

Peat transformation as a response on environmental changes under swampy alder forest

András Bidló (1), Tibor József Novák (2), Botond Búró (3), and Adrienn Horváth (1)

(1) University of Sopron, Institute of Environmental and Earth Sciences, Department of Soil Site Survey, Sopron, Hungary (bidlo.andras@uni-sopron.hu, horvath.adrienn@uni-sopron.hu), (2) University of Debrecen, Institute of Earth Sciences, Department for Landscape Protection and Environmental Geography, Debrecen, Hungary (novak.tibor@science.unideb.hu), (3) Isotope Climatology and Environmental Research Centre, Institute for Nuclear Research, Hungarian Academy of Sciences, Debrecen, Hungary (buro.botond@atomki.mta.hu)

The study area is a protected alder swamp forest located in direct vicinity of Lake Fertő, in Hungary. In the last millennia thick peat layers developed in the flood-feed swampy area, anyway peat and sediment accumulation changed several times its dynamic depending on environmental changes. This study aimed to investigate how this changes (drainage, water management and climate change) affected the soils of this swamp forest.

The drainage of the area began already in the Roman age, but no significant changes have been made until the middle of the 20th century, when significant drainage works resumed with the intent to gain agricultural land. Tree cover was up to the 1960-ies fairly low in the area, but on several places alder- and willow bogs and oak woods were also preserved. The climatic conditions (annual mean temperature 10.2 °C, the average sum of precipitation 572 mm, for the growing season 15.9 °C and 390 mm) compared to the periods of 1971-200 and 1981-2010 changed slightly. The mean temperatures of the growing season get higher with 0.6 °C. The soil surveys from 1960-ies were repeated in 2017. Soil profiles were described in detail, pH, OC content, particle size distribution were measured. ¹⁴C dating were done on the graphitized peat samples using a compact radiocarbon AMS system (EnvironMICADAS). Calibrated ages are reported as age ranges at the 2 sigma confidence level (95.4%).

The studied soil profile were classified as Utric – Rheic - Mursic - Hemic Histosol (WRB 2014 (2015 update) expressing the higher decomposition grade of the upper part of peat layer). In topsoil layer slightly acidic pH (pHH₂O 5.7-6.5) were measured with 40 % organic matter content in average. With sinking groundwater level and reduced duration of water saturation peat layers started to shrink. Due to decomposition they turned into mursh in many parts of the soil profile. Peat layers were several meters thick until the 1960ies, but in the last decades peat layers not exceeded the thickness of 50-80 cm. As a visible effect of the shrinkage the root system and trunks of old alder trees indicate the original surface, since the peat surface among them subsided with several decimeters below that.

Summarized, transformation of peat layers due drainage, climatic effects and sedimentation conditions can affect the wood production in few decades. The forest's response to changed habitat conditions is questionable. Besides, an explicit change in climatic conditions can be also expected accelerating the above mentioned alteration of peat in the near future.

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