Integrating PhenoCam and Landsat Greenup Data to Inform Elk and Bison Management

Poster · October 2016

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Integrating PhenoCam and Landsat Greenup Data to Inform Elk and Bison Management

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Photo courtesy Lori Iverson, USFWS

Conclusion

Currently the criteria used to determine the end of the National Elk Refuge supplemental feed season each spring are subjective but based on the absence of snow cover and the initial presence of green grass on the Refuge. Quantifying green-up on the Refuge and linking it to conditions off the Refuge will help refuge managers shorten feed seasons potentially reducing density dependent disease transmission and costs.

Overview

The National Elk Refuge and Grand Teton National Park Bison and Elk Management Plan has four principal goals:

1. Habitat conservation,
2. sustainable elk and bison populations,
3. maintaining herd-wide elk numbers of 11,000 with 5,000 elk and 500 bison wintering on NER, and
4. Disease management through reduced reliance on supplemental feeding

Vegetation productivity affects each of these goals. Specifically, habitat conservation and native range improvement increase forage production, which can reduce the amount of supplemental feed needed to sustain animals through the winter. Knowledge of native range green-up in the spring can reduce the length of the feeding season and thus reduce the risk of disease (brucellosis) transmission. The National Elk Refuge PhenoCam view encompasses an area where vegetation greenness and snow cover are of interest to Refuge managers and scientists. Use of this view in conjunction with remotely sensed data allows greater understanding of greenness over a larger area particularly related to the lag in detection of green-up between ground-based and remote observation.

Results

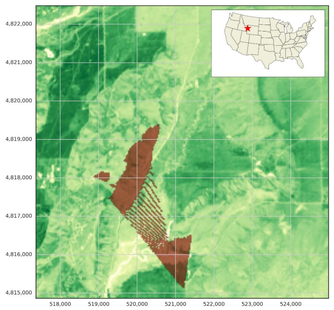

Figure 6 Map of study area with Landsat 8 pixels represented in PhenoCam image shown in red.

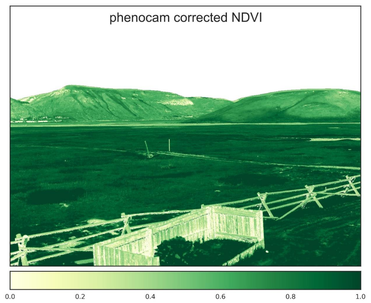

Figure 7 PhenoCam Normalized Difference Vegetation Index (NDVI)

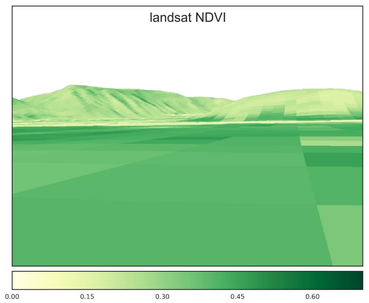

Figure 8 NDVI from corresponding Landsat Image 'draped' onto PhenoCam for comparison.

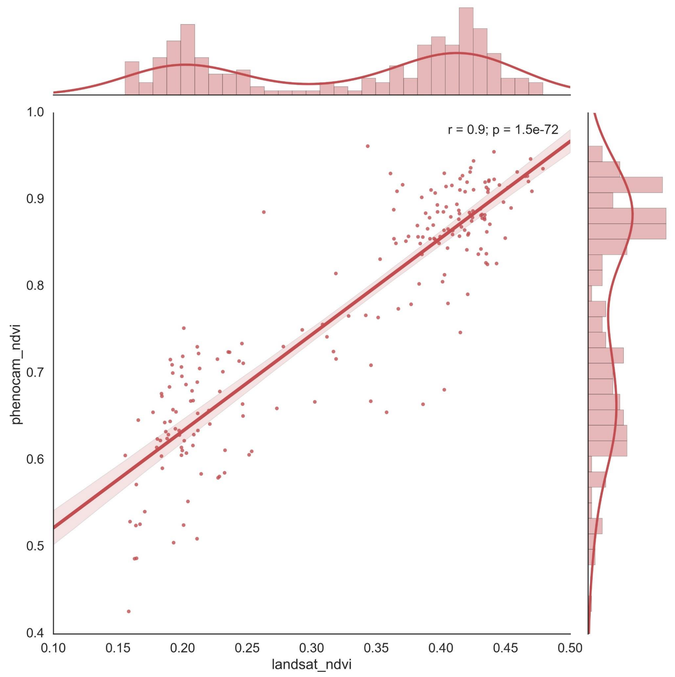

Figure 9 Relationship between PhenoCam NDVI and Landsat 8 NDVI (single images seen in figures 6 and 7, small and oblique pixels removed)

Methods

Figure 1 National Elk Refuge PhenoCam camera on historic Miller House. Installation includes IR enabled security camera with automatic web upload capabilities.

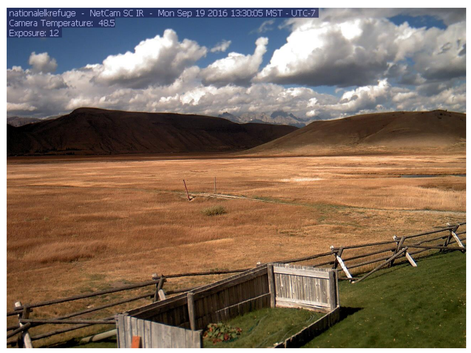

Figure 2 Representative image, available in near real time with a half hour return interval from the National PhenoCam Network: https://phenocam.sr.unh.edu/webcam/sites/nationalelkrefuge

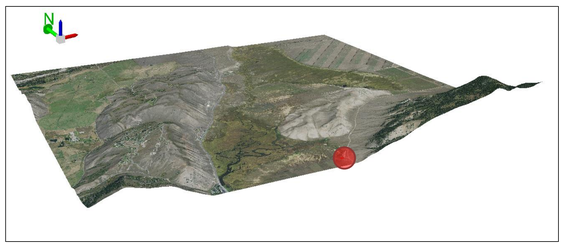

Figure 3 3-D representation of study area created in ESRI ArcScene. PhenoCam location in red

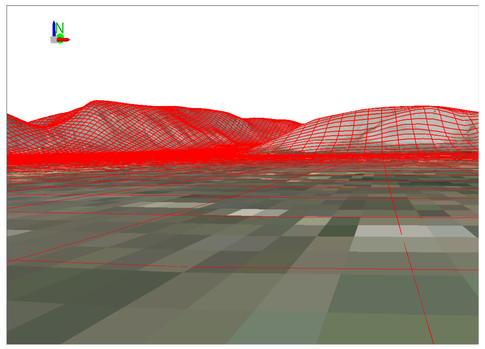

Figure 4 3-D representation aligned to PhenoCam location and orientation. Landsat 8 pixel boundaries overlaid in red. This can now be used to crosswalk between PhenoCam pixels and remote sensing pixels (Landsat and MODIS)

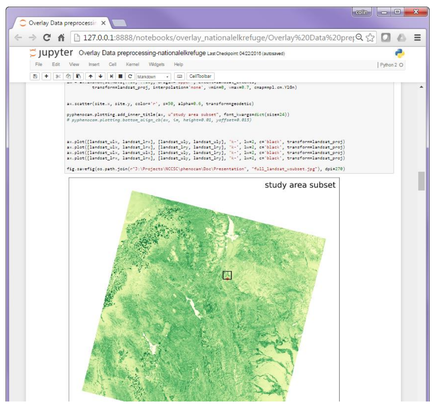

Figure 5 Python code and reproducible Jupyter notebooks used to obtain, process, and visualize PhenoCam and other data (Elevation, Landsat 8, MODIS, etc.) available from: https://github.com/ColinTalbert/pyphenocam

Acknowledgments: Funding provided by USGS North Central Climate Science Center. PhenoCam installation photo courtesy Geneva Chong. The PhenoCam network was created and is maintained by Andrew Richardson, Harvard University (https://phenocam.sr.unh.edu/webcam/about)