Species Loss – illustrates the fact that most of the coastal rainforest ecosystems that are below a critical limit of remaining old forest (less than 30 percent) are good and medium productivity forests that are disproportionately targeted by logging.

Glossary of Terms

Biogeoclimatic zone/variant: A biogeoclimatic zone is a geographic area with similar patterns of energy flow, vegetation, and soils as a result of a broadly homogeneous macroclimate. A biogeoclimatic variant is a subdivision of a biogeoclimatic subzone. Variants reflect further differences in regional climate and are generally recognized for areas slightly drier, wetter, snowier, warmer, or colder than other areas in the subzone.

Ecosystem: a community of living organisms in a particular geographical area, defined by a unique combination of soils/productivity, species, and climate

Ecosystem services or environmental services: benefits to human life and economy that are provided by functioning ecosystems (such as clean water, air, abundant fish populations etc.)

Old forest or old growth forest: The definition most commonly used for these ecosystems puts the threshold at 250 years. However, for the purpose of this report we use 140 years as a cut-off point because forests over 140 years in age regenerated naturally (rather than from industrial forestry, which started more recently on the vast majority of the coast).

Good productivity forest: Good productivity forest ecosystems tend to produce the largest stature forests, with fast-growing trees and many large-girth and tall trees. Often associated with nutrient rich sites such as floodplains, areas that can grow trees like this tend to be relatively rare over the coastal landscape.

Medium productivity forest: Medium productivity sites usually grow trees more slowly but depending on conditions can also grow very large and very old trees. These sites are often located on steeper slope situations and are found commonly across the coastal landscape.

Poor productivity forest: Poor productivity systems are often moisture-saturated with poor nutrient levels so have slow growth and limited total tree sizes. Trees tend to be small in stature, often dominated by stunted, but very old cedar.

Key findings

BC's coastal rainforests are places of stunning biological richness and store massive amounts of carbon that are a key asset in the fight against climate change. This analysis by the Sierra Club BC mapping department shows how decades of industrial logging have led to a significant decline in the amount of old-growth coverage in coastal rainforest ecosystems, seriously compromising species habitat and carbon storage capacity.

Ancient Douglas Fir, Francis King Regional Park. On Vancouver Island the Coastal Douglas Fir ecosystem has a total average of 1.2 percent oldforest remaining today.

- A minimum of 30 percent of old-growth coverage per ecosystem is needed to avert a high risk of species extinction for coastal temperate rainforests.
- More than two million hectares of rainforest ecosystems on BC's coast, mostly on Vancouver Island and in the South Coast, are now below the critical limit needed to sustain species.
- Vancouver Island has lost one million hectares of good and medium productivity old growth rainforest, representing the loss of approximately 100 million tonnes of carbon storage.
- Emissions from logging are a major contributor to BC's greenhouse gas emissions. Logging on Vancouver Island alone has resulted in the addition of around 370 million tonnes of carbon dioxide to the atmosphere over time, more than five times the official annual emissions of British Columbia.

This report also points to steps British Columbia can take to steward the wealth of our carbon stores – among the best on the planet – and protect species habitat by strategically refocusing land use policy. Conservation measures for those rainforest ecosystems that are at the highest risk of species extinction should be given high priority, with Vancouver Island and the South Coast requiring particularly urgent attention.

Executive summary

BC's coastal temperate rainforests are home to unique species and are among the best carbon storehouses on the planet.

The health of a coastal rainforest ecosystem is measured in part by the amount of old growth remaining and its ability to sustain the species that are dependent on it for survival. A thorough review of recent science[3] confirms that 30 percent of old growth forest in an ecosystem is a critical threshold. Anything below this threshold in coastal rainforest indicates a high risk of species loss.

Our research was focused on coastal forest ecosystems that are below this critical amount of old growth forest within four regions: Haida Gwaii, Central and North Coast, Vancouver Island and the South Coast.

Decades of industrial logging have converted large tracts of old growth forest into younger, second growth. This has resulted in significant degradation of the ecosystem and undermined the carbon storage capacity of BC's coastal temperate rainforest.

We found that an alarming 50 percent of all forest ecosystems on Vancouver Island and on the South Coast--representing close to 2 million hectares—are at a high risk of species loss. As well, more than 300,000 hectares of forest ecosystems on Haida Gwaii (14 percent of ecosystems) and on the Central and North Coast (16 percent of ecosystems) are in critical condition.

Almost all of the forest ecosystems below the critical limit of 30 percent old forest are good productivity sites, where the tallest trees grow, with habitat for unique species and massive carbon storage.

The levels of protection for coastal rainforest vary greatly along the coast. In the Great Bear Rainforest 50 percent of the forest is now off-limits to logging through a combination of protected areas and logging regulations, with the ultimate goal of setting aside 70 percent of the natural level of old growth forest.[4]

On Vancouver Island, however, only 13 percent of the land base is protected, and on the South Coast 15 percent. If we look only at good-productivity forest ecosystems, that number is even smaller. Conservation of old growth forest through logging regulations is also minimal.

3 Price, K., R.F. Holt and L. Kremsater. How much is enough: can threshold science inform old growth targets? Submitted for publication. Originally written for Ecosystem Based Management Working Group.

4 Great Bear Rainforest Update November 2009 http://www.savethegreatbear.org/files/gbr_update_nov09

IMPLICATIONS FOR EMISSIONS AND CLIMATE

The amount of carbon emissions from the forest industry continues to be an enormous burden on our provincial performance. CO_2 emissions from forest lands, in the Pacific Maritime ecosystem were 28 million tonnes in 2007, mostly from logging.[5] This is equivalent to 41 percent of BC's total emissions.

On Vancouver Island alone, at least one million hectares[6] of high and medium productivity forests have been converted from old growth to second growth/younger forest, resulting in the addition of 370 million tonnes of carbon dioxide to the atmosphere over time, more than 5 times the official annual emissions of British Columbia.

If British Columbia is to provide a leadership role on climate change, we require a major reform of forest and land use policies to enable forest ecosystems to be part of a coherent mitigation and adaptation strategy for the province. This must include short-, mid- and long-term conservation targets.

5 National Inventory Report 1990–2007: Greenhouse Gas Sources and Sinks in Canada, page 196

6 Analysis of satellite images in 2004 showed that up to 1.7 million hectares of productive forests have been logged.

RECOMMENDATIONS

Our research has confirmed that priority areas for conservation must now be focused on Vancouver Island and the South Coast, using the innovative land use planning model that has been successful in the Great Bear Rainforest.

The highest priority for policy reform is to protect remaining areas of old forest from logging and identify older second growth forest for conservation to close the gap to the high-risk threshold and avert loss of species in threatened ecosystems.

At the same time it is critical that land use planning in regions that are still relatively intact - like the Great Bear Rainforest or Clayoquot Sound - are managed using the precautionary approach [7] to avoid further degradation of those ecosystems.

Logging practices must be improved through new regulations and incentives to both reduce emissions from logging and conserve old growth forest to maintain habitat for species. Improved forest management practices like selective logging and longer rotation allow for more employment than industrialized clear-cutting. Combined with promotion of value-added products and a phase-out of raw log exports we can move towards a truly green forestry sector that provides jobs, carbon sinks and species habitat.

Forestry in the era of climate change has the potential to be a key part of a low-carbon economy providing new jobs. However, in order to realize this potential, swift and strategic action is required. BC must implement land use policies that maintain and increase carbon storage capacity while also maintaining critical habitat for species.

7 Based on a review of current best available science in the context of land use planning in the North and Central Coast, low risk precautionary management requires maintaining 70% of the natural amount of old forest present in the ecosystem

Introduction

All eyes are on Copenhagen as world leaders meet to develop a new regime to address climate change – a historic moment and perhaps the most significant meeting since the end of World War II.

While success is far from certain, one positive trend is that many countries are increasingly aware of the role healthy forests play in mitigation of the most serious effects of climate change. Hand in hand with this awareness comes the realization that carbon emissions from forest loss and degradation are increasing. Countries are pledging to Reduce Emissions from Deforestation and Degradation (REDD); for example, Brazil has pledged to reduce deforestation of the Amazon rainforest by more than 70 per cent by 2018.

Here in British Columbia, one of the most powerful tools in the fight against climate change is in our own backyard. **Coastal temperate rainforests are one of the best carbon storehouses on the planet,** with accumulated carbon storage of above 1000 tonnes per hectare. However, without an overhaul of logging practices and prioritization of old growth forest protection in key regions, our capacity to store carbon and maintain ecosystems may be lost.

Globally, it is estimated that 20 percent of CO_2 emissions originate from deforestation and degradation of forests. In BC, official emissions would be 77 percent higher if emissions from forest lands were included - which, incidentally, appear only as a "memo item" in the 2009 Greenhouse Gas Inventory Report[8].

In order to reduce emissions from this source countries that harbour large areas of forests must swiftly implement land use policies that maintain and increase carbon storage capacity while also maintaining critical habitat for species. British Columbia can and must be a leader in this undertaking.

Coastal temperate rainforests are also home to unique species and a globally rare ecosystem – covering less than 1 percent of the planet's land base, and an even more minuscule area in its intact state. Biodiversity values in this ecosystem are very high and are becoming more important under a changing climate.

8 Gov't Buries Fact that Logging Blows our Emissions Target, September 22, 2009, The Tyee, http://thetyee.ca/Opinion/2009/09/23/LoggingCO2/

Coastal temperate rainforests may be buffered from the effects of climate change, at least relative to other ecosystems, by their proximity to the ocean. Intact or largely functional rainforest ecosystems may therefore have more chance than other systems of maintaining many of their species, and adapting to climate change as it occurs.

Compared to temperate rainforests in much of the world, BC's coastal forests, in particular on the Central and North Coast, are often considered to be in relatively good condition. In many areas salmon still run in the rivers, trees hundreds of years old still tower across vast landscapes, bears and wolves remain as key elements of intact predator-prey systems, and unknown diversities of beetles inhabit the complex canopy.

However, there is growing evidence that coastal rainforests are already under pressure as a declines in iconic species portend an ecosystem fraying at the edges. The Vancouver Island Wolverine and the Vancouver Island Marmot have disappeared or are at the brink of extinction. Other rainforest species like the Marbled Murrelet, Tailed Frog, the Haida Gwaii Northern Goshawk and Grizzly Bear are classified as species at risk.

This report describes the state of the different types of rainforest ecosystems in different regions of the coast and indicates which rainforest types are at high risk of species loss and should therefore be prioritized for conservation. It also describes the massive loss of carbon storage that occurs after clear-cutting old-growth rainforest and demonstrates the benefits of conserving old growth forest for the climate.

Old Growth Forest as Indicator of Ecosystem Health

One measure of the health of a landscape unit is the extent to which it resembles its historic natural condition, or the amount of old-growth forest coverage.

Naturally, coastal forest ecosystems have been shaped and dominated by small and local natural disturbances. Wind and insects create gaps in the forest canopy; seedlings that have waited on the forest floor for hundreds of years surge towards these new patches of light. This process, over a long period of time, creates complex multi-level forests with old and ancient trees, and vast landscapes dominated by old growth forest ecosystems.

'Old' forests on the coast can be thousands of years old, but for the purposes of this analysis old forest is defined as forests over 140 years old. [9]

Younger forests may have been created by various natural disturbances that affected a larger area, creating a noticeable patch of younger trees. For example, areas of windthrow (patches of forests uprooted by storms) that occurred within the last 140 years would naturally have been succeeded by a younger forest. Larger-scale disturbances like this are relatively rare across the landscape.

Today the main source of disturbance is industrial harvesting which shifts the age distribution away from the natural pattern of mostly old forest. On BC's coast today, most younger forest is created by harvesting. However, it is the total disturbance (natural + harvesting) that will ultimately affect how well ecosystems continue to function.

FOR B.C.'S COASTAL CONIFEROUS ECOSYSTEMS, A KEY MEASURE OF HEALTH IS THE AMOUNT OF OLD FOREST EXISTING THERE TODAY.

9 The definition most commonly used for these ecosystems puts the threshold at 250 years. However, we prefer 140 years as a cut-off point because forests over 140 years in age regenerated naturally (rather than from industrial forestry, which started more recently on the vast majority of the coast). Also, using this cut-off prevents problems of bias in the data where lower stature forests (such as the old forests growing on poor sites) tend to be mis-classified as younger than 'larger' forests of similar ages.

How Much is Enough?

Understanding precisely "how much" old forest is enough to maintain functioning ecological systems now and into the future is one of the primary questions in conservation biology. There is no single definitive answer. However, a recent review of available science on thresholds (undertaken for the Ecosystem-Based Management Working Group in the context of land use planning in the Central and North Coast[10]) provides a workable foundation for policy.

The review shows that maintaining 70 percent of the natural levels of old forest in each ecosystem likely results in low risk to ecosystems because most species can be maintained with this relatively small level of habitat change.

However, at about 30 percent habitat remaining, a significant number of species show alarming population declines or species loss from the remaining suitable habitat (two thirds of species in the above-mentioned).

In conservation planning, projects that focus on the question of how much intact ecosystem is needed to maintain functional landscapes have often called for much higher percentages (e.g. 57 percent for Florida[11]; 60 percent in Oregon[12]; 50 percent for the boreal[13]).

Climate change provides additional pressure with unknown consequences. Undoubtedly, climate change will result in a need for increased protection to reduce external pressures on ecosystems if we desire to maintain as many of today's species and functions as possible into the future.

In this report, we apply **30 percent of the total forest as a critical threshold that indicates a high risk of species loss as well as loss of important environmental services** – benefits to human life and economy that are provided by functioning ecosystems (such as clean water, air, abundant fish populations etc.)

10 Price, K., R.F. Holt and L. Kremsater. How much is enough: can threshold science inform old growth targets? Submitted for publication. Originally written for Ecosystem Based Management Working Group.

11 Hoctor, T.S., M.H. Carr, P.D. Zwick. 2000. Identifying a linked reserve system using a regional landscape approach: the Florida Ecological Network. Conservation Biology 14: 984-1000.

12 Noss, R.F., C. Carroll, K. Vance-Borland, G. Wuerthner. 2002. A multicriteria assessment of the irreplaceability and vulnerability of sites in the Greater Yellow Ecosystem. Conservation Biology 16: 895-908.

13 International Boreal Conservation Science Panel: http://www.interboreal.org/

DIFFERENT TYPES OF COASTAL RAINFOREST ECOSYSTEMS

The whole temperate rainforest region on the coast of BC covers about 15 million hectares, with about 10 million covered in forests. The remainder is largely non-forested alpine areas, and freshwater lakes, wetlands and rivers.

This analysis uses existing data on the state of the forest, separating out the forested land base into three productivity groups (Good, Medium and Poor productivity) dominated by conifer trees species. Also separated are 'deciduous' leading stands and areas with only age data (unknown productivity).

Coastal old growth forests differ considerably from one another. Forests located on sites with Good productivity tend to produce the largest stature forests, with fast-growing trees and many large-girth and tall trees. Often associated with nutrient rich sites such as floodplains, areas that can grow trees like this tend to be relatively rare over the coastal landscape. Medium productivity sites usually grow trees more slowly – but depending on conditions can also grow very large and very old trees. These sites are often located on steeper slope situations and are found commonly across the coastal landscape. Poor productivity systems are often moisture-saturated with poor nutrient levels so have slow growth and limited total tree sizes. Trees tend to be small in stature, often dominated by stunted, but very old cedar. Carbon storage levels of good and medium productivity tend to be much higher than for this type of forest. Poor productivity systems cover the largest area on the coast (see Figure 1 for coastal distribution of these types).

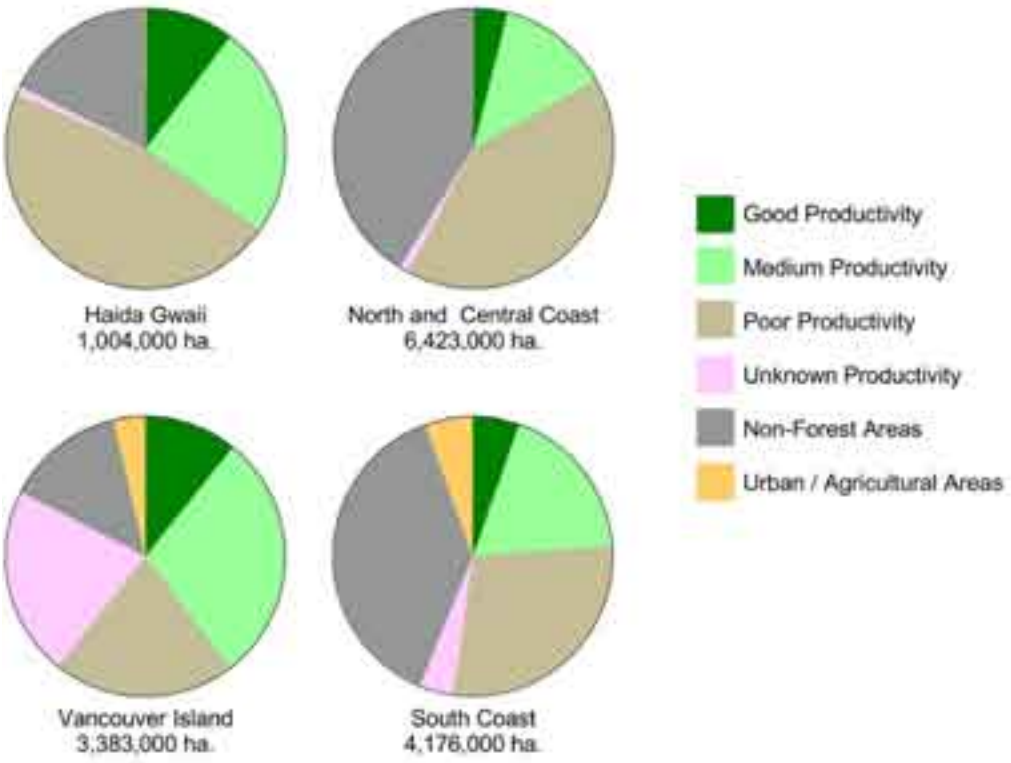


Figure 1. Coverage by different forest types, non-forest and urban/agricultural areas for Haida Gwaii; North and Central coast; South coast, and Vancouver Island.

The North and Central coast is by far the largest administrative zone though nearly 50 percent of this massive area is non-forested. The proportion of non-forest is lower in the other areas, particularly for Vancouver Island and Haida Gwaii. Good productivity ecosystems are rare – they cover only a small percent of each region, followed by medium productivity systems. A large percentage of the North &

Central coast and the South Coast region is poor productivity forest. Vancouver Island has a relatively large area of private forest land where basic forest age data is available from satellite information, but productivity information is unknown. Finally, significant portions of the South Coast and Vancouver Island have had their original forests converted to urban or agricultural lands.

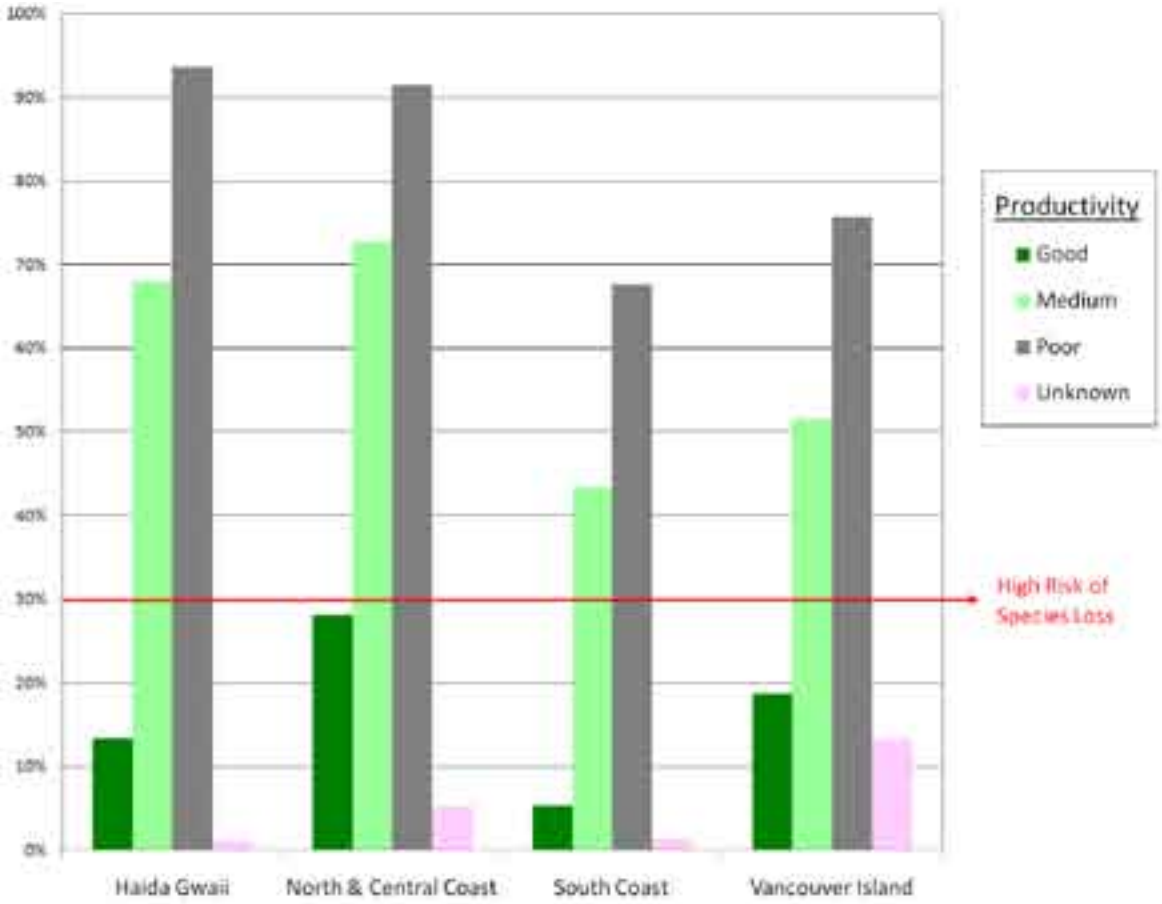


Figure 2. Percent old forest (>140 years old) remaining in 3 productivity classes, plus 'unknown' productivity. Separated into four regions of the coast.

What is the Condition of these Forest Types?

The amount of forest that is over 140 years old (old forest) is shown for each of the four regions, and broken down into three productivity groups plus an 'unknown' productivity group. This unknown area does not have available data because it is primarily privately owned but can be considered as mostly good or medium productivity.

For all four regions, the Poor productivity category – where industrial harvesting has had a very small footprint to date – has a very high proportion of old forests (coastal average 76 percent). In the Medium productivity category, a lower percent of the forest is old growth today (coastal average 51 percent); these areas tend to have seen harvesting, but more recently since they tend to be on steeper slopes and can be less accessible. The Good productivity sites have a very low percent old growth remaining today (coastal average 17 percent) (Figure 2).

The categories of Good, Medium and Poor Productivity capture only a tiny part of the real ecological variability on the landscape: many different ecosystems occur within these very broad groups.

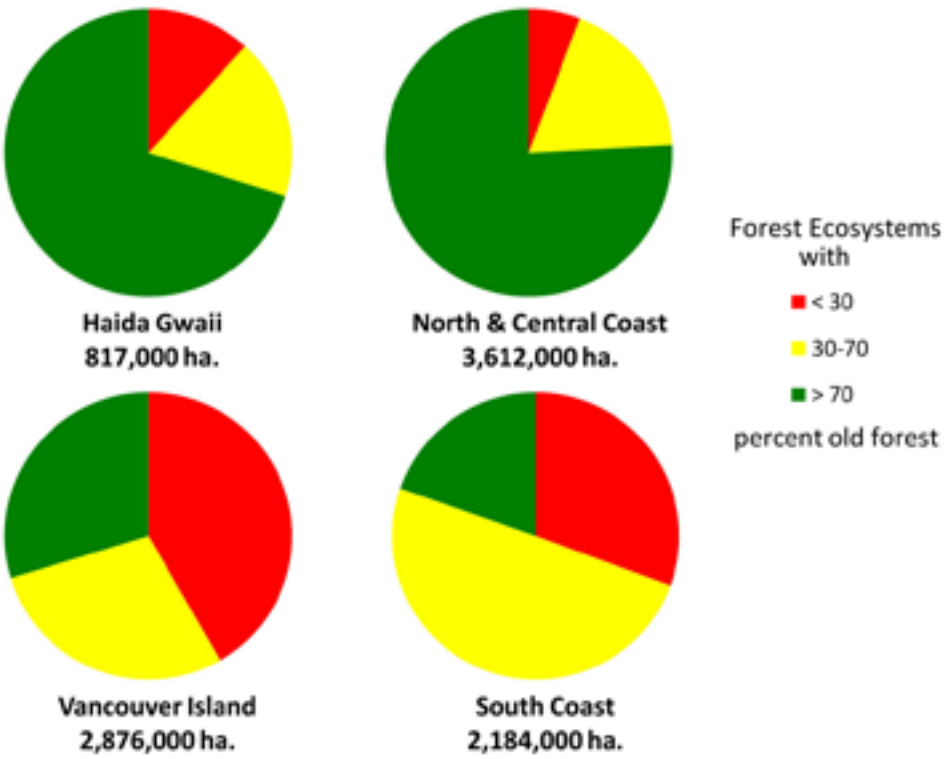


Figure 3. Percentage of area of forest ecosystems (defined by productivity and biogeoclimatic variant), with <30 percent, 30-50 percent and >70 percent old forest remaining.

Zooming in on the biogeoclimatic variants within each region and looking at the productivity categories within these variants[14] affords a slightly more detailed look at what is occurring in each region. In total, 55 of 163 ecosystems have less than 30 percent old forest remaining – representing about 2.2 million hectares. Of these, many have less than 10 percent old forest remaining. Figure 3 shows the percentage of forest ecosystems falling within each category of risk for each of the four regions. It shows that an alarming 50 percent of all forest ecosystems on Vancouver Island and on the South Coast are below the high-risk limit to maintain species - representing close to 2 million hectares. As well, over 300,000 hectares of forest ecosystems on Haida Gwaii (14 percent of the ecosystems) and on the Central and North Coast (16 percent of the ecosystems) are in critical condition .

Vancouver Island and the South Coast have the highest number and relative area of ecosystems with less than 30 percent old forest remaining. Although some of these ecosystems – such as the drier east coast of Vancouver Island forest - naturally have fairly high rates of disturbance under natural conditions, many are at extremely low levels of old forest today, considerably lower than what would have occurred naturally.

14 Defined by productivity class (good, medium, poor, unknown) within biogeoclimatic variant, e.g. good productivity areas within the coastal Douglas fir mm1 variant. Deciduous leading stands are not included, nor is forested alpine zones (e.g. parkland zones, or coastal mountain-heather alpine zone).

On Vancouver Island, of the 18 ecosystems with less than 30 percent, 11 have less than 10 percent old forest remaining. For example, the Coastal Douglas Fir ecosystem has a total average of 1.2 percent old forest remaining today. Similarly, the 100,000 hectares of higher productivity dry coastal western hemlock on the South coast zone has about 2.5 percent old forest remaining.

Higher productivity dry coastal western hemlock zone, here the Koksilah Douglas Fir on Southeastern Vancover Island. In the South Coast this forest type covers around 100,000 hectares and only 2.5 percent remain as old.


Photo: TJ Watt

Even with these broad zones there is much ecological variability. Some specific ecosystems - such as some riparian floodplain Sitka spruce ecosystems – have so little older forest remaining that they are identified as endangered or of special concern (red and blue-listed) by the B.C. Conservation Data Centre.

Forest ecosystems at lower elevation and those at higher elevations[15] have different roles in ecosystem diversity and functioning. Often much more ecological variability occurs at lower elevations. Even in rugged mountain-dominated landscapes, lower elevation areas provide travel and movement corridors between areas and are important for maintaining many ecosystem services, such as water supplies and fish abundance and diversity.

The amount of carbon stored in old forest on Good and Medium productivity sites represents some of the highest stores of carbon in forested ecosystems anywhere in the world.

Riparian floodplain Sitka spruce ecosystems, here Maxine's tree in the Walbran Valley on the west coast of Vancouver Island, have now so little older forest remaining that they are identified as endangered or of special concern (red and blue-listed) by the B.C. Conservation Data Centre.

Maintaining these stores intact will reduce future contributions to atmospheric carbon levels. Conversely, where these areas have already been harvested, the potential sequestration rates can be extremely high. If these areas are taken out of an industrial forest model, they can greatly contribute to potential future reductions in atmospheric carbon levels.

15 Lower elevations defined using coastal Douglas fir, coastal western hemlock and montane spruce zones. Higher elevations include mountain hemlock and engelmann spruce – subalpine fir zones.

BC'S COASTAL RAINFOREST – A LEAKING CARBON BANK

BC's temperate rainforests not only store massive volumes of carbon but natural disturbance is also extremely low, making a compelling argument for its conservation. Fires and insects, which can cause huge releases of carbon dioxide in some of BC's forests, are rare in coastal forests so the long-term certainty of storage is relatively high.

Harvesting such old-growth forests, even if second growth forest regrows, causes massive loss of carbon storage. Harvesting of one hectare of 'average' coastal rainforest results in emissions equivalent to putting more than 100 cars on the road for a year[16].

A Pacific Northwest study also found a 400-year-old forest stand stored typically more than double the carbon stored by a 60-year-old stand[17], and the ability to recover total carbon stores is limited for hundreds of years[18]. A study examining higher productivity stands on Vancouver Island showed that individual old forest stands store between 600 – 1,300 tonnes of carbon/ha[19] - considerably higher than the 'average' number often used for coastal forests.

According to BC's provincial inventory report[20], annual net emissions from forest land are 52 million tonnes of CO_2 (close to 80 percent of the official total account in which these emissions are not included) with logging being the main emission source.

The provincial report doesn't distinguish between emissions from coastal and interior forest but according to the federal inventory report[21], managed forests in the Montane Cordillera and Pacific Maritime reporting zones were the only two large net sources of CO2 emissions in Canada in 2007. While the Montane Cordillera is affected by the Mountain Pine Beetle outbreak this is not the case for the Pacific Maritime. According to the federal report the annual net CO2 emissions within the Pacific Maritime were 28 million tonnes in 2007 (equivalent to 41 percent of BC's official emissions), mostly covered by the forests analysed in this report.

16 Ecosystem-Based Management in the Great Bear Rainforest, Defense for Climate and Species, February 2009 http://www.savethegreatbear.org/resources/Reports/climate_report_0309

17 Quoted in Wilson, S.J. and R. J. Hebda 2008: Mitigating and adapting to climate change through the conservation of nature. Published by the Land Trust Alliance;

18 Trofymow, J.A., G. Stinson and W.A. Kurz. 2008. Derivation of a spatially explit 86-year retrospective carbon budget for a landscape undergoing conversion from old-growth to managed forests on Vancouver Island. Forest ecology and management 256: 1677-1691

19 Trofymow, J.A. and B.A. Blackwell. 1998. Changes in ecosystem mass and carbon distributions in coastal forest chronosequences. Northwest Science 72: 40 – 42.

20 http://www.env.gov.bc.ca/epd/climate/ghg-inventory/index.htm

21 National Inventory Report 1990–2007: Greenhouse Gas Sources and Sinks in Canada, page 196

A careful estimate based on our analysis shows that on Vancouver Island alone at least one million hectares of high and medium productivity forests has been converted from old growth to second growth/younger forest.[22] Even when using the estimated average of 375 tonnes of carbon storage/ha for all productivity types of coastal forest, at least 375 million tonnes of carbon were stored in this forest area of Vancouver Island before harvesting began.

Based on the findings mentioned above, the carbon storage of these forests after logging is approximately half compared to undisturbed ecosystems. Even when assuming that up to 23 percent of the original carbon storage continues to be stored in harvested wood products[23], the carbon storage lost would be more than 100 million tonnes (resulting in 370 million tonnes of carbon dioxide added to the atmosphere over time, more than 5 times the annual emissions of British Columbia).

This estimate comes very close to the result of a study for one million hectares of forest managed by the Bureau of Land Management in Western Oregon[24]. The forest ecosystems in this area are very similar to those on Vancouver Island. The study found a loss of carbon storage of 149 million tonnes between historic and current conditions (with only 11 million tonnes stored in wood products).

These findings highlight the enormous climate benefit of avoiding further conversion of old growth into second growth in the coastal temperate rainforest zones, and of improved forest management practices, like selective logging and longer rotation, that maintain and increase the carbon storage of our forest.

22 295,000 hectares of good productivity forest, 474,000 hectares of medium productivity forest and 600,000 hectares of unknown productivity forest (most of the areas with unknown productivity are in highly productive southeastern Vancouver Island and can therefore be assumed as almost entirely good or medium productivity), resulting in a total of more than 1.3 million hectares of second-growth or young forest of these types on Vancouver Island. Choosing the smaller number of 1 million hectares reflects the fact that a small percentage of forest would be younger forest under natural conditions as well due to natural disturbance. Analysis of satellite images in 2004 showed that up to 1.7 million hectares of productive forests have been logged.

23 Harmon, M.E., W.K. Ferrell and J.F. Franklin. 1990. Effects on carbon storage of conversion of old-growth forests to young forests. Science 247: 699 – 702.

24 Final Environmental Impact Statement For the Revision of the Resource Management Plans of the Western Oregon Bureau of Land Management Districts, Chapter 3, section 2 http://www.blm.gov/or/plans/wopr/final_eis/index.php

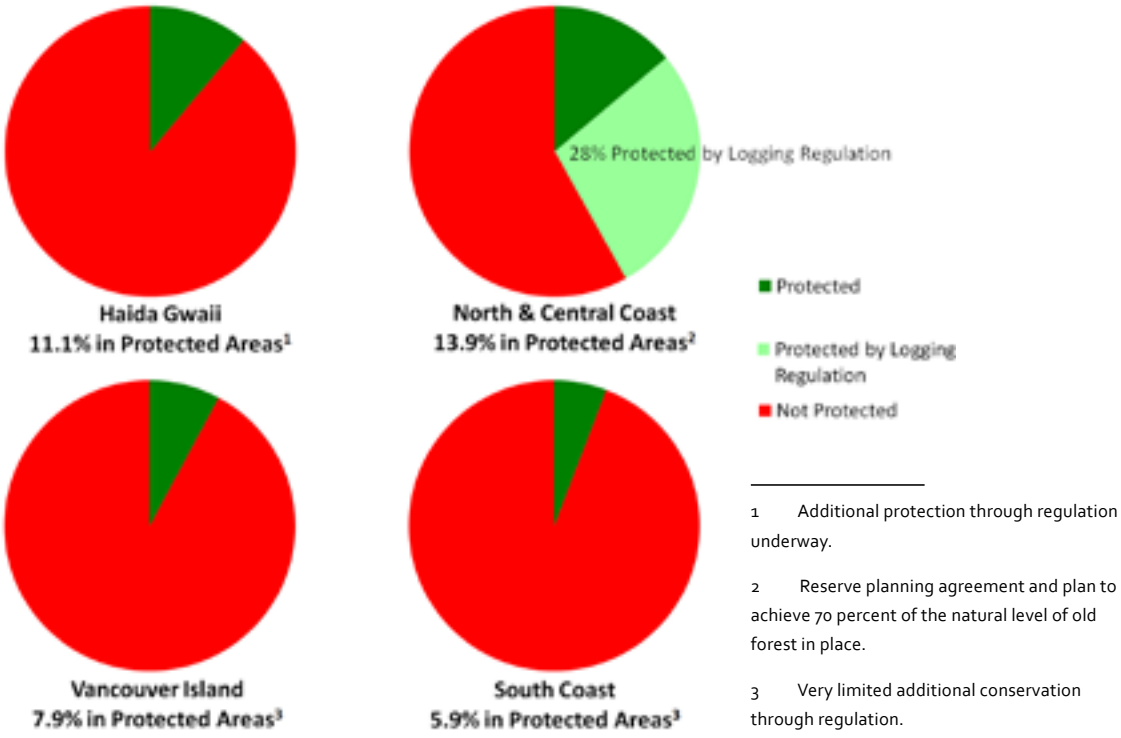
EXISTING PROTECTION AND MANAGEMENT

On Haida Gwaii and the North and Central Coast, work is underway to implement a new form of forest management – Ecosystem Based Management. Both regions have similar levels of protection with a relatively high level of representation of different ecosystems, both forest and non-forest. On Haida Gwaii approximately 50 percent of the land base is under protection, while in the North and Central Coast 33 percent of the land base is protected from logging and additional forest areas set aside through logging regulation, resulting in 50 percent of the forest in the North and Central Coast being off-limits to logging.

Implementation of Ecosystem Based Management in the North and Central Coast continues with the ultimate goal of achieving low ecological risk (defined as setting aside 70 percent of the natural level of old growth).[25]

The levels of protection on Vancouver Island and the South Coast look drastically different. Only 13.2 percent of the land base of Vancouver Island are protected with only 7.9 percent of good productivity forest ecosystems and only minimal amounts of additional conservation of old forest within ecosystems. In the South Coast 15.1 percent of the land base is under protection, but only 5.9 percent of good productivity forest ecosystems; targets for old growth protection within ecosystems fall considerably behind those established in the North and Central Coast.

25 Great Bear Rainforest Update November 2009 http://www.savethegreatbear.org/files/gbr_update_nov09



1 Additional protection through regulation underway.

2 Reserve planning agreement and plan to achieve 70 percent of the natural level of old forest in place.

3 Very limited additional conservation through regulation.

Figure 4. Percentage of Good Productivity Forest Ecosystems in Protected Areas

RECOMMENDATIONS AND OUTLOOK

Industrial logging in BC's coastal temperate rainforests has caused significant ecosystem degradation and loss of carbon storage for most of the high productivity forest ecosystem types along the coast. Many ecosystems, particularly on Vancouver Island and in the South Coast, are now below a critical amount of old forest to sustain species that depend on them.

Climate change increases the stress and vulnerability for species and ecological functions of rainforests and other ecosystems. The world must cut CO_2 emissions drastically within the next ten years to avert dangerous global warming with uncontrollable consequences for the natural world and for humanity. At the same time we have to lower the human footprint on the ecosystems and give nature the best chance we can to adapt to the shift in climate that is already underway.

A 2008 report by the Pacific Institute for Climate Solutions states that "adaptation to the stresses induced by climate change builds resilience" and highlights the opportunity for "the transition from a traditional resource-based economy to an ecosystem-based economy that recognizes and values environmental goods and services, and diversifies the economic base at a time when the traditional base is being challenged".

The report refers to the Central and North Coast as the only example in BC where resource management on an ecosystem basis is being implemented.

The ecosystem-based management approach in the the Central and North Coast is a model that can be applied to other areas in BC and other parts of the world, in particular for temperate rainforest zones. The implementation of a new conservation model in in this region helps reduce future climate change by maintaining massive stores of carbon locked in rainforests while at the same time fostering species adaptation to climate change with a higher likelihood of maintaining fully functional ecosystems.

Climate change requires a reform of BC's forest and land use policies, including conservation measures, with short-, mid- and long-term components. This analysis points to priority areas for conservation measures, in particular for the forests in the southern part of the coast.

Within coastal rainforest ecosystems below the critical limit of 30 percent of old forest, remaining areas of old forest must be protected from logging and supplemented by older second growth stands to restore species habitat and other ecological functions. The initial goal should be to bring these forest ecosystems above the high-risk threshold for old forests as soon as possible.

At the same time it is critical that land use planning in regions that are still relatively intact like the Great Bear Rainforest follows the precautionary approach[26] to avoid degradation of healthy ecosystems in these regions. This region is globally unique as the largest remaining relatively intact rainforest of this type and therefore with the best chance of maintaining its unique species, even under changing climate. Smaller but also relatively intact rainforest areas south of the Great Bear Rainforest, such as Clayoquot Sound and other intact forest areas along the West-Coast of Vancouver Island are similarly important.

In operating areas logging practices must be improved through new regulations and incentives to reduce emissions and improve habitat for species, including

- Selective logging and longer rotation
- Reduction of wood waste
- Elimination of slash burning

Forestry in the era of climate change has the potential to be a key part of a diverse low-carbon economy providing new jobs, but we have to take a close look where it is done, how it is done, and how much gets logged and left behind.

Improved forest management practices like selective logging and longer rotation allow for more employment than industrialized clear-cutting. Combined with promotion of value-added products and a phase out of raw log exports we can move towards a truly green forestry sector that provides jobs, carbon sinks and species habitat.

BC's coastal rainforests are an ecological treasure and the best carbon storehouse of the province. Managing the coastal rainforest to increase its potential as a carbon storehouse and maintain critical habitat for species must be part of a comprehensive strategy for the province that addresses climate change mitigation as well as adaptation.

In particular, the coastal forest ecosystems on Vancouver Island and the South Coast at high risk of species loss require urgent conservation measures.

26 Based on a review of current best available science in the context of land use planning in the North and Central Coast, low risk precautionary management requires maintaining 70% of the natural amount of old forest present in the ecosystem.