Non-invasive Mountain Lion Sampling in Seven Southwestern National Parks

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Elusive, mysterious hunters lurk in the shadows. Most of us will never see them; some do. Hundreds of mountain lion sightings are reported across the western United States and Canada each year. The majority of mountain lion and human encounters are of a benign nature. Research shows that only 66 attacks—resulting in 15 human fatalities—have been recorded in the past century. While this averages out to fewer than one mountain lion attack per year over the past 100 years, the alarming reality is that over three-quarters of these attacks have occurred since 1970. The distinct increase in attacks over the past few decades provokes increased concern among managers about risks to people recreating or residing in an environment with mountain lions.

While recreationists in wilderness areas face inherent risks, resource managers can take measures to reduce those risks, including those posed by predators. Useful indicators of lion activity in proximity to humans may provide early warnings, enabling managers to minimize potential for harmful situations. Knowing how and when mountain lions use habitat, especially areas frequented by humans, may contribute to reducing the potential for dangerous incidents involving mountain lions and humans. Data collected regarding lion populations and movement patterns enable managers to protect mountain lions, people, and ecosystems. A multiyear project at Grand Canyon National Park is providing a framework for other parks to obtain valuable information about their mountain lion populations.

Historically, mountain lions occupied almost every identifiable biogeographic zone throughout North and South America. The lion had the widest distribution of any mammal in the Western Hemisphere, testimony to its ability to adapt to ecosystems and the multitude of species inherent within them. The cat's greatest adaptive challenge has been eradication campaigns in the United States. The lion's superb predatory abilities and elusive nature made it hated and feared among the settlers. Since then, the lion has disappeared from nearly two-thirds of its previous range.

Natural systems require viable populations of predators in order to maintain complete and sustainable ecosystems. Predators are often referred to as keystone species whose presence indicates a healthy ecosystem, as they require substantial amounts of habitat and diverse prey bases. With large carnivore populations declining worldwide, the mountain lion fills an integral ecological niche as the last remaining predator throughout much of its historical range.

Large carnivore populations across the West are facing increasingly shrinking and fragmented habitat as human development clambers farther into wild ecosystems. Large tracts of undeveloped land, which often occur in national parks, provide some of the only remaining habitat where populations of large predators can thrive. National parks often serve as safe havens for large carnivores where they are not hunted and can successfully reproduce. Resource managers in national parks are faced with the complex mandate of maintaining critical predator populations while providing for visitor safety.

The situation facing parks today is underscored by an insufficient understanding of park ecosystems and threats. According to research in California, most attacks on people and pets occur along the "urban fringe," where human development and recreation in mountain lion habitat is highest. Visitor services and residential areas located within parks create a wildland–urban interface, similar to urban fringe, where the risk of attacks is increased.

Currently, many parks only have informa-

tion on the presence of mountain lions, in part because of the notorious difficulties obtaining information about populations of large terrestrial mammals with low densities. Practical and accurate methods of estimating population numbers and monitoring trends are scarce and tend to be very costly and time-intensive. Invasive sampling techniques are often impossible for small parks due to financial and practical constraints. Recent developments in non-invasive, genetic sampling techniques provide a practical alternative. Non-invasive sampling can be used successfully to monitor elusive carnivores that often inhabit remote, inaccessible areas. These techniques are often cost-effective, require less intensive field work than invasive methods, and do not interfere with the natural behavior of the animals.

In an effort to initiate a project among multiple parks to gather information on mountain lion populations, resource managers from six national park and monument units joined forces in 2001. A protocol using non-invasive sampling techniques was developed and implemented, first at Grand Canyon National Park, then expanded to include Mesa Verde, Saguaro, Carlsbad Caverns, Guadalupe Mountains, Zion, and Flagstaff-area national parks and monuments. The non-invasive methods include track surveys, scat collection, hair sampling, and use of remote infrared camera systems. Two years of field surveying at each park was initiated in fall 2001. Staff and volunteers trained in 2001 are assisting in data collection and coordinating lab analysis in support of the project.

This study is providing a standardized process for conducting extensive mountain lion surveys. The protocol is intended to assist other national park and forest units in monitoring lion populations and movement patterns. This project will expand non-invasive sampling to focus on mountain lion response to varying human population densities within parks. The primary objectives of this study are to document movement patterns of mountain lions, focusing on the areas of high human activity, and to relate temporal and spatial use patterns of mountain lions to areas of the park. Information obtained from this research will have direct applicability to development of management alternatives in each park. This research will allow the National Park Service to refine its management strategies to protect mountain lions, people, and ecosystems.

The National Park Foundation, Grand Canyon National Park Foundation, and Colorado Plateau Cooperative Ecosystem Study Unit Research Office funded the project and also paid for a shared seasonal technician experienced in non-invasive sampling. Matching Cooperative Ecosystem Study Unit funding allows for multi-lab analysis at the University of Idaho, Virginia Tech, and the University of Arizona, to ensure accuracy of DNA fingerprinting and consistency in analysis, and to allow for several years of data collection.

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