MONITORING REPORT

MANCOS MILKVETCH
(*ASTRAGALUS HUMILLIMUS*: FABACEAE)

SAN JUAN COUNTY, NEW MEXICO

1990 – 2014

Daniela Roth
NM Energy, Minerals, & Natural Resources Department
Forestry Division
Santa Fe, NM

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INTRODUCTION

Mancos milkvetch (*Astragalus humillimus* A. Gray ex Brand) is only known from the Four Corners region of New Mexico and Colorado. The species is a member of the Colorado Plateau subdivision of the Great Basin Desert. It occurs primarily on tribal lands administered by the Bureau of Indian Affairs, with small populations on Bureau of Land Management and New Mexico State Trust lands.

Mancos milkvetch grows only on rimrock outcrops of the Point Lookout member of the Mesa Verde series of sandstone with flat or gently sloping surfaces at elevations between 5,200 and 6,000 feet (Figure 1). Within this range the species is confined to large sloping sheets of exfoliating whitish-tan colored sandstone. In San Juan County, New Mexico, this habitat extends southward from the Colorado border to the end of the Farmington Hogback, about 20 miles south of the San Juan River.
In all, fifteen population sites are known to occur in New Mexico, and four populations in adjacent Colorado. The majority of populations are located on Navajo Nation lands (Roth 2008, USFWS 2011). Within its restricted range Mancos milkvetch forms highly localized populations; occupied habitat ranges from 1.5 to 7.6 hectares in size, where plants can be concentrated in densities as high as 40 plants per square meter (Sivinski 2008). The largest and best known site is Slickrock Flats on the Navajo Nation. Mancos milkvetch is usually found on large nearly flat sheets of sandstone in small depressions (tinajas) on bedrock, in cracks or fissures in sandstone, or at the base of gentle slickrock inclines.

The density within populations can vary dramatically, depending on rainfall and habitat suitability (Sivinski 2008). Optimum habitat conditions are large nearly flat surfaces with cracks and tinajas that accumulate soil and water. The majority of plants within a population tend to be seedlings and juvenile plants, indicating a high level of reproductive effort within populations (Sivinski 2008).

Mancos milkvetch was listed endangered under the federal Endangered Species Act on June 27, 1985 (50 FR 26568-26572). Primary reasons for listing included a very limited distribution combined with low disturbance tolerance, and close proximity to powerline corridors, roads, and oil wells (energy development). A recovery plan to guide recovery efforts was completed in 1989 (USFWS 1989). Monitoring populations and their habitat to document trends and threat impacts was identified as an action that must be taken to prevent a significant decline in species population and habitat quality. It is one of the primary actions needed to remove the species from the list of threatened and endangered species. To date, two monitoring sites have been established for Mancos milkvetch, located on NM State Trust lands (Sleeping Rocks) and lands managed by the Bureau of Land Management (Slickrock Flats). A summary of the results from 1990 to 2014 is presented here.

Figure 1. Mancos milkvetch habitat, Farmington Hogback area, San Juan County, NM.

METHODS

In 1990 five monitoring plots were established on State Trust land at Sleeping Rocks (T30N R15W S16 SE¼) and five plots were established at Slickrock Flats on the northwest BLM boundary with the Navajo Reservation (T30N R15W S2 NW¼). Study plots were monitored annually during the first 2 weeks of June between 1990 and 1999, and infrequently since then (2002, 2008, 2014).

Each of the 10 monitoring plots represents a specific piece of Mancos milkvetch habitat, such as a single tinaja or crack segment with its own small individual watershed. Each is a different size island habitat separated from other island habitats by an interval of unoccupied sandstone surface. The plots are read by bisecting them with a measuring tape and locating all Mancos milkvetch plants growing between 2 permanently placed rebar stakes, and tracing individuals on a mm graph paper within a sketch of the habitat feature. This method allows for the documentation of changes in foliar cover over time and is therefore a reflection of overall health and population trend. Documenting changes in live plant cover is considered more indicative of the overall vigor of a

population than reporting plant density fluctuations. Counting individual plants is difficult for Mancos milkvetch because plants coalesce into one large, pulvinate mass as they mature and can no longer be recognized as individuals (Sivinski 2008). In addition to plant cover, the number of seedlings within each monitoring plot is recorded.

RESULTS

When plots were established in 1990, it was apparent that each population had suffered severe mortality during previous drought years (Figure 2). Recently dead plants could readily be distinguished from old remains by their color and lack of decay. By counting the living and the remains of recently dead plants in each sample plot it was determined that the loss of mature plants was 60 percent of the total. This loss varied greatly between habitats which have different water holding capacities. Habitats consisting of deep cracks in the bedrock generally appeared to fare better than the tinajas or narrow cracks with only a shallow reservoir of soil and limited water holding capacity. Some tinaja habitats experienced 100 percent mortality during the extreme drought of 1989. Therefore, it is thought that the more permanent habitats for mature plants are those that occur on deep cracks in the sandstone. This may also be true for the germination and establishment of seedlings. In 2014 the majority of seedlings were found in cracks. However, no plants were found in 4 of the 10 monitoring plots in 2014, 2 were located in tinajas, and two in cracks.

Establishment and maturation of the Mancos milkvetch is slow compared to other perennial species of *Astragalus.* The establishment period is usually two full growing seasons, with maturation and flowering occurring during the third or fourth spring. Some adult plants are very large (>15 cm in diameter) and appear to be many years old. The majority of the population, however, is composed of seedlings, which indicates a high rate of mortality in young plants during germination and establishment. This is demonstrated by plots NM1 and NM2 which were established in May of 1990. The other eight plots were established in July of 1990 and plots NM1 and NM2 were reread to document any mortality during the intervening dry period. Of the 205 seedlings found in these two plots in May, only 62 (30%) had survived through the dry early summer month of June. Mortality of old plants also appeared to be increased by drought years. Plants weakened by dry conditions were often infested by spider mites which hastened the demise of older individuals.

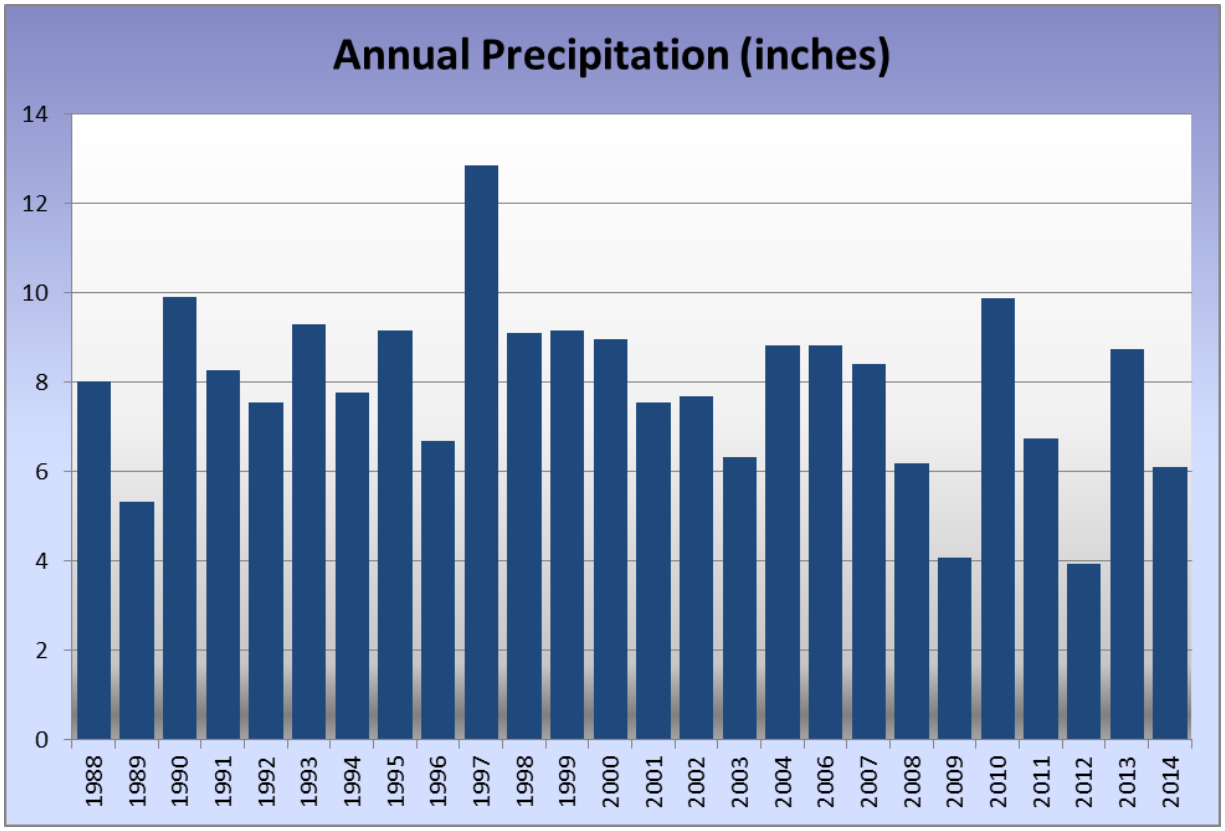

Figure 2. Annual precipitation at the AG Science Center near Fruitland, NM, from 1988 to 2014.

While there was some mortality of older, more established plants from spring to spring, the general trend at both sites was increasing cover of Mancos milkvetch between 1990 to 1993 (Figure 4). Both monitoring sites began to decline in 1994. Although total Mancos milkvetch cover did not significantly increase in 1997, during the highest rainfall year within the study period, seedling density did show a dramatic rise from the previous years (Figures 2, 3 & 4). The wet year of 1997 caused the total foliar cover of Mancos milkvetch to increase by 1998, continuing into 1999 (Figures 2 & 4). Similar results were found in 2014. Although more seedlings were found in the monitoring plots in 2014, the overall cover of plants decreased significantly over previous recorded values (Figures 2 & 3). In 2014 only 12 adult plants were found in the 10 monitoring plots, 10 in the Sleeping Rocks plots, and only 2 adults in the 5 Slickrock Flats plots. A total of 155 seedlings were found at the two sites. The majority of seedlings (129) were found in the Sleeping Rocks plots. Four monitoring plots (40%) had no plants whatsoever (2 plots at Sleeping Rocks, 2 plots at Slickrock Flats). Although dead plants can persist for several years, few dead plants were documented in the monitoring plots. Therefore, mortality likely occurred several years prior to 2014, presumably during the drought years of 2009 and 2012 (Figure 2).

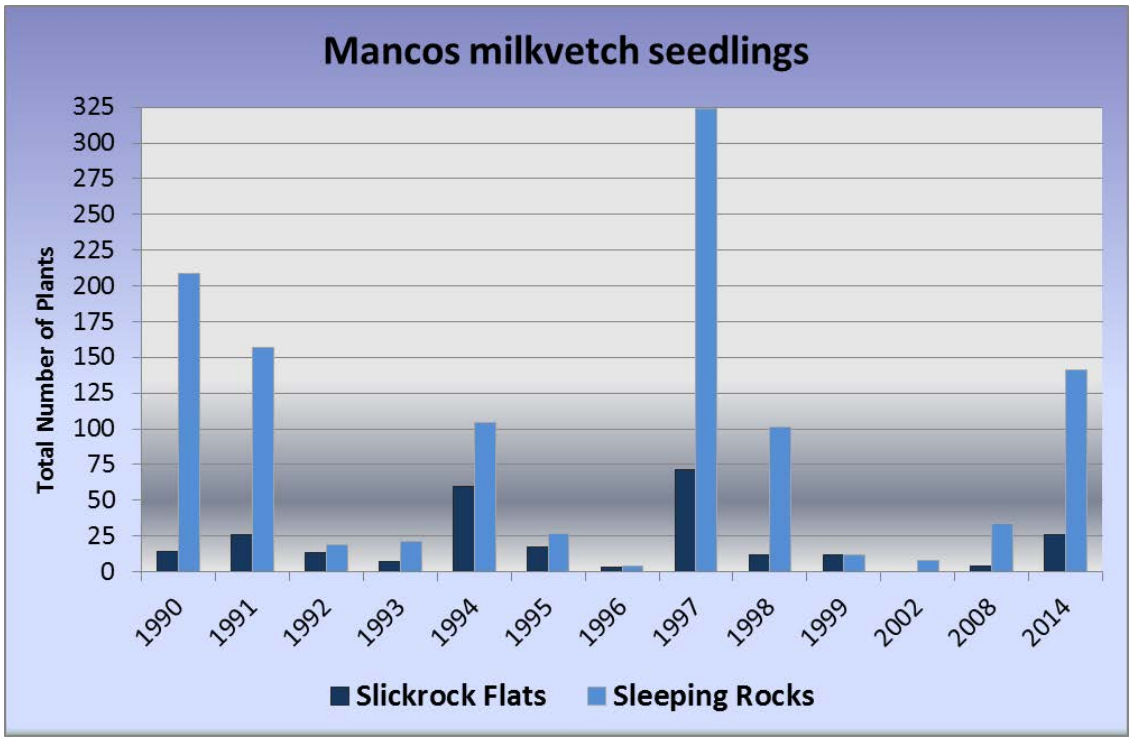

Figure 3. Density of Mancos milkvetch seedlings at Sleeping Rocks and the Slickrock Flats monitoring sites near Waterflow, NM.

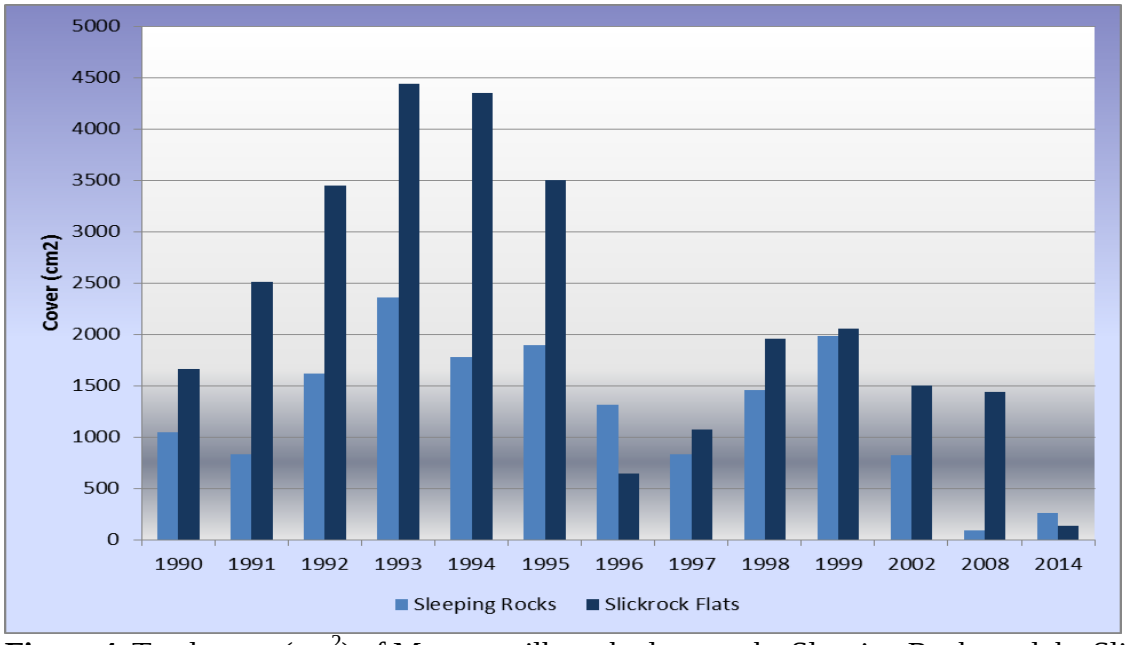

Figure 4. Total cover (cm^2) of Mancos milkvetch plants at the Sleeping Rocks and the Slickrock Flats monitoring sites near Waterflow, NM.

DISCUSSION

Long term monitoring data documents an apparent decline at the two monitoring sites north of Waterflow. Although the two populations appeared to be recovering in 1998 and 1999 from a sharp decline experienced in 1996 and 1997, by 2014 the overall cover was at an all-time low. Similar declines were documented in 2008 from all sites on the Navajo Nation (Roth 2008). Although it is likely that this species experiences normal boom and bust years with variable climatic conditions, severe and prolonged drought conditions brought on by climate change may impact the persistence of Mancos milkvetch more than previously thought. 2009 and 2012 were the lowest rainfall years on record since 1978 in nearby Fruitland, NM, likely causing further decline of plants at the monitoring sites. Although there were more seedlings documented in 2014 than during the past 4 monitoring years, seedling survival and establishment are crucial to maintaining persistent and viable populations. It is thought that germination and initial survival of seedlings is positively related to the death of older plants and the subsequent increase of precipitation (Sivinski 2008). Since the last monitoring year (2008), above average rainfall was recorded in 2010 and 2013, likely resulting in increased germination of seedlings. Any seedlings germinating following the above average rainfall year of 2010 apparently did not get established in significant numbers, or did not survive the drought year of 2012. Perhaps the surviving 2014 seedlings will be able to establish a new cohort of adult reproductive plants.

However, predicted ongoing drought conditions may limit establishment and therefore the reproduction and seed banking of the species, leading to a slow decline. Four of the 10 monitoring plots had no plants in 2014 (2 plots at each monitoring site). As there are fewer adult reproducing plants at each plot, fewer seeds are stored in the seedbank. If seedlings cannot establish themselves as reproductive adults, the population will slowly decline and eventually go locally extinct. We may already document this decline in the monitoring plots. Considering the current trend at the monitoring sites and the apparent rangewide decline, it is highly recommended that monitoring of the 2 sites occurs more frequently than previously, at a minimum of every other year. In addition, a census of the all populations and rangewide surveys in suitable habitat to update the overall status of the species is essential to understand current trends and threats. Considering the rangewide decline, Mancos milkvetch should be seed banked for ex-situ conservation purposes.

ACKNOWLEDGEMENTS

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