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## V. Summary

Forest vegetation of the Kirchleerau area of Switzerland was studied using field and analytic methods adapted from those of the so-called "Wisconsin school" of plant ecology. Results were compared with those of four European methods applied in the same area and which were compiled by ELLENBERG (1967). The study area of *c.* 400 hectares had been selected for its ecological diversity. In order to insure a good range of vegetation types, areas to study were selected from seven associations of FREHNER (1967); 25 stands were then sampled after on-site inspection. Quantitative information was gathered on size and number of trees in four  $\frac{1}{20}$  acre (2 are) circular plots per stand. Frequency was determined for understory species (herbs, shrubs, tree seedlings) using 25  $1\text{ m}^2$  quadrats per stand. Various environmental data were also recorded for each stand.

A modification of the BRAY and CURTIS (1957) ordination was performed using a similarity index derived from frequency-classes of the understory species. On the basis of absolute and relative similarities, four groups of stands were recognized although these groups were somewhat overlapping. These four groups of stands were used in the selection of end stands of two axes. Vegetation and environmental data and correlations plotted on a two-dimensional ordination are more readily understood than data plotted on a multi-dimensional ordination. Since similarities and groups of stands as well as dissimilarities were used in achieving the ordination, it was considered that more information was expressed than in two axes of a conventional dissimilarity ordination.

Environmental data and data from the tree and understory species were plotted on the ordination. Several environmental trends were recognized on the ordination, but the main trends were considered to be soil moisture and soil pH. Patterns of individual species appear to show correlation with certain environmental trends. It is noted in the paper that the ordination technique is valuable for suggesting correlation, but that further study is necessary to determine if these correlations are valid or not.

Trees have been influenced by man for a long period of time in the Kirchleerau area by management practices of planting, thinning, and cutting, and this has influenced the understory species through opening the canopy, disturbing the soil, changing the soil characteristics by introduction of conifers, etc. Therefore, unusual (rather than "natural") combinations of understory species likely occur in stands. Considering that the ordination was based on understory species, it is of interest that good patterns appeared for the environmental factors and the tree species. No important understory or tree

species have identical distribution patterns, and an individualistic interpretation and lack of definitive groupings is indicated. No good environmental groupings appear either, as the various environmental factors trend in a number of directions. An individualistic interpretation and lack of species and environmental groups (*i.e.*, lack of "associations") does not mean that meaningful trends are absent, however. For example, relative basal area was used as a measure of relative importance for the trees, and when stands of peak importance values of different tree species are plotted on one ordination, a pattern resembling a continuum is achieved. Tree genera appear in the order of *Pinus-Quercus-Fagus-Picea-Abies-Fraxinus* and *Acer*, essentially a moisture gradient from dry to mesic to moist.

A comparison of my results with those achieved by the other four methods was made by plotting their groups (associations, phytocoenoses, etc.) on my ordination, and also by plotting my stands on tables based on their environmental groupings. When vegetation groupings of the other workers were plotted on my ordination, the major groups of SAXER were seen to be most similar to my ordination and those of AICHINGER were least similar. The groupings of FREHNER and of EBERHARDT et al. were intermediate. Species and environmental trends were found to be similar among all five methods, so the main difference seemed to be the method of grouping stands.

The differences between their methods and mine thus are mainly those of the concepts of classification vs. ordination.

Possible methods of mapping from ordinations are discussed, but it is concluded that classificatory methods lend themselves to mapping more readily than does ordination, especially in areas which have been long disturbed by man.

## VI. Zusammenfassung

Die Waldvegetation der Gegend von Kirchleerau (Kt. Aargau, Schweiz) wurde im Feld aufgenommen und nach modifizierten Methoden der "Wisconsin"-Schule analysiert und anschliessend die Ergebnisse mit jenen von vier europäischen Methoden verglichen, nach denen in der gleichen Gegend bereits kartiert worden war (Zusammenstellung von ELLENBERG 1967). Das Untersuchungsgebiet von etwa 400 ha hatte man seinerzeit wegen der standörtlichen Vielfalt gewählt. Für die vorliegenden Untersuchungen wurden 25 Probeflächen aus 7 Assoziationen von FREHNER (1967) ausgesucht, um möglichst viele Vegetationstypen berücksichtigen zu können. In jedem Bestand wurden in vier Kreisflächen von 2 a Grösse und Anzahl der Bäume gemessen, ebenso auf 25 Quadratflächen von 1 m<sup>2</sup> die Frequenz der Untersucharten (Kräuter, Sträucher, Keimlinge) bestimmt und in jedem Bestand verschiedene Standortfaktoren aufgezeichnet.

Die Unterwuchsarten wurden nach ihrer Frequenz klassiert und daraus ein Ähnlichkeitsindex bestimmt. Unter Anwendung dieses Index konnten die Bestände nach einer etwas abgeänderten Ordinationsmethode von BRAY und CURTIS aufgezeichnet werden.