

# Flora

The evolution of the flora and vegetation started at the end of the late glacial period, about 12,000 years BP (Before Present). The mountains became covered by sparse pine and birch woodlands and the lowlands by tundra-like *Artemisia* steppes with scattered groves of pine and birch. From 10,000 years BP in the Preboreal phase – or ‘pine-birch age’ – the climate had improved somewhat. Closed pine forests developed, the first broad-leaved trees (oak, lime and maple) appeared in the mountains, and alder, birch and elm grew on the lowland.

By 9,000 years BP the climate had turned notably warmer and drier, marking the start of the Boreal phase, or ‘hazelnut age’. The pine forests almost completely disappeared and in the mountains mixed-forests became dominant, composed of oak, elm and lime, whilst in the lowlands forested areas were dramatically shrinking in size and large grassland areas developed with a prevalence of drought-tolerant grasses on the loess plateaus, and forest-steppe mosaics did on the sandy terrain. Hazelnut played a less decisive role than elsewhere in the plains of Central Europe. This was also the main period of immigration for the continental elements of the Pannonian flora, with the opening of the waste shifting sand areas and the appearance of Pannonian endemics that settled on them.

The postglacial (Holocene) climate optimum was warm and wet, lasting between 8,000 and 5,000 years BP. This was the Atlantic phase or ‘oak-age’, when the annual mean temperature was 3°C higher than today. Oak forests dominated, beech and hornbeam stands grew in the mountains, and evergreens appeared in the shrub and herb layers. Beech prevailed even on the Balaton Upland. This was also the main period for the immigration of Submediterranean, Ponto-Mediterranean and Atlanto-Mediterranean elements. In the Hungarian plains the steppes withdrew; they were replaced by the zonal forest-steppe mosaic as the ruling vegetation type, and by the thermophilous water vegetation in the waste alluvial areas of the big river valleys.

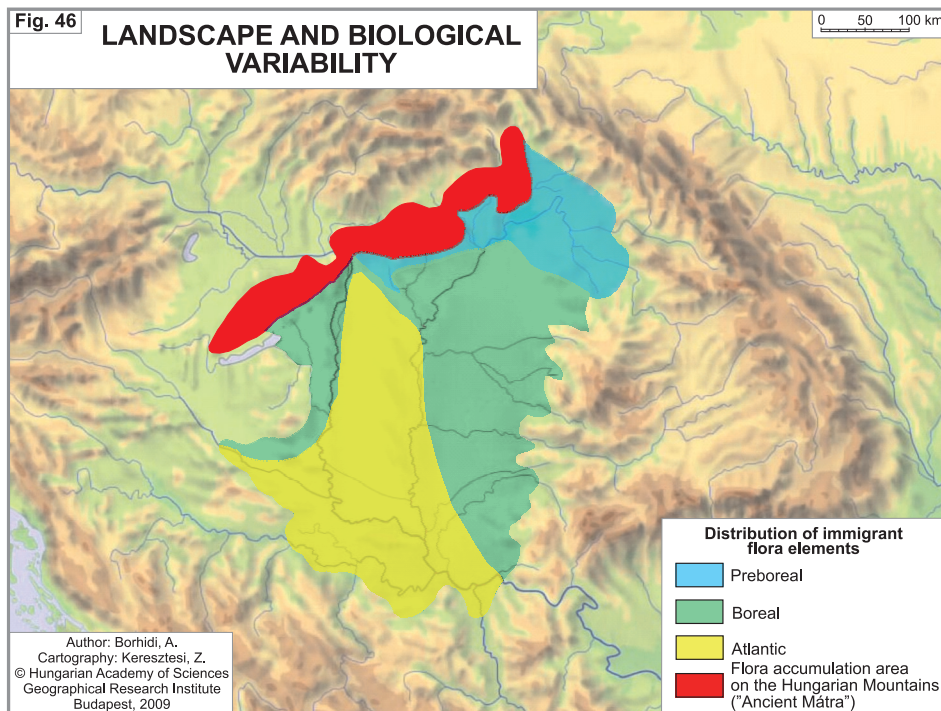
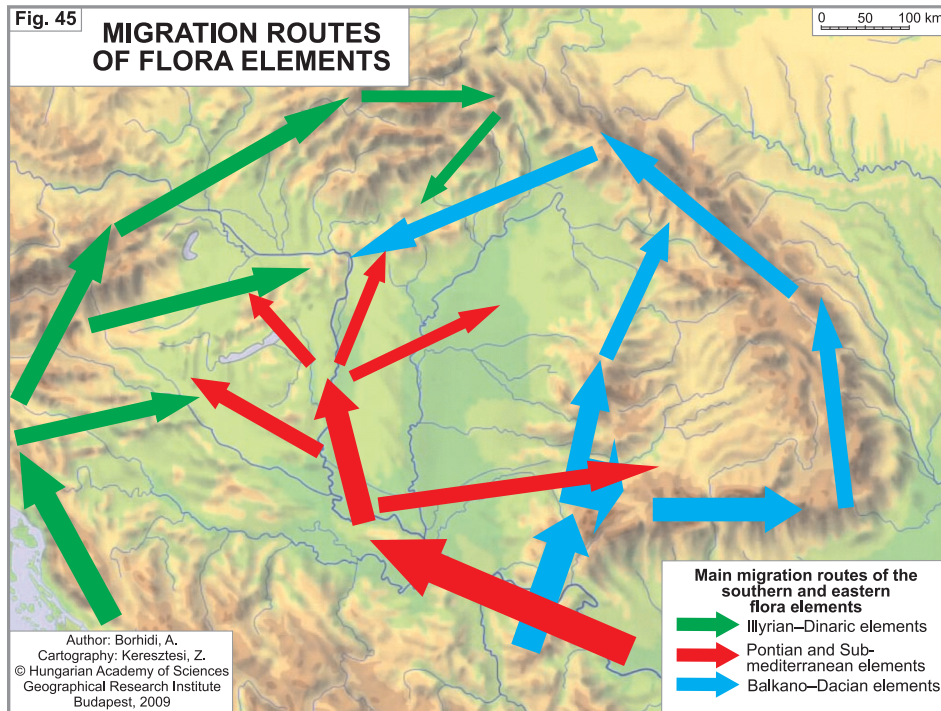
Around 5,000 years BP the climate again started to cool down and the Subboreal phase or ‘beech 1 period’ set in. However, it remained wet, which was advantageous for the expansion of the beech and oak-hornbeam forests, even facilitating their descent onto the plains. The climate was also favourable for a massive expansion of swamps and bogs. It was in this period that human impact started to transform the landscape which has eventually resulted in a definitely cultural landscape. This process has amplified over the last 2,500 years, during the Subatlantic phase or ‘beech 2 period’ until the present day.

## Distribution Types and Migration of the Flora

Hungarian flora includes 2,600 species of higher plants, grouped into the following distribution types: Endemics (3.4%), Balkanian (4%), Alpine (2.7%), Boreal (0.5%), Eastern-continental (13.2%), Submediterranean (12.2%), Subatlantic (2.3%), European (14.4%), Eurasian (22.1%), Circumboreal (6.8%), Cosmopolitan (5.6%) and Aliens (12.6%). Old endemics, e.g. *Linum dolomiticum*, *Ferula sadleriana*, and *Onosma tornense*, are sporadically encountered in the mountains, while the younger types are endemics in the

Alföld (Great Hungarian Plain), e.g. *Colchicum hungaricum*, *Dianthus diutinus* and *Crataegus nigra*. These are confined to the sandy and alluvial areas of the Danube–Tisza Interfluvium, reshaping pioneering habitats by the postglacial river dynamics of the Danube controlled by a similar process acting also actually in the Amazonas Basin.

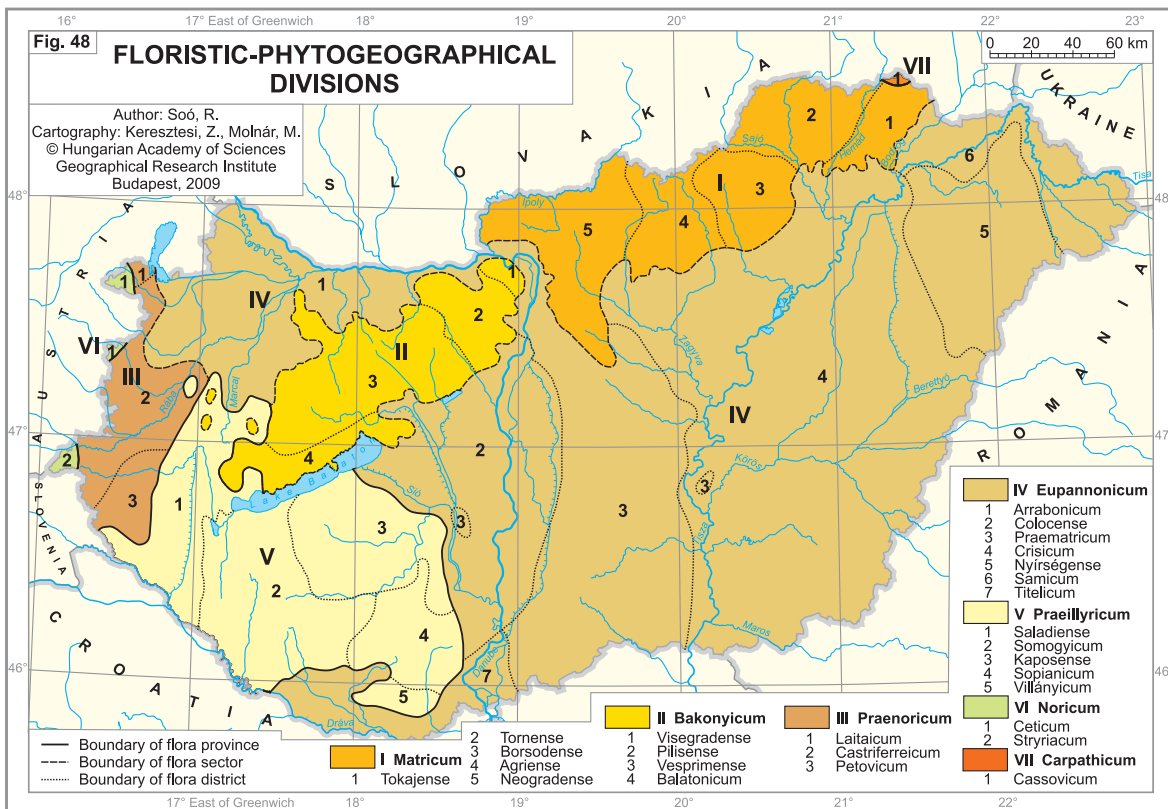
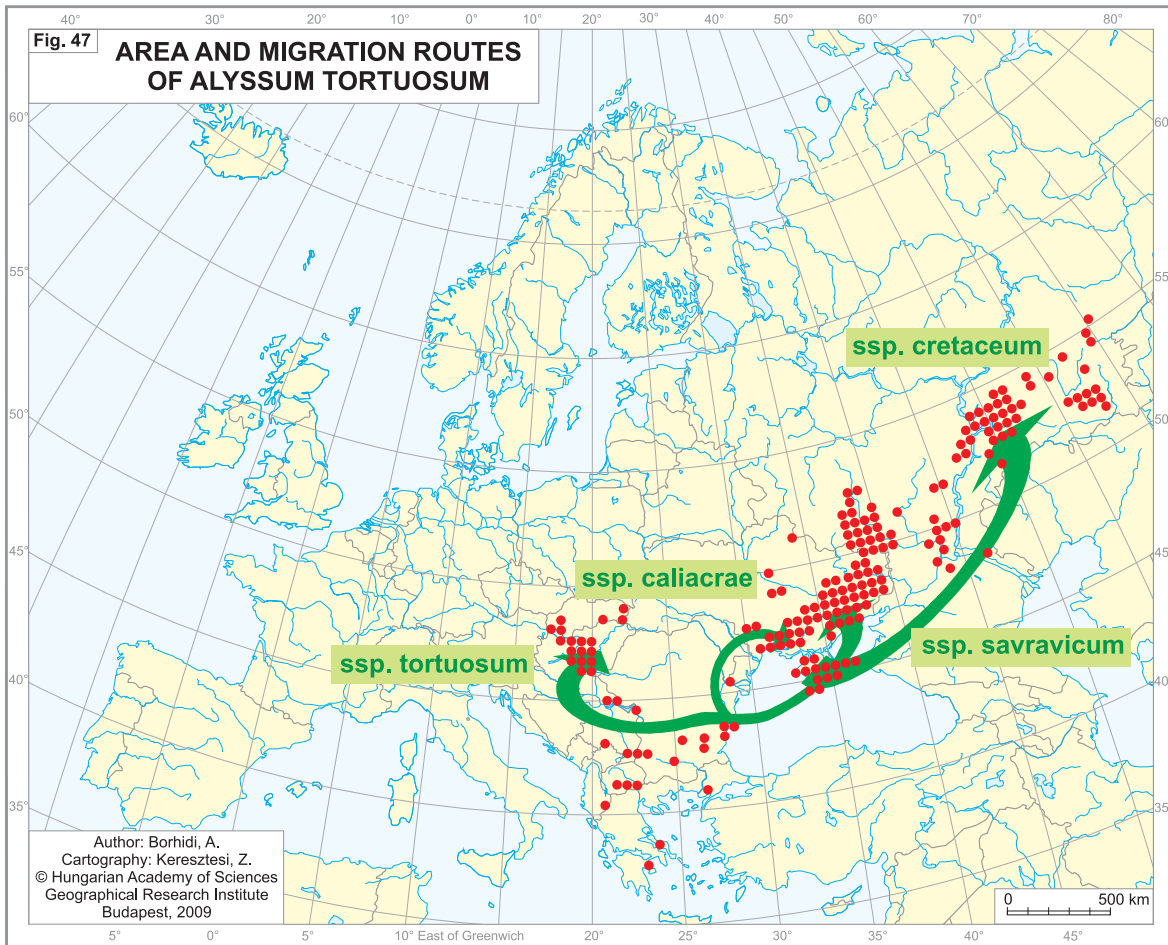
During the postglacial age, about 4,500 species changed their areas of distribution. The postglacial immigration of flora took place in



well as the spread of the steppe elements over the open lowland areas, encouraged by increasing human activity. The three main migratory routes of the southern and eastern elements are seen in *Figure 45*. The distribution of elements from outside the territory, and their accumulation, is illustrated in *Figure 46*. The Oriental and Pontian elements of current Pannonian flora do not originate from the Ukrainian–Russian steppes, rather they herald from the western shores of the Black Sea, from whence they migrated along the Danube Valley. Their immigration is the result of a simultaneous process with the evolution of the East European one (see the area of *Alyssum tortuosum*, in *Figure 47*). As a result of these flora migrations, the plains and hills of the Carpathian Basin form the autonomous Pannonian

two major phases: 1. The 'Flora-jam phase', i.e. the accumulation of flora migrating northwards from the lowlands to the Hungarian Mountains and the southern foothills of the Carpathians, starting from the late Glacial to the end of the Atlantic (12,000 to 5,000 BP); 2. Descent of the montane elements from the hills to the alluvial lowland belts, starting from the Subboreal, as

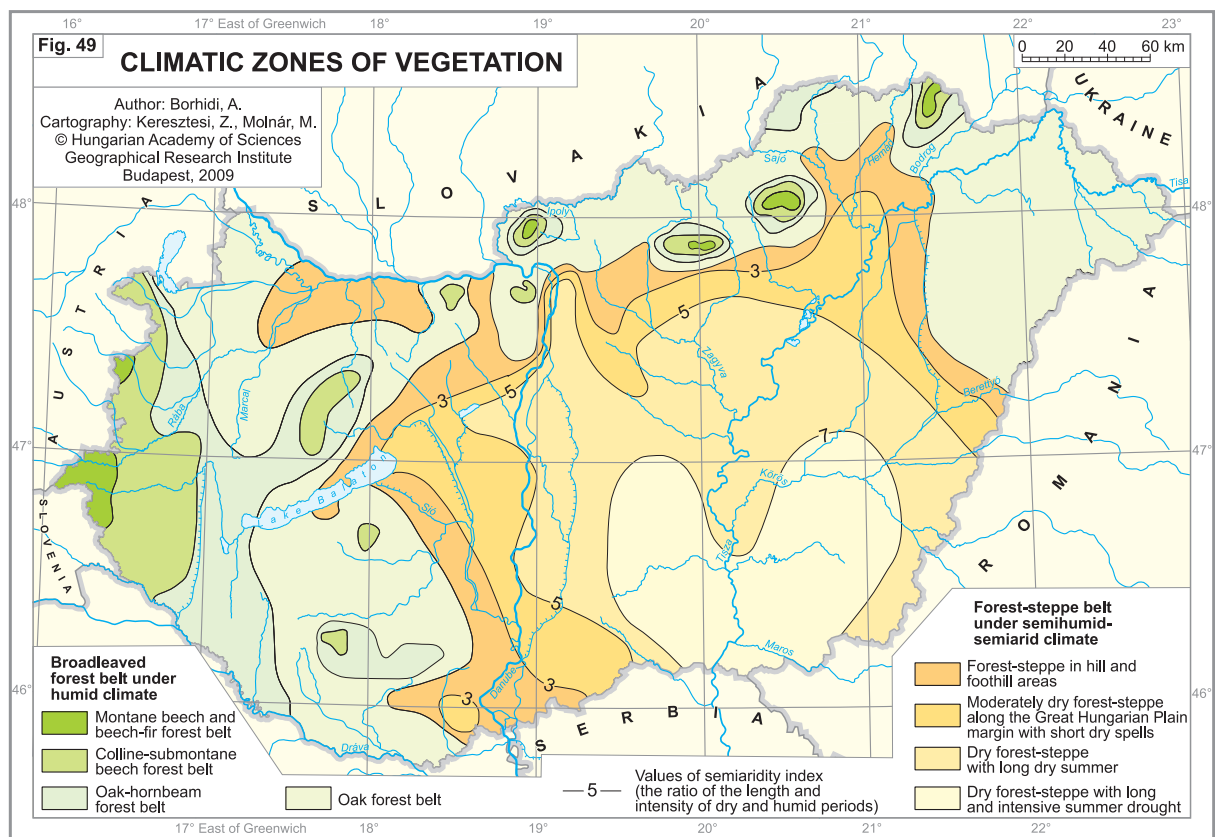
flora province, divided into 5 sectors: Eupannonicum (Alföld, comprising 7 districts); Matricum (North Hungarian Mountains with 5 districts); Bakonyicum (Transdanubian Mountains with 4 districts); Praenoricum (West Hungarian Borderland with 5 districts); and Praeillyricum (South-West Hungary with 4 districts) (*Figure 48*).



## Vegetation Belts

Five vegetation belts can be distinguished and characterised, the same as climatic belts (Figure 49). Based on the climatic diagrams of Gaussen and Walter, the boundary between the zones of broad-leaved forests and forest steppe was drawn in the first step. Subzones within the forest belt can be identified by the position of the T: P=1:3 curve. First are those of the montane and the submontane beech forests, above and below 700 m a.s.l., respectively. Between 500 and 700 m the oak-hornbeam forest belt is to be found,

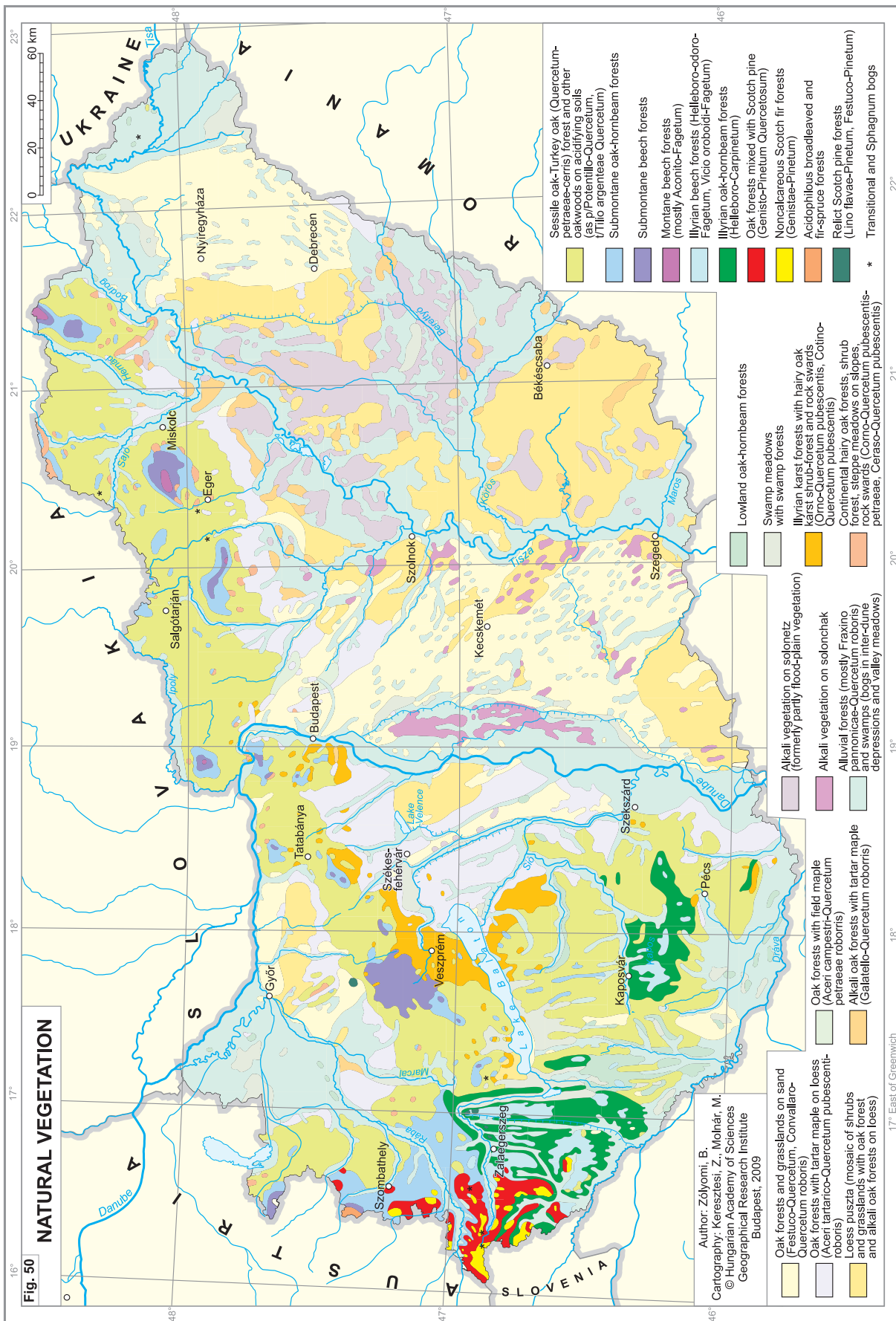
whilst below 500 m the oak woodland belt is conditioned climatically. Where the summer months bring a semi-arid climate, the forest steppe dominates, which has less of a continental and more of a Submediterranean character, as regards its magnitude and distribution in temperature and precipitation, its climate being similar to the Pontian region. The duration and intensity of the dry season is illustrated by the semiaridity index values that range between 1 and 7.



## Natural Vegetation

The recreation of the original and undisturbed state of vegetation (that dominated the Carpathian Basin prior to river regulation and intensive use of forests, meadows and forest steppes in the Alföld), is based on histori-

cal documents published by Zólyomi in 1967 (Figure 50). The map primarily indicates the climax forest associations and the characteristic mosaic-like landscapes of forest, grassland and shrub-woodland on the sand and loess *pusztas*



in the forest steppe belt. On the extensive floodplains of the lowlands, alluvial oak, ash, elm and poplar are to be found, along with wide areas of wetland and patches of bogs, all outlined by long borders of alkali soils covered by extrazonal desert-like alkali *pusztas*.

The zonal vegetation clearly reflects the elements of three climatic regions alternating and overlapping on Hungary's territory: a Central European climate, with marked Alpine influences in the west; Continental climatic features in the north-east; and Submediterranean climatic influences in the central and southern parts of the country, and over most of the Alföld. Accordingly, the medium-height beech and oak-hornbeam stands in the mountains are of a Central European character. In contrast,

the most widespread associations are the oak forests, such as the turkey oak-sessile, hairy oak, as well as the mesophilous forests of South Transdanubia, that are related to the forests of the Balkan Peninsula. Typical of these are silver lime in the canopy, along with Butcher's Broom and other evergreens in the herb layer. In West Transdanubia a pine-oak woodland belt and even patches of fir-spruce forest reflect the Alpine influence. The composition of the forest steppe vegetation shows connection to the Ukrainian forest steppe belt in the north-east, while elsewhere, in particular on the Danube-Tisza Interfluve it resembles that of the Pontian steppe belt. The alkali *pusztas* share similarities with the plant associations of the Pontian semi-deserts.