



CALFed Progress Questionnaire
California Sea Grant College Program

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Project Information

ProjectNo_2C R/SF-10 StartDate_3a 9/1/2005 EndDate_3b 8/31/2008
ProjectTitle_4 Determining the Factors Controlling Site Invasibility to (I)Lepidium latifolium(I)

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Summary of progress in meeting each of these goals and objectives

ProgressSummary_11

Using field spectrometer data, research this year has demonstrated that (I)Lepidium latifolium(/I) is spectrally distinct from co-occurring species, suggesting that it may be successfully mapped with hyperspectral data. This understanding is currently being applied to image data of the Delta and preliminary maps have been generated.

I have also conducted an extensive literature review on remote sensing change detection. Once (I)Lepidium latifolium(/I) has been mapped in all image dates, change detection techniques will be used to test what factors influence invasibility.

Hyperspectral image data of the Delta and Suisun Marsh in June 2006 has been acquired and a field campaign to ground truth these data has been conducted. This field data will be used to train and validate maps generated from the 2006 imagery. This year's fieldwork is the most extensive to date, with five times as much (I)Lepidium(/I) data as the previous year. The field data alone provides a good, although not comprehensive, record of (I)Lepidium(/I) infestations.

PROJECT MODIFICATIONS: Please explain any substantial modifications in research plans, including new directions pursued. Describe major problems encountered, especially problems with experimental protocols and how they were resolved. Describe any ancillary research topics developed.

Modifications_12

Mapping (I)Lepidium latifolium(/I) in 2005 data suffered mainly from a relative paucity of field data. New imagery of the entire Delta region has been acquired in June 2006. Imagery of a new study area, Rush Ranch in Suisun Marsh, was also acquired in June 2006. An extensive field campaign was performed in support of the 2006 overflights and much more field data is now available for analyses.

At the Rush Ranch site, a relatively small-scale study area is coupled with detailed field data. This will allow me to test several high-powered image processing techniques that aren't viable options on the much larger dataset of the entire Delta. This analysis will not only increase my understanding of mapping (I)Lepidium latifolium(I) in the imagery, improving maps across the overall Delta, but it will also provide the opportunity for a much more detailed detection of (I)Lepidium(I), including small, nascent patches on the periphery of the invasion front.

BENEFITS AND APPLICATIONS: Suggest the relevance of these new findings to management. Describe any accomplishment, that is significant effects your project has had on resource management or user group behavior. CALFED is looking for "management cue" (see <http://science.calwater.ca.gov/pdf/soemgmtcues.pdf>).

BenefitsApplic_13

- Management of invasive species can be improved with comprehensive maps of their distribution.
- * (I)Lepidium latifolium(I) is a problem weed invading California's Bay Delta.
 - * Hyperspectral remote sensing offers the potential to map invasive weeds.
 - * (I)Lepidium(I) is spectrally distinct from co-occurring species and thus may be mapped from hyperspectral data.
 - * These maps can be used to target and evaluate management efforts, improving management efficiency and monitoring.

PUBLICATIONS: List any publications, presentations, or posters that have resulted from this funded research. Give as many details as possible, including status of paper (e.g., in review; in press), journal name, conference location and date of presentation. Please note (as outlined in the conditions of the award) that each fellow is required to submit an abstract for an oral or poster presentation at each State of the Estuary conference and CALFED Science Conference during the duration of the fellowship.

Publications_14

Andrew, M.E. and S.L. Ustin (2006). Spectral and physiological uniqueness of perennial pepperweed (*Lepidium latifolium*). *Weed Science* (in press).

Andrew, M.E. and S.L. Ustin (2006). Mapping perennial pepperweed with hyperspectral imagery of the Sacramento-San Joaquin Delta. Poster presented at 4th Biennial CALFED Bay-Delta Program Science Conference. October 23-25, 2006. Sacramento, CA, USA.

Andrew, M.E., and S.L. Ustin (2005). Spectral and physiological uniqueness of *Lepidium latifolium*. Poster presented at 7th Biennial State of the San Francisco Estuary Conference. October 4-6, 2005. Oakland, CA, USA.

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COOPERATING ORGANIZATIONS: List those agencies and/or persons who provided financial, technical or other assistance to your project since inception. Describe the nature of their collaboration.

CoopOrganiz_15

- * California Department of Boating and Waterways ñ a grant from CDBW provides imagery of the Delta.
- * California Department of Food and Agriculture ñ provides boats and crews for fieldwork in the Delta, also the agency of my community mentors, Robert Leavitt and Steve Schoenig.
- * Solano Land Trust ñ collaborating to map Lepidium and other invasive weeds on SLT lands in the Bay/Delta.
- * Cosumnes River Preserve and Information Center for the Environment ñ Collaborating with Dr. Joshua Viers to map Lepidium at the CRP. CRP has provided GIS data of Lepidium inventories on the preserve.

AWARDS: List any special awards or honors that you, or mentor or members of the research team, have received during the duration of this project.

Awards_16

NA

KEYWORDS: List keywords that will be useful in indexing your project.

Keywords_17

Airborne Visible/Infrared Imaging Spectrometer (AVIRIS); Geographic Information Systems (GIS); HyMap; hyperspectral; invasibility; Lepidium latifolium; perennial pepperweed; remote sensing.

