



NSRC Progress Report 2022

Implementing Forest Adaptation Options for Northern Forest Ecosystems

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Project Abstract

Climate change and increasing prevalence of non-native invasive insects and diseases are some of the most significant challenges facing forest managers in sustaining ecosystems across the Northern Forest region. This project will increase the application of adaptation strategies to enhance forest resilience to climate change and invasive pest and disease impacts, while also sustaining critical ecosystem services, including wildlife habitat, carbon storage, and local forest-based economies. NSRC researchers will evaluate outcomes and effectiveness of already implemented adaptation strategies and partner with resource managers to produce site-tailored recommendations on best practices for anticipated impacts of climate change and invasive species. This project uses a network of adaptation experiments and demonstrations in Maine, New Hampshire, New York, and Vermont on more than 30 sites to better understand the ability of forest adaptation strategies to address emerging forest health and climate change impacts. Researchers will measure forest structural, compositional, and functional outcomes of these strategies at these sites to document forest management approaches that provide the greatest adaptation potential for northern hardwood, mixed wood, and spruce-fir ecosystems. Through partnerships with federal, state, Tribal, private, and NGO forestry stakeholders, researchers will develop outreach materials, such as pamphlets, webpages, webinars, and workshops that identify site-tailored, best adaptation practices for these key forest types in northern New England and New York. Short-term benefits for the Northern Forest include management guidance and a broadened community of practice for operationalizing forest adaptation strategies to address emerging threats. Long-term benefits include the ability to sustain ecological and economic benefits of critically important forest ecosystems despite changing climate and disturbances.



Black cherry seedling established as adaptation planting in rich northern hardwood forests threatened by emerald ash borer and climate change impacts in Corinth, VT.

Progress in 2022

We established an advisory committee of forest managers and science partners to identify key knowledge gaps and priorities surrounding best adaptation practices for northern hardwood, mixed wood, and spruce-



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fir ecosystems. This included determining the range of existing adaptation demonstrations, experiments, and operational trials in ME, NH, NY, and VT that could be used to inform recommendations for increasing the resilience of Northern Forest systems. A priority list of adaptation practices to evaluate and associated field sites were developed and are being used to inform field sampling in 2023. In addition, preferred outlets and approaches for delivering findings and recommendations to managers and other end users were determined, including a web-based interface and series of workshops planned for 2023.



Quarter-acre gap being planted with northern conifer species projected to be adapted to future climate change within variable density thinning treatment designed to increase ecosystem complexity and habitat diversity in

Plans for 2023

During 2023, we will conduct field surveys or integrate existing data collections from 30 demonstration and research areas in ME, NH, NY, and VT to quantify outcomes of adaptation tactics for northern hardwood, mixed wood, and spruce-fir forests. Outcomes of adaptation treatments will be evaluated in the context of forest regeneration, including survivorship of adaptation plantings where applicable, forest health indicators, aboveground forest carbon storage, and overall ecosystem resilience to projected climate change and invasions of insects and diseases. In addition, we will examine non-structural carbohydrate reserves in overstory red spruce and sugar maple at a subset of sites to evaluate tree-level resilience to environmental stress in relation to climate change and insect impacts.

Outcomes from the field assessments will be summarized and integrated with manager feedback to develop a refined suite of best adaptation practices tailored to specific site conditions and forest conditions. These practices will be shared via a web-based decision support tool, which will be drafted in 2023 with input from our advisory team and other partners. We also will host at least two field tours and workshops with forest managers at adaptation research areas in NH and VT during the next year.

Collaboration

Project PIs include Maria Janowiak from the USDA Forest Service Northern Research Station Northern Institute of Applied Climate Science (NIACS), and project results are designed to help advance forest adaptation strategies and decision support tools developed by NIACS for the northeastern US. In addition, we are partnering with several public, private, and non-profit forest management organizations and companies, including the Green and White Mountain National Forests; Lyme Timber Company; Vermont Forests, Parks, and Recreation; the US Fish and Wildlife Service; The Nature Conservancy; Forest Stewards Guild; and Dartmouth College Woodlands. These broad and diverse partnerships are informing the co-production of the research design and associated outreach products to ensure alignment with key management priorities for the region, as well as the relevance of adaptation strategies for diverse forest conditions and ownerships.