

2022 Annual Report

NOTES & UPDATES – NOVEMBER 2022

Cooperative Forestry Research Unit



Highlights from CFRU research projects in 2021. For more information, check out our full annual report, coming out in December 2022!

www.umaine.edu/cfru
cfru@maine.edu
[CFRU on YouTube](#)

Silviculture & Management

A new northern conifer silviculture guide

Principle researcher: Laura Kenefic, U.S. Forest Service

The New Northern Conifer Silviculture Guide will update management recommendations, taking into account conditions and challenges facing forest managers today. By compiling robust silvicultural recommendations from the last half century, the guide aims to meet contemporary forest management needs such as changing forest types and climate change. The guide is set to be released in 2023 by the U.S. Forest Service, accompanied by a video and field workshop for CFRU members. Recent accomplishments include:

- A new stocking guide developed in 2021-2022 for spruce-fire dominated stands
- Formed an advisory panel for the project including many individuals from CFRU member organizations and solicited feedback on work completed thus far
- Presented to the New England Society of American Foresters in March of 2023. Breakout groups were used to identify needs and strategies for the guide.

Habitat & Biodiversity

Thirty years of change in commercial forest management and implications for bird conservation in Maine (1992-2022)

Principle researcher: John Hagan, Our Common Climate

In 2021, this project began a replication of a major study of birds and commercial forestry conducted in the 1990s in the Moosehead Lake region. With a drastic drop in national bird populations and changes in forest types from the 1990s, this project seeks to answer some questions about how the birds in our neck of the woods are faring by going back to their original methodologies.

- At the close of their field season in August 2022, all of the field data required for the project has been collected. This totals 422 sampled locations for birds in all forest types and age classes using the point count method. A detailed vegetation survey at each point were also collected
- Began using LiDAR data for describing and predicting bird habitat
- A communications success story, the 30-year bird survey continues to make headlines in Maine news. Maine Public Radio visited and interviewed the research team in the field in August of 2022



Field crews conducting a productivity survey for nesting birds

Watershed Scale Drivers of Temperature and Flow of Headwater Streams in Northern Maine

Principle researcher: Neil Thompson, University of Maine Fort Kent

This project was initiated to investigate the influence of forest management on stream temperature and flow in northern Maine's headwater streams and is nearing completion. Temperature data loggers have been launched each season since 2019 in the Smith Brook study area (see map in annual report). Preliminary findings have pointed to a strong correlation between stream slope and temperature, with steeper streams trending cooler thus far.

- Temperature loggers are being collected in the fall of 2022 and work will begin on a final analysis, reporting, and publication.



Students make stream measurements and observations at Smith Brook, T14 R9WELS. Photo - Neil Thompson

American marten: refining the umbrella species concept in Maine

Principle researcher: Erin Simons-Legaard, University of Maine



The concept of umbrella species allows us to use a single species habitat requirement (typically a larger-bodied habitat species with large area requirements) to guide ecosystem management. This project aims to refine the role of American marten in Maine as an umbrella species for other mature forest vertebrates in the Northern Forest Region. Project accomplishments in 2021 include a successful deployment of acoustic monitors across 60 the study area.

Inventory & Growth Modeling

Maine Adaptive Silviculture Network CFRU

The Maine Adaptive Silviculture Network is still in its infancy when we consider the long-term research plans for these sites scattered across central and northern Maine. Created as an outdoor laboratory for comparing silvicultural treatments, our membership continues to brainstorm ideas and asks of us “what else can we measure with MASN?”. MASN turns 5 this year, with 9 out of 18 sites installed across the CFRU membership landholdings. This year, protocols were revised and student crews spent the summer conducting inventories for forest measurements and collecting wildlife data. In 2022 we accomplished the following:

- Completed 3 full site inventories with our crews measuring a total of 135 plots
- This spring, Seven Islands Land Company in conjunction with the



Amos Hinkley, CFRU summer student, counts beech saplings on a MASN plot

Maine Forest Service implemented a prescribed burn on one of their MASN sites as an alternative method for site preparation. Prescribed fire is seldom explored in Maine and we look forward to following its effects on growth, site nutrient levels, and composition in years to come.

- MF student and CFRU Eric McPherson continues to work on site summaries based on the most recent inventories collected including aboveground live carbon by treatment and year.

Measurements, Models and Maps: toward a reliable and cost-effective workflow for large-area forest inventory from airborne LiDAR data

Principle researcher: Dan Hayes, University of Maine

Geospatial analysis and related mapping technology research is continuously emerging as a key research priority for the CFRU membership. The rate at which remote-sensed information has been collected over large areas has drastically increased in the last few years. This project utilizes Airborne Laser Scanning (ALS) data and is made available for free from the USGS, along with data samples from NASA. This project seeks to utilize these datasets to develop Enhanced Forest Inventories (EFIs) more accurately and at a lower cost relative to traditional methods. As new remote sensing technologies emerge, so do important research questions that seek to improve the methodologies. Accomplishments this year include:

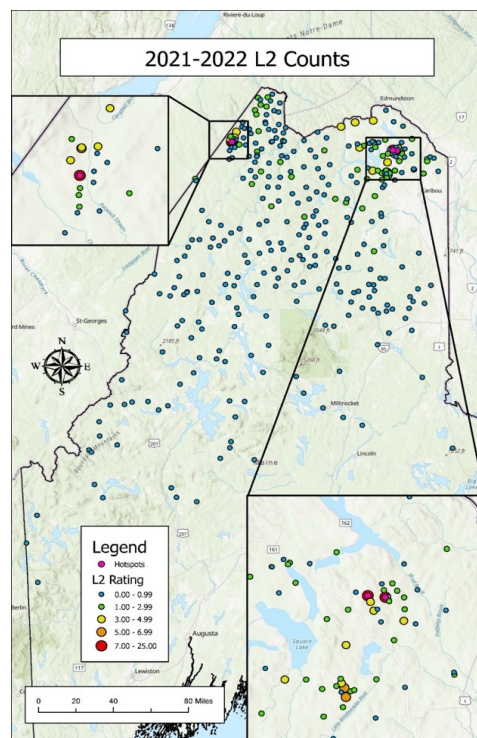
- Develop a workflow for area-based modeling of ALS data to predict EFI variables. This method utilizes the variability to guide the number and placement of necessary ground-based calibration plots
- Conducted EFI analysis for UMaine forests, the Penobscot Experimental Forest, and the Demeritt Research Forest. So far, 238 PCA and CFI plots have been locally completed. Calibration plots were selected based on the PCA approach to identify unique forest structures in the LiDAR measurements for said areas
- Hosted multiple workshops and presentations to CFRU members and other partners to give hands-on demonstrations for EFI maps and data products, with discussions on how utilize the tools available thus far most effectively

Spruce budworm L2 monitoring program in Maine

Principle researcher: Angela Mech, University of Maine

In 2021, the Spruce Budworm Lab opened for L2 processing (overwintering spruce budworm larvae). The lab has afforded cooperators, and individuals outside of the CFRU network, the capability to process samples in a timely manner and has been key to successfully monitoring populations and responding to high population levels. Branches containing more than 7 L2's are considered over the threshold for natural controls of the budworm. The Spruce Budworm Lab processed spruce and fir branches for 292 long-term monitoring sites in 2021. Their findings include:

- Populations were reduced where a hotspot had been detected and treated in 2021 near Cross Lake, just south of Fort Kent
- While none of the 292 long-term monitoring sites in 2021 were above 7 L2's/branch, 3 hotspots were identified by supplemental branch sampling
- There has been a 30% increase in the average number of L2's per site compared with 2020 values



Interdisciplinary spatial modeling of terrain, wetness, soils, and productivity: new tools for forest management

Principle researcher: Colby Brungard, Environmental Soil Consulting

Digital soil mapping (DSM) combines thousands of georeferenced soil observations with hi-resolution LiDAR and satellite imagery to create raster maps of soil properties. In 2021-22, this ambitious research project produced spatial predictions for 3 modeled soil properties: depth to redoximorphic features, depth to densic horizon (glacially-compacted, root-limiting layer), depth to bedrock. These are some of the first available digital soil maps in the United States. The next step in this project is to create logic-based algorithms that generate forest management interpretation layers for harvest operability, harvest season, and soil rutting hazards.

High Resolution Land Cover and Forest Type Data for the State of Maine

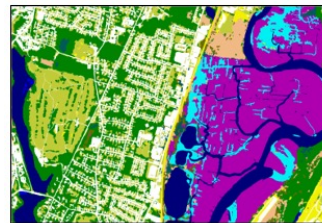
Principle researcher: Kasey Legaard, University of Maine

This project will produce a multi-resolution set of land cover products for the state including a 1-meter land cover product and a 10-meter land cover product including detailed forest type categories. These layers will be able to be updated every 4-6 years in conjunction with NOAA's C-CAP (Coastal Change Analysis Program) updates to reduce future costs. Project accomplishments in 2021 include:

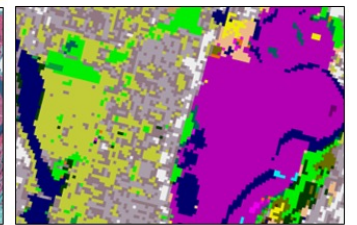
- Summarizing species associations within forest types and applying decision criteria to reference plot data
- Sentinel-2 satellite imagery was assembled and processed for statewide forest mapping.

Acquisitions were obtained from May to November will help to leverage growing season phenology for species differentiation

1-meter NOAA C-CAP, 2016



30-meter NOAA C-CAP, 2016



Revisiting Weymouth Point

CFRU

Weymouth Point is one of the cornerstone long-term research sites of the CFRU, starting shortly after the formation of the CFRU itself. Weymouth Point originally sought to address effects of whole-tree harvesting starting with pre-harvest measurements in 1979. In October 2022, the CFRU fall field tour re-visited Weymouth Point to discuss outcomes, future measurement plans, and potential treatment replications on the untreated watershed. We were joined by Dr. Tat Smith, who completed his PhD thesis on Weymouth Point in the early 1980s as well as representatives Acadian Timber, the current landowners of the site. Looking to the future of the site and the potential for nested research projects, we are working to identify areas of interests including silvicultural treatments for enhancing carbon sequestration. A full remeasurement of the plots at Weymouth Point will be completed in summer of 2023.

