

Northern Research Station

Rooted in Research

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Forest Inventory and Analysis: Mining a Treasure Trove

Years ago, during the summer months, countless northern long-eared bats darted between trees in the White Mountain National Forest (NF). The tiny, winged bug-hunter rests and raises its young inside hollow live trees and snags. The rapid spread of white-nose syndrome across the country led the U.S. Fish and Wildlife Service to list the northern long-eared bat as threatened under the Endangered Species Act in 2015.¹

Managers and scientists on the White Mountain NF sought to assess the number of potential roost trees available to northern long-eared bats. Live trees not suitable for timber can serve as roost sites but are sometimes felled during forest management projects. Managers needed to know if and how these projects affect an already-stressed species.

The team turned to the U.S. Department of Agriculture (USDA) Forest Service's Forest Inventory and Analysis (FIA) data. Results revealed an abundance of potential roost trees and showed that forest management activities have a minimal risk of impacting the small northern long-eared bat population. Equipped with FIA data, biologists used existing tools to analyze a large area quickly and reliably.

Using FIA data to obtain information like this is "mining a treasure trove," said Coeli Hoover, research ecologist with the Northern Research Station. In January, Hoover published a paper highlighting four examples where FIA helped Forest Service managers meet information needs, including the White Mountain NF work on roost trees. FIA data indicate that potential roost trees are abundant relative to the size of the bat population on the White Mountain NF, and the risk of management activities impacting the northern long-eared bat population is small. This paper also offers solutions for increasing managers' access to and use of the complicated database.

Thinking Outside the Box

Since the late 1920s, the Forest Service has been congressionally mandated to collect, analyze, and report information on the status and trends of America's forests. This includes a suite of measurements on trees (live and dead) and other forest vegetation. Over time, this ongoing effort has evolved into the Forest Inventory and Analysis program. Today, FIA field crews routinely collect a core set of variables within plots across the country, on both public and private lands.

Hoover points out that the FIA database comprises information beyond the summaries provided in annual state-level FIA reports and fact

¹ At the time this work took place, the northern long-eared bat was listed as threatened. The U.S. Fish and Wildlife Service recently reclassified this species as endangered under the Endangered Species Act. This rule takes effect on January 30, 2023.

KEY COLLABORATION CONSIDERATIONS

- Extensive natural resources data exist in the Forest Inventory and Analysis (FIA) database. Data go through rigorous data quality checks, are scientifically sound, and are updated frequently. Local data collection can be supplemented, or sometimes even replaced, with FIA data.
- FIA data collection began in the 1920s. The FIA datasets provide historical and current information about land ownership, land status and distribution, and forest health, in addition to many other landscape characteristics.
- FIA research scientists and inventory specialists, along with National Forest System regional inventory staff, are available to help managers with data needs. Specialized training in the use of the FIA database is not required to obtain or to use FIA data.

sheets. Managers and biologists can use FIA data for analyzing area, growth, mortality, removals, and more. "With this paper, we are trying to get people to think outside the state report box," said Hoover.

Hoover's paper points to four case studies where FIA data facilitated the analysis, including forest health, wildlife habitat, oak silviculture, and updating a monitoring plan, all management considerations that nearly every national forest works with in some way.



A potential roost tree for the northern long-eared bat, complete with plenty of cavities for the bats to rest and raise young in. USDA Forest Service photo.

“Collecting your own data is expensive! Even if you have the money, collecting data also takes time,” said Hoover. “Plus, managers might not know that FIA data and tools are available as a resource. This paper aims to help move this resource toward the front of potential users’ minds.”

The FIA database is updated regularly and offers consistent, scientifically sound data that provides users many advantages that are not possible with local data collection efforts. Extensive historical datasets allow managers to see changes in forest health, ownership, or composition over time, while also allowing managers to assess conditions at a specific point in time.

Admittedly, complexities in the FIA database abound. “FIA is always working on new tools to try to bridge the gap,” said Hoover, “but there is so much information in the database that just knowing how to use FIA data can be a big question.” Hoover aims to define creative uses of FIA data for potential users, lessening this burden for resource managers. Collaboration with FIA personnel, National Forest System (NFS) regional inventory staff, or research scientists is a key component to making the most of FIA datasets. Managers are encouraged to reach out to both FIA and NFS scientists and inventory specialists to explore how FIA data can be used for local and regional projects.

Maximizing FIA Data

The FIA database is a vast resource available to land managers because these data and tools can help to address management questions without the expense of collecting additional field data. While many managers are familiar with the FIA program, the breadth of information available and the many potential uses of the data are often not well known.

What began in the early 1900s as a timber-focused periodic survey has evolved over time into a nationally consistent, annualized inventory with a core set of variables. Information such as ownership, land status, forest type, habitat type, tree species, tree diameter, and crown class is collected on every plot. A core-optional set of variables provides supplemental information that is collected using consistent protocols. Additionally, a suite of attributes on a subsample of plots provides data on soils, understory vegetation, tree crown conditions, down woody material, and invasive species.

FIA data provide many advantages for land managers: data are frequently updated, data collection procedures and protocols are nationally consistent and repeatable, the sample grid can be intensified, and uncertainty can be quantified. Although the complex structure of the FIA database might initially be an obstacle for managers, FIA staff and data analysis tools are available to assist data users.

The utility of FIA data is broad, and the analysis potential is diverse. Along with standard uses often associated with forest inventory, FIA data can be used for baseline assessments of carbon stocks, assessing watershed condition and trends, and identifying drivers and stressors such as insect and disease mortality and wildland fire effects. FIA data



FIA tally trees are assessed for insect and disease damage. Exit holes, such as these caused by the emerald ash borer, are assessed and recorded as insect damage. USDA Forest Service photo.

collected on the standard grid can help to alert managers of the need for supplemental data collection and analysis at a finer scale. An intensified sample collected by using FIA protocols is easily scaled to suit the needs of local and regional land managers.

Project Lead

Coeli Hoover is a Research Ecologist with Sustaining Forests in a Changing Environment. Learn more about her work at <https://www.nrs.fs.usda.gov/people/choover>.

FIA PROGRAM LINKS

[National Program – Forest Inventory and Analysis](#)

[Program Features – Forest Inventory and Analysis National Program](#)

[Tools and Data – Forest Inventory and Analysis National Program](#)

[FIA Library – Forest Inventory and Analysis National Program](#)

FURTHER READING

Hoover, C.M.; Bartig, J.L.; Bogaczyk, B.; Breeden, C.; Iverson, L.R.; Prout, L.; Sheffield, R.M. 2022. [Forest inventory and analysis data in action: Examples from eastern national forests](#). *Trees, Forests and People*. 7(2): 100178. 8 p. <https://doi.org/10.1016/j.tfp.2021.100178>.

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