

**MONITORING MULFORD'S MILKVETCH (*ASTRAGALUS MULFORDIAE*)
IN THE BOISE FOOTHILLS: 2001 RESULTS**

By

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ABSTRACT

Mulford's milkvetch (*Astragalus mulfordiae*) is a rare plant endemic to the western Snake River Plain in southwestern Idaho and adjacent eastern Oregon. The Boise Foothills support one of the main population centers for this species. In 1999, monitoring transects for Mulford's milkvetch were established by the Idaho Conservation Data Center at a Boise City reserve. Similar transects were established at the seven other foothills occurrences located on city, county, and federal lands in 2000. The monitoring protocol entails the collection of Mulford's milkvetch census, plant community, weed, and ground disturbance information. In addition, photo-point photographs are taken at each monitoring station. The goal of the monitoring program is to provide trend information concerning the long-term conservation of Mulford's milkvetch and its habitat to city, county, and federal resource land managers. This information can be used to help plan proactive conservation measures and evaluate resource protection or other activities occurring in areas supporting Mulford's milkvetch. This report summarizes monitoring information collected during 2001 and compares it to baseline data collected in prior years. Census results showed the number of Mulford's milkvetch plants at some transects were stable, but varied at others between 2000 and 2001; that cheatgrass (*Bromus tectorum*) and other weeds were common at most transects; and that most transects had some level of ground disturbance. The most noteworthy change in the vegetation plot data was an increase in cheatgrass abundance at three transect sites.

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INTRODUCTION

Mulford's milkvetch (*Astragalus mulfordiae*) is a rare plant endemic to the western Snake River Plain in southwestern Idaho and adjacent eastern Oregon. It is a high priority conservation concern in both states and was a U.S. Fish and Wildlife Service category 2 candidate species until this category was eliminated in 1996. One of the main population centers for Mulford's milkvetch is the Boise Foothills, an area where several populations have been extirpated or reduced in size and/or quality in recent years (Moseley 1989; U.S. Fish and Wildlife Service 1995). Rangeland, habitat destruction and degradation are ongoing major conservation problems for Mulford's milkvetch. Disturbances associated with wildfires, motorized and non-motorized recreation, sand quarrying, and livestock grazing all contribute to habitat degradation problems. Habitat destruction from urbanization pressures are most acute in the Boise Foothills portion of its range.

Although the majority of Mulford's milkvetch occurrences in the foothills are located on private property, eight occur at least partly on city, county, or federal land. Six of these are in reserves managed by the Boise Parks and Recreation Department, one is largely within the Ada County Sanitary Landfill, and part of another is on Bureau of Land Management (BLM) land.

It was recognized several years ago that monitoring information was needed to help city and county land managers be proactive in their conservation actions on behalf of Mulford's milkvetch and other rare plant species in the Boise Foothills. For example, one management objective for some of the city reserves is the maintenance of rare plant populations and their habitat (Boise Parks and Recreation Department 1996). The need for monitoring information has become more important as the population of the Treasure Valley grows and recreation and other pressures on foothill reserves and open space areas increase.

In 1999, monitoring transects for Mulford's milkvetch were established at Camel's Back Reserve by the Idaho Conservation Data Center (CDC) with funding from the Ada County Planning Department (Mancuso 1999). Similar transects were established at the seven other occurrences located on city, county, and federal lands in 2000 with funds provided by the U.S. Fish and Wildlife Service (Mancuso 2001). The monitoring protocol requires the collection of Mulford's milkvetch census, plant community, weed, and ground disturbance information at each monitoring station. Photo-point photos are also taken at each transect. The goal of the monitoring program is to provide trend information concerning the long-term conservation of Mulford's milkvetch and its habitat to city, county, and federal resource managers. This information can be used to help evaluate resource protection or other activities occurring in areas supporting Mulford's milkvetch. This report summarizes monitoring information collected during 2001 and compares it to the baseline data collected in prior years.

METHODS

Monitoring methods were outlined in my initial Mulford's milkvetch monitoring report (Mancuso 1999). Additional details about the methods were provided in a subsequent report summarizing baseline monitoring results for 2000 (Mancuso 2001). These earlier reports should be consulted for background information regarding the monitoring protocol and locations and directions to the transects.

The monitoring program includes the eight foothill occurrences located on city, county, and federal lands. The CDC's Element Occurrence number (a three-digit identifier code for each occurrence in the CDC database) is used to label and identify each transect. To date, a total of eleven transects have been established. The occurrence at Military Reserve/Cemetery Ridge East (705) does not have a transect because it supports only a handful of scattered Mulford's

milkvetch plants. A count of all the plants and the plant community portion of the protocol are the only monitoring data collected for this occurrence.

Monitoring protocol

Monitoring plots are comprised of a single 25 m belt transect. Red-painted rebar stakes hammered into the ground permanently mark the location of most transects. The stakes also serve as the photo-point reference marker. Two transects at Camel's Back Reserve use existing wood fenceposts to reference the location of the transects. One-meter square quadrats are sampled at each meter mark along the transect tape. Mulford's milkvetch census information is collected from microplots sampled along both sides of the transect tape – a total of 50 microplots/transect. Weed composition and abundance information, and soil disturbance information are also collected at each microplot. However, the weed and ground disturbance information are sampled on only one side of the transect tape – a total of 25 microplots/transect. Plant community information is collected at each transect area as well. Photo-points provide a photographic record of each monitoring area. Trail width or other disturbance measurements are made at a few selected transects. Sampling information and general transect observations for 2001 are in Appendix 1.

Mulford's milkvetch census monitoring

Census information is collected by counting every Mulford's milkvetch plant rooted within the quadrat microplot and assigning each plant to one of three growth stage class categories: (1) Reproductive stage class -- all individuals with flowers and/or fruits; (2) Non-reproductive stage class -- non-flowering/fruited individuals that are obviously not seedlings; (3) Seedlings -- tiny germinants, usually less than 2 cm tall.

Weed monitoring

Although invasive exotic forbs are the primary target of this monitoring attribute, all non-native weed species rooted within the microplot get recorded. The cover of each weedy species within the microplot is estimated and assigned to one of six cover classes: 0 = no weedy forbs; 1 = <1% cover; 2 = 1% - 10% cover; 3 = 11% - 25% cover; 4 = 26% - 50% cover; 5 = >50% cover.

Ground disturbance monitoring

The amount of ground disturbance within each microplot is estimated and scored. The disturbance classes reflect the percentage of ground surface within the microplot clearly broken, crushed, or sloughed due to footprints, bicycle and motorcycle tread marks, animals, or other factors. There are eleven ground disturbance cover class categories:

0 = none	40 = 35 – 44.9%	80 = 75 – 84.9%
10 = 1 – 14.9%	50 = 45 – 54.9%	90 = 85 – 94.9%
20 = 15 – 24.9%	60 = 55 – 64.9%	98 = 95 - 100%
30 = 25 – 34.9%	70 = 65 – 74.9%	

A special "ground disturbance" monitoring transect was established at Lower Powderhouse Gulch (700) in Military Reserve to monitor changes in the size of an erosion gully bisecting this occurrence. Some Mulford's milkvetch habitat was destroyed when the gully was deeply cut during a storm a number of years ago. Enlargement of the gully threatens additional habitat along the small draw bottom. Photos were taken and the width of the gully measured at breast height at predetermined intervals along the transect.

Vegetation monitoring

Plant community information is based on visual estimates of cover class values for all vascular plant species occurring in a 1/10th acre circular plot. Cover class estimates are also made for several ground cover categories such as bare soil and litter. Plant community changes are monitored by comparing the plant species and cover values recorded one year, against the

species and cover values recorded another year. Because this method has an acceptable accuracy standard of +/- one cover class, an increase or decrease of two or more classes is required to indicate measurable change. Cover classes are:

1 = <1%	30 = 25 – 34.9%	70 = 65 – 74.9%
3 = 1 – 4.9%	40 = 35 – 44.9%	80 = 75 – 84.9%
10 = 5 – 14.9%	50 = 45 – 54.9%	90 = 85 – 94.9%
20 = 15 – 24.9%	60 = 55 – 64.9%	98 = 95 – 100%

Photo points

Photographs using a wide-angle lens and 35 mm print film are taken at each transect. A total of nine photographs are taken at each photo point – the transect azimuth, then 0^o, 45^o, 90^o, 135^o, 180^o, 225^o, 270^o, and 315^o. This array of photos provides a full panoramic view of the transect area.

RESULTS

Mulford's milkvetch census monitoring

In previous years, census information at most transects was collected along only one side of the transect tape. In 2001, Mulford's milkvetch plants were tallied on both sides of the tape at each transect. I made this modification in order to boost the number of plants sampled and being tracked, as well as to eliminate the inconsistency of sampling along one side of the tape at some transects, but both sides at others. Table 1 summarizes the complete Mulford's milkvetch census data set collected in 2001. In comparison, Table 2 contains only a subset of the 2001 census information. It includes census data collected in the same manner as in 2000, omitting information collected as a result of the sampling modification made in 2001. This subset allows a direct comparison between the 2000 versus 2001 census data sets. Future monitoring results will be based on sampling both sides of the transect tape, the same as in 2001. The three transects at Camel's Back Reserve are the only transects with three years of monitoring data.

A total of 426 Mulford's milkvetch plants were tallied at the 12 monitoring stations in 2001. Of these, 153 (36%) plants were reproductive, 49 (11%) were non-reproductive, and 224 (53%) were seedlings. Reproductive plants were the most common stage class at nine transects, while seedlings dominated the other three. The number of non-seedling plants/transect varied from a low of 2 to a high of 35. The 141 seedlings tallied at one of the Camel's Back Reserve transects (715-1) accounted for 33% of the total 2001 census.

The direct comparison in Table 2 shows slightly fewer plants were tallied in 2001 versus 2000. The difference becomes substantially more pronounced if one discounts the large number of seedlings at transect 715-1. Seven transects (58%) had fewer plants in 2001 compared to 2000. Six of the transects (50%) had fewer reproductive plants, compared to only one having more. The reduced number of reproductive plants was substantial at two transects (701-2 and 018-2). Three transects had seedlings in 2000, but not in 2001. Another three transects had no seedlings in either monitoring year. The seedling life stage has shown the greatest annual variation so far.

The three transects at Camel's Back Reserve were sampled in 1999, as well as the last two years. One of these transects (715-1) has shown a substantial increase in the number of seedlings and corresponding increase in the total number of plants each year. The number of non-reproductive plants has decreased each year at another one of the Camel's Back Reserve transects (715-3), while a concurrent slight increase has occurred in the number of reproductive plants. Copies of the 2001 transect data sheets are in Appendix 2.

Weed monitoring

Nine weed species tallied along the transects in 2000. The same nine species were again tallied in 2001. No new weed species were encountered. Every transect had at least three weed species, and most microplots contained at least two species. Within a microplot, individual weed species most commonly occurred in trace amounts (cover class = 1). However, a microplot's total weed cover was often higher (cover class = 2 or more). None of the 276 microplots sampled in 2001 were weed free. Cheatgrass (*Bromus tectorum*) was the only weed found at every transect. At least a trace amount occurred in nearly every microplot. Weed cover class values for cheatgrass were higher at several transects in 2001 (most notably 700-1, 701-1, 708-1, and 018-2). Storksbill (*Erodium cicutarium*) occurred at all but one and bulbous bluegrass (*Poa bulbosa*) at all but two transects. Low levels of bulbous bluegrass (a perennial introduced grass) were recorded at four transects (700-1, 706-1, 715-1, and 715-3) for the first time in 2001. All other weed species were present at fewer than half of the transects and tended to have low cover class values, similar to last year. In 2001, rush skeletonweed (*Chondrilla juncea*) was not recorded at one transect (700-1) having trace cover in 2000. Similarly, there was one transect (715-3) where blue bachelor buttons (*Centaurea cyanus*) was recorded in 2000, but not 2001. Weed cover class information is summarized in Tables 3 and 4. Additional weed species monitoring information is summarized in Appendix 3.

Ground disturbance monitoring

The milkvetch's loose, sandy soil habitat usually leaves ready evidence of trampling, churning, sloughing, and other disturbances. Deer tracks were common around two transects (708-1 and 015) and abundant at two others (018-1 and 018-2). Footprints were common along all three of the Camel's Back Reserve transects. Fresh motorcycle tracks were present at the two Middle Stewart Gulch transects (018-1 and 018-2). Disturbances without clear evidence of the causative factor also occur at most transects. Sixty-nine percent of all microplots had some level of ground disturbance in 2001, compared to fifty-seven percent the previous year. As in 2000, only transect 701-1 had no ground disturbance. Ground disturbance was evident in all but one of the 76 microplots sampled at the three Camel's Back Reserve transects. One of these transects (715-3) had substantially higher disturbance scores compared to 2000. Two at Camel's Back Reserve (715-1 and 715-2) and two in Middle Stewart Gulch (018-1 and 018-2) were the only transects to have microplots with ground disturbance cover class values greater than 50. Ground disturbance cover class information is summarized in Table 5.

Erosion gully measurements for the special ground disturbance transect at Lower Powderhouse Gulch (700) were similar to last year; indicating the width of the gully has not substantially changed. A comparison of the breast height measurements are provided in Table 6.

Vegetation monitoring

Overall, plant community plot data collected in 2001 was similar to 2000 at all of the monitoring transects. The most notable difference was the increase in cheatgrass at three transect sites (705-1, 708-1, and 715-2). Table 7 summarizes the plant community plot data by transect for both 2000 and 2001. It lists the cover class values for each species, as well as overall constancy values. The list is comprised of 62 species, including 4 shrubs, 10 grasses, and 48 forbs. Four of the grasses and eleven of the forbs are introduced species. One of these, rush skeletonweed is a noxious weed in Idaho. Vegetation at most transect sites is characterized by open shrub cover, usually high graminoid cover dominated by cheatgrass, and a diverse set of forbs, all with low cover. Changes in plant composition or cover class values between 2000 and 2001 are listed for each of the vegetation monitoring plots in Table 8.

Photo points

A second year of photo-point photographs were taken in 2001. The photos have been labeled and placed on file at the CDC office in Boise. Duplicate photos were placed on file at the U.S. Fish and Wildlife Service office in Boise.

DISCUSSION

With only two years of monitoring information for most transects, it is premature to assign any trends to Mulford's milkvetch and its habitat in the Boise Foothills. Mulford's milkvetch census numbers were stable at some transects, but varied at others between 2000 and 2001. Preliminary research and observations in Oregon indicate Mulford's milkvetch population numbers can fluctuate substantially over time (Findley 1998). A one-year decrease in the number of non-seedling Mulford's milkvetch plants at some transects may reflect nothing more than natural annual fluctuations. It will require one or two more years of monitoring before population and habitat trends can be assigned. Seedlings are expected to show the greatest variation of the three census stage classes based on the life history of Mulford's milkvetch, variations in annual precipitation patterns, and other factors affecting germination. Preliminary information collected the past two years seems to confirm this assumption.

Monitoring results show that cheatgrass and other weeds are common at most transect sites. They also show that most transect areas are subject to some level of ground disturbance. A substantial reduction in the amount of disturbance did not occur at any of the transects between 2000 and 2001. Cheatgrass levels were higher at several transects in 2001. It is unclear at what levels weed competition and site disturbance become limiting factors for Mulford's milkvetch. Long-term monitoring will hopefully provide insight into important conservation questions such as these. It is also premature to know if habitat restoration and protection efforts are improving Mulford's milkvetch and its habitat at Camel's Back Reserve. Results indicate ground disturbance was prevalent at all three transects in 2001. An increase in off-trail motorcycle use has the potential to cause serious disturbance problems at the Middle Stewart Gulch site. This is the premier Mulford's milkvetch population in the foothills. The prevention of habitat degradation in this area should be a BLM management priority.

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Table 1. Mulford's milkvetch census monitoring data for 2001.

Transect #	Name of transect	# of plants	Stage class information		
			Reproductive (%)	Non-repro. (%)	Seedling (%)
700-1	Lower Powderhouse Gulch	2	2 (100)	0	0
701-1	MRP - Veterans Ridge	15	15 (100)	0	0
701-2	MRP - Veterans Ridge	70	35 (50)	21 (30)	14 (20)
705	MRP - Cemetery Ridge E	10	10 (100)	0	0
706-1	MRP - Cemetery Ridge W	6	6 (100)	0	0
708-1	Lower Hulls Gulch	8	7 (88)	1 (12)	0
715-1	Camels Back Reserve	152	5 (3)	6 (4)	141 (93)
715-2	Camels Back Reserve	23	8 (35)	3 (13)	12 (52)
715-3	Camels Back Reserve	31	18 (58)	4 (13)	9 (29)
015-1	Seamans Gulch	9	9 (100)	0	0
018-1	Middle Stewart Gulch	54	17 (31)	7 (13)	30 (56)
018-2	Middle Stewart Gulch	46	21 (46)	7 (15)	18 (39)
Sum		426	153 (36)	49 (11)	224 (53)

Table 2. Comparison of selected Mulford's milkvetch census monitoring data, 1999 - 2001.

Transect	Year	# of plants	Reproductive (%)	Non-reproductive (%)	Seedling (%)
700-1	2000	6	6 (100)	0	0
	2001	2	2 (100)	0	0
701-1	2000	20	18 (90)	1 (5)	1 (5)
	2001	15	15 (100)	0	0
701-2	2000	57	41 (72)	7 (12)	9 (16)
	2001	47	26 (55)	13 (28)	8 (17)
705	2000	9	9 (100)	0	0
	2001	10	10 (100)	0	0
706	2000	10	6 (60)	1 (10)	3 (30)
	2001	6	6 (100)	0	0
708	2000	15	5 (33)	1 (7)	9 (60)
	2001	6	6 (100)	0	0
715-1	1999	39	12 (31)	7 (18)	20 (51)
	2000	71	13 (18)	3 (4)	55 (78)
	2001	152	5 (3)	6 (4)	141 (93)
715-2	1999	10	6 (60)	1 (10)	3 (30)
	2000	27	8 (30)	4 (15)	15 (55)
	2001	11	5 (46)	2 (18)	4 (36)
715-3	1999	23	11 (48)	12 (52)	0

	2000	25	14 (56)	6 (24)	5 (20)
	2001	28	15 (54)	4 (14)	9 (32)
015-1	2000	7	6 (86)	1 (14)	0
	2001	7	7 (100)	0	0
018-1	2000	27	7 (26)	4 (15)	16 (59)
	2001	31	13 (42)	3 (10)	18 (58)
018-2	2000	80	33 (41)	4 (5)	43 (54)
	2001	31	13 (42)	5 (16)	13 (42)
Sum (%)	2000	354	166 (47)	32 (9)	156 (44)
	2001	346	120 (34)	33 (10)	193 (56)
Average	2000	29.5	13.8	2.7	13
	2001	28.8	9.9	2.8	16

Table 3. Cover class tally for weed species by transect. N = 75 microplots for 1999; 275 microplots for 2000; and 276 microplots for 2001. Cover class values are explained in the text.

Transect	Weed cover class																	
	No weeds			1			2			3			4			5		
Year	99	00	01	99	00	01	99	00	01	99	00	01	99	00	01	99	00	01
700-1	ns			ns			ns			ns	2		ns	7	3	ns	16	22
701-1	ns			ns	2		ns	9	6	ns	6	3	ns	8	8	ns		8
701-2	ns			ns	15	6	ns	10	19	ns			ns			ns		
706-1	ns			ns			ns			ns		2	ns	5	3	ns	20	20
708-1	ns			ns	3		ns	13	7	ns	6	6	ns	3	9	ns		3
715-1	21			4	20	5		5	14			6						
715-2	25	2			8	3		11	7		4	13						
715-3	14			10	1		1	21	10		3	13						
015-1	ns			ns	1		ns	12	10	ns	10	6	ns	1	7	ns	1	2
018-1	ns			ns	3	5	ns	18	11	ns	4	7	ns			ns		2
018-2	ns			ns	5	1	ns	16	5	ns	4	12	ns		2	ns		5
Total	60	2	0	14	58	20	1	115	89	0	39	68	0	24	32	0	37	62
Total %	80	<1	0	19	21	7	1	42	32	0	14	25	0	9	12	0	13	23

ns=not sampled (only the three transects at Camel's Back Reserve sampled in 1999).

Table 4. Cover class tallies for individual weed species.

Species	Weed cover class										# of microplots (%)	
	1		2		3		4		5		00	01
	00	01	00	01	00	01	00	01	00	01		
Cheatgrass (<i>Bromus tectorum</i>)	60	47	116	82	37	54	26	36	33	53	272 (99)	272 (99)
Bulbous bluegrass (<i>Poa bulbosa</i>)	21	39	20	31	1	3		1		2	42 (15)	76 (28)
Storksbill (<i>Erodium cicutarium</i>)	123	115	8	22							131 (48)	137 (50)
Desert alyssum (<i>Alyssum desertorum</i>)	93	87	3	13							96 (35)	100 (36)
Tumblemustard (<i>Sisymbrium altissimum</i>)	16	3	2								18 (7)	3 (1)
Blue bachelor buttons (<i>Centaurea cyanus</i>)	26	16	1	2							27 (10)	18 (7)
Rush skeletonweed (<i>Chondrilla juncea</i>)	11	9	6	7							17 (6)	16 (6)
Prickly lettuce (<i>Lactuca serriola</i>)	1	3									1 (<1)	3 (1)
Yellow salsify (<i>Tragopogon dubius</i>)	7	5									7 (3)	5 (2)

Table 5. Ground disturbance cover class summary, 1999 - 2001. Cover classes are explained in the text.

Transect	Year	Ground disturbance cover classes										
		0	10	20	30	40	50	60	70	80	90	98
700-1	2000	16	7	2								
	2001	17	8									
701-1	2000	25										
	2001	24	1									
701-2	2000	3	12	10								
	2001	4	21									
706	2000	19	6									
	2001	19	6									
708	2000	10	14	1								
	2001	3	13	6	3							
715-1	1999		2	3	4	3	2	4		4	3	2
	2000						1	1		7	12	4
	2001						1	2	6	3	10	4
715-2	1999		3	1		1		2		2	6	10
	2000		3	2	3		1	1	2	1	4	8
	2001						1	1		5	10	8
715-3	1999	25										
	2000	15	4	2	4							
	2001	1	7	6	9	2						
015-1	1999											
	2000	19	5	1								
	2001	15	9	1								
018-1	2000	2	13	10								
	2001	1	4	4	2	1	2	1	3	4	3	

018-2	2000	9	15									
	2001	1	3	5	2	2	2	2	3	5		
Totals (%)	2000	118 (43)	79 (29)	28 (10)	8 (3)	0	2 (<1)	2 (<1)	2 (<1)	8 (3)	16 (6)	12 (4)
	2001	85 (31)	72 (26)	22 (8)	16 (6)	5 (2)	6 (2)	6 (2)	12 (4)	17 (6)	21 (8)	12 (4)

Table 6. Erosion gully measurements for Lower Powderhouse Gulch.

Transect point	Breast height measurement (m)	
	2000	2001
10 m	3.7	4.5
25 m	3.3	no
50 m	2.7	2.8
75 m	7.9	7.7
100 m	6.7	6.6

no = no measurement made

Table 7. Vegetation plot data for Mulford's milkvetch monitoring stations, 2000 and 2001. Cover class values are explained in the text.

Species	Transect																						Constancy	
	700-1		701-1		705-1		706-1		708-1		715-1		715-2		715-3		015-1		018-1					
	Year	00	01	00	01	00	01	00	01	00	01	00	01	00	01	00	01	00	01	00	01	00	01	
Shrubs																								
<i>Chrysothamnus nauseosus</i>	10	3	10	3	3	3	10	3	10	20	3	3	20	20	20	20	20	20	20	1		100	90	
<i>Chrysothamnus viscidiflorus</i>							3	3	1	1	1	1	1	1			3	3				50	50	
<i>Eriogonum microthecum</i>																				1	1	10	10	
<i>Purshia tridentata</i>	3	10	3	3	10	10	10	10									1	1	20	20	60	60		
Graminoids																								
<i>Agropyron spicatum</i>			1	3	1	1	1													3	3	40	30	
<i>Aristida longiseta</i>	3	3	10	10	3	3	1	1	3	3			1	3	1	3	30	20			80	80		
<i>Bromus tectorum</i>	80	80	50	60	60	80	80	80	30	60	60	70	40	80	50	60	20	30	10	10	100	100		
<i>Festuca sp. (annual)</i>			1	3		1												1			10	30		
<i>Oryzopsis hymenoides</i>																				1	1	10	10	
<i>Poa bulbosa</i>	1	1	3	3			1				3	3	1	1	3	1			1	3	70	60		
<i>Poa secunda</i>	1	1	1	3	1	3	1	3	1	1	1	10	1	1	1	3	10	10	3	1	100	100		
<i>Secale cereale</i>					1	1	1	1			3	3	1		1						50	30		
<i>Sitanion hystrix</i>															1						10	0		
<i>Stipa comata</i>	10	10	10	10	3	3	10	10		1	10	20	20	20	10	20					70	80		
Forbs																								
<i>Achillea millefolium</i>	1		1	1	1		1	1	1	1	1	1			1	1					70	50		
<i>Allium aaseae</i>								1					1	1			1	1			20	30		
<i>Allium acuminatum</i>	1																				10	0		

<i>Alyssum desertorum</i>					10	10			1	1	1	1	3	10					3	3	50	50			
<i>Ambrosia artemisiifolia</i>			1		1				1	1	1	1			1	1	1				60	30			
<i>Amsinckia retrorsa</i>	1	1			1		1	1													30	20			
<i>Amsinckia tessellata</i>											1	1							1	1	20	20			
<i>Antennaria dimorpha</i>				1													1	1			10	20			
<i>Astragalus mulfordiae</i>	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	100	100	
<i>Astragalus purshii</i>			1	1											1	1		1			20	30			
<i>Balsamorhiza sagittata</i>			1	3									1	1	1	1					30	30			
<i>Brodiaea douglasii</i>		1	1	1		1	1	1	1	1	1	1	1	1	1	1					60	80			
<i>Calochortus</i> sp						1															0	10			
<i>Centaurea cyanus</i>	3	3	1	1						3					1	1					30	40			
<i>Chaenactis douglasii</i>			1		1	1	1	1	1												40	20			
<i>Chondrilla juncea</i>	1	1	3	3	1	1	1	1	3	3	1	1	1	1	3	3	1				90	80			
<i>Comelina microcarpa</i>												1									0	10			
<i>Commandra umbellata</i>							1	1													10	10			
<i>Crepis occidentalis</i>			1	1																	10	10			
<i>Cryptantha circumscissa</i>							1														10	0			
<i>Cryptantha flaccida</i>	1	1				1			1	1					1	1		1	1		40	50			
<i>Delphinium andersonii</i>																			1	1	10	10			
<i>Descurainia richardsonii</i>																			1	1	10	10			
<i>Draba verna</i>									1						1						20	0			
		700-1	701-1	705-1	706-1	708-1	715-1	715-2	715-3	015-1	018-1	Constancy													
	Year	00	01	00	01	00	01	00	01	00	01	00	01	00	01	00	01	00	01	00	01	00	01		
<i>Epilobium brachycarpum</i>						1								1			1	1			30	10			
<i>Eriogonum strictum</i>					1	1	1	1									1		1	1	40	30			
<i>Eriophyllum lanatum</i>					1	1															10	10			
<i>Erodium cicutarium</i>	3	1	1	1	1	1			1	1	1	1	3	3	3	1	3	1	1	1	90	90			
<i>Galium aparine</i>																			1	1	10	10			
<i>Gilia leptomeria</i>						1	1	1													20	10			
<i>Grindelia squarrosa</i>			1												1						20	0			
<i>Holosteum umbellatum</i>				3	1	1	1	1	1				1			1	1	1			50	60			
<i>Lactuca serriola</i>		1							1	1								1			10	30			
<i>Layia glandulosa</i>						1	1														10	10			
<i>Lomatium triternatum</i>			1	1							1	1	1	1			1	1			40	40			
<i>Machaeranthera canescens</i>	1	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	100	100
<i>Mentzelia albicaulis</i>																			1	1	10	10			
<i>Oenothera pallida</i>	1								1	1	3	1	1								40	20			
<i>Oenothera scapoidea</i>	1								1	1					1	1	1				40	20			
<i>Phacelia heterophylla</i>	3	3	1	1	1	1	1	1	1	1			1	1	1	1			1	1	80	80			
<i>Phacelia linearis</i>							1										1	1	1	1	30	20			
<i>Phlox longifolia</i>				1																	0	10			
<i>Plantago patagonica</i>			1	1					1	1					1	1	1	1			40	40			
<i>Polygonum douglasii</i>						1			1		1										30	0			
<i>Salsola iberica</i>						1															10	0			
<i>Sisymbrium altissimum</i>	1	1	1			1	1	1	1	1	1				1						60	40			
<i>Taraxacum officinale</i>										1											10	0			
<i>Tragopogon dubius</i>			1	1	1				1	1						1	1	1			40	40			

Ground cover																									
Soil	80	80	70	na	80	80	60	60	80	80	80	80	80	80	80	80	70	70	80	80					
Gravel	1	1	1	na	3	3	0	0	0	0	1	1	3	3	1	1	1	1	1	1					
Rock	0	0	1	na	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1					
Litter	10	20	10	na	20	20	20	20	10	10	10	10	10	10	10	10	10	10	10	10					
Wood	1	1	0	na	1	1	1	1	1	1	0	0	1	1	0	0	1	1	0	0					
Moss/lichen	1	1	10	na	3	3	20	20	3	3	1	1	1	1	10	10	20	20	3	3					
Basal vegetation	10	10	10	na	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	3	3				

na = information not collected

Table 8. Plant community changes at Mulford's milkvetch monitoring transects.

Transect area	Plant community changes 2000 vs. 2001
Lower Powderhouse Gulch (700)	No changes
MRP - Veterans Ridge (701)	The annual, introduced forb jagged chickweed (<i>Holosteum umbellatum</i>) was common in 2001, but missed in 2000
MRP - Cemetery Ridge E (705)	Increase in cheatgrass cover
MRP - Cemetery Ridge W (706)	No changes
Lower Hulls Gulch (708)	Increase in cheatgrass cover; the weed species blue bachelor buttons recorded for the first time in 2001
Camels Back Reserve (715-1)	Increase in Sandberg's bluegrass (<i>Poa secunda</i>) cover
Camels Back Reserve (715-2)	Increase in cheatgrass cover
Camels Back Reserve (715-3)	No changes
Seamans Gulch (015)	Rush skeletonweed present in trace amount in 2000, but not recorded in 2001
Middle Stewart Gulch (018)	No changes

Appendix 1

Sampling information and transect notes for 2001.

Transect information

All compass readings were taken with declination set at 16°.

700 Lower Powderhouse Gulch

Transect 700-1

Transect bearing = 112°. The transect runs parallel to and just below the south crest of a spur ridge. The marker stake position is slightly higher than the end point of the transect. Mulford's milkvetch census information is sampled on both sides of the transect tape. Weed and ground disturbance cover class information is collected on the uphill (left-hand) side of the transect tape. The vegetation plot is located on the southerly-facing slope immediately below the transect, with plot center positioned 11.3 m downslope from the 13 m mark along the transect tape. This makes the 13 m mark the top of the plot.

In addition to the Mulford's milkvetch transect, a special "ground disturbance" transect has also been established to monitor size changes to the large erosion gully bisecting this occurrence. A series of photographs are taken from the east rim of the gully at the 10 m, 25 m, 50 m, 75 m, and 100 m transect marks. A series of gully width measurements at breast height are made at these same transect marks.

701 Military Reserve - Veterans Ridge - This occurrence has two transects.

Transect 701-1

Transect bearing = 312°. The transect runs roughly parallel to the slope. Mulford's milkvetch census information is sampled on both sides of the transect tape. Weed and ground disturbance cover class information is collected on the uphill (left side) of the transect tape. The 10 m point of the transect tape serves as the center of the vegetation plot.

Transect 701-2

Transect bearing = 323°. The transect runs parallel to the slope, more or less along the west (left-hand when facing uphill) edge of a sandy dirt track used by hikers and bicyclists. Mulford's milkvetch census information is sampled on both sides of the transect tape. Weed and ground disturbance cover class information is collected on the right side (when facing uphill at the marker stake) of the tape. Separate vegetation plot data are not collected for this transect because it is located so close to 701-1.

705 Military Reserve - Cemetery Ridge/East - This is a small occurrence, about 0.1 acre in size, located on a steep, southeast-facing, sandy slope with open bitterbrush and intermixed gray rabbitbrush. These conditions are not conducive to a monitoring transect. Census information is collected by walking around and counting all the Mulford's milkvetch plants in the area. Weed and ground disturbance cover class data are not collected. The occurrence is permanently marked with a rebar stake, which serves as the center point for the vegetation plot and the reference point for taking photographs.

706 Military Reserve, Cemetery Ridge/West

Transect 706-1

Transect bearing = 14° . The transect runs perpendicular to the slope. Mulford's milkvetch census information is sampled on both sides of the transect tape. Weed and ground disturbance cover class information is collected on the uphill (right side) of the transect tape. The 13 m mark of the transect tape serves as the center for the vegetation plot.

708 Lower Hulls Gulch

Transect 708-1

Transect bearing = 258° . The transect runs more or less perpendicular to the gentle lower slope. Mulford's milkvetch census information is sampled on both sides of the transect tape. Weed and ground disturbance cover class information is collected on the uphill (right side) of the transect tape. The vegetation plot is centered at the 15 m mark of the transect tape.

715 Camel's Back Reserve - This occurrence has three transects. Detailed information about the transects is provided in an earlier report (Mancuso 1999).

Transect 715-1 (equals 1999 transect CB-1)

Transect bearing = 197° . The transect runs perpendicular to the slope along the uphill margin of a pedestrian trail. Microplots for Mulford's milkvetch census, weed, and ground disturbance information are sampled on the uphill side of the transect tape. I sampled 26 m for this transect to capture a relatively dense cluster of Mulford's milkvetch plants just beyond the 25 m mark. The vegetation plot is centered at the 13 m mark of the transect, and includes sections of the west-facing slope located both uphill and downhill of the transect.

Transect 715-2 (equals 1999 transect CB-2)

Transect bearing = 186° . The transect runs downhill, parallel to the slope, along the margin of a closed dirt path. Mulford's milkvetch census information is sampled on both sides of the transect tape. Weed and ground disturbance cover class information is collected on the right (west) side of the tape. The vegetation plot is located on an adjacent, steep, southeasterly-facing slope to minimize impacts to the very erosive transect area. The eastern post of the split-rail fence passing above the transect forms the uphill edge of the vegetation plot.

Transect 715-3 (equals 1999 transect CB-3)

Transect bearing = 298° . The transect runs uphill, parallel to the slope along the north (right-hand side when facing uphill) margin of an old tread. Mulford's milkvetch census information is sampled on both sides of the transect tape. Weed and ground disturbance cover class information is collected on the left side of the tape when facing uphill. The vegetation plot is centered at the 13 m mark of the transect.

015 Seaman Gulch

Transect 015-1

Transect bearing = 336° . The transect runs along and perpendicular to the upper slope, just below the ridgecrest. Mulford's milkvetch census information is sampled on both sides of the transect tape. Weed and ground disturbance cover class information is collected on the downhill (left) side of the tape. The vegetation plot is located on the southwest-facing slope below the transect, with plot center situated 11.3 m downhill from the 13 m mark on the transect tape. The middle of the transect forms the top of the vegetation plot with this layout.

018 Middle Stewart Gulch - This is a large occurrence, most of which is located on private land. Two monitoring transects have been established in close proximity to each other on BLM land, in the northeastern corner of the occurrence.

Transect 018-1

Transect bearing = 153°. The transect runs perpendicular to the slope. Mulford's milkvetch census information is sampled on both sides of the transect tape. Weed and ground disturbance cover class information is collected on the uphill (left) side of the transect tape. The transect area is comprised of unconsolidated sand and care must be taken to minimize trampling the milkvetch and its habitat. The vegetation plot is centered 15 m uphill from the transect tape's 13 m mark to avoid further trampling along the transect.

Transect 018-2

Transect bearing = 161°. The transect runs perpendicular to the slope and is located roughly 50 paces downhill from transect 018-1. There is a cluster of large strict buckwheat (*Eriogonum strictum*) plants located close to the rebar marker stake. There are no fenceposts or other conspicuous reference points to base measurements and help relocate the transect stake. A separate vegetation plot was not done for transect 018-2 because of its close proximity and generally similar vegetation to 018-1.

Transect observations for 2001

700 Lower Powderhouse Gulch - the most vigorous Mulford's milkvetch plants were the few established in small, more or less weed-free openings. Some Mulford's milkvetch plants were hard to see due to the dense cheatgrass understory. Soil mounds (rodent and perhaps also fox) were common on the northeast-facing slope below the transect. Rush skeleton weed was more common on this slope.

701 Military Reserve – Veterans Ridge - Boise City Parks and Recreation was scheduled to do some restoration work along the trails in the immediate vicinity of this transect sometime during the summer of 2001. It was difficult to distinguish *Stipa comata* and *Aristida longiseta* at the time vegetation plot information was collected.

706 Military Reserve, Cemetery Ridge/West - no new disturbances were observed in the transect area.

708 Lower Hulls Gulch - lots of animal tracks/divots were observed around the transect area.

715 Camel's Back Reserve

715-1: the transect is located along a very popular hiking/biking trail. Disturbances related to these activities impact the uphill side of the trail where Mulford's milkvetch plants occur.

715-2: although signed as "closed", the steep trail still gets used by some people. The transect looked different compared to 1999. Some filling in of the badly eroded dirt path has occurred. It now has more of a "U-shape" versus "V-shape" cross-section. Cheatgrass has become established on portions of the berm bank that have become relatively stabilized. I recommend putting a 25 m marker stake in the ground to assist with transect placement in the future.

715-3: although "closed", people still occasionally walk up and down the old tread where most of the Mulford's milkvetch plants occur. The lower half of the tread has more bare ground than further upslope. None of the Mulford's milkvetch plants looked trampled in 2001. Rush skeletonweed was more common on the slope than along/within the tread.

015 Seaman Gulch - no new disturbances observed, although deer tracks were common in the transect area. Between 30 and 35 flowering Mulford's milkvetch plants were counted on the slope around the transect. Most plants were relatively large (older?), but a few smaller ones also occurred. I gave Mr. David Neal and Mr. Ted Hutchinson with the Ada County Landfill a letter outlining the Landfill's role in the Mulford's milkvetch monitoring program. The landfill plans to remove approximately 2 million cubic yards of soil from the small valley located northwest of the transect to cover the portion of the landfill now done with. It is unclear to me how or if this will affect the Mulford's milkvetch population. The landfill has been receiving requests for permission to open the area for recreational purposes.

018 Middle Stewart Gulch

018-1: deer tracks were abundant (1000s) in the transect area. Recent motorcycle tracks occurred just downslope of the transect.

018-2: abundant deer tracks in the area, although they were not as deep as in the softer sand at 018-1. Recent motorcycle tracks passed within ten feet of the transect. The track leading to the transect area was observed cutting down the steep south-facing slope north of the transect (probably off the powerline road). Someone went "gonzo" on their motorcycle.

Appendix 2

Mulford's milkvetch 2001 monitoring transect data sheets.

Appendix 3.

Weed species cover class data by transect for 2000 and 2001.

Weed species cover class data by transect for 2000 and 2001.

<i>Bromus tectorum</i>												<i>Poa bulbosa</i>											
Weed cover class												Weed cover class											
0		1		2		3		4		5		0		1		2		3		4		5	
00	01	00	01	00	01	00	01	00	01	00	01	00	01	00	01	00	01	00	01	00	01	00	01
700-1							2		12	4	11	21	no	22		3							
701-1			2		11	7	4	4	8	8		6	19	14	3	3	3	6		2			
701-2		3	21	14	4	8							8	2	9	10	8	13					
706-1								2	4	3	21	20	no	23		2							
708-1			3		13	8	8	8	1	8		1	no	no									
715-1		1		11	20	8	5	6					no	19		6		1					
715-2	2		11	3	8	12	4	8		2			21	21	2	4	2						
715-3			2		21	10	2	14		1			no	24			1						
015-1			2		11	10	10	6	1	7	1	2	no	no									
018-1	1		6	11	16	11	2	2				1	13	11	6	5	6	7	1	1		1	
018-2			13	8	12	8		4		3		2	23	14	1	6	1	3				2	
sum			60	47	116	82	37	54	26	36	33	53			21	39	20	31	1	3	0	1	
<i>Erodium cicutarium</i>												<i>Alyssum desertorum</i>											
Weed cover class												Weed cover class											
00	01	00	01	00	01	00	01	00	01	00	01	00	01	00	01	00	01	00	01	00	01	00	01
700-1	3	3	14	8	8	14							no	no									
701-1	9	18	16	6		1							no	no									
701-2	7	15	18	9		1							no	no									
706-1	no	no											no	no									
708-1	19	11	6	12		2							no	no									
715-1	17	11	8	14		1									25	26							
715-2	13	6	12	18		1							6	1	19	23		1					
715-3	5	6	20	18		1							24	no	1								
015-1	10	8	14	16	1	1							no	no									
018-1	14	16	11	9											24	21	1	4					
018-2	22	20	3	5											23	17	2	8					
sum			122	115	9	22									92	87	3	13					
<i>Sisymbrium altissimum</i>												<i>Centaurea cyanus</i>											
Weed cover class												Weed cover class											
0		1		2		3		4		5		0		1		2		3		4		5	
00	01	00	01	00	01	00	01	00	01	00	01	00	01	00	01	00	01	00	01	00	01	00	01
700-1	15	24	10	1									11	13	13	12	1						
701-1	no	no											21	23	4	2							

Appendix 4

Plant community data sheets for 2001.