

COOPERATIVE FORESTRY RESEARCH UNIT

2024 ANNUAL REPORT

SELECTED HIGHLIGHTS & ACCOMPLISHMENTS

SILVICULTURE

MAINE ADAPTIVE SILVICULTURE NETWORK (MASN)

Along with continuing long-term measurements of the MASN sites, 2024 also saw new site installations and projects proposed and funded using the MASN sites and related data. The CFRU summer crews worked hard to get out to some of the most remote sites, JDI Saul's Brook and SILC T13R15, and conduct postharvest surveys. Baxter State Park's Scientific Forest Management Area joined the study with one block measured and the first round of the prescriptions being discussed with SFMA staff.

MIXEDWOOD MANAGEMENT: SILVICULTURE FOR HARDWOOD-SOFTWOOD MIXTURES IN MAINE

The Mixedwooders have completed a preliminary analysis of FIA data in Maine to determine the extent, composition, and trends in mixedwood (hardwood-softwood) forests. The Mixedwood Memos, a CFRU deliverable/report on the status and trends of mixedwoods in Maine, was compiled by Lance Vickers (UKentucky) and Laura Kenefic (USFS) and [can be viewed here](#).

SILVICULTURAL SYSTEMS FOR ADAPTIVE PLANTED-SPRUCE FORESTS (SSAPSF)

5 installations were established on JDI and Seven Islands Land Company managed lands during the 2024 field season for a total of 15 plots. Initial tree measurements were taken at each installation including root collar diameter and total height. Data loggers to measure environmental and site variables were installed. Data has been entered and analyzed, and results have been generated into a research note provided to the CFRU. Results suggest significantly greater height of JDI seed sources at 7 and 8 years after planting. [CFRU members can view recent write-ups under "results series"](#).

GROWTH & YIELD

REFINING THE ACADIAN MODEL (FVS)

In October 2024, the CFRU hosted a FVS Acadian Model workshop with lead researcher Ben Rice of Midgard Natural Solutions. The technology transfer workshop was a successful key deliverable for this project and incorporated member feedback from a FVS webinar in 2023 that introduced members to Ben's work. Creating training opportunities and providing reference material ensures that members of all backgrounds, from foresters to biometricians, have the tools and understanding at their disposal to use FVS for their organization's needs. [Click here to access the training materials and recording from the workshop](#).

MAPPING

HIGH RESOLUTION LAND COVER AND FOREST TYPE DATA FOR THE STATE OF MAINE

The Maine High Resolution Land Cover project has hit key milestones in the last year as it marches towards completion. Machine learning algorithms and workflows that are used to map species from Sentinel-2 imagery were fleshed out and improvements include more consistent representation of fine-scale spatial heterogeneity in species and forest type predictions. Substantial progress was made toward completing image processing across southern, western, and Downeast Maine. 15 species/species groups have been mapped across northern Maine. Stay tuned for final deliverables.

USING 3-D NAIP DATA FOR ENHANCED FOREST INVENTORY IN MAINE

Statewide digital height model data sets at high resolution (1 - 2 m raster maps) calculated from NAIP acquisitions for Maine in 2018 and 2021 were completed in the summer of 2024 by Wheatland Geospatial Laboratory Staff, Dave Sandilands and Tony Guay. For their next CFRU deliverable, the team is working towards open-access visualization and modeling tools (e.g. R code) developed for incorporating NAIP-derived photo point clouds in EFI projects.

The data sets are hosted on Google Drive

- [2018 DHM tiles](#)
- [2021 DHM tiles](#)



A Core Program of the Center for
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Dr. Neil Thompson does show-and-tell on a fallen fir tree with SBW defoliation at the 2024 CFRU Fall Field Tour.

SPRUCE BUDWORM L2 MONITORING PROGRAM IN MAINE

The UMaine Spruce Budworm Lab continues to provide monitoring data for CFRU members, researchers, and interested organizations alike by processing L2 (overwintering spruce budworm larvae) samples. 2024 was the busiest year yet for the lab with major increases in L2 numbers seen in northwestern Maine and the St. John Valley (Fort Kent and surrounding towns). Nearly [400 additional fee-for-service samples](#) outside of the CFRU-supported monitoring sites (~350) were processed by Dr. Mech and her team in 2024. [New results are added weekly during the processing season \(Sept. - spring\) to the online ArcGIS map.](#)

ESTABLISHMENT OF EFFECTIVE WORKFLOWS FOR PEST-INDUCED DAMAGE DETECTION AND FOREST HEALTH MONITORING IN MAINE BY INTEGRATING REMOTE SENSING TECHNOLOGY AND FIELD DATA

This project utilizes satellite data for change detection and ground-truthed defoliation (from SBW) data to develop defoliation detection models for Maine. Researchers are using ground based data to train and validate the defoliation models and outputs. The team created single-year defoliation detection models for the years 2018-2022 and assessed accuracy based on different variables used (elevation, canopy height model, BGI, and a number of spectral vegetation indices to help pick up the red-tinge of defoliated trees from satellite data) as well as general models that incorporated data for all the years combined (2018-2022). Single-year model variables provided more accurate results than general model variables. More statistical details can be found in the full annual report upon release.

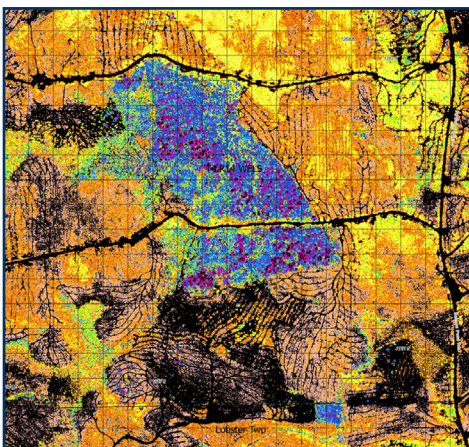
UNDERSTANDING WHITE PINE'S RESPONSES TO FUTURE ENVIRONMENTAL CHANGES: DEVELOPING STRATEGIES TO REDUCE DAMAGE CAUSED BY THE WHITE PINE WEEVIL

While the white pine weevil is a native insect to the US, prevalence of damage to white pine is higher in Maine compared to southern states in the Appalachian Region according to FIA data collected throughout the northern region. Understanding the factors, environmental and genetic, could lead to better management strategies for growing white pine in Maine. The research team sampled 17 white pine plots in Maine, 6 in Virginia, and 6 in North Carolina to measure differences in stand conditions and weevil occurrence. A notable difference between stands in Maine and the Blue Ridge Plateau is the lack of a duff layer in the later. An analysis of FIA data and weevil damage in Maine is nearly complete and will aid the project objective of creating a weevil hazard rating map for growing white pine throughout the state.



Graduate student Maeve Noone-Price heading out to sample a young white pine plantation in North Carolina

HABITAT & BIODIVERSITY



MAPPING AND MANAGING FOR LATE-SUCCESSIONAL (LS) FOREST IN MAINE'S COMMERCIAL FOREST LANDSCAPES

Using publicly available LiDAR data, the machine learning algorithm Random Forest, and field validated data on LS stands, the research team produced a map of late-successional forest for the unorganized territories of Maine in 2024, with 94% accuracy¹. Understanding and quantifying how much LS forest is remaining in Maine is key to the project's next objective: how do we manage and protect what's left? The researchers worked to produce landowner-specific maps to help cooperating landowners understand the results and applicability of the products. You can read the [Our Climate Common report here, which details the mapping methodology portion of the project.](#) Stay tuned for a landowner workshop/management guide, to be held/released in 2025.

Photo above: (J. Hagan) The blue-magenta canopy height "signature" often indicates a late-successional stand in the unorganized townships of Maine. Grid=1 ha units. 1. Using LiDAR to Map, Quantify, and Conserve Late-successional Forest in Maine. Hagan et. al 2024.

USING eDNA FOR BIODIVERSITY AND RARE SPECIES MONITORING

This study aims to establish protocols for using eDNA in Maine’s forested wetlands, to examine the potential for false positives and false negatives, and to synthesize the state of knowledge for managers. Major accomplishments in 2024 include expanding eDNA metabarcoding to hundreds of species of vertebrates, invertebrates, and various microorganisms. At their study sites, the team detected 36 wildlife species (amphibians, reptiles, birds, mammals) and 36 invertebrate species. Of interest, salamander DNA quantity increased from spring to summer, peak in mid-summer when larvae are hatching in wetlands. This may inform decision making around timing on when to collect eDNA samples (post-breeding surveys may yield greater detection probabilities for amphibians).



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LIST OF SUPPORTED PROJECTS

16
RESEARCH
PROJECTS
SUPPORTED

\$450K
DEDICATED TO
RESEARCH

32
CFRU
MEMBERS
REPRESENTING

8.5
MILLION
ACRES
IN MAINE

SILVICULTURE	LEAD RESEARCHER
Maine Adaptive Silviculture Network (MASN)	CFRU
Northern Conifer Silvicultural Guide	L. Kenefic (USFS)
Mixedwood Management: Silviculture for Hardwood–Softwood Mixtures in Maine	L. Kenefic (USFS)
Secrets in the CTRN: Causal factors of thinning response and transfer to adaptive management regimes in Maine spruce-fir forests	M. Premer (UMaine)
Silvicultural Systems for Adaptive Planted-Spruce Forests (SSAPSF)	M. Premer (UMaine)
GROWTH AND YIELD MODELING	LEAD RESEARCHER
Refining the Acadian model	B. Rice (Midgard Natural Solutions)
MAPPING	LEAD RESEARCHER
High Resolution Land Cover and Forest Type Data for the State of Maine	K. Legaard (UMaine)
Using 3-D NAIP data for Enhanced Forest Inventory in Maine	Sandilands & Guay (UMaine)
FOREST HEALTH	LEAD RESEARCHER
Spruce budworm L2 Monitoring Program in Maine	A. Mech (UMaine)
Establishment of effective workflows for pest-induced damage detection and forest health monitoring in Maine by integrating remote sensing technology and field data	P. Rahimzadeh (UMaine)
Understanding white pine’s responses to future environmental changes: Developing strategies to reduce damage caused by the white pine weevil	B. Livingston (UMaine)
CARBON	LEAD RESEARCHER
Forest Carbon and Timber Potential for Northern Maine’s Working Forests	A. Daigneault (UMaine)
Soil carbon sequestration dynamics post-harvesting: effect of stand characteristics and site factors	L. Louis (UMaine Fort Kent)
HABITAT & BIODIVERSITY	LEAD RESEARCHER
American marten: refining the umbrella species concept in Maine	E. Simons-Legaard (UMaine)
Thirty years of change in commercial forest management and implications for bird conservation in Maine (1992-2022)	J. Hagan (Our Climate Common)
Using eDNA for biodiversity and rare species monitoring	N. Charney (UMaine)