

# Early Results of Improved Delta-Wide Integrated Adaptive Management of Water Hyacinth, Brazilian Waterweed and Curly-Leaf Pondweed

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Bay Delta Science Conference  
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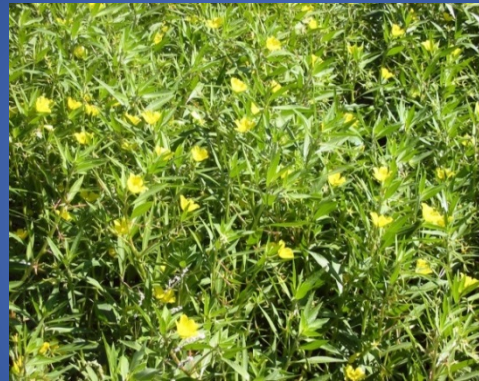


# Parks-DBW role

- 68,000 acres of Delta & Tributaries
- Parks is the lead agency to cooperate with federal, state and local agencies to control:



**Water hyacinth**  
(*Eichhornia crassipes*)



**Water primrose**  
(*Ludwigia hexapetala*)



**Spongeplant**  
(*Limnobium laevigatum*)



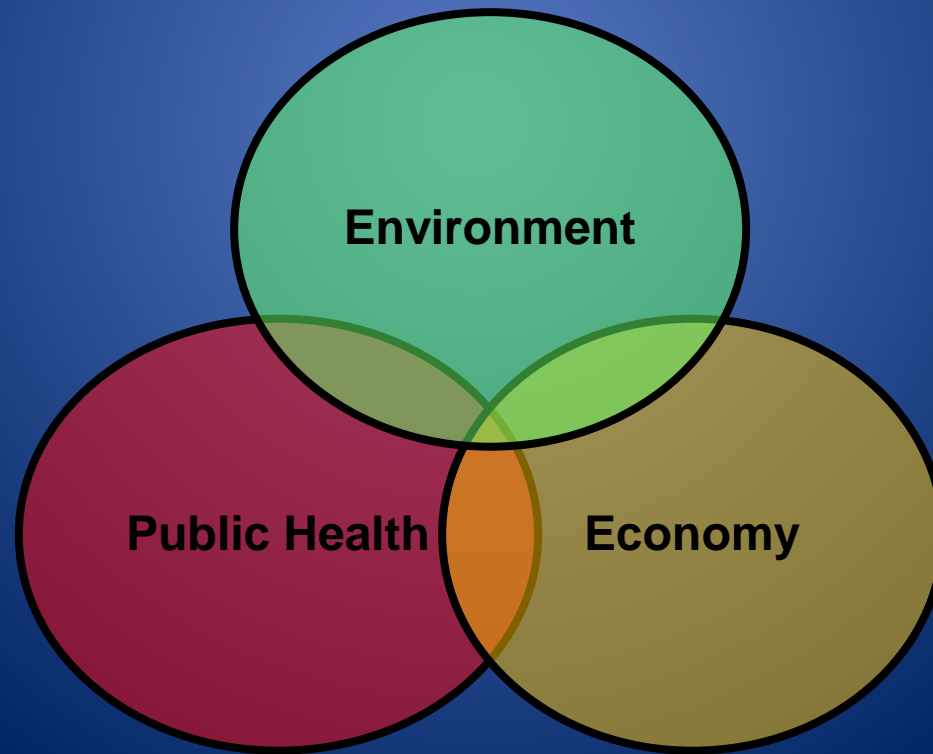
**Brazilian waterweed**  
(*Egeria densa*)



**Curlyleaf pondweed**  
(*Potamogeton crispus*)

# Program Mission

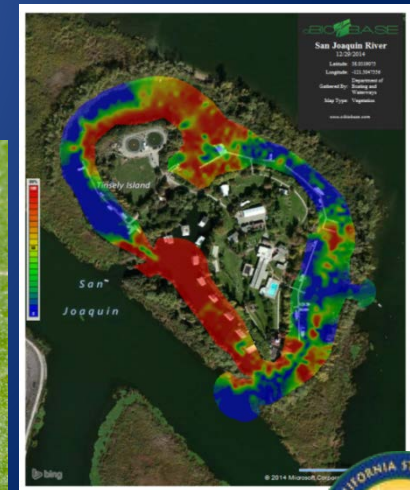
- Control program, not an eradication program
- Permissive, not mandatory program
- Control and manage invasive aquatic plants for:



# IAM Control Strategy

## Decision Support Tools

- Chemical Treatments
- Mechanical Harvesting
- Biological Controls
- Manual Removal
- Mapping



# Concepts To Guide Program Design

- Collaborative approach
- Science based control
- Adopt an adaptive management approach
- Strive for the widest range of tools & flexibility
- Include mapping, monitoring, and performance metrics



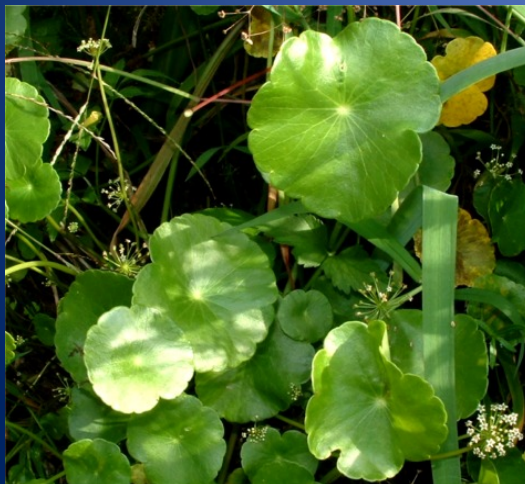
# Future Challenges



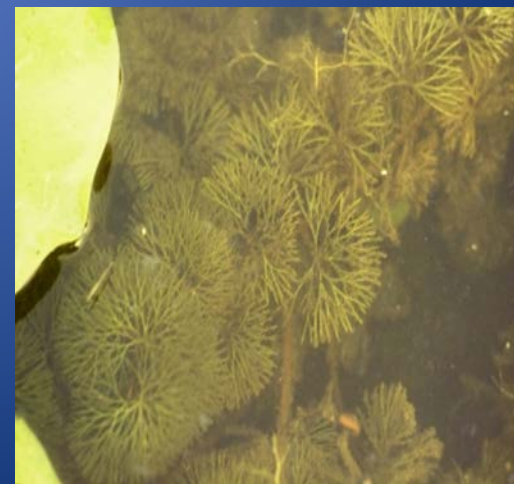
**Eurasian watermilfoil**  
**(*Myriophyllum spicatum*)**



**Coontail**  
**(*Ceratophyllum demersum*)**



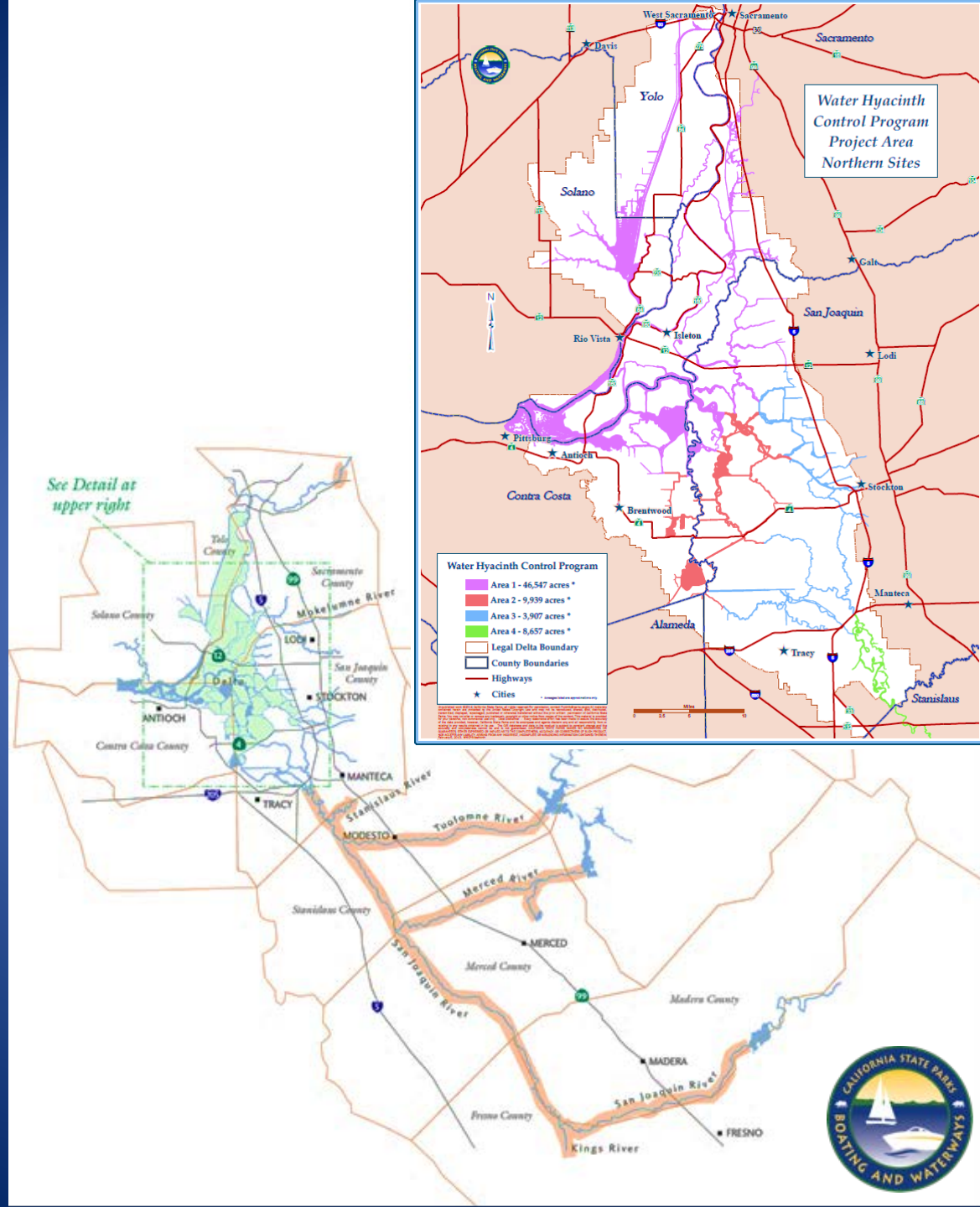
**Pennywort**  
**(*Hydrocotyle ranunculoides*)**



**Fanwort**  
**(*Cabomba caroliniana*)**

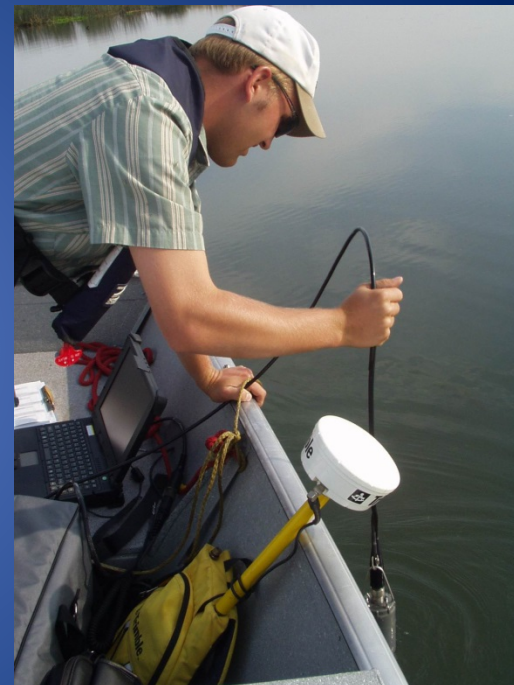


# Project Area: Sacramento – San Joaquin Delta and tributaries



# Environmental Regulatory Requirements

- Clean Water Act
  - NPDES
- Endangered Species Act
  - Section 7 Consultation
  - Biological Opinion
  - Letter of Concurrence
- CEQA
  - EIR
- Porter Cologne Act
  - Basin Plan Compliance
  - Water Quality Objectives
- Streambed Alteration Agreement (CDFW)
- Restricted Materials/Notification (CAC)





# Current Status

## Floating Aquatic Vegetation

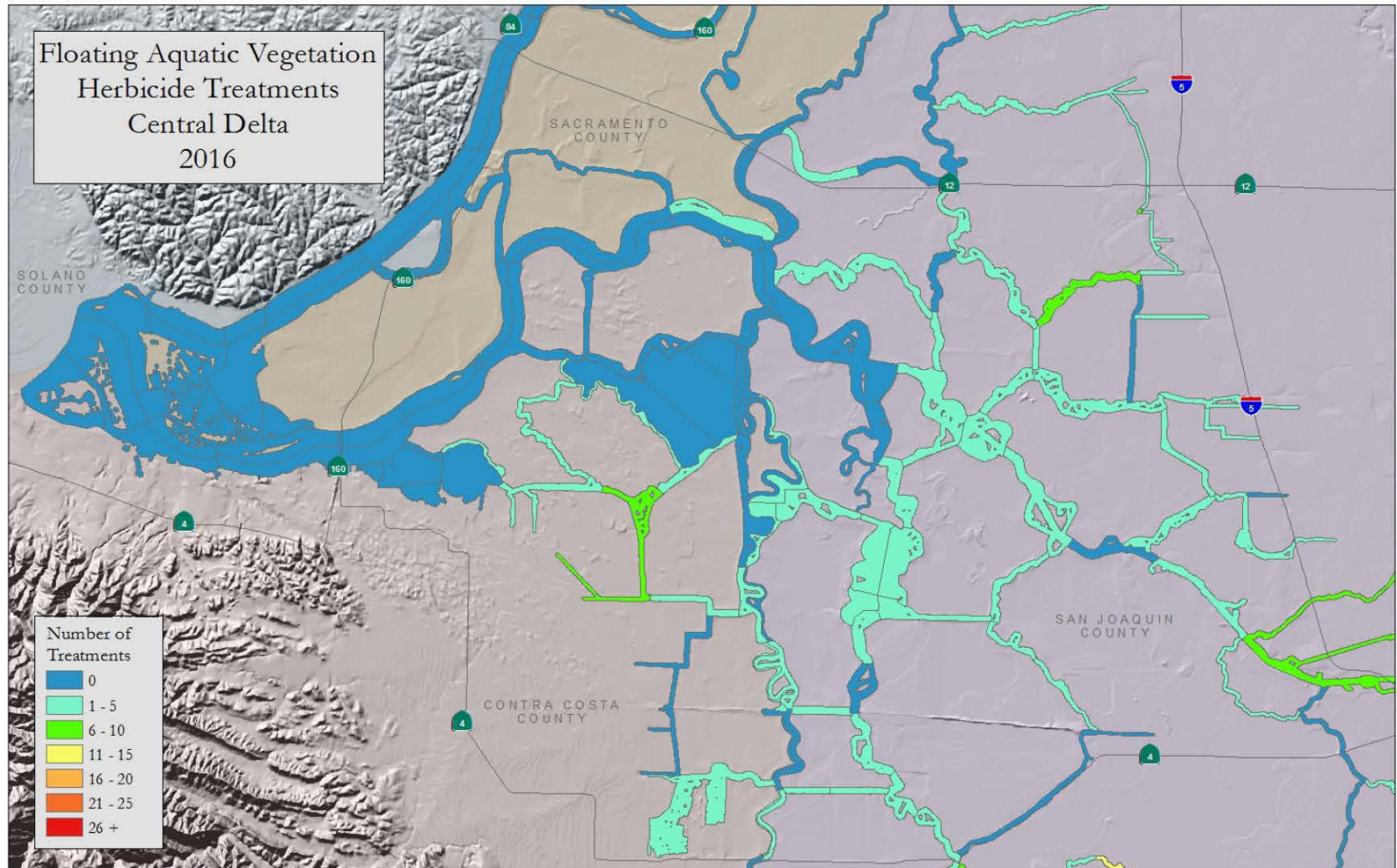
- water hyacinth, spongeplant & water primrose
  - Treatments began March 10
  - 217 sites, 1,099 applications (~3,805 acres)
  - Mechanical harvesting and handpicking

## Submersed Aquatic Vegetation

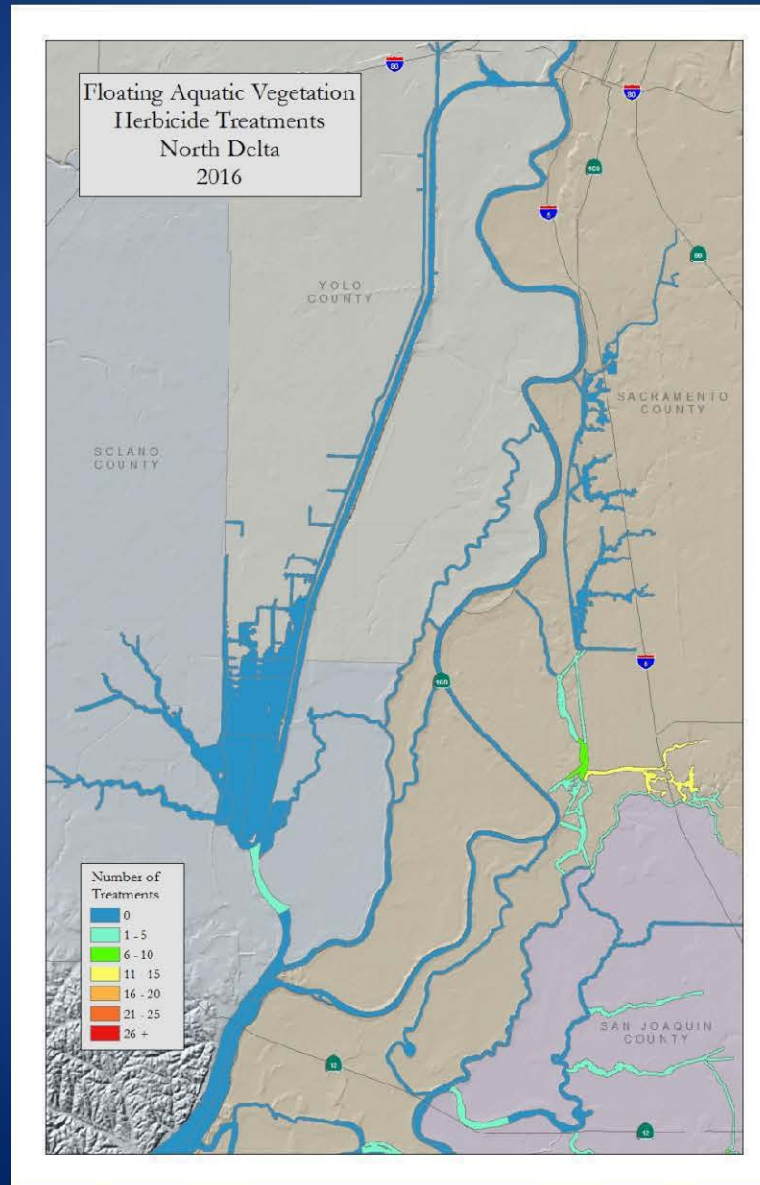
- *Egeria densa* & curlyleaf pondweed
  - Treatments began March 9 (12-17 weeks)
  - 22 sites (2,494 acres)



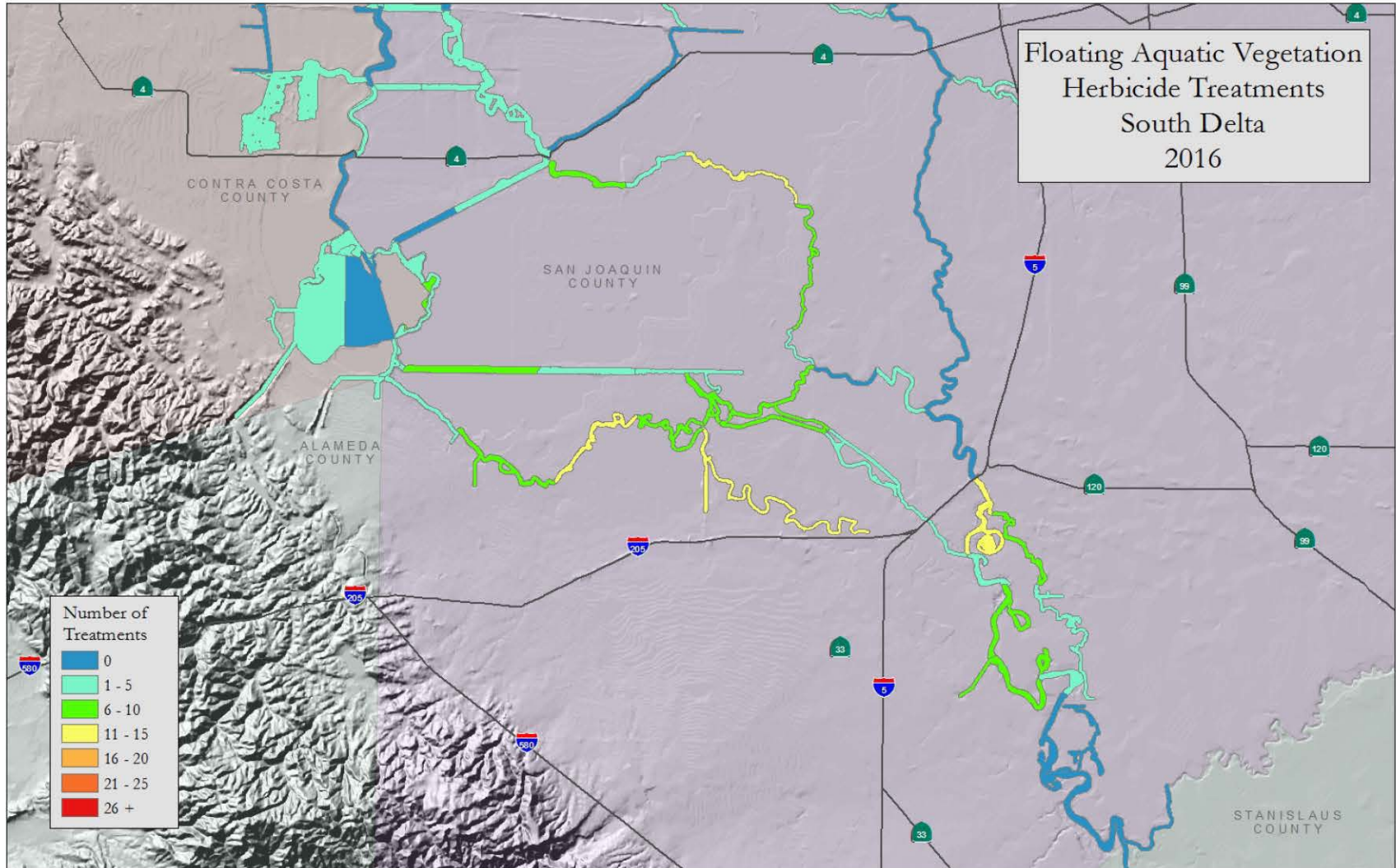
# FAV Treatments in 2016



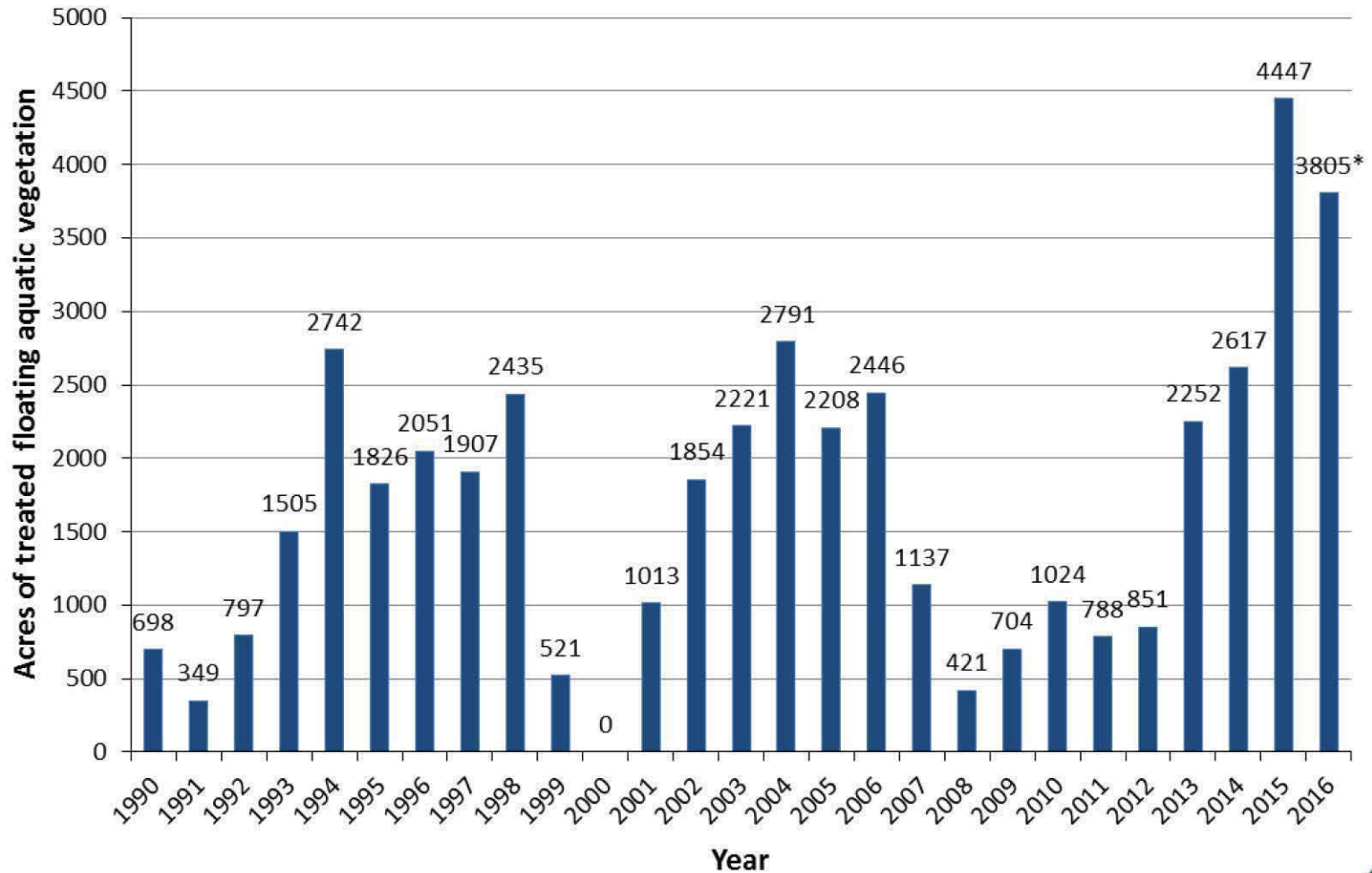
# FAV Treatments in 2016



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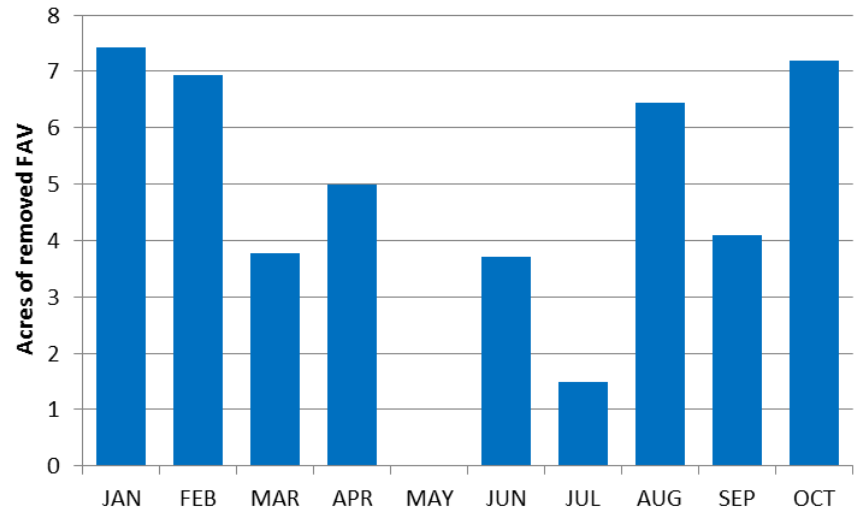
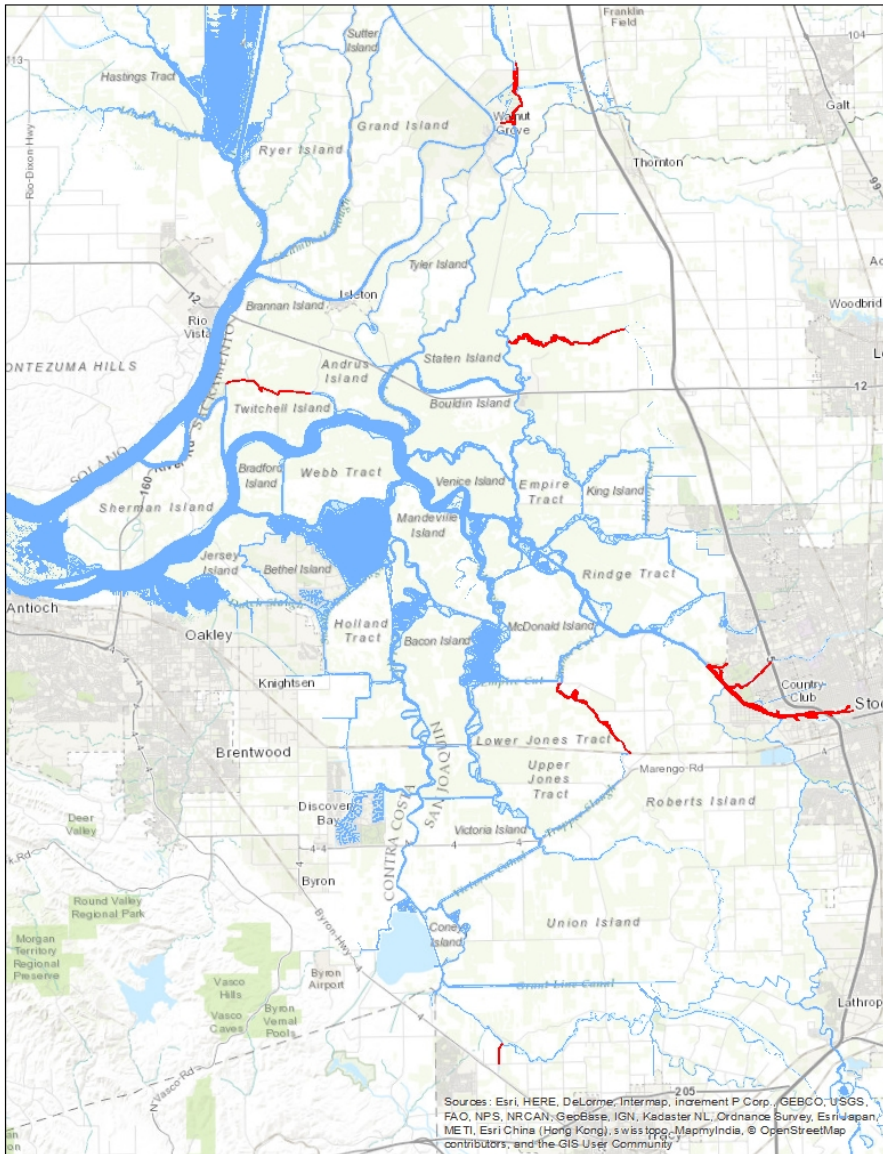
# FAV Program Acreage Through 2016



\*preliminary data as of 11/9/16



# FAV Mechanical Control 2016



Total Jan – Oct = 46.06 Acres  
(74,302 cubic yards)



PM 2:56 3/OCT/2016



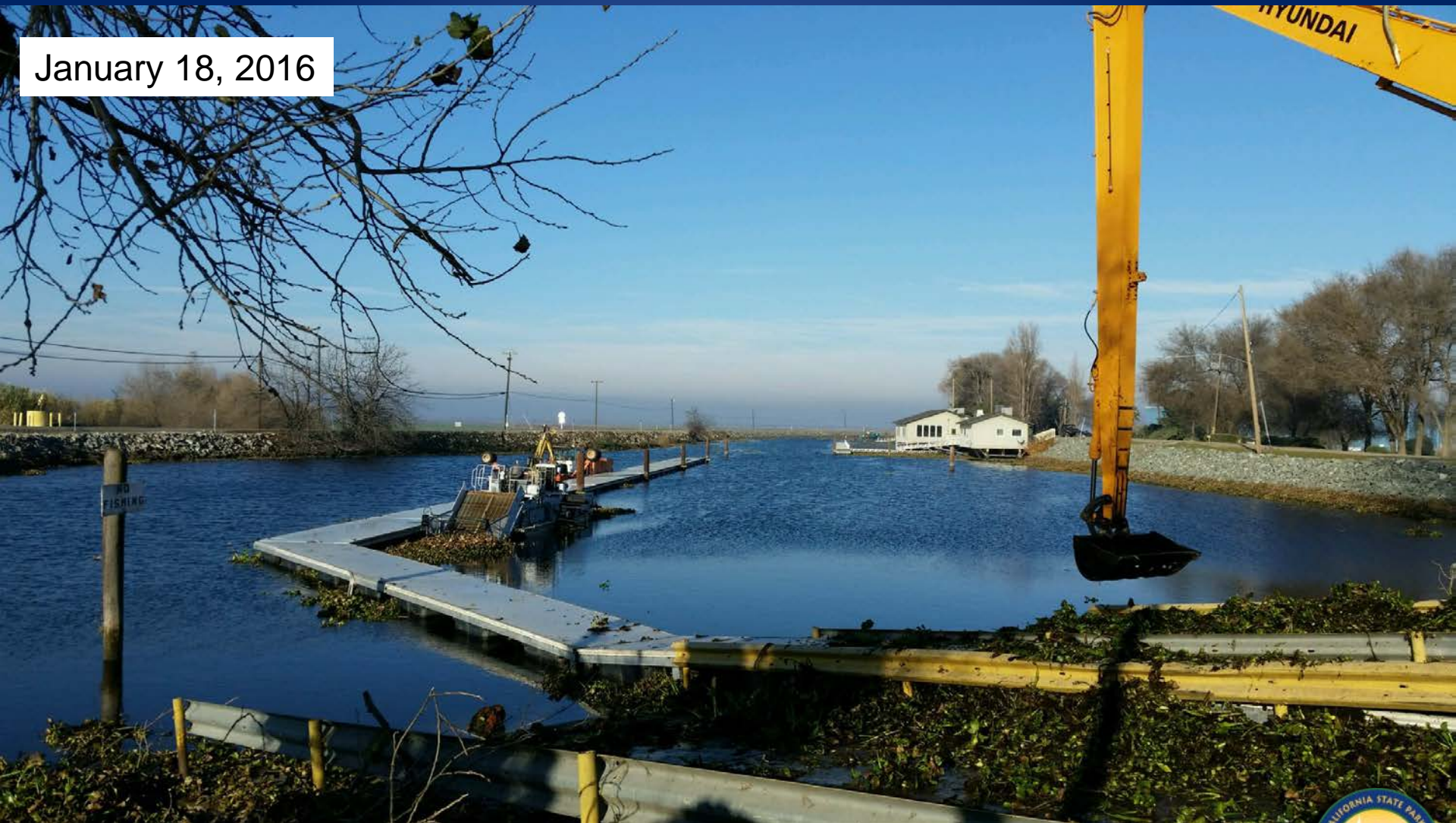
# Whiskey Slough

December 4, 2015



# Whiskey Slough

January 18, 2016



Dec 4 , 2015 to Jan 29, 2016 – Removed ~18,147 cubic yards





# Snodgrass Slough

April 5, 2016



# Snodgrass Slough

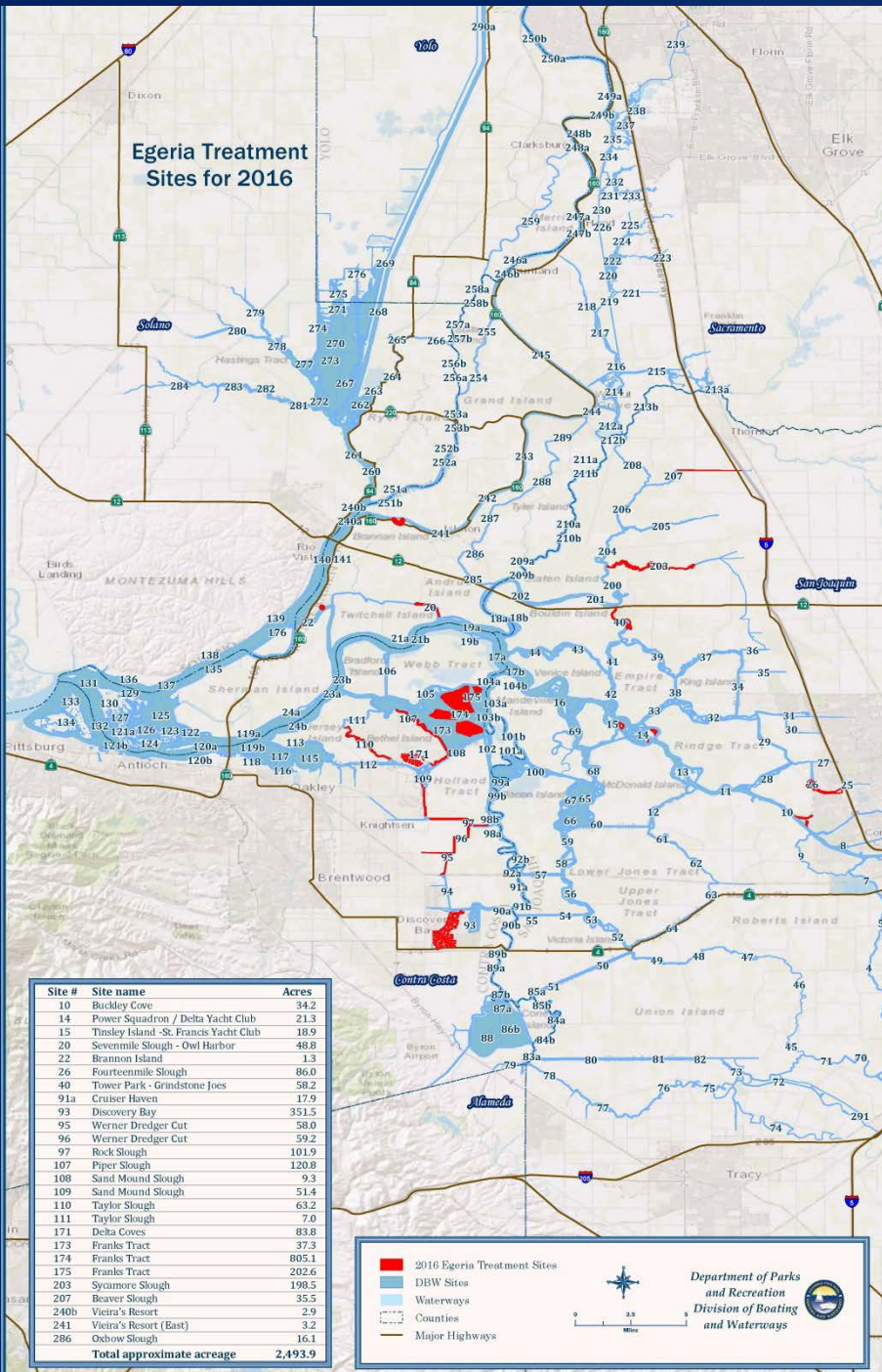
April 18, 2016



April 6 to April 29, 2016 – Removed ~ 6,075 cubic yards



**Egeria Treatment Sites for 2016**



# 2016 SAV Treatment Sites

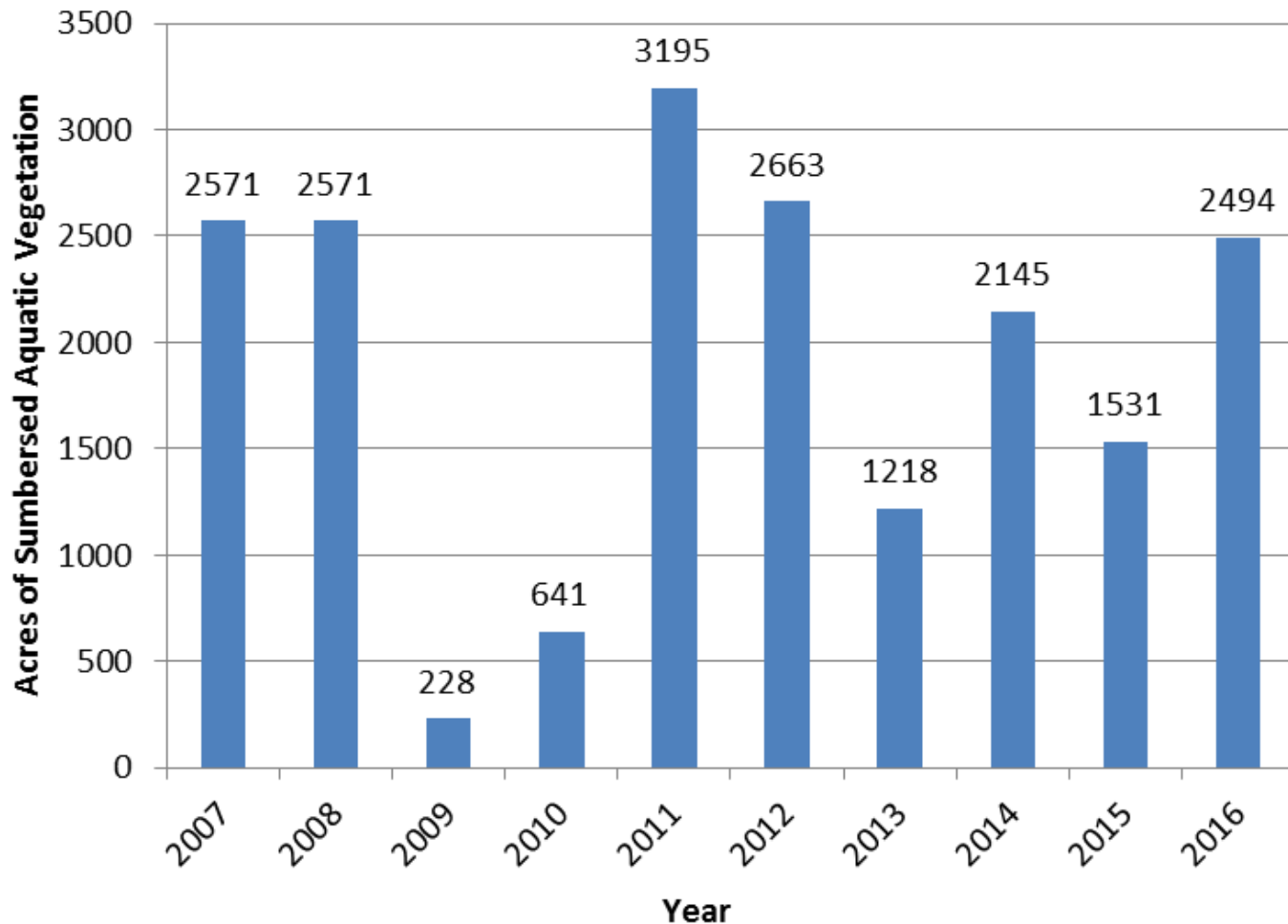
Site #	Site name	Acres
10	Buckley Cove	34.2
14	Power Squadron / Delta Yacht Club	21.3
15	Tusley Island - St. Francis Yacht Club	18.9
20	Sevensmile Slough - Owl Harbor	48.8
22	Brannon Island	1.3
26	Fourteenmile Slough	86.0
40	Tower Park - Grindstone Joes	58.2
91a	Cruiser Haven	17.9
93	Discovery Bay	351.5
95	Werner Dredger Cut	58.0
96	Werner Dredger Cut	59.2
97	Rock Slough	101.9
107	Piper Slough	120.8
108	Sand Mound Slough	9.3
109	Sand Mound Slough	51.4
110	Taylor Slough	63.2
111	Taylor Slough	7.0
171	Delta Coves	83.8
173	Franks Tract	37.3
174	Franks Tract	805.1
175	Franks Tract	202.6
203	Sycamore Slough	198.5
207	Beaver Slough	35.5
240b	Vicira's Resort	2.9
241	Vicira's Resort (East)	3.2
286	Oxbow Slough	16.1
<b>Total approximate acreage</b>		<b>2,493.9</b>

■ 2016 Egeria Treatment Sites  
■ DBW Sites  
■ Waterways  
 Counties  
— Major Highways

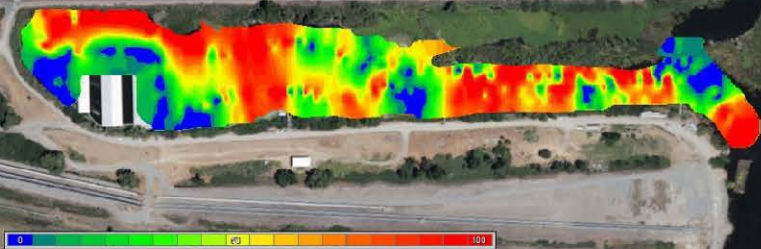
Department of Parks and Recreation  
 Division of Boating and Waterways



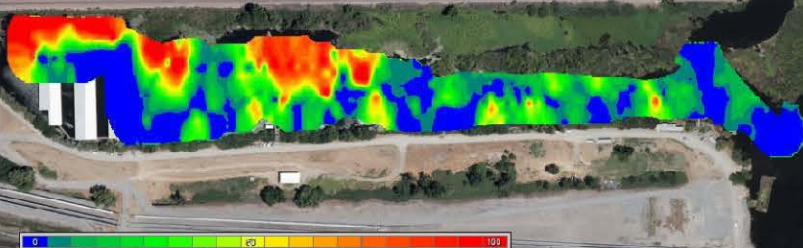
# SAV Program Acreage Through 2016



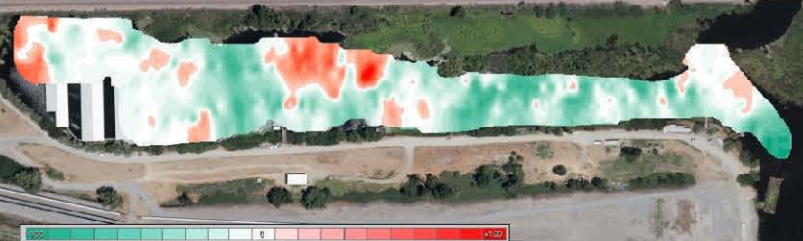
Cruiser Haven Pre-Treatment 02/04/2016  
Mean Percent Biovolume: 48.33



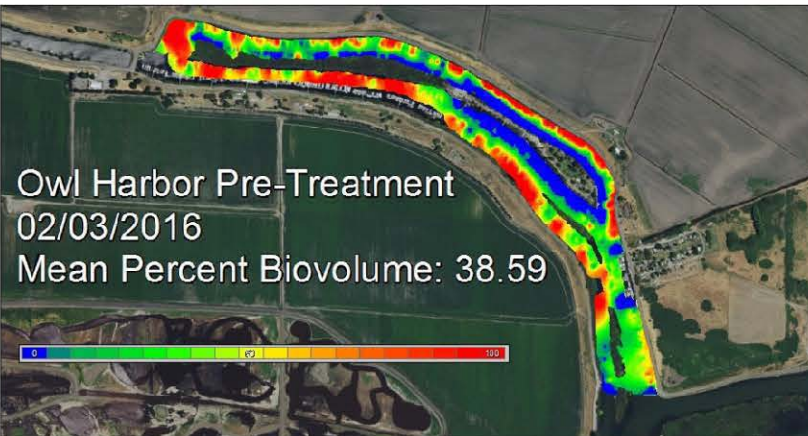
Cruiser Haven Post-Treatment 10/02/2016  
Mean Percent Biovolume: 25.78



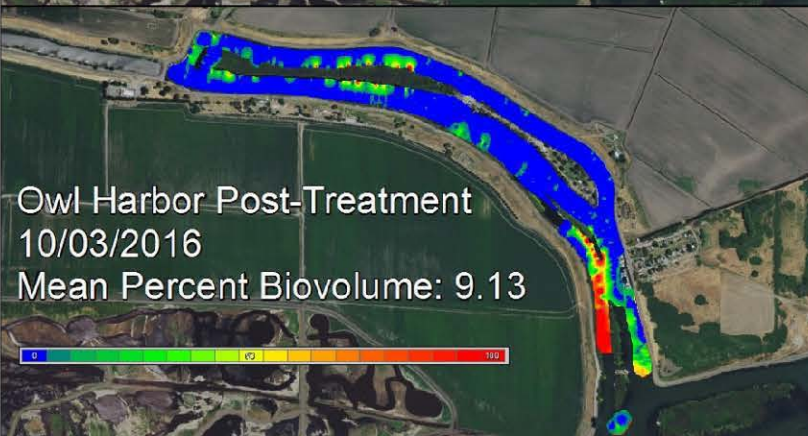
Mean Percent Biovolume Reduction: - 22.15



Owl Harbor Pre-Treatment  
02/03/2016  
Mean Percent Biovolume: 38.59



Owl Harbor Post-Treatment  
10/03/2016  
Mean Percent Biovolume: 9.13



Mean Percent  
Biovolume Reduction: - 29.25

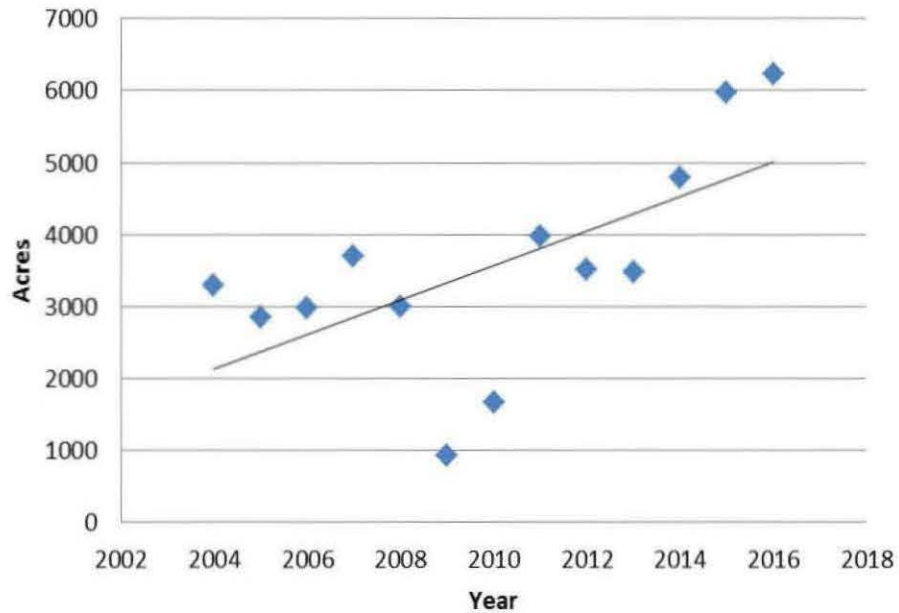


Provisional data

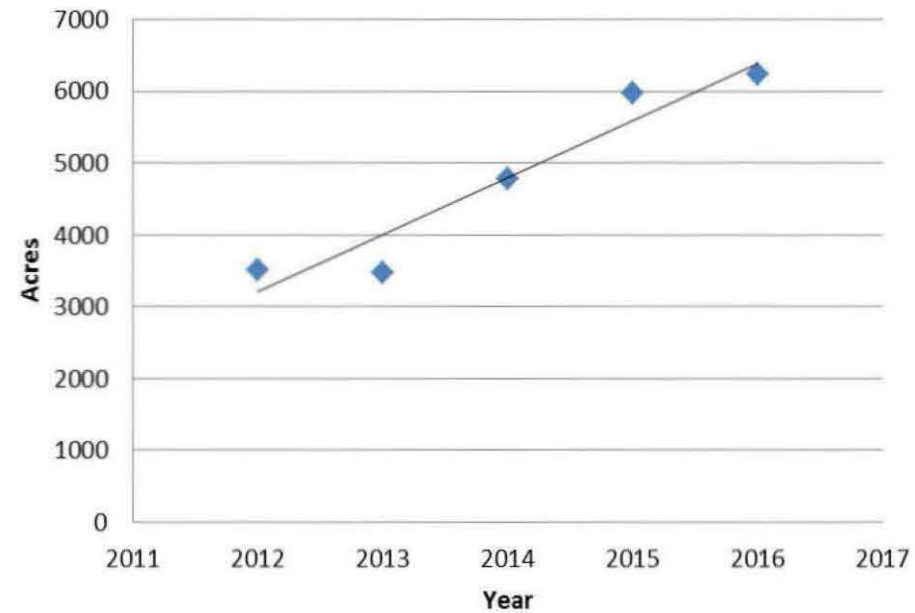


# Overall Performance

## FAV + SAV Treated Acres by Year



## FAV + SAV Treated Acres - Last 5 Years



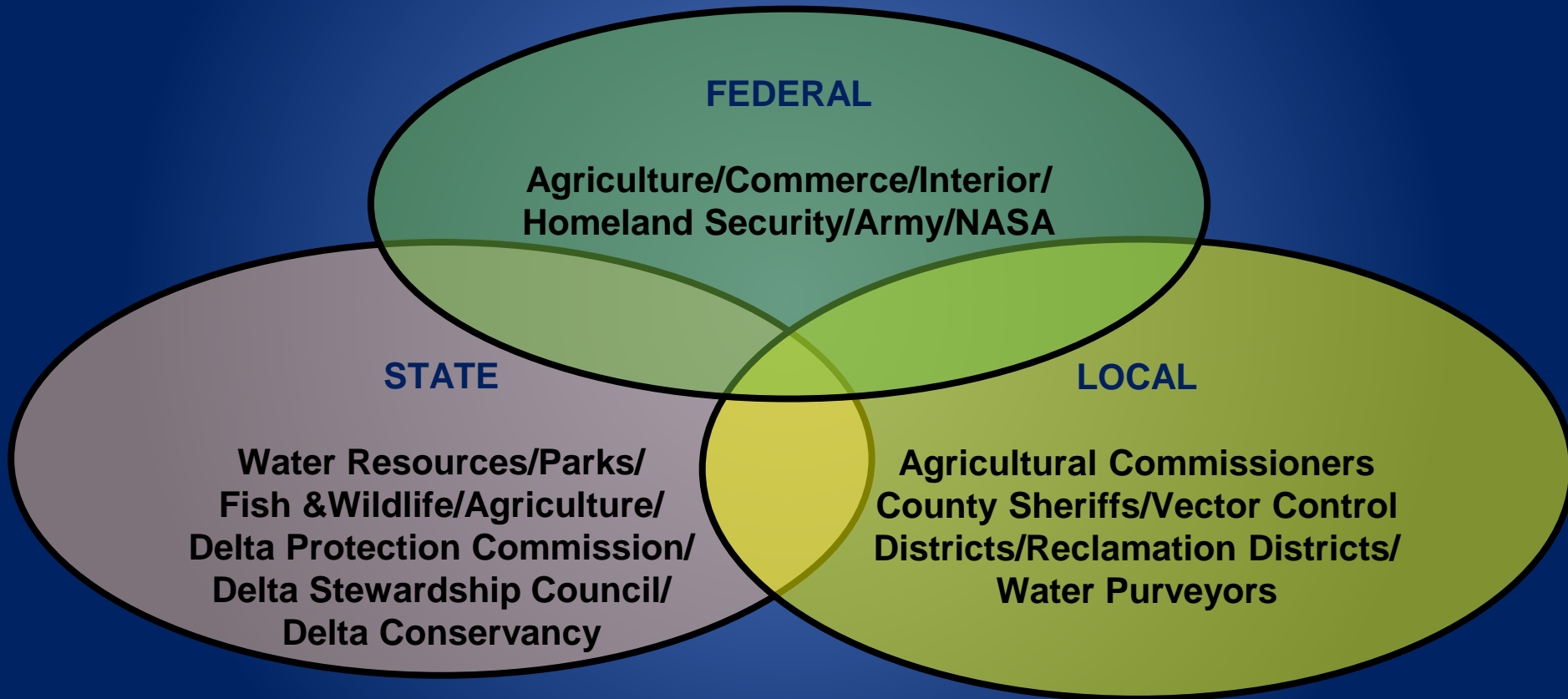
# Toxicology Study

- Goal: Determine toxicological effects of new herbicides and adjuvants on Delta Smelt and their food web.
- Timing: Project initiated in 2014, hope to complete in 2017
  - Acute and chronic effects of herbicides and adjuvants to delta smelt life stages
  - Interactive effects of herbicide + adjuvant mixtures
  - Herbicide Toxicity Comparison
  - Food Web Investigation (96-hr assays)
    - Copepod (*Eurytemora affinis*)
    - Diatom (*Thalassiosira pseudonana*)

<b><u>LC50 vs Application Rates</u></b>	
Glyphosate	14,123x higher
2,4-D	3,354x higher
Fluridone	3,125x higher
Penoxsulam	2,548x higher
Imazamox	800x higher



# Leveraging Partnerships





# Summary

- Increased acreage of FAV control in 2015, similar trend in 2016
- Collaborative opportunities increase knowledge and tools to benefit program and encompass IAM approach
- New and more resources
- Growing partnerships
- New, smarter approaches



# Questions?



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