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Observing Wildlife in Different Urban Environments

An Undergraduate Thesis Proposal

By Colleen Ballinger

Presented to:

The Environmental Studies Program at the University of Nebraska-Lincoln

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Major: Environmental Studies

Emphasis Area: Natural Resources

Thesis Advisor: Name: Mark Vrtiska

Thesis Reader: Name: Larkin Powell

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Observing Wildlife in Different Urban Environments

Colleen Ballinger

University of Nebraska, 2023.

Advisor: Mark Vrtiska

Abstract

My project was about comparing ecological communities in different locations. As many of us Natural Resource studiers know, urbanization has become a prime factor in ecosystems and landscapes of the modern world. Numerous studies from the Urban Ecology field have shown us that urbanization is on an unstable trajectory for the future (Wu 2014). My research will be to find out where and what species of wildlife live in varying levels of urbanization. This topic is important to me because of how impactful habitat loss is to wildlife. Habitat loss is the number one cause of wildlife death here in the United States. My research question is asking is there a significant difference in wildlife amongst varying urban environments? Because humans have such a large effect on our environment, it will be very intriguing to see how wildlife in different urban environments adapt (Pardini et al 2017). It is important to my study to also know and understand alternate reasons for a decrease in wildlife in an area. In a past study to study the interactions between climate and habitat loss effects on biodiversity, they found that current climate and climate change are important factors determining the negative effects of a habitat loss on species density (Mantyka-Pringle et al 2012). The experimentation will be setting up the field cameras in three different locations and then comparing the data between areas. The description and modeling will come in when I need to present my data via poster. My modeling will represent the results of my experiment. I am currently thinking that my model will be represented by a bar graph that will show the number of different species located in the different

areas. I will then use the data to describe my findings and compare to my hypothesis from the start of the project and see if I can accept it.

Acknowledgements

I wanted to thank my advisor, Mark Vrtiska and my reader Larkin Powell. Without their support I would not be able to complete my thesis. I also wanted to thank Dave Gosselin, he has been a source of information and support for years. My family and my best friend were also very important in my thesis project, and I couldn't have collected my data without their help. This project ended up being very near and dear to my heart and I am very thankful for the opportunity to do this research.

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Literature Review

My research project is based on the continuing habitat loss in urban places and how that is affecting the native wildlife. For my project, I had to identify what types of literature would be the most informative. I decided that peer reviewed articles and using information that I used to study in a previous candid study class. Scholarly articles that were found on the University of Nebraska at Lincoln's databases provided informative insight for my project. The key words that I used to find articles relevant to my study were: habitat loss, urbanization, urban ecology, wildlife patterns, wildlife migration, and wildlife behaviors. The articles that I mainly looked for were up to date research. The steps I took to complete my literature review were listing my research topic broadly, narrowing down my data bases, narrowing down my key words, identifying limitations that helped me get the most relevant information, and finally repeating the process to find the best information in the most efficient way possible.

Introduction

My project was comparing ecological communities in different locations. As many of us Natural Resource studiers know, urbanization has become a prime factor in ecosystems and landscapes of the modern world. Numerous studies from the Urban Ecology field have shown us that urbanization is on an unstable trajectory for the future (Wu 2014). According to the book Urban Ecology, this is the urban century in which, for the first time, the majority of people live in towns and cities and that makes understanding how people influence the environment is therefore of enormous significance (Gaston 2010). My research was to find out where and what

species of wildlife live in varying levels of urbanization. This topic is important to me because of how impactful habitat loss is to wildlife. Biologists are almost unanimous in the belief that humanity is currently in the process of killing off a significant portion of earth's species (Wilcove 2022). According to Wu, habitat loss is the number one cause of wildlife death here in the United States (Wu 2014). Due to the previous facts, research into the effects of urbanization is more important than ever before.

Understanding policies and economics behind future land-use projects will help us predict how future wildlife and their environment will be affected (Martinuzzi et al 2015). One of the Midwest's greatest economic contributors is our agriculture, understanding the effects that the agriculture has on our wildlife is important. Habitat loss is greatly attributed to grassland loss and deforestation to promote agriculture (Scanes 2018). According to the article, *Bioenergy and wildlife: threats and opportunities for grassland conservation*, the demand for corn growth for ethanol in the United States increased effects on wildlife, mainly due to habitat loss (Fargione et al 2008). The Midwest is especially known for its agriculture production, and I kept that in mind when I was picking locations to set my cameras up.

Urban ecology is an important topic for everyone to care about because the loss of species from their ecosystems can be detrimental to us humans. According to Wu in his writings on Urban Ecology, urbanization is having a profound impact on ecosystems, landscapes, biosphere and as a result is accelerating the arrival of the Anthropocene epoch. My main goal was to compare ecological communities in different locations. Rapid urbanization has become an area of crucial concern. Radical changes to habitat have caused mass loss of species directly affected by urban and suburban development (Shochat, E. et al 2006). Comparing the

information from different types of urban environments can help us paint a picture of the human effect on natural spaces.

My hypothesis is that if the neighborhood is very human dense, then there will be less dense ecological communities present. The reasoning behind my hypothesis is that as wildlife initially gets displaced, they will try to find new habitats and distance themselves from the original habitat. As different neighborhoods begin to get built around forests or land is flattened for agriculture, the amount of wildlife begins to change. Neighborhoods tend to be places where wildlife can get easy resources, such as trash for food scraps, so they are more likely to stick around if they are finding easy resources.

My research question asked is there a significant difference in wildlife amongst varying urban environments? Since humans have such a large effect on our environment, it will be very intriguing to see how wildlife in different urban environments adapt (Pardini et al 2017). It is important to my study to also know and understand alternate reasons for a decrease in wildlife in an area. In a past study to study the interactions between climate and habitat loss effects on biodiversity, they found that current climate and climate change are important factors determining the negative effects of a habitat loss on species density (Mantyka-Pringle et al 2012). While climate change may influence species density, in my research I found that the effects of urbanization are causing a decreasing number at a much more rapid speed. I chose to study the effects of urbanization because to me, that is the most immediate threat to our ecosystems. Hanski states in his article that habitat loss has been and still is the greatest threat to biodiversity (Hanski 2005) which helps confirm my project's goals.

My research was empirically based meaning that my conclusion was based on evidence instead of theory. Determining the minimum scale of ecological space that is sufficient for

sustainable urban development is one of the difficult tasks in quantitative urban ecological research (Hong 2023). My research questions are relationship-based, meaning that variables are being depended on each other. Scientific research matches my project the best because one of the key concepts of scientific research is that scientists use multiple research methods to gather data and develop hypotheses. These methods include experimentation, description, comparison, and modeling. Starting off with a hypothesis, I included all these methods in my project to see if I can reject or accept.

I used nine total field cameras to capture photos of wildlife in my determined locations that I stated above. I went through each photo that is going to be collected over a two weeks' time. I collected data on what kind of wildlife appears in what location and how many different wildlife species emerge. I utilized the stratified sampling for my research project. Stratified sampling is when the population is first divided into subgroups (or strata) who all share similar characteristics. In the case of my project, the characteristic they will have in common will be the area that each sample group comes from.

Methods

To monitor my observations, I will set up three cameras in three different locations that are close to or in Bellevue, Nebraska. Bellevue is my hometown and I trust the cameras in the locations I picked. My first location is next to my parent's house in the Hyda Hills neighborhood that borders Bellevue and Plattsmouth. Within the last couple of years, we have witnessed first-hand how the construction of new homes has led to a dramatic decrease in wildlife activity. The once overgrown field that was right next to our house has now been cleared for new housing and a new road now runs all the way through the old field causing the wildlife that once inhabited this place to leave. I chose this location because it will represent an environment that has heavy

human traffic and low wildlife traffic. This will provide a good comparison between my other two locations.

The next location is in the Fontenelle Forest area where there is heavy wildlife as well as heavy human traffic. The dense forest surrounding this neighborhood provides lots of resources for wildlife and is a great place to compare to the other sample locations. My third location will be in Silver Springs, Iowa. This area represents urbanization that has occurred due to the surrounding area being made for agriculture. Silver Spring has a very low human population, but high wildlife activity due to the abundance of open fields nearby. I have provided a rough map of these different locations in relation to each other in my figures section under Figure 1.

The experimentation will be setting up the field cameras in three different locations and then comparing the data between areas. The description and modeling will come in when I need to present my data via poster. My modeling will represent the results of my experiment. I am currently thinking that my model will be represented by a bar graph that will show the number of different species located in the different areas. I will then use the data to describe my findings and compare to my hypothesis from the start of the project and see if I can accept it. The goal of my project is similar to the research that was being conducted by Wiegand, T., et al in (2005). They simulated population dynamics in landscapes composed of three habitat types, like the three different locations that I chose for my project (Wiegand et al 2005). Their specific aims were to investigate which biological circumstances failed and assesses the potential impact of restoring matrix to poor-quality habitat, similar to why I picked my certain locations compared to others. They were also trying to figure out how much of the variation in population size was explained by landscape composition alone. Finally, their last goal was to estimate the maximum fragmentation effects expressed in equivalent pure loss of good-quality habitat. Their findings

suggest that predicting fragmentation requires an expert knowledge of biology and habitat use of the species in question. They also found that the uniqueness of species and the landscapes in which they live confound simple analysis.

Results

Going into my data, in total, the animal most caught on camera were fox squirrels (*Sciurus niger*). The only location that captured a squirrel on camera was at the Silver Springs Iowa location. The second most seen animal on the cameras was white tailed deer (*Odocoileus virginianus*). White tail deer also only showed up in a single location, this time being at the Fontenelle Forest location. Since Fontenelle was my forest location, it makes sense that larger mammals and grazers, such as white tail deer, will show up most in this area. Hyda Hills ended up not capturing any kind of wildlife. With the constant building of new homes in the Hyda Hills area, wildlife will naturally be pushed away as people take away their food sources and habitat. The absence of wildlife at the Hyda Hills location confirms my hypothesis, but the fact that the Fontenelle Forest location had a decent number of white tail deer captured, this goes against what I initially thought.

Discussion

For each of my locations, I had set three cameras about 20 yards apart. For reasons that I am not aware of, one camera at each location didn't capture any photos. I am not sure if the SD card of the camera was already full or if there was some other type of issue, but that significantly affected my project. I would consider it lucky that one camera at each location went down so I could still compare the same amount of data with each location. I also didn't capture as much data as I would have liked, but that's all part of research. If the cameras all have worked, then I

would have been able to have a larger pool of wildlife to view and compare. This would have greatly helped my research by providing more species for location. The Silver City Iowa location had the most diverse wildlife, I captured raccoons, birds, foxes, and a woodchuck.

Summary & Conclusion

According to my research, my data allowed me to accept my hypothesis. My hypothesis is that if the neighborhood is very human dense, then there will be less dense ecological communities present. The reasoning behind my hypothesis is that as wildlife initially gets displaced, they will try to find new habitats and distance themselves from the original habitat. Hyda Hills had zero animals captured on camera, which was consistent with my predictions. Fontenelle Forest and Silver City both were also consistent with my predictions. I was surprised that I didn't capture more wildlife from the Fontenelle forest area.

My research question was to see if there was any variation in wildlife at different locations. Going off the research that I was able to collect, there was a significant difference in wildlife seen in Hyda Hills compared to my other two locations, Fontenelle Forest and Silver City. As I said in my discussion, I would have lengthened this study a little longer in attempts to capture more wildlife and have more data to examine. This project was important to me, and I also think important to familiarize yourself with.

Habitat loss is a huge problem in the United States, and without the knowledge of the variables that causes it, we have no chance to combat it. Luckily for us all, researchers are trying to figure out the best way for humans and wildlife can coexist smoothly. To try and combat the risk of extinction due to habitat loss and other human-related factors, environmentalist have put forth a global goal of conserving 30 percent of natural lands by 2030 (Kerr 2004). Bowman and

other researchers have coined the term “renewal energy” which is based on the acceptance that environmental change will have major effects on humans and natural systems. This recognizes the importance of harmony in the biodiversity for the benefit of us both (Bowman 2017). With studies like these happening, I feel that we do have a bright future, regardless of all the doom that we see often. If passionate people are looking for solutions, I think that we will be able to figure out a way to coexist peacefully.

Figures



Figure 1: The areas where I placed my three cameras in relation to each other. Hyda Hills neighborhood is by the black star, Fontenelle Forest neighborhood is represented by the red star, and Silver City Iowa is represented by the blue star.



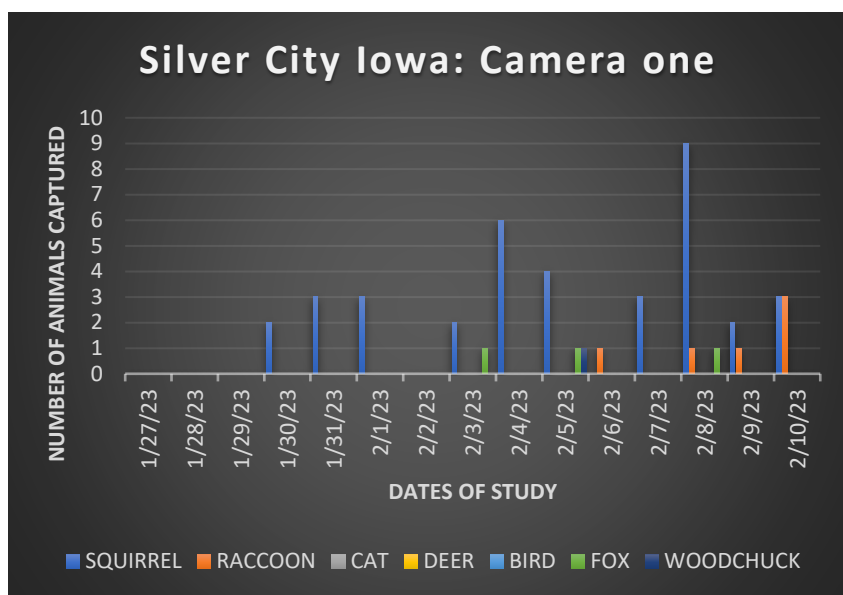
Figure 2: Aerial photo of Hyda Hills with cameras indicated by red stars.



Figure 3: Aerial photo of Silver City, Iowa with cameras indicated by red stars.



Figure 4: Aerial photo of Fontenelle Forest with cameras indicated by red stars.



A)

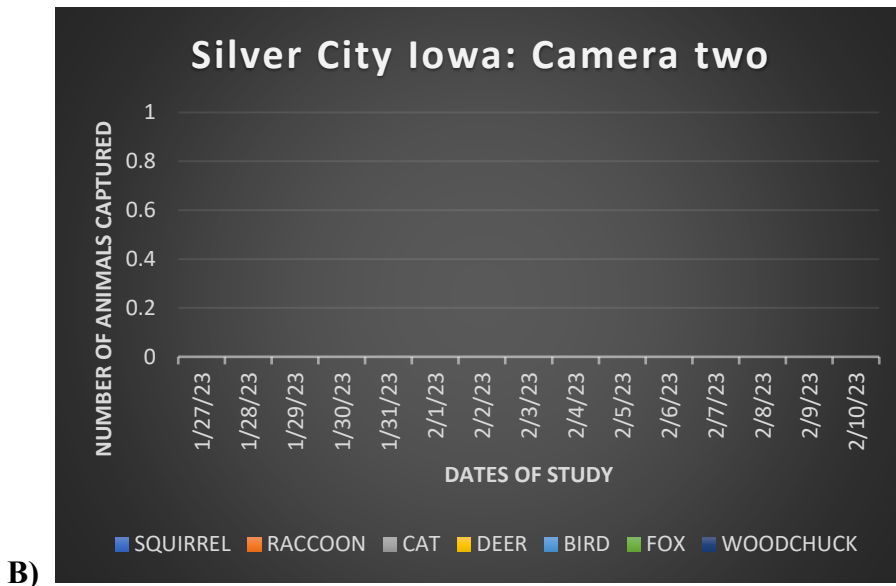
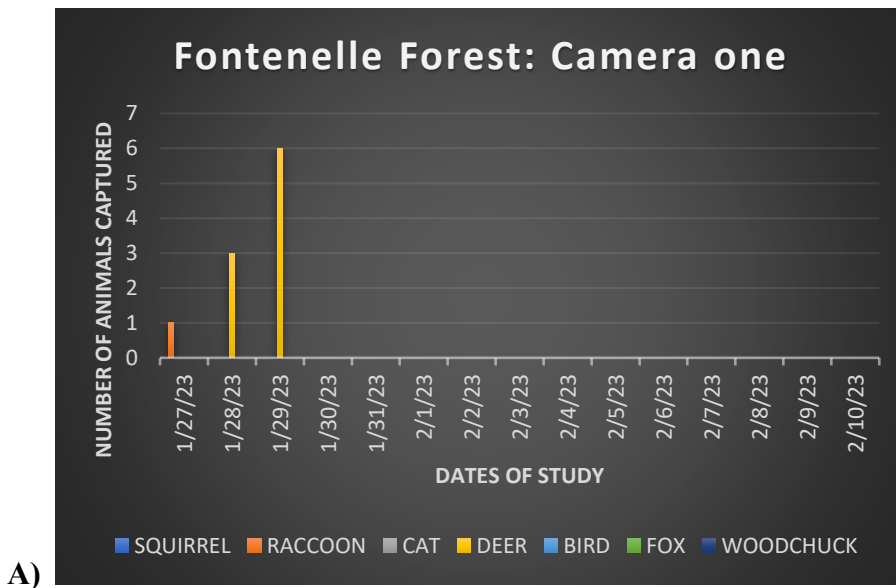


Figure 5 A and B: These bar graphs represent the camera one and two data that I received from the Silver City Iowa location.



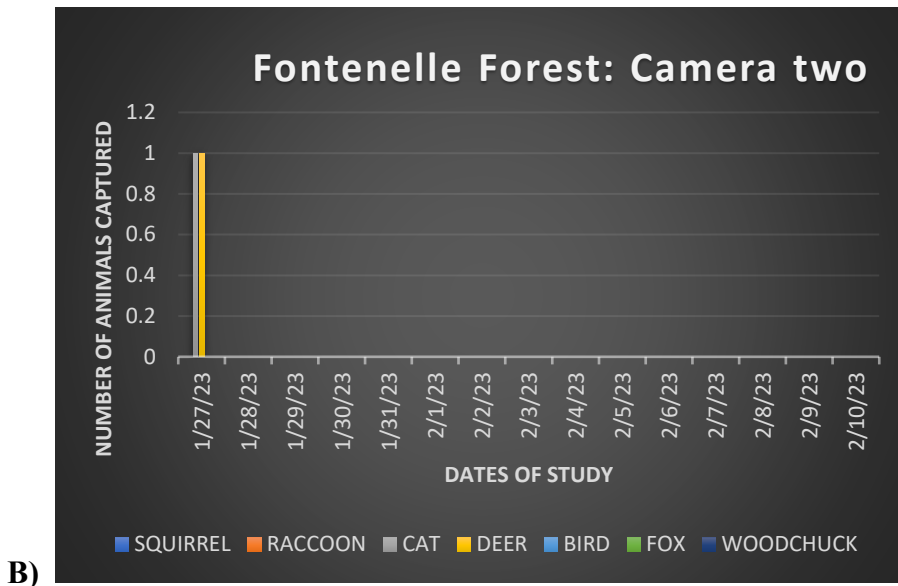
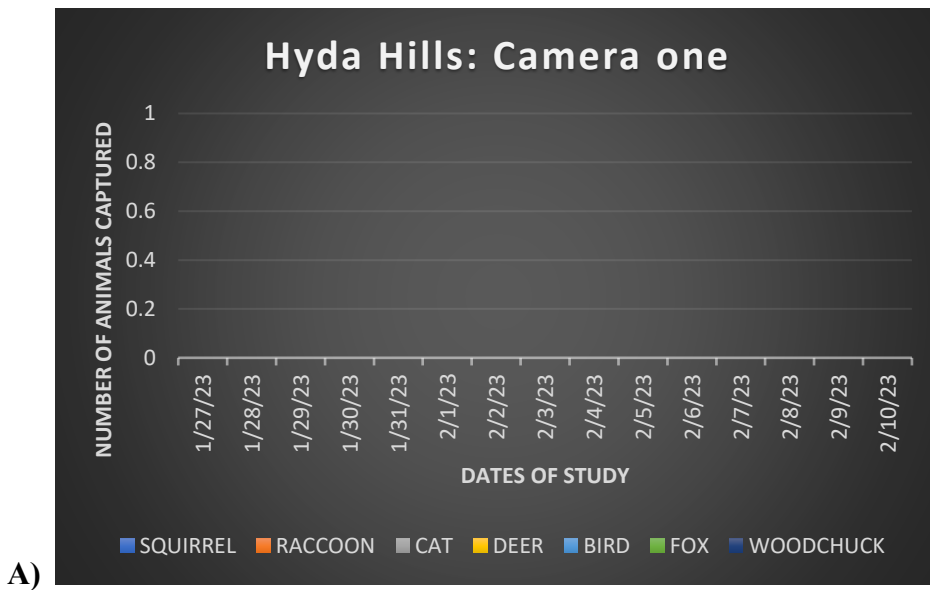


Figure 6 A and B: These bar graphs represent the camera one and two data that I received from the Fontenelle Forest area.



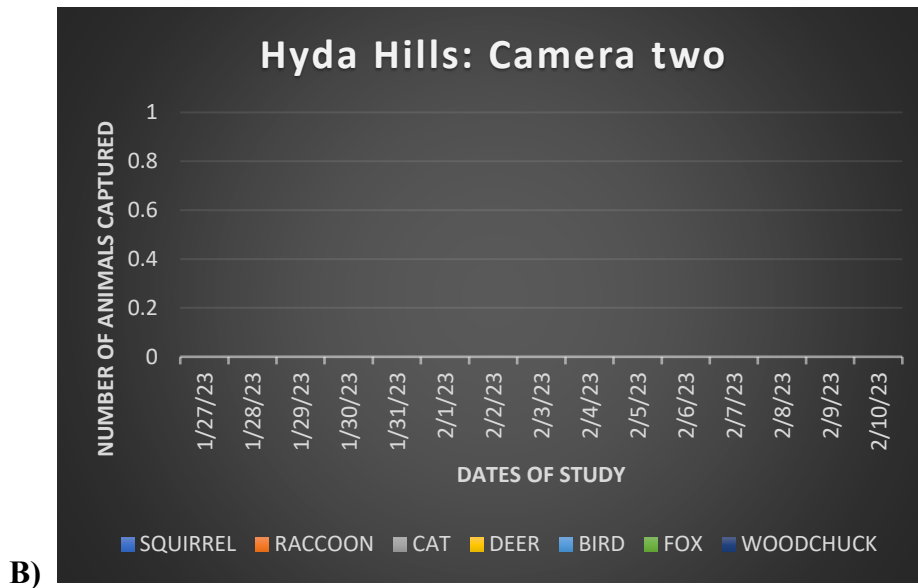


Figure 7 A and B: These bar graphs represent the camera one and two data that I received from the Hyda Hills location.

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