Yolo Bypass Wildlife Area

Land Management Plan

June 2008

EDAW

yolo basin foundation

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Yolo Bypass Wildlife Area

Land Management Plan

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ACRONYMS AND ABBREVIATIONS

2002 Farm Bill	Farm Security and Rural Investment Act of 2002
ºF	Fahrenheit
A-P	Agricultural Preserve
Accord	May 2000 Putah Creek Water Accord
ADA	Americans with Disabilities Act
afa	acre-feet per annum
af/acre	acre-foot per acre
Basin	Yolo Basin
Basin Plan	Sacramento-San Joaquin River Basin Plan
BIT	Biennial Inspection of Terminals
BMP	best management practices
CALFED	CALFED Bay-Delta Program
CALFED Final PEIS/EIR	*CALFED Final Programmatic Environmental Impact Statement and Environmental Impact Report*
Caltrans	California Department of Transportation
CBDA	California Bay-Delta Authority
CDF	California Department of Forestry and Fire Protection
Central Valley RWQCB	Central Valley Regional Water Quality Control Board
CEQA	California Environmental Quality Act
CESA	California Endangered Species Acts
cfs	cubic feet per second
CHRIS	California Historical Resources Information System
cm	centimeters
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
Comprehensive Study	Sacramento and San Joaquin River Basins California Comprehensive Study
CR	County Road
CRHR	California Register of Historical Resources
CSP	Conservation Security Program
CVHJV	California Central Valley Habitat Joint Venture
CVJV	Central Valley Joint Venture
CVP	Central Valley Project
CWA	California Waterfowl Association
CWA	Clean Water Act

Acronyms and Abbreviations *(continued)*

Delta	Sacramento–San Joaquin River Delta
DFG	California Department of Fish and Game
Dixon RCD	Dixon Resource Conservation District
DOC	California Department of Conservatio
DPC	Delta Protection Commission
Drain	Colusa Basin Drain
DU	Ducks Unlimited
DUHU	Diverse Upland Habitat Unit
DWR	California Department of Water Resources
EFH	Essential Fish Habitat
ERP	CALFED Ecosystem Restoration Program
ERPP	Ecosystem Restoration Program Plan
EPA	Environmental Protection Agency
ESA	Federal Endangered Species Acts
ESA/CESA	Federal or California Endangered Species Acts
Estuary	San Francisco Estuary
ESU	Evolutionarily Significant Unit
FMMP	Farmland Mapping and Monitoring Program
FOC	State-Federal Flood Operations Center
Forum	Sacramento River Corridor Planning Forum
Foundation	Yolo Basin Foundation
FSA	Farm Services Agency
GIS	geographic information system
GRCD	Grasslands Resource Conservation District
HCP	Habitat Conservation Plan
HCP/NCCP	Habitat Conservation Plan/Natural Communities Conservation Plan
hp	horsepower
I-5	Interstate 5
I-80	Interstate 80
ICS	Incident Command System
IRWMP	Integrated Water Management Plan
IS	Initial Study

Acronyms and Abbreviations *(continued)*

kg/yr	kilograms/year
LMP	Land Management Plan
LPCCC	Lower Putah Creek Coordinating Committee
m	meters
MCL	Maximum concentration levels
mg/L	milligrams per liter
MND	Mitigated Negative Declaration
MOU	Memorandum of Understanding
MSCS	Multi-Species Conservation Strategy
NASR	National Association of Shooting Ranges
NAWCA	North American Wetlands Conservation Act
NAWMP	North American Waterfowl Management Plan
NCCP	Natural Communities Conservation Plan
NIWQP	National Irrigation Water Quality Program
NMFS	National Oceanic and Atmospheric Administration, National Marine Fisheries Service
NOA	Notice of Applicability
NOI	Notice of Intent
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWIC	Northwest Information Center
NWR	National Wildlife Refuges
NWS	National Weather Service
O&M	operation and maintenance
PDD	Putah Creek Diversion Dam
PFMC	Pacific Fishery Management Council
PG&E	Pacific Gas and Electric Company
Plan	Land Use and Resource Management Plan for the Primary Zone of the Delta
POC	pollutants of concern
Putah Creek Accord	Putah Creek Settlement Agreement
RCD	Resource Conservation District
RD	Reclamation District
regional plan	Primary Zone of the Delta
RMA2	two-dimensional hydraulic model
ROD	Record of Decision

Acronyms and Abbreviations *(continued)*

RWQCB	Regional Water Quality Control Board
SAAMI	Sporting Arms and Ammunition Manufacturers' Institute
SACOG	Sacramento Area Council of Government
SAFCA	Sacramento Area Flood Control Agency
SCWA	Solano County Water Agency
SHPO	State Historic Preservation Officer
SMUD	Sacramento Metropolitan Utilities District
SNRR	Sacramento North Railroad
SPRR	Southern Pacific Railroad
SRFCP	Sacramento River Flood Control Project
SSO	site-specific objectives
State Reclamation Board	California Department of Water Resources
SVWQC	Sacramento Valley Water Quality Coalition
SWP	State Water Project
SWRCB	State Water Resources Control Board
SYMVCD	Sacramento-Yolo Mosquito and Vector Control District
TMDL	total maximum daily load
UCD	University of California, Davis
UPRR	Union Pacific Railroad
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USDA NRCS	U.S. Department of Agriculture Natural Resources Conservation Service
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WA	State Wildlife Areas
WCB	Wildlife Conservation Board
WDR	waste discharge requirements
WAHC	Wildlife Area Habitat Committee
WMAP	Watershed Management Action Plan
Working Group	Yolo Bypass Working Group
WRP	Wetland Reserve Program
YBIWG	Yolo Bypass Interagency Working Group
YCWMA	Yolo County Weed Management Area

EXECUTIVE SUMMARY

The Yolo Bypass Wildlife Area (Wildlife Area) comprises approximately 16,770 acres of managed wildlife habitat and agricultural land within the Yolo Bypass (Bypass). The Bypass conveys seasonal high flows from the Sacramento River to help control river stage and protect the cities of Sacramento, West Sacramento, and Davis and other local communities, farms, and lands from flooding. Substantial environmental, social and economic benefits are provided by the Yolo Bypass, benefiting the people of the State of California.

The California Department of Fish and Game (DFG), as part of the Resources Agency of the State of California, has the following mission to guide its planning and operations: *"The mission of the Department of Fish and Game is to manage California's diverse fish, wildlife, and plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public."*

The stated purpose of the Yolo Bypass Wildlife Area Land Management Plan (LMP) is to:

- guide management of habitats, species, appropriate public uses, and programs to achieve DFG's mission;
- direct an ecosystem approach to managing the Yolo Bypass Wildlife Area in coordination with the objectives of the CALFED Ecosystem Restoration Program (ERP);
- identify and guide appropriate, compatible public-use opportunities within the Yolo Bypass Wildlife Area;
- direct the management of the Yolo Bypass Wildlife Area in a manner that promotes cooperative relationships with adjoining private-property owners;
- establish a descriptive inventory of the sites and the wildlife and plant resources that occur in the Yolo Bypass Wildlife Area;
- provide an overview of the Yolo Bypass Wildlife Area's operation, maintenance, and personnel requirements to implement management goals, and serve as a planning aid for preparation of the annual budget for the Bay-Delta Region (Region 3); and
- present the environmental documentation necessary for compliance with state and federal statutes and regulations, provide a description of potential and actual environmental impacts that may occur during plan management, and identify mitigation measures to avoid or lessen these impacts.

This LMP was prepared through a partnership between DFG and the Yolo Basin Foundation (Foundation) and with the benefit of an extensive public-input program. DFG provided overall guidance to the planning process and was responsible for all decisions regarding the content of the LMP. The Foundation was responsible for coordinating substantial stakeholder outreach and facilitating stakeholder input in the LMP development. The Foundation was instrumental in the development of environmental education and interpretation programs at the Yolo Bypass Wildlife Area and helped facilitate the documentation of these programs in this plan.

The public-outreach program featured six focus group meetings conducted before initiation of LMP development (2002); a total of 37 Yolo Bypass Working Group Meetings (1999 to 2006; updates on developments at the Yolo Bypass Wildlife Area have been a frequent topic of discussion); one advertised public meeting for initial input (December 12, 2005, in Davis, attended by 30 persons); five additional focus group meetings to receive input on the Preliminary Draft LMP (March and April, 2006), one advertised public meeting for input on the Draft LMP and Initial Study. Appendix A provides a summary of the comments received at the public meetings and examples of the various communication devices that were used to publicize the planning process.

An environmental analysis pursuant to the California Environmental Quality Act (CEQA) was conducted concurrently with plan development to identify the potential environmental impacts of operating the Yolo Bypass Wildlife Area under the provisions of this LMP. As described in the Initial Study/Negative Declaration (IS/ND) prepared for the plan under CEQA, implementing the plan would not have a significant impact on the environment. The IS/ND is included in the LMP as Appendix H.

The following sections provide a summary of the LMP and of the CEQA analysis of its potential environmental impacts.

HISTORY OF ACQUISITIONS

The Wildlife Conservation Board (WCB) approved DFG's original acquisition of approximately 2,917 acres, establishing the Yolo Bypass Wildlife Area. Subsequent expansions resulted in the 16,770-acre Wildlife Area by 2005.

The largest acquisition consisted of two separate ownerships, the Glide Ranch and Los Rios Farms, totaling approximately 13,062 acres in 2001.

PROPERTY DESCRIPTION AND MANAGEMENT SETTING

The Yolo Bypass Wildlife Area is located within the historic Yolo Basin of the Sacramento Valley and is part of the DFG's Bay-Delta Region. It lies almost entirely within the Yolo Bypass in Yolo County, between the cities of Davis and West Sacramento. The Yolo Bypass Wildlife Area is composed of 17 separate management units throughout its approximately 16,770 acres.

The northern boundary of the Yolo Bypass Wildlife Area is generally formed by the Union Pacific Railroad (UPRR) (formerly Southern Pacific Railroad) tracks that run parallel to and north of Interstate 80 (I-80). The eastern boundary is shaped largely by the East Toe Drain, which runs inside of the east levee of the Yolo Bypass (which is also the west levee of the Sacramento River Deep Water Ship Channel. The western boundary of the Yolo Bypass Wildlife Area is generally defined by the west levee of the Yolo Bypass, except that the boundary also encompasses two properties outside of the Bypass levee. The southern boundary is approximately 8.7 miles south of I-80 on the east side and approximately 10 miles south of I-80 on the west side of the Wildlife Area.

The primary entrance to the Yolo Bypass Wildlife Area, which can be reached via the East Chiles Road (County Road 32B) exit of I-80, is approximately 2 miles east of Davis and 4 miles west of West Sacramento. The entry driveway intersects Chiles Road at the west levee of the Yolo Bypass, immediately west of the west end of the Yolo Causeway.

MANAGEMENT SETTING

The current management of the Yolo Bypass Wildlife Area operates under several legal constraints and existing agreements. These constraints and agreements include: Sacramento River Flood Control Project—Project Modification Agreement, Agreement under Section 8618 of the California Water Code, several agreements and commitments conveyed through the 2001 acquisition of the Glide Ranch and Los Rios Farms, memoranda of understanding regarding threatened and endangered species, memorandum of understanding between DFG and the Foundation, Fish And Game Code 1602 Streambed Alteration Agreement, coordination with the Sacramento-Yolo Mosquito And Vector Control District, management agreement with Dixon Resource Conservation District, programs through the Farm Service Agency, and coordination/cooperation associated with the Putah Creek Water Accord.

ENVIRONMENTAL SETTING

PLANNING INFLUENCES AND CONSIDERATIONS

Planning influences include the Sacramento River Flood Control Project; CALFED Bay-Delta Program; Sacramento and San Joaquin River Basins Comprehensive Study; Central Valley Regional Water Quality Control Board; Sacramento Area Flood Control Agency; Yolo County General Plan; Colusa Basin Drain planning; Delta Protection Commission's Land Use and Resource Management Plan for the Primary Zone of the Delta and Delta Recreation Plan; North American Waterfowl Management Plan; Yolo County Habitat Conservation Plan/Natural Community Conservation Plan; Agricultural/Irrigated Lands Conditional Waiver Program; Natural Resources Conservation Service Programs; Yolo Bypass Fish Passage and Fish Habitat Improvement Planning; Sacramento Area Council of Government's Regional Bicycle, Pedestrian, and Trails Master Plan; City Of Davis' General Plan, Comprehensive Bicycle Plan, and Open Space Program; City Of West Sacramento's General Plan and Access and Bike Plan; and the Lower Putah Creek Watershed Management Action Plan.

Yolo Basin Foundation

The Foundation is a community-based nonprofit organization dedicated to the appreciation and stewardship of wetlands and wildlife through education and innovative partnerships. It was founded in 1990 to assist in the establishment of the then approximately 3,700-acre Yolo Bypass Wildlife Area.

One of the principal goals of the Foundation is the facilitation of environmental education in the Yolo Bypass Wildlife Area. Foundation staff, interns and volunteers assist students and visitors with hands on learning activities in the Demonstration Wetlands and lead exploratory walks on the Wildlife Area.

The Foundation also is the sponsoring non-profit organization for California Duck Days, publishes the Yolo Flyway Newsletter, brings wetland education to classrooms with "Wild about Wetlands" learning kits, introduces the public to natural places in the community through public field trips, and hosts the popular Flyway Nights speaker series. The Foundation also hosts and facilitates the Yolo Bypass Working Group, which provides an opportunity for farmers, landowners and agencies with interests in the Yolo Bypass to discuss Bypass related issues as well as provide guidance and opinions on such issues.

AGRICULTURAL RESOURCES

The nearly annual floods that flow through the Yolo Bypass severely limit the kinds of crops that can be grown. The proximity of the Yolo Bypass to the San Francisco Bay system brings a prevailing wind from the south during summer evenings. Although the daily appearance of this Delta Breeze makes life bearable in the Sacramento area, it limits the production of rice to wild rice, or special varieties that are more adapted to the climate.

A small percentage of the land in the Wildlife Area is designated as prime farmland. DFG wildlife area managers commonly grow agricultural crops for the benefit of wildlife. The Yolo Bypass Wildlife Area utilizes agriculture to manage habitats while providing important income for the management and operation of the property. Many innovative, natural resource-compatible agricultural practices occurring in the Yolo Bypass Wildlife Area provide valuable habitat for a diverse assemblage of wildlife species. Rice is grown, harvested, and flooded to provide food for thousands of waterfowl. Corn fields are harvested to provide forage for geese and cranes. Crops such as safflower are cultivated and mowed to provide seed for upland species such as ring-necked pheasant and mourning dove. Much of the grassland in the southern portion of the Yolo Bypass Wildlife Area is managed with cattle grazing, resulting in spectacular blooms of wildflowers during the spring months.

GEOLOGY, SOILS, TOPOGRAPHY, AND CLIMATE

CLIMATE

Yolo County has a Mediterranean climate characterized by hot, dry summers and temperate, wet winters. However, the county receives a marine air influence from the Delta regions to the south that moderates the temperature extremes of the Central Valley. During the summer months (June–August), average daily high temperatures are in the mid-90s Fahrenheit (ºF) and average daily low temperatures are in the mid-50s. During the winter months (December–February), average high temperatures are in the 50s and average lows are 38–40ºF. Virtually all precipitation falls as rain, between November and April in most years. Annual rainfall typically ranges from 16 to 22 inches, and the average annual air temperature is 60–62°F. The frost-free season is 230–280 days throughout the year.

GEOLOGY

The Yolo Bypass Wildlife Area is located in the Yolo Basin on the west side of the Sacramento Valley, in the Great Valley geomorphic province of California. Most of the surface of the Great Valley is covered with alluvium of Holocene and Pleistocene age, composed primarily of sediments from the Sierra Nevada and the Coast Ranges that were carried by rivers and deposited on the valley floor. These sediments are primarily fine grained silts and clays.

TOPOGRAPHY

Historic landforms in the Yolo Bypass Wildlife Area include the floodplains and natural levees along the Sacramento River; the historic delta and distributary channels of Putah Creek; a remnant oxbow lake (Green's Lake); the closed depression formations of the Putah Creek Sinks; the edge of the alluvial fan of Putah Creek extending into the Basin; and the Yolo Basin rims within and around its borders.

SOILS

Six general soil associations have been identified in the Yolo Bypass Wildlife Area. A soil association is a landscape that has a distinctive proportional pattern of soil types. The soil associations include: Yolo-Brentwood Association, Rincon-Marvin-Tehama Association, Sycamore-Tyndall-Valdez Association, Willows-Pescadero-Riz Association, Capay-Sacramento-Clear Lake Association, and Corning-Hillgate Association.

GEOMORPHOLOGY, HYDROLOGY, AND WATER QUALITY

GEOMORPHOLOGY

The historic Yolo Basin was a natural depression formed on the Sacramento Valley floor after the last Ice Age. The trough of the Basin did not function as a true floodplain that directly interacted with the Sacramento River as it rose and fell during the winter and spring. Instead it formed a vast mosaic of wetlands that transitioned from seasonal wetlands in the north, through willow thickets, tule marshes, and backwater ponds, to the freshwater tidal marshes and slough channels of the estuary to the south.

During the 1800s, floods from the Sacramento River inundated large portions of the Sacramento Valley leading to the planning and implementation of the Sacramento River Flood Control Project that converted the natural Yolo Basin into the weir regulated Yolo Bypass. The Bypass is 41 miles long and is surrounded completely on the east and partially on the west by levees constructed by the U.S. Army Corps of Engineers (USACE). Levee construction began in 1917 and the weirs were completed in 1917 (Sacramento Weir) and 1924 (Fremont Weir). In 1963, a deep water ship channel was constructed along the eastern edge of the Bypass.

HYDROLOGY

During periods of high snowmelt and rainfall, much of the Central Valley became inundated, forming an extensive inland sea that took months to drain downstream to the Bay-Delta system. In moderate flood years, the river frequently overtopped it banks spilling into the Yolo Basin. The southerly portions of the Basin likely remained inundated until late spring. The Sacramento River historically was the largest watercourse affecting the Yolo Basin from the north and east. Cache Creek, Putah Creek, and Willow Slough were the major tributaries inflowing to the basin from the west. Flows slowly drained towards the south through a vast array of wetlands and non-tidal marshes into the tidal marshes of the north Delta. Permanent bodies of water persisted in the Cache Creek Sink and Putah Creek Sinks.

In 1911 the State Reclamation Board was assigned to coordinate a basin wide plan for flood control for the entire Sacramento Valley. This project included the construction of a bypass capable of delivering 500,000 cubic feet per second (cfs) of water through Cache Slough in the north delta and increasing the Sacramento River capacity to 100,000 cfs from Sacramento to Cache Slough. Levees were constructed along both sides of the Yolo Bypass with project completion in 1948. The Yolo Bypass is the largest flood control bypass in California.

In 1957 the U.S. Bureau of Reclamation constructed Monticello Dam on Putah Creek, located 10 miles upstream of Winters, California. The large capacity of the reservoir (Lake Berryessa) has decreased the 100-year peak flow from 90,000 cfs (pre-dam) to 32,300 cfs (post-dam). The large decrease in peak flows and annual discharge has decreased sediment influx and capacity, essentially dried out the Putah Creek Sinks and prevented additional alluvial fan formation.

Cache Creek drains approximately 1,290 square miles as it travels nearly 80 miles from its natural outlet from Clear Lake to its confluence with the Yolo Bypass. Flows have been controlled by the Indian Valley Reservoir on the north fork of Cache Creek since 1974 and by the Clear Lake Dam since 1913.

The Colusa Drain was connected to the Bypass via the artificial overflow channel Knights Landing Ridge Cut. The Drain has a watershed area of 130 square miles, receiving input from all the creeks flowing from the Coast Range between Knights Landing and Stony Creek. The Ridge Cut drains into the Sacramento River near Knight's Landing, except during high flows, when it empties into the Yolo Bypass.

The Yolo Bypass provides a direct path for Sacramento and Feather River flows to enter the Sacramento River Delta. Flow is diverted from the Sacramento River into the Bypass when the stage exceeds 33.5 feet (corresponding to 56,000 cfs at Verona). During large flood events, up to 80% of the Sacramento River flows are diverted into the Bypass. In high flow years, additional water can enter the Bypass via the Sacramento Weir. Water leaves the Yolo Bypass either via the Toe Drain at Prospect Slough or over the southern end of Liberty Island to Cache Slough.

The timing of inundation is of utmost importance to agricultural interests within the Bypass. Inundation in late spring or early fall, although very rare, can have disastrous impacts on unharvested or newly planted crops.

WATER QUALITY

Mercury

One water quality variable of particular concern regarding management activities at the Yolo Bypass Wildlife Area is methylmercury. Mercury occurs as a result of both natural and anthropogenic sources in the environment and continually cycles in the aquatic environments of the Sacramento River and San Joaquin River basins and Delta. The cycle involves different chemical forms of mercury as a result of both chemical and biological reactions in aerobic and anoxic microenvironments. A large proportion of the loads of mercury and methyl

mercury in San Francisco Bay and the Delta are thought to originate in Cache Creek and pass through the Yolo Bypass.

Methylation of mercury is the key step in the entrance of mercury into the food web. The rates of methylation are influenced by the bioavailability of inorganic mercury to methylating bacteria, the concentration and form of inorganic mercury, and the distribution and activity of methylating (i.e., sulfate-reducing) bacteria. Sediments appear to be a net source of methylmercury into the water column. Sinks or losses of total mercury and methylmercury include volatilization, sequestration (i.e., storage) in local soil, and biological uptake (i.e., accumulation in organisms' tissues). Demethylation of methylmercury is considered likely to be the major loss mechanism for this form.

Wetlands support methylation processes and may export methylmercury to surrounding channels, however, recent research shows that there is still much to learn about methylmercury production and export processes from wetlands. Recent studies in the Delta indicate that some wetlands import and some export methylmercury.

The Central Valley Water Quality Control Board identified the Delta as impaired by mercury because Delta fish have elevated levels of methylmercury that pose a risk for human and wildlife consumers. The Central Valley Water Board's development of a water quality attainment strategy to resolve the mercury impairment in the Delta has two components: the methylmercury total maximum daily load (TMDL) for the Delta and the amendment of the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins (the Basin Plan) to implement the TMDL program.

Other Water Quality Issues

Toxic chemicals including pesticides have impaired water quality in many Central Valley and Delta waterways and have recently been studied in the Yolo Bypass. High concentrations of some metals from point and nonpoint sources appear to be ubiquitous in these waterways. In addition to mercury, high levels of other metals (i.e., aluminum, copper, cadmium, and lead) in Central Valley and Delta waters are also of concern. Additionally, in localized areas of the Delta, fish tissues contain elevated levels of dioxin as a result of industrial discharges.

BIOLOGICAL RESOURCES

Two-hundred-eighty terrestrial vertebrate species are known to use the Yolo Bypass Wildlife Area at some point during their annual life cycles, over 95 of which are known to breed in the Yolo Bypass Wildlife Area. The Yolo Bypass Wildlife Area also provides suitable habitat for 23 additional species that may occur on site but have not yet been observed there. The Yolo Bypass Wildlife Area is also known to support 38 special-status wildlife species, and many more are locally rare or have specialized habitat requirements that the Wildlife Area provides. The Wildlife Area also provides seasonal or permanent aquatic habitat for 44 species of fish, 8 of which are special-status species. Hundreds of invertebrate species also inhabit the Wildlife Area, including five special-status invertebrates.

VEGETATION COMMUNITIES

Common vegetation communities found within the Yolo Bypass Wildlife Area include seasonal and permanent wetlands, annual grasslands, riparian scrub and woodlands, vernal pools and swales, and row crop-seasonal wetlands.

Managed Seasonal and Permanent Wetlands

Wetlands have evolved as dynamic ecosystems, constantly changing due to the physical and chemical processes associated with floods, drought, and fire. Today, the Yolo Bypass is an engineered floodway; managed wetlands in the Yolo Bypass Wildlife Area are now enclosed by levees and berms, and flooded with water from irrigation

conveyance systems. Whereas natural wetland hydrology was very dynamic, flooding cycles now used for wetlands can be predictable through strategic and innovative management.

Permanent wetlands are flooded year round. They are generally relatively deep (~4 feet) and constructed with islands and shallow underwater shelves. Seasonal wetlands are drained April 1st and flooded September 1st. The management of productive wetland habitat requires dynamic water management, as well as periodic soil and vegetation disturbances. Adequate water conveyance systems are essential for meeting water management objectives, thus pumps, delivery ditches, water control structures, and drainage systems must be maintained in functional condition. Discing and mowing are used to interrupt the natural evolution of wetland habitats, setting back plant succession to a point which is the most productive of those elements required by waterfowl and other wetland-dependent species.

Annual Grasslands

Grasslands are found across the majority of the 9,000-acre Tule Ranch unit and in scattered locations within other management units. Like much of California, these habitats are dominated by a variety of naturalized, nonnative grasses and forbs. Species composition in this community varies widely in response to a variety of micro-scale factors such as soil moisture, soil fertility, disturbance (e.g., gopher mounds), and soil depth. Most grasslands in the Yolo Bypass are dominated by Italian (annual) rye grass.

Community composition in wetter sites is similar to vernal pools on shallower soils grasses generally become less dominant and native forbs are more common. Annual grasslands may occasionally contain small areas of remnant perennial native grasses are important components of the grassland community. The Tule Ranch grasslands are grazed with cattle as a primary management strategy. This strategy has been proven to be successful with resulting spectacular wildflower blooms in recent years.

Riparian Woodland

Riparian woodland and associated riparian scrub habitats are primarily found adjacent to Green's Lake, Putah Creek, and along the East Toe Drain within the Yolo Bypass Wildlife Area Riparian scrub is typically dominated by phreatophytes (i.e., water-loving plants) representative of early to mid successional stage vegetation communities within riparian areas in California's Central Valley. Typical species include native plants such as creek dogwood, California rose, Sandbar willow, buttonbush, and arroyo willow, along with nonnative invasive species such as Himalayan blackberry, arundo, and tamarisk. Native trees such cottonwood, alder, and Oregon ash are occasionally found overtopping the shrub layer. Riparian woodland is a tree-dominated community found adjacent to riparian scrub on older river terraces where flooding frequency and duration is less. Common native overstory species in riparian communities include cottonwood, alder, valley oak, Oregon ash, black willow, California sycamore, box elder, and northern California black walnut hybrids (northern California black walnut readily hybridizes with cultivated English walnut). The understory is typically sparse in this community; although, native species such as California rose, California grape, Santa Barbara sedge, mulefat, blue elderberry, California barley, and creeping wildrye may be common in tree canopy openings.

Vernal Pool and Swale

Vernal pools and swales within the Yolo Bypass Wildlife Area are primarily found within the southwest portion of the Tule Ranch Unit. A recent survey of this area (Witham 2003) documented approximately 1,600 acres of vernal pool grassland as well as the presence of a distinct vernal pool subtype, playa pools. Vernal pools typically support a suite of mostly endemic and sometimes rare plants in several genera including *Lasthenia, Plagiobothrys, Navarretia, Psilocarphus, Downingia,* and *Limnanthes*, among others. The nonnative Italian ryegrass is also widely distributed in vernal pools. The margins of playa pools support many of the same species as smaller vernal pools. Additionally, several rare grasses, including Colusa grass and Crampton's tuctoria, although not confirmed to be present in Yolo Bypass Wildlife Area, have the potential to occur on the pool

bottoms, which are otherwise typically sparsely vegetated. Developing a refined grazing plan for the vernal pool areas throughout the Tule Ranch is a high priority for future management.

Row Crop-Seasonal Wetland

Row crop-seasonal wetland communities are found across the northern and central portions of the Yolo Bypass Wildlife Area (e.g., Causeway Ranch and 1,000 Acre units). These are generally agricultural plant communities comprising various annual row crops in the spring and summer months. The primary crop is rice but a variety of other crops are produced including grains (e.g., corn, millet, and milo [grain sorghum]). The fields are typically managed as flooded open water habitat in the winter months. During the winter months few, if any, plants are likely encountered except for residual stubble and other by-products remaining after crop harvesting. During the summer months, non-crop plants are limited primarily to agricultural weeds unless fields are fallowed or flooded to shallow depths as a shorebird habitat enhancement strategy. In these cases beneficial wildlife plants such as swamp timothy and the related swamp grass may be common.

Special-Status Plant Species

Based on queries of the California Natural Diversity Database (CNDDB 2006) and the California Native Plant Society (CNPS) Inventory of Rare and Endangered Plants of California (CNPS 2001), there are 24 special-status plant species known from the vicinity of the Yolo Bypass Wildlife Area (Table 3.5-2). Special-status plants are those plants listed as threatened or endangered under either the Federal or California Endangered Species Acts (ESA/CESA). Botanical surveys conducted in 2004 verified the occurrence of several rare plants on the Tule Ranch unit of the Wildlife Area.

WILDLIFE RESOURCES

The Yolo Bypass Wildlife Area supports a diverse assemblage of communities that provide valuable wildlife habitat for a variety of species guilds.

Species Guilds

Waterfowl

A significant feature of the Yolo Bypass Wildlife Area is the abundance and variety of wintering waterfowl that migrate down the Pacific Flyway each year. Large numbers of ducks, geese, and swans winter in the Wildlife Area after migrating from northern breeding areas. Waterfowl populations are a highly valued and diversified biological resource. They are of high interest to a variety of recreational users of the Wildlife Area, particularly hunters and bird watchers. Species that occur in high abundance include northern pintail, northern shoveler, mallard, gadwall, American wigeon, cinnamon and green-winged teal, lesser scaup, tundra swan, snow goose, and white-fronted goose. Some species, such as mallard, gadwall, and Canada goose are year-round residents and breed locally in wetlands and nearby uplands.

Seasonal flooding of wetlands is the primary wetland management strategy in the Yolo Bypass Wildlife Area for migratory waterfowl. Grazing, upland cover plantings, and maintenance of properly spaced brood ponds are strategies used for nesting waterfowl. In addition, agricultural activities result in high quality foraging habitat for some waterfowl species.

Shorebirds and Wading Birds

The Yolo Bypass Wildlife Area has become an important shorebird area in the Central Valley. These species are a significant component of the Wildlife Area and are of high interest to recreational bird watchers. Shorebirds and wading birds that breed in or nearby the Wildlife Area include American avocet, black-necked stilt, killdeer, spotted sandpiper, Virginia rail, white-faced ibis, black-crowned night heron, great blue heron, and snowy and

great egret. Since the opening of the Wildlife Area, a heronry (nesting colony of herons and egrets) has become established. In addition large numbers of ibis from nesting colonies elsewhere in the region use the Wildlife Area during summer months, feeding primarily on crayfish. Large numbers of black-crowned night herons also roost on the Wildlife Area. Many diverse species of shorebirds rely on the Wildlife Area to provide habitat during migration and winter. Species regularly observed during these periods include western and least sandpiper, long- and short-billed dowitchers, dunlin, greater and lesser yellowlegs, whimbrel, long-billed curlew, and Wilson's and red-necked phalaropes.

Managed seasonal wetlands with complex diverse topography combined with innovative rice/shorebird habitat rotations in the Wildlife Area provide critical foraging, nesting, and loafing habitat for an abundance of shorebird and wading bird species.

Neotropical Migratory Birds

Many species of neotropical migratory birds migrate through or breed in the Yolo Bypass Wildlife Area. The neotropical migratory bird guild includes species that breed in North America and winter in Central and South America. Representative species that breed and/or migrate through the Wildlife Area include western kingbird, western wood-pewee, tree swallow, barn swallow, Bullock's oriole, Wilson's warbler, yellow warbler, and blue grosbeak.

Management of upland habitat to provide variations in height and density of vegetation, food crops, and water has proven to be beneficial to many neotropical migratory song birds.

Raptors

A wide variety of wintering and/or breeding raptors utilize the Yolo Bypass Wildlife Area, including red-tailed hawk, white-tailed kite, rough-legged hawk, ferruginous hawk, prairie falcon, peregrine falcon, kestrel, barn owl, great horned owl, short-eared owl, and northern harrier. Of these, Swainson's hawk, red-tailed hawk, kestrel, northern harrier, white-tailed kite, barn owl, burrowing owl and great horned owl are known to nest in the Wildlife Area.

All of these raptor species can be seen foraging and hunting for prey in recently flooded wetlands and in fresh cut alfalfa fields. Management strategies for raptors include optimizing foraging opportunities by managing for a food base consisting of rodents and large insects. Discing, mowing, and summer irrigations attract large numbers of Swainson's hawks feeding on grasshoppers.

Cavity-nesting Birds

Cavity-nesting birds, such as kestrels, tree swallows, and wood ducks can be seen throughout the Wildlife Area. Providing nesting boxes for these cavity-nesters benefits these species in the Wildlife Area.

Upland Game Birds

The Yolo Bypass Wildlife Area provides habitat for several upland game birds of great interest to recreational hunters. The primary upland game bird species that utilize the Wildlife Area are mourning dove and ring-neck pheasant. Tenant farmers grow fields of safflower that provide abundant foraging opportunities. Safflower is also left unharvested and mowed to provide additional foraging prospects for these species. These management strategies have resulted in improved upland game bird hunting throughout the Wildlife Area. Spring floods can significantly affect pheasant nesting and recruitment success thereby limiting populations in subsequent years.

Bat Colony

An additional important feature of the Wildlife Area is its breeding colony of over 100,000 Mexican free-tailed bats. These bats roost each summer under the Yolo Causeway and prey on insects throughout Yolo and Sacramento counties. The location of this colony in a protected Wildlife Area will help to ensure its long-term success.

Wildlife Habitats

Open Water (Floodwater Inundation)

Winter floodwaters in the Yolo Bypass support thousands of migratory waterbirds each year. These birds are distributed according to water depth and include American white pelican, double-crested cormorant, and diving ducks, such as canvasback at depths averaging 3–9 feet; dabbling ducks, such as northern pintail at depths averaging 6–10 inches; wading birds, such as great egret at depths averaging 4 inches; and greater sandhill crane and shorebirds, such as black-necked stilt at depths less than 3 inches. The quality of this open water habitat is increased for dabbling ducks and geese by the pre-flood planting of seed crops and managed growth of swamp timothy, which provides high-quality forage underneath the shallow waters. Shorebirds and cormorants also benefit from roosting islands amidst the open water, which are provided by the infrastructure for the flooded agricultural crops. The abundant waterfowl and shorebirds onsite in turn attract many raptors, including American peregrine falcon.

After floodwaters recede, smaller areas of open water habitat remain in the Yolo Bypass Wildlife Area's perennial wetlands and ponds. These areas support foraging waterbirds and raptors throughout the year, including species which breed in the on-site uplands and marshes, such as pied-billed grebe, mallard, gadwall, American avocet, and black-necked stilt. The perennial ponds also support many reptiles such as northwestern pond turtle, and re-eared sliders, which forage in the open water and breed in adjacent uplands, and amphibians such as Pacific treefrog frog, and the nonnative bullfrog, which forage and breed in the open water and its emergent marsh margins.

Mudflat

Mudflats are present throughout managed seasonal wetlands and in the Wildlife Area's rice rotation that contains a fallow stage specifically managed to support shorebirds. Shorebirds forage exclusively in mudflat/sandflat and shallow open water habitats. The on-site mudflats support abundant invertebrate populations, and thus provide important foraging habitat for large numbers of migrating and wintering shorebirds along the Pacific Flyway, including least sandpiper, western sandpiper, long-billed dowitcher, and dunlin. Some dabbling ducks such as cinnamon teal also forage by skimming the mudflats' surface, and raptors such as American peregrine falcon prey upon the shorebirds and waterfowl in this habitat. Reptiles such as northwestern pond turtle and red-eared sliders also use the mud banks of perennial ponds for basking and thermoregulation.

Managed Seasonal and Permanent Wetlands

Only a small portion of the historical distribution of freshwater marsh remains in California, due to widespread conversion of wetlands to agriculture. Managed seasonal and permanent wetland habitat in the Wildlife Area is especially important to migratory waterfowl which utilize this habitat in tremendous numbers. Other species in the managed wetlands include resident American bittern, terns, Virginia rail, marsh wren, moorhens, grebes, ruddy ducks, and common muskrat, which forage and breed on site exclusively in wetland habitat; northern harrier, tricolored, yellow-headed and red-winged blackbirds, western aquatic garter snake, and Pacific tree frog, which breed in marshes and other habitats on site; and black-crowned night-heron, green heron, great-blue heron, great egrets, and snowy egret, which do not breed on site but commonly forage in the Wildlife Area's wetlands.

Natural Seasonal Alkali Marsh and Seasonal Disturbed Wetland

Portions of alkali marsh containing alkali-adapted plants are structurally similar to seasonal disturbed wetlands. Both plant communities provide lower quality habitat for wildlife than other wetland communities such as freshwater marsh or vernal pool, as they lack the hydrology and vegetation structure necessary to support most wetland-dependent wildlife species. The vegetated alkali marsh and seasonal disturbed wetlands on site do support more generalist wildlife, however, that are capable of breeding and foraging in both upland and wetland communities. These species include common garter snake, savannah sparrow, and California vole.

Agricultural Crops

Agricultural lands at the Wildlife Area are actively managed to benefit wildlife. This management results in the use of safflower fields by foraging mourning doves and ring-necked pheasants; use of corn, milo, and millet fields by foraging sandhill cranes and waterfowl, use of grain fields by foraging waterfowl; and use of grain fields by some grassland bird species. In addition, the on-site rice fields support foraging white-faced ibis,; and tomato fields also support foraging Swainson's hawks and other raptors, which prey on the small mammals made more accessible by grading and harvesting activities. Post harvest flooding of rice fields attracts thousands of waterfowl and shorebirds on an annual basis. The governmental programs that encouraged the flooding of rice have lessened the impacts of wetland loss in the Central Valley.

Ditch

Wildlife use of the ditches on site varies according to each ditch's pattern of water conveyance. Ditches that remain inundated throughout the summer months and are connected to rice fields or permanent wetlands provide very important habitat for giant garter snake. This aquatic species commonly travels through irrigation ditches, forages for amphibians and small fish, which may be present, and uses the dry associated banks for basking and thermoregulation. The connectivity function of ditches is also extremely important for waterfowl and their young during the breeding season. Ditches with suitable hydrology also support the foraging of other aquatic wildlife such as western aquatic garter snake, Pacific treefrog, otters, muskrat and beaver.

Riparian Woodland and Scrub

Although relatively small areas of riparian woodland and scrub communities are present on site, these areas provide very important habitat to a number of wildlife species, many of which are restricted to riparian communities. Wildlife species known to forage in the on-site riparian communities include Cooper's hawk, sharp-shinned hawk, red-shouldered hawk, king fisher, yellow warbler, willow flycatcher, western grey squirrel, and western aquatic garter snake. Recently, tricolored blackbird breeding colonies have also occurred in an on-site patch of buttonwillow trees.

Vernal Pool and Swale

Vernal pools are a unique, rare, and rapidly declining community in California. Because of the limited distribution of this community in the state and its continued decline due to land conversion for development and other uses, many vernal pool-associated wildlife species receive state or federal protection or are considered species of concern. The vernal pools at the Wildlife Area provide high-quality habitat for these species, due to the diversity in pool size, long inundation periods, and active vegetation management through grazing. Vernal pool species known to breed in the Wildlife Area include vernal pool tadpole shrimp, vernal pool fairy shrimp, conservancy fairy shrimp, midvalley fairy shrimp, and California linderiella. The vernal pools at the Wildlife Area also provide suitable habitat for California tiger salamander and possibly western spadefoot toad, although these species have not been documented on site.

Annual Grassland

The grassland community in the Yolo Bypass Wildlife Area's Tule Ranch are important for grasshopper sparrow, northern harrier, California horned lark, savannah sparrow and western meadowlark. Historically, pronghorn antelope and tule elk grazed the grassland plants. However, today, grazing cattle provide this function and control nonnative competing grasses while providing income, which funds management of the Yolo Bypass Wildlife Area. Grasslands also provide important breeding and foraging habitat for upland game birds such as mourning dove and ring-necked pheasant, as well as nesting habitat for resident waterfowl such as mallard, cinnamon teal, and gadwall. Grasslands also support abundant small mammals, which in turn attract many avian, mammalian, and reptilian predators. Large flocks of snow geese and white fronted geese are also attracted to winter grasslands on the Tule Ranch.

Special-status Wildlife Species

Special-status wildlife species are legally protected or are otherwise considered sensitive by federal, state, or local resource conservation agencies and organizations. Special-status wildlife species that occur or have the potential to occur on the Yolo Bypass Wildlife Area include 5 species of invertebrates, 2 species of reptiles, 2 amphibian species, 32 species of birds, and 2 mammal species. Of all the special-status wildlife species, the vernal pool tadpole shrimp, vernal pool fairy shrimp, conservancy fairy shrimp, giant garter snake, California tiger salamander, bald eagle, Swainson's hawk, American peregrine falcon, greater sandhill crane, little willow flycatcher, and bank swallow are listed as a state or federally threatened or endangered species. The remaining species are considered Species of Special Concern by DFG and/or federal Species of Concern by U.S. Fish and Wildlife Service (USFWS).

FISHERIES RESOURCES

Historically, seasonal flooding covered various lands adjacent to the Sacramento River and tributaries and provided important spawning and rearing habitat for many fish species, including Sacramento splittail and juvenile Chinook salmon and steelhead. Levee and flood control facility (i.e., Fremont Weir and Sacramento Weir) construction has caused a reduction in the overall amount of seasonal flooding and shallow-water habitat in the Sacramento River system. In winter and spring, however, agricultural fields and wetland habitats throughout the Yolo Bypass often flood during high flows and are used by Sacramento splittail for spawning and rearing, and by Chinook salmon and steelhead for rearing. Altered flow regimes, flood control, and floodwater conveyance activities along much of the Yolo Bypass have affected available habitat and ecological processes.

Primary aquatic habitats throughout the Yolo Bypass Wildlife Area include the Yolo Bypass floodplain during seasonal flooding events, Putah Creek, East Toe Drain, and permanent wetlands.

Yolo Bypass Floodplain

Similar to other Sacramento-San Joaquin Delta habitats, there are more introduced species than native species in the Yolo Bypass floodplain. Introduced species are one of the major environmental issues in the Delta, where they frequently dominate the fauna on a year-round basis and in fact make up approximately 90 percent of the biomass in the Delta. However, unlike other Sacramento-San Joaquin Delta habitats, this floodplain is seasonally dewatered during late spring for agricultural production. This prevents introduced fish species from establishing year-round dominance except in perennial water sources. Moreover, many of the native fish are adapted to spawn and rear in winter and early spring during the winter flood pulse.

Recent surveys demonstrate that the Yolo Bypass provides habitat for a wide variety of fish species. Sampling to date has shown that the floodplain is used by at least 42 fish species including seasonal fish and fish that are year-round residents in perennial water sources. Examples include federal and state-listed species (steelhead trout, delta smelt, spring-run and winter-run Chinook salmon) and sport fish (striped bass and white sturgeon).

The native minnow Sacramento splittail is perhaps the most floodplain-dependent species in the Sacramento-San Joaquin Delta. Studies by Sommer et al. (1997) demonstrated that the Yolo Bypass provides some of the most important habitat for this species. Their sampling data indicated that adults move onto the floodplain in winter and early spring to forage and spawn among flooded vegetation.

The results published by Sommer et al. (2001) indicated that this seasonal floodplain habitat seems to provide better rearing conditions for Chinook salmon than the adjacent Sacramento River channel. Another important attribute of floodplain habitat is an enhanced food web. Sommer et al. (2001) found that drift insects (primarily chironomids) were 10 to 100 times more abundant in the floodplain than the adjacent Sacramento River channel during 1998 and 1999 flood events.

Although these results suggest that several measures of habitat variables demonstrate their benefit to young salmon in the Yolo Bypass, floodplain habitat carries stranding risks. The relative importance of stranding mortality is difficult to evaluate because there is currently no reliable estimate of the total number of salmon which migrate through the Sacramento River and its tributaries. However, the Yolo Bypass floodplain has been graded for agriculture which promotes successful emigration of young salmon.

Recent analysis of juvenile salmon utilizing the Bypass indicates higher methylmercury levels in these fish when compared to juvenile salmon that used the Sacramento River to reach the Delta. Further study is needed as well as analysis of methylmercury levels in splittail using the Yolo Bypass. Splittail spend their entire lives within the Bay-Delta ecosystem and therefore may have a higher propensity to contribute towards the bioaccumulation of methylmercury in the food chain.

Other Benefits of Floodplain to Aquatic Communities

Floodplain inundation may also provide benefits to organisms downstream in the brackish portion of the Delta (i.e., estuary). At the base of the estuarine food web, phytoplankton are responsible for most of the primary production in the estuary. Modeling studies by Jassby and Cloern (2000) suggest that phytoplankton produced in the Yolo Bypass may be an important source of organic carbon to the Delta, at least during flood events. Moreover, Yolo Bypass is probably also a major pathway for detrital material, an important additional source of organic carbon to the food web of the phytoplankton-deficient Delta.

Putah Creek

The reach of Putah Creek within the Yolo Bypass Wildlife Area (i.e., Putah Creek Cross Channel) consists of an unnatural ditch that is seasonally dammed by the Los Rios Check Dam. The Los Rios Check Dam is a 12-foot-high, 30-foot-long concrete box that serves as a seasonal check dam in the Yolo Bypass to create a head of water for irrigation pumping for neighboring agricultural lands and to flood the seasonal wetlands in the Yolo Bypass Wildlife Area. The Los Rios Check Dam is currently being managed to facilitate the migration of fall-run Chinook salmon into lower Putah Creek by removing boards in fall/winter in conjunction with pulse flow releases from the Putah Creek Diversion Dam (PDD).

Habitat and fisheries conditions in this reach of lower Putah Creek have been affected and shaped by several factors, including historic agricultural activities in the Yolo Bypass, upstream flood control grading and vegetation removal, construction and operation of the Solano Water Project, and, in May 2000, settlement and implementation of the historic Putah Creek Water Accord (Accord). The purpose of the Accord is to create as natural a flow regime as feasible and to maintain a living stream for the benefit of fish, wildlife, and plants from the PDD to the connection at the East Toe Drain in the Yolo Bypass.

Fisheries response to the Accord flow releases is currently being evaluated; however, based on initial data, several improvements have been noted. The most noteworthy result of the new flow releases is that fall-run Chinook salmon are migrating up Putah Creek to spawn. An estimated 70 adult fall-run Chinook salmon migrated up lower Putah Creek in the of fall 2003, resulting in the largest salmon run in more than 40 years.

East Toe Drain

The tidally influenced East Toe Drain provides perennial aquatic habitat for several fish species. The East Toe Drain is characterized by a wide (50 to 1,500 feet) and fairly deep (more than 5 feet) channel with no canopy and little bank or overhead vegetation. Portions of the Toe Drain bank bordering the Yolo Bypass Wildlife Area are riprapped. The channel is homogeneous with little habitat complexity and having generally low fish habitat value. The Lisbon Weir is located in the East Toe Drain adjacent to the Tule Ranch Unit. The Lisbon Weir is a rock weir used to capture water at high tide to maintain a higher elevation pool for irrigation source water.

Fish studies in the East Toe Drain show that this aquatic feature likely functions as year-round habitat for resident species, as a migration corridor (e.g., fish movement into Putah Creek and onto the seasonally inundated floodplain), and potentially as spawning habitat for striped bass and American shad. Resident species are primarily nonnative and include common carp, channel catfish, white catfish, striped bass, threadfin shad, black crappie, white crappie, Sacramento blackfish, and Sacramento sucker.

Permanent Wetlands

Permanent wetlands in the Yolo Bypass Wildlife Area provide perennial aquatic habitat for a diverse assemblage of fish species (dominated by nonnative species). Three of the permanent wetland ponds in the Yolo Bypass Wildlife Area were surveyed in 2001 to examine the functional role of perennial floodplain ponds for fishes in a regulated and highly invaded temperate river-floodplain system (Feyrer et al. 2004). Fish sampling resulted in the collection of 18 different species, all of which were nonnative with the exception of one native fish species, Sacramento blackfish.

Special-Status Fish Species

A total of nine special-status fish species occur or have the potential to occur in the Yolo Bypass and/or lower Putah Creek and are described below. Of the nine species, Central Valley steelhead Evolutionarily Significant Unit (ESU), Central Valley spring-run Chinook salmon ESU, Sacramento River winter-run ESU, green sturgeon, and delta smelt are listed as a federally threatened or endangered species. The USFWS de-listed Sacramento splittail from its federally threatened status on September 22, 2003. National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS) determined that listing is not warranted for Central Valley fall-/late fall-run Chinook salmon ESU. However, it is still designated as a Species of Concern because of concerns over specific risk factors. The two remaining species (hardhead and Sacramento perch) are considered Species of Special Concern by DFG.

CULTURAL RESOURCES

The Yolo Basin is rich in cultural history. From the earliest Native American inhabitants to those farming and residing there in recent times, the Yolo Basin has been an important part of people's being and livelihood.

The Yolo Basin is within the ethnographic territory of the Patwin. The word "Patwin" literally means "the people" in the native tongue. Although native people did not identify themselves as Patwin, this name is used to describe a series of linguistically and culturally related groups who occupied a portion of the lower Sacramento Valley west of the Sacramento River and north of Suisun Bay. The southern group or Pooewin claimed the Yolo Basin, however, no known ethnographic village locales are within this area. Because of reoccurring seasonal flooding, the area would have most likely been used during the drier summer months.

An early settler was J. H. Glide who purchased a large portion of land in the Yolo Bypass in the 1870s. Much of this property was held by this family until 2001.

Several cultural resources surveys have been conducted within and directly adjacent to the Yolo Bypass Wildlife Area. With the exception of a few all have been linear surveys which have resulted in the inventory of only a very small percentage of the area. These investigations have resulted in the identification of five resources (two prehistoric archaeological sites, an historic farmhouse with associated outbuildings, the remains of the historic Sacramento Northern Railroad, and the route of the Southern Pacific Railroad) within the Yolo Bypass Wildlife Area. While not formerly documented, other resources located within the Yolo Bypass Wildlife Area include the "Umbrella Barn" in the southern portion of the Tule Ranch Unit, and two locales, the "Tree House" and another known as " The Fireman's Club" also located in the Tule Ranch Unit.

RECREATION AND PUBLIC USE

Since the inception of the Yolo Bypass Wildlife Area, tens of thousands of visitors from throughout the region have used the area for hunting, fishing, walking, hiking, wildlife viewing, nature photography, and a broad range of environmental education activities for all ages of students, and the general public. A trail and road network present in the Yolo Bypass Wildlife Area supports these activities.

The Yolo Bypass Wildlife Area is managed by the DFG with education programs and public outreach provided by the Foundation. This mutually beneficial partnership was memorialized in June of 1997 when the Foundation and DFG signed a Memorandum of Understanding (MOU) with DFG recognizing their long-term partnership to provide public outreach and educational programs. The MOU allows the Foundation to use DFG facilities for a base for programs related to the Yolo Bypass Wildlife Area.

ENVIRONMENTAL EDUCATION AND INTERPRETIVE PROGRAMS

Environmental education and interpretive programs for school children and the general public are an important component of the Yolo Bypass Wildlife Area's existing public use activities. The Foundation and DFG collaborate in managing and staffing a wide variety of environmental education and interpretation programs including the Discover the Flyway program, Marsh Madness Youth Days, Nature Bowl, public tours, docent program, Flyway Nights lecture series, California Duck Days, Project Wet, and other workshops. Yolo Basin Foundation is the primary organization for developing, establishing, and acquiring funding for Yolo Bypass Wildlife Area's education and interpretation programs. DFG provides facilities, staff support, and expertise towards the education program in its shared role with the Foundation.

HUNTING

Hunting is one of the main forms of recreation currently available within the Yolo Bypass Wildlife Area. Waterfowl and pheasant hunting are the most popular, however, visitors also participate in hunting of other upland game species including dove. The Yolo Bypass Wildlife Area currently maintains 16 duck blinds and one fully accessible blind on the approximate 3,000 acres available for waterfowl hunting. DFG currently allows 40 hunters to free roam plus up to 16 parties in designated blinds on any given hunting day. With the recent acquisition of additional lands, the Wildlife Area will someday have a capacity of over 200 hunters, with 38 acres per hunter at any one time, to ensure a safe, high quality hunting experience. Pheasant hunting is currently allowed on approximately 5,000 acres of the Yolo Bypass Wildlife Area. Five designated parking lots are available for use by hunters. Hunters are allowed to use shotguns and archery for hunting.

FISHING

Fishing is also popular and several opportunities are provided within the Yolo Bypass Wildlife Area. Primary game species present include sturgeon, catfish, black bass, and striped bass. Primary fishing locations include the East Toe Drain and along Putah Creek near the Los Rios Check Dam. Access can be obtained through parking Lot F (Toe Drain) and Lot G (Putah Creek). The East Toe Drain can also be reached from outside the Yolo Bypass Wildlife Area on the West Sacramento (east) side of the drain. Sturgeon and striped bass are both

anadromous fish (i.e., fish that spend all or part of their adult life in salt water and return to freshwater streams and rivers to spawn) that can be caught in the Toe Drain during their upstream migration from San Francisco Bay.

WILDLIFE VIEWING

Many species of birds and mammals may be observed in the Yolo Bypass Wildlife Area. Visitors may see a multitude of birds of prey, shorebirds, waterfowl and other migratory birds with over 200 known species having been identified within the area. Typical species include ibis, pelicans, cormorants, great blue herons, orioles, blue grosbeaks, and western kingbirds. Mammals that can be seen in the area include coyotes, raccoons, gray fox, mule deer, beaver, mink, and river otters. The extensive water system maintained on the Yolo Bypass Wildlife Area also harbors large numbers of fish, amphibians, and invertebrates.

Public wildlife viewing is currently allowed along the existing auto tour route and along existing open trails as well as through scheduled tours and educational programs. Wildlife viewing is also permitted within designated hunting areas during non-hunting seasons.

RESEARCH ACTIVITY

Yolo Bypass Wildlife Area has been the site of several research projects in recent years, as the scientific community has focused a tremendous amount of interest and effort on learning about the biological conditions and processes in the Yolo Bypass. Examples of recent study topics include: native fish use of seasonal floodplains, floodplain processes and productivity, effects of vegetation removal on mosquito production, effects of mowing on native forb communities and investigations about mercury methylation in wetlands. The Wildlife Area strongly supports high school science classes, colleges and universities getting involved in conducting field studies and research at the Yolo Bypass Wildlife Area.

MANAGEMENT GOALS

In the LMP, the current and planned management of the Yolo Bypass Wildlife Area is described using the terminology that is part of DFG's standardized format for management plans. This terminology includes the terms element, goal, and task, which are defined below.

Element: refers to any biological unit, public use activity, or facility maintenance or management coordination program, as defined below, for which goals have been prepared and presented within this plan.

Goal: is a statement describing management and its intended long-term results for an element.

Task: an individual project or work element that implements the goals and is useful in planning operation and maintenance budgets.

This LMP contains 10 elements; the biological element contains 7 sub-elements. They are:

- Biological Resources
  - Management for Species Guilds
  - Special-Status Species
  - Nonnative Invasive Species
  - Seasonal and Permanent Wetland Communities
  - Riparian Communities
  - Grassland and Upland Communities
  - Aquatic Ecosystems
- Agricultural Resources
- Cultural Resources

- Authorized Public Use
- Unauthorized Public Use
- Facilities
- Administration
- Fire Management
- Scientific Research and Monitoring
- Management Coordination

For these elements and sub-elements, the LMP has 45 goals and 300 tasks.

It is important to note that implementation of many of the tasks identified in the LMP is dependent upon the availability of the necessary staff and an adequate operations and maintenance budget. Thus, additional resources may be required to accomplish the tasks identified in the LMP.

OPERATIONS AND MAINTENANCE

Additional staffing and resources will be required to perform all the tasks described in this LMP. Thus, it will require a commitment of additional budgetary resources if the goals of this plan are to be achieved.

FUTURE REVISIONS

To prevent this LMP from becoming outdated, a process will be implemented to accommodate minor revisions. The minor revision requires approval by the Regional Manager.

Major revisions or a new LMP could occur if new policy direction requires a procedure comparable to the LMP planning process. A major revision or new plan requires recommendation by the Regional Manager and approval by the Director of DFG.

An exhaustive review of the achievement of the goals of the LMP will be prepared every five years following the date of adoption of this LMP. A status report documenting this review will be prepared by the Area Manager. It will be submitted to the Regional Manager and to the Director of DFG. This report will serve as a basis for revision of this LMP and appropriate adjustments to ongoing management practices.

ENVIRONMENTAL REVIEW

The management goals and tasks described in this LMP were evaluated for their potential impact on the environment in accordance with the provisions of the CEQA. An IS, which is included herein as Appendix H, was prepared in accordance with the State CEQA Guidelines. This IS concluded that this LMP, as proposed, would not have any significant or potentially significant impacts on the environment. Accordingly, a proposed Negative Declaration (ND) has been prepared for adoption with a finding that the project will not have a significant impact on the environment.

This CEQA document analyzes impacts resulting from the programmatic implementation of this LMP. The details of specific projects that may be developed consistent with this LMP are not yet known. Any future projects that may involve environmental effects will need to be evaluated in light of the IS/ND to determine if additional project-specific CEQA document preparation is necessary. Permits, consultations and/or approval actions may also be required to approve specific future projects. Examples of potential future permit requirements include the following:

- **U.S. Army Corps of Engineers (USACE)** – Section 404 of the Clean Water Act (CWA), permit for discharge of fill in waters of the U.S.; Section 10 Rivers and Harbors Act permit for work in navigable waters of the U.S.; approval of modification of USACE levees.

- **California Department of Fish and Game** – streambed alteration agreement (Section 1602 of Fish and Game Code);

- **California Department of Water Resources (State Reclamation Board)** – encroachment permit to work on or adjacent to levees and in designated floodways, approval/authorization of new or restored levees;

- **Regional Water Quality Control Board** – National Pollutant Discharge Elimination System construction stormwater permit (Notice of Intent to proceed under the statewide General Construction Permit), potential discharge permit for wastewater, general order for dewatering, CWA Section 401 certification if a Section 404 permit is required.

1 INTRODUCTION

The **Yolo Bypass** (Bypass) is a unique resource that provides substantial environmental, social, and economic benefits to the people of the state of California. It is located in Yolo and Solano counties, west of the Sacramento River. The Bypass conveys seasonal high flows from the Sacramento River to control river stage and protect the cities of Sacramento, West Sacramento, and Davis and other local communities, farms, and lands from flooding (Exhibit 1-1). This Land Management Plan (LMP) addresses a key area of the Bypass, the California Department of Fish and Game's (DFG) **Yolo Bypass Wildlife Area** (Wildlife Area) (Exhibit 1-2). The Yolo Bypass Wildlife Area comprises approximately 16,770 acres of managed wildlife habitat and agricultural land within the Yolo Bypass, an area dedicated to providing flood protection to the Sacramento Valley. The Yolo Bypass Wildlife Area is unique in the way agriculture, wildlife habitat and flood protection objectives are achieved in a highly compatible manner while also providing ample opportunities for public access, recreation, and natural resource education.

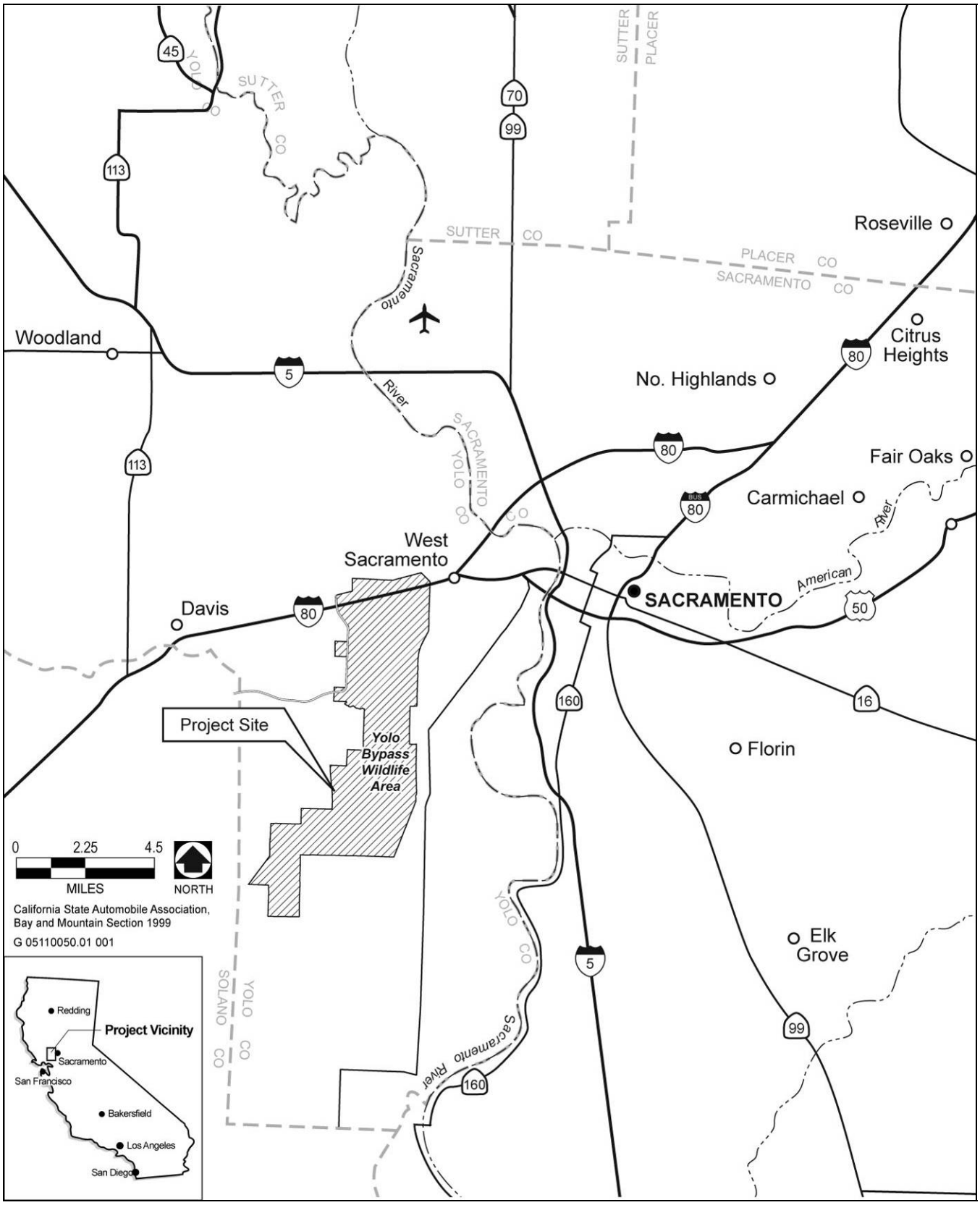
The **Yolo Basin** is the name of the natural basin that for thousands of years has been receiving flood waters from the Sacramento River. Within this Basin lies the Yolo Bypass, a flood control channel constructed in the early part of the 20th century to direct these flood waters to the Sacramento-San Joaquin Delta and away from reclaimed farmland and Sacramento Valley settlements. The U.S. Army Corps of Engineers (USACE) project to restore wetlands in the Yolo Bypass was called the **Yolo Basin Wetlands**. This restoration project was renamed the **Vic Fazio Yolo Wildlife Area** in honor of the Northern California Congressman who helped make the project a reality. The official name of the Wildlife Area established in 1997 remains the Yolo Bypass Wildlife Area. This title is used throughout this document.

HISTORY OF THE YOLO BASIN

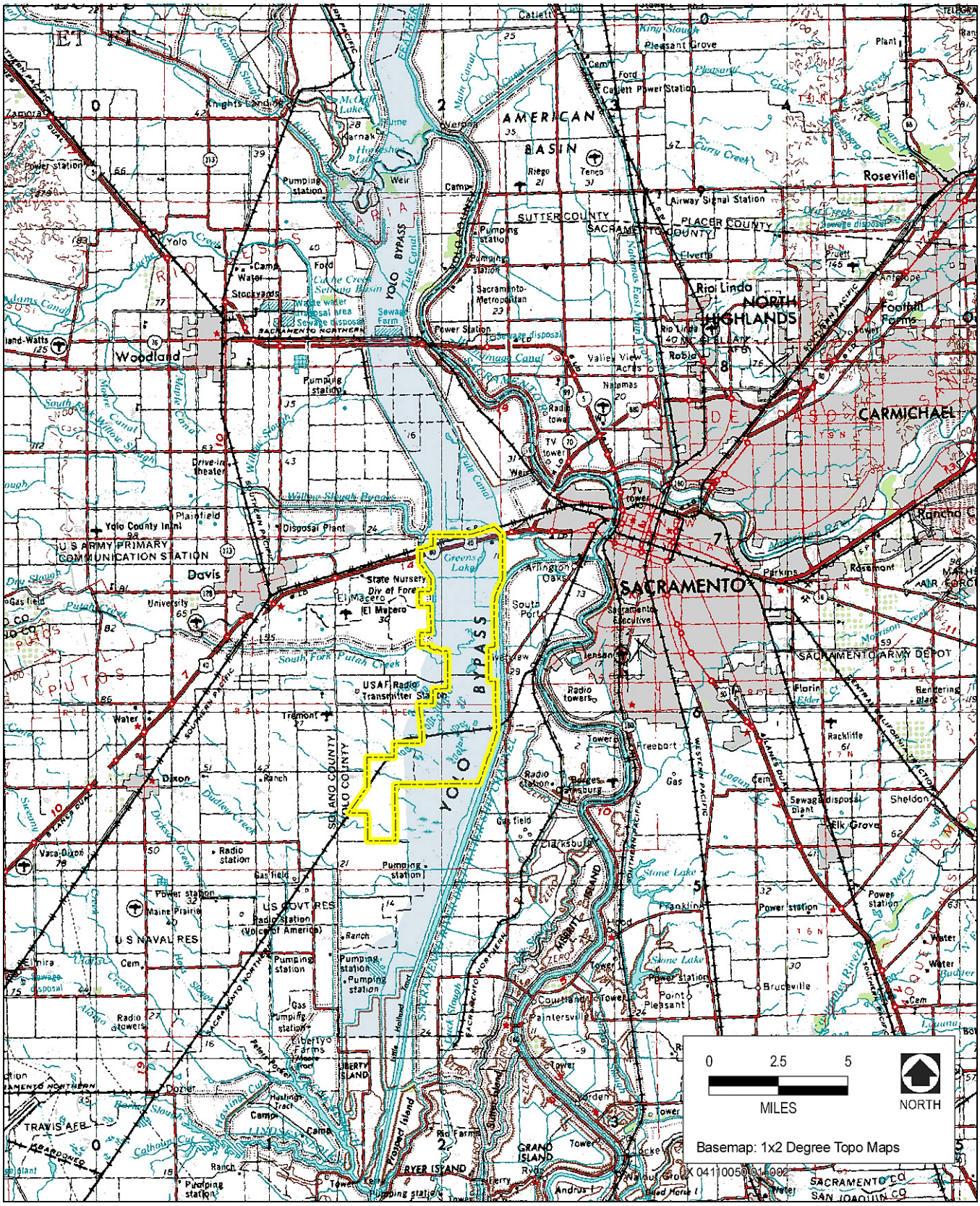
The Yolo Basin was once a nearly 80,000-acre wetland teeming with wildlife, from herds of tule elk roaming its marshes to dense clouds of migratory waterfowl seeking winter food and shelter (Exhibit 1-3). Yolo was one of several basins located within the Sacramento River floodplain. All the basins received water during high winter and spring flows as a normal occurrence. Migratory birds came from the far north to feed on seeds and invertebrates produced in the wetlands. Several native fish species used the seasonally inundated floodplain for vital spawning and rearing habitat. The resources found in the Yolo Basin also sustained many small groups of Native Americans through the winter and spring months. The seasonal presence of waterfowl and fish provided food, while the wetlands provided materials for cultural use and building, such as willow and tules. To this day, the seasonal hydrological and other conditions of the Yolo Basin drive its use by people and wildlife (Yolo Basin Foundation and California Department of Fish and Game 2007).

Over time the Yolo Basin ecosystem has been profoundly altered by human activity. Beginning in 1860, the adverse effects of hydraulic mining for gold upstream in the Sierra Nevada (which caused tremendous accumulation of sediment in rivers and on floodplains downstream of the mining) and the increased amount of lands reclaimed for use in agriculture led to the implementation of large-scale flood control projects to protect private lowlands. Large levees were eventually constructed along both sides of the Yolo Basin from Cache Slough north to the Fremont Weir (Thompson 1957). The construction of these levees and flood control structures, including the Sacramento Weir, formed what is now known as the Yolo Bypass.

In more recent history, the majority of lands within the Bypass have been used for grazing and farming with limited wetland management taking place on private waterfowl hunting club lands. The historic culture of waterfowl hunting on private clubs continues to this day on properties neighboring the Yolo Bypass Wildlife Area. The goals of reestablishing wetland habitat for water birds and other wildlife in the Yolo Bypass, while still maintaining the agricultural character and flood control function, are at the core of the Yolo Bypass Wildlife Area's mission.

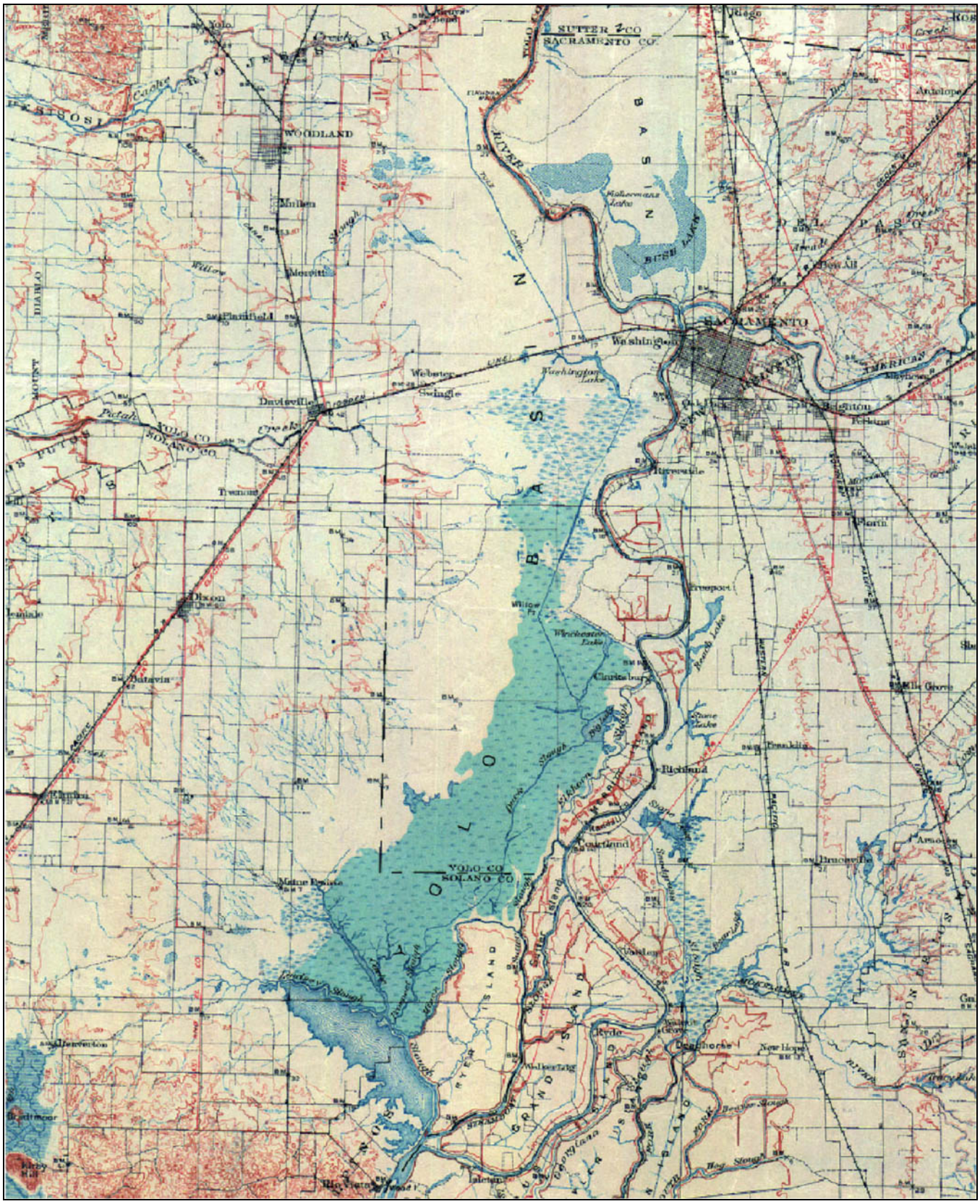


Regional Location of the Yolo Bypass Wildlife Area **Exhibit 1-1**



Source: U.S. Geological Survey

Map of the Yolo Bypass Wildlife Area (Yolo Bypass) **Exhibit 1-2**


SUTTER CO
SACRAMENTO CO
WOODLAND
Mulberry
Merritt
Plainfield
Washington
SACRAMENTO
Webster
Swingle
Davisville
YOLO CO
SOLANO CO
Dixon
Batavia
Clarksburg
Richland
Walnut Grove
Ryde
Isleton
Rio Vista
Willow Pt
Winchester Lake
Stone Lake
Beach Lake
Washington Lake
Hallowman's Lake
BIRD LAKE
Sacramento River
Sacramento Slough
Sutter Slough
Steamboat Slough
Cache Slough
Lindsey Slough
Prospect Slough
Miner Slough
Elkhorn Slough
Dry Slough
Beaver Slough
Hog Slough
Tyler Island
Grand Island
Walker Island
Ryer Island
Brannan Island
Andrus Island
Decker Island
Twitchell Island
Sherman Island
Bradmoor
Alleghany
Tracy Lake
Tracy Blvd
Pocket
Elk Grove
Franklin
Freeport
Hood
Courtland
Walnut Grove
Isleton
Deadhorse
New Hope
Walker Tdg
Clarksburg
Ryde
Rio Vista
Alleghany
Bradmoor

CURRENT WILDLIFE USE OF THE YOLO BYPASS WILDLIFE AREA

Over 200 species of birds have been seen on the Yolo Bypass Wildlife Area ranging from migratory arctic breeders in search of a more temperate winter home to species that breed locally and then fly south to the tropical climes of Central and South America. The brilliantly colored orioles, blue grosbeaks, and western kingbirds are still feeding their young when the first Alaskan shorebirds arrive on their Yolo wintering grounds. Following on the heels of the shorebirds are waterfowl, arriving in tremendous waves through the fall and winter in search of food and shelter. Thousands of northern pintails, American widgeons, mallards, snow geese, and white-fronted geese swarm onto the flooded rice and seasonal wetlands of the Yolo Bypass Wildlife Area with a backdrop of the Sacramento skyline (Yolo Basin Foundation and California Department of Fish and Game 2007). Several species of raptors including the rare Swainson's hawk can also be found foraging on fresh cut alfalfa or soaring over flooded fields in search of prey in the Yolo Bypass Wildlife Area.

Coyotes, raccoons, gray fox, and mule deer may occasionally be spotted at the Yolo Bypass Wildlife Area. Waterways are home to resident aquatic mammals, such as beaver, mink, and river otters. The extensive water system maintained on the Yolo Bypass Wildlife Area harbors large numbers of fish, amphibians, and invertebrates. Resident fish include many introduced species, such as catfish, largemouth bass, carp, and smaller species, such as inland silversides and threadfin shad. With the arrival of fall flows, native Chinook salmon travel upstream into the Yolo Bypass. Some return to their ancestral spawning grounds in Putah Creek, while others continue north to the Sacramento River and its tributaries. White sturgeon and striped bass also move into the Yolo Bypass on a seasonal basis. Habitat in the Yolo Bypass Wildlife Area ranges from managed seasonal wetlands to remnant riparian forests along Putah Creek. Further west on the higher parts of the Yolo Bypass Wildlife Area, flood inundation is less common and a unique vernal pool community has thrived in the presence of many years of cattle grazing. Rare species inhabit the vernal pool areas, including grasshopper sparrows,

Ferris' alkali milk vetch, and conservancy fairy shrimp (Yolo Basin Foundation and California Department of Fish and Game 2007).

DEVELOPMENT OF THE YOLO BYPASS WILDLIFE AREA LAND MANAGEMENT PLAN

This LMP represents the commitment of DFG to manage the resources of the Yolo Bypass Wildlife Area in accordance with the laws of the United States and the State of California, incorporating the best available scientific information and professional judgment. It also incorporates the commitment of DFG to coordinate and cooperate with Yolo Bypass Wildlife Area neighbors, other local interests, and other conservation entities that are active throughout the region. This LMP proposes practical, science-based management and conservation of the natural resources, consistent with the necessary flood water conveyance purpose of the Bypass, including provisions for compatible agriculture and public recreation use. It is based on an ecosystem approach to habitat management consistent with the principles of the Ecosystem Restoration Program (ERP) included in the CALFED Bay-Delta Program (CALFED) as implemented by the California Bay-Delta Authority (CBDA) and DFG. This LMP is intended to contribute to habitat management that utilizes natural processes to create a sustainable system over the long term. This ecosystem-based management approach is intended to benefit both common and sensitive species of wildlife and plants. It may also contribute to the recovery of state and federally listed species. The LMP has been developed with guidance from the DFG's *Guide and Annotated Outline for Writing Land Management Plans*, February 2003 (updated in 2006) (California Department of Fish and Game 2003, 2006).

1.1 THE MISSION OF THE CALIFORNIA DEPARTMENT OF FISH AND GAME

The mission of DFG is to manage California's diverse fish, wildlife, and plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public.

DFG manages fish, wildlife and plant species, and natural communities for their intrinsic and ecological value and their benefits to people. This includes the goal of habitat protection and maintenance in a sufficient amount and quality to ensure the survival of all native species using the area and natural communities that support those species. DFG is also responsible for the diversified use of fish and wildlife, including recreational, commercial, scientific, and educational uses.

1.2 PURPOSE OF WILDLIFE AREAS

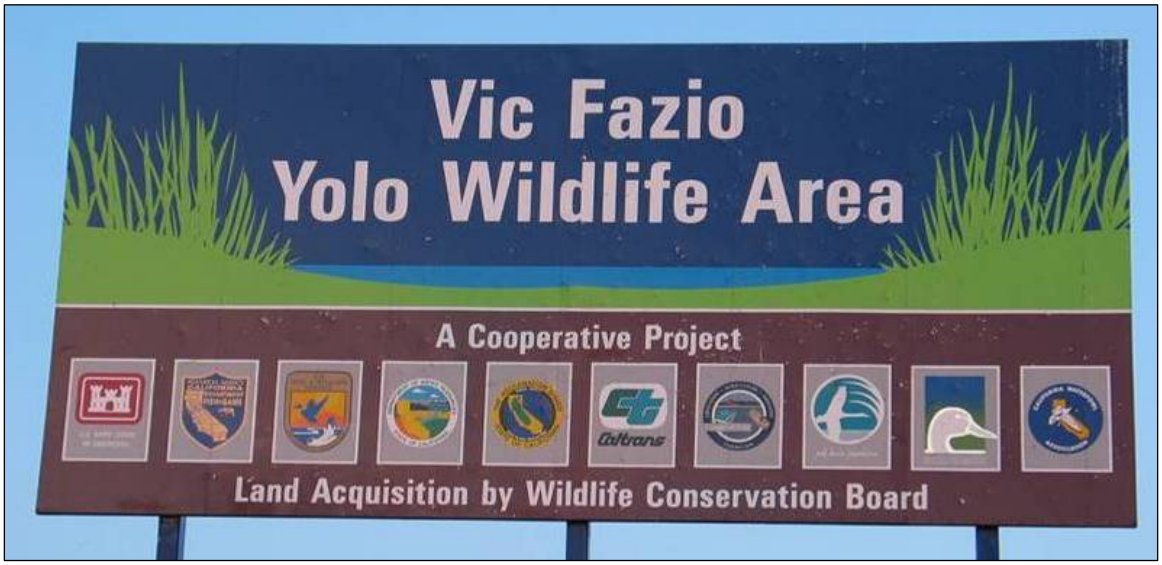
California is renowned as a land of magnificent natural scenery and a wealth of wildlife. Some of the state's most important sites for wildlife are designated DFG wildlife areas. These wildlife areas, including the Yolo Bypass Wildlife Area, provide habitat for a wide array of plant and animal species, including many that are listed for protection under state and federal endangered species acts or otherwise protected due to their rarity.

Consistent with its mission, DFG administers 108 state wildlife areas and ecological reserves encompassing approximately 650,000 acres of wildlife habitat. These areas are located throughout the state, with most located in central and northern California. Major facilities in the Central Valley include Upper Butte, Gray Lodge, Los Banos, North Grasslands, Grizzly Island, and Yolo Bypass Wildlife Area. DFG's stated purpose in managing these wildlife areas is: *"to protect and enhance habitat for wildlife species, and to provide the public with compatible, wildlife-related recreational uses."*

The protection and enhancement of habitat for wildlife is the principal natural resource management consideration for the Yolo Bypass Wildlife Area. Because DFG is also committed to providing appropriate public recreation uses within the Yolo Bypass Wildlife Area, this LMP also focuses on the management of wildlife-related recreation activities that are compatible with the diverse mosaic of habitats.

1.3 HISTORY AND PURPOSE OF YOLO BYPASS WILDLIFE AREA

Establishment of the current Yolo Bypass Wildlife Area in 2001 was a result of a 12-year-long cooperative effort to restore wetlands and associated habitats in the Yolo Basin that involved the DFG, Yolo Basin Foundation (Foundation); several local, state, and federal agencies; and other private-sector entities. Beginning in 1989, a broad coalition of conservationists; hunters; farmers; business people; elected officials; and local, state, and federal agencies worked to restore the wetlands of the Putah Creek Sinks located in the Yolo Bypass and provide outdoor education opportunities to the public. The Yolo Bypass Wildlife Area was founded by a community working together as it restored a critical link in the Pacific Flyway through cooperative, innovative partnerships.



1.3.1 THE YOLO BASIN FOUNDATION

The Foundation has its roots in the establishment of the Yolo Bypass Wildlife Area, a project achieved through public education and collaborative efforts of many people, agencies, and organizations. The Foundation was created in 1990 as a community-based organization to facilitate the creation of the Yolo Bypass Wildlife Area.

- The mission of the Foundation is to promote the stewardship and appreciation of wetlands and wildlife through education and innovative partnerships.

The Foundation's board of directors represents a diverse group of interests, from agriculture and waterfowl conservation to local government and the business community. The Foundation is universally credited with being the driving force behind the partnerships that created the Yolo Bypass Wildlife Area and continues as the communication link between many people and organizations involved in creating wetlands and managing land in the Yolo Bypass. The Yolo Bypass Wildlife Area, first opened to the public in 1997, is the physical embodiment of the Foundation's mission: *it restored a critical link in the Pacific Flyway through cooperative, innovative partnerships and is the principal focus of the Foundation's educational programs.*

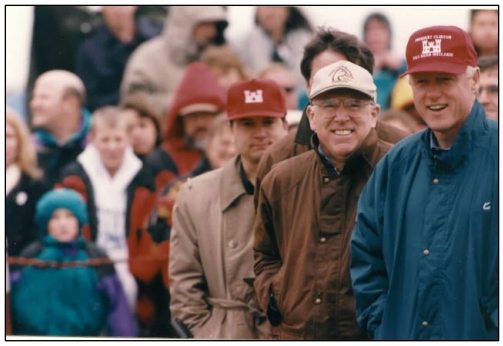
A principal goal of the Foundation is facilitating environmental education at the Yolo Bypass Wildlife Area. In August 1997, the Foundation held the first of its *Discover the Flyway* teacher workshops, which introduced area teachers to the Yolo Bypass Wildlife Area and prepared them to bring their classes out for exciting and hands-on field studies. In its first year, the *Discover the Flyway* school program hosted 800 students between October 1997 and June of 1998. Since the pilot year, the school program has expanded to over 4,000 kindergarten through 12th-grade students annually. Foundation staff, interns, and dedicated volunteers assist students in hands-

on learning activities at demonstration wetlands at the Yolo Bypass Wildlife Area Headquarters and lead students on exploratory walks throughout the Yolo Bypass Wildlife Area.

In addition, the Foundation facilitates the Yolo Bypass Working Group meetings, which provide a focused opportunity for farmers, land owners, and agencies within the Yolo Bypass to discuss Bypass related issues, as well as provide guidance and opinions on such issues. The Yolo Bypass Working Group meetings have been the primary forum to gather stakeholder input towards the development of this land management plan (see below for additional information on the Yolo Bypass Working Group).

1.3.2 History and Purpose of Land Acquisitions

The Wildlife Conservation Board (WCB) approved DFG's original acquisition of approximately 2,917 acres, establishing the Yolo Bypass Wildlife Area, recorded on December 31, 1991. The WCB approved the first expansion, consisting of approximately 390 acres, recorded on April 8, 1994, and the second expansion, approximately 182 acres of wetland area and 14 acres for a headquarters site, recorded on October 12 and September 29, 1994, respectively.



President Bill Clinton dedicated the Yolo Bypass Wildlife Area in November 1997, hailing the project as a national model for meeting the challenge of ***"trying to improve our economy and lift our standard of living while improving, not diminishing, our environment."*** *He also acknowledged the extraordinary collaboration and effort that have enabled the mosaic of seasonal and year-round ponds, grasslands, and riparian forest to thrive.*

The largest expansion consisted of the acquisition from two separate ownerships, the Glide Foundation and Los Rios Farms, totaling approximately 13,062 acres, recorded on December 14, 2001 (Glide Ranch) and February 1, 2002 (Los Rios Farms). The Glide Ranch consisted of three separate ranches, commonly known as the Causeway Ranch, Geiberson Ranch, and Tule Ranch. An initial option to purchase was first acquired by the Nature Conservancy, which immediately relinquished this option to the Wildlife Conservation Board who made this historic acquisition. Additional expansions included the 100-acre Parker Unit recorded on September 20, 2002 and the 119 acre Cowell Pond Unit approved on February 19, 2004. A description of all management units within the entire Yolo Bypass Wildlife Area is provided in Chapter 2, "Property Description."

The purpose of the acquisition resulting in the largest expansion of the Wildlife Area was expressly stated by the WCB on August 30, 2001 (Wildlife Conservation Board 2001):

> *"Expansion of the Yolo Bypass Wildlife Area will allow for the preservation of historic wetlands, wintering habitat for waterfowl, shorebirds, threatened and endangered species and other wetland associated species."*

The purchase was exempt from the California Environmental Quality Act (CEQA) under Section 15313 of the State CEQA Guidelines as a Class 13 Categorical Exemption for the acquisition of land for wildlife protection. The Notice of Exemption for the Glide Ranch and Los Rios Farms acquisition was filed with the State Clearinghouse on July 17, 2001.[1]

[1] Pursuant to State CEQA Guidelines Section 15313, "Acquisition of Lands for Wildlife Conservation Purposes." Class 13 consists of the acquisition of lands for fish and wildlife conservation purposes, including preservation of fish and wildlife habitat; establishing ecological reserves under California Fish and Game Code Section 1580; and preserving access to public lands and waters where the purpose of the acquisition is to preserve the land in its natural condition.

1.4 LAND ACQUISITIONS AND ROLE OF THE WILDLIFE CONSERVATION BOARD

The various acquisitions of lands for the Yolo Bypass Wildlife Area were carried out by the WCB with funding from Propositions 12, Proposition 13, and the General Fund. (California Public Resources Code [Section 5096.310{7}{m}] designates funding to the WCB for various acquisition and restoration projects.) The WCB was created by legislation in 1947 to administer a capital outlay program for wildlife conservation and related public recreation. The WCB is an independent board with authority and funding to carry out an acquisition and development program for wildlife conservation (California Fish and Game Code Section 1300 et seq.).
The primary responsibilities of the WCB are to select, authorize, and allocate funds for the purchase of land and waters suitable for recreation purposes and for the preservation, protection, and restoration of wildlife habitat. The three main functions of the WCB are land acquisition, habitat restoration, and development of wildlife-oriented, public-access facilities. The acquisition program is administered pursuant to the WCB's original enabling legislation, the Wildlife Conservation Law of 1947 (Fish and Game Code Section 1300 et seq.), and land acquisition is a component of all WCB programs. The WCB acquires real property or rights in real property on behalf of DFG and can also grant funds to other governmental entities or nonprofit organizations to acquire real property or rights in real property. The acquisition activities are carried out in conjunction with DFG, with DFG recommending priorities for proposed acquisitions.

1.5 PURPOSE OF THE LAND MANAGEMENT PLAN

The stated purposes of the Yolo Bypass Wildlife Area Land Management Plan are to:

- guide the management of habitats, species, appropriate public use, and programs to achieve DFG's mission;
- direct an ecosystem approach to managing the Yolo Bypass Wildlife Area in coordination with the objectives of the CALFED ERP;
- identify and guide appropriate, compatible public-use opportunities within the Yolo Bypass Wildlife Area;
- direct the management of the Yolo Bypass Wildlife Area in a manner that promotes cooperative relationships with adjoining private-property owners;
- establish a descriptive inventory of the sites and the wildlife and plant resources that occur in the Yolo Bypass Wildlife Area;
- provide an overview of the Yolo Bypass Wildlife Area's operation, maintenance, and personnel requirements to implement management goals, and serve as a planning aid for preparation of the annual budget for the Bay-Delta Region (Region 3); and
- present the environmental documentation necessary for compliance with state and federal statutes and regulations, provide a description of potential and actual environmental impacts that may occur during plan management, and identify mitigation measures to avoid or lessen these impacts.

1.6 PLANNING PROCESS

This LMP was prepared through a partnership between DFG and the Foundation and with the benefit of an extensive public-input program and substantial coordination with other public and private entities that operate in the immediate region. DFG provided overall guidance to the planning process and was responsible for all decisions regarding the content of the LMP. The Foundation was responsible for coordinating substantial stakeholder outreach and facilitating stakeholder input in the LMP development. The Foundation has been instrumental in the development of environmental education and interpretation programs at the Yolo Bypass Wildlife Area and facilitated the documentation of these programs in this plan. The Foundation's participation

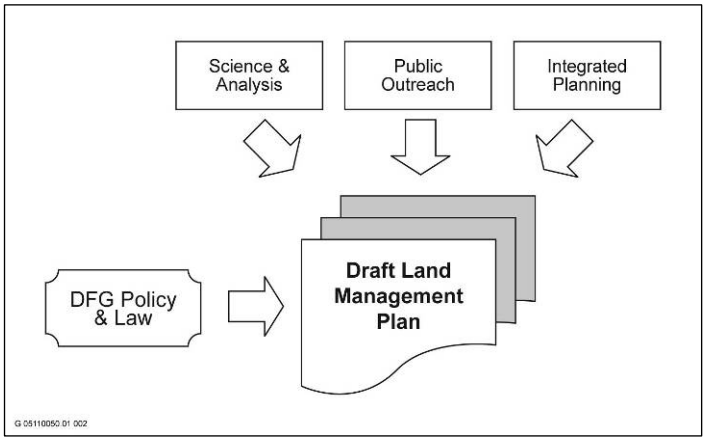
was funded in part through a CALFED ERP grant. The majority of the funding for the development of the land management plan consisted of Proposition 40 monies accessed through the WCB. The planning process was also coordinated with other resource agencies, stakeholders within the Yolo Bypass, including participants in the Yolo Bypass Working Group, and the public.

The planning process was guided by the general policy parameters that direct DFG, including compliance with all state and federal laws. DFG's mission, the purpose of the wildlife areas, and the purposes of the LMP, as stated in this chapter, provided broad direction for the development of this LMP. Finally, the objectives established through the CALFED ERP were considered as guidelines for this LMP. The ERP goals include recovering endangered and other at-risk species, maintaining ecological processes, restoring expanses of habitat to support species, limiting nonnative invasive species, and improving water and sediment quality. A list of applicable CALFED ERP targets and actions is provided in Appendix B to show the relationship between the CALFED ERP and the proposed LMP.

The planning process focused on the development of three major forms of input that all contributed to the LMP:

- Public input
- Science and analysis
- Integrated planning

Public input was obtained through an extensive public-outreach program as described below. **Science and analysis** was established through the development of a detailed property inventory for all of the units within the Yolo Bypass Wildlife Area. Information was obtained through a literature search, meetings with knowledgeable individuals, on-site field analysis, and review of various technical studies. **Integrated planning** included meetings with local, state, and federal districts and agencies that manage and regulate other public properties along the Yolo Bypass. Integrated planning was also generated through the Yolo Bypass Working Group meetings (discussed under "Public-Outreach Program" below). Exhibit 1-4 depicts the key information inputs to the planning process.

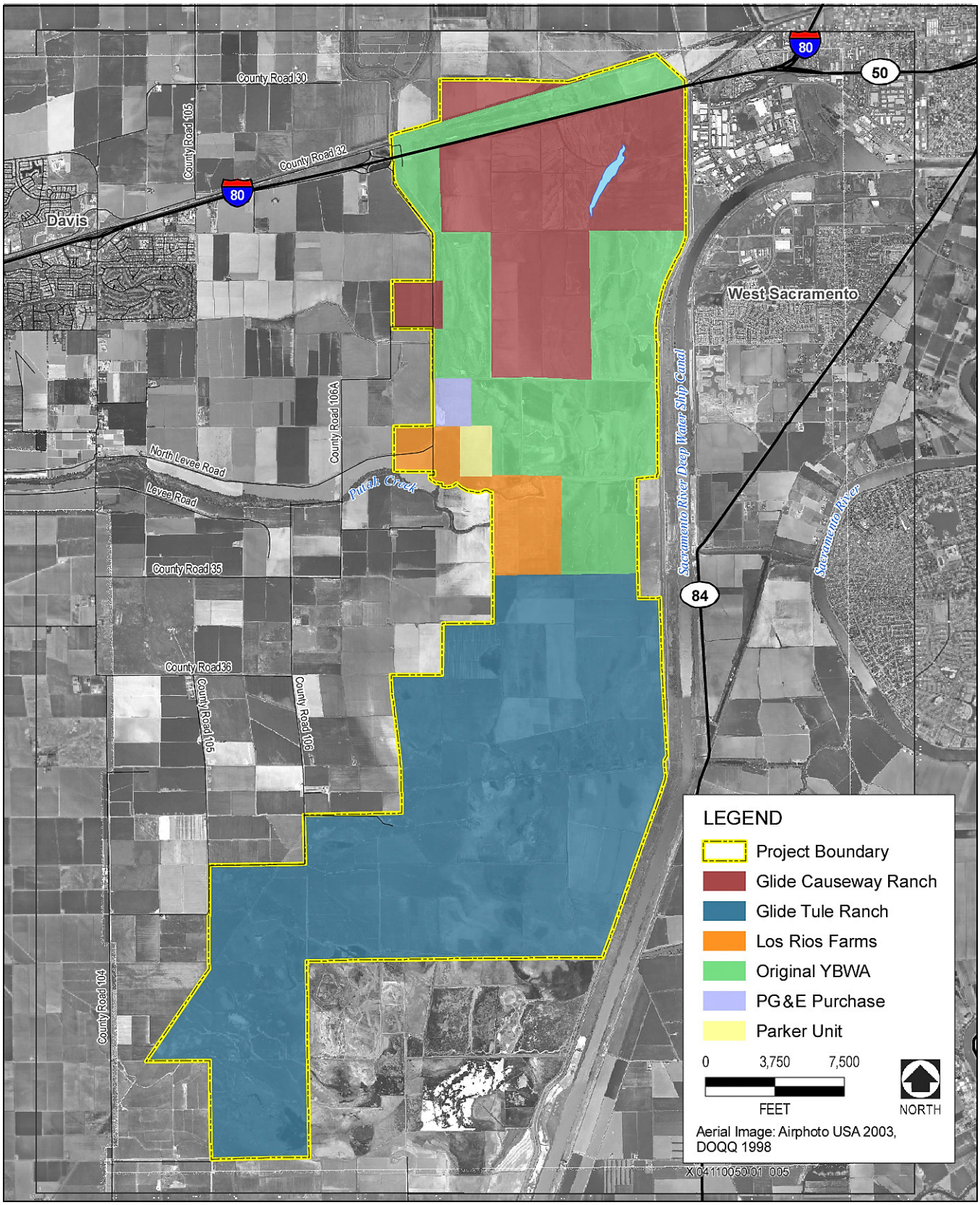


1.6.1 PUBLIC-OUTREACH PROGRAM

A public-outreach program was designed as a key element of the planning process to ensure that there would be ample opportunities for local interests and the general public to be a part of the development of this LMP. DFG made a commitment to the Yolo County Board of Supervisors and the Delta Protection Commission at the time of the Glide Ranch and Los Rios Farms purchases to involve Yolo Bypass stakeholders in the development of the LMP. It was recognized that a wide range of people considered themselves stakeholders in the planning process.

Substantial efforts were made to identify stakeholders, contact them, and solicit their ideas regarding the future of the Yolo Bypass Wildlife Area. The public-outreach program featured the following components:

- six focus group meetings conducted before initiation of LMP development (2002);
- a total of 37 Yolo Bypass Working Group Meetings (1999 to present; updates on developments at the Yolo Bypass Wildlife Area have been a frequent topic of discussion);
- one advertised public meeting for initial input (December 12, 2005, in Davis, attended by 30 persons); and
- five additional focus group meetings to receive input on the Preliminary Draft LMP (March and April, 2006).



Source: Department of Fish and Game, City of Davis 2005 CaSIL 1993

Land Acquisitions to the Yolo Bypass Wildlife Area **Exhibit 1-4**

Appendix A provides a summary of the comments received at the initial public meetings and examples of the various communication devices that were used to publicize the planning process.

YOLO BYPASS WORKING GROUP

The Foundation initiated the Yolo Bypass Working Group (Working Group) in 1998 under a CALFED ERP grant. This ad hoc stakeholder group has been very successful and continues to meet approximately every 2–4 months. More than 30 people representing a wide range of stakeholders with an interest in the Yolo Bypass regularly attend these meetings, including representatives from many local, state, and federal agencies. Participants include landowners and their tenants (farmers, ranchers, duck hunters), DFG, the California Department of Water Resources (DWR), State Reclamation Board, U.S. Fish and Wildlife Service (USFWS), California Department of Food and Agriculture, Natural Resources Conservation Service (NRCS), Sacramento-Yolo Mosquito and Vector Control District (SYMVCD), Dixon and Yolo Resource Conservation Districts (RCDs), Sacramento Area Flood Control Agency (SAFCA), Yolo County, Cities of West Sacramento, Woodland and Davis, California Waterfowl Association (CWA), Ducks Unlimited (DU), National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS), National Weather Service (NWS), Sacramento-Yolo Mosquito and Vector Control District (SYMVCD), and the Port of Sacramento.

The Working Group meetings serve as a forum to educate and inform all parties interested in the Yolo Bypass. Information on Bypass-related land use, flood management, resource policy, proposed projects, economics, and ecological issues is presented and openly discussed by members of the Working Group. Guest speakers have included representatives from USFWS (also a landowner/stakeholder), SAFCA, Northern California Water Association, DWR, DFG (also a landowner/stakeholder), State Reclamation Board, Port of Sacramento, U.S. Department of Agriculture's (USDA's) Farm Services Agency (FSA), NRCS, SYMVCD, U.S. Army Corps of Engineers (USACE), CWA, University of California, Davis (UCD), a variety of project proponents, and several technical consultants on ecological and hydrologic issues.

It should be noted that before the Working Group was formed, many landowners and other stakeholders were often not informed about issues and decision-making processes that directly affected the Yolo Bypass in general and their interests in particular. These meetings give local stakeholders the chance to provide direct input, helping to protect their interests, and guide projects proposed by others. The Working Group has been meeting regularly since 1998, supported during this entire period by CALFED ERP funding. The Working Group provided the guidance for the development of the document published by the Foundation in August 2001, "*A Framework for the Future: Yolo Bypass Management Strategy*" (Yolo Basin Foundation 2001), which can be viewed on the Foundation's website (www.yolobasin.org).

The group has identified and discussed numerous issues regarding natural resources and public uses in the Yolo Bypass. These issues are addressed in greater detail in Chapters 2, 3, and 4.

1.7 ENVIRONMENTAL ANALYSIS

An Initial Study (IS) pursuant to CEQA and the State CEQA Guidelines has been prepared in conjunction with the Draft LMP. This assessment evaluates the potential environmental impacts of the continued operation of the Yolo Bypass Wildlife Area under the provisions of the Draft LMP. The IS for the LMP is found in Appendix H, "Environmental Review." This assessment recommended that a Negative Declaration be approved for the project with a finding that the project would not have a significant impact on the environment.

1.7.1 RELATIONSHIP OF THIS LAND MANAGEMENT PLAN TO CALFED

The *CALFED Final Programmatic Environmental Impact Statement and Environmental Impact Report* (CALFED Final PEIS/EIR) provides a very broad, programmatic analysis of the general effect of implementing the multiple components of CALFED over a 30-year period (2000–2030) across two-thirds of the state of

California. The analysis of impacts in the CALFED Final PEIS/EIR is not intended to address any site-specific environmental effects of individual projects; therefore, the analyses of direct, indirect, and cumulative impacts contained in the CALFED programmatic document are not sufficiently detailed by itself to evaluate effects of the proposed LMP on the Yolo Bypass Wildlife Area. Preparation of the Draft LMP for the Yolo Bypass Wildlife Area included reviews of applicable chapters and sections contained in the CALFED Final PEIS/EIR and the Record of Decision (ROD) on the Final PEIS/EIR to develop background information, assess consistency of the proposed LMP with the CALFED Preferred Program Alternative, and provide mitigation guidance.

The LMP is intended to be consistent with the programmatic guidance contained in the CALFED programs and Final PEIS/EIR. Furthermore, it is intended to be consistent with the *Multi-Species Conservation Strategy* (MSCS), which is part of the comprehensive regulatory compliance strategy that is integrated with the CALFED Final PEIS/EIR.

Review of the resource sections of the CALFED Final PEIS/EIR included identification of mitigation strategies, which addresses potential significant impacts on special-status wildlife species, important wildlife use areas, and agricultural lands. These mitigation strategies serve as the basis for development of strategic elements that are incorporated into the LMP management goals and tasks, thereby avoiding potential significant impacts. (Refer to Chapter 5, "Management Goals," of this Draft LMP for further discussion.)

1.8 ORGANIZATION OF THIS LAND MANAGEMENT PLAN

This LMP for the Yolo Bypass Wildlife Area is organized as follows:

- *Chapter 1, "Introduction,"* summarizes the purpose of the land acquisition for the Yolo Bypass Wildlife Area, acquisition history, purpose of the LMP, and the planning process; explains the scope and uses of this LMP; and describes the relationship of this LMP to CALFED.

- *Chapter 2, "Property Description and Management Setting,"* summarizes the most current information available to describe the geographical setting, property boundaries and easements, existing infrastructure, and management setting, including any legal constraints and existing agreements and descriptions of existing working partnerships with other agencies, and nonprofit groups. This chapter (along with Chapter 3) also will serve as part of the environmental setting of the IS.

- *Chapter 3, "Environmental Setting,"* describes the primary existing resource conditions on the property and includes a discussion on planning influences and considerations. It will also serve as the environmental setting of the IS.

- *Chapter 4, "Compatible Resource Management and Public Use,"* describes and evaluates opportunities and constraints associated with compatible resource management and public uses throughout the Yolo Bypass Wildlife Area.

- *Chapter 5, "Management Goals,"* describes the resource management direction of the LMP and the project description necessary for performing environmental review pursuant to CEQA. The chapter includes conceptual descriptions of management actions.

- *Chapter 6, "Operations and Maintenance,"* guides the budget preparation and work plans for the property; summarizes the number of existing staff employed at the property and any additional requirements for personnel; summarizes all estimated operations and maintenance costs associated with management of the property; identifies potential funding sources.

- *Chapter 7, "Future Revisions to the Plan,"* describes a process that will be implemented to update and accommodate revisions to the LMP.

- *Chapter 8, "Document Preparers,"* lists the agencies involved in preparation or review of the LMP and individuals who prepared this LMP.

- *Chapter 9, "References and Personal Communications,"* lists the sources of information cited throughout this LMP.

- *Appendix A, "Public-Outreach Summary,"* includes news releases for the public-input meetings; a summary of the December 12, 2005 and August 16, 2007 public scoping and comment meeting; including written comments received; a summary of focus group meetings to be held on March 27 and 30, and April 4 and 7, 2006; a list of public presentations; and a news release for the Draft LMP.

- *Appendix B, "Yolo Bypass Wildlife Area–Related Targets and Programmatic Actions from the CALFED Ecosystem Restoration Program Plan,"* presents the verbatim Yolo Bypass–Related CALFED Targets and Programmatic Actions that appear to be relevant to issues addressed in the Yolo Bypass Wildlife Area LMP.

- *Appendix C, "Yolo Bypass Wildlife Area–Hydraulic Modeling Workplan,"* presents a specific hydraulic modeling workplan for guiding the design of future restoration projects in the Yolo Bypass Wildlife Area and confirming achievement of performance criteria (i.e., confirmation that project-related adverse affects to flow conveyance will not occur).

- *Appendix D, "Existing Memorandums of Understanding and Agreements,"* presents existing Memorandums of Understanding and Agreements between DFG and the Yolo Basin Foundation (regarding public education programming and facilities); DFG, USACE, DWR, and The Reclamation Board (regarding flood control); DFG, State Reclamation Board, DWR, and USFWS (regarding management for flood control and endangered species); DFG and Dixon RCD (regarding management of agricultural leases), and the Mace Ranch Irrigation System and Water Delivery Agreement.

- *Appendix E, "Yolo Bypass Wildlife Area Program History and Overview,"* provides an overview of public use programs, site history, and a description of interpretive resources.

- *Appendix F, "Yolo Bypass Wildlife Area Agricultural Plan,"* presents the Agricultural Plan for the Yolo Bypass Wildlife Area.

- *Appendix G, "Species List for the Yolo Bypass Wildlife Area,"* presents a species list for the Yolo Bypass Wildlife Area.

- *Appendix H, "Environmental Review,"* presents the Initial Study / Negative Declaration for the Draft LMP.

2 PROPERTY DESCRIPTION AND MANAGEMENT SETTING

This chapter describes the existing geographic setting of the Yolo Bypass Wildlife Area, including the Wildlife Area boundaries, associated management units, and existing easements. Existing infrastructure and its management (i.e., water delivery and management, roads, levees, utilities, and houses and other structures) are also discussed. This chapter also describes the existing management setting of the Yolo Bypass Wildlife Area, including legal constraints and existing agreements.

2.1 GEOGRAPHICAL SETTING

The Yolo Bypass Wildlife Area is located within the historic Yolo Basin of the Sacramento Valley and is part of the California Department of Fish and Game's (DFG's) Bay-Delta Region. It lies almost entirely within the Yolo Bypass in Yolo County, between the cities of Davis and West Sacramento (Exhibits 1-1 and 1-2).

2.2 PROPERTY BOUNDARIES AND EASEMENTS

Exhibit 2-1 depicts the boundaries of the approximately 16,770-acre Yolo Bypass Wildlife Area. The northern boundary of the Yolo Bypass Wildlife Area is generally formed by the Union Pacific Railroad (UPRR) (formerly Southern Pacific Railroad) tracks that run parallel to and north of Interstate 80 (I-80). There is, however, a 182-acre portion of Yolo Bypass Wildlife Area that abuts the UPRR tracks on the north side. The eastern boundary is shaped largely by the East Toe Drain, which runs inside of the east levee of the Yolo Bypass (which is also the west levee of the Sacramento River Deep Water Ship Channel). This eastern boundary is the centerline of the open water in the East Toe Drain, except in an area approximately 3 miles due south of I-80 where the boundary turns west to avoid a small area of privately owned land. The western boundary of the Yolo Bypass Wildlife Area is generally defined by the west levee of the Yolo Bypass, except that the boundary also encompasses two properties outside of the Bypass levee. The southern boundary is approximately 8.7 miles south of I-80 on the east side and approximately 10 miles south of I-80 on the west side of the wildlife area (Exhibit 2-1).

The primary entrance to the Yolo Bypass Wildlife Area, which can be reached via the East Chiles Road exit of I-80, is approximately 2 miles east of Davis and 4 miles west of West Sacramento. The entry driveway intersects County Road 32B (aka east Chiles Road) at the west levee of the Yolo Bypass, immediately west of the west end of the Yolo Causeway (I-80 Bridge).

The Yolo Bypass Wildlife Area is composed of 17 separate management units throughout its approximately 16,770 acres (Exhibit 2-1). A brief description of each management unit is provided below.

2.2.1 UNIT DESCRIPTIONS

Existing cover types within the Yolo Bypass Wildlife Area include wetlands, riparian areas, grasslands and other uplands, vernal pools, open-water, and agricultural lands. There are flowage easements covering all of the Yolo Bypass Wildlife Area units within the Yolo Bypass that allow for water to be diverted from the Sacramento River during high flows for flood protection purposes. As a result, most of the Yolo Bypass Wildlife Area has been inundated by Bypass flows in approximately 71% of water years (as measured at the Lisbon Weir) (Yolo Basin Foundation 2001). Management units outside of the Bypass include an approximately 130-acre portion of the Northwest Unit called the Geiberson Ranch and the Pacific Flyway Center Unit (Exhibit 2-1). A general description of each management unit is provided below. Management units are organized by primary acquisitions/ previous ownership (i.e., Causeway Ranch, Original Yolo Bypass Wildlife Area, Los Rios Farms Complex, and Tule Ranch). Descriptions of the most recent acquisitions, the Parker Unit and the Cowell Pond Unit, are included in the Los Rios Farms Complex discussion. Descriptions of existing infrastructure, i.e., water management and delivery, roads, levees, utilities, and houses and other structures, are provided separately under Section 2.3,

"Existing Infrastructure." Table 2.2-1 specifies the area and primary land use/cover type for each of the management units in the Yolo Bypass Wildlife Area. Additional details regarding planning influences and considerations, agricultural resources, soils and climate, hydrology and water resources, biological resources, cultural resources, and recreation and public access are provided in Chapter 3, "Environmental Setting."

CAUSEWAY RANCH

Causeway Ranch Unit (North)

The Causeway Ranch Unit (North) is approximately 182 acres and is located north of the UPRR trestle. This unit has two productive farm fields with a total of approximately 160 farmable acres. The balance of this unit consists of roads, ditches, and a narrow strip of trees and vegetation along the UPRR trestle on the eastern point of this unit. The same tenant has been farming this unit for many years. Recent crops have been sunflower, safflower, and corn.

Causeway Ranch Unit (Main)

The Causeway Ranch Unit (Main) is approximately 1,966 acres and is located immediately south of I-80 and, combined with the 1,000 Acres Unit described below, has 24 productive farm fields totaling approximately 2,785 acres and one field of approximately 22 acres dedicated exclusively to wildlife habitat. Crops grown in these two units have consisted of corn, hay, safflower, tomatoes, rice, wild rice, milo, and wheat. Planted acres have ranged from 1,837 acres to 2,760 acres with a 4-year average of 2,434 acres. A significant amount of this area has recently been planted in wildlife food plots and shorebird management areas in rotation with rice production.

The most notable feature of this unit is the approximately 25-acre Green's Lake. The lake is surrounded by riparian vegetation and is one of the very few mature riparian woodland areas existing within the Yolo Bypass. Green's Lake appears to be the remnant of a hydraulic connection between the historic north fork of Putah Creek and Lake Washington in West Sacramento.

1,000 Acres Unit

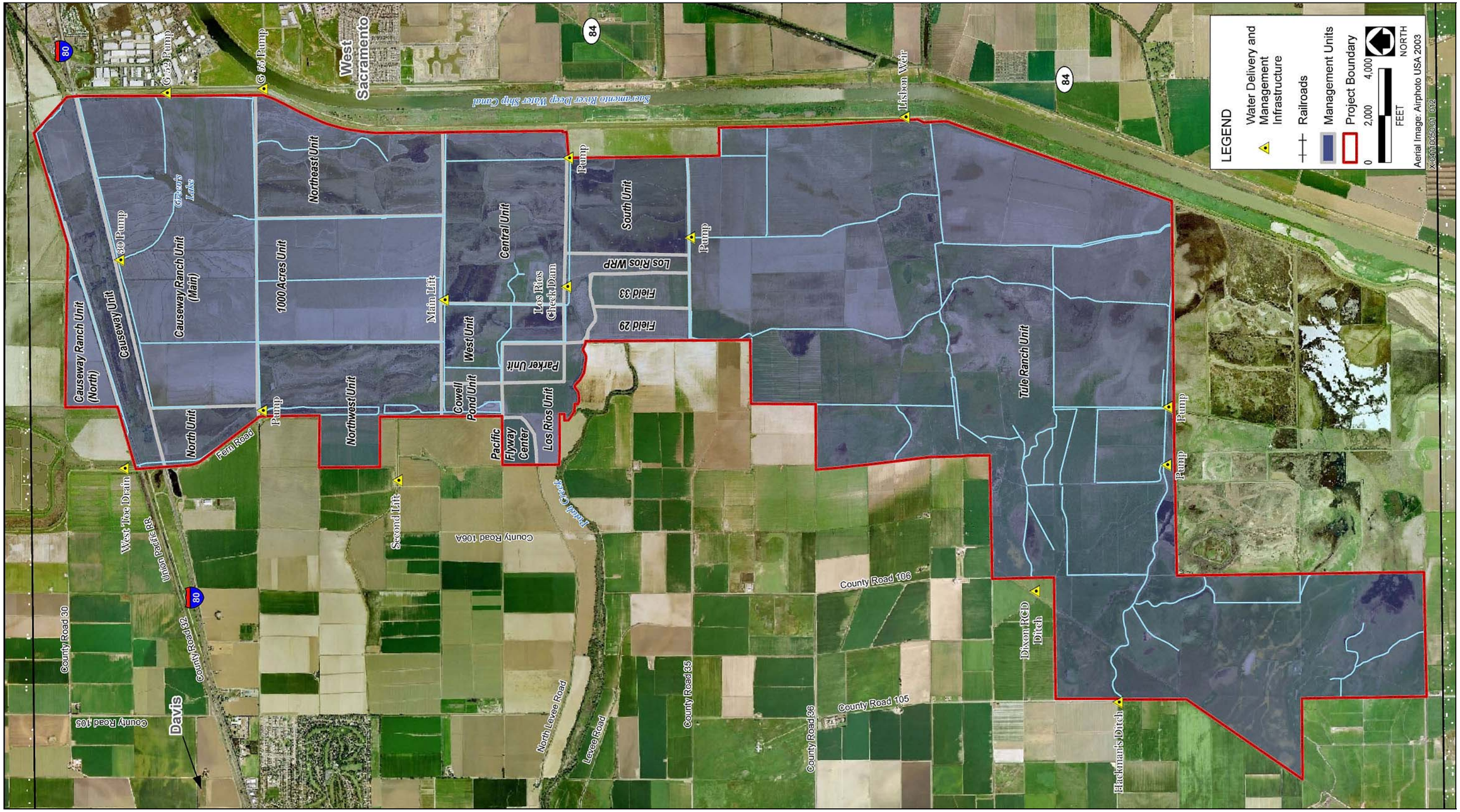
As its name implies, the 1,000 Acres Unit is approximately 1,000 acres. This management unit is located immediately south of the Causeway Ranch Unit (Main). Crops grown in these two units are described above under "Causeway Ranch Unit (Main)." In addition to supporting agricultural crops, portions of the 1,000 Acres Unit have also been managed specifically as shorebird habitat on a 3-year rotational basis (see Chapter 3, "Environmental Setting," for additional detail).

ORIGINAL YOLO BYPASS WILDLIFE AREA

The original Yolo Bypass Wildlife Area includes a series of early acquisitions that formed the original Yolo Bypass Wildlife Area.

Causeway Unit

The Causeway Unit is approximately 420 acres and lies between the UPRR trestle and I-80. The property consists of approximately 205 acres of grassland and riparian vegetation communities, approximately 95 acres of fallow land, and approximately 120 acres of farmable land on the eastern portion of this property. There is one permanent pond that was restored in 1996 by the U.S. Army Corps of Engineers (USACE). There is also an



Source: Department of Fish and Game, City of Davis 2005, CaSIL 1993

Yolo Bypass Wildlife Area **Exhibit 2-1**

Table 2.2-1
Management Units in the Yolo Bypass Wildlife Area

Management Unit (Subunit)	Area (acres)[1]	Land Use/Cover Type(s)
Causeway Ranch		
Causeway Ranch Unit (North)	182	Farmland
Causeway Ranch Unit (Main)	1,966	Farmland; Green's Lake; seasonal wetland and riparian vegetation communities
1,000 Acres Unit	1,000	Farmland
Original Yolo Wildlife Area		
Causeway Unit	420	Farmland; grassland and riparian vegetation communities
North Unit	182	Seasonal wetland, grassland, and riparian vegetation communities
Northwest Unit[2]	683	Seasonal and permanent wetland, farmland, grassland, and riparian vegetation communities
West Unit	255	Seasonal wetland and grassland vegetation communities
Northeast Unit	759	Seasonal and permanent wetland, grassland, and riparian vegetation communities
Central Unit	892	Seasonal and permanent wetland, grassland, and riparian vegetation communities
South Unit	488	Seasonal and permanent wetland, and grassland vegetation communities
Los Rios Farms Complex		
Los Rios Unit	230	Farmland
Los Rios WRP	153	Seasonal and permanent wetland, grassland, and riparian vegetation communities
Cowell Pond Unit	119	Seasonal and permanent wetland, grassland, and riparian vegetation communities
Pacific Flyway Center	69	Seasonal and permanent wetlands, riparian, and grassland communities; farmland and other
Parker Unit	100	Farmland
Field 29	132	Farmland
Field 38	140	Farmland
Tule Ranch		
Tule Ranch Unit	9,000	Farmland; pasture; seasonal and permanent wetland, grassland, vernal pool, and riparian vegetation communities
Total (approximate)	**16,770**	

Note: WRP = Wetland Reserve Program

[1] Areas are based on assessor's parcel number records obtained from DFG and calculated from property boundaries in geographic information system (GIS) database (compiled by EDAW in 2006), which reflect land area shown in 2003 aerial photography.

[2] Includes additional 160 acres that was part of the Glide acquisition.

extensive area of natural seasonal wetlands in the center of the unit. The balance of this land consists of scattered remnants of the old causeway structure, the structural foundation of the current I-80 Causeway, and the UPRR trestle. The farmed portion of this unit has recently supported sunflower and corn crops. DFG holds a conservation easement on the eastern half of this unit. California Department of Transportation (Caltrans) retains ownership of the property for 30 years as a potential borrow site. The landmark eucalyptus grove is located on the west side of the unit. A complex web of underground pipeline and fiber optic cable easements crosses the unit making active management for wildlife habitat difficult. Additionally, the numerous concrete slabs that were once part of a previous incarnation of the Yolo Causeway lie shallowly buried over several acres, making the area unmanageable and a potential hazard to vehicles and pedestrians.

North Unit

The North Unit is approximately 182 acres. Located immediately south of the Causeway Unit and adjacent to the west levee of the Yolo Bypass, this unit serves as the primary entry point into the Yolo Bypass Wildlife Area. It consists of approximately 131 acres of seasonal wetland, 10 acres of permanent wetland, and 38 acres of grassland vegetation communities with sparse areas of riparian scrub and woodland. This unit was originally restored from fallow agricultural land to seasonal wetlands in 1995 as part of the USACE Yolo Basin Wetlands project. California Waterfowl Association (CWA) completed a habitat improvement project in fall of 2005 using funds from a North American Wetlands Conservation Act (NAWCA) grant. The west side of the unit is a low area that was created when the levees were constructed decades ago, resulting in established wetlands. This existing wetland habitat pre-dates the establishment of the Wildlife Area. Parking Lot A is located on the north end of the unit.

Northwest Unit

The Northwest Unit is approximately 683 acres and is located south of the North Unit, adjacent to and largely within the west levee of the Yolo Bypass. Approximately 523 acres of this unit are part of the original Yolo Bypass Wildlife Area; the remaining 160 acres (130 acres of which are outside of the Yolo Bypass [aka the Geiberson Ranch]) were purchased as part of the Glide Ranch acquisition. The primary portion of the unit (i.e., the portion within the Bypass) consists of approximately 314 acres of seasonal wetlands with 57 acres of permanent wetland, 5 acres of riparian, and 55 acres of grassland vegetation communities. The auto tour loop is located within this unit. This unit was originally restored from fallow agricultural land to seasonal wetlands in 1995 as part of the USACE Yolo Basin Wetlands project. The southwest corner of this unit contains a 15-acre of restored riparian habitat with1,500 trees that were planted by the USACE in 1995. CWA completed an extensive habitat improvement project in fall of 2005 using funds from a NAWCA grant. The approximately 130-acre parcel outside the Yolo Bypass was part of the 2001 Glide acquisition and was known as the Giberson Ranch. This parcel is currently being farmed under a lease, as accepted by DFG as a condition of the sale. The west side north of the riparian area contains low-land tule marsh habitat that pre-dates the establishment of the Wildlife Area. The northwest side of the unit receives the agricultural and stormwater runoff from the South Davis Drain. Parking lots B, C, and D are located along the perimeter of this unit.

West Unit

The West Unit is approximately 255 acres. Located immediately south of the Northwest and 1,000 Acres units, this unit is part of the original Yolo Bypass Wildlife Area. It consists of approximately 196 acres seasonal wetland and 53 acres grassland vegetation communities. This unit was originally restored from fallow agricultural land to seasonal wetlands in 1995 as part of the USACE Yolo Basin Wetlands project. DU completed an extensive habitat improvement project in summer 2005 using funds from a NAWCA grant. This unit is part of the current hunt zone and contains one of the original Putah Creek Sinks.

Northeast Unit

The Northeast Unit is approximately 759 acres and is located immediately south of the Causeway Ranch Unit and east of the 1,000 Acres Unit. The eastern boundary of the Northeast Unit, the centerline of the East Toe Drain, is the same as a portion of the western Yolo Bypass Wildlife Area boundary. This unit is part of the original Yolo Bypass Wildlife Area and consists of approximately 476 acres of seasonal and 80 acres of permanent wetland, 127 acres of grassland, and sparse riparian vegetation communities. This unit was originally restored from fallow agricultural land to seasonal wetlands in 1995 as part of the USACE Yolo Basin Wetlands project. CWA completed an extensive habitat improvement project in fall 2003 using funds from a NAWCA grant. Hunting is allowed in this unit, featuring 16 double concrete pit blinds located on islands in seasonal wetlands. Parking lot H is located on the southwest corner of this unit. The Northeast Unit is also accessed from Parking lot F, located in the northeast corner of the Central Unit.

Central Unit

The Central Unit is approximately 892 acres and is located immediately south and east of the Northwest Unit. The cross canal defines the north border. This unit is part of the original Yolo Bypass Wildlife Area and consists of approximately 356 acres seasonal wetlands, 54 acres of permanent wetlands, and 354 acres grassland vegetation communities. This unit was originally restored from fallow agricultural land to seasonal wetlands in 1995 as part of the USACE Yolo Basin Wetlands project. DU completed an extensive habitat improvement project in fall 2004 using funds from a NAWCA grant. Hunting is allowed in this unit. Parking Lot F is located on the north east corner of this unit, lot G is located at the south east corner of this unit and lot E is located on the west side of this unit.

South Unit

The South Unit is approximately 488 acres and is located immediately south of the Central Unit. This unit is part of the original Yolo Bypass Wildlife Area and consists of approximately 272 acres of seasonal and 19 acres of permanent wetland, and 48 acres of grassland vegetation communities. This unit was originally restored from fallow agricultural land to seasonal wetlands in 1994 as part of the USACE Yolo Basin Wetlands project. The entire unit has been primarily managed as sanctuary with no public use allowed.

LOS RIOS FARMS COMPLEX

Los Rios Unit

The Los Rios Unit is approximately 230 acres and is located north and south of Putah Creek within the Yolo Bypass. This unit, combined with several other parts of the Los Rios Complex, includes nine productive fields with a total of approximately 696 farmable acres. Recent crops in these units have been corn, barley, sorghum, safflower, melon, seed, and tomatoes.

Los Rios WRP Unit

The Los Rios WRP Unit is approximately 153 acres and is located east of the Los Rios Unit. The previous owner of this unit entered into a perpetual easement with the Wetland Reserve Program (WRP) of the U.S. Department of Agriculture Natural Resources Conservation Service (USDA NRCS). The unit currently consists of restored seasonal and permanent wetland, riparian, and grassland vegetation communities. CWA completed this restoration project in fall of 2005. Riparian vegetation will be planted in summer 2006. Hydraulic analysis was used to determine the extent of riparian vegetation allowable under the State Reclamation Board permit. This unit will be available for hunting beginning in the 2006–07 season. Putah Creek is the north boundary of this unit and often overflows its channel on the west side of this unit during high flows.

Cowell Pond Unit

The Cowell Pond Unit is approximately 119 acres and is located immediately south of the Northwest Unit and west of the West Unit. This unit is adjacent to the west levee of the Yolo Bypass. DFG had a long-term easement for wildlife habitat in this area before it purchased the land from Pacific Gas & Electric (PG&E). This unit contains a large but shallow holding pond that is part of the Mace Ranch Irrigation System. Water for the irrigation system moves out of the Bypass in a culvert through the west levee from this pond. This unit has not been farmed since the WCB purchased the conservation easement for the property in 1991. Over the years there has been annual cattle grazing activity.

Pacific Flyway Center Unit

The Pacific Flyway Center Unit is approximately 69 acres. Located outside of the Yolo Bypass levee, to the south and west of the Cowell Pond Unit, this unit has been identified as the preferred site for the proposed Pacific Flyway Center. The Pacific Flyway Center project involves construction of a visitor and environmental education center along with associated infrastructure and support facilities, restoration of 45 acres of habitat, and construction of a new site access road. DFG would operate and maintain the site as a visitor/educational center; the site could also serve as the main entrance to the Wildlife Area and would include facilities for administration of the Yolo Bypass Wildlife Area. (See Chapter 3, "Environmental Setting," and Chapter 4, "Compatible Resource Management and Public Use," for additional information on the Pacific Flyway Center.) Forty five acres of this unit were recently restored to seasonal and permanent wetland habitat and will be also managed for riparian and grass land communities. Approximately 15 acres of the site will remain in agricultural production. About 9 acres has been graded as a building site and parking lot. CEQA compliance for these activities was completed in early 2006 (California Department of Fish and Game 2006).

Parker Unit

The Parker Unit is approximately 100 acres and is located west and north of the Los Rios Unit. This unit has been farmed as part of the Los Rios Complex. It may possibly be restored to wetland habitat by CWA in the summer/fall of 2007 with NAWCA funds. This unit is not currently in the hunting zone.

Field 29 Unit

The Field 29 Unit is approximately 132 acres and is located south of a portion of the Los Rios WRP Unit. The western boundary of this unit forms a portion of the western boundary of the Yolo Bypass Wildlife Area. This unit has been farmed as part of the Los Rios Complex. A fork of Putah Creek forms the north boundary of this unit and another fork serves as the west boundary. This unit has recently been used to grow tomatoes, safflower or sudan and is currently within the hunting area.

Field 38 Unit

The Field 38 Unit is approximately 140 acres and is located south and west of the Los Rios WRP Unit. This unit has been farmed as part of the Los Rios Complex and lies within the hunting area.

TULE RANCH

Tule Ranch Unit

The Tule Ranch Unit is approximately 9,000 acres and is located completely within the Yolo Bypass, generally between County Road 105 and the Sacramento Deep Water Channel and approximately 4.5 miles south of I-80 to 10 miles south of I-80 in the southeastern portion of Yolo County. This unit has a maximum width (east/west) of 4.25 miles and maximum length (north/south) of 6 miles. The unit consists of a combination of annual rye grass pasture, row and field crops, wetlands, vernal pools, and riparian vegetation located along the waterways and in

wetland areas. These waterways are extensive and are generally associated with the existing wetlands and/or ponds. Near the western boundary, along the natural shoreline of the Yolo Basin, uplands predominate in a landscape which still contains the natural topography of the region. These southern portions of the Tule Ranch Unit contain a fine assemblage of plants typical of vernal pools and playas. There are numerous swales that are often crossed by roads in this area. When this condition occurs, water can be impounded at these roads, creating vernal pool conditions. The property is currently leased for farming and cattle grazing; DFG assumed ownership of these leases as a condition of sale. The property contains numerous improvements, including a main residence, a garage, shop, a second residence, sheds, four barns, several storage buildings, fuel tanks, fencing, and corrals, all of which are located in the southwest quadrant and related to the cattle lease operation.

2.2.2 EASEMENTS AND RIGHTS-OF-WAY

Easements and rights-of-way are legally recorded documents that run with the deed of the property, and are, therefore, transferred with the property from owner to owner. Easements typically preserve the rights of an entity other than the landowner. Within the Yolo Bypass Wildlife Area there are generally three different types of easements. The first type includes easements for accessing levees, utilities, roadways, pipelines, etc. These easements exist for the purpose of maintaining, repairing, replacing, and installing levees, roads, railroads, power lines, utility lines, and pipelines needed for regional public works. The second type of easement that exists within the Yolo Bypass Wildlife Area is the conservation easement. A conservation easement is a legal agreement between a landowner and a land trust or government agency that permanently limits uses of the land to protect its conservation values. A discussion of each easement and/or right-of-way is provided below. Exhibit 2-2 depicts easements and rights-of-way within or running through the Yolo Bypass Wildlife Area. Easements and rights-of-way are discussed further under Section 2.4.1, “Legal Constraints and Existing Agreements,” below. The third type of easement is a flowage easement.

FLOWAGE EASEMENTS

The Yolo Bypass Wildlife Area lands located within the Yolo Bypass are restricted by easements held by the State Reclamation Board. These easements grant the state the right to inundate the land with floodwaters. They prevent landowners from building structures, berms, or growing vegetation that would significantly obstruct flow conveyance. The easement language varies slightly (Yolo Basin Foundation 2001). Reclamation Board regulations regarding vegetation maintenance standards for floodways and bypasses throughout the state include the following (CCR Title 23, Section 131 (g)).

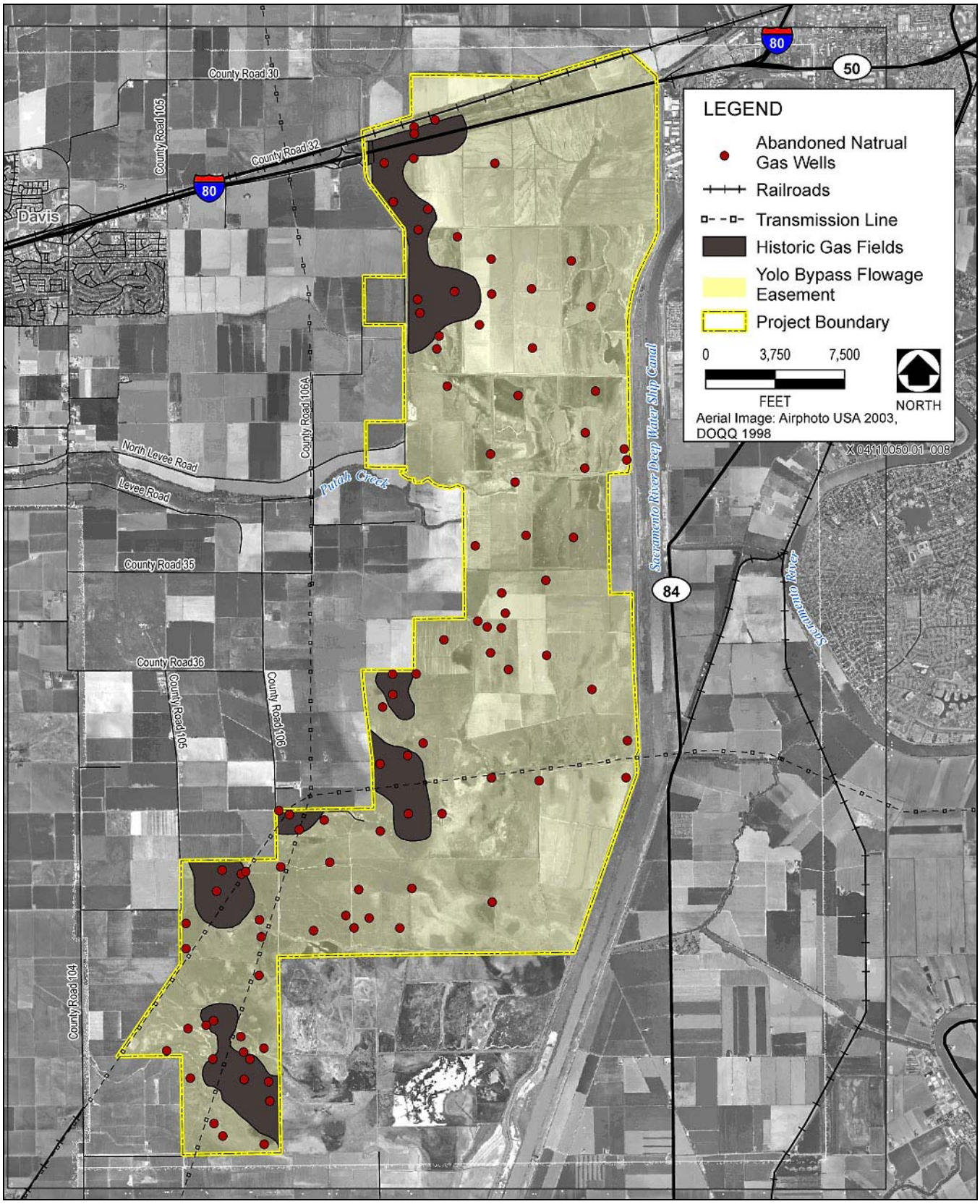
- Invasive or difficult-to-control vegetation, whether naturally occurring or planted, that impede or misdirect flood flows is not permitted to remain on a berm or within the floodway or bypass.

- The Reclamation Board may require clearing or pruning of trees and shrubs planted within floodways in order to minimize obstruction of flood flows.

DFG is required to obtain an encroachment permit from the Reclamation Board for projects such as building a pump tower, creating new wetlands, and proposing the planting of riparian vegetation. The permitting process may include conducting hydraulic modeling of the project to confirm the project would not adversely affect the conveyance of flood flows.

LEVEE EASEMENTS

The DWR and State Reclamation Board maintain easements for accessing levees. Both agencies conduct inspections on levees bounding the Yolo Bypass Wildlife Area. The DWR maintains the west side Bypass levees and Reclamation Districts 900, 899, 765, and 999 maintain portions of the east side levees (see Exhibit 2-4).



Source: Department of Fish and Game, SACOG 1005, City of Davis 2005, CASIL 1993

Easements and Rights-of-Way **Exhibit 2-2**

UNION PACIFIC RAILROAD RIGHT-OF-WAY

UPRR holds a right-of-way along the tracks that run through the Causeway Ranch Unit (North). Management activities in the UPRR right-of-way or modification of the trestle require UPRR approval.

CALIFORNIA DEPARTMENT OF TRANSPORTATION RIGHT-OF-WAY

Caltrans holds a right-of-way along the I-80 causeway and projects located in the right-of-way (Causeway Unit) may require Caltrans approval and/or an encroachment permit.

WETLAND RESERVE PROGRAM CONSERVATION EASEMENT

The prior owner of the Los Rios WRP Unit entered into a conservation easement with the WRP of the USDA NRCS on December 31, 2000. The WRP conservation easement is intended to perpetually restore and protect wetlands and precludes the use of this land for commercial agriculture.

PG&E EASEMENT

PG&E holds easements through the North Unit, Causeway Unit, Los Rios Farms Unit, Pacific Flyway Center Unit, and Tule Ranch Unit to allow for placement and necessary maintenance of transmission lines. Management activities in the PG&E easements area may require PG&E approval.

NATURAL GAS WELL EASEMENTS

There are numerous abandoned natural gas wells located throughout the Yolo Bypass Wildlife Area (Exhibit 2-2). All mineral, oil, and gas rights in the Causeway Ranch and Tule Ranch units have been retained by the previous owner (i.e., Colby Glide estate) (see below). The field location and easements of the wells and infrastructure must be determined prior to conducting substantial management activities in these areas. Additionally, an approved surface access agreement must be negotiated prior to accessing any mineral resources at the Yolo Bypass Wildlife Area.

OTHER EASEMENTS

In addition to UPRR and Caltrans rights-of-way, there are a number of gas pipelines and fiber optic cables running through the Causeway Unit. Gas pipelines such as the Kinder Morgan line are located in other units throughout the Yolo Bypass Wildlife Area. There is a Sacramento Metropolitan Utilities District (SMUD) pipeline along much of the east-side Toe Drain as far south as Lisbon.

2.3 EXISTING INFRASTRUCTURE

Existing infrastructure within the Yolo Bypass Wildlife Area includes water delivery and management facilities, roads, levees, utilities, houses and other structures. A discussion of each of these infrastructure components is provided below.

2.3.1 WATER RIGHTS, DELIVERY, AND MANAGEMENT

Water delivery and management in the Yolo Bypass Wildlife Area is largely dictated by existing water rights, delivery and easement agreements, and infrastructure. The delivery system is a complex system of canals, ditches, pumps including elevated pumps and control gates (Exhibit 2-1).

WATER RIGHTS AND DELIVERY AGREEMENTS

Water Rights

The primary sources of irrigation water for the Yolo Bypass Wildlife Area are the East Toe Drain and Putah Creek. Information on water rights associated with use of East Toe Drain and Putah Creek water by the original Yolo Bypass Wildlife Area (see Exhibit 1-4) can be found in the 1990 *Hydrologic Analysis of the Mace Ranch Portion of the Proposed Yolo Basin Wildlife Area* (Central Valley Habitat Joint Venture 1990) and two delivery and easement agreements.

Delivery and Easement Agreements

March 25, 1991 "Mace Ranch Irrigation System Grant of Easements and Water Delivery Agreement (see Appendix D)"

> This purpose of the agreement between Los Rios Farms, Inc., and Alhambra Pacific Joint Venture (now AKT) is to 1) allocate "pro rata" capacity in the Yolo Bypass Wildlife Area irrigation system, which functions both as a delivery and drainage system, 2) provide for the continued operation of the Mace Ranch Irrigation System, and 3) to allocate operation and maintenance (O&M) expenses and responsibility.
>
> Los Rios Farms and Alhambra Pacific Joint Venture (now AKT) and the Department of Fish and Game collectively own the Mace Ranch Irrigation System, which obtains water from the Toe Drain, Putah Creek, and various groundwater wells. Los Rios Farms is responsible for Irrigation System O&M, with parties to the agreement sharing in the capacity limitations. Sharing of available Putah Creek water is based on estimated annual water use. Each of the parties to the Agreement is to rely solely on their individual ground or surface water rights or contracts as the basis for their water diversions into the Irrigation System. Parties agree to maintain all their riparian, appropriative, or other water rights.
>
> Prior to each irrigation season, the Yolo Bypass Wildlife Area's manager estimates annual summer irrigation needs and coordinates with Los Rios Farms in order to determine shared irrigation system capacity for the coming irrigation season.

December 30, 1991 "Agreement and Grant of Easements"

> This purpose of this agreement between Alhambra Pacific Joint Venture (now AKT) and DFG is to convey, by Grant Deed, the property listed in "Exhibit A" (of the agreement) from PG&E to DFG for use as wildlife habitat, and to grant easements from DFG allowing PG&E to collect, transport, and use water and water rights retained by PG&E. As owner of the property, DFG is subject to the 3-25-91 "Mace Ranch Irrigation System Grant of Easements and Water Delivery Agreement." A series of DFG easements grant PG&E the ability to construct, access, maintain, and operate the Irrigation Facilities (including roads, wells, and ditches), the Second Putah Creek Dam, and other water conveyance facilities. Term 5 allows PG&E to extract groundwater and use or sell it on or off the property, while Term 9 states that PG&E has transferred to DFG all water rights to "Exhibit A" properties, or other Yolo Bypass properties DFG acquires which have a "proprietary or cooperative management interest", which are "reasonably necessary for wildlife habitat purposes." PG&E reserves that amount of water not used by DFG as reasonably necessary for wildlife habitat purposes.

DFG use of water is conditioned by the following:

- Term 9(a) allows DFG use of water for wildlife habitat purposes on other property within the Yolo Bypass.
- Term 9(b) requires DFG to use surface water first and only then allows use of groundwater. Groundwater can be pumped if there is a surface water delivery failure, or if surface supplies are insufficient or unsuitable, but cannot be pumped due to inadequate capacity in the existing surface water delivery facilities.
- Term 9(c) allows PG&E to deliver groundwater to DFG in lieu of DFG using surface water, and to use, sell, or transfer an equal amount of surface water.
- Term 9(d) allows DFG construction and operation of wells for domestic and "similar" uses.
- Term 9(e) states that if DFG requires groundwater for habitat purposes under 9(b), the wells and conveyance facilities listed in Exhibit B (existing Well Sites C1, C2, C3, 49SW, 57NW, 57SW, and proposed Well Sites #1 through #8) and Exhibit C (Putah Creek Temporary Dam and associated lands) can be used, with DFG responsible for payment of power costs and a prorated sum for well wear and tear.

The previous terms restrict the use of water by DFG from the Mace Ranch Irrigation System to wildlife habitat purposes only on those properties purchased from Alhambra Pacific Joint Venture in 1992 and any adjacent properties. These rights are now held by their successor, AKT Properties. This lien precludes DFG's use of Mace Ranch Irrigation System water for agricultural purposes anywhere on the Yolo Bypass Wildlife Area. Additionally, the DFG may not use the 10 described wells located on DFG property. For these reasons, irrigation systems have been developed to independently deliver water for agricultural uses on the Wildlife Area.

Riparian Rights

The DFG has a riparian right to pump from the east side Toe Drain. This is accomplished at several pump stations. Other farmers in the area also receive irrigation water from the same source which is lifted into the Mace Ranch Irrigation System. As stated above, each of the parties to this system still retains their water rights to Putah Creek or the Toe Drain that they had prior to entering this agreement. In addition to the Toe Drain, DFG also has a riparian right on Putah Creek.

The approximately 9,000-acre Tule Ranch Unit has riparian water rights from the East Toe Drain, which is located at the eastern boundary of the unit. The water is delivered via a series of canals and lift pumps to all areas of the unit.

The Los Rios Farms Complex has a licensed appropriative water right issued by the State Water Resources Control Board (application No. 17201, Permit No. 10867, License No. 9707) for diversion of 196 acre-feet per annum (afa) from South Fork Putah Creek from April 1 to September 15 of each year for use on 120 acres within the southwest 1/4 of Section 22.

As additional wetlands are developed, there will be a need to develop additional water delivery systems to fully utilize the water available to the Wildlife Area, while being respectful of the water needs of local farmers.

Water Delivery and Management

A complex system of canals, elevated pumps, submersible pumps, and various other water control structures is maintained and used to flood and drain wetlands within the original Yolo Bypass Wildlife Area units according to

established prescriptions. These actions are designed to generally mimic the natural flooding and drainage that once occurred in the Yolo Basin.

The primary source of irrigation water for the Yolo Bypass Wildlife Area is the East Toe Drain. The East Toe Drain pool is tidal water that is trapped behind the Lisbon Weir; it also includes limited amounts of drainage water from the Willow Slough Bypass and the Tule Canal.

Lisbon Weir, looking north (upstream) the East Toe Drain

The Lisbon Weir maintains the water level in this pool. The Lisbon Weir is located approximately 6.75 miles south of I-80 along the east levee of the Yolo Bypass. The Lisbon Weir has existed in one form or another for several decades. It currently consists of a porous rock berm and series of flap gates that pass water north during high tides and trap this water at low tide.

Water is diverted from the East Toe Drain and Putah Creek into the original Yolo Bypass Wildlife Area at the following three points (see Table 2.3-1):

- *Northeast Submersible Pump Station:* Three submersible pumps (50 horsepower [hp] each) lift water into the ditch that runs across the top of the northeast section. This provides water to the Northeast Unit of the Yolo Bypass Wildlife Area.

- *Main Lift Pump Station:* Four elevated low lift pumps (one at 75 hp and three at 60 hp) located at the Main Lift Station, lift water into the central ditch (aka the cross canal). This water is augmented by the Putah Check Dam when it is in place. This portion of the system feeds the Central Unit, the Northwest Unit, the West Unit and after a second lift (the 180 pump), the North and Causeway Units. This system also feeds the South Unit downstream of the Putah Creek Check Dam. The West Unit also has a low lift pump which is used for drainage. As previously discussed this Main Lift Station is an integral part of the Mace Ranch Irrigation System and the DFG is precluded from utilizing this water for agricultural purposes.

- *South Submersible Pump Station:* Two submersible pumps (50 hp each) pump water into the Central Unit and the South Unit. This pump station is used when the Los Rios Check Dam has been removed or to augment Putah Creek flows.

- *180 Pump Station:* One 20 hp elevated low lift pump floods wetlands in the North Unit, the Causeway Unit and also supplements wetland areas at the north end of the northwest unit. This pump is fed from the Mace Ranch Irrigation System along the western toe drain of the west exterior levee.

Table 2.3-1
Water Diversion and Delivery for the Original Yolo Bypass Wildlife Area

Unit Name	Primary Water Source	Water Pumped from	Water Supply Augmented by
Causeway Unit	East Toe Drain	East Toe Drain pool	--
North Unit	North Pump	Cross Canal connecting to West Toe Drain	180 Pump Station
Northeast Unit	Northeast Pump Station	East Toe Drain	--
Northwest Unit	Central Pump Station Los Rios Check Dam	Cross Canal connecting to East Toe Drain	180 Pump Station
West Unit	Main Lift Station Putah Creek Check Dam	Cross Canal connecting to East Toe Drain	Drainage of unit through west pump
Central Unit	Main Lift Station Putah Creek Check Dam South Pump Station	Cross Canal connecting to East Toe Drain	--
South Unit	Main Lift Pump Station Putah Creek Check Dam South Pump Station	--	--

Source: California Department of Fish and Game 2001

Water also enters the Yolo Bypass Wildlife Area directly from Putah Creek via the Putah Creek Check Dam. The dam is typically operated from April through the end of November. This water flows by gravity to the Northwest, Central, West, and South Units of the Yolo Bypass Wildlife Area.

Approximately 0.2 mile north of I-80 at the east level, the tenant uses a diesel pump to lift water from the Willow Slough Bypass. This water irrigates agricultural fields on the Causeway North Unit.

In addition to the pump stations described above, there are ten existing groundwater wells, none of which is currently in production. Only one has a motor, and this has been submerged during flood events. The status of the wells is currently unknown. Use of these wells was retained by the former owner of the property as a condition of sale as previously described. Water availability for the original Yolo Bypass Wildlife Area can become limited during the spring and summer months when adjacent agricultural lands are irrigated for crop production. This makes it difficult for DFG to irrigate seasonal wetlands quickly. Strategies to address this issue are presented in Chapter 5, “Management Goals.”

Causeway Ranch Unit (North). The sources of irrigation water for the Causeway Ranch (north) are the Willow Slough Bypass and the west toe drain of the Yolo Bypass. The water from these sources enters a borrow ditch along the UPRR trestle and flows east toward the East Toe Drain. Approximately 1 mile east of the west levee, the tenant uses a diesel pump to lift water from the borrow ditch for irrigation. The water level in the ditch is controlled using an earthen dam with a culvert and flashboard riser located on or adjacent to the Yolo Bypass Wildlife Area, approximately 1.6 miles east of the west levee. This pool of water is also used by the Swanston properties located north of the Yolo Bypass Wildlife Area. The lease tenant on this unit maintains the pump, dam,

and ditches on this unit. DFG is not required to participate in any of the maintenance. It may be possible to receive delivered water from the Yolo County Flood Control and Water Conservation District through the Willow Slough Bypass.

Causeway Ranch (Main) and 1,000 Acres Units. The primary source of irrigation water for the Causeway Ranch (Main) and 1,000 Acres Units is the East Toe Drain, facilitated by the Lisbon Weir. Two primary pumping plants (G 52 and G 55) and two secondary pumping plants (G 32 and the 180 pump) serve the two units. The northernmost pumping plant (G 52 in the East Toe Drain) serves approximately 609.5 acres in the northeastern corner of the Causeway Ranch Unit. The G 55 pumping plant serves the balance of the approximately 1,847 acres in the two units. This pumping plant can serve approximately 940 acres by gravity. The balance of the two units is irrigated out of the Green's Lake pool by means of secondary pumping plants. The north-central portion of the Causeway Ranch Unit, comprising approximately 637 acres, is served by pumping plant G 32. The southwestern 80 acres of the 1,000 Acres Unit is served by the Mace Ranch Irrigation System making it unavailable for agricultural activities.

Since the DFG purchase of the Glide Ranch, significant improvements have been made to ensure that irrigation could continue on this property. These improvements were necessary to ensure adequate water for both agriculture and managed wildlife habitat and to increase land management options restricted by aforementioned agreements with the previous land owners.. The first improvements made were to the pump stands at pumping plants G 32 and G 52. These improvements consisted of new elevated permanent pump stands installed in fall 2002 and spring 2003 to raise the electrical panels above the floodplain (as required by PG&E). In fall 2003, new pumps were added to these pump stands to replace the seasonally installed pumps that were previously being rented from Los Rios Farms. These improvements allow for the post harvest flooding of rice, attracting thousands of migratory waterfowl and shorebirds on an annual basis.

Extensive improvements have been made to the irrigation delivery system in addition to the installation of replacement pump stations. These improvements have consisted of enlarging and cleaning the irrigation ditches and installing new turnouts, drainpipes, and rice boxes. The improvements to the ditches and control structures were necessary for the system to deliver and drain water in a timely manner, thus enabling proper water control. The proper control of water is critical for rice production and seasonal wetland flooding and minimizes the potential for production of mosquitoes. These improvements were financed largely by the rice rent revenues from 2002 and 2003. Furthermore, the lease tenant provided operators, fuel, and maintenance in exchange for the use of DFG's excavator, tractor, and scraper to accomplish several components of these improvements.

Los Rios Farms Complex. The Los Rios Farms complex consists of several properties that were owned by Los Rios Farms, PG&E Properties, and L. Parker. The source of water on these properties historically has been a combination of groundwater wells and Putah Creek. These properties are located on the north and south sides of Putah Creek and adjacent to the original Yolo Bypass Wildlife Area and include the following management units: Los Rios, Los Rios WRP, Cowell Pond, Parker, Field 29, and Field 38. Irrigation water is drawn from Putah Creek in several locations to serve these lands. The easternmost lift pump is located on Putah Creek approximately 1.65 miles west of the East Toe Drain and 0.8 mile north of the Tule Ranch Unit's northern boundary. This pump provides water to approximately 350 acres of land south of Putah Creek. Adjacent to this low lift pump is a well, which supplies water to the same acreage. On the north side of Putah Creek, there are three fields (parcels) inside the levee. The two eastern fields have been served either by a well (currently non-operational) or by a lift pump located approximately 1 mile upstream of the Los Rios Check Dam.

Tule Ranch. The Tule Ranch Unit consists of two distinct subunits in regard to agriculture and water management. The northeastern subunit consists of a mixture of irrigated crops and dry pasture and the southwestern subunit consists of irrigated pasture and dry pasture.

Tule Ranch (Northeastern Subunit). The northern portion of the northeastern subunit has historically received water from the East Toe Drain pool (above the Lisbon Weir) through a series of two lift pumps. The first lift

station was located approximately 0.9 mile west of the East Toe Drain along the unit's north boundary, and the second was located approximately 1.65 miles west of the East Toe Drain along the unit's north boundary. Currently there are no lift pumps at either of these locations. A duck stamp proposal has been submitted and approved to rebuild the first lift station and should be completed in 2006 or 2007. Once the water is lifted, it will flow though a series of highline ditches to surrounding fields. The current lease tenant has constructed a ditch from the Los Rios Check Dam pool approximately .8 mile upstream of the dam to deliver water to the Tule Ranch. A lift pump located on Putah Creek approximately 1.65 miles west of the East Toe Drain and approximately 0.8 mile north of the Tule Ranch Unit's north boundary is lifting the water into the ditch. This lift station is described above as part of the Los Rios Farms system. The ditch has enabled parts of the northeastern subunit to be irrigated from the Mace Ranch irrigation system pool.

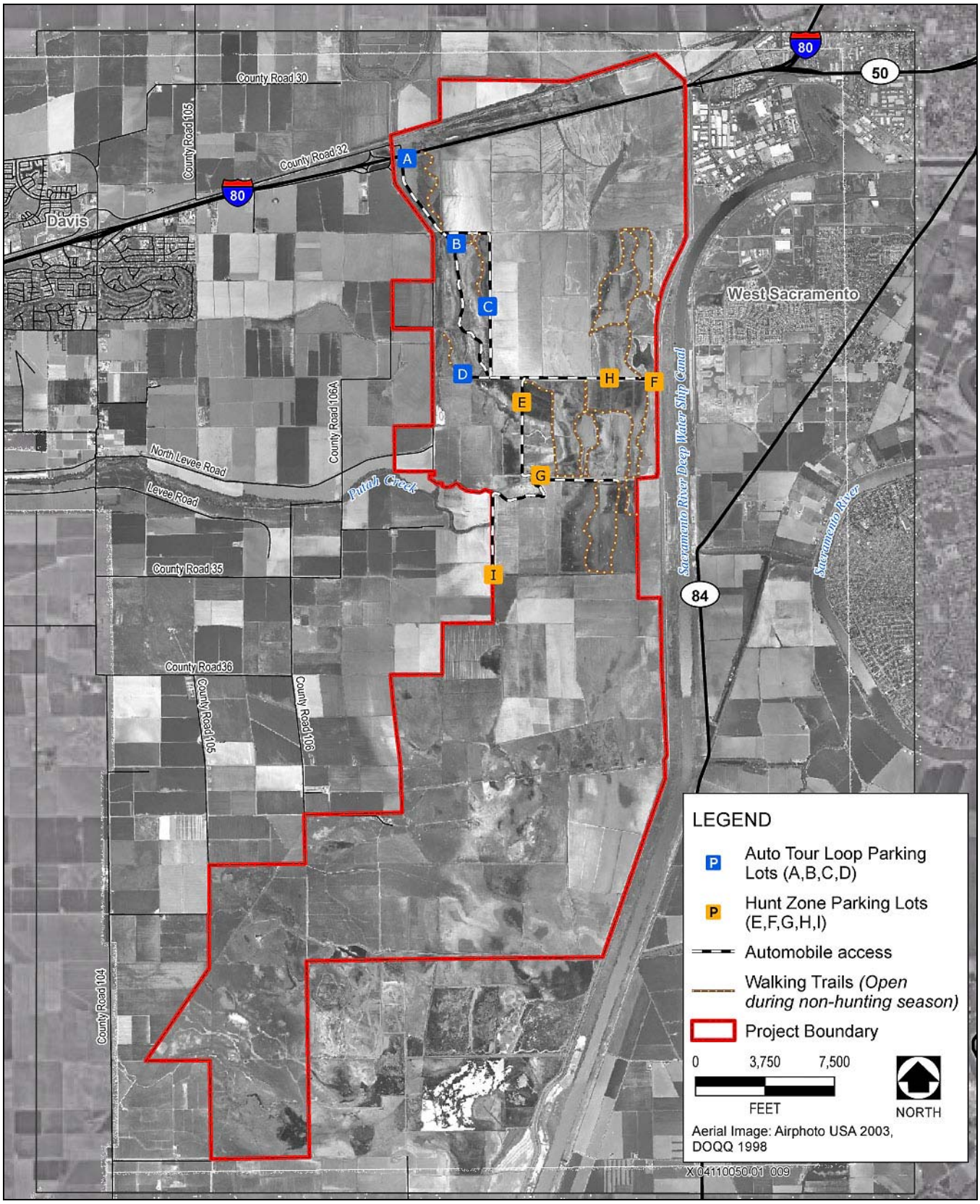
The northeastern subunit also has historically received water from the East Toe Drain below the Lisbon Weir. This southern portion of the northeastern subunit had two lift stations in the southern pool (as described below). These lifts were located approximately 0.2 mile and 1.65 miles west of the East Toe Drain, respectively. Currently only remnants of the western lift station remain. It is uncertain how long this facility has been out of use. No irrigated crops have been planted on this portion of the Tule Ranch Unit in recent years.

Tule Ranch (Southwestern Subunit). The southwestern subunit consists of irrigated and dry pasture. The irrigation water is first lifted directly from the East Toe Drain below the Lisbon Weir. The first lift station consists of two electric pumps located approximately 8.8 miles south of I-80 and 5 miles east of County Road 104. The first lift pumps water into a 2.5-mile canal that flows west to the second lift. The second lift consists of two pumps located approximately 8.8 miles south of I-80 and 2.5 miles east of County Road 104, respectively. These pools also receive drainage water from farms west of the Yolo Bypass Wildlife Area from the lands within Reclamation District (RD) 2068 and the Dixon Resource Conservation District (Dixon RCD). While the volume of water varies over the irrigation season, this drainage water reduces the total amount pumped from the East Toe Drain. Water from this system irrigates approximately 764 acres of pasture on the Tule Ranch.

In addition, water is provided to the Bull Sprig Outing, Senator Outing, H-Pond, Skyrakers, and Glide-In Ranch duck clubs per agreements that DFG inherited when it purchased the Tule Ranch. The water usage of the duck clubs approximates 330 acres of permanent wetlands and 1,290 acres of seasonal wetlands. Maintenance and power costs for the first and second lift stations and maintenance costs for approximately 3.3 miles of canals is shared by the DFG's southwest Tule Ranch Unit lease tenant and the duck clubs. Water usage ratios have been developed to determine the share for each property. A discussion of water delivery agreements for the duck clubs is provided below in Section 2.4.1, "Legal Constraints and Existing Agreements."

2.3.2 ROADS

Access to the Yolo Bypass Wildlife Area is provided via gravel roads. Nine miles of gravel roads are currently available for public use on the Yolo Bypass Wildlife Area, when Bypass flow water is not present. The gravel roads lead to nine parking lots (i.e., lots A–I) that allow access to the hiking trails and hunting sites in the Yolo Bypass Wildlife Area (Exhibit 2-3). All roads within the Yolo Bypass Wildlife Area are currently maintained by DFG. Approximately 10 miles of gravel roads on the Tule Ranch also provide access to several duck clubs located south of the Yolo Bypass Wildlife Area (see Section 2.4.1, "Legal Constraints and Existing Agreements," for additional information on access agreements). These clubs, as well as the south west Tule Ranch tenant will share in any future maintenance costs of these roads.



Source: Department of Fish and Game, City of Davis 2005, CaSIL 1993

Current Roads, Trails, and Parking Lots **Exhibit 2-3**

2.3.3 LEVEES

The Yolo Bypass is the largest feature of the SRFCP (Exhibit 2-4). In addition to 980 miles of levees along the Sacramento, Feather, and American Rivers and a number of smaller creeks and rivers, the SRFCP includes three flood relief structures and five overflow weirs that shunt excess flows from the main Sacramento River channel into the Butte Basin and two flood bypasses (Sutter and Yolo). Runoff from the entire Sacramento Valley watershed reaches the Sacramento–San Joaquin Delta via the lower Sacramento River and the Yolo Bypass. The design capacity of the Yolo Bypass (500,000 cubic feet per second at the southern end) is approximately 4.5 times greater than the capacity of the lower Sacramento River; consequently, the Yolo Bypass is relied upon as the principal means of draining the Sacramento Valley during major floods.

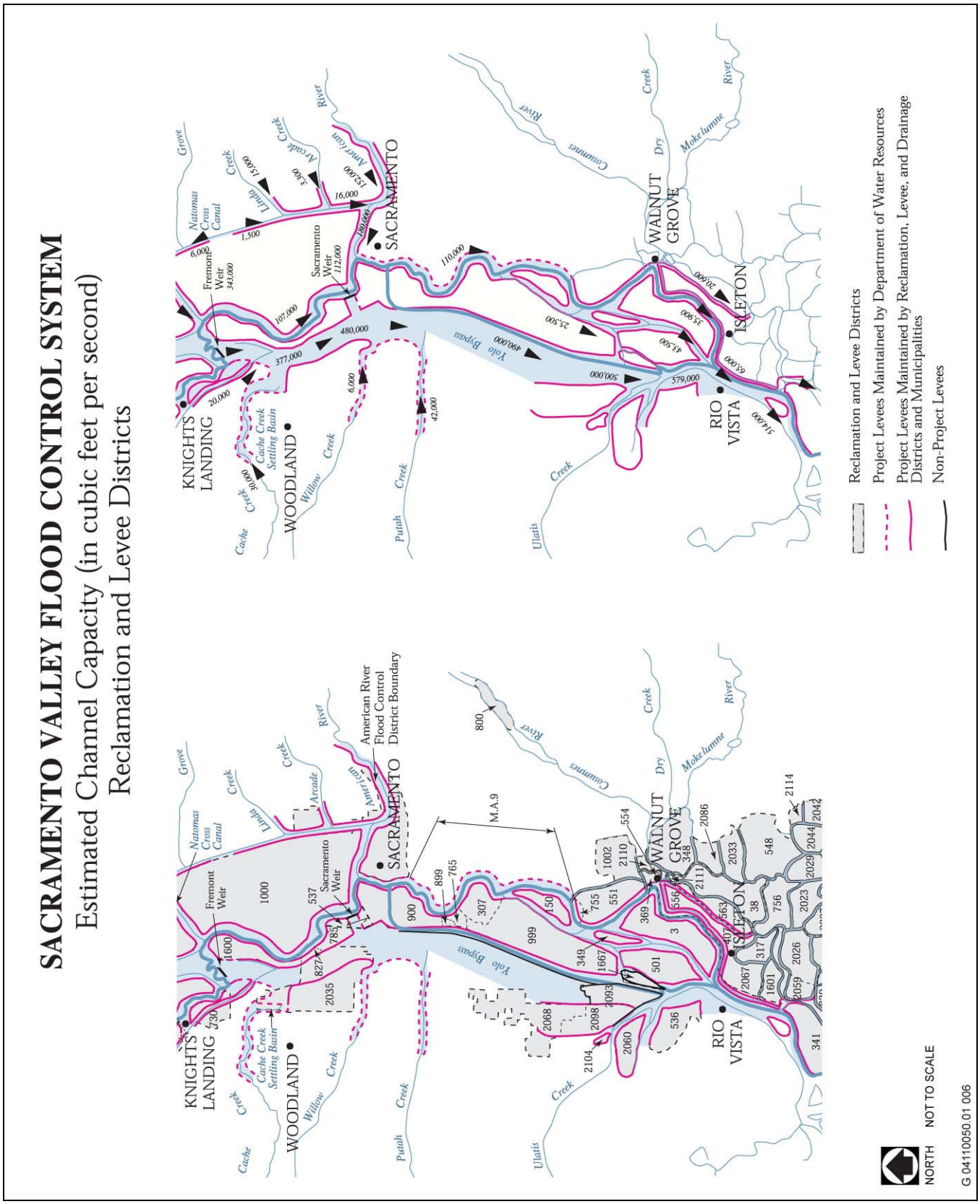
The Yolo Bypass is approximately 41 miles long and is bounded on the east side and along most of the west side by levees constructed by the U.S. Army Corps of Engineers (USACE). Construction of the levees began in 1917, and the Sacramento and Fremont Weirs (the two spillways that release water from the Sacramento River into the Bypass) were built in 1917 and 1924, respectively. The height and grade of the levees are designed to match the calculated water-surface profile of the design flow, with an extra allowance for freeboard. An 8-mile segment along the western boundary of the Yolo Bypass between the South Fork of Putah Creek and 1 mile north of County Road 155 has no levee. The natural ground elevation in this area is close enough to the design flood stage that a levee was considered unnecessary.

The conveyance capacity of the southern half of the Yolo Bypass (including the area within the Yolo Bypass Wildlife Area) was decreased by construction of the Sacramento River Deep Water Ship Channel. The channel was completed in 1963. Dredged material excavated during construction of the 30-foot-deep channel was used to build a second levee along the west side of the channel adjacent to the East Toe Drain. This levee extends from near the I-80 causeway (i.e., Causeway Ranch Unit) to the southern tip of Prospect Island. The second levee of the Sacramento River Deep Water Ship Channel is classified as a navigation levee and is not constructed or maintained to flood control levee standards. However, because it is higher than the original federal flood control levee on the east side of the channel, it constitutes the new east levee of the Yolo Bypass for practical purposes.

Berms and interior levees within the Yolo Bypass could potentially obstruct the conveyance of diverted river flows,. Land grading within the Bypass is restricted by the State Reclamation Board. Interior or restricted-height levees have historically been allowed within the Yolo Bypass to prevent inundation of selected areas from tidal fluctuations and small floods; however, the height of those levees, most of which existed when the Bypass was constructed, is limited to minimize flow obstruction during large floods. Generally berms no taller than 3 feet are allowed within the Yolo Bypass. Higher berms are approved on a case-by-case basis. Other major earthen berms, more or less perpendicular to flow, include the berms that support about half of the length of the I-80 causeway and the nearby UPRR causeway (Causeway Ranch Unit [North]) and portions of the embankment for the abandoned SNRR line that cuts diagonally across the Yolo Bypass a few miles to the south (Tule Ranch Unit).

2.3.4 UTILITIES

Utilities are limited throughout the Yolo Bypass Wildlife Area. The primary utilities located throughout the Yolo Bypass Wildlife Area include PG&E transmission lines running along the UPRR and SNRR track right-of-ways through the Causeway and Tule Ranch unit, respectively. An additional PG&E transmission line runs from north to south through the southwest portion of the Tule Ranch Unit. Exhibit 2-2 depicts utilities running through the Yolo Bypass Wildlife Area. Additional utilities include the several fiber optic cable and gas pipelines running through the Causeway Unit, lower voltage transmission lines running throughout several units to serve pump stations, the Kinder Morgan petroleum pipeline running through several units, and a SMUD pipeline running adjacent to much of the East Toe Drain on the east boundary of the Yolo Bypass Wildlife Area.



Source: California Department of Water Resources

Sacramento River Flood Control Project **Exhibit 2-4**

2.3.5 HOUSES AND OTHER STRUCTURES

There are four residences in the Yolo Bypass Wildlife Area (including the headquarters complex). Two residences are located at the historic Tule Ranch Headquarters on the Tule Ranch Unit. One of these homes date back to at least the early 1900's and may have some historical significance. The ranch headquarters also has a complex of corrals used to process livestock. Also found in the Tule Ranch Unit is a large barn (Umbrella Barn) thought to have been constructed in the 1930s. This barn could be used as an educational facility for interpretation of the adjacent vernal pools. The Tule Ranch headquarters may also serve as an interpretive facility that could allow students to experience the role that agriculture has played in the Yolo Basin. The third residence is located in the Pacific Flyway Center Unit and will be retained for use as a caretaker's residence. This house is currently being remodeled. A fourth residence is located within the headquarters complex on County Road 32B (see below).

Other structures in the Yolo Bypass Wildlife Area include a hunters' check station that is operated during the fall and winter hunting season. A trailer currently serves as the check station. The trailer is transported and placed on-site at the south end of the auto tour route near parking lot D, and removed with the onset of potential winter flooding. Portable toilets are placed in some parking lots of the Yolo Bypass Wildlife Area during the appropriate seasons. They are removed prior to flooding. Heavy concrete picnic tables are currently located at lots B, C, D, F and G. These can safely withstand flooding.

In addition, the Yolo Bypass Wildlife Area is currently administered from the DFG headquarters complex on Chiles Road 1 mile west of the Yolo Bypass. This 13-acre complex includes a 3-acre demonstration wetland, the aforementioned residence, maintenance shop, office building with a conference room, restrooms, display area and office space for employees of both DFG and the Yolo Basin Foundation. Three sheds provide space for storage of educational materials and miscellaneous supplies. Additionally, the site is the home of the Yolo Fish Screen shop, whose function is to fabricate, install, and maintain fish screen structures throughout the northern California area.

2.4 MANAGEMENT SETTING

This section describes the existing management setting of the property. The current management of the Yolo Bypass Wildlife Area operates under several legal constraints and existing agreements. These constraints and agreements are discussed in detail below.

2.4.1 LEGAL CONSTRAINTS AND EXISTING AGREEMENTS

SACRAMENTO RIVER FLOOD CONTROL PROJECT—PROJECT MODIFICATION AGREEMENT

DFG, DWR, the State Reclamation Board, and USACE have a management agreement (in lieu of an encroachment permit) that allows for project modifications as long as they are compatible with flood control. Under this agreement signed in 1994, DFG assumes responsibility for all claims of damage or liability. DFG is responsible for maintenance of lands within the boundaries of the project modification (i.e., The Yolo Bypass Wildlife Area). This maintenance is consistent with the purposes of public safety and is detailed in the draft USACE Operating Manual. In this agreement, the following statement appears: "DFG will endeavor to manage the Project Modification in a manner that will be compatible with agricultural practices" (U.S. Army Corps of Engineers 2003).

AGREEMENT UNDER SECTION 8618 OF THE CALIFORNIA WATER CODE

For purposes of managing the Yolo Bypass Wildlife Area, DFG entered into an agreement with the State Reclamation Board under Water Code Section 8168, for maintenance of the Yolo Bypass floodway.
This agreement make the Department of Fish and Game responsible for maintaining the Wildlife Area in a condition that is compatible with the flood control function of the Yolo Bypass.

Section 8618 of the California State Water Code states:

> All political subdivisions, agencies of the State, and municipal and quasi-municipal corporations may make agreements with the board obligating themselves to do or perform those things which are required of the State, political subdivisions thereof, or other local agencies by the act of Congress approved June 22, 1936, or any acts amending or adding to it, now or hereafter adopted.
>
> When an elimination, modification, or alteration of any authorized plan of flood control is made at the request of a political subdivision, agency of the State, or municipal or quasi-municipal corporation, the political subdivision, agency of the State, or municipal or quasi-municipal corporation may, in agreements made pursuant to this section, assume responsibility for all claims of damage or liability made against the State and its agencies or the United States and arising from the requested elimination, modification, or alteration of the authorized plan of flood control.

GLIDE RANCH/LOS RIOS FARMS ACQUISITION

Several assurances were conveyed to the Delta Protection Commission and the Yolo County Board of Supervisors during the 2001 acquisition of the Glide Ranch and Los Rios Farms. These assurances are as follows:

- Land Management Plan commitments:
  - In recognition of the importance of developing an LMP appropriate to local, state, and federal goals for the area, DFG committed to wide public involvement and an open process including coordination and involvement and input from stakeholder groups such as the Yolo Bypass Working Group (see Chapter 1 for a discussion on the planning process and Appendix A for a summary on public outreach).
  - No land use changes will be made until a land management plan is completed.
  - Upon acquisition (in 2001), existing agricultural leases will be maintained until the LMP is completed. At this time, the state will enter into a bid process to begin the renegotiation of the agricultural leases.
  - The management plan will be subject to treatment under the California Environmental Quality Act (CEQA) prior to DFG consideration.
  - The property will be managed in strict compliance with any conditions of the State Reclamation Board (see below for additional discussion).
  - There is no desire or intent to transfer any of the water associated with the property outside of Yolo County.
  - The payment of appropriate in-lieu fees is prescribed by state law. These include payments for county taxes and irrigation, drainage and reclamation district assessments. In addition, the DFG pledges to work with mosquito abatement districts and other special districts to address their concerns.
- All mineral, oil, and gas rights on the Glide Ranch properties (Tule Ranch and Causeway Ranch) will be retained by the previous owner (i.e., Colby Glide estate).
- Water delivery and road access agreements shall be maintained with neighboring duck clubs south of the Yolo Bypass Wildlife Area (see below for additional discussion).

Tule Ranch–Duck Club Agreements

Two types of existing agreements with duck clubs (located to the south of the Tule Ranch) were conveyed as part of the Wildlife Conservation Board's (WCB's) acquisition of the Tule Ranch. The first type of agreement allows the Bull Sprig and Skyrakers duck clubs to use the Yolo Bypass Wildlife Area road and to receive water from the Yolo Bypass Wildlife Area irrigation system. The second type of agreement allows H Pond and Channel Ranch duck clubs access to the appropriate Yolo Bypass Wildlife Area road. Two additional clubs, the Senator Outing Duck Club and the Glide-In Ranch Duck Club, did not appear to have agreements with the Glide Colby estate; however, they do use the Yolo Bypass Wildlife Area road and receive water from the Yolo Bypass Wildlife Area irrigation system. Agreements with each of these clubs will be updated and executed as soon as possible.

Tule Ranch–Bull Sprig Duck Club Agreement

The Bull Sprig Duck Club consists of approximately 120 acres, of which 100 acres are irrigated from the Yolo Bypass Wildlife Area irrigation system. This club receives both summer and fall water. Summer usage is typically 1 acre-foot per acre (af/acre) and fall water is typically 5 af/acre. The water is delivered to this club just west of the second lift station described above. The agreement states that the "Duck Club shall pay its pro rata share (based on percentage of total usage by all duck clubs) of all electric bills and its pro rata share of all expenses associated with regular maintenance of said pumps." The percentage of use, and thereby the pro rata share, for the duck club shall be determined relative to the overall water use in the Tule Ranch southwestern subunit. These percentages shall then be applied to the electricity and maintenance costs as outlined in the agreement.

The agreement also requires the duck club to pay its pro rata share of all expenses required to maintain its road access. The distribution of road maintenance costs needs to be considered in greater detail to determine the basis for the pro rata shares.

Tule Ranch—Skyrakers Duck Club Agreement

The Skyrakers Duck Club consists of approximately 340 acres, of which 240 acres are irrigated from the Yolo Bypass Wildlife Area irrigation system. This club receives both summer and fall water. Summer usage is typically 1 af/acre and fall water use is typically 5 af/acre. The water is delivered to this club just west of the second lift station. As with the Bull Sprig Duck Club, the agreement with the Skyrakers Duck Club requires the duck club to pay its pro rata share of electric bills and expenses associated with pump maintenance and road access (although road maintenance cost distribution needs to be considered in greater detail).

Tule Ranch–Channel Ranch Duck Club Agreement

The Channel Ranch Duck Club consists of approximately 191 acres. This duck club does not receive water directly from the Yolo Bypass Wildlife Area irrigation system but is at the downstream end of the drainage system of the various clubs. The agreement pertains to road access and requires that the duck club pay its pro rata share of all expenses required to maintain their road access. As with agreements with other duck clubs, the distribution of road maintenance costs needs to be considered in greater detail to determine the basis for the pro rata shares.

Tule Ranch–H Pond Duck Club Agreement

The H Pond Duck Club consists of approximately 480 acres, of which 250 acres receive water from the Yolo Bypass Wildlife Area irrigation system. The agreement also requires that the duck club pay its pro rata share of all expenses required to maintain their road access. As with agreements with other duck clubs, the distribution of road maintenance costs needs to be considered in greater detail.

Tule Ranch–Senator Outing Duck Club

The Senator Outing Duck Club consists of approximately 480 acres, of which 360 acres are irrigated from the Yolo Bypass Wildlife Area irrigation system. This club receives both summer and fall water; summer usage is typically 1 af/acre and fall water is typically 5 af/acre. The water is delivered to this club just west of the second lift station.

DFG has been unable to locate a previous agreement with the Glide Colby Estate to cover the use of the irrigation system or the road. Payment of a pro rata share should be handled as described above for other duck clubs. The club currently uses the Yolo Bypass Wildlife Area road to access the property; however, there appears to be no agreement to cover this use or maintenance of the road.

Tule Ranch–Glide In Ranch Duck Club

The Glide In Ranch Duck Club consists of approximately 1,160 acres, of which 340 acres are irrigated from the Yolo Bypass Wildlife Area irrigation system. This club receives only fall water. Fall usage is typically 5 af/acre. The water is delivered to this club from a new lift station just east of the second lift station. As with the other duck clubs, the agreement with the Glide In Ranch Duck Club requires the duck club to pay its pro rata share of electric bills and expenses associated with pump maintenance. The club currently uses the Yolo Bypass Wildlife Area road to access the property; however, there appears to be no agreement to cover this use or maintenance of the road.

Williamson Act Contracts

Before the Glide Ranch was acquired by the WCB, portions of the ranch (i.e., Tule Ranch and Causeway Ranch) were under Williamson Act contract (entered into by Peggy Glide Colby and Thorton Glide on September 6, 1972). (The Geiberson Ranch portion of the Glide Ranch was not under Williamson Act contract.) Because the land was acquired by the State of California (i.e., WCB), a new Williamson Act contract was not required (pursuant to California Government Code Section 51295). However, as stated in Government Code Section 51292, it is the policy of the state that public agencies cannot locate public improvements in agricultural preserves unless specific findings can be made:

> The location is not based primarily on a consideration of the lower cost of acquiring land in an agricultural preserve. *(Section 51292[a])*
>
> If the land is agricultural land covered under a contract pursuant to this chapter for any public improvement, that there is no other land within or outside the preserve on which it is reasonably feasible to locate the public improvement. *(Section 51292[b])*

The first finding was made (by Yolo County Planning and Public Works Department), as the selection of the properties was based on their historic wetland nature and their location relative to the original Yolo Bypass Wildlife Area. The properties represented an expansion of the Yolo Bypass Wildlife Area and contain interrelated water systems and accesses.

This second required finding was also supported, as the purpose of the acquisition is both preservation of historic wetlands and expansion of the existing Yolo Bypass Wildlife Area, and the selected property is within the Bypass, is contiguous with the original Yolo Bypass Wildlife Area, and contains habitat acceptable for DFG's needs for species of concern. Another location would not have met these criteria (Yolo County Planning and Public Works Department 2001).

Local Fees

A suite of fees have been requested from the DFG for the operation of the Yolo Bypass Wildlife Area. The current status of these requests are discussed below.

Yolo County Tax Assessments – DFG supports payment of County in lieu fees and budget requests have been made to make such payments; however, these budgetary requests have not been passed in the state legislature. DFG will continue to make budgetary requests to cover in-lieu fees for County taxes.

Yolo County Flood Control and Water Conservation District (Southeast Davis Drainage and Maintenance District [SDDMD]) – DFG has committed to make payment for benefits and services provided by SDDMD.

Yolo County Fire Assessments – The DFG has paid Yolo County Fire Assessment fees for the period from 1997-2003 based on commitments made at the time of the land acquisition. Assessments for years beyond the initial time period, however, are evaluated as to their validity under Proposition 218, including whether such assessments meet the "special benefit" requirement of California Constitution Article 13D Section 4(a) or are precluded from assessment as a general governmental service such as those designated in Article 13D Section 6(b)(5).

North Delta Water Agency Assessments – In Wildlife Management Areas, Fish and Game Code provides, by statute, for the payment of irrigation, drainage, or reclamation district assessments. (CA Fish and Game Codes, section 1504(a).) However, North Delta Water Agency's assessment does not fit into these statutorily pre-approved payment categories. Additionally, North Delta Water Agency's contract with DWR is unique and this makes any assessments unique as well. As a result, no conditions or commitments to pay these assessments were made at the time of the land acquisition. DFG will carefully analyze the legal and equitable grounds under which the DFG would owe such an obligation.

MEMORANDA OF UNDERSTANDING

Memoranda of Understanding Regarding Threatened and Endangered Species

The Yolo Bypass Wildlife Area Memorandum of Understanding (MOU) between DFG, the State Reclamation Board, DWR, and the U.S. Fish and Wildlife Service (USFWS) articulates an agreement between these agencies on construction and maintenance of the Yolo Bypass Wildlife Area within flood control constraints, as well as constraints of the federal and California Endangered Species Acts. The MOU states that "management of the Yolo Bypass Wildlife Area will take into consideration the specific habitat requirements of the giant garter snake and Swainson's hawk, but the area will not be specifically managed for any other listed or candidate species" (State Reclamation Board 1995). A copy of this MOU is provided in Appendix D. This agreement will be updated to add all the additional acreage acquired since 1994 within the Yolo Bypass.

Memorandum of Understanding between the California Department of Fish and Game and the Yolo Basin Foundation

In June 1997 the Foundation signed a MOU with DFG recognizing their long-term partnership to provide public outreach and educational programs. The MOU allows the Foundation use of the DFG facilities for office space and as a base for programs related to the Yolo Bypass Wildlife Area (California Department of Fish and Game 1997). A copy of this MOU is provided in Appendix D. Updating this agreement to reflect the current state of the partnership has been identified as a task in Chapter 5, "Management Goals."

SACRAMENTO-YOLO MOSQUITO AND VECTOR CONTROL DISTRICT

The Yolo Bypass Wildlife Area lies within the jurisdictional boundaries of the Sacramento-Yolo Mosquito and Vector Control District (SYMVCD). The SYMVCD is responsible for mosquito abatement and control of other

vectors in the district. While a formal agreement or understanding does not exist between the DFG/ Yolo Bypass Wildlife Area and SYMVCD, the two parties do actively coordinate and collaborate regarding management activities. The SYMVCD was involved in the establishment of the Wildlife Area and developed a set of "best management practices" for the Wildlife Area, which included design and operations criteria. In consultation with SYMVCD, DFG implements a mosquito control plan that applies these and other best management practices (BMPs) including water management practices, vegetation management practices, wetland infrastructure maintenance, wetland restoration and enhancement features, and biological controls (Kwasny et al. 2004) and the California Rice Commission's BMPs for mosquito control in flooded agricultural lands. In addition, SYMVCD coordinates with DFG regarding treatments and other activities that may occur on the Yolo Bypass Wildlife Area to avoid conflicts with public uses including school groups and other public activities. In reciprocation, DFG also informs SYMVCD of all water management activities throughout the year. Additional discussion on mosquito control and management is provided in Chapter 3, "Environmental Setting," and Chapter 5, "Management Goals."

DIXON RESOURCE CONSERVATION DISTRICT

At the time of the Glide/Los Rios acquisition, DFG committed to maintaining the existing leases on the Yolo Bypass Wildlife Area. An agreement was forged with the Dixon RCD to manage the existing agricultural leases in the Yolo Bypass Wildlife Area (see Appendix D). Dixon RCD manages contracts, annual reports, collects rents, and makes funds available for use in the Yolo Bypass Wildlife Area. The Dixon RCD retains 15% of the rental income for these services. This has proven to be an invaluable source of funding for the operation of the Yolo Bypass Wildlife Area. Additionally, it has allowed the DFG to maintain and actually increase the agricultural productivity of the property. This unique situation has inspired a renaissance of ideas to help integrate agriculture into the long term management of the Yolo Bypass Wildlife Area. At a time when the Yolo Bypass Wildlife Area budget was severely challenged, DFG was able to generate additional monies for the management of the Wildlife Area, while increasing agricultural productivity of the land, experimenting with wildlife friendly agricultural techniques, and immersing the wildlife area into the local agricultural community.

FARM SERVICE AGENCY

The USDA Farm Service Agency (FSA) administers farm commodity and conservation programs for farmers and makes and guarantees farm emergency, ownership, and operating loans. FSA's responsibilities are organized into five areas: farm credit, farm programs, commodity operations, management, and state operations.

Currently there are six FSA farm designations on the Yolo Bypass Wildlife Area and there are four farm tenants. Under the new LMP, DFG plans to combine the six FSA farms into one FSA farm. Combining the FSA farms would make additional money available to the tenants based on the program history from the existing Yolo Bypass Wildlife Area. The goal of DFG would be to make 100% of the FSA program payments available to the tenants.

Upon the expenditure of federal North American Waterfowl Conservation Act (NAWCA) grants, property can no longer be used for commercial agricultural production. This, in turn, results in a reduction in income for the Wildlife Area. For this reason, NAWCA habitat restoration funds must be used judiciously with full knowledge of the long term impacts to the operation of the Yolo Bypass Wildlife Area.

FISH AND GAME CODE 1602 STREAMBED ALTERATION AGREEMENT

DFG regulates actions that substantially divert or obstruct the natural flow or that change the bed, channel, or bank of any river, stream, or lake, or use material from a streambed (California Fish and Game Code Sections 1600–1607). Los Rios Farms holds a Section 1602 Streambed Alteration Agreement for conducting routine maintenance of the Lisbon Weir on the East Toe Drain.

PUTAH CREEK WATER ACCORD

The seasonal instream flow and release pattern of Putah Creek from Monticello Dam to the East Toe Drain is regulated through the May 2000 Putah Creek Settlement Agreement (aka Water Accord) (Sacramento County Superior Court 2000). The Accord is intended to balance the competing uses for water between supply, demand, and maintenance of aquatic and riparian resource functions. The purpose of the Accord is to create as natural a flow regime as feasible and to maintain a living stream for the benefit of fish, wildlife, and plants from the Putah Diversion Dam to the connection at the East Toe Drain in the Yolo Bypass. The Accord focuses on the protection and enhancement of native resident and anadromous fish populations. It includes six primary elements, including four functional flow requirements. The four flow requirements pertain to rearing flows, spawning flows for native resident fishes, supplemental flows for anadromous fishes, and drought-year flows. The six Accord elements are as follows:

- Flows for resident native fish, which include important spawning and rearing components and guarantee a continuous flow to I-80;
- Flows that will attract and support salmon and steelhead;
- A drought schedule that provides enough water to maintain Putah Creek as a living stream but provides water users relief from other flow requirements;
- Creation of the Lower Putah Creek Coordinating Committee (LPCCC);
- Habitat restoration and monitoring funds for the creek;
- Creation of a Streamkeeper position for Putah Creek; and
- A requirement that Solano County Water Agency (SCWA) notify riparian water users of the amount of riparian water available in any given year and prevent illegal water diversions in excess of the amount of riparian water available.

SCWA is required to coordinate with the Yolo Bypass Wildlife Area regarding release of the fall anadromous fish attraction flows to allow DFG to remove the check boards at the Los Rios Check Dam within the Yolo Bypass Wildlife Area. Removing the check boards in coordination with the fall attraction flows helps to attract and enable salmon to migrate up into Putah Creek from the East Toe Drain. Additional information on the Accord is provided in Chapter 3, “Environmental Setting.”

3 ENVIRONMENTAL SETTING

This chapter summarizes the existing land uses, resource values, and local and regional plans that influence the management, operations, and visitor experiences at the Yolo Bypass Wildlife Area. The environmental setting chapter provides the baseline data for developing goals and tasks (Chapter 5) in this land management plan (LMP). It also constitutes the baseline conditions to compare with the proposed project (i.e., Chapter 5 goals and tasks) in accordance with State California Environmental Quality Act (CEQA) Guidelines Section 15125.

The chapter is divided into seven main sections. Section 3.1 discusses planning influences and considerations. Sections 3.2 through 3.7 address the six primary resource topics discussed in this LMP: Agricultural Land and Land Uses; Climate, Geology, Topography, and Soils; Geomorphology, Hydrology, and Water Resources; Biological Resources; Cultural Resources; and Recreation and Public Access.

One objective of this chapter is to briefly describe what is known about the historical setting and principal natural and human-caused changes in the Basin and Bypass that have occurred over time. A second objective is to describe the key physical, chemical, and biological conditions of the Yolo Bypass that define the Yolo Bypass Wildlife Area's existing characteristics as they relate to existing beneficial uses and potential restoration opportunities.

HISTORICAL CONTEXT

The historic setting of the Yolo Bypass Wildlife Area can be generally divided into two distinct conditions: 1) natural predisturbance conditions and 2) conditions and processes that have been affected by historic changes in the landscape.

Natural Predisturbance Conditions

The historic Yolo Basin was formed on the western floodplain of the Sacramento River. It was a vast floodplain influenced by seasonal high flows sustaining a diverse mosaic of natural communities. These communities provided habitat and stop-over areas to numerous species of fish and wildlife. Arguably, the most important ecological features were the wetlands and riparian ecosystems, which covered huge areas, supported high seasonal concentrations of wildlife and fish, and contained many endemic species. Before European colonization, the Yolo Basin intermittently received water, sediment, nutrients, other dissolved and suspended constituents, wood, organisms, and other debris from the Sacramento River and its many tributaries which then passed through to the Sacramento-San Joaquin Delta, the Suisun, San Pablo, and San Francisco Bays and ultimately to the Pacific Ocean. Hundreds of species of plants, wildlife, and fish evolved to take advantage of the hydrologic and geomorphic characteristics of this system and the Delta (CALFED Bay-Delta Authority 2000a).

The Mediterranean climate of the region ensures that the aquatic and riparian systems are highly dynamic, driven by strong annual patterns of wet winters and dry summers and longer multi-year periods of extreme wet and drought conditions. The high peaks of the Sierra Nevada intercept much of the moisture coming off the ocean and stores it as snow and ice that melts gradually, generating cold rivers that flow throughout the dry summers. During periods of high snowfall and rainfall prior to large scale changes, much of the Central Valley, including the Yolo Basin, became inundated, forming an extensive shallow lake that took months to drain through the narrows of the Bay-Delta system. In periods of drought, the Basin would be reduced to shallow pools and other seasonal wetland features (CALFED Bay-Delta Authority 2000a). The decreased outflow of the Sacramento San Joaquin Delta resulted in increased salinity due to the magnified influence of the San Francisco Bay system tides. Saline conditions were reported well into the Yolo Basin prior to the construction of Shasta Dam.

The productive floodplain marshlands and seasonal intervening waterways were extremely attractive to waterbirds. The abundant and diverse resident populations of ducks, geese, shorebirds, herons, and other birds were augmented by millions of ducks, geese, shorebirds, and cranes migrating south in fall and winter from

summer breeding grounds in the north. The migratory birds would take advantage of the expanded wetlands that were the result of the winter rains and floods. Arguably, the Pacific Flyway, one of the major migratory routes for birds in North America, owes its existence to the Great Central Valley and its wetlands. No matter how severe the drought, there would be wetlands somewhere in the valley (CALFED Bay-Delta Authority 2000a).

Anadromous fish also found the region to be very favorable habitat when innundated. Chinook salmon (*Oncorhynchus tshawytscha*) migrated through or reared in the system, along with steelhead (*O. mykiss*), sturgeon (*Acipensier* spp.), and lamprey (*Lampetra* spp.) (CALFED Bay-Delta Authority 2000a).

The once abundant and migratory (i.e., semi-anadromous) delta smelt (*Hypomesus transpacificus*) could move up and down with the seasons, seeking favorable seasonal conditions for spawning and rearing of young. The short, 1- to 2-year life cycles of these fish suggests that appropriate spawning and rearing habitat conditions were consistently available at one or another location within the Delta system in most years, regardless of the prevailing climatic patterns. In contrast, the resident fishes were largely stream or floodplain spawners that did not necessarily find appropriate conditions for spawning and rearing of young every season. As a consequence, they adopted a life history strategy of living 5 or more years, enabling these species to spawn and exploit floodplains on those inconsistent occasions when the rivers flooded. Middens near Native American village sites throughout the Central Valley and Delta indicate that many of these fishes (e.g., thicktail chub [*Gila crassicauda*], Sacramento perch [*Archoplites interruptus*], Sacramento splittail [*Pogonichthys macrolepidotus*], hitch [*Lavinia exilicauda*], and Sacramento blackfish [*Orthodon microlepidotus*]) were extremely abundant and easy to harvest (CALFED Bay-Delta Authority 2000a).

How Historic Changes to the Landscape and Processes Have Affected Habitat and Species

The Yolo Basin ecosystem has been profoundly altered over time by human activity. The most considerable alteration of the ecosystem and loss of wetlands began with hydraulic gold mining operations in the mid-1800s that led to downstream deposition of sediments in the Delta and Bay, including the mineral byproducts of the mining operations. Shortly thereafter, levee building in the Central Valley began disconnecting the main rivers from their floodplains. In the 20th century, the construction of dams and reservoirs on the Sacramento, Feather, and American rivers dramatically changed the hydrology of the Yolo Bypass. Additionally, construction of Monticello Dam on Putah Creek in 1955 significantly altered the flooding patterns of this sometimes very powerful stream. Vast amounts of water was stored in these newly constructed reservoirs, and gradually released throughout the year. The operation of these reservoirs became the primary factor controlling flooding in the Yolo Bypass as the area was transformed into the primary flood control feature of the Sacramento Valley, the Yolo Bypass. Today, the Yolo Bypass provides flood protection for hundreds of thousands of acres of highly productive agricultural lands and for millions of people in surrounding urbanized and rural areas.

In more recent times, the lands within the Bypass have been used for farming and grazing with limited wetland management taking place on private waterfowl hunting club lands. The creation of the Yolo Bypass Wildlife Area has resulted in restoration and management of wetland, riparian, and grassland communities that provide habitat for a diverse assortment of plant, wildlife, and fish species and the creation of educational and interpretive programs, and partnerships to serve the public. The notable traditions of agriculture have also been maintained throughout the Yolo Bypass Wildlife Area, employing innovative wildlife friendly management strategies to achieve multiple resource objectives.

3.1 PLANNING INFLUENCES AND CONSIDERATIONS

Planning for the Yolo Bypass Wildlife Area encompasses issues that cross regional, local, and project area boundaries. This section identifies the federal, state, county, and local agency policies and other planning influences that affect the function and management planning of the Yolo Bypass Wildlife Area.

The Yolo Bypass Wildlife Area is unique in that a community-based organization, the Yolo Basin Foundation, recognized from the beginning that there is a complex web of policies and other influences that needed to be reconciled. The success of the Wildlife Area is based on this premise and management activities will continue in this mode into the future.

3.1.1 SACRAMENTO RIVER FLOOD CONTROL PROJECT

Flooding in the Yolo Bypass

Management of the Yolo Bypass Wildlife Area must be considered in the context of the Sacramento River Flood Control Project (SRFCP). The U.S. Army Corps of Engineers (USACE), in conjunction with the State of California, developed a flood control plan for the Sacramento River as part of the SRFCP, which included levee construction, channel improvements, and reservoir flood storage.

The Sacramento River levees were constructed by the USACE as part of the SRFCP. Construction and repair of the existing levees along the Sacramento River has been undertaken by the USACE over the years as part of its ongoing efforts to improve the regional protections provided by the SRFCP. “Project” levees in California must meet the standards for design and construction specified by the USACE in Engineering Manual 1110-2-1913 (U.S. Army Corps of Engineers 2000).

The Reclamation Board enforces appropriate standards for the construction, maintenance, and protection of flood control facilities in the Central Valley. The Reclamation Board must review and approve any activity that may affect “project works,” or physically change the “designated floodway” to ensure that the activity maintains the integrity and safety of flood control project levees and floodways and is consistent with the flood control plans adopted by The Reclamation Board and the California legislature. “Project works” are the components of a flood control project within The Reclamation Board’s jurisdiction that the Board or the legislature has approved or adopted. Project works include levees, bank protection projects, weirs, pumping plants, floodways, and any other related flood control works or rights-of-way that have been constructed using state or federal funds. Project works also include flood control plans. Rules promulgated in Title 23 of the California Code of Regulations (CCR Title 23, Division 1, Article 8 [Sections 111 through 137]) regulate the modification and construction of levees and floodways to ensure public safety. The flood season for the Sacramento River is November 1 through April 15.

Levee and floodway operation and maintenance are overseen by the California Department of Water Resources (DWR), which inspects the levees and issues a biannual report. The report covers the general condition of the levee, vegetation control, rodent control, and flood preparedness. The DWR, Division of Flood Management, Flood Operations Branch is responsible for the gathering, analysis, and dissemination of flood and water-related information and coordinates flood operations of Fremont and Sacramento Weir spills into the Yolo Bypass (see below).

STATE-FEDERAL FLOOD OPERATIONS CENTER

The mission of the Division of Flood Management is to prevent loss of life and reduce property damage caused by floods and to assist in recovery efforts following any natural disaster. The State-Federal Flood Operations Center (FOC), located in Sacramento, is a component of the Division's Flood Operations Branch. Year-round the FOC is the focal point for the gathering, analysis, and dissemination of flood and water-related information. During flood conditions the FOC provides a facility from which DWR can centrally coordinate operations and emergency response (California Department of Water Resources 2005).

As major storm systems approach California forecasters from the National Weather Service (NWS) and DWR forecast the location, amount, and timing of expected precipitation and make initial river forecasts. Once the storm arrives and runoff begins forecasts are updated and issued as necessary. Reservoir operators adjust flood control releases as inflows increase or downstream channels swell with runoff. Additionally, FOC personnel make high water notification calls to appropriate local flood system maintenance and emergency response agencies. Maintaining agencies are required to patrol their levees on a 24-hour basis as long as the water level is at or above monitor stage and until no threat remains to the levees.

Fremont Weir

FREMONT WEIR

Fremont Weir was completed in 1924. It is the first overflow structure on the river's west side (right bank), and its two-mile overall length marks the beginning of the Yolo Bypass. It is located about 15 miles northwest of Sacramento and eight miles northeast of Woodland. South of this latitude the Yolo Bypass conveys 80 percent of the system's floodwaters through Yolo and Solano counties until it rejoins the Sacramento River a few miles upstream of Rio Vista. The weir's primary purpose is to release overflow waters of the Sacramento River, Sutter Bypass, and the Feather River into the Yolo Bypass. The project design capacity of the weir is 343,000 cfs (California Department of Water Resources 2003).

Sacramento Weir

SACRAMENTO WEIR AND BYPASS

The Sacramento Weir was completed in 1916. It is the only SRFCP weir "opened" or "closed" – all others overflow by gravity on their own. It is located along the west levee (right bank) of the Sacramento River approximately 4 miles upstream of the Tower Bridge, and about 2 miles upstream from the mouth of the American River. Its primary purpose is to protect the City of Sacramento from excessive flood stages in the Sacramento River channel downstream of the American River. The weir limits flood stages (water surface elevations) in the Sacramento River to SRFCP design levels through the Sacramento/West Sacramento area. The project design capacity of the weir is 112,000 cfs (California Department of Water Resources 2003).

The Sacramento Weir is 1,920 feet long and consists of 48 gates that divert Sacramento River and American River floodwaters to the west down the mile-long Sacramento Bypass to the Yolo Bypass. Each gate has 38 vertical wooden plank "needles" (4 inches thick by 1-foot wide by 6 feet long), hinged at the bottom and retained at the top by a hollow metal beam. The beam is manually released using a latch. Flood forecasters

provide the necessary predictive information to weir operators who manage the number of opened gates in order to control the river's water surface elevation (California Department of Water Resources 2003).

DWR operates the weir according to regulations established by the USACE. The opening and closing criteria have been optimized to balance two goals: (1) minimize sediment deposition due to decreased flow velocities in the river channel downstream from the weir to the mouth of American River; and (2) to limit the flooding of agricultural lands in the Yolo Bypass only until after they have been inundated by floodwaters over Fremont Weir (California Department of Water Resources 2003).

The weir gates are not opened until the river reaches 27.5 feet at the I Street gage with a forecast to continue rising. This gage is about 1,000 feet upstream from the I Street Bridge, and about 3,500 feet downstream from the mouth of the American River. The number of gates to be opened is determined by the NWS/DWR river forecasting team (until all are opened) to meet either of two criteria: (1) to prevent the stage at the I Street gage from exceeding 29 feet, or (2) to hold the stage at the downstream end of the weir to 27.5 feet. Once all 48 gates are open, Sacramento River stages from Verona to Freeport may continue to rise during a major flood event. Project design stages are 41.3 feet at Verona, 31.5 feet at the south end of the Sacramento Weir, and 31 feet at the I Street gage (California Department of Water Resources 2003). Prior to water spill or release into the Bypass, the State-Federal Flood Operations Center (FOC) makes notification calls to entities with operations in the Bypass including the Yolo Bypass Wildlife Area (see below).

As discussed in Section 2.4.1, "Legal Constraints and Existing Agreements," the DFG, DWR, The State Reclamation Board, and USACE have a management agreement (in lieu of an encroachment permit) that allows for project modifications (e.g., wetland or other restoration projects) as long as they are compatible with flood control. Under this agreement, DFG assumes responsibility for all claims of damage or liability. DFG is responsible for the maintenance of lands within the boundaries of the project modification. This maintenance must be consistent with the purposes of public safety and is detailed in the USACE Operating Manual. Under the agreement, "DFG will endeavor to manage the Project Modification in a manner that will be compatible with flood control" (U.S. Army Corps of Engineers 2003).

3.1.2 CALFED BAY-DELTA PROGRAM

In 1995, the State of California and the federal government initiated a collaborative effort among state and federal resource management agencies and representatives from urban, agricultural, and environmental interests to attempt to resolve numerous water-related issues associated with the Sacramento River-Sac Joaquin River Delta and San Francisco Bay. The program was titled the CALFED Bay-Delta Program (CALFED). The mission of CALFED is to create a long-range, implementable solution for the Bay-Delta that focuses on four major problem areas: drinking water supply, water quality, levee system integrity, and environmental restoration. As part of CALFED, each of these issues has an established program and staff (CALFED Bay-Delta Program 2000a and 2000b).

In 1996, regional interested parties and CALFED staff developed overall objectives for CALFED that include achievement of ecosystem quality, water quality and supply reliability, and levee system integrity in the Bay-Delta and its watersheds. As part of this process, the Ecosystem Restoration Program (ERP) was created to identify a long-range set of specific ecosystem-related objectives and methods for implementation of those objectives. The result of that development process was the CALFED Ecosystem Restoration Program Plan (ERPP). The ERPP is a far-reaching document that outlines and describes a multitude of ecological improvement targets and actions intended to be implemented over the next several decades. It also delineates the area (known as the CALFED Study Area) where most of the prescribed CALFED ecologically based actions would occur. The Yolo Bypass Wildlife Area is included in the CALFED Study Area in what is known as the Yolo Basin Ecological Management Zone.

As discussed in Chapter 1, "Introduction," this LMP is based on an ecosystem approach to habitat management consistent with the principles of the CALFED ERP. Yolo Bypass Wildlife Area-related targets and programmatic actions from the CALFED ERPP are presented verbatim in Appendix B. Additionally, the ERP's goals and objectives (CALFED Bay-Delta Program 2000a and 2000b) are to:

- achieve recovery of at-risk native species dependent on the Delta and Suisun Bay to establish large, self-sustaining populations of these species, support similar recovery of at-risk native species in the Bay-Delta estuary and the watershed above the estuary, and minimize the need for future endangered species listings by reversing downward population trends of native species that are not listed;

- rehabilitate natural processes in the Bay-Delta estuary and its watershed to fully support, with minimal ongoing human intervention, natural aquatic and associated terrestrial biotic communities and habitats in ways that favor native members of those communities;

- maintain or enhance populations of selected species for sustainable commercial and recreational harvest, consistent with the other ERP goals;

- protect or restore functional habitat types in the Bay-Delta estuary and its watershed in support of ecological and public values (such as species, biotic community, and ecological processes), health, recreation, aesthetic quality, and scientific research;

- prevent the establishment of additional nonnative invasive species and reduce the negative ecological and economic impacts of established nonnative species in the Bay-Delta estuary and its watershed; and

- improve or maintain water and sediment quality conditions that fully support healthy and diverse aquatic ecosystems in the Bay-Delta estuary and watershed and eliminate (to the extent possible) toxic impacts on aquatic organisms, wildlife, and people.

CONSISTENCY OF THE LAND MANAGEMENT PLAN WITH THE CALFED FINAL PROGRAMMATIC EIS/EIR RECORD OF DECISION

In launching "the most complex and extensive ecosystem restoration project ever proposed" (CALFED Bay-Delta Authority 2000a and 2000b), the CALFED Final Programmatic Environmental Impact Statement and Environmental Impact Report (CALFED Final PEIS/EIR) recognized that the Preferred Program Alternative could have potentially significant effects on biological resources and agricultural land and water use. This LMP has been developed to meet CALFED Program objectives (see Chapter 1 and Appendix B) and to be consistent with applicable mitigation strategies adopted as part of the Record of Decision (ROD) for the approval of the CALFED Program.

The CALFED Final PEIS/EIR also identified potential effects to special-status wildlife species and/or important wildlife use areas and developed mitigation strategies to avoid these impacts. A review of Section 6.2 of the CALFED Final PEIS/EIR, "Vegetation and Wildlife," resulted in identification of one mitigation strategy that has been incorporated into the LMP:

- Mitigation Strategy 9: Avoid construction or maintenance activities within or near habitat areas occupied by special-status wildlife species or in important wildlife use areas when species may be sensitive to disturbance.

- All construction and maintenance activities at the Yolo Bypass Wildlife Area are designed and timed to avoid potential disturbances to habitat areas occupied by special-status wildlife species or in important wildlife use areas when species may be sensitive to disturbance. Because construction or maintenance activities identified in the LMP (i.e., tasks) will be directed to avoid these potential impacts, the proposed LMP is consistent with Mitigation Strategy 9.

The CALFED Final PEIS/EIR specifically identified potential effects of converting Prime, Statewide Important, and Unique Farmland to project uses. It also identified potential conflicts with local government plans and policies and potential incompatibilities with adjacent land uses. As a result, the CALFED Program developed mitigation strategies to reduce potential impacts to agricultural land and water use. A review of Section 7.1, "Agricultural Land and Water Use," resulted in identification of five mitigation strategies (described below) that have been incorporated into the LMP:

- Mitigation Strategy 4: Involve all affected parties, especially landowners and local communities, in developing appropriate configurations to achieve optimal balance between resource effects and benefits.

  The Yolo Bypass Working Group, initiated and facilitated by the Yolo Basin Foundation (Foundation), provides a focused forum and opportunity for farmers, landowners, and agencies with a role in the Yolo Bypass to discuss Bypass related issues, as well as provide guidance and opinions on such issues. DFG is a regular and important participant in the Working Group and the meetings have been a primary forum to gather stakeholder input towards the development of this LMP (see Chapter 1 for additional information on the Yolo Bypass Working Group). Therefore, this proposed LMP is consistent with Mitigation Strategy 4.

- Mitigation Strategy 10: Focus habitat restoration efforts on developing new habitat on public lands before converting agricultural lands.

  This proposed habitat restoration project would develop new habitat on public lands in DFG ownership; therefore, it is consistent with Mitigation Strategy 10.

- Mitigation Strategy 11: If public lands are not available for restoration efforts, focus restoration efforts on acquiring lands that can meet ecosystem restoration goals from willing sellers where at least part of the reason to sell is economic hardship (i.e., lands that flood frequently or where levees are difficult to maintain).

  The public lands which make up the Yolo Bypass Wildlife Area were acquired from willing sellers where at least part of the reason for selling was economic. Therefore, the proposed LMP is consistent with Mitigation Strategy 11.

- Mitigation Strategy 18: Minimize the amount of water supply required to sustain habitat restoration acreage.

  Lands in the Wildlife Area (including potential future restoration projects) are managed to minimize water use through maximum use efficiency. Therefore, the proposed LMP is consistent with Mitigation Strategy 18.

- Mitigation Strategy 19: Develop buffers and other tangible support for remaining agricultural lands. Vegetation planted on these buffers should be compatible with farming and habitat objectives.

  The Yolo Bypass Wildlife Area is managed with extreme consideration to be respectful of neighboring public and private properties that together support a wide range of wildlife species and provide for economic vitality through agricultural production. Integration of agriculture with habitat management is a primary objective for management at the Yolo Bypass Wildlife Area. The LMP identifies goals and tasks including continued effective communication with neighbors (though the Yolo Bypass Working Group and other means), working with farmer lease tenants (directly and through Dixon RCD), and to conform to standards such as, vector control and maintenance of flood flow conveyance that are outlined in the LMP. Additionally, the Yolo Bypass Wildlife Area is extremely supportive of surrounding agricultural land uses and operations. Therefore, the LMP is consistent with Mitigation Strategy 19.

3.1.3 SACRAMENTO AND SAN JOAQUIN RIVER BASINS CALIFORNIA COMPREHENSIVE STUDY

The Sacramento and San Joaquin River Basins California Comprehensive Study (Comprehensive Study) was a joint effort by The Reclamation Board and the USACE, in coordination with federal, state, and local agencies, groups, and organizations in California's Central Valley. Responding to the flooding of 1997, the California Legislature and the U.S. Congress directed USACE to develop a comprehensive plan for flood damage reduction and environmental restoration purposes for the Sacramento and San Joaquin River Basins. The effort was conducted in cooperation with The Reclamation Board. The Comprehensive Study is not a regulatory program per se, but consistency with its goals and objectives is important for any project affecting flood control in the Sacramento and San Joaquin River basins.

In December 2002, an interim report was released by the Comprehensive Study team (U.S. Army Corps of Engineers and State of California Reclamation Board 2002). The report identified the comprehensive plan as an approach to developing projects in the future to reduce damages from flooding and restore the ecosystem in the Sacramento-San Joaquin River basins. As described in the report, the comprehensive plan has three parts: (1) a set of principles to guide future projects, (2) an approach to develop projects with consideration for systemwide effects, and (3) an organization to consistently apply the guiding principles in maintaining the flood management system and developing future projects.

The Comprehensive Study has proposed a set of guiding principles to govern implementation of projects that propose modifying the Sacramento or San Joaquin River flood control systems. These principles have been developed to ensure that projects proposed to be implemented are consistent with the objectives established by USACE and The Reclamation Board. The following are the Comprehensive Study's guiding principles:

- recognize that public safety is the primary purpose of the flood management system;
- promote effective floodplain management;
- promote agriculture and open space protection;
- avoid hydraulic and hydrologic impacts;
- plan system conveyance capacity that is compatible with all intended uses;
- provide for sediment continuity;
- use an ecosystem approach to restore and sustain the health, productivity, and diversity of the floodplain corridors;
- optimize use of existing facilities;
- integrate with the CALFED Bay-Delta Program and other programs; and
- promote multi-purpose projects to improve flood management and ecosystem restoration.

The Yolo Bypass lies in the Lower Sacramento River Region of the Comprehensive Study.

3.1.4 CENTRAL VALLEY REGIONAL WATER QUALITY CONTROL BOARD

Pursuant to section 303(d) of the Clean Water Act, the Central Valley Regional Water Quality Control Board (RWQCB) is developing a Total Maximum Daily Load (TMDL) for methyl and total mercury in the Sacramento-San Joaquin Delta (Central Valley Regional Water Quality Control Board 2005).

The Delta methylmercury TMDL development and implementation is a two-part process: TMDL development and Basin Plan amendment.

TMDL development is currently underway and involves the technical analysis of methyl and total mercury sources, fate and transport of each, development of a proposed mercury fish tissue water quality objective and an aqueous methylmercury goal, and a description of the amount of reduction necessary to attain the proposed objective. A report produced for the TMDL development step was completed in August of 2005. This report contains preliminary implementation options for the control of mercury but does not formally propose regulations. Implementation options for the control of mercury include the following objectives:

- Reduce total mercury loads entering the Delta by at least 110 kilograms/year (kg/yr).
- Require responsible parties for point and non point sources of methylmercury to characterize their discharge by measuring methylmercury concentrations and loads. If their discharge concentrations are determined to be greater than the recommended aqueous goal, then responsible parties could be required to develop control measures to reduce their loads. (Wetlands are identified as a source of methylmercury.)
- Reduce methylmercury exposure to the fish eating public.

The Basin Plan Amendment focuses on the development of a Basin Plan amendment and a staff report for RWQCB consideration. The Basin Plan amendment staff report will propose a site-specific water quality objective for the Delta and an implementation plan to achieve the objective, all based on the foundation provided by the TMDL analysis. The Basin Plan amendment staff report will propose regulations to reduce mercury and methylmercury discharges. Potential amendments to the Basin Plan regarding methylmercuy and wetlands could affect management of the Yolo Bypass Wildlife Area. Additional discussion on the methylmercury TMDL for the Delta is provided in Chapter 3, “Environmental Setting.”

3.1.5 SACRAMENTO AREA FLOOD CONTROL AGENCY

The Sacramento Area Flood Control Agency (SAFCA), a “joint powers agency” of City of Sacramento, County of Sacramento, County of Sutter, American River Flood District, and Reclamation District 1000, has been coordinating regional flood control since its creation in 1989.

In March 2002, SAFCA entered into a Memorandum of Understanding (MOU) with the State Reclamation Board, DWR, the cities of Sacramento and West Sacramento and the counties of Sacramento, Yolo and Sutter to form the Sacramento River Corridor Planning Forum (Forum). Membership on the Forum is open to the public.
The Forum’s mission is to develop a Sacramento River Corridor Floodway Management Plan containing recommendations on flood management goals and policies, with guidelines for riparian habitat protection, public access and recreation, and riverfront development. The plan would also include recommendations for assessing and mitigating impacts of proposed projects. The Forum is looking at the Yolo Bypass with respect to proposals and studies to enhance the flood control system through its study area reach, which comprises the Sacramento River corridor from Fremont Weir south to the town of Courtland.

3.1.6 YOLO COUNTY GENERAL PLAN

The Yolo County General Plan designates the Yolo Bypass Wildlife Area lands as A-P (Agricultural Preserve). Zoning for Agricultural Preserve states that "the purpose of the Agricultural Preserve Zone shall be to preserve land best suited for agricultural use from the encroachment of nonagricultural uses. The A-P zone is intended to be used to establish agriculture preserves in accordance with the California Land Conservation Act of 1965, as amended. Uses approved on contracted land shall be consistent and compatible with the provisions of the Act" (Yolo County 1983).

Principal uses (allowable with only site plan review and approval of facilities, infrastructure, health and safety issues) include:

- Agriculture (not dairies, stockyards, slaughterhouses, hog farms, fertilizer works, or plants for the reduction of animal matter);
- One single-family dwelling;
- Parks, publicly owned, and
- Rural recreation (defined as the shooting of skeet, trap, and sporting clays; archery; gun, hunting, or fishing clubs; dude ranches; health resorts, incidental and dependent upon primary agricultural use, and/or directly dependent upon a unique natural resources feature; the use of public or private lands or structures for commercial staging of rafting, hiking, backpacking, bicycling, and/or touring excursion).

The Yolo County General Plan also includes several other goals and policies related to management and planning at the Yolo Bypass Wildlife Area including the following:

GENERAL PLAN GOALS AND POLICIES

- REC 1. Recreation Basic - Yolo County acquires, maintains and provides a variety of park, open and natural areas for recreational and leisure pursuits at the regional, community and neighborhood level through means of California statute, established land use controls, regulations, real property transfer, and the advice, guidance and cooperation of other jurisdictions and through coordination with other elements of this General Plan, as amended.

  It shall be the basic recreation policy of the County to:

  1. Protect and preserve as many of the County's recreational and scenic resources as possible;
  2. Maintain diversified regional-type recreation facilities and programs;
  3. Assist in preserving the open space resources of the County;
  4. Cooperate with special districts, cities, adjacent counties, and state and federal agencies in the acquisition, development and administration of recreation facilities, resources and programs for joint use and mutual advantage;
  5. Cooperate with and encourage private individuals and organizations in the preservation, acquisition and administration of recreation resources;
  6. Assist local rural communities in obtaining a basic level of recreation service;

7. Encourage and assist in the development of bicycle and hiking trails in and to County parks and recreation areas;

8. Encourage greater understanding of the park system and the resources it protects by development of an interpretive program.

    - Pedestrians – Yolo County shall promote and ensure the provision of facilities and routes, where appropriate, for safe and convenient use by pedestrians including sidewalks, pedestrian access to all public facilities and transit stops, and to public areas in the community including waterfront projects and recreation hiking trails.

    - Bicycle Routes and Facilities – Encouragement and establishment of bike routes along trails, on levees, along railroad levees, along drainage canals, and along transmission right-of-ways where feasible.

    - Bikeways and Pedestrian Ways – Yolo County shall plan and promulgate adequate, safe bikeways and pedestrian ways, integrated with other transit modes and coordinated with all forms of development.

    - Physically Impaired (formerly Handicapped) – Require designs of buildings, sidewalks, and all other public facilities and transit/transportation modes to facilitate use by the physically impaired, including those in wheelchairs.

3.1.7 COLUSA BASIN DRAIN

The Colusa Basin watershed comprises nearly 1,620 square miles of mostly agricultural land in the north Sacramento Valley, and encompasses approximately 255 square miles in Yolo County. The Colusa Basin Drain is a man-made channel designed to convey irrigation return drainage to the Knights Landing outfall that discharges to the Sacramento River. Thirty-two ephemeral streams, seven of which lie in the Dunnigan Hills of Yolo County, supply the channel. The capacity of the Colusa Basin Drain is approximately 12,450 cfs and primarily conveys water from the Tehama-Colusa Canal (Yolo County Water Resources Association 2004).

The Tehama-Colusa Canal is 110.9 miles long and flows south from the Red Bluff Diversion Dam through Tehama, Glenn, and Colusa counties into Yolo County, terminating about 2 miles south of Dunnigan. The initial capacity of the canal is 2,530 cubic feet per second, diminishing to 1,700 cubic feet per second at the terminus in Yolo County (U.S. Bureau of Reclamation 2006). The water is used for irrigation by Central Valley Project (CVP) contractors, including the Dunnigan Water District. The Knights Landing Ridge Cut Canal was constructed to improve flow conditions during high flow events. All waters from the Colusa Basin Drain are directed through the Ridge Cut Canal into the Yolo Bypass during high flows in the Sacramento River.
The Colusa Basin Drain is listed as a water quality impaired water body due to a number of agricultural pesticide-related pollutants (Central Valley RWQCB 2002; Smalling et al. 2005). A recent proposal has been developed by groups representing Sacramento River water users to divert additional water from the Colusa Basin Drain into the Yolo Bypass on a more continuous year-round basis. This proposal is currently being evaluated for potential effects related to water quality and hydrology in the Yolo Bypass. Additional discussion on the Colusa Basin Drain and potential water quality implications is provided in Section 3.4, “Geomorphology, Hydrology, and Water Quality.”

3.1.8 DELTA PROTECTION COMMISSION

The Delta Protection Commission (DPC) was created by the State Legislature in 1992 with the goal of developing regional policies for the Delta to protect and enhance the existing land uses in the Primary Zone: agriculture, wildlife habitat, and recreation. Working closely with local communities and local governments, the DPC adopted

its Land Use and Resource Management Plan for the Primary Zone of the Delta (regional plan) in 1995. Local government incorporation of the policies in the DPC regional plan was completed in 1998. In 2000, the DPC became a permanent state agency. The policies in the regional plan were adopted as regulations in 2000 and approved by Office of Administrative Law on May 8, 2001. A large portion of the Yolo Bypass Wildlife Area is within the Primary Zone of the Delta.

LAND USE AND RESOURCE MANAGEMENT PLAN FOR THE PRIMARY ZONE OF THE DELTA

The DPC's Land Use and Resource Management Plan for the Primary Zone of the Delta (Delta Protection Commission 1995) include the following policies and recommendations applicable to the Yolo Bypass Wildlife Area LMP:

- **Environment Policy P-1:** The priority land use of areas of prime soil shall be agriculture. If commercial agriculture is no longer feasible due to subsidence or lack of adequate water supply or water quality, land uses which protect other beneficial uses of Delta resources and which would not adversely affect agriculture on surrounding lands, or viability or cost of levee maintenance, may be permitted. If temporarily taken out of agricultural production due to lack of adequate water supply or water quality, the land shall remain reinstateable to agricultural production for the future.

- **Environment Policy P-3:** Land managed primarily for wildlife habitat shall be managed to provide several interrelated habitats. Delta-wide habitat needs should be addressed in development of any wildlife habitat plan. Appropriate programs, such as "Coordinated Resource Management and Planning" and "Natural Community Conservation Planning" should ensure full participation by local government and property owner representatives.

- **Environment Recommendation R-1:** Seasonal flooding should be carried out in a manner so as to minimize mosquito production. Delta-wide guidelines outlining "best management practices" should be prepared and distributed to land managers.

- **Environment Recommendation R-4:** Feasible steps to protect and enhance aquatic habitat should be implemented as may be determined by resource agencies consistent with balancing other beneficial uses of Delta resources.

- **Environment Recommendation R-5:** Publicly-owned land should incorporate, to the maximum extent feasible, suitable and appropriate wildlife protection, restoration and enhancement as part of a Delta-wide plan for habitat management.

- **Environment Recommendation R-6:** Management of suitable agricultural lands to maximize habitat values for migratory birds and other wildlife should be encouraged. Appropriate incentives, such as conservation easements, should be provided by nonprofits or other entities to protect this seasonal habitat through donation or through purchase.

- **Environment Recommendation R-7:** Lands currently managed for wildlife habitat, such as private duck clubs or publicly owned wildlife areas, should be preserved and protected, particularly from destruction from inundation.

- **Land Use Policy P-2:** Local government General Plans and zoning codes shall continue to strongly promote agriculture as the primary land use in the Primary Zone; recreation land uses shall be supported in appropriate locations and where the recreation uses do not conflict with agricultural land uses or other beneficial uses, such as waterside habitat.

- **Land Use Policy P-8:** Local government policies regarding mitigation of adverse environmental impacts under CEQA may allow mitigation beyond County boundaries, if acceptable to reviewing fish and wildlife

agencies, for example in approved mitigation banks. Mitigation in the Primary Zone for loss of agricultural lands in the Secondary Zone may be appropriate if the mitigation program supports continued farming in the Primary Zone.

- **Land Use Recommendation R-1:** A program by non-profit groups or other appropriate entities should be developed to promote acquisition of wildlife and agricultural conservation easements on private lands with the goal of protecting agriculture and wildlife habitat in the Delta.

- **Land Use Recommendation R-2:** Public agencies and non-profit groups have or propose to purchase thousands of acres of agricultural lands to restore to wildlife habitat. The amount, type, and location of land identified to be enhanced for wildlife habitat should be studied by wildlife experts to determine goals for future acquisition and restoration. Lands acquired for wildlife habitat should also be evaluated for recreation, access, research and other needed uses in the Delta. Habitat restoration projects should not adversely impact surrounding agricultural practices. Public-private partnerships in management of public lands should be encouraged. Public agencies shall provide funds to replace lost tax base when land is removed from private ownership.

- **Land Use Recommendation R-3:** Multiple use of agricultural lands for commercial agriculture, wildlife habitat, and, if appropriate, recreational use, should be supported, and funding to offset management costs pursued from all possible sources. Public agencies shall provide funds to replace lost tax base when land is removed from private ownership.

- **Agriculture Policy P-1:** Commercial agriculture in the Delta shall be supported and encouraged as a key element in the State's economy and in providing the food supply needed to sustain the increasing population of the State, the Nation, and the world.

- **Agriculture Policy P-2:** Local governments shall identify the unique qualities of the Delta that make it well suited for agriculture. These qualities include: rich soil, ample supplies of water, long growing seasons, mild climate, and proximity to packaging and shipping infrastructure. The unique physical characteristics of the Delta also require that agricultural landowners maintain extensive levee systems, provide flood control, and have adequate drainage to allow the lands to be farmed.

- **Agriculture Policy P-8:** Encourage management of agricultural land which maximize wildlife habitat seasonally and year-round, through techniques such as sequential flooding in fall and winter, leaving crop residue, creation of mosaic of small grains and flooded areas, controlling predators, controlling poaching, controlling public access, and others.

- **Agriculture Recommendation R-1:** Programs to educate California and the U.S. about the value and diversity of California agriculture should continue. Education should provide information about various crops and about the different agricultural regions, such as the Delta.

- **Recreation and Access Recommendation R-2:** Support a scientifically-valid study of the carrying capacity of the Delta waterways for recreation activities without degradation of habitat values which minimize impacts to agriculture or levees.

- **Recreation and Access Recommendation R-6:** State and federal projects in the Primary and Secondary Zones should include appropriate recreation and/or public access components to the extent consistent with project purposes and available funding. State and federal agencies should consider private or user group improvements on publicly owned lands to provide facilities.

- **Water Policy P-1:** Local governments shall ensure that salinity in Delta waters allows full agricultural use of Delta agricultural lands, provide habitat for aquatic life, and meet requirements for drinking water and industrial uses.

- **Water Policy P-2:** Local governments shall ensure that design, construction, and management of any flooding program to provide seasonal wildlife habitat on agricultural lands shall incorporate "best management practices" to minimize mosquito breeding opportunities and shall be coordinated with the local vector control districts.

- **Water Recommendation R-3:** Programs to enhance the natural values of the State's aquatic habitats and water quality will benefit the Delta and should be supported.

- **Water Recommendation R-4:** Programs to regulate agricultural drainage in the Delta should be accompanied with education programs, be implemented over time, and should, where needed, provide financial assistance such as grants and interest-free loans to ensure compliance. Any regulation of Delta agricultural discharges must recognize that a) dischargers must be permitted to discharge back to the channels any dissolved solid loads that were derived from the channels in irrigation diversions and seepage inflows, and b) any net addition of dissolved carbon compounds must be compared to the addition of such compounds that would occur with any other land use option that would provide equal protection of the land and channel configuration and would consume no more water.

- **Water Recommendation R-5:** Water for flooding to provide seasonal and year-round wildlife habitat should be provided as part of State and federal programs to provide water for wildlife habitat.

DELTA COLLABORATIVE

In response to the Central Valley Regional Water Quality Control Board's development of a Total Maximum Daily Load (TMDL) value for mercury in the Delta, the Delta Protection Commission has convened a collaborative group to provide coordinated input into the Board's Delta mercury TMDL process. To date, the Collaborative has expressed a desire for integration of the Commission's Land Use and Resource Management Plan for the Primary Zone of the Delta (Plan), several "Delta visioning" processes and programs being undertaken by other entities, multi-species HCP/NCCPs, and other prominent Delta activities, into the process. To date, the Collaborative includes representatives from: CALFED Bay-Delta Authority, DFG, DWR, U.S. Department of Agriculture, Contra Costa Water Agency, Yolo County Planning, Resources, and Public Works, Sacramento County Sanitation District, San Joaquin County Public Works, San Joaquin County RCD, Yolo NCCP Joint Powers Agency, Foundation, The Nature Conservancy, Ducks Unlimited, HART Restoration, DCC Engineering, KSN Engineering, Environmental Justice Water Coalition, and Delta landowners/stakeholders.

DELTA RECREATION PLAN

The Delta Recreation Plan is currently under development. A draft aquatic-based component of the plan has been completed and consists of inventory and policy-level goals for aquatic-based recreational resources within the Delta (Delta Protection Commission 2006). Completion of the plan is subject to current funding limitations.

3.1.9 NORTH AMERICAN WATERFOWL MANAGEMENT PLAN

The North American Waterfowl Management Plan (NAWMP) was signed on May 14, 1986, by the Secretary of Interior for the United States and the Minister of Environment for Canada. The NAWMP provides a broad framework for waterfowl conservation and management in North America through the year 2000. Population objectives for key species were identified in it and habitat goals to sustain these populations were established. Although the 1986 agreement was originally only between the United States and Canada, a subsequent memorandum of understanding for the conservation of migratory birds and wetlands was signed by the national conservation agencies' directors of Canada, Mexico, and the United States on March 16, 1988. This international memorandum of understanding will also contribute to achievement of the international goals defined in the overall NAWMP.

On December 13, 1989, President Bush signed the North American Wetlands Conservation Act (NAWCA), which obligates annual appropriations for the implementation of the NAWMP. Funding for NAWCA includes interest from obligations held by the U.S. Treasury as part of the Federal Aid in Wildlife Act (Pittman-Robertson) (16 U.S.C. 669b) of September 2, 1937; Migratory Bird Act-related fines, penalties, and forfeitures; and direct appropriations.

The NAWMP seeks to restore and maintain the diversity, abundance, and distribution of waterfowl that occurred during 1970–79. Population objectives for 20 species of ducks, 18 species or subspecies of geese divided into 27 management populations, and 2 species of swans are identified. The NAWMP further seeks to assure sufficient habitat to support 62 million breeding ducks, a fall flight of 100 million ducks, and 6 million wintering geese and swans. Updating of the NAWMP will occur at five-year intervals beginning in 1990.

In the NAWMP, broad recommendations are made for wetland and upland habitat protection, restoration, and enhancement, as well as duck harvest, overall waterfowl population management, subsistence hunting and research. The major focus, however, is on ducks and their habitat. Two of the NAWMP's seven habitat objectives relate to the general maintenance or rehabilitation of 34 major waterfowl habitats. Five of the seven priority objectives are specifically focused on seven habitat areas (six in the US; one in Canada) of the highest international priority. These seven areas are the focus of initial joint ventures that will receive priority planning and funding.

The Central Valley is one of the seven priority areas. Within the priority areas, mallards, northern pintails and American black ducks receive special attention where appropriate. The major strategy for implementing the NAWMP is to establish specific habitat joint ventures where agencies and private organizations collectively pool their resources to address waterfowl habitat problems. Each joint venture will develop implementation plans to address specific needs of each area.

CENTRAL VALLEY HABITAT JOINT VENTURE

The California Central Valley Habitat Joint Venture (recently renamed the Central Valley Joint Venture [CVJV]) was formally established by a working agreement signed in July, 1988. An Implementation Board comprised of representatives from the California Waterfowl Association, Defenders of Wildlife, Ducks Unlimited, National Audubon Society, Waterfowl Habitat Owners Alliance, and The Nature Conservancy guides the CVJV. Technical assistance and advice is provided to the Implementation Board by the DFG, U.S. Fish and Wildlife Service (USFWS), California Department of Food and Agriculture, and other organizations and agencies.

Upon completion of the CVJV objectives, the Central Valley will support 4.7 million wintering ducks, including 2.8 million pintails. The goal of the CVJV is to "protect, maintain, and restore habitat to increase waterfowl populations to desired levels in the Central Valley of California consistent with other objectives of the NAWMP." Six objectives were developed by the Implementation Board to achieve this goal (Central Valley Habitat Joint Venture 1990):

1. Protect 80,000 additional acres of existing wetlands through acquisition of fee-title or perpetual conservation easements.

2. Secure an incremental, firm 402,450 acre-foot water supply that is of suitable quality and is delivered in a timely manner for use by National Wildlife Refuges (NWR), State Wildlife Areas (WA), and the Grasslands Resource Conservation District (GRCD).

3. Secure Central Valley Project (CVP) power for NWRs, WAs, GRCD, and other public and private lands dedicated to wetland management.

4. Increase wetland areas by 120,000 acres and protect these wetlands in perpetuity by acquisition of fee-title or conservation easement.

5. Enhance wetland habitats on 291,555 acres of public and private lands.

6. Enhance waterfowl habitat on 443,000 acres of agricultural lands.

The CVJV recently updated the Implementation Plan (Central Valley Habitat Joint Venture, in prep.). The new plan include goals and accomplishments for the conservation of breeding and wintering waterfowl, breeding and wintering shorebirds, grassland and riparian birds, and other waterbirds. Specific habitat objectives for the Yolo Basin with primary opportunity areas in the vicinity of the current Yolo Bypass Wildlife Area include:

1. Increase wetland areas in the Yolo Basin by 11,558 acres and protect these wetlands in perpetuity by acquisition of fee-title or conservation easement.

2. Achieve seasonal wetland area objectives in the Yolo Basin of 713 acres/year (enhancement objectives will increase to 963 acres/year when wetland restoration objectives are met for the Basin).

3. Secure 57,790 acre-feet of water when wetland restoration objectives in the Basin have been met.

4. Achieve agricultural enhancement objective of 11,000 acres, of which 8,000 is assumed to be corn with the remaining 3,000 acres assumed to be flooded rice. (Agricultural enhancement objectives are currently exceeded for the basin.)

Creation and management of the Yolo Bypass Wildlife Area is a key component of the CVJV's habitat restoration goals and accomplishments for the Yolo Basin.

3.1.10 YOLO COUNTY HABITAT CONSERVATION PLAN/NATURAL COMMUNITY CONSERVATION PLAN

In the mid-1990s, Yolo County initiated development of a Habitat Conservation Plan (HCP). The purpose of this plan was to guide future development, agriculture, other land use, and natural resource conservation activities throughout the county in such a way that incidental take of special-status species resulting from development and land-use changes would be minimized and mitigated in accordance with the Section 10 of the federal Endangered Species Act. If approved by USFWS, this HCP would grant Yolo County the authority to implement all planned actions in the county without further USFWS consultation regarding special-status species.

A "final" HCP for Yolo County was published in 1996, but was subsequently tabled for further revision. A revised draft HCP was published in January of 2001, and was also tabled in favor of pursuing a joint Habitat Conservation Plan/Natural Communities Conservation Plan (HCP/NCCP), which, if approved, would be a combined agreement between the county, USFWS, and DFG, and would include coverage under both the federal and state Endangered Species Acts. This HCP/NCCP is currently under development. The Yolo County Joint Powers Agency received USFWS funding in October 2005 to complete Phase II of the plan, to develop conservation strategies and designate areas for preservation. The Joint Powers Agency currently expects to finish Phase II in the spring of 2007 and complete the HCP/NCCP by 2008 (Yolo County Habitat/Natural Communities Conservation Plan Joint Powers Agency 2005).

It is hoped that the lands protected by the Yolo County HCP/NCCP will compliment the conservation efforts underway at the Yolo Bypass Wildlife Area. One important way it can do this is by insuring the long-term presence of agriculture on lands between the Davis city limits and the Yolo Bypass south of Interstate 80 (I-80). Yolo Bypass Wildlife Area staff will continue to communicate with the Joint Powers Agency and staff as the HCP/NCCP is developed.

3.1.11 AGRICULTURAL/IRRIGATED LANDS CONDITIONAL WAIVER PROGRAM

The California Water Code (Section 13269) authorizes the State Water Resources Control Board (SWRCB) and RWQCBs to conditionally waive waste discharge requirements (WDR) if that is in the public interest. The RWQCBs have issued waivers for over 40 categories of discharges over the years. Senate Bill 390, signed into law on October 6, 1999, required the RWQCBs to review their existing wavers and to renew them or replace them with WDRs. To comply with SB 390, the RWQCBs adopted waivers to regulate most of the categorical discharges.

The Central Valley RWQCB has adopted conditional waivers for agricultural discharges. The agricultural waivers use different regulatory models, are conditional, and comply with SB 390. The RWQCBs are making extensive enrollment, education, and public outreach efforts in these regions.

On July 2003, the Central Valley RWQCB adopted a Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands (Conditional Waiver for Irrigated Lands) Resolution No. R5-2003-0105 (Discharges of water from managed wetlands in the Sacramento River watershed are also exempt from WDRs under the July 2003 Central Valley RWQCB conditional waiver covering "discharges from irrigated lands". Irrigated Lands includes managed wetlands by definition). In January 2004, the SWRCB amended Resolution No. R5-2003-0105 and provided important guidance to move forward. The regulations provide for a watershed approach focused on a regional monitoring program to measure compliance with the waivers' terms and conditions and rely on a locally driven outreach program to enhance and improve water quality. The conditional waivers were set to expire on December 31, 2005. In response to the pending expiration, the RWQCB provided a 6-month renewal of the waiver. The Central Valley RWQCB revisited the issue of adopting a revised conditional waiver at its June 2006 Board meeting. Minutes from the June meeting have not been posted so specifics regarding adoption of the revised conditional waiver are uncertain at this time. Refer to website: <http://www.waterboards.ca.gov/centralvalley> for additional information and future meeting minutes.

SACRAMENTO VALLEY WATER QUALITY COALITION

Water quality coalitions have been formed throughout the Central Valley in response to Conditional Waiver of WDR passed on July 11, 2003 by the RWQCB. Viewed by many as the most economical way to comply with the regulations, the coalitions' goals are to represent farmers with irrigated cropland within a regional watershed so they do not need to file individual reports with the RWQCB. Coalitions can also minimize filing fees and monitoring requirements by individual farmers and land managers.

The Sacramento River watershed is the northern most hydrologic basin included in the Central Valley Conditional Waiver for Irrigated Lands Program and is represented by the Sacramento Valley Water Quality Coalition (SVWQC). The SVWQC was formed in 2002 to enhance and improve water quality in the Sacramento River watershed, while sustaining the economic viability of agriculture, associated values of managed wetlands and sources of safe drinking water. The SVWQC is comprised of more than 200 agricultural and wetland interests that have joined with local governments throughout the region to improve water quality for northern California farms, cities and the environment. The DFG is a participant in the SVWQC.

The SVWQC is dedicated to working with the RWQCB in developing a comprehensive approach to managing water quality on irrigated lands at the watershed level. This regional effort provides the framework necessary to meet water quality goals, help local subwatersheds meet regulatory requirements, and ensure that watershed management practices are broadly implemented through sustainable economic management measures.

In June 2003, the SVWQC submitted a Regional Plan for Action to the SWRCB and the Central Valley RWQCB. The plan was resubmitted in October 2003 as the General Report for the SVWQC with a Notice of Intent (NOI) to meet the newly adopted water quality regulations and obtain coverage under the Conditional Waiver for Irrigated Lands. More than 200 organizations throughout the Sacramento River watershed support the plan and are

committed to implementing a regional strategy to address water quality. The SVWQC will evaluate a range of water quality parameters for the entire watershed rather than focusing only on specific water quality constituents, and will manage the region to meet the objectives in the Porter-Cologne Water Quality Control Act (Water Code 13000 et seq.).

On February 10, 2004, the Regional Board issued a Notice of Applicability (NOA) to the SVWQC verifying the NOI was complete and approved with conditions. The NOA required the SVWQC to submit a watershed evaluation report and a monitoring and reporting program plan for the Sacramento River watershed by April 1, 2004. To implement the plan and to meet the Conditional Waiver for Agricultural Lands requirements, the SVWQC has prepared and is submitting the following documents that will serve as the foundation for a phased water quality management program: (1) Sacramento River Watershed Evaluation Report; and, (2) Sacramento River Watershed Monitoring and Reporting Plan.

The quantitative data and analysis presented in the above-mentioned reports is designed to provide a consistent and comprehensive approach to watershed management. This approach will support farmers and wetland managers in meeting water quality goals and regulatory requirements. Together these plans satisfy the requirements of the Conditional Waiver for Irrigated Lands.

The reports will change as new information is developed during the interim program and throughout the 10-year implementation program proposed for the Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands. This long-term planning horizon supports an “adaptive management” approach at the local level, by allowing the time to evaluate options in order to make optimal decisions with limited resources to achieve desired results.

For purposes of compliance with the July Waiver, the DFG has joined the SVWQC. DFG continues to participate in the Coalition process and provides annual funding based on acres of managed wetlands at the Yolo Bypass Wildlife Area.

3.1.12 NATURAL RESOURCES CONSERVATION SERVICE PROGRAMS

WETLANDS RESERVE PROGRAM

The U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), Wetlands Reserve Program (WRP) is a voluntary program to restore wetlands. Participating landowners have the opportunity to establish conservation easements in perpetuity or for a 30-year duration. Landowners also have the option to enter into restoration cost-share agreements where no easement is involved. In exchange for establishing a permanent easement, the landowner receives payment up to the agricultural value of the land and 100 percent of the restoration costs for restoring the wetlands. The 30-year easement payment is 75 percent of what would be provided for a permanent easement on the same site and 75 percent of the restoration cost. The voluntary agreements are for a minimum of 10-year duration and provide 75 percent of the cost of restoring the involved wetlands. Easements and restoration cost-share agreements establish wetland protection and restoration as the primary land use for the duration of the easement agreement. In all instances, landowners continue to control access to their land. Wetland restoration activities implemented in the Los Rios WRP Unit of the Yolo Bypass Wildlife Area were conducted through a perpetual WRP easement acquired by Los Rios Farms prior to acquisition by the State.

There is a 153-acre WRP restoration on the Yolo Bypass Wildlife Area that was constructed in 2005. This property is adjacent to Putah Creek and includes 11 acres of riparian restoration. The restoration plan underwent hydraulic analysis prior to construction and received an encroachment permit from the Reclamation Board. The management of this unit has been turned over to DFG.

CONSERVATION SECURITY PROGRAM

The Conservation Security Program (CSP) is a voluntary program that provides financial and technical assistance to promote the conservation and improvement of soil, water, air, energy, plant, and animal life, and other conservation purposes on Tribal and private working lands. Working lands include cropland, grassland, prairie land, improved pasture, and rangeland, as well as forested land that is an incidental part of an agriculture operation. The program provides equitable access to benefits to all producers, regardless of size of operation, crops produced, or geographic location. The Farm Security and Rural Investment Act of 2002 (2002 Farm Bill) (Pub. L. 107-171) amended the Food Security Act of 1985 to authorize the program. CSP is administered by USDA's NRCS.

One CSP enhancement activity in particular was developed on the Yolo Bypass Wildlife Area. Wildlife Habitat Management Enhancement, "EHM17-#11 Manage Fallow Cropland Areas for Shorebird Habitat" was developed on site and submitted to NRCS, who incorporated this practice into the CSP. This practice provides $125 per acre to manage fallowed cropland fields for winter shorebird migration by flooding from July 20 through September 15 to a depth of 3 inches. Additional information on managing shorebird habitat is provided in Section 3.5, "Biological Resources"

DIXON RESOURCE CONSERVATION DISTRICT

Formed as independent local liaisons between the federal government and landowners, resource conservation districts (RCDs) have always worked closely with the USDA NRCS. RCDs address a wide variety of conservation issues such as water quality, wildlife habitat restoration, soil erosion control, drainage, conservation education, and much more. The Dixon RCD covers over 114,000 acres and is involved in the operation and maintenance of an extensive drainage system, water quality issues, and assisting local farmers. Each district has a locally elected or appointed volunteer board of directors made up of landowners in that district. The DFG has an agreement with Dixon RCD to manage agricultural leases and other agriculture-related activities occurring in the Yolo Bypass Wildlife Area (see Appendix D). Dixon RCD staff has made invaluable contributions towards DFG's goal of integrating agriculture into the long-term management of the Wildlife Area.

3.1.13 YOLO BYPASS FISH PASSAGE AND FISH HABITAT IMPROVEMENT PLANNING

Several studies and planning efforts have been conducted to examine the feasibility of managing a portion of the Yolo Bypass to improve passage and habitat for aquatic species, particularly native fishes such as Chinook salmon, Sacramento splittail, and sturgeon (U.S. Army Corps of Engineers and the CALFED Bay-Delta Program 2002; Kirkland et al. 2005). Other recent planning efforts that have focused on Delta-wide fisheries and aquatic food web issues include: the Delta Smelt Action Plan (Resources Agency 2005), and the Pelagic Fish Action Plan (Resources Agency 2007). Ideas and concepts that have been developed for the Bypass range from modifying the hydrology of the Yolo Bypass to yield system-wide changes, to modifying a small portion of the Yolo Bypass topography to produce localized changes, to simply improving fish passage at physical impediments.

The most recent studies and planning efforts have been directed towards fish passage improvements at Fremont Weir and on Putah Creek in a way that is not intended to harm existing agricultural and/or managed wetlands operations at the Yolo Bypass Wildlife Area. Modifications to Fremont Weir, whether for fish passage or for fish habitat source flow, are outside the boundaries of the Yolo Bypass Wildlife Area and beyond the scope of this LMP. However, there is great concern that modifications to Fremont Weir to achieve managed spring floodplain inundation conditions could adversely affect existing agricultural, public use and managed wetland operations at the Yolo Bypass Wildlife Area. There is also concern that smaller flows which might be associated with providing multi-species fish passage at Fremont Weir could adversely affect existing agricultural and/or managed wetland operations and/or public use at the Yolo Bypass Wildlife Area. The Wildlife Area personnel would not take a lead role in improving fish passage beyond its northern and southern boundaries, but DFG would support

fish passage improvement plans if they do not unduly interfere with other existing or planned functions of the Yolo Bypass Wildlife Area.

A Yolo Bypass Interagency Working Group (YBIWG) has been formed which will develop priorities for fisheries projects within the Yolo Bypass. This group includes representatives from National Oceanic and Atmospheric Administration, national marine Fisheries Service (NMFS), DWR, DFG, and USFWS. The agreed upon prioritized fishery opportunities have been developed are included in the following document:

YOLO BYPASS CONCEPTUAL AQUATIC RESTORATION OPPORTUNITIES

The following describes potential northern Yolo Bypass (above Little Holland Tract) aquatic restoration opportunities. The CALFED Ecosystem Restoration Program Implementing Agencies (DFG, USFWS, NMFS) in cooperation with the DWR, are evaluating the feasibility of implementing the following opportunities. These opportunities were developed through consultations with participating agencies of the Yolo Bypass Interagency Working Group. The YBIWG acknowledges key issues, interests, and concerns raised during previous discussions with stakeholders and evaluates potential restoration opportunities with these issues in mind.

The primary goal of the YBIWG is to improve conditions for native fish species (particularly State and federal Threatened and Endangered fish species and species of special concern) in the Yolo Bypass, thereby enhancing populations and recovery efforts while minimizing land management impact.

This document focuses, at a conceptual level, on the sequential development of potential restoration opportunities in the northern Yolo Bypass. The set of potential restoration opportunities is provided to foster discussion among public entities and stakeholders interested in the northern Yolo Bypass.

The YBIWG has identified the following potential restoration opportunities for further evaluation:

- **Putah Creek** – Lower Putah Creek stream realignment and floodplain restoration for fish passage improvement and multi-species habitat development on existing public lands.
- **Lisbon Weir** – Improve agriculture and habitat water control structure for fish and wildlife benefits.
- **Additional multi-species habitat development** – Identify areas of opportunity within the Yolo Bypass Wildlife Area, or other appropriate areas that could provide for controlled localized seasonal inundation on more frequent intervals.
- **Tule Canal Connectivity** – Identify passage impediments. Evaluate the feasibility of improving fish passage or removing fish passage impediments.
- **Multi-species fish passage structure** – Evaluate the feasibility of constructing a multi-species fish passage structure at the Fremont Weir.

Biological monitoring will be implemented as necessary and may be used to guide future actions and adaptive management.

Multi-species restoration opportunities discussed here are presented in a sequential order of completion. For the full value of the proposed restoration opportunities in the Yolo Bypass to be realized, the following ordered scheme should occur.

Step 1 – Putah Creek

Evaluate and develop a plan for the realignment and restoration of lower Putah Creek. The area proposed for restoration is within existing public lands. The realignment has the potential to create 130 to 300 acres of shallow

water habitat. Benefits would include improved salmonid immigration and emigration to and from Putah Creek, an increase in avian (shorebird and waterfowl) habitat, increased aquatic and riparian habitat for other native species, as well as a significant enhancement to existing fish habitat in and around Putah Creek. Any potential actions would be consistent and coordinated with the Putah Creek Water Accord.

Goals:

- Improve passage, rearing, and emigration of adult and juvenile salmon and steelhead in Putah Creek
- Provide diverse aquatic and riparian habitats for shorebirds, ground nesting birds, waterfowl, plants, invertebrates, plankton, and spawning and rearing of native fish species

Step 2 – Lisbon Weir

Modify or replace Lisbon Weir to provide better fisheries management opportunities in Putah Creek and the Toe Drain, while improving the reliability of agricultural diversions and reducing maintenance requirements. A conceptual example of the synergistic benefits of these proposed restoration actions is the idea that improving Lisbon Weir's reliability for agricultural diversions could increase flexibility in water distribution, thereby allowing for greater attraction flows to be released down the realigned Putah Creek.

Goals:

- Improve irrigation water distribution system to benefit fish and wildlife
- Improve likelihood of adult fall-run Chinook immigration to Putah Creek
- Reduce delay and possible stranding of adult steelhead, Chinook salmon and sturgeon, when passable conditions to the Sacramento River exist
- Reduce delay of juvenile salmonid emigration within the Toe Drain

Step 3 – Additional multi-species habitat development

Expand existing shallow water habitat for various species including juvenile native fish. Additional multi-species habitat could be developed through the excavation of a low shelf along a limited portion of the Toe Drain and through small scale setback levees, or by other unidentified means. Restoration opportunities for the development of additional seasonal shallow water habitat, where opportunities exist, may occur on: 1) undeveloped lands within the Yolo Bypass Wildlife Area; 2) other undeveloped public lands within the Yolo Bypass; and 3) private lands where cooperative agreements between the implementing agencies and the landowners provides mutual benefits.

Goals:

- Increase rearing habitat available to juvenile steelhead, Chinook salmon, and splittail
- Increase shallow water habitat availability for multiple species (fish, wildlife, plankton, and others)

Step 4 – Tule Canal connectivity

Identify areas of stranding adjacent to the Fremont Weir. Evaluate the feasibility of improving connectivity between the Fremont Weir, the Fremont Weir scour ponds, and the Toe Drain to reduce stranding of adult and juvenile fish. Identify seasonal road crossings and agricultural impoundments in the northern Yolo Bypass that

impact wetted habitat connectivity, immigration, and emigration of fish species utilizing the Yolo Bypass. Develop conceptual approaches for the modification of crossings and impoundments.

Goals:

- Reduce delay and stranding of adult steelhead, Chinook salmon, and sturgeon immigrating within the Yolo Bypass
- Reduce delay and overall losses of juvenile Chinook salmon and steelhead emigrating within the Yolo Bypass

Step 5 – Multi-species fish passage

Evaluate the feasibility and appropriateness of providing fish passage improvements in and along the Fremont Weir. Appropriate operational constraints would guide plan development and would ensure: 1) continued maintenance of flood conveyance capacity; 2) no substantial changes in timing, volume, and/or duration flow; and 3) minimal disturbance to existing land use and agricultural practices.

Restoration opportunities may include the addition of a new, controlled multi-species fish passage structure at the eastern edge of the Fremont Weir. Additionally, restoration opportunities may include improvements along the existing weir face and apron to facilitate sturgeon passage along the length of Fremont Weir without introducing any additional flows. Conceptual designs for this option could include rock ramps that would provide a gradual slope up the face of the weir. In addition to the installation of new fish passage structures, the existing fish ladder will be analyzed to determine if modifications could allow for a greater range of fish species passage.

Goals:

- When present in the northern Yolo Bypass, improve immigration and emigration (reduce delay and stranding) of adult and juvenile fish (steelhead, Chinook salmon, and sturgeon).

The YBIWG identified potential restoration opportunities with consideration given to the elimination or minimization of potential negative impacts to the following areas of concern:

- Flood control
- Agricultural operations
- State and federal wildlife area infrastructure investments
- Public and private waterfowl management operations
- Wildlife management operations
- Water quality
- Educational activities
- Recreation
- Vector control
- Welfare of selected fish species at various life stages.

The intent of the YBIWG is to keep all users and interest whole. Conceptual restoration opportunities were developed to be implemented with minimal impact to Yolo Bypass users. Restoration opportunities that significantly changed the timing and/or duration of flow, or that resulted in substantial new regulation of the Yolo Bypass, were eliminated from further consideration.

3.1.14 SACRAMENTO AREA COUNCIL OF GOVERNMENT'S REGIONAL BICYCLE, PEDESTRIAN, AND TRAILS MASTER PLAN

The Sacramento Area Council of Government's (SACOG) Regional Bicycle, Pedestrian, and Trails Master Plan is intended to guide the long-term decisions for the Bicycle and Pedestrian Funding Program, adopted by the SACOG Board of Directors in September 2003. The focus of both the Master Plan and the Funding Program is to provide facilities for walking and biking in the cities and towns of the region, and provide connections between cities and towns. The goal is to integrate local plans to create a seamless regional bicycle and pedestrian system. This approach prioritizes local projects by their contribution to the regional network, providing key connections and access between communities, counties and jurisdictions.

Specific goals identified for capital projects that relate to the Yolo Bypass Wildlife Area include:

1. Provide bicycle/pedestrian connections
    a. Between, through, and within all cities and towns of the six-county region.

It may be possible for bike paths to connect through or adjacent to the Yolo Bypass Wildlife Area at the Causeway Unit; however, the once proposed Union Pacific Rail Trail (old Southern Pacific east/west mainline in the Causeway Unit) through the Yolo Bypass to the I Street Bridge (in the City of West Sacramento) has been identified in the Regional Master Plan as: "Low Priority Rails-to/with-Trails."

3.1.15 CITY OF DAVIS

The City of Davis has several plans and programs related to public access at the Yolo Bypass Wildlife Area including the General Plan, Open Space Program, and City Bike Plan. Planning work within the Putah Creek watershed by the City of Davis has contributed synergistic support for the creation of the Yolo Bypass Wildlife Area. The City's policies support continued coordination. Bikeways connecting Sacramento and Davis are also goals of Davis planning efforts and will likely require coordination with the Yolo Bypass Wildlife Area and Bypass stakeholders.

The City of Davis also values habitat and wildlife preservation and as such is a continuing partner in support of the Yolo Bypass Wildlife Area and Pacific Flyway Center.

GENERAL PLAN

- **Policy POS 1.1 -** Use systematic and comprehensive planning to guide the development, operation and allocation of resources for all City parks, facilities, and recreation programs.

    - Actions

      Emphasize joint planning and cooperation with all public agencies as the preferred approach to meeting the parks, open space and program needs of Davis residents.

- **Policy POS 1.2** – Provide informal areas for people of all ages to interact with natural landscapes, and preserve open space between urban and agricultural uses to provide a physical and visual edge to the City.

    - Actions

      Incorporate existing habitat areas, including Putah Creek, Dry Slough, and Willow Slough, into the open space network, while maintaining the emphasis on wildlife and habitat preservation in these areas.

Within urban open space areas, provide habitat elements (e.g., roosting trees, nesting trees, etc.) for birds, such as songbirds, hawks, owls, and for other wildlife as appropriate.

Develop criteria regarding the types of locations where the City would like to establish new resource preservation, education and recreation areas and programs.

Establish criteria for location and design of natural habitat areas accessible to the public, including criteria for natural habitat areas that can complement and accommodate other open space uses such as viable wildlife habitat.

Set policies and criteria for the establishment of trails and picnic areas in natural open space areas.

- **Policy POS 3.3 -** Implement specific projects to augment the existing greenbelt/open space system.
  - Actions

    Develop, maintain and improve a trail, and other greenbelt type amenities, if possible, in the Second Street/I-80 Corridor.

COMPREHENSIVE BICYCLE PLAN

The purpose of the Bicycle Plan is to improve and encourage bicycle transportation in the City of Davis. This is an update of the 1993 Bikeway Plan, and is part of an effort to maintain a document that is current and meaningful to the city. Additionally, this Plan meets the requirements contained in Section 891.2 of the California Streets and Highways Code. A goal of the Bicycle Plan is to coordinate and cooperate with surrounding jurisdictions such as University of California at Davis, and Yolo and Solano counties, to create a continuous and interconnected bikeway network.

OPEN SPACE PROGRAM

Highlights of the City's activities include:

- Wildlife habitat lands acquisition and site development program which includes the South Fork Preserve natural area on Putah Creek and the Davis Wetlands Project associated with the city's water pollution control plant. The City's activities on Putah Creek will eventually and directly interface with public use programs on the Wildlife Area.

- Active pursuit of state and federal grant funds, cooperative partnerships and other creative funding arrangements that have brought over twelve million new dollars to City of Davis open space projects over the last eight years.

- Open space components of the City's internal network of greenbelts, parks and street corridors.

3.1.16 CITY OF WEST SACRAMENTO

The City of West Sacramento has plans and programs related to natural resources adjacent to and public access at the Yolo Bypass Wildlife Area including the General Plan and Access and Bike Plan. The City's policies support coordination and values habitat and wildlife preservation.

GENERAL PLAN

Section V, Recreational and Cultural Resources, Goal E: To provide a network of pedestrian and bicycle pathways connecting parks and open space areas with other destination points within and beyond the city of West Sacramento.

Policies:

1. The City shall develop a system of pedestrian and bicycle pathways linking City parks, neighborhood shopping areas, and major open space areas with one another and with nearby residential areas.

3. The City shall develop and implement a Bicycle Route Master Plan to link parks, scenic areas, the riverfront, schools, the Central Business District, public facilities, and neighborhoods.

5. The City shall coordinate with SACOG and surrounding jurisdictions to ensure that bicycle pathways within the city connect with existing and planned facilities outside the city.

Section VI, Natural Resources Goals and Policies, Goal C: To protect sensitive native vegetation and wildlife communities and habitat in West Sacramento.

Policies:

7. The City shall seek to minimize the loss or degradation of wetland and riparian habitats at the following sites: Lake Washington and associated wetlands; Bee Lakes and associated riparian woodlands; riparian woodlands along the Sacramento River north of the I Street Bridge and south of the barge canal; and riparian woodlands along the Deep Water Ship Channel and the Yolo Bypass.

12. Public access and recreation facilities shall not eliminate or degrade riparian habitat values. Trails, picnic areas, and other developments shall be sited to minimize impacts on sensitive wildlife habitat or riparian vegetation.

ACCESS AND BIKE PLAN

The City of West Sacramento is currently updating the 1995 Pedestrian and Bicycle Master Plan. The new Bicycle, Pedestrian, and Trail Master Plan will identify ways to enhance and expand the existing network of pedestrian and bike travelways and recreational trails, connect gaps in the system, and improve problem areas. It may be possible for bike paths to connect through the Yolo Bypass Wildlife Area at ground level in the Causeway Unit.

3.1.17 LOWER PUTAH CREEK WATERSHED MANAGEMENT ACTION PLAN

The Lower Putah Creek Watershed Management Action Plan (WMAP) represents a three-phase program for enhancing watershed resources in the lower Putah Creek watershed (Lower Putah Creek Coordinating Committee 2005). The WMAP is a science and community based comprehensive approach to the protection and enhancement of resources in the lower Putah Creek riparian corridor, including tributaries, extending from Lake Berryessa to the Yolo Bypass. It is one of the first actions initiated by the Lower Putah Creek Coordinating Committee (LPCCC), through funding by a grant from the CALFED Bay-Delta Program. The LPCCC serves as the watershed group joining several primary stakeholders together to oversee implementation of the Putah Creek Accord and to begin planning for the enhancement and protection of Putah Creek's resources.

The goal is to develop a dynamic WMAP that landowner stakeholders can use as a framework and that will be updated with new information and new ideas to improve the watershed. Importantly, it is intended to provide

landowners and management entities with a blueprint for actions to protect and enhance resources in the lower Putah Creek watershed in a manner that is compatible with and respectful of landowner priorities, interests and concerns.

Development and implementation of the WMAP is divided into three phases. Phase I, completed in 2005, includes comprehensive biological, physical, and cultural resource assessments. Phase II, completed in 2006, is the landowner stewardship component. It includes a summary of goals, objectives, and project ideas for management of the lower Putah Creek watershed, based primarily on Landowner Stewardship meetings and coordination. The final WMAP, anticipated to be completed in 2008, will be a result of both the information from the resource assessments and landowner guidance. It will include a set of landowner interests and concerns; and resource enhancement goals and objectives; and an implementation plan containing a prioritized set of restoration and enhancement actions. Phase III is the implementation phase of the WMAP. Implementation will follow the recommended goals, objectives, and project ideas in the WMAP and will depend on funding, stewardship actions, permits and regulatory approvals, and the support of resource agencies and other stakeholders.

A copy of Phase 1 of the WMAP can be found on the Lower Putah Creek Watershed Portal at the following web address: <http://www.watershedportals.org/lpccc/viewDoc_html?did=2898>.

3.1.18 YOLO COUNTY INTEGRATED REGIONAL WATER MANAGEMENT PLAN

The Water Resources Association of Yolo County is using Proposition 50 funds to develop the Yolo County Integrated Water Management Plan (IRWMP) with intentions to adopt this plan in 2007. The IRWMP will serve as a planning document to help guide water actions within Yolo County. These actions include programs, policies and projects which are divided into five areas:

1. Water supply and drought preparedness
2. Water quality
3. Flood and storm water management
4. Recreation
5. Riparian and aquatic ecosystem enhancement

A draft list of actions in all five areas listed above has been developed and will eventually be prioritized through a watershed based stakeholder developed work plan. There are also integrated projects. The Yolo Bypass Wildlife Area related actions are part of the Yolo Bypass Integrated Project. The implementation strategy for the integrated projects is currently being developed by the WRA Technical Advisory Committee. It is anticipated that various agencies will take the lead on specific actions as appropriate within the context of the integrated project. DFG may seek funding for Yolo Bypass Wildlife Area Land Management Plan related actions through the Yolo County IRWMP implementation process.

3.1.19 YOLO COUNTY WEED MANAGEMENT AREA

The Yolo County Weed Management Area (YCWMA) was formed in 1999 by federal, state, county and city agencies, private industry, and landowners that are concerned about the explosion of invasive plant species in Yolo County. The YCWMA promotes and coordinates efforts toward the management and control of the County's noxious weeds through education and cooperation with landowner's, agencies, organization, and the general public. The YCWMA uses an integrated approach in weed control and eradication. The DFG, through employees of the Yolo Bypass Wildlife Area have been an active partner since the inception of the Yolo County WMA.

Herbicides, hand removal, mechanical removal, mowing, burning, grazing, mulching, biological control, and revegetation are all methods employed to various extents on a project by project basis to achieve the most biologically sound, environmentally friendly, and cost effective, long-term weed control possible.

3.1.20 CALIFORNIA'S WILDLIFE ACTION PLAN

California's Wildlife Action Plan was prepared by the UC Davis Wildlife Health Center for DFG and published in 2007. This was written as a requirement to received funding from the State Wildlife Grants Program authorized by Congress in 2000. A number of conservation actions are identified in this plan. These are intended to restore and conserve wildlife. These actions are categorized as either Statewide Conservation Actions or Regional Conservation Actions. In this plan, the Yolo Bypass Wildlife Area is located within the Central Valley and Bay-Delta Region.

Below is a listing of conservation actions pertinent to the Yolo Bypass Wildlife Area LMP.

RECOMMENDED STATEWIDE CONSERVATION ACTIONS

Statewide conservation actions are those actions that are important across most or all regions. The following are recommended statewide conservation actions:

c. The state should develop policies and incentives to better integrate wildlife conservation into state and regional transportation planning. Wildlife considerations need to be incorporated early in the transportation planning process.

d. State and federal agencies should work with cities and counties to secure sensitive habitats and key habitat linkages.

e. State and local agencies should allocate sufficient water for ecosystem uses and wildlife needs when planning for and meeting regional water supply needs.

f. Federal, state, and local agencies should provide greater resources and coordinate efforts to eradicate or control existing occurrences of invasive species and to prevent new introductions.

g. Federal, state, and local agencies and nongovernmental conservation organizations, working with private landowners and public land managers, should expand efforts to restore and conserve riparian communities.

h. Federal, state, tribal, and local agencies and nongovernmental organizations, working with private landowners, should expand efforts to implement agricultural and rangeland management practices that are compatible with wildlife and habitat conservation.

j. The state and federal governments should give greater priority to wildlife and natural resources conservation education.

k. The state should strengthen its capacity to implement conservation actions and to assist local agencies and landowners with planning and implementation of wildlife and habitat restoration and conservation efforts.

n. To address habitat fragmentation and avoid the loss of key wildlife corridors, federal, state and local agencies, along with nongovernmental organizations, should support scientific studies to identify key wildlife habitat linkages throughout the state.

RECOMMENDED REGIONAL CONSERVATION ACTIONS

The following are Central Valley and Bay-Delta Regional conservation actions to restore and conserve wildlife:

c. Public land managers need to continue improving wildlife habitat for a variety of species on public lands.

e. Public agencies and private organizations need to collaboratively protect and restore habitat connectivity along major rivers in the Central Valley.

j. Water management agencies need to reestablish and maintain more natural river flows, flooding patterns, water temperatures, and salinity conditions to support wildlife species and habitats.

l. Public agencies and private organizations should conserve and restore water dependent habitats (including wetland, riparian, and estuarine) throughout the region. Design of these actions should factor in the likely effects of accelerated climate change.

m. Water management agencies, state and federal wildlife agencies, and other public agencies and private organizations need to collaboratively improve fish passage by removing or modifying barriers to upstream habitat.

n. To support healthy aquatic ecosystems, public agencies and private organizations, in collaboration with the California Bay-Delta Authority, need to improve and maintain water quality in the major river systems of this region.

3.2 AGRICULTURAL RESOURCES AND LAND USES

This section describes the agricultural resource and land use characteristics of the Yolo Bypass Wildlife Area. Existing infrastructure including water delivery and management systems are described in Chapter 2, "Property Description." Biological resources are described in Section 3.5.

The Yolo Bypass Wildlife Area is seen as a model for bridging the seemingly disparate fields of agriculture and wildlife management. The success of this management philosophy is epitomized by the land management scenes played out south of the Yolo Causeway. Commuters in the spring watch tractors endlessly discing rice stubble until a fine seed bed is created. Next, long land planes level these fields. The infrastructure is rebuilt, with rice checks pulled and ditches cleaned. Water floods the fields by late April and soon the airplane is flying back and forth, seeding each field. By early summer the Bypass is a sea of green as the young rice plants break the surface of the water. Multiple duck broods have migrated to this water from their upland nests. During the hot days of summer, the rice grows taller and matures by the end of the summer. In early autumn the harvesters are cutting the rice as hundreds of egrets and white-faced ibis feast on the exposed crayfish. Soon the rice will go to the dryers to be prepared for markets. Much will go to Asia, via the Sacramento River Deep Water Channel. By October, DFG takes over the fields and floods them once again. Within a few days, the fields begin to attract mallards that have come to the Yolo Bypass after breeding elsewhere. Pintail may accumulate in large numbers in November. By December spectacular flocks of snow geese, white-fronted geese, tundra swans, and innumerable pintail are slowing traffic on Interstate 80, as massive waves of wings roam over the flooded rice fields. Soon winter is upon us, and the rice stubble disappears under the floodwaters. Gone are the snow geese, instead replaced by rafts of scaup and canvasback. Below the water surface, white sturgeon may be roaming the floor of the Bypass, as well as Sacramento splittail engaged in spawning behavior in their ancestral floodplain. As winter turns to spring, the rice fields are once more exposed and eventually drained, with eager farmers in the wings, ready to till the earth once again.

The following text was developed through a review of existing literature, annual agriculture plans, and Yolo Bypass Wildlife Area staff information. These sources provided information on agricultural land characteristics throughout the Yolo Bypass Wildlife Area.

BACKGROUND

Agriculture has been an important land use in the Yolo Bypass since the seasonal wetlands and perennial marsh and riparian areas were first converted to farms in the mid-1800s. Indeed, the massive reclamation efforts of the 19th century were driven by the desire to create productive farmland. For many years, grazing was the primary use of agricultural lands in the Yolo Bypass. In the latter part of the 20th century with the rise in commodity prices, irrigation systems were developed and fields were engineered for the production of row crops such as tomatoes and sugar beets.

The nearly annual floods that flow through the Yolo Bypass severely limit the kinds of crops that can be grown. Orchards and winter crops are not an option, nor are long-term ventures such as alfalfa. The proximity of the Yolo

Bypass to the San Francisco Bay Delta brings a prevailing wind from the south during summer evenings. Although the daily appearance of this Delta Breeze makes life bearable in the Sacramento area, it limits the production of rice in favor of wild rice, or special varieties that are more adapted to the climate.

At the time of the acquisition of the Glide and Los Rios properties, one concern expressed by the agricultural community was the potential loss of farm land to wildlife habitat. The DFG made a commitment at that time to maintain the existing agricultural leases present on the property and to integrate agriculture into the long-term management of the Wildlife Area.

Agriculture and wildlife management are not that far apart. DFG wildlife areas commonly grow agricultural crops for the benefit of wildlife. The Yolo Bypass Wildlife Area utilizes agriculture to manage habitats while providing important income for the management and operation of the property. Many innovative, natural resource-compatible agricultural practices occurring in the Yolo Bypass Wildlife Area provide valuable habitat for a diverse assemblage of wildlife species. Rice is grown, harvested, and flooded to provide food for thousands of waterfowl. Corn fields are harvested to provide forage for geese and cranes. Working with local farmers, the Yolo Bypass Wildlife Area provides fields of milo, corn, and sudan grass specifically for wildlife forage purposes. Crops such as safflower are cultivated and mowed to provide seed for upland species such as ring-necked pheasant and mourning dove.

Much of the grassland in the southern portion of the Yolo Bypass Wildlife Area is managed with cattle grazing, resulting in spectacular blooms of wildflowers during the spring months. The predominance of nonnative annual grasses in that area can otherwise inhibit the production of the native plant community that includes several rare and endangered species. Whereas historically pronghorn antelope and tule elk grazed competing native grasses, exposing the emerging forbs to sunlight, grazing cattle provide this function today, eating the mostly nonnative competing grasses. Due to the aggressiveness of these nonnative grasses, an aggressive grazing strategy is needed to favor the production of native forbs. This can be accomplished through a carefully crafted agricultural lease that reflects the results of scientific grazing studies while still providing the potential for a lessee to make a profit on the Wildlife Area.

EXISTING AGRICULTURAL SETTING

Existing conditions related to agricultural resources within the Yolo Bypass Wildlife Area are described in greater detail below. Additional information on agriculture in regards to wildlife management is provided in Section 3.5, "Biological Resources." Agricultural land characteristics throughout the Yolo Bypass Wildlife Area include lands designated by the California Department of Conservation (DOC) as being of prime, unique, or statewide importance (California Department of Conservation 2004).

3.2.1 AGRICULTURAL LAND CLASSIFICATION

The DOC uses the USDA's modern classification when administering the Farmland Mapping and Monitoring Program (FMMP) to characterize the types and amounts of agricultural land in an area. The majority of land within the Yolo Bypass Wildlife Area has been classified by the DOC into one of five different agricultural land designations (DOC undated). Lands in the Yolo Bypass Wildlife Area are primarily characterized as:

- *Prime Farmland* – approximately 350 acres: Prime farmland is farmland with the best combination of physical and chemical features able to sustain long-term agricultural production. This land has the soil quality, growing season, and moisture supply needed to produce sustained high yields. Land must have been used for irrigated agricultural production at some time during the four years prior to the mapping date. Prime farmland is defined by DOC according to mapped soil types developed by the NRCS.

- *Unique Farmland* – approximately 6,600 acres: Unique farmland is farmland of lesser quality soils used for the production of the state's leading agricultural crops. This land is usually irrigated, but may include

nonirrigated orchards or vineyards as found in some climatic zones in California. Land must have been cropped at some time during the four years prior to the mapping date.

- *Farmland of Local Importance* – approximately 450 acres: Farmland of Local Importance is land of importance to the local agricultural economy as determined by each county's board of supervisors and a local advisory committee. Within Yolo County, these are soils that meet the criteria of Prime Farmland or Farmland of Statewide Importance but are not irrigated. It can also include other nonirrigated farmland as determined by the Board of Supervisors (DOC undated).

- *Potential Farmland of Local Importance* – approximately 950 acres: Potential Farmland of Local Importance denotes farmland that would otherwise meet the criteria of Farmland of Local Importance but is not currently farmed.

- *Grazing Land* – approximately 4,100 acres: Grazing land is land on which the existing vegetation is suited to the grazing of livestock. This category was developed in cooperation with the California Cattlemen's Association, University of California Cooperative Extension, and other groups interested in the extent of grazing activities.

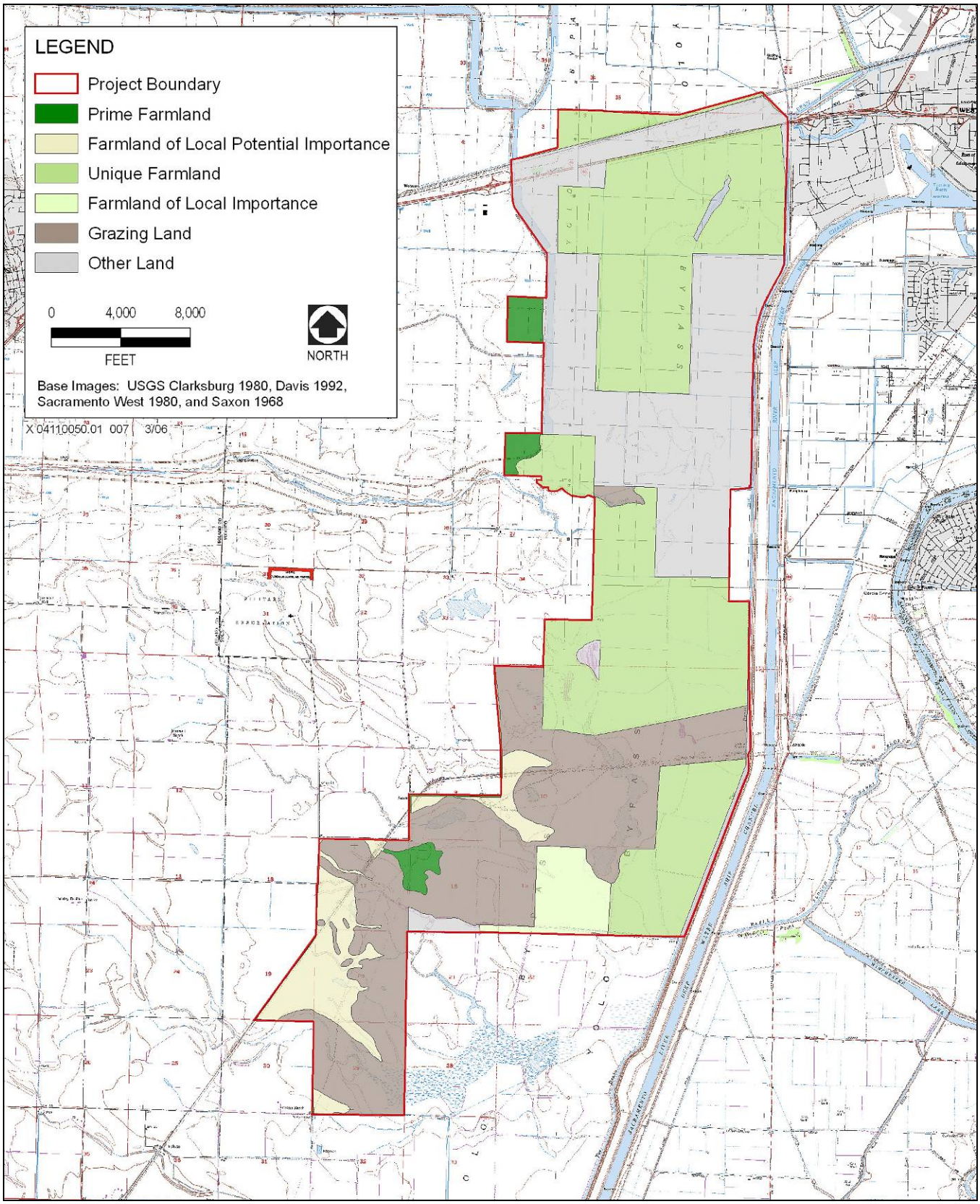
- *Other Land* – approximately 4,320 acres: Other Lands include land not included in any other mapping category. Common examples include low density rural developments; brush, timber, wetland, and riparian areas not suitable for livestock grazing; confined livestock, poultry or aquaculture facilities; strip mines, borrow pits; and water bodies smaller than forty acres. Vacant and nonagricultural land surrounded on all sides by urban development and greater than 40 acres is mapped as Other Land. This designation does not include urban lands or water, which are mapped in separate categories.

These designations, including the total acreage and locations of each designation within the Yolo Bypass Wildlife Area are provided in Table 3.2-1 and shown in Exhibit 3.2-1.

Table 3.2-1
Yolo Bypass Wildlife Area – Agricultural Land Designations

Agricultural Land Designation	Approximate Acreage	Management Units
Prime Farmland	350	Northwest, Los Rios Farms, Pacific Flyway Center, and Tule Ranch
Unique Farmland	6,600	Causeway Ranch, 1,000 Acres, Los Rios, Parker, Field 29, Field 38, Tule Ranch
Farmland of Local Importance	450	Tule Ranch
Potential Farmland of Local Importance	950	Tule Ranch
Grazing Land	4,100	Tule Ranch, Los Rios WRP
Other Land	4,320	North, Northwest, West, Central, Cowell Pond, Causeway, Tule Ranch

Source: DOC undated; EDAW 2006



Source: FMMP 2002

Yolo Bypass Wildlife Area Agricultural Land Designations (DOC/USDA) **Exhibit 3.2-1**

Given the prevalence of land within the Yolo Bypass Wildlife Area suited to agriculture, many of the management units incorporate some form of agriculture at least on an occasional basis as a management tool. In general, agricultural activities contribute to Yolo Bypass Wildlife Area goals:

1. Maintain or enhance habitat for native wildlife and plants; and

2. Provide an income source for DFG management and operations of the wildlife area while helping to maintain agriculture as a viable economic activity in Yolo County.

3.2.2 YOLO BYPASS WILDLIFE AREA AGRICULTURAL LAND USES

Agricultural lands within the Yolo Bypass Wildlife Area are leased to local farmers and managed, under an agreement with DFG, by the Dixon RCD. Currently, there are four agricultural lease tenants in the Yolo Bypass Wildlife Area. These tenants work in cooperation with DFG to grow a variety of agricultural crops and to manage livestock grazing for wildlife and native plant habitat management. Revenues from these leases provide valuable operating income for the Yolo Bypass Wildlife Area. A description of these two activities is provided below. Exhibit 3.2-2 depicts agricultural land uses throughout the Yolo Bypass Wildlife Area. Crop production practice tables for the Yolo Bypass Wildlife Area are provided at the end of this section.

ROW AND TRUCK CROPS

Row and truck crops are grown across the northern half of the Yolo Bypass Wildlife Area (i.e., Causeway Ranch and Los Rios Farms Complex) and on the northern portion of the Tule Ranch. The primary crops grown include: rice, corn, millet, milo (grain sorghum), safflower, sunflower, and tomatoes. These crops are cultivated during the summer months. From fall to spring, some farmed areas are fallowed and flooded to provide a valuable source of forage for wildlife (Table 3.2-2) as well as seasonal wetland habitat. Three common crop rotations are:

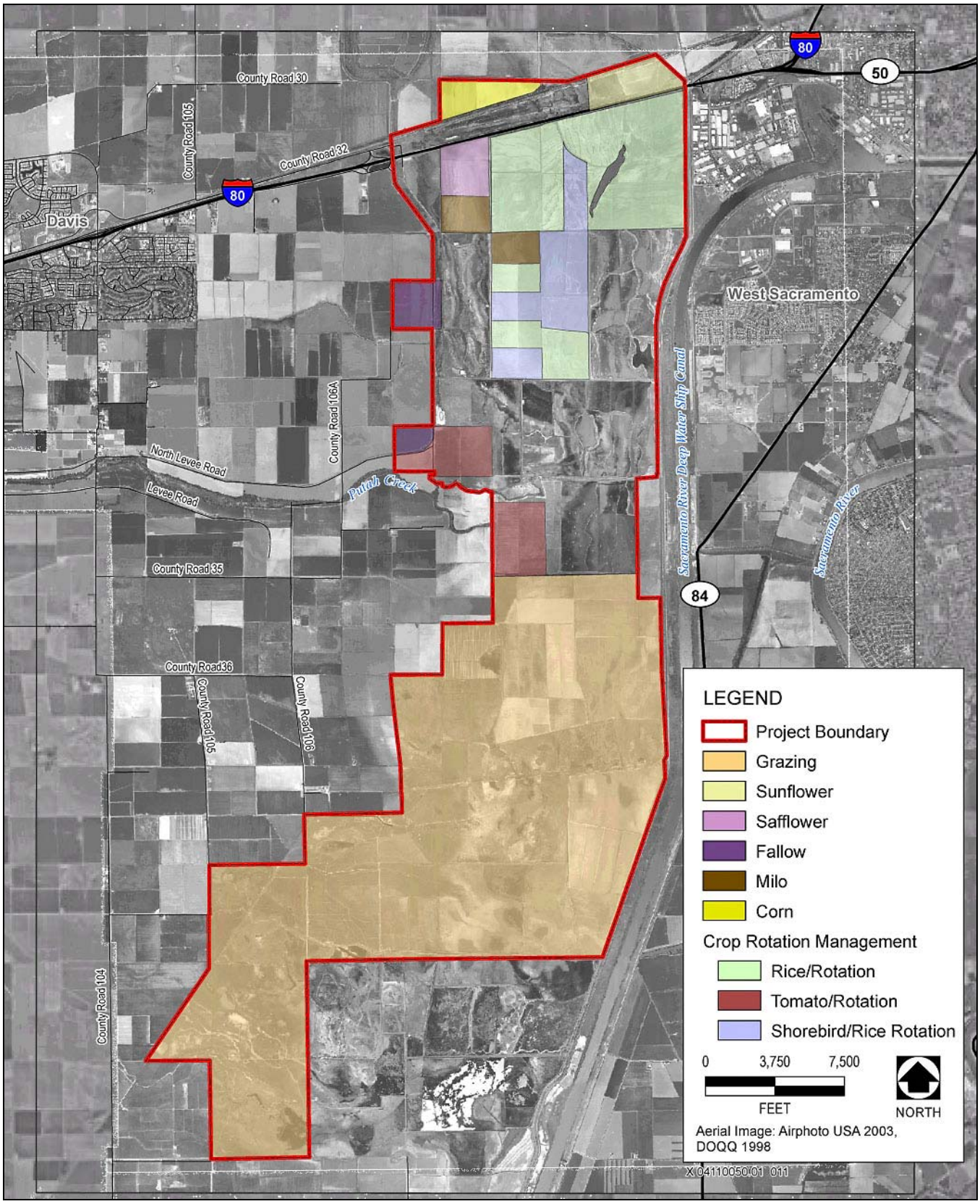
1. Corn to safflower/sunflower to tomatoes;

2. White rice to white rice to wild rice or;

3. White rice to wild rice to shorebird habitat (fallowed rice fields that are flooded to a shallow depth during the growing season).

Table 3.2-2
Yolo Bypass Wildlife Area – Crop Forage Values for Wildlife

Crop	Target Species or Species Groups
Rice (Wild and Conventional)	Ducks, geese, cranes, ibis, egrets, shorebirds, terns
Tomatoes	Swainson's hawk, shorebirds
Corn	Ducks, geese, cranes, shorebirds
Millet	Pheasants, waterfowl
Wheat	Provides nesting cover and winter green feed for a variety of species
Milo	Waterfowl and shorebirds
Safflower	Mourning dove, pheasant, curlews, plovers



Source: Department of Fish and Game, City of Davis 2005, CaSIL 1993

Yolo Bypass Wildlife Area Agricultural Land Uses (2005 Crop Year) **Exhibit 3.2-2**

Rotation strategies are designed to provide a diversity of wildlife habitat elements and to facilitate sustainable agricultural practices (e.g., maintain soil fertility and reduce herbicide application). Other crops, (e.g., millet, milo, safflower, and sunflower) are occasionally planted to provide supplemental sources of wildlife forage. These crops may be planted as part of one of the three above rotation strategies or may be periodically planted on fields designated solely for wildlife forage production. The total acreage of each crop grown during the last three years is provided below (Table 3.2-3).

Table 3.2-3
Yolo Bypass Wildlife Area – Crop Production Acreages 2004–2006

Crop	Year		
	2004	2005	2006
Wild Rice	829	570	270
Conventional Rice	871	0	0
Tomatoes	368	539	581
Corn	84	78	0
Sunflower	173	84.5	121
Misc./Wildlife Crops	995	60	699
Fallow/Shorebird	538	950	2,240

Source: Dixon RCD Annual Crop Plans for the Yolo Bypass Wildlife Area

GRAZING

Cattle grazing occurs primarily on an extensive portion of the Tule Ranch Unit in the southern end of the Yolo Bypass Wildlife Area. Additional grazing, specifically for vegetation management, occurs throughout many of the remaining portions of the Yolo Bypass Wildlife Area. Cattle are often used as an initial treatment of vegetation prior to discing or spraying with herbicide. Animals are brought onto the Yolo Bypass Wildlife Area in mid spring or early summer after the threat of flooding has passed and they are removed by January. Forage is provided in irrigated pasture, uplands within the Bypass and the annual grasslands-vernal pool complex. Vast areas within the Bypass grow sweet clover, a nutritious legume. This plant can also cause severe bloating or thinning of blood and must be utilized judiciously. During years that experience spring flooding, the vegetation in the Bypass dominated by curly dock and cocklebur, two plants very low in forage value.

The exact number of animals brought onto the Yolo Bypass Wildlife Area varies on an annual basis based on weather patterns and the total amount of available forage. There is currently no set stocking rate, utilization standard, or grazing monitoring program for the Yolo Bypass Wildlife Area. It is anticipated that standard AUM units will be the basis for future grazing strategies. The total acreage of unirrigated range and irrigated pasture grazed over the last three years is provided in Table 3.2-4.

Table 3.2-4
Yolo Basin Wildlife Area Grazing Acreages 2004–2006

Rangeland Type	Year		
	2004	2005	2006
Un-irrigated Range	7,131	7,568	6,793
Irrigated Pasture	764	764	1,083

Source: Dixon RCD Annual Crop Plans for the Yolo Bypass Wildlife Area

The following represent typical activities by crop on an average farm. Activities in the YBWA may differ due to seasonal flooding.

Additional products to those included in the table (s) may be used. For a complete list of products registered for each crop, contact the County Agricultural Commissioner.

Table 3.2-5
Crop Production Practices
(information compiled from UC Cooperative Extension Cost Studies and DFG input)

White & Wild Rice Production Activities			
		Date Range	**Special Considerations**
Groundwork (land preparation)		April–May	
Preplant Fertilization		April–May	
Planting		April–May	
Irrigation		May–Aug	flood
Fertilization		May–July	top-dress by air in production years
Harvest		Sept–Oct	
Post Harvest (groundwork)		Sept–Oct	not used in Yolo Bypass
Post Harvest Flooding		Oct–May	for waterfowl
***Pesticide/ Herbicide Product Options**	**Target Pest / Weed**	**Date Range**	**Special Considerations**
Copper Sulfate	Algae / Shrimp	May	after planting
Malathion SS	Midge	May	
Roundup	Levee Weeds	May–Aug	
Propanil, Grandstand	Weeds	May–June	broadleaf, sedges & grass weeds (white rice only)
Warrior	Weevil / Armyworms	May, July	after planting for weevil, in July for armyworms
Quadris	Diseases	July–Aug	
Possible Wildlife Benefited	**Use**	**Date Range**	**Special Considerations**
General Wildlife Species	Habitat and Food	Year-round	in fallow years as wildlife cover crop
Stilts and Avocets	Breeding Habitat	April–May	
	Brood Habitat	May–Oct	
Egrets and Ibis	Food	May–Sept	crayfish
Waterfowl and Shorebirds	Wintering Habitat	Oct–May	during post harvest flooding

* Organic rice is also grown in the YBWA with similar production activities to those listed below, except all practices comply with the USDA National Standards for Organic Food. For more information visit www.ams.usda.gov/nop/NOP/standards.html

* Not all of the pesticide/herbicide product options will be needed every year.

Table 3.2-5
Crop Production Practices
(information compiled from UC Cooperative Extension Cost Studies and DFG input)

Corn Production Activities			
		Date Range	
Groundwork (land preparation)		Mar–April	
Preplant Fertilization		April–May	
Planting		April–May	
Cultivation		Mar, May	weed control
Irrigation		May–Aug	
Fertilization		May–Aug	
Harvest		Sept–Oct	
Post Harvest (groundwork)		Sept–Oct	
***Pesticide/ Herbicide Product Options**	**Target Pest / Weed**	**Date Range**	
Roundup	Weeds	Feb	not typical in Yolo Bypass due to winter flooding
Weedar	Weeds	May	
Sevin Bait	Cutworms	May–June	
Comite	Mites	June	
Possible Wildlife Benefited	**Use**	**Date Range**	**Special Considerations**
Upland Game	Cover and Food	May–Sept	Ring-necked Pheasant & Mourning Dove
Ducks, Geese & Sandhill Cranes	Habitat	Oct–Mar	during post harvest flooding
* Not all of the pesticide/herbicide product options will be needed every year.			
Sunflower Production Activities			
		Date Range	**Special Considerations**
Groundwork (land preparation)		Mar–April	
Planting		April–May	
Fertilization		April–May	
Irrigation		April–July	
Pollinate		May–June	
Harvest		Aug–Sept	
Post Harvest (groundwork)		Sept–Nov	

Table 3.2-5 Crop Production Practices (information compiled from UC Cooperative Extension Cost Studies and DFG input)			
***Pesticide/ Herbicide Product Options**	**Target Pest**	**Date Range**	**Special Considerations**
Asana	Moth	June–July	
Treflan	Weeds	Mar–April	pre-plant
Roundup	Weeds	Jan	not typical in Yolo Bypass due to winter flooding
Possible Wildlife Benefited	**Use**	**Date Range**	**Special Considerations**
Tria-colored Blackbird, upland game birds, Mourning Dove	Food source	Sept–Dec	Post harvest
* Not all of the pesticide/herbicide product options will be needed every year.			
Safflower Production Activities			
		Date Range	**Special Considerations**
Groundwork (land preparation)		Aug–Oct	in year preceding planting
Planting		Mar–May	
Fertilization		Mar–May	prior to planting
Irrigation		May–Aug	
Cultivation		May	
Fertilization		May–June	
Harvest		July–Sept	
Post Harvest (groundwork)		Aug–Oct	
***Pesticide/ Herbicide Product Options**	**Target Pest**	**Date Range**	**Special Considerations**
Roundup	Winter Weeds	Feb	not typical in Yolo Bypass due to winter flooding
Treflan	Weeds	Mar–Apr	
Possible Wildlife Benefited	**Use**	**Date Range**	**Special Considerations**
Mourning Dove & Ring-necked Pheasant	Food	Mar–Aug	Unharvested food plots provide food and hunting opportunities.
* Not all of the pesticide/herbicide product options will be needed every year.			

Table 3.2-5
Crop Production Practices
(information compiled from UC Cooperative Extension Cost Studies and DFG input)

Tomato Production Activities			
		Date Range	**Special Considerations**
Groundwork (land preparation)		Mar–Apr	not typical in Yolo Bypass due to winter flooding
Fertilization		April–May	at planting
Planting		April–May	to meet contracted weekly delivery schedules
Fertilization		April–May	side dress at lay by and during planting
Irrigation		Apr–Sept	sprinkler to establish, then furrow
Fertilization		April–Aug	
Harvest		June–Sept	
***Pesticide/ Herbicide Product Options**	**Target Pest**	**Date Range**	**Special Considerations**
Roundup	Weeds	Jan	not typical in Yolo Bypass due to winter flooding
Vapam	Weeds	Feb–May	before planting
Devrinol / Telam	Weeds	Feb–May	Pre-emergent
Shadeout, Trilin, Sencor, Dual	Weeds	Feb–May	to seedlings and/or at lay by
Sevin 80	Flea Beetle	Feb–May	after seedling emergence
Sevin 5	Beetle / Cutworm	Feb–May	
Kocide / Dithane	Bacterial Speck	Feb–May	
Sulfur Dust	Russet Mite	Feb–May	
Asana	General Insect Ctrl	Feb–May	
Confirm	Worm	Feb–May	
Bravo	Blight / Fruit Protect	June, Sept	
Ethrel	Fruit Ripening Agent	June–Sept	prior to harvest
Possible Wildlife Benefited	**Use**	**Date Range**	**Special Considerations**
Swainson's Hawk	Foraging	May–June	Discing for preparation of fields exposes rodents and insects.

* Organic tomatoes are also grown in the YBWA with similar production activities to those listed below, except all practices comply with the USDA National Standards for Organic Food. For more information visit www.ams.usda.gov/nop/NOP/standards.html.

* Not all of the pesticide/herbicide product options will be needed every year.

Table 3.2-5
Crop Production Practices
(information compiled from UC Cooperative Extension Cost Studies and DFG input)

Wheat Production Activities			
		Date Range	**Special Considerations**
Groundwork (land preparation)		Aug–Oct	
Pre-Plant Fertilization		Aug–Oct	preplant
Planting		Oct–Dec	
Irrigation		April	
Fertilization		Oct–Dec, Feb	at planting & during growing season
Harvest		May–July	
***Pesticide/ Herbicide Product Options**	**Target Pest**	**Date Range**	**Special Considerations**
2, 4-D	Winter Weeds	Feb	
Possible Wildlife Benefited	**Use**	**Date Range**	**Special Considerations**
Ducks & Geese	Food	Oct–May	Birds foraging on green feed may affect yield.
Waterfowl, Pheasant	Nesting Habitat	April–July	

* Wheat Production on the Yolo Bypass has occurred in extended drought periods. Currently wheat is not in the crop rotation.
* Not all of the pesticide/herbicide product options will be needed every year.

Oat Hay Production Activities			
		Date Range	**Special Considerations**
Groundwork (land preparation)		Sept–Oct	
Pre-Plant Fertilization		Oct	
Planting		Oct–Nov	
Irrigation		Mar–May	
Harvest		May–June	
***Pesticide/ Herbicide Product Options**	**Target Pest**	**Date Range**	**Special Considerations**
2, 4-D	Winter Weeds	April	not typical on the Yolo Bypass
Possible Wildlife Benefited	**Use**	**Date Range**	**Special Considerations**
Egrets, Herons, Swainson's Hawk	Food	Summer	irrigation provides rodent & insect food sources
Swainson's Hawks, Egrets, Heron, Crows	Food	May–Aug	haying process provides food

* Not all of the pesticide/herbicide product options will be needed every year.

Table 3.2-5
Crop Production Practices
(information compiled from UC Cooperative Extension Cost Studies and DFG input)

Rye Grass Hay Production Activities			
		Date Range	**Special Considerations**
Pre-Plant Fertilization		Sept–Nov	
Planting		Sept–Nov	
Irrigation		Sept–Apr	quick applications to keep soil moist
Fertilization		Dec–Feb	after grazing or 1st cut
Harvest		Jan–Apr	75 days to 1st cut, then on 28–40 day cycle
***Pesticide/ Herbicide Product Options**	**Target Pest**	**Date Range**	**Special Considerations**
Possible Wildlife Benefited	**Use**	**Date Range**	**Special Considerations**
Waterfowl, pheasant, Northern Harrier	Nesting Habitat	April–July	

* Rye Grass Hay is grown occasionally on the grazing lands in years when there is more vegetation than can be grazed in a timely manner. This hay is typically used by the tenant and no rent is charged above normal grazing rents, except where noted in Annual Crop Plans.
* Not all of the pesticide/herbicide product options will be needed every year.

Grain Sorghum (Milo) Production Activities			
		Date Range	**Special Considerations**
Groundwork (land preparation)		Mar–May	
Planting		Apr–June	
Irrigation		May–Aug	
Fertilization		May–Aug	
Harvest		Sept–Nov	dependent on grain moisture content
***Pesticide/ Herbicide Product Options**	**Target Pest**	**Date Range**	**Special Considerations**
2, 4-D	Weeds	May–Aug	dependent on plant height
Atrazine	Weeds	Apr–Aug	for grasses and broadleaves
Possible Wildlife Benefited	**Use**	**Date Range**	**Special Considerations**
Upland Game	Cover & Food		Ring-necked Pheasant & Mourning Dove
Ducks, Geese, Shorebirds, Sandhill Cranes	Habitat		During post-harvest flooding

* Not all of the pesticide/herbicide product options will be needed every year.

Table 3.2-5
Crop Production Practices
(information compiled from UC Cooperative Extension Cost Studies and DFG input)

Grazing Activities (compiled for 300 head cow/calf operation)

		Date Range	Special Considerations
Winter Range Feeding		Nov–Apr	
Summer Feeding		May–Oct	
Irrigation		May–Oct	for winter weed control
Calving			
Breeding		Dec–Feb	
Sale of Culls (Bulls & Cows)		March	time frames vary based on tenant's operation
Sale of Calves		May	time frames vary based on tenant's operation
Sale of Yearling Heifers		Sept	time frames vary based on tenant's operation
***Pesticide/ Herbicide Product Options**	**Target Pest**	**Date Range**	**Special Considerations**
Possible Wildlife Benefited	**Use**	**Date Range**	**Special Considerations**
Establishment of Native Forb Communities and vernal pools			managing grazing to remove non-native grasses and control unwanted vegetation in wetlands
Mallard & Ring-necked Pheasant	Nesting		can be managed as dense nesting cover
Geese & Sandhill Cranes	Food		can be grazed as low pasture

* Not all of the pesticide/herbicide product options will be needed every year.

3.3 CLIMATE, GEOLOGY, TOPOGRAPHY, AND SOILS

This section describes the climate, geology, topography, and soil resource characteristics of the Yolo Bypass Wildlife Area (Wildlife Area). Agricultural soil resources (e.g., Prime Farmland) are described in Section 3.2, "Agricultural Resources and Land Uses." Geomorphology, hydrology, and water quality are described in Section 3.4.

The following text was developed through a review of existing scientific literature and Yolo Bypass Wildlife Area staff information. These sources provided information on climate, geology, topography, and soils characteristics throughout the Yolo Bypass Wildlife Area.

3.3.1 CLIMATE

Yolo County has a Mediterranean climate characterized by hot, dry summers and temperate, wet winters. However, the county receives a marine air influence from the Delta regions to the south that moderates the temperature extremes of the Central Valley. During the summer months (June–August), average daily high temperatures are in the mid-90s Fahrenheit (ºF) and average daily low temperatures are in the mid-50s. During the winter months (December–February), average high temperatures are in the 50sºF and average lows are 38–40ºF. Virtually all precipitation falls as rain, between November and April in most years. Annual rainfall typically ranges from 16 to 22 inches, and the average annual air temperature is 60–62°F. The frost-free season is 230–280 days throughout the year (Yolo County Planning Department 2005).

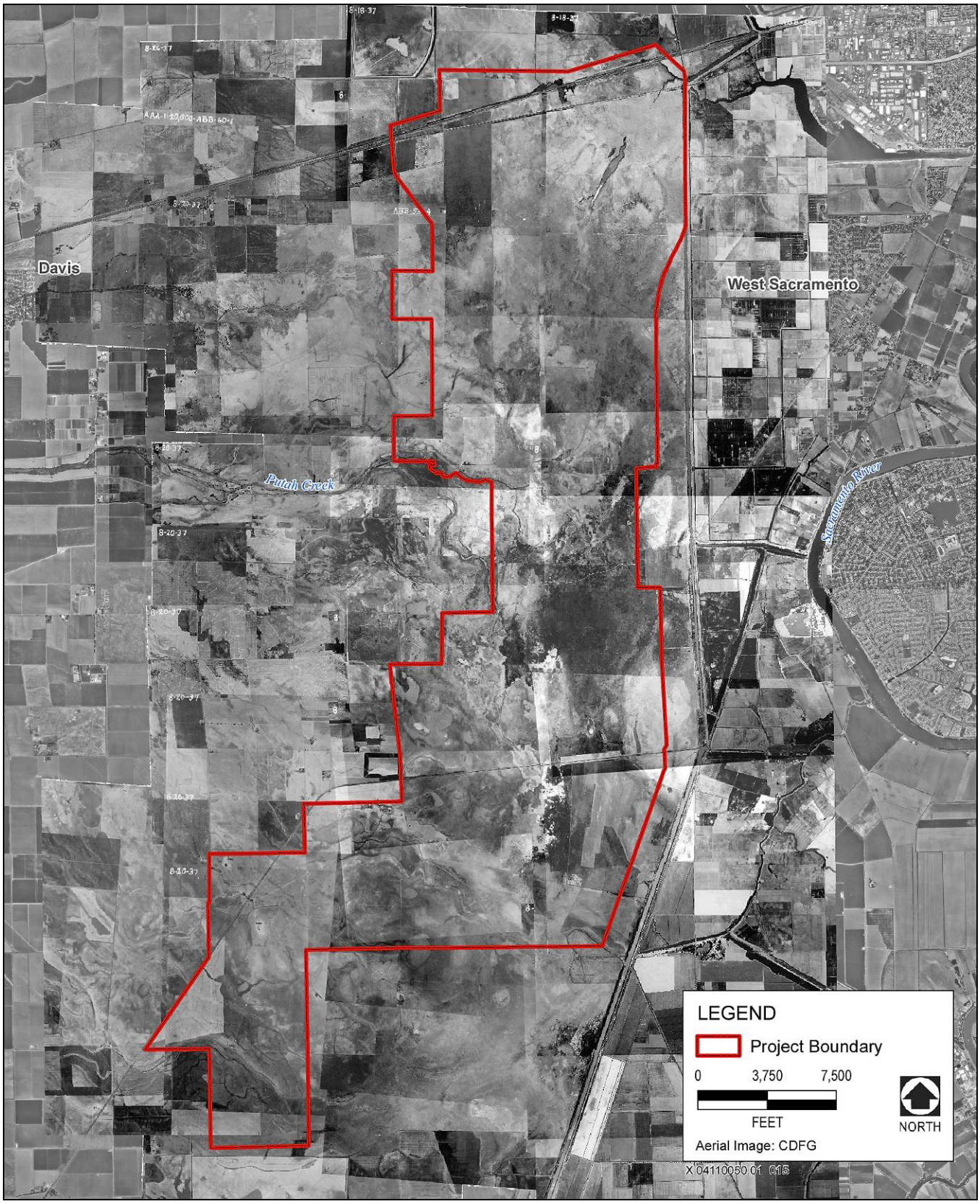
3.3.2 GEOLOGY

The Yolo Bypass Wildlife Area is located in the Yolo Basin on the west side of the Sacramento Valley, in the Great Valley geomorphic province of California. The Sacramento Valley forms the northern half of the Great Valley, which fills a northwest-trending structural depression bounded on the west by the Great Valley Fault Zone and the southern Coast Ranges, and to the east by the Sierra Nevada and the Foothills Fault Zone. Most of the surface of the Great Valley is covered with alluvium of Holocene and Pleistocene age, composed primarily of sediments from the Sierra Nevada and the Coast Ranges that were carried by rivers and deposited on the valley floor.

The Wildlife Area is underlain by Holocene-age (i.e., the last 10,000 years) Basin deposits, composed of fine-grained silt and clay, which overlie older Pleistocene-age alluvial fan deposits (Riverbank Formation) of the Sacramento River (Helley and Harwood 1985, Wagner et al. 1987). These periods of deposition correlate with periods of glaciation in the Sierra Nevada, the rise and fall in sea level, and climatic change. Additional information regarding the geomorphology and hydrology of the Yolo Wildlife Area is provided in Section 3.4.

3.3.3 TOPOGRAPHY

Historic landforms in the Yolo Wildlife Area include the floodplains and natural levees along the Sacramento River; the historic delta and distributary channels of Putah Creek (as depicted in Exhibit 3.3-1); the closed depression formations of the Putah Creek Sinks; the edge of the alluvial fan of Putah Creek extending into the Basin; and the Yolo Basin rims within and around its borders. Green's Lake in the northern portion of the present-day Wildlife Area appears that it could be an oxbow lake that may have been formed over time as erosion and deposits of soil changed the course of the Sacramento River and perhaps Putah Creek. Historic maps seem to depict a connection between the north fork of Putah Creek, Green's Lake, Lake Washington, and perhaps the Sacramento River.



Source: Department of Fish and Game

Yolo Bypass Wildlife Area Aerial Photo (1937) **Exhibit 3.3-1**

The alluvial fans, natural levees, and floodplains including the sinks of Putah Creek are composed of coarse sediment deposited by the flowing water of periodic overbank flooding of the Sacramento River and Putah Creek. The basins and basin rims are composed of fine sediment deposited by the ponded water of rainfall and flood overflows.

The current topographic features and landforms within the Wildlife Area are largely a product of anthropogenic alterations to the natural system. The construction of dams (upstream in the Sacramento River watershed and in Putah Creek) and levees, management of water releases, and grading of topography for purposes of conversion to agricultural lands has resulted in substantial changes to the current topography. Currently elevations range from approximately 5 feet above sea level at the bank of the East Toe Drain to 15 feet above sea level at the western edge of the Tule Ranch Unit. Primary topographic features now include human-made levees, trestles, and berms. Remaining natural topographic features include closed landform depressions, (e.g., Putah Creek Sinks, natural seasonal wetlands, vernal pools), remnant alluvial fan features that drain the western portion of the Tule Ranch to the East Toe Drain, and Green's Lake (i.e., remnant oxbow lake). Additional information regarding physical processes that formed the topographic features and landforms throughout the Yolo Bypass Wildlife Area is provided in Section 3.4, Geomorphology, Hydrology, and Water Quality."

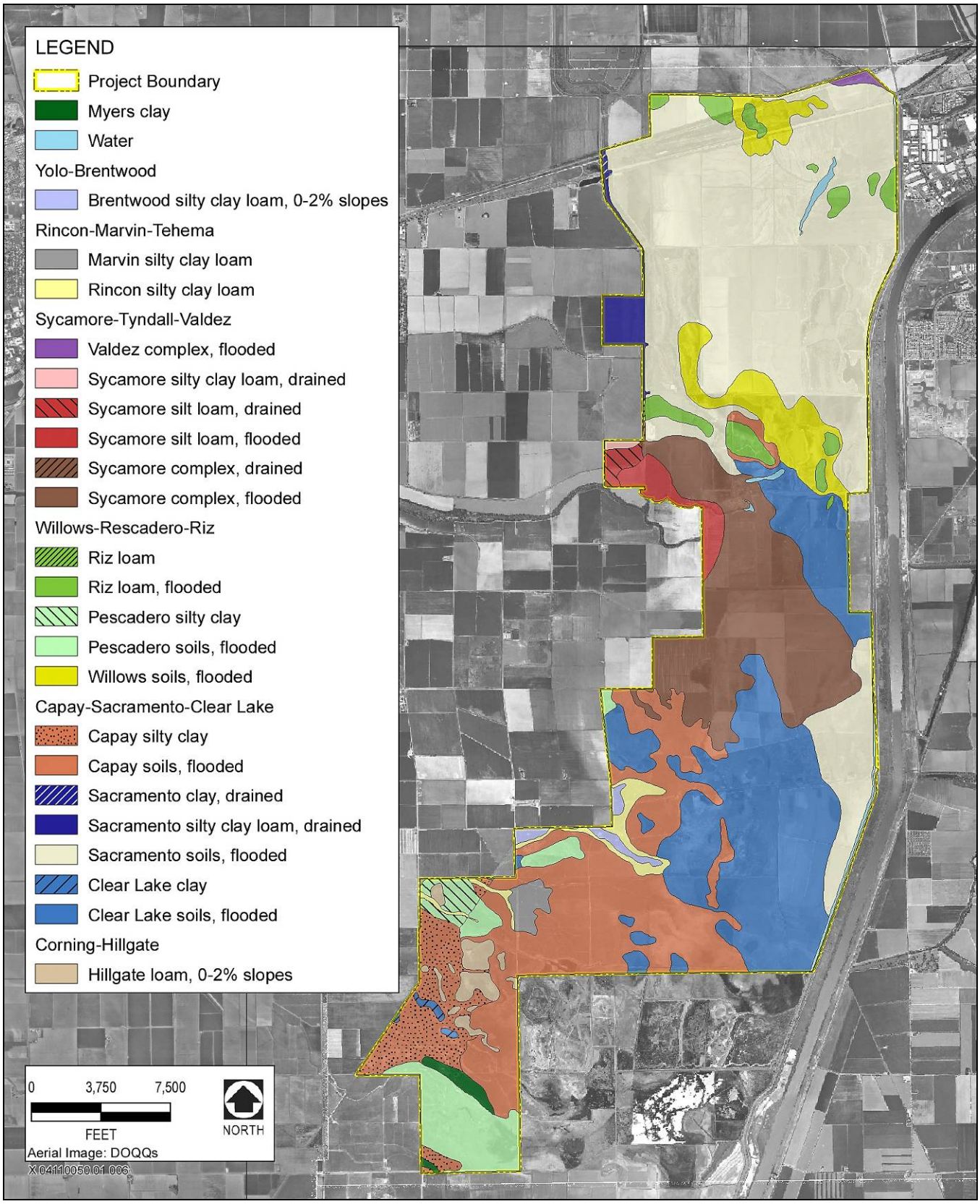
3.3.4 SOILS

Six general soil associations have been identified in the Wildlife Area (Natural Resources Conservation Service 1972) (Exhibit 3.3-2). A soil association is a landscape that has a distinctive proportional pattern of soil types. It normally consists of one or more major soils and at least one minor soil; it is named for the major soils. The soils in one association may occur in another, but in a different pattern. Table 3.3-1 summarizes the natural vegetation and agricultural/land use characteristics of the soil associations identified in the Wildlife Area (Andrews 1972; Yolo County Planning Department 2005). A brief description of each soil association is provided below. In the NRCS characterization of each association described below, the terms for texture apply to the surface layer.

Table 3.3-1
Soil Association Characteristics of the Yolo Bypass Wildlife Area

Soil Association	Natural Vegetation Characteristics[1, 2]	Agricultural and Other Land Use Characteristics[3]
Yolo-Brentwood	Annual grasses and forbs	Wide range of irrigated and nonirrigated crops
Rincon-Marvin-Tehema	Annual grasses and forbs with scattered oaks	Wide range of irrigated and nonirrigated crops
Sycamore-Tyndall-Valdez	Annual grasses and forbs	Irrigated crops and pasture and dry-farmed grain
Willows-Pescadero-Riz	Annual grasses, forbs, salt-tolerant plants	Alkali-tolerant irrigated crops and pasture and dry-farmed grain; wildlife habitat
Capay-Sacramento-Clear Lake	Annual grasses and forbs	Irrigated crops and pasture and dry-farmed grain
Corning-Hillgate	Annual grasses and forbs with scattered oaks and brush in places	Dry-farmed grain, pasture, rangeland, recreation, wildlife habitat

[1] Current vegetation of uncultivated and otherwise undisturbed soils; historic vegetation (prior to 1800s) characteristics would have been different, likely including native grasses and forbs, wetland plants and riparian trees and shrubs.
[2] Many of these soils have wetland soil characteristics (e.g., hydric).
[3] Primary uses may have changed in some of the associations as a result of reclamation and development of the irrigation system.
Sources: Andrews 1972: Yolo County Planning Department 2005



Source: SSURGO 2005, EDAW 2005

Soils Associations in the Yolo Bypass Wildlife Area **Exhibit 3.3-2**

YOLO-BRENTWOOD ASSOCIATION

NRCS characterizes the Yolo-Brentwood Association as a "well-drained soil with nearly level topography, characterized by silt loams to silty clay loams, on alluvial fans." These soils formed in alluvium derived from sedimentary rock. In uncultivated areas the vegetation is typically annual grasses and forbs. Minor soils of this association are the Myers, Reiff, Sycamore, and Zamora. The soils of this association are used chiefly for irrigated orchards, row crops, and field crops. The soils are also used for truck crops, irrigated pasture, dry-farmed grain, recreation areas, and wildlife habitat.

RINCON-MARVIN-TEHAMA ASSOCIATION

NRCS characterizes the Rincon-Marvin-Tehama Association as "well-drained and somewhat poorly drained soil with nearly level topography, characterized by silty clay loams to loams, and found on alluvial fans and basin rims." These soils formed in alluvium derived from sedimentary rock. They have a subsoil of clay loam, silty clay loam, or silty clay. In areas not cultivated, the vegetation is mainly annual grasses and forbs, but Valley oaks may grow in scattered areas. Marvin soils are somewhat poorly drained and Tehama soils are well drained. Minor soils of this association are the Capay, Clear Lake, and Hillgate. The soils of this association are used chiefly for irrigated orchards, row crops, and field crops. The soils are also used for dry-farmed grain, for recreation areas, and as wildlife habitat.

SYCAMORE-TYNDALL-VALDEZ ASSOCIATION

This soil association occurs within the alluvial zone of Putah Creek. Most of the productive agricultural fields on the Wildlife Area contain these soils. NRCS characterizes the Sycamore-Tyndall-Valdez Association as "somewhat poorly drained soil with nearly level topography, characterized by very fine sandy loams to silty clay loams, on alluvial fans." These soils formed in alluvium derived from mixed sources. In some areas drainage has been improved and the water table has been lowered. In uncultivated areas the vegetation is annual grasses and forbs. Lang is a minor soil in this association. Also included in this association are small, alkali-affected areas and a few small areas that have a silty clay substratum. The soils of this association are used chiefly for row crops, hay crops, orchards, irrigated pasture, and dry-farmed grain. The soils are also used for recreation areas and as wildlife habitat.

WILLOWS-PESCADERO-RIZ ASSOCIATION

NRCS characterizes the Willows-Pescadero-Riz Association as "poorly drained soil on nearly level topography, characterized by saline-alkali silty clay loams to clays, and located in basins." These soils formed in alluvium derived from mixed and sedimentary rocks. In uncultivated areas the vegetation is annual grasses, forbs, salt grass, pickleweed, and other salt-tolerant plants. Minor soils of this association are the Lang, Laugenour, and Sacramento. The soils of this association are used chiefly for alkali-tolerant, irrigated row crops, field crops, and pasture plants, and as wildlife habitat. The soils are also used for dry-farmed grain and field crops, dryland pasture, and recreation areas.

CAPAY-SACRAMENTO-CLEAR LAKE ASSOCIATION

NRCS characterizes the Capay-Sacramento-Clear Lake Association as "moderately well drained to poorly drained soil located on nearly level topography, characterized by silty clays and clays, and located on basin rims and in basins." These soils formed in alluvium derived from sedimentary rock under moderately good to poor drainage. In uncultivated areas the vegetation is annual grasses and forbs. Capay soils are moderately well drained, and Sacramento and Clear Lake soils are poorly drained. Minor soils of this association are the Lang, Laugenour, and Sacramento. Soils may be subject to ponding. The soils of this association are used chiefly for irrigated row crops, truck crops, field crops, dry-farmed field crops, and pasture. The soils are also used for recreation areas and as wildlife habitat.

CORNING-HILLGATE ASSOCIATION

NRCS characterizes the Corning-Hillgate Association as "well-drained soil on gently sloping to moderately steep topography, characterized by gravelly loams or loams, and located on terraces." These soils formed in alluvium derived from sedimentary rock and mixed sources. They have a very slowly permeable subsoil at a depth between 10 and 30 inches. The vegetation is chiefly annual grasses and forbs, although a few oaks can grow and patches of brush can also occur. The depth to the clay subsoil in both the Corning and Hillgate soils ranges from 10 to 30 inches. Minor soils of this association are the Positas, San Ysidro, and Sehorn. Also found in this association are a few areas of soil that are moderately deep over clay subsoil, and a few severely eroded areas where the clay subsoil is exposed. The soils of this association are used chiefly for dry-farmed grain, pasture, range, and recreation areas, and as wildlife habitat.

The suitability of the soils for particular agricultural uses and their farmland classification (e.g., Prime Farmland) is described in more detail in Section 3.2, "Agricultural Resources."

3.4 GEOMORPHOLOGY, HYDROLOGY, AND WATER QUALITY

This section describes the geomorphology, hydrology, and water quality conditions in the Yolo Bypass Wildlife Area. It provides an overview of the historical setting, including the principal natural and human-caused changes in the Yolo Basin/Bypass that have occurred over time. It also describes the key physical and chemical conditions of the Yolo Bypass that define the Yolo Bypass Wildlife Area's existing characteristics.

The following text was developed through a review of scientific literature and existing data sources, aerial photography, Yolo Bypass Wildlife Area staff information, and staff expertise. These sources provided information on the historic and existing geomorphic and hydrologic conditions and current water quality conditions in the Yolo Bypass Wildlife Area.

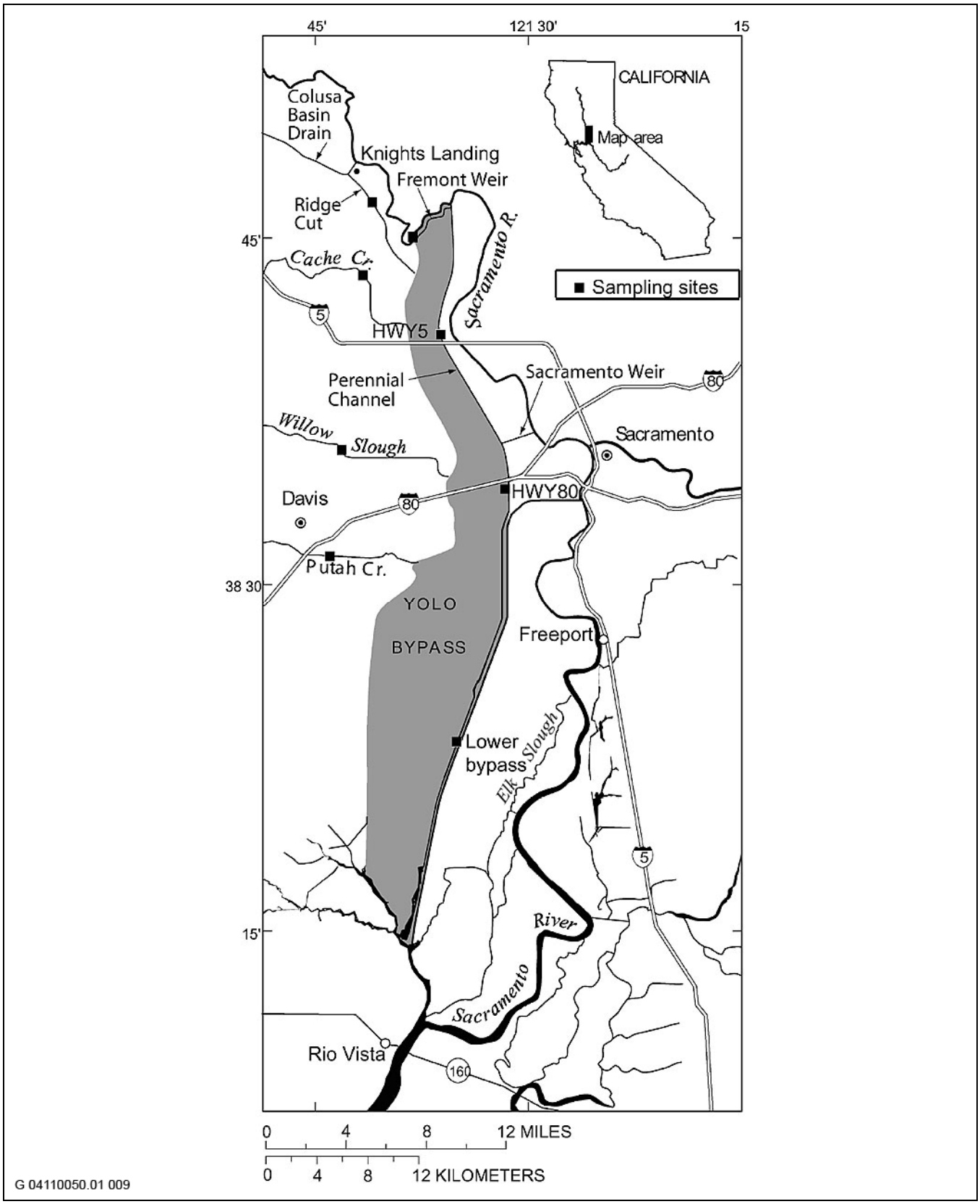
HISTORIC LANDSCAPE

The lower Sacramento River from Knights Landing to the Delta, along with its adjacent flood basins (Yolo Basin to the west and the American Basin to the east) formed a single geomorphic system shaped by tectonic subsidence, flood borne sedimentary processes, and a rising sea level following the end of the last Ice Age 10,000 years ago. The broad natural levees along the river were built up by the deposition of coarser sediments deposited during floods and supported a continuous miles-wide corridor of mixed riparian and valley oak riparian forests in the floodplain meander belt, transitioning to extensive tule marsh extending from the basins to the estuary, as described below. As the river meandered and banks eroded, large overhanging trees along the riverbank would fall into the channel creating structurally complex riverine habitat. This dynamic landscape provided high quality habitat for anadromous fish migrating between the estuary and the upper Sacramento River and for millions of migratory and resident birds and large and small mammals.

Geomorphology

The historic Yolo Basin (Basin) was a natural depression formed on the Sacramento Valley floor after the last Ice Age. It was defined to the north and east by the natural levees of the Sacramento River and its distributary channels, on the west by the edge of the coalesced alluvial fans of Putah Creek and Cache Creek, and to the south by the tidal tule marshes of the Sacramento River Delta (see Exhibit 1-3). The trough of the Basin was about 12 feet lower than the tops of the adjacent natural levees and was isolated from the river except during larger flood events that overtopped the natural levees (Phillip Williams and Associates 2005). The area most susceptible to overtopping was the reach affected by backwater from the Feather River, in the vicinity of the present Fremont Weir, as shown by Exhibit 3.4-1. Although overtopping of the natural levees in this area would occasionally form 'crevasses' that would erode and redistribute sediments, scouring was insufficient to create distributary channels through the Basin. Only where this influence was felt at the vicinity of Freeport (see Exhibit 3.4-1) would permanent crevasses form in the natural levee of the Sacramento River allowing the formation of stable distributary channels like Elk Slough (Exhibit 3.4-1).

The trough of the Basin therefore did not function as a true floodplain that directly interacted with the Sacramento River as it rose and fell during the winter and spring. Instead it formed a vast mosaic of wetlands that transitioned from seasonal wetlands in the north, through willow thickets, tule marshes, and backwater ponds, to the freshwater tidal marshes and slough channels of the estuary to the south. The wetlands were seasonally fed by runoff and groundwater discharges from the Sacramento River and from Putah and Cache creek alluvial fans to the west. The Basin was intermittently inundated by large flood overflows from the Sacramento, Feather, and American rivers and from Putah and Cache creeks. Based on historic maps it appears that permanent wetlands



Source: Schemel 2002

Current Map of Yolo Bypass **Exhibit 3.4-1**

formed in low-lying areas characterized by a high water table. Willow thickets grew around the margins and at the edges of the alluvial fans from about 5 to 10 feet above sea level. An extensive tule marsh occupied the Basin trough below elevations of about 5 feet above sea level, blending into the tidal tule marsh above Cache Slough (Exhibit 1-2) at elevations of about 3 feet above sea level. The non-tidal marsh functioned differently from the tidal portion as it was mapped with no distinct natural drainage channels and probably functioned with lower flows gradually filtering through the vegetation towards the estuary. This type of wetland would tend to accumulate alluvial sediment, gradually rising in elevation, and isolating floodplain ponds on its periphery.

Hydrology

The hydrology of the Sacramento River is dominated by the Mediterranean climate of the region with wet winters, dry summers, and long multi-year periods of extreme wet and drought conditions. The high peaks of the Sierra Nevada intercepted much of the moisture coming off the ocean and stored it as snow and ice that melted gradually, generating cold rivers that flowed throughout the dry summers. During periods of high snowmelt and rainfall, much of the Central Valley became inundated, forming an extensive inland sea that took months to drain downstream to the Bay-Delta system. In moderate flood years, the river frequently overtopped it banks spilling into the Yolo Basin. The Basin likely remained inundated in the southerly portions of the Basin until late spring. During the dry season, river flows were greater than 5,000 cubic feet per second (cfs) (Phillip Williams and Associates 2006).

The Sacramento River historically was the largest watercourse affecting the Yolo Basin from the north and east (Central Valley Habitat Joint Venture 1993). Cache Creek, Putah Creek, and Willow Slough were the major tributaries inflowing to the basin from the west. Flows slowly drained towards the south through a vast array of wetlands and non-tidal marshes into the tidal marshes of the north Delta. Permanent bodies of water persisted in the Cache Creek Sink and Putah Creek Sinks.

Historically, Putah Creek frequently overflowed its banks during high flow events in winter and spring (Central Valley Habitat Joint Venture 1993). Elevated ground water elevations within the Putah Basin contributed to seasonal floods that resulted in a meandering planform (i.e., condition of a stream as seen in aerial view) with a gently sloping alluvial fan that formed as a result of accumulated sedimentary deposits. Along the western edge of the Sacramento floodplain, Putah Creek meandered towards depressions (“sinks”) along the base of the Yolo Basin. This area is currently referred to as the Putah Creek Sinks. Putah Creek historically supplied substantial amounts of water to tule marshes within the Basin. Before construction of the Monticello Dam and the subsequent water regulation, the streams annual discharge into the Basin was approximately 359,000 acre-feet (Central Valley Habitat Joint Venture 1993). During dry flows, the reduced inflows and discharging groundwater resulted in intermittent deep pools within its lower reaches.

The Cache Creek Basin was geologically divided into upper, middle, and lower reaches by Clear Lake, the Vaca Range and the Sacramento Valley floor (Central Valley Habitat Joint Venture 1993). Little is known about the pre-European condition of lower Cache Creek, however, flows probably ranged from very little runoff during the summer months to approximately 40,000 cfs during the winter and spring events (Central Valley Habitat Joint Venture 1993). Historically, the creek transported large amounts of sediment to the valley floor, defining the northern boundary of the Yolo Basin, as its waters disappeared most of the year into the Cache Creek Sink.

Willow Slough has a small watershed and historically consisted of intermittent swales and sloughs which drained to the Yolo Basin between Putah and Cache creeks. The slough was fed by groundwater about four miles north of Putah Creek and terminated several miles southeast of the Cache Creek Sink.

HUMAN CHANGES TO THE LANDSCAPE

Modifications to Geomorphology

Regular flooding in the Sacramento Valley led to the construction of the Sacramento Flood Control Project that converted the natural Yolo Basin into the weir regulated Yolo Bypass. The history of this flood control system is discussed in Section 3.6, "Cultural Resources."

The Bypass is 41 miles long and is surrounded completely on the east and partially on the west by levees constructed by the U.S. Army Corps of Engineers (USACE) (Yolo Basin Foundation 2001). Levee construction began in 1917 and the weirs were completed in 1917 (Sacramento Weir) and 1924 (Fremont Weir). The designs of the levees meet the calculated water-surface profile of the designed flow, with an extra buffer for freeboard. A small segment along the western boundary of the Bypass between Putah Creek and County Road (CR) 155 does not have a constructed levee due the sufficient height of the natural ground elevation.

In 1963, a deep water ship channel was constructed along the eastern edge of the Bypass. The material excavated for this channel was used to construct a second levee along the west side of the channel from the I-80 causeway to the southern tip of Prospect Island. This new levee was higher than the existing flood control levee, and thus serves as the new east levee for the Bypass. The construction of the ship channel decreased the designed conveyance capacity of the Bypass and increased the impacts of smaller flood events (Yolo Basin Foundation 2001).

There are a variety of small interior levees and berms constructed for local agricultural development that partially hinder the flood conveyance of the Bypass. These features have been used to prevent the inundation of particular areas from tidal fluctuations and small floods. The grading of land for such features is controlled by the Reclamation Board. Examples of major interior levees include the north levees of Little Holland Tract and Liberty Island.

In addition, the construction of causeways and bridge crossings along I-80, I-5, portions of the abandoned Sacramento North Railroad (SNRR) and the Southern Pacific Railroad (SPRR) also affected flood conveyance in the Bypass.

The flows in the Bypass produced from the 1986 and 1997 floods roughly equaled the capacity of the Bypass. Analysis of peak flows indicated that both of these floods approximately equaled that of a 70-year event (U.S. Army Corps of Engineers 1991; Yolo Basin Foundation 2001). Water surface elevations during the 1986 flood were only 2 to 3 feet below the crest of the east levee and 2 to 4 feet above the design water surface profile in some locations (U.S. Army Corps of Engineers 1996). In both the 1986 and 1997 floods, areas west of the Bypass along the unleveed section were inundated. As a result of these recent floods, some of the levees have incurred substantial wave damage including slipping and the creation of erosional shelves.

MODIFICATIONS TO HYDROLOGY

Flooding of newly developed agricultural land, aggravated by the cumulative effects of 19th century hydraulic mining led to the implementation of large-scale flood control projects within the entire Sacramento Basin (Central Valley Habitat Joint Venture 1993). In 1911, the State Reclamation Board was assigned to coordinate a basin wide plan for flood control for the entire Sacramento Valley. This project included the construction of a bypass capable of delivering 500,000 cfs of water through Cache Slough in the north delta and increasing the Sacramento River capacity to 100,000 cfs from Sacramento to Cache Slough (Central Valley Habitat Joint Venture 1993). Levees were constructed along both sides of the Yolo Bypass with project completion in 1948. The Yolo Bypass is the largest flood control bypass in California. It prevents flooding of the City of Sacramento and other nearby cities and farmland by diverting floodwaters through the Fremont and Sacramento Weirs and

routing them directly to the Sacramento Delta, just north of Rio Vista, as shown by Exhibit 3.4-1 (Schemel et al. 1996).

The Central Valley Project (CVP) (1938) and the State Water Project (SWP) (1951) were also designed as part of the Sacramento Valley Flood Control system (Central Valley Habitat Joint Venture 1993). Their purpose was to improve the imbalance in water supply between the northern and southern parts of the state. This project included 20 reservoirs and 1,100 miles of canals in the Sacramento, Trinity, Feather, American, and San Joaquin river basins. The CVP featured reservoirs created by Shasta Dam on the Sacramento River, Whiskeytown Dam on Clear Creek, and Folsom Dam on the American River. The SWP featured the reservoir at Oroville on the Feather River.

In 1957 the U.S. Bureau of Reclamation constructed Monticello Dam on Putah Creek, located 10 miles upstream of Winters, California. The reservoir (Lake Berryessa) has a capacity of 1.6 million acre-feet, which is approximately four times the average annual runoff of Putah Creek. This large capacity has decreased the 100-year peak flow from 90,000 cfs (pre-dam) to 32,300 cfs (post-dam). The large decrease in peak flows and annual discharge has decreased sediment influx and capacity, essentially dried out the Putah Creek Sinks and prevented additional alluvial fan formation. Since the 1950's, there has been no significant change in channel alignment downstream of Lake Berryessa (U.S. Army Corps of Engineers and CALFED Bay-Delta Program 2002).

Cache Creek drains approximately 1,290 square miles as it travels nearly 80 miles from its natural outlet from Clear Lake to its confluence with the Yolo Bypass. Flows have been controlled by the Indian Valley Reservoir on the north fork of Cache Creek since 1974 and by the Clear Lake Dam since 1913. Gravel mining, extensive grazing, and naturally erodible soils in the watershed contribute to a high sediment yield with an annual average suspended-sediment load of approximately 1.5 million tons per year (Jones et al 1972). The approximately two square-mile Cache Creek Settling Basin (constructed in 1937) was designed to catch this sediment before it entered the Yolo Bypass. In 1993 the USACE completed a reconstruction of the Settling Basin by enlarging it and removing several million cubic yards of sediment. Before this reconstruction, accumulated sediment had filled the Settling Basin, allowing substantial quantities of sediment to reach the Bypass (Central Valley Habitat Joint Venture 1993).

The Colusa Drain was connected to the Bypass via the artificial overflow channel Knights Landing Ridge Cut (Yolo Basin Foundation 2001). The Drain has a watershed area of 130 square miles, receiving input from all the creeks flowing from the Coast Range between Knights Landing and Stony Creek. The Drain transports drainage and irrigation water nearly 70 miles between Stony Creek and Knights Landing along the west side of the Sacramento River (Exhibit 3-2). The drain released water to the Sacramento River from a set of gates (constructed 1930) that maintain a constant upstream (drain side) water elevation of 25 feet (0 ft USACE datum = -3 ft MSL). The design allows for a backwater condition along the entire length of Knights Landing Ridge Cut which facilitates water for irrigation. To prevent water from flowing into the Bypass, a berm is constructed at the Bypass end of Knights Landing Ridge Cut. Flows entering the Sacramento River through the Colusa Basin Drain are measured by the DWR. When flows on the Sacramento River increase to 25 feet, the Colusa Drain closes and flows move through the Knights Landing Ridge Cut to the Bypass. These flows are not gaged but DWR does operate a second gage about halfway down the Drain where it crosses Highway 20.

3.4.1 EXISTING GEOMORPHOLOGY

SEDIMENT INPUT INTO THE YOLO BYPASS

Wright (2004) studied the changing trends of sediment yield within the Sacramento Basin for the period from 1957 to 2001. By examining the discharge and sediment yields on the Sacramento River upstream and downstream of the Fremont and Sacramento Weirs, which allow sediments to enter the Yolo Bypass, he was able to make the following conclusions:

- There is a very high probability of a decreasing trend in suspended-sediment discharge for a given flow.
- The annual suspended sediment yield has decreased by one-half from 1957 to 2001.
- During the largest flood events, peak sediment concentrations have decreased with time.
- The three largest reservoirs in the watershed have accumulated a mass of sediment of the same order of magnitude as the decreases in suspended-sediment yield from 1957 to 2001.

It has been suggested that this decreasing trend in suspended-sediment discharge is a result of reservoir sedimentation, bank protection measures, and the gradual depletion of stored hydraulic mining sediments. Although the data used to make these conclusions have been derived from the main stem of the Sacramento River; it is reasonable to suggest that the same trends will hold for sediment input into the Yolo Bypass through the Fremont and Sacramento Weirs.

If the balance between sediment supply and transport capacity has reached equilibrium, there should be a minimal change in sediment input into the Bypass in the future. However, changes in factors such as logging, levees, urbanization, and agricultural practices can have the potential to increase future sediment yield (Wright 2004).

3.4.2 EXISTING HYDROLOGY

SURFACE WATER HYDROLOGY

Current Operation of the Yolo Bypass

The Yolo Bypass provides a direct path from the confluence of the Sacramento and Feather Rivers and the Sutter Bypass to the Sacramento River Delta. Flow is diverted from the Sacramento River into the Bypass when the stage exceeds 33.5 feet (corresponding to 56,000 cfs at Verona). Diversion of the majority of Sacramento River, Sutter Bypass, and Feather River floodwaters to the Yolo Bypass from Fremont Weir controls Sacramento River flood stages at Verona. During large flood events, 80% of the Sacramento River flows are diverted into the Bypass. The Sacramento River at the Fremont Weir has natural levees on the unprotected right (south) bank, and out of bank flows disperse through a series of tree covered areas of higher ground dissected by distributary channels until reaching the upper end of the Fremont Weir. The high ground and distributary channels regularly shown on old maps of the area are considered natural apart from being maintained through the periodic removal of sand deposits by DWR.

The area between the Fremont Weir and the Sacramento River is one of high sediment deposition, as fast moving water from upstream meets slower moving water in the Yolo Bypass. Once water overtops the Sacramento River levees and the Fremont Weir, it flows into the Bypass. In high flow years, additional water can enter the Bypass via the Sacramento Weir. This weir is controlled so that flow can be released once the Sacramento River stage at Sacramento's I Street Bridge reaches 27.5 feet (corresponding to 98,000 cfs). Because the design flood capacity of the American River (115,000 cfs) is 5,000 cfs higher than that of the Sacramento River channel past downtown Sacramento, the Sacramento Weir is a critical component of the project to keep flood control project runoff at safe water levels. The Sacramento Weir and Yolo Bypass are designed and managed to divert an equivalent volume of water from the Sacramento River as that joining it downstream from the American River, to maintain equal flood levels either side of the American River confluence. In practice, during large flood events, approximately 15% of

the flow from the American River can pass upstream on the Sacramento River and enters the Sacramento Bypass (California Department of Water Resources 2003).

The weir gates are closed as rapidly as practicable once the stage at the weir drops below 25 feet. This provides "flushing" flows to re-suspend sediment deposited in the Sacramento River between the Sacramento Weir and the American River during the low velocity flow periods in that reach when the weir is open during the peak of the flood event (California Department of Water Resources 2003).

Once water has entered the Bypass it accumulates in the lower eastern side in the area occupied by the Tule Canal (from one mile south of the Fremont Weir to I-80) and the Toe Drain (from I-80 to Liberty Island). These constructed channels lie adjacent to the flood levees on the eastern boundary of the Bypass and collect water from the west side tributaries, primarily Knights Landing, Cache Creek and Putah Creek (Exhibit 3.4-2 depicts natural color bands from tributaries into the flooded Yolo Bypass). Water leaves the Yolo Bypass either via the Toe Drain or Liberty Cut at Prospect Slough via Shag Slough or over the southern end of Liberty Island to Cache Slough.

Flood Hydraulics of the Yolo Bypass

As part of the Sacramento River Flood Control Project, the flood conveyance of the Bypass has been defined for the 100-year flood event. By default, the design water surface profile is the standard by which any future land use modifications within the Bypass, to include those in the Yolo Bypass Wildlife Area, will be judged (U.S. Army Corps of Engineers 2003). The USACE is in the process of finalizing a two-dimensional hydraulic model (RMA2) of the Bypass for the purpose of assessing the impacts of proposed land use changes, such as ecosystem restoration within the Yolo Bypass Wildlife Area, on flood conveyance as well as cumulative impacts on flood conveyance (U.S. Army Corps of Engineers 2006). Typical Manning's n values and designs flows for future modeling of the Bypass are provided below. Manning's n values are relative values representative of roughness (resistance to the flow of water) in a channel due to vegetation or other features and are used to calculate measures of flow in rivers and creeks in terms such as velocity and river stage (elevation).

Table 3.4-1 displays the typical roughness conditions or Manning's n values representative of each land use during the mid-to-late winter flood season within the Bypass. These values were developed based on engineering judgment and model calibration (January 1997 flood) during the USACE's development of the hydraulic model of the Bypass (U.S. Army Corps of Engineers 2006). Roughness is also affected by the configuration patterns of vegetation. Trees grown in a linear fashion in line with predominant flows present less resistance than a line of trees grown perpendicular to the flow of flood waters.

Table 3.4-1
Land Uses and Flood Season Manning's n Values

Land Use	Manning's n Value
Open water	0.025
Fallow agricultural fields	0.030
Pasture	0.040
Native grass	0.045
Maintained levee slope	0.040
Tules	0.045
Mixed grassland/riparian	0.070
Riparian	0.085
Dense riparian	0.120
Bridge crossing	0.070

Source: U.S. Army Corps of Engineers 2006

Source: DWR 1998

Yolo Bypass Natural Color Bands **Exhibit 3.4-2**

Table 3.4-2 displays the boundary conditions for the hydraulic model during the design flood. Tributary inflows were computed by the USACE as the difference between the Bypass design flows upstream and downstream of a given tributary.

Table 3.4-2
Yolo Bypass Boundary Conditions

Inflow Boundary	Discharge (cfs)
Fremont Weir	343,000
Knights Landing Ridge Cut	19,000
Cache Creek (Settling Basin)	15,000
Sacramento Weir	100,000
Willow Slough Bypass	3,000

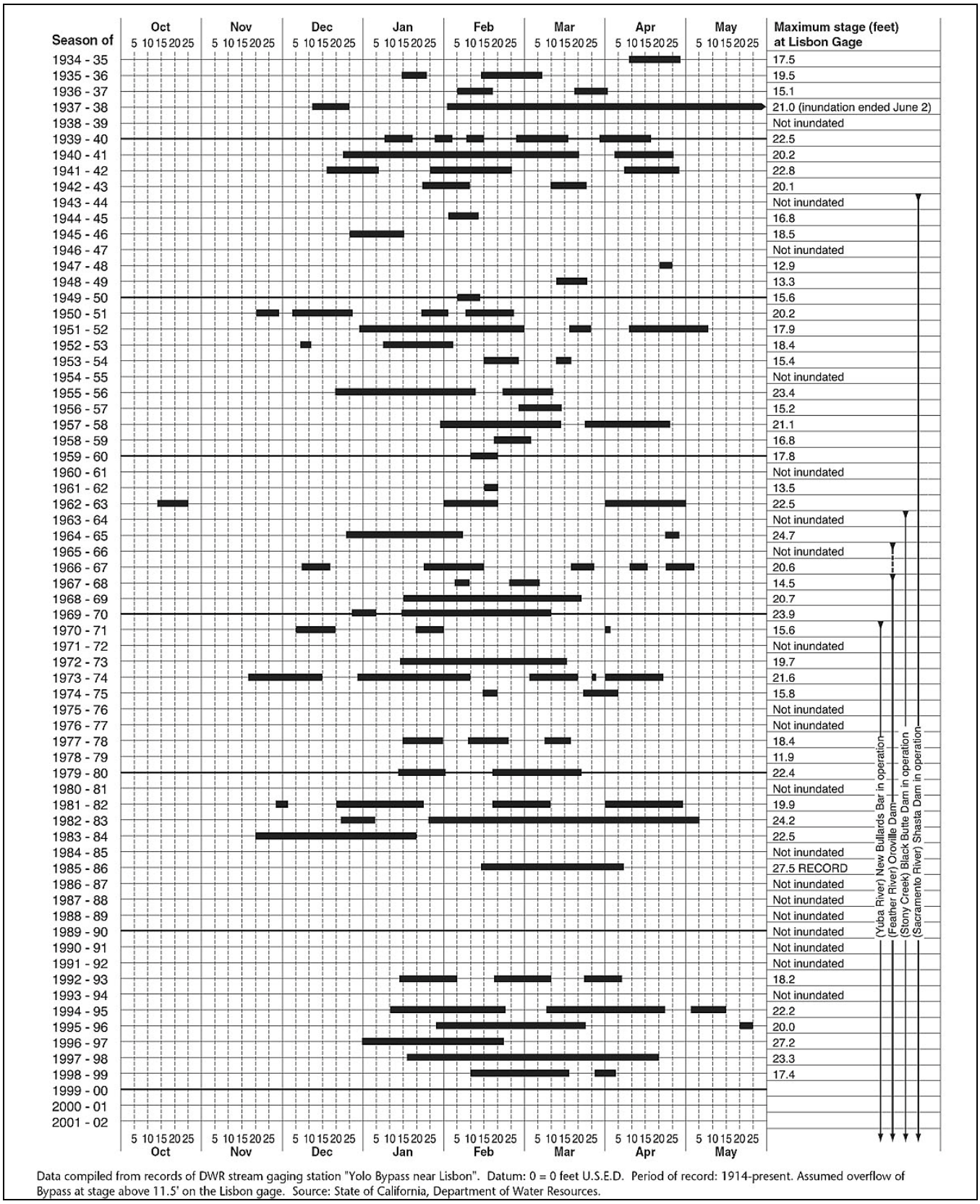
Source: U.S. Army Corps of Engineers 2006

Flood Inundation of the Yolo Bypass

In an effort to quantify the historical frequency, depth, and duration of inundation in the Bypass, stage data was analyzed from the Lisbon Weir. The Lisbon Weir is located in the Toe Drain in the southern section of the Bypass and DWR has recorded stage here since 1935. The stage at the gage site is tidally dominated and oscillates between 3–7 feet USACE (USACE datum). Flood flows entering the Bypass are initially contained within a small perennial channel at the northern end (that becomes the East Toe Drain further to the south), but begins to inundate the floodplain when the discharge exceeds 3,530 cfs or 11.5 feet (USACE datum). Exhibit 3.4-3 displays the times when the stage at Lisbon exceeded 11.5 feet during water years 1935–1999. Inundation occurred in 71% of the years and was uniformly distributed throughout this period. It should be noted that the record number of consecutive years with and without inundation, six years each, both occurred during the period from 1985–1999, which may indicate increased variability in flood hydrology during the recent period.

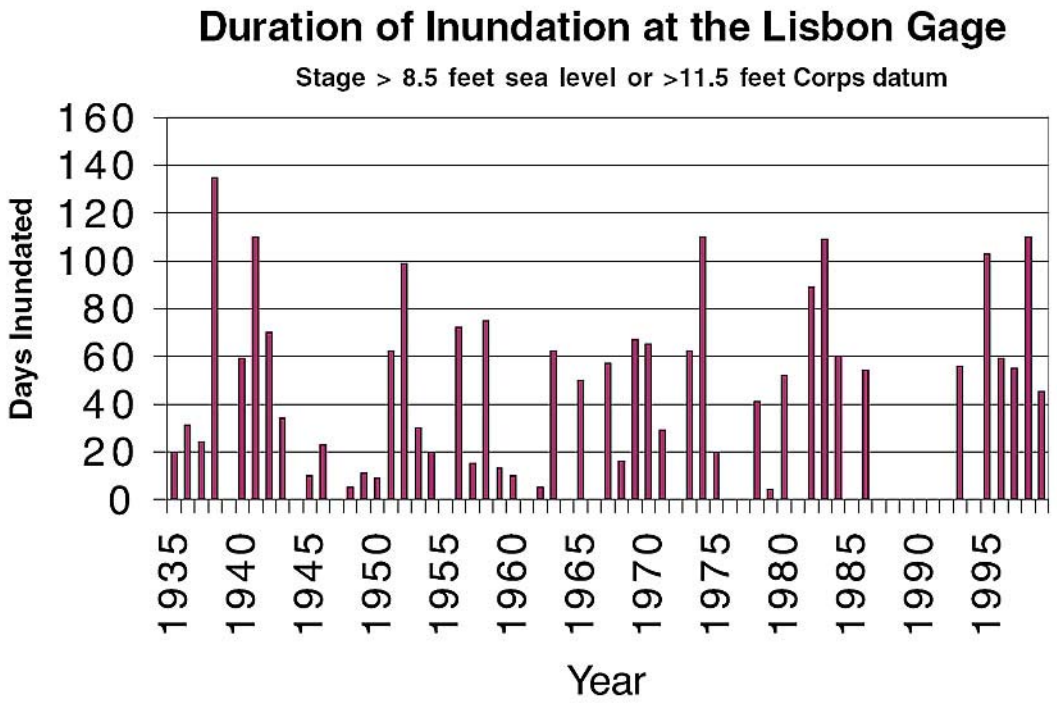
Exhibit 3.4-3a displays the duration of inundation for each water year from 1935–1999. The seasonal duration of inundation for this period varied from 0 to 135 days. Exhibit 3.4-3a also displays the maximum stage recorded for each year at the Lisbon gage. The stage during the February 1986 and January 1997 floods were both 2.5 feet higher than any other year on record. Exhibit 3.4-4 displays a correlation in the relationship between maximum stage and duration of inundation for the smaller floods during this period. This correlation shows that the higher the stage produced for a given small flood event, the longer the Bypass will be inundated. It is important to note that, in an effort to avoid exceeding the design stage, releases from reservoirs during major floods are typically controlled by increased duration rather than an increased release rate (Yolo Basin Foundation 2001).

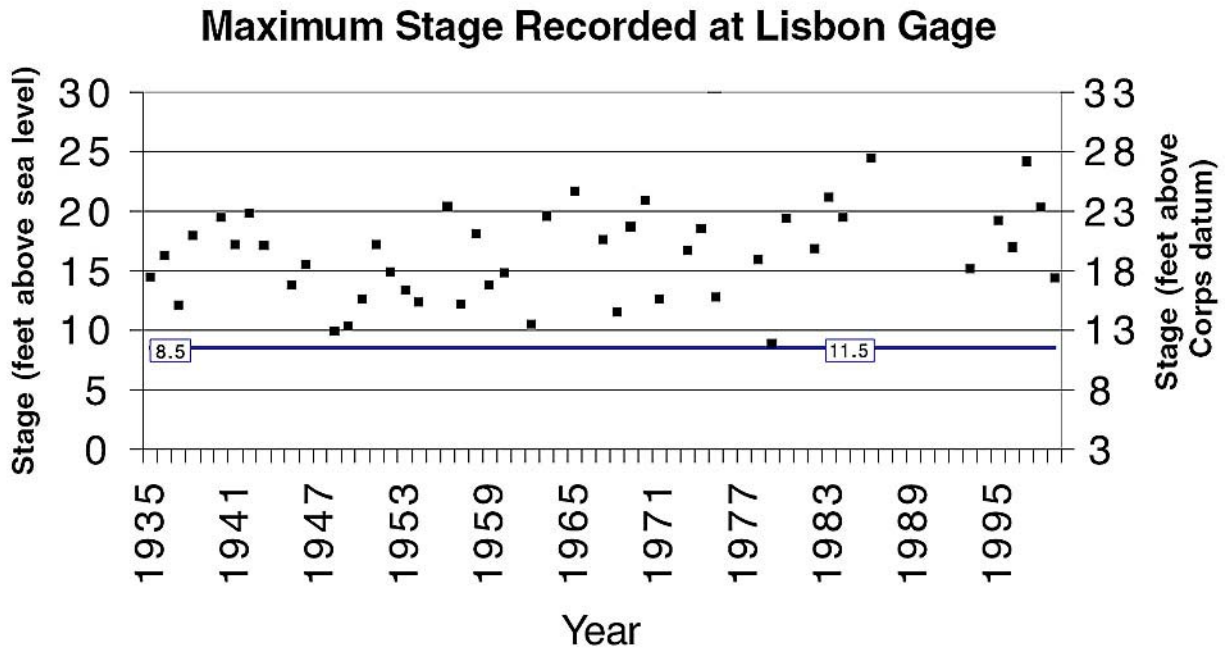
The timing of inundation is of utmost importance to agricultural interests within the Bypass. Inundation in late spring or early fall, although very rare, can have disastrous impacts on unharvested or newly planted crops. Additionally, flooding during this period may trigger the production of tremendous numbers of mosquitoes. In late spring, inundation occurred after May 10th in only four years between 1935 and 1999 with three of the four occurring since 1990. This recent change has led some to suggest that changes in climate, hydrology or reservoir operations have occurred. The spring floods of 1998 produced the latest (June 10, 1998) and longest duration of inundation. This late spring flood caused substantial economic losses to farmers in the Bypass. Early fall floods are extremely rare in the period of record, having occurred only once (October 14, 1962) prior to November 18.



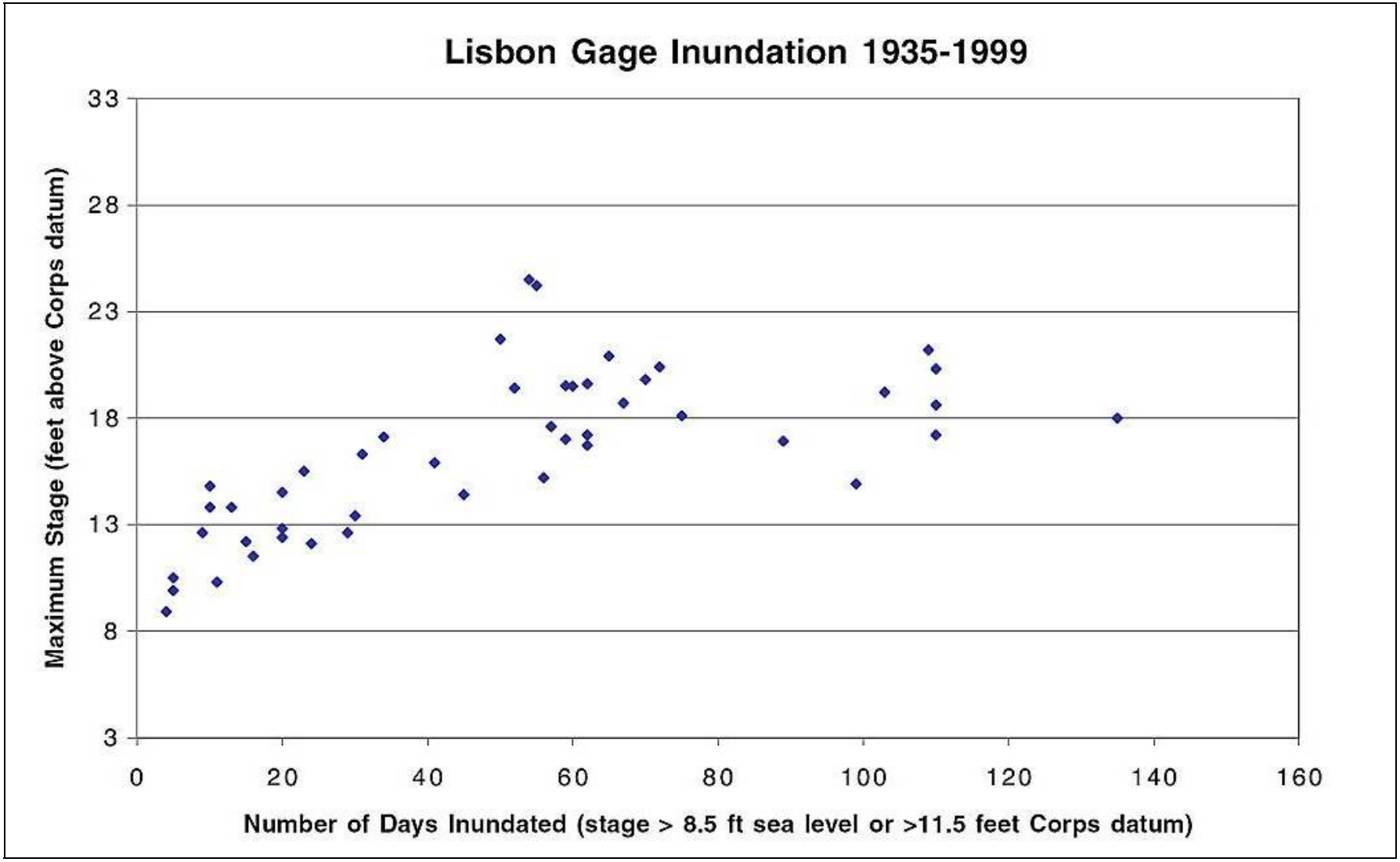
Source: Yolo Basin Foundation 2001

Periods of Inundation at Lisbon Weir **Exhibit 3.4-3**





Duration of Inundation and Maximum Stage at the Lisbon Gage **Exhibit 3.4-3a**



Source: Yolo Basin Foundation 2001

Lisbon Gage Inundation 1935–1999 **Exhibit 3.4-4**

Recent Changes in Flood Inundation of the Yolo Bypass

The 15-year period from 1985 and 1999 has been marked by several record breaking hydrological events (Yolo Basin Foundation 2001). These include two record breaking floods and a record number of consecutive years with and without inundation. Due to these most recent events, many have hypothesized that flood operations have changed, climate has changed, or urbanization has substantially altered runoff. In an effort to determine whether the suspected changes have occurred, historic time series of peak flows, annual discharge, and inundation duration were examined. A linear regression analysis was performed on (duration and stage) (Exhibit 3.4-3a). Neither data set revealed a relationship confirming these changes have taken place.

An analysis of the "four rivers index," which combines hydrologic data for the Sacramento, American, Yuba, and Feather River systems to establish an annual indicator of water availability in the Sacramento Basin, was used to determine if climate change was responsible for the recent extreme hydrologic trends (Yolo Basin Foundation 2001). This analysis involves the correction of flows on the Sacramento, American, Yuba, and Feather rivers to account for changes in storage, diversion, and evaporation in reservoirs. Exhibit 3.4-5 displays the corrected runoff for the 1906–1999 water years. No long term trends were observed, but statistical analysis revealed that runoff variability has been greater in the last 30 years than the 30 years preceding (Dettinger et al. 1995).

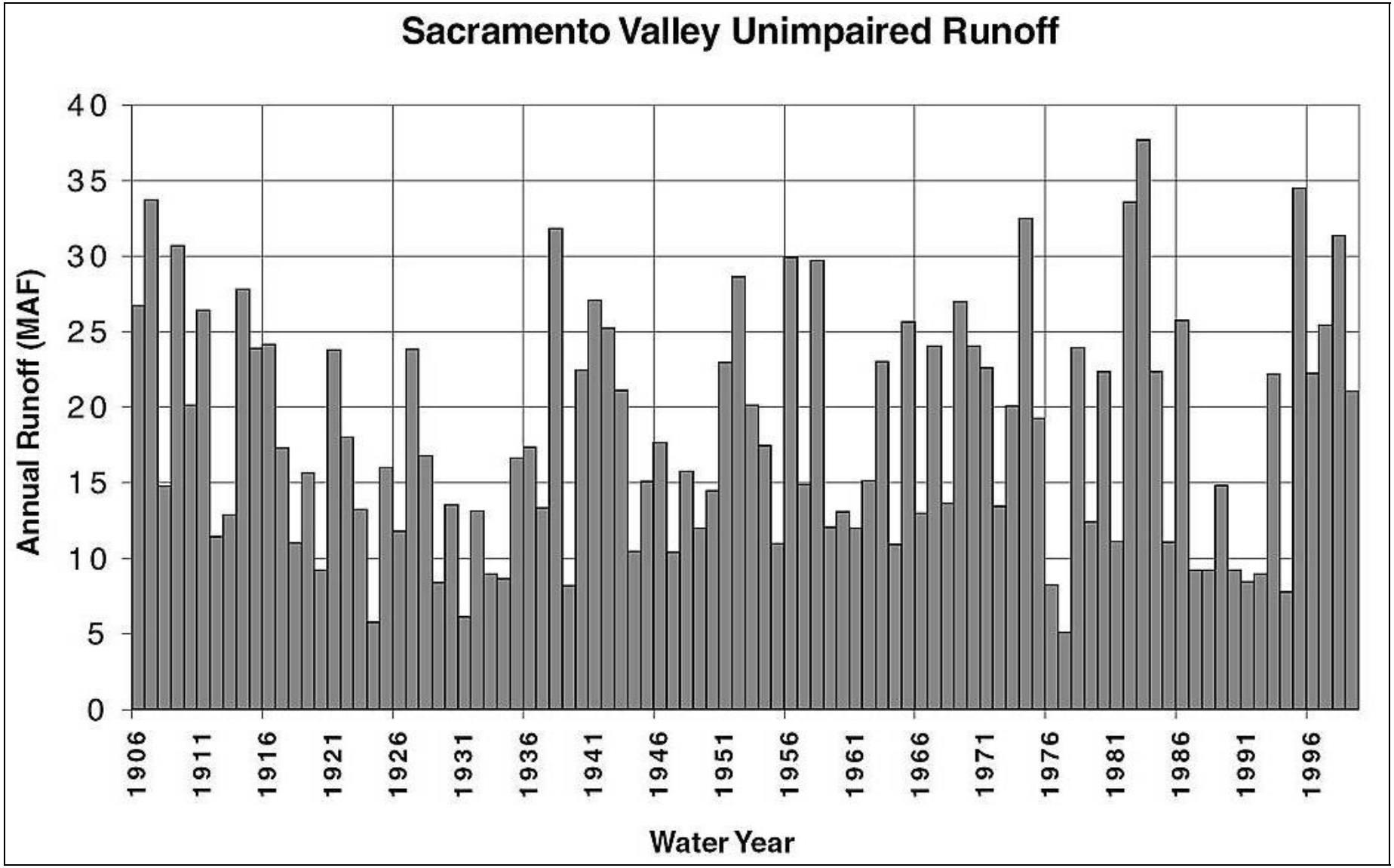
In an effort to examine the potential change in reservoir operations, the relationship between unimpaired runoff and the duration of inundation is plotted in Exhibit 3.4-6. The results of this graph show that the same relationship exists for the recent period as does for the years prior. If there were significant changes in reservoir operations, the trends would have likely changed over the period of record.

Folsom Reservoir has undergone considerable changes in its flood operations since the 1986 flood. After the 1986 flood, it was decided to increase the storage volume from 400,000 acre-feet to a variable volume up to 670,000 acre-feet (Yolo Basin Foundation 2001). During major floods, this increased capacity has lessened the peak flows and thus decreased the stage in the Bypass during those flood events. During medium flood events, the additional capacity in Folsom has allowed for an overall decrease in the combined peak flows released from all reservoirs. Overall, the results of these and other analyses indicate that flood management has not changed from 1985 to 1999.

Low Flow Inundation

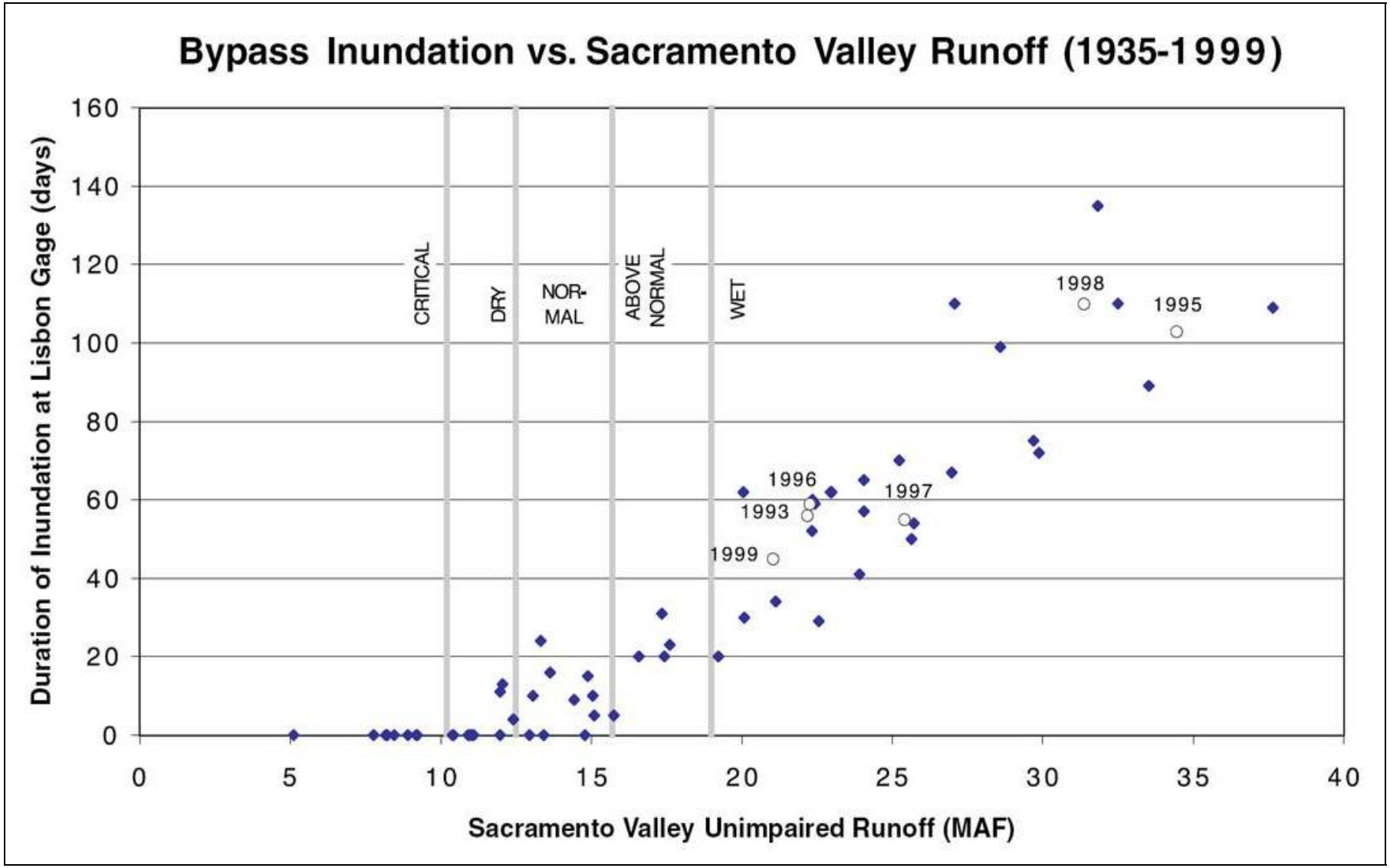
The major inputs to the Bypass are the Fremont and Sacramento Weirs, Knights Landing Ridge Cut, Cache Creek, Willow Slough, and Putah Creek. By comparing the magnitude and timing of the inundation in the Bypass at Lisbon Weir with the magnitude and timing of these inputs, the relative significance of each input for inundation potential can be identified. Exhibits 3.4-7 and 3.4-8 compare the maximum daily flows at the Sacramento and Fremont Weirs, Putah Creek, and Cache Creek to the inundation at Lisbon Weir for each water year from 1935 to 1999. Inundation at the Lisbon Weir showed a strong relationship with the years the Fremont Weir was active and there is also a relationship between the duration of the inundation and the magnitude of the weir flow. Flows through the Sacramento Weir were of a lesser magnitude, although there was a significant relationship between inundation at Lisbon and weir activity.

The timing of the Fremont Weir activity provides further evidence of its pivotal role in inundation of the Bypass. Exhibit 3.4-9 plots the periods of activity of the Fremont Weir from 1935 to 1999. A comparison of this chart to the equivalent chart of inundation events at the Lisbon Weir (Exhibit 3.4-3) reveals a direct correlation between Fremont Weir activity and Bypass inundation. There is a lag of approximately two days from the initial weir activity to inundation, and inundation may lag 5–10 days after weir activity ceases. Very short periods of weir activity do not necessary result in inundation at the Lisbon Weir.



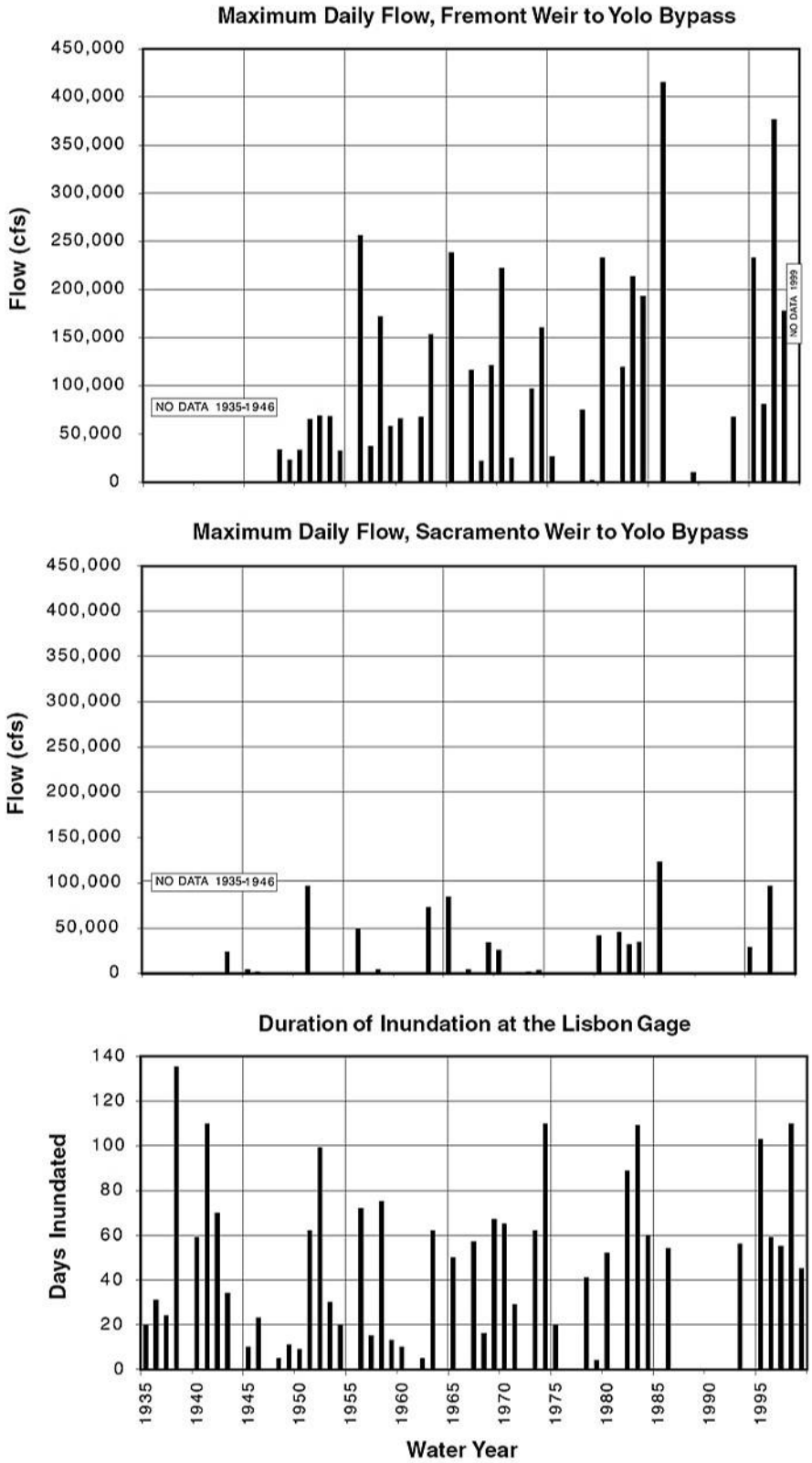
Source: Yolo Basin Foundation 2001

Annual Unimpaired Runoff – Four Rivers Index 1906–1999 **Exhibit 3.4-5**



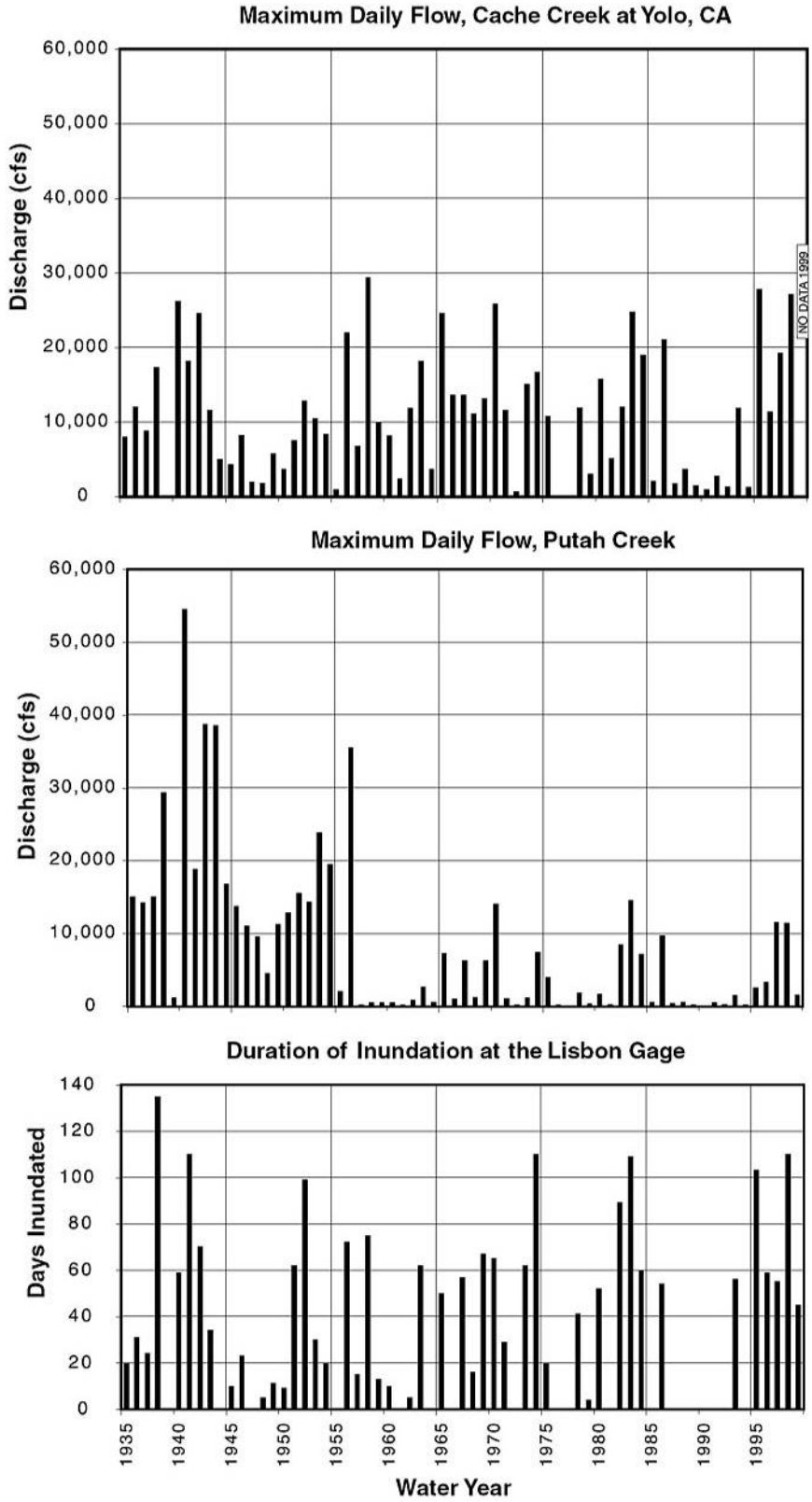
Source: Yolo Basin Foundation 2001
Note: Relationship between Yolo Bypass inundation and Sacramento Valley unimpaired runoff, 1935–1999

Bypass Inundation vs. Sacramento Valley Runoff 1935–1999 **Exhibit 3.4-6**



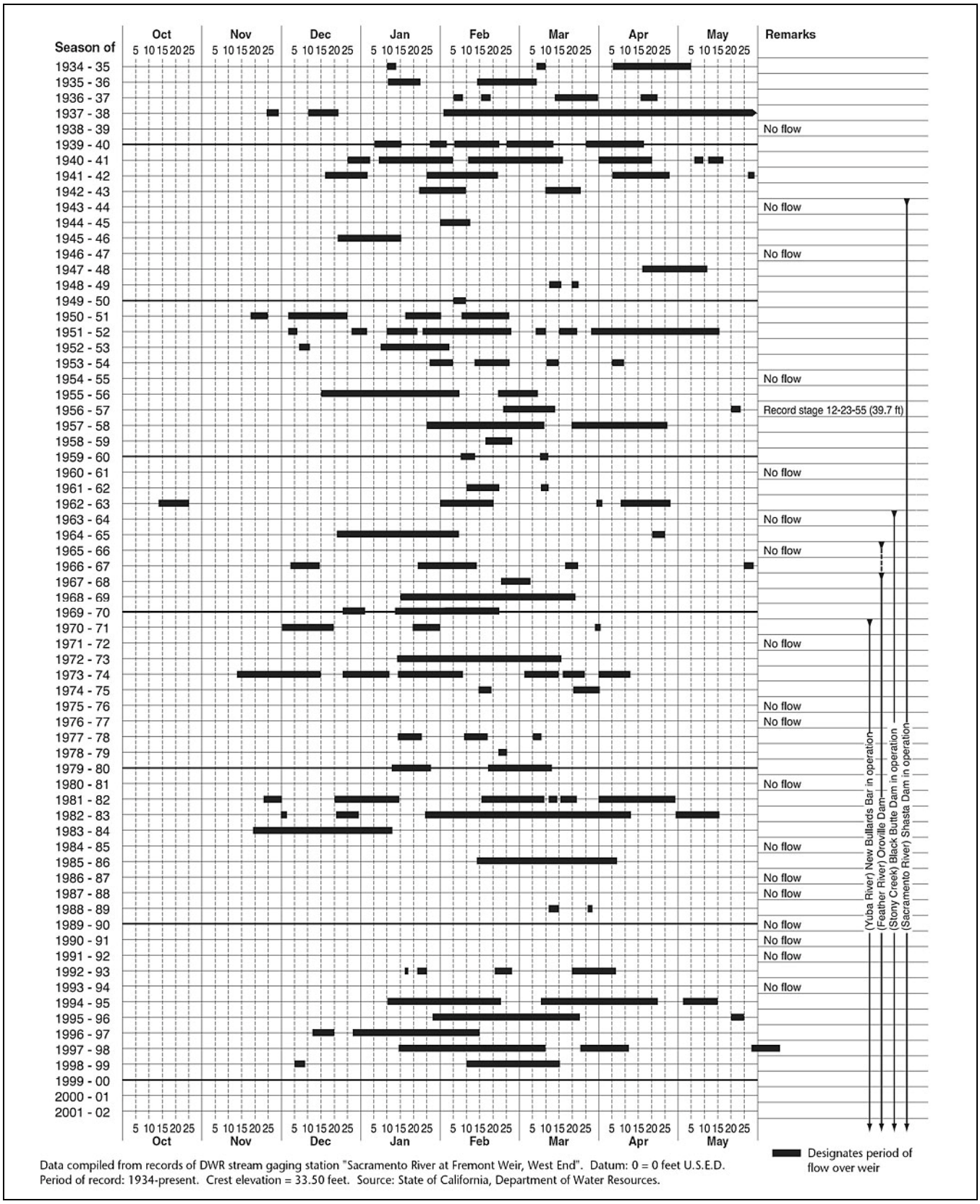
Source: Yolo Basin Foundation 2001
Note: Annual maximum daily flow at Fremont and Sacramento Weirs and duration of Yolo Bypass inundation during water years 1935–1999

Fremont and Sacramento Weir Maximum Daily Flow and Yolo Bypass Inundation 1935-1999 **Exhibit 3.4-7**



Source: Yolo Basin Foundation 2001
Notes: Annual maximum daily flow at Putah and Cache Creeks and duration of Yolo Bypass inundation during water years 1935–1999

Putah and Cache Creeks Maximum Daily Flow and Yolo Bypass Inundation 1935–1999 Exhibit 3.4-8



Source: Yolo Basin Foundation 2001

Periods of Fremont Weir Activity **Exhibit 3.4-9**

Daily flow hydrographs can be useful in identifying the relative contributions of the six sources of inflow to the Bypass. Inflows from Cache Creek, Fremont and Sacramento Weirs are gauged, and the data can be used without adjustment. Yolo Basin Foundation (2001) developed daily flow time series for ungaged sites and sites with missing data by estimating inflow using a variety of methods involving subtraction or addition of flows at upstream gages, watershed runoff correlations based on rainfall and drainage areas, and adjustments for seepage losses. Additional detail on these methodologies can be found in the Yolo Basin Foundation 2001 report. Selected results are summarized below.

Exhibit 3.4-10 shows hydrographs of daily flows during a moderately wet period from 1995 to 1998. Flows from the Fremont and Sacramento Weirs, Knights Landing, Cache Creek, Willow Slough, Putah Creek and the Bypass flow at I-5 are shown consecutively in the top four hydrographs with the hourly stage at Lisbon shown at the bottom. The Y axis scales are 12 times larger for the I-5 and Bypass flows than for the other tributaries. The smaller floods and low flows for this same period can be viewed more easily in Exhibit 3.4-11 with the Y axis expanded 10 times (Yolo Basin Foundation 2001).

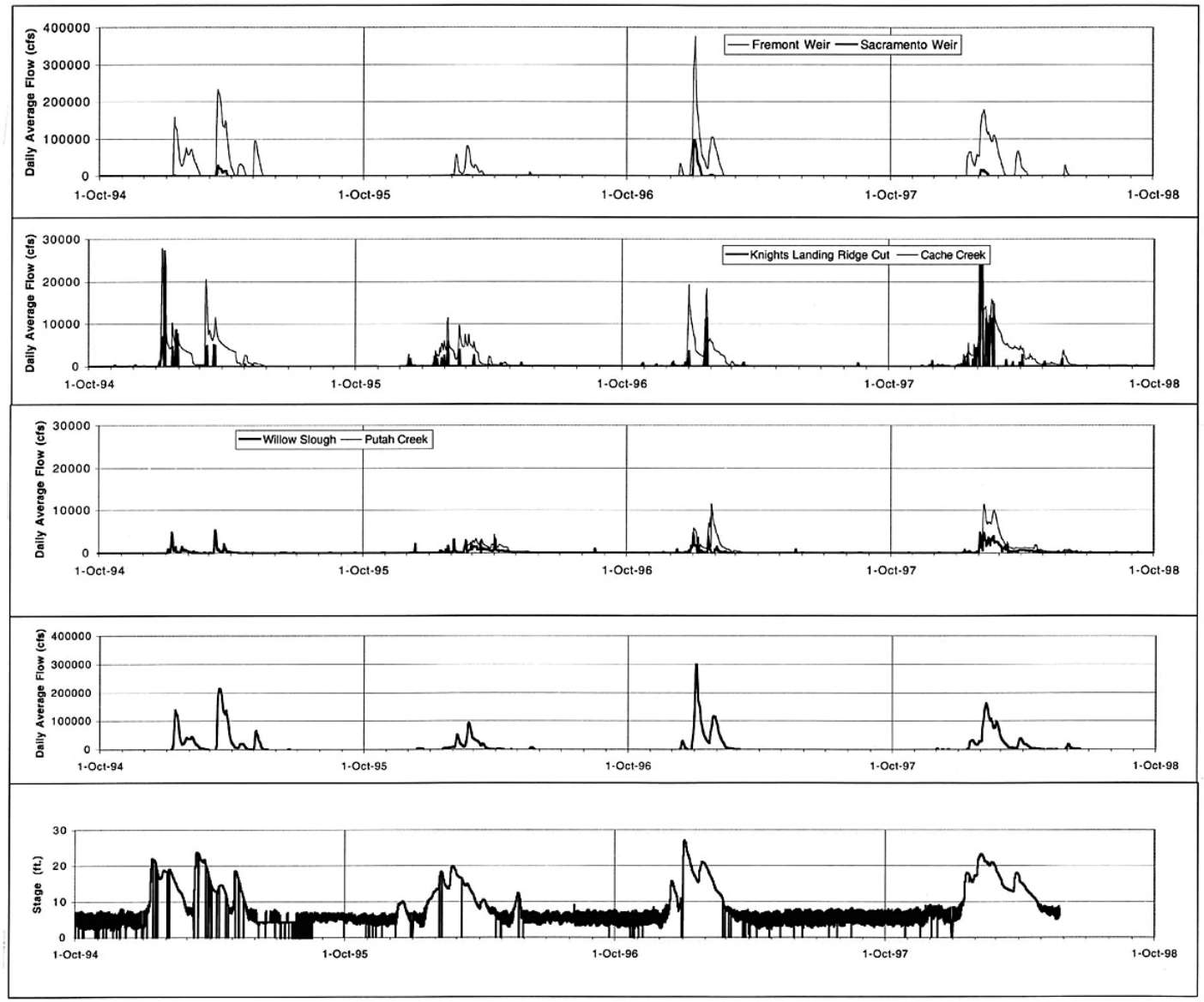
The examination of the Sacramento and Fremont Weir hydrographs reveal that Sacramento Weir is only active during periods when the Fremont Weir has been active. It also shows the Sacramento Weir flows are of a lesser magnitude and are shorter in duration than that of the Fremont. These relationships hold true for the entire period of record, revealing that the Sacramento Weir only contributes to the inundation already produced by Fremont Weir during large flood events.

The hydrographs reveal that Putah Creek tends to produce few high-flow events which are likely to occur in succession during wet years. This is likely due to the presence and operation of flows at the Monticello Dam (Lake Berryessa) and downstream at the Putah Diversion Dam (Lake Solano). Willow Slough is unregulated and produces a large number of small peak runoff events.

During dry periods when the weirs are not active, the four remaining tributaries have the potential to produce localized flooding within the Bypass. Exhibit 3.4-12 shows hydrographs of daily flows during a dry period from 1987 to 1990, when the weirs were not active (Yolo Basin Foundation 2001). The inputs from Putah Creek and Willow Slough were about 1,200 cfs and 1,500 cfs, respectively, in January 1985, while combined inputs from Cache Creek and Knights Landing Ridge Cut were approximately 5,000 cfs in January 1981 and January 1988. Putah Creek flows are often exceeded by Willow Slough inflows during small flood events when Lake Berryessa isn't releasing.

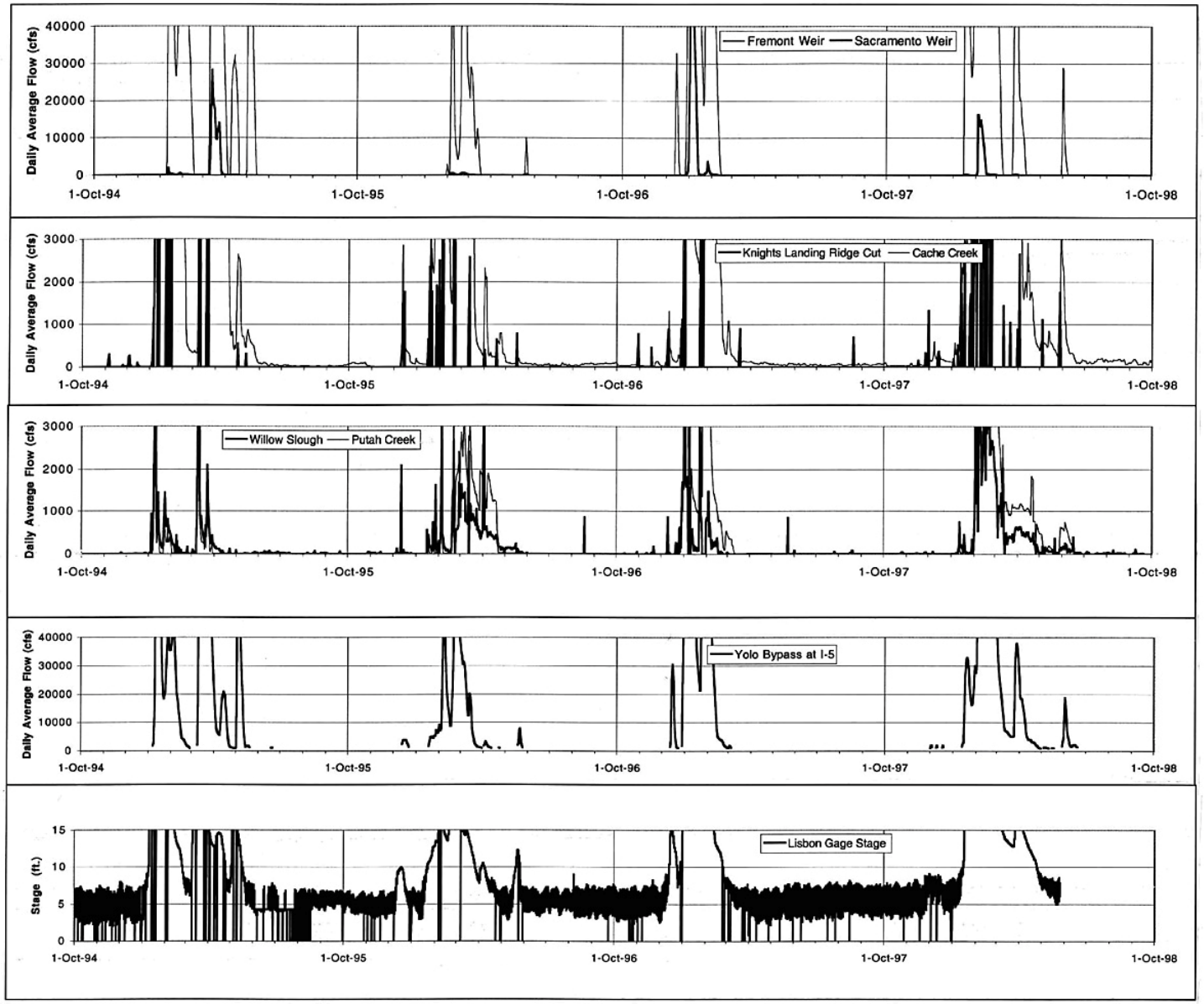
The tributaries were also examined for their contribution to localized flooding by comparing the increase in stage at the Lisbon gage to the magnitude of peak flows during dry periods when the weirs were not active. Daily discharge from Cache Creek are matched with hourly stage at the Lisbon Gage during the 1988 water year (weirs not active) as displayed in Exhibit 3.4-13. The peak events in December and January increased the stage at Lisbon by about 1.5 feet over its normal range. The importance of the tributaries on localized flooding is further demonstrated in Exhibit 3.4-14 which plots the increases in stage at the Lisbon Gage against peak flows on Cache Creek for similar events. For every 2,000 cfs of increased flow on Cache Creek, the stage at Lisbon increases approximately 1 foot (Yolo Basin Foundation 2001).

Local climatic conditions along with groundwater elevations can have implications on the extent of low flow inundation and creation of seasonal wetlands. Exhibit 3.4-15 displays the temperature, precipitation, and evapotranspiration regime from selected areas within the Yolo Basin. These data show that over the annual cycle, as temperature increases there is a corresponding increase in evapotranspiration and a decrease in precipitation.



Source: Yolo Basin Foundation 2001

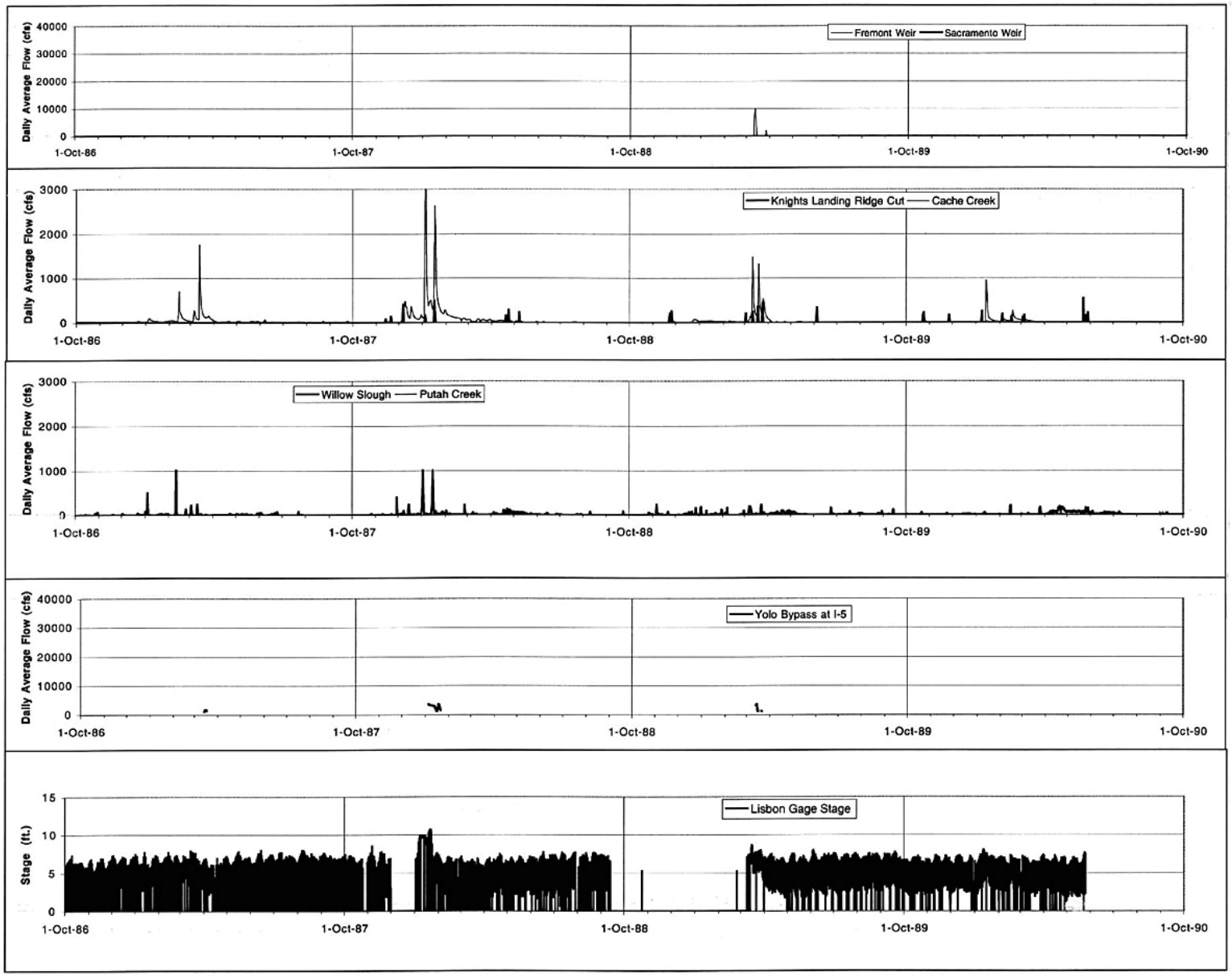
Hydrographs of Inputs to Yolo and Stage at Lisbon Gage 1995–1998 **Exhibit 3.4-10**



Source: Yolo Basin Foundation 2001

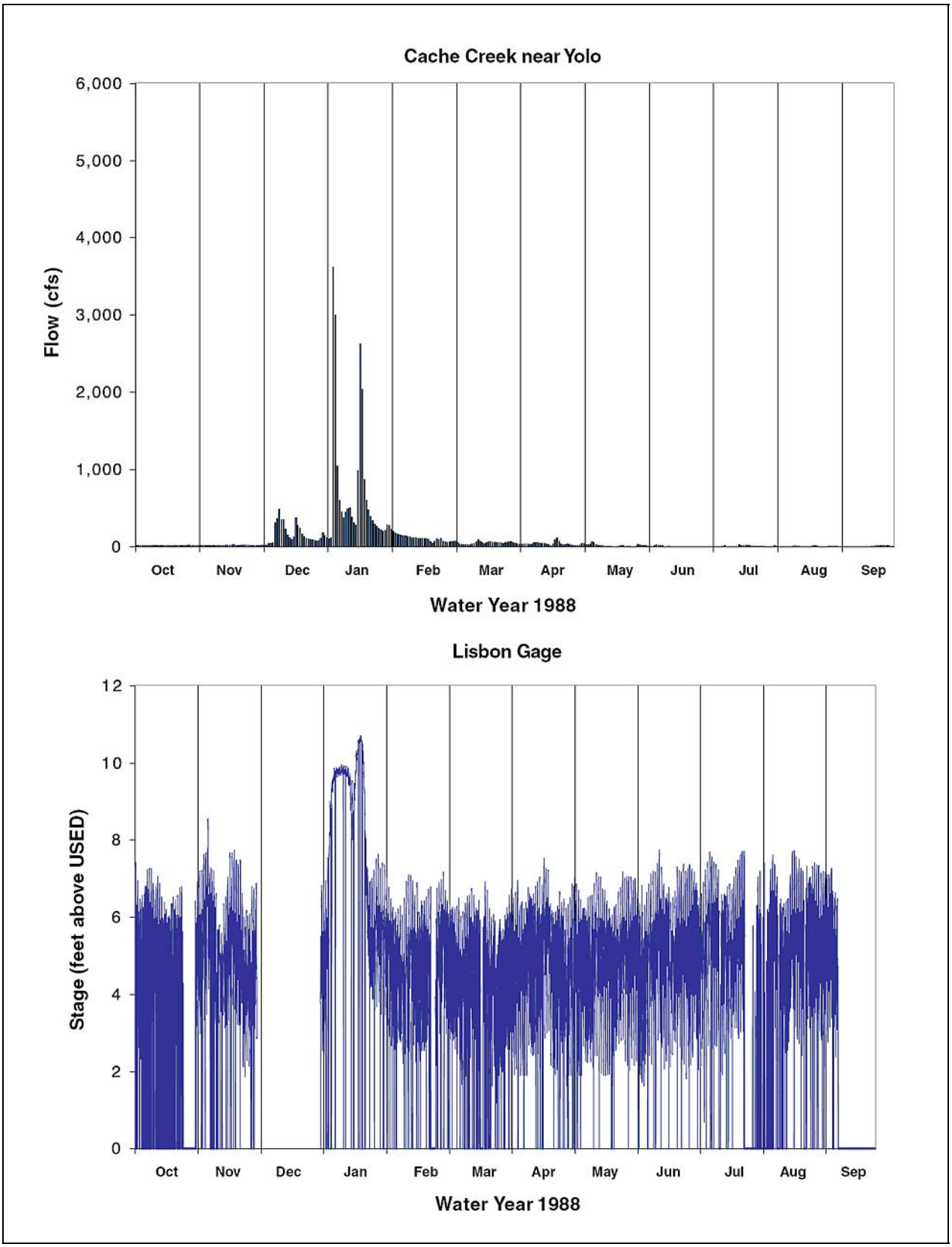
Hydrographs of Inputs to Yolo and Stage at Lisbon Gage 1995–1998
Expanded Scale

Exhibit 3.4-11



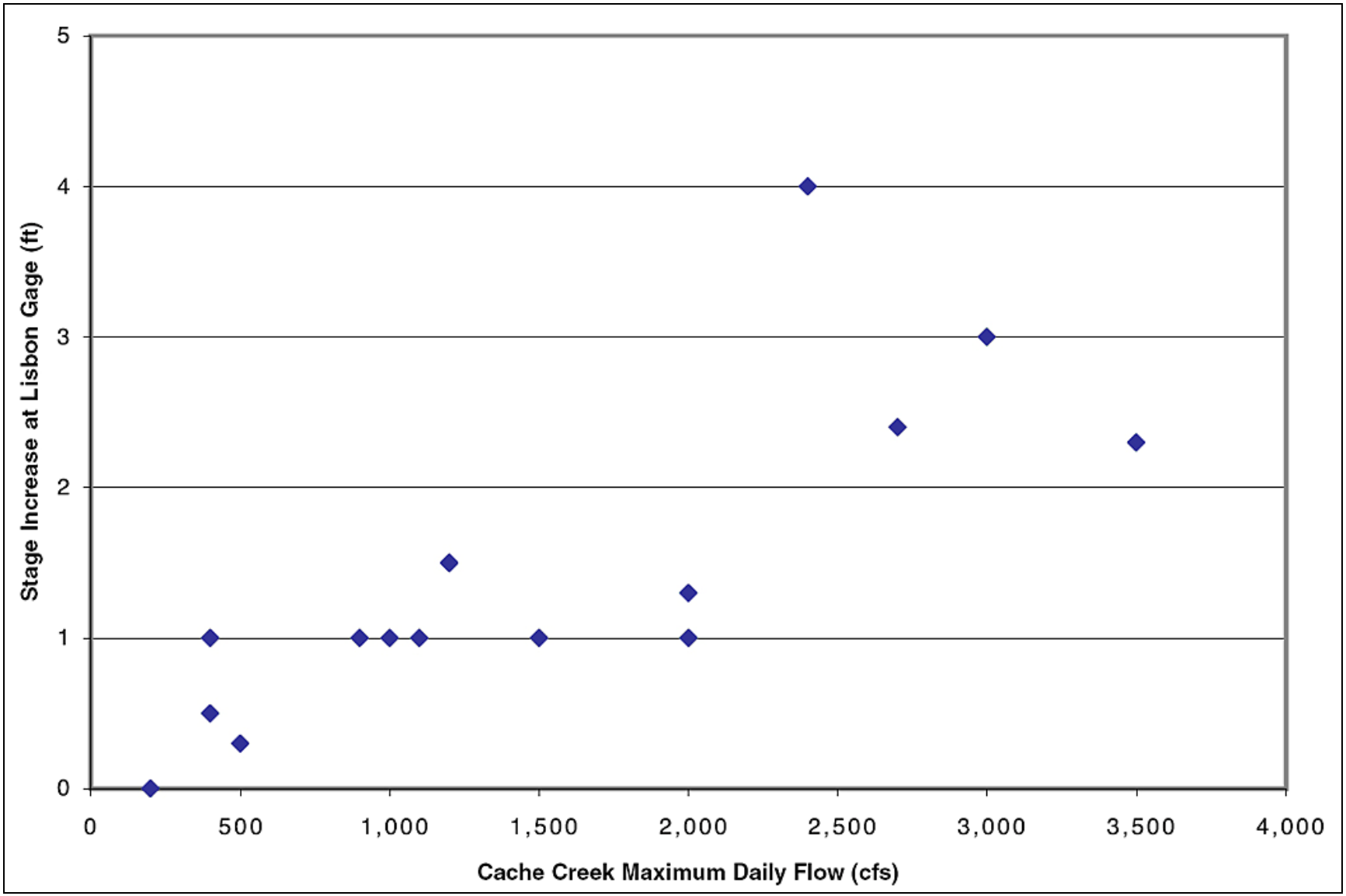
Source: Yolo Basin Foundation 2001

Hydrographs of Inputs to Yolo and Stage at Lisbon Gage 1987–1990 **Exhibit 3.4-12**



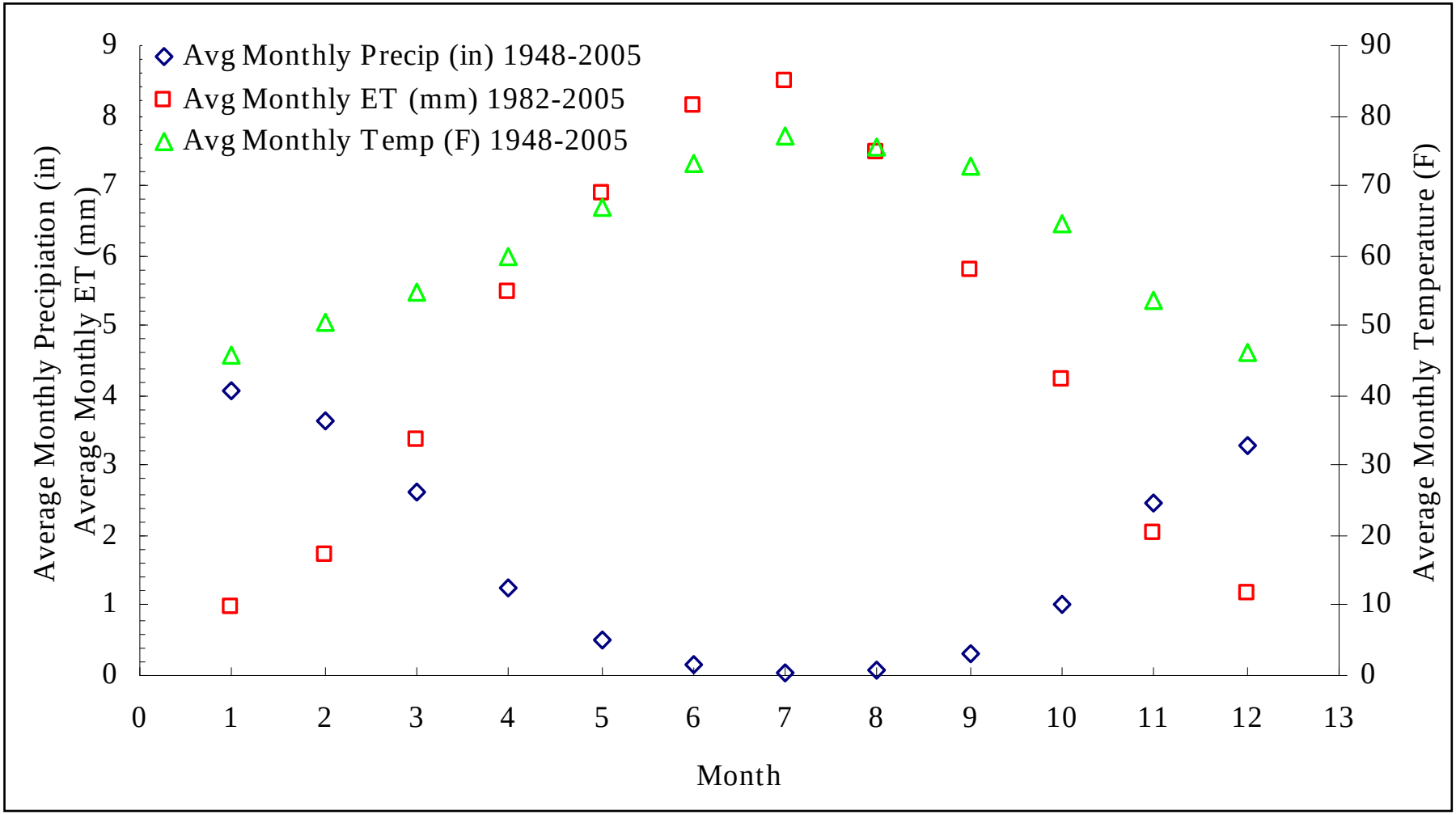
Source: Yolo Basin Foundation 2001

Cache Creek Flow and Lisbon Gage Stage 1988 **Exhibit 3.4-13**



Source: Yolo Basin Foundation 2001

Stage Increase at Lisbon vs. Cache Creek Maximum Daily Flow **Exhibit 3.4-14**



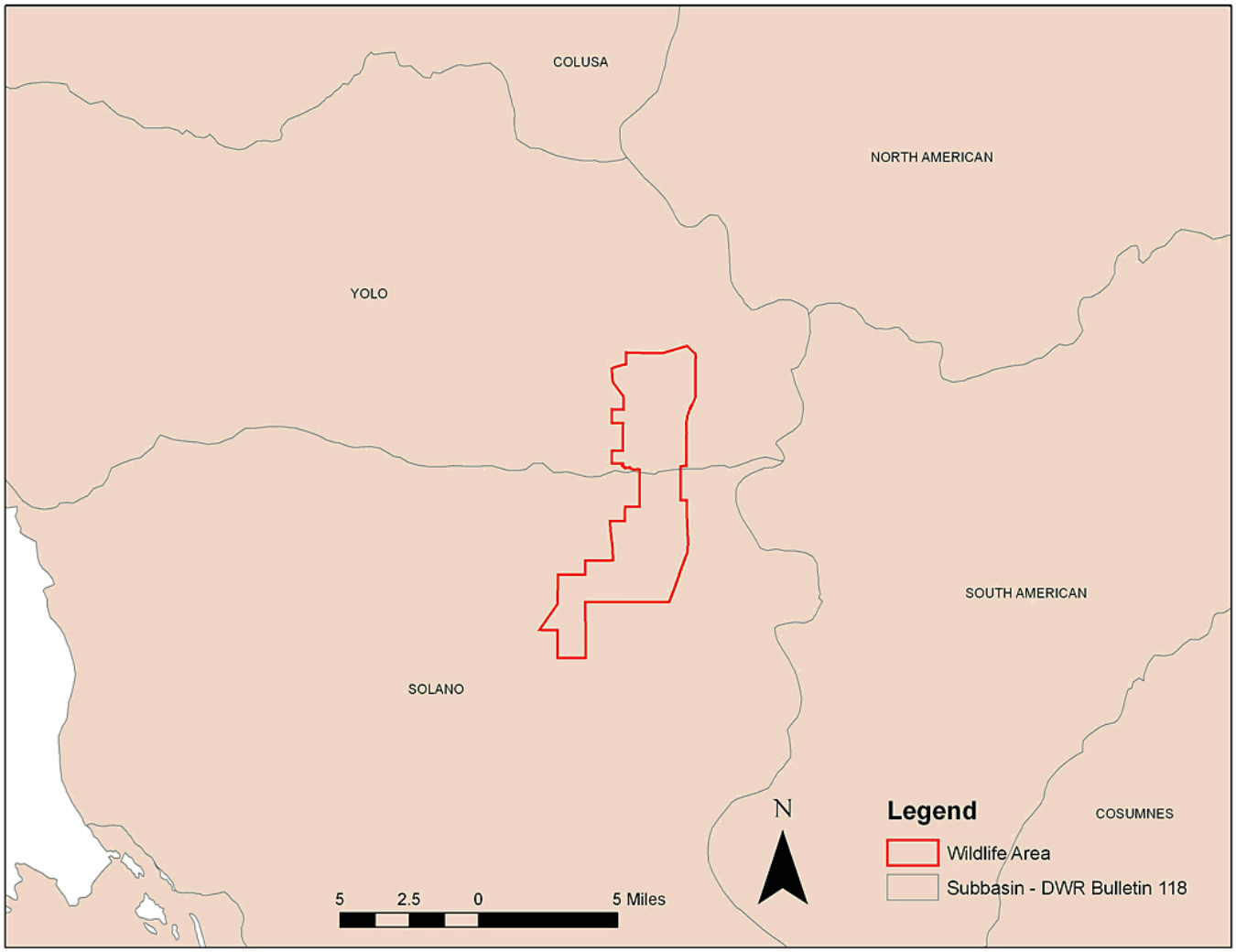
Source: PWA 2004

Average Monthly Evapotranspiration, Precipitation, and Temperature within the Yolo Basin

Exhibit 3.4-15

GROUNDWATER HYDROLOGY

The Yolo Bypass Wildlife Area is contained within the Sacramento Valley Groundwater Basin. Within this Groundwater Basin, the Yolo Bypass and Yolo Bypass Wildlife Area are located on the eastern edge of the Yolo and Solano Subbasins as mapped in DWR Groundwater Bulletin 118 as shown by Exhibit 3.4-16.



Source: DWR Groundwater Bulletin 118 2004

Groundwater Subbasins According to DWR Bulletin 118 **Exhibit 3.4-16**

Yolo Subbasin

The Yolo Subbasin is located primarily within Yolo County, bounded on the east by the Sacramento River, on the west by the Coast Range, on the north by Cache Creek, and on the south by Putah Creek. The Subbasin slopes gently from west to east with elevations ranging from 400 feet in the west to near sea level on the eastern edge.

The hydrogeologic formations relevant to the Yolo Bypass include flood basin deposits and recent stream channel deposits. The flood basin deposits consist of silts and clays and are generally between 100–150 feet thick with low permeability. The recent stream channel deposits consist of unconsolidated silt, fine- to medium-grained sand, gravel and cobbles (embedded in finer material) and are generally up to 150 feet thick with high permeability.

The channel deposits occur along the Sacramento River, Cache Creek, and Putah Creek and often lie above the saturated zone.

The subsurface flow within this Yolo Subbasin is obstructed from east to west by an anticlinal ridge oriented northwest to southeast. Subsurface outflow sometimes moves from the Yolo Subbasin into the Solano Subbasin to the south. Subsurface flow may also move beneath the Sacramento River to exchange with the South and North American River Subbasins.

Groundwater levels are impacted by periods of drought due to increased pumping and less surface water recharge, but recover quickly during wet years. Long term trends do not indicate any substantial decline, with the exception of localized pumping depressions in the vicinity of Davis, Woodland, and the Dunnigan/Zamora areas.

SOLANO SUBBASIN

The Solano Subbasin is bounded by Putah Creek to the north, the Sacramento River to the east, the North Mokelumne River to the southeast, and the San Joaquin River to the south. Elevations range from 120 feet in the northwest to sea level in the south.

The relevant hydrogeologic formations are similar to those of the Yolo Subbasin and occur along the Sacramento, Mokelumne and San Joaquin rivers and the upper reaches of Putah Creek. In the southern Delta region, the flood basin substrate contains a high proportion of peat, attesting to thousands of years of inundation. Over the past 150 years, as Delta islands have been drained and converted to agricultural use, the peat soils have subsided substantially.

The general subsurface flow direction is from northwest to southeast. Water level trends are similar to that of the Yolo Subbasin, but with large pumping depressions between Davis and Dixon.

3.4.3 WATER QUALITY

This section analyzes current water quality conditions in the Yolo Bypass Wildlife Area including the Yolo Bypass associated canals, Cache Creek, Willow Slough, Putah Creek and more generally in the greater Sacramento River drainage and Delta. Waters within and downstream of the Yolo Bypass Wildlife Area (i.e., Yolo Bypass) serve several beneficial uses, each of which has water quality requirements and concerns associated with it. These beneficial uses include habitat for fish and aquatic organisms, as well as a source of water for municipal, agricultural, recreational, and industrial uses. Water quality variables of particular concern in the Yolo Bypass are discussed in detail below.

GENERAL WATER QUALITY

Water quality in the Yolo Bypass, and more specifically the Yolo Bypass Wildlife Area, is influenced by a number of sources and processes. During flood events, water enters the Bypass from the Sacramento, Feather, and American rivers via the Fremont and Sacramento weirs. Other major inputs to the Bypass include, from north to south, the Knights Landing Ridge Cut (i.e., Colusa Basin Drain), Cache Creek, Willow Slough, and Putah Creek. Urban stormwater runoff and wastewater treatment facility discharges come from the University of California Davis campus and the cities of Davis and Woodland (City of Woodland 2005).

Basin Plan Beneficial Uses

Beneficial uses of water in the Yolo Bypass are legally designated by the Central Valley Regional Water Quality Control Board (Central Valley RWQCB) in the Sacramento-San Joaquin River Basin Plan (Basin Plan) (Central Valley RWQCB 1998). Beneficial use designations determine the applicable water quality objectives. In addition to the beneficial uses for the Yolo Bypass, there are additional and different beneficial uses for the water bodies in

and near the Bypass and/or Yolo Bypass Wildlife Area such as Cache Creek, Putah Creek, and the Delta. Consequently these additional beneficial uses are also considered. Between these water bodies, almost every beneficial use designation applies. The various beneficial uses include:

- Agricultural Supply,
- Water Contact Recreation,
- Non-contact Water Recreation,
- Warm Freshwater Habitat,
- Cold Freshwater Habitat,
- Spawning, and
- Wildlife Habitat.

An additional beneficial use, municipal and domestic supply does not apply to the Bypass but does apply to Cache Creek and Putah Creek upstream and to the Delta downstream.

Impaired Water Bodies

Under Section 303(d) of the Clean Water Act (CWA), states are required to develop lists of water bodies that would not attain water quality objectives after implementation of required levels of treatment by point source dischargers (municipalities and industries).

Section 303(d) requires that the state develop a total maximum daily load (TMDL) for each of the listed pollutants. The TMDL is the amount of loading that the water body can receive and still be in compliance with water quality objectives. The TMDL is also a plan to reduce loading of a specific pollutant from various sources to achieve compliance with water quality objectives. The TMDL prepared by the state must include an allocation of allowable loadings to point and nonpoint sources, with consideration of background loadings and a margin of safety. The TMDL must also include an analysis that shows the linkage between loading reductions and the attainment of water quality objectives. EPA must either approve a TMDL prepared by the state or disapprove the state's TMDL and issue its own. After implementation of the TMDL, it is anticipated that the problems that led to placement of a given pollutant on the Section 303(d) list would be remediated.

The Yolo Bypass is not listed as impaired; however, TMDLs are in various stages of development and implementation for water bodies both upstream and downstream of the Yolo Bypass Wildlife Area (Table 3.4-3).

Sacramento River–Yolo Bypass and Associated Canals

Water quality of the Sacramento River is closely monitored to assess suitability for potable, agricultural, and wildlife/fisheries uses. Water quality of the Sacramento River, from Knights Landing to the Delta, was determined to be impaired by diazinon, mercury, and unknown toxins by the U.S. Environmental Protection Agency (USEPA) under Section 303(d) of the CWA (U.S. Environmental Protection Agency 2003). In 2003, the Central Valley RWQCB adopted a TMDL limit on discharges of diazinon to the Sacramento and Feather rivers (Central Valley RWQCB 2003). TMDLs for mercury and other toxins are currently under development. Pesticides from agricultural use are also contaminants of concern to water quality of the Sacramento River. Maximum concentration levels (MCLs) for pesticides such as thiobencarb and molinate have been developed by the Central Valley RWQCB (Yolo County Water Resources Assessment 2004).

To determine the effect of incoming discharges on water quality of floodwaters within the Yolo Bypass and the Sacramento River, the U.S. Geological Survey (USGS) conducted studies during 2000 and 2004–2005 (the 2004–2005 focused specifically on pesticides in water and sediment) (Schemel et al. 2002; Smalling et al. 2005).

Table 3.4-3
Clean Water Act Section 303(d) List of Impaired Waters Associated with the Yolo Bypass

Water Body	Pollutant / Stressor	Priority	Potential Source(s)	TMDL Status
Sacramento River (Red Bluff to Knights Landing)	Unknown toxicity	Low	Unknown	No activity
Sacramento River (Knights Landing to the Delta)	Diazinon[1]	High	Agriculture	Adopted
	Mercury	Medium	Resource extraction	No activity
	Unknown toxicity	Low	Unknown	No activity
Feather River (Lake Oroville Dam to Confluence with Sacramento River)	Diazinon[1]	High	Agriculture, Urban Runoff/Storm Sewers	Adopted
	Group A Pesticides	Low	Agriculture	No activity
	Mercury	Medium	Resource extraction	No activity
	Unknown toxicity	Low	Unknown	No activity
Colusa Basin Drain	Azinphos-methyl	Medium	Agriculture	No activity
	Carbofuran/Furadan	Low	Agriculture	No activity
	Diazinon	Medium	Agriculture	Adopted
	Group A Pesticides	Low	Agriculture	No activity
	Malathion	Low	Agriculture	No activity
	Methyl Parathion	Low	Agriculture	No activity
	Molinate/Odram	Low	Agriculture – irrigation tailwater	No activity
	Unknown Toxicity	Low	Agriculture	No activity
Cache Creek	Mercury	Medium	Resource extraction	2nd draft staff completed
	Unknown toxicity	Low	Unknown	No activity
Lower Putah Creek	Mercury	Low	Resource extraction	No activity
Delta (eastern portion)	Mercury	Medium	Resource extraction	Draft staff report complete
	Unknown toxicity	Low	Unknown	No activity
	Chlorpyrifos and Diazinon	High	Agriculture, Urban Runoff/Storm Sewers	Draft staff report in progress
	DDT	Low	Agriculture	No activity
	Group A pesticides	Low	Agriculture	No activity

[1] Recommended for delisting

Source: City of Woodland 2005; Central Valley RWQCB 2002

Sampling of physical and chemical parameters in 2000 during high flows where runoff from agricultural fields and tributaries were deposited to the Bypass concluded that, after initial draining of the floodplain after a large storm, the concentration of chemical contaminants within the Bypass is influenced directly by discharges from Cache Creek and the Knights Landing Ridge Cut. High concentrations of nutrients and contaminants, perhaps from abandoned mines and agricultural fields, were detected at discharge points from these sources. Spring rains flushed accumulated nutrients to the tidal area of the Sacramento River. The study recommended the addition of fresh water to perennial reaches of the Bypass to increase habitat quality for aquatic species (Schemel et al. 2002). The City of Woodland discharges its wastewater effluent to the Tule Canal, which flows to the Yolo Bypass.

Sampling conducted during 2004–2005 resulted in the detection of thirteen current-use pesticides in surface water samples collected during the study. The highest pesticide concentrations detected at the input sites to the Bypass corresponded to the first high-flow event of the year. The highest pesticide concentrations at the two sites sampled within the Bypass during the early spring were detected in mid-April following a major flood event as the water began to subside. The pesticides detected and their concentrations in the surface waters varied by site. The highest number of pesticides was detected in the suspended sediments compared with bed sediments and surface water. With the exception of a few compounds, the same pesticides were detected in the sediment and the water, and correlate with the agricultural use in each of the different watersheds. Measured pesticide concentrations varied by site/source watershed; however, Knights Landing Ridge Cut (i.e., Colusa Basin Drain) and Willow Slough generally appeared to have the highest concentration inputs into the Bypass (Smalling et al. 2005).

Cache Creek

Erosion and groundwater discharge from marine sediments have resulted in release of boron and mercury to the Cache Creek watershed. Mercury contamination from past mining activities, erosion of naturally occurring mercury latent soils, geothermal springs, and atmospheric deposition near Clear Lake and at tributaries to Cache Creek have contaminated sediments and water (Central Valley RWQCB 2004). Elevated quantities of mercury travel through the creek channel during high flows. Consequently, mercury has been detected in the Yolo Bypass. The Cache Creek watershed is a significant source of mercury in the Sacramento-San Joaquin Delta (Central Valley RWQCB 2004). The Central Valley RWQCB adopted a TMDL to limit discharges of mercury to Clear Lake and Cache Creek. A fish consumption advisory is in effect for Clear Lake fish to protect human health due to concerns of bioaccumulation of mercury in fish tissue (Office of Environmental Health Hazard Assessment 1994). Clear Lake is also listed as impaired by elevated levels of nutrients. Cache Creek is also impaired by unknown toxicity (U.S. Environmental Protection Agency 2003).

Boron concentrations typically range from 0.7 milligrams per liter (mg/L) in the spring to 2.2 mg/L in the winter, and the average concentration during the irrigation season is less than 1.0 mg/L (Yolo County Water Resources Assessment 2004).

Willow Slough

The Yolo County RCD is initiating a program to monitor suspended sediment, nutrient, and water level at 4–6 sites along Willow Slough. Previous monitoring studies conducted by the County Department of Health Services and UCD noted invertebrate and algae impairment from unknown causes and sources. The City of Davis discharges its treated wastewater effluent to Willow Slough Bypass. The Central Valley RWQCB requires municipal dischargers such as the City of Davis to regularly perform effluent and receiving water toxicity testing for invertebrates and algae. Pesticide concentrations in Willow Slough waters have been measured to be above other Bypass tributary water bodies (Smalling et al. 2005).

Putah Creek

Much like the Cache Creek watershed, the Putah Creek watershed contains high concentrations of mercury and boron. During low flows in summer months, Putah Creek flow is dominated by effluent downstream of UCD wastewater treatment plant outfall. Lower Putah Creek, downstream of Lake Solano, is listed as impaired by

mercury (originating from old mines in the upper watershed) on the US EPA 303(d) list (U.S. Environmental Protection Agency 2003). Water temperature monitoring by UCD documented seasonal warming profiles downstream of the Putah Diversion Dam (PDD), diurnal temperature fluctuations, and localized thermal stratification (Yolo County Water Resources Assessment 2004). Pesticide concentrations in Putah Creek were generally low relative to other sites in the 2004–2005 study. The only exception was concentrations measured in bed sediments, which were higher than at most other locations (Smalling et al. 2005).

Knights Landing Ridge Cut (Colusa Basin Drain)

The Colusa Basin Drain (Drain) watershed comprises nearly 1,620 square miles in the Sacramento Valley, and includes portions of Glenn, Colusa, and Yolo counties. There are 32 ephemeral streams that convey storm runoff to the Drain. The Drain is an artificial channel designed to convey irrigation drainage to the Knights Landing outfall gates for discharge into the Sacramento River. When the water level in the river exceeds the water level in the Drain, Drain water discharges into the Knights Landing Ridge Cut directly into the Yolo Bypass. The Knights Landing Ridge Cut, which consists of two excavated channels with a center island, has a discharge capacity of approximately 20,000 cfs. Water from the Drain is pumped into the Ridge Cut for irrigation at other times of the year, providing additional water into the upper Bypass during the summer-fall period. The Drain is listed as a water quality impaired water body due to a number of agricultural pesticide-related pollutants (Table 3.4-3) (Central Valley RWQCB 2002). Pesticide concentrations (in the 2004–2005 study) in Drain water were high relative to all other sample sites (Smalling et al. 2005), consistent with the impairment listing status noted above.

As discussed in Section 3.1 above, proposals have been developed to divert additional water from the Drain into the Yolo Bypass on a more continuous year-round basis. This potential project could have water quality implications for the Yolo Bypass Wildlife Area.

Groundwater Quality

Groundwater in the Yolo Basin is characterized by the presence of sodium magnesium, calcium magnesium, and/or magnesium bicarbonate. The groundwater quality is characterized as good for agricultural and municipal uses, although it is hard to very hard overall. Elevated concentrations of selenium, nitrate, and boron have been detected in groundwater along Cache Creek and the Cache Creek Settling Basin area. Brackish and saline waters are found in water bearing units underlying the Tehama Formation (California Department of Water Resources 2004). According to monitoring conducted in the Yolo Subbasin beneath the City of Davis and University of California, average concentrations of arsenic in the Tehama formation below 600 feet below ground surface are 0.04 mg/L (Yolo County Water Resources Assessment 2004.) This value exceeds the USEPA MCL of 0.01 mg/L that became effective as of January 23, 2006 (U.S. Environmental Protection Agency 2005). The existing California MCL for arsenic is 0.05 mg/L, as stated in the California Code of Regulations (Section 64431 - Maximum Contaminant Levels-Inorganic Chemicals).

POLLUTANTS OF CONCERN

Larry Walker Associates completed an evaluation of water quality conditions as a component of a water quality management plan for the Yolo Bypass (City of Woodland 2005). This plan included identification of pollutants of concern (POC) for the Bypass. POCs identified in the plan are consistent with many of those identified in the discussions above.

Yolo Bypass Water Quality Management Plan

The objective of the project was to develop a comprehensive water quality management plan for the Bypass. The general steps followed to develop the plan were to (City of Woodland 2005):

- Identify through review of existing information and stakeholder input current POCs for the Bypass;

- Conduct surface water quality monitoring to help quantify POCs and their major sources;
- Identify and evaluate effective, implementable control measures for reducing POC concentrations and loads;
- Investigate, if necessary, the applicability of current water quality criteria for the POCs and the feasibility of developing site-specific objectives (SSOs);
- Involve stakeholders regarding POCs and potential control measures; and
- Produce a Water Quality Management Plan containing a recommended implementation program to address POCs that are degrading surface water quality.

The POCs were identified by stakeholders after a cursory review of available data. The identified POCs were then monitored over a one-year period. Based on these monitoring results and stakeholder input, the POCs were prioritized as shown in Table 3.4-4.

Table 3.4-4
Yolo Bypass Water Quality Management Plan Pollutants of Concern

Pollutant of Concern	Priority		
	High	Medium	Low
Bacteria Total coliform Fecal coliform E. coli	X		
Boron	X		
Metals			
Aluminum	X		
Chromium			X
Copper			X
Lead			X
Mercury	X		
Selenium			X
Nitrate			X
Organic Carbon Total organic carbon Dissolved organic carbon		X	
Pesticides and Herbicides			
OCs (DDE and DDT)		X	
OPs (Chlorpyrifos and Diazinon)		X	
Carbamates (Diuron and Methomyl)			X
Salinity	X		
Total Suspended Solids (TSS)			X

Source: City of Woodland 2005

The discussion below focuses on high priority pollutants of concern identified in the water quality management plan that are also concerns related to management at the Yolo Bypass Wildlife Area.

Mercury

One water quality variable of particular concern regarding management activities at the Yolo Bypass Wildlife Area is methylmercury. Mercury occurs as a result of both natural and anthropogenic sources in the environment and continually cycles in the aquatic environments of the Sacramento River and San Joaquin River basins and Delta. The cycle involves different chemical forms and/or species of mercury as a result of both chemical and biological reactions in aerobic and anoxic microenvironments. On a world wide scale, mining sources are geographically localized and generally small but, in California's Central Valley, they are of great importance (Jones and Slotten 1996).

Historic gold-mining practices created the primary source of mercury in northern California rivers and the Delta. The mountain ranges that surround California's Central Valley and drain into the Sacramento and San Joaquin watersheds contain extensive mineral deposits. Discovery of gold deposits in the Sierra Nevada stimulated the California Gold Rush in 1848, and an abundance of mercury from hundreds of mercury mines in the Coast Ranges facilitated the rapid historic proliferation of gold-mining operations that used the mercury-amalgamation process to extract gold (Alpers and Hunerlach 2000). Hundreds of hydraulic gold-placer mines operated on the east side of the Central Valley (e.g., Feather River watershed). About 100,000 metric tons of mercury was produced by mercury-mining operations in the Coast Ranges, and about 12,000 metric tons of this were used in gold mining in California, with annual losses at mine sites ranging from about 10 to 30 percent of the mercury used (Alpers and Hunerlach 2000). Mercury mines in the Cache Creek and Putah Creek watersheds (both upstream of the Yolo Bypass) supplied much of the mercury amalgam for gold mining in the Sierras and other industrial uses. The majority of Coast Range mercury mines that supplied this practice has since been abandoned and remains unreclaimed. As a result of these two activities, bulk mercury contamination exists today on both sides of the Central Valley (Jones and Slotten 1996) and within the Yolo Bypass. A large proportion of the loads of mercury and methyl mercury in San Francisco Bay and the Delta are thought to originate in Cache Creek and pass through the Yolo Bypass (Domagalski et al. 2002).

Methylation of mercury is the key step in the entrance of mercury into the food web. Nearly 100% of the mercury that bioaccumulates in fish tissue is methylated. The rates of methylation are influenced by the bioavailability of inorganic mercury to methylating bacteria, the concentration and form of inorganic mercury, and the distribution and activity of methylating (i.e., sulfate-reducing) bacteria (Jones and Slotten 1996; Heim et al. 2003). Solid phase methylmercury concentrations vary seasonally; with the highest concentrations tending to occur during late spring and summer (Heim et al. 2003).

Gill et al. (2002) found that sediments appear to be a net source of methylmercury into the water column. Sinks or losses of total mercury and methylmercury include volatilization, sequestration (i.e., storage) in local soil, and biological uptake (i.e., accumulation in organisms' tissues). Demethylation of methylmercury is considered likely to be the major loss mechanism for this form. Stephenson et al. (2002), who employed a mass balance approach, suggests that the Delta is a sink for methyl mercury, due to photodemethylation (i.e., process of demethylation of mercury through sunlight exposure) or storage via bioaccumulation. Slotton et al. (2003) suggests that inorganic mercury newly delivered from upstream sources is more readily methylated and bioaccumulated than is inorganic mercury stored in the Delta and lower tributaries.

Wetlands support methylation processes and may export methylmercury to surrounding channels (Heim et al. 2003), however, recent research shows that there is still much to learn about methylmercury production and export processes from wetlands. Recent studies in the Delta indicate that some wetlands import and some export methylmercury (Stephenson, pers. comm., 2006). Two almost identical wetlands on Twichell Island that differ in depth and channel structure produce very different amounts of methylmercury (Stephenson, pers. comm., 2006). Biological findings indicate no distinct localized increase in net methylmercury bioaccumulation in wetlands

versus adjacent upland areas within Delta subregions (Slotten et al. 2003). Some of the most well developed, highly vegetated wetland tracts have exhibited reduced levels of localized net mercury bioaccumulation (Slotten et al. 2003). Recent DFG studies indicate that permanent wetlands could serve as demethylation ponds for water draining from seasonal wetlands, where methyl mercury levels are increased (Stephenson, pers. comm., 2008).

Additionally, recent findings on methylmercury production rates suggest that there may be an inverse relationship between environmental conditions that support high concentrations of biologically available mercury (e.g., relatively clean inorganic sediments [typically not associated with wetlands]) and those that support high sulfate reduction rates (e.g., oxic-anoxic sediment interface with relatively high amounts of organic material [typically associated with wetlands]) (Marvin-DiPasquale, pers. comm., 2005). These results suggest that wetland restoration may result in localized mercury bioaccumulation at levels similar to, but not necessarily greater than, levels within their surrounding subregion.

Mercury research from the Delta and tributaries consistently indicates that sediment methylmercury concentrations, methylmercury formation and demethylation, organism uptake and bioaccumulation, and mass flux of methylmercury transfer from sediment to water are highly dynamic processes that can vary considerably, depending on the land use/community type (e.g., wetlands/marsh, agriculture, open water), location in the region, and a host of other factors (e.g., hydrologic factors, salinity, pH, temperature, organic matter, temporal-seasonal conditions) (Jones and Slotten 1996, Foe 2002, Gill et al. 2002, Stephenson et al. 2002, Choe and Gill 2003, Choe et al. 2003, Davis et al. 2003, Foe et al. 2003, Heim et al. 2003, Slotten et al. 2003, Wiener et al. 2003).

As discussed in Section 3.1.4, the Central Valley Regional Water Quality Control Board is developing a Total Maximum Daily Load (TMDL) for methyl and total mercury in the Sacramento-San Joaquin Delta. This action could affect the management of the Yolo Bypass Wildlife Area.

Toxic Chemicals

Toxic chemicals including pesticides have impaired water quality in many Central Valley and Delta waterways and have recently been studied in the Yolo Bypass (Smalling et al. 2005). High concentrations of some metals from point and nonpoint sources appear to be ubiquitous in these waterways. In addition to mercury (discussed above), high levels of other metals (i.e., aluminum, copper, cadmium, and lead) in Central Valley and Delta waters are also of concern. Additionally, in localized areas of the Delta, fish tissues contain elevated levels of dioxin as a result of industrial discharges (State Water Resources Control Board 1999).

As discussed above, pesticides are found throughout the waters and bottom sediments of the Bypass. The more persistent organochlorine pesticides (e.g., DDT) are generally found throughout the system at higher levels than the less persistent organophosphate compounds (e.g., diazinon). Pesticides have concentrated in aquatic life in the Delta, and the long-term effects are unknown. The effects of intermittent exposure of toxic pesticide levels in water and of long-term exposure to these compounds and combinations of them are likewise unknown (State Water Resources Control Board 1999).

Salinity

High salts content in water potentially impacts productivity of agricultural crops and may create problems for seasonal wetlands. Local groundwater aquifers are relatively high in salts content (City of Woodland 2005). Because the Yolo Bypass Wildlife Area relies primarily on surface water for irrigation and flooding, high salt content groundwater is not as much of a concern. Prior to the construction of Shasta Dam, salinity was indeed more of an issue in the Yolo Basin with saline conditions being reported in the vicinity of County Road 155.

Bacteria

The bacteriological quality of Bypass waters, as measured by the presence of coliform bacteria, varies depending upon the proximity of waste discharges and land runoff. Bacteria are not a primary water quality concern at the Yolo Bypass Wildlife Area.

Selenium

Varying concentrations of selenium have been found naturally occurring in soils in California's Central Valley and can be found in high concentrations in agricultural drain water. The two primary agricultural drains discharging to the Yolo Bypass, Knights Landing Ridge Cut and Willow Slough Bypass, have been measured to have relatively high total and dissolved selenium concentrations and have been identified as low priority pollutants of concern (see Table 3.4-4) (City of Woodland 2005). The City of Davis conducts ongoing food chain and avian egg monitoring for selenium bioaccumulation. No adverse effects have been detected during the last 7 years of monitoring (City of Davis, unpublished data) Some of the effects on organisms when selenium is present in aquatic environments are reproductive dysfunction, deformities, anemia, and death in many species of birds, fish, and mammals (Amweg et al. 2003).

Boron

Boron is an essential element for plant growth and is needed in relatively small amounts; however, if present in amounts appreciably greater than needed, it can become toxic. Boron toxicity can affect nearly all crops and vegetation types but, like salinity, there is a wide range of tolerance among crops (City of Woodland 2005). Currently, boron is not of primary concern to agricultural and/or wetland management at the Yolo Bypass Wildlife Area. However, boron concentrations do have the potential to effect management if concentrations increase.

A reconnaissance investigation (Setmire et al. 1990) conducted at the Salton Sea under the Department of the Interior's National Irrigation Water Quality Program (NIWQP) identified boron as a contaminant of concern for wildlife. A more detailed study, conducted as a follow-up found that ruddy duck liver concentrations of boron increased during the course of their winter stay at the Salton Sea (Setmire et al. 1993). Additionally, laboratory studies with mallards indicate that reproductive impacts can occur at dietary concentrations of boron that have been found in waterfowl food items in the San Joaquin Valley (Smith and Anders 1989).

3.5 BIOLOGICAL RESOURCES

This section discusses common and sensitive biological resources, including vegetation, wildlife, and fisheries resources that occur or have the potential to occur in the Yolo Bypass Wildlife Area.

The following text was developed through a review of scientific literature, existing data sources, and Yolo Bypass Wildlife Area staff information. These sources provided information on documented occurrences, regional distributions, and habitat associations of key plant, wildlife, and fish species.

HABITAT MANAGEMENT BACKGROUND

Protection and active management of wetland and upland communities, and agricultural lands at the Yolo Bypass Wildlife Area provides vital, high-quality habitat for hundreds of wetland dependent wildlife species. California has lost approximately 95 percent of these types of habitats due to reclamation efforts, reservoir construction, levee and channelization projects, livestock grazing, timber harvest, water pollution, introduction of nonnative invasive plant species, gravel and gold mining, and clearing for agricultural, residential, and industrial uses over the past 150 years (Riparian Habitat Joint Venture 2000). The restoration of wetland and, to the extent allowable, riparian woodland communities at the Yolo Bypass Wildlife Area is providing important habitat for numerous species. Two-hundred-eighty terrestrial vertebrate species are known to use the Yolo Bypass Wildlife Area at some point during their annual life cycles (Appendix G), over 95 of which are known to breed in the Yolo Bypass Wildlife Area. The Yolo Bypass Wildlife Area also provides suitable habitat for 23 additional species that may occur on site but have not yet been observed there. The Yolo Bypass Wildlife Area is also known to support 38 special-status wildlife species (Table 3.5-3), and many more are locally rare or have specialized habitat requirements that the Wildlife Area provides. The Wildlife Area also provides seasonal or permanent aquatic habitat for 44 species of fish, 8 of which are special-status species (Table 3.5-5). Hundreds of invertebrate species also inhabit the Wildlife Area, including five special-status invertebrates (Table 3.5-3). Under the ecosystem management approach, management of the Yolo Bypass Wildlife Area is intended to maximize benefits for the full suite of these species as opposed to management at the single-species level.

During the winter and early spring of some years, flooding of the Yolo Bypass brings dramatic changes to the Wildlife Area. The floods provide vast expanses of aquatic habitat, as well as fish and invertebrate prey that attract thousands of waterbirds annually. The National Audubon Society has classified the Yolo Bypass Wildlife Area as a Globally Important Bird Area because it supports globally significant numbers of waterfowl, continentally significant numbers of least sandpiper (*Calidris minutilla*) and northern pintail (*Anas acuta*), and nationally significant numbers of American white pelican (*Pelecanus erythrorhynchos*), canvasback (*Aythya valisineria*) and dunlin (*Calidris alpina*) (Yolo Audubon Society Checklist Committee 2004).

The timing, area, volume, and duration of flooding have lasting effects on the Yolo Bypass Wildlife Area after the waters have receded. Winter (i.e., December through February) floods, which occur approximately 60 percent of years, have the most ecological value to waterbirds. Spring floods (i.e., March through May), which occur only in the wettest years, occur after many waterbirds have migrated away from the site. Initially, many wading birds are attracted to the floodwaters each year, to prey upon large populations of mammals and reptiles seeking refuge from the high waters. In the long term, spring floods are known to decrease small mammal and associated predator populations due to drowning and relocation, and it is assumed that resident reptiles experience similar declines. Spring floods also destroy early-season bird nests at the Yolo Bypass Wildlife Area. Upland habitat quality is also decreased by spring flooding, which causes many nutritious legumes to be replaced by less nutritious cocklebur and dock, and can preclude the planting of wildlife forage and agricultural crops such as safflower, milo, millet, sunflower, and rice. These habitat changes are also known to delay and ultimately reduce pheasant reproduction in years with spring floods, and affect many other species of wildlife as well.

An additional important feature of the Wildlife Area is its breeding colony of over 100,000 Mexican free-tailed bats (*Tadarida brasiliensis*). These bats nest each summer under the Yolo Causeway and prey on insects

throughout Yolo and Sacramento counties. The location of this colony in a protected Wildlife Area will help to ensure its long-term success.

3.5.1 VEGETATION RESOURCES

VEGETATION COMMUNITIES

Common vegetation communities found within the Yolo Bypass Wildlife Area are discussed below. Wildlife habitat characteristics are included in this discussion with additional description of wildlife guilds provided under Section 3.5.2, "Wildlife Resources." A crosswalk among community types and other common vegetation community classifications is provided in Table 3.5-1.

Table 3.5-1
Crosswalk Among Yolo Bypass Wildlife Area Community Types and Other Vegetation Classifications

Yolo Bypass Wildlife Area Community Types	CALFED MSCS NCCP Habitat Type [1]	DFG Holland Habitat Types [2]	Related Sawyer/Keeler-Wolfe Habitat Series [3]
Managed Seasonal and Permanent Wetland	Managed seasonal wetland, Seasonally flooded agricultural land	None	None
Natural Seasonal Wetland	Natural seasonal wetland	Vernal marsh (52500), Coastal and valley freshwater marsh (52410), Cismontane alkali marsh (52310)	Bulrush-cattail series, Saltgrass series, Sedge series, Spikerush series
Natural Perennial Wetland	Non-tidal freshwater permanent emergent	Coastal and valley freshwater marsh (52410)	Bulrush series
Riparian Woodland	Valley/foothill riparian	Great Valley willow scrub (63410), Great Valley cottonwood riparian forest (61410), Great Valley mixed riparian forest (61420), Great Valley valley oak riparian forest (61430), Elderberry savanna (63430)	Mixed willow series, Black willow series, Fremont cottonwood series, Mexican elderberry series, Narrowleaf willow series, Sandbar willow series, Valley oak series
Vernal Pool and Swale	Natural seasonal wetland	Northern claypan vernal pool (44120)	Northern claypan vernal pool series
Ditch	Seasonally flooded agricultural land	None	Mosquito fern series
Annual Grassland	Grassland	Non-native grassland (42200), Valley needlegrass grassland (42110), Valley wildrye grassland (42140)	California annual grassland series, Purple needlegrass series, Creeping ryegrass series

[1] CALFED Multi-Species Conservation Strategy - Natural Community Conservation Plan (CALFED Bay-Delta Program 2000b)
[2] Holland 1986
[3] Sawyer and Keeler-Wolfe 1995

Seasonal and Permanent Wetlands

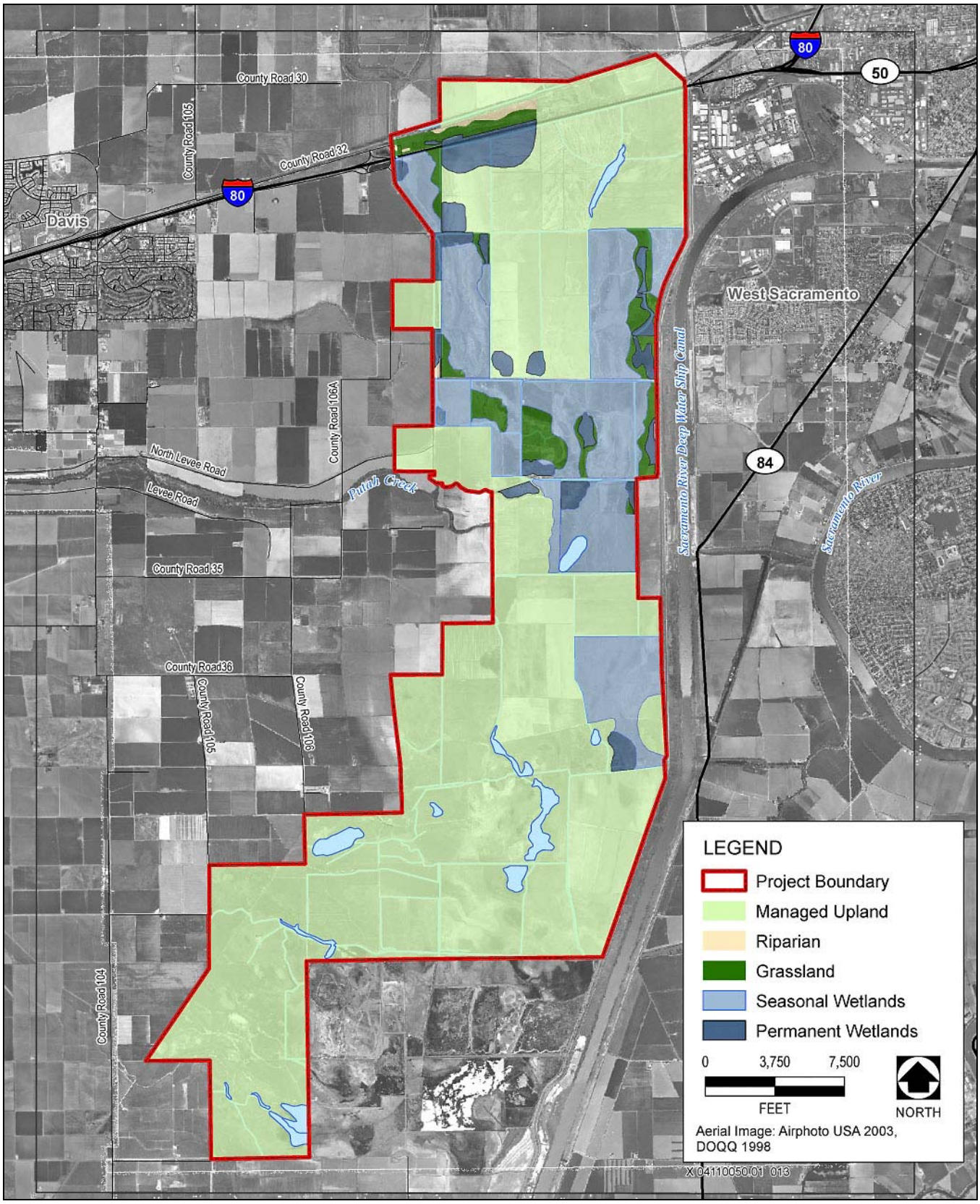
Wetlands have evolved as dynamic ecosystems, constantly changing due to the physical and chemical processes associated with floods, drought, and fire. Today, the Yolo Bypass is an engineered floodway; managed wetlands in the Yolo Bypass Wildlife Area are now enclosed by levees and berms, and flooded with water from irrigation conveyance systems. Whereas natural wetland hydrology was very dynamic, flooding cycles now used for wetlands can be predictable through strategic and innovative management. It is the task of the Yolo Bypass Wildlife Area management to emulate natural hydrology and re-create a dynamic, productive wetland system. With only an estimated 5 percent of the Central Valley's original wetlands remaining, it is also imperative that the remaining wetlands are managed such that they support the maximum abundance and diversity of wildlife (California Department of Fish and Game 1995). The Yolo Bypass Wildlife Area, geographically positioned in the heart of the Pacific Flyway where the Sacramento Valley meets the Delta, supports an extremely large concentration of wintering waterfowl, thus management has an enormous responsibility to provide optimum habitat. Furthermore, wetland management at the Wildlife Area can be conducted in such a manner that shorebirds, wading birds, breeding waterfowl, and other wetland-dependent wildlife also realize maximum benefits (California Department of Fish and Game 1995).

Wetland management techniques in the Yolo Bypass Wildlife Area are built upon the cursory prescriptions as described in *"A Guide to Wetland Habitat Management in the Central Valley"* (California Department of Fish and Game 1995) and have been adapted to specific environmental conditions within the Yolo Bypass and the need to remain compatible with the flood control function of the Yolo Bypass. The management of productive wetland habitat requires dynamic water management, as well as periodic soil and vegetation disturbances. Adequate water conveyance systems are essential for meeting water management objectives, thus pumps, delivery ditches, water control structures, and drainage systems must be maintained in functional condition. Discing and mowing are used to interrupt the natural evolution of wetland habitat and to set back plant succession from climax to early successional stages, stabilizing the marsh vegetation at a point which is the most productive of those elements required by waterfowl and other wetland-dependent species (California Department of Fish and Game 1995). It has also been demonstrated that manipulation of vegetation in seasonal wetlands can change the invertebrate community by increasing the proportion of midges while decreasing the number of mosquitoes. This result has the dual benefit of providing an important protein source to birds and fish while decreasing the chances of exasperating a potential public health issue by increasing mosquito production. Exhibit 3.5-1 depicts a map of managed seasonal and permanent wetlands in the Yolo Bypass Wildlife Area.

Habitat management activities are evaluated annually by the DFG Wildlife Area Habitat Committee (WAHC). The WAHC was established in 1991 to develop acreage and quality guidelines for wetland and upland habitats occurring on DFG's 14 major wetland wildlife areas. A habitat management plan is prepared each year and assessed by the WAHC. A site visit occurs during the summer months to monitor habitat conditions, develop recommendations for future efforts, and evaluate the success of planned field work.

Managed Seasonal Wetlands

Managed seasonal wetlands at the Yolo Bypass Wildlife Area occur primarily throughout the original Wildlife Area units (i.e., North, Northwest, West, Central, Northeast, and South) and are generally flooded in the fall beginning on September 1, with standing water maintained continuously throughout the winter until drawdown occurs in the following spring on April 1. A variety of annual plants germinate on the exposed mudflats of seasonal wetlands during the spring draw down. These plants are then managed through the timing, duration or absence of summer irrigations. These plants are collectively known as "moist-soil plants." These plants produce seeds that are important foods for waterfowl and other wetland-dependent wildlife. The target species for managed seasonal wetlands at the Yolo Bypass Wildlife Area is swamp timothy (*Crypsis vaginaflora*) because it provides tremendous numbers of nutritious seeds for consumption by migratory waterfowl, its branch structure is an excellent substrate for invertebrate production, and its low stature presents very little resistance to flood waters moving through the Yolo Bypass. Interestingly, this plan is considered undesirable in the vernal pool areas of the



Source: Department of Fish and Game, City of Davis 2005, CaSIL 1993

Yolo Bypass Wildlife Area Managed Permanent and Seasonal Wetlands **Exhibit 3.5-1**

Tule Ranch, where a native forb community predominates. A combination of moist-soil plants and robust emergent vegetation (e.g., cattails [*Typha*] and/or tules [*Scirpus*]) results from management practices employed in Yolo Bypass Wildlife Area seasonal wetlands. A primary objective of "moist-soil management" (i.e., seasonal wetland management) is to provide an abundance and diversity of seeds, aquatic invertebrates, and other moist-soil foods for wintering waterfowl and other wildlife. Although agricultural grains produced in the Wildlife Area (e.g., rice and corn) supplement the diets of waterfowl in winter, these foods lack many of the vitamins, minerals, and proteins essential for survival and subsequent reproductive success (Euliss and Harris 1987; Chabreck et al. 1989; Combs and Fredrickson 1996). The seeds of moist-soil plants provide waterfowl with the essential nutritional balance lacking in grains. Invertebrates are protein-rich by-products of moist-soil management that serve as an important food source for waterfowl and shorebirds during autumn, winter, and spring. (California Department of Fish and Game 1995).

Wildlife Values of Managed Seasonal Wetland Plant Communities

Diets of wintering waterfowl are diverse and include aquatic invertebrates, moist-soil plant seeds, and agricultural grains (Euliss and Harris 1987; Chabreck et al. 1989; Combs and Fredrickson 1996). Research in waterfowl nutrition has recognized variability in value among foods, whereas studies of waterfowl food habits (Combs and Fredrickson 1996) and foraging ecology (Euliss and Harris 1987; Euliss et al. 1991) have focused primarily on differences in abundance among foods. Winter diet restriction in waterfowl can affect timing of molt, body mass, mortality and pair formation (Demarest et al. 1997), and nest initiation date (Dubovsky and Kaminski 1994). Studies also have shown that food quality can affect egg production and timing of molt (Richardson and Kaminski 1992). Canvasbacks (*Athya valisineria*) have been documented to quickly regain lost body mass when fed a nutritionally balanced diet following short-term food deprivation, but continue to lose mass when fed unbalanced diets (California Department of Fish and Game 1995). Thus, diet quality is important not only in maintaining condition of wintering birds, but also in mitigating physiological effects of short-term food deprivation, such as periods immediately after long distance migrations. Given the maintenance and anabolic costs of migrating and wintering birds, wetland management prescriptions at the Yolo Bypass Wildlife Area that promote the production of nutritionally balanced foods is a primary objective.

The wildlife value of a moist-soil plant species is generally based on its seed production capability, the nutritional quality of its seeds, and the invertebrate habitat the plant community provides. Management practices at the Yolo Bypass Wildlife Area promote a diversity of highly valuable moist-soil plants, many of which are non native species. Swamp timothy, watergrass (*Echinochloa crus-galli*), and smartweed (*Polygonum amphibium*) are the most important moist-soil plants in the Central Valley, although smartweed is not commonly grown on the Wildlife Area. Seeds of these three plants, in aggregate and combined with agricultural and wildlife forage crops, provide waterfowl and other seed-eating wildlife with a nutritionally balanced diet. Additionally, a variety of other wetland plants are also needed to provide additional nutrition, cover, and thermal protection including sweet clover (*Melilotus alba* and *Melilotus indica*), and the emergent cattails and bulrushes. Some moist-soil plants are not good seed producers or produce seeds with modest nutritional value, but have a complex leaf structure and harbor rich invertebrate communities, thus are also valuable to wildlife at the Area (California Department of Fish and Game 1995).

Other species that may be found in managed seasonal wetlands that are less desirable for wildlife include nonnative plants such as dock (*Rumex* spp.); native plants like gumweed *(Grindelia camporum* var. *camporum*), joint grass (*Paspalus distichum*) and cocklebur (*Xanthium strumarium*), and nonnative invasive plants like perennial pepperweed (*Lepidium latifolium*).

Seasonal wetlands are important production areas for invertebrates that provide a food source for birds both during their aquatic stages and as adults. Larger predatory invertebrate larvae such as dragonfly nymphs help control undesirable invertebrate species such as mosquitoes. They are large enough to be eaten by herons and egrets. Midge (chironomidae) larvae are a critical component of the invertebrate community. Indeed, midge larvae

provide much of the protein needed by waterfowl in the spring, by fish foraging on the flood plain in late winter, and by shorebirds throughout the year.

Habitat Values of Managed Seasonal Wetland Plant Communities

The vast majority of wetlands managed on the Yolo Bypass Wildlife Area are seasonal wetlands. Seasonal wetlands are the most productive type of wetland and they can be managed in a way that is compatible with flood protection. The target vegetation species in seasonal wetlands at the Yolo Bypass Wildlife Area is swamp timothy, making the seasonal wetlands very open and allowing efficient floodwater conveyance. When shallowly flooded, this is the preferred habitat of the northern pintail, which is important given the Pacific Flyway is the preferred wintering ground for sixty percent of the pintail on the continent. Over 100,000 waterfowl winter on the Yolo Bypass Wildlife Area on a routine basis, and many of these birds are pintail. The diminutive green-winged teal is also very numerous, preferring the same shallowly flooded seasonal wetlands. Mallard, gadwall, American widgeon round out the “big five” waterfowl species in the Central Valley.

On the shallow fringes, large numbers of shorebirds feed on invertebrates produced in the organic soup of the seasonal wetlands. Ground disturbances such as discing and mowing favor the production of midges, whose larvae provide a critical food source for shorebirds and waterfowl.

Low islands are disced prior to fall flood up to provide roosting areas for the large numbers of waterfowl crowding for a space on the dirt mounds. The “furniture” is well used throughout the winter and only the arrival of a peregrine falcon will clear the islands of waterfowl.

The deeper swales that cut through the seasonal wetlands not only help disperse water during flood up and draw down periods, they also provide deeper water habitat in the winter for diving ducks and white pelicans. In the spring, the swales can be maintained in a flooded state to present foraging areas for nesting shorebirds.

Mudflats are present on the upper edge of managed seasonal wetlands and in the Wildlife Area’s rice rotation that is specifically managed to support shorebirds. Shorebirds forage exclusively in mudflats and shallow open water habitats, which have declined substantially in California’s Central Valley due to the historical conversion of wetlands to agriculture. The on-site mudflats support abundant invertebrate populations, and thus provide important foraging habitat for large numbers of migrating and wintering shorebirds along the Pacific Flyway, including least sandpiper, western sandpiper, long-billed dowitcher, and dunlin. Shorebirds known to breed in the Wildlife Area’s upland communities also depend on mudflats to meet their foraging requirements. These species include American avocets, black-necked stilts, spotted sandpiper, and killdeer. Some dabbling ducks such as cinnamon teal also forage by skimming the mudflats’ surface. Terrestrial predators such as coyotes, raccoons, and skunks prey upon the nesting shorebirds, their young, and eggs in this habitat.

Water Drawdown and Soil Disturbance

Important moist-soil waterfowl food plants such as swamp timothy, smartweed, and watergrass are propagated on seasonal wetlands in the Yolo Bypass Wildlife Area. The primary factors that affect the type and abundance of moist-soil plants that are found in seasonal wetlands are the timing and duration of flooding and the disturbance of the soil. The seeds of these target plant species germinate best at a specific soil temperature under specific successional conditions. Therefore, as plants compete for dominance, prescribed wetland management favor specific plants (or groups of plants) by timing drawdowns to coincide with optimum germination conditions (primarily soil temperature), and discing periodically to maintain the successional stage required by the target vegetation (California Department of Fish and Game 1995). Therefore, seasonal wetlands are usually drawn down on April 1 to favor the germination of swamp timothy. Watergrass appears with later drawn down dates or with summer irrigations.

The rate of water drawdown affects moist-soil plant composition, seed production, and the duration of food availability to waterbird species. Slow drawdowns over 2 to 3 weeks cause invertebrates to become concentrated

in the shallow water and allow waterfowl and shorebirds optimum foraging conditions for a prolonged period. This presents an ideal foraging opportunity for these birds who are about to embark on their annual journey to their northerly breeding grounds. These draw downs may also concentrate fish that were captured during the winter floods, presenting a productive feeding opportunity for resident wading birds. Slow drawdowns also may enhance seed production. Rapid drawdowns (i.e., 2 to 3 days) may produce extensive stands of waterfowl food plants if timed correctly, but lose the extended shallow water habitat associated with slow drawdowns. Rapid drawdowns late in the growing season are preferably followed by a summer irrigation to ensure a good seed crop. Although slow drawdowns are generally better for wildlife, there is no "right" or "wrong" way to drain a seasonal wetland. The rate of drawdown at the Wildlife Area is based on site-specific circumstances and may vary year to year. For example during a warm spring, it may be preferable to draw down faster in order to avoid the production of large numbers of mosquitoes.

Irrigation

Spring and summer irrigations are very important to seasonal wetland management throughout the continent. Most waterfowl food plants will not attain maximum seed production without at least one irrigation. Swamp timothy is a waterfowl food plant that may be grown successfully without irrigation; however, irrigations greatly enhance seed production if timed correctly and may stimulate an over story of watergrass. Summer irrigation of swamp timothy also tends to concentrate grasshoppers and rodents to the edge of the waterline, where they are quickly consumed by Swainson's hawks, white-faced ibis, egrets and herons. Large concentrations of Swainson's hawks foraging in irrigated seasonal wetlands are an annual spectacular phenomenon at the Wildlife Area. Irrigation schedules at the Yolo Bypass Wildlife Area for smartweed and watergrass may vary depending on annual weather patterns (California Department of Fish and Game 1995).

Summer Water

Southbound migratory shorebirds start arriving in the Central Valley during the last week of June, peaking in mid July to early August. They have already nested in their northerly breeding grounds and are already moving south. Some of these birds may be stopping over on their way to the San Joaquin Valley or more southerly wintering grounds, and some are here for the duration of the winter. At any rate, these birds are in need of nutrition in the form of invertebrates and require a habitat that provides varying shallow water depths and a sparseness of vegetation. Additionally, they require resting areas that provide some protection from predators. These habitat characteristics are provided in the fallowed rice fields managed for migratory shorebirds. The fields are prepared identically to rice fields but are not planted and are flooded from July 1 through August 31st. At this time, significant amount of vegetation has become established. The fields are then drained, the weeds disced and the field readied for rice production the following year. This management strategy has proven to have benefits for a variety of species including waterfowl, terns, gulls, wading birds and predators such as peregrine falcon.

Fall Flooding

The timing of fall flooding is based on many factors. Early fall flooding (i.e., August and September) is particularly important for shorebirds, mallards and early migrant pintails and is generally preferred if feasible. During the planning phases of the original Yolo Bypass Wildlife Area, September 1 was determined to be the optimal fall flood up date for seasonal wetlands. With the arrival of West Nile Virus in California, the Department has abided by the requests of the Sacramento Yolo Mosquito and Vector Control District and delayed the fall flood up until October 1st on a year by year basis. The shorebird management areas have been able to provide the necessary early flood water through the month of August for the arriving pintail and mallards, but there currently remains a deficit during September.

Water Depth

Water depth is an extremely important component in Wildlife Area seasonal wetland management. Dabbling ducks (e.g., mallards, pintails, green-winged teal) cannot effectively feed on the seeds and invertebrates found on

pond-bottoms if the water is deeper than 12 inches. Water depths of 4–10 inches are preferred for feeding. Therefore, in order to provide feeding habitat for dabbling ducks, shallow water must be maintained. Shallow water habitat management is valuable to many other wildlife species as well. Shorebirds are particularly dependent on shallow water and seldom use habitats in which the water is deeper than 6 inches (California Department of Fish and Game 1995). Water depths of one inch or less are valuable for smaller shorebirds such as least and western sandpipers and even recently dried mudflats are important for certain species such as snowy plover. The complete absence of water in a plowed field has habitat value as well, attracting such birds as horned larks, mountain plover and various species of longspurs.

Managed Semi-permanent/Permanent Wetlands

Many of the Yolo Bypass Wildlife Area's resident wildlife species are highly dependent on semi-permanent and permanent wetlands during the late spring and summer when seasonal wetlands are dry. Generally, the two primary habitat requirements of wetland wildlife during this time period are sufficient cover and protection from predators, and an abundant food supply of aquatic invertebrates. Such invertebrates are the primary source of dietary protein for ducks and other wetland-dependent birds during the breeding season. For example, breeding ducks and shorebirds eat invertebrates almost exclusively, but herons eat other direct consumers of invertebrates such as fish and amphibians.

Managed Semi-permanent wetlands, commonly referred to as "brood ponds," are flooded during the spring and summer, but may experience a 2–6 month dry period each year. Semi-permanent wetlands in the Yolo Bypass Wildlife Area provide breeding ducks, ducklings, and other wetland wildlife with protection from predators and abundant invertebrate food supplies. Water depths of 6–12 inches are necessary to allow wildlife access to invertebrate forage; however, permanent deeper and larger areas (e.g., Green's Lake and ponds) are also important in that they provide open water.

Both managed semi-permanent and permanent wetlands provide ample protection from predators; however, semi-permanent wetlands can supply a much greater abundance of invertebrates. Invertebrate populations decline with prolonged flooding, thus a dry period of approximately 2 months each year is essential for maintaining abundant populations of invertebrates (California Department of Fish and Game 1995). During this dry period, excessive vegetation is cut or burned and worked back into the soil, in order to remain in compliance with flood control agreements, while adding large amounts of organic matter to fuel the production of invertebrates in successive years. Vegetation removal is often necessary in order to remain within the percent cover limits imposed by agreements with the Reclamation Board.

Permanent wetlands remain flooded throughout the year. Due to year-round flooding, permanent wetlands support a diverse, but usually not abundant, population of invertebrates. However, submerged aquatic vegetation such as pondweed (*Potomogeton* spp.) and arrowhead (*Sagittaria* sp.) may occur if adequate water clarity exists. The leaves and/or nutlets of these aquatic plants are commonly consumed by waterfowl, particularly gadwalls and canvasbacks. Other aquatic plants including water primrose (*Ludwigia peploides*) and parrot's feather (*Myriophyllum aquaticum*) are potentially invasive and can lead to choking the water column. Permanent wetlands are ultimately dominated by emergent plants such as cattail (*Typha* sp.) and bulrush (*Scirpus* sp.) which must periodically be thinned out in managed wetlands.

Habitat Values of Permanent Wetlands

Managed wetlands as wildlife habitat lie at the core of the Wildlife Area's focus. Permanent wetlands provide important deep water habitat for diving ducks such as ruddy ducks, scaup, goldeneye, as well as other aquatic species including pied-billed grebes, coots, and moorhens. The dense emergent cover commonly found on the edges of permanent wetlands are often the preferred breeding grounds for marsh wrens, red-winged blackbirds, and roosting areas for black-crowned night herons, white-faced ibis and egrets. Islands created in the permanent wetlands are the preferred nesting areas for many waterfowl and shorebirds. Muskrats, and beaver utilize the tules

as building material for their domed homes. Otters swim effortlessly through the reeds, carving deep slides into the permanent ponds from adjacent ditches. Fish trapped in the permanent ponds following the winter floods live throughout the year in these ponds, with another chance for dispersal the following wet season.

Permanent Wetlands provide important brood habitat for resident waterfowl including mallard, cinnamon teal and gadwall. Waterfowl will nest within one mile of water, so with this in mind, permanent wetlands are situated less than one mile apart from each other. During the late spring and early summer months, dozens of young ducklings may be seen in the permanent wetlands. The hens often form large nursery groups consisting of ducklings from several broods.

Permanent marshes are important to resident waterfowl in mid- to late summer when local ducks are molting their flight feathers; the deep water and dense cover provide protection from predators (California Department of Fish and Game 1995).

Young willows and cottonwoods growing on the shoreline of permanent wetlands are controlled by DFG staff as maintenance to ensure that the flood carrying capacity of the Bypass is not diminished and are therefore always of low stature. This appears to be important habitat for yellowthroats, song sparrows and northern orioles.

Unmanaged Open Water Habitat (Floodwater Inundation)

Although not a managed habitat type and with a diminished influence of vegetation type, open water habitats provide similar habitat values to permanent wetlands. Winter floodwaters in the Yolo Bypass support thousands of migratory waterbirds each year, and are thus important to breeding populations throughout California and beyond. A wide variety of waterbirds forage in the open water habitat provided by seasonal flooding. These birds are distributed according to water depth and include American white pelican, double-crested cormorant (*Phalacrocorax auritus*), and diving ducks such as canvasback and scaup. If the flooding is not substantial, water levels day light out on the western edge, providing thousands of acres of shallow water habitat, albeit unmanaged. This edge is extremely valuable for wintering dabbling ducks, shorebirds, and wading birds. The abundant waterfowl and shorebirds onsite in turn attract many raptors, including American peregrine falcon.

After floodwaters recede, smaller areas of open water habitat remain in the Yolo Bypass Wildlife Area's perennial wetlands and ponds. These areas support foraging waterbirds and raptors throughout the year, including species which breed in the uplands and marshes, such as pied-billed grebe (*Podilymbus podiceps*), mallard, gadwall, American avocet, and black-necked stilt. The perennial ponds also support reptiles such as northwestern pond turtle (*Actinemys marmorata marmorata*) and an introduced turtle species, the red-eared slider (*Trachemys scripta*), which forage in the open water, bask on floating logs and breed in adjacent uplands A discussion on fish species that utilize Yolo Bypass open water habitats is provided in Section 3.5.3 below.

Seasonal and Permanent Wetland Habitat Diversity

Wetland habitat diversity including variations in topography, water depths, and vegetation patterns are valuable in supporting a wide variety of wildlife species and can also more effectively resist the potentially adverse effects of plant diseases, mosquito production, and bird depredation. Diversified habitats also provide a variety of foraging opportunities throughout the fall and winter for a variety of target species. Even though some moist-soil plants are poor seed producers, when flooded they may support excellent assemblages of invertebrates. Waterfowl also utilize other plants (e.g., cattails and tules) for cover. An ideal seasonal wetland is dominated by waterfowl food plants, contains other moist-soil plants, and provides waterfowl, shorebirds, and wading birds with substantial cover.

Yolo Bypass Wildlife Area habitat improvements that were initiated in 2003 were designed to provide such habitat diversity. These enhancements were federally funded by the North American Wetland Conservation Act (NAWCA) monies matched by the acquisition dollars expended by the Wildlife Conservation Board for the expansion of the Wildlife Area. NAWCA funded improvements were carried out throughout several units on the

Wildlife Area and included adding much needed topographic variation, increasing connectivity of drainage swales, and constructing independent flooding and drainage capabilities. Through the expertise of DFG staff, Ducks Unlimited, and the California Waterfowl Association, a wetland enhancement project was constructed that improved manageability of the wetlands, allowing DFG to more effectively meet obligations to manage wetlands that are compatible with flood protection and mosquito abatement considerations. The end result are individually managed seasonal wetlands with meandering channels, deep pockets, sculptured islands, and shallow benches growing stands of lush watergrass. This complex diversity in topography and associated vegetation communities functions to provide a wide spectrum of microhabitat to meet the specific seasonal and life-stage requirements of a wide assortment of wildlife species.

Vegetation Control

As discussed above, wetland management techniques in the Yolo Bypass Wildlife Area are built upon the prescriptions as described in *"A Guide to Wetland Habitat Management in the Central Valley"* (California Department of Fish and Game 1995) and have been adapted to specific environmental conditions within the Yolo Bypass and the need to remain compatible with the flood control function of the Yolo Bypass. The need to ensure compatibility of managed wetlands with floodwater conveyance includes management of emergent vegetation to make certain that these communities will not conflict with necessary flow conveyance requirements of the Yolo Bypass. Specific criteria for managing emergent vegetation have been developed for the managed wetlands in the Yolo Bypass Wildlife Area, and are described in the U.S. Army Corps of Engineers Operating Manual for the Wildlife Area (U.S. Army Corps of Engineers 2003); these criteria include:

- no more than 5% emergent vegetation in seasonal wetlands;
- no more that 50% emergent vegetation in permanent wetlands (which make up approximately 5% of the total Wildlife Area acreage); and
- riparian vegetation allowed only in specifically designated areas as determined by hydraulic modeling.

For purposes of the operating manual, emergent vegetation includes cattails and bulrush. Acceptable seasonal wetland plants include swamp timothy, watergrass, and smartweed.

In addition to maintaining necessary flow conveyance functions, some plants can also reduce the value of a wetland to waterfowl if they become overly abundant. Tules and/or cattails can eventually "fill-in" a pond, eliminate open water, and exceed emergent vegetation criteria provided above. Any coverage greater than 50% in a permanent wetland is undesirable for waterfowl management. Of course, other species benefit from increased emergent cover such as white-faced ibis, marsh wren, and black-crowned night herons. The primary tools for tule/cattail control at the Yolo Bypass Wildlife Area are discing and mowing. Mowing can be most effective when followed by discing and 2–3 months of exposure to the sun, which is necessary in order to dry out and kill the tubers and rhizomes. Discing tules and cattails also disturbs the soil and provides favorable conditions for invasion by valuable moist-soil waterfowl food plants (California Department of Fish and Game 1995). Ideally, discing of emergent vegetation is preceded by burning, grazing, mowing and or an application of a broad spectrum herbicide to increase the effectiveness of the discing operation.

Discing is typically accomplished with either a "stubble disc" or a "finish disc." The depth of discing varies with soil structure, soil moisture, implement weight, tractor size, and tractor speed. Most stubble discs have blades that range from 26–36 inches in diameter; these make cuts that are 7 to 14 inches deep. Stubble discs are necessary for most types of pond-bottom discing, however, a finish disc and ring-roller can be used afterward to break up dirt clods to create a better seed bed and make walking easier under subsequent flooded conditions (California Department of Fish and Game 1995).

Finish discs, which typically have blades that range from 18–24 inches in diameter, usually make cuts that are 4–6 inches deep. Finish discs often suffice for discing low-growing vegetation such as pricklegrass and swamp

timothy, but are less effective for controlling cattails, tules, and other robust wetland plants (California Department of Fish and Game 1995).

Wetland Management and Mosquito Control

With the arrival of the West Nile virus, public health concerns about mosquito production in wetlands, rice fields, or other rural sources have elevated substantially. The control of mosquitoes in the managed wetlands within the Yolo Bypass Wildlife Area is a primary concern, due to the close proximity of large urban populations in West Sacramento, Sacramento, and Davis. Seasonal and permanent wetlands at the Yolo Bypass Wildlife Area are managed in coordination with the Sacramento-Yolo Mosquito Vector Control District (SYMVCD) and with best management practices (BMPs) included in the CVHJV's Technical Guide to Best Management Practices for Mosquito Control in Managed Wetlands (Kwasney et al. 2004) and the operation manual (U.S. Army Corps of Engineers 2003) to minimize the production of mosquitoes. The term, "BMPs" is used to describe habitat management strategies that are generally defined as a practice or combination of practices determined to be an effective and practical means for reducing mosquito populations, production rates, or the timing of hatch. BMPs can be effectively classified into the following five categories:

- Water Management Practices,
- Vegetation Management Practices,
- Wetland Infrastructure Maintenance,
- Wetland Restoration and Enhancement Features, and
- Biological Controls.

A full discussion on BMPs that are used to reduce mosquito production in managed wetlands at the Yolo Bypass Wildlife Area can be found online at: <http://www.centralvalleyjointventure.org/images/CVJV_Mosquito_BMP_rev.pdf> (Kwasney et al. 2004). Wildlife Area staff in partnership with the SYMVCD was able to fund an mosquito BMP implementation project with funds made available through Senate Bill 1982. This project focused on the control of joint grass (*Paspalum dicitum*), through discing and herbicide application. Joint grass has been implicated as a plant which facilitates the production of large numbers of mosquitoes while providing little wildlife habitat value. First year monitoring has yielded promising results, with a significantly reduced number of mosquito larvae collected in the treated areas.

In response to elevated concern about West Nile Virus and Encephalitus, DFG agreed to temporarily delay the initial flood of seasonal wetlands. Continuous communication and coordination between Wildlife Area and SYMVCD staff regarding water level management, spraying operations, public use scheduling, research projects and planning and design of future wetlands are vital components of management at the Yolo Bypass Wildlife Area. The goals of both wetland managers and mosquito vector interests are not that different. Both seek effective management of water in wetlands that do not result in significantly increased mosquito numbers.

Annual Grassland

Grasslands are found across the majority of the 9,000-acre Tule Ranch unit and in scattered locations within other management units. The majority of annual grassland in California is are dominated by a variety of naturalized, nonnative grasses and forbs. Species composition in this community varies widely in response to a variety of micro-scale factors such as soil moisture, soil fertility, disturbance (e.g., gopher mounds), grazing pressure and soil depth. Most grasslands in the Yolo Bypass are dominated by Italian (annual) rye grass (*Lolium multiflorum Lam.*). Common, and occasionally dominant, species include a variety of naturalized nonnative grasses and forbs such as medusahead (*Taeniatherum caput-medusae*), soft chess (*Bromus hordeaceus*), filaree (*Erodium botrys*), Mediterranean barley (*Hordeum marinum* ssp. *gussoneum*), slender wild oats (*Avena barbata*), ripgut brome (*Bromus diandrus*), and rose clover (*Trifolium hirtum*). Native geophytes (bulbs) are also common in these habitats and include a variety of species in the genus *Brodiaea* as well as *Tritelia hyacynthina*, *Tritelia laxa*, and *Calochortus*.

Community composition in wetter sites is similar to vernal pools (discussed below). On shallower soils, grasses generally become less dominant and native forbs such as smooth goldfields (*Lasthenia glabrata* ssp. *glabrata*), owl's clover (*Triphysaria eriantha*), Fitch's tarweed (*Hemizonia fitchii*), blow wives (*Achyrachaena mollis*), California plantain (*Plantago erecta*), and others are more common. Annual grasslands may occasionally contain small areas of remnant perennial native grasses where purple needlegrass (*Nassella pulchra*) and, in more moist areas, creeping wildrye (*Leymus triticoides*) are important components of the grassland community. Purple needlegrass rarely occurs in pure stands; rather it is more commonly encountered as single individuals or scattered groups of several individuals surrounded by and interspersed with nonnative annuals. On saline or alkaline soils, saltgrass (*Distichlis spicata*) becomes a common or dominant component of the grassland. The Tule Ranch grasslands are grazed with cattle as a primary management strategy. This strategy has been proven to be a successful technique for the management of native forbs, resulting in spectacular wildflower blooms in recent years.

The grassland community in the Yolo Bypass Wildlife Area's Tule Ranch Unit provides high-quality breeding and foraging habitat that is relatively scarce in the region, due to habitat conversion to agriculture and the widespread habitat degradation by nonnative invasive plants. Managed (i.e., grazed) grasslands such as those found in the Tule Ranch Unit are especially important given the grassland-obligate wildlife that they support, such as grasshopper sparrow (*Ammodramus savannarum*), and the many grassland-associated wildlife that they support, such as the ground-nesting northern harrier, California horned lark (*Eremophila alpestris actia*), Western burrowing owl (*Speotyto cunicularia*) and western meadowlark (*Sturnella neglecta*). Historically, pronghorn antelope and tule elk grazed the grassland plants. However, today, grazing cattle provide this function and serve to control mostly nonnative competing grasses while providing income, which funds management of the Yolo Bypass Wildlife Area. Grasslands also provide important breeding and foraging habitat for upland game birds such as mourning dove and ring-necked pheasant, as well as nesting habitat for resident waterfowl such as mallard, cinnamon teal, and gadwall. In addition to their ecological value, these upland game bird and waterfowl species also provide income for Wildlife Area management in the form of hunting licenses. Grasslands also support abundant small mammals such as California ground squirrel (*Spermophilus beecheyi*), which in turn attract many avian, mammalian, and reptilian predators such as Swainson's hawk, burrowing owl (*Athene cunicularia*), coyote (*Canis latrans*), racers (*Coluber constrictor*),and gopher snake (*Pitupohis melanoleucus*). Large flocks of snow geese and white fronted geese are also attracted to winter grasslands on the Tule Ranch.

Natural Seasonal Wetland

Natural seasonal wetlands are found throughout the Tule Ranch Unit in the Yolo Bypass Wildlife Area. Depending on the duration of inundation, local soil factors, site history, and other characteristics, seasonal wetlands typically are dominated by species characteristic of one of three common natural wetland communities: freshwater marshes, alkali marshes, or freshwater seasonal (often disturbed) wetlands. Because these three communities are characterized by different dominant species and provide different wildlife habitat values, each is discussed separately below.

Freshwater Marsh

Freshwater marshes at Yolo Bypass Wildlife Area are usually dominated by robust native herbaceous species in two genera, *Typha* (cattails) and *Scirpus* (bulrush or tule), which frequently co-occur in large stands interspersed with areas of largely unvegetated open water that, during the dry summer months, may be dominated by nonnative swamp timothy and swamp grass (*Crypsis schoenoides*). Many of the native forbs characteristic of vernal pools in the region, such as coyote thistle (*Eryngium* spp.), gum plant (*Grindelia* sp.), Baker's Navarettia (*Navarettia bakeri*), and goldfields (Lasthenia spp.), may also be found in these natural wetland areas. These communities are typically found in areas subjected to prolonged flooding during the winter months and frequently do not dry down until early summer. Freshwater marsh occurs in small areas throughout the Tule Ranch primarily in the low elevation areas adjacent to East Toe Drain at the south end of the Wildlife Area. During wet springs the acreage of natural freshwater marsh increases significantly. A small area in the southeast corner of the Wildlife

Area is of such low elevation that it is subject to tidal fluctuations through a breech in the berm along the toe drain.

Alkali Marsh

Alkali marshes are commonly found in and around the Sacramento Delta at the fringes of freshwater marsh communities. They are the areas of seasonal inundation where rainfall ponds during the winter and evaporates in the late spring leaving behind layers of accumulated mineral salts leached from surrounding upland soils (many of which are slightly to moderately saline and alkaline, e.g., Pescadero clay soils). Typically, these areas are either unvegetated salt scalds or they contain a unique assemblage of low-growing plants adapted to periodic winter inundation, summer drought, and alkaline/saline soils. Dominant native plants in this community are saltgrass (*Distichlis spicata*) and alkali heath (*Frankenia salina*). Common native associates, depending on the degree of seasonal inundation and soil alkalinity include sea blite (*Suaeda* spp.), California coyote-thistle (*Eryngium aristulatum*), clustered field sedge (*Carex praegracilis*), Baltic rush (*Juncus balticus*), and pale spikerush (*Eleocharis macrostachya*). Species commonly associated with vernal pools may also be found in this community. Small alkali marsh communities can be found in the south and southwest portions of the Tule Ranch. The nonnative invasive plant tamarisk (*Tamarix* spp.) may be invasive in alkali marshes.

Portions of alkali marsh containing alkali-adapted plants (e.g., *Distichlis spicata*) are structurally similar to seasonal disturbed wetlands. Both plant communities provide lower quality habitat for wildlife than other wetland communities such as freshwater marsh or vernal pool, as they lack the hydrology and vegetation structure necessary to support most wetland-dependent wildlife species. The vegetated alkali marsh and seasonal disturbed wetlands on site do support more generalist wildlife, however, that are capable of breeding and foraging in both upland and wetland communities. These species include common garter snake (*Thamnophis sirtalis*), savannah sparrow (*Passerculus sandwichensis*), Northern Harrier (*Circus cyaneus*) , Mallard (*Anas platyrhinos*)and California vole (*Microtus californicus*).

Seasonal (Disturbed) Wetland

Seasonal wetlands are plant communities typically characterized by any number of seasonal wetland generalist plants, many of which are nonnative and adapted to frequent disturbance, and may be found throughout the Yolo Bypass Wildlife Area. Common species include mainly nonnative species such as rabbit's foot grass (*Polypogon monspeliensis*), Italian ryegrass, curly dock (*Rumex crispus*), and hyssop loosestrife (*Lythrum hyssopifolia*), and invasive species, such as perennial pepperweed (*Lepidium latifolium*) and dallisgrass (*Paspalum dilitatum*). Some native species also occur, such as nutsedge (*Cyperus eragrostis*). Seasonal wetlands are often isolated wetlands that may have previously functioned more like vernal pools but, due to past disturbances and altered hydrology, now support species that are adapted to longer inundation periods or are more tolerant of repeated disturbance. Seasonal wetlands may also be inadvertently created in areas of claypan or hardpan soils where a lack of water infiltration results in seasonal ponding within areas of excavation or other ground disturbances.

Vernal Pool and Swale

Vernal pools and swales within the Yolo Bypass Wildlife Area are primarily found within the southwest portion of the Tule Ranch Unit. A recent survey of this area (Witham 2003) documented approximately 1,600 acres of vernal pool/grassland habitat as well as the presence of a distinct vernal pool subtype, playa pools. Playa pools are generally larger and deeper than other vernal pool types (several hectares in size and 1–2 meters deep) and defined by cut banks from repeated wave action during the winter and spring. Vernal pools typically support a suite of mostly endemic and sometimes rare plants in several genera including goldfields (*Lasthenia* spp.), popcorn flower (*Plagiobothrys* spp.), *Navarretia*, woolly-marbles (*Psilocarphus* spp.), *Downingia*, and *Limnanthes*. The nonnative Italian ryegrass is also widely distributed in vernal pools. The margins of playa pools support many of the same species as smaller vernal pools. Additionally, several rare grasses, including Colusa grass (*Neostapfia colusana*) and Crampton's tuctoria (*Tuctoria mucronata*), although not confirmed to be present

in Yolo Bypass Wildlife Area, have the potential to occur on the pool bottoms, which are otherwise typically sparsely vegetated. Vernal swales, because they hold water for relatively short periods of time, typically contain a mix of species found in both vernal pools and annual grasslands. Developing a refined grazing plan for the vernal pool areas throughout the Tule Ranch is a high priority for future management and will most certainly focus on the management of the nonnative Italian ryegrass.

Vernal pools are a unique, rare, and rapidly declining community in California. Because of the limited distribution of this community in the state and its continued decline due to land conversion for development and other uses, many vernal pool-associated wildlife species receive state or federal protection or are considered species of concern. The vernal pools at the Wildlife Area provide high-quality habitat for these species, due to the diversity in pool size, long inundation periods, and active vegetation management through grazing. Vernal pool and swale-obligate species known to breed in the Wildlife Area include vernal pool tadpole shrimp (*Lepidurus packardi*), vernal pool fairy shrimp (*Branchinecta lynchi*), conservancy fairy shrimp (*Branchinecta conservatio*), midvalley fairy shrimp (*Branchinecta mesovallensis*), and California linderiella (*Linderiella occidentalis*). Vernal pool tadpole shrimp, vernal pool fairy shrimp, and California linderiella may also inhabit vernal swales, provided that water remains ponded in the swales long enough for the shrimp to mature and reproduce (a minimum of 18 days for vernal pool fairy shrimp, 31 days for California linderiella, and 41 days for vernal pool tadpole shrimp). The vernal pools at the Wildlife Area also may provide suitable habitat for California tiger salamander (*Ambystoma californiense*) and possibly western spadefoot toad (*Spea hammondi*), although these species have not been documented on site. In addition to these species which are restricted to vernal pools and swales, a variety of more generalist wildlife forage and breed in these habitats as well, such as Pacific chorus frog, wetland-associated insects, shorebirds, and waterfowl.

Riparian Woodland

Riparian woodland was probably a dominant habitat type in the primal Yolo Basin, but are currently kept in check in order to maintain the flood conveyance capacity of the Yolo Bypass. Riparian woodland and associated riparian scrub habitats are primarily found adjacent to Green's Lake, Putah Creek, and along the East Toe Drain within the Yolo Bypass Wildlife Area. Riparian scrub is a shrub-dominated community found typically found along stream margins and within the streambed on gravel bars and similar formations. This community is typically dominated by phreatophytes (i.e., water-loving plants) representative of early to mid successional stage vegetation communities within riparian areas in California's Central Valley. Typical species include native plants such as creek dogwood (*Cornus sericea*), California rose (*Rosa californica*), Sandbar willow (*Salix exigua*), buttonbush (*Cephalanthus occidentalis* var. *californicus*), and arroyo willow (*Salix lasiolepis*), along with nonnative invasive species such as Himalayan blackberry (*Rubus discolor*), and potentially arundo (*Arundo donax*), and tamarisk (*Tamarix parviflora*). Native trees such cottonwood (*Populus fremontii*), alder (*Alnus rhombifolia*), and Oregon ash (*Fraxinus latifolia*) are occasionally found overtopping the shrub layer. Riparian woodland is a tree-dominated community found adjacent to riparian scrub on older river terraces where flooding frequency and duration is less. Common native overstory species in riparian communities include cottonwood, alder, valley oak (*Quercus lobata*), Oregon ash, black willow (*Salix gooddingii*), California sycamore (*Plantanus racemosa*), box elder (*Acer negundo*), and northern California black walnut (*Juglans californica* var. *hindsii*) hybrids (northern California black walnut readily hybridizes with cultivated English walnut [*J. regia*]). The understory is typically sparse in this community; although, native species such as California rose, California grape (*Vitis californica*), Santa Barbara sedge (*Carex barbarae*), mulefat (*Baccharis salicifolia*), California barley (*Hordeum brachyantherum* ssp. *californicum*), creeping wildrye and potentially blue elderberry (*Sambucus mexicana*), occur in tree canopy openings.

Although relatively small areas of riparian woodland and scrub communities are present on site, these areas provide very important habitat to a number of wildlife species, many of which are restricted to riparian communities. Riparian communities in California currently cover only a small fraction of their historic range, due to the widespread conversion of river floodplain to agriculture. As such, the riparian communities at the Wildlife Area provide important foraging habitat for many migrating and wintering birds in the Pacific Flyway, as well as

breeding individuals from a variety of taxa. Cavity nesting species such as tree swallow, wood duck, and several woodpecker species benefit from the presence of riparian habitat. Mature stands of cottonwood/sycamore in the Central Valley are of primary importance to breeding red bats (*Lasiurus blossevillii*). Wildlife species known to forage in the on-site riparian communities include Cooper's hawk (*Accipter cooperii*), sharp-shinned hawk (*Accipiter striatus*), red-shouldered hawk, kingfisher, yellow warbler, willow flycatcher (*Empidonax traillii*), western grey squirrel (*Sciurus griseus*), and western aquatic garter snake. Recently, tricolored blackbird breeding colonies have also occurred in an on-site patch of buttonwillow trees.

Ditch

Ditches are found throughout most management units within the Yolo Bypass Wildlife Area. They typically contain a mixture of weedy herbaceous wetland and upland generalist plants. If frequently cleared, ditch banks may be largely unvegetated and contain only scattered upland weeds or, if unmaintained, they may be densely vegetated. A native species commonly found within ditches at the Yolo Bypass Wildlife Area is water primrose, a species that can eventually form dense stands that slow down the flow of water. Control measures are implemented at this point, which include application of herbicides or mechanical control. Additionally, ditches that are unmaintained and hold water for long period during the growing season may contain a mix of species more commonly found in perennial wetlands or freshwater marshes described above. Ditches serve as corridors, hydrologically connecting land management units.

Wildlife use of the ditches on site varies according to each ditch's pattern of water conveyance. Ditches that remain inundated throughout the summer months and are connected to rice fields or permanent wetlands provide very important habitat at the site, as these ditches and their associated infrastructure provide habitat for the state and federally-listed, threatened, giant garter snake. This aquatic species commonly travels through irrigation ditches, forages for amphibians and small fish, which may be present, and uses the dry associated banks for basking and thermoregulation. Ditches with suitable hydrology also support the foraging of other aquatic wildlife such as western aquatic garter snake, Pacific chorus frog, the nonnative bullfrog, and dabbling ducks such as mallard. Ditches are considered lower quality habitat for these species than perennial ponds, however.

Ditches that remain dry through most of the year and contain abundant vegetation may support foraging upland wildlife such as song sparrow (*Melospiza melodia*), white-crowned sparrow (*Zonotrichia leucophrys*), and American goldfinch (*Carduelis tristis*).

Agricultural Crops

Agricultural fields are found across the northern and central portions of the Yolo Bypass Wildlife Area (e.g., Causeway Ranch and 1,000 Acre units). These fields are generally planted in various annual row crops in the spring and summer months. The primary crop is rice but a variety of other crops are produced including corn, milo, tomatoes, sunflower and safflower. The rice, corn and milo fields are typically managed as flooded open water habitat in the winter months. During the winter months few, if any, plants are likely encountered in any of these fields, except for residual stubble and other by-products remaining after crop harvesting. A warm autumn may sprout a crop of such wildlife beneficial weeds as water grass.

Agricultural lands at the Wildlife Area are actively managed to benefit wildlife. This management results in the use of safflower fields by foraging mourning doves and ring-necked pheasants, which feed on the unharvested seeds; use of corn, milo, and millet fields by foraging sandhill cranes and waterfowl, which feed on the waste grains after the fields are flooded; use of grain fields by foraging waterfowl, which feed on the green shoots during the early growing season; and use of grain fields by some grassland bird species, which nest in the wheat and feed on associated insects and grains. In addition, the on-site rice fields support foraging white-faced ibis, which feed on the abundant invertebrates in the flooded fields; and tomato fields also support foraging Swainson's hawks and other raptors, which prey on the small mammals made more accessible by grading and

harvesting activities. Post harvest flooding of rice fields attracts thousands of waterfowl and shorebirds on an annual basis.

SPECIAL-STATUS SPECIES

Based on queries of the California Natural Diversity Database (CNDDB 2006) and the California Native Plant Society (CNPS) Inventory of Rare and Endangered Plants of California (CNPS 2007: <http://cnps.web.aplus.net/cgi-bin/inv/inventory.cgi/BrowseAZ?name=LIST>), there are 24 special-status plant species known from the vicinity of the Yolo Bypass Wildlife Area (Table 3.5-2). Special-status plants are those plants listed as threatened or endangered under either the Federal or California Endangered Species Acts (ESA/CESA). The CNPS also maintains a list of rare and endangered plants. Although these plants carry no formal regulatory status, except for those plants also listed as threatened or endangered by the federal government or State of California, potential impacts to these species are generally analyzed under the California Environmental Quality Act (CEQA).
A discussion on the habitat requirements for each of these species and their potential for occurrence within the Yolo Bypass Wildlife Area is provided below.

Table 3.5-2
Special-status Plants Known to Occur or with Potential to Occur at Yolo Bypass Wildlife Area

Species	Status 1			Habitat and Blooming Period	Potential for Occurrence
	USFWS	DFG	CNPS		
Suisun Marsh aster *Aster lentus*	FSC	--	1B	Endemic to San Joaquin Delta, generally occurs in marshes and swamps, often along sloughs, from 0 to 3 meters in elevation. Blooms May–November	CNDDB documents occurrences south of the Yolo Bypass Wildlife Area at Lindsey Slough/Calhoun Cut.
Ferris' milkvetch *Astragalus tener* var. *ferrisiae*	FSC	--	1B	Meadows, valley and foothill grassland, subalkaline flats on overflow land in the Central Valley; usually seen on dry, adobe soil, 5 to 75 meters in elevation. Blooms April–May	Witham survey of Tule Ranch (2003) documented this species within the Tule Ranch boundary in the Yolo Bypass Wildlife Area.
Alkali milkvetch *Astragalus tener* var. *tener*	FSC	--	1B	Playas and vernal pools in valley and foothill grassland, alkali flats and flooded lands, from 0 to 60 meters in elevation. Blooms March–June	Witham survey of Tule Ranch (2003) documented this species within the Tule Ranch boundary in the Yolo Bypass Wildlife Area. CNDDB documents 27 other occurrences close by, including Calhoun Cut, Yolo County Grasslands park, Jepson Prairie, Woodland, and Davis area alkaline flats. The locality "0.5 miles W of R.R. tracks, Yolo Bypass area" is most likely within the Yolo Bypass Wildlife Area and may correspond with Tule Ranch.

Table 3.5-2 Special-status Plants Known to Occur or with Potential to Occur at Yolo Bypass Wildlife Area					
Species	Status 1			Habitat and Blooming Period	Potential for Occurrence
	USFWS	DFG	CNPS		
Heartscale *Atriplex cordulata*	FSC	--	1B	Alkaline flats and scalds in the Central Valley, sandy soils in Chenopod scrub, valley and foothill grassland, meadows, from 1 to 375 (600) meters in elevation. Blooms April–October	Witham survey of Tule Ranch (2003) documented suitable habitat for this species within the Tule Ranch boundary in the Yolo Bypass Wildlife Area, however the species was not encountered during her survey. CNDDB documents occurrences at Gridley Ranch, Jepson Prairie, alkaline flats between Davis and Woodland, and Calhoun Cut.
Brittlescale *Atriplex depressa*	FSC	--	1B	Alkali scalds or alkaline clay and playas, in chenopod scrub, meadows, and valley and foothill grassland, rarely associated with riparian, marshes, or vernal pools, from 1 to 320 meters in elevation. Blooms May–October	CNDDB documents occurrences of this species on alkaline flats between Woodland and Davis, just north of Davis, and at Dozier Station (Jepson Prairie).
San Joaquin spearscale *Atriplex joaquiniana*	FSC	--	1B	Alkali meadow, chenopod scrub, seeps in valley and foothill grassland, often in seasonal alkali wetlands or alkali sink scrub, from 1 to 835 meters in elevation. Blooms April–October	Witham survey of Tule Ranch (2003) documented suitable habitat for this species within the Tule Ranch boundary in the Yolo Bypass Wildlife Area; however, the species was not encountered during her survey. CNDDB documents occurrences at Liberty Island, alkaline flats between Davis and Woodland, just north of Davis, and Yolo County Grasslands Park.
Lesser saltscale *Atriplex persistens*	FSC	--	1B	Alkaline vernal pools, from 10 to 115 meters in elevation. Blooms June–October	Witham survey of Tule Ranch (2003) documented suitable habitat for this species within the Tule Ranch boundary in the Yolo Bypass Wildlife Area, however the species was not encountered during the survey. CNDDB documents occurrences at Jepson Prairie.
Bristly sedge *Carex comosa*	--	--	2	Coastal prairie, marshes and swamps, valley and foothill grassland, on lake margins and wet places, from 0 to 625 meters in elevation. Blooms May–September	CNPS documents this species within the 12 quad search performed, however no location information was provided. This species is known to occur in the Delta along sloughs and in marshes.

Table 3.5-2 Special-status Plants Known to Occur or with Potential to Occur at Yolo Bypass Wildlife Area					
Species	Status 1			Habitat and Blooming Period	Potential for Occurrence
	USFWS	DFG	CNPS		
Palmate-bracted bird's beak *Cordylanthus palmatus*	E	E	1B	Chenopod scrub, alkaline areas in valley and foothill grassland, usually on Pescadero silty clay, which is alkaline, from 5 to 155 meters in elevation. Blooms May–October	CNDDB documents an occurrence of this species at the City of Woodland reserve and Yolo County Park along County Road 102.
Dwarf downingia *Downingia pusilla*	--	--	2	Margin of vernal lakes and pools (mesic sites) in valley and foothill grassland, from 1 to 485 meters in elevation Blooms March–May	Witham survey of Tule Ranch (2003) documented suitable habitat for this species within the Tule Ranch boundary in the Yolo Bypass Wildlife Area; however, the species was not encountered during the survey. CNDDB documents occurrences at Barker Slough, Calhoun Cut, Dozier area, Jepson Prairie, the Rio Linda area, and Elk Grove.
Fragrant fritillary *Fritillaria liliacea*	FSC	--	1B	Coastal scrub, coastal prairie, valley and foothill grasslands, often on serpentine (often clay in grasslands), from 3 to 410 meters in elevation Blooms February–May	Witham survey of Tule Ranch (2003) documented suitable habitat for this species within the Tule Ranch boundary in the Yolo Bypass Wildlife Area; however the species was not encountered during surveys. CNDDB documents occurrences at Jepson Prairie.
Bogg's Lake hedge hyssop *Gratiola heterosepala*	--	E	1B	Freshwater marshes and swamps, vernal pools, lake margins, usually on clay soils, from 5 to 2,400 meters in elevation Blooms April–August	Witham survey of Tule Ranch (2003) documented suitable habitat for this species within the Tule Ranch boundary in the Yolo Bypass Wildlife Area; however the species was not encountered during surveys. CNDDB documents occurrences at Jepson Prairie, the Rio Linda area, and Mather County Park.
Rose-mallow *Hibiscus lasiocarpus*	--	--	2	Freshwater marshes and swamps, generally found on wetted river banks and low peat islands in sloughs, known from the Sacramento-San Joaquin Delta watershed, from 0 to 120 meters in elevation Blooms June–September	CNDDB documents occurrences of this species in Snodgrass and Lost Sloughs, as well as near I-80 at the W. El Camino Avenue on ramp.

Table 3.5-2 Special-status Plants Known to Occur or with Potential to Occur at Yolo Bypass Wildlife Area					
Species	Status 1			Habitat and Blooming Period	Potential for Occurrence
	USFWS	DFG	CNPS		
Carquinez goldenbush *Isocoma arguta*	FSC	--	1B	Alkaline soils, flats, near drainages, on low benches, on tops an sides of mounds in swale habitat, lower hills, in valley and foothill grassland, from 1 to 20 meters in elevation. Blooms August–December	Witham survey of Tule Ranch (2003) documented suitable habitat for this species within the Tule Ranch boundary in the Yolo Bypass Wildlife Area, however the species was not encountered during surveys. CNDDB documents occurrences near Dozier along Hwy 113 and at Jepson Prairie.
Northern California black walnut *Juglans hindsii*	FSC	--	1B	Riparian forest/woodland on deep alluvial soil, from 0 to 400 meters in elevation. Blooms April–May	CNDDB documents occurrences along the Sacramento River between Rio Vista and Freeport.
Delta tule pea *Lathyrus jepsonii* var. *jepsonii*	FSC	--	1B	Freshwater and brackish marshes, usually on marsh/slough edges, generally restricted to the Sacramento-San Joaquin Delta, from 0 to 4 meters in elevation. Blooms May–September	CNDDB documents occurrences at Snodgrass, Barker, Lindsey, Hass, and Cache Sloughs, Delta Meadows Park, and Calhoun Cut.
Legenere *Legenere limosa*	FSC	--	1B	Vernal pool bottoms, from 1 to 880 meters in elevation. Blooms April–June	Witham survey of Tule Ranch (2003) documented suitable habitat for this species within the Tule Ranch boundary in the Yolo Bypass Wildlife Area; however, the species was not encountered during surveys. CNDDB documents occurrences near Calhoun Cut, Jepson Prairie, Elk Grove, Gibson Ranch (Rio Linda), and Robla.
Heckard's peppergrass *Lepidium latipes* var. *heckardii*	FSC	--	1B	Grasslands, alkaline soils, edges of vernal pools, in valley and foothill grassland, from 3 to 200 meters in elevation. Blooms March–May	Witham survey of Tule Ranch (2003) documented this species within the Tule Ranch boundary in the Yolo Bypass Wildlife Area. According to CNDDB, this species also occurs north of Davis, at Jepson Prairie, and in Haas Slough (Dozier).
Mason's lilaeopsis *Lilaeopsis masonii*	FSC	R	1B	Freshwater and brackish marsh, riparian scrub, generally found in tidal zones on muddy or silty soils formed through river deposition or bank erosion, from 0 to 10 meters in elevation. Blooms April–November	CNDDB documents occurrences of this species in Barker, Lindsey, Cache, and Snodgrass Sloughs as well as in Calhoun Cut.

Table 3.5-2
Special-status Plants Known to Occur or with Potential to Occur at Yolo Bypass Wildlife Area

Species	Status 1			Habitat and Blooming Period	Potential for Occurrence
	USFWS	DFG	CNPS		
Delta mudwort *Limosella subulata*	--	--	2	Riparian scrub, freshwater and brackish marsh, generally on mud banks of the delta in marshy or scrubby riparian associations, from 0 to 3 meters in elevation. Blooms May–August	CNDDB documents occurrences of this species in Barker Slough as well as in Calhoun Cut.
Baker's navarretia *Navarretia leucocephala* ssp. *bakeri*	FSC	--	1B	Vernal pools, swales, meadows and seeps in cismontane woodland, lower montane coniferous forest, and valley and foothill grassland, on adobe or alkaline soils, from 5 to 1,740 meters in elevation. Blooms April–July	Witham survey of Tule Ranch (2003) documented this species within the Tule Ranch boundary in the Yolo Bypass Wildlife Area. CNDDB documents occurrences of this species at Glide Ranch and Jepson Prairie.
Colusa grass *Neostapfia colusana*	T	E	1B	Usually in large or deep vernal playa pools (flowering on drying pool bottoms), on adobe soils, from 5 to 200 meters in elevation. Blooms May–August	Witham survey of Tule Ranch (2003) documented suitable habitat for this species within the Tule Ranch boundary in the Yolo Bypass Wildlife Area, however the species was not encountered during her survey. CNDDB documents occurrences at Jepson Prairie and at Yolo County Grasslands Park.
Sanford's arrowhead *Sagittaria sanfordii*	FSC	--	1B	Marshes and swamps, shallow, slow-moving, freshwater habitats, ponds, ditches, from 0 to 619 m in elevation. Blooms May–October	CNDDB documents occurrences in Sacramento along the American River, in Morrison Creek, and northern Sacramento sites.
Crampton's Tuctoria/Solano grass *Tuctoria mucronata*	E	E	1B	Usually in dry bottoms of large or deep vernal playa pools in valley and foothill grassland (flowering on drying pool bottoms), 5 to 10 meters in elevation. Blooms April–September	Witham survey of Tule Ranch (2003) documented suitable habitat for this species within the Tule Ranch boundary in the Yolo Bypass Wildlife Area; however, the species was not encountered during surveys. CNDDB documents occurrences west of Jepson Prairie and at Yolo County Grasslands Park.

Legal Status Definitions

U.S. Fish and Wildlife Service (USFWS)
- E Endangered
- T Threatened
- FSC Federal Species of Concern

California Department of Fish and Game (DFG)
- E Endangered
- T Threatened
- R Rare

California Native Plant Society (CNPS) Categories
- 1A Plants presumed extinct in California
- 1B Plant species considered rare, threatened, or endangered in California and elsewhere
- 2 Plant species considered rare, threatened, or endangered in California but more common elsewhere
- 3 Plants about which we need more information – a review list
- 4 Plants of limited distribution – a watch list

Aster lentus

Suisun marsh aster (*Aster lentus*) is a perennial in the sunflower (Asteraceae) family. It grows in marshes along tidal streams in the Sacramento-San Joaquin Delta, frequently at or very near the water line mixed with tules, cattails, and other emergent vegetation. It may be found in the Yolo Bypass Wildlife Area within perennial wetlands and similar habitats. Suisun marsh aster is listed as a federal species of concern and has been placed on List 1B by the CNPS.

Astragalus tener var. *ferrisiae*

Ferris' milkvetch (*Astragalus tener* var. *ferrisiae*) is a small annual in the pea (Fabaceae) family. It occurs in moist and slightly alkaline habitats such as vernal pools, vernal marshes, and grasslands in the Sacramento Valley and is known from only six sites, one of which is the Tule Ranch (Witham 2003). Ferris' milkvetch is a federal species of concern and has been placed in List 1B by the CNPS.

Astragalus tener var. *tener*

Alkali milkvetch (*Astragalus tener* var. *tener*) is closely related to Ferris' milkvetch and has similar habitat requirements; however, alkali milkvetch is more widely distributed throughout the Bay Area, Sacramento Valley, and San Joaquin Valley. Witham (2003) detected several occurrences of this plant on the Tule Ranch, including one large population containing approximately 300 plants. Alkali milkvetch is a federal species of concern and has been placed on List 1B by CNPS.

Atriplex spp.

Four different special-status species in the genus *Atriplex* are known from the vicinity of the Yolo Bypass Wildlife Area. These four species are: heartscale (*Atriplex cordulata*), brittlescale (*Atriplex depressa*), San Joaquin spearscale (*Atriplex joaquiniana*), and lesser saltscale (*Atriples persistens*). All are annuals in the amaranth (Amaranthaceae) family (formerly considered part of Chenopodiaceae) and distributed throughout the Central Valley and Bay Area in saline or alkaline habitats. *Atriplex cordulata* and *A. joaquiniana* both grow up to 40cm in height or taller and may be found in a variety of vernally mesic saline or alkaline habitats including salt scalds, grasslands, and alkali flats. *A. depressa* and *A. persistens* are both low growing, rarely exceeding 20cm in height. *A. depressa* shares similar habitat requirements with *A. cordulata* and *A. joaquinana* and may frequently be found growing in association with these species; *A. persistens* is more commonly found growing on the drying bottoms of large, alkaline vernal pools. Although none of these species have been found in the Yolo Bypass Wildlife Area, all have the potential for occurrence. All four species are federal species of concern and have been placed on List 1B by CNPS.

Carex comosa

Bristly sedge (*Carex comosa*) is an herbaceous, grass-like perennial in the sedge (Cypreaceae) family. It is found throughout the Delta along sloughs, river channels, pond margins, and marshes. It also inhabits similar habitats in other parts of the United States with the exception of the Great Basin. Bristly sedge may be found along perennial wetlands, the Toe Drain, and ditches within the Yolo Bypass Wildlife Area. This plant has been placed on List 2 by CNPS.

Cordylanthus palmatus

Palmate-bracted birds' beak (*Cordylanthus palmatus*) is an annual in the figwort (Scrophulariaceae) family and can reach 30 cm in height. It grows in vernally mesic alkaline or saline grassland or scrub habitats in scattered localities in the Sacramento and San Joaquin Valleys and at Livermore in the Bay Area. Locally, it is frequently found growing on Pescedaro saline-alkaline silty clay soils in association with saltgrass (*Distichlis spicata*), tarplant (*Hemizonia* spp.), pickleweed (*Salicornia subterminalis*), and alkali-heath (*Frankenia salina*) near

Woodland, California. *Cordylantus palmatus* is a hemiparasite, forming connections with the roots of a host plant. Although *Cordylanthus* has photosynthetic capability, it also receives nutrients from its host plant. Although not found during surveys by Witham (2003), suitable habitat is found on the Fireman's Club in the Tule Ranch unit of the Wildlife Area. Palmate-bracted birds' beak is listed by the State and U.S. Fish and Wildlife Service as an endangered species. It is placed on List 1B by CNPS.

Downingia pusilla

Dwarf downingia (*Downingia pusilla*) is a diminutive annual in the bellflower (Campanulaceae) family. It is widely distributed in vernal pools and wet grasslands throughout the Central Valley and north Bay areas as well as Central Chile. This species occurs in sparsely vegetated micro-habitats. Witham (2003) did not locate this species during her surveys; however, the species is difficult to locate if surveys are not timed specifically to detect it. Suitable habitat is found on the Tule Ranch unit. Dwarf downingia has been placed on List 2 by CNPS.

Fritillaria liliacea

Fragrant fritillary (*Fritillaria liliacea*) is an herbaceous perennial in the lily family (Liliaceae). It may be found in grassland or scrub habitats, often on clay soils. Locally, this species is usually found growing on the tops of mima-mounds or other upland areas within vernal pool grasslands. Although this species has not been located on the Tule Ranch unit (Witham 2003) suitable grassland habitat exists in the Tule Ranch unit and in other management units in the wildlife area. *Fritillaria liliacea* is found at the Jepson Prairie. Fragrant fritillary has been placed on list 1B by CNPS and is a federal species of concern.

Gratiola heterosepala

Bogg's Lake hedge-hysssop is a diminutive annual in the figwort (Scrophulariaceae) family. It grows on the margins and bottoms of deeper vernal pools as well as lake margins, marshes, ponds, and similar habitats at scattered locations in the Central Valley, northern Coast Ranges, central Sierra Foothills, and Modoc Plateau. Although this species has not been located in the Project area, suitable habitat for this species is found in the Tule Ranch unit. Bogg's Lake hedge-hyssop is listed by the State of California as endangered and has been placed on List 1B by CNPS.

Hibiscus lasiocarpus

California hibiscus (*Hibiscus lasiocarpus*) is a robust, shrub-like perennial in the mallow (Malvaceae) family. It grows alongside creeks, streams, rivers, and marshes in California's Central valley from Butte County south to San Joaquin County (as well as similar habitats in the central, southern, and southeastern United States). This species may be found along the Toe Drain and within perennial wetlands in the Yolo Bypass Wildlife Area. California hibiscus has been placed on List 2 by CNPS.

Isocoma arguta

Carquinez golden-bush (*Isocoma arguta*) is a perennial sub-shrub in the sunflower (Asteraceae) family. It typically grows on alkaline soils in open grasslands, on the tops and sides of mima-mounds in vernal pool grasslands, or near drainages in the Delta. This species has not been located in the Yolo Bypass Wildlife Area; although, suitable habitat does exist on the Tule Ranch an in similar grassland habitats. Carquinez golden-bush has been placed on List 1B by CNPS and is a federal species of concern.

Juglans californica var. *hindsii*

Northern California black walnut (*Juglans californica* var. *hindsii*) is a large tree in the walnut (Juglandaceae) family. It was formerly found throughout riparian areas in northern California and has served as rootstock for cultivated English walnuts. Northern California black walnut readily hybridizes with other walnuts, including

other rootstock and English walnut, and this propensity has reduced the genetic purity of extant native walnut stands and contributed to the increasing rarity of genetically pure individuals. Northern California black walnut may be found along riparian areas of Putah Creek and the Toe Drain. This species is a federal species of concern and has been placed on List 1B by CNPS.

Lathyrus jepsonii var. *jepsonii*

Delta tule pea (*Lathyrus jepsonii* var. *jepsonii*) is an herbaceous, perennial vine in the pea (Fabaceae) family. It is found only in the Sacramento-San Joaquin Delta where it grows within and above the upper tidal zone, frequently mixed among shrubby vegetation, such as California rose, Himalayan blackberry, or sandbar willow. Within the Yolo Bypass Wildlife Area, it is possible that this plant may be found along the edges of perennial or seasonal wetlands and the Toe Drain. Delta tule pea is listed as a federal species of concern and has been placed on List 1B by CNPS.

Legenere limosa

Green's legenere (*Legenere limosa*) is a diminutive annual in the bellflower (Campanulaceae) family. It grows in the bottoms of larger vernal pools, frequently with species such as pale spikerush (*Eleocharis macrostachya*) and rayless goldfields (*Lasthenia glaberrima*). It may also be found with the related dwarf downingia. This species has not been located on the Yolo Bypass Wildlife Area although it may grow in suitable habitats within the Tule Ranch and similar vernal pool or seasonal wetland habitats. Green's legenere is a federal species of concern and has been placed on List 1B by CNPS.

Lepidium latipes var. *heckardii*

Heckard's peppergrass is a small annual in the mustard (Brassicaceae) family. It is known from eight locations across California, one of which is the Tule Ranch, and tends to be found in vernally wet alkali grasslands where it co-occurs with plants such as annual rye grass, dwarf pepperweed (*Lepidium latipes* var. *latipes*), smooth goldfields (*Lasthenia glabrata* ssp. *glabrata*), annual hairgrass (*Deschampsia danthonioides*), and others. Recent vegetation surveys (Witham 2003) documented this species in several locations throughout Tule Ranch. Heckard's peppergrass has been placed on List 1B by CNPS and is a federal species of concern.

Lilaeopsis masonii

Mason's lilaeopsis (*Lilaeopsis masonii*) is a tiny perennial in the carrot (Apiaceae) family. It is found primarily on mudflats and similar habitats within the tidal zone of marshes and rivers within the Sacramento-San Joaquin Delta. This species may occur along the Toe Drain. Mason's lilaeopsis is listed as a federal species of concern and has been placed on List 1B by CNPS.

Limosella subulata

Delta mudwort (*Limosella subulata*) is a diminutive perennial in the figwort (Scrophulariaceae) family found in the Sacramento-San Joaquin delta and on the east coast of the United States. Similar to Masons' lilaeopsis, it is frequently found in microhabitats where bank sloughing and other similar disturbances have created localized areas of saturated fine sediment (clay and silty clay) deposition below the average high tide level. This species may occur along the Toe Drain. Delta mudwort has been placed on List 2 by CNPS.

Navarretia leucocephala ssp. *bakeri*

Baker's navarretia (*Navarretia leucocephala* ssp. *bakeri*) is a diminutive annual in the phlox (Polemoniaceae) family. As with other *Navarretia leucocephala* subspecies, it grows throughout vernal pools as well as seasonally wet grasslands. In contrast to the more widely distributed, and occasionally sympatric, *N. leucocephala* spp. *leucocephala*, the corolla tube is smaller, the corolla lobes are more linear, and the corolla tube is included within

the calyx tube. Witham (2003) found that most habitats within the Tule Ranch are suitable for this species. Somewhat notably, it was the not only the sole *Navarretia* species found during her surveys but also the only member of the phlox family found on the Tule Ranch. CNPS has placed Baker's navarretia on List 1B, and it is listed as a federal species of concern.

Neostapfia colusana and *Tuctoria mucronata*

Colusa grass (*Neostapfia colusana*) and Crampton's tuctoria (*Tuctoria mucronata*) are small, annual plants in the grass (Poaceae) family. They are part of a larger group of related vernal pool grasses, most of which were formerly placed in the genus *Orcuttia*. These species tend to be found in larger, deeper vernal pools where they grow on the drying pool bottoms, frequently later into the summer than many other vernal pool plants. They are widely distributed throughout suitable habitats within the Central Valley; although, they are uncommon wherever they are found. Both species are known from the vicinity of the Yolo Bypass Wildlife Area and, although not detected during recent surveys (Witham 2003), they could occur in suitable habitat within the Tule Ranch unit. Both species are listed by the State of California as endangered, and CNPS has placed both species on list 1B. Colusa grass is federally listed as threatened and Crampton's tuctoria is federally listed as endangered.

Sagittaria sanfordii

Sanford's arrowhead (*Sagittaria sanfordii*) is an aquatic perennial in the water plantain (Altismataceae) family. It grows in shallow, slow-moving streams, drainage canals, ditches, and pond or lake margins throughout the Central Valley as well as scattered localities on the north and central California coast where it can form large, mono-specific clumps of plants or be interspersed with a variety of other similar vegetation such as common water plantain (*Alisma plantago-aquatica*). It may be found in suitable habitats throughout most management units within the Yolo Bypass Wildlife Area. Sanford's arrowhead is a federal species of concern and has been placed on List 1B by CNPS.

3.5.2 WILDLIFE RESOURCES

The Yolo Bypass Wildlife Area supports a diverse assemblage of communities that provide valuable wildlife habitat for a variety of species guilds. The communities are described in Section 3.5.1, "Vegetation Resources." Two additional features, open water and mudflat, are not vegetation communities but provide important foraging habitat for many wildlife species and are key components of the Yolo Bypass Wildlife Area's ecological value. Primary species guilds and key wildlife species that utilize each of the communities are discussed below.

SPECIES GUILDS

The Yolo Bypass Wildlife Area lies within a central portion of the Pacific Flyway, the major pathway for migratory bird species on the West Coast. Many of the species that inhabit the Wildlife Area are there during the fall and winter months, when the Central Valley becomes home to an abundance of birds. The most conspicuous groups of wintering birds include waterfowl, shorebirds and wading birds, and raptors. Other groups that utilize the Wildlife Area include upland game species, cavity-nesting birds, and neotropical migratory birds.

Waterfowl

A significant feature of the Yolo Bypass Wildlife Area is the abundance and variety of wintering waterfowl that migrate down the Pacific Flyway each year. Large numbers of ducks, geese, and swans winter in the Wildlife Area after migrating from northern breeding areas. Waterfowl populations are a highly valued and diversified biological resource. They are of high interest to a variety of recreational users of the Wildlife Area, particularly hunters and bird watchers. Species that occur in high abundance include northern pintail (*Anas acuta*), northern shoveler (*Anas clypeata*), mallard (*Anas platyrhynchos*), gadwall (*Anas strepera*), American wigeon (*Anas americana*), cinnamon and green-winged teal (*Anas cyanoptera* and *A. crecca*), lesser scaup (*Aythya affinis*),

tundra swan (*Cygnus columbianus*), snow goose (*Chen caerulescens*), and white-fronted goose (*Anser albifrons*). Some species, such as mallard, gadwall, and Canada goose (*Branta canadensis*) are year-round residents and breed locally in wetlands and nearby uplands.

Natural wetland areas have declined by approximately 95% in California and as a result,, waterfowl breeding and wintering populations have declined from historical levels. Therefore, the Wildlife Area is a critical link in the chain of wetlands that make up the Pacific Flyway, contributing to the preservation of wintering and breeding waterfowl populations.

A peak in the number of waterfowl in the Wildlife Area occurs in December–April, when large numbers are attracted to the seasonally flooded wetlands. During periods of water inundation in the Bypass, less abundant diving species such as canvasaback (*Aythya valisineria*), scaup (*Aythya* spp.), and goldeneye (*Bucephala* spp.) can be present. These species may also be present in the deeper areas of seasonal and permanent ponds. A secondary peak in waterfowl abundance occurs in late summer and is correlated with the presence of breeding ducks, their young and early migrants. Primary nesting species a the Wildlife Area include mallard, gadwall, and cinnamon teal. Grazing, upland cover plantings, and maintenance of properly spaced brood ponds are strategies used for nesting waterfowl. Semi permanent wetlands and permanent wetlands provide brood cover for ducklings for the first few weeks of their lives.

Seasonal flooding of wetlands is the primary wetland management strategy in the Yolo Bypass Wildlife Area for migratory waterfowl. In addition, agricultural activities provide high quality foraging habitat for some waterfowl species. Pintail, tundra swans, snow geese, and white-fronted geese can often be seen foraging in large numbers in rice fields.

The periodic flooding that occurs during high flow events results in deeper water and a subsequent increase in diving ducks, such as canvasback and scaup.

Shorebirds and Wading Birds

The Yolo Bypass Wildlife Area has become one of the premier shorebird areas in the Central Valley. With managed seasonal wetlands providing shallow water, mud flats, and island mounds, hundreds of thousands of shorebirds and wading birds annually migrate through, winter, and/or breed in the Yolo Bypass Wildlife Area. These species are a significant component of the Wildlife Area and are of high interest to recreational bird watchers.

Shorebirds and wading birds that breed in or nearby the Wildlife Area include American avocet (*Recurvirostra Americana*), black-necked stilt (*Himantopus mexicanus*), killdeer (*Charadrius vociferus*), spotted sandpiper (*Actitis macularia*), Virginia rail (*Rallus limicola)*, white-faced ibis (*Plegadis chihi*), black-crowned night heron (*Nycticorax nycticorax*), great blue heron (*Ardea herodias*), and snowy and great egret (*Egretta thula* and *Ardea alba*). Since the opening of the Wildlife Area, a heronry (nesting colony of herons and egrets) has become established nearby. In addition large numbers of ibis, egrets, and black-crowned night herons from nesting colonies elsewhere in the region use the Wildlife Area during summer months, feeding primarily on crayfish, fish and amphibians. A considerable number of black-crowned night herons and white-faced ibis roost on the Wildlife Area in dense cattail thickets or willows.

A high diversity of shorebirds rely on the Wildlife Area to provide habitat during migration and winter. Species regularly observed in during these periods include western and least sandpiper (*Calidris maurim* and *minutilla*), long- and short-billed dowitchers (*Limnodromus scolopaceus* and *griseus*), dunlin (*Calidris alpina*), greater and lesser yellowlegs (*Tringa melanoleuca* and *flavipes*), whimbrel (*Numenius phaeopus*), long-billed curlew (*Numenius americanus*), and Wilson's phalarope (*Phalaropus tricolor lobatus*). Species that occur more rarely in the Wildlife Area include ruff (*Philomachus pugnax*), pectoral sandpiper (*Calidris melanotos*), and red-necked phalarope (*Phalaropus lobatus*).

On a regional scale, there have been substantial losses of historic habitat used by these species, resulting in smaller, detached patches of suitable habitat for nesting and foraging. Available information suggests that their populations are declining. Riparian habitats suitable for use by colonial-nesting species, such as egrets, have been lost or fragmented on the Wildlife Area. The aforementioned heron rookery is located on property owned and managed by the Sacramento-Yolo Port District.

Managed seasonal wetlands with complex diverse topography combined with innovative rice/shorebird habitat rotations in the Wildlife Area provide critical foraging, nesting, and loafing habitat for an abundance of shorebird and wading bird species. Maintaining existing and restoring additional suitable seasonal and permanent wetland, and riparian communities, and reducing the effect of factors that can suppress breeding success in the Yolo Bypass Wildlife Area is critical to maintaining healthy shorebird and wading bird populations in the region.

Neotropical Migratory Birds

Many species of neotropical migratory birds migrate through or breed in the Yolo Bypass Wildlife Area. The neotropical migratory bird guild includes species that breed in North America and winter in Central and South America. Representative species that breed and/or migrate through the Wildlife Area include western kingbird (*Tyrannus verticalis*), western wood-pewee (*Contopus sordidulus*), tree swallow (*Tachycineta bicolor*), barn swallow (*Hirundo rustica*), Bullock's oriole (*Icterus bullockii*), Wilson's warbler (*Wilsonia pusilla*), yellow warbler (*Dendroica petechia*), and blue grosbeak (*Guiraca caerulea*).

Regionally, there have been substantial losses of historic habitat used by neotropical migratory species, and available information suggests that population levels for many of these species are declining. Continued management of existing habitat and restoration of additional suitable wetland, riparian, and grassland habitats in the Yolo Bypass Wildlife Area is important to maintaining healthy neotropical migrant bird populations. Opportunities to increase length and density of riparian vegetation along Putah Creek and the East Toe Drain will also benefit species in this guild. Protection and restoration of nesting habitat helps reduce nest parasitism and predation by creating habitat conditions that render neotropical birds less susceptible to these stressors. Management of upland habitat to provide variations in height and density of vegetation, food crops, and water has proven to be beneficial to many neotropical migratory song birds.

Raptors

A wide variety of wintering and/or breeding raptors utilize the Yolo Bypass Wildlife Area, including red-tailed hawk (*Buteo jamaicensis*), white-tailed kite (*Elanus leucurus*), rough-legged hawk (*Buteo lagopus*), ferruginous hawk (*Buteo regalis*), prairie falcon (*Falco mexicanus*), peregrine falcon (*Falco peregrinus anatum*), kestrel (*Falco sparverius*), barn owl (*Tyto alba*), great horned owl (*Bubo virginianus*), short-eared owl (*Asio flammeus*), and northern harrier (*Circus cyaneus*). Of these, Swainson's hawk (*Buteo swainsoni*), red-tailed hawk, kestrel, northern harrier, white-tailed kite, barn owl, and great horned owl are known to nest in the Wildlife Area.

All of these raptor species can be seen foraging and hunting for prey in recently flooded wetlands and in fresh cut alfalfa fields. Management strategies for raptors include optimizing foraging opportunities by managing for a food base consisting of rodents and large insects. Rodent numbers are highly dependent on the timing, magnitude, and duration of flooding in the Yolo Bypass. Maintaining high humidity in pond/wetland bottoms helps to develop high grasshopper numbers. Discing, mowing, and summer irrigations attract large numbers of Swainson's hawks feeding on grasshoppers. Fall preparation of agricultural fields also attracts wintering raptors and often provides important foraging opportunities for Swainson's Hawks, shortly before their autumn journey to Mexico and Central America.

Cavity-nesting Birds

Cavity-nesting birds, such as kestrels, tree swallows, and wood ducks (*Aix sponsa*) can be seen throughout the Wildlife Area. Providing nesting boxes for these cavity-nesters benefits these species in the Wildlife Area, as shown by the success of a series of next box projects.

Swallows are summer migrants, occurring in the Wildlife Area from late winter to early fall (February–October), with peak abundance generally in June and July. Large post and pre-breeding mixed flocks of swallows can occur in the spring and summer, particularly when flying insect populations associated with wetlands and agricultural fields are abundant.

Upland Game Birds

The Yolo Bypass Wildlife Area provides habitat for several upland game birds of great interest to recreational hunters. The primary upland game bird species that utilize the Wildlife Area are mourning dove (*Zenaida macroura*) and ring-neck pheasant (*Phasianus colchicus*). Tenant farmers grow fields of safflower that provide abundant foraging opportunities. Safflower is also left unharvested and mowed to provide additional foraging prospects for these species. These management strategies have resulted in improved upland game bird hunting throughout the Wildlife Area. Spring floods can significantly affect pheasant nesting and recruitment success thereby limiting populations in subsequent years.

SPECIAL-STATUS SPECIES

Special-status wildlife species are legally protected or are otherwise considered sensitive by federal, state, or local resource conservation agencies and organizations. Special-status wildlife species addressed in this section include:

- species listed as threatened or endangered under the ESA/CESA;
- species identified by USFWS or DFG as species of special concern;
- species fully protected in California under the California Fish and Game Code; and
- species identified as priorities for recovery under CALFED's MSCS.

Table 3.5-3 includes 43 special-status species that are known (38) or have potential (5) to occur regularly in the Yolo Bypass Wildlife Area. The table also provides information on each species' regulatory status, habitat requirements, and potential for occurrence, and each species is discussed further in the text that follows. Migratory birds described as "winter" visitors may occur in small numbers throughout the year, but do not breed in the area and are most common in winter. A map of special-status species occurrences in the Wildlife Area that have been documented in the CNDDB is provided in Exhibit 3.5-2.

Invertebrates

Vernal pool crustaceans

Vernal pool crustaceans are restricted to vernal pools, swales, and other seasonal pools. Eggs of these species lie dormant during most of the year in the form of cysts, which are capable of withstanding extreme environmental conditions, such as heat, cold, and prolonged desiccation. The cysts hatch when the pools fill with rainwater, and the young rapidly develop into sexually mature adults. Not all of the cysts hatch with the first rainfall; some remain dormant to hatch during subsequent events or in later years. Eggs are dispersed from one pool to another on the feet of birds and mammals, which move between the pools. The vernal pools in the Tule Ranch Unit of the Wildlife Area are known to support five special-status vernal pool crustaceans; suitable habitat on site is restricted to this unit. Species known to occur on site include the federally endangered vernal pool tadpole shrimp (*Lepidurus packardi*), federally endangered conservancy fairy shrimp (*Branchinecta conservatio*), federally threatened vernal pool fairy shrimp (*Branchinecta lynchi*), and two federal species of concern: midvalley fairy

shrimp (*Branchinecta mesovallensis*) and California linderiella (*Linderiella occidentalis*). The first four of these species are listed as species to be maintained under CALFED's MSCS.

Table 3.5-3
Special-Status Wildlife Known or with Potential to Occur Regularly at Yolo Bypass Wildlife Area

Species	Status[1]			Habitat	Potential for Occurrence
	USFWS	DFG	MSCS		
Invertebrates					
Vernal pool tadpole shrimp *Lepidurus packardi*	E	--	m	Inhabit vernal pools and seasonal wetlands, which range from 2 m^2 to over 350,000 m^2.	Known to occur in vernal pools in the Tule Ranch Unit, which provide suitable habitat.
Vernal pool fairy shrimp *Branchinecta lynchi*	T	--	m	Typically inhabit vernal pools and seasonal wetlands less than 200 m^2 and less than 5 cm deep; they may also occur in larger, deeper pools.	Known to occur in vernal pools in the Tule Ranch Unit, which provide suitable habitat.
Conservancy fairy shrimp *Branchinecta conservatio*	E	--	m	Large vernal pools and seasonal wetlands, ~ 1 acre in size.	Known to occur in vernal pools in the Tule Ranch Unit, which provide suitable habitat.
Midvalley fairy shrimp *Branchinecta mesovallensis*	SSC	--	m	Small vernal pools and seasonal wetlands less than 202 m^2 in area (average area 67 m^2), with average depth of 10 cm (range 5–15 cm).	Known to occur in vernal pools in the Tule Ranch Unit, which provide suitable habitat.
California linderiella *Linderiella occidentalis*	SSC	--	--	Vernal pools and seasonal wetlands from 1 to 52,500 m^2 in area (average area 1,283 m^2), with average depth of 19 cm (range 3–151 cm).	Known to occur in vernal pools in the Tule Ranch Unit, which provide suitable habitat.
Reptiles					
Giant garter snake *Thamnophis gigas*	T	T	r	Inhabits slow-moving streams, sloughs, ponds, marshes, flooded rice fields, irrigation and drainage ditches, and adjacent upland areas.	Known to occur in the northwestern portion of the Wildlife Area. Suitable habitat is present throughout the site in wetlands, rice fields, irrigation channels, riparian areas, and adjacent uplands.
Northwestern pond turtle *Actinemys marmorata marmorata*	SSC	SSC	m	Inhabits slow-moving streams, sloughs, ponds, irrigation and drainage ditches, and adjacent upland areas.	Known to occur in suitable habitats throughout the site, including: wetlands, rice fields, irrigation channels, riparian areas, and adjacent uplands.
Amphibians					
California tiger salamander *Ambystoma californiense*	T	SSC	m	In winter, breeds in vernal pools and seasonal wetlands with a minimum 10-week inundation period. In summer, aestivates in grassland habitat, primarily in rodent burrows.	Could occur. Not documented on site, but suitable habitat is present in vernal pools within the Tule Ranch Unit, and the Wildlife Area is within the species' known range.
Western spadefoot toad *Spea hammondii*	--	SSC	m	In winter, breeds in vernal pools and seasonal wetlands with a minimum 3-week inundation period. In summer, aestivates in grassland habitat, in soil crevices and rodent burrows.	Could occur. Not documented on site, but suitable habitat may be present in vernal pools within the Tule Ranch Unit, and the Wildlife Area is within the species' known range.

Table 3.5-3 Special-Status Wildlife Known or with Potential to Occur Regularly at Yolo Bypass Wildlife Area					
Species	Status[1]			Habitat	Potential for Occurrence
	USFWS	DFG	MSCS		
Birds					
American white pelican *Pelecanus erythrorhynchos*	--	SSC	--	Forages in open water. Although individuals may be present year-round, this species does not breed in the Central Valley.	Known to forage on site throughout the year, occasionally in numbers significant to the nation-wide population.
Double-crested cormorant *Phalacrocorax auritus*	--	SSC	m	Forages in open water. Breeds colonially in rock ledges and trees.	Known to forage on site throughout the year. No breeding colonies are present on site.
Great blue heron *Ardea herodias*	--	--	m	Nests colonially in tall trees. Forages in fresh and saline marshes, shallow open water, and occasionally cropland or low, open, upland habitats.	Known to breed in trees just outside of the Wildlife Area. Known to forage in wetlands, and uplands and agricultural fields throughout the site. No breeding colonies are present on site, but suitable nesting habitat is present.
Great egret *Ardea alba*	--	--	m	Nests colonially in tall trees. Forages in fresh and saline marshes, shallow open water, and occasionally cropland or low, open, upland habitats.	Known to forage in wetlands, uplands, and agricultural fields throughout the site, which provide suitable habitat. Breeding colonies have been recently documented on site.
Snowy egret *Egretta thula*	--	--	m	Nests colonially in dense marshes and low trees. Forages in fresh and saline marshes, shallow open water, and occasionally irrigated cropland or wet upland habitats.	Known to forage in wetlands throughout the site, which provide suitable habitat. No breeding colonies are present on site, but suitable nesting habitat is present.
Black-crowned night-heron *Nycticorax nycticorax*	--	--	m	Nests colonially in dense marshes, groves of low trees, and dense shrubs. Forages in fresh and saline marshes and in shallow open water at the edge of marsh vegetation.	Known to forage in wetlands throughout the site, which provide suitable habitat. Roosts in large numbers in willow trees and cattail marsh. No breeding colonies are present on site, but suitable nesting habitat is present.
White-faced ibis *Plegadis chihi*	--	SSC	m	Forages in wetlands and irrigated or flooded croplands and pastures. Breeds colonially in dense freshwater marsh.	Known to forage in flooded croplands and wetlands throughout the site, especially in summer months. No breeding colonies are present on site but there has been a breeding colony just north of the Causeway Unit.
Osprey *Pandion haliaetus*	--	SSC	m	Forages exclusively in fish-bearing waters.	Known to forage on site during the winter floods, which provide suitable foraging habitat. Unlikely to nest because foraging habitat is marginal during the dry summer breeding season.

Table 3.5-3 Special-Status Wildlife Known or with Potential to Occur Regularly at Yolo Bypass Wildlife Area					
Species	Status[1]			Habitat	Potential for Occurrence
	USFWS	DFG	MSCS		
White-tailed kite *Elanus leucurus*	SSC	FP	m	Nests in woodlands and isolated trees; forages in grasslands, shrublands and agricultural fields.	Known to nest and forage in open habitats throughout the site, which provide suitable habitat.
Bald eagle *Haliaeetus leucocephalus*	T PFD	E FP	m	Winter visitor to the Central Valley floor. Forages primarily in fish-bearing waters, but also in open terrestrial habitats.	Known to forage on site during the winter months.
Northern harrier *Circus cyanus*	--	SSC	m	Nests and forages in open habitats including marshes, grasslands, shrublands and agricultural fields.	Known to nest and forage in open habitats throughout the site, which provide suitable habitat.
Sharp-shinned hawk *Accipiter striatus*	--	SSC	--	Winter visitor to the Central Valley floor. Forages primarily in riparian woodlands and other wooded habitats.	Known to forage in riparian habitat along the toe drains and Putah Creek, which provide suitable winter foraging habitat.
Cooper's hawk *Accipter cooperii*	--	SSC	m	Nests and forages primarily in riparian woodlands and other wooded habitats.	Known to forage in riparian habitat throughout the Wildlife Area, especially along Putah Creek, which provide suitable foraging habitat. Not known to nest on site.
Swainson's hawk *Buteo swainsoni*	SSC	T	r	Nests in riparian woodlands and isolated trees; forages in grasslands, shrublands and agricultural fields.	Known to nest and forage in open habitats throughout the site, which provide suitable habitat. Several nests on site along Putah Creek and in scattered large trees throughout the Wildlife Area.
Ferruginous hawk *Buteo regalis*	--	SSC	--	Winter visitor to the Central Valley. Forages most commonly in grasslands and shrub-steppe; also forages in agricultural fields.	Known to forage in upland habitats throughout the site, which provide suitable winter habitat when not flooded.
Golden eagle *Aquila chrysaetos*	--	FP	m	Nests and forages in a variety of open habitats including grassland and cropland, but most common in foothill and shrub-steppe habitats. Rare breeder in the Central Valley foothills; breeds in cliffs, rock out crops, and large trees.	Known to forage in upland habitats throughout the site, which provide suitable habitat. The site is unsuitable for nesting.
Merlin *Falco columbarius*	--	SSC	--	Winter visitor to California. Forages in a wide variety of habitats, bit in the Central Valley is most common around agricultural fields and grasslands.	Known to forage throughout the site in winter. Suitable habitat is provided by on-site wetlands, and uplands when not flooded.
American peregrine falcon *Falco peregrinus anatum*	--	E FP	m	Nonbreeding visitor to the Central Valley. Forages in a wide variety of habitats, but is most common near water, where shorebirds and waterfowl are abundant.	Known to hunt the abundant shorebirds and waterfowl present from mid-summer to late winter.
Prairie falcon *Falco mexicanus*	--	SSC	--	Currently presumed to be a non-breeding visitor to Yolo County. Forages most commonly in grasslands and shrub-steppe; also forages in agricultural fields.	Known to forage throughout the site, which provides suitable habitat when not flooded.

Table 3.5-3 Special-Status Wildlife Known or with Potential to Occur Regularly at Yolo Bypass Wildlife Area					
Species	Status[1]			Habitat	Potential for Occurrence
	USFWS	DFG	MSCS		
Greater sandhill crane *Grus canadensis tabida*	--	T FP	r	Winter visitor to the Central Valley. Forages primarily in moist croplands with rice or corn stubble; also frequents grasslands and emergent wetlands.	Known to forage in the agricultural habitats and wetlands throughout the site, which provide suitable winter foraging habitat.
Long-billed curlew *Numenius americanus*	--	SSC	m	Forages in cropland, grassland, wetland, and mudflat habitats. Although individuals may be present throughout the year, this species does not breed on the Central Valley floor.	Known to forage in agricultural, upland, wetland, and mudflat habitats throughout the site, which provide suitable foraging habitat.
California gull *Larus californicus*	--	SSC	m	Forages in open water, wetland, and cropland habitats, as well as landfills. Although individuals may be present year-round, this species does not breed in the Central Valley.	Known to forage year-round throughout the site and especially during the winter floods, which provide suitable foraging habitat.
Black tern *Chlidonias niger*	--	SSC	m	Nests in freshwater marsh and rice habitats, forages for fish and insects in open water, rice, and marsh. This species is present in Yolo County primarily during migration.	Known to forage in the wetland and rice habitats throughout the site during migration; numbers increasing in recent years.
Burrowing owl *Athene cunicularia*	SSC	SSC	m	Nests and forages in grasslands, shrublands, deserts and agricultural fields, especially where ground squirrel burrows are present.	Known to nest and forage in upland habitats throughout the site, which provide suitable habitat, and most commonly in the Tule Ranch Unit.
Short-eared owl *Asio flammeus*	--	SSC	m	Winter visitor and rare nesting species to Yolo County. Forages in open habitats including marshes, grasslands, shrublands and agricultural fields.	Known to forage in marsh and upland habitats throughout the site, and occasionally nests.
Little willow flycatcher *Empidonax traillii brewsteri*	--	E	r	Migrates through the Central Valley during spring and fall. Forages in riparian willow scrub.	Known to forage in low numbers in riparian habitats along Putah Creek and the toe drains, which provide suitable foraging habitat during migration.
Loggerhead shrike *Lanius ludovicianus*	SSC	SSC	--	Nests and forages in grasslands, agricultural fields, open woodlands and shrublands.	Known to nest and forage in upland habitats throughout the site, which provide suitable habitat, and most commonly in the Tule Ranch Unit.
California horned lark *Eremophila alpestris actia*	--	SSC	--	Nests and forages in open habitats with sparse vegetation including grasslands and fallow agricultural fields.	Known to nest and forage in sparsely vegetated habitats throughout the site, which provide suitable habitat.
Bank swallow *Riparia riparia*	--	T	R	Forages primarily over water. Nests in vertical banks and cliffs with fine textured or sandy soils near streams, rivers, lakes, and ocean.	Known to forage in low numbers over wetland habitats in summer. Suitable nesting habitat is not present.

Table 3.5-3
Special-Status Wildlife Known or with Potential to Occur Regularly at Yolo Bypass Wildlife Area

Species	Status[1]			Habitat	Potential for Occurrence
	USFWS	DFG	MSCS		
California yellow warbler *Dendroica petechia brewsteri*	--	SSC	r	Nests in riparian woodland and riparian scrub habitats. Forages in a variety of wooded and shrub habitats during migration.	Known to forage in low numbers in riparian habitats along Putah Creek and the toe drains, which provide suitable foraging habitat during migration.
Grasshopper sparrow *Ammodramus savannarum*	--	--	m	Nests and forages in dense native grasslands containing diverse assemblages of grasses and forbs. This species is rare and localized in Yolo County.	Known to forage and presumed to breed in the Tule Ranch Unit, which provides suitable habitat. Territorial males have been observed singing on site.
Tricolored blackbird *Agelaius tricolor*	SSC	SSC	m	Nests colonially in tules, cattails, willows, thistles, blackberries, and other dense vegetation. Forages in grasslands and agricultural fields.	Recorded breeding once (2005) colonially in a patch of button willow trees on the Tule Ranch, while foraging in agricultural fields and uplands.
Mammals					
Pallid bat *Antrozous pallidus*	--	SSC	--	Typically roosts in caves or rock crevices; however, colonies of ~12 individuals occasionally roost in buildings or tree cavities. Forages in grassland, shrub and wooded habitats.	Unlikely to breed on site due to marginal breeding habitat, but may forage on site. Old buildings may provide roosting habitat.
Townsend's big-eared bat *Corynorhinus townsendii*	--	SSC	--	Typically roosts in caves; however, colonies of <100 individuals occasionally roost in buildings. Forages in all but alpine and subalpine habitats, but prefers mesic forests.	Unlikely to breed on site due to marginal habitat, but may forage on site. Old buildings may provide roosting habitat.

[1] Legal Status Definitions

U.S. Fish and Wildlife Service (USFWS)

- E Endangered
- T Threatened
- PFD Proposed for delisting
- SSC Species of special concern

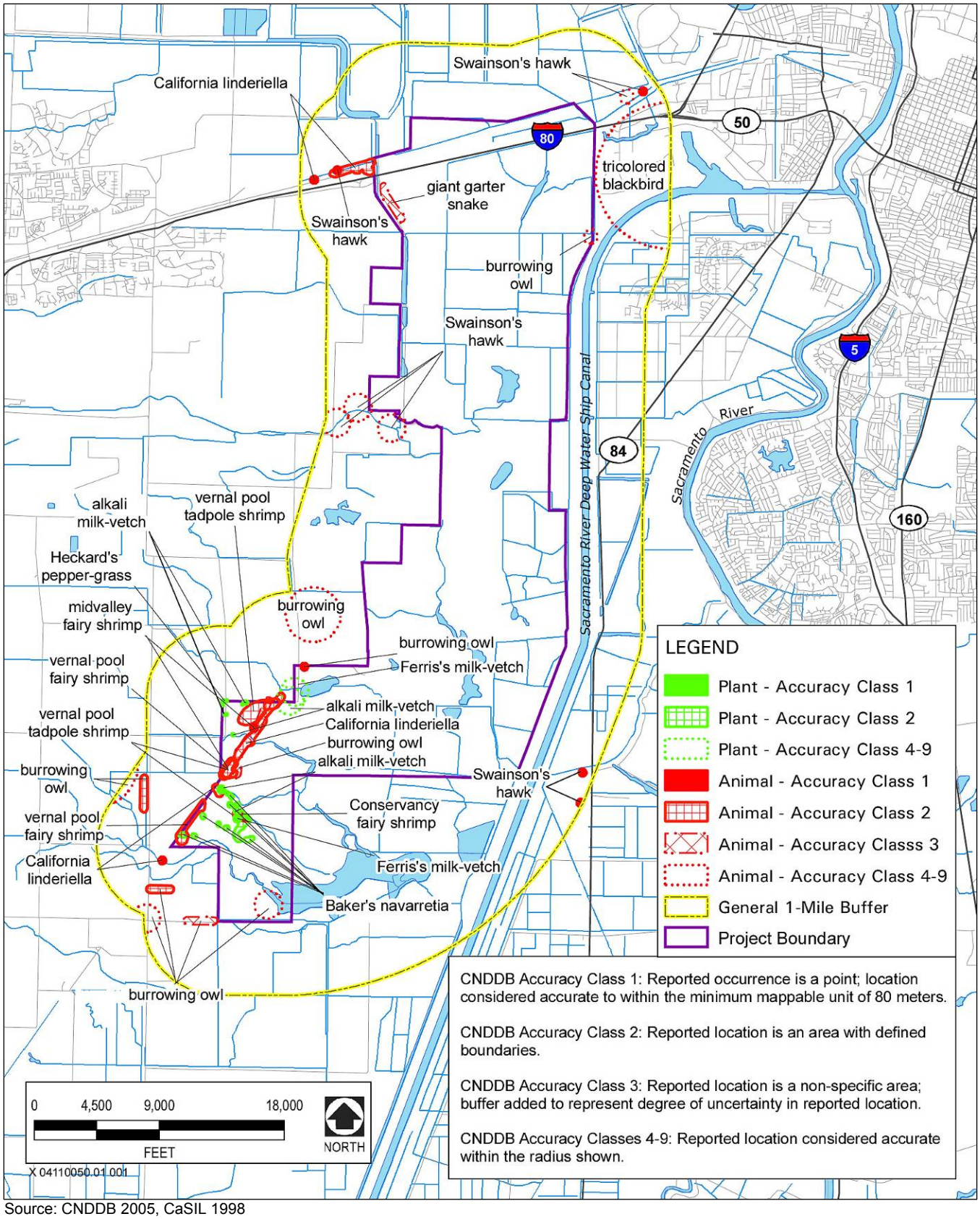
California Department of Fish and Game (DFG)

- E Endangered
- T Threatened
- FP Fully Protected
- SSC Species of special concern

CALFED Multi-Species Conservation Strategy (MSCS)

- R Recovery: CALFED is expected to undertake all actions within the ERP ecological management zones and program scope necessary to recover the species so that its long-term survival in nature is assured.
- r Contribute to recovery: CALFED will make specific contributions to the species' recovery; however, CALFED actions will have a limited effect on the species in a limited portion of its range.
- m Maintain: CALFED will take actions to maintain the species by improving habitat conditions where practicable and by avoiding, minimizing, and compensating for any adverse effects. This designation is less rigorous than "contribute to recovery," and CALFED actions are expected to have minimal effects on the species.

Source: Compiled by EDAW in 2005



Source: CNDDB 2005, CaSIL 1998

Map of CNDDB Recorded
Special-status Species Occurrences in the Yolo Bypass Wildlife Area **Exhibit 3.5-2**

Reptiles

Giant garter snake

Giant garter snake (*Thamnophis gigas*) inhabits sloughs, marshes, low-gradient streams, flooded rice fields, ponds, irrigation and drainage ditches, and adjacent upland habitats. This snake forages primarily at the interface between open water and emergent aquatic vegetation, and is most often found in habitats with slow flowing or standing water, permanent summer water, mud bottoms, earthen banks, and an abundance of prey such as small fish, frogs and tadpoles. Giant garter snakes use upland habitat with grassy or shrubby banks for basking and thermoregulation. They also use upland burrows and soil or rock crevices as nighttime refugia, daytime escape cover, and winter aestivation sites. Giant garter snakes typically emerge from winter retreats from late March to early April and can remain active through October. The timing of their annual activities is subject to varying seasonal weather conditions. Cool winter months are spent in dormancy or periods of reduced activity. While this species is strongly associated with aquatic habitats, individuals have been noted using burrows as far as 165 feet from marsh edges during the active season and retreats more than 800 feet from the edge of wetland habitats while overwintering. Giant garter snakes have been observed in the northwest portions of the Wildlife Area, and suitable habitat for this species exists in many marsh, pond, rice, ditch, and upland edge habitats on site, while the western external levee of the Bypass provides the high ground necessary to survive the winter floods. Unknown until recently, the Yolo Bypass Wildlife Area population was verified as part of a survey of Yolo County giant garter snake distribution in 2005 (Hansen, in prep. 2006). During this study, 41 giant garter snakes (20 male and 21 female) were detected within the Wildlife Area. Dispersal was detected between Wildlife Area wetlands and privately managed rice lands outside the levee of the Yolo Bypass. Using mark-recapture techniques, this population was estimated at 57 individuals with a 95% confidence interval ranging from 45 to 84. As such, this population is comparable with estimates provided for southern American Basin (i.e., Natomas Basin) populations (Hansen 2005; Hansen, in prep. 2006; Jones and Stokes 2006). The dynamics of this population and the effects of periodic inundation within the Yolo Bypass on its health and distribution are unknown. Giant garter snake is state and federally listed as threatened, and CALFED has pledged to contribute to the recovery of this species.

Northwestern pond turtle

Northwestern pond turtle (*Actinemys marmorata marmorata*) occurs in ponds, marshes, rivers, streams, and irrigation ditches supporting aquatic vegetation. Adjacent upland areas are also used for basking and thermoregulation, egg-laying, and aestivation. Features which improve habitat quality for this species include emergent and submergent aquatic vegetation for cover, as well as rocks, logs, and open mud banks for basking. This species is widely distributed throughout the Yolo Bypass Wildlife Area and is believed to breed on site. Northwestern pond turtle is a California species of special concern, and is listed as a species to be maintained under CALFED's MSCS.

Amphibians

California tiger salamander and western spadefoot toad

California tiger salamander (*Ambystoma californiense*) and western spadefoot toad (*Spea hammondii*) breed in suitable aquatic habitats (e.g., vernal pools) during wet winter conditions, and aestivate in adjacent grassland habitat after the pools have dried. Although vernal pools are the preferred habitat for these species, other aquatic habitats may be used, provided that they are free of predatory fish and hold water long enough to sustain reproduction. California tiger salamanders require pools that are large enough to retain water during the ten weeks required for larval development and metamorphosis (Jennings and Hayes 1994). Western spadefoot larvae can complete development in as little as three weeks, but may require up to twelve weeks depending on pool conditions (Jennings and Hayes 1994; Feaver 1971). The vernal pools and adjacent uplands in the Wildlife Area's Tule Ranch Unit may provide suitable habitat for both species, although cursory sampling efforts in 2001 failed to document either species. Other seasonal wetlands throughout the Wildlife Area may also be used by these species,

provided that their habitat requirements are met. Both species are California species of special concern and are listed as species to be maintained under CALFED's MSCS. California tiger salamander is also federally listed as threatened.

Birds

Non-breeding Waterbirds

The Wildlife Area provides important foraging habitat for waterbirds, including several special-status species, although no special-status waterbirds are known to nest on site. The special-status waterbirds in this section include some species that only occur in the Central alley during winter and the fall and spring migrations. Other included species are present during the late spring and summer breeding season and may nest elsewhere in the Central Valley, but do not breed on site due to lack of suitable habitat or regional location.

Non-breeding residents

Double-crested cormorant

Double-crested cormorant (*Phalacrocorax auritus*) forages for fish in open water and nests colonially in rock ledges or groves of trees. This species is abundant at the Yolo Bypass Wildlife Area throughout the year. Cormorants occasionally forage in ditches and permanent wetlands during the summer nesting season, but the more limited fish resources in summer make the site unlikely to support a breeding colony of cormorants. Double-crested cormorant is a California species of special concern and is listed as a species to be maintained under CALFED's MSCS.

Great blue heron, great egret, snowy egret, and black-crowned night-heron

These four species are common in the Wildlife Area, and forage in marshes and shallow open water habitats throughout the site. Great blue heron (*Ardea herodias*) and great egret (*Ardea alba*) also forage less frequently in the grasslands and agricultural fields on site, while snowy egret (*Egretta thula*) and black-crowned night-heron (*Nycticorax nycticorax*) are unlikely to forage in these upland habitats. Although they do not currently nest on site, suitable nesting habitat is available in the Wildlife Area for all four species. A great blue heron and egret rookery is present in a grove of tall trees just outside the Wildlife Area along the Sacramento River Deep Water Ship Channel, and these individuals forage and roost in the Wildlife Area. Large numbers of black-crowned night herons roost in willows on the Wildlife Area during the non breeding season. CALFED has pledged to maintain the colonial rookeries of these four species, under its MSCS.

White-faced ibis

White-faced ibis (*Plegadis chihi*) forage in wetlands, mudflats, and irrigated or flooded croplands and pastures. This species typically nests in dense colonies in large stands of emergent marsh. Individuals from breeding colonies in ponds north of the Causeway Unit forage in the Wildlife Area during summer, when they feed on crayfish in the site's wetlands and flooded rice fields. Smaller numbers of birds forage on site throughout the year. This species may roost in large numbers in cattail marshes during the late summer. White-faced ibis is a California species of special concern and is listed as a species to be maintained under CALFED's MSCS.

Black tern

Black tern (*Chlidonias niger*) nests semicolonially in marsh vegetation and occasionally rice fields, and forages for fish and insects in these habitats and the adjacent open water. This species inhabits inland California and the Delta during summer, and forages primarily in marine habitats in winter. This species regularly forages throughout the marsh, rice, and open water habitats of the Wildlife Area during its spring migration. It may be possible to accommodate nesting black terns within the rice production fields with small islands. Black tern is a California species of special concern, and is listed as a species to be maintained under CALFED's MSCS.

Winter visitors

American white pelican

American white pelican (*Pelecanus erythrorhynchos*) forages for fish in open water and is abundant at the Yolo Bypass Wildlife Area throughout the year. Birds forage on site throughout the year, especially in mid-summer, when birds from distant breeding colonies and non-breeding birds arrive in the Central Valley. American white pelican does not nest in the Central Valley. American white pelican is a California species of special concern.

Long-billed curlew

Long-billed curlews (*Numenius americanus*) forage in wetlands, mudflats, and irrigated or flooded croplands and pastures. This species does not breed on the floor of the Central Valley, but non-breeding individuals forage in the Wildlife Area throughout the year. This is one of the first species to migrate with some individuals arriving as early as June. The largest aggregations are often of post-breeding birds in late summer. Long-billed curlew is a California species of special concern and is listed as species to be maintained under CALFED's MSCS.

Greater sandhill crane

Greater sandhill crane (*Grus canadensis tabida*) is a winter visitor to the Central Valley that forages primarily in moist croplands with rice or corn stubble, as well as grasslands and emergent wetlands. In winter, this species is most densely concentrated in counties south of Yolo County, in agricultural regions and large preserves that support vast fields of suitable habitat. Water levels in the agricultural fields and wetlands in the northern management units of the Yolo Bypass Wildlife Area are managed to provide high-quality foraging habitat for cranes and similar species. As a result, cranes forage casually in the Wildlife Area on a regular basis.

California gull

California gull (*Larus californicus*) forages in open water, wetland, and cropland habitats, as well as landfills. Although this species does not breed in the Central Valley, individuals forage in the Wildlife Area throughout the year. California gulls are most common on site during the winter floods. California gull is a California species of special concern and is listed as a species to be maintained under CALFED's MSCS.

Breeding Raptors

The Wildlife Area provides high-quality habitat for four special-status raptors that are known to nest on site. Section 3503.5 of the California Fish and Game Code provides protection for all raptor nests, including those of the species below. Their nests are also protected by the Migratory Bird Treaty Act.

Northern harrier

Northern harrier (*Circus cyanus*) nests and forages in a variety of open habitats including marshes, grasslands, low shrublands, and agricultural fields. This raptor nests on the ground and preys on a variety of prey, particularly small mammals (e.g., rabbits, mice, voles) and small birds. Harriers are common in the Wildlife Area and they nest and forage throughout the site. Northern harrier is a California species of special concern, and is listed as a species to be maintained under CALFED's MSCS.

Swainson's hawk and white-tailed kite

These two species nest in large and medium-sized trees such as oak and cottonwood and forage in grasslands, low shrublands, seasonal wetlands and agricultural fields. Portions of Yolo, Sacramento, and San Joaquin counties contain optimal nesting and foraging habitat conditions with their landscapes of scattered trees, riparian strips, open fields and manipulated agricultural fields that are mowed, irrigated and disced on a somewhat regular basis. These counties support the majority of Swainson's hawks (*Buteo swainsoni*) that breed in the state. Swainson's hawk and white-tailed kite (*Elanus leucurus*) nests and foraging activity have been observed throughout the Yolo

Bypass Wildlife Area. These species are particularly abundant when the discing, mowing, and summer irrigation of the site's agricultural fields and seasonal wetlands expose numerous grasshoppers and small mammals for prey. Kettles of 50–100 Swainson's hawks can be seen foraging at the edge of ponds during the fall flood up and just prior to the hawks leaving on their southern migration. A significant number of nesting pairs use the trees of the Wildlife Area and Putah Creek. Swainson's hawk is state listed as threatened and is a federal species of concern; it is estimated that the 700 to 1,000 breeding pairs in California represent less than 10% of the historical population. CALFED has pledged to contribute to the recovery of this species. White-tailed kite is a federal species of concern and a fully protected species under the California Fish and Game Code. White-tailed kite is also listed as a species to be maintained under CALFED's MSCS.

Western burrowing owl

Western burrowing owl (*Athene cunicularia*) forages in grasslands, low shrublands and agricultural fields. It nests and roosts in underground burrows, often those created by medium-sized mammals such as ground squirrels. Several burrowing owl nests have been documented in the Wildlife Area's Tule Ranch Unit; the species may also nest in other locations throughout the site. Burrowing owls are known to forage throughout the upland and agricultural habitats on site. These animals appear to be opportunistic, often appearing in unlikely places such as remote pipe crossings and piles of discarded pipe or concrete. Winter and spring flooding displaces several Burrowing owls each year, sending them to the edge of the flood waters, sometimes in impressive numbers. A series of artificial burrow structures were placed on the Tule Ranch in late 2006. A substantial number of these structures were occupied in early 2007. Western burrowing owl is a California species of special concern and a federal species of concern, and is listed as a species to be maintained under CALFED's MSCS.

Non-breeding Raptors

The Wildlife Area provides important winter foraging habitat for a variety of birds of prey. The raptors in this section include some species that only occur in the Central Valley during winter and the fall and spring migrations. Other included species are present during the late spring and summer breeding season and may nest elsewhere in the Central Valley, but do not breed on site due to lack of suitable habitat or regional location.

Non-breeding residents

Osprey

Osprey (*Pandion haliaetus*) forages exclusively for fish over open water, and is most commonly seen at the Yolo Bypass Wildlife Area during migration in August. Osprey is a California species of special concern and is listed as a species to be maintained under CALFED's MSCS.

Cooper's hawk

Cooper's hawk (*Accipter cooperii*) is a bird of riparian woodlands and other wooded habitats, where it preys primarily on birds and to a lesser extent, small mammals. This species has been observed foraging in the Wildlife Area during fall and winter months, but is not known to nest on site. Cooper's hawk generally requires more extensive woodland for nesting than that present at the Wildlife Area. Cooper's hawk is a California species of special concern and is listed as a species to be maintained under CALFED's MSCS.

Winter visitors

Bald eagle

Bald eagle (*Haliaeetus leucocephalus*) is a winter visitor to the Central Valley floor. This species forages primarily over open water, and occasionally occurs at the Yolo Bypass Wildlife Area during the winter months. Bald eagle is federally listed as threatened, although it has been proposed for delisting. Bald eagle is also state listed as endangered, is a fully protected species under the California Fish and Game Code, is federally protected by the Bald Eagle Protection Act of 1940, and is listed as a species to be maintained under CALFED's MSCS.

Sharp-shinned hawk

Sharp-shinned hawk (*Accipiter striatus*) nests and forages primarily in riparian woodlands and other wooded habitats, where it preys primarily on small birds. This species has been observed foraging in the Wildlife Area, but is a winter visitor that does not nest on the Central Valley floor. Sharp-shinned hawk is a California species of special concern.

Ferruginous hawk

Ferruginous hawk (*Buteo regalis*) forages in upland habitats and preys primarily upon rabbits, as well as other small mammals and birds. This raptor is a winter visitor to the Central Valley, and is known to forage occasionally throughout the upland habitats of the Yolo Bypass Wildlife Area. Ferruginous hawk is a California species of special concern.

Golden eagle

Golden eagle (*Aquila chrysaetos*) nests and forages in a variety of open habitats including grassland and cropland. This species is most common, however, in foothill and shrub-steppe habitats, where it preys upon jackrabbits, other mid-sized mammals, and upland game birds. Golden eagle is a rare breeder in the foothill fringes of the Central Valley. This species is known to forage occasionally in upland habitats throughout the Wildlife Area in winter. Golden eagle is a fully protected species under the California Fish and Game Code, is federally protected by similarity of appearance under the Bald Eagle Protection Act of 1940, and is listed as a species to be maintained under CALFED's MSCS.

Merlin, American peregrine falcon, and prairie falcon

These three falcons are primarily winter visitors to the Central Valley, and are known to forage in the Yolo Bypass Wildlife Area. Merlin (*Falco columbarius*) forages in a variety of habitats and feeds primarily on small shorebirds and passerines. American peregrine falcon (*Falco peregrinus anatum*) forages primarily in mudflats and open water, where it preys upon waterfowl and shorebirds, and hence also occurs on-site from mid summer through spring, a time period corresponding with the presence of migratory shorebirds.

Peregrine Falcons have become more common on the Wildlife Area since the initiation of shorebird management activities in 2002. Prairie falcon (*Falco mexicanus*) forages in upland habitats, where it preys upon small mammals and less frequently birds. Merlin and prairie falcon are California species of special concern. American peregrine falcon is state listed as endangered and is a fully protected species under the California Fish and Game Code. American peregrine falcon is also listed as a species to be maintained under CALFED's MSCS.

Short-eared owl

Short-eared owls (*Asio flammeus*) forage in a variety of open habitats including marshes, grasslands, low shrublands, and agricultural fields, and are known to forage throughout the Wildlife Area during the non-breeding seasons of late summer through early spring. Short-eared owls have been sighted during the spring and summer months in some years and are presumed to occasionally nest on the Wildlife Area. Shore-eared owls are irruptive and will nest in more southerly locations when their prey are numerous. At the Yolo Wildlife Area, the prey is primarily California voles, whose numbers fluctuate according to the severity of the previous winter floods. Short-eared owl is a California species of special concern, and is listed as species to be maintained under CALFED's MSCS.

Breeding Songbirds

In addition to protections afforded to special-status species, the nests of these neotropical migrants are also protected by the Migratory Bird Treaty Act.

Loggerhead shrike

Loggerhead shrike (*Lanius ludovicianus*) nests and forages in grassland, shrub-steppe, open woodland/savannah, riparian, and agricultural habitats with scattered shrubs and trees. This species nests and forages throughout the Wildlife Area, with the Tule Ranch Unit providing the highest quality habitat. Loggerhead shrike is a California species of special concern and a federal species of concern.

California horned lark

California horned lark (*Eremophila alpestris actia*) inhabits flat plains with short vegetation (often less than 10 centimeters high) or bare ground, and is found in both grassland and fallow agricultural areas. California horned lark is a year-round resident of the Yolo Bypass Wildlife Area, and is known to breed in sparsely vegetated patches throughout the site. California horned lark is a California species of special concern.

Grasshopper sparrow

Grasshopper sparrow (*Ammodramus savannarum*) nests and forages in dense native grasslands containing diverse assemblages of tall grasses and forbs. They have been seen in seasonal wetlands during the summer months for several years but their stronghold on the Wildlife Area appears to be the Tule Ranch. The Tule Ranch Unit of the Yolo Bypass Wildlife Area provides diverse, high-quality habitat for this species with vegetation heights close to two feet. Grasshopper sparrows have become a significant feature of this unit in recent years. They have regularly been observed foraging and are presumed to breed, as territorial males have regularly been observed singing on site. This rare remnant of diverse native grassland is one of only a handful of breeding sites in Yolo County for this rare and localized species; the few other sites are in the western foothills. Grasshopper sparrow is listed as a species to be maintained under CALFED's MSCS.

Tricolored blackbird

Tricolored blackbird (*Agelaius tricolor*) nests in dense colonies in a variety of habitats, including freshwater marsh, riparian scrub, and other vegetation that provides dense cover for protection from predators. Tricolored blackbird colonies range in size from fewer than 25 individuals to more than 100,000, and colony locations often change from year to year. This species forages in grasslands, pastures and agricultural fields. Tricolored blackbirds were observed breeding on the Wildlife Area for the first time in 2005. Their colony was located among the branches of buttonwillow trees on the Tule Ranch. Tricolored blackbird flocks also forage in the Wildlife Area's upland communities and agricultural areas. Tricolored blackbird is both state and federally listed as a species of special concern, and is listed as a species to be maintained under CALFED's MSCS.

Non-breeding Songbirds

The Wildlife Area provides important foraging habitat for many songbird species that do not nest on site. The songbirds in this section include two species that only occur in the Central Valley during migration and one summer resident that nests elsewhere in the Central Valley but does not breed on site due to lack of suitable habitat.

Non-breeding resident

Bank swallow

Bank swallow (*Riparia riparia*) is a neotropical migrant that nests in vertical banks and cliffs near water, and forages for insects over water. The Wildlife Area does not contain vertical banks for bank swallow nesting, and the nearest nesting colonies are along Cache Creek in Yolo County, and along the Sacramento River at the border of Yolo and Sutter Counties. A few individuals from these colonies are known to forage over the Wildlife Area's wetlands after cessation of breeding in late summer. Bank swallow is state listed as threatened and CALFED has

pledged to undertake all actions within the ERP ecological management zones and program scope necessary to recover this species.

Migration visitors

Little willow flycatcher

Little willow flycatcher (*Empidonax traillii brewsteri*) nests in montane riparian willows and migrates through the Central Valley in spring and fall. During migration, this species is known to forage in the Wildlife Area's riparian communities along Putah Creek and the toe drains of the Sacramento River levees. Little willow flycatcher is state listed as endangered and CALFED has pledged to contribute to the recovery of this species.

California yellow warbler

California yellow warbler (*Dendroica petechia brewsteri*) nests and forages in riparian woodland and riparian scrub habitats, where it gleans insects from the riparian foliage. This species is currently present in Yolo County only during migration. Yellow warbler has declined dramatically in California's Central Valley with the loss of riparian habitat, and the species has not been known to breed in Yolo County since 1974 (Gaines 1974). California yellow warbler is a California species of special concern and CALFED has pledged to contribute to the recovery of this species.

Mammals

Pallid bat, Red Bat, and Townsend's big-eared bat

These three species forage over a wide variety of grassland, wetland, shrub, and wooded habitats, although Pallid bat (*Antrozous pallidus*) is most common in grassland and other arid habitats and Townsend's big-eared bat (*Corynorhinus townsendii*) is most common in mesic forests. These two species typically have maternity roost in small colonies of 12–200 individuals in caves and rock crevices, while the red bat (*Lasiurus blossevillii*) is usually solitary. Bridges, buildings, and tree cavities are also occasionally used for roosting. Townsend's big eared bats are unlikely to breed at the Wildlife Area due to the marginal maternity roosting habitat present for this species. Pallid bats have the potential to breed on site although unlikely. Red bats may utilize trees on the Wildlife Area for both roosting and breeding. All of these species may forage and night-roost in the Wildlife Area. Pallid bats, red bats and Townsend's big-eared bats are California species of special concern.

Mexican Free-tailed Bat

Although not a species of special concern, the large colony of Mexican Free-tailed Bats (*Tadarida basiliensis*) that roosts and breeds under the Yolo Causeway is of significant conservation value. Over 100,000 of these individuals can be seen leaving their daytime roost during summer months.

3.5.3 FISHERIES RESOURCES

This section summarizes the current conditions for fisheries resources in Yolo Bypass Wildlife Area. It discusses native and nonnative fish use of the Yolo Bypass Wildlife Area, aquatic habitats, and special-status fish species. The primary sources of information for this section were published reports on the fish, fisheries, ecology, and natural history of the Yolo Bypass and associated habitats.

The Yolo Bypass provides vital fish spawning, rearing, and/or migratory habitat for a diverse assemblage of native and nonnative fish species (Table 3.5-4) (Moyle 2002a; Sommer et al. 2001). Native and nonnative species can be separated into anadromous (i.e., species that spawn in fresh water after migrating as adults from marine habitat) and resident species.

Native anadromous species that occur or have the potential to occur in the Yolo Bypass Wildlife Area include four runs of Chinook salmon (*Oncorhynchus tshawytscha*), steelhead trout (*O. mykiss*), green and white sturgeon (*Acipenser medirostris* and *A. transmontanus*), and Pacific lamprey (*Lampetra tridentata*). Native resident species include delta smelt (*Hypomesus transpacificus*), Sacramento pikeminnow (*Ptychocheilus grandis*), Sacramento splittail (*Pogonichthys macrolepidotus*), Sacramento sucker (*Catostomus occidentalis*), Sacramento perch (*Archoplites interruptus*), hardhead (*Mylopharodon conocephalus*), and rainbow trout (*O. mykiss*). Nonnative anadromous species include striped bass (*Morone saxatilis*) and American shad (*Alosa sapidissima*). Nonnative resident species include largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieu*), white and black crappie (*Pomoxis annularis* and *P. nigromaculatus*), channel catfish (*Ictalurus punctatus*), white catfish (*Ameiurus catus*), brown bullhead (*Ictalurus nebulosus*), bluegill (*Lepomis macrochirus*), green sunfish (*Lepomois cyanellus*), and golden shiner (*Notemigonus crysaleucas*). Several of the resident species (i.e., Sacramento splittail and delta smelt) can show a strong migratory life history pattern.

Table 3.5-4
Fish Species in the Yolo Bypass Wildlife Area

Common Name	Scientific Name	Common Name	Scientific Name
American Shad	*Alosa sapidissima*	Redear Sunfish	*Lepomis microlophus*
Bigscale Logperch	*Percina macrolepida*	River Lamprey	*Lampetra ayersii*
Black Bullhead	*Ameiurus melas*	California Roach	*Hesperoleucus symmetricus*
Black Crappie	*Pomoxis negromaculatus*	Sacramento Blackfish	*Orthodon microlepidotus*
Bluegill	*Lepomis macrochirus*	Sacramento Pikeminnow	*Ptychocheilus grandis*
Brown Bullhead	*Ameiurus nebulosus*	Sacramento Sucker	*Catostomus occidentalis*
Channel Catfish	*Ictalurus punctatus*	Shimofuri Goby	*Tridentiger bifasciatus*
Chinook Salmon	*Oncorhynchus tshawytscha*	Smallmouth Bass	*Micropterus salmoides*
Common Carp	*Cyprinus carpio*	Splittail	*Pogonichthys macrolepidotus*
Delta Smelt	*Hypomesus transpacificus*	Spotted Bass	*Micropterus punctulatus*
Fathead Minnow		Steelhead Trout	*Oncorhynchus mykiss*
Golden Shiner	*Notemigonus crysoleucas*	Striped Bass	*Morone saxatilis*
Goldfish	*Carassius auratus*	Threadfin Shad	*Dorosoma petenense*
Green Sunfish	*Lepomois cyanellus*	Threespine Stickleback	*Gasterosteus aculeatus*
Hardhead	*Mylopharodon conocephalus*	Tule Perch	*Hysterocarpus traski*
Hitch	*Lavinia exilicauda*	Wakasagi	*Hypomesus nipponensis*
Inland Silverside	*Menidia beryllina*	Warmouth	*Chaenobryttus gulosus*
Largemouth Bass	*Micropterus salmoides*	Western Mosquitofish	*Gambusia afinis*
Pacific Lamprey	*Lampetra tridentata*	White Catfish	*Ameiurus catus*
Pacific Staghorn Sculpin	*Leptocottus armatus*	White Crappie	*Pomoxis annularis*
Prickly Sculpin	*Cottus asper*	White Sturgeon	*Acipenser transmontanus*
Red Shiner	*Cyprinella lutrensis*	Yellowfin Goby	*Acanthogobiusflavimanus*

Source: Moyle 2002a; Sommer et al. 2001

Throughout the Yolo Bypass, the use of different aquatic habitats by various fish species is influenced by variations in permanent habitat conditions, seasonal inundation of the floodplain (i.e., Yolo Bypass), and by the habitat requirements, life history, daily and seasonal movements, and behavior of each species. Altered flow regimes, flood control, and floodwater conveyance activities along much of the Yolo Bypass have affected available habitat and ecological processes (see Section 3.4, "Geomorphology, Hydrology, and Water Quality," for additional information on physical processes). Historically, seasonal flooding covered various lands adjacent to the Sacramento River and tributaries and provided important spawning and rearing habitat for many fish species, including Sacramento splittail and juvenile Chinook salmon and steelhead. Levee and flood control facility (i.e., Fremont Weir and Sacramento Weir) construction has caused a reduction in the overall amount of seasonal flooding and shallow-water habitat in the Sacramento River system. In winter and spring, however, agricultural fields and wetland habitats throughout the Yolo Bypass often flood during high flows and are used by Sacramento splittail for spawning and rearing, and by Chinook salmon and steelhead for rearing (Sommer et al. 2001, 2003).

AQUATIC HABITATS

Primary aquatic habitats throughout the Yolo Bypass Wildlife Area include the Yolo Bypass floodplain during seasonal flooding events, Putah Creek, East Toe Drain, and permanent wetlands. General characteristics of each of these aquatic habitats are provided below.

Yolo Bypass Floodplain

Similar to other Sacramento-San Joaquin Delta habitats, there are more introduced species than native species in the Yolo Bypass floodplain (Table 3.5-4) (Sommer et al. 2003). Introduced species are one of the major environmental issues in the Delta, where they frequently dominate the fauna on a year-round basis (Bennett and Moyle 1996) and in fact make up approximately 90 percent of the biomass in the Delta. However, unlike other Sacramento-San Joaquin Delta habitats, the floodplain is seasonally dewatered during late spring through autumn. This prevents introduced fish species from establishing year-round dominance except in perennial water sources (Sommer et al. 2003). Moreover, many of the native fish are adapted to spawn and rear in winter and early spring (Moyle 2002a) during the winter flood pulse. Introduced fish typically spawn during late spring through summer when the majority of the floodplain is not available to them.

Recent surveys demonstrate that the Yolo Bypass provides habitat for a wide variety of fish species (Table 3.5-4). Sampling to date has shown that the floodplain is used by at least 42 fish species including seasonal fish and fish that are year-round residents in perennial water sources. Examples include federal and state-listed species (steelhead trout, delta smelt, spring-run (state-listed only) and winter-run Chinook salmon) and sport fish (striped bass and white sturgeon) (Sommer et al. 2003).

The native minnow Sacramento splittail is perhaps the most floodplain-dependent species in the Sacramento-San Joaquin Delta (Sommer et al. 1997). For much of the year, splittail reside in the San Francisco Estuary (Estuary); however, in autumn and winter they seasonally migrate upstream to spawn in the Sacramento-San Joaquin Delta and its tributaries.

Studies by Sommer et al. (1997) demonstrated that the Yolo Bypass provides some of the most important habitat for this species. Their sampling data indicated that adults move onto the floodplain in winter and early spring to forage and spawn among flooded vegetation. DWR has conducted both a pilot study and a more expanded investigation of splittail spawning behavior, first using the small ¼ acre wetland at the DFG demonstration wetlands on Chiles Road, and again in a 10-acre pond in the North Unit within the Yolo Bypass Wildlife Area.

Splittail rear in the Yolo Bypass and emigrate to the river channels and estuary as floodwaters recede. As one indication of the importance of the floodplain habitat to splittail, Sommer et al. (1997) showed that larval

production of splittail for two floodplain habitats (Yolo and Sutter bypasses) was substantially higher than in surrounding river channels.

Juvenile Chinook salmon represent another good example of the value of the floodplain habitat to native fish. There are four races of Chinook salmon in the Sacramento Valley: winter, spring, late-fall and fall-run (Yoshiyama et al. 2000). Historical data indicate that all races have declined in abundance since the 1950s, however, the spring, winter and late-fall runs have shown the largest declines. There are multiple causes for these long-term reductions, including habitat loss, habitat degradation, water diversions and oceanic conditions. These declines led to the federal listing of winter-run Chinook as “endangered” in 1991 and spring-run as “threatened” in 1999.

Although there are multiple races, most young Chinook salmon emigrate from upstream riverine spawning habitats during winter and spring, then enter the Sacramento-San Joaquin Delta (Fisher 1994). In low flow periods, downstream migrants are confined to the Sacramento River and similar Delta channels. During flood pulses the Yolo Bypass floodplain provides an alternative migration corridor.

The results of Sommer et al. (2001) indicated that this seasonal floodplain habitat potentially provides better rearing conditions than the adjacent Sacramento River channel. They noted two major advantages of floodplain: 1) increased area of suitable habitat and 2) increased food resources.

Young Chinook salmon typically prefer habitat that is shallow and has low velocity (Everest and Chapman 1972). Sommer et al. (2001) estimated that complete inundation of the Yolo Bypass floodplain creates a wetted area approximately ten times larger than the comparable reach of the Sacramento River.

Moreover, they observed that the river channel lacked the broad, low velocity shoal (areas with mean depth typically < 2 meters) areas preferred by young salmon because flows are confined to deep, narrow rip-rapped channels. By contrast, Sommer et al. (2001) noted that the Yolo Bypass has extensive shoals and substantial habitat complexity.

Another important attribute of floodplain habitat is an enhanced food web. Sommer et al. (2001) found that drift insects (primarily chironomids) were 10 to 100 times more abundant in the floodplain than the adjacent Sacramento River channel during 1998 and 1999 flood events. Sommer et al. (2001) also observed that the higher drift insect abundance was reflected in the diets of juvenile salmon; Yolo Bypass salmon had significantly more prey in their stomach than salmon collected in the Sacramento River. However, they noted that the increased feeding success may have been partly offset by significantly higher water temperatures on the floodplain habitat, resulting in increased metabolic costs for young fish. The higher water temperatures were a consequence of the broad shallow shoals, which warm faster than deep river channels. Through bioenergetic modeling, Sommer et al. (2001) concluded that floodplain salmon had substantially better feeding success than fish in the Sacramento River, even when the prey data were corrected for increased metabolic costs of warmer floodplain habitat.

In his study, Sommer et al. (2001) found that improved rearing conditions potentially allowed juvenile salmon to grow substantially faster in the Yolo Bypass floodplain than the adjacent Sacramento River. They showed that the mean salmon size increased significantly faster in the seasonally-inundated Yolo Bypass floodplain than the Sacramento River, suggesting better growth rates.

Although these results suggest that several habitat measures may be better for young salmon in the Yolo Bypass, floodplain habitat carries stranding risks. The relative importance of stranding mortality is difficult to evaluate because there is currently no reliable estimate of the total number of salmon which migrate through the Sacramento River and its tributaries. However, the Yolo Bypass floodplain has been graded for agriculture using laser leveling technology, resulting in an exceptionally well drained topography. Observations indicate that highly efficient drainage may promote successful emigration of young salmon (Sommer et al. 2003). Sommer et al. (2001) examined this issue by doing paired releases of juvenile coded-wire-tagged salmon in the Yolo Bypass and Sacramento River to obtain comparative survival data for fish migrating through each habitat type. They found

that the Yolo Bypass floodplain release groups had somewhat higher survival indices than Sacramento River fish in both 1998 and 1999; however, the sample size (n=2) was too low to demonstrate statistical significance.

Although preliminary results suggest that growth of juvenile salmon in the Bypass may be accelerated, because of the low sample size, these results should be considered with caution. It is unknown exactly how significantly the Bypass contributes to overall Central Valley escapement.

Recent analysis of juvenile salmon utilizing the Bypass indicates higher methylmercury levels in these fish when compared to juvenile salmon that used the Sacramento River to get to the Delta. Further study is needed as well as analysis of methylmercury levels in splittail using the Yolo Bypass. Splittail spend their entire lives within the Bay-Delta ecosystem and therefore may have a higher propensity to contribute towards the bioaccumulation of methylmercury up the food chain.

Other Benefits of Floodplain to Aquatic Communities

Floodplain inundation may also provide benefits to organisms downstream in the brackish portion of the Delta (i.e., estuary). At the base of the estuarine food web, phytoplankton are responsible for most of the primary production in the estuary (Jassby et al. 1996). However, to the detriment of the organisms dependent on phytoplankton, there has been a major long-term decline in phytoplankton biomass in the estuary as a result of multiple factors including introduction of new benthic grazers (i.e., Asian clam) (Alpine and Cloern 1992), water exports and low outflow (Jassby et al. 1995), and climate change (Lehman 2000). Modeling studies by Jassby and Cloern (2000) suggest that phytoplankton produced in the Yolo Bypass may be an important source of organic carbon to the Estuary, at least during flood events. Moreover, Yolo Bypass is probably also a major pathway for detrital material, an important additional source of organic carbon to the food web of the phytoplankton-deficient Estuary. This conclusion is supported by Schemel et al. (1996), who found that the Yolo Bypass is the major pathway for organic matter to the Estuary in wet years.

Putah Creek

The reach of Putah Creek within the Yolo Bypass Wildlife Area (i.e., Putah Creek Cross Channel) consists of a historic channel that is seasonally dammed by the Los Rios Check Dam. The creek channel in this reach is approximately 40 feet wide on average. The riparian corridor above the dam is less than 5 trees wide although many of these trees are substantial in height. Below the Los Rios Check Dam, the channel has very few trees and steep banks. There is also an approximately one mile stretch of Putah Creek that is lined with a narrow band of tall riparian trees. This stretch is currently cut off from perennial flow. The Los Rios Check Dam is a 12-foot-high, 30-foot-long concrete box culvert with hardware to hold large flashboards that serves as a seasonal check dam in the Yolo Bypass to create a head of water for irrigation pumping for neighboring agricultural lands and to flood the seasonal wetlands in the Yolo Bypass Wildlife Area. The Los Rios Check Dam is also managed to facilitate the migration of fall-run Chinook salmon into lower Putah Creek by removing boards in fall/winter in conjunction with pulse flow releases from the Putah Diversion Dam (PDD). The boards are typically removed in the fall/winter as soon as the irrigation season ends and upon the arrival of Chinook salmon in the East Toe Drain (based on DWR fike trap sampling) and replaced in April of the following year (for agricultural and wildlife habitat uses). Replacement of the check dam in April could impede emigration of late hatching young fall-run Chinook salmon.

Habitat and fisheries conditions in this reach of lower Putah Creek have been affected and shaped by several factors, including historic agricultural activities in the Yolo Bypass Wildlife Area, upstream flood control grading and vegetation removal, construction and operation of the Solano Project and, in May 2000, settlement and implementation of the historic Putah Creek Settlement Agreement (aka Water Accord) (Sacramento County Superior Court 2000). Due to hydrologic connectivity to the reach of Putah Creek in the Yolo Bypass Wildlife Area, the following discussion from the Lower Putah Creek Watershed Management Action Plan (Lower Putah

Creek Coordinating Committee 2005) provides a description on the segment of Putah Creek from the East Toe Drain in the Yolo Bypass Wildlife Area, upstream to the PDD.

Stream Conditions Prior to Water Accord (1960s to 2000)

Construction and operation of the Solano Project had major effects on flows and sediment conditions downstream of the PDD. In general, the Solano Project substantially decreased total annual discharges through lower Putah Creek compared with pre-project conditions (Jones & Stokes 1992). Following operation of the project, the minimum normal and dry year annual releases required (by a 1970 State Water Resource Control Board decision) were about 22,000 acre-feet and 19,000 acre-feet, or 6 percent and 5 percent of the estimated pre-project discharges, respectively. The Solano Project also modified summer hydrological conditions, extending streamflow throughout summer, such that median flows in August through October were higher than during pre-project conditions, and flows were generally present from the PDD to the Yolo Bypass in most years. However, significant periods of reduced flows in the lowest reaches of Putah Creek occurred at various times since the Solano Project became operational. The 1987–1992 drought years were the driest 6-year period on record for the Putah Creek drainage. At the same time, surface water diversions and increased groundwater pumping were further reducing Putah Creek flows due to a shortage of surface water supplies. The reduced releases during drought years, coupled with reduced recharge from the adjacent groundwater table, resulted in the complete dewatering of long stretches of the creek, major fish die-offs, and raised concern for fish habitat and other beneficial functions of Putah Creek.

The impoundment of gravel upstream of the dams has resulted in a lack of gravel substrate in Putah Creek downstream of the PDD. In addition to the reduction in sediment movement downstream following completion of the Solano Project, gravel mining occurred along Putah Creek during the 1960s and 1970s (USFWS 1993). Channel surveys in 1972 indicated that mining had left a wide, relatively flat channel with a few artificial berms and levees (Jones & Stokes 1992).

Vegetation clearing activities in the creek channel by state and federal agencies continued through the 1960s and early 1970s. After 1975, when vegetation clearing policies were changed (USFWS 1993), the creek bed stabilized, riparian woodland cover increased, and a seemingly more natural stream channel was created (Moyle 1991).

Fisheries Prior to Water Accord (1960s to 2000)

About 40 species of fish have been reported from lower Putah Creek below the PDD, including 17 permanent residents (LPCCC 2003, Moyle 1991, Marchetti and Moyle 2001). The fish species could be divided into four categories: anadromous fish, resident native fish, introduced resident game fish, and introduced resident non-game fish. Sightings of anadromous fish, including spawning activity by small numbers of Chinook salmon, occurred when there were adequate late fall and winter flows in Putah Creek, the Yolo Bypass, and the Sacramento River (Lower Putah Creek Coordinating Committee 2003).

Native resident fishes in the creek included mainly Sacramento blackfish, hitch, prickly sculpin, riffle sculpin, Sacramento pikeminnow, Sacramento sucker, three-spine stickleback, and tule perch (USFWS 1993). Introduced game species in the creek provided many opportunities for angling. These included species such as brown trout, largemouth bass, smallmouth bass, bluegill, green sunfish, warmouth, white and black crappie, white catfish, channel catfish, black bullhead, and common carp (USFWS 1993, Moyle 1991). Other nonnative species included Western mosquitofish, inland silverside, goldfish, bigscale log perch, fathead minnow, golden shiner, and red shiner (USFWS 1993).

Putah Creek Water Accord

From 1987 to 1992 the worst 6-year drought on record hit the region. Lake Berryessa was drawing down at a rate of about 200,000 net acre-feet per year. In summer 1989, long stretches in the downstream reaches of lower Putah

Creek began drying up and major fish die-offs of fish began occurring (Moyle et al. 1998). Attempts to negotiate a permanent solution to the problem resulted in several legal actions over a period of approximately 10 years.

On May 23, 2000, a settlement (the Accord) was reached. It created a new permanent release schedule intended to balance the competing uses for water between supply, demand, and maintenance of aquatic and riparian resource functions. The purpose of the Accord is to create as natural a flow regime as feasible and to maintain a living stream for the benefit of fish, wildlife, and plants from the PDD to the connection at the East Toe Drain in the Yolo Bypass. The Accord focuses on the protection and enhancement of native resident and anadromous fish populations. It includes six primary elements, including four functional flow requirements. The four flow requirements pertain to rearing flows, spawning flows for native resident fishes, supplemental flows for anadromous fishes, and drought-year flows. The six Accord elements are as follows (a discussion on release schedules is provided below):

1. Flows for resident native fish, which include important spawning and rearing components and guarantee a continuous flow to I-80;

2. Flows that will attract and support salmon and steelhead;

3. A drought schedule that provides enough water to maintain Putah Creek as living stream but provides water users relief from other flow requirements;

4. Creation of the Lower Putah Creek Coordinating Committee (LPCCC) and the streamkeeper position;

5. Habitat restoration and monitoring funds for the creek; and

6. A term requiring Solano County Water Agency (SCWA) to notify riparian water users of the amount of riparian water available in any given year and to prevent illegal water diversions in excess of the amount of riparian water available.

Rearing Flows

This is a baseline flow regime designed to maintain a year-round living stream from the PDD to the East Toe Drain. It is intended to provide cool-water habitat for native fishes for at least several miles below the PDD, even under the worst drought conditions. It also provides enough water to support introduced fishes (e.g., largemouth bass, catfishes, and bluegill) in the lower reaches. These flows overcome past limitations in which the stream dried up during summer in extreme drought years, except for a few large pools and a short section below the PDD (Moyle 2002b).

Spring Pulse Flows

Spring pulse flows consist of a short pulse in February–March, lasting three consecutive days, followed by a month-long release of higher than baseline flows. The purpose of these flows is to promote emigration of juvenile salmon and to provide spawning opportunities for native fishes in winter and spring if there was insufficient rain to provide for them naturally. Native fishes, such as Sacramento sucker, are stimulated to spawn by hydrological changes that deepen spawning riffles and flood shoreline habitat for rearing. The pulse would bring the fish upstream and the increased flows would allow them to spawn and rear. Dr. Moyle predicted that these flows, in combination with baseline rearing flows, would greatly increase the abundance and distribution of native fishes in the creek (Moyle 2002b).

Supplemental (Pulse) Flows

Supplemental flows are designed to primarily benefit the migration of fall-run Chinook salmon. The Accord includes a requirement for a minimum flow beginning in November and a 5-day pulse flow to occur at an optimal

time (based on monitoring) in November or December to attract and enable adult fall-run Chinook salmon to migrate up Putah Creek from the East Toe Drain. The Accord also specifies a minimum flow that follows the pulse flow and continues through the end of May. The springtime minimum flows are designed to benefit juvenile salmon for rearing and to enable them to return back to the East Toe Drain and sea (Moyle 2002b).

When salmon are detected in the East Toe Drain during the fall, and DFG personnel as well as local farmers are through utilizing the pool of water trapped behind the Los Rios Check Dam, a well orchestrated sequence of events takes place. Los Rios Farms schedules the removal of the boards. SCWA coordinates with Yolo Bypass Wildlife Area regarding release of the fall attraction flows which is timed to coincide with the removal of the boards from the Los Rios Check Dam. Removing the check boards in coordination with the fall attraction flows helps to attract and enable salmon to migrate up into Putah Creek from the East Toe Drain.

The supplemental flow regime, although designed primarily to benefit salmon, seems to benefit lampreys and may be adequate for rearing juvenile steelhead as well. Adult steelhead may make it up the stream under high winter flows (Moyle 2002b).

Drought Year Flows

These flows are to be implemented during severe droughts, when all flows but the minimum flows can be eliminated for 2 years. During droughts, normal flow regimes outlined in the subsections above are not in effect every year. Droughts are defined as periods in which the total storage in Lake Berryessa is less than 750,000 cfs on April 1 of any given year. Severe droughts are defined as periods in which Lake Berryessa holds less than 400,000 acre-feet of water on April 1. Under the drought year flow regime, normal flows are implemented in every third year of an extended drought unless the drought is severe. During extended (e.g., 3 or more years) severe droughts, normal flows are not implemented until the first year immediately after Lake Berryessa storage exceeds 400,000 acre-feet.

The drought year flow regime seeks to strike a reasonable balance between human water demands and the minimum needs of fishes during droughts. While the stream and its fish will not receive more than minimum flows during most drought years, periodically they regain priority for water if the drought continues. The drought regime also recognizes that during drought conditions, native fish can persist under minimal flow conditions without reproducing. Native fishes can persist if competition and predation from introduced fishes is limited or if suitable habitat refuges exist for the native fishes (Marchetti and Moyle 2001). Even before the settlement, small numbers of native fishes managed to persist through extreme drought conditions that dried up most of the creek. The minimum flows provided under the new schedule are expected to enable native fishes to have a higher level of persistence than prior to the Accord.

The drought schedule requires that a continuous flow be maintained in the reach from PDD to I-80 (a 15-mile stretch) at all times. Thus, the reaches of Putah Creek closer to the Diversion Dam, which are the reaches dominated by resident native fishes, will not go dry, protecting native fish from lengthy droughts. The nonnative species, which tend to dominate in the reaches nearer to and below I-80, will not receive as much protection from the drought year flow schedule. However, introduced fish may repopulate those reaches from upstream populations following the end of drought cycles (Moyle 2002b).

Fisheries after Water Accord (2000 to Present)

Fisheries response to the Accord flow releases is still currently being evaluated; however, based on initial data, several improvements have been noted. The most noteworthy result of the new flow releases is that fall-run Chinook salmon are migrating up Putah Creek to spawn. An estimated 70 adult fall-run Chinook salmon migrated up lower Putah Creek in fall 2003, resulting in the largest salmon run in the past 40 or more years (Putah Creek Council 2003).

East Toe Drain

The tidally influenced East Toe Drain provides perennial aquatic habitat for several fish species. The East Toe Drain is characterized by a wide (50 to 150 feet) and fairly deep (more than 5 feet) channel with no canopy and little bank or overhead vegetation. Portions of the Toe Drain bank in this Yolo Bypass Wildlife Area are riprapped. The channel is homogeneous with little habitat complexity and generally low fish habitat value. The Lisbon Weir is located in the East Toe Drain adjacent to the Tule Ranch Unit. The Lisbon Weir is a rock weir used to capture water at high tide to maintain a higher elevation pool for irrigation source water.

Fish studies in the East Toe Drain show that this aquatic feature likely functions as year-round habitat for resident species, as a migration corridor (e.g., fish movement into Putah Creek and onto the seasonally inundated floodplain), and potentially as spawning habitat for striped bass and American shad (Harrel and Sommer 2003). Resident species are primarily nonnative and include common carp, channel catfish, white catfish, striped bass, threadfin shad, black crappie, white crappie, Sacramento blackfish, and Sacramento sucker (Harrel and Sommer 2003).

Permanent Wetlands

Permanent wetlands in the Yolo Bypass Wildlife Area provide perennial aquatic habitat for a diverse assemblage of fish species (dominated by nonnative species). Three of the permanent wetland ponds in the Yolo Bypass Wildlife Area were surveyed in 2001 to examine the functional role of perennial floodplain ponds for fishes in a regulated and highly invaded temperate river-floodplain system (Feyrer et al. 2004). Fish sampling resulted in the collection of 18 different species, all of which were nonnative with the exception of one native fish species, Sacramento blackfish (Feyer et al. 2004). The most abundant species sampled included threadfin shad, common carp, inland silverside, and white and black crappie.

Fish assemblages in these aquatic habitats likely change over time between floodplain inundation events. Immediately following inundation events, the species composition is likely shuffled with native and nonnative species becoming more balanced. As the permanent wetlands become isolated and more stable, interactions between the native and nonnative species likely play an important role. Negative interactions between native and nonnative species, such as predation (Turner and Kelley 1966; Bennett and Moyle 1996) and/or competition (Marchetti 1999) are likely to be major factors affecting native fish use of the perennial floodplain ponds between inundation events. Predation is an important factor structuring fish assemblages in similar habitats (Rodriguez and Lewis 1994; Tejerina-Garro et al. 1998) and considered to be a primary mechanism. Additionally, predation is generally enhanced where the visual environment (i.e., reduced turbidity in the stabilized environment) is optimal.

SPECIAL-STATUS SPECIES

Special-status fish species are legally protected or are otherwise considered sensitive by federal, state, or local resource conservation agencies and organizations. Special-status fish species addressed in this section include:

- species listed as threatened or endangered under the state or federal Endangered Species Acts;
- species identified by USFWS, NMFS, or DFG as species of special concern;
- species fully protected in California under the California Fish and Game Code; and
- species identified as priorities for recovery under CALFED's MSCS.

A total of nine special-status fish species occur or have the potential to occur in the Yolo Bypass and/or lower Putah Creek and are described below (see also Table 3.5-5). Of the nine species, Central Valley steelhead Evolutionarily Significant Unit (ESU), Central Valley spring-run Chinook salmon ESU, Sacramento River winter-run ESU, green sturgeon, and delta smelt are listed as a federally threatened or endangered species. The USFWS de-listed Sacramento splittail from its federally threatened status on September 22, 2003. NMFS determined that listing is not warranted for Central Valley fall-/late fall-run Chinook salmon. However, it is still

designated as a Species of Concern because of concerns over specific risk factors. The two remaining species (hardhead and Sacramento perch) are considered Species of Special Concern by DFG and/or federal Species of Concern by USFWS. Brief descriptions follow for the special-status species with potential to occur in the Yolo Bypass and/or lower Putah Creek.

Table 3.5-5
Special-status Fish Species Potentially Occurring in the Yolo Bypass Wildlife Area

Species	Status [1]			Habitat	Potential to Occur in the Yolo Bypass Wildlife Area
	USFWS/ NMFS	DFG	MSCS Goals		
Central Valley steelhead *Oncorhyncus mykiss*	T	--	R	Requires cold, freshwater streams with suitable gravel for spawning; rears seasonally inundated floodplains, rivers, tributaries, and Delta.	Occurs in the Sacramento River and tributaries. Occurs seasonally in the Yolo Bypass Wildlife Area.
Sacramento winter-run Chinook salmon *Oncorhyncus tshawytscha*	E	E	R	Requires cold, freshwater streams with suitable gravel for spawning; rears seasonally inundated floodplains, rivers, tributaries, and Delta.	Occurs in the Sacramento River and tributaries. Occurs seasonally in the Yolo Bypass Wildlife Area.
Central Valley spring-run Chinook salmon *Oncorhyncus tshawytscha*	T	T	R	Requires cold, freshwater streams with suitable gravel for spawning; rears seasonally inundated floodplains, rivers, tributaries, and Delta.	Occurs in the Sacramento River and tributaries. Juveniles occasionally occur seasonally in the Yolo Bypass Wildlife Area.
Central Valley fall/late fall–run Chinook salmon *Oncorhyncus tshawytscha*	--	SSC	R	Requires cold, freshwater streams with suitable gravel for spawning; rears seasonally inundated floodplains, rivers, tributaries, and Delta.	Occurs in the Sacramento River and tributaries. Occurs seasonally in the Yolo Bypass Wildlife Area.
Green sturgeon *Acipenser medirostris*	T	--	R	Requires cold, freshwater streams with suitable gravel for spawning; rears seasonally inundated floodplains, rivers, tributaries, and Delta.	Occurs in the Sacramento River and tributaries. Has potential to occur in the Yolo Bypass Wildlife Area.
Delta smelt *Hypomesus transpacificus*	T	T	R	Spawns in tidally influenced freshwater wetlands and seasonally submerged uplands; rears seasonally inundated floodplains, tidal marsh, and Delta.	Occurs in the Sacramento River downstream of its confluence with the American River. Has potential to occur seasonally in the Yolo Bypass Wildlife Area.
Sacramento splittail *Pogonichthys macrolepidotus*	DT	SSC	R	Spawning and juvenile rearing from winter to early summer in shallow weedy areas inundated during seasonal flooding in the lower reaches and flood bypasses of the Sacramento River including the Yolo Bypass.	Occurs in the Sacramento–San Joaquin River Delta and Sacramento River and tributaries. Occurs seasonally in the Yolo Bypass Wildlife Area and breeds successfully.

Table 3.5-5 Special-status Fish Species Potentially Occurring in the Yolo Bypass Wildlife Area					
Species	Status [1]			Habitat	Potential to Occur in the Yolo Bypass Wildlife Area
	USFWS/ NMFS	DFG	MSCS Goals		
Hardhead *Mylopharodon conocephalus*	--	SSC	m	Spawning occurs in pools and side pools of rivers and creeks; juveniles rear in pools of rivers and creeks, and shallow to deeper water of lakes and reservoirs.	Occurs in freshwater portions of Sacramento River and tributaries. Occurs seasonally in the Yolo Bypass Wildlife Area.
Sacramento perch *Archoplites interruptus*	--	SSC	r	Spawning has been reported to extend from spring to late summer, depending on location and water temperature; among aquatic plants or congregating in shallow waters in schools among or near inshore vegetation.	Historically occurred in Sacramento and San Joaquin rivers and tributaries; depleted in native range, and now are restricted to a few locations, principally ponds and reservoirs where they are stocked. Not known to occur in the Yolo Bypass Wildlife Area.

[1] Legal Status Definitions

Federal Listing Categories (USFWS & NMFS)
- E Endangered (legally protected)
- T Threatened (legally protected)
- DT Recently delisted from threatened status
- SC Species of Concern

State Listing Categories (DFG)
- E Endangered (legally protected)
- T Threatened (legally protected)
- FP Fully Protected (legally protected, no take allowed)
- CSC California Species of Concern (no formal protection)

Multi-Species Conservation Strategy Goals
- R Recovery. Recover species' populations within the MSCS focus area to levels that ensure the species' long-term survival in nature.
- r Contribute to recovery. Implement some of the actions deemed necessary to recover species' populations within the MSCS focus area.
- m Maintain. Ensure that any adverse effects on the species that could be associated with implementation of CALFED actions will be fully offset through implementation of actions beneficial to the species (CALFED 2000b).

Source: Data compiled by EDAW in 2006

Steelhead

The Central Valley steelhead ESU (*Oncoryhnchus mykiss*) is a federally threatened species. The Central Valley steelhead includes all naturally spawned populations of steelhead in the Sacramento and San Joaquin rivers and their tributaries (McEwan and Jackson 1996). Steelhead have a complex life history, including the capability to be anadromous or resident (called rainbow trout) (Moyle 2002a). Anadromous species spend most or a portion of their adult life in the ocean and then migrate back into freshwater to reproduce. Spawning and rearing habitat for steelhead typically occurs in perennial streams with clear, cool to cold, fast-flowing water with a high dissolved oxygen content and abundant gravels and riffles (McEwan and Jackson 1996). After spending 1–4 years in the ocean, adult steelhead return to their home streams to spawn (Moyle 2002a). Migration into freshwater begins in August and peaks in September–October, after which the steelhead hold until flows are sufficiently high to enable migration into tributaries (Moyle 2002a). Spawning begins in late December and peaks in February–March (Busby et al. 1996). Steelhead eggs hatch in 3–4 weeks (at 50–59°F), and fry emerge from the gravel 2–3 weeks later (Moyle 2002a). After steelhead fry emerge from spawning gravels, they continue to grow and mature in freshwater for 1–3 years before emigrating to the ocean (Moyle 2002a). Unlike salmon, steelhead do not

necessarily die after spawning and can spawn more than one time. In central California, most spawning steelhead are 3 years old, with one year spent in the ocean (Busby et al. 1996). Steelhead have been captured in Yolo Bypass fish sampling (Sommer et al. 2001).

Chinook salmon

Threatened or endangered Chinook salmon with potential to occur in the Yolo Bypass Wildlife Area consist of three ESUs, the fall-run, winter-run, and spring-run Chinook. Chinook are relatively common within the Sacramento–San Joaquin River system. Adult and juvenile Chinook may move through the portions of the Yolo Bypass and Putah Creek on their way to and from the ocean (i.e., adult migration and juvenile rearing and emigration).

Winter-run Chinook salmon is listed as an endangered species under both CESA and ESA (59 FR 440). Designated critical habitat for winter-run Chinook includes the Sacramento River adjacent to the project study area. Winter-run Chinook return to the upper Sacramento River between December and July, but delay spawning until the spring and summer (April–August) (Moyle 2002a). Juveniles typically spend 5–9 months in the river and Sacramento–San Joaquin River Delta (Delta) before entering the ocean (Moyle 2002a).

Spring-run Chinook salmon is listed as a threatened species under CESA and ESA (50 FR 50394). Designated critical habitat was proposed for spring-run Chinook in December 2004 with a final determination September of 2005. Spring-run Chinook salmon enter the Sacramento River system between March and September and move upstream into the headwaters, where they hold in pools until they spawn between August and October (Moyle 2002a). Juveniles typically emigrate from the tributaries from mid-November through June; however, some juveniles spend a year in the streams and emigrate as yearlings the following October (Moyle 2002a).

Fall-run Chinook salmon ESU is a federal Species of Concern. Fall-run Chinook salmon is the most widely distributed and most numerous run occurring in the Sacramento and San Joaquin rivers and their tributaries (McEwan and Jackson 1996). After spawning, eggs generally hatch in 6–12 weeks, and newly emerged larvae remain in the gravel for another 2–4 weeks until the yolk is absorbed. Fall-run juveniles typically rear in fresh water for up to 5 months before migrating to sea. Fall-run Chinook salmon have historically spawned in Putah Creek and, after decades of sparse occurrences; have returned to spawn in lower Putah Creek in recent years (Lower Putah Creek Coordinating Committee 2005).

Green Sturgeon

Green sturgeon has recently has been listed as threatened by NMFS (71 FR 17757). Green sturgeon occur in the lower reaches of large rivers, including the Sacramento–San Joaquin River basin, and in the Eel, Mad, Klamath, and Smith rivers (Moyle et al. 1992). Green sturgeon adults and juveniles occur throughout the upper Sacramento River, based upon observations incidental to winter-run Chinook monitoring at the Red Bluff Diversion Dam in Tehama County (NMFS 2005). Green sturgeon spawn predominantly in the upper Sacramento River. They are thought to spawn every 3–5 years (Tracy 1990). Their spawning period is March to July, with a peak in mid-April to mid-June (Moyle et al. 1992). Juveniles inhabit the estuary until they are approximately 4–6 years old, when they migrate to the ocean (Kohlhorst et al. 1991). Green sturgeon have been recorded in the toe of the Yolo Bypass and Cache Slough downstream and there is potential for this species to occur in the Wildlife Area due to the hydrologic connectivity between these areas (and the Sacramento River) and Yolo Bypass.

Delta Smelt

Delta smelt occur in the Sacramento-San Joaquin Delta where, for most of the year, they are typically associated with the freshwater edge of the salt-water/fresh water mixing zone, in the portion of the water column that has relatively low water velocities. The species moves inland to areas of flooded terrestrial vegetation for spawning. Spawning season varies from year to year and may occur from February to July, but mainly from April through May (Moyle 2002a). The lower Yolo Bypass is a known spawning area for this species (USFWS 2004). Delta

smelt was federally listed as a threatened species in March 1993 (58 FR 12854). Critical habitat for the species was designated in December 1994 and includes the Delta and Sacramento River up to the City of Sacramento (59 FR 65256). Delta smelt are tolerant of a wide range of salinity and typically rear in shallow, fresh or slightly brackish waters of the estuary (Moyle 2002a). Delta smelt have been captured in the Yolo Bypass (Sommer et al. 2001).

Sacramento splittail

Sacramento splittail (*Pogonichthys macrolepidotus*) has been de-listed from its federal threatened status but remains a California Species of Special Concern. This large cyprinid (minnow family) is endemic to California and occurs in sloughs, lakes, and rivers of the Central Valley (Moyle 2002a). Sacramento splittail spawn and rear on terrestrial vegetation and debris on floodplains inundated by high spring flows (i.e., late February through April) (Moyle 2002a). In wet years, Sacramento splittail are commonly found in the Putah Creek Sinks, in the region where Putah Creek crosses the Yolo Bypass, and, as discussed above, the Yolo Bypass provides valuable spawning and rearing habitat for splittail (Sommer et al. 1997; 2001).

Hardhead

Hardhead (*Mylopharodon conocephalus*) is a California Species of Special Concern. It is a large minnow that resembles pikeminnow. It prefers clear, deep pools and runs with sand-gravel-boulder substrates and slow water velocities. Most of the streams in which it occurs have summer temperatures in excess of 60°F. However, hardhead tends to be absent from streams that have been severely altered by humans and where introduced species, especially sunfish, predominate (Moyle 2002a). Hardhead is widely distributed in low to mid-elevation streams in the main Sacramento-San Joaquin river drainage. Despite its widespread distribution, hardhead populations are increasingly isolated from one another, making them vulnerable to local extinctions (Moyle 2002a). As a result, hardhead is much less abundant than it once was (Moyle 2002a). Hardhead is no longer present in lower Putah Creek (Moyle et al. 1998). Hardhead have not been captured in the Yolo Bypass (Sommer et al. 2001).

Sacramento perch

Sacramento perch (*Archoplites interruptus*) is a federal Species of Concern and a California Species of Special Concern. It is the only native centrarchid (sunfish) in California. Historically, Sacramento perch was found below 300 feet in elevation throughout the Central Valley, the Pajaro and Salinas rivers, and Clear Lake (Moyle 2002a). Along with the Sacramento pikeminnow (formerly squawfish), it was the dominant piscivorous (fish-eating) fish in waters of the Central Valley. However, Sacramento perch has been extirpated from most of its former range because of the introduction of 11 species of sunfish (Moyle 2002a). Adults do not remain on nests and unguarded eggs are vulnerable to predation. Sacramento perch formerly inhabitated sloughs, slow-moving rivers, and lakes; however, it is now mostly found in reservoirs and farm ponds. Sampling during the 1980s and 1990s indicated that Sacramento perch were no longer present in lower Putah Creek (Moyle et al. 1998). They were re-introduced into the creek in 1997 but failed to become established. However, a small population exists in a pond that drains into Putah Creek (Moyle et al. 2003). Sacramento perch have not been captured in the Yolo Bypass (Sommer et al. 2001).

SENSITIVE HABITATS

The East Toe Drain and Putah Creek, including the portion within the Yolo Bypass Wildlife Area, has been designated as Essential Fish Habitat (EFH) by the Pacific Fishery Management Council (PFMC) to protect and enhance habitat for coastal marine fish and macroinvertebrate species that support commercial fisheries. This is in addition to the critical habitat designations noted above. EFH is defined as waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity. Under the Pacific Coast Salmon Fisheries Management Plan (Pacific Fishery Management Council 2003), the East Toe Drain and Putah Creek, including the reaches within Yolo Bypass Wildlife Area, have been designated as EFH for fall-run Chinook salmon.

3.6 CULTURAL RESOURCES

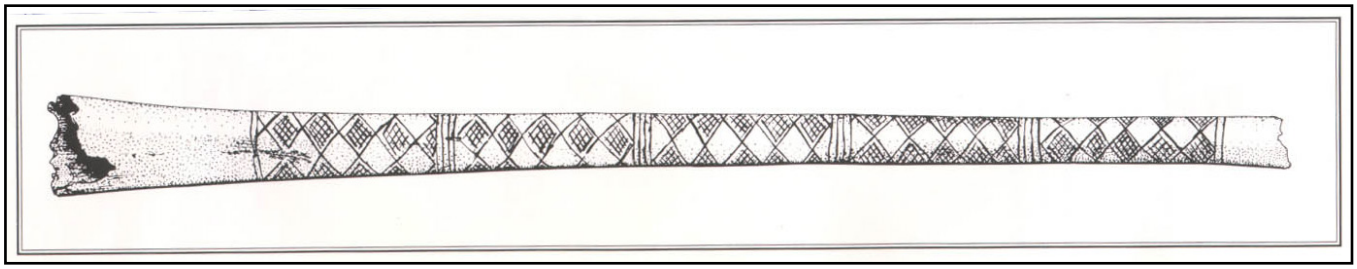
The Yolo Basin is rich in cultural history. From the earliest Native American inhabitants to those farming and residing there in recent times, the Yolo Basin has been an important part of people's being and livelihood. This section provides information on the prehistoric, ethnographic, and historic settings, previous cultural resource investigations in the property and surrounding vicinity, and resources that have been documented and recorded in the Yolo Wildlife Area.

The following text was developed through a cultural records search, review of literature and existing data sources, Yolo Wildlife Area staff information, Foundation program information, and EDAW staff expertise.

3.6.2 ETHNOGRAPHIC SETTING

The Yolo Basin is within the ethnographic territory of the Patwin. The word "Patwin" literally means "the people" in the native tongue. Although native people did not identify themselves as Patwin, this name is used to describe a series of linguistically and culturally related groups who occupied a portion of the lower Sacramento Valley west of the Sacramento River and north of Suisun Bay. Major sources of information on these groups include the works of Bennyhoff (1977), Johnson (1978), Kroeber (1925), McKern (1922 and 1923), Powers (1877), and Work (1945). These people spoke dialects of a single historically related language. Use of the Patwin language extended southward to the Sacramento-San Joaquin Delta system. There were numerous dialects, which were historically recorded including Hill, River, Cache Creek, Lake, Tebti, Dahcini and Suisun (Shipley 1978). Powers (1877) identified 14 tribes based upon linguistic differences, while Merriam, using linguistic and geographic boundaries identified 10 tribes within three broad distinct dialect divisions (Patwin, Win, and Pooewin). Kroeber (1932) later reorganized the groups along three linquistic-political lines, Hill (southwest) and River (southeast and southern). The southern group or Pooewin claimed the Yolo Basin, however, no known ethnographic village locales are within this area (Johnson 1978). Because of reoccurring seasonal flooding, the area would have most likely been used during the drier summer months.

The Patwin were politically organized into tribelets that consisted of one primary and several satellite villages. Each tribelet maintained its own autonomy and sense of territoriality. Villages were located along rivers and major creeks, often near the juncture with other waterways or in the vicinity of foothill settings. Structures within these villages were usually earth covered, semi subterranean elliptical (River Patwin) or circular (Hill Patwin) in form (Kroeber 1932a). All except the individual family dwellings were built with the assistance of everyone in the village. Ethnographic accounts indicate that one's paternal relatives built single-family homes within the settlements (Johnson 1978).



Incised sandhill crane bone found adjacent to the Sacramento River (i.e., Brazil Mound) six miles east of the Yolo Bypass Wildlife Area

Through the skilled use of the natural materials available within their range, the Patwin exploited a wide variety of edible resources. Netting and cordage was of particular importance in fishing and hunting activities and wild hemp (*Apocynum cannabinum*), and milkweed (*Asclepias* sp.) provided particularly suitable fibers for the production of fishing nets and lines. Anadromous fish such as sturgeon (*Acipenser* spp.) and chinook salmon

(*Oncorhynchus tshawytscha*) were part of the staple Patwin diet (Johnson 1978) and were typically caught in large numbers using stone and wood weirs and cordage nets.

In general, the Patwin territory was well watered which supported a wide variety of animal life available for hunters including tule elk, deer, antelope, bear, various species of duck, geese, turtles, and other small animals. While hunting and fishing were clearly important subsistence activities among the Patwin, as with many Native American groups throughout the region, their primary staple food was the valley oak (*Quercus lobata*) acorn. The oak groves themselves were considered as "owned" communally by the particular tribelet. Other commonly exploited floral food resources included; buckeye (*Aesculus* spp.), pine nuts, juniper (*Juniperus* sp.), manzanita (*Arctostaphylos* spp.), and black berries (*Rubus ursinus*), wild grape (*Vitis californica*), and tule (*Scirpus* spp.) roots. Various seeds such as sunflower (*Helianthus* spp.), clover (*Melilotus* spp.), bunchgrass (*Festuca* spp.), and wild oat (*Avena fatua*) were also gathered and ground into course flours. As with the oak groves, particularly fruitful tracts of seed-bearing lands were controlled by individual families or the tribelets themselves (Powers 1877; Kroeber 1932).

One of the more distinctive aspects of the Patwin culture was the Kuksu or "big-head" dances cult system, also found in other tribes through much of north central California. Within each cult were secret societies, each with its own series of dances and mythologies centered on animal figures such as Sede-Tsiak (Old Man Coyote) or Ketit (Peregrine Falcon). The Patwin were unique in possessing three secret societies. In the central California cult system, almost all groups possessed the Kuksu but the Patwin also had the "ghost dance" (way saltu) and Hesi societies (Krober 1932). Each secret society engaged in specific spiritual activities such as the way saltu society stressed curing and shamanistic functions (Johnson 1978).

3.6.3 HISTORIC SETTING

This historical resources section was prepared by Dave Feliz, Yolo Bypass Wildlife Area manager using a multitude of resources including interviews with the players themselves, their descendants or friends. Research was conducted in the Yolo County Library – Davis Branch, the Yolo County Archives, the State Library Archives, and online. Historical knowledge is key to preserving place names and the character of an area so that people can understand the historical context as well as the scientific context of the Yolo Bypass Wildlife Area.

EARLY EXPLORATION AND SETTLEMENT

Various Spanish explorers, (i.e., Pedro Fages in 1772 and Jose Canizares in 1776), searching for sites for inland missions, visited the Central Valley in the 1700s. Francisco Eliza sailed into the unexplored Sacramento River in 1793. Expeditions were also conduced in the early 1800s, and included those of Gabriel Moraga, Jose Antonio Sanchez and Father Narciso Duran. These explorers were followed by trappers of the Hudson Bay Company, beginning with Jedidiah Strong Smith in the late 1820s and Joseph Walker and Ewing Young in the 1830s (Hoover et al. 1990).

Historic development within the Central Valley commenced in 1839 when John Sutter established a trading post. Later, in 1841, he was granted 11 leagues by the Mexican government, where he established New Helvetia and Sutter's Fort, now known as Sacramento (Hoover et al. 1990).

Although various trappers, traders, and missionaries had ventured into and near the project site and vicinity since at least the first decade of the 19th century, considerable historic-era developments did not occur until the Mexican period. Within present-day Yolo County, there were 11 grants of land made by the Mexican Government between 1842 and the American conquest in 1846. Of those 11 land grants, only five were confirmed by the United States. While no grants were within the Yolo Wildlife Area, the nearest was Rancho Rio de Los Putos, located on the banks of Putah Creek. According to Hoover et al. (1990), the name Los Putos and Putah appear to be Spanish approximations of the local Native American groups. The grant for four leagues (17,755 acres) was to

William Wolfskill, who was living in Los Angeles, and it was his brother John who began planting vines and trees.

One of the first settlers in the area was Frederick Babel, a farmer, who arrived in 1849, near the town of Clarksburg. Apparently Babel Slough east of the Yolo Bypass Wildlife Area was named for this early family. Another early settler was J. H. Glide who purchased a large portion of the Yolo Wildlife Area in the 1870s (additional discussion on the Glide Family is provided below). During the early 20th century farmers and ranchers were attracted by the rich fertile soil; however, farming was difficult because of yearly flooding that occurred until the 1920s when higher levees and a system of canals brought flooding more under control (Hoover et al. 1990).

LAND RECLAMATION AND FLOOD CONTROL

Most immigrants traveling to the gold fields of the Sierra Nevada foothills from San Francisco in the mid 19th century sailed through the Delta waterways upriver to Sacramento, marveling at the rich tule marshes and forests surrounding the Sacramento River. Some of these travelers realized that the true gold of California lay in these soils. Settlements and farms were established on the natural levees of the Sacramento River, and often the Yolo Basin was utilized as open rangeland. Seasonal flooding by the Sacramento River repeatedly devastated the burgeoning community of Sacramento, underscoring the need for flood protection. Lands that drained rapidly were quickly reclaimed, but long term flooding prevented further reclamation efforts within the basins themselves.

Laying down the tules in preparation for burning. The spotter on the roof is looking for deep holes.
Photo credit: Sacramento Archives & Museum Collection Center

The Swamp Land Act of 1850 ceded all overflow lands to the State to facilitate their reclamation. Limitations to acreage were capped at first at 320, then 640 acres, which were made available by the State for one dollar an acre. If a purchaser could certify he had spent two dollars an acre in reclamation, his purchase price was refunded, and he was given deed to the land. In an attempt to increase this acreage limit, the Board of Reclamation was created in 1861, which authorized the formation of reclamation districts to accomplish the task of more wholesale reclamation efforts. Thirty-two reclamation districts were formed at this time. One project completed during this period was the construction of an eleven and a half mile drainage canal along the trough of the Yolo Basin to Cache Slough. This first incarnation of the Tule Canal was completed in November 1864 at a cost of eighteen thousand dollars. Its intent was to drain the Cache Creek Sinks area, Lake Washington, and Big Lake, near Clarksburg. Winter overflow was drained earlier, making the land available for pasture. The Tule Canal remains to this day along parts of the eastern edge of the Yolo Bypass and is an integral part of the irrigation system of the Yolo Bypass.

More local control of reclamation and flood control efforts was desired, and by 1866 this control was turned over to the counties. At this time, acreage restrictions were removed, clearing the way for speculators. Military script from the Civil War was received at face value, although it could be obtained for a few cents on the dollar. In this way land agents acquired properties sometimes exceeding 100,000 acres. It was charged that the only expense incurred by the purchaser of the Yolo Basin was that of paying witnesses to testify that the land had been reclaimed, so that the owners could get a refund on the amount paid, although less than one sixth of the property actually was reclaimed.

The devastating flood of 1862 was a wake up call to the new settlers of the Sacramento Valley. Extensive levee building projects were initiated with a general strategy of raising all levees along the Sacramento River to contain its flows. It was thought that the increased velocity of the constrained river would wash debris in the river bed out to the Delta and San Francisco Bay, a common scenario in the Mississippi River system. Much of this debris came from hydraulic mining activities, especially prevalent on the Yuba and Bear Rivers. The debris clogged river channels, forcing water overland with disastrous results. The flood of 1878 was one of the worst in valley history and hit Yolo County especially hard: “It is a tale of devastating grain fields, vineyards and orchard; of drowning cattle and houseless settlers seeking refuge in the hills and shelter under the roofs of their more fortunate neighbors” (Yolo Democrat 1879).

A pattern of significant floods followed by periods of increased levee building activity continued for twenty years until a new flood protection paradigm was embraced. This alternative vision included utilization of the natural basins that paralleled the Sacramento River for flood control. This concept was long advocated by William S. Green, Colusa County surveyor, newspaper editor, state assemblyman, ardent states rights advocate, state library trustee, surveyor, General of California, State Treasurer and unofficial “father of California irrigation.” Observing that the Sacramento River channel regularly overflowed its banks and moved water onto the floodplain, he suggested the intentional diversion of these waters into the basins and developed a plan to construct this proposal. The idea was embraced by others of the period including Mr. Treadwell of Woodland who proposed digging a channel from the confluence of the Feather and Sacramento Rivers through the trough of the Yolo Basin, passing east of Maine Prairie and continuing on to Suisun Bay. The *Sacramento Bee* joined in the chorus insisting that a bypass canal should be the primary means of flood control.

By 1897 the Elkhorn Weir was constructed which diverted Sacramento River flows into the Yolo Basin. Located on the west bank of the Sacramento Rive six miles below the mouth of the Feather River, this weir remained in operation until 1917.

Early in the 20th century, the U.S. Geological Survey recognized the wisdom of Green’s observations and proposals and confirmed that the Sacramento River Channel was inadequate to handle massive flows.
The Sacramento River Flood Control Project was adopted as part of the Flood Control Act of 1917, making the federal government responsible for flood control. Construction of the main levees along the Yolo Bypass began that same year.

Water flowing over the Fremont Weir

The Fremont Weir was constructed in 1929, creating a fixed wall to serve as the main inlet to the newly constructed Yolo Bypass. This concrete structure is 10,000 feet long and has an elevation of 33.5 feet at its crest. To this day, whenever the Sacramento River reaches this elevation at the weir, water begins to flow into the Yolo Bypass.

Two features of the Yolo Bypass that were not part of the original design but were included in the construction were the Sacramento Weir and Sacramento Bypass. The weir was built by the city of Sacramento in 1916 to divert the flows of the American River into the Yolo Bypass and has the capacity to move 112,000 cubic feet per second of water. It is manually opened by DWR when the Sacramento River reaches an elevation of 28 feet. After the weir is opened, the Sacramento River curiously flows backwards from the mouth of the American River to the Sacramento Bypass due to the overwhelming flow of the American River.

The Yolo Bypass was designed so that erosion and deposition could be minimized. Rather than run down the middle of the Yolo Basin trough, it was constructed upslope to maintain an elevational gradient from north to south, rapidly delivering water to the Delta. Until the 1940s there was no levee between the current Interstate 80 and Putah Creek, and today there is no levee south of Putah Creek for approximately 6 miles. It was determined that the high ground associated with the alluvial fan of Putah Creek would contain most flows, and this exposed section of land had such poor agricultural potential that sediment deposition could only improve its alkali soils. Ironically, the alkali soils contribute significantly to the biological richness of the area and were an important factor that led to acquisition of the Tule Ranch by the Department of Fish and Game in 2001.

CROSSING THE WETLANDS

Water was the primary means of transport in the mid 19th century. Areas in close proximity to navigable waters served as nuclei for the emerging farming communities. Maine Prairie, near the south end of the Yolo Bypass, owed its existence to its location along the south bank of Cache Slough. For several years it was one of the busiest shipping ports in northern California. The flood of 1862 devastated Maine Prairie, bringing water up to 12 feet deep to its streets. The town's fate was sealed with the arrival of the railroad in California and Maine Prairie faded into memory. A letter from Maine Prairie in 1875 captures the profound changes occurring in the Yolo Basin:

> *"I wish I could remain here the balance of my days. But it is not to be. I am preparing to take my departure. Farewell thou beautiful Maine Prairie. With tearful eyes, and heart I bid you "adieu." No longer will I be able to sail down the fair bosom of the peaceful water of Cache Slough, and buy fish from Chinese fishermen and on our return swear we ketched every one of them. Never again will I be able to stand all day long in three feet of water in tule during hunting seasons."*

Until the spanning of the Yolo Bypass by a causeway, there was no year round route across the wetlands of the Yolo Basin. A ferry crossing of the Sacramento River near its confluence with the Feather River accessed the high ground emanating from the alluvial fan of Cache Creek. This crossing of the wetlands was so important that a settlement was established at this location and declared the first county seat. The town of Fremont was short lived too, however, due to the power of the flood waters of 1851 which wiped it off the map.

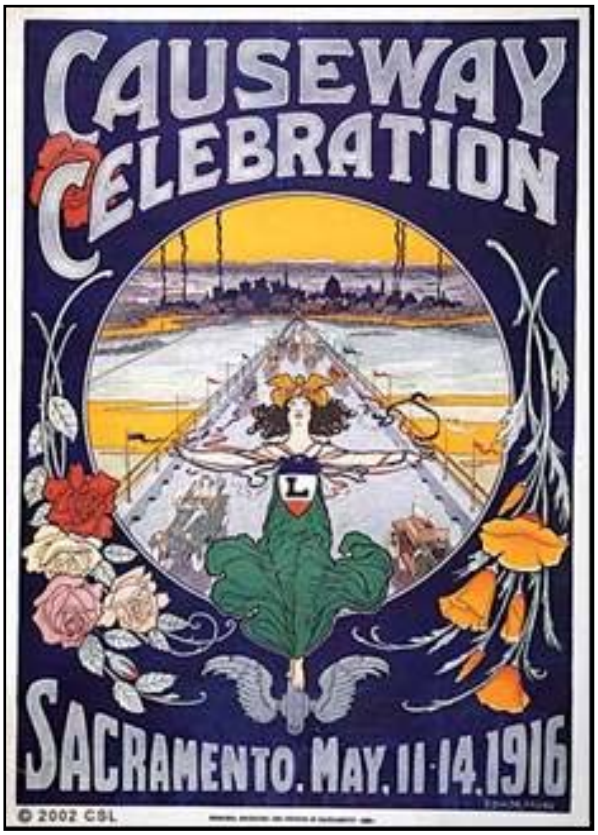
During flood periods, boats were often used to cross the tule marshes of the Yolo Basin by individuals and in some years, ferries provided transportation services between Davisville and Sacramento. In 1868 the *Daily Bee* (forerunner to the *Sacramento Bee*) reported the following:

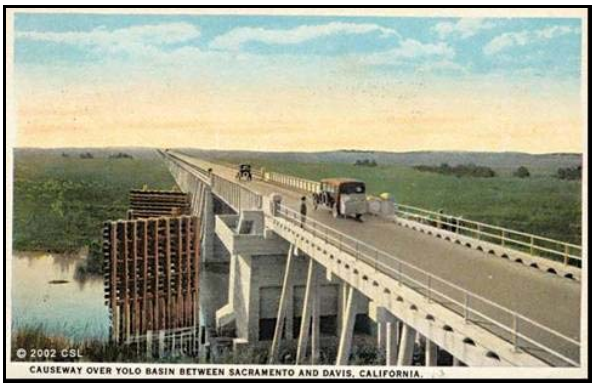
"Almost Drowned - About 9 o'clock this morning John and Bill HOLMES, with their Whitehalf boat, started from Washington, Yolo County, with four passengers and some freight for the Tule House, on the west of the overflowed district. The water was rough, and when out about a mile they discovered that they could not proceed with safety with so much freight, and the danger became so imminent that they had to throw overboard two kegs of nails, one of lead, etc.; but about the time this was done the boat capsized and all were precipitated into the water. They clung to the boat and began to hallo loudly - so loudly that persons on that side and on this, also, heard them. W. S. HUNT, who was in Washington of this city, and Mr. HOYT, were among the first to give the alarm; and the result was that three boats started to the rescue. They found all clinging to the boat, but some of them were nearly lifeless - as they had been in the water for about an hour and were chilled. They brought them ashore and put them to the fire, rubbed them and administered restoratives. All are now doing well, save DOOLY, one of the passengers, who remains very low."

One ingenious dry land route was the Yolo Plankroad. This wood plank road extended from the Sacramento River to the Tule House, and was four and one-half miles long. It was built in 1855 and crossed the Yolo Basin about 3 miles north of Washington, ending about 5 miles southeast of Woodland at the Buckeye Road. This road was located near the far northern boundary of the current Wildlife Area. The wooden plank road was built to enable travel across the tules during the winter and spring months, but even this route was often interrupted by winter floods. On the west side, the Tule Plankroad ended at the Tule House, a structure built on stilts which served as a early stage stop and hotel. This site is currently near the southeast corner of the City of Davis Wetlands. The Tule House was also the site of a dairy operated by a Mr. Enos. With 80 to 100 cows, Mr. Enos specialized in manufacturing cheese and is reputed to have made some of the finest cheese in California. His cattle spent the summer foraging in the tule range of the Yolo Basin. Unfortunately, the Tule House was destroyed in the flood of 1862. The ill conceived plank road was replaced by the Tule Jake Road which allowed travel across the Yolo Basin during the dry season. The course of this road through the tules was uncertain; its path following the tracks of the first wagon to make it through

Crossing the Yolo Basin on the Tule Jack Road in 1913
Photo courtesy of Bud Rossi

Construction of the Yolo Causeway – 1915





The newly constructed Yolo Causeway – 1916
Photos Credit: California State Library

The Modern Day Yolo Causeway over a Flooded Bypass

Message rocks on west side of Yolo Bypass

CAUSEWAY

In the 1890s the first commercial automobiles began to arrive in the Sacramento region and by July 1911, in what can only be called an "Auto Frenzy," Sacramentans and others in the region were buying seventy-five autos per day. This large influx of automobiles required a network of paved roads to allow for travel, leading to construction of new roads throughout the region. Perhaps the best symbol of the growing network would be the completion of the Yolo Causeway in 1916.

The completion of this wood and concrete viaduct was dedicated with the "Causeway Celebration" on May 11 through 14. The Causeway would be a key local component in the completion of a National Road linking by automobile, the east and west coasts, right through Sacramento and Davis and across the center of the nation, identified as the "Lincoln Highway" (Sacramento History Project 2006). This structure was replaced by a six lane structure in 1963, and the former crossing was buried in place, and remains to this day just under the surface of the Causeway Unit.

The present day I-80 passes through the Causeway Unit of the Yolo Wildlife Area in the same approximate location of the first causeway built back in the early 1900s.

In 1994 the Yolo Causeway was officially designated the "Blecher-Freeman Memorial Causeway." Roy P. Blecher and W. Michael Freeman were veteran California Highway Patrol officers shot to death during an enforcement stop on Route 80 near the Yolo Causeway in the early morning hours of December 22, 1978 at the hands of an armed felon.

Today the Causeway is used by over ten million people per year, many commuting on a daily basis between Yolo County and the Sacramento Area. During winter mornings, they are often greeted by thousands of waterfowl feeding in the rice fields in the Yolo Bypass.

On the west side of the Yolo Bypass immediately south of the Causeway lie the message rocks. These rocks are located on the western slope of the exterior levee of the Bypass and for many years have been rearranged by local fraternities, sororities or other groups to spell out messages or depict symbols.

RAILROAD

The area where the Wildlife Area headquarters is located on Chiles Road was once part of the Swingle Ranch, established by George Hutton Swingle in 1858. Mr. Swingle purchased 1,900 acres and operated a dairy on site. When the Central Pacific Railroad requested to split the property with the construction of the new railroad, Mr. Swingle obliged. For many years, the train stop in this area was known as the Swingle Station and was an important agricultural export point.

The railroad was constructed between 1866 and 1868 and was purchased by the Central Pacific Railroad in 1871, following construction of the transcontinental route. The Southern Pacific acquired the line in 1884; however, under public resentment of a possible monopoly, the route west from Sacramento continued to operate under the corporate California Pacific Railroad. Union Pacific later purchased all of the Southern Pacific Lines in 1996.

Trestles being rebuilt in 1950s

The remains of another rail system pass through the Yolo Wildlife Area. First organized in 1913, the Oakland, Antioch, and Eastern Railway provided high speed passenger service between San Francisco and Sacramento. The system was reorganized into the San Francisco-Sacramento Railroad in 1919 and was purchased by the Sacramento Northern in 1928, forming a route 184 miles in length, extending service from Sacramento to Chico. This was an electric train that interestingly, was placed on a barge to cross the Suisun Bay. To get across the Yolo Bypass, the train traveled on trestles. These trestles collapsed in 1951. The tracks were rebuilt upon large mounds, bridged by shorter trestle spans.

These mounds still exist on the Tule Ranch in the vicinity of the Lisbon Weir. Passenger service was discontinued in 1940. In 1953, Sacramento-Northern's ferry (the Ramon), which was used to transfer trains across Suisun Bay, was also retired (Bay Area Electric Railroad Association 2006) and the route north to Sacramento became a secondary line. The Yolo Shortline continues to operate on the route from Woodland to West Sacramento, while other segments have been taken over by Sacramento Regional Transit, Bay Area Rapid Transit, and the Western Railway Museum (Vantine n.d.).

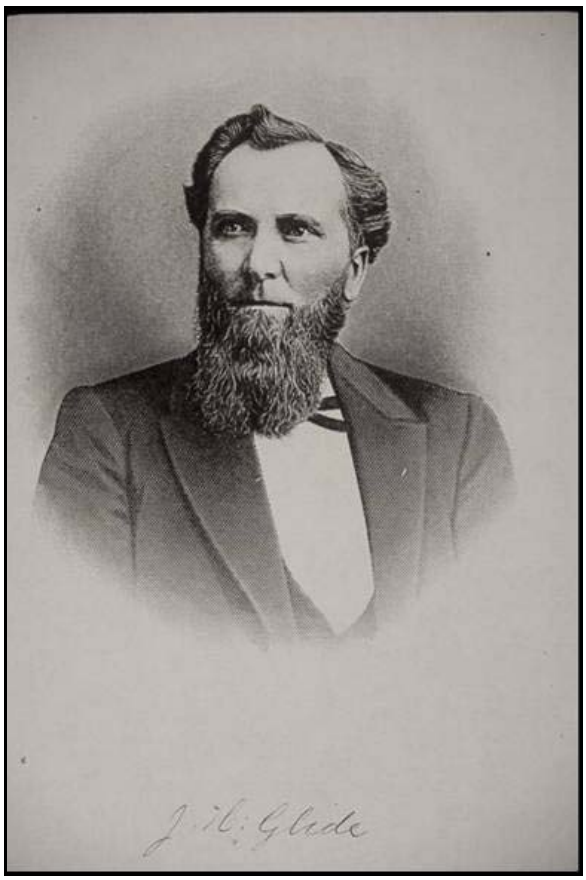


Photo of J.H Glide

THE GLIDE FAMILY

Joseph Henry Glide came to California from England in 1854, and was a prominent resident of Sacramento. He described himself as a capitalist who was largely interested in swamp and overflow lands. Mr. Glide developed ranches in several counties, including extensive holdings in the Yolo Basin. For a time, he operated the Freeport Ferry which crossed the Sacramento River 1 ¾ miles north of Freeport. In 1871 he married Elizabeth "Lizzie" Helen Snider who was 17 years younger. Their son Thornton S. Glide was born in 1881. Joseph H. Glide constructed systems of levees in the Yolo Basin, reclaiming this land for grazing. His ranches specialized in pure-bred shorthorn cattle and French merino sheep. Mr. Glide was the first person to bring registered shorthorn and Hereford cattle into Yolo County. Mr. Glide was one of the first three original exhibitors at the California State Fair. He died in 1916, at which time his widow took over the responsibility of managing his large business. She did so very successfully.

Joseph H. Glide had homesteaded on property west of Davis where he developed a home ranch for the various Glide properties. This home ranch was given to Thornton as a wedding present in 1908 when he married Margaret

Sinclair. In 1910 Thornton purchased his father's shorthorn herd and formed Hillcrest Stake Farms. A year later, he purchased his brother Joseph Henry's herd of shorthorns. These were the cattle grazing the Glide property in the Yolo Basin. Much of the farm work on the ranch was accomplished through the use of powerful Percheron horses. These draft animals remained on the lower portions of the Tule Ranch into the 1950s.

The Umbrella Barn was built over 100 years ago

It was probably Thornton who constructed the "Umbrella barn" about a mile north of the southwest corner of the ranch. This magnificent structure was built around 1913 on the highest point of the ranch. The presence of square nails in the barn dates it to an era prior to 1906, the last year these nails were sold. The intent was to provide refuge for the livestock during high water. Mr. Glide was well known in Davis for his blue Cadillac which he used to haul livestock in a trailer. Thornton S. Glide continued the family management of the property until his death in 1955.

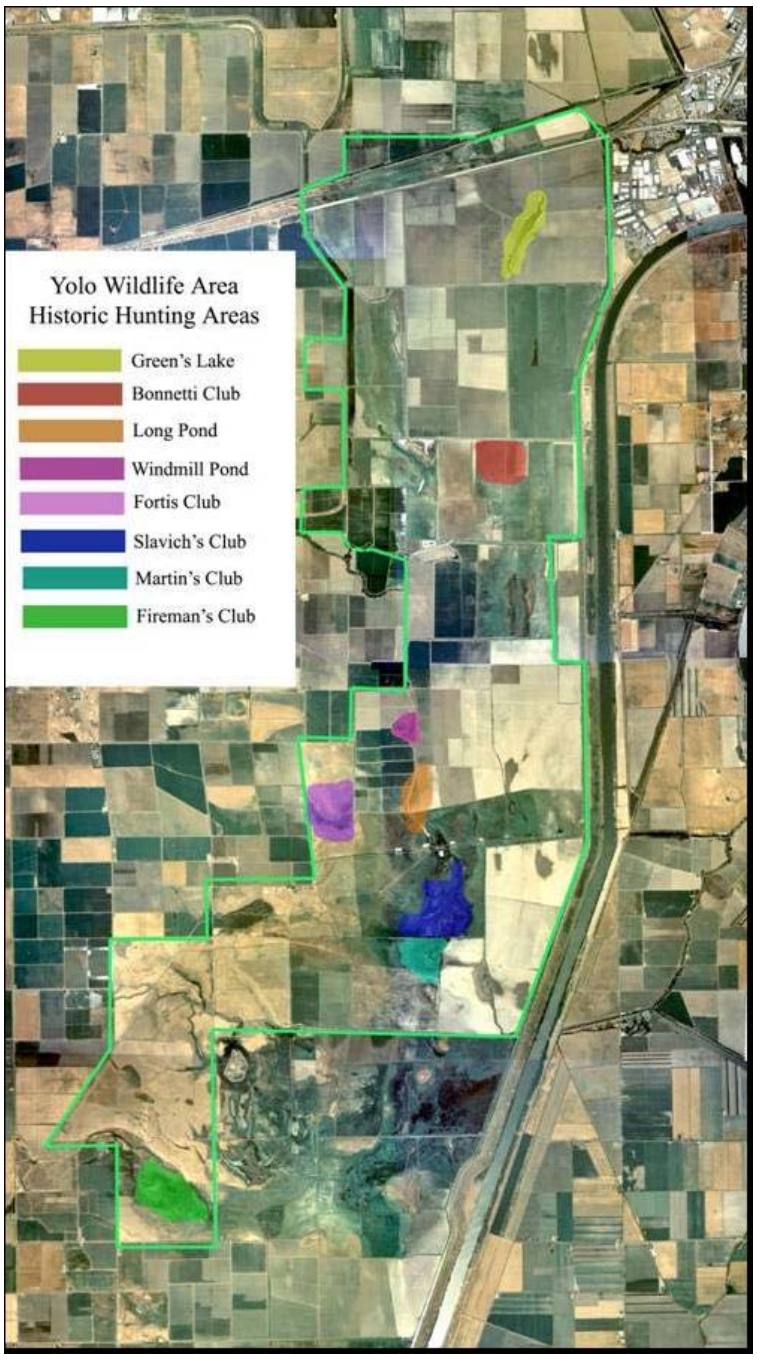
Thornton "Tony" (pronounced "Tawny") Snider Glide, Jr. was born at the home ranch and was a rancher from a young age. He married Katrina "Scatter" Dangberg Glide in 1954 and the couple is still fondly remembered in the Yolo/ Solano countryside. Upon the death of his mother in 1959, Tony and his sister Peggy Glide Colby assumed control of the 20,000 acre farming and grazing operation. Just as his parents, Tony and Katrina lived on the home ranch west of Davis while Mrs. Colby lived in Pasadena. Tony and Katrina Glide held the Tule Ranch very dearly and considered it the traditional home of the Glide properties. Tony pursued a series of unique arrangements to help take care of the Tule Ranch property. Tony passed away on July 10, 1995, followed shortly by Katrina nine days later. Most assets were placed in a trust and, in 2001, the Tule Ranch, Causeway Ranch and Geiberson Ranch was acquired from the Glide Trust (see Chapter 2, "Property Description").

Photo of Thorton S. Glide Jr.

WATERFOWL AND HUNTING

The natural resources of the Yolo Basin sustained native people for centuries. Among the most valuable of these resources were the enormous numbers of waterfowl that annually came to the marshes of the Yolo Basin to spend the fall and winter months.

Beginning in the middle of the 19th century, waterfowl hunters plied through the wetlands and harvested a seemingly endless supply of waterfowl. These birds became a major food source for the new settlers of the region. Many of the finest restaurants in the San Francisco Bay Area and Sacramento served wild fowl provided to them by market hunters. A number of accounts help characterize some of the past hunting times that current hunters may appreciate.



Historic Yolo Bypass Hunting Areas in the Yolo Bypass Wildlife Area

One of the most well known market hunters was a man named John Patterson who was born in the town of Washington, which today is part of West Sacramento. He sold birds to merchants in San Francisco. One receipt from 1903 documents Mr. Patterson being paid $13.20 for 73 teal of two species, three mallards, one canvasback, four sprig, one wigeon, and four lesser white geese. Patterson did most of his hunting in the Yolo Bypass in a spot he referred to as the "dobe hole." He often shipped his birds to the Bay Area by flagging down west bound trains at the Swingle Station, once located near the corner of Roads 32A and 105.

Patterson carved fine decoys out of redwood. They usually depicted male pintail or "bull sprig" as they are still known to hunters. He also made boats out of redwood, specially built to ply the big water of the Yolo Basin and Sacramento River. It was not uncommon for Mr. Patterson to row from Broderick to Rio Vista and back in order to hunt waterfowl in the Delta. Mr. Patterson carved decoys until the day he died in 1937.

Seth "Tiny" Barry hunted ducks with John Patterson and followed Patterson's decoy style of bull sprig with high necks and an alert posture. Tiny hunted the tule swamp west of Sacramento, more specifically at Green's Lake. This lake is found in the Causeway Ranch Unit of the Yolo Bypass Wildlife Area. Tiny would take his family out to Green's Lake and camp in an elevated shack.

Milton "Chick" DeRiso hunted from sink boxes in the Yolo Basin starting in the 1930s. He recalled his father telling him to record the huge flights of waterfowl in his mind, because "You'll never see that again!" He also remembered crossing the Yolo Basin in a Model T Ford on the Tule Jake road.

Many of these early hunters used the Anchor Drug Store on K Street in Sacramento as a source of hunting equipment and a general meeting place, similar to the role Broadway Bait currently serves for local hunters. Anchor Drug was run by Mr. Joseph Garibaldi and later his son, Amiel "Ame" Garibaldi.

A hunting program was managed on the Glide property for many years. In the later years, Tony Glide would hand out hunting permits free of charge that were good for the entire year. These permits were valid only for pheasant

and there were a limited number handed out each year. Soon the number of permits numbered 200. People would call earlier in the season to try to get their permits, much to the annoyance of Mrs. Glide. Most of this activity was in pursuit of ring-necked pheasants, but some hunters enjoyed other privileges. Of course there were also a few individuals who tried to access the property illegally for hunting activity. Over the years, the Glide property was patrolled by a series of interesting characters.

One of the ranch managers from the 1930s was a gentleman named Melt Mason. Mr. Mason was a cattle man who also patrolled the ranch for poachers. One morning he came upon a group of hunters from Sacramento hunting illegally in a pond. As Mr. Mason approached on horseback, the hunters saw him coming and shot his horse out from under him.

Tony Glide ran a pheasant hunting program on the west side of the duck club road from the Road 106 gate to the Umbrella Barn. Some of this area was farmed in milo, corn or other crops and after harvest was opened for hunting.

Wayne Brock reports that one time he was hunting the cornfield across from the Senator Outing duck club with the county sheriff. They had a great morning and killed 12 birds, a legal limit in those days. The game patrolman Warren Sievers saw all those birds and on the spot declared that "from now on the limit on the ranch is 4 birds."

Other hunters had the special privilege of hunting waterfowl on the Ranch. The Wildlife Area property was home to several hunting areas that were loosely organized as duck clubs prior to the land's acquisition by the state. Many were located on the Glide Tule Ranch and existed primarily due to the good graces of Tony Glide. In the lower sinks area were the Martin Brother's pond and Slaviches' pond. Bob and Don Martin did much of the farming on the Tule Ranch. Bob Martin flew a Piper Cub airplane and was a frequent sight flying low over the marshes of the Yolo Basin. Their pond was just north of the current southern boundary of the Tule Ranch near the toe drain.

The north pond in this area was hunted by the Slaviches. Dink Slavich was the patriarch of this clan, later hunting with sons Ed and Don Slavich. Dink originally hunted with "old man Garibaldi," perhaps one of the proprietors of the aforementioned Anchor Drug Store in Sacramento. Slavich's pond has been referred to as "the best duck pond in the country." In 2004, Dick Goodell, a long time hunter on the Glide In Ranch declared he saw more ducks in this area than he'd ever seen in his life.

Bill Fairfield at Dawson's in 2006

In earlier times, no one wanted to respond to wildfires in the Yolo Bypass. For the Dixon firemen, it was beyond the frontier of Solano County, for the City of Davis, it was too far out of town. It was No Man's Land. With Bill Fairfield at the helm, the volunteer firemen of Dixon began to respond to wildfires in the area, at times battling ferocious blazes that raced through the Bypass fed by north winds. Tony Glide was so enamored with their efforts that he gave them control over an entire section of land with the assurance that "nobody will bother you out here."
Mr. Fairfield ran the hunting program and anybody in the fire department could hunt ducks or pheasants on the property. Over the years, probably 60 to 70 people utilized this property. The deal was based solely on the word of Tony Glide and Bill Fairfield.

Mr. Fairfield formed the "No Man's Land" Fire District and was in charge of operating the newly christened "Fireman's Duck Club." Whenever a fire broke out on the Ranch, Tony would personally call Mr. Fairfield and their trucks would be on the way. They fought the fire that eventually burned down the Sacramento Northern

trestles. They also responded to medical emergencies and assisted with the evacuation of livestock during flood events. Mr. Fairfield modeled the Fire District's badge after that of Los Angeles County, and gave one to Tony Glide.

As for the club, the firemen set out to create levees and install water control structures to capture water in the historic slough found on the property. The end result was, as Bill Fairfield described, a "duck hunter's paradise."

The remains of the Fireman's Clubhouse

The firemen sank a handful of barrels to serve as duck blinds. They got a line on a caboose that was reasonably priced. This was hauled to the southwest corner of the property and served as the clubhouse. Later a trailer was brought in, connected to the caboose in an L shaped fashion and now they had a duck club headquarters with sleeping quarters in the caboose and the kitchen and social area in the trailer. Ironically, both the caboose and trailer were lost in a fire. They were replaced by a house built on pilings to stay above the floodwaters. Many good times were enjoyed in these structures until Bill Fairfield's retirement from the fire department in 1985. At that time, the relationship between the No Man's Land Fire District and the Dixon Fire Department was severed. The platform and pilings of the Fireman's Duck Club still remain in the southwest corner of the Tule Ranch.

North and east of the Tule Ranch headquarters lies the Fortis Club. Pete Fortis was farming land west of the ranch boundary, and his drain water would come onto the ranch. These wet areas improved the cattle forage, and soon Mr. Fortis and Tony had an arrangement. If he continued to irrigate parts of the ranch with his drain water, Mr. Fortis could use part of the ranch for duck hunting. Such was born the Fortis Club.

A little further north there is a small grove of mostly eucalyptus trees with an unusual treehouse structure. This treehouse belonged to Mr. Jack Howarth who was a veterinarian in Davis. Mr. Howarth built the tree house and hunted ducks in a pond approximately 200 yards north of the grove. This was known as the Windmill Pond and it still exists, though the windmill does not.

Directly east of the main lift in current ponds 6D and 2A of the Central Unit, was the Bonnetti Club. Like many of the hunting clubs, the clubhouse consisted of trailer houses brought in for the season. These men also hunted around Green's Lake.

Tony Glide was much more tolerant of hunting on the Tule Ranch than Mrs. Glide. When Wayne Brock visited Mrs. Glide in the hospital prior to her death, she said," If I outlive Tony, your hunting is all done." Sure enough Tony passed away first and the hunting stopped. Warren Sievers no longer checked permits and the Slavich's hunting days were through on the ranch.

Immediately south of the Tule Ranch near the toe drain are a cluster of private duck hunting clubs that share a close working relationship with the ranch and the Department of Fish and Game. Many are in state wetland easement programs and most get their water from the Tule Ranch irrigation system. These clubs were once part of the original Glide property. The first club established in this area was the Senator Outing duck club, reputedly they once had a senator among their members. This club was formed by Chris Fulster Sr. who also produced unique sheet metal decoys that were attached to a stake and pressed into the mud. Later he established the Glide In Ranch club to the east against the toe drain. His son Mr. Chris Fulster Jr., has hunted ducks in the Yolo Basin for 50 years or more. As the proprietor of Broadway Bait in Sacramento, Mr. Fulster has filled a niche once occupied by the Anchor Drug Store in an earlier time.

Other clubs in this area include the Skyrakers, H- Pond Channel Ranch and Bull Sprig which counts longtime Tule Ranch cattle man Bob Brown as one of its members.

The Skyraker's Duck Club once counted Roy Regals as a member. Mr. Regals is forever remembered as "Wrong Way Regals" because of one play in the 1929 Rose Bowl. As Center for the University of California, Mr. Regals picked up a fumble and, after being hit and spun around, began running for the wrong end zone. He was fortunately stopped by his own players, but Cal lost to Georgia Tech by a score of 8 to 7.

With the state acquisition of the Glide property, one of the last vestiges of Yolo Basin wetlands was made available for public use. In 2003, Green's Lake was once again the scene of waterfowl hunting as it had been for many years.

3.6.4 CULTURAL RESOURCES OF THE YOLO WILDLIFE AREA

EDAW's research into cultural resource issues for the Yolo Wildlife Area began with a record search of known pertinent cultural resource information as it relates to the Yolo Wildlife Area. This search was conducted by the Northwest Information Center (NWIC) of the California Historical Resources Information System (CHRIS). The record search included, but was not necessarily restricted to, a review of select publications and sources listed in the following:

- *National Register of Historic Places (National Park Service 1996)*
- *California Register of Historical Resources (State of California 1976)*
- *California Points of Historical Interest (State of California 1992 and updates)*
- *California Historical Landmarks (State of California 1996)*
- *Historic Spots in California (State of California 1990)*
- *Directory of Properties in the Historical Resources Inventory (State of California)*
- *NWIC Historic Resources Map*
- *California Place Names (Gudde 1969)*
- *California Department of Transportation Bridge Inventory*
- *1852 GLO Plat Maps (T8N,R3E and R4E; and T7N,R3E and R4E)*
- *Courtland 15' USGS Quad, 1908*
- *Davisville 15' USGS Quad Map, 1907*

Historic maps provide limited information on structures and features located within the Yolo Wildlife Area. A review of the 1852 GLO Plat maps do not indicate the presence of historic roads, structures, or other features, but do indicate that at that time a large portion of the Yolo Wildlife Area was characterized by swamp and overflow lands. The 1908 15' USGS Courtland quadrangle shows a structure in the eastern edge of Section 9, which matches the location of the Glide Ranch, now known as the Tule Ranch. A north south road is also depicted in Sections 3 and 34. With the exception of the Southern Pacific Railroad no features or structures are depicted within the Yolo Wildlife Area.

The directory of Properties in the Historical Resources Inventory lists the Olson Family house at the east end of Road 34A, and the location appears to match that depicted on the 1908 USGS Courtland quadrangle mentioned above.

Several studies, which are summarized in Table 3.6-1, have been conducted within and directly adjacent to the Yolo Bypass Wildlife Area. All of these documents and reports are on file at the NWIC. With the exception of a few all have been linear surveys which have resulted in the inventory of only a very small percentage of the area.

Table 3.6-1 Summary of Previous Cultural Investigations in the Vicinity of the Yolo Bypass Wildlife Area				
Report Title	NWIC File Number	Author and Date	Distance to Project Area	Management Unit
Investigations Within the Yolo Wildlife Area				
Archaeological Site Record CA-YOL-117	---	Johnson (1968)		Causeway
Sacramento Metropolitan Area Cultural Resources Survey, Sacramento and Yolo Counties, California (Contract No. DACW0590P2429)	S-12191	Glover and Bouey (1990)		Northeast, Causeway Ranch North
Archaeological Survey of the Supplement to the Sacramento Metropolis Area Cultural Resources Survey, Sacramento and Yolo Counties, California	S-12467	Berg and Bouey (1991)		Northwest, Los Rios
Addendum to the Report on the Archaeological Survey for the Proposed SMUD Gas Pipeline between Winters and Sacramento, Yolo and Sacramento Counties, California	S-15334	Waechter (1993)		Northeast, Causeway, Causeway Ranch, Tule Ranch
Report on the Third Phase of Archaeological Survey for the Proposed SMUD Gas Pipeline between Winters and Sacramento, Yolo and Sacramento Counties, California	S-15403	Waechter (1993)		Causeway, Tule Ranch
Cultural Resources Monitoring Report for the SMUD Cogeneration Pipeline Project	S-17674	Woodward-Clyde Consultants (1995)		Causeway, Tule Ranch
Archaeological Surveys: Sacramento River and Major and Minor Tributaries, Bypass Revetment Project	S-17955	True and Jensen (1974)		Causeway Ranch
Cultural Resources Assessment within Reclamation Districts 537, 900, 765, 999 and Maintenance Area 4, Yolo County, California	S-19740	Peak (1997)		Northeast
Cultural Resource Inventory Report for the Williams Communications, Inc. Fiber Optic Cable System Installation Project, Pittsburg to Sacramento, California	S-22464	Jones and Stokes Associates, Inc. (1999)		Tule Ranch, Causeway
Volumes I, II, and III: Final Cultural Resources Inventory Report for the Williams Communications, Inc. Fiber Optic Cable System Installation Project, Point Arena to Robbins and Point Arena to Sacramento, California	S-22736	Jones and Stokes Associates, Inc. (2000)		Causeway
Cultural Resources Survey for the Level (3) Communications Long Haul Fiber Optics Project, Segment WS01: Sacramento to Oakland	S-22817	Nelson, Carpenter and Costello (2000)		Causeway
Cultural Resources Assessment Report SFPP, L.P. Proposed Concord to Sacramento Pipeline Project	S-25311	Martin and Self (2002)		Tule Ranch, Causeway North
Cultural Resources Assessment Report Proposed Construction Yards Nos. 1, 2, 3, and 4, SFPP L.P. Concord to Sacramento Pipeline Project	S-28381	Martin, Brown, and Self (2004)		Causeway

Table 3.6-1 Summary of Previous Cultural Investigations in the Vicinity of the Yolo Bypass Wildlife Area				
Report Title	NWIC File Number	Author and Date	Distance to Project Area	Management Unit
Investigations Adjacent to Yolo Wildlife Area				
Cultural Resources Reconnaissance: Sacramento River Deep Water Ship Channel (Collinsville to Sacramento)	S-5055	Seldomridge and Seldomridge (1976)	¼ mile	
Southport GPA/EIR. (letter report)	S-5699	Putman (1982)	¼ mile	
Intensive Cultural Resource Survey and Literature Review for the Sacramento Deep Water Ship Channel Project, Yolo and Solano Counties, California	S-7295	Werner (1985)	¼ mile	
Sacramento Deep Water Ship Channel, Cultural Resources Survey and Literature Review, Yolo and Solano Counties, California	S-7448	Werner (1985)	¼ mile	
A Cultural Resources Study for Environmental Impact Report for Industrial Planned Development 37 of the Port of Sacramento, Yolo County, California	S-11920	Derr (1990)	¼ mile	
A Cultural Resources Study for the Riviera Lakes EIR, Yolo County, California	S-12650	Cultural Resources Unlimited (1991)	¼ mile	
A Cultural Resources Study for Villages of Southport ADEIR, Bevan Road at Jefferson Boulevard, West Sacramento, Yolo County, California	S-13551	Cultural Resources Unlimited (1991)	¼ mile	
Archaeological Survey Report of the proposed Southport Wastewater Treatment Plant, West Sacramento, California	S-16932	Supernowicz (1993)	¼ mile	
An Archaeological Assessment within Reclamation District 2035, Yolo County, California COE Water Basin System Designation SAC 05 DACW05-97-P-0465	S-20005	Shapiro (1997)	¼ mile	
An Addendum Archaeological Assessment within Reclamation District 2035, Yolo County, California COE Water Basin System Designation SAC 05 DACW05-97-P-0465	S-20006	Shapiro, and Syda (1997)	¼ mile	
Source: Northwest Information Center, Sonoma State University, Rohnert Park 2006				

These investigations have resulted in the identification of five resources (two prehistoric archaeological sites, an historic farmhouse with associated outbuildings, the remains of the historic Sacramento Northern Railroad, and the route of the Southern Pacific Railroad) within the Yolo Wildlife Area.

None of these resources have been evaluated for CRHR significance to the CRHR or NRHP eligibility.

Umbrella Barn in the Tule Ranch Unit

All of the formerly documented resources are summarized below (by site record), and a complete list of resources by management unit is presented in Table 3.6-2.

CA-YOL-172

When recorded in 1991 the site appeared to have been extensively impacted by farming operations. The investigators indicated the presence of flaked stone artifacts, baked clay, and a burned bone fragment. Density of the material was quite light, averaging 4 specimens per 10 meters square (Bouey and Bethard 1991). While a formal assessment has not been conducted, impacts from farming coupled with the paucity of the archaeological deposit suggests that the site may lack the necessary integrity to be considered significant/eligible. Because of ongoing agricultural impacts in the vicinity of the locale, it is recommended that the site be formally evaluated for significance/eligibility.

CA-YOL-117

In 1964 this site appeared as a low mound, approximately 5 feet above the surrounding area. Excavations conducted in 1964, prior to the area being leveled for farming, resulted in the recovered of four burials, and artifacts associated with the Emmergent Period (Johnson 1971). Given the continued impacts from farming operations beginning in the 1950s and the impacts of salvage excavations in 1974, it is doubtful that further archaeological remains are present, and if so the integrity may have been extremely compromised. Because of ongoing agricultural impacts in the vicinity of the locale, it is recommended that the site be formally evaluated for significance/eligibility.

Table 3.6-2 Cultural Resources Documented in the Yolo Bypass Wildlife Area			
Management Unit	Cultural Resources	Significance/Eligibility	Management Recommendation
Causeway Ranch Unit	Southern Pacific/Union Pacific Railroad	Not evaluated	No further management
Causeway Unit	Southern Pacific/Union Pacific Railroad CA-YOL-117	Not evaluated Excavated	No further management Confirm no remains are present
North Unit	--	--	--
Northwest Unit	--	--	--
1,000 Acres Unit	--	--	--
Northeast Unit	CA-YOL-172	Recommended Not Eligible	No further management
Central Unit	--	--	--
PG&E Purchase	--	--	--
West Unit	--	--	--
Pacific Flyway Center	--	--	--
Los Rios Unit	--	--	--
Parker Unit	--	--	--
Tomato Field 29	--	--	--
Tomato Field 38	--	--	--
Los Rios WRP	--	--	--
South Unit	--	--	--
Tule Ranch Unit	Sacramento Northern Railroad Glide Ranch Complex (Tule Ranch HQ) Umbrella Barn Treehouse Fireman's	Recommended Not Eligible Not evaluated Not evaluated Not evaluated Not evaluated	No further management Continued management Continued management Continued management Continued management

CA-YOL-195H (P-57-000422)

Portions of the Sacramento Northern Railroad have been documented both within and outside of the project area (see Scott 1999; Jones and Stokes 2000; Martin et al. 2001; and Martin 2004). Within the Yolo Wildlife Area, the route appears as an earthen berm with associated trestle remains. All of the rails and ties have been removed and many of the rails can be found throughout the area, used for such purposes as fence posts, cattle chutes, and pump station support structures. Research has indicated that the integrity of the earth work has been severely impacted by erosional processes. A low density historic artifact concentration was discovered near the Saxon Rail Stop during pipeline construction associated with the Kinder Morgan Concord to Sacramento Pipeline Replacement Project. The remains were documented, but not assessed for significance (Martin 2004). As mentioned above, since the route was abandoned, portions have either been completed dismantled or others have been subsumed by modern transportation systems (e.g., BART and Sacramento Regional Transit). A record documenting a portion

of the route within the Yolo Wildlife Area indicated that because of a lack of integrity the railway does not appear to meet the criteria for inclusion into the National Register of Historic Places (Martin et al. 2001). Therefore, pending the discovery of previously undocumented constituents (i.e., significant archaeological deposits), which may qualify the resource for significance, no further management is required.

P-57-000400

Within the project area the route of the historic Southern Pacific Railroad has been previously documented (Syda 1999), with the route extending to the west to Cordelia prepared by Nelson et al. (1999). While the researchers note that the route has been rebuilt several times during its history, thereby compromising the integrity, it does maintain the original setting. Undoubtedly the route qualifies for eligibility under Criteria a, b, and c for inclusion in the NRHP, and elsewhere portions of the route (i.e., rail segments and depots) are listed on the NRHP.

Glide Ranch (Olson Family House)

A record prepared in 1979 documents a one-story vernacular farm house with rectangular gabled roof and a shed-roofed porch across the front, and that the building was in a state of decay at this time. The exterior is clad with shiplap siding. A well constructed water tank tower structure and corrugated metal structures were associated with the residence in 1979. The record also indicates that although the property is referred to as the Olson residence the property was originally purchased by J. H. Glide in 1879, and that the structure was built shortly thereafter in the 1880s. Beginning in the early 20th century the residence was occupied by the Olson family (Historic Environment Consultants 1980). None of the structures have been evaluated for significance/eligibility. This structure is not on the Wildlife Area property.

3.7 RECREATION AND PUBLIC USE

This section describes the numerous recreation and public use activities and opportunities currently available at the Yolo Bypass Wildlife Area. Primary recreation and public use activities include environmental education and interpretation programs, hunting, fishing, wildlife viewing, nature photography, and hiking.

The following text was developed through a review of literature, relevant websites, program information, the Yolo Bypass Wildlife Area Program History and Overview (Appendix E), maps, and Yolo Bypass Wildlife Area and Foundation staff information.

3.7.1 HISTORY OF PUBLIC ACCESS AND USE IN THE YOLO BYPASS WILDLIFE AREA

The Yolo Bypass Wildlife Area was created through a broad coalition of conservationists, hunters, farmers, business people, elected officials, and local, state, and federal agencies. Work to establish the Yolo Bypass Wildlife Area began in 1989, over 8 years prior to its opening to the public in 1997. Since the inception of the Yolo Bypass Wildlife Area, 24,000 students have participated in the Discover the Flyway program and tens of thousands of visitors from throughout the region have used the area for hunting, fishing, walking, hiking, wildlife viewing, nature photography, and a broad range of environmental education activities for all ages of students, as well as for teachers and the general public. A trail and road network present in the Yolo Bypass Wildlife Area supports these activities.

The Yolo Bypass Wildlife Area is increasingly recognized as a national model for sound ecologically-based integrated resource management and exemplary partnership among many agencies and stakeholders. The Yolo Bypass Wildlife Area is managed by the DFG with education programs and public outreach provided by the Foundation. This mutually beneficial partnership was memorialized in June of 1997 when the Foundation and DFG signed a Memorandum of Understanding (MOU) with DFG recognizing their long-term partnership to provide public outreach and educational programs. The MOU allows the Foundation to use DFG facilities for office space and as a base for programs related to the Yolo Bypass Wildlife Area (California Department of Fish and Game 1997). A copy of this MOU is provided in Appendix D.

3.7.2 EXISTING PUBLIC USE ACTIVITIES AND OPPORTUNITIES

Public access and use of the Yolo Bypass Wildlife Area is an important aspect of its continued success. Visitors come to the Yolo Bypass Wildlife Area with expectations of a certain quality and type of experience that are to be met by use of the public lands, waters, and other facilities. It is the scenic beauty and the abundant presence of wildlife that provide visitors with a high quality, natural outdoor experience. This opportunity is even more valuable, given the proximity of the Yolo Bypass Wildlife Area to the greater Sacramento urban area, providing urban residents with a nearby opportunity to escape urban life and experience a connection with nature, while enjoying first class wildlife viewing opportunities and gaining an understanding of compatible farming and floodway management.

EXISTING FACILITIES

Based on an evaluation of appropriate and compatible uses, DFG has designated different units within the Yolo Bypass Wildlife Area for various public use activities (see Chapter 4, "Compatible Resource Management and Public Uses," for additional detail). Exhibits 3.7-1 and 3.7-2 illustrate the main publicly accessible land areas and facilities. Some lands within the Yolo Bypass Wildlife Area are available and open for activities conducted on foot, such as hunting and wildlife viewing. No overnight camping is allowed within the Yolo Bypass Wildlife Area. Some lands are designated as wildlife sanctuaries and are completely closed to the public. Flood protection is the primary purpose of the Yolo Bypass and all interior lands (i.e., inside SRFCP levees) are closed during flooding (e.g., during Fremont Weir overtopping and/or west side tributary flooding and/or when access roads are impassable).

BUILDINGS AND STRUCTURES FOR PUBLIC USE PROGRAMS

Headquarters

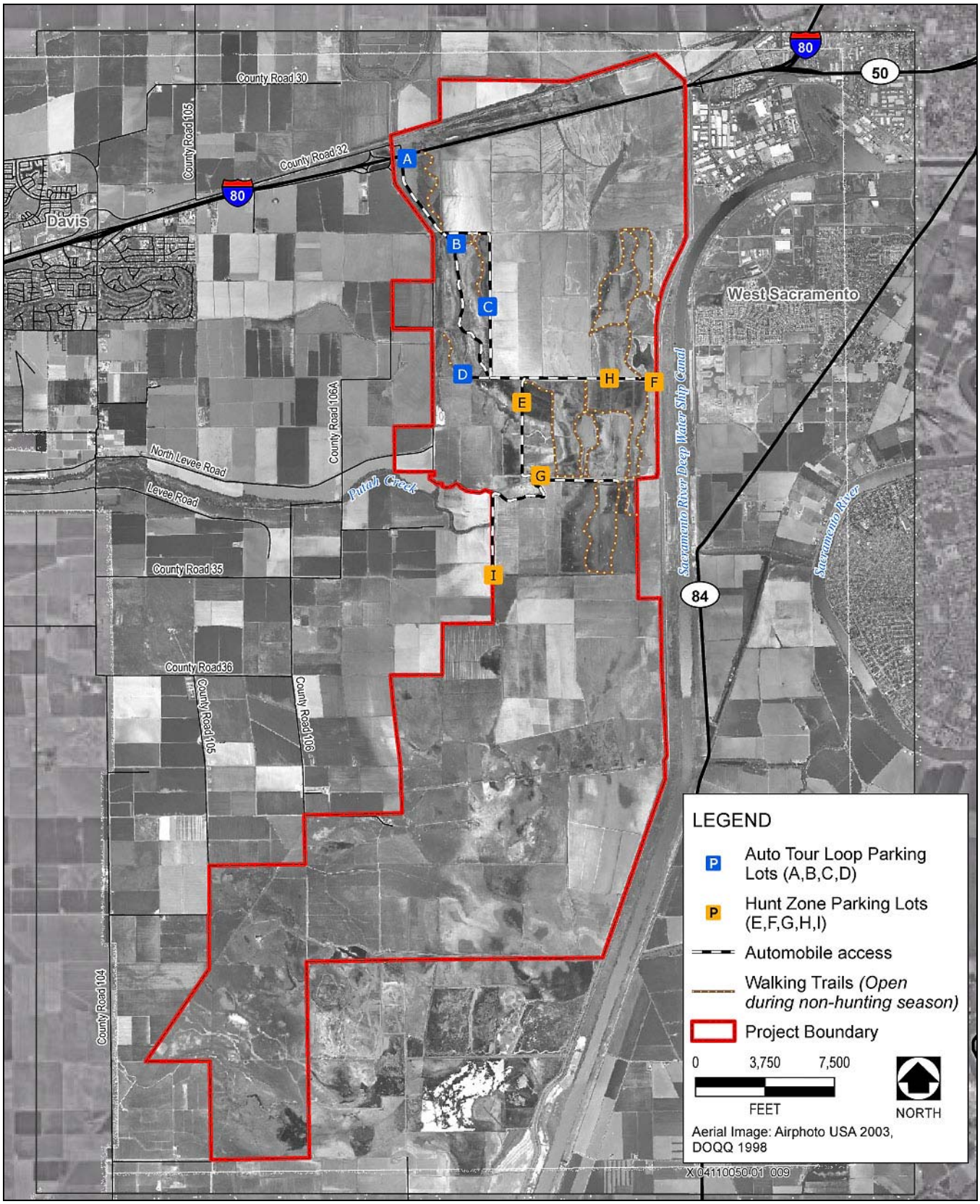
The Yolo Bypass Wildlife Area is currently administered from the DFG headquarters complex at 45211 County Road 32B (aka Chiles Road) one mile west of the Yolo Bypass Wildlife Area. This complex includes a 3-acre demonstration wetland, a residence, maintenance shop, conference room, and office space for employees of both the DFG and Foundation. The headquarters building conference room serves as a popular place for meetings and workshops for resource agencies. During the winter the room it is used as an activity and lunch room for Discover the Flyway students. It also serves that purpose for special activities such as Marsh Madness and Nature Bowl. The porch surrounding the headquarters building provides cover for activity stations, lunch and for greeting field trip participants.

The headquarters entry way provides a small area for brochures and other program information. It is also used for interpretive displays such as mounted Tule elk antlers, waterfowl suspended from the ceiling and a display case with historic decoys, an insect collection and other wildlife artifacts. The California native landscaping surrounding the building also serves an educational purpose.

The Foundation is headquartered in a 40' by 20' modular office unit behind the DFG Headquarters office. The Foundation program office is located in the headquarters building. The administrative and management staff works in the office unit. Three sheds provide space for storage of educational materials and miscellaneous supplies.

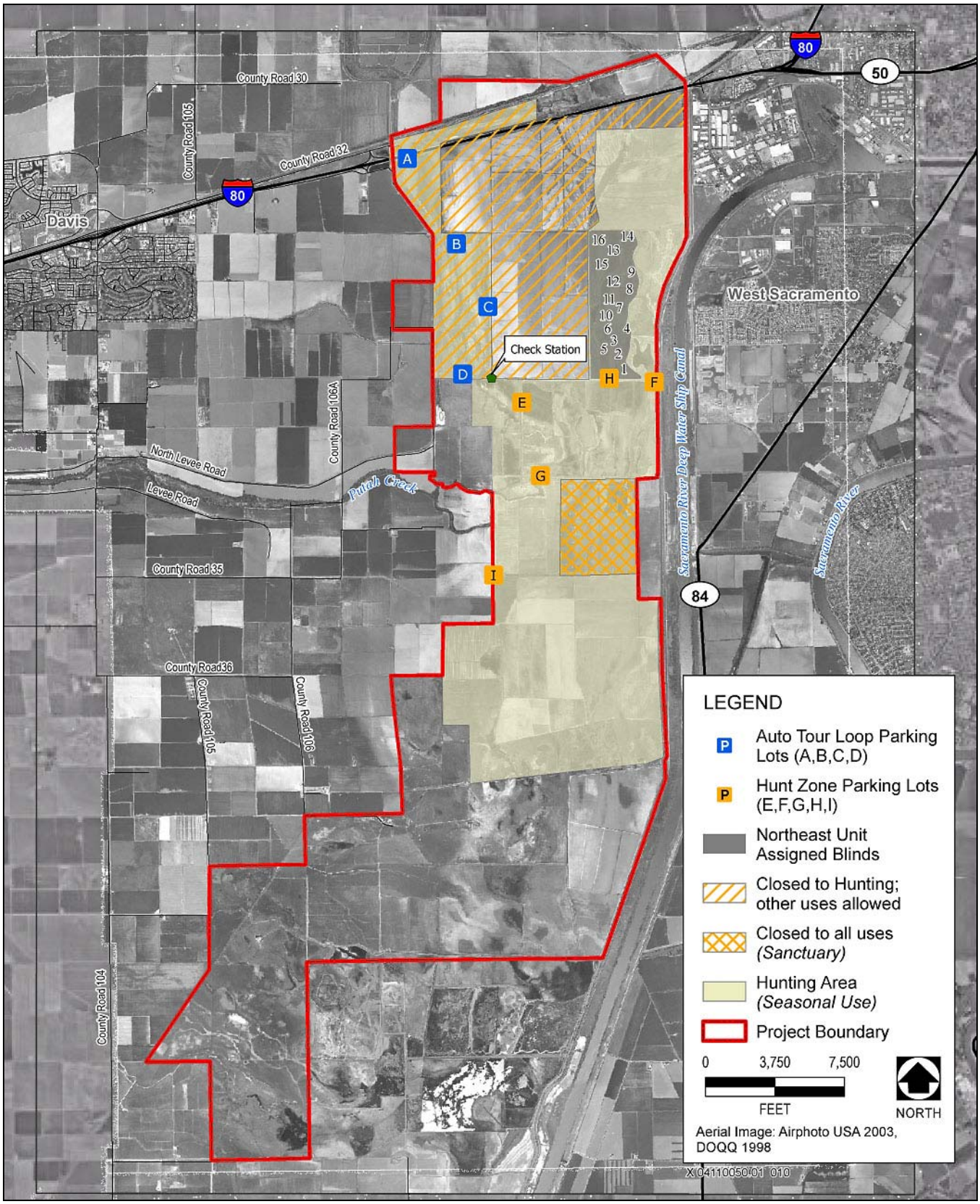
The Yolo Demonstration Wetlands

The 3-acre demonstration area was restored from a fallow farm field to a microcosm of Central Valley wetland habitats in the summer of 1998. The land was graded by a volunteer tractor operator, trees were donated by the USACE, and the



Source: Adapted by EDAW 2007

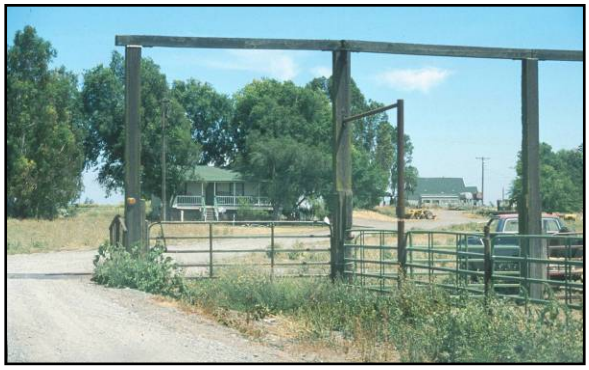
Current Public Use Map of the Yolo Bypass Wildlife Area (2006) **Exhibit 3.7-1**



Source: Adapted by EDAW 2007

Hunting Map of the Yolo Bypass Wildlife Area (2006) **Exhibit 3.7-2**

water system materials were provided by DFG. The installation of the irrigation system was completed by Yolo Basin and DFG staff and a group of boy scouts as an Eagle Scout project. The habitats represented include a seasonal wetland, permanent wetland, willow thicket, riparian forest, native grassland and oak woodland. In 1999 the Foundation and DFG completed a nature trail with a series of five signs interpreting the habitats and the goals of restoration. A Davis area Rotary Club donated an information kiosk located on the edge of the demonstration area. There are two field guides to the plants and animals of the Yolo Bypass Wildlife Area that can be used on a walk through the area. The success of this habitat project is reflected in the fact that over 100 species of birds have been observed on site.



Tule Ranch Headquarters

In addition to two residences, the Tule Ranch Headquarters also includes a complex of corrals used to process livestock. Also found on the Tule Ranch Unit is a large barn thought to have been constructed in the 1930's. This barn known locally as the Umbrella barn may be used as an educational facility for the interpretation of the adjacent vernal pools in the future. The ranch headquarters may also serve as an interpretive facility that will allow students to experience the role agriculture has played in the Yolo Basin.

Hunter Check Station

A mobile hunter check station is operated at the Yolo Bypass Wildlife Area during the autumn and winter hunting season. The check station opens at least two hours before sunrise and provides a base from which to manage the daily hunting activity. Permits are sold and information about the hunting program is exchanged with the public. Currently, a trailer is transported and placed at the southern end of the auto tour route. This trailer is removed at the onset of winter flooding.

Pacific Flyway Center (Proposed Facility)

The proposed Pacific Flyway Center to be constructed on the 69-acre Pacific Flyway Center unit just outside the bypass levee would include visitor parking, exhibit areas, and multi-use meeting spaces for a variety of educational opportunities for school children and visitors from throughout the community and region. Public exhibit areas would depict the natural history of the Yolo Basin and its place in the Pacific Flyway, as well as interpretation of the role of agriculture and flood protection in habitat creation and resource conservation. In June 2006, about 45 acres of the site were restored to representative Central Valley habitats including seasonal and permanent wetlands, riparian forest, and uplands. This complex will serve as demonstration wetlands to educate visitors about the managed and natural habitats found throughout the Wildlife Area with the added benefit that it is located outside the Bypass and not subject to flooding. A 250-foot border surrounds one half of the site to provide demonstration farm fields and an agricultural buffer between the site and adjacent field. There is a three-bedroom residence on this property.

Roads and Parking

Eight miles of gravel roads are currently available for public use. Nine parking lots are located along various parts of the roads and several of the parking areas provide access to the hiking trails and hunting sites at the Yolo Bypass Wildlife Area (Exhibits 3.7-1 and 3.7-2). The roads also allow access through the auto tour route to observe the many types of wildlife attracted to this area.

Trails

The Yolo Bypass Wildlife Area provides approximately 16 miles of unpaved, improved trails for walking and hiking and are mostly used by visitors participating in other primary activities such as hunting, fishing, wildlife viewing, or participating in scheduled programs. Trail locations can be seen on Exhibit 3.7-1. Certain areas are closed to non-hunters during hunting season on open hunting days (Saturday, Sunday, and Wednesday). Trails restricted during the hunting season are all within the designated hunting area and are illustrated on Exhibit 3.7-2. Currently, the only trails and/or roads open to bicycle use are located in the Causeway Unit (See also Chapter 4, "Compatible Resource Management and Public Use"). Additionally, bicycle use in the hunting area is allowed for hunting access purposes. There are currently no trails open for equestrian use.

Signs

The Yolo Bypass Wildlife Area uses four categories of signage to regulate public use and access. These categories include directional, regulatory, informational, and interpretive signs. Some directional signs are located at various intersections inside the Yolo Bypass Wildlife Area to help visitors navigate within the area. Regulatory signs at parking lots inform visitors of allowable activities and restrictions within the respective areas. Signs such as the Yolo Bypass Wildlife Area nameplate adjacent to I-80 inform visitors of the existence of the Yolo Bypass Wildlife Area and to acknowledge the many agencies and organizations that worked to create and formalize the Yolo Bypass Wildlife Area. Interpretive signs/kiosks are located at the DFG Headquarters site and include interpretation of Central Valley habitats and the Yolo Demonstration Wetlands. An additional sign is located at the entrance to the existing auto route and serves as a place to post a map of publicly accessible roads and paths, DFG regulations, and notes regarding upcoming events.

EXISTING RECREATIONAL AND EDUCATIONAL ACTIVITIES

This section provides a description of the various recreational and educational activities currently available at the Yolo Bypass Wildlife Area. The Yolo Bypass Wildlife Area is a unique example of a place where these activities can co-exist with carefully managed multiple land use objectives such as agriculture, flood control, and habitat for native species.

Hunting

Hunting is one of the main forms of recreation currently available within the Yolo Bypass Wildlife Area. Waterfowl and pheasant hunting are the most popular, however, visitors also participate in hunting of other upland game species including dove. See Exhibit 3.7-2 for a map of designated hunting areas throughout the Yolo Bypass Wildlife Area.

September 1 is the traditional beginning of the hunting season and is the opening day of the dove season. This is typically a very busy hunt day at the Wildlife Area. Waterfowl season usually opens in mid October and runs until the end of January or early February. At the Yolo Bypass Wildlife Area, the hunting season often ends or is interrupted by seasonal flooding of the Yolo Bypass.

Table 3.7-1 below lists the game species hunted at the Yolo Bypass Wildlife Area along with hunting seasons, required permits, licenses, stamps and tags.

Table 3.7-1 Yolo Bypass Wildlife Area Hunting Seasons		
Species	Days[1]	Required Licenses
Waterfowl, coots, moorhens and snipe	Saturdays, Sundays & Wednesdays	Resident hunting license and daily permit Federal Duck Stamp State Duck Stamp
Pheasant	First 9 days of season and then Saturdays, Sundays and Wednesdays	Resident hunting license and daily permit Upland Game Stamp Daily permit
Dove	Daily during September and only waterfowl and pheasant hunt days during the late dove season	Resident hunting license Upland Game Stamp and daily permit

1 Closed Christmas Day when falls on Saturday, Sunday, or Wednesday hunt day

Source: California Department of Fish and Game 2002a, 2002b, 2002c

The Yolo Bypass Wildlife Area currently maintains 16 duck blinds and one fully accessible blind on the approximate 3,000 acres available for waterfowl hunting. DFG currently allows 40 hunters to roam free plus up to 16 parties in designated blinds on any given hunting day. With the recent acquisition of additional lands, the Wildlife Area will someday have a capacity of over 200 hunters with 38 acres per hunter, at any one time to ensure a safe and positive hunting experience.

Pheasant hunting is currently allowed on approximately 5,000 acres of the Yolo Bypass Wildlife Area. Five designated parking lots are available for use by hunters. Hunters are allowed to use shotguns and archery for hunting. They may also use dogs to assist in hunting. Steel shot is required for waterfowl, coot and moorhen hunting. Lead shot is allowed for pheasant, dove and snipe. In 2005 DFG issued 3,066 hunting permits to the Yolo Bypass Wildlife Area. A hunter check-in station is operated by DFG during the autumn and winter hunting season. Hunting results from the Yolo Bypass Wildlife Area are summarized in Table 3.7-2 below.

Table 3.7-2
Yolo Bypass Wildlife Area Hunting Results (1997-98 through 2005-06)

Year	Total Hunters	Junior Hunters	Ducks Killed	Geese Killed	Pheasants Killed	Total Waterfowl Killed
1997–98	575	36	767	19	19	786
1998–99	1,297	76	1,380	16	43	1,396
1999–00	1,939	123	1,980	56	53	2,036
2000–01	2,198	161	1,988	66	91	2,054
2001–02	2,096	148	2,081	21	176	2,102
2002–03	1,371	70	882	8	271	890
2003–04	3,280	256	3,799	117	606	3,916
2004–05	3,819	244	4,971	199	189	5,170
2005–06	3,066	157	3,147	113	267	3,037

Source: DFG 2006

The Yolo Bypass Wildlife Area also hosts junior pheasant hunts and post season youth waterfowl hunt days (i.e., junior waterfowl hunts). Generally, there are 3 junior hunting days each year. All junior hunters must have successfully completed a hunter education course, possess a valid Resident Junior Hunting License, and be 15 years of age or younger. State and federal duck stamps are not required.

Fishing

Fishing is also popular and several opportunities are provided within the Yolo Bypass Wildlife Area. Primary game species present include sturgeon, catfish, black bass, and striped bass. Primary fishing locations include the East Toe Drain and along Putah Creek near the Los Rios Check Dam. Access can be obtained through parking Lot F (Toe Drain) and Lot G (Putah Creek). The East Toe Drain can also be reached from outside the Yolo Bypass Wildlife Area on the West Sacramento (east) side of the drain, although this area is not in the Yolo Bypass Wildlife Area. Sturgeon and striped bass are both anadromous fish (i.e., fish that spend all or part of their adult life in salt water and return to freshwater streams and rivers to spawn) that can be caught in the Toe Drain during their upstream migration from San Francisco Bay. Adult sturgeon are generally in the rivers throughout the winter months and adult striped bass are typically present in April and May. All of the game fish species present in the Yolo Bypass Wildlife Area offer great recreational opportunities. Valid California Fishing Licenses are required at all times.

Wildlife Viewing

Many species of birds and mammals may be observed in the Yolo Bypass Wildlife Area. Visitors may see a multitude of birds of prey, shorebirds, waterfowl and other migratory birds with over 200 known species having been identified within the area. Typical species include ibis, pelicans, cormorants, great blue herons, orioles, blue grosbeaks, and western kingbirds. The innovative shorebird management strategies implemented at the Yolo Bypass Wildlife Area have made the Wildlife Area a key shorebird viewing area in the Central Valley, attracting birdwatchers from throughout northern California. Mammals that can be seen in the area include coyotes, raccoons, gray fox, mule deer, beaver, mink, and river otters. The extensive water system maintained on the Yolo Bypass Wildlife Area also harbors large numbers of fish, amphibians, and invertebrates.

Public wildlife viewing is currently allowed year round along the existing auto tour route and along existing open trails as well as through scheduled tours and educational programs. Wildlife viewing is also permitted within designated hunting areas during non-hunting seasons. Flooding in the Yolo Bypass closes all public use. See Exhibit 3.7-1 for location of existing open trails.

Environmental Education and Interpretive Programs

Getting people in the outdoors is at the heart of the Yolo Bypass Wildlife Area's mission. The Foundation and DFG collaborate in managing and staffing a wide variety of environmental education and interpretation programs including the Discover the Flyway program for schools, Marsh Madness Youth Days, Nature Bowl, public tours, docent program, Flyway Nights lecture series, California Duck Days, Project Wet, and other workshops. Yolo Basin Foundation is the primary organization for developing, establishing, staffing and acquiring funding for Yolo Bypass Wildlife Area's

education and interpretation programs. DFG provides facilities, staff support, and expertise in its shared role with the Foundation.

Yolo Basin Foundation

The Foundation is a community-based nonprofit organization dedicated to the appreciation and stewardship of wetlands and wildlife through education and innovative partnerships. It was founded in 1990 to lead the effort to establish the 3,700-acre Yolo Bypass Wildlife Area.

One of the principal goals of the Foundation is the facilitation of environmental education with the Discover the Flyway school program. Foundation staff, DFG staff, interns and volunteers assist students, teachers and parents with hands on learning activities in the Demonstration Wetlands and lead exploratory walks on the Wildlife Area.

The Foundation is the sponsoring non-profit organization for California Duck Days, publishes the Yolo Flyway Newsletter, brings wetland education to classrooms with "Wild about Wetlands" learning kits, introduces the public to natural places in the community through public field trips, and hosts the popular Flyway Nights speaker series. The Foundation also hosts and facilitates the Yolo Bypass Working Group, which provides an opportunity for farmers, landowners and agencies with interests in the Yolo Bypass to discuss Bypass related issues as well as provide guidance and opinions on such issues.

Staffing is the largest expense associated with Yolo Bypass Wildlife Area programs. Seven part-time employees provide the wide array of programs available. The staff positions include an executive director, associate executive director, development director, program coordinator, office manager and two education associates. There is a part time volunteer coordinator who is funded through both DFG and the Foundation. During the school year there are usually a few interns from UC Davis or other area colleges assisting as well.

Funding for Foundation programs is provided through individual and business memberships as well as by a wide variety of private sector sponsors including CWA, Davis Sunrise Rotary Club, Dean Witter Foundation, Environmental Law Section of the Sacramento Bar Association, First Northern Bank, Intel Corporation, Rumsey Community Foundation, NEC Corporation. There are two giving clubs, the Yolo Basin Club and Yolo Flyway Club for donors of $300 to $2,500. Bucks for Ducks, a dinner and auction, is the Foundation's fundraising event held every October since 1991.

Public sector sponsors include USBR, USFWS, U.S. EPA, Central Valley Joint Venture, City of Davis. Yolo Basin Foundation has two service contracts with CBDA, one for the Yolo Bypass Working Group through December 2006 and the Pacific Flyway Center through December 2007. Public funding for educational programs is decreasing in general and the Foundation has had to rely more heavily on the private sector.

The Foundation has received numerous awards for its work in conservation efforts and environmental education, including the California Department of Fish and Game Conservation Award (1994 and 2002), the U.S., Department of Interior Wetlands Conservation Award (1995), Outstanding Implementation Award from the Friends of the San Francisco Estuary (1996), Governor's Environmental and Economic Leadership Award (2000), City of Davis Environmental Recognition Award (2002), and Western Section of the Wildlife Society Conservationist of the Year Award (2007).

Educational Programs

The Foundation in collaboration with DFG offers a number of informative environmental education programs aimed at training teachers and educating students. The environmental education programs have been developed with the understanding that teachers bear, in large part, the

responsibility of building the foundation that children will need to become well rounded, original thinkers who can make a difference in the world they live in. The programs have been developed in a way that makes it easy for teachers to incorporate them into their school curriculum.

The Foundation's environmental education program seeks to foster:

- **Awareness:** to help people acquire an awareness and sensitivity to the natural environment and the interactions, which occur in the Wildlife Area.
- **Knowledge:** to provide a variety of experiences in and acquire a basic understanding of the environment in the Wildlife Area, including how it functions, how it is managed, and what plants and animals live there.
- **Attitude:** to help students understand the value of the natural environment and to motivate them to actively participate in environmental improvement and protection; to see positive examples of how wildlife habitat can coexist with flood control, agriculture and the surrounding urban area.
- **Skills:** to help acquire the tools for identifying, understanding, and solving environmental problems.
- **Participation:** to provide an opportunity to be involved with Wildlife Area restoration activities, and with the resolution of environmental problems in the community.
- **Impact:** to provide a format for the public to enjoy the Wildlife Area with minimal impact on its wildlife.

The Foundation, in close cooperation with DFG has developed a document (Appendix E), which provides an overview of public use programs, site history, and a description of interpretive resources (Yolo Basin Foundation and California Department of Fish and Game 2007).

Discover the Flyway School Program

The Discover the Flyway school program is an education and outreach program that includes teacher workshops, a curriculum guide, classroom field trips, the Wild About Wetlands classroom kits, and volunteer training sessions. The program focuses on hands-on, interactive learning experiences for K–12 students that create a connection between ecological processes and the Yolo Bypass Wildlife Area.

The Foundation trains hundreds of teachers and hosts over 4,000 students and parents annually from Sacramento, Yolo, Solano, El Dorado, and Placer Counties. There are over 60 participating schools from 15 school districts and numerous private schools. The program operates four days a week during the school year and includes structured small group activities at the Demonstration Wetlands as well as tours of the Yolo Bypass Wildlife Area.

In the past few years the Foundation has put considerable effort into recruiting classroom teachers from underserved schools. These schools are identified as Title I schools based on participation in the state-wide school free breakfast and lunch program. These schools often lack the resources for field trip transportation. The Foundation has found corporation and foundation sponsors to cover the expenses associated with the extra outreach. These sponsorship funds are also used to maintain a bus fund to cover the bus costs that enables students to attend a field trip.

Program activities correlate to the California State standards for science or social studies enabling teachers to incorporate a field trip to the Yolo Bypass Wildlife Area into their daily curriculum. Before bringing students on a Discover the Flyway field trip, teachers attend a required one time only Discover the Flyway Workshop, where they are given the materials and instruction needed for a successful and education packed field trip experience tailored to their grade level. All field trips are facilitated and directed by highly trained Foundation staff, interns,

and volunteers. A four-dollar per student donation to assist with program expenses is requested. However, if students cannot afford this or teachers are unable to collect the full amount the class is still welcome to participate. No one is prevented from participating due to cost.

Discover the Flyway Teacher Workshops

The Discover the Flyway one-day teacher workshops are geared for teachers in grades K–12 who are interested in providing a learning resource for their students that aids in an understanding and appreciation of the natural world in their community. The workshops familiarize teachers with various wetland habitats in the context of the Yolo Bypass Wildlife Area and provide suggestions and lessons for hands-on learning activities. Teachers are given a handbook with curriculum related activities that includes activity themes, background information, and instructions.

In the summer of 2005 teachers were introduced to the Foundation's new curriculum with third through fifth grade units: "Living with Water, the Story of Yolo Basin and its People" The third grade curriculum, Patwin Life: A Circle of Seasons was successfully implemented in the 2005–2006 school year. Teacher workshops for 2006 will include introduction of the fourth grade agriculture oriented curriculum, "Yolo Basin: Feeding the People."

Discover the Flyway Class Field Trips

After completion of the workshop the Foundation offers teachers staff support and use of field equipment for classroom field trips. Teachers are then encouraged to schedule a field trip to bring their students to the Wildlife Area with active support by Foundation staff and volunteers. After scheduling a trip teachers work with Foundation staff to select 3 to 4 grade level appropriate field activities to be done by the students under guidance of a trained volunteer, when they arrive at the Yolo Demonstration Wetlands. After an orientation by a Foundation staff person and completion of the 3 to 4 activities, the students eat lunch and then head out for an hour or two of exploring in a wild setting at the Wildlife Area.

Wild About Wetlands classroom kits are another resource available to teachers. The kits hold full instructions and materials for numerous wetlands related activities that are geared toward preparing students for a trip to the Wildlife Area. They can be checked out by teachers who participate in a Discover the Flyway Workshop. California Waterfowl Association (CWA) has assisted the Foundation with maintenance and distribution of the kits for many years.

Marsh Madness

The Foundation and the CWA co-host Marsh Madness Youth Days at the Yolo Bypass Wildlife Area several times a year. This program targets underserved elementary schools with limited resources in both metropolitan and rural areas.

CWA provides volunteers, equipment, lunch, and plans the activities. The Foundation provides the school outreach and bus transportation. DFG provides the facility and helps with set up. Each Marsh Madness Day brings 60 students to the Wildlife Area to spend the day learning about wetlands, wildlife, and conservation. The students receive small group instruction and hands-on experience identifying birds, searching for signs of animal life, examining pond water, studying wetland plants, and much more. Their day includes discussions about conservation, hunting, and other outdoor issues. Everyone is treated to a lunch buffet including foods from wetlands such as rice, cranberries, duck, elk and tule roots.

Nature Bowl

Nature Bowl is a cooperative team competition for 3rd through 6th grade students sponsored by the DFG, California State University Sacramento, American River Natural History Association, American River Nature Center, Effie Yeaw Nature Center, Placer Nature Center, Sacramento Zoo, and the Foundation. This engaging event introduces students to environmental issues, reinforces key concepts, increases critical thinking skills, and encourages student involvement in community conservation efforts. Students take part in fun activities such as Nature Investigations, Nature Relay, Team Problems, Bell-Ringers, Enviro-mercials and Nature Games. Questions and activities focus on local and regional environmental science and issues, and correlate with the science content standards. The Nature Bowl serves as a model for teachers to use in their environmental education instruction. Teams can be coached by teachers, parents, youth leaders, or high school students. DFG and the Foundation provide some guidance to team coaches during the months that teams prepare for the event. DFG and the Foundation host the Nature Bowl semi-finals each March at the Wildlife Area Headquarters.

Volunteers

Yolo Bypass Wildlife Area volunteers have the unique opportunity to participate in specialized trainings as well as go on informative field trips both at the Yolo Bypass Wildlife Area and surrounding areas. Volunteers work within the Foundation programs and are all also signed up as DFG volunteers. Introductory workshops for volunteers are held throughout the year as needed. Volunteers serve in a variety of positions as described below:

Flyway Assistants

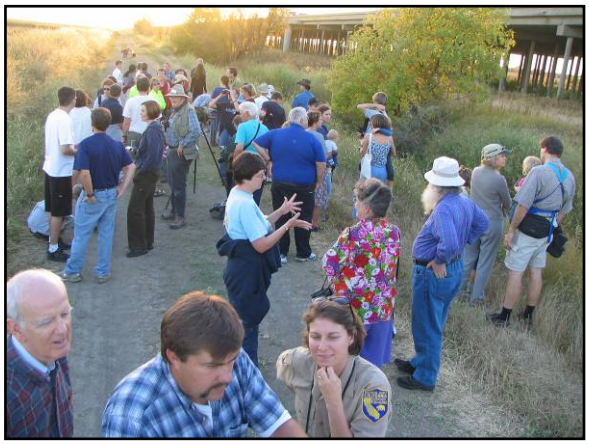
Flyway Assistants assist with Discover the Flyway field trips. They lead learning stations at the Demonstration Wetlands, assist with field equipment, help develop program tools, and join with staff to lead Yolo Bypass Wildlife Area walks.

Field Trip Ambassadors

Field Trip Ambassadors accompany the local wildlife and habitat experts who serve as volunteer leaders for public tours of the Yolo Bypass Wildlife Area and quickly become experts themselves on local birds and the natural history of this unique and multi-functional ecosystem. They are available to assist the leader, give beginners individual guidance and also promote the Foundation's role by providing a brief introduction to the organization as well as by providing membership sign up sheets, newsletters and program flyers to tour participants.

Special Events/Administration

Throughout the year, the Foundation organizes special events such as California Duck Days, and participates in community events, Volunteers are the number one resource for making these events a success. Special Events/ Administration volunteers are often involved with large mailings, event set-up, fund-raising assistance, as well as interpretive display staffing. Volunteers also assist Foundation staff with various administrative tasks in the office.



Public Outreach

Public outreach events include monthly tours of the Yolo Bypass Wildlife Area, bat viewing tours, vernal pool tours, Flyway Nights lectures and California *Duck Days*, an annual celebration and awareness-raising event that has been held at the Yolo Bypass Wildlife Area since 2003. The Yolo Flyway is a newsletter that is published three times a year with educational articles, updates on activities, and a schedule of upcoming activities. The Foundation also hosts and facilitates Yolo Bypass Working Group meetings as a forum for stakeholder and public discussion of Yolo Bypass issues.

Yolo Bypass Wildlife Area Tours

Public tours of the Yolo Bypass Wildlife Area are offered on the second Saturday of each month from September through June. Tours meet at parking lot A in the Yolo Bypass Wildlife Area, focus on a variety of specialty topics, and are led by experienced naturalists, often associated with Yolo Audubon Society. DFG staff also lead trips. The tours provide opportunities to view the abundant wildlife that inhabit the seasonal and permanent wetlands, riparian areas, and uplands present in the Yolo Bypass Wildlife Area throughout the year. Depending on the season, migrating and resident waterfowl, shorebirds, songbirds, raptors, and wading birds may also be viewed. These tours are open to anyone, are always advertised in the local media and are a good introduction to the Wildlife Area. They are geared toward any level of bird watcher or nature enthusiast.

Vernal Pool Open House

The vernal pool open house is co-sponsored by DFG and the Foundation and provides an opportunity for the public to visit the unique vernal pools at the Tule Ranch in the southern part of the Wildlife Area. The vernal pool open house typically takes place in April during the peak of the wildflower viewing season, and trips are led by volunteers, often associated with the Jepson Prairie Docent Program. Training to become a Jepson Prairie docent is very applicable to the Wildlife Area's vernal pool program and is made available to all volunteers.

Bat Tours

Bat tours are offered six to seven times during the spring and summer months and are co-sponsored by the California Native Bat Conservancy. Bat tours offer a presentation on the benefits and wonders of bats followed by a guided tour, just before sunset, into the Wildlife Area. During the tour, participants have the opportunity to view what is perhaps the largest colony of Mexican free-tailed bats in California emerge from their roosting area on the underside of the Yolo Causeway bridge. In the spring and summer of 2005, between fifty and one hundred people attended each trip.

Flyway Nights Lecture Series

The Flyway Nights Lecture Series takes place at the Yolo Bypass Wildlife Area Headquarters Building. On the first Wednesday of each month from November through April at 7 p.m. the general public is invited to Foundation sponsored lectures presented by local and regional experts. Topics are generally wetland related and feature local issues relating to wetlands and wildlife. The program has included experts on snakes and amphibians, mammals, hawks, rice growing, local geology, butterflies, and dragonflies. There is usually a full house present on these evenings.

California Duck Days

California Duck Days is a wetland festival hosted at the Yolo Bypass Wildlife Area with the mission to educate and inspire the public about wetlands and wildlife of the Central Valley in a fun, relaxed atmosphere. The event is a partnership of regional organizations and agencies (including the Foundation, Yolo Audubon, CWA, City of Davis, and Yolo County RCD) and has been held annually since 1994. The event includes an evening reception, field trips, workshops, exhibits, and a show of wetland related artwork by area high school students. Duck Days is a family friendly event that attracts visitors from throughout the region and out of state to learn about and appreciate the natural environment of the Central Valley. The event also showcases wildlife friendly farming techniques by organizing field trips to area farms. The festival provides a platform for a broad range of diverse conservation perspectives, including farmers, birding enthusiasts, and hunters, and encourages wetland conservation by promoting regional wetland stewardship on public and private land.

Yolo Bypass Working Group

The Foundation initiated the Yolo Bypass Working Group in 1998 under a CALFED Ecosystem Restoration Grant as a communication and educational forum. This ad hoc stakeholder group has been very successful and continues to meet approximately every three months. The 37th meeting was held in June 2006. Over 30 people representing a wide range of stakeholders with an interest in the Yolo Bypass regularly attend these meetings. Participants include landowners (farmers, ranchers, duck hunters), DWR, State Reclamation Board, DFG, USFWS, State Department of Food and Agriculture, NRCS, Dixon and Yolo RCDs, SAFCA, Yolo County, City of West Sacramento, CWA, DU, NMFS, National Weather Service, SYMVCD, Port of Sacramento, and others. DFG and the Foundation host the meetings at the Wildlife Area headquarters conference room. Grant funds cover the costs for contracting a facilitator. The presence of the facilitator has created an atmosphere of trust and relaxed exchange of information that has been praised by the stakeholders.

The 2000 Governor's Environmental and Economic Leadership Award was presented to the Yolo Basin Foundation in recognition of the Yolo Bypass Working Group for outstanding contributions in the area of environmental restoration and rehabilitation.

In August 2001 the Foundation published a document prepared with Working Group participants entitled: *A Framework for the Future: The Yolo Bypass Management Strategy*. This document can be found on the Yolo Basin Foundation website, www.yolobasin.org.

Funding to support the Yolo Bypass Working Group beyond the finish of the Calfed grant in December 2006 is being pursued through several grant proposals. It is anticipated that the Working Group will play a key role in the implementation of the Yolo County Integrated Regional Water Management Plan now in the draft stage.

The Importance of Public Access in the Future

Encouraging public access in its many forms will allow generations of Central Valley inhabitants to come to understand the lessons of the Yolo Bypass Wildlife Area: that wildlife habitat, flood control, agriculture, and urban life can successfully co-exist. In the current planning vocabulary it is a clear, understandable example of this important aspect of creating a sustainable community.

The Yolo Bypass Wildlife Area is considered a community treasure as articulated at a recent Yolo County Board of Supervisors meeting. As the human population grows in the coming decades the habitat values and public access opportunities will continue to increase in importance. In the not to distant future the Yolo Bypass Wildlife

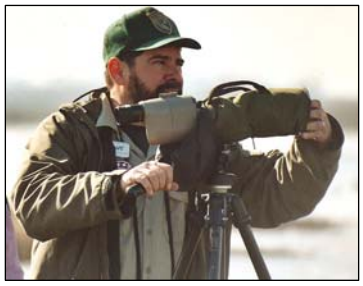
Area will become a valued landmark. Increasing numbers of commuters and other travelers crossing the I-80 Causeway will look forward to the glimpse of wildness that the Yolo Bypass Wildlife Area gives them. Much like Central Park in New York City and the American River Parkway in Sacramento, the Yolo Bypass Wildlife Area will be a treasured community symbol.

4 COMPATIBLE RESOURCE MANAGEMENT AND PUBLIC USE

The Yolo Bypass Wildlife Area is a living example of the successful meshing of flood control, wildlife habitat, public use, and agriculture. Compatible use is one of the messages that school children are introduced to when visiting the Yolo Bypass Wildlife Area. The Yolo Bypass Wildlife Area is unique among wildlife areas in that it is managed almost entirely within an engineered floodway and agriculture produces both wildlife habitat and operating income. On a fall day, students will see rice being harvested while egrets and ibis eat what is left behind in the field. They will see fields being disked and perhaps 30 Swainson's hawks following the tractor, feasting on mice and grasshoppers. Later in the fall and throughout the winter they will see thousands of pintails loafing in the flooded rice while hunters pass by on the road after a morning hunt. Autumn sounds include geese crying in the distance, the whistle of a thousand pintails and perhaps a shot fired by a late morning hunter. In the spring they will see rice being seeded by a low flying airplane while listening to the cries of nesting stilts and killdeer. In the late spring, students will see ducklings swimming behind their parents in a permanent wetland while other wetlands are dry to prepare for disking to remove tules and cattails as required to meet flood control requirements.

DFG manages wildlife areas to protect and enhance aquatic and terrestrial habitats for plant, wildlife, and fish species and to provide the public with compatible recreational and educational uses. The key consideration for these activities at the Yolo Bypass Wildlife Area is compatibility with the primary function of the Yolo Bypass, which is flood control. In the past decade the most common public uses at the Yolo Bypass Wildlife Area included environmental education and interpretation, hunting, fishing, wildlife observation, and other uses such as photography and painting, and these uses are projected to continue to be popular. This chapter includes an evaluation of the compatibility of different resource management objectives with various existing and potential new public uses at the Yolo Bypass Wildlife Area, and the potential of those public uses to adversely affect management of diverse habitat.

4.1 EVALUATION OF RESOURCE MANAGEMENT AND PUBLIC USE



The planning process included an evaluation of the public's demand for use of the Yolo Bypass Wildlife Area and the compatibility of such use with resource management activities and objectives including seasonal floodwater conveyance, protection, and enhancement of wildlife habitat, and continued agriculture. This compatibility evaluation focused on five principal factors:

- the potential for land management to conflict with necessary flood control operations;
- the potential for conflicts between resource management activities and other objectives (i.e., flood control, vector control, wildlife resources, fisheries resources, and agriculture);
- the potential for public uses to unreasonably adversely affect habitat and the fish and wildlife that inhabit the area;
- the potential for resource management and public uses to adversely affect adjacent land uses; and
- the anticipated resources required by DFG to manage the resources and public uses.

Information was obtained through analysis of existing information and through public outreach. The information-gathering process for this LMP also involved interviews and focus group meetings with representatives of various interest groups and meetings with DFG and State Reclamation Board staff members familiar with flood control operations, agricultural activities, and recreation use of the Yolo Bypass.

The mission of the DFG and function of the Yolo Bypass Wildlife Area are focused on natural resource management. In addition, the Yolo Bypass Wildlife Area is a low-lying area that is subject to frequent flooding. All public uses to consider are, therefore, limited by these constraints. Permanent buildings within the greater portion of the Yolo Bypass Wildlife Area between levees would be subject to frequent flood damage and are fundamentally precluded by regulations of the Federal Emergency Management Agency (FEMA) and the State Reclamation Board. Other permanent developed recreation features would also be subject to frequent inundation and likely damage. Developed recreation uses, such as traditional team sports, are not consistent with the DFG mission and functions of the Yolo Bypass Wildlife Area and are not allowed.

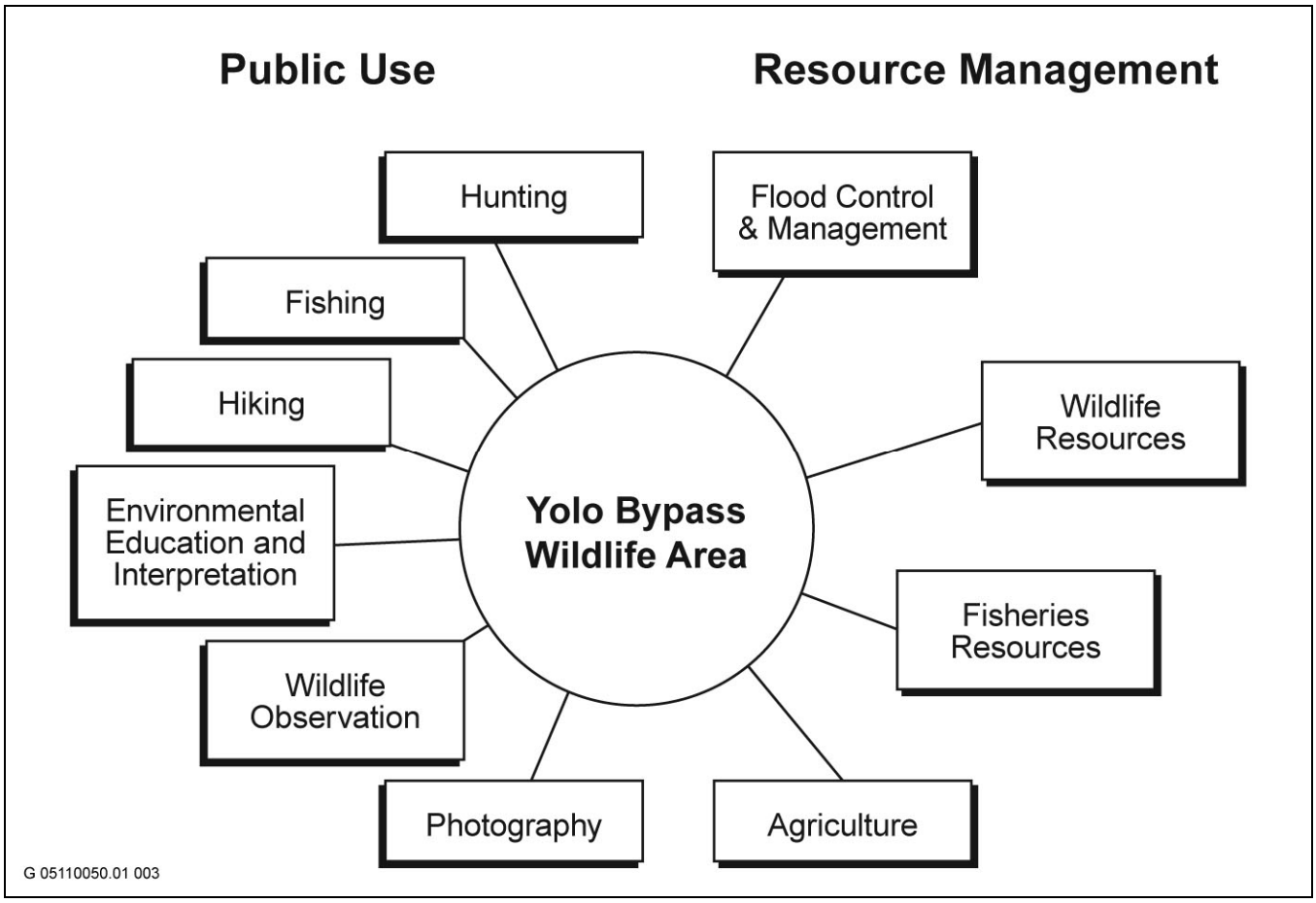
The potential public use of the Yolo Bypass Wildlife Area is additionally affected by the limited access to many of the management units. No paved roadways exist in the Yolo Bypass Wildlife Area and the limited gravel and dirt roadways available are restricted to use during non-flooded and, typically, dry periods. Access is further limited by the presence of sensitive habitats (i.e., wetlands), agricultural activities that occur throughout the Yolo Bypass Wildlife Area, and use restrictions limiting the type and/or timing of recreation activities. The management of these access limitations function to regulate the level of human activity within certain units and help to ensure that agricultural activities and the habitat value of the Yolo Bypass Wildlife Area are not substantially diminished by public use. Management also minimizes conflicts between various public uses, such as nature observation and hunting. Another factor that limits access for all uses is the availability of DFG staff resources. Access requires road maintenance, opening and closing of gates, garbage pickup, portable toilets, and law enforcement.

As depicted in Exhibit 4.1-1, four (4) resource management and six (6) primary public-use activities were determined to be compatible uses that could be supported in the management of the Yolo Wildlife Area. Compatible resource management activities in the Yolo Wildlife Area include flood control and management, protection and enhancement of wildlife resources, protection and enhancement of fisheries resources, and agriculture. Primary public uses include environmental education and interpretation, hunting, fishing, hiking, wildlife viewing, and photography. Existing beneficial uses and site improvements, including investments in infrastructure, were also considered in the evaluation. Exhibits 4.1-2 and 4.1-3 depict resource management activities and public uses occurring in the Yolo Wildlife Area.

4.1.1 RESOURCE MANAGEMENT

FLOOD CONTROL AND MANAGEMENT

The Yolo Bypass Wildlife Area is being managed with the recognition that the primary purpose of the Yolo Bypass is flood protection for the people of the Sacramento Valley. Flood flow design criteria for the Yolo Bypass indicate a specific water surface elevation when flood flows are at capacity. These criteria are maintained through the management of vegetation and hard structures in the Bypass in such a way that this water surface elevation is not increased. Emergent and riparian vegetation is maintained at acceptable levels as prescribed through the Supplement to the Standard Operation and Maintenance Manual for the Yolo Basin Wetlands (U.S. Army Corp of Engineers 2003). This prescription was developed through application of a hydraulic



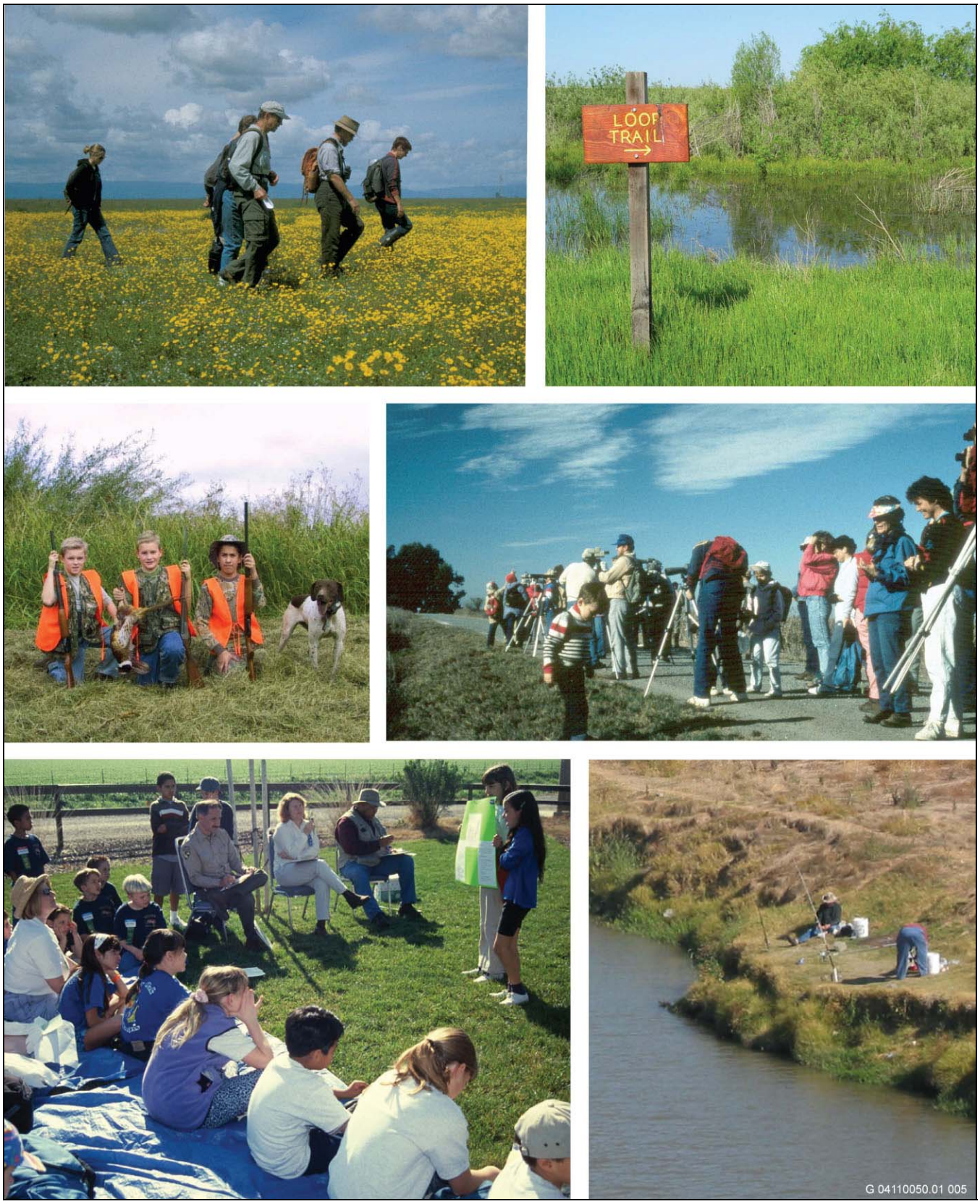
Compatible Resource Management Activities and Public Uses in the Yolo Wildlife Area Exhibit 4.1-1

model. Anticipated topographic and vegetative changes were inputted into the model to predict their effect on water surface elevation. The primary tool for maintaining acceptable levels of emergent vegetation is timing and duration of flooding, and maintenance of existing vegetation through mechanical and chemical treatments. Generally, prevention is the best policy. Prevention of establishment of substantial stands of emergent vegetation and riparian vegetation is achieved by draining seasonal wetlands as close as possible to April 1. Management for floodwater conveyance will continue to be an overriding priority for the Yolo Bypass Wildlife Area.

Recently, USACE has updated and improved a two-dimensional (2-D) detailed hydraulic model for the Yolo Bypass for determining flood conveyance impacts that may result from proposed ecosystem restoration projects. The new Yolo Bypass 2-D model (U.S. Army Corps of Engineers 2006) provides the State Reclamation Board, DFG, and other restoration proponents with a useful tool to effectively evaluate the hydraulic effects on flood capacity of the Bypass, including the Yolo Bypass Wildlife Area. As the regulating agency, the State Reclamation Board will require DFG to provide hydraulic modeling of any future proposed restoration or any land-use modification projects in the Yolo Bypass Wildlife Area, which must confirm that the proposed project would meet performance criteria and not adversely affect the flood conveyance capacity. These modeling requirements apply to construction of any earthen structures that exceed 3 feet in height. Since most restoration efforts do not require berms above three feet, it is the management of these restoration projects that are subject to hydraulic modeling. Additional discussion on hydraulic modeling requirements is provided in Chapter 5, “Management Goals” and Appendix C.

Photos Source: Dave Feliz

Resource Management Yolo Bypass Wildlife Area **Exhibit 4.1-2**



Photos Source: Dave Feliz

Public Uses of the Yolo Bypass Wildlife Area **Exhibit 4.1-3**

PROTECTION AND ENHANCEMENT OF WILDLIFE RESOURCES

The Yolo Bypass Wildlife Area provides important staging and wintering habitat for numerous species of waterfowl, shorebirds, and other birds migrating along the Pacific Flyway. These species are associated primarily with shallow flooded fields, ponds, wetlands, and mudflats. They are most abundant in the Yolo Bypass Wildlife Area in fall and winter, when managed inundation for waterfowl also increases the availability of habitat for shorebirds (Page et al. 1992).

The Yolo Bypass Wildlife Area also supports numerous species of raptors (e.g., northern harrier, red-tailed hawk, kestrel), songbirds (e.g., oriole, towhee, bluebird), and mammals (e.g., otter, raccoon, skunk, beaver, gray fox). Though not part of specific management objectives, the Yolo Bypass Wildlife Area appears to be especially important to the Swainson's hawk, a state-listed threatened species that uses the floodplain as foraging habitat.

The Yolo Bypass Wildlife Area is a key component of the habitat restoration planned as part of the CALFED ERP, and is a vital element of the Central Valley Habitat Joint Venture's habitat restoration goals associated with implementation of the North American Waterfowl Management Plan (NAWMP). Millions of dollars in grant funding from the North American Wetlands Conservation Act (NAWCA) have been invested in creating the infrastructure to manage wetland ecosystems at the Yolo Bypass Wildlife Area. NAWCA was passed, in part, to support activities under the NAWMP. Accordingly, these grants are intended to support the conservation of wetlands and associated upland habitats needed by waterfowl and other migratory birds in North America. Importantly for Yolo Bypass Wildlife Area land use considerations, the wetlands created are required to be managed in perpetuity.

The stated purpose of the most recent land acquisition for the Yolo Bypass Wildlife Area was "to allow for the preservation of historic wetlands, wintering habitat for waterfowl, shorebirds, threatened and endangered species and other wetland associated species." Managing for fish and wildlife and their associated habitats on which they depend on, as well as compatible public uses, will be an ongoing priority for the Yolo Bypass Wildlife Area.

Flooding Effects on Recreational Activities

Flooding also has the potential to affect wildlife dependent recreational activities. Significant flooding during the hunting season (i.e., mid-October to mid-January) requires the Yolo Bypass Wildlife Area to discontinue access to these areas, resulting in lost hunting time. When the Wildlife Area is closed due to flooding other public uses are prevented especially school field trips.

Flooding Effects on Wildlife Resources

Flooding of the Bypass can affect management operations and thus, related wildlife resources. Floods damage infrastructure, requiring repairs and additional maintenance. Ditches and canals sometimes fill with sediment and need to be excavated to maintain flow capacity. In addition, debris deposited on fields needs to be removed; roads, field levees, gates, pipes, and pumps may need to be repaired. Permanent structures, such as pump stands can also be damaged by high water. Floods and their timing can adversely affect plant species composition (e.g., promotes growth of undesirable plant species like cocklebur), which may adversely affect waterfowl, pheasants, and other nesting birds (Yolo Basin Foundation 2001).

PROTECTION AND ENHANCEMENT OF FISHERIES RESOURCES

The Yolo Bypass Wildlife Area provides important year-round and seasonal aquatic habitat for a diverse assemblage of native and nonnative fish species when the Yolo Bypass floods. In more than half of all water years, excess floodwaters enter the Yolo Bypass (including the Yolo Bypass Wildlife Area) from the main channel of the Sacramento River, creating up to 60,000 acres of shallow water habitat for native fish populations (Sommer et al. 2002). The importance of Yolo Bypass spring floodplain inundation for native fish passage, spawning and rearing, as well as estuary food web processes have been well documented (Schemel et al. 1996; Sommer et al. 1997; Sommer et al. 2001a; Sommer et al. 2001b; Sommer et al. 2002). Management for floodwater conveyance and the subsequent fisheries benefits generated by this flooding are part of the working environment at the Yolo Bypass Wildlife Area.

Recent studies and planning efforts have been conducted to examine the feasibility of managing a portion of the Yolo Bypass to improve habitat for multiple aquatic species, particularly native fishes such as Chinook salmon, Sacramento splittail, and green sturgeon (U.S. Army Corps of Engineers and the CALFED Bay-Delta Program 2002; Kirkland et al. 2005). Habitat improvement concepts are generally focused on winter and early spring floodplain inundation in one or more low-lying areas throughout the Bypass and fish passage improvements at Fremont Weir and on Putah Creek.

There is interest in pursuing habitat improvement for aquatic species (see Appendix A) and the Yolo Bypass Wildlife Area is generally supportive of such projects. However, Yolo Bypass Wildlife Area land use changes to benefit fish spawning, rearing, and passage in Putah Creek must be compatible with existing agricultural and/or managed wetland operations. As discussed above, the Yolo Bypass Wildlife Area is impacted by spring flooding in many ways, including decreased breeding success for ground nesting birds, decreased forage value of grazed areas, reduction of acreage available for farming and subsequent reduction of income for the Wildlife Area. Additionally, spring floods dramatically increase the establishment of emergent riparian vegetation, which requires subsequent vegetation control measures in order to remain compatible with habitat management strategies derived from hydraulic analysis. Future designs for created fish habitat on Yolo Bypass Wildlife Area land must be cooperatively planned with DFG as a primary lead agency with oversight authority. This would ensure that future proposals are mutually compatible with waterbird habitat management, agricultural activities, and other resource management functions of the Yolo Bypass Wildlife Area. As the lead implementing agency for CALFED's Ecosystem Restoration Program, DFG must approve any CALFED funded proposed aquatic ecosystem restoration activities to insure consistency with ecosystem planning.

Proposals related to improving fish passage at Fremont Weir are not considered in this LMP as the Fremont Weir is located outside of the geographic boundaries of the Yolo Bypass Wildlife Area. However, because modifications to Fremont Weir could effect management and operations at the Yolo Bypass Wildlife Area, the effects on the Yolo Bypass Wildlife Area would need to be considered in any discussions regarding potential project planning and implementation. These discussions would need to be inclusive of other stakeholders in the Yolo Bypass due to the potentially profound impacts to rice farming, grazing, wetland management, and flood protection. As always, the flood protection function of the Yolo Bypass should be maintained as a top priority.

Potential opportunities exist to restore and enhance fish habitat in the Yolo Bypass Wildlife Area along Putah Creek and along the East Toe Drain at the southeast end (Tule Ranch unit) of the Yolo Bypass Wildlife Area. Opportunities along Putah Creek include potential realignment of the creek channel to improve passage, geomorphic processes, and floodplain connectivity. The prospect of habitat enhancement in Putah Creek is especially attractive given the habitat improvement achievements upstream and the recent return of small chinook salmon runs in the creek.

Opportunities along the East Toe Drain include the potential creation of managed seasonal floodplain areas and tidal channels in the Tule Ranch Unit. These opportunities are consistent with particular project components/ alternatives identified in past studies (U.S. Army Corps of Engineers and the CALFED Bay-Delta Program 2002;

Kirkland et al. 2005). For the Putah Creek channel considerations, proposed changes must be compatible with existing agreements, primarily the Putah Creek Settlement Agreement (Putah Creek Accord) which established minimum flow requirements in the Putah Creek channel to maintain a living stream for fish and riparian resources from the Putah Diversion Dam to the Toe Drain (Sacramento County Superior Court 2000; Moyle 2002). In order to determine if potential fish habitat restoration and enhancement opportunities are feasible, additional studies and coordination with local stakeholders including the Lower Putah Creek Coordinating Committee would be required.

AGRICULTURE

Agriculture, including rice, row crops, and ranching, is an important component of the management of the Yolo Bypass Wildlife Area (see Exhibits 3.2-1 and 3.2-2). Agricultural operations provide important wildlife habitat benefits, critical income for Wildlife Area operations, maintain vegetation in a desired and compatible state, and contribute toward the local farming economy. Since the acquisition of the Glide and Los Rios properties, Wildlife Area staff has creatively incorporated agriculture into the management of the Area. Agricultural operations are expected to continue to have a significant presence at the Yolo Bypass Wildlife Area.

Flooding Effects on Agricultural Operations

Late spring flooding in the Bypass has a substantial detrimental effect on farming operations. Floods affect crops in a variety of ways. Floods in April–June can damage or destroy crops planted during dry periods in March–May. When this flooding happens, it is usually too late to replant those fields with a different crop. If the ground remains too wet to work until May or June, the shortened season results in limited crop options and decreased yields (Yolo Basin Foundation 2001). The reduction of agricultural productivity on the Wildlife Area translates into a reduction of income generated for the management of the Wildlife Area.

Flooding Effects on Infrastructure

The maintenance of infrastructure, including roads, canals, drainage ditches, diversion structures, pumps, and wells, is done on an as-needed basis, often in response to flood damage. Roads are sometimes eroded and require regrading or rebuilding. Some canals and ditches fill with sediment deposited from floods and require periodic excavation to maintain necessary flow capacity. East-west trending canals and ditches often create eddies and other hydraulic disturbances that can cause erosion and deposition of sediments and deposition of flood debris, such as tree limbs, agricultural vegetation, and irrigation pipes, in fields and canals. Such debris conditions can necessitate extensive cleanup efforts (Yolo Basin Foundation 2001).

4.1.2 PUBLIC USE

The following public activities are entirely compatible with the ecosystem restoration goals of the Yolo Bypass Wildlife Area and the flood control function of the Yolo Bypass.

ENVIRONMENTAL EDUCATION AND INTERPRETATION

The Yolo Bypass Wildlife Area, in partnership with the Foundation, supports popular and extensive environmental education and interpretation programs. Field trips for classes ranging from local elementary schools to area colleges and universities allow for a “hands-on” appreciation of the ecosystem including wildlife, fisheries resources, vegetation, cultural resources, agriculture and flood hydrology.

Each year, through the Discover the Flyway school program, the Foundation trains hundreds of teachers and hosts over 4,000 K–12 students and parents from Sacramento, Solano, Yolo, Placer and El Dorado counties. Since the program began in 1997 over 20,000 students have had the opportunity to visit the Yolo Bypass Wildlife Area through this program. Foundation and DFG staff, interns and volunteers assist students in hands-on learning activities as they lead students on exploratory Yolo Bypass Wildlife Area walks (Yolo Basin Foundation and California Department of Fish and Game 2007).

Unique education programs like Marsh Madness, which targets underserved schools, and Nature Bowl are also offered. In addition, the Foundation provides community programs such as the Flyway Nights speaker series, and monthly tours of the Yolo Bypass Wildlife Area. The Yolo Basin Foundation is the sponsoring non-profit organization for California Duck Days. It publishes the Yolo Flyway newsletter and brings wetlands education to the classroom with the Wild About Wetlands kits. The Yolo Bypass Wildlife Area partnership with the Yolo Basin Foundation and support of environmental education programs will continue to be a priority and is memorialized in a Memorandum of Understanding (see Appendix D). An document was recently prepared by the Foundation and DFG that identifies the history and overview of programs in the Wildlife Area (Yolo Basin Foundation and California Department of Fish and Game 2007) (see Appendix E).

Pacific Flyway Center

The proposed Pacific Flyway Center, initiated and coordinated by the Foundation in partnership with DFG and WCB, would be a unique visitor and education center located on a 69-acre site in the Yolo Bypass Wildlife Area outside of the SRFCP levees. This facility would allow the Foundation's and DFG's educational and public outreach programs to expand to meet the needs of future generations.

The proposed Pacific Flyway Center would be a 12,000 square foot educational facility that would serve as the new headquarters of the Yolo Bypass Wildlife Area, while hosting 5,000 school children a year who would learn about the Pacific Flyway. The Flyway Center would highlight the Yolo Bypass Wildlife Area and utilize the management of this area to illustrate the mission of the DFG. A central theme of the programming for this project would be the value of wetlands in the Central Valley as a critical component of the Pacific Flyway. Farming for both people and wildlife would be highlighted as a critical habitat component of the area as well as for its tremendous economic value. The building would contain exhibition spaces, meeting rooms, site observation areas, multipurpose educational facilities, and parking. A separately funded adjacent 45-acre restored habitat area would serve as an "outdoor classroom" complimenting the educational function of the Pacific Flyway Center building.

HUNTING

Hunting has historically been a popular seasonal use of the Yolo Bypass Wildlife Area. There is approximately 5,000 acres currently open for hunting; principal game species include several species of ducks and geese, ring-necked pheasants, and mourning doves. The public hunting program includes accessible hunting facilities (e.g., roads and blinds) and a junior hunt program for kids. The hunting season runs from the opening of dove season (i.e., September) through January (or flood inundation). The Yolo Bypass Wildlife Area currently has a daily capacity ranging from 35–75 hunters in the free roam area (depending on acreage flooded and local agricultural activities), plus assigned blinds. The Yolo Bypass Wildlife Area currently manages a total of 16 blinds in the Northeast Unit (see Exhibits 2-1 and 3.7-2).

Much of the Yolo Bypass Wildlife Area is closed to all non-hunting purposes from two weeks before waterfowl season to one week after waterfowl season. Areas designated for wildlife viewing purposes are open on most days throughout the year. Travel is restricted to designated roads and parking lots. Roads may not be passable for large vehicles such as motor homes, and such vehicles are not permitted. Bicycles and hunting dogs are allowed in the hunting areas during hunting season.

Opportunities for increases in blinds and expansion of designated hunting areas exist in limited areas throughout the Yolo Bypass Wildlife Area and will be developed as funding for their construction, operation, and maintenance becomes available. Currently one blind is available with Americans with Disabilities Act (ADA) access for limited mobility hunters.

FISHING

Fishing in the Yolo Bypass Wildlife Area focuses on the adjoining East Toe Drain, although there are potential additional fishing opportunities in Green's Lake, Putah Creek, and permanent wetlands (see Exhibits 2-1 and 4.1-2). Fishing for sturgeon, striped bass, black bass, bluegill, green sunfish, and catfish in the East Toe Drain tends to attract the most interest. The Yolo Bypass Wildlife Area has limited opportunities for "walk-in" fishing; most activity is on the Toe Drain from the east levee of the Sacramento River Deep Water Ship Channel outside of the Yolo Bypass Wildlife Area boundary. Access to fishing opportunities will continue to be provided. There are additional opportunities to install ADA–accessible fishing piers at select locations along the East Toe Drain, including sites accessible only from West Sacramento.

HIKING

While hiking opportunities are limited at the Yolo Bypass Wildlife Area, due to sensitive habitats and agricultural operations, there are opportunities available along wildlife viewing tour routes and in the grassland areas of the Tule Ranch Unit (see Exhibit 2-1 and 3.5-1). All trails are located on the crest of berms created for the impoundment of water in managed wetlands. The attractiveness of hiking is greatly enhanced by the opportunity for wildlife viewing and general appreciation of the beauty of the expansive basin. There is a popular hiking trail connecting parking lot B and C. Another trails leaves from lot D. Miles of hiking routes are available from lot F except during hunting season. Trails are not paved and often are not graveled as well.

WILDLIFE VIEWING

The opportunity for wildlife viewing is substantial. The rich environment of seasonal and permanent wetlands, agricultural fields, upland grasslands, vernal pools, and riparian forest supports a very wide range of wildlife species. The potential for bird watching is especially great due to the wide variety of and abundance of avian species that frequent the area in different seasons. Opportunities exist to expand and create new wildlife viewing tour routes that would expand wildlife observation options in the Yolo Bypass Wildlife Area. Wildlife viewing accessibility is seasonal in many areas, essential to avoiding conflicts with hunters, livestock, and agricultural activity. It is possible to provide some limited bicycle access for wildlife viewing purposes.

PHOTOGRAPHY

The Yolo Bypass Wildlife Area offers opportunities for photography of wildlife species and the general environment. The expansive mosaic of habitats and abundant wildlife provides a substantial and diverse range of photographic possibilities. The potential exists to develop photographic blinds for public use.

OTHER PUBLIC USES

The public-outreach component of the planning process identified interest in several other public use considerations, including:

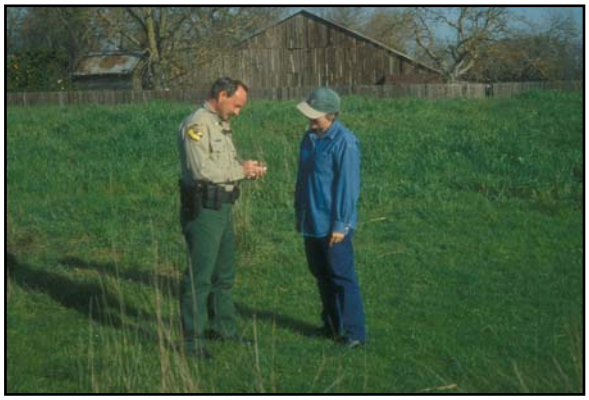
- establishing equestrian trails,
- establishing an access route from West Sacramento,
- allowing bicycle access and establishing connections with regional bicycle-trail planning efforts, and
- allowing overnight camping.

The potential for the use of portions of the Yolo Bypass Wildlife Area for these recreation uses was reviewed. It was determined that regional equestrian trails could pass through the area but horse riding would not be considered a primary recreational activity at the Yolo Bypass Wildlife Area. Additional bicycle access uses could potentially be accommodated and they may be considered on an individual basis. These types of uses would likely require the establishment of a partnership with another agency for development and operation of such facilities. The DFG is happy to consider involvement in regional trail planning efforts but will not take the lead on such efforts. Overnight camping is currently not being allowed because of the flood hazards inherent in a flood control channel.

Other public-use options were evaluated as part of the planning process but were determined to be incompatible with the Yolo Bypass Wildlife Area for various reasons. These included:

- off-road vehicle use - potentially detrimental to the unique and sensitive habitat and the wildlife resource;
- buildings - not physically suitable to the frequently flooded environment;
- unlimited equestrian and bicycle use - potentially detrimental to the unique and sensitive habitat and the wildlife resource;
- dog trials - incompatible with Wildlife Area purpose;
- parachuting - potentially detrimental to the unique and sensitive habitats and the wildlife resource; and
- developed park and sports facilities – incompatible with DFG mission.

4.2 WILDLIFE AREA REGULATIONS



The regulations guiding public use of the Yolo Bypass Wildlife Area are provided in Title 14 (“Natural Resources”) of the California Code of Regulations. Division 1 of Title 14 includes regulations that have been formally adopted by the California Fish and Game Commission, reviewed and approved by the Office of Administrative Law, and filed with the Secretary of State. The current regulations applicable to the Yolo Bypass Wildlife Area include Regulations for General Public Use Activities (Section 550), which are applicable to all wildlife areas. They also include Hunting, Firearms, and Archery Equipment and Permit Requirements (Section 551), which contain hunting regulations that relate to all wildlife areas as well as use regulations that apply specifically to the Yolo Bypass Wildlife Area. In addition, standard hunting and fishing regulations apply to the Yolo Bypass Wildlife Area.

Although the regulations that govern public use of the Yolo Bypass Wildlife Area are expected to change over time, a summary of the current regulations is provided to inform the reader about the current situation. The following summary of the regulations that apply to the Yolo Bypass Wildlife Area does not reflect all requirements in detail. The most current and complete regulations should be consulted for any determination related to the use of the Yolo Bypass Wildlife Area.

4.2.1 GENERAL PUBLIC-USE ACTIVITIES

These general requirements set basic standards for protection of all wildlife areas and protection of public safety. The Regional Manager has authority to establish additional regulations for wildlife areas that are not otherwise provided in Sections 550 and 551. The following regulations for general public-use activities are currently applicable to all wildlife areas, including the Yolo Bypass Wildlife Area. Where regulations require a specific action by DFG to be applicable, the status of any such action is noted in italics.

- DFG may specify entry locations, limit entry, or close wildlife areas to protect resources or public safety. Specified public notice is required of such entry limitations or closure. Entry locations, limitations, and closures have been established and may vary depending on seasonal management activities and flood control/management conditions.

- Use permits are required for organized events or gatherings.

- Motor-driven vehicles are not permitted except on public roads, parking areas, or other routes designated by DFG.

- Trailers are not permitted on the Yolo Bypass Wildlife Area

- Drivers must comply with all posted traffic signs.

- DFG may restrict the use and operations of boats in Yolo Bypass Wildlife Area waterways.

- Certain activities are not permitted for the protection of the Yolo Bypass Wildlife Area and protection of public safety. These prohibited uses include:

    - damage or removal of property owned by others;
    - deposit of litter, rubbish, toxic substances, or other materials;
    - damage to plant materials;
    - removal of soil, sand, gravel, rock, etc.;
    - collection, disturbance, or removal of bottles or other artifacts;
    - livestock grazing, except by lease; Existing leases for grazing and farming have been maintained
    - taking fish or frogs for commercial purposes.

- Hunting and fishing are permitted subject to regular open seasons and regulations and the special provisions of Section 551.

- Dogs are allowed only for hunting or only when under immediate control. DFG may prohibit or restrict the use of dogs (with the exception of assistance dogs).

- DFG may eject a person from the Yolo Bypass Wildlife Area for specified reasons.

- Users are responsible for knowing area-specific regulations in Section 550.

- Access to the Yolo Bypass Wildlife Area is closed between sunset and sunrise.

- Access to the Wildlife Area is closed when the Fremont Weir spills and/or when the Area is flooding from other local sources.

4.2.2 HUNTING, FIREARMS, AND ARCHERY EQUIPMENT AND PERMIT REQUIREMENTS

This section contains general regulations related to hunting and firearms that apply to wildlife areas in general. It also contains specific regulations that apply to the Yolo Bypass Wildlife Area. These specific regulations are in addition to the other requirements of Sections 550 and 551. They are intended to respond to the unique characteristics of the Yolo Bypass Wildlife Area. The general regulations applicable to all wildlife areas include:

- Raptors may be used to take legal game in accordance with general hunting regulations.
- Possession and use of firearms and archery equipment is permitted only for hunting purposes.
- Hunting Regulations for Waterfowl, Upland Game, and State and Federal Areas that apply to the Yolo Bypass Wildlife Area can be obtained from:

  California Fish and Game Commission
  1416 Ninth Street
  Sacramento, California 95814
  Online at: http://www.fgc.ca.gov/html/regs.html

As previously noted, it is anticipated that the current regulations will change in the future as DFG continues to monitor the public use of the Yolo Bypass Wildlife Area and proposes appropriate responses to changed circumstances.

4.3 COORDINATION TO SUPPORT RESOURCE MANAGEMENT AND PUBLIC USE

Because the Yolo Bypass Wildlife Area is part of a mosaic of publicly managed habitat within the larger Yolo Bypass, coordination with other agencies is a key to providing the best and most cost effective resource management and public-use opportunities in the Yolo Bypass Wildlife Area and throughout the Yolo Bypass in general. While the various agencies have different functional niches and procedures, a cooperative environment has been established through an inclusive approach to both the creation and management of the Wildlife Area by the Foundation and DFG. This environment has been maintained by the scope and tone of the Yolo Bypass Working Group meetings. Additional technical work groups have also been established to focus on more specialized topics (e.g., hydraulic, fisheries resources). The need for a permanent management-coordination organization has not been established.

Coordinated planning and regulatory consistency is an important objective for the Yolo Bypass Wildlife Area. This includes coordinated flood management and control, resource and agricultural management planning, and consistency between the public use regulations that currently apply to the Yolo Bypass Wildlife Area. Coordination with the Sacramento Yolo Mosquito and Vector Control District is very important as control of mosquitoes, especially with the arrival of West Nile virus, is crucial due to the proximity of a large urban population. Coordinated planning also includes being consistent with the regulations that govern the public use of other publicly and privately managed properties. The development of a comprehensive planning effort for the entire Yolo Bypass offers the opportunity to make resource management and public use of the Yolo Bypass Wildlife Area and the Yolo Bypass as a whole as seamless as possible. Support for this type of effort is incorporated into this LMP. As with any relationship, communication is the vehicle by which cooperation is achieved. Management of the Wildlife Area will continue to speak frequently with flood protection and vector control personnel, local farmers, and other resource management agencies on a daily basis.

4.4 SUPPORT OF RESOURCE ENHANCEMENT AND PUBLIC USE

As the population of Yolo, Sacramento, and Solano counties, which surround the Yolo Bypass Wildlife Area, and of California in general continues to increase, the demand for public recreation use will continue to grow. With increased access and use, stresses placed on natural resources of the Yolo Bypass Wildlife Area will likely also increase. This LMP anticipates the opportunities and issues that may arise and identifies the management actions that will be required to address them to adequately support compatible resource enhancement and public recreation use of the Yolo Bypass Wildlife Area. A complete program of goals and follow-up tasks to achieve the goals is contained in Chapter 5.

4.4.1 REGULATION ADJUSTMENTS

As the circumstances surrounding the Yolo Bypass Wildlife Area change over time, adjustment of the regulations that govern public uses may be required. The revision of these regulations requires approval of the California Fish and Game Commission. A review of the regulations by Yolo Bypass Wildlife Area management staff every three years coincides with the review cycle of the Fish and Game Commission and is appropriate to ensure that regulations remain current.

4.4.2 PUBLIC INFORMATION

A common theme raised during public outreach for the Yolo Bypass Wildlife Area LMP was that additional information sharing is needed to enable people to make better use of the Yolo Bypass Wildlife Area for compatible recreation uses. Information to improve public knowledge of resource management and public-use opportunities in the Yolo Bypass Wildlife Area should be a coordinated effort among DFG, the Foundation, and other public land management agencies and organizations. It should include:

- online information regarding public access locations, compatible resource management, and public use opportunities;
- a hard-copy brochure and posted maps to identify public-access lands and compatible public uses throughout the Yolo Bypass Wildlife Area; and
- a signage program for improving public access and identifying Yolo Bypass Wildlife Area key regulations.

4.4.3 COORDINATED ECOSYSTEM RESTORATION EFFORTS

The Yolo Bypass Wildlife Area LMP is based on an ecosystem approach to habitat management consistent with the principles of the CALFED ERP. Although the Yolo Bypass Wildlife Area is not managed specifically for any special-status species, this LMP is intended to contribute to the recovery of special-status species as well as the maintenance of other native and game species using specific management techniques along with natural processes to create a sustainable system over the long term (refer to Appendix B, “Yolo Bypass Wildlife Area–Related Targets and Programmatic Actions from the CALFED Ecosystem Restoration Program Plan”). In addition to CALFED, the Yolo Bypass Wildlife Area is committed to coordinated ecosystem restoration efforts with other organizations throughout the Yolo Bypass and in the region.

4.4.4 REGIONAL TRAIL CONNECTIONS AND ACCESS IMPROVEMENTS

Improved and expanded trail connections and public access opportunities are needed to support regional planning efforts and compatible public uses. This need was commonly expressed as part of public-outreach meetings that were included in the planning process. Consistent with the purposes of this LMP, improvements should include:

- additional land access points where a substantial public-use potential exists;
- low impact parking areas and pedestrian use of low impact access roads at key locations; and
- incorporation of access roads and/or trails in future restoration project areas, when compatible.

The primary purpose of the Yolo Bypass Wildlife Area is the conservation of habitat for wildlife, and very limited public access improvements are proposed. The Yolo Bypass Wildlife Area is composed of frequently flooded property with sensitive habitats and agricultural leases, and access is limited in this area. In compliance with applicable state and federal laws, DFG will accommodate the accessibility of the Wildlife Area for persons with disabilities, including potential planned facilities. To fully support compatible public uses and concurrently protect habitat and wildlife resources, designated staffing and an operations and maintenance budget will be required.

4.4.5 COOPERATION WITH STAKEHOLDERS

During the public-outreach component of the planning process, stakeholders expressed concerns that resource management and public use of the Yolo Bypass Wildlife Area could result in effects on adjoining lands. In response to these concerns, Chapter 5 includes a number of strategies to mitigate the types of concerns that were raised.

These actions will include direct communication with neighbors, continued communication through the Working Group, signage throughout the Yolo Bypass Wildlife Area, access controls, and coordinated management of existing lands and design of future restoration projects.

5 MANAGEMENT GOALS

The goals in this chapter provide broad guidance for management and are accompanied by practical tasks intended to achieve the goals. The central focus of this Land Management Plan (LMP) is the use of an ecosystem-based approach to management of the diverse mosaic of managed and natural habitat communities in the Yolo Bypass Wildlife Area (Wildlife Area). The goals are drawn from nine years of adaptive management and the information generated through the planning process, and express the direction that ongoing operation of the Yolo Bypass Wildlife Area will take. It is important to note, however, that implementation of many of the tasks identified in this plan is dependent upon having adequate staff and operations and maintenance budget. Thus, additional Wildlife Area personnel and budget are required to accomplish the tasks identified in this chapter. These personnel needs are described in Chapter 6, "Operations and Maintenance."

The management goals and tasks described in this chapter were evaluated for their potential impact on the environment in accordance with the provisions of the California Environmental Quality Act (CEQA). An Initial Study was prepared in accordance with the State CEQA Guidelines, which is included as Appendix H. This Initial Study concluded that this LMP, as proposed, would not have a potentially significant impact on the environment. Accordingly, a proposed Negative Declaration finding that the project will not have a potentially significant impact on the environment has been prepared.

The CEQA document analyzes impacts resulting from the programmatic implementation of this LMP. The details of specific projects that may be developed consistently with this LMP are not yet known. Any future projects that may involve environmental effects will need to be evaluated in light of the IS/ND to determine if additional project-specific CEQA analysis is necessary. The type of additional CEQA review completed would be determined based on CEQA Guidelines Sections 15162–15164. Permits, consultations and/or approval actions may also be required to approve specific future projects. Examples of potential future permit requirements include the following:

- U.S. Fish and Wildlife Service (USFWS) – federal Endangered Species Act (ESA) consultation and issuance of take authorization;
- National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS) – federal Endangered Species Act consultation and issuance of take authorization;
- U.S. Army Corps of Engineers (USACE) – Section 404 Clean Water Act (CWA) permit for discharge or fill of waters of the U.S., Section 10 Rivers and Harbors Act permit for work in navigable waters of the U.S., approval of modification of USACE levees;
- California Department of Fish and Game (DFG) – internal consultation regarding California Endangered Species Act (CESA) compliance and streambed alteration agreement (Section 1602 of DFG Code);
- California Department of Water Resources (State Reclamation Board) – encroachment permit to work on or adjacent to levee and in designated floodways, approval/authorization of new or restored levees;
- California State Lands Commission – consultation/permit regarding possible secondary impacts to surrounding lands underlying rivers and streams; and

- Regional Water Quality Control Board – National Pollutant Discharge Elimination System construction stormwater permit (Notice of Intent to proceed under the statewide General Construction Permit), potential discharge permit for wastewater, general order for dewatering, CWA Section 401 clean water certification if Clean Water Act (CWA) Section 404 permit is required or if isolated wetlands subject to the Porter-Cologne Act will be affected.

Prior to ground disturbance in areas that have experienced development or disturbance and could contain hazardous materials, a hazardous materials assessment will be conducted. If hazardous materials are detected, the appropriate agencies or companies will be consulted to ensure that people and the environment are not exposed to hazardous materials.

Habitats are managed in accordance with the operations and maintenance manual for the project modifications (as updated in supplement, U.S. Army Corps of Engineers 2003) to the Sacramento River Flood Control Project, and pursuant to the MOU between DFG, State Reclamation Board, USFWS, and DWR regarding threatened and endangered species.

5.1 DEFINITION OF MANAGEMENT TERMS

This LMP has been developed in accordance with the California Department of Fish and Game's (DFG's) *Guide and Annotated Outline for Writing Land Management Plans*, February 2003 (updated 2006) (California Department of Fish and Game 2003, 2006). The Guide organizes management information and guidelines into elements, goals, and tasks, establishing a hierarchy of management direction for the Yolo Bypass Wildlife Area. Elements relate to the broad categories of consideration, goals define objectives within the elements and tasks establish specific actions to attain the goals. Goals are based on the Fish and Game Code, policies of the California Fish and Game Commission, and the goals and objectives of the CALFED ERP (for which DFG is an implementing agency). In addition, it is the policy of the California Fish and Game Commission to protect and preserve all native species diversity including those species experiencing a significant decline that, if not halted, would lead to their designation as threatened or endangered. Similarly, the goals of the CALFED ERP include achieving the recovery of at-risk native species that depend on the Delta and reversing downward population trends of native species that are not listed. Together these elements, goals, and tasks express the policy direction that will guide the management of the Yolo Bypass Wildlife Area.

A terminology for describing management is part of DFG's standardized format for management plans. The terms defined below are used throughout this LMP to describe the current and planned management of the Yolo Bypass Wildlife Area.

ELEMENTS

- An **element** is any biological unit, public-use activity, facility maintenance program, or management coordination program (as defined below) for which goals have been prepared and presented within this LMP.

- The **biological element** refers to ecosystems for which specific management goals have been developed within this LMP.

- The **agricultural resources element** refers to agricultural activities.

- The **public-use element** refers to recreational and other public uses.

- The **cultural resources element** refers to preservation of cultural resources.

- The **facility maintenance element** refers to the program of maintenance and administrative tasks that supports the attainment of goals for the biological and public-use elements.

- The **scientific research and monitoring element** refers to scientific research and monitoring that supports the attainment of goals for the biological and public-use elements.
- The **fire management element** refers to the planning and implementation of fire management that supports the attainment of the goals for the biological and public use elements.
- The **management coordination element** refers to coordination with management programs that are supportive of and compatible with the activities of other public agencies.

GOALS

- A **biological goal** is a statement describing management and its intended long-term results for a biological element.
- An **agricultural resources goal** is a statement describing management and the resulting type and level of agricultural activities for the agricultural element.
- A **public-use goal** is a statement describing management and the resulting type and level of public use (which is intended to be compatible with the goals for biological elements).
- A **cultural goal** is a statement describing management and its intended results for a cultural resources element.
- A **facility maintenance goal** is a statement describing management and the resulting type and level of facility maintenance (which is intended to support attainment of the goals for the biological and public-use elements).
- A **scientific research and monitoring goal** is a statement describing management of procedures for or types of scientific research and monitoring conducted at Yolo Bypass Wildlife Area.
- A **fire management goal** is a statement describing a desired component of fire management planning and coordination of activities occurring before, during, or after fires.
- A **management coordination goal** is a statement describing the desired type and level of management coordination activities that are required to achieve the biological element and public use goals previously specified within this LMP.

TASKS AND ADAPTIVE MANAGEMENT

- **Tasks** are individual projects or work elements that implement the goals and are useful in planning operation and maintenance budgets.
- **Adaptive management** is a dynamic strategy in which management efforts are monitored regularly to assess their status and effectiveness. Monitoring results are then evaluated and used to update management goals and implementation strategies (i.e., tasks). An adaptive management strategy has been applied to all elements within this LMP.

5.2 GOALS AND TASKS FOR ELEMENTS

Elements, goals and tasks are described here in detail. The accompanying chart of assigned staff hours necessary to complete these tasks are described in chapter 5. This chart summarizes many of these tasks and is therefore not an identical task list.

5.2.1 BIOLOGICAL ELEMENTS

White-faced Ibis at sunrise

The biological elements of the Yolo Bypass Wildlife Area include management for species guilds and natural communities. The species guilds have been grouped into nine sub-elements: waterfowl, shorebirds and wading birds, upland game species, raptors, cavity-nesting birds, neotropical birds, other waterbird species, special-status species, and nonnative species not beneficial to wildlife.

A more general discussion of the natural communities of the Yolo Bypass Wildlife Area have been grouped into five sub-elements: seasonal and permanent wetlands, agriculture, riparian, grasslands, upland, and aquatic ecosystems. Each of these sub-elements has its own set of goals and tasks. These sets of goals and tasks are not focused on particular species of plants and animals, but instead are more broadly focused on achieving ecosystem level benefits. More specifically, these are intended to create, maintain and enhance wetlands, agricultural lands, riparian areas, grasslands and uplands, and aquatic ecosystems to sustain habitats for native plants and animals and provide other desired ecosystem services. At all times these habitats are to allow for necessary conveyance of flood flows. Chapter 3, “Environmental Setting,” contains additional information regarding biological resources within the Yolo Bypass Wildlife Area.

At the Yolo Bypass Wildlife Area, there are opportunities to manage for species guilds and maintain, enhance, and/or restore all of these natural communities, including those that provide habitat for special-status and game species. These opportunities include:

- maintenance, enhancement, and/or restoration of communities for use by:
    - large numbers of wintering waterfowl by propagating adequate food supplies and presenting them appropriately at the appropriate time;
    - breeding waterfowl by providing nesting cover and appropriately spaced brood water;
    - shorebirds and wading birds, including both migratory and resident species, by propagating adequate invertebrate food supply, and providing appropriate water depths for foraging activities throughout the year;
    - breeding shorebirds and wading birds including avocets, stilts, phalaropes, killdeer, rails, ibis, black crowned night herons, moorhens, great blue herons, and snowy and great white egrets by providing appropriate nesting habitat;
    - a variety of other resident and migratory species including raptors, grebes, loons, rails, and songbirds;
    - ground nesting birds such as meadowlark, short-eared owls, harriers, and terns by providing adequate cover and prey base;
    - cavity-nesting birds, such as kestrels, tree swallows, and wood ducks by providing large trees for nesting or nest boxes;
    - neotropical migratory birds by providing riparian habitat when appropriate;

- management of seasonal and permanent wetlands, and agricultural lands to minimize mercury methylation as prescribed by the most current research - monitoring of mercury levels within wetland units will judge effectiveness and direct adaptive management;

- management of seasonal and permanent wetlands and agricultural lands to minimize mosquito populations and outbreaks of disease through implementation of agreed upon "best management practices" as described in Kwasny et.al. (2004);

- management of agricultural lands to generate critical income for the operation of the Wildlife Area while utilizing agriculture as a wildlife management tool, providing important wildlife habitat values;

- maintenance, enhancement, and/or restoration of seasonal and permanent wetland, vernal pool and grassland, and riparian communities;

    - management activities to support all vernal pool species including special-status plant species including Ferris' milk-vetch, alkali milk vetch, Baker's navarretia, Heckard's pepper-grass, and potentially suitable habitat for nearly two dozen other special-status plants. Management activities will follow accepted scientific principles and may include selective use of herbicides, appropriate grazing practices, and the ecological use of fire. Translocation of plants or their introduction to the Wildlife Area will follow scientific precepts and hypothesis testing;

    - management activities to support the distribution, among all Yolo Bypass Wildlife Area habitats, 46 special-status and priority wildlife and fish species identified in the CALFED Bay-Delta Program (CALFED) *Multi-Species Conservation Strategy (MSCS)*, and the presence of potentially suitable habitat for eight additional special-status wildlife and fish species (among the special-status wildlife occurring in the Yolo Bypass Wildlife Area are five vernal pool crustaceans, giant garter snake, northwestern pond turtle, Swainson's hawk, burrowing owl, loggerhead shrike, tricolored blackbird, American white pelican, Chinook salmon, steelhead, and Sacramento splittail);

- management activities to support the presence of a breeding colony of more than 100,000 Mexican free-tailed bats and other bat species;

- restoration and enhancement of freshwater tidal marsh adjacent to the East Toe Drain below Lisbon Weir;

- restoration and enhancement of Putah Creek and associated aquatic habitats and ecological processes in the seasonal floodplain by creating a south flowing channel alignment from the creek through the sinks of the Tule Ranch and entering the East Toe Drain in a tidal area south of Lisbon Weir; and

- enhancement of habitats through removal and management of nonnative invasive species that do not benefit wildlife species or that impact special status plants.

There are also a number of important constraints on the management of the Yolo Bypass Wildlife Area's biological element. These constraints include:

- Seasonal flooding resulting from the operation of regional flood control systems and overflow from local creeks and sloughs;

- availability of staff and funding;

- the need to ensure compatibility of biological resource management activities and floodwater conveyance including management of emergent vegetation;

- the need to ensure compatibility of biological resource management activities and public uses;

- human disturbance to wildlife habitat or agricultural operations;
- vector management (i.e., mosquito control) requirements;
- adverse effects of spring flooding on management and operations, wildlife nesting, and farming;
- potentially inadequate water quantity available for summer irrigation;
- methylation of mercury in wetlands and agricultural lands; and
- potential management conflicts between agricultural practices and wildlife management activities and the ecological requirements of special status plant and animal species.

Chapter 3, "Environmental Setting," contains additional information regarding biological resources within the Yolo Bypass Wildlife Area.

5.2.1.1 MANAGEMENT FOR SPECIES GUILDS

The Yolo Bypass Wildlife Area is one of the primary wintering, breeding, and migratory stopover areas along the Pacific Flyway. The Wildlife Area supports vast numbers of birds on a year-round and seasonal basis. The broad diversity of species guilds supported by the Yolo Bypass Wildlife Area is tied, in part, to the diversity of communities that provide habitat within the Wildlife Area. These managed communities, which include seasonal and permanent wetlands, agricultural fields, riparian woodlands, and grasslands provide a diverse matrix of nesting and foraging habitats for several guilds and support a rich assemblage of terrestrial and aquatic invertebrates as well as cultivated crops and natural vegetation that form the forage base for shorebirds and wading birds, waterfowl, upland game species, raptors, cavity-nesting birds, neotropical migratory birds, and a variety of other waterbirds.

In recognition of the vital habitat values provided by the Yolo Bypass Wildlife Area, the National Audubon Society has named it a Globally Important Bird Area. As California's Great Central Valley continues to grow and natural areas are converted to housing and commercial developments, the importance of large, contiguous areas with a diverse variety of habitats such as the Yolo Bypass Wildlife Area will increase. To preserve these values, the YBWA is managed using an ecosystem approach to benefit the full suite of wildlife guilds utilizing the wildlife area as opposed to a management approach focused on a single species or single group of species.

The Species Guilds sub-element includes goals for management of multiple communities to provide habitat and benefit several guilds of bird species. An additional goal is also provided for the Mexican free-tailed bat colony present under the Yolo Causeway. These goals are based on the stated purpose of land acquisition by the Wildlife Conservation Board (WCB) (Wildlife Conservation Board 2001); on the CVHJV's habitat restoration goals under the North American Waterfowl Management Plan (NAWMP); and on the California Fish and Game Code, the policies of the California Fish and Game Commission, and the goals and objectives of the CALFED Ecosystem Restoration Program (ERP) (for which DFG is an implementing agency).

These tasks are based on nine years of experience in adaptively managing these communities on the original 3,700-acre Yolo Bypass Wildlife Area and five years of managing the newly acquired Glide and Los Rios properties. Actions proposed must comply with the federal and California Endangered Species Acts (ESA and CESA) and other regulations aimed at the protection of special-status species and sensitive habitats, including the current Memorandum of Understanding (MOU) with the U.S. Fish and Wildlife Service (USFWS), California Department of Water Resources (DWR), and the State Reclamation Board regarding the management of special-status species at the Yolo Bypass Wildlife Area.

Wetland management techniques are built upon the prescriptions as described in *"A Guide to Wetland Habitat Management in the Central Valley"* (California Department of Fish and Game 1995) and have been adapted to

specific environmental conditions within the Yolo Bypass and the need to remain compatible with the flood control function of the Yolo Bypass.

Northern Pintail

Species Guilds Goal 1 (SG-1): *Manage and maintain habitat communities for waterfowl species.*

A significant feature of the Yolo Bypass Wildlife Area is the abundance and variety of wintering waterfowl that migrate down the Pacific Flyway each year. Waterfowl populations are a highly valued and diversified biological resource. Large numbers of ducks, geese, and swans winter in the Wildlife Area after migrating from northern breeding areas. Abundant species include northern pintails, northern shovelers, mallards, gadwalls, American wigeons, cinnamon and green-winged teals, scaups, ring-necked ducks, snow gees, tundra swans, and white-fronted geese. Some species, such as mallards, cinnamon teal, gadwalls, and Canada geese, are also yearlong residents and breed locally in wetlands and nearby uplands. Waterfowl are a significant component of the Wildlife Area, and are of high interest to recreational hunters and bird watchers.

A peak in the number of waterfowl in the Wildlife Area occurs in December–April, when large numbers of species in this guild are present and seasonal wetlands are flooded. A secondary peak in summer correlates with the presence of breeding ducks that nest throughout the Wildlife Area, primarily mallard and cinnamon teal. During periods of water inundation in the Bypass, diving species such as canvasaback, scaup, and goldeneye can be present in significant numbers.

The propagation of beneficial plants and subsequent fall flooding of seasonal wetlands is the primary wetland management strategy in the Yolo Bypass Wildlife Area for migratory waterfowl. The post harvest flooding of agricultural crops, primarily rice, has effectively attracted thousands of wintering waterfowl to the Yolo Bypass Wildlife Area. Grazing, upland cover plantings, and the maintenance of properly spaced brood ponds are some strategies used for nesting waterfowl. In addition, agricultural activities provide high quality habitat for species in this bird guild.

The tasks listed below identify specific management activities intended to benefit resident and migratory waterfowl species.

Tasks:

1. Manage seasonal and permanent wetlands and other communities to provide habitat for resident waterfowl species.

    a. Draw down flooded seasonal wetlands in the spring (April 1) to promote growth of swamp timothy as a forage crop.

        i. include summer irrigation (as necessary) throughout 33% of the seasonal wetlands in order to increase seed yield, stimulate germination and propagation of water grass and provide foraging opportunities for Swainson’s hawk.

    b. Disc, mow, burn, and/or graze vegetation as necessary to promote desirable species, eliminate species not valuable for wildlife (e.g., cocklebur), promote a higher quality seed bed for the following year and to maintain required ratios of open water and emergent vegetation after fall flood up.

    c. Maintain shallowly flooded shorebird management areas in August to attract early arriving waterfowl.

d. Flood seasonal wetlands beginning September 1 in anticipation of the arrival of migratory waterfowl.

e. Flood rice fields as early as possible after harvest is completed to attract migratory waterfowl.

f. Disc islands in seasonal wetlands prior to flood up in order to provide loafing areas for waterfowl and shorebirds.

g. Construct linear islands with disc ridger prior to flood up in order to increase loafing areas for waterfowl and shorebirds.

h. Maintain permanent ponds and other brood water at no more than one mile intervals to promote increased waterfowl chick survival in the Yolo Bypass Wildlife Area.

   i. Space managed brood waters at no more than one mile intervals.

   ii. Perform periodic irrigation in upland swales to increase brood water and promoted production of important prey species for waterfowl chicks.

2. Manage upland vegetation to provide desired nesting habitat.

   a. Plant fields of wheat combined with vetch to provide high quality nesting habitat the following year.

   b. Control invasive weeds such as perennial pepperweed and starthistle.

   c. Perform scattered irrigations in upland areas to increase humidity and subsequent invertebrate numbers for the benefit of ground nesting birds such as mallard and ring-necked pheasant. These irrigations must be conducted quickly and drained thoroughly to prevent production of large numbers of mosquitoes.

   d. Continue to enhance upland areas with the construction of topographic features such as swales to create microhabitats and more effectively move water on and off the field.

3. Maintain a sanctuary area where public access is prohibited in order to provide safe haven for migratory waterfowl.

   a. Flood sanctuary area within the month of September.
   b. Maintain permanent sanctuaries without changing locations.
   c. Do not consider non-hunting areas open for other public uses as sanctuary.

4. Monitor waterfowl populations periodically to assess management techniques and species response; apply adaptive management techniques as appropriate.

   a. Conduct monthly surveys of waterfowl numbers, twice monthly during the months of September through March.

   b. Acquire survey data collected by USFWS during annual mid-winter surveys.

   c. Conduct annual surveys of representative upland areas for nesting waterfowl.

American avocet, a common breeding species at the Yolo Bypass Wildlife Area

Species Guilds Goal 2 (SG-2): *Manage and maintain habitat communities for shorebird and wading bird species.*

The Yolo Bypass Wildlife Area has become one of the premier shorebird areas in the Central Valley. With managed seasonal wetlands providing shallow water, mud flats, and island mounds, and the development and implementation of a fallow shorebird management phase introduced to the rice rotation, hundreds of thousands of shorebirds and wading birds annually migrate through the Wildlife Area, spend the winter, and perhaps breed in the Yolo Bypass Wildlife Area. Some shorebird and wading bird species are year-round residents. Representative species of breeding shorebirds and wading birds include American avocets, black-necked stilts, spotted sandpipers, Wilson's phalarope (rarely), killdeer, pied-billed grebe, sora and Virginia rail, white-faced ibis, great blue heron, common moorhen, great and snowy egret, and black-crowned night heron. All of these species are a significant component of the Wildlife Area avifauna and are of high interest to recreational bird watchers.

Common wintering species include greater yellowlegs, dowitcher, least sandpiper, and black-bellied and semipalmated plover. During the late winter, these species are joined by dunlin, western sandpiper, and marbled godwit.

Habitat characteristics valuable for shorebirds when presented at the proper seasonal period and timing include:

- shallow open water with varied topography or a sloped pond bottom;
- a forage base of invertebrate populations, and dense concentrations of invertebrate prey necessary to feed shorebirds; and
- bare islands for roosting and nesting.

The tasks listed below identify specific seasonal management activities intended to benefit shorebird species. These techniques have been tested and adapted as needed on the 3,700-acre Yolo Bypass Wildlife Area over the last nine years.

Tasks:

1. Manage seasonal wetlands for shorebird species.

    a. *Spring:* Draw down flooded seasonal wetlands in spring (April 1) to promote growth of swamp timothy while providing important mudflat habitat for migratory and resident shorebirds. Provide bare islands for nesting which become raised mounds upon draw down. Water maintained in low lying swales will provide foraging areas for breeding shorebirds.

    b. *Summer:* Provide mudflat habitat in July and August during the peak of shorebird migration.

        1. Drain permanent wetlands in midsummer.

            a. Permanent wetlands are periodically drained in midsummer on a 4–6 year cycle in order to perform important vegetation control activities. When drained, open areas will contain concentrated numbers of fish and invertebrates, which will be available for consumption for a

large variety of water birds. Timing these draw downs with the arrival of migratory shorebirds in July will provide excellent shorebird foraging habitat.

2. Flood newly disced areas in July.

a. Areas can be opened up through burning, mowing, grazing, followed by discing and flooded for shorebird use.

3. Hold winter water until late drawdown in June.

a. While still experimental at this time, a June drawdown provides the required density of prey species but will also result in an increased amount of emergent vegetation and undesirable plant species such as cocklebur (*Xanthium* strumarium) and joint grass (*Paspalum distichum*). These areas also provide good brood water for waterfowl.

c. *Winter:* Flood and maintain shallow water for shorebird foraging. Maintain bare islands for loafing.

2. Manage agriculture for shorebird species through newly developed shorebird/rice rotation.

a. *June:* Prepare fallow rice field for planting, including rough discing, finish discing, land planning (if necessary), construction of contour ridges, and installation of water control structures.

b. *July 1:* Flood shallow unplanted rice fields which have been disced at least twice.

c. *July 1 through end of August:* Maintain shallow water.

d. *September 1:* Drain fields, disc weeds and prepare field for rice planting to occur in the following spring.

Black-necked stilts in fallow rice field managed for shorebirds

3. Monitor shorebird populations periodically to assess management techniques and species response; apply adaptive management techniques as appropriate.

4. Perform field preparation of some agricultural fields in the fall in order to present disced field habitat for species that utilize this habitat such as horned larks, longspurs, and mountain plover.

5. Provide staggered timing of rice shore bird rotation so that there are always some fields in the shorebird rotation.

Species Guilds Goal 3 (SG-3): *Maintain and enhance habitat for upland game species.*

Primary upland game bird species include mourning doves and ring-neck pheasants. Ring-necked pheasant numbers fluctuate in the Yolo Bypass based on the severity of flooding. Successive years without serious flooding result in spectacular numbers of pheasants. Tenant farmers grow fields of safflower that greatly benefit mourning dove with abundant foraging opportunities. Safflower is also left unharvested and mowed to provide additional foraging prospects for these species. These management strategies have resulted in improved upland game bird hunting throughout the Wildlife Area.

Ring-necked pheasant

Turkeys are a recent addition to the avifauna of the Yolo Bypass Wildlife Area. Found primarily moving up and down Putah Creek and adjacent agricultural fields, turkey may soon become a prominent fixture at the Wildlife Area and perhaps could be considered for inclusion in an upland game hunting program.

California quail are occasionally seen along Putah Creek and the Toe Drain. They are not expected to become common enough to include in an upland game hunting program.

The tasks listed below identify specific management activities intended to benefit upland game species.

Tasks:

1. On an experimental basis, dedicate two fields to provide all habitat requirements within discreet areas in accordance with Diverse Upland Habitat Unit (DUHU) techniques being developed on several state wildlife areas.

2. Annually plant nesting cover including legumes that will improve nesting habitat for upland game species.

3. Consider providing nesting structures for mourning dove.

4. Annually plant grain field to provide foraging areas for upland game and hunting opportunities for upland game hunters.

5. Control invasive weeds such as perennial pepperweed and starthistle.

6. Perform scattered irrigations in upland areas to increase humidity and subsequent invertebrate numbers for the benefit of ground nesting birds such as mallard and ring-necked pheasant. These irrigations must be conducted quickly and drained thoroughly to prevent production of large numbers of mosquitoes.

7. Continue to enhance upland areas with the construction of topographic features such as swales to create micro habitats and more effectively move water on and off the field.

Soaring Swainson's hawks

Species Guilds Goal 4 (SG-4): *Manage and maintain habitat communities for raptors.*

The Yolo Bypass Wildlife Area is a very important location for wintering birds of prey including white-tailed kites, rough-legged hawks, prairie falcons, merlins, peregrine falcons, kestrels, ferruginous hawks, barn owls, great horned owls, short-eared owls, northern harriers, and large numbers of red-tailed hawks. Breeding raptor species in the Wildlife Area include Swainson's hawks, red-tailed hawks, kestrels, northern harriers, white-tailed kites, barn owls, burrowing owls and great horned owls. Swainson's Hawks are especially abundant through much of Yolo County and the Wildlife Area lies in middle of an abundant local population. Over a dozen nests have been found on or adjacent to the Wildlife Area. Discing, mowing, and

summer irrigations attract large numbers of Swainson's hawks feeding on grasshoppers. Fall preparation of agricultural fields also attracts wintering raptors.

Discing often attracts several Swainson's hawks

Management strategies for raptors include optimizing foraging opportunities by managing for a food base consisting of rodents and large insects. Although rodent numbers are highly dependent on the timing, magnitude, and duration of flooding in the Yolo Bypass, they seem to quickly reinvade the floodplain. The propagation of grain fields increases local numbers of rodents, providing an increased prey base. Encouraging the proliferation of sweet clover and maintaining high humidity in pond/wetland bottoms helps to develop high grasshopper numbers, an important food item for Swainson's Hawks. Recent development of shorebird management areas has locally increased numbers of shorebird predators, including peregrine falcon and merlin.

The tasks listed below identify specific management activities intended to benefit these bird species.

Tasks:

1. Manage for rodents and large insects to provide adequate prey items in order to benefit foraging raptor species.

    a. Maintain moist pond-bottom conditions to promote the development of high grasshopper populations.

    b. Manage discing, mowing, and summer irrigation to attract large numbers of Swainson's hawks, which feed on grasshoppers.

    c. Manage fall flooding of agricultural fields to attract wintering raptors.

    d. Plant food plots that will not only provide food for birds, but rodents as well. Legumes and grain crops such as vetch, clovers, wheat, sunflower, milo, corn, and safflower are recommended.

    e. Consider the adverse effects of intentional spring flooding on rodent numbers and subsequent raptor use.

2. Monitor populations of raptors to assess management techniques and species response; apply adaptive management techniques as appropriate.

    a. Identify correlative factors such as Bypass flood dates, annual rainfall totals, or rodent numbers.

    b. Conduct bi weekly raptor surveys throughout the year.

Species Guilds Goal 5 (SG-5): *Manage and maintain habitat communities for cavity-nesting bird species.*

Cavity-nesting birds, such as kestrels, tree swallows, and wood ducks can be seen throughout the Wildlife Area. Providing nesting boxes for these cavity-nesters benefits these species in the Wildlife Area. Swallows are summer migrants, occurring in the Wildlife Area from late winter to early fall (February–October), with peak abundance generally in June and July. Large post-breeding flocks of swallows can occur in the late summer, particularly when flying insect populations associated with wetlands and agricultural fields are abundant.

The tasks listed below identify specific management activities intended to benefit cavity-nesting bird species.

Tasks:

1. Utilizing interested volunteers, provide and maintain nesting boxes for cavity nesters such as American kestrels, tree swallows, barn owls, and wood ducks in appropriate habitats.

2. Restore and enhance riparian vegetation for cavity nesters where compatible with flood management.

3. Monitor populations of cavity-nesting bird species periodically to assess management techniques and species response; apply adaptive management techniques as appropriate.

Species Guilds Goal 6 (SG-6): *Manage and maintain communities for neotropical bird species.*

Many species of neotropical migratory birds migrate through or breed in the Yolo Bypass Wildlife Area. The neotropical migratory bird guild comprises bird species that breed in North America and winter in Central and South America. Representative species of the neotropical migratory bird guild are western kingbirds, western wood-pewees, swallows, orioles, warblers, blue grosbeaks and yellow-breasted chats.

Regionally, there have been substantial losses of historic habitat used by neotropical migratory species, and available information suggests that population levels for many of these species are declining. Continued management of existing and restoration of additional suitable wetland, riparian, and grassland habitats in the Yolo Bypass Wildlife Area is important to maintaining healthy neotropical migrant bird populations. Protection and restoration of nesting habitat helps reduce nest parasitism and predation by creating habitat conditions that render neotropical birds less susceptible to these stressors.

Upland habitat management that includes providing community variations in height, density of vegetation, food crops, and water has proven to be beneficial to many neotropical migratory song birds. Opportunities to increase length and density of riparian vegetation along Putah Creek and the East Toe Drain will also benefit species in this guild. Riparian areas act as corridors for migratory songbirds.

The tasks listed below identify specific management activities intended to benefit neotropical migratory bird species.

Tasks:

1. Maintain and enhance riparian vegetation along Putah Creek and the East Toe Drain to serve as corridors for resident and migratory songbirds and nest sites for a variety of species. Due to the increased roughness created by riparian vegetation in the floodway, any increase in acreage of riparian vegetation would require hydraulic modeling to guide design and confirm achievement of performance criteria, and approval from the State Reclamation Board.

2. It has been shown that rows of trees growing parallel to the two external levees of the Bypass can protect these levees from erosion due to wave action. Approval and establishment of appropriate tree lines should be pursued.

3. Manage upland habitat to include variations in height, density of vegetation, food crops, and water to benefit a diverse array of resident ground nesting shorebirds, songbirds, raptors and owls as well as game species such as ring-necked pheasant.

4. Monitor populations of neotropical bird species periodically to assess management techniques and species response; apply adaptive management techniques as appropriate.

Species Guilds Goal 7 (SG-7): *Manage and maintain communities for a variety of other waterbird species including grebes, rails, bitterns, ibis and songbirds associated with emergent marsh vegetation.*

Common moorhen feeding chicks

Emergent marsh vegetation communities provide valuable habitat for a number of water bird species. The tasks listed below identify specific management activities intended to benefit these bird species.

Tasks:

1. Maintain appropriate and consistent water levels to maintain high quality habitat for floating nest builders such as pied-billed grebe.

2. Maintain varying amounts of thatch within emergent marsh vegetation in order to attract such nesting species as white-faced ibis, black-crowned night herons, tri-colored blackbirds, and yellow headed blackbirds.

3. Time spring drawdown in some ponds so young grebes, moorhens, coots, and ibis are not stranded.

Mexican free-tailed bats leaving their roost under the Yolo Causeway

Species Guilds Goal 8 (SG-8): *Maintain and enhance foraging opportunities for the presence of breeding colonies of bats roosting under the Yolo Causeway.*

An important feature of the Wildlife Area is its breeding colony of over 100,000 Mexican free-tailed bats. These bats nest each summer under the Yolo Causeway and prey on insects throughout Yolo and Sacramento counties. The location of this colony in a protected Wildlife Area will help to ensure its long-term success. The tasks listed below identify specific management activities intended to benefit the Mexican free-tailed bat colony.

Tasks:

1. Establish baseline data on roosting bat species and population density under the Yolo Causeway.
   a. Conduct acoustic surveys of roosting bats for species identification.
   b. Conduct area measurements of active roosting habitat to establish population density information.
   c. Determine location of foraging areas for Causeway population of bats.
   d. Submit survey results to the CNDDB.

2. Support bat diversity.

   a. After determining which species of bats are roosting under the Yolo Causeway (in addition to the Mexican free-tailed bat, the little brown bat, and the big brown bat), evaluate existing management practices (and constraints) within areas of foraging habitat provided by the Wildlife Area to evaluate if alternative management practices would be suitable for encouraging bat species diversity. Target new adaptive management practices to bat species, which may currently be using the area in small numbers.

b. If pallid bats, a species which feeds almost entirely from the ground, are determined to be roosting under the Yolo Causeway, evaluate if foraging habitat could be managed (within other management constraints) to encourage populations of its most common prey including crickets, beetles, and grasshoppers.

c. If Townsend's big-eared bats, a species particularly susceptible to human disturbance, are determined to be roosting under the Yolo Causeway, reduce human disturbances in this area.

d. Control public access to bat colonies as needed to protect roosting and nesting bats.

e. Protect and enhance scattered riparian vegetation near bat colony.

3. Protect existing bat maternity roost sites under the I-80 Causeway against unauthorized public disturbance by maintaining existing conditions that make it difficult for the public to gain access to these roosting areas.

4. Coordinate with California Department of Transportation (Caltrans) to ensure that their inspections, bridge maintenance activities, and bat colony management actions are consistent with Yolo Bypass Wildlife Area management goals and tasks regarding the maternity roosts under the I-80 Causeway, and to ensure that bat colony management policies are consistent between the two agencies.

5. Encourage preservation of bat colonies as a beneficial natural resource by maintaining and enhancing existing education and outreach programs.

   a. Expand presentation facilities and/or increase the frequency of bat-related educational presentations to accommodate existing levels and anticipated increased levels of public interest in this natural resource.

   b. Encourage bat protection by members of the public who visit the wildlife area by emphasizing their benefits to the ecosystem and the human population, by emphasizing the compromised status of many bat species populations, and by emphasizing regulatory protections that apply to bat species (e.g., Fish and Game Code Sections 1002 and 4150; and Title 14 California Code of Regulations Chapter 3 and Chapter 1 Section 251.1).

6. Monitor bat population species and density periodically to track population trends and assess management techniques and species response; apply adaptive management techniques as appropriate.

5.2.1.2 SPECIAL-STATUS SPECIES

The Special-Status Species sub-element includes goals for management of special-status species that may occur on the Yolo Bypass Wildlife Area. These goals are based on the California Fish and Game Code, the policies of the California Fish and Game Commission, and the goals and objectives of the CALFED Ecosystem Restoration Program (ERP) (for which DFG is an implementing agency).

Giant Garter Snake

DFG currently manages the Yolo Bypass Wildlife Area under a multi-agency MOU with the USFWS, DWR, and the State Reclamation Board. The MOU specifically states that "DFG will take into consideration the specific habitat requirements of the giant garter snake and Swainson's hawk, but the area will not be specifically managed for any other listed or candidate species. Consideration of the habitat needs of the giant garter snake and Swainson's hawk will not impair management in accordance with the operations and maintenance manual for the project

modifications (as updated in supplement, U.S. Army Corps of Engineers 2003) to the Sacramento River Flood Control Project." As such, the following goal is not intended to direct species management. Rather, it is intended to promote management of the communities in a manner that increases general habitat quality, which may benefit many species, including special-status wildlife, fish, and plant species. This goal is specifically intended to not conflict with the existing multi-agency MOU for the Yolo Bypass Wildlife Area.

Special Species Goal 1 (SS-1): *Without specifically managing for special-status species, the communities at the Yolo Bypass Wildlife Area should be managed in a way that generally improves overall habitat quality for species abundance and diversity while not discouraging the establishment of special-status species.*

Several special-status animals are currently known or have the potential to use the ecosystems at the Yolo Bypass Wildlife Area. Comprehensive surveys for all these species have not been conducted; thus their distribution at Yolo Bypass Wildlife Area could be more extensive than documented in the California Natural Diversity Database (CNDDB). Therefore, the results of surveys for these species would determine the need for and scope of the other tasks listed below.

Tasks:

1. Conduct surveys of wildlife, fish, and vegetation communities. The highest priority is to survey for special-status animals and plants that could be present in the ecosystems at the Yolo Bypass Wildlife Area but that are not yet known to occur, such as California tiger salamander, western spadefoot toad, Colusa grass, Crampton's tuctoria, and Bogg's Lake hedge-hyssop. It is also important to survey for other special-status species known to occur in the ecosystems at the Yolo Bypass Wildlife Area but for which much information is lacking, such as giant garter snake and vernal pool crustaceans. Submit observation records to the CNDDB.

2. Monitor populations of special-status species periodically to assess overall habitat integrity, detect changes in distribution and abundance, and detect positive and adverse effects of management activities, human use, and/or nonnative species. Conduct surveys prior to management activities as appropriate to avoid effects.

3. Monitor special-status species use of the floodway in the face of rising and receding floodwaters.

4. Expand the purview of the MOU to address all special-status species currently known to occur in the Yolo Bypass Wildlife Area and include the entire acreage of the expanded Wildlife Area.

5. Upon certification of the operations and maintenance manual for the project modifications (as updated in the supplement, U.S. Army Corps of Engineers 2003) to the Sacramento River Flood Control Project, fulfill reporting requirement described within.

5.2.1.3 NONNATIVE INVASIVE SPECIES

The Nonnative Invasive Species sub-element includes goals for management of nonnative invasive species not beneficial to wildlife or that could impact special status plants. These goals are based on the California Fish and Game Code, the policies of the California Fish and Game Commission, and the goals and objectives of the CALFED Ecosystem Restoration Program (ERP) (for which DFG is an implementing agency).

The Yolo Bypass Wildlife Area contains several invasive weeds that are in need of control efforts. Yellow star thistle tends to occur in disturbed upland areas including parking lots and roads. It appears to thrive during non-flood years. Perennial pepperweed is pervasive in the higher portions of the wetland areas and throughout the uplands. Cattle grazing has effectively kept perennial pepperweed controlled on the Tule Ranch, allowing native forbs to thrive. Most ditches in the Yolo Bypass are eventually choked with water primrose. Many of these ditches are shared with lessees, who contribute towards the control of this invasive aquatic weed. Control measures may include mechanical removal with an excavator or chemical control through the use of aquatic herbicides. Many management activities are coordinated within the Yolo Weed Management Area.

Invasive Species Goal 1 (IS-1): *Prevent the introduction and spread of invasive nonnative species that have no benefit to wildlife or that impact special status plants.*

This goal is based on the need to avoid the potential consequences of the introduction and spread of invasive species, and on a related goal of the CALFED ERP (for which DFG is an implementing agency).
The establishment of additional invasive nonnative species could cause substantial adverse modifications to ecosystems. Thus, a goal of the CALFED ERP is to prevent the establishment of additional nonnative invasive species. The tasks listed below represent a strategic approach toward attaining this goal.

Tasks:

1. Inventory habitats within the Yolo Bypass Wildlife Area for infestations of invasive plants. Monitor these infestations and identify correlative factors such as flooding or vegetation manipulation.

    a. Monitor occurrences of star thistle throughout all upland habitats.

    b. Monitor occurrences of perennial pepperweed in grassland and wetland communities.

    c. Monitor abundance and distribution of water primrose in the wetlands and irrigation infrastructure on the Yolo Bypass Wildlife Area.

2. Prioritize infestations for treatment based on the risks that individual infestations pose to ecosystem services, public infrastructure, and other resources within the Yolo Bypass Wildlife Area, and based on the likelihood that the infestation can be treated and maintained in a cost-effective manner.

    a. Monitor hot spots of introduction (e.g., sites along roads, trails, ditches, and canals, near parking areas, and in turnoffs) to enable early detection and rapid eradication of invasives.

    b. Monitor upstream populations of *Arundo* and water hyacinth along Putah Creek to insure they do not spread to the Wildlife Area. Encourage the eradication of these colonies through participation in the Yolo County Weed Management Area.

    c. Continue monitoring of Iberian star thistle population established on the Tule Ranch.

3. Manage and control invasive and other nonnative species through specified grazing practices, controlled flood-up and drawdown procedures, use of pesticides, and other conventional agricultural practices.

    a. During the rosette growth stage of star thistle, apply Transline® for control of this invasive weed.

    b. Apply Telar® to perennial pepperweed stands during early growth stages in spring.

    c. Utilize grazing as a tool to control perennial pepperweed in the grazing areas of the Tule Ranch.

    d. Utilize grazing as a means of controlling perennial pepperweed in pastures and as an initial treatment in preparation for discing or Roundup® application for the control of jointgrass.

    e. Evaluate the effectiveness of monitoring and control methods periodically; adjust methods as needed.

    f. Coordinate with and support regional control efforts including the efforts of the Yolo County Weed Management Area.

    g. Continue coordination with Yolo County for the control of Iberian star thistle on the Tule Ranch.

h. Coordinate with DWR Division of Flood Management, Sacramento Flood Maintenance Office on management of invasive species on and adjacent to levees.

i. Provide education and outreach regarding impacts associated with invasive plants and control efforts.

j. Share results of control efforts with other Wildlife Areas and private habitat managers in the area.

k. Coordinate control efforts with needs of local farmers who share the use of the Mace Ranch Irrigation System.

l. Coordinate all actions with the DFG pesticide use programs. Ensure that all actions comply with the ESA and CESA and other regulations aimed at the protection of special-status species and sensitive habitats as well as current county and state regulations regarding the application of pesticides.

m. Maintain a consistent level of expertise in regards to pesticide use techniques and chemical effectiveness by requiring current pesticide applicator's certification for at least two on-site employees.

n. Consider and avoid unintentional effects to non-target plant species.

o. Avoid adverse effects to native forbs in Tule Ranch grassland communities as a result of herbicide applications for the control of star thistle.

p. Avoid adverse effects to agricultural crops in the area through drift in the air or water.

q. Coordinate herbicide treatments to avoid contact with visitors. Clearly identify dates, locations, and times of herbicide treatments to inform the public and facilitate closure of herbicide treatment areas.

Management goals for various species guilds have already been discussed. The following goals are less focused on particular groups of plants or animals, but instead establish broader-ecosystem wide goals.

5.2.1.4 SEASONAL AND PERMANENT WETLAND COMMUNITIES

Seasonal and permanent wetlands were once one of the dominant community types within California's Great Valley. Seasonal and permanent wetlands on the Yolo Bypass Wildlife Area can be divided into two separate groups: those that are actively managed to achieve maximum benefit to wildlife and those that are natural or are passively managed. The Yolo Bypass Wildlife Area is unique in that it preserves a large, contiguous block of land with representative examples of each wetland type. The Wildlife Area is further unique in that these wetland types are interspersed among one another, creating a diverse habitat matrix of various wetland types.

Actively managed seasonal and permanent wetlands are generally found in the original Yolo Bypass Wildlife Area, were reconstructed from bare ground, and are intensively managed by the DFG via a complex system of pumps, canals, and water control structures to flood and drain wetlands according to established prescriptions. Additionally, vegetation is disturbed by mowing, discing, or water management in order to maximize the habitat value of these lands.

Passively managed wetlands on the Yolo Bypass Wildlife Area include natural alkali marshes, vernal pools, and seasonal marshes. These areas are less intensely managed although usually some water control is still required to impound water. For example in the somewhat alkali area on the Fireman's Club, natural sloughs which were once on the shoreline of the vast Yolo Basin, subject to inundation during high water, complete with a tidal influence. Absent of this natural hydrology, this slough has two embankments built across its width, with water control structures installed. Water is delivered from the west into the slough, where it is backed up by the water control structure. Many of the vernal pool areas are affected by previous road construction efforts. Natural swales sweep to the southeast, draining small watersheds. When the swale encounters a road embankment, the water is

Natural slough of the Fireman's Club looking west

Flooded swale on the Tule Ranch

2004 wetland enhancement project workers

impounded, creating vernal pool conditions. These interruptions in the natural topography of the Tule Ranch are quite effective at creating the conditions necessary for the survival of these rare plants and animals of the vernal pools.

Within the heart of the Bypass on the southeast portion of the Tule Ranch remain low lying areas that were not leveled for agricultural purposes, but were instead utilized as open range for cattle and waterfowl hunting. Historically, small berms were constructed to impound water and the existing irrigation system was modified to deliver water to these "sinks." These wet areas were utilized as duck hunting clubs, named after their principle hunters. This was the location of the Martin's Pond and Slaviches. Currently, these low areas are the first place to flood and the last to drain, resulting is some of the same plant communities found further west in the vernal pool communities.

One field, adjacent to the toe drain is so low in elevation that it is subject to tidal inundation through a break in the west berm of the toe drain. This emerging fresh water tidal wetland represents a unique habitat type found no where else on the Wildlife Area.

The Seasonal and Permanent Wetland Ecosystems sub-element includes goals for management of these communities to maintain or enhance wetland species abundance and diversity (including special-status species), to prevent the spread of nonnative invasive species not beneficial to wildlife, and to restore and enhance degraded communities.

Seasonal and Permanent Wetland Ecosystems Goal 1 (SPW-1): *Following accepted scientific principles and practices, restore and enhance wetlands to conditions that provide desired ecological functions.*

Tasks:

1. Evaluate opportunities, constraints, and potential restoration benefits to identify feasible wetland restoration projects for intensely managed wetlands as well as the described more passively managed wetland areas. Potential restoration project sites may include the Tule Ranch Unit, Parker Unit, Los Rios Unit, South Unit, and Causeway Ranch.

2. Pursue funding and develop plans for identified restoration projects that include goals, techniques, costs, monitoring, an adaptive management process, and a schedule. Funding programs to pursue may

include the following:

a. North American Wetlands Conservation Act,

b. State Duck Stamp Program,

c. Upland Game Stamp Program,

d. U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) Farm Bill Programs,

e. USFWS State Wildlife Grant Program, Federal Aid in Wildlife Restoration Program,

f. Central Valley Project, Wildlife Habitat Augmentation Plan,

g. Neotropical Migratory Bird Conservation Act Grants Program,

h. Riparian Joint Venture,

i. Ducks Unlimited, Wetland Restoration Program,

j. Department of Fish and Game Minor/Major Capital Outlay proposals,

k. DFG Comprehensive Wetlands Program,

l. Wildlife Conservation Board Inland Wetlands Conservation Program,

m. Other programs authorized under future bond acts,

n. DWR grants available for mitigation of water projects and levee maintenance activities,

o. Funding available through Yolo County Integrated Regional Water Management Plan,

p. Funding available through the Sacramento River Watershed Program,

q. Funding from grant programs administered by U.S. Environmental Protection Agency,

r. Funding from grant programs administered by National Oceanic and Atmospheric Administration,

s. Funding from grant programs administered by the National Fish and Wildlife Foundation,

t. Funding from grant programs administered by US Bureau of Reclamation,

u. Funding that becomes available as a result of programs to improve the Sacramento River Flood Control System by expanding the Yolo Bypass (including Sacramento Area Flood Control Agency),

v. Funding from the Yolo County NCCP.

3. Cooperate with development and implementation of existing restoration plans for wetland ecosystems by the CALFED ERP, North American Waterfowl Management Plan, Partners in Flight, United States Shorebird Conservation Plan, Waterbird Conservation for the Americas, Yolo County NCCP and other programs that are consistent with the goals of this LMP.

4. Coordinate habitat restoration acreages with goals developed for the Yolo Basin component of the Central Valley Joint Venture.

5.2.1.5 RIPARIAN COMMUNITIES

As with seasonal and permanent wetlands, riparian communities were once extensive in California's Central Valley. Historically, riparian areas occurred in broad bands within the floodplains of the streams and rivers draining from the Coast Ranges, Sierra Nevada, and Cascades. These rivers and streams flowed into the Sacramento and San Joaquin Rivers, which supported even broader bands of riparian communities. The vast majority of this community in the Central Valley has been lost to flood control projects, agriculture, and urban development. The riparian communities that remain are often restricted to the immediate stream border and are frequently less diverse due to the alteration of flood regimes, river flows, and the disturbance processes that create new riparian habitat and permit the succession of immature riparian communities into mature communities.

Within the Yolo Bypass Wildlife Area, riparian communities are restricted to narrow bands along Putah Creek, the East Toe Drain, and adjacent to some permanent wetlands. Despite the limited extent, riparian areas provide valuable wildlife habitat, particularly given their close proximity to grasslands, wetlands, and other communities within the Yolo Bypass Wildlife Area. As with many other riparian areas in the Central Valley, these communities are threatened by invasive plants, such as giant reed and alteration of hydrologic regimes.

Riparian habitat presents the greatest amount of hydraulic roughness to flood flows in the Yolo Bypass. For this reason, any potential riparian restoration projects require approval and permitting from the State Reclamation Board. Hydraulic analysis must be performed to guide the design of future restoration projects in the Wildlife Area and confirm achievement of performance criteria (i.e., confirmation that project-related adverse affects to flow conveyance will not occur). This analysis must be performed on a detailed restoration plan indicating locations, types and numbers of trees, as well as a description of the project's management. A hydraulic modeling workplan for guiding the design of future restoration projects in the Yolo Bypass Wildlife Area can be found in Appendix C.

Fragmented riparian vegetation along Putah Creek where it empties into the Yolo Bypass

The Riparian Community sub-element includes goals for management to maintain or enhance riparian species abundance and diversity and to restore and enhance degraded communities to provide desired ecological functions. Constraints to achieving these goals are primarily related to the maintenance of necessary flow conveyance throughout the Bypass.

Riparian Goal 1 (R-1): *Maintain and enhance riparian communities for native species diversity and abundance (including special-status species).*

A diverse abundance of native species including several special-status species are currently known or have the potential to be using riparian communities at the Yolo Bypass Wildlife Area. Comprehensive surveys for these species have not been conducted; thus their distribution at Yolo Bypass Wildlife Area could be more extensive than documented. Therefore, the results of surveys for these species would determine the need for and scope of the other tasks listed below.

Tasks:

1. Conduct surveys for wildlife and vegetation of riparian communities. The highest priority is to survey for special-status animals and plants that could be present in riparian ecosystems at the Yolo Bypass Wildlife Area but that are not yet known to occur, such as Northern California black walnut, California hibiscus, yellow-billed cuckoo, Mason's lilaeopsis, and Delta mudwort. It is also important to survey for other special-status species known to occur in riparian ecosystems. Regular monitoring of Swainson's hawk nesting efforts on or adjacent to the Wildlife Area should be continued.

2. Monitor populations of special-status species periodically to assess overall habitat integrity, detect changes in distribution and abundance, and detect positive and adverse effects of management activities, human use, and/or nonnative species.

3. After appropriate hydraulic analysis and receipt of Reclamation Board approval, improve habitat in the riparian ecosystems at the Yolo Bypass Wildlife Area through enhancement of existing riparian areas and establishment of new riparian habitats as permitted. Maintain and enhance riparian vegetation along Putah Creek and the East Toe Drain to provide nest trees and brush for resident and migratory songbirds, wading birds, and raptors.

4. Manage habitats in accordance with the operations and maintenance manual for the project modifications (as updated in supplement, U.S. Army Corps of Engineers 2003) to the Sacramento River Flood Control Project, pursuant to the MOU between DFG, State Reclamation Board, USFWS, and DWR regarding threatened and endangered species.

Riparian Goal 2 (R-2): *Restore and enhance riparian communities to conditions that provide desired ecological functions.*

This goal is based on DFG concerns and the goals and objectives of the CALFED ERP (for which DFG is an implementing agency). The preservation, enhancement, and restoration of riparian areas is a primary concern of DFG, as evidenced by the California Riparian Habitat Conservation Program (Chapter 4.1 of the Fish and Game Code). It is also a goal of the ERP to restore large expanses of riparian habitats. In addition to providing habitat for fish and wildlife species, restoring additional riparian vegetation along the Toe Drain would have the added benefit of protecting the east side levee from erosion by wind waves, if it can be accommodated without impeding conveyance or cutting into freeboard. This appears to be consistent with the USACE Operating Manual for the SRFCP, which states in Section IV 4-05b that "brush and small trees may be retained on the waterward slopes (of levees) where desirable for the prevention of erosion and wave wash" and that "where practicable, measures shall be taken to retard bank erosion by planting willows or other suitable vegetation on areas riverward of levees." A band of trees along the west side levee might also provide erosion protection if it can be accommodated without affecting other flood control parameters. As always, implementation of this concept would require approval of the Reclamation Board.

Opportunities for riparian community restoration and enhancement exist along the East Toe Drain, Putah Creek, and adjacent to permanent wetlands (e.g., Green's Lake) in certain areas. The tasks listed below represent a strategic approach toward restoring and enhancing riparian habitat in these areas.

Tasks:

1. Evaluate opportunities, constraints, and potential restoration benefits to identify feasible riparian restoration projects that would support the goals of this LMP. Riparian restoration projects may include new restoration areas or enhancement of existing restoration areas (e.g., seasonal and permanent wetlands) with riparian vegetation.

2. Pursue funding and develop plans for identified restoration projects that include goals, techniques, costs, monitoring, an adaptive management process, and a schedule.

3. Cooperate with development and implementation of restoration plans for riparian ecosystems by the CALFED ERP and other programs that are consistent with the goals of this LMP.

4. Design and manage riparian restoration and enhancement projects that would not conflict with necessary flood flow conveyance requirements of the Yolo Bypass. Ensure that proposed projects would not result in adverse effects on local or downstream flood hydrology and would comply with the requirements of the State Reclamation Board. Project planning will include necessary hydraulic modeling to guide design and confirm achievement of performance criteria. A work plan for hydraulic modeling is provided in Appendix C.

5.2.1.6 GRASSLAND AND UPLAND COMMUNITIES

Nonnative rabbit's foot grass

Grasslands across the Great Central Valley and other parts of California have been drastically altered over the last 300 years. During this timeframe, the native grassland flora, which consisted of a variety of perennial grasses, bulbs, and annual wildflowers, has been replaced by a variety of nonnative annual grasses and forbs of Eurasian origins. The shift from perennial to annual grasses as the dominant component of the grassland community has modified grassland community structure from a comparatively open and structurally diverse community to one characterized by dense vegetation with fairly homogenous structure. The Yolo Bypass Wildlife Area has not escaped this shift, with its grasslands dominated by the proliferation of annual rye grass.

Because of unique soil types and the propensity for upland areas to experience periods of soil saturation, a portion of the grasslands within the Yolo Bypass Wildlife Area are characterized by a higher occurrence of native wildflowers than many other grassland communities in the Central Valley. Grassland habitat structure within the Yolo Bypass Wildlife Area generally consists of nonnative Italian ryegrass with a diverse assemblage of native forbs supplementing the floral community on the western part of the Tule Ranch. Remnant native perennial grasses make their appearance on higher ground in this area, particularly along the eastern end of the Dixon ridge, an innocuous geographic feature dominated by Myers Clay soils.

The Grassland and Upland Ecosystems sub-element includes goals for management of this community to maintain or enhance grassland species abundance and diversity and to restore and enhance degraded communities to provide desired ecological functions.

Grassland and Upland Goal 1 (GU-1): *Maintain and enhance grassland and upland communities for diversity and abundance of native species (including special-status species).*

A diverse abundance of species including several special-status species are currently known or have the potential to be using grassland and upland ecosystems at the Yolo Bypass Wildlife Area. Comprehensive surveys for these species have not been conducted; thus their distribution at Yolo Bypass Wildlife Area could be more extensive than documented. Therefore, the results of surveys for these species would determine the need for and scope of the other tasks listed below.

Western meadowlark - common resident of upland communities

Tasks:

1. Conduct surveys for wildlife and vegetation in grassland and upland communities. The highest priority is to survey for special-status animals and plants that could be present in grassland and upland communities at the Yolo Bypass Wildlife Area but that are not yet known to occur, such as heartscale, San Joaquin spearscale, Colusa grass and Carquinez goldenbush. It is also important to survey for other special-status species known to occur in grassland and upland ecosystems at the Yolo Bypass Wildlife Area but for which much information is lacking, such as Ferris' milk-vetch, alkali milk-vetch, grasshopper sparrow, burrowing owl, and California horned lark.
2. Monitor populations of special-status species periodically to assess overall habitat integrity, detect changes in distribution and abundance, and detect positive and adverse effects of management activities, human use, and/or nonnative species.
3. Improve habitat for special-status species in the grassland ecosystems at the Yolo Bypass Wildlife Area through the adaptive management of livestock grazing, limited herbicide application, native grass plantings, and other management techniques.
4. Support existing populations of burrowing owls and increase breeding populations through the installation of artificial burrows.
5. Ensure that actions comply with the federal and California Endangered Species Acts and other regulations aimed at the protection of special-status species.

Grassland and Upland Goal 2 (GU-2): *Restore and enhance grassland and upland communities to conditions that provide desired ecological functions.*

This goal was selected because it could help DFG meet the LMP goal regarding native species abundance and diversity in grassland and upland ecosystems. The tasks listed below represent a strategic approach toward attaining this goal.

Tasks:

1. Evaluate opportunities, constraints, and potential restoration benefits to identify feasible grassland and upland restoration projects.
2. Pursue funding and develop plans for identified restoration projects that include goals, techniques, costs, monitoring, an adaptive management process, and a schedule.
3. Cooperate with development and implementation of restoration plans for grassland and upland ecosystems by the CALFED ERP and other programs that are consistent with the goals of this LMP.
4. Enhance grasslands and uplands through grazing, native grass plantings, and other management techniques.

AQUATIC ECOSYSTEMS

The Yolo Bypass provides vital fish spawning, rearing, and/or migratory habitat for a diverse assemblage of anadromous and resident fishes. Both native and nonnative species are common; however, as with most other aquatic habitats in California, nonnative species frequently dominate and compete with native fishes for

spawning, rearing, and feeding habitat. Additionally, nonnative fishes frequently prey upon native fishes, particularly juveniles which are susceptible to predation by higher level predators including black bass, striped bass, and other nonnative fish. However, many nonnative fishes provide significant angling opportunities, and the potential ecological impacts of nonnative fishes must be weighed against their value as a popular recreational resource.

While aquatic habitats in the Yolo Bypass Wildlife Area share many characteristics with similar habitats in the Central Valley, the Wildlife Area is unique in that it is managed as a large floodplain that is hydrologically connected to the Sacramento River (i.e., the Yolo Bypass) and the Sacramento-San Joaquin Delta. Historically, these floodplains were common the Central Valley and Delta and provided important spawning and rearing habitat for many native fishes. In addition to providing important habitat elements for many species of native fish, nonnative fish are less likely to make use of floodplain habitats because the spawning season for most nonnative fishes does not coincide with floodplain availability (i.e., inundation) and because floodplains are ephemeral in nature, thereby preventing the establishment of resident populations of nonnative fish. The relative lack of competition from nonnative fish, as well as the habitat complexity, flow regimes, and food web benefits provided by floodplains are particularly important to declining species such as Sacramento splittail and Chinook salmon.

In addition to supporting valuable floodplain habitat, the Yolo Bypass Wildlife Area also encompasses the lowermost segment of Putah Creek down to its confluence with the East Toe Drain. The reach of Putah Creek within the Wildlife Area (i.e., Putah Creek Cross Channel) consists primarily of a straight treeless ditch that is seasonally dammed by the Los Rios Check Dam. The one mile long riparian corridor above the Los Rios Check Dam is an extremely narrow swath with very few trees and steep banks.

The Los Rios Check Dam is currently being managed to optimize the migration of Chinook salmon into lower Putah Creek by removing boards in fall/winter in conjunction with pulse flow releases from the PDD. This action, along with upstream improvements have resulted in the recent return of small runs of fall-run Chinook salmon in the creek. The boards are typically removed in the fall/winter as soon as the irrigation season ends and upon the arrival of Chinook salmon in the East Toe Drain (based on DWR fyke trap sampling) and replaced in April of the following year (for agricultural and wildlife habitat uses).

Researcher conducting radio telemetry studies of spawning Sacramento splittail

The Aquatic Ecosystems sub-element includes goals for management of this habitat to maintain or enhance aquatic species abundance and diversity (including game species and special-status species), to maintain or enhance game species populations, and to restore and enhance degraded habitats to provide desired ecological functions.

Aquatic Ecosystems Goal 1 (AE-1): *Maintain and enhance aquatic ecosystems for diversity and abundance of native species (including special-status species).*

The California Endangered Species Act (Chapter 1.5 of the Fish and Game Code) declares that all state agencies shall seek to conserve threatened and endangered species. It is the policy of the California Fish and Game Commission to protect and preserve all native species experiencing a significant decline that, if not halted, would lead to their designation as threatened or endangered. DFG is also guided by the understanding that it is the desire of the State of California to recover salmon and anadromous trout populations to self-sustaining levels. Similarly, the goals of the CALFED ERP include achieving the recovery of at-risk native species dependent on the Delta and reversing downward population trends of native species that are not listed. The tasks listed below represent a strategic approach toward attaining this goal.

Tasks:

1. Monitor use of aquatic habitats at the Yolo Bypass Wildlife Area by special-status fish species.

2. Improve habitat for special-status fish species using aquatic habitats at the Yolo Bypass Wildlife Area (see Aquatic Ecosystems Goal 3 below).

3. Identify sites (e.g., permanent wetlands, ponds, Green's Lake) for reintroduction of native fish species (e.g., Sacramento perch).

4. Ensure that actions comply with the ESA and CESA and other regulations aimed at the protection of special-status species and are in accordance with the MOU between DFG, USFWS, DWR, and the State Reclamation Board.

Aquatic Ecosystems Goal 2 (AE-2): *Maintain and enhance habitat for game fish species.*

It is the policy of the California Fish and Game Commission that DFG shall emphasize programs that ensure continued sport fishing opportunities, enhance such opportunities, and prevent their loss. It is also commission policy that DFG work toward stabilizing and then restoring the declining native fishery of the Delta.
The enhancement of fisheries for white sturgeon and the maintenance of fisheries for striped bass and nonnative warm water fish are objectives of the CALFED ERP. The tasks listed below represent a strategic approach toward upholding these policies and objectives.

Tasks:

1. Monitor and assess management, human use, invasive nonnative species, and other effects on habitat for desired game species.

2. Evaluate access points, angling use, and regulations periodically; recommend changes as warranted to maintain and enhance aquatic habitats and populations of game species.

3. Improve habitat structure in permanent wetlands for the benefit of game fish species.

Aquatic Ecosystems Goal 3 (AE-3): *Restore and enhance aquatic ecosystems to conditions that provide desired ecological functions.*

Substantial achievements have been made to restore habitat and improve flow regimes throughout the lower Putah Creek watershed. These efforts have resulted in the historic return of small Chinook salmon spawning runs in the lower creek in recent years. Continued efforts are ongoing to address remaining limiting factors through additional collaborative restoration planning and implementation. The DFG supports the continued restoration efforts in the lower Putah Creek watershed, especially those opportunities that exist in the lowermost segment of Putah Creek that runs through the Yolo Bypass Wildlife Area.

This goal includes tasks to restore and enhance aquatic habitat and passage in the segment of Putah Creek flowing through the Wildlife Area, restoration of intertidal marsh habitat adjacent to the East Toe Drain, and reintroduction of rare native species including Sacramento perch into appropriate water bodies throughout the Wildlife Area.

The restoration of aquatic habitat at the Yolo Bypass Wildlife Area could contribute to attainment of this LMP's goals regarding habitat for special-status and game species. Opportunities exist to enhance habitat and improve fish passage along Putah Creek and at the southeast portion of the Tule Ranch Unit adjacent to the East Toe Drain. The tasks listed below represent a strategic approach toward enhancing habitat and improving fish passage in these areas.

Tasks:

1. Identify opportunities to restore aquatic ecosystems at the Yolo Bypass Wildlife Area. Cooperate with development and implementation of restoration plans for aquatic ecosystems by the CALFED ERP and other programs that are consistent with the goals of the Yolo Bypass Wildlife Area and this LMP. Potential projects may include the following:

    a. Creating a new realigned Putah Creek channel through the Tule Ranch Unit (Putah Creek from above the Los Rios Check Dam to the East Toe Drain below the Lisbon Weir).

    b. Exploring the potential for restoration of intertidal marsh habitat and/or seasonal managed floodplain habitat at the southeast portion of Tule Ranch adjacent to the East Toe Drain for the benefit of native fish species such as splittail. Certain bird species such as black rail may also benefit.

    c. Independent of Goal 1, consider improving coordination and enhancement of spring passage of Chinook salmon smolts emigrating from Putah Creek through the Los Rios Check Dam to the East Toe Drain.

        i. Coordinate annual replacement of the check dam after the arrival of spring water releases from the Solano Diversion Dam intended to move salmon smolts from Putah Creek into the toe drain.

        ii Consider the construction of a fish passage facility at the check dam to move adult salmon upstream and smolts downstream.

    d. Restore native fish to Green's Lake and permanent ponds including Sacramento perch. Stocking of this fish species may also serve as a biological control agent for mosquitoes.

2. Continue coordination and enhancement of fall passage of Chinook salmon immigrating from the East Toe Drain through the Los Rios Check Dam to Putah Creek. Currently, when fish are detected in the Toe Drain, based on fyke trapping results conducted by the DWR, a sequence of events is initiated. If local farmers and Wildlife Area staff are through utilizing the check dam for irrigation and flood up, its removal is scheduled. A release of water from the Putah Diversion Dam is directed to arrive at the Los Rios Check Dam at the same time the flash boards are being removed. The combined flows from the Diversion Dam coupled with the head of water released from the check dam act as an attraction flow to entice salmon into Putah Creek.

    a. Consider the construction of a fish passage facility at the Los Rios Check Dam to allow passage of adult salmon upstream and juveniles downstream while still maintaining the Los Rios Check Dam in place.

    b. Improve Lisbon Weir for both the passage of anadromous salmon into Putah Creek and increased water capture efficiency for irrigation purposes.

3. Pursue funding and develop plans for additional potential aquatic ecosystem restoration projects.

4. Design and manage restoration and enhancement projects that would not conflict with necessary flood flow conveyance requirements of the Yolo Bypass, as determined through the application of hydraulic analysis. A work plan for hydraulic modeling is provided in Appendix C.

5. Ensure that actions comply with the ESA and CESA and other regulations aimed at the protection of special-status species and/or sensitive habitats.

6. Design and operate restoration and enhancement projects in coordination with the SYMVCD. Project design and operation shall include technical BMPs for mosquito control in managed wetlands developed by the CVJV (Kwasny et al. 2004).

5.2.2 AGRICULTURAL RESOURCES ELEMENT

Harvesting of milo

Agriculture has been an important land use in the Yolo Bypass since the seasonal wetlands and perennial marsh and riparian areas were first converted to farms in the mid-1800s. For many years, grazing was the primary use of agricultural lands in the Yolo Bypass. In the latter part of the 20th century, irrigation systems were developed and fields were engineered for the production of row and truck crops. The local climate and nearly annual floods that flow through the Yolo Bypass severely limit the kinds of crops that can be grown. Orchards and winter crops are not an option, nor are long term ventures such as alfalfa. The proximity of the Yolo Bypass to the San Francisco Bay system brings a cool prevailing wind from the south during summer evenings. Although the daily appearance of this Delta Breeze makes life bearable in the Sacramento area, it limits the production of rice to wild rice, or special varieties that are more adapted to the climate.

Row and truck crops are currently grown across the northern half of the Yolo Bypass Wildlife Area (i.e., Causeway Ranch and Los Rios Farms Complex) and on the northern portion of the Tule Ranch. The primary crops grown include: rice, corn, millet, milo (grain sorghum), safflower, sunflower, and tomatoes. These crops are cultivated during the summer months. From fall to spring, farmed areas are fallowed and grain crops are flooded to provide a valuable source of forage for wildlife as well as seasonal wetland habitat. Three common crop rotations are: 1) corn to safflower/sunflower to tomatoes; 2) wild rice to wild rice to conventional rice; or 3) rice to rice to shorebird habitat (fallowed rice fields that are flooded to a shallow depth during July and August).

Rotation strategies are designed to provide a diversity of wildlife habitat elements and to facilitate sustainable agricultural practices (e.g., maintain soil fertility and reduce herbicide application). Other crops, (e.g., millet, milo, safflower, and sunflower) are occasionally planted to provide supplemental sources of wildlife forage. These crops may be planted as part of one of the three above rotation strategies or may be periodically planted on fields designated solely for wildlife forage production.

Cattle grazing occurs primarily on an extensive portion of the Tule Ranch Unit in the southern end of the Yolo Bypass Wildlife Area. Additional grazing, specifically for vegetation management, occurs throughout many of the remaining portions of the Yolo Bypass Wildlife Area. Cattle are often used as an initial treatment of vegetation prior to discing or spraying with herbicide. Animals are brought onto the Yolo Bypass Wildlife Area in mid spring or early summer after the threat of flooding has passed and they are removed by November. Forage is provided in irrigated pasture, uplands within the Bypass, and the annual grasslands-vernal pool complex.

GOALS

Given the prevalence of land within the Yolo Bypass Wildlife Area suited to agriculture, many of the management units incorporate some form of agriculture at least on an occasional basis as a management tool. In general, agricultural activities contribute to Yolo Bypass Wildlife Area goals. Listed below are several goals and tasks identified for the agricultural element. Because of the tightly interrelated and coordinated nature of agricultural activities with other management in the Yolo Bypass Wildlife Area, several of these tasks may be redundant with those identified in other elements throughout this chapter.

Agricultural Resources Goal 1 (AR-1): *Use agricultural techniques to maintain and enhance habitat for native wildlife and plants.*

Snow geese and cattle sharing the irrigated pasture

DFG wildlife areas commonly grow agricultural crops for the benefit of wildlife. The Yolo Bypass Wildlife Area utilizes agriculture to manage habitats while providing important income for the management and operation of the property. Many innovative, natural resource-compatible agricultural practices occurring in the Yolo Bypass Wildlife Area provide valuable habitat for a diverse assemblage of wildlife species. Rice is grown, harvested, and flooded to provide food for thousands of waterfowl. Corn fields are harvested to provide forage for geese and cranes. Working with local farmers, the Yolo Bypass Wildlife Area provides fields of milo, corn, and sudan specifically for wildlife forage purposes. Crops such as safflower are cultivated and mowed to provide seed for upland species such as ring-necked pheasant and mourning dove. Much of the grassland in the southern portion of the Yolo Bypass Wildlife Area is managed with cattle grazing, resulting in spectacular blooms of wildflowers during the spring months. The predominance of nonnative annual grasses in that area can otherwise inhibit the production of the native plant community that includes several rare and endangered species. Whereas historically pronghorn antelope and tule elk grazed competing native grasses, exposing the emerging forbs to sunlight, grazing cattle provide this function today, eating the mostly nonnative competing grasses. Due to the aggressiveness of these nonnative grasses, an aggressive grazing strategy is needed to favor the production of native forbs.

Tasks:

1. Manage and control invasive nonnative plant species through specified grazing practices, controlled flood-up and drawdown procedures, use of pesticides, and other conventional agricultural practices.

2. Enhance grasslands and uplands through grazing, native grass plantings, and other management techniques.

3. Work with adjacent property owners to limit aerial seeding of Italian ryegrass in areas that would support native alkali grassland under natural conditions.

4. Improve habitat for special-status species in the grassland ecosystems at the Yolo Bypass Wildlife Area through the adaptive management of livestock grazing, limited herbicide application, native grass plantings, and other management techniques.

5. Manage for rodents and large insects to provide adequate prey items in order to benefit foraging raptor species.

    a. Plant food plots that will not only provide food for birds, but rodents as well. Legumes and grain crops such as vetch, clovers, wheat, sunflower, milo, corn, and safflower are recommended.

    b. Manage discing, mowing, and summer irrigation to attract large numbers of Swainson’s hawks, which feed on grasshoppers.

    c. Manage fall flooding of agricultural fields to attract wintering raptors.

6. Annually plant grain fields to provide foraging areas for upland game and hunting opportunities for upland game hunters.

7. Manage seasonal and permanent wetlands and other communities to provide habitat for resident waterfowl species.

    a. Disc, mow, burn, and/or graze vegetation as necessary to promote desirable species, eliminate species not valuable for wildlife (e.g., cocklebur), promote a higher quality seed bed for the following year and to maintain required ratios of open water after fall flood up.

    b. Flood rice fields as early as possible after harvest is completed to attract migratory waterfowl.

8. Manage upland vegetation to provide desired nesting habitat.

    a. Plant fields of wheat and vetch to provide high quality nesting habitat the following year.

9. Manage agriculture for shorebird species through newly developed shorebird/rice rotation.

    a. *July 1:* Flood shallow unplanted rice fields which have been disced at least twice.

    b. *July 1 through end of August:* Maintain shallow water.

    c. *September 1:* Drain fields, disc weeds and prepare field for rice planting to occur in the following spring.

10. Perform field preparation of some agricultural fields in the fall in order to present disced field habitat for species that utilize this habitat such as horned larks, longspurs, and mountain plover.

Agricultural Resources Goal 1 (AR-2): *Manage agricultural lands to contribute to the agricultural community, to maintain agriculture as a viable economic activity in Yolo County, and to provide revenue for continued operation of the Wildlife Area.*

At the time of the acquisition of the Glide and Los Rios properties, one concern expressed by the agricultural community was regarding the loss of farm land to wildlife habitat. DFG made a commitment at that time to maintain the existing agricultural leases present on the property and to integrate agriculture into the long term management of the Wildlife Area. The Yolo Bypass Wildlife Area is now seen as a model for bridging the seemingly disparate fields of agriculture and wildlife management. Practices used in agriculture and wildlife management are not that far apart. The success of this management philosophy is best epitomized by the land management approaches implemented in the Yolo Bypass Wildlife Area where agricultural lands are leased to local farmers and managed, under an agreement with DFG, by the Dixon RCD. These tenants work in cooperation with DFG to grow a variety of agricultural crops and to manage livestock grazing for wildlife and native plant habitat management.

Revenues from agricultural leases provide valuable operating income for the Yolo Bypass Wildlife Area. These revenues are viewed as vital for continued operation and management of the Wildlife Area. The DFG has an agreement with Dixon RCD to manage agricultural leases and other agriculture-related activities occurring in the Yolo Bypass Wildlife Area. Dixon RCD staff has made invaluable contributions towards DFG's goal of integrating agriculture into the long-term management of the Wildlife Area.

Integration of agriculture into the long term management of the Wildlife Area contributes to attainment of this LMP's goals regarding contribution to the local agricultural community while providing habitat for wildlife species. The tasks listed below are intended to represent DFG's approach toward continued contribution to the local agricultural community.

Tasks:

1. Work with local farmers to grow agricultural crops that mutually benefit the farmer lease tenants, the agricultural community, and the Wildlife Area.

2. Manage agricultural lands to provide an income source for DFG management and operations of the Wildlife Area.

3. Administer agricultural leases as necessary in cooperation with staff from the Dixon RCD.

    a. Annually plan agricultural activities throughout the Wildlife Area including production fields and wildlife food plots.

    b. Coordinate desires of lessees with limitations of Mace Ranch Irrigation System and its other users.

    c. Plan for administration of Farm Service Agency funds to lessees and reciprocal services to be provided to Wildlife Area.

    d. Periodically inspect agricultural activities throughout the year.

    e. Plan for the post harvest treatment of agricultural fields.

4. Maintenance of water management infrastructure including pumps, water control gates, and water distribution system performed by DFG, agricultural lease tenants, and cooperatively by members of the Mace Ranch Irrigation System.

5. Meet or correspond with adjacent landowners and tenants as needed individually or through the Yolo Bypass Working Group to maintain communication about regional agricultural issues, management needs of the Yolo Bypass Wildlife Area, determine adjacent landowners' access and management needs, and convey useful information regarding activities.

6. Work with local agriculture community to provide information on wildlife friendly farming approaches used the Wildlife Area.

7. Collaborate with adjacent landowners and tenants regarding DFG management activities that may affect their operations. Resolve potential issues by proactively working with adjacent landowners and tenants.

8. Collaborate with adjacent special districts including Dixon RCD, Reclamation District 2068 and Yolo RCD.

5.2.3 CULTURAL RESOURCES ELEMENT

Cultural resources at Yolo Bypass Wildlife Area are limited. DFG is not aware of any significant historical or archaeological resources at the Yolo Bypass Wildlife Area. Consequently, there are few opportunities or constraints on the management of cultural resources at the Yolo Bypass Wildlife Area. Nonetheless, significant historical or archaeological resources may be present and could potentially be affected by public uses or management actions, particularly ground-disturbing activities in areas not yet surveyed. Potential ground-disturbing activities include levee maintenance by DWR and restoration of ecosystems by DFG or other agencies in collaboration with DFG. (See also Public Use Goal 7 below for additional goals related to cultural resources.)

Chapter 3, "Environmental Setting," contains additional information regarding cultural resources of the Yolo Bypass Wildlife Area.

Cultural Resources Goal 1 (CR-1): *Catalog and preserve all cultural resources that have yielded or have the potential to yield information important to the prehistory or history of the Yolo Bypass Wildlife Area or that otherwise would meet significance criteria according to the California Register of Historical Resources (CRHR).*

This goal is based on CEQA requirements and on DFG's intent to provide long-term stewardship of cultural resources at the Yolo Bypass Wildlife Area. The tasks listed below represent a strategic approach toward providing such stewardship.

Tasks:

1. Maintain library of printed cultural resource reports from the vicinity.

2. Conduct cultural resource surveys as necessary before significant ground-disturbing activities (e.g., excavations below normal plow depths) at undisturbed sites.

3. Complete and submit site records to the State Historic Preservation Officer (SHPO) to establish and submit culturally significant resources that may be eligible for inclusion in the National Register of Historic Places (NRHP) or the CRHR.

4. When facility improvements or restoration efforts are proposed and may affect historical or archaeological resources, consult the State CEQA Guidelines for guidance on compliance with regulations. Consult with the California Native American Heritage Commission as appropriate.

5. Maintain historic structures present on site including the Tule Ranch main residence and the umbrella barn.

5.2.4 AUTHORIZED-PUBLIC-USE ELEMENT

It is the policy of the California Fish and Game Commission that lands under its administration be available to the public for wildlife-dependent recreational use whenever such uses will not unduly interfere with the primary purpose for which such lands were acquired. The Yolo Bypass Wildlife Area was acquired for the primary purpose of providing habitat for resident and migratory bird species. Various compatible, wildlife-dependent uses authorized and ongoing at the Yolo Bypass Wildlife Area are listed below.

The Yolo Bypass Wildlife Area presents a unique opportunity to affect the environmental awareness of unlimited numbers of people due to the proximity of its spectacular wildlife numbers to the urban environment of the Sacramento area. This mix of humanity and the natural world lie at the heart of the Yolo Bypass Wildlife Area and illustrate the mutual goals shared by the Yolo Basin Foundation (Foundation) and the DFG. Each organization has extended themselves towards achieving a common desire of getting people into the habitats of the Yolo Basin and appreciating what they experience there. This successful working relationship is memorialized in a MOU between the DFG and Foundation (see Appendix D) and has resulted in nine years of visitors enjoying docent lead walks, guest speakers, educational field activities, hunting adventures, special events, as well as the spectacle of thousands of waterfowl lifting off from the Wildlife Area's rice fields at the north end or the aroma of thousands of acres of wildflowers on some of California's last remaining wild prairie at the south end.

Opportunities for public uses at the Yolo Bypass Wildlife Area include hunting, angling, walking, hiking, vehicle touring for wildlife observation, nature study, and environmental education and interpretation. There is also significant potential for gathering of native plant materials for cultural uses. Other types of nature study include photography, drawing, and painting.

There are currently also several important constraints on public use of the Yolo Bypass Wildlife Area. These constraints include:

- limited availability of staff and funding for operations such as opening and closing of gates, garbage collection, visitor use coordination, and law enforcement.
- limited availability of staff and funding for maintenance of roads, trails, parking lots, fencing, and signs.
- limited public access to Yolo Bypass Wildlife Area management units, due to a lack of roads, ditch crossings, and parking lots.
- other management activities such as farming, presence of heavy equipment for farming and habitat maintenance can present safety problems for smaller vehicles, pedestrians, and bicyclists.
- environmental factors such as flooding that prevents access and presents significant safety risks to the public.
- access to the Yolo Bypass Wildlife Area from the West Sacramento side is limited by the lack of Toe Drain crossings and the east side levee access is controlled by local reclamation districts, primarily RD 900 and RD 999:
    - access to the Yolo Bypass Wildlife Area from the west levee of the Yolo Bypass south of the entrance gate is controlled by the DWR and thus not available to the public.
- roads are graveled with large size gravel to withstand flooding making for rough terrain. Ungravelled levees can have large cracks during the dry season. These factors present safety risks for bicycling.
- potential effects of human disturbance on wetlands, agricultural areas, riparian areas, grasslands and uplands, and aquatic ecosystems of the Yolo Bypass Wildlife Area.
- potential effects of human disturbance to wildlife including frightening wildlife, flushing of wildlife from habitat, disturbance while roosting, and noise disturbance.
- potential effects of human disturbance to wildlife during breeding and nesting season.
- the need to prevent access to sanctuary areas which are closed to public use.
- potential effects on cultural resources.
- incompatibility of various public uses (for example hunting and wildlife viewing cannot be accommodated in the same area).
- the need to exclude public use during pesticide applications for agriculture, vector control, and invasive species management.
- conflicts between vehicle traffic, bicycles, and pedestrians.

Chapter 3, “Environmental Setting,” contains additional information regarding public uses of the Yolo Bypass Wildlife Area.

Public-Use Goal 1 (PU-1): *Increase existing and provide new long-term opportunities for appropriate wildlife-dependent activities by the public.*

The Yolo Bypass Wildlife Area is located along the heavily traveled I-80 corridor and within the growing Sacramento metropolitan area, making it among the most accessible wildlife areas in the state. As the region’s population grows and the need for open space activities increases, the Yolo Bypass Wildlife Area will become an increasingly important place for the public. DFG acquired the Yolo Bypass Wildlife Area, in part, to provide opportunities for wildlife-related activities. Uses that have been actively managed for the non-hunting public include wildlife observation and nature study by foot and vehicle on trails and roads.

There is a five-mile driving loop for observation of wildlife from vehicles. This route is open all year except during flooding. There are several turnouts along this route. Other roads are open to non-hunter vehicle access except during the hunting season. The potential exists to improve this tour route by enlarging its length and modifying it to improve wildlife viewing. The current route loops back in a linear fashion creating a long, narrow natural area. Wildlife is often frightened away by the first vehicle in the morning. A loop that encompasses a larger area with increased wildlife cover will encourage wildlife use adjacent to viewing areas. Research conducted at the Sacramento River National Wildlife Refuge has shown that vehicles cause the least disturbance to wildlife when compared to both people on foot or on bicycles, thus improving the wildlife viewing experience and minimizing disturbance to wildlife. It is recognized that many people would rather enjoy the experience by being outside of their vehicles. It is anticipated that the future tour loop will include both an area in which people are required to stay within their vehicles and areas where hiking is encouraged.

Trails are located primarily on the raised areas between ponds. Some trails are marked by signs and are mowed once a year to keep them more accessible. Most trails leave from a designated parking lot. Some trails are open all year but those located in hunt areas are closed to non-hunters during hunting season. There is one maintained trail with limited interpretive signs that starts at parking lot D. The potential exists to expand marked trails and provide more signage. Picnic tables are currently located at parking lots B, C, D, F, and G. Portable toilets are also located at these same lots. An accessible portable toilet is currently provided at parking lot C.

Bird watching in the Yolo Bypass

The population of West Sacramento is growing and the Yolo Bypass Wildlife Area is increasingly seen as a resource for the city's residents. There is some interest in making the Wildlife Area accessible from the east side levees. DFG and Foundation staff has met with representatives of the city to explore this option. East side access would have to overcome some complex problems including crossing the East Toe Drain. Currently much of the east side of the Wildlife Area is open for hunting during waterfowl season. Conflicts with this use would also have to be resolved. There has also been some interest expressed in providing equestrian access from the east side. DFG will cooperate in discussions to explore the potential for regional equestrian trail linkages, but it is not anticipated that equestrian use of trails will be encouraged at the Wildlife Area.

Tasks:

Tasks for maintaining and improving wildlife observation:

1. Expand existing northern auto tour route to encompass portions of the Causeway Ranch and 1,000 Acre units.

2. Evaluate potential to develop a new southern auto tour route in the same manner for the Tule Ranch Unit.

3. Designate about half of the length of each tour route for vehicle access only while encouraging out of vehicle wildlife viewing from parking lots and turnouts on at least half the length of the tour routes.

4. For all wildlife viewing areas, manage existing routes and design future habitat enhancements to provide adequate vegetative screening to protect wildlife while providing viewing areas into created openings, highlighting slough channels, islands, and wildlife resting areas.

5. Develop interpretive signage for wildlife viewing roads and trails.

6. Develop viewing blinds, observation towers, and board walks where appropriate.

Tasks for maintaining and improving angling:

7. Develop maps and signs that indicate fishing access points.

8. Post fishing regulations in appropriate locations.

9. Build access points for anglers with limited mobility along East Toe Drain.

10. Coordinate with DFG "Fishing in the City" program to provide additional angling opportunities.

11. Expand spring bow fishing program to include all areas within the hunting area during the non hunting season.

Pre junior hunt safety meeting

Tasks for maintaining and improving hunting:

12. Continue current hunting program.

13. Expand hunting opportunities as habitat and access is improved on the Tule Ranch and Causeway Ranch units.

14. Consider use of boats in specified areas.

15. In the interest of maintaining a historical use of the Yolo Bypass, consider means of allowing boat access from the Yolo Bypass Wildlife Area to the Bypass during flooding periods, without incurring any liability to the State of California.

16. Continue to work with local farmers to grow agricultural food plots in order to provide improved hunting opportunities.

17. Locate waterfowl sanctuary areas to enhance hunting experience while providing adequate resting areas.

18. Maintain physical separation of hunting areas from non-hunting areas during hunting season. Open hunting areas to other uses following end of hunting season.

19. Evaluate feasibility of moving all hunting to Tule Ranch area with potential check station at the Tule Ranch Headquarters. This would separate wildlife viewing areas from hunting areas in a north-south direction rather than the current east-west situation.

20. Communicate with neighboring duck clubs to identify Yolo Bypass Wildlife Area management strategies that may affect waterfowl hunting opportunities on their properties. Coordinate Yolo Bypass Wildlife Area management strategies to provide mutual benefits (e.g., managed movement and spread of local bird densities, location of sanctuaries) for the Yolo Bypass Wildlife Area and neighboring lands.

21. Continue recruitment of new hunters by providing hunter safety instruction on a regular basis at the Wildlife Area headquarters.

22. Continue encouragement of young hunters through participation in junior hunt programs for waterfowl and pheasants.

23. Conduct late summer "clean up day" to ready the Wildlife Area for the upcoming hunting season and maintain good relationship with the hunters.

24. Consider providing falconry opportunities for the purpose of taking upland game and waterfowl on the Yolo Bypass Wildlife Area in accordance with falconry regulations and season dates adopted by the State Fish and Game Commission.

Tasks applicable to all uses include:

25. Evaluate use levels and visitor satisfaction periodically.

26. Evaluate the hunting, angling, and wildlife viewing programs and Wildlife Area regulations periodically to identify changes that are warranted to maintain consistency with the goals of this LMP.

Public-Use Goal 2 (PU-2): *Support and expanded public use of the* Yolo Bypass Wildlife Area *for environmental education and interpretation.*

School children learn about pond invertebrates

This goal is based on policies of the California Fish and Game Commission and the mission of the Foundation. It is the policy of the California Fish and Game Commission that, to the maximum extent feasible, DFG shall disseminate information to the public regarding conservation, protection, and management of the state's fish and wildlife resources. It is also a policy that DFG shall encourage education programs that increase the public's respect and concern for wild animals, and their knowledge of the interrelationships between wild animals, their environment, and their human neighbors. As stated in the Foundation's mission, the foundation is "dedicated to the stewardship and appreciation of wetlands and wildlife through education and innovative partnerships." DFG and the Foundation have a unique and very successful partnership at the Yolo Bypass Wildlife Area that supports a diverse education program.

The objective of the program is to encourage the public's awareness of the presence and importance of wetlands in their environment and increase their understanding of issues that impact these ecosystems by providing various educational opportunities for the public through school programs, field experiences, and special programs. The programs provide easily accessible field oriented learning opportunities to the large regional student/teacher population and the general public.

The primary feature of the environmental education program at the Yolo Bypass Wildlife Area is entitled "Discover the Flyway." This program is operated cooperatively with DFG Wildlife Area staff.

The objective of the Discover the Flyway program for schools is to make wetlands and their stewardship, in the context of the Yolo Basin, a consistent educational component in the schools of the Sacramento region.

The Discover the Flyway program takes an ecosystem approach to educating teachers and students about wetlands: ecosystem relationships, habitats, species composition, human and natural threats, and compatible land uses.

These programs have developed over that last decade to a point where 4,000 K–12 students and hundreds of teachers and parents participate in the Discover the Flyway Program. The participants come from at least

15 school districts in Sacramento, Yolo, Solano, Placer, and El Dorado Counties. Significant numbers of students from private schools and home school networks also participate.

Training workshops provide teachers with the experience to successfully lead classroom and field studies in the Yolo Bypass Wildlife Area. The program offers teachers, subsequent to participating in their first workshop, staff support and equipment for classroom field trips to the Yolo Demonstration Wetlands (located at the DFG Headquarters site) and the Wildlife Area.

The workload associated with this program includes advertising and outreach, teacher and volunteer training, scheduling class visits and volunteers, working with the teacher to plan pre trip activities, 3–4 field activities, and post visit activities. The Wild About Wetlands Kits, with a wide range of classroom activities, are available for teachers to check out prior to their visit. The kits need regular maintenance and updating.

The Foundation provides a staff person to lead the field trip, volunteers to run activity stations, and binoculars and scopes. DFG maintains the Demonstration Wetlands at the Headquarters site, provides the maintenance needed for trail access at the Wildlife Area, coordinates the use of volunteers, provides a portion of the education tools and materials and assists in the development of new programs.. Foundation staff coordinates with DFG to determine where to take the students. Trips are scheduled four days of the week. One day is set aside to allow for road and habitat maintenance. Pesticide use is coordinated so that spraying activities do not take place while students are present.

School children learning about "migration madness"

Tasks:

Tasks to support kindergarten through 12th grade environmental education:

1. Provide Teacher Training Workshops at least four times a year.

2. Maintain Wild About Wetlands kits for pre and post trip activities.

3. Provide and maintain curriculum materials and field equipment.

4. Provide other workshops and educational activities:

   a. Project Wet: This is a K–12 teacher workshop on water topics offered in cooperation with DFG.

   b. Salmonids in the Classroom: This project sponsored by DFG and local fly-fisher groups, offers teachers curriculum and aquarium supplies to grow salmon eggs to the fry stage and release them in the Sacramento River.

   c. Introduction to Watershed Education: This is a workshop co-hosted with the Water Education Foundation to teach 8th–12th grade teachers how to measure and monitor for parameters of water quality, including nutrients, and bioassessment.

   d. Nature Bowl: This is an event for 3rd–6th graders held at the Yolo Bypass Wildlife Area to promote learning about natural systems and the local environment. The event is co-sponsored with DFG and Yolo County Office of Education.

e. Marsh Madness: The Foundation works with CWA to target under served schools twice a year for a full day of field activities. Bus transportation and a wetlands lunch buffet are provided. CWA provides the lunch, tables and chairs, and volunteers for the day.

5. Creation and maintenance of curriculum workbook with activities adapted to the State science framework and environmental education guidelines. The Foundation is also implementing a new curriculum that meets state social studies standards for 4th–6th grade.

Public education extends beyond K–12 students to include all ages. There are multiple education programs for the general public.

Tasks to support environmental education for people of all ages:

Spring field trip to vernal pools

6. Foundation volunteers are scheduled to lead monthly public field trips to the Yolo Bypass Wildlife Area

7. Scheduling and providing publicity for monthly Flyway Nights Lecture Series.

8. California Duck Days – DFG and YBF host the annual California Duck Days Wetlands Festival in partnership with a volunteer steering committee. The steering committee, in addition to DFG and Foundation staff, includes representatives from Central Valley Joint Venture, City of Davis, CWA, Yolo and California Audubon, and Conaway Ranch. This a huge effort requiring the scheduling of dozens of volunteers, arranging for field trip and workshop leaders, and preparing the Wildlife Area headquarters site for the event.

9. Publicizing and scheduling of summer and spring guided tours at sunset to view the flyout of thousands of Mexican free-tail bats from under the Causeway.

10. Publicizing and scheduling guided spring tours and open house events to view the Tule Ranch vernal pools.

    a. Special tours for other organizations (USACE [watershed training course four times/year], American River Conservancy docents, Sacramento Zoo staff, Elkhorn Slough docents, visiting dignitaries from other countries, and many others.)

    b. Jepson Prairie/Tule Ranch vernal pool docent training course.

11. Other events hosted by others in which DFG and the Foundation participate require varying amounts of preparation and presence:

    a. Salmon Festival at Nimbus Hatchery

    b. Earth Day at the Sacramento Zoo

    c. International Migratory Bird Day

    d. Celebrate Davis Chamber of Commerce event

    e. Sandhill Crane Festival

f. Make presentations to various service clubs, chambers of commerce, university classes, educational conferences

12. Educational Materials for Loan:
    a. Wild About Wetlands kits
    b. Birds of Yolo Bypass Wildlife Area PowerPoint
    c. Books and videos
    d. Soil testing kits
    e. Binoculars

YOLO FLYWAY

New Species Discovered in Yolo Bypass

Yolo Wildlife Area Management Plan Is On Its Way

Bucks for Ducks
October 13, 2006
Veo Memorial Center, Davis

Yolo Flyway newsletter is published quarterly

13. Outreach and communication includes "Yolo Flyway" newsletter three times a year, press releases, articles in regional newspapers and periodicals, public service announcements on television and radio, listserve announcements and maintenance of information presented on the Yolo Basin Foundation website.

14. Develop and distribute interpretive materials including brochures, plant and wildlife and tour guides, interpretive displays and signs.

15. Develop new programs as time and budget allows.

Public-Use Goal 3 (PU-3): *Coordinate public access to and use of facilities including tour routes, parking areas, Putah Creek, the planned Pacific Flyway Center, and other areas to accommodate a variety of different user groups.*

Opportunities exist to maintain and expand tour routes throughout the Yolo Bypass Wildlife Area and to coordinate with and participate in regional trail planning efforts. Constraints include increased disturbance of wildlife and other natural resources as a result of increased public use.

Access Tasks:

Entrance to Yolo Bypass Wildlife Area

1. Provide a large sign marking the Yolo Bypass Wildlife Area entrance.

2. Improve physical and design aspects of Yolo Bypass Wildlife Area entrance, with the goal of making this area more inviting (potential improvements include creating a scenic wetland area at the entrance and increasing the ability to pass water under this road during periods of high water flows).

3. Provide Watchable Wildlife signs on I-80 and County Road 32b.

4. Coordinate with Watchable Wildlife program, visitor and convention bureaus and others to provide for accurate Yolo Bypass Wildlife Area descriptions and directions in printed materials and on the web.

Roads

5. Maintain access routes to all open facilities and parking lots.

6. Maintain and improve existing tour loop.

7. Develop a new southern auto tour route.

8. Construct all roads with natural/gravel surface with minimal maintenance requirements.

School children on Wildlife Area trail

Trails

9. Evaluate the feasibility of a walking trail along Putah Creek on Yolo Bypass Wildlife Area property that could join a similar trail coming from Mace Blvd. developed by the City of Davis.

10. Continue to allow off-season, walking access to hunting areas and evaluate potential to expand this opportunity to new hunt areas.

11. Expand signage on trail network.

12. Evaluate the feasibility of connecting the Causeway Ranch with the Davis Wetlands through a trail system.

Bicycling

13. Continue to allow bicycle access to the Causeway Unit.

14. Evaluate, develop, and consider implementing a plan for allowing bicycle use on specified parts of the tour routes.

15. Continue to monitor the use of bicycles in the hunting area during hunting season.

16. Cooperate with regional trail development efforts to create bicycle access across the Yolo Bypass through the Causeway Unit at ground level.

17. Evaluate efforts to provide bicycle access to the Pacific Flyway Center and participate as infrastructure is developed and funding permits.

Wildlife Area boundary sign in winter

Signage

Compatible public uses of the Yolo Bypass Wildlife Area are facilitated by signage that informs the public of the boundaries, laws, and regulations applicable at Yolo Bypass Wildlife Area; encourages public use; reduces conflicts among uses; increases the safety of users; and discourages unauthorized uses. The tasks listed below are intended to promote the use of such signage.

18. Maintain signs and bulletin boards at the Yolo Bypass Wildlife Area Headquarters, parking lot A and any other entrances that may be developed in the future with wildlife area maps and regulations, interpretive materials, and safety information.

19. Work with California Department of Transportation (Caltrans) and Yolo County to install signage on I-80 to direct visitors to the entrance of the Yolo Bypass Wildlife Area.

20. Start a monitoring and maintenance schedule for all signage.

21. Inventory existing boundary signage and fencing, and install new signs and fencing where necessary.

22. Provide sign board in parking lot A that provides a comprehensive display of public use opportunities at the Yolo Bypass Wildlife Area. This will include a map showing currently available public use areas.

23. Provide signs marking tour routes, trails, and bicycle access areas.

24. Provide signs marking areas that are temporarily closed for nesting, maintenance, or other reasons.

25. Develop a plan for interpretive features including signs, blinds, and board walks.

26. Develop, construct, install and maintain interpretive signs.

Operations

27. Rent and maintain portable toilets.

28. Provide garbage cans.

29. Provide picnic tables in some visitor areas.

30. Provide for the opening and closing of gates to control access.

31. Improve ditch and creek crossings as needed for public use.

32. Continue to open entrance gates at sunrise (except on hunting days) and closing gates at sunset.

Other Uses

33. Evaluate the feasibility of providing canoeing or fishing opportunities at Green's Lake and Putah Creek.

34. Evaluate coordinating with the City of Davis regarding put-ins and take-outs of boats on Putah Creek.

Regional trail systems and coordination of access

35. Cooperate with the City of West Sacramento in assessing feasibility of access from the east side.

36. Cooperate with agencies promoting regional hiking, bicycle, and equestrian trail connections including Caltrans, Delta Protection Commission, Yolo County, City of Davis, and City of West Sacramento.

37. Evaluate the feasibility of establishing a regional trail along abandoned Sacramento Northern Railroad easement that traverses the Tule Ranch.

Public-Use Goal 4 (PU-4): *Continue to foster community partnerships*

DFG and the Foundation will continue to work together and coordinate as provided in the MOU. The relationship of these two organizations is an excellent example of a well-functioning public-private partnership. The benefits of the public-private partnership include the ability of each to take advantage of different funding sources to

develop and implement programs at the Yolo Bypass Wildlife Area. The tasks listed below represent a strategic approach toward fostering community partnerships.

Tasks:

1. Update the MOU between the Yolo Basin Foundation and the DFG to reflect the current operating relationship and expansion of the Wildlife Area acreage and programs.

2. Coordinate press releases and other forms of outreach.

3. Collaborate in developing new program areas.

4. Coordinate with other non-profit groups (e.g., Foundation, DU, CWA, Yolo and Sacramento Audubon Societies, Audubon California, Putah Creek Council, CVHJV) that promote wildlife-dependent education and interpretation, and recreational or hunting opportunities that can provide additional support to DFG's management of the Yolo Bypass Wildlife Area.

5. Encourage and cooperate with the long-term continuation of the Yolo Bypass Working Group.

Public-Use Goal 5 (PU-5): *Continue and expand the volunteer program.*

Volunteering is a vital element of many activities carried out by DFG and the Foundation. The volunteer program will continue to be supported and opportunities will be identified to expand programs. Volunteers assist with Discover the Flyway activities and support other educational programs in a variety of ways. Monthly public field trips are lead by volunteers. Nature Bowl, Marsh Madness, and California Duck Days rely on volunteer labor to be successful. Volunteers help maintain educational materials, photograph events, provide administrative help in the Foundation office, maintain Foundation press files, and provide help with entering information into the organization's database. Volunteers provide construction skills as needed. The Foundation provides training for volunteers involved with the Discover the Flyway program several times a year. Volunteer recognition activities include special field trips and an annual volunteer dinner. Volunteers wear nametags to identify them as volunteers. All volunteers are registered as DFG volunteers and the DFG volunteer handbook is utilized for the administration of the volunteer program. . Foundation and DFG staff maintain records of volunteer hours.
Over the last decade volunteers have provided thousands of hours of labor that has been critical to the success of educational programs at the Yolo Bypass Wildlife Area. Last year volunteers provided 3500 hours of donated labor.

A group of Wildlife Area volunteers inside the Umbrella Barn

Tasks:

1. Use the existing DFG volunteer handbook and YBF volunteer materials to provide consistent direction for volunteers.

2. Expand existing volunteer materials.

3. Sign up all volunteers as DFG volunteers to take advantage of the benefits of being a volunteer for the state including workers compensation coverage and the ability to count these volunteer efforts as "in kind" contributions on grant applications.

4. Continue to coordinate with the Foundation to jointly plan use of volunteers including the development of

volunteer job descriptions.

5. Recruit new volunteers through regional media, community organizations, local colleges, professional associations, conservation organizations, and at public events.

6. Expand volunteer training opportunities.

7. Expand volunteer recognition program.

8. Continue tracking of volunteer hours for use as inkind labor contribution for state and federal grant programs.

Public Use Goal 6 (PU-6): *Minimize competition and conflicts among users and facilitate compatibility between public uses.*

Conflicts between various uses groups have potential to arise due to compatibility issues. The tasks listed below are intended to reduce conflicts among user groups.

Tasks:

1. Encourage hunter safety through monitoring and enforcement of regulations.

2. Inform the public of Wildlife Area use designations and use restrictions through outreach, signage, and DFG's web site.

3. Periodically evaluate management of access locations, tour routes, parking areas, and associated regulations to identify changes that are warranted to maintain consistency with the goals of this LMP.

4. Identify potential conflicts with other recreational uses and resolve such conflicts.

5. Inform the public of times and locations where hunting is allowed and of all other restrictions and applicable regulations through outreach, signage, and DFG's web site.

6. Have DFG and/or YBF personnel available on-site during high use times to monitor visitor activities and provide information as needed to visitors.

7. Include a DFG contact person's name, phone number, and e-mail address on signage for questions, comments, and suggestions regarding compatible uses of the Yolo Bypass Wildlife Area.

8. Conduct periodic reviews of public uses of the Yolo Bypass Wildlife Area; evaluate patterns of usage, rules, regulations, guidelines, and materials to ensure compatibility of public uses.

Modern day Native American gathering tules

Public-Use Goal 7 (PU-7): *Support use of the Yolo Bypass Wildlife Area by Native Americans for activities such as gathering native plant materials for cultural purposes.*

Gathering of limited quantities of native plant materials can be compatible with the goals of the Wildlife Area. The tasks listed below are intended to ensure that such uses are authorized only when compatible and when they take place in a manner that minimizes conflicts with other uses.

Tasks:

1. Develop access plans for and issue permits to native peoples whose activities are compatible with the goals of the LMP. Any authorization for access would include standard liability clauses.

2. Allow limited gathering of materials for educational and craft purposes by the public.

Public-Use Goal 8 (PU-8): *Facilitate safe use of the Yolo Bypass Wildlife Area by informing the public of potential risks, and also develop an emergency response plan.*

Although risks are inherent in any physical activity, informing the public of potential risks and reducing access to unsafe areas should increase the safety of users. The tasks listed below express this intent.

Tasks:

1. Continue to close the Yolo Bypass Wildlife Area when the Yolo Bypass is flooding (e.g., Fremont Weir and/or Sacramento Weir overtopping and/or west side tributaries flooding).

2. Identify areas where warning signs are needed.

3. Post warning signs at identified locations and indicate on these signs whom to contact during an emergency.

4. Coordinate with the SYMVCD regarding timing of pesticide applications.

5. Restrict access to unsafe areas such as construction zones and at times, active farming areas.

6. Develop an emergency response plan.

    a. Work with local, regional, and state agencies to integrate the Yolo Bypass Wildlife Area into emergency communications and response plans.

    b. Work with Yolo County and local fire districts to improve coordination of emergency services.

5.2.5 UNAUTHORIZED-PUBLIC-USE ELEMENT

Disposal of waste, construction of unauthorized structures, camping, use of generators and fires, and other illegal activities have the potential to occur in the Yolo Bypass Wildlife Area. These unauthorized uses damage the Yolo Bypass Wildlife Area's ecosystems, affect special-status and game species and their habitats, and interfere with authorized uses. The limited availability of staff and funding substantially constrains management of unauthorized uses.

Unauthorized-Public-Use Goal 1 (UPU-1): *Prevent unauthorized use of the Yolo Bypass Wildlife Area.*

Preventing unauthorized uses would prevent the adverse effects caused by those uses. The tasks listed below are intended to reduce the frequency and effects of unauthorized uses.

Tasks:

1. Prohibit activities that are inconsistent with the Yolo Bypass Wildlife Area mission in the Wildlife Area regulations.

2. Require CEQA analysis and surface agreements for access to the area for mineral extraction.

3. Discourage dumping of trash or waste within the Yolo Bypass Wildlife Area by providing and servicing trash receptacle.

4. Patrol the Yolo Bypass Wildlife Area and enforce regulations that prohibit unauthorized uses.

5. Maintain adequate signage on boundaries to satisfy lawful enforcement of Wildlife Area regulations.

6. Use signage and written notifications to foster cooperation.

7. Issue citations and/or pursue legal action when voluntary cooperation cannot be obtained.

8. Enforce laws through DFG Wildlife Protection personnel and request assistance from the Yolo County Sheriff's Department as necessary to enforce laws.

9. Issue citations to violators illegally using the Yolo Bypass Wildlife Area and seek remediation from unauthorized users.

10. Restore ecosystems damaged by unauthorized uses as necessary.

5.2.6 FACILITIES ELEMENT

Platform of elevated pump station

Facilities at the Yolo Bypass Wildlife Area include the public access roads, hunting blinds, check stations, water management–related infrastructure, and other facilities listed below. Sacramento River Flood Control Project levees on the east and west boundaries of the Wildlife Area are maintained by the DWR and Reclamation Districts. These facilities support flood protection.

There are also a number of important constraints on construction and maintenance of facilities at the Yolo Bypass Wildlife Area. These constraints include:

- limited availability of staff and funding;
- flooding of the Yolo Bypass limits access for construction and maintenance of facilities in the Bypass;
- flooding has the potential to cause damage to roads, crossings, water distribution system, and pumps;
- the DWR and State Reclamation Board easement for flood flow conveyance; and
- potential effects on conveyance of flood waters.

Chapter 2, "Property Description," contains additional information regarding facilities at the Yolo Bypass Wildlife Area.

Winter flooding in 2006

Facilities Goal 1 (F-1): *Management and operation of the Yolo Bypass Wildlife Area in coordination with state and federal flood operations in the Yolo Bypass.*

Facilities throughout the Yolo Bypass Wildlife Area require construction, maintenance, and removal in response to initiation of flood flow conveyance in the Yolo Bypass. The tasks listed below are intended to address facilities construction, maintenance, and removal needs. A discussion on the Sacramento River Flood Control Project, the State-Federal Flood Operations Center, and operation of Fremont Weir and Sacramento Weir is provided in section 3.1, "Planning Influences and Considerations."

Tasks:

1. Upon notification call by DWR Division of Flood Management, implement and follow the following flood response protocol:

    a. Remove hunter check station, portable restrooms, and other movable structures as necessary.

    b. Close gates at Wildlife Area access points.

    c. The most critical areas are those structures which adjoin the Toe Drain/canals. When water in these areas reaches the level of the water in the ponds, remove all check boards.

    d. Pull all the boards in irrigated agricultural fields (or as many as can be safely reached). Screw gates should also be opened. This may increase sedimentation in the pipes but it will also help to decrease the potential for the flash boards floating away and being lost.

    e. Pull boards in internal structures to allow water in the cells to equalize prior to flooding to reduce erosion effects.

    f. If internal structures are not pulled prior to a flood event, then the progression typically is from east to west; pull external boards, open screw gates, and then follow the water as it moves to the west.

    g. Close and cap alfalfa valves to prevent sedimentation.

    h. Close pipeline in the Causeway Ranch Unit to prevent sedimentation in the pipe. Mark screw gate and alfalfa valve locations in order to relocate when floodwater recedes.

    i. Open screw gate structure at central lift station and pull boards on the structure immediately west of the station.

    j. Leave control box heaters on at pump stations as this will help dry out any moisture that may occur.

    k. Decision needs to be made regarding pulling central lift pumps and west pump– generally the pumps should be pulled in severe events.

    l. After the waters recede:

        1. Clean out bowls at the submersible pump stations.

2. Dry pump motors that may have received moisture during the flood event before putting back in operation.

Cleaning out mud from pump station sump

Facilities Goal 2 (F-2): *Construction, maintenance, and removal of facilities.*

Facilities throughout the YWBA require construction, maintenance, and removal for various purposes. The tasks listed below are intended to address facilities construction, maintenance, and removal needs.

Tasks:

1. Maintenance of hunting blinds and the hunter check station performed by DFG.

2. Maintenance of water management infrastructure including pumps, water control gates, and water distribution system performed by DFG, agricultural lease tenants, and cooperatively by members of the Mace Ranch Irrigation System.

3. Maintenance of gravel roads on an ongoing basis.

4. Construction and maintenance of new access roads.

5. Maintenance of gates and fences.

6. Construction of new gates and fences.

7. Maintenance of signs.

8. Maintenance for other facilities:

   a. Yolo Bypass Wildlife Area Headquarters 13-acre site with office building, residence, equipment, landscaping, parking lot,, fences, gravel road, and shop buildings and related facilities, fish screen shop, various portable buildings including one used by DFG wardens as base station, and portable office unit owned by YBF;

   b. Yolo Demonstration Wetlands located at the Yolo Bypass Wildlife Area Headquarters;

   c. Kiosk at Yolo Fruit Market operated jointly with the Foundation;

   d. House on Pacific Flyway Center site;

   e. Tule Ranch Headquarters compound; and

   f. Tule Ranch Umbrella barn.

9. Work with the Foundation to develop interpretive signs and other features such as kiosks, shade structures, blinds, and boardwalks to enhance the value for visitors.

Facilities Goal 3 (F-3): *Effectively manage existing facilities and/or structures for resource protection, safety, and prevention of unauthorized uses.*

Management of facilities/structures for resource protection, safety, and prevention of unauthorized uses will contribute to the attainment of goals for biological and public use elements. The tasks listed below are intended to facilitate effective management of Yolo Bypass Wildlife Area facilities.

Tasks:

1. Regularly monitor the condition and use of existing facilities/structures.

2. Take actions as needed to keep desired facilities/structures in good repair.

3. Schedule preventative maintenance of all facilities and structures.

4. Take actions to demolish and remove those structures that are unauthorized or have become unsafe or undesirable.

Facilities Goal 4 (F-4): *Construct, operate and maintain the Pacific Flyway Center and other associated facilities.*

Tasks:

1. Construction of the Pacific Flyway Center is a goal of DFG. The continuing efforts to establish the center will be supported.

2. Participate in program development phase, schematic design phase, and construction phase in partnership with the Foundation.

3. Determine what needs to be accomplished to change location of entrance to the Wildlife Area if needed.

4. Move administrative and interpretive functions to the Pacific Flyway Center.

5. Operate and maintain the Pacific Flyway Center.

6. Manage the approximately 15 acres of farm land on the Flyway Center site to be a demonstration of wildlife friendly farming.

7. Work with the Foundation to fund, construct, update and maintain exhibits and other interpretive features of the Pacific Flyway Center.

8. Maintain gates and access road to Flyway Center.

Facilities Goal 5 (F-5): *Maintain equipment necessary for future management of the Wildlife Area.*

Habitat management activities require the use of a staggering variety of equipment, tools, and vehicles. Each of these elements must be maintained, repaired and replaced as necessary. These items range from large farm tractors and implements to commercial vehicles, welders, generators, wood working tools, incinerators, boats, all terrain vehicles, compressors, and hand tools.

Tasks

1. Repair and maintenance of heavy equipment including various tractors and implements.

2. Maintenance and operation of commercial vehicles.

a. Maintain current compliance with Department of California Highway Patrol Biennial Inspection of Terminals (BIT) Program.

b. Maintain commercial vehicles through regular BIT inspections.

c. Tractor Operator Laborer to maintain current commercial driver's license.

d. Provide commercial vehicle driving services to other Department of Fish and Game facilities as necessary.

3. Maintenance and operation of wheeled vehicles other than commercial vehicles.

4. Maintenance and operation of shop facility.

5. Maintenance and operation of miscellaneous tools and equipment.

6. Maintain office equipment including computers, printers, copy machine, plotter, telephone system.

Facilities Goal 6 (F-6): *Consider the construction and operation of an outdoor shooting range for bi-annual use by local game warden squad for periodic firearm use qualification process.*

Range construction, operation and maintenance shall consider the following tasks:

Tasks

1. Implementation of Environmental Protection Agency (EPA) best management practices for the management of lead at outdoor shooting facilities.

2. Operation of the shooting range will not proceed until after development of a shooting range use protocol in accordance with National Rifle Association (NRA) standards as detailed in the NRA Range Source Book. This protocol shall designate a point of contact within DFG's Wildlife Protection Branch and a Range Master shall be designated for each instance of use. This operations plan and subsequent use is to be approved by the Yolo Bypass Wildlife Area Manager.

3. Construction of the shooting range shall conform to standards and guidelines established by the Occupational Safety and Health Administration, the National Association of Shooting Ranges (NASR) and the Sporting Arms and Ammunition Manufacturers' Institute (SAAMI), with the intention of controlling hazards and prevention of exposures to hazardous substances in shooting range facilities.

4. Maintenance of the shooting range shall be the responsibility of the Wildlife Protection Branch.

5.2.7 ADMINISTRATION ELEMENT

Administration of the Yolo Bypass Wildlife Area includes maintaining and providing records of management actions and expenditures, allocation of staff time, procurement of needed supplies and equipment, solicitation of grant monies to supplement operating income, habitat management activities, and agriculture management activities and/or leases.

Administration Goal 1 (A-1): *Maintain current data on the management and resources of the Yolo Bypass Wildlife Area.*

Current data on the management and resources of the Yolo Bypass Wildlife Area will support attainment of goals for biological, cultural, public use, and facility elements. The tasks listed below are intended to promote maintenance of needed data.

Tasks:

1. Regularly update geographic information system (GIS) data sources as information becomes available.

2. Maintain accurate financial records regarding expenditures, staff, maintenance, and other administrative duties.

3. Facilitate the planning and paying of Wildlife Area expenses.

4. Administer agricultural leases as necessary in cooperation with staff from the Dixon Resource Conservation District (RCD).

    a. Annually plan agricultural activities throughout the Wildlife Area including production fields and wildlife food plots.

    b. Coordinate desires of lessees with limitations of Mace Ranch Irrigation System and its other users.

    c. Plan for administration of Farm Service Agency funds to lessees and reciprocal services to be provided to Wildlife Area.

    d. Periodically inspect agricultural activities throughout the year.

    e. Plan for the post harvest treatment of agricultural fields.

5. Document facilities needs in a DFG maintenance and capital outlay database.

6. Prepare annual and periodic status reports as defined in the future Chapter 6, "Operations and Maintenance."

7. Perform scheduling function for conference room.

8. Participate in habitat planning efforts for areas close to the Wildlife Area.

9. Supervise permanent and seasonal staff.

10. Actively pursue funding to help facilitate implementation of the LMP.

5.2.8 FIRE MANAGEMENT ELEMENT

Burning of emergent vegetation in a permanent pond

Fires within the Yolo Bypass Wildlife Area are rare, but there is the potential for natural (e.g., lightning) or human-caused fires to be started. Additionally, at the Yolo Bypass Wildlife Area, there are opportunities to employ fire as a habitat manipulation tool. Fires at the Yolo Bypass Wildlife Area may have both adverse and beneficial effects on the attainment of the goals of this LMP. For example, fires can have benefits to native vegetation and may contribute to attainment of the goals for the biological element. Conversely, fires also may damage facilities, injure staff and visitors, and thus may interfere with the attainment of goals for public use and facilities.

The Yolo Bypass Wildlife Area lies within two special fire districts. Land north of Putah Creek is part of the East

Davis Fire District and lands to the south of Putah Creek are in the No Man's Land Fire District. Each of these fire districts collects assessments from property owners within their districts and contracts with the City of Davis for emergency services. Per the terms of Proposition 218, it is the policy of the DFG to not pay assessments to special districts unless DFG is receiving "special services." Proposition 218 specifically states that fire and ambulance services are not considered "special services" and therefore, the DFG pays no assessments to either the No Man's Land or East Davis Fire Districts. Nevertheless, the DFG would consider it mutually beneficial to cooperate with these fire districts in the event of an emergency.

There are a number of constraints on fire management at the Yolo Bypass Wildlife Area. These constraints include:

- Availability of staff and funding;
- potential adverse effects on air quality,
    - the geographic position of the Wildlife Area is such that prevailing Delta breezes tend to move fire smoke into the Sacramento metropolitan area;
- public safety;
- facilities; and
- public use.

Fire Management Goal 1 (FM-1): *Develop and implement a wildfire plan for the Yolo Bypass Wildlife Area.*

In 1994, the California State Board of Forestry and the California Fish and Game Commission adopted a *Joint Policy on Pre, During, and Post-fire Activities and Wildlife Habitat* (California State Board of Forestry and California Fish and Game Commission 1994). This joint policy describes multiple measures that both the California Department of Forestry and Fire Protection (CDF) and DFG should undertake to protect lives and property with consideration of natural resources. These measures would be implemented before, during, and after fires. The tasks listed below are intended to facilitate implementation of fire protection measures.

Tasks:

1. Meet biannually if necessary with CDF representatives to discuss fire-related issues relevant to the Yolo Bypass Wildlife Area, including vegetation management, recent fires in the Yolo Bypass Wildlife Area, current contact information, and procedures.

2. Coordinate with CDF to develop a wildland fire response plan for the Yolo Bypass Wildlife Area. This plan would give protection of life and property the highest priority during fire response, but would also give careful consideration to effects on the natural resources of the Yolo Bypass Wildlife Area. This plan should identify fire suppression tactics that could have long-term effects on ecosystems (e.g., use of retardant). Those tactics should be avoided or modified whenever feasible to avoid or minimize long-term effects on the ecosystems of the Yolo Bypass Wildlife Area. The plan should also identify critical areas where emergency revegetation or mechanical or structural measures may be contemplated to prevent excessive erosion or flooding after a fire. The potential effect of such practices on special status plants should be considered.

3. Design and implement vegetation management activities at fire breaks along existing roads and parking lots.

4. Train a DFG biologist to serve the role of resource specialist or agency representative through the Incident Command System (ICS).

a. As part of the ICS, make available a local plant, wildlife, and fisheries specialist from DFG's staff to provide advice during fires and for post fire rehabilitation that threaten wildlife habitat at the Yolo Bypass Wildlife Area.

5. Following a fire or fire suppression, implement emergency revegetation, mechanical, and structural measures within those previously defined critical areas that were affected.

6. Coordinate fire suppression activities and cooperate with local fire districts.

5.2.9 SCIENTIFIC RESEARCH AND MONITORING ELEMENT

Scientific research and monitoring contributes to sound management of wetlands, agricultural areas, riparian areas, grasslands and uplands, and aquatic ecosystems both in and beyond the Yolo Bypass Wildlife Area. It is also a key component of successful adaptive management programs. Monitoring results of management actions is the key feed back feature of an adaptive management approach to land management. There are unlimited possibilities within innumerable disciplines to conduct research that may affect management decisions. However, current and/or recent studies on fisheries resources, hydraulic analysis, resource assessments, mosquito abatement, and water quality conducted at or near the Yolo Bypass Wildlife Area have especially relevant ramifications. The status of these "big five" topics are summarized below:

FISHERIES

Previously described research regarding use of the Yolo Bypass by native fish during seasonal flooding events has sparked significant interest in managing this floodplain of the Sacramento River for these species. Additional research should be conducted to adequately describe the use of the Bypass by Chinook salmon, Sacramento splittail, and white and green sturgeon. Management options should be investigated with complete respect for ongoing wetland habitat projects already established with the broad support of Bypass stakeholders and land owners.

HYDRAULIC ANALYSIS

With the development of the RMA 2 model by the USACE, a tool now exists to more accurately predict the hydraulic effects of proposed land management actions. Continued application of this model to planned restoration efforts will further improve the long-term management of land use in the Yolo Bypass.

RESOURCE ASSESSMENT

DFG is preparing a field-verified vegetation map of the Yolo Bypass Wildlife Area. However, detailed inventory data are lacking for portions of the Yolo Bypass Wildlife Area. For example, plant species lists based on field surveys do not exist for the entire Yolo Bypass Wildlife Area (e.g., areas within the Tule Ranch Unit). Although the species list for the Yolo Bypass Wildlife Area (see Appendix G) is field-based and comprehensive for all species on-site, field verification is needed to determine the presence of several expected amphibian, reptile, and mammal species. There is also no formal ongoing monitoring of invasive plant populations, special-status plant populations or their habitats, wildlife responses to Yolo Bypass Wildlife Area's innovative management of agriculture, or any monitoring that could be used to evaluate the effects of public use on ecosystems at Yolo Bypass Wildlife Area.

MOSQUITO ABATEMENT

With the arrival of West Nile Virus, it is imperative that the operation of the Yolo Bypass Wildlife Area is conducted in a manner that is not dangerous to the local community which it serves. Research into the effects of ground disturbance upon the production of mosquito larvae has been promising, with broad ramifications for wetland managers with potential mosquito production conflicts. Continued research regarding the fine tuning of established "Best Management Practices" for wetlands will further the collaborative relationship the Yolo Bypass Wildlife Area shares with the Sacramento Yolo Mosquito and Vector Control District.

Mercury

Although much is uncertain in regards to the role wetlands play in the methylation of mercury, certain wetland characteristics appear to minimize this concern. Projects should be designed to minimize the potential for mercury methylation as much as possible. Appropriate project features include open-water swales, active drainage and water movement to promote aerobic (i.e., oxygen rich) conditions, and tailwater detention basins for post-flood demethylation. Extensive research is being conducted to help understand the finer nuances of methylation processes in wetlands.

The Central Valley RWQCB is currently in the process of developing a mercury and methylmercury TMDL for the Delta. Characterization of existing conditions and potential development of BMPs are two potential requirements of the TMDL. Development and implementation of experimental BMPs to address mercury methylation holds great potential to better understand and address wetland restoration throughout the region.

Thus, additional research and monitoring could benefit management and attainment of goals for biological and public use elements.

Many opportunities exist at the Yolo Bypass Wildlife Area for scientific research and monitoring. These include:

- basic resource assessment to document what currently exists on the Yolo Bypass Wildlife Area; and
- monitoring of all of the following:
  - wildlife and natural community responses to the management of wetlands, agricultural areas, riparian areas, uplands and grasslands, and aquatic ecosystems;
  - floodplain processes (e.g., hydrology, geomorphology, fisheries resources, and primary production); and
  - mercury methylation processes in managed wetlands and agriculture;
- development and monitoring of experimental BMPs to reduce/minimize mercury methylation processes;
- monitoring of mosquito control BMPs;
- management of public use activities in a natural setting;
- implementation of agricultural techniques that provide wildlife habitat benefits;
- importance of agricultural buffer areas to wildlife habitat management areas;

- compilation of existing background information by this and other reports;
- coordination with other branches of DFG that are conducting data collection and mapping activities;
- coordination with other resource agency departments including DWR, California Department of Conservation, and California Department of Food and Agriculture on monitoring, mapping, and other types of data collection;
- coordination with federal agencies such as NOAA, NMFS, USGS, USFWS, USACE on data collection and mapping;
- coordination with private organizations such as California Waterfowl Association, Ducks Unlimited, CA Audubon, and Point Reyes Bird Observatory on data collection;

Proximity of the Yolo Bypass Wildlife Area to universities, colleges, and other academic institutions presents opportunities to:

- actively promote the Wildlife Area to local academic institutions as a resource available for research activities; and
- establish long term working relationships with local academic institutions.

There are also a number of important constraints on scientific research and monitoring of the Yolo Bypass Wildlife Area. These constraints include:

- limited availability of staff and funding;
- public use of much of the Wildlife Area; and
- seasonal flooding.

Scientific Research and Monitoring Goal 1 (SRM-1): *Support appropriate scientific research and monitoring and encourage or conduct research that contributes to adaptive management strategies and management goals of the Yolo Bypass Wildlife Area.*

This goal is based on the need for data from monitoring and scientific research to attain many of the goals of this LMP, and on the policies of the California Fish and Game Commission. It is the policy of the California Fish and Game Commission that research shall be performed to provide scientific and management data necessary to promote the protection, propagation, conservation, management, or administration of fish and wildlife resources; whenever possible and advantageous, the services of the University of California, California State University, or other academic or research institutions, or federal, state, or local agencies shall be used. The tasks listed below are intended to promote continuance of appropriate scientific research related to the Yolo Bypass Wildlife Area.

Tasks:

1. Prepare an annual Wildlife Area Habitat Management Work Plan Summaries and submit summaries to the DFG Wildlife Area Habitat Committee (WAHC), and DFG headquarters staff for evaluation.

    a. Implement recommendations for habitat improvement provided by the WAHC.

2. Develop a prioritized list of research needs.

3. Review and evaluate proposed research projects using the following criteria:

a. Potential for research results to improve management of the Yolo Bypass Wildlife Area, other wildlife areas, or other ecosystems;

b. Potential for conflicts between the research and compatible public uses;

c. Potential for conflicts between the research and any biological goals stated in this LMP; and

d. Scientific rigor in the proposed research design, methods of study, and scope of inference.

4. Provide letters or permits to researchers specifying dates and times of authorized access, and information on regulations and area restrictions.

5. Require that researchers provide copies of data and/or published papers, and contact researchers to ensure that this requirement is fulfilled.

6. Encourage long-term studies of the following:

   a. Ecology of managed wetlands;

   b. Agroecology;

   c. Wildlife friendly agricultural practices;

   d. Vernal pool ecology and management;

   e. Native grassland ecology and management, including management of grazing to enhance native species diversity;

   f. Invasive species management;

   g. Trends in abundance of migrant and/or wintering waterfowl and shorebirds, in support of regional population monitoring throughout the Pacific Flyway;

   h. Trends in abundance, reproduction, survival, and/or habitat use by special-status species (e.g., giant garter snake), game species, or other species of regional interest (e.g., grasshopper sparrow);

   i. Mercury methylation processes in managed wetlands and crops, development and monitoring of experimental demethylation BMPs, and effects of methyl mercury on birds and other wildlife; As part of the LMP planning process a focus group meeting was held to discuss mercury / methylmercury research needs and opportunities (see Appendix A). Several needs and opportunities were identified. Follow-up meetings should be convened to continue these discussions.

7. Conduct high-priority surveys, including surveys for special-status species, as time and budget permit;

8. Investigate public use patterns and effectiveness of public use programs;

9. Investigate effectiveness of environmental education programs; and

10. Encourage sharing of scientific information through the Yolo Bypass Working Group.

5.2.10 MANAGEMENT COORDINATION ELEMENT

The creation and expansion of the Yolo Bypass Wildlife Area involved significant and complex coordination and partnership building with many agencies and organizations. The management of the Yolo Bypass Wildlife Area has continued in a spirit of cooperation and coordination. The result is a successful public private partnership with the DFG managing the Wildlife Area and the Yolo Basin Foundation managing many of the public use programs. The Wildlife Area is a successful model of cooperation between many agencies and organizations and the same approach should continue through the life of this LMP.

There are opportunities for continued management coordination at the Yolo Bypass Wildlife Area including:

- ongoing flood management activities with DWR, the State Reclamation Board, USACE, and the Sacramento Area Flood Control Agency (SAFCA);
- coordination of land use activities in the Yolo Bypass with the Yolo Bypass Working Group;
- coordination with the development and execution of the Yolo County Habitat Conservation Plan/Natural Community Conservation Plan (HCP/NCCP);
- ongoing wetland management activities coordinated with mosquito abatement by SYMVCD;
- law enforcement by the Yolo County Sheriff's Department;
- land use planning by Yolo County and cities of West Sacramento and Davis including General Plans and open space planning;
- water supply planning by Yolo County Water Resource Association through the Integrated Regional Water Management Plan;
- fisheries and flow on Putah Creek with the Lower Putah Creek Coordinating Committee;
- ongoing regional recreational planning by local agencies (e.g., Yolo County, Sacramento County, the City of West Sacramento, the City of Davis);
- regional invasive-plant control efforts by the California Department of Food and Agriculture and Yolo County Agricultural Commissioner's Office;
- fire-management planning by CDF and local fire districts;
- activities of the DWR-Broddrick Maintenance Yard for levee maintenance;
- State Reclamation Board 2-dimensional Hydraulic Model;
- water supply and drainage with RD 2068;
- mercury monitoring and research with CVRWQCB, USGS, UC Davis, and others;
- hazardous waste storage and disposal program administered by Yolo County;
- Yolo County emergency response planning;

- activities of California Bay-Delta Authority programs, particularly the CALFED ERP; and
- regional (i.e., Yolo Bypass) ecosystem restoration planning including DWR/Aquatic Restoration Project Implementation.

Management Coordination Goal 1 (MC-1): *Coordinate with federal, state, and local agencies regarding plans and projects that may affect habitats and/or management at the Yolo Bypass Wildlife Area.*

It is the policy of the California Fish and Game Commission that to provide maximum protection of fish and wildlife and their habitats. DFG shall review and comment on proposed flood management, ecosystem restoration, and water development projects or other projects affecting habitat in the Yolo Bypass Wildlife Area, and shall recommend and seek the adoption of proposals necessary or appropriate for the protection and enhancement of fish and wildlife and their habitat. The tasks listed below are intended to foster improved interagency coordination on issues pertinent to management of the Yolo Bypass Wildlife Area.

Tasks:

1. Review, coordinate, and provide comments and recommendations on federal, state, and local government plans and proposed projects as appropriate for the purpose of determining the consistency of such plans with the goals of DFG's LMP.

2. Coordinate with Yolo County NCCP proponents to make them aware of habitat restoration efforts at the Wildlife Area and coordinate proposed actions to compliment each other's efforts such as insuring the long-term presence of agricultural lands between the Davis city limits and the Yolo Bypass south of I-80.

3. Coordinate with the Yolo County program to survey, control, and monitor invasive plant species.

4. Collaborate with or submit proposals for CALFED-funded projects that could contribute both to the attainment of the goals of this LMP and to the attainment of CALFED goals, objectives, targets, and milestones.

5. Support the implementation of research, monitoring, and restoration actions compatible with the goals of this LMP by the California Bay-Delta Authority and other CALFED implementing agencies.

Management Coordination Goal 2 (MC-2): *Coordinate with flood control agencies regarding flood control and management in the Yolo Bypass.*

The primary function of the Yolo Bypass is flood control and management. DFG shall continue to coordinate with flood control agencies (i.e., DWR, the State Reclamation Board, and USACE) regarding all potential restoration projects and other activities that could affect flood flow conveyance in the Yolo Bypass. DFG will also review and comment on proposed flood management and water development projects or other projects that could affect habitat and/or management in the Yolo Bypass Wildlife Area. As necessary, DFG will also reconsider appropriate elements in the LMP if new flood control alternatives are developed in the future. This would be part of the overall adaptive management process for implementing the LMP. The tasks listed below are intended to foster coordination with flood control agencies regarding management of the Yolo Bypass.

Tasks:

1. Review, coordinate, and provide comments and recommendations on plans and proposed projects as appropriate to determine the consistency of such plans with the goals of DFG's LMP. DFG biologists in the Sacramento Valley Central Sierra Region shall serve as the lead in coordinating ecosystem restoration components of future flood protection improvement efforts.

2. Coordinate with DWR, the State Reclamation Board, USACE and, where appropriate, local flood control agencies, reclamation districts, and SAFCA regarding the design and operation of restoration and enhancement projects that have the potential to conflict with necessary flood flow conveyance requirements. All projects should continue to be designed and operated to continue to have no impact on existing flood flow conveyance requirements of the Yolo Bypass. Additionally, design and operation of habitat restoration and enhancement projects shall consider affects on the Yolo Bypass design flow as well as its current capacity and on the ability to maintain the project at reasonable costs in conformance with USACE operation and maintenance manuals. Project planning may include necessary hydraulic modeling to guide design and confirm achievement of performance criteria (i.e., avoid potential adverse effects on necessary flow conveyance). All hydraulic modeling should be conducted in coordination with appropriate flood control and management agencies. A work plan for hydraulic modeling is provided in Appendix C.

3. Participate in ecosystem restoration components of any overall improvements to the Lower Sacramento Flood Control System.

4. Continue public outreach programs that describe the compatible nature of appropriate wetland management activities with flood protection efforts.

Management Coordination Goal 3 (MC-3): *Coordinate with other law enforcement agencies.*

The jurisdictions of multiple law enforcement organizations overlap at the Yolo Bypass Wildlife Area, and thus coordination among them should lead to more effective law enforcement; this should also support attainment of the goals of this LMP for public-use elements. The tasks listed below are intended to foster coordination with the appropriate law enforcement agencies.

Tasks:

1. Meet on an annual basis with local Wildlife Protection squad prior to waterfowl hunting season to review Wildlife Area regulations, work schedules, exchange contact information and intricacies of public hunting program.

2. Continue ongoing communication with Wildlife Protection staff throughout the year.

3. Meet regularly with law enforcement staff from the California Highway Patrol and Yolo County Sheriff's Department and other agencies as appropriate to coordinate law enforcement activities and explore options for cooperative programs.

4. Pursue joint funding requests with other law enforcement entities to address law enforcement concerns.

Management Coordination Goal 4 (MC-4): *Coordinate with local public-service agencies including the SYMVCD and the Yolo County Health Department.*

Section 1507 of the California Fish and Game Code contains language regarding the control of mosquito production of managed wetlands in DFG's wildlife areas. Control of mosquito production in wetlands and agricultural fields (e.g., rice fields) shall be a priority for DFG. As described in Section 1507, mosquito production should be controlled in a manner that:

- maintains or enhances habitat values for waterfowl and other wildlife;
- minimizes financial costs to DFG and SYMVCD;
- reduces the need for chemical treatment or other nonecological mosquito control; and

- increases coordination and communication between DFG and SYMVCD, and the California Department of Health Services.

The tasks listed below are intended to foster coordination of mosquito and vector control activities.

Tasks:

1. In consultation with SYMVCD, continue to implement a mosquito control plan that applies BMPs and any other necessary management practices as identified in the *Central Valley Habitat Joint Venture, Technical Guide to Best Management Practices for Mosquito Control in Managed Wetlands* (Kwasny et al. 2004) and the California Rice Commission's BMPs for mosquito control.

2. Communicate regularly with SYMVCD. Coordinate mosquito and vector control activities. Meet annually with mosquito abatement agencies to discuss needed infrastructure improvements, identify areas of high mosquito productivity, schedules of summer irrigations and fall flood up, and scheduling of public use activities.

3. Conduct annual meeting with private wetland managers in the Yolo Bypass and SYMVCD staff to coordinate fall flood up of wetlands, target habitat infrastructure improvements and firm up contact information.

4. Coordinate with Yolo County Health Department as necessary.

5. Apply for grants and matching funds with SYMVCD to implement BMPs.

6. Jointly conduct research to measure land management effects on mosquito production.

Management Coordination Goal 5 (MC-5): *Maintain relationships with neighbors and tenants to address management issues.*

Activities of neighbors, agricultural and duck club interests, and tenants in the Yolo Bypass Wildlife Area all affect ecosystems and public uses at the Yolo Bypass Wildlife Area. Maintaining relationships with neighbors and tenants can thus contribute to attainment of most goals of this LMP. This can best be done through continued involvement and leadership within the Yolo Bypass Working Group, as well as through personal communication over the phone and in person.

The tasks listed below are intended to foster improved relationships between DFG and Yolo Bypass Wildlife Area neighbors and tenants.

Tasks:

1. Meet or correspond with adjacent landowners and tenants as needed individually or through the Yolo Bypass Working Group to maintain communication about management needs of the Yolo Bypass Wildlife Area, determine adjacent landowners' access and management needs, and convey useful information regarding activities.

2. Collaborate with adjacent landowners and tenants regarding DFG management activities that may affect their operations. Resolve potential issues by proactively working with adjacent landowners and tenants.

3. Collaborate with adjacent special districts including Reclamation District 2068, Dixon RCD, Yolo RCD, No Man's Land Fire District, East Davis Fire District, South Davis Drainage District, and other neighboring special districts.

4. Area Manager and appropriate staff should attend annual site visits to duck hunting clubs conducted by DFG headquarters staff as part of the implementation of various wetland easement programs.

5. Meet at least annually with duck club owners and SYMVCD to discuss fall flood-up schedule and summer irrigations.

6. Meet annually with SYMVCD to target field work in areas that have a high propensity to produce large numbers of mosquitoes to prevent abatement issues later during flood up.

7. Coordinate flooding of duck clubs through the Tule Ranch Irrigation System.

    a. Review, modify, and exercise agreements with adjacent duck hunting clubs regarding the delivery of water and use of Wildlife Area roads as necessary.

    b. Review billing process.

    c. Collect fees on an annual basis for water delivery and road use.

Management Coordination Goal 6 (MC-6): *Coordinate activities associated with managing cholera, avian flu, and other disease outbreaks.*

Continued preparedness training is necessary as increasing numbers of wildlife diseases appear in North America. The Department of Fish and Game will have the lead on surveillance of wild bird populations for the presence of avian influenza. Additionally, regular visual monitoring of birds for the presence of avian botulism and avian cholera will continue.

Tasks:

1. Conduct regular visual monitoring of birds for the presence of botulism in the summer and avian cholera in the winter.
    a. Submit carcass samples to Wildlife Investigations Laboratory for evaluation.
    b. Conduct clean up operations as necessary in order to remove carcasses.
    c. Incinerate carcasses as they arrive.
    d. Improve circulation of water or other management activities to prevent spread of the disease.

2. Conduct regular monitoring of harvested birds at the hunter check station for the presence of avian flu.

3. Participate in disease related work groups.

4. Coordinate with county and state public health agencies, and UC Davis.

5. Participate in Incident Command System (ICS) activities.

6 OPERATIONS AND MAINTENANCE

The purpose of this Chapter is to indicate staffing, funding and other resources to operate and maintain the Yolo Bypass Wildlife Area (Wildlife Area). Implementation of this Land Management Plan (LMP) will require additional staffing and resources than are currently allocated to the Yolo Bypass Wildlife Area, to accomplish the tasks indicated in Chapter 5. This LMP proposes proactive application of an ecosystem approach to the management of the multiple natural communities and habitats present at the Yolo Bypass Wildlife Area at a more intensive level than in the past. This will require a commitment of additional budgetary resources if the goals of this LMP are to be achieved.

In addition to financial resources, this LMP will require periodic revision to ensure that it is kept current, reflecting goals met, and changing needs and understanding. It is fully expected that the ongoing, adaptive management of the Yolo Bypass Wildlife Area and advancement of scientific knowledge regarding the area will result in new techniques and opportunities for more effective management of habitat. Suggested procedures to help keep this LMP current and relevant are included in this chapter.

6.1 OPERATIONS AND MAINTENANCE TASKS TO IMPLEMENT PLAN

Table 6.1-1 summarizes and synthesizes operations and maintenance requirements (i.e., tasks identified in Chapter 5, “Management Goals”) to implement the LMP. Estimated hours by staff position is also included in the table.

6.2 EXISTING STAFF AND ADDITIONAL PERSONNEL NEEDS

The Yolo Bypass Wildlife Area is currently staffed by four permanent employees and five part time temporary employees. Their duties are described below:

Position	Duties
Wildlife Habitat Supervisor II	Give direction to maintenance staff, California Department of Fish and Game’s (DFG’s) principle representative at Working Group meetings; Coordination of scientific research; Management of agricultural leases; Budget planning and management; Grant proposal preparation; Contract Management; Representative for Wildlife Area for media exposure; Writing articles for newsletter and local media; Presentation of public programs to a variety of audiences; Communication with local elected officials; Representative of Wildlife Area working with various governmental agencies and non governmental organizations; Creation of annual habitat management plans; Grant application writer; Permit application writer; Presentations to local schools; Occasional operation of heavy equipment; Maintains compliance with various agreements for management; Author of land management plans; Wildlife Area photographer.
Wildlife Habitat Supervisor I	Lead person for field staff; operation of heavy equipment; Surveys of local wildlife populations; Procurement of supplies and equipment; Maintenance of Wildlife Area electronic equipment; Assists in planning of field activities; Coordination with farmers sharing irrigation system; Operation of Wildlife Area irrigation system; Lead person for hunter check station.
Tractor Operator Laborer	Lead for operation and maintenance of heavy equipment and implements; Construction and fabrication of equipment utilizing metal and wood technologies; Lead for operation of shop facility; Lead for hunter check station;
Fish and Wildlife Technician	Construction and fabrication of equipment utilizing metal and wood technologies; Lead for maintenance of vehicles and residences; Operation and maintenance of heavy equipment; Lead for application of herbicides; Liaison for adjacent duck hunting clubs and Tule Ranch operations; Lead for hunter check station; Installation and maintenance of water control structures.
Scientific Aids Total of 3 personnel years	Greeting visitors to administrative facility; Administration of procurement procedures; Tracking of expenditures; Maintenance of office records; Maintenance of Demonstration Wetlands area; Operation of heavy equipment; General construction activities; Application of herbicides; Operation of hunter check station; Volunteer coordinator; Instructor for Wildlife Area education program; Coordinator of teacher workshops.

To ensure appropriate support of the Yolo Bypass Wildlife Area and performance of the tasks identified in this LMP, a combination of additional site management, maintenance, interpretive and administrative staffing is required. The staffing team developed here includes all permanent personnel needed to operate the Yolo Wildlife Area and implement the land management plan. The staffing program proposed in this LMP incorporates permanent staffing augmented by seasonal labor although seasonal labor tasks are not itemized. It is anticipated that an additional 6 personnel years of seasonal employee time (Scientific Aids, Seasonal Aids) will be needed in order to implement this plan.

DFG standard staffing levels for wildlife areas varies according to the intensity of management undertaken. Intensely managed areas should be staffed with one field person per 1,000 acres for the first 10,000 acres. Approximately 10,000 of the 16,770 acre Yolo Bypass Wildlife Area will be intensely managed. Application of the standard indicates that 10 field staff personnel are justified. These ten field staff positions will consist of 1 Wildlife Habitat Supervisor II, 1 Wildlife Biologist, I Wildlife Habitat Supervisor I, 2 Wildlife Habitat Assistants, 3 Tractor Operator Laborers, and 2 Fish and Wildlife Technicians.

Additional staff will include an Interpreter II, an Interpreter I, and an Office Technician. All of the personnel will be supervised by a Senior Biologist Supervisor (Wildlife). The duties of the proposed staff will consist of the following:

Title	Duties
Senior Biologist Supervisor (Wildlife)	Representative for Wildlife Area with elected officials, local events and media, procurement of funding for future activities, supervision of all Wildlife Area employees, DFG's principle representative at Working Group meetings; Management of agricultural leases; Budget planning and management; Grant proposal preparation; Contract Management; Representative for Wildlife Area for media exposure; Writing articles for newsletter and local media; Presentation of public programs to a variety of audiences; Representative of Wildlife Area working with various governmental agencies and non governmental organizations. This person will have the principal responsibility for implementation of this LMP.
Wildlife Habitat Supervisor II	Planning and implementation of wildlife habitat management activities. Supervise field staff. Oversee procurement of equipment and supplies. Coordination with other land management entities in the Yolo Bypass.
Wildlife Biologist	Plant and wildlife surveys, analysis of biological benefits of management, assist in planning of habitat construction and maintenance activities, coordination of scientific research on Wildlife Area.
Wildlife Habitat Supervisor I	Lead person for field staff, procurement of supplies for habitat management activities, planning of field work
Wildlife Habitat Assistant	Water management, habitat management activities, operation of heavy equipment, check station operation.
Tractor Operator Laborer	Operation and maintenance of heavy equipment, vehicles, and various tools and machinery, check station operation.
Fish and Wildlife Technician	Assist wildlife habitat management activities, check station operation, vehicle and equipment maintenance.
Fish and Wildlife Interpreter II	Administration and supervision of Wildlife Area volunteer program. Lead DFG representative for development of new curriculum, interpretive programs and public use management. Coordinate public use programs with outdoor recreation and interpretive programs developed by other groups.
Fish and Wildlife Interpreter I	Participate in Wildlife Area interpretive and education programs, represent Wildlife Area in public festivals and special events.
Office Technician	Administration of procurement activities, budget tracking, communication with visitors over the phone, via email and in person.

Implementation of the LMP involves completing the tasks described in Chapter 5. The duties of each position translate into hours spent towards each of these tasks. The following chart distributes hours towards each of the above positions to complete the described tasks. These tasks are summarized and synthesized from the detailed descriptions provided in Chapter 5.

6.3 ESTIMATED OPERATIONS AND MAINTENANCE COST AND FUNDING SOURCES

6.3.1 ESTIMATED COSTS

The proposed staffing of the Yolo Bypass Wildlife Area required in order to fully implement this land management plan (e.g., salary [not including benefits]), is estimated to be approximately $801,000 in 2006 dollars.

STAFFING

The annual cost of the proposed staffing program is provided in Table 6.3-1.

6.3.2 FUNDING SOURCES

OPERATIONS AND MAINTENANCE

Current funding sources for operation and maintenance include:

- Federal Aid in Wildlife Restoration Act (Pittman-Robertson Act),
- Agricultural lease revenues,
- The Tobacco Tax and Health Initiative (Proposition 99),
- The Environmental License Plate Fund,
- Mitigation funds,
- Funding under CALFED Bay-Delta Program, and
- The Central Valley Project Improvement Act.

Additionally, substantial in kind contributions are received from the Yolo Basin Foundation.

CAPITAL IMPROVEMENTS / RESTORATION AND ENHANCEMENT

On a project basis, funding sources for capital improvements / restoration and enhancement could include:

- North American Wetlands Conservation Act (NAWCA) funding (approximately $8 million in NAWCA funding is currently available for restoration activities in the Yolo Bypass Wildlife Area);
- California Endangered Species Tax Check-Off Fund;
- U.S. Fish and Wildlife Service support under the Federal Endangered Species Act Section 6 provisions for cooperation with the states;
- Wetlands Conservation Fund;
- IRWMP-DWR Bond fund;
- State Duck Stamp Program;
- Upland Game Stamp Program;

- U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) Farm Bill Programs;
- USFWS State Wildlife Grant Program, Federal Aid in Wildlife Restoration Program;
- Central Valley Project, Wildlife Habitat Augmentation Plan;
- Neotropical Migratory Bird Conservation Act Grants Program;
- Riparian Habitat Joint Venture;
- Ducks Unlimited, Wetland Restoration Program;
- Department of Fish and Game Minor/Major Capital Outlay proposals;
- DFG Comprehensive Wetlands Program;
- Wildlife Conservation Board Inland Wetlands Conservation Program;
- Other programs authorized under future bond acts;
- DWR grants available for mitigation of water projects and levee maintenance activities;
- Funding available through Yolo County Integrated Regional Water Management Plan;
- Funding available through the Sacramento River Watershed Program;
- Funding from grant programs administered by U.S. Environmental Protection Agency;
- Funding from grant programs administered by National Oceanic and Atmospheric Administration;
- Funding from grant programs administered by the National Fish and Wildlife Foundation;
- Funding from grant programs administered by US Bureau of Reclamation;
- Funding that becomes available as a result of programs to improve the Sacramento River Flood Control System by expanding the Yolo Bypass (including Sacramento Area Flood Control Agency);
- Funding from the Yolo County NCCP;
- Farm Service Agency payments to tenants;
- AB 1982 : Funding to implement mosquito best management practices; and
- DFG deferred maintenance fund.

Table 6.1-1
Operations and Maintenance Requirements (hours by staff position) to Implement Plan

Element / Sub-element	Goal	Tasks	Senior Biologist Super (Wildlife) (1)	Wildlife Habitat Super II (1)	Wildlife Biologist (1)	Wildlife Habitat Super I (2)	Wildlife Habitat Assist (2)	Tractor Operator Laborer (2)	Fish and Wildlife Tech (2)	Fish and Wildlife Interpret II (1)	Fish and Wildlife Interpret I (1)	Office Tech (1)
5.2.1 BIOLOGICAL ELEMENT												
5.2.1.1 Management for Species Guilds	**Species Guilds Goal 1 (SG-1):** *Manage and maintain habitat communities for waterfowl species.*	1. Manage seasonal and permanent wetlands and other communities to provide habitat for resident waterfowl species.	22	4	4	135	283	308	205			
		2. Manage upland vegetation to provide desired nesting habitat.	16	16	11	42	100	206	115			6
		3. Maintain a sanctuary area where public access is prohibited in order to provide safe haven for migratory waterfowl.	8		5	6	5					
		4. Monitor waterfowl populations periodically to assess management techniques and species response; apply adaptive management techniques as appropriate.	4	5	70	10						15
	Species Guilds Goal 2 (SG-2): *Manage and maintain habitat communities for shorebird and wading bird species.*	1. Manage seasonal wetlands for shorebird species.	16	6		20	75		40			
		2. Manage agriculture for shorebird species through newly developed shorebird/rice rotation.	16			13	30	90				
		3. Monitor shorebird populations periodically to assess management techniques and species response; apply adaptive management techniques as appropriate.			24							
		4. Perform field preparation of some agricultural fields in the fall in order to present disced field habitat for species that utilize this habitat such as horned larks, longspurs, and mountain plover.				6	20	60				
		5. Provide staggered timing of rice shore bird rotation so that there are always some fields in the shorebird rotation.				2	5					
	Species Guilds Goal 3 (SG-3): *Maintain and enhance habitat for upland game species.*	1. On an experimental basis, dedicate two fields to provide all habitat requirements within discreet areas in accordance with Diverse Upland Habitat Unit (DUHU) techniques being developed on several state wildlife areas.	8	5	8	16	10	16				
		2. Annually plant nesting cover including legumes that will improve nesting habitat for upland game species.				24	25	60				5

Table 6.1-1
Operations and Maintenance Requirements (hours by staff position) to Implement Plan

Element / Sub-element	Goal	Tasks	Senior Biologist Super (Wildlife) (1)	Wildlife Habitat Super II (1)	Wildlife Biologist (1)	Wildlife Habitat Super I (2)	Wildlife Habitat Assist (2)	Tractor Operator Laborer (2)	Fish and Wildlife Tech (2)	Fish and Wildlife Interpret II (1)	Fish and Wildlife Interpret I (1)	Office Tech (1)
		3. Provide nesting structures for mourning dove.				5	16		20	10		
		4. Annually plant grain field to provide foraging areas for upland game and hunting opportunities for upland game hunters.		5		36	50	85	45			5
		5. Control invasive weeds such as perennial pepperweed and starthistle.		4		16	85	20	60			5
		6. Perform scattered irrigations in upland areas to increase humidity and subsequent invertebrate numbers for the benefit of ground nesting birds such as mallard and ring-necked pheasant. These irrigations must be conducted quickly and drained thoroughly to prevent production of large numbers of mosquitoes.	4	4	5	14	20		20			
		7. Continue to enhance upland areas with the construction of topographic features such as swales to create micro habitats and more effectively move water on and off the field.	4	6		24	25	60	20			
	Species Guilds Goal 4 (SG-4): *Manage and maintain habitat communities for raptors.*	1. Manage for rodents and large insects to provide adequate prey items in order to benefit foraging raptor species.	8	12	75	44	70	100	80			
		2. Monitor populations of raptors and to assess management techniques and species response; apply adaptive management techniques as appropriate.	4	2	20	5						
	Species Guilds Goal 5 (SG-5): *Manage and maintain habitat communities for cavity-nesting bird species.*	1. Provide and maintain nesting boxes for cavity nesters such as American kestrels, tree swallows, barn owls, and wood ducks in appropriate habitats.			5	8	10		60		12	
		2. Restore and enhance riparian vegetation for cavity nesters where compatible with flood management.			5	8	10		9			
		3. Monitor populations of cavity-nesting bird species periodically to assess management techniques and species response; apply adaptive management techniques as appropriate.			14	5			10			
	Species Guilds Goal 6 (SG-6): *Manage and maintain communities for neotropical bird species.*	1. Maintain and enhance riparian vegetation along Putah Creek and the East Toe Drain to serve as corridors for resident and migratory songbirds and	8	6	16	24	6		15			

Table 6.1-1
Operations and Maintenance Requirements (hours by staff position) to Implement Plan

Element / Sub-element	Goal	Tasks	Senior Biologist Super (Wildlife) (1)	Wildlife Habitat Super II (1)	Wildlife Biologist (1)	Wildlife Habitat Super I (2)	Wildlife Habitat Assist (2)	Tractor Operator Laborer (2)	Fish and Wildlife Tech (2)	Fish and Wildlife Interpret II (1)	Fish and Wildlife Interpret I (1)	Office Tech (1)
		nest sites for a variety of species.										
		2. Pursue approval and establishment of appropriate tree line.	2		2							
		3. Manage upland habitat to include variations in height, density of vegetation, food crops, and water to benefit a diverse array of resident ground nesting shorebirds, songbirds, raptors and owls as well as game species such as ring-necked pheasant.	6	4	6	32	8	5	16			
		4. Monitor populations of neotropical bird species periodically to assess management techniques and species response; apply adaptive management techniques as appropriate.		4	24		5					
	Species Guilds Goal 7 (SG-7): *Manage and maintain communities for a variety of other waterbird species including grebes, rails, and songbirds associated with emergent marsh vegetation.*	1. Maintain appropriate and consistent water levels to maintain high quality habitat for floating nest builders such as pied-billed grebe.				36	10					
		2. Maintain varying amounts of thatch within emergent marsh vegetation in order to attract such nesting species as white-faced ibis, black-crowned night herons, tri-colored blackbirds, and yellow headed blackbirds.			5	4		10	5			
		3. Time spring drawdown in some ponds so young grebes, moorhens, coots, and ibis are not stranded.			2	2		2	2			
	Species Guilds Goal 8 (SG-8): *Maintain and enhance foraging opportunities for the presence of breeding colonies of bats roosting under the Yolo Causeway.*	1. Establish baseline data on roosting bat species and population density under the Yolo Causeway.	4	5	30	9	25				5	
		2. Support bat diversity.		5	12	8	24		8			
		3. Protect existing bat maternity roost sites under the I-80 Causeway against unauthorized public disturbance by maintaining existing conditions that make it difficult for the public to gain access to these roosting areas.				4	8		8			
		4. Coordinate with Caltrans to ensure that their inspections, other bridge maintenance activities, and bat colony management actions are consistent with Yolo Bypass Wildlife Area management goals and tasks regarding the maternity roosts under the I-80	8	4	8							

Table 6.1-1
Operations and Maintenance Requirements (hours by staff position) to Implement Plan

Element / Sub-element	Goal	Tasks	Senior Biologist Super (Wildlife) (1)	Wildlife Habitat Super II (1)	Wildlife Biologist (1)	Wildlife Habitat Super I (2)	Wildlife Habitat Assist (2)	Tractor Operator Laborer (2)	Fish and Wildlife Tech (2)	Fish and Wildlife Interpret II (1)	Fish and Wildlife Interpret I (1)	Office Tech (1)
		Causeway, and to ensure that Yolo Wildlife Area management activities are consistent with Caltrans bat colony management policies.										
		5. Encourage preservation of bat colonies as a beneficial natural resource by maintaining and enhancing existing education and outreach programs.							25		80	
		6. Monitor bat population species and density periodically to track population trends and assess management techniques and species response; apply adaptive management techniques as appropriate.		2	20				20			
5.2.1.2 Special-Status Species	**Special Species Goal 1 (SS-1):** *Without specifically managing for special-status species, the communities at the Yolo Wildlife Area should be managed in a way that generally improves overall habitat quality and diversity while not discouraging the establishment of special-status species.*	1. Conduct surveys of wildlife and vegetation communities. The highest priority is to survey for special-status animals and plants that could be present in wetland ecosystems at the Yolo Wildlife Area but that are not yet known to occur, such as California tiger salamander, western spadefoot toad, Colusa grass, Crampton's tuctoria, and Bogg's Lake hedge-hyssop. It is also important to survey for other special-status species known to occur in wetland ecosystems at the Yolo Wildlife Area but for which much information is lacking, such as giant garter snake and vernal pool crustaceans. Submit observation records to the CNDDB.	8		32	20			40			
		2. Monitor populations of special-status species periodically to assess overall habitat integrity, detect changes in distribution and abundance, and detect positive and adverse effects of management activities, human use, and/or nonnative species.		6	40				50			
		3. Monitor special-status species use of the floodway in the face of rising and receding floodwaters.		2	10				10			
		4. Evaluate management in light of MOU between DFG, State Reclamation Board, USFWS, and DWR regarding threatened and endangered species.	8	18	16							

Table 6.1-1
Operations and Maintenance Requirements (hours by staff position) to Implement Plan

Element / Sub-element	Goal	Tasks	Senior Biologist Super (Wildlife) (1)	Wildlife Habitat Super II (1)	Wildlife Biologist (1)	Wildlife Habitat Super I (2)	Wildlife Habitat Assist (2)	Tractor Operator Laborer (2)	Fish and Wildlife Tech (2)	Fish and Wildlife Interpret II (1)	Fish and Wildlife Interpret I (1)	Office Tech (1)
		5. Upon certification of the operations and maintenance manual for the project modifications (as updated in supplement, U.S. Army Corps of Engineers 2003) to the Sacramento River Flood Control Project, fulfill reporting requirement described within.	36	32	16	20						
5.2.1.3 Nonnative Invasive Species	**Invasive Species Goal 1 (IS-1):** *Prevent the introduction and spread of invasive nonnative species that have no benefit to wildlife.*	1. Inventory habitats within the Yolo Wildlife Area for infestations of invasive plants not beneficial to wildlife.		4		56	20					
		2. Prioritize infestations for treatment based on the risks that individual infestations pose to ecosystem services, public infrastructure, and other resources within the Yolo Bypass Wildlife Area, and based on the likelihood that the infestation can be treated and maintained in a cost-effective manner.	2	6	8	12	12	40	12			
		3. Manage and control invasive and other nonnative species through specified grazing practices, controlled flood-up and drawdown procedures, use of pesticides, and other conventional agricultural practices.	34	65	60	130	175	77	153			10
5.2.1.4 Seasonal and Permanent Wetland Communities	**Seasonal and Permanent Wetland Ecosystems Goal 1 (SPW-1):** *Restore, enhance and manage wetlands to conditions that provide desired ecological functions.*	1. Evaluate opportunities, constraints, and potential restoration benefits to identify feasible wetland restoration projects that would support the goals of this LMP.	80	32	16	24						
		2. Pursue funding and develop plans for identified restoration projects that include goals, techniques, costs, monitoring, an adaptive management process, and a schedule.	180	32	12							
		3. Cooperate with development and implementation of existing restoration plans for wetland ecosystems by the CALFED ERP, North American Waterfowl Management Plan, Partners in Flight, United States Shorebird Conservation Plan, Waterbird Conservation for the Americas, Yolo County NCCP and other programs that	38	24	12	12						

Table 6.1-1
Operations and Maintenance Requirements (hours by staff position) to Implement Plan

Element / Sub-element	Goal	Tasks	Senior Biologist Super (Wildlife) (1)	Wildlife Habitat Super II (1)	Wildlife Biologist (1)	Wildlife Habitat Super I (2)	Wildlife Habitat Assist (2)	Tractor Operator Laborer (2)	Fish and Wildlife Tech (2)	Fish and Wildlife Interpret II (1)	Fish and Wildlife Interpret I (1)	Office Tech (1)
		are consistent with the goals of this LMP.										
		4. Coordinate habitat restoration acreages with goals developed for the Yolo Basin component of the Central Valley Joint Venture.	2	12	12	16						
5.2.1.5 Riparian Communities	**Riparian Goal 1 (R-1):** *Maintain and enhance riparian communities for native species diversity and abundance (including special-status species).*	1. Conduct surveys for wildlife and vegetation of riparian communities. The highest priority is to survey for special-status animals and plants that could be present in riparian ecosystems at the Yolo Wildlife Area but that are not yet known to occur, such as Northern California black walnut, California hibiscus, yellow-billed cuckoo, Mason's lilaeopsis, and Delta mudwort.	6		24				10			
		2. Monitor populations of special-status species periodically to assess overall habitat integrity, detect changes in distribution and abundance, and detect positive and adverse effects of management activities, human use, and/or nonnative species.	8	32	24	32	14	80	30			
		3. After appropriate hydraulic analysis and receipt of Reclamation Board approval, improve habitat in the riparian ecosystems at the Yolo Bypass Wildlife Area through enhancement of existing riparian areas and establishment of new riparian habitats as permitted. Maintain and enhance riparian vegetation along Putah Creek and the East Toe Drain to provide nest trees and brush for resident and migratory songbirds, wading birds, and raptors.	2	14	20	60	60	60				
		4. Manage habitats in accordance with the operations and maintenance manual for the project modifications (as updated in supplement, U.S. Army Corps of Engineers 2003) to the Sacramento River Flood Control Project, pursuant to the MOU between DFG, State Reclamation Board, USFWS, and DWR regarding threatened and endangered species.		10	10	40	40	40	20			

Table 6.1-1
Operations and Maintenance Requirements (hours by staff position) to Implement Plan

Element / Sub-element	Goal	Tasks	Senior Biologist Super (Wildlife) (1)	Wildlife Habitat Super II (1)	Wildlife Biologist (1)	Wildlife Habitat Super I (2)	Wildlife Habitat Assist (2)	Tractor Operator Laborer (2)	Fish and Wildlife Tech (2)	Fish and Wildlife Interpret II (1)	Fish and Wildlife Interpret I (1)	Office Tech (1)
	Riparian Goal 2 (R-2): *Restore and enhance riparian communities to conditions that provide desired ecological functions.*	1. Evaluate opportunities, constraints, and potential restoration benefits to identify feasible riparian restoration projects that would support the goals of this LMP. Riparian restoration projects may include new restoration areas or enhancement of existing restoration areas (e.g., seasonal and permanent wetlands) with riparian vegetation.		5	4	20	24	24				
		2. Pursue funding and develop plans for identified restoration projects that include goals, techniques, costs, monitoring, an adaptive management process, and a schedule.		6	12	20						
		3. Cooperate with development and implementation of restoration plans for riparian ecosystems by the CALFED ERP and other programs that are consistent with the goals of this LMP.		20	20	20						
		4. Design and manage riparian restoration and enhancement projects that would not conflict with necessary flood flow conveyance requirements of the Yolo Bypass. Ensure that proposed projects would not result in adverse effects on local or downstream flood hydrology and would comply with the requirements of the State Reclamation Board. Project planning will include necessary hydraulic modeling to guide design and confirm achievement of performance criteria. A work plan for hydraulic modeling is provided in Appendix C.		10	20	20	40					
5.2.1.6 Grassland and Upland Communities	**Grassland and Upland Goal 1 (GU-1):** *Maintain and enhance grassland and upland communities for diversity and abundance of native species (including special-status species).*	1. Conduct surveys for wildlife and vegetation in grassland and upland communities. The highest priority is to surveys for special-status animals and plants that could be present in grassland and upland communities at the Yolo Wildlife Area but that are not yet known to occur, such as heartscale, San Joaquin spearscale, and Carquinez goldenbush. It is also important to survey for other special-status species known to occur in grassland and upland			36	20	20		25			

Table 6.1-1
Operations and Maintenance Requirements (hours by staff position) to Implement Plan

Element / Sub-element	Goal	Tasks	Senior Biologist Super (Wildlife) (1)	Wildlife Habitat Super II (1)	Wildlife Biologist (1)	Wildlife Habitat Super I (2)	Wildlife Habitat Assist (2)	Tractor Operator Laborer (2)	Fish and Wildlife Tech (2)	Fish and Wildlife Interpret II (1)	Fish and Wildlife Interpret I (1)	Office Tech (1)
		ecosystems at the Yolo Wildlife Area but for which much information is lacking, such as Ferris' milk-vetch, alkali milk-vetch, grasshopper sparrow, burrowing owl, and California horned lark.										
		2. Monitor populations of upland and grassland species periodically to assess overall habitat integrity, detect changes in distribution and abundance, and detect positive and adverse effects of management activities, human use, and/or nonnative species.			20	10			20			
		3. Improve habitat for upland and grassland species in the grassland ecosystems at the Yolo Wildlife Area through the adaptive management of livestock grazing, limited herbicide application, native grass plantings, and other management techniques.	8	25	8	25	60	30	30			
		4. Support existing populations of burrowing owls and increase breeding populations through the installation of artificial burrows.			4	12	25	30	40			
		5. Ensure that actions comply with the federal and California Endangered Species Acts and other regulations aimed at the protection of special-status species, including MOU between DFG, State Reclamation Board, USFWS, and DWR regarding threatened and endangered species.			18							
	Grassland and Upland Goal 2 (GU-2): *Restore and enhance grassland and upland communities to conditions that provide desired ecological functions.*	1. Evaluate opportunities, constraints, and potential restoration benefits to identify feasible grassland and upland restoration projects that would support the goals of this LMP.	8	8	20							
		2. Pursue funding and develop plans for identified restoration projects that include goals, techniques, costs, monitoring, an adaptive management process, and a schedule.	36	16	16							
		3. Cooperate with development and implementation of restoration plans for grassland and upland ecosystems by the CALFED ERP and other programs that	16	16	12							

Table 6.1-1
Operations and Maintenance Requirements (hours by staff position) to Implement Plan

Element / Sub-element	Goal	Tasks	Senior Biologist Super (Wildlife) (1)	Wildlife Habitat Super II (1)	Wildlife Biologist (1)	Wildlife Habitat Super I (2)	Wildlife Habitat Assist (2)	Tractor Operator Laborer (2)	Fish and Wildlife Tech (2)	Fish and Wildlife Interpret II (1)	Fish and Wildlife Interpret I (1)	Office Tech (1)
		are consistent with the goals of this LMP.										
		4. Enhance grasslands and uplands through grazing, native grass plantings, and other management techniques.			12	50	35	40	75			
5.2.1.7 Aquatic Ecosystems	**Aquatic Ecosystems Goal 1 (AE-1):** *Maintain and enhance aquatic ecosystems for diversity and abundance of native species (including special-status species).*	1. Monitor use of aquatic habitats at the Yolo Wildlife Area by special-status fish species.			52				30			
		2. Improve and maintain habitat for special-status fish species using aquatic habitats at the Yolo Wildlife Area (see Aquatic Ecosystems Goal 3 below).			18	20	25	20	25			
		3. Identify sites (e.g., permanent wetlands, ponds, Green's Lake) for reintroduction of native fish species (e.g., Sacramento perch).			14							
		4. Ensure that actions comply with the ESA and CESA and other regulations aimed at the protection of special-status-species and are in accordance with the MOU between DFG, USFWS, DWR, and the State Reclamation Board.	8		8							
	Aquatic Ecosystems Goal 2 (AE-2): *Maintain and enhance habitat for game fish species.*	1. Monitor and assess management, human use, invasive nonnative species, and other effects on habitat for desired game species.	8	20	50	30	10		25			
		2. Evaluate access points, angling use, and regulations periodically; recommend changes as warranted to maintain and enhance aquatic habitats and populations of game species.	8	20	24	50	50		35			
		3. Improve habitat structure in permanent wetlands for the benefit of game fish species.		10	24	25	40	40	30			
	Aquatic Ecosystems Goal 3 (AE-3): *Restore and enhance aquatic ecosystems to conditions that provide desired ecological functions.*	1. Identify opportunities to restore aquatic ecosystems at the Yolo Wildlife Area. Cooperate with development and implementation of restoration plans for aquatic ecosystems by the CALFED ERP and other programs that are consistent with the goals of the Yolo Wildlife Area and this LMP. Potential projects may include the following:	36	10								

Table 6.1-1
Operations and Maintenance Requirements (hours by staff position) to Implement Plan

Element / Sub-element	Goal	Tasks	Senior Biologist Super (Wildlife) (1)	Wildlife Habitat Super II (1)	Wildlife Biologist (1)	Wildlife Habitat Super I (2)	Wildlife Habitat Assist (2)	Tractor Operator Laborer (2)	Fish and Wildlife Tech (2)	Fish and Wildlife Interpret II (1)	Fish and Wildlife Interpret I (1)	Office Tech (1)
		a. Create a new realigned Putah Creek channel through the Tule Ranch Unit (Putah Creek from above the Los Rios Check Dam to the East Toe Drain below the Lisbon Weir).	36	32	70	48	40	80	35			
		b. Explore the potential for restoration of intertidal marsh habitat and/or seasonal managed floodplain habitat at the southeast portion of Tule Ranch adjacent to the East Toe Drain for the benefit of native fish species such as splittail. Certain bird species such as black rail may also benefit.	40	25	38	36	25	120	75			
		c. Independent of Goal AE-1, consider improving coordination and enhancement of spring passage of chinook salmon smolts emigrating from Putah Creek through the Los Rios Check Dam to the East Toe Drain.	16		25							
		i. Coordinate annual replacement of the check dam after the arrival of spring water releases from the Solano Diversion Dam intended to move salmon smolts from Putah Creek into the toe drain.	4	8	5	13			25			
		ii. Consider the construction of a fish passage facility at the check dam to move adult salmon upstream and smolts downstream.	8		16	8						
		d. Restore native fish to Green's Lake and permanent ponds including Sacramento perch. Stocking of this fish species may also serve as a biological control agent for mosquitoes.	4	8	16	16			20			
		2. Continue coordination and/or timing of fall passage of chinook salmon immigrating from the East Toe Drain through the Los Rios Check Dam to Putah Creek.	4	4	8	10			8			
		a. Consider the construction of a fish passage facility at the Los Rios Check Dam to allow passage of adult salmon upstream and juveniles	8	16	25	10	15		12			

Table 6.1-1
Operations and Maintenance Requirements (hours by staff position) to Implement Plan

Element / Sub-element	Goal	Tasks	Senior Biologist Super (Wildlife) (1)	Wildlife Habitat Super II (1)	Wildlife Biologist (1)	Wildlife Habitat Super I (2)	Wildlife Habitat Assist (2)	Tractor Operator Laborer (2)	Fish and Wildlife Tech (2)	Fish and Wildlife Interpret II (1)	Fish and Wildlife Interpret I (1)	Office Tech (1)
		downstream while still maintaining the Los Rios Check Dam in place.										
		3. Pursue funding and develop plans for identified aquatic ecosystem restoration projects that include goals, techniques, costs, monitoring, an adaptive management process, public outreach, and a schedule.	60	30	31	20						
		4. Design and manage restoration and enhancement projects that would not conflict with necessary flood flow conveyance requirements of the Yolo Bypass, as determined through the application of hydraulic analysis.	2	12	12	20	20					
		5. Ensure that actions comply with the ESA and CESA and other regulations aimed at the protection of special-status species and/or sensitive habitats.	8		4							
		6. Design and operate restoration and enhancement projects in coordination with the SYMVCD. Project design and operation shall include technical BMPs for mosquito control in managed wetlands developed by the CVHJV (Kwasny et al. 2004).	16	8	8	16						
5.2.2 AGRICULTURAL RESOURCES ELEMENT												
	Agricultural Resources Goal 1 (AR-1): *Manage agricultural lands to maintain and enhance habitat for native wildlife and plants.*	1. Manage and control invasive and other nonnative species through specified grazing practices, controlled flood-up and drawdown procedures, use of pesticides, and other conventional agricultural practices.	8	4		40	10	60	81			
		2. Enhance grasslands and uplands through grazing, native grass plantings, and other management techniques.		25	8	30	25	40	50			
		3. Work with adjacent property owners to limit aerial seeding of Italian ryegrass in areas that would support native alkali grassland under natural conditions.		18		20	20					
		4. Improve habitat for special-status species in the grassland ecosystems at the Yolo Bypass Wildlife Area through the adaptive management of livestock grazing, limited herbicide application,				10	20	60	60			

Table 6.1-1
Operations and Maintenance Requirements (hours by staff position) to Implement Plan

Element / Sub-element	Goal	Tasks	Senior Biologist Super (Wildlife) (1)	Wildlife Habitat Super II (1)	Wildlife Biologist (1)	Wildlife Habitat Super I (2)	Wildlife Habitat Assist (2)	Tractor Operator Laborer (2)	Fish and Wildlife Tech (2)	Fish and Wildlife Interpret II (1)	Fish and Wildlife Interpret I (1)	Office Tech (1)
		native grass plantings, and other management techniques.										
		5. Manage for rodents and large insects to provide adequate prey items in order to benefit foraging raptor species.										
		6. Annually plant grain field to provide foraging areas for upland game and hunting opportunities for upland game hunters.	4			24	25	80	20			5
		7. Manage seasonal and permanent wetlands and other communities to provide habitat for resident waterfowl species.										
		8. Manage upland vegetation to provide desired nesting habitat.				16	25	60	16			
		9. Manage agriculture for shorebird species through newly developed shorebird/rice rotation.		16	8	40	41	43	41			
		10. Perform field preparation of some agricultural fields in the fall in order to present disced field habitat for species that utilize this habitat such as horned larks, longspurs, and mountain plover.			4	36	10	65	28			
	Agricultural Resources Goal 1 (AR-2): *Manage agricultural lands to contribute to the agricultural community, to maintain agriculture as a viable economic activity in Yolo County, and to provide revenue for continued operation of the Wildlife Area.*	1. Work with local farmers to grow agricultural crops that mutually benefit the farmer lease tenants, the agricultural community, and the Wildlife Area.	24	26	4	35	40	40	15			
		2. Manage agricultural lands to provide an income source for DFG management and operations of the Wildlife Area.				40	20	20				
		3. Administer agricultural leases as necessary in cooperation with staff from the Dixon RCD.	56	90	12	60	10					81
		4. Maintenance of water management infrastructure including pumps, water control gates, and water distribution system performed by DFG, agricultural lease tenants, and cooperatively by members of the Mace Ranch Irrigation System.	16	21	10	80	40		16			16
		5. Meet or correspond with adjacent landowners and tenants as needed individually or through the Yolo Bypass Working Group to maintain communication about regional	36	14	6	16						

Table 6.1-1
Operations and Maintenance Requirements (hours by staff position) to Implement Plan

Element / Sub-element	Goal	Tasks	Senior Biologist Super (Wildlife) (1)	Wildlife Habitat Super II (1)	Wildlife Biologist (1)	Wildlife Habitat Super I (2)	Wildlife Habitat Assist (2)	Tractor Operator Laborer (2)	Fish and Wildlife Tech (2)	Fish and Wildlife Interpret II (1)	Fish and Wildlife Interpret I (1)	Office Tech (1)
		agricultural issues, management needs of the Yolo Wildlife Area, determine adjacent landowners' access and management needs, and convey useful information regarding activities.										
		6. Work with local agriculture community to provide information on wildlife friendly farming approaches used in the Wildlife Area.					20				20	
		7. Collaborate with adjacent landowners and tenants regarding DFG management activities that may affect their operations. Resolve potential issues by proactively working with adjacent landowners and tenants.	24	6	4	8	4	8	4			
		8. Collaborate with adjacent special districts including Dixon RCD and Yolo RCD.	48	25								
5.2.3 CULTURAL RESOURCES ELEMENT												
	Cultural Resources Goal 1 (CR-1): *Catalog and preserve all cultural resources that have yielded or have the potential to yield information important to the prehistory or history of the Yolo Wildlife Area or that otherwise would meet significance criteria according to the California Register of Historical Resources (CRHR).*	1. Maintain library of printed cultural resource reports from the vicinity.		8								
		2. Conduct cultural resource surveys as necessary before significant ground-disturbing activities (e.g., excavations below normal plow depths) at undisturbed sites.		8								
		3. Complete and submit site records to the State Historic Preservation Officer (SHPO) to establish and submit culturally significant resources that may be eligible for inclusion in the National Register of Historic Places (NRHP) or the CRHR.	8	4								
		4. When facility improvements or restoration efforts are proposed and may affect historical or archaeological resources, consult the State CEQA Guidelines for guidance on compliance with regulations.		4								
		5. Maintain historic structures present on site including the Tule Ranch main residence and the umbrella barn.		8	8	16			35			

Table 6.1-1
Operations and Maintenance Requirements (hours by staff position) to Implement Plan

Element / Sub-element	Goal	Tasks	Senior Biologist Super (Wildlife) (1)	Wildlife Habitat Super II (1)	Wildlife Biologist (1)	Wildlife Habitat Super I (2)	Wildlife Habitat Assist (2)	Tractor Operator Laborer (2)	Fish and Wildlife Tech (2)	Fish and Wildlife Interpret II (1)	Fish and Wildlife Interpret I (1)	Office Tech (1)
5.2.4 AUTHORIZED-PUBLIC-USE ELEMENT												
	Public-Use Goal 1 (PU-1): *Increase existing and provide new long-term opportunities for appropriate wildlife-dependent activities by the public.*	**Tasks for maintaining and improving wildlife observation:**										
		1. Expand existing northern auto tour route to encompass portions of the Causeway Ranch and 1,000 Acre units.		35	16	80	35	160	40	2	2	
		2. Evaluate potential to develop a new southern auto tour route in the same manner for the Tule Ranch Unit as funding permits.		16	16	100	160	300	40	12	2	
		3. Designate about half of the length of each tour route for vehicle access only while encouraging out of vehicle wildlife viewing from parking lots and turnouts on at least half the length of the tour routes.		4	8		10	10		2	2	
		4. For all wildlife viewing areas, manage existing routes and design future habitat enhancements to provide adequate vegetative screening to protect wildlife while providing viewing areas into created openings, highlighting slough channels, islands, and wildlife resting areas.		8		20	20	20		2	2	
		5. Develop interpretive signage for wildlife viewing roads and trails.		8		8	25		4		100	
		6. Develop viewing blinds, observation towers, and board walks where appropriate.		8		16	20	45			40	
		Tasks for maintaining and improving angling:										
		7. Develop maps and signs that indicate fishing access points.				20	4				18	4
		8. Post fishing regulations in appropriate locations.				4			8		10	
		9. Build access points for anglers with limited mobility along East Toe Drain.		21		24	20	75	32		16	
		10. Coordinate with DFG fishing in the city program to provide additional angling opportunities.			4				8		25	
		11. Expand spring bow fishing program to include the designated hunting area during non hunting seasons.		4	4				8		6	
		Tasks for maintaining and improving hunting:										
		12. Continue current waterfowl hunting program operating a staffed hunter	24	60	60	250	375	110	300		32	24

Table 6.1-1
Operations and Maintenance Requirements (hours by staff position) to Implement Plan

Element / Sub-element	Goal	Tasks	Senior Biologist Super (Wildlife) (1)	Wildlife Habitat Super II (1)	Wildlife Biologist (1)	Wildlife Habitat Super I (2)	Wildlife Habitat Assist (2)	Tractor Operator Laborer (2)	Fish and Wildlife Tech (2)	Fish and Wildlife Interpret II (1)	Fish and Wildlife Interpret I (1)	Office Tech (1)
		check station on all available waterfowl hunting days.										
		13. Expand hunting opportunities as habitat and access is improved on the Tule Ranch and Causeway Ranch units.		16	24	45	75	45	16			
		14. Consider use of boats in specified areas.		8	8				16		2	
		15. In the interest of maintaining a historical use of the Yolo Bypass, consider means of allowing boat access from the Yolo Wildlife Area to the Bypass during flooding periods, without incurring any liability to the State of California.	16	8	8						4	
		16. Continue to work with local farmers to grow agricultural food plots in order to provide improved hunting opportunities.		8		16	15		4			
		17. Locate waterfowl sanctuary areas to enhance hunting experience while providing adequate resting areas.		4		16	16		4			
		18. Maintain physical separation of hunting areas from non-hunting areas during hunting season. Open hunting areas to other uses following end of hunting season.		8	8		20	24	24			
		19. Evaluate feasibility of moving all hunting to Tule Ranch area with potential check station at the Tule Ranch Headquarters. This would separate wildlife viewing areas from hunting areas in a north-south direction rather than the current east-west situation.	3	8	8	8						
		20. Communicate with neighboring duck clubs to identify Yolo Wildlife Area management strategies that may affect waterfowl hunting opportunities on their properties. Coordinate Yolo Wildlife Area management strategies to provide mutual benefits (e.g., managed movement and spread of local bird densities) for the Yolo Wildlife Area and neighboring lands.	8	16		35			16			

Table 6.1-1
Operations and Maintenance Requirements (hours by staff position) to Implement Plan

Element / Sub-element	Goal	Tasks	Senior Biologist Super (Wildlife) (1)	Wildlife Habitat Super II (1)	Wildlife Biologist (1)	Wildlife Habitat Super I (2)	Wildlife Habitat Assist (2)	Tractor Operator Laborer (2)	Fish and Wildlife Tech (2)	Fish and Wildlife Interpret II (1)	Fish and Wildlife Interpret I (1)	Office Tech (1)
		21. Continue recruitment of new hunters by providing hunter safety instruction on a regular basis at the Wildlife Area headquarters.		8		8				5	10	16
		22. Continue encouragement of young hunters through participation in junior hunt programs for waterfowl and pheasants.		8		16	16	24	16		8	
		23. Conduct late summer "clean up day" to ready the Wildlife Area for the upcoming hunting season and maintain good relationship with our hunters.	8	12	12	35	24	20	24	16	16	16
		24. Consider providing falconry opportunities for the purpose of taking upland game and waterfowl on the Yolo Bypass Wildlife Area in accordance with falconry regulations and season dates adopted by the State Fish and Game Commission.	1	4	12	12						
		Tasks applicable to all uses include:										
		25. Evaluate use levels and visitor satisfaction periodically.		4	8						16	16
		26. Evaluate the hunting, angling, and wildlife viewing programs and Wildlife Area regulations periodically to identify changes that are warranted to maintain consistency with the goals of this LMP.		8	4	8				16	8	8
	Public-Use Goal 2 (PU-2): *Support and expanded public use of the Yolo Wildlife Area for environmental education and interpretation.*	**Tasks to support kindergarten through 12th grade environmental education:**										
		1. Provide Teacher Training Workshops at least four times a year.		4						25	80	16
		2. Maintain Wild About Wetlands kits for pre and post trip activities.							8		40	8
		3. Provide and maintain curriculum materials and field equipment.							8		35	8
		4. Provide other workshops and educational activities:								5	25	8
		a. Project Wet: This is a K–12 teacher workshop on water topics offered in cooperation with DFG.								16	36	16
		b. Salmonids in the Classroom: This project sponsored by DFG and local fly-fisher groups, offers teachers curriculum and aquarium supplies to								12	16	4

Table 6.1-1
Operations and Maintenance Requirements (hours by staff position) to Implement Plan

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		grow salmon eggs to the fry stage and release them in the Sacramento River.										
		c. Introduction to Watershed Education: This is a workshop co-hosted with the Water Education Foundation to teach 8th–12th grade teachers how to measure and monitor for parameters of water quality, including nutrients, and bioassessment.								8	25	4
		d. Nature Bowl: This is an event for 3rd–6th graders held at the Yolo Wildlife Area to promote learning about natural systems and the local environment. The event is co-sponsored with DFG and Yolo County Office of Education.							16	8	24	35
		e. Marsh Madness: The Foundation works with CWA to target under served schools twice a year for a full day of field activities. Bus transportation and a wetlands lunch buffet are provided. CWA provides the lunch, tables and chairs, and volunteers for the day.							16	16	16	8
		5. Working with the Yolo Basin Foundation, creation and maintenance of curriculum workbook with activities adapted to the State science framework and environmental education guidelines. The Foundation is also implementing a new curriculum that meets state social studies standards for 4th–6th grade.								30	80	16
		Tasks to support environmental education for people of all ages:										
		6. Monthly public field trips to the Yolo Wildlife Area.									8	4
		7. Monthly Flyway Nights Lecture Series.								8	16	10
		8. Facilitate California Duck Days hosted by DFG and YBF, the annual California Duck Days Wetlands Festival in partnership with a volunteer steering committee.		12	12	12	12	20	16	36	65	40

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Operations and Maintenance Requirements (hours by staff position) to Implement Plan

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		9. Summer and spring guided tours at sunset to view the flyout of thousands of Mexican free-tail bats from under the Causeway.								16	16	4
		10. Guided spring tours and open house events to view the Tule Ranch vernal pools.	16	8			8			48	48	18
		11. Events hosted by others in which DFG and the Foundation participate:										8
		a. Salmon Festival								12	12	4
		b. Earth Day at the Zoo								12	12	2
		c. International Migratory Bird Day								12	12	2
		d. Celebrate Davis								12	8	6
		e. Sandhill Crane Festival	25	8							40	
		f. Make presentations to various service clubs, chambers of commerce, university classes, educational conferences	25	8							40	
		12. Educational Materials for Loan:									8	8
		13. Outreach and communication includes "Yolo Flyway" newsletter three times a year, press releases, articles in regional newspapers and periodicals, public service announcements on television and radio, listserve announcements and website.	20		8					16	16	20
		14. Develop and distribute interpretive materials including brochures, plant and wildlife and tour guides, interpretive displays and signs.		4	8					16	40	36
		15. Develop new programs as time and budget allows.		8							40	16
	Public-Use Goal 3 (PU-3): *Coordinate public access to and use of facilities including tour routes, parking areas, Putah Creek, the planned Pacific Flyway Center, and other areas to accommodate a variety of different user groups.*	**Entrance to Yolo Wildlife Area**										
		1. Provide a large sign marking the Yolo Bypass Wildlife Area entrance.		6	6	10	10	80				
		2. Improve the Yolo Wildlife Area entrance with signage, landscaping and road improvements.		8		24	45	45	16	4	16	4
		3. Provide Watchable Wildlife signs on I-80 and County Road 32b.		8							16	4
		4. Coordinate with Watchable Wildlife program, visitor and convention bureaus and others to provide for accurate Yolo Wildlife Area		6							16	6

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		descriptions and directions in printed materials and on the web.										
		Roads										
		5. Maintain access routes to all open facilities and parking lots.						80	20			
		6. Maintain and improve existing tour loop.				20	20	80	20			
		7. Develop a new southern auto tour route.	2		20	60	60	100				
		8. Construct all roads with natural/gravel surface with minimal maintenance requirements.						80				
		Trails										
		9. Coordinate with the City of Davis to complete a walking trail along Putah Creek on Yolo Wildlife Area property that could join a similar trail coming from Mace Blvd.		8							8	4
		10. Continue to allow off-season, walking access to hunting areas and consider expanding these opportunities to new hunt areas.		4		4	25		8		8	4
		11. Expand trail network with signage				16	25		24		16	
		12. Evaluate the feasibility of connecting the Causeway Ranch with the Davis Wetlands through a trail system.	16								8	
		Bicycling										
		13. Continue to allow bicycle access to the Causeway Unit.					24		20			
		14. Evaluate, develop, and implement a plan for allowing bicycle use on specified parts of the tour routes.	16	8							16	
		15. Continue to monitor bicycle use in the hunting area during hunting season.					4					
		16. Cooperate with regional trail development efforts to create bicycle access across the Yolo Bypass through the Causeway Unit at ground level.	8	4							4	
		17. Evaluate efforts to provide bicycle access to the Pacific Flyway Center and develop facilities as time and funding permits.	8	4							4	
		Signage: Compatible public uses of the Yolo Wildlife Area are facilitated by signage that informs the public of the boundaries, laws, and regulations applicable at Yolo Wildlife Area; encourages public use; reduces conflicts among uses; increases the safety of users; and discourages unauthorized uses. The tasks listed below are intended to promote the use of such signage.										

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		18. Maintain signs and bulletin boards at the Yolo Wildlife Area Headquarters, parking lot A and any other entrances that may be developed in the future with wildlife area maps and regulations, interpretive materials, and safety information.		4		4			6		16	16
		19. Work with California Department of Transportation (Caltrans) to install signage on I-80 to direct visitors to the entrance of the Yolo Wildlife Area.	4								8	
		20. Start a monitoring and maintenance schedule for all signage.				8	8				4	4
		21. Inventory existing boundary signage and fencing, and install new signs and fencing where necessary.				8	25		65			4
		22. Provide sign board in parking lot A that provides a comprehensive display of public use opportunities at the Yolo Wildlife Area. This will include a map showing currently available public use areas.				16	4		4		8	4
		23. Provide signs marking tour routes, trails, and bicycle access areas				8	16		16		8	
		24. Provide signs marking areas that are temporarily closed for nesting, maintenance, or other reasons.							8		4	
		25. Develop a plan for interpretive features including signs, blinds, and board walks.	8	8						50	45	8
		26. Develop, construct, install and maintain interpretive signs.				8	15		24		20	
		Operations										
		27. Rent and maintain portable toilets.				32						16
		28. Provide garbage cans.							4			
		29. Provide picnic tables in some visitor areas.				4			8			
		30. Provide for the opening and closing of gates to control access.				8	100		300			
		31. Improve ditch and creek crossings as needed for public use.		8		36	16	45	16			
		32. Continue to open entrance gates at sunrise (except on hunting days) and closing gates at sunset.					100		100			

Table 6.1-1
Operations and Maintenance Requirements (hours by staff position) to Implement Plan

Element / Sub-element	Goal	Tasks	Senior Biologist Super (Wildlife) (1)	Wildlife Habitat Super II (1)	Wildlife Biologist (1)	Wildlife Habitat Super I (2)	Wildlife Habitat Assist (2)	Tractor Operator Laborer (2)	Fish and Wildlife Tech (2)	Fish and Wildlife Interpret II (1)	Fish and Wildlife Interpret I (1)	Office Tech (1)
		Other Uses										
		33. Evaluate the feasibility of providing canoeing or fishing opportunities at Green's Lake and Putah Creek.	8	4	4	4					4	
		34. Evaluate coordinating with the City of Davis regarding put-ins and take-outs on Putah Creek.	4	4		4				4	4	4
		Regional trail systems and coordination of access										
		35. Cooperate with the City of West Sacramento in assessing feasibility of access from the east side.	4	8	4						4	
		36. Cooperate with agencies promoting regional hiking, bicycle, and equestrian trail connections including Caltrans, Delta Protection Commission, Yolo County, City of Davis, and City of West Sacramento.	8	8							4	
		37. Evaluate the feasibility of establishing a regional trail along abandoned Sacramento Northern Railroad easement that traverses the Tule Ranch.									6	
	Public-Use Goal 4 (PU-4): *Continue to foster community partnerships, especially with the Yolo Basin Foundation.*	1. Update the MOU between the Yolo Basin Foundation and the DFG to reflect the current operating relationship and expansion of the Wildlife Area acreage and programs		8								4
		2. Coordinate press releases and other forms of outreach with Yolo Basin Foundation and DFG Media liaisons.	8	8							24	25
		3. Collaborate in developing new program areas.	10								22	4
		4. Coordinate with other non-profit groups (e.g., Foundation, DU, CWA, Yolo and Sacramento Audubon Societies, Audubon California, Putah Creek Council, CVHJV) that promote wildlife-dependent education and interpretation, and recreational or hunting opportunities that can provide additional support to DFG's management of the Yolo Wildlife Area.	8	16	4	8				40	48	
		5. Encourage and cooperate with the long-term continuation of the Yolo Bypass Working Group.	30	10								16

Table 6.1-1
Operations and Maintenance Requirements (hours by staff position) to Implement Plan

Element / Sub-element	Goal	Tasks	Senior Biologist Super (Wildlife) (1)	Wildlife Habitat Super II (1)	Wildlife Biologist (1)	Wildlife Habitat Super I (2)	Wildlife Habitat Assist (2)	Tractor Operator Laborer (2)	Fish and Wildlife Tech (2)	Fish and Wildlife Interpret II (1)	Fish and Wildlife Interpret I (1)	Office Tech (1)
	Public-Use Goal 5 (PU-5): *Continue and expand the volunteer program.*	1. Use the existing DFG volunteer handbook and YBF volunteer materials to conduct volunteer program.	4	6		16				1440	160	87
		2. Expand existing volunteer materials.				20	20				3	12
		3. Sign up all volunteers as DFG volunteers to take advantage of the benefits of being a volunteer for the state including workers compensation coverage and the ability to count these volunteer efforts as "in kind" contributions on grant applications.				20						20
		4. Continue to coordinate with the Foundation to jointly plan use of volunteers including the development of volunteer job descriptions.				20	20					20
		5. Recruit new volunteers through regional media, community organizations, local colleges, professional associations, conservation organizations, and at public events.				20						20
		6. Expand volunteer training opportunities.				20	20					8
		7. Expand volunteer recognition program.				20	20					2
		8. Continue tracking of volunteer hours for use as in-kind labor contribution for state and federal grant programs.										16
	Public Use Goal 6 (PU-6): *Minimize competition and conflicts among users and facilitate compatibility between public uses.*	1. Encourage hunter safety through monitoring and modification of Wildlife Area regulations.		8		6						8
		2. Inform the public of Wildlife Area use designations and use restrictions through outreach, signage, and DFG's web site.					16		8		8	16
		3. Periodically evaluate management of access locations, tour routes, parking areas, and associated regulations to identify changes that are warranted to maintain consistency with the goals of this LMP.	4	6	4							
		4. Identify potential conflicts with other recreational uses and resolve such conflicts.		6	8							
		5. Inform the public of times and locations where hunting is allowed and of all other restrictions and applicable				12	20		10	16	6	16

Table 6.1-1
Operations and Maintenance Requirements (hours by staff position) to Implement Plan

Element / Sub-element	Goal	Tasks	Senior Biologist Super (Wildlife) (1)	Wildlife Habitat Super II (1)	Wildlife Biologist (1)	Wildlife Habitat Super I (2)	Wildlife Habitat Assist (2)	Tractor Operator Laborer (2)	Fish and Wildlife Tech (2)	Fish and Wildlife Interpret II (1)	Fish and Wildlife Interpret I (1)	Office Tech (1)
		regulations through outreach, signage, and DFG's web site.										
		6. Have DFG, YBF personnel and volunteers available on-site during high use times to monitor visitor activities and provide information as needed to visitors.		8	20		35		20	10	40	100
		7. Provide information about the Wildlife Area while responding to phone inquiries and visitors to administrative area and Pacific Flyway Center.	8	24								80
		8. Conduct periodic reviews of public uses of the Yolo Wildlife Area; evaluate rules, regulations, guidelines, and materials to ensure compatibility of public uses.		8	8							8
	Public-Use Goal 7 (PU-7): *Support use of the Yolo Bypass Wildlife Area by Native Americans for activities such as gathering native plant materials for cultural purposes.*	1. Develop access plans for and issue permits to native peoples whose activities are compatible with the goals of the LMP. Any authorization for access would include standard liability clauses.	4	4						4	4	
		2. Allow limited gathering of materials for educational and craft purposes by the public.			12	12	12					
	Public-Use Goal 8 (PU-8): *Facilitate safe use of the Yolo Wildlife Area by informing the public of potential risks, and also develop an emergency response plan.*	1. Continue to close the Yolo Wildlife Area when the Yolo Bypass is flooding and communicate the status of the Wildlife Area to the public.				8						8
		2. Identify areas where warning signs are needed.				20	20		20			
		3. Post warning signs at identified locations and indicate on these signs whom to contact during an emergency.						80	60			
		4. Coordinate with the SYMVCD regarding timing of pesticide applications.		8	4	16				4		
		5. Restrict access to unsafe areas such as construction zones and at times, active farming areas.				4	8		4			
		6. Develop an emergency response plan with cooperation of local fire districts and Yolo County.	8	8		40						24

Table 6.1-1
Operations and Maintenance Requirements (hours by staff position) to Implement Plan

Element / Sub-element	Goal	Tasks	Senior Biologist Super (Wildlife) (1)	Wildlife Habitat Super II (1)	Wildlife Biologist (1)	Wildlife Habitat Super I (2)	Wildlife Habitat Assist (2)	Tractor Operator Laborer (2)	Fish and Wildlife Tech (2)	Fish and Wildlife Interpret II (1)	Fish and Wildlife Interpret I (1)	Office Tech (1)
5.2.5 UNAUTHORIZED-PUBLIC-USE ELEMENT												
	Unauthorized-Public-Use Goal 1 (UPU-1): *Prevent unauthorized use of the Yolo Wildlife Area.*	1. Prohibit activities that are inconsistent with the Yolo Wildlife Area mission in the Wildlife Area regulations.		4		4						
		2. Require CEQA analysis and surface agreements for access to the area for mineral extraction.		6								
		3. Discourage dumping of trash or waste within the Yolo Bypass Wildlife Area by providing and servicing trash receptacle.		12		39	45		128			4
		4. Patrol the Yolo Bypass Wildlife Area and enforce regulations that prohibit unauthorized uses.				40	80					
		5. Maintain adequate signage on boundaries to satisfy lawful enforcement of Wildlife Area regulations.				4	20		32			
		6. Use signage and written notifications to foster cooperation.				20		20				
		7. Issue citations and/or pursue legal action when voluntary cooperation cannot be obtained.					40					
		8. Enforce laws through DFG Wildlife Protection personnel and request assistance from the Yolo County Sheriff's Department as necessary to enforce laws.					40					
		9. Issue citations to violators illegally using the Yolo Bypass Wildlife Area and seek remediation from unauthorized users.					12					
		10. Restore ecosystems damaged by unauthorized uses as necessary.			8	4	25	16				
5.2.6 FACILITIES ELEMENT												
	Facilities Goal 1 (F-1): *Management and operation of the Yolo Wildlife Area in coordination with state and federal flood operations in the Yolo Bypass.*	1. Upon notification call by DWR Division of Flood Management, implement and follow agreed upon flood response protocol.	16	8		53	71	40	65		4	4
	Facilities Goal 2 (F-2): *Construction, maintenance, and removal of facilities.*	1. Maintenance of hunting blinds and the hunter check station performed by DFG.				16	50	8	25			
		2. Maintenance of water management		16		75	55		20			16

Table 6.1-1
Operations and Maintenance Requirements (hours by staff position) to Implement Plan

Element / Sub-element	Goal	Tasks	Senior Biologist Super (Wildlife) (1)	Wildlife Habitat Super II (1)	Wildlife Biologist (1)	Wildlife Habitat Super I (2)	Wildlife Habitat Assist (2)	Tractor Operator Laborer (2)	Fish and Wildlife Tech (2)	Fish and Wildlife Interpret II (1)	Fish and Wildlife Interpret I (1)	Office Tech (1)
		infrastructure including pumps, water control gates, and water distribution system performed by DFG, agricultural lease tenants, and cooperatively by members of the Mace Ranch Irrigation System.										
		3. Maintenance of gravel roads on an ongoing basis.				35	25	125	30			8
		4. Construction and maintenance of new access roads.				45	40	120	15			
		5. Maintenance of gates and fences.				12	15		40			4
		6. Construction of new gates and fences.				20		10	40			
		7. Maintenance of signs.				8	30		50			4
		8. Maintenance for other facilities including Yolo Demonstration Wetlands, kiosk at Yolo Fruit Market, residences and Tule Ranch facilities.		8	8	81	150	16	205		8	54
		9. Work with the Foundation to fund, construct, update and maintain exhibits and other interpretive features of the Pacific Flyway Center.		18	4						80	16
	Facilities Goal 3 (F-3): *Effectively manage existing facilities and/or structures for resource protection, safety, and prevention of unauthorized uses.*	1. Regularly monitor, maintain and replace as necessary the condition and use of existing facilities/structures.	16	8	4		65	35	40		16	8
		2. Take actions as needed to keep desired facilities/structures in good repair.		6							8	
		3. Schedule preventative maintenance of all facilities and structures.		2		20						
		4. Take actions to demolish and remove those structures that are unauthorized or have become unsafe or undesirable.	4	10		25			40	30	25	40
	Facilities Goal 4 (F-4): *Construct, operate and maintain the Pacific Flyway Center and other associated facilities.*	1. Construction of the Pacific Flyway Center is a goal of DFG. The continuing efforts to establish the center will be supported.	1	4	4	12						
		2. Participate in program development phase, schematic design phase, and construction phase in partnership with the Foundation.		4	4	12				4	8	
		3. Determine what needs to be accomplished to change location of entrance to the Wildlife Area if needed.			2	4						
		4. Move administrative and interpretive functions to the Pacific Flyway Center.								4	4	4
		5. Operate and maintain the Pacific	~~TBD~~	~~TBD~~	~~TBD~~	~~TBD~~	~~TBD~~	~~TBD~~	~~TBD~~	~~TBD~~	~~TBD~~	~~TBD~~

Table 6.1-1
Operations and Maintenance Requirements (hours by staff position) to Implement Plan

Element / Sub-element	Goal	Tasks	Senior Biologist Super (Wildlife) (1)	Wildlife Habitat Super II (1)	Wildlife Biologist (1)	Wildlife Habitat Super I (2)	Wildlife Habitat Assist (2)	Tractor Operator Laborer (2)	Fish and Wildlife Tech (2)	Fish and Wildlife Interpret II (1)	Fish and Wildlife Interpret I (1)	Office Tech (1)
		Flyway Center.										
		6. Manage the approximately 15 acres of farm land on the Flyway Center site to be a demonstration of wildlife friendly farming.				10		4	20			
		7. Work with the Foundation to fund, construct, update and maintain exhibits and other interpretive features of the Pacific Flyway Center.	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
		8. Maintain gates and access road to Flyway Center.							28			
	Facilities Goal 5 (F-5): *Maintain equipment necessary for future management of the Wildlife Area.*	1. Maintain all heavy equipment including tractors, implements, and farm equipment.				24		80	40			16
		2. Maintain all vehicles including regular inspection of commercial vehicles.				24		20				16
		3. Maintenance and operation of wheeled vehicles other than commercial vehicles.				24	36					16
		4. Maintenance and operation of shop facility.				12						2
		5. Maintenance and operation of miscellaneous tools and equipment.				6				7		
		6. Maintain office equipment including computers, printers, copy machine, plotter, and telephone system.										4
	Facilities Goal 6 (F-6): *Consider the construction and operation of an outdoor shooting range for bi-annual use by local game warden squad for periodic firearm use qualification process. Range construction, operation and maintenance shall consider the following(tasks):*	1. Implementation of Environmental Protection Agency (EPA) best management practices for the management of lead at outdoor shooting facilities.	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
		2. Operation of the shooting range will not proceed until after development of a shooting range use protocol in accordance with National Rifle Association (NRA) standards as detailed in the NRA Range Source Book. This protocol shall designate a point of contact within DFG's Wildlife Protection Branch and a Range Master shall be designated for each instance of use. This operations plan and subsequent use is to be approved by the Yolo Bypass Wildlife Area Manager.	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

Table 6.1-1
Operations and Maintenance Requirements (hours by staff position) to Implement Plan

Element / Sub-element	Goal	Tasks	Senior Biologist Super (Wildlife) (1)	Wildlife Habitat Super II (1)	Wildlife Biologist (1)	Wildlife Habitat Super I (2)	Wildlife Habitat Assist (2)	Tractor Operator Laborer (2)	Fish and Wildlife Tech (2)	Fish and Wildlife Interpret II (1)	Fish and Wildlife Interpret I (1)	Office Tech (1)
		3. Construction of the shooting range shall conform to standards and guidelines established by the Occupational Safety and Health Administration, the National Association of Shooting Ranges and the Sporting Arms and Ammunition Manufacturers' Institute, with the intention of controlling hazards and prevention of exposures to hazardous substances in shooting range facilities.	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
		4. Maintenance of the shooting range shall be the responsibility of the Wildlife Protection Branch.	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
5.2.7 ADMINISTRATION ELEMENT												
	Administration Goal 1 (A-1): *Maintain current data on the management and resources of the Yolo Wildlife Area.*	1. Regularly update geographic information system (GIS) data sources as information becomes available			72	40	25					
		2. Maintain accurate financial records regarding expenditures, staff, maintenance, and other administrative duties.	80	30		25						386
		3. Develop and maintain Wildlife Area operating budget	40	20		10						30
		4. Administer agricultural leases as necessary in cooperation with staff from the Dixon Resource Conservation District (RCD).		25								120
		5. Document facilities needs in a DFG maintenance and capital outlay database.		8		8						8
		6. Prepare annual and periodic status reports as defined in Chapter 6.	8	8		8						36
		7. Perform scheduling function for conference room.										16
		8. Participate in habitat planning efforts for public habitat areas close to the Wildlife Area.	25	8	8	8						
		9. Supervise permanent and seasonal staff.	74	35								
		10. Actively pursue funding to help facilitate implementation of the LMP.	100	24		16						4

Table 6.1-1
Operations and Maintenance Requirements (hours by staff position) to Implement Plan

Element / Sub-element	Goal	Tasks	Senior Biologist Super (Wildlife) (1)	Wildlife Habitat Super II (1)	Wildlife Biologist (1)	Wildlife Habitat Super I (2)	Wildlife Habitat Assist (2)	Tractor Operator Laborer (2)	Fish and Wildlife Tech (2)	Fish and Wildlife Interpret II (1)	Fish and Wildlife Interpret I (1)	Office Tech (1)
5.2.8 FIRE MANAGEMENT ELEMENT												
	Fire Management Goal 1 (FM-1): *Develop and implement a wildfire plan for the Yolo Wildlife Area.*	1. Meet biannually if necessary with CDF representatives to discuss fire-related issues relevant to the Yolo Wildlife Area, including vegetation management, recent fires in the Yolo Wildlife Area, current contact information, and procedures.	6	10	8	22	8	12	10			
		2. Coordinate with CDF to develop a wildland fire response plan for the Yolo Bypass Wildlife Area.	4	6		10	8	12	6			
		3. Design and implement vegetation management activities at fire breaks along existing roads and parking lots.			10				10			
		4. Train a DFG biologist to serve the role of resource specialist or agency representative through the Incident Command System (ICS).			8							
		6. Coordinate fire suppression activities and cooperate with local fire districts.	4	4		24						
5.2.9 SCIENTIFIC RESEARCH AND MONITORING ELEMENT												
	Scientific Research and Monitoring Goal 1 (SRM-1): *Support appropriate scientific research and monitoring and encourage or conduct research that contributes to adaptive management strategies and management goals of the Yolo Wildlife Area.*	1. Prepare annual Wildlife Area Habitat Management Work Plan Summaries and submit summaries to DFG Wildlife Area Habitat Committee (WAHC) for evaluation.	6	10	6	12						16
		a. Implement recommendations for habitat improvement provided by the WAHC.				24	65	85	20			
		2. Develop a prioritized list of research needs.	4	6		4						
		3. Review, evaluate and administer approved research projects.	16		40	8						8
		4. Provide letters or permits to researchers specifying dates and times of authorized access, and information on regulations and area restrictions.		4	2							2
		5. Require that researchers provide copies of data and/or published papers, and contact researchers to ensure that this requirement is fulfilled.		4								
		6. Encourage long-term studies that benefit management.	1	2	2							

Table 6.1-1
Operations and Maintenance Requirements (hours by staff position) to Implement Plan

Element / Sub-element	Goal	Tasks	Senior Biologist Super (Wildlife) (1)	Wildlife Habitat Super II (1)	Wildlife Biologist (1)	Wildlife Habitat Super I (2)	Wildlife Habitat Assist (2)	Tractor Operator Laborer (2)	Fish and Wildlife Tech (2)	Fish and Wildlife Interpret II (1)	Fish and Wildlife Interpret I (1)	Office Tech (1)
		7. Conduct high-priority surveys, including surveys for special-status species, as time and budget permit.	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
		8. Investigate public use patterns and effectiveness of public use programs.	4								24	15
		9. Investigate effectiveness of environmental education programs.	6								16	8
5.2.10 MANAGEMENT COORDINATION ELEMENT												
	Management Coordination Goal 1 (MC-1): *Coordinate with federal, state, and local agencies regarding plans and projects that may affect habitats and/or management at the Yolo Wildlife Area.*	1. Review, coordinate, and provide comments and recommendations on federal, state, and local government plans and proposed projects as appropriate for the purpose of determining the consistency of such plans with the goals of DFG's LMP.	93	36	50	8	25					16
		2. Coordinate with Yolo County NCCP proponents to make them aware of habitat restoration efforts at the Wildlife Area and coordinate proposed actions to compliment each other's efforts.				12						
		3. Coordinate with the Yolo County program to survey, control, and monitor invasive plant species.				12		6				
		4. Collaborate with or submit proposals for CALFED-funded projects that could contribute both to the attainment of the goals of this LMP and to the attainment of CALFED goals, objectives, targets, and milestones.		12	12	12						
		5. Support the implementation of research, monitoring, and restoration actions compatible with the goals of this LMP by the California Bay-Delta Authority and other CALFED implementing agencies.		12	12	12						2
	Management Coordination Goal 2 (MC-2): *Coordinate with flood control agencies regarding flood control and management in the Yolo Bypass.*	1. Review, coordinate, and provide comments and recommendations on regional plans and proposed projects such as the Yolo County Integrated Regional Water Management Plan as appropriate.	20		25							
		2. Coordinate with DWR, and the State Reclamation Board, USACE, and, where appropriate, local flood control agencies, reclamation districts, and	4	25	8	16						

Table 6.1-1
Operations and Maintenance Requirements (hours by staff position) to Implement Plan

Element / Sub-element	Goal	Tasks	Senior Biologist Super (Wildlife) (1)	Wildlife Habitat Super II (1)	Wildlife Biologist (1)	Wildlife Habitat Super I (2)	Wildlife Habitat Assist (2)	Tractor Operator Laborer (2)	Fish and Wildlife Tech (2)	Fish and Wildlife Interpret II (1)	Fish and Wildlife Interpret I (1)	Office Tech (1)
		SAFCA regarding the design and operation of restoration and enhancement projects that have the potential to conflict with necessary flood flow conveyance requirements. All hydraulic modeling will be conducted in coordination with appropriate flood control and management agencies. A work plan for hydraulic modeling is provided in Appendix C.										
		3. Participate in ecosystem restoration components of any overall improvements to the Lower Sacramento Flood Control System.		20		20						
		4. Continue public outreach programs which describe the compatible nature of appropriate wetland management activities with flood protection efforts.	6	8	8	8					8	6
	Management Coordination Goal 3 (MC-3): *Coordinate with other law enforcement agencies.*	1. Meet on an annual basis with local Wildlife Protection squad prior to waterfowl hunting season to review Wildlife Area regulations, work schedules, exchange contact information and intricacies of public hunting program.	4	4	4	4	4	4	4		4	4
		2. Continue ongoing communication with Wildlife Protection staff throughout the year.		8		8						8
		3. Meet regularly with law enforcement staff from the California Highway Patrol and Yolo County Sheriff's Department and other agencies as appropriate to coordinate law enforcement activities and explore options for cooperative programs.	4									
		4. Pursue joint funding requests with other law enforcement entities to address law enforcement concerns.	8									
	Management Coordination Goal 4 (MC-4): *Coordinate with local public-service agencies including the SYMVCD and the Yolo County Health Department.*	1. In consultation with SYMVCD, continue to implement a mosquito control plan that applies BMPs and any other necessary management practices as identified in the Central Valley Habitat Joint Venture, Technical Guide to Best Management Practices for	6	8	8	16						

Table 6.1-1
Operations and Maintenance Requirements (hours by staff position) to Implement Plan

Element / Sub-element	Goal	Tasks	Senior Biologist Super (Wildlife) (1)	Wildlife Habitat Super II (1)	Wildlife Biologist (1)	Wildlife Habitat Super I (2)	Wildlife Habitat Assist (2)	Tractor Operator Laborer (2)	Fish and Wildlife Tech (2)	Fish and Wildlife Interpret II (1)	Fish and Wildlife Interpret I (1)	Office Tech (1)
		Mosquito Control in Managed Wetlands (Kwasny et al. 2004) and the California Rice Commission's BMPs for mosquito control.										
		2. Communicate regularly with SYMVCD. Coordinate mosquito and vector control activities. Meet annually with mosquito abatement agencies to discuss needed infrastructure improvements, identify areas of high mosquito productivity, schedules of summer irrigations and fall flood up, and scheduling of public use activities.		10	8	20						
		3. Conduct annual meeting with private wetland managers in the Yolo Bypass and SYMVCD staff to coordinate fall flooding of wetlands, target habitat infrastructure improvements and firm up contact information.	10	6	6	8						
		4. Coordinate with Yolo County Health Department as necessary.	4	7								8
		5. Apply for grants and matching funds with SYMVCD to implement BMPs.	2		12	12						
		6. Jointly conduct research to measure land management effects on mosquito production.			12	8			16			
	Management Coordination Goal 5 (MC-5): *Maintain relationships with neighbors and tenants to address management issues.*	1. Meet or correspond with adjacent landowners and tenants as needed individually or through the Yolo Bypass Working Group to maintain communication about management needs of the Yolo Wildlife Area, determine adjacent landowners' access and management needs, and convey useful information regarding activities.	16	20		16						
		2. Collaborate with adjacent landowners and tenants regarding DFG management activities that may affect their operations. Resolve potential issues by proactively working with adjacent landowners and tenants.										
		3. Collaborate with adjacent special districts including Reclamation District 2068, Dixon RCD, Yolo RCD, No Man's Land Fire District, East Davis Fire District, South Davis Drainage	8	8		16						

Table 6.1-1
Operations and Maintenance Requirements (hours by staff position) to Implement Plan

Element / Sub-element	Goal	Tasks	Senior Biologist Super (Wildlife) (1)	Wildlife Habitat Super II (1)	Wildlife Biologist (1)	Wildlife Habitat Super I (2)	Wildlife Habitat Assist (2)	Tractor Operator Laborer (2)	Fish and Wildlife Tech (2)	Fish and Wildlife Interpret II (1)	Fish and Wildlife Interpret I (1)	Office Tech (1)
		District, and other neighboring special districts.										
		4. Area Manager and appropriate staff should attend annual site visits to duck hunting clubs conducted by DFG headquarters staff as part of the implementation of various wetland easement programs.	8			8						
		5. Meet at least annually with duck club owners and SYMVCD to discuss fall flood-up schedule and summer irrigations.	8	8	4	4						
		6. Meet annually with SYMVCD to target field work in areas that have a high propensity to produce large numbers of mosquitoes to prevent abatement issues later during flood up.	8	8	4	8						
		7. Coordinate flooding of duck clubs through the Tule Ranch Irrigation System.		16		8			16			14
	Management Coordination Goal 6 (MC-6): *Coordinate activities associated with managing cholera, avian flu, and other disease outbreaks.*	1. Conduct regular visual monitoring of birds for the presence of botulism in the summer and avian cholera in the winter.		12	12							
		2. Conduct regular monitoring of harvested birds at the hunter check station for the presence of avian flu.		12	12							
		3. Participate in disease related work groups.		12	12							
		4. Coordinate with county and state public health agencies, and UC Davis.		6	6							
		5. Participate in Incident Command System activities.		6	8							
TOTAL HOURS (by staff position)			2040	2040	2040	4080	4080	4080	4080	2040	2040	2040

Table 6.3-1
Proposed Staffing Program for the Yolo Bypass Wildlife Area

Position	Senior Biologist Supervisor (Wildlife)	Wildlife Habitat Supervisor II	Wildlife Biologist	Wildlife Habitat Supervisor I	Wildlife Habitat Assistant	Tractor Operator Laborer	Fish and Wildlife Technician	Fish and Wildlife Interpreter I	Fish and Wildlife Interpreter II	Office Technician	Total
Number	1	1	1	1	2	3	2	1	1	1.5	
Top Salary	$5,864	$4,896	$3,908	$4,073	$3,558	$3,763	$3,276	$3,908	$4,969	$2,998	
Total Monthly Salary	$5,864	$4,896	$3,908	$4,073	$7,116	$11,289	$6,552	$3,908	$4,969	$4,497	**$57,072**
Total Annual Salary	$70,368	$58,752	$46,896	$48,877	$85,393	$135,469	$78,631	$46,896	$59,628	$53,964	**$684,874**
Total Annual Salaries											**$801,303**
Equipment Needed											
Vehicle	1	1	1	1	1	1	1	1	1	1	**10**
Office Space	1	1	1	1				1	1	1	**7**
Computer	1	1	1	1				1	1	1	**7**

7 FUTURE REVISIONS TO PLAN

All planning documents eventually become dated and require revision so that they can continue to provide practical direction for operational and maintenance activities. A common and unfortunate situation is that the revision of planning documents is often neglected for budgetary or staff constraints, or other reasons. To address this problem, this section incorporates a suggested hierarchy of revision procedures in which the level of process and required involvement is proportionate to the level of change that is proposed. This Land Management Plan (LMP) reflects the best information available during the planning process, but it is understood that new information will become available over time and adjustments will be required to keep this LMP current. Such new information may include:

- feedback generated by adaptive management of the Yolo Bypass Wildlife Area (Wildlife Area);
- other scientific research that directs improved techniques of habitat management;
- research that directs improved management of agricultural resources;
- documented threats to fish and wildlife species and their habitats;
- future modeling results;
- management of related facilities in the Yolo Bypass (e.g., flood management); or
- new legislative or policy direction.

When the new information dictates a change to this LMP, it is important that there is an appropriate process established. Public outreach and public input will be necessary in proportion to the proposed policy change established by this LMP. Unless a reasonable and clear revision process exists, this LMP could become outdated and irrelevant. If the appropriate procedure for a particular, proposed revision is not apparent, the determination of which of the following procedures to use shall be made by the regional manager in consultation with the Lands and Facilities Branch.

7.1 MINOR REVISIONS

A process is required to accommodate minor revisions to this LMP. Minor revisions may include the addition of new property to the Yolo Bypass Wildlife Area or the adoption of limited changes to the goals and tasks through adaptive management, based on other scientific information or legislative direction. This procedure will be applicable to revisions that meet the following criteria:

- No change is proposed to the overall purposes of this LMP;
- California Environmental Quality Act (CEQA) documentation (if required) is prepared and approved;
- Appropriate consultation occurs within the region and with the Lands and Facilities Branch;
- Appropriate consultation with other agencies occurs;
- Adjoining neighbors are consulted regarding the revision, if the revision is related to a specific location or the acquisition of additional area; and
- An information presentation regarding the proposed revision is made to the Working Group.

The minor revision may be prepared by the staff members assigned to the Yolo Bypass Wildlife Area or with other California Department of Fish and Game (DFG) resources, and requires approval by the regional manager.

7.2 MAJOR REVISIONS

A major revision or a new LMP requires a procedure comparable to the initial LMP planning process, but also proportionate to the level of policy change that is proposed. This procedure will be applicable to revisions that meet the following criteria:

- Substantial revision and/or a new policy direction is proposed to this LMP or the adoption of a completely new plan is proposed;
- Appropriate CEQA documentation is prepared and approved;
- Appropriate consultation occurs throughout DFG;
- Appropriate coordination and consultation with other agencies occurs;
- A public outreach program is conducted that is proportional to the level of the proposed revision; and
- An information presentation regarding the proposed revision or plan is made to the Working Group.

The major revision or new plan may be prepared using available DFG resources. The major revision or new plan requires recommendation by the regional manager and approval by the director of DFG.

If the appropriate procedure for a particular, proposed revision is not apparent, the determination of which of these procedures to use shall be made by the regional manager in consultation with the Lands and Facilities Branch.

7.3 FIVE-YEAR PLAN STATUS REPORTS

Periodic evaluation is important to help ensure that the purposes and goals of the LMP are being met. Chapter 5, "Management Goals," contains many specific tasks that involve monitoring of the Wildlife Area and evaluation of the adequacy of management of the area. Cumulatively, these efforts will provide feedback regarding the success of the overall management effort. Periodic and detailed analysis of these feedback data will be necessary to assess the status of this LMP, however.

An exhaustive review of the achievement of the goals of the LMP should be prepared every 5 years following the date of adoption of the LMP or subsequent revisions. A status report documenting this review should, at minimum, include:

- evaluation of the achievement of the purposes and goals of the LMP;
- evaluation of the completion or annual completion, as appropriate, of each task contained in this LMP;
- fiscal evaluation of the program;
- evaluation of the effectiveness of DFG's coordination efforts with CALFED, local governments, and other property management and regulatory agencies involved in the Yolo Bypass;
- notation of important new scientific information that has bearing on the management of the Wildlife Area; and
- recommendation for revisions to this LMP to incorporate new information and improve its effectiveness.

The status report should be prepared or coordinated by the Area Manager. It should be submitted to the DFG Bay-Delta Region for review and comment, then should be approved by the Regional Manager and submitted to the Director of DFG. This report should serve as a basis for revision of this LMP and appropriate adjustment to ongoing management practices.

8 DOCUMENT PREPARERS

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9 REFERENCES AND PERSONAL COMMUNICATIONS

CHAPTER 1, "INTRODUCTION"

CALFED Bay–Delta Program. 2000a (July). *Final Programmatic Environmental Impact Statement and Environmental Impact Report.* Including portions of the Ecosystem Restoration Program Plan. Including the Multi-Species Conservation Strategy, Technical Appendix. Sacramento, CA.

———. 2000b (August 28). *Final Programmatic Environmental Impact Statement and Environmental Impact Report. Programmatic Record of Decision.* Sacramento, CA.

California Department of Fish and Game. 2003. *Guide and Annotated Outline for Preparing Land Management Plans.* State of California, The Resources Agency, Department of Fish and Game. Sacramento, CA.

California Department of Fish and Game. 2006. *Guide and Annotated Outline for Preparing Land Management Plans (Updated).* State of California, The Resources Agency, Department of Fish and Game. Sacramento, CA.

Thompson, J. 1957. *The Settlement Geography of the Sacramento–San Joaquin Delta, California.* Prepared for Ph.D. thesis. Stanford University. Stanford, CA. University Microfilm International, Ann Arbor, MI.

Wildlife Conservation Board. 2001 (August 30). Wildlife Conservation Board meeting minutes. Sacramento, CA.

Yolo Basin Foundation. 2001 (August). *A Framework for the Future: Yolo Bypass Management Strategy*. Davis, CA. Prepared by Jones & Stokes (J&S 99079). Sacramento, CA.

Yolo Basin Foundation and California Department of Fish and Game. 2007. *Yolo Wildlife Area Program History and Overview.* Prepared by Yolo Basin Foundation and California Department of Fish and Game. Davis, CA.

CHAPTER 2, "PROPERTY DESCRIPTION"

California Department of Fish and Game. 1992. *Management Plan for the Yolo Bypass Wildlife Area*. Sacramento, CA.

California Department of Fish and Game. 1997. Memorandum of Understanding between California Department of Fish and Game and Yolo Basin Foundation recognizing long-term partnership to provide public outreach and educational programs. Davis, CA.

California Department of Fish and Game. 2001. *Yolo Bypass Wildlife Area, Water Management Activities Synopsis.* Prepared by Land and Facilities Branch, Sacramento, CA.

California Department of Fish and Game. 2006. Initial Study / Mitigated Negative Declaration for the Pacific Flyway Center. Prepared by EDAW, Sacramento, CA.

Central Valley Habitat Joint Venture. 1990. *Hydrologic Analysis of the Mace Ranch Portion of the Proposed Yolo Basin Wildlife Area.* Prepared by Jones and Stokes Associates, Sacramento, CA.

Kwasny, D. C., M. Wolder, and C. R. Isola. 2004. *Central Valley Habitat Joint Venture, Technical Guide to Best Management Practices for Mosquito Control in Managed Wetlands.*

Sacramento County Superior Court. 2000. *Settlement Agreement and Stipulation Among Solano County Water Agency Solano Irrigation District, Maine Prairie Water District, Cities of Vacaville, Fairfield, Vallejo, and Suisun City, and Putah Creek Council, City of Davis, and the Regents of the University of California.*

State Reclamation Board. 1995. Memorandum of Understanding between The State Reclamation Board, California Department of Fish and Game, California Department of Water Resources, and U.S. Fish and Wildlife Service regarding Threatened and Endangered Species in the Yolo Basin Wetlands Project. Original MOU was signed in 1994, additional concurrence signed in 1995.

U.S. Army Corps of Engineers. 2003. *Supplement to the Standard Operation and Maintenance Manual, Sacramento River Flood Control Project (as revised 1995) for the Yolo Basin Wetlands, Project Modifications Works, Yolo County, CA.*

Yolo County Planning and Public Works Department. 2001. Letter to the Honorable Tom Stallard from John Bencomo and Linda Caruso regarding recommended actions on Zone File 2001-092 Authorization for Williamson Act Successor Agreements for the T. S. and K. D. Glide Foundation and the Peggy Glide-Colby Estate. Woodland, CA.

CHAPTER 3, "ENVIRONMENTAL SETTING"

Alpers, C. N. and Hunerlach, M. P. 2000. Mercury Contamination from Historic Gold Mining in California. U.S. Geological Survey Fact Sheet FS-061-00. Sacramento, CA.

Alpine, A. E. and J. E. Cloern. 1992. Trophic interactions and direct physical effects control phytoplankton biomass and production in an estuary. *Limnology and Oceanography* 37(5):946–955.

Amweg, E. L., D. L. Stuart, and D. P. Weston. 2003. Comparative bioavailability of selenium to aquatic organisms after biological treatment of agricultural drainage water. *Aquatic Toxicology* 63: 13–25.

Andrews, W. F. 1972. *Soil Survey of Yolo County, California.* USDA Soil Conservation Service in cooperation with the University of California Agricultural Experiment Station. U.S. Government Printing Office, Washington, DC.

Atwater, B. F., S. C. Conard, I. N. Dowden, C. W. Hedel, R. L. MacDonald, & W. Savage. 1979. History, landforms, and vegetation of the estuary's tidal marshes in T. J. Conomos, Ed. San Francisco Bay: The Urbanized Estuary. Proceedings of the 58th Annual Meeting of the Pacific Division of the American Association for the Advancement of Science, San Francisco, CA.

Bennett, W. A. and P. B. Moyle. 1996. Where have all the fishes gone?: interactive factors producing fish declines in the Sacramento-San Joaquin Estuary. Pages 519–542 in: J.T. Hollibaugh (Editor). *San Francisco Bay: The Ecosystem*. Pacific Division of the American Association for the Advancement of Science, San Francisco, CA.

Bennyhoff J. A. and D. A. Fredrickson. 1969. A Proposed Integrative Taxonomic system for Central California Archaeology in *Toward a New Taxonomic Framework for Central California Archaeology.* edited by Richard E. Hughes.

Bennyhoff, J. A. 1977. Ethnogeography of the Plains Miwok. Davis: *University of California, Center for Archaeological Research at Davis, Publication 5.*

Bennyhoff, J. A. and R. E. Hughes. 1987. Shell Bead and Ornament Exchange networks between California and the Western Great Basin. *American Museum of Natural History Anthropological Papers* Vol 64, Pt. 2. New York.

Borcalli & Associates, Inc. 2000. Water Management Plan. Prepared for Yolo County Flood Control and Water Conservation District (YCFCWCD). October 2000. Sacramento, CA.

Bouey, P. and Bethard. 1991. *Archaeological Site Record for CA-YOL-117.* On file at the Northwest Information Center, California State University, Sonoma, Rohnert Park, CA.

Busby, P. J., T. C. Wainwright, G. J. Bryant, L. J. Lierheimer, R. S. Waples, F. W. Waknitz, and I. V. Lagomarsino. 1996. *Status review of west coast steelhead from Washington, Idaho, Oregon, and California.* U.S. Dep. Commer., NOAA Tech. Memo. NMFS - NWFSC-27, 261 p.

CALFED Bay–Delta Program. 2000a (August 28). *Final Programmatic Environmental Impact Statement and Environmental Impact Report. Programmatic Record of Decision.* Sacramento, CA.

CALFED Bay–Delta Program. 2000b (July). *Final Programmatic Environmental Impact Statement and Environmental Impact Report.* Including portions of the Ecosystem Restoration Program Plan. Including the Multi-Species Conservation Strategy, Technical Appendix. Sacramento, CA.

California Department of Conservation. 2004. Important Farmland Categories. Available <http://www.consrv.ca.gov/dlrp/FMMP/mccu/map_categories.htm>. Accessed on February 10, 2006.

California Department of Fish and Game Website, accessed by Petra Unger, Senior Botanist, EDAW on March 13, 2006. URL = http://www.creec.org/.

California Department of Fish and Game. 1995. *A Guide to Wetland Habitat Management in the Central Valley.* Sacramento, CA.

California Department of Fish and Game. 2002a. Hunting and Other Public Uses on State and Federal Lands California Regulations, 2002. Sacramento, CA. July 2002.

California Department of Fish and Game. 2002b. Mammals and Furbearers California Regulations, 2002. Sacramento, CA. July 2002.

California Department of Fish and Game. 2002c. Resident and Migratory Upland Game Birds California Regulations, 2002. Sacramento, CA. July 2002.

California Department of Fish and Game. 2006. California Sportfishing Regulations. Site accessed March 3, 2006 by I. Mayes, Environmental Planner, EDAW, Inc. URL = http://www.fgc.ca.gov/html/fishregs.html.

California Department of Water Resources. 2003. Fact Sheet, Sacramento River Flood Control Project, Weirs and Flood Relief Structures. State of California, The Resources Agency, Department of Water Resources, Division of Flood Management, Flood Operations Branch. Sacramento, CA.

California Department of Water Resources. 2004. California's Groundwater Bulletin 118. Sacramento River Hydrologic Region, Sacramento Valley Groundwater Basin, Yolo Subbasin. Last update February 27, 2004. Available at: <http://www.groundwater.water.ca.gov/bulletin118/basin_desc/>. Accessed September 11, 2004.

California Department of Water Resources. 2005. Fact Sheet, State-Federal Flood Operations Center. State of California, The Resources Agency, Department Of Water Resources, Division of Flood Management, Flood Operations Branch. Sacramento, CA.

California Fish and Game Code (CFCG). 2006. Chapter 6: Fish and Wildlife Protection and Conservation. Site accesses March 3, 2006 by I. Mayes, Environmental Planner, EDAW, Inc. URL = http://www.leginfo.ca.gov/cgi-bin/calawquery?codesection=fgc&codebody=&hits=20.

California Native Plant Society (CNPS). 2007. Electronic Inventory of Rare and Endangered Plants. Database Search for the Yolo Bypass Wildlife Area. Available at <http://www.cal.net/~levinel/cgi-bin/cnps/sensinv.cgi>.

California Natural Diversity Database (CNDDB). 2006. Electronic database search for the Yolo Bypass Wildlife Area.

California Regional Environmental Education Community (CREEC) website. Site accessed by Petra Unger, Senior Botanist, EDAW on March13, URL = http://www/yolobasin.org.

Central Valley Habitat Joint Venture. 2006. *Central Valley Joint Venture Implementation Plan (2006 Plan Update).* Sacramento, CA.

———. 1990. *Central Valley Habitat Joint Venture Implementation Plan, A Component of the North American Waterfowl Management Plan.* Sacramento, CA.

———. 1993. Suitability analysis for enhancing wildlife habitat in the Yolo Basin (JSA 90-285). Sacramento, CA. Prepared by Jones and Stokes, Sacramento, CA.

Central Valley Regional Water Quality Control Board. 1998. Water Quality Control Plan (Basin Plan) for the Sacramento River and San Joaquin River Basins. Fourth Edition. September 15, 1998. Sacramento, CA.

———. 2002. Watershed Management Initiative Plan Chapter. State of the Watershed Report - Cache Creek Sub-Watershed. December 1, 2002. Sacramento, CA.

———. 2002. 2002 CWA Section 303(d) List of Water Quality Limited Segment, Central Valley Regional Water Quality Control Board. Approved by U.S. Environmental Protection Agency July 2003. Available: <http://www.swrcb.ca.gov/ctmdl/docs/2002reg5303dlist.pdf>. Accessed March 2, 2006.

———. 2004. Cache Creek, Bear Creek, and Harley Gulch TMDL for Mercury. Staff Report. February 2004. Sacramento, California.

———. 2005. Sacramento – San Joaquin Delta Estuary TMDL for Methyl & Total Mercury, Staff Report. Rancho Cordova, CA.

Central Valley RWQCB. *See* Central Valley Regional Water Quality Control Board.

Chabreck, R. H., T. Joanen, and S. L. Paulus. 1989. Southern coastal marshes and lakes. Pages 249–277 in L. M. Smith, R. L. Pederson, and R. M. Kaminski, editors. Habitat Mark H. Sherfy Chapter 1. *Habitat management for migrating and wintering waterfowl in North America.* Texas Tech University Press, Lubbock, TX.

Choe, K. Y. and Gill, G. A. 2003. Distribution of particulate, colloidal, and dissolved mercury in San Francisco Bay estuary. 2. Monomethyl mercury. Limnology and Oceanography 48: 1547–1556.

Choe, K. Y., Gill, G. A., and Lehman, R. 2003. Distribution of particulate, colloidal, and dissolved mercury in San Francisco Bay estuary. 1. Total mercury. Limnology and Oceanography 48: 1535–1546.

City of West Sacramento. 2006. Site accessed March 3, 2006 by I. Mayes, Environmental Planner, EDAW, Inc. Available: <http://www.ci.west-sacramento.ca.us/cityhall/departments/comdev/Documents/>.

City of Woodland. 2005. Yolo Bypass Water Quality Management Plan Report. Prepared by Larry Walker Associates. Prepared for City of Woodland, CA.

Combs, D. L., and L. H. Fredrickson. 1996. Foods used by male mallards wintering in southeastern Missouri. *Journal of Wildlife Management* 60:603–610.

Davis, J., Yee, D., Collins, J., Schwarzbach, S., and Luoma, S. 2003. Potential for Increased Mercury Accumulation in the Estuary Food Web In: Larry R. Brown, editor. Issues in San Francisco Estuary Tidal Wetlands Restoration. San Francisco Estuary and Watershed Science. Vol. 1, Issue 1 (October 2003), Article 4.

Delta Protection Commission. 1995. *Land Use and Resource Management Plan for the Primary Zone of the Delta.* Adopted February 23, 1995. Reprinted May 2002.

Delta Protection Commission. 2006. *Aquatic Recreation Component of the Delta Recreation Strategy Plan.* Prepared by the Dangermound Group and LSA Associates.

Demarest, D. W., R. M. Kaminski, L. A. Brennan, and C. R. Boyle. 1997. Body-mass, survival, and pairing consequences of winter-diet restriction in wood ducks. *Journal of Wildlife Management* 61:822–832.

Dettinger, M. D., Ghil, M., and Keppenne, C. L., 1995. Interannual and interdecadal variability in United States air temperatures, 1910–87. *Climate Change*, 31:35–66.

Dixon RCD. *See* Dixon Resource Conservation District.

Dixon Resource Conservation District. 2004. 2004 Annual Crop Plan for the Yolo Basin Wildlife Area. Dixon, CA.

Dixon Resource Conservation District. 2005. 2005 Annual Crop Plan for the Yolo Basin Wildlife Area. Dixon, CA.

Dixon Resource Conservation District. 2006. 2006 Annual Crop Plan for the Yolo Basin Wildlife Area. Dixon, CA.

Domagalski, J. L., Alpers, C. N., Slotton, D. G., Suchanek, T. H., and S. M. Ayers. 2002. Mercury and Methylmercury Concentrations and Loads in Cache Creek Basin, California, January 2000 through May 2001: U.S. Geological Survey Scientific Investigations Report. 2004–5037.

Dubovsky, J. A., and R. M. Kaminski. 1994. Potential reproductive consequences of winter-diet restriction in mallards. *Journal of Wildlife Management* 58:780–786.

Euliss, N. H., Jr., and S. W. Harris. 1987. Feeding ecology of northern pintails and green-winged teal wintering in California. *Journal of Wildlife Management* 51:724-732.

Euliss, N. H., Jr., R. L. Jarvis, and D. S. Gilmer. 1991. Feeding ecology of waterfowl wintering on evaporation ponds in California. *Condor* 93:582–590.

Everest, F. H. and D. W. Chapman. 1972. Habitat selection and spatial interaction by juvenile chinook salmon and steelhead trout in two Idaho streams. *Journal of the Fisheries Research Board of Canada* 29(1):91–100.

Feaver, P. E. 1971. *Breeding pool selection and larval mortality of three California amphibians*: Ambystoma tigrinum californiense *Gray,* Hyla regilla *Baird and Girard, and* Scaphiopus hammondii *Girard.* MA Thesis, Fresno State College, Fresno, California.

Feyrer, F., T. Sommer, S. C. Zeug, G. O'Leary, and W. Harrell. 2004. Fish assemblages of perennial floodplain ponds of the Sacramento River, California (USA), with implications for the conservation of native fishes. *Fisheries Management and Ecology*, 11, 335–344

Fisher, F. W. 1994. Past and present status of Central Valley Chinook salmon. *Conservation Biology* 8:870–873.

Foe, C. 2002. Mercury mass balance for the freshwater Sacramento-San Joaquin Bay-Delta Estuary. Draft Final Report to the California Bay Delta Authority. Sacramento, CA.

Foe, C., M. Stephenson, and S. Stanish. 2003. Pilot Transplant Studies with the Introduced Asiatic Clam, Corbicula fluminea, to Measure Methyl Mercury Accumulation in the Sacramento-San Joaquin Delta Estuary. In CALFED Final Report titled "An Assessment of Human Health and Ecological Impacts of Mercury in the Bay-Delta Watershed."

Gaines, D. 1974. A new look at the nesting riparian avifauna of the Sacramento Valley, California. *West. Birds* 5: 61–80.

Gill, G. A., Lehman, R., Choe, K. Y., and Han, S. 2002. Sediment-water exchange and estuarine mixing fluxes in the San Francisco Bay-Delta watershed. Draft Final Report to the California Bay Delta Authority. 139 pp.

Harrell, W. C. and T. R. Sommer. 2003. Patterns of Adult Fish Use on California's Yolo Bypass Floodplain. Pages 88–93 in P. M. Faber, editor. *California riparian systems: Processes and floodplain management, ecology, and restoration.* 2001 Riparian Habitat and Floodplains Conference Proceedings, Riparian Habitat Joint Venture, Sacramento, California.

Heim, W. A., Coale, K., and Stephenson, M. 2003. Methyl and total mercury spatial and temporal trends in surficial sediment of the San Francisco Bay-Delta. Final Report to the California Bay Delta Authority.

Helley, E. J., and D. W. Harwood. 1985. *Geologic Map of the Late Cenozoic Deposits of the Sacramento Valley and Northern Sierran Foothills, California.* USGS MF-1790.

Historic Environment Consultants. 1980. *Historic Resources Inventory for the Olson Family House.* Manuscript on file at the Northwest Information Center, California State University Sonoma, Rohnert Park, CA.

Holland, R. F. 1986. *Preliminary Descriptions of the Terrestrial Natural Communities of California.* Sacramento, California: State of California Department of Fish and Game.

Hoover, M. B., H. E. Rensch, E. G. Rensch, and W. N. Abeloe. 1990. *Historic Spots in California.* Fourth Edition, revised by Douglas E. Kyle, Stanford University Press, Stanford.

Jassby, A. D. and J. E. Cloern. 2000. Organic matter sources and rehabilitation of the Sacramento-San Joaquin Delta (California, USA). *Aquatic Conservation: Marine and Freshwater Ecosystems* 10(5):323–352.

Jassby, A. D., et al. 1995. Isohaline position as a habitat indicator for estuarine populations. *Ecological Applications* 5:272–289.

Jassby, A. D., J. R. Koseff, and S. G. Monismith. 1996. Processes underlying phytoplankton variability in San Francisco Bay. Pages 325–350 in: J. T. Hollibaugh (Editor). *San Francisco Bay: The Ecosystem*. Pacific Division of the American Association for the Advancement of Science, San Francisco, CA.

Jennings, M. R., and M. P. Hayes. 1994. *Amphibian and reptile Species of Special Concern in California.* Final report submitted to California Department of Fish and Game, Inland Fisheries Division, Rancho Cordova, California, under Contract 8023.

Johnson, P. J. 1971. *Archaeological Site Survey for CA-YOL-117.* On file at the Northwest Information Center, California State University, Sonoma, Rohnert Park, CA.

Johnson, P. J. 1978. Patwin: in R. F. Heizer, Vol. Ed., *Handbook of North American Indians,* Vol. 8: California: 350–360. Smithsonian Institution, Washington, D.C.

Jones, A. and Slotton, D. 1996. Mercury Effects, Sources, and Control Measures. A Special Study of the San Francisco Estuary Regional Monitoring Program, San Francisco Estuary Institute. Richmond, CA.

Jones, B. L., Hawley, N. L., Crippen, J. R. 1972. Western tributaries of the Sacramento River, California. USGS Water Supply Paper. 1798-J.

Jones & Stokes Associates. 1992. Final Hydraulic, Hydrologic, Vegetation, and Fisheries Analysis for the U.S. Fish and Wildlife Service Putah Creek Resource Management Plan. (JSA 91–196). Sacramento, CA. Prepared for USFWS. As Cited in: USFWS. 1993. *Reconnaissance planning report: fish and wildlife resource management options for Lower Putah Creek, California.* 128 pp. Sacramento, CA.

———. 2000. *Site Document prepared for site P-48-000541 (CA-YOL-195H).* Prepared by Jones and Stokes, Sacramento. On file at the Northwest Information Center, California State University, Sonoma, Rohnert Park, CA.

Kelley, R. L. 1989. *Battling the inland sea: floods, public policy, and the Sacramento Valley, 1885–1986.* University of California Press, California. 395 pp.

Kirkland, M., R. Beckwith, T. Greene, and Z. Matica. 2005. *Aquatic Restoration Planning in the Yolo Bypass Floodplain*. Poster presentation at the Seventh Biennial State of the San Francisco Estuary Conference. Oakland, CA.

Kohlhorst, D. W., L. W. Botsford, J. S. Brennan, and G. M. Cailliet. 1991. Aspects of the structure and dynamics of an exploited central California population of white sturgeon (*Acipenser transmontanus*). Pages 277 to 283 In P. Williot, editor. *Acipenser: Actes du premier colloque international sur l'esturgeon*. CEMAGREF, Bordeaux, France.

Kroeber, A. L. 1925. Handbook of the Indians of California. *Bureau of American Ethnology Bulletin* 78. Smithsonian Institution, Government Printing Office, Washington, D.C.

Kroeber, A. L. 1932. The Patwin and Their Neighbors. *University of California Publications in American Archaeology and Ethnology,* 29(4):253–423. Berkeley, CA.

Kwasny, D. C., M. Wolder, and C. R. Isola. 2004. *Central Valley Habitat Joint Venture, Technical Guide to Best Management Practices for Mosquito Control in Managed Wetlands.*

Lehman, P. W. 2000. The influence of climate on phytoplankton community biomass in San Francisco Bay Estuary. *Limnology and Oceanography* 45(3):580–590.

Lower Putah Creek Coordinating Committee. 2003. Lower Putah Creek Coordinating Committee Database of Electrofishing Samples and Other Fish and Non-Fish Observations in Lower Putah Creek from 1991 to 2002. Sampling was conducted primarily by Thomas R. Payne and Associates and by Dr. Peter Moyle and research associates in the Department of Wildlife and Fisheries Biology, University of California,

Davis, CA. Access 2000 database with Visual Basic database application, programmer Avry Deton, AD Consultants. October 10, 2003 version.

———. 2005. *Lower Putah Creek Watershed Management Action Plan, Phase 1 – Resource Assessments.* Prepared for the Lower Putah Creek Coordinating Committee. Prepared by EDAW, Inc., Sacramento, CA.

Marchetti M. P. 1999. An experimental study of competition between the native Sacramento perch (*Archopolites interruptus*) and introduced bluegill (*Lepomis macrochirus*). *Biological invasions* 1, 1–11.

Marchetti, M. P., and P. B. Moyle. 2001. Effects of flow regime on fish assemblages in a regulated California stream. *Ecological Applications* 11:530–539.

Martin, L. 2004. *Continuation Record prepared for site P-48-000541 (CA-YOL-195H)*. Prepared by William Self Associates, Orinda, CA. On file at the Northwest Information Center, California State University, Sonoma, Rohnert Park, CA.

Martin, L., S. Hill, and S. Huster. 2001. *Site Document prepared for site P-48-000541 (CA-YOL-195H)*. Prepared by William Self Associates, Orinda, CA. On file at the Northwest Information Center, California State University, Sonoma, Rohnert Park, CA.

Marvin-DiPasquale, Mark C. Water Resource Division, U.S. Geological Survey, Menlo Park, CA. March 21, 2005—Interview conversation with EDAW and NHI staff regarding recent Delta methylmercury research.

McEwan, D. and T. A. Jackson. 1996. Steelhead Restoration and Management Plan for California. California Department of Fish and Game, Inland Fisheries Division. Sacramento, CA.

McKern W. C. 1922. Functional families of the Patwin. *University of California Publications in American Archaeology and Ethnology* 13(7):235–258.

Moratto, Michael J. 1984. *California Archaeology*. Academic Press, San Francisco, CA.

Moyle, P. B. 1991 (unpublished). *A history of the fisheries in Lower Putah Creek.* Department of Wildlife and Fisheries Biology. University of California, Davis, CA. 11 pp.

Moyle, P. B. 2002a. *Inland Fishes of California, Revised and Expanded*. University of California Press, Berkeley CA.

Moyle, P. B. 2002b. December 9. Letter to Ms. Diane Windham, Recovery Coordinator, Central Valley Area, National Marine Fisheries Service, 650 Capitol Mall, Suite 8300, Sacramento, CA 95814. Letter to National Marine Fisheries Service providing explanation of the scientific justification for the current regime of flows in lower Putah Creek.

Moyle, P. B., P. J. Foley, and R. M. Yoshiyama. 1992. *Status of green sturgeon,* Acipenser medirostris, *in California.* Final Report submitted to National Marine Fisheries Service. University of California, Davis. Davis, CA.

Moyle, Peter B., M. P. Marchetti, J. Baldridge, and T. L. Taylor. 1998. Fish Health and Diversity: Justifying Flows for a California Stream. *Fisheries* Vol. 23, No. 7: 6–15.

Moyle, Peter B., P. Crain, and K. Small. 2003 (unpublished). Analysis of Lower Putah Creek Fisheries Data from 1991 though 2002. Department of Wildlife and Fisheries Biology. University of California, Davis, CA.

Myrick, D. F. 1992. *Railroads of Nevada and Eastern California. Volume 1, the Northern Roads.* University of Nevada Press, Reno, NV.

National Marine Fisheries Service. 2005. Green Sturgeon (*Acipenser medirostris*) Status Review Update. Prepared by Biological Review Team, Santa Cruz Laboratory, Southwest Fisheries Science Center. Santa Cruz, CA.

Natural Resources Conservation Service. 1972. *Soil Survey of Yolo County*. Reprinted 1990.

Nelson, J., H. Davis, S. Dies, K. Syda. 1999. *Site Document prepared for site P-48-000549*. Prepared by Jones and Stokes Associates, Sacramento, CA. On file at the Northwest Information Center, California State University, Sonoma, Rohnert Park, CA.

Office of Environmental Health Hazard Assessment. 1994. Methyl mercury in sport fish: answers to questions on health effects. Office of Environmental Health Hazard Assessment, California Environmental Protection Agency. Available at: http://www.oehha.ca.gov/fish/pdf/HGfacts.pdf.

Pacific Fishery Management Council. 2003. *Pacific Coast Salmon Plan, Fishery Management Plan for Commercial and Recreational Salmon Fisheries off the Coasts of Washington, Oregon, and California.* As revised through Amendment 14 (adopted March 1999). Portland, OR.

Philip Williams and Associates. 2005. *An overview of the Potential for Achieving Large Scale, System-Wide, Ecological Restoration Benefits with a Modified Yolo Bypass*.

Philip Williams and Associates. 2006. (Draft) *An Evaluation of the Feasibility of Restoring Freshwater Tidal Wetlands to Calhoun Cut Ecological Reserve*.

Powers, T. W. 1877. Tribes of California. *Contributions to North American Ethnology* 3. Washington, D.C.: U.S. Geographical and Geological Survey of the Rocky Mountain Region.

Putah Creek Council. 2003. Putah Creek Council e-mail announcements of salmon observations on lower Putah Creek between October and December 2003.

Resources Agency (State of California). 2005. *Delta Smelt Action Plan*. State of California Resources Agency, California Department of Fish and Game, California Department of Water Resources.

Resources Agency (State of California). 2007. *Pelagic Fish Action Plan*. State of California Resources Agency, California Department of Fish and Game, California Department of Water Resources.

Riparian Habitat Joint Venture. 2000. The riparian bird conservation plan: a strategy of reversing the decline of riparian associated birds in California. *California Partners in Flight*. Available: <http://www.prbo.org/CPIF/Riparian/Riparian.html>.

Rodriguez, M. A. and W. M. Lewis Jr. 1994. Regulation and stability in fish assemblages of neotropical floodplain lakes. *Oecologia* 99, 166–180.

Sacramento County Superior Court. 2000. *Settlement agreement and stipulation among Solano County Water Agency Solano Irrigation District, Maine Prairie Water District, Cities of Vacaville, Fairfield, Vallejo, and Suisun City, and Putah Creek Council, City of Davis, and the Regents of the University of California.*

Sacramento History Project. 2006. Sacramento History Online, Historic Sacramento Photograph and Document Archive. Available: <http://www.sacramentohistory.org/>. Accessed March 15, 2006.

Sawyer, J. O. and T. Keeler-Wolfe. 1995. *A manual of California vegetation*. California Native Plant Society, Sacramento, CA.

Schemel, L. E., S. W. Hagar, and D. Childers. 1996. The supply and carbon content of suspended sediment from the Sacramento River to San Francisco Bay. Pages 237–260 in: J. T. Hollibaugh (Editor). *San Francisco Bay: The Ecosystem*. Pacific Division of the American Association for the Advancement of Science, San Francisco, CA.

Schemel, L. E., M. Cox, S. Hager, T. Sommer. 2002. *Hydrology and Chemistry of Floodwaters in the Yolo Bypass, Sacramento River System, California, During 2000.* U.S. Geological Survey Water Resources Investigations Report 02-4202. September 2002. Menlo Park, CA.

Scott, B. 1999. *Site Document prepared for site P-48-000541 (CA-YOL-195H)*. Prepared by Jones and Stokes, Sacramento, CA. On file at the Northwest Information Center, California State University, Sonoma, Rohnert Park, CA.

Setmire, J. G., J. C. Wolfe, and R. K. Stroud. 1990. Reconnaissance investigation of water quality, bottom sediment, and biota associated with irrigation drainage in the Salton Sea area, California, 1986–1987. U.S. Geological Survey, Water-Resources Investigation Report 89-4102. 68 pp.

Setmire, J. G., R. A. Schroeder, J. N. Densmore, S. L. Goodbred, D. J. Audet, and W. R. Radke. 1993. Detailed study of water quality, bottom sediment, and biota associated with irrigation drainage in the Salton Sea area, California. U.S. Geological Survey. Water Resources Investigations Report 93-4014. 102 p.

Shipley, W. F. 1978. Native Languages of California. in R. F. Heizer, Vol. Ed., *Handbook of North American Indians, Vol. 8: California:* 80–90. Smithsonian Institution, Washington, D.C.

Slotten, D. G., S. M. Ayers, T. H. Suchanek, R. D. Weyand, A. M. Liston, C. Asher, D. C. Nelson, and B. Johnson. 2003. The Effects of Wetland Restoration on the Production and Bioaccumulation of Methyl mercury in the Sacramento-San Joaquin Delta, California. In CALFED Final Report titled "*An Assessment of Human Health and Ecological Impacts of Mercury in the Bay-Delta Watershed.*"

Smalling, K. L., Orlando, J. L., and Kuivila, K. M. 2005. Analysis of Pesticides in Surface Water and Sediment from Yolo Bypass, California. 2004–2005: U.S. Geological Survey Scientific Investigations Report 2005–5220, 20 p.

Smith, G. J. and V. P. Anders. 1989. Toxic effects of boron on mallard reproduction. *Environ. Toxicol. Chem*. 8:943–950.

Solano County Water Agency. 1998. *Lake Solano Sediment Removal and Management Study*. Phase I final report. November. West Sacramento, CA. Prepared by Northwest Hydraulic Consultants.

Sommer, T. R., M. L. Nobriga, W. C. Harrell, W. Batham, and W. J. Kimmerer. 2001. Floodplain rearing of juvenile chinook salmon: evidence of enchanced growth and survival. *Canadian Journal of Fisheries and Aquatic Sciences* 58(2):325–333.

Sommer, T. R., W. C. Harrell, M. L. Nobriga and R. Kurth. 2003. Floodplain as habitat for native fish: Lessons from California's Yolo Bypass. Pages 81–87 In P. M. Faber, editor. *California riparian systems: Processes and floodplain management, ecology, and restoration*. 2001 Riparian Habitat and Floodplains Conference Proceedings, Riparian Habitat Joint Venture, Sacramento, CA.

Sommer, T., B. Harrell, M. Nobriga, R. Brown, P. Moyle, W. Kimmerer, and L. Schemel. 2001. California's Yolo Bypass: evidence that flood control can be compatible with fisheries, wetlands, wildlife, and agriculture. *Fisheries* 26:6–16.

Sommer, T., R. Baxter, and B. Herbold. 1997. The resilience of splittail in the Sacramento-San Joaquin Estuary. *Transactions of the American Fisheries Society* 126:961–976.

State Water Resources Control Board. 1999. Environmental Impact Report for Implementation of the 1995 Bay-Delta Water Quality Control Plan. Sacramento, CA.

Stephenson, M., Coale, K., Gill, G., Foe, C., Marvin-DiPasquale, M. 2002. Conceptual model and working hypotheses of mercury cycling and transport in the Bay-Delta ecosystem and its tributaries. Draft Final Report to the California Bay Delta Authority. 28 pp.

Stephenson, Mark. Marine Pollution Studies Lab, California Department of Fish and Game, Moss Landing, CA. February 16, 2006—interview conversation with EDAW and DFG regarding recent methyl mercury research.

Syda, K. 1999. *Site Document prepared for site P-48-000549*. Prepared by Jones and Stokes Associates, Sacramento, CA. On file at the Northwest Information Center, California State University, Sonoma, Rohnert Park, CA.

Tejerina-Garro F. L., Fortin R. & Rodriguez M. 1998. Fish community structure in relation to environmental variation in floodplain lakes of the Araguaia basin. *Environmental Biology of Fishes* 51, 399–410.

Tracy, C. 1990. *Memorandum: Green sturgeon meeting and comments*. State of Washington Department of Fisheries 11 p.

Turner J. L. & Kelley D. W. (eds) 1966. *Ecological studies of the Sacramento-San Joaquin Delta. Part II, Fishes of the Delta.* California Department of Fish and Game Fish Bulletin 136, 168 pp.

U.S. Army Corps of Engineers. 1991. Draft environmental assessment/initial study, Yolo Basin wetlands, Sacramento River, California. Appendix 8, Office Report, basis of hydraulic analysis. October. Sacramento, CA.

U.S. Army Corps of Engineers. 1996. *Reconnaissance Report, Little Holland Tract, California*. January. Sacramento District, Sacramento, CA.

U.S. Army Corps of Engineers. 2000 (April 30). *Design and Construction of Levees.* Engineering Manual 1110-2-1913.

U.S. Army Corps of Engineers. 2003. *Supplement to the Standard Operation and Maintenance Manual, Sacramento River Flood Control Project (as revised 1995) for the Yolo Basin Wetlands, Project Modifications Works, Yolo County, CA.*

U.S. Army Corps of Engineers. 2006. Office Report: Yolo Bypass 2-D Hydraulic Model Development and Calibration (Draft). U.S. Army Corps of Engineers Sacramento District.

U.S. Army Corps of Engineers and CALFED Bay-Delta Program. 2002 (December). *Habitat Improvement for the Native Fish in the Yolo Bypass.* Prepared by Natural Heritage Institute, California Department of Water Resources, California Department of Fish and Game, Yolo Basin Foundation, Northwest Hydraulic Consultants, Gus Yates, Peter Kiel, and Jones and Stokes.

U.S. Army Corps of Engineers and State of California Reclamation Board. 2002 (December). *Sacramento and San Joaquin River Basins California Comprehensive Study*. Interim report. Sacramento District, Corps of Engineers and The Reclamation Board, Sacramento, CA.

U.S. Department of Interior, Bureau of Reclamation. 2006. General description of the Sacramento Canals Unit of the Central Valley Project—Sacramento River Division. Available: <http://www.usbr.gov/dataweb/html/sacramento.html>. Accessed on February 27, 2006.

U.S. Environmental Protection Agency. 2003. 2002 Clean Water Act Section 303(d) List of Water Quality Limited Segments. Approved July 2003.

———. 2005. USEPA List of Drinking Water Contaminants and MCLs. Available online at URL: <http://www.epa.gov/safewater/mcl.html>. Updated February 4, 2005. Accessed on February 7, 2005.

U.S. Fish and Wildlife Service. 1993. *Reconnaissance Planning Report – Fish and Wildlife Resource Management Options for Lower Putah Creek, California. Report to Congress. Including Appendix A (maps) – Land Use and Habitat Cover Types of the Lower Putah Creek Planning Area.* Sacramento Field Office, Sacramento, California.

U.S. Fish and Wildlife Service. 2004. *Biological Opinion Issued for Delta Smelt on the Revised CVP/SWP Operating Plan.* Prepared for the Regional Environmental Officer, Bureau of Reclamation, Mid-Pacific Regional Office, Sacramento, CA. Prepared by Acting Field Supervisor, U.S. Fish and Wildlife Office, Sacramento, CA.

Wagner, D. L., C. W. Jennings, T. L. Bedrossian, and E. J. Bortugno. 1987. *Geologic Map of the Sacramento Quadrangle.* California Division of Mines and Geology, Regional Geologic Map Series, Map No. 1A.

Wiener, J., Gilmour, C., and Krabbenhoft, D. 2003. *Mercury Strategy for the Bay-Delta Ecosystem: A Unifying Framework for Science, Adaptive Management, and Ecological Restoration*. Final Report to the California Bay-Delta Authority. Sacramento, CA.

Witham, C. 2002. *Vegetation Survey of the Tule Ranch, Yolo Bypass Wildlife Area*.

Work, J. 1945. *Fur Brigade to the Bonaventura: John Works California Expedition, 1832–1833, for the Hudson's Bay Company.* A.B. Maloney (ed.). California Historical Society, San Francisco, CA.

Wright, S. A., D. H. Schoellhamer. 2004. Trends in the Sediment Yield of the Sacramento River, California, 1957–2001. San Francisco Estuary & Watershed Science.

Yolo Audubon Society Checklist Committee. 2004. *Checklist of the Birds of Yolo County, California*. Yolo Audubon Society, Davis, CA.

Yolo Basin Foundation. 2001 (August). A Framework for the Future: Yolo Bypass Management Strategy. Davis, CA. Prepared by Jones & Stokes (J&S 99079). Sacramento, CA.

Yolo Basin Foundation Website. Site accessed by Petra Unger, Senior Botanist, EDAW on March13, Available: http://www/yolobasin.org.

Yolo Basin Foundation and California Department of Fish and Game. 2007. *Yolo Wildlife Area Program History and Overview*. Prepared by Yolo Basin Foundation and California Department of Fish and Game. Davis, CA.

Yolo County Habitat Conservation Plan/Natural Communities Conservation Plan Joint Powers Agency. 2005.

Yolo County HCP/NCCP JPA. *See* Yolo County Habitat Conservation Plan/Natural Communities Conservation Plan Joint Powers Agency.

Yolo County Planning Department. 2005. *Background Report for the Yolo County General Plan Update.* Prepared by Jones & Stokes, Cotton Bridges Associates, Inc., Fehr & Peers Associates, Inc., House Agricultural Consultants, and Applied Development Economics.

Yolo County Water Resources Association. 2004 (August). *Draft Integrated Regional Water Management Plan.* Volume 1. Woodland, CA.

Yolo County. 1983. *Yolo County General Plan.* Prepared by the Yolo County Community Development Agency. Davis, CA.

Yoshiyama, R. M., E. R. Gerstung, F. W. Fisher, and P. B. Moyle. 2000. Chinook salmon in the California Central Valley: an assessment. *Fisheries* 25(2):6–20.

CHAPTER 4, "COMPATIBLE RESOURCE MANAGEMENT AND PUBLIC USE"

Kirkland, M., R. Beckwith, T. Greene, and Z. Matica. 2005. *Aquatic Restoration Planning in the Yolo Bypass Floodplain*. Poster presentation at the Seventh Biennial State of the San Francisco Estuary Conference. Oakland, CA.

Moyle, P. B. 2002 (December 9). Letter providing scientific justification of Accord flow regime, to Ms. Diane Windham, Recovery Coordinator, Central Valley Area, National Marine Fisheries Service, Sacramento, CA.

Page, G. W., W. D. Shuford, J. E. Kjelmyr, and L. F. Stenzel. 1992. *Shorebird Numbers in Wetlands of the Pacific Flyway: A Summary of Counts from April 1988 to January 1992.* Point Reyes Bird Observatory. Stinson Beach, CA.

Sacramento County Superior Court. 2000. *Settlement Agreement and Stipulation Among Solano County Water Agency Solano Irrigation District, Maine Prairie Water District, Cities of Vacaville, Fairfield, Vallejo, and Suisun City, and Putah Creek Council, City of Davis, and the Regents of the University of California.*

Sommer, T., R. Baxter, and B. Herbold. 1997. The resilience of splittail in the Sacramento–San Joaquin Estuary. *Transactions of the American Fisheries Society* 126: 961–976.

Sommer, T. R., W. C. Harrell, M. L. Nobriga, R. Brown, P. B. Moyle, W. J. Kimmerer, and L. Schemel. 2001a. California's Yolo Bypass: Evidence that flood control can be compatible with fisheries, wetlands, wildlife, and agriculture. *Fisheries* 26(8):6–16.

Sommer, T. R., M. L. Nobriga, W. C. Harrell, W. Batham and W. J. Kimmerer. 2001b. Floodplain rearing of juvenile Chinook salmon: evidence of enhanced growth and survival. *Canadian Journal of Fisheries and Aquatic Sciences* 58(2):325–333.

Sommer, T., L. Conrad, G. O'Leary, F. Feyrer, and W. Harrell. 2002. Spawning and rearing of splittail in a model floodplain wetland. *Transactions of the American Fisheries Society* 131:966–974.

Schemel, L. E., S. W. Hagar, and D. Childers. 1996. The supply and carbon content of suspended sediment from the Sacramento River to San Francisco Bay. Pages 237–260 in J. T. Hollibaugh (ed.), *San Francisco Bay:*

The Ecosystem. Pacific Division of the American Association for the Advancement of Science. San Francisco, CA.

U.S. Army Corps of Engineers. 2003. *Supplement to the Standard Operation and Maintenance Manual, Sacramento River Flood Control Project (as revised 1995) for the Yolo Basin Wetlands, Project Modifications Works, Yolo County, CA.*

———. 2006. *Yolo Bypass RMA-2 2-D Hydraulic Model*. Sacramento, CA.

U.S. Army Corps of Engineers and CALFED Bay-Delta Program. 2002 (December). *Habitat Improvement for the Native Fish in the Yolo Bypass.* Prepared by Natural Heritage Institute, California Department of Water Resources, California Department of Fish and Game, Yolo Basin Foundation, Northwest Hydraulic Consultants, Gus Yates, and Peter Kiel.

Yolo Basin Foundation. 2001 (August). *A Framework for the Future: Yolo Bypass Management Strategy*. Davis, CA. Prepared by Jones & Stokes (J&S 99079). Sacramento, CA.

Yolo Basin Foundation and California Department of Fish and Game. 2007. *Yolo Wildlife Area Program History and Overview.* Prepared by Yolo Basin Foundation and California Department of Fish and Game. Davis, CA.

CHAPTER 5, "MANAGEMENT GOALS"

CALFED Bay–Delta Program. 2000a (July). Final Programmatic Environmental Impact Statement and Environmental Impact Report. Including portions of the Ecosystem Restoration Program Plan. Including the Multi-Species Conservation Strategy, Technical Appendix. Sacramento, CA.

———. 2000b (August 28). Final Programmatic Environmental Impact Statement and Environmental Impact Report. Programmatic Record of Decision. Sacramento, CA.

California Department of Fish and Game. 2003. *Guide and Annotated Outline for Preparing Land Management Plans.* State of California, The Resources Agency, Department of Fish and Game. Sacramento, CA.

———. 2006. *Guide and Annotated Outline for Preparing Land Management Plans.* State of California, The Resources Agency, Department of Fish and Game. Sacramento, CA.

California State Board of Forestry and California Fish and Game Commission. 1994. *Joint Policy on Pre-, During, and Post-fire Activities and Wildlife Habitat.*

Kwasny, D. C., M. Wolder, and C. R. Isola. 2004. *Central Valley Habitat Joint Venture, Technical Guide to Best Management Practices for Mosquito Control in Managed Wetlands.*

Wildlife Conservation Board. 2001 (August 30). Wildlife Conservation Board meeting minutes. Sacramento, CA.

Notice of Determination

Appendix D

To:

☒ Office of Planning and Research

For U.S. Mail: P.O. Box 3044, Sacramento, CA 95812-3044

Street Address: 1400 Tenth St., Sacramento, CA 95814

☒ County Clerk

County of: Yolo

Address: Yolo County Administration Building, 625 Court Street, Room B-05 Woodland CA 95776

From:

Public Agency: CA Department of Fish and Game

Address: Bay Delta Region, (Region 3) 7329 Silverado Trail, Napa CA 94558

Contact: Mr. Dave Feliz

Phone: 530 - 757-2431

Lead Agency (if different from above):

Address:

Contact:

Phone:

SUBJECT: Filing of Notice of Determination in compliance with Section 21108 or 21152 of the Public Resources Code.

State Clearinghouse Number (if submitted to State Clearinghouse): 2007072099

Project Title: Yolo Bypass Wildlife Area Final Land Management Plan (LMP)

Project Location (include county): City of Davis and West Sacramento, approximately 16,770 acres within the Yolo Bypass in Yolo County, California.

Project Description:

This LMP proposes continuation of an ecosystem-based approach to management of the diverse mosaic of natural communities. The purpose of the Wildlife Area is to protect and enhance habitat for wildlife species, and to provide the public with compatible, wildlife-related recreational uses. The Wildlife Area provides habitat for special-status species, game species, and other native and nonnative species.

This is to advise that the California Department of Fish and Game ☒ Lead Agency or ☐ Responsible Agency has approved the above described project on _____ (Date) and has made the following determinations regarding the above described project:

1. The project [☐ will ☒ will not] have a significant effect on the environment.
2. ☐ An Environmental Impact Report was prepared for this project pursuant to the provisions of CEQA.
   ☒ A Negative Declaration was prepared for this project pursuant to the provisions of CEQA.
3. Mitigation measures [☐ were ☒ were not] made a condition of the approval of the project.
4. A mitigation reporting or monitoring plan [☐ was ☒ was not] adopted for this project.
5. A statement of Overriding Considerations [☐ was ☒ was not] adopted for this project.
6. Findings [☐ were ☒ were not] made pursuant to the provisions of CEQA.

This is to certify that the final EIR with comments and responses and record of project approval, or the negative Declaration, is available to the General Public at: California Department of Fish and Game Bay-Delta Region Headquarters 7329 Silverado Trail Napa, CA 94558

Signature (Public Agency) _____ Title Deputy Director

Date 6-3-08 Date Received for filing at OPR _____

RECEIVED
JUN - 5 2008
STATE CLEARING HOUSE

Authority cited: Sections 21083, Public Resources Code.
Reference Section 21000-21174, Public Resources Code.

Revised 2005