Introduction:

Mountain lions (Puma concolor) are found widely dispersed throughout the western hemisphere, boasting a range from the Canadian Yukon to the southern tip of South America (Hornocker et al. 2009). Their generalist nature and extreme adaptability allows them to survive in many different landscapes with other top predators, including wolves (Canis lupus), bears (Ursus spp.) and jaguars (Panthera onca). With wolves re-colonizing the west, cougars and wolves will once again compete for niche space in ecosystems in which wolves have been absent for ~70 years. Both species are able to subsist in the same ecosystem, however, in Washington State, wolves will likely displace cougars as they re-colonize, leading to a potential increase in human-cougar interactions and perhaps an decline in cougar population numbers.

For my project I set out to compare predation site properties between two different ecosystems in which cougars are found, with the hopes of predicting how cougars in the west may react to wolves. The western study site is located in parts of Snoqualmie National Forest, King County and Snohomish County. Yellowstone National Park will serve as the wolf-present study site. These two locations differ in more than just wolf presence and absence, as Snoqualmie is characterized by large swaths of forest with patches of clear cuts and an extensive road network. Yellowstone is quite the contrary as it is a large open landscape with occasional patches of forest. By comparing slope, canopy cover at two different radii and sorting the kill habitat into one of three (open, edge, closed) categories I hope to determine if cougars are using similar attributes of the landscape. This would help inform a prediction as to how much re-colonizing wolves are going to affect already existing cougar populations.

Methods:

Data was obtained in two different ways depending on study site.

In Snoqualmie cougars are captured, fitted with a GPS collar and then tracked to determine kill sites. Two or more GPS pings in one area is indicative of a predation (Anderson et al. 2003) and after observing a "cluster" of GPS points a team was sent in to collect data.

In Yellowstone, researchers would take advantage of heavy snow to track cougar movement until discovering a predation site where data would be recorded.

Once all data was collected methods were as follows:

• Overlay predation sites onto slope and vegetation GIS layers to determine slope and percent canopy cover for each site.

• Use Google Earth imaging closest to date of predation to categorize kill site habitat with either "open", "edge" or "closed".

• Analyze data using MANOVA, ANOVA and Chi-squared tests. First comparing individual cougars in Snoqualmie, and then compare Snoqualmie to Yellowstone.

Results: Part I: Snoqualmie

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Primary ANOVA testing shows that slope (p=0.079), percent canopy cover at 15 meters (p-value= 0.033) and percent canopy cover at 200 meters (p-value= 0.004) all vary when comparing individual cougars in Snoqualmique National Forest. Although all are statistically significant, in actuality percent canopy cover does not look significantly different (i.e. at a 15 meter radius, four of the six cougars have made nearly all kills in full cover). MANOVA testing that paired slope and canopy cover also showed that there is variability between individual cougar predation sites in Snoqualmique. With a p-value of 0.012 for the 200 meter radius and a p-value of 0.001 for the 15 meter radius. The chi-squared test on the number of kills in either open, edge or closed cover areas, there is little variation as cougars tend to perform the most kills in areas deemed "closed" (p-value=0.16).

Part II: Snoqualmie vs. Yellowstone

Although cougars in Snoqualmie and Yellowstone use the landscape in different ways, predation site properties at the two study sites shows just how versatile the mountain lion (Puma concolor) can be in its use of habitat. MANOVA testing showed similar results, both the 15 meter (p-value= 2.47x10^-13) and the 200 meter (p-value= 2.2x10^-13) were response variables along with slope. The categorization of kill sites also proved to vary between the two sites as the p-value was 0.06.

Discussion:

Predation site properties were shown to vary both within a single study site and between both study sites. Cougars in Snoqualmie make kills in areas where slope varied significantly, although all were shown to have a high percentage of canopy cover. This could be due to niche differentiation or the solitary nature of cougars that is not conducive to sharing space between individuals. Based on previous studies, I would have expected cougars in Yellowstone to have made kills in areas that had more canopy cover and an increased slope (Elbroch et al. 2015; Ruth et al. 2009) compared to Snoqualmique due to wolf presence. However, the Yellowstone killrates proved to be on flatter ground with an average incline of 14.82 degrees whereas Snoqualmique had a mean incline of 61.32 degrees. Yellowstone kills were also made in areas with less overall percent canopy cover. This is most likely due a lack of available canopy cover and the fact that this data was collected in the winter, when snow forces cougars to make kills closer to edges (Laudre et al. 2006). The habitat in which the Yellowstone kills were made is also conducive to wolf presence, therefore cougar predation site characteristics may be more closely linked to climate and landscape features than the presence of a competitor.

Although cougars in Snoqualmie and Yellowstone use the landscape in different ways, predation site properties at the two study sites shows how versatile and adaptable cougars can be. With the ability to make a kill near a suburban backyard (Snoqualmie; Kertson et al. 2011) or the middle of an open plain (Yellowstone) cougars clearly demonstrate their ability to remain a part of the landscape. As wolves re-colonize Washington, I believe that they will displace cougars to a degree, but the Yellowstone data shows that cougars are very adept at continuing to make kills in areas conducive to wolf presence, therefore cougars should be able to adequately compete with wolves and remain within their current range.

Future Research:

• Under-story canopy cover may be more indicative of how cougars are using the landscape, a study looking at the under-story cover at each kill site may give more insight into cougar hunting strategy.

• In Snoqualmique some researchers have a rare opportunity to study how the two predators interact and how one may displace the other. A study site looking at both species’ movement and kill sites would be ideal for determining how each affect the others niche differentiation.

• GPS collaring of cougars in Yellowstone will provide more data as well as allow for nesting of individual cougar kills.

References:


