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field measurements of vegetation impacts on flow in a reclamation channel

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Hydraulic experiments have been set up in two reclamation channels to assess the vegetation effects on flow at the field scale. Four mobile pumps have been operated to control the flow rates in two channel stretches under different scenarios of vegetation management: 1) full vegetation cover; 2) vegetation only on channel embankments; 3) vegetation totally removed from the channel. Vegetation was mainly composed by common reed (Phragmites australis) and its properties were characterized by measuring the stem density, diameters, horizontal and vertical distribution of stems and leaves along each cross section. The full vegetation scenario corresponded to the maximum development stage of the vegetation in early autumn, when the field experiments were conducted. The vegetation development was monitored across the antecedent summer crossing ground measurement and UAV flights with NIR and RGB cameras. Leaf Area Index was determined along each section by means of a Li-Cor 2000 device and compared with UAV surveys. The other two vegetation scenarios were obtained by mowing the reeds by means of machinery commonly employed in the study area, to reproduce the traditional management practices. Hydraulic profiles were monitored by rods located at four cross sections. Velocity distribution and turbulences were measured by means of a current meter and an acoustic doppler velocimetry along five verticals of a cross section. The presence of a dense, mature reed canopy affected both flow velocity distribution and channel conveyance. The opening of a central channel, with the release of lateral buffers of vegetation, resulted in an increase of flow velocity in the open portion of the channel. Cleared channel resulted in the highest discharge capacity and most regular distribution of flow velocity profiles. These results are examined in order to identify good practices of in-channel vegetation management, that can meet the objectives of the Water Framework Directive.