Geophysical Research Abstracts
Vol. 15, EGU2013-7264, 2013
EGU General Assembly 2013

Salix response to different flow regimes in controlled experiments: first results

Lorenzo Gorla (1), Constant Signarbieux (2), Alexandre Buttler (2), and Paolo Perona (1)

(1) AHEAD, Institute of Environmental Engineering, EPFL, Lausanne, Switzerland (lorenzo.gorla@epfl.ch), (2) ECOS, Institute of Environmental Engineering, EPFL, Lausanne, Switzerland

Dams and water management for hydropower production, agriculture and other human activities alter the natural flow regime of rivers. The new river hydrograph components depend on the type of impoundment and the policy of regulation but such a different flow regime will likely affect the riparian environment. The main challenge in order to define sustainable flow releases is to quantify hydrological effects in terms of geomorphology and ecosystem response. A considerable lack of knowledge still affects the link hydrology-ecology and inadequate flow rules (e.g., minimal or residual flows) are consequently still widespread: further research in this direction is urgently required.
We present an experiment, which aims to investigate the effects of different water stage regimes on riparian vegetation (salix Viminalis cuttings) development in a temperate region (Switzerland). This work describes the installation setup, together with the first results concerning the first of the two scheduled seasons of campaign.

Sixty Salix cuttings were planted in non-cohesive sandy-gravel sediment within 1 meter tall plastic pots installed outside in the EPFL campus. After grouping them in three batteries, the water level within them has been varying following three river regimes simulated by adjusting the water level within the pots by means of an automatic hydraulic system. The three water level regimes reproduce a natural flow regime, a minimum residual flow policy, which only conserves peaks during flooding conditions, and an artificial regime conserving only low frequencies (e.g., seasonality) of the natural dynamic. The natural flow regime of the first battery has been applied for two months to the entire system; the three regimes above said started in June 2012. This triggered a plant response transitory regime, which we monitored by measuring plant growth, soil and atmospheric variables. Particularly, measures concern with branches development leaves photosynthesis and fluorescence, together with pictures of each plant. Sap flow was measured for thirty cuttings using a time resolution of thirty minutes, whereas psychrometers measuring the water potential were sampling data every fifteen minutes. Soil moisture and meteo data have also been collected as essential drivers of plant response: these data as well as sap flow measurements can be later compared to a similar field installation along Thur River (Switzerland). After the first season of measurement, in 2012, part of the cuttings have been carefully removed and further analyzed as far as the below ground biomass is concerned.

Strong differences in terms of stress and growth performances were observed in correspondence of the transitional phase, following the alterations of the natural flow regime. A later adjustment in the roots distribution allowed survivors to re-sprout and to withstand new conditions.