

Beath's Milk-vetch *(Astragalus beathii)*

Monitoring Report

2005 – 2009



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INTRODUCTION

The Beath's milk-vetch (*Astragalus beathii* Porter) was first collected in 1939 and described by C.L. Porter in 1941 (Porter, 1941). It was named after the original discoverer of the species, Orville Andrew Beath, a research chemist at the University of Wyoming, noted for his work on selenium occurring in plants.

Astragalus beathii was listed as a Candidate Species, Category Two, in 1980 (Fed. Reg. 45 (242)). However, a status report by Brian and Phillips (1982) did not recommend this species for listing because of the abundance of habitat and the difficulty in determining the population sizes. Casual observations in the habitat of Beath's milk-vetch and the evident misidentification of specimens in local herbaria prompted questions on the current status of this species and a new status report was completed in 2004 (Roth 2004).

Astragalus beathii is a weak perennial or annual which responds strongly to rainfall. It was reported to be abundant in wet years and rare during less favorable springs. It is restricted to seleniferous soils derived from Moenkopi shale. Although there is a large area of this substrate exposed between Gray Mountain and Marble Canyon, only a small fraction of it is occupied. Following extensive field surveys and herbarium searches for the status report, Roth found only 3 extant populations of *Astragalus beathii*, all within a 5-mile radius of Cameron, AZ. All populations are on Navajo Nation lands. As a result of the findings in the status report, *Astragalus beathii* was listed as a "Candidate" species (G4) on the 2005 Navajo Endangered Species List (NESL 2005). The main threats to the species are consider habitat modifications through road construction and urban development as well as competition with invasive species. Tamarisk (*Tamarix sp.*), Russian thistle (*Salsola kali*), Camelthorn (*Alhagi maurorum*) and diffuse knapweed (*Centaurea diffusa*) have been observed in close proximity of *Astragalus beathii*. Off-road vehicle use and global climate change may also negatively impact the species in the future.

In 2005 the Arboretum of Flagstaff obtained a grant from the USFWS to establish a monitoring site for *Astragalus beathii* on the Navajo Nation. Funding for this project was discontinued in 2006 and the Navajo Natural Heritage Program has been monitoring the Burro Canyon population ever since.

Plant Description

Astragalus beathii is a coarsely robust, weak perennial, with stiff appressed hairs when young but becoming glabrous with age. Stems are several to numerous from 2 – 6 dm long. The leaves are pinnate, 6 – 12cm long, shortly petioled with 11 – 21 narrowly elliptic-oblong to oblong obovate leaflets, 5 – 25mm long. The racemes are 10 – 27 flowered, rather dense at anthesis. Flowers 20 to 25mm long, petals are bright purple, the wing tips paler or often white. Pods deflexed, sessile or nearly so, oblong-ellipsoid, leathery, hairless, straight, 2.5 – 3.9mm long, 7 – 11mm in diameter. Flowering takes place from mid March to early May. Some plants may also germinate and flower during the monsoon season in late July and August. *Astragalus beathii* grows on red clay knolls and gullied washes on selenium rich soils derived from Moenkopi sandstone at 4000 to 4800ft. It is associated with *Ephedra torreyana*, *Gutierrezia sarothrae*, *Chrysothamnus sp.*, *Atriplex confertifolia*, *Stanleya pinnata*.

Similar Species:

Astragalus beathii resembles *A. preussii* in stature and flower size. The closest known population of *A. preussii* is in northern Coconino Co., in the vicinity of Navajo Bridge at Marble Canyon. The pods of *A. preussii* are stipitate and are erect or ascending.

METHODS

Five monitoring plots were established in Burro Canyon, ca. 5 miles southwest of Cameron on April 26, 2005. Each of the 5 plots measures 5m x 5m and all 4 corners are marked with rebar stakes. All plots were mapped using GPS units and we recorded the SE corner of each plot using UTM's (NAD 27). In each plot the total number of plants is counted as well as how many of the plants are perennial vs. annual. In an effort to better understand the longevity of a perennial plant, perennials are tagged with metal tags and individually numbered. Also recorded is the number of plants that are reproductive and the number of dead plants in each plot. Monitoring is repeated each year during the same time period (third week of April).

RESULTS

In 2005 there were a total of 449 plants inside the 5 monitoring plots at Burro Canyon (Figure 1). Twenty-seven of those we considered perennial (Figure 2). Only about 8% of all the 2005 plants were reproductive during the monitoring date (Figure 3). Seventeen plants were found dead. In 2006 there were no plants found in the 5 monitoring plots. In 2007, a total of 15 plants were found in the 5 monitoring plots, none of which were perennial and only one was reproductive. In 2008 a total of 87 plants were found inside the 5 monitoring plots, two were considered perennial and surviving from the previous year. These two perennial plants were the only plants that were reproductive during the time of monitoring. All others were non-reproductive seedlings. In 2009 no plants were found in the monitoring plots except for two dead perennial plants, tagged in 2008.

DISCUSSION

Due to the extreme fluctuations of plant numbers from one year to the next, the status report of 2004 recommended long term monitoring of *Astragalus beathii* throughout the range. The first five years of monitoring within the same population illustrate the difficulty in determining the status and abundance of this mostly annual species from just a few years of monitoring data. These results also indicate that despite extensive surveying over the three-year period of the status report (2002 – 2004), it is still possible to locate new populations of this plant within the appropriate habitat. It appears that perennial plants flower and fruit early in the season during the monitoring period but

it is unclear whether newly recruited seedlings ever make it to a reproductive stage. Certainly, very few, if any make it through the winter and into the next season.

Five years of monitoring have shown that few years are good reproductive years for *Astragalus beathii*. Even when plants are present during spring surveys, they are often seedlings that likely do not make it to reproductive age or into the following year. Even during a good year (2005), less than 10% of the population is reproductive, substantially less during in between years. The largest amount of reproductive effort is recorded from perennial plants but even in a good year only a fraction of the population can be considered perennial (6% in 2005). It is likely that the majority of plants remain dormant as seeds for many years before germinating and establishing during springs with sufficient rainfall. These germination events are likely the main contributor to resupplying exhausted seed banks. Observations from within the monitoring sites were consistent with observations of plants in the surrounding greater population as well as other sites for *Astragalus beathii* in the Cameron area.

Additional surveys should be conducted during all wet spring periods. Monitoring plots should be set up within each of the currently known populations to get a better understanding of the population dynamics of this species from one year to the next and to better understand the potential effects of global climate change and other disturbances to the plants and their habitat.

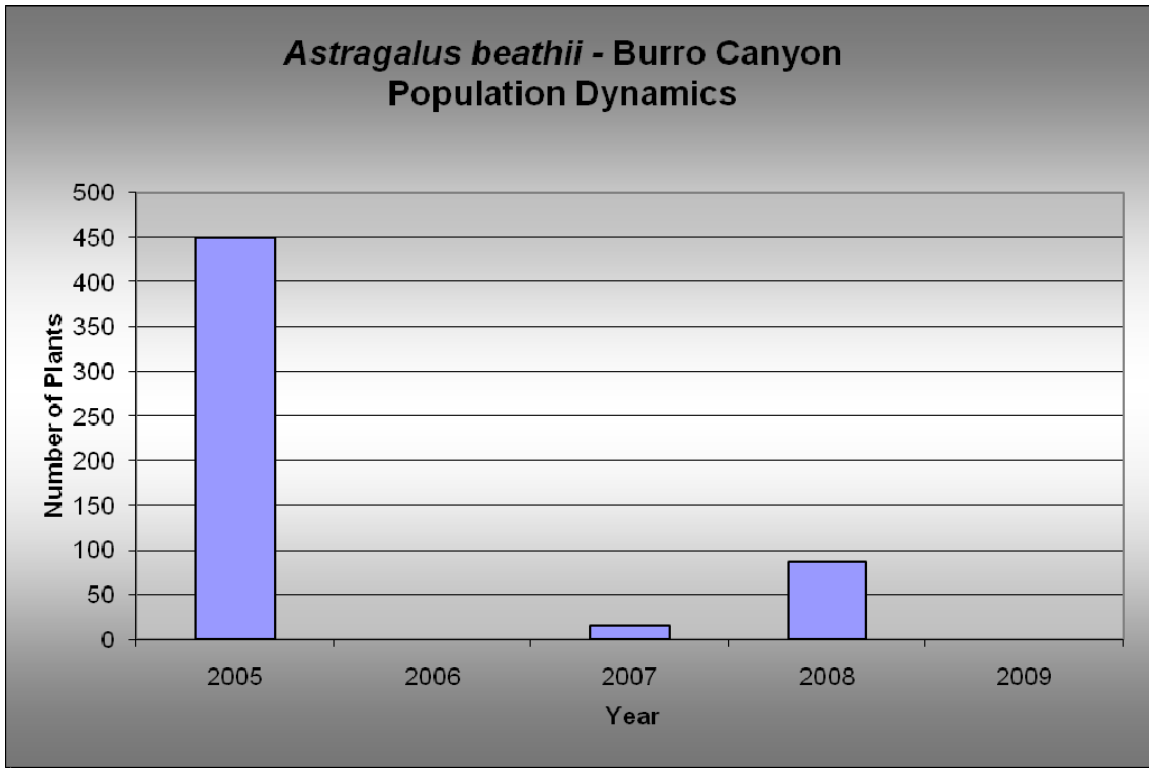


Figure 1. Total number of *Astragalus beathii* plants in 5 monitoring plots near Burro Canyon, Coconino County, AZ, from 2005 to 2009.

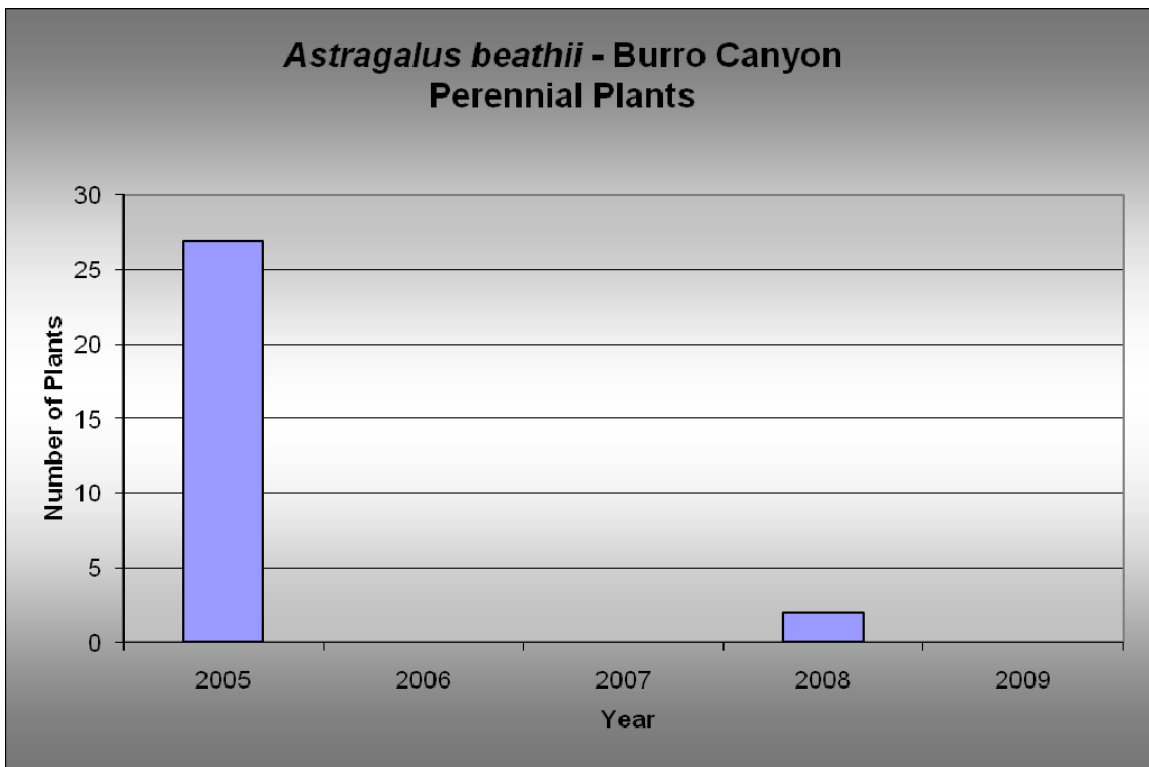


Figure 2. Total number of perennial *Astragalus beathii* plants in 5 monitoring plots near Burro Canyon, Coconino County, AZ, from 2005 to 2009.

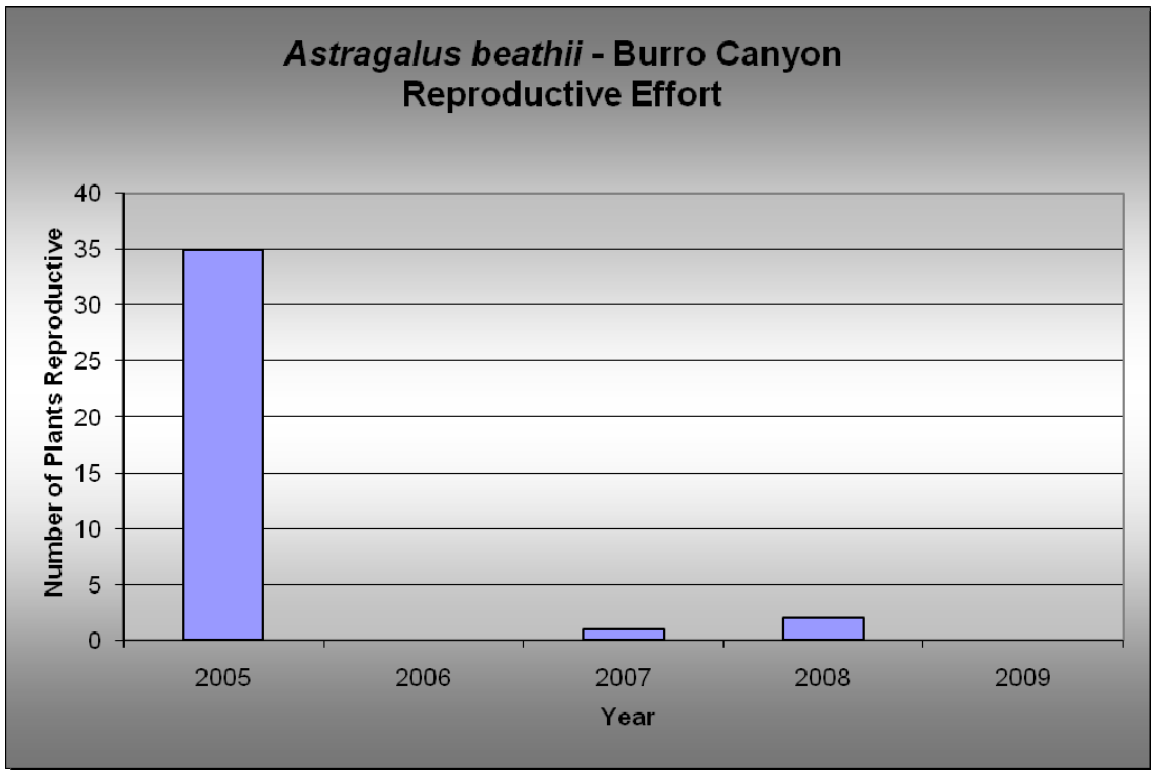


Figure 3. Reproductive effort of *Astragalus beathii* plants in 5 monitoring plots near Burro Canyon, Coconino County, AZ, from 2005 to 2009.

REFERENCES

- Arizona Rare Plant Committee. 2001. Arizona rare plant field guide: a collaboration of agencies and organizations. Washington: U.S. Government Printing Office.
<http://aznps.org/rareplants.html>
- Brian, N.J. and B.J. Phillips. 1982. Status report: *Astragalus beathii* Porter. Submitted to the Office of Endangered Species, USDI, U.S. Fish & Wildlife Service, Albuquerque, NM. 12pp.
- Barneby, R.C. 1964. Atlas of the North American *Astragalus*, Part I. Memoirs of the New York Botanical Garden Vol. 13. New York Botanical Garden, Bronx, NY.
- Porter, C.L. 1941. A new species of *Astragalus* from Arizona. Madroño Vol. 6: 18-22.
- Navajo Endangered Species List. 2008. Navajo Nation Department of Fish & Wildlife. Resources Committee Resolution No. RCS-41-08
- Roth, D. 2008. Species Account for Beath's Milk-vetch. In: Mikesic, D. & D. Roth, Navajo Nation Endangered Species List Species Accounts. Navajo Natural Heritage Program, Department of Fish & Wildlife, Window Rock, AZ.
<http://nnhp.nndfw.org/>
- Roth, D. 2004. *Astragalus beathii* (Beath's Milk-vetch) Status Report. Navajo Natural Heritage Program, Window Rock, AZ. Prepared for the U.S. Fish & Wildlife Service, Ecological Services Field Office, Tucson, AZ. <http://nnhp.nndfw.org/>