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Biebrza ecohydrological research experiences: embracing the science of place

Harte (2002) published a provoking paper on the need for integration of Newtonian and Darwinian scientific approaches. A synthesis is required for a sustainable future of our planet and hence should lie at the basis of ecohydrological research. One of the ingredients he suggested for the seemingly conflicting scientific traditions, meeting in ecohydrology, is to 'embrace the science of place'. Place-centered studies provide the best means we have for going beyond pattern to process and for identifying the actual mechanisms at work. The knowledge of those mechanisms then provides the basis for formulating reliable generalizations at larger scales (Harte, 2002). The Biebrza River (NE-Poland), sometimes called the European Amazon, is an almost natural lowland river of intermediate size with a mean annual discharge of about 30 m³/s. In 1921 and 1925 two strict nature reserves were established in the valley wetlands, originally to protect elk population and mires. In 1993 these became part of the Biebrza National Park, covering more than 59,000 ha, protecting the wetlands in the upper, middle and lower Biebrza valley basins. In Biebrza ecohydrological patterns are easy to observe and the underlying processes are easy to understand since relationships are not blurred by human

domination. The area is quite undisturbed and human interference is still low. This makes Biebrza for Europe a unique reference area for lowland valley mires and river floodplains. Polish, Dutch and Belgian scientist cooperate since many years in unravelling the ecohydrological relationships of this wetland. Regular field campaigns have determined ecological, surface and groundwater conditions and given insight in: plant-water relationships; effects of nutrient availability on floristic diversity; river ecosystem functioning; groundwater discharge to wetlands supporting habitat connectivity within natural fens; spatial and temporal heterogeneity of groundwater-surface water exchange processes; bush encroachment; and effects of changing land management. Analysis are supported by a suite of rainfall-runoff, hydraulic and groundwater models.

It is shown that due to international and interdisciplinary ongoing research Biebrza is a showcase for the analysis of spatial patterns of plant communities and occurrence of plant species, hydrological features such as groundwater discharge, river flooding and concomitant chemical water types and nutrient availabilities. Embracing Biebrza research is of great value for three reasons: gain fundamental knowledge on the functioning of these types of ecosystems; realize effective preservation strategies for the Biebrza wetlands; and design restoration measures for deteriorated ecosystems elsewhere.