Climate Change Vulnerability of BC's Fish and Wildlife: First Approximation

Executive Summary

BC's climate is changing with implications for ecosystems and fish and wildlife health. This report outlines a simple, transparent framework to assess climate change vulnerability for BC's fish and wildlife species and ecosystems, and uses the framework to assess vulnerability for selected species. An accompanying database includes detailed ratings and rationales. The report also identifies high-level adaptation strategies to reduce risks associated with climate change.

Climate-change vulnerability assessments measure the susceptibility to, and ability to cope with, adverse climate change effects[i]. Vulnerability depends on the level of **exposure** to changed conditions, the **sensitivity** of a system to change, and the **adaptive capacity** to recover or adjust following change. The described framework assesses species' sensitivity to changes in habitat and in the abiotic and biotic environment related to climate change. It also assesses sensitivity to non-climate stressors which combine with climate to create cumulative effects. Finally it rates adaptive capacity.

Vulnerability is assessed for a suite of species including those with a high priority for conservation, keystone and characteristic species, and species likely to be sensitive to a changing climate. The assessment groups species by climate-relevant traits to create a coarse-filter classification and to identify broadly-applicable mitigation options. Although species are assessed individually, the focus on groups of species and their habitat follows the recommendations of the Species-At-Risk Task Force: "*both science and experience indicate that this single-species approach is not the best way to proceed in the interests of species themselves*."[ii]

Results

Climate change increases unpredictability in weather and resources. Generalist species, and those adapted to unpredictability, will likely benefit: coyotes and crows, bullfrogs and warm-water fish will be able to exploit new conditions. Most specialised species, however, will face stressors. Even species able to migrate to newly-suitable climates will be challenged by atypical ecosystems arising from changed disturbance patterns, increased variability, invasive species and new patterns of disease. Although some changes are predictable (e.g., loss of small wetlands, increased water temperature), surprises will be unavoidable. For example, some bird species assessed as low risk and resilient to anthropogenic disturbance may be sensitive to high nestling mortality due to increased spring storms and changes in the timing of insect prey. Disease outbreaks and ecosystem regime shifts may change conditions rapidly. Most amphibians, alpine and riparian-dependent mammals, aerial insectivores and marine birds, and anadromous and cold-water fish are highly sensitive to climate change.

Mitigation[1]

Many mitigation strategies are similar across BC. It is not possible to change an organism's sensitivity, but it is possible to reduce exposure and to maintain adaptive capacity. Strategies to address exposure include buffering ecosystems from rapid change by, for example, maintaining old forest to buffer microclimate, and conserving riparian buffers to minimise changes to water flow and temperature. Strategies that favour adaptive capacity include maintaining connectivity to facilitate dispersal to suitable ecosystems. Strategies to reduce overall risk include

1. **promoting resilience** by maintaining or increasing ecological diversity, with a focus on enduring features of the landscape as the core of climate adaptation areas;
2. **combating detrimental change** by providing thermal and hydrological buffers, avoiding water withdrawals from sensitive wetlands, controlling invasive plants (particularly in ecosystems undergoing ecological transformation), avoiding disease transmission from domestic livestock;
3. **guiding ecological transformation** by facilitating dispersal through maintaining latitudinal, longitudinal and altitudinal corridors with minimised barriers, and assisting migration if appropriate;
4. **limiting cumulative effects** of multiple land-use activities, including, e.g. managing the impacts of development, preventing overharvest, limiting density of roads and linear corridors, regulating recreational activities in sensitive ecosystems, conserving water, avoiding pollution, including pesticides that kill insect prey bases, and following already-developed best management practices.

Increased planning for cumulative effects of climate change and other factors will be critical to prioritise appropriate strategies. As recommended by the 2011 Species-At-Risk taskforce, planning should **take an ecosystem-based approach to species at risk**. Increased **watershed assessments** will facilitate maintenance of resilient hydrological functions and identify priority actions and locations. Increased monitoring will also be important to track and respond to unpredictable and changing conditions, including changed hydrology, natural disturbance and patterns of disease.

Building management capacity may be the biggest challenge. Ultimately, success in maintaining BC's vibrant, functional, wild ecosystems will depend upon integrating conservation and climate action strategies.[iii]

---

[i] **Intergovernmental Panel on Climate Change. 2007.** Climate Change 2007 Synthesis Report. P. 48

[ii] **Species at Risk Task Force 2011.** Report of the British Columbia Task Force on Species at Risk. Report to BC Cabinet.

[iii] **Pojar J 2010.** A New Climate for Conservation: Nature, Carbon and Climate Change in British Columbia. Report to the Working Group on Biodiversity, Forests and Climate

---

[1] Cumulative effects literature uses "mitigation" to refer to strategies designed to reduce impacts of climate change and other pressures on species (i.e., impact mitigation), while climate change literature reserves "mitigation" for strategies that reduce greenhouse gases, and uses "adaptation" for strategies that reduce impacts.