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Vegetation Green Up: Ground-Truthing NDVI Data Using Wildlife Cameras

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Overview

Camera traps can be used to track seasonal vegetation change across vast landscapes

- **Understanding vegetation** growth dynamics is vital to understanding how and why herbivores move through their habitats in search of food
- **Camera traps**, placed to monitor wildlife, also collect valuable 'bycatch' vegetation data, potentially allowing quantification of changes in green vegetation abundance over space and time ('green up' in the spring and 'senescence' in the fall)
- **Camera-based greenness** and its daily rate of change could be employed in evaluating the reliability of often-used satellite-based indices (NDVI and its temporal derivative IRG).

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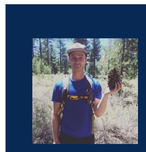

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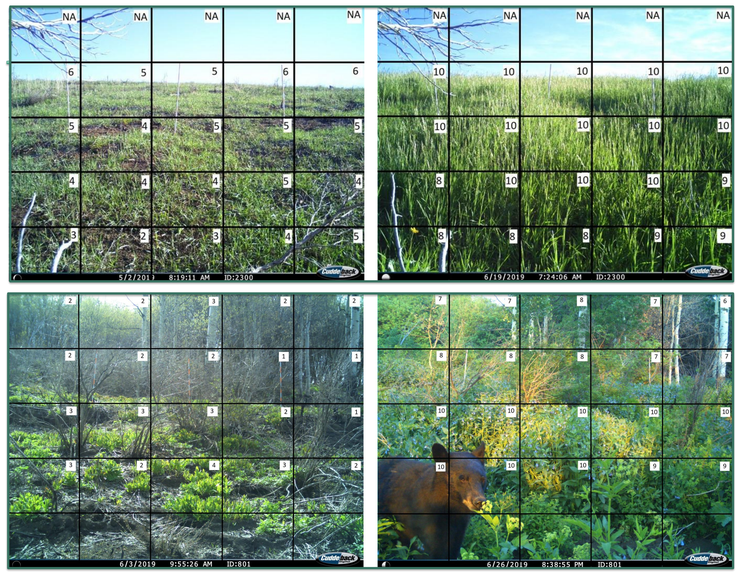
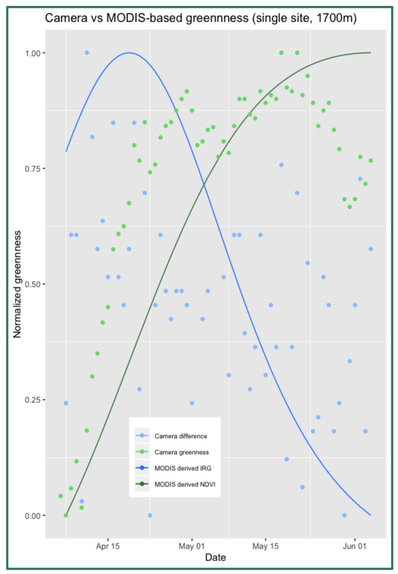
Tracking Greenness at Individual Sites



Vegetation growth at two sites, above at 1900 m, below at 2560 m.



NDVI and IRG compared to camera-based greenness and green-up

Methods

1. 1,036 daily photos (when available) were collected across 106 camera sites between March and July 2019
2. Classify each of 25 pixels in each photo by vegetation type and 'greenness' values on a scale of 0-10
3. Calculate the average (across pixels) camera-based greenness and green-up rates at each site on each day with available data
4. Use a mixed-effects linear model (with site as a random effect) to regress camera-based green-up rate against IRG (satellite-based green-up rate)
5. Evaluate whether residual variation in this regression could be explained by other site attributes, such as NDVI, vegetation type, or elevation

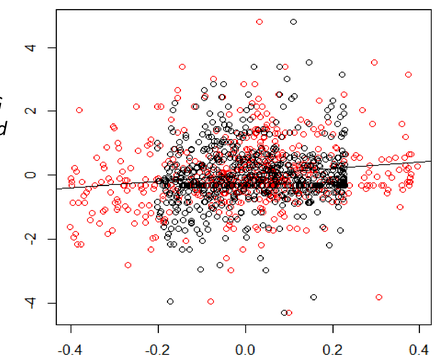
Results

- Based on AIC stepwise model selection, the most supported model is one including (in addition to IRG) site elevation as a predictor of camera-based green-up rates
- Whereas this model explained only 4% in variation in the response variable, the addition of site elevation clearly improved the agreement between predicted and observed values

Conclusions

- **Commonly used IRG** is weakly yet linearly related to camera-based green up
- **Weak relationship** may reflect the different scales at which the two measurements are taken: cameras typically cover an area of several 100's of m^2 whereas a single NDVI pixel corresponds to an area of 1000's of m^2
- **It is recommended** that future applications relying on IRG to predict rate of green up across mountainous landscapes should incorporate an additive positive effect of elevation

Observed (camera-based) green-up rates plotted against model prediction based on IRG only (black) and IRG and elevation (the best model; red)



Effects sizes (parameter estimates) based on the the best model for predicting camera-based green-up rates