Operational-scale Demonstration of Propagation Protocols and Comparative Demographic Monitoring for Reintroducing Five Southeastern Endangered and At-Risk Plants

NCBG is currently part of a collaborative research project with the US Army Corps of Engineers, and the Department of Defense. The overall objective of this project is to conduct an operational-scale demonstration of recently developed propagation protocols for reintroducing one endangered and four at-risk plant species that occur across multiple military installations in the Southeast. Our specific objectives are to (1) demonstrate that four populations per target species can be successfully reintroduced, (2) identify plant size classes most important in determining positive population growth rates using life table response experiments (LTRE), (3) optimize costs for establishment of self-sustaining populations using data collected from natural a populations, and (4) secure user acceptance.

Sandhills lily *(Lilium pyrophilum*)

Description: Army direct-funded research has made propagation and reintroduction protocols available for *Amorpha georgiana* (Georgia leadplant), *Astragalus michauxii* (Sandhills milkvetch), *Lilium pyrophilum* (Sandhills lily)*, Lysimachia asperulifolia* (rough leaf loostrife), and *Pyxidanthera brevifolia* (Sandhills pixiemoss). These protocols will be demonstrated at production and operational scales, respectively (e.g., multi-population, reintroduction). Demonstration of the propagation and reintroduction protocols will be deemed successful if it is possible to cost-effectively establish self-sustaining, viable populations of the five target species. We will establish four new populations for each of the five target species and demographically monitor natural and reintroduced populations for four years (2013-2016. Demographic modeling methods will allow us to decompose population growth rates into their constituent parts, such as the contribution from survivorship or growth of small individuals. The vital rates (e.g., growth, survival, and reproduction of

Georgia leadplant *(Amorpha georgiana*) seedlings

different size classes) and the population growth rates of the natural and reintroduced populations will be compared using generalized linear models, LTRE, and demographic matrix modeling in order to optimize population reintroduction in terms of population viability and cost for the five target species.

Expected Benefits: Demonstration of reintroduction for these five species is needed to effectively make this new management capability available to military installations and their non-military conservation partners. Expected benefits include: reduced restrictions on training land use, potential recovery of listed species, improved reintroduction success, lower reintroduction costs, expanded conservation strategies, new opportunities to share conservation responsibility with partner agencies and organizations, and reduced likelihood that at-risk species are federally listed. By combining reintroduction technologies with demographic modeling methods, we will be able to establish and evaluate meaningful performance objectives. This demonstration will provide the data and analyses needed to gain the acceptance of regulators, DoD installations, and non-DoD rare plant managers, because it allows the cost and efficacy of the methods to be evaluated and a formal assessment of the viability of reintroduced populations.

Project Funding: This demonstration and validation project is funded by DoD's Environmental Security and Technology Certification Program (ESTCP).

Planting rough-leaved loosestrife *(Lysimachia asperulifolia)* rhizomes

Sandhills milkvetch (*Astragalus michauxii*)

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Project Team (*Contact for additional information):

Janet B. Gray	US Army Garrison Fort Bragg
Matthew G. Hohmann*	US Army Engineer Research and Development Center (Matthew.G.Hohmann@erdc.usace.army.mil)
Michael Kunz*	North Carolina Botanical Garden (mkunz@unc.edu)
Dr. Johnny L. Randall*	North Carolina Botanical Garden (jrandall@unc.edu)
Dale Suiter	US Fish and Wildlife Service, Raleigh Ecological Services Field Office
Dr. Wade A. Wall	US Army Engineer Research and Development Center

Rough-leaved loosestrife *(Lysimachia asperulifolia*)