

## Final Research Paper

### Project Summary:

The specific problem that our project sought to explore was the issue that modern-day developers face when developing in areas where wildlife exist. Currently, urban sprawl is an issue in states like Utah that have a high concentration of urban neighborhoods located in concurring areas of high wildlife activity. Developing in areas with high concentrations of adjacent wildlife habitats can cause various issues due to the nature of these animals and their inability to stay clear of these newly developed urban areas. Wild animals, such as pumas, are known for entering into densely populated urban areas when their traditional food sources run scarce or simply by mere happenstance. Mapping habitat and species movement can provide us valuable insight as to where we should focus urban development efforts and also how we might be able to accommodate the species we find present in proposed areas of development. Our approach to investigating this problem is a straightforward approach of mapping habitat cores, collar data of a specific species, and roads, railways, and other forms of human movement to draw a correlation between species and human movement. Through these specific forms of data, we hope to draw a correlation between the movement of a species in proximity to human development.

In our specific area of interest, we chose the area which comprises southern/central Utah. To be completely honest, we chose this area because it accommodated us with the most available data that could be mapped spatially in regards to our motivational question. The species we decided to track was a puma species which was being tracked as part of a predator-prey study which explains why there was so much available collar data. The data sets we used as part of our analysis includes the Movebank data set of individual points which represented the collar data of the 12 animals which we ended up using for our spatial analysis. Additionally, we used data from OpenStreetMaps and Living Atlas which provided us the Trails/Roads/Railway layer which we eventually applied a buffer layer to. Lastly, we used Esri data on intact habitat cores to determine the degree of disturbance in our area of interest. The link to our used data is in this drive folder:

- [https://drive.google.com/drive/folders/1iWy4I-ooREdZIn7BgG\\_yn\\_krhKF0s9Eu?usp=drive\\_link](https://drive.google.com/drive/folders/1iWy4I-ooREdZIn7BgG_yn_krhKF0s9Eu?usp=drive_link)

### Technical Report:

For our animal layer (layer 1) we used the Movebank data which gave us vector points, lines, and kernel density which allowed us to represent our puma species accurately and in contrast with our other data layers. We specifically kernel density to show the concentration of pumas in a specific area. For our human layer (layer 2), we used the data from OpenStreetMaps and Living Atlas which allowed us to represent some form of human development and movement. Land use would have been the ideal layer to include but alas, we could not make it work properly and effectively due to complications with ArcGIS Pro. This layer is primarily composed of lines and a buffer layer which we added to express the overlap between the buffer region of 1,000 feet and any puma collar data which was detected within the buffer region. Lastly, our habitat disturbance layer (layer 3) used data from Esri's Green Infrastructure Initiative which provided us with the location and extent of intact habitat cores which we would then use to compare the existing collar and road/trail/railroad data to show the existence of species and habitats in relation to the existence of human development.

My role in the group project involved coming up with the premise and baseline of the project, researching for methods in which we could analyze animal movement (studies and research projects currently on-going with available data), ensuring our map that was made primarily by another group member correlated our objective correctly, and contributing to the slideshow in making/presenting the challenges and future extensions slides.

Our final map (Figure 1) is as shown to the right. We were able to spatially express animal presence and movement within their habitat core with human development. As seen on the map, the kernel density of collar data can be expressed within and outside the buffer layer that we put on the human developed roads, streets, and highways. The heat mapping ranges from sparse to dense and can be seen within the areas of human development with a sparse indication. This matches with the intact habitat core data that we used as the habitat cores which are classified as best match more accurately with the densely mapped collar data of the pumas in the area.

### Conclusion:

In conclusion, a future extension that we would have preferred to use would include land use instead of road data. This would have given a much more in depth look into how urban sprawl is contributing to the habitat fracturing as indicated on the map in areas where roads are intersecting the habitat cores, causing a ‘pinching’ effect in the density of the reported collar data. Additionally, a piece of feedback which we received from my TA Zijan was to compare the point density instead of the counts inside and outside of the buffer area to show the differences in density. I personally learned that this kind of work requires a lot of time and coordination and I wish that we could have prepared better for the work that we wanted to produce. Our final map achieved our objective to a degree, however I feel like we could have made a better map had we found the desirable data layers, however as a group, we all understand how difficult and unrealistic it is to find data that directly supports our objective. We also would’ve liked to include an additional species in order to contextualize the presence of the pumas in the habitats that we mapped. Lastly, I would have liked to include an additional vector layer for buildings which would have provided an additional layer of clarity to the human development aspect.

### Career-Readiness Component:

I would describe this course to my friend as a fun, insightful introduction to the complex world of GIS. I learned the importance of maps and how we use them to express information and patterns in the real world. I learned how difficult it can be to search for and work with real-world data. I would describe my readiness and qualifications through my ability to conduct research and use available data to fit a motivating objective. In addition to this, being able to collaborate with others and communicate my ideas would make me qualified.

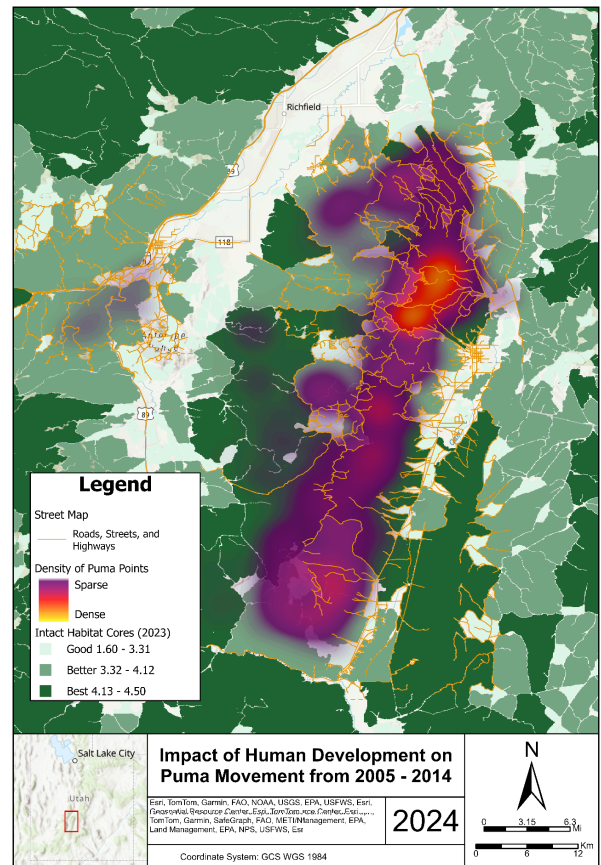


Figure 1: Final Map