Geophysical Research Abstracts
Vol. 14, EGU2012-7450, 2012
EGU General Assembly 2012

Biohydrology – it has its uses

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The term biohydrology has existed for years but resurged during the 2005 EGU General Assembly. Various sessions covered topics relevant to biological and hydrological interactions, so the convenors and participants (Dekker, Doerr, Hallett, Lichner, Ritsema and Sir) proposed to draw together the scientists by developing a unified conference. Biohydrology was viewed as a simple, descriptive and catchy title. These efforts resulted in the conferences Biohydrology 2006 in Prague and Biohydrology 2009 in Bratislava. Biologists and soil-water scientists were united under one banner, rather than being stuck like sticks in unsaturated (vadose zone), saturated (hydrogeology) or large-scale (hydrology) mud. Yes, much of the work could be badged under a number of other discipline names, as was evident from the publication of high quality papers from the conferences in special issues of Biologia (61, 2006, Suppl. 19, and 64, 2009, 3), Ecohydrology (3, 2010, 4), and the Journal of Hydrology and Hydromechanics (58, 2010, 3). Other works presented at the conferences appeared in the Journal of Hydrology, microbiology journals, numerous soil science journals and in specialist journals dealing in turfgrass research and wildfires.

The entire premise of EGU meetings is to bring together a range of geoscience disciplines under one roof so that the boundaries that separate them can be broken. Biohydrology serves to break the boundary between soil-water physics (at whatever scale and level of saturation) and biology. By coining a not so new name, we are not redefining old research, but providing a vehicle to bridge disciplines to gain scientific advances that would not be possible by working alone.

This interdisciplinary approach to the interactions between living organisms and hydrology will be presented on an example of aeolian sand dunes on Borska nizina lowland (Slovakia). They cover about 410 km2 and show all the stages of succession, from biological soil crust to mixed forest. Vegetation retards infiltration by the help of soil water repellency. In hot and dry spells, the soil covered with vegetation had the water drop penetration time up to 10000-times that of pure sand. Sorptivity and hydraulic conductivity in these areas were only 4% and 2% those of pure sand, respectively. Moreover, water applied on all planted and/or crusted surfaces was redistributed to the series of micro-catchments, which acted as runon and runoff zones and flowed As a result, preferential flow was revealed during dye tracer experiments.

The original stages of succession were studied in the laboratory, where coccal and filamentous green algae were grown on sterile pure sand as monoalgal and bialgal crusts. The growth of Klebsormidium subtile crust resulted in an increase in water drop penetration time of the dried crusts up to 14-times that of the pure sand and a decrease in the water sorptivity and hydraulic conductivity up to 10% and 9% those of the pure sand, respectively. A greater impact of K. subtile on the shifts in hydraulic behaviour can result in better prevention of its pools of nutrients from leaching, and thus, in easier vegetation establishment and development on the crust.