Notices

Federal Register

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[FWS-R6-ES-2009-0021 MO 92210-0-0010]

Endangered and Threatened Wildlife and Plants; 12-month Finding on a Petition to List the American Pika as Threatened or Endangered

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Notice of 12-month petition finding.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), announce a 12-month finding on a petition to list the American pika (*Ochotona princeps*) as threatened or endangered under the Endangered Species Act of 1973, as amended. After review of all available scientific and commercial information, we find that listing the American pika, at the species level or any of the five recognized subspecies (*O. p. princeps*, *O. p. saxatilis, O. p. fenisex*, *O. p. schisticeps*, and *O. p. uinta*), is not warranted at this time. However, we ask the public to submit to us any new information that becomes available concerning the threats to the American pika, the five subspecies, or its habitat at any time.

DATES: The finding announced in this document was made on [*insert date of* **Federal Register** *publication*].

ADDRESSES: This finding is available on the Internet at *http://www.regulations.gov* at Docket Number FWS-R6-ES-2009-0021. Supporting documentation we used in preparing this finding is available for public inspection, by appointment, during normal business hours at the U.S. Fish and Wildlife Service, Utah Ecological Services Field Office, 2369 W. Orton Circle, Suite 50, West Valley City, UT 84119. Please submit any new information, materials, comments, or questions concerning this finding to the above address.

FOR FURTHER INFORMATION CONTACT: Larry Crist, Field Supervisor, Utah Ecological Services Field Office (see **ADDRESSES**); by telephone at 801-975-3330; or by facsimile at 801-975-3331. Persons who use a telecommunications device for the deaf (TDD) may call the Federal Information Relay Service (FIRS) at 800-877-8339.

SUPPLEMENTARY INFORMATION:

Background

Section 4(b)(3)(B) of the Endangered Species Act of 1973, as amended (Act) (16 U.S.C. 1531 *et seq.*), requires that, for any petition to revise the Federal Lists of Endangered and Threatened Wildlife and Plants that contains substantial scientific or commercial information indicating that listing the species may be warranted, we make a finding within 12 months of the date of receipt of the petition. In this 12–month finding, we may determine that the petitioned action is either: (1) not warranted, (2) warranted, or (3) warranted, but the immediate proposal of a regulation implementing the petitioned action is precluded by other pending proposals to determine whether species are threatened or endangered, and expeditious progress is being made to add or remove qualified species from the Federal Lists of Endangered and Threatened Wildlife and Plants. Section 4(b)(3)(C) of the Act requires that we treat a petition for which the requested action is found to be warranted but precluded as though resubmitted on the date of such finding, that is, requiring a subsequent finding to be made within 12 months. We must publish these 12–month findings in the **Federal Register**.

Previous Federal Actions

On October 2, 2007, we received a petition dated October 1, 2007, from the Center for Biological Diversity (Center) requesting that the American pika (*Ochotona princeps*) be listed as threatened or endangered under the Act. Included in the petition was a request that we conduct a status review of each of the 36 recognized subspecies of American pikas to determine if separately listing any subspecies as threatened or endangered may be warranted. Specifically, the Center requested that seven American pika subspecies be listed as endangered: the Ruby Mountains pika (*O. p. nevadensis*), *O. p. tutelata* (no common name), the White Mountains pika (*O. p. sheltoni*), the gray-headed pika (*O. p. schisticeps*), the Taylor pika (*O. p. taylori*), the lava-bed pika (*O. p. goldmani*), and the Bighorn Mountain pika (*O. p. obscura*). The Center requested that the remaining subspecies be listed as threatened. We acknowledged receipt of the petition in a letter to the Center dated October 18, 2007. In that letter, we also stated that we could not address its petition at that time, because existing court orders and settlement agreements for other listing actions required nearly all of our listing funding. We also concluded that emergency listing of the American pika was not warranted at that time.

We received a 60–day notice of intent to sue from the Center dated January 3, 2008. We received a complaint from the Center on August 19, 2008. We submitted a settlement agreement to the Court on February 12, 2009, agreeing to submit a 90–day finding to the **Federal Register** by May 1, 2009, and, if appropriate, to submit a 12–month finding to the **Federal Register** by February 1, 2010.

We received a letter from the Center, dated November 3, 2008, that discussed and transmitted supplemental information found in recent scientific studies that had not been included in the original petition. We considered this additional information when making this finding.

In our 90–day finding published on May 7, 2009 (74 FR 21301), we reviewed the petition, petition supplement, supporting information provided by the petitioner, and information in our files, and evaluated that information to determine whether the sources cited support the claims made in the petition. We found that the petitioner presented substantial information indicating that listing the American pika as threatened or endangered under the Act may be warranted, because of the present or threatened destruction, modification, or curtailment of its habitat or range as a result of effects related to global climate change. We also solicited additional data and information from the public, other governmental agencies, the scientific community, industry, and other interested parties concerning the status of the American pika throughout its range. The information collection period for submission of additional information ended on July 6, 2009. This notice constitutes our 12–month finding on the October 1, 2007, petition to list the American pika as threatened or endangered.

Species Information

Biology

Like other pika species, the American pika (hereafter pika, unless stated otherwise) has an egg-shaped body with short legs, moderately large ears, and no visible tail (Smith and Weston 1990, p. 2). Fur color varies among subspecies and across seasons, typically with shorter, brownish fur in summer and longer, grayish fur in winter (Smith and Weston 1990, p. 3). The species is intermediately sized, with adult body lengths ranging from 162 to 216 millimeters (6.3 to 8.5 inches) and mean body mass ranging from 121 to 176 grams (4.3 to 6.2 ounces) (Hall 1981, p. 287; Smith and Weston 1990, p. 2).

American pikas are generalist herbivores that select different classes of vegetation (Huntley *et al.* 1986, p. 143) and use different parts of the same plants when grazing versus haying (Dearing 1997a, p. 1160). Feeding (the immediate consumption of vegetation) occurs year-round; haying (the storage of vegetation for later consumption) and the creation of haypiles occurs only in summer months after the breeding season (Smith and Weston 1990, p. 4). The primary purpose of haypiles is overwintering sustenance, and individuals harvest more vegetation than necessary for these haypiles (Dearing 1997a, p. 1156). Pikas feed an average distance of 2 meters (m) (6.5 feet (ft)) from talus and will travel an average distance of 7 m (23 ft) when haying (Huntly *et al.* 1986, pp. 141-142). Huntly *et al.* (1986, p. 142) found that no feeding occurred beyond 10 m (33 ft) from talus, but haying was observed up to 30 m (98 ft).

Vegetative communities immediately adjacent to pika locations are typically dominated by grasses (Huntly 1987, p. 275). When pikas are excluded from grazing near talus slopes, the biomass of forbs and sedges (Roach *et al.* 2001, p. 319) and cushion plants (Huntly 1987, p. 275) increases rapidly. Therefore, foraging pikas influence the presence of specific plant classes or functional groups, vegetative cover, and species richness (Huntly 1987, p. 274; Roach *et al.* 2001, p. 315), and modify habitat in their quest for food and survival (Aho *et al.* 1998, p. 405). Forbs and woody plants are typically found in pika haypiles (Huntly *et al.* 1986, p. 143), which provide the major source of sustenance for the winter (Dearing 1997a, p. 1156). High phenolic (chemical compounds characterized by high acidity) concentrations of forbs and shrubs prevent pikas from grazing immediately on these plant types; however, pikas cache these plants and delay consumption until the toxins decay to tolerable levels (Dearing 1997b, p. 774). Additionally, plants with high levels of the phenolics deter bacterial growth and exhibit superior preservation qualities (Dearing 1997b, p. 774).

Thermoregulation is an important aspect of American pika physiology, because individuals have a high normal body temperature of approximately 40 °C (104 °F) (MacArthur and Wang 1973, p. 11; Smith and Weston 1990, p. 3), and a relatively low lethal maximum body temperature threshold of approximately 43 °C (109.4 °F) (Smith and Weston 1990, p. 3). Most thermoregulation of individuals is behavioral, not physiological (Smith 1974b, p. 1372; Smith and Weston 1990, p. 3). In warmer environments, such as during midday sun and at lower elevation limits, pikas typically become inactive and withdraw into cooler talus openings (Smith 1974b, p. 1372; Smith and Weston 1990, p. 3). Below-surface temperatures within talus openings can be as much as 24 °C (43.2 °F) cooler than surface temperatures during the hottest time of day (Finn 2009a, pers. comm.). Pikas avoid hyperthermia (heat stroke) during summer months by engaging in short bursts of surface activity followed by retreat to a cooler microclimate beneath the surface (MacArthur and Wang 1974, p. 357). Pikas can be nocturnal where daytime temperatures are stressful and restrict diurnal activity (Smith 1974b, p. 1371).

Habitat occupied by American pikas is often patchily distributed, leading to a local population structure that is composed of island-like sites commonly termed a metapopulation (Smith and Weston 1990, p. 4; Moilanen *et al.* 1998, pp. 531-532). A metapopulation is composed of many largely discrete local populations, and metapopulation dynamics are characterized by extinction and recolonization occurring within independent local populations (Hanski 1999, cited in Meredith 2002, p. 47). Local populations that make up each metapopulation frequently become extirpated and can be subsequently reestablished by immigration (Smith 1974a, p. 1112; Moilanen *et al.* 1998, p. 532). American pikas within metapopulations often exhibit a low emigration rate, especially in adults. Juveniles usually have short migration distances; however, exceptions occur (Peacock 1997, pp. 346-348).

Dynamics of American pika populations are sufficiently asynchronous (not occurring at the same time), so that simultaneous extinction of entire metapopulations is unlikely (Smith 1980, p. 11; Moilanen *et al.* 1998, p. 532). When a single population becomes extirpated, distance to a source of colonizing pikas is an influential factor determining the probability of recolonization (Smith 1980, p. 11). American pika populations on small and medium-sized islands are more likely to be extirpated, with the probability of extirpation being higher on more distant islands (Smith 1980, p. 12).

Historically, researchers hypothesized that American pika juveniles are philopatric (remain in or return to their birthplace), dispersing only if no territory is available within their birth place (various studies cited in Smith and Weston 1990, p. 6). However, Peacock (1997, pp. 346-348) demonstrated that juvenile emigration to other population sites occurred over both long (2 kilometers (km); 1.24 miles (mi)) and short distances, and acted to support population stability by replacing deceased adults. Territory availability is a key factor for dispersal patterns, and local pika populations lack clusters of highly related individuals (Peacock 1997, pp. 347-348).

Dispersal by American pikas is governed by physical limitations. Smith (1974a, p. 1116) suggested that it was difficult for juveniles to disperse over distances greater than 300 m (984 ft) in low-elevation (2,500 m (8,200 ft)) populations. Lower elevations are warmer in summer and represent the lower edge of the elevational range of the species (Smith 1974a, p. 1112). While dispersal distances of 3 km (1.9 mi) have been documented at other locations and elevational ranges (Hafner and Sullivan 1995, p. 312), it is believed that the maximum individual dispersal distance is probably between 10 and 20 km (6.2 and 12.4 mi) (Hafner and Sullivan 1995, p. 312). This conclusion is based on genetic (Hafner and Sullivan 1995, pp. 302-321) and biogeographical (Hafner 1994, pp. 375-382) analysis. Genetic analysis revealed that pika metapopulations are separated by between 10 and 100 km (6.2 to 62 mi) (Hafner and Sullivan 1995, p. 312). Biogeographical analysis demonstrated that, during the warmer period of the mid-Holocene (about 6,500 years ago), the species retreated to cooler sites, and the species subsequently expanded its range somewhat as climatic conditions cooled (Hafner 1994, p. 381). However, the species has not recolonized vacant habitat patches greater than 20 km (12.4 mi) from refugia sites and has recolonized less than 7.8 percent of available patches within 20 km (12.4 mi) of those same refugia sites (Hafner 1994, p. 381). The lack of recolonization is due to habitat becoming unsuitable from vegetation filling in talus areas (removing pika habitat) or from habitat becoming too dry due to environmental changes resulting from historical changes in climate (Hafner 1994, p. 381).

Individual pikas are territorial, maintaining a defended territory of 410 to 709 square meters (m^2) (4,413 to 7,631 square feet (ft^2)), but fully using overlapping home ranges of 861 to 2,182 m^2 (9,268 to 23,486 ft^2) (various studies cited in Smith and Weston 1990, p. 5). Individuals mark their territories with scent and defend the territories through aggressive fights and chases (Smith and Weston 1990, p. 5).

Adults with adjacent territories form monogamous mating pairs. Males are sexually monogamous, but make little investment in rearing offspring (Smith and Weston 1990, pp. 5-6). Females give birth to average litter sizes of 2.4 to 3.7 twice a year (Smith and Weston 1990, p. 4). However, fewer than 10 percent of weaned juveniles originate from the second litter, because mothers only wean the second litter if the first litter is lost (various studies cited in Smith and Weston 1990, p. 4).

Adult pikas can be territorially aggressive to juveniles, and parents can become aggressive to their own offspring within 3 to 4 weeks after birth (Smith and Weston 1990, p. 4). To survive the winter, juveniles need to establish their own territories and create haypiles before the winter snowpack (Smith and Weston 1990, p. 6; Peacock 1997, p. 348). However, establishing a territory and building a haypile does not ensure survival.

Yearly average mortality in pika populations is between 37 and 53 percent. Few pikas live to be 4 years of age (Peacock 1997, p. 346), however, some individuals survive up to 7 years (Smith 2009, p. 2).

Taxonomy

Historically, many taxonomic forms have been identified within Nearctic pikas, including as many as 13 species and 37 subspecies (Hafner and Smith 2009, p. 1). Initially, 13 species and 25 subspecies of Nearctic (a biogeographic region that includes the Arctic and temperate areas of North America and Greenland) pikas were described (Richardson 1828, cited in Hafner and Smith 2009). Howell (1924, pp. 10-11) performed a full taxonomic revision of the American pika and recognized 3 species: *Ochotona collaris, Ochotona princeps* (16 subspecies), and *Ochotona schisticeps* (9 subspecies). Later, Hall (1981, pp. 286-292) described 36 subspecies of American pika spread throughout western Canada and the western United States. The petition (Wolf *et al.* 2007) from the Center of Biological Diversity that requested that all American pika subspecies be listed as threatened or endangered was based on the Hall (1981, pp. 286-292) taxonomy.

These references, in addition to others (Hafner and Smith 2009, p. 5) were used as the set of authoritative resources on pika taxonomy until genetic work identified four major genetic units of the American pika in the northern Rocky Mountains, Sierra Nevada, southern Rocky Mountains, and Cascade Range (Hafner and Sullivan 1995, p. 308). Further molecular phylogenetic and morphometric studies indicate the existence of five cohesive genetic units that have been referred to as ''distinct evolutionarily significant units'' (Galbreath *et al.* 2009a, p. 17; Galbreath *et al.* 2009b, pp. 7, 52). These studies support a revision of the subspecific taxonomy of the American pika to include five recognized subspecies: *Ochotona princeps princeps* (Northern Rockies), *O. p. saxatilis* (Southern Rockies), *O. p. fenisex* (Coast Mountains and Cascade Range), *O. p. schisticeps* (Sierra Nevada and Great Basin), and *O. p. uinta* (Uinta Mountains and Wasatch Range of Central Utah) (Hafner and Smith 2009, pp. 16-25). The previously described 36 subspecies (Hall 1981, pp. 286-292) are now referred to as subspecies synonyms, with each subspecies synonym corresponding to a subspecies described by Hafner and Smith (2009, pp. 16-25). We are making our finding based on the most recent information that has identified five subspecies of American pika. The petition (Wolf *et al.* 2007) from the Center of Biological Diversity no longer contains the best available information on taxonomy.

Historic Distribution and Habitat

The restriction of American pikas to their current distribution (discussed below) is relatively recent. The shift in habitat range was shaped by long-term climate change and attendant impacts on vegetation.

The geographic distribution of American pika may have encompassed not only the western United States and Canada during the last glacial maximum (30,000 years ago or later), but also parts of the eastern United States (Grayson 2005, p. 2104). Archaeological and paleontological records for pika demonstrate that approximately 12,000 years ago, pikas were living at relatively low elevations (less than 2,000 m (6,560 ft)) in areas devoid of talus (Mead 1987, p. 169; Grayson 2005, p. 2104). By the Wisconsinan glacial period (approximately 40,000 to 10,000 years ago), American pikas were restricted to the intermontane region of the western United States and Canada.

Low-elevation populations of American pikas became extinct in the northern half of the Great Basin between 7,000 and 5,000 years ago (Grayson 1987, p. 370). Fossil records indicate that the species inhabited sites farther south and at lower elevations than the current distribution during the late Wisconsinan and early Holocene periods (approximately 40,000 to 7,500 years ago), but warming and drying climatic trends in the middle Holocene period (approximately 7,500 to 4,500 years ago) forced populations into the current distribution of montane refugia (Grayson 2005, p. 2103; Smith and Weston 1990, p. 2). During the late Wisconsinan and early Holocene, now-extirpated American pika populations in the Great Basin occurred at an average elevation of 1,750 m (5,740 ft), which is 783 m (2,569 ft) lower than 18 extant (in existence) Great Basin pika populations (Grayson 2005, p. 2106).

Current Distribution and Habitat

Ochotona princeps princeps is patchily distributed in cool, rocky habitat, primarily in high-elevation alpine habitats (see below for exceptions), from the Northern Rocky Mountains of central British Columbia and Alberta through Idaho and Montana, several mountain ranges of Wyoming, the Ruby Mountains of Nevada, the Wasatch Range of Idaho and Utah, and the Park Range and Front Range of Colorado north of the Colorado River (Hafner and Smith 2009, p.19). *O. p. saxatilis* occupies habitat in the southern Rocky Mountains south of the Colorado River (Front Range, San Juan Mountains, Sangre de Cristo Range), and isolated highlands including the La Sal Mountains of southeastern Utah, Grand Mesa of Colorado, and Jemez Mountains of New Mexico (Hafner and Smith 2009, pp. 21-22). *O. p. schisticeps* occupies habitats in volcanic peaks of northern California, throughout the Sierra Nevada of California and Nevada, and isolated highlands throughout the Great Basin of Nevada, eastern Oregon (north to the Blue Mountains), and southwestern Utah (Hafner and Smith 2009, pp. 23-

24). *O. p. fenisex* occupies habitats from the Coast Mountains and Cascade Range from central British Columbia south to southern Oregon (Hafner and Smith 2009, p. 20). *O. p. uinta* is patchily distributed in habitats in the Uinta Mountains and Wasatch Range of central Utah (Hafner and Smith 2009, p. 24).

Temperature restrictions influence the species' distribution because hyperthermia or death can occur after brief exposures (as little as 6 hours) to ambient temperatures greater than 25.5 °C (77.9 °F), if individuals cannot seek refuge from heat stress (Smith 1974b, p. 1372). Therefore, American pika habitat progressively increases in elevation in the southern extent of the distribution (Smith and Weston 1990, p. 2). In the northern part of its distribution (southwestern Canada), populations occur from sea level to 3,000 m (9,842 ft), but in the southern extent (New Mexico, Nevada, and southern California) populations rarely exist below 2,500 m (8,202 ft) (Smith and Weston 1990, p. 2). Some exceptions exist in the southern portion of the species' range. For example, pikas in 10 percent of 420 study sites in the Sierra Nevada Mountains, Great Basin, and Oregon Cascade Mountains occur below 2,500 m and as low as 1,645 m (5,396 ft) at McKenzie Pass in the Cascade Mountains of Oregon (Millar and Westfall 2009, p. 16). Beever *et al*. (2008, p. 10) recently discovered a new population of American pika in the Hays Canyon Range of northwestern Nevada at elevations ranging from 1,914 to 2,136 m (6,280 to 7,008 ft).

American pikas primarily inhabit talus fields fringed by suitable vegetation in alpine or subalpine areas (Smith and Weston 1990, pp. 2-4). A generalist herbivore that does not hibernate, the species relies on haypiles of summer vegetation stored within talus openings to persist throughout the winter months (Smith and Weston 1990, p. 3). Alpine meadows that provide forage are important to pika survival in montane environments. The species also occupies other habitats that include volcanic land features (Beever 2002, p. 26; Millar and Westfall 2009, p. 10) and anthropogenic settings such as mine tailings, piles of lumber, stone walls, rockwork dams, and historic foundations (Smith 1974a, p. 1112; Smith 1974b, p. 1369; Lutton 1975, p. 231; Crisafulli 2009, pers. comm.; Millar and Westfall 2009, p. 10).

Pikas use talus, which can include rock-ice features, and other habitat types for den sites, food storage, and nesting (Smith and Weston 1990, p. 4; Beever *et al*. 2003, p. 39). Rock-ice features are defined as glacial- or periglacial- (i.e., around or near glaciers) derived landforms in high-elevation, semi-arid temperature mountain ranges and arctic landscapes (Millar and Westfall 2008, pp. 90-91). Talus, rock-ice feature till, and volcanic features (described below) also provide microclimate conditions suitable for pika survival by creating cooler, moist refugia in summer months (Beever 2002, p. 27; Millar and Westfall 2009, p. 19-21) and insulating individuals in the colder winter months (Smith 1978, p. 137; Millar and Westfall 2009, p. 21).

Among 420 sites surveyed by Millar and Westfall (2009, p. 10), 83 percent of the pika sites occurred in rock-ice feature till, most notably rock-glacier and boulder-stream landforms, which contain topographic-climatic conditions that are favored by pikas (Millar and Westfall 2009, p. 20).

Pikas also inhabit more atypical habitats that include lava tubes, caves, valley trenches, fault scarps, fault cracks, and cliff faces, which provide suitable habitat and thermal refuge (Beever 2002, pp. 26, 28; Millar and Westfall 2009, p. 10). For example, in Lava Beds National Monument in northern California and Craters of the Moon National Monument in southern Idaho, pikas typically inhabit large, contiguous areas of volcanic habitat (Beever 2002, p. 28). Within this habitat type, forage vegetation is accessible within distances comparable to dimensions of home ranges (Beever 2002, p. 28). Pikas select habitat that includes topographical features characterized by rocks large enough to provide necessary interstitial spaces for underground movement and tunneling. Like talus and rock-ice features, these habitats provide pikas with cool refugia during conditions that may result in heat stress, which in addition to behavioral thermoregulation mechanisms, allow pika to persist in these low-elevation and potentially thermally challenging environments (Beever 2002, pp. 27-28).

Population Status

We relied on information from the International Union for Conservation and Nature of Natural Resources (IUCN), NatureServe, published literature, and public submissions during the information collection period on our 90–day finding to evaluate the status of American pika populations.

The IUCN Red List of Threatened Species provides taxonomic, conservation status, and distribution information on plants and animals (IUCN 2009, p. 2). The IUCN Red List system is designed to determine the relative risk of extinction for species, and to catalogue and highlight plant and animal species that are facing a higher risk of global extinction. The IUCN identified the status of the American pika species as Least Concern in 2008 under the Red List review process (Beever and Smith 2008, p. 3). According to IUCN (version 3.1): ''a taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.'' The IUCN uses five quantitative criteria to determine whether a taxon is threatened or not, and if threatened, which category of threat it belongs in (i.e., critically endangered, endangered, or vulnerable). ''To list a particular taxon in any of the categories of threat, only one of the criteria needs to be met. The five criteria are: (1) Declining population (past, present and/or projected); (2) Geographic range size, and fragmentation, decline or fluctuations; (3) Small population size and fragmentation, decline, or fluctuations; (4) Very small population or very restricted distribution; and (5) Quantitative analysis of extinction risk (e.g., Population Viability Analysis) (IUCN Standards and Petitions Working Group 2008, p. 11).''

However, the IUCN (using the Hall (1981) taxonomic classification, as Vulnerable or Near Threatened) considers eight American pika subspecies synonyms. These subspecies synonyms are *Ochotona princeps goldmani, O. p. lasalensis*, *O. p nevadensis, O. p. nigrescens*, *O. p. obscura, O. p. sheltoni*, *O. p. tutelata*, and *O. p. schisticeps* (Beever and Smith 2008, p. 3). A vulnerable species or subspecies is facing a high risk of extinction in the wild. A near threatened species or subspecies is close to qualifying as or is likely to qualify as vulnerable in the near future (IUCN, section 3.1). Status for the eight subspecies synonyms applies under the Hall (1981) taxonomic classification of the American pika but may not apply to any of the subspecies described by Hafner and Smith (2009, pp. 16-25). For example, a status of ''vulnerable'' for *O. p. goldmani* does not imply that *O. p. princeps* (described by Hafner and Smith 2009, pp. 17-20) is vulnerable as well because the range of *O. p. goldmani* does not constitute the entire range of *O. p. princeps*.

NatureServe is a nonprofit organization that, in part, collects and manages species information and data in an effort to increase our understanding of species, ecosystems, and conservation issues (NatureServe 2009a, p. 1). NatureServe also assesses available scientific information to determine species status based on factors, including population number and size, trends, and threats. NatureServe provides comprehensive reports for species, including American pika. The report (Nature Service 2009b, pp. 1-7) for the American pika includes taxonomic information, conservation status information, lists of natural heritage records, species distribution by watershed, ecology and life history information, population delineation, population viability, and references. The report does not contain information on threats or a justification for designation of conservation status within states and provinces.

In a review conducted in 1996, NatureServe assigned the American pika a global status of secure (i.e., common; widespread and abundant) in the United States and the Canadian provinces of Alberta and British and Columbia (NatureServe 2009b, pp. 1-2; Quinlan 2009, pers. comm.). Within the United States, NatureServe considers the species secure or apparently secure (i.e., uncommon but not rare; some cause for long-term concern due to declines or other factors) in Colorado, Idaho, Montana, Oregon, Washington, and Wyoming. NatureServe assigned the American pika a status of vulnerable in California and Utah (i.e., vulnerable in the jurisdiction due to a restricted range, relatively few populations, recent and widespread declines, or other factors making it vulnerable to extirpation), and a status of imperiled in Nevada and New Mexico (i.e., imperiled in the jurisdiction, because of rarity due to very restricted range, very few populations, steep declines, or other factors making it very vulnerable to extirpation from the jurisdiction).

Northern Rocky Mountain Subspecies (*Ochotona princeps princeps*)

The Northern Rocky Mountains subspecies (*Ochotona princeps princeps*) occurs primarily in Canada, Montana, Idaho, and Wyoming, with a smaller amount of occupied habitat in Washington, Nevada, Utah, and Colorado. Data on status and trends of *O. p. princeps* are lacking for portions of the subspecies range. Available data consists mostly of a list of sites verified to be occupied in recent surveys. In locations where pika surveys have been conducted, we do not have historical information of the subspecies' at those sites for comparison.

The Canadian Endangered Species Conservation Council (2005) assigned a ranking of secure to *Ochotona princeps princeps* in Alberta and British Columbia, which are the only two provinces where this subspecies occurs in Canada. The ranking is based upon occurrence of large numbers of pikas in secure habitat (British Columbia Conservation Data Centre 2009, p. 1; Court 2009, pers. comm.). Pikas are common in suitable habitat in the mountains on both provincial lands and in national parks (Court 2009, pers. comm.). The population is thought to be stable in Alberta, Canada (Court 2009, pers. comm.). Greater than 100 occurrences of *O. p. princeps* occur within Alberta (Court 2009, pers. comm.). We do not have population trend information for British Columbia. We do not have any information to suggest the distribution of the pika is changing in Canada.

In Montana, there is little historical information to assess whether habitat loss has occurred or if populations are stable. Limited available data does not indicate a decline. Approximately 90 percent of available habitat in Glacier National Park is occupied (National Park Service (NPS) 2009, p. 9). Based upon occupancy rates elsewhere (Utah Division of Wildlife Resources (UDWR) 2009, pp. 6, 11), we conclude the occupancy rate of pikas within Glacier National Park is high.

Limited data are available for pika distribution, abundance, and population status in Wyoming. American pikas occur in every Wyoming mountain range except Laramie, Wasatch, and Black Hills (Wyoming Game and Fish Department (WGFD) 2009, p. 1). American pikas are believed to occur in all locations where they were observed historically within the Grand Teton National Park (NPS 2009, p. 10). The WGFD will add the American pika to their 2010 State Wildlife Action Plan (WAP) (WGFD 2009, p. 1). They propose to treat the subspecies as having an Unknown Native Species Status because population and distribution trends are unknown and limiting factors are poorly understood (WGFD 2009, p. 1).

In Idaho, the subspecies is broadly distributed and occupies a substantial number of sites throughout much of the State (Idaho Department of Fish and Game (IDFG) 2009, p. 1). The IDFG has no information to suggest threats exist to the subspecies. Pikas are not identified as a Species of Greatest Conservation Need in the Idaho Comprehensive Wildlife Conservation Strategy (CWCS) and pikas are considered to be secure, common, and widespread based on NatureServe's conservation status (IDFG 2005, App. A, p. 18). *O. p. princeps* was studied at Craters of the Moon National Monument in Idaho (Beever 2002, p. 25; NPS 2009, pp. 2-3), but reports did not reveal any information related to the status of pika populations there.

Ochotona princeps princeps in Utah currently have a high occupancy rate (96 percent) in suitable habitat (UDWR 2009, p. 7). Although there is no historical population information, UDWR believes that the high occupancy rate reflects stable populations (UDWR 2009, p. 11).

In Colorado, *Ochotona princeps princeps* is found only in the northern part of the State. Colorado Division of Wildlife (CDOW) (2009, p. 19) documented greater than 40 occupied sites based on historic and recent site surveys. Reports on *O. p. princeps* in Colorado do not provide any information on status (NPS 2009, p. 10-12; Ray 2009, pp. 1-4).

Nevada and Washington have little information on the subspecies status. American pika records collected from 1969 to 2008 from the Ruby Mountain chain in northeast Nevada identify at least 33 pika locations (Nevada Department of Wildlife (NDOW) 2009, pp. 2-3); however, we have no information on the status of populations from those locations. We have no information on the status of *O. p. princeps* in Washington.

As previously stated, Beever and Smith (2008, p. 3) considered populations of *O. p. goldmani, O. p. nevadensis*, and *O. p obscura*, which represent a portion of the range of *O. p. princeps* (Hafner and Smith 2009, pp. 18-19), as vulnerable (i.e., facing a high risk of extinction in the wild). Additionally, NatureServe (2009, p. 2) assigned Utah pikas, which contains populations representing all subspecies except *O. p. fenisex*, a status of vulnerable (i.e., a restricted range, relatively few populations, recent and widespread declines, or other factors making it vulnerable to extirpation).

In summary, most States and provinces that contain populations of *O. p. princeps* have not determined the subspecies' status and do not have information on population trends. Some populations within central Idaho (*O. p. goldmani*), northwestern Nevada (*O. p. nevadensis*), north-central Wyoming (*O. p. obscura*), and north-central Utah may be vulnerable (Beever and Smith 2008, p. 3; NatureServe 2009, p. 2). Outside of these areas, we do not have adequate information to determine the status of *O. p. princeps* populations.

Sierra Nevada Subspecies (*Ochotona princeps schisticeps*)

The Sierra Nevada subspecies (*Ochotona princeps schisticeps*) occurs primarily in California, Nevada, and

Oregon with a small portion of occupied habitat in Utah. This subspecies has received more scientific study than any other American pika subspecies (Grayson 2005, p. 2104). Pikas are designated as a vulnerable species as well as a species of conservation priority in Nevada's WAP, with a declining population (WAP Team 2006, pp. 291, 405). *O. p. schisticeps* status appears to be declining within the interior Great Basin, primarily in southern Oregon and northwestern Nevada, and some places along the eastern Sierra Nevada Mountain Range (Beever *et al.* 2003, p. 44; Wilkening 2007, p. 58); however, outside of these areas there is no indication that the subspecies is in decline (Millar and Westfall 2009, p. 25). As identified by Beever *et al.* (2003, pp. 39, 44), the interior Great Basin refers to the hydrographic definition of the Great Basin (Grayson 1993, cited in Beever *et al.* 2003, p. 39).

As previously mentioned, some isolated populations of *O. p. schisticeps* have been extirpated in the interior Great Basin. Beever *et al.* (2003, p. 43) did not detect pikas at 6 of 25 historical (dating back to the early to mid-1900s) populations during surveys from 1994 to 1999 and later documented three extirpations during 2000 to 2007 (Wilkening 2007, pp. 25-27; Beever *et al.* 2009, p. 15).

Researchers have not systematically searched all potential pika habitat within the Great Basin and acknowledge that other sites with pikas may exist (Beever *et al.* 2009, pp. 31), particularly the Toiyabe Mountain Range, White Mountains, Toquima Mountain Range, and the Warner Mountains (Meredith 2002, p. 11; Beever 2009a, pers. comm.). In fact, two new sites were discovered in the Great Basin in northwestern Nevada from 2008 to 2009: Hays Canyon (Beever *et al.* 2008, p. 9) and Sheldon-Hart National Wildlife Refuge (Collins 2009, pers. comm.). However, the subspecies is rare in the Great Basin, and likely has been relatively rare in the Great Basin for the past several thousand years. It is unlikely that many additional occupied sites will be found (Beever *et al.* 2008, p. 11).

Trends of pika status are mixed in other locations within the subspecies range. Pikas occur within Sequoia and Kings Canyon National Parks in California along the eastern edge of the Sierra Nevada Mountain Range, however, the population status is unknown (NPS 2009, p. 6). Pikas are widely distributed throughout Lava Beds National Monument (Ray and Beever 2007, p. 2) and populations appear to persist in warmer and drier sites, which is contrary to expectations because pikas are generally restricted to cool, moist habitats on higher peaks (Hafner 1993, p. 375). The lower elevation range limit of pikas in Yosemite National Park has contracted and moved upslope by 153 m (502 ft) (Moritz *et al.* 2008, p. 263), and at least one historic pika site has been extirpated within the Park (Moritz 2007, p. 37). Despite this extirpation, we do not know the status of the entire Yosemite National Park pika population. Pika populations near Bodie, California, have experienced decline as well, but not in the largest portion of the population which contains more suitable habitat and subsequently more pikas (Moilanen *et al.* 1998, p. 531; Nichols 2009, pp. 2, 5; Smith 2009, pers. comm.).

The relative number of unoccupied sites increased from the Sierra Nevada eastward into the Great Basin ranges (Millar and Westfall 2009, pp. 9, 11). Millar and Westfall (2009, p. 25) concluded that pika populations in the Sierra Nevada and southwestern Great Basin are thriving and show little evidence of extirpation or decline. Central Great Basin populations, on the other hand, appear less viable and more subject to disturbance from random events (Millar and Westfall 2009, p. 25).

In Utah, a population of pikas at Cedar Breaks National Monument was extirpated sometime between 1974 and 2006 (Oliver 2007, p. 5). As of 2009, the site still does not contain pikas (NPS 2009, p. 9). Pikas may have disappeared from sites near Lava Point in Zion National Park (NPS 2009, p. 13; Oliver 2007, pp. 7-8). However, pikas occur in other nearby locations (NPS 2009, p. 9; UDWR 2009, p. 20), demonstrating that suitable habitat capable of supporting a pika population still exists in southern Utah. Eighty-four percent of *Ochotona princeps schisticeps* suitable habitats in Utah are occupied (UDWR 2009, p. 7).

In summary, despite some of the uncertainty in trends across the current range of *O. p. schisticeps* populations, it is clear that some interior Great Basin pika populations (Beever *et al.* 2003, pp. 44, 53-54; Beever *et al.* 2009, p. 6) are being extirpated and moving upslope in elevation. The recent loss of low-elevation historical pika populations near the southern edge of historical range within the Great Basin appears to track the fossil record (see section on Historic Distribution and Habitat). The recent rate of population loss is more rapid than that suggested by paleontological records (Beever *et al.* 2003, p. 48). The majority of suitable habitat for *O. p. schisticeps* occurs outside of the Great Basin in the Sierra Nevada Mountain Range and a large study area in the Sierra Nevada Mountain Range shows the status appears to be stable.

Southern Rocky Mountain Subspecies (*Ochotona princeps saxatilis*)

Even in the absence of survey data for portions of the range of the Southern Rocky Mountain subspecies, *Ochotona princeps saxatilis,* available information suggests that the subspecies is stable across the majority of its range. Survey data are lacking for portions of the subspecies' range.

Pikas are well distributed in high-elevation areas of Colorado, which contains the majority of the subspecies' habitat. Fifty-eight of 62 historical sites surveyed had *O. p. saxatilis* populations persisting even at relatively low-elevation 2,743 to 3,048 m (9,000 to 10,000 ft) sites (CDOW 2009, p. 22; Peterson 2009, pers. comm.). Pika habitat is extensive in Colorado, and connectivity between pika habitat and populations appears sufficient to maintain a healthy population structure (CDOW 2009, p. 22).

In Utah, 92 percent of surveyed suitable pika habitat in the La Sal Mountains of eastern Utah was occupied (UDWR 2009, p. 7). There is no evidence of declines of American pika populations from historical levels in Utah (UDWR 2009, p. 11).

Density and trend data are not available for *Ochotona princeps saxatilis* populations in New Mexico (New Mexico Department of Game and Fish (NMDGF) 2009, p. 2; U.S. Forest Service (USFS) 2009, p. 1). New Mexico's CWCS lists the Goat Peak pika (was *Ochotona princeps nigrescens*, now included in *O. p. saxatilis*) as a subspecies of greatest conservation need as well as vulnerable and State sensitive (NMDGF 2006, pp. 55, 57). However, based on limited field observation, persistence of *O. p saxatilis* populations within New Mexico does not appear to reflect the pattern of recent extirpation observed within the interior Great Basin (NMDGF 2009, p. 3). Beever and Smith (2008, p. 3) have assigned *O. p. lasalensis* and *O. p. nigrescens*, which now belong to the *O. p. saxatilis* subspecies (see Table 1; Hafner and Smith 2009, p. 21), a status of vulnerable.

Despite some of the uncertainty in status across the range of *O. p. saxatilis* in New Mexico, the subspecies appears to be well distributed throughout the available habitat, especially in Colorado and Utah (CDOW 2009, p. 22; UDWR 2009, p. 11). There is no evidence indicating that the subspecies is in decline across its range in Utah and

Colorado. Based on other status reviews (Beever and Smith 2008; NatureServe 2009b, p. 2), further monitoring may be warranted for *O. p. saxatilis* populations in the Jemez Mountains of New Mexico and La Sal Mountains of Utah to obtain a current status characterization of this portion of the subspecies range.

Cascade Mountain Subspecies (*Ochotona princeps fenisex*)

We have no trend data available for *Ochotona princeps fenisex* populations. In many locations where recent pika surveys have been conducted, no historical information exists for purposes of comparison. NatureServe has assigned the American pika a status of apparently secure (i.e., uncommon but not rare; some cause for long-term concern due to declines or other factors) in Oregon; secure (i.e., common; widespread and abundant) in the State of Washington; and secure in the Canadian province of British Columbia.

All eight survey locations in the Three Sisters Mountains and at McKenzie Pass, (located in the Cascade Mountain Range) have evidence of recent pika activity (Millar and Westfall 2009, p. 9). *O. p. fenisex* populations also occur in low-elevation (range of 121 to 255 m (397 to 837 ft)) habitat in the Columbia River Gorge, Oregon (Simpson 2009, p. 244). We have population estimates of *O. p. fenisex* from Mt. St. Helens from 1992 to 1994 (Bevers 1998, p. 42), but no information on the population status.

Survey data are lacking for a large portion of *O. p. fenisex* range, and no reports indicate population status. Based on the current pattern of known occupancy and the NatureServe (2009b, pp. 1-2) assessment, the subspecies is apparently secure.

Uinta Mountain Subspecies (*Ochotona princeps uinta*)

The Uinta Mountain subspecies, *Ochotona princeps uinta*, occurs solely within the State of Utah. The species is believed to have a relatively high occupancy rate (63 percent) with no evidence of declines from historical levels (UDWR 2009, pp. 7, 9, 11, 20). Based on available information, *O. p. uinta* populations appear stable.

Summary of American Pika Population Status

Most States and provinces that contain populations of *O. p. princeps* and *O. p. fenisex* have not determined the subspecies' status and do not have information on population trends. Information presented above suggests that *O. p. schisticeps* populations in some areas, primarily in the interior Great Basin, may be in decline. *O. p. saxatilis* populations appear to be well distributed throughout the majority of available habitat and *O. p. uinta* populations appear stable. Recent observed trends for *O. p. princeps, O. p. saxatilis*, *O. p. fenisex*, and *O. p. uinta* subspecies do not seem to mirror the loss of occupied pika sites and upward range contraction that has been reported for interior Great Basin populations. There is discrepancy among reported population trends within California, southern Utah, and New Mexico. Some information suggests that the species is vulnerable within some areas of California, southern Utah, and New Mexico (Beever and Smith 2008; NatureServe 2009b); however, other reports discussed above suggest that the *O. p. schisticeps* subspecies is stable or not in decline (Millar and Westfall 2009, p. 25; NMDGF 2009, p. 3; UDWR 2009, p. 11).

Summary of Information Pertaining to the Five Factors

Section 4 of the Act and implementing regulations (50 CFR part 424) set forth procedures for adding species to, removing species from, or reclassifying species on the Federal Lists of Endangered and Threatened Wildlife and Plants. Under section 4(a)(1) of the Act, a species may be determined to be endangered or threatened based on any of the following five factors: (1) The present or threatened destruction, modification, or curtailment of its habitat or range; (2) overutilization for commercial, recreational, scientific, or educational purposes; (3) disease or predation; (4) the inadequacy of existing regulatory mechanisms; or (5) other natural or manmade factors affecting its continued existence. In making this finding, information pertaining to the American pika in relation to the five factors provided in section 4(a)(1) of the Act is discussed below. In making our 12–month finding on a petition to list the American pika or any of the five subspecies of pika, we considered and evaluated the best available scientific and commercial information. Below, we provide a summary of our analysis of threats to the five recognized subspecies of the American pika and to the species as a whole.

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

The following potential factors that may affect the habitat or range of American pika are discussed in this section: (1) Climate change; (2) livestock grazing; (3) native plant succession; (4) invasive plant species; and (5) fire suppression.

Climate Change

Climate change is a potential threat to the long-term survival of the American pika. Thermal and precipitation regime modifications may cause direct adverse effects to individuals or populations. Climate change has the potential to contribute to the loss of and change in pika habitat and enhance negative ecological and anthropogenic effects.

The Science of Climate Change

The Intergovernmental Panel on Climate Change (IPCC) concluded that global climate change is occurring and is caused by human activities, such as the burning of fossil fuels and clearing of forests (Forster *et al*. 2007, pp. 135-136). The IPCC is a scientific intergovernmental body established by the World Meteorological Organization and the United Nations Environment Programme ''to assess scientific information related to climate change, to evaluate the environmental and socio-economic consequences of climate change, and to formulate realistic response strategies'' (IPCC 2007, p. iii). The publications of the IPCC, specifically the four-volume *IPCC Fourth Assessment Report: Climate Change 2007*, constitute the best available science on global climate change. The *IPCC Fourth Assessment Report: Climate Change 2007* included the findings of three working groups composed of more than 500 lead authors and 2,000 expert reviewers and provided objective scientific guidance to policymakers on the topic of climate change (IPCC 2007, p. iii). We believe the IPCC information is the best available scientific information on global climate change at a broad scale.

Historical records analyzed by the IPCC demonstrate that global surface temperatures have risen (with regional variations) during the past 157 years, most strongly after the 1970s (Trenberth *et al*. 2007, p. 252). Globally, average surface temperatures have risen by 0.074 °C plus or minus 0.018 °C (0.13 °F plus or minus 0.03 °F) per decade during the past century (1906 through 2005) and by 0.177 °C plus or minus 0.052 °C (0.32 °F plus or minus 0.09 °F) per decade during the past quarter-century (1981 through 2005) (Trenberth *et al*. 2007, p. 253).

Changes in the amount, intensity, frequency, and type of precipitation have been summarized by the IPCC (Trenberth *et al*. 2007, p. 262). The warming of global temperatures has increased the probability of precipitation falling as rain rather than snow, especially in near-freezing situations, such as the beginning and end of the snow season (Trenberth *et al.* 2007, p. 263). In many Northern Hemisphere regions, this has caused a reduced snowpack, which can greatly alter water resources throughout the year (Trenberth *et al.* 2007, p. 263). As a result of thermal and precipitation regime changes, the IPCC expects the snowline (the lower elevation of year-round snow) in mountainous regions to rise 150 m (492 ft) for every 1 °C (1.8 °F) increase in temperature (Christenson *et al.* 2007, p. 886). These predictions are consistent with regional predictions for the Sierra Nevada in California that calculate that year-round snow will be virtually absent below 1,000 m (3,280 ft) by the end of the 21st century under a high emissions scenario (Cayan *et al.* 2006, p. 32).

Scientists at climate research institutions in the United States and in over a dozen countries worldwide, have generated projections of future climatic conditions both globally and in the United States, which includes the range of the American pika. These projections were assessed and synthesized in the Fourth Assessment Report of the IPCC. The United States Global Change Research Program (USGCRP) coordinates climate change research from 13 departments and agencies and was mandated by Congress in the Global Change Research Act of 1990 to, ''assist the Nation and the world to understand, assess, predict, and respond to human-induced and natural processes of global change.'' The IPCC has predicted global average surface warming during the 21st century is likely between 1.1 and 6.4 °C (2.0 and 11.5 °F), depending on the emissions scenario, and taking into account other sources of uncertainty in the projections (Solomon *et al.* 2007, p. 70, Table TS. 6). The recent USGCRP assessment of climate impacts (Karl *et al.*, 2009, pp. 129, 135) also adopts the IPCC range of temperature projections for different United States regions.

On a regional scale, North America is likely to exceed the global mean warming in most areas (Christenson *et al.* 2007, p. 850). Specifically, warming is likely to be largest in winter in northern regions of North America, with minimum winter temperatures likely rising more than the global average (Christenson *et al.* 2007, p. 850). Across 21 global climate models using a mid-level emissions scenario, the IPCC predicted that the average annual temperature in western North America (covering the entire range of the American pika) will increase between 2.1 and 5.7 °C (median 3.4 °C) (3.8 and 10.3 °F (median 6.1 °F)) during the 21st century (Christenson *et al.* 2007, p. 856). The 2009 USGCRP impacts report projects the Southwest to warm 2 to 6 °C (4 to 10 °F) relative to the 1960-1979 baseline (Karl *et al.* 2009, p. 129) and the Northwest to warm by ''another 2 to 6 °C (3 to 10 °F)'' by the end of the century (Karl *et al.* 2009, p. 135).

In the 20th century, the Pacific Northwest and western United States experienced annual average temperature increases of 0.6 to 1.7 °C (1.1 to 3.1 °F) and 1.1 to 2.8 °C (2.0 to 5.0 °F), respectively (Parson *et al.* 2001, p. 248; Smith *et al.* 2001, p. 220). Temperature increases are expected to affect precipitation, snowpack, and snowmelt in the range of the American pika. Climate warming corresponds with a reduced mountain snowpack (Mote *et al.* 2005 and Regonda *et al.* 2005 cited in Vicuna and Dracup 2007, p. 330; Trenberth *et al.* 2007, p. 310) and a trend toward earlier snowmelt in western North America (Stewart *et al.* 2004, pp. 217, 219, 223). The IPCC concluded that snow-season length and depth of snowpack are very likely to decrease in most of North America (Christenson *et al.* 2007, p. 850). Leung *et al.* (2004, p. 75) concluded that future warming increases in the western United States will cause increased rainfall and decreased snowfall, resulting in reduced snow accumulation or earlier snowmelt. Similarly, Rauscher *et al.* (2008, p. 4) concluded that increased temperatures in the late 21st century could cause early-season snowmelt-driven runoff to occur as much as 2 months earlier than presently in the western United States.

The above information applies at large, general scales. To understand the changes likely to occur in pika habitat, we worked with the National Oceanic and Atmospheric Administration (NOAA) to assess the best available climate science across the range of the American pika (NOAA 2009, p. 4). The NOAA study reviewed historical climate observations and climate projections of surface temperatures for 20–year periods centered on 2025, 2050, and 2100 in alpine and subalpine mountain areas that are habitat for the American pika. Because model projections for precipitation are less reliable than for temperature in this region, their report focused primarily on temperature (NOAA 2009, pp. 10, 15). We primarily relied on this report to perform deterministic risk assessments of increased temperature in the foreseeable future to American pika populations throughout their range in the western United States. In addition, we used information on historical climate observations to supplement previous peer-reviewed publications and other reports from the literature to assess how temperature increases may have affected pikas in recent decades.

The NOAA's analysis (NOAA 2009, p. 9) revealed an evident warming trend between 1950 and 2007 in the western United States. Strong warming trends occurred across 89 percent of the western United States and 37 to 42 percent of western United States mountain ranges (Das *et al.* 2009, cited in NOAA 2009, p. 9). Within the western United States, warming was documented and is attributable to anthropogenic climate change (Bonfils *et al.* 2008, cited in NOAA 2009, p. 11). Some studies (Barnett *et al.* 2008, p. 1080; Pierce *et al.* 2008, p. 6436) have estimated that up to about half of the trends in temperature and associated hydrologic variables can be attributed to anthropogenic causes. Natural climate variability may account for the remainder of the observed climate change in the western United States, and will likely play a role in the future climate of that region.

Changes in the hydrologic cycle, including timing of snowmelt runoff, amount of precipitation falling as snow versus rain, and spring snow water equivalent, have been documented in the mountains of western North American and attributed to anthropogenic causes (multiple references cited in NOAA 2009, p. 8), with the exception of some high-elevation areas, especially in the Rocky Mountains. Most of the reduction in snowpack in the western United States has occurred below about 2,500 m (8,200 ft) (Regonda *et al.* 2005, cited in NOAA 2009, p. 9). This elevation is near the lower limit of American pikas' elevation range (Smith and Weston 1990, p. 2); therefore, it can be inferred that the majority of pika habitat in mountainous areas has not experienced the large changes in the hydrologic cycle seen at lower elevations.

Climate Change and Pika Biology

Several climate variables are relevant to persistence of American pika populations because past and present trends in climate have been identified as having important physiological, ecological, and demographic consequences. These climate variables include, but may not be limited to, number of extremely hot or cold days, average summer temperatures, and duration of snow cover (Beever *et al.* 2009, pp. 5, 10, 16-18).

In general, pika biologists agree that temperatures below the habitat surface, such as in talus crevices, better approximate the conditions experienced by individual pikas because pikas rely on subsurface refugia to escape hotter summer daytime temperatures and obtain insulation in the colder winter months (Beever *et al.* 2009, p. 9). Therefore, surface temperature variables may not be as useful as subsurface temperatures for predicting persistence or extirpations of pika populations in the face of climate change. However, data on subsurface temperatures within pika habitat vary depending on site-specific conditions and are largely unavailable.

Beever *et al.* (2009, p. 18) found that average summer (June-July-August (J-J-A)) below-talus temperature was the best predictor of pika extirpation. They also discovered two other patterns: (1) The number of extremely cold and hot days based on estimates of below-talus temperatures was useful in predicting patterns of pika extirpations (Beever *et al.* 2009, p. 18); and (2) the majority of pika-extirpated sites were covered with snow for only 2 weeks or less; whereas, the majority of pika-extant sites had continuous snow cover for greater than 2 weeks and as long as 8.2 months (Beever *et al.* 2009, p. 16). Because American pikas are small and do not hibernate, reduced snowpack can mean a lack of insulation from cold winter temperatures (Morrison and Hik 2008, p. 905). Exposure to colder temperatures could have an adverse effect on pika individuals and populations as a result of increased energy expenditure during a time of year where food resources are limited (Smith *et al.* 2004, p. 5). However, pika biologists have not determined the actual effects of acute cold-stress on pikas (Beever *et al.* 2009, p. 29).

The population collapse of a closely related pika species, the collared pika (*Ochotona collaris*), was related to warmer winters that resulted in low snow accumulation (and, therefore, poor insulation value), increased frequency of freeze-thaw events, icing following winter rains, and late winter snowfalls that delay the start of the growing season (Morrison and Hik 2008, pp. 104-105, 110). Following a decline in population abundance, populations recovered in subsequent years, in some cases to near pre-decline levels (Morrison and Hik 2007, pp. 902-903). Declines in snowpack and earlier montane snowmelt are predicted to occur within the next century, and winter survival of the American pika may consequently decrease. Alternatively, earlier snowmelt could improve pika survival and positively affect American pika populations (Morrison and Hik 2007, p. 905). Based on the available information there does not appear to be a direct line of evidence linking reduced snowpack to reductions in American pika populations.

Several lines of evidence have been used to suggest that thermal stress will adversely impact the American pika. Wolf *et al.* (2007, p. 43) pointed out that increasing temperatures will eliminate cool, moist refugia in talus habitat, causing individuals to be unable to thermoregulate in summer months. However, Millar and Westfall (2009, p. 25) stated that non-rock-ice features will likely become warmer and more marginal for pikas, but environments with rock-ice features are highly likely to remain buffered against temperature change due to the insulation of rock features. Millar and Westfall (2009, p. 10) documented that 83 percent of over 400 surveyed pika sites in the Sierra Nevada and Great Basin occurred in rock-ice landforms, indicating that pikas have a preference for these types of environments. Therefore, we expect pika habitat that contains rock-ice features or features that are similar to rock-ice (i.e., talus or talus-like environments) to be buffered from rising surface temperatures. We are not aware of any studies that have identified the distribution of these types of features, and thus we are not able to use that type of information to help us increase the sensitivity of our climate change threats analysis.

Wolf *et al.* (2007, p. 44) also state that, even if the talus refugia remain cool, ambient external temperatures may reduce an individual's ability to forage during midday. They assert that if pika individuals cannot adequately forage in the summer months, they may not have the required body mass or haypile volume needed for winter survival. However, pikas at low elevations restrict their activity when temperatures exceed their thermal tolerance but are able to obtain enough food and overwintering vegetation (hay pile) during the morning and evening so that long-term population persistence is not affected (Smith 1974a, pp. 1117-1118; Smith 1974b, pp. 1370-1372; Smith 2009, p. 4).

Warmer summer temperatures may affect the ability of juvenile pikas to successfully disperse and colonize new areas (Smith 1974a, p. 1112; Smith 1978, p. 137; Wolf *et al.* 2007, p. 44). Because dispersal occurs on the habitat surface, dispersing pikas are exposed to the hottest temperatures on the surface of their environment. Hotter surface temperatures may decrease the distance juveniles are able to travel in search of new habitat patches, but primarily in warmer, low-elevation habitats. A pika metapopulation range may decline if juveniles are unable to colonize new patches or immigrate to other populations.

Wilkening (2007, pp. 36-37) suggested that a greater depth of available talus should be positively associated with pika persistence, and pika populations located in habitat with shallow talus or small diameter rocks of similar size might be susceptible to adverse effects of increasing temperatures. With the appropriate assemblage of talus structural features, below-talus microclimate might be less thermally variable and more suitable for pikas (Millar and Westfall 2009, p. 21). Studies from Lava Beds National Monument support this hypothesis by demonstrating that talus depth (amount of insulation) was one of the strongest predictors of pika occurrence (Ray and Beever 2007, p. 45). Based on these data, it is likely that habitat with sub-optimal talus characteristics would be less likely to support pika populations under projected warming scenarios.

American Pika Responses to Climate Change

Past and Present Trends

Recent climatic change, including increased temperatures, freeze-free periods, and changes in precipitation is an important driving force on ecosystems and has affected a wide variety of organisms with diverse geographic distributions (Walther *et al.* 2002, pp. 391-392; Parmesan and Yohe 2003, p. 41). Many plant and animal species have advanced the timing of spring events (e.g., plant flowering or bird migration) and experienced a shift in latitudinal and altitudinal range (i.e., movement to higher latitudes or higher altitude) (Walther *et al.* 2002, pp. 391-392).

The biology of the American pika makes the species a useful indicator of changing climatic conditions and useful to test extinction theory (Smith *et al.* 2004, p. 5; Smith 2009, p. 2). The species lives in a very narrow ecological habitat (primarily talus) that is frequently fragmented or patchily distributed. They are generally poor dispersers, and thus the narrow niche may expose some populations to negative effects associated with increasing temperatures (Smith 1974b, p. 1372; Smith 2009, p. 2). However, pikas also may exhibit considerable behavioral and physiological flexibility that may allow them to persist in environmental conditions that humans perceive to be outside of the species' ecological niche (Smith 2009, p. 4).

The distribution of American pikas from prehistoric times to the present is a result of changing climatic conditions. Pika population occurrences in the southern Rocky Mountains are closely tied to the past and present distribution of alpine permafrost conditions, with altithermal (i.e., a dry postglacial interval centered about 5,500 years ago during which temperatures were warmer than at present) warming accounting for 66.7 percent of all post-Wisconsinan period population extirpations (Hafner 1994, p. 375). Climate change and subsequent impacts on vegetation determined the distribution of the American pika in the Great Basin (Grayson 2005, p. 2103). The present distribution of the American pika in the Great Basin is approximately 783 m (2,568 ft) higher in elevation than the distribution during the late Wisconsinan and early Holocene periods (Grayson 2005, p. 2103), demonstrating an elevational retreat tracking colder microclimates. While these trends, acting over long timescales, demonstrate the role of historical climate conditions in shaping pika distribution, we have evidence that recent climate change has caused additional contractions in the American pika's range within some localities.

NOAA (2009, pp. 11-14) analyzed past climate observations at 22 sites known to be recently or currently occupied by American pikas. They analyzed the observations in detail for a subset of sites along the southern Nevada/California border, southern Oregon, and northern California, where recent pika extirpations were documented in the Great Basin; however, NOAA's analyses were not limited to these regions (see Figure 1 in NOAA 2009, p. 1). Along the southern Nevada/California border, the summers of the last decade showed a pronounced warming trend (NOAA 2009, p. 12). By comparison, nearly all extirpated sites within the Great Basin are associated with relatively low elevations with little suitable habitat accessible nearby at higher elevations, which is in agreement with previous reports (Beever *et al.* 2003, p. 48; Wilkening 2007, p. 32). Southern Oregon and northern California experienced less pervasive warming over the past 75 years in these regions when compared to Nevada (NOAA 2009, p. 14). However, the last 30 years in southern Oregon and northern California feature a pronounced warming in the summer (NOAA 2009, p. 14). Based on observations of climatology in areas known to contain American pikas, it is apparent that pikas have been and currently are being exposed to warmer temperatures, which may correlate with extirpations in Nevada, Oregon, and California.

The American pika appears to be experiencing habitat shifts in some areas, including an increasing rate of upslope movement (Beever 2009b, pers. comm.); the disappearance of populations at relatively lower elevations and hotter sites (Beever *et al.* 2003, pp. 45, 49; Beever *et al.* 2009, pp. 16-18); and loss of populations from habitats that do not maintain adequate snowpack levels (Smith *et al.* 2004, p. 5; Morrison and Hik 2008, p. 905; Beever *et al.* 2009, p. 16).

A few reports have documented 20th century range contractions in both the Great Basin and the Sierra Nevada. A study of Great Basin pika populations found that 7 of 25 populations, which is a subset of all pika-occupied sites within the Great Basin, appeared to have experienced extirpations between 1994 and 1999 (Beever *et al.* 2003, p. 37). Of these, one site was subsequently determined to be occupied (Wilkening 2007, p. 26). The most recent information indicates that 9 out of 25 (36 percent) historically occupied pika sites within the Great Basin have been extirpated (Krajick 2004, p. 1602; Wilkening 2007, p. 46). These 25 sites in the Great Basin were first described in 1946 by Hall (pp. 587-593). Elevation is an important parameter in models predicting the persistence of pika populations, and thermal effects (because it is typically hotter at lower elevations) are the primary reason for recent extirpations. Thermal effects have also influenced recent persistence trajectories of Great Basin populations of pikas (Beever *et al.* 2003, pp. 43, 46-47; Beever 2009, pp. 1, 3). Other anthropogenic factors may affect persistence to a lesser degree (Beever 2009, pp. 1, 3), such as proximity to roads, habitat size, and livestock grazing, particularly when assessed cumulatively with environmental conditions (Beever *et al.* 2003, p. 46).

Millar and Westfall (2009, p. 12) similarly documented that unoccupied historical pika sites were associated with significantly higher warmer maximum surface temperatures than occupied sites. In general, their survey sites in the Great Basin had colder winter and warmer summer temperatures than their survey sites in the Sierra Nevada (Millar and Westfall 2009, p. 13). The authors also documented that unoccupied pika sites were significantly more likely to be associated with southern aspects, which receive more direct sunlight and, therefore, may experience warmer temperatures, than occupied pika sites (Millar and Westfall 2009, p. 11).

Long-term responses of small mammal communities to recent climate change were studied in the Sierra Nevada (Moritz *et al.* 2008, pp. 261-264). Because the study area has been protected since 1890, responses to climate change were not confounded by land-use effects (Moritz *et al.* 2008, p. 261). Range contractions were documented in high-elevation species and upward range expansion in low-elevation species (Moritz *et al.* 2008, p. 262). The lower range limit of the American pika within their study site shifted 153 m (502 ft) upslope from approximately 1920 to present (Moritz *et al.* 2008, p. 263). Based on the Great Basin and Sierra Nevada studies, temperatures provide the most likely explanation for observed range shifts in American pika populations.

Despite the trends of increasing pika extirpations in the Great Basin and upward range expansion as a response to increasing temperatures, there is ample evidence suggesting the species can survive and thrive in habitats with relatively hot surface temperatures. American pika populations thrive at a low-elevation (2,550 m (8,366 ft)) site in the mountains near Bodie, California, where August daily maximum shade temperatures approach 30 °C (86 °F) at the hottest time of day (Smith 1974a, p. 1117; Smith 1974b, p. 1369). Pikas persist here, because they reduce activity during hot mid-day temperatures by retreating to significantly cooler conditions under the talus surface (MacArthur and Wang 1974, p. 357; Finn 2009a, pers. comm.; Millar and Westfall 2009, pp. 13-14), and perform necessary daily activities during the cooler morning and evening periods (Smith 1974b, p. 1370). Despite altering their behavior in response to high temperatures, pikas maintain high birth and low mortality rates (Smith 1974a, p. 1117).

American pikas also persist in the hot climates of Craters of the Moon and Lava Beds National Monuments (Idaho and California, respectively). Average and extreme maximum surface temperatures in August at these sites are 32 °C (90 °F) and 38 °C (100 °F), respectively (Western Region Climate Center 2009, p. 1). Pika persistence at these sites is noteworthy because the climate is an estimated 18 to 24 percent drier and 5 to 11 percent warmer during the hottest months of the year than experienced at the interior Great Basin locations where pikas have been extirpated (Beever 2002, pp. 26-27).

Three habitat characteristics seem important to these two California and Idaho populations: large, contiguous areas of rocky, volcanic habitat; average or greater than average amounts of accessible vegetation; and microtopography with rocks large enough for subsurface movement and tunneling by pikas (Beever 2002, p. 28). With suitable structural habitat, American pikas persist in climates that typically would be considered too hot for the species.

Pikas persist at low-elevation (2,400 to 2,500 m (7,874 to 8,202 ft)), relatively warm sites in areas adjacent to human disturbance and lacking in accessible vegetation (Smith 2009, p. 5). Pikas exist in environments not typically viewed as suitable pika habitat. For example, pikas were found at a low-altitude (2,400 to 2,500 m (7,874 to 8,202 ft)) site adjacent to an area of human land-use that was almost barren of vegetation; yet, biologists found a robust haypile (Smith 2009, p. 5). This information suggests the species tolerates a wider range of environmental conditions than previously thought.

Habitat structure appears to be just as or more important of a predictor of pika population persistence as temperature. The amount of talus habitat appears to be the strongest individual variable useful for predicting persistence. In 17 of 18 instances, populations in mountain ranges with moderate to large amounts of talus remained extant (Beever *et al*. 2003, pp. 43, 47; Wilkening 2007, p. 33). Pika island (patch) size was the most important persistence factor near Bodie, California (Smith 1974a, p. 1114).

We believe recent American pika range contractions that have occurred or are occurring in one locality or region should not be assumed to have occurred or be occurring in other areas. For example, American pika have been documented moving upslope in the Great Basin and Yosemite National Park; however, populations in the Sierra Nevada occur 650 m (2,132 ft) below historically known low-elevation pika sites (Millar and Westfall 2009, p. 16), and therefore have not moved upslope in this region. Given the available information we conclude that the species range has not contracted upslope on a range-wide basis in the recent past and changes in the elevation range of the species appear to be site-specific. Persistence of lower elevation sites is likely related to local climate, habitat structure, geomorphology, and intra-talus microclimate (Millar and Westfall 2009, pp. 16-23).

Based on information we have obtained from a variety of sources, it is apparent that American pika have responded to long-term climate change (10,000 to 40,000 years) as seen by the current patchy distribution of the species at generally higher elevations, particularly in the southern portion of it range. The species also appears to be responding to shorter term climatic change in the last century in some locations. Some lower elevation populations in the southern portions of the species range have been extirpated and some have shown evidence of upslope movement in response to increased temperatures. Responses of American pika to changing climatic conditions are variable as a result of localized environmental conditions.

We are unaware of any losses of American pika populations outside the interior Great Basin as a response to climate change (see Population Status section). We acknowledge that there is evidence that eastern Sierra Nevada and Great Basin pikas may be responding to recent climate change (Beever *et al*. 2009, p. 18). These effects are most prevalent at low elevations.

Future Trend Projections

The timeframe over which the best available scientific information allows us to reliably assess the effect of climate change on the American pika is a critical component of our status review and finding. The projections generated by NOAA (2009) for surface temperature in pika habitat centered on 2025, 2050, and 2100, but the study concludes that projection results over the next 30 to 50 years are more reliable than projections over the next 80 to 100 years (NOAA 2009, p. 8).

Until about 2050, greenhouse gas emissions scenarios (reviewed in IPCC Special Report on Emission Scenarios in 2000 as cited in NOAA 2009, p. 8), which are an essential component of any climate change assessment, result in a similar range of projections of global and regional climate change (NOAA 2009, p. 8). Temperature increases over the next 30 to 50 years are relatively insensitive to the emissions scenarios used to model the projected change. Some warming as projected in the greenhouse gas emissions scenarios is anticipated as a result of greenhouse gases already in the atmosphere that will influence future climate; however, this is more so for mid-century versus late century (Meehl *et al*. 2007, p. 749). For a given emissions scenario there is still a range in the spread of the model projection. This spread is due both to details in the formulation of the models that differ among the individual models and to natural variability in climate that is simulated by the models. Because increases of greenhouse gas emissions have lag effects on climate and projections of greenhouse gas emissions, it can be interpreted with greater confidence until approximately mid-century, model projections for the next 30 to 50 years (centered on 2050) have greater reliability than results projected further into future.

The range of projections for surface temperatures beyond mid-century will partially depend on human population growth, technological improvements, societal and regulatory changes, and economic growth effects to greenhouse gas emissions. Reports from the IPCC Fourth Assessment (Meehl *et al*. 2007, p. 749) and Mote and Salathé (2009, p. 30) reach a similar conclusion about the reliability of projection results until mid-century versus results for the end of the 21st century. On the basis of NOAA's report (2009, p. 8) and other supplemental information (Meehl *et al*. 2007, p. 749; Mote and Salathé 2009, p. 30), we have determined that climate changes for 2025 and 2050 are more reliable than projections for the second half (up until 2100) of the 21st century. As such, we consider the time period from 2025 to 2050 to represent the foreseeable future for the purposes of our evaluation and this finding. Nonetheless, it should be noted that the IPCC projections indicate continued global and regional warming into the second half of this century, and if emissions follow the higher scenarios, warming in 2090 could be double that in 2050.

There are a few studies that attempt to project future pika trends. McDonald and Brown (1992, pp. 409-415) applied the theory of island biogeography to isolated mountaintop ranges in the Great Basin of western North America and modeled potential extinctions brought on by changing climatic conditions. They predicted that the American pika would be locally extirpated within the next century from four of five mountain ranges in the Great Basin assuming a less than 3 °C (5.4 °F) increase in temperature (McDonald and Brown 1992, p. 411, Table 1). Broader ecological results of the model indicate that mountain ranges would lose 35 to 96 percent of their boreal habitat and 9 to 62 percent of boreal mammal species, depending on the mountain range in question (McDonald and Brown 1992, p. 413). At this point, the fate of pika populations occupying portions of the five mountain ranges discussed in McDonald and Brown (1992) is unclear because pikas still exist in the five mountain ranges analyzed and we are aware of only one metapopulation that has been extirpated from one of the five mountain ranges in the last 15 years (Wilkening 2007, p. 46).

Other researchers have used the species-climate envelope modeling approach (Pearson and Dawson 2003, p. 361; Araújo *et al.* 2005, p. 529), also known as ecological niche or bioclimatic envelope modeling, to generate projections of altered American pika distributions by the late 21st century. Essentially, a species' ecological niche is the range of biological and physical conditions under which an organism can survive and grow (Hutchinson 1957, cited in Pearson and Dawson 2003, p. 362). A bioclimatic envelope model is one that relates a species current distribution to its climatic driving forces, and then applies scenarios of future climate change to project a redistribution of the species' climate space (Pearson and Dawson 2003, p. 361). Bioclimatic models typically consider only climatic variables and do not include other environmental, biotic or abiotic, factors that influence the distribution of species. These models are potentially powerful tools for predicting the potential effects of climate change to animal distributions, including those of American pikas; however, Guisan and Thuiller (2005, pp. 1003-1004) and Hijmans and Graham (2006, p. 2) state that the usefulness of these models for guiding policymaking and conservation planning are limited.

In one such model, Loarie *et al.* (2009, p. 2) predicted that 9 of 427 (2 percent) extant pika sites will have an annual extirpation probability greater than 5 percent in 2010. By 2099, they predict the annual extinction probability of extant pika sites increases to 21 percent (range of 2 to 30 percent) under a medium emissions scenario (Loarie *et al.* 2009, p. 5). They also predict that the percentage of 427 sites with a greater than 50 percent probability of persisting from 2010 through 2099 is 60 percent (range of 51 to 81 percent) under a medium emissions scenario (Loarie *et al.* 2009, p. 5). In the Great Basin, persistence probabilities in 2099 will be lower than the range-wide average, equaling 44 percent under the medium emissions scenario. According to this model, only 11 percent of pikas within the species current range have a very high (95 percent) probability of surviving from 2010 through 2099. By 2100, the areas with the highest predicted probabilities of persistence occur primarily in the high elevations of the southern Rocky Mountains, Yellowstone National Park region, portions of the Northern Rocky Mountains, Uinta Mountains, Olympic Mountains, and a small portion of the Sierra Nevada (Loarie *et al.* 2009, p. 13, Figure 3).

Such extensive loss of suitable pika habitat across the range of the American pika in the United States has been projected by others as well. Trook (2007, pp. 6-16) used a similar approach as Loarie *et al.* (2009, pp. 2-5), and predicted dramatic declines in pika range over the next 80 years for projections centered on 2090 (10–year average from 2085 to 2095). His projections estimated the amount of suitable habitat for low, medium, and high emission scenarios would represent an 81 percent decrease, 86 percent decrease, and 98 percent decrease in suitable habitat across the range of the species in the United States (Trook 2007, p. 19). Under this model, areas that would experience the greatest loss, or complete disappearance, of suitable habitat include the Cascade Mountains, the northern Rocky Mountains, and isolated mountain ranges within Nevada (Trook 2007, p. 19). Galbreath *et al.* (2009a, pp. 13-16) also predicted extensive loss of suitable pika habitat under a scenario where atmospheric carbon dioxide (a major greenhouse gas) concentrations are double their current levels (Galbreath *et al.* 2009, p. 20). Particular losses were projected in the Sierra Nevada and throughout the southwestern portion of the species range (Galbreath *et al.* 2009, pp. 20, 45, Figure 5c).

As stated earlier, Guisan and Thuiller (2005, pp. 1003-1004) and Hijmans and Graham (2006, p. 2) state that the usefulness of bioclimatic envelope models is limited for several reasons, which include making unrealistic assumptions of species distributions being at equilibrium with current climate, interpreting species-climate relationships as if indicating causal mechanisms, and ignoring the biotic interactions between species (Pearson and Dawson 2003, p. 361; Hampe 2004, pp. 469-470). Climate can be considered a dominant factor at the continental scale, while at more local scales factors such as topography and land-cover type become important (Pearson and Dawson 2003, p. 368). Such is the case of the American pika, a species that is not only generally tied to cool, moist climate, but also is reliant upon particular topographical features and land-cover types such as talus, rock-ice features, and volcanic substrates and the features (such as caves or crevices) contained within them. If conditions at the landscape level are satisfied, biotic interactions and microclimate may become even more significant to species such as the American pika (Pearson and Dawson 2003, p. 368). Climate forecasts of species distributions are intended to be accurate at spatial resolutions at much coarser levels than the resolution of field data that have been collected for American pikas (Beever *et al.* 2009, p. 19).

We point out the following reasons for considering the bioclimatic envelope models discussed above as not being useful for the American pika status review:

(1) All three reports (Galbreath *et al.* 2009a, p. 14; Loarie *et al.* 2009, p. 5; Trook 2007, p. 6) provide projections for beyond mid-century; as stated earlier, we have determined that climate changes predictions for 2025 and 2050 are more reliable than projections for the second half (up until 2100) of the 21st century.

(2) Authors used relatively few explanatory (climate) variables in modeling current and future suitable habitat; none of the variables included those which are known to be important predictors of pika persistence, such as land-cover type (e.g., talus), microclimate, or other physical habitat features.

(3) Bioclimatic envelope models for pikas base persistence projections on surface temperatures. However, we determined that temperatures below the habitat surface, such as in talus crevices, are more important for survival of individual pikas and are a better predictor of persistence (see Climate Change and Pika Biology section).

(4) None of the models factor in the pika's documented behavioral ability to avoid warmer temperatures during the hottest part of the day.

Because of the problems associated with relying solely on available bioclimatic envelope models, we partnered with NOAA to assess temperature projections for the western United States and 22 pika-relevant sites representing the 5 subspecies (*Ochotona princeps princeps* (Northern Rockies), *O. p. saxatilis* (Southern Rockies), *O. p. fenisex* (Coast Mountains and Cascade Range), *O. p. schisticeps* (Sierra Nevada and Great Basin), and *O. p. uinta* (Uinta Mountains and Wasatch Range of Central Utah) (Hafner and Smith 2009, pp. 16-25) across the range of the species (NOAA 2009, pp. 1, 15-21). This information was useful in our analysis to determine if pikas would experience significant risk of extirpation within the foreseeable future.

The average projection of annual mean temperature increase for much of the interior western United States by 2050 is approximately 2.2 °C (range from 1.4 to 3.0 °C (4 °F (range from 2.5 to 5.5 °F)) (NOAA 2009, p. 15). Summers are predicted to warm more than winters (mean of 2.8 °C (5 °F) vs. 1.7 °C (3 °F)). In general, the dominant precipitation pattern in North America projects a wetter climate in northern portions of North America and a drier climate in the southwestern United States (NOAA 2009, p. 15); however, as previously stated, for much of the range of the American pika, precipitation projections diverge and are not in agreement (NOAA 2009, p. 15). The Washington Climate Change Impacts Assessment has projected an increase in average annual Pacific Northwest temperature of 1.1 °C (2.0 °F) by the 2020s and 1.8 °C (3.2 °F) by the 2040s when compared to climate observations from 1970 to 1999 (Mote and Salathé 2009, p. 21). By 2050, the summer J-J-A climate has moved northward in latitude and the climate zones of the valleys and mountains has migrated upward in elevation (NOAA 2009, p. 16).

Projections for climate at 22 sites anchored on pika observations tell a similar story to what is projected for the western United States. Using established methods and existing gridded temperature datasets (see NOAA 2009, pp. 15-20), NOAA generated site-specific projections for surface temperatures within elevation bands known to harbor pikas (Table 1). In Table 1, we present NOAA's calculations for the J-J-A mean surface temperatures from 1950 to 1999 (Column 4) and compare them to J-J-A mean surface temperature projections for 2050 (Column 5) using a medium emissions scenario. The projections shown here are for the average of the climate model projections considered. The NOAA study (2009, p. 19) also considers high- and low- end model projections. High-end projections are approximately 1 °C (1.8 °F) warmer than the multi-model average, and would indicate increased risk at a number of sites, including at the maximum elevations in some study areas.

For 2025 and 2050, projections from all three emissions scenarios (low, medium, and high) are nearly the same; therefore, their datasets reflect projected surface temperatures into the foreseeable future (a 20–year average centered on 2050). Upon calculating the J-J-A mean historical and projected surface temperatures at a mean elevation of the temperature gridcell (Column 2 in Table 1), NOAA (2009, pp. 26-27) performed a simple calculation using lapse rates (the change in temperature with changes in elevation) to determine the projected temperatures at the mean elevation to the actual minimum and maximum elevation of pika observations (Column 3 in Table 1) used in the analysis.

TABLE 1. HISTORICAL (1950 – 1999) CLIMATOLOGY AND J-J-A PROJECTIONS FOR AVERAGE DAILY TEMPERATURE AT ELEVATION FOR 22 HISTORICAL AMERICAN PIKA STUDY AREAS.

Temperature range of minimum and maximum elevation sites in each study area based on a simple lapse rate adjustment is shown in parentheses. Bold text indicates that the locations in the study area at the elevation of the gridcell used in the temperature analysis by NOAA, or at the minimum or maximum elevations, may be at higher risk from increased J-J-A temperature. Measure of risk is equal to or greater than 16.2 °C (61.2 °F). Multi-model average projections shown here. The NOAA study (NOAA 2009) also considers high- and low- end model projections.

SITE	Mean Elevation of Temperature Analysis (ft)	Range of Pika Observations (ft)	Historical J-J-A Mean Surface Temperature (°C)	Projected J-J-A Mean Surface Temperature (°C)
		O. p. fenisex		
Crater Lake	7,121	6,436 – 7,660	10.6 (12.0 - 9.6)	13.2 (14.5 – 12.1)
Mt. Hood/Three Sisters	8,062	6,242 – 7,621	9.85 (13.5 – 10.7)	12.4 (16.0 – 13.3)
Mt. St. Helens	3,691	3,000 – 4,200	13.3 (14.3 – 12.5)	15.7 (**16.7** – 14.9)
North Cascades/Mt. Baker	5,237	3,800 – 7,210	10.0 (12.9 – 6.1)	12.5 (15.4 – 8.6)
		O. p. princeps		
Bighorn Mtns	12,048	*	7.2 (NA)	10.2 (NA)
Clearwater Mtns	8,141	*	11.1 (NA)	14.1 (NA)
Gallatin National Forest	9,167	9,180	10.4 (NA)	13.4 (NA)
Glacier National Park	6,158	4,574 – 8,337	11.0 (14.1 – 6.7)	13.7 (**16.9** – 9.4)
N. Wasatch Mtns	9,755	8,472 – 10,800	13.2 (15.7 – 11.1)	**16.5** (**19.0** – 14.4)
Ruby Mtns	9,676	8,664 – 10,413	14.1 (16.1 – 12.6)	**17.4** (**19.4** – 15.9)
Sawtooth Range	9,085	6,857 – 8,382	11.3 (15.7 – 12.7)	14.4 (**18.8** – 15.8)
Wind River/Bridger-Teton	12,154	*	6.3 (NA)	9.6 (NA)
		O. p. saxatilis		
Sangre de Cristo Mtns	11,197	7,562 – 12,263	9.8 (**17.0** – 7.7)	12.7 (**19.9** – 10.6)
Southern Rockies	10,781	9,715 – 14,000	12.1 (14.2 – 5.7)	15.2 (**17.3** – 8.8)
		O. p. uinta		
Eastern Uintas	11,916	9,810 – 12,076	7.5 (11.6 – 7.2)	10.8 (15.0 – 10.5)
		O. p. schisticeps		

TABLE 1. HISTORICAL (1950 – 1999) CLIMATOLOGY AND J-J-A PROJECTIONS FOR AVERAGE DAILY TEMPERATURE AT ELEVATION FOR 22 HISTORICAL AMERICAN PIKA STUDY AREAS.—Continued

Temperature range of minimum and maximum elevation sites in each study area based on a simple lapse rate adjustment is shown in parentheses. Bold text indicates that the locations in the study area at the elevation of the gridcell used in the temperature analysis by NOAA, or at the minimum or maximum elevations, may be at higher risk from increased J-J-A temperature. Measure of risk is equal to or greater than 16.2 °C (61.2 °F). Multi-model average projections shown here. The NOAA study (NOAA 2009) also considers high- and low- end model projections.

SITE	Mean Elevation of Temperature Analysis (ft)	Range of Pika Observations (ft)	Historical J-J-A Mean Surface Temperature (°C)	Projected J-J-A Mean Surface Temperature (°C)
Bodie Mtns	8,841	8,530 – 8,635	12.3 (12.9 – 12.7)	15.2 (15.8 – 15.6)
SE Oregon	7,600	5,800 – 7,925	12.8 (**16.4** – 12.2)	15.9 (**19.4** – 15.2)
Monitor Hills	8,250	8,105 – 8,822	13.0 (13.3 – 11.9)	16.0 (**16.3** – 14.8)
Sierras/Yosemite	10,270	9,657 – 11,160	9.0 (10.2 – 7.2)	11.8 (13.0 – 10.0)
S. Wasatch Mtns	10,520	8,472 – 10,800	12.9 (**16.9** – 12.3)	16.0 (**20.0** – 15.4)
Toiyabe Mtns	9,092	7,896 – 11,023	12.4 (14.8 – 8.6)	15.5 (**17.9** – 11.7)
Warner Mtns	7,326	5,429 – 8,267	14.8 (**18.6** – 13.0)	**17.8** (**21.5** – 15.9)

* Local summit chosen as a representative site. Range of pika observations not available. NA = Not Available.

The resulting 2050 J-J-A projections for surface temperatures are consistently higher than the recent climatology by approximately 3 °C (5.4 °F), which is consistent with a projected increase in temperature on a west-wide United States basis (NOAA 2009, p. 29). The low model projections are in most cases higher than the 90th percentile of recent climatology, which suggests that the coolest summers of the mid-21st century at the 22 pika sites will be warmer than the hottest summer of the recent past (NOAA 2009, p. 19). The NOAA states that the set of projections for surface temperatures in 2050 are statistically different from the historical climatology.

Based on NOAA's calculations (NOAA 2009, p. 20), we compared past versus projected climatology for each of the 22 pika sites chosen to represent habitats for the five subspecies *(Ochotona princeps princeps*, *O. p. saxatilis, O. p. fenisex*, *O. p. schisticeps*, and *O. p. uinta*) across the range of the species.

Chronic heat-stress (e.g., recent average summer (J-J-A) subsurface temperatures) was identified as the best predictor of pika extirpations (Beever *et al.* 2009, p. 18). Pika-extirpated sites from the Great Basin had warmer below-talus temperatures than pika-extant sites from time periods 1945-1975, 1976-2006, and 2005-2006 (Beever *et al.* 2009, Table 1), with the strongest predictive ability of heat stress metrics being based on recent climate during 2005-2006 (Beever *et al.* 2009, pp. 13, 18). For the most recent time period, below-talus (0.8 m (2.6 ft) subsurface) temperatures from extirpated sites had a mean temperature of 17 °C (62.6 °F) plus or minus one standard error of 0.8 °C (1.4 °F) when compared to a mean temperature of 12.4 °C (54.3 °F) plus or minus one standard error of 1.0 °C (1.8 °F) for extant sites. Therefore, we assumed that warmer below-talus temperatures increase the risk of extirpation to American pikas.

The following discussion analyzes the effects on pika populations of: (1) Historical mean summer surface temperatures; (2) projected mean summer surface temperatures; and (3) estimated subsurface temperatures. As stated previously, below-talus temperatures from extirpated sites had a mean temperature of 17 °C (62.6 °F) when compared to a mean temperature of 12.4 °C (54.3 °F) for extant sites (Beever *et al.* 2009, Table 1). However, we were unable to convert historical and projected average summer surface temperatures to below-talus temperatures at the 22 pika sites used in NOAA's analysis. Relationships between surface and subsurface temperatures at the 22 pika sites are not known. The relationship between surface and subsurface temperatures is not linear and is site-specific, making it impossible to generalize across the range of a subspecies or the species as a whole. Therefore, we used a mean surface temperature of 16.2 °C (61.2 °F), which is equal to 17 °C (62.6 °F) minus one standard error of 0.8 °C (1.4 °F), as a conservative indicator of increased risk to pika populations used in NOAA's report (2009). We determined that any pika site that was projected to experience a surface temperature (realizing that below-talus temperatures can be substantially cooler than surface temperatures in the summer) of greater than or equal to 16.2 °C (61.2 °F) would be at increased risk of extirpation as a result of stress from climate change. The sites that exceed our measure of risk are represented by the bold numbers in Table 1 above. This temperature should not be considered deterministic, but only a starting point, based on current best available science, for identifying a temperature range that represents increased risk to pikas.

Table 1 above uses our conservative measure of potential risk and shows that historical climatology (J-J-A mean for 1950 to 1999) at the mean elevation for NOAA's climate projections, and at higher elevations (J-J-A mean for 1950 to 1999 at maximum elevations) known to harbor pikas, suggests that all sites (22 of 22) across the range of species were not at risk from average summer surface temperatures of greater than or equal to 16.2 °C (61.2 °F) from 1950 to 1999. However, historical climatology at minimum elevations (J-J-A mean 1950 to 1999 at minimum elevations) demonstrate that lower elevation pika sites (4 of 18) were at higher risk of experiencing adverse effects as a result of increased average summer temperatures from 1950 to 1999. Pika sites at relatively low elevations from the Sangre de Cristo Mountains, mountains of southeastern Oregon, southern Wasatch Mountains, and Warner Mountains were at risk from high average summer temperatures (Table 1 above). In fact, extirpations occurred at low elevations in areas adjacent to the Warner Mountains, in the mountains of southeastern Oregon, and southern Wasatch Mountains (Beever *et al.* 2003, p. 43; Oliver 2007,

p. 5; Wilkening 2007, p. 58). We are not aware of any extirpations from the Sangre de Cristo Mountains; however, we have no historical information to compare back to recent survey data. Corroboration of findings between NOAA's report and other recent reports of extirpations or higher risk areas in the Great Basin suggests mean summer temperature is a useful variable for predicting the relative risk of increased temperatures to pika populations.

We do not anticipate the species to be adversely affected on a range-wide basis by increased summer temperatures. In our climate change risk assessment, we determine that no pika site would be at risk across its entire range of elevation, but some mid- to low-elevation areas that contain pikas would be at risk from increased summer surface temperature (Table 1 above). This determination, paired with the fact there is a significant amount of habitat not at risk from climate change, prevents the species from being threatened or endangered from climate change. The relatively low elevations within pika sites that would be at risk were distributed among four of five subspecies, with *Ochotona princeps uinta* not containing any populations that would be at risk. These relatively low-elevation, at-risk areas do not represent a substantial amount of pika habitat, especially since pikas primarily occupy high-elevation talus habitat. Therefore, we conclude the entire species would not be at risk from increased summer surface temperatures now or in the foreseeable future. Our next analysis focuses on a climate change risk assessment at the subspecies level as discussed below.

We determine that portions of the Sierra Nevada subspecies, *Ochotona princeps schisticeps*, may be at risk of extirpation due to potential impacts from recent and future climate change. In general, the populations of *O. p schisticeps* that would be at highest risk of extirpation represent the lower elevation sites in the Great Basin with correspondingly higher mean temperatures. Populations at mid- to high elevations at most sites, which are projected to be cooler than 16.2 °C (61.2 °F), should not be at risk of extirpation as a result of exposure to increased summer temperatures. We expect at least portions (primarily lower elevations) of five of seven sites for *O. p. schisticeps* (Table 1 above) to be at risk from increased summer temperatures by the year 2050.

Pika populations in the Bodie Mountains and the Sierra Nevada Range are not at risk of extirpation. Populations in the Sierra Nevada Range are not at risk due to the preponderance of high-elevation habitats (2,943 to 3,402 m (9,657 to 11,160 ft)) and correspondingly cooler environments. This conclusion is consistent with available literature (Beever *et al*. 2003, pp. 43, 45; Smith 2009, p. 5), which suggests that lower elevation sites, particularly along the southern edge of the species' range, are at a higher risk of being extirpated from increased temperatures.

We also determine that portions of the Northern Rocky Mountain subspecies, *Ochotona princeps princeps*, may be at risk of extirpation due to potential impacts from future climate change. We anticipate higher risks of extirpation for low to medium elevation (below approximately 3,048 m (10,000 ft)) of *O. p. princeps* populations in the Northern Wasatch Mountains of Utah, Ruby Mountains of Nevada, lower elevations of Glacier National Park, and Sawtooth Range in Idaho. These higher risks are due to projected mean surface temperatures above our 16.2 °C (61.2 °F) measure of elevated risk (Table 1 above).

We do not anticipate an increase in mean summer temperature by 2050 will have an adverse affect on the majority of *O. p. princeps* populations found in Wyoming, Idaho, and Montana; specifically in the Bighorn Mountains, Clearwater Mountains, Gallatin National Forest, mid- to high elevations of Glacier National Park, Wind River Range, and Bridger-Teton National Forest. Average summer surface temperature for these areas is projected to be below 16.2 °C (61.2 °F). The NOAA was unable to generate surface temperature projections for 2050 at minimum and maximum elevations of occupied pika sites in the Bighorn Mountains, Clearwater Mountains, Gallatin National Forest, Wind River Range, and Bridger-Teton National Forest. Specific locations (latitude and longitude coordinates) for pika populations, which are necessary in order to generate temperature projections at elevation, were not available for these five areas. While temperature projections are not available for these five areas, it is possible that at least some lower elevation pika sites will be at increased risk of extirpation as a result of exposure to summer temperatures at or above 16.2 °C (61.2 °F). Mid- to high-elevation sites, where pikas are usually more common in the Northern Rocky Mountain Range, should be at a lower risk of extirpation or experience no risk, because summer temperatures will be cooler. Therefore, we anticipate the majority of *O. p. princeps* populations will not be at risk from increased summer temperature.

We also determine that portions of the Coast Mountain and Cascade Range subspecies, *Ochotona princeps fenisex*, may be adversely affected by climate change. We anticipate risks to pika populations occurring at lower elevations (approximately 914 m (3,000 ft or less)) at Mt. St. Helens. Pika populations occurring above approximately 914 m (3,000 ft) at Mt. St. Helens would likely experience a reduced risk of extirpation from increased summer temperature. Projections for 2050 summer surface temperature are below our measure of increased risk (16.2 °C (61.2 °F)) at Crater Lake, near Mt. Baker in the North Cascades Mountain Range, and the Mt. Hood/Three Sisters Mountains; therefore, we do not anticipate any risks to pika populations in these areas (Table 1 above). Of the 69 unique pika observations used to generate an elevation range of *O. p. fenisex*, we do not anticipate risks (temperature approximately greater than or equal to 16.2 °C (61.2 °F)) from increased summer temperatures occurring at 98 percent (68 of 69) of the observation points. Therefore, we determined that the majority of *O. p. fenisex* populations would not be at a high risk of extirpation from increased summer temperatures by 2050. Because a sufficient amount of the habitat for *O. p. fenisex* is not at risk, we determined that future climate change does not threaten or endanger the subspecies.

We do not anticipate populations of *Ochotona princeps uinta* to be at risk from the effects of increased summer temperatures; all projected surface temperatures remain below our measure of elevated risk (16.2°C (61.2°F)) (Table 1 above). Therefore, we do not anticipate adverse population-level effects from increased summer temperatures to occur in populations of this subspecies.

We do not anticipate an increase in mean summer temperature by 2050 to have an adverse effect on the majority of *Ochotona princeps saxatilis* populations, because the majority (76% in Colorado) of pika populations in the Southern Rocky Mountains occur at higher elevations where temperatures will remain below our 16.2 °C (61.2 °F) measure of elevated risk (Table 1 above; CDOW 2009, p. 21). Lower elevation populations of *O. p. saxatilis* in the Sangre de Cristo Mountains of northern New Mexico and Southern Rocky Mountains in Colorado are at higher risk of extirpation than populations occurring at mid- to high elevations in the Sangre de Cristo Mountains and Southern Rocky Mountains, again due to higher mean summer temperatures

(Table 1 above). The majority of the pika populations in the Sangre de Cristo Mountains of New Mexico and Southern Rocky Mountains of Colorado occur at elevations near or greater than 3,353 m (11,000 ft) (CDOW 2009, p. 16; USFS 2009, pp. 2-6). We expect lower risks of extirpation at these sites as a result of populations being exposed to relatively lower average summer temperatures (below 16.2 °C (61.2 °F)).

As previously discussed, the subsurface temperatures of occupied habitats are a better predictor of the temperatures experienced by individual pikas and of the persistence of populations (Beever *et al.* 2009, pp. 9-10; Millar and Westfall 2009, p. 21). In addition to presenting comparisons of average summer surface temperatures, we reviewed below-surface (0.8 m (2.6 ft) below talus surface) temperatures as a variable to compare extant to extirpated sites (Beever *et al.* 2009, Table 1).

Summer microclimate in below-talus interstices is significantly cooler, as much as 24 °C (43.2 °F) during the hottest times of day (Finn 2009a, pers. comm.), at pika-extant sites compared to pika-extirpated sites (Beever *et al.* 2009, Table 1). Millar and Westfall (2009, p. 20) discovered that within-rock matrix (interstitial spaces between boulders) temperatures at Sierra Nevada pika sites are as much as 4 to 7 °C (7.2 to 12.6 °F) lower than adjacent bedrock or mineral soil. Below-talus (0.8 m (2.6 ft)) temperatures from five Great Basin pika sites were on average 6 °C (10.8 °F) cooler than those recorded from the surface during the hottest time of the day (Finn 2009a, pers. comm.), which is the time of day when pikas retreat to subsurface areas to escape thermally stressful conditions (at least at lower elevations sites).

Based on these data, it is evident that conditions below the talus-surface are site-specific and likely are specific to several other factors at a finer scale. These data suggest that pikas can persist in relatively warm surface environments if temperatures below the talus-surface contain favorable thermal conditions for survival (Millar and Westfall 2009, p. 21).

Comparisons between below-talus summer temperatures and surface summer temperatures indicate that our risk assessment for climate change may be overly conservative because risk estimates for pika sites were based on projections for summer surface temperatures. Because below-talus microclimate provides pikas with cool habitat during the hottest time of day during the summer, and pikas are dependent on these subsurface environments for survival, heat-stress levels experienced by pikas may be less than expected. The actual risk levels for pika populations at these sites are likely to be lower than we estimate above.

In summary, we anticipate that the majority of *Ochotona princeps princeps, O. p. fenisex*, *O. p. schisticeps,* and *O. p. saxatilis* populations are not now or will not be at risk of extirpation due to increased summer temperatures resulting from climate change in the foreseeable future. Our analysis also shows that no portions of the *O. p. uinta* populations are at risk of extirpation now or in the foreseeable future due to climate change. Increased summer temperatures have the potential to adversely impact some lower and mid-elevation pika populations of *O. p. princeps, O. p. fenisex*, *O. p. schisticeps,* and *O. p. saxatilis* in the foreseeable future; however, this does not equate to a significant portion of the suitable habitat for any of these subspecies or the species collectively. American pika can tolerate a wider range of temperatures and precipitation than previously thought (Millar and Westfall 2009, p. 17). The American pika has demonstrated flexibility in its behavior and physiology that can allow it to adapt to increasing temperature (Smith 2009, p. 4). Based on all these lines of evidence, we determine that climate change is not a threat at the species-level or the subspecies-level now or in the foreseeable future.

Livestock Grazing

In general, pikas forage within 50 m (164 ft) of talus. The potential for interactions between pika and livestock in the immediate vicinity of talus (i.e., within 50 m (164 ft)) depends on the site-specific conditions. In some areas, steep terrain or rock formations may largely prevent livestock from accessing talus margins (Beever *et al.* 2003, p. 50); in other areas, if livestock have access to the talus edge, effects to pikas from livestock presence may not be through competition for food, but rather an indirect influence of trampling of soils or vegetation affecting vegetative growth (Beever *et al.* 2003, p. 49). Livestock grazing also could reduce vegetation close to talus habitat and subsequently cause pikas to forage farther from the protective cover of talus, thus increasing energy demands and risk of predation (Beever *et al.* 2003, p. 49). However, Beever *et al.* (2003, p. 50) noted the presence of an active haypile directly under a well-traveled horse trail and several haypiles near other trails in Nevada, suggesting that livestock may not affect foraging activities. Livestock generally avoid crossing rocky talus slopes, preventing direct interactions between livestock and pikas (Beever *et al.* 2003, p. 50). If interactions are happening between pika and livestock that result in a negative impact, we believe that these impacts occur primarily on a local scale within few pika habitats and are not a threat to overall pika populations.

There are few studies regarding the effects of grazing on pika populations. Within the range of *Ochotona princeps schisticeps*, extirpations at 6 of 25 sites in the Great Basin occurred primarily in livestock-grazed areas (Beever *et al.* 2003, p. 43). A modeling revealed that grazing was one of the top three predictors of the probability of pika extirpation (Beever *et al.* 2003, pp. 45, 46, 49). However, the authors stated their methods were not sufficient to determine whether a cause-and-effect relationship existed (Beever *et al.* 2003, p. 47), and they subsequently withdrew their conclusion due to errors in the analysis (Beever 2009c, pers. comm.). Reanalysis showed that grazing occurrence at pika sites in the Great Basin was no longer in the top models to predict the probability of population extirpation (Beever 2009c, pers. comm.), showing there is not a significant correlation between pika extirpations that have occurred in the Great Basin and livestock grazing.

Additionally, it also is possible that livestock do not affect the generalist diet of pikas. In North America, pika diet changes in the face of changing nutrition values in available plant species by shifting to an increase in sedges and forbs, especially in late summer when grasses become less nutritious. In general, cattle and horses, as ruminants, prefer grasses (graminoids) over forbs or shrubs (Shipley 1999, pp. 20-21) and can be considered specialist foragers relative to American pikas, which are generalist foragers. Furthermore, Wilkening (2007, p. 39) found that the relative amount of forb cover, not graminoids, was the single greatest predictor of persistence for *Ochotona princeps schisticeps* in the Great Basin. We conclude that the potential competition for forage between pikas and livestock is low.

In summary, the potential for interactions between pika and livestock in the immediate vicinity of talus where pikas forage depends on the site-specific conditions. In some areas, steep, rocky terrain may largely prevent livestock from accessing talus margins (Beever *et al.* 2003, p. 50). If livestock have access to the talus edge, effects to pikas may be indirectly influenced by trampling of soils or vegetation (Beever *et al.* 2003, p. 49). However, livestock generally avoid crossing rocky talus slopes, preventing direct interactions between livestock and pikas (Beever *et al*. 2003, p. 50). Thus, livestock may not affect foraging activities (Beever *et al*. 2003, p. 50). Pikas are generalist foragers while livestock specialize in foraging on graminoids (grasses), reducing the potential competition for forage. If interactions are happening between pika and livestock that result in negative impacts, we believe that these impacts occur primarily on a local scale within few pika habitats and are not a threat to overall pika populations. We conclude that livestock grazing is not a significant threat to any of the five subspecies of the American pika and, therefore, is not a threat to the species now or in the foreseeable future.

Native Plant Succession

Changes in vegetation, such as conifer encroachment into subalpine or alpine meadows, could potentially affect available forage for the American pika. Altitudinal treeline in the western North America has rarely moved more than 100 m (330 ft) vertically during the Holocene period, even during prolonged warm periods (Rochefort *et al*. 1994 cited in Farge 2003, p. 267). Although there is no clear evidence of uniform upward altitudinal treeline movement, tree establishment in subalpine meadows has been documented across the range of the American pika in areas like Glacier National Park in Montana (Bekker *et al*. 2000 cited in Farge 2003, p. 267), Mount Rainer National Park (Franklin *et al*. 1971, p. 215) and the Olympic Mountains (Woodward *et al*. 1995, p. 217) in Washington, the central Sierra Nevada mountain range in California (Millar *et al*. 2004, p. 181), the White Mountains of south-central New Mexico (Dyer and Moffett 1999, p. 444) and the Uinta Mountains in Utah (Dyer and Moffett 1999, p. 452).

Tree establishment in subalpine meadows may affect pikas for a number of reasons. Trees near pika territories could obstruct a pika's ability to visually detect predators, and trees could provide perches for avian predators (Wilkening 2007, pp. 42-43). Tree presence in meadows also alters vegetation composition that could potentially affect pika foraging behavior or forage availability. Relative tree cover is negatively correlated with *Ochotona princeps schisticeps* occupancy in the Great Basin (Wilkening 2007, p. 42). However, *O. p. schisticeps* sites in Lava Beds National Monument in northern California that have a low ratio of grass (graminoids) to forbs, shrubs, and trees are more likely to be used by pikas (Ray and Beever 2007, p. 45). *O. p. schisticeps* sites recently discovered on the Klamath National Forest in northern California found pikas occurring in talus sites surrounded by mixed conifer forests at approximately 1,800 m (6,000 ft) in elevation and haypiles at those sites that included conifer branches (Hoyer and Fleissner 2009, pers. comm.). Studies also have documented pika foraging on tree saplings, which may prevent the establishment of trees near talus areas occupied by pikas (Krear 1965 and Simpson 2001 cited in Wilkening 2007, p. 42).

Studies on *Ochotona princeps schisticeps* in the Great Basin have demonstrated that vegetation factors, specifically relative forb cover, influence pika persistence (Wilkening 2007, p. 39) and are a strong predictor of occupancy (Ray and Beever 2007, p. 1). Relative forb cover is negatively correlated with mean summer temperature and average daily summer highs (Wilkening 2007, p. 39). Wilkening's (2007, p. 40) analysis is based on only two years of temperature data collected at extant and extirpated sites and may not represent conditions pikas experienced when extirpations occurred. It also is too short of a time period to document temperature variability, and it may not be representative of what pikas may experience in the future.

Meadow invasions during the 20th century are correlated with climate change and other abiotic factors (Dyer and Moffett 1999, pp. 444, 452; Millar *et al*. 2004, p. 181). Precipitation (snow depth or snow pack) (Rochefort and Peterson 1996, p. 52; Farge *et al*. 2003, p. 263) and snow-free periods in subalpine meadows (Franklin *et al*. 1971, p. 215) are critical variables regulating conifer expansion. Tree encroachment also is influenced locally by vegetation type, topographic variation, landscape position (Rochefort and Peterson 1996, p. 58), aspect (Dyer and Moffett 1999, p. 453), and warmer minimum temperatures (Millar *et al*. 2004, p. 193) making uniform predictions difficult across the range of the American pika. However, in general, tree and shrub distributions in North America are likely to shift northward and upward in elevation in response to future climate change and species ranges (Shafer *et al*. 2001, p. 213).

One example of a study investigating vegetative response to climate change occurs within the range of *Ochotona princeps saxatilis* in Colorado. This study shows increased warming expected under an atmosphere with a concentration of carbon dioxide twice that of pre-industrial levels could change the dominant vegetation of meadow habitat from forbs to shrubs like *Artemisia tridentata* (sagebrush) and *Pentaphylloides floribunda* (shrubby cinquefoil) (Harte and Shaw 1995, p. 876). However, Dearing (1996, p. 474) found both of these plant species in abundance in pika haypiles in Colorado. While climate change has historically and may continue to affect sagebrush and shrubby cinquefoil distribution in Colorado in the future, it appears that pikas are adapting locally to these vegetative changes and utilizing these plant species in their haypiles.

Although we have data to support that climate change has the potential to influence vegetative species distribution in the future, the resolution at which the simulations are made is very coarse (25 km (15.5 mi) grids in Shafer *et al*. 2001 (p. 202)). Very coarse data are difficult to apply to the American pika. All species have inherent spatial bounds on their life histories which can very extremely among species. Considering all vertebrates, American pikas are close to the smaller end of this spectrum. A typical pika can live its entire life within a 0.8 km (0.5 mi) diameter circle, which, ecologically, is bounded by the extent of a talus patch and a narrow buffer surrounding it. Conversely, climate models are often initially constructed at much coarser resolution – as much as 60 x 60 km (37.3 x 37.3 mi) resolution. For each climatic parameter (average temperature, average precipitation) there is only one value for each pixel (i.e., 60 x 60 km (37.3 x 37.3 mi) cell) despite the known ecological variation present in this pixel. Several techniques are available to 'downscale' climate models and downscaled maps are available (e.g., Shafer *et al*. 2001). However, factors such as topography, landform, geology, and soil properties can modify climate properties at finer resolutions. Whereas modelers have high confidence in coarse resolution climate models downscaled climate model interpretations becomes less reliable especially when applied to an ecological response (i.e., pika behavior) acting at fine resolution. Using plant species distribution models from Shafer *et al*. (2001) as an example, there may be fine-resolution factors (e.g., soil properties) affecting plant species distributions that were not accounted for. That may be acceptable when tracking common species range shifts but not necessarily useful to evaluate threats to a population inhabiting a small fraction of a pixel, such as in the case of the American pika.

Additionally, projections of vegetative changes from Shafer *et al*. (2001) are for a 10–year period around 2090, a time period in which we think drawing any conclusions would be too speculative. Pikas have a generalist diet and manipulate vegetative species composition and growth rates in areas where they forage. As a result of these life history characteristics, we anticipate pikas will likely be able to adapt the level of changes happening to vegetative communities as a result of climate change. We have no clear trends to indicate that native plant succession as a result of climate change represents a significant threat to the American pika's ability to forage.

In summary, the relationship between pikas and their associated vegetative communities are complex, multifaceted and not well understood (Wilkening 2007, p. 40). Potential changes in native vegetative plant communities, including tree encroachment of meadows, in American pika habitat could affect foraging. Pikas do not forage far from talus areas, and they manipulate the vegetative species composition and growth rates where they forage, suppressing plant succession. There are no clear trends showing that native vegetative changes are occurring at the scale that would affect pika foraging habitat and there is no evidence to suggest that native plant succession is a threat to pikas. We do not believe that this represents a significant threat to any of the five subspecies of the American pika and is not a threat to the species as a whole now or in the foreseeable future.

Invasive Plant Species

Nonnative plant invasions vary according to climate, elevation, soils, and topography, as well as natural or human-mediated disturbance (Parks *et al.* 2005, p. 151). Several studies in North America indicate a negative correlation between elevation and nonnative species' richness or abundance. Invasive species richness may decline with increasing elevation because fewer species (native as well as nonnative) thrive in the shorter growing seasons, cooler temperatures, and generally more stressful environment of subalpine and alpine ecosystems than at lower elevations (Zouhar *et al.* 2008, p. 28). Parks *et al.* (2005, pp. 149, 154) synthesized much of the available information on the patterns of invasive plant diversity within the northwest mountain regions of the United States and found that alpine and subalpine plant communities (including wilderness areas and national parks) are still relatively unaffected by invasive plants. This condition is due in part to the remoteness of these areas and limited human access to these sites. However, Parks *et al.* (2005, p. 149) found that hay hauled into wilderness areas to support horses and mules for hunting and pack trips is a major source of noxious weeds, but the nonnative plant distribution along trails decreased sharply within a few meters (feet) of the trails, indicating that wilderness areas are not ideal habitats for nonnative plants.

Fire can result in nonnative plant invasions at high elevations. Fire increases resource availability for invading plants, exposes mineral soils, reduces native species dominance and vigor, and could accelerate invasions (Zouhar *et al.* 2008, p. 28). Within the forests of the western United States, the greatest increases in wildfire frequency have been in the northern Rocky Mountains followed by the Sierra Nevadas, and the southern Cascade Mountains and the Coast Ranges of northern California and southern Oregon (Westerling *et al.* 2006, p. 941). This increase in fire frequency has occurred between 1,680 and 2,590 m (5,512 and 8,497 ft) in elevation and with the greatest increase centered around 2,130 m (6,988 ft) (Westerling *et al.* 2006, p. 941). Reduced winter precipitation, early spring snow melt, warmer spring and summer temperatures, longer dry summers, and drier vegetation all played a role in the increased wildfire activity (Westerling *et al.* 2006, p. 943). Whether the changes observed in wildfire are the result of greenhouse gas-induced climate change or normal climatic variability, climate model projections indicate that warmer springs and summers will occur in the coming decades creating conditions favoring the occurrence of large wildfires in forested areas (Westerling *et al.* 2006, p. 943) which would potentially affecting the spread of invasive plant species.

However, the pioneering nonnative species most favored in recent burns are unlikely to persist in high-elevation environments (Zouhar *et al.* 2008, p. 28). This outcome has been confirmed in fire effects studies conducted in wilderness and national parks along the crest of the Cascade Mountains that have not found nonnative plants (Douglas and Ballard 1971, pp. 1061-1062; Miller and Miller 1976 and Hemstrom and Franklin 1982 cited in Parks *et al.* 2005, p. 145); whether this absence is due to lack of seed source or environmental barriers to establishment is unknown. Therefore, we conclude that fire occurrences at high elevations in alpine and subalpine areas are not likely to increase nonnative plant invasions and this factor does not represent a significant threat to pika foraging.

When we reviewed the State WAPs in the range of the American pika, we found that invasive plants are listed as threats in some pika habitat, but not in the species' primary alpine habitat. New Mexico's WAP acknowledged that wet meadow habitat can be manipulated to replace native vegetation with pasture species (NMDGF 2006, p. 183). California's WAP (Bunn *et al.* 2006, p. 272) listed invasive plants as a threat to the Modoc plateau (for example, *Bromus tectorum* (cheatgrass) and *Lepidium virginicum* (pepper weed)), but stated that subalpine and alpine plant communities in the Sierra Nevada and Cascades are relatively intact, with few invasive plants (Schwartz *et al.* 1996 cited in Bunn *et al.* 2006, p. 299). Similarly, Nevada's WAP (NDOW 2005, p. 159) did not list invasive plants as a threat to alpine and subalpine habitats. Utah's WAP (Sutter *et al.* 2005, pp. 5-7, 8-7) listed invasive plants (cheatgrass and noxious weeds) as a threat to the American pika's secondary habitat of mountain shrub. Alpine habitats that are the primary habitat for the American pika are not identified as a key habitat by the State of Utah and, therefore, threats to this habitat are not listed in the Utah WAP (Sutter *et al.* 2005, pp. 5-8).

The invasion of the American West by *Bromus tectorum* has caused widespread modifications in the vegetation of semi-arid ecosystems (Rowe and Brown 2008, p. 630) replacing native vegetation with a monoculture of nonnative annual grass. Additionally, invasions of *B. tectorum* and other nonnative grass species alter fuel loads, alter fuelbed flammability, and increase fire frequency and intensity (Zouhar *et al.* 2008, pp. 38-39), further promoting the spread of *B. tectorum*. Generally this invasion is occurring at or below 2,000 m (6,562 ft) in elevation; however, *B. tectorum* has been documented in Rocky Mountain National Park up to 2,750 m (9,022 ft) in elevation (Rowe *et al.* 2007, p. 45), suggesting that *B. tectorum* may be a future invader of higher elevations.

Bromus tectorum is a relatively nutritious food plant for herbivores in its earliest stages, but as the grass matures it presents mechanical difficulties for digestion and has low nutritional value for herbivores (Klemmedson and Smith 1964, p. 249). Additionally, the period that *B. tectorum* is palatable and nutritious for herbivore consumption is considerably shorter than for most native herbaceous plants (Klemmedson and Smith 1964, p. 250). Studies have documented *B. tectorum* in haypiles at *Ochotona princeps princeps* sites in central Idaho

(Elliot 1980, p. 208). At sites in the Great Basin, *B. tectorum* was the fourth or fifth most abundant plant species in *Ochotona princeps schisticeps* haypiles (Beever *et al.* 2008, pp. 11, 14). Even though pikas are haying *B. tectorum*, studies have not documented pikas grazing on *B. tectorum* nor has the nutritional value and digestibility of *B. tectorum* for pikas been investigated (Wilkening 2007, p. 10; Beever *et al.* 2008, p. 12).

Bromus tectorum seeds can germinate even after the mature plant is uprooted or its stem is cut, or after seeds pass through an herbivore's digestive system. Thus, pikas may alter the dynamics of the spread of *B. tectorum* at local spatial scales (Beever *et al.* 2008, p. 12). The pika's consumption and digestibility of seeds is unknown; thus, the potential for seed redistribution also is unknown. At this time, there is no data that indicate that *B. tectorum* presence in pika habitat represents a significant threat to the species or any of the five subspecies.

In summary, invasions of nonnative plants could change the composition of meadows used for foraging by the American pika. However, subalpine and alpine ecosystems are relatively intact and free from invasive species. *Bromus tectorum* (cheatgrass) has been documented in pika habitat below 2,750 m (9,022 ft) in elevation. *Ochotona princeps schisticeps* and *O. p. princeps* have been documented to use this species, but the nutritional value and digestibility of *B. tectorum* for pikas is poorly understood. At this time, we have no evidence indicating that invasive plant species pose a significant threat to any of the five subspecies of the American pika and, therefore invasive plant species are not a threat to the species now or in the foreseeable future.

Fire Suppression

Fire is considered an important factor in creating and maintaining meadow areas, and the microclimate of the fire-created openings determines whether or how fast trees reinvade (Franklin *et al.* 1971, p. 221). For example, many subalpine meadows in the Olympic Mountains in Washington were probably created by fire (Woodward *et al.* 1995, p. 218).

Human suppression of wildfires could allow for the establishment of trees in subalpine meadows. However, in general, human wildfire suppression efforts focus on protection of urban areas first and foremost. Pikas typically occur in remote areas far from urban settings where human access for suppression is sometimes difficult due to the remoteness of the area and steep terrain. Additionally, in most cases, pika occur in wilderness areas, national parks, and other federally protected areas with specific management goals and objectives that implement Minimum Impact Suppression Tactics (MIST). The MIST emphasize suppressing wildland fire with the least impact to the land and use the minimum amount of fire-fighting resources necessary to effectively achieve the fire management protection objectives consistent with land and resource management objectives (National Wildfire Coordinating Group 2003, p. 1). Implementation of MIST in areas where pikas occur on federally protected lands minimizes the potential for humans interfering with the process of wildfires limiting tree encroachment and creating or maintaining alpine meadows. Additionally, implementation of MIST reduces the possibility of humans acting as vectors for introduction of invasive plants. We conclude that there is no evidence that indicates that human fire suppression efforts represent a significant threat to pikas.

In summary, fire is considered an important factor in creating and maintaining meadow areas. Human suppression of wildfires could allow for the establishment of trees in subalpine meadows or possible invasions from nonnative plants in pika habitat. However, pikas typically occur in remote areas and in most cases, are occurring in federally protected areas with specific management goals and objectives that implement MIST. We conclude that there is no evidence to indicate that human fire suppression efforts are a significant threat to any of the five subspecies of the American pika; therefore, fire suppression is not a threat to the species now or in the foreseeable future.

Summary of Factor A

In our analysis of Factor A, we identified and evaluated the following risks to habitat of the five subspecies of the American pika and the species as a whole: (1) Climate change; (2) livestock grazing; (3) native plant succession; (4) invasive plant species; and (5) fire suppression.

Increased summer temperatures as a result of climate change may have the potential to adversely affect some lower and mid-elevation pika populations of *Ochotona princeps princeps, O. p. fenisex*, *O. p. schisticeps* and *O. p. saxatilis* in the foreseeable future; however, this does not equate to a significant portion of the suitable habitat for any of the five subspecies or the species collectively. American pika can tolerate a wider range of temperatures and precipitation than previously thought (Millar and Westfall 2009, p. 17). The American pika has demonstrated flexibility in its behavior, such as using cooler habitat below the surface to escape hotter summer daytime temperatures, and physiology that can allow it to adapt to increasing temperature (Smith 2009, p. 4). Cooler temperatures below the talus surface can provide favorable thermal conditions for pika survival in relatively warm surface environments. Based on all these lines of evidence, we have determined that climate change is not a threat at the species or the subspecies-level now or in the foreseeable future.

The potential for interactions between pika and livestock where pikas forage depends on the site-specific conditions. If interactions are happening between pika and livestock that result in negative impacts, we believe that these impacts occur primarily on a local scale within a few pika habitats and are not a threat to overall pika populations. We conclude that livestock grazing is not a significant threat to any of the five subspecies of the American pika and, therefore, it is not a threat to the species now or in the foreseeable future.

Potential changes in native vegetative plant communities, including tree encroachment of meadows, in American pika habitat could affect foraging. Pikas do not forage far from talus areas, and they manipulate the vegetative species composition and growth rates where they forage, suppressing plant succession. There are no clear trends showing that native vegetative changes are occurring at the scale that would affect pika foraging habitat and there is no evidence to suggest that native plant succession is a threat to pikas. We do not believe that native plant succession represents a significant threat to any of the five subspecies of the American pika and, therefore, it is not a threat to the species now or in the foreseeable future.

Invasions of nonnative plants could change the composition of meadows used for foraging by the American pika. However, studies document that subalpine and alpine ecosystems are relatively intact and free from invasive species. *Bromus tectorum* (cheatgrass) has been documented in pika habitat below 2,750 m (9,022 ft) in elevation. *Ochotona princeps schisticeps* and *O. p. princeps* have been documented to use this species, but the nutritional value and digestibility of *B. tectorum* for pikas is poorly understood. At this time, we have no evidence indicating that invasive plant species pose a significant threat to any of the five subspecies of the American pika, and, therefore, invasive plants are not a threat to the species now or in the foreseeable future.

Fire is considered an important factor in creating and maintaining meadow areas. Human suppression of wildfires could allow for the establishment of trees in subalpine meadows or possible invasions from nonnative plants in pika habitat. However, pikas typically occur in remote areas and in most cases, are occurring in federally protected areas with specific management goals and objectives that implement MIST. We conclude that there is no evidence to indicate that human fire suppression efforts are a significant threat to any of the five subspecies of the American pika and, therefore, these efforts are not a threat to the species now or in the foreseeable future.

Based on our review of the best available information, we find that the present or threatened destruction, modification, or curtailment of the American pika's habitat or range is not a threat to the five subspecies or the species as a whole now or in the foreseeable future.

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

During our review of the available information, we found no evidence of risks from overutilization for commercial, recreational, scientific, or educational purposes affecting any of the five subspecies of the American pika populations. Therefore, based on the best available scientific information, we conclude that the American pika is not threatened by overutilization for commercial, recreational, scientific, or educational purposes now or in the foreseeable future.

C. Disease or Predation

Disease

Pikas are known to be infected by coccidian parasites (Duszynski 1974, p. 94; Hobbs and Samuel 1974, p. 1079; Lynch *et al*, 2007 p. 1230); however, no information indicates these parasites affect the persistence of the species. Nematodes (*Murielus* spp.) (Hoberg 2005, pp. 358, 360-362) and pinworms (*Labiostomum* spp.) (Hoberg 2009 *et al*, pp. 490-491, 497) also are known to infect pikas. Galbreath (2009, pp. 98-100) describes seven helminth parasite species collected from pika (*Ochotona princeps*) that represent five distinct genera that including tapeworms (*Schizorchis*), oxyurid nematodes (*Cephaluris, Labiostomum*), and strongylid nematodes (*Graphidiella, Murielus*). Bot fly larvae (*Cuterebra* spp.) infestation and pulmonary fungus (*Haplosporangium parvum*) also have been reported in pikas, but these are likely extremely unusual cases (Carmichael 1951, pp. 606, 613, 616; Baird and Smith 1979, p. 553).

Pikas are hosts to Rocky Mountain wood ticks (*Dermacentor andersoni*) (James *et al*. 2006, pp. 21-22) and fleas (*Megabothris abantis, Meringis hubbardi*) (Bossard 2006, pp. 261, 264, 266). Fleas and ticks are potential vectors of disease and pathogens that may affect the health of pikas. However, during our review of the best available information, we only found one record of a disease-related mortality in pika. Plague was reported in an individual pika found in 1989 at Lava Beds National Monument in northern California (Bonkrude 2009, pers. comm.), in the subspecies *Ochotona princeps schisticeps*.

In summary, based on the best available scientific information, we conclude that disease does not pose a significant threat to the five subspecies of the American pika and, therefore, disease is not a significant threat to the species.

Predation

While pikas may be prey for numerous species, no information indicates that predation presents a threat to the species. Potential predators across the range of pikas include coyotes (*Canis latrans*), long-tailed weasels (*Mustela frenata*), short-tailed weasels (*M. erminea*), pine martens (*Martes americana*), raptors, and corvids (Broadbooks 1965, pp. 327, 329; Lutton 1975, p. 234; Marti and Braun 1975, p. 213; Ivins and Smith 1983, pp. 277-284; Smith and Weston 1990, p. 5; Forsman *et al*. 2004, p. 218; Quick 1951 and Murie 1961 *in* Gustafson 2007, p. 12). Pikas averaged less than one percent of northern spotted owl (*Strix occidentalis caurina*) prey found in pellets collected from 1970 to 2003 throughout Oregon (Forsman *et al*. 2004, p. 219) within the range of the subspecies *Ochotona princeps fenisex*. However, in Colorado within the ranges of *O. p. princeps and O. p. saxatilis*, pika was the most frequent mammalian prey collected near one nest and several roost sites of prairie falcons (*Falco mexicanus*) (Marti and Braun 1975, p. 213).

Ivins and Smith (1983, p. 277) investigated the response of *Ochotona princeps saxatilis* to martens and weasels in Rocky Mountain National Park in Colorado. Weasels have been identified as the most effective predator of pikas because of their ability to hunt within talus interstices (rocky slopes) (Ivins and Smith 1983, p. 279). Ivins and Smith (1983, p. 277) found that adult pikas use alarm calls to broadcast the presence of predators, warning kin and other pikas of the presence of a predator in the area. This may be one mechanism that has allowed pikas to persist in Rocky Mountain National Park in the presence of this effective predator. Another potential persistence factor is that pikas have a relatively high reproductive rate giving birth to average litter sizes of 2.34 to 3.68 young twice a year (Smith and Weston 1990, p. 4).

We have considered the best available information on predation and conclude that predation is not a significant threat to any of the five subspecies of American pika, and, therefore, predation is not a significant threat to the species as a whole.

Summary of Factor C

In conclusion, we found that while pikas are hosts to several species of internal parasites, as well as species of fleas and ticks, only one record exists of a disease-related morality of a single pika from plague in northern California. Additionally, we note that while pikas may be prey for numerous species, no information indicates that predation has an overall adverse effect on the species. We find that neither disease nor predation is a threat to any of the five subspecies of the American pika, and, therefore, neither disease nor predation is a threat to the species now or in the foreseeable future.

D. The Inadequacy of Existing Regulatory Mechanisms

To determine if existing regulatory mechanisms protect the five subspecies of the American pika, we evaluated existing international and United States conventions, agreements, and laws for the specific protection of the American pika or their habitats.

United States

Federal Laws and Regulations

The Wilderness Act

The USFS, NPS, Bureau of Land Management (BLM), and the Service all own lands designated as wilderness areas under the Wilderness Act of 1964 (16 U.S.C. 1131-1136). Within these areas, the Wilderness Act states the following: (1) New or temporary roads cannot be built; (2) there can be no use of motor vehicles, motorized equipment, or motorboats; (3) there can be no landing of aircraft; (4) there can be no other form of mechanical transport; and (5) no structure or installation may be built. As shown in Table 2 below, a large amount of suitable pika habitat occurs within Federal wilderness areas in the United States (Wilderness.net 2009). As such, a large proportion of existing pika habitat is protected from direct loss or degradation by the Wilderness Act's prohibitions. Where human activity and threats are increasing in wilderness areas that contain pika habitat, we have no evidence to suggest that pikas are being affected or will be affected in the foreseeable future (see Factor E).

TABLE 2. AMOUNT (PERCENT) OF AMERICAN PIKA HABITAT ACROSS LAND OWNERSHIP BY SUBSPECIES AND SPECIES (FINN 2009B, PERS. COMM.). MEASUREMENTS ARE GIVEN IN ACRES, [HECTARES], AND (PERCENT OF TOTAL) WITHIN RANGE

	O. p. schisticeps	*O. p. uinta*	*O. p. fenisex*	*O. p. princeps*	*O. p. saxatilis*	Species-wide
BLM*	96,002 [38,852] (15.08%)	106,803 [43,222] (25.98%)	16 [6] (0.01%)	29,457 [11,921] (1.70%)	54,644 [22,114] (6.00%)	286,922 [116,116] (7.18%)
DOD*	3,903 [1,580] (0.61%)	2 [1] (<0.01%)	9 [4] (<0.01%)	23 [9] (<0.01%)	0	3,937 [1,593] (0.10%)
NPS*	134,150 [54,290] (21.07%)	26,664 [10,791] (6.49%)	82,531 [33,400] (27.50%)	88,028 [35,624] (5.07%)	58,175 [23,543] (6.39%)	389,547 [157,648] (9.75%)
USFS*	370,580 [149,972] (58.20%)	237,520 [96,123] (57.77%)	213,163 [86,266] (71.03%)	1,515,056 [613,135] (87.26%)	711,626 [287,991] (78.18%)	3,047,945 [1,233,486] (76.31%)
Service*	2,253 [912] (0.35%)	0	0	63 [26] (<0.01%)	66 [27] (0.01%)	2,382 [964] (0.06%)
Misc. Fed.*	0	0	0	151 [61] (0.01%)	0	151 [61] (<0.01%)
Tribal Lands	3,883 [1,571] (0.61%)	4,885 [1,977] (1.19%)	549 [222] (0.18%)	44,392 [17,965] (2.56%)	108 [44] (0.01%)	53,817 [21,780] (1.35%)
Private	8,405 [3,401] (1.32%)	22,581 [9,138] (5.49%)	3,058 [1,238] (1.02%)	52,016 [21,050] (3.00%)	81,849 [33,124] (8.99%)	167,909 [67,952] (4.20%)
County	16,971 [6,868] (2.67%)	0	0	3 [1] (>0.01%)	0	16,974 [6,869] (0.42%)
State	607 [246] (0.10%)	12,678 [5,130] (3.08%)	777 [314] (0.26%)	6,996 [2,831] (0.40%)	3,723 [1,506] (0.41%)	24,780 [10,028] (0.62%)
Total	636,755 [257,686]	411,133 [166,380]	300,104 [121,448]	1,736,186 [702,610]	910,189 [368,340]	3,994,367 [1,616,498]
Total Wilderness Within Above Federal Land	295,962 [119,774] (46.48%)	19,558 [7,915] (4.76%)	192,754 [78,006] (64.23%)	514,726 [208,307] (29.65%)	178,118 [72,083] (19.57%)	1,201,118 [486,086] (30.07%)

*Federal land

National Environmental Policy Act

All Federal agencies are required to adhere to the National Environmental Policy Act (NEPA) of 1970 (42 U.S.C. 4321 *et seq.*) for projects they fund, authorize, or carry out. The Council on Environmental Quality's regulations for implementing NEPA (40 CFR 1500-1518) state that agencies shall include a discussion on the environmental impacts of the various project alternatives (including the proposed action), any adverse environmental effects which cannot be avoided, and any irreversible or irretrievable commitments of resources involved (40 CFR 1502). The NEPA itself is a disclosure law, and does not require subsequent minimization or mitigation measures by the Federal agency involved. Although Federal agencies may include conservation measures for pika as a result of the NEPA process, any such measures are typically voluntary in nature and are not required by the statute. Table 2 above shows the amount of pika habitat occurring on Federal lands; additionally, activities on non-Federal lands are subject to NEPA if there is a federal nexus.

Federal Land Policy and Management Act

The BLM's Federal Land Policy and Management Act of 1976 (43 U.S.C. 1701 *et seq.*), as amended, states that the public lands shall be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values, and that where appropriate, BLM will preserve and protect certain public lands in their natural condition, and provide food and habitat for wildlife (BLM and SOL 2001, p. 8). Pikas and pika habitat occur on BLM lands in Oregon, California, Nevada, Idaho, Wyoming, Colorado, and Utah. Table 2 above shows the amount of pika habitat occurring on BLM lands. We are unaware of any BLM-specific regulations, policies, or guidance that directly manages threats to pikas.

National Forest Management Act

Under the USFS' National Forest Management Act of 1976, as amended (16 U.S.C. 1600-1614), the USFS shall strive to provide for a diversity of plant and animal communities when managing national forest lands. Individual national forests may identify species of concern which are significant to each forest's biodiversity. It is unknown what level of protection, if any, each of the individual national forests offer for pika. In many of the 10 States in which pikas are found, pikas occur in wilderness areas and are thus protected under the Wilderness Act. Outside of wilderness but still on USFS lands, pikas occur mainly in alpine areas, which are sensitive to negative habitat alterations. Their habitat is generally offered more protections from harvest or road building than would otherwise be the case in lowland areas. Table 2 above shows the amount of pika habitat occurring on USFS lands.

National Park Service Organic Act

The NPS Organic Act of 1916 (16 U.S.C. 1 *et seq.*), as amended, states that the NPS ''shall promote and regulate the use of the Federal areas known as national parks, monuments, and reservations ... to conserve the scenery and the national and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.'' Where pikas occur in National Parks, they and their habitats are protected from large-scale loss or degradation due to the Park Service's mandate to ''...conserve scenery... and wildlife...[by leaving] them unimpaired.'' Table 2 above shows the amount of pika habitat occurring on NPS lands.

National Wildlife Refuge System Improvement Act of 1997

The National Wildlife Refuge Systems Improvement Act (NWRSIA) of 1997 (Pub. L. 105-57) amends the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd *et seq.*). The NWRSIA directs the Service to manage the Refuge System land and waters for conservation. The NWRSIA also requires monitoring of the status and trends of refuge fish, wildlife, and plants. The NWRSIA requires development of a comprehensive conservation plan for each refuge and management of each refuge consistent with the plan. Where pikas occur on National Wildlife Refuge lands (see Table 2 above), they and their habitats are protected from large-scale loss or degradation due to the Service's mission to ''to administer a national network of lands... for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats.''

Sikes Act

The Sikes Act of 1960 (16 U.S.C. 670a *et seq.*) authorizes the Secretary of Defense to develop cooperative plans for conservation and rehabilitation programs on military reservations and to establish outdoor recreation facilities, and it provides for the Secretaries of Agriculture and the Interior to develop cooperative plans for conservation and rehabilitation programs on public lands under their jurisdiction. The Sikes Act Improvement Act of 1997 required Department of Defense (DOD) installations to prepare integrated natural resources management plans (INRMPs). Consistent with the use of military installations to ensure the readiness of the Armed Forces, INRMPs provide for the conservation and rehabilitation of natural resources on military lands and incorporate, to the maximum extent practicable, ecosystem management principles and provide the landscape necessary to sustain military land uses. Table 2 above shows the amount of pika habitat occurring on DOD lands.

Clean Air Act of 1970

The petitioner claims that the American pika is threatened by a lack of regulatory mechanisms to curb greenhouse gases that contribute to global temperature rises (Wolf *et al.* 2007, p. 50). However, as stated earlier under Factor A, our status review did not reveal information that increased summer temperatures are a significant threat to the five subspecies or species range-wide now or in the foreseeable future. Nonetheless, we acknowledge that no regulatory mechanisms adequately address global climate change.

The Clean Air Act of 1970 (42 U.S.C. 7401 *et seq.*), as amended, requires the Environmental Protection Agency (EPA) to develop and enforce regulations to protect the general public from exposure to airborne contaminants that are known to be hazardous to human health. In 2007, the Supreme Court ruled that gases that cause global warming are pollutants under the Clean Air Act, and that the EPA has the authority to regulate carbon dioxide and other heat-trapping gases (Massachusetts *et al.* v. *EPA* 2007 [Case No. 05-1120]). The EPA published a regulation to require reporting of greenhouse gas emissions from fossil fuel suppliers and industrial gas suppliers, direct greenhouse gas emitters and manufacturers of heavy-duty and off-road vehicles and engines (74 FR 56260; October 30, 2009). The rule, effective December 29, 2009, does not require control of greenhouse gases; rather it requires only that sources above certain threshold levels monitor and report emissions (74 FR 56260; October 30, 2009). On December 7, 2009, the EPA found under section 202(a) of the Clean Air Act that the current and projected concentrations of six greenhouse gases in the atmosphere threaten public health and welfare. The finding itself does not impose requirements on any industry or other entities but is a prerequisite for any future regulations developed by the EPA. At this time, it is not known what regulatory mechanisms will be developed in the future as an outgrowth of the finding or how effective they would be in addressing climate change.

Secretarial Order Number 3289

Department of the Interior Secretarial Order Number 3289, issued September 14, 2009 (Department of the Interior (DOI) 2009), provides guidance to bureaus and offices within DOI to work ''...with other federal, state, tribal and local governments, and private landowner partners to develop landscape-level strategies for understanding and responding to climate change impacts.'' The DOI bureaus and offices also shall ''...[c]onsider and analyze potential climate change impacts when undertaking long-range planning exercises, setting priorities for scientific research and investigations, developing multi-year management plans, and making major decisions regarding potential use of resources under the Department's purview.'' The DOI land management plans and NEPA documents are subject to this Order. This Secretarial Order requires that Federal agencies consider the future potential impacts of climate change in their planning process. However, as stated earlier under Factor A, our status review did not reveal information that increased summer temperatures are a significant threat to the species range-wide now or in the foreseeable future.

State Comprehensive Wildlife Conservation Strategies (CWCS) and State Environmental Policy and Protection Acts

The pika receives some protection under State laws in Washington, Oregon, California, Idaho, Nevada, Utah, Montana, Wyoming, Colorado, and New Mexico. Each State's fish and wildlife agency has some version of a CWCS in place. These strategies, while not state or national legislation, can help prioritize conservation actions within each State. Named species and habitats within each CWCS may receive focused attention during State Environmental Protection Act (SEPA) reviews as a result of being included in a State's CWCS. However, only Washington, California, and Montana appear to have SEPA-type regulations in place. In addition, each State's fish and wildlife agency often specifically names or implies protection of pikas in their hunting and trapping regulations. See below for an overview of pertinent regulations for each state in the range of the American pika.

Washington

The Washington Department of Fish and Wildlife's (WDFW) hunting regulations name the pika as ''protected wildlife,'' meaning it is illegal to hunt, kill, possess, or control pikas in Washington (WDFW 2009, p. 65). This designation offers adequate protection to individual pikas from direct harm but offers no protection to pika habitat.

The WDFW does not include the pika in its CWCS. However, protection of talus (considered a rare habitat type) is identified as a conservation action under the CWCS (WDFW 2005, p. 293). Conservation actions are those actions necessary to improve the conservation status of the species or habitat in the next 10 years. Implementation of these actions will likely require the cooperation of partners (private, State, Federal, and so forth) and landowners.

Oregon

The Oregon Department of Fish and Wildlife (ODFW) does not include the pika in its CWCS. However, their hunting regulations name the pika as a ''protected mammal,'' making it illegal to be taken without a permit (ODFW 2009, p. 82). This designation protects individual pikas from direct harm, but does not offer protection to pika habitat.

California

The California Fish and Game Code, Section 2000, states that it is illegal ''...to take any bird, mammal, fish, reptile, or amphibian except as provided in the code or regulations made pursuant thereto.'' Pikas are considered a nongame mammal in California (California Fish and Game Code, Section 4150), and as such are protected from taking or possessing. This designation protects pikas from direct harm, but does not offer protection to pika habitat.

A major component of the California WAP (Bunn *et al.* 2007) is the identification of species of greatest conservation need in the State. The California Department of Fish and Game (CDFG) uses the Special Animal List, which includes Species of Special Concern (SSC), as the primary source list of these species. Revisions to the WAP will include threat assessments for current SSCs and their habitats, and will change conservation actions and priorities accordingly (Bunn *et al.* 2007, p. 19). The pika is listed as an SSC under California's WAP (CDFG 2009, p. 46).

Being designated as an SSC is an administrative label only and carries no formal legal status. The California Environmental Quality Act (CEQA) (California Public Resources Code secs. 21000-21177) requires State agencies, local governments, and special districts to evaluate and disclose impacts to SSCs from projects in the State. Section 15380 of the CEQA Guidelines clearly indicates that SSCs should be included in an analysis of project impacts if they can be shown to meet the criteria of sensitivity outlined therein. Sections 15063 and 15065 of the CEQA Guidelines guide managers in assigning ''impact significance'' to populations of non-listed species. Analysts are to consider factors such as population-level effects, proportion of the taxon's range affected by a project, regional effects, and impacts to habitat features. Because SSC designation carries no legal status, it does not require mitigation where impacts are found to occur and as such would not protect pika habitat with certainty.

Idaho

Under the Idaho CWCS, pikas are considered to be secure, common, and widespread based on NatureServe's conservation status (IDFG 2005, App. A, p. 18), and are not a species of greatest conservation need in that State. Pikas are designated as ''protected nongame wildlife'' under Idaho's upland game hunting regulations. They may not be hunted, taken, or possessed (IDFG 2008, p. 9). This designation protects pikas from direct harm, but does not offer protection to pika habitat.

Nevada

Nevada Administrative Code (503.030) designates the pika as a protected mammal. As such it is illegal to hunt them in Nevada. This designation protects individual pikas from direct harm, but does not offer protection to pika habitat.

Pikas are designated as a vulnerable species as well as a species of conservation priority in Nevada's WAP, with a declining population (WAP Team 2006, pp. 405, 291). Nevada's conservation approach is to determine population viability, analyze demographics, confirm trends, identify suitable unoccupied habitat, and evaluate the potential for reintroduction. Talus slopes are identified as key elements of alpine and tundra habitat of importance to pika (WAP Team 2006, p. 154). Nevada's WAP Team has identified priority research needs focused on pikas, including determining: the effects of recreation; minimum viable population size; population demographics; factors contributing to pika extirpation in Nevada; and long-term responses of alpine and tundra communities to global climate change. They also intend to model viability of individual populations and refine population trend estimates and factors.

Utah

Under Utah's CWCS, pikas are a Tier III species (Sutter *et al.* 2005, pp. 5-7). The primary action for Tier III species is to gather more information regarding their status and any threats to them or their habitats. The UDWR considers pika to be a sensitive mammal species and SSC due to limited distribution (Messmer *et al.* 1998, p. 57). The UDWR administrative rules designate pikas as nongame mammals. A Utah certificate of registration is required in order to take nongame mammals (UDWR 2007). Usually such certificates pertain to banding, collection, salvage, depredation, fishing events, dog trials, or possession of live birds or certain ungulates. We do not know how likely it is that an applicant would be approved to kill or possess pikas. This designation protects pikas from direct harm, but does not offer protection to pika habitat.

Montana

Pikas are considered to be a nongame animal (MCA 2009 87-5-102), as they are not a nuisance animal (MCA 2009 80-7-1101) or expressly otherwise named in Montana's hunting regulations (MFWP 2009). It is illegal to take, possess, transport, export, sell, or offer them for sale (MCA 2009 87-5-106). This designation protects pikas from direct harm, but does not offer protection to pika habitat.

Montana Fish, Wildlife and Parks (MFWP) has identified pika as a species with greatest inventory need (MFWP 2005, p. 410) in their CWCS. They are not on Montana's Animal Species of Concern list (MNHP 2009), which is the list MFWP refers to when implementing their CWCS. Pikas are designated as a Tier 3 species in Montana, meaning they have a lower conservation need because they are either abundant and widespread or they have adequate conservation already in place (MFWP 2005, pp. 32, 444).

Wyoming

Pikas are not listed as a species of concern under Wyoming's CWCS (Wyoming Department of Game and Fish 2005). Wyoming's Nongame Wildlife Regulations (WGFD 1998, p. 20) consider pikas as ''protected animals'' which means they may only be taken after the issuance of a scientific or educational permit. This designation protects pikas from direct harm, but does not offer protection to pika habitat.

Colorado

The Colorado Division of Wildlife has designated pika as nongame wildlife and ''protected'' (CDOW 2009, p. 17). Their harassment, taking, or possession is prohibited unless permitted under a license from the State. This designation protects pikas from direct harm, but does not offer protection to pika habitat. Pikas are not mentioned in Colorado's CWCS.

New Mexico

New Mexico's CWCS lists the Goat Peak pika (was *Ochotona princeps nigrescens*, now included in *O. p. saxatilis*) as a species of greatest conservation need as well as vulnerable and State sensitive (NMDGF 2006, pp. 55 and 57).

The New Mexico Department of Game and Fish has designated pika as a ''protected species'' (19 NMAC 36.2). As such, take of pikas is prohibited without a permit or license from the State. This designation protects pikas from direct harm, but do not offer protection to pika habitat.

Summary of Factor D in the United States

In summary, American pika habitat that occurs in the United States on public land is protected by several laws including the Wilderness Act of 1964; the National Forest Management Act of 1976, as amended; the Federal Land Policy and Management Act of 1976, as amended; the NPS Organic Act of 1916; the Sikes Act of 1960; and the National Wildlife Refuge System Improvement Act of 1997. Additionally, the American pika receives some protection under State laws in Washington, Oregon, California, Idaho, Nevada, Utah, Montana, Wyoming, Colorado, and New Mexico. Each State's fish and wildlife agency has some version of a CWCS in place. All of these States have regulations that protect pikas from direct harm, but do not offer protection to pika habitat.

Canada

National Regulations

Parks Canada is committed to protecting the natural heritage of their parks and ensuring that they remain healthy and whole (Parks Canada 2002). Hunting is prohibited in all Canadian National Parks, Regional District Parks, National Wildlife Areas, and Migratory Bird Sanctuaries unless a special Federal permit is granted or notices to the contrary are posted. Numerous Provincial and National Parks occur within the range of *O. p. princeps* in Canada, and overlap a large portion of the known occupied pika habitat there (BritishColumbia.com 2009; Government of Alberta 2009c). Where pikas occur in National Parks in Canada, their habitat is likely to be protected from loss or degradation due to the manner in which Parks are managed, and individual pikas would be protected from direct harm. Currently, the pika has no status under Canada's Species at Risk Act (Government of Canada 2002).

Provincial Regulations

British Columbia

In British Columbia, all native species of animals in the province (excluding invertebrates and fish) as well as several nonnative species have been designated as wildlife, giving them full protection under the Wildlife Act (Ministry of Environment British Columbia 1996, Chapter 488). These species may not be hunted, killed, captured, kept as pets, or used for commercial purposes unless specifically allowed by regulation or by authority of a permit from the Ministry of Environment. This designation protects individual pikas from direct harm, but does not offer protection to pika habitat.

Under British Columbia's Forest and Range Practices Act (Ministry of Forests and Range 2008), it is illegal for individuals to cause environmental damage. Updated regulations define environmental damage to include any change to soil that adversely alters an ecosystem. Under the new provision, individuals found to have caused environmental damage may be fined or jailed or both. This law applies on Crown lands as well as on private lands. This law helps to protect pika habitat within British Columbia's portion of the *Ochotona princeps fenisex* and *Ochotona princeps princeps* subspecies.

Alberta

In Alberta, it is illegal to hunt or trap pika because they are a nongame species, which are illegal to hunt or trap without a special collection permit. American pika are not listed by name in either Alberta's hunting or trapping regulations (Government of Alberta 2009a, 2009b).

Summary of Factor D in Canada

In summary, individual pikas in Canada are protected from human-caused direct mortality, and the majority of habitat is protected as well. No threats have been documented to be occurring to pikas in Canada. Therefore, we find that the level of protection in Canada appears to be sufficient to protect the portions of the two American pika subspecies (*Ochotona princeps fenisex* and *O. p. princeps*) that occur within Canada.

Summary of Factor D

As described under Factor A, a factor potentially affecting four out of the five subspecies is loss of lower elevation habitat due to increased summer surface temperatures. While the Clean Air Act of 1970 (42 U.S.C. 7401 *et seq.*), as amended, requires the EPA to develop and enforce regulations to protect the general public from exposure to airborne contaminants that are known to be hazardous to human health, the EPA does not have regulations in place to control the emissions of greenhouse gases. The EPA's December 7, 2009 endangerment finding signals that regulations might be developed in the future; however, the contents and effectiveness of any such regulation is uncertain. Therefore, there are no known existing regulatory mechanisms currently in place at the local, State, national, or international level that effectively address these types of climate-induced threats to pika habitat. However, we determined in Factor A that climate change would not adversely affect the American pika at the species or subspecies level now or within the foreseeable future. Therefore, any inadequacy of existing regulatory mechanisms to address the threat of climate change do not now or will not result in adverse impacts to the five subspecies or species as a whole within the foreseeable future.

Based on our analysis of the existing regulatory mechanisms, we have found a diverse network of laws and regulations that provide varied protections to the American pika and its habitat rangewide. Specifically, American pika habitat that occurs in the United States on public land is protected by the Wilderness Act of 1964; the National Forest Management Act of 1976, as amended; the Federal Land Policy and Management Act of 1976, as amended; the NPS Organic Act of 1916; the Sikes Act of 1960; and the National Wildlife Refuge System Improvement Act of 1997. Additionally, the American pika receives some protection under State laws in Washington, Oregon, California, Idaho, Nevada, Utah, Montana, Wyoming, Colorado, and New Mexico. Each State's fish and wildlife agency has some version of a CWCS in place, and all of these States have regulations that protect pikas from direct harm, but do not offer protection to pika habitat. Two American pika subspecies (*Ochotona princeps fenisex* and *O. p. princeps*) occur in Canada, and individual pikas are protected from human-caused direct mortality, and the majority of habitat is protected as well. No threats have been documented to be occurring to pikas in Canada. Therefore, based on our review of the best available scientific information, we conclude that adequate regulatory mechanisms are in place to protect the species, including the five subspecies, now and in the foreseeable future.

E. Other Natural or Manmade Factors Affecting the Species' Continued Existence

Roads

Pika habitats, such as alpine and subalpine areas, may be sensitive to disturbance from roads and the activities which occur on them. Disturbance from roads may have a permanent impact on the landscape and negative impact on pika population persistence (Beever *et al*. 2003, p. 45). Roads may destroy or isolate habitat, prevent dispersal and migration, and interfere with necessary behavior. However, a study in the Great Basin shows proximity to roads does not play a substantial role in pika extirpations when compared to other factors, such as elevation and maximum daily air temperatures (Beever 2009c, pers. comm.).

Road construction can create habitat for pikas due to placement of rubble as road grades and riprap for armoring waterways. Pikas have established colonies in human-made rock structures where none existed before in Oregon (Fontaine 2009, pers. comm.) and Washington State (Bruce 2009, pers. comm.; Wagner 2009, pers. comm.). Pikas were found to inhabit mine tailings and a rock wall in the Sierra Nevada and Great Basin Mountains (Millar *et al*. 2008, p. 1). A total of 55 sites (or 32 percent of the sites surveyed) were in areas of moderate human visitation (Millar *et al*. 2008, p. 1), many accessed by roads. Within Colorado, 44 percent of historic pika locations are within 100 m (328 ft) of a jeep or hiking trail; only one of these sites is currently unoccupied (CDOW 2009, p. 12), although the cause of unoccupancy is unknown. Therefore, while it is possible that there could be some localized impacts at pika sites near roads, we have no evidence to suggest that roads constitute a significant threat to any subspecies of pika or the American pika species as a whole.

In summary, we have documentation of pikas occurring in human-made settings and occupying sites in areas of moderate human use, and we have a study showing that presence of roads does not play a substantial role in pika extirpations at sites in the Great Basin. Therefore, we conclude that the presence of roads and their related human disturbance do not constitute a significant threat to the continued existence of the pika at either the species or subspecies level now or in the foreseeable future.

Off-Highway Vehicles and Off-Road Vehicles

We determined that off-highway vehicle (OHV) and off-road vehicle (ORV) use does not appear to be a significant threat to any subspecies of pika or the pika species now or in the foreseeable future. We used four lines of evidence to support this decision. As discussed in the 90–day finding, there is little evidence to support the hypothesis that human influence in alpine communities constitutes a range wide threat to the American pika, because the probability of direct human disturbance to population locations remains quite low. Sensitive habitats, where pikas often occur, are considered during the Federal land management planning process (70 FR 68264-68291, 16 U.S.C 1131-1136). Federal agencies monitor sensitive habitats and close roads to protect areas containing sensitive habitat (70 FR 68264-68291, 16 U.S.C 1131-1136). Vehicle restrictions are enforced under the National OHV Policy (36 CFR 212, 251, 261), Wilderness Act (16 U.S.C. 1131-1136), and local regulations (e.g., Okanogan Land and Resource Management Plan (USDA 1989, pp. 4-8) and the Wenatchee Land and Resource Management Plan (USDA 1990, pp. IV-90-91) in Washington).

Trails

Many hikers rely on trails to enter higher, more isolated areas inhabited by pikas. Trails can increase human activity near pika sites, with potential effects related to habitat disturbance and noise. However, Millar *et al*. (2008, pp. 1-2) found that of 173 occupied pika sites within the range of *Ochotona princeps schisticeps* in the Great Basin and Sierra Nevada mountain ranges: (1) 3 sites (2 percent) were on human-made structures; (2) 55 (32 percent) were in areas moderately impacted by human visitation; and (3) 3 of the occupied sites (2 percent) were within 1 m of well-used trails. Subsequent surveys revealed a total of 28 of 420 sites (7 percent) were within 1 m (3 ft) of active trails, and all 28 sites were occupied (Millar and Westfall 2009, p. 10).

Also, as discussed above, 27 of 62 historical sites (44 percent) were within 100 m (328 ft) of a jeep or hiking trail; only one of these sites was unoccupied (CDOW 2009, p. 12). Since access and disturbance by human activity does not correlate with extirpation of pika colonies, we conclude that disturbance by humans using trails is not a significant threat to pika at either the species or subspecies level now or in the foreseeable future.

Recreational Shooting

Shooting of pika is prohibited throughout most of its range. Disturbance, including construction activities and trash dumping, occurred at three out of seven sites and evidence of recreational shooting at only a single site, Smith Creek, Nevada (Beever *et al*. 2003, p. 45). The authors mention no evidence of pika mortality, only the presence of shell casings at a single site. We are not aware of any other information on recreational shooting of pika. Therefore, we conclude that while recreational shooting may occur on occassion, it is not a significant threat to the pika at either the species or subspecies level now or in the foreseeable future.

Summary of Factor E

In summary, we assessed the potential risks to pika populations from other natural or manmade factors associated with nearness to roads, nearness to trails, proximity to OHV/ORV use, and recreational shooting, and we find that there is no evidence that indicates these activities significantly threaten the continued existence of American pika, at either the species or subspecies level, now or in the foreseeable future.

Finding

As required by the Act, we considered the five factors in assessing whether the species is threatened or endangered throughout all or a significant portion of its range. We have carefully examined the best scientific and commercial information available regarding the past, present, and future threats faced by the species. We reviewed the petition, information available in our files, other available published and unpublished information, and other information provided to us after the 90–day finding was published. We also consulted with recognized American pika experts and other Federal, State, and tribal agencies.

In our analysis of Factor A, we identified and evaluated the risks of the present or threatened destruction, modification, or curtailment of the habitat or range of the five subspecies of the American pika, and the species as a whole, from: (1) Climate change; (2) livestock grazing; (3) native plant succession; (4) invasive plant species; and (5) fire suppression. We determine that increased summer surface temperature from climate change is not a significant threat to the species as a whole. In our climate change risk assessment, we determined that no pika site would be adversely affected across the species' entire range of elevation, but some mid- to low elevations that contain pikas would be at risk from increased summer temperature (see Table 1 above). These relatively low elevations within pika sites that would be at risk were distributed among four of five subspecies (*Ochotona princeps princeps, O. p. fenisex*, *O. p. schisticeps* and *O. p. saxatilis*), with *O. p. uinta* not containing any populations that would be at risk. These relatively low elevation at-risk areas do not represent a significant portion of the subspecies' habitat (and, therefore, the species' habitat as a whole), especially since pikas primarily occupy high-elevation talus habitat. Therefore, we conclude the five subspecies and the entire species are not at risk from increased summer temperatures now or in the foreseeable future.

Actual risk levels from increased summer surface temperatures of pika populations at pika sites may be lower than we estimated in Factor A. Results from comparisons between below-talus summer temperatures and surface summer temperatures indicate that our risk assessment for climate change may be overly conservative because risk estimates for pika sites were based on projections for summer surface temperatures. Because below-talus microclimate provides pikas with cool habitat during the hottest time of day during the summer, and pikas are dependent on these subsurface environments for survival, heat-stress levels experienced by pikas may be less than expected and are likely to be lower than we estimated. There is also evidence indicating the American pika can tolerate a wider range of temperatures and precipitation than previously thought (Millar and Westfall, p. 17). The American pika demonstrates flexibility in its behavior and physiology that allows it to adapt to the degree of increasing temperature that we expect within the foreseeable future. We have evidence that suggests the five American pika subspecies have persisted through climatic oscillations in the past (Hafner 1994, p. 375; Grayson 2005, p. 2103), which indicates that the species-wide pool of genetic diversity should not be greatly diminished by ongoing climate change.

We investigated the potential effects to the American pika and its habitat from interactions with domestic livestock, native plant succession, nonnative plant invasions and human fire suppression. We concluded that interactions with domestic livestock, native plant succession, nonnative plant invasions, and human fire suppression do not represent a significant threat to any of the five subspecies of the American pika and, therefore, these are not a threat to the species now or in the foreseeable future. Based on our review of the best available information, we find that the present or threatened destruction, modification, or curtailment of the American pika's habitat or range is not a threat to the five subspecies or the species as a whole now or in the foreseeable future.

During our review of the available information, we found no evidence of risks from overutilization for commercial, recreational, scientific, or education affecting any of the five subspecies of the American pika populations or the species as a whole. Therefore, we conclude that the American pika is not threatened by overutilization for commercial, recreational, scientific, or educational purposes now or in the foreseeable future.

We found that while pikas are hosts to several species of internal parasites as well as species of fleas and ticks, only one record exists of a disease-related morality of a single pika from plague in northern California. Additionally, we note that, while pikas may be prey for numerous species, no information indicates that predation has an overall adverse effect on the species. We find that neither disease nor predation is a threat to any of the five subspecies of the American pika and, therefore, neither disease nor predation is a significant threat to the species now or in the foreseeable future.

Based on our analysis of the existing regulatory mechanisms, we have found a diverse network of laws and regulations that provide protections to the American pika and its habitat on Federal lands in the United States. There are no known existing regulatory mechanisms currently in place at the local, State, national, or international level that effectively address climate-induced threats to pika habitat. However, we determined that climate change would not adversely affect the American pika at the species or subspecies level now or within the foreseeable future. Additionally, the American pika receives some protection under State laws in Washington, Oregon, California, Idaho, Nevada, Utah, Montana, Wyoming, Colorado, and New Mexico. Each State's fish and wildlife agency has some version of a CWCS in place, and all of these States have regulations that protect pikas from direct harm, but do not offer protection to pika habitat. Two American pika subspecies (*Ochotona princeps fenisex* and *O. p. princeps*) occur in Canada, and individual pikas are protected from human-caused direct mortality, and the majority of habitat is protected as well. No threats have been documented to be occurring to pikas in Canada. Therefore, based on our review of the best available scientific information, we conclude that adequate regulatory mechanisms are in place to protect the species and the five subspecies now and in the foreseeable future.

We also assessed the potential risks to pika populations from other natural or manmade factors associated with nearness to roads, trails, and OHV/ORV use, and associated with recreational shooting, and we find that there is no evidence that indicates these activities significantly threaten the continued existence of American pika, at either the species or subspecies level, now or in the foreseeable future.

Our review of the best available scientific and commercial information pertaining to the five factors does not support the assertion that there are threats of sufficient imminence, intensity, or magnitude as to cause substantial losses of population distribution or viability of the American pika or any of its five subspecies. Therefore, we do not find that the

American pika is in danger of extinction (endangered), nor is it likely to become endangered within the foreseeable future (threatened) throughout its range. As a result, we determine that listing the American pika at the species or subspecies level, as endangered or threatened under the Act is not warranted at this time.

Distinct Vertebrate Population Segments (DPSs)

After assessing whether the species and subspecies are endangered or threatened throughout their range, we next consider whether any DPS of American pika meets the definition of endangered or is likely to become endangered in the foreseeable future (threatened). In this case, because we have determined that portions of the *Ochotona princeps fenisex* subspecies, *O. p. princeps, O. p. saxatilis* subspecies, and portions within the Great Basin of the *O. p. schisticeps* subspecies are likely to experience increased extirpations of pika within the forseeable future, we analyzed whether any of these areas meet the definition of a DPS.

Distinct Vertebrate Population Segments

Under the Service's Policy Regarding the Recognition of Distinct Vertebrate Population Segments Under the Endangered Species Act (61 FR 4722, February 7, 1996), three elements are considered in the decision concerning the establishment and classification of a possible DPS. These are applied similarly for an addition to or a removal from the Federal List of Endangered and Threatened Wildlife. These elements include: (1) The discreteness of a population in relation to the remainder of the taxon to which it belongs; (2) the significance of the population segment to the taxon to which it belongs; and (3) the population segment's conservation status in relation to the Act's standards for listing, delisting (removal from the list), or reclassification (i.e., whether the population segment is endangered or threatened).

In our analysis of Factor A, we partnered with NOAA to assess historical and future temperature projections for the western United States. In the assessment, 22 pika sites were identified for analysis representing the five subspecies across the range of the species. We determined that certain populations of *Ochotona princeps schisticeps, O. p. fenisex*, *O. p. princeps*, and *O. p. saxatilis* are currently at risk or would be at risk in the foreseeable future from the threat of increased summer temperature (see Table 1 above). These subpopulation include: (1) Southeastern Oregon, Monitor Hills, southern Wasatch Mountains, Toiyabe Mountains, and Warner Mountains for *Ochotona princeps schisticeps*; (2) Mt. St. Helens for *O. p. fenisex*; (3) Glacier National Park, Northern Wasatch Mountains, Ruby Mountains, and Sawtooth Mountain Range for *O. p. princeps*; and (4) Sangre de Cristo Mountains and Southern Rockies for *O. p. saxatilis*. Because we have identified climate change as being a potential factor that may influence the future distribution of the four subspecies listed above, we analyzed these areas to determine whether they meet our DPS policy.

Discreteness

Under the DPS policy a population segment of a vertebrate taxon may be considered discrete if it satisfies either one of the following conditions: (1) It is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors. Quantitative measures of genetic or morphological discontinuity may provide evidence of this separation; and (2) It is delimited by international governmental boundaries within which differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist that are significant in light of section 4(a)(1)(D) of the Act. We begin our analysis of discreteness by addressing the first condition listed above (markedly separate).

Ochotona princeps schisticeps in southeastern Oregon, Monitor Hills, southern Wasatch Mountains, Toiyabe Mountains, and Warner Mountains

American pikas are distributed across a subset of Great Basin mountain ranges, including the mountains of southeastern Oregon, Monitor Hills, southern Wasatch Mountains, Toiyabe Mountains, and Warner Mountains (hereafter, *O. p. schisticeps* subpopulation or Great Basin subpopulation) and typically found at high elevations within this geographic area. Geographical features, such as broad desert valleys, are effective at isolating these patches and serve as barriers to gene flow between pika metapopulations belonging to the same subspecies (Meredith 2002, pp. 47-48, 53; Grayson 2005, p. 2104). In the numerous ''sky islands'' of the Great Basin, American pikas are isolated (greater than the maximum estimated individual dispersal distance (10 to 20 km; 6.2 to 12.4 mi) of the species from the nearest extant population by these geographic barriers (Hafner 1994, pp. 376-378). These barriers eliminate dispersal of pikas between and among mountain ranges. Because temperatures in these valleys often exceed the physiological constraints of pikas (e.g., valley temperatures often are greater than or equal to 28 °C (82.4 °F)), pikas are unable to disperse to other mountain ranges and are now confined to a subset of ranges within the Great Basin.

We would expect a higher probability of long-distance dispersal in suitable habitat containing favorable climate conditions within mountain ranges occupied by the *O. p. schisticeps* subpopulation. Within cool habitat, such as high elevation talus slopes, populations separated by less than 20 km (12.4 mi) might experience occasional contact (Hafner 1993, p. 378; Hafner 1994, p. 380). Unsuitable, low-elevation habitat ranging from 3 to 8 km (1.9 to 5.0 mi) can act as a complete barrier to gene flow in Great Basin pika populations (Meredith 2002, p. 54). In low elevations, distances of as little as 300 m (984 ft) can be effective barriers to pika dispersal (Smith 1974a, p. 1116). Therefore, given the current distribution and the physiological and physical limitations of the species, we expect few successful dispersal events from populations within the *O. p. schisticeps* subpopulation to adjacent habitats outside of this subpopulation.

Analyses of genetic similarity among pikas of increasing geographic separation demonstrate that metapopulations are separated by somewhere between 10 and 100 km (Hafner and Sullivan 1995, p. 312). More substantial gene flow occurs within mountain ranges containing continuous or semi-continuous habitat than between mountain ranges that may be separated by geographical barriers to dispersal (Peacock 1997, p. 346; Meredith 2002, p. 48). Genetic substructure within subspecies and discontinuity among metapopulations is evident within the American pika. However, the genetic distinctiveness of population segments below the subspecies level is not necessarily correlated with biological and ecological significance, especially when it is not clear which populations contain relatively higher genetic variability. Geneticists have suggested resolution of genetic structure and connectivity below the subspecies level is required before management at finer scales below the subspecies level is warranted (Galbreath *et al.* 2009b, p. 33). Great Basin pika populations separated by geographic barriers to dispersal can develop distinct genetic signatures (Meredith 2002, pp. 37, 44, 46). Analyses of genetic distance demonstrate population differentiation as well (Hafner and Sullivan 1995, p. 306). Additionally, we have genetic information that provides evidence of this separation, such as the Great Basin subpopulation having mitochondrial deoxyribonucleic acid (DNA) haplotypes (a combination of forms of a gene at multiple specific locations on the same chromosome) that are different from other *O. p. schisticeps* populations (Galbreath *et al*. 2009a, Figures 1 and 2; Galbreath *et al*. 2009b, p. 19, Figures 1, 4, and 5). These lines of genetic evidence indicate that the Great Basin *O. p. schisticeps* subpopulation is markedly separated from other *O. p. schisticeps* populations.

In summary, physical barriers to dispersal within the Great Basin *O. p. schisticeps* subpopulation, such as warmer valleys, and physiological factors limit the connectivity of pikas between and among isolated sites. Genetic analyses demonstrate that geographic barriers to dispersal can isolate pikas and cause populations to form distinct genetic signatures over ecological time. Therefore, we determined that the Great Basin *O. p. schisticeps* subpopulation under threat of climate change is markedly separate from other *O. p. schisticeps* populations as a consequence of physical, physiological, and ecological factors. We also have genetic information that demonstrates evidence of this separation, although we believe it is of limited use with respect to its correlation with biological and ecological significance for the subpopulation. We conclude that the *O. p. schisticeps* subpopulation is discrete under the Service's DPS policy.

Ochotona princeps fenisex at Mt. St. Helens

Similar physical, physiological, and ecological factors that we determined markedly separate the Great Basin *O. p. schisticeps* subpopulation from other *O. p. schisticeps* populations also play a role in separating the Mt. St. Helens subpopulation from other *O. p. fenisex* populations. These factors include: (1) Physical barriers to dispersal; (2) physiological restraints, such as sensitivity to high temperatures, that limit dispersal; and (3) the patchy nature of the subspecies' distribution typically at high elevations. Additionally, we have genetic information that provides evidence of this separation, such as the Mt. St. Helens subpopulation having mitochondrial DNA haplotypes that are different from other *O. p. fenisex* populations (Galbreath *et al*. 2009a, Figures 1 and 2; Galbreath *et al*. 2009b, p. 19, Figures 1, 4, and 5).

We determined that the Mt. St. Helens subpopulation under threat of climate change is markedly separate from other *Ochotona princeps fenisex* populations as a consequence of physical, physiological, and ecological factors. We also have genetic information that demonstrates evidence of this separation, although we believe it is of limited use with respect to its correlation with biological and ecological significance for the subpopulation. We conclude that the Mt. St. Helens subpopulation is discrete under the Service's DPS policy.

Ochotona princeps princeps in Glacier National Park, Northern Wasatch Mountains, Ruby Mountains, and Sawtooth Mountain Range

Similar physical, physiological, and ecological factors that we determined markedly separate the Great Basin *Ochotona princeps schisticeps* subpopulation from other *O. p. schisticeps* populations also play a role in separating the Glacier National Park, Northern Wasatch Mountains, Ruby Mountains, and Sawtooth Mountain Range population segment (here after, *O. p. princeps* subpopulation) from other *O. p. princeps* populations. These factors include: (1) Physical barriers to dispersal; (2) physiological restraints, such as sensitivity to high temperatures, that limit dispersal; and (3) the patchy nature of the subspecies' distribution typically at high elevations. Additionally, we have genetic information that provides evidence of this separation, such as the Ruby and Northern Wasatch Mountains populations having mitochondrial DNA haplotypes that are different from other *O. p. princeps* populations (Galbreath *et al*. 2009b, p. 19, Figures 1, 2, and 5).

We determined that the *Ochotona princeps princeps* subpopulation under threat of climate change is markedly separate from other *O. p. princeps* populations as a consequence of physical, physiological, and ecological factors. We also have genetic information that demonstrates evidence of this separation, although we believe it is of limited use with respect to its correlation with biological and ecological significance for the subpopulation. We conclude that the *O. p. princeps* subpopulation is discrete under the Service's DPS policy.

Ochotona princeps saxatilis in the Sangre de Cristo Mountains and Southern Rockies

Similar physical, physiological, and ecological factors that we determined markedly separate the Great Basin *Ochotona princeps schisticeps* subpopulation from other *O. p. schisticeps* populations also play a role in separating the Sangre de Cristo Mountain and Southern Rockies subpopulation (here after, *O. p. saxatilis* subpopulation) from other *O. p. saxatilis* populations. These factors include: (1) Physical barriers to dispersal; (2) physiological restraints, such as sensitivity to high temperatures, that limit dispersal; and (3) the patchy nature of the subspecies' distribution typically at high elevations. Additionally, we have genetic information that provides evidence of this separation, such as the Sangre de Cristo Mountains and Southern Rocky Mountains populations having mitochondrial DNA haplotypes that are different from other *O. p. saxatilis* populations (Galbreath *et al*. 2009b, p. 19, Figure 1, 2 and 5).

We determined that the *Ochotona princeps saxatilis* subpopulation under threat of climate change is markedly separate from other *O. p. saxatilis* populations as a consequence of physical, physiological, and ecological factors. We also have genetic information that demonstrates evidence of this separation, although we believe it is of limited use with respect to its correlation with biological and ecological significance for the subpopulation. We conclude that the *O. p. saxatilis* subpopulation is discrete under the Service's DPS policy.

Significance

If a population segment is considered discrete under one or more of the conditions described in the Service's DPS policy, its biological and ecological significance will be considered in light of Congressional guidance that the authority to list DPSs be used ''sparingly'' while encouraging the conservation of genetic diversity. In making this determination, we consider available scientific evidence of the discrete population segment's importance to the taxon to which it belongs. Since precise circumstances are likely to vary considerably from case to case, the DPS policy does not describe all the classes of information that might be used in determining the biological and ecological importance of a discrete population. However, the DPS policy describes four possible classes of information that provide evidence of a population segment's biological and ecological importance to the taxon to which it belongs. As specified in the DPS policy (61 FR 4722), this consideration of the population segment's significance may include, but is not limited to, the following:

(1) Persistence of the discrete population segment in an ecological setting unusual or unique to the taxon;

(2) Evidence that loss of the discrete population segment would result in a significant gap in the range of a taxon;

(3) Evidence that the discrete population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historic range; or

(4) Evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics.

A population segment needs to satisfy only one of these conditions to be considered significant. Furthermore, other information may be used as appropriate to provide evidence for significance.

Persistence of the population segment in an ecological setting that is unusual or unique for the taxon

We evaluated all discrete population segments (described as subpopulations under Discreteness) to determine if any population segment persists in an ecological setting this is unusual or unique for the species. Our analysis for each subpopulation is provided below.

Pikas occupying habitat in the *Ochotona princeps schisticeps* subpopulation in the Great Basin are found in what has been described as talus or rockslides (Smith and Weston 1990, p. 4), where talus can be more specifically described as rock-ice or non-rock-ice features (Millar and Westfall 2009, pp. 6, 18). Talus fields are typically fringed by suitable vegetation for foraging. Great Basin pika sites have been associated with diverse vegetation associations (Millar and Westfall 2009, p. 10) and a pika's generalist diet can include a wide variety of plant material (Huntly *et al.* 1986, p.143; Beever *et al.* 2008, p. 14). Pika populations in the Great Basin not only occur adjacent to alpine meadow habitat, but also have been documented at relatively lower elevations persisting under a diet consisting of plants that commonly include *Elymus cinereus* (Great Basin wild rye), *Artemisia tridentata* (sagebrush), *Rosa woodsii* (wild rose), and *Bromus tectorum* (cheatgrass) (Beever *et al.* 2008, p. 14; Collins 2009 pers. comm.).

Pikas inhabiting the Mt. St. Helens subpopulation of *Ochotona princeps fenisex* are found in talus, rockslides, or in the case of 2 of 8 populations, they can be found in log piles (Bevers 1998, pp. 68, 70-71). The studies on Mt. St. Helens suggest that pikas are more opportunistic in habitat use than has been previously described (Bevers 1998, p. 72). Populations from Mt. St. Helens were associated with forage items that include forbs, trees, and ferns (Bevers 1998, p. 75).

Pikas inhabiting the *Ochotona princeps princeps* subpopulation are found in talus or rockslides generally at high elevations (Meredith 2002, p. 8; UDWR 2009, p. 8; USFS 2009b, pp. 2-6). We do not have information to the specific type of ecological setting that is occupied by the populations inhabiting these segments, but we expect the habitats to contain features that have been previously described for the species.

Pikas inhabiting the *Ochotona princeps saxatilis* subpopulation are described as occupying talus slopes situated in cool, moist habitats of the alpine tundra and subalpine forests (Fitzgerald *et al.* 1994 cited in CDOW 2009, p. 3). We do not have information to the specific type of ecological setting that is occupied by this subpopulation, but we expect the habitats to contain features that have been previously described for the species.

For the purposes for determining significance in a DPS analysis, we look at whether the settings occupied in the area under consideration are unique or unusual to the taxon in question, and whether the persistence of the population in the unique or unusual ecological setting may provide a behavioral or physiological adaptation that would be significant to the taxon as a whole. Thus, for this analysis, we analyzed whether the discrete population segments constitute an unusual or unique ecological setting for each of the four subspecies of the pika under consideration. Pikas select habitat that includes topographical features characterized by rocks or other surface features, such as log piles, large enough to provide necessary interstitial spaces for subsurface movement and microclimate conditions suitable for pika survival by creating cooler refugia in summer months and insulating individuals in colder, winter months (Beever 2002, p. 27; Millar and Westfall 2009, pp. 19-21). Pikas also select habitats that contain forage vegetation that is accessible within distances comparable to dimensions of home ranges (Beever 2002, p. 28). Occupied habitats within the population segments under consideration do not constitute an unusual or unique setting for the pika because they fall within the species' typical ecological niche, and there does not appear to be any behavioral or physiological differences in these population segments that result from ecological pressures in their specific geographic areas. Additionally, the food resources used by pika in these areas are similar to those found elsewhere throughout the range. No information indicates that American pika habitat in the four population segments under consideration constitutes an unusual or unique ecological setting for the species.

Evidence that loss of the discrete population segment would result in a significant gap in the range of taxon

We evaluated all discrete population segments (described as subpopulations under Discreteness) to determine if loss of any population segment would result in a significant gap in the range of the subspecies to which the population segment belongs. Our analysis for each subpopulation is provided below.

Ochotona princeps schisticeps or Great Basin Subpopulation

Pika sites potentially at risk of extirpation in the foreseeable future from increased summer surface temperatures from climate change within the *O. p. schisticeps* subpopulation (see Table 1 above) occur at relatively low elevations. Pika sites within this same subpopulation at higher elevations, where pikas more typically occupy suitable talus habitat, are not at risk from climate change now or in the foreseeable future. Therefore, within the subpopulation, not all pika sites are potentially at risk from the effects of climate change, and results from comparisons between below-talus summer temperatures and surface summer temperatures indicate that our risk assessment for climate change may be conservative because risk estimates for pika sites were based on projections for summer surface temperatures. As stated under Discreteness, in the numerous ''sky islands'' of the Great Basin, American pikas are isolated (greater than the maximum estimated individual dispersal distance (10 to 20 km, or 6.2 to 12.4 mi of the species from the nearest extant population) by these geographic barriers (Hafner 1994, pp. 376-378). These barriers eliminate dispersal of pikas between and among mountain ranges. Because temperatures in these valleys often exceed the physiological constraints of pikas (e.g., valley temperatures often exceed greater than or equal to 28 °C (82.4 °F)), pikas are unable to disperse to other mountain ranges and are now confined to a subset of ranges within the Great Basin, thereby creating many gaps between pika populations in the Great Basin. Because there is no opportunity for populations to interact between these barriers, the loss of a pika site potentially at risk from increased summer surface temperatures may potentially create an additional gap in the range of the subspecies, however, we have determined that the possible loss of the pika occurrence would not result in the creation of a significant gap in the range of the subspecies. Our basis for this determination is that loss of the pika occurrence would not result in a gap that is biologically significant for subspecies since they are already highly fragmented throughout the Great Basin. Additionally, the amount of suitable habitat and number of pika populations in the *O. p. schisticeps* subpopulation is small when compared to the Sierra Nevada Mountain Range in the remainder of the range of the subspecies.

Therefore, the contribution of the *Ochotona princeps schisticeps* subpopulation to the subspecies as a whole is small, and loss of the population segment would not result in a significant gap in the range of the subspecies.

Ochotona princeps fenisex or Mt. St. Helens Subpopulation

One out of a total of eight known pika populations on Mt. St. Helens (Bevers 1998, pp. 68, 70-71) is potentially at risk of extirpation from increased summer surface temperatures from climate change within the *O. p. fenisex* subpopulation in the foreseeable future (see Table 1 above) and occurs at relatively low elevations. Pika sites within this same subpopulation at higher elevations, where pikas more typically occupy suitable talus habitat, are not at risk from climate change now or in the foreseeable future. Therefore, within the subpopulation, not all pika sites are potentially at risk from the effects of climate change, and results from comparisons between below-talus summer temperatures and surface summer temperatures indicate that our risk assessment for climate change may be conservative because risk estimates for pika sites were based on projections for summer surface temperatures.

Of the 69 unique pika observations used to generate an elevation across the range of *O. p. fenisex*, we do not anticipate risks from increased summer temperatures occurring at 98 percent (68 of 69) of the observation points. As such, the amount of suitable habitat in the Mt. St. Helens subpopulation segment when compared to the rest of the range of the subspecies is small.

Therefore, the contribution of the Mt. St. Helens subpopulation to the subspecies as a whole is small and provides a nominal contribution ecologically and biologically to the subspecies, such that loss of the population segment would not result in a significant gap in the range of the subspecies.

Ochotona princeps princeps Subpopulation

Pika sites potentially at risk of extirpation in the foreseeable future from increased summer surface temperatures from climate change within the *O. p. princeps* subpopulation (see Table 1 above) occur at relatively low elevations. Pika sites within this same subpopulation at mid- to higher elevation talus habitat, where pikas currently occupy suitable talus habitat, are not at risk from climate change now or in the foreseeable future. Best available information suggests that pikas more frequently occupy the highest elevation talus slopes in the Northern Rocky Mountains, and based on the NOAA projected surface temperatures (see Table 1 above), these habitats are not at risk from climate change now or in the foreseeable future. Therefore, within the subpopulation, not all pika sites are potentially at risk from the effects of climate change and results from comparisons between below-talus summer temperatures and surface summer temperatures indicate that our risk assessment for climate change may be conservative because risk estimates for pika sites were based on projections for summer surface temperatures.

Therefore, the contribution of the *Ochotona princeps princeps* subpopulation to the subspecies as a whole is small and provides a nominal contribution ecologically and biologically to the subspecies, such that loss of the subpopulation would not result in a significant gap in the range of the subspecies.

Ochotona princeps saxatilis Subpopulation

Pika sites potentially at risk of extirpation in the foreseeable future from increased summer surface temperatures from climate change within the *O. p. saxatilis* subpopulation (see Table 1 above) occur at relatively low elevations. Pika sites within this same subpopulation at mid- to higher elevation talus habitat, where pikas currently occupy suitable talus habitat, are not at risk from climate change now or in the foreseeable future. Therefore, within the subpopulation, not all pika sites are potentially at risk from the effects of climate change and results from comparisons between below-talus summer temperatures and surface summer temperatures indicate that our risk assessment for climate change may be conservative because risk estimates for pika sites were based on projections for summer surface temperatures. Pikas inhabiting the *Ochotona princeps saxatilis* subpopulation in the Southern Rockies in Colorado are described as occupying talus slopes situated in cool, moist habitats of the alpine tundra and subalpine forests at or above 3,000 m (10,000 ft) (Fitzgerald *et al.* 1994 cited in CDOW 2009, p. 3). These habitats are extensive in Colorado and the topography of Colorado is described as follows: ''Roughly three quarters of the Nation's land above 10,000 feet altitude lies within its borders. The State has 59 mountains 14,000 feet or higher, and about 830 mountains between 11,000 and 14,000 feet in elevation'' (Doesken *et al.* 2003 cited in CDOW 2009, p. 3).

Therefore, the contribution of the *Ochotona princeps saxatilis* subpopulation to the subspecies as a whole is small and provides a nominal contribution ecologically and biologically to the subspecies, such that loss of the population segment would not result in a significant gap in the range of the subspecies.

Evidence that the discrete population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historical range

The American pika survives naturally throughout much of British Columbia, Alberta, and the western United States. As such, this consideration is not applicable to any population segment of the American pika or the subspecies under consideration in the finding.

Evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics

A recent extensive genetic analysis has determined there are five major genetic lineages of American pikas (Galbreath *et al.* 2009b, p. 7), which have since been interpreted as subspecies (Hafner and Smith 2009, p. 16). Galbreath *et al.* (2009b, p. 18) determined it is unlikely that additional deeply divergent lineages (i.e., subspecies) of American pika remain to be identified. Minor differences in genetic signatures can occur within each subspecies. For example, metapopulations separated by geographic barriers to dispersal can develop distinct genetic signatures (Meredith 2002, pp. 37, 44, 46). Additionally, as discussed under the Discreteness section above, mitochondrial DNA haplotypes are unique to each American pika population (Galbreath *et al.* 2009b, p. 19). However, each of the smaller genetic units (i.e., populations) can be linked back to one of five major genetic lineages. Geneticists have suggested resolution of genetic structure and connectivity below the subspecies level is required before management at finer scales below the subspecies level is warranted (Galbreath *et al.* 2009b, p. 33).

Genetic substructure within subspecies and discontinuity among metapopulations is evident within the American pika. However, the genetic distinctiveness of population segments below the subspecies level is not necessarily correlated with biological and ecological significance, especially when it is not clear which populations contain relatively higher genetic variability. We consider genetic differences among subspecies to be markedly different. However, as indicated by Galbreath *et al.* (2009b, p. 33), information concerning the utility of genetic differences at the subspecific level for pika are lacking for use in conservation management actions. As a consequence, even though we have used the information that demonstrates apparent genetic discontinuity between the different population segments to support our arguments for discreteness under the DPS policy, for the reasons stated above, we believe that this information is of limited use with respect to its correlation with biological and ecological significance for the population and therefore the taxon as a whole and, hence, conservation value.

We determine, based on review of the best available information, that no population segment below the subspecies level is significant in relation to the remainder of the taxon. Therefore, no population segments (as described previously under Discreteness) qualify as a DPS under our 1996 DPS policy and none are a listable entity under the Act. Because we found that the *Ochotona princeps schisticeps, O. p. fenisex, O. p. princeps, and O. p. saxatilis* subpopulations do not meet the significance criterion of the DPS policy, we need not proceed with an evaluation of the threats to pikas in any of the population segments.

Significant Portion of the Range Analysis

Having determined that the American pika at the species and subspecies level do not meet the definition of an endangered or threatened species under the Act and no populations qualify under our policy, we must next consider whether there are any significant portions of the range where the species is in danger of extinction or is likely to become endangered in the foreseeable future.

The Act defines an endangered species as one ''in danger of extinction throughout all or a significant portion of its range,'' and a threatened species as one ''likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.'' The term ''significant portion of its range'' is not defined by the statute. For the purposes of this finding, a significant portion of a species' range is an area that is important to the conservation of the species because it contributes meaningfully to the representation, resiliency, or redundancy of the species. The contribution must be at a level such that its loss would result in a decrease in the ability to conserve the species.

In determining whether a species is endangered or threatened in a significant portion of its range, we first identify any portions of the range of the species that warrant further consideration. The range of a species can theoretically be divided into portions an infinite number of ways. However, there is no purpose to analyzing portions of the range that are not reasonably likely to be significant and endangered or threatened. To identify only those portions that warrant further consideration, we determine whether there is substantial information indicating that: (1) The portions may be significant, and (2) the species may be in danger of extinction there or likely to become so within the foreseeable future. In practice, a key part of this analysis is whether the threats are geographically concentrated in some way. If the threats to the species are essentially uniform throughout its range, no portion is likely to warrant further consideration. Moreover, if any concentration of threats applies only to portions of the species' range that are not significant, such portions will not warrant further consideration.

If we identify portions that warrant further consideration, we then determine whether the species is endangered or threatened in this portion of its range. Depending on the biology of the species, its range, and the threats it faces, the Service may address either the significance question or the status question first. Thus, if the Service considers significance first and determines that a portion of the range is not significant, the Service need not determine whether the species is endangered or threatened there. Likewise, if the Service considers status first and determines that the species is not endangered or threatened in a portion of its range, the Service need not determine if that portion is significant. However, if the Service determines that both a portion of the range of a species is significant and the species is endangered or threatened there, the Service will specify that portion of the range as endangered or threatened under section 4(c)(1) of the Act.

The terms ''resiliency,'' ''redundancy,'' and ''representation'' are intended to be indicators of the conservation value of portions of the range. Resiliency of a species allows the species to recover from periodic disturbance. A species will likely be more resilient if large populations exist in high-quality habitat that is distributed throughout the range of the species in such a way as to capture the environmental variability found within the range of the species. A portion of the range of a species may make a meaningful contribution to the resiliency of the species if the area is relatively large and contains particularly high-quality habitat, or if its location or characteristics make it less susceptible to certain threats than other portions of the range. When evaluating whether or how a portion of the range contributes to resiliency of the species, we evaluate the historical value of the portion and how frequently the portion is used by the species, if possible. In addition, the portion may contribute to resiliency for other reasons—for instance, it may contain an important concentration of certain types of habitat that are necessary for the species to carry out its life-history functions, such as breeding, feeding, migration, dispersal, or wintering.

Redundancy of populations may be needed to provide a margin of safety for the species to withstand catastrophic events. This does not mean that any portion that provides redundancy is necessarily a significant portion of the range of a species. The idea is to conserve enough areas of the range such that random perturbations in the system act on only a few populations. Therefore, each area must be examined based on whether that area provides an increment of redundancy that is important to the conservation of the species.

Adequate representation ensures that the species' adaptive capabilities are conserved. Specifically, the portion should be evaluated to see how it contributes to the genetic diversity of the species. The loss of genetically based diversity may substantially reduce the ability of the species to respond and adapt to future environmental changes. A peripheral population may contribute meaningfully to representation if there is evidence that it provides genetic diversity due to its location on the margin of the species' habitat requirements.

We evaluated the American pika's current range in the context of the most significant factor(s) affecting the species (in this case, only climate change) to determine if there is any apparent geographic concentration of potential threats. As identified under the threats assessment in Table 1 above, the threat of recent, current, and future increased summer surface temperature from climate change is primarily concentrated in portions of the range of *Ochotona princeps schisticeps, O. p. fenisex, O. p. princeps and O. p. saxatilis.* We defined the portion of the range for these subpopulation to include: (1) The lower elevation portions of southeastern Oregon, Monitor Hills, southern Wasatch Mountains, and Toiyabe Mountains, and the low- and mid-elevations of the Warner Mountains for *O. p. schisticeps*; (2) the low-elevation portion of Mt. St. Helens for *O. p. fenisex*; (3) the low-elevation portion of Glacier National Park and the Sawtooth Mountain Range, and low- to mid-elevation portion of the Northern Wasatch Mountains and Ruby Mountains for *O. p. princeps*; and (4) the low-elevation portion of the Sangre de Cristo Mountains and Southern Rockies for *O. p. saxatilis.*

Ochotona princeps schisticeps

As stated above, we defined the portion of the range for *Ochotona princeps schisticeps* as the lower elevation portions of the Great Basin in southeastern Oregon, Monitor Hills, southern Wasatch Mountains, and Toiyabe Mountains, and the low and mid-elevations of the Warner Mountains. As stated under Discreteness in the DPS section of this finding, in the numerous ''sky islands'' of the Great Basin, American pikas are isolated (greater than the maximum estimated individual dispersal distance (10 to 20 km; 6.2 to 12.4 mi) of the species from the nearest extant population) by these geographic barriers (Hafner 1994, pp. 376-378). These barriers eliminate dispersal of pikas between and among mountain ranges. Because temperatures in these valleys often exceed the physiological constraints of pikas (e.g., valley temperatures often exceed greater than or equal to 28 °C (82.4 °F)), pikas are unable to disperse to other mountain ranges and are now confined to a subset of ranges within the Great Basin, thereby creating many gaps between pika populations in the Great Basin. However, there are pika populations in suitable habitat at mid- to high elevations on the ''sky islands'' of the Great Basin that are not at risk of extirpation from increased summer temperatures from climate change, ensuring adequate redundancy and resiliency across the portion of the range under consideration.

Additionally, the amount of suitable habitat and number of pika populations in the Great Basin portion when compared to the range of the rest of the subspecies in the Sierra Nevada Mountain Range is small. There are larger, contiguous blocks of suitable habitat in the Sierra Nevada Mountains, none of which was identified as potentially at risk from climate change. Approximately 64 percent of the subspecies' suitable habitat occurs in the Sierra Nevada (Finn 2009, pp. 1-2), ensuring adequate redundancy and resiliency across the subspecies.

Galbreath *et al.* (2009b, pp. 20-21) demonstrated that three distinct mitochondrial DNA clades (genetically similar groups that share a common ancestor) are evident within *Ochotona princeps schisticeps*; however, Galbreath (2009, pers. comm.) also states there is not sufficient evidence at this point to distinguish among the three subregions of *O. p. schisticeps* as distinct evolutionary significant entities. Genetic substructure at the nuclear DNA level needs to be elucidated before northern (eastern Oregon/northern California), central (Sierra Nevada Range and central Nevada), and eastern (western Utah) subclades are evident. Therefore, at this point, there are no subclades (genetically different groups) associated with *O. p. schisticeps* (Galbreath *et al.* 2009b, p. 55, Figure 5). Hafner and Smith (2009, pp. 12-14) recently performed analyses of morphometric variation among American pikas, but did not make any conclusions about morphology differences between *O. p. schisticeps* populations. Therefore, based on the best available information, we have determined that this portion of the range does not contribute to the diversity of genetic, morphological, or physiological diversity of the subspecies, and there is adequate representation across the portion of *O. p. schisticeps* under consideration and the rest of the range of the subspecies.

For these reasons, we conclude that no portions of the *Ochotona princeps schisticeps*' range warrant further consideration as a significant portion of the range. We do not find that the *O. p. schisticeps* is in danger of extinction (endangered) now, nor is it likely to become endangered within the foreseeable future (threatened) throughout all or a significant portion of its range.

Ochotona princeps fenisex

As stated above, we defined the portion of the range for *Ochotona princeps fenisex* as the low-elevation portion of Mt. St. Helens. One out of a total of eight known pika populations on Mt. St. Helens (Bevers 1998, pp. 68, 70-71) is potentially at risk of extirpation from increased summer surface temperatures from climate change within the *O. p. fenisex* subpopulation in the foreseeable future (see Table 1 above) and occurs at relatively low elevations. Pika sites on Mt. St. Helens at higher elevations, where pikas more typically occupy suitable talus habitat, are not at risk from climate change now or in the foreseeable future, ensuring adequate redundancy and resiliency across the portion of the range under consideration. Therefore, not all pika sites on Mt. St. Helens are potentially at risk from the effects of climate change, and as stated under Factor A, results from comparisons between below-talus summer temperatures and surface summer temperatures indicate that our risk assessment for climate change may be conservative because risk estimates for pika sites were based on projections for summer surface temperatures.

Of the 69 unique pika observations used in our analysis to generate an elevation across the range of *O. p. fenisex*, we do not anticipate risks from increased summer temperatures occurring at 98 percent (68 of 69) of the observation points. As such, the amount of suitable habitat in the Mt. St. Helens subpopulation segment when compared to the rest of the range of the subspecies is small. There are larger, contiguous blocks of suitable habitat in the Coast and Cascade Mountains, none of which was identified as potentially at risk from climate change, ensuring adequate redundancy and resiliency across the range of the subspecies.

Galbreath *et al.* (2009b, p. 19) demonstrated Cascade Range populations also were closely related, though they did not form an unambiguous clade (group) descending from an ancestor. However, Galbreath (2009, pers. comm.) also states there is not sufficient evidence at this point to distinguish among *O. p. fenisex* as distinct evolutionary significant entities. Therefore, at this point, there are no subclades (genetically different groups) associated with *O. p. fenisex* (Galbreath *et al.* 2009b, Figure 5). Hafner and Smith (2009, pp. 12-14) recently performed analyses of morphometric variation among American pikas, but did not make any conclusions about morphology differences between *O. p. fenisex* populations. Therefore, based on the best available information, we have determined that this portion of the range does not contribute to the diversity of genetic, morphological, or physiological diversity of the subspecies, and there is adequate representation across the portion of *O. p. fenisex* under consideration and the rest of the range of the subspecies.

For these reasons, we conclude that no portions of the *Ochotona princeps fenisex's* range warrant further consideration as a significant portion of the range. We do not find that the *O. p. fenisex* is in danger of extinction (endangered) now, nor is it likely to become endangered within the foreseeable future (threatened), throughout all or a significant portion of its range.

Ochotona princeps princeps

As stated above, we defined the portion of the range for *Ochotona princeps princeps* as the low-elevation portion of Glacier National Park and Sawtooth Mountain Range, and low- to mid-elevation portion of the Northern Wasatch Mountains and Ruby Mountains. Pika sites at higher elevations on the same mountains, where pikas more typically occupy suitable talus habitat, are not at risk from climate change now or in the foreseeable future, ensuring adequate redundancy and resiliency across the portion of the range under consideration. Therefore, not all pika sites in this portion under consideration are potentially at risk from the effects of climate change, and results from comparisons between below-talus summer temperatures and surface summer temperatures indicate that our risk assessment for climate change may be conservative because risk estimates for pika sites were based on projections for summer surface temperatures.

This portion of the range includes the southwestern and parts of the central portion of the subspecies' range. However, the amount of suitable habitat in this portion of the range when compared to the rest of the range of the subspecies that will not be at risk from climate change in the foreseeable future is small. There are larger, contiguous blocks of suitable habitat in the northern Rocky Mountains, none of which was identified as potentially at risk from climate change, ensuring adequate redundancy and resiliency across the range of the subspecies.

The *Ochotona princeps princeps* lineage is partitioned into northwestern and southeastern genetic phylogroups (type of pika group) (Galbreath *et al*. 2009b, pp. 19-20, 55). Pika populations in the Northern Wasatch and Ruby Mountains make up a portion of the southeastern phylogroup, and Glacier National Park and Sawtooth Range pika populations make up a small portion of the northwestern phylogroup. All suitable habitat in Wyoming and northern Colorado, which are not part of the portion of the range under consideration, make up a substantial portion of the southeastern phylogroup. Additionally, the majority of the northwestern phylogroup is made up of pika populations occurring outside the portion of the range at risk from climate change.

Although there are some genetic (mitochondrial DNA) differences between phylogroups, there is not sufficient evidence at this point to distinguish among *O. p. fenisex* as distinct evolutionary significant entities beyond the subspecies level (Galbreath *et al*. 2009b, Figure 5). Hafner and Smith (2009, pp. 12-14) recently performed analyses of morphometric variation among American pikas, but did not make any conclusions about morphology differences between O. *p. princeps* populations. Therefore, based on the best available information, we have determined that this portion of the range does not contribute to the diversity of genetic, morphological, or physiological diversity of the subspecies, and there is adequate representation across the portion of *O. p. princeps* under consideration and the rest of the range of the subspecies.

For these reasons, we conclude that no portions of the *Ochotona princeps princeps*' range warrant further consideration as a significant portion of the range. We do not find that the *O. p. princeps* is in danger of extinction (endangered) now, nor is it likely to become endangered within the foreseeable future (threatened), throughout all or a significant portion of its range.

Ochotona princeps saxatilis

As stated above, we defined the portion of the range for *Ochotona princeps saxatilis* as the low-elevation portion of the Sangre de Cristo Mountains and Southern Rockies. Pika sites at higher elevations where there are larger, contiguous blocks of suitable habitat, where pikas more typically occupy suitable talus habitat, are not at risk from climate change now or in the foreseeable future, ensuring adequate redundancy and resiliency across the portion of the range under consideration and the range of the subspecies. Therefore, not all pika sites in this portion under consideration are potentially at risk from the effects of climate change, and as stated under Factor A, results from comparisons between below-talus summer temperatures and surface summer temperatures indicate that our risk assessment for climate change may be conservative because risk estimates for pika sites were based on projections for summer surface temperatures.

Galbreath *et al*. (2009b, pp. 20-21) demonstrated populations south of the Colorado River were closely related genetically, although sites closer to the Colorado River exhibited some morphological similarities to pikas north of the Colorado River, which is the dividing line between *Ochotona princeps saxatilis* and *O. p. princeps*. However, Galbreath *et al*. (2009b, Figure 5) also states there is not sufficient evidence at this point to distinguish among *O. p. saxatilis* as distinct evolutionary significant entities. Therefore, based on the best available information, we have determined that this portion of the range does not contribute to the diversity of genetic, morphological, or physiological diversity of the subspecies, and there is adequate representation across the portion of *O. p. saxatilis* under consideration and the rest of the range of the subspecies.

For these reasons, we conclude that no portions of the *Ochotona princeps saxatilis*' range warrant further consideration as a significant portion of the range. We do not find that the *O. p. saxatilis* is in danger of extinction (endangered) now, nor is it likely to become endangered within the foreseeable future (threatened), throughout all or a significant portion of its range.

We request that you submit any new information concerning the status of, or threats to, this species to our Utah Ecological Services Field Office (see **ADDRESSES** section) whenever it becomes available. New information will help us monitor this species and encourage its conservation. If an emergency situation develops for this species or any other species, we will act to provide immediate protection.

References Cited

A complete list of references cited is available on the Internet at *http://www.regulations.gov* and upon request from the Utah Ecological Services Field Office (see **ADDRESSES** section).

Author(s)

The primary authors of this notice are the staff members of the Utah Ecological Services Field Office.

Authority

The authority for this action is section 4 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Dated: January 26, 2010

Signed: James W. Kurth

Acting Director, U.S. Fish and Wildlife Service

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