FIELD INVESTIGATION FOR *LEPIDIUM PAPILLIFERUM* (SLICKSPOT PEPPERGRASS) ON IDAHO BLM LANDS IN THE BRUNEAU DESERT AREA

by

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ABSTRACT

Slickspot peppergrass (*Lepidium papilliferum*) is an annual or biennial forb endemic to southwestern Idaho. Much of its original sagebrush-steppe habitat has been destroyed or seriously degraded over the past century. The documented downward conservation trend for slickspot peppergrass resulted in it being made a Candidate for listing under the Endangered Species Act in 1999. Field inventories for slickspot peppergrass have been conducted throughout large segments of this species range, but several areas of known or suspected suitable habitat remain unsurveyed. One such area is the Bruneau Desert, situated between known populations to the north near Hammett/Glenns Ferry, and to the south around Juniper Butte. The Bruneau Desert is dominated by land administered by the Bureau of Land Management (BLM) for whom slickspot peppergrass is a priority conservation and management concern. In 2001, the BLM and Idaho Conservation Data Center entered into a Challenge Cost-share agreement to conduct a systematic field investigation for slickspot peppergrass in the Bruneau Desert area, south of Bruneau, Idaho. We visited over 50 areas and searched approximately 3,600 acres, but did not find any new slickspot peppergrass populations. Several areas supporting unburned, good condition sagebrush-steppe vegetation were identified during the investigation. In light of how much regional sagebrush-steppe has been lost or seriously degraded over the years, these remnant stands may represent worthy conservation targets irrespective of the presence or absence of slickspot peppergrass.

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INTRODUCTION

Slickspot peppergrass (*Lepidium papilliferum*) is an annual or biennial forb endemic to southwestern Idaho. Much of its original sagebrush-steppe habitat has been lost to agricultural and urban development, while an ever-increasing amount has converted to annual grassland or seeded grassland vegetation as a result of wildfires or associated rehabilitation programs. The ecological condition of much of what sagebrush-steppe remains in the western Snake River Plain is largely impoverished due to over a century of intensive use. A direct consequence of this habitat loss and degradation has been the outright loss or reduction in size of many slickspot peppergrass populations. This downward conservation trend resulted in slickspot peppergrass being added to the federal Endangered Species Act Candidate list in 1999 (U.S. Fish and Wildlife Service 1999). Detailed population, life history, habitat, distribution, and other information concerning this species has been outlined elsewhere (e.g., Fisher et al. 1996; Moseley 1994; Quinney 1998).

Rangewide, the majority of known slickspot peppergrass occurrences are located on lands administered by the Bureau of Land Management (BLM). Most areas containing additional unsurveyed habitat are also BLM land. Because of these ownership patterns, the BLM has a leading role in slickspot peppergrass management; and this species is a priority conservation concern for the agency. The BLM has made a concerted effort to conduct field surveys in recent years, but gaps remain in documenting the distribution, abundance, and threats to slickspot peppergrass in several geographic areas. Until more of these distribution gap questions are answered, development of a rangewide and comprehensive conservation plan for slickspot peppergrass will likely remain elusive. To further this and other conservation efforts on behalf of slickspot peppergrass, the BLM's Lower Snake River District and the Idaho Department of Fish and Game's Conservation Data Center (CDC) entered into a Challenge Cost-share agreement in 2001, to conduct a systematic field investigation for slickspot peppergrass in the Bruneau Desert area.

METHODS

The study area for our field investigation was located in the Bruneau Desert area, south of Bruneau, Idaho. It extended from Clover Creek on the west to Clover Road on the east. The northern perimeter was bounded by the southeastern portion of Saylor Creek Air Force Range, while the junction of the Clover Three Creek Road with Clover Road formed the southern end of the study area (Figure 1). The BLM delineated the study area for our field investigation, which covered approximately 140 square miles. The study area was located between known slickspot peppergrass populations in the Hammett/Glenns Ferry area approximately 20 miles to the north, and populations around Juniper Butte, approximately 15 miles further south. We focused our surveys on unburned sagebrush habitat as much as possible, but searched a considerable amount of mosaic burned, burned, and seeded areas as well. After selecting an area to survey, we either walked a transect, or more commonly intuitively walked through the area stopping at slickspot microsites to look for slickspot peppergrass.

Fieldwork was conducted between June 4 and June 12, 2001. We documented our survey routes as polygons on the appropriate USGS topographic map quadrangle (Appendices 1 and 2). The polygons form the basis for our survey acreage estimates. At each survey area we collected information about both the vegetation and the distribution, abundance, and condition of slickspot microsites, including levels of livestock

Figure 1.

disturbance and weed invasion. This descriptive information is summarized in the Results section of this report. If new slickspot peppergrass populations were discovered, location, size, habitat, threat, and other conservation information would be recorded.

RESULTS

No slickspot peppergrass was found during the survey. During the survey we visited over 50 different areas and surveyed approximately 3,600 acres. Approximately 60% of this acreage supported sagebrush-steppe habitat; the remainder was either crested wheatgrass (*Agropyron cristatum* and related taxa) seedings, annual grassland vegetation, or a mosaic of these various vegetation types. We looked at well over 1,500 slickspot microsites during the course of our survey.

Like many short-lived desert plants, the annual appearance and abundance of slickspot peppergrass is apparently linked to seasonal precipitation patterns. Spring and summer precipitation in 2001 was below average in Bruneau (Western Regional Climate Center 2001), which probably made this a less than ideal year to survey for slickspot peppergrass in the Bruneau Desert. Conditions were probably adequate to determine if any slickspot peppergrass was present within the survey area, however. This judgement is based on the observation that most slickspot peppergrass occurrences visited elsewhere in southwestern Idaho, including the Juniper Butte area south of the study area, had at least a few plants in 2001 (Michael Mancuso, personal observation 2001; and Steve Popovitch, Wildhorse Consulting, pers. comm.).

We concentrated survey efforts in unburned sagebrush habitat, although a number of mosaic burned, burned, and seeded areas were also searched. The vegetation in most unburned areas was characterized by mature Wyoming sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) with generally high understory cover of Sandberg's bluegrass (*Poa secunda*). Other native bunchgrasses such as squirreltail (*Sitanion hystrix*) and Thurber's needlegrass (*Stipa thurberiana*) were widespread, but almost always had low cover. Native forb cover was rarely more than a trace. Even in higher quality sagebrush stands, the low diversity and abundance of forbs was often striking. Bur buttercup (*Ranunculus testiculatus*) was a common weedy forb in some places, but its occurrence seemed to be spotty overall. Cheatgrass (*Bromus tectorum*) was widespread, but in most sagebrush stands it tended to have sparse cover except for a few local dense patches. Cheatgrass was much more common in disturbed, mosaic burn, and many of the seeded areas. Extensive acreage in the Bruneau Desert has been seeded to crested wheatgrass, and this species dominates the landscape for miles within the study area. Microbiotic crust was present in all sagebrush stands to one degree or another, in some cases exceeding 50% cover. Crust cover was much less or absent in seeded or recently burned areas.

Many of the areas we surveyed contained suitable-looking slickspot peppergrass habitat. The vegetation structure and composition in sagebrush stands within the study area were similar to places supporting slickspot peppergrass elsewhere. The sagebrush habitats in the study area appeared to more closely resemble plant communities found along the Snake River Plain to the north, as opposed to the Juniper Butte area further south. The scarcity of bluebunch wheatgrass (*Agropyron spicatum*) and the low diversity and abundance of native forbs were two features of the study area vegetation that highlighted this relationship. Evidence of ground squirrel and badger activity was sporadic and relatively uncommon overall in the study area. This stands in contrast to

many of the known slickspot peppergrass occurrences, where digging mammal sign is often a noticeable part of the landscape. On a finer scale, it was less clear if slickspot microsites in the study area were ecologically/edaphically identical to microsites at known population sites, or if this resemblance was merely superficial.

The density of slickspot microsites varied in the study area. This uneven distribution and density of slickspots is a pattern repeated throughout the range of slickspot peppergrass. Slickspots were a regular feature of the landscape in portions of the study area, especially the northwestern quarter. In other portions they had a much more sporadic distribution and were uncommon overall. On a local scale, microsites in many areas were widespread, but spotty, consisting of scattered individual, or more commonly clusters of slickspots. Some of the seeded areas we surveyed had few if any remnant slickspots. Similar to elsewhere in the species' range, cheatgrass, bur buttercup, and clasping peppergrass (*Lepidium perfoliatum*) where the most common weed species in the slickspot microsites.

Survey area descriptions

To facilitate descriptive information, we divided the study area into 13 arbitrary survey areas named for nearby geographic reference points. Each survey area consists of one or more polygons representing areas we directly searched for slickspot peppergrass. Vegetation and slickspot abundance and condition information is included in the description information. We used three abundance categories to rank the amount of weed invasion and cattle disturbance observed in the slickspot microsites. The ranks are partly based on categories used in the Habitat Integrity Index monitoring program for slickspot peppergrass (Mancuso and Moseley 1998).

Weed disturbance (plant density)	Cattle disturbance (number of prints)
Low = <10 plants/sq. ft.	Low = <10 prints
Moderate = 10-25 plants/sq.ft.	Moderate = 10-50 prints
High = >25 plants/sq.ft.	High/Severe = >50 prints

The Polygon Number for the survey area equates to the reference number for each polygon in Appendix 1. The survey areas are listed below in a more or less north to south direction. Estimated polygon sizes are listed in Table 1. They ranged in size from approximately 10 acres to 600 acres.

Clover Three Creek Road area - located east of the Clover Three Creek Road in the northwestern portion of the study area. Part of this survey area is located within the boundaries of the Saylor Creek Air Force Range.

Polygon 1 (Pot Hole Butte quad; Appendix 1, Map 1)
Vegetation - mostly unburned sagebrush habitat supporting the Arttriwyo/Poasec (*Artemisia tridentata wyomingensis/Poa secunda*)ct.; Sandberg's bluegrass clearly dominates the understory, but squirreltail ubiquitous at low cover, and needle-and-thread grass (*Stipa comata*) and Indian ricegrass (*Oryzopsis hymenoides*) in scattered pockets; variable cheatgrass abundance, generally low or trace amounts, but locally abundant in places; low perennial forb diversity and cover; an impressive microbiotic crust throughout most of polygon, approaching 75% cover or more in many areas. Overall, this was one of the highest quality sagebrush stands encountered during the survey. The exceptions

Table 1. Size estimates (acres) for *Lepidium papilliferum* survey area polygons.

Polygon #	Size		Polygon #	Size		Polygon #	Size
1	600		21	25		41	100
2	70		22	25		42	300
3	60		23	5		43	100
4	300		24	5		44	40
5	30		25	40		45	35
6	90		26	50		46	20
7	80		27	30		47	100
8	30		28	10		48	85
9	30		29	75		49	80
10	25		30	20		50	30
11	25		31	10		51	100
12	25		32	15		52	100
13	15		33	50		53	60
14	15		34	20		54	25
15	15		35	20		55	80
16	15		36	20		56	50
17	20		37	15		57	75
18	10		38	120		58	15
19	10		39	100		59	10
20	20		40	50		60	10

were burned areas near the main road and in Sec6 SW4SW4 and Sec7 NW4. These seeded areas now support a mix of crested wheatgrass, cheatgrass, and Sandberg's bluegrass.
Slickspots - widespread, but sporadic; consisting mainly of scattered small to large slickspot clusters; individual slickspots variable in size, including large and multi-lobed complexes in some places; many looked perfectly suitable for slickspot peppergrass. The majority of slickspots with low level of weed invasion, but some in the moderate category; approximately 70% of slickspots with no or low level of cattle disturbance, the rest with moderate level, and a few with severe trampling disturbance. Slickspots were less common in the burned/seeded areas; crested wheatgrass and forage kochia (*Kochia prostrata*) established in most of the seeded area slickspots.

Polygon 2 (Pot Hole Butte quad; Appendix 1, Map 1)
Vegetation - relatively good condition sagebrush habitat similar to #1 above.
Slickspots - less common than #1; consisting of widely separated individual or small clusters of slickspots interspersed between large gaps with no slickspots; only a few large multi-lobed slickspots; majority of slickspots with low weed cover and low level of cattle disturbance sign; a few with severe cattle disturbance evidence.

Polygon 3 (Pot Hole Butte quad; Appendix 1, Map 1)
Vegetation - similar sagebrush vegetation as #1 above, except Thurber's needlegrass more common and widespread, although still very subordinate to Sandberg's bluegrass; prominent microbiotic crust cover throughout most of polygon.
Slickspots - distribution and disturbance patterns very similar to #2 above.

Polygon 4 (Winter Camp quad; Appendix 1, Map 3)
Vegetation - a large block of mostly high quality sagebrush-steppe habitat supporting Arttriwyo/Poasec ct., but surrounded by burned habitat to the north, west, and southwest; squirreltail and Thurber's needlegrass widespread, but usually at low cover; variable cheatgrass cover, absent from large portions of polygon, otherwise mostly trace cover, but forming dense swards and replacing the Sandberg's bluegrass in a few limited areas; moderate microbiotic crust cover. Sagebrush was absent from most of the area west of the polygon.
Slickspots - absent from majority of polygon; rare elsewhere except for two areas along the ridgecrest, where locally common; low levels of both cattle trampling disturbance and weed invasion.

Winter Camp Butte Road area - polygons in this survey area occur in series along the Winter Camp Butte Road. This road heads east off the Clover Three Creek Road, passes by the north side of Winter Camp Butte, and continues eastward to the southeastern corner of the Saylor Creek Air Force Range, before turning northeastward to eventually intersect the main gravel road south of Black Butte. We stopped every 0.5 mile along this 7-mile route to search for slickspot peppergrass.

Polygon 5 (Pot Hole Butte quad; Appendix 1, Map 2)
Vegetation - unburned Arttriwyo/Poasec ct; bunchgrasses other than Sandberg's bluegrass occur sporadically and at low cover; cheatgrass cover low overall, but with scattered dense patches; low forb diversity and cover.
Slickspots - widely scattered individuals, or more commonly, small patches of a few slickspots grouped together, most with only low level of cheatgrass invasion; cattle disturbance low in most slickspots, although varied from absent to moderate levels.

Polygon 6 (Pot Hole Butte and Winter Camp quads; Appendix 1, Maps 2 and 3)
Vegetation - nice Arttriwyo/Poasec ct. on both sides of Winter Camp Butte road; high Sandberg's bluegrass cover; Thurber's needlegrass and squirreltail widespread, but never abundant; cheatgrass widespread, but only trace amounts except for a few locally dense patches; depauperate forb diversity and abundance, except for long-leaved phlox (*Phlox longifolia*) which is common; good microbiotic crust cover.
Slickspots – common north of the Air Force Range boundary line, but scattered and uncommon south of the boundary; some large slickspot complexes north of boundary; little or no weed invasion into most slickspots; low incidence of cattle disturbance, some undisturbed microsites.

Polygon 7 (Pot Hole Butte quad; Appendix 1, Map 2)
Vegetation - a relatively recent fire around Winter Camp Butte has killed nearly every sagebrush shrub; portions of the area have been treated; cheatgrass, Sandberg's bluegrass, squirreltail, and a mix of native and weedy forbs characterize the vegetation; cheatgrass abundance varies from rare to common.
Slickspots - patchy distribution; absent or rare in some sections, but locally common east of Winter Camp Butte summit.

Polygons 8 - 12 (Pot Hole Butte and Black Butte West quads; Appendix 1, Maps 2 and 4)
Vegetation - area recently burned; only a few small/tiny remnant patches or strips of sagebrush remain; entire area drill-seeded and associated ground disturbance furrows ubiquitous, including through/across all slickspots; drill-seeding tractors did not divert

around the small sagebrush patches, resulting in breakage of many of the remnant shrubs; sagebrush seedlings seemed to be common; the paucity of cheatgrass west of the R8E-R9E fenceline compared to east of this fenceline suggests OUST or some other herbicide treatment.
Slickspots – were a regular feature of the landscape in this area; varying from scattered individuals in most sections, to locally common in places; seeded species have established in the majority of slickspots, although usually only a few plants.

Polygons 13 - 16 (Black Butte West quad; Appendix 1, Maps 4 and 5)
Vegetation - a mosaic of mostly burned and seeded areas, interspersed with mosaic-burn sagebrush patches and a limited extent of unburned/not seeded sagebrush patches; high cover of Sandberg's bluegrass and varying amounts of Thurber's needlegrass in unburned patches; cheatgrass with moderate to high cover in the seeded and mosaic burn areas, but generally low cover in the sagebrush patches.
Slickspots - soils seems different compared to areas to the west; widely scattered individual slickspots or small clusters, very uncommon overall; mostly low level of weed invasion; all with cattle trampling disturbance to one degree or another; some having more than 50% of surface disturbed.

Pot Hole Reservoir Road area - this survey area is located along the dirt spur road that accesses the southeastern end of the Saylor Creek Air Force Range enroute to Pot Creek Reservoir. We did not attempt to cross the fence forming the eastern boundary of the Air Force Range. A monoculture of burned and seeded vegetation dominated the landscape to the west and north of the fence as far as the eye could see.

Polygons 17 - 19 (Black Butte West quad; Appendix 1, Maps 4 and 5)
Vegetation - nearly all of the original sagebrush-steppe in this portion of the study area has been converted to annual or seeded grassland vegetation, either by wildfire or other means; this pattern continues further north as well; a few patches of sagebrush persist in polygon #17, but hardly a shrub left anywhere else.
Slickspots - widely scattered individuals or small clusters, but uncommon or absent throughout most of area; most with low level of weed invasion; most impacted by cattle trampling at low or occasionally moderate levels. We found several examples of what may have been slickspots in the past, but they can no longer be discerned clearly.

Black Butte South area - this survey area is located about one mile south of Black Butte along the road that forms the northern perimeter of the study area. A regular series of polygons were visited along this route.

Polygons 20 - 22 (Black Butte West quad; Appendix 1, Map 5)
Vegetation - sagebrush vegetation intermixed with patches of mosaic burn or small burned areas; mostly Arttriwyo/Brotec (*Artemisia tridentata wyomingensis/Bromus tectorum*) ct., but patches of Arttriwyo/Poasec ct. too; variable amounts of interseeded crested wheatgrass.
Slickspots - infrequent; averaging between <1 to <10/acre; variable in size; moderate to high weed invasion levels; all disturbed by cattle trampling, most moderate, some severe; low level of small mammal digging disturbance throughout general area.

Polygons 23 - 24 (Black Butte West and Black Butte East quads; Appendix 1, Maps 5 and 6)
Vegetation - crested wheatgrass seeding with high cover of cheatgrass in most places. The entire Black Butte area has burned in the past.
Slickspots - widely scattered individual or small clusters of slickspots, very uncommon overall; all invaded by low to high levels of bur buttercup and with varying amounts of either crested wheatgrass or a wheatgrass species cultivar (?); all slickspots with low to moderate incidence of cattle impacts.

Point 4008 area - located along the dirt two-track that passes near a small, unnamed butte (elevation 4,008 ft.) between Black Butte Road on the north, and Crows Nest Flat Road to the south. This road is not shown on the USGS topographic map and probably follows a water pipeline track.

Polygon 25 (Black Butte East and Black Butte West quads; Appendix 1, Maps 5 and 6)
Vegetation - a crested wheatgrass seeding with high cover of cheatgrass and a few small sagebrush patches.
Slickspots - rare; <3/acre; absent from some sections; all with some level of weed invasion and cattle trampling disturbance.

Polygons 26 - 27 (Black Butte East, Black Butte West, and Crows Nest Butte quads; Appendix 1, Maps 5, 6, and 7)
Vegetation - mix of sagebrush (mostly basin big sagebrush, *Artemisia tridentata* ssp. *tridentata*) and mosaic burn vegetation with cheatgrass dominating the understory in most places; crested wheatgrass ubiquitous, but varying in abundance; Sandberg's bluegrass common in a few places.
Slickspots - rare; <1/acre, tending to be small and not looking "right" for slickspot peppergrass; all weedy and with low to moderate cattle trampling disturbance.

Polygon 28 (Crows Nest Butte quad; Appendix 1, Map 7)
Vegetation - relatively good condition Arttriwyo/Poasec ct.
Slickspots - scattered distribution; some quite large in size; all with low level of weed invasion and low or no cattle disturbance sign.

Crows Nest Flat Road area - polygons in this survey area are located along the road that cuts across Crows Nest Flat, west of Crows Nest Road, and north of Crows Nest Butte.

Polygon 29 (Crows Nest Butte quad; Appendix 1, Map 7)
Vegetation - Arttriwyo/Poasec ct. with patches of cheatgrass; north of the road much more weedy than south.
Slickspots - fairly common away from road; low weed density and low level of cattle disturbance; relatively good slickspot integrity.

Polygons 30 - 34 (Crows Nest Butte quad; Appendix 1, Maps 7 and 8)
Vegetation - mosaic of burned, burned and seeded, open sagebrush, and denser, unburned swaths of sagebrush vegetation; crested wheatgrass and cheatgrass common in most open sagebrush areas. The landscape surrounding these polygons is largely annual grassland or seeded vegetation, especially to the south towards Crows Nest Butte.

Slickspots - absent or rare in some sections, but tending to be locally common along the tops of low rises or ridges; nearly all slickspots with low to moderate level of weeds, especially bur buttercup; many also with crested wheatgrass; cattle disturbance ranges from none in a small number of cases to low or moderate levels in all others; overall slickspot integrity marginal to poor. There were a lot of large white or colored flags posted in the Crows Nest Flat area – perhaps by BLM for seeding or other post-fire treatment purposes.

Winter Camp area - this survey area is located north and east of Winter Camp in close proximity to the East Fork Bruneau Canyon.

Polygon 35 (Winter Camp quad; Appendix 1, Map 9)
Vegetation - Arttriwyo/Poasec-Brotec ct.; cheatgrass very dense in places; only rare crested wheatgrass.
Slickspots - scattered, various sizes; most with low weed (bur buttercup) density and no or low level of cattle impacts.

Polygon 36 (Winter Camp quad; Appendix 1, Map 9)
Vegetation - Arttriwyo/Poasec ct. with some squirreltail and Indian ricegrass; cheatgrass spotty away from the road.
Slickspots - very rare; <1/acre; undisturbed; minimal evidence of cattle use in area.

Polygon 37 (Winter Camp quad; Appendix 1, Map 9)
Vegetation - mostly crested wheatgrass seeding with some Sandberg's bluegrass and cheatgrass; strip of good condition, unburned Arttriwyo/Poasec ct. near canyon.
Slickspots - none.

Polygon 38 (Winter Camp and Hodge Station quads; Appendix 1, Maps 9 and 12)
Vegetation - Arttriwyo/Poasec ct.; also a few small weedy old burn inclusions; variable cheatgrass cover, but locally abundant.
Slickspots - widely scattered and uncommon on the flats, but large, rocky slickspots locally common along the ridge in section 23; most with low level of weed invasion and low level of cattle disturbance; some undisturbed.

Reservoir Butte area - "Reservoir Butte" is a prominent, unnamed butte located about three miles southeast of Winter Camp Butte that has a small reservoir perched atop its summit.

Polygon 39 (Hodge Station quad; Appendix 1, Map 10)
Vegetation - Arttriwyo/Poasec ct.; good condition just west of reservoir, but more cattle use and impacts to vegetation on flats to south of reservoir; cheatgrass more common on flats subject to higher cattle activity; the sagebrush gives way to a large crested wheatgrass seeding towards lower slope position.
Slickspots - widespread and common on flats north of reservoir, but less common on steeper slopes; mostly in poor condition due to high level of cattle disturbance, except west of reservoir where disturbance was minor; low to moderate weed invasion levels.

Polygon 40 (Hodge Station quad; Appendix 1, Map 10)
Vegetation - mix of Arttriwyo/Poasec and Arttriwyo/Brotec ct. giving way to an extensive crested wheatgrass seeding extending northward for several miles from the northern base of the butte.

Slickspots - rare in the sagebrush; <3/acre; all with low weed cover and low or moderate levels of cattle trampling disturbance; no slickspots observed in the limited amount of crested wheatgrass seeding surveyed to the north.

Big Draw area - located south of "Reservoir Butte", both north and south of Big Draw.

Polygon 41 (Hodge Station quad; Appendix 1, Map 11)
Vegetation - mosaic of unburned sagebrush, mosaic-burn sagebrush, and burned areas with crested wheatgrass.
Slickspots - patchy distribution, varying from locally common to absent or rare near bottoms or sandy soil areas with needle-and-thread grass; also varying from small individual slickspots to large complexes; highest integrity slickspots in places with intact sagebrush vegetation; most with minimal weed invasion; about 20% with moderate or high levels of livestock disturbance; the rest with low levels, or in a few cases, undisturbed; many of the slickspots with native bunchgrasses, or in some cases, crested wheatgrass; also occasionally some small sagebrush shrubs, and in this way reminiscent of slickspots further south in the Juniper Butte area.

Polygon 42 (Hodge Station quad; Appendix 1, Map 11)
Vegetation - mosaic vegetation, with sagebrush habitat intermixed with areas of open/sparse sagebrush cover, or seeded areas dominated by crested wheatgrass and varying amounts of cheatgrass and native bunchgrasses; bur buttercup abundant in places.
Slickspots - abundance varies from locally common to rare; most common near the low ridge in section 5 NE4; usually with low or moderate weed density and cattle trampling disturbance, but occasionally with a high disturbance level.

Polygon 43 (Hodge Station quad; Appendix 1, Map 11)
Vegetation - Big Draw bottoms is a sea of crested wheatgrass. The broad upland ridge area between Points 4127 and 4165 supports an island of unburned sagebrush intermixed with patches of mosaic burn sagebrush; mainly Arttriwyo/Poasec-Sithys ct.; cheatgrass and crested wheatgrass spotty, locally common, but some segments more or less free of weeds; mostly cheatgrass and crested wheatgrass in burned segments with no or little sagebrush. Three groups of sage grouse, totaling over 25 birds, were encountered in this polygon. In each case the birds were in areas having good quality sagebrush habitat, including high Sandberg's bluegrass cover. Crested wheatgrass and cheatgrass vegetation dominates the landscape for miles to the east, south, and west of this polygon.
Slickspots - individual or small clusters of slickspots scattered throughout the ridge area; locally common in a few small areas, but almost always small in size; averaging about 10/acre; great majority of slickspots weed free, while about 35% with low level of cattle disturbance; the rest with no cattle sign. Slickspots absent or exceedingly rare in the Big Draw bottoms.

Reservoir Butte Road area - this survey area is located along the road between the Clover Three Creek Road and "Reservoir Butte".

Polygons 44 - 45 (Hodge Station quad; Appendix 1, Map 12)
Vegetation - large crested wheatgrass seeding on south side of road, associated species include Sandberg's bluegrass, cheatgrass, and alfalfa (*Medicago sativa*); perhaps not

seeded on north side, with less crested wheatgrass, and more cheatgrass and tumble mustard (*Sisybrium altissimum*) compared to south side; native bunchgrasses also more common in places.
Slickspots - none.

Polygon 46 (Hodge Station quad; Appendix 1, Map 12)
Vegetation - burned area with some remnant sagebrush, but more green rabbitbrush (*Chrysothamnus viscidiflorus*), along with Sandberg's bluegrass and Thurber's needlegrass; crested wheatgrass also abundant.
Slickspots - scattered distribution and variable in size, generally larger on the north side of the road versus the south side; low incidence of weed invasion and livestock disturbance.

Crows Nest Lake area - this survey area is comprised of a single polygon located around Crows Nest Lake, just west of Clover Road.

Polygon 47 (Crows Nest Butte quad; Appendix 1, Map 13)
Vegetation - some remnant sagebrush northwest of road; remainder of landscape burned and mechanically treated; cheatgrass is spotty and general area may have been treated with herbicide. Crows Nest Lake to Crows Nest Butte has all burned in the past.
Slickspots - fairly common in remnant sagebrush northwest of road; various sizes represented; low to moderate levels of weed invasion and low levels of cattle disturbance; mostly scattered distribution elsewhere, but locally common in places, especially the low ridge north of Crows Nest Lake, where soil runoff into the slickspots has changed their color from whitish to light tan; all slickspots disturbed by drill seeding efforts; low levels of weed invasion and cattle disturbance.

East of Hodge Station area - polygons in this survey area are located east of the Hodge Station site between the Clover Three Creek Road and Clover Road, north of the junction of these roads.

Polygon 48 (Hodge Station quad; Appendix 1, Map 14)
Vegetation - sparse sagebrush; Chrvis/Poasec-Brotec (*Chrysothamnus viscidiflorus/Poa secunda-Bromus tectorum*) ct. dominates the northwestern portion of the polygon.
Slickspots - widely scattered, varying from small to large in size; all with a low level of weed density and cattle disturbance impacts; no slickspots observed in the old seeding in eastern part of the polygon.

Polygon 49 (Hodge Station quad; Appendix 1, Map 14)
Vegetation - a strand of sagebrush occurs north of the road; a single small patch of sagebrush persists in the seeded vegetation on south side of road
Slickspots - scattered slickspots on north side of main road, all with low levels of weed density and cattle disturbance; no slickspots found on south side of road.

Polygon 50 (Hodge Station quad; Appendix 1, Map15)
Vegetation - mostly Arttriwyo/Poasec ct.
Slickspots - scattered distribution and low density overall; low levels of weed density and cattle disturbance.

Polygon 51 (Clover Butte North quad; Appendix 1, Map 16)
Vegetation - sagebrush dominates on the west side of main road, while sagebrush is sparse except along the ridge position on the east side; crested wheatgrass, cheatgrass, and Sandberg's bluegrass all common.
Slickspots - density varies from low to moderate; nearly every slickspot with some level of cattle disturbance, generally more pronounced on east side of road.

Polygon 52 (Clover Butte North quad; Appendix 1, Map 16)
Vegetation - Arttriwyo/Poasec ct.; giving way to seeded vegetation in all directions; low cover of seeded or weedy grasses.
Slickspots - uncommon overall; a few scattered individuals or small clusters; most with low to moderate weed invasion and a moderate level of cattle disturbance.

Polygon 53. (Hodge Station quad; Appendix 1, Maps 14 and 15)
Vegetation - crested wheatgrass seeding. This seeding extends for miles to the north, east, and west within the study area.
Slickspots - none encountered.

Polygon 54 (Hodge Station quad; Appendix 1, Map 15)
Vegetation - remnant patch of sagebrush with Sandberg's bluegrass and Thurber's needlegrass dominating the understory.
Slickspots - scattered, mostly small in size; all with low level of weed invasion and cattle disturbance sign.

Polygon 55 (Hodge Station quad; Appendix 1, Map 15)
Vegetation - crested wheatgrass seeding.
Slickspots - none seen.

Polygon 56 (Hodge Station quad; Appendix 1, Map 15)
Vegetation - rocky, burned, cheatgrass-dominated slope surrounded by crested wheatgrass seeding in all directions.
Slickspots - nothing clearly identifiable as a slickspot.

Polygon 57 (Hodge Station and Crows Nest Butte quads; Appendix 1, Maps 15 and 17)
Vegetation - no sagebrush; crested wheatgrass dominates the vegetation; varying amounts of cheatgrass.
Slickspots - spotty, absent in most areas, but locally common in a few places; no or low level of weed invasion; mostly low levels of cattle disturbance, except approximately 20% of slickspots with moderate or high level levels, or a few with no disturbance.

Polygons 58 - 60 (Crows Nest Butte quad; Appendix 1, Map 17)
Vegetation - crested wheatgrass seeding. This vegetation type continues for miles to the northwest within the study area.
Slickspots - none or rare and in poor condition.

DISCUSSION

Although extensive segments of the Bruneau Desert have burned and been seeded to crested wheatgrass in the past, several small to large stands of good condition, unburned sagebrush-steppe habitat persists in the study area. In light of how much of the regional sagebrush-steppe has been lost or seriously degraded over the years, these

remnant stands represent worthy conservation targets irrespective of the presence or absence of slickspot peppergrass. Four areas in particular deserve consideration:

1. The largest block of intact sagebrush-steppe in the study area is located east of Clover Three Creek Road, within the Saylor Creek Air Force Training Range. It occurs in T9S R8E section 5 N2, and section 6, all but the SW4, and corresponds to study area polygon #1. Sagebrush extends further east, at least into section 4, but we did not directly survey this section. Most of this several square-mile area is in good ecological condition. It boasts some of the highest microbiotic crust cover we have ever seen in southwestern Idaho. It also supports a relatively high density of good condition slickspot microsites in many places. More than anywhere else, this portion of the study area may be worthy of a re-survey for slickspot peppergrass in a year with more favorable climatic conditions. Any such re-survey should probably also include polygon #6 to the south.

2. A relatively large sagebrush stand is located about two miles further south in T9S R8E section 20 E2, and most of sections 21 and 28. There were only trace amounts of cheatgrass in most places, although several exceptions occurred. This area corresponds to survey area polygons #4 and #6. The stand extends beyond the perimeter of where we searched in these two polygons.

3. Most of the Big Draw area is a crested wheatgrass seeding. One exception is a segment of low ridge located in portions of T10S R9E sections 8 and 17. An oblong-shape sagebrush stand extends from near 4127, south to Point 4165, and corresponds to a portion of Survey area polygon #43. This was the only area we observed sage grouse during our survey. Cheatgrass is absent or only at trace amounts in much of this sagebrush stand.

4. Much of the landscape around Crows Nest Butte area is dominated by crested wheatgrass or annual grassland vegetation. A relatively good condition sagebrush stand is located approximately 2.5 miles northwest of the butte in T9S R9E section 29 SE4 and adjacent section 35, and corresponds to survey area polygon #29.

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Appendix 1

Maps of areas surveyed for *Lepidium papilliferum*.

Appendix 2

Legal descriptions for the location of *Lepidium papilliferum* survey polygons.

Polygon #	USGS 7.5' quad.	Legal description
Polygon 1	Pot Hole Butte	T9S R8E sec 5 & 6; also R7E sec 1
Polygon 2	Pot Hole Butte	T9S R8E sec 7
Polygon 3	Pot Hole Butte	T9S R8E sec 17 & 18
Polygon 4	Winter Camp	T9S R8E sec 28 & 29
Polygon 5	Pot Hole Butte	T9S R8E sec 20
Polygon 6	Pot Hole Butte	T9S R8E sec 17, 20 & 21
Polygon 7	Pot Hole Butte	T9S R8E sec 21 & 22
Polygon 8	Pot Hole Butte	T9S R8E sec 22
Polygon 9	Black Butte West	T9S R8E sec 22 & 23
Polygon 10	Black Butte West	T9S R8E sec 23
Polygon 11	Black Butte West	T9S R8E sec 23 & 24
Polygon 12	Black Butte West	T9S R8E sec 24
Polygon 13	Black Butte West	T9S R9E sec 19
Polygon 14	Black Butte West	T9S R9E sec 18
Polygon 15	Black Butte West	T9S R9E sec 18
Polygon 16	Black Butte West	T9S R9E sec 7 & 8
Polygon 17	Black Butte West	T9S R9E sec 5 & 8
Polygon 18	Black Butte West	T9S R9E sec 6
Polygon 19	Black Butte West	T9S R9E sec 6
Polygon 20	Black Butte West	T9S R9E sec 8
Polygon 21	Black Butte West	T9S R9E sec 9
Polygon 22	Black Butte West	T9S R9E sec 9
Polygon 23	Black Butte West	T9S R9E sec 10
Polygon 24	Black Butte East	T9S R9E sec 11
Polygon 25	Black Butte East	T9S R9E sec 14
Polygon 26	Black Butte East	T9S R9E sec 14 & 15
Polygon 27	Black Butte East	T9S R9E sec 23
Polygon 28	Crows Nest Butte	T9S R9E sec 26
Polygon 29	Crows Nest Butte	T9S R9E sec 26 & 35
Polygon 30	Crows Nest Butte	T9S R9E sec 25
Polygon 31	Crows Nest Butte	T9S R10E sec 30
Polygon 32	Crows Nest Butte	T9S R10E sec 29
Polygon 33	Crows Nest Butte	T9S R10E sec 28 & 33
Polygon 34	Crows Nest Butte	T9S R10E sec 28 & 33
Polygon 35	Winter Camp	T10S R8E sec 9
Polygon 36	Winter Camp	T10S R8E sec 9
Polygon 37	Winter Camp	T10S R8E sec 4 & 5
Polygon 38	Winter Camp & Hodge Station	T10S R8E sec 14, 15 & 23
Polygon 39	Hodge Station	T9S R9E sec 29, 30 & 31
Polygon 40	Hodge Station	T9S R9E sec 29
Polygon 41	Hodge Station	T9S R9E sec 33; also R10S sec 4
Polygon 42	Hodge Station	T10S R9E sec 5 & 8

Polygon #	USGS 7.5' quad.	Legal description
Polygon 43	Hodge Station	T10S R9E sec 8 & 17
Polygon 44	Hodge Station	T10S R8E sec 1
Polygon 45	Hodge Station	T10S R8E sec 2 & 11
Polygon 46	Hodge Station	T10S R8E sec 10
Polygon 47	Crows Nest Butte	T10S R10E sec 9, 10, 15 & 16
Polygon 48	Hodge Station	T10S R8E sec 25 & 36; also R9E sec 30 & 31
Polygon 49	Hodge Station	T10S R9E sec 30 & 31
Polygon 50	Hodge Station	T10S R9E sec 32; also T11S R9E sec 5
Polygon 51	Clover Butte North	T11S R9E sec 4
Polygon 52	Clover Butte North	T11S R9E sec 3, 4, 9 & 10
Polygon 53	Hodge Station	T10S R9E sec 29, 31 & 32
Polygon 54	Hodge Station	T10S R9E sec 32 & 33
Polygon 55	Hodge Station	T10S R9E sec 33
Polygon 56	Hodge Station	T10S R9E sec 34
Polygon 57	Hodge Station & Crows Nest Butte	T10S R9E sec 34 & 35; also T11S R9E sec 2
Polygon 58	Crows Nest Butte	T10S R9E sec 36
Polygon 59	Crows Nest Butte	T10S R10E sec 30 & 31
Polygon 58	Crows Nest Butte	T10S R10E sec 29 & 30