

**Geomorphology, Hydrology and Biology of Floodplain Vegetation in the Sprague Basin,
OR: History and Potential for Natural Recovery**

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Restoration of riparian ecosystems in semi-arid riparian ecosystems requires an understanding of geomorphic, hydrologic and biologic factors and how they relate to vegetation. Such an understanding allows prioritization of restoration projects and avoidance of activities that are either unnecessary or likely to fail. In this dissertation I examined a suite of factors controlling distribution of vegetation types in the Sprague Basin, OR, and used those factors to predict potential for natural recovery. Factors ranged from basin-wide (e.g. floodplain width and slope) to local (e.g. topography, hydrology and soil texture). Results of historical analysis and photographic mapping showed that basin-wide vegetation types have remained generally stable since the early 1940s and that wide floodplains have been without woody vegetation since the late 1800s. The most prevalent changes in floodplain vegetation due to land use included reduction of shrub cover in moderately wide floodplains and associated increases in herbaceous vegetation. Soil moisture conditions were studied using piezometers and nested clusters of soil moisture tension meters. The interrelations among soil texture, elevation and distance from the channel, and vegetation (herbaceous and woody) characteristics in the riparian zone were examined along 75 transects using a generalized additive model for non linear factors and Hurdle analysis for abundance data. On the Sprague mainstem, fine soils with high recession rates supported abundant shrubs, while on the Sycan (Sprague tributary) coarse soils with readily available moisture and greater subsurface water movements supported abundant shrubs. Habitats in the Sycan were well colonized with new shrub seedlings though long term persistence was unlikely. Results show that riparian shrubs are unlikely to influence stream shade or bank stability on the mainstem Sprague whether they germinate naturally or are planted through restoration efforts, as shrubs near the channel are unlikely to persist long term. In the Sycan, germination and persistence are more likely than on the Sprague, though risks of predation, trampling from grazers, and fluvial action will be constant threats to near-channel shrubs. Results emphasize the need to understand factors controlling vegetation prior to restoration in any basin or stream segment.