Department of Fish and Game
Sacramento, California

EVALUATION OF PETITION FROM CENTER FOR BIOLOGICAL DIVERSITY TO LIST AMERICAN PIKA (*Ochotona princeps*) AS THREATENED [1]

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[1] Gustafson, J. R., and R. J. Logsdon. 2007 (Dec. 21.). Evaluation of petition from Ctr. for Biological Diversity to list American pika (*Ochotona princeps*) as threatened. Calif. Dep. of Fish and Game, Wildl. Branch, Sacramento CA. Nongame Wildlife Program Report 2007-05, 19 pp.

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December 14, 2007

EXECUTIVE SUMMARY

The Center for Biological Diversity, San Francisco, California (Petitioner), submitted a petition to the Fish and Game Commission (Commission) on August 21, 2007, to list the American pika (*Ochotona princeps*) (pika) as a Threatened species, pursuant to the California Endangered Species Act (CESA: Fish and Game Code (FGC) Sections (§) 2050- 2115.5). As an alternative, the Petitioner asked that the Commission list each of the five subspecies of the pika occurring in California as, variously, either Endangered or Threatened species. The Commission received the petition on August 22, 2007. The Commission referred it for evaluation to the Department of Fish and Game (Department) on August 30, 2007.

On September 12, 2007, the Department asked the Commission to grant the Department an additional 30 days, for a total 120 days, to evaluate the petition, pursuant to CESA (FGC § 2073.5(b)) (J. McCamman *in litt.* 2007). On October 19, 2007, the Commission granted this request (J. Carlson Jr. *in litt.* 2007).

The Department evaluated the petition, using the information in that document and other available relevant information, and found that the scientific information presented in the petition is insufficient to indicate that either of the petitioned actions may be warranted. That is, we found that the petition did not provide sufficient scientific information to indicate that the following actions may be warranted: 1) State listing of the pika as a Threatened species, and 2) State listing of each of the five subspecies of the pika occurring in California as, variously, either Endangered or Threatened species. Our review of additional scientific information supports these findings. The Department recommends to the Commission that, pursuant to FGC § 2073.5(a), the Commission reject and not consider the petition.

Summary of Department's Evaluation

A petition to list or delist a species must include "information regarding the population trend, range, distribution, abundance, and life history of a species, the factors affecting the ability of the population to survive and reproduce, the degree and immediacy of the threat, the impact of existing management efforts, suggestions for future management, and the availability and sources of information. The petition shall also include information regarding the kind of habitat necessary for species survival, a detailed distribution map, and other factors the petitioner deems relevant" (FGC § 2072.3).

The Department found that the petition provides adequate information in some but not all categories required by CESA. The petition does not describe the overall geographic range of the pika in California or the geographic range of any of the five subspecies found in the State. The petition provides no information on the distribution of the pika within its California geographic range, other than to say that "elevations of historic populations [in California] ranged from 1370 [meters] to 3700 [meters]". The petition provides no information or description on any overall trend in the size or distribution of populations of the pika in California or of populations of four of the five sub-species occurring in the State. The petition has no information on abundance of the pika.

The rationale for the petition is that local populations of the pika in California are experiencing declines due to "global warming" (petition: page 1). Although the petition cites evidence of pika declines and local extinctions in the Great Basin of Nevada, it provides no evidence of such declines and extirpations in California. The petition has much information on global warming in California, the western United States, and globally, but it provides no data regarding any effect that such warming currently has on the pika in California. In fact, the petition only speculates that warming will affect the pika. As an example of this speculation, the petition states (page 18), "Pika populations in many regions across California may be already committed to extinction due the loss of climatically[-]suitable habitat".

The petition does cite a recent comparative study conducted by the University of California, Berkeley (UCB) in and near Yosemite National Park and co-led by Dr. James Patton of UCB. According to the petition (page 1), the report on the UCB study found that "the pika showed an upward range shift and substantial range contractions on both eastern and western slopes "[of the Sierra Nevada], in comparison with a similar examination in the period of 1911-1920. Again citing the UCB study, the petition (page 17) states, "In California, pika populations have been lost from multiple low-elevation sites in Yosemite National Park during the past 90 years as mean air temperatures in Yosemite rose by 3°C (5.4°F)". On page 21, in referring to the UCB study, the petition says, "In California, ongoing work in Yosemite National Park has recorded the recent disappearance of low-elevation pika populations".

However, in e-mail correspondence to the Department, Dr. Patton wrote, "[We in the Yosemite study are] a long way from even believing, much less documenting, that the pika is under any threat any place in California. Every population we've encountered in Yosemite is seemingly healthy". In separate e-mail correspondence to the Petitioner which he shared with the Department, Dr. Patton stated, "It is not correct that 'In California, pika populations have been lost from multiple low-elevation sites in Yosemite National Park'. We failed to find [the] pika at only one of the historical sites where [the 1911-1920 researchers] had observed and/or collected the species…. [This] "is but one data point for range retraction, and the cited degree of retraction could result simply from the elevational spacing of the [1911-1920] sites". As to the timing of the loss of the pika at this single site, Dr. Patton said that "it is impossible to conclude when in the past 90 years that event occurred. It could have just as easily been in 1916 as any year hence. Use of the word 'recent' is unjustified".

Summary of Life History, Distribution, Population Trend, and Management Status of the Pika

The pika is a relative of the hares and rabbits. The geographic range of the pika includes all of the 11 western United States, except for Arizona, and the Canadian provinces of Alberta and British Columbia. Five recognized subspecies of the pika occur in California, apparently geographically separated in distinct regions of the State. The subspecies, as distributed from north to south, are the Taylor pika (*O. p. taylori*), gray-headed pika (*O. p. schisticpes*), Yosemite pika (*O. p. muiri*), Mt. Whitney pika (*O. p. albata*), and White Mountain pika (*O. p. sheltoni*). Only the geographic range of the Mt. Whitney pika is limited to California. The Taylor pika also is found in Oregon, and the remaining three subspecies also are found in Nevada.

In California, the pika is found from the Oregon border south through the Cascade region to Tulare and Inyo counties in the Sierra Nevada. Generally an alpine species, the pike historically was found above the fir-tree belt in California's Sierra Nevada. Elsewhere in the State, pikas were found above 2,500 meters in elevation.

The pika primarily lives in high-elevation patches of talus surrounded by alpine meadow vegetation. The species also is found in lava formations (Beever 2002). The pika remains in its habitat year-round. Individuals are territorial, and adjacent home ranges tend to be occupied by members of the opposite sex. The pika vocalizes and uses scent-marking to advertise territories and perhaps to attract mates. This species is chiefly diurnal. An individual may spend up to one-half of its waking time perched on a prominent boulder for surveillance. Physical activity occurs when infrequently defending territories with aggressive behavior (such as fights or chases) or while haying or feeding.

Pikas den and nest beneath the talus and generally do not dig burrows (Smith and Weston 1990). Markham and Whicker (1972) documented that pikas do dig burrows while in captivity and observed that "pikas may be capable of enlarging den and nest sites by digging". They are most commonly found near the interface between the talus fields and alpine meadow vegetation, since they frequently graze on grasses closest to the rocks. Pikas depend on the rocks as cover to avoid predation. The farther they travel from the rocks, the more vulnerable they are to mortality from predation, which particularly is significant while juveniles are dispersing and while individuals are foraging beyond the talus-meadow interface.

The pika is strictly herbivorous and engages in two distinct modes of foraging. One is direct feeding and the other is caching food for later consumption (referred to as haying). The pika harvests herbaceous vegetation or tall grasses for storing in hay piles.

Storing food through haying during the summer allows pikas to survive the harsh, prolonged winters of high-elevation habitats.

Pikas behaviorally thermoregulate in response to high ambient temperatures by remaining inactive on particularly warm days or mid-day hours. These animals have a high body temperature and low upper lethal temperature, relative to other small mammal species. Individuals may seek out cool refugia, such as crevices, tubes, and caves, to avoid heat stress during high temperatures. The pika does not hibernate but remains active throughout the winter, using snow tunnels to abate the effects of extremely cold temperatures and to access food storage supplies. Temperature is a primary factor controlling the initial dispersal success of juveniles, primarily at low-altitude sites. At higher altitudes, temperature is not as much of a limiting factor to dispersal success. The majority of California populations are at higher altitudes.

Since pikas have such specific temperature and habitat requirements, they are often biogeographically isolated in habitat patches referred to as ‘islands’ in areas having short summers, long winters with most of the days below freezing temperatures, and high annual rainfall. Pikas are not able to make large dispersal or migration movements between islands of habitat, since they are vulnerable to even slight changes in climate and microhabitats and to increased predation away from rock fields.

INFORMATION PROVIDED IN THE PETITION AND ADDITIONAL INFORMATION GATHERED BY THE DEPARTMENT OF FISH AND GAME

Population Trend ("Population Status, Trend and Abundance" in the petition, beginning on page 17)

The petition provides no information or description on any overall trend in the size or distribution of populations of the pika in California or of populations of four of the five sub-species occurring in the State. Regarding the pika in Yosemite National Park (Yosemite), which likely is *O. p. muiri*, the petition states that "pika populations have been lost from multiple low-elevation sites in Yosemite National Park during the past 90 years as mean air temperatures in Yosemite rose by 3°C (5.4°F)". On page 21, the petition says, "In California, ongoing work in Yosemite National Park has recorded the recent disappearance of low-elevation pika populations". According to the petition, the basis for the latter claims is a report (Moritz 2007) prepared by the University of California, Berkeley. The work upon which the report is based was a UCB study in 2003-2006 of the distribution and abundance of vertebrates at 21 sites within Yosemite "that were originally studied between 1911-1920 by Joseph Grinnell and other staff" at UCB and compiled in Grinnell and Storer (1924). The modern study noted "[s]ubstantial changes in the presence and elevational distribution of species" (Moritz 2007). "The changes of greatest concern relate to the substantial contractions of elevational ranges of the mid-high elevation taxa", including the pika (Moritz 2007).

The petition's statement regarding loss of pikas at "multiple low-elevation sites" has been refuted by Dr. James Patton, one of UCB's leaders for the modern study. In an e-mail message to the Petitioner, Dr. Patton (Patton *in litt.* 2007a) stated, "It is not correct that 'In California, pika populations have been lost from multiple low-elevation sites in Yosemite National Park'. We failed to find [the] pika at only one of the historical sites where [the 1911-1920 researchers] had observed and/or collected the species…. [This] "is but one data point for [pika] range retraction, and the cited degree of retraction could result simply from the elevational spacing of the [1911-1920] sites".

The petition also stated that the report on the UCB study found that "the pika showed an upward range shift and substantial range contractions on both eastern and western slopes" of the Sierra Nevada, in comparison with Grinnell's effort in the period of 1911-1920. Dr. Patton has responded (Patton *in litt.* 2007a) to the Petitioner that "it is impossible to conclude when in the past 90 years that event occurred. It could have just as easily been in 1916 as any year hence. Use of the word 'recent' is unjustified".

In a separate e-mail message to the Department, Dr. Patton (Patton *in litt.* 2007b) wrote, ""[We in the Yosemite study are] a long way from even believing, much less documenting, that the pika is under any threat any place in California. Every population we've encountered in Yosemite is seemingly healthy".

Range (“Range and Distribution” in the petition, beginning on page 12)

The petition states that the pika “is distributed discontinuously in mountainous areas throughout western North America”. This concurs with the descriptions in Smith (1978), Smith *et al.* (1990) and in Smith and Weston (1990). Maps in Hall (1981) and in Hafner and Sullivan (1995) show that the pika is found from southern British Columbia and southwestern Alberta, Canada, south into the coastal United States to east-central California and in the Rocky Mountain states to southern Utah and extreme northern New Mexico. Only Arizona of the 11 western United States does not have populations of the pika. Beever (2002) wrote, “Climatic warming during the past 10,000 years led to the extirpation of most low-elevation pika populations, producing the modern-day relictual distribution of the species”. According to Hafner (2003), temperature seems to limit the distribution of the pika more than does elevation.

The petition does not identify the geographic range of the species in California. According to records identifying the locations of California specimens of the pika known to Hall (1981), in California the pika was found in Siskiyou, Modoc, Shasta, Lassen, Plumas, Placer, El Dorado, Alpine, Tuolumne, Madera, Tulare, Mono, and Inyo counties. Although maps included in Hall (1981) and in Ingles (1965) do not display county lines, they do display a geographic range of the pika as being from the Oregon border south through the Cascade Region to near the southern end of the Sierra Nevada.

Distribution (“Range and Distribution” in the petition, beginning on page 12)

The petition does not describe the geographic distribution of the pika within its California range. The petition does not identify the geographic distribution of any of the five recognized subspecies of the pika in the State, except to list specific geographic points at which the subspecies historically was found and to plot certain museum records on a map in the petition (page 16). Regarding elevational distribution, the petition states that “elevations of historic populations [in California] ranged from 1370 [meters] to 3700 [meters]”.

In California’s Sierra Nevada, the pika historically was found above the fir-tree (Grinnell and Storer 1924), and now commonly is found above 2,500 meters (Smith and Weston 1990). The Taylor pika (*O. p. taylori*) is the northern-most subspecies found in California. Its range extends from Siskiyou and Modoc counties into southern Oregon (Hall 1981). The range of the gray-headed pika (*O. p. schisticpes*) is from Shasta and Lassen counties south to Placer County. Its range extends into extreme-northwestern Nevada (Hall 1981). The Yosemite pika (*O. p. muiri*) occurs from El Dorado and Alpine counties to Tuolumne and Madera counties. Its range includes extreme-western Nevada (Hall 1981). The White Mountain pika (*O. p. sheltoni*) is found in Mono County. Its range also occurs in immediately-adjacent Nevada (Hall 1981). The Mt. Whitney pika (*O. p. albata*) is the only subspecies occurring in California whose geographic range does not include part of another state. It is found Tulare and Inyo counties (Hall 1981).

Within the geographic range of the pika as a species or within the range of a subspecies, “[t]he talus habitat is patchily distributed. A regional population of pikas is normally composed of many discretely[-]distributed subpopulations” (Smith 1978).

Abundance (“Population Status, Trend and Abundance” in the petition, beginning on page 17)

The petition provides no information on abundance or local population densities of the pika, either for the California distribution or for any of the five recognized subspecies in the State. In examining other sources, the Department did not find information on abundance. For density, Smith and Ivens (1983) reported 4.0 to 8.6 individuals per hectare, and Southwick *et al.* (1986) reported 3.4 to 9.9 individuals per hectare in Colorado.

Life History (“Biology, Ecology, and Life History” in the petition, beginning on page 6)

The petition accurately describes the life history of the pika. This primarily is a diurnal species that does not hibernate. The pika is the size of a guinea pig and is a small member of the mammalian Order Lagomorpha, to which rabbits and hares belong (Smith and Weston 1990). The pika is a member of the mammalian Family Ochotonidae, which has one other North American species, the collared pika (*O. collaris*) (Smith and Weston 1990, Hafner and Sullivan 1995). The latter species is found in southeastern Alaska, much of the Yukon Territory, extreme-west Northwestern Territories, and extreme-northwest British Columbia (MacDonald and Jones 1987).

The pika is an obligate resident of high-elevation patches of talus (Grinnell and Storer 1924, Smith and Weston 1990), which is piled or fallen broken rock occurring naturally on mountains at relatively-high elevations, and adjacent alpine or subalpine meadows, or in lava formations with vegetation occurring at the edges of the lava fields or interspersed in the lava (Beever 2002). The pika also may live in human-produced piles of materials such as mine tailings (Severaid 1950, Smith 1980, Beever 2002), lumber (Lutton 1975), and scrap metal (Smith 1974a). This species forages in meadows adjacent to the talus.

Pikas are strictly herbivorous, with strategic foraging habits ensuring both nutritional quality of food and ample sustenance over harsh winters. A wide variety of plant species are selectively harvested according to the composition of plant communities within an individual’s home range, the changes of season, and the assessed nutritional value of plants available (Huntley *et al.* 1986). Pikas engage in two distinct modes of foraging, one of which is direct feeding and the other is caching food for later consumption. The latter method is known as haying, in which the individual pika cuts grasses and herbs and stores them in piles below, or on the surface of, the talus (Smith and Weston 1990). Haying occurs exclusively during the summer at highest levels of vegetation growth (Huntley *et al.* 1986). Timing of haying is sensitive to annual variation in precipitation, which affects emergent spring growth of vegetation (Smith 1974b). Dearing (1997) concluded that the primary function of hay piles is “to provide the major source of sustenance for pikas during the winter”. Although Barash (1973) related that pikas “spend considerable energy ‘curing’ [gathered] vegetation for winter storage”, Smith and Weston (1990) dispute this, stating, “Hay is stored directly in haypiles”.

Both feeding and haying require many foraging trips of varying length per day (up to 13 trips per hour) to meet the demands of the pika’s high metabolism, year-round activity, and haying requirements (Beever *et al.* 2003). The food-intake requirements increase even further for females during the breeding season (Huntley *et al.* 1986). Barash (1973) found in a Montana study that “[p]ikas tend to make short, rapid forays from the talus, rarely straying more than 5 meters”. However, when haying, a pika will travel significantly further into the meadow than when feeding (Smith and Weston 1990).

Food choices generally include short alpine grasses for direct consumption and forbs or tall grasses harvested for haying (Huntley *et al.* 1986). Severaid (1950) documented that the pika in the area of Bodie, California, consumed big sage (*Artemisia tridentata*) but did not specify whether consumed parts were leaves or twigs. The amount of vegetation stored in hay piles may vary according to the individual pika’s sex or age, availability of selected vegetation, and distance traveled to obtain it (Smith and Weston 1990). During the winter, food sources may include cushion plants, lichens, or stored caecal pellets to supplement shortages in hay piles (Smith and Weston 1990).

The pika is active on the surface of talus or in adjacent vegetation for about 30% of daylight hours; up to one-half of this time may be spent sedentarily perched on a prominent boulder for surveillance (Smith and Ivins 1986). Physical activity occurs when infrequently defending territories with aggressive behavior (such as fights or chases) (Stewart *et al.* 1982) or while haying or feeding. On warm days, the pika is relatively inactive (Smith 1974b).

Pikas are individually territorial and adjacent home ranges tend to be occupied by members of the opposite sex (Stewart *et al.* 1982). The pronounced territoriality may be due to the need to protect hay piles (Lutton 1975, Kawamichi 1976). The pika exhibits social structuring and tolerance behaviors, particularly during the breeding season, to conspecifics of the opposite sex and in areas of territory overlap (Stewart *et al.* 1982). In a Colorado study, Svendsen (1979) found that territories of adult males included territories of adult females, “but males were exclusive to other males and females [were exclusive] to other females”.

Adult pikas rarely disperse (Smith and Ivens 1983), but juveniles may need to disperse from their natal talus patch to find vacant territories elsewhere. In a study conducted near Yosemite, a researcher found that “marked juvenile pikas tended to settle vacant territories near their natal territory” (Peacock 1997) in the same talus patch. In a Colorado study, almost all juveniles establishing territories in a talus patch settled within 50 meters of the center of their natal home range (Smith and Ivens 1983). Whitworth and Southwick (1984) suggested that, although most juveniles acquire territories in or near their natal home range, females tend to disperse farther than their dominant male siblings. If all potential territories are filled, the talus patch is considered to be “saturated” (Smith 1978). Although the mean dispersal distance is unknown, Bunnell and Johnson

(1974) speculated that "[a] mean dispersal distance of 2 miles seems [to be] reasonable for pikas. Sites isolated by unsuitable habitat at greater distances would receive immigrants only rarely". Smith (1974a) reported that the maximum dispersal distance typically is three kilometers. The likelihood of pikas successfully dispersing across non-talus habitats may be low (Smith 1974a, Smith 1974b, Smith 1980).

Temperature is a primary factor controlling the initial dispersal success of juveniles, primarily at low-altitude sites. At higher altitudes, temperature is not as much of a limiting factor to dispersal success (Smith 1974b). Juveniles are most susceptible to mortality while dispersing or acquiring their own territory, when they are vulnerable to predation and conspecific aggression (Smith and Weston 1990). Annual mortality rates average between 36 and 47% and are similar throughout the pika's range and between sexes (Smith 1978).

Pikas have a high body temperature and low upper-lethal temperature, relative to other small mammal species (Smith 1974b). Smith and Weston (1990) attribute these characteristics to a high basal-metabolic rate and low thermal conductance, which may assist the pika's survival during low ambient temperatures over the winter. These same characteristics also contribute to increased mortality during seasons of high ambient diurnal temperatures in the summer, particularly in lower altitudinal ranges, thus facilitating the need for pikas to adjust their behavioral response (Smith 1974b). Brief exposures to ambient temperatures between 25 and 30 degrees Celsius can be lethal (Beever 2002; Smith 1974b). Beever (2002) also suggests that thick fur used for insulation during the winter may prevent evaporative cooling during higher temperatures.

Pikas behaviorally thermoregulate in response to high ambient temperatures by remaining inactive on particularly warm days or during mid-day hours (Smith 1974b; Beever 2002). Pikas seek out cool refugia, such as crevices, tubes, and caves in complex rock formations, to avoid heat stress during high temperatures (Beever 2002). Pikas remain active throughout the winter, using snow tunnels to abate the effects of extremely cold temperatures and to access food-storage supplies (Grinnell and Storer 1924, Huntley *et al.* 1986, Smith and Weston 1990). Thermal stress can occur during winters with extreme temperatures, as a result of a less-protective snow pack from early snowmelt (Smith 1978).

Factors Affecting Ability of Population to Survive and Reproduce ("Nature and Degree of Threat" in the petition, beginning on page 18)

Beever (2002) said that "pikas may be early sentinels of biological response to global climate change such as increased temperatures". The vulnerability of the pika to high temperatures "partly results from the thick fur that insulates them against severe cold, because it also inhibits evaporative cooling [from the skin] during warm periods". The petition and other scientific sources (Beever 2002, Smith 1974b) indicate that high diurnal ambient temperatures can cause direct mortality of individuals, if those temperatures reach between 25 and 30 degrees Celsius. Indirect threats related to the pika's survival may also occur as a result of high diurnal temperatures. Increased time taking cover in cooler spaces under rocks results in a decrease in the amount of time available for critical surface activities. In lower elevations and in areas with hot summer climates, pikas can only remain surface-active during the morning and evening hours, which can cause a major stress on an individual's ability to forage and to disperse (Smith 1974b).

Unusual weather phenomena such as heat waves can cause inconsistent and unpredictable changes in levels of precipitation, amount of snow pack, and the abundance and composition of vegetation communities. Such changes can affect the timing of pika reproduction events, winter snow insulation, obtaining a food supply needed to survive a long harsh winter, and the ability to maintain an adequately nutritional diet (Huntley *et al.* 1986, Smith 1978). Pika life-history characteristics are susceptible to being disrupted by even slight changes in microclimate conditions. However, more data will be needed to identify a direct relationship between changing climate conditions and pika mortality or reproduction failures (Smith 1978).

Long-term changes in climate can cause changes in alpine and subalpine plant communities, which can effectively alter the habitat and vegetation structure critical to the pika's survival. Although this is a gradual, long-term effect, any immediate changes or degradation of habitat composition (talus or vegetation) could pose an immediate threat to pika population persistence and individual dispersal capabilities (Beever 2003, Hafner 1994).

The petition states, "Two recent studies of pika population persistence in California and the Great Basin have found that pika populations have been extirpated from lower elevation sites over the past century, resulting in an upslope range shift in both regions. Both studies concluded that increased temperatures provide the best explanation for low-elevation population extirpations". This statement is accurate, in regard to the Great Basin work. Although the petition does not identify a source for the statement in the first sentence regarding persistence of the pika in California, the Department believes that the petition is referring to the work reported by Moritz (2007). As we demonstrated above in the section entitled Population Trend, the Petitioner has misinterpreted information. Researchers in the study reported by Moritz (2007) found only one formerly-occupied site at which the pika had been lost since a study done in the second decade of the twentieth century. As we quoted above Dr. Patton of UCB, the single site of loss "is but one data point for [pika] range retraction, and the cited degree of retraction could result simply from the elevational spacing of the [1911-1920] sites".

The petition's quoted sentence in the preceding paragraph also does not identify a source regarding the Great Basin. However, the Department believes that it is a reference to the work by Beever *et al.* (2003). If it is, we disagree with the petition's interpretation of that paper. As we describe below in the section of this evaluation report entitled Degree and Immediacy of Threat, Beever *et al.* (2003) did not conclude that climatic warming is likely responsible for the plight of the pika in the Great Basin.

The primary author of the Great Basin work also has studied the pika in California at

Lava Beds National Monument in Modoc County and in Craters of the Moon National Monument in south-central Idaho, both of which are in relatively-low elevation sites. Based on the fact that the pika recently had been extirpated from lower-elevation sites in Nevada, Beever (2002) commented that the "current persistence of pikas in Craters and Lava Beds National Monuments is noteworthy".

In addition to climatic warming, the petition (citing Beever 2002) lists additional factors possibly contributing to the loss of pika populations as altered composition of plant communities due to anthropogenic fire regimes, intense grazing by livestock, and introduction of exotic species of plants. Animals grazing near the talus-meadow interface could trample, consume, or otherwise alter the vegetation available for pika grazing. Beever *et al.* (2003) cites livestock grazing and proximity to primary roadways as potential factors negatively affecting populations of the pika.

Predation is a cause of both adult and juvenile mortality, particularly while juveniles are dispersing and while individuals are foraging beyond the talus-meadow interface (Huntley *et al.* 1986, Smith and Weston 1990). Smith and Weston (1990) named the following species as potential predators of the pika: coyote (*Canis latrans*), long-tailed weasel (*Mustela frenata*), short-tailed weasel (*M. erminea*), and marten (*Martes americana*). Quick (1951) documented that the long-tailed weasel both pursues and eats pikas in Colorado. Murie (1961) documented that the marten eats pikas in Wyoming. Lutton (1975) observed that short-tailed weasels hunted for pikas in Colorado. Ivins and Smith (1983) noted that "martens and weasels differ considerably in their ability to capture pikas. Martens possess the ability to ambush pikas while they are on the meadow where access to cover is limited, or while they are surface[-]active on the talus. Weasels, on the other hand, are smaller and can follow pikas into the talus interstices where martens do not go".

Degree and Immediacy of Threat ("Nature and Degree of Threat" in the petition, beginning on page 18)

The petition argues that, "[b]ecause of the high thermal sensitivity of pikas, temperature appears to be one of the most important climate variables affecting pika distributions and population persistence. Pika scientists have attributed pika population extirpations in the past century to rising temperatures due to global warming, and therefore, continuing warming poses a significant threat to the American pika". The statement in the latter sentence is inaccurate, in that scientists have not been able to pinpoint climate warming as the underlying cause of loss of pika populations, even in the Great Basin of Nevada where much work has been done. In any case, the petition presents no information supporting the contention that a warming climate poses a threat, significant or otherwise, to the pika in California. The petition presents no information that any climate changes currently are negatively affecting the pika in California.

The following summary demonstrates that there has been wide-spread concern among scientists about the loss of populations of the pika in the Great Basin of Nevada, as well as much speculation regarding the causes of the loss.

The relevant work cited by the petition is that of Dr. Eric Beever of the U. S. Geological Survey, who along with colleagues at the University of Nevada - Reno, has documented the loss of lower-elevation populations of the pika in the Great Basin of Nevada (Beever *et al.* 2003). These researchers found that pikas in the Great Basin appeared to have undergone significant losses, *i.e.*, extirpation of the species at more than 25% of historically-occupied sites (seven of 25), in the previous half-century (Beever *et al.* 2003). They could not identify the reasons for the failure of the pika to persist in these sites but reasoned that it could be due to one or a combination of the following causes: 1) isolation factors, due to the difficulty of individual pikas dispersing across inhospitable habitat to recolonize sites in which the species had become extirpated, 2) climatic factors, due to short-term changes in local (Great Basin) temperatures causing death of individuals, and 3) human-induced factors, due to local impacts of grazing animals (Beever *et al.* 2003). Although these authors stated that "[l]ong-term studies are needed to verify these patterns of apparent extirpation and to more firmly establish their causes", they believed that "warmer temperatures seem likely to be contributing to apparent losses [of pika populations] that have occurred at a pace significantly more rapid than that suggested by paleontological records".

In the mid-1980s, at a time when climate warming was being called the 'greenhouse effect', Peters and Darling (1985) warned that, due to "[c]ontinued burning of fossil fuels, with a possible contribution from progressive deforestation", the lower atmosphere likely would grow warmer. These authors said that increases in temperature in the next 50 years might have "significant impact on biological systems" and that the related changes in precipitation patterns would have an even greater effect for many species (Peters and Darling 1985). They believed that "the consequences would be most dire" for those species with "limited [geographic] range, small populations, and genetic isolation".

McDonald and Brown (1992) drew attention to the potential plight of mountain-dwelling small mammals in the Great Basin, including the pika, in developing a model predicting that the pika is in danger of extinction due changing climate and vegetation. Skaggs and Boecklen (1996) challenged the key assumption of the McDonald and Brown model, which is that populations of these small mammals are isolated by absolute barriers to dispersal. "The final resolution of the biogeography of montane mammals (and predictive models of extinction) in the Great Basin must await a full and accurate accounting of past and present species distributions" (Skaggs and Boecklen 1996). However, Grayson (2005) believed that the discovery of seven extirpated pika populations as reported by Beever *et al.* (2003) "has added emphasis to earlier warnings [of McDonald and Brown 1992] that Great Basin populations of [the pika] are highly vulnerable".

In reviewing the conservation status of the subspecies of the pika, Smith *et al.* (1990) said that "there appear to be no current threats to the distribution or abundance of most forms of the American pika. However, some isolated populations in the Great Basin of the United States … have disappeared in recent years". In a review of the conservation status of species and subspecies of *Ochotona*, Nowak (1999) named only one California subspecies, *O. p. sheltoni*, as being "vulnerable".

Impact of Existing Management Efforts (“Effect of Current Management and Recommended Management Actions” in the petition, beginning on page 36)

The petition states, “Current management has been inadequate to prevent the decline of the American pika in California, and is inadequate to ensure this animal’s survival in the wild”. The petition describes neither the nature of the ‘current management’ nor its inadequacies. The Department is unaware of any current management for this species, beyond its protection as a nongame species under the Fish and Game Code.

Suggestions for Future Management (Effect of Current Management and Recommended Management Actions” in the petition, beginning on page 36)

The petition makes the following general recommendations as needed for managing the pika in California: “mitigating greenhouse gas pollution, facilitating adaptation to climate change, and monitoring pika populations and their habitat”. We believe that the former two recommendations are not in the purview of the Commission or Department to effect. However, the latter recommendation is a fair one for the Department to consider. In its forthcoming effort to revise the report on mammalian species of special concern in California, the Department will address the conservation status of the pika.

The petition further advocates the following specific actions on the part of the Department which, although none of the actions realistically are related to conserving or managing the pika in California, we may consider as an institution in the future:

- Enact a policy requiring a quantitative analysis of the greenhouse gas implications of all project reviews submitted to the Department of Fish and Game pursuant to the California Environmental Quality Act or other statutory authority. Require projects’ greenhouse gas emissions to be avoided, reduced, or mitigated to the maximum extent practicable.
- Enact a policy requiring a quantitative analysis of the greenhouse gas implications of all Department of Fish and Game regulations. Require greenhouse gas emissions to be avoided, reduced, or mitigated to the maximum extent practicable.
- Enact a policy to reduce greenhouse gas emissions from all Department of Fish and Game activities. Measures could include considering the greenhouse gas implications of all Department purchases, including converting Department vehicle fleets to hybrid, plug-in hybrid, and alternative fuels vehicles, retrofitting Department offices for the maximum possible energy conservation, installing solar power or purchasing renewable energy for all Department facilities, allowing telecommuting for Department staff, and providing solar-powered vehicle charging stations at Department facilities.
- Initiate programs to educate the public about the impact of greenhouse gas emissions and global warming on wildlife, and encourage and facilitate greenhouse gas reductions.

The petition also recommends certain actions to the Commission, the Resources Agency, and State government as a whole. We do not list or consider those recommendations here. They are beyond the scope of CESA and the authority of the Commission to effect.

Habitat Necessary for Survival ("Habitat Necessary for Survival" in the petition, beginning on page 5)

The petition and other scientific sources indicate that the pika is restricted to isolated areas containing specific habitat requirements. We describe the characteristics of these habitat requirements below, including geologic features, biogeographic characteristics, climate conditions, and surrounding biotic communities.

The pika dens and nests beneath high-elevation talus and generally does not dig burrows (Markham and Whicker 1972). The species most commonly is found dwelling near the interface between the talus fields and alpine meadow vegetation, since pikas frequently graze on grasses closest to the rocks (Huntley *et al.* 1986). Pikas depend on the piled rocks for predator-avoidance, thermal protection, and surveillance while perching on prominent boulders. The further that pikas travel from the rocks, the more vulnerable they are to mortality (Huntley *et al.* 1986). As generalist herbivores, pikas depend on habitat that contains a small radius (about five meters) of high plant diversity around the rock piles for both grazing and haying (Huntley *et al.* 1986).

Due to the pika's habitat requirements, they often are biogeographically isolated in patches referred to as 'islands' that contain the requisite habitat. Pikas are not able to make large dispersal or migration movements between suitable talus fields, since they are vulnerable to even slight changes in climate and microhabitats (Smith 1974b). Beever *et al.* (2003) found that pika population persistence was strongly correlated with suitable talus habitat that was continuous and in higher elevations. Pikas defend individual territories and seldom intrude on active conspecifics during the non-breeding season (Smith and Ivins 1986). Territories average up to 55% of the total home range and may vary in size and shape depending on the characteristics of the talus, distance to and quality of vegetation, and even the season (Smith and Weston 1990). Spacing of individual territories is specific to the life history characteristics of the pika. For example, the nearest-neighbor distance and the amount of territory overlap during the breeding season are determined by the sex of the adjacent-territory occupant (Smith and Ivins 1986). For the pika, large areas of continuous suitable talus habitat surrounded by meadow vegetation usually are required to support the survival and persistence of local populations, some of which have home range sizes that average in excess of 2,000 meters squared (Smith and Weston 1990).

Distribution Map

The petition has a single map, on page 16, illustrating the distribution of certain museum records of the five recognized subspecies of the pika in California. The

Department has no reason to believe that the illustrated records are not accurately plotted.

Availability and Sources of Information ("Availability and Sources of Information" in the petition, beginning on page 44)

The petition includes an extensive section listing the literature sources cited in the text. Many of these sources address climatic warming.

CONCLUSIONS

Based on our review of the petition and other available information, the Department concludes that there is insufficient information to indicate that the petitioned action may be warranted. The petition heavily leans on the supposition, based on inconclusive results of studies of the pika in the Great Basin of Nevada, that climatic warming either currently is threatening the pika in California as a whole or one of its five subspecies in the State, and/or is projected to lead to conditions threatening the pika in California as a whole or one of its five subspecies in the State. However, the Department found that neither the petition nor other source offers information supporting the suggestion that the pika in California is being threatened by climatic warming or any other factor or combination of factors and, thus, deserves the protection of CESA. The Department recommends to the Commission that, pursuant to FGC § 2073.5(a), the Commission reject and not consider the petition.

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