Monitoring Two Milk-vetches on the Arizona Strip

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Introduction

Monitoring studies on rare plants are necessary to determine future management practices. The plants are evaluated to determine whether man is having an effect on their populations. Is the effect negative or positive? How much of the effect is weather related? Can answers to these questions be teased out of the data? Some monitoring studies have revealed surprises regarding how plants survive over time in their environment and the effects of man and environment on them. Some impacts are direct such as rabbit depredation on Siler Pincushion Cactus (*Pediocactus sileri* (Engelm.) L.Benson (Hughes, 2009). A much more difficult problem to ascertain from the monitoring studies is indirect effects. When drought occurs and livestock are present in a rare plant's habitat, is the competition between the livestock and rodents for forage driving rodents to eat the rare plant (vice cactus) due to shortages of other forage caused by livestock eating same? This cannot be determined as no monitoring study measures intent of a rodent (Hughes 2009). The surprises revealed to an observer during monitoring of plants, is equal to causal factors of changes in population numbers. Some plants can simply puzzle an observer.

The Plants

The two milk vetches to be discussed are the Holmgren milk-vetch *Astragalus holmgreniorum* Barneby (listed Endangered) and the Diamond Butte milk-vetch *Astragalus toanus* Jones var. *scidulus* Welsh and Atwood (Bureau of Land Management lists as Sensitive). The Holmgren is a prostrate plant, except for its flower stems which once burdened with seed pods become prostrate as well. The Diamond Butte milk-vetch is opposite of Holmgren in growth form being bushy and rush-like appearing similar to young rabbit brush (*Chrysothamnus* spp.). The main population is of *Astragalus toanus* var. *toanus* (vice *scidulus*) which grows 150 km north of Diamond Butte, in Nevada, Idaho, Utah and sparsely in Oregon (Welsh, 1993).

Monitoring Methods

The Holmgren milk-vetch was the first to be monitored as it was a candidate for listing (as endangered) in the 1980s and was eventually listed in the early 2000s. A plot was set up in 1989. Plants were tagged as adults (with flowers and seed pods) or seedlings. The plant is biennial and thus every two years the tags were removed and placed by another plant, as the plants originally tagged died. The plot was monitored from 1989 to 1999. After 1999 there were no more plants in the plot as they had all died out. It was not until 2010 that 12 plants reappeared in the plot.

As a result of the lessons learned in the traditional square or rectangular plots and tagging of plants, a different method of monitoring was adopted. As the plant seems to disappear for periods of time, transects were run in the habitat and a population was located with a hand held geographical plotting system. The population was designated as a polygon and the plants in the polygon were counted. A map with the polygons was produced and the number of plants found in each polygon was noted. This served as the record for the year's monitoring of that plant.

Holmgren milk-vetch in bloom (L. Hughes)

The Diamond Butte milk-vetch occurs in two populations in very small numbers. The two small populations are counted where found in the two locales. Within the two locales, the milk-vetches die out and reappear in later years in a different location. The most milk-vetches counted has been ten. Sometimes, it's all in one population or in both populations combined (Table 2).

Diamond Butte milk-vetch in bloom (L. Hughes)

Results

The Holmgren milk-vetch data from 1989 to 2007 are presented in June 2009 ***Desert Plants*** (Volume 25, Number 1) page 34. The data from to 2008 to present are shown in Table One.

The count transects and polygons were in the same or near same locations each year, though in some polygons the plants did not appear, as is discussed above. The weather patterns during 2009-2012 were mostly wet winters or springs, which favors Holmgren milk-vetch. However this also favors African mustard (*Malcomia africana*) in some years. 2005 was a wet year and this mustard appeared to out-compete Holmgren milk-vetch for soil moisture, as the mustard was very dense. The milk-vetch failed to develop seed pods or where a few pods occurred, they were in very small quantities. It has been stated that this mustard and the filaree (*Erodium circutarium*) are indirect threats to this milk-vetch (Van Buren and Harper, 2003). However in 2009-2012, in the section 31 transects, the mustards were in small quantities and failed to have a visible effect on the milk-vetch. The winter of 2012 was dry and the milk-vetch plants appeared smaller in size than when wetter winters occured, yet they were numerous due to a wet spring.

The population counts for the Diamond Butte milk-vetch's two populations are shown in Table 2. This plant has a small population. As the data in Table 2 show, either one or both populations do not appear for years. It does not seem to be moisture regimes ruling the appearances. They show in dry years and wet years somewhat independent of moisture amounts. Adequate moisture is surely needed, but properly timed moisture will stimulate growth of plants. Population Two, for example, had a good show in 2012 during a dry spring. The long period of no visual sightings of the vetch from 2001 to 2009 was also a long dry spell with below average rainfall. However, it showed up in Population One in 2009 with similar precipitation levels as the previous six years. In 2010 the winter and spring precipitation was above average and the number of plants counted was ten, a high to that point. Even though the population of this milk-vetch is very small, the plants grow to robust sizes with numerous seed pods.

Diamond Butte milk-vetch with seed pods (L. Hughes)

Discussion

The data and observations demonstrate that the above milk-vetches can be absent for long periods of time and then reappear, indicating that the seeds are able to withstand long periods of dormancy or that some other process is at work. I had begun to feel, wrongly, that Population Two of the Diamond Butte milk-vetch disappeared from the site. With both taxa, the monitor cannot be hasty in determining if the milk-vetches are extinct from the site. Continuous monitoring revealed a surprise. My annual check of Population Two of the Diamond Butte milk-vetch and my old plot of the Holmgren milk-vetch revealed the plant stands, tall and robust, in the case of the Diamond Butte milk-vetch, and boldly prostrate in the case of Holmgren milk-vetch.

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TABLE ONE
Holmgren Milk-Vetch Section 31 Count Transects. Percent of Normal Winter and Spring Precipitation (Lizard Rain Gauge).

Year	Number of Plants	Winter Percent of Average Precipitation	Spring Percent of Average Precipitation
2009	209	104%	28%
2010	278	188	150
2011	386	127	51
2012	476	55	143

TABLE TWO
Diamond Butte Milk-Vetch Count Transects and Percent of Normal Precipitation Data (Marchant Tank Rain Gauge on the Arizona Strip) October 1 to September 30 (Water Year)

Year or years	Population One # of Plants	Population Two # of Plants	Precipitation Fall Avg	Precipitation Winter Avg	Precipitation Spring Avg	Precipitation Summer Avg
1999	2	8	No data(nd)	No data	No data	No data
2000	1	6	nd	nd	nd	nd
2001-2008	0	0	60*	68*	56*	81*
2009	7	0	91	84	56	55
2010	10	0	14	167	138	29
2011	5	1	198	91	110	94
2012	5	5	99	56	42	No data

*Average rainfall for the 2003-2008 time period.