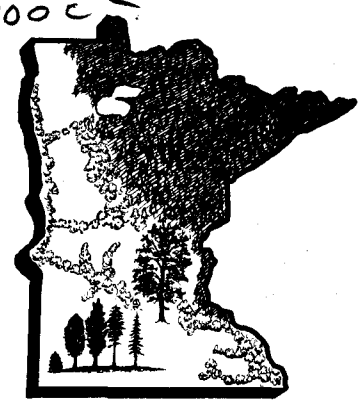

MINNESOTA FORESTRY NOTES

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COVER RELATIONSHIPS IN MINNESOTA FOREST COMMUNITIES[1/]

Egolfs V. Bakuzis, Donald P. Duncan and Henry L. Hansen[2/]

The use of synecological coordinates in the analysis of forest vegetation has been previously described (see Minnesota Forestry Notes 84, 90, 91, 92 and 99). Briefly the method involves an evaluation of the moisture, nutrient, heat, and light requirements of individual species on a relative scale from 1 (lowest) to 5 (highest). Community values are computed as averages of the values of species present. Such values from a certain geographical area, delineate characteristic "fields" on coordinate systems.

This method was used in analyzing 327 Minnesota forest communities with respect to the density of their stand components: trees, shrubs, ground cover, and tree reproduction. Cover density of each of these was estimated as a percent of the total stand area. Average cover percentages were computed for all communities falling into separate quarter units (ecotopes) of six different combinations of bivariate scales. Isolines were drawn at certain levels of cover density percent according to the common techniques of contour mapping. The results are shown in Fig. 1. Even though Minnesota is quite heterogeneous from a plant geographical point-of-view, considerable regularity can be observed in some of the bivariate scales.

In the moisture-nutrient (edaphic) coordinates system the tree cover is densest at mesic moisture conditions at all nutrient levels and culminates at the highest nutrient position. The shrub cover is at its maximum at medium nutrient levels under dry to mesic conditions. It is strikingly low under the high nutrient, mesic moisture conditions where the tree cover is heaviest. Ground cover is densest approaching bog formations with a minor intrusion at the dry, low-nutrient, prairie position. Advance tree reproduction is heaviest in 3 separate areas: sugar maple on mesic nutrient-rich sites, pine and oaks on the dry-poor sites, and balsam fir with some spruce on the wet-poor sites.

In heat-light (climatic) coordinates, tree cover remains dense at low heat in spite of increasing community requirements for light. In the warmer situations, tree cover density decreases rapidly when light requirements increase (savanna effect). Shrub cover has its maximum at medium heat and high light. Ground cover encircles the field from both the coldest and warmest sides, and in shade intolerant communities, also at medium heat conditions. The maximum reproduction density at low to medium light conditions and medium to high levels represents the sugar maple species group previously referred to.

Analyses of the other bivariate combinations are more complicated. For development of management techniques a refinement is necessary using tree cover, shrub cover, ground cover and reproduction cover densities as additional coordinate axes and not merely as dependent variables. Depending on the sample size, it might become necessary to change the scale of moisture, nutrient, heat, and light coordinate axes.

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2/ Research Associate and Professors, respectively, School of Forestry, University of Minnesota.

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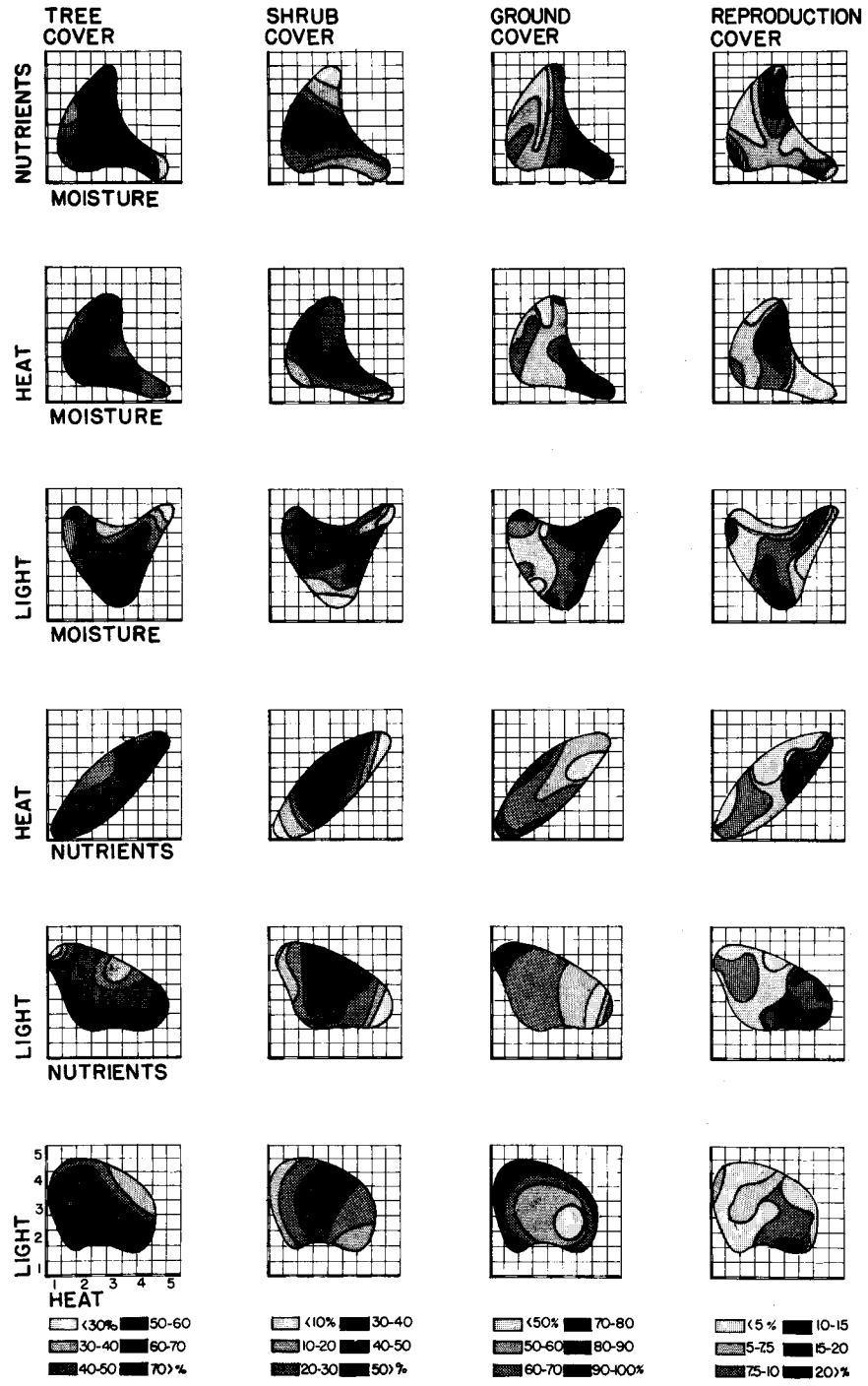

Fig. 1. Average density of tree cover, shrub cover ground cover, and reproduction cover in percent at different bivariate combinations of the relative community requirements for moisture, nutrients, heat, and light in Minnesota forests.

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