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Wild animals heading for the hills at Yosemite

By **Eric Bailey**
Los Angeles Times

Scientists studying Yosemite National Park's bountiful wildlife have found that several animal species have moved to higher altitudes, an uphill migration possibly spawned by the effects of global warming.

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The scientists from the University of California, Berkeley, Museum of Vertebrate Zoology made the discovery while retracing the pioneering research of biologist Joseph Grinnell, who about 90 years ago cataloged the park's mammals, birds and reptiles.

Over the past three summers, the Berkeley researchers revisited many of the spots Grinnell plotted in his landmark study. What they found was an environment that has seen a remarkable shift in many of its wild inhabitants.

Several species of small rodents that once lived in Yosemite's lower elevations have moved higher up in the Sierra Nevada, in some cases shifting their range by as much as 3,000 feet.

Yosemite Valley, meanwhile, has seen a 50 percent turnover in the types of birds it harbors, and several species have spread to far higher elevations than ever seen in Grinnell's day.

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Part of the shift, the scientists said, could be explained by natural variations that species experience over time, or by alterations in flora and the forest canopy caused by a century of aggressive wildfire suppression. The California pocket mouse, for instance, may have expanded its range nearly 3,000 feet higher because the chaparral it inhabits has spread farther up the park's western slope.

But in high-elevation spots where fire is not a factor, several small mammal species have moved uphill, prompting researchers to suspect that larger forces are at work.

"I didn't go into this expecting any shifts, to be quite honest," said James Patton, the museum's curator and an emeritus professor of integrative biology. "But the changes are clear-cut. The data record is very strong."

Several other studies have documented similar environmental changes in the Sierra, among them disappearing glaciers and alterations in the growth pattern of trees in some types of soil. Over the past century, the average annual temperature in Yosemite has risen by 9 degrees Fahrenheit.

While most scientists now accept that the Earth has been warming for more than a century, the exact cause of that trend remains a topic of debate in academic and political circles. Many researchers have implicated greenhouse gases made by humans as a principal cause, but doubters contend the rise may be a natural climate shift after centuries of cooler weather.

Patton and his colleagues have skirted that larger debate while conducting their painstaking review of Grinnell's original work.

Over nearly four decades, Grinnell visited more than 700 locations around



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California to establish a bedrock database detailing the state's fauna.

Along with a team of young scientists, Grinnell examined more than 20,000 specimens.

Grinnell, founding director of the Museum of Vertebrate Zoology, visited Yosemite over several years in the mid-1910s. The volume his team compiled, "Animal Life in Yosemite," remains "the seminal description" of the park's fauna, said Leslie Chow, a U.S. Geological Survey wildlife biologist assisting with the new study.

The Berkeley researchers returned to Yosemite in the summer of 2003 and almost immediately saw that fundamental change had taken place.

The rare Inyo shrew, once found no higher than 8,000 feet, now ranges as high as 10,000 feet, the scientists discovered. The western harvest mouse had moved more than 1,000 feet uphill.

Patton said "the big surprise" was the piñon mouse, which frequents the juniper belt in the eastern Sierra. Known to elevations of 8,000 feet in Grinnell's day, it now ranges above 10,000 feet at Mount Lyell and is common at 9,000 feet in Tuolumne Meadows.

While several species expanded their range uphill, a few others have retreated to higher ground. The Belding's ground squirrel has disappeared from the lower reaches of its territory of a century ago. So has the alpine chipmunk, which once ranged as low as 7,900 feet but now can't be found below 10,000 feet.

Among the most provocative discoveries, Patton said, was the upward

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retrenchment of the pika, a tiny relative of the rabbit. The pika has little tolerance for higher summer temperatures and is seen by some researchers as a sort of canary in the coal mine for global warming. Once found as low as 7,800 feet by Grinnell, the pika now isn't found below 9,500 feet in Yosemite.

Patton said the findings leave him concerned for the future of some of Yosemite's creatures.

"For species like the alpine chipmunk, there's no more 'up' left," he said. "The Sierras get to 13,000 (feet) and that's it; there's no more room to move higher. If that habitat disappears, the animal could be gone. And it's never going to be back."

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