The Geomorphic Effects of Native and Invasive Riparian Vegetation: Sprague River, Oregon

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Numerous studies have addressed the role of stream geomorphology on vegetation distribution. These studies have shown that channel morphology, including depositional and erosional processes, influence vegetation colonization. However, few studies have addressed the impact of vegetation on the geomorphic processes of streams. Vegetation has the ability to stabilize channel banks and alter stream hydrology and stream power. Little research has addressed the impact of invasive vegetation and its ability to change river channel processes. My research addresses the impact of the highly invasive Phalaris arundinacea and quantifies its influence on the stream channel form of the Sprague River, Oregon. I conducted field research that included root density and root strength surveys to determine the below ground influences of vegetation in terms of added bank cohesion provided by the invasive and two similar native species: Eleocharis palustris and Carex vesicaria. To ascertain differences between the species above ground characteristics and influences, I measured stem density and elasticity to calculate their roughness (Manning's n) and determine their potential impact on stream velocity. Finally, I used these vegetation characteristics to model stream velocity, water depth, and bed shear stress within the 2-D model MD-SWMS. Differences in root size were significant with C. vesicaria having the largest root diameters, largest root area ratio, and largest bank cohesion provided by roots. This was followed by the invasive and then E. palustris. E. palustris had the highest stem density, followed by C. vesicaria and P. arundinacea. The invasive had the highest stem stiffness. E. palustris was associated with the highest roughness value, closely followed by the invasive and C. vesicaria. Using modeling I found the presence of the invasive increased velocity compared to E. palustris and increased bed shear stress compared to C. vesicaria. Therefore, changes in species composition, such as a shift from either of the natives to the invasive, could affect channel morphology over time. By comparing the impact of this invasive to that of native grasses and sedges, this research provides insight into how further spread of the invasive may affect the Sprague River and other riparian ecotones.