

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R1–ES–2011–0065]

[MO 92210-0-0008 B2]

Endangered and Threatened Wildlife and Plants; 90-Day Finding on a Petition To List the Franklin’s Bumble Bee as Endangered

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Notice of petition finding and initiation of status review.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), announce a 90-day finding on a petition to list the Franklin’s bumble bee (*Bombus franklini*) as endangered and to designate critical habitat under the Endangered Species Act of 1973, as amended (Act). Based on our review, we find that the petition presents substantial scientific or commercial information indicating that listing this species may be warranted. Therefore, with the publication of this notice, we are initiating a review of the status of the species to determine if listing the Franklin’s

bumble bee is warranted. To ensure that this status review is comprehensive, we are requesting scientific and commercial data and other information regarding this species. Based on the status review, we will issue a 12-month finding on the petition, which will address whether the petitioned action is warranted, as provided in section 4(b)(3)(B) of the Act.

DATES: To allow us adequate time to conduct this review, we request that we receive information on or before [INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]. The deadline for submitting an electronic comment using the Federal eRulemaking Portal (see **ADDRESSES**, below) is 11:59 p.m. Eastern Time on this date. After [INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER], you must submit information directly to the Field Office (see **FOR FURTHER INFORMATION CONTACT**, below). Please note that we might not be able to address or incorporate information that we receive after the above requested date.

ADDRESSES: You may submit information by one of the following methods:

- (1) *Federal eRulemaking Portal:* <http://www.regulations.gov>. Go to the Federal eRulemaking Portal: <http://www.regulations.gov>. In the Enter Keyword or ID box, enter FWS–R1–ES–2011–0065, which is the docket number for this rulemaking. Then, in the Search panel at the top of the screen, under the Document Type heading, click on the Proposed Rules link to locate this document. You may submit a comment by clicking on “Submit a Comment.”

Please ensure that you have found the correct rulemaking before submitting your comment.

- (2) *U.S. mail or hand-delivery:* Public Comments Processing, Attn: FWS–R1–ES–

2011–0065; Division of Policy and Directives Management; U.S. Fish and Wildlife Service; 4401 N. Fairfax Drive, MS 2042-PDM; Arlington, VA 22203.

We will post all information we receive on <http://www.regulations.gov>. This generally means that we will post any personal information you provide us (see the **Request for Information** section below for more details).

FOR FURTHER INFORMATION CONTACT: Paul Henson, State Supervisor, U.S. Fish and Wildlife Service, Oregon Fish and Wildlife Office, 2600 SE 98th Ave., Suite 100, Portland, OR 97266, by telephone 503–231–6179, or by facsimile 503–231–6195. If you use a telecommunications device for the deaf (TDD), please call the Federal Information Relay Service (FIRS) at 800–877–8339.

SUPPLEMENTARY INFORMATION:

Request for Information

When we make a finding that a petition presents substantial information indicating listing a species may be warranted, we are required to promptly review the status of the species (status review). For the status review to be complete and based on the best available scientific and commercial information, we request information on the Franklin’s bumble bee throughout its range, which includes parts of Douglas, Jackson, and Josephine counties in Oregon, and Siskiyou and Trinity counties in California, from governmental agencies, Native American Tribes, the

scientific community, industry, and any other interested parties. We seek information on:

(1) The species' biology, range, and population trends, including:

- (a) Habitat requirements for feeding, breeding, and sheltering;
- (b) Genetics and taxonomy;
- (c) Historical and current range including distribution patterns;
- (d) Historical and current population levels, and current and projected trends; and
- (e) Past and ongoing conservation measures for the species, its habitat, or both.

(2) The factors that are the basis for making a listing determination for a species under section 4(a) of the Act (16 U.S.C. 1531 *et seq.*), which 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; or
- (e) Other natural or manmade factors affecting its continued existence.

(3) Information on pathogens and parasites within and near the range of the Franklin's bumble bee and potential pathways for introductions, including:

- (a) Historical and recent records of *Nosema bombi*, *Crithidia bombi*, *Apicystis bombi*, *Locustacarus buchneri*, deformed wing virus and other bee pathogens and

parasites within parts of Douglas, Jackson, and Josephine counties in Oregon and Siskiyou and Trinity counties in California, and recent studies about known or potential bumble bee pathogens and their effects on bumble bees; and

(b) The transport and use of commercial honey bees or bumble bees including species, year(s) of use, type(s) of use (e.g., greenhouse or open field pollination) and any associated State or Federal quarantine, inspection, permit, compliance, and enforcement action records related to the import and transport of bees in and around parts of Douglas, Jackson, and Josephine counties in Oregon and Siskiyou and Trinity counties in California;

(3) Information on environmental changes that have occurred within the range of the Franklin's bumble bee that may be associated with climate change or other factors.

If, after the status review, we determine that listing the Franklin's bumble bee is warranted, we will propose critical habitat (see definition in section 3(5)(A) of the Act), under section 4 of the Act, to the maximum extent prudent and determinable at the time we propose to list the species. Therefore, within the geographical range currently occupied by the Franklin's bumble bee, we request data and information on:

(1) What may constitute "physical or biological features essential to the conservation of the species,"

(2) Where these features are currently found, and

(3) Whether any of these features may require special management considerations or protection.

In addition, we request data and information on specific areas outside the geographical area occupied by the Franklin's bumble bee that are essential to the conservation of the species. Please provide specific comments and information as to what, if any, critical habitat you think we should propose for designation if the species is proposed for listing, and why such habitat meets the requirements of section 4 of the Act.

Please include sufficient information with your submission (such as scientific journal articles or other publications) to allow us to verify any scientific or commercial information you include.

Submissions merely stating support for or opposition to the action under consideration without providing supporting information, although noted, will not be considered in making a determination. Section 4(b)(1)(A) of the Act directs that determinations as to whether any species is an endangered or threatened species must be made “solely on the basis of the best scientific and commercial data available.”

You may submit your information concerning this status review by one of the methods listed in **ADDRESSES**. We request that you send comments **only** by the methods described in **ADDRESSES**. If you submit information via *http://www.regulations.gov*, your entire submission—including any personal identifying information—will be posted on the website. If you submit a hardcopy that includes personal identifying information, you may request at the top of your document that we withhold this personal identifying information from public review.

However, we cannot guarantee that we will be able to do so. We will post all hardcopy submissions on <http://www.regulations.gov>.

Information and supporting documentation that we received and used in preparing this finding is available for you to review at <http://www.regulations.gov>, or you may make an appointment, during normal business hours, at the U.S. Fish and Wildlife Service, Oregon Fish and Wildlife Office (see **FOR FURTHER INFORMATION CONTACT**).

Background

Section 4(b)(3)(A) of the Act (16 U.S.C. 1533(b)(3)(A)) requires that we make a finding on whether a petition to list, delist, or reclassify a species presents substantial scientific or commercial information indicating that the petitioned action may be warranted. We are to base this finding on information provided in the petition, supporting information submitted with the petition, and information otherwise available in our files. To the maximum extent practicable, we are to make this finding within 90 days of our receipt of the petition and publish our notice of the finding promptly in the **Federal Register**.

Our standard for substantial scientific or commercial information in the Code of Federal Regulations (CFR) with regard to a 90-day petition finding is “that amount of information that would lead a reasonable person to believe that the measure proposed in the petition may be warranted” (50 CFR 424.14(b)). If we find that substantial scientific or commercial information was presented, we are required to promptly conduct a species status review, which we

subsequently summarize in our 12-month finding.

Petition History

On June 28, 2010, we received a petition dated June 23, 2010, from The Xerces Society for Invertebrate Conservation and Dr. Robbin W. Thorp, Department of Entomology, University of California, Davis, requesting that the Franklin's bumble bee be listed as endangered and that critical habitat be designated under the Act (hereafter cited as "Petition"). The petition clearly identified itself as such and included the requisite identification information for the petitioners, as required by 50 CFR 424.14(a). In a letter to the petitioners dated August 16, 2010, we responded that we had reviewed the information presented in the petition and determined that issuing an emergency regulation temporarily listing the species under section 4(b)(7) of the Act was not warranted. Our response also stated that we would not be able to address the petition at that time due to court orders and court-approved settlement agreements with specific deadlines, listing actions with absolute statutory deadlines, and high-priority listing actions that required us to spend most of our listing and critical habitat funding for fiscal year 2010. In fiscal year 2011, we received funding to address this petition.

Previous Federal Actions

On January 6, 1989, we published a notice of review that assigned category 2 status to the Franklin's bumble bee (54 FR 554). Category 2 candidates were species for which we had information indicating that protection under the Act may be warranted, but the information was

insufficient to determine if elevation to category 1 candidate status was appropriate. Category 2 status was maintained for the Franklin's bumble bee in Candidate Review notices published on November 21, 1991 (56 FR 58804) and November 15, 1994 (59 FR 58982). We discontinued the practice of maintaining the list of category 2 candidate species in 1996 (61 FR 64481; December 5, 1996). Franklin's bumble bee has not held a Federal conservation status designation since 1996.

Species Information

Taxonomy

Bombus (formerly *Bremus*) *franklini* was originally described by Frison (1921, pp. 144–148). Several studies have been published on the taxonomic relationship of the Franklin's bumble bee to other bumble bees ((Stephen 1957, pp. 79–81; Milliron 1971, pp. 58–67; Plowright and Stephen 1980, pp. 475–479; Thorp *et al.* 1983, pp. 29–30; Scholl *et al.* 1992, pp. 46–51; Cameron *et al.* 2007, p. 173) (Note—common names are used in this finding, when presented in the petition or available in our files; otherwise, only the scientific names are used.). With the exception of Milliron (1971), who assigned the Franklin's bumble bee subspecific status under *B. terricola occidentalis*, all of these studies have accorded the Franklin's bumble bee its own specific rank. The Franklin's bumble bee is also recognized as a valid species in the Integrated Taxonomic Information System (ITIS 2011). Therefore, we recognize the Franklin's bumble bee as a valid species and, therefore, a potentially listable entity under the Act.

Physical Description

As described by the petitioners (Petition, pp. 5–6), the Franklin’s bumble bee is readily distinguished from other bumble bees in its range by: (1) the extended yellow coloration on the anterior thorax (the middle division of an insect between the head and abdomen), which extends well beyond the wing bases and forms an inverted U-shape around the central patch of black; (2) the lack of yellow on the abdomen; (3) a predominantly black face with yellow on the top of the head; and (4) white coloration at the tip of the abdomen. Other bumble bees with similar coloration in the range of the Franklin’s bumble bee have the yellow coloration extending back to the wing bases or only slightly beyond, and usually have one or more bands of yellow either on the middle or slightly behind the middle of the abdomen. Females of most species have yellow pubescence (fine hair-like structures) on the face, in contrast to black on the Franklin’s bumble bee. Females of the western bumble bee (*Bombus occidentalis*) and *B. californicus* that have black pubescence on the face also have the same coloration on the vertex (the top or crown of the head), in contrast to the yellow pubescence on the vertex in the Franklin’s bumble bee. Females of *B. californicus* have a long face in contrast to the round face of the Franklin’s bumble bee and the western bumble bee. The two types of females (queens and workers), and the males share similar characteristics, although there are some differences.

Life History

As described in the petition (pp. 10–11), the Franklin’s bumble bee is a primitively eusocial bumble bee (i.e., the queen is not well-differentiated from her workers). Eusocial

organisms live in cooperative groups with both reproductive and nonreproductive individuals, and different types of individuals carry out different specialized tasks such as reproduction, defense, or foraging. Like all other bumble bees, this species lives in colonies consisting of a queen and her female workers and male offspring. Queens are responsible for initiating colonies and laying eggs. Workers are responsible for most food collection, colony defense, nest construction, and feeding of the young. The function of male bumble bees is to mate with new queens produced at the end of the colony season. Bumble bee colonies depend on floral resources for their nutritional needs; nectar provides carbohydrates and pollen provides protein. The petitioners state that the Franklin's bumble bee is restricted to habitat patches where its host species are present, and its limited historical distribution suggests that it probably has a limited ability to disperse.

The nesting biology of the Franklin's bumble bee is unknown, but like other *Bombus* species, it is believed to nest underground in grassy areas, presumably in abandoned rodent burrows (Plath 1927, pp. 122–128; Hobbs 1968, p. 157; Thorp *et al.* 1983, p. 1; Thorp 1999, p. 5). It may occasionally nest on the ground (Thorp *et al.* 1983, p. 1) or in rock piles (Plowright and Stephen 1980, p. 475). Bumble bee colonies are annual occurrences, starting from colony initiation in spring by solitary, mated queens that emerge out of hibernation to search for appropriate nesting sites. There are differences among various bumble bee species in their foraging ranges. Species such as *B. terrestris* and *B. lapidaries* forage farther afield than so-called “doorstep” foragers, such as *B. pascuorum*, *B. sylvarum*, *B. ruderarius*, and *B. muscorum*. It is perhaps significant that the former two species remain ubiquitous in much of Europe, whereas three of the four doorstep foragers have declined. In theory, a larger foraging range

gives a greater chance of colony survival in areas where the average density of floral resources is highly patchy (Goulsen *et al.* 2007, p. 11.12). Although the maximum flight distance of *B. franklini* is not known, as noted above, the petitioners suggest that the species is most likely not capable of long-distance flight, based on its restricted range. Franklin's bumble bee has been observed collecting pollen from lupine (*Lupinus* spp.) and California poppy (*Eschscholzia californica*), and collecting nectar from horsemint or nettle-leaf giant hyssop (*Agastache urticifolia*) and mountain monardella (*Monardella odoratissima*) (Petition, p. 11).

In the early stages of colony development, the queen is responsible for all food collection and care of the larvae. The queen collects nectar and pollen from flowers to support the production of her eggs, which are fertilized by sperm she has stored since mating the previous fall. As the colony grows, the workers take over the duties of food collection, colony defense, nest construction, and larval care, while the queen remains within the nest and spends most of her time laying eggs (Petition, pp. 10–11). Generally, bumble bee colonies consist of multiple broods, with the number of workers for some species ranging from 50 to 400 at their peak (Plath 1927, pp. 123–124; Thorp *et al.* 1983, p. 2, Macfarlane *et al.* 1994, p. 7). Two colonies of Franklin's bumble bees that were initiated in the laboratory and moved to a field location to complete development contained over 60 workers each when censused (counted) in early September, and may have reached a total worker complement of well over 100 individuals by the end of the season (Plowright and Stephen 1980, p. 477).

The flight season of the Franklin's bumble bee is typically from mid-May to the end of September (Thorp *et al.* 1983, p. 30), although a few individuals have been encountered as late

as October (Petition, pp. 34–40). Reproductive queens and males are produced near the end of the colony cycle. Queens usually mate with only one male, but males may mate with multiple queens. After mating, the queens feed to build up their fat reserves. The founding queen and all workers and males from the colony die by the end of the season, and inseminated new queens go into hibernation and are left to carry on the line the following year (U.S. Forest Service and Bureau of Land Management 2009, p. 3).

Range and Distribution

The Franklin's bumble bee is thought to have the most limited distribution of all known North American bumble bee species (Plowright and Stephen, p. 479; Petition, p. 6), and one of the most limited geographic distributions of any bumble bee in the world (Williams 1998, as cited in the petition (p. 6)). The original description by Frison (1921, pp. 313–315) was based on two queens reported from Nogales, Arizona. These localities were later determined to be outside of the distribution of all other specimens subsequently assigned to the species, and the location reports were invalidated (Stephen 1957, p. 79; Thorp 1970, pp. 177–180). All other specimens assignable to the species have been found in an area about 190 miles (mi) (306 kilometers (km)) to the north and south and 70 mi (113 km) to east to west between 122° to 124° west longitude and 40° 58' to 43° 30' north latitude in Douglas, Jackson, and Josephine counties in southern Oregon, and in Siskiyou and Trinity counties in northern California (Thorp 1999, p. 3; Thorp 2005c, p. 1; IUCN 2009, p. 1).

Survey Efforts

A survey effort specifically focused on the Franklin's bumble bee began in 1998 and continued through 2009 at sites representing both historical and potential new localities for the species. According to the information provided in the petition (Thorp 2001, 2004, 2005a, 2005c), from 9 to 17 historical sites (averaging 13.8 sites annually), and from 2 to 23 additional sites were surveyed each year during this period, and some sites were visited more than once per year, or in multiple years. As presented in Table 1 of the petition, these surveys appear to have been conducted throughout the known range of the species (Petition, p. 9).

During the surveys, the Franklin's bumble bee was observed at 11 sites, including 7 locations where it had not been previously documented. According to the petitioners, despite continued surveys through 2009, no observations of the Franklin's bumble bee have been reported since 2006, when a single worker was observed at Mt. Ashland in Oregon (Thorp 2008, p. 5). The number of sightings was at its highest in 1998 when surveys were initiated and 94 individuals were documented (Petition, p. 9), and then fluctuated between 0 and 20 individuals in subsequent years up until 2006. In 2006, the Bureau of Land Management conducted a survey of 16 sites that were believed to provide optimal habitat for the Franklin's bumble bee. Each site was surveyed twice by trained technicians, but no Franklin's bumble bees were found (Code and Haney 2006, p. 3). While it has been postulated that the species may be extinct (Natural Research Council 2007, p. 43; NatureServe 2010, p. 1), we do not consider the available evidence to be conclusive, since one individual was observed during surveys in 2006 even after none had been observed in the previous 2 years (Petition, p. 4), and there may be other unknown populations. The failure to detect a species during surveys is not equivalent to a conclusive

demonstration of its absence, but may simply reflect the detection probability for that species, which decreases as a function of rarity.

Evaluation of Information for this Finding

Section 4 of the Act (16 U.S.C. 1533) and its implementing regulations at 50 CFR 424 set forth the procedures for adding a species to, or removing a species from, 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:

- (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; or
- (E) Other natural or manmade factors affecting its continued existence.

In considering which factors might constitute threats, we must look beyond the mere exposure of the species to the factor to determine whether the species responds to the factor in a way that causes actual impacts to the species. If there is exposure to a factor, but no response, or only a positive response, that factor is not a threat. If there is exposure and the species responds negatively, the factor may be a threat and we then attempt to determine how significant a threat it is. If the threat is significant, it may drive or contribute to the risk of extinction of the species

such that the species may warrant listing as threatened or endangered as those terms are defined by the Act. This does not necessarily require empirical proof of a threat. The combination of exposure and some corroborating evidence of how the species is likely impacted could suffice. The mere identification of factors that could impact a species negatively may not be sufficient to compel a finding that listing may be warranted. The information shall contain evidence sufficient to suggest that these factors may be operative threats that act on the species to the point that the species may meet the definition of threatened or endangered under the Act.

In making this 90-day finding, we evaluated whether information regarding threats to the Franklin's bumble bee, as presented in the petition and other information available in our files, is substantial, thereby indicating that the petitioned action may be warranted. Our evaluation of this information is presented below. The petitioner stated it is likely that disease outbreak in commercial bee pollination facilities in North America, such as the one reported in 1998 (see below discussion), is one major cause responsible for the major severe declines seen in the Franklin's bumble bee since that time, although their current status is not known in detail (Code *et al.* 2006, p. 2). There is some information available on threats specific to the Franklin's bumble bee, although much of the information presented in the petition was extrapolated from what is known about other bumble bee species.

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

Information Provided in the Petition and Available in Service Files

The petition asserts that threats that have altered Franklin's bumble bee habitat include agricultural intensification (increases in farm sizes and operating efficiencies related to production (irrigation, tilling, etc.)), water impoundments, livestock grazing, urban development, fragmentation of landscapes, natural and introduced fire, and invasive species. The petitioners believe these threats are even more significant and can have a more pronounced impact on the extinction potential of an animal that has been reduced to just a few locations, which they believe is the case with the Franklin's bumble bee (Petition, p. 12). Many of the petitioner's assertions involve activities that may have historically affected habitat for the Franklin's bumble bee, but may no longer be acting on the species. Factor A requires an evaluation of the present (i.e., ongoing) or threatened (i.e., foreseeable) impacts to a species' habitat or range. Accordingly, although historical habitat loss may be instructive with regard to conditions leading to a species' current status, it does not represent an ongoing or foreseeable threat under Factor A. Each of the petitioner's assertions is described in more detail below.

Agricultural Intensification

The petitioners reported one pre-2004 agricultural activity within the Franklin's bumble bee's historical range near Gold Hill in Jackson County, Oregon, where significant excavation and soil deposition altered approximately 50 percent of the available bumble bee foraging habitat (Petition, p. 12). Several references provided with the petition confirm that agricultural intensification can negatively impact wild bees by reducing the floral resource diversity and abundance needed for forage (Johansen 1977, p. 177; Williams 1986, p. 57; Kearns *et al.* 1998, p. 89; Hines and Hendrix 2005, p. 1477; Carvell *et al.* 2006, p. 481; Diekötter *et al.* 2006, p. 57;

Fitzpatrick *et al.* 2007, p. 185; Kosior *et al.* 2007, pp. 81, 84–86; Öckinger and Smith 2007, p. 50; Goulson *et al.* 2008, p. 11.1; IUCN 2009, p. 2; Le Féon *et al.* 2010, p. 143) and causing loss of nest sites (Johansen 1977, p. 177; Kearns *et al.* 1998, p. 89; Diekötter *et al.* 2006, p. 57; Öckinger and Smith 2007, p. 50; Goulson *et al.* 2008, p. 11.4). Agricultural intensification was determined to be a primary factor leading to the local extirpation and decline of Illinois bumble bees (Grixti *et al.* 2009, p. 75), and the decline of bumble bees and cuckoo bees (*Bombini spp.*) in countries across western and central Europe (Kosior *et al.* 2007, pp. 81). The petition did not present any information indicating impacts related to agricultural intensification are ongoing or foreseeable in currently occupied habitat for the Franklin's bumble bee, and we have no information in our files in this regard.

Water Impoundments

The petitioners reported that two historical Franklin's bumble bee sites in Jackson County, Oregon, were inundated following the completion of Applegate Dam in 1980; historical records for the Franklin's bumble bee were documented at this location in 1963 and 1968. The petition did not present any information indicating that impacts related to water impoundments are ongoing or foreseeable in currently occupied habitat for the Franklin's bumble bee, and we have no information in our files in this regard.

Livestock Grazing

The petitioners stated that U.S. Bureau of Land Management and U.S. Forest Service

lands historically occupied by the Franklin's bumble bee are periodically subject to substantial livestock impact (Petition, p. 13). According to the petition, livestock grazing may adversely impact bumble bee populations by: (1) depleting food resources (Morris 1967, p. 472; Sugden 1985, p. 299; Kruess and Tscharntke 2002b, p. 1570; Vazquez and Simberloff 2003, p. 1081; Hatfield and LeBuhn 2007, p. 150); (2) trampling nesting sites (Sugden 1985, p. 299); and (3) negatively impacting ground-nesting rodents (Johnson and Horn 2008, p. 444; Schmidt *et al.* 2009, p. 1), which may in turn reduce the number of nest sites available for bumble bees.

The petition stated that livestock grazing has differing impacts on flora and fauna based on the type, habitat, intensity, timing and length of grazing (Gibson *et al.* 1992, p. 174; Carvell 2002, p. 44; Kruess and Tscharntke 2002a, p. 293; Kruess and Tscharntke 2002b, p. 1577). Several studies of livestock grazing impacts on bees suggest increased intensity of livestock grazing negatively affects the species richness of bees (Morris 1967, p. 473; Sugden 1985, p. 309; Vazquez and Simberloff 2003, p. 1080; Hatfield and LeBuhn 2007, p. 156). Interestingly, one study cited by the petitioners suggests that grazing, especially by cattle (as opposed to sheep or mowing), can play a key positive role in maintaining the abundance and species richness of preferred bumble bee forage (Carvell 2001, p. 44). The petition did not present any information indicating that livestock grazing impacts are ongoing or foreseeable in currently or most recently occupied habitat for the Franklin's bumble bee, and we have no information in our files in this regard.

Urban Development

One study in Boston, Massachusetts, concluded that human-built structures, such as roads and railroads, can fragment plant populations and restrict bumble bee movement (Bhattacharya *et al.* 2003, p. 37). Another study of the factors adversely affecting bumble bees and cuckoo bees in western and central Europe found the expansion of urban areas to be an important driver of pollinator loss in approximately half of the countries examined (Kosior *et al.* 2007, p. 81). The petitioners stated that while urban parks and gardens may provide habitat for some pollinators, including bumble bees (Frankie *et al.* 2005, p. 227; McFrederick and LeBuhn 2006, p. 372), they tend not to support the species richness that was either present historically or found in nearby wild landscapes (petition p. 13; McFrederick and LeBuhn 2006, p. 378). The petitioners reported that the Franklin's bumble bee has been found in urban areas of Ashland, Oregon, and that nests of a close relative, the western bumble bee, have been found in urban San Francisco, California (Petition, p. 13).

Thorp (1999, p. 12) stated that increased urbanization in areas in Oregon (Ashland, Medford-Central Point, Grants Pass and Roseburg) may have already reduced historical populations of the Franklin's bumble bee. The author also stated that the Franklin's bumble bee was found on the Southern Oregon University campus as recently as spring 1998, and acknowledged that most major urban areas within the range of the species have not been intensively surveyed (Thorp 1999, p. 8). The petition did not present any information indicating urban development impacts are ongoing or foreseeable in currently or most recently occupied habitat for the Franklin's bumble bee, and we have no information in our files in this regard.

Habitat Fragmentation

The petitioners asserted that habitat fragmentation from land uses such as agriculture, grazing, urban development and other factors is a threat to the Franklin's bumble bee (Petition, p. 13). One study found that populations of a number of bumble bee species have become increasingly small, making them more vulnerable to local extinctions and less able to recolonize extirpated habitat patches (Goulson *et al.* 2008, pp. 11.6–11.7). Fragmentation can alter pollinator community composition, change foraging behavior of bumble bees and reduce bee foraging rates (Kearns and Inouye, 1997, p. 299; Öckinger and Smith 2007, p. 50; Rusterholz and Baur 2010, p. 148). Bumble bees have been found to be susceptible to the disruption of healthy metapopulation structures due to fragmentation (National Research Council 2007, p. 93; Goulson *et al.* 2008, p. 11.7), and studies suggest fragmented bumble bee populations can suffer from inbreeding depression as a result of geographic isolation (Darvill *et al.* 2006, p. 601, Goulson *et al.* 2008, p. 11.7). Fragmentation is believed to be one of the factors contributing to the decline of bumble bees and cuckoo bees in countries across western and central Europe (Kosior *et al.* 2010, pp. 81). Information regarding the effects of habitat fragmentation on the Franklin's bumble bee was not provided by the petitioners, although they did present conclusions from studies of other bumble bee species (Petition, p. 13). We have no information available in our files regarding habitat fragmentation of Franklin's bumble bee habitat. However, as stated earlier, there are differences among bumble bee species in their foraging range; some forage farther afield than other species. A larger foraging range gives a greater chance of colony survival in areas where the average density of floral resources becomes highly patchy because of habitat fragmentation (Goulson *et al.* 2007, p. 11.12). Although further study would be required, the threat of habitat fragmentation would be expected to be greater if the Franklin's bumble bee's

geographically limited range is related to a limited foraging distance, as suggested by the petitioners (Petition, p. 20).

Natural and Prescribed Fire

The petition asserted that current fuel loads, including invasive trees and shrubs, combined with reduction and fragmentation of Franklin's bumble bee populations, and reduction in size of native meadows, makes natural or prescribed burning a potential threat (Petition, p. 14). Generally, fire suppression can lead to increased fuel loads and tree densities that dramatically increase the risk of severe fire (Huntzinger 2003, p. 1), and degradation and loss of native prairies and grasslands can occur in the absence of fire due to succession of plant communities to habitats dominated by invasive and woody vegetation (Schultz and Crone 1998, p. 245). Using prescribed fire is a common practice for restoring and managing native prairie and grassland plant communities (Panzer 2002, p. 1297). Although the use of prescribed fire is generally beneficial to insect populations that rely on grassland habitats by maintaining suitable habitat conditions, some taxa can be negatively affected, especially in the short-term (Schultz and Crone 1998, p. 244; Panzer 2002, p. 1296).

The petitioners believe that increased fuel loads due to long-term fire suppression could result in a large-scale, high-temperature fire that could potentially extirpate an entire population of the Franklin's bumble bee if it were to occur in an area where they are concentrated (Petition, p. 14). The petition did not present any information indicating the extent to which natural or prescribed fire has occurred in currently or most recently occupied habitat for the Franklin's

bumble bee, and we have no information in our files in this regard. The petition characterized natural or prescribed fire as a threat to the Franklin's bumble bee because of current site fuel loads (invasive trees and shrubs), combined with the reduction and fragmentation of populations and habitat (Petition, p. 14). Because of current site fuel loads, as characterized by the petitioner, we consider this potential threat to be reasonably foreseeable, even though the timing, magnitude, and location of natural fire events (or prescribed fires that become wild fire events) is unpredictable.

Invasive Species

The petitioners stated that the “invasion and dominance of native grasslands by exotic plants is a common issue” (Warren 1993, p. 47; Schultz and Crone 1998, p. 244), which has likely occurred at historical Franklin's bumble bee sites (Petition, p. 14). Invasive plant species that displace native plant communities have the potential to negatively impact the Franklin's bumble bee if they provide less pollen or nectar than the native species, or if they bloom during a different time period than the native plant species available for foraging (Petition, p. 14; Kearns *et al.* 1998, p. 103). The petition did not present any information indicating that invasive species-related impacts are occurring in currently or most recently occupied habitat for the Franklin's bumble bee, and we have no information in our files in this regard.

Summary of Factor A

The publications cited by the petitioners appear to support their assertions that

agricultural intensification, livestock grazing, urban development, fragmentation of landscapes, natural and introduced fire, and invasive species can pose threats to bumble bees and other pollinators in general; however, very little information was presented with which to correlate these potential threats to habitat occupied specifically by the Franklin's bumble bee. In addition, one of the petition references indicates that, during surveys conducted from 1998 to 2004, it was observed that most of the sites surveyed remained suitable habitat, based on the constant abundance of other bumble bee species (Thorp 2005c, p. 4). The petition does not indicate whether the sites surveyed from 1998 to 2004 encompass all areas potentially habitable by the Franklin's bumble bee, and implies that at least some sites may have become unsuitable habitat. We have no information available in our files that provides any additional information in this regard.

We find that the petition presents substantial scientific or commercial information indicating that the Franklin's bumble bee may warrant listing due to the present or threatened destruction, modification, or curtailment of habitat, primarily due to the potential impacts of natural or prescribed fire to remaining populations. Habitat fragmentation may additionally pose a threat to the Franklin's bumble bee, although at present we do not have sufficient information to assess the degree of fragmentation that has occurred within its range, or to determine the dispersal limitations of the species. There is no substantial information indicating that agricultural intensification, water impoundments, livestock grazing, urban development, or invasive species specifically, are currently impacting Franklin's bumble bee habitat, or will impact the species' habitat in the foreseeable future. However, we will assess each of these potential threats more thoroughly during our status review, in order to better quantify potential

effects on the Franklin's bumble bee.

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

Information Provided in the Petition and Available in Service Files

The petitioners asserted that, while generally the collection of insects does not present a threat to their populations, the collection of a small number of Franklin's bumble bee queens could significantly reduce the production of offspring and pose a threat to the entire species due to its rarity, small populations, and relatively low fecundity compared to most insects (Petition, p. 14). Based on a table of historical and recent records presented by the petitioners, Franklin's bumble bee specimens (including queens) have been collected as recently as 1998, and deposited at several universities and museums. There are records of 28 queens collected between 1950 and 1998; the records since 1998 are based on observations only with no collections of males, workers, or queens noted (Petition, pp. 34–40). In 1998, the year that the most recent surveys for the Franklin's bumble bee were initiated and the last year for any documented collections (i.e., where specimens were retained), the highest number of individuals ever documented was recorded (94 individuals), and 4 queens were collected by another individual. We are unaware of any collections beyond those documented in the table of historical and recent records provided in the petition (Petition, pp. 34–40). The petition did not present any information indicating that the collection of Franklin's bumble bee queens is currently occurring, and we have no information in our files in this regard.

Summary of Factor B

Neither the petition nor information available in our files presents substantial scientific or commercial information that collection of Franklin's bumble bee queens is still occurring, or if so, occurring at a level that impacts the overall status of the species. In addition, we have no information indicating pre-1998 collections may have been a factor resulting in the Franklin's bumble bee's current population status, although queen specimens have been retained for scientific collections in the past (last recorded in 1998). Therefore, we find that the petition does not present substantial scientific or commercial information to indicate that overutilization for commercial, recreational, scientific, or educational purposes may present a threat such that the petitioned action may be warranted. However, we will assess this factor more thoroughly during our status review for the species.

C. Disease or Predation.

Information Provided in the Petition and Available in Service Files

The petitioners asserted there is potential for the spread of an exotic strain of the microsporidium (parasitic fungus) *Nosema* and other disease organisms, such as the protozoan parasite *Crithidia bombi*, tracheal mite *Locustacarus buchneri*, or deformed wing virus through wild populations of the Franklin's bumble bee and other species in the subgenus *Bombus* in North America. While no specific examples were provided within the range of the Franklin's bumble bee, the petitioners hypothesize that the main cause of the decline of the Franklin's

bumble bee is due to a disease organism introduced through the use of commercially reared bumble bee colonies (Petition, p. 14).

Commercial bumble bee production started in North America in the early 1990s (Petition, p. 15). The petitioners stated that commercially produced bumble bee colonies that were potential carriers of pests or disease were distributed throughout much of North America, when the Franklin's bumble bee and other closely related wild bumble bees started to decline. In addition to being used for commercial pollination, western bumble bee colonies were used in field research between 1991 and 2000 in California, Washington, and Alberta, Canada (Mayer *et al.* 1994, p. 21; Mayer and Lunden 1997, p. 283; Richards and Myers 1997, p. 293; Mayer and Lunden 2001, p. 277; Thomson 2004, p. 460). The petition referenced a news story published by the Associated Press that highlighted a strawberry and vegetable grower in Grants Pass, Oregon (within the range of the Franklin's bumble bee), who purchased *Bombus impatiens* hives in 2007 to pollinate his crop (Associated Press 2007; Petition, p. 18). In 2007, there was also a proposal by a commercial bee company to import nonnative bumble bees (*B. impatiens*) for the pollination of field crops in the State of California (California Department of Food and Agriculture 2006, pp. 1–59).

The Service found that bees were proposed for use less than 150 mi (241 km) from the southern extent of the historical range of the Franklin's bumble bee and raised concerns about potential impacts to the species. In a comment letter to the California Department of Agriculture dated January 17, 2007, the Service specifically mentioned the risk of potential disease transmission that could occur if infected hives were shipped through or used in areas where

commercial bees could come into contact with Franklin's bumble bee, and requested that an analysis of potential effects to the species be conducted in accordance with the California Environmental Quality Act (U.S. Fish and Wildlife Service 2007, pp. 1–2). Information about the outcome is not available in our files. Parasites and pathogens have been found to spread from commercial bee colonies to native bee populations through a process sometimes referred to as “pathogen spillover” (Colla *et al.* 2006, p. 461; Otterstatter and Thompson 2008, p. 1). Pathogens specifically addressed in the petition are discussed below.

Nosema bombi

Nosema bombi has been detected in native bumble bees in North America, but whether it is an introduced species or occurs naturally is uncertain (Petition, p. 16). As described by the petitioners, *N. bombi* is a microsporidian that infects bumble bees, primarily in the malpighian tubules (small excretory or water regulating glands), but also in fat bodies, nerve cells, and sometimes the tracheae (Macfarlane *et al.* 1995, as cited by the petitioners, Petition, p. 15). Colonies can appear to be healthy but still carry *N. bombi* and transmit it to other colonies. The effect of *N. bombi* on bumble bees varies from mild to severe (Macfarlane *et al.* 1995, as cited by the petitioners (Petition, pp. 15–16); Otti and Schmid-Hempel 2007, p. 118; Larson 2007, as cited by the petitioners (Petition, pp. 15–16); Rutrecht *et al.* 2007, p. 1719; Otti and Schmid-Hempel 2008, p. 577).

The petition described the probable route of introduction and spread as follows: In the early 1990s, queens of both the western bumble bee and *Bombus impatiens* were shipped from

the United States to rearing facilities in Belgium that were also likely rearing *B. terrestris*, a close relative of the western bumble bee and the Franklin's bumble bee. The commercially-reared colonies produced from these queens were shipped back into the United States between 1992 and 1994. The petitioners hypothesize that a virulent strain of *Nosema bombi* from *B. terrestris* spread to *B. impatiens* and the western bumble bee prior to their shipment back into the United States, and once in this country the commercially reared colonies of the western bumble bee may have spread this virulent strain of *N. bombi* to wild populations of the Franklin's bumble bee (Petition, p. 15).

Bumble bee producers experienced major problems with *Nosema bombi* infection in commercial western bumble bee colonies in 1997 (Flanders *et al.* 2003, p. 108; Velthuis and van Doorn 2006, p. 432), and eventually stopped producing the western bumble bee. In addition, the morphology of *N. bombi* found in a native bumble bee in China, *Bombus leucorum*, was found to be the same as that found in *B. terrestris* imported from New Zealand (Jilian *et al.* 2005, p. 53), suggesting the disease may have been introduced to native bumble bee populations in China by commercial bees.

Researchers at the University of Illinois recently identified a strain of *Nosema bombi* in multiple species of North American bumble bees (Petition, p. 16). Studies suggest the disease can spread from commercial bumble bees to nearby wild bumble bees (Niwa *et al.* 2004, p. 60; Whittington *et al.* 2004, p. 599; Jilian *et al.* 2005, p. 53; Colla *et al.* 2006, p. 461), even when commercial bumble bees are used for pollination in greenhouses, because commercial bumble bees frequently forage outside greenhouse facilities (Petition, p. 15), and can transmit disease at

shared flowers (Whittington *et al.* 2004, p. 599; Colla *et al.* 2006, p. 461). The extent to which this pathogen occurs within the current range of the Franklin's bumble bee was not described in the petition, and we have no information in our files in this regard.

Crithidia bombi

The petitioners believe the internal protozoan parasite, *Crithidia bombi*, could also be leading to the decline of the Franklin's bumble bee. *C. bombi* has been shown to have detrimental effects on colony founding success of queens, the fitness of established colonies, and the survival and foraging efficiency of bumble bee workers (Brown *et al.* 2000, p. 421; Brown *et al.* 2003, p. 994; Otterstatter *et al.* 2005, p. 388; Gegear *et al.* 2005, p. 1; Gegear *et al.* 2006, p. 1073).

As with *Nosema bombi*, studies suggest that *Crithidia bombi* can spread from commercial bumble bees to nearby wild bumble bees through shared use of flowers, even when commercial bumble bees are used for pollination in greenhouses, because they can escape to forage outside and transmit the disease (Durrer and Schmid-Hempel 1994, p. 299; Whittington *et al.* 2004, p. 599; Colla *et al.* 2006, p. 461; Otterstatter and Thompson 2008, p. 1). Although *C. bombi* is considered to be a bumble bee parasite, honey bees have also been shown to be possible vectors (Ruiz-González and Brown 2006, p. 621). This parasite has been shown to be present in higher frequencies in bumble bees near greenhouses where commercial colonies of *Bombus impatiens* are used than in bumble bees remote from these facilities (Colla *et al.* 2006 in litt., p. 3). The extent to which this pathogen occurs within the current range of the Franklin's bumble bee was

not described in the petition, and we have no information in our files in this regard. However, as described above, the petition referenced a news story published by the Associated Press that highlighted a strawberry and vegetable grower in Grants Pass, Oregon (within the range of the Franklin's bumble bee), who purchased *B. impatiens* hives in 2007 to pollinate his crop (Associated Press 2007; Petition, p. 18). We are also aware of a proposal to use commercial *B. impatiens* for field pollination at a site in California within 150 mi (241 km) of the historical range of the Franklin's bumble bee (U.S. Fish and Wildlife Service 2007, p. 1). As *B. impatiens* is a potential carrier of *C. bombi*, *B. impatiens* would be a potential vector for transmission to the Franklin's bumble bee.

Locustacarus buchneri

The petition stated that *Locustacarus buchneri* is a tracheal mite that affects bumble bees (Petition, p. 17), and that bumble bees in the subgenus *Bombus*, such as the Franklin's bumble bee, may be more susceptible to tracheal mite infestation than other bumble bees, based on a study in southwestern Alberta, Canada, by Otterstatter and Whidden (2004, p. 351). One of the cited references (Goka *et al.*, 2001, pp. 2095–2099) documents the presence of this mite in bumble bee (*Bombus* spp.) populations in Japan, the Netherlands, and Belgium. The petitioners did not describe the specific effects of *L. buchneri* on bumble bees, but Ottersatter and Whidden (2004) found bumble bees containing tracheal mites to have significantly reduced lifespans in the laboratory. Otterstatter and Whidden (2004, p. 351) and Goka *et al.* (2001) cite a study that found heavy mite infestation can severely injure bumble bees (Goka *et al.* 2001, p. 2098). In that study, diarrhea was observed, and some bees became lethargic and no longer able to forage.

Commercially raised bumble bees from Europe were found to be infested with tracheal mites at higher rates than detected in wild bees (Goka *et al.* 2001, p. 2098). The petitioners stated that the method of mite dispersal is not well understood, but they could spread from commercial to wild colonies through drifting workers or contact on shared flowers. The petitioners cited a study of parasitic mites in native and commercial bumble bees in Japan, cautioning that the transportation of bumble bee colonies will cause overseas migration of parasitic mites (Goka *et al.* 2001, p. 2098). The extent to which this pathogen occurs within the current range of the Franklin's bumble bee was not described in the petition, and we have no information available in our files in this regard.

Deformed Wing Virus

The petitioners stated that deformed wing virus, a honey bee pathogen that results in crippled wings, may also be a threat to the Franklin's bumble bee. Deformed wing virus (DWV) was thought to be specific to honey bees until 2004, when dead *Bombus terrestris* and *B. pascuorum* queens with deformities resembling those in honey bees were observed. These DWV-infected specimens were observed in European commercial bumble bee breeding facilities at a frequency of approximately ten percent (Genersch *et al.* 2006, p. 63). In addition to the potential transmission of this and other diseases from honey bees in apiaries to bumble bees, commercial bumble bee rearing may also provide an opportunity for transmission. Commercial bumble bee producers sometimes introduce young honey bees to nesting bumble bee queens to stimulate egg-laying, thus providing a potential interface that exposes bumble bees to diseases

carried by the honey bees (Genersch *et al.* 2006, pp. 61–62).

DWV infection could pose a serious threat to bumble bee populations, as infected bumble bees with deformed wings are not able to forage. Those found with the observed deformities were also not viable (Genersch *et al.* 2006, p. 61). The petitioners are aware of unpublished personal observations of DWV symptoms in commercially raised *Bombus impatiens* colonies in North America, but stated that research has not been conducted to determine if other species of bumble bees are also susceptible to this disease (Petition, p. 17). The petitioners did not present any information linking DWV to the Franklin's bumble bee, and we have no information available in our files in this regard.

Summary of Factor C

Information specific to the occurrence of *Nosema bombi*, *Crithidia bombi*, *Locustacarus buchneri* or deformed wing virus within the range of the Franklin's bumble bee was not provided by the petitioners, and we have no information in our files regarding these pathogens. However, the studies cited by the petitioners appear to support their assertions related to the threats of the diseases and parasites to bumble bees in general, and it appears each of these diseases may be readily transferred from commercial to wild bumble bees. We, therefore, find that the petition presents substantial scientific or commercial information indicating that the Franklin's bumble bee may warrant listing due to disease, since (1) a microsporidian pathogen genetically identical to *N. bombi* in European bumble bees has been found in bumble bees in the United States (Solter *et al.* 2007, p. 15; Thorp 2008, p. 7); (2) studies on the effects of *N. bombi* generally demonstrate

bumble bees are negatively affected; (3) *Bombus impatiens* is a potential carrier of *C. bombi*, and would be a potential vector for transmission to Franklin's bumble bee; and (4) studies have demonstrated infected bumble bees with deformed wings are unable to forage.

There is no information presented in the petition indicating the Franklin's bumble bee is threatened by the tracheal mite *L. buchneri*, and we have no information in our files in this regard. Although this mite has been known to attack at least 25 bumble bee species across the holarctic region (the geographic region that includes the northern areas of the earth), it typically occurs in only a small fraction of the host species available at a site (Otterstatter *et al.* 2004, p. 351). The mite has also parasitized *B. vagans* and *B. bimaculatus* in the eastern United States (Otterstatter *et al.* 2004, p. 351); however, there are no indications it occurs within the known geographic range of the Franklin's bumble bee or within the western United States. The petitioners did not present any information indicating predation was an ongoing or foreseeable threat to the Franklin's bumble bee, and we have no information in our files in this regard. Accordingly, we find that the petition does not present substantial information indicating that predation is a threat to the species. However, we will assess this factor more thoroughly during our status review for the species.

D. The Inadequacy of Existing Regulatory Mechanisms.

Information Provided in the Petition and Available in Service Files

The petition stated there are currently no Federal regulations that limit the interstate

transportation of bumble bees, even outside their native range (Petition, p. 18). The petitioners also stated the Franklin's bumble bee has no substantive protection for habitat or take under Federal law or State laws in Oregon or California, and neither Oregon nor California allows listing of insects under their State endangered species statutes (Petition, p. 17).

The petitioners believe the spread of disease introduced by commercial bees may be the primary threat to the species, and existing regulatory mechanisms are inadequate to protect against this threat (Petition, pp. 21–22). They stated that few precautions are taken to prevent commercially reared colonies from interacting with wild populations. While bumble bee colonies imported to commercial rearing facilities are typically subject to inspection, typical inspections only include honey bee parasites and diseases, even though honey bee diseases and pests are not transmitted to bumble bees (Velthuis and van Doorn 2006, p. 430).

The U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS) is responsible for implementing the Honey Bee Act (HBA) (Petition, p. 18). According to the petition, sections 322.4 and 322.5 of the HBA allow the transport of two species of bumble bees from Canada (*Bombus impatiens* and the western bumble bee) to all U.S. States except Hawaii, and section 322.12 of the HBA provides for requests to import bumble bees from other countries. The petitioners stated that APHIS is responsible for evaluating applications and making importation determinations (Petition, p. 18). One reference cited by the petitioners stated that the HBA has helped protect the U.S. beekeeping industry from exotic parasites and pathogens, and undesirable bee species and strains of honey bees (Flanders *et al.* 2003, p. 101). The petitioners also stated the California Department of Food and Agriculture allows *B.*

impatiens to enter the State for greenhouse pollination (but not for open field pollination), although the law may not be regularly enforced or growers may not be aware of it (Petition, p. 18)). They stated that the Oregon State Department of Agriculture currently does not allow *B. impatiens* to enter the State (Petition, p. 18), but acknowledge a 2007 news story published by the Associated Press that documented a strawberry grower in Oregon who purchased colonies of *B. impatiens* for pollination (Associated Press, 2007; Petition, p. 18). Accordingly, the petitioners asserted that existing regulations and authorities do not effectively protect against the threat of exposure to disease that may be carried by commercial bumble bees (Petition, p. 18), since *B. impatiens* has apparently been successfully imported into the State, despite the existing regulations.

One study cited by the petitioner stated that nearly all laws and regulations addressing the importation, movement, and release of bees in the United States focus almost exclusively on bee diseases and parasites, with little or no consideration for possible adverse environmental impacts associated with the bees themselves (Flanders *et al.* 2003, p. 99). One reference cited by the petitioners stated “current federal laws pertaining to bees restrict APHIS’ oversight to preventing the introduction of parasites and pathogens that may harm bees. Except for the provisions in the HBA about undesirable species and strains of honey bees, it remains unclear whether APHIS has a basis for restricting the release of exotic bee species. Similarly, APHIS has little jurisdiction over the interstate movement and release of native bees, even when that movement is to an area previously unoccupied by the species” (Flander *et al.* 2003, p. 109). As an example, even though APHIS has regulations in place, problems associated with heavy infestations of *Nosema bombi* in the western bumble bee were discovered in rearing facilities in 1996 (Velthuis and van Doorn

2006, p. 432), and Flanders *et al.* (2003, p. 108) reported disease was found in commercially produced western bumble bees in 1997 (Flanders *et al.* 2003, p. 108). The petitioners reported that bumble bee producers in North America eventually stopped producing the western bumble bee due to the *N. bombi* infestation.

Summary of Factor D

Factor D concerns whether the existing regulatory mechanisms are adequate to address the current threats identified under Factors A, B, C, or E. We find that the petition presents substantial scientific or commercial information indicating (1) the existing regulatory mechanisms may be inadequate to protect against the spread of disease introduced by commercial bumble bees; (2) that few precautions appear to be taken to prevent commercially reared colonies from interacting with wild bumble bee populations; (3) inspections of bumble bee colonies imported to commercial rearing facilities may be ineffective; and (4) open field pollination restrictions may not be regularly enforced by the California Department of Food and Agriculture, which may exacerbate the potential for commercially raised bumble bees to transfer disease to the Franklin's bumble bee. We will assess this factor more thoroughly during our status review for the species.

E. Other Natural or Manmade Factors Affecting Its Continued Existence.

Information Provided in the Petition and Available in Service Files

The petitioners assert that several other natural or manmade factors may be threats to the Franklin's bumble bee, including the use of pesticides, population dynamics and structure, global climate change and competition from honey bees and other nonnative bees. Each of the petitioner's assertions is described in more detail below.

Pesticides

The petitioners asserted the application of pesticides, including insecticides, herbicides, and fungicides, may negatively affect remaining populations of the Franklin's bumble bee (Petition, p. 18–20). Numerous studies were cited related to pesticide use for various purposes in varied environments, including wild, agricultural, urban, and forested areas. Some of the references cited in the petition identify a concern that, while data related to the toxicity of pesticides to honey bees is considered to be generally applicable to other bees (Kevan and Plowright 1995, p. 609), pesticide risk assessments conducted for honey bees may be inadequate for evaluating the risks to bumble bees due to differences in foraging behavior and phenology (Thompson and Hunt 1999, p. 147; Thompson 2001, p. 305; Goulson *et al.* 2008, p. 11.4). Phenology refers to the relationships between regularly recurring biological phenomenon and climatic or environmental influences (i.e., bumble bees and honey bees may have different biological schedules with regard to their ecological needs or behaviors).

Bumble bee exposure can occur from direct spray or drift (Johansen and Mayer 1990, as cited by the petitioners (Petition, p. 19)), or from gathering or consuming contaminated nectar or pollen (Morandin *et al.* 2005, p. 619). Lethal and sublethal effects on bumble bee eggs, larvae,

and adults have been documented for many different pesticides under various scenarios (Kevan 1975, p. 301; Johansen 1977, p. 178; Plowright *et al.* 1978, p. 1145; Plowright *et al.* 1980, p. 765; Kearns and Inouye 1997, p. 302; Kearns *et al.* 1998, p. 91–92; Kevan 1999, p. 378; Thompson 2001, p. 305; Gels *et al.* 2002, p. 722; Morandin *et al.* 2005, p. 619; Mommaerts *et al.* 2006, p. 752; Goulson *et al.* 2008, pp. 11.4–11.5). Studies have also found evidence of adverse impacts to bumble bee habitat associated with pesticides due to changes in vegetation and the removal or reduction of flowers needed to provide consistent sources of pollen, nectar, and nesting material (Johansen 1977, p. 188; Plowright *et al.* 1978, p. 1145; Williams 1986, 54; Kearns and Inouye 1997, p. 302; Smallidge and Leopold 1997, p. 264; Kearns *et al.* 1998, p. 91–92; Shepherd *et al.* 2003, as cited by the petitioners (Petition, p. 19)). Declines in bumble bees in parts of Europe have been at least partially attributed to the use of pesticides (Williams 1986, p. 54; Kosior *et al.* 2007, p. 81).

The petition did not present any information indicating that impacts related to pesticide application are occurring or are foreseeable in currently or most recently occupied habitat for the Franklin’s bumble bee, and we have no information in our files in this regard.

Population Dynamics and Structure

The petitioners asserted that small populations are generally at greater risk of extirpation from normal population fluctuations due to predation, disease, and changing food supply, as well as from natural disasters such as droughts (Petition, p. 20), and small and isolated populations can experience a loss of genetic variability (Cox and Elmqvist 2000, p. 1237). The petitioners

believe the Franklin's bumble bee is rare and has very small populations, and likely has low genetic diversity. They believe this population structure likely makes the species more vulnerable to habitat change or loss, parasites, diseases, stochastic events, and other natural disasters such as droughts (Petition, p. 20).

Between 1998 and 2009 (when surveys specifically for the Franklin's bumble bee were conducted and for which we have data), the number of Franklin's bumble bee observations declined precipitously from 94 individuals in 1998 to 20 in 1999. Nine individuals were observed in 2000, and one individual in 2001. Although 20 were observed in 2002, only 3 were observed in 2003 (at a single locality), and a single worker was observed in 2006. There were no observations documented in 2007, 2008, or 2009 (Petition, p. 7).

The petitioners cited several papers that discuss the particular susceptibility of bumble bees to threats related to small population size and low genetic diversity, in part because bumble bees exhibit a haplodiploidy sex determination system, as do all other hymenopterans (bees, wasps, ants). In a haplodiploidy sex determination system, unfertilized, or haploid, eggs become males that carry a single set of chromosomes, and fertilized, or diploid, eggs become females that carry two sets of chromosomes. This may result in lower levels of genetic diversity than the more common diploid-diploid sex determination system, in which both males and females carry two sets of chromosomes (Petition, p. 20).

Haplodiploid organisms may be more prone to population extinction than diploid-diploid organisms, due to their susceptibility to low population levels and loss of genetic diversity

(Packer and Owen 2001, p. 26; Zayed and Packer 2005, p. 10742; Darvill *et al.* 2006, p. 601; Ellis *et al.* 2006, 4375; Goulson *et al.* 2008, p. 11.7–11.9). Inbreeding depression in bumble bees can lead to the production of sterile diploid males (Goulson *et al.* 2008, p. 11.7), and has been shown to negatively affect bumble bee colony size (Herrmann *et al.* 2007, p. 1167), which are key factors in a colony's reproductive success. Until recently, diploid male production had not been detected in naturally occurring populations of bumble bees, and recent modeling work has shown that diploid male production, where present, may initiate a rapid extinction vortex (a situation where genetic traits and environmental conditions combine to make a species gradually become extinct) (Goulson *et al.* 2008, p. 11.8).

Global Climate Change

The petitioners asserted that global climate change may threaten the Franklin's bumble bee (Petition, pp. 20–21). For example, changing climate may cause shifts in the range of host plant species, which can be especially detrimental to dependent pollinators when combined with habitat loss (Petition p. 20). The petitioners state that the Franklin's bumble bee is restricted to habitat patches where its host species are present, and its limited historical distribution suggests that it probably has a limited ability to disperse. The petition did not clarify which plant species represent host species for the Franklin's bumble bee, and we have no information in our files in this regard. The petition characterized the Franklin's bumble bee as a generalist forager, meaning they gather pollen and nectar from a wide variety of flowering plants (Petition, p. 11), which may somewhat mitigate any potential impacts of climate change relative to food resources. Darvell *et al.* (2010) suggest the decline of another bumble bee species, *Bombus*

muscorum, from the United Kingdom mainland has been severe because of its limited ability to disperse, although in this study the stressor was agricultural intensification (Petition, pp. 20–21). The petitioners believe the ecology of the Franklin’s bumble bee, combined with the patchy distribution of its remaining habitat, might similarly hinder dispersal made necessary by climate change and cause the extirpation of the remaining populations (Petition, p. 21), although no specific supporting information was presented and we have no information in our files in this regard.

The petitioners asserted that an increase in atmospheric carbon dioxide from global climate change may alter plant nectar production, which could negatively impact bumble bees (Petition, p. 21). They also believe the reduction in ozone, as a result of climate change, could delay flowering in plants and reduce the amount of flowers plants produce, which could have negative effects on all bumble bees (Petition, p. 21). However, no specific supporting information was presented correlating these potential impacts to the Franklin’s bumble bee or its host plants, and we have no information in our files in this regard.

Competition from Honey Bees

The petitioners believe European honey bees (*Apis mellifera*), which are not native to North America, could be a threat to the Franklin’s bumble bee (Petition, p. 21). The honey bee was first introduced to eastern North America in the early 1620s, and introduced to California in the early 1850s. The petition acknowledges that honey bees have been present without noticeable declines in bumble bee populations over large portions of their ranges (Petition, p.

21), but cited several studies on the effects of honey bees on native bumble bees, which found: (1) resource overlap and competition for resources (Thomson 2004, p. 458; Thomson 2006, p. 407); (2) decreased foraging activity and lowered reproductive success of *Bombus* (bumble bee) colonies nearest honey bee hives (Evans 2001, p. 32–33; Thomson 2004, p. 458; Thomson 2006, p. 407); and (3) reduced native bumble bee worker sizes where honey bees were present, which may be detrimental to bumble bee colony success (Goulson and Sparrow 2009, p. 177).

The petitioners stated it is likely that the effects discussed in these studies are local in space and time, and most pronounced where floral resources are limited and large numbers of commercial honey bee colonies are introduced (Petition, p. 21). They also stated that due consideration should be given to when, where, and how many honey bee colonies should be imported to areas with sensitive bumble bee populations (Petition. p. 21), to minimize competition for floral resources. The petition did not present information related to the placement of commercial honey bee colonies in or near Franklin’s bumble bee habitat, and we have no information in this regard.

Competition from Other Nonnative Bumble Bees

The petitioners asserted there is potential for nonnative commercially raised bumble bees to naturalize and outcompete native bumble bees for limited resources such as nesting sites and forage areas. Five commercially reared *Bombus impatiens* workers and one queen were captured in the wild near greenhouses where commercial bumble bees are used, suggesting this species has naturalized outside of its native range. In this study, *B. impatiens*, which has a native range

in eastern North America, was detected in western North America (Ratti and Colla 2010, pp. 29–31). A study of bumble bees in Japan found that nonnative *B. terrestris* colonies founded by bees that had escaped from commercially produced colonies had over four times the mean reproductive output of native bumble bees (Matsumura *et al.* 2004, p. 93). A study in England found that commercially raised *B. terrestris* colonies had higher nectar-foraging rates and greater reproductive output than a native subspecies of *B. terrestris* (Ings *et al.* 2006, p. 940). The petitioners stated commercial bumble bee producers have likely selected for colonies that are highly productive to ensure strong colony populations for use in pollination. They expressed concern that while this is a desirable quality for commercial rearing, this practice could introduce nonnative bumble bees that could outcompete native bumble bee populations (Petition, pp. 21–22). As stated earlier, the petitioners cited a 2007 Associated Press story on the importation of *B. impatiens* colonies to pollinate agricultural crops and strawberries in Grants Pass, Oregon, which is within the range of the Franklin’s bumble bee (Associated Press 2007; Petition, p. 18).

Summary of Factor E

The assertions made by the petitioners appear to be supported by the cited references and information available in our files for bumble bees and other pollinators in general. Pesticides, global climate change, small population size, and low genetic variability are of concern for other rare invertebrates for reasons similar to those outlined by the petitioners for the Franklin’s bumble bee. The potential adverse impacts of honey bee competition on declining *Bombus* species in western and central Europe have been recognized by surveyed experts from several European countries (Kosior *et al.* 2007, p. 85). Possible negative effects of introduced bees on

native organisms may include competition with native pollinators for floral resources, competition for nest sites, and introduction of pathogens (Goulsen 2003, pp. 1, 18).

It remains uncertain whether or to what extent any of the threats suggested by the petitioners are occurring within habitat currently or most recently occupied by the Franklin's bumble bee. We acknowledge that some of the information presented by the petitioners addresses other bumble bee species, and not the Franklin's bumble bee. However, survey results for this species clearly demonstrate a precipitous decline in the number of individuals observed since 1998 (94 in 1998; 1 in 2006; none in 2007, 2008, or 2009). Therefore, we believe it is reasonable to conclude that the potential threats associated with pesticides, global climate change, competition from honey bees, competition with other nonnative bees, or some other presently unknown natural or manmade factor may be affecting the continued existence of Franklin's bumble bee. In addition, any threats acting on the Franklin's bumble bee are likely particularly perilous in light of the species' limited geographic distribution and extremely low population numbers, based on recent surveys. Therefore, we find that the petition presents substantial scientific or commercial information indicating the Franklin's bumble bee may warrant listing due to other natural or manmade factors affecting its continued existence. We will assess each of these factors more thoroughly during our status review for the species.

Finding

On the basis of our determination under section 4(b)(3)(A) of the Act, we determine that the petition presents substantial scientific or commercial information indicating that listing the

Franklin's bumble bee throughout its entire range may be warranted. This finding is based on the information presented in the petition documenting the precipitous decline of the Franklin's bumble bee since 1998, to the point that only a single individual of the species has been observed since 2006, despite continued survey efforts. The petition additionally presented information regarding a variety of threats that may potentially be acting on the species; this suite of threats falls under Factors A, C, D, and E, as discussed above. Although the information presented does not allow us to definitively identify which of these threats, acting either singly or in concert, may be the causative factor of the species' decline, we believe the petition has presented substantial information demonstrating that some natural or manmade factor is affecting the continued existence of the Franklin's bumble bee to the point that the species may be considered threatened or endangered. Because we have found that the petition presents substantial information indicating that listing the Franklin's bumble bee may be warranted, we are initiating a status review to determine whether listing the species under the Act is warranted.

The "substantial information" standard for a 90-day finding differs from the Act's "best scientific and commercial data" standard that applies to a status review to determine whether a petitioned action is warranted. A 90-day finding does not constitute a status review under the Act. In a 12-month finding, we will determine whether a petitioned action is warranted after we have completed a thorough status review of the species, which is conducted following a substantial 90-day finding. Because the Act's standards for 90-day and 12-month findings are different, as described above, a substantial 90-day finding does not mean that the 12-month finding will result in a warranted finding.

References Cited

A complete list of references cited is available on the Internet at <http://www.regulations.gov> and upon request from the Oregon Fish and Wildlife Office (see **FOR FURTHER INFORMATION CONTACT**).

Authors

The primary authors of this notice are the staff members of the Oregon Fish and Wildlife Office.

Authority

The authority for this action is the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Date: _____ August 31, 2011 _____

_____ Daniel M. Ashe _____

Director, U.S. Fish and Wildlife Service

~~**Endangered and Threatened Wildlife and Plants; 90-Day Finding on a Petition To List the Franklin's Bumble Bee as Endangered**~~

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