

# Small mammal and avian range shifts

*Birds and mammals are found at different elevations in three study regions of the Sierra Nevada mountains today compared to a century ago.*



Over the past century, many small mammals and birds in the Sierra Nevada have changed the elevation in which they live. These movements to higher or lower elevations, called elevational range shifts, happen when animals move to new areas and/or leave previously inhabited areas in response to unfavorable changes in the environment. Global range shifts observed among animals and plants have been associated with warming temperatures.

Although range shifts benefit the animals that find more suitable environmental conditions, these redistributions can disrupt the ecosystem. The loss of a species from one area and its introduction into another can impact important community functions, such as predator-prey interactions and competition for food resources. These changes can ultimately lead to a decline in wildlife biodiversity.



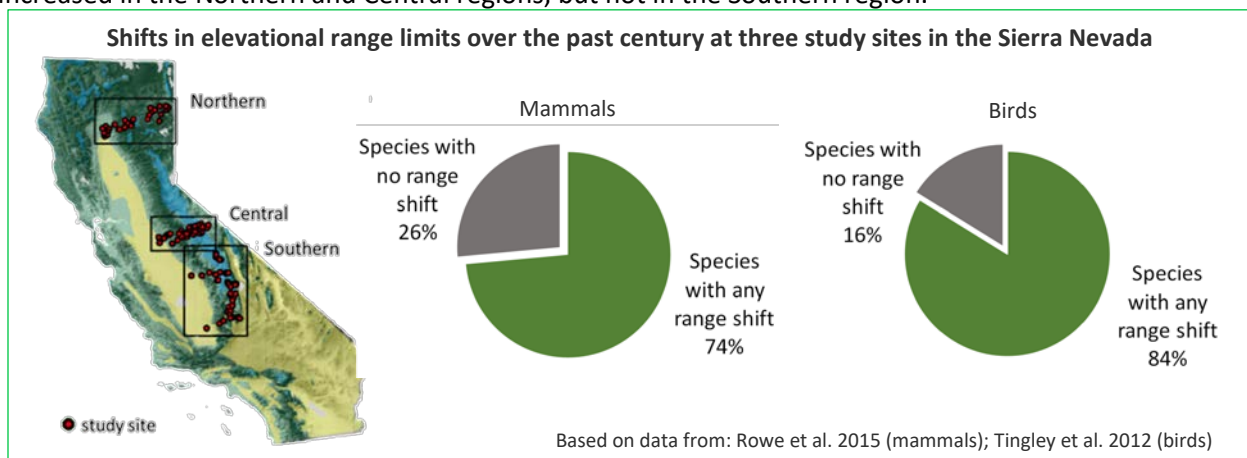
*The western gray squirrel has moved both upslope and downslope in different regions of the Sierra Nevada.*

Photo: Yosemite National Park Service

## What does the indicator show?

Compared to the early 20<sup>th</sup> century, small mammals and birds in three study regions of the Sierra Nevada live at different elevations today. This finding is based on observations between 2003 and 2010, when scientists revisited the same field sites surveyed at the turn of the last century. As shown in the pie charts below, almost 75 percent of small mammal species and over 80 percent of bird species surveyed across the regions have shifted ranges. Some species have expanded their range by moving to higher or lower elevations. Other species have contracted their range by moving out of elevations they had historically occupied. Some did both. Upward shifts were more than twice as likely as downward shifts among mammals, while upward and downward shifts were equally likely among birds.

Across all three regions, the maximum temperature of the warmest month was relatively constant over the past century, while the minimum temperature of the coldest month increased. Precipitation increased in the Northern and Central regions, but not in the Southern region.





### Why is this indicator important?

Animals reproduce, grow and survive within specific ranges of climatic and environmental conditions. Changes in temperature or precipitation can cause species to respond by shifting the boundaries they occupy. In general, climate change should favor species that are better able to tolerate warmer and more variable climatic conditions. Species that are not able to migrate fast enough to suitable environments may experience declines in population – or, in extreme cases, extirpation (eradication from an area) or extinction.

When species shift their habitats, they can disrupt predator-prey relationships, alter competitive interactions for food and other resources, and cause other disruptions to the ecosystem. For example, after a species has shifted away from an area, its predators may no longer have adequate prey. In its new habitat, the population of the newcomer species may grow unchecked if its natural predators are not present.

None of the 22 species found in all three study sites shifted their upper or lower limits consistently in the same direction in all regions. Factors other than temperature and moisture, such as community structure and competitive interactions, could help explain these mixed responses in range shifts. Some species may also seek refuge in areas such as campgrounds where food and water are available, allowing them to live through a period of unfavorable conditions.

Species movement is expected to be common with continued warming. Tracking range shifts helps in understanding and anticipating the long-term dynamics of the distribution of small mammals and birds in California, and examining the factors that influence them. This knowledge is crucial to efforts to identify which species are resilient or sensitive to climate change and to guide efforts to maintain species diversity in the face of regional warming.



*The American pika is no longer found at 10 of 67 historical sites from Mount Shasta to the southern Sierra Nevada. This change was likely influenced by warming over the past century.*

Photo: National Park Service,  
Sequoia/Kings Canyon

For more information about this and other climate change indicators, visit:

<https://oehha.ca.gov/climate-change/report/2018-report-indicators-climate-change-california>