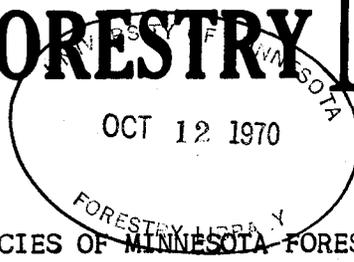


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ECOGRAPHS OF SHRUBS AND OTHER UNDERGROWTH SPECIES OF MINNESOTA FOREST COMMUNITIES^{1/}

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This Note evaluates further the data from a 1957 reconnaissance of 356 Minnesota forest communities. The method and some results have been described earlier in Minnesota Forestry Notes (Nos. 84, 90-92, 99-101) and in greater detail elsewhere (Bakuzis, 1959)

Relative values from 1 to 5 were assigned previously to individual forest species according to their prevailing occurrence at different intensities of moisture, nutrient, heat, and light factors in competition with other species. Starting values were obtained from earlier publications. Each species' value was adjusted on the basis of its occurrence in forest communities in the region (See Minn. For. Notes No. 84) Community values are computed as averages of values of species present in the community. Minnesota Forestry Notes No. 91 presented ecographs for tree species.

Species ecographs are prepared as scatter diagrams by plotting community values in which a species occurs in bivariate (or multivariate) coordinate systems. Relating the numbers of these communities to the total numbers of communities, it is possible to compute frequency percentages for individual units within the coordinate systems. This paper presents ecographs in edaphic (moisture and nutrients) and climatic (heat and light) coordinates with frequency lines drawn at 0, 40, and 70 percent levels.

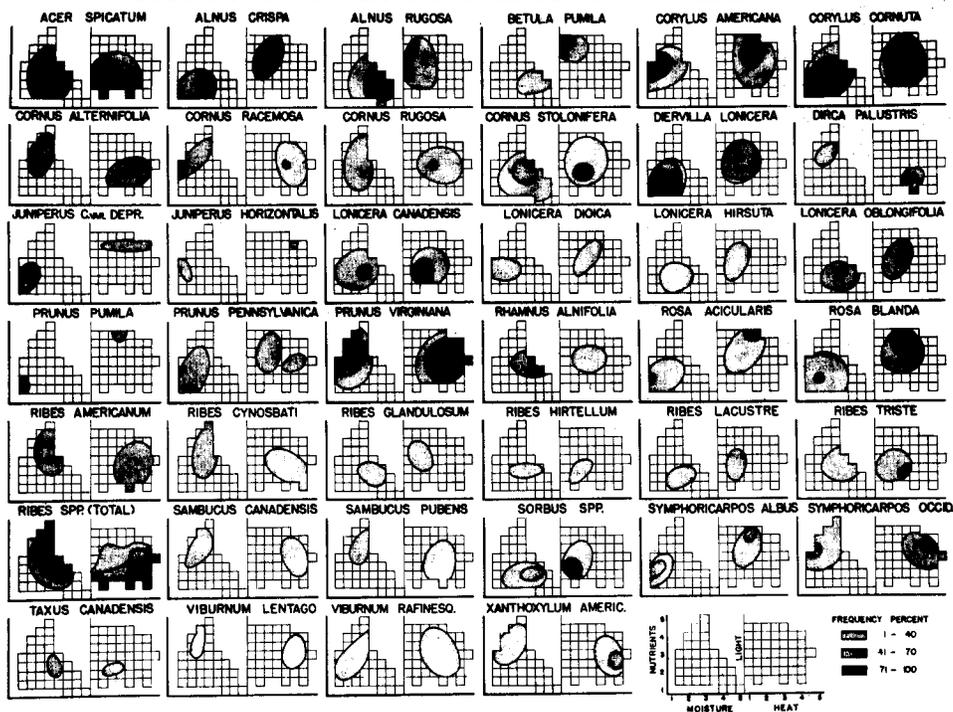
The figure shows ecographs for shrub species, other woody species, ferns and allies, and a composite ecograph for all Sphagnum species. Comparing the ecographs among themselves and with previously reported information a number of conclusions can be drawn. Some examples are given below.

Acer spicatum Lam. is a more northern species than other maples. It is very shade tolerant and difficult to control by maintenance of a dense tree canopy, except under sugar maple and northern white cedar. The two Alnus species are complementary with respect to their moisture requirements. Corylus cornuta Marsh. is more shade tolerant and requires more moisture than Corylus americana Walt. The former may have a southern ecotype as indicated by the second frequency maximum. The ecograph of Rhus radicans L. shows marked agreement with the ecograph of Corylus americana. There is a rather wide belt where the ecographs of Pinus strobus L. and Pinus resinosa Ait. overlap and where Ribes spp. are sparse or do not occur. This indicates the existence of areas for growing white pine with low blister rust protection costs. Very dense balsam fir or white cedar understories suppress Ribes species. Pteridium aquilinum (L.) Kuhn differs strikingly from the majority of ferns with its xeric nature and high light requirements. The ecograph of Sphagnum spp. illustrates their boreal nature and the adaptability of the genus to the greatest range of light conditions.

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ECOGRAPHS OF SHRUB SPECIES IN MINNESOTA



ECOGRAPHS OF LOWER PLANTS, HALF-SHRUBS AND VINES IN MINNESOTA

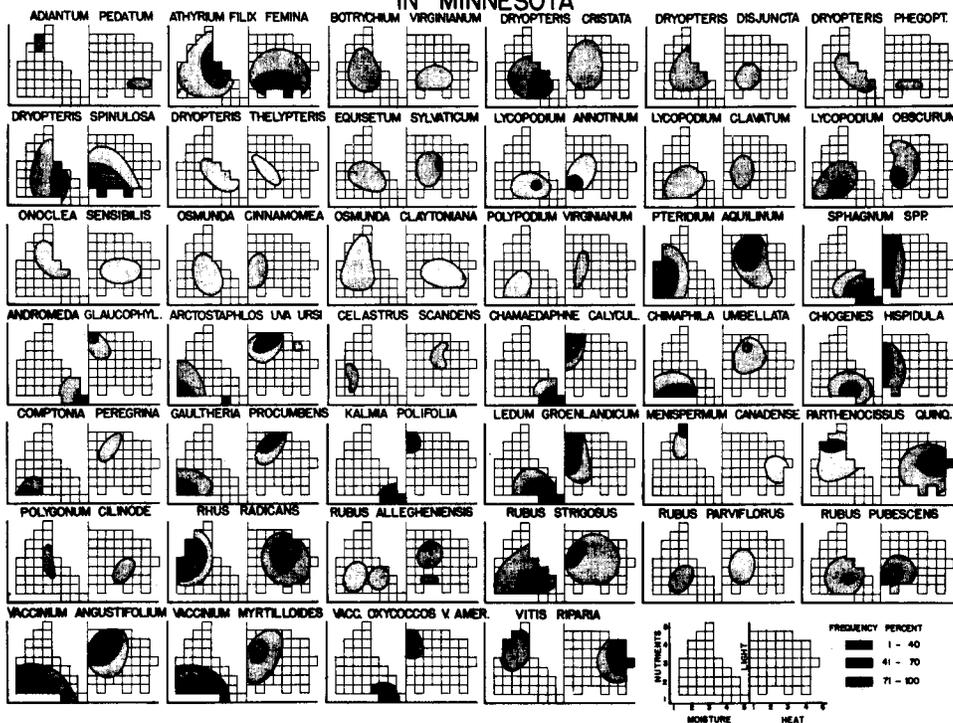


Figure. Ecographs of forest species in Minnesota. Percentages of the numbers of forest communities containing a certain forest species as related to the total numbers of communities within unit combinations of moisture-nutrient and heat-light coordinate systems.

Literature Cited

Bakuzis, E. V. 1959. Synecological coordinates in forest classification and in reproduction studies. Ph.D. thesis Univ. Minnesota. Microfilm and xerox publ. University Microfilms, Inc., Ann Arbor, Michigan. 242 pp.