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POPULATION-LEVEL GENETICS INFLUENCES *POPULUS FREMONTII* SUCCESS MORE THAN ANTECEDANT CLIMATE REGIME AT RIO MESA RESEARCH GARDEN

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Riparian zones play a crucial role in both human and environmental well-being (González, et al., 2015). They maintain biological diversity by providing habitat for various endangered and threatened species and numerous other flora and fauna, facilitate groundwater recharge, filter runoff to lessen pollution, prevent catastrophic floods by absorbing water, and maintain streambanks (NRCS, 1996; Bernhardt, et al., 2005; Meyer, et al, 2007). Upon recognizing the abundant benefits of riparian ecosystems, there have been several state and federal agencies expanding their time, money, and resources to restore riparian plant communities (Bernhardt, et al., 2005; Follstad Shah, et al., 2007). Unfortunately, these efforts are often foiled by the rapidly changing environment and the long-term legacy effects associated with past land use (Foster, et al., 2003; González, et al., 2015;). This project studied the role these past legacies have on native *Populus fremontii* (Fremont cottonwood) by utilizing a research garden, established in 2014, at the Bonderman Field Station at Rio Mesa (BFSRM) with the goal of informing restoration and conservation practices.

The data collection efforts focused on plots within the BFRSM garden associated with six source location sites, two at high elevation, two at low elevation, and two at an intermediate elevation (Fig. 1). The BFSRM has a long history of human use including habitation, ranching, and farming. The research garden is also situated in a location with a history of agriculture, while other areas of the BSFRM have not been tilled or grazed. Thus, we could assess responses based on the following factors: genotypic variation within species, source location, climate history (elevation gradient), and soil history (agriculture vs. no agriculture). Currently, only a few studies have explored plant-soil feedbacks in relation to plant genetic diversity. Therefore, this project will add to this limited, but growing field.

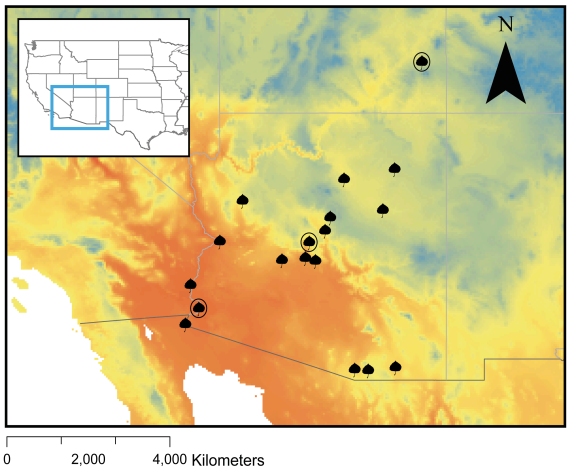

Figure 1. Provenance (collection sites) of *P. fremontii*

The results suggest that antecedent climate history may not persist as a legacy effect because neither survivorship nor tree growth varied by elevation of provenance sites (Fig. 2). However, there were differences in survivorship and growth amongst specific provenance sites, indicating that

site-specific legacies or intraspecific genetic variation may still play a role in Fremont cottonwood success (Fig. 2).

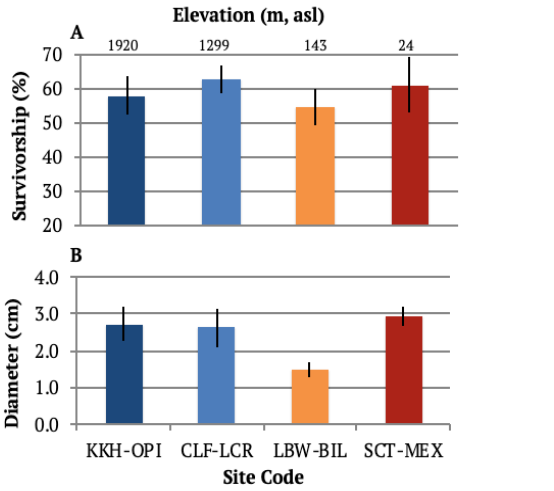

Figure 2. Survivorship (A) and growth (B) of *P. fremontii*

The differences in soil texture between non-vegetated areas of the research garden and non-cultivated soils at the BFSRM confirm that the legacy of agriculture is still apparent. Furthermore, the soils beneath the study trees within the research garden have less sand and somewhat higher organic matter content than soils from non-vegetated areas of the garden. This indicates that the trees are altering soil texture through organic matter amendments. However, soil chemical and physical characteristics studied to date do not appear to vary with respect to specific provenance sites.

Sample processing, laboratory analyses, and data analyses are ongoing. Sample processing and laboratory analyses take place in the Stable Isotope Ratios for Environmental Research (SIRFER) facility at the University of Utah and the Records of Environmental Disturbance (RED) lab at the University of Utah. Data analysis occurs in the offices of the Environmental & Sustainability Studies Program at the University of Utah. Moving into the future this project is specifically interested in the analyses of soil microbial community diversity and leaf litter decomposition to determine if provenance site legacies influence soil community structure and ecosystem function.

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