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**Agricultural
Research
Service**

Roles of the USDA-Agricultural Research Service In the Control of Aquatic Invasive Weeds In the Sacramento-San Joaquin Delta



Mission of the USDA-Agricultural Research Service

ARS conducts research to solve problems in agriculture, and to enhance and protect natural resources that are essential for agriculture and healthy natural ecosystems (water, soil, air).

- Ensure high-quality, safe food and other agricultural products.
- Enhance the natural resource base and the environment.
- Sustain a globally competitive U.S. agricultural economy.
- Provide economic opportunities for rural citizens, communities and society as a whole.

Research products/technology are transferred to users/stakeholders.

Roles of the USDA-ARS Exotic and Invasive Weeds Research Unit in Control Programs Focused On Aquatic Weeds in the Delta

- **USDA-ARS is the *Federal Nexus* for the Division of Boating and Waterways permits from Federal regulatory agencies:**
 - U.S. Fish and Wildlife Service (USFWS)
 - NOAA-National Marine Fisheries Service (NMFS)
 - Preparation of Biological Assessments for the permits
 - Submission of annual reports
- **USDA-ARS conducts research to develop new technology to improve aquatic weed control programs in the Delta and throughout the western U.S.**
 - Testing/development of new integrated chemical, physical, cultural control methods.
 - Discovery and testing of new biological control agents.



Project Overview

USDA-Agricultural Research Service Areawide Pest Management Program

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Area-Wide Management of Aquatic Weeds in the Sacramento-San Joaquin Delta for Protection of Critical Water Resources in Farming Areas, Wildlife Habitats, Recreational and Commercial Navigation Areas, and Water Conveyance Systems Important for Agriculture and Human Health





Goals of the USDA-ARS Areawide Delta Pest Management Pilot Project

- Redesign, implement, and demonstrate effective management of three major invasive aquatic weeds (floating water hyacinth, submersed egeria or Brazilian waterweed, and emergent/riparian arundo).
- Improve control of disease-vectoring mosquitos by determining relationships between mosquitos and aquatic weeds, and use this information to optimize mosquito control operations.
- Identify key agricultural and urban inputs (pesticides and nutrients) that exacerbate weed infestations, and/or hinder weed control.

Project Partners



USDA-Agricultural Research Service Exotic and Invasive Weeds Research Unit Albany and Davis, CA

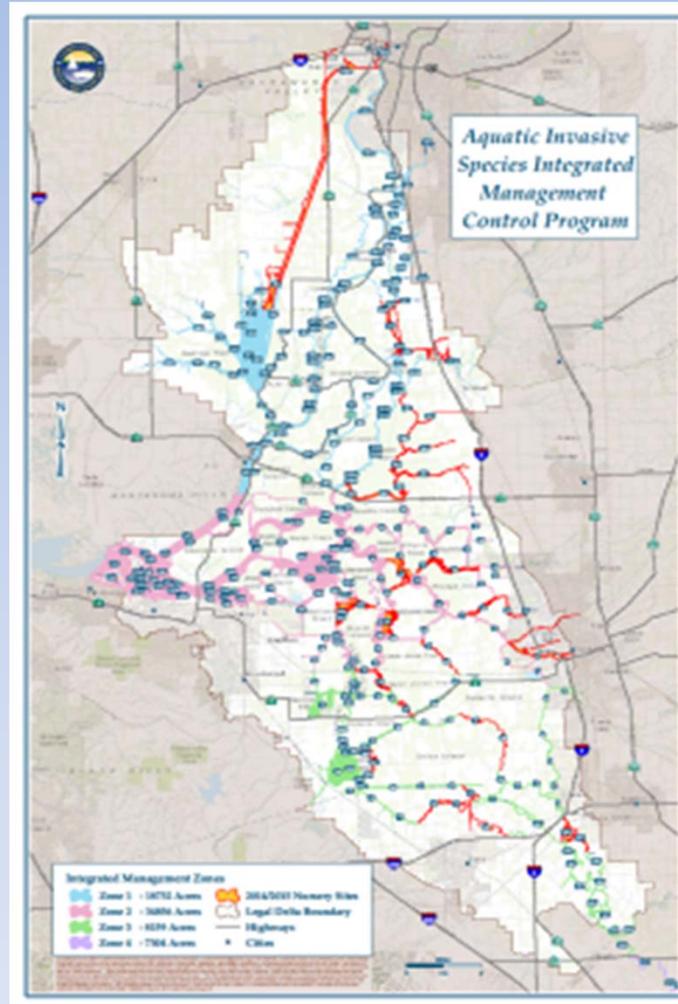
- Determination of aquatic weed growth cycles under Delta conditions.
- Assist DBW to determine efficacy (weed-killing success) of treatments.
 - Assist DBW with efficacy evaluations of new herbicides.
- Work with NASA to develop models of weed population growth and movement in dynamic Delta environment.
 - Test, release and evaluate biological control agents.
(involves collaboration with CDFA, SSJDC, and other USDA-ARS labs)
- Determine effects of aquatic weeds and control on aquatic invertebrates.
- Work with UC Davis and MVCDs to examine effects of weeds on mosquitos.





Project Partners

Division of Boating and Waterways
California Department of Parks and Recreation



Map of Delta treatment zones
With priority areas in red

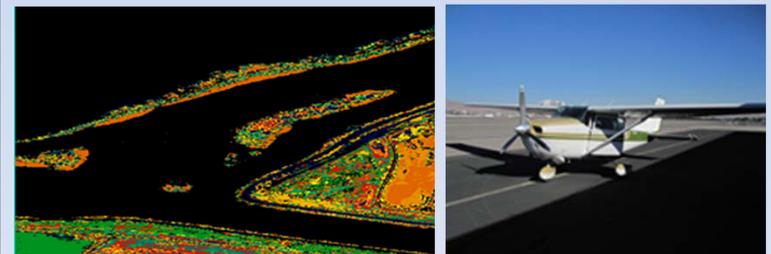
- Receiving information from NASA and USDA-ARS to prioritize treatment locations for water hyacinth and egeria
 - Satellite images
 - Plant movement model
 - Water nutrient model
- Providing information on treatment success/efficacy, and for studies of effects of treatments on mosquitos and aquatic organisms.
- Providing information on control program costs for economic model of Areawide project benefits.



Project Partners

NASA-Ames Research Center, Moffett Field, CA

- Use of LANDSAT satellite images (every 2 weeks, 30 m resolution) for remote sensing and quantification of water hyacinth coverage in Delta.
- Development of airplane-based AVIRIS, SPECTIR, and ASIA systems with 1 to 15 m resolution for detection of water hyacinth and egeria.
- Provide images and decision support models to DBW to prioritize and optimize control of the aquatic weeds.
- Summary and modeling of existing data on agricultural drainage areas and water nutrient concentrations-Delta SWAT model.
- Modeling of water hyacinth population growth and movement in relation to water flow.
- Help ARS with studies on plant growth under simulated Delta conditions





Project Partners



University of California-Davis:

Department of Entomology and Nematology
Department of Plant Sciences

Entomology

- Studies of development of mosquito populations in live and dying water hyacinth and egeria.
- Identify associations between agricultural practices (fertilization and pest management) in determining nutrient inputs into Delta.

Plant Sciences

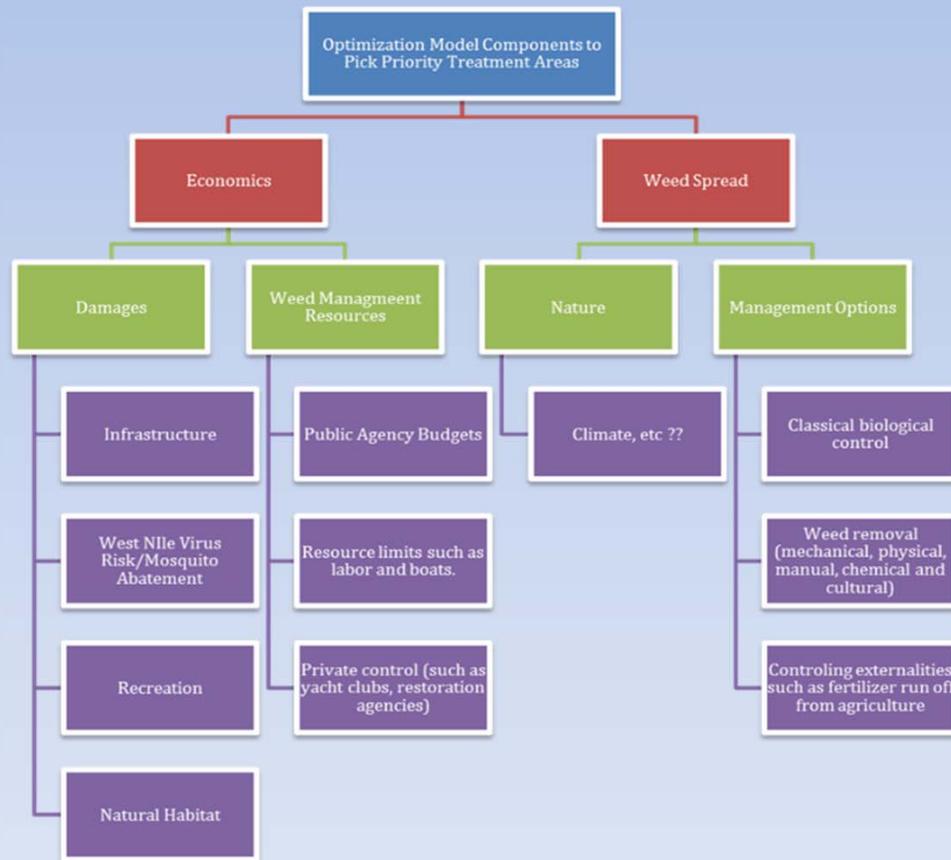
- Assist with plant growth studies under simulated Delta conditions.



University of California
Agricultural Issues
Center

Project Partners

University of California-Davis: Agricultural Issues Center

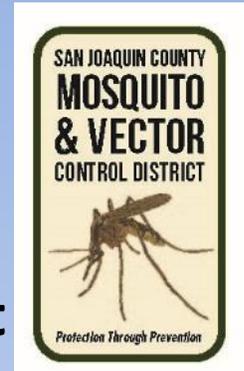


Bio-economic model to document project benefits

- Weed control cost function
- Weed damage function-economic and environmental damage/lost revenue
- Mosquito control function
- When measured over time, benefits of the Areawide project can be determined.



Project Partners



Contra Costa Mosquito Vector Control District San Joaquin County Mosquito Vector Control District

- Survey and treat mosquitos near live aquatic weed infestations.
- Document effect of herbicide-related decline/death of weeds on mosquito population size.
- Report data on mosquito control costs in areas of aquatic weed invasion, success of population abatement, and West Nile Virus levels for bio-economic model.



New Areawide Project Partners-2015 Project

Sacramento-San Joaquin Delta Conservancy

- Mapping of arundo and identification of biological and integrated control sites.
- Interface with landowners and managers.
- Coordination of biocontrol and other control treatments.

California Department of Food and Agriculture

- Rearing of biological control agents

University of California Cooperative Extension

- Development of website, brochure, educational materials for stakeholders and the public

Other agencies/organizations participating in project meetings:

- CA DWR, CDFW, SWRCB, CVWRCB, USBOR, USFWS, NOAA-NMFS, Delta Weed Watch, CA Recreational Boaters Association, Port of Stockton, Delta marina owners, legislative staffers

USDA-ARS Areawide Delta Pest Management Project: Expected Benefits/Outcomes

- Improved area-wide management of water hyacinth and egeria in the Delta- led by the Division of Boating and Waterways-CA Parks-achieved through science-based control prioritization and optimization.
- Integration of biological control into arundo control and habitat restoration plans led by the SSJDC.
- Decrease in water loss/waste, and in economic damage caused by aquatic and riparian weed invasions.
- Improved efficiency of suppression of potentially disease-vectoring mosquito populations in areas adjacent to aquatic weed infestations.
- Increased opportunities for restoration of wetland and aquatic habitats under the Delta Plan and BDCP.