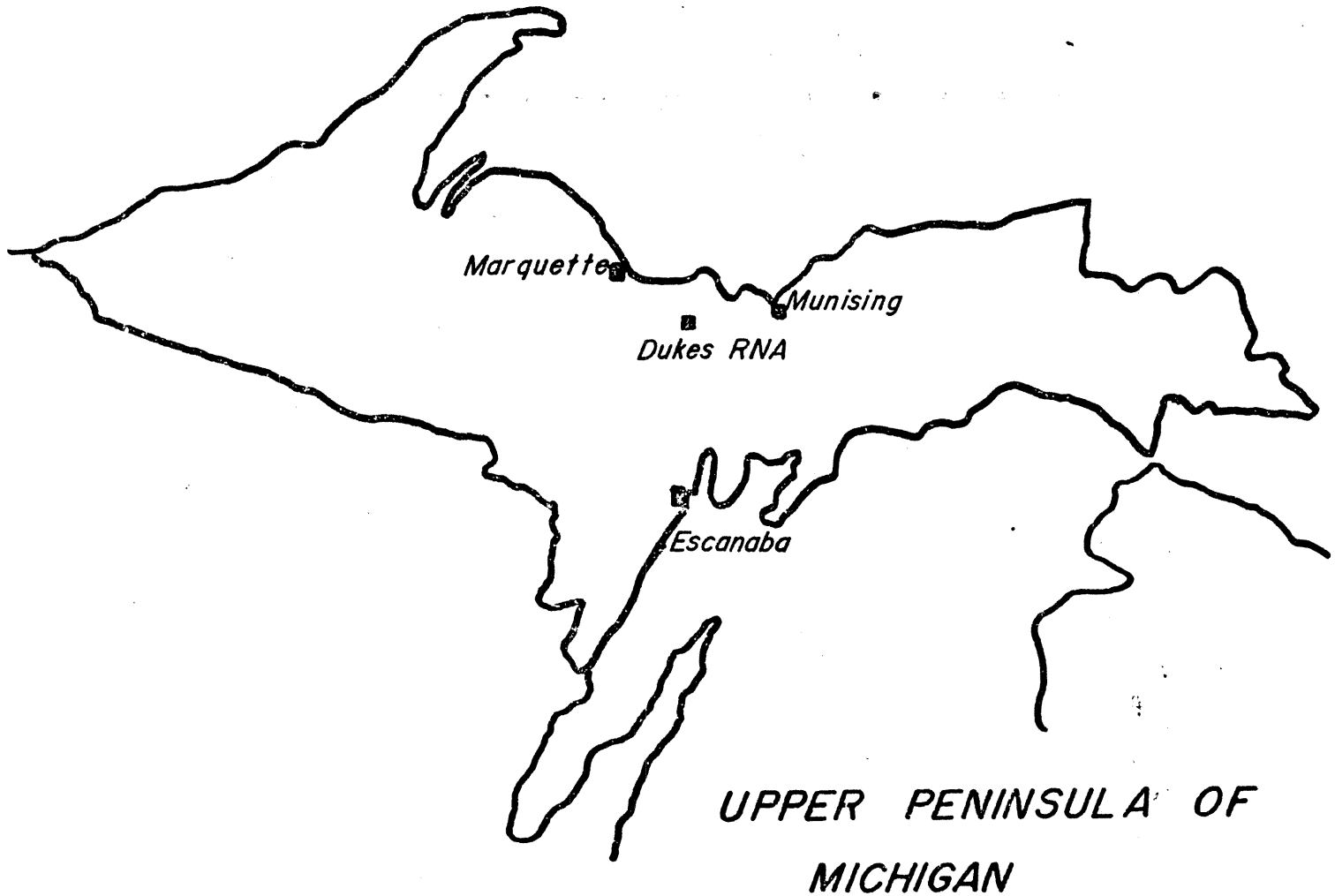
DESIGNATION ORDER

By virtue of the authority vested in me by the Secretary of Agriculture under Title 36, Section 251.23 of the Code of Federal Regulations, I hereby designate as the Dukes Research Natural Area the lands described in the preceding report by Kenneth A. Brinkman, dated September 26, 1973; Said lands shall hereafter be administered as a research natural area subject to the said regulations and instructions thereunder.

Nov. 19, 1974 (Date)

John R. McGuire Chief

DUKES RESEARCH NATURAL AREA



ESTABLISHMENT REPORT
FOR THE
DUKES RESEARCH NATURAL AREA
WITHIN THE
HIAWATHA NATIONAL FOREST
Marquette County
Michigan

Principal distinguishing features

The Research Natural Area comprises 233 acres in the Upper Peninsula Experimental Forest within the Hiawatha National Forest near Marquette, Michigan. The Area contains well stocked, mature northern hardwood forests that have been undisturbed for over 60 years. Five forest types are represented, ranging from sugar maple dominated hardwood stands on mesic sites to swamp-conifer forests on the wet lowlands. The other sites are dominated by hemlock, yellow birch, red maple, black ash and American elm. All five types are commercially valuable in this region.

The Area occupies a glacial till plain that has little relief. The low and mesic sites are intermixed and neither are extensive. The Area is on the divide between the drainages of Lake Superior and Lake Michigan. Drainage from the Area is ill-defined but ultimately is to Lake Superior. The Area is 9 miles south of Lake Superior and less than 2 miles from the shore of Glacial Lake Algonquin. Elevations range from 1070 to 1100 feet above mean sea level and slope slightly to the northwest.

Location

The Research Natural Area is in the central portion of Michigan's Upper Peninsula, 16 miles southeast of Marquette, Michigan (latitude 46° 22' N, longitude 87° 9' W). The tract is part of the Upper Peninsula Experimental Forest, and consists of 233 acres in Section 23, T46N, R23W, Michigan Principal Meridian (Figure 1). Actual boundary of the tract is defined by a metes and bounds survey on the east and north, the line common to Sections 22 and 23 on the west and forest road 2915 on the south. Trees along the boundary have been marked with painted blazes. A 2-chain wide buffer strip is provided along the south edge, abutting forest road 2915.

The Area is readily accessible from forest road 2915 along the south and forest road 2918 about 1/8 mile from the east boundary. Logging spur roads extend to the Area boundary at several locations.

Experimental Forest lands border the Area to the south, east and north. Stands in these areas have been partially cut periodically, primarily as part of a stocking level, cutting cycle study (NH-5). A continuous forest cover of mature trees is maintained in these study areas, but stocking levels are reduced. Adjoining lands in Section 22 are owned by the Cleveland-Cliffs Iron Company and are periodically harvested under a partial cutting system.

Area by cover types

The tract was cruised in 1936 and a timber type map was prepared (Figure 1). Areas by cover type and corresponding S.A.F. forest type based on this survey are:

Type	Acres
Northern Hardwoods (SAF type 27 - sugar maple)	94
Hemlock-Hardwoods (SAF type 24 - hemlock-yellow birch)	32
Cedar-Spruce (SAF type 37 - northern white cedar)	45
Hardwood-Conifer (SAF type 39 - black ash-American elm red maple)	57
Hemlock (SAF type 23 - hemlock)	5
Total	233

Climatic conditions

Because of its proximity to Lake Superior, climate of the Area is altered from that typical of this latitude. The most noticeable difference is in snowfall. Snow squalls originating over Lake Superior supplement the cyclonic storms and result in a mean snowfall of 100-110 inches per year. Less than half this amount of snow falls only 65 miles south of the Area.

Climatological records are available for the Upper Peninsula Experimental Forest for 1927 through 1942. Records dating from 1900 to the present are available for Michigan State University Experiment Farm at Chatham, 10 miles east of the forest, with monthly means

ranging from 17.3° F. in January to 76.7° F. in July. At the Chatham station, precipitation totals 33 inches per year, with 9.3 inches falling during June, July, and August. During these three summer months mean monthly precipitation should exceed 1.5 inches 90 percent of the time and be less than 5.0 inches 90 percent of the time.[1/] The freeze-free season averages 110 days, with the average season occurring between June 7 and September 15.[2/]

Concurrant records for the two stations show that the Experimental Forest receives about 24 inches more snowfall and has a mean annual temperature consistently 1.6° F. lower than the Chatham Farm. Precipitation tended to be 0.8 inch higher at the Forest but there was greater year to year variation. The freeze-free season at the Forest averaged only 64 days and sub-freezing temperatures have occurred in every month.

Description of Values

(1) Flora

Plant communities in the Area include representatives of Braum's[3/] hemlock and hemlock-hardwood forests of eastern Upper Michigan as they occur in the hemlock-white pine-northern hardwood region. The northern hardwood type, dominated by sugar maple, is the climax for

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1/ N. D. Strommen. 1967. Monthly precipitation probabilities for climate divisions in Michigan. Mich. Dep. Agr. and Mich. Weather Serv., East Lansing, Mich. 22 p.

2/ Anon. N. D. Mich. Freeze Bull. Res. Rep. 26, Mich. State Univ. Agr. Exp. Sta., East Lansing, Mich. 40 p.

3/ Braun, E. L. Deciduous forests of eastern North America. Hafner Publ. Co., New York, p. 354-363.

mesic sites in the Area. The other types in the Research Natural Area are considered developmental stages of climax forest formation. Largely because of soil moisture conditions, these types are expected to persist for many years on these sites.

Logging has occurred at least twice within the Area. White pine was removed between 1880 and 1900, with the logs transported to mills by water. A railroad was built through the Experimental Forest about 1902 and in 1904 the basswood and elm in the area were sold by the Cleveland Cliffs Iron Company to Tindle and Jackson. Local sources indicate the cutting in the vicinity of the Area took place between 1906 and 1910. An "elm camp" was built southwest of the junction of roads 2915 and 2918. It is likely that wood from the Area may have been used for fuel or building at the camp. The amount or extent of cutting in either operation is not known.

Since 1910, there has been no cutting in the Research Natural Area except in the 2-chain wide buffer strip along road 2915; snags in this strip were felled whenever they presented a traffic hazard.

Isolation zones were not established except alongside road 2915 and timber has been harvested to the Research Natural Area border on all sides. On Forest Service lands the continuation of current studies will maintain a partially stocked mature stand forming a satisfactory isolation zone. On the adjoining private lands partial overstories have been maintained but are not guaranteed and it may become necessary to create an isolation zone within the tract along the west edge.

In 1935 a series of 245 permanent 1/5-acre plots was installed in the Research Natural Area. Species and diameter-breast-high of poles and saw logstrees were determined on these plots in 1935 and on about half of them in 1948. These data provide an unusual opportunity to obtain baseline information on composition of undisturbed stands in this area.

The Research Natural Area contains a large number of successionally advanced forest communities of this region. These make the area well suited to ecological studies such as community development and site relationships.

(2) Geology

The Area is on a ground moraine deposited by an advance of the Green Bay lobe as it moved southward from the Lake Superior Basin. This activity was part of the Valders substage of Wisconsin glaciation, estimated to have ended 10,000 years ago in this area. Till depths are quite variable; only 2 feet of till is present in some areas. The tills are reddish-brown, sandy-loams that are slightly acidic, derived from sandstone, but usually free of rock.

Bedrock beneath the till is of the Au Train formation of the middle Ordovisian period.[4/] This resistant formation forms the cap rock of the northernmost cuesta of the Michigan basin and is responsible for numerous waterfalls including nearby Laughing Whitefish Falls.

4/ Hamblin, W. K. 1958. The Cambrian sandstones of northern Michigan. Mich. Dep. Conserv., Geol. Survey Div. Publ. 51, Lansing, Michigan. 146 p.

The hard dolomitic sandstone varies in the ratio of sand to dolomite but little is known about its characteristics in the vicinity of the Research Natural Area. The underlying rock may be either Cambrian sandstone or Precambrian strata.

On sites where drainage is moderate or better, the mineral soils are spodosols that are sandy-loam in texture. In addition to the spodic horizon, they have an argillic horizon with high base saturation and clay accumulation on soil peds. Fragipans also occur in these soils at depths of 1 foot or more. The poorly drained mineral soils are inceptisols with a heavy mollic horizon. In the lowest sites, the organic soils are very poorly drained and consist of 12 to 42 inches of slightly acid peaty muck.

Soil series occurring in the Research Natural Area and shown in Figure 2 are:

Series		
1.	Munising	Well drained
2.	Skanee	Somewhat poorly drained
3.	Angelica	Poorly drained
4.	Longrie	Well drained over bedrock
5.	Bonduel	Somewhat poorly drained over bedrock
6.	Ruse	Poorly drained over bedrock
7.	Linwood muck	Very poorly drained over loam
8.	Chippeny muck	Very poorly drained over bedrock

This cline of soil moisture conditions and variation in soils offer an excellent opportunity to study their effect on the ecology of northern hardwood forests.

(3) Fauna

The Research Natural Area is suited to studying the ecology of small mammals, amphibians, reptiles and invertebrates under undisturbed conditions. Small mammals occurring on these forest types are: deer and white-footed mice, red-backed voles, least and eastern chipmunks, red and gray squirrels, northern flying squirrels, short-tailed and masked shrews, and snowshoe hares. Larger mammals that make use of the Area are porcupine, raccoon, several furbearers, white-tailed deer and black bear but their use is either seasonal or temporary. A number of song and predatory birds, plus ruffed grouse and woodcock inhabit the Area.

(4) Minerals

At present, the major mining activity in the region is extraction of iron ore from Precambrian formations 20 to 40 miles northwest of the Area. Intensive exploration for deeper-lying ores of other minerals has been made in the region. The potential for mineral development in the vicinity of the Research Natural Area is not public information but it appears unlikely.

Mineral rights are not held by the Forest Service. Problems may arise with exploration or development of minerals in the Area but even then surface disturbance is not inevitable.

(5) Recreation

The Area is sporadically used by hunters, trappers and hikers. Species taken by hunters are: ruffed grouse, woodcock, white-tailed deer, black bear and snowshoe hare. Previous hunting pressure and levels of game population have not been excessive and suggest that future game production and hunting should not conflict with research goals for the Area. No other recreation use of the Area has been observed.

(6) Water use

Surface water flows from the Area via a series of swamps and a small temporary stream. No problems of water regulation, diversion or pollution are anticipated.

RECOMMENDATION

The proposed Research Natural Area contains examples of relatively undisturbed, mature northern hardwood forest communities that were once common in the Upper Great Lakes Region. The Area is well suited for ecological research. Comparisons between undisturbed and disturbed forests can be made because the Research Natural Area has many environmental features similar to nearby well-documented long term silvicultural research plots. The Area is large enough to provide essentially undisturbed conditions for scientific and educational purposes. It is recommended that the tract be designated and established as the "DUKES RESEARCH NATURAL AREA."

Oct. 2, 1973
Date

Reporting Officer

10/9/73
Date

Director, North Central Forest Experiment Station

10/15/73
Date

Supervisor, Hiawatha National Forest

12-18-73
Date

Regional Forester

Approved:

Acting Director, Division of Recreation — 11-15-74 (Date)

for Deputy Chief, Research — 11/18/74 (Date)

SUMMARY OF MINERAL RIGHTS OWNERSHIP ON THE DUKES NATURAL AREA

The area of the proposed natural area was originally granted by the State of Michigan in 1874 to the Chicago and Northwestern Railroad Company (N½ NE¼, W½ NW¼, NE¼ NW¼, and W½ SW¼) and in 1882 to the Detroit, Mackinac and Marquette Railroad Company (S½ NE¼, SE¼ NW¼, E½ SW¼ and SE¼). There was one intermediate owner in each case before the tracts passed to Cleveland-Cliffs Iron Co. and finally to the United States. The two railroads as well as the subsequent owners withheld mineral rights to varying degrees, CCI did likewise with the United States but only for a 99-year period.

Developments on the mineral rights continued after the tract's acquisition by the United States. In 1948 both railroads filed a claim of interest in the mineral rights, apparently in response to a state law on mineral rights according to William Hanks of the Hiawatha. However, in 1958 CCI obtained a quit claim deed to the mineral rights from the Detroit, Mackinac and Marquette Land Company, apparently the successor of the railroad.