

DEPARTMENT OF THE INTERIOR**Fish and Wildlife Service****50 CFR Part 17**

RIN 1018-AU99

Endangered and Threatened Wildlife and Plants; Withdrawal of Proposed Rule To List *Lepidium papilliferum* (Slickspot Peppergrass)**AGENCY:** Fish and Wildlife Service, Interior.**ACTION:** Proposed rule; withdrawal.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), again withdraw our July 15, 2002, proposal (67 FR 46441) to list *Lepidium papilliferum* (slickspot peppergrass) as an endangered species under the Endangered Species Act of 1973, as amended (Act). The best available data for *L. papilliferum* indicates that, while its sagebrush-steppe matrix habitat is degraded, there is little evidence of negative impacts on the abundance of *L. papilliferum*, which inhabits slickspot microsites within this system. Annual abundance of the plant is strongly correlated with spring precipitation, therefore a high degree of variability in annual abundance is to be expected. Data on overall population trends are inconsistent; although recent declines that do not correlate with spring rainfall are noted in one portion of the species' range, range-wide data demonstrate increases in abundance that continue to track consistently with rainfall during those same years. The best available range-wide data indicate that abundance of the population range-wide is strongly correlated with precipitation and has increased in recent years in association with increased rainfall, as expected.

ADDRESSES: Supporting documentation for this action is available for public inspection, by appointment, during normal business hours at the Snake River Fish and Wildlife Office, 1387 S. Vinnell Way, Boise, ID 83709.

FOR FURTHER INFORMATION CONTACT: Jeffery Foss, Field Supervisor, Snake River Fish and Wildlife Office at the above address; by telephone at 208/378-5243; by facsimile at 208/378-5262; or by electronic mail at: fw1srbocomment@fws.gov.

SUPPLEMENTARY INFORMATION:**Species Information**

Lepidium papilliferum was originally described as *L. montanum* var. *papilliferum* in 1900 by Louis Henderson. It was renamed *L. papilliferum* by Aven Nelson and J.

Francis Macbride in 1913, based on its distinctive growth habit, short lifespan, and unusual pubescence (Nelson and Macbride 1913, p. 474). Hitchcock regarded *L. papilliferum* as *L. montanum* var. *papilliferum* (Hitchcock *et al.* 1964, p. 516; Hitchcock and Cronquist 1973). In a review of taxa in the mustard family (Brassicaceae), Rollins (1993) maintained the species based on differences in the physical features between *L. papilliferum* and *L. montanum*. More recently, a taxonomic review concluded that *L. papilliferum* warrants species recognition based on distinct morphological features (Lichvar 2002), and a contrasting life history when compared to *L. montanum* regarding seed dormancy and its seed bank (Meyer *et al.* 2005, p. 21). The preliminary results of recent genetic studies comparing *L. papilliferum* with *L. montanum* indicate that *L. papilliferum* forms a monophyletic group or subgroup that is genetically distinct from *L. montanum* (Larson *et al.* 2006, p. 13 and Figs. 4, 8; Smith 2006, pp. 5-7, Fig. 1). The currently accepted taxonomy recognizes *Lepidium papilliferum* (Henderson) A. Nels and J.F. Macbr as a full species (Taxonomic Serial No. 53383, Integrated Taxonomic Information System (ITIS), 2006).

Biology

Lepidium papilliferum is a taprooted, intricately branched plant. The plant flowers once and then dies (it is monocarpic), and displays two different life cycles, an annual and a biennial form. The plant averages 2 to 8 inches (in) (5 to 20 centimeters (cm)), but can reach up to 16 in (40 cm) in height. Leaves and stems are covered with fine, soft hairs, and the leaves are divided into linear segments. Flowers are numerous, 0.1 in (3 to 4 millimeter (mm)) diameter, white, and 4-petalled. Fruits (siliques) are 0.1 in (3 mm), round in outline, flattened, and 2-seeded (Moseley 1994, pp. 3 and 4; Holmgren *et al.* 2005, p. 260).

The annual form of the *Lepidium papilliferum* matures, reproduces by setting seed, and dies in one growing season. The biennial life form initiates growth in the first year as a rosette, but does not produce seed and die until the second year. Biennial rosettes must survive dry summers on the Snake River Plain and Owyhee Plateau, and consequently many of these rosettes die before flowering and producing seed. The proportion of annuals versus biennials in a population can vary greatly (Meyer *et al.* 2005, p. 15). Depending on individual plant vigor and the effectiveness of pollination, dozens, if not thousands, of seeds can be

produced by a single *L. papilliferum* plant (Quinney 1998, pp. 15 and 17), with individual biennial plants producing a much greater number of seeds than annual plants (Meyer *et al.* 2005, p. 15). Average seed output for annual plants at the Orchard Training Area (OTA) (an Idaho Army National Guard training area on BLM land) in 1993, was 125 seeds per plant, and in 1994, was 46 seeds per plant. Biennial seed production in 1993 and 1994 averaged 787 and 105 seeds per plant, respectively (Meyer *et al.* 2005, p. 16).

Lepidium papilliferum seeds produced in a given year are dormant for at least a year before any germination takes place. Following this year of dormancy, approximately 6 percent of seeds produced in a given year germinate annually and approximately 3 percent die annually (Meyer *et al.* 2005, pp. 17, 18). After 12 years, all seeds in a given cohort will likely have either died or germinated (Meyer *et al.* 2005, p. 18). Seeds are released in late June or early July.

Like many short-lived plants growing in arid environments, above-ground numbers of *Lepidium papilliferum* individuals can fluctuate widely from one year to the next, depending on seasonal precipitation patterns (Mancuso and Moseley 1998, p. 1; Meyer *et al.* 2005, pp. 4, 12, 15; Palazzo *et al.* 2005, p. 9; Menke and Kaye 2006a, p. 8; Menke and Kaye 2006b, pp. 10, 11). In an analysis of monitoring data, minimum and maximum temperatures were not statistically correlated with *L. papilliferum* abundance (Menke and Kaye 2006b, p. 8). Above-ground plants represent only a portion of the population; the seed bank (a reserve of dormant seeds, generally found in the soil) contributes the other portion, and apparently in many years constitutes the majority of the population (Mancuso and Moseley 1998, p. 1). According to Meyer *et al.* (2005, p. 21), "Without a persistent seedbank, *L. papilliferum* could probably not succeed as an annual in its stochastically varying habitat." Seed banks are adaptations for survival in a "risky environment," because they buffer a species from stochastic impacts such as lack of soil moisture (Baskin and Baskin 2001, p. 160).

Lepidium papilliferum seeds have an extremely patchy distribution, making it difficult to estimate seed density without taking a large number of samples (Meyer and Allen 2005, pp. 5, 6). The vast majority of *L. papilliferum* seeds in slickspots (see Ecology and Habitat section) have been located near the soil surface, with lower numbers of seeds located in deeper soils (Meyer *et*

al. 2005, p. 19; Palazzo *et al.* 2005, p. 3). *L. papilliferum* seeds have been found in slickspots with no above-ground plants (Meyer *et al.* in press, p. 18; Palazzo *et al.* 2005, p. 10). Viable seeds have also been located outside of slickspots, indicating that some seed dispersal is occurring beyond slickspot habitat (Palazzo *et al.* 2005, p. 10). The primary seed dispersal mechanism for *L. papilliferum* has not been identified and is not known (Robertson and Ullappa 2004, p. 1708).

Lepidium papilliferum seeds located near the soil surface show higher rates of germination and viability (Meyer and Allen 2005, pp. 6 to 8; Palazzo *et al.* 2005, p. 10), and the greatest seedling emergence success rate (Meyer and Allen 2005, pp. 6 to 8). Seeds were more abundant, more viable, and had greater germination percentages and rates from the upper 2 in (5 cm) of soil (Palazzo *et al.* 2005, pp. 8, 10). In another study, the highest level (60 percent) of seedling emergence was observed at a seed depth of 0.1 in (approximately 2 mm), with a marked decrease in seedling emergence at 0.2 in (approximately 5 mm) (Meyer and Allen 2005, pp. 6, 7).

Deep burial of slickspot peppergrass seeds (average depths greater than 5.5 in (14 cm)) entombs seeds that are still viable and preserves them beyond the 12-year period previously assumed as the maximum period of viability for *Lepidium papilliferum* seeds (Meyer and Allen 2005, pp. 6, 9). While there may be processes such as badger (*Taxidea taxus*) burrow-digging that could return these buried viable seeds to the near-surface, the successful establishment of seedlings may be reduced due to modification of soil layers following previous disturbance events (Meyer and Allen 2005, pp. 6, 8). The effects of environmental threats such as wildfire on *L. papilliferum* seed dormancy and viability are currently unknown.

Lepidium papilliferum has low seed set in the absence of pollinators, and is primarily an outcrossing species requiring pollen from separate plants for

more successful fruit production (Robertson 2003a, p. 5; Robertson and Klemash 2003, p. 339; Robertson and Ullappa 2004, p. 1707). In pollination experiments where researchers moved pollen from one plant to another, fruit production was observed to be higher with pollen from distant sources 246 to 330 feet (ft) (75 to 100 meters (m)) away within a plant patch, and 4 to 12.4 miles (mi) (6.5 to 20 kilometers (km)) away from another patch of plants (Robertson and Ullappa 2004, p. 1705). Genetic exchange can occur either thorough pollen or seed dispersal.

Lepidium papilliferum has been observed to be visited by at least 25 families of insects, although only some of these insects serve as effective pollinators (Robertson 2003b, pp. 10, 11; Robertson and Klemash 2003, p. 336). Scarcity of pollinators were not found to limit seed set at any site (Robertson *et al.* 2004, p. 14). Pollinators include insects from several families of bees and ants (Hymenoptera), including Apidae, Halictidae, Sphecidae, and Vespidae; beetles (Coleoptera), including Dermestidae, Meloidae, and Melyridae; flies (Diptera), including Bombyliidae, Syrphidae, and Tachinidae; and others (Robertson and Klemash 2003, p. 336). The pollen transfer efficiency for *L. papilliferum* varies among these insects. Pollinators of *L. papilliferum* with high pollen transfer efficiencies and visitation rates include sphecids and vespid wasps, bombyliid and tachnid flies, and honeybees, with lesser contributions from halictid bees.

The genetics of *Lepidium papilliferum* were studied using samples collected from areas across the entire range of the species, including both the Snake River Plain and a disjunct range on the Owyhee Plateau (Stillman *et al.* 2005, pp. 6, 8, 9). The largest amounts of genetic difference occurred between the Snake River Plain and the Owyhee Plateau populations. The Snake River Plain and the Owyhee Plateau populations are separated by 44 mi (70 km), which is considered beyond the distance that insect pollinators can

travel or that seed dispersal can occur. Despite the distance that separates the Snake River Plain and the Owyhee Plateau populations, plants from these two areas share a 94-percent similarity in allelic diversity. This high degree of similarity suggests that they were either part of one continuous distribution or they originated from similar ancestral material (Stillman *et al.* 2005, pp. 6, 8, 9). Sites in the Snake River Plain with fewer numbers of plants had less genetic diversity than sites with larger numbers of plants. Interestingly, a correlation between population size and genetic diversity did not exist in the Owyhee Plateau region. The authors suggested that this may be because the Owyhee Plateau region is less fragmented than the Snake River Plain, but suggested further genetic research is needed. Larson (2006, p. 14 and Fig. 4) also found geographically well-defined populations of *Lepidium papilliferum* between the Snake River Plain and Owyhee Plateau based on genetics. In contrast to the Stillman *et al.* (2005) study, Larson's findings indicate the possibility of depressed genetic diversity in *L. papilliferum* based on significantly greater average similarity coefficients within collection sites of *L. papilliferum* compared to those of *L. montanum*, (Larson *et al.* 2006, p. 13).

Ecology and Habitat

The habitat of *Lepidium papilliferum* is found within semiarid sagebrush-steppe habitats in southern Idaho. This plant is known from the extensive volcanic plains of the Snake River Plain (and foothills) and the Owyhee Plateau, with most element occurrences (EOs) occurring on flat to gently sloping terrain (see Figure 1 below). Element occurrences are defined as "an area of land in which a species is or was present" (NatureServe 2002). *L. papilliferum* is associated with basalt ridges and plains, stable piedmont, and older alluvial floodplains and deposits (Fisher *et al.* 1996, pp. 14, 16).

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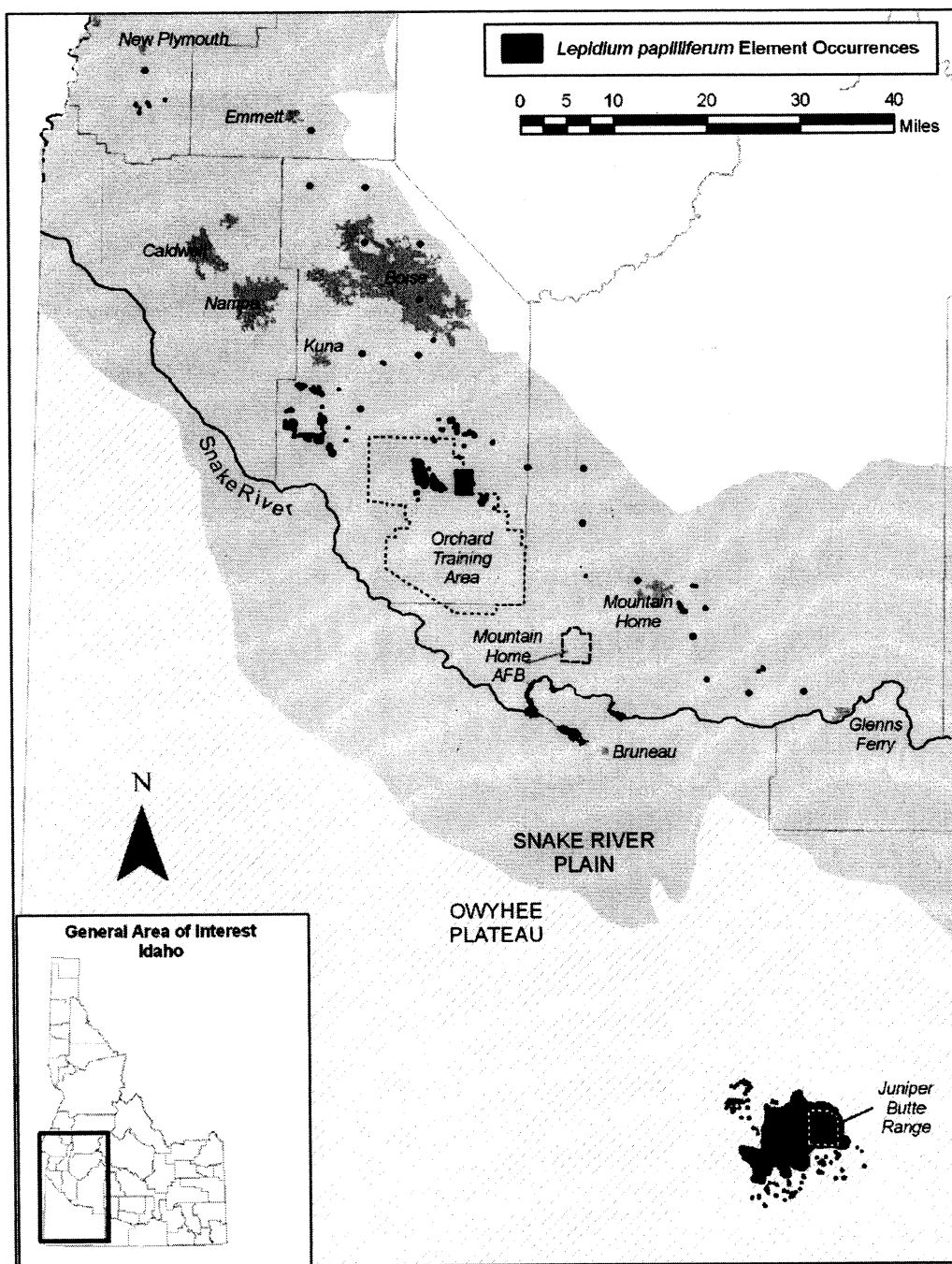


Figure 1. Range-wide Distribution for *Lepidium papilliferum*

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Range-wide, *Lepidium papilliferum* is associated with visually distinct microsites known as slickspots (mini-playas or natric sites) (Moseley 1994, p. 7). Slickspots are distinguished from the surrounding sagebrush matrix as having the following characteristics—microsites where water pools when rain falls (Fisher *et al.* 1996, pp. 2, 4); little vegetation; more distinct soil layers

with a more columnar or prismatic structure; higher alkalinity and clay content and natric (higher sodium) properties (Fisher *et al.* 1996, pp. 15, 16; Meyer and Allen 2005, pp. 3 to 5, 8); and reduced levels of organic matter and nutrients due to lower biomass production (Meyer and Quinney 1993, pp. 3, 6; Fisher *et al.* 1996, p. 4). The slickspots range in size from less than 10 square feet (ft²) (1 square meter (m²))

to about 110 ft² (10 m²) (Mancuso *et al.* 1998, p. 1), but most are between 10 ft² and 20 ft² (1 m² and 2 m²).

Slickspots cover a relatively small cumulative area within the larger sagebrush-steppe matrix, and only a small percentage of slickspots are known to be occupied by *Lepidium papilliferum*. For example, a thorough field inventory within the Juniper Butte Range in 2002 found that of the 11,070

acres (ac) (4,480 hectares (ha)) surveyed, approximately 1 percent (109 ac (44 ha)) consisted of slickspot habitat, and only 4 percent of the slickspot habitat was occupied by above-ground *L. papilliferum* plants (U.S. Air Force 2002, p. 9). The total amount of occupied slickspot habitat (above-ground plants and known occurrences of seed in the soil) within this large occurrence was approximately 4 ac (1.6 ha) at the time it was surveyed (0.1 percent of the acreage).

Based on studies in 2004 on the Orchard Training Area (OTA), a training area of the Idaho Army Reserve National Guard (IARNG) on the Snake River Plain, slickspots have three primary layers: the surface silt layer, the restrictive layer, and the moist clay layer beneath. The top two layers (surface silt and restrictive) of slickspots are very thin; the surface silt layer varies in thickness from 0.1 to 1.2 in (a few mm to 3 cm) in slickspots known to support *Lepidium papilliferum*, and the restrictive layer varies in thickness from 0.4 to 1.2 in (1 to 3 cm) (Meyer and Allen 2005, p. 3). The moist clay basal layer, which continues down to bedrock, is consistently below the restrictive layer (Meyer and Allen 2005, p. 3). All slickspots have variations in surface silt thickness.

As part of the *Lepidium papilliferum* Habitat Integrity and Population (HIP) monitoring conducted range-wide in 2005, the depth of the surface silt layer was measured 3 times in every slickspot along 79 transects across the range of *L. papilliferum*; a total of 769 slickspots were sampled. Measurements were taken directly adjacent to live *L. papilliferum* plants; the range-wide mean surface silt layer depth was 0.31 in (0.78 cm) (Colket 2006a).

The surrounding sagebrush matrix soils are distinguished from slickspot soils by a deeper silt layer with a clay layer beneath, and usually the restrictive layer is lacking (Meyer and Allen 2005, pp. 3 to 5). Non-slickspot soils at the OTA had thick silt layers with a mean depth of 4.7 in (12 cm); the silt layer typically transitioned directly into the clay layer beneath, although some samples had restrictive layers which were abnormally thickened (over 3.9 in (10 cm)) (Meyer and Allen 2005, pp. 3 to 5, 8).

It is unknown how long slickspots take to form, but it is hypothesized to take several thousands of years (Nettleton and Petersen 1983, p. 193; Seronko 2006, p. 1). The conditions that allowed for the formation of slickspots in southwestern Idaho are thought to have occurred during a wetter Pleistocene climate. Holocene additions

of wind-carried salts (often loess deposits) produced soils high in sodium (natric) (Nettleton and Petersen 1983, p. 191; Seronko 2006, p. 1). It may take several hundred years to alter or lose slickspots through natural climate change or severe natural erosion (Seronko 2006, p. 1). Some researchers hypothesize that, given current climatic conditions, new slickspots are no longer being created (Nettleton and Petersen 1983, pp. 166, 191, 206), but that some slickspots subjected to light disturbance in the past may re-form (Seronko 2006, p. 1). Slickspots may be destroyed and lost to disturbances that alter the physical properties of the soil layers.

The forces that hold clay particles together are greatly weakened when sodium-clay and water come into contact. In this condition, clay particles are easily detached or dispersed from larger aggregates, i.e., slickspot soils are especially susceptible to mechanical disturbances when wet (Rengasmy *et al.* 1984, p. 63; Seronko 2004, pp. 1, 2). Such disturbances disrupt the soil layers important to *Lepidium papilliferum*'s seed germination and seedling growth. Meyer and Allen (2005, p. 9) suggest that if sufficient time passes following the disturbance of slickspot soil layers, it is possible that the slickspot soil layers may reform similar to their pre-disturbance configuration. Slickspots that no longer support *L. papilliferum*, but still retain the thin silt and restrictive layer structure, are the most likely sites to support reintroductions. Restoration and species reintroduction potential for *L. papilliferum* habitat have not been studied.

The highest monthly temperatures within the range of *Lepidium papilliferum* normally occur in July (approximately in the low 90 degrees Fahrenheit (approximately 33 degrees Celsius)), and lowest monthly temperatures occur in January (approximately in the low 20 degrees Fahrenheit (minus 7 degrees Celsius)). Average precipitation within the species' range is 11.7 in (29.7 cm) for Boise, 7.4 in (18.8 cm) for Bruneau, and 9.9 in (25.1 cm) for Mountain Home. Precipitation tends to fall as rain, primarily in winter and spring (November to May); the lowest rainfall occurs in July and August, and June, September, and October receive slightly more. Freeze-free days average about 120 days in Boise, 146 days in Bruneau, and 138 days in Mountain Home (WRCC 2006).

Spring precipitation has been correlated with above-ground numbers of *Lepidium papilliferum* in several analyses. Palazzo *et al.* (2005, p. 9) and

Menke and Kaye (2006a, p. 8) utilized Habitat Integrity Index (HII) range-wide data collected from 1998 to 2001. Menke and Kaye (2006b, pp. 10, 11) utilized HII data collected from 1998 to 2002, as well as 2004 Habitat Integrity and Population (HIP) data. Meyer *et al.* (2005, p. 15) utilized demographic data from the OTA collected from 1993 to 1995. Palazzo *et al.* (2005, p. 9) found a positive relationship (p-value of less than 0.01) between above-ground plants and February to June precipitation. Menke and Kaye (2006a, p. 8) found March to May precipitation accounted for 99.4 percent (2006a, p. 8) and 89 percent (2006b, pp. 10, 11) of the variation in *L. papilliferum* numbers. Meyer *et al.* (2005, p. 15) found that an increase in February through May precipitation increased the number of *L. papilliferum* seedlings at the OTA. This correlation of abundance with spring rainfall is important, as it at least partially explains past fluctuations in population numbers, and suggests that perceived declines were largely a result of years with low precipitation levels. Menke and Kaye (2006b, p. 8) also found that minimum and maximum temperatures were not statistically correlated with *L. papilliferum* abundance.

The sparse native vegetation naturally present at slickspots suggests that *Lepidium papilliferum* is more tolerant than surrounding vegetation at surviving in alkaline soils and spring inundation. Plant ecology literature suggests that plants tolerant of stress (e.g., alkaline soils) are poor competitors (Grime 1977, p. 1185).

Range and Distribution

Lepidium papilliferum is known only from the Snake River Plain and its adjacent northern foothills (an area 90 by 25 mi (145 by 40 km)) in southwest Idaho, and a disjunct population on the Owyhee Plateau in Idaho (see Figure 1 above). The plant occurs at elevations ranging from approximately 2,200 ft (670 m) to 5,400 ft (1,645 m) in Ada, Canyon, Gem, Elmore, Payette, and Owyhee Counties (Moseley 1994, pp. 3 to 9). The separation of population centers into two physiographic regions is important for the conservation of *L. papilliferum*. We regard the two physiographic regions as two distinct metapopulations, the Snake River Plain metapopulation and the Owyhee Plateau metapopulation. Metapopulation concepts are useful when considering fragmented habitats, such as those within *L. papilliferum*'s range, because they include discussion of when extinction events exceed colonization events, which can cause

the species to not persist (Husband and Barrett 1996, pp. 461 to 462).

In 2003, a "Candidate Conservation Agreement for Slickspot Peppergrass (*Lepidium papilliferum*)" (CCA) was developed by several State, Federal, and private entities in Idaho (State of Idaho *et al.* 2003) (see Previous Federal Actions section). The CCA is based on two geographical management areas that include known EOs, one on the Snake River Plain and a second on the Owyhee Plateau, called "consideration zones." Although somewhat arbitrary in nature, this designation is useful for management purposes. There are 1,595,205 ac (645,597 ha) within the Snake River Plain consideration zone, and 126,946 ac (51,373 ha) within the Owyhee Plateau consideration zone. Factors affecting the species vary between the two physiographic regions. For example, urban and rural development, agriculture, and infrastructure development of sagebrush-steppe habitat has been substantial within the Snake River Plain, but little development has occurred within the Owyhee Plateau portion of *L. papilliferum*'s range.

Element occurrences have been used to describe distribution of *Lepidium papilliferum* by assuming that slickspots within 1 kilometer (0.6 mi) of each other are capable of genetic exchange through pollination (Colket and Robertson, pers. comm. 2006). As of February 2006, there were 85 delineated EOs that occupied 13,359 ac (5,406 ha) (Colket *et al.* 2006). We estimate that the actual acreage occupied by *L. papilliferum* is only a fraction of a percent of this total acreage number because the majority of slickspots are not occupied by *L. papilliferum* and slickspots occupy a small percentage of the landscape (see U.S. Air Force 2002, p. 9, for an example). Of these EOs, 60 (11,025.3 ac (4,461.8 ha)) occur on the Snake River Plain, and 25 (2,333.8 ac (944.5 ha)) occur on the Owyhee Plateau (Colket *et al.* 2006, Table 14). Of the total EO acreage, 521 ac (211 ha) (3.9 percent) occur on private lands, 1,254 ac (507 ha) (9.4 percent) occur on lands managed by the State of Idaho, and 11,582 ac (4,687 ha) (86.7 percent) occur on Federal lands (USFWS 2006c). On the Snake River Plain, 85 percent of the EO acreage occurs on federally managed lands, 10.3 percent of the EO acreage occurs on State-managed lands, and 4.7 percent of the EO acreage occurs on private lands. On the Owyhee Plateau, 94.7 percent of the EO acreage occurs on Federally managed lands, with the remaining 5.3 percent occurring on State managed lands; no EOs on the Owyhee Plateau occur on private lands.

The approximate extant range of the plant was first described in 1994 (Moseley 1994, p. 6), and has not changed substantially since, although the amount of known occupied habitat, particularly on the Owyhee Plateau, has expanded in recent years. Since 2003, sixteen new occurrences, all within 3 mi (4.8 km) of previously existing occurrences, have been documented: 2 on the Snake River Plain with an area of 2.7 ac (1 ha) and approximately 2,500 individuals, and 14 on the Owyhee Plateau with an area of 46.6 ac (18 ha) and approximately 650 individuals (Colket *et al.* 2006, Tables and Appendix A). It should be noted that not all potential *L. papilliferum* habitat in southwest Idaho has been surveyed, and it is likely that additional occupied *L. papilliferum* sites will be found.

Estimating the number of individuals (abundance) of *Lepidium papilliferum* is confounded by its annual or biennial life cycle, because the number of individuals of each life form can fluctuate widely depending on precipitation. To assess abundance, we utilized four available data sets: range-wide EO records maintained by the Idaho Conservation Data Center (CDC), range-wide data associated with the HII/ HIP monitoring, transect monitoring data collected on the OTA, and special use plot data from the OTA.

As of February 2006, the Idaho CDC had ranked 101 EO records for *Lepidium papilliferum* (Colket *et al.* 2006a, pp. 15 to 41); 9 are ranked as extirpated (lost) or probably extirpated, and 7 are considered historical (information for most is too vague for relocation). All 9 extirpations were verified locations from old herbarium collections, the most recent from 1955, where the habitat has been completely converted to urban or agricultural lands (Colket *et al.* 2006, Table 13). The remaining 85 records (as of February 2006) are for EOs considered extant (existing). In the review of EO specifications and ranks conducted in February 2006, observed abundance was categorized as being greater than 1,000 plants, 400 to 999 plants, 50 to 399 plants, less than 50 plants, 0 plants, or an unknown number of plants. This classification was based on the number of plants present at the last survey, regardless of year and associated precipitation patterns. Existing data provide an estimated abundance for extant EOs: 15 (18 percent) have over 1,000 plants, 11 (13 percent) have between 400 and 999 plants, 1 (1 percent) has about 400 plants, 18 (21 percent) have between 50 and 399 plants, 22 (26 percent) have fewer than 50 plants, 9 (11 percent) had no plants at the last visit, and 9 (11

percent) have an unknown number of individuals.

Two monitoring methods, HII and HIP, have been used range-wide for *Lepidium papilliferum*. Each included different methodologies, but are still useful for tracking abundance at transects across the two efforts. HII monitoring was developed to assess the overall habitat condition that includes attributes associated with the slickspots and the sagebrush-steppe habitat, occurred for 4 years (1998 to 2001), and is presented in various reports (Mancuso and Moseley 1998; Mancuso *et al.* 1998; Mancuso 2000, 2001, 2002; Menke and Kaye 2006a, b). HIP monitoring was developed to assess the overall habitat condition that includes those attributes associated with the slickspots and the sagebrush-steppe habitat, and also the effectiveness of the CCA. HIP monitoring was conducted in 2004 and 2005 (State of Idaho *et al.* 2006, p. 18), and is expected to continue. HIP monitoring results in 2004 are reported in Menke and Kaye 2006b, and results through 2005 are included in our report "Best Available Biological Information for Slickspot Peppergrass (*Lepidium papilliferum*)" (USFWS 2006f, Figures 8, 9). Although neither the HII nor HIP methodologies have been peer reviewed, they represent the best available survey and monitoring techniques for *L. papilliferum*.

Abundance data for *Lepidium papilliferum* have been collected range-wide since 1998, and collected at the OTA since the early 1990s. The range-wide HII and HIP transect data illustrate that plant abundance is positively correlated with spring precipitation, and specifically that rainfall in the months of March through May accounts for 89 percent of the variability in plant numbers (Menke and Kaye 2006b, p. 10). Plant abundance therefore fluctuates widely between years in association with precipitation. In the areas monitored by HII and HIP, Menke and Kaye (2006b, p. 10) report that *L. papilliferum* abundance decreased range-wide between 1998 and 1999, remained low through 2002, and began to increase again beginning in 2002. This pattern closely tracks that of rainfall during those same years. Abundance data from transects at the OTA illustrate declines in abundance first noted in 1996, with a declining trend in recent years that is not correlated with spring precipitation (Weaver 2006, pp. 1–6). Abundance data from the range-wide HII and HIP transects showed increasing trends in *L. papilliferum* between the years 2002 and 2005 (no data were collected in 2003) (USFWS 2006f, Figures 8, 9).

Thus range-wide abundance data from the HII and HIP transects continue to show a consistently positive correlation with spring precipitation. We consider this range-wide data to be the best available at this time.

We conducted a review of the abundance data and study methodology following the reopened comment period on the proposal to list *L. papilliferum* as endangered (October 23, 2006, to November 13, 2006; 71 FR 62078). A review of the special use plot counts at the OTA (USFWS 2006e, Figure 7) shows a decline in plant numbers during the drought years of 1992 (249 plants), 1997 (624 plants), and 2002 (270 plants) followed by a positive response in plant numbers as spring precipitation increased in subsequent years 1993 (6,369 plants), 1998 (3,330 plants), and 2003 (4,080 plants). Reviewing the special use plot data at OTA for 2004–2006 illustrates a relatively stable or declining number of plants despite increases in spring precipitation.

We reviewed the OTA population monitoring transect study and updated the description of the study methods from our BAI based upon clarification of new information provided by IARNG staff during the reopened comment period on the proposal to list *L. papilliferum* as endangered (October 23, 2006, to November 13, 2006; 71 FR 62078). The BAI cited study methods as described by IARNG staff and stated that the census effort occurred annually at the OTA and that observers cover 98 percent of the plants' habitat at OTA. New information obtained since the BAI was written suggests that 90 percent may be a more accurate estimate of the amount of habitat surveyed at OTA. Since 2003, additional plant inventories have increased the size of the known population of *L. papilliferum* at OTA, including the documentation of 365 new occupied slickspots in 2005 (URS Corporation 2005, pp. 6–7). The OTA population monitoring transects for 2005 reported 18,599 plants in the transect areas; the survey inventory by URS corporation reported 43,925 plants (365 new slickspots with *L. papilliferum*, 125 historic slickspots with *L. papilliferum*, 66 historic slickspots without *L. papilliferum*) in the areas surveyed at OTA (URS Corporation 2005, p. 7).

We reviewed the results of range-wide HII and HIP monitoring, including reported plant abundance since these studies were initiated in 1998, and new information available to us since the time we last issued a listing finding on this species. These data illustrate a general pattern of plant numbers

correlating with spring precipitation (USFWS 2006f, Figures 8, 9). Data are incomplete for 2002 and 2003. Menke and Kaye (2006b, p. 19) report that “populations generally decreased during 1998–2004 and these trends appear to be strongly influenced by spring precipitation.” In contrast to the results reported from the OTA, range-wide abundance of *Lepidium papilliferum* as measured by the HII and HIP increased as spring precipitation increased in the years 2002 through 2005 (USFWS 2006f, Figures 8, 9). Comparing years 1998 and 2005, which are relatively comparable in terms of range-wide spring precipitation (6.6 inches and 6.3 inches, respectively), plant numbers are also similar (17,611 and 15,226 respectively), indicating little change in overall abundance of *L. papilliferum* range-wide over this time interval, despite the intervening fluctuations in yearly abundance that are to be expected for an ephemeral annual plant. In general, the HII and HIP data from 1998–2005 indicate that the abundance of *L. papilliferum* range-wide remained relatively stable over this time interval (USFWS 2006f, Figure 8). We consider this range-wide data to be the best available at this time.

Habitat Quality

Vegetation community data are collected as one component of *Lepidium papilliferum* HIP monitoring. One of the attributes documented in HIP monitoring is the fire history pattern. Observations are recorded to document if there is evidence of fires at four landscape scales; in the HIP transects, and in the surrounding habitat at 65 meters, 250 meters, and 500 meters from the transect. Given the mosaic pattern of wildfire burns, often the surrounding habitat may be burned while an individual HIP transect is unburned or predominately unburned. In 2004, vegetation communities were sampled at 71 HIP transects, and 41 (58 percent) of the transects were classified as unburned, with predominantly big sagebrush cover and less than 33 percent introduced annual cover; 7 (10 percent) were classified as unburned, with moderate big sagebrush cover and at least 33 percent introduced annual cover; 6 (8 percent) were classified as burned, with predominantly native vegetation, although introduced annual cover sometimes comprised up to 50 percent of the total plant cover; 2 (3 percent) were classified as burned, with predominantly introduced annual cover (*Salsola kali* (Russian thistle or tumbleweed) and *Ceratocephala testiculata* (bur buttercup, formerly *Ranunculus testiculatus*)), with low

cheatgrass (*Bromus tectorum*) and some crested wheatgrass (*Agropyron cristatum*); 11 (14 percent) were classified as burned and dominated by cheatgrass; and 4 (6 percent) were classified as burned and seeded with crested wheatgrass (Colket 2005a, p. 8). In summary, over 42 percent of the HIP vegetation plots along HIP transects were in habitats with over 33 percent nonnative, invasive plant cover.

Menke and Kaye (2006b) evaluated the association between measures of habitat quality measured by HIP and abundance of *L. papilliferum*. For the one year for which data were available (2004), they report that *L. papilliferum* abundance was not significantly correlated with soil crust cover or weedy species cover in slickspots, and that the proportion of flowering plants had a positive correlation with soil crust cover, but was not significantly correlated with livestock print cover or weedy species cover (Menke and Kaye 2006b, p. 15). In their overall evaluation of habitat condition, they report that total vascular plant cover, species richness, and species diversity had declined between 1998 and 2004, and suggest that past fires have been a factor in degrading slickspot condition (Menke and Kaye 2006b, p. 19). Several features of slickspots, including soil crust cover and weedy species cover, were consistently more degraded in burned areas. Although slickspots in burned areas had more dense weedy annual species cover (Menke and Kaye 2006b, p. 19), Menke and Kaye state that “Competition from weedy annual species (which may be promoted by fire), does not appear to influence abundance of *L. papilliferum* plants in a given year, but may influence reproductive output, other plant traits, and other life history stages” (Menke and Kaye 2006b, p. 17). Soil crust cover was significantly lower in 2004 transects with evidence of livestock grazing, but there was no direct relationship between abundance of *L. papilliferum* and total livestock print cover or cover of print penetrating to the slickspot clay layer (Menke and Kaye 2006b, p. 15).

Another measure of habitat quality within *Lepidium papilliferum*'s range is the EO ranking by the Idaho CDC. The first EO ranks for *L. papilliferum* were assigned in 1993 (Colket *et al.* 2006, Tables 1–13). In 2006, EO specifications and ranking were revised by the Idaho CDC (Colket *et al.* 2006, pp. 15 to 44). Due to the change in methodology, it is difficult to draw conclusions about changes in EO rankings over time. EO ranks are designed as an assessment of estimated viability or probability of persistence and help prioritize

conservation planning or actions (NatureServe 2002, p. 36). We consider EO rankings to be part of the best available data on the species at this time.

Table 1 summarizes the rankings for 85 EOs based on the 2006 revised methodology. A-ranked EOs have one or more of the following conditions that are summarized through a formula: (1)

Over 1,000 detectable above-ground plants; (2) intact native plant communities with trace nonnative species cover; (3) slickspots with zero or trace nonnative cover or livestock disturbance; (4) zero or few minor anthropogenic disturbances; (5) a lack of burning; and (6) a surrounding landscape within 0.6 mi (1 km) that is

not fragmented by agricultural lands, residential or commercial development, introduced annual grasslands, or drill seeding projects (Colket *et al.* 2006, p. 3). By contrast, D-ranked EOs exist in the most highly degraded habitats, with the fewest plants, and with the most degraded surrounding landscape (Colket *et al.* 2006, p. 3).

TABLE 1.—NUMBER OF ELEMENT OCCURRENCES IN 2006 BY CDC RANKING (PERCENT OF TOTAL)

[Colket *et al.* 2006, Tables 1 to 13 and Appendix C]

A	B	BC	C	pC ¹	D	pD ¹	E ²	F	Total
0	15 (18)	1 (1)	26 (31)	4 (5)	19 (22)	1 (1)	10 (12)	9 (11)	85

¹ Probable ranks assigned when incomplete information available.

² Not enough habitat information available to make a ranking.

Of the 66 EOs with B through D rankings (13,123 ac (5,310 ha)), 51 occur on the Snake River Plain (10,804 ac (4,372 ha)), and 15 on the Owyhee Plateau (2,318 ac (938 ha)). Of these 66 middle-ranked EOs, 50 are ranked as a C or D (averaging fewer than 399 plants, partial to nonexistent native plant communities that are partially to predominately burned, and partially to predominantly fragmented landscapes). The 40 EOs on the Snake River Plain cover 3,170 ac (1,283 ha), and the 10 EOs on the Owyhee Plateau cover 73 ac (30 ha).

Habitat data (HII, HIP) have been collected annually for approximately one-half of the extant EOs since 1998. Given that monitoring methodologies and the specifications for determining EO rank changed in 2004/2005, and not every EO is monitored annually, it is not possible to draw definitive conclusions about the change in habitat quality over time. It is possible, however, to gain an understanding of the current condition of habitat quality from the available data. Based on the most recent EO ranks, at least 75 percent (n = 49) were ranked as C, D, or F, indicating that most EOs occurred in partially or predominantly fragmented landscapes with partial to nonexistent native plant communities. As discussed below we don't have any data that correlate *L. papilliferum* population numbers with effects to habitat.

Previous Federal Actions

For a description of Federal actions concerning *Lepidium papilliferum* that occurred prior to January 22, 2004, please refer to the document to withdraw our July 15, 2002, proposal published in the **Federal Register** on January 22, 2004 (69 FR 3094).

On January 22, 2004, we published a document withdrawing our proposed

rule to list *Lepidium papilliferum* as endangered (69 FR 3094). That action was based on our conclusion that there was "a lack of strong evidence of a negative population trend, and the formalized conservation plans (e.g., the CCA and INRMPs) had sufficient certainty that they would be implemented and effective such that the risk to the species was reduced to a level below the statutory definition of endangered or threatened."

On April 5, 2004, Western Watersheds Project filed a lawsuit challenging our decision to withdraw the proposed rule to list *Lepidium papilliferum* as threatened or endangered (*Western Watersheds Project v. Jeffery Foss, et al.*, Case No. CV 04-168-S-EJL). On August 19, 2005, the U.S. District Court for the District of Idaho reversed the decision to withdraw the proposed rule, with directions that the case be remanded to the Secretary of the Department of Interior for reconsideration of "whether a proposed rule listing the slickspot peppergrass as either threatened or endangered should be adopted."

After issuance of the District Court's remand order, we notified Federal, State and local agencies, county governments, elected officials, and other interested parties of the Court's decision in a letter dated October 13, 2005. We requested new scientific data and comments about *Lepidium papilliferum*. We also stated that scientific data received from the public would be included in an updated "Draft Best Available Biological Information for Slickspot Peppergrass (*Lepidium papilliferum*)" (BAI) document. In response to our request, we received a total of 13 comment letters. The updated BAI combined all existing and new information about the species and its habitat, and we utilized it in making this final listing determination.

On February 27, 2006, we opened a 30-day public comment and peer review period, through an electronic process referred to as VOCUS, for our comprehensive document entitled "Draft Best Available Biological Information for Slickspot Peppergrass (*Lepidium papilliferum*)" (USFWS 2006f). Following public and peer review, we used new data and technical corrections, along with existing data, for our analysis described below as the best available scientific and commercial data.

After an order by the district Court on October 4, 2006, which requires "a final listing determination on the slickspot peppergrass by January 4, 2007," we opened a 22-day public comment period that closed on November 13, 2006 (71 FR 62078). A variety of documents were posted on the FWS Web site for public comment, including peer review comments on the draft BAI and results of the expert panel.

Summary of Comments and Responses

We received a total of 13 comment letters in response to our October 13, 2005, request for additional information to assist with the listing determination for *Lepidium papilliferum*; 17 public comment letters and 19 peer review responses on the Draft BAI released on February 27, 2006; and 20 public comment letters in response to our October 23, 2006, reopening of the public comment period. The majority of comments were specific to the draft BAI and associated data as well as issues surrounding the 2003 CCA developed to conserve *L. papilliferum*. Comments that were substantive or that provided new information were incorporated into the final determination where appropriate, or are addressed below. We consolidated the comments into categories by issue.

Issue 1: Several commenters provided new data and information regarding the biology, ecology, life history, genetics, and factors affecting *Lepidium papilliferum*, and requested that it be incorporated into the body of existing knowledge concerning the species and considered by us in making any future management determinations.

Our response: In making this final listing determination, we have considered scientific and commercial data contained in over 75 technical reports, published journal articles, and other general literature documents, including nearly 30 reports received since the January 23, 2004. The body of available information specific to this species has greatly expanded since 2004, with new information regarding species locations, known condition of its habitat, slickspot soil characteristics and disturbance, *Lepidium papilliferum*'s pollinators, seed viability and germination, ongoing conservation efforts, genetics, and factors affecting the species. This information was contained in various State agency reports (Colket 2005a; Colket 2006; Colket *et al.* 2006; IDARNG 2005; State of Idaho *et al.* 2006) and other scientific reports and peer reviewed articles (Menke and Kaye 2006a, b; Meyer and Allen 2005; Meyer *et al.* 2005; Meyer *et al.* 2006; Palazzo *et al.* 2005; Robertson 2003a; Robertson and Klemesh 2003; Robertson and Ulappa 2004; Robertson *et al.* 2005; Stillman *et al.* 2005). Additionally, we reviewed and considered data from ongoing *L. papilliferum* conservation efforts (Binder 2006; Boise Airport 2003; Hoffman 2005; IDARNG 2005; State of Idaho *et al.* 2006; U.S. Air Force 2004). Further research and continued monitoring would provide a more thorough understanding of the species; however, we have a legal obligation to make a final listing determination based on the best available scientific and commercial data.

Issue 2: Some commenters stated that an urgent need to list *Lepidium papilliferum* exists due to ongoing and current threats. One commenter suggested that there is evidence for widespread and rapid population decline. Another commenter stated that the species is at such risk of extinction that it should be listed to ensure that the BLM and other Federal land management agencies implement management actions that result in substantive conservation. Other commenters stated that existing regulations are insufficient in providing for the long-term persistence of the species. Conversely, some commenters stated that existing regulatory

mechanisms, primarily through the CCA and its associated conservation measures, are sufficient or more than sufficient to preclude the need to list *L. papilliferum* under the Act.

Our response: The Act requires us to make listing decisions based solely on the best scientific and commercial data available at the time the decision is made (section 4(b)(1)(A) of the Act). We thoroughly reviewed all available scientific and commercial data for *Lepidium papilliferum* in preparing this final determination. We reviewed historical and recent publications, and unpublished reports concerning *L. papilliferum* and the sagebrush-steppe habitat of southwestern Idaho. From this information, we produced the document "Draft Best Available Biological Information for Slickspot Peppergrass (*Lepidium papilliferum*)" (BAI); we solicited public comment and peer review on the BAI in February 2006. We also convened a panel of seven scientific experts to review the scientific information available to us pertaining to *L. papilliferum*. Additionally, we reopened the public comment period on the proposed rule in October 2006 (71 FR 62078) to solicit additional review and comment on new data that we have considered in this final determination.

We followed our Policy on Information Standards Under the Endangered Species Act, published in the **Federal Register** on July 1, 1994 (59 FR 34272), and our associated Information Quality Guidelines in preparing this final determination. Our evaluation of the significance of these numerous ongoing threats across the range of *Lepidium papilliferum* is presented in the Summary of Factors Affecting the Species section of this final determination. This analysis includes the adequacy of existing regulatory mechanisms, including public land management practices. During the listing process, we provided 6 public comment periods that were open for a total of 262 days, and held 2 public hearings. We received new information since the proposed rule specific to *L. papilliferum* that ranged from additional Idaho CDC survey data to slickspot soils information. While the body of available information specific to this species is limited, our legal obligation is to make a final listing determination based on the best available data.

Issue 3: Several comments regarded the effectiveness of the CCA (first approved in 2003 and subsequently revised in 2006) in conserving *Lepidium papilliferum*. Some commenters stated that the voluntary commitment of non-governmental cooperators developed

during the CCA process is equal to or better for conservation of *L. papilliferum* than mandated actions that would be associated with listing the species. One commenter suggested that the commitment to better livestock grazing management by the *L. papilliferum* Conservation Committee and permittees continues, and is still strong after 2 years of implementation, and that the follow-through on implementing CCA conservation measures, such as responding to grazing triggers and off-highway vehicle (OHV) events during 2005, was good. The State of Idaho reported that, of the 203 conservation measures identified in the CCA, 193 were accomplished in either 2004 or 2005, and 7 measures were not implemented due to wildfire or ongoing litigation. One commenter stated that the inclusion of an adaptive management process within the CCA will ensure that the identified conservation measures, if initially ineffective, would become effective well before the probable extinction of *L. papilliferum* given existing threats. The U.S. Air Force provided comments on our October 23, 2006 draft description and analysis of conservation measures (71 FR 62078). The U.S. Air Force believed that several more conservation measures have been implemented and are effective in conserving *L. papilliferum* at the Juniper Butte Range than what we had determined.

Conversely, some comments suggested that there is little certainty that implementation of *Lepidium papilliferum* conservation measures identified in the CCA will occur. One commenter stated that the adaptive management approach used in the CCA provides no certainty of protection for *L. papilliferum*. Another commenter suggested that any cooperator can drop out of the CCA at any time without repercussion. Another comment asserted that the adaptive management approach as currently described in the CCA allows for a one-time disturbance event that could result in irreversible harm to *L. papilliferum* habitat. Comments indicated that the CCA provides vast opportunity for a one-time livestock penetrating trampling event to occur, and is therefore insufficient. Other comments suggested that the CCA does not protect *L. papilliferum* and its habitat from soil disturbance, and did not include active restoration measures for the vast majority of the species' habitats. Commenters stated that, due to the downward trend in *L. papilliferum* abundance, reintroduction of the species should be considered. One commenter stated that management

under an Instruction Memorandum (IM) is uncertain, and that because the IM is not a legal requirement, interpretation will be inconsistent among field staff.

Our response: We support utilizing a collaborative conservation approach to address factors affecting species being considered for listing under the Act. Prior to July 18, 2003, we worked with various agencies and individuals to assess the status of *Lepidium papilliferum*, and also to identify and implement conservation actions. Since February 2000, we have been an active technical advisor in an interagency group of biologists and stakeholders to share data and coordinate conservation actions for *L. papilliferum*.

Using our Policy for Evaluation of Conservation Efforts When Making Listing Decisions (PECE) (68 FR 15100), we reviewed the conservation measures in five plans, or conservation strategies, for *L. papilliferum*: (1) The Candidate Conservation Agreement for Slickspot Peppergrass (CCA), which was initially approved in 2003 and revised in 2006; (2) the Idaho Army National Guard Integrated Natural Resource Management Plan for Gowen Field/ Orchard Training Area; (3) the U.S. Air Force Integrated Natural Resource Management Plan for Mountain Home Air Force Base, which was modified in 2004 and contains more measures that promote the conservation of *L. papilliferum* than the 2000 version; (4) the Conservation Agreement (Hull's Gulch Agreement) by and between Boise City and the U.S. Fish and Wildlife Service for *Allium aaseae* (Aase's onion), *Astragalus mulfordiae* (Mulford's milkvetch), and *Lepidium papilliferum* (slickspot peppergrass), which was in place until it expired on October 22, 2006, and (5) the Conservation Agreement for slickspot peppergrass (*Lepidium papilliferum*) at the Boise Airport, Ada County, Idaho. These five agreements and plans include a wide array of conservation measures to address the need to maintain and enhance slickspot peppergrass, and to potentially avoid or reduce adverse effects that might occur in relation to various types of activities. We recognize that many of the conservation efforts identified in the plans are having conservation benefits for the species, particularly as they relate to limiting the effects of wildfire and livestock use. We believe conservation efforts are important for this species because, while we do not have sufficient information to determine that potential threats are having a population level impact on the species, further research is necessary. To the extent that there are

effects from activities, these conservation efforts should offset them.

We evaluated conservation efforts within each plan under PECE (60 FR 15100). PECE is relevant in situations where it is necessary to determine whether individual conservation efforts that have not been implemented, or that have been implemented but have not yet demonstrated whether they are effective, are sufficiently certain to be implemented and effective so as to have contributed to the elimination or adequate reduction of one or more threats to the species identified through our threats analysis conducted pursuant to section 4(a)(1) of the Act. In this case, the efforts that met the standard in PECE for sufficient certainty of implementation and effectiveness were not used as a basis for our conclusion, because our analysis did not show that the species met the definition of threatened or endangered. However, this does not mean that conservation efforts which have yet to be implemented, or which have yet to be demonstrated to be effective, are unimportant. In fact we strongly encourage continued implementation of all on-going and planned conservation efforts, as they can contribute to maintaining or improving the status of *L. papilliferum*.

Issue 4: There were several comments regarding the use of available monitoring and survey data in determining the historical and existing distribution, population size, and trend information for *Lepidium papilliferum*. One commenter suggested there have been no comprehensive systematic surveys for *L. papilliferum*, and therefore, we do not fully understand the distribution or status of the species. Numerous commenters stated that monitoring protocols and methods used to gather data regarding *L. papilliferum* trends and distribution were biased toward documenting declines, were insufficient, or were poorly timed, and therefore conclusions are poor. Several commenters stated that there is no clear relationship between *L. papilliferum* trends and threat factors affecting the species. Some commenters suggested that the data demonstrate a negative population trend for *L. papilliferum*; other commenters suggested the data are inconclusive, and no trend can be determined. One commenter thought the trend from 2004 to 2005 was positive or stable due to implementation of the CCA, a wet spring, and a minimal wildfire season. Another commenter identified that the number of extant EOs have increased from 45 in 1998 to 85 in 2006, and there has been only 1 EO that has been extirpated since 1955. Several commenters cited information relating

L. papilliferum annual abundance to precipitation, while other commenters disputed the claim that annual abundance is related to precipitation. Several commenters stated that the number of element occurrences has increased from 1998 (45 extant EOs) to 2006 (85 extant EOs).

Several commenters thought that the soil type (slickspots) used by *Lepidium papilliferum* is a limited resource that is not reforming, because the processes that originally created it no longer occur. Slickspots being modified, altered, or developed are lost to the ecosystem forever.

Our response: In this determination, we have reviewed and considered scientific and commercial data contained in over 75 technical reports, published journal articles, and other documents, including nearly 30 reports received since January 22, 2004. We must base our listing determination for *Lepidium papilliferum* on the best available data regarding the plant's current known population status, the known condition of its habitat, and the current factors affecting the species, along with ongoing conservation efforts, as described in the Summary of Factors Affecting the Species section of this final determination. We also acknowledge that uncertainties exist.

While a systematic survey, utilizing similar techniques, has not been conducted for *Lepidium papilliferum* range-wide, at least 30 separate survey efforts for *L. papilliferum* have occurred (Baczowski 2006; USFWS 2006d). Some of these surveys were within the known range of *L. papilliferum* habitat, and others were outside of the known distribution, for example, in the State of Oregon, in the Saylor Creek area between the Snake River Plain and the Owyhee Plateau, and the City of Hagerman. In 2003, for example, 2,350 acres were surveyed in the Saylor Creek area between the Snake River Plain metapopulations and the Owyhee Plateau metapopulations. During these surveys, 1,727 slickspots were documented, but no *L. papilliferum* individuals were found (U.S. Air Force 2003, p. 16). We agree that undiscovered sites occupied by *L. papilliferum* likely exist. Inventories for *L. papilliferum* have not been completed on the majority of private lands within its range due to restricted access. Recent discoveries of new occupied slickspot sites and new EOs since 1998 have not added substantially to our knowledge of where the species exists. For example, an inventory survey at the OTA in 2005 found 365 new slickspots with *L. papilliferum* all within the range of known habitat on the OTA (URS

Corporation 2005, p. 6). Since 2003, 16 new EOs on approximately 50 ac (28 ha) (0.4 percent of the total acreage) have been documented, all within 3 mi (4.8 km) of previously existing EOs (Colket *et al.* 2006, Tables 1 to 14). Although there has been only one documented extirpation since 1955, up to 9 small and isolated EOs had no plants detected during one or more recent monitoring surveys.

Numerous monitoring efforts have been conducted for *Lepidium papilliferum*, including population trend monitoring transects at the OTA (IDARNG 2005) completed since 1991, demographic monitoring at the OTA from 1993 to 1996 (Meyer *et al.* 2005), Habitat Integrity Index (HII) monitoring done by the Idaho CDC at *L. papilliferum* EOs range-wide conducted from 1998 to 2002 (Mancuso and Moseley 1998; Mancuso *et al.* 1998; Mancuso 2000; Mancuso 2001; Mancuso 2002), Habitat Integrity Population (HIP) monitoring built on HII monitoring at *L. papilliferum* EOs range-wide conducted by the Idaho CDC in 2004 and 2005 (Colket 2005a, Colket 2005b), and monitoring done at the Juniper Butte Range in 2003 and 2005 (U.S. Air Force 2003). HIP monitoring, the most extensive range-wide effort to date, was developed by the Idaho CDC in conjunction with the *L. papilliferum* Technical Team to statistically analyze and detect trends in *L. papilliferum* and its habitat (the technical team includes IDARNG, BLM, Air Force, the Service, Idaho Department of Agriculture, and other interested parties) (Colket 2005a, p. 3). Both the HII and HIP monitoring, because of the difficulties associated with tracking numbers of *L. papilliferum* individuals across years, utilize habitat information as a metric of *L. papilliferum* health (Mancuso *et al.* 1998, pp. 1 to 7).

Because of the fluctuations in *Lepidium papilliferum* numbers associated with precipitation (Meyer *et al.* 2005, pp. 4, 12, 15; Palazzo *et al.* 2005, p. 9; Menke and Kaye 2006b, p. 10), determining trends requires long-term monitoring data sets. Two long-term monitoring data sets in which we see a downward trend in recent years in numbers of individuals that do not mimic precipitation are the population trend monitoring transect data and special use plot data at the OTA. In contrast, an analysis by Palazzo *et al.* (2005, p. 9) for all 4 years of HII data found a relationship (p-value less than 0.01) between February to June precipitation and numbers of *L. papilliferum*. In their analysis of range-wide HII and HIP data collected from 1998–2002 and 2004 (no data was

collected in 2003), Menke and Kaye (2006b, p. 10) further refined this relationship and found a strong positive relationship between precipitation from March through May and *L. papilliferum* abundance. In contrast to the monitoring data from OTA, the range-wide data shows that *L. papilliferum* continues to track consistently with precipitation throughout all years of the data set (Menke and Kaye 2006b, p. 10 and Figs. 1, 2). We consider this range-wide data to be the best available at this time.

The conditions that allowed for the formation of slickspots in southwestern Idaho are thought to have occurred during a wetter Pleistocene climate (Nettleton and Petersen 1983, p. 191; Seronko 2006). Under natural conditions, several hundred years may be necessary to alter or lose slickspots, generally through climate change or severe natural erosion (Seronko 2006). Meyer and Allen (2005, p. 9) suggest that if sufficient time passes following the disturbance of slickspot soil layers, it is possible that slickspots can reform similar to their pre-disturbance configuration.

Issue 5: Numerous commenters provided information or opinions regarding how various threats may or may not affect *Lepidium papilliferum*, its habitat, and its possible probability of extirpation. Threats specifically mentioned included residential, commercial, and agricultural development; military training; OHV use; nonnative, invasive plant species; wildfire; wildfire rehabilitation methods (including drill seeding and invasive, nonnative plant seedings); fragmentation; soil disturbance; herbicide spraying; wildlife grazing; herbivory; and agricultural pesticides (e.g., insecticide for grasshoppers or Mormon crickets) affecting *L. papilliferum* pollinators. One commenter suggested that the decreased quality of sagebrush grassland (steppe) habitat is the primary problem with the apparent decline of *L. papilliferum*.

Our response: Our evaluation of the significance of the various threats across the range of *Lepidium papilliferum* is discussed in the Summary of Factors Affecting the Species section of this final determination. We analyzed the adequacy of existing regulatory mechanisms, including the effectiveness of ongoing, recently implemented, and proposed conservation efforts that attempt to conserve *L. papilliferum* in three conservation agreements, and two INRMPs from the IDARNG and the U.S. Air Force. The primary factors impacting *L. papilliferum* and its surrounding habitat include habitat

degradation and modification of the sagebrush-steppe ecosystem from the current wildfire regime (i.e., increasing frequency, size, and duration of wildfires), invasion of nonnative weed species (e.g., cheatgrass), effects of livestock use (e.g., trampling and disruption of soils), and habitat loss due to agricultural and urban development. Less important factors that may affect the species include effects from rangeland revegetation projects, wildfire management practices, recreation, and military use. Herbivory is reported as sparse or at low levels, and is mainly by insects. Herbivory impacts to *L. papilliferum* from native ungulates such as elk, deer, and antelope have not been observed. However, pronghorn antelope tracks and droppings (U.S. Air Force 2003, p. 14), and elk tracks and droppings (State of Idaho *et al.* 2006, Appendix A) have been infrequently documented in slickspots that support *L. papilliferum*. Herbicide spraying was not considered by the Expert Panel to be an important threat to *L. papilliferum*, and is not discussed in this listing determination. While the decreased quality of sagebrush-steppe and the development and implementation of successful habitat restoration may impact the species, we have found no correlation to date between the existence of these threats and population numbers.

Issue 6: Several comments referred to the effects of livestock use on *Lepidium papilliferum* and its habitat. They suggested that livestock use (past, current, or future) adversely affects *L. papilliferum* by trampling and uprooting individual plants, transporting nonnative invasive seeds, disturbing slickspot habitat soil crusts, burying *L. papilliferum* seeds to a soil depth at which germination cannot occur, accelerating erosion of slickspots, compacting soils, and changing slickspot soil chemistry through the deposition of manure.

Conversely, several commenters suggested that livestock use has minimal effects and can even provide beneficial effects to *Lepidium papilliferum* and its habitat. One commenter suggested that only three documented examples exist in which livestock use has been implicated as the primary factor in either a reduction or elimination of *L. papilliferum* from a given area. In each case, the incident was isolated and occurred prior to implementation of the CCA. Several commenters suggested that *L. papilliferum* co-evolved with historical livestock use and wild ungulate grazing pressure; therefore the impact of existing livestock use is as likely to be

beneficial as it is to be adverse, although effects generally remain unknown. Commenters suggested that potential benefits to *L. papilliferum* from livestock use include reduced frequency, intensity, and magnitude of wildfire; reduced nonnative invasive annual grasses; and improved germination of *L. papilliferum* seeds as a result of abrasion and reduced physical resistance of the surface soil crust. One commenter suggested that without authorized livestock grazing permits on Federal lands, some conservation benefits would not occur, including weed control, wildfire suppression, habitat rehabilitation, and a ready source of information regarding the land upon which ranchers run their livestock. Other commenters suggested that insufficient information exists, so we cannot draw conclusions regarding the effects of livestock use on *L. papilliferum* and its habitat.

Our response: The most visible effect on *Lepidium papilliferum* and its slickspot habitat from livestock use is trampling impacts. Penetrating trampling is defined as livestock trampling of water-saturated slickspot soils that break through the restrictive soil layer (see Ecology and Habitat section above). Penetrating livestock trampling can affect the fragile soil layers of slickspots (Meyer *et al.* 2005, pp. 21, 22; Seronko 2004, pp. 1, 2), especially when it occurs during wet periods when slickspots are most vulnerable to disturbance. Penetrating trampling also potentially affects the seed bank for *L. papilliferum* by pushing the seeds below their ability to germinate (i.e., below 1.5 in (3 cm)) (Meyer *et al.* in press, pp. 3, 24, 25). Livestock use at an appropriate level, and during dry conditions, may reduce the spread of nonnative annual grasses at some *L. papilliferum* sites. However, using livestock to control nonnative annual grasses would need to occur during early spring when the grasses are growing strongly, and spring is when slickspots are most likely to be wet and most susceptible to damage. Responsive management, involving quickly removing livestock during rain events and moving them regularly to prevent soil disturbance, would be difficult over large areas.

Livestock use has been documented (Colket *et al.* 2006, Appendix C) within 62 of the 75 *Lepidium papilliferum* EOs for which habitat information has been collected (49 of 60 on the Snake River Plain and 13 of 15 on the Owyhee Plateau). Penetrating hoof prints have been documented within 21 EOs on the Snake River Plain, and 9 on the Owyhee

Plateau (Colket *et al.* 2006, Appendix C).

Data limitations have made it difficult to establish impact (or effect) thresholds from livestock management activities for *Lepidium papilliferum*. Based on a single year of HIP data (2004), there was no correlation between *L. papilliferum* abundance in the short-term and total livestock print cover or cover of prints penetrating to the slickspot clay layer (Menke and Kaye 2006b, p. 15). The HIP data are observational in nature; controlled experiments are needed to more accurately assess the effects of livestock on *L. papilliferum* and its habitat. At this time we have no data that long-term declines in abundance will arise from livestock grazing. Adaptive management techniques for areas occupied by *L. papilliferum* and affected by livestock use could result in new information from ongoing and proposed livestock use studies and monitoring conservation efforts for the species. We anticipate that additional information regarding *L. papilliferum* and livestock use, from research currently underway by the U.S. Air Force and University of Idaho will be available for use in species conservation.

A more complete discussion on the effects of livestock use on *Lepidium papilliferum* and its habitat is found in the Summary of Factors Affecting the Species section.

Issue 7: One commenter suggested that wildfire historically (prior to European influence) occurred on a 60- to 100-year frequency and resulted in small burned areas where wind erosion could scour slickspots, maintaining the thin silt layer on the slickspot and the mini-playas as a depression. Wind scour likely occurred, since the only species growing on the slickspot was *Lepidium papilliferum*. With exotic species currently occupying slickspots, wind erosion may not be effectively scouring them, and in fact, deposition may be occurring. One commenter suggested that historical wildfire intervals in Wyoming big sagebrush communities were much longer, and some areas rarely, if ever, burned.

Conversely, one commenter stated that while an abundance of information exists regarding wildfire in *Lepidium papilliferum* habitat, no long-term monitoring data confirmed the significance of its effect on *L. papilliferum*.

Our response: As previously stated in the July 15, 2002, proposed rule (67 FR 46441) and January 22, 2004, document to withdraw the proposed rule (69 FR 3094), wildfire affects *Lepidium papilliferum* EOs throughout the

species' range. Where habitat information is known, 42 of 60 EOs on the Snake River Plain and 6 of 15 on the Owyhee Plateau have been at least partially burned; 57 EOs on the Snake River Plain and 12 on the Owyhee Plateau have adjacent landscapes that are at least partially burned (Colket *et al.* 2006, Appendix C).

Current research indicates wildfire frequency in the sagebrush-steppe ecosystem throughout the range of *Lepidium papilliferum* has increased, from a historical average of once every 60 to 110 years to once every 5 years at many sites, due to the invasion of nonnative annuals such as cheatgrass that became common on the Snake River Plain rangelands in the 1950's (Wright and Bailey 1982, p. 158; Billings 1990, pp. 307 to 308; Whisenant 1990, p. 4; USGS 1999, pp. 1 to 9; West and Young 2000, p. 262). Wildfires in cheatgrass tend to be larger, burn more uniformly, and leave fewer patches of unburned vegetation, all of which influence the post-fire recovery of native sagebrush-steppe vegetation (Whisenant 1990, p. 4). The result of this altered wildfire regime has been the conversion of vast areas of the former sagebrush-steppe ecosystem into nonnative annual grasslands (USGS 1999, pp. 1 to 9). Frequent wildfires can also promote soil erosion and sedimentation (Bunting *et al.* 2003, p. 82) in arid environments such as the sagebrush-steppe ecosystem. Increased sedimentation can result in a silt layer that is too thick for optimal *L. papilliferum* seed germination (Meyer and Allen 2005, pp. 6 to 7), and that allows weedy species to invade slickspots. See the Summary of Factors Affecting the Species section for a more complete discussion.

Following wildfire events, the use of nonnative forage grass species (such as crested wheatgrass and Russian wildrye (*Elymus junceus*)) for rehabilitation can result in successful establishment of perennial plants, ultimately reducing and diminishing the impacts of cheatgrass and its accelerated wildfire frequency. The use of nonnative species that closely mimic the biology and ecological function of species native to the area may be a necessary first step in restoring a site following wildfire if native seed cannot be used due to limited availability or prohibitive cost.

Of the known *Lepidium papilliferum* occurrences, 14 (19 percent) are located within areas where wildfire rehabilitation projects and crested wheatgrass seedings have occurred (Colket *et al.* 2006, Appendix C). Although *L. papilliferum* still occurs in these areas, most support lower numbers of plants (Mancuso and

Moseley 1998). See “Factor A” in the Summary of Factors Affecting the Species section below for a more detailed discussion.

In a review of available information, the Expert Panel considered the current wildfire regime the most important factor affecting *Lepidium papilliferum* and its remaining habitat.

Issue 8: One commenter expressed concerns regarding the U.S. Air Force’s development of the Juniper Butte Range (beginning in 1998) on the Owyhee Plateau where *Lepidium papilliferum* and its habitat occur. Development and use of this training range, along with resulting road construction, human presence, and proposed use of aerial flares/white phosphorus munitions during training exercises, has increased the risk of wildfire within a substantial portion of *L. papilliferum*’s range.

Our response: Currently, the impact of military training activities does not represent a principal threat to *Lepidium papilliferum*. Both the IDARNG and U.S. Air Force are implementing conservation efforts that potentially avoid or reduce adverse effects of military training on the species and its habitat. Threats from military activities are localized and have little significance across the range of the species.

Military activities within the range of *Lepidium papilliferum* include ordnance use, facility development, and transportation, all of which create an increased risk of wildfire and nonnative plant invasions. Military training occurs on the Snake River Plain at the OTA, on all or portions of seven EOs, and on the Owyhee Plateau at the Juniper Butte Range on a portion of one EO (sub EO 704). The U.S. Air Force intends to use 300 ac (121 ha) of the 11,070-acre Juniper Butte Range as the actual bombing impact area (U.S. Air Force 2000). It anticipates that a small amount of ordnance will be dropped outside the bombing impact area, but the potential impact to *L. papilliferum* would likely be minimal.

The Integrated Natural Resource Management Plan (INRMP) developed for the Juniper Butte Range provides management directions that ameliorate many of the threats from military training exercises. Range-wide, the most intact *Lepidium papilliferum* habitat occurs at the OTA, where similar conservation efforts have been implemented for 14 years (Colket *et al.* 2006, pp. 22 to 23; Meyer 2005, p. 1). The IDARNG has implemented a variety of actions to meet the conservation needs of *L. papilliferum*, while still providing for military training activities. These actions include wildfire suppression efforts, and restricting

ground-operated military training to areas where the plants are not found.

Issue 9: Some commenters asserted the taxonomic status of *Lepidium papilliferum* is problematic and warrants further evaluation. For example, one commenter suggested that our failure to complete a genetic study of *Lepidium montanum* seriously flaws any discussion assessing *L. papilliferum* as a species on its own. A few commenters suggested that if *L. papilliferum* is a subspecies or variety it is not eligible for protection under the Act.

Our response: *Lepidium papilliferum* was originally described as *L. montanum* var. *papilliferum* in 1900 by Louis Henderson. It was renamed *L. papilliferum* by Aven Nelson and J. Francis Macbride in 1913 based on its distinctive growth habit, short lifespan, and unusual pubescence (Nelson and Macbride 1913, p. 474). Hitchcock regarded *L. papilliferum* as *L. montanum* var. *papilliferum*, influencing several publications including *Flora of Idaho* and *Flora of the Pacific Northwest* (Hitchcock *et al.* 1964, p. 516; Hitchcock and Cronquist 1973, p. 170; Steele 1981, p. 55; Moseley 1994, p. 2). In a review of taxa in the mustard family (Brassicaceae), Rollins (1993) maintained the species based on differences in the physical features between *L. papilliferum* and *L. montanum* such as: (1) *L. papilliferum* has trichomes (hair-like structures) occurring on the filaments of stamens (part of flower that produces pollen), and *L. montanum* does not; (2) all the leaves on *L. papilliferum* are pinnately divided, and *L. montanum* has some leaves that are not divided; (3) the shape of the silicle [silique] (seed capsule) of *L. papilliferum* is different from that of *L. montanum*; and (4) the silicle of *L. papilliferum* has no wings, or even vestiges of wings, at its apex (end of the capsule), unlike that of *L. montanum* (Rollins 1993, p. 578; Moseley 1994, p. 2).

A review of the taxonomic status by Lichvar (2002), using classic morphological features and study of herbarium specimens, concluded that *L. papilliferum* has distinct morphological features that warrant species recognition. Meyer *et al.* (2005, p. 17) described a life history contrast when compared to *L. montanum* regarding seed dormancy and the seed bank. *L. papilliferum* seeds can remain dormant (and viable) and persist in the seed bank for about 12 years, whereas *L. montanum* has largely non-dormant seeds (Meyer *et al.* 2005, p. 17). Most recently, *L. papilliferum* has been accepted as a distinct species by

Intermountain Flora, a recognized regional text (Holmgren *et al.* 2005, p. 259); the U.S. Department of Agriculture’s “PLANTS Database” (USDANRCS 2006); and the Biota of North America Project, the recognized taxonomic reference for the United States (ITIS 2006).

The preliminary results of two studies on the genetics of *Lepidium papilliferum* recently became available. The first, based on a relatively small sample size and more limited methodology, found that *L. papilliferum* forms a distinct monophyletic group that is most closely related to *L. fremontii* (Smith 2006, pp. 5 to 7 and Fig. 1). The second, utilizing larger sample sizes and additionally applying the methodology of AFLP (amplified fragment length polymorphisms, recognized for greater resolution or discriminatory power in detecting genetic differentiation) (Mueller and Wolfenbarger 1999, pp. 389 to 393; Savelkoul *et al.* 1999, p. 3085)), found that *L. papilliferum* forms a distinct monophyletic group or subgroup, and indicates that it is most closely related to *L. montanum* var. *montanum* (Larson *et al.* 2006, p. 13, 15, and Fig. 4). These genetic studies are consistent with the interpretation that *L. papilliferum* is either a variety or subspecies of *L. montanum*, or that it is a full and distinct species that has recently diverged from *L. montanum*. Plant species and subspecies (or varieties) are eligible for protection under the Act.

Issue 10: One commenter stated that very little scientific research has been conducted on *Lepidium papilliferum*, and subsequently very little peer-reviewed literature is available for the species. Most of the information we have is based on technical reports and personal communications.

Our response: The Act requires us to make listing decisions based on the best scientific and commercial data available at the time the decision is made (section 4(b)(1)(A) of the Act). Following the August 19, 2005, Federal Court decision regarding our January 22, 2004, document to withdraw the proposed rule to list *Lepidium papilliferum* as endangered, we sought and received new scientific and commercial data pertaining to the species. We incorporated all relevant new information into the “Draft Best Available Information (BAI) for Slickspot peppergrass (*Lepidium papilliferum*)” document, which was updated from the 2003 version. We solicited public comment and peer review on the draft BAI document and requested additional scientific data pertaining to the species. We followed

our Information Quality Guidelines in preparing this final determination (see Information Quality Act discussion below). We also convened a panel of seven scientific experts (see Expert Panel discussion below) to review the available data pertaining to *L. papilliferum* prior to making this final determination.

Information Quality Act

In our review of the status of *Lepidium papilliferum*, we assembled information that addressed the current biological and ecological condition of the plant and its habitats. This information included reports from private industry, public universities, State and Federal resource agencies, published texts on a variety of biological topics, and peer-reviewed literature from the primary scientific journals. Additionally, we included unpublished scientific and commercial data, documents written and included in literature, and personal communications. Personal communications were used when they represented information that was pertinent and not available through other sources such as technical reports or published texts.

We carefully evaluated each piece of data for its usefulness in the review process, and used those that contributed important information to the review. State and Federal government documents are generally considered to be of high utility, objectivity, and integrity. These documents are often subject to public review and comment, and State and Federal agencies generally employ the current standards in resource survey, monitoring, and analysis methodologies. The peer-reviewed scientific literature and scientific textbooks are rigorously reviewed and edited at several levels before publication, and represent the highest degree of utility, objectivity, and integrity.

In compiling this document, we tried to present the information in an accurate, clear, complete, and unbiased manner. Given that the data available on this species covered a wide spectrum from peer-reviewed literature to personal communications, we developed this document with the goal of providing a high degree of transparency regarding the source of data.

We followed our Information Quality Act Guidelines in developing this document. These guidelines provide direction for ensuring and maximizing the quality of information disseminated to the public. The guidelines define quality as an encompassing term that

includes utility, objectivity, and integrity. Utility refers to the usefulness of the information to its intended users, including the public. Objectivity includes disseminating information in an accurate, clear, complete, and unbiased manner and ensuring accurate, reliable, and unbiased information. If data and analytic results have been subjected to formal, independent peer review, we generally presume that the information is of acceptable objectivity. Integrity refers to the security of information, i.e., protection of the information from unauthorized access or revision to ensure that the information is not compromised through corruption or falsification.

One of our goals in obtaining public comment and peer review of the draft BAI was to ensure that we were considering the best available data while accurately representing the source of the information. Background information on the taxonomy, distribution, abundance, life history, conservation actions, and needs of *Lepidium papilliferum*, and threats affecting the species, were derived from previous petition findings, previous **Federal Register** notices, Idaho's Conservation Data Center EO records, and other pertinent references from 1897 (when the species was first collected) through 2006.

The supporting information, administrative finding, and other relevant materials can be reviewed in person at the address listed in the **ADDRESSES** section, or copies of information can be made available to you (see References Cited at the end of this rule).

Summary of Factors Affecting the Species

Section 4 of the Act and its implementing regulations (50 CFR part 424) set forth the procedures for adding species to the Federal Lists of Endangered and Threatened Wildlife and Plants. A species may be determined to be an endangered or threatened species due to one or more of the five factors described in section 4(a)(1) of the Act. The five listing factors are: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; and (E) other natural or manmade factors affecting its continued existence.

A. The Present or Threatened Destruction, Modification, or Curtailment of its Habitat or Range

Current Wildfire Regime

The invasion of nonnative plant species, particularly annual grasses such as cheatgrass and medusahead (*Taeniatherum caput-medusae*), beginning in the early 1900's has increased the amount and continuity of fine fuels across the landscape. As cheatgrass became more dominant on the rangelands of the Snake River Plain in the 1950's, wildfire frequency intervals began to shorten from the historic average of between 60 to 110 years to the current frequency intervals of less than 5 years in many areas on the Snake River Plain where *Lepidium papilliferum* resides (Whisenant 1990, p. 4) and within the sagebrush-steppe ecosystem as a whole (Wright and Bailey 1982, p. 158; Billings 1990, pp. 307 to 308; USGS 1999, pp. 1 to 9, West and Young 2000, p. 262). Wildfires tend to be larger and burn more uniformly when annual grasses are present, resulting in fewer patches of unburned vegetation, which can affect the post-fire recovery of native sagebrush-steppe vegetation (Whisenant 1990, p. 4). This altered wildfire regime has contributed to the conversion of vast areas of sagebrush-steppe ecosystem into nonnative annual grasslands (USGS 1999, pp. 1 to 9). More frequent wildfires also promote soil erosion and sedimentation (Bunting *et al.* 2003, p. 82) in arid environments such as the sagebrush-steppe ecosystem. Increased sedimentation can result in a silt layer that is too thick for optimal *L. papilliferum* germination (Meyer and Allen 2005, pp. 6 to 7).

Of the 75 EOs for which habitat information is known, 48 (42 of 60 on the Snake River Plain and 6 of 15 on the Owyhee Plateau) have been at least partially burned, and 69 (57 on the Snake River Plain and 12 on the Owyhee Plateau) have adjacent landscapes that are at least partially burned (Colket *et al.* 2006, Appendix C). Within the Snake River Plain, approximately 448,917 acres (181,670 ha) (28 percent) were burned between 1970 and 2003 (calculated from USBLM 2004). Within the Owyhee Plateau 60,467 acres (24,470 ha) (47 percent) have burned between 1970 and 2003 (calculated from BLM 2004).

Table 3 shows the evidence of wildfire documented through HIP range-wide transect monitoring in 2005. Wildfire evidence can remain on the landscape for up to 20 years, and evidence documented in Table 3 includes both recent and historical fires.

TABLE 3.—EVIDENCE OF WILDFIRE DOCUMENTED AT HIP TRANSECTS IN 2005 (COLKET 2005A, TABLES 1 AND 2)

	Number of transects at least partially burned	Number of transects not burned	Total transects	Adjacent landscapes within 0.31 mi (500 m) of EOs burned or partially burned
Snake River Plain	26	31	57	45
Owyhee Plateau	12	10	22	21
Total	38	41	79	66

In a statistical analysis of HII data between 1998 and 2001, burned areas at the beginning of the study had depleted shrub and soil crust cover that persisted throughout the monitoring period (Menke and Kaye 2006a, p. iii). In addition, burned areas had less native plant cover, greater nonnative plant cover, increased slickspot perimeter compromise, and increased organic debris accumulation (Menke and Kaye 2006a, p. iii). Similarly, in a statistical analysis of HII and HIP data between 1998 and 2004, burned areas had less soil crust cover and higher nonnative plant cover (Menke and Kaye 2006b, p. 3). Although the proportion of flowering plants was positively correlated with soil crust cover, there was no relationship between *L. papilliferum* plant abundance and soil crust cover or weedy species cover in slickspots based on the 2004 HIP data (Menke and Kaye 2006b, p. 15). In their analysis, Menke and Kaye (2006b, p. 17) concluded that competition from weedy annual species does not appear to influence abundance of *L. papilliferum* plants in a given year, although it may influence reproductive output or other traits, and that past fire disturbance does not appear to significantly alter longer-term trends in plant abundance. Past fires have apparently degraded slickspot condition, as evidenced by lower soil crust cover and greater exotic species cover (Menke and Kaye 2006b, p. 19), however *Lepidium papilliferum* abundance was statistically similar between burned and unburned transects from 1998 to 2004 (Menke and Kaye 2006b, p. 10), and the proportion of *L. papilliferum* in flower was similar between burned and unburned transects in 2004 (Menke and Kaye 2006b, p. 15).

Past fires appear to have had a lasting negative impact on the plant community surrounding slickspots, including increased exotic species cover and decreased soil crust cover (Menke and Kaye 2006b, p. 19). Menke and Kaye (2006b, p. 17) note that the HII and HIP data are observational only, and controlled experiments are needed to more accurately assess the impacts of factors such as fire and grazing on *L. papilliferum* (Menke and Kaye 2006b, p.

17). At this point, given the equivocal nature of the habitat integrity and population monitoring data, the effects of an altered sagebrush steppe wildfire regime on *L. papilliferum* need further study. We have no data at this point that indicates that fire has a long-term impact on the species abundance; the available data show no correlation between fire and *L. papilliferum* population numbers.

Existing conservation measures designed to reduce the adverse effects of wildfire apply to approximately 96 percent of *Lepidium papilliferum*'s occupied range. For example, the IDARNG, U.S. Air Force, and BLM will continue their rapid response or mutual support agreement for wildfire control. BLM has established wildfire suppression goals for management areas in the CCA (State of Idaho *et al.* 2006, Table 5).

The military is implementing a number of efforts that address wildfire suppression that have been shown to be effective in certain respects at controlling this threat. However, we are not relying on the implementation of conservation measures to make this finding. Implemented and effective conservation measures will, however, help to counter habitat degradation generally and may help conserve the species. Since the late 1980s, the policies of the IDARNG included immediate wildfire suppression during military activities to prevent damage to intact sagebrush-steppe and *Lepidium papilliferum* sites within the OTA (IDARNG 2004, pp. 65 to 67). Seven occurrences of *L. papilliferum* occur within this area (Colket *et al.* 2006, pp. 8 to 9). Since 2002, the U.S. Air Force has instituted a high-level rapid response for wildfire suppression on the Juniper Butte Range (U.S. Air Force 2004, pp. 6–45 to 6–47). The U.S. Air Force addresses wildfire prevention through reducing standing fuels and weeds, planting fire-resistant vegetation in areas with a higher potential for ignition sources (*e.g.*, along roads), and using wildfire indices to determine wildfire hazard ratings and restricting activities when the rating is extreme (U.S. Air Force 2004, pp. 6–45 through

6–47). The BLM and IDARNG are continuing their mutual support agreement for wildfire suppression in the Snake River Birds of Prey National Conservation Area (IDARNG 2004, p. 83).

On the OTA, the reduction in wildfires within EOs has demonstrated that management efforts to suppress wildfire can be effective. The 7 EOs on the OTA represent nearly 40 percent of the total area occupied by *Lepidium papilliferum* (see Figure 1 above), and aggressive wildfire suppression has occurred for over 12 years. The feasibility of implementing rapid response wildfire suppression techniques elsewhere is complicated by the fact that many of the remaining *L. papilliferum* EOs are in remote areas away from wildfire control facilities. The current wildfire regime is interrelated with several other factors that may affect *L. papilliferum*, including the replacement of large areas of native vegetation with more flammable nonnative grasses, increased sedimentation of slickspots, and habitat fragmentation. While these effects may be occurring, the existing data do not correlate them with declines in abundance of *L. papilliferum*.

Invasive Nonnative Species

The most common nonnative annual grasses known to occur in *Lepidium papilliferum*'s habitat include cheatgrass and medusahead. Annual forbs most commonly associated with slickspots include clasping pepperweed (*Lepidium perfoliatum*), tumbleweed (also known as Russian thistle), tumble mustard (*Sisymbrium altissimum*) (also known as tall tumble mustard), and bur buttercup (Colket 2005a, p. 6). Nonnative plants may become established in *L. papilliferum* habitats by spreading through natural dispersal (unseeded) or may be intentionally planted through re-vegetation projects (seeded). Invasive nonnative plants can alter attributes of ecosystems, including geomorphology, wildfire regime, hydrology, microclimate, nutrient cycle, and productivity (Dukes and Mooney 2003, pp. 1 to 35). They can also negatively affect native plants through

competitive exclusion, niche displacement, hybridization, and competition for pollinators; examples are widespread among taxa and ecosystems (D'Antonio and Vitousek 1992, pp. 63 to 87; Olson 1999, p. 5; Mooney and Cleland 2001, p. 1). All 75 EOs for which habitat information is available have nonnative, unseeded plants present (Colket *et al.* 2006a, Appendix C).

The results from 2004 HIP monitoring revealed that all 71 HIP transects monitored within EOs (49 on the Snake River Plain and 22 on the Owyhee Plateau) had nonnative, unseeded plant cover. For example, within the Snake River Plain (49 transects), 1 had nonnative plant cover occurring over 50 percent of the transect, 7 transects had nonnative plant cover between 25 and 50 percent of the transect, and 10 transects had nonnative plant cover between 10 and 25 percent. Two transects on the Owyhee Plateau had nonnative plant cover between 10 and 25 percent (Colket 2005a, pp. 46 to 47).

In their analysis of *Lepidium papilliferum* population trends in association with plant community trends and habitat quality based on HII and HIP monitoring data from 1998–2002 and 2004, Menke and Kaye (2006b, p. 12) report that species diversity and species richness of the plant community had declined, but that exotic species cover and shrub cover had remained the same. Total exotic species cover and exotic grass cover was high in burned transects in all years (Menke and Kaye 2006b, p. 15). Weedy species cover was higher in burned slickspots, but there was no significant correlation between weedy species cover and either abundance of *L. papilliferum* or proportion of *L. papilliferum* in flower (Menke and Kaye 2006b, p. 15). The authors note that although competition from weedy annuals does not appear to influence the short-term abundance of *L. papilliferum*, it may be influencing other plant traits or life history stages

not assessed in this study (Menke and Kaye 2006b, p. 17). However, we have no data to corroborate that this threat will result in future declines in abundance.

Existing conservation measures designed to reduce the potential adverse effects of nonnative, unseeded species apply to approximately 96 percent of *Lepidium papilliferum*'s occupied range (CCA, U.S. Air Force INRMP, IDARNG INRMP). Conservation measures identified within the CCA include protecting remnant blocks of native vegetation, prioritized weed control measures at *L. papilliferum* EOs, protective weed control techniques, revegetation requirements in disturbed areas, education on nonnative species and their spread, vehicle wash points and stations, and research support and funding for nonnative species control (State of Idaho *et al.* 2006, pp. 131 to 132).

The military has a number of ongoing efforts to suppress non-native species. The IDARNG requires all military vehicles entering the OTA from a distance greater than 50 mi (80.4 km) to be washed at a high-pressure wash rack facility to prevent weed seed introduction. Noxious weeds at small sites are hand-pulled when they are found by IDARNG staff, and noxious weed sites on the OTA are reported annually to BLM for treatment (IDARNG 2004, p. 67). The U.S. Air Force reduces the spread of exotic annual species by reseeding disturbed areas with native vegetation to the maximum extent practicable, eradicating noxious weeds prior to spread, and requiring cleaning of U.S. Air Force vehicles and equipment on a wash rack upon return to base. They avoid the use of pesticides within 25 feet of slickspots and use pesticides only if wind conditions are favorable (away from the slickspot) to prevent the loss of *Lepidium papilliferum* (U.S. Air Force 2004, pp. R–4, R–5).

The OTA has demonstrated that management efforts to suppress wildfire, rehabilitating areas with native species, and using wildfire rehabilitation activities with minimal ground disturbance can be effective in reducing the wildfire threat and reducing rates of spread of nonnative unseeded species. Nonnative, unseeded species are increasing at the OTA, although not as rapidly as at other areas where these conservation efforts are not being implemented or have only been implemented for a short period.

We have no evidence that correlates invasive species presence with declines of *L. papilliferum* or the proportion of *L. papilliferum* in flower (Menke and Kaye 2006b, p. 15).

Livestock Use

Trampling of *Lepidium papilliferum* and slickspots can result from livestock use. Table 4 documents the extent of livestock use at HIP transects. Livestock trampling can affect the soil layers of slickspots (Colket 2005a, p. 34; Meyer *et al.* 2005, pp. 21 and 22; Seronko 2004, pp. 1 and 2). Trampling when slickspots are dry can lead to mechanical damage to the slickspot soil crust, potentially resulting in invasion of nonnative plants into the slickspots and altering the hydrologic function of slickspots. Livestock trampling of water-saturated slickspot soils that breaks through the restrictive layer, which is referred to as penetrating trampling (State of Idaho *et al.* 2006, p. 9), has the potential to alter the soil structure and the functionality of slickspots (Rengasamy *et al.* 1984, p. 63; Seronko 2004, pp. 1 and 2). Penetrating trampling, which occurs when slickspots are wet, also has the potential to affect the seed bank for *L. papilliferum*. Meyer and Allen (2005, pp. 6 and 7); seed emergence success decreased with increasing depth from a mean of 54 percent at the shallowest plant depth of 2 mm to a mean of 5 percent at 30 mm depth.

TABLE 4.—LIVESTOCK USE DOCUMENTED AT ELEMENT OCCURRENCES AND HIP TRANSECTS IN 2004 (COLKET *et al.* 2006, APPENDIX C).

[Evidence of livestock use does not infer effects throughout a transect or EO]

	Evidence of penetrating trampling (EO)	Evidence of penetrating trampling (HIP Transects)
Snake River Plain	21/60	19/49
Owyhee Plateau	9/15	20/22
Total	30/75	33/71

In a statistical analysis of HII data from 1998 to 2001, it was found that recent livestock use had neutral effects on *Lepidium papilliferum*, slickspot attributes, and plant community attributes (Menke and Kaye 2006a, p. iii). Recent livestock use estimated by HIP monitoring in the year 2004 resulted in decreased soil crust cover in slickspots, decreased vascular plant cover, and decreased plant litter cover in the surrounding plant community (Menke and Kaye 2006b, p. 3). There was no significant correlation between total livestock print cover or cover of prints penetrating to the slickspot clay layer and abundance of *L. papilliferum*, and both the abundance of *L. papilliferum* per slickspot and proportion of flowering plants was similar between grazed and ungrazed transects for the single year of data reported in 2004 (Menke and Kaye 2006b, p. 15). In the surrounding plant community, grazed and ungrazed transects had similar species richness, diversity, and soil crust cover, but total vascular plant cover and plant litter cover were significantly lower in grazed transects (Menke and Kaye 2006b, pp. 15 and 16).

Livestock trampling events that are most likely to adversely affect *Lepidium papilliferum* usually occur when large numbers of livestock are concentrated on or around slickspots that are saturated with water (Hoffman 2005; Meyer *et al.* 2005, pp. 21 to 22). Saturated conditions typically exist for short periods each year and may never occur in some (drought) years (Hoffman 2005). Predicting when soils will be wet in a climate with few and inconsistent precipitation events is difficult. Consequently, managing livestock to avoid penetrating trampling events is difficult. Supplemental salt and watering sites can alter livestock distribution, and depending on location, can increase or decrease trampling of slickspots.

At least two penetrating trampling events have been suggested as the cause of substantial losses in *Lepidium papilliferum* numbers. In 1996, when other sites at the OTA had a reasonably high numbers of *L. papilliferum* individuals, a study site referred to as the "States site" experienced substantial declines. In 1993, this site had thousands of plants. In the spring of 1996, a trampling event disrupted or buried the in-situ seed bank (Meyer *et al.* 2005, pp. 21 and 22). Since this trampling event, fewer than 10 plants have been observed at the site despite yearly visits (Meyer *et al.* 2005, pp. 21 and 22). In another study area, four of five sites experienced increases in plant

numbers; the fifth site, Glenn's Ferry, was the only one that incurred a trampling event, and the only one with a dramatic reduction in *L. papilliferum* numbers (Robertson 2003b, p. 8). Research designed to specifically examine the relationship between livestock use trampling effects and *L. papilliferum* is currently being conducted by University of Idaho and the State of Idaho in cooperation with us (State of Idaho *et al.* 2006, p. 119). However, at this point we have nothing but this anecdotal evidence to indicate a threat. Information we do have does not suggest that habitat threats are correlated with declines in species population levels.

There are also indirect effects from livestock use that have impacted the sagebrush-steppe ecosystem. The spread of both native and nonnative plant species has been attributed to livestock use (Frost and Launchbaugh 2003, pp. 43 to 45). The spread of cheatgrass on the Snake River Plain has been attributed to several causes, including the past practice of heavy livestock use in the late 1800s (Mack 1981, pp. 145 to 165). Today, nonnative, annual plants such as cheatgrass are so widespread that they have been documented spreading into areas that have not been disturbed (Piemeisal 1951, p. 71; Tisdale *et al.* 1965, pp. 349 and 351; Stohlgren *et al.* 1999, p. 45); therefore, the absence of livestock use does not protect the landscape from invasive, nonnative weeds (Frost and Launchbaugh 2003, p. 44). With careful management, livestock grazing may be used as a tool to select for certain native species or even to control cheatgrass (Frost and Launchbaugh 2003, p. 43).

There was no significant difference in cover of exotic plant species in slickspots between grazed and ungrazed areas in the 2004 HIP dataset, although soil crust cover was significantly lower in grazed transects (Menke and Kaye 2006b, p. 19). Analysis of HII data from 1999 through 2001 found no effect of livestock grazing on slickspot perimeter integrity, weedy species density, perennial forb or grass establishment, or organic debris accumulation in slickspots (Menke and Kaye 2006a, p. 10). Cumulative livestock sign had a significant negative correlation with exotic grass dominance around slickspots (Menke and Kaye 2006a, p. 11) and with the frequency of slickspots with dense weedy annuals in 2001 (Menke and Kaye 2006a, p. 10). The analysis of grazing effects was limited since the HII data were observational only (no controlled experiments were performed), all areas were likely grazed at some point in the past, and grazing

effects could only be observed in habitats that had been burned in the past (Menke and Kaye 2006a, p. 18).

The conservation plans (CCA, U.S. Air Force INRMP, IDARNG INRMP) contain numerous measures to avoid, mitigate, and monitor effects of livestock use on the species. Livestock grazing conservation measures implemented through the CCA and the U.S. Air Force INRMP apply to all Federal and State-managed lands (96 percent of the acreage) within the occupied range of *Lepidium papilliferum*. Conservation measures prescribed by the CCA include minimum distances for placement of salt and water troughs away from occurrences of the species, and several troughs and salt blocks have been moved as a result of these measures (State of Idaho *et al.* 2006, p. 133; State of Idaho *et al.* 2005). The CCA also includes measures to reduce trampling during wet periods, including trailing (moving cattle to, or between, allotments repeatedly on the same path) restrictions (State of Idaho *et al.* 2006, pp. 132 to 134). High priority EOs, as identified in the CCA, tend to have more restrictive conservation measures, such as no early spring grazing, fencing to exclude livestock, and delaying turnout of livestock when soils are saturated (State of Idaho *et al.* 2006, pp. 133 to 134). High priority EOs were designated based on existing habitat quality, geographic location relative to other existing EOs, minimal land use activities, the absence or presence of resources to address threats, and the need to preserve enough EOs throughout the species' range to prevent extinction in case of a catastrophic event. In high priority EOs, greater emphasis is placed on protection and restoration of habitat. BLM has changed the season of grazing use from spring to fall, and implemented a deferred rotation management system on some allotments to protect flowering annuals from grazing (State of Idaho *et al.* 2006, pp. 133 to 134).

Under the revised Juniper Butte Range INRMP, the U.S. Air Force will continue to use livestock throughout the majority of the Juniper Butte Range to reduce the amount of standing grass biomass to reduce wildfire risk (U.S. Air Force 2004, pp. 6–37 to 6–39). The grazing component plan for the INRMP states that livestock use will occur annually for up to 60 days while the bombing range is shut down for clean-up and target maintenance. The shutdown period lasts a maximum of 60 days within a 90-day period, from April 1 through June 30 (U.S. Air Force 2000, pp. B–18 to B–21). The INRMP

emphasizes avoiding grazing when slickspots are wet in order to reduce trampling of slickspot habitats. It also provides guidance for annual monitoring of slickspot soil moisture to determine livestock turnout dates for Juniper Butte Range (U.S. Air Force 2000, pp. B-18 to B-21). The U.S. Air Force established three fenced areas of 173 ac (70.0 ha), 8 ac (3.2), and 30 ac (12.1 ha), respectively, in 2002, with the intent of promoting *Lepidium papilliferum* research and seed collection (Binder 2006), when compatible with the Air Force mission.

There was no significant correlation between total livestock print cover or cover of prints penetrating to the slickspot clay layer and abundance of *L. papilliferum*, and both the abundance of *L. papilliferum* per slickspot and proportion of flowering plants was similar between grazed and ungrazed transects for the single year of data reported in 2004 (Menke and Kaye 2006b, p. 15) and no other data were available that indicated otherwise. Therefore, we do not believe that livestock impacts are a threat to the species.

Residential and Agricultural Development

Past residential and agricultural development has been responsible for five documented local extirpations and four probable local extirpations of *Lepidium papilliferum* (Colket *et al.* 2006, p. 4). The long-term viability of *L. papilliferum* occurrences on private land on the Snake River Plain has the potential to be compromised due to the continuation of residential and urban development in and around Boise (Moseley 1994, p. 20). Today, all or portions of 18 *L. papilliferum* EOs covering 457 acres (3.5 percent) (not including EOs managed by cities or counties) occur on private land. However, half of these 18 EOs are smaller than one acre, and most are classified as having fair to poor habitat quality (Colket *et al.* 2006, pp. 39 to 41). Residential and agricultural development can affect *L. papilliferum* and slickspot habitat through habitat conversion, increased nonnative plant invasions, increased off-highway vehicle use, increased wildfire, changes to insect populations, and increased fragmentation. Future residential and agricultural development on private land occupied by the species is a potential threat that is limited to 3.5 percent of the total known element occurrence acreage, therefore such development is not a significant threat.

Gravel or cinder mining may affect *Lepidium papilliferum* on State and

Federal lands (Mancuso 2000, p. 13). One site was impacted by illegal mining activity in 1999 on BLM and private lands (DeBolt 1999). No other impacts from gravel or cinder mining have been documented, therefore gravel or cinder mining does not constitute a significant threat to the species.

Power, gas, and other lines, and related roads, affect and fragment *Lepidium papilliferum* EOs. Utility lines and accompanying roads have been documented running through at least four EOs, gas lines run through two EOs, and roads run through at least six EOs (Colket *et al.* 2006, Appendix C). In addition to direct habitat destruction, these corridors allow off-road vehicle access and increase the chance of nonnative plant invasions and human-ignited wildfires. Transportation corridors associated with development also increase the probability of human-ignited wildfires and the spread of nonnative, invasive plants. Future developments associated with power, gas, other lines, and related roads through habitat occupied by the species may be a potential threat depending upon design and mitigation measures associated with the developments. But at this time we have no data that such development constitutes a significant threat to the species.

Of the *Lepidium papilliferum* EOs for which habitat information has been collected, 14 of 75 (13 of 60 on the Snake River Plain and 1 of 15 on the Owyhee Plateau) have development (e.g., utility lines, mining, agricultural development, and residential development) within them, and 28, all on the Snake River Plain, have development adjacent to them within 0.31 mi (500 m) (Colket *et al.* 2006, Appendix C). On the Owyhee Plateau, one EO has development occurring within it, and no EOs have development within 0.31 mi (500 m) (Colket *et al.* 2006, Appendix C).

Within the Snake River Plain, an estimated 327,549 ac (132,554 ha) (20 percent) has been converted to agriculture (IDWR 1999), and 94,974 ac (38,435 ha) (6 percent) has been converted to urban areas (University of Idaho 2001).

Development was not a parameter that was measured in 2004 through the HIP transect monitoring program (Colket 2005a). In 2005, 79 HIP transects were monitored (57 on the Snake River Plain and 22 on the Owyhee Plateau); of these transects only one transect on the Snake River Plain had development occurring at the transect (in this case residential/commercial). Monitoring in 2005 on the Snake River Plain also documented residential and commercial

development occurring within 0.31 mi (500 m) of 17 transects, and agricultural development was documented adjacent to 10 transects (Colket 2005b, Table 2).

Currently, the effects from development to *Lepidium papilliferum* are confined geographically to the Snake River Plain, however these threats are not significant. Development does not appear to be a threat at all for *L. papilliferum* EOs on the Owyhee Plateau.

Nonnative Seeded Species

A decline in habitat quality for *Lepidium papilliferum* since 1998 in terms of decreased vascular plant cover, species richness, and species diversity was noted by Menke and Kaye (2006b, p. 19), although they found no change in the cover of exotic grasses or forbs in the plant community between 1998 and 2004, and no relationship between short-term abundance of *L. papilliferum* and weedy species cover in slickspots (Menke and Kaye 2006b, p. 15). At this time, we have no data supporting a conclusion that longer-term abundance will be negatively affected by the presence of exotic grasses.

Rangeland revegetation priorities on public lands in southeast Idaho have included providing forage for livestock, erosion control, wildfire prevention, reducing nonnative annual grass density, and watershed rehabilitation. Some nonnative perennials can out-compete native species and decrease biodiversity (summarized by Harrison *et al.* 1996, 62 pp.). For example, crested wheatgrass, a forage species that was once commonly planted within the range of *Lepidium papilliferum*, is a competitor and its seedlings are better than some native species at acquiring moisture at low temperatures (Lesica and DeLuca 1998, p. 1; Pyke and Archer 1991, p. 4; Bunting *et al.* 2003, p. 82). The results from surveys conducted on the Owyhee Plateau by (Popovich 2002, p. 16) indicated that the number of *L. papilliferum* plants per site was lower in habitat with crested wheatgrass seedlings, compared to native sagebrush-steppe habitat areas or burned areas that had not been seeded (Popovich 2002, p. 16). Forage kochia (*Bassia prostrata*, formerly *Kochia prostrata*) is another nonnative species that has been used for rangeland habitat restoration. Thousands of forage kochia plants have been observed in relatively small slickspots, and it is documented as a direct competitor with *L. papilliferum* in slickspots (DeBolt 2002; Quinney 2005). In one study area within the Poen fire rehabilitation project, post-wildfire monitoring over a 6-year period following aerial seeding with forage

kochia showed eventual loss of *L. papilliferum* along the monitoring transect, and a dramatic increase in forage kochia (DeBolt 2002). Four other slickspots, containing a total of 31 individual *L. papilliferum* plants and numerous forage kochia plants in 2000, were void of *L. papilliferum* and dominated by forage kochia in 2005 (Quinney 2005). Blue flax (*Linum lewisii*) is another nonnative seeded plant that was found within HIP transects (Colket 2005a, p. 6). It is not clear why these *L. papilliferum* plants were absent.

Nonnative seeded species exist in 23 of the 75 EOs with documented habitat information (17 of 60 on the Snake River Plain and 6 of 15 on the Owyhee Plateau), and 18 (14 on the Snake River Plain and 4 on the Owyhee Plateau) have non-native seeded species adjacent to the EO within 0.31 mi (500 m).

The effects of invasive, nonnative seeded plants are monitored as parts of HIP range-wide transect monitoring for *Lepidium papilliferum*. In 2004, 71 *L. papilliferum* HIP transects (49 on the Snake River Plain and 22 on the Owyhee Plateau) were measured (Colket 2005a, pp. 46 to 47). Results indicate that 11 transects within the Snake River Plain and 13 transects within the Owyhee Plateau had introduced perennial plant cover (nonnative, seeded species) (Colket 2005a, pp. 46 to 47). In general, the documented high percentage of plant cover in the 2004 HIP transect monitoring is attributable to crested wheatgrass, except at the site with the highest percent cover. This site in the Snake River Plain contained 26.8 percent cover in forage kochia (Colket 2005a, pp. 17, 32). Approximately 80 percent (9,163 ac (3,708 ha)) of the Juniper Butte Range is dominated by nonnative perennial plant communities as a result of wildfire rehabilitation efforts (U.S. Air Force 1998, pp. 31–120 to 3–121).

Although the use of native plant species for wildfire rehabilitation is preferable, previously there have been problems with the availability and high cost of native seed (Jirik 1999, p. 110; Brooks and Pyke 2001, p. 9). In recent years, with an increase in research and agencies (e.g., BLM) investing heavily in projects such as the Great Basin Native Plant Selection and Increase Project and the Great Basin Restoration Initiative, native seeds and plants are more available to use in restoration of sagebrush-steppe habitat. However, restoration of sagebrush-steppe habitat, and *Lepidium papilliferum* habitat in particular, is still considered a difficult and expensive task.

Under current policies, BLM no longer uses forage kochia as a wildfire rehabilitation species in *Lepidium papilliferum* habitat (USBLM 2002). BLM emphasizes the use of native plants, including forbs, in seed mixes and avoids the use of invasive, nonnative species (State of Idaho *et al.* 2006, p. 26). In January 2004, BLM issued an Instruction Memorandum to employees on compliance with CCA requirements for emergency stabilization and wildfire rehabilitation activities (State of Idaho *et al.* 2006, p. 71).

The military has a number of ongoing efforts to address invasive nonnative, seeded plants. These efforts are implemented and effective in reducing this threat. The U.S. Air Force uses only non-invasive plant materials and will not use forage kochia, intermediate wheatgrass (*Thinopyrum intermedium*, formerly *Agropyron intermedium*), or salt-tolerant species such as four-wing saltbush (*Atriplex canescens*) in revegetation efforts, with native plants being used to the maximum extent practicable and in concert with the military mission for rehabilitation efforts (U.S. Air Force 2004, p. R–4). The IDARNG INRMP for the OTA includes the objectives for maintenance; where possible, improvement of *Lepidium papilliferum* habitat; and restoration of areas damaged by wildfire, through native species and broadcast seeding, collecting, and planting small amounts of native seed not commercially available, and monitoring the success of seeding efforts (IDARNG 2004, p. 72 to 73). Since 1991, the IDARNG has examined historical records and has seeded areas back to the native vegetation that was present prior to past wildfires. Care is taken to ensure that restoration does not damage *L. papilliferum* or its habitat, or introduce species into the habitat that were not present in presettlement times (IDARNG 2004, p. 73).

The IDARNG has demonstrated that diligent efforts to suppress wildfire, the use of native species, and minimal ground-disturbing wildfire rehabilitation activities can be effective in reducing the wildfire threat and rates at which nonnative species spread. Because of limited rainfall and harsh conditions, restoration is a difficult task and often requires repeated seedings on the OTA (IDARNG 2004, p. 73). Methods currently used by the IDARNG may not be economically feasible for revegetation of large areas of damaged habitat found in other parts of the range of the species.

Menke and Kaye (2006b, p. 19) evaluated rangewide data from 1998–

2004 and found a decline in the quality of habitat surrounding slickspots occupied with *Lepidium papilliferum* in terms of decreased vascular plant cover, species richness, and species diversity. They found no change in the cover of exotic grasses or forbs in the plant community between 1998 and 2004, and no relationship between short-term abundance of *L. papilliferum* and weedy species cover in slickspots (Menke and Kaye 2006b, p. 15). Because abundance cannot be correlated with habitat changes, we find that a decline in habitat quality is not threatening the species.

Wildfire Management and Post-Wildfire Rehabilitation

Activities associated with wildfire management include fuel management projects (e.g., greenstrips, prescribed fire), wildfire suppression activities, and post-wildfire rehabilitation. These activities can potentially impact existing *Lepidium papilliferum* occurrences and damage slickspot habitat (ILPG 1999) by the establishment of nonnatives or by mechanical disturbances.

Drill seeding is a rehabilitation technique that is used after wildfire. Drill seeding uses a rangeland drill that plants and covers seed simultaneously in furrows. It is designed to give the seeds moisture and temperature advantages that will enhance their competitive fitness and, consequently, their success rate (Scholten and Bunting 2001, p. 3). Drill seeding has been used on wildfire rehabilitation projects on BLM lands where *Lepidium papilliferum* occurs. It impacts slickspots through mechanical disturbance and introduces other, often nonnative, plant materials. Historically, slickspots were not understood to have any special ecological value, and so no attempt was made to avoid them during rehabilitation activities. We have no data on the extent that drill seeding may still be affecting *L. papilliferum* habitat, although some habitat areas have buffers established to protect them.

Disk or drill seeding has occurred on 14 of 60 EOs on the Snake River Plain and 10 of 15 EOs on the Owyhee Plateau (Colket *et al.* 2006, Appendix C). Drill seeding may have less severe impacts on slickspot habitat than disk seeding the soil, but the success of restoring slickspots and *Lepidium papilliferum* plants varies considerably. The benefits of post-fire revegetation, and subsequent recovery of soil surfaces conducive to germination and establishment of native perennial grass and shrub communities, may outweigh the initial short-term disturbance associated with drill

seeding (Young and Allen 1996, pp. 533 to 534; Bunting *et al.* 2003, pp. 82 to 85).

Ground disturbance associated with wildfire control, such as establishment of fire lines (areas with vegetation removed to break fuel continuity), fire camps, and staging areas, and the use of wildfire suppression vehicles, can also impact existing *Lepidium papilliferum* occurrences and damage slickspot habitat (ILPG 1999). Similarly, construction of fuel breaks, while beneficial in slowing the movement of wildfire, may also impact *L. papilliferum* through ground disturbance or the use of invasive, nonnative, seeded species. Only two EOs, both on the Snake River Plain, are documented as having wildfire lines within them, although neither has documented wildfire lines within slickspots (Colket *et al.* 2006, Appendix C). Herbicides used to pretreat rehabilitation areas prior to seeding may also impact *L. papilliferum*. These activities may injure or kill individual plants or the seed bank through mechanical disturbance or direct exposure to herbicides. Indirect effects associated with mechanical disturbance of slickspot soils include increased probability of establishment of invasive, nonnative plants, burying of the seed bank to a depth where seedlings cannot emerge from the soil, and mixing of slickspot soil layers, which affects the suitability of a microsite for the species.

The effect of drill seeding is monitored as part of the HIP range-wide transect monitoring. In 2004, of the 71 *Lepidium papilliferum* transects monitored, 3 transects on the Snake River Plain and 5 transects on the Owyhee Plateau had evidence of old drill seedings within slickspots; no transects had evidence of firefighting disturbances within slickspots (Colket 2005a, pp. 44 to 45).

Through the CCA, BLM has implemented a number of conservation measures to avoid or minimize impacts to the species from wildfire prevention, wildfire suppression, and post-wildfire emergency rehabilitation activities. These measures are effective to reduce this threat at least partially. BLM and fire cooperators distribute maps and inform crew members of the location of *Lepidium papilliferum* to maximize wildfire protection in those areas, and to minimize potential impacts from suppression related activities (State of Idaho *et al.* 2006, p. 26). Per conservation measure .08 of the CCA, BLM uses seeding techniques that minimize soil disturbance, such as no-till drills and rangeland drills equipped with depth bands, when rehabilitation and restoration projects have the

potential to impact occupied or suitable habitat (State of Idaho *et al.* 2006, p. 26). Rehabilitation and restoration standard operating procedures for *L. papilliferum* were issued in an Instruction Memorandum in January 2004 (State of Idaho *et al.* 2005, p. 33). BLM avoids spraying herbicides within or near known occupied habitat, and conducts pretreatment surveys of at least 5 percent of previously unsurveyed habitat prior to herbicide or ground disturbing treatments associated with emergency wildfire rehabilitation activities (State of Idaho *et al.* 2006, p. 27).

The military has a number of ongoing, effective efforts to address wildfire management activities. The potential for wildfire ignition and spread are decreased by the placement of appropriate restrictions on activities, and the use of wildfire indices to restrict activities when the wildfire rating hazard is extreme (U.S. Air Force 2004, p. R-3). The U.S. Air Force uses drill seeders equipped with depth bands to avoid unnecessary disturbance to soils, avoids slickspots to the maximum extent practicable in drill seeding efforts, and uses broadcast seeding to the maximum extent practicable consistent with reseeding goals (U.S. Air Force 2004, p. R-4). The IDARNG restores wildfire-damaged areas using native species and broadcast seeding. Similarly, the IDARNG provides their fire crews with maps of all known occupied habitat, and actively suppresses all wildfires on the OTA. Blading is not permitted in *Lepidium papilliferum* habitat areas on the OTA. Existing roadways serve as fuel breaks within the OTA, and allow for quick access for wildfire management (IDARNG 2004, p. 73). Since 1987, the IDARNG has demonstrated that efforts to suppress wildfire and the use of native species with minimal ground-disturbing fire rehabilitation activities can be effective in reducing the wildfire threat and reducing establishment rates of nonnative, unseeded species associated with wildfire management activities (IDARNG 2004, p. 73).

Wildfire management has positive consequences (i.e., the control of wildfires) and potentially negative consequences (i.e., destruction of slickspots through habitat restoration and wildfire control practices), depending on how the activity is implemented. The Expert Panel considered wildfire management to be less of an impact than the first four factors discussed above. After our review of the available data, we have determined that wildfire management can potentially impact *Lepidium*

papilliferum, although this activity is not threatening the species.

Recreation

Recreational activities that may affect *Lepidium papilliferum* include hiking, horseback riding, and off-highway vehicles. Juniper Butte Range and areas of the OTA are protected from recreational activities because of military restrictions.

Off-highway vehicle use has been documented in 16 of the 75 EOs (16 of 60 on the Snake River Plain, none on the Owyhee Plateau) for which habitat information has been collected (Colket *et al.* 2006, Appendix C).

Effects from recreational activities are monitored as part of the HIP range-wide transect monitoring for *Lepidium papilliferum*. In 2004, 3 of 49 transects on the Snake River Plain showed off-highway vehicle tracks within the EO area, and 1 transect had off-highway vehicle tracks directly through it (Colket 2005b, Table 1). In 2005, two EOs on the Snake River Plain had tracks in the general occurrence area, and one had tractor tracks running through the transect (Colket 2005b, Table 1). New tracks are documented each year, so monitoring reports are not cumulative. Off-highway vehicle use was also monitored within the Owyhee Plateau *L. papilliferum* EOs in 2004 and 2005, but no off-highway use was documented. An analysis of HII transects between 1998 and 2001 indicated that only a few transects had OHV use in each year, that impacts appeared to be minimal, and that OHV use regionally does not appear to be a major agent of habitat degradation, while noting that concentrated OHV use in localized areas could potentially be more problematic (Menke and Kaye 2006a, p. 18). Therefore, we have determined from the available data that any potential impact to *Lepidium papilliferum* from recreation appears to be localized. Additionally, we have no data indicating that recreation is a major agent of habitat degradation and therefore is not threatening the species.

Military Training

Military activities within the range of *Lepidium papilliferum* include ordnance impact areas, training activities, military development, and an increased risk of wildfire and nonnative plant invasions. Military training occurs on the Snake River Plain at the OTA (seven EOs) and on the Owyhee Plateau at the Juniper Butte Range (a portion of one EO). INRMPs developed for both the Juniper Butte Range and the OTA provide management direction reducing or eliminating many of these threats

from military training exercises. The OTA, where 14 years of INRMP conservation efforts have been implemented, is considered the most intact, native *L. papilliferum* habitat range-wide (Colket *et al.* 2006, pp. 22 to 23; Meyer 2005, p. 1).

The IDARNG and the U.S. Air Force are implementing various conservation efforts to avoid or reduce adverse effects of military training on the species and its habitat, and the IDARNG has had measures in place that promote the conservation of *Lepidium papilliferum* prior to revisions to the IDARNG INRMP made in 2004. The threat of military training is localized in area, and minimal in significance across the range of the species.

Summary of Factor A

There is little disagreement that the quality and composition of the sagebrush steppe ecosystems that surrounds the slickspot microsites inhabited by *Lepidium papilliferum* has become degraded over time. Increased fire frequencies largely caused by the invasion of exotic annual grasses are of particular concern, as are potentially destructive penetrating trampling events of slickspots by livestock. What is not clear is the relationship between these factors and the long-term persistence or viability of *L. papilliferum*. What little data we have at this time does not indicate any direct relationship between the abundance of *L. papilliferum* and factors such as livestock use and weedy species cover. Burning appears to have a negative impact on slickspot conditions, such as increasing exotic species cover and decreasing soil crust cover, but these factors were not significantly correlated with *L. papilliferum* abundance. Accordingly we find that *L. papilliferum* is not threatened by habitat changes to the extent that protection under the Act is needed.

B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

We have no data indicating that overutilization for commercial, recreational, scientific, or educational purposes is a threat to *Lepidium papilliferum*.

C. Disease or Predation

Herbivory of *Lepidium papilliferum* is reported as sparse. Herbivory by rodents and insects has been occasionally observed on *L. papilliferum* plants. In one instance, grasshoppers (possibly Acrididae) were observed consuming *L. papilliferum* flower petals (Geertson 2004, p. 3). We are unaware of any

specific studies documenting foraging on *L. papilliferum* by Mormon crickets (*Anabrus simplex*). Insect herbivores have been studied as part of pollinator and reproductive biology studies (Robertson *et al.* 2004). Flower petal herbivory of *L. papilliferum* by chrysomelid beetles (*Phyllotreta* spp.) was shown to be detrimental to seed production because of decreased pollinator visitation; pollinators did not visit flowers with missing flower petals. Other insect herbivores include plutellid moth larvae, which eat all portions of the plant; harvester ants which eat entire fruits or leaves from plants; mirid bugs, which probably suck phloem; grasshoppers (Acrididae); and leafhoppers (Cicadellidae), which probably suck phloem (Robertson *et al.* 2004, p. 12). At three different sites (one at Kuna Butte and two at the Orchard Training Area), 35 percent, 37 percent, and 23 percent of plants showed evidence of insect herbivore damage (Robertson *et al.* 2004).

Herbivory impacts to *L. papilliferum* from large, native ungulates, such as elk, deer and antelope, have not been observed. However, pronghorn antelope tracks and droppings (U.S. Air Force 2003, p. 14) and elk tracks and droppings (State of Idaho *et al.* 2006, Appendix A) have been infrequently documented in slickspots that support *L. papilliferum*. Domestic sheep have been observed pulling the plants from the ground and spitting them out (Quinney and Weaver 1998). Herbivory by cattle has not been observed.

We have no data to support the conclusion that disease or predation are a significant threat to *Lepidium papilliferum*.

D. Inadequacy of Existing Regulatory Mechanisms

Lepidium papilliferum is considered a sensitive species by BLM (BLM 2003, p. 2–1). BLM has regulations that address the need to protect sensitive, candidate, and federally listed species, and BLM has initiated monitoring of *L. papilliferum* on Federal lands. Monitoring can be used to identify threats, which can result in management actions necessary for controlling *L. papilliferum* habitat degradation.

As a signatory of the CCA (State of Idaho *et al.* 2003, 2006), BLM is the primary land management agency implementing conservation efforts for this species. The majority of implemented conservation efforts associated with the CCA occur on BLM lands. In recent years, BLM has initiated efforts to conserve the species, and the CCA represents a major commitment by BLM for management of lands that

account for a majority of the range of the species (87 percent of the total area and portions of 71 of the 85 extant EOs). Conservation efforts are not a basis for our finding here, but ongoing conservation efforts will be helpful in offsetting any effects that do occur from potential threats, and further voluntary conservation efforts are encouraged. Therefore, available data does not suggest that existing regulatory mechanisms are inadequate.

E. Other Natural or Manmade Factors Affecting Its Continued Existence

The Expert Panel identified unpredictable rain events and drought as climate factors affecting *Lepidium papilliferum*, but did not consider them to be significant threats to the species. We have no data that climatic patterns of rainfall will significantly change over time. Therefore, we do not consider drought or lack of rainfall to pose an extinction risk, although it can cause a short-term decline in population numbers. No other threats to *L. papilliferum* were identified under Factor E.

Summary of Factors Affecting the Species—Conclusion

The primary factors affecting *Lepidium papilliferum* are habitat based. We examined other potential threats and determined that the available data does not suggest that the other factors are threatening the species. We examined data available for effects of wildfire frequency, invasive nonnative plants (especially annual grasses), livestock impacts, and residential and agricultural development. While disturbances to *L. papilliferum* can result from wildfire, commercial and residential development, livestock use, and ground-disturbing wildfire management practices or recreation activities the available data did not support a finding that the species is threatened by one or more of these potential threats. Our analysis of the factors affecting the species indicates that there is cause for concern regarding the decline in quality of the sagebrush-steppe ecosystem and the slickspot microhabitats within. We examined the increased frequency of fires, fueled largely by invasive exotic annual grasses, and how it is altering the diversity and composition of the native plant community. We found that there was no evidence that habitat degradation is a threat to the species such that listing is warranted at this time. However, the concerns generated by our analysis emphasize the need for further research and support for ongoing efforts to restore and manage the

sagebrush steppe ecosystem. This also underscores the necessity for close monitoring of *L. papilliferum* and other components of the sagebrush community to better determine the response of these species to the alteration of their environment. The best available data do not demonstrate any relationship between altered habitat conditions and the status of *L. papilliferum*. The limited data available do not demonstrate any significant relationship between the abundance of *L. papilliferum* and factors such as livestock use or weedy species cover. The two available datasets of abundance monitoring present conflicting results regarding the trend of the population over time. The population of *L. papilliferum* is positively correlated with spring precipitation. *L. papilliferum* evolved in an arid environment and has adapted to fluctuations in precipitation. We have no data demonstrating that precipitation levels are varying significantly from historical patterns. Accordingly, we do not find that fluctuation in precipitation is a threat to the species.

Status Review Process

Section 4(b)(1)(A) of the Act requires us to consider the best scientific and commercial data available, as well as efforts being made by States or other entities to protect a species, when making a listing decision. To meet this standard, we systematically collected information on *Lepidium papilliferum*, its habitats, and environmental factors affecting the species from a wide array of sources. In addition, we received a substantial amount of unpublished information from other Federal agencies, States, private industry, and individuals. We solicited information on all Federal, State, or local conservation efforts currently in operation or planned for either *L. papilliferum* or its habitat.

In addition, we convened an Expert Panel of seven independent scientists who assisted in evaluating the available data and discussed threats to *L. papilliferum*. Expert Panels are not a required component of our analysis, but are used occasionally by the Service to help inform decision makers when there is uncertainty. Scientific information on *Lepidium papilliferum* and associated habitat is limited; data gaps and uncertainty exist in the scientific community's knowledge of threats that may affect *L. papilliferum* populations across its geographical range of sagebrush-steppe habitat. For these reasons, we requested input from scientific experts to help us assess the status of *L. papilliferum*. The Expert

Panel consisted of experts in the fields of small populations/fragmentation, annual desert plants, sagebrush community ecology, wildfire/nonnative species, soils and livestock use, and *L. papilliferum*. The discussion of the Expert Panel, and other available data, was then considered by our Manager Panel in order to develop the decision reported in this finding.

We conducted three phases of information synthesis and evaluation. First, the information on individual planned conservation efforts was evaluated to determine which of the efforts that have not yet been implemented, or have been implemented but have not yet demonstrated whether they are effective, met the standard for sufficient certainty of implementation and effectiveness in the Policy for Evaluating Conservation Efforts (68 FR 15115, March 28, 2003). Second, we employed the assistance of an Expert Panel that evaluated all factors possibly affecting the species' current status. Subsequent to the work done by the expert panel new information became available. Our Manager Panel evaluated all the information, including the new information, on status, trends, ongoing conservation efforts, and potential risk to determine whether the species should be listed as threatened, listed as endangered, or not warranted for listing. We structured these three phases by differentiating two distinct stages of the analysis: (1) A risk analysis phase that included compiling biological information and estimating the risk to the species; and (2) a risk management phase where our Manager Panel evaluated whether the potential threats identified as part of our section 4(a)(1) analysis, and summarized in this finding, qualify *Lepidium papilliferum* as a threatened or endangered species under the Act.

Policy for Evaluation of Conservation Efforts

PECE provides a framework and criteria for evaluating conservation efforts that have not been implemented or have not demonstrated whether they are effective at the time of a listing decision. Recognizing that the certainty of implementation and effectiveness of various planned efforts within a conservation plan, strategy, or agreement may vary, PECE requires that we evaluate each individual conservation effort that has not been implemented or for which effectiveness has not been demonstrated, and the policy provides criteria to direct our analysis. PECE specifies that to consider that a conservation effort(s) contributes

to forming a basis for not listing a species or listing a species as threatened rather than endangered, we must find that the conservation effort is sufficiently certain to be implemented and effective so as to have contributed to the elimination or adequate reduction of one or more threats to the species identified through the section 4(a)(1) analysis. (68 FR 15115, March 28, 2003). Thus, PECE is relevant in situations where a threats analysis, conducted without consideration of conservation efforts that meet the standard in PECE, indicates that listing is warranted. In such situations, we then consider the effect of conservation efforts that meet the "sufficient certainty" standard in PECE to determine whether such efforts have contributed to the elimination or adequate reduction of threats, leading to a determination that the species does not meet the definition of threatened or endangered and therefore does not warrant listing, or that that listing as threatened, rather than endangered, is appropriate.

Because of the time needed to evaluate large numbers of individual conservation efforts under PECE, it sometimes is necessary to proceed with the evaluation process prior to completing the threats analysis pursuant to section 4(a)(1) of the Act, i.e., before we have determined whether efforts that meet the standard in PECE will actually play a role in our determination. That was the case in this situation.

For the PECE analysis, we reviewed activities identified in five plans or conservation strategies. The five plans were: (1) The Candidate Conservation Agreement for Slickspot Peppergrass; (2) the Idaho Army National Guard Integrated Natural Resource Management Plan for Gowen Field/ Orchard Training Area; (3) the U.S. Air Force Integrated Natural Resource Management Plan for Mountain Home Air Force Base; (4) the Conservation Agreement by and between Boise City and the U.S. Fish and Wildlife Service for *Allium aasea* (Aase's onion), *Astragalus mulfordiae* (Mulford's milkvetch), and *Lepidium papilliferum* (slickspot peppergrass); and (5) the Conservation Agreement for Slickspot Peppergrass (*Lepidium papilliferum*) at the Boise Airport, Ada County, Idaho.

We reviewed each conservation effort contained in the five conservation plans to determine which had been implemented and demonstrated effectiveness in reducing one or more threats. We relied on available documentation to determine if the effort was implemented by the time of our analysis. As explained above, conservation efforts that have been

implemented and demonstrated effectiveness are not subject to evaluation under PECE, and are considered as part of the section 4(a)(1) threats analysis (below). We also used the criteria in PECE to evaluate efforts that had not been implemented, and efforts that had been implemented but had not yet demonstrated whether they were effective. We did not rely on those efforts that met the PECE standard in our determination. We made our determination on the basis of the threats analysis and information about population status and trends (see below). However, we consider the conservation plans and the continued commitment of stakeholders to implement the conservation efforts important to the long-term sustainability of *Lepidium papilliferum*.

Expert Panel

In May 2006, we convened a panel composed of seven experts to provide assistance in understanding the ecology and biology of *Lepidium papilliferum*, to assess the threats and extinction risk to the species, and to identify areas of scientific uncertainty. The panelists brought a variety of expertise to the discussion, including knowledge and experience with wildfire, nonnative species, range and grazing issues, soils, small populations and fragmentation, annual desert plants, and sagebrush community ecology, and included a *L. papilliferum* species expert.

The top two potential threats identified by the Expert Panel were the invasion of cheatgrass and the subsequent changes to the fire regime in the sagebrush-steppe ecosystem. Several members of the panel agreed that the expansion of cheatgrass will likely create annual grasslands that will dominate the Snake River Plain within the next 50 years, and would impact *Lepidium papilliferum* and its habitat. The invasion of exotic annual grasses in turn increases the frequency of fire, leading to further alterations of the native plant community.

Following the May 2006 Expert Panel, the Service received additional information including new analysis of *Lepidium papilliferum* population and habitat monitoring data (e.g., Menke and Kaye 2006b). This information was not available to the expert panel and did not factor into their extinction risk estimates. The Service considers the extinction risk estimates by the expert panel to be informative in that they provide a context in which we were able to assess the new information. However, the estimates have limited applicability to our determination in light of this new information. In particular, the new

information limits the Service's confidence in extrapolation of *L. papilliferum* population trends at the OTA to population trends in the remaining Snake River Plain metapopulation and the range-wide population.

Manager Panel

Our Manager Panel reviewed background materials, interacted with the Expert Panel during their exercises, and participated in discussions about the application of the Act and specific terms contained in the Act. The managers based their assessments on the data in the record, including comments previously received; the data presented by the individual members of the Expert Panel, as well as data received subsequent to the Expert Panel process; known information gaps and uncertainty; the number and severity of the threats affecting the species; and mitigating circumstances that might ameliorate one or more of the threats. The Manager Panel convened on three occasions. This rule is based on the record of these discussions and all relevant and available information pertaining to the threats to and status of the species.

Determination

We examined the data regarding *L. papilliferum* populations and occurrence as well as the specific habitat needs of the species. We included an examination of habitat degradation and modification to the sagebrush-steppe ecosystem and the slickspot microhabitats from the current wildfire regime (i.e., increasing frequency, size, and duration), invasion of non-native weed species (e.g., cheatgrass), effects of livestock use (e.g., penetrating trampling, disruption of soil crust covers), and residential and agricultural development to determine whether there were any resulting effects on *L. papilliferum*. While the sagebrush steppe-ecosystem has experienced decreased native shrub cover and increased exotic grass cover, we have no data demonstrating that these factors affect *L. papilliferum* populations. Data at this point are limited and based on observational measures rather than controlled experiments, but indicate no significant relationship between the abundance of *L. papilliferum* and factors such as livestock use or weedy species cover in slickspots. The data limitations point to the value of the conservation activities and collection of data and to improve our understanding of the species, as well as preventive actions. However, we do not have evidence that the factors evaluated here have led to a

negative population trend range-wide in *L. papilliferum*.

Determining range-wide abundance and population trends of *Lepidium papilliferum* is complicated by its annual and biennial life histories and its correlation to spring precipitation, which can vary widely from year to year. Spring rainfall patterns also vary at the local scale, which can influence abundance of the plant from one population to another in the same local area. Abundance estimates are confounded because seeds can remain dormant (and viable) in the seed bank for at least 12 years. All of these factors lead to great natural variability in the abundance of *L. papilliferum* from year to year, which confounds our assessment of population trends.

Currently we have two relatively long-term datasets of abundance monitoring for *Lepidium papilliferum* on which to base our evaluation of population trends for this species, the data from the OTA and the data from range-wide HII and HIP monitoring (which includes several transects on the OTA). The dataset from the OTA indicates recent declines in the abundance of the species that do not correlate as expected with patterns of spring precipitation, beginning in 2003 (Weaver 2006, pp. 1–6). Data from the range-wide HII and HIP transects demonstrate that although the population declined following one of its highest recorded peaks in abundance in 1998 (the first year for which HII data was available), the range-wide population then stabilized and began increasing after 2003 (Menke and Kaye 2006b, Figure 3; USFWS 2006f, Figures 8, 9). The range-wide data show increases in populations since 2003, and populations have continued to show a positive relationship to spring precipitation. The available data are not consistent with regard to an overall population trend for *L. papilliferum*. The data from OTA indicate that plant abundance declined after 1995 and was generally correlating with spring precipitation until 2003 through present when plant abundance did not increase with higher levels of spring precipitation. Range-wide data indicate that *L. papilliferum* abundance has correlated with spring precipitation and abundance of the plant range-wide has increased since 2004 to levels comparable to 1998 range-wide data. We consider this range-wide data to be the best available at this time.

Identification of data gaps and uncertainties helps explain the limits of our understanding of future risk to *Lepidium papilliferum*. We are required to make a determination whether the species qualifies as threatened or

endangered under the Act based solely on the best available scientific and commercial data. To ensure that we considered this data in the proper context, the Manager Panel (see Status Review Process) participated in a structured analysis that included an evaluation of the Act's statutory requirements, in particular the Act's definitions of threatened and endangered, and a review of the data from the risk analysis and all other compiled biological information. They considered the data about risks to *L. papilliferum*, including explicit measures of uncertainty, and the data supporting the existence of those risks, in the context of the requirements of the Act. The definitions in the Act include: an endangered species is in danger of extinction throughout all or a significant portion of its range, and a threatened species is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range (16 U.S.C. 1532(6), (20)).

The Manager Panel convened on three occasions: once during the science panel and shortly after the science panel in May 2006, and again in November 2006.

When the Manager Panel convened in November 2006, focal points of discussion included results of the Menke and Kaye 2006 report that was not available at the time of the science panel and new insights gained from public comment and review of monitoring results. Of particular note were the results that spring precipitation (March–May) explained 89 percent of the variation in plant abundance for the years 1998–2001, 2002, and 2004 sampled by range-wide HII and HIP transects (Menke and Kaye 2006b, p. 10). In addition, this report demonstrated a consistent correlation between the abundance of *Lepidium papilliferum* and spring rainfall throughout all years and reported population increases range-wide since 2003, which contradicted trends reported based on data from the OTA.

Upon reviewing the studies and plant abundance data, the Manager Panel concluded that indications of declines in plant abundance at OTA cannot be reasonably extrapolated to the range-wide population of *Lepidium papilliferum*, and that the conflicting

data indicating range-wide population increases in recent years from the HII and HIP transects add additional uncertainty to our ability to assess the nature of any population trend for *L. papilliferum*. The high variability in plant numbers from year to year, expected for an ephemeral annual plant with a dormant seed bank that is highly dependent on seasonal rainfall, increases the difficulty of discerning any trend in abundance data over time. Although the quality of the sagebrush-steppe slickspot habitat of *L. papilliferum* has become degraded due to a variety of threats, the existing data do not support a determination that those threats are affecting *L. papilliferum* across all or a significant portion of its range sufficient to require the protections of the Act at this time. The managers decided that the data before them did not support a determination that *L. papilliferum* is exhibiting a population decline. The available data do not lead us to conclude that the species is declining range-wide, thus we are unable to establish that there is a point in time when the species is likely to be in danger of extinction throughout all or a significant part of its range. The district court decision found that our previous analysis of foreseeable future was unsupported in the record. In particular, the court noted that the expert panel concluded that there was a 64–80 percent chance that *L. papilliferum* would become extinct in the next 100 years. Thus, the court thought that our ultimate conclusion that the species was not likely to become in danger of extinction in the foreseeable future depended upon a preliminary conclusion that the foreseeable future was in this case a period of time considerably less than 100 years. Because the court found that we had not adequately explained why the Service selected the timeperiod it did for foreseeable future, the court held that our determination was arbitrary and capricious. In contrast, given the new information, the question of how much of the future is foreseeable is no longer relevant. We conclude that apparent abundance of the plant can fluctuate widely from one year to the next, and abundance is strongly correlated with spring precipitation. We have no data demonstrating that precipitation levels

are varying significantly from historical patterns. *L. papilliferum* evolved in an arid environment and has adapted to fluctuations in precipitation by a strategy of relatively long-term seed viability and by increased seed production during favorable conditions. Thus, there is no current evidence that threats are working to threaten the species with endangerment and we cannot predict extinction at any point in time in the foreseeable future, regardless of whether the foreseeable future is defined as less than 100 years, 100 years, or more than 100 years.

In summary, the Act requires us to make a decision based on the best available data at the time of the listing determination. The best available data for *Lepidium papilliferum* indicate that, while the broad scale habitat in which the species exists is degraded, we have no data that correlates this with species abundance. We know that annual abundance is strongly correlated with spring precipitation (March–May) and a high degree of variability in annual abundance is therefore to be expected. The best available range-wide data indicate that abundance of the population range-wide is strongly correlated with precipitation and has increased in recent years in association with increased rainfall, as expected.

Accordingly based solely on the best available data, we find that *Lepidium papilliferum* is not presently in danger of extinction throughout all or a significant portion of its range nor is it likely to become an endangered species throughout all or a significant portion of its range in the foreseeable future.

References Cited

A complete list of all references cited herein, as well as others, is available upon request from our Snake River Basin Office (see **ADDRESSES** section).

Author(s)

The primary authors of this final rule are staff of the U.S. Fish and Wildlife Service.

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Dated January 4, 2007.

H. Dale Hall,

Director, U.S. Fish and Wildlife Service.

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