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Determination of the Annual Shading Potential of Salix Purpurea Coppice using Hemispherical Photographs

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The European Water Framework Directive (WFD) aims to achieve a good ecological potential and good surface water chemical status for all surface waters. Widely constant shading with riparian vegetation is the potential natural plant cover condition and plays a key role by the implementation of the WFD. The shading effect of vegetation is considered to be particularly relevant for small and medium sized rivers with slow flow velocity.

Soil Bioengineering measures effect technical (e.g. soil protection), ecological and socio-economical issues on river systems. Positive ecological effects are based on the development of the used plants and result among others in shading of the water body. Natural bank vegetation provides very important niches for terrestrial and aquatic stages and reduces the incident solar radiation up to 95%. Consequently large riparian wooded areas form a microclimate that leads to a decrease of water temperature or prevent an increase. They even reduce evaporation and increase the relative air humidity which contributes to reducing water temperature and enlarges the oxygen uptake capacity. Accordingly the daily variations of temperature and those of oxygen content are definitely lower in vegetated areas. This issue is especially important considering climate change scenarios with increasing water temperatures. From an ecological point of view it is essential to quantify the processes.

There are different ways to characterize densities of vegetation. Most of them - such as the method by Braun-Blanquet and Londo - rely on estimations of the dominance of species. Applying this kind of procedures on riparian vegetation result in uncertainties due to the strong variations in height and densities. Hemispherical photographs are a standardized method in forest ecology under more or less uniform forest stand conditions. However it is now hardly used for riparian vegetation stands.

Questions that will be addressed are the determination of annual stand densities in terms of Leaf Area Index (LAI) and the corresponding incident solar radiation energy reaching a shaded water surface (Global Site Factor). Responding to these questions a two year old natural stand of Salix purpurea was monitored. The growth of riparian vegetation and the correlation to solar transmission during different phenological phases are measured periodically with radiation sensors. LAI is investigated using hemispherical photographs. Analysis is done with the software Hemiview and Gap Light Analyser (GLA).

Results show discrepancies between analysis with the software programs and measurements. Altogether, the variability and the trends of both are similar: the same daily and annual changes can be seen.