

## 2007 Funded Section 6 Plant Proposals - AZ

The following proposals were funded in 2007 (Segment 12). Award amount does not include administration costs.

### 1) **Paradine plains cactus population assessment and fire ecology.**

Principal Investigator(s): **Robert Frye**, private

Award: \$11,105

Objective(s): 1. Establish weather stations within the range of the species to correlate reproduction, establishment and survival with precipitation. 2. Establish new monitoring plots within the burned area where cacti were found to examine the impact of fire on the population in the burned area 3. Conduct surveys in areas previously known to have individuals and to use newly published geological maps to search for new areas where the species may occur.

Final Report Abstract: Permanent plot data was used to estimate the year of extinction of some of the conservation areas of the species. Linear and an exponential decay model were calculated where data were available. The earliest extinction years were predicted for the linear model and ranged from 2007 for the Trail Canyon north area, to 2027 for Trail Canyon south. The exponential models ranged from 2010 in the Rock Canyon area to 2130 for the Trail Canyon south area. These models indicate that in some areas the populations will become extinct within the decade, while other areas may have cacti for the foreseeable future. The utility of these estimates are supported by the extinction of the permanent plots in Rock Canyon, Valley, and Trail Canyon north. Survey data support the conclusion that the population is thinning throughout its range. A few individuals still persist near Seegmiller Point implying that there may be very low densities of cacti still persisting in areas where it was thought to be extinct.

### 2) **Protect an existing population and establish a new population of endangered sentry milkvetch.**

Principal Investigator(s): **Deborah Tuck**, **Grand Canyon Foundation**

Award: \$40,108

Objective(s): The objectives of this project are to: Purchase and use a greenhouse dedicated to the sentry milk-vetch as a resource in ultimately establishing a new population in a natural setting; Protect and enhance the reproduction, recruitment, and survival of the existing population at Maricopa Point using several manipulative techniques; Investigate species ecology and phenology (when plants begin active growth, flower, and set seed, and when seed germinates, etc.), as well as monitor the Maricopa Point population to prevent population decline from drought, herbivory, or disturbance (such as animal trampling) by adaptively managing the population in consultation with USFWS; Apply and evaluate techniques for creating new populations and managing natural populations.

Final Report Abstract: We purchased, assembled and installed a 10' x 20' passive solar greenhouse, the SolarGro Phoenix, at the Grand Canyon National Park nursery. This greenhouse provides good ventilation, low humidity, bright sunlight, herbivore and pest exclusion, and protection from extremes of temperature that will optimize sentry milk-vetch growth, flowering, and seed and plant production. Accessories and supplies in the greenhouse include automatic vents for convection cooling, an air circulation fan, a back-up electrical heater, Benchmaster portable benches, a utility sink, 27 55-gallon drums providing thermal mass. Propagation supplies include containers, potting soil, organic fertilizers, and pest control supplies to support the ex-situ population, plant pollination, and seed and seedling production for recovery plan actions. An SCA Intern was employed between May 2009 and February 2010. In July 2009, we completed the greenhouse population planting of 360 sentry milk-vetch seeds in plug trays. A greenhouse population of 99 individuals has been established at the Grand Canyon native plant nursery. Upon flowering, we will hand pollinate plants and thus begin seed production from the ex-situ population. A total of 597 seeds were collected at Maricopa Point (285), Grandview (8) and Lollipop (304) populations. We monitored seedling survival, pollinators, disturbance, and threats at Maricopa Point, and assessed the current condition of and threats to the Grandview Point and Lollipop Point sentry milk-vetch populations. The ground work to establish a new population in a natural setting has begun. The ex situ plant population is started, and seed production should begin by July 2009. We will use the information we gained from the seeding trials to start more individuals from seed to expand the ex situ population in the spring of 2010, and plan to conduct the first reintroduction trials with progeny from the ex situ population in 2010.

**3) Ecological study and comparison of two rare *Astragalus* species.**

Principal Investigator(s): **Kris Haskins, The Arboretum at Flagstaff**

Award: \$16,004

Objective(s): This project has four major objectives for each of the rare species: 1) investigate new propagation protocols using native soils to acquire native sources of mycorrhizal fungi and rhizobia, 2) test different outplanting techniques with our propagated seedlings. The methods to be tested will include drilling holes in the appropriate substrate to examine direct seeding vs. seedling outplants, substrate examination (type and moisture levels), and use of nurse plants to provide shade and herbivore protection for seedlings, 3) use *Astragalus troglodytus*, a common *Astragalus* species that is closely related to the two rare species, as a surrogate to examine the mycorrhizal status of both rare species, 4) develop an interpretative sign for the public which will be placed in the greenhouse to describe the ongoing research, conservation needs, and ways in which the general public can aid the preservation of both rare *Astragalus* species.

Final Report Abstract: Due to some paperwork issues, this project got a late start which affected the timing of some of our experiments. Furthermore, we ran into problems with growth of *Astragalus troglodytus* and soil acquisition for *A. humillimus*. The *A. troglodytus* seeds germinated but failed to grow in our soil inoculum experiment (Objective 1 & 3e). We are not sure why. Furthermore, we did not have enough fresh soil to conduct the nurse plant experiment for *A. humillimus*, thus Objectives 2b and 2d were not completed. We have been

collecting growth and phenology data for *A. cremnophylax* var. *cremnophylax*, so objective 2e is partially completed. It is our intention to follow up on these missed experiments when the timing is better and fresh soil can be acquired. Data collected from these experiments will be part of a manuscript that will be sent off for publication in a peer-reviewed journal. Furthermore, some of this information will be part of a book chapter being prepared by K. Haskins on the use of soil microbes in plant conservation efforts.

**4) Survey northwestern Arizona for *Astragalus holmgreniorum*, a rare and endangered species.**

Principal Investigator(s): **Ally Bench** and **Wendy Yates**, private

Award: \$16,716

Objective(s): Determine and document the total range of *Astragalus holmgreniorum* within Mohave County, Arizona. This project will allow researchers to know the full habitat range of this species, which will provide information to protect and manage this species.

Final Report Abstract: Surveys of approximately 1,000 acres of BLM lands south of the Utah / Arizona border took place during peak flowering season, April-May, 2008. *Astragalus holmgreniorum* individuals were mapped with handheld GPS and recorded according to age class (seedling, juvenile, non-flowering adult, and flowering adult). A total of 6,249 plants were located, however 6,192 (roughly 99%) were considered seedlings. There were 14 juveniles, 14 non-flowering adults, and 29 flowering adults. Other researchers have reported an 84% mortality rate, accounting for the low number of adults recorded. Flowering adults are very critical to the survival of this species, since they produce the seeds that enter the seedbank.