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To Eat or Not to Eat? Developing Biomarkers for Diet Selection by Herbivores

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Background

A major goal in conservation biology is to explain habitat use by animals. Remote sensing has been used for landscape-scale analysis of habitat features. However, studies that directly link specific parameters of habitat quality to selection by wildlife are needed at the microsite-scale before landscape-scale mapping can be validated. We used the sagebrush-pygmy rabbit system (Fig. 1) to develop spectral biomarkers that can predict how the quality of food influences habitat use.

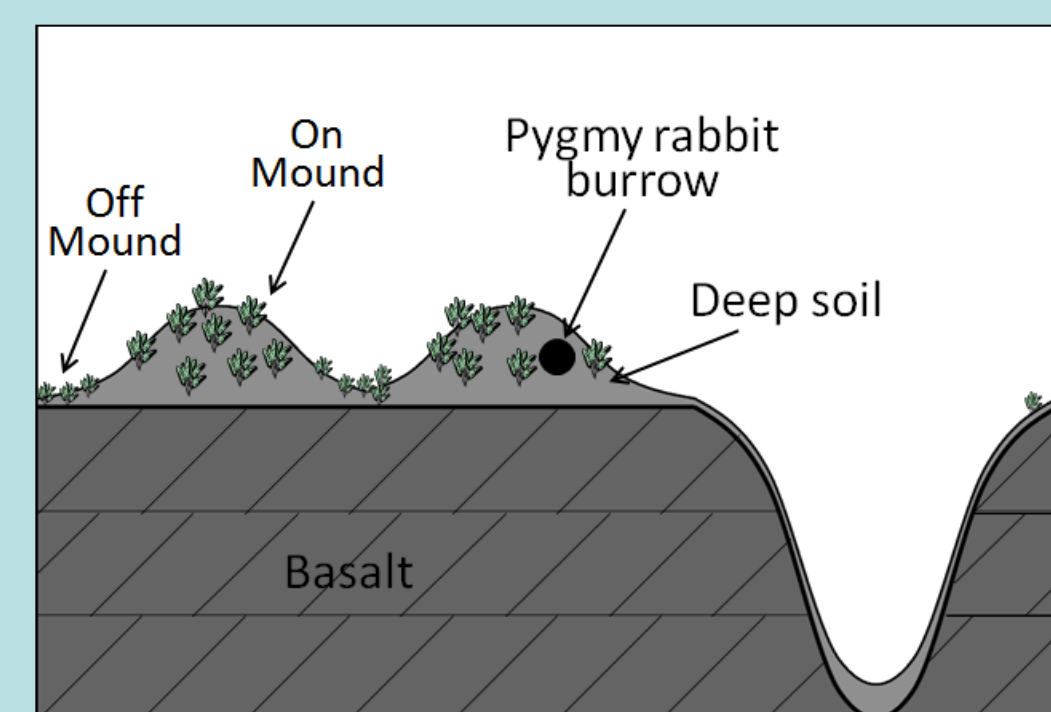


Figure 1. Diagram (left) showing the sagebrush-pygmy rabbit system. The deeper soil provides both a burrow habitat for the rabbits (pictured, right) and produces higher quality sagebrush.

Objectives

Objective 1: Compare dietary quality of sagebrush on-mounds and off-mounds.

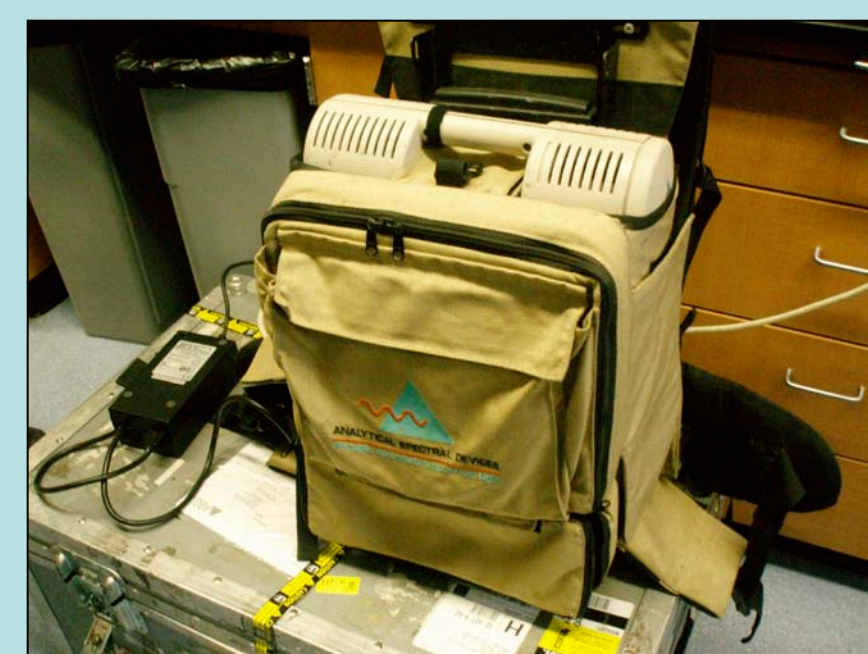
Objective 2: Show that high-browsed plants are higher in crude protein than low-browsed plants.

Objective 3: Develop a spectral biomarker that can predict crude protein and thus diet selection by pygmy rabbits.

Methods

- We quantified crude protein of sagebrush on- (n=27) and off-mounds (n=27) and from plants high- (n=30) and low-browsed (n=30) by pygmy rabbits.
- We then used a spectrophotometer to scan these same samples.

Figure 2. The contact probe (left) used to scan samples and the spectrophotometer (right).



Plants differ within landscapes

- Crude protein was higher in sagebrush taken on-mound than off-mound (Fig. 3, $P < 0.0001$).
- Crude protein was higher in plants highly browsed than plants less browsed by pygmy rabbits (Fig. 4, $P = 0.05$).

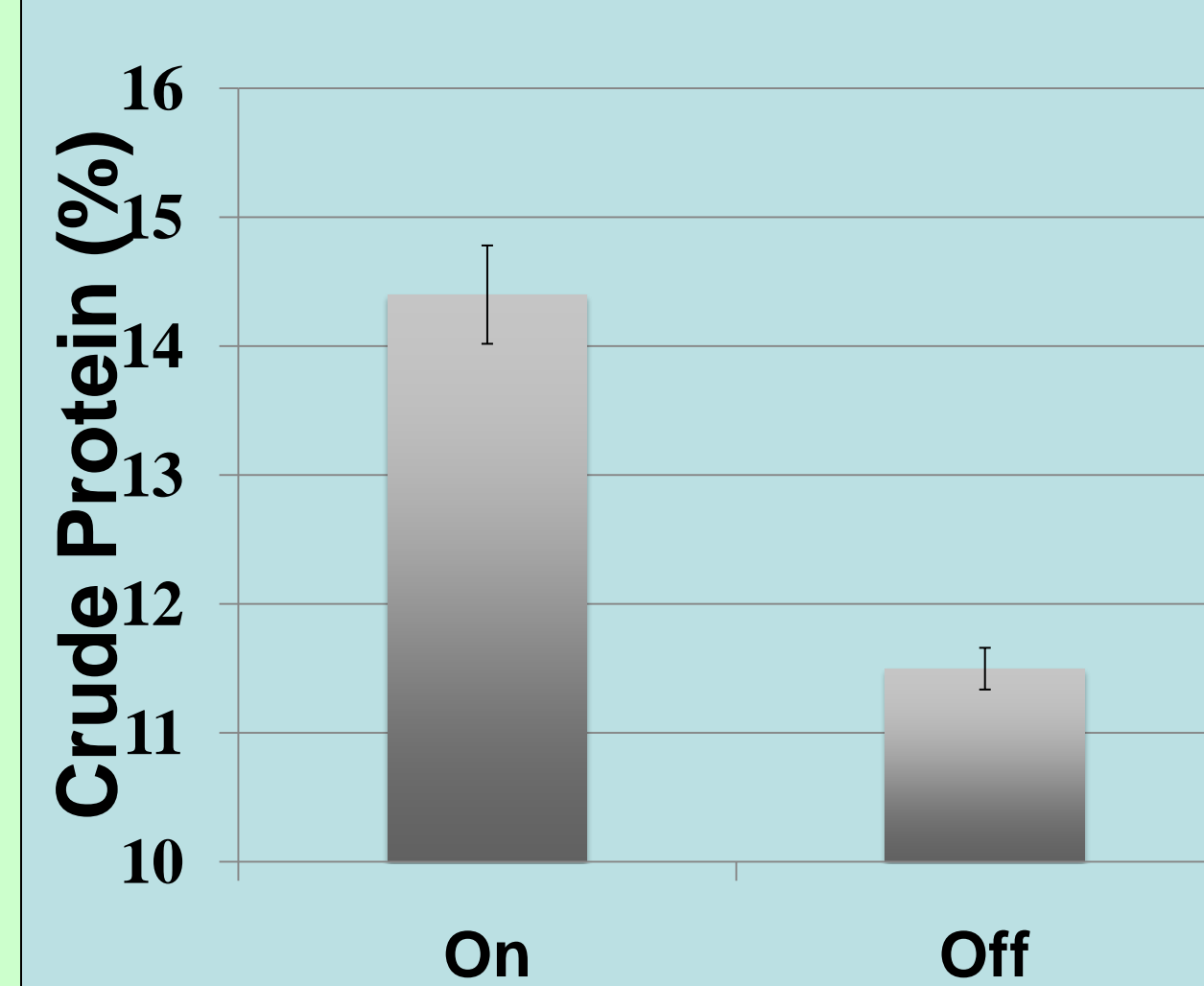


Figure 3. Mean percent crude protein for sagebrush taken from on and off mounds ($P < 0.0001$).

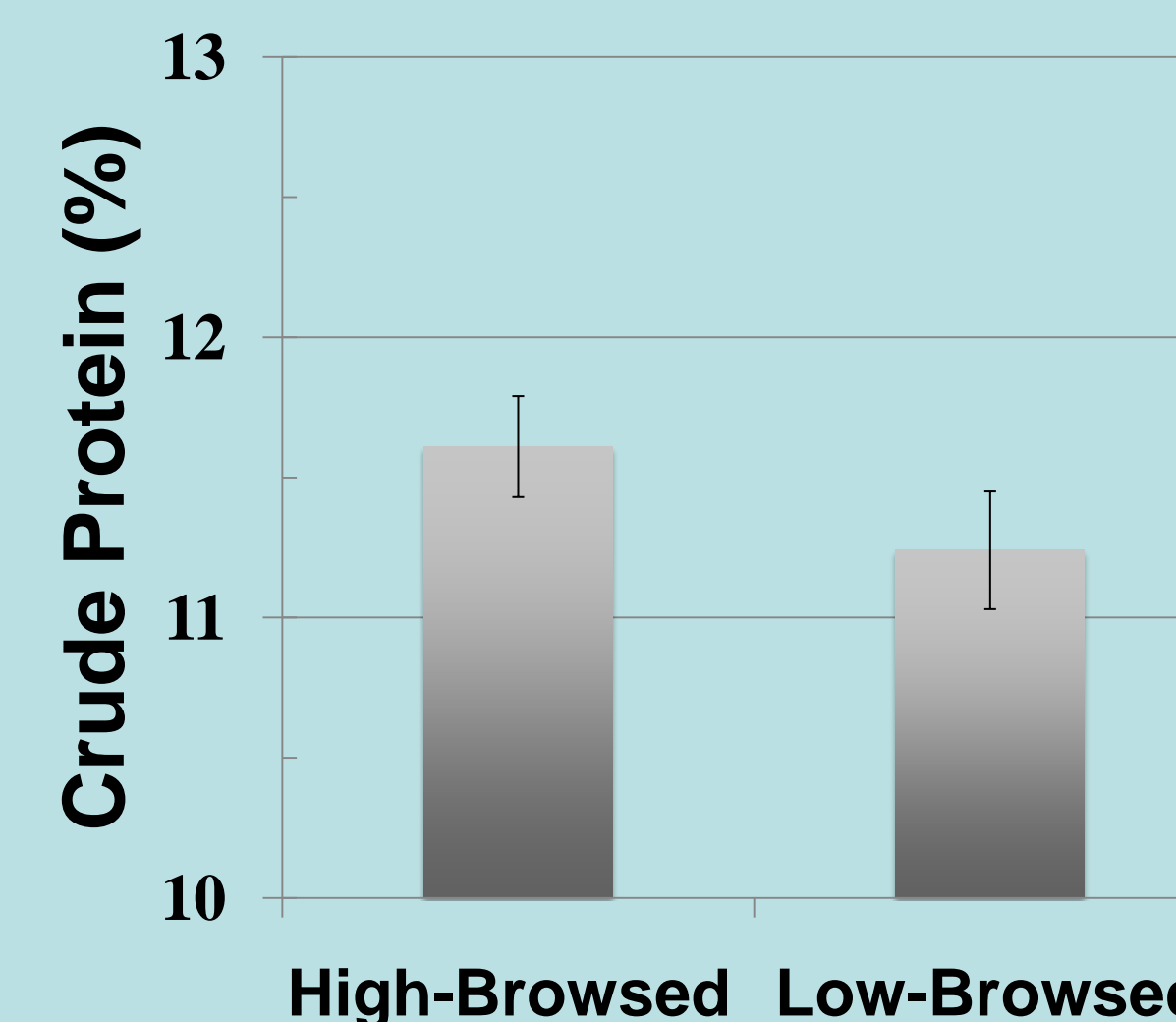


Figure 4. Mean percent crude protein for high-browsed and low-browsed sagebrush ($P = 0.05$).

Conclusions

- Variation exists: higher quality sagebrush closer to burrows
- Rabbits choose to browse plants with higher crude protein
- Preliminary spectral differences can be used to develop biomarkers
- Spectral biomarkers could provide a tool for the rapid assessment of quality food across landscapes (Fig. 6)
- Agencies armed with this tool would be able to better identify and conserve quality habitat for pygmy rabbits

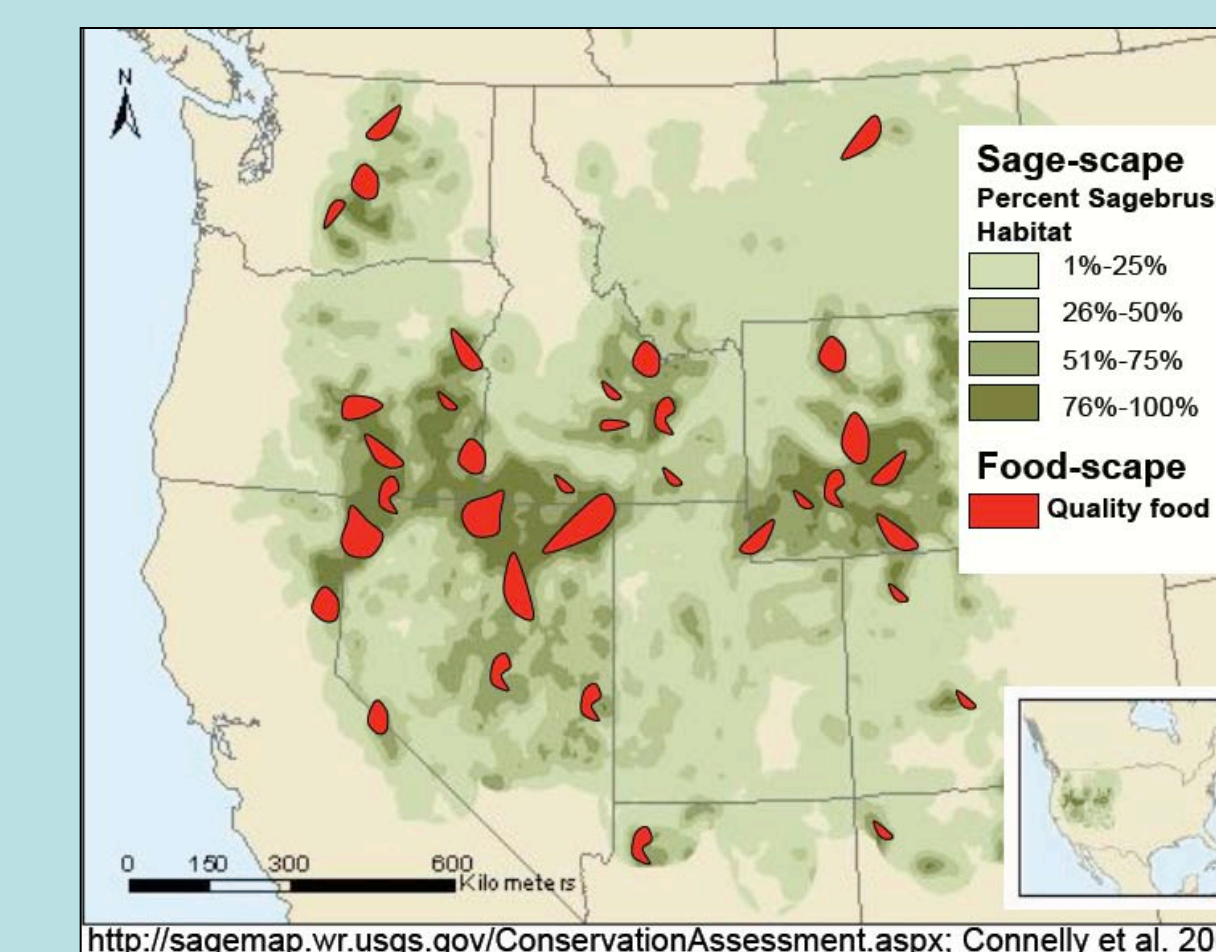


Figure 6. Theoretical food-scape showing a possible distribution of quality sagebrush as food for an herbivore across the landscape. The map is adapted from Connelly et al. 2004.

Literature Cited

- Connelly, J.W., et. al. 2004. Western Association of Fish and Wildlife Agencies. Unpublished Report. Cheyenne, WY.
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Acknowledgements

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Each plant has a unique spectrum

- Preliminary data shows the spectra of sagebrush taken from on- and off-mounds are different at several wavelengths (Fig. 5).

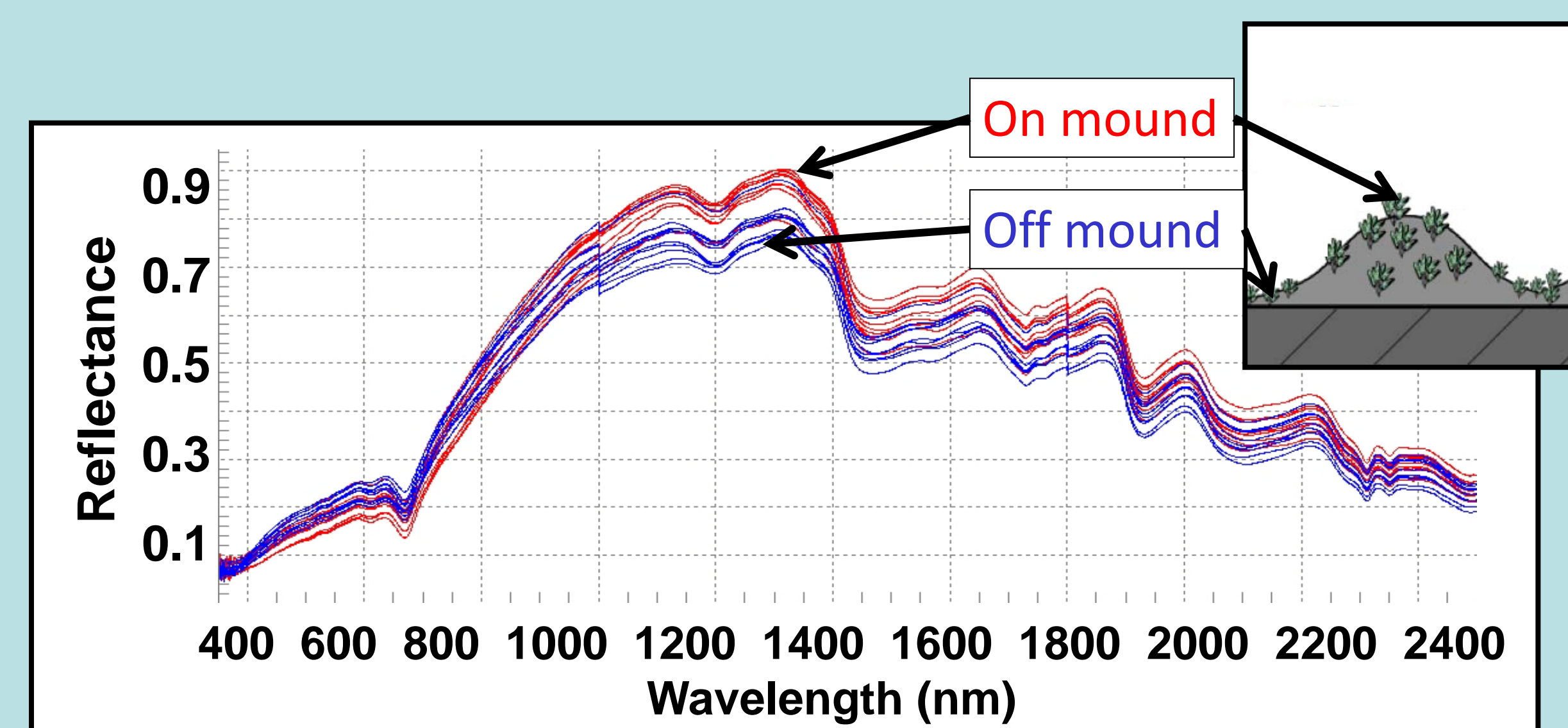


Figure 5. Reflectance spectra comparing a subsample of sagebrush on mound (red, n=10) and off mound (blue, n=10).