

## NSRC Progress Report 2022

## Quantifying Changes in Forest Condition, Connectivity and Resilience in the Northeast Using Geospatial and Remotely Sensed Data

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### **Project Abstract**

To ensure the long-term sustainability of the Northern Forest, land managers, agencies, and conservationists need a way to measure and monitor forest condition and connectivity for wildlife movement, assess how it is distributed across the region, and estimate the impact of forest management practices. Where are forests improving or degrading? What is the prevalent condition? Where are the most climate-resilient sites? How do individual management decisions affect the connectivity of the landscape for wildlife? Researchers will use newly available remotely sensed time-series information covering 30 years to assess and evaluate forest condition and forest connectivity based on human impacts on wildlife, climatic gradients, and forest condition to project spatial patterns of species movement in response to climate change. Guided by a steering committee of agency and NGO scientists and tapping USDA Forest Service experts on key topics, researchers will translate the comprehensive spatial information into a user-friendly decision-support tool for decision-makers and other concerned audiences.

Results from the tool will allow users to quantify the condition of the forest at any location and run scenarios to estimate the impact of various management practices or types of land conversion implemented at specific places. Design of the decision-support tool will be tested with focus groups to ensure its utility in providing useful information for making informed decisions about the individual and cumulative impact of conservation and management activities on the Northern Forest.

## Progress in 2022

# September through December:

Assembled latest version of remotely sensed and GIS datasets for study region.

- <u>Ecological</u>: Terrestrial habitats and forest types, landforms, moisture index, elevation, stream, and wetlands, estimated carbon stock.
- <u>Human Use and Change</u>: LCMAP (land use change 40 years), Global Forest Watch (2001-2020), National Landcover Data (NLCD 2001, 2011, 2022), Roads (paved and dirt), powerlines, oil and gas wells, solar farms, agriculture.



Forest transition in the Northeast. Over 92% of northeast forests were undisturbed across the last 20 years. The majority of forest change was due to cutting and regrowth (Turnover = 5%). Another 2% transitioned to another natural state (shrub or grassland) that may with succession eventually return to forests. Only 0.4% of forests were converted to development or agriculture. Almost three times more agriculture has returned to forests (0.34%) than have been converted from forests to agriculture (0.12%).



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• <u>Conservation Lands</u>: To conduct region-wide analysis, we worked with state data stewards to compile the best available parcel-level conserved lands dataset for the northeast. This dataset contains information on ownership, protection type, manger, and management status (GAP status).

Initiated analysis of time series data on forest condition. Using the <u>Forest Loss and Gain</u> from Global Forest Watch, we explored the 20-year trends in forest loss and gain throughout the Northeast region.

- $\circ$   $\;$  Explored trends in forest loss, turn-over, and regeneration (see figure above).
- $\circ$   $\;$  Compared forest trends to ownership and management intent.

Initial results from the time series data look promising and have motivated us to look deeper into similar datasets.

## Plans for 2023

### January 2023

- Launched internal (Nature Conservancy) steering committee and generated list of external participants for technical committees. We plan to invite participation on the technical committees starting in February.
- This internal steering committee is currently compiling reference sites data that will be used to ground-truth comparisons for the remote sensing data.

<u>Committees</u>: We will meet with the steering committee every two months by Zoom and with technical experts as needed to get review and guidance on the project.

Create Forest Habitat Condition Map:

- Dive deeper into the analysis of remotely sensed time series data including: <u>Land Surface Change</u> from USGS LC Map data, <u>Forest Canopy Height</u> from NASA GEDI, <u>Forest Stand Attributes</u> from USDA Forest Service, <u>Forest Health Aerial Detections</u> from USDA Forest Service, and <u>Tree Health</u> from NASA Forwarn.
- Compile reference sites as contributed by Steering Committee and from FIA and Conservation Land data.
- Apply the Habitat Condition Assessment System approach (or a modification thereof) to create a draft map of forest condition. Develop a random forest or regression model to predict the condition of the ground-checked reference sites using the remotely sensed time-series and land use data supplemented by the GIS attributes of ecology and human uses.

Model Regional Connectivity -first draft

- Using the map of forest condition, we will model local and regional connectivity using condition as a "resistance" input. We will compare the condition-based connectivity results with anthropogenic and climate connectivity models.

### Collaboration

We developed a list of key agency and NGO scientists in each state with technical expertise on forest condition. We plan to reach out to them and tap Forest Service experts on key topics this spring. We will invite them on to the steering committee if they are interested in guiding the analysis. Otherwise, we will interact with them in small groups or one-on-one to get their feedback and guidance on specific analyses. We hope for the project approach, methods, and results to be transparent and widely vetted to ensure that we translate the comprehensive spatial information into useful results and a format that can be used to make management decisions.