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How Variation in Activity Time and Duration at Water Sources Affects Feral Horse Vulnerability to Cougar Predation in Southern Nevada

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HOW VARIATION IN ACTIVITY TIME AND DURATION AT WATER SOURCES AFFECTS FERAL HORSE VULNERABILITY TO COUGAR PREDATION IN SOUTHERN NEVADA

by

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ABSTRACT

Feral horses have become prominent in the Intermountain West. Approximately 43,000 horses are found in Nevada alone. With increasing numbers, they have become a large portion of ungulate biomass. Thus, it is important to understand their behavior, as they become integrated into western wildlife communities. However, little research has been conducted on the ecology of feral horses, and their relationships with native ungulates, carnivores, and local resources such as water.

To address these concerns, I outlined three objectives: (1) determine if horses changed their water visitation activity times in relation to temperature. As a primarily diurnal species, we were interested in discovering if they showed more crepuscular behavior during bouts of hotter temperatures to combat heat stress and water requirements. (2) to determine if horse water behavior varied seasonally and (3) compared the timing and frequency of horses and deer visitation to water sources across seasons. Horses are water dependent, meaning they need water daily to maintain good fitness. During times of lactation, mares require upwards of 21 gallons per day.

We observed water visitations of mule deer and feral horses to two permanent springs in two mountain ranges in Southwestern Nevada. From 2021-2023 we set up cameras at two springs to monitor the frequency and timeline of horse and wildlife visits to perennial sources of water. Our results indicated predictable behavior, especially during the hotter months of the year. Horses visited water sources more frequently during the summer months (April - October) as compared to the winter months (November - March). During summer, horses primarily visited water during diurnal and crepuscular hours. However, during winter, horses visited during nocturnal hours more frequently. Similarly, mule deer detections showed more visitation during

diurnal hours in winter. To contrast, during summer, mule deer visited water nocturnally in addition to diurnal hours.

Future research is needed to see how this behavior affects their vulnerability to predation as well as how dominant horse presence at water sources affects the behavior of native ungulates, such as mule deer. Future discussions of water dominance are needed to determine if the feral horse populations limit access to water of the other wildlife in southern Nevada, including elk and deer.

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INTRODUCTION

Horses were domesticated about 5,500 years ago, and since then have led to important advancements in human civilization. They enabled nomadic people to build empires, transformed warfare, allowed for far-reaching trade of goods, and long-distance communication (Schubert et al. 2014). When domestic horses were introduced to North America, they proliferated very quickly, formed feral populations, and started changing rangeland, degrading soil and vegetation, overgrazing, and altering water uses of other native wildlife (Hall et al. 2018). Approximately 43,000 horses are found in Nevada alone. With their increasing numbers, they have become a large portion of ungulate biomass (Andreasen 2014, Nuñez et al. 2016).

Horses live in familial groups called herds or bands, comprised of mares, foals, yearlings, and a charge stallion. Young will disperse as they age, but mares typically remain with the same band throughout their adult lives (Nunez et al. 2013). Stallions will form bachelor bands if they do not have a harem to protect, but also can live as individuals. Feral Bands in the western US range in size, from a stallion and mare to a stallion and 3-4 mares.

Typically, domestic horses have been bred to be “diurnal” to match the human circadian rhythm. Much of what we know about activity time is from observations of captive domestic animals (Smale et al. 2003). Because horses have been domesticated since the late-Neolithic, humans have been morphing the ecology of horses to match their schedule. Under wild conditions, it is possible that horses might adapt to nocturnal or crepuscular behavior, depending on weather and prevailing climatic patterns (Smale et al. 2003). In a semi-arid desert, behaviors change throughout the year to account for varying environmental factors, like hot dry summers, and cold, windy winters.

Horses and Water

Water is a key predictor of horse movements (Schoenecker et al. 2022). They will not migrate far from water sources as they are water dependent. Typically to maintain basic functions in a mild climate, they need about 5 L per 100 Kg of body weight daily (Freeman 2021). Water intake varies with age, sex, reproductive status, but increases across demographic classes during times of extreme temperatures (Freeman 2021). During hotter parts of the season, they will visit water sources for longer durations, and more often (Hall et al. 2018). In periods of lactation, mares require more water to meet their demands, with the ability to consume 74% more than their maintenance requirements when not lactating (Freeman 2021). Horses are pregnant for lengths of 320 to 380 days. Foals then exclusively nurse for one month, begin consuming plant matter at two months, and are weaned at about 6 months (Coumbe 2001). Feral horse movements have been shown to correlate with the breeding season and distance traveled from available water (Schoenecker et al. 2022). Horses' dependence on water can make their behavior predictable and their movements strategic, especially during times of lactation and heat stress. Moreover, frequent use of predictable water sources results in trailing, making their movements in space and time highly predictable.

Mule deer foraging and water behavior in arid climates

Mule deer tend to select areas for foraging that contain shrubs and for communities that are devoid of dense vegetation (Morano et al. 2019). They get most of their water from the forage they consume. The preformed water acquired from forage varies from 30-80%, depending on the food item (Monteith et al. 2023). Winter forage on average only contains 30% but green vegetation in spring can contain 80% water (Monteith et al. 2023). On average, they need to drink about 6 liters per day, but during times of heat stress and lactation, they will consume more

(Hall et al. 2018). To optimize water retention, deer move and forage more during crepuscular and nocturnal hours, and rest more during diurnal hours to avoid the hottest parts of day when they are ruminating (Morano et al. 2019). Because they are not dependent on free water, they have the ability to move farther from water sources and use those sources less frequently. This behavior makes their movements less predictable and less vulnerable to predation when compared to feral horses. Horses' dominance at water sources negatively affects native ungulates use of water (Hall et al. 2018).

Cougar ecology

Cougars (*Puma concolor*), also called mountain lions, are large cats found throughout both North and South America (Iacono 2023). Males can weigh 140-220 lbs. and stand up to 30 inches at the shoulder. Females weigh anywhere from 75-150, standing about 28 inches at the shoulder. General habitats chosen by cougars typically have high vegetative cover, some areas being heavily forested with slopes ranging from a subtle hill to a steep aspect. (Hornocker 1970). Cougars are crepuscular and nocturnal, meaning they are active during dawn and dusk hours (Penteriani et al. 2017)

Cougars are generalists, hunting many different types of prey. However, they show a strong preference for deer, as they use the types of habitats cougars use for hunting, all age and sex classes are susceptible to cougar hunting styles, and their activity times overlap. In arid environments, mountain lions have diversified diets, as food resources are more limited (Choate et al. 2018). In addition to deer, cougars have been documented preying on other larger ungulates, including moose, elk, cattle, and horses (Iacono 2023). Notably, these prey species are quite a bit larger than the individual lions, and so predation tends to be focused on juveniles

rather than adults (Knopff et al. 2010). Some studies suggest they go after individual prey in vulnerable positions. For deer, females were targeted close to the birthing period, males were targeted around the rut and in late winter, and juveniles were selected in times when they were most vulnerable (Knopff et al. 2010). Although these data reflect patterns of predation on small ungulates, preliminary data suggest they hold for horses as well, especially at 10X the size of an average mule deer.

Interactions between cougars and horses

Horses are a non-native species whose population has proliferated over a short period of time. Because of increasing population numbers, they can be a potential prey option for cougars in the area when the two species overlap. In our project study area in the Delmar/Clover Mountain region, some cougars are considered "horse specialists" (Iacono 2023). These are individuals that meet the three criteria established by Knopff and Boyce (2007). The criteria are as follows: (1) the prey species is the primary component of the diet: (2) the prey species is selected above their availability: and (3) the individual's specialization is not reflected on the population-level's specialization. In this area, 29 collared cougars had diets ranging from 24% to 49% horse, with variation between male and female (Ianoco 2023). Within the data, all age classes of feral horses were represented. Foals were consumed most frequently, at 60.5%, then adults at 15.8% and subadults at 13.2%. Among adult horses, 2:1 ratio was found between males and females (Ianoco 2023)

Interaction between the two species was unexpected, as their traditional activity times are not similar, i.e. cougars following a more crepuscular rhythm, and horses following diurnal patterns. The question that arises is do their activity times overlap, and is there correlation

between seasons and activity time? And if so, do coincident activity patterns make horses more vulnerable to predation? I hypothesize that as seasons change, horses will alter their behavior in relation to water. I predict that as the weather gets cooler, horses will follow a traditional diurnal circadian rhythm. But as the weather warms up, horses will visit the spring during more crepuscular hours to avoid the hottest parts of the day. I also predict that during the summer months, horses will visit water sources more frequently, and during the winter months, they will visit the springs less frequently.

METHODS

Study Site

The study area is located in southeast Nevada, in Lincoln County. The two springs that were observed in the Delamar and Clover mountains were selected at random from a wider sample on each side of the study area. Elevations ranged from 1,371m to 2,449m in the Delamars and 1,371m to 2,316m in the Clovers. Water sources in the area are provided by springs, cattle troughs, creeks, and man-made guzzlers. Cattle grazing occurs throughout the site and as such numerous anthropogenic water sources were available. Our two study sites were stationed at two permanent springs, one on each mountain range. The site of the Delamar spring is latitude 37.40102 longitude -114.27701. This is the only permanent water source in the area. The site of the Clover spring is latitude 37.40686, longitude -114.7257. In this area, water is also available from scattered cattle troughs.

Figure 1 - Map of study area. Both cameras marked by red pins

The site sits on the transition between the Great Basin and Mojave Desert ecoregions, with the plant communities reflecting these climatic zones. Prominent vegetation includes semi-arid pinyon-juniper woodlands (*Pinus monophylla*, *Juniperus osteosperma*), along with some Great Basin sagebrush steppe (*Artemisia tridentata*), and Joshua tree foothills (*Yucca brevifolia*). Cheatgrass dominated areas (*Bromus tectorum*), are only found in the Clovers, along with ponderosa forest (*Pinus ponderosa*) and some Gambel oak (*Quercus gambelii*) and shrub thickets.

98% of the area is owned by the Bureau of Land management (BLM), with designated wild horse Herd Areas (HAs) scattered throughout. Land Use in this area is primarily cattle grazing and outdoor recreation, including cougar, elk, and deer hunting (Ianoco 2023). Natural disturbances include wildfire, and heavy summer rains. These rains have the capacity to cause flash floods and mudslides. Mean annual precipitation ranged from 106.6 mm to 403.1 mm in 2018 – 2022, while mean annual temperatures range from 11.7°C to 13.6°C (Iacono, 2023).

Sampling Design

We observed camera photos over three years, 2021-2023. The two springs we monitored were selected randomly from a larger population of sampled springs. The cameras were in the field year-round. We collected camera memory cards approximately 2-3x / yr. We then downloaded all photographic data and censored any photo without evidence of wildlife, e.g. blowing grass or branches. We then cataloged photos with wildlife detections and exported data from the photos into an excel sheet. The data we recorded for photos included: date, time, temperature, species, number of individuals, age, and location. False triggers were ignored, after observation to conclude there was no vertebrate in the photo. Each actual trigger was recorded, even if it was not one of our target species. We then attributed a season category to each photo. Summer months were defined as April - October, while winter months as November - March.

Cameras

The cameras used at the permanent springs were Bushnell Core Trail Camera (model #3119938C, Bushnell Outdoor Products, Kansas USA). To reduce sun glare, they were set NW (330 degrees) and NE (30 degrees) (Ianoco 2023). Each camera was set 0.75 meters from the ground. The parameters of the camera were as follows, image size = 3 megapixels, number of pictures per trigger = 2, capture interval = 5 sec, sensor level = low and camera mode = 24 hours. Each bout in our data set was the sum of individuals within a 30-minute interval. If the next trigger was greater than 30 minutes, a new bout would be started.

Temporal Classifications

Because animals show distinct patterns of behavior, we converted our continuous time stamps into categorical groups. Thus, time was separated into 4 categories: crepuscular AM (sunrise ± 1 hr.), diurnal, crepuscular PM (sunset ± 1 hr.), and nocturnal. We took the sunset and sunrise times recorded from Caliente, Nevada and used those values to calculate the time of visitation across our allotted study years based on the records in the US Naval Observatory (https://aa.usno.navy.mil/data/RS_OneYear).

Figure 2 - Delamar Mountain Spring, 2022. Within each photo, data about time, temperature, date, weather, and individuals present can be extracted. Note that there are currently two species within the photo.

RESULTS

We analyzed camera photos taken from April 2021- April 2023. Although cameras did have false triggers, 24,522 photos were taken over 3 years that had wildlife, livestock, or humans present. In those photos, there were 819 different bouts recorded. We recorded 436 different bouts of horse detections, and 42 bouts of deer detections. We recorded 14 other species of vertebrate including wild turkeys (*Meleagris gallopavo*), cattle (*Bos taurus*), foxes (*Urocyon cineroargenteus*), cougars (*Puma concolor*), ravens (*Corvus corax*), and a variety of other small wildlife.

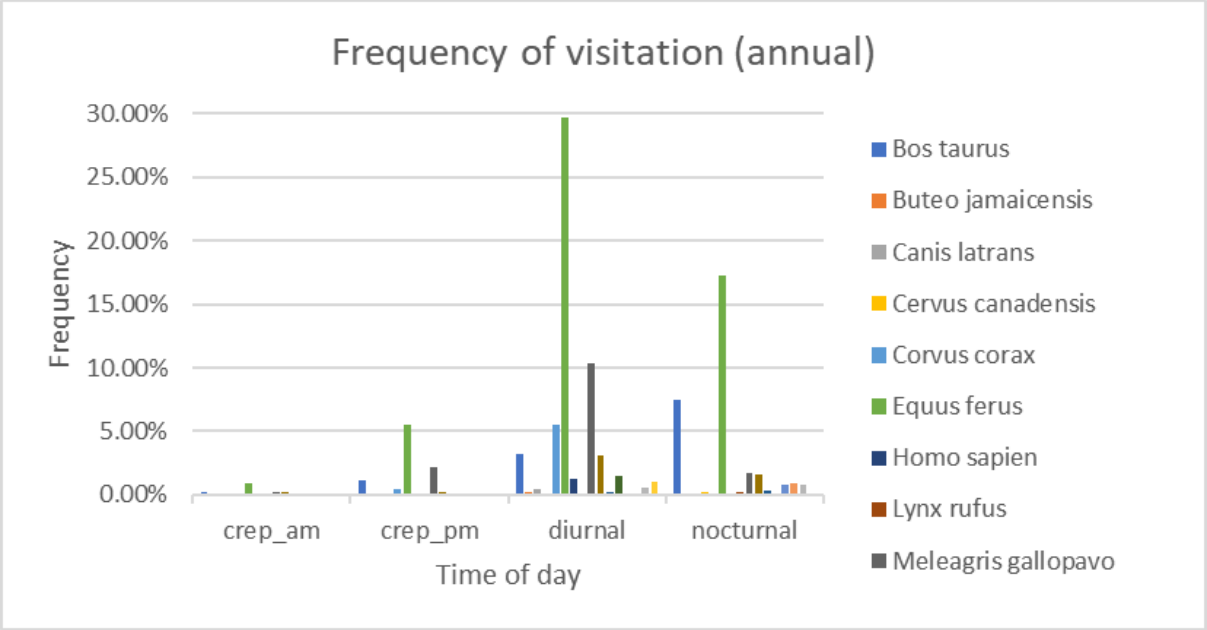

Figure 3 - Annual Frequency of visitations among all the species that were detected at both springs.

Photo triggers from horse and deer detections were analyzed. Horses visited water more frequently than all the other species caught in the camera photos. Figure 4 portrays the proportion of detections of horse visits to water by season. During summer months, horses visited water during all circadian categories, however, diurnal visits were highest (64.3%) and

crepuscular AM lowest (1.7%). During winter months, they visited during more nocturnal hours (23.4%), followed by diurnal hour visits (19.4%). Comparing the two seasons, horses visited water more frequently during the summer months than during winter months. During summer months, horses visited diurnally much more than during winter months. They did not visit water much during crepuscular hours.

In Figure 5, we compared the proportion of visitations to water between mule deer and horses during the winter months. Deer visited water more frequently during winter months than horses did. Horses visited more during nocturnal hours, followed by diurnal visitations. Deer visited more frequently nocturnally, followed by diurnal visitations.

Figure 6 shows the proportions of water visitations comparing deer and horse during summer months. Horses visited water more frequently than deer did. Horses visited frequently during diurnal hours, followed by nocturnal hours. Deer visited diurnally and nocturnally. During the summer months, horses visited water more frequently than deer. Conversely, deer visited water more frequently nocturnally than horses during the summer months.

Limitations

Sample size of deer detections was too small to accurately predict activity time of deer. Because our data was proportional, it showed that deer were more diurnal, with a majority of visitations around the time horses were visiting the water source. But our sample size was disproportionate between feral horses and deer. The amount of deer detections was 10% of the amount of horse detections. When looking at the dates of the photos taken, no photos were taken from June to September, which is part of the hottest part of the year. Because of this gap, our sample was missing important dates that could have affected the distribution of visitations.

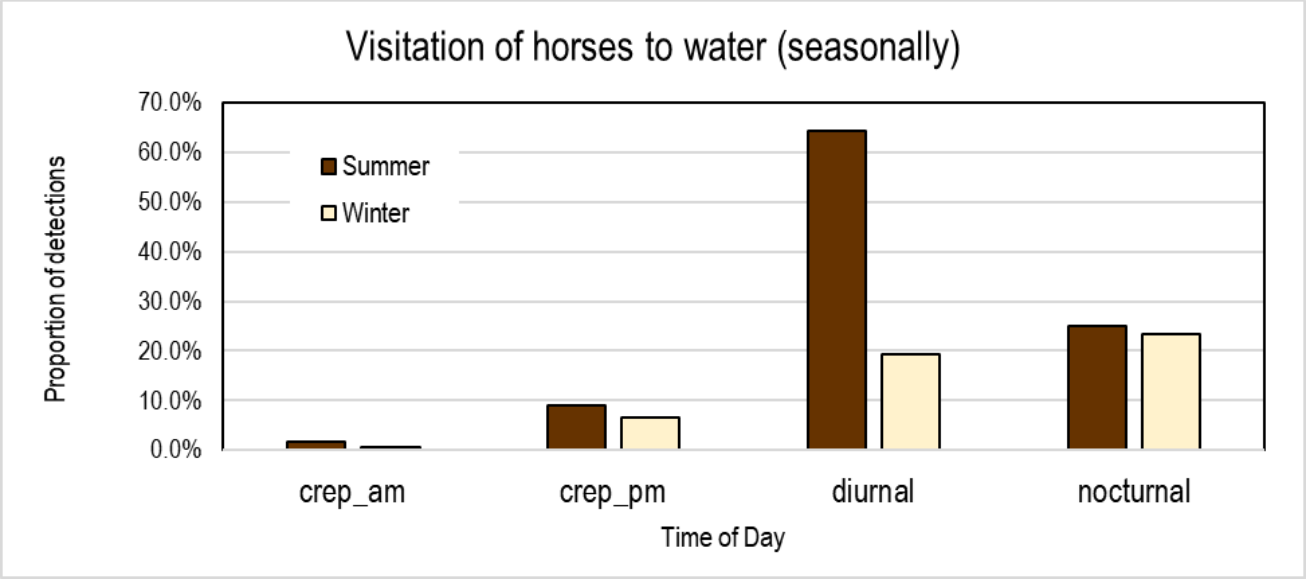

Figure 4 - Frequency of horse visitations during both summer and winter months

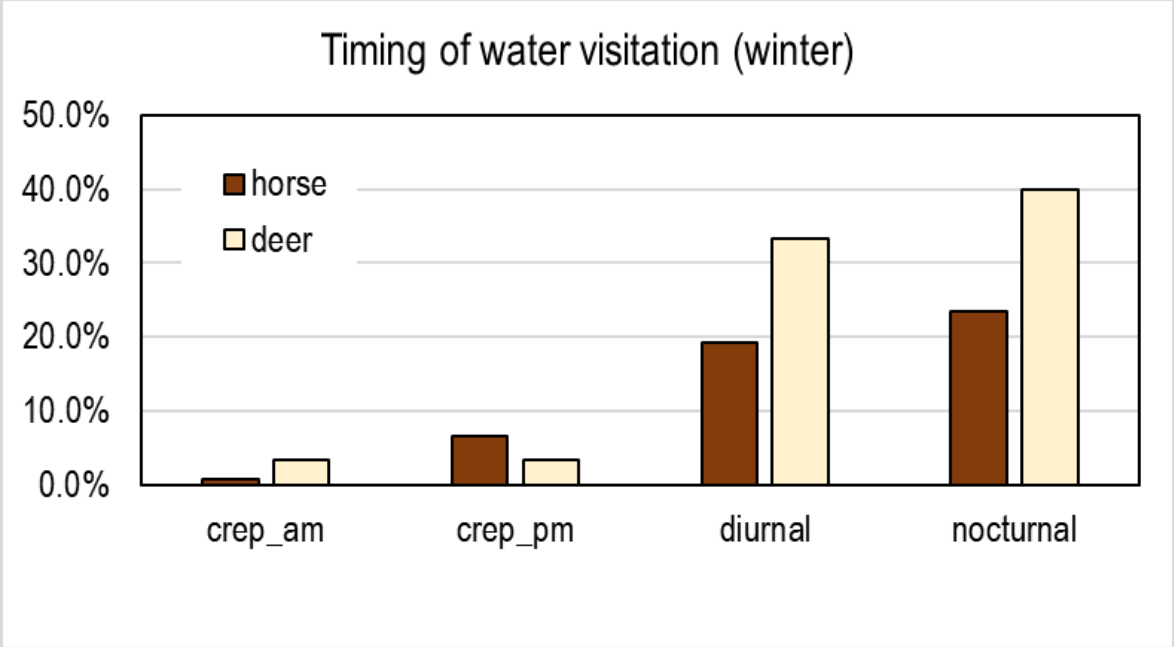

Figure 5 - Frequency of visitation to water during winter (November - April) months of mule deer and horses.

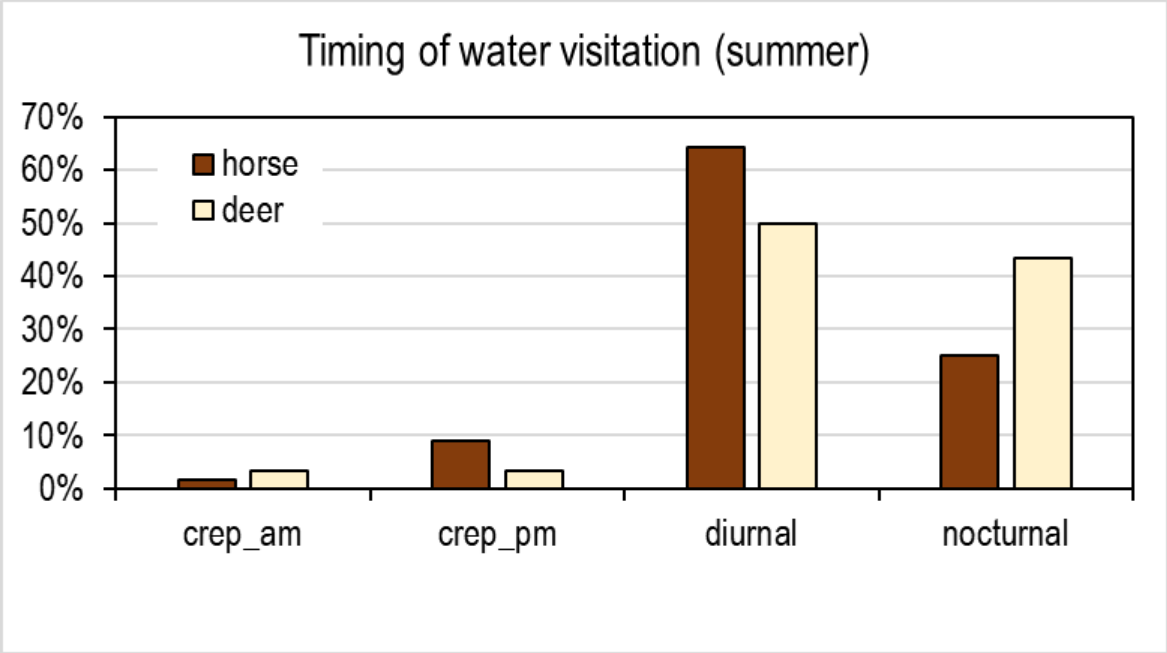

Figure 6 - Frequency of visitation to water during summer (April- October) months of mule deer and horses.

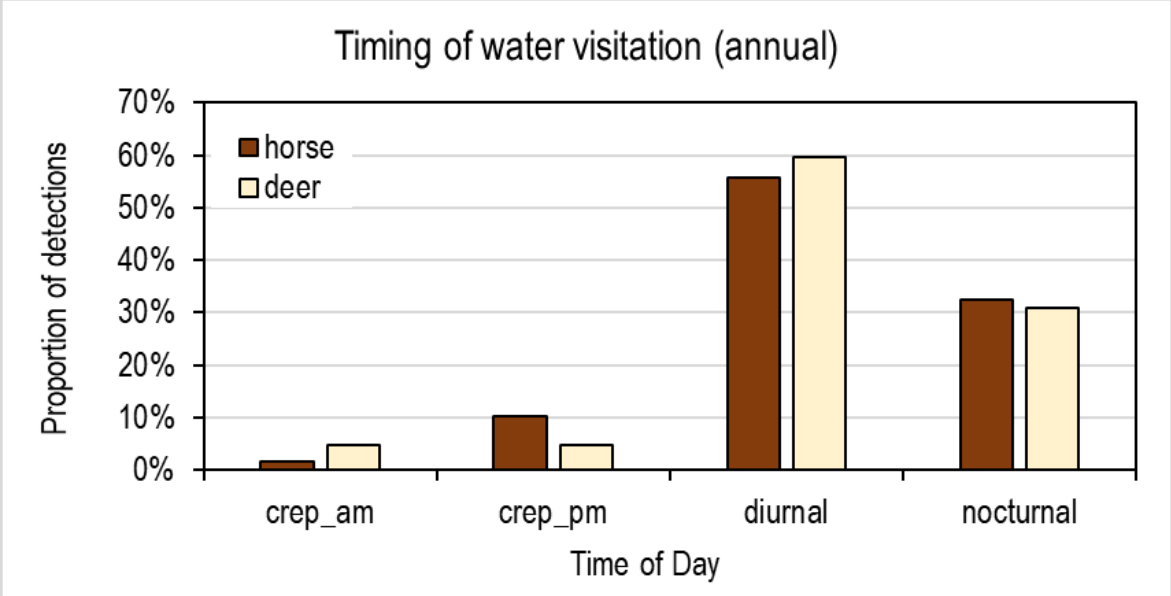

Figure 7 - Frequency of visitation to water annually mule deer and horses.

DISCUSSION

Our goal with this project was to determine whether horses changed their behavior with differing environmental factors, such as temperature and seasons, and if these patterns might render them more or less vulnerable to predation. We also wanted to see if there were interactions between horses and deer at water sources. When analyzing data, we also saw how the frequency of horse visitations changed throughout the seasons.

Horses are heavily reliant on water for fermentation and temperature regulation (Freeman 2021). If they are not able to intake the necessary amount of water, they are at higher risk of colic through impaction, metabolic diseases, anhidrosis, and can result in decreased food intake, or death (Merck 2024). This limitation can become difficult to accommodate in semi-arid environments. It also makes horse movements predictable, especially when other stressors such as lactation, heat stress, and drought increase water intake. Foal survival has also been linked to access to water (Schoenecker et al. 2022). Our data showed that horses' behavior can become more predictable in times of water stress, like hot days during summer months. They visit water more frequently during summer months, when temperatures were as high as 114 degrees F. During winter months, they did not visit water as much, which could be in relation to water available on the ground through snow and runoff during Nevada winters (Schoenecker et al. 2023). We saw some variation in activity times between summer and winter. During the summer, horses visited water during crepuscular and dirunal hours more than during the winter. During the winter, they visited water less frequently, and more nocturnally. This was in contrast to my prediction, in that, they showed preference for nocturnal visits when the weather was cooler rather than warmer. During winter, horses are able to maintain hydration requirements by consumption of snow (Mejdell et al. 2005).

Management of horses has been focused on removal from the landscape, or on methods to decrease fertility and birth rates to slow population growth (Stoner et al. 2021). Horses can alter the landscape they inhabit, and in turn not only affect the environment, but also the native wildlife. Much of what we know about their behavior is what researchers have learned from domestic populations. As horses become more prominent on the landscape, they can alter their behavior to capture efficiencies determined by the environment, which may contrast with what we know about their domestic counterparts.

In arid and semi-arid environments, dependence on water varies for each species; each having evolved different ecological mechanisms of digestion and thermo-regulation. Horses are less efficient at utilizing water than ruminants, such as deer. They excrete much of their available water during digestion (Schoenecker et al. 2022). But given that horses frequent water X times more than deer, but at similar times of day, it is important to understand how it affects water availability to other wildlife, especially game species, like deer, elk, and pronghorn. There are many different situations of larger more dominant herbivores outcompeting smaller species at water sources and manipulating the behavior of the smaller herbivores (Hall et al. 2018). Horses in the Great Basin Desert were found to affect the foraging and drinking behavior of pronghorn (Gooch et al. 2017). Our results suggest this may be more intense during times of water limitation (drought), or in areas where water sources are limited.

Future Research

This project allowed us to see that the behavior of wild horses is predictable around water sources. Future research can be done to take that information and look deeper into how it affects feral horse vulnerability to cougar predation. Looking forward, we can see if there is any relation between kills and water. We can take documented kill sites and overlay them with GPS data of

known water sources to analyze patterns that could be present. Through our study, we saw that these horses were indeed a water-dependent species, so their behavior can be predictable. With this information, we can look at kills over different years to see if there are increased rates of predation as cougars become more familiar with horses as available, abundant prey species.

As well as their interactions with cougars, future, more in-depth research should be done on the effects of horse presence on other wildlife species. Assuming deer and horse numbers are similar in our study area, we saw that deer detections were proportionally less than horses, so research should be done to see if horses are affecting the availability of resources available to deer, especially in environments that are resource limited. While deer do not need to drink much free water, with horse presence increasing in the area, deer presence at water sources decrease. With their dominance at water sources, it is important to understand how they are affecting the wildlife in the area. Management to completely remove horses has been unsuccessful, so it is important to learn horses' effect on wildlife to help wildlife managers manage populations more effectively to protect other large wildlife populations.

Word Count: 3311

REFLECTIVE WRITING

I have been able to be a part of other's research projects, and through helping, I became excited to possibly do my own research. I had previously helped a grad student with the data I ended up working with. I met Dr. Stoner after helping with data collection on his graduate student's thesis. It was a great experience to work with him. It was his first time working with the Honors Program, so it was a learning curve for both of us, but he helped me with data analysis, writing and editing. I was able to bring a different perspective to the project because of my background. I have an equine science minor, so I knew about domestic horse behavior, identification, and social structure. When talking to Dr Stoner during our meetings, I would notice things in the photos that he hadn't thought about. For example, while I was sorting photos, I could identify individuals and watch their herd dynamics shift over the years. I also produced accurate counts because I could tell the difference between similar individuals. For example, I could find small differences between two chestnut horses.

Our conversations lead us to discuss possible future research. Dr. Stoner talked about the people he knows and possible connections that I could have through him. We discussed possible future outlets of where I could take my research. While I didn't have time during my capstone, we intend to do a fact sheet after I graduate to look more in the statistics and make an extension friendly product.

This capstone taught me how to conduct research; how to come up with a question, design a project, collect data, and produce a final product. As a future graduate student these skills will propel me and give me an advantage in graduate school. My capstone solidified my want to go to an upper division graduate school. While I don't know if that will be a vet degree or a masters/PhD program, I know that I want to be involved in research.

Within the Quinney College of Natural Resources, there are opportunities to be involved in research, however competition is tight, and spots can be limited. Because of this capstone, I was able to find the mentor that best suited me and was able to work on a project that interested me. I had helped on many research projects prior to my capstone year, but just as a technician. This opportunity let me take control of a project. The struggles of producing this capstone deepened my research experiences, and it also humbled me as to what a project takes.

My end data analysis created graphs that were in frequency, which made it difficult to look at comparisons between horse and deer detections. My sample size was disproportionate, with deer detections being only 10% of the horse detections. It was important to critically look at my data and determine what it was telling me, and the limitations within my research.

Another aspect of my project that made me think critically was the application of my research in management. When dealing with management issues, often there are many different possible solutions. When working on my discussion portion of my product, I had to really think about the application of my research and how it could affect management.

While my project focused on feral horses, I did not always want to be involved in feral horse work. Management of feral horses is a highly polarized political issue, with opposing views on management and control. Until recently, very little research had been done on the ecology of feral horses. Once it was discovered that they were integrating into the ecosystem and affecting the native wildlife, research turned more to the ecology of horses and their behaviors.

One thing I noticed throughout my research is that the general public doesn't know that the “wild” horses are invasive. When people learned that there was usually the “why does it matter” question. In wildlife management, managers commonly must explain the importance of what they are managing. This is extremely important in cases of managing invasive species.

They can occasionally be beneficial, but many invasive species in the West cause damage and affect the native wildlife/ecosystems. Many of the popular invasive species are cheatgrass, tamarisk and starlings. Horses fall into that category as well. Much of the damage they do to the environment includes overgrazing and damage to riparian areas, but they are affecting wildlife as well. It is important for the public to understand their impact and how they are changing the West. What my project did was begin to look for answers to the question of if they change their own behavior and if it's predictable. Now, we can look further into that question and see the effects they are having on native wildlife like deer and elk behavior.

Engaging with the public to explain changes and behaviors in wildlife is going to be part of my job as I graduate and begin full-time in the workforce. This project showed me that I can't assume that people know what's happening just because I work with it every day. This experience began the process of communicating with the public. As I learn to communicate with them more effectively, I will be able to show how important managing wildlife, including feral horses, will be.

I didn't directly work with other disciplines, other than with some exchange with a statistician and with others in the Student Research Symposium. When I got my data analysis finished, I reached out to a statistician to get help deciding which statistical test would suit my project the best. My email exchanges with the statistician, however, were not as planned. She didn't like which media I had used for data collection and thought that my project was poorly designed. She then went on to belittle my skills and recommended I do more to be accepted into graduate school. While this criticism hurt, it did broaden my experience with dealing with other disciplines. When she emailed me, it was too late to make major changes to the project and so I had to take the criticism and move on, which was difficult. But it helped me learn how to take

criticism and make plans to move forward with the suggestions. Learning how to deal with criticism, even if it was on a small, individual basis, can lead to better results and more integrative research with co-researchers.

Another discipline I worked with was presenting my data at the Student Research Symposium from Spring 2024. There are not many students in the QCNR in the Honors program, so many of the people I presented to did not have a natural resource management background. When presenting, I had to figure out how to explain the importance of my research clearly and precisely. One of my favorite questions that I received while presenting was why my data is important. Even though I knew, it did not mean that everyone else would also know. I wanted to be able to explain the importance without seeming condescending. A question I might find very simple might not be common knowledge outside of my discipline. Learning how to show the importance of what I was doing without seeming condescending to my listener I believe is a good skill to have, and I intend on taking it with me to make sure that I can create positive relationships with other disciplines and people.

This experience was good, but it did not go as I expected. I became very ill in the middle of my capstone, and much of what I wanted to do with the project became unattainable with my circumstances. But through those roadblocks, I learned the importance of resilience, especially when working with research. The dictionary definition of research is “the systematic investigation into and study of materials and sources in order to establish facts and reach new conclusions” (Merriam-Webster, 2024). Research does not mean you will find the answers that you think are correct. There will be times when it doesn’t go how you plan, but just because it didn’t turn out that way you thought it would, doesn’t make it bad. Good research is reporting the unbiased facts of what you find through your studies. Advice that I would have given myself

at the beginning of my capstone project would include knowing that capstones are rough and require a lot of work. It is okay to get frustrated but keep working on it and learn from it. Don't let it break you, let it help you learn new skills. And it is okay if the project takes on a different form to how you originally put it together. Just because it changed does not make it invalid or bad, it just means a different approach is needed.

Word Count: 1473

LITERATURE REVIEW

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Katelyn Davies grew up in Sandy, UT and graduated from Hillcrest High school with an Honors Degree. She spent her high school years doing sports, including tennis and swimming. During her senior year, she was awarded Female Student Athlete of the Year. Upon graduating, she immediately attended Utah State University, and will graduate with a B.S. in Wildlife Ecology and Management with an Equine Science minor in May 2024.

During her time at Utah State, Katelyn held many on campus jobs. She was a research technician studying feral horse body condition scores in Nevada on two different projects. She was also an Undergraduate Teaching Fellow for the Monitoring and Assessment of Natural Resources course. During two semesters, she was a farm hand down at the Sam Skaggs Family Equine Education Center, caring for the University's team roping horses, broodmares, yearlings, and riding horses.

Katelyn enjoys being outdoors, and doing activities including hiking, camping, boating, paddleboarding, and swimming. She loves spending time with her family and friends.
After graduating, Katelyn will be working for the Utah Division of Wildlife Resources, working with pelicans around the Great Salt Lake. In the future, she plans to attend some type of graduate school, either pursuing a master's degree or attending vet school.