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Floodplain Forest Ecosystem in South Moravia

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For establishing a representative experimental area to be studied within the framework of the International Biological Programme (IBP), a lowland forest in the region of South-Moravian woodland was found to be a suitable natural forest type in which complex biological and silvicultural studies have been carried out since 1949. The above mentioned area comprises inundated lowland forest with rich vegetation situated in the depressions of the Low Moravian Dale, esp. confined to the basin of the river Dyje at an elevation from 165 (site near Nové Mlýny) to 151 m a.s.l. (site near the confluence of the rivers Dyje and Morava). The chosen area is a complex of inundated lowland forests with extreme water regime, very favourable macroclimatic conditions and varied natural community.

The selection of a suitable site for establishing an IBP project was confirmed after a comprehensive survey had been made in different sites within the boundaries of the State Forests in Břeclav, in a session held on 7th March 1968, in which the members of the Professor's staff of the Faculty of Forestry as well as the scientific workers of the Czechoslovak Academy of Sciences in Brno were present.

The local name of the lowland forest site is „Lednický luh"; it is located near Lednice, Nejdek and Bulhary, which is a section of the Horni les Forest District, State Forests, Břeclav, and which was found to be the most representative research area. This area has been supervised by the author since 1949 on the basis of the agreement with the Ministry of Forestry and Water and should serve as a model for the improvement of lowland forests. From the qualitative point of view, the Lednický luh is the best South-Moravian lowland forest complex, in which primeval unique lowland forest reservations have been preserved. One of them, the so-called Lanžhot virgin forest, has been also included into the project of our long-term experimental areas (VYSKOT 1959).

Thus, on the basis of a detailed investigation the stand 623 a_2, located in the Horní les Forest District, was chosen as the most suitable site for establishing experimental area for the International Biological Programme. This stand represents an almost intact model of a mature inundated oak stand type of a forest, most satisfactory for a complex scientific study.

The present shape of Lednický luh, as well as the majority of lowland forests in the basin of the rivers Dyje and Morava is a mere fragment of the former extensive forest complexes, which have been well-preserved after a gradual long lasting settlement process in the lowest sections of the inundated area. The margins of these lowland forests have been stabilized gradually to the present shape, which is, actually limited by yearly repeated inundations. The process of stabilization of the boundaries of the Lednický luh is documented in the forest map dating back to 1844 (VYSKOT 1951).

Topographically, the Lednický luh forms a part of a large island located in between the main water course of the river Dyje and its Lednice branch, the so-called Zámecká Dyje. This river branch originates near the so-called Arský jez below the site near Bulhary and returns to the main river stream of the Dyje in Lednice to the lower area located below the castle, where it supplies a network of lakes in the castle park. This whole inundated woodland territory is situated at the elevation from 161 to 163.5 m a.s.l. On gently sloping ground we find scattered patches of meadows and fields and in the depressions the site is covered with swamps, stagnant water pools and remnants of closed river branches. At the beginning of our century, within the scope of water management project a network of canals was built, connecting both parts of the river. The Lednický luh is situated on the south-eastern part of this insular territory, which is spreading from north-west near the site Nejdek and to south-east near Lednice. On the eastern part it is bounded by the main stream of the river Dyje and by large pasturelands, whereas the whole western boundary line is formed by the left bank of the Zámecká Dyje river branch. The Lednický luh is located at the elevation of 162 m a.s.l. The mean length of the area facing north-west - south-east is ca. 2,500 m, the mean width towards east-west is ca. 1,000 m. From the total area of 275 hectares the typical inundated territory covers 213.67 hectares.

The Lednický luh is being inundated regularly thus causing the sedimentation of fertile muds which come from the basins of the Dyje, Svratka, Svitava and Jihlava rivers.

The layers of young holocene sediments of fine gravel, sand, loam and clay give rise to soils well-supplied with mineral nutrients, especially to those rich on potassium.

Recently, however, the favourable effect of inundations has been predominated by fatal damages caused by repeated inundations especially due to their long-lasting period of time. The inundations are of the most destructive effect when coming during the vegetation period and in winter time when considerable damages are caused by ice. Therefore, the system of old canals was renovat-

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ed, permitting fast outflow of inundation waters and also the system of retention ponds was built. In the region of South Moravia in the basin of the rivers Morava and Dyje a large-scale water regime regulation project has been gradually realized, with the aim to prevent the influence of harmful inundation waters and to maintain the typical riverine landscape features.

Inundations affect approximately a half of the Lednický luh area. Soils suffer from the lack of the air to a considerable extent reaching the critical point particulary during the vegetation period when the soils are water-logged for a long time. The situation has been improved essentially after a network of canals was built.

Water levels and especially their variability in both branches of the river Dyje (which should be considered as a whole from the hydrological point of view), have a very unfavourable impact upon the normal underground water regime, and that is why this process is considered as an important ecological factor in the Lednický luh. The changes of water levels are also dependent upon the microrelief of the alluvial plane. If the parent rock of subrecent sediments is formed by gravels which enable the connection with river streams, rapid compensation up to normal level is possible. If the substrate is formed by impermeable clays, in addition to orographic conditions, the pattern of parent neogene rock influences the underground water level decisively. This results in underground water stagnation, independently upon the water level in the river courses.

Under these complicated conditions the underground water level is an important factor determining different ecological conditions for planting specific communities according to the species and spatial arrangement influencing their localization in the field.

The climatic conditions are characterized by a long-term temperature average of 8.4°C; the average precipitation amounts to 508 mm. The coldest month is January with -2.9°C and the warmest is July with an average temperature of 19.1°C. The lowest precipitation is expressed by 21 mm in February and the highest value amounts to 70 mm in July. The summer period, especially from May to August, shows the greatest amount of rainfall. During an extremely rainless year in 1947, the Lednice meteorological Station showed on average annual temperature of 9.5°C. Temperature changes between day and night are considerable both in air and soil. These data were obtained at micrometeorological stations measured during 1952 - 1968. It was found that in soils with higher underground water level the temperature changes had been moderated. The length of the vegetation period, considered as the number of days with an average temperature higher than 10°C, is 172 - 183 days. The sunshine represents 1,800 - 2,000 hrs. per year. The average number of bright days amounts to 50 - 60 days per year, the average annual number of cloudy days is attaining 110 to 120. Fog occurs for 40 - 50 days per year. In accordance with these microclimatic data the Lednický luh represents an area with the longest vegetation period, hot summer sunshine, and minimum frequency of cloudy days within our whole territory. Due to the water regime the Lednický luh is represented by a high productivity of forest tree population increments and by their high economic value.

From the point of view of plant ecology, site conditions in the Lednický luh may be characterized as an outstandingly favourable environment for trees, shrubs and hygrophilic plants, which are anatomically, morphologically and physiologically adapted to complicated conditions of the extreme water regime. The most prevalent tree species occupying the area are pedunculate oak *(Quercus robur)*, European ash *(Fraxinus excelsior)*, *(Fraxinus oxycarpa)*, elms (which, however, have been nearly killed by the Dutch elm disease), white and black poplars and alder as well as tree-willow in permanent moors. In accordance with carbon-14 dating of samples consistent with those taken from ancient graves, the composition of hard wood species was found to be identical to that occurring in the fifth century of the Christian Era when the lowland forests in the depressions of Dyje river basin were formed in a similar way (NEČESANÝ 1948). According to the results of typological investigations the Lednický luh was divided into three forest-type groups, belonging to the sequence C, group c 23 Saliceto alnetum, 24 Querceto-Fraxinetum and 25 Ulmeto-Fraxinetum according to ZLATNÍK's classification system, including the topographic survey of locations of ten forest type compositions as well. According to spatial distribution of the ten forest types located in the Lednický luh and taking into consideration the necessary economic alternatives of the species composition in individual forest types, in this experimental forest, i. e. in Compartments 620-633 occupying 213.67 hectares, pedunculate oaks should represent 66.6 per cent and other tree species 33.4 per cent of which 15.9 per cent should fall to ash trees, 10.3 per cent to lime-trees, 3.2 per cent to elms, 2.7 per cent to willows, 1.3 per cent to alders, hornbeams and poplars occurring only as admixed species. The actual present species composition does not differ very much from the alternative stand composition, mainly as far as the representation of pedunculate oak is concerned. Mass dying out of elm due to Dutch elm disease has been observed.

The climax features of the area forming the Lednický luh and the representative conditions of the forest being of a high natural and economic value were the reasons for establishing an experimental area with the aim to serve for scientific and pedagogical purposes and for application of achievements into the forestry practice. This work started in 1949 and was contracted in 1953-1954. In 1953, 1964, 1973 and 1983 separate parts of forest management plans were worn out for the area mentioned. Thus all natural scientific and forestal aspects of this unique lowland forest were secured. During this period the forest was inspected by several hundreds of experts both native

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and foreign, students and representatives of forestry practitioners. This project covers the whole system of long-term research areas, in which the development of forest tree species populations and their natural reproduction is being studied under the influence of different ecological and economic impact. Due to all these facts, the experimental area for the International Biological Programme was selected here, the site being a true and unique representative of its kind within the world-wide system of scientific studies.

The Lednický luh represents an interstage between the forests of mild and subtropical zone and the site requirements and living conditions are very hard during the period of high inundations and invasions of mosquitoes and gad-flies and that is why the research work is quite complicated. The Lednický luh is, however, a unique type of landscape which has to be preserved. Our scientific research started in 1949, we recorded the heaviest inundations and dry periods; we shall continue investigating changed conditions caused by a large-scale amelioration project, a considerable part of which has been already put into operation. Thus it will be possible to estimate the differences in ecological conditions especially as far as the decrease of the underground water level and its influence upon the development and productivity of tree species populations is concerned.

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