



Dukes Experimental Forest

**NORTHERN RESEARCH STATION
EXPERIMENTAL FOREST NETWORK**

NRS-INF-26-13

Dukes Experimental Forest

The 5,500-acre Dukes Experimental Forest (DEF; formerly Upper Peninsula Experimental Forest) was established in 1926 on the Hiawatha National Forest in the Upper Peninsula of Michigan. The DEF is about 16 miles southeast of Marquette, MI. Studies have focused on tree growth, stand development, logging damage, tree quality, and regeneration under various cutting methods, including no cutting, partial cutting, and clearcutting in old-growth and second-growth forests. Information from these studies has been used to develop management guides for northern hardwood forests in the Lake States; these guides are applied by nearly all management organizations in the region. In 1974, a 233-acre research natural area was established within the forest's boundaries. Long-term data records on old-growth northern hardwoods make the DEF an especially unique asset.

Map by U.S. Forest Service.





Interpretive sign for a study treatment. Photo by Mark Twery, U.S. Forest Service.

Features

The uplands of the DEF are dominated by northern hardwoods and eastern hemlock-hardwoods. Hemlock dominates the somewhat poorly drained soils and northern white-cedar and spruce dominant the poorly drained soils and muck. Some white pine and elm was logged during the early 1900s. The DEF establishment occurred before the surrounding landscape was cutover, consequently, today the DEF has rare demonstrations and replicated studies of managing old-growth forests, unique among other regional silvicultural research that focuses on second-growth forests.

- Soils:** The DEF is on a ground moraine deposited by an advance of the Green Bay lobe as it moved southward from the Lake Superior Basin. Dominant soils are the well-drained Munising sandy loam, somewhat poorly drained Skanee sandy loam, poorly drained Angelica sandy loam, and Linwood muck.
- Precipitation:** Average annual precipitation is about 34 inches and is distributed evenly through the year. Lake-effect snowfall is considerable and averages 132 inches per year, with up to 300 inches some years.
- Temperature:** Proximity to Lake Superior results in a cool lacustrine climate, with moderated minimum and maximum temperatures. Average annual temperature is 41 °F.
- Growing season:** The growing season averages 110 days.

Research

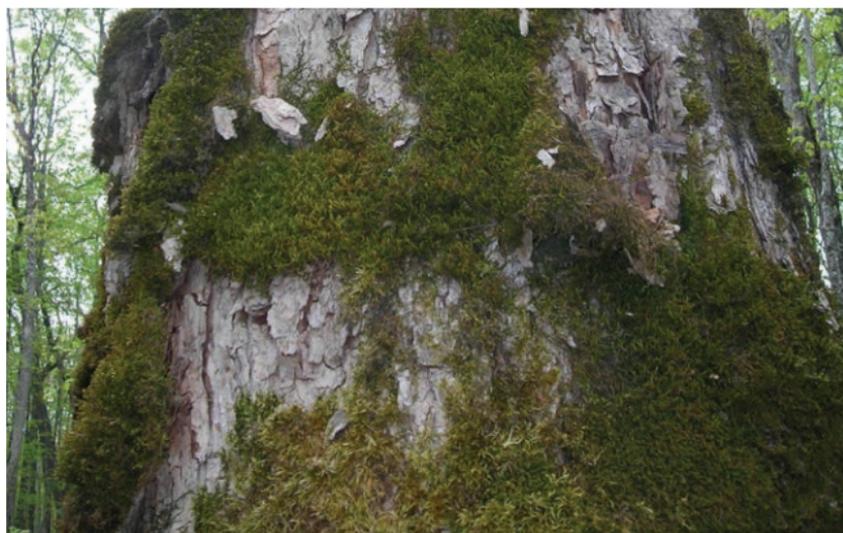
Research began on the Dukes in the 1920s. Studies consisted of stocking levels of hardwoods and swamp conifers, cutting cycles, regeneration, and cutting methods of northern hardwoods. Currently, only the stocking-level studies, methods of cutting, and a red maple growth and yield study remain active. The DEF is home to the oldest running northern hardwood management experiments in the Great Lakes region. As such, the long-term data records are being used in computer models to explore forest composition, diameter distributions, volume growth, and large dead wood abundance under different forestry approaches. Additional research objectives to address current management needs, such as habitat structure and diversity, are being studied along with original long-term silvicultural studies.

Outcomes

The lessons learned from the 80 years of research on northern hardwood ecosystems at the DEF have led to numerous publications and management guides, and have impacted thousands of forestry professionals and millions of acres of land. Pioneering work by Carl Arbogast on a sustainable age structure for uneven-age northern hardwoods was conducted on the DEF's Methods of Cutting Study. This structure (known as the Arbogast guide) is applied to millions of acres of northern hardwoods in the Lake States and more broadly to uneven-age forests in general. Today, the long-term data records are also being used in computer models to test ecological forestry approaches and continue to influence northern hardwood forest management.

Study treatments being established by sawyers (circa 1930). Photo by U.S. Forest Service.





Old-growth tree in uneven-age silvicultural treatment. Photo by Laura Kenefic, U.S. Forest Service.

Science Delivery

For decades, DEF has been an outdoor “center” for research, training, and educational tours. A stocking and cutting cycle study and methods of cutting study are posted with interpretive signs making them excellent demonstration areas of contrasting silvicultural treatments for landowners and land managers. Research is also communicated through presentations and publications. Visitors from all over the world visit the DEF, particularly to see the longest running silviculture study in northern hardwood forests.

Partners

Forest Service scientists affiliated with the DEF collaborate with the Hiawatha and Ottawa National Forests, Hiawatha Interpretive Association, Michigan Department of Natural Resources, University of Minnesota, Michigan Technical University, Michigan State University, Northern Michigan University, and many forest industries.

Facilities

There are no facilities associated with the DEF.

U.S. Forest Service Experimental Forest and Range Network

Forest Service Research and Development (R&D) works at the forefront of science to improve the health and use of our nation's forests and grasslands. Research has been part of the Forest Service mission since the agency's inception. Today, Forest Service researchers work in a range of biological, physical, and social science fields; their research covers all 50 states, U.S. territories, and commonwealths. The Northern Research Station is one of six in R&D, and includes 20 states in the north-central and northeastern U.S., comprising both the most densely populated and most heavily forested portions of the country.

The Experimental Forest and Range (EFR) network contributes importantly to R&D's research infrastructure and is increasingly viewed as one of its most valued assets. There are currently 22 official experimental forests in the Northern Research Station, and 80 EFRs nationwide. Taken together, these sites provide a record of forests and forest change that dates back more than 100 years. Though initially focused on local and regional topics, EFRs are becoming increasingly networked to address issues of national and international concern such as climate change, carbon sequestration, air and water quality, and invasive plants and animals.

For more information about the Dukes Experimental Forest

Websites:

<http://www.nrs.fs.fed.us/ef/locations/wi/dukes/>

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On the cover: Group selection cutting, Methods of Cutting Study. Photo by Mark Twery, U.S. Forest Service.