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Notes: additional unpublished research reports may be available from the following institutes:
Hungarian Forest Research Institute;
Faculty of Forestry, Sopron University;
National Authority for Nature Conservation, Ministry of Environment and Regional Policy.

Selected references

Stand structure research and modelling the stand structure in natural forests

Czajlik P. (1991): Examination of the relationships among forest structure, forest management and protected species (Erdőszerkezetek, erdészeti nevelővágások, és a védett fajok kapcsolatának vizsgálata) *Környezet és fejlődés* 2 (3), 9-13.

Abstract: The author examined the occurrence of the hazel grouse on the basis of a survey made between 1974 and 1985 in the Mátra mountain. In this area, like in most areas in Hungary, clear cut is the usual way of felling. The birds need different kind of living space for their different ecological requirements: bushes where they can find food, clearings for bringing up chickens, leafy trees to protect them against predator birds, etc. Most hazel grouse was observed in 20-30 years old forests where no trees had been cut in the preceding five years. The survey done by K. Eiberle in 60's in Switzerland served as a model for the survey in Hungary, and the results are compared. The survey done in Switzerland shows that forests similar to the Mátra are not favoured by hazel grouse. Birds prefer those forests, where the stand is managed by selection cut, and not collapses at the same time, like in the case of clear cut. The author concludes this is an example how clear felling (common in Hungary) restricts the protection of rare species.

Key-words: Forest structure, maps of tree position and crown projection, management, protected species

Czajlik P. (1994): On the use of forest reserves (Az erdőrezervátumok hasznosításáról)

Környezet és fejlődés 5 (2), 29-35.

Abstract: Forest which posses natural structure and soil, and provide habitats for the original species are suitable for establishing forest reserves. These areas are valuable scientific open-air laboratories as well, where the complex natural processes and relationships of the species can be studied. The destruction of the forests and the decrease of the number of forest-inhabiting species draw the attention for the need of the development of a new type of forestry, which regards the natural processes as a model of the management. This requires more knowledge about the changes of the forest structure and species composition during the development. The author summarizes the methodology of the examination of forest structure, and compares the developmental phases of a natural forest with the forest forms created by management.

Key-words: Natural processes, management, species composition, forest structure, methods

Czajlik P. (1994): Forest reserves (Erdőrezervátumok)

Élet és Tudomány 29, 899-901

Abstract: The author gives a review of the history of the forest reserves in Europe from the XIXth century. This is the time when the foresters recognized the damaging effect of large scale clear cuts, and the need for preservation of ancient forests first emerged. Early experiments on the alternative, less destructive forest management, like imitation of the selection, were not successful due to the lack of the necessary knowledge. From the beginning of the XXth century foresters recognized the needs for this knowledge, and initial studies began in the remaining natural or nature-close forests. It was the time when many forest reserves were established. The

aim and methodology of the forest reserve research was first defined by Leidschütz in 1966 (Forest reserves). By that time only a few natural forests remained in Europe, so researchers began to work in nature-close stands. In Hungary the Forest Reserve Network - aiming the scientific research of the natural processes in unmanaged forests and habitat protection - was set recently. It consists of 71 reserves (4100 ha) including all of the forest types of Hungary.

Key-words: History, forest structure, forest phases, management

Fekete L. (1906): Study on stand structure of the virgin beech forests of Ung County (Tanulmány az ungmegyei bükk őserdők faállományának szerkezetéről)

Erdészeti Kísérletek VIII. 3.4.sz., 105-118

Abstract: The author examined the distribution of the D13 and tree height data of each trees in two areas (0.25 acre both) of the ancient beech forest of Ung county. He analyzed the chart of the thickness and tree height data and found that "...the curve of the thickness distribution shows incredible order. This order is observable in an evenaged forest as well, however, it is more surprising in an ancient forest where one would expect totally irregular pattern in the thickness distribution." He assumed that a forest ecosystem can reach the climax stage by self-regulation, without human activity, however, the natural process is slower.

Key-words: Forest structure, forest history, ancient forest

Földvály M. (1933): Forest Reserves in the Northeastern Carpathians (Őserdő-rezervációk az Északkeleti Kárpátokban)

Erdészeti Lapok, 416-432

Abstract: The author gives a descriptive characterization about the East-Carpathian ancient beech forests, and draw special attention to their natural beauty and value. He highlighted the importance of the forest structural changes. He suggested the conservation of ancient forests for future scientific studies, since they preserve valuable knowledge for the development of the forestry management.

Key-words: Forest structure, ancient forest, management, protection

Czajlik P., Gergely Z., Tulipánt T. (1993): "Kekes North" - a forest reserve to be established ("Kékes Észak"-egy létesítendő erdőrezervátum)

Környezet és Fejlődés 4 (3-4), 64-66

Abstract: On the Northern side of Kékes mountain, a forest reserve of 370 hectare has been set up in 1986 in a strictly protected area situated at 700 to 950 meters above the sea level. Based on available data it appears that no intensive silviculture has ever been conducted on this territory, therefore the forest structure is natural. The area is an undisturbed zonal mountain beech forest inhabited by rare species, including 15 protected plant species, 67 protected and 4 strictly protected animal species. Authors highlight the importance of the investigation of the area.

Key-words: Natural forest structure, biodiversity of natural forest

Successional development, disturbances

Czajlik P. (1996): Case study: age distribution, succession in undisturbed forests (Esettanulmány: koreloszlás, szukcesszió háborítatlan erdőállományokban)

In: Mátyás, Cs. (ed) Erdészeti ökológia (Forest ecology), 84-92. Mezőgazda Kiadó, Budapest

Abstract: The study includes a description of the formation of possible developmental phases and successional processes in different types of forests, and shows the results of the forest structure analysis of the Kekes North forest reserve, which is a mountain beech forest in close to natural condition (was never cut down, site and species composition is original). Forest Structure was studied by transect method, completed with 50*50 m plots. Additionally aerial photographs of the area was also examined. The age and size distribution and the mortality of the trees show



characteristic differences between the developmental phases, and indicate the typical natural disturbances occurred in the forest. The author concluded that forest development has different ways and end-stages during natural processes, which are affected by numerous - natural and random - effects and disturbances. Stable or predictable stages, based on the inner stability of the life community, are not necessarily formed.

Key-words: Forest structure, forest phases, core area, permanent plots, maps of tree position and crown projection, regeneration, mortality.

Somogyi Z. (1998): The phenomenon of disturbance, its role in forest ecosystems, and its silvicultural importance. Review of literature with some consideration (A bolygatás jelensége, szerepe az erdei ökoszisztémákban és erdőművelési jelentősége. Szakirodalmi áttekintés néhány megfontolással)

Erdészeti Kutatások 88, 165-194

Abstract: Forest dynamics is the study of change of composition, structure and function of forests in time. Disturbance, any relatively abrupt, discrete event of weaker or stronger effects is an essential phenomenon in the development of forests. Disturbances are not identical to "abiotic or biotic damages" as defined by classical forest protection, and are of utmost importance for maintaining diversity and functioning of forests. This importance has only been acknowledged recently, which is shown by the growing number of studies and reviews of disturbance. This review is a summary of relevant pieces of information in the literature concerning disturbance, and it analyses how this knowledge could be used in silviculture in Hungarian forests. One of the lessons of the review is that forests can effectively be managed also if management units, i.e. forest components, are thinned inhomogeneously to enhance both habitat diversity and, thus, biological diversity. The paper also draws attention to several related issues that should be studied in the frame of research in forest reserves.

Key-words: Disturbance, forest dynamics, silviculture, forest reserve, biodiversity

Standovár T. (1998): Diversity of ground-layer vegetation in beech forest: Comparison of semi-natural and managed beech stands in Northern Hungary

In: Bachmann P., Koehl M. Paivinen R. (eds.) Assessment of Biodiversity for Improved Forest Planning, Proceedings of the Monte Verita Conference on October 7-11, 1996. Monte Verita, Switzerland, Kluwer Academic Publishing, 381-388

Abstract: The comparison of six beech (*Fagus sylvatica*) stands showed that one semi-natural plot possesses more vascular species than five managed plots together. The causes for higher diversity were studied using the vegetation and site data collected from the 576 systematically distributed 0.5 by 0.5 m quadrats in the 1.44 ha semi-natural plot. It was shown that vascular species richness and total cover are strongly related to site heterogeneity expressed in terms of steepness, stoniness, etc. The analyses of data, collected from a 30 by 30 m sub-plot with relatively uniform site properties, indicated that even within such a small area, vascular species richness and total cover vary not only according to site heterogeneity, but also to the spatial pattern of small canopy gaps. Results support the assumption that creation of large even-aged stands can substantially reduce natural diversity of vegetation in temperate deciduous forests by homogenizing the habitat mosaic produced by natural small-scale gap dynamics.

Key-words: Herbaceous vegetation, methods, forest structure, small-scale gap formation

Biodiversity aspects, dead wood component related to stand structure

Czajlik P., Harmos K. (1997): Data on the occurrence of bat species in the Kékes Észak forest reserve (Adatok Kékes Észak erdőrezervátum denevér faunájához)

Fol. Hist.-nat. Mus. Matraensis 22, 348-351

Abstract: The authors describe bat species living in Kékes Észak forest reserve (Mátra mountain in Northern Hungary). The connection between the forest developmental phases and the occurrence of three rare bat species, *Myotis bechsteinii* Kuhl., *Nyctalus leisleri* Kuhl., and *Nyctalus lasiopterus* Schreber, is also examined. Both of the *Nyctalus* species are associated with the collapsing phase, while the *Myotis bechsteinii* prefers the optimal phase. Data on the activity and behavior of these species are also included.

Key-words: Fauna, forest phases, bats, dead woods

Czajlik P. (1997): Mammalian fauna of Kékes North forest reserve (Kékes Észak erdőrezervátum emlős faunája). *Fol. Hist.-nat. Mus. Matraensis* 22, 352-358

Abstract: Mammalian species of the "Kékes North" forest reserve (located at the northern slope of the Kékes peak) and the surrounding protected areas were examined. The study is part of a long term ecological forest reserve research. The goal of this project was to describe the composition and spatial distribution of the mammalian species. On the basis of the results a research methodology will be set up, and indicator species will be selected. In this study results were compared with our earlier observations made in the Csörgő valley forest reserve in 1988. Location of the species is also given in UTM coordinates.

Key-words: Fauna, forest phases, mammals, game impact, ecosystem

Czajlik P., Harnos K. (2000): Etological and ecological description of the white-backed woodpecker (*Dendrocopos leucotos*) populations of the Kékes North and Csörgő-valley forest reserves (A Kékes Észak és Csörgő-Völgy erdőrezervátum valamint azok környékének Fehérhátú harkály (*Dendrocopos leucotos*) populációinak etológiai és ökológiai leírása)

Aquila, 1999, in press

Abstract: The habitat and structure elements used by the white backed woodpecker (*Dendrocopos leucotos*) were examined in two forest reserves (Csörgő valley and Kékes North, Mátra mountain, Hungary) and in the surrounding production forests between 1980-1997. Forest type, tree species, the behaviour of the bird, foraging strategies and the parameters of trees utilized by the birds are statistically analyzed (total of 250 observations). Results show strong correlation between the forest developmental phases and the occurrence of the white backed wood pecker. The birds prefer old stands with dead woods and large trees for foraging and nesting. The forage behaviour is not associated to dead woods exclusively, the birds use the large healthy trees as well. Stable nesting population were found only in natural forest stands consisting mosaics of different forest phases (including collapsing and aging phases). In contrast production forests, where trees are cut in their middle age and dead wood component is removed annually, do not provide stable habitat for the white backed wood pecker. These results show that forest management strategies should be changed for the protection of the birds, special attention should be paid to leave large, older trees, and a part of dead wood components in production forests.

Key-words: *Dendrocopos leucotos*, foraging strategies, structure elements of habitats, protection.

Siller, I. (1986): Phytocenological test of macro-fungi in reservation and managed beech-wood (Nagygyombák cönológiai vizsgálata rezervátum és gazdasági bükkös állományokban.)

Mikológiai Közlemények 2-3, 95-116

Macrofungi – among them first of all the lignivorous species – of the old growth forest in the Bükk Mountains, Hungary, as well as of a managed beech forest were compared in order to establish what is the role of these organisms in the forests having developed under different circumstances. The aims of the study were definition of the ceonological methods are suitable for the characterisation of the examined fungal associations, the quantitative-qualitative differences existing among the lignicole and lignivorous macrofungi of the two forests, and the

characteristics of the successive phase of timber decay. Despite of the differences in the basic potentialities and the degree of disturbances, the fungal associations show similarities in species composition, abundance and dominance values. The greatest differences were found in the number, dominance and productivity of the lignivorous species. In the old growth forest the old, giant trees die in a natural way, and their elements gradually return into the biogeochemical cycle. The lignivorous fungi are essential components of this process. Rare species and fungal associations characteristic for this successive phases of timber decay offer an exciting task for research.

Keywords: fungi, dead wood, natural processes, reserve, managed forest

Methods, plot design for gathering information on natural forests

Hahn I., Standovár T. (1994): On the botanical researches in forest reserves (Az erdőrezervátumokban végzendő botanikai kutatásokról)

Környezet és Fejlődés 5 (2), 43-45

Abstract: This paper contains a suggested protocol of vegetation description to be used in forest reserves. First the possible scientific questions to be studied are outlined. Among others, delineation of main vegetation types (associations, forest types etc.), changes in flora, changes of dominance structure, changes of spatial patterns, changes in the level of degradation are proposed as important issues. A hierarchical approach is proposed for the sampling. The first (least intensive) level is suggested for a rough vegetation description, and is connected to the systematic sampling plots of stand structure. More detailed analyses of species abundances are connected with detailed core-area sampling of transects or rectangular plots.

Key-words: Vegetation, forest structure, method

Somogyi Z. (1994): Some general issues of researches to be carried out in forest reserves (Az erdőrezervátumokban folytatandó kutatások néhány általános kérdése)

Környezet és Fejlődés 5 (2), 39-42

Abstract: The paper emphasizes the importance of having a sound concept of research on forest reserves. This concept includes comparison of undisturbed forests with managed forests to point out the differences. Forest management experiments must also be carried out in the buffer zone of the undisturbed forests, and are necessary to obtain knowledge for the sustainable forest management. The investigation should be expanded to numerous special fields and should involve their synthesis. Appropriate financial background is necessary for the long-term studies.

Key-words: Management, comparison, research methods

Somogyi, Z (1994): Site ecological researches in forest reserves (Termőhelyökológiai kutatások az erdőrezervátumokban)

Környezet és Fejlődés 5 (2), 46-47

Abstract: The present paper is a brief summary of methods and topics belonging to site ecological studies in forest reserves, including detailed description of the climatic parameters, site maps, soil profile methodology, with special attention to specificity to forest reserves, study of the decaying of the dead wood component and other examinations. The investigation of the spatial heterogeneity of the stand and the long-term processes are especially important.

Key-words: Research methodology, soil profile, site ecology

Standovár T. (1996): Aspects of diversity in forest vegetation.

In: Assessment of Biodiversity for Improved Forest Management. (Eds: Bachmann P.; Kuusela K, Uuttera J.) (EFI Proceedings, 6.) European Forest Institute, Joensuu, 17-28.

Abstract: The value of biological variation (biodiversity) can be conceived by recognizing its fundamental role in evolution. So, beyond ethical and selfish human reasoning, biodiversity has

its biological importance on its own. However, there are some potential pitfalls of applying an oversimplified diversity concept in forestry. Species richness can not be the single best indicator of forest health and good forest management. Diversity can (and should) be described and interpreted at several levels, considering both spatial and temporal aspects. But, even when evaluating only species richness, the natural geographic and ecological range of the involved species should be taken into consideration.

Some ways of measuring diversity in communities are discussed with a special emphasis on the often disregarded spatial component. A method for studying the compositional variation of plant communities is shown. Florula diversity reflects how many of possible species combinations occur and in what proportions. The actual value of this measure is dependent on the size of sampling units used.

The efficacy of this method is illustrated by an example in which herb layer vegetation of two forest stands was compared by diversity measures. Field data were collected in two seemingly similar forest stands. Traditional diversity measures (species richness, classical diversity indices) could not differentiate the two areas. However, compositional diversity was different in the two plots. The analysis of canopy structure suggests that crown class diversity might be related to the compositional diversity of herb layer vegetation.

Key-words: Vegetation, methods, diversity measures

Standovár T., Somogyi Z. (1998): Corresponding patterns of site quality, decline and tree growth in a sessile oak stand.

European Journal of Forest Pathology 28, 133-144

Abstract: This study focuses on two neglected aspects of oak decline: relations with site characteristics and effects on tree growth. The study was carried out in a 5.5 ha stand that is strongly affected by oak decline. The nearly pure sessile oak (*Quercus petraea*) stand of mostly coppice-origin was 90 years old at the beginning of the study. Within-stand site heterogeneity was described by the herbaceous vegetation. Four ecological site types were distinguished by the species composition of herbs, and they were characterized by the ecological indicator values of the species. Tree growth between 1987 and 1993 was measured, and tree vigour was estimated from visual characteristics five times between 1987 and 1993. Potential volume increment of declining trees was estimated with the growth rates of healthy trees of the same size. Volume increment loss caused by oak decline was also assessed. Significant positive relationships were found between tree vigour and tree size and between tree vigour and tree growth. The growth of seriously declining trees dropped to almost one half of that of healthy ones. Growth loss of ill trees at the stand level amounted to 5.4 %, whereas growth loss of all trees, including those that died during the observation period, amounted to 19.9 % of the potential growth. Tree size and growth were higher on better sites. A strong relationship was also found between tree vigour and site type, but sessile oak was more susceptible to decline at better sites.

Key-words: Vegetation relevés, maps of tree positions, forest deceases, stand increment data

Basic descriptions and studies about the forest vegetation and ecosystems in Hungary

Danszky I. (ed.) (1963-1964): Directives and methods for afforestation and forest regeneration in Hungarian forest regions (Magyarország erdőgazdasági tájainak erdőfelújítási és erdőtelepítési irányelvei és eljárásai) Vol. I-VII. Országos Erdészeti Főigazgatóság, Budapest

Fekete G. (1965): Die Waldvegetation im Gödöllőer Hügelland. Vergleichende pflanzengeographische Studie über die Wälder der kühl-kontinentalen Waldsteppe Akadémiai Kiadó, Budapest. 223 p.

- Horánszky A. (1964): Die Wälder des Szentendre-Visegráder Gebirges
Akadémiai Kiadó, Budapest. 288 p.
- Horváth A.O. (1972): Die Vegetation des Mecsekgebirges und seiner Umgebung
Akadémiai Kiadó, Budapest. 376 p.
- Jakucs P. (1972): Dynamische Verbindung der Wälder und Rasen (Quantitative und qualitative Untersuchungen über die synökologischen, phytözönologischen und strukturellen Verhältnisse der Waldsäume)
Akadémiai Kiadó, Budapest. 228 p.
- Jakucs P. (ed.) (1985): Ecology of an oak forest in Hungary. Results of the "Síkfőkút Project"
Vol. 1. Akadémiai Kiadó, Budapest. 545 p.
- Jakucs P. (1987): "Rejtekt Project". Biological researches for favourable regeneration of forests covering shallow soil derived from limestone in Hungary.
Acta Biologica Debrecina 19, 5-12
- Kovács M. (1975): Beziehung zwischen Vegetation und Boden Akadémiai Kiadó, Budapest. 365 p.
- Majer A. (1968): Hungarian forest communities (Magyarország erdőtársulásai)
Akadémiai Kiadó, Budapest
- Majer A (1980): The yew forest of the Bakony (A Bakony tiszafása)
Akadémiai Kiadó, Budapest, 373 p.
- Majer A (1988): Pine forest of the lower Bakony (Fenyves a Bakonyalján)
Akadémiai Kiadó, Budapest. 375 p.
- Pócs T., Domokos E., Pócs-Gelencsér I., Vida G. (1958): Vegetationsstudien im örség
Akadémiai Kiadó, Budapest, 124 p.
- Seregélyes T., Szollát G.y., Standovár T. (1995): Vegetation and plant communities (Vegetáció és növénytársulások)
In: Pannon Enciklopédia: Magyarország növényvilága (Pannon Encyclopedia: Plants and vegetation of Hungary). (Ed: Járai-Komlódi, M) Dunakanyar 2000, Budapest, 148-219
- Simon T. (1957): Die Wälder des Nordlichen Alföld
Akadémiai Kiadó, Budapest, 172 p.
- Simon T. (1977): Vegetationsuntersuchungen im Zempléner Gebirge
Akadémiai Kiadó, Budapest. 350 p.
- Soó R. (1968-1980): Systematic and biogeographic handbook of the Hungarian flora and vegetation (A magyar flóra és vegetáció rendszertani-növényföldrajzi kézikönyve)
Vol. I-VI. Akadémiai Kiadó, Budapest