

**ARI
Final Report**

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46910

Project Title:

Invasive Plant Management Project

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Executive Summary:

Exotic species invasion into natural ecosystems represents among the most significant threats to biodiversity and ecosystem stability. Scientists and land managers agree that the most effective management protocol is prevention, prediction, and control. The following are the original objectives with accomplishments for each objective.

- 1. Education** is the essence of a viable management strategy based on prevention. In cooperation with the San Luis Obispo County Agriculture Commissioners Office we have developed a Memorandum of Understanding to form the SLO Weed Management Area (WMA) organization, which brings together key private, state, and federal players in the war on invasive weeds. We have developed a manual for identifying invasive plants of San Luis Obispo County, which contains pictures and descriptions of the County's most significant invasive species.
- 2. Predictive models** have been developed using information from mapping, research surveys conducted by graduate students and members of the WMA. Our model is based primarily on climatic preferences and constraints for a species. With it we can predict the characteristics of a site that make it prone to plant invasion so that the land manager may remedy them before invasion occurs. The model can also predict the plant species, which have not yet infested SLO County but have the potential to if brought in inadvertently.
- 3. Population mapping** has been accomplished for several of the most problematic plant species. Identifying invaded locations is the first step to a control program for established species.

Major Accomplishments:

1. Education:

- ***San Luis Obispo County Weed Management Area (WMA):*** a Memorandum of Understanding (MOU) was developed that describes the purpose and role of a San Luis Obispo Weed Management Area (WMA). The purpose of the MOU is to establish the San Luis Obispo County WMA and define the role of federal, state, county, city, and private agencies and sectors in preventing the introduction, establishment, and dispersal of invasive plant species throughout the County. Management strategies include monitoring, eradication, and management of designated noxious and invasive plant species. The WMA conducts bi-quarterly meetings to exchange information on current problems with established invasive species, any findings of new potential invaders, and management progress. We also discuss research goals and management strategies for funding acquired through agencies such as California Department of Food and Agriculture (CDFA) and the California Exotic Plant Council (Cal EPPC). The WMA has been successful in addressing invasive plant concerns for many diverse interests such as the County Agriculture Commissioners Office, Cal Poly SLO, Bureau of Land Management (BLM), California Department of Transportation (Cal Trans), California State Parks, California Department of Fish and Game, Los Padres National Forest, San Luis Obispo County Parks, California Native Plant Society, Sierra Club, San Luis Obispo County Cattlemen's Association, among others.
- ***ID manual:*** the guide, *Noxious Weeds of San Luis Obispo. An illustrated guide to SLO County's most notorious plant pests*, was published through a joint effort by the SLO County Foundation for Agriculture and the SLO County Weed Management Area. This guide is being distributed through the SLO County Agriculture Commissioners Office, Cal Poly Crop Science Department, and other members of the WMA. This manual provides the first line of defense from invasive plant species for those with a vested interest in preventing their establishment or managing their impact.

2. Prediction

- ***Predictive models using CLIMEX:*** we have been successful in the incorporation of climatic data from 328 National Oceanic and Atmospheric Administration (NOAA) weather stations in California in cooperation with Michael Pitcairn of California Department of Food and Agriculture (CDFA). This accomplishment greatly improves the resolution of predictions of potential plant invasions for regions within California, which are necessary to create robust models for San Luis Obispo County. We have parameterized a model for the species gorse (*Ulex europaeus*), which is a serious invasive plant of coastal regions along the Pacific Northwest and is moving southward toward San Luis Obispo County. The objective with our modeling efforts was to determine the likelihood for success of gorse so that we would determine whether serious efforts would be required to keep the species out of the county. We determined that Monterey County was the likely southernmost ecoclimatic limit for gorse. Therefore, we could confidently turn our monitoring and management efforts toward other species. Having developed a parameterized model for gorse we have established a protocol for developing predictive models for any invasive species. Thus the predictive models provide an objective tool in the decision process for

whether to focus on a given species or not. These models can take into account the multidimensional nature of ecological and biological systems for which the human mind has difficulty.

3. Mapping

- **Global Positioning Systems/ Global Information Systems (GPS/GIS):** in cooperation with the SLO County Agricultural Commissioners Office, longitudinal/latitudinal coordinates (GPS) have been collected for several major species in SLO County. The major species that have been mapped include yellow starthistle (*Centarurea solstitialis*), barbed goatgrass (*Aegilops trunciialis*), giant reed (*Arundo donax*), medusahead (*Taeniantherum medusa-caput*). From this we are currently developing an invasive plant database, which includes site characteristics for where a species is successful. This information is being collected in ArcView GIS so that we can begin to develop species preferences and constraints based on factors in addition to climate. We will be able to greatly improve predictive accuracy with models that include climatic, biotic, and abiotic information. GIS/GPS information allows us to follow population sizes through time so that we can determine the effectiveness of a management strategy. Achieving this objective will help us to develop an ecological and biological understanding of a successful plant invasion thus elucidating the strengths and weaknesses of a site and a species.

Impact Statements:

1. Ratification of the Memorandum of Understanding (MOU) that establishes the SLO County Weed Management Area (WMA). The WMA provides a vehicle through which we can acquire and disseminate information and qualifies SLO County for CDFA research and management funding which we have already received.
1. The SLO County WMA brings together many diverse public and private agencies in a concerted effort to manage invasive plants.
2. Developed a predictive model for *U. europaeus*, which predicts the locations and species which are likely to be involved in a successful invasion. The model aided in our decision to focus on other species because the model predicted that the species had attained its southernmost ecoclimatic limit in Monterey County.
3. With the *U. europaeus* model we established a protocol for developing predictive models for any invasive species.
4. Publication of *Noxious Weeds of San Luis Obispo County. An illustrated guide to SLO County's most notorious plant pests*. This invasive plant identification manual provides an educational tool for WMA members who educate their employees and/or the public about invasive species.
5. GPS/GIS mapping of invasive plants provides the first step in their management and allows us to follow populations so that we can assess the effectiveness of management or lack thereof.
6. The climatic, abiotic, and biotic characteristics that we incorporate into ArcView will help develop an ecological and biological understanding of a species so that we can focus management efforts on weaknesses rather than waste efforts on their strengths.

Dissemination, publications and presentations of research:

- Steinmaus, S. and J.C. Fox. XXXX. Climatic predictions of an invasive plant in California: *Ulex europaeus* (Ulex). Journal of Applied Ecology. Manuscript in preparation.
- Workshop on invasive exotic plant species in native Monterey pine forests will be Wednesday, October 10, 2001. The venue will be the Pebble Beach Community Services District (PBCSD) Board meeting room in Pebble Beach. S. Steinmaus will present a seminar entitled: *The Development of Predictive Models for Invasive Plant Species*.
- June 2001. *Noxious Weeds of San Luis Obispo County. An illustrated guide to SLO County's most notorious plant pests*. Identification pamphlets completed and disseminated to private and public sectors affected by or concerned with invasive plants.
- Fox, J.C. and S. Steinmaus. 2001. Climatic predictions of an invasive plant in California: *Ulex europaeus* (Gorse). Proceedings of the California Weed Science Society 53:34- 37.
- San Luis Obispo County Weed Management Area. Information (WMA) exchange among members of the SLO WMA at meetings biquarterly since Fall 2000 at the San Luis Obispo County Agriculture Commissioners Office.
- October 1, 2000. Memorandum of Understanding ratified which establishes the San Luis Obispo County Weed Management Area.