

**BASELINE ASSESSMENT
FOR
RIPARIAN RESTORATION
AT THE
CRUISE'N TARRY RESTORATION AREA**

Prepared by:

**Jean G. Hubbell, M.S.
Catherine Little
Katie C. Price
John W. Hunt, M.S.
Dr. David M. Wood
Department of Biological Sciences
California State University, Chico**

March 2006

Prepared for:

**The Nature Conservancy
Sacramento River Project, Chico, California**

TABLE OF CONTENTS

	Page
SECTION 1: RESTORATION PLANTING RECOMMENDATIONS	2
Introduction	3
Adjacent Landcover	4
Methods	4
Restoration Type Recommendations	5
Restoration Planting Recommendations	6
References	16
SECTION 2: REMNANT RIPARIAN VEGETATION SURVEY	17
Introduction	18
Methods	19
River Channel History	20
Remnant Riparian Vegetation Community Descriptions	20
Special-status Plant Species	27
References	28
SECTION 3: SOIL SURVEY	29
Introduction	30
Methods	30
Soils Description	31
References	38
SECTION 4: SPECIAL STATUS ANIMAL SPECIES, BIRD COUNTS, AND NON-NATIVE MAMMALS	39
Introduction	40
Methods	40
Special Status Animal Species	40
Threatened and Endangered Wildlife Species	42
Non-native Mammal Species	43
Bird Counts	44
References	47

SECTION ONE

CRUISE'N TARRY

RESTORATION PLANTING RECOMMENDATIONS

Prepared by:

Jean G. Hubbell, M.S.
Catherine Little
Katie C. Price
Dr. David M. Wood
Department of Biological Sciences
California State University, Chico

Introduction

The Cruise'n Tarry tract is located northeast of Colusa, in Colusa County on the east side of the Sacramento River at river mile 145.5 and is owned by the Sacramento and San Joaquin Drainage District, State of California and managed by the California Department of Water Resources. The entire tract is 10 acres in area including land that is covered by flood control levees. The Cruise'n Tarry Restoration Area (hereafter "Restoration Area") comprises 8 acres of the tract inside the levees and surrounds a small inlet off the main channel of the Sacramento River that was previously a marina. Currently the Restoration Area is composed of patches of remnant riparian vegetation with fruitless mulberry trees and two non-native herbland areas. The Colusa Weir forms the Restoration Area's northern boundary. A gravel parking area and a levee form the eastern boundary. There is a non-native herbland east of the levee until the southeastern corner of the tract, where a patch of California black walnut (*Juglans californica*) and valley oak trees (*Quercus lobata*) occurs. River Road is to the east of the parking area and east of the levee. On the far side of River Road there are bands of valley oaks and a large patch of narrow-leaved willow (*Salix exigua*), to the south of which is a house and non-irrigated pasture. Valley oaks and a few gum trees (*Eucalyptus* sp.) occur along the edge of River Road. South of the Restoration Area is a levee with a house and a pasture on the other side. The Sacramento River forms the western boundary of the Restoration Area.

Within the Restoration Area there are approximately 3 acres of predominantly riparian vegetation (not mapped). The forest in the northern portion of the property is dominated by mulberry trees with scattered valley oaks and California wild grape (*Vitis californica*). Without the mulberry trees this would be considered valley oak riparian forest. There is a corridor of willow scrub along the river, to the west of the mulberry/valley oak riparian forest. This willow scrub is composed of narrow-leaved willow, arroyo willow (*Salix lasiolepis*), and young Fremont cottonwood (*Populus fremontii*). To the east of the mulberry/valley oak riparian forest, closer to the open parking area, there is blue elderberry (*Sambucus mexicana*) and Fremont cottonwood. Along the inlet there is a band of buttonbush scrub visually dominated by California button willow (*Cephalanthus occidentalis* var. *californicus*). The northern spit of land between the river and the inlet, and the southern portion of the inlet edge, are dominated by a narrow-leaved willow scrub. Further upbank along the inlet is a cottonwood riparian forest dominated by Fremont cottonwood interspersed with valley oak trees. Farther upbank, closer to the road, there are interspersed Oregon ash (*Fraxinus latifolia*) and California wild grape, making this more of a valley oak riparian forest. In the southeastern portion of the Restoration Area on the west side of the road are mature mulberry trees. There is a patch of cottonwood riparian forest in the southwestern corner of the Restoration Area and along the river south of the tract.

Field surveys of nearby remnant riparian vegetation, site soils and birds were conducted during May and June 2005, at the Restoration Area. Information on special status animals and non-native mammals for the site was also compiled during that time.

Vegetation sampling was done in the six natural plant communities nearby to the south and west of the Restoration Area on both sides of the Sacramento River. General qualitative description of vegetation communities to the east and south of the Restoration Area were done although no sampling occurred there due to the very small size and access limitations (e.g. flooded). To the west, across the Sacramento River, five communities were sampled: Great Valley mixed riparian forest, Great Valley cottonwood riparian forest, buttonbush scrub, Great Valley willow scrub, and herbland (Holland 1986; Figure 1). To the south, two communities were sampled: Great Valley cottonwood riparian forest and blackberry scrub (Holland 1986; Figure 1). With the exception of herbland, all of these communities in some form (i.e. may differ in nomenclature) are on the list of California Terrestrial Natural Communities recognized by the

California Natural Diversity Database (CA DFG 2003). Three of these plant communities, cottonwood riparian forest, buttonbush scrub and willow scrub, along with valley oak riparian forest comprise the estimated 3 acres of native riparian vegetation within the Cruise'n Tarry tract and Restoration Area. A detailed discussion of nearby remnant riparian vegetation is in Section Two.

The restoration planting recommendations are presented below with supporting vegetation and soil surveys in Sections Two and Three. The special status animal and non-native mammal information is in Section Four.

Adjacent Landcover

The Cruise'n Tarry tract is adjacent to three properties. To the east is the 5.5-acre Welker property with a single family residence and a non-irrigated pasture. Along this eastern boundary going from north to south the distance between this property and the Restoration Area varies from 19-66 m. In the north this property is approximately 37 m from the Restoration Area separated by River Road and a parking area. In the middle the separation is approximately 19-37 m from the Restoration Area separated by River Road, the levee and a strip of non-native herbland. In the south the property is approximately 19-66 m from the Restoration Area separated by River Road, the levee and a patch of valley oak riparian forest. To the south of the Restoration Area is the 4.5 acre Lorenzinni property with a pasture and a house. The levee separates this property from the Restoration Area by approximately 12 m. To the west is the Sacramento River. To the north is the Colusa Weir, owned by the Department of Water Resources.

Methods

The 8-acre Restoration Area was stratified into sections based on soils, topography and geomorphology. The sections were determined from aerial photographs and soil maps, and refined as needed upon site review. Potential plant communities were chosen for the Restoration Area utilizing the remnant riparian vegetation community descriptions and Restoration Area soil descriptions and estimated elevations (not shown), including the influence of historic channels and estimated flood frequency (Figures 1-4; Sections Two and Three). In the figures, the information on flood frequency comes from Department of Water Resources (DWR) 1997 data whereas the aerial photographs are from 1999. Thus on occasion the two do not coincide due to changes in landform and river location between the two time periods. This is especially evident at the Cruise'n Tarry tract where the line between the photo 4-year and estimated 5-year floodplains appears to be offset to the west for unknown reasons (Figures 2, 4). Based on its shape this line is likely either the levee or eastern boundary of the Cruise'n Tarry tract. Thus the Restoration Area was considered completely in the photo 4-year floodplain. Furthermore the DWR estimated flood frequencies do not account for local topography and thus the estimated flood frequencies may not represent actual flooding patterns (CA DWR 2002, US ACOE 1997).

Although only the flood frequencies are shown here, restoration recommendations take into account the topography data from the U.S. Army Corps of Engineers 1997 digital elevation model (DEM) with 2 foot contours. Since the error on these data is +/- 2 feet, only differences greater than 4 feet are considered real. The potential plant communities are based on Holland's riparian communities (1986). Since biodiversity enhancement is an important restoration goal, species composition of the Holland community is adjusted to reflect nearby remnant riparian plant communities and local differences in that plant community (Hubbell and Efsaaff 1998).

Recommended frequencies for woody species are based on species frequency in the remnant riparian vegetation, visual dominance and biodiversity concerns (Tables 1 and 2;

Peterson et al. 2003, Wood 2003). For communities where no nearby remnant vegetation data exist, data from other baseline assessments with that community were used (e.g. Hubbell et al. 1998, 1999a-d, 2003a-d) or estimates were made based on expected frequency of a species for that community. Remnant riparian woody species frequency was calculated in two ways to provide information on both species composition and distribution for recommended woody species. (1) Calculating remnant riparian woody species frequency across quadrants provides data on species composition and thus is referred to as composition frequency in this document. Within a remnant riparian community type composition frequency was calculated as: number of quadrants a species occurred in divided by total number of quadrants sampled times 100 (Table 4). Since remnant riparian vegetation composition frequencies for woody species are by one of three physiognomic classes, and recommended composition frequencies are for all woody species lumped together, then recommended composition frequencies will be 1/3 of those found in the remnant vegetation and then possibly adjusted as noted above (Table 1). For species that occurred in multiple physiognomic classes the composition frequency was totaled and then divided by three. (2) Calculating remnant riparian woody species frequency across sampling points provides data on species distribution within the community (e.g. is it clumped or ubiquitous) and thus is called distribution frequency in this document (Table 2). These data can be utilized in the details of the planting design. Within a remnant riparian community type distribution frequency was calculated as: number of points a species occurred at divided by total number of points sampled times 100 (Table 4). For recommendations of species that occurred in multiple physiognomic classes, distribution frequency was calculated across these physiognomic classes. Thus remnant vegetation distribution frequencies are more similar to recommendations.

The species composition and abundance recommendations for herbaceous species are predominantly based on local visual dominance in remnant riparian areas, ecologically-based substitutions of natives for those non-natives common in remnant areas, and biodiversity enhancement (Table 3; Peterson et al. 2003, Wood 2003). Recommendations for herbaceous species are not as precise as are those for woody species due to low occurrence of native herbs in remnant riparian vegetation as well as to the paucity of information regarding composition and abundance of the natural herbaceous layer of riparian communities. Holl and Crone's (2004) study of herbaceous communities along a 150 km reach of the middle Sacramento River found no relationship between understory herbaceous communities and overstory dominance. Still, we were able to use Holl and Crone's data as a basis for some of the recommended herbaceous species. If there were data from both remnant riparian vegetation surveys and from Holl and Crone (2004) we used a mean of the two for the basis of our recommendations. Abundance of remnant riparian herbaceous species within a community type was calculated as mean percent cover: percent cover for a species summed over all points divided by the total number of sampling points (Table 5). Direct seeded grass species are listed without abundances. Only abundance for recommended herbaceous species composition is included here due to the limited data for distribution frequency of remnant riparian herbaceous species (Table 3).

For communities with *Salix* species (cottonwood riparian forest, mixed riparian forest, willow scrub, mule fat scrub, buttonbush scrub) the total recommended herbaceous species coverage is less than 100 % because this value was calculated as 100% minus the sum of mean percent cover for all the *Salix* species in that community.

Restoration Type Recommendations

Active horticultural restoration is recommended to derive the greatest habitat benefit for this Restoration Area. Direct loss of habitat is one of the primary reasons that many native species and communities of the Sacramento River ecosystem are in such critical condition. To

improve the situation more habitat must be created in the short term. While restoration by natural processes provides one means of creating new terrestrial habitats, the approach has its limitations. Natural process restoration only works in a timely manner on the lowest lying areas of the floodplain where appropriate hydrogeomorphologic conditions exist. Sites where natural process restoration is appropriate are limited on the Sacramento River, as most areas are not subject to the erosional and depositional forces that foster natural recruitment events. Although the Restoration Area is adjacent to the Sacramento River, remnant valley oak riparian forest occurs on site at elevations from approximately 66-72 feet compared to the river level at approximately 46 feet at the time of the 2004 photo (US ACOE 1997), indicating a higher floodplain for most of the Restoration Area (with the exception of the steep bank along the inlet and restoration Sections D and E). Also, the Restoration Area lies in the photo 4-year floodplain (DWR 1997). This suggests that much of the Restoration Area itself will probably not flood to the degree required for natural process restoration to be successful. Higher floodplain lands such as those found in much of this Restoration Area will likely become infested with non-native invasive species (e.g., yellow-starthistle, Johnson grass, Bermuda grass) that will inhibit the colonization and proliferation of desirable native vegetation for the foreseeable future. Previous research along the Sacramento River has shown that even when sites are artificially flooded coincident with the dispersal of native propagules, exotic species will come to dominate (Peterson 2002). Thus active restoration of this Restoration Area would be the most efficient method to create natural habitat relatively quickly.

Natural process restoration is expected to expand the willow scrub and buttonbush scrub along much of the inlet's steep bank due to its low elevation and the proximity of the scrubs, but only to the extent that river height and floodwaters permit (US ACOE 1997). If natural process restoration is not occurring in a timely manner then the active restoration recommendations for Section D could be expanded along the steep bank of the inlet.

Restoration Planting Recommendations

The potential plant communities are shown in Figure 3, whereas Figure 4 depicts the potential plant communities with flood frequency and soil sampling locations. Composition and distribution frequencies for the recommended species within a potential plant community are in Tables 1-3. Communities are placed in arcuate bands as much as possible to simulate the natural vegetation pattern. Valley oak riparian forest is the ecologically-based recommendation for sections A and C to enhance and extend the existing valley oak riparian forest. These two sections are at higher elevation (ranging from 60-72 feet), have sandier soils and greater depth to the water table and are within the photo 4-year floodplain, typical characteristics of valley oak riparian forest. At the Restoration Area valley oak riparian forest generally occurs between 60 and 74 feet and from 62-68 feet in the sampled remnant riparian vegetation at the Boeger Tract (US ACOE 1997). Section A has an elevation of 64 feet sloping up to 72 feet going away from the river (west to east). The management-based recommendation for section A, which is adjacent to the Colusa Weir, is to leave section A as is due to the use of this area by California Department of Water Resources to maintain the Colusa Weir. Section C runs between the predominantly native vegetation at elevations of 60-64 feet to the western and then northern side of the levee with an elevation of 72 feet. The management-based recommendation for section C is valley oak riparian forest to the west and north of the existing road and valley needlegrass grassland for the road and east to limit interference with the flood control structure (levee).

Since sections A and C are to be restored using management-based recommendations that significantly limit valley oak riparian forest restoration, removal of the mulberries throughout the Restoration Area is imperative. Mulberries should be replaced by valley oaks to enhance the

existing valley oak riparian forest. This could be done using the State of California SB 1334 mitigation ratio for valley oaks of 5:1 (i.e. 5 valley oaks for each mulberry removed) or on a per acre basis using The Nature Conservancy's current ratio of 90 valley oaks/acre (assuming an 80% survival rate after three years). The latter will require calculating the acreage of mulberries.

Rose/baccharis scrub, co-dominated by *Rosa californica* and *Baccharis pilularis*, is recommended for section B due to gravel refusal, the high elevation (approximately 70 feet; US ACOE 1997) and because it is within the photo 4-year floodplain. It is likely that a gravel bar, rather than just a small lens, occurs at approximately 10 feet below the surface since there has been no evident tree invasion of this area between 1999 and 2004 (not shown) despite the clay loam soils above the gravel layer (Soils Table 11).

Willow scrub is recommended for section D since it is adjacent to the water and its low elevation of 46-58 feet coincides with the elevation of willow scrub on-site and in the sampled remnant riparian vegetation across the river at the Ward tract (US ACOE 1997). This lowland is likely to flood more often than the rest of the Restoration Area, despite being considered in the 4-year floodplain, further supporting a willow scrub recommendation. Section D will expand the current willow scrub, however it is hoped that natural process restoration will fill in the very steep, muddy bank of the inlet from Section D eastward to the present willow scrub and below that scrub.

Cottonwood riparian forest is recommended for section E to connect the southwestern patch of cottonwoods with existing cottonwood riparian forest along the inlet. Section E is adjacent to the water and its elevation ranges from 58 to 64 feet going from north to south (or away from the inlet) which coincides with the elevation of cottonwood riparian forest in the sampled remnant riparian vegetation across the river at the Ward tract. This is also within the range of 47-65 feet where cottonwood riparian forest is found on the Department of Fish and Game's Colusa-South property to the south of the Restoration Area (US ACOE 1997). The northern portion of section E is likely to flood more often than the remainder of the Restoration Area and more frequently than the estimated once-every-4-years designation. This is due to the northern section's significantly lower elevation as compared to the rest of the Restoration Area and is further supported by the gleyed layer found here in soil sample 5 (Table 12). The evident increased flood frequency of this section along with a shallower depth to the water table (in part due to elevation differences) further supports the cottonwood riparian forest recommendation.

Cruise'n Tarry Restoration Area: Remnant Riparian Plant Communities

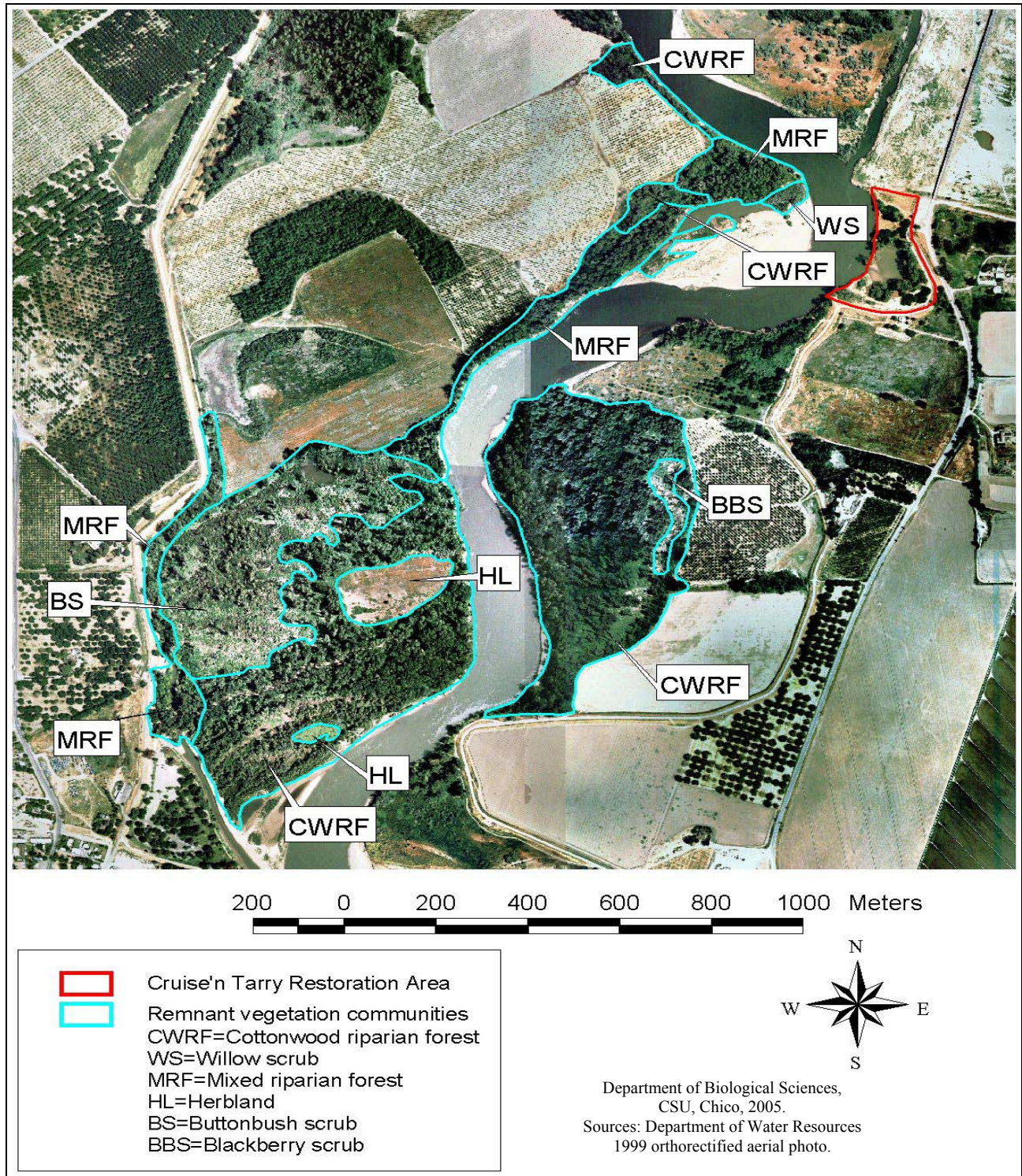


Figure 1. Remnant riparian plant communities nearby the Cruise'n Tarry Restoration Area, Colusa County, California.

Cruise'n Tarry Restoration Area: Estimated Flood Frequency, Soil Sampling Locations and Historic River Channels

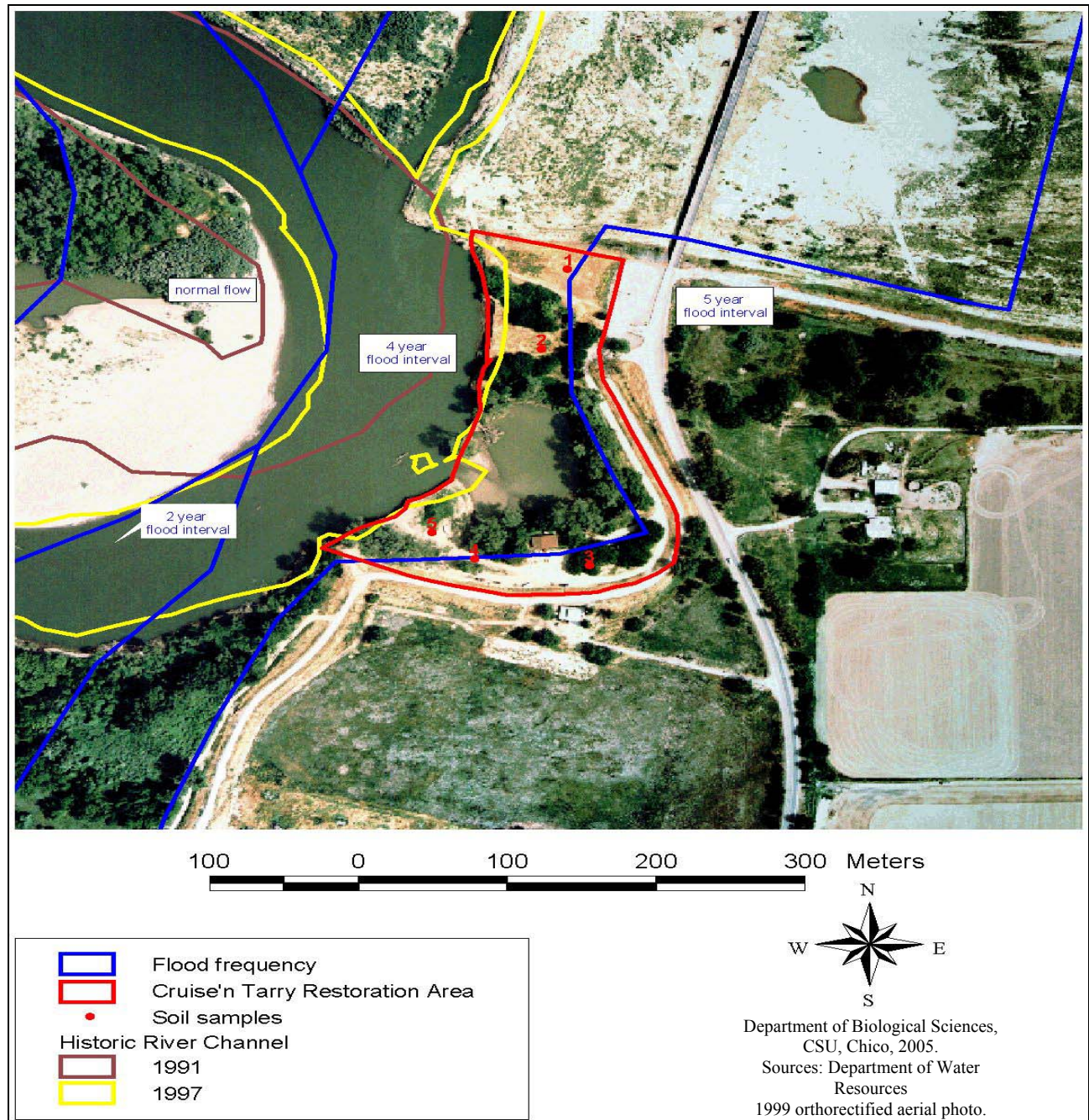


Figure 2. Estimated flood frequency, soil sampling locations, and historic river channels from 1991 and 1997 at the Cruise'n Tarry Restoration Area, Colusa County, California. Flood frequencies are from Department of Water Resources 1997 data; air photos are from 1999. See text for discussion of discrepancy.

Cruise'n Tarry Restoration Area: Potential Plant Communities

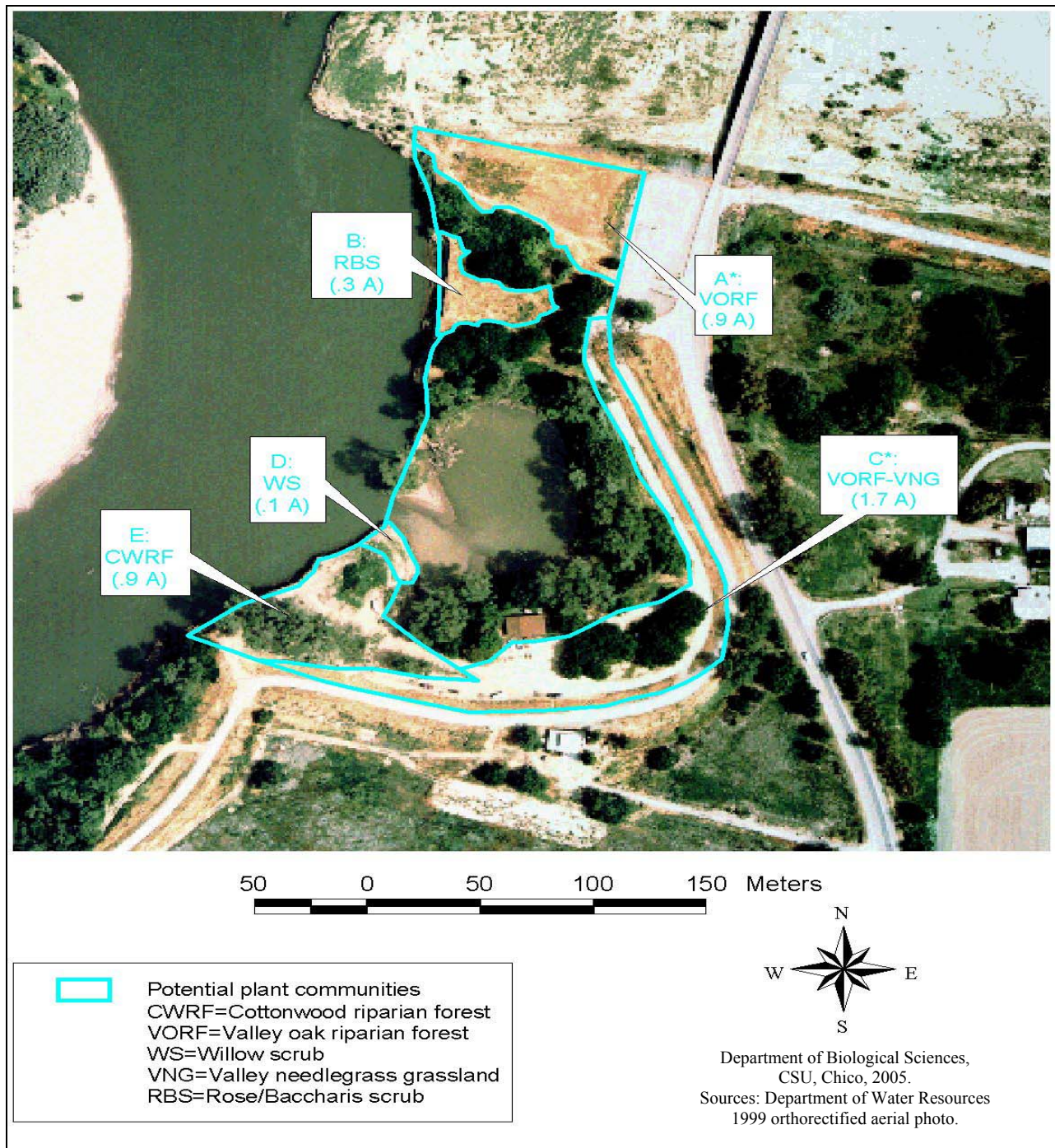


Figure 3. Potential plant communities for the Cruise'n Tarry Restoration Area, Colusa County, California. An "*" is for sections that have management-based recommendations for flood control structures. See text for details.

Cruise'n Tarry Restoration Area: Estimated Flood Frequency, Soil Sampling Locations, and Potential Plant Communities

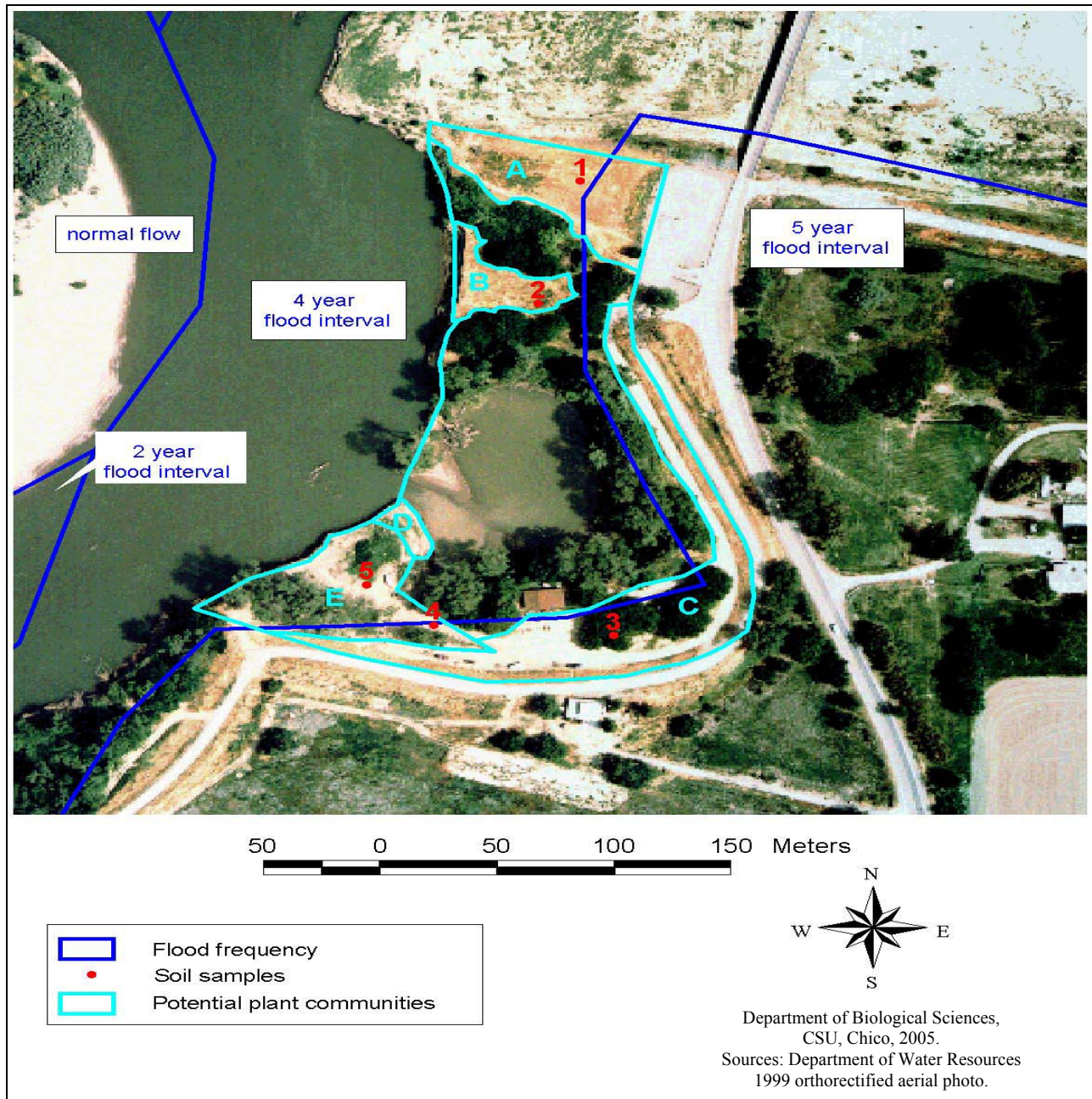


Figure 4. Estimated flood frequency, soil sampling locations, and potential plant communities at the Cruise'n Tarry Restoration Area, Colusa County, California. A is valley oak riparian forest (0.9 acres), B is rose/baccharis scrub (0.3 acres), C is valley oak riparian forest and valley needlegrass grassland (1.7 acres), D is willow scrub (0.1 acres) and E is cottonwood riparian forest (0.9 acres). Flood frequencies are from Department of Water Resources 1997 data; air photos are from 1999.

Table 1. Composition frequency by community type for potential woody overstory restoration species for the Cruise'n Tarry Restoration Area, Colusa County, California. Remnant vegetation frequency is given by community type for those species recorded during quantitative sampling. Abbreviations are: CWRP=Cottonwood Riparian Forest; WS=Willow Scrub; VORF=Valley Oak Riparian Forest; RBS=Rose/Baccharis Scrub. A "+" indicates observed but not sampled for that community; a blank indicates not observed. An "H" indicates a species added since listed by Holland. A "W" indicates a species added due to it being found at the Womble tract VORF. Nomenclature follows The Jepson Manual (Hickman 1993).

Common Name	Scientific Name	Composition Frequency (%)						
		Remnant Vegetation			Cruise'n Tarry Recommendations			
		Cruise'n Tarry/Ward	Boeger					
Woody Species		CWRF (n=52)	WS (n=8)	VORF (n=12)	RBS	CWRF	WS	VORF
box elder	<i>Acer negundo</i>	54		17		18		7
western sycamore	<i>Platanus racemosa</i>			8				5
Fremont cottonwood	<i>Populus fremontii</i>	63	H			30	5	
valley oak	<i>Quercus lobata</i>			92				34
narrow-leaved willow	<i>Salix exigua</i>	H	126			5	42	
Goodding's black willow	<i>Salix gooddingii</i>	10	13			5	10	
arroyo willow	<i>Salix lasiolepis</i>	H	H			5	10	
Oregon ash	<i>Fraxinus latifolia</i>	H		H		3		3
coyote brush	<i>Baccharis pilularis</i>			W+	30			3
California button willow	<i>Cephalanthus occidentalis</i> var. <i>californicus</i>	H				5		
California rose	<i>Rosa californica</i>	4	H	33	30	3	3	11
California blackberry	<i>Rubus ursinus</i>	13	38	50	20	5	13	17
blue elderberry (E)	<i>Sambucus mexicana</i>				5			
western poison oak	<i>Toxicodendron diversilobum</i>	14	25	8		5	6	3
red willow	<i>Salix laevigata</i>	H				3	4	
shining willow	<i>Salix lucida</i> ssp. <i>lasiandra</i>	H	H			3	4	
California pipevine	<i>Aristolochia californica</i>			17	15			5
virgin's bower	<i>Clematis ligusticifolia</i>			8				3
California man-root	<i>Marah fabaceus</i>			+				3
California greenbrier	<i>Smilax californica</i>			H				3
California wild grape	<i>Vitis californica</i>	65	H	W 50		10	3	3
Total Coverage					100	100	100	100

Table 2. Distribution frequency by community type for potential woody overstory restoration species for the Cruise'n Tarry Restoration Area, Colusa County, California. Frequency is given by community type for those species recorded during quantitative sampling. Abbreviations are: CWRP=Cottonwood Riparian Forest; WS=Willow Scrub; VORF=Valley Oak Riparian Forest; RBS=Rose/Baccharis Scrub. A blank indicates not observed. An "*" indicates estimated frequency for species that were recommended but not sampled within a remnant community. Nomenclature follows *The Jepson Manual* (Hickman 1993).

Common Name	Scientific Name	Cruise'n Tarry Recommendations			
		Distribution Frequency (%)			
Woody Species		RBS	CWRF	WS	VORF
box elder	<i>Acer negundo</i>		0		67
western sycamore	<i>Platanus racemosa</i>				33
Fremont cottonwood	<i>Populus fremontii</i>		15	10*	
valley oak	<i>Quercus lobata</i>				100
narrow-leaved willow	<i>Salix exigua</i>		10*	0	
Goodding's black willow	<i>Salix gooddingii</i>		0	0	
arroyo willow	<i>Salix lasiolepis</i>		10*	50*	
Oregon ash	<i>Fraxinus latifolia</i>		10*		10*
coyote brush	<i>Baccharis pilularis</i>	75*			75*
California button willow	<i>Cephalanthus occidentalis</i> var. <i>californicus</i>		10*		
California rose	<i>Rosa californica</i>	75*	0	10*	33
California blackberry	<i>Rubus ursinus</i>	50*	0	0	100
blue elderberry	<i>Sambucus mexicana</i>	10*			
western poison oak	<i>Toxicodendron diversilobum</i>		0	0	33
red willow	<i>Salix laevigata</i>		10*		
shining willow	<i>Salix lucida</i> ssp. <i>lasiandra</i>		10*	10*	
California pipevine	<i>Aristolochia californica</i>	50*			67
virgin's bower	<i>Clematis ligusticifolia</i>				33
California man-root	<i>Marah fabaceus</i>				10*
California wild grape	<i>Vitis californica</i>		15	75*	75*

Table 3. Mean percent cover by community type for potential herbaceous understory restoration species at the Cruise'n Tarry Restoration Area, Colusa County, California. Abbreviations are: CWRP=Cottonwood Riparian Forest; WS=Willow Scrub; VORF=Valley Oak Riparian Forest; RBS=Rose/Baccharis Scrub; VNG=Valley Needlegrass Greassland. Abundances in italics are from Holl and Crone (2004). A blank indicates not observed. "E" indicates species to be planted on the edge. The "*" indicates that the source data are for this genus, and one or more appropriate species were selected to represent the genus. "DS" indicates that these species will be direct seeded and thus not planted as plugs. Note that the herbaceous component is less than 100 % in communities with *Salix* species (see Methods). Nomenclature follows *The Jepson Manual* (Hickman 1993).

Common Name	Scientific Name	Mean Percent Cover							
		Remnant Vegetation			Cruise'n Tarry Recommendations				
		Cruise'n Tarry/Ward	Boeger						
Herbaceous Species		CWRF (n=13)	WS (n=2)	VORF (n=3)	RBS	CWRF	WS	VORF	VNG
mugwort	<i>Artemisia douglasiana</i>	3.00	41.67			24	10		
horseweed	<i>Conyza canadensis</i>						3		
goose grass	<i>Galium aparinum</i>	2.00	16.67	10.00		7.20	4	10	
lotus	<i>Lotus purshianus</i>								
bugleweed	<i>Lycopus americanus</i>	0.10				2			
nettle	<i>Urtica dioica</i>					5	3		
western goldenrod	<i>Euthamia occidentalis</i>				50	5	3		
California goldenrod	<i>Solidago californica</i>				50	5	3		
hairy evening-primrose (E)	<i>Oenothera elata</i>					5	3		
Santa Barbara sedge	<i>Carex barbarae</i>	2.60*		7.00*		10		10	
clustered field sedge	<i>Carex praegracilis</i>					4		5	
false nutsedge	<i>Cyperus strigosus</i>	0.08*				2			
blue wildrye	<i>Elymus glaucus</i>	0.40	3.50		DS	DS	DS	DS	DS
creeping wildrye	<i>Leymus triticoides</i>	H		H	DS	DS	DS	DS	
deergrass	<i>Muhlenbergia rigens</i>					10			
purple needlegrass	<i>Nassella pulchra</i>				DS			DS	DS
nodding needlegrass	<i>Nassella cernua</i>							25	25
California melic	<i>Melica californica</i>							25	21
one-sided bluegrass	<i>Poa secunda</i> ssp. <i>secunda</i>							25	21
wavy-leaved soap plant	<i>Chlorogalum pomeridianum</i>								3

Table 3 continued.

Table 3 continued.

Common Name	Scientific Name	Mean Percent Cover							
		Remnant Vegetation			Cruise'n Tarry Recommendations				
		Cruise'n Tarry/Ward	Boeger						
Herbaceous Species		CWRF (n=13)	WS (n=2)	VORF (n=3)	RBS	CWRF	WS	VORF	VNG
purple clarkia	<i>Clarkia purpurea</i>								3
shooting star	<i>Dodecatheon clevelandii</i>								3
annual agoseris	<i>Agoseris heterophylla</i>								3
erect plantain	<i>Plantago erecta</i>								3
yarrow	<i>Achillea millefolium</i>								3
blow-wives	<i>Achyrrachaena mollis</i>								3
blue dicks	<i>Dichelostemma capitatum</i>								3
wild hyacinth	<i>Dichelostemma multiflorum</i>								3
harvest brodiaea	<i>Brodiaea elegans</i>								3
valley tassels	<i>Castilleja attenuata</i>								3
meadow barley	<i>Hordeum brachyantherum</i>					DS			
Total Coverage					100	79	30	100	100

References

- California Department of Fish and Game. 2003. California Natural Diversity Database, List of California Terrestrial Natural Communities. Wildlife and Habitat Data Analysis Branch, Sacramento CA. Retrieved from: <http://www.dfg.ca.gov/whdab/pdfs/natcomlist.pdf>.
- California, Department of Water Resources. 2002. GIS of the middle Sacramento River, California. Northern District, Red Bluff, California.
- Hickman, J., Ed. 1993. The Jepson Manual: Higher Plants of California. University of California Press, Berkeley, California.
- Holl, K. D. and E. L. Crone. 2004. Applicability of landscape and island biogeography theory to restoration of riparian understorey plants. *Journal of Applied Ecology* 41:922-933.
- Holland, R. F. 1986. Preliminary Descriptions of the Terrestrial Natural Communities of California. California Department of Fish and Game, Non-game Heritage Program, Sacramento, California.
- Hubbell, J.G. and D.S. Efsaaff. 1998. Vegetation Assessment of Five 1998/1999 Sacramento River Project Restoration Sites for The Nature Conservancy. Unpublished report to The Nature Conservancy.
- Hubbell, J.G., D.L. Brown, J. Rotnem, J. Schwenkler, G. Magda, C. Wilder, and S. Ellberg. 1999a. Kaiser 1999 Site Assessment for The Nature Conservancy. Unpublished report to The Nature Conservancy.
- . 1999b. River Vista 1999 Site Assessment for The Nature Conservancy. Unpublished report to The Nature Conservancy.
- Hubbell, J.G., D.L. Brown, J. Rotnem, J. Schwenkler, G. Magda, and C. Wilder. 1999c. Ryan 1999 Site Assessment for The Nature Conservancy. Unpublished report to The Nature Conservancy.
- . 1999d. Stone 1999 Site Assessment for The Nature Conservancy. Unpublished report to The Nature Conservancy.
- Hubbell, J.G., J.W. Hunt, M. Quinn, and D.M. Wood. 2003a. Site Assessment for Riparian Restoration at the RX Ranch Unit. Unpublished report to The Nature Conservancy.
- . 2003b. Site Assessment for Riparian Restoration at the Deadman's Reach Unit of U.S. Fish and Wildlife Service's Sacramento River National Wildlife Refuge. Unpublished report to The Nature Conservancy.
- . 2003c. Site Assessment for 2003 Restoration at the Haleakala Unit of U.S. Fish and Wildlife Service's Sacramento River National Wildlife Refuge. Unpublished report to The Nature Conservancy.
- . 2003d. Site Assessment for Riparian Restoration at the Sunset Ranch Unit. Unpublished report to The Nature Conservancy.
- National Agriculture Imagery Program. 2004. Orthorectified aerial photos of Glenn and Colusa Counties, California.
- The Nature Conservancy. 2005. Draft Colusa Subreach Background Report. Northern Central Valley Office, Chico, California.
- Peterson, D.R. 2002. The development of an alternative restoration strategy for Sacramento River riparian forests. Master's Thesis, California State University, Chico.
- Peterson D.R., G.H. Golet, R. Luster, M. Roberts, and D. Jukkola. 2003. Modeling plant community types as a function of physical site characteristics. Report to CALFED. Available at: <http://www.sacramentoriverportal.org>.
- U.S. Army Corps of Engineers. 1997. Digital elevation model. Received from The Nature Conservancy.
- Wood, D.M. 2003. An analysis of vegetation on restoration sites. Report to The Nature Conservancy. Available at: <http://www.sacramentoriverportal.org>.

SECTION TWO

CRUISE'N TARRY

REMNANT RIPARIAN VEGETATION SURVEY

**Catherine Little
Jean G. Hubbell, M.S.
Gay Ann Silman
Katie C. Price
Dr. David M. Wood**

Introduction

Remnant riparian vegetation surveys of nearby stands are used as a reference for potential vegetation communities and for determining planting recommendations in the Restoration Area. Vegetation surveys were conducted in May and June 2005.

The Colusa Weir forms the Restoration Area's northern boundary. A gravel parking area and a levee form the eastern boundary. There is a non-native herbland east of the levee until the southeastern corner of the tract, where a patch of California black walnut (*Juglans californica*) and valley oak trees (*Quercus lobata*) occurs. River Road is to the east of the parking area and of the land east of the levee. On the far side of River Road there are bands of valley oaks and a large patch of narrow-leaved willow (*Salix exigua*), to the south of which is a house and non-irrigated pasture. Valley oaks and a few gum trees (*Eucalyptus* sp.) occur along the edge of River Road. South of the Restoration Area is a levee with a house and a pasture on the other side. The Sacramento River forms the western boundary of the Restoration Area.

Within the Restoration Area there are approximately 3 acres of predominantly riparian vegetation (not mapped). The forest in the northern portion of the property is dominated by mulberry trees with scattered valley oaks and California wild grape (*Vitis californica*). Without the mulberry trees this would be considered valley oak riparian forest. There is a corridor of willow scrub along the river, to the west of the mulberry/valley oak riparian forest. This willow scrub is composed of narrow-leaved willow, arroyo willow (*Salix lasiolepis*), and young Fremont cottonwood (*Populus fremontii*). To the east of the mulberry/valley oak riparian forest, closer to the open parking area, are blue elderberry (*Sambucus mexicana*) and Fremont cottonwood. Along the inlet there is a band of buttonbush scrub visually dominated by California button willow (*Cephalanthus occidentalis* var. *californicus*). The northern spit of land between the river and the inlet, and the southern portion of the inlet edge, are dominated by a narrow-leaved willow scrub. Further upbank along the inlet is a cottonwood riparian forest dominated by Fremont cottonwood interspersed with valley oak trees. Farther upbank, closer to the road, there are interspersed Oregon ash (*Fraxinus latifolia*) and California wild grape, making this more of a valley oak riparian forest. In the southeastern portion of the Restoration Area on the west side of the road are mature mulberry trees. There is a patch of cottonwood riparian forest in the southwestern corner of the Restoration Area and along the river south of the tract. Details of adjacent landcover can be found in Section One.

Remnant riparian vegetation surveyed occurs on the Ward tract and on Department of Parks and Recreation land on the west side of the Sacramento River across from the Cruise'n Tarry tract. This remnant riparian vegetation bounds the Ward Restoration Area to the east and south. General qualitative plant community descriptions of remnant riparian vegetation to the west and north of the Ward Restoration Area were done although no sampling occurred there due to access limitations (e.g. flooded) and small size. California Department of Fish and Game's Colusa-South Unit was surveyed on the east side of the Sacramento River. The Colusa-South Unit is approximately 500 m south of the Cruise'n Tarry tract. The same remnant vegetation was sampled for both the Cruise'n Tarry and Ward Restoration Area Baseline Assessments.

Six natural communities were found to occur nearby the Restoration Area: Great Valley mixed riparian forest, Great Valley cottonwood riparian forest, buttonbush scrub, Great Valley willow scrub, blackberry scrub, and herbland (Figure 5). Qualitative community descriptions follow Holland (1986). With the exception of herbland, all of these communities in some form (i.e. nomenclature may differ) are on the list of California Terrestrial Natural Communities recognized by the California Natural Diversity Database (CA DFG 2003). Three of these plant communities, cottonwood riparian forest, buttonbush scrub and willow scrub, along with valley oak riparian forest comprise the estimated 3 acres of native riparian vegetation within the Cruise'n Tarry tract and Restoration Area.

Methods

The vegetation survey maps community types and lists the most obvious plant species for nearby remnant riparian vegetation. Here much of the nearby remnant riparian vegetation is not adjacent to the Restoration Area, but was the closest and most accessible that was large enough to sample. Community typing here is qualitative and is based on visually dominant species, overall species list and frequency data rather than complete quantified sampling for community composition. Intergradations occur for most community types in the riparian vegetation. Listing of the visually common plant species was performed during point-quarter sampling and site reconnaissance. Nomenclature follows *The Jepson Manual* (Hickman 1993). If no common name is listed in *The Jepson Manual* then Oswald and Ahart's (1994) common name was used.

Vegetation sampling was conducted in the remnant riparian vegetation to the south and west of the Restoration Area (Figures 1, 5). Point-quarter sampling was used to quantify frequency of woody species and abundance of herbaceous species (Barbour et al. 1999). Remnant vegetation was stratified into approximate community types using aerial photograph interpretation and GIS vegetation coverage (CA DWR 2002; not shown). Each community type was then sampled to provide enough data to confirm the community type, adjust boundaries, and describe species composition. The amount of sampling for each community is proportional to its area. In each community type within the adjacent riparian vegetation at least two sampling points were established (if possible). Twenty-nine sampling points, each with four quadrants, were established along several transects running roughly perpendicular to the bands of vegetation. A large portion of the riparian vegetation was not sampled due to access issues. For frequency of woody species, each quadrant was sampled for three types of woody species: trees, shrubs and vines. For each type of woody species, the first species encountered within each quadrant of a sampling point was recorded. Since a number of riparian woody species occur as both trees and shrubs, physiognomic criteria were used (e.g. multiple stems for shrub and diameter at breast height greater than 8 cm for trees). Thus some woody species can be listed in two categories. For abundance of herbaceous species, the percent cover of the three most visually abundant species within a 3 m radius of each sampling point was recorded.

Within each remnant riparian community type and woody species category, frequency was calculated in two ways to provide information on both woody species composition and distribution. (1) Calculating woody species frequency across quadrants provides data on species composition and thus is referred to as composition frequency in this document. Within a community type composition frequency was calculated as: number of quadrants a species occurred in divided by total number of quadrants sampled times 100 (Tables 4 and 6). These data are the basis for determining frequency of recommended species for restoration. (2) Calculating woody species frequency across sampling points provides data on species distribution within the community (e.g. is it clumped or ubiquitous) and thus is called distribution frequency in this document. These data can be utilized in the details of the planting design. Within a community type distribution frequency was calculated as: number of points a species occurred at divided by total number of points sampled times 100 (Tables 4 and 6). Abundance of herbaceous species within a community type was calculated as mean percent cover: percent cover for a species summed over all points divided by the total number of sampling points (Tables 5 and 7). Total percent herbaceous cover for a given point may sum to above or below 100% as a result of overlapping herb layers or patches of bare ground, respectively.

Species observed in the remnant riparian vegetation were divided into potential woody and herbaceous restoration species (Tables 4 and 5) and species not recommended for restoration (Tables 6 and 7). Composition and distribution frequency by community type are given for

species that occurred at the sampling points. Species observed, but not quantitatively sampled, in a community type are noted by a "+" in the tables.

A search of the literature and the California Natural Diversity Database (CNDDDB; CA DFG 2005) records was performed to determine potential and known occurrences of threatened and endangered plant species occurring within 1.0 mile of the Restoration Area. A separate CNDDDB search was done by USGS quadrangles (7.5' series) to determine additional species with potential to occur on site. Four quadrangles were searched including Moulton Weir, Sanborn Slough, Colusa, and Meridian. An electronic copy of the CNDDDB records is included on the Baseline Assessment CD.

River Channel History

On the west side of the present Sacramento River, the main river channel scrolled across the remnant riparian vegetation from at least 1896 through 1981 (CA DWR 2002; not shown but see Ward Baseline Assessment). By 1981 the main channel had moved to the eastern edge of the present day forests in the northern portion of the remnant vegetation, making these forests between 24 and 45 years old. The point bar area in the north was the main channel in 1981, but by 1997 the channel had migrated to the eastern edge of the current point bar. The present day forests in the southern portion of the remnant vegetation were the main channel between 1946 and 1960, and the channel had migrated to the eastern edge by 1991, making these forests between 14 and 45 years old. The point bar area in the south was the main channel in 1991 and by 1997 the channel had migrated to the eastern edge of this point bar.

On the east side of the present Sacramento River, the main river channel scrolled across most of the remnant vegetation from at least 1896 through 1976 (CA DWR 2002). There is a small area of forest in the southern portion of the remnant vegetation which does not appear to have been main channel since before 1896. Therefore, this forest could be over 109 years old. By 1981 the main channel had moved to the western edge of the majority of the present day forests, making them between 24 and 82 years old. The blackberry scrub area was the main channel in 1923 and then it migrated west by 1935. Therefore, the blackberry scrub is between 70 and 82 years old.

Remnant Riparian Vegetation Community Descriptions

Qualitative community descriptions follow those of Holland (1986) with approximate acreage in parentheses. Remnant riparian plant communities sampled are mapped in Figure 5. Across the river the northern portion of the sampled remnant riparian vegetation is located along the eastern border of the Ward Restoration Area. The majority of this section is a mixed riparian forest in two patches (13 acres and 7 acres) dominated by box elder (*Acer negundo*) and interspersed with other species such as Fremont cottonwood (*Populus fremontii*), valley oak (*Quercus lobata*), arroyo willow (*Salix lasiolepis*), and blue elderberry (*Sambucus mexicana*). This community is a fairly mixed, dense forest with various levels of tree canopies, with several shrub and vine species present. There are two patches of cottonwood riparian forest (both 3 acres) in this northern section of riparian vegetation that are dominated primarily by Fremont cottonwood and Goodding's black willow (*Salix gooddingii*) with a subcanopy of box elder. Closer to the river are two areas of willow scrub (1 acre and 2 acres) that are dominated by narrow-leaved willow (*Salix exigua*). The northern area is dominated by large, mature, narrow-leaved willows, creating a willow scrub forest community.

The southern portion of the sampled remnant riparian vegetation that borders the Ward Restoration Area to the south is composed mostly of cottonwood riparian forest and buttonbush scrub with a narrow corridor of mixed riparian forest along the edge and a herbland community

near the center. The mixed riparian forest (10 acres) community along the levee is similar to the community described above. The cottonwood riparian forest is much more open than the cottonwood riparian forest in the northern portion of the remnant riparian vegetation. It is composed of widely spaced Fremont cottonwood trees interspersed with Goodding's black willow trees and blanketed with California wild grape (*Vitis californica*) vines. The buttonbush scrub (40 acres) community is dominated by California button willow (*Cephalanthus occidentalis* var. *californicus*) and large California wild grape hummocks with occasional Fremont cottonwood and Goodding's black willow trees. There are two herbland communities (7 acres and 1 acre) within the cottonwood riparian forest that were not sampled due to access issues.

The remnant riparian vegetation on the east side of the Sacramento River is composed of a cottonwood riparian forest surrounding a small area of blackberry scrub (Figure 5). The cottonwood riparian forest (56 acres) is dominated by Fremont cottonwood interspersed with occasional Goodding's black willow and California black walnut (*Juglans californica*) trees, a subcanopy of box elder, and pockets of edible fig (*Ficus carica*). There are several native vines present including California blackberry (*Rubus ursinus*), western poison oak (*Toxicodendron diversilobum*), and California wild grape. The blackberry scrub (3 acres) is an open scrub community dominated by California blackberry.

The remnant riparian vegetation north of the Ward Restoration Area that was visually surveyed but not sampled appears to be dominated by a cottonwood riparian forest consisting primarily of Fremont cottonwood interspersed with Goodding's black willow and covered in California wild grape. There are large open areas within this forest that are visually dominated by California button willow, California blackberry, California wild grape, and cocklebur and thus are best described as buttonbush and blackberry scrubs. On the southern edge of this forest and scrubs, closest to the Ward Restoration Area, appears to be a thin band of mixed riparian forest with additional visually obvious species such as narrow-leaved willow, California black walnut, valley oak, arroyo willow, and Himalayan blackberry (*Rubus discolor*). In the southwest corner of this northern remnant riparian vegetation there is a fallow English walnut grove (*Juglans regia*).

The remnant riparian vegetation in the western lowland, bounded by the Ward Restoration Area on three sides and the levee road to the west, that was visually surveyed but not sampled appears to be dominated by young or stunted Fremont cottonwood, Goodding's black willow, and narrow-leaved willow, suggesting cottonwood riparian forest. The area closest to the levee road appears to have a narrow band of willow scrub composed mainly of narrow-leaved willow, young Fremont cottonwood, and one valley oak. In between the willow scrub and the eastern cottonwood riparian forest is a more moist area composed primarily of cocklebur (*Xanthium strumarium*) and some Fremont cottonwood seedlings.

Cruise'n Tarry Restoration Area: Remnant Riparian Vegetation Sampling Locations

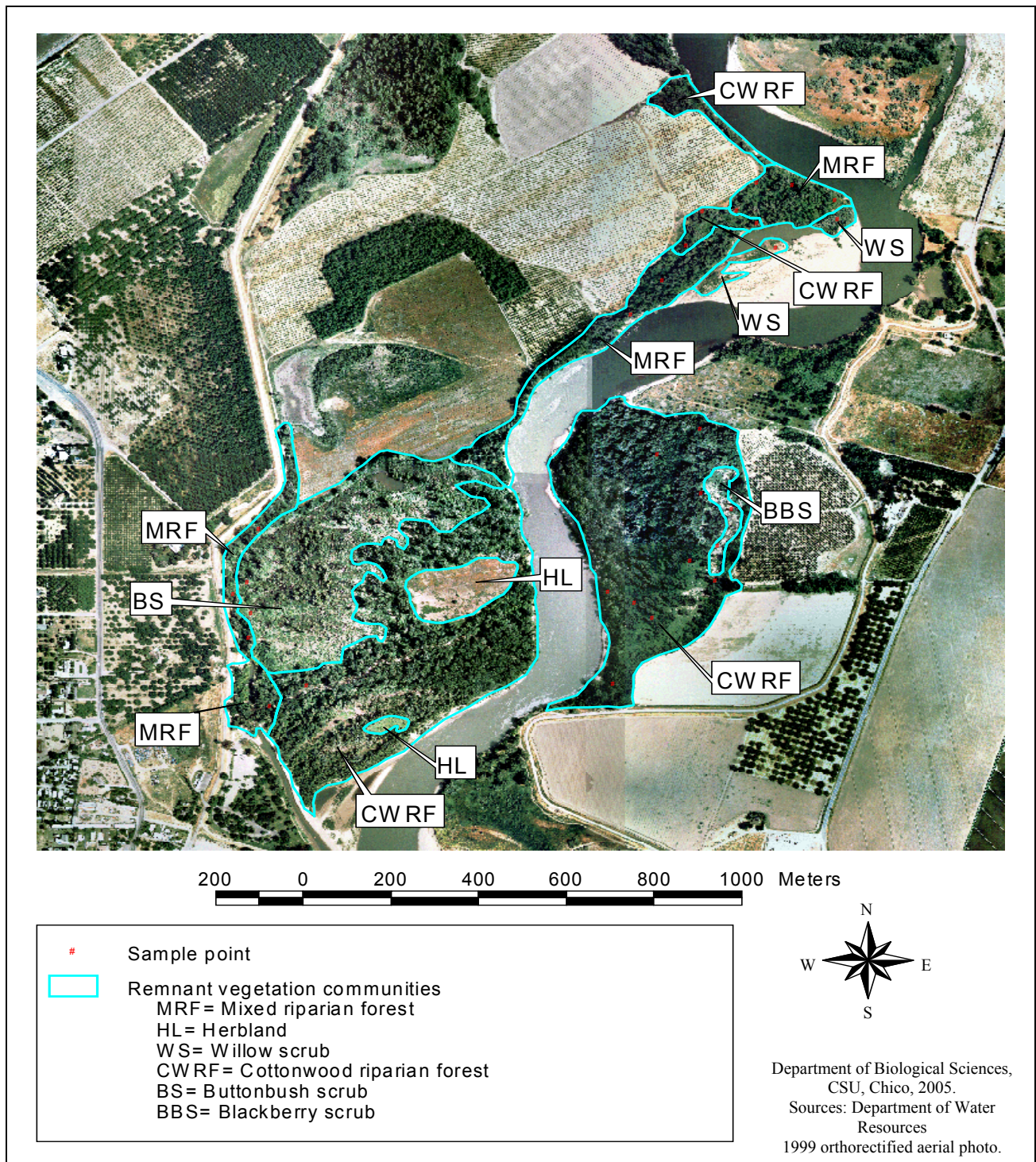


Figure 5. Remnant riparian plant communities and vegetation sampling locations within riparian plant communities close to the Cruise'n Tarry and Ward Restoration Areas, Colusa County, California.

Table 4. Composition and distribution frequencies by community type for potential native woody restoration species found in remnant riparian vegetation close to the Cruise'n Tarry Restoration Area, Colusa County, California. Frequency is given by community type for those species recorded during quantitative sampling. The sample size (n) for composition frequency represents the number of quadrants sampled. The sample size (n) for distribution frequency represents the number of points sampled. Abbreviations are: MRF=Mixed Riparian Forest; CWRP=Cottonwood Riparian Forest; BS=Buttonbush Scrub; BBS=Blackberry Scrub; WS=Willow Scrub. A blank indicates not observed. Nomenclature follows *The Jepson Manual* (Hickman 1993).

Common Name	Scientific Name	Family	Composition Frequency (%)					Distribution Frequency (%)				
Trees			MRF (n=40)	CWRP (n=52)	BS (n=8)	BBS (n=8)	WS (n=8)	MRF (n=10)	CWRP (n=13)	BS (n=2)	BBS (n=2)	WS (n=2)
box elder	<i>Acer negundo</i>	Aceraceae	35	6				60	15			
Fremont cottonwood	<i>Populus fremontii</i>	Salicaceae	5	63	13			10	92	50		
valley oak	<i>Quercus lobata</i>	Fagaceae	5					20				
narrow-leaved willow	<i>Salix exigua</i>	Salicaceae					63					100
Goodding's black willow	<i>Salix gooddingii</i>	Salicaceae		10					31			
arroyo willow	<i>Salix lasiolepis</i>	Salicaceae	3					10				
blue elderberry	<i>Sambucus mexicana</i>	Caprifoliaceae	5					20				
Shrubs												
box elder	<i>Acer negundo</i>	Aceraceae	14	48				50	69			
California button willow	<i>Cephalanthus occidentalis</i> var. <i>californicus</i>	Rubiaceae	2		100			10		100		
Fremont cottonwood	<i>Populus fremontii</i>	Salicaceae	2					10				
valley oak	<i>Quercus lobata</i>	Fagaceae	2					10				
California rose	<i>Rosa californica</i>	Rosaceae	2	4				10	8			
narrow-leaved willow	<i>Salix exigua</i>	Salicaceae	2				63	10				100
Goodding's black willow	<i>Salix gooddingii</i>	Salicaceae	2				13	10				50
arroyo willow	<i>Salix lasiolepis</i>	Salicaceae	12					20				
blue elderberry	<i>Sambucus mexicana</i>	Caprifoliaceae	7					10				
western poison oak	<i>Toxicodendron diversilobum</i>	Anacardiaceae	17	6			25	30	15			50

Table 4 continued.

Common Name	Scientific Name	Family	Composition Frequency (%)					Distribution Frequency (%)				
Vines			MRF (n=40)	CWRF (n=52)	BS (n=8)	BBS (n=8)	WS (n=8)	MRF (n=10)	CWRF (n=13)	BS (n=2)	BBS (n=2)	WS (n=2)
California pipevine	<i>Aristolochia californica</i>	Aristolochiaceae	3					10				
California blackberry	<i>Rubus ursinus</i>	Rosaceae	28	13		100	38	50	31		100	50
western poison oak	<i>Toxicodendron diversilobum</i>	Anacardiaceae	5	8				10	15			
California wild grape	<i>Vitis californica</i>	Vitaceae	63	65	100			80	85	100		

Table 5. Mean percent cover and distribution frequency by community type of potential native herbaceous restoration species found in remnant riparian vegetation close to the Cruise'n Tarry Restoration Area, Colusa County, California. The sample size (n) for mean percent cover and for distribution frequency is the same and represents the number of points sampled. Abbreviations are: MRF=Mixed Riparian Forest; CWRF=Cottonwood Riparian Forest; BS=Buttonbush Scrub; BBS=Blackberry Scrub; WS=Willow Scrub. A blank indicates not observed. Nomenclature follows *The Jepson Manual* (Hickman 1993).

Common Name	Scientific Name	Family	Mean Cover (%)					Distribution Frequency (%)				
Herbs			MRF (n=10)	CWRF (n=13)	BS (n=2)	BBS (n=2)	WS (n=2)	MRF (n=10)	CWRF (n=13)	BS (n=2)	BBS (n=2)	WS (n=2)
mugwort	<i>Artemisia douglasiana</i>	Asteraceae	3.00	3.00				30	15			
sedge	<i>Carex</i> sp.	Cyperaceae	1.00					10				
goose grass	<i>Galium aparine</i>	Rubiaceae	27.00	2.00				60	15			
nettle	<i>Urtica dioica</i>	Urticaceae	0.40					20				
nutsedge	<i>Cyperus</i> sp.	Cyperaceae		0.08					8			

Table 6. Composition and distribution frequencies by community type for woody plant species not recommended, but found in remnant riparian vegetation close to the Cruise'n Tarry Restoration Area, Colusa County, California. Frequency is given by community type for those species recorded during quantitative sampling. The sample size (n) for composition frequency represents the number of quadrants sampled. The sample size (n) for distribution frequency represents the number of points sampled. Abbreviations are: MRF=Mixed Riparian Forest; CWRF=Cottonwood Riparian Forest; BS=Buttonbush Scrub; BBS=Blackberry Scrub; WS=Willow Scrub. A blank indicates not observed. Nomenclature follows *The Jepson Manual* (Hickman 1993).

Common Name	Scientific Name	Family	Composition Frequency (%)					Distribution Frequency (%)				
Trees			MRF (n=40)	CWRF (n=52)	BS (n=8)	BBS (n=8)	WS (n=8)	MRF (n=10)	CWRF (n=13)	BS (n=2)	BBS (n=2)	WS (n=2)
California black walnut	<i>Juglans californica</i>	Juglandaceae	30	8				70	23			
white mulberry	<i>Morus alba</i>	Moraceae	13					30				
cherry plum	<i>Prunus cerasifera</i>	Rosaceae	3					10				
Shrubs												
edible fig	<i>Ficus carica</i>	Moraceae	10	38				30	69			
California black walnut	<i>Juglans californica</i>	Juglandaceae	7	4		13		20	15		50	
white mulberry	<i>Morus alba</i>	Moraceae	5					20				

Table 7. Mean percent cover and distribution frequency by community type for herbaceous plant species not recommended, but found in remnant riparian vegetation close to the Cruise'n Tarry Restoration Area, Colusa County, California. Frequency is given by community type for those species recorded during quantitative sampling. The sample size (n) for mean percent cover and for distribution frequency is the same and represents the number of points sampled. Abbreviations are: MRF=Mixed Riparian Forest; CWRF=Cottonwood Riparian Forest; BS=Buttonbush Scrub; BBS=Blackberry Scrub; WS=Willow Scrub. A blank indicates not observed. Nomenclature follows *The Jepson Manual* (Hickman 1993).

Common Name	Scientific Name	Family	Mean Cover (%)					Distribution Frequency (%)				
Herbs			MRF (n=10)	CWRF (n=13)	BS (n=2)	BBS (n=2)	WS (n=2)	MRF (n=10)	CWRF (n=13)	BS (n=2)	BBS (n=2)	WS (n=2)
dog-fennel	<i>Anthemis cotula</i>	Asteraceae	0.20					10				
bur-chervil	<i>Anthriscus caucalis</i>	Apiaceae	9.00					10				
ripgut grass	<i>Bromus diandrus</i>	Poaceae	7.00					10				
black mustard	<i>Brassica nigra</i>	Poaceae		2.00					8			
grass	Grass sp.	Poaceae	2.00	7.00				20	8			
Italian ryegrass	<i>Lolium multiflorum</i>	Poaceae	0.30					10				
curly dock	<i>Rumex crispus</i>	Polygonaceae	0.20					10				
lady's thumb	<i>Polygonum persicaria</i>	Polygonaceae		0.23					8			
cocklebur	<i>Xanthium strumarium</i>	Asteraceae		0.08					8			

Special-status Plant Species

Information about known and potential occurrences of special-status plant species was obtained from the California Natural Diversity Database (CNDDDB; CA DFG 2005). Based on the quadrangle search of the CNDDDB, five species were initially identified to potentially occur within 1 mile of the Restoration Area. Based on distribution, elevation, and habitat requirements, one of these species was determined to be unlikely to occur. Of the four species with potential to occur, no known occurrences were found within 1.0 mile of the Restoration Area.

Table 8. Special-status plant species potentially occurring within 1.0 mile of the Cruise'n Tarry Restoration Area, Colusa County, California. FE=federally listed as endangered; FT=federally listed as threatened; CE=California state listed as endangered; CNPS=California Native Plant Society, 1B=rare, threatened or endangered in California and elsewhere, 2=rare in California but more common elsewhere, 3=need more information, 4=plants of limited distribution; a watch list. Habitat descriptions were adapted from CNPS (2004).

Scientific Name	Common Name	Habitat	Status	Potential to Occur
<i>Astragalus tener</i> var. <i>ferrisiae</i>	Ferris's milk-fetch	Meadows and seeps (vernally mesic), valley and foothill grassland (subalkaline flats); elevation 5-75 meters.	CNPS 1B	May occur. No known occurrences within 1 mile of the restoration area.
<i>Atriplex depressa</i>	brittlescale	Chenopod scrub, meadows and seeps, playas, valley and foothill grassland, vernal pools/alkaline, clay; elevation 1-320 meters.	CNPS 1B	May occur. No known occurrences within 1 mile of the restoration area.
<i>Cordylanthus palmatus</i>	palmate-bracted bird's-beak	Chenopod scrub, valley and foothill grassland (alkaline); elevation 5-155 meters.	FE, CE, CNPS 1B	May occur. No known occurrences within 1 mile of the restoration area. Known from only nine occurrences.
<i>Hibiscus lasiocarpus</i>	rose-mallow	Marshes and swamps (freshwater); elevation 0-120 meters.	CNPS 2	May occur. No known occurrences within 1 mile of the restoration area.
<i>Lasthenia glabrata</i> ssp. <i>coulteri</i>	Coulter's goldfields	Marshes and swamps (coastal salt), playas, vernal pools; elevation 1-1220 meters.	CNPS 1B	Unlikely to occur due to the lack of suitable habitat. No known occurrences within 1 mile of the restoration area.

References

- Barbour, M.G., J.H. Burk, W.D. Pitts, F.S. Gilliam and M.W. Schwartz. 1999. *Terrestrial Plant Ecology* 3rd Edition. Addison Wesley Longman, Menlo Park, CA.
- California Department of Fish and Game. 2003. California Natural Diversity Database. List of California Terrestrial Natural Communities. Wildlife and Habitat Data Analysis Branch, Sacramento, CA. Retrieved from: <http://www.dfg.ca.gov/whdab/pdfs/natcomlist.pdf>
- California Department of Fish and Game. 2005. California Natural Diversity Database. RareFind 3. Updated May 27, 2005. Wildlife and Habitat Data Analysis Branch, Sacramento, CA.
- California Department of Water Resources. 2002. GIS of the middle Sacramento River, California. Northern District, Red Bluff, California.
- California Native Plant Society (CNPS). 2004. *Inventory of Rare and Endangered Vascular Plants of California* (sixth edition). Rare Plant Scientific Advisory Committee, David P. Tibor, Convening Editor. California Native Plant Society. Sacramento, CA.
- Hickman, J.C. 1993. *The Jepson Manual*. University of California Press, Berkeley, California.
- Holland, R.F. 1986. Preliminary descriptions of the terrestrial natural communities of California. California Department of Fish and Game, Sacramento, California.
- Oswald, V. and L. Ahart. 1994. *Manual of the Vascular Plants of Butte County, California*. CNPS Press, Sacramento, California.
- The Nature Conservancy. 2005. Draft Colusa Subreach Background Report. Northern Central Valley Office, Chico, California.

SECTION THREE

CRUISE'N TARRY

SOIL SURVEY

**Jean G. Hubbell, M.S.
Catherine Little
Katie C. Price
Dr. David M. Wood**

Introduction

A survey of Restoration Area soils is used to document existing conditions for plant growth and thus guide the restoration planting recommendations. Information on soil texture and depth to water table gathered from auger holes across the Restoration Area is used to match specific locations with appropriate plant community types.

The Cruise'n Tarry tract is located northeast of Colusa, in Colusa County on the east side of the Sacramento River at river mile 145.5 and is owned by the Sacramento and San Joaquin Drainage District, State of California and managed by the California Department of Water Resources. The Restoration Area comprises 8 acres of the tract inside the levees and surrounds a small inlet off the main channel of the Sacramento River that was previously a marina. Currently the Restoration Area is composed of patches of remnant riparian vegetation with fruitless mulberry trees and two areas of non-native herbland.

Methods

Soil data were gathered from augering 5 holes by hand across the Restoration Area during June 2005 (Figures 2, 4, 9). Due to Cruise'n Tarry's unique shape, abundance of remnant vegetation and small size, auger hole locations were determined by hand utilizing the 1999 aerial photo. The 5 holes were located across the Restoration Area to meet the minimum of 5 holes per Restoration Area, or 1 hole per 10 acres in order to give an accurate representation of soils across the Restoration Area. Textural analysis was done following the Natural Resource Conservation Service's (NRCS) texture-by-feel method at one-foot increments (Table 9; Schoeneberger et al. 2002). In addition, depth to refusal (gravel, water table or unconsolidated sand) was noted for each sample location along with any unique characteristics. Soil locations were classified into deep and shallow based on NRCS soil survey standards (Table 10; Schoeneberger et al. 2002).

Table 9. Natural Resource Conservation Service's soil texture classification.

<u>Texture</u>	<u>% Sand</u>
Silt	0-20
Silt loam	20-35
Sandy silt loam	35-50
Sandy loam	50-70
Loamy sand	70-85
Sand	85-100

Table 10. Natural Resource Conservation Service's soil depth classification.

<u>Depth class</u>	<u>Depth (inches)</u>
Very Shallow	0-10
Shallow	10-20
Moderately Deep	20-40
Deep	40-60
Very Deep	>60

Soils Description

The Restoration Area is generally dominated by clay loam soils, except in the northern portion where sandy loam soils dominate. This differs from the historic Marysville area Soil Survey (1909), but generally concurs with the historic soil surveys of Colusa County from 1948 and 1967, although not with the current 1998 soil survey (Figures 6-9). In the historic Colusa County soil surveys of 1948 and 1967 the majority of the Restoration Area soils are described as Columbia Soils undifferentiated with medium texture (USDA 1948), and Columbia-Sycamore Association with textures ranging from fine sandy loam to silty clay loam (USDA 1967) which generally concurs with the soil auger data (Table 11). The Restoration Area soils are generally more fine-textured than the designations in the 1909 and 1998 soil surveys. These surveys describe the Restoration Area soils as Sacramento silt loam (USDA 1909) and mostly Vina loam (USDA 1998; Figures 6, 9). Note that in the 1998 soil survey the Restoration Area's northern section is delineated as Tujunga loam, which is coarser, being mainly sand, than the sandy loams and clay loams found in the soil auger hole. Table 11 gives the auger hole data, and Table 12 lists comments (if any) for each hole. Surface textures across the site are relatively uniform, consisting of clay loams except in the far north which is sandy loam (Table 11). The two northern soil auger holes have more stratified profiles than the more heterogeneous profiles of the southern auger holes (Figure 9, Table 11).

The Restoration Area soils are typical of active floodplain soils where stratification from various flooding events is still quite evident and the uniform fining upward sequence (where coarser material is found at depth and finer textures make up the upper layers of the profile) has yet to occur. A uniform fining upward sequence is more typical of alluvial soils further from the active channel (Andrew Conlin Pers. Comm. 2003). All the soil auger holes have series of fining upward sequences suggesting channel deposits, although some of these auger holes are more heterogeneous than others (Table 11). These deposits are likely very old as the scrolling of the Sacramento River over the last 109 years has been to the west of the 1999 channel and has only just begun to scroll across the Restoration Area since 1999 (Figures 6-9; DWR 2002, USDA 1909). For example, the southwest corner shown in Figure 9 no longer exists. These soils may be influenced by the levee building as well as other construction at the marina site on the south end.

Most of the Restoration Area has very deep soils with the water table or gravel refusal being reached between roughly 7 and 20.5 feet. Tree canopy reflects this well with good coverage where trees occur at the Restoration Area (Figure 9). Gravel refusal occurs at auger holes 2 and 5 indicative of a gravel lens or old point bar. Auger hole 2, although deeper than auger hole 5, had gravels present at 6-8 feet before attaining refusal at 10 feet. Although the gravel occurs at similar depth from the surface for these two auger holes, their elevation difference is such that the elevation of refusal differs by 11 feet. The surface of auger hole 2 is approximately 72 feet whereas auger hole 5 is approximately 58 feet (US ACOE 1997). Thus it is difficult to say whether the gravel refusal of these two holes is completely unrelated or different portions of the same gravel bar.

Three auger holes reached the water table at 8, 17 and 20.5 feet (holes 4, 3 and 1 respectively, Table 11). This variation in depth to the water table essentially reflects the difference in elevation among these holes. Auger holes 1 and 3, at 67 and 65 feet respectively, are on higher ground than auger hole 4 at 58 feet and so have a greater depth to the water table (US ACOE 1997). Thus when the surface elevation is taken into account, the water table elevation apparently ranges from 46-50' across this location. However, because 2005 was a particularly wet spring and early summer, the water table may be more elevated than in a typical year.

Although the water table was reached in only 3 of the 5 auger holes, 4 holes had reduced oxygen features (redox features) at depths ranging from 3 to 16 feet (Table 12; Figure 9). Redox features represent soil horizons influenced by saturated conditions for extended periods of time throughout the year. These conditions would be expected in soils that are adjacent to present channels, overflow channels, or sloughs, or in the annual floodplain and in historic buried channels, which may then act as a channel for the underground flow of water. Gleyed layers occurred in auger holes 3 and 5 at depths of 11 and 3 feet respectively (Table 12). This reduced or "gleyed" layer is the extreme example of redox features where no oxygen is present in the soil resulting in the minerals remaining in a reduced form. These locations apparently have periods of inundation longer than those just showing redox features.

Table 11. Soil texture by depth across the Cruise'n Tarry Restoration Area, Colusa County, California.

Date Sampled	6/20/2005	6/20/2005	6/20/2005	6/20/2005	6/20/2005
Point	1	2	3	4	5
Surface	Sandy Loam	Clay Loam	Sandy Clay Loam	Clay Loam	Clay Loam
1 ft	Sandy Clay	Clay Loam	Sandy Clay Loam	Clay Loam	Loam
2 ft	Sandy Loam	Clay Loam	Sandy Clay Loam	Silty Clay Loam	Loamy Sand
3 ft	Sandy Loam	Clay Loam	Sandy Clay Loam	Clay	Sandy Clay Loam
4 ft	Sandy Loam	Silty Clay Loam	Sandy Loam	Silty Clay	Sandy Loam
5 ft	Sandy Loam	Silty Clay Loam	Sandy Clay Loam	Silty Clay Loam	Sandy Clay Loam
6 ft	Sandy Clay Loam	Sandy Clay Loam	Sandy Loam	Silty Clay	Clay Loam
7 ft	Loamy Sand	Clay Loam	Sandy Clay Loam	Silty Clay	
8 ft	Loamy Sand	Clay Loam	Sandy Loam		
9 ft	Sandy Loam	Sandy Clay Loam	Clay Loam		
10 ft	Sandy Loam	Sandy Clay Loam	Sandy Clay Loam		
11 ft	Sandy Clay Loam		Sandy Loam		
12 ft	Sandy Clay Loam		Sandy Loam		
13 ft	Sandy Clay Loam		Clay		
14 ft	Clay Loam		Clay		
15 ft	Clay Loam		Clay		
16 ft	Clay Loam		Clay		
17 ft	Clay Loam				
18 ft	Clay Loam				
19 ft	Sandy Loam				
20 ft	Sandy Loam				
Total	20 ft 7 in	10 ft 2 in	17 ft	8 ft	6 ft 10 in
Refusal	Saturation	Gravel	Saturation	Saturation	Gravel

Table 12. Soil auger hole comments for the Cruise'n Tarry Restoration Area, Colusa County, California. Reduced oxygen conditions are noted as mottling. Extreme anaerobic conditions are noted as gleying or gleyed layers.

Hole #1. No Comments.

Hole #2. Less gritty at 3 ft. Gravel present at 6, 7, 8 and 10 ft. Mottling at 8 ft.

Hole #3. Gravel present at 8 ft. Gleying at 9 and 10 ft. Gleyed layer from 11 through 16 ft.

Hole #4. Gray and red mottling from 3 through 6 ft.

Hole #5. Gleyed layer from 3 to 4 ft. Gray and red mottling at 6 ft.

Cruise'n Tarry Restoration Area: 1909 Soil Series

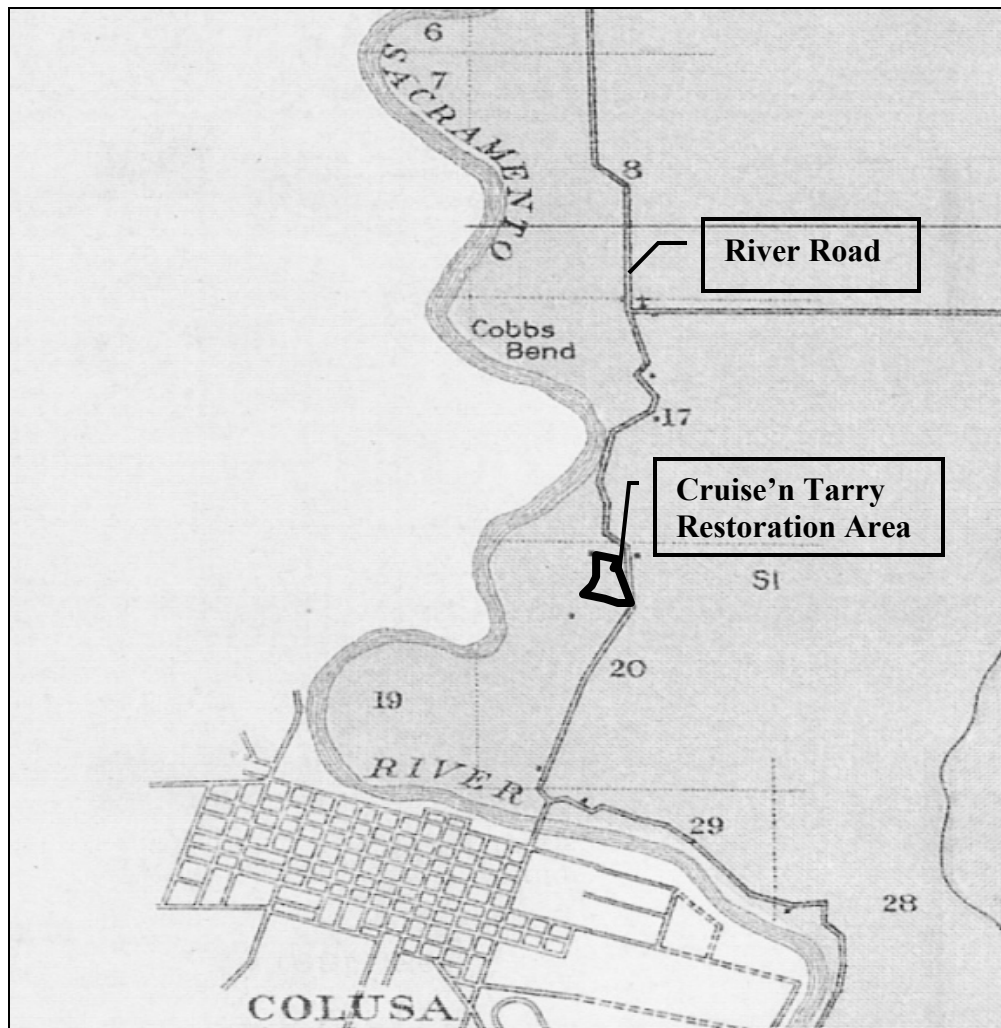
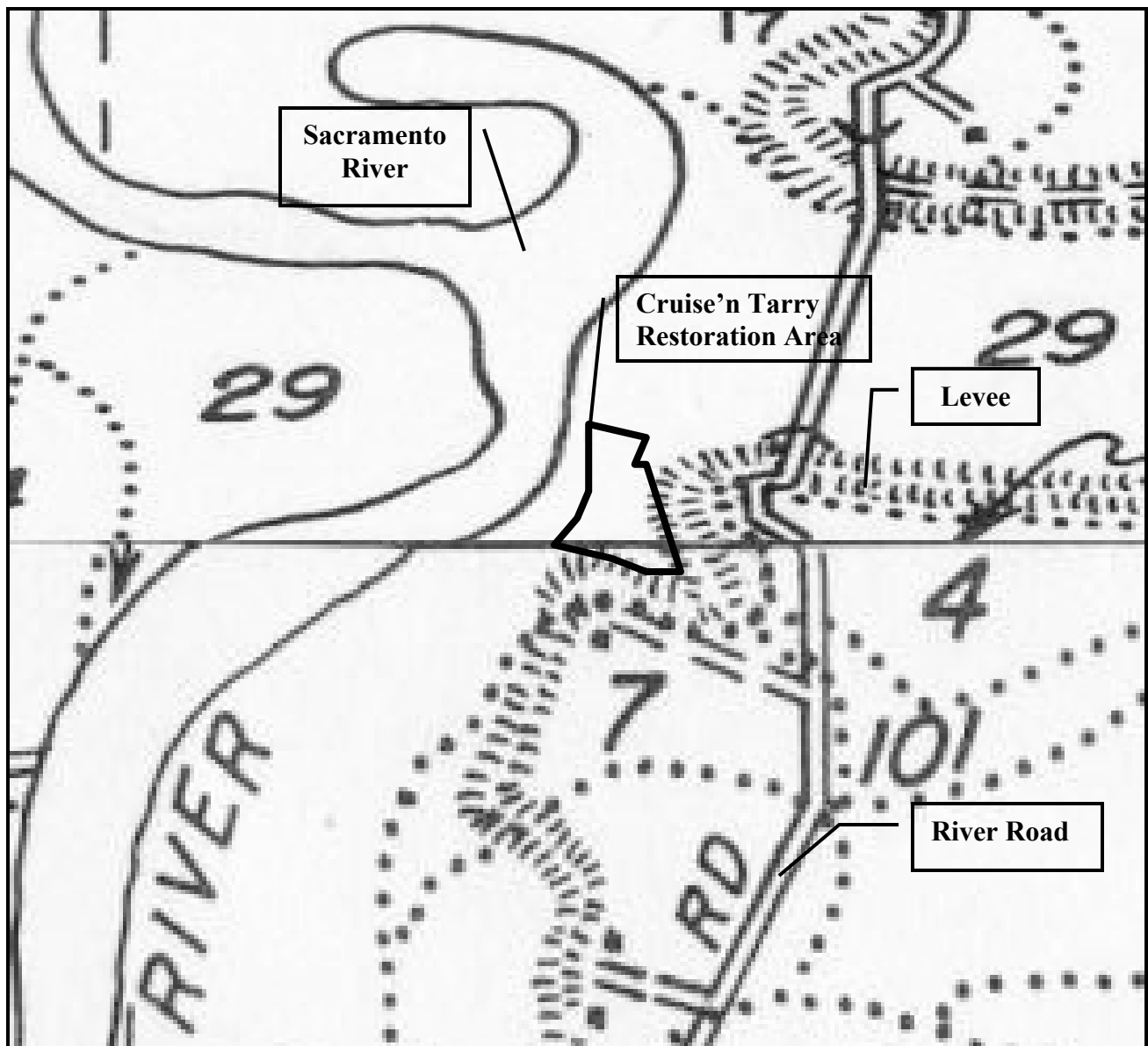


Figure 6. Approximate boundary and location of Cruise'n Tarry Restoration Area on the 1909 Soil Survey map, California Marysville Sheet (USDA Bureau of Soils).

Cruise'n Tarry Restoration Area: 1948 Soil Series



Soil Series Contours

- 7= Sycamore Loam, 0-2% slope, nearly level
- 9= Columbia Loam, 0-2% slope, gently undulating
- 29= Columbia soils undifferentiated, variable microrelief, 0-2% slope, gently undulating

1 mile= approximately 6 inches

Figure 7. Approximate boundary and location of Cruise'n Tarry Restoration Area on the 1948 Soil Survey map, Colusa County, California (Harradine 1948).

Cruise'n Tarry Restoration Area: 1967 Soil Series

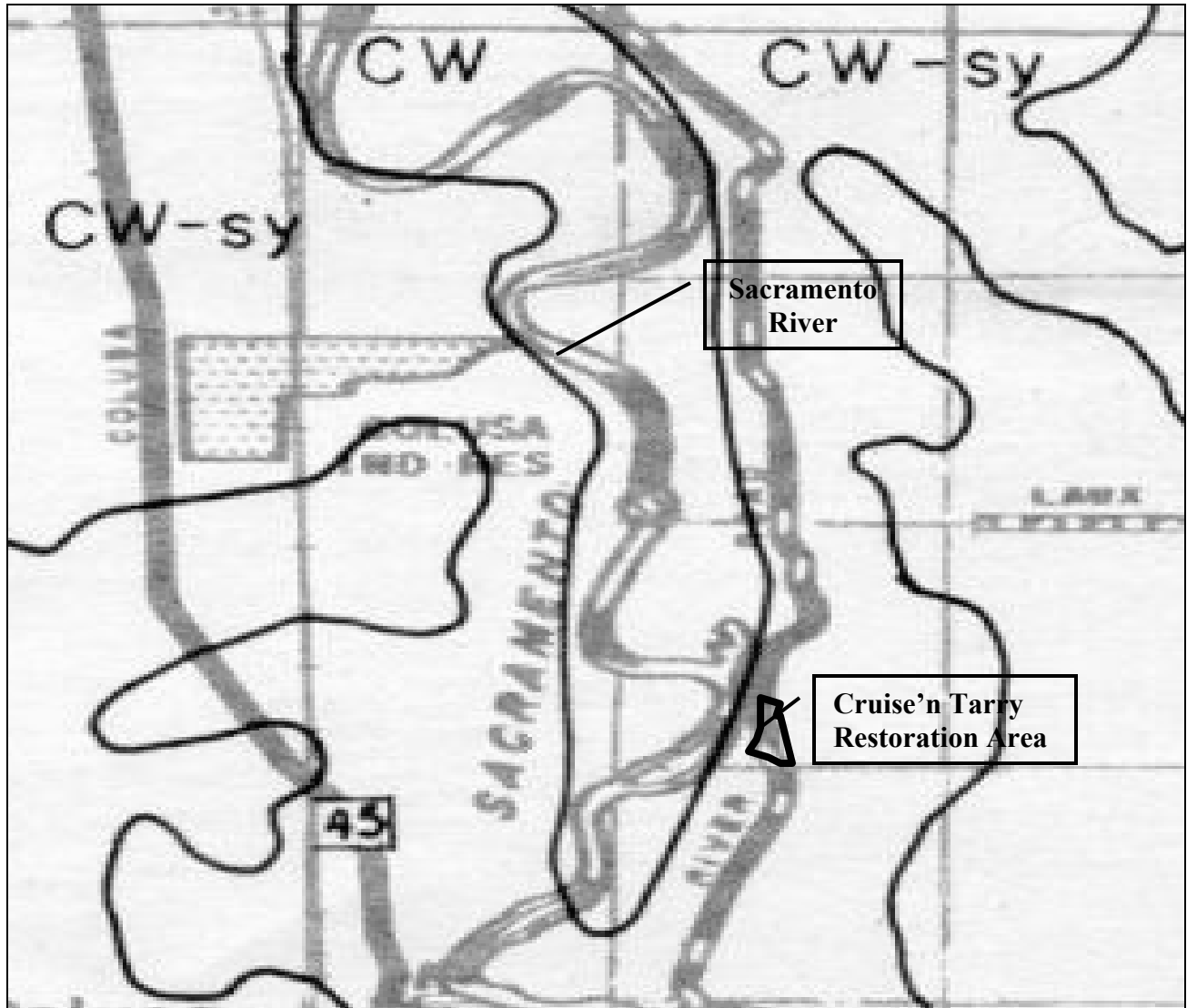


Figure 8. Approximate boundary and location of Cruise'n Tarry Restoration Area on the 1967 Soil Survey map, Colusa County, California (USDA Soil Conservation Service).

Cruise'n Tarry Restoration Area: 1998 Soil Series

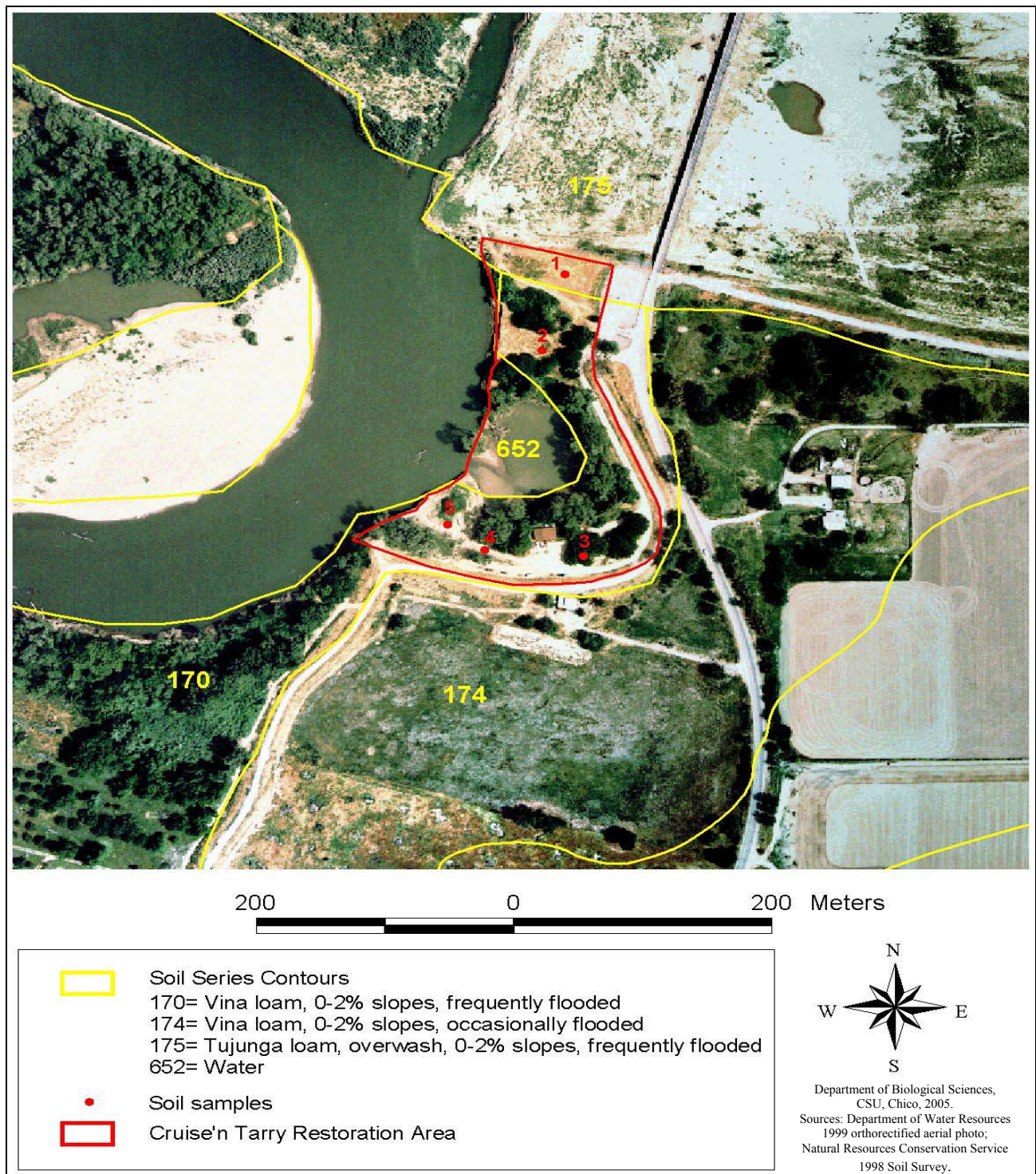


Figure 9. Soil series contours from the 1998 Colusa County Soil Survey at Cruise'n Tarry Restoration Area, Colusa County, California (USDA Natural Resources Conservation Service) along with soil sample locations.

Acknowledgements

Thanks to our field assistants Gay Ann Silman, Aggie Morrow, Mark Lynch, Stacey Henderson, and Jason Glick for augering holes and data entry.

References

- California Department of Water Resources. 2002. GIS of the middle Sacramento River, California. Northern District, Red Bluff, California.
- Harradine, F. F. 1948. Soils of Colusa County, California. University of California Berkeley, College of Agriculture, Agricultural Experiment Station, Division of Soils. Berkeley, California.
- Schoeneberger, P.J., D.A. Wysocki, E.C. Benham and W.D. Broderson, (editors). 2002. Field book for describing and sampling soils, Version 2.0. Natural Resources Conservation Service, National Soil Survey Center, Lincoln, NE.
- The Nature Conservancy. 2005. Draft Colusa Subreach Background Report. Northern Central Valley Office, Chico, California.
- U.S. Department of Agriculture, Bureau of Soils. 1909. Soil map, California Marysville Sheet.
- U.S. Department of Agriculture, Soil Conservation Service. 1967. Report and general soil map, Colusa County, California.
- U.S. Department of Agriculture, Natural Resources Conservation Service. 1998. Soil Survey of Colusa County, California.

SECTION FOUR

CRUISE'N TARRY

**SPECIAL STATUS ANIMAL SPECIES,
BIRD COUNTS, AND NON-NATIVE MAMMALS**

**John W. Hunt, M.S.
David Koenig
Dr. David M. Wood**

Introduction

Animals such as wildlife and birds will benefit from the increased habitat created through natural process or active restoration. Information on wildlife and bird species present or known to occur near the Restoration Area can be used to better judge the value of restoration actions at a particular site. Non-native mammal species are important due to their probable negative impact on native wildlife species. Non-native mammal species can prey upon, directly compete with, and significantly disturb native wildlife.

Methods

A computer search for known occurrences of special status animal species (federal and state threatened and endangered species and species of special concern) occurring within 1.0 mile of the Restoration Area was conducted using the California Natural Diversity Database (CA DFG 2005). An assessment of potential non-native mammals and special status animal species occurring at or within 1.0 mile of the Restoration Area was performed in June 2005. This assessment was based on aerial photographs, field surveys of remnant riparian vegetation and associated nearby habitat, field experience of the authors and habitat characteristics of the species involved. During the bird point count survey (see below), any occurrences or signs of special status species or non-native mammals were noted. General habitat characteristics were gathered from vegetation surveys (Section Two). Information on species status was taken from California Wildlife Habitat Relations 8.0 (CA DFG 2002) and the California Natural Diversity Database (CA DFG 2005).

Bird species were surveyed on June 22, 2005, following an adaptation of the methods proposed by Ralph et al. (1993). Due to the limited availability of adjacent remnant riparian habitat, three point count stations set approximately 200 m apart were established in remnant riparian habitat at the California Department of Fish and Game's Colusa-South Unit, approximately 500 m southwest of the Cruise'n Tarry tract (Figure 10). All birds observed (either seen or heard) within an eight-minute observation period were recorded. To reduce the possibility of individuals being recorded a second time at another station, only data on species encountered within 50 m of each station are presented here. To compute frequency of occurrence for a species, the total number of observations for that species was divided by the total number of observations for all species.

Special Status Animal Species

Table 13 lists California Natural Diversity Database special status species occurrences within 1.0 mile of the Restoration Area. More than one record indicates multiple sightings of a species in different years and/or locations. Table 14 is a list of special status wildlife species with potential or known to occur or reside within 1.0 mile of the Restoration Area.

Table 13. California Natural Diversity Database special status species occurrences occurring within 1.0 mile of the Cruise'n Tarry Restoration Area, Colusa County, California. FE/FT=federally endangered/federally threatened; FSC=Federal species of special concern; SE/ST=state endangered/state threatened; SSC=California species of special concern.

Common Name	Scientific Name	Status	# of known occurrences
Valley elderberry longhorn beetle	<i>Desmocerus californicus dimorphus</i>	FT	4
Swainson's hawk	<i>Buteo swainsonii</i>	ST	1
Western yellow-billed cuckoo	<i>Coccyzus americanus occidentalis</i>	SE	4
Bank swallow	<i>Riparia riparia</i>	ST	1

Table 14. Special status animal species with potential or known to occur or reside within 1.0 mile of the Cruise'n Tarry Restoration Area, Colusa County, California. FE/FT=federally endangered/federally threatened; FSC=Federal species of special concern; SE/ST=state endangered/state threatened; SSC=California species of special concern; SSC1=species that face immediate extirpation of their entire California population or their California breeding population if current trends continue (these species may qualify as state endangered or threatened, but are not yet listed); SSC2=species on the decline in a large portion of their range in California, which require management to prevent their becoming SSC1; SSC3=species not in any present danger of extirpation and their populations within most of their range do not appear to be declining seriously, however, due to their small populations in California they are vulnerable to extirpation should a threat materialize; ?=not enough information.

Common Name	Scientific Name	Status	Breeding
Valley elderberry longhorn beetle	<i>Desmocerus californicus dimorphus</i>	FT	probable
Sacramento splittail	<i>Pogonichthys macrolepidoptus</i>	SSC1	potential
Steelhead – Central Valley ESU	<i>Oncorhynchus mykiss</i>	FT	potential
Chinook salmon (fall run)	<i>Oncorhynchus tsawyscha (fall run)</i>	SSC	potential
Chinook salmon (spring run)	<i>Oncorhynchus tsawyscha (spring)</i>	FT/ST	potential
Chinook salmon (winter run)	<i>Oncorhynchus tsawyscha (winter)</i>	FE/SE	probable
Hardhead	<i>Mylopharodon conocephalus</i>	SSC3	
Western spadefoot toad	<i>Spea hammondi</i>	SSC	potential
Western pond turtle	<i>Clemmys marmorata</i>	SSC	probable
Giant garter snake**	<i>Thamnophis gigas</i>	FT/ST	potential
American white pelican	<i>Pelecanus erythrorhynchos</i>	SSC	
Double-crested cormorant	<i>Phalacrocorax auritus</i>	SSC2	potential
White-faced ibis	<i>Plegadis chihi</i>	SSC	
Osprey	<i>Pandion haliaetus</i>	SSC2	potential
Bald eagle	<i>Haliaeetus leucocephalus</i>	FT/SE	
Northern harrier	<i>Circus cyaneus</i>	SSC2	probable
Sharp-shinned hawk	<i>Accipiter striatus</i>	SSC3	probable
Cooper's hawk	<i>Accipiter cooperii</i>	SSC3	probable
Swainson's hawk*	<i>Buteo swainsoni</i>	ST	probable
Ferruginous hawk	<i>Buteo regalis</i>	SSC	
Golden eagle	<i>Aquila chrysaetos</i>	SSC3	
Peregrine falcon	<i>Falco peregrinus</i>	SE	
Prairie falcon	<i>Falco mexicanus</i>	SSC3	
California gull	<i>Larus californicus</i>	SSC3	
Burrowing owl	<i>Athene cunicularia</i>	SSC2	potential
Short-eared owl	<i>Asio flammeus</i>	SSC2	potential
Long-eared owl	<i>Asio otus</i>	SSC	
Greater sandhill crane	<i>Grus canadensis tabida</i>	ST	
Long-billed curlew	<i>Numenius americanus</i>	SSC	
Western yellow-billed cuckoo	<i>Coccyzus americanus occidentalis</i>	FSC/SE	probable
Willow flycatcher	<i>Empidonax traillii</i>	SE	?
Loggerhead shrike	<i>Lanius ludovicianus</i>	CSC	probable
Purple martin	<i>Progne subis</i>	SSC2	
Bank swallow	<i>Riparia riparia</i>	ST	probable
Yellow warbler	<i>Dendroica petechia</i>	SSC2	potential
Yellow-breasted chat	<i>Icteria virens</i>	SSC2	probable
California horned lark	<i>Eremophila alpestris actia</i>	SSC	potential
Tricolored blackbird	<i>Agelaius tricolor</i>	SSC	potential

Table 14 continued.

Townsend's big-eared bat**	<i>Corynorhinus townsendii</i>	SSC2	?
Pallid bat**	<i>Antrozous pallidus</i>	SSC	?
Western mastiff bat	<i>Eumops perotis</i>	SSC2	?

*Species observed within 1.0 miles of the Restoration Area by the authors.

** Species not known or with low probability of occurrence within area of consideration.

Threatened and Endangered Wildlife Species

Seven threatened or endangered wildlife species are of particular interest in the vicinity of the Cruise'n Tarry tract. Following is a brief discussion of their status and any observations noted during fieldwork.

1. Valley elderberry longhorn beetle (*Desmocerus californicus dimorphicus*)

Valley elderberry longhorn beetle (VELB) is a federally threatened species. Potential VELB habitat occurs throughout nearby remnant vegetation wherever blue elderberry (*Sambucus mexicana*) is present. This species is recorded in the CNDDB as occurring within 1.0 mile of the Restoration Area and nearby remnant riparian habitat.

2. Steelhead (*Oncorhynchus mykiss*) – Central Valley Evolutionarily Significant Unit (ESU)

The Central Valley steelhead ESU is a federally threatened population. Steelhead is an anadromous fish species spawning in tributaries of the Sacramento River.

3. Chinook salmon (*Oncorhynchus tsawytscha*) – spring run

The spring run Chinook salmon is a federal and state threatened species. Spring run Chinook salmon is an anadromous species of fish that spawns in tributaries of the Sacramento River. Mill, Deer, and Butte Creek are the principle spawning grounds of this species.

4. Chinook salmon (*Oncorhynchus tsawytscha*) – winter run

Winter run Chinook salmon is a federal and state endangered species. Winter run Chinook salmon is known to spawn in cold gravels of the Sacramento River. This species is recorded as occurring throughout the lower Sacramento River below Keswick Dam.

5. Swainson's hawk (*Buteo swainsonii*)

Swainson's hawk is a state threatened species. A pair of Swainson's hawks was observed soaring over the Cruise'n Tarry Tract. This species is recorded in the CNDDB as occurring within 1.0 mile of the Restoration Area and nearby remnant riparian habitat.

6. Bank Swallow (*Riparia riparia*)

Bank swallows are a state threatened species. This species is known to nest in colonies in undercut banks along the Sacramento River. This species is recorded in the CNDDB as nesting within 1.0 mile of the Restoration Area.

7. Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*)

Western yellow-billed cuckoos are a state endangered species known to nest in riparian forests along the Sacramento River. This species is recorded in the CNDDB as nesting within 1.0 mile of the Restoration Area.

Non-native Mammal Species

Table 15 lists the non-native mammal species known to occur or potentially occurring within 1.0 mile of the Restoration Area, and an estimate (where possible) of abundance. Due to the lack of available field data, information on non-native mammals presented here is highly qualitative and should be taken as such.

Domestic dogs were not observed on or near the Restoration Area. Because of the proximity of residences, domestic dogs potentially occur on the Restoration Area periodically. Feral cats were not observed at the Restoration Area, but this species is expected to occur periodically due to the proximity of residences to the Restoration Area and the fact that feral cats have been observed repeatedly at other restoration areas. Feral cats can cause significant depredation on small vertebrates as well as serving as a potential vector for disease to other mammals (e.g. feline distemper, feline leukemia, feline immune deficiency disease, and toxoplasmosis; Coleman et. al. 1997).

House mice, roof rats, and Norway rats all have potential to occur within 1.0 mile of the Restoration Area. These animals are relatively widespread in lower elevations in California, especially in association with residences and agriculture (Whitaker 1991) and have been documented in riparian areas. Roof rats have been shown to be important nest predators in remnant riparian and riparian restoration sites at Cosumnes River Preserve (Whisson and Engilis Jr. 2005). According to Whisson (unpublished), because of its arboreal habits, mixed riparian forests can provide an ideal habitat for roof rats. Norway rats are also a widespread invasive mammal species with a high potential of occurrence, but they lack the arboreal tendencies of roof rats.

Nutria were not observed on or near the Restoration Area. Potential effects of nutria on native wildlife are not well documented. Tracks of Virginia opossum were observed on and around the Restoration Area.

Domestic/feral dogs, feral cats, roof rats, Norway rats and Virginia opossum are all known predators of small mammals, birds, reptiles and amphibians. All non-native mammals listed below are likely to have a widespread occurrence within riparian habitat along the Sacramento River. Information is currently being gathered on the relative abundance of non-native rodent species, but more information on the presence/absence and relative abundance of other non-native mammals (such as feral cats) needs to be collected in order to determine the relative importance of these species.

Table 15. Non-native mammal species known or potentially occurring within 1.0 miles of the Cruise'n Tarry Restoration Area, Colusa County, California. Estimated abundances are based upon the experience of the authors and field observations at the Restoration Area and similar sites. A "common" indicates that the species was observed in abundance either during visual surveys or during small mammal trapping. An "unknown" indicates that either the species was never observed or that the site itself was not sampled.

Common Name	Scientific Name	Observed	Abundance
Domestic dog	<i>Canis domesticus</i>	No	Unknown
Feral Cat	<i>Felis catus</i>	No	Unknown
House Mouse	<i>Mus musculus</i>	No	Unknown
Roof Rat	<i>Rattus rattus</i>	No	Unknown
Norway Rat	<i>Rattus norvegicus</i>	No	Unknown
Nutria	<i>Myocastor coypu</i>	No	Unknown
Virginia Opossum	<i>Didelphus virginianis</i>	Sign (tracks)	Unknown

Bird Counts

Figure 10 shows sampling locations and Table 16 lists all bird species observed on the June 22, 2005 point counts. Figure 11 shows the frequency of occurrence for species observed more than once. The California Department of Fish and Game's Colusa-South Unit is the site of a large rookery for great blue herons and great egret. Because there were a large number of individuals in this rookery these species were not included in the point count survey. Twenty-eight species were encountered during the survey and species composition was fairly typical of riparian habitats along the Sacramento River. Black-headed grosbeak was the species most frequently observed (14.6%). The second most frequently observed species were house finch and Bewick's wren (12.2%). The third most frequently observed species were Nuttall's woodpecker, ash-throated flycatcher, tree swallow, Bullock's oriole, and American goldfinch (7.3%).

Table 16. Bird species observed within and adjacent to remnant riparian habitat nearby the Cruise'n Tarry Restoration Area, Colusa County, California (see Table 14 for definition of status).

Common name	Scientific Name	Status
American goldfinch	<i>Carduelis tristis</i>	
American robin	<i>Turdus migratorius</i>	
Ash-throated flycatcher	<i>Myiarchus cinerascens</i>	
Bewick's wren	<i>Thryomanes bewickii</i>	
Black-headed grosbeak	<i>Pheucticus melanocephalus</i>	
Brown-headed cowbird	<i>Molothrus ater</i>	nonnative
Bullock's oriole	<i>Icterus bullocki</i>	
California towhee	<i>Pipilo crissalis</i>	
Downy woodpecker	<i>Picoides pubescens</i>	
European starling	<i>Sturnus vulgaris</i>	nonnative
Great blue heron	<i>Ardea herodias</i>	
Great egret	<i>Ardea alba</i>	
House finch	<i>Carpodacus mexicanus</i>	
House wren	<i>Troglodytes aedon</i>	
Mourning dove	<i>Zenaida macroura</i>	
Northern flicker	<i>Colaptes auratus</i>	
Nuttall's woodpecker	<i>Picoides nutalli</i>	
Oak titmouse	<i>Baeolophus inornatus</i>	
Red-tailed hawk	<i>Buteo jamaicensis</i>	
Spotted towhee	<i>Pipilo maculatus</i>	
Swainson's hawk	<i>Buteo swainsonii</i>	ST
Tree swallow	<i>Tachycineta bicolor</i>	
Turkey vulture	<i>Cathartes aura</i>	
Western bluebird	<i>Sialia mexicana</i>	
Western kingbird	<i>Tyrannus verticalis</i>	
Western scrubjay	<i>Aphelocoma californica</i>	
Western wood-pewee	<i>Contopus sordidulus</i>	
White-breasted nuthatch	<i>Sitta carolinensis</i>	

Cruise'n Tarry Restoration Area: Bird Survey Locations

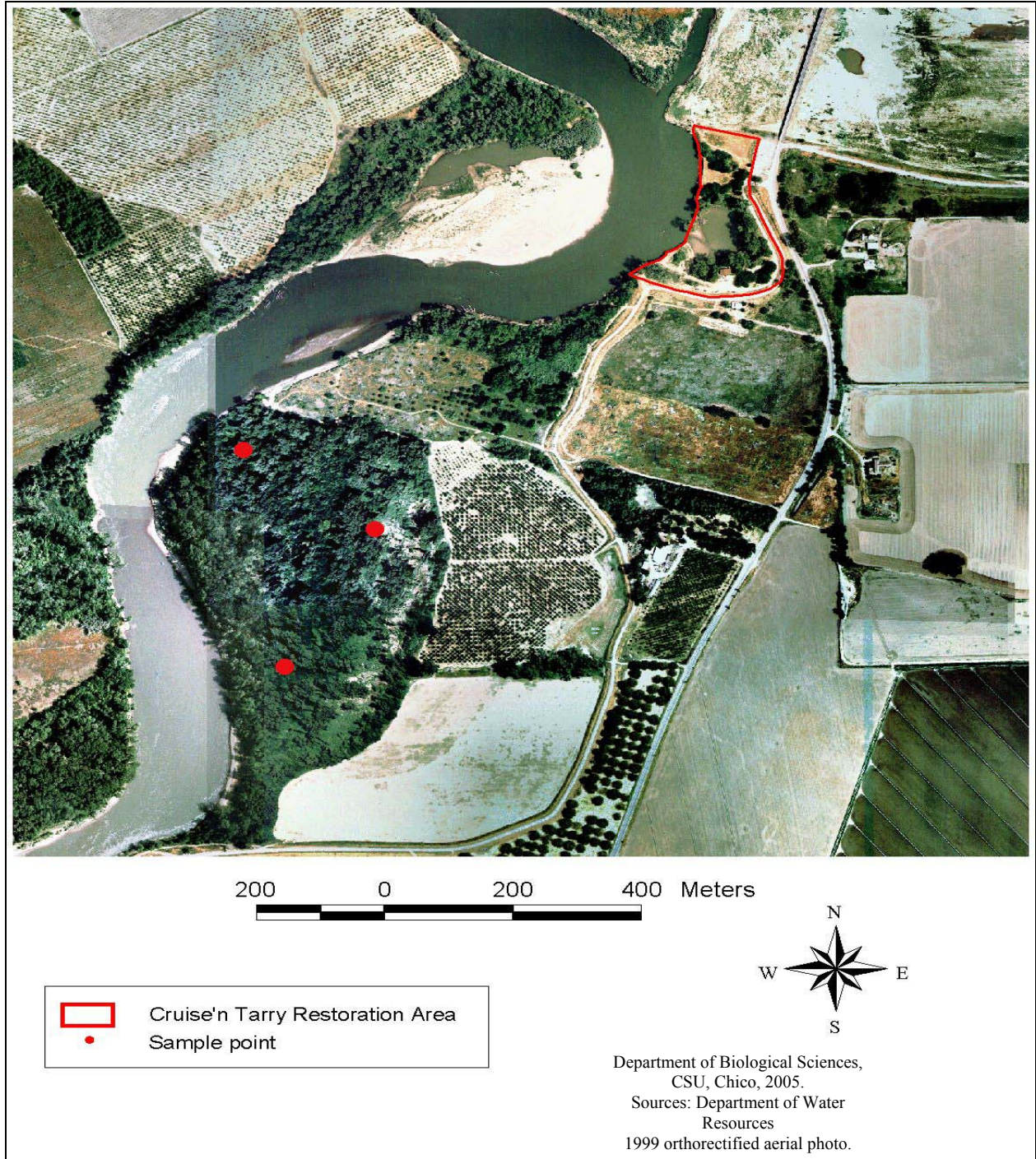


Figure 10. Bird survey station locations at the California Department of Fish and Game's Colusa-South Unit, the closest riparian habitat to the Cruise'n Tarry Restoration Area, Colusa County, California.

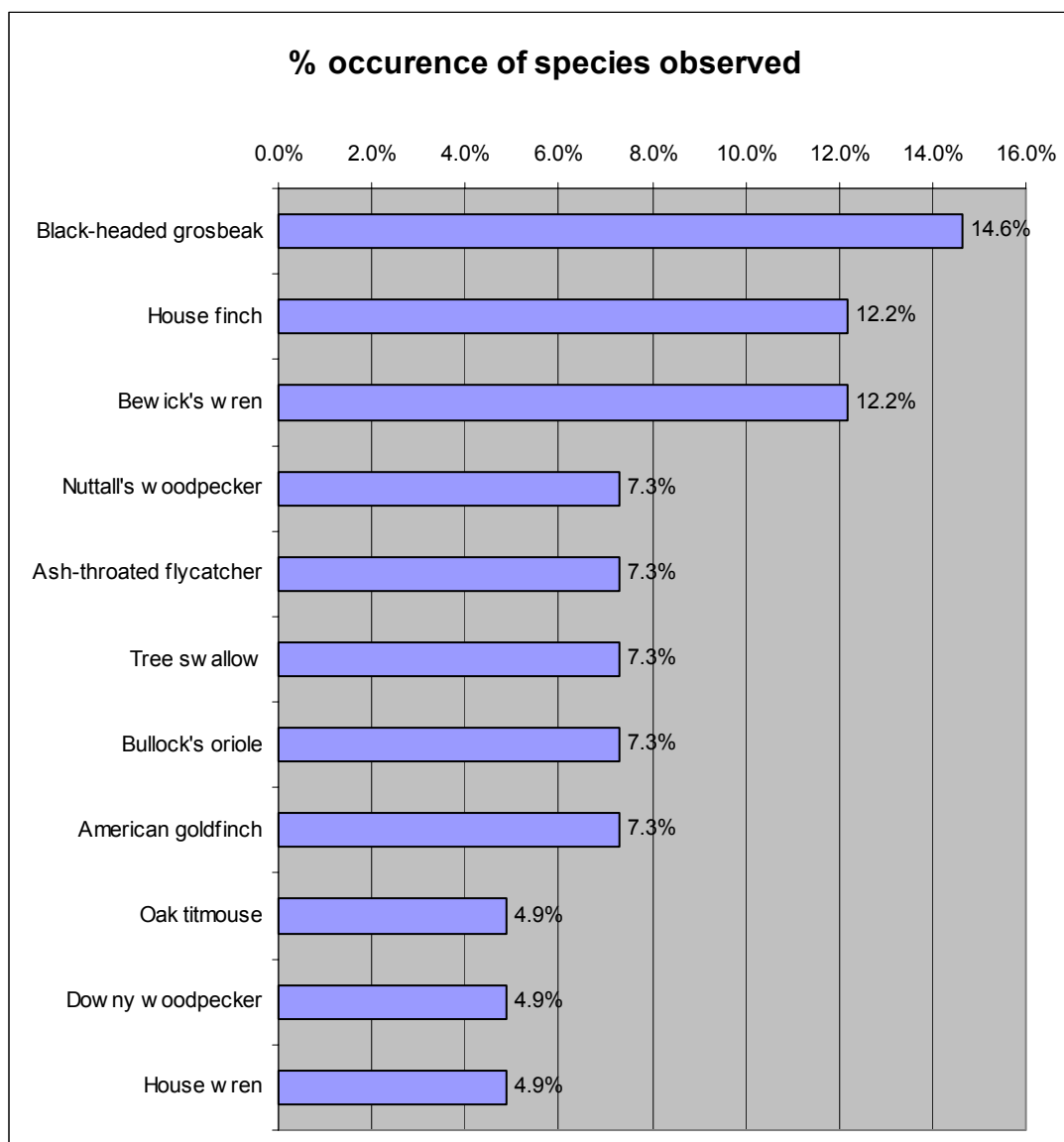


Figure 11. Frequency of bird species observed more than once within a 50 m radius of three 8-minute observation stations within remnant riparian habitat at the California Department of Fish and Game's Colusa-South Unit, close to the Cruise'n Tarry Restoration Area, Colusa County, California. Species observed only once are excluded for clarity.

References

- Burt, W. H., and R. P. Grossenheider. 1976. *A Field Guide to Mammals*. Houghton Mifflin Co., Boston, MA.
- California Department of Fish and Game. 2002. *California Wildlife Habitat Relationships Systems 8.0*. Wildlife and Habitat Data Analysis Branch, Sacramento, CA.
- California Department of Fish and Game. 2005. *California Natural Diversity Database. RareFind 3*. Updated May 27, 2005. Wildlife and Habitat Data Analysis Branch, Sacramento, CA.
- California Department of Fish and Game. 2005. *California's Plants and Animals*. Wildlife and Habitat Data Analysis Branch, Sacramento, CA. Retrieved from:
<http://www.dfg.ca.gov/hcpb/species/species.shtml>.
- California, Department of Water Resources. 2002. *GIS of the middle Sacramento River, California*. Northern District, Red Bluff, California.
- Coleman, J.S., S.A. Temple, and S.R. Craven. 1997. *Facts on cats and wildlife: a conservation dilemma*. University of Wisconsin Extension, Madison, WI.
- Ehrlich, P. R., D.S. Dobkin and D. Wheye. 1988. *The Birder's Handbook*. Simon and Schuster, Inc., New York, NY.
- Ingles, L.G. 1965. *Mammals of the Pacific States*. Stanford University Press, Stanford, CA.
- Moyle, P. 1976. *Inland Fishes of California*. University of California Press, Berkeley, CA.
- National Geographic. 1999. *Field Guide to the Birds of North America*. National Geographic Society, Washington, D.C.
- Ralph, C. J., G.R. Geupel, P. Pyle, T.E. Martin, and D.F. DeSante. 1993. *Handbook of field methods for monitoring landbirds*. Gen. Tech. Rep. PSW-GTR-144. Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture, Albany, CA.
- Small, S. S., J. DeStaebler, G.R. Geupel, and A. King. 1999. *Landbird response to riparian restoration on the Sacramento River system: preliminary results of the 1997 and 1998 field season*. Submitted to The Nature Conservancy and U.S. Fish and Wildlife Service, October 1999, by Point Reyes Bird Observatory, Stinson Beach, CA.
- Stebbins, R.C. 1985. *A Field guide to Western Amphibians and Reptiles*. Peterson Field Guide Series. Houghton Mifflin Company, Boston, MA.
- Whitaker Jr., J.O. 1991. *The Audubon Society Field Guide to North American Mammals*. Alfred A. Knopf, Inc., New York, NY.
- Whisson, D. and A. Engilis Jr.. 2005. *Predation of songbirds in California riparian areas (ongoing research)*. Retrieved from:
<http://wfcb.ucdavis.edu/www/Faculty/desley/research.htm>
Department of Wildlife, Fish, and Conservation Biology, University of California, Davis, CA.