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Pika Monitoring at Crater Lake National Park, Craters of the Moon National Monument and Preserve, Lassen Volcanic National Park, and Lava Beds National Monument

2010 Annual Monitoring Report

ON THE COVER
Left: An American pika at Craters of the Moon NM&P
Photograph by: Doug Owen

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2010 Annual Monitoring Report

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Abstract

The mission of the National Park Service (NPS) is "to conserve unimpaired the natural and cultural resources and values of the national park system for the enjoyment of this and future generations" (NPS 1999). To uphold this goal, the Director of the NPS approved the Natural Resource Challenge to encourage national parks to focus on the preservation of the nation's natural heritage through science, natural resource inventories, and expanded resource monitoring (NPS 1999). Through the Challenge, 270 parks in the national park system were organized into 32 inventory and monitoring (I&M) networks.

Four park units in the Pacific West Region, Crater Lake National Park (CRLA), Craters of the Moon National Monument and Preserve (CRMO), Lassen Volcanic National Park (LAVO), and Lava Beds National Monument (LABE) have formed a partnership with the Upper Columbia Basin Network (UCBN) to develop a long-term monitoring protocol for the American pika (*Ochotona princeps*) following common methods that support comparative analyses. The pika is a charismatic species in all of these parks and evidence of recent localized extirpations and range contractions in some areas, particularly in the Great Basin and Sierra Nevada mountains, have led to concerns about the impacts of climate change on this heat-intolerant animal.

This protocol annual report details the status estimates obtained during the first year of monitoring (2010). A total of 318 randomly-selected sites were surveyed at the four parks from mid-June through mid-September 2010. Occupancy of sites was determined by surveying for pikas, pika calls, fresh food caches, and fresh fecal pellets within plots with a 12-m radius. Monitoring efforts for 2010 were coordinated with the "Pikas in Peril" research project. The proportions of sites considered occupied were (by park, lowest to highest): 0.145 for LAVO, 0.214 for CRMO, 0.238 for LABE, and 0.647 for CRLA. A customized relational database application, implemented in Microsoft Access, is being used to store and manipulate the data associated with this project. In 2011, established sites will be resurveyed as well as new sites to reach the goal of 100 monitoring sites per park.

Acknowledgments

Funding for this project was provided through the National Park Service Natural Resources Preservation Program (NRPP), the Natural Resource Challenge and the Servicewide Inventory and Monitoring Program. Survey efforts were also coordinated with the NPS Climate Change Response Program funded “Pikas in Peril” research project. Many people contributed their ideas and hard work toward the development and implementation of this pika monitoring effort. We thank the UCBN Data Manager, Gordon Dicus, and GIS Analyst, Meghan Lonneker, for their contributions to the GIS and data management ideas and procedures. UCBN Science Communication Specialist, Paulina Starkey, was helpful in producing interpretive materials, such as resource briefs. We thank the park superintendents, other park resource staff and key field technicians including Emilie Blevins, Laura Hudson, Michael Magnuson, Michael Munts, Jeffrey Murphy, Corinne Ross, Garrett Steensland, Ross Steensland, and Devin Stucki for their contributed thoughts and help with various phases of the 2010 implementation.

Introduction

This report describes the 2010 pilot testing efforts of the American Pika Monitoring Protocol (Jeffress et al. *in review*) and status estimates for pika populations in Crater Lake National Park (CRLA), Craters of the Moon National Monument and Preserve (CRMO), Lassen Volcanic National Park (LAVO), and Lava Beds National Monument (LABE).

Rationale for Monitoring

The American pika (*Ochotona princeps*), a small mammal related to rabbits and hares (Order Lagomorpha), inhabits rocky montane environments of western North America from British Columbia south to northern New Mexico (Hall 1981). Pikas have received increasing attention over concerns that the species is at risk of extinction due to global climate change, and several authors have proposed that it is a sensitive climate change indicator species (Smith 1974, McDonald and Brown 1992, Lawlor 1998, Beever et al. 2003, Krajick 2004, Smith et al. 2004, Grayson 2005, Beever et al. 2010). Localized extirpations of pika populations have been documented in the Great Basin (Beever et al. 2003, Grayson 2005, Beever et al. 2010). The species appears to have responded to climate change with rapid range contractions during the Holocene and over the last century (Hafner 1994, Hafner and Sullivan 1995, Beever et al. 2003, Grayson 2005, Moritz et al. 2008, Galbreath et al. 2009). Elevational range contractions in the Great Basin appear to be particularly pronounced (Beever et al. 2003, Grayson 2005). The hypothesized mechanism for these range contractions is elevated temperatures and decreased mountain snowpack resulting from accelerated climate change (Smith et al. 2004, Grayson 2005). Recent habitat models (Craighead *unpublished report*) as well as dynamic models of climate-mediated extinction (Loarie et al. *in press*) predict that pikas may disappear from up to 80% of their current range by the turn of the century. The American pika was recently considered for protection under the Endangered Species Act (USFWS 2009). At the same time, a taxonomic revision of the species (Hafner and Smith 2010) led to the aggregation of formerly recognized subspecies, including several that were endemic to NPS lands, into five large phylogenetic groupings. In its listing decision, the USFWS recognized that “climate change is a potential threat to the long-term survival of the American pika” but concluded that none of the newly recognized phylogenetic groups were in immediate risk of extinction. Notably, however, the USFWS called for further data on the status, trends, and determinants of pika distribution for future listing and management considerations (USFWS 2010).

Pikas may be directly impacted by climate change for several reasons. First, they have a relatively high metabolic rate and low thermal conductance, such that resting body temperature is only about 3°C lower than lethal body temperature (MacArthur and Wang 1973, MacArthur and Wang 1974, Smith 1974). Due to this low thermotolerance, pikas primarily thermoregulate through behavioral adaptations and strategically time activity during the hot, summer months (MacArthur and Wang 1974, Smith 1974). Pikas are locally restricted to boulder-strewn talus fields and lava flows where abundant crevices and cavities provide sufficient cover and thermal refugia (Smith and Weston 1990, Millar and Westfall 2010, Rodhouse et al. 2010). This leads to pika occurrence patterns distributed along latitudinal and elevational gradients (Hafner 1993, Hafner 1994, Rodhouse et al. 2010). In the southern and more arid portions of the species’ range, such as in the Great Basin and Sierra Nevada Mountains, it is uncommon to find pikas below 2,500 m (Grinnell 1917, Smith and Weston 1990, Beever et al. 2003, Moritz et al. 2008, Beever et al. 2010, but see Millar and Westfall 2010 and Rodhouse et al. 2010), but pikas occur at elevations as low as 300 m in mesic, northern latitudes (Simpson 2009). Furthermore, since pikas do not hibernate, the snowpack serves as thermal insulation in cold winter months, which has been studied in the closely-related collared pika (*O. collaris*; Morrison and Hik 2007). Without this insulation, pikas may be exposed to freezing rain and prolonged freezing temperatures (Smith et al. 2004, Morrison and Hik 2007). Recent research suggests that pikas are being lost from sites that have higher average summer temperatures and that experience more extremely cold days, presumably due to reductions in the insulation provided by winter snowpack (Beever et al. 2010). Therefore, snowpack declines projected to occur in mountainous regions of the western United States as a result of warming temperatures and altered precipitation patterns (Wagner et al. 2003, Mote et al. 2005, Karl et al. 2009) may also increase the risk of local extinction, particularly at lower elevations (Smith et al. 2004, Morrison and Hik 2007, Beever et al. 2010).

Our approach for monitoring pika populations in NPS lands is based on repeat presence-absence surveys of circular plots (hereafter "sites") that will permit detection of changes in site occupancy patterns over time. Site occupancy is an efficient and informative measure of change in animal populations, and occupancy models can be used to examine factors affecting site occupancy and rates of turnover in site occupancy (i.e., local site "extinction" and local site "recolonization"; MacKenzie et al. 2006, Royle and Dorazio 2008). Presence-absence surveys have been successfully used to inventory the species in CRMO (Rodhouse et al. 2010) and LABE (Ray and Beever *unpublished report*), and occupancy models developed from these surveys have revealed important insights that have been useful in guiding the development of this protocol. These efforts have indicated that the species is readily detectable when present, particularly when direct (e.g., visual observation, calling) and indirect (e.g., scat, haypiles) signs of occupancy are used. Patterns of site occupancy appear to follow elevation gradients in some parks, most notably in CRMO (Rodhouse et al. 2010) but also in LABE (Ray and Beever *unpublished report*). These observations follow patterns of historic elevational range contractions previously noted elsewhere (Hafner 1993, Beever et al. 2003, Grayson 2005). Accordingly, we have designed the protocol explicitly within the context of elevation, which integrates climatic factors and is an efficient, stable, and more easily measured proxy for the physiological stresses caused by temperature and snowpack (Körner 2007). Site surveys will be conducted across park samples of permanent monitoring plots that are distributed along the elevational gradients that occur in each of these parks. Because the four parks share similar latitude, this potential source of variation will be controlled. Furthermore, we have followed a hierarchical approach to occupancy modeling (Royle and Dorazio 2008) that will enable both within- and among-park analyses to be accomplished in an efficient and robust manner. This hierarchical strategy will provide a much broader regional perspective on pika occupancy patterns and dynamics than would be achievable if analyzed on a park-by-park basis.

Objectives

The monitoring questions to be addressed by this program are:

- What are the current spatial patterns of pika site occupancy in the four parks?
- What are the trends in pika site occupancy patterns in the four parks?
- Does the status and trend in pika site occupancy patterns vary along the elevational gradient within and among parks?

Methods

Pika site occupancy was evaluated at randomly-selected sampling sites in the four parks following methods described in the peer-reviewed monitoring protocol developed by the Upper Columbia Basin Network (Jeffress et al. *in review*). Pilot testing of the monitoring protocol was coordinated with the NPS Climate Change Response Program funded "Pikas in Peril" research project.

Sampling Frames and Site Selection

Survey site locations were drawn from GIS-based models of predicted habitat using the generalized random-tessellation stratified (GRTS) spatially-balanced sampling design described by Stevens and Olsen (2004). A GRTS sample design is a flexible, efficient, and statistically robust approach that accommodates many of the difficulties commonly encountered in field sampling (e.g., sample frame errors, inaccessibility), allows for inclusion of new sample locations in response to these difficulties, maintains spatial balance, and, through a modified variance estimator developed for GRTS samples, increases precision of status estimates (Stevens and Olsen 2003, 2004). These attributes help ensure that GRTS survey designs are representative of the target population of interest, may be efficiently implemented, and allow unbiased inference from sampled sites to un-sampled elements of the resource of interest. This last attribute of GRTS is possible because the design generates known inclusion probabilities (or "sample weights") and can adjust for biases in the design and be used in design-based inference. The sampling design also accounted for accessibility and safety concerns, determined on a park-by-park basis. Sites were further evaluated for their potential as pika habitat during field visits. A site had to contain ≥10% target habitat, which included talus, lava, outcrops or other forms of creviced rock that can provide shelter for pikas. Sites that did not meet the criteria were dropped from the sampling list and replaced with a GRTS oversample from the same stratum. Once a site was established, it was marked for relocation purposes with a discrete aluminum tree tag marker wired to a rock. Given variation among parks in data available for construction of the sampling frame, slightly different design specifications were used to select survey locations in each park.

CRLA

In order to delineate a sampling frame for CRLA, a map of potential pika habitat was created using an automated process to define the boundaries of different habitat types in the park. NAIP imagery from 2007 was used as the base map. Polygons were delineated and then classified by habitat type. Those polygons containing potential pika habitat were identified and selected for inclusion in a map of potential pika habitat. As a final step, the potential pika habitat map was reviewed by a wildlife specialist at the park and edited where appropriate. For site accessibility considerations, the sampling frame only included areas within 1 km of roads. Furthermore, steep slopes (>35°), identified using digital elevation models in GIS, and traversable areas isolated by these steep slopes were excluded from sampling. The pika sampling frame for CRLA was then stratified by four elevational quantiles, with spatially-balanced samples distributed equally across each stratum.

CRMO

Historical sightings, recent pilot data (Rodhouse et al. 2010), current vegetation maps (Bell et al. 2009), and geologic maps were used to develop the CRMO sampling frames. Sampling was limited to habitat within 1 km of roads or sections of the northern portions of the CRMO

Wilderness Trail and Tree Molds Trail. Given that the pilot analyses found pika distribution restricted to the northern portion of the Monument above 1600 m (Monument and Huddle's Hole frames from Rodhouse et al. 2010), these areas as well as additional areas within 1 km of Highway 93 and the Minidoka-Arco road were combined into one primary sampling frame to be sampled at regular intervals. Furthermore, steep slopes (>35°), identified using digital elevation models in GIS, and traversable areas isolated by these steep slopes were excluded from sampling. This frame captured >400 m range in elevation and was stratified by two elevational strata, based on median elevation of the frame, and in two substrate strata (i.e., pahoehoe and aa lava). This yielded a total of four strata with spatially-balanced samples distributed equally across each stratum.

LABE
A map of the black lava flows provided by the park was used to delineate available habitat for the LABE sampling frame. The sampling frame includes areas designated as wilderness and portions of the Callahan, Schonchin, Ross, and Devils Homestead Flows. This sampling frame also captured the majority of study area addressed by Ray and Beever (*in litt.*). For site accessibility considerations, the sampling frame only included areas within 1 km of roads and excluded steep slopes (>35°), which were identified using digital elevation models in GIS. Samples were distributed across two elevational strata based on median elevation of the frame.

LAVO
In order to delineate a sampling frame for LAVO, a map of potential pika habitat was created using an automated process to define the boundaries of different habitat types in the park. NAIP imagery from 2007 was used as the base map. Polygons were delineated and then classified by habitat type. Those polygons containing potential pika habitat were identified and selected for inclusion in a map of potential pika habitat. As a final step, the potential pika habitat map was reviewed by a wildlife specialist at the park and edited where appropriate. Given the remoteness of a significant amount of potential habitat, the sampling frame included areas within a 1 km buffer of trail sections in addition to the habitat within 1 km of roads. Starting from the trailhead, 1 km of each trail was buffered, and in a couple instances, >1 km of trail (≤3 km of the Butte Lake trails and 2 km of the southern portion of Kings Creek Trail). Furthermore, steep slopes (>35°), identified using digital elevation models in GIS, and traversable areas isolated by steep slopes were also excluded from the LAVO sampling frame. The pika sampling frame for LAVO was stratified by four elevational quantiles, with spatially-balanced samples distributed equally across each stratum.

Occupancy Surveys
A site was defined as a 12-m radius plot containing ≥10% target habitat. Although survey crews varied in size, survey effort was standardized among sites and parks, usually by having only one crew member survey each site. Surveys began with a 5-minute period of silent observation to allow for visual and aural detection. The surveyor then thoroughly examined the entire plot and recorded all evidence of pika activity that he/she detected, including pika sightings, calls, scat, and hay. Once the surveyor felt the survey was complete, he/she collected the ancillary data, such as vegetation cover, and marked the site. Several sites were surveyed more than once either using independent observers or surveying the same site at different times (i.e., early versus late season) to estimate detection probabilities.

A site was considered occupied for the purposes of this report if either a pika was seen or heard within the plot and/or fresh scat or fresh hay was found within the plot. Occupancy modeling has not yet been conducted for this project (but see Rodhouse et al. 2010 for an example), so all reports of “occupied” sites in this document refer to those sites at which fresh sign was detected. Detection probabilities have not yet been estimated and our estimates of the proportion of sites “occupied” are therefore preliminary and conservative. The proportion of sites “occupied” that are reported here vary widely by park. Because our results are preliminary, we strongly caution that no inferences should be made that compare the proportions among parks; for example, by concluding that CRLA has more pikas than LAVO. There are fundamental differences in the distribution and characteristics of suitable habitat and the coming detailed data analyses should provide more insight into factors affecting pika site occupancy. Furthermore, complete reporting of detection and occupancy probabilities will follow in future reports.

Results

The pika occupancy survey season ran from mid-June until mid-September, although specific dates varied by park. A total of 318 sites were surveyed across the four parks. An Access database with data entry manual was developed and provided to the field leads in late August. Data entry and quality assurance was completed in early November.

Below we provide the summaries of the status result by park. Site turnover was not estimated for 2010 since this was the first year of surveys at these sites.

CRLA

Four people surveyed CRLA from August to September of 2010. Surveys conducted in September were all resurveys of sites established in August to assess detectability throughout the season.

Status

A total of 85 sites were established and surveyed for evidence of pika activity. Fifty-five of the sites surveyed were considered occupied, seven sites had only old sign, and 23 sites lacked any evidence of pika activity within the plot. Therefore, the proportion of sites surveyed considered occupied in CRLA was 0.647. This status information is presented in Table 1. The locations of sites surveyed and detection results for CRLA are presented in Figure 1.

Table 1. Pika status summary information for CRLA in 2010.

Annual Pika Survey Results – Crater Lake	2010
Number of Sites Surveyed	85
Number of Occupied Sites	55
Proportion of Sites Occupied (Ψ)	0.65

Additional work

A total of 190 fecal samples were collected for use in genetic analyses as part of the “Pikas in Peril” research project. Please see Jeffress et al. (*unpublished report*) for more details. The field crew also spent 1 day searching for evidence of pikas on Wizard Island where they found only old scat.

Furthermore, 28 temperature sensors were deployed in the park. Four sensors were deployed at non-survey sites, 3 of which were on Wizard Island and one on the lake shore inside the caldera. The remaining 24 sensors were deployed at monitoring sites with 2 sensors at each site. Sites were selected based on 2010 occupancy status (occupied or unoccupied) and elevation.

CRMO

One person surveyed CRMO in July and September of 2010. Two SCA interns also assisted for independent observer surveys used to estimate detection probabilities.

Status

A total of 56 sites were established and surveyed for evidence of pika activity. Twelve of the sites surveyed were considered occupied, three sites contained only old sign, and 41 sites lacked any evidence of pika activity within the plot. Therefore, the proportion of sites surveyed considered occupied in CRMO was 0.214. This status information is presented in Table 2. The locations of sites surveyed and detection results for CRMO are presented in Figure 2.

Table 2. Pika status summary information for CRMO in 2010.

Annual Pika Survey Results – Craters of the Moon	2010
Number of Sites Surveyed	56
Number of Occupied Sites	12
Proportion of Sites Occupied (Ψ)	0.21

Additional work

A total of 11 fecal samples were collected for use in genetic analyses as part of the "Pikas in Peril" research project. Please see Jeffress et al. (*unpublished report*) for more details. Furthermore, 24 temperature sensors were deployed at monitoring sites with 2 sensors at each site. Sites were selected based on 2010 occupancy status (occupied or unoccupied) and substrate type (i.e., pahoehoe or aa lava type).

LABE

Two people surveyed LABE in June, August, and September of 2010. Surveys conducted in August and September were all resurveys of sites established in June to assess detectability throughout the season.

Status

A total of 101 sites were established and surveyed for evidence of pika activity. Twenty-four of the sites surveyed were considered occupied, 22 sites contained only old sign, and 55 sites lacked any evidence of pika activity within the plot. Therefore, the proportion of sites surveyed considered occupied in LABE was 0.238. This status information is presented in Table 3. The locations of sites surveyed and detection results for LABE are presented in Figure 3.

Table 3. Pika status summary information for LABE in 2010.

Annual Pika Survey Results – Lava Beds	2010
Number of Sites Surveyed	101
Number of Occupied Sites	24
Proportion of Sites Occupied (Ψ)	0.24

Additional work

Although funding is currently not available to conduct genetic analyses of fecal samples at LABE for the "Pikas in Peril" research project, 43 fecal samples were collected in case funding does become available.

LAVO

Three people surveyed LAVO from July to early September of 2010.

Status

A total of 76 sites were established and surveyed for evidence of pika activity. Eleven of the sites surveyed were considered occupied, six sites contained only old sign, and 59 sites lacked any evidence of pika activity within the plot. Therefore, the proportion of sites surveyed considered occupied in LAVO was 0.145. This status information is presented in Table 4. The locations of sites surveyed and detection results for LAVO are presented in Figure 4.

Table 4. Pika status summary information for LAVO in 2010.

Annual Pika Survey Results – Lassen	2010
Number of Sites Surveyed	76
Number of Occupied Sites	11
Proportion of Sites Occupied (Ψ)	0.14

Additional work

A total of 11 fecal samples were collected for use in genetic analyses as part of the "Pikas in Peril" research project. Please see Jeffress et al. (*unpublished report*) for more details.

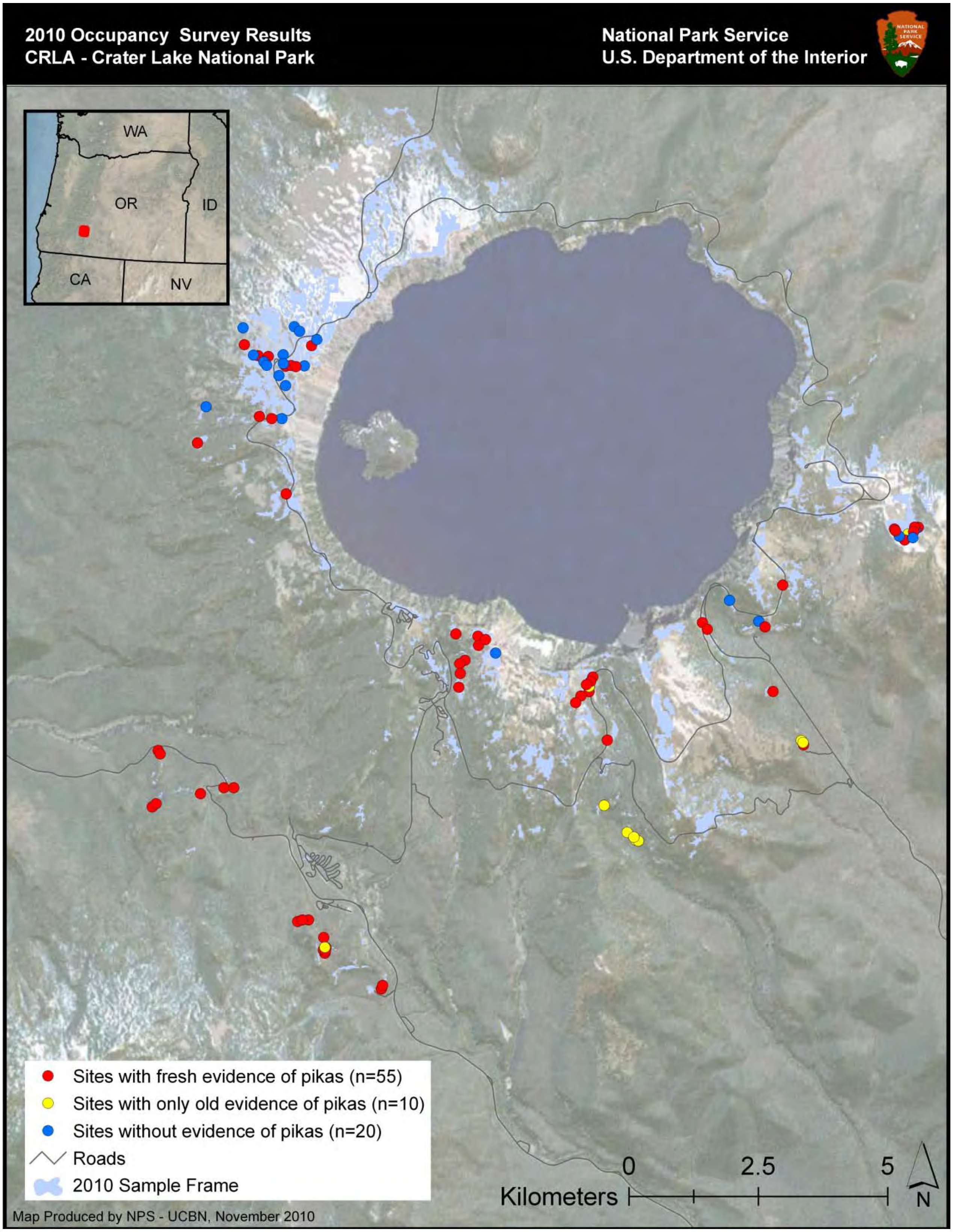

Figure 1. Map of sites surveyed with survey results for CRLA.

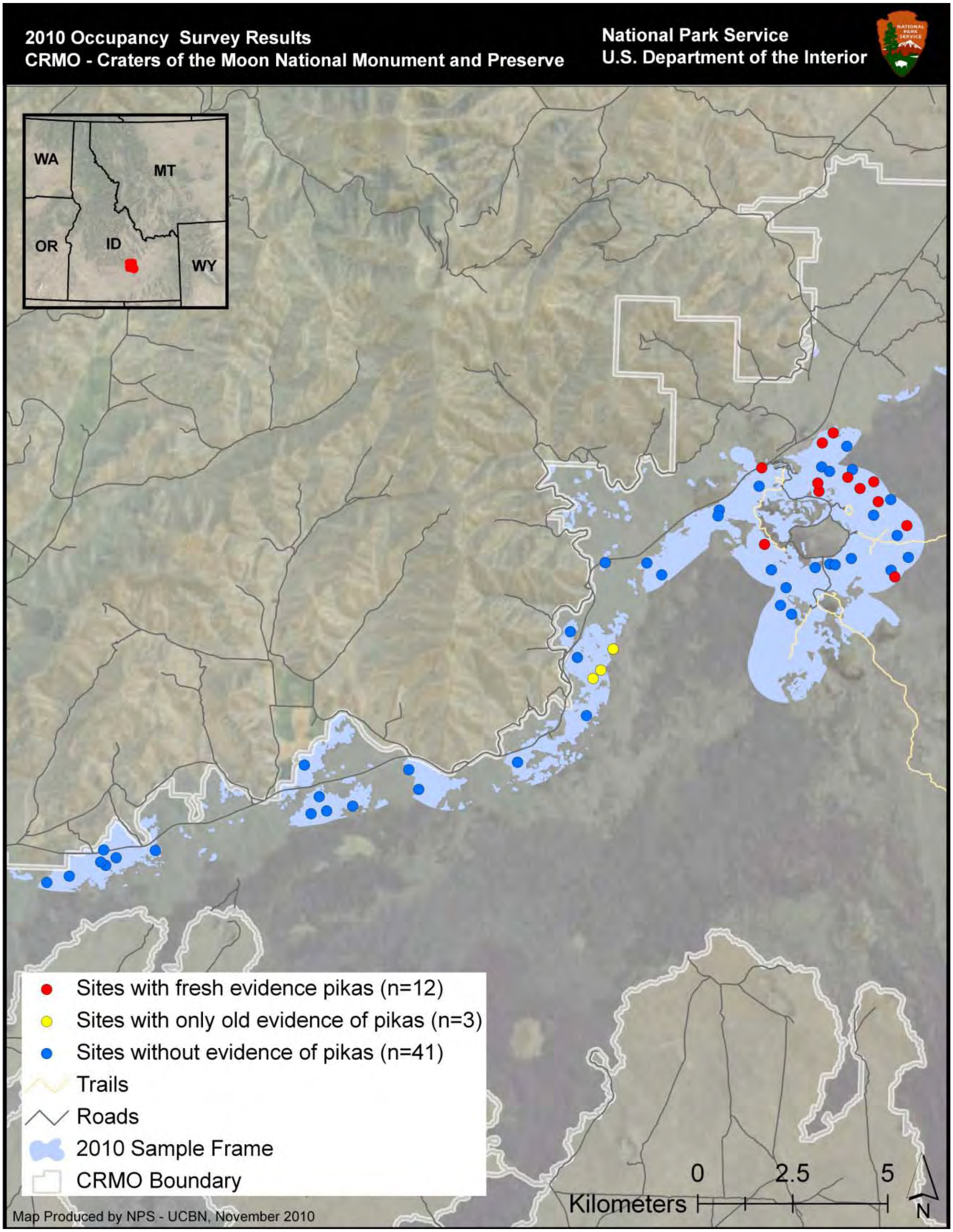

Figure 2. Map of sites surveyed with survey results for CRMO.

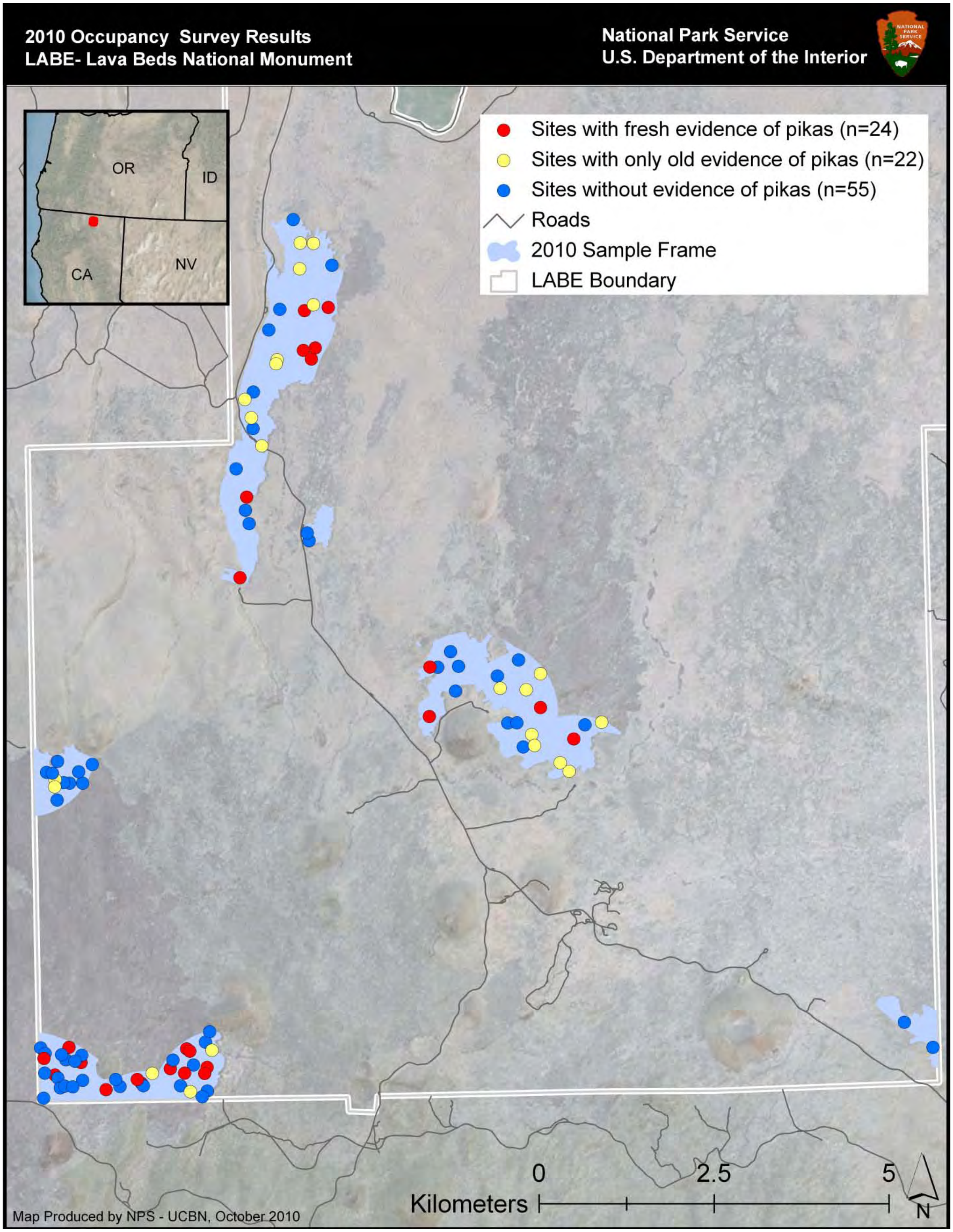

Figure 3. Map of sites surveyed with survey results for LABE.

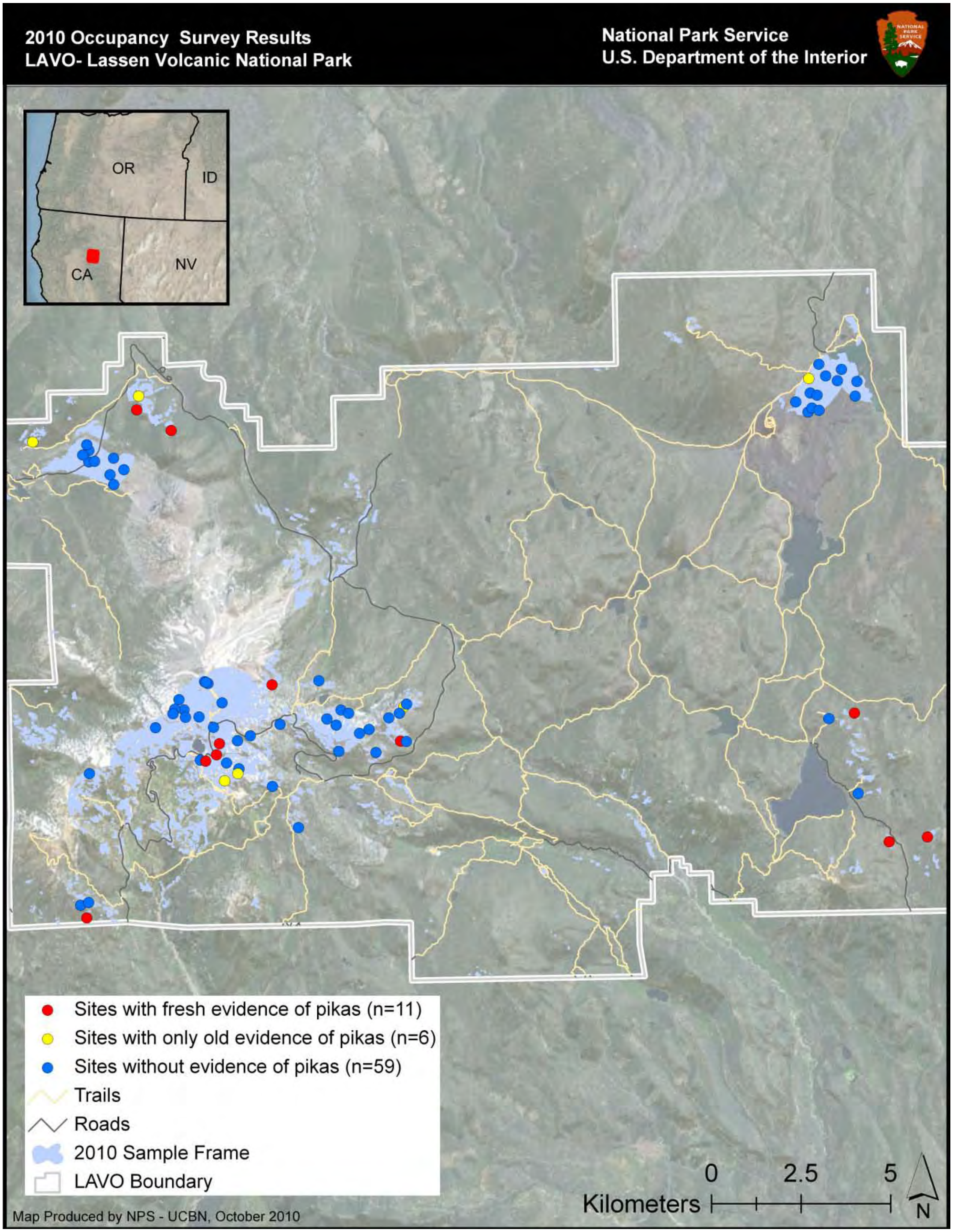

Figure 4. Map of sites surveyed with survey results for LAVO.

Future Plans and Deliverables

Four park-specific resource briefs detailing both the monitoring efforts described in this document as well as the "Pikas in Peril" research efforts have been created and are provided as Appendixes (Appendixes A-D). PDF versions can also be downloaded from the following website: http://science.nature.nps.gov/im/units/ucbn/monitor/pika/pika_peril/outreach.cfm. The revised draft pika monitoring protocol (Jeffress et al. *in review*) was submitted for further review and/or approval in November 2010 and we will keep the parks informed of the status of this protocol when the information becomes available.

The monitoring sites established in 2010 will be resurveyed in 2011 and 2011 monitoring efforts will again be coordinated with the "Pikas in Peril" research project. Any modifications to the park sampling frames will be addressed sometime during the winter and spring 2011. Furthermore, new sites will be established in 2011 using the same approach as previously described until 100 permanent monitoring sites have been established in each of the four parks. A monitoring report similar to this one will be produced in the fall of 2011. Starting in 2012, monitoring responsibilities at CRLA, LABE, and LAVO will be turned over to the individual parks and the UCBN will continue to support pika monitoring at CRMO.

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Appendix A. Resource Brief – Crater Lake NP

Upper Columbia Basin Network
Resource Brief

Inventory & Monitoring
National Park Service
U.S. Department of the Interior

Pika Research and Monitoring at Crater Lake NP

An American pika at Crater Lake NP
Photo: Devin Stucki, NPS

Importance: Species Vulnerable to Climate Change

The American pika (*Ochotona princeps*) is considered an indicator species for detecting ecological effects of climate change. Results from recent studies suggest that in some areas pikas are being lost from lower elevations in response to increased warming, and thus, their suitable habitat is being reduced. The National Park Service has a unique opportunity to assess the vulnerability of pikas to climate change and monitor pika population trends over time. Crater Lake National Park (CRLA) contains typical pika habitat comprised of high elevation talus fields and is one of eight National Park Service units included in a 3-year research project titled "Pikas in Peril." Additionally, the Upper Columbia Basin Network (UCBN) has developed a long-term pika monitoring protocol, which is being implemented in CRLA and 3 other Pacific West Region parks.

Objectives

"Pikas in Peril" research

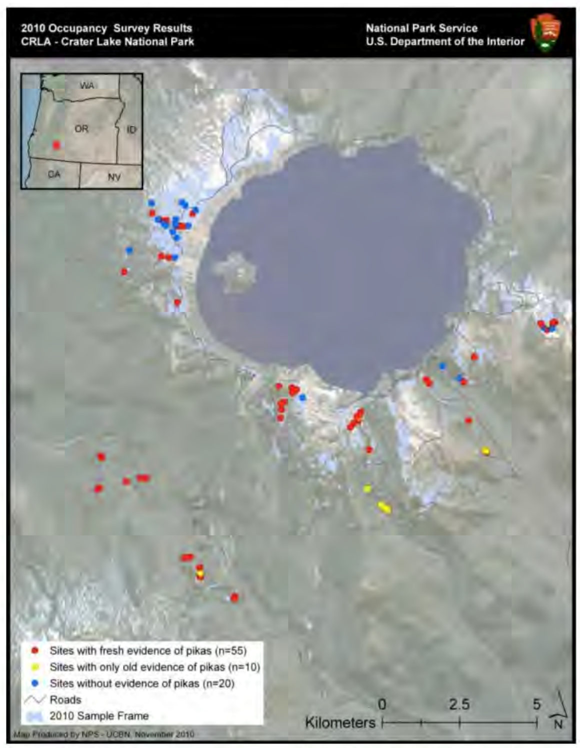
1. Document pika occurrence patterns and predict pika distribution across the eight park units.
2. Measure gene flow and model connectivity of pika populations within five park units (CRLA included).
3. Project climate change effects on the future distribution, connectivity and vulnerability of pika populations in each park unit.

Pika monitoring

1. Determine current patterns of pika site occupancy in the four parks.
2. Determine trends in pika site occupancy patterns in the four parks.

Methods and Preliminary Results

In 2010, research and monitoring methods were merged into a single survey effort. In August and September, 85 randomly-selected sites (12-m radius circular plots) were searched for evidence of pika occupancy in the form of visual encounters, calls, fresh fecal pellets, and fresh food caches found within the site. Pikas occupied 55 (65%) sites surveyed and occupied sites covered the range of elevations sampled. Additionally, 190 fresh fecal pellet samples were collected for genetic analysis.



Map of 2010 occupancy survey results for Crater Lake National Park

Timeline and Future Plans

Data analysis will continue fall and winter 2010. Surveys of new sites and resurveys of current sites are scheduled for 2011 with a final research project report due in 2012. Furthermore, these sites will be monitored over time to detect trends in pika site occupancy using the revised UCBN pika monitoring protocol, which was submitted for approval in November 2010. Further details and results from these efforts will be available on the websites listed below.

Contact Information

Mackenzie Jeffress, University of Idaho / Upper Columbia Basin I&M Network, jeffress@uidaho.edu

"Pikas in Peril" research: http://science.nature.nps.gov/im/units/ucbn/monitor/pika/pika_peril/index.cfm **November 2010**
Pika monitoring: http://science.nature.nps.gov/im/units/ucbn/monitor/pika/pika.cfm

Appendix B. Resource Brief – Craters of the Moon NM&P

Upper Columbia Basin Network
Resource Brief

Inventory & Monitoring
National Park Service
U.S. Department of the Interior

Pika Research and Monitoring at Craters of the Moon

An American pika at CRMO
Photo: Doug Owen, NPS

Importance: Species Vulnerable to Climate Change

The American pika (*Ochotona princeps*) is considered an indicator species for detecting ecological effects of climate change. Results from recent studies suggest that in some areas pikas are being lost from lower elevations in response to increased warming, and thus, their suitable habitat is being reduced. The National Park Service has a unique opportunity to assess the vulnerability of pikas to climate change and monitor pika population trends over time. Craters of the Moon National Monument & Preserve (CRMO) provides unique, low-elevation pika habitat and is one of eight National Park Service units included in a 3-year research project titled "Pikas in Peril." Additionally, the Upper Columbia Basin Network (UCBN) has developed a long-term pika monitoring protocol, which is being implemented in CRMO and 3 other Pacific West Region parks.

Objectives

"Pikas in Peril" research

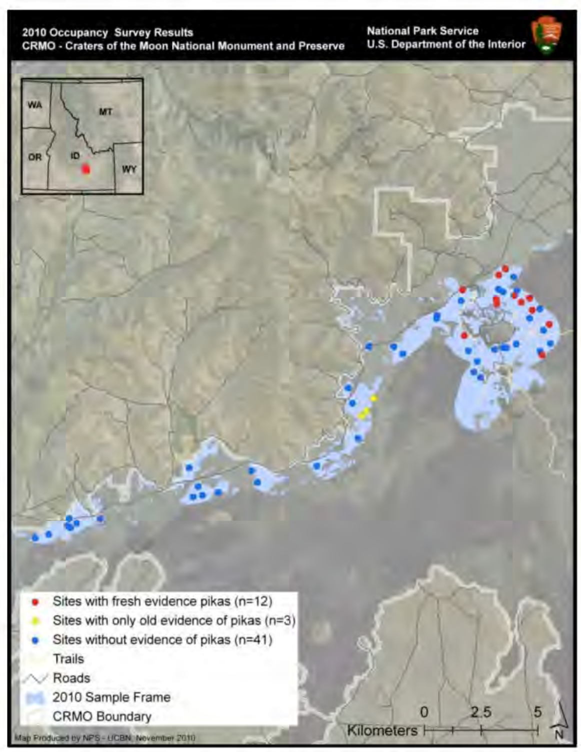
1. Document pika occurrence patterns and predict pika distribution across the eight park units.
2. Measure gene flow and model connectivity of pika populations within five park units (CRMO included).
3. Project climate change effects on the future distribution, connectivity and vulnerability of pika populations in each park unit.

Pika monitoring

1. Determine current patterns of pika site occupancy in the four parks.
2. Determine trends in pika site occupancy patterns in the four parks.

Methods and Preliminary Results

In 2010, research and monitoring methods were merged into a single survey effort. In July and September, 56 randomly-selected sites (12-m radius circular plots) were searched for evidence of pika occupancy in the form of visual encounters, calls, fresh fecal pellets, and fresh food caches found within the site. Pikas occupied 12 (21%) sites surveyed and occupied sites continue to most often be found in the higher elevation, pahoehoe areas. Eleven fresh fecal pellet samples were collected for genetic analysis.



Map of 2010 occupancy survey results for Craters of the Moon NM&P

Timeline and Future Plans

Data analysis will continue fall and winter 2010. Surveys of new sites and resurveys of current sites are scheduled for 2011 with a final research project report due in 2012. Furthermore, these sites will be monitored over time to detect trends in pika site occupancy using the revised UCBN pika monitoring protocol, which was submitted for approval in November 2010. Further details and results from these efforts will be available on the websites listed below.

Contact Information

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"Pikas in Peril" research: http://science.nature.nps.gov/im/units/ucbn/monitor/pika/pika_peril/index.cfm **November 2010**
Pika monitoring: http://science.nature.nps.gov/im/units/ucbn/monitor/pika/pika.cfm

Appendix C. Resource Brief – Lassen Volcanic NP

Upper Columbia Basin Network
Resource Brief

Inventory & Monitoring
National Park Service
U.S. Department of the Interior

Pika Research and Monitoring at Lassen Volcanic NP

Typical rocky pika habitat at Lassen

Importance: Species Vulnerable to Climate Change

The American pika (*Ochotona princeps*) is considered an indicator species for detecting ecological effects of climate change. Results from recent studies suggest that in some areas pikas are being lost from lower elevations in response to increased warming, and thus, their suitable habitat is being reduced. The National Park Service has a unique opportunity to assess the vulnerability of pikas to climate change and monitor pika population trends over time. Lassen Volcanic National Park (LAVO) contains typical pika habitat comprised of high elevation talus fields and is one of eight National Park Service units included in a 3-year research project titled "Pikas in Peril." Additionally, the Upper Columbia Basin Network (UCBN) has developed a long-term pika monitoring protocol, which is being implemented in LAVO and 3 other Pacific West Region parks.

Objectives

"Pikas in Peril" research

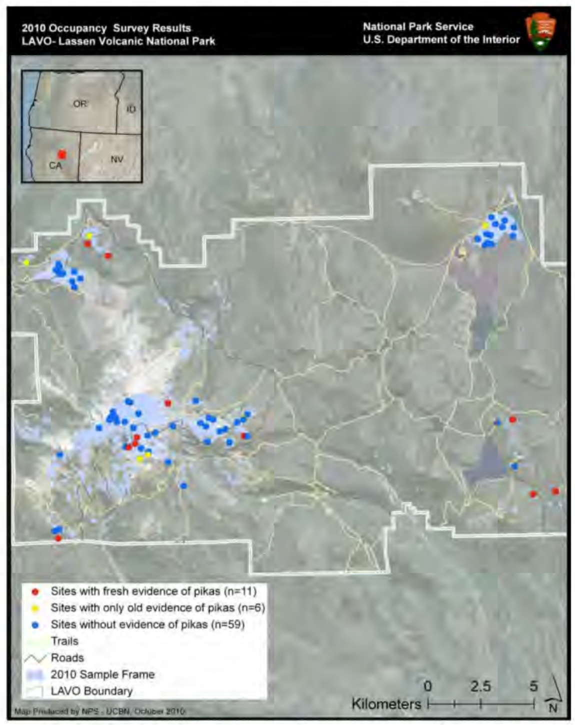
1. Document pika occurrence patterns and predict pika distribution across the eight park units.
2. Measure gene flow and model connectivity of pika populations within five park units (LAVO included).
3. Project climate change effects on the future distribution, connectivity and vulnerability of pika populations in each park unit.

Pika monitoring

1. Determine current patterns of pika site occupancy in the four parks.
2. Determine trends in pika site occupancy patterns in the four parks.

Methods and Preliminary Results

In 2010, research and monitoring methods were merged into a single survey effort. From July to September, 76 randomly-selected sites (12-m radius circular plots) were searched for evidence of pika occupancy in the form of visual encounters, calls, fresh fecal pellets, and fresh food caches found within the site. Pikas occupied 11 (14%) sites surveyed and occupied sites covered the range of elevations sampled. A total of 15 fresh fecal pellet samples have been collected for genetic analysis.



Map of 2010 occupancy survey results for Lassen Volcanic National Park

Timeline and Future Plans

Data analysis will continue fall and winter 2010. Surveys of new sites and resurveys of current sites are scheduled for 2011 with a final research project report due in 2012. Furthermore, these sites will be monitored over time to detect trends in pika site occupancy using the revised UCBN pika monitoring protocol, which was submitted for approval in November 2010. Further details and results from these efforts will be available on the websites listed below.

Contact Information

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"Pikas in Peril" research: http://science.nature.nps.gov/im/units/ucbn/monitor/pika/pika_peril/index.cfm **November 2010**
Pika monitoring: http://science.nature.nps.gov/im/units/ucbn/monitor/pika/pika.cfm

Appendix D. Resource Brief – Lava Beds NM

Upper Columbia Basin Network
Resource Brief

Inventory & Monitoring
National Park Service
U.S. Department of the Interior

Pika Research and Monitoring at Lava Beds NM

An American pika at Lava Beds NM
NPS photo

Importance: Species Vulnerable to Climate Change

The American pika (*Ochotona princeps*) is considered an indicator species for detecting ecological effects of climate change. Results from recent studies suggest that in some areas pikas are being lost from lower elevations in response to increased warming, and thus, their suitable habitat is being reduced. The National Park Service has a unique opportunity to assess the vulnerability of pikas to climate change and monitor pika population trends over time. Lava Beds National Monument (LABE) provides unique, low-elevation pika habitat and is one of eight National Park Service units included in a 3-year research project titled "Pikas in Peril." Additionally, the Upper Columbia Basin Network (UCBN) has developed a long-term pika monitoring protocol, which is being implemented in LABE and 3 other Pacific West Region parks.

Objectives

"Pikas in Peril" research

1. Document pika occurrence patterns and predict pika distribution across the eight park units.
2. Measure gene flow and model connectivity of pika populations within five park units (LABE not included).
3. Project climate change effects on the future distribution, connectivity and vulnerability of pika populations in each park unit.

Pika monitoring

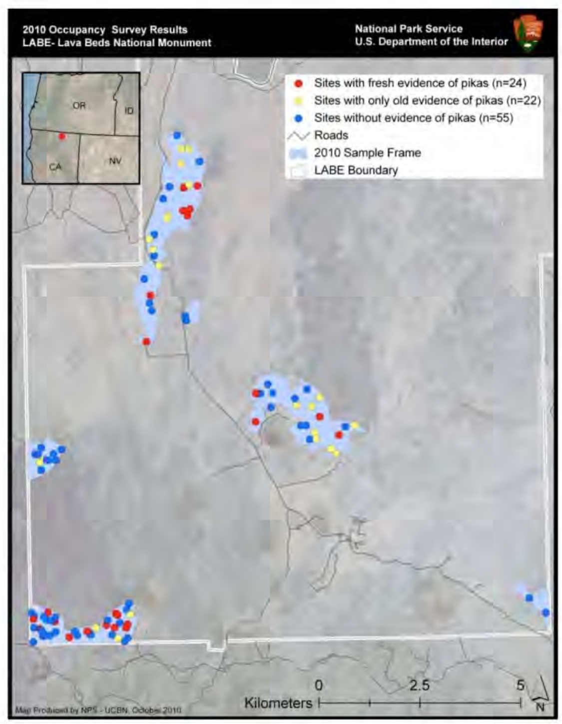
1. Determine current patterns of pika site occupancy in the four parks.
2. Determine trends in pika site occupancy patterns in the four parks.

Methods and Preliminary Results

In 2010, research and monitoring methods were merged into a single survey effort. In June and September, 101 randomly-selected sites (12-m radius circular plots) were searched for evidence of pika occupancy in the form of visual encounters, calls, fresh fecal pellets, and fresh food caches found within the site. Pikas occupied 24 (24%) sites surveyed and were found on the Callahan, Devil's Homestead, and Schonchin flows. Detectability of pika increased substantially in the September surveys.

Timeline and Future Plans

Data analysis will continue fall and winter 2010. Surveys of new sites and resurveys of current sites are scheduled for 2011 with a final research project report due in 2012. Furthermore, these sites will be monitored over time to detect trends in pika site occupancy using the revised UCBN pika monitoring protocol, which was submitted for approval in November 2010. Further details and results from these efforts will be available on the websites listed below.



Map of 2010 occupancy survey results for Lava Beds National Monument

Contact Information

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"Pikas in Peril" research: http://science.nature.nps.gov/im/units/ucbn/monitor/pika/pika_peril/index.cfm **November 2010**
Pika monitoring: http://science.nature.nps.gov/im/units/ucbn/monitor/pika/pika.cfm