GLOBAL RE-INTRODUCTION PERSPECTIVES

Re-introduction case-studies from around the globe

Edited by

Pritpal S. Soorae

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Cover photo: Clockwise starting from top-left:

- Formosan salmon stream, Taiwan
- Students in Madagascar with tree seedlings
- Virgin Islands boa

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Contact Details: Pritpal S. Soorae, Editor & RSG Program Officer
E-mail: ***psoorae@ead.ae***

Recovery of smooth coneflower in the Chattahoochee National Forest, Georgia, USA

Heather Alley[1], James M. Affolter[2] & Jennifer F. Ceska[3]

[1] - Research Coordinator, [2] - Director of Research & [3] - Conservation Coordinator
Plant Conservation Program, State Botanical Garden of Georgia,
2450 S. Milledge Ave. Athens, Georgia, USA (alley@uga.edu)

Introduction

Smooth coneflower (***Echinacea laevigata***, Boyton & Beadle) Blake, was listed as federally endangered in 1995. It is rare throughout its range, listed as endangered in Georgia, North Carolina and Virginia, and of special concern in South Carolina. It is considered extirpated in Pennsylvania. In Georgia, it is found only in two counties, Habersham and Stephens where there are 25 occurrences, comprising four geographically distinct populations. Smooth coneflowers are found in shallow, rocky soils high in calcium and magnesium. Populations occur in open woodlands or human-maintained roadsides on United States Forest Service land and utility rights-of-way. Historically, they were found in prairie habitats and post oak-blackjack oak-pine savannas that were maintained by fire. The objective for downlisting the species to threatened status is 12 geographically distinct, self-sustaining populations that are stable or increasing in number for 10 years or more (US Fish and Wildlife Service, 1995).

Freshly planted smooth coneflower © Jennifer Ceska

Goals & Indicators

- Goal 1: Broad-scale restoration of the post oak-blackjack oak-pine savannah plant community by prescribed burning and manual thinning for landscape and biodiversity.
- Indicator 1: An average of no more that 3.7 to 5.6 m^2 of basal woody stem area per 0.4046 ha consisting of an post oak (***Quercus stellata***), blackjack oak (***Quercus marilandica***) and shortleaf pine (***Pinus echinata***) mosaic with mixture of forbs and grasses dominating the understory. A reduction in ***Acer rubrum***, ***Cornus florida***, ***Oxydendrum arboreum*** and ***Nyssa sylvatica*** resulting in a sparse mid-story (pers. com. Jimmy Rickard, US Fish and Wildlife Service).

- Goal 2: Sustain and enhance individual smooth coneflower populations by maintaining the required open habitat by prescribed burning and manual removal of woody

competition.

- Indicator 2: Steady or increasing population size, increased flowering, and seedling recruitment following burns and manual clearing.

- Goal 3: Translocation, re-introduction, and augmentation of populations of smooth coneflowers within the managed area of their natural range for species recovery.
- Indicator 3: Germination, plant survival, reproduction, and recruitment of smooth coneflowers following translocation.

- Goal 4: Translocation of rare associates (***Clematis ochroleuca***, ***Lysimachia fraseri***, ***Oligoneuron album*** , and ***Symphyotrichum georgiana***) to smooth coneflower recovery sites for community level restoration.
- Indicator 4: Survival, reproduction, and recruitment of ***Clematis ochroleuca***, ***Lysimachia fraseri***, ***Oligoneuron album*** , and ***Symphyotrichum georgiana*** following translocation.

Lisa Kruse preparing ground for smooth coneflower seeds

Project Summary

Feasibility: Habitat destruction and alteration are the primary causes of decline. It is thought that smooth coneflower requires disturbance and that suppression of fire is a cause for its decline (Gaddy, 1991). The majority of known populations occur on roadsides and utility rights-of-way where they are vulnerable to human impact. The few undisturbed populations are declining in number and size as succession shades out the understory (Gaddy,1991). Protection, monitoring and management are vital to the preservation of the remaining smooth coneflower populations. The recovery plan calls for wild-re-introduction and safeguarding throughout the range of the species (US Fish and Wildlife Service, 1995). Echinacea is an exclusively North American genus, which ranges from the midwest to the eastern United States. ***Echinacea tennesseensis***, a central Tennessee cedar glade endemic, is also endangered. Interest in ***Echinacea*** stems from its long history as a medicinal herb and, more recently, from its popularity as a garden ornamental. All species of ***Echinacea*** are at risk of wild collection.

Smooth coneflower is a rhizomatous perennial, which flowers in May through July; its primary mode of reproduction is sexual, by outcrossing (Leuszler ***et al.***, 1996). Reproductive success appears inadequate for maintaining population size in the wild (Gaddy, 1991). Bare soil, rich in magnesium and/or calcium, is thought to be a requirement for germination and growth in the wild (Gaddy, 1991); however, germination ***in situ*** is high (80 - 90%). Healthy, reproductive plants may

Close up of smooth coneflower

be easily grown in standard potting mix. The majority of seedlings appear to be clustered in the vicinity of adult plants. Seed dispersal by animals is likely, but has not been documented (Gaddy, 1991).

Populations of smooth coneflower sampled from North Carolina, South Carolina and Virginia were found to have moderate levels of genetic diversity, comparable to that of the widespread congener ***E. angustifolia*** DC. Significant population structure was documented, with each population containing about 90% of the total genetic variation. This partitioning of genetic variation has implications for the collection of material for conservation efforts as populations may be locally adapted (Apsit & Dixon, 2001). Recovery efforts in Georgia are headed by a multi-agency committee comprising members of the Georgia Plant Conservation Alliance (GPCA). Smooth coneflower recovery has been a priority of GPCA since its inception in 1995. Collaborators for the project include The US Fish and Wildlife Service (USFWS), USDA Forest Service, Georgia Department of Natural Resources Non-Game Conservation Section, Georgia Forest Watch, The State Botanical Garden of Georgia (SBG), and the University of Georgia. Funding for this project came from several sources. A grant from the Turner Foundation. supported the research of the graduate student who designed and carried out the experimental re-introduction. The Georgia Department of Natural Resources and USFW provide funds for the State Botanical Garden of Georgia (SBG) to collect and propagate plants for habitat restoration. Private donations to the SBG Plant Conservation Program enable SBG staff to recruit and supervise volunteers who participate in the project. Forest Service appropriations support prescribed burning. GPCA member institutions provide generous in-kind support in the form of staff time, transportation, propagation facilities, equipment, and supplies.

Implementation

Sites for translocation of populations were chosen based on a variety of factors including: general proximity to existing populations, suitability of habitat, logistical accessibility, and appropriateness for prescribed burns. Sites were chosen that closely resemble extant habitat in terms of plant community, soil type and composition, slope and aspect. The unique characteristics of smooth coneflower habitat made site selection relatively straight forward. Before translocations were conducted on a wider basis, a preliminary experimental re-introduction was conducted in the course of a Master's thesis. Different methods of transplanting ***Echinacea laevigata*** were tested according to a carefully designed and statistically valid protocol (Alley & Affolter, 2004). The success of the experimental re-introduction (as high as 95% survival over two years) was influential in moving

governmental agencies to support translocation as a tool for larger scale restoration and safeguarding. Landscape level habitat restoration included a spring prescribed fire affecting all of the three translocation sites. The prescribed burn was conducted 18 months prior to planting. Specific translocation sites, each approximately 400 m^2 (20 m x 20 m), received an additional treatment of woody competition removal (shrubs, mid-story and canopy) three months prior to the outplanting. Two additional sites are being prepared for augmentation and translocation in 2008. Subsequent prescribed burns are scheduled on a three-year cycle.

The preliminary experimental re-introduction indicated bare-root planting was a viable means of transplanting seedlings, but the logistics of this method proved difficult. Further, it is not clear to what extent root washing can prevent disease spread. Therefore, plants were quarantined prior to translocation and visually inspected for disease. The plants were grown in isolation from other ***Echinacea*** species, flowers were removed, and carefully weeded to reduce the risk of disease, hybrids, and weeds being introduced to the wild. The translocation sites are geographically isolated from any extant populations. The effectiveness of direct seeding is also being explored as a possible circumvention to such risks from future translocations and augmentations. The first in a series of translocations took place in the late fall of 2007. Over 100 one-year old smooth coneflower plants and 300 seeds were sown at each of the three sites. Four other rare species (***Clematis ochreleuca***, ***Lysimachia fraseri***, ***Oligoneuron album***, and ***Symphyotrichum georgiana***) associated with smooth coneflower habitat are being propagated for outplanting at these safeguarding sites.

Post-release monitoring: The restoration effort is being monitored at both the landscape and individual translocation site levels. At the landscape level, a set of six, long-term, prescribed fire effects/habitat restoration monitoring plots have been established. The plots are 0.1 ha each (50 m x 20 m) and employ the North Carolina Vegetation Survey Pulse Method, based upon a modified Whittaker design. Data collected include species composition (all plants), and woody plant diameters (dbh). Plots are located in both restoration areas and in relatively intact "reference" sites. Data were collected both pre- and post-restoration treatments. Individual translocation site monitoring follows the fate of individual translocated plants (a quantitative measurement) and the relative success of direct sowing (a qualitative assessment). Future reproductive success of the translocated plants and their offspring will be documented.

Major difficulties faced

- Prioritizing species recovery on multi-use public land.
- Effects of drought.
- Coordinating multi-agency effort.
- Staff turnover.

Major lessons learned

- The success of this project is owed to the collaboration of multiple partners

over the span of a decade.

- A project of this scope requires long-term involvement of both personnel and agencies.
- Such projects offer graduate students opportunity to collaborate with conservation professionals in a hands-on way that is mutually beneficial.
- A scientifically designed preliminary study is valuable in defining management strategies.

Success of project

Highly Successful	**Successful**	Partially Successful	Failure
	√		

Reasons for success/failure:

- GPCA Partnership.
- Long-term involvement of both personnel and agencies.
- Careful definition of goals, planning, and defined outcomes.

References

Alley, H. & J. M. Affolter (2004) Experimental comparison of re-introduction methods for endangered ***Echinacea laevigata*** (Boynton and Beadle) Blake. Natural Areas Journal 24: 345 - 350.

Apsit, V. J. & P. M. Dixon (2001) Genetic diversity and population structure in ***Echinacea laevigata*** (Boynton and Beadle) Blake, an endangered plant species. Natural Areas Journal 21: 71 - 77

Gaddy, L. L. (1991) The status of ***Echinacea laevigata*** (Boynton & Beadle) Blake. U.S. Fish and Wildlife Service, Atlanta, Georgia.

Leuszler, H. K., V. J. Tepedino & D. G. Alston (1996) Reproductive biology of purple coneflower in southwestern North Dakota. The Prairie Naturalist 28: 91 - 102.

U. S. Fish and Wildlife Service (1995) Smooth coneflower recovery plan. U.S. Fish and Wildlife Service. Atlanta, Georgia.