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USE OF NONALPINE ANTHROPOGENIC HABITATS BY AMERICAN PIKAS (*OCHOTONA PRINCEPS*) IN WESTERN OREGON

Tom Manning[1] and Joan C. Hagar[2]

ABSTRACT.—The American pika (*Ochotona princeps* Richardson) has long been characterized in field guides and popular literature as an obligate inhabitant of alpine talus and as having relatively low dispersal capability. However, recent work reveals pikas to have broader habitat associations than previously reported. Over a large portion of the western slope of the Cascade Range in Oregon, pikas inhabit relatively low-elevation sites far from alpine areas and frequently occur in rocky man-made habitats such as roadcuts or rock quarries. We present observations of pikas in these previously overlooked habitats and discuss implications for (1) the proposed listing of the American pika as an endangered or threatened species; (2) furthering our understanding of pika population dynamics, habitat associations, and dispersal capabilites; and (3) management of federal, state, and private forest lands.

RESUMEN.—Por mucho tiempo la pika americana (*Ochotona princeps* Richardson) ha sido caracterizada en guías de campo y literatura popular como un habitante obligado de taludes alpinos y por tener una capacidad de dispersión relativamente baja. Sin embargo, trabajo reciente ha revelado que las pikas tienen asociaciones de hábitat más amplias de lo que hasta ahora se creía. En una gran parte de la vertiente occidental de la cordillera Cascade en Oregón, las pikas habitan sitios de elevación relativamente baja, lejos de las áreas alpinas y frecuentemente aparecen en hábitats rocosos artificiales tales como canteras y cortes de carretera. Presentamos observaciones de pikas en estos hábitats pasados por alto anteriormente y discutimos las implicaciones para (1) la propuesta de agregar la pika americana a la lista de especies amenazadas o en peligro; (2) ampliar nuestro conocimiento sobre la dinámica poblacional, las asociaciones de hábitat y la capacidad de dispersión; y (3) la gestión de tierras forestales federales, estatales y privadas.

The American pika (*Ochotona princeps*) generally inhabits rocky talus in mountainous regions of western North America from central British Columbia to the southern Rocky Mountains in New Mexico and the southern end of the Sierra Nevada in California (Smith and Weston 1990). Recent work has documented loss of historical pika populations from several mountain ranges in the Great Basin of the western United States (Beever et al. 2003) and suggested that anthropogenic influences (i.e., climate change and proximity to roads) are likely causes for the observed decline of these populations. Similarly, anthropogenic climate change has been implicated in the contraction of pika distribution in the Sierra Nevada (Moritz et al. 2008). The U.S. Fish and Wildlife Service was petitioned in 2007 to list several pika subspecies as endangered and the entire species as threatened under the Endangered Species Act (ESA; USFWS 2009). Key evidence provided in support of this petition included findings that American pikas are particularly vulnerable to high ambient temperatures (MacArthur and Wang 1973, Smith 1974b), and that prehistoric (Grayson 2005) and historic (Beever et al. 2003) declines of pikas in the Great Basin may have been caused, at least in part, by climatic warming.

Until recently, consensus held that American pikas were obligate inhabitants of alpine talus (i.e., talus at or above timberline in high mountains) (Barash 1973a, 1973b, Smith and Weston 1990) and that they required deep snow cover for winter insulation (Smith 1978), a long-winter climate (>150 days with temperatures <0 °C; Hafner 1993), and accumulation of hay piles for winter food (Dearing 1997). However, Simpson (2009) found that in Oregon's Columbia River Gorge, pikas exist year-round in a short-winter climate (<0 °C for <85 days) at elevations as low as 22 m above sea level (far below timberline and having little or no snow cover) and create almost no visible hay piles. Simpson (2009) convincingly countered the assertion by Hafner (1993) that American pikas exist only within a narrowly constrained bioclimatic envelope. Also, Beever (2002) and Beever et al. (2008) describe pikas in low-elevation sites in or near the Great Basin, suggesting that the habitat associations of American pikas may be more complex than

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TABLE 1. Characteristics of American pika (*Ochotona princeps*) sites in anthropogenic habitat in the Western Cascade Range of Oregon. All sites were surveyed from July through August 2010. Map reference numbers are those used as labels in Fig. 1. Evidence of the presence of pikas included visual, auditory, or fecal detection. Haypiles are described as fresh (green, undecomposed vegetation), old (dried, brown, decomposing vegetation, presumably ≥1 year old), or none (no haypiles observed). The dominant tree species observed at each site were used as indicators of the surrounding forest community. Aspect is reported in degrees azimuth.

Map reference number	Habitat type	Strongest evidence of pika presence	Presence of haypiles	UTM coordinates NAD83	Dominant tree species	Elevation (m)	Aspect (deg.)
1	Roadcut	Visual	Old	10T 566026 E, 4960624 N	Douglas-fir & Silver fir	1341	190
2	Quarry	Visual	Fresh	10T 533062 E, 4942649 N	Douglas-fir & Silver fir	1299	270
3	Quarry	Visual	Fresh	10T 531755 E, 4942368 N	Douglas-fir & Silver fir	1129	variable
4	Quarry	Visual	Fresh	10T 566962 E, 4916356 N	Douglas-fir & Western hemlock	1318	240
5	Roadcut	Visual	Fresh	10T 568680 E, 4916321 N	Douglas-fir & Silver fir	1283	180
6	Roadcut	Visual	Fresh	10T 562325 E, 4916308 N	Douglas-fir & Western hemlock	797	345
7	Roadcut	Visual	Fresh	10T 566443 E, 4894706 N	Douglas-fir & Silver fir	1341	5
8	Roadcut	Visual	Fresh	10T 552580 E, 4860916 N	Douglas-fir & Western hemlock	762	140
9	Roadcut	Visual	None	10T 561359 E, 4855778 N	Douglas-fir & Subalpine fir	1501	105
10	Roadcut	Visual	Fresh	10T 555929 E, 4854165 N	Douglas-fir & Subalpine fir	1450	100
11	Roadcut	Visual	Fresh	10T 535849 E, 4839621 N	Douglas-fir & Western hemlock	1135	135
12	Roadcut	Visual	Fresh	10T 535743 E, 4839264 N	Douglas-fir & Western hemlock	1140	30
13	Quarry	Visual	Fresh	10T 534308 E, 4838571 N	Douglas-fir & Western hemlock	1265	variable
14	Riprap	Visual	None	10T 560433 E, 4834387 N	Douglas-fir & Western hemlock	1099	35
15	Roadcut	Visual	Fresh	10T 537013 E, 4826857 N	Douglas-fir & Subalpine fir	1502	215
16	Roadcut	Visual	Fresh	10T 530341 E, 4825395 N	Douglas-fir & Subalpine fir	1563	335
17	Roadcut	Visual	None	10T 517758 E, 4820679 N	Douglas-fir & Western hemlock	1128	305
18	Roadcut	Auditory	None	10T 543651 E, 4949023 N	Douglas-fir & Western hemlock	1052	220
19	Quarry	Auditory	Old	10T 584411 E, 4942182 N	Douglas-fir & Western hemlock	769	280
20	Quarry	Auditory	Old	10T 536866 E, 4942066 N	Douglas-fir & Western hemlock	945	variable
21	Roadcut	Auditory	Fresh	10T 567804 E, 4916002 N	Douglas-fir & Western hemlock	1253	180
22	Roadcut	Auditory	None	10T 547129 E, 4864512 N	Douglas-fir & Western hemlock	1341	210
23	Roadcut	Auditory	Fresh	10T 542130 E, 4858707 N	Douglas-fir & Western hemlock	1279	45
24	Roadcut	Auditory	Fresh	10T 541284 E, 4857740 N	Douglas-fir & Western hemlock	913	70
25	Roadcut	Auditory	Old	10T 559781 E, 4856404 N	Douglas-fir & Silver fir	1279	335
26	Roadcut	Auditory	Fresh	10T 554184 E, 4854554 N	Douglas-fir & Silver fir	1389	350
27	Roadcut	Auditory	Old	10T 536208 E, 4840878 N	Douglas-fir & Western hemlock	1095	280
28	Roadcut	Auditory	None	10T 537086 E, 4840613 N	Douglas-fir & Western hemlock	1002	90
29	Roadcut	Auditory	Fresh	10T 534888 E, 4834760 N	Douglas-fir & Western hemlock	1380	210
30	Roadcut	Auditory	None	10T 535269 E, 4833560 N	Douglas-fir & Silver fir	1377	265
31	Roadcut	Auditory	None	10T 535882 E, 4831459 N	Douglas-fir & Silver fir	1409	195
32	Quarry	Auditory	Fresh	10T 536843 E, 4828066 N	Douglas-fir & Western hemlock	1388	15

TABLE 1. Continued.

Map reference number	Habitat type	Strongest evidence of pika presence	Presence of haypiles	UTM coordinates NAD83	Dominant tree species	Elevation (m)	Aspect (deg.)
33	Roadcut	Auditory	Old	10T 533093 E, 4825917 N	Douglas-fir & Subalpine fir	1455	130
34	Quarry	Auditory	Fresh	10T 543371 E, 4948980 N	Douglas-fir & Western hemlock	1043	135
35	Quarry	Auditory	Fresh	10T 563677 E, 4818287 N	Subalpine fir/Mountain hemlock	1616	220
36	Quarry	Auditory	Fresh	10T 562766 E, 4793230 N	Douglas-fir & Subalpine fir	1707	variable
37	Roadcut	Auditory	Old	10T 577011 E, 4893351 N	Douglas-fir & Western hemlock	637	315
38	Quarry	Fecal	Fresh	10T 562937 E, 4833251 N	Douglas-fir & Western hemlock	886	290
39	Roadcut	Fecal	None	10T 536032 E, 4839924 N	Douglas-fir & Western hemlock	1109	135
40	Roadcut	Fecal	Old	10T 536125 E, 4840083 N	Douglas-fir & Western hemlock	1116	85
41	Roadcut	Fecal	Fresh	10T 543619 E, 4860797 N	Douglas-fir & Western hemlock	1129	190
42	Roadcut	Fecal	Fresh	10T 534573 E, 4834852 N	Douglas-fir & Subalpine fir	1450	30

previously understood. Most recently, Millar and Westfall (2010) detailed the use of periglacial habitats by pikas in the Sierra Nevada and western Great Basin, and argued that microclimatic temperature regimes may make it possible for pikas to exist in areas previously thought of as unsuitable macroclimate.

Another frequently cited characteristic of American pikas is their limited capacity for successful long-distance dispersal (Smith 1974a, 1974b). The dispersal capability of pikas has important implications for expected distribution of the species and its ability to colonize new habitat patches, but empirical data on pika dispersal capabilities are lacking. However, Peacock (1997) found evidence of gene flow among populations as much as 2 km apart. Anthony (1923) described pikas occurring in places that implied their dispersal across "several miles" of forested habitat in Colorado and in eastern Oregon. Thus, pikas appear capable of dispersing at least several kilometers through forest between suitable talus patches.

The objective of this note is to document the widespread occurrence of American pikas in small patches of talus surrounded by large expanses of coniferous forest at low elevations on the west slope of the Cascade Range in Oregon. Most interesting is that these sites are located many kilometers from alpine habitat, and many consist of man-made rocky habitat (e.g., quarries, road fill, and railroad riprap) established within the last several decades. In addition to possibly providing suitable breeding habitat, these anthropogenic talus patches may enhance the ability of pikas to disperse by shortening the travel distance between patches of naturally occurring habitat. Increasing our understanding of how pikas use these habitats will provide information important for guiding species conservation and management.

We recently confirmed the presence of American pikas in 42 sites of anthropogenic origin in western Oregon (Table 1, Fig. 1). Several of these sites were discovered serendipitously during the course of other work, and the others resulted from probing locations similar to the serendipitous discoveries. One of us (TM) confirmed the presence of pikas at 37 of the 42 sites during July–August 2010 by visual and/or auditory detection of live pikas. We employed a standard protocol (adapted from USDI–National Park Service 2008) during visits to these sites. Maximum search time for each site was

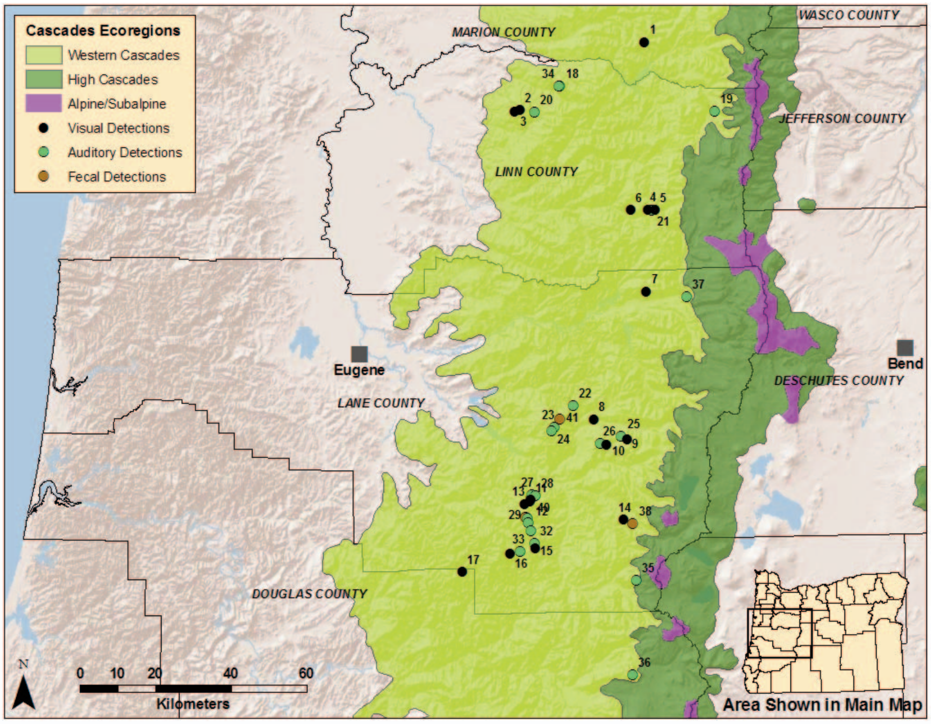

Fig. 1. Sites where American pikas (*Ochotona princeps*) used anthropogenic habitat in the Western Cascade Range of Oregon, July–August 2010. Level-4 ecoregions were derived from Omernik (1987). Anthropogenic habitats include all rocky substrates placed or significantly altered by humans, including quarries, roadcut debris, and riprap reinforcing railroad grades. Map reference numbers cross-reference with Table 1.

20 minutes, during which the site was searched for pika fecal pellets, urine sign, and hay piles. Visual and auditory detections indicated in Table 1 were made during this 20-minute period. Observations were made at various times of day.

In 5 sites where visual or auditory confirmation was not detected during a 20-minute survey, the presence of fresh fecal pellets indicated current occupation of the site by pikas. Our criterion for fresh pika feces was the presence of pellets adhered to rocks by dried urine at sentry posts (Fig. 2). In some cases, these pellets were still wet when collected. Sites where fecal pellets did not meet our criterion for freshness are not included in Table 1, because the lack of fresh fecal sign in the absence of visual or auditory detection does not constitute convincing evidence of pika occupation. Similarly, urine sign and its relative freshness were recorded, but because we strongly suspected that bushy-tailed woodrats (*Neotoma cinerea*) make similar sign, we did not consider urine sign alone to be an adequate indicator of pika presence.

Although we observed hay piles at most of the sites, we also found some locations where pikas were definitely present, but the area had no obvious hay piles. Simpson (2009) also found few and small hay piles in sites occupied by American pikas in the Columbia River Gorge, about 85 km north of our northernmost study site. Because of the inconsistency in occurrence of hay piles and the extensive (versus intensive) nature of our surveys, we made no effort to estimate the density of hay piles per unit area, nor the distance between hay piles.

The patches where we found pikas occurred on a variety of aspects (Table 1), indicating that northern exposure was not necessary for pikas to occupy relatively low-elevation sites (ranging from 610 to 1707 m above sea level). However, we have observed cold air flowing out of talus cavities where pika sign is abundant, similar to conditions described by Millar and Westfall (2010). Thus, microclimates below the talus/debris surfaces appear to be cooler than at the surface and may provide refuge for pikas to

Fig 2. Fresh pika (*Ochotona princeps*) fecal pellets adhering to a urine sentry post, Western Cascade Range, Oregon.

maintain thermal homeostasis on warm summer days. To test this hypothesis, we have begun building a long-term database of temperature data by measuring differentials between deep cavities and talus surface at 4 pika-occupied sites in our study area.

Occurrence of pikas in anthropogenic habitat in the Western Cascades is more than a localized phenomenon; the north–south range of the locations we identified is approximately 170 km from Marion County to Douglas County (Fig. 1), and while we have not yet searched beyond those limits, it seems probable that additional surveys to the north and south will extend that range. The westward extent of pikas in Oregon has not been well documented and is currently unknown. The locations described here are as much as 60 km west of the nearest true alpine habitat, which occurs in small islands surrounding the major volcanic peaks of the Cascade Range (Fig. 1).

The petition for listing the American pika under the ESA was based on evidence for population declines in the Great Basin and Sierra Nevada (Wolf et al. 2007). However, little or no data have been published that indicate a decline of pika populations in the Pacific Northwest, and our observations indicate that pikas have a greater distribution in the Cascades than previously recognized. Simpson (2009) documented pikas at 22 m above sea level (asl) in the Columbia Gorge, and we have found pikas in natural talus sites as low as 538 m asl near the McKenzie River. Because pikas occur in low-elevation natural talus in Oregon, it is likely that they have been distributed widely on the western slope of the Cascades for a long time. Furthermore, it now appears possible that the total amount of high-quality habitat (talus-like rock substrates with a suitable range of subsurface cavity sizes) available to pikas may be increased by human modification of unsuitable rocky substrates in forested areas. One site we found provides an example of how rapidly pikas are capable of occupying this kind of anthropogenic habitat (map reference number 14 in Table 1). In January 2008, a large landslide swept away the railroad tracks at Coyote Mountain in Lane County. Repair of the railroad bed included placement of a vast field (approximately 10 ha) of freshly quarried rock (riprap) to reinforce the entire slope. Only 21 months after the slide, pikas were observed in the newly placed rock (October 2009; D. Davis personal communication). We confirmed the current habitation of pikas at this site in August 2010.

To determine if these anthropogenic rocky patches actually are valuable pika habitat, it will be important to ascertain whether pikas occupying them are reproducing successfully and thus represent viable populations, or if these patches are merely demographic sinks occupied by individuals of low fitness (sensu Van Horne 1983). If the former proves to be the case, and western Oregon pika populations are found to be stable or increasing, the western side of the Cascades may already be operating as a refugium for pikas, though they may be in decline elsewhere due to changing climate (Beever et al. 2003, Grayson 2005, Moritz et al. 2008).

Few descriptions of anthropogenic habitats used by pikas have been published, and none explore implications for management or research. Roest (1953) documented 4 cases of pikas in quarries and roadcuts near the crest of the Oregon Cascades. Smith (1974a) published long-term observations of pikas living in mine tailings, and Lutton (1975) observed pikas living in lumber piles. Millar and Westfall (2010) found 6 instances of pikas using mine tailings and man-made rock structures. Accounts of pikas occurring in low-elevation natural habitats in the Pacific Northwest include those of Howell (1924), Horsfall (1925), Roest (1953), and Simpson (2001, 2009).

The geographically widespread use of anthropogenic habitats by pikas in the Oregon Cascades may influence the management of federal, state, and private forest lands in western Oregon, particularly if the American pika is listed as a threatened or endangered species. New road construction or maintenance projects may impact pika populations either by reopening old quarries and possibly disturbing pikas or by developing new quarries, thereby creating new potential habitat for pikas. Similarly, breakage and dispersal of bedrock alongside new roads has potential to make new pika habitat available. However, additional research is crucial to understanding the function and quality of these habitats (i.e., whether they support reproduction, facilitate dispersal, or function as sinks).

In summary, pikas in the western Oregon Cascades occupy different habitats than pikas in areas such as the Rocky Mountains, Great Basin, and Sierra Nevada. The fact that pikas in Oregon live at low elevations and make widespread use of anthropogenic habitats such as quarries and roadcuts raises interesting questions regarding their range of habitat associations, ability to disperse, and capacity to cope with threats from human disturbance and global climate warming. Given the recent interest in the potential listing of pikas under the ESA, studies of pika habitat associations and population ecology in the Oregon Cascades will provide necessary information for framing conservation strategies and aiding decision makers. We recommend research be undertaken to investigate current geographic limits of these west-slope pikas, source-sink dynamics of west-slope pika populations, dispersal capability through forests, annual thermal regimes to which pikas are exposed in western Oregon, the relationship between pika presence and time since creation of anthropogenic habitat, and genetic diversity of pikas with respect to differences among populations living at various elevations.

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