



Pikas of Grand Teton National Park

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.



NPS/Will Deacy

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

Grand Teton National Park (GRTE) receives a large amount of snow and is one of the highest, coldest and wettest parks among the eight studied, representing the cooler part of the American Pika's range within the United States. Models for GRTE present a rather surprising relationship between current and forecasted pika distribution patterns and climate. Pikas are typically associated with high elevations, high precipitation, and low temperature. However, in GRTE pika site occupancy probabilities actually decreased with elevation and precipitation, and increased with summer heat. Large expanses of bare rock emerged as the primary limitation to dispersal. Aspect also appeared to influence pika dispersal, with warmer west-facing slopes being more favorable. Again, this is contrary to expectations; in other parks, south and west facing aspects are the hottest and typically limit dispersal. Why do these contradictions occur? It appears likely that cool season temperature and precipitation extremes at GRTE may actually exceed the upper threshold for pikas, leading to a novel selection for warmer, drier sites – relative to prevailing conditions in the park. Climate change models predict that GRTE will transition from a cool, wet park to a warm, wet park, which may actually lessen the impacts of cold season stress and contribute to long-term population persistence.

Importantly, habitat connectivity and configuration was also shown to have a strong influence on pika occupancy patterns. The expected persistence of habitat connectivity into the future, regardless of changing temperature and precipitation, is likely one of the primary drivers behind the long-term population stability predicted for this park. The overall connectedness of pika habitat in GRTE contributes to the high genetic diversity and gene flow observed, relative to other studied parks (Figure 1). Even in the face of anticipated accelerated rates of warming in and around GRTE, American pika population persistence is likely, and the overall extent of pika distribution within the park may even increase (Figure 2). These findings suggest GRTE and other similar kinds of habitats can serve as long-term refugia for the species even as it is lost from other hotter and drier locations.

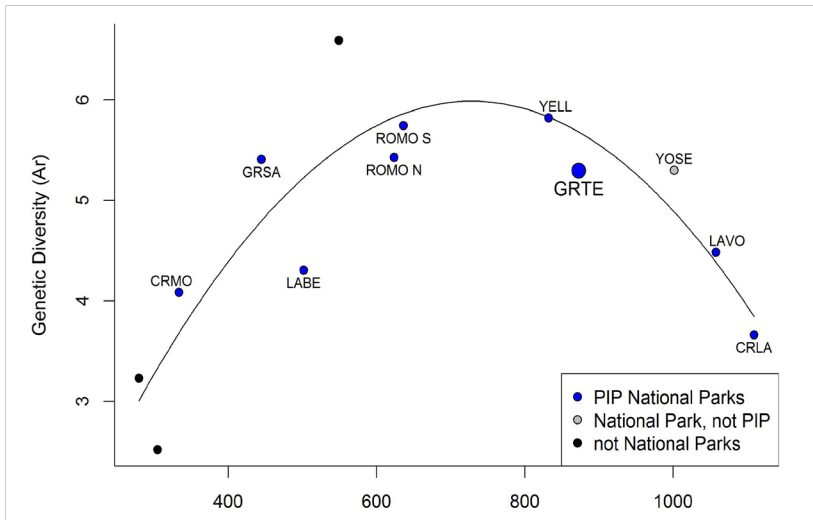


Figure 1. Genetic diversity, quantified as allelic richness corrected for sample size (A_r), was strongly predicted by mean annual precipitation. Study sites with moderate precipitation had higher genetic diversity than those with extremely high or low precipitation. GRTE had relatively high diversity genetic diversity, reflecting the large and well-connected expanses of habitat in that park.

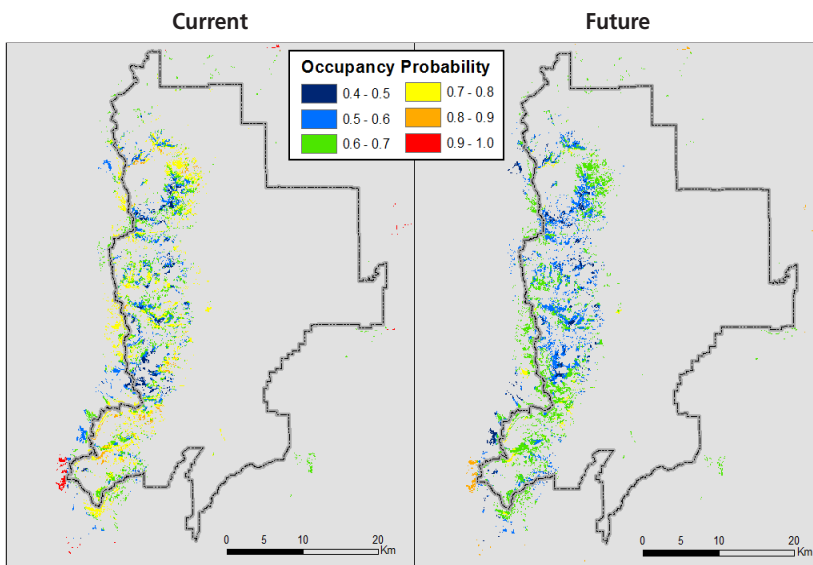


Figure 2. Current occupancy (left) and predicted future (2071-2099) occupancy (right) in Grand Teton National Park. The pika population shows limited change in terms of the total amount of habitat occupied or the probability of occupancy in mapped pika habitat. The pika population at GRTE appears resilient to climate change.

Conclusions

The pika population at GRTE is predicted to remain stable or perhaps even increase in distribution by 2099. However, this prediction hinges largely on the percentage of available habitat and the connectedness of that habitat in the future, both of which were primary drivers in pika occupancy models for this park. Monitoring pika populations over time and working to maintain both the amount and connectivity of suitable talus habitat will be important conservation activities that can help the NPS to ensure that pikas remain in GRTE in to the future.

NPS Contact Information:

Tom Rodhouse, tom_rodhouse@nps.gov

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>