# The Importance of Understanding Biodiversity

## *Distribution of Mammals in Big Bend National Park*

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Photos courtesy of **BORDERLANDS RESEARCH INSTITUTE**

A mother black bear and her two cubs in Big Bend National Park. Black bears had a wide distribution in this study as well as a high number of detections.

Biodiversity supports vital ecosystem services—benefits like pollination for crops, nutrient cycling, and maintaining clean water—that are provided to humans by the natural environment and healthy ecosystems. Ecosystems are healthiest when the biological community is intact with a large variety and number of species.

Some species play vital roles in their ecosystems, without which ecosystems can degrade and even collapse. Carnivores, especially large-bodied carnivores, are an example of important species for an ecosystem. Carnivores can have significant impacts on the other species, and therefore on ecosystem services and productivity.

Carnivores have a contentious history with humans, often due to conflict over space and predation. Removing carnivores from ecosystems due to conflict with humans and habitat loss has led to worldwide losses in biodiversity and unstable biological communities.

While there is still a significant amount of direct and indirect conflict between humans and carnivores, there have been

efforts across the globe to restore carnivore populations and protect their habitat. Globally, conserving large carnivores and biodiversity as a whole has relied heavily on protected areas. In the United States, national parks were formed to preserve natural resources and have taken the role of protecting habitat and native species.

Big Bend National Park (BBNP) is one such park and is home to a variety of species that contribute to biodiversity while attracting many visitors. BBNP was established in 1944 to preserve these species within the desert, river, and mountain ecosystems of the Chihuahuan Desert in the Trans-Pecos ecoregion of Texas near the U.S.-Mexico border.

Given the importance of BBNP for biodiversity and habitat protection in the Trans-Pecos ecoregion, the distribution of species has been well-studied. However, it is also important to monitor changes in the distribution of species over time and to gauge what factors within the park may contribute to change such as increased visitation and climate change.

The park provides vital and protected habitat within the Trans-Pecos to many species. It is one of the last areas in Texas with established breeding populations of black bears (*Ursus americanus*) and mountain lions (*Puma concolor*). It is beneficial to know where these top predators occur to better understand species distribution, biodiversity, and species interactions within the park's ecosystem.

Other carnivores that occupy BBNP include bobcats, badgers, coyotes, kit foxes, gray foxes, raccoons, ringtails, long-tailed weasels, hooded skunks, hog-nosed skunks, striped skunks, and spotted skunks. Ungulate species present in BBNP that can interact with these carnivores include the Carmen Mountain white-tailed deer, mule deer, and javelina, as well as the invasive feral hog and aoudad.

Borderlands Research Institute (BRI) conducted a study on the mammals of BBNP to understand their distribution, activity, habitat use, and co-occurrence patterns. We surveyed specifically for carnivores and ungulates due to the higher detection rate of large-bodied animals as well as their importance to ecosystem functions and human interests.

We used 58 motion-triggered camera traps that were located within and surrounding the Chisos Basin between 2014–2019. We first wanted to understand which species were present in BBNP to assess biodiversity in this important ecosystem. To do this, we identified where in BBNP ungulate and carnivore species occurred.

We then wanted to understand spatial and temporal patterns for certain carnivore species to understand patterns of co-occurrence. We also examined how large predators used the more frequently

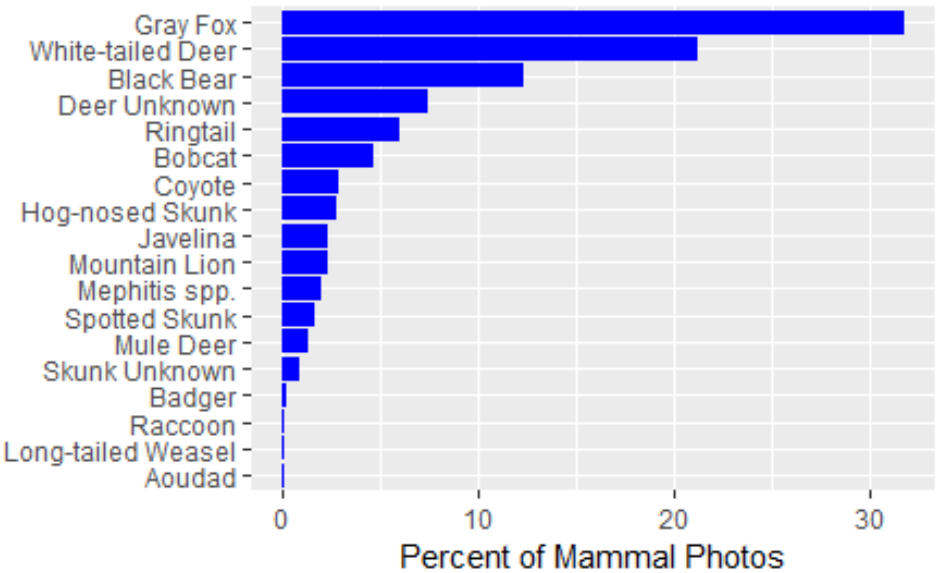


Figure 1 - Percentages of mammal photos (n = 12,499) for species detected during camera surveys in Big Bend National Park, 2014-2019.

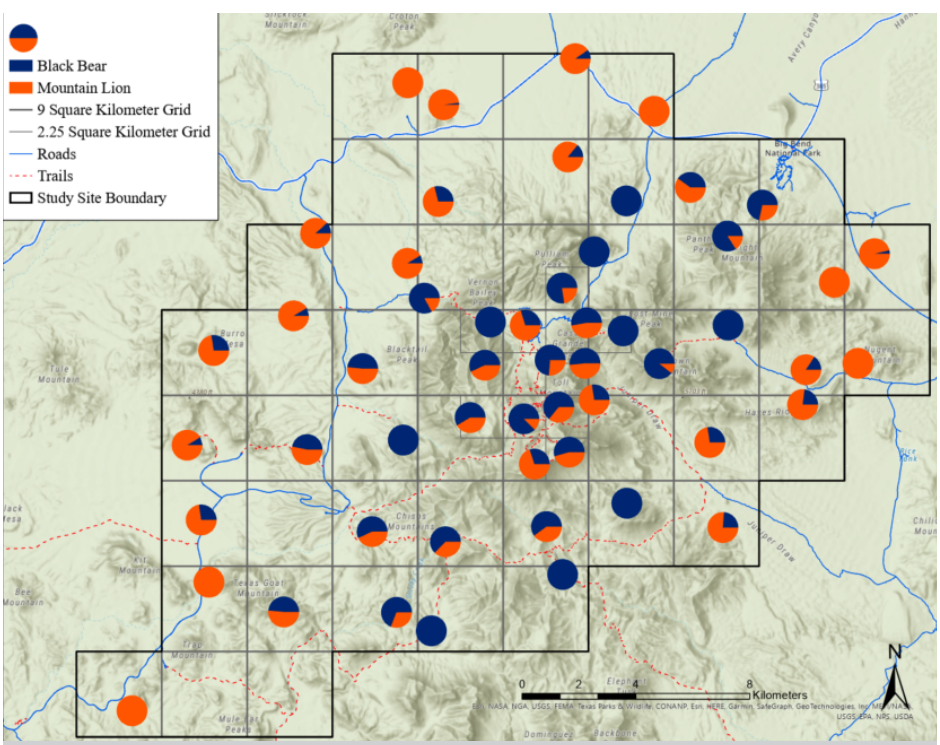


Figure 2 - Co-occurrence of black bears and mountain lions across all cameras in Big Bend National Park, 2014-2019.

visited areas in BBNP to understand how human recreation impacts the occurrence of these species.

For our first objective, we documented a wide variety of mammals in BBNP; 12 carnivores and four ungulates. (*Figure 1*). All carnivores overlapped with at least one other carnivore except raccoons and long-tailed weasels. Mountain lions, bobcats, gray foxes, hooded skunks, striped skunks, and hog-nosed skunks appeared in all habitat types.

Javelina were the only ungulate to occur in all habitat types but had a limited number of detections compared to the Carmen Mountain white-tailed deer. We found that gray fox and black bears had the widest distribution of all mammals in this study, as well as a high number of detections on our cameras. Mountain lions also had a wide distribution but had limited detections.

The two large carnivores overlapped with all mammal species within the park (*Figure 2*). Of the ungulates, the Carmen Mountain white-tailed deer had the widest distribution and showed some overlap with mule deer, but generally occurred in higher elevations.

Managing invasive exotics is a priority in the park. Aoudad are an invasive species that may negatively influence the native desert bighorn. Their generalist diet and similar habitat use to desert bighorn could suggest competition between the two species in BBNP. Aoudad had the smallest distribution of ungulates within our study area, but they showed a generalist pattern of using a wide variety of habitats.

Another exotic species of concern in the Trans-Pecos is the feral hog. There were no detections of feral hogs in our study, but biologists at the park have found that they occur mainly in the northern parts of the park, where we had few cameras.

Biologists are concerned with hogs invading the Rio Grande corridor due to its dense vegetation. Previous studies have shown that feral hogs in the nearby Davis Mountains used similar habitat to that of white-tailed deer and mule deer. The Davis Mountains contain similar habitat and elevations to the Chisos Mountains in BBNP, indicating the potential for feral hogs to further spread and compete with native species within the park. Continued monitoring will be important to detect changes in the distribution of both species in the park.

For our second objective, we found that black bears were detected more during the day and overlapped with mountain lions more at dawn and dusk (*Figure 3*). Further, black bears had more detections in the summer months and when temperatures increased, although they had some activity in the winter months.

We also found no significant relationship between the presence of black bears and mountain lions. We found some evidence for these species using similar areas, but at different times of the day. However, more research is needed to better understand these interactions.

We also determined that black bears and mountain lions differed in their use of areas near the Chisos Basin. Black bears were detected more often and closer to this highly recreated area of the park. The Chisos Basin is in the park's highest elevations, which is considered good habitat for bears to den with access to high-quality food and water sources.

There are also anthropogenic attractants that could encourage bears to occupy this area, such as trash and food near campsites. As bear populations continue to grow in Texas, and human visitation to the park increases, there is potential for an increase in human-bear encounters and therefore conflict.

Mountain lions tend to avoid areas near high human activity, but in this study, they seemed to neither avoid nor select areas of the park with high human use. This could be due to a lack of detections for mountain lions by our cameras, and their general low densities.

In 2021, BBNP had a new record of 600,000 visitors. Understanding where large carnivores live and when they are most active can help guide best practices to ensure the safety of humans, black bears, and mountain lions.

Our goal was to provide an in-depth overview of the current distribution of carnivores and ungulates in BBNP and the potential reasons behind these patterns. This information is vital for developing and improving conservation strategies for BBNP.

There are still many questions to be answered about the mammals of Big Bend, especially those with limited detections, but this can provide park biologists with a baseline for monitoring as the climate changes, visitors increase within the park, and the potential for invasive species to spread increases.

The park is one of the most biologically diverse areas in Texas and the Trans-Pecos ecoregion; by understanding species interactions and occurrence patterns, this vital ecosystem can be protected for many future generations of Texans to experience and enjoy.

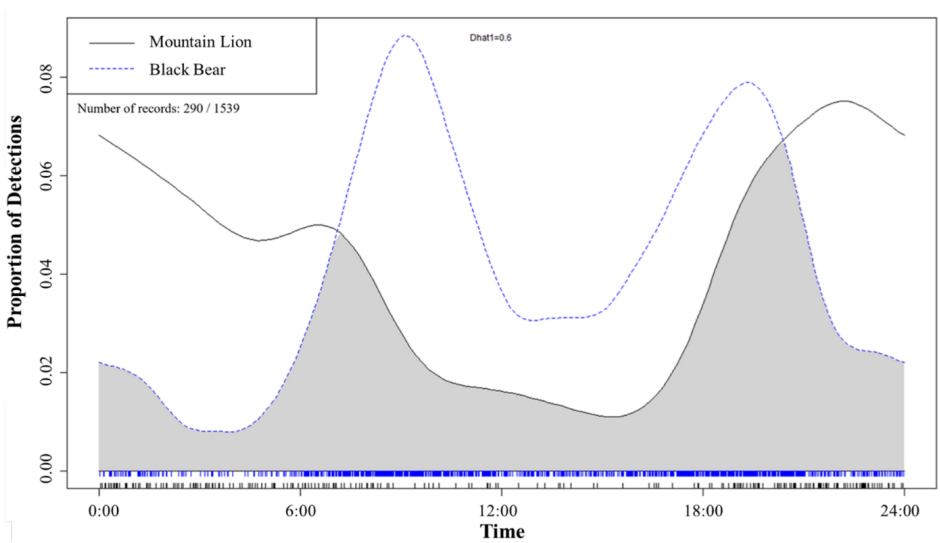


Figure 3 - Daily activity patterns of mountain lions and black bears in Big Bend National Park, 2014-2019.