The Importance of Plant Traits on River Processes and How to Incorporate them into Revegetation Strategies

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The strength of interactions between plants and river processes is dependent on plant traits such as stem density, plant frontal area, and stem bending properties. A combination of flow regulation, river management, and exotic species invasion have altered the distribution of vegetation in many waterways, with subsequent shifts in the distribution of plant traits. For example, in most U.S. Southwest waterways, *Tamarix* has invaded, displacing native pioneer vegetation such as *Populus*. Our team investigated whether plant-trait differences between *Tamarix* and *Populus* differentially affect hydraulics, sediment transport, and river morphology with a combination of flume, field, and remote sensing approaches spanning the individual seedling to river-corridor scales. We found that *Tamarix* requires more force to bend compared to *Populus,* has greater stem densities and a different crown morphology, resulting in a greater influence on near-bed flow velocities, and subsequently sediment transport (greater aggradation rates). In the Bill Williams (Arizona) watershed, at the patch and corridor scales, remote sensing observations confirmed greater aggradation for denser vegetation patches. Furthermore, long-term channel adjustments were faster for *Tamarix* versus *Populus* dominated reaches. More broadly, because the plant traits that influence hydraulics and sediment transport are correlated to plant functional traits (e.g., specific leaf area and stem-tissue density), they should be explicitly considered in riparian management and restoration efforts. Restoration designs should use a collaborative approach that includes the views of fluvial geomorphologists and riparian ecologists such that plants are distributed in a manner with desirable outcomes.