



Climate Change Adaptation White Paper Series

Fish and Wildlife Conservation and Climate Change Adaptation in Vermont

John Austin, March 2012

Introduction

The mission of the Vermont Fish and Wildlife Department is the conservation of all species of fish, wildlife, plants and their habitats for the people of Vermont. Vermont has a rich natural heritage with a landscape that supports 258 species of birds, 58 species of mammals, 91 species of fish, 40 species of reptiles and amphibians, more than 2,000 species of vascular plants, and over 20,000 species of invertebrates. People who live in and visit Vermont have a deep appreciation for the natural landscape that supports diverse fish and wildlife resources, from black bear and moose, to loons and hermit thrush, to brook trout and orchids.

Impacts and Vulnerabilities

Clear and convincing evidence indicates that Vermont's climate is changing (Betts 2011). Climate change is having and will continue to have significant effects on Vermont's fish and wildlife, and the natural communities that support them (Beckage et al. 2008, Iverson et al. 2008, GCCIUS 2009, Hayhoe et al. 2006, Rodenhouse et al. 2009, Walther et al. 2002). Anticipated challenges for fish and wildlife include:

- **Warmer summers and shorter winters,** resulting in an increased growing season and potential changes in the composition of natural communities. As ecological conditions change, they may become less suitable for some species and more suitable for others. For example, certain climate-sensitive habitats such as high-elevation spruce-fir forest may shrink or vanish, with implications for specialized species



(e.g. Bicknell's thrush) that depend on them. In contrast, some important wildlife food sources such as oaks and hickories may expand their range and thrive.

- **Changes in precipitation, evaporation, snowmelt**, and other factors related to water, leading to flooding, drought, and changes in water temperatures in streams, rivers, and lakes. These changes can have profound effects on the physical habitat for many fish and wildlife species.
- **Changes in the timing of seasonal events** such as: leaf-out, ice-out, lake turn-over, spring runoff, and the emergence of plant and insect species. The emergence of some plants triggers the emergence of some insects which are an important and reliable source of food for a variety of fish and wildlife species such as trout and birds. Likewise, many fish species begin spawning in response to snowmelt and spring run-off.

Fish and wildlife responses to these changes in Vermont and the northeast will be varied and complex (Beckage et al. 2008, Chen et al. 2011, Dukes et al. 2009, Ficke et al. 2007, Hellmann et al. 2008, National Audubon Society 2012, Rodenhouse et al. 2009). Anticipated effects include:

- **Species will move.** Some species of fish and wildlife may shift their distribution on the landscape to follow the presence of preferred or essential habitats. For example, some migratory songbirds rely on high elevation spruce/fir forest for nesting habitat. These island habitats are expected to become smaller and less abundant in Vermont as temperatures warm and other trees and plants move into higher elevations. Birds such as Bicknell's thrush and the boreal chickadee will shift in accordance with changes in these habitats. Brook trout may retreat further up into the colder headwater reaches of streams and rivers, and warm water species may move further into brook trout habitat.
- **There will be winners and losers.** Certain species may simply disappear from Vermont's landscape, because they are at the edge of their existing range, are adapted to cold environments, or are uniquely sensitive to changes in habitat conditions. Bicknell's thrush may be one of these species. At the same time, other species of plants and animals may thrive in a warmer climate, such as deer,



reptiles and many species of birds associated with forest and climate conditions more closely aligned with the mid-Atlantic region.

- **New species will arrive.** Species formerly uncommon in Vermont, or only present during warmer seasons, may become more commonplace. This is already evident with two formerly southern-oriented species, the black vulture and opossum, which are now a regular part of Vermont’s wildlife portfolio. Winter bird-count data indicates that many migrant birds that used to be absent from Vermont in winter are increasingly observed in the state year-round.
- **Non-native, invasive species will continue to spread.** These species, such as honeysuckle, common buckthorn, Eurasian milfoil, hemlock woolly adelgid, and zebra mussel often thrive in the face of disturbance and out-compete native species of plants and animals. As climate change continues, invasive species are likely to expand their distribution and abundance and result in additional stress for native fish, wildlife, and plants.
- **Some changes will be unpredictable.** As species relocate on the landscape and change the timing of important natural processes (e.g. reproduction, migration), there likely will be new interactions between species. It is possible that some natural community associations, predator-prey relationships, or species habitat preferences will be entirely unlike present-day interactions, and may lead to unanticipated consequences for fish and wildlife species.



Adapting Fish and Wildlife Conservation to Climate Change

Climate change will result in inevitable shifts in Vermont’s fish and wildlife communities. While some potential consequences for fish, wildlife and their habitats can be anticipated, many of these changes are unpredictable in terms of their scope and timing. Therefore, the overall strategy for adapting fish and wildlife conservation to climate change is to foster an interconnected landscape of high-quality habitats and natural communities, so that species have an opportunity to move and adapt in response to whatever changes may occur. By and large, many of the conservation programs already undertaken or supported by the Vermont Fish and

Wildlife Department and many other federal, state and non-government organizations are likely to remain effective, including:

- The **permanent conservation of land and habitat**. This is one of the most important steps in maintaining a resilient landscape for the uncertain future of climate change. Every year, the Agency of Natural Resources buys land for the long-term conservation of fish, wildlife, plants, habitats, natural communities, and public enjoyment. Land acquisition will continue to be an essential underpinning of effective conservation.
- Creating a **well-connected regional landscape of undeveloped land and habitat**. Fish and wildlife will respond to climate change in various ways, but their ability to respond is only as good as their ability to move within the broader landscape. Studying wildlife movements and modeling wildlife travel corridors, purchasing land, acquiring conservation easements, providing technical assistance and incentives for habitat management to landowners, removing barriers to aquatic organism passage, and working with the Vermont Agency of Transportation to ensure a network of roads that is permeable to fish and wildlife are some of the strategies aimed at improving connectivity.
- **Habitat management and invasive species control**. Along with land use planning and regulation, this can help protect and improve high-quality natural communities and important wildlife habitat. These resources are assessed in detail and carefully considered in the management of Wildlife Management Areas, State Parks, and State Forests. On private land the Department provides technical assistance (e.g. Wildlife Habitat Improvement Program or ‘WHIP’) and regulatory review (e.g. Act 250). Inventory, monitoring, and control of invasive species will remain integral components of all habitat management activities.
- **Species management**. This will continue to be an important conservation strategy. For example, population management of white-tailed deer and moose can provide hunting opportunities while addressing the over-browse of forest regeneration. Monitoring and management of rare, threatened, and endangered species such as the spruce grouse, spiny softshell turtle, and little brown bat can help protect vulnerable species with small populations or very specific habitat needs which might be especially sensitive to changes in climate. In extreme cases, such as for alpine plants and animals with vanishing habitat, it may be necessary to consider assisted migration strategies.

Addressing the conservation challenges of climate change will require an unprecedented degree of cooperation. Partnerships among various conservation organizations such as land trusts, town

conservation and planning commissions, the U.S. Fish and Wildlife Service, the U.S. Department of Agriculture, private landowners, and many more, have been the cornerstone for the great conservation success in Vermont. Importantly, private landowners continue to hold the key for wildlife conservation in Vermont, as 80% of Vermont land is in private ownership. As the effects of climate change become clearer, it may be possible to adapt conservation programs with private landowners to offer incentives and assistance to better conserve the habitats and resources required by fish and wildlife.

Because climate change occurs on such a large scale, fish and wildlife conservation programs will need to become aligned, coordinated and managed on a regional basis. To this end, the Department supports partnerships such as the Staying Connected Initiative, a joint project of The Nature Conservancy, Vermont Agency of Transportation, the Vermont Fish and Wildlife Department, and other organizations, designed to identify and protect corridors for large mammals to move across the regional landscape. Also at a larger scale, the U.S. Fish and Wildlife Service initiated a new framework to facilitate fish and wildlife conservation on a regional scale, referred to as the Landscape Conservation Cooperative initiative. Monitoring, research, and to some extent applied management programs for fish and wildlife can now be coordinated more effectively, with the focus on climate change, within the northeast region. This will allow for greater efficiencies in the applications of limited funding and technical resources as well as ensure that the most effective conservation strategies for fish and wildlife are applied consistently region-wide.

Next Steps

While the challenges of fish and wildlife conservation arising from climate change may be new, the overall approaches to addressing them will remain consistent. Sound scientific study is an essential foundation of fish and wildlife conservation. Continuing existing monitoring and exploring options for new research is an important next step in adapting to climate change. In particular, updating Vermont's Wildlife Action Plan with an emphasis on climate change, species vulnerabilities, and adaptation strategies could provide a foundation for future steps. At the same time, seeking out new partnerships while maintaining existing relationships will be essential for transforming scientific understanding into specific conservation and management actions.

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