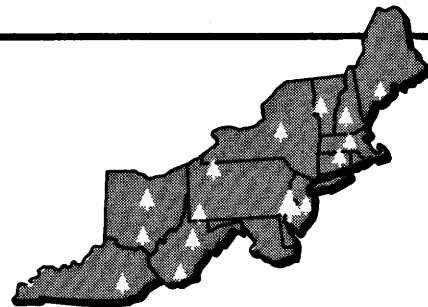


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Northeastern Forest Experiment Station



FOREST SERVICE, U.S. DEPT. OF AGRICULTURE, 6816 MARKET STREET, UPPER DARBY, PA. 19082

SPECIES AND STRUCTURE OF A VIRGIN NORTHERN HARDWOOD STAND IN NEW HAMPSHIRE

Abstract.—Virgin northern hardwoods in the Bowl, a natural area in the White Mountain National Forest in New Hampshire, exhibit a limited number of species, large sizes in all key species except beech, a full understory, and a well-developed diameter distribution.

Nearly all forest stands in the Northeast have been cut over at least once in the past. However, during the last few years, groups interested in natural resources have been trying to locate and permanently protect the few remaining virgin stands—mature forest stands that have never been logged nor heavily disturbed by natural catastrophe. This effort is in recognition of the scientific and esthetic value of these areas. Virgin stands provide a basis for evaluating innate species characteristics, tracing successional trends, and weighing the influence of management or disturbance.

One important virgin forest area is the Bowl, a 206-hectare (510-acre) natural area in the White Mountain National Forest (*Lyon and Bormann 1962*). The Bowl contains virgin stands of both spruce-fir and northern hardwoods or beech-birch-maple. In the summer of 1972, I inventoried one of the northern hardwood stands. The record provides a description of the unique character of the vegetation as compared to that of cutover stands.

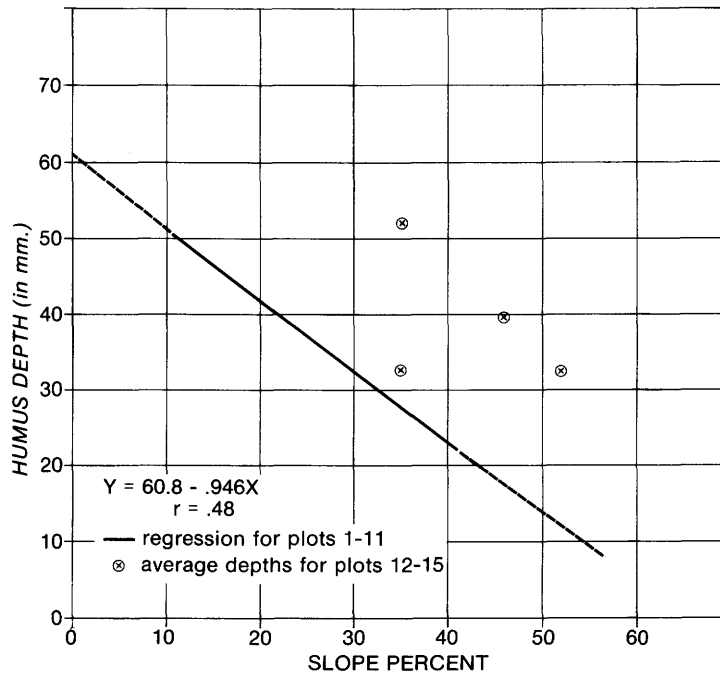
The stand is an 18-hectare (44-acre) tract of northern hardwoods in the southeast corner of the Bowl. The aspect is east to northeast.

Elevation ranges from 580 to 640 meters above sea level. The soil is Berkshire, a well-drained, fine, sandy loam.

Fifteen plot locations were systematically established in the stand. Eleven of these plot locations fell in typical northern hardwoods well within the stand borders. Four plots fell near the transition between hardwoods and spruce-fir at the upper elevations of the study area. At each plot location, the diameter above the root collar (above root swell) and the species were recorded for all trees 100 mm and larger on a 1/10-hectare plot, all woody stems 10 to 99 mm on a 1/100-hectare plot, and all woody stems of 1 year old to 9 mm on four 1/10,000-hectare plots. Ten humus-depth measurements (H layer, excluding L and F layers) were made per plot location, using a sharp tube sampler. Slope percent was estimated at each plot location with a clinometer.

Slope percent varied in the stand from 11 to 52 percent and averaged 34 percent. Humus depth on the 11 plots well within the stand was negatively related to slope percent with a fair degree of accuracy ($r = .48$). However, average humus depths on the four plots near

Figure 1.—Regression of humus depth over slope percent for typical hardwood (plots 1-11) and average humus depths for hardwood-softwood transition plots (12-15).



the hardwood-softwood transition were considerably above the regression line (fig. 1), possibly because of the influence of the slightly higher softwood component.

A stand table for the Bowl was compared with a table based on two plots in compartment 26 on the Bartlett Experimental Forest, New Hampshire (table 1). Compartment 26 has been reserved as a natural area of old-growth northern hardwoods—a stand that was high-graded for the best softwoods and hardwoods in the late 1800s and has remained uncut since that time. Elevation is about 335 meters; aspect and soils are similar to those of the Bowl.

The Bowl stand contains a relatively small number of species: beech, yellow birch, sugar maple, red spruce, balsam fir, striped maple, mountain maple, and hobblebush are well represented. Red maple, paper birch, white ash, hemlock, and yew are noticeably absent as compared with the compartment 26 stand. An analysis of age distribution indicates that spruce, fir, and yellow birch also are decreas-

ing in the typical hardwood portion of the Bowl stand.

This limited number of species is further emphasized by comparison with the species composition (based on basal area) of a range of stands on the Bartlett Experimental Forest, representing both old-growth and second-growth (stands clearcut in the late 1800s) (table 2).

Table 1 reveals the fairly large sizes attained by yellow birch, sugar maple, spruce, striped maple, and mountain maple in the virgin Bowl stand. Beech, on the other hand, does not grow very large in the Bowl even though it is an abundant, stable, and long-lived (250 years) resident.

All species considered together, the diameter distributions of the Bowl stand and the compartment 26 stand are similar. If we ignore the very small stems (0 to 9 mm), the understory in the Bowl is at least as dense as that of compartment 26—a departure from the parklike conditions sometimes associated with virgin stands.

Table 1.—Stand tables (numbers per hectare) for virgin northern hardwoods (The Bowl) and old-growth northern hardwoods (Compartment 26, Bartlett Experimental Forest)

Diameter (mm)	Beech	Yellow birch	Sugar maple	Red maple	Paper birch	White ash	Red spruce	Eastern hemlock	Balsam fir	Striped maple	Mountain maple	Hobble-bush	Scarlet elder	Yew	Service berry	Total
THE BOWL (15 PLOTS)																
0-9	5,167	—	37,667	—	—	—	167	—	167	4,667	2,833	9,667	0	—	—	60,335
10-99	3,333	20	886	—	—	—	254	—	20	993	453	2,120	7	—	—	8,086
100-199	188	9	24	1	—	—	7	—	2	76	3	—	—	—	—	310
200-299	61	17	11	—	—	—	5	—	2	8	—	—	—	—	—	104
300-399	24	17	15	—	—	—	5	—	—	—	—	—	—	—	—	61
400-499	9	10	23	—	—	—	3	—	—	—	—	—	—	—	—	45
500-599	3	11	15	—	—	—	1	—	—	—	—	—	—	—	—	30
600-699	—	3	4	—	—	—	1	—	—	—	—	—	—	—	—	8
700-799	—	3	1	—	—	—	—	—	—	—	—	—	—	—	—	4
800-899	—	2	1	—	—	—	—	—	—	—	—	—	—	—	—	3
900-949	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1
COMPARTMENT 26 (2 PLOTS)																
0-9	8,568	2,499	27,489	34,272	—	17,493	714	714	—	9,282	—	92,963	—	3,213	357	197,564
10-99	4,195	—	122	0	—	—	169	248	83	730	—	679	—	—	—	6,316
100-199	130	20	15	15	5	5	5	90	—	5	—	—	—	—	—	290
200-299	20	5	15	35	—	10	0	15	—	—	—	—	—	—	—	100
300-399	35	10	—	30	—	5	5	—	—	—	—	—	—	—	—	85
400-499	10	5	—	20	5	10	0	5	—	—	—	—	—	—	—	55
500-599	10	10	5	—	10	5	—	—	—	—	—	—	—	—	—	40
600-699	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5
700-799	—	—	—	—	—	5	—	—	—	—	—	—	—	—	—	5
800-899	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
900-949	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table 2.—Species composition of old-growth and second-growth northern hardwoods in percent of basal area, trees over 114 mm (4.5 inches) d.b.h. (Filip et al 1960; Leak 1961)

Stand condition	Beech	Yellow birch	Sugar maple	Red maple	Paper birch	White ash	Red spruce	Eastern hemlock	Others
Well-stocked									
second-growth	21	11	7	30	11	8	1	11	—
Old-growth	41	13	12	13	4	2	3	12	—

In summary, the virgin northern hardwoods in the Bowl are characterized by a limited number of species, fairly large sizes in all key species except beech, a full understory, and a well-developed diameter distribution similar to that found in old-growth northern hardwoods. This information may prove useful as a basis for comparison with managed or disturbed northern hardwood stands and as a base line for future observations on the development of virgin stands in the Bowl.

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