BMCCA | BIODIVERSITY MANAGEMENT & Climate Change Adaptation

2013-2014

OVERVIEW

The climate in Alberta is becoming warmer, drier and more variable. These changes are affecting our landscapes, species and communities. The ABMI's Biodiversity Management and Climate Change Adaptation project is working to understand the impacts of climate change on Alberta's living resources and to identify and test adaptation strategies that can support successful management of our wildlife, plants, and ecosystems, of our biodiversity, into the future.

The project has four objectives:

1. *Predicting the impacts of climate change on our native species and ecosystems*
   Understanding the potential consequences of climate change for Alberta's species and ecosystems is the first step towards adaptation.
2. *Predicting invasive species responses to climate change in Alberta*
   The establishment and spread of new invasive species, some of which are harmful to native wildlife, may be facilitated by climate change.
3. *Assessing strategies to protect Alberta's species at risk in a changing climate*
   Climate change may exacerbate the current threats to species at risk, and some may even require targeted interventions to withstand the change.
4. *Identifying, developing and evaluating tools to manage biodiversity in a changing climate*

   Community resilience through natural systems — Community-based climate change adaptation can be achieved through no-regrets, resilience-based strategies that also support the well-being of our natural systems, but communities require tools to understand these strategies.

   Biodiversity management — Applying our understanding of the potential impacts of climate change on Alberta's species and ecosystems towards better biodiversity management requires addressing questions at the interface between science and policy.

HIGHLIGHTS

- *Amphibians are among the most climate-vulnerable species in Alberta. Individual assessments for 173 species are now available on our website.*
- *Climate change will likely increase Alberta's risk of invasion by several non-native plants that pose serious threats to native species and ecosystems.*
- *Our climate change adaptation plan for Burrowing Owls in Alberta emphasizes habitat management for prey availability and prevention of burrow flooding.*
- *Reviewed adaptation options for policy and practice surrounding management of biodiversity in a changing climate in Alberta*
- *Video: "Weathering the Storm—Ferruginous Hawks in a Changing Climate" highlights our research on the impacts of extreme weather on this threatened grassland bird*
- *Publication: Our research projecting the impacts of climate change on boreal bird distributions is accepted for publication in Ecological Applications*

Our goal is to develop knowledge and tools to support the management of Alberta's biodiversity in a changing climate.

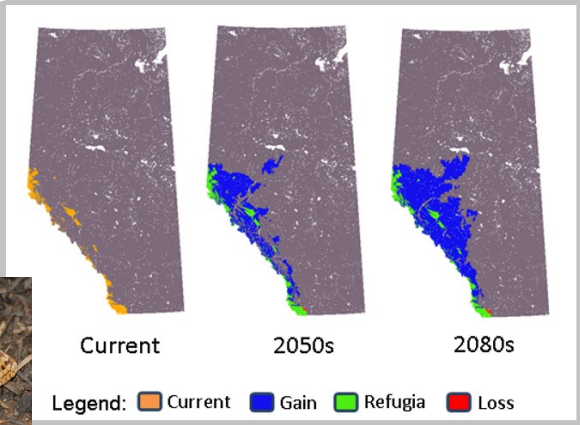
EFFECTS OF CLIMATE CHANGE ON NATIVE SPECIES

MODELLING AND MAPPING SPECIES DISTRIBUTIONS

By modelling the current and potential future distributions of Alberta birds, rare plants, and butterflies we are determining where these species are likely to persist in Alberta in the future, and identifying regions of the province that may become suitable for these species as climate changes.

Our models for 214 of Alberta's native plants show that these species will respond to climate change in diverse ways, including potential upslope and northward shifts in distribution, and expansions or reductions in suitable habitat.

We have found the effect of climate change on the future distributions of boreal songbirds is evident for most species (88%), despite multiple sources of uncertainty. Of 84 boreal songbirds examined, 44 are likely to decline in abundance in Alberta as a result of shifts in suitable habitat due to climate change by the end of the century.



Models for 9 butterflies indicate these species may experience an overall expansion of suitable habitat. This example shows habitat suitability for the Pacific Fritillary in Alberta under current and future (2050s and 2080s) climate conditions. Regions of overlap between current and future suitable habitat are in indicated as refugia. Modelled climate data from ensemble of 15 GCMs and the A2 emissions scenario. Maps: Stolar and Nielsen *in prep.* Photo: W. Siegmund.

SPECIES VULNERABILITY ASSESSMENTS

A species' vulnerability to climate change can be assessed by the combination of its sensitivity to changes in climate and the amount of climate change it is likely to experience.

Our assessment of 173 of Alberta's native species indicates that amphibians are among Alberta's most climate-vulnerable species, but vulnerability varies widely among species.

We have assembled a public, online database of assessments for individual species that can help improve the evaluation of the conservation status of climate-vulnerable species, and support the recovery of species at risk through consideration of potential climate impacts.

The Great Plains toad is among the Alberta amphibians most vulnerable to climate change due to its specific habitat requirements. Photo: L. Badura.

CLIMATE CHANGE AND INVASIVE PLANT THREATS

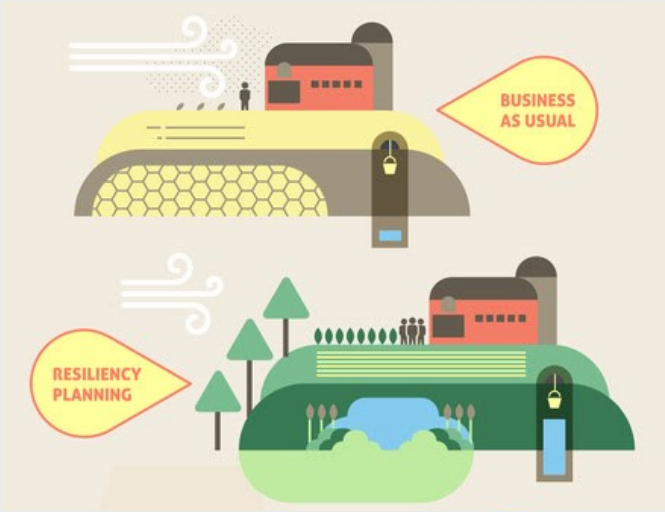
We have demonstrated a method of considering climate change in the evaluation of invasive plant risks for Alberta by combining species distribution models with invasiveness risk assessments. This research could support the incorporation of climate change as a risk factor in the process of listing invasive plants under the Weed Control Act.

Giant knotweed (left) and alkali swainsonpea (right) are two highly invasive plants, potentially threatening Alberta's native ecosystems, for which climate change could be an aggravating factor; both are currently or proposed listed as prohibited noxious species in Alberta.
Photos: Wikimedia; Utah State University.

Assisted migration could be used as a tool to help species reach newly suitable habitat that may appear as Alberta's climate changes. We're currently monitoring transplanted populations of a rare plant, the northern blazing star, to understand whether assisted migration may be a viable conservation tool. So far, it appears that northern blazing star is highly adapted to its current climate and may be negatively affected by future climate change within its range.

COMMUNITY RESILIENCE THROUGH NATURAL SYSTEMS

Several climate change adaptation planning processes for communities are underway in Alberta, and they are likely increase in relevance and popularity. We are developing an online toolkit, *Adapt-action*, that will support the consideration of ecosystem-based adaptation strategies in community planning.



The *Adapt-action* toolkit will focus on encouraging the incorporation of relevant climate change resilience strategies into existing municipal planning, emphasizing ecosystem-based adaptation actions that promote community resilience.

GRASSLAND BIRDS

The nesting success of Burrowing Owls and Ferruginous Hawks – two threatened birds in Alberta's grassland region – is diminished by extreme weather events like heavy rain and wind storms, which are expected to become more frequent with climate change.

We have assembled a climate change adaptation plan for Alberta's Burrowing Owls that outlines strategies to support Burrowing Owls under a changing climate, including reintroductions to capitalize on the potential expansion of grassland, habitat management strategies that emphasize areas with good drainage to prevent burrow flooding during heavy rain.

Monitoring of Ferruginous Hawk nests indicates that tree nests are nearly two times more likely to be destroyed over winter compared to artificial nest platforms. Artificial nest platforms could be an important management tool for buffering Ferruginous Hawks against increases in the intensity and frequency of extreme wind events.

Using local data from weather stations like this one, we have observed that Ferruginous Hawks increase prey delivery rates to nestlings when storms are imminent.
Photo: R. Fisher

The distribution of Alberta's ecosystems in Alberta is strongly linked to climatic factors like temperature, precipitation and moisture balance. Many climate models project that the climate required to support the boreal forest will no longer exist in Alberta at the end of the century. Evidence of this change in the vegetation of the forest is likely to appear more slowly, and will depend on disturbances like fire. Photo: Nagy Lehel

BIODIVERSITY MANAGEMENT IN A CHANGING CLIMATE

Our current approach to biodiversity management in Alberta does not consider the potential consequences of climate change for our living resources.

Adaptation of the management of biodiversity in Alberta to climate change may be warranted because of the unprecedented rate of change, both recently observed and expected in the future, and because recent anthropogenic disturbances may inhibit the capacity of our species and ecosystems to adapt independently.

Many opportunities for adaptation exist within Alberta's current management strategies, including: maintenance and creation of parks and protected areas, land use planning, and the listing and recovery of species at risk.

We are helping to frame ongoing and future discussions in Alberta on the practice and policy options for managing biodiversity in a changing climate, and are supporting successful management of our wildlife, plants, and ecosystems into the future.

A ROLE FOR BIODIVERSITY MONITORING

Biodiversity monitoring is emerging as a key component of climate change adaptation. The ABMI's monitoring program provides high-quality data that could be used as an early warning system for detecting the effects of climate change on biodiversity in Alberta, to document such changes, and to inform natural resource management decisions in a changing climate. The BMCCA project is currently assessing if and how biodiversity monitoring in Alberta could be improved to better support climate change adaptation in the province.

FOR MORE INFORMATION:

Amy Nixon, Project Coordinator,
Alberta Biodiversity Monitoring Institute
aenixon@ualberta.ca
(780) 492-6322

Visit our project website for the most recent reports, products and updates from the project:

www.biodiversityandclimate.abmi.ca

PROJECT COLLABORATORS:

Alberta Innovates Technology Futures
University of Alberta
University of Saskatchewan
Miistakis Institute

This project receives its core funding from the Climate Change and Emissions Management (CCEMC) Corporation.

CCEMC
Climate Change & Emissions Management Corporation