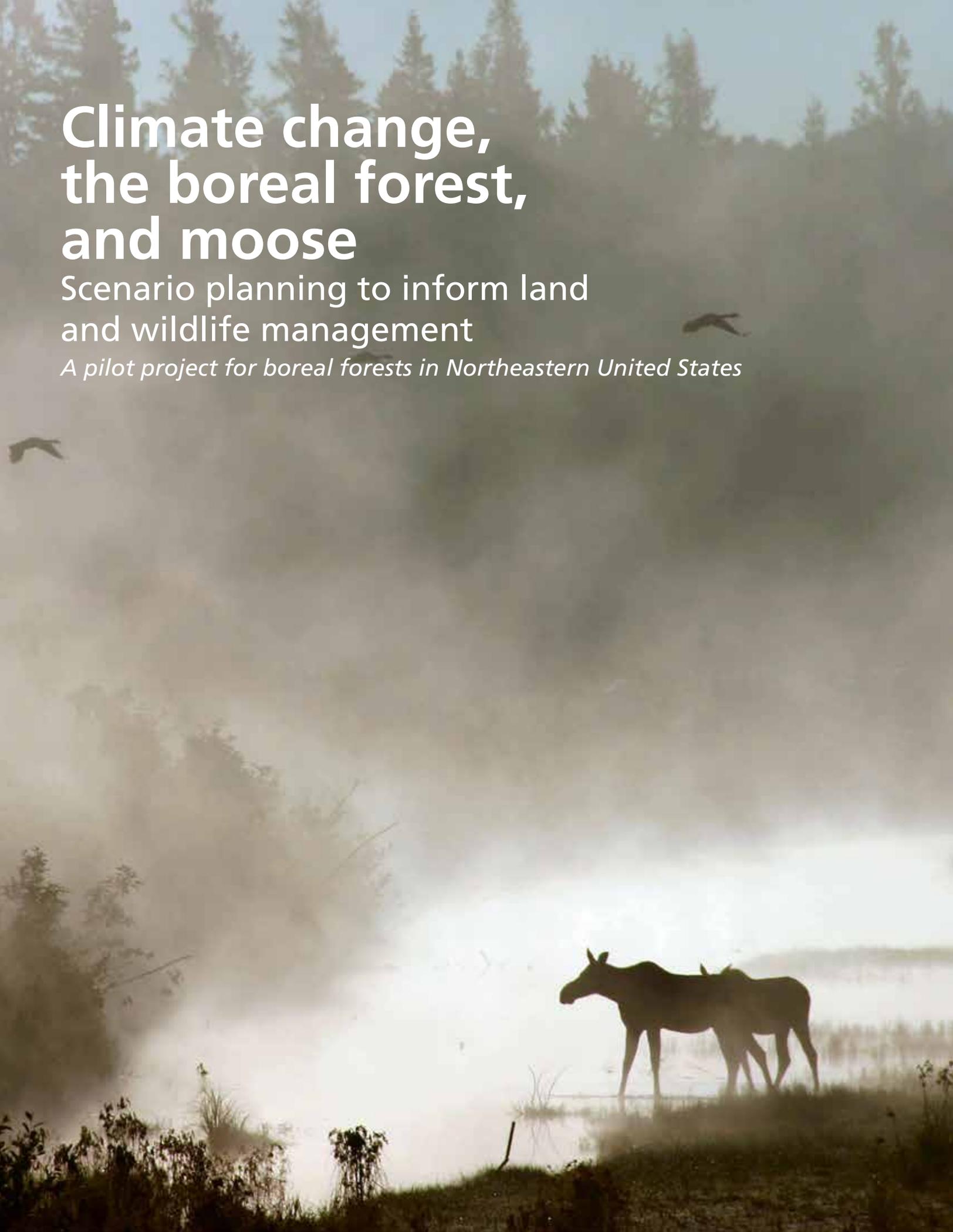


# Climate change, the boreal forest, and moose

Scenario planning to inform land  
and wildlife management

*A pilot project for boreal forests in Northeastern United States*



## Climate change, the boreal forest and moose

Climate-related changes that are already underway and projected to continue through this century are unparalleled in recent history and present unprecedented challenges to land and wildlife management. While many state and federal managers are becoming more aware of the possible impacts of climate change and other stressors (such as land-use change) on natural resources and social values, they tend to be less clear on how they might need to think about their management actions differently as changes unfold.

The southern distribution of the boreal forest occurs across the states of northern New England and New York, providing habitat for several iconic wildlife species of the region. Wildlife Conservation Society (WCS) has worked in the Adirondack Mountains of northern New York for several decades, focusing its conservation efforts on upland and lowland boreal systems. It is widely acknowledged that climate change poses risks to these boreal systems and many associated species, including moose. WCS has collaborated with wildlife managers to understand the distribution and population densities of moose within New York, as well as across Vermont, New Hampshire, and Maine. Moose also reside in Massachusetts and are of interest to state wildlife managers. Increasing, but also geographically varying, reports of the direct effects (e.g., heat stress) and indirect effects (e.g., parasites and disease) of current and continued changes in climate on moose populations proliferate in the literature and media. While moose have documented thermal tolerances and habitat requirements, uncertainties remain regarding the pathways through which climate change might affect the species and the nature and timing of its response, presenting an opportunity to proactively consider the implications for the management and conservation of this species into the future from a multi-state perspective.

## Project objectives

- 1 Develop a set of scenarios (3-5) based on uncertain aspects of climate change and ecological response in northeastern boreal forests relevant to moose and other species and ecosystems in the region.
- 2 Apply scenarios to explore management implications for moose and identify specific climate-informed management options.
- 3 Support at least one state wildlife management agency to incorporate information from the pilot scenario-planning project into their State Wildlife Action Plan and/or other relevant management plan.
- 4 Document and share the scenario planning pilot process and outcomes.



*Within the United States, the southern distribution of the boreal forest occurs across the states of northern New England and New York, providing habitat for several iconic wildlife species of the region (Map source: legal-planet.org).*

## Why scenario planning?

Scenario planning is one decision support method that can help managers incorporate information about future changes in climate and other drivers into their management decisions. The development of future scenarios (of climate change, socioeconomic conditions, land use changes, and ecological responses) can help state and federal managers understand plausible ecological futures, vulnerabilities, and opportunities as a result of climate change and related stressors. Scenario planning focuses specifically on components of management issues or the associated systems that involve high levels of uncertainty—such as some aspects of climate change—and offers a framework for embracing those irreducible uncertainties toward developing improved understanding and identifying and deciding among management options. Scenario planning also provides an excellent opportunity to integrate information from a wide array of sources and disciplines, thereby capitalizing on the vast existing body of scientific research and practitioners' knowledge.

While scenario planning is increasingly being proposed as a useful method for addressing climate change uncertainties in land and wildlife management, there is a need for additional models that show proof of concept of how management plans and decisions can be informed by scenario planning. WCS and the US Fish and Wildlife Service, with contributions from numerous agency and other partners, recently released a report describing scenario planning and case studies of its application in natural resource management. Building off the momentum of the report release, our expertise in climate change adaptation planning, and funding from the USGS National Climate Change and Wildlife Science Center, we are piloting a scenario-planning project aimed at informing land and wildlife management in the boreal forest transition zone of the Northeast. The pilot will be designed to showcase how scenario planning might be useful for this as well as other systems and geographies.

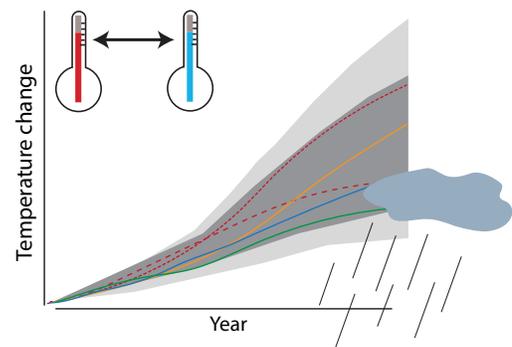
*Scenario planning is a comprehensive exercise that involves the development of scenarios that capture a range of plausible future conditions. The basic steps to scenario planning can be broken down into the three phases as described.*

### Phase 1 Process and scoping



Assemble experts and stakeholders to define project outcomes, identify key drivers within the system, and develop a planning timeline.

### Phase 2 Building and refining scenarios



Identify, assess, and prioritize the critical drivers within the system and explore, and evaluate scenarios.

### Phase 3 Using scenarios



Evaluate the potential implications of each scenario and identify and lay out actions options to take now and under future conditions. Design monitoring and research to track changes and action effectiveness.

## Seeking your involvement

The project team will work with the USGS Northeast Climate Center and the North Atlantic Landscape Conservation Cooperative to synthesize existing climate science and impact studies relevant to the project. We wish to engage researchers and managers working on moose issues across the region to help:

- Identify planning and decision opportunities that would benefit from a consideration of climate change.
- Identify components of the ecological system and key drivers of change affecting moose populations, particularly those with links to climate conditions, and key information gaps related to those drivers.
- Consider the pathways through which projected changes in climate have the potential to affect moose populations and distribution, now and into the future.
- Pinpoint the most uncertain factors with the greatest implications for moose management.
- Build and refine scenarios based on these uncertain yet impactful factors (e.g., drivers of change, ecological responses) that reveal future challenges and opportunities facing moose and habitat managers.
- Develop management and conservation options that address the implications of climate change, under multiple plausible scenarios of the future.

You can dictate your level of engagement. We plan to work closely with a core group who perceive relevance of this work to a current or upcoming planning or decision effort, but a broader group is welcome to participate as time and interest permits. We envision periodic engagement across the 2-year project, which might include group calls, semi-structured interviews, meetings (most likely tacked-on to conferences that participants are already planning on attending), and 1–2 one-day workshops. We can offer compensation to help offset travel expenses required to attend meetings scheduled solely for this project.

**Organizations Involved:** Wildlife Conservation Society (WCS), US Geological Survey (USGS) National Climate Change and Wildlife Science Center, Department of Interior Northeast Climate Science Center, North Atlantic Landscape Conservation Cooperative, Massachusetts Division of Fisheries and Wildlife, New York State Department of Environmental Conservation, US Forest Service Northern Institute for Applied Climate Science, New York Cooperative Fish and Wildlife Research Unit, University of Maryland Center for Environmental Science.



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Integration & Application Network

[ian.umces.edu](http://ian.umces.edu)



*Participants at a Wildlife Conservation Society lowland boreal climate change planning workshop. Photo © Larry Masters.*

**For more information:**  
Erika Rowland, Climate Change Ecologist  
Wildlife Conservation Society  
[erowland@wcs.org](mailto:erowland@wcs.org)

