

Mapping Small Emergent Wetlands Using Ikonos Satellite Imagery in the Sierra Nevada Foothills

Project Vision

While California's coastal wetlands are well-studied and inventoried, surprisingly little information is available regarding the State's inland wetlands — their distribution, size, ecological function or habitat value. In addition to providing ecosystem services such as water filtration and groundwater recharge, wetlands in the Sierra Nevada foothills afford habitat for a variety of wildlife, including the rare California Black Rail (*Laterallus jamaicensis coturniculus*), a threatened species in California. Rapid population growth over the last 30 years has resulted in large-scale conversion of ranch and farmland to residential uses and the development of water resources for irrigation and hydroelectric power. Existing National Wetlands Inventory maps (<http://www.fws.gov/nwi/>) for the Sierra foothills are out of date. A current wetland inventory that is developed using the latest technologies will greatly improve management of California's inland wetland resources.

Recent advances in high-resolution satellite imagery provide an opportunity to conduct large-scale mapping and monitoring of wetlands in a manner that is both cost and time-efficient. Satellite imagery has distinct advantages over aerial photography including more rapid acquisition of data covering larger areas, frequent re-visit times, and the ability to collect data unhindered by local air traffic constraints. New classification programs such as eCognition (© Definiens Imaging) use an object-based approach have enabled improved classification accuracy of high-resolution imagery.

Research Objectives

A one-year study is proposed to develop an automated inland wetland detection procedure using high-resolution, multi-spectral Ikonos satellite imagery. The specific research objectives of the proposed project are to: (1) Develop an accurate wetland detection procedure, comparing pixel-based, object-based and combined approaches using high-resolution imagery; (2) Test model accuracy through extensive field surveys; and (3) Produce an accurate map of inland freshwater wetlands in Butte, Yuba and Nevada counties, California.

Conclusion

We propose an interdisciplinary research project that integrates novel advances in the fields of remote sensing and image classification with applications in wildlife biology. The proposed work supports the mission of the BWC by developing methods to monitor changes in California's water/wetland resources in a rapidly developing part of the state. As the human population in the Sierra foothills expands, increasing pressure on water resources coupled with land use change will alter the amount and spatial distribution of wetland habitat. The proposed project will complement ongoing research and spatial modeling of Black Rail metapopulation dynamics, thus providing a means to assess potential impacts of water use change on a sensitive species. The proposed work will involve investigators from multiple disciplines and will make use of existing Berkeley resources, such as the newly opened Geospatial Imaging and Informatics Facility (<http://giif.cnr.berkeley.edu/>). Finally, much of the proposed work will be conducted on private lands, thus providing a rare opportunity to interface with private landowners.