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Agriculture and Natural Resources
Making a Difference for California

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Livestock, Range, & Watershed

San Luis Obispo, Santa Barbara and Monterey Counties

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IN THIS ISSUE:

Setting up a Matrice 600Pro Hexacopter integrated with an Altum multispectral and thermal sensor

Use of Drones for Vegetation Management

Alex Hernandez and Royce Larsen

The use of drones to measure forage production is a fairly new phenomenon. Drones can be used to accurately predict forage production values, along with many other uses. Understanding forage yield estimates are important for several reasons. Forage grasses are a crucial source of nutrition for livestock and estimates of forage yield can help ensure an adequate feed supply and proper stocking rate. It is important to set a proper stocking rate, which in turn allows for proper management of soils, plants, wildlife and livestock. Most ranchers have enough experience that they generally know how many cattle they can run on their ranch. But, there are new ways being developed that increases the ability to measure forage production across an entire ranch or landscape, which in turn helps improve ranch management.

To help us understand more about the use of drones, we did a study on our pasture seeding trial on Shell Creek Road, and other areas in Utah. A paper was recently published showing the results. That paper was published in the journal Grasses **2024**, 3, 84–109. https://doi.org/10.3390/grasses3020007.

The paper was titled "**Using Unmanned Aerial Vehicles and Multispectral Sensors to Model Forage Yield for Grasses of Semiarid Landscapes"**

By Alexander Hernandez, Kevin Jensen, Steve Larson, Royce Larsen, Craig Rigby, Brittany Johnson, Claire Spickermann and Stephen Sinton

Abstract: Forage yield estimates provide relevant information to manage and quantify ecosystem services in grasslands. We fitted and validated prediction models of forage yield for several prominent grasses used in restoration projects in semiarid areas. We used field forage harvests from three different sites in Northern Utah and Southern California, USA, in conjunction with multispectral, high-resolution UAV imagery. Different model structures were tested with simple models using a unique predictor, the forage volumetric 3D space, and more complex models, where RGB, red edge, and near-infrared spectral bands and associated vegetation indices were used as predictors. We found that for most dense canopy grasses, using a simple linear model structure could explain most (R^2 0.7) of the variability of the response variable. This was not the case for sparse canopy grasses, where a full multispectral dataset and a non-parametric model approach (random forest) were required to obtain a maximum R^2 of 0.53. We developed transparent protocols to model forage yield where, in most circumstances, acceptable results could be obtained with affordable RGB sensors and UAV platforms. This is important as users can obtain rapid estimates with inexpensive sensors for most of the grasses included in this study.

Setting up and launching a Wingtra II fixed-wing aircraft integrated with a Sony RX1 RGB camera.

Though there are many important points of discussed in this paper about using drones with multispectral lenses. Just to highlight one area of interest in this paper, we were able to calculate the volumetric or 3D space that the grasses project from the soil to their canopy. We then developed a digital surface model (DSM) which is shown as (Figure 8 in the paper). This was one of the parameters used to determine total biomass across varying canopy densities and species of grasses. You can go to the paper to learn more about using drones with multispectral lenses to determine forage production. This paper can be found online at:https://www.mdpi.com/2813-3463/3/2/7.

If you have technical questions regarding this paper please contact :

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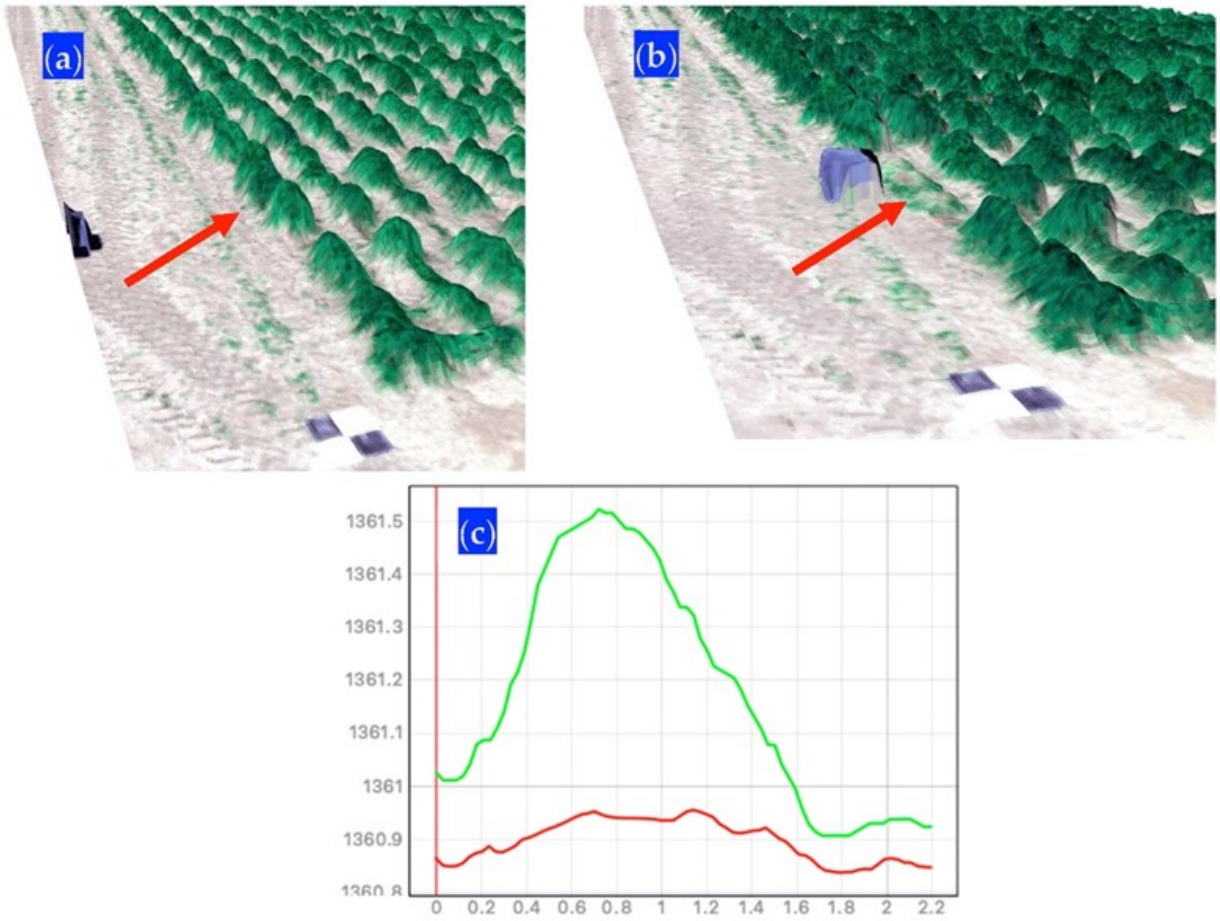


Sample of a typical DSM collected at the Richmond site with: (**a**) A border plot of Intermediate Wheat Grass, selected for forage harvest; (**b**) same plot has been collected and green matter placed inside tote; (**c**) typical grass canopy height (green line) and ground level (red line) used for the volumetric space calculation.

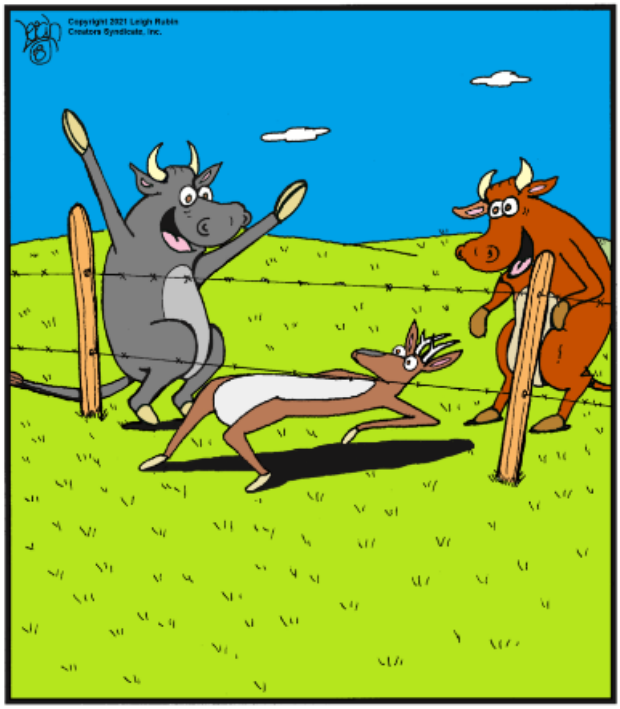
The California Rancher Sustainability Assessment is Online

https://crsa.cnr.berkeley.edu

Royce Larsen

There are 5 modules that are online now. Each module contains a set of multiple-choice or short -answer questions about the ranching topic. We invite you to complete the CRSA with other members of your family and ranch managers. There is a certain amount of intended overlap among categories that reflects fundamental interrelationships. Once you've answered the questions, the CRSA defines areas where you're meeting best practices, where you're doing even better, and where you could make improvements. For this newsletter, I am highlighting the Wildlife Management module.

Wildlife Management



Getting past barriers takes some flexibility.

The Wildlife Management module helps to promote good stewardship that can support diverse animal and plant communities. This then helps the land manager to provide hunting, tourism and other economic opportunities involving wildlife as well as much personal satisfaction. Maintaining populations of game species and watchable wildlife can be a foundation for a hunting and tourism program that increases and diversifies your income stream, while highlighting the important role of private lands in protecting and enhancing biological diversity. There are 11 different questions in the Wildlife module covering different concepts helping each person to improve their own management. This module takes between 10 and 20 minutes to complete. In addition to the questions, there are several fact sheets and articles in the library associated with this module.

CRSA development was funded by a UC ANR Renewable Resources Extension Act (RREA) grant, Project #20-6284.

CRSA University of California Agriculture and Natural Resources Cooperative Extension
California Rancher Sustainability Assessment

We are still waiting for the General Technical Report published through the US Forest Service, which will contain the papers presented at the 8th Oak Symposium. Sorry for the delay, we now expect the proceedings to be completed in 2025.

Wishing you and your family a wonderful holiday season.

Best wishes for a happy and prosperous new year!

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