

Introduction

American Bison (*Bison bison*) are large herbivores that are currently occupying less than 1% of their historic range (Hendrick 2009). Studies have found that Bison **increase ecosystem diversity and heterogeneity** (Ratajczak 2022). Bison are important keystone species that shape North American prairie ecosystems and increase ecosystem diversity and heterogeneity in several ways including wallowing (McMillan, 2011).

Background

Utilizing the bison herd in Genesee Park, Colorado (Figure 4). I studied the spatial distribution of wallows with the goal of **assessing trends in a spatially restricted site**.

- Wallowing is a behavior in which the bison dust bathe by rolling around on the ground and throwing up dirt.
- Bison wallow to remove pests, shed hair and as an aggressive behavior during rut (Coppedge & Shaw, 2000).
- Wallows create localized disturbances which increase habitat and plant diversity (Polley & Wallace, 1886).
- Understanding the spatial distribution of bison wallows provides valuable insights on how bison affect landscapes.



Figure 1: Large wallow sites found in Middle pasture at Genesee Park. Photo Credits: Teddy McCormack using aerial drone imagery



Figures 2 & 3: Post drone flight (Left), and plant cover collection for the Bison Ecology Project in North Pasture (Right). Photo Credits: Emma Galofre Garcia, and Garrett Ordonez

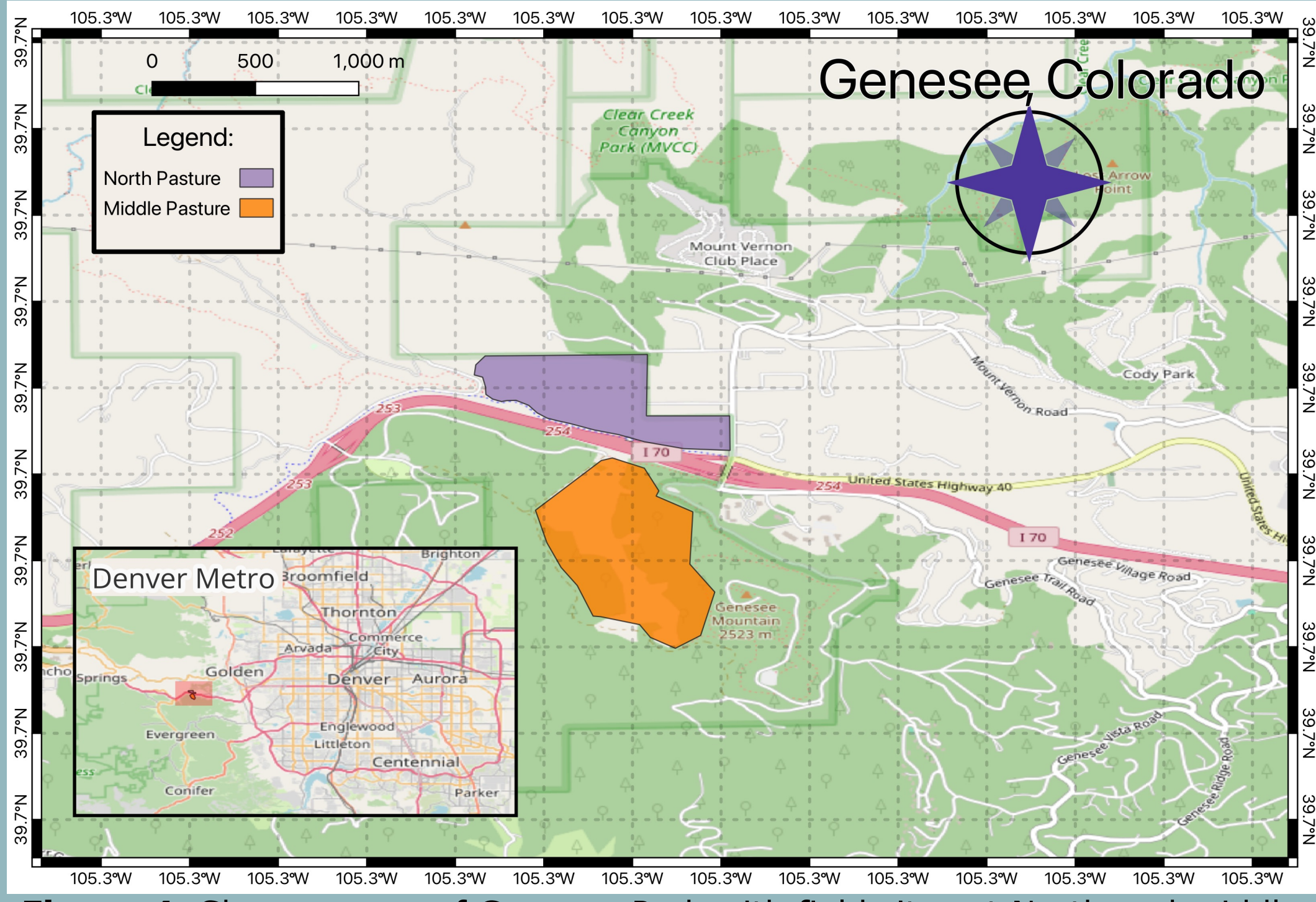


Figure 4: Shows a map of Genesee Park with field sites at North and middle pasture inset from Denver Metro. The park was established, and the bison were reintroduced in 1914. The bison have access to the two pastures and approximately 259.49 total acres of land. There are a total of 43 bison in the park. Map created by: Teddy McCormack using QGIS.

Methodology

- Collected coordinates of wallow sites in North & South pasture using Qfield & QGIS.
- Collected aerial imagery of wallows using drones (figures 1, 2, & 5).
- Analyzed the distribution of wallows using DEMs (Digital elevation models) in QGIS, to understand how slope, aspect, and elevation differed across the wallow sites. (figures 7, 8, & 9).



Figure 5: Two large wallows near the Genesee Park barn in middle pasture. Photo Credits: Teddy McCormack using aerial drone imagery

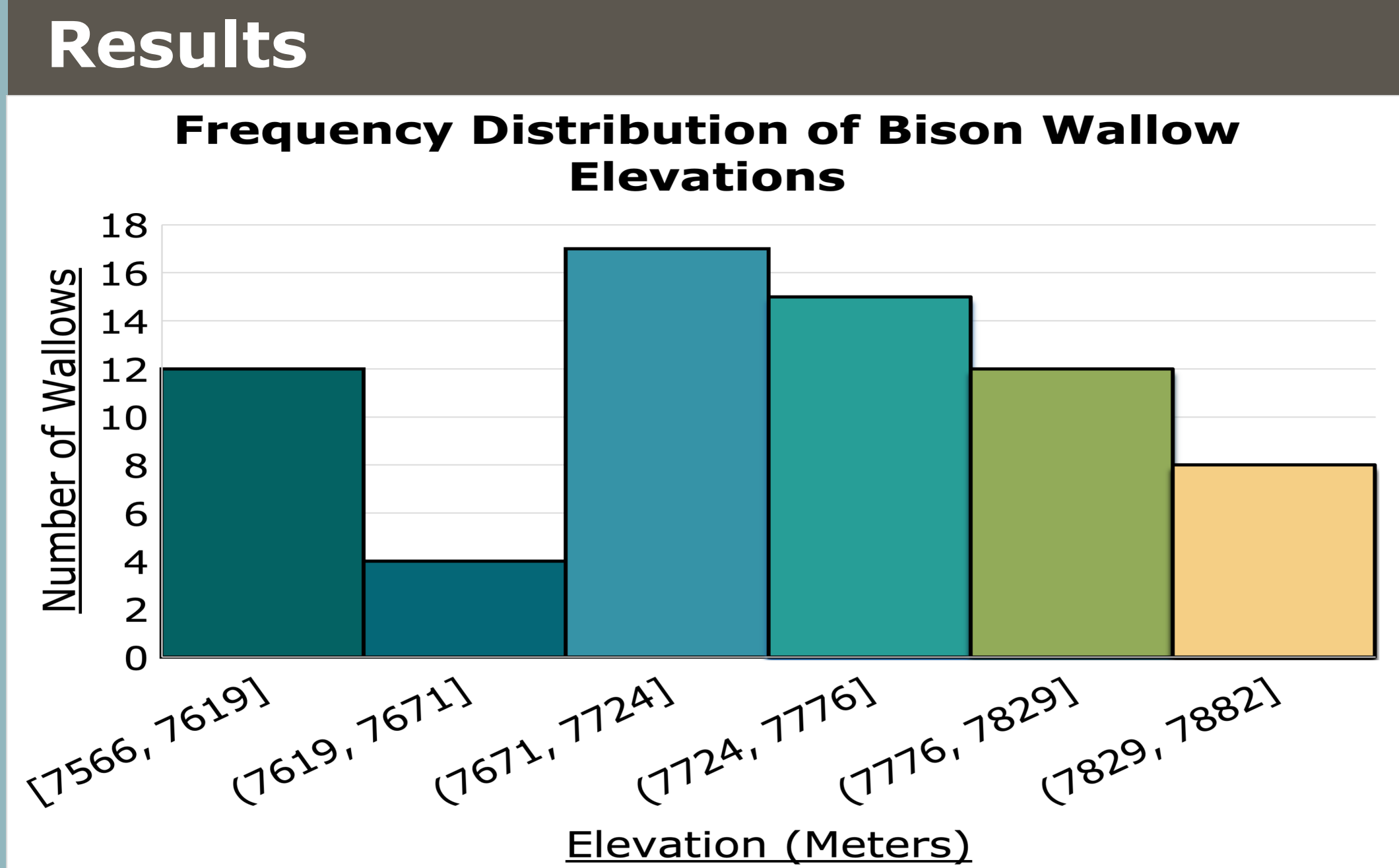


Figure 6: Frequency Distribution of Bison Wallow Elevations made in Excel.

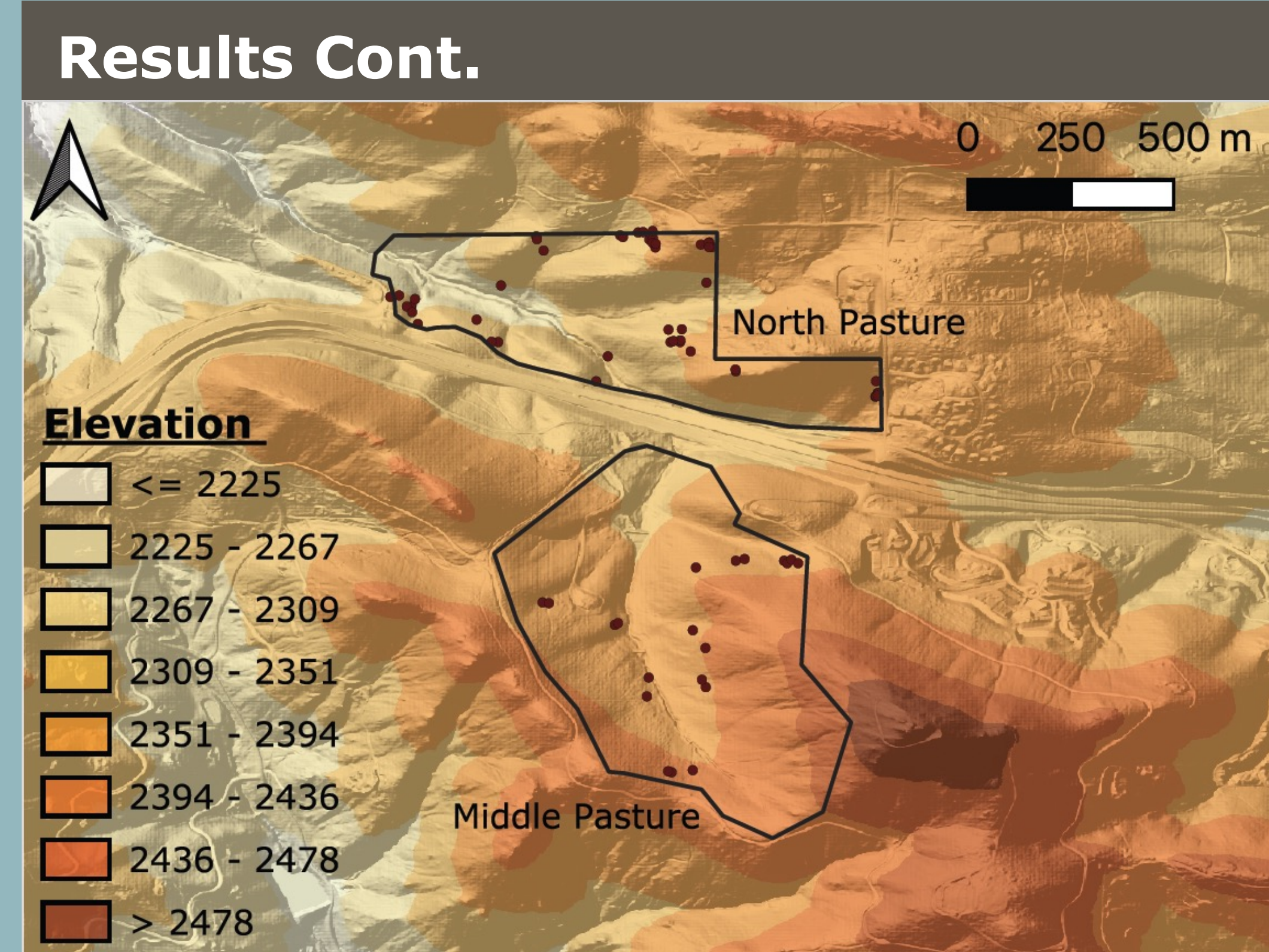


Figure 7: Map showing the elevation of North and middle pastures in relation to wallow sites in meters.

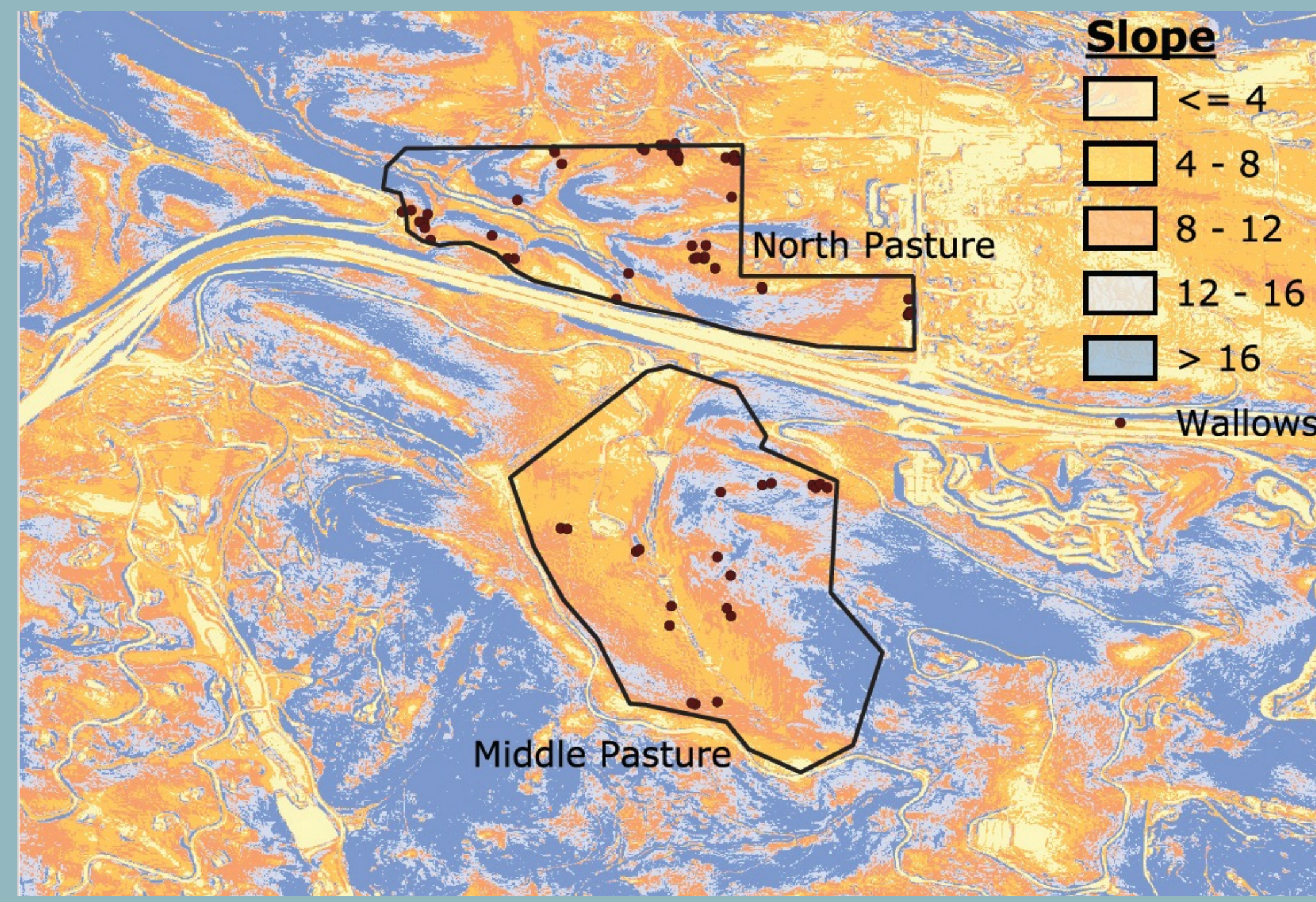


Figure 8: Map showing the slope of North and middle pasture in relation to wallow sites in degrees.

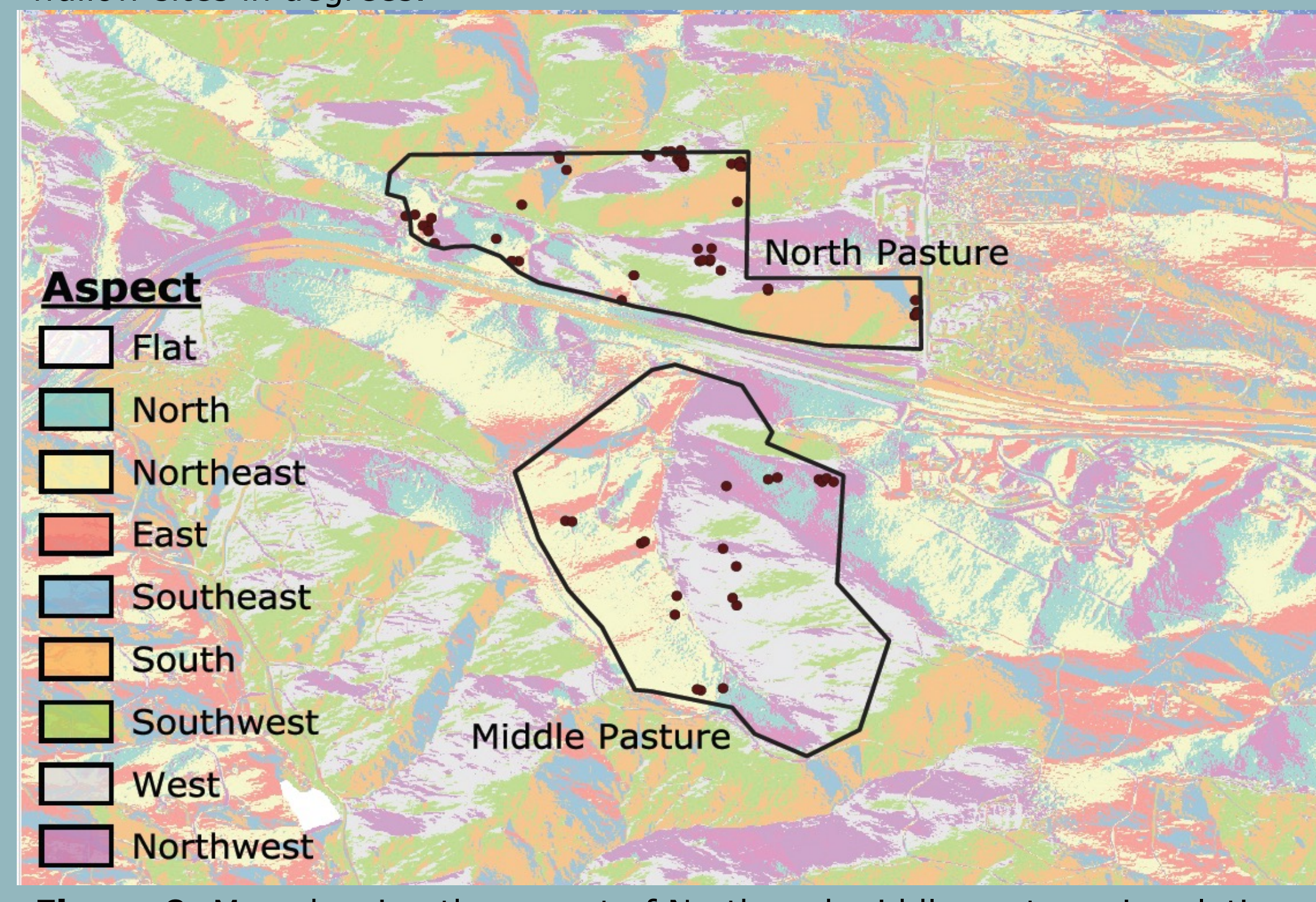
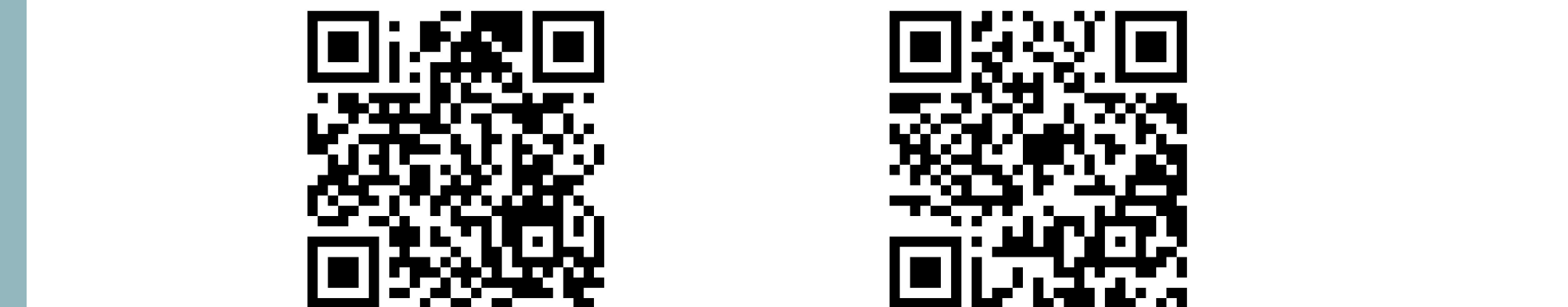


Figure 9: Map showing the aspect of North and middle pastures in relation to wallow sites by cardinal direction.

Bibliography & Acknowledgements



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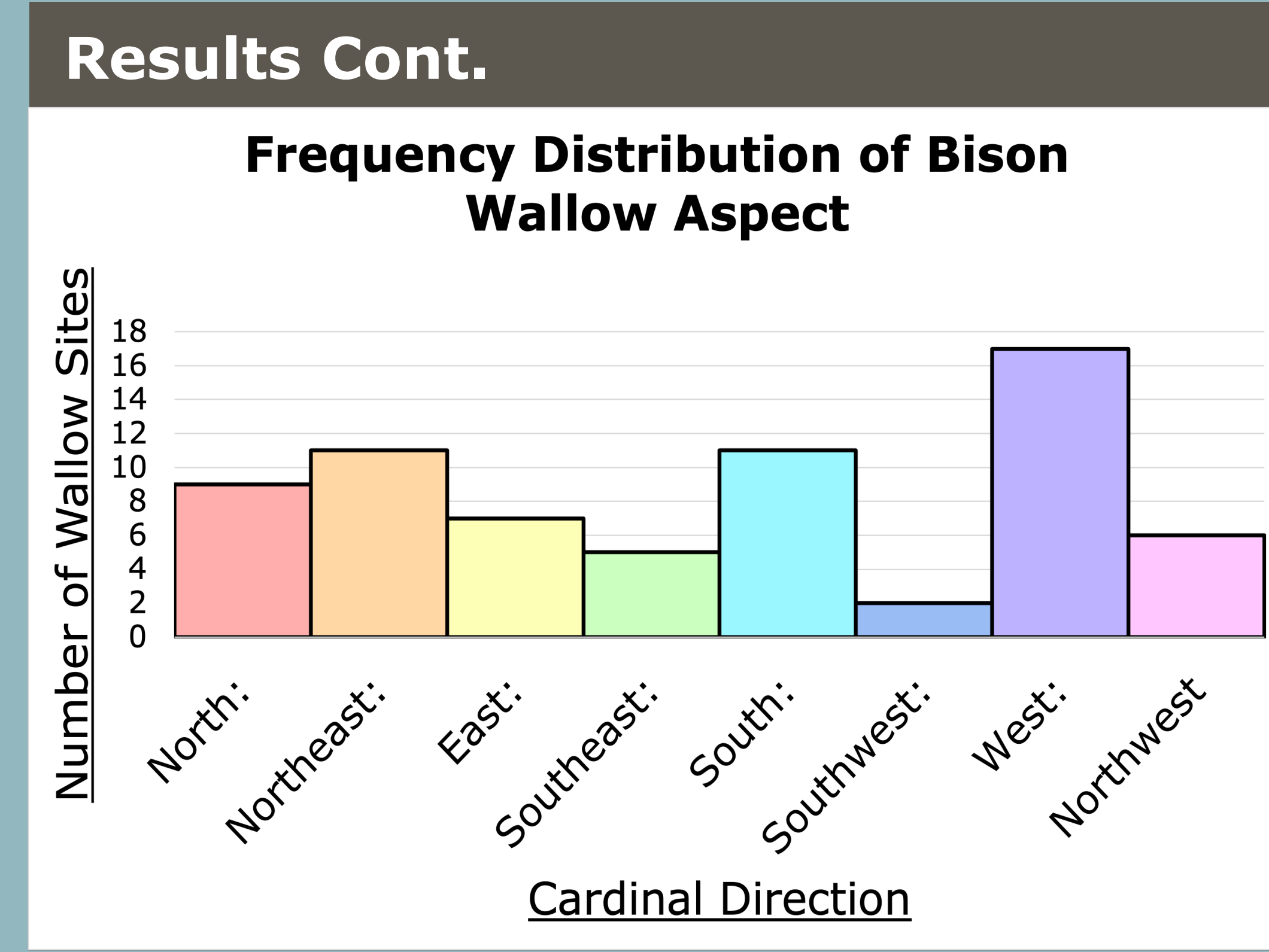


Figure 10: shows the frequency distribution of bison wallow aspect made in Excel.

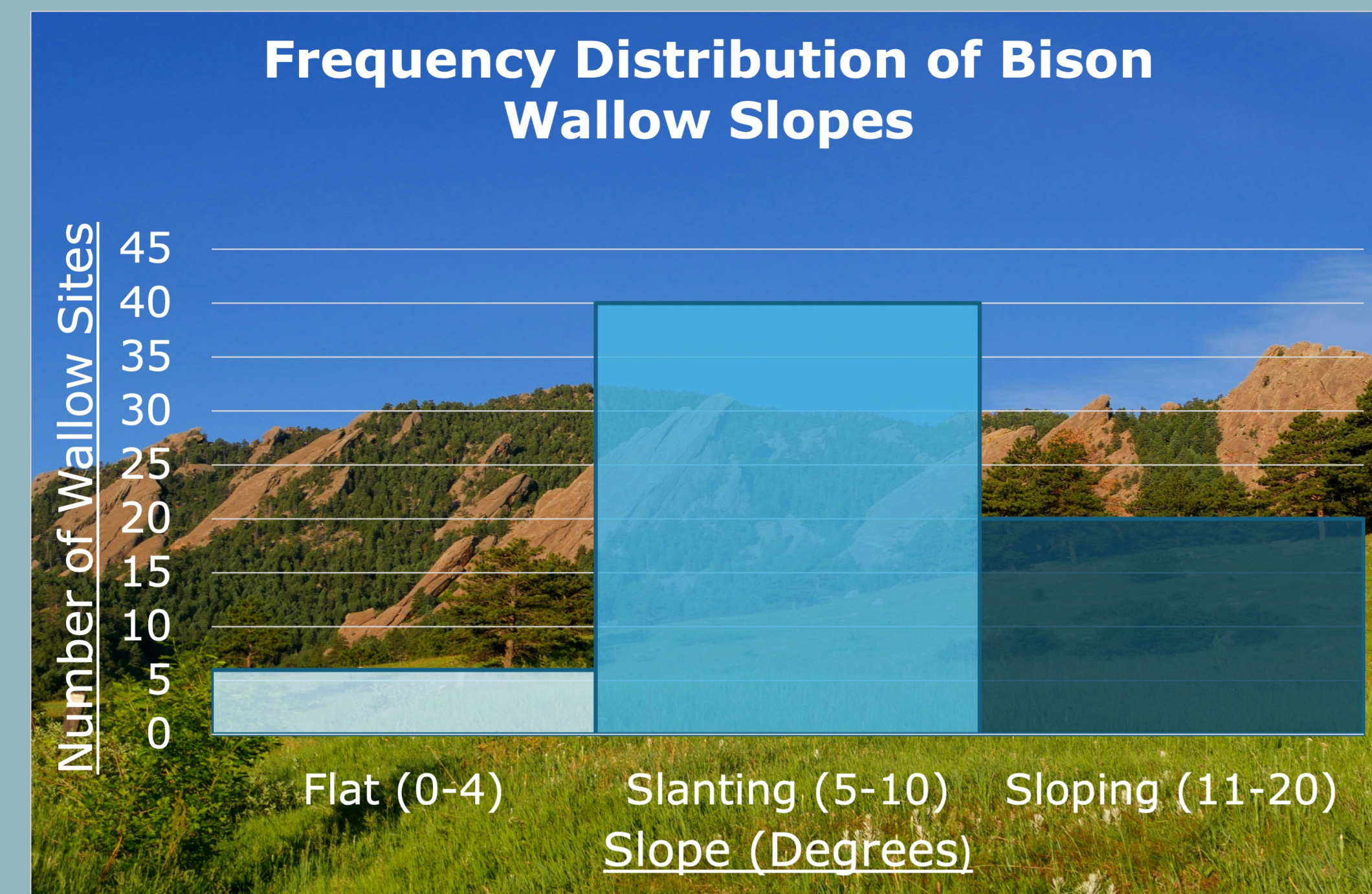


Figure 11: Shows the Frequency distribution of wallow slopes, for context the Flatirons in Boulder have an average slope of 55°. Photo by Malachi Brooks on Unsplash.

Conclusion

- This study found that wallow sites in Genesee Park were commonly found above 7,671 ft in elevation (Figure 6). 58.8% of wallows were located on a 5-10° slope (figure 10). Surprisingly, there was no apparent trend between wallow sites and aspect.
- My findings are consistent with a previous study evaluating the spatial distribution of wallows in Kansas which observed that bison wallows were found more frequently in areas with a combination of higher elevations, and lower slopes (Horne 2024).
- Additional research is needed to understand the spatial distribution of wallows in smaller spatially restricted herds in Colorado. Future research could compare wallow sites in North and middle pastures and analyze them in relation to tree cover. Understanding the spatial distribution of bison wallows is useful in understanding the keystone species' impact on montane short grass ecosystems.