



Sacramento River National Wildlife A Model for Multiple Benefits of Well-functioning Riparian Ecosystems

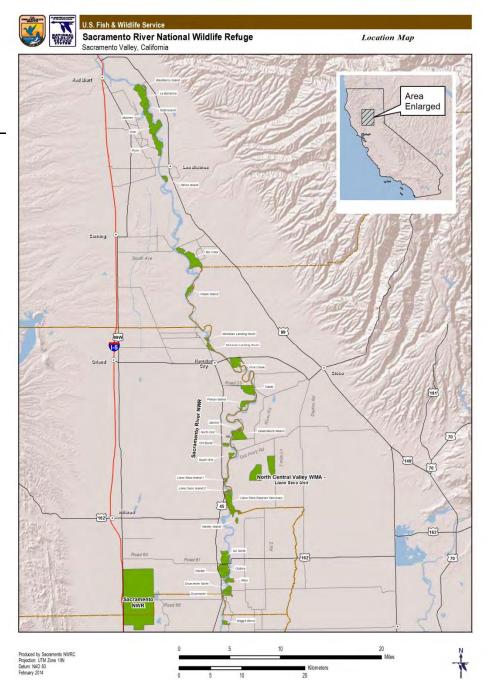
Joe Silveira, Tim Arendt, John Carlon, Adrian Frediani, Tom Gardali, Meghan Gilbart, Greg Golet, Tom Griggs, Jessica Hammond, Colleen Hatfield, Karen Holl, Ryan Luster, John Merz, Kelly Moroney, Luis Ojeda, Chris Parrez, Michael Rogner, Michael Singer, Garrett Spann, John Stella, Helen Swagerty, Dave Wood, Dawit Zeleke

UC Davis Riparian Summit October 18, 2017

Sacramento River National Wildlife Refuge Est. 1989

- Currently 31 Units
- 10,355 acres
- 81-mile reach within the 100-year floodplain
- Restored (5,360 ac) &
 Natural Lands (4,535 ac)

Willow scrub & herb land, CTW, MR & VO forests, VO woodland, VO & elderberry savannas, grasses & wildflowers





Purpose of the Refuge (Authorities)

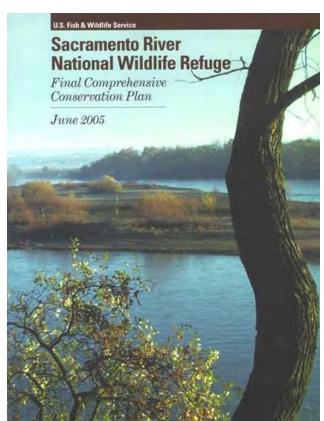


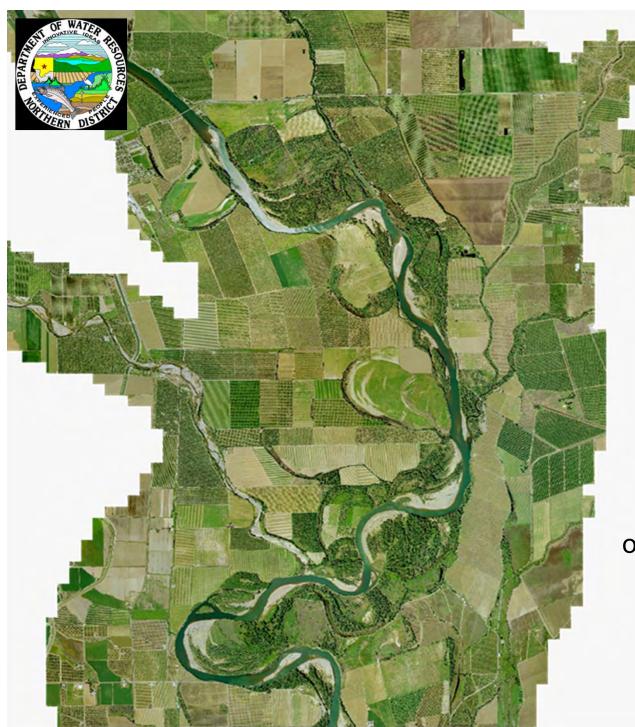
 Conserve endangered and threatened species (In 1989, winter-run Chinook salmon, Valley elderberry long-horned beetle, Least Bell's Vireo, American Bald Eagle) and their

habitats (*Endangered Species Act 1973*)

 Provide riparian/floodplain wetland habitat for migratory bird conservation
 (Emergency Wetland Resources Act 1986)

 Manage for fish, wildlife and native plant resources (Fish & Wildlife Act 1956)







Sacramento River

Reach 2 & 3

Sinuosity;
over-bank flooding,
erosion & deposition;
lateral channel migration,
floodplain re-working;
on-channel meander loops,
off-channel oxbow lakes,
floodplain sloughs

Recent alluvium has not yet developed pedogenic

"acquired" soil horizons— they are "inherited" through the various dynamic energies at the time of deposition, and on top of this, channel migration / floodplain reworking further mixes and creates new (inherited) horizons—resulting in unpredictable, azonal stratigraphic soil texture (horizons) across the recent (100-year) floodplain





Columbia & Gianella Soils with & without gravel lenses



Openings in restoration Indicated buried gravel bars, also seen in the 1936 air photo

Sacramento River Winter 2017













Habitat Restoration Planting Design Planning 1923 1976 Planning for Success 1896 1997 Mouth of Provident Irrigation Main Cana

500 Main Street



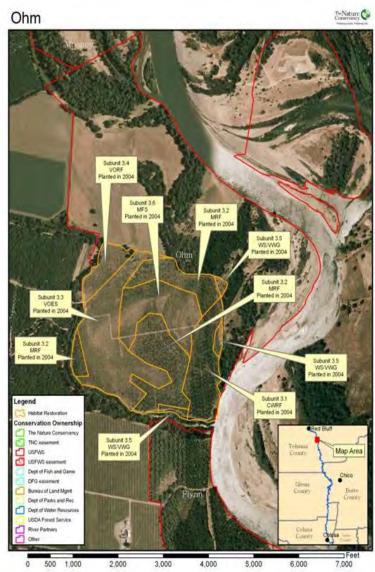
Historic River Channels

Soil Texture Depth to Gravel & Water



2-D Hydraulic Modeling **Baseline & Restoration**

AYRES



Planting Design- Vegetation Plant Spp. Comp, Freq & Density

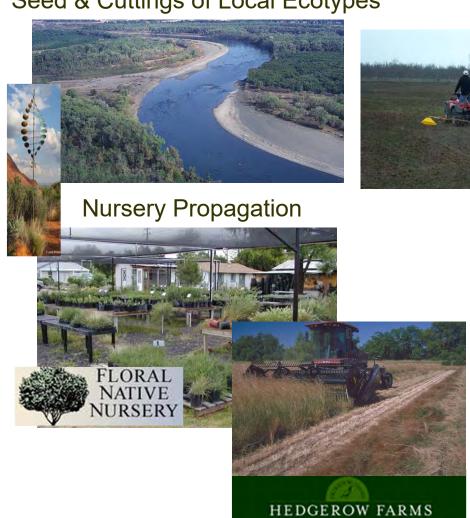


Sacramento River National Wildlife Refuge Riparian Vegetation Restoration



Site Preparation

Seed & Cuttings of Local Ecotypes



Planting



Maintenance

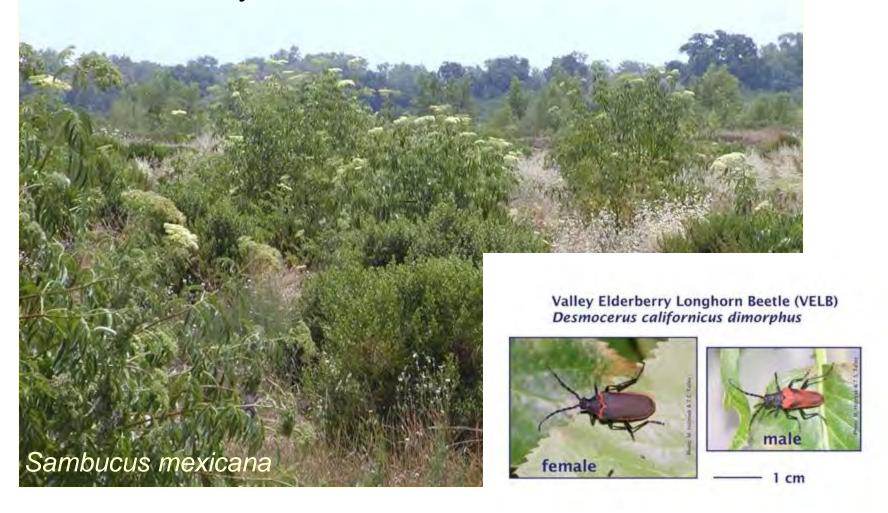




Sacramento River National Wildlife Refuge



Elderberry Savanna – Ord Bend Unit



1990 – 2012: **114,420 elderberry shrubs planted**



RIPARIAN & FLOODPLAIN RESTORATION BENEFITS TO A DIVERSITY OF TAXA

INSECTS

- Valley elderberry LB
- Ground-dwelling Beetles
- Bees

BIRDS

Landbirds

SMALL MAMMALS

- Rodents
- Bats



Wildlife Response to Riparian Restoration on the Sacramento River

Gregory H. Galnt, The Nature Conservancy*
Thomas Gardali, PRBO Commensation Science
Christine A. Howell, PRBO Conservation Science
John Hunt, California State University, Chico
Ryan A. Luster, The Nature Conservancy
William Rainey, University of California, Berkeley
Michael D. Roberts, The Nature Conservancy
Joseph Silveira, U.S. Fish and Wildlife Service
Helen Sowgerty, River Partners
Neal Williama, Bryn Mawr College

*Corresponding author: gyaler@tnc.org

ARSTRACT

Studies that assess the success of riparian restoration projects seldom focus on wildlife. More generally, vegetation characteristics are studied, with the assumption that animal populations will recover once adequate habitats are established. On the Sacramento River, millions of dollars have been spent on habitat restoration, yet few studies of wildlife response have been published. Here we present the major findings of a suite of studies that assessed responses of four taxonomic groups (limects, birds, bats, and rodents). Study designs fell primarily into two broad categories: comparisons of restoration sites of different ages, and comparisons of restoration sites with agncultural and remnant riparian sites.

Older restoration sites showed increased abundances of many species of landbirds and bats relative to

younger sites, and the same trend was observed for the Valley elderberry longhorn beetle (Desmocerus californicus dimorphus), a federally threatened species. Species richness of landbirds and grounddwelling beetles appeared to increase as restoration sites matured. Young restoration sites provided benefits to species that utilize early successional riparian habitats, and after about 10 years, the sites appeared to provide many of the complex structural habita) elements that are characteristic of remnant forest patches. Eleven-year old sites were occupied by both cavity-nesting birds and special-status crevice-roosting bats. Restored sites also supported a wide diversity of bee species, and had richness similar to remnant sites. Reminant sites had species compositions of beetles and rodents more similar to older sites than to vounger sites.

Sacramento River NWR
Monitoring & Research
1992-2017
~ 90 Projects





The Health of Blue Elderberry (Sambucus mexicana) and Colonization by the Valley Elderberry Longhorn Beetle (Democerus californicus dimorphus) in Restored Riparian Habitat Meghan Gilbart — CSU Chico 2009



It Was Built... Did They Come:
Habitat Characteristics of
Yellow-billed Cuckoo in
Restored Riparian Forests
Along the Sacramento River, California
Jessica E. Hammond — CSU Chico
2011





Sacramento River NWR - Public Use 81,000 visits (2017)



- Wildlife Observation
- Wildlife Photography
- **Environmental Education**
- Interpretation
- Hunting
- Fishing

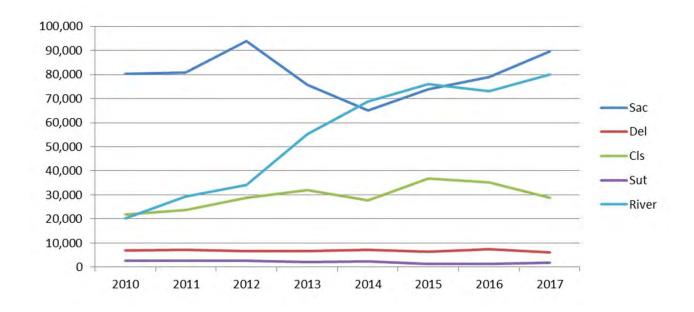




Sacramento National Wildlife Refuge Public Use



Wildlife Observation – Photography – Hunting – Fishing – Environmental Interpretation - Education



Sacramento National Wildlife Refuge Complex Auto Counter Numbers

		Total							
	2010	2011	2012	2013	2014	2015	2016	2017	Average
Sac	80,402	80,734	93,813	75,693	65,157	73,759	78,869	89,746	79,772
Del	7,013	7,178	6,716	6,534	7,147	6,450	7,350	6,208	6,825
Cls	21,773	23,730	28,825	32,047	27,757	36,724	35,211	28,720	29,348
Sut	2,719	2,622	2,677	2,145	2,233	1,198	1,258	1,767	2,077
River	20,207	29,320	34,143	55,064	68,824	76,034	73,107	80,086	54,598
Complex	132,114	143,584	166,174	171,483	171,118	194,165	195,795	208,544	172,872

WEEDS

















Sacramento River NWR Annual Habitat Management Plan



Habitat Management — Annual Vegetation Management (IPM) 2016

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
Total			4,060

Prescribed Fire Valley Oak Woodland Burn



Sacramento River NWR - Afton Unit
Arundo Locations, August 2008

Anndo isolated plants
Anndo stande (8:00 acros)

Arundo donax Control burn or cut/ spray

Prescribed Grazing enhances native grasses & wildflower





Forest Understory, Edge & Openings Native Grass Habitats

















U.S. Fish & Wildlife Service

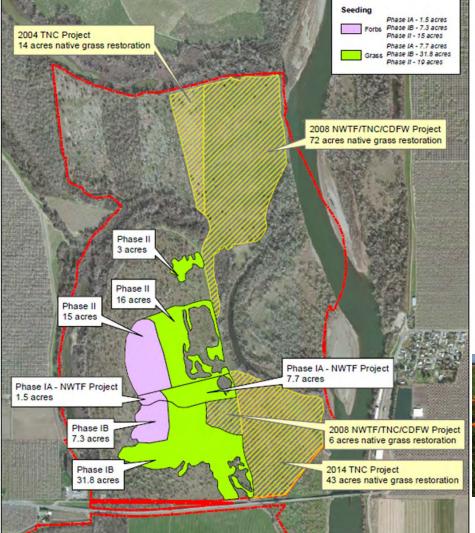
Sacramento River National Wildlife Refuge Sul Norte Unit

Proposed Grass/Wildflower Restoration, 2014-15





















Livestock Grazing Management



Cattle eat grass...





- **Native Plant Vigor**
- **Vertical Habitat** Structure
- **Thatch Reduction** / wildflowers / fuels

Sheep eat wildflowers... will eat bark...





- **Broadleaf Weed** Control
- **Firebreaks**

Goats





- **Firebreaks**
- **Broadleaf Weed** Control



Grazing Prescriptions



Sacramento River National Wildlife Refuge

Timing Is Everything

- Native grass phenology CRG tillering (late Feb early March;
 PNG flowering (mid-March mid-May)
- Grass thatch reduction for Spring wildflowers (September)
- Weed phenolgy (grazing as primary treatment or to lower grass height for herbicide application)
- Ground nesting birds (mid-March mid-July)
- Deer Season (C4: mid-Sept 1 Oct; D3: late Sept late Oct; G1: late Oct early Nov); Spring Wild Turkey (late March early May)
- Winter & Spring Flooding (late December late March)



Grazing Monitoring/Research



Sacramento River National Wildlife Refuge

Monitoring & Research

- Point Blue Pine Creek Grassland Birds (2007, 2008, 2009, 2010, 2011)
- Point Blue, UC Santa Cruz, North State Resources –
 Baseline Grazing Study (2012-2013: La Barranca, Capay, Sul Norte)
- Adrian Frediani (Humbolt State University, TNC) Wildflower Response to Grazing (Capay Unit: 2012-2013)
- Point Blue Rangeland Monitoring Network/ Rangeland Watershed Initiative (Pine Creek, La Barranca, Capay: 2015, 2016, 2017...)















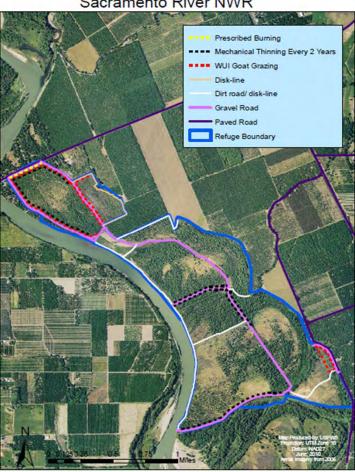
Sacramento River NWR Annual Habitat Management Plan



Facilities Maintenance — Gravel & Dirt Access Roads, Firebreaks, Hiking Trails, Gates, Fences, Culverts, Levees, Water Control Structures

Routine Maintenance Projects

FUELS MANAGEMENT: Rio Vista Unit Sacramento River NWR



<u>Deferred Maintenance Projects</u>



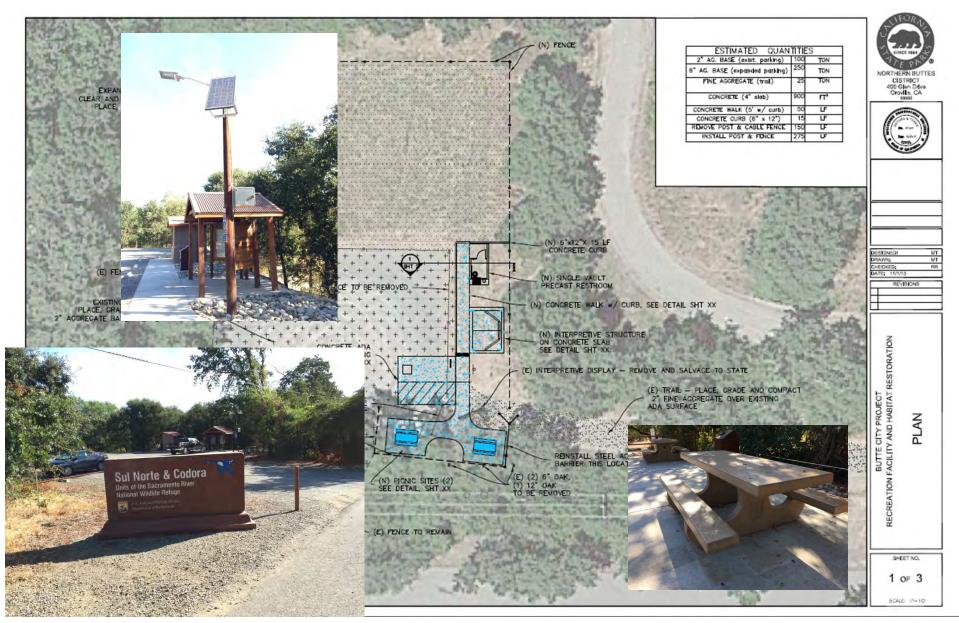




Sacramento River NWR Annual Habitat Management Plan



Facilities Maintenance — Visitor Services Public Use Parking Lot, Kiosk, Restroom, Picnic Benches, Signage





South Ord Unit Edible Fig Control















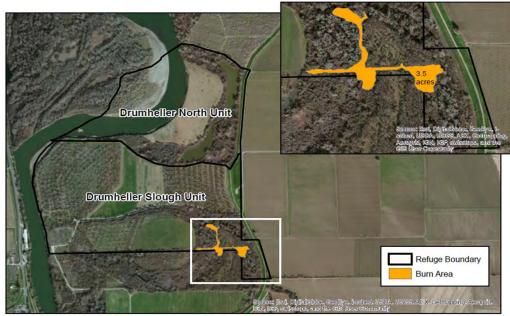


Drumheller Slough Unit Fire Breaks













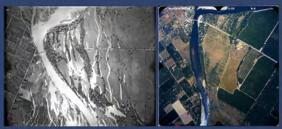


Rio Vista Unit Swale Restoration

Sacramento River National Wildlife Refuge Rio Vista Unit

Conceptual Restoration and Local Flood Hazard Reduction Plan

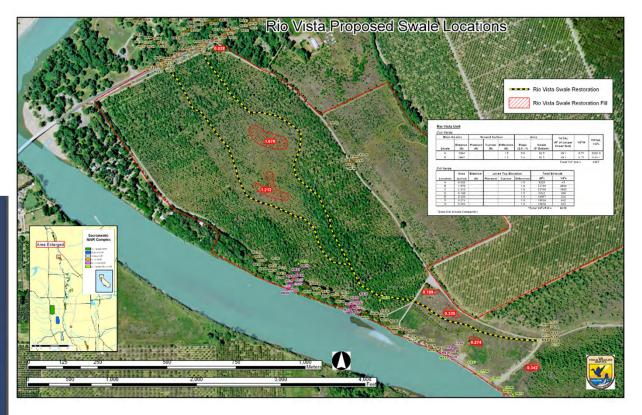
January 19, 2004 Final Report



The Nature Conservancy and US Fish & Wildlife Service













U.S. Fish & Wildlife Service Levee Maintenance Brush Removal Project Drumheller Unit 2007



BEFORE



U.S. Fish & Wildlife Drumheller Unit

DEERE



DURING







Flynn Unit Levee Removal Channel Meander



Refuge implements levee removal Summer/Fall 2001







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



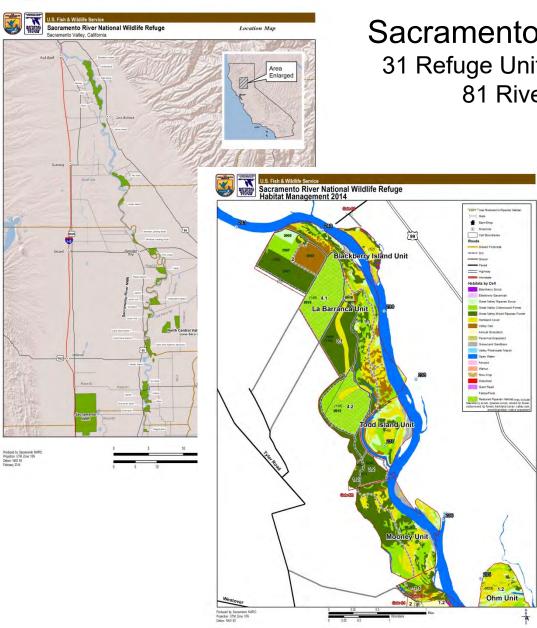
June 2002 BANS Survey 2,770 nest burrows at levee removal site





Annual Habitat Management Planning





Sacramento River NWR

31 Refuge Unites – 128 Cells 81 River Miles

Refuge Management Team

- Management
- Biology
- Maintenance/ Field Ops
- Public Use
- Fire
- Law Enforcement





Sacramento River NWR Annual Habitat Management Plan Unit Map & Unit Plan for Cell 3.2



YEAR 2014

ACTUAL

SUCCESSFUL?

Yes / No / Partial / Unk

TOTAL UNIT ACREAGE:

TOTAL CELL ACRES: 238

CLMA #1 241 TNO

CLMA #2: 241 LSR

V YIN

V

V YIN

YIN

YIN YIN

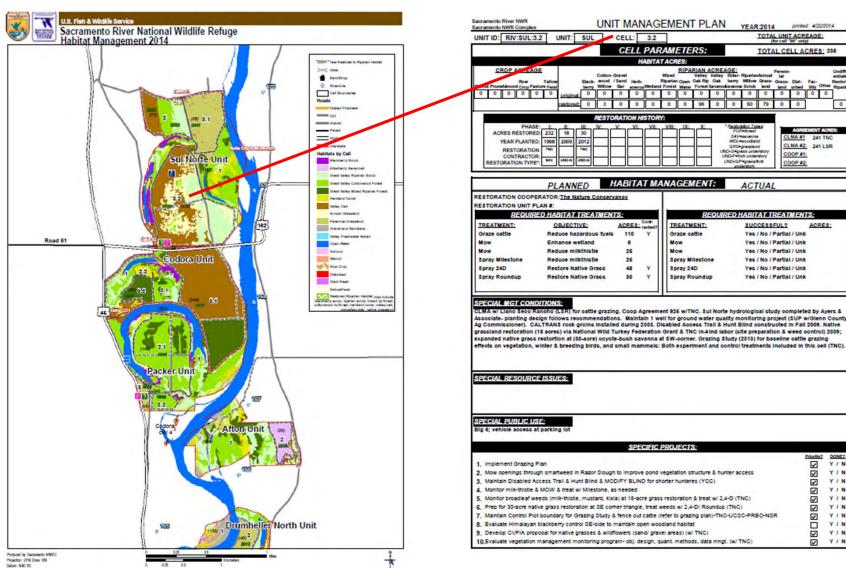
YIN

YIN

YIN

YIN

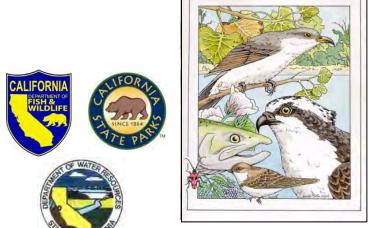
COOP #1: COOP #2:





Sacramento National Wildlife Refuge Complex Partnerships for Habitat Restoration, Management & Conservation







HEDGEROW FARMS

















sacramento



















preservation



CALFED



CALIFORNIA































