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## NOTES

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## NEW VEGETATION SURVEY METHODOLOGY FOR THE SUISUN MARSH

Cassandra Enos, DWR

### INTRODUCTION

A new vegetation survey methodology has been developed to characterize the overall vegetation composition of the Suisun Marsh. This new methodology was developed by the California Department of Fish and Game (DFG) Habitat Conservation Division and reviewed and approved by the Suisun Marsh Preservation Agreement Environmental Coordination Advisory Team (ECAT) (DFG 1999). It will incorporate data from aerial photographs, satellite images, and field vegetation surveys into a geographic information system to create an accurate vegetation map of the marsh. The SMPA agencies are implementing this new methodology for the first time in Suisun Marsh during summer 1999.

### BACKGROUND

As part of the Suisun Marsh Preservation Agreement (SMPA) monitoring program, the California Department of Water Resources (DWR) conducted vegetation surveys conducted to better understand the overall vegetation composition of the Suisun Marsh, including habitat of the federal- and State-endangered salt marsh harvest mouse (SMHM) (*Reithrodontomys raviventris halicoetes*), using aerial photography in combination with ground verification. An initial vegetation survey was conducted in 1981 to provide a baseline for future vegetation surveys. Additional vegetation surveys were carried out in the Suisun Marsh in 1988, 1991, and 1994 to observe changes in vegetation composition over time.

In 1996, an interagency technical committee was convened to review the current survey methodology and recommended a more detailed monitoring system for vegetation changes within the marsh. The committee identified the following limitations: (1) the lack of useful maps from the 1988, 1991, and 1994 surveys; (2) the past methodology was not based on a habitat classification system such as that used in the California Wildlife Habitat Relationship System; and (3) use of inappropriate methods for calculating the acreages of each habitat type. Consequently, in July 1997, the committee agreed to implement a new survey methodology for the next vegetation survey.

Development of the new survey methodology was facilitated by the SMPA ECAT. The ECAT is a multi-agency team formed to ensure compliance with mitigation and monitoring requirements of the SMPA, and to provide technical guidance and oversight of Suisun Marsh monitoring, management and restoration programs conducted as part of the SMPA. Participants in the ECAT include the US Bureau of Reclamation (USBR), DWR, DFG, US Fish and Wildlife Service, National Marine Fisheries Service, US Army Corps of Engineers, and Suisun Resource Conservation District. The new methodology was developed by DFG staff and reviewed and approved by ECAT members.

### SURVEY METHODOLOGY

The Suisun Marsh vegetation surveys were originally intended to answer specific questions required by permits and the SMPA. With new technology it is now possible to meet the original needs of the vegetation survey and fulfill additional data needs. This new methodology is based on work by DFG's Wildlife and Habitat Data Analysis Branch at Anza-Borrego Desert State Park, Point Reyes National Seashore, and the Mojave Desert. The proposed survey methodology is designed to document changes in preferred habitat for the SMHM, and gather vegetation data in such a way that it can be used for a variety of other purposes, including correlating management activities with vegetation changes, gathering data to support the use of a geographic information system (GIS) format, and creating a base vegetation map for future studies. By incorporating vegetation data into a GIS, it is possible to create a single vegetation map for the Suisun Marsh that provides an accurate characterization of vegetation types and acreages of each. The vegetation map and database will

allow easy access to vegetation data, change detection, and determination of underlying influences of vegetation. It will also allow queries and overlaying additional information such as soil type and hydrology.

The vegetation map will be constructed through the interpretation of aerial photographs, field investigations, vegetation classification, and GIS processing. Vegetation throughout the project area will be sampled and characterized during field visits. Vegetation sampling and classification methods will be based on a Vegetation Sampling Protocol developed by the California Native Plant Society (CNPS) Vegetation Committee. The CNPS sampling method uses variable-sized relevé plots centered in representative vegetation stands based on aerial photograph delineations. The number of samples per vegetation stand are determined in the field and depend on the size and floristic variability of the stand, the time available to the field team, and the proximity of other stands of the same vegetation type. The percent cover for each species is estimated according to vegetation strata.

The DFG will analyze the survey data using hierarchical classification techniques to develop a vegetation classification that lists and describes the vegetation types within the project area. Polygons are assigned final vegetation attributes and transferred to the GIS through a process which involves digitizing vegetation polygons, georeferencing the data, and editing the data for quality control.

Additional opportunities of this new methodology will be trend analysis using annual aerial and satellite surveys, and a responsive means to determine the need for repeat surveys of Suisun Marsh. The monitoring agreement for the SMPA requires mapping the entire marsh every third year. As a result of the short-term inconsistency of both natural and non-natural disturbance patterns, it is likely that the justifications for resurvey will vary significantly from year to year. The new methodology enables a rapid assessment protocol conducted on a yearly basis to determine the need and timing for a complete field resurvey.

The rapid assessment protocol requires acquisition of aerial photographs and satellite imagery of the marsh annually, stressing phenological congruence (flown at the same growth stage every year). These photographs will be checked for the overall percent of polygon change by a

trained photo-interpreter. Randomly selected polygons will be compared by observing new photos with overlays of the most recently produced map. If the percentage of polygons in the sample showing a major change is greater than a certain percent for any given year, or a certain cumulative percent for any given multiyear period then a complete resurvey will be conducted.

Under such a regime, resurvey could occur regularly after a major environmental disturbance over a period of years, or may not occur for several years during a stable phase. It is likely that additional information based on independent sampling of SMHM populations should be considered in the decision to resurvey. Based on consultation with biologists familiar with population dynamics of this species, a specific threshold could be developed. In addition, inquiries of land managers should be made to determine what, if any, land and water management shifts are expected to take place that may warrant resurvey.

### NEW SURVEY METHODOLOGY PRODUCTS

The products from this new vegetation survey will include the following:

- Complete and partial 7.5" US Geological Survey (USGS) Quadrangle hard copy vegetation maps.
- A color-coded legend with vegetation series and cross walks to other vegetation types.
- Digital files of each quadrangle map.
- Digital and hardcopy metadata.
- A final report including details of map accuracy, mapping methods and standards, a final listing of vegetation types mapped with an acreage summary, and a delineation of SMHM habitats. The report will also include recommendations for efficient remapping of the marsh.

This new methodology is being implemented in the 1999 Suisun Marsh vegetation survey, funded by DWR and USBR. Aerial photographs and satellite images of the marsh were taken in mid-June, and vegetation field surveys are expected to begin in mid-July. The DFG will dis-

tribute final results from the initial field survey by November 2000.

**REFERENCES**

[DFG] California Department of Fish and Game. 1999. The Vegetation Survey for the Suisun Marsh Proposal for a New Methodology. Sacramento (CA): California Department of Fish and Game. 13 p.

**ANNOUNCEMENTS**

**8TH ANNUAL PACIFIC NORTHWEST FISH SCREENING AND PASSAGE WORKSHOP  
14 TO 16 SEPTEMBER 1999, RED BLUFF, CALIFORNIA**

This is the first announcement of the 8th Annual Pacific Northwest Fish Screening and Passage Workshop. If you are interested in attending, please indicate your interests from the items listed below, include your name, telephone number, address, and E-mail address, and mail a copy of this form to Dan B. Odenweller, California Department of Fish and Game, 4001 N. Wilson Way, Stockton, California, 95205.

- I am interested in attending the workshop.
- I am interested in exhibiting at the workshop.
- I would be interested in a social evening and barbecue.
- I would be interested in an afternoon raft trip to the barbecue site.
- I would be interested in an extra cost trip to see the CVP and SWP fish facilities in the south Delta ( ) Monday 9/13, or ( ) Friday 9/17.
- I would be interested in seeing the new screen and ladder projects on Butte Creek.
- I would be interested in seeing the new Glenn-Colusa fish screen (3,000 ft<sup>3</sup>/s).
- I would be interested in seeing the Red Bluff Pump Test Facility and Red Bluff Diversion Dam.

**ANNUAL SALMONID WORKSHOP, 29 AND 30 SEPTEMBER 1999**

The Central Valley Salmonid Team is planning its annual workshop for 29 and 30 September at the Bodega Marine Laboratory. Randy Brown, Ken Lentz, and Serge Birk will be working with individual salmonid satellite team chairs (for example, genetics, Delta, San Joaquin, VAMP) to develop the agenda. Interested parties can contact Randy Brown (rbrown@water.ca.gov) for more information.

**DELTA INFLOW, OUTFLOW, AND PUMPING**

*Dawn Friend, DWR*

Figures 1 and 2 contain plots of some important flow and pumping measurements for the second quarter of calendar year 1999 (1 April through 23 June). A few notes:

- Sacramento and San Joaquin River flows are measured. Delta Outflow is calculated by DWR's Division of Operations and Maintenance.
- Export/Inflow ratios are calculated from a 14-day running average over the period shown.
- In response to high numbers of delta smelt entrained at the SWP pumping facility, pumping was reduced to less than 1000 ft<sup>3</sup>/s beginning 30 May.

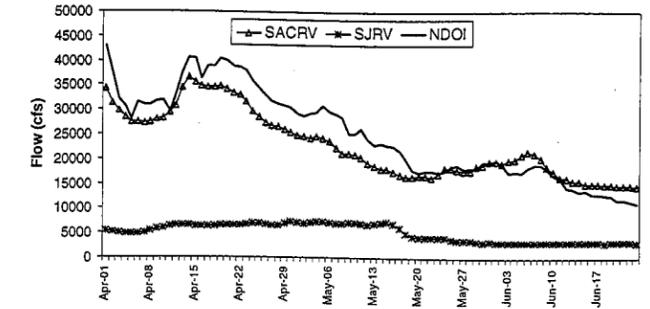


Figure 1 Sacramento and San Joaquin flows and Delta Outflow Index for 1 April through 23 June 1999

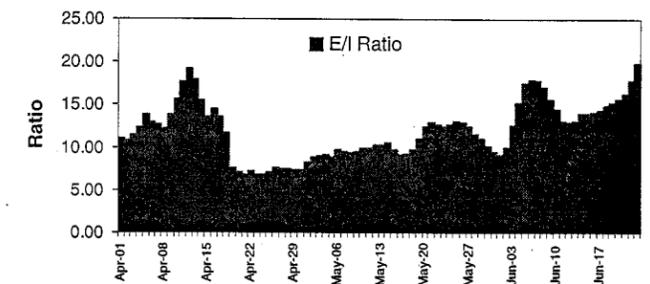
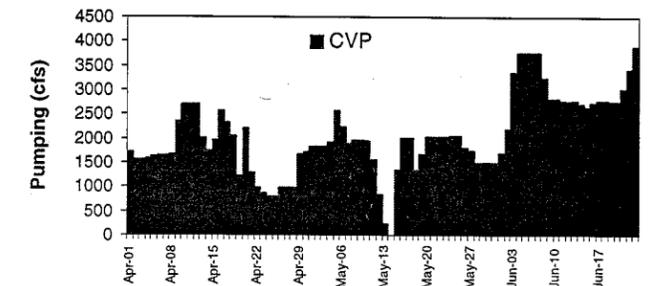
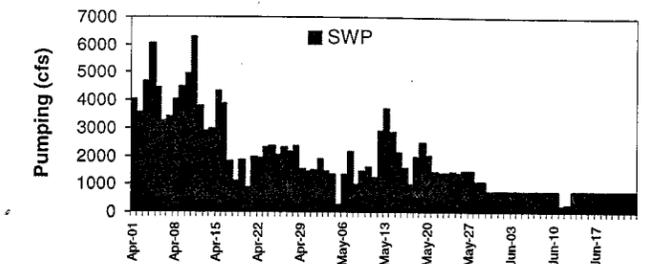


Figure 2 Sacramento and San Joaquin flows and Delta outflow for 1 April through 23 June 1999