

2011 Funded Section 6 Plant Proposals – AZ

The following proposals were funded in 2011 (Segment 15). Federal shares include Arizona Department of Agriculture administration costs.

1. Surveys of Fish Creek Fleabane (*Erigeron piscaticus*)

Principal Investigator(s): **Dr. Jim Malusa**, private

Federal Share: \$4,328

Objective(s): The project will review all known collections and survey for Fish Creek fleabane (*Erigeron piscaticus*) in historic sites including a never-relocated site in the Catalina Mountains. Products will include the creation of a key to field identification, a summary of herbarium specimens, survey maps, and census data.

Final Report Abstract: This study sought to extend the range and population of *E. piscaticus*, by surveying historical collection sites in the Santa Catalina and Superstition Mountains. The Superstition Mountain locales, in Fish Creek Canyon, have not been searched since 1990 (Gori and Malusa, 1991). The Catalina Mountains have not, to my knowledge, ever been surveyed for *E. piscaticus*. In addition, I visited herbaria at the California Academy of Science (San Francisco), the University of Arizona (Tucson), and the Desert Botanical Garden (Phoenix). The goal was to verify the taxonomic foundation of the species. This study found no populations outside of Oak Grove Canyon in the Galiuros. A 2011 census of Oak Grove found 21 plants. Examination of curated specimens supports the notion of *Erigeron piscaticus* as a distinct species.

2. Surveys of *Amoreuxia gonzalezii* in Sonora

Principal Investigator(s): **Dr. Thomas R. Van Devender**, Sky Island Alliance

Federal Share: \$19,700

Objective(s): The objective of the proposal is to conduct surveys for Santa Rita yellowshow (*Amoreuxia gonzalezii*) to assess the distribution, abundance, habitat, and threats in populations in Sonora.

Final Report Abstract: *Amoreuxia palmatifida* is much more common than *A. gonzalezii* in general, especially in Sonoran desertscrub in central Sonora and desert grassland in northern Sonora. Nowhere in Sonora is *A. gonzalezii* known to be abundant. As a result of these surveys, two new areas were added to the known distribution in Sonora, Mexico; however *A. gonzalezii* was only verified present at 5 of 14 known areas in the state.

3. Status report for *Hexalectris colemanii*

Principal Investigator(s): **Dr. Marc Baker**, private

Federal Share: \$20,878

Objective(s): The objective of the proposal is to conduct a herbarium and literature review plus field surveys of crested coralroot (*Hexalectris colemanii*) to ascertain geographic distribution, abundance, and threats to populations in southern Arizona and Sonora.

Final Report Abstract: For this report, a collection of previous reports, journal articles, herbarium data, and personal communications were acquired and reviewed. In addition, 22 days of fieldwork were conducted performing surveys for undocumented populations of the species. GIS layers for habitat criteria from known occupied sites, including elevation, slope inclination and exposure, accessibility, and soil type were used to assess known populations and determine potential survey areas. Of the 22 sites attempted, individuals of *H. colemanii* were recorded at only three, all of which were in close proximity within the Peloncillo Mountains. One of these sites, however, included a single individual from New Mexico, which provided the state with a new orchid. Westland Resources, Inc, who have been studying the species since 2010, performed 2012 surveys concurrently with ours and discovered several new sites. There are now 12 generally locations for the species, five of which were discovered by crews from Westland. Although populations occur over a substantial geographic area, a large percentage of the total number of *H. colemanii* individuals occur within areas that may soon be impacted by mining.

4. Population genetic study of the Arizona hedgehog cactus in support of multiple Recovery Plan objectives

Principal Investigator(s): **Dr. Shannon Fehlberg, Dr. Kimberlie McCue, and Wendy Hodgson, M.S., The Desert Botanical Gardens**

Federal Share: \$22,155

Objective(s): The objective of the proposal is to describe genetic diversity within and among populations of the Arizona hedgehog cactus (*Echinocereus triglochidiatus* var. *arizonicus*). The proposal includes survey for and documentation of new populations, including a threats assessment and collection of abundance data from all located populations.

Final Report Abstract: Although some research investigating the taxonomy of the genus has recently been published, no prior research has addressed genetic diversity within and among populations. Twenty-one sites were visited and detailed information about location, plant characteristics, abundance, habitat, and observed threats were recorded. At each site, spines were also sampled for genetic analysis from an average of 12 individuals. Results of preliminary genetic analyses indicated that populations maintain moderately high levels of diversity and are connected by high levels of gene flow. Results also indicated that further study is needed to clarify taxonomic confusion among *E. arizonicus* and other closely related species, especially in populations outside of the core range. Such studies should include an examination of ploidy level, genetic variation, and precise stem, spine, and floral characteristics, as these may be the best indicators of taxonomic identity in this group.

5. Sentry milk-vetch tools for recovery: Long-term data analysis and propagation protocols

Principal Investigator(s): **Dr. Kristin E. Haskins and Sheila Murray, The Arboretum at Flagstaff**

Federal Share: \$19,416

Objective(s): The objective of this proposal is to rigorously examine a long-term dataset on sentry milkvetch (*Astragalus cremnophylax* var. *cremnophylax*) to assess the plants

demography, life history, and effects of climate change on the species. Additional benefit will be the development of protocols for vegetative propagation of the taxon.

Final Report Abstract: All available raw data were compiled and analyzed. Further exploration of this long-term dataset will undoubtedly reveal important information and compilation of the data to date is a first step in moving towards meaningful modeling results. A cutting experiment was undertaken using 5 different rooting hormone levels plus a control; the control produced twice as many roots compared to other treatments. Propagating ASCRCR via cuttings of field plants is a viable method for plant increase, and is more likely to produce plants than cuttings from greenhouse propagated plants.

6. Arizona Plant Species of Concern: A statewide assessment and prioritized ranking of G1 and G2 Species

Principal Investigator(s): **Dr. Andy Laurenzi** and **Dr. John Spence**, private

Federal Share: \$9,811

Objective(s): The objective of the proposal is to assess 179 Arizona plant species with Heritage Rank of G1, including updating summary information through literature, database, and expert interview research. The product will be a prioritized list of Arizona rare plants based on distribution and threats.

Final Report Abstract: A ranked list of Arizona G1 and G2-ranked (globally imperiled or globally threatened) plant species was created using the Fertig Approach. When known, geographic range, habitat specificity, number of occurrences, abundance, intrinsic rarity, threats, and trend were scored with a 1 or 0 to determine the final score and ranking. The list is dynamic and intended to be reviewed regularly.

7. Continue Grand Canyon National Park Recovery Plan actions for sentry milk-vetch (*Astragalus cremnophylax* var. *cremnophylax*) including ecological studies, planting trials, population augmentation, determination of reintroduction sites, and peer-reviewed revision of monitoring protocol

Principal Investigator(s): **Janice K. Busco**, Grand Canyon National Park

Federal Share: \$18,422

Objective(s): The objective of the proposal is the continuation of research on sentry milkvetch (*Astragalus cremnophylax* var. *cremnophylax*), which includes defining habitat parameters and reintroduction sites including soil depth/ seed study, and planting of individuals into suitable niches within the area.

Final Report Abstract: Planting trials were completed in the field including experimenting with soil depths; there were no relationships noted, however depth of soil to underlying limestone is important due to the size of the rootball in planting. In other studies, larger plugs had greater survival over smaller younger plants, July had greater germination and survival than seeds sewn in the fall, more seedlings germinated in moderate, rather than low or high light levels, shading may increase seed germination and survival early on due to increased surface soil moisture. Pollination studies showed that mason bees, *Osmia ribifloris* *ribifloris*, are the primary spring pollinator. Reintroduction efforts at Maricopa Point are

moving this population towards reaching the USFWS Recovery Plan goal of a population of 1000 individuals. More individuals have been discovered near Lollipop Point, with estimates of over 2,500 individuals growing there. In reintroduction efforts, it was discovered that protective structures such as Remy-covered 6" PVC pipe ring and Remy-covered cage increase seedling survival and establishment in comparison to seeding in a simple unprotected depression, likely because they keep surface debris off the seedlings and prevent them from washing away. Other work includes removal of non-natives near populations, assessing appropriate habitat for introductions, working group meetings, ongoing monitoring, and ongoing care of newly established plants.

8. Searching for New *Echinocactus horizonthalonius* var. *nicholii* in Sonora, Mexico

Principal Investigator(s): **Dr. Thomas R. Van Devender, Sky Island Alliance**
Federal Share: \$19,943

Objective(s): Four limestone areas with potential habitat to support *E. horizonthalonius* var. *nicholii* in Sonora will be surveyed. All plants observed will be added to the MABA online database (Madrean.org). If *E. horizonthalonius* var. *nicholii* is found, plants will be counted, measured, and non-lethal documentation made to the Universidad de Sonora Herbarium. The discovery of a new population of *E. horizonthalonius* var. *nicholii* will increase the knowledge of distribution and ecology of this species.

Final Report Abstract: Surveys were conducted, locals interviewed, and a total of 83 *E. horizonthalonius* var. *nicholii* were discovered in two populations near Mazatán in the Municipio de Mazatán and near Nácori Grande. The sites where the plants were located were a very small part of the potential area of habitat (using Google Earth, the potential habitat was a dendritic pattern of whitish ridgetops bordered by dark foothills thornscrub). Scatter diagrams of diameter and height suggest that the age structures reflect relatively continuous reproduction and recruitment in both populations. Marc Baker accompanied the researchers and took measurements / conducted canonical discriminate function analyses show that “the Mazatán individuals are classified 100% within the *E. horizonthalonius* var. *nicholii* group” and provide evidence for the validity of the variety.

9. Publication of the report: Circumscription of *Coryphantha* section *Robustispina* (Cactaceae) using multivariate analysis of morphological characters.

Principal Investigator(s): **Dr. Marc Baker**, private
Federal Share: \$7,000

Objective(s): An earlier report will be updated and submitted to a peer-reviewed journal for publication. This will make available the data and information in a 2006 report on the circumscription of *Coryphantha* section *Robustispina* using multivariate analysis of morphological characters.

Final Report Abstract: Taxonomic circumscription of subspecific taxa within *Coryphantha robustispina* was reviewed using morphological and DNA analyses. This review was of particular importance to both conservation and commercial interests because of controversy over the taxonomic status of *C. robustispina* ssp. *robustispina*, which is listed Endangered by the United States Fish and Wildlife Service. Geographical distribution of populations within

the species was determined through herbarium records and fieldwork. Stem characters were measured from a total of 638 individuals among 20 populations, including four populations of the out-group, *C. poselgeriana*. Flower characters were measured from 180 individuals among 12 populations. Ten microsatellite DNA loci were isolated and characterized for 204 individuals among 13 populations. Data were analyzed using multivariate analyses to test the question of whether there were statistically recognizable groups and whether these groups were correlated with geographic distribution. The results indicated that, within *C. robustispina*, there were three morphologically, genetically, and geographically coherent groups represented by the names *C. robustispina* ssp. *robustispina*, which occurred in Pima and Santa Cruz Counties of Arizona and in adjacent Sonora, Mexico; *C. robustispina* ssp. *uncinata*, which occurred from Cochise and Graham Counties, Arizona, through southern New Mexico and northern Chihuahua to Hudspeth County, Texas; and *C. robustispina* ssp. *scheeri*, which occurred from Hudspeth to Pecos Counties, Texas, and possibly in Chihuahua. The report was submitted to and published in the American Journal of Botany, May 2013, vol. 100 no. 5 pp. 984-997.