

# *Implementing Strategies for Wildlife and Habitat Objectives for the Sacramento River National Wildlife Refuge Comprehensive Conservation Plan*

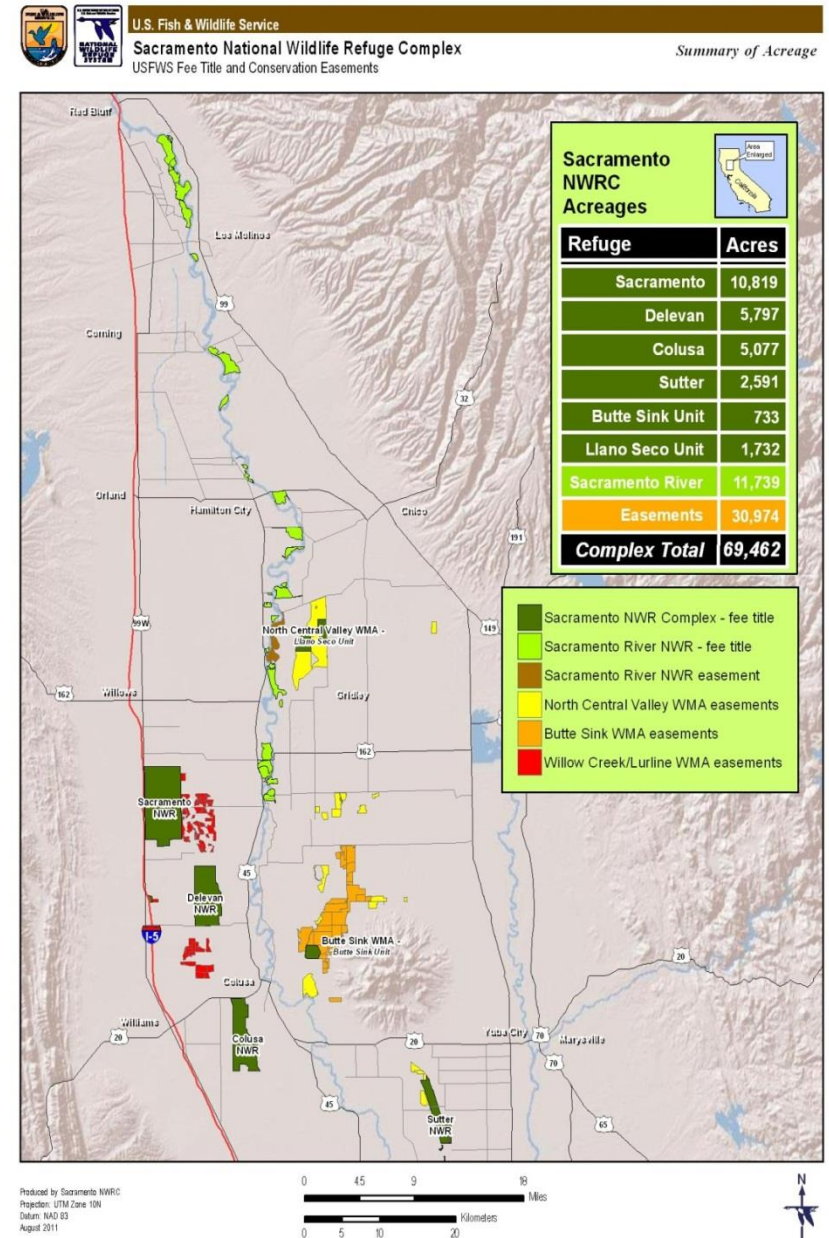
Joe Silveira  
Kelly Moroney  
Sacramento National Wildlife Refuge Complex

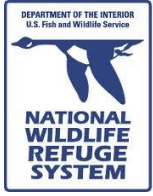


Middle Sacramento River Science Conference  
June 3-4, 2013

# Sacramento River National Wildlife Refuge

- Established in 1989
- 18,000 acres authorized between Red Bluff and Colusa (Tehama, Glenn, Butte, and Colusa counties)
- Acquire flood-prone agricultural lands on the 100-year floodplain





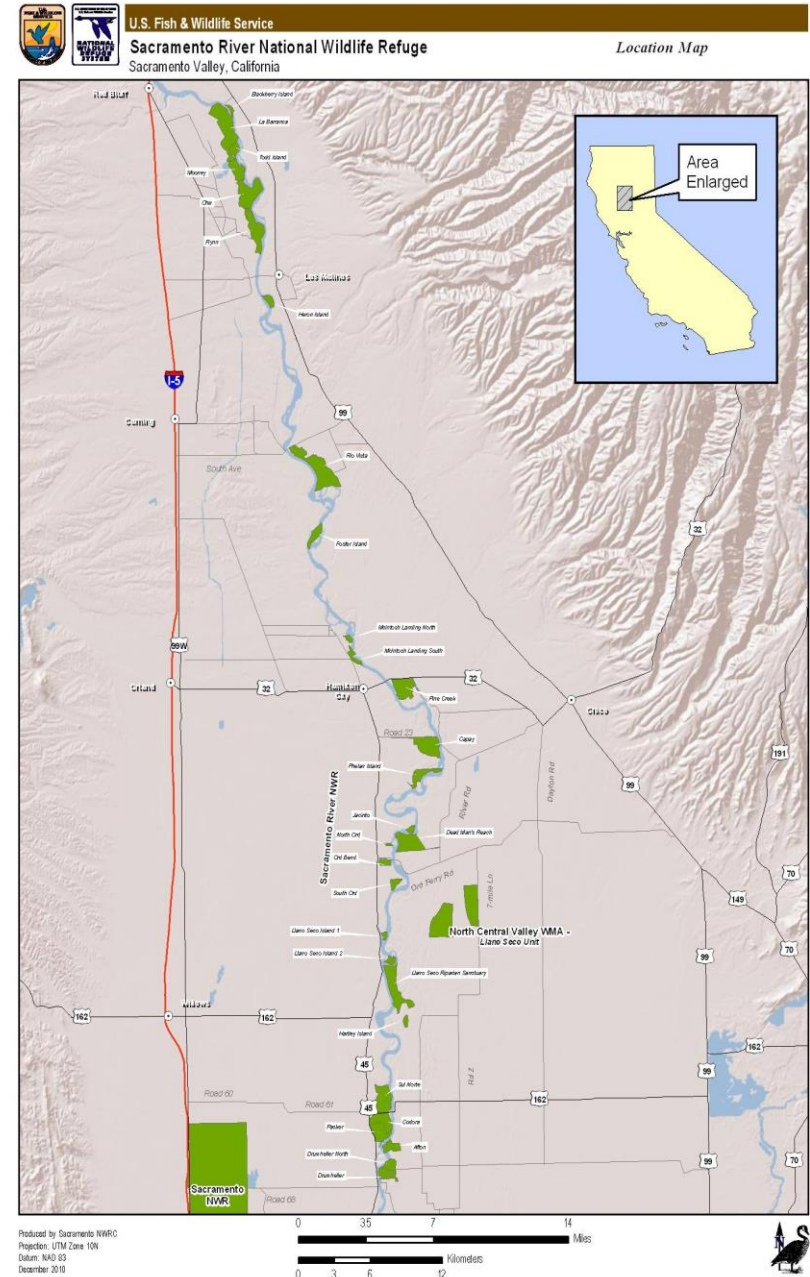
# Purpose of the Refuge

- Conserve endangered and threatened species (In 1989, winter-run Chinook salmon, Valley elderberry long-horned beetle, Least Bell's Vireo, American Bald Eagle) and their habitats
- Provide riparian/floodplain wetland habitat for migratory bird conservation
- Manage for fish, wildlife and native plant resources



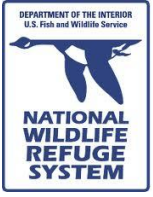
# Sacramento River National Wildlife Refuge

- 10,235 acres acquired scattered along a 77 miles reach of the Sacramento River
- Currently 29 Units
- Existing land uses of riparian habitat, restored riparian habitat, production orchards, row crops & fallow lands





# Sacramento River National Wildlife Refuge



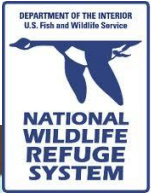
## Planned Refuge Management Programs

### **Wildlife and Habitat Goal**

*Contribute to the recovery of endangered and threatened species and provide a natural diversity and abundance of migratory birds and anadromous fish through the restoration and management of riparian habitats along the Sacramento River using the principles of Landscape Ecology*



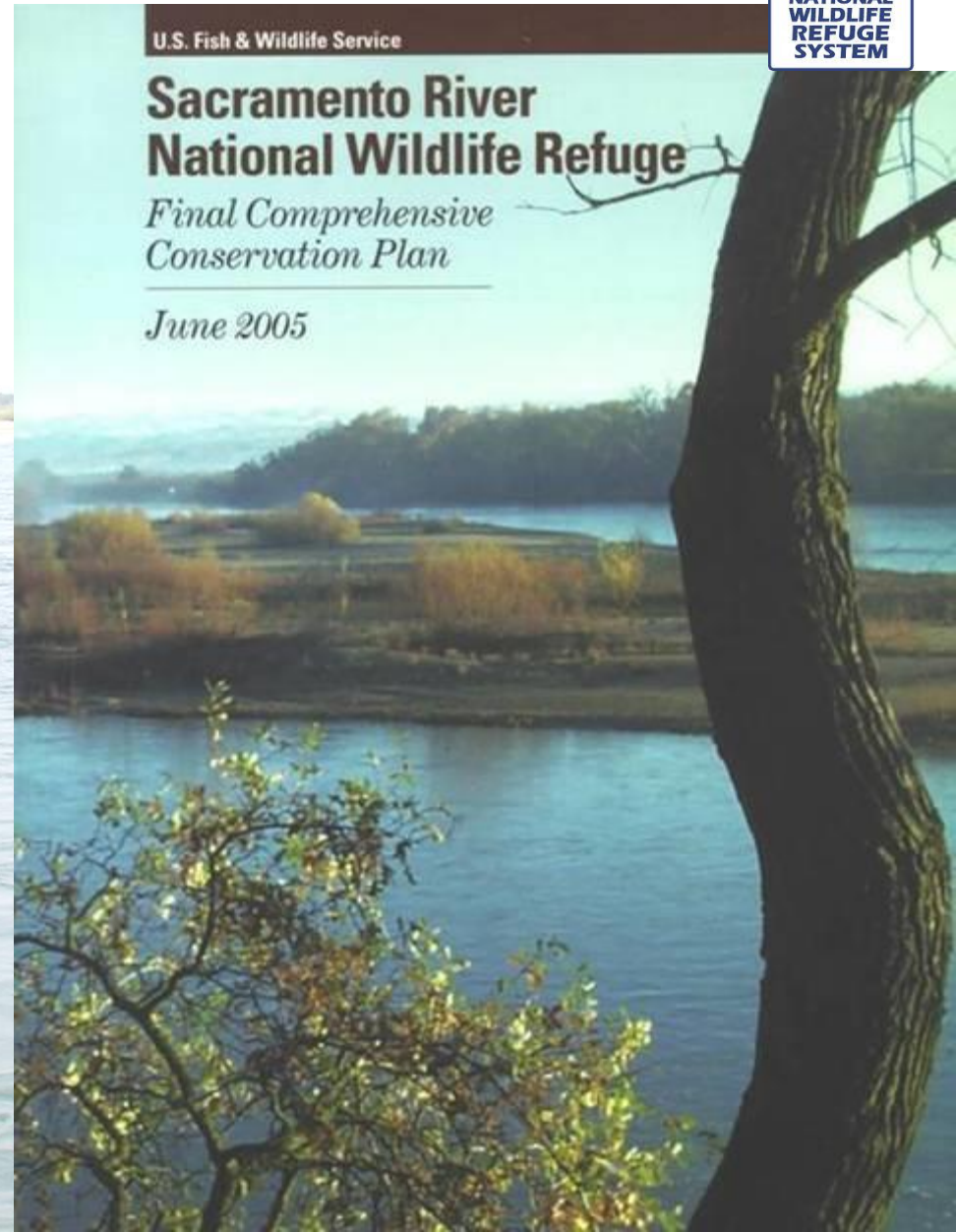
# Sacramento River National Wildlife Refuge



## Objectives for the Wildlife & Habitat Goal

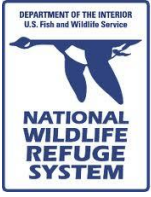
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1. Riparian Vegetation & Habitat
2. Floodplain & River Processes
3. Threatened & Endangered Species
4. Migratory & Resident Landbirds
5. Winter Migratory Landbirds
6. Waterfowl & other Waterbirds
7. Anadromous & Native Fisheries
8. Native Plant Species
9. Exotic, Invasive Species Control
10. Wildlife & Cultural Sanctuary





# Sacramento River National Wildlife Refuge



## *Riparian Vegetation and Habitat Strategies*

- Develop site assessment and restoration plans following the principles of Landscape Ecology
  - ~ Restore mid- and high-elevation floodplain riparian vegetation and habitat
  - ~ Incorporate habitat requirements for threatened and endangered species into restoration plans
- Maintain CLMA to administer the agricultural and restoration programs
- Maintain, monitor and evaluate restoration sites to provide high quality habitat
- Continue to explore potential habitat restoration sites at the Refuge

## Site Preparation, Planting

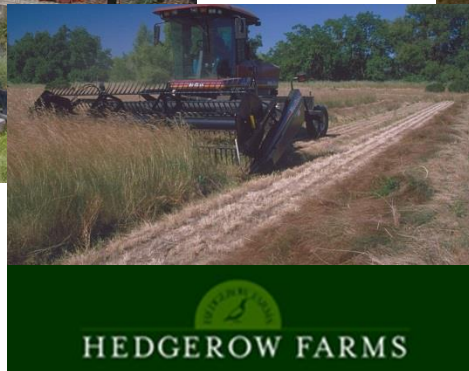
### Seed & Cuttings of Local Ecotypes



### Nursery Propagation



### and Maintenance







# Sacramento River National Wildlife Refuge Acreage

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## Natural Riparian Lands

*Forest, scrub & herb land, sand & gravel* 4,436

## Agriculture Lands

*Walnut & dryland crop* 520

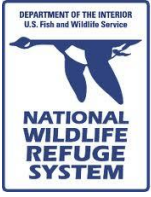
## Restoration Lands

*Cultivated restoration & natural recruitment* 5,279

**Total Acres** **10,235**



# Sacramento River National Wildlife Refuge



## *Floodplain and River Processes Strategies*

- Modify privately constructed levees, restore or enhance topographic features and other bank revetment features on Refuge land if supported by studies, associated hydrologic investigations, and NEPA/CEQA documentation
- Coordinate Refuge projects with USFWS-Ecological Services, US Army Corp of Engineers, NOAA-Fisheries, State Reclamation Board, CDFG, local irrigation districts, and affected groups
- Work with Federal State, county levee and irrigation districts to investigate best management practices for habitat, water diversion, and flood management projects
- Protect and manage Refuge lands within the 100-year floodplain to facilitate geomorphic and hydrologic processes that create and maintain fish and wildlife habitat



# Floodplain Restoration – SRNWR Flynn Unit



Refuge implements levee removal  
Summer/Fall 2001



Levee removal completed  
Fall 2001



October 2002  
Fall-run Chinook Salmon Spawn  
at levee removal site



Winter 2001- 02  
Sacramento River floods  
bank fills



June 2002 BANS Survey  
2,770 nest burrows  
at levee removal site

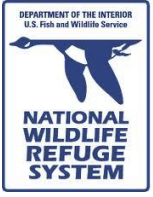


channel migrates





# Sacramento River National Wildlife Refuge



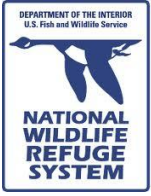
## Threatened & Endangered Species Strategies

- Valley Elderberry Longhorn Beetle
- Chinook salmon-Sacramento River winter-run ESU
- Chinook salmon-Central Valley spring-run ESU
- Chinook salmon-Central Valley fall-run & late fall-run ESU
- Steelhead-Central Valley spring-run ESU
- Green Sturgeon Southern DPS
- Giant Garter Snake
- Least Bell's Vireo
- Willow Flycatcher
- Western Yellow-billed Cuckoo
- Swainson's Hawk
- Bank Swallow





# Sacramento River National Wildlife Refuge



Established in part to protect VELB & Contains largest patches of potential VELB habitat in Sacramento Valley



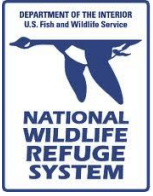
Largest patches of potential YBCU habitat in CA > 1000 hectare

Contained over 1/3 of the BANS colonies on the middle Sacramento River in 2007





# Sacramento River National Wildlife Refuge



## *Valley Elderberry Longhorn Beetle (VELB) Strategies*

### **Riparian Vegetation & Habitat Strategies**

Restore mid & high floodplain vegetation – include T&E spp. habitat requirements

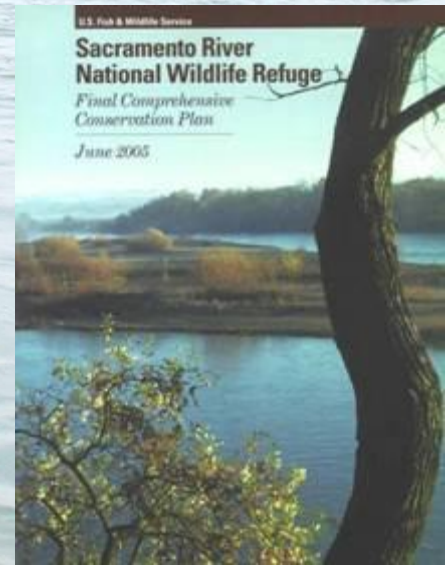
\* *Sambucus mexicana* host plant for VELB in mixed riparian forest, valley oak woodland & savanna, elderberry savanna

### **Floodplain & River Processes Strategies**

Promote recruitment of fish & wildlife habitat through cooperative investigations of overbank flooding, erosion, sediment deposition, channel migration

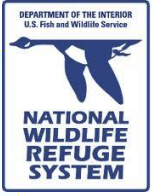
### **Threatened & Endangered Species Strategies**

- Conduct VELB Population Monitoring
- Support Cooperative VELB Research at the Refuge





# Sacramento River National Wildlife Refuge



## Elderberry Savanna – Ord Bend Unit



*Sambucus mexicana*

Valley Elderberry Longhorn Beetle (VELB)  
*Desmocerus californicus dimorphus*



1 cm

1990 – 2012: 114,420 elderberry shrubs planted

# The effects of host plant quality and associated vegetation on colonization rates of the Valley Elderberry Longhorn Beetle



Meghan Gilbert & Colleen Hatfield



- *Age* and *Cover* are important variables influencing *Shrub Health* and *VELB Occupancy*
- Dense vegetation cover is associated with high percent dead biomass of elderberry shrubs
- Shrubs with highest amounts of dead biomass are not used by VELB
- VELB occupancy increases with the age of restoration sites
- VELB occupancy not associated with cottonwood and willows



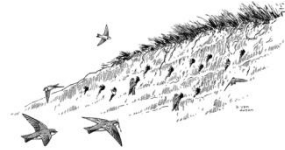
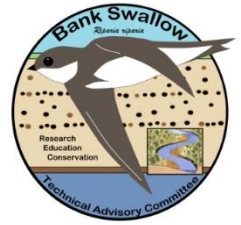


# Habitat Characteristics of Western Yellow-billed Cuckoo in Restored Riparian Forests on the Sacramento

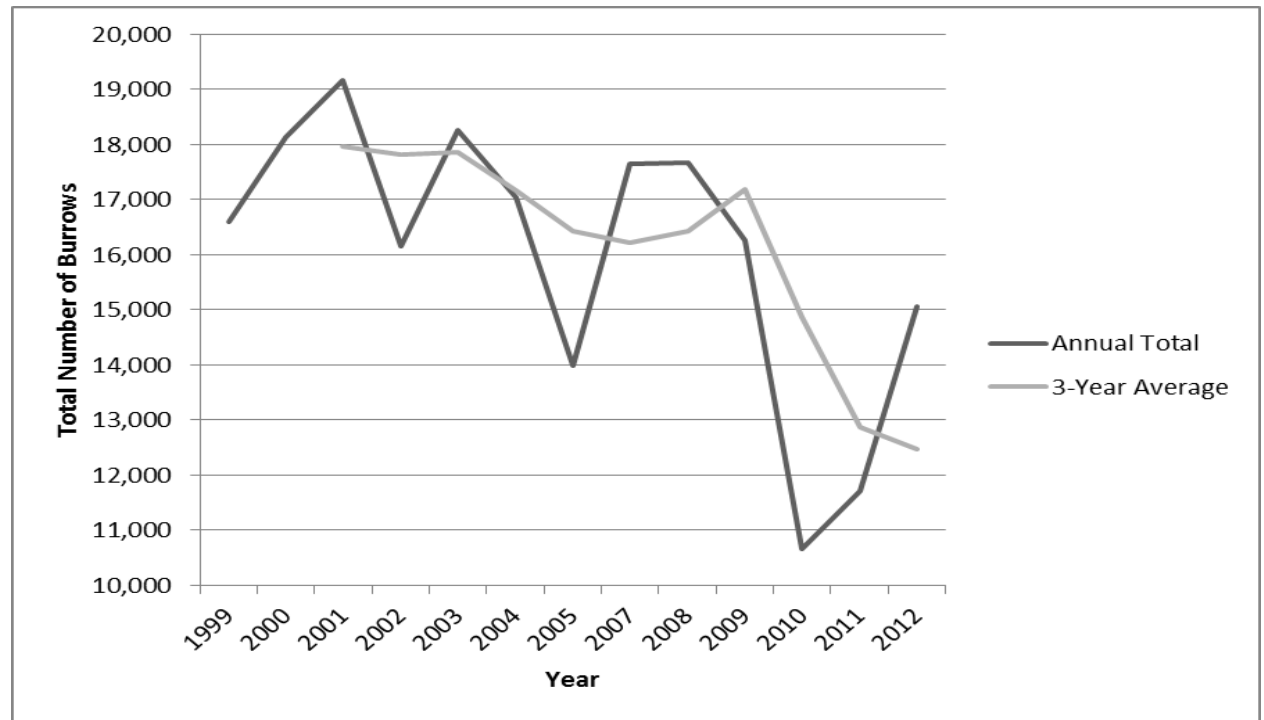
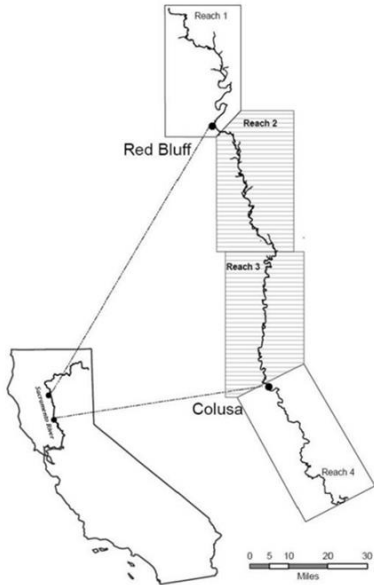
Jessica Hammond & Colleen Hatfield

- Present in restoration sites
- Closed canopy Cottonwood Forest &
- Mixed Riparian Forest with Cottonwood or Sycamore
- Shrub layer with Arroyo Willow;
- length of shrub patch was important
- Proximity to oxbow meander loop cut-off





# 1999 – 2011 Results Annual Bank Swallow Survey Sacramento River Red Bluff (RM 243) to Colusa (RM 143)





# Soil Sampling at Bank Swallow Colonies Sacramento River



Yellow = Use area (burrows)

Soil Textures: Sand, Loamy sand, sandy loam, loam

Clay range: 1-15 %

Blue = Non-use area

Soil Textures: Sandy loam, Loam, Silt loam

Clay range: 10-20 %



Dean W. Burkett  
 Chico Soil Survey



# Spatial and Temporal Patterns of the Bank Swallow on the Sacramento River

Colony Size, Persistence,  
Over Bank Vegetation, Flows, Sinuosity

Dawn Garcia & Coleen Hatfield

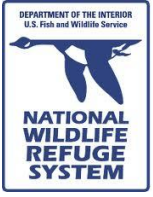


- Fewer, larger colonies in Reach 2
- Smaller more abundant Colonies in Reach 3
- Number of burrows in Reach 2 & Reach 3 **not** significantly different
- Larger colonies more persistent ~ but subject to catastrophic loss
- Smaller more frequently established ~ very dynamic
- Colonies located below grasslands showed the greatest persistence, followed by riparian habitat
- Colonies located below orchards were the least persistent ~ greater erosion than in forests/grasslands; increased burrow disturbance (irrigation, mowing vibration)





# Sacramento River National Wildlife Refuge



## *Breeding Migratory & Resident Landbirds Strategies*

- Restore mid- and high-elevation floodplain riparian vegetation using habitat features identified in California Partners for Flight/Riparian Habitat Joint Venture Riparian Bird Conservation Plan
- Coordinate with USFWS Office of Migratory Bird Management, California Partners in Flight, Riparian Habitat Joint Venture, PRBO, and other partners to monitor focal species productivity at restored and native riparian sites to evaluate and adapt restoration design and management practices to enhance habitat for these species
- Annually evaluate breeding species diversity and abundance at sites under habitat restoration and planned for restoration to adapt restoration management and design for riparian focal species
- Conduct Sacramento River main channel surveys for nesting Osprey and other visible nesting species (Belted Kingfisher burrows)



AP / Steve Yeater



## Abundance Patterns of Landbirds in Restored and Remnant Riparian Forests on the Sacramento River, California, U.S.A.

Thomas Gardali,<sup>1,2</sup> Aaron L. Holmes,<sup>1</sup> Stacy L. Small,<sup>3</sup> Nadav Nur,<sup>1</sup> Geoffrey R. Geupel,<sup>1</sup> and Gregory H. Golet<sup>4</sup>

### Abstract

Riparian vegetation along the Sacramento River—California's largest river—has been almost entirely lost, and several wildlife species have been extirpated or have declined as a result. Large-scale restoration efforts are focusing on revegetating the land with native plants. To evaluate restoration success, we conducted surveys of landbirds on revegetated and remnant riparian plots from 1993 to 2003. Our objectives were to estimate population trends of landbirds, compare abundance patterns over time between revegetated and remnant riparian forests, and evaluate abundance in relation to restoration age. Of the 20 species examined, 11 were increasing, 1 was decreasing (Lazuli Bunting [*Passerina amoena*]), and 8 showed no trend. The negative trend for Lazuli Bunting is consistent with information on poor reproductive success and with Breeding Bird Survey results. There was no

apparent guild association common to species with increasing trends. Nine species were increasing on revegetated and remnant plots, four were increasing on revegetated plots only, three were increasing on remnant plots only, the Lazuli Bunting was decreasing on both, and three species were stable on both. Although many species were increasing at a faster rate on revegetated plots, their abundance did not reach that of the remnant plots. For revegetated plots, "year since planting" was a strong predictor of abundance trends for 13 species: positive for 12, negative for 1. Our study shows that restoration activities along the Sacramento River are successfully providing habitat for a diverse community of landbirds and that results from bird monitoring provide a meaningful way to evaluate restoration success.

**Key words:** birds, California, Central Valley, indicator, monitoring, restoration, riparian, Sacramento River.

### Introduction

The Sacramento River—California's largest river—has been severely impacted by a wide variety of activities including habitat conversion, water diversion and regulation, mining, pollution, and the introduction of nonindigenous invasive species. The once vast riparian forests have been reduced to small, widely spaced, remnant patches, and it is estimated that only about 2% of the original forest area remains (Katibah 1984). Furthermore, massive changes to the natural hydrologic regime have rendered this once dynamic system relatively stable. Historically, the river would regularly break its banks, meander up to several kilometers over the course of a single year, and inundate thousands of hectares. The result was a mosaic of habitat types that included seasonal and permanent wetlands, oxbow lakes, and forests in a dynamic array of seral stages (Katibah 1984; Mount 1995).

Paralleling the loss and degradation of habitat and ecosystem function have been the loss and decline of numerous wildlife species in the Sacramento Valley. For example, Thick-tailed chub (*Gila crassicauda*), Least Bell's Vireo (*Vireo belli pusillus*), and Willow Flycatcher (*Empidonax traillii*) have been extirpated. The abundance of Chinook salmon (*Oncorhynchus tshawytscha*) has declined more than 75% since the 1950s (Yoshiyama et al. 1998), and both the winter and spring runs have federal U.S. status (endangered and threatened, respectively). Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), endemic to upland riparian areas of California's Central Valley, was listed as federally threatened in 1980. Two birds that still breed in the Sacramento Valley have been listed as state threatened (Bank Swallow [*Riparia riparia*]) and state endangered (Western Yellow-billed Cuckoo [*Coccyzus americanus occidentalis*]).

Despite the degraded condition of the Sacramento River system, opportunities for its restoration exist (Griggs 1993). In 1988 The Nature Conservancy, U.S. Fish and Wildlife Service, California Department of Fish and Game, and the California Department of Parks and Recreation launched the Sacramento River Project (SRP), which aims to restore the riparian ecosystem from Red Bluff to Colusa (Fig. 1; Golet et al. 2003). In general, the

<sup>1</sup> PRBO Conservation Science, 3020 Cypress Drive #11, Petaluma, CA 94954, U.S.A.

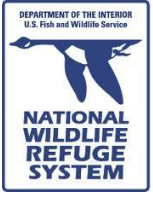
<sup>2</sup> Address correspondence to T. Gardali, email tgardali@prbo.org

<sup>3</sup> Division of Biological Sciences, University of Missouri, 105 Tucker Hall, Columbia, MO 65211, U.S.A.

<sup>4</sup> The Nature Conservancy, Chico, CA 95926, U.S.A.



# Sacramento River National Wildlife Refuge



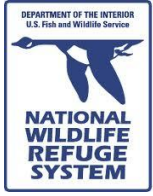
## *Waterfowl & other Waterbirds Strategies*

- Conduct Sacramento River main channel surveys for waterfowl and other waterbirds
- Coordinate with USFWS Office of Migratory Bird Management to conduct and report Sacramento River waterfowl populations surveyed during midwinter waterfowl survey
- Conduct and evaluate the results of annual colonial waterbird surveys to estimate breeding colony locations, sizes and productivity
- Survey, locate, map and protect heron, egret and cormorant rookeries



# Sacramento River Wildlife Surveys

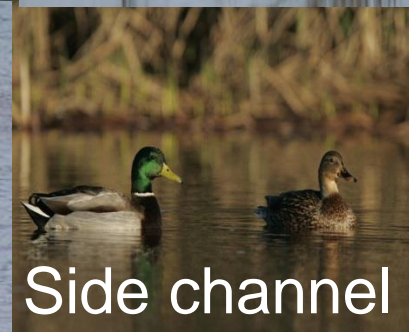
## Red Bluff (RM 243 – Princeton RM 164)



Winter– February 1–15 (target Feb 8– *waterfowl distribution*)  
Spring– April 16–30 (target Apr 22– *spring arrivals/nesting*)  
Late Spring– June 1–15 (target June 1– *spring nesting/broods*)  
Summer– August 1–15 (target Aug 1– *fall shorebird migration*)



Main channel

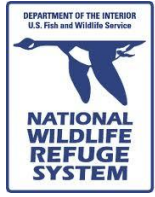


Side channel





# Sacramento River National Wildlife Refuge



## *Anadromous Fisheries and Native Fisheries Strategies*

- Restore mid- and high-elevation floodplain riparian forest to create shaded riverine aquatic habitat (SRA) important for temperature regulation and insect sources AND sources for large woody debris (LWD) important for aquatic fish habitat structure, fish prey food habitat, fish carcass entrapment, a source of marine derived nitrogen (MDN)

- Modify privately constructed levees, res bank revetment features on Refuge land channel and to ensure recruitment of spa Central Valley fall-run ESU Chinook salm



aphic features and other



- Enhance and restore slough and oxbow lake wetlands for sac native resident fishes that require warmer temperatures and slow

- Coordinate research investigations and monitoring at the Refug Demographics, habitat use and requirements and health of anad

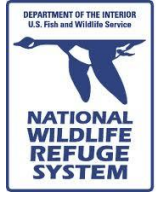


# La Barranca Unit Levee Breach Floodplain Fish Passage





# Sacramento River National Wildlife Refuge



## *Native Plant Species Strategies*

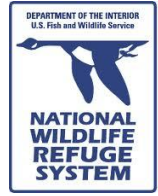
- Use plant materials (seeds, acorns, stem and leaf cuttings) for habitat restoration projects derived from local ecotypes of indigenous native plant populations to ensure conservation of natural diversity and re-vegetation success
- Identify, locate, map and conserve important and unique native plant populations and habitats, which includes reference sites for trees, shrubs, and grasses
- Annually evaluate plant species populations and research needs (grazing, burning, herbicide use)
- Update and maintain Refuge herbarium (plant specimens)
- Restore patches of native wildflowers, important for pollinators
- Support university botanical research of ecologists





# Sacramento River National Wildlife Refuge

## Native Plant Reference Sites



Llano Seco Floodplain Meadow

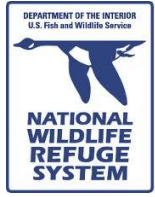


La Barranca Wildflower Gravelly Floodplain





# Sacramento River National Wildlife Refuge



## *Exotic, Invasive Species Control Strategies*

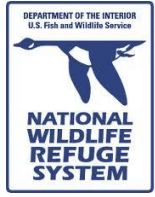
- Manage vegetation and habitat for desired species composition and population levels of native plant species: annually evaluate invasive species to be controlled; locate, map and monitor invasive exotics that may trigger management (prescribed grazing, prescribed fire, herbicide applications, and other mechanical removal methods such as discing and mowing)
- Conduct and support research to evaluate techniques for controlling target invasive plant species including prescribed grazing, prescribed fire, herbicide treatments, mowing, discing and weed tarping





# Sacramento River National Wildlife Refuge

## Vegetation Management—2013



Treatment	Refuge Units	Unit Cells	Acres
Burn	18	22	220
Mow/ chip	12	16	110
Disc/ grade	10	10	48
Rototill	2	2	12
Spray	24	60	540
Graze	13	32	3,130
<b>Total</b>			<b>4,060</b>

Rio Vista Unit  
Valley Oak Woodland Burn  
January 2012



Afton Unit  
*Arundo donax* Mapping  
August 2008

Llano Seco cattle  
grazing annual ryegrass  
enhances native  
perennial grasses



# RIPARIAN & FLOODPLAIN RESTORATION BENEFITS TO A DIVERSITY OF TAXA

## INSECTS

- Valley elderberry LB
- Ground-dwelling Beetles
- Bees

## BIRDS

- Landbirds

## SMALL MAMMALS

- Rodents
- Bats



Sacramento River NWR  
Monitoring & Research  
1992-2013  
~ 80 Projects



## VELB



- Health status of elderberry bushes at Cottonwood Forest & Mixed riparian Forest restoration sites
- Natural recruitment of elderberry bushes on the Sacramento River floodplain

## YBCU



- Current population distribution in the Sacramento Valley and California
- Habitat use

## BANS



- Alarming breeding population decline on the middle Sacramento River!
- Bank Swallow Technical Advisory Committee — Bank Swallow Conservation Plan
- Central Valley Joint Venture Breeding Riparian Songbird Focal Species

## Salmon & Sturgeon

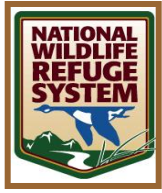


- Replacing flood-prone orchards with floodplain habitats reduces pesticide load
- Longterm effects of rocking middle Sacramento River!

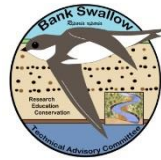


# Sacramento National Wildlife Refuge Complex

## Partnerships for Habitat Restoration Management & Conservation



**CALFED**  
**Bay-Delta Program**



**C & J Ohm Ranch**



**T Adams Livestock**

Like the Dude's carpet  
our CCP *ties "this" whole room together*

