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Patuxent Wildlife Research Center

Directing Succession Through Adaptive Management in National Wildlife Refuges: Reed Canary Grass Control and Transition to Wetland Forests and Meadows

- ***The Challenge:*** Reed canary grass (RCG; *Phalaris arundinacea*), an invasive species, has increased in abundance in North America over the last several decades, coincident with human-caused increases in soil nitrogen levels, alteration of hydrological systems, and intentional cultivation for forage and soil stabilization. Spread of RCG has been especially notable in forests and wet meadows subject to routine flooding in states of the northcentral U.S. Floods deposit sediments that kill native vegetation and broadcast RCG seed from upstream sources. Therefore, RCG-dominated lands, which include many units of the National Wildlife Refuge System, are often in a state of arrested succession, with limited capacity for forest or meadow regeneration. Refuge managers need guidance for the control of RCG and for the recovery of impacted ecosystems after its removal.
- ***The Science:*** Collaborating scientists from University of Florida, Lincoln Park Zoo, and Patuxent Wildlife Research Center are developing an adaptive management framework for controlling RCG and restoring native plant species on National Wildlife Refuge System lands in U.S. Fish and Wildlife Service Regions 3 and 6. The framework makes use of predictive models that project changes in vegetation composition as a consequence of current invasion level of RCG, site-specific characteristics such as soil nitrogen and flooding frequency, and a management action. The models represent different hypotheses about relative effectiveness of treatments under different site conditions and about abilities of native communities to reestablish. Available management actions include application of alternative types of herbicide, seeding of native species, and no action. Data for the models were collected from a multi-refuge experiment involving replicated blocks of treated and untreated management units. The models provide guidance on appropriate treatments to apply in the face of uncertainty about resource response. A repeated cycle of decision making, monitoring, and assessment provides continuous feedback about model performance, results of management actions in turn helping to provide better guidance for future decisions.
- ***The Future:*** The experimental phase is ongoing, but results so far have demonstrated that herbicide effectiveness is dependent on soil nitrogen level, that reliance on natural seeding to reestablish forest sites is limited, and that the RCG seed bank on study refuges is far higher than anticipated. Provisional models of how vegetation changes in time have been developed from data provided by the experiment. The framework of a spatially-explicit decision tool has been developed on a GIS platform. The decision tool will overlay the current vegetation conditions of a site on its physiographic features, and these layers will be linked to a state-specific optimal decision policy. Managers will have the ability to map their management units, input current resource conditions, and query the policy for an optimal, site-specific recommended action. Following the action and site monitoring, the predictive capabilities of the models are reassessed, and the updated information is rolled back into the decision tool, ready for the next management cycle. The decision tool will be completed and handed over to the USFWS in FY2011.

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