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Englische Zusammenfassungen der im Berichtsjahr 1977 abgeschlossenen Dissertationen und Diplomarbeiten

Summaries of Ph D. and Diploma Thesis

Dissertationen (Ph D. thesis)

1977

BOLLER-ELMER, K. Ch. Stickstoff-Düngungseinflüsse von Intensiv-Grünland auf Streu- und Moorwiesen. Veröff. Geobot. Institut ETH, Stiftung Rübel, Zürich, 63, 103 S.

Influence of fertilized sites on wetlands.

In the northern Swiss Midlands, the contact zone between fertilized land and straw meadows was investigated. At 17 stations, transects were drawn from fertilized meadows or wheat fields to straw or fen meadows. On each transect, several fixed points were chosen for an analysis of the plant community and of the soil to assess nutritional gradients.

At the borders of the fertilized land, a transition zone was developed with a luxuriant vegetation, dominated by *Filipendula ulmaria*, *Carex acutiformis* and *Lysimachia vulgaris*. In its typical form, it can be apportioned to the *Valeriano-Filipenduletum* (SISS., 1945). Along the transect there are transitions of this community to the *Arrhenatheretum* on the one side and to the fen communities (*Primulo-Schoenetum*; *Caricetum davallianae*; *Caricetum canescenti-fuscae*; *Caricetum elatae*) on the other.

The nitrogen supply of the soil was determined by measurements of the content of mineral nitrogen and the potential of nitrogen mineralization. Both quantities were high near the border of the fertilized land and both dropped steadily towards the fen meadow, in the parallel with a decrease of the species of the *Valeriano-Filipenduletum* and a diminution of the productivity of the vegetation. Several times the nitrogen supply seemed to increase in the more central parts of the fen, in spite of a further decrease in productivity.

The nitrogen content of the plants also decreased along the transect and increased sometimes again in the inner regions of the fen.

Both results indicate that the *Valeriano-Filipenduletum*-zone is formed where the nitrogen supply is high and that the decrease of the latter limits the extension of the community.

In the discussion, the increased nitrogen supply is interpreted as a probe for an indirect fertilization, due to surface runoff, biogenous transport in the soil or leaching and groundwater flow. The transition zone can use the entering nutrients for luxurious growth. Therefore, it has the effect of a buffering zone against indirect fertilization and protects fens against it. The protection is effective only when the vegetation of the buffering zone is cut regularly and the plant material with the incorporated nutrients removed. The buffering zone extends 2 - 15 m towards the fen, depending on the strength of the indirect fertilization effect.

PORRET Marianne. Comparaison d'écosystèmes de prairies permanentes exploitées de manière conventionnelle et biodynamique. Veröff. Geobot. Inst. ETH, Stiftung Rübel, 65, 152 S.

Comparison between ecosystems in conventionally and biodynamically cultivated meadows.

In order to compare the conventional cultivation with the biodynamical one, experimental investigations were carried out in seven different pairs of meadows in the Swiss Midlands; each pair consisted of two neighbouring plots, one being cultivated conventionally, the other - biodynamically. With the help of several specialists, various aspects of these ecosystems were studied.

All the seven biodynamically cultivated plots proved to be richer in grasses, leguminous et herbaceous species than the conventionally cultivated surfaces. The difference is very distinct in the vegetation table listed by decreasing number of species.

The soil samples from all the plots were studied as to the content of organic carbon, total nitrogen, hydrosoluble phosphate, potassium, magnesium and the cation exchange capacity. In addition, the nitrogen mineralization and mangan were analyzed in five pairs.

Within the pair 1, the differences in the humus content and vegetation between the plots were particularly pronounced; for this reason (determination of the size) soil particles, soil density, curve of desorption as well as the suction power were performed.

The earthworm fauna was investigated in the meadow pairs 1 - 3, the nematodes in the pairs 1 and 2, the microarthropods and the carabids in the pair 1. Distinct differences in this respect were found between conventionally and biodynamically cultivated plots.

An experiment with white clover potted in the soils from the surfaces 1 - 3 showed that the biomass production in conventionally managed soils was higher than the biodynamically cultivated ones. The same results were obtained in subsequent experiments with various sorts of red clover.

To obtain information on differences in the productivity of the meadows, the productivity of five farms was studied.

ZüST Susanna. Die Epiphytenvegetation im Raume Zürich als Indikator der Umweltbelastung. Veröff. Geobot. Institut ETH, Stiftung Rübel, Zürich, 62, 113 S.

The epiphyte vegetation in the region of Zurich as an indicator of air pollution.

The changes in the epiphyte vegetation from Zurich during the last 40 years and some effects that are causing those changes have been investigated. The cryptogamic epiphyte vegetation in the Zurich area was mapped with a method using 11 growth form types (forms of colonization). This method was taken over from a study carried out 40 years ago in the same place. According to the various growth forms four zones could be distinguished: Zone I, being without lichens and zone II and III representing the transition to zone IV with normal epiphyte growth. A comparison with the 1936 situation shows, that both the composition of the species that characterize a growth form and the size of the zones changed.

Zone I proved to be 9 times larger and covers almost the entire city. However it is not entirely without epiphytes. Zone II and III expanded to the north and east. On the steep slope of the Uetliberg in the south and west of the city few changes were noted. While zone IV can no longer be observed in area of Zurich, it was studied in a rural area with little immissions.

The growth forms of the beard lichens, fruticose lichens, broadfoliose lichens and the liverworts have disappeared from the area of Zurich. The species most frequently found in the town in 1936, *Parmelia borreri*, has disappeared along with *Candelaria concolor*, *Frullania dilatata* and others. The growth form of the narrow-foliose lichens (with *Hymnum spec.* and *Pylaisia polyantha*) is the most widespread today.

The phorophytes which today have most frequently become devoid of epiphytes are the coniferous trees. Phorophytes with an alkaline bark such as *Acer* and *Fraxinus* have been observed to bear epiphytes even in zone I.

The stem flow of *Fagus* was analyzed in both rural and urban areas: The lowest pH values and the highest sulfate concentrations were measured in winter in the city (pH 2.1; sulfate: 914 mg/l). Sulfate concentrations are very low. It could be shown that acide stem flow from the city had an adverse effect upon epiphytes in rural areas. Mycobiont growth experiments proved that growth ceases below pH 2.5.

Epyphytes are subject to the influences of nature as well as civilization; the difficulties encountered in the attempt to distinguish between these two influences are pointed out.

Diplomarbeiten (diploma thesis)

1977

KRÜSI, Bertil. Schnittzeitpunkt und Artenreichtum. 184 S. (Manuskript).

Time of mowing and diversity.

In the jurassic mountains of the Randen near Merishausen (Ct. Schaffhouse/CH) the influence of the management on dry meadows (Mesobromion) was investigated with the aim of assessing the most appropriate management of these rare meadow types, guaranteeing their protection.

For this purpose time and frequency of mowing were compared with phenological data. These were determined by the analysis of distributional patterns of important species and their flowering on a grid system applied over plots that were especially examined. By comparing frequency of all (flowering species on the 50-sq.m-plots of this grid and parallel 1-sq.m-plots on the grid points the ecological homogeneity of these surfaces, the ecological demands of certain species (e.g. distance from forest edge), and the influence of management could be evaluated. The same time also some knowledge was gained on their colonization dynamics.

In specially drawn phenological spectra the flowering dynamics of all important species was visualised including curves for mean number of individuals/sq.m as well as for the percentage of plots within the grid with flowering individuals.

The examination of these data showed clearly that the actual time and frequency of mowing does not correspond with the best time in the growing season but just with the phase of bud formation. Therefore another cutting regime is proposed to maintain the highest diversity and flowering intensity on these protected dry meadows.

MEISTERHANS, Edwin. Menschliche Einflüsse in der alpinen Stufe in Davos.

142 S. und 1 Vegetationstabelle (Manuskript).

Human influence in the alpine zone near Davos, Switzerland.

The most severe of the human influences in the alpine zone near Davos is ski-track grading; it is made in a large scale with bulldozers and explo-

sives. The vegetation cover and top-soil are destroyed and very often only soil is left behind. Erosion starts and humus and fine-earth are then washed into deeper horizons. Natural re-establishment of the vegetation is very slow. Its speed increases with increasing humus content of the top of the soil and decreasing elevation a.s.l. The floristic composition of the pioneer vegetation depends on the type of the substrate and the humus content, exposure and slope being of minor importance. The pioneer species are mostly tussocks, cushion-plants and "Facultative" cushion-plants. It was shown by comparison with the natural vegetation that the succession on surfaces where ski-tracks have been made was at its very beginning even after 10 years. To prevent erosion, the companies of the mountain railways tried to re-establish the vegetation by resowing (however with foreign seed mixtures) and other measures. The success was greatest where also the best re-establishment of the natural vegetation occurs.

Given its many negative effects and particularly the failure of the re-establishment of the vegetation, no new large-scale ski-track grading should be allowed.

SCHWANK, Othmar. Biosystematisch-ökologische Differenzierung bei *Lotus alpinus*. 129 S.

Biosystematic-ecological differentiation in *Lotus alpinus*.

The investigation deals with 106 populations of *Lotus alpinus* occurring on various substrates above timberline in surrounding of Davos (Grisons, Switzerland). In addition to field observations, studies on germination as well as some transplantation experiments were carried out.

Lotus alpinus within the alpine zone is differentiated into diploids ($2n=12$) and tetraploids ($2n=24$). A rather definite pattern of distribution of either race results from their respective ecological requirements. The diploid occur exclusively on silicate and most frequently are confined to altitudes higher than 2300-2400 m.a.s.l. The tetraploids inhabit silicate, dolomite and serpentine substrates; on silicate, however, only lower alpine stations are accessible to the 24chromosomic plants and the contact zone between the two chromosomic races is remarkably narrow, whereas on dolomite and serpentine the tetraploids are found as well at higher altitudes. Phytosociological affinities of diploids and tetraploids within the contact zone are not distinct. As indicated by experiments, the absence of the diploids on substrates other than silicate is apparently due to competition. The distribution pattern observed on silicate seems to be influenced by the snowmelt time within the alpine zone.

A positive distinction between diploids and tetraploids was not possible, morphological variation being too pronounced, particularly in tetraploid plants. No hybridization between the two races was found.

The 24chromosomic plants originating from various substrates mani-

fested some differences in habitus and behaviour and might accordingly be considered as local edaphic races.

A continuous transition between the tetraploid *Lotus alpinus* and *Lotus corniculatus* seems to occur; however, the problem of gene exchange between these taxa requires further study.

Cyanogenesis was studied in 490 plants of both chromosomic races of *Lotus alpinus*. Some trends that confirm the previous results of URBANSKA-WORYTKIEWICZ and WILDI (1975) are discussed.

In conclusion, comments on a further evolution of *Lotus alpinus* are given.

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