MONITORING HABITAT INTEGRITY FOR *LEPIDIUM PAPILLIFERUM* (SLICKSPOT PEPPERGRASS): 1999 RESULTS

by

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ABSTRACT

Lepidium papilliferum (slickspot peppergrass) is one of Idaho's highest priority plant conservation concerns, highlighted by the U.S. Fish and Wildlife Service's 1999 proposal to list it under the Endangered Species Act. Dramatic losses to, and the diminished ecological quality of most of Idaho's western Snake River Plain sagebrush-steppe habitat are the primary reasons for much of the species' decline. In response to growing conservation concerns, a Habitat Integrity Index was developed to assess conditions and monitor the rangewide and long-term ecological integrity of slickspot peppergrass habitat. Forty of the 50 known extant occurrences of slickspot peppergrass are included in the monitoring program. Baseline index and associated monitoring data were collected in 1998. This report summarizes the results from the second year of sampling completed in 1999. Overall, habitat attribute scores were similar, indicating little change in ecological habitat integrity between the two years. Tallies for livestock disturbance sign were also similar, but the abundance of slickspot peppergrass was significantly less in 1999. Factors affecting the viability and defensibility of each occurrence were also reassessed. New threats, not present in 1998, were observed at seven occurrences. At some point in the near future, we hope the monitoring program is just one component of a comprehensive and integrated conservation plan for the sagebrush-steppe of southwestern Idaho and associated obligate species such as slickspot peppergrass.

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INTRODUCTION

Lepidium papilliferum (slickspot peppergrass) is a small annual/biennial plant species endemic to southwestern Idaho. It has become one of the highest priority plant conservation concerns in the state. One reason is that it has the highest documented extirpation rate for any of Idaho's rare flora (Moseley 1994), due largely to the combination of outright loss and dramatic ecological decline of most of the western Snake River Plain's sagebrush-steppe habitat. The conservation concern for slickspot peppergrass was highlighted in 1999, when the U.S. Fish and Wildlife Service (1999) proposed to list this species under the Endangered Species Act.

Monitoring is recognized as an integral conservation tool (Noss and Cooperrider 1994), but has been limited for slickspot peppergrass. Earlier monitoring efforts concentrated on collecting demographic information at populations within the Idaho Army National Guard's Orchard Training Range, southeast of Boise (Quinney 1998). In light of the growing conservation concern for slickspot peppergrass it became evident that a more comprehensive monitoring program was needed. Furthermore, it was recognized that monitoring should focus on the species' habitat. In 1997, the Conservation Data Center (CDC) collaborated with the Idaho Army National Guard to develop a Habitat Integrity Index (HII) to assess and monitor the rangewide and long-term ecological integrity of slickspot peppergrasss habitat (Mancuso and Moseley 1998). This information will be used to assess and document habitat integrity trends and help promote slickspot peppergrass conservation. Use of the HII began in 1998, with the establishment and sampling of monitoring transects at 37 slickspot peppergrass occurrences (Mancuso et al. 1998). Another round of sampling was completed in 1999, when all the original transects except one were revisited, and three additional occurrences were added to the monitoring program. This report summarizes our 1999 results and makes comparisons to the 1998 data set.

METHODS

Background information and the HII methodology and associated plant community sampling, viability rank assignment, and photo documentation protocols were explained in a previous report (Mancuso and Moseley 1998). Further details were provided with last year's results (Mancuso et al. 1998). In 1999, monitoring consisted of resampling the HII transects, taking repeat photo-point photographs, reassessing Occurrence Viability ranks, and for the new occurrences added to the monitoring program, also collecting plant community data. In addition, fieldnotes were taken to (a) clarify the location of, and access to transects; (b) help relocate transect marker stakes; and (c) improve consistency for future resampling. Other fieldnotes were taken concerning (a) the abundance of slickspot peppergrass; (b) plant community patterns; and (c) livestock and other animal disturbances. These fieldnotes are all summarized in Appendix 1.

Habitat Integrity Index

1) It was understood from the beginning that one or two field seasons would be required to complete fine-tuning the HII protocol. Several modifications to the HII were made in 1999 to ensure the scores more fully reflected the range in variability displayed in the field. The improvements to HII attributes #4 and #5 were based on experience gained the first year of sampling in 1998. An updated HII scorecard field form incorporating the following modifications appears in Appendix 2.

Attribute 4. What is the average density of weedy annual species?

Scores in 1998 were:	Scores for 1999 were modified to:
0 = <10 plants/sq.ft.	0 = <10 plants/sq.ft
1 = 10 – 50 plants/sq.ft.	1 = 10 - 25 plants/sq.ft

2 = >50 plants/sq.ft.	2 = >25 plants/sq.ft.

The changes were made because the density of weedy species such as cheatgrass, clasping peppergrass, and bur buttercup in severely disturbed slickspots is typically >25, but only rarely surpasses >50 plants/sq.ft.

Attribute 5. Are rabbitbrush or other shrub species established within the slickspot?

Scores in 1998 were:	Scores for 1999 were modified to:
0 = no	0 = 2 or fewer plants
1 = yes	1 = >2 individuals.

Furthermore, seedlings should not be counted when determining this attribute because there may be a flush of sagebrush or rabbitbrush germination following spring rains, but few if any of them will persist within the slickspot.

2) One additional modification is now recommended for future versions of the HII scorecard.

Attribute 3. Are weedy annual species present in the slickspot?

Attribute scoring should be changed from 0 = none, and 1 = one or more; to 0 = none or <5 individual plants, and 1 = one or more. Even the highest quality slickspot in the most intact habitat will usually have a few blades of cheatgrass. For this reason nearly every slickspot station scored a “1” in both 1998 and 1999. Modifying the scoring will help differentiate the highest quality transects.

3) After two seasons of sampling, clarifications for most of the other HII attributes are in order to ensure a more consistent interpretation in the future.

Attribute 7. How much livestock disturbance sign (tracks/scat) is present within the slickspot?

Livestock evidence from the “current” year usually poses no interpretation problems. However, the identification of older tracks can be less clear cut. Although many old divots and markings may have originated from livestock prints, they should only be counted if sufficient detail remains for a positive identification.

Attribute 9. Fire history.

Score “2” is defined as a mosaic of burned and unburned habitat. The definition has been clarified to account for occurrences comprised of distinct burned and unburned areas, as opposed to a more mosaic pattern. Therefore, the description for the score has been changed to “mosaic of burned/unburned, or distinct burned/unburned areas.”

Attribute 9d. Fire history of the entire occurrence.

This attribute can be confusing for many of the smaller occurrences. To clarify scoring, attribute 9d has been modified to the “scale of surrounding 50-200 acres”. This is a radius of up to about 500m from the point of reference.

Attribute 10. Do livestock use the general occurrence area?

This attribute has been reworded to read - “What is the level of livestock use in the area surrounding the slickspot station?” The degree of livestock use tends to be consistent over an area the size of a typical occurrence and it is not uncommon for all the stations along a particular transect to have the same score for this attribute. A one acre area is the intended scale for

scoring this attribute. This equals about a 35m (120ft) radius centered around the slickspot station.

Attributes 11, 12, 13 and 14.

A one acre area is the intended reference scale for scoring these attributes. Again, this equals about a 35m (120ft) radius centered around the slickspot station.

Occurrence Viability Rank

Part of the *Lepidium papilliferum* Occurrence Viability Rank form is based on the HII score. A minor modification to grading the score will improve its consistency with the Integrity condition rating portion of the protocol. Appendix 3 contains an updated Occurrence Viability Rank form that incorporates this adjustment.

Data base information

The discovery of new sites and the expansion of previously known sites over the past two years has led to changes in the way the CDC tracks slickspot peppergrass occurrences in the Inside Desert area. Based on new field survey information, several former occurrences were lumped together, while others were split into two occurrences. For data management purposes, all of the occurrences in the Inside Desert are now considered to be part of the Juniper Butte metapopulation. Because of this change, the Element Occurrence Record numbers also had to be changed to meet CDC data management protocol for tracking metapopulations. The metapopulation is presently comprised of 11 occurrences, numbered 700 – 710. Six of these occurrences are currently part of the HII monitoring program. The transects at Post Office Reservoir (701, formerly 051), Three Creek Well (702, formerly 063 as part of the Flat Draw Reservoir occurrence), and Poison Creek North (708, formerly 059) were established in 1998, while transects at Juniper Butte North (704), Juniper Butte South (707), and Juniper Butte West (709) were added in 1999. This report references the occurrences using the new 700 number series.

The land unit area being monitored for the HII is the Element Occurrence (EO), a biologically-based data management unit used to track elements of biodiversity by the Natural Heritage Program/Conservation Data Center network. A three-digit reference code for each occurrence corresponds to the record number in the Idaho Conservation Data Center data base. Each occurrence also has a survey site name related to a nearby geographic reference. The occurrences included in the HII project are listed in Table 1.

Table 1. Occurrences of *Lepidium papilliferum* included in the HII monitoring program.

EO #	**Name**		**EO #**	**Name**
Kuna/Boise area			Boise/Eagle Foothills	
018	Kuna Butte SW		012	Military Reserve Park
019	Initial Point		038	Goose Creek
022	Pleasant Valley North		040	Woods Gulch
024	Kuna Butte		047	Willow Creek
025	Melba Butte		052	Woods Gulch
032	Tenmile Creek		056	Willow Creek
048	South Cole Road/Tenmile Ck.		065	Lower Seaman Gulch

049	Fivemile Creek		Mt. Home/Glenns Ferry area	
057	Kuna Butte Northwest		008	Bennett Road
066	New Plymouth SW		010	Chalk Flat
Orchard area			021	Fraser Reservoir East
015	Simco Road		029	Mountain Home SE
020	Soles Rest Creek		050	West Side Canal/Slade Flat W
027	West of Orchard		058	Glenns Ferry NW
028	Christmas Mountain N		061	SE of Reverse
030	Soles Rest Creek		Inside Desert area	
031	Bowns Creek		701	Post Office Reservoir
035	Orchard Southwest		702	Three Creek Well
041	Orchard SSW		704	Juniper Butte North
053	Christmas Mountain		707	Juniper Butte South
060	West of Squaw Creek		708	Poison Creek North
			709	Juniper Butte West

RESULTS

Habitat Integrity Index

The Habitat Integrity Index uses a series of scored attributes to assess conditions and monitor trends to the ecological integrity of slickspot peppergrass habitat. Baseline HII and associated plant community, photo points, and viability rank information were collected at 37 slickspot peppergrass occurrences using 45 permanently marked transects established and sampled in 1998. The results from 1998, along with information concerning the establishment of the transects were summarized in last year's report (Mancuso et al. 1998). A second year of HII monitoring data were collected in 1999, when we were able to resample all but one of the original transects. The Post Office Reservoir (701) occurrence could not be accessed due to a water pipeline improvement project.

Following one of the recommendations made in last year's report, we expanded the monitoring program in 1999 to include three additional occurrences in the Inside Desert area. One transect was established at each of the Juniper Butte North (704), Juniper Butte South (707), and Juniper Butte West (709) occurrences. Map locations for the new transects are in Appendix 4, with additional transect location, GPS coordinate, and sampling information in Appendix 5. A total of 47 transects at 39 occurrences were sampled in 1999, between June 23 and July 16.

New disturbances were not observed at any of the occurrences, and scores for most transects were similar to 1998. It became clear in 1999, that factors other than changing habitat integrity can affect the HII attribute scores. Different weather/precipitation patterns and a degree of subjectivity during the scoring process likely accounts for the discrepancy between some of the 1998 and 1999 attribute scores. In addition, modifications made to two of the attributes in 1999 affected the way they were scored. The relationship between the HII attributes and these factors are briefly discussed.

Attributes 1 and 2 – These are probably the two most subjective attributes in the HII, making them more sensitive to sampling interpretation.

Attribute 3 – Annual weed germination is sensitive to seasonal weather patterns and the lower scores observed at several transects in 1999 can probably be attributed to the cooler and drier spring compared to 1998.

Attributes 4 and 5 – The scoring for these two attributes was amended in 1999. As a result many transects had lower scores in 1999 compared to last year. In the absence of new disturbances

there will probably be less variability in the future. However, attribute 4 is sensitive to annual precipitation patterns and scores may fluctuate regardless.

Attribute 6 – This attribute may be somewhat sensitive to annual weather patterns, but is assumed to be more sensitive to changes in the physical and chemical make-up of the slickspots.

Attributes 7 and 10 – Scores for this attribute reflect livestock use in the occurrence area. Different year to year scores can be expected if livestock management is different one year to the next.

Attributes 8 and 11 – Scores for these attributes depend on ORV use in the occurrence area. This use can be different from one year to the next. Because of the different scales involved, attribute 11 can be sensitive to changes in ORV use that may not affect the scores for attribute 8.

Attributes 9a to 9d – No new wildfires were observed at any of the occurrences with HII transects. As a result, the 1998 and 1999 scores should have been identical. In a few cases they were not due to different interpretations of the attribute criteria.

Attributes 12 and 13 – Annual grass and weedy annual forb abundance are sensitive to fluctuations in seasonal weather patterns. The lower scores observed at many transects for attribute 13 can probably be attributed to the cooler and drier spring compared of 1999.

Attribute 14 – At several transects, scores for this attribute were lower in 1999. This suggests that the ability to see and estimate microbiotic crust cover may be affected by seasonal weather patterns, and perhaps also the time of year sampling is done.

Slickspot microsite, sagebrush-steppe, and combined HII attribute scores for 1999 are listed in Table 2, along with 1998 scores for comparison. The Integrity condition ratings for each occurrence are also listed and will be discussed in a later section of this report. Copies of the completed 1999 HII field forms are in Appendix 6. A 1998 versus 1999 comparison of attribute scores for each transect is summarized in Appendix 7.

Slickspot microsite attributes

The first eight attributes in the HII pertain to the integrity of individual slickspot microsites. In 1999, the majority of slickspots sampled along a majority of transects had some level of organic material accumulation (74%; attribute 1); had some loss of slickspot perimeter distinctness (56%; attribute 2); and had evidence of livestock disturbance (62%; attribute 7). In contrast, a minority of slickspot stations showed moderate to high levels of weed invasion (28%; attributes 3 and 4); shrubs (17%; attribute 5), or perennial forbs or grasses (25%; attribute 6) established in them; or evidence of ORV-use (11%; attribute 8).

Table 3 summarizes the 1999 slickspot microsite data in two ways – by individual slickspots stations, and by transects. The first column lists the number of slickspot stations receiving a score “0”, “1”, or “2”. In the second column, the most common score for each attribute by transect is reported. An identical summary was done for the 1998 data set (see Mancuso et al. 1998, Table 2) and has been incorporated into the table for comparison. The 1999 data are based on 433 slickspot microsite stations at 47 transects, while the 1998 data set was compiled from 408 microsite stations at 45 transects.

Table 2. Summary of HII scores and Integrity condition ratings.

	Slickspot microsite attributes avg. score			Sagebrush-steppe attributes avg. score			Combined avg. score		[1]Integrity condition rating	
EO	**1998**	**1999**		**1998**	**1999**		**1998**	**1999**	**1998**	**1999**

Kuna/Boise area										
018A	2.5	2.1		16.5	15.3		19.0	17.4		
018B	3.5	4.0		11.6	10.1		15.1	14.1		
018	3.0	3.0		14.0	12.7		17.0	15.7	Poor	Fair
019A	6.7	5.6		20.0	18.0		26.7	23.6		
019B	4.3	2.5		18.0	17.0		22.3	19.5		
019	5.5	4.1		19.0	17.5		24.5	21.6	Poor	Poor
022A	5.9	4.8		16.1	16.8		22.0	21.6		
022B	2.9	2.8		10.0	10.2		12.9	13.0		
022	4.4	3.8		13.1	13.5		17.5	17.3	Poor	Poor
024	4.1	6.5		16.6	13.7		20.7	20.2	Poor	Poor
025	8.0	5.7		14.7	11.6		22.7	17.3	Poor	Poor
032	5.4	2.0		2.5	2.8		7.9	4.8	Good	Good
048	4.5	2.8		3.0	3.1		7.5	5.9	Good	Good
049	5.8	8.8		13.0	14.2		18.8	23.0	Poor	Poor
057	5.1	3.0		4.9	6.6		10.0	9.6	Fair	Fair
066	4.5	5.2		9.6	8.8		14.1	14.0	Fair	Fair
Boise/Eagle Foothills area										
012	5.0	7.0		19.0	16.0		24.0	23.0	Poor	Poor
038	2.0	4.0		15.0	13.0		17.0	17.0	Poor	Poor
040	4.7	5.2		4.0	3.7		8.7	8.9	Fair	Fair
047	5.2	5.6		20.0	17.7		25.2	23.3	Poor	Poor
052	3.4	3.1		14.0	12.0		17.4	15.1	Poor	Fair
056	5.7	5.3		14.8	14.0		20.5	19.3	Poor	Poor
065	3.0	2.7		8.0	9.2		11.0	11.9	Fair	Fair
Orchard area										
015	4.6	2.7		20.0	19.0		24.6	21.7	Poor	Poor
020A	7.7	5.4		18.0	15.8		25.7	21.2		
020B	4.7	3.6		6.0	6.0		10.7	9.6		
020	6.1	4.5		12	10.9		18.1	15.4	Poor	Fair
027A	6.1	4.5		1.0	1.0		7.1	5.5		
027B	6.9	5.7		10.3	7.5		17.2	13.2		
027	6.5	5.1		5.7	4.3		12.2	9.4	Fair	Fair
028A	6.1	3.4		1.4	1.0		7.5	4.4		
028B	3.9	3.3		2.0	1.0		5.9	4.3		
028	5.0	3.4		1.7	1.0		6.7	4.4	Good	Good
030	4.6	3.8		2.1	2.2		6.7	6.0	Good	Good
031	5.4	4.2		7.9	7.3		13.3	11.5	Fair	Fair
	Slickspot microsite attributes avg. score			**Sagebrush-steppe attributes avg. score**			**Combined avg. score**		**Integrity condition rating**	
035A	3.7	2.3		5.2	5.4		8.9	7.7		
035B	5.2	4.8		13.4	12.5		18.6	17.3		
035	4.4	3.6		9.3	9.0		13.7	12.6	Fair	Fair
041	4.8	3.9		17.0	16.0		21.8	19.9	Poor	Poor
053	6.5	3.8		9.0	10.4		15.5	14.2	Fair	Fair
060	6.7	7.2		7.5	4.8		14.2	12.0	Fair	Fair
Mt.Home/Glenns Ferry area										
008A	5.0	4.1		9.5	8.4		14.5	12.5		
008B	4.2	5.4		16.7	15.1		20.9	20.5		
008	4.6	4.8		13.6	11.8		18.3	16.6	Poor	Fair
010	6.3	3.7		14.7	13.5		21.0	17.2	Poor	Poor
021	5.6	4.4		2.0	1.8		7.6	6.2	Good	Good
029	3.7	2.3		10.1	8.2		13.8	10.5	Fair	Fair
050	2.5	2.3		7.8	9.0		10.3	11.3	Fair	Fair
058	4.2	3.2		1.6	2.0		5.8	5.2	Good	Good
061	5.7	6.5		11.5	10.5		17.2	17.0	Poor	Poor
Inside Desert area										
701	3.3	-		6.3	-		9.6	-	Fair	
702	4.6	3.0		6.0	7.3		10.6	10.3	Fair	Fair

704	-	5.3		-	12.6		-	17.9		Poor
707	-	6.6		-	8.7		-	15.3		Fair
708	6.5	6.5		18.7	16.0		25.2	22.5	Poor	Poor
709	-	4.2		-	7.4		-	11.6		Fair

1. For occurrences with two transects, the Integrity condition rating is based on the combined average score of both transects.

Sagebrush-steppe attributes

The second half of the HII focuses on vegetation characteristics of the transect. Attribute 9 looks at fire history. No new wildfires occurred at any of the occurrences in 1999, so the scores for this attribute are unchanged from last year. Some scores were not precisely the same due to inconsistent interpretations of the attribute criteria. Both of the new occurrences added to the HII monitoring program in 1999 supported a mix of unburned, burned, and mosaic burned habitats. Of the 40 occurrences presently included in the monitoring program 11 (27%) are unburned, seven (18%) are completely burned, 14 (35%) have a mosaic burn pattern, and eight (20%) are comprised of distinct burned and unburned segments.

The majority (78%) of occurrences had evidence of livestock grazing (attribute 10), but ORV use (attribute 11) was evident at a minority (23%). Invasive annual grasses (attribute 12) dominated or co-dominated the herbaceous vegetation at most occurrences (92%), in contrast to weedy forb cover (attribute 13), which was no more than sparse at the majority of occurrences (66%). Finally, 50% of the occurrences had high to moderate microbiotic crust cover (attribute 14), while 23% had no more than trace amounts.

Table 4 summarizes the scores for the vegetation characterization. The first column lists the number of slickspot stations receiving a score “0”, “1”, “2”, or “3. In the second column, the most common score for each attribute by transect is reported. A similar summary was done for the 1998 data set (see Mancuso et al. 1998, Table 5). This information has been incorporated into the table for comparative purposes.

Table 3. Summary of HII slickspot microsite attribute scores for 1999 and 1998.

	[1]**Attribute scores by slickspot microsite** Number of slickspots (%)				**Attribute scores by transect** Number of transects (%)		
Slickspot microsite attributes	0	1	2		0	1	2
1. Is organic debris or soil being deposited within the slickspot?							
1999	110 (26)	248 (57)	75 (17)		8 (17)	34 (72)	5 (11)
1998	141 (35)	186 (45)	81 (20)		9 (20)	25 (56)	11 (24)
2. Are the slickspot boundaries (perimeter) compromised?							
1999	191 (44)	155 (36)	87 (20)		19 (40)	19 (40)	9 (20)
1998	173 (42)	154 (38)	81 (20)		14 (31)	24 (53)	7 (16)
3. Are weedy annual species present in the slickspot?							
1999	95 (22)	433 (78)	-		8 (17)	39 (83)	-
1998	19 (5)	389 (95)	-		2 (4)	43 (96)	-
4. What is the average density of weedy annual species?							
1999	313 (72)	99 (23)	21 (5)		33 (70)	11 (24)	3 (6)
1998	211 (52)	165 (40)	32 (8)		21 (47)	22 (49)	2 (4)
5. Are rabbitbrush or other shrub species established within the slickspot?							

1999	359 (83)	74 (17)	-		43 (91)	4 (9)	-
1998	208 (51)	200 (49)	-		23 (51)	22 (49)	-
6. Are perennial forbs or grasses established within the slickspot?							
1999	326 (75)	107 (25)	-		37 (79)	10 (21)	-
1998	244 (60)	164 (40)	-		29 (64)	16 (36)	-
7. How much livestock disturbance sign (tracks/scat) is present within the slickspot?							
1999	165 (38)	154 (36)	114 (26)		19 (40)	17 (36)	11 (24)
1998	146 (36)	157 (38)	105 (26)		17 (38)	19 (42)	9 (20)
8. Are ORV or other vehicle tracks present across the slickspot?							
1999	385 (89)	48 (11)	-		44 (94)	3 (6)	-
1998	386 (95)	22 (5)	-		44 (98)	1 (2)	-

1. The 1999 scores for each attribute are: Attribute # 1: 0 = none, 1=<10%, 2 = >10%; Attribute #2: 0 = no, 1= <10%, 2 = >10%; Attribute #3: 0 = none, 1 = one or more; Attribute #4: 0 = <10 plants/sq.ft., 1 = 10 to 25 plants/sq.ft., 2 = >25 plants/sq.ft.; Attribute #5: 0 = 2 or less plants, 1 = more than 2 plants; Attribute #6: 0 = 3 or fewer plants, 1 = more than 3 plants; Attribute #7: 0 = none, 1 = 1 to 10, 2 = >10; Attribute #8: 0 = no, 1 = yes.

Table 4. Summary of HII sagebrush-steppe attribute scores for 1999 and 1998.

Sagebrush-steppe attributes									
	[1]Attribute scores by slickspot microsite Number of slickspots (%)					**Attribute scores by transect** Number of transects (%)			
	0	1	2	3		0	1	2	3
9a. Fire history – adjacent to slickspot microsite									
1999	241 (56)	-	60 (14)	132 (30)		22 (47)	-	9 (19)	16 (34)
1998	215 (52)	-	70 (17)	127 (31)		22 (49)	-	9 (20)	14 (31)
9b. Fire history – 3 acres									
1999	153 (35)	-	166 (39)	114 (26)		16 (34)	-	10 (40)	12 (26)
1998	154 (37)	-	139 (34)	119 (29)		16 (36)	-	15 (33)	14 (31)
9c. Fire history – 3 to 50 acres									
1999	106 (25)	-	249 (57)	78 (18)		12 (26)	-	25 (53)	10 (21)
1998	108 (26)	-	226 (55)	78 (19)		12 (27)	-	23 (51)	10 (22)
9d. Fire history – 50+ acres									
1999	113 (26)	-	253 (58)	67 (16)		13 (28)	-	25 (53)	9 (19)
1998	115 (28)	-	220 (53)	77 (19)		11 (25)	-	24 (53)	10 (22)
10. Do livestock use the general occurrence area?									
1999	150 (35)	243 (56)	40 (9)	-		18 (38)	25 (53)	4 (9)	-
1998	86 (21)	271 (66)	51 (13)	-		13 (29)	28 (62)	4 (9)	-
11. Do ORV's or other vehicles go off-road in cross-country fashion?									
1999	378 (87)	53 (12)	2 (<1)	-		41 (87)	6 (13)	0 (0)	-
1998	314 (77)	94 (23)	0 (0)	-		36 (80)	9 (20)	0 (0)	-
12. The grass layer is?									

1999	74 (17)	163 (38)	-	196 (45)		8 (17)	20 (43)	-	19 (40)
1998	87 (21)	95 (23)	-	226 (56)		8 (18)	13 (29)	-	24 (54)
13. Are weedy annual or seeded forbs present?									
1999	358 (83)	54 (12)	21 (5)	-		37 (79)	8 (17)	2 (4)	-
1998	229 (56)	121 (30)	58 (14)	-		23 (51)	14 (31)	8 (18)	-
14. How much microbiotic crust cover is there?									
1999	243 (56)	91 (21)	99 (23)	-		24 (51)	12 (26)	11 (23)	-
1998	196 (48)	133 (33)	79 (19)	-		19 (42)	16 (36)	10 (22)	-

Attribute #10: 0 = no evidence, 1 = light to moderate use, 2 = heavy use; Attribute #11: 0 = no, or rare, 1 = light to moderate use, 2 = heavy use; Attribute #12: 0 = clearly dominated by native bunchgrasses, 1 = both bunchgrasses and exotic annual grasses common, 3 = clearly dominated by exotic annual or seeded grasses, native bunchgrasses reduced to remnant status or largely extirpated; Attribute #13: 0 = sparse or absent, 1 = patchy, 2 = widespread and abundant; Attribute #14: 0 = high/moderate (>10%), 1 = low (1-10%), 2 = trace or absent (<1%).

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Integrity condition rating

The Integrity condition rating is a way to depict the HII scores in a habitat condition context. It categorizes the occurrences as either good, fair, or poor. The rating system was updated this year to clarify the category thresholds. The scoring parameters for each category are listed in Table 5, and the Integrity condition rating for each occurrence listed in Table 2 (see page 6).

In 1999, six (15%) occurrences had a “Good”, 18 (46%) a “Fair”, and 15 (39%) a “Poor” Integrity condition rating. All but one of the occurrences with a rating of Good for the sagebrush-steppe attributes was also rated Good for the combined HII average score. Similarly, all but one of the occurrences with a rating of Poor for the sagebrush-steppe attributes was also rated Poor. The majority of occurrences that rated Fair had both the slickspot microsite and sagebrush-steppe attributes also rated as Fair. The Integrity condition rating was unchanged for 33 of the 37 (89%) occurrences originally sampled in 1998. The four occurrences with a different Integrity condition rating changed from the Poor category in 1998, to Fair in 1999, and are briefly discussed.

1. Bennett Road (008) – the 18.3 combined average HII scored in 1998 is close to the 16.6 scored this year, but they are on either side of 17, considered the breakpoint between the Poor and Fair ratings. Lower scores for Attributes 5,12, and 14 in 1999 account for the lower combined score and rating change. This occurrence is comprised of distinct burned and unburned segments on either side of Bennett Road. The Integrity condition rating was Fair for the unburned portion (transect A) and Poor for the burned portion (transect B) both years.

2. Kuna Butte SW (018) –1998’s combined average HII score of 17.0 just slips into the Poor category, and is close to this year’s score of 15.4. A lower score for Attribute 13 in 1999 was enough to change the rating from the Poor to Fair category.

3. Soles Rest Creek (020) - this is another occurrence consisting of distinct burned and unburned areas. The Integrity condition rating was Fair for the unburned portion (transect B) and Poor for the burned portion (transect A) both years, however, the combined average HII score of 18.1 for 1998 and 15.4 for 1999 are in different rating categories. Lower scores for Attributes 6 and 13 account for much of the difference. In addition, the 1998 score was inflated because Attribute 9d was incorrectly scored at one transect.

4. Woods Gulch (052) – lower scores for Attributes 11, 13, and 14 in 1999 account for the different HII combined average score and Integrity condition rating compared to 1998. Although most of this occurrence burned in the past, its ready placement in either the Fair or Poor category is not clear-cut.

Table 5. Integrity condition ratings for HII scores (updated from 1998 rating system). The way the HII is designed, the lower the score the higher the integrity rating.

Rating	Slickspot microsite attributes avg. score	Sagebrush-steppe attributes avg. score	Combined avg. score
Good	0 - 3	0 – 4	0 - 8
Fair	3.1 – 6.5	4.1 – 11.5	8.1 – 16.9
Poor	6.6 - 12	11.6 - 22	17 - 34

Lepidium papilliferum abundance

The abundance of slickspot peppergrass is known to fluctuate greatly from year to year, a common pattern for many short-lived plants growing in arid environments. This is one of the main reasons the HII focuses on slickspot peppergrass habitat attributes and not demographic attributes. However, the HII protocol includes a count or estimate of slickspot peppergrass plants at each microsite station, and assignment to one of four abundance class categories.

Throughout the range of slickspot peppergrass, plants were less abundant in 1999, compared to last year. In 1998, 38% of the slickspot microsites we sampled had one or more slickspot peppergrass plants. This dropped to 26% in 1999. A total of approximately 16,000 slickspot peppergrass were tallied along the HII transects in 1998, compared to only about 3,060 this year. The largest number of slickspot peppergrass plants counted along a transect was approximately 2,000 in 1998, but only about 285 in 1999. The difference was dramatic between the two years at several transects. For example, one transect (008A) had about 1,600 plants last year, but only 2 this year. Another transect (015) had nearly 800 plants last year and none in 1999. Twenty-five transects had 50% or more fewer plants in 1999, versus 1998. There were seven transects that had slickspot peppergrass plants in 1998, but none in 1999. Conversely, three transects had a few plants in 1999, where none were counted last year. Eight transects had no slickspot peppergrass plants in either year.

Abundance class data are contained in Table 6, with transect abundance information summarized in Table 7. Data from last year are included in the tables and provides evidence of the annual variation in above-ground slickspot peppergrass numbers. Appendix 8 contains a transect by transect account of the slickspot peppergrass abundance class data, while the HII scorecards in Appendix 6 have a record of the number of plants we observed at each microsite station, including notes about the number of flowering plants versus basal rosettes. General observations regarding slickspot peppergrass are included within Appendix 1.

Table 6. Summary of abundance class data for *Lepidium papilliferum*.

Abundance classes	Number of *Lepidium papilliferum* plants	Number of slickspot microsites (%)	
		1998	**1999**
0	0	252 (62)	320 (74)
1	1 – 9	32 (8)	55 (13)
2	10 – 100	71 (17)	48 (11)
3	>100	53 (13)	10 (2)

For 1998, n = 408 slickspot microsites. For 1999, n = 433 slickspot microsites.

Table 7. Summary of *Lepidium papilliferum* abundance by transect.

Range of *Lepidium papilliferum* numbers by transect (%)	1998	1999
0	11 (24)	15 (32)
1 – 100	12 (27)	19 (40)
101 - 1000	17 (38)	13 (28)
>1000	5 (11)	0 (0)

For 1998, n = 45 transects. For 1999, n = 47 transects.

Livestock disturbance abundance

Another part of the HII monitoring protocol attempts to quantify the level of livestock disturbance within the slickspot microsite stations. The number of individual prints and scats confidently assigned to livestock are counted or estimated at each microsite station and given an abundance class score. Most of the livestock sign recorded in 1999 was from cattle. Horse or sheep sign were relatively uncommon, the same pattern as in 1998. Only nine occurrences (19%) had no livestock sign recorded along their transects. The highest tally of sign at any single slickspot was approximately 200. The Juniper Butte South (707) transect averaged about 100 prints and scat/slickspot station, the highest of any occurrence. Two transects with livestock sign in 1998, had no sign in 1999, but two other transects with no livestock sign in 1998, did have sign in 1999.

The percentage of slickspot stations with livestock sign was slightly lower in 1999, but in most regards the data are similar to 1998. Tables 8 and 9 summarize the livestock disturbance data for 1999, and compares it to 1998. More detailed livestock abundance sign information is listed by transect in Appendix 9, while the HII scorecards in Appendix 6 contains the tallies for each sample station. Appendix 1 includes a section that lists additional livestock disturbance information for many transects.

Table 8. Summary of HII livestock sign abundance class data.

Abundance class	Number of livestock tracks and scat in slickspot microsite	Number of slickspot microsites (%)	
		1998	1999
0	0	146 (36)	176 (41)
1	1 –10	154 (38)	145 (33)
2	>10	108 (26)	112 (26)

For 1998, n = 408 slickspot microsites. For 1999, n = 433 slickspot microsites.

Table 9. Summary of livestock disturbance sign data.

	1998	1999
Number (%) of slickspot stations with livestock sign	262 (64)	257 (59)
% of slickspots with livestock sign – Kuna/Boise area	-	27
% of slickspots with livestock sign – Boise/Eagle Foothills area	-	34
% of slickspots with livestock sign – Orchard area	-	77
% of slickspots with livestock sign – Mt. Home/Glenns Ferry area	-	79
% of slickspots with livestock sign – Inside Desert area	-	81
Number (%) of transects with no livestock sign	10 (22)	9 (19)
Number (%) of transects with livestock sign in all slickspot stations	14 (31)	14 (30)
Number (%) of transects with 50% or more of slickspot stations with livestock sign	27 (60)	29 (62)

For 1998, n = 408 slickspot stations and 45 transects. For 1999, n = 433 slickspot stations and 47 transects.

Occurrence viability rank

The Occurrence Viability Rank provides a scale to assess the prospects that an occurrence will persist over time. It augments the HII by considering additional criteria important for conservation purposes. In 1998, ranks were assigned to all occurrences sampled that year (Mancuso et al.1998). In 1999, factors affecting viability and defensibility were reassessed for each occurrence. Most occurrences had no changes in these factors. However, new disturbances, threats, removal of threats, or other information that could affect viability and defensibility were observed at seven occurrences. Details regarding the reassessments are listed below.

Each of the three new Inside Desert occurrences added to the monitoring program in 1999 received "C" Occurrence Viability Ranks. For the 40 occurrences that are part of the HII monitoring program, six (15%) have an "A" Occurrence Viability Rank, seven (17%) a "B" rank, 18 (45%) a "C" rank, and nine (23%) a "D" rank. Occurrence Viability Rank forms for the seven occurrences with updated information, as well as for the three new occurrences are in Appendix 10.

Soles Rest Creek (020) – It appears that urban development is creeping into this area. Since 1998, two new houses were constructed along Old Highway 30 about one mile west of the occurrence. In addition, a new private road has been built about 0.2 miles west of the transect that leads to the new Soles Rest Creek development, in the early stages of construction. This changing land use will probably decreases the defensibility of the occurrence. As a result, the Occurrence Viability rank changes from "B" to "C".

Fraser Reservoir East (021) – A new mining claim marker not present in 1999, was posted near the middle of the HII transect. The occurrence is located close to an existing cinder/gravel operation. I have chosen not to change the Occurrence Viability rank at this time due to a lack of information about this potential threat.

Pleasant Valley North (022) – The transect for this occurrence is located on private land adjacent to the prison farm on State land. New "For Sale" signs were posted around the private land. Also, motorcycle and vehicle tracks not present in 1998 were observed in the transect area. Construction of a another prison or some other large structure was underway on the State land, within 0.2 mile of the transect. There was no evidence of this project last year. Reflecting this new information, the Occurrence Viability rank changes from "C" to "D".

Melba Butte (025) – Slickspot peppergrass plants were discovered in an unburned area on the eastern flank of Melba Butte. This was an area proposed for land exchange by the BLM. The exchange is no longer under consideration (A. DeBolt, BLM Boise District botanist, pers. comm.). This new information changes the Occurrence Viability rank from "D" to "C".

Soles Rest Creek (030) – The land-use status has changed dramatically for the private property immediately adjacent to this occurrence on BLM land. Construction is now underway for the signed "Soles Rest Creek" development. An all-season road has replaced the two-track tread that previously provided access to this occurrence. Spur roads lead off to what most likely are future home sites. During my visit to this occurrence I could hear the crushing of the sagebrush by the well-drilling trucks operating at the time. In light of the neighboring land-use changes the Occurrence Viability rank has been changed from "A" to "B".

Tenmile Creek (032) – A new mining claim marker was posted within a few feet of the start of the HII transect. The general area is well known for its extensive gravel deposits. A couple miles east of this occurrence, a large, new gravel pit was operating in an area undeveloped last year. I have chosen not to change the Occurrence Viability rank pending more information about the status of the new claim.

Willow Creek (047) – New Idaho Power survey stakes were present along the ridge just upslope from the HII transect. They are for a possible project to extend power to a private individual. The fate of this project is unknown. There was also evidence of new off-road vehilce use in the area, including tracks that cut across several slickspots. The occurrence already has an Occurrence Viability rank of "D", which remains unchanged.

Vegetation sampling

Plant community data were collected at each of the original transects in 1998. For 1999, we decided to limit repeating this procedure to occurrences with new disturbances or other largescale changes. No occurrences met these criteria. We did collect plant community plot data for the three new transects established in 1999, and in the unburned segment of an occurrence (Melba Butte 025) where only the burned habitat was sampled last year. Plant community information for these four areas is summarized in Table 10, and follows the general format used in last year's report (Mancuso et al. 1998; see Table 9). The plant community plot data are in Appendix 11. General vegetation notes for most transects are included as part of Appendix 1.

Table 10. Plant community information for plots sampled in 1999.

EO #	Name	[1]Plant community type	Habitat type	Seral status (shrub layer/ herb layer)	Fire history
025	Melba Butte	Artrwy/Brte	Artrwy/Stth?	late/early	Unburned portion of occurrence
704	Juniper Butte N.	Artrwy/Pose	Artrwy/Agsp	mid/mid	Mosaic burn
707	Juniper Butte S.	Artrwy/Agsp	Artrwy/Agsp	late/mid	Unburned portion of occurrence
709	Juniper Butte W.	Arte/Pose	Artrwy/Agsp	late/mid	Unburned portion of occurrence

1. Species codes: Artrwy=*Artemisia tridentata wyomingensis*; Agsp=*Agropyron spicatum*; Brte=*Bromus tectorum*; Pose = *Poa secunda*; Stth = *Stipa therberiana*.

All species composition and cover class attributes were estimated to be similar to 1998 at 14 (30%) transects. Forb species cover was noticeably less at 23 (49%) transects. For these transects, all forb species had trace cover 1999, but had one or more forbs with higher cover in 1998. Large decreases in the cover of *Sisybrium altissimum* (tumblemustard) were observed at ten (21%) of the transects. Another ten (21%) transects had substantially (typically, a cover class increase of 20 or more) greater *Bromus tectorum* (cheatgrass) cover in 1999, compared to 1998. No transects were estimated to have substantially less cheatgrass.

These composition and cover class differences are likely related, at least in part, to the different precipitation patterns between the two years. Precipitation during the late winter/spring season of 1999 was considerably less compared to 1998. Records for this period summarized in Table 11 reveal how widely seasonal precipitation totals may fluctuate in southwestern Idaho. The drop in slickspot peppergrass plant numbers in 1999 was also at least partly related to differences in precipitation.

Table 11. Southwestern Idaho precipitation records for winter/spring 1998 and 1999. (Western Regional Climate Center 2000).

Location	Year	Total precipitation (inches)					
		January	February	March	April	May	Total
Boise	1998	2.73	1.39	0.99	0.81	4.40	10.32
	1999	1.40	1.96	0.75	0.61	1.10	5.82
Swan Falls Dam	1998	1.21	1.15	0.81	0.67	3.48	7.32
	1999	0.72	0.58	0.24	0.67	0.56	2.77
Glenns Ferry	1998	2.37	0.38	1.78	0.78	3.36	8.67
	1999	2.16	1.95	0.67	0.35	0.81	5.94

Photo points

A second year of photo point photographs were taken at every transect in 1999. Photographs are on file at the CDC in Boise, along with a duplicate set at the Idaho Army National Guard's Boise office.

DISCUSSION

There are 50 known extant occurrences for slickspot peppergrass. Forty (80%) of these are included in the HII monitoring program. There are several occurrences located on private land and in the Inside Desert area that are not yet included. At some point in the near future, we hope this monitoring program is just one component of a comprehensive and integrated conservation plan for the sagebrush-steppe of southwestern Idaho and associated obligate species such as slickspot peppergrass. A mix of conservation strategies and collaboration among agencies and other entities will be needed to institute a series of integrated, multidisciplinary, conservation plans (Falk 1987; 1992). Land acquisition, legal protection, site management, research, ecological restoration, and other ideas will probably all have to be used to ensure the HII monitoring program is more than an exercise in documenting the extirpation of slickspot peppergrass and its habitat. The conservation predicament facing slickspot peppergrass is highlighted by its recent addition to the U.S. Fish and Wildlife Service's (1999) candidate species category.

Results from 1999 indicate the ecological habitat integrity of slickspot peppergrass occurrences changed little compared to 1998's baseline conditions. Regional wildfires, or smaller more targeted disturbances missed most occurrences. An exception was the Juniper Butte North (704) occurrence, where construction within the 300 acre target zone at the Air Force's new training range undoubtedly destroyed a portion of this large occurrence. In addition, new threats were observed at six occurrences (15% of the occurrences that are part of the monitoring program). Impacts from threats such as urban development and gravel mining have the potential to be alleviated or minimized if proactive management actions can be taken. The HII monitoring program provides some of the timely information needed to help this happen.

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Appendix 1.

Transect notes from 1999.

1. Transect access, transect location, and transect sampling information

Chalk Flats (010)
An alternate way to access this occurrence is to turn south on the Billy Rio Road off Old Highway 30 for approximately 0.5 mile. Park along the roadside and walk east, cross-country to the transect.

Simco Road (015)
The transect marker stake is located in the middle of a slickspot and was partly hidden by weedy species.

Kuna Butte SW (018A)
1)The identification number (299) on the power pole used to help relocate this transect was mutilated (shotgun blasts). It was still readable, but looked close to falling off. The portable weather station located near the end of the transect in 1998 has been removed.
2) The transect marker stake is located 73.5 m at a 274^0 azimuth from power pole #299, just south of the intersecting west-trending dirt road.
3) Most of the transect stations correspond to labeled slickspots used for a BLM-sponsored research project. Attribute scores are based on the entire slickspot, which may be larger than the research plots outlined with wire. The HII transect purposefully attempts to sample the same slickspots used by the research project. As a result, several slickspots along the transect azimuth were skipped. Without the slickspots labels as guides it would be difficult to precisely resample the same slickspots each year.

Kuna Butte SW (018B)
It is possible to drive directly from transect A to transect B by taking the two-track dirt road that passes by the marker stake for transect A. Take this road in a westerly direction for 0.8 mile and turn onto an intersecting road that leads to the powerlines in 0.2 mile. Head south on the road that parallels the powerline and fenceline for 0.6 mile to the transect B area. A high clearance vehicle is required.

Initial Point (019A)
1) *Sisymbrium altissimum* was incredibly abundant in the transect area in 1998, and impeded seeing the ground and finding slickspots. This tall weed was more or less absent in 1999. Because of this, the sampling transect was only a fraction as long as last year when the slickspots were so hard to find. My original impression that there were hardly any slickspots left in the area was inaccurate.
2) Slickspots were identified by their white color and largely unvegetated appearance, including a lack of seeded grass species and paucity of *Bromus tectorum.*

Initial Point (19B)
1) In 1999, all sampling took place within the ca 0.5 acre no seeding area within the exclosure. In 1998, the transect extended into the adjacent seeded area, where stations 9 and 10 were sampled. The change was made because I could not differentiate slickspots from “non-slickspots” in the seeded zone. The post-fire site preparation process has apparently destroyed most of the former slickspots in the seeded zone. As a result, stations 9 and 10 were sampled in slickspots off the transect bearing, near station 8 in 1999.
2) Tumbleweeds piling up against the exclosure fence were within one meter of covering the transect marker stake.

Soles Rest Creek (020A)
The transect marker stake is located more like 29^0 from the gas pipeline post, not 25^0 as noted in the original transect description. The stake occurs in an open area ca 2.5 m south of a small group of sagebrush shrubs. In addition, there were a bunch of old *Macaeranthera canescens* stalks in the area. This information may help make it easier to relocate the marker stake.

Pleasant Valley North (022A and B)
The transect marker stake (one stake used for both transects A and B) was missing and not replaced because of its inadvertent location on private land. Tire tracks that were not present in 1998 now lead from the Pleasant Valley

Road along the fenceline to the transect area. The tracks pass over the original stake location. For future resampling, it will easy to closely estimate where the marker was located if the fenceline remains intact.

Kuna Butte (024)
1) The transect marker stake is located approximately 125 m, not 250 m from the road as originally stated in last year's directions. The stake would be difficult to relocate without the BLM fencepost marker.
2) This transect deviates a bit from the transect azimuth (a somewhat "wandering" transect) to enable several extra labeled BLM research plots to be sampled.

Melba Butte (025)
1) Plot community data were collected at a plot in the unburned segment of the occurrence. A plot in the burned area was sampled last year.
2) Slickspots in burned area were barely recognizable due to weediness and litter accumulation.
3) The transect passes through both burned and unburned areas. Slickspot stations #1 –5 were sampled in the burn area, and #6 – 10 in the unburned area.

West of Orchard (027A)
The transect marker stake is located about 4 m east of the dirt two-track at about a 50^0 azimuth from the small parking "pullout" along the road. This pullout is about 0.1 mile from the main access road and near a small, low knoll.

West of Orchard (027A)
It is necessary to walk quite a ways to "hit" ten slickspot stations along the transect. The transect ends within sight of a corner fence.

Mountain Home SE (029)
1) The transect's 330^0 azimuth soon leads toward the freeway. The azimuth was changed to 295^0 in 1999.
2) This is a relatively long transect. It is necessary to walk a ways to reach station #1. After this, the slickspots are well spaced until the end of the transect, where a cluster are found in close proximity to each other. The transect ends near the no burn – burn boundary.

Bowns Creek (031)
1) From turnoff onto the dirt two-track off Old Highway 30, it is 1.8, not 1.6 miles, to the fence where the transect marker stake is located.
2) Station #1 is located ca 70 m from the transect marker stake. The area between the marker stake and station #1 is characterized by burned, annual grassland vegetation with no slickspots. The occurrence is unburned, but surrounded on three sides by burned habitat.

Tenmile Creek (032)
1) The transect marker stake was missing in 1999. A replacement stake was placed in a more cryptic spot very close to the original location. The marker stake was probably removed by the individuals who erected a new, nearby mining claim post.
2) Monitoring stations #8 –10 are located across a dirt 2-track, a relatively long distance past station #7.

Goose Creek (038)
1)This transect originally consisted of a single slickspot station. Three new slickspots were discovered further southeast along the ridge and added to the monitoring transect in 1999.
2) The Goose Creek Road is now paved and a new commercial venture is located at the old airport hangers. The dirt road that goes from the old hangers uphill to access the transect area now dead ends after about one mile from the Ada County Firearms Range.

Orchard SSW (041)
1) Monitoring stations #1 – 7 located in first exclosure (with marker stake), #8 – 9 in the second exclosure, and #10 in the third.
2) Windblown tumbleweed piling along the exclosure fence was encroaching on station #9. At the time of sampling it was within inches of the slickspot's perimeter.

Willow Creek (047)

The transect marker stake can be hard to see due to dense *Bromus tectorum* cover. The stake is located ca 1m east of a couple of *Elymus cinereus* plants and ca 2 m south of a slickspot shaped like a bicycle saddle.

Woods Gulch (052)
There is room to park vehicles off the road across the street from 6021 Willow Creek Road, located about 0.3 mile north of Lucy Street, and 1.3 miles north of the junction of Willow Creek and Eagle roads.

Christmas Mountain (053)
Presently, the transect begins in sagebrush stand, then enters an old burn zone, and finishes in a section of more sagebrush habitat. It is necessary to wander off the azimuth somewhat to sample 10 stations.

Kuna Butte NW (057)
An alternate route to the occurrence approaches the transect from the west side of Kuna Butte. From Kuna, go west to Robinson Road. Then turn south for 2.2 miles to Murphy Road (ca. 0.2 mile south of the Ada – Canyon County line). Turn east for ca 1 mile, at which point the road bends to the south. Right before the bend turn northeast onto a dirt road that leads towards Kuna Butte. Take this dirt road for 0.2 mile, bear right; at 0.4 mile, bear right again. Continue for ca 0.6 mile and turn left onto an intersecting two-track dirt road (not on topographic map). Take this road for ca 0.2 mile where it intersects another two-track cutting north through the sagebrush. This road leads to the transect area in less than 0.2 mile. A high clearance vehicle is required for these dirt roads.
2) There are orange-painted BLM monitoring stakes near the west end of the transect.
3) Slickspots were relatively uncommon in the transect area. In addition, slickspot boundaries were often difficult to delineate. I walked ca 200m to sample the ten transect stations.

Glenns Ferry NW (058)
Slickspot station #1 is located north of the gas pipeline road.

West of Squaw Creek (060)
The transect is located exactly 0.5 mile from junction with the road that parallels the RR tracks (see original directions from last year). As one approaches the 0.5 mark, note a large slickspot on the north side and a smaller one on the south side of the dirt road. The marker stake is located ca 55 paces east of the large slickspot and 6.8 m north of the road, in a small opening in the sagebrush. I placed a piece of pink flagging on a nearby sagebrush skeleton to help relocate the transect in the future.

SE of Reverse (061)
The transect marker stake next to the benchmark was undisturbed. However, a yellow fencepost also adjacent to the benchmark was knocked down. The fencepost makes it easier to find the benchmark and transect stake, but it was not very steady after I stood in back up.

Lower Seaman Gulch (065)
This transect originally consisted of a single slickspot station. Two new slickspots were discovered and added to the monitoring transect in 1999.

Post Office Reservoir (701)
This transect was not resampled in 1999 due to a lack of access. The rough two-track dirt road leading to the transect was in poor condition due to ongoing water pipeline repair/upgrade work taking place along the roadbed.

Three Creek Well (702)
The transect is located along a narrow remnant of unburned sagebrush-steppe habitat.
Poison Creek North (708)
1) Water pipeline repair/upgrade work was being conducted in the general area at the time of sampling. A large water tank that is the landmark to help relocate this transect remains in place. However, the original transect marker stake was disturbed and lost during recent earth moving activities near the tank. The replacement stake is located 19 m at a 272^0 azimuth from the NW corner of the tank.
2) I found only two slickspots along ca 250 m walk along the transect. Nearly all former slickspots in the area have apparently been destroyed by post-fire rehabilitation work.

2. Vegetation and plant community information

Bennett Road (008A)

Vegetation/plant community attributes were similar to 1998, except for the forb layer. It was even more depauperate than in 1999. Hardly any forb plants were observed.

Bennett Road (008B)
1) Vegetation/plant community attributes were similar to 1998, except: (a) there was much less *Sisymbrium altissimum* in 1999, and the little bit that was present was stunted; and (b) there was apparently greater biotic crust cover in 1999, most of which was the moss *Tortula ruralis*. An estimated cover class = 20, versus an estimate of = 10 last year.
2) Sagebrush and rabbitbrush are slowly re-establishing in the old burn area on the west side of Bennett Road.

Chalk Flats (010)
Vegetation/plant community attributes were similar to 1998.

Military Reserve Park (012)
1) Vegetation/plant community attributes were similar to 1998.
2) HII Attribute 12 received a different score in 1999 versus 1998. Although annual grasses dominate the vegetation, this attribute was scored a "1" in 1999 because the estimated cover of *Aristida longiseta* was 15%. In retrospect it probably should have received a score of "3", same as last year.
3) *Bromus tectorum, Elymus caput-meduseae*, and lesser amounts of *Salsoa iberica* and *Lactuca serriola* were established in the slickspot. *Chondrilla juncea* is within 2m of the slickspot.

Simco Road (015)
1) Vegetation/plant community attributes were similar to 1998 except: (a) there was considerably less *Sisymbrium altissimum* in 1999, with a cover class value of only 3; and (b) all other forb species had only trace amounts, which was less than last year for *Lepidium perfoliatum* and *Epilobium paniculatum*.
2) A lot of the *Bromus tectorum* was infected with a black smut.

Kuna Butte NW (018A)
Vegetation/plant community attributes were similar to 1998, except: (a) the *Bromus tectorum* cover class value was 80 in 1999, versus 60 last year; and (b) no forb species were observed.

Kuna Butte NW (018B)
Vegetation/plant community attributes were similar to 1998, except the few forb species all had cover class of 1 (trace), and no *Sisymbrium altissimum* was observed in 1999.

Initial Point (019A)
1) *Sisymbrium altissimum* was incredibly abundant in the transect area in 1998, but absent in 1999. This was the main vegetation difference between the two years.
2) A limited amount of biotic crusts was beginning to recolonize the ground surface.

Initial Point (019B)
1) Only trace amounts of annual forbs were observed in 1999, including for *Sisymbrium altissimum*.
2) Several stations scored a "1" for HII attribute 6 mostly due to the establishment of *Kochia prostrata* within the slickspots.

Soles Rest Creek (020A)
1) Vegetation/plant community attributes were similar to 1998: a) there was only a trace cover for all forb species in 199; and b) the *Bromus tectorum* cover was greater with a cover class value of 70.
2) Some slickspots in the general area have accumulated a lot of detritus and also have *Bromus tectorum* and *Lepidium perfoliatum* establishing in them. There were also former slickspots (based on shape and whitish color) nearly masked by the close to 100% cover of *Lepidium perfoliatum*. These changes may represent stages leading to the complete loss of the slickspots in this burned area.

Soles Rest Creek (020B)
1) Vegetation/plant community attributes were similar to 1998, except no *Chondrilla juncea* was observed along transect.
2) There is a large crested wheatgrass seeding east of occurrence.

Fraser Reservoir East (021)
1) Vegetation/plant community attributes were similar to 1998, except for a higher cover of *Ranunculus testiculatus* along the transect, varying between coverage classes 3 and 10.

2) Some recruitment of small sagebrush plants was observed.

Pleasant Valley North (022A)
1) Vegetation/plant community attributes were similar to 1998, except: (a) there was less *Sisymbrium altissimum* in 1999; and (b) there was a trace amount of *Elymus caput-medusae*, which was not recorded in 1998.

Pleasant Valley North (022B)
1) Vegetation/plant community attributes were similar to 1998.
2) Algae and other microbiotic crust organisms were establishing in some of the slickspots.

Kuna Butte (024)
1) Vegetation/plant community attributes were similar to 1998 except: (a) there was only a trace amount of *Sisymbrium altissimum* in 1999, compared to a cover class of 60 last year; (b) no flowering *Linum* or *Spharalcea* were observed; and (c) *Bromus tectorum* cover was higher, with cover classes of 80 in unseeded areas, and 30 in the seeded areas, versus only 20 last year.
2) What we recorded on last year's vegetation plot data sheet as *Elymus cinereus* is mostly, if not exclusively, *Psathyrostachys juncea* (Russian wildrye).

Melba Butte (025)
Vegetation/plant community attributes were similar to 1998, except there were only trace amounts of *Sisymbrium altissimum* and *Lepidium perfoliatum*.

West of Orchard (027A)
Vegetation/plant community attributes were similar to 1998.

West of Orchard (027B)
Vegetation/plant community attributes were similar to 1998, although the sparse forb component was even more depauperate in 1999.

Christmas Mountain North (028A)
Vegetation/plant community attributes similar to 1998. Very low forb production in 1999.

Christmas Mountain North (028A)
Vegetation/plant community attributes were similar to 1998, except all forb species had only a trace cover class in 1999.

Mountain Home SE (029)
Vegetation/plant community attributes similar to 1998.

Soles Rest Creek (030)
Vegetation/plant community attributes similar to 1998, except it looks like I underestimated the sagebrush cover last year. It should be cover class = 30, not 20.

Bowns Creek (031)
Vegetation/plant community attributes were similar to 1998.

Tenmile Creek (032)
Vegetation/plant community attributes were similar to 1998, except the *Bromus tectorum* cover class was at least 50, versus 40 last year.

Orchard SW (035A)
Vegetation/plant community attributes similar to 1998, except: (a) no native perennial forbs were seen in 1999; and (b) all weedy forbs had a trace cover, although *Ranunculus testiculatus* locally common on disturbed spots.

Orchard SW (035B)
Vegetation/plant community attributes similar to 1998, except all forbs had only a trace cover in 1999.

Goose Creek (038)

1) Vegetation/plant community attributes were similar to 1998, except for the higher cover class of *Bromus tectorum*, which was 40 in 1999, versus 1 (trace) last year.
2) *Chondrilla juncea* was abundant on the nearby south-facing slope. It has also established within 10m of transect station #1.

Woods Gulch (040)
1) Vegetation/plant community attributes were similar to 1998.
2) The *Bromus tectorum* in the area was infected with a black smut.

Orchard SSW (041)
Vegetation/plant community attributes were similar to 1998, except for less *Lepidium perfoliatum*.

Willow Creek (047)
Vegetation/plant community attributes were similar to 1998.

South Cole Road (048)
Vegetation/plant community attributes were similar to 1998.

Fivemile Creek (049)
Vegetation/plant community attributes were similar to 1998, except for less *Sisymbrium altissimum* and *Lepidium perfoliatum*.

West Side Canal (050)
Vegetation/plant community attributes were similar to 1998. All forbs had a trace cover in 1999.

Woods Gulch (052)
1) Vegetation/plant community attributes were similar to 1998 except *Bromus tectorum* had a cover class of 40 in 1999, versus 20 last year.
2) Some of the *Bromus tectorum* infected with a black smut.
3) Patches of *Verbascum blatteria* and a few scattered *Chondrilla juncea* plants occur near the transect.

Christmas Mountain (053)
Vegetation/plant community attributes were similar to 1998, except the few forbs species all had cover class of 1 (trace). Also, a large volume of dead tumbleweed was piled within the sagebrush stand along the lower north slope of Christmas Mountain.

Willow Creek (056)
Vegetation/plant community attributes were similar to 1998, although *Chondrilla juncea* cover was greater than 1% overall. It was abundant enough to score attribute #13 a “2”.

Kuna Butte NW (057)
1) Vegetation/plant community attributes were similar to 1998, except the *Bromus tectorum* cover class was 30 in 1999, more than the cover recorded last year.

Glenns Ferry NW (058)
Vegetation/plant community attributes were similar to 1998.

West of Squaw Creek (060)
1) Vegetation/plant community attributes were similar to 1998, except for an increase in *Bromus tectorum,* with a cover class of 80 in 1999, versus 50 last year.
2) Nearly all slickspots were being invaded by *Artemisia tridentata wyomingensis* to one degree or another.
3) Nearly all the slickspots along the transect are large. They probably average the largest size of all the HII monitoring sites.

SE of Reverse (061)
1) Vegetation/plant community attributes were similar to 1998.
2) Seeded grasses were establishing within some slickspots and account for the “1” scores for HII Attribute 6.

Lower Seaman Gulch (065)

Vegetation/plant community attributes were similar to 1998, except: (a) *Bromus tectorum* cover was much higher, with a cover class of 80 in 1999, versus 20 last year; and (b) there were only trace amounts of the annual forbs *Epilobium paniculatum* and *Lagophylla ramosissimum*. Both were more abundant in 1998.

New Plymouth SW (066)
1) Vegetation/plant community attributes were similar to 1998, except there was less *Sisymbrium altissimum*, and more *Bromus tectorum* in 1999.
2) *Centaurea diffusa* appears to be increasing in area.

Three Creek Well (702)
Vegetation/plant community attributes were similar to 1998.

Juniper Butte North (704)
Baseline vegetation data collected in 1999.

Juniper Butte South (707)
Baseline vegetation data collected in 1999.

Poison Creek North (708)
Vegetation/plant community attributes were similar to 1998.

3. *Lepidium papilliferum* observations

Simco Road (015)
Although no slickspot peppergrass was encountered along the transect, I did find three slickspots with plants in a nearby area.

Kuna Butte NW (018A)
The only slickspot peppergrass I observed in the transect area were five plants along the edge of the dirt road.

Kuna Butte NW (018B)
In several places slickspot peppergrass plants were established in the open, away from any noticeable slickspots. This was also the case last year.

Initial Point (019A)
All the slickspot peppergrass plants along the transect were subject to herbivory, probably from ground squirrels or other small mammals. It was about the only green forb in the area.

Soles Rest Creek (020A)
I searched the general area south of Old Highway 30, but did not find any slickspot peppergrass.

Pleasant Valley North (022A)
Slickspot peppergrass plants were most common along the slickspot edges.

Kuna Butte (024)
Many of the slickspot peppergrass plants rooted along the perimeter, or what seemed to be outside the slickspot margins.

West of Orchard (027B)
I was unable to find any slickspot peppergrass during a search of the general transect area.

Mountain Home SE (029)
All flowering slickspot peppergrass plants were small, some with only a single flower. Several hundred additional slickspot peppergrass plants were observed in slickspots near the end of the transect.

Soles Rest Creek (030)
I searched for more slickspot peppergrass outside the transect area, but did not find any.

South Cole Road (048)
Despite searching for about 20 minutes, I did not find any slickspot peppergrass in the general occurrence area.

Woods Gulch (052)
1) Some slickspot peppergrass rosettes had curled, brownish leaves.
2) Slickspot peppergrass plants were rooted along the margins or adjacent to a slickspot at a several stations.

Kuna Butte NW (057)
Branches lying on the ground indicated several slickspot peppergrass plants were nipped. This was likely from rabbits or other small mammals, as there was abundant evidence of these animal in the area.

Glenns Ferry NW (058)
No slickspot peppergrass was found along transect or during a search of the general occurrence area.

SE of Reverse (061)
There were several large concentrations of slickspot peppergrass atop and along old badger or ground squirrel mounds. Plants were also observed in sagebrush interspaces, outside the margins of nearby slickspots.

Lower Seaman Gulch (065)
1) At station #1, a few slickspot peppergrass plants were rooted along the margin of the slickspot, but most were clustered nearby in "non-slickspot" habitat.
2) Nearly all slickspot peppergrass plants were large, plus about five plants that were very large (>0.3 m diameter). Most plants had hundreds of silicles.

Juniper Butte South (707)
Additional slickspots with slickspot peppergrass were observed in the general area.

4. Disturbances by livestock or other animals

Bennett Road (008A)
Cattle grazed the area hard prior to my sampling in 1999. Approximately 99% of the crested wheatgrass plants and many of the *Poa secunda* plants were grazed. Many of the *P. secunda* plants appeared dead. Every slickspot in the general area was impacted by cattle prints to one degree or another.

Bennett Road (008B)
Heavy cattle grazing was observed on west side of the road too.

Chalk Flats (010)
1) No evidence of livestock grazing was observed in 1999. This contrasts strongly to 1998, when livestock sign was ubiquitous and every *Stipa comata* in the area was grazed. Many of the livestock prints counted in the slickspots last year have more or less "healed", except for the deeper divots.
2) There was considerably less slickspot damage than recorded last year. As a result, HII attribute #2 scores were lower along the transect.

Simco Road (015)
About one-half of the slickspots in the transect area had deer prints. There was no evidence of recent livestock use in the area.

Kuna Butte NW (018A)
Ground squirrel and badger diggings common in the transect area.

Kuna Butte NW (018B)
1) The majority of *Poa secunda* clumps were grazed to nubs, but I was unsure if this was due to sheep or ground squirrels. There was evidence of both animals in the general area.
2) Ground squirrel and badger diggings were common in the transect area. Several slickspots were impacted by ground squirrel scrapings and holes.

Initial Point (019A)
Ground squirrel and badger holes were commonplace along the transect.

Initial Point (019B)
Ground squirrel/badger holes were all over the place.

Soles Rest Creek (020B)
Some of the tallied livestock sign was probably from 1998.

Fraser Reservoir East (021)
Many of the bunchgrasses were grazed by cattle and/or rodents.

Kuna Butte (024)
Ground squirrel and badger diggings were common, including failed attempts at digging holes within several slickspots.

Christmas Mountain North (028)
Nearly every bunchgrass was grazed.

Mountain Home SE (029)
There was a lot of rabbit sign along the transect.

Soles Rest Creek (030)
There was plenty of jackrabbit sign in the general area.

Bowns Creek (031)
1) All the *Stipa thurberiana* clumps were grazed very close to the ground by livestock. In contrast, many of the *Poa secunda* clumps were not grazed.
2) There were lots of grasshoppers in the area.

Tenmile Creek (032)
Jackrabbit sign was common in the transect area. Narrow paths (runs) produced by jackrabbits or other small animals were common. Several were closely associated with some of the slickspots.

Orchard SW (035B)
Numerous ground squirrel and badger diggings present in the area, including within slickspots or on slickspot margins. Many slickspots were intersected by rodent runways. In a few cases the runways were also judged to be affecting the slickspot boundary and the HII Attribute #2 scored accordingly.

Willow Creek (047)
Depressions/divots in the slickspots were undoubtedly caused by hooveprints in the past. Many lacked sufficient definition to ascertain if they were caused by horses, cattle, or deer. I counted only those prints I could definitely assign to horses or cattle.

Christmas Mountain (053)
The occurrence area was heavily grazed by sheep, with some cattle evidence along the lower the slopes.

Willow Creek (056)
Several slickspots had deer prints.

Kuna Butte NW (057)
Slickspot peppergrass branches lying on the ground indicated several plants were nipped. There was abundant rabbit sign in the general area, as well as some rodent and badger sign.

Glenns Ferry NW (058)
Depth of hooveprints suggested cattle were present when the ground was very wet. There was plenty of rabbit sign in the area too.

Poison Creek North (708)
At the time of sampling, livestock use was moderate in the transect area.

SE of Reverse (061)
At the time of sampling, some of the livestock sign in the area looked very fresh.

Juniper Butte South (707)
The “1” and “2” scores for HII Attribute 2 were associated with damage to slickspot margins from cattle trampling. At the time of sampling, cattle use was greater in the nearby burned areas compared to the unburned sagebrush stand characterizing the transect.

Appendix 2.

Updated Habitat Integrity Index scorecard form.

***LEPIDIUM PAPILLIFERUM* HABITAT INTEGRITY INDEX** Modified Feb., 2000

Slickspot microsite attributes	**Score**
1. Is organic debris or soil being deposited and accumulating within the slickspot?	0 (none) 1 (minimal; <10%) 2 (yes; >10%)
2. Are the slickspot boundaries (perimeter) compromised?	0 (no) 1 (minimal;<10%) 2 (yes; >10%)
3. Are weedy annual species present in the slickspot?	0 (none, or <5 individual plants) 1 (one or more)
4. What is the average density of weedy annual species?	0 (<10 plants/sq. ft.) 1 (10-25 plants/sq.ft.) 2 (>25 plants/sq.ft.)
5. Are rabbitbrush or other shrub species established within the slickspot? Do not count seedlings.	0 (2 or fewer plants) 1 (>2 plants)
6. Are perennial forbs or grasses established within the slickspot?	0 (3 or fewer plants) 1 (> 3 plants)
7. How much livestock disturbance sign (tracks/scat) is present within the slickspot?	0 (none) 1 (1-10 tracks/scat) 2 (>10 tracks/scat)
8. Are ORV or other vehicle tracks present across the slickspot?	0 (no) 1 (yes)
Sagebrush-steppe attributes	
9. Fire History a) immediately adjacent to slickspot (ca 10m radius)	0 (unburned) 2 (mosaic burn, or distinct burned/unburned areas) 3 (burned)
b) scale of surrounding 3 acres (ca 65m radius)	0 (unburned) 2 (mosaic burn, or distinct burned/unburned areas) 3 (burned)
c) scale of surrounding 3-50 acres (ca 250m radius)	0 (unburned) 2 (mosaic burn, or distinct burned/unburned areas) 3 (burned)
d) scale of surrounding 50-200 acres (ca 500m radius)	0 (unburned) 2 (mosaic burn, or distinct burned/unburned areas) 3 (burned)
10. What is the level of livestock use in the area near (ca 40m radius) the slickspot station?	0 (no evidence) 1 (light to moderate use) 2 (heavy use)
11. Do ORV's or other vehicles go off-road in cross-country fashion near (ca 40m radius) the slickspot station?	0 (no, or rare) 1 (light to moderate use) 2 (heavy use)
12. The grass layer near (ca 40m radius) the slickspot station is?	0 (clearly dominated by native bunchgrasses) 1 (both bunchgrasses and exotic annual grasses common) 3 (clearly dominated by exotic annual or seeded grasses; native bunchgrasses reduced to remnant status or largely extirpated)
13. Are weedy annual forbs present near (ca 40m radius) the slickspot station?	0 (sparse or absent) 1 (patchy) 2 (widespread and abundant)
14. How much microbiotic crusts cover is there near (ca 40m radius) the slickspot station?	0 (high/moderate; >10%) 1 (low; 1-10%) 2 (trace or absent; <1%)

Appendix 3.

Updated Occurrence Viability Rank form.

***Lepidium papilliferum* Occurrence Viability Rank form** Modified Feb. 2000

Element Occurrence # _____ Occurrence name _____

Date _____ Examiner _____

Original ranking _____ or Reevaluation of ranking _____

Grade the occurrence's viability, defensibility, and habitat integrity according to the following scale:
0 = high 1 = fair 2 = marginal 3 = poor

Occurrence Viability - base grade on the long-term prospects for continued existence of *Lepidium papilliferum* and its habitat at the occurrence site. Provide comments as needed. Some factors to consider include: fire history; fire restoration/rehabilitation methods and success; threats such as urban development, weed invasion, and recreational use; condition of the surrounding landscape; problems with habitat fragmentation; and extent of suitable habitat.

Grade = _____ (0 - 3)

Comments –

Occurrence Defensibility - base grade on the extent to which the occurrence can be protected from extrinsic human factors that might otherwise degrade or destroy it. Provide comments as needed. Some factors to consider include: protection from fire; land ownership (public versus private land); condition and ownership of surrounding land; special protection measures or designations conferred to all or part of the occurrence; manageability.

Grade = _____ (0 – 3)

Comments –

Occurrence Habitat Integrity – base grade on the Habitat Integrity Index score for the occurrence. The index considers disturbances from fire, weedy species invasion, livestock use, and ORV use. These factors can affect the habitat quality of both slickspot microsites and the surrounding sagebrush-steppe vegetation

Grade _____ (HII score 0–9 = grade 0; score 10–16 = grade 1; score 17 or greater = grade 3)

Comments –

TOTAL _____ (Viability grade + Defensibility grade = Integrity grade)

RANK _____ (A-rank = 0 – 2; B-rank = 3 - 4; C-rank = 5 - 6; D-rank = 7 - 9)

Appendix 4.

Map locations for the Habitat Integrity Index transects at the Juniper Butte North (704), Juniper Butte South (707), and Juniper Butte West (709) occurrences.

Map 1. Transects for the Juniper Butte North (704) and Juniper Butte West (709) occurrences. Portion of the Juniper Butte USGS 7.5' topographic quadrangle.

Map 2. Transect for the Juniper Butte South (707) occurrence. Portion of the Mosquito Lake Butte USGS 7.5' topographic quadrangle.

Appendix 5.

Transect location forms and sampling notes for the Habitat Integrity Index transects at the Juniper Butte North (704), Juniper Butte South (707), and Juniper Butte West (709) occurrences.

Sampling notes for transects established in 1999.

Juniper Butte North (704)

1. This transect is located within the Air Force's Juniper Butte training range. The transect is within visual site of the 300 acre impact zone segement of the training range. It will be necessary to make arrangements with and obtain permission from the Air Force prior to resampling this transect.

2. The transect uses a BLM witness post (a BLM monitoring site?) as a reference to help relocate the HII transect marker stake. The transect stake is located right next to the fencepost.

3. The transect azimuth is 8^0 . This was not a random transect bearing, but chosen to capture a series of slickspots known to have slickspot peppergrass plants.

4. The transect is approximately 160 m long, including about a 40 m gap between slickspot stations nine and ten.

5. Transect GPS coordinates are 11T 0635175 UTM 4684260.

Juniper Butte South (707)

1. This transect is located near the base of the southern flank of Juniper Butte.

2. The transect marker stake is located in the slickspot that represents station #1 for the transect. The stake is situated in a lobe near the west edge of the large slickspot. In 1999, this slickspot was in an unburned area, but less than 10 m away from the burn/mosaic burn interface.

3. As points of reference - from the stake to the highest point in the Jarbidge Mountains is 174^0. From the stake to a small rock outcrop located about one mile east is 88^0. From the the stake to the summit of Juniper Butte is 310^0. Three Creek Well is not visible from the transect stake.

4. The transect azimuth is 335^0 . This was not a random bearing, but chosen to pass through a series of slickspots known to have slickspot peppergrass plants.

5. The transect is about 60 m long and runs close close to the no burn/mosaic burn interface.

6. GPS coordinate for the transect stake is N42 14.820 W115 20.130.

Junuiper Butte West (709)

1. This transect is located west of Juniper Butte. Its location west of the Clover Three Creek Road puts it outside the Juniper Butte training range buffer perimeter. The fence delineating the perimeter parallels the east side of the road.

2. The transect marker stake is located in a relatively large slickspot that represents station #1. The slickspot has an anthill in one of its lobes.

3. The jeep trail shown on the USGS topographic quadrangle is discontinued and largely overgrown. Openings formed by the old tread may look like a slickspot, but they were not sampled where the transect crosses this old tread.

4. The transect azimuth is 230^0.

5. GPS coordinate for the transect stake is 11T 0634447 UTM 4681046.

Appendix 6.

1999 Habitat Integrity Index field data scorecards.

Appendix 7.

Summary of 1998 and 1999 Habitat Integrity Index attribute scores.

Appendix 8.

1998 and 1999 *Lepidium papilliferum* abundance class data by transect.

Appendix 9.

1998 and 1999 livestock sign abundance class data by transect.

Appendix 10.

1999 Occurrence Viability Rank forms.

Appendix 11.

1999 vegetation sampling plot data sheets.