

MITIGATING AND ADAPTING TO
CLIMATE CHANGE
THROUGH THE
CONSERVATION OF NATURE

BY SARA J. WILSON AND RICHARD J. HEBDA



JANUARY 2008
THE LAND TRUST ALLIANCE OF BRITISH COLUMBIA

Acknowledgements

The Land Trust Alliance of British Columbia initiated this report in response to increasing concerns about climate change. We are grateful for the extensive economic review and expertise provided by Sara J. Wilson. Dr. Richard Hebda provided his authoritative research on climate change and added several original contributions to this report. We are thankful to them both, plus the many people whose names appear below who provided materials, review or assistance for this report.

Sheila Harrington, Land Trust Alliance of BC
 Dan Buffet, Ducks Unlimited Canada
 Jan Kirkby, Environment Canada
 Shyanne Smith, Garry Oak Ecosystem Recovery Team
 Pierre Lachetti, Nature Conservancy of Canada
 Kathryn Martell, The Land Conservancy of BC
 Tory Stevens, BC Ministry of Environment
 Dr. Katherine Dunster, Land Trust Alliance of BC
 Trevor Murdock, Pacific Climate Impacts Consortium
 Werner Kurz, Canadian Forest Service

Editorial, graphic and promotional support:

Sheila Harrington, Valerie Huff, Patricia Walker
 Dan van Stolk
 David Suzuki Foundation
 Todd Carnahan
 Cover photo: Tim Ennis, Nature Conservancy of Canada
 -View from Pine Butte Ranch

Many thanks to Mountain Equipment Coop and VanCity for their financial contributions toward the dissemination of this report.

We are especially thankful to the following for providing financial support:

The Bullitt Foundation



Copyright: LTA The Land Trust Alliance of British Columbia

Executive Summary

Climate change will have wide-ranging impacts on natural, managed and human systems. These impacts pose challenges and opportunities for human settlement and resource use as well as the conservation, management and stewardship of lands. The combination of climate change and human conversion and the degradation of natural landscapes threatens ecosystems and the services they provide.

Current and future climate change will impact forests, wetlands, rivers, and coastal areas, as well as the human communities that depend upon them. International studies have reported that northern forests and the Arctic region are the most affected by the changing climate. Climate in northern areas, including British Columbia is warming, and will likely continue to warm, more rapidly than the global average.

This report provides an overview of:

- the role that natural ecosystems play to mitigate and adapt to climate change;
- the projected impacts of climate change on ecosystems in British Columbia; and,
- strategies to reduce impacts, focusing on conservation and ecosystem protection.

Valuing Nature in an Era of Climate Change

Biomass and soils, the living carbon of ecosystems, remove and store carbon dioxide from the atmosphere naturally. Adapting to and reducing the degree of climate warming demands more than reducing or replacing the use of ancient carbon, namely fossil fuels, for energy. One of the essential life support services provided by ecosystems is the protection of the climate through carbon cycling. We suggest that "Carbon Stewardship" is an important concept that needs to be incorporated into policies and planning for climate change. This includes protecting the carbon stored in natural and semi-natural ecosystems.

Natural ecosystems provide an enormous range of goods and services that sustain our health and well-being including food, materials, clean air, clean water, nutrient cycling, as well as recreation, education and spiritual uplift. A recent global assessment of human impacts on the world's ecosystems found that 60 percent of ecosystem services including fresh water, air and water purification, and the regulation of climate are in decline. The loss of natural habitat worldwide due to human impact has resulted in an estimated loss of \$250 billion per year. Climate change will exacerbate the degradation of ecosystems and the loss of ecosystem services.

Natural ecosystems provide key services related to climate change notably carbon dioxide absorption and carbon storage. For example, global ocean and land ecosystems typically remove about 50-60 percent of human-caused carbon dioxide emissions. Intact natural ecosystems are the most resilient to change, therefore they provide the best opportunities for adaptation as the climate changes through the provision of corridors for migrating wildlife, water storage, and flood protection. Intact natural systems also store the most carbon.

It is not the strongest of the species that survive, nor the most intelligent, but the most responsive to change.

- Charles Darwin (1835)

British Columbia ecosystems play an important role in carbon cycling and storage. Forest ecosystems in particular are huge reservoirs of carbon, storing it in living plants, soil and peat. Globally, forest ecosystems contain more than half of all terrestrial carbon and account for about 80 percent of the exchange of carbon between terrestrial ecosystems and the atmosphere. British Columbia forests have the some of the highest carbon stores in Canada averaging 311 tonnes per hectare with some coastal forests holding 600 to 1,300 tonnes per hectare. Based on the average estimates, the total carbon stored by BC's forests amounts to 88 times Canada's annual greenhouse gas emissions. (989 times BC's GHG annual emissions). This stored carbon is worth an estimated total of \$774 billion, or \$62 billion per year (\$1,072 per hectare). In addition, British Columbia's peatlands hold 6.8 billion tonnes of carbon and remove a further 1.5 million tonnes per year.

Conversion of forests to non-forest land use rapidly releases stored carbon as carbon dioxide impacting the atmosphere and climate for centuries. The conversion of a coastal old-growth forest to a younger plantation forest reduces carbon storage by 305 tonnes of carbon per hectare over a 60-year rotation, and total carbon storage is reduced for at least 250 years. For example the past century's conversion of five million hectares of old-growth forests to younger plantations in Oregon and Washington released 1.5 to 1.8 billion tonnes of carbon to the atmosphere. As a result, the conservation of British Columbia's natural ecosystems can have a strong impact on the avoidance of carbon emissions. In comparison, the planting of trees on an unforested site has no net carbon dioxide benefits over the first 10-20 years, and thereafter the benefits are much less than the avoided emissions from a protected forest of equal area.

Nature Under Threat from Climate Change

British Columbia's ecosystems and the services they provide are at high risk to the impacts of climate change. Average annual temperature and precipitation have changed significantly in British Columbia consistent with the projections from climate change models. Climate change impacts such as earlier snowmelt, the mountain pine beetle outbreak, and declining health in western redcedar are already evident in British Columbia.

Studies of fossil records demonstrate that the projected changes in British Columbia's climate will result in a different pattern of terrestrial and aquatic ecosystems than exists today and will force widespread species migrations. Climate impact models project several changes across our landscapes including an overall shift of southern ecosystem types towards northern BC. Dry forest and grassland ecosystems, and lowland conifer forests will spread upslope along the coast and in the interior. A major decline in spruce forests and alpine ecosystems will occur. A wide range of changes in wetlands and aquatic ecosystems such as the drowning of estuaries and erosion of shorelines are predicted as sea level rises. In addition, increased damage from storms, flooding, erosion, droughts, and pest outbreaks are expected.

Strategies to Reduce the Impacts of Climate Change

Carbon Offsets

Offsets are intended to counteract greenhouse gases that are emitted into the atmosphere at a specific source by sequestering them elsewhere. Carbon offsets are purchased by individuals and companies to offset their own carbon emissions. The voluntary market for carbon offsets by corporations and individuals is growing very rapidly. In 2006, it was worth an estimated \$100 million. The major concerns regarding the validity of voluntary carbon offsets are the verification of the quality of offsets, the long term accountability of projects, and the lack of a universal standard. Some offset providers have a certification

process, but it is difficult to verify the validity of many projects. The key issues are whether the offset is in addition (i.e. additionality) to what would occur as a normal matter of course (i.e. business as usual), and whether or not a project results in increased GHG emissions elsewhere (i.e. leakage).

There is however much support for carbon offsets because they prompt people and communities to factor in the cost of their carbon footprint when making decisions. Carbon offsets also result in a price on carbon, a value that begins to filter into people's thinking and business operations.

Carbon offsets for the protection of stored carbon (i.e. avoided emissions from ecosystem degradation and conversion), are not currently available in carbon markets, although reliable institutions such as the Chicago Climate Exchange provide offsets from managed lands including agricultural, forest and range lands. There are also other mechanisms for land trust and conservation agencies to directly facilitate financial contributions towards the protection of forests and peatlands as a gift or to reduce a business or individual's carbon footprint.

British Columbia's Climate Change Initiatives

The BC government has mandated the reduction of GHG emissions by at least 33 percent below 2007 levels by 2020, and that government agencies become carbon neutral by 2010. For every tonne of GHGs emitted by government travel, the province will invest \$25 in a new BC Carbon Trust to ensure that taxes are invested in valid offset projects in BC. Also a new carbon-trading registry will allow BC residents to offset their personal carbon footprint beginning in 2008.

BC's local governments also have committed to be carbon neutral by 2012. The Union of BC Municipalities and the BC government will establish a joint Green Communities committee and Working Groups to develop actions to address climate change and meet the 2012 target. These initiatives may provide opportunities for land trusts and other conservation agencies to form partnerships on land-use planning, land stewardship projects, and conservation or management agreements on natural areas for building resiliency to climate change.

Conservation Strategies: Adaptation and Mitigation

The protection of land offers multiple values in addition to fostering biodiversity. The protection of healthy, functioning and diverse ecosystems provides resilience for natural areas and nearby human communities and reduces the risk of rapid changes and loss of ecosystem values and services. In the last ten years, British Columbia land trusts have protected more than a quarter million hectares of land in trust for public benefits. Land trusts will benefit by expanding their partnerships with local, provincial and federal agencies and protected area strategies to ensure that the areas and ecosystems will continue to provide benefits to society.

It is now imperative that land use planning including conservation initiatives anticipate climate change impacts and integrate appropriate strategies to avoid risks and optimize opportunities. Local, regional and national agencies will need to review their objectives in the context of climate change. For example, conservation planning for relatively large areas and a wide range of values are at less risk to climate change than those focused on small areas for specific values such as single species conservation. In addition, it will be even more important for conservation objectives to be linked to other land management decision-making.

Decisions concerning land acquisition or conservation strategies need to consider the potential impacts of climate change, links and corridors to other natural lands for species migration, and in setting the priority for multiple ecosystem values rather than a single specific value. Providing the greatest options for the changing character of habitats ahead will be critical.

Decision Support for a Responsive Climate Change Strategy

We ranked BC's ecosystems according to their sensitivity to climate change, carbon storage capability, biodiversity habitat, and the degree of human impacts. Accordingly, for BC ecosystems:

1. The Coastal Douglas-fir zone is of very high importance.
2. The Interior Douglas-fir and Ponderosa Pine zones, Garry Oak and related ecosystems and wetlands are of high to very high importance.
3. Coastal Western Hemlock, Bunchgrass, and Interior Cedar Hemlock zones are of medium importance.
4. Mountain Hemlock, Sub-Boreal Spruce, Sub-boreal Pine Spruce, Boreal White and Black Spruce, Spruce Willow Birch, Montane Spruce and Engelmann Spruce- Sub-alpine Fir and the aggregate Alpine Tundra zones are of low to medium importance.

Conclusions

The immense stores of carbon in existing ecosystems are of great importance for both mitigation and adaptation to climate change, especially compared to the potential of removing atmospheric carbon by planting new forests. Carbon storage in young forests takes a long time especially in terms of replacing lost carbon. Second, because there is so little time to slow global warming, the priority should be on preventing carbon losses and conserving the carbon stores that exist. Third, by protecting existing ecosystems there will be a wide range of habitat to provide connecting corridors for plant and animal migration as the climate warms. Fourth, the protection of intact ecosystems provides resiliency for ecosystems and the communities that depend upon them.

This report clearly demonstrates that conserving land with healthy natural ecosystems is a cost effective and important strategy to both mitigate and adapt to climate change. The report concludes that the conservation of intact ecosystems for the numerous values and services they bring humans, in addition to providing habitats for wildlife, biodiversity and ecosystem functioning and the health of communities needs to be a significant part of any climate change strategy for both mitigation and adaptation to changing climates.

