Berkeley-Chile Proposal

Title: Development of advanced remote sensing methods for mapping and managing plant species diversity in Mediterranean Forests of Chile and California

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Project Proposal

Abstract

The decline of biodiversity is an issue of global concern. There are about 4 million hectares of oak woodlands in California. Oak woodlands have some of the highest levels of biodiversity of terrestrial ecosystems in California. For example, there are approximately 1,100 native vascular plant species in this important ecosystem. Similarly, the Mediterranean forests of central Chile have been identified as a biodiversity "hotspot." Using field measurement alone to assess biodiversity does not provide the synoptic view needed to manage and protect biodiversity at the landscape, regional and national levels. Utilizing remotely sensed data in combination with select field measurements may provide a path forward. However, this field is relatively new and the best methodologies and satellite sensors needed for this task have still not been resolved. We have a tremendous opportunity to push this science forward using field and remotely sensed data from two important Mediterranean areas (central Chile and central California) for comparative studies that will aid in discovering the most appropriate technologies for this task. Our team is well suited for this undertaking having the array of analytic and field skills needed to be successful. The University of Chile and UC Berkeley teams provide complementary capabilities that are together stronger than our individual teams. Our project will help train graduate students and young researchers in this emerging field. We envision that we will be able to seek additional funding through the NSF Research Coordination Network funding call and through the Fondecyt Regular Program to continue this research, education and training collaboration.

Introduction

Biodiversity is an important element in providing ecosystem services. The California Floristic Province and Central Chile are two of the 25 top biodiversity hotspot areas in the world (Myers et al., 2000). The decline in biodiversity that is being observed has many causal factors including climate change, the rapid change in land-use leading to habitat destruction as well as by invasive species. The decline in biodiversity of plants and animals, while of current global importance, is hindered by a lack of knowledge of the spatial distribution of individual species (Jetz et al. 2012; Leutner et al., 2012). This is partly because of the cost to do adequate field sampling and because remote sensing is not fully developed for this task. Work has already begun to address this need (see e.g., Ceballos, Galleguillos and Hernández, 2013; Leutner et al., 2013; Feilhauer, He and Rocchini, 2012; and Clark and Roberts, 2012). Light detection and ranging (LiDAR), flown typically on airplanes, presents options for analyzing biodiversity via canopy structure whereas imaging spectroscopy helps to identify plants by their spectral reflectance curves (Asner, 2013; Xu and Gong, 2007; Treitz et al., 2010; Hernández et al., 2013).