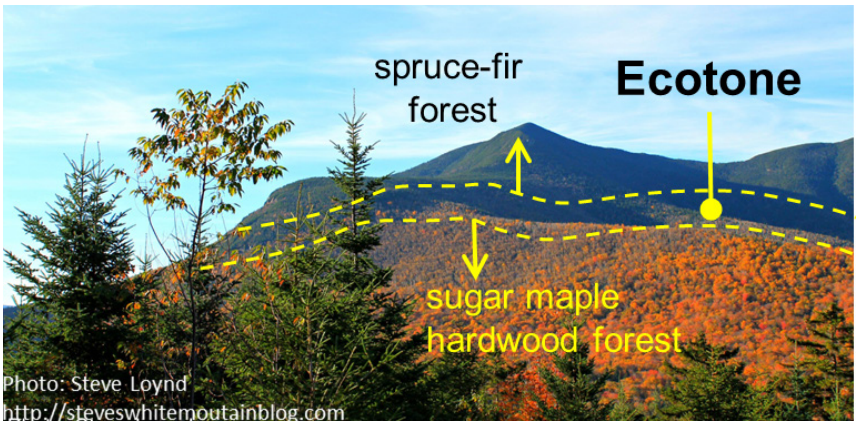
Spruce - Fir Ecosystems

NE CASC
Northeast Climate Adaptation Science Center

Spruce-fir forests contribute greatly to regional biodiversity, but there is a risk of losing them to climate change. NE CASC researchers are working with resource managers to help them adapt.

Northern Forest

At 2,500 feet until treeline, and in some northern New England flats, red spruce and balsam fir dominate. These high elevation and high latitude forests, although rare, are critical habitats for a wide variety of northern species including the Bicknell's thrush, Canada lynx, snowshoe hare, and northern flying squirrel.



The dotted lines indicate the ecotone where maple-dominated hardwood forests transition into higher elevation spruce-fir forests

Montane Climate Change Refugia

Scientists are working to predict how climate change will impact ecosystems and species distributions. Although climate change has far-reaching effects, areas known as climate change refugia that are buffered from temperature and precipitation shifts can allow valued ecological, physical, and sociocultural resources to persist. **NE CASC researchers including Tony D'Amato, Toni Lyn Morelli, and Jane Foster** study these forest ecosystems to project where they will persist as climate change refugia in the future. **Morelli and past NE CASC fellow Bill DeLuca** have modeled refugia locations for several species dependent on spruce-fir forests, including Bicknell's thrush, Blackpoll warbler, and snowshoe hare. This work will help guide the conservation of species that inhabit these forests as part of Nature's Network, a landscape conservation design toolkit.

USGS science for a changing world

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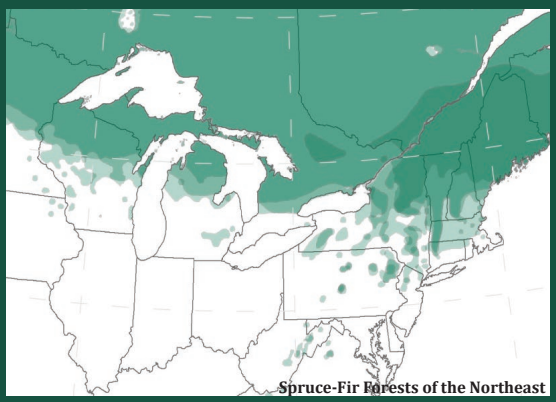
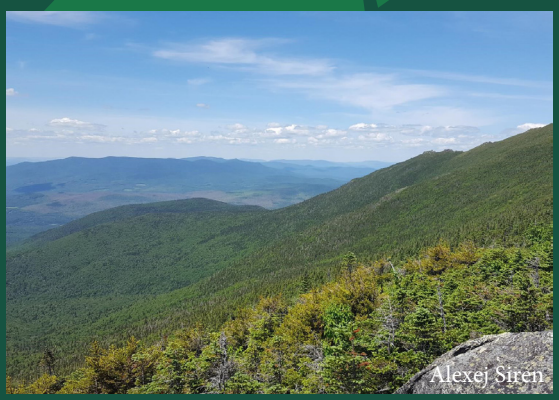


The current range of Spruce-Fir Forests of the Northeast, Midwest, and Canada

Spruce-fir forest in the White Mountains



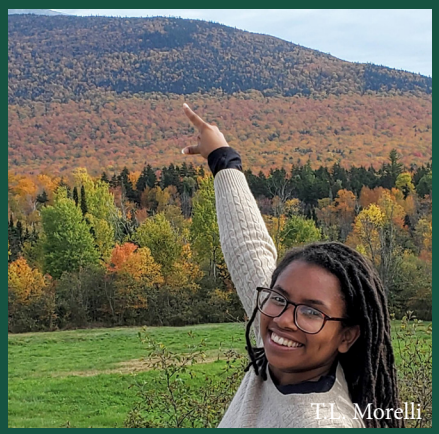
Mount Jefferson, White Mountains, NH

Research Topics in Spruce - Fir forests

Canada lynx (L) and snowshoe hare (R) in summer

Mammals and Changing Winters

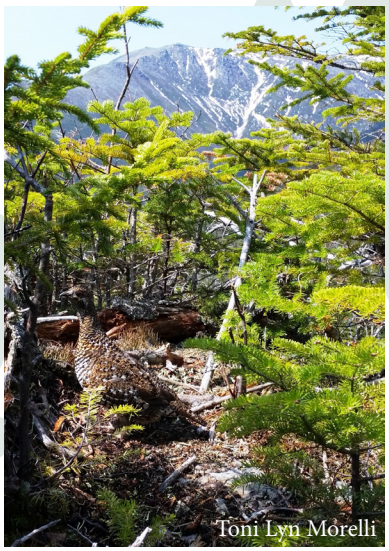
Wildlife populations in this range are likely to experience warmer winters with more precipitation falling as rain during the 21st century. **NE CASC researcher Toni Lyn Morelli** and her team are seeking to understand how American red squirrels, a key predator of vulnerable high elevation birds, are responding to climate change in spruce-fir forests. **NE CASC Fellow Jahiya Clark** is working with foresters to understand how forest management for climate change affects the wildlife community. Former **NE CASC Fellow Alexej Siren** is studying the responses of Canada lynx and its prey and competitors to climate change; lynx are highly adapted for hunting in areas with deep, persistent, powdery snow.



Left to right: NE CASC Fellow Jahiya Clark pointing to the transition from a maple-dominated hardwood forest to a high elevation spruce-fir forest, Researcher Bill Deluca geotagging a Blackpoll warbler, and Researcher Toni Lyn Morelli tagging a red squirrel.

Vulnerability of Birds and Prospects for Conservation

NE CASC partner Bill DeLuca is working with wildlife and forest managers in northern New Hampshire, Vermont, and Maine to improve our ability to accurately forecast and address threats to priority bird populations. Researchers are finding that bird distributions are shifting and NE CASC scientists are beginning to understand the mechanisms that are causing these changes. In the White Mountain National Forest of New Hampshire, **NE CASC Fellow Sarah Deckel's** work focuses on understanding the breeding biology of Swainson's Thrush (*Catharus ustulatus*), a migratory songbird, along an elevation gradient by studying how climate and habitat influence their diet. She will use this information to further understand how climate change may be contributing to recent dramatic declines in bird populations. This research allows better predictions of how species will respond to changes in climate and forest structure.



A spruce grouse in the White Mountain National Forest

Learn more at: necasc.umass.edu

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Northeast Climate Adaptation Science Center, 136 Morrill Science Center, 611 N. Pleasant Street, UMass Amherst, Amherst, MA 01003