



Pikas of Craters of the Moon National Monument and Preserve

Project Summary and Results

Pikas in Peril Project Background

The American Pika (*Ochotona princeps*) is a charismatic indicator species of the potential effects of climate change on mountain ecosystems. Pikas are sensitive to summer heat and rely on winter snowpack for insulation from harsh winter temperatures. The National Park Service stewards pika populations in more than a dozen parks and seeks to understand the vulnerability of pikas and other mountain species to climate change. Pikas in Peril, funded in 2010, is a collaborative research program directed by scientists from the National Park Service, Oregon State University, University of Idaho, and University of Colorado-Boulder. To help the National Park Service better prepare for the ecological changes anticipated in the coming decades, the team pursued three objectives in eight of these parks.



Photo courtesy of Michael Durham

Objectives

1. Identify the factors (e.g., temperature, precipitation, habitat connectivity, topography, etc.) that shape contemporary pika distributions.
2. Assess the connectivity and gene flow of pika populations, including how landscape features affect movement of pikas between patches of suitable talus and lava flow habitat.
3. Evaluate climate change vulnerability of pika populations in each park by integrating pika distribution and gene flow models with forecasted regional changes in temperature and precipitation.

Results

Of the eight parks studied, Craters of the Moon National Monument and Preserve (CRMO) is the driest and hottest, as well as one of the lowest in elevation. Its lava flows provide some of the most extensive and physically well-connected habitat of any of the parks. However, only about one quarter of the available habitat is currently occupied by pikas, restricted mostly to the highest elevations and northernmost portions of the large pahoehoe lava flows near the Monument headquarters (Figure 1). Maximum temperature, patch size, and warm season precipitation are the most significant factors in models of persistence for pikas in CRMO. Although gene flow among pikas in this portion of the Monument appears to be high, reflecting lava flow connectivity, overall genetic diversity in the CRMO population is low relative to many of the other studied populations due to its general isolation. For example, a comparison of genetic diversity between pikas in CRMO and the mountains north of CRMO revealed a striking contrast (Figure 2). While increasing heat stress is likely to negatively impact the CRMO pika population, our models also showed that this effect might be offset by other

ecological influences. Changes in the timing and in the amounts of precipitation are forecasted and this could result in lengthened growing season and an increase in available forage. However, warming temperatures could also increase rates of evapotranspiration and decrease snowpack, resulting in net aridification.

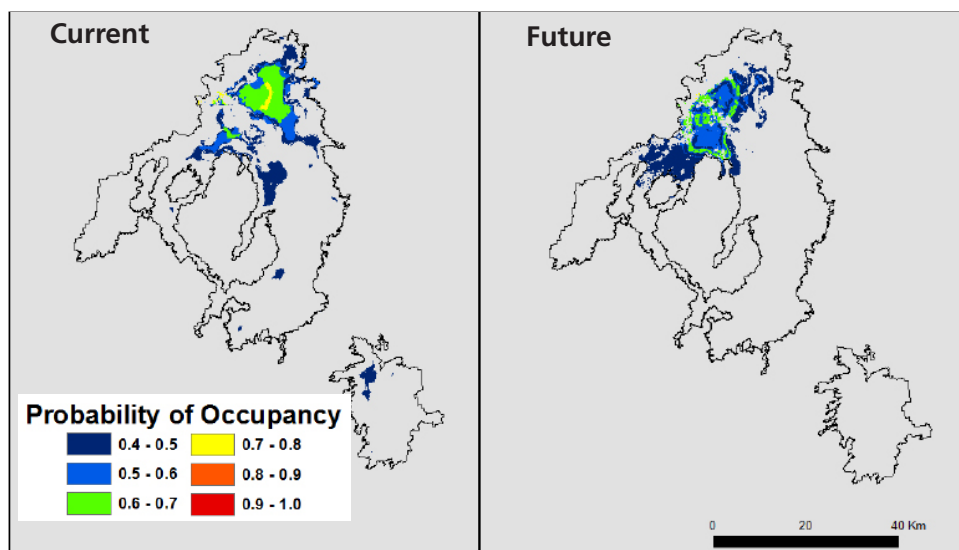


Figure 1. Mapped projections from current (left) to future (right) indicate that although the total of occupied habitat remains approximately the same, it becomes further concentrated into the highest, northernmost portions of the lava flows. Additionally, occupancy probability is expected to decline over time, by almost 20% on average.

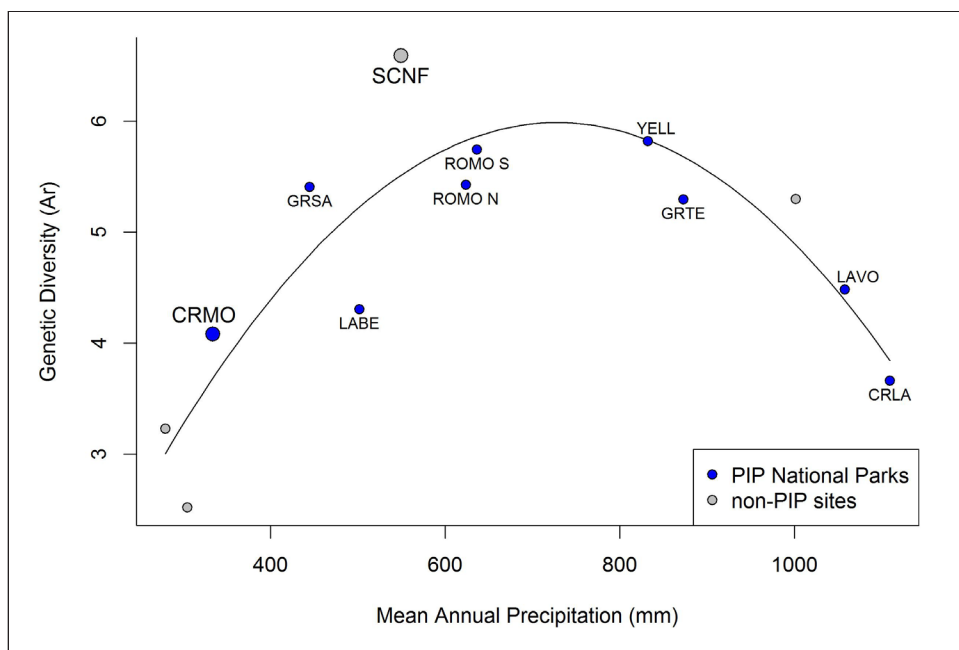


Figure 2. Genetic diversity, quantified as allelic richness corrected for sample size (A_r), was strongly predicted by mean annual precipitation. Study sites with moderate precipitation had higher genetic diversity than those with extremely high or low precipitation. CRMO had low genetic diversity compared to the relatively geographically close Salmon Challis National Forest (SCNF), as well as the other Pikas in Peril parks.

Conclusions

The pika population in CRMO is projected to persist under the scenarios that we considered, but pikas will be further restricted to the northernmost portions of the Monument lava flows and occupancy probabilities will decline sharply. There was considerable variability in model predictions relative to other parks, possibly reflecting the uncertainty associated with changing precipitation patterns and the influence of subsurface microclimates of the deep lava flows that are hard to model. Given the isolation of the CRMO pika population, low genetic diversity, small area of the current distribution within the Monument, and high annual turnover in site occupancy that we found when developing distribution models, we conclude that the CRMO pika population is vulnerable to extirpation. Continued monitoring will enable park managers to track pika population status in the face of climate change in this unique ecosystem.

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For more information, visit the UCBN pika monitoring webpages:

http://science.nature.nps.gov/im/units/ucbn/monitor/pikas_in_peril.cfm
<http://science.nature.nps.gov/im/units/ucbn/monitor/pika.cfm>