LAND USE PLANNING FOR NATURE, CLIMATE, AND COMMUNITIES

APPENDIX 1: MANAGING FOR RESILIENCE IN BC

In this research project West Coast Environmental Law analyzed the resource management direction provided by twenty years of strategic land use planning in BC to address three related questions:

1. How well do existing land designations and related resource management objectives manage the effects of cumulative environmental change from resource management and other human activities?
2. Do BC's existing land designations and resource management objectives provide for resilience and adaptability of ecological systems and human communities in the face of climate change?
3. How could existing or new land designations be used to enable a 'greener' BC economy while safeguarding our natural life support systems?

All legally established, mapped areas with conservation-related management objectives at the landscape level or above were included in the analysis,[1] which examined legislative requirements associated with relevant designations and related management objectives.

Appendix 1 summarizes key concepts and background analysis related to question 2 above.

Methodology

Based on a review of the scientific and policy literature on nature and climate, we first identified the following framework of priority considerations to assess the potential of land designations to be used in the context of nature-based climate adaptation strategies. Brief summaries of each topic are contained in this Appendix.

- Resilience and ecosystem function (coarse filter biodiversity)
  - ✓ Low risk to ecological integrity from permitted management activities.
  - ✓ Precautionary factor to account for climate change
- Species
  - ✓ Habitat needs of focal species.
  - ✓ Habitat needs of species at risk, rare and endemic species.
- Connectivity
  - ✓ Science-based thresholds for roads and surface disturbance
  - ✓ Land-use management and industrial practices compatible with species movement
  - ✓ Landscape level connectivity
- Water
  - ✓ Maintaining hydrological/riparian function.
  - ✓ Water quality and supply for human consumption

Second, we examined the laws and policies governing the nature, extent and distribution of the environmental designations that have been applied on the ground in BC. We sought to identify legal or policy barriers, if any, to effectively addressing the priority considerations listed above.

Table 1 summarizes some of the key barriers identified, which are discussed in more detail in the body of the report *Land Use Planning for Nature, Climate and Communities.*

Resilience & Ecosystem Function (coarse filter biodiversity)

"Large-scale coarse filter approaches –at the levels of ecosystems and landscapes—are the only reasonable way to conserve the overwhelming mass—the millions of species—of existing biodiversity."[2]

"Landscapes with intact, functional natural ecosystems probably will be better equipped to accommodate, adapt to and recover from the impacts of climate change than industrialised landscapes with ecosystems fragmented and degraded by human activities, especially if they are large landscapes."[3]

Large-scale strategies that focus at the level of ecosystems and landscapes are referred to as "coarse filter" biodiversity approaches. Key coarse filter biodiversity approaches include establishing a network of representative protected areas and using other legal tools, such as land designations and resource management objectives outside of protected areas to ensure that the key attributes of ecological systems remain within their "natural range of variability."[4] Because protected areas in BC are frequently too small on their own to conserve biodiversity and resilient ecosystems, our biodiversity strategies have, in theory, relied heavily on other designations and resource management objectives outside of protected areas.

The closer to natural levels key attributes (like the amount and distribution of old forest) are maintained the lower the risk to the ecological integrity of the ecosystem.

Natural Range of Variability

In the centuries before European settlement in BC, First Nations management and recurring natural disturbances like fire played a central role in shaping today's great diversity of ecosystems. These historic ecosystem dynamics created the conditions to which all of our native species are adapted. Thus, conservation science tells us that if we can manage key attributes of ecosystems and landscapes in a manner consistent with this natural range of variability, the species and processes associated with those ecosystems and landscapes can be maintained.

Ensuring that the full complement of existing species and processes is maintained increases the likelihood that the ecosystem can heal itself in the face of human and natural disturbances.[5] This ability of an ecosystem to cope with disturbance or stress and rebuild itself is referred to as "resilience".

This objective is recognized by the Ministry of Forests, Lands and Natural Resource Operations in its Future Forest Ecosystems Initiative which has adopted the goal of "managing for resilience" in our forests.[6]

These conservation biology principles have taken on heightened importance in the face of climate change.

> "[T]he cumulative effects of climate change, increased human settlement and use and other agents of changes such as invasive alien species can stress ecosystems to the point where they cannot recover from disturbances or recover at a rate that is unacceptably slow. It is therefore an important principle of planning to create conditions under which ecosystems can absorb disturbance and remain resilient."[7]

Thus, from a climate adaptation perspective, any legal barriers that limit the effectiveness of our land designations and resource management objectives to contribute to the maintenance of intact, functioning natural ecosystems are problematic.

Furthermore, conservation planning must be additionally precautionary when it comes to dealing with the impacts of climate change, for example, by extending the elevational and latitudinal breadth of protected areas and other land designations to give species room to adapt to a variety of climate scenarios.[8]

In one extreme example, the climate conditions that currently support the Mountain Hemlock zone in BC (a narrow swath on the east side of the Coast Mountains) will not exist anywhere within its current geographic area by 2055,[9] which has implications for example for achieving ecosystem representation goals over the long-term.

Thus, increasingly conservation planners are focusing on 'enduring features' –the less changeable aspects of ecosystems like landforms and soils –as vegetation is very sensitive to climate change but "the physical landscape is the template for ecosystems" of the future.[10]

Connectivity

Connectivity can be thought of as a life-line linking core protected areas, and as the landscape's circulatory system, facilitating the movement, dispersal and migration of species and their genes, and the continuity of ecological processes.[11]

In many areas of BC, habitats that once existed in large blocks[12] have become fragmented by human activities. Outside of protected areas, small patches of older forest may be left surrounded by clearcuts, and seismic lines and roads may bisect the landscape. Fragmentation affects biodiversity in several ways: through actual loss of habitat; through changes in conditions at the edges of undisturbed habitat; and through isolation of remaining blocks of habitat, which can result in barriers to gene flow and dispersal.[13] Furthermore, landscape conditions between habitat patches affect the ability of species to move between them. For example, roads not only block movement but also increase mortality risk for some species.[14] Perhaps most critically in a warming climate, fragmentation can limit the ability of organisms to move in response to changing conditions. Species range shifts northward or upward to stay within their climate 'comfort zone' are already happening, are expected to continue, and can be impeded by human land uses. Because of the speed with which climate is changing, "[e]ven with a completely unfragmented landscapes, some species will not be able to move with the rapidity necessary"[15] to avoid extirpation or extinction.

This ability of the landscape (both terrestrial and aquatic) to facilitate or impede movement among resource patches is referred to as "landscape connectivity."[16] For the past two decades, maintaining or improving connectivity across landscapes has been the action most frequently recommended by scientists for enabling biodiversity adaptation to climate change.[17]

Addressing connectivity in the context of climate change will likely require measures directed both at augmenting protection for relatively intact "core" areas (e.g., to increasing north-south connectivity), and maintaining or restoring functional linkages between habitats in the rest of the landscape in a way that takes climate change into account. This means thinking about connectivity across climate gradients as a key element of landscape connectivity both inside and outside of protected areas, as species need to move northward and upward in response to changing climate. For example, ongoing research through the Washington Wildlife Habitat Connectivity Working Group is modelling how "pathways through a changing climate" could be maintained or restored by conserving habitat areas that connect warm areas to cool, avoid areas of heavy human use, and minimize changes in temperature along the way.[18]

Species

As discussed above, conservation biologists tell us that by protecting a representative array of ecosystems we also contribute to protecting most species and their genetic diversity. However, specific species can also be important in conservation planning, either because:

- Their survival requirements also represent factors that are important to maintaining the overall health of the ecosystem (focal species).[19]
- They have specialized requirements or require special management attention (e.g., species at risk, rare and endemic species).

Some focal species are helpful in conservation planning because they are wide-ranging and their habitat needs can help determine the appropriate size, shape and distribution of protected areas, e.g., grizzly bears, raptors (umbrella species). Others have significance in maintaining the integrity of an ecosystem disproportionate to their numbers, such that management efforts focused on them can be particularly helpful in maintaining or restoring ecosystem processes, e.g., beavers in certain environments, large carnivores (keystone species). Some species, because they are closely tied to particular biological elements or processes and are sensitive to ecological change, are important in evaluating habitat quality and as a surrogate for ecosystem integrity, e.g., spotted owls for old growth forest (indicator species). Using a suite of complementary focal species can also enhance effectiveness.

From a climate change perspective, with respect to focal species:

> The general point is that if climate change has a significant impact on any of these sorts of species, most of which are not considered conventionally at risk, the cascading consequences for other species and for ecosystems could be huge.[20]

Some species will also require individual attention, because, for example, they are rare or at risk. Because habitat loss is the top threat to species and ecosystems at risk in BC, designations that ensure "full protection of [their] habitat from resource extraction as part of an interconnected, representative protected area system"[21] are particularly critical.

Ultimately, an effective law for species at risk must be science-based and protect habitat needed by species for survival and recovery. More specifically, a strong *Species and Ecosystems Protection Act* would:

• Identify species and ecosystems at risk through an independent, scientific listing process;

• Immediately protect the full habitat of listed species and ecosystems until a final decision is made about how much long-term protection they need; and,

• Restore species and ecosystems to health by developing and implementing recovery plans that address both the causes of their decline and the threats to their future health.[22]

Water

Enhanced watershed conservation to maintain quality, quantity and timing of flow will be essential to safeguard this essential ecosystem service in the face of climate change.

> *With respect to climate change, the most beneficial service of intact forests—and intact ecosystems in general—could be hydrological buffering, their contribution to maintaining hydrologic connectivity*[273] *and water quality and quantity in environments increasingly subject to extreme events (storms, floods, erosion and droughts) as well as to changes in streamflows and water temperatures.*[23]

In sum, "water is a principal agent of resilience in a climate-changing world."[24]

Climate adaptation with respect to water resources will necessarily be multi-faceted, but "[i]ncreasing the protection of water sources is a crucial, commonsense approach to ensuring better quality and quantity of water downstream for use by both humans and nature."[25]

Conservation efforts may be focused on restricting activities in and around water bodies (e.g., in the hydroriparian zone –the area where water influences land and land influences water) and/or throughout a given watershed.

Legal Barriers to Resilience –Table 1

In summary, we examined the laws and policies governing the nature, extent and distribution of the environmental designations that have been applied on the ground in BC, to identify legal or policy barriers, if any, to effectively addressing the priority considerations listed above.

Key barriers we identified are summarized in Table 1.

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[1] Including resource management zones and special management areas outside of protected areas; in some cases site level designations were also included in data sets used by ForestEthics Solutions in their mapping project.

[2] M.A. Austin, D.A. Buffett, D.J. Nicolson, G.G.E. Scudder and V. Stevens (eds.), *Taking Nature's Pulse: The Status of Biodiversity in British Columbia (Victoria:* Biodiversity BC, 2008) at 19, online: Biodiversity BC <www.biodiversitybc.org> [*Natures Pulse*].

[3] Jim Pojar, *A New Climate for Conservation: Nature, Carbon and Climate Change in British Columbia* (Vancouver: Working Group on Biodiversity, Forests and Climate, 2010) at 39, online: West Coast Environmental Law <www.wcel.org> [Pojar, *New Climate*].

[4] Natures Pulse at 19.

[5] Natures Pulse at 23.

6 "Managing for ecological resilience requires that the forest management framework (i.e., legislation, policy, planning, and guidance that governs forest management) enables ecosystem components such as soils, hydrology, species composition, landscape features and natural disturbances … to remain within their range of natural variability": Sybille Haeussler, Andy MacKinnon et al. "Managing B.C.'s Forest and Rangeland Ecosystems to Achieve Ecological Resilience," Appendix 1 to *Future Forest Ecosystems Draft Recommendations* (Ministry of Forests, 2006) at 2.

[7] Natures Pulse at 23.

[8] Victoria Stevens, "Opportunities in a Changing Climate: British Columbia Parks and Protected Areas," in Samantha Weber and David Harmon, eds. *Proceedings of the 2007 George Wright Society Biennial Conference on Parks, Protected Areas, and Cultural Sites* (Hancock, Michigan: The George Wright Society, 2008) at 254, online: <www.georgewright.org/0747stevens.pdf > [*Opportunities in a Changing Climate*]

[9] Andreas Hamann and Tongli Wang, Potential Effects of Climate Change on Ecosystem and Tree Species Distribution in British Columbia, Ecology (2006) 87: 2773 at 2780.

[10] Jim Pojar, *Climate Change And Land Use Planning In The Atlin – Taku Area*, report prepared for the Taku River Tlingit First Nation and for the Integrated Land Management Bureau, British Columbia Ministry of Agriculture and Lands (2009) at 12-13, online: <www.ilmb.gov.bc.ca/sites/default/files/resources/public/PDF/SRMP/climate-change-in-the-atlin-taku-pojar.pdf> [Pojar, *Atlin Taku*]

[11] L. Graumlich, L. and W.L. Francis (Eds.). 2010. *Moving Toward Climate Change Adaptation: The Promise of the Yellowstone to Yukon Conservation Initiative for addressing the Region's Vulnerabilities*, (Canmore, AB: Yellowstone to Yukon Conservation Initiative, 2010) [*Moving Toward Climate Change Adaptation*].

[12] Referred to as "patches".

[13] British Columbia Ministry of Forests, *Biodiversity Guidebook* (1995), Appendix 1.

[14] Philip D. Taylor et al, "Landscape connectivity: a return to basics" in *Connecting Conservation*, Kevin R. Crooks and M. Sanjayan eds (Cambridge U.K.: Cambridge University Press, 2006) at 38-39.

[15] *Opportunities in a Changing Climate* at 254.

[16] Philip D. Taylor et al, Connectivity is a vital element of landscape structure, OIKOS 68:3 (1993) at 571.

[17] Nicole Heller and Erika Zavaleta, "Biodiversity management in the face of climate change: A review of 22 years of recommendations." Biological Conservation 142 (2009) 14 at 18.

[18] Washington Wildlife Habitat Connectivity Working Group (WHCWG), *Washington Connected Landscapes Project: Climate-Gradient Corridors Report* (Olympia, WA: Washington Departments of Fish and Wildlife, and Transportation, 2011), on-line <waconnected.org>; Meade Krosby, "Analyzing connectivity in light of a changing climate in Washington and neighboring habitats including BC" (Presentation to Wildlinks Conference, Vancouver BC, October 24, 2011); Meade Krosby, et al, "Ecological Connectivity for a Changing Climate," Conservation Biology 24 (2010): 1686–1689.

[19] This section of the appendix summarizes foundational analysis on these concepts from e.g., B. Miller, B., R. Reading, J. Strittholt, C. Carroll, R. Noss, M.E. Soulé, O. Sanchez, J. Terborgh, D. Brightsmith, T. Cheeseman, and D. Foreman, Using focal species in

the design of nature reserve networks, Wild Earth 8 (1998/99): 82-92; R.F. Noss and A.Y. Cooperrider, *Saving Nature's Legacy: Protecting and Restoring Biodiversity* (Washington, D.C.: Islands Press, 1994); R.J. Lambeck, Focal Species: A Multi-species umbrella for nature and conservation, Conservation Biology 11 (1997): 849-856, G.K. Meffe and C.R. Carroll, Principles of Conservation Biology, 3rd ed (Sunderland, Mass.:Sinauer Associates, 2006).

[20] Pojar, *Atlin Taku* at 16.

[21] Sean Nixon et al., *The Last Place on Earth: British Columbia needs a law to protect species from habitat loss and global warming* (Ecojustice Canada, David Suzuki Foundation, ForestEthics, Wilderness Committee, 2008) at 14.

[22] Ibid.

[23] Pojar, *New Climate* at 39.

[24] *Moving Toward Climate Change Adaptation* at 54.

[25] Bob Sandford, *Climate Change Adaptation and Water Governance: Background Report* (Vancouver: Simon Fraser University Adapting to Climate Change Team, 2011) at 39.