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Phragmites Management in Watersheds with Differing Land Uses

Phragmites australis is one of the most invasive plants in North America, and management of *Phragmites*-invaded ecosystems represents significant expenditures in time, dollars, and personnel. After over 40 years of management, there are still too many unknowns in terms of how best to restore native vegetative communities. We reviewed the literature on *Phragmites* management field studies in the United States. We found A) bias in the literature toward herbicide use (66%) and B) only a few studies (12%) recorded community recovery (species composition, diversity), and none analyzed community associations. The majority of studies (51%) presented either the recovery of functional vegetation, or animal use (27%). Furthermore, most studies were short in duration (71% shorter than 4 years). The narrow focus of existing studies has resulted in a gap in the literature regarding how to restore invasion-resistant plant communities. More research is needed to determine A) how to best limit the spread and reinvasion from *Phragmites* propagules (timing management with phenology, and decreasing nutrients) and B) how to best facilitate the establishment of native plants. In addition to our quantitative review, we present findings on the role of watershed-scale land use on *Phragmites* vigor, reproduction, clonal diversity, and impact on native plant communities. We discuss the review in the context of recent findings on the role of land use in *Phragmites* invasion. Given evidence that anthropogenic disturbance and nutrient enrichment increase *Phragmites*' success, future management efforts should focus on decreasing these factors at the watershed scale, or concentrating management in watersheds that are likely to recover from *Phragmites* invasion.