

Mountain Lion-Human Interactions at Grand Canyon National Park: The Effects of Human Use Areas on Mountain Lion Movements, Behavior, and Activity Patterns.

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Photo by Elaine Leslie

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*Submitted by Elaine Leslie
Grand Canyon National Park Science Center*

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Mountain Lion-Human Interactions at Grand Canyon National Park: The Effects of Human Use Areas on Mountain Lion Movements, Behavior, and Activity Patterns.

Increase in the frequency of mountain lions attacking humans has heightened concerns of managers in areas where mountain lions and people coexist. Although mountain lions are present throughout Grand Canyon National Park and the Colorado Plateau, little is known of how they use these parks and monuments. With increased pressure from hunting, poaching, and habitat reduction, parks and monuments are believed to be not only refugiums for these large carnivores, but also serve as reservoirs for their populations as they disperse into these areas of high pressure. Knowing how and when mountain lions use these parks and park habitat, especially those areas frequented by park visitors, may provide the information needed to reduce the potential for mountain lion-human interactions.

Obtaining information on wild animal populations has been a long-standing logistical problem. However, the ability through non-invasive techniques to detect and analyze animal sign in the wild is becoming an integral part of wildlife research and management. Particularly with carnivores, which are generally secretive and costly to capture and study, DNA samples from field-collected hair, tissue and feces can yield insights into the ecology of difficult-to-study creatures such as mountain lions. A three year study of mountain lions within Grand Canyon National Park is proving that DNA sampling and analysis of genotypes is an effective, low-cost method for detecting and identifying individual mountain lions, kinship, and minimum population estimates. This study is beginning to provide a framework for other parks particularly on the Colorado Plateau (many of which have little or no budget to collect this information) with similar habitat types, to obtain information regarding their mountain lion populations in order to preserve an integral component of the ecosystem while providing for visitor safety. Information already gathered at Grand Canyon National Park is providing insight into mountain lion populations, distribution and kinship.

Although numerous techniques have been proposed for the enumeration of cougar populations, few have been simultaneously applied and rigorously evaluated for their efficacy and accuracy. The study being conducted at Grand Canyon National Park is analyzing a variety of methodologies including ground-based track counts in winter and summer, and mark-recapture methods combined with scent station visitation. The latter is a non-invasive technique that captures a DNA sample from hair allowing for analysis of age, sex, kinship, and animal identification.

This project has begun to document movement patterns of mountain lions associated in and adjacent to areas of human use at Grand Canyon National Park. Mountain lions are the sole remaining large predator in the southwest (aside from reintroduction efforts for the Mexican gray wolf in the eastern portion of the state) and as such, play a unique role in parks natural systems. They are the Ecoregion's only remaining natural predators of adult mule deer, elk, desert bighorn sheep, and recently, javelina.

Although seldom seen by visitors, simply the presence of large carnivores contributes to the richness of visitor experience. However, recent increase in the frequency of attacks on humans by mountain lions has

led to human safety concerns in areas where humans concentrate in mountain lion habitat. Changes in the distribution and abundance of prey, mountain lion hunting behavior and movement of humans into areas

traditionally occupied by mountain lions, has been advanced as factors contributing to increased human-mountain lion incidents.

National parks, because they offer security from hunting and generally stable habitats, tend to attract ungulates and the predators that feed on them. Habituation of deer and elk to humans and their structures often results in them living among humans and attracting predators to these areas. Increasing elk numbers on the South Rim may have contributed to a shift in dispersion of mule deer and elk toward higher human density areas. This past year, we have frequently documented sites where mountain lions have killed deer, elk, and javelina on the North and South Rims of the park, including the developed zones adjacent to campgrounds, schools, and residential dwellings. In addition, mitochondria and nucleic DNA analysis is starting to provide information on lion home ranges and kinship (see Map II).

Knowing the spatial and temporal patterns of mountain lion use of the park and focusing on areas of high human density, is providing the basis for risk assessment. For example, it is possible mountain lions use developed areas only at night and retreat to secluded areas during the day when humans are most active. There appears to be an influence on lion behavior resulting from loose and feral pets and habituated and abnormal concentrations of large prey species in and around the developed zone. Further, manipulation of vegetation in and around areas of concern may directly, through loss of hunting habitat, or indirectly through changes in distribution of deer and elk, reduce the likelihood of human-mountain lion interactions.

Recent presentations (6th Biennial Mountain Lion Conference, George Wright Society, and study replication by California Polytechnic University) on the information collected at Grand Canyon National Park in the year 2000, has brought attention to this study from scientists throughout the western states seeking to replicate our information in other geographical locations where lions interact with humans.

Researchers have identified understanding the adaptability of lions in the presence of humans, i.e., where and how do they spend their time, to what extent, how, and where do lions interact with humans, as a high priority for research. Information being obtained from this research will have direct applicability to development of management alternatives. The comparative nature of this study will allow for refinement of alternatives that will be transferable to other areas throughout the range of the mountain lion.

The objectives of this study are to:

- Continue to document movement patterns of mountain lions focusing on areas of high human density in Grand Canyon (river and rims).
- Relate temporal and spatial use patterns of mountain lions to areas of the park emphasizing those areas that receive heavy human use.

In order to:

- Maintain a naturally functioning and viable population of lions.
- Ensure safety of park visitors and staff.
- Address education of park visitors and staff on mountain lion biology in order to minimize the risk of being attacked by a mountain lion.

Funding for the year 2000-2001 has allowed for the preliminary collection of baseline data regarding DNA collection, prey base information compilation, and track and vegetation transect establishment mainly in concentrated areas of the south and north rims. The continuation of this research will provide a larger sample size, thereby increasing the reliability of results. Concurrent studies would also allow for

investigation of how mountain lions respond to varying human population densities, and levels of developments in varying geographical locations. In fact, this study has now been expanded to other parks on the Colorado Plateau as well as in the Intermountain Region through the support of Rick Flory and Earth Friends.

We are just beginning to collect scientific information available that allows us to evaluate human risk from observed lion behaviors. This research will allow the NPS to refine its management strategies and recommendations for dealing with human/lion encounters in a proactive manner.

Because lions are predators and are fully capable of killing a human, our inclination is to assume a hazardous or lethal possibility in any lion behaviors that we do not understand or are unable to interpret. Therefore, we should attempt to manage those conditions that predispose or are conducive to lion encounters and that could escalate into human injury. Data from this research will enable the Park Service to establish scientifically based recommendations for management that will help ensure visitor safety and resource protection.

This study has also provided opportunities to include community members, employees and visitors in the collection and reporting of mountain lion observations to be entered into the observation database. Another tangent of the study was incorporating young adults with a keen interest in biology into the collection of biological data. These efforts have now been funded as the *Youth Biologist Program* in the park.



Dr. Kerry Murphy, Carnivore Biologist at Yellowstone National Park, instructs the youth biologists on aging of ungulates utilizing tooth age structure and analysis.

Increased visitation at Grand Canyon National Park has resulted in an attendant increase in the number of conflicts and confrontations between native wildlife and visitors. Recent years have seen an increase in visitor injuries resulting from their attempts to feed or approach native wildlife species. Simultaneously, the park has experienced high mortality rates in wildlife as a direct result of these interactions. The 1997 approved Resource Management Plan addresses visitor impacts on wildlife and habitat (3-116) and proposes that an “expanded wildlife program assess effects of people on wildlife and their habitat”.

The 1999 Small Grant Project entitled "Nuisance Wildlife and Human Conflicts Intervention" funded a short-term position whose function was to be a presence in areas of high human/wildlife interactions. The intended goal was to deter illegal feeding, approaching, and harassment of wildlife, in addition to educating the public as to the negative impacts of this behavior. The Grand Canyon National Park Wildlife Group relies heavily on volunteers to assist in the collection of field data. In any given year, 40-50 volunteers work under the biologists' supervision.

For the past several years, the wildlife biologists have been sponsoring a group of eight youth volunteers ranging in ages from 10 to 17, supervised for approximately two to four weeks. These volunteers have expressed an interest in not only volunteering for the National Park Service, but also have keen interests in wildlife biology. The youths have come from Texas, Washington, California, Arizona and Colorado.

In 1999, volunteers were quickly trained in recognizing human/wildlife conflicts, interpretive skills and small mammal trapping methodologies. Over the course of their two-week period within the park, they assisted in roving the South Rim and preventing condor/human interactions, educating visitors, and trapping nuisance squirrels and feral pets. These youths became highly effective, learned quickly the methods of communication and were a great asset to the wildlife branch. In turn, they recognized useful skills in wildlife management and had an opportunity to understand the role and function of a biologist in a real work setting.

This year, eight youths ranging from 10-17 years old, some returning, participated in the program for 3 weeks. Those that were repeat volunteers were quickly put to the tasks of trapping loose and feral pets. They required no training as they had obtained this skill for the previous years experience in the park. For the remainder of the period, the group assisted in the establishment of vegetation, ungulate pellet, and mountain lion track and hair snare transects and stations on the north and south rims.

The group, following an average week of 58 hours of work time, accompanied the wildlife biologist to Yellowstone National Park for a lion workshop. There, the group assisted the wolf project and mountain lion field team in data collection and entry. They were also instructed on tracking methodologies and lectured on the role of predators in the ecosystem by Yellowstone wolf biologists.

This project allows for the continued opportunity for youths participating in field biology and to gain a realistic understanding of the discipline in their formative years. For the year 2001, the group, consisting of new and repeat volunteers, will once again assist in the mountain lion project as well as any new wildlife projects awarded through the small grant system.

Year 2 and 3 of this study will allow for genetic sampling and analysis of data from the river corridor and remote areas of the park such as Tuweep, the Great Thumb, Cape Solitude and Mt. Emma. This will enable us to better define home ranges, population estimates and kinship. In Nov/Dec 2001, following data analysis, the following scenario may occur:

The study design will use satellite collars that will record hourly locations from 1700 to 2300 each day; then we download data every second day and physically visit all sites where puma were holding tight in order to look for caches and kills. The idea is to follow 2-3 puma for 12 continuous months to get accurate information on kill rate, prey species, and ages. Secondary facts would be daily and seasonal movement patterns, particularly in areas of high visitor use density. We will be going back against the tide to try to learn a great deal about a few animals rather than a little about a large number of animals, which has been the trend for the last 2 decades. This will be in conjunction with the noted lion expert, Fred Lindzey, of USGS/BRD.

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