The 36th International Symposium on Remote Sensing of Environment,
11 – 15 May 2015, Berlin, Germany, ISRSE36-224

MODELLING FORAGE RESOURCES WITH AIRBORNE IMAGING SPECTROSCOPY: IMPLICATIONS FOR UNGULATE AND ECOSYSTEM CONSERVATION

A. K. Schweiger [a, b, c,*], M. Kneubühler [a], A. C. Risch [b], M. Schütz [b], R. Haller [c], M. E. Schaepman [a]

[a] Remote Sensing Laboratories, Department of Geography, University of Zurich - Irchel, Winterthurerstrasse 190, 8057 Zürich, Switzerland – (mathias.kneubuehler/ michael.schaepman)@geo.uzh.ch
[b] Research Unit Community Ecology, Swiss Federal Institute for Forest, Snow and Landscape Research WSL, Zürcherstrasse 111, 8903 Birmensdorf, Switzerland - (anna.schweiger/ anita.risch/ martin.schuetz)@wsl.ch
[c] Swiss National Park, Department of Research and Geoinformation, Chastè Planta-Wildenberg, 7530 Zernez, Switzerland - rhaller@nationalpark.ch

THEME: BIOD - Forests, biodiversity and terrestrial ecosystems, SPECIAL SESSION: Biodiversity and conservation

KEY WORDS: Alpine Grassland, Forage Quality, Forage Quantity, Chamois, Ibex, Red Deer

ABSTRACT:

The spatial distribution of forage resources is a major driver of animal movement patterns. Studying these movement patterns in multi-species ungulate communities is especially appealing, because they not only affect the spatial distribution and population dynamics of each other but also have profound impacts on ecological processes, such as nutrient cycling and productivity, which subsequently influences the biodiversity of the entire ecosystem. However, forage resources in alpine grasslands are not evenly distributed across the landscape. Topographic complexity causes environmental parameters to vary at small spatial scales which in turn shape vegetation properties such as community composition, productivity, or plant nutrient content. Therefore, high-resolution vegetation data are needed, but restricted accessibility of alpine areas limits acquiring these data in traditional field surveys. We used data from the airborne imaging spectrometer APEX (airborne prism experiment) and data from 100 research plots to model plant biomass, plant nitrogen and plant fibre content in the alpine grasslands of the Swiss National Park. Our models predicted all three vegetation properties with high accuracies (biomass: $R^2 = 0.70$, RMSE = 156 $g.m^{-2}$; nitrogen content: $R^2 = 0.53$, RMSE = 0.5 %; fibre content: $R^2 = 0.79$, RMSE = 2.5 %). We mapped these resources with 2 m x 2 m spatial resolution and delineated the foraging areas of three sympatric ungulate species, i.e. ibex (*Capra ibex*), chamois (*Rupicapra rupicapra*) and red deer (*Cervus elaphus*), using time-use metrics of GPS data. In contrast to previous studies that did not have access to high resolution vegetation data, we were able to detect marked differences in the vegetation characteristics of the foraging areas of the three species. This result helps to better understand the foraging ecology of ungulates, which is essential for the conservation of their communities and enables to monitor possible ecosystem changes.

* Corresponding author.