Chapter 2
Conservation

Introduction

This background report provides base data for development of the Conservation Element of the Yolo County General Plan. The Conservation Element will address the following issues covered in this report:

- Water Resources and Hydrology,
- Soils and Mineral Resources,
- Biological Resources,
- Harbors,
- Air Quality,
- Energy Resources and Conservation, and
- Agriculture.

Water Resources and Hydrology

Introduction

In Yolo County, as in much of California, the availability, location, and quality of water resources has a substantial effect on economic activity and environmental resources. Future land uses will continue to play a large role in the allocation of water resources in the county. Additionally, some of Yolo County's waterways are important components of the greater Sacramento River system. To assist in understanding these considerations, this section describes topics and issues related to water resources in Yolo County. These subjects include:

- the regulatory framework that governs water rights and water quality issues;
- an overview of Yolo County's surface and groundwater resources;
- known surface water supplies, use, and quality; and

- known groundwater supplies, use, and quality.

Sources of Information

Key sources of data used in the preparation of this section include the following.

- The County's existing general plan (Yolo County 1983).
- The Yolo County Water Resources Association Draft Integrated Regional Water Management Plan (Yolo County Water Resources Association 2004).
- The Yolo County Flood Control and Water Conservation District's Water Management Plan (Borcalli & Associates 2000).
- A Framework for the Future: Yolo Bypass Management Strategy prepared for the Yolo Basin Foundation (Jones & Stokes 2001).
- The Central Valley Regional Water Quality Control Board's (RWQCB's) Basin Plan for the Sacramento and San Joaquin River basins.
- Various materials on mercury contamination in Clear Lake prepared by the Central Valley RWQCB, including the mercury Total Maximum Daily Load (TMDL) program for Clear Lake.

Key Terms

- **Acre-Foot:** The term *acre-foot* describes the volume of water needed to cover 1 acre of land with water 1 foot deep. An acre-foot is approximately 325,900 gallons.
- **Aquifer:** An aquifer is an underground layer of permeable rock, sand, or gravel that contains water. Aquifers can have multiple layers of confined groundwater at different depths. The top of the uppermost aquifer in an area is sometimes referred to as a water table.
- **Groundwater Transfer:** Surface water is sometimes transferred for use in a location outside of Yolo County. In some cases, groundwater is substituted for that surface water to meet local demand.
- **Overdraft:** Overdraft is a condition of a groundwater basin or aquifer in which withdrawals exceed inflow (i.e., more water is taken out than is put back in).
- **Watershed:** A watershed is the area or region bounded peripherally by a divide and draining ultimately to a particular waterway or body of water.

Regulations That Affect Water Resources

The federal Clean Water Act (CWA) and the Safe Drinking Water Act have established water quality standards and attainment programs, which are

administered by the U.S. Environmental Protection Agency (EPA). At a statewide level, the California Water Code provides a legal framework and the State Water Resources Control Board (SWRCB) serves as the administrative vehicle for managing water resources. Within Yolo County, water resources are managed through the Yolo County General Plan (Chapter 7, Title 10 of the Yolo County Code) and water agencies, consisting of special districts, cities, and community service districts.

Federal Regulations

Clean Water Act and Associated Environmental Compliance

The CWA is the primary federal law that protects the quality of the nation's surface waters, including lakes, rivers, and coastal wetlands. It operates on the principle that all discharges into the nation's waters are unlawful unless specifically authorized by a permit; permit review is the CWA's primary regulatory tool.

The following sections of the CWA are particularly relevant to the proposed program.

- Section 303—Water Quality Standards and Implementation Plans, and
- Section 402—National Pollutant Discharge Elimination System,

The EPA has delegated its authority to implement and enforce the provisions of these sections to the individual states. In California, the provisions are enforced by nine RWQCBs under the auspices of the SWRCB. Additional information on the requirements imposed by CWA Sections 303, 401, and 402 is provided in "Porter-Cologne Act and State Implementation of Clean Water Act Requirements" below.

Safe Drinking Water Act

The Safe Drinking Water Act of 1974 is the principal federal law that protects the quality of the nation's drinking water. It empowers EPA to set drinking water standards and to oversee water providers—cities, water districts, and other agencies—that actually implement those standards. It also includes provisions for the protection of surface waters and wetlands, in support of drinking water quality.

In California, EPA delegates some of its implementation authority to the California Department of Health Services (DHS) Division of Drinking Water and Environmental Management. DHS administers a wide range of regulatory programs that include components aimed at drinking water quality and safety, including permits for water well installation; potable water supply monitoring

requirements for public drinking water systems and new domestic wells; regulations for septic and sewer systems; regulations governing generation, handling, and discharge/disposal of hazardous materials and wastes; and regulations for underground storage tanks (USTs) and solid waste disposal facilities. Yolo County is required to comply with all federal regulations as administered by state agencies.

State Regulations

Porter-Cologne Act and State Implementation of Clean Water Act Requirements

The Porter-Cologne Water Quality Control Act, passed in 1969, implements the federal CWA (see "Clean Water Act and Associated Environmental Compliance" above). It established the SWRCB and divided the state into nine regions, each overseen by an RWQCB. The SWRCB is the primary state agency responsible for protecting the quality of the state's surface and groundwater supplies, but much of its daily implementation authority is delegated to the nine RWQCBs. Yolo County lies within the jurisdiction of the Central Valley RWQCB.

The Porter-Cologne Act provides for the development and periodic review of Water Quality Control Plans (Basin Plans) that designate beneficial uses of California's major rivers and groundwater basins and establish narrative and numerical water quality objectives for those waters (Central Valley Regional Water Quality Control Board 1998). Beneficial uses are the resources, services, and qualities of the aquatic system that are the ultimate goals of achieving and protecting high water quality. The purpose of water quality objectives is to protect designated beneficial uses for each basin's waters. To ensure the most current watershed information is considered, Basin Plans must be updated every 3 years. The Central Valley RWQCB enforces compliance with water quality objectives for beneficial uses of surface waters in Yolo County, listed in Table Hydro-1.

Basin Plans are primarily implemented by using the National Pollutant Discharge Elimination System (NPDES) permitting system to regulate waste discharges so that water quality objectives are met (see discussion of the NPDES system in the following section). Basin Plans provide the technical basis for determining waste discharge requirements, taking enforcement actions, and evaluating clean water grant proposals. The Porter-Cologne Act also assigns responsibility for implementing the NPDES and TMDL programs to the SWRCB and RWQCBs.

State Responsibility for Clean Water Act Section 303—Total Maximum Daily Load Program Overview

Section 303(d) of the CWA established the TMDL process to guide and ensure the application of state water quality standards. A TMDL represents the maximum amount or concentration of a given pollutant allowable in a given water body, based on the nature of the water body and its designated beneficial uses.

Table Hydro-1. Designated Beneficial Uses of Surface Waters in Yolo County

		Agriculture		Industry		Recreation		Freshwater Habitat		Migration		Spawning			
	Municipal	Irrigation	Stock Watering	Process/ Service Supply	Power	Contact	Noncontact	Warm	Cold	Warm	Cold	Warm	Cold	Wildlife Habitat	Navigation
Colusa Basin Drain to "I" Street Bridge	E	E				E	E	E	E	E	E	E	E	E	E
Yolo Bypass		E	E			E	E	E	P	E	E	E		E	
Cache Creek: Clear Lake to Yolo Bypass	E	E	E	E		E	E	E	P			E	E	E	
Putah Creek: Lake Berryessa to Yolo Bypass	E	E	E			E	E	E	P			E		E	
Other lakes and reservoirs in Sacramento River Basin	E	E	E	E	E	E	E	E	E				E	E	

Notes: E = existing beneficial use.
P = potential beneficial use.

Source: CVRWQCB 1998.

To identify water bodies in which the TMDL program may be needed, the SWRCB maintains a Section 303(d) list of water bodies in which water quality is impaired.[1] A water body can be impaired by more than one pollutant. Consequently, multiple TMDLs can be established for a single water body. The most urgent impairments are then prioritized for development of TMDL programs, establishing a means of limiting pollutant input. The Sacramento River is listed as being impaired by unknown toxicity from Red Bluff to Knights Landing and by diazinon, mercury, and unknown toxicity from Knights Landing to the Sacramento River–San Joaquin River Delta. Clear Lake and Cache Creek are listed for impairment by mercury and nutrients. Lake Berryessa and Lower Putah Creek, downstream of Lake Solano, are listed for mercury impairment. The establishment of mercury TMDLs for Lake Berryessa and Lower Putah Creek is listed as low priority for the region (U.S. Environmental Protection Agency 2003).

Mercury Total Maximum Daily Loads for Clear Lake and Cache Creek. Clear Lake is listed as an impaired water body under Section 303(d) of CWA for mercury, from resource extraction, and nutrients, from unknown sources. Cache Creek, the outlet of Clear Lake, is listed as impaired for mercury and unknown toxicity from resource extraction and unknown sources. Mercury impairments in both watersheds were identified on the basis of water and fish tissue testing. The TMDL for nutrients in Clear Lake is scheduled for completion in 2008.

Clear Lake and the Cache Creek drainage basin contribute large quantities of mercury to the Delta. Because multiple significant sources of mercury in large quantities have been identified, the Central Valley RWQCB is developing separate TMDLs to address specific drainage basins more accurately. The final Clear Lake TMDL for mercury was completed and amended to the Central Valley RWQCB Basin Plan in 2002. The mercury TMDLs for Clear Lake and its drainage basin include an implementation plan that presents a strategy and proposes actions to reach established numeric targets to reduce the mercury load. Numeric targets for methylmercury, the toxic form of mercury, have been established to protect humans and wildlife eating fish from Clear Lake and its drainage basin. These targets are associated with specific trophic levels[2].

The *Staff Report for the Cache Creek, Bear Creek, and Harley Gulch TMDL for Mercury*[3] was completed in February 2004 (Central Valley Regional Water Quality Control Board 2004). Based on this staff report, Central Valley RWQCB staff will submit language to amend the Basin Plan in June 2005.

An initial investigation of mercury problems in the Sulphur Creek drainage, a tributary to Cache Creek, was completed in 2002. A draft staff report addressing mercury pollution in Sulphur Creek is was completed in August 2004. A Basin

[1] A stream, lake, or other water body is said to be *impaired* for a pollutant if established water quality standards for that water body are not met despite implementation of technology-based controls on point sources of pollutant input.

[2] *Trophic levels* are the steps on a food chain from producers to primary, secondary, and tertiary consumers. While trophic levels in fish are not clearly defined, it is important to note that bioaccumulation of methylmercury increases as the trophic level ascends.

[3] Clear Lake is part of the Cache Creek drainage basin. This basin also drains Harley Gulch, Bear, Sulphur, and Davis Creeks.

Plan amendment to implement the Sulphur Creek TMDL will be included in the Cache Creek TMDL. The draft staff report is available for review online at http://www.waterboards.ca.gov/centralvalley.

State Responsibility for Section 402—National Pollutant Discharge Elimination System Program

CWA Section 402, enacted as an amendment to the original act in 1972, regulates discharges of pollutants from point sources to surface waters. It established the NPDES program, administered by EPA. Additional amendments to the CWA in 1987 created a new subsection of the CWA specifically devoted to permitting for discharges of stormwater (Section 402[p]).

CWA Section 402 regulates construction-, industrial-, and municipal- related stormwater discharges to surface waters through the NPDES program, administered by EPA. In California, the SWRCB is authorized by EPA to oversee the NPDES program through the RWQCBs (see the related discussion under "Porter-Cologne Water Quality Control Act" below). The NPDES permitting process requires the applicant to file a public notice of intent (NOI) to discharge stormwater and to prepare and implement a storm water pollution prevention plan (SWPPP). The NPDES program provides for *general permits* (those that cover a number of similar or related activities) and *individual permits* (those issued on a project-by-project basis). For example, all construction activities affecting more than 1 (one) acre are regulated under the NPDES General Permit for Discharges of Storm Water Runoff associated with Construction Activity (General Construction Permit). The Industrial Permit Program regulates discharges from ten broad categories of industrial discharges, including manufacturing facilities, mining operations, disposal sites, recycling yards, transportation facilities, and others, under General Industrial Permits. The RWQCB regulates numerous General Industrial Permits covering discharges from industrial activities within Yolo County. Municipal separate storm sewer systems (MS4s) discharges are regulated by General MS4 Permits. These permits were issued in two phases, first for municipalities serving 100,000-250,000 people (medium) and over 250,000 people (large). There are no medium or large MS4s in Yolo County. Phase two covered small municipalities, including non-traditional MS4s, which are governmental facilities such as military bases, public campuses, and prison and hospital complexes. Woodland, Davis, Yolo, UCD, and West Sacramento are covered under Phase II General MS4 Permits. Further information about these municipalities is discussed in the water use section below.

State Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California

Due to a court decision in 1994, California was left with a gap in water quality standards covering priority toxic pollutants. Accordingly, the state developed the Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (SIP) (State Water Resources Control

Board 2000). The SIP established the policy for development of new standards for a variety of toxic pollutants, as required by the CWA. It applies to discharges of toxic pollutants into California's inland surface waters, enclosed bays, and estuaries subject to regulation under the Porter-Cologne Water Quality Control Act and the federal CWA. Such regulation may occur through the issuance of NPDES permits, the issuance or waiver of waste discharge requirements (WDRs), or other regulatory approaches. For instance, the new NPDES general permit for aquatic pesticide application is specifically intended to ensure compliance with the requirements of the SIP. The California Toxics Rule (CTR) implements the SIP through establishment of numeric criteria for priority toxic pollutants.

The goal of the state policy is to establish a standardized approach for permitting discharges of toxic pollutants to non-ocean surface waters in a manner that promotes statewide consistency. Accordingly, the state policy is a tool to be used in conjunction with watershed management approaches and, where appropriate, the development of TMDLs, to ensure that water quality standards are met and beneficial uses are protected.

The state policy establishes implementation provisions for priority pollutant criteria promulgated by EPA through the California Toxics Rule (CTR), and for priority pollutant objectives established by the RWQCBs in their respective Basin Plans. The state is required to use the CTR criteria together with the state's existing water quality standards when controlling pollution in inland waters and other water bodies in Yolo County.

Groundwater Management Act (AB 3030)

California's Groundwater Management Act (Water Code Sections 10750–10756) provides guidelines by which local agencies not having authority for groundwater management can acquire that authority over the management of groundwater resources in basins recognized by the Department of Water Resources. Its intent is to promote the voluntary development of groundwater management plans and provide criteria for the plans in order to ensure sustainable groundwater supplies for the future.

The Act stipulates the technical components of a groundwater management plan as well as procedures for such a plan's adoption, including passage of a formal resolution of intent to adopt a groundwater management plan, and holding a public hearing on the proposed plan. The Act also allows agencies to adopt rules and regulations to implement an adopted plan, and empowers agencies to raise funds to pay for the facilities needed to manage the basin, such as extraction wells, conveyance infrastructure, recharge facilities, and testing and treatment facilities. The passage of SB 1938 (Machado 2002) also required basin management objectives and other additions to be included in the groundwater management plans to comply with California Water Code Section 10750 et seq.

Water Rights

Surface water law and rights are discussed below in the context of how they control and govern water use and supplies in California and specifically, Yolo County. Water rights are presented under the different types of rights and entitlements existing in Yolo County, including appropriative, riparian, Central Valley Project Contracts, and Sacramento River Settlement Contracts.

Riparian Water Rights

Riparian water rights are entitlements to water that are held by owners of land bordering natural flows of water. A landowner has the right to divert a portion of the natural flow for reasonable and beneficial use on his or her land within the same watershed. If natural flows are not sufficient to meet reasonable beneficial requirements of all riparian users on a stream, the users must share the available supply according to each owner's reasonable requirements and uses (State Water Resources Control Board 1989). Thus, all users must reduce their water use in times of water shortages. Natural flows do not include return flows from use of groundwater (e.g., for irrigation), water seasonally stored and later released (e.g., water stored at Indian Valley Reservoir by the YCFCWCD for future release), or water diverted from another watershed. There is no permit requirement for riparian rights; however, riparian right holders must file statements of diversion and use with the SWRCB.

Appropriative Water Rights

Appropriative rights are held in the form of conditional permits or licenses from the State Water Resources Control Board (SWRCB). These authorizations contain terms and conditions to protect prior water right holders, including Delta and upstream riparian water users, and to protect fish and wildlife resources in the public interest. The SWRCB may establish or revise permit or license terms and conditions for salinity control, protection of fish and wildlife, protection of vested water rights, and coordination of terms and conditions between the major water supply projects. Water that is above and beyond the needs of riparian users and prior appropriators may be stored or diverted for a specified type of use at a specified location. Typical uses may include irrigation, municipal, and recreational. The priority of use among appropriators is based on the principal of "first in time, first in right." During periods of reduced flows on a waterway, senior water rights have priority, and junior right holders must reduce or cease water use, if necessary. Appropriative rights are also divided into two categories: pre-1914 and post-1914 (or modern) appropriative rights, marking the time when the state began to regulate appropriations of water. Pre-1914 appropriative rights do not fall under any statewide permitting authority, and holders are not required to give notice or request permission to change the purpose of use, place of use, or points of diversion. In contrast, post-1914 appropriative rights are subject to an administrative process that issues water rights permits and licenses from the SWRCB. Any change to post-1914 appropriative rights must complete a public notification, petition, and approval process.

Central Valley Project Surface Water Contract Entitlements

In addition to water rights obtained directly from the state, many water users have a right to use water though contract with the holder of a water right. After

completion of the Central Valley Project (CVP) by the U.S. Bureau of Reclamation (USBR), many irrigators signed agreements with the USBR for delivery of CVP water. Water availability for delivery to contractors of CVP water during periods of insufficient water supply is determined at the discretion of USBR and based on a combination of operational objectives, hydrologic conditions, and reservoir storage conditions. There is no limit on the shortage that USBR can declare for CVP agricultural water service contractors; USBR can redue their water supplies to zero. In contrast, municipal and industrial water service contracts typically provide for a minimum allocation of 75% of the contract supply in drought years.

Sacramento River Settlement Contracts

In conjunction with construction of the CVP, the USBR entered into settlement contracts with existing riparian and appropriative water rights holders along the Sacramento River. The California water rights law guarantees no harm to these water rights holders by any project such as the CVP. These "settlement contractors" negotiated agreements with the USBR to receive firm water supplies during water shortages.

Other Surface Water Agreements

Water users may also enter into sales agreements with other parties to purchase water entitlements, either short-term (1-year) or long-term (multi-year). These sales agreements are subject to the conditions associated with the type of water right and typically require SWRCB approval.

The above types of water rights and entitlements are active in Yolo County. The Water Planning section, below, discusses water rights and entitlements of agricultural and urban water purveyors. Further detail regarding water use in Yolo County can be found in the IRWMP (Yolo County WRA 2004).

Local Regulations

County Code

The following chapters of the Yolo County Code address hydrology and water quality issues within Yolo County.

Chapter 4—Off-Channel Surface Mining of Title 10 of the Yolo County code pertains to both in-channel and off-channel mining for Lower Cache Creek (commercial in-channel mining is no longer permitted in the county). It sets forth monitoring requirements such that mining activities protect public health and safety and requires that mining operations are adapted to site-specific conditions. The Final Off-Channel Mining Plan (OCMP) for Lower Cache Creek (County of Yolo 1996) established as a comprehensive and integrated planning framework for regulating and protecting the Cache Creek area. The OCMP accommodates gravel mining on the creek terraces (not in-channel) while emphasizing habitat restoration. The OCMP describes a future groundwater

recharge and storage program and allows for future recreation opportunities along the creek.

Chapter 5—Surface Mining Reclamation of Title 10 of the Yolo County code (known as the Surface Mining Reclamation Ordinance of Yolo County) ensures reclamation of mined lands to minimize the adverse effects of mining on the environment and to protect public health and safety. It requires that reclamation plans be adapted to site-specific conditions and be directed to reclaiming of mined areas to a beneficial use, particularly for groundwater storage and recharge; fish, wildlife, and plant habitat; watercourses and flood control basins; and recreational or open space lands.

Chapter 7- Groundwater Export of Title 10 of the Yolo County code (known as the Groundwater Export Ordinance) requires a permit to extract groundwater for the purposes of export outside the County. The permit ensures groundwater usage will not affect basin elevation or adversely affect long-term storage or transmission of groundwater within the aquifer.

Cache Creek Resources Management Plan

To further implement the OCMP, the Cache Creek Resources Management Plan for Lower Cache Creek (CCRMP) was developed (County of Yolo 2002) is a comprehensive management plan that eliminated commercial in-channel aggregate mining, established an improvement program from implementing on-going projects to improve channel stability, and ensured restoration of riparian habitat along creek banks in the future. The plan area extends from the Capay Dam to Interstate 5.

Together with the OCMP, the CCRMP comprises the Cache Creek Area Plan. The Cache Creek Area Plan describes approaches for managing riparian habitats along Cache Creek below Capay, in particular, for restoring habitats, reducing erosion, maintaining flood capacity, and improving water quality. Among the goals of the plan is to promote coordination of local, state, and federal regulation of activities within Cache Creek.

Local Responsibilities

Numerous water purveyors in Yolo County provide water for agricultural, urban, and environmental uses. These purveyors are water districts, water agencies, or county service areas. Most are governed by a number of elected directors who work to guide water delivery and secure water rights. These are discussed in more detail below.

Water Planning

Integrated Regional Water Management Plan

The Integrated Regional Water Management Plan (IRWMP) was prepared by the Yolo County Water Resources Association (Yolo County WRA) and the California Department of Water Resources (DWR) to plan an integrated resources management program to identify potentially feasible opportunities, initiatives, programs, or projects to improve water supply reliability in Yolo County. This plan is part of the continuing countywide planning effort to manage water within Yolo County, with participation of existing water purveyors. The IRWMP also serves to update the County's 1992 Water Management Plan. The IRWMP is currently under development, however the information gathered as of August 2004 was used extensively for the Background Report.

Water Purveyors

There are numerous water purveyors throughout Yolo County that provide water-related services, such as drainage and flood control and water supply for agricultural and urban uses. Major agricultural water purveyors on Yolo County include the Colusa Drain Mutual Water Company, Conaway Conservancy Group, Dunnigan Water District, Reclamation District 108, River Garden Farms Company, U.C. Davis (Field Teaching and Research System), and the Yolo County Flood Control and Water Conservation District (YCFCWCD). Major purveyors of water for urban use include the City of Davis, U.C. Davis (domestic system), City of West Sacramento, City of Winters, and the City of Woodland. The locations of agricultural and urban water purveyors are shown in Figure Hydro-9. More detailed information regarding water use in the county can be found in the Yolo County Integrated Regional Water Management Plan (Yolo County WRA 2004).

Agricultural Water Purveyors

Colusa Drain Mutual Water Company

This company consists of a group of users that obtain water supply under a contract with the U.S. Bureau of Reclamation (USBR) and appropriative water rights. The contract has a maximum project water quantity determined by the acreage irrigated on a year-by-year basis, which will not exceed 100,000 acre-feet per year.

Conaway Conservancy Group

The Conaway Conservancy Group covers approximately 18,000 acres in Eastern Yolo County along the west bank of the Sacramento River and includes land in the Yolo Bypass. The Group has appropriative water rights on the Sacramento

River, Willow Slough, and Cache Creek, as well as a settlement contract with the USBR that provides water from the Sacramento River.

Dunnigan Water District

The Dunnigan Water District was formed by a group of landowners for the purposes of contracting with the USBR for delivery of water from the Central Valley Project via the Tehama-Colusa Canal. The contracted supply from the Central Valley Project is 19,000 acre-feet.

Reclamation Districts

Reclamation Districts 108, 150, and 999 utilize surface water supplies primarily for irrigation of agricultural lands. Reclamation District 108 receives water via an USBR contract and appropriative rights to Sacramento River water for its 48,000-acre service area. A total of 232,000 acre-feet per year is allocated to Reclamation District 108 under the contract. Reclamation District 150 has an appropriative water right to divert water from Elkhorn Slough at the maximum diversion rate of 4.2 cfs. Reclamation District 999's supply comes from four appropriative water rights with various points of diversion on the Sacramento River, Sacramento River Deep Ship Channel, Elk Slough, Sutter Slough, and Minor Slough.

River Garden Farms Company

The River Garden Farms Company covers approximately 7,000 acres on the west side of the Sacramento River in northeastern Yolo County, near the town of Knights Landing. The Company has appropriative water rights to the Sacramento River and the Knights Landing Ridge Cut Canal and receives 29,800 acre-feed under an USBR contract. In addition, private and Company-owned groundwater wells produce 11,000 acre-feet per year, on average.

University of California, Davis – Field Teaching and Research System

The field teaching and research water system of UCD is used to conduct agricultural education and research. Supply sources are groundwater (via riparian water rights), a sales agreement (Clear Lake water supplied by YCFCWCD), and Putah Creek (via the Solano Project).

Yolo County Flood Control and Water Conservation District (YCFCWCD)

The YCFCWCD service area covers approximately 190,000 acres, much of the central region of Yolo County. Water supply is provided by Cache Creek, Clear Lake, and Indian Valley Reservoir via pre-1914 appropriative water rights in Lake and Yolo County and riparian water rights to Cache Creek.

Urban Water Purveyors

City of Davis

The City of Davis services an approximate population of 60,000. The sole source of water supply for the City of Davis is groundwater. A total of 15,100 acre-feet of water was pumped from groundwater supplies in 2001.

University of California, Davis Domestic System

UC Davis supplies water to approximately 3,500 persons who use the university. Six groundwater wells are used for domestic water supply. A total of 2,700 acre-feet of groundwater was produced for the year 1999.

City of West Sacramento

The City of West Sacramento services approximately 8,000 connections with treated water diverted from the Sacramento River under an appropriative water right and a contract with the USBR for the Central Valley Project water. The City is allowed to divert a combined total of up to 23,600 acre-feet of water.

City of Winters

The City of Winters supplies groundwater and underflow water from Putah Creek within the 1,980-acre city limits. The City's underflow water right to Putah Creek is taken from the gravel beneath a flowing stream at the rate of 1.5 cubic feet per second. The City does not have rights to divert water directly from Putah Creek.

City of Woodland

Groundwater is the sole water supply source for the City of Woodland. In 2001, a total of 17,000 acre-feet was pumped to meet water demands.

Others

In addition to the water purveyors discussed above, the following service districts also distribute water to consumers within the county. Service area and operations information was not available for these purveyors.

- Cacheville County Service District
- Esparto Community Services District
- Knights Landing County Service District
- Madison County Service District
- North Davis Meadows County Service Area

Physical Setting

Surface Water Resources

Topography and Precipitation

Much of the precipitation received in Yolo County falls on the Vaca Mountains to the west of the County. The highest elevation in the County is Berryessa Peak at 3,046 feet above sea level, decreasing to 5 feet above sea level near the Sacramento River on the eastern edge of the County. The average annual precipitation is 17 inches per year in the northeast portion of the County, increasing to 34 inches along the western edge of the County. Refer to Figure Hydro-1 showing average precipitation for Yolo County.

Surface Water Hydrology and Supply

Surface waters in Yolo County drain generally west to east terminating in the Sacramento River. Four major drainages are found in Yolo County, the Sacramento River, Cache Creek, Putah Creek, and Willow Slough watersheds (see Figures Hydro-2 and Hydro-3). In addition, many sloughs and drainage ditches cross the eastern half of the county. These watersheds are used to irrigate agricultural fields, control floods, or transport water supplies to users within the County and downstream and provide wildlife habitat. Landowners and water districts along the Sacramento River have rights to water supply from the Bureau of Reclamation or riparian water rights. Surface water supplies in the County originate from the Cache Creek and Putah Creek watersheds, and the Sacramento River.

Sacramento River

The Sacramento River forms the County's eastern border and is California's largest river. Unlike the watersheds that drain from the west to the east through Yolo County, the Sacramento River watershed benefits from a large snowpack, which supports flow throughout the spring and early summer. The Sacramento watershed contains Lake Shasta and Lake Oroville, the two largest reservoirs in California, which are major features of the Federal Central Valley Project and State Water Project, respectively. The Sacramento River conveys two thirds of California's water via the Central Valley and State Water Projects.

Due to high flows during the rainy season, the U.S. Army Corps of Engineers, the State Board of Reclamation, and local reclamation districts constructed a series of weirs, bypasses, and levees that make up the Sacramento River Flood Control Project (see Figure Hydro-4) in the first half of the 20th century. Initially envisioned by the U.S. Army Corps in 1910, it took decades to build. Together with flood protection offered by the state Department of Water Resources' State Water Project, the Sacramento River Flood Control Project eventually protected significant amounts of agricultural land and urban development from flooding. Flow in the lower Sacramento River is perennial, and the operation of upstream storage reservoirs serves to make the flow seasonally more uniform than under natural conditions.

Yolo Bypass

The Yolo Bypass is a 59,000-acre, 41 mile leveed floodplain constructed during 1917-1924 as part of the Sacramento River Flood Control Project. The Bypass can convey a maximum of 377,000 cfs at the Fremont Weir, to 490,000 cfs south of Putah Creek (Yolo County WRA 2004). The Yolo Bypass carries floodflows generated by runoff from the entire Sacramento River watershed, including the Sacramento, Feather, and American Rivers and their associated tributary watersheds. Tributaries specific to the Bypass include Cache and Putah Creeks, Willow Slough, and the Knights Landing Ridge Cut from the Colusa Basin. The majority of the land within the Bypass is farmed and approximately 9,652 acres are dedicated to publicly and privately managed wetlands (Jones & Stokes 2001).

Colusa Basin Drain

The Colusa Basin Drain watershed comprises nearly 1,620 square miles in the 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 WRA 2004).

The Tehama-Colusa Canal is 110.9 miles long and travels south from Red Bluff Diversion Dam through Tehama, Glenn, Colusa Counties, and 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 (USBR 2004). The water is used for irrigation by Central Valley Project 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. Without the Ridge Cut Canal, agricultural land in the Colusa Basin Drain watershed would flood.

Cache Creek Watershed

The Cache Creek watershed originates in Lake County to the northwest of Yolo County. The watershed is divided in two, Upper Cache Creek and Lower Cache Creek. The Upper Cache Creek portion includes the watershed upstream of the YCFCWCD's Capay Diversion Dam. The Lower Cache Creek portion extends from the Capay Diversion Dam downstream to and including the Cache Creek Settling Basin. The two areas cover 1,044 and 1,139 square miles for the upper and loser portions of the drainage system, respectively (Yolo County WRA 2004).

The most distinct feature in the upper watershed is Clear Lake. Clear Lake, located in Lake County, is a large shallow natural body of water with an area of approximately 44,000 acres when full, and has a maximum depth of approximately 50 feet. Inflow to the lake can be in the order of 40,000 cfs, while outflow is in the range of 4,000-5,000 cfs depending on the lake stage. Thus, a large portion of the lake's capacity is held in storage. The YCFCWCD owns and operates Cache Creek Dam, a conservation structure constructed on Cache Creek approximately five miles downstream of Clear Lake. Cache Creek Dam is located approximately 49 miles upstream from the YCFCWCD's Capay Diversion Dam and is equipped with a hydroelectric plant (Borcalli & Associates 2000). In 1975, the YCFCWCD completed construction of the Indian Valley Dam and Reservoir Project on North Fork Cache Creek to provide additional water supply for Yolo County. When full, Indian Valley Reservoir has a surface area of 4,000 acres and a total storage capacity of 300,600 acre-feet. The dam and reservoir are located on the North Fork Cache Creek approximately 54 miles from the Capay Diversion Dam. Other tributaries in the upper portion include North Fork Cache Creek and Bear Creek. The Capay Diversion Dam was

constructed in 1914 to divert water from Cache Creek into the West Adams and Winters canals for agricultural irrigation.

Lower Cache Creek transports collected waters from the coastal foothills and the Dunnigan Hills in the west to the Cache Creek Settling Basin in the east. The lower channel has degraded from gravel extraction and levee work, which have caused increased erosion and subsequent channel migration. The Settling Basin traps a large part of the sediment load from Cache Creek that would otherwise be deposited in the Yolo Bypass, thus reducing flood capacity. The Basin is an artificial structure built by the U.S. Army Corps of Engineers as part of the Sacramento River Flood Control Project. The Settling Basin can convey a design flow of 30,000 cfs (Yolo County WRA 2004).

Willow Slough

The Willow Slough watershed contains 131,000 acres running from the Blue Ridge in the coast range eastward then northeast toward the Sacramento River and Yolo Bypass. The Willow Slough Bypass was constructed to divert floodwaters through a shorter path to the Yolo Bypass. This bypass was designed to convey 6,000 cfs of floodwaters (Jones & Stokes 2001).

Putah Creek

The Putah Creek watershed originates in Napa County to the west and encompasses approximately 710 square miles. The upper watershed originates at 4,700 feet at Cobb Mountain in the Blue Ridge Mountains that straddle Napa and Yolo counties. The Bureau of Reclamation constructed the Monticello Dam on Putah Creek in 1957, thus forming Lake Berryessa. The lake, located in Napa County, has a capacity of 1.6 million acre-feet and provides surface water for the Solano Irrigation District, which supplies water to Solano County. Releases from the lake flow to the Putah Diversion Dam that impounds Lake Solano.

Surface Water Quality

Sacramento River–Yolo Bypass and Associated Canals

Water quality of the Sacramento River is closely monitored by a number of groups and agencies to assess suitability for potable, agricultural, and wildlife uses. Water quality of the Sacramento River, from Knights Landing to the Delta, was determined to be impaired by diazinon, mercury, and unknown toxicity by the US EPA under Section 303(d) of the Clean Water Act (USEPA 2003). In 2003, the Central Valley Regional Water Quality Control Board adopted a Total Maximum Daily Load (TMDL) limit on discharges of diazinon to the Sacramento and Feather Rivers (CVRWQCB 2003). TMDLs for mercury and toxicity are 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 CVRWQCB (Yolo County WRA 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 conducted a study during 2000. Sampling of physical and chemical parameters

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, L 2002). The City of Woodland discharges its wastewater effluent to the Tule Canal, which flows to the Yolo Bypass.

Cache Creek

Erosion and groundwater discharge from marine sediments have resulted in release of high boron and mercury concentrations to the Cache Creek watershed. Boron concentrations typically range from 0.7 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 WRA 2004). Many fruit and nut tree crops are sensitive to boron concentrations as low as 0.5-1.0 mg/l, although some of these crops are successfully grown in the Capay Valley. Mercury contamination from past mining activities, erosion of naturally occurring mercury contaminating soils, geothermal springs, and atmospheric deposition near Clear Lake and at tributaries to Cache Creek have contaminated sediments and water (CVRWQCB 2004). High quantities of mercury travel through the creek channel during high flows. Consequently, high concentrations of mercury have been detected in the Yolo Bypass. The Cache Creek watershed is a large source of mercury contamination in the Sacramento-San Joaquin Delta (CVRWQCB 2004). The Central Valley Regional Water Quality Control Board (Regional Board) adopted a TMDL to limit discharges of mercury to Clear Lake and Cache Creek. A fish consumption advisory is in effect for high mercury levels in Clear Lake fish. Clear Lake is also listed as impaired by high levels of nutrients. Cache Creek is also impaired by unknown toxicity (USEPA 2003). The YCFCWCD monitors boron and mercury at seven locations throughout the watershed. Water temperature data taken while sampling for fish in 1998 in Lower Cache Creek and its tributaries (Bear, Sulphur, and North Fork) indicated that temperatures are warmer (16-18 degrees C) in upper tributaries and cooler (11-12 degrees C) further downstream (USFWS 2001).

Willow Slough

The Yolo County Resource Conservation District is initiating a program to monitor suspended sediment, nutrient, and water level at 4-6 sites along Willow Slough. Results from this monitoring program had not been published as of the date of this report. 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 wastewater effluent to Willow Slough.

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. Lake Berryessa and Lower Putah Creek, downstream of Lake Solano, are listed as impaired by mercury on the US EPA 303(d) list (USEPA 2003). Water temperature monitoring by UCD documented seasonal warming profiles downstream of the Putah Diversion Dam, diurnal temperature fluctuations, and localized thermal stratification (Yolo County WRA 2004).

Groundwater Resources

The Yolo subbasin of the Sacramento Valley groundwater basin underlies the majority of Yolo County. Aquifers beneath Yolo County are essentially contained within two stratigraphic units: the thick alluvial and river sediments of the Tehama formation, deposited during the Pliocene epoch, and the younger sediments that overlie the Tehama formation, deposited entirely during the Quaternary period and predominately by the modern drainages that flow into and through the Sacramento Valley.

Yolo County is underlain by a substantial amount of groundwater. It is estimated that groundwater storage for all of Yolo County, between 20 and 420 feet below the surface, is 14,000,000 acre feet. Approximately 6,456,000 acre-feet are contained in storage within the Yolo subbasin (DWR 2004). Figure Hydro-5 shows groundwater contours for the County in the fall of 2000. Wells in Yolo County extend 50 feet to more than 1,500 feet below ground surface (Yolo County WRA 2004).

Yolo County has an extensive network of wells that are used for monitoring groundwater levels. In addition to this extensive network, numerous wells have records dating back more than 40 years. The majority of the well readings are made twice a year, in the spring and fall. The intent of the measurements is to observe the basin in the spring before pumping for irrigation commences and in the fall following the irrigation season. In 2004, the YCFCWCD prepared a groundwater monitoring program that will greatly expand the water level monitoring network and more importantly, initiated a comprehensive groundwater quality network for using wells outside urban areas. Results from this program were not available as of the date of this document. During the period of 1950 to 1976 the basin experienced a large decline in storage due to well overdraft. The construction of the Indian Valley Dam and Reservoir in 1976 alleviated the overdraft by supplying surface water for irrigation and potable uses (Borcalli & Associates 2000).

Groundwater Supplies

The groundwater basin in Yolo County is divided into six subbasins: Capay Valley, Buckeye Creek, Dunnigan Hills, West Yolo, East Yolo, and Sacramento River. Figure Hydro-6 depicts relative soil infiltration properties and the six groundwater subbasins of the county. The information for this section was drawn from the draft IRWMP (Yolo County WRA 2004).

Capay Valley Subbasin

The Capay Valley subbasin is located along the northwestern edge of the county. The geologic structure of the subbasin is complex, representing several stages in development of the valley. Freshwater-bearing sediments on the subbasin are more than 1,000 feet thick and are comprised mostly of Tehama formation sediments, but include a significant thickness of Quaternary deposits.

Buckeye Creek Subbasin

The Buckeye Creek subbasin lies along the northern boarder of Yolo County. Relatively little drilling and installation of wells have occurred in the Buckeye Creek subbasin, consequently, groundwater flow has not been adequately characterized here. However, topography of the surrounding area suggests that the western portion of the subbasin provides significant recharge to groundwater in the eastern portion of the subbasin.

Dunnigan Hills Subbasin

This subbasin is defined by a doubly plunging anticline, a fold imposed on the sediments by influences from the San Andreas fault. The fold kinked overlying Quaternary sediments upward, causing them to erode and exposing the underlying Tehama formation throughout the hills. Irrigation wells drilled in the Tehama formation in the Dunnigan Hills typically produce less than wells tapping the Tehama formation elsewhere in the county. This is perhaps due to the structural high formed by the Dunnigan Hills.

West Yolo Subbasin

The West Yolo subbasin borders the west boundary of the county. The subbasin is divided into two areas, Hungry Hollow and Upper Cache-Putah areas. The Hungry Hollow area encompasses Cache Creek and north, while the Upper Cache-Putah area covers the region south of Cache Creek. Groundwater recharge is provided directly by foothill runoff, flows from Cache and Putah Creeks and smaller foothill drainages, and by water diverted north and south from Cache Creek to the unlined canals in the subbasin.

East Yolo Subbasin

This subbasin covers the eastern portion of the county and runs north to south. The subbasin has been divided into two areas, the Zamora and Lower Cache-Putah areas. The Zamora area covers the region north of Cache Creek, while the Lower Cache-Putah area covers the region south of Cache Creek. Most of the population of Yolo County resides within the boundaries of the East Yolo subbasin, primarily in the cities of Woodland and Davis and the University of California campus, all within the Lower Cache-Putah area. The cities of Woodland, Davis, and the University campus rely entirely on groundwater to meet domestic and some irrigation needs. The Yolo-Zamora Water District depends entirely on groundwater from the Zamora area to meet its water supply demands. Significant land subsidence (more than one foot) has occurred within a roughly linear zone, which extends from Zamora to Davis, incorporating Woodland. Wells throughout the subbasin tap into the Tehama formation. The City of Davis and the University have determined that the general quality of the groundwater from the Tehama formation in the southern portion of the East Yolo subbasin improves below 600 feet below ground surface, though wells produce

relatively little water when screened between 700 and 1,000 feet bgs (Yolo County WRA 2004).

Sacramento River Subbasin

The Sacramento River subbasin is defined by the Sacramento River on the east boarder of the county. The subbasin is divided into two areas, Sacramento River North and Sacramento River South. The division line is the path of Interstate Highway 5. This subbasin is within the flood plain of the Sacramento River, consequently Quaternary fine-grained sands, silts, and clays predominate. Tehama formation sediments extend from 150 to more than 2,500 feet bgs. Groundwater recharge is provided by flows from the Sacramento River, the Sacramento River Deep Water Ship Channel, and the Yolo Bypass flood control channel.

Groundwater Quality

Groundwater in the Yolo basin is characterized by presence of sodium magnesium, calcium magnesium, or magnesium bicarbonate. The groundwater quality is good for agricultural and municipal uses, though 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 (DWR 2004). According to monitoring conducted in the East Yolo subbasin beneath the City of Davis and University of California, average concentrations of arsenic in the Tehama formation below 600 feet bgs are 0.04 mg/L (Yolo County WRA 2004.) This value exceeds the USEPA maximum contaminant level (MCL) of 0.01 mg/L that will become effective as of January 23, 2006 (USEPA 2005). The existing California MCL for arsenic is 0.05 mg/L, as stated in the California Code of Regulations (§64431 - Maximum Contaminant Levels-Inorganic Chemicals).

Intrusion of Saline Water

The intrusion of saline or brackish water into what was historically fresh water is generally thought to be associated with coastal areas (e.g., the Salinas Valley). However, the intrusion of saline or brackish water could occur in the Sacramento Valley, including eastern Yolo County. New deeper wells for agriculture and municipal supply are being explored. Increase of groundwater use from deeper wells threatens to lower the groundwater basin, thus allowing saline water to upwell and contaminate the water supply (Borcalli & Associates 2000).

Land Subsidence

In Yolo County, as much as 4 feet of land subsidence due to groundwater withdrawal has occurred since the 1950s. The land subsidence has damaged or reduced the integrity of highways, levees, irrigation canals, and wells in Yolo County, particularly near the communities of Zamora, Knights Landing, and Woodland. These areas lie in the East Yolo subbasin.

The Yolo County Subsidence Monitoring Network was established in 1999 in response to land subsidence concerns. The network monitors sediment compaction between the ground surface and a fixed point at depth at 58 locations throughout the county. Surveys are conducted periodically and two extensometers near Zamora and Woodland are monitored continuously. According to most recent surveys, the greatest amount of subsidence occurs west of Zamora and in the Davis/University area (see Figure Hydro-7).

Water Demand, Supply, and Use

The following section was written using information and data from the draft IRWMP (Yolo County WRA 2004). Once finalized, this document will be updated to reflect the most current information.

Water Demand and Supply

In Yolo County, approximately 960,000 acre-feet of water are used annually. The major water supplies for Yolo County are surface waters from Cache Creek and the Sacramento River and groundwater supplies, mainly from the East Yolo subbasin. Figure Hydro-8 illustrates the extent of surface, ground, and mixed surface and ground water use in Yolo County. Water demands are difficult to fulfill during drought years because supplies are reduced.

Water demand in the county is identified in the context of three key sectors: agricultural, urban (municipal and industrial), and environmental. The Department of Water Resources assesses the water use and supply throughout the state every five years according to these categories. As shown in Table Hydro-2, existing supplies will meet the current (1995) and future (2020) demands for average year conditions and will fall slightly short during drought years. Table Hydro-3 illustrates the sources of water during average and drought year conditions for the three sectors of water users in Yolo County. Each water use sector is discussed further below.

Table Hydro-2. Yolo County Annual Demands and Supplies (Estimated for Average Year-Type Conditions)

	Current (1995) (Units: 1,000 acre-feet/year)			Future (2020) (Units: 1,000 acre-feet/year)		
	Agriculture	Urban	Total	Agriculture	Urban	Total
Estimated for Average Year-Type Conditions						
Total water demand	866	49	915	848	79	927
Total water supply	875	49	924	857	79	936
Shortfall (-) or surplus (+)	9	0	9	9	0	9
Estimated for Drought Year-Type Conditions						
Total water demand	1,017	53	1,070	983	86	1,069
Total water supply	988	53	1,041	988	82	1,070

Shortfall (-) or surplus (+)	-30	0	-30	5	-4	1

Source: Yolo County WRA 2004.

Table Hydro-3. Yolo County Current and Future Supply Sources

	Current (1995) (Units: 1,000 acre-feet/year)			Future (2020) (Units: 1,000 acre-feet/year)		
	Agriculture	Urban	Total	Agriculture	Urban	Total
Estimated for Average Year-Type Conditions						
Surface Water	489	9	498	496	15	511
Groundwater	241	39	280	224	63	287
Reuse						
Surface water	109	0	109	104	0	108
Groundwater	36	0	36	33	0	33
Total	**875**	**49**	**924**	**857**	**79**	**936**
Estimated for Drought Year-Type Conditions						
Surface Water	454	12	496	461	12	473
Groundwater	361	41	402	374	71	445
Reuse						
Surface water	117	0	124	98	0	98
Groundwater	54	0	54	55	0	55
Total	**988**	**53**	**1,076**	**988**	**82**	**1,070**

Source: Yolo County WRA 2004.

Agricultural

Agricultural use comprises the majority, approximately 88%, of water consumption in the county. As of 1997, irrigated lands in the County comprised 366,000 acres. According to data shown in Table Hydro-3, 30% of water used for agriculture is from groundwater supplies, but the majority is from surface water. The total water demand for irrigation in 1995 was approximately 866,000 acre-feet. Currently, water supplies to meet agricultural demands during drought year conditions fall short by approximately 30,000 acre-feet. Table Hydro-4 lists major purveyors of water for agricultural use. Service areas are shown on Figure Hydro-9.

Urban

As shown in Table Hydro-5, urban water use within the YCFCWCD is largely within the cities of Davis, Woodland, and Winters, and UCD although there is urban-type water use within the communities of Esparto, Madison, Knights Landing, and Yolo. According to Yolo County WRA (2004), urban lands within the County comprised approximately 30,000 acres, or 5%, in 1997. Estimates

Table Hydro-4. Agricultural Water Use by Major Water Purveyors in Yolo County

				Current (1995)						Future (2020)					
Water Purveyor	Service Area (acres)	Irrigated Acreage	Surface Supply Source	Percent of Surface Supply	Percent of Ground water Supply	Percent of Water Reuse	Annual Supply (acre-feet)	Annual Demand (acre-feet)	Annual Shortage (acre-feet)	Percent of Surface Supply	Percent of Ground water Supply	Percent of Water Reuse	Annual Supply (acre-feet)	Annual Demand (acre-feet)	Annual Shortage (acre-feet)
Colusa Drain Mutual Water Company		100,000	Colusa Basin Drain												
Conaway Conservancy Group	18,000	17,000	Sacramento River, Cache Creek, Willow Slough	82	18	0	67,520	26,000	0						
Dunnigan Water District	10,700	7,235 (1999)	Central Valley Water Project (CVP)	82	16	0	16,513	16,770	257	60	20	0	25,500	31,844	6,344
Reclamation District 108	47,600	51,000 1995)	CVP	65	4	31	193,800	181,400	0	65	4	31	193,800	173,700	0
River Garden Farms Company	7,000	7,000	Sacramento River	63	37	0	31,800	22,215	0						
UC Davis (Field Teaching and Research System)	1,800	1,200	Solano Project												
Yolo County Flood Control and Water Conservation District	190,000	51,787 (2000)	Cache Creek	54	46	0									

Note: Minor water purveyors were not included here.
Blanks indicate information was unavailable.

Source: Yolo County WRA 2004.

from 1995, shown in Table Hydro-3, indicate that 49,000 acre-feet per year are consumed by the cities of Davis, Winters, Woodland, West Sacramento, and the University of California. This amounts to 5% of the total water use by the county. Water supply for urban use relies heavily on groundwater in Yolo County. Groundwater supplies currently meet 80% of urban demand and are projected to nearly double by the year 2020. Approximately 63,000 acre-feet of groundwater supplies will be required to meet urban demands during an average year in 2020. Reliance on surface water is expected to increase only slightly from current use. However, the City of West Sacramento is currently the only urban community that obtains the majority of their water supply from surface water sources.

Table Hydro-5. Urban Water Use in Yolo County

Water Purveyor	Population Served	Supply Source	Average Annual Supply (acre-feet)	Maximum Day Demand (acre-feet)	Peak Hour (acre-feet)	Future Demand in 2050 (acre-feet)
City of Davis	65,110 (2001)	Groundwater	15,072	30,144	45,216	30,000
UC Davis (Domestic System)	42,682 (1999)	Groundwater	2,700	5,400	9,180	9,000
City of West Sacramento	31,800 (2000)	57% Sacramento River 34% Central Valley Project 9% Groundwater	11,290	24,838	48,547	30,000
City of Winters	6,125 (2000)	Groundwater	1,905	3,810	3,334	3,000 (2025)
City of Woodland	49,500 (2000)	Groundwater	16,800	29,400	58,800	25,000

Source: Yolo County WRA 2004.

Soil and Mineral Resources

Introduction

Yolo County contains important soil and mineral resources. This section describes soil resource characteristics and mineral resource types and the general areas in Yolo County where these resources are found. Agricultural soil resources (e.g., Prime Farmland) are described in the Agriculture section of this report. Soil characteristics from a geologic hazard perspective (e.g., expansive soils) are described in the Seismic and Geologic Hazards section of the Safety Element Background Report.

Sources of Information

Information on soil resources was based on a general soil map of the county prepared by the USDA Soil Conservation Service (Andrews 1972), which is the most recent mapping available. The USDA soil surveys are detailed studies of soils conducted at the county level.

Information on mineral resources was based on regional mineral land classification maps of aggregate resources, *Mines and Mineral Producers in California (1997-1998), Mineral Land Classification: Portland Cement Concrete-Grade Aggregate in the Sacramento-Fairfield Production-Consumption Region*, and other California Geological Survey (formerly called the California Division of Mines and Geology) publications.

Key Terms

- **Accelerated Erosion.** Soil erosion that occurs at a rate in excess of that of geologic (i.e., natural) erosion rates; usually caused by human activities, such as tillage, grazing, and timber harvesting.
- **Aggregate.** Any of a type of hard earthen materials, such as sand, gravel, or crushed stone, used for mixing with a cementing agent to form concrete, mortar, or plaster, or used alone for construction purposes.
- **Soil**. The unconsolidated mineral or organic material on the immediate surface of the earth that serves as a natural medium for the growth of land plants.
- **Soil Association**. A landscape that has a distinctive proportional pattern of soils. It normally consists of one or more extensive soil series and at least one less-extensive soil series, and it is named for the major soil series.
- **Soil Series**. The lowest category of the U.S. system of soil taxonomy; a conceptualized class of soil bodies that have limits and ranges more restrictive than all higher taxa. Soil series are commonly used to name dominant soil profile characteristics.

Regulations That Affect Soil and Mineral Resources

Soil Resources

Soils generally are considered a resource only for those uses to which people are able to put them. Soils are considered to be a resource for agriculture, and regulations affecting them are described in the Agriculture section of this report.

Mineral Resources

Surface Mining and Reclamation Act of 1975

The principal legislation addressing mineral resources in California is the State Surface Mining and Reclamation Act of 1975 (SMARA) (Public Resources Code Sections 2710–2719), which was enacted in response to land use conflicts between urban growth and essential mineral production. The stated purpose of SMARA is to provide a comprehensive surface mining and reclamation policy that will encourage the production and conservation of mineral resources while ensuring that adverse environmental effects of mining are prevented or minimized; that mined lands are reclaimed and residual hazards to public health and safety are eliminated; and that consideration is given to recreation, watershed, wildlife, aesthetic, and other related values.

SMARA provides for the evaluation of an area's mineral resources using a system of Mineral Resource Zone (MRZ) classifications that reflect the known or inferred presence and significance of a given mineral resource. The MRZ classifications are based on available geologic information, including geologic mapping and other information on surface exposures, drilling records, and mine data; and socioeconomic factors such as market conditions and urban development patterns. The MRZ classifications are defined as follows.

MRZ-1—Areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence.

MRZ-2—Areas where adequate information indicates that significant mineral deposits are present, or where it is judged that a high likelihood for their presence exists.

MRZ-3—Areas containing mineral deposits, the significance of which cannot be evaluated from available data.

MRZ-4—Areas where available information is inadequate for assignment into any other MRZ.

SMARA governs the use and conservation of a wide variety of mineral resources. However, certain resources and activities are exempt from the provisions of SMARA. Subject to certain conditions, exempted activities include excavation and grading conducted for farming, onsite construction, or recovery from flooding or other natural disaster.

In addition to mineral resource conservation, SMARA regulates surface mining in California. The California Mining and Geology Board has established mine reclamation regulations that fulfill the reclamation requirements of SMARA. The regulations are summarized below.

Annual Mining Report. A mining report is required to be submitted annually. The report must include such information as the amount of land disturbed during the previous year, acreage reclaimed during the previous year, and amendments made to the reclamation plan. The requirement for an annual monitoring report was added to SMARA in 1990 as a result of AB 3903, Chapter 1101.

Reclamation Plan. Before a mining project is approved, a reclamation plan must be prepared and approved by the lead agency. The plan must include such information as the following:

- maximum anticipated depth of extraction,
- quantity and type of materials to be extracted,
- time span of the operation,
- mine waste disposal method,
- manner in which reclamation will be accomplished including erosion control measures,
- post-reclamation land use, and
- how the reclamation will affect future mining in the area.

Additionally, SMARA specifies that lead agencies require financial assurances of each mining operation to ensure reclamation is performed in accordance with the approved reclamation plan. The financial assurances may take the form of surety bonds, irrevocable letters of credit, trust funds, or similar mechanism.

Most of the mining operations along Cache Creek are subject to all of SMARA's requirements. However, two of the mines, one of which is inactive, were operating before SMARA was enacted. These "grandfathered" operations are nevertheless subject to certain regulatory requirements, such as providing financial assurances and implementing reclamation plans.

California Code of Regulations

Chapter 4- Development, Regulation, and Conservation of Oil and Gas Resources of Title 14- Natural Resources of the California Code of Regulations (Department of Conservation 2004) governs natural gas well drilling, operation, and abandonment procedures. It provides detailed standards and regulations that operators and local jurisdictions must comply with.

Yolo County Code

Chapter 4- Off-Channel Surface Mining of Title 10 of the Yolo County code pertains to both in-channel and off-channel mining within the lower Cache Creek watershed. (In-channel commercial mining is no longer permitted in the county, as discussed below.) It sets forth monitoring requirements such that mining

activities such protect public health and safety and requires that mining operations are adapted to site-specific conditions.

Chapter 5- Surface Mining Reclamation of Title 10 of the Yolo County code (known as the Surface Mining Reclamation Ordinance of Yolo County) ensures reclamation of mined lands to minimize the adverse effects of mining on the environment and to protect public health and safety. It requires that reclamation plans be adapted to site-specific conditions and be directed to reclaiming of mined areas to a beneficial use; in particular, agriculture, wildlife habitat, or recreation.

Chapter 5- Agricultural Surface Mining and Reclamation Ordinance of Title 10 of the Yolo County Code sets forth restrictions on surface mining of agricultural lands to ensure soil productivity, to protect wildlife habitat, and to maintain drainage and flood control facilities.

Off-Channel Mining Plan for Lower Cache Creek

The Final Off-Channel Mining Plan (OCMP) for Lower Cache Creek (County of Yolo 1996a) established as a comprehensive and integrated planning framework for regulating and protecting the Cache Creek area. The OCMP, together with the Cache Creek Resources Management Plan (described below), constitute the Cache Creek Area Plan. The OCMP accommodates gravel mining on the creek terraces (but not in-channel) while emphasizing habitat restoration, open space, and reclamation of mined lands to agricultural use. The OCMP describes a future groundwater recharge and storage program and allows for future recreation opportunities along the creek.

Cache Creek Resources Management Plan

The Cache Creek Resources Management Plan for Lower Cache Creek (CCRMP) (County of Yolo 1996b) is a comprehensive management plan that eliminated commercial in-channel aggregate mining, established an improvement program from implementing on-going projects to improve channel stability, and ensured restoration of riparian habitat along creek banks in the future. The plan area extends from the Capay Dam to Interstate 5.

Together with the OCMP, the CCRMP comprises the Cache Creek Area Plan. The Cache Creek Area Plan describes approaches for managing riparian habitats along Cache Creek below Capay, in particular, for restoring habitats, reducing erosion, maintaining flood capacity, and improving water quality. Among the goals of the plan is to promote coordination of local, state, ad federal regulation of activities within Cache Creek.

Soil Resource Characteristics

Twelve soil associations have been identified in Yolo County (Figure Soils-Min-1) (Andrews 1972). Seven of the associations are on alluvial fans or are in basins, which may generally be referred to as “bottomland” soils. The remaining five associations are on uplands or terraces.

Table Soils-Min-1 summarizes the soil associations' characteristics that are not already provided in the legend of Figure Soils-Min-1.

Many of the soils in the steeper, upland areas in the western part of the county have been subject to accelerated erosion, such that they have lost part or all of their original topsoil layer (Andrews 1972). This is presumably largely a result of past overuse of forage by grazing animals.

Soils in the Yolo-Brentwood association are suited to a wide range of crops and are among the best arable soils in the county. Among the upland soils used for livestock grazing, soils in the Sehorn-Balcom and Dibble-Millsolm associations generally produce the greatest amounts of forage (Andrews 1972). The suitability of the soils for particular agricultural uses and their farmland classification (e.g., Prime Farmland) is described in more detail in the Agriculture technical report.

Mineral Resources

A variety of minerals, described below, were once mined in the county. The chief minerals presently mined are aggregate and natural gas.

Aggregate

The State of California (Dupras 1988) has mapped the aggregate resources along lower Cache Creek as three Mineral Resource Zones. MRZ-1 comprises 1,458 acres, MRZ-2 comprises 18,452 acres, and MRZ-3 comprises 8,220 acres (County of Yolo 1996a). The extent of MRZ-2 is shown in Figure Soils-Min-2.

Six aggregate mines (listed below) are currently operational in the county; all are located on the stream terraces of Cache Creek. Most are commercial operations.

- Madison Plant: Syar Industries, Inc.
- Esparto-Reiff Property and Mast Property: Teichert Aggregates
- Solano Concrete Off-Channel: Rinker Materials, Inc.
- Capay Facility: Granite Construction Company
- Woodland Plant: Teichert Aggregates
- Cache Creek Facility: Schwarzgruber & Sons

The primary mineral resource presently being extracted in the county is aggregate. Most of the aggregate occurs along Cache Creek, beginning at the upstream end of Capay Valley (at County Road 85) and extending downstream to approximately Interstate 5. Throughout this area, the aggregate consists of gravel, sand, and clay and is roughly 100-125 feet thick (Dupras 1988).

Table Soils-Min-1. Summary of Soil Association Characteristics

Soil Association Name	Natural Vegetation in Uncultivated Areas[1]	Primary Use[2]	Water Erosion Hazard	Comments
Yolo-Brentwood	Annual grasses and forbs	Wide range of irrigated and non-irrigated crops	None to slight	–
Rincon-Marvin-Tehema	Annual grasses and forbs with scattered oaks	Wide range of irrigated and non-irrigated crops	None to slight	Some areas formed under poor drainage conditions such that wetlands were present; drainage has since been improved.
Capay-Clear Lake	Annual grasses and forbs	Irrigated crops and pasture	None to slight	Some areas formed under poor drainage conditions such that wetlands were present; drainage has since been improved.
Sycamore-Tyndall	Annual grasses and forbs	Irrigated crops and pasture and dry-farmed grain	None to slight	Formed under poor drainage conditions such that wetlands were present; drainage has since been improved.
Sacramento	Annual grasses and forbs	Irrigated crops and pasture and dry-farmed grain	None to slight	Formed under poor drainage conditions such that wetlands were present; drainage has since been improved.
Willows-Pescadero	Annual grasses, forbs, salt-tolerant plants	Alkali-tolerant irrigated crops and pasture and dry-farmed grain; wildlife habitat	None to slight	Formed under poor drainage conditions such that wetlands were present; drainage has since been improved.
Capay-Sacramento	Annual grasses and forbs	Irrigated crops and pasture and dry-farmed grain	None to slight	Some areas formed under poor drainage conditions such that wetlands were present; drainage has since been improved.
Corning-Hillgate	Annual grasses and forbs with scattered oaks and brush in places	Dry-farmed grain, pasture, range land, recreation, wildlife habitat	Slight to high	Some areas have been subject to accelerated erosion.
Sehorn-Balcom	Annual grasses and forbs	Dry-farmed grain, pasture, range land, recreation, wildlife habitat	Moderate to very high	Many areas have been subject to accelerated erosion.
Dibble-Millsolm	Annual grasses and forbs with oak and perennial grasses in places	Range, recreation, and wildlife habitat	Moderate to very high	Many areas have been subject to accelerated erosion.
Positas	Annual grasses and forbs with scattered oaks and brush in places	Range, recreation, watershed, and wildlife habitat	Moderate to high	Many areas have been subject to accelerated erosion.

Table Soils-Min-1. Continued.

Soil Association Name	Natural Vegetation in Uncultivated Areas[1]	Primary Use[2]	Water Erosion Hazard	Comments
Rock land	Chamise or barren	Recreation, wildlife habitat, and watershed	Very high	Most areas are barren. Some areas are underlain by serpentinite.

Note: See legend on Figure Soils-Min-1 for thickness, texture, and landform characteristics of the associations.

[1] Refers to post-European settlement vegetation.

[2] Primary uses may have changed in some of the associations as a result of reclamation and irrigation system development.

Source: Andrews 1972.

Relatively minor amounts of aggregate (sand and gravel) were once mined along Putah Creek, but the aggregate was of low quality and of limited use (County of Yolo 2000).

Mining of aggregate within the Cache Creek channel is no longer permitted; however, removal of aggregate may still be conducted for the purpose of maintaining existing flood capacity and preventing erosion.

Natural Gas

In recent years, natural gas has become more important to the county's economy. According to the California Department of Conservation (California Department of Conservation 2004) there are approximately 25 gas fields located within Yolo County. Natural gas has been produced from the Dunnigan Hills northwest of Woodland, from the Fairfield Knolls gas field northeast of Winters, and from the Rumsey Hills area east of Rumsey. Natural gas wells have also been established in Clarksburg, Yolo, and Davis. A large gas storage area (maximum capacity of 3.25 billion cubic feet) has been identified at the dry Pleasant Creek gas field, located approximately 2.5 miles northwest of Winters (County of Yolo 2000).

The 1982 Energy Plan for Yolo County (ADM Associates, Inc. 1982) listed Yolo County estimated natural gas reserves at 117,402 MMcf (million million cubic feet). Further research would be needed to determine the extent of present day county-wide reserves, as the data listed is from 1978, approximately twenty-six years old. However, based on the 2002 annual report of the State Oil & Gas Supervisor (California Department of Conservation 2003), nearly all of these fields have been abandoned and there are presently no identified reserves in the county.

Gold and Silver

Of the five producing gold mines in the state in 2002, one (the Barrick Gold Mining Company's McLaughlin Mine) was located in the northeastern corner of the county. (The McLaughlin Mine also extends into Napa and Lake counties.) Before it ceased gold production operation in 2002, it was the state's richest modern-day gold mine. (Kohler 2003, U.S. Geological Survey 2003).

According to the U.S. Geological Survey (2003), silver was also produced at the McLaughlin Mine in 2002.

In the past, small amounts of gold and silver were mined from Cache and Putah Creeks (County of Yolo 2000).

Mercury

Mercury (also known as quicksilver) was mined in the northwestern part of the county, near the Lake and Napa county lines until 1952. Mercury mining reached its peak during the first and second World Wars (County of Yolo 2000).

Limestone

Limestone has not been mined in the county; however, a limestone deposit is known to exist west of Esparto (County of Yolo 2000).

Sandstone and Other Rock

Sandstone was quarried along Putah Creek near Winters from 1894 to 1908, some was used for monuments and as a building stone (County of Yolo 2000).

Tuff (a consolidated rock consisting of material ejected from a volcano) quarried from the hills west of Winters was also used as an early building stone (County of Yolo 2000).

Clay

Clay is one of the mineral resources in Yolo County. No significant clay resource extraction or industry currently exists, but hand-made and machine-made common bricks were once manufactured from clay beds near Woodland, Winters, and Capay (County of Yolo 2000).

Biological Resources

Introduction

This section of the report provides an overview of biological resources in Yolo County. Yolo County has a wide variety of habitat types, and extensive areas of important habitats for many species of plants and animals. The County has joined together with other agencies to undertake a Natural Communities Conservation Plan (NCCP), and this effort will provide a wealth of detailed information on the locations of existing habitats in the county. For the purposes of the General Plan Update, this background report summarizes the types of resources known to exist in the county. This information will guide policy development.

Sources of Information

The methods used to identify biological resources in Yolo County included review of existing resource information related to the County and coordination with resource agencies to identify existing biological communities and known occurrences of special-status species in Yolo County. The following pertinent sources were reviewed:

- A record search of the California Department of Fish and Game's (DFG's) California Natural Diversity Database (CNDDB) (2004) for Yolo County (Tables Bio-1 and Bio-2);
- A list of sensitive species provided by USFWS (Appendix Bio-A)
- California Native Plant Society's (CNPS's) Inventory of Rare and Endangered Plants of California (California Native Plant Society 2002);
- Preliminary Draft Yolo County Habitat Conservation Plan (HCP) (EIP and Yolo County HCP Steering Committee 2001);
- Yolo County Open Space & Recreation Element and Background Report (Quad Knopf 2000) and Yolo County General Plan Open Space & Recreation Element Policy Document (Quad Knopf 2002);
- Yolo Bypass Management Strategy (Jones & Stokes 2001);
- Final Report Inventory of the Wetlands and Riparian Habitats of Yolo County, California (Jones & Stokes Associates, Inc. 1990);
- Yolo County General Plan (Yolo County Community Development Agency 1983).

Biologists conducted a reconnaissance-level windshield survey of the County in August 2004 by driving along major roadways. This survey along with existing information was used to identify the biological communities that occur in the county and to develop lists of special-status plant, wildlife, and fish species known to occur or identified as having the potential to occur in the County. The preliminary draft HCP was used extensively for identifying the biological communities and special-status species present in Yolo County. Additional special-status species are included in this report that were not included in the HCP because the species were not expected to become federally listed in the near future. The HCP was also reviewed as part of the information on special-status species in Yolo County, although the HCP includes primarily federally listed special-status species that will be covered by the federal Endangered Species Act consultation. This report includes additional special-status species that are not federally listed as threatened or endangered (see Special-Status Species below).

General Biological Setting

Yolo County encompasses a portion of the Sacramento Valley and the eastern edge of the Inner North Coast Ranges (Hickman 1993). These subregions vary in

topography, climate, and plant communities. The eastern and southern portions of the County are located on the relatively level valley floor. The north-central County encompasses the Dunnigan Hills, and the western portion rises into the Blue Ridge and Rocky Ridge of the Inner North Coast Ranges.

Yolo County has a Mediterranean climate characterized by hot, dry summers and temperate, wet winters. However, the County comprises two distinct climate zones. The northern and central areas of Yolo County experiences hot summers and moderately cold winters, while the southeastern County receives marine air influence from the San Joaquin-Sacramento Delta regions to the south that reduces the temperature extremes of the valley. During the summer, temperatures generally average a high of 95º F and a low in the mid-50s. Winter temperatures average a high in the 50s, and low of 38 to 40º F. Average annual precipitation ranges from 17 inches in the northeast to 34 inches along the western part of the County. In spite of these distinctions, the biological communities in Yolo County are distributed primarily based on the location of streams and agricultural development. Biological communities are described below.

Biological communities in Yolo County became greatly altered beginning in the mid-1800s as the area was developed for agriculture, including growing crops and raising livestock. Water diversions from area streams were used to expand crop production, and grasslands were converted to agricultural use. Urban growth, dam construction, and highway construction in the 1950s further altered natural communities, particularly in stream and riparian, wetland, and grassland communities.

Within Yolo County, several regional parks and other protected public and private lands contain sensitive biological habitats (i.e., riparian, oak woodland, vernal pool) and support state and federally listed species such as, giant garter snake, western yellow-billed cuckoo, Swainson's hawk, peregrine falcon, bald eagle, vernal pool fairy shrimp, vernal pool tadpole shrimp, valley elderberry longhorn beetle, Colusa grass, and Solano grass. These lands include the Vic Fazio Yolo Wildlife Area in the Yolo Bypass floodway, Helvetia Oaks Park and Elkhorn Park along the Sacramento River, Grasslands Regional Park south of Davis, Cache Creek Canyon Regional Park and Otis Ranch Open Space Area along Cache Creek at the northeastern boundary of Yolo County, Cache Creek Nature Preserve in the lower Cache Creek corridor, future development of the Capay Open Space Park near the community of Capay in Western Yolo County, Clarksburg Boat Launch Facility south of the town of Clarksburg, Putah Creek Fishing Access Areas along Highway 128 west of Winters, the Knights Landing Boat Launch Facility along Highway 45 in the community of Knights Landing, and additional public open space lands and reserves managed by BLM, DFG, and UC Davis.

Biological Communities

Five main types of biological communities occur in Yolo County, including agricultural, grassland, woodland, wetland, and riparian (Quad Knopf 2000; EIP

Table Bio-1. Major Biological Communities of Yolo County

Biological Community	Distribution	Typical Plant Species	Typical Wildlife and Fish Species
Riparian Communities	Occur along stream courses throughout the County.		
Stream Course	Primary riparian corridors occur along streams including: Cache Creek, Buckeye Creek, Dunnigan Creek, Bird Creek, Oat Creek, Sycamore Slough, Colusa Basin Drain, Willow Slough/Willow Slough Bypass, Union School Slough, Dry Slough, Chickahominy Slough, Putah Creek, Yolo Bypass, and the Sacramento River.	Primarily unvegetated open water, includes sandbar and bank habitats, may be associated with an overstory of woody shrubs or trees. Nonwoody riparian, which is associated with ditches, canals and disturbed portions of stream courses, supports false bamboo, cocklebur, weedy annual grasses, sedges, rushes, mustard, sweet clover, thistle, and nonnative agricultural weeds.	**Wildlife:** Vegetation growing along the edges of streams provides nesting habitat for several bird species and foraging and refuge habitat for amphibians, reptiles, and mammals occupying the open water and adjacent grassland habitats. Birds such as herons and belted kingfishers forage in these communities, primarily along the water's edge. Many species of insectivorous birds, including white-throated swift, barn swallow, cliff swallow, black phoebe, and ash-throated flycatcher, catch their prey over open water. **Fish:** A number of fish species occur in streams within the County, including: Delta smelt, Central Valley steelhead, Central Valley spring-run Chinook salmon, winter-run Chinook salmon, green sturgeon, Central Valley fall/late fall-run Chinook salmon, river lamprey, Pacific lamprey, Sacramento splittail.
Riparian Forest	Develops on low terraces subject to more frequent and longer duration flooding than valley oak riparian forest. A dense riparian forest occurs at Elkhorn Park. Also occurs in the Yolo Bypass and along Cache Creek, Putah Creek, the Sacramento River, and other streams.	Includes cottonwood forest, mixed riparian forest, and willow scrub communities. Dominant species include cottonwood, willows, Oregon ash, valley oak, salt cedar (particularly along Cache Creek), and buttonwillow. Yolo Bypass additionally includes sycamore and black walnut in the overstory with saplings, black willow, box elder, wild grape, blackberry, California rose, and poison oak in the midstory.	Riparian forest and associated streams are considered high-quality habitat for wildlife and support the most diverse wildlife community in Yolo County. The mixture of plant species and the multi-layered vegetation (i.e., shrub layers, small tree layers, and large tree layers) provides a variety of foods and micro-habitat conditions for wildlife. Wildlife species commonly occurring in this habitat and adjacent stream habitat include bushtits, black phoebe, yellow warbler, blue-gray gnatcatchers, downy woodpecker, pacific treefrog, California newt, mule deer, wild turkey, Virginia opossum, and raccoon.
Valley Oak Riparian	Develops on high terraces with infrequent flooding. Occurs in the Yolo Bypass and at Helvetia Oaks Park	Valley oak, black walnut, sycamore, wild grape, poison oak, elderberry, blackberry, grasses, and sedges	Similar wildlife value and composition as described under Riparian Forest.

Table Bio-2. Special-Status Plant Species Documented or Identified as Having the Potential to Occur in Yolo County

Common and Scientific Name	Status[a] Federal/State/CNPS	Distribution	Preferred Habitats	Blooming Period	Known Occurrences in Yolo County
Purdy's onion *Allium fimbriatum* var. *purdyi*	–/–/4	Southern north coast ranges, southern Sierra Nevada foothills, Tehachapi mountains, central western and southwestern California, Colusa and Lake Counties; extirpated from Yolo County	Serpentinite soils in chaparral, cismontane woodland, between 1,000–2,000 feet	May	No CNDDB records for Yolo County (2004); Yolo County is part of the historic range of the species (CNPS 2001)
Serpentine milkweed *Asclepias solanoana*	–/–/4	North Coast Ranges, Colusa, Glenn, Lake, Mendocino, Napa, Shasta, Sonoma, Tehama, Trinity, and Yolo Counties	Chaparral, cismontane woodland, lower montane coniferous forest on serpentinite	May–August	No CNDDB records for Yolo County (2004)
Brewer's milk-vetch *Astragalus breweri*	–/–/4	Central and southern North coast ranges, northern San Francisco Bay, Colusa, Marin, Yolo, Mendocino, Sonoma, Lake and Napa Counties	Chaparral, cismontane woodland, in meadows and grassy hillsides, often on serpentine/volcanic	April–June	No CNDDB records for Yolo County (2004)
Cleveland's milk-vetch *Astragalus clevelandii*	–/–/4	Southern inner north Coast Ranges, eastern inner South coast ranges; Colusa, Lake, Napa, San Benito and Yolo Counties	Chaparral, cismontane woodland on serpentinite seeps	June–September	No CNDDB records for Yolo County (2004)
Jepson's milk-vetch *Astragalus rattanii* var. *jepsonianus*	SLC/–/1B	Southern inner north Coast Range, Colusa, Glenn, Lake, Napa, Tehama, and Yolo Counties	Grasslands and open grassy areas in chaparral, on serpentinite soils, between 1,140–2,000 feet	April–June	Two records located in northwestern Yolo County near Knoxville (CNDDB 2004)
Ferris's milk-vetch *Astragalus tener* var. *ferrisae*	SC/–/1B	Central Valley from Butte to Alameda Counties	Subalkaline flats and floodlands, usually on adobe soils of valley and foothill grasslands, below 200 feet	April–May	Three records, one located west of Dunnigan (possibly extirpated), and two on or near the Glide Tule Ecological Reserve in southeastern Yolo County (one possibly extirpated) (CNDDB 2004)

Table Bio-2. Continued

Common and Scientific Name	Status[a] Federal/State/CNPS	Distribution	Preferred Habitats	Blooming Period	Known Occurrences in Yolo County
Alkali milk-vetch *Astragalus tener* var. *tener*	–/–/1B	Merced, Solano, and Yolo Counties; historically more widespread	Grassy flats and vernal pool margins, on alkali soils, below 200 feet	March–June	Eleven CNDDB records located in southeastern Yolo County and southeast of Woodland; plants at six of these locations are extirpated or possibly extirpated (CNDDB 2004)
Heartscale *Atriplex cordulata*	SC/–/1B	Western Central Valley and valleys of adjacent foothills	Alkali grassland, alkali meadow, and alkali scrub, below 660 feet	May–October	One record located north of Davis, now extirpated (CNDDB 2004)
Brittlescale *Atriplex depressa*	SC/–/1B	Western Central Valley and valleys of adjacent foothills on west side of Central Valley	Alkali flats in grassland, on alkaline or clay soils, below 660 feet	May–October	Four records, located east of Woodland to the north and south (CNDDB 2004)
San Joaquin spearscale *Atriplex joaquiniana*	SC/–/1B	West edge of Central Valley from Glenn to Tulare Counties	Alkali grassland, alkali meadow, below 1,000 feet	April–September	Seven records, located east of Woodland to the north and south (CNDDB 2004)
Pink creamsacs *Castilleja rubicundula* ssp. *rubicundula*	SC/–/1B	Butte, Colusa, Glenn, Lake, and Napa Counties	Chaparral (openings), cismontane woodland, meadows and seeps, valley and foothill grassland/serpentinite	April–June	One record in northwest Yolo County, identified as Knoxville Ridge (CNDDB 2004)
Serpentine collomia *Collomia diversifolia*	–/–/4	Inner north Coast Ranges, northeastern San Francisco Bay; Contra Costa, Colusa, Glenn, Lake, Mendocino, Napa, Yolo, Shasta, and Stanislaus Counties	Chaparral, cismontane woodland on serpentinite, rocky or gravelly substrate	May–June	No CNDDB records for Yolo County (2004)
Palmate-bracted bird's-beak *Cordylanthus palmatus*	E/E/1B	Livermore Valley and scattered locations in the Central Valley from Colusa County to Fresno County	Alkaline grassland, alkali meadow, chenopod scrub	May–October	Four records between Woodland and Davis and to the east (CNDDB 2004)
Deep-scarred cryptantha *Cryptantha excavata*	–/–/4	Colusa, Lake, and Yolo Counties	Cismontane woodland, sandy or gravelly substrates	April–May	No CNDDB records for Yolo County (2004)

Table Bio-2. Continued

Common and Scientific Name	Status[a] Federal/State/CNPS	Distribution	Preferred Habitats	Blooming Period	Known Occurrences in Yolo County
Snow Mtn. buckwheat *Eriogonum nervulosum*	SC/–/1B	North Coast ranges: Colusa, Lake, Napa, Sonoma, Yolo, and possibly Glenn Counties	Serpentine chaparral	June–September	Two records in northwestern Yolo County (CNDDB 2004)
Round-leaved filaree *Erodium macrophyllum*	–/–/2	Sacramento Valley, northern San Joaquin Valley, Central Western California, South Coast, and northern Channel Islands (Santa Cruz Island)	Open sites, dry grasslands, and shrublands below 4,000 feet	March–May	One record located west of Davis (CNDDB 2004)
Adobe lily *Fritillaria pluriflora*	SC/–/1B	Northern Sierra Nevada foothills; inner Coast Ranges foothills; Sacramento Valley, Butte, Colusa, Glenn, Lake, Napa, Plumas, Solano, Tehama, and Yolo Counties	Adobe soil in chaparral, woodland, and valley and foothill grassland	February–April	Six records in northwestern Yolo County north and west of Rumsey to Knoxville (CNDDB 2004)
Purdy's fritillary *Fritillaria purdyi*	–/–/4	Colusa, Glenn, Humboldt, Lake, Mendocino, Napa, Tehama, Trinity, and Yolo Counties; possibly Oregon	Chaparral, cismontane woodland, lower montane coniferous forest on serpentinite	March–June	No CNDDB records for Yolo County (2004)
Hall's harmonia *Harmonia hallii* [*Madia hallii*]	SC/–/1B	Colusa, Lake, Napa and Yolo Counties	Serpentinite chaparral, 1,500–3,000 feet	April–June	One record in northwestern Yolo County near Knoxville in a chaparral opening (CNDDB 2004)
Hogwallow starfish *Hesperevax caulescens*	–/–/4	Alameda, Amador, Butte, Contra Costa, Colusa, Fresno, Glenn, Kern, Merced, Napa, San Diego, San Joaquin, San Luis Obispo, Solano, Stanislaus, Sutter, Tehama, and Yolo Counties	Valley and foothill grassland (mesic clay), 0–1,650 feet	March–June	No CNDDB records for Yolo County (2004)

Table Bio-2. Continued

Common and Scientific Name	Status[a] Federal/State/CNPS	Distribution	Preferred Habitats	Blooming Period	Known Occurrences in Yolo County
Drymaria-like western flax *Hesperolinon drymarioides*	SC/–/1B	Colusa, Glenn, Lake, Napa, and Yolo Counties	Closed-cone coniferous forest, chaparral, cismontane woodland, valley and foothill grassland on soils derived from serpentinite	May–August	Two records located in northwestern Yolo County near Knoxville in a mining area (CNDDB 2004)
Rose-mallow *Hibiscus lasiocarpus*	–/–/2	Central and southern Sacramento Valley, deltaic central valley, Butte, Contra Costa, Colusa, Glenn, Sacramento, San Joaquin, Solano, Sutter, and Yolo Counties	Wet banks, freshwater marshes, generally below 135 feet	June–September	One record in central eastern Yolo County in the Yolo Bypass north of Old River (CNDDB 2004)
Northern California black walnut *Juglans* [*californica* var.] *hindsii*	–/–/1B	Native stands in Contra Costa, Napa, Sacramento*, Solano*, and Yolo* Counties	Riparian scrub and woodland	April–May	The one record in Yolo County is of an extirpated stand between Freeport and Rio Vista (CNDDB 2004)
Ferris's goldfields *Lasthenia ferrisiae*	–/–/4	Occurs in Alameda, Butte, Contra Costa, Colusa, Fresno, Kings, Kern, Merced, Monterey, Lsan Benito, Lsan Joaquin, San Luis Obispo, Solano, Stanislaus, Tulare, Ventura, and Yolo Counties	Vernal pools on alkaline, clay-based soils, 60–2,300 feet	February–May	No CNDDB records for Yolo County (2004)
Colusa layia *Layia septentrionalis*	–/–/1B	Inner north Coast Range; Colusa, Glenn, Lake, Mendocino, Napa, Sonoma, Sutter, Tehama, and Yolo Counties	Sandy or serpentine soils in grasslands and openings in chaparral and foothills woodlands, 300–3,600 feet	April–May	Two records in northwestern Yolo County north of Rumsey (CNDDB 2004)
Heckard's pepper-grass *Lepidium latipes* var. *heckardii*	–/–/1B	Glenn, Solano, and Yolo Counties	Alkaline flats in valley and foothill grasslands	March–May	Six records, four located between Davis, Woodland, and Zamora; two located at the Glide Tule Ecological Reserve in southeastern Yolo County (CNDDB 2004)

Table Bio-2. Continued

Common and Scientific Name	Status[a] Federal/State/CNPS	Distribution	Preferred Habitats	Blooming Period	Known Occurrences in Yolo County
Woolly-headed lessingia *Lessingia hololeuca*	–/–/3	Southern north Coast Ranges, southern Sacramento Valley, northern San Francisco Bay region, Alameda, Monterey, Marin, Napa, Santa Clara, San Mateo, Solano, Sonoma, and Yolo Counties	Clay or serpentinite soils of coastal scrub, lower montane coniferous forest, valley and foothill grassland, below 1,000 feet	June–October	No CNDDB records for Yolo County (2004)
Hoover's lomatium *Lomatium ciliolatum* var. *hooveri*	–/–/4	Colusa, Lake, Napa, and Yolo Counties	Chaparral, cismontane woodland on serpentinite	May–July	No CNDDB records for Yolo County (2004)
Heller's bush mallow *Malacothamnus helleri*	–/–/4	Colusa, Glenn, Lake, Napa, Tehama, and Yolo Counties	Chaparral on sandstone	June–August	No CNDDB records for Yolo County (2004)
Sylvan microseris *Microseris sylvatica*	–/–/4	Occurs in Alameda, Amador, Butte, Contra Costa, Colusa, Fresno, Glenn, Kern, Lassen, Los Angeles (?*), Merced, Napa, Nevada, Placer, San Benito, Santa Clara*, Solano, Stanislaus, Sutter, Tehama, Tuolumne, Tulare, and Yolo Counties	Chaparral, Great Basin scrub, pinyon and juniper woodland, oak woodland, and valley and foothill grassland on serpentinite, 150–5,000 feet	March–June	No CNDDB records for Yolo County (2004)
Cotula navarretia *Navarretia cotulifolia*	–/–/4	Occurs in alameda, Butte, Contra Costa, Colusa, Glenn, Lake, Mendocino, Marin, Napa, San Benito, Santa Clara, Siskiyou?, Solano, Sonoma, Sutter, and Yolo Counties	Chaparral, woodland, valley and foothill grassland, 15–6,000 feet	May–June	No CNDDB records for Yolo County (2004)
Jepson's navarretia *Navarretia jepsonii*	–/–/4	Colusa, Glenn, Lake, Napa, Tehama, and Yolo Counties	Chaparral, cismontane woodland, valley and foothill grassland on serpentinite	May–June	No CNDDB records for Yolo County (2004)
Baker's navarretia *Navarretia leucocephala* ssp. *bakeri*	–/–/1B	North Coast Ranges	Vernal pools and swales	May–July	One record located at the Glide Tule Ecological Reserve in southeastern Yolo County (CNDDB 2004)

Table Bio-2. Continued

Common and Scientific Name	Status[a] Federal/State/CNPS	Distribution	Preferred Habitats	Blooming Period	Known Occurrences in Yolo County
Colusa grass *Neostapfia colusana*	T/E/1B	Merced, Solano, and Yolo Counties	Deep vernal pools on Pescadero series soils (in Yolo)	May–August	Two records located at the Davis Air Force Communication site and the adjacent Grasslands Regional Park in southeastern Yolo County (CNDDB 2004, Quad Knopf 2000); the USFWS has designated critical habitat for this species at the Communications site (68 FR 46684)
Delta woolly-marbles *Psilocarphus brevissimus* var. *multiflorus*	–/–/4	Deltaic central valley and San Francisco bay area, Alameda, Napa, Santa Clara, San Joaquin, Solano, Stanislaus, and Yolo Counties	Vernal pools, 30–1,650 feet	May–June	No CNDDB records for Yolo County (2004)
Cleveland's ragwort *Senecio clevelandii* var. *clevelandii*	–/–/4	Colusa, Lake, Napa, Trinity, and Yolo Counties	Serpentinite seeps in chaparral	June–July	No CNDDB records for Yolo County (2004)
Green jewel-flower *Streptanthus breweri* var. *hesperidus*	SC/–/1B	Lake, Napa and Yolo Counties	Chaparral (openings), cismontane woodland (serpentinite, rocky)	May–July	One record located in northwestern Yolo County west of Knoxville on serpentine (CNDDB 2004)
Kruckeberg's jewel-flower *Streptanthus morrisonii* ssp. *kruckebergii*	–/–/1B	Lake, Napa, and Sonoma Counties; potentially identified in Yolo County	Cismontane woodland on serpentinite, 700–3,400 feet	April–July	Three records located in northwestern Yolo County northwest of Knoxville and east of Morgan Valley; subspecies is not positively confirmed, but thought to be *kruckebergii* (CNDDB 2004)
Crampton's tuctoria *Tuctoria mucronata*	E/E/1B	Southwestern Sacramento valley, Solano and Yolo Counties	Claypan vernal pools, on saline-alkaline clay in the Pescadero series	April–July	One record located on the Davis Air Force Communication site and the adjacent Grasslands Regional Park in southeastern Yolo County (CNDDB 2004, Quad Knopf 2000); the USFWS has designated critical habitat for this species at the Communications site (68 FR 46684)

Table Bio-2. Continued

Common and Scientific Name	Status[a] Federal/State/CNPS	Distribution	Preferred Habitats	Blooming Period	Known Occurrences in Yolo County

Notes: CNDDB = California Natural Diversity Database.
CNPS = California Native Plant Society.

[a] Status explanations:

Federal

E = listed as endangered under the federal Endangered Species Act.
T = listed as threatened under the federal Endangered Species Act.
SC = considered a species of special concern by the USFWS.
SLC = considered a species of local concern by the USFWS.
– = No status definition.

State

E = listed as endangered under the California Endangered Species Act.
– = No status definition.

California Native Plant Society

1A = List 1A species: presumed extinct in California.
1B = List 1B species: rare, threatened, or endangered in California and elsewhere.
2 = List 2 species: rare, threatened, or endangered in California but more common elsewhere.
3 = List 3 species: plants about which we need more information—a review list.
4 = List 4 species: plants of limited distribution—a watch list.

[b] Species that have no CNDDB records in Yolo County were included in this table because they are on the Yolo County list in the CNPS Inventory (2001). The CNPS has established that these species have been observed in Yolo County, whether or not the occurrence is recorded with the CNDDB.

Table Bio-1. Continued

Biological Community	Distribution	Typical Plant Species	Typical Wildlife and Fish Species
Wetlands	Primarily located east of Woodland, northeast of Davis, and in the Yolo Bypass.		
Marsh	Primarily in the south County area within the Yolo Bypass and in association with ponds, wetlands, irrigation canals and streams.	Cattail, tule, verbena, smartweed, swamp timothy, watergrass, grasses, sedges, rushes	Vegetation associated with marshes provide foraging, nesting, and refuge habitat for numerous wildlife species that also occur in the adjacent open water. Common and special-status wildlife that are expected to occur in the marshes of Yolo County include Pacific tree frog, northwestern pond turtle, common garter snake, giant garter snake, great blue heron, mallard, northern harrier, red-winged blackbird, and song sparrow.
Vernal Pool	Rare in the County, although the Solano-Colusa Vernal Pool Region extends through the central portion of the County. A complex occurs south of Davis at Grasslands Regional Park and the adjacent Davis Air Force Communication site. Several vernal pools occur east of Rocky Ridge, which is along the southwestern border between Yolo and Napa Counties. Some fallow rice fields in the City of Woodland support vernal pool species.	Primarily herbaceous annual species adapted to the seasonally wet conditions of vernal pools. The vernal pool complex at Grasslands Regional Park supports two special-status species, Colusa grass and Crampton's tuctoria.	Vernal pools provide aquatic habitat for common and special status amphibians, including western toad, Pacific tree frog, and western spadefoot. Insect larvae and invertebrate species that commonly occur in vernal pool systems, such as predacious diving beetles, water scavenger beetles, back swimmers, seed shrimp, fairy shrimp, and tadpole shrimp, provide a valuable food source for amphibians as well the many birds that overwinter in or migrate through the county. Birds such as killdeer, greater yellow-legs, mallards, egrets, and great blue herons may use vernal pools for foraging and potential nesting in both winter and spring.
Pond/Lake/Open Water	Large open water habitats are primarily along the Sacramento River, in the Deep Water Ship Channel, and in Davis Creek Reservoir.	Primarily unvegetated, may support floating or submergent aquatic species	Delta smelt, Central Valley steelhead, Central Valley spring-run Chinook salmon, winter-run Chinook salmon, green sturgeon, Central Valley fall/late fall-run Chinook salmon, river lamprey, Pacific lamprey, Sacramento splittail
Alkalai Sinks	Remnant areas west of the Yolo Bypass between Cache and Putah Creeks.	Contain alkaline tolerant plant species and may support vernal pools and their associated species.	Provide similar habitat value and composition as described for Vernal Pool and Grassland.

Table Bio-1. Continued

Biological Community	Distribution	Typical Plant Species	Typical Wildlife and Fish Species
Woodland			
Oak Woodland	Occurs primarily in the western portion of Yolo County along the eastern side of Blue Ridge and Rocky Ridge and within the Capay Hills.	Mature oak trees; varies from closed canopy to open woodland with 10-70 percent canopy cover. Grades into chaparral habitat along Blue Ridge with species such as deerbrush, manzanita, scrub oak, rabbitbrush, chamise, and toyon.	Oak woodlands provide high value to wildlife in the form of nesting sites, cover, and food. This community type commonly is used by species that require both woodlands and adjacent open areas, such as annual grasslands or low-intensity agriculture or pasture. Also, large trees with hollow cavities provide important habitat for tree-roosting bats such as, Yuma myotis, Townsend's long-eared bat, pallid bat, and long-legged bat. Bats play an important role in pest management in agricultural areas and near large water bodies.
Wooded Savannah	Occurs mostly within the Capay Hills and surrounding areas.	Scattered mature trees not exceeding a 10 percent canopy cover	Wooded savannahs provide similar habitat function as oak woodlands but can also support ground nesting birds such as burrowing owl, and northern harrier.
Scattered Oaks in Agriculture	Occur on agricultural lands throughout the County.	Single or small clusters of mature oak trees on or adjacent to active agricultural land	Because trees are a limiting resource within large agricultural areas, they provide important nesting and roosting habitat for birds and raptor that forage over agricultural lands.
Elderberry Savannah	Occurs along seasonal and perennial streams, creeks, and Rivers throughout Yolo County.	Elderberry shrubs, nonnative annual grasses in understory	Elderberry shrubs are the host plant for the federally threatened valley elderberry longhorn beetle.
Grassland	Occurs in ungrazed areas primarily on slopes greater than 2 percent; also associated with riparian, oak savannah, and occasionally with agriculture. Present at Grasslands Regional Park.	Wild oats, ripgut brome, soft chess, barleys, and nonnative forbs; may support Heckard's peppergrass.	Nonnative annual grassland in the study area provides foraging habitat and cover for many wildlife species. Wide-ranging animals, such as turkey vultures, red-tailed hawks, and coyotes, are common in the area.

Table Bio-1. Continued

Biological Community	Distribution	Typical Plant Species	Typical Wildlife and Fish Species
Agriculture	Occurs throughout the County.		
Alfalfa and Pasture	Occurs in lowlands and valleys throughout Yolo County.	Alfalfa and irrigated grassland with species such as Bermuda grass, dallisgrass, fescue, orchard grass, timothy	Alfalfa and irrigated pastures provide high quality foraging habitat for migratory birds and raptors including the state-threatened Swainson's hawk that forage on the abundant mice and voles. Ground squirrels dig underground burrow complexes within the adjacent berms that are also used by burrowing owls.
Annual Field Crop	Occurs in lowlands and valleys throughout Yolo County.	Common field crops grown in Yolo County include tomato, safflower, sunflower, grains, and corn.	Depending on the crop pattern and the proximity to native habitats, agricultural lands can provide relatively high-value habitat for wildlife, particularly as foraging habitat. Raptor species use row and grain crop agricultural lands for foraging because several species of common rodents are found in agricultural fields. When fallow, these lands also provide foraging and resting habitat for migrating and wintering waterfowl and shorebirds.
Vineyards and Orchards	The majority of vineyards occur in the northern portion of Yolo County, especially in area characterized by rolling hill topography; orchards are found throughout the County.	Grapevines, fruit and nut trees	Vineyards and orchards are managed intensively and typically provide low wildlife value. The understory of vineyards and orchards are often devoid of vegetation and sprayed with herbicides or disked. Despite these conditions, some wildlife species have adapted to these artificial settings. Tree squirrels and ground squirrels feed on the abundant supply of nuts and fruits. Many common bird species such as the Brewer's blackbird, mourning dove, yellow-billed magpie, and house sparrow use orchard trees for nesting. The state-threatened Swainson's hawk has also been reported to nest in large orchard trees that are located near open foraging areas.
Rice	Occurs primarily along the eastern portion of the County near the Sacramento River.	Rice during the growing months and open water during the flooding stage.	Rice fields provide important foraging and resting habitat for wintering and migratory waterfowl. Within their range, giant garter snakes (a state and federally listed species) can be found foraging in rice fields and adjacent irrigation canals.

Sources: Yolo County Open Space & Recreation Element (Quad Knopf 2000); Yolo Bypass Management Strategy (Jones & Stokes 2001); Preliminary Draft Yolo County HCP (EIP 2001); Inventory of the Wetlands and Riparian Habitats of Yolo County, California (Jones & Stokes 1990)

2001). The distribution of biological communities in the County is closely associated with topography and hydrology. Much of the flat valley area supports agricultural communities, the hilly portions support most of the remaining grassland and woodland communities, and stream corridors support riparian communities. These categories have been further divided into more specific community types. A summary of these biological communities, including distribution and typical plant and wildlife species associated with each community type, is provided in Table Bio-1.

Special-Status Species

Special-status species are plants and animals that are legally protected under the state and/or federal endangered Species Acts (ESAs) or other regulations, and species that are considered by the scientific community to be sufficiently rare to qualify for such listing. Special-status plants and animals are species in the following categories:

- species listed or proposed for listing as threatened or endangered under the federal Endangered Species Act (50 CFR 17.12 [listed plants], 50 CFR 17.11 [listed animals], and various notices in the Federal Register [proposed species];
- species that are candidates for possible future listing as threatened or endangered under the federal Endangered Species Act (69 FR 24876, May 4, 2004);
- species listed or proposed for listing by the State of California as threatened or endangered under the California Endangered species Act (14 CCR 670.5);
- species that meet the definitions of rare or endangered under CEQA (State CEQA Guidelines, Section 15380);
- plants listed as rare under the California Native Plant Protection Act (California Fish and Game Code, Section 1900 et seq.);
- plants considered by the California Native Plant Society (CNPS) to be "rare, threatened, or endangered in California" (Lists 1B and 2 in California Native Plant Society 2001);
- plants listed by CNPS as plants about which more information is needed to determine their status and plants of limited distribution (Lists 3 and 4 in California Native 2001), which may be included as special-status species on the basis of local significance or recent biological information;
- animal species of special concern to the California department of Fish and Game (Remsen 1978 [birds], Williams 1986 [mammals], and Jennings and Hayes 1994 [amphibians and reptiles]); and
- animals fully protected in California (California Fish and Game Code, Section 3511 [birds], 4700 [mammals], 5050 [amphibians and reptiles] and 5515 [fish]).

The sections below discuss the available information regarding special-status plants, wildlife, and fish known to occur in Yolo County. Much of the information is based on current records in the CNDDB (2004). While the CNDDB is the most comprehensive and reliable source of special-status species occurrences, it contains only the records that have been submitted to DFG. In addition, there is generally a time lag between when records are submitted to the CNDDB and when they appear in the current version of the CNDDB software. Figure Bio-1 provides a general distribution of CNDDB records for special-status plant and wildlife occurrences in Yolo County. Data on special-status species occurrences from additional sources have been included in this report as available (see Methods section above).

Special-Status Plants

A total of 39 special-status plants are currently known to occur in Yolo County (Table Bio-2). Of these 39 species, three species (palmate-bracted bird's-beak, Colusa grass, and Solano grass) are federally and state listed. The other special-status plant species in the table are included on one of the CNPS lists for rare plants. The USFWS has designated critical habitat in Yolo County for Colusa grass and Solano grass (68 FR 46684, August 6, 2003).

Special-Status Wildlife

A total of 14 state and/or federally listed and 23 nonlisted special-status wildlife species are known to occur or have the potential to occur in Yolo County based on a review of existing information and presence of suitable habitat. The listing status, preferred habitat, and occurrence information for Yolo County is listed in Table Bio-3 for each of these species. USFWS has designated critical habitat in Yolo County (Unit 10) for vernal pool fairy shrimp and vernal pool tadpole shrimp. Critical habitat for the California tiger salamander has been proposed by USFWS for the Dunnigan Hills area in northern Yolo County (69 FR 48570, August 19, 2004).

Special-Status Fish

A total of 10 special-status fish species are known to occur based on the USFWS list of sensitive species in Yolo County and a review of existing information. The listing status, preferred habitat, and potential for occurrence in Yolo County is listed in Table Bio-4 for each of these species. NOAA Fisheries and USFWS has designated critical habitat in Yolo County for winter-run Chinook salmon (58 FR 114) and delta smelt (59 FR 65256) (Appendix Bio-A). Essential Fish Habitat (EFH) is designated for Central Valley fall/late fall-run Chinook salmon.

Table Bio-3. Special-Status Wildlife Species Documented or Identified as having the Potential to Occur in Yolo County

Common and Scientific Name	Status[a] Federal/State	Distribution	Preferred Habitats	Known Occurrences in Yolo County
Conservancy fairy shrimp *Branchinecta conservatio*	E/–	Disjunct occurrences in Solano, Merced, Tehama, Ventura, Butte, and Glenn Counties	Large, deep vernal pools in annual grasslands	Only known from one location south of the City of Davis near the Glide Tule Elk Reserve (CNDDB 2004)
Vernal pool fairy shrimp *Branchinecta lynchi*	T/–	Central Valley, central and south Coast Ranges from Tehama County to Santa Barbara County; isolated populations also in Riverside County	Common in vernal pools; also found in sandstone rock outcrop pools	Two CNDDB (2004) records occur south of the City of Davis along the Northern Railroad line; the species has also been found in vernal pools on the D.Q. University Property west of the City of Davis; additional vernal pool habitat also exists at Grasslands Regional Park and McClellan telecommunications site located south of the City of Davis, near Moody Slough north of the City of Winters and along the Dunnigan Hills in northern Yolo County
Vernal pool tadpole shrimp *Lepidurus packardi*	E/–	Shasta County south to Merced County	Vernal pools and ephemeral stock ponds	Five CNDDB (2004) records occur south of the City of Davis at Grasslands Regional Park and along the Northern Railroad line; the species has also been found in vernal pools at the McClellan telecommunications site located south of the City of Davis and near Moody Slough north of the City of Winters; additional vernal pool habitat also exists on the D.Q. University Property west of the City of Davis and along the Dunnigan Hills in northern Yolo County
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	T/–	Stream side habitats below 3,000 feet throughout the Central Valley	Riparian and oak savanna habitats with elderberry shrubs; elderberries are the host plant	A total of 15 CNDDB (2004) records are scattered throughout Yolo County and are associated with riparian habitat and floodplains of Cache Creek, Putah Creek and the Sacramento River; abundant elderberry shrubs (host plant for the species) occur in Capay Valley in the northwestern portion of the county

Table Bio-3. Continued

Common and Scientific Name	Status[a] Federal/State	Distribution	Preferred Habitats	Known Occurrences in Yolo County
California tiger salamander (Central Valley Distinct Vertebrate Population Segment) *Ambystoma californiense* (=*A. tigrinum c*.)	T/SSC	Known from the Santa Rosa Plain in Sonoma County; separated from the nearest populations to the east in Yolo, Solano, and Contra Costa Counties by the coast ranges, Napa River, and the Carquinez Straits	Typically inhabits low elevation (below 200 feet) vernal pools and seasonal ponds, associated grassland, and oak savannah plant communities	Four CNDDB (2004) records are known from northern portion of Yolo County at the northern end of the Dunnigan Hills; this area has been proposed as critical habitat for the species by USFWS (69 FR 48570, August 19, 2004)
California red-legged frog *Rana aurora draytoni*	T/SSC	Currently occurs along the coast and coastal mountain ranges of California from Marin County south to the northern Tansverse Range; isolated locations in the northern Sierra Nevada (midelevations [generally above 300 meters (1,000 feet) above sea level] from Butte County to Fresno County)	Permanent and semipermanent aquatic habitats, such as creeks and coldwater ponds, with emergent and submergent vegetation and riparian species along the edges; may estivate in rodent burrows or cracks during dry periods	No CNDDB (2004) records are known from Yolo County; historically, the species was known from 46 counties, including Yolo County; the current range of the species does not extend into Yolo County (USFWS 2002)
Foothill yellow-legged frog *Rana boylii*	SC/SSC	Currently occurs from the Cascade Range and Northern Coast Range south along the Coast Range and Sierra Nevada to the Transverse Range up to 6,000 feet	Creeks and Rivers in forest , mixed chaparral, and wet meadow habitats with rock and gravel substrate and emergent vegetation	Four CNDDB (2004) records are known from northwestern portion of Yolo County along Davis Creek, Cache creek and a stock pond in the Blue Ridge mountain range
Western spadefoot *Scaphiopus hammondii*	SC/SSC	Sierra Nevada foothills, Central Valley, Coast Ranges, coastal counties in southern California	Shallow streams with riffles and seasonal wetlands, such as vernal pools in annual grasslands and oak woodlands	Historically known from Buckeye Creek at the northern boundary of Yolo County (CNDDB 2004); could also occur in vernal pool habitat in the southern portion of the county
Northwestern pond turtle *Clemmys marmorata marmorata*	SC/SSC	Occurs from the Oregon border of Del Norte and Siskiyou Counties south along the coast to San Francisco Bay, inland through the Sacramento Valley, and on the western slope of Sierra Nevada	Occupies ponds, marshes, rivers, streams, and irrigation canals with muddy or rocky bottoms and with watercress, cattails, water lilies, or other aquatic vegetation in woodlands, grasslands, and open forests	Only one CNDDB (2004) record for pond turtles has been documented within Yolo County; however, pond turtles are known from the Knight's Landing Slough as well as Gray's Bend area (Sterling pers. comm.); the species could occur within perennial streams, creeks, irrigation ditches, and stock ponds throughout Yolo County

Table Bio-3. Continued

Common and Scientific Name	Status[a] Federal/State	Distribution	Preferred Habitats	Known Occurrences in Yolo County
Giant garter snake *Thamnophis couchi gigas*	T/T	Central Valley from the vicinity of Burrel in Fresno County north to near Chico in Butte County; has been extirpated from areas south of Fresno	Sloughs, canals, low gradient streams and freshwater marsh habitats where there is a prey base of small fish and amphibians; also found in irrigation ditches and rice fields; requires grassy banks and emergent vegetation for basking and areas of high ground protected from flooding during winter	Several (9) CNDDB (2004) occurrences have been documented in the eastern portion of Yolo County within Sycamore Slough, Willow Slough, Yolo Basin, and irrigation ditches and canals associated with rice fields
White-tailed kite *Elanus caeruleus*	–/FP	Lowland areas west of Sierra Nevada from head of Sacramento Valley south, including coastal valleys and foothills, to western San Diego County at the Mexico border	Low foothills or valley areas with valley or live oaks, riparian areas, and marshes near open grasslands for foraging	Uncommon breeder throughout much of the lowland areas of Yolo County (Yolo Audubon Checklist Committee 2004); suburban nesting has been documented in the cities of Davis and Woodland (Sterling pers. comm.) as well as in more typical riparian, savannah and agricultural landscapes
Northern harrier *Circus cyaneus*	–/SSC	Throughout lowland California; has been recorded in fall at high elevations	Nests and forages in grasslands, meadows, marshes, and seasonal and agricultural wetlands providing tall cover	Common, year-round resident throughout the year in Yolo County (Yolo Audubon Checklist Committee 2004)
Bald eagle *Haliaeetus leucocephalus*	T/E	Nests in Siskiyou, Modoc, Trinity, Shasta, Lassen, Plumas, Butte, Tehama, Lake, and Mendocino Counties and in the Lake Tahoe Basin; reintroduced into central coast; winter range includes the rest of California, except the southeastern deserts, very high altitudes in the Sierra Nevada, and east of the Sierra Nevada south of Mono County	In western North America, nests and roosts in coniferous forests within 1 mile of a lake, reservoir, stream, or the ocean	Rare winter visitor along Putah Creek west of Winters and along Cache Creek; only one recent breeding record within Yolo County (Yolo Audubon Checklist Committee 2004)

Table Bio-3. Continued

Common and Scientific Name	Status[a] Federal/State	Distribution	Preferred Habitats	Known Occurrences in Yolo County
Swainson's hawk *Buteo swainsoni*	–/T	Lower Sacramento and San Joaquin Valleys, the Klamath Basin, and Butte Valley; highest nesting densities occur near Davis and Woodland, Yolo County	Nests in oaks or cottonwoods in or near riparian habitats; forages in grasslands, irrigated pastures, and grain fields	Numerous (300+) nesting records have been documented throughout the lowlands of Yolo County (CNDDB 2004); within the County, riparian woodlands and isolated oak trees near annual grasslands or low-growing agricultural crops (especially alfalfa) provide suitable habitat
Golden eagle *Aquila chrysaetos*	SSC, FP	Foothills and mountains throughout California; uncommon nonbreeding visitor to lowlands such as the Central Valley	Nest on cliffs and escarpments or in tall trees overlooking open country; forages in annual grasslands, chaparral, and oak woodlands with plentiful medium and large-sized mammals	Rare, year-round resident of Yolo County with documented breeding records from woodland in the western portion of Yolo County (Yolo Audubon Checklist Committee 2004)
American peregrine falcon *Falco peregrinus anatum*	–/E	Permanent resident along the north and south Coast Ranges; may summer in the Cascade and Klamath Ranges and through the Sierra Nevada to Madera County; winters in the Central Valley south through the Transverse and Peninsular Ranges and the plains east of the Cascade Range	Nests and roosts on protected ledges of high cliffs, usually adjacent to lakes, rivers, or marshes that support large prey populations	Regular migrant and winter visitor to lowland areas with high concentrations of ducks and shorebirds in Yolo County; one peregrine was observed near Blue Ridge during a August 17, 2004 field survey
Prairie falcon *Falco mexicanus*	–/SSC	Permanent resident in the south Coast, Transverse, Peninsular, and northern Cascade Ranges, the southeastern deserts, Inyo-White Mountains, foothills surrounding the Central Valley, and in the Sierra Nevada in Modoc, Lassen, and Plumas Counties; winters in the Central Valley, along the coast from Santa Barbara County to San Diego County, and in Marin, Sonoma, Humboldt, Del Norte, and Inyo Counties	Nests on cliffs or escarpments, usually overlooking dry, open terrain or uplands	Rare winter visitor, no breeding records from Yolo County (Yolo Audubon Checklist Committee 2004)

Table Bio-3. Continued

Common and Scientific Name	Status[a] Federal/State	Distribution	Preferred Habitats	Known Occurrences in Yolo County
Greater Sandhill Crane and Lesser Sandhill Crane *Grus canadensis tabida and Grus canadensis canadensis*	–/T and –/SSC	Breeds in Siskiyou, Modoc, Lassen, Plumas, and Sierra Counties; winters in the Central Valley, southern Imperial County, Lake Havasu National Wildlife Refuge, and the Colorado River Indian Reserve	Summers in open terrain near shallow lakes or freshwater marshes; winters in plains and valleys near bodies of fresh water	Does not breed in Yolo County; irregular migrant over the Yolo Bypass but rarely lands (Yolo Audubon Checklist Committee 2004)
Snowy plover (inland population) *Charadrius alexandrinus*	–/SSC	Breeds at inland saline playas, lakes and salt ponds in the Central Valley, Modoc Plateau, Mono Basin, Owen's Valley, Salton Sea and Harper Dry Lake in the Mojave Desert	Salt flats, residual dunes and levees; Plovers lay eggs in a scrape on bare ground with no nest structure	Nesting has been documented in the Yolo Bypass area in 1963, 1970 and 1998 (England 1998)
Mountain plover *Charadrius montanus*	PT/SSC	Does not breed in California; in winter, found in the Central Valley south of Yuba County, along the coast in parts of San Luis Obispo, Santa Barbara, Ventura, and San Diego Counties; parts of Imperial, Riverside, Kern, and Los Angeles Counties	Occupies open plains or rolling hills with short grasses or very sparse vegetation; nearby bodies of water are not needed; may use newly plowed or sprouting grainfields	Does not breed in Yolo County; wintering flocks have been annually reported north of Woodland since at least 1970, and up to 187 were detected in a single flock during 1999 (Edson and Hunting 1999)
Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	–/E	Nests along the upper Sacramento, lower Feather, south fork of the Kern, Amargosa, Santa Ana, and Colorado Rivers	Wide, dense riparian forests with a thick understory of willows for nesting; sites with a dominant cottonwood overstory are preferred for foraging; may avoid valley-oak riparian habitats where scrub jays are abundant	Historically nested in riparian habitat throughout the Sacramento Valley; currently the species is presumed to be extirpated from Yolo County; existing riparian habitat in Yolo County does not currently provide suitable conditions for western yellow-billed cuckoo; recent nesting records occur in the nearby Sutter Bypass and the lower Feather River (Sterling pers. comm.)
Burrowing owl *Athene cunicularia hypugea*	SC/SSC	Lowlands throughout California, including the Central Valley, northeastern plateau, southeastern deserts, and coastal areas; rare along south coast	Level, open, dry, heavily grazed or low stature grassland or desert vegetation with available burrows	Numerous (20+) nesting records have been documented in grasslands and agricultural landscapes throughout Yolo County (CNDDB 2004)

Table Bio-3. Continued

Common and Scientific Name	Status[a] Federal/State	Distribution	Preferred Habitats	Known Occurrences in Yolo County
Long-eared owl *Asio otus*	–/SSC	Permanent resident east of the Cascade Range from Placer County north to the Oregon border, east of the Sierra Nevada from Alpine County to Inyo County; scattered breeding populations along the coast and in southeastern California; winters throughout the Central Valley and southeastern California	Nests in abandoned crow, hawk, or magpie nests, usually in dense riparian stands of willows, cottonwoods, live oaks, or conifers	Rare winter visitor in Yolo County; only one historic breeding record from 1961 in the Yolo Bypass (Yolo Audubon Checklist Committee 2004)
Short-eared owl *Asio flammeus*	–/SSC	Permanent resident along the coast from Del Norte County to Monterey County although very rare in summer north of San Francisco Bay, in the Sierra Nevada north of Nevada County, in the plains east of the Cascades, and in Mono County; small, isolated populations	Freshwater and salt marshes, lowland meadows, and irrigated alfalfa fields; needs dense tules or tall grass for nesting and daytime roosts	Regular wintering locations in Yolo County include grassland and agricultural fields west of the Davis Landfill, with occasional breeding and the Vic Fazio Wildlife Area (Sterling pers. comm.); potential migrant and wintering birds are expected to occur in other grasslands and fallow agricultural fields throughout the lowland areas of Yolo County
Willow flycatcher *Empidonax traillii*	SC/E	Summers along the western Sierra Nevada from El Dorado to Madera County, in the Cascade and northern Sierra Nevada in Trinity, Shasta, Tahama, Butte, and Plumas Counties, and along the eastern Sierra Nevada from Lassen to Inyo County	Riparian areas and large wet meadows with abundant willows; usually found in riparian habitats during migration	Does not breed in Yolo County; rare spring (May–June) and common fall (August–September) migrant (Yolo Audubon Checklist Committee 2004) in lowland riparian woodlands throughout the county
Purple martin *Progne subis*	–/SSC	Coastal mountains south to San Luis Obispo County, west slope of the Sierra Nevada, and northern Sierra and Cascade ranges; absent from the Central Valley except in Sacramento; isolated, local populations in southern California	Nests in abandoned woodpecker holes in oaks, cottonwoods, and other deciduous trees in a variety of wooded and riparian habitats; also nests in vertical drainage holes under elevated freeways and highway bridges	Only Yolo County breeding record was from 2003 in west Davis (Sterling 2003)

Table Bio-3. Continued

Common and Scientific Name	Status[a] Federal/State	Distribution	Preferred Habitats	Known Occurrences in Yolo County
Bank swallow *Riparia riparia*	–/T	Occurs along the Sacramento River from Tehama County to Sacramento County, along the Feather and lower American Rivers, in the Owens Valley; and in the plains east of the Cascade Range in Modoc, Lassen, and northern Siskiyou Counties; small populations near the coast from San Francisco County to Monterey County	Nests in bluffs or banks, usually adjacent to water, where the soil consists of sand or sandy loam	Several (13) nesting records have been documented in Yolo County along Cache Creek and the Sacramento River (CNDDB 2004)
Loggerhead shrike *Lanius ludovicianus*	–/SSC	Resident and winter visitor in lowlands and foothills throughout California; rare on coastal slope north of Mendocino County, occurring only in winter	Prefers open habitats with scattered shrubs, trees, posts, fences, utility lines, or other perches	Uncommon resident throughout the lowlands of Yolo County Yolo Audubon Checklist Committee 2004)
Yellow warbler *Dendroica petechia*	–/SSC	Nests over all of California except the Central Valley, the Mojave Desert region, and high altitudes in the Sierra Nevada; winters along the Colorado River and in parts of Imperial and Riverside Counties	Nests in riparian areas dominated by willows, cottonwoods, sycamores, or alders or in mature chaparral; may also use oaks, conifers, and urban areas near stream courses	Does not breed in Yolo County; rare spring and common fall migrant in lowland riparian woodlands throughout the county (Yolo Audubon Checklist Committee 2004)
Yellow-breasted chat *Icteria virens*	–/SSC	Nests locally in coastal mountains and Sierra Nevada foothills, east of the Cascades in northern California, along the Colorado river, and very locally inland in southern California	Nests in dense riparian habitats dominated by willows, alders, Oregon ash, tall weeds, blackberry vines, and grapevines	Possible breeding birds have been observed at Putah Creek fishing access areas west of Winters (Sterling pers. comm., Yolo Audubon Checklist Committee 2004); occasional migrant within riparian woodlands along the Sacramento River and Babel Slough
Grasshopper sparrow *Ammodramus savannarum*	–/SSC	Sierra foothills, Coast Ranges, and coastal areas from Mendocino County south to San Diego County	Dry grasslands with scattered shrubs for song perches	A total of six breeding records have been documented from the Yolo Bypass and western foothills (Sterling 2003, Yolo Audubon Checklist Committee 2004)

Table Bio-3. Continued

Common and Scientific Name	Status[a] Federal/State	Distribution	Preferred Habitats	Known Occurrences in Yolo County
Yellow-headed blackbird *Xanthocephalus xanthocephalus*	–/SSC	Permanent resident in the Central Valley from Butte County to Kern County; breeds at scattered locations from Siskiyou, Modoc, and Lassen Counties south to the Salton Sea region	Nests in dense colonies in emergent marsh vegetation, such as tules and cattails	Nesting colonies have been documented within the Yolo Bypass and the Davis Wetlands (Jaramillo manuscript)
Tricolored blackbird *Agelaius tricolor*	SC/SSC	Permanent resident in the Central Valley from Butte County to Kern County; breeds at scattered coastal locations from Marin County south to San Diego County; and at scattered locations in Lake, Sonoma, and Solano Counties; rare nester in Siskiyou, Modoc, and Lassen Counties	Nests in dense colonies in emergent marsh vegetation, such as tules and cattails, or upland sites with blackberries, nettles, thistles, and grainfields; habitat must be large enough to support 50 pairs; probably requires water at or near the nesting colony	Three nesting colonies have been documented in Yolo County (CNDDB 2004)
Yuma myotis *Myotis yumanensis*	SC/–	Common and widespread throughout most of California except the Colorado and Mojave deserts	Found in a wide variety of habitats from sea level to 11,000 feet, but uncommon above 8,000 feet; optimal habitat is open forests and woodlands near water bodies	Potential tree roosting and foraging habitat in woodlands near bodies of water throughout Yolo County
Long-legged myotis *Myotis volans*	SC/–	Throughout California from near sea level along the coast to high elevations in the Sierra Nevada and White Mountains	Found in pinyon-juniper, Joshua tree woodland, montane coniferous forest habitats, and in forested habitat along the coast; may also be found in streamside and arid habitats; roosts in hollow trees, rock crevices, mines, and buildings	Potential roosting and foraging habitat throughout Yolo County
Pallid bat *Antrozous pallidus*	–/SSC	Occurs throughout California except the high Sierra from Shasta to Kern County and the northwest coast, primarily at lower and mid elevations	Found in a variety of habitats from desert to coniferous forest; most closely associated with oak, yellow pine, redwood, and giant sequoia habitats in northern California and oak woodland, grassland, and desert scrub in southern California; relies heavily on trees for roosts	Potential tree roosting and foraging habitat in grasslands and woodlands throughout Yolo County

Table Bio-3. Continued

Common and Scientific Name	Status[a] Federal/State	Distribution	Preferred Habitats	Known Occurrences in Yolo County
Pale Townsend's (=western) big-eared bat *Corynorhinus townsendii pallescens*	SC/SSC	Klamath Mountains, Cascades, Sierra Nevada, Central Valley, Transverse and Peninsular Ranges, Great Basin, and the Mojave and Sonora Deserts	Found in mesic habitats; gleans insects from brush or trees and feeds along habitat edges	Potential tree roosting and foraging habitat in woodlands near bodies of water throughout Yolo County

Note: CNDDB = California Natural Diversity Database.

[a] Status explanations:

– = no listing.

Federal

E = listed as endangered under the federal Endangered Species Act.
T = listed as threatened under the federal Endangered Species Act.
PT = proposed for listing as threatened under the federal Endangered Species Act.
SC = species of concern; species for which existing information indicates it may warrant listing but for which substantial biological information to support a proposed rule is lacking.

State

E = listed as endangered under the California Endangered Species Act.
T = listed as threatened under the California Endangered Species Act.
FP = fully protected under the California Fish and Game Code.
SSC = species of special concern in California.

Table Bio-4. Special-Status Fish Species Known to Occur in Yolo County

Common and Scientific Name	Status[a] Federal/State	Distribution	Preferred Habitats	Known Occurrences in Yolo County
Sacramento River Winter-run Chinook salmon *Oncorhynchus tshawytscha*	E/E	Mainstem Sacramento River below Keswick Dam (Moyle 2002)	Occurs in well-oxygenated, cool, riverine habitat with water temperatures from 8.0 to 12.5°C; habitat types are riffles, runs, and pools (Moyle 2002)	Sacramento River
Delta smelt *Hypomesus transpacificus*	T/T	Primarily in the Sacramento–San Joaquin Estuary, but has been found as far upstream as the mouth of the American River on the Sacramento River and Mossdale on the San Joaquin River; range extends downstream to San Pablo Bay	Occurs in estuary habitat in the Delta where fresh and brackish water mix in the salinity range of 2–7 parts per thousand (Moyle 2002)	Possibly occur on the Sacramento River during high flow years
Central Valley spring-run Chinook salmon *Oncorhynchus tshawytscha*	T/T	Upper Sacramento River and Feather River	Has the same general habitat requirements as winter-run Chinook salmon; coldwater pools are needed for holding adults (Moyle 2002)	Sacramento River
Central Valley steelhead *Oncorhynchus mykiss*	T/–	Sacramento River and tributary Central Valley rivers	Occurs in well-oxygenated, cool, riverine habitat with water temperatures from 7.8 to 18°C (Moyle 2002). Habitat types are riffles, runs, and pools.	Putah Creek, Yolo Bypass, Sacramento River
Green sturgeon *Acipenser medirostris*	C/–	Sacramento, lower Feather, and Klamath and Trinity Rivers (Moyle 2002)	Spawns in well-oxygenated, cool, riverine habitat with water temperatures from 8.0 to 14°C	Sacramento River
Central Valley fall/late fall-run Chinook salmon *Oncorhynchus tshawytscha*	C/–	Sacramento and San Joaquin Rivers and tributary Central Valley rivers (Moyle 2002)	Has the same general habitat requirements as winter and spring-run Chinook salmon	Putah Creek, Yolo Bypass, Sacramento River

Table Bio-4. Continued

Common and Scientific Name	Status[a] Federal/State	Distribution	Preferred Habitats	Known Occurrences in Yolo County
River lamprey *Lampetra ayresi*	SC/SC	Sacramento, San Joaquin, and Napa Rivers, tributaries to San Francisco Bay (Leidy 1984, Moyle 2002, Moyle et al. 1995)	Adults live in the ocean and migrate into fresh water to spawn	Sacramento River, Cache Creek
Pacific lamprey *Lampetra tridentata*	SC/–	Sacramento, San Joaquin, and Napa Rivers (Leidy 1984, Moyle et al. 1995)	Adults live in the ocean and migrate into fresh water to spawn	Sacramento River
Sacramento splittail *Pogonichthys macrolepidotus*	SC/SC–	Occurs throughout the year in low-salinity waters and freshwater areas of the Sacramento–San Joaquin Delta, Yolo Bypass, Suisun Marsh, Napa River, and Petaluma River (Moyle 2002)	Spawning takes place among submerged and flooded vegetation in sloughs and the lower reaches of rivers	Yolo Bypass, Sacramento River

[a] Status explanations:

Federal

E = listed as endangered under the federal Endangered Species Act.
T = listed as threatened under the federal Endangered Species Act.
SC = considered a species of special concern by the USFWS.
SLC = considered a species of local concern by the USFWS.
– = no status definition.

State

E = listed as endangered under the California Endangered Species Act.
T = listed as threatened under the California Endangered Species Act.
– = no status definition.

Regulatory Setting for Biological Resources

This section describes the federal, state, and local plans, policies, and laws relevant to biological resources in the study area.

Federal Regulations

Federal Endangered Species Act

ESA protects fish and wildlife species, and their habitats, that have been identified by USFWS or the National Marine Fisheries Service (NMFS) as threatened or endangered. *Endangered* refers to species, subspecies, or distinct population segments that are in danger of extinction through all or a significant portion of their range. *Threatened* refers to species, subspecies, or distinct population segments that are likely to become endangered in the near future.

ESA is administered by USFWS and NMFS. In general, NMFS is responsible for the protection of ESA-listed marine species and anadromous fishes, whereas other listed species are under USFWS jurisdiction. Provisions of Sections 7 and 9 of ESA are relevant to this project and are summarized below.

ESA Authorization Process for Federal Actions (Section 7)

Section 7 of ESA provides a means for authorizing a *take* of threatened and endangered species by federal agencies. *Take*, as defined by ESA, means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Under Section 7, the federal agency conducting, funding, or permitting an action (the lead federal agency) must consult with USFWS or NMFS, as appropriate, to ensure that the proposed action will not jeopardize endangered or threatened species or destroy or adversely modify designated critical habitat. If a proposed project "may affect" a listed species or designated critical habitat, the lead agency is required to prepare a biological assessment evaluating the nature and severity of the expected effect. In response, USFWS or NMFS issues a biological opinion, with a determination that the proposed action either:

- May jeopardize the continued existence of one or more listed species (*jeopardy finding*) or result in the destruction or adverse modification of critical habitat (*adverse modification finding*), or
- Will not jeopardize the continued existence of any listed species (*no jeopardy finding*) or result in adverse modification of critical habitat (*no adverse modification finding*).

The biological opinion issued by USFWS or NMFS may stipulate discretionary "reasonable and prudent" conservation measures. If the project would not

jeopardize a listed species, USFWS or NMFS issues an incidental take statement to authorize the proposed activity.

ESA Prohibitions (Section 9)

Section 9 of ESA prohibits the *take* of any fish or wildlife species listed under ESA as endangered. *Take* of threatened species also is prohibited under Section 9, unless otherwise authorized by federal regulations.[4] *Harm* is defined as "any act that kills or injures the species, including significant habitat modification." In addition, Section 9 prohibits removing, digging up, cutting, and maliciously damaging or destroying federally listed plants on sites under federal jurisdiction.

Clean Water Act Section 404

The CWA serves as the primary federal law protecting the quality of the nation's surface waters, including lakes, rivers, and coastal wetlands. CWA Section 404 regulates the discharge of dredged and fill materials into waters of the United States. Waters of the United States refers to oceans, bays, rivers, streams, lakes, ponds, and wetlands.

On January 9, 2001, U.S. Supreme Court made a decision in Solid Waste Agency of Northern Cook County v. United States Army Corps of Engineers (SWANCC) [121 S.CT. 675, 2001] that affected Corps jurisdiction in isolated waters. Based on the SWANCC decision, the Corps no longer has jurisdiction or regulates isolated wetlands, i.e., wetlands that have no hydrologic connection with a water of the United States.

Applicants must obtain a permit from the Corps for all discharges of dredged or fill material into waters of the United States, including adjacent wetlands, before proceeding with a proposed activity. The Corps may issue either an individual permit evaluated on a case-by-case basis or a general permit evaluated at a program level for a series of related activities. General permits are preauthorized and are issued to cover multiple instances of similar activities expected to cause only minimal adverse environmental effects. Nationwide permits (NWPs) are a type of general permit issued to cover particular fill activities. Each NWP specifies particular conditions that must be met for the NWP to apply to a particular project. Waters of the United States in the project area are under the jurisdiction of the Sacramento District of the Corps.

Compliance with CWA Section 404 requires compliance with several other environmental laws and regulations. The Corps cannot issue an individual permit or verify the use of a general permit until the requirements of NEPA, ESA, and NHPA have been met. In addition, the Corps cannot issue or verify any permit until a water quality certification or a waiver of certification has been issued pursuant to CWA Section 401.

[4] In some cases, exceptions may be made for threatened species under ESA Section 4[d]; in such cases, USFWS or NMFS issues a "4[d] rule" describing protections for the threatened species and specifying the circumstances under which take is allowed.

Permits for Stormwater Discharge (Section 402)

See page 2-6 for the discussion of Section 402.

Water Quality Certification (Section 401)

Under CWA Section 401, applicants for a federal license or permit to conduct activities that may result in the discharge of a pollutant into waters of the United States must obtain certification from the state in which the discharge would originate or, if appropriate, from the interstate water pollution control agency with jurisdiction over affected waters at the point where the discharge would originate. Therefore, all projects that have a federal component and may affect state water quality (including projects that require federal agency approval, such as issuance of a Section 404 permit) must also comply with CWA Section 401.

Executive Order 11990—Protection of Wetlands

Executive Order 11990 (May 24, 1977) directs all federal agencies to refrain from assisting in or giving financial support to projects that encroach on publicly or privately owned wetlands.

Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) (16 USC 703) enacts the provisions of treaties between the United States, Great Britain, Mexico, Japan, and the Soviet Union and authorizes the U.S. Secretary of the Interior to protect and regulate the taking of migratory birds. It establishes seasons and bag limits for hunted species and protects migratory birds, their occupied nests, and their eggs (16 USC 703, 50 CFR 21, 50 CFR 10).

State Regulations

California Environmental Quality Act

CEQA is the regulatory framework by which California public agencies identify and mitigate significant environmental impacts. A project normally is considered to result in a significant environmental impact on biological resources if it substantially affects a rare or endangered species or the habitat of that species; substantially interferes with the movement of resident or migratory fish or wildlife; or substantially diminishes habitat for fish, wildlife, or plants. The State CEQA Guidelines define rare, threatened, or endangered species as those listed under CESA and ESA, as well as any other species that meets the criteria of the resource agencies or local agencies—for example, the DFG-designated "species of special concern" and CNPS-listed species. The State CEQA Guidelines state

that the lead agency preparing an EIR must consult with and receive written findings from DFG concerning project impacts on species that are listed as endangered or threatened. The effects of a proposed project on these resources are important in determining whether the project has significant environmental impacts under CEQA.

California Endangered Species Act

California implemented CESA in 1984. The act prohibits the take of endangered and threatened species; however, habitat destruction is not included in the state's definition of *take*. Section 2090 of CESA requires state agencies to comply with endangered species protection and recovery and to promote conservation of these species. DFG administers the act and authorizes take through Section 2081 agreements (except for species designated as fully protected). Regarding rare plant species, CESA defers to the California Native Plant Protection Act of 1977, which prohibits importing rare and endangered plants into California, taking rare and endangered plants, and selling rare and endangered plants. State-listed plants are protected mainly in cases where state agencies are involved in projects under CEQA. In these cases, plants listed as rare under the California Native Plant Protection Act are not protected under CESA but can be protected under CEQA.

State Regional Water Quality Control Board (Porter-Cologne Water Quality Control Act)

Under the Porter-Cologne Act, California retains authority to regulate discharges of waste into any waters of the state, regardless of whether the Corps has concurrent jurisdiction under Section 404. If the Corps determines that the wetland is not subject to regulation under Section 404 of the Clean Water Act, Section 401 water quality certification is not required. However, the RWQCB may impose waste discharge requirements (WDRs) if fill material is placed into waters of the state.

California Fish and Game Code

Section 1602

Under Section 1602 of the California Fish and Game Code, public agencies are required to notify DFG before undertaking any project that would divert, obstruct, or change the natural flow, bed, channel, or bank of any river, stream, or lake. Preliminary notification and project review generally occur during the environmental process. When an existing fish or wildlife resource may be substantially adversely affected, DFG is required to propose reasonable project changes to protect the resources. These modifications are formalized in a streambed alteration agreement that becomes part of the plans, specifications, and bid documents for the project.

Fully Protected Species

The California Fish and Game Code provides protection from take for a variety of species, referred to as *fully protected species*. Section 5050 lists protected amphibians and reptiles. Section 3515 prohibits take of fully protected fish species. Eggs and nests of all birds are protected under Section 3503, nesting birds (including raptors and passerines) under Sections 3503.5 and 3513, birds of prey under Section 3503.5, and fully protected birds under Section 3511. Migratory nongame birds are protected under Section 3800. Mammals are protected under Section 4700. The California Fish and Game Code defines *take* as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill." Except for take related to scientific research, all take of fully protected species is prohibited.

Sections 3503 and 3503.5

Section 3503 of the California Fish and Game Code prohibits the killing of birds or the destruction of bird nests. Section 3503.5 prohibits the killing of raptor species and the destruction of raptor nests.

Local Regulations

General plans for cities and unincorporated communities or areas within Yolo County provide goals and policies relating to local biological resources. These plans provide additional guidance for development within each city, community, or area.

Harbors

Introduction

Yolo County has one port in operation in its boundaries, the Port of Sacramento, which is described below.

Sources of Information

The Port of Sacramento is in the early stages of a master planning effort. As a first step, the Port has had a Maritime Demand Analysis Draft Report prepared that looks at existing facilities and the demand for port facilities. Other sources of information were the Port of Sacramento's website and the 1983 Yolo County General Plan.

Port of Sacramento

The Port of Sacramento is an inland port, located 79 nautical miles (146.3 km) northeast of San Francisco (as measured from the Golden Gate Bridge), with a main entrance channel project depth of 30 ft. (9.1m). The port contains five berths, each 600 ft. (183 m.) long; three transit sheds; an open storage yard; and a log yard (Port of Sacramento 2004). The Port of Sacramento's existing marine terminal site occupies an approximately 165-acre upland area bounded by Industrial Blvd., the Sacramento Deep Water Ship Channel and turning basin, and the shallow water extension and lowlands of Lake Washington north of the turning basin. The Port's cargo berths and marine terminal facilities are located on the approximately 100-acre area southeast of the main entrance at Harbor Blvd. (Parsons Brinckerhoff 2004). The port is serviced by Union Pacific rail lines and a 200-railcar terminal area marshalling yard is located on the port property. More than 50 trucking companies provide a range of services and equipment for the port (Port of Sacramento 2004).

Commodity handling capabilities at the port include bulk rice and bulk grain elevators, a bulk commodities bagging facility, and dry bulk cargo warehousing (Port of Sacramento 2004). According to the *Port of Sacramento Draft Maritime Analysis* (Parsons Brinckerhoff 2004) Sacramento's cargo base consists mainly of rice, woodchips, fertilizer, cement, lumber, wheat and other miscellaneous products. The Port of Sacramento facilities are primarily used by local agriculture producers, forest products manufacturers and local building markets located within 500 miles of the Port's facilities (Parsons Brinckerhoff 2004).

Exports, imports, and domestic non-waterborne cargoes move through the Port of Sacramento, with the largest share of cargo in exports. Exports at the Port of Sacramento peaked in 1994, with 930,000 metric tons of cargo exported through port facilities. Export volumes have dropped steadily since 1994 (with the exception of a slight increase in 2001), reaching a low of 304,000 metric tons in fiscal year 2004 (Parsons Brinckerhoff 2004).

Following exports, imports make up the next largest share of cargo at the port. After the decline in imports from 1990 through 1997, imports have climbed steadily. Import volumes in 2004 dropped sharply from 2003, but the 2003 volumes were exceptional, and the 2004 import volume of 214,000 metric tons was the second highest since 1997 (Parsons Brinckerhoff 2004).

Total cargo tonnage moving through Sacramento declined from 1.7 million revenue tons in 1982 to 680,000 revenue tons in 2003. During that time Sacramento's market share declined from approximately 10% to 2.3% of Northern California port volumes, and from 1.8% to 0.2% of U.S. West Coast port volumes (Parsons Brinckerhoff 2004). Gross revenues at the Port were $11,794,000 in Fiscal Year 2000-01 with a positive net income of $382,000 and were $8,307,000 in Fiscal Year 2003-04 with a net loss of $1,686,000 (Parsons Brinckerhoff 2004).

The Port of Sacramento Master Planning Project

According to the Port of Sacramento Master Planning Project website (City of West Sacramento 2004), the Port of Sacramento is at a critical juncture in its 40 years of operation. Cargo volumes and cash flows are down, deepening of the Sacramento Deep Water Ship Channel to 35 feet has been on hold, and many West Sacramento citizens would prefer to see non-port or non-industrial development along the water. Many of these issues have been under discussion for years, but the current circumstances add considerable urgency to the situation, prompting the Port of Sacramento, the City of West Sacramento and three other local agencies (City of Sacramento, Sacramento County, and Yolo County) represented on the Port's board to closely examine the Port's future (City of West Sacramento 2004).

The goal of the Master Plan is to provide a fact-based analysis that will help policy makers clearly define the Port's future. In doing so, the scope of the planning effort will address the following (City of West Sacramento 2004):

- Provide a detailed assessment of the market opportunities, competitiveness and cargo outlook for the Port
- Characterize the Port's regional economic significance
- Identify the Port's future facility and land requirements
- Provide recommendations on a Port development strategy
- Evaluate the potential for non-maritime activities on the Port's undeveloped lands
- Evaluate land use alternatives in the Port area
- Identify the traffic and air quality impacts associated with Port activity
- Establish a land use plan the protects and buffers Port and non-Port activities

Air Quality

Introduction

This chapter discusses the overall regulatory framework for air quality management in California and the region, federal and state ambient air quality standards, and existing air quality conditions in Yolo County, and identifies sensitive receptors in the county.

Sources of Information

Information presented in this chapter is based in part on communication with the Yolo-Solano Air Quality Management District (YSAQMD). Existing air quality data was obtained from the following sources:

- California Air Resources Board (ARB) Top 4 Measurements and Days Above the Standard (2004).
- ARB Community Health Air Pollution Information System (2004).
- U.S. Environmental Protection Agency (EPA) Air Data (2004).

Key Terms

- **ARB:** California Air Resources Board
- **CAAQS**: California Ambient Air Quality Standards
- **Carbon Monoxide** – Carbon monoxide (CO) is a public health concern because it combines readily with hemoglobin and reduces the amount of oxygen transported in the bloodstream. CO can cause health problems such as fatigue, headache, confusion, dizziness, and even death.
- **EPA:** U.S. Environmental Protection Agency
- **Inhalable Particulate Matter:** Particulates can damage human health and retard plant growth. Health concerns associated with suspended particulate matter focus on those particles small enough to reach the lungs when inhaled. Particulates also reduce visibility and corrode materials.
- **mph:** miles per hour
- **NAAQS**: National Ambient Air Quality Standards
- **NO_x**: oxides of nitrogen
- **Ozone:** Ozone is a respiratory irritant that increases susceptibility to respiratory infections. It is also an oxidant that can cause substantial damage to vegetation and other materials.
- **ppm:** parts per million
- **ROG:** reactive organic gases
- **SIP:** state implementation plan
- **SVAB:** Sacramento Valley Air Basin

Regulations that Affect Air Quality

Federal Regulations

The federal Clean Air Act, enacted in 1970 and amended twice thereafter (including the 1990 amendment), establishes the framework for modern air pollution control. The act directs the EPA to establish ambient air standards for six pollutants, called the "criteria" pollutants: ozone, CO, lead, nitrogen dioxide (NO_2), particulate matter less than or equal to 10 or 2.5 microns in diameter (PM10 and PM2.5), and sulfur dioxide (SO_2). The standards are divided into primary and secondary standards; the former are set to protect human health within an adequate margin of safety and the latter to protect environmental values, such as plant and animal life.

New standards were recently adopted by the EPA: the 8-hour ozone standard and the 24-hour and annual PM2.5 standards. The National Ambient Air Quality Standards (NAAQS) and the California Ambient Air Quality Standards (CAAQS) are presented in Table Air-1.

Areas are classified as either attainment or nonattainment with respect to state and federal ambient air quality standards. These classifications are made by comparing actual monitored air pollutant concentrations to state and federal standards. The project area is currently designated as "nonattainment" for the federal and state ozone standards and for the state PM10 standards. The Sacramento Federal Nonattainment Area Plan includes control measures to achieve federal standards, which is part of the State Implementation Plan (SIP) for California. Table Air-1 summarizes the attainment status of the project area for each pollutant.

State Regulations

Responsibility for achieving California's air quality standards, which are more stringent than federal standards, is placed on the ARB and local air pollution control districts. State standards are to be achieved through district-level air quality management plans (AQMPs).

The California Clean Air Act requires local and regional air pollution control districts that are not attaining one or more of the state ambient air quality standards for ozone, CO, SO_2, or NO_2 to adopt plans specifically designed to attain these standards. Each plan must be designed to achieve an annual 5% reduction in districtwide emissions of each nonattainment pollutant or its precursors or, if that is not achievable, an expeditious schedule for adopting every feasible emission control measure under air district purview. The district's AQMP reflects expeditiously adopting feasible control measures.

Local Regulations

The air quality management agencies of direct importance in Yolo County include EPA, ARB, and YSAQMD. EPA has established NAAQS for which ARB and YSAQMD have primary implementation responsibility. ARB and YSAQMD are also responsible for ensuring that CAAQS are met. In addition, YSAQMD is responsible for implementing strategies for air quality improvement and recommending mitigation measures for new growth and development.

Air Quality Planning

State Implementation Plan

The Clean Air Act requires states to submit a state implementation plan (SIP) for areas designated nonattainment of federal air quality standards. The SIP, which is reviewed and approved by EPA, must demonstrate how the federal standards will be achieved. Failing to submit a plan or secure approval could lead to denial of federal funding and permits. In cases where the SIP is submitted by the state but fails to demonstrate achievement of the standards, EPA is directed to prepare a federal implementation plan.

Sacramento Federal Nonattainment Area

The Sacramento Federal Nonattainment Area for the 1-hour ozone standard includes all of Sacramento and Yolo Counties and portions of El Dorado, Placer, Sutter, and Solano Counties. The clean air plan for this region was adopted in 1994 in compliance with the 1990 Federal Clean Air Act Amendments. This is designated by EPA as a "severe" nonattainment area, which means it is required to meet the federal ozone standard by 2005 or face significant consequences that range from the imposition of financial penalties to the adoption of even more stringent air emission control requirements. To show the standard has been met, no more than one violation per year for 3 years at any one station must be averaged.

The air districts of the region have adopted more than 25 rules to reduce emissions from stationary sources. By 2005, these rules will result in reductions of more than 25 tons per day of ozone-forming emissions. However, anticipated emission reductions from mobile sources have not been realized. Federal heavy-duty engine and fuel standards will not be enacted in time to help the region meet its 2005 goal.

On April 15, 2004, the air districts in the Sacramento Federal Nonattainment Area were designated and classified for the federal 8-hour ozone standard as nonattainment-serious with attainment scheduled June 2013. The air districts are developing a workplan to prepare and submit the 8-hour ozone SIP to EPA on June 2007. Currently, the 1-hour SIP is in effect until June 2005. Then the 8-

Table Air-1. Ambient Air Quality Standards Applicable in California and the Attainment Status of Yolo County

Pollutant	Symbol	Average Time	Standard (parts per million)		Standard (micrograms per cubic meter)		Violation Criteria		Attainment Status of Yolo County	
			California	National	California	National	California	National	California	National
Ozone	O_3	1 hour	0.09	0.12	180	235	If exceeded	If exceeded on more than 3 days in 3 years	Nonattainment	Nonattainment
		8 hours	NA	0.08	NA	157	NA	If fourth highest 8-hour oncentration in a year, averaged over 3 years, is exceeded	No state standard	Nonattainment
Carbon monoxide	CO	8 hours	9.0	9	10,000	10,000	If exceeded	If exceeded on more than 1 day per year	Attainment	Unclassified/ attainment
		1 hour	20	35	23,000	40,000	If exceeded	If exceeded on more than 1 day per year	Attainment	Unclassified/ attainment
Nitrogen dioxide	NO_2	Annual average	NA	0.053	NA	100	NA	If exceeded	No state standard	Attainment
		1 hour	0.25	NA	470	NA	If exceeded	If exceeded	Attainment	No federal standard
Sulfur dioxide	SO_2	Annual average	NA	0.03	NA	80	NA	If exceeded	No state standard	Attainment
		24 hours	0.04	0.14	105	365	If exceeded	If exceeded on more than 1 day per year	Attainment	Attainment
		1 hour	0.25	NA	655	NA	NA	NA	Attainment	No federal standard
Hydrogen sulfide	H_2S	1 hour	0.03	NA	42	NA	If equaled or exceeded	NA	Unclassified	No federal standard
Vinyl chloride	C_2H_3Cl	24 hours	0.010	NA	26	NA	If equaled or exceeded	NA	No designation	No federal standard
Inhalable particulate matter	PM10	Annual geometric mean	NA	NA	20	NA	If exceeded	NA	Nonattainment	No federal standard
		Annual arithmetic mean	NA	NA	NA	50	NA	If exceeded	No state standard	Unclassified
		24 hours	NA	NA	50	150	If exceeded	If average 1% over 3 years is exceeded	Nonattainment	Unclassified
	PM2.5	Annual geometric mean	NA	NA	12	NA	If exceeded	NA	Unclassified	No federal standard
		Annual arithmetic mean	NA	NA	NA	15	NA	If exceeded	No state standard	No designation
		24 hours	NA	NA	NA	65	NA	If average 2% over 3 years is exceeded	No state standard	No designation
Sulfate particles	SO_4	24 hours	NA	NA	25	NA	If equaled or exceeded	NA	Attainment	No federal standard
Lead particles	Pb	Calendar quarter	NA	NA	NA	1.5	NA	If exceeded no more than 1 day per year	No state standard	Attainment
		30 days	NA	NA	1.5	NA	If equaled or exceeded	NA	Attainment	No federal standard

Notes: All standards are based on measurements at 25ºC and 1 atmosphere pressure; National standards shown are the primary (health effects) standards; NA = not applicable.
Source: ARB, "Area Designations for State and National Ambient Air Quality Standards."

hour standard becomes effective, and the 1-hour standard is no longer effective. EPA requested an 8-hour Rate of Progress (ROP) report submitted by June 2006. The ROP requires nonattainment areas show 15% emission reductions for the 2002–2007 period. A draft 8-hour ROP was prepared and showed compliance without requiring additional control measures. As an early submittal, the 1-hour SIP is expected to be replaced with the 8-hour ROP next June.

When the EPA adopts the regulations for the new 8-hour ozone standard, two planning scenarios will be triggered:

- An ROP plan that will demonstrate how the air districts' efforts will meet emission reduction targets.
- An 8-hour attainment plan that will contain sufficient control measures to demonstrate that the region will attain the 9-hour standard by the target date.

This clean air plan will include control strategies, emissions inventory (current and projected), air quality monitoring information, air quality modeling, and a demonstration of compliance with planning requirements.

Physical Conditions

Climate and Meteorological Conditions

The project area is located in Yolo County. Yolo County is in the Sacramento Valley Air Basin (SVAB), which includes Sacramento, Shasta, Tehama, Butte, Glenn, Colusa, Sutter, Yuba, Yolo, and parts of Solano and Placer Counties. The SVAB is bounded on the west by the Coast Ranges and on the north and east by the Cascade Range and Sierra Nevada. To the south is the San Joaquin Valley Air Basin.

The SVAB has a Mediterranean climate characterized by hot, dry summers and cool, rainy winters. During winter, the North Pacific storm track intermittently dominates valley weather, and fair weather alternates with periods of extensive clouds and precipitation. Also characteristic of winter weather in the valley are periods of dense and persistent low-level fog, which is most prevalent between storms. The frequency and persistence of heavy fog in the valley diminishes with the approach of spring. The average yearly temperature range for the Sacramento Valley is between 20 to 115°F, with summer high temperatures often exceeding 90°F and winter low temperatures occasionally dropping below freezing. Table Air-2 summarizes temperature and precipitation data from three meteorological monitoring stations in Yolo County.

Table Air-2. Monthly Climate Summary

	Davis			Winters			Woodland		
	Avg. Max. Temp (oF)	Avg. Min. Temp (oF)	Precipitation (in.)	Avg. Max. Temp (oF)	Avg. Min. Temp (oF)	Precipitation (in.)	Avg. Max. Temp (oF)	Avg. Min. Temp (oF)	Precipitation (in.)
Jan.	53.5	36.5	3.51	55.0	37.1	4.97	53.6	37.5	4.04
Feb.	59.7	39.6	3.34	61.5	40.8	4.09	60.3	40.9	3.62
Mar.	65.2	41.7	2.34	67.0	43.8	2.94	66.1	43.4	2.64
Apr.	72.1	44.3	1.20	74.3	47.4	1.22	73.4	46.4	1.27
May	80.5	49.0	0.46	82.6	52.9	0.52	82.0	51.6	0.47
June	88.6	53.8	0.15	90.8	57.9	0.14	90.3	56.3	0.14
July	94.1	55.3	0.01	96.6	59.7	0.02	95.8	58.0	0.02
Aug.	92.7	54.1	0.03	95.1	58.7	0.05	94.3	57.0	0.07
Sept.	88.6	52.5	0.24	90.6	56.6	0.25	90.1	55.4	0.32
Oct.	79.0	47.4	0.86	80.8	50.3	0.95	79.5	49.9	0.97
Nov.	64.9	40.6	2.04	66.0	42.5	2.78	64.5	42.9	2.44
Dec.	54.4	36.9	3.14	55.9	37.3	4.11	54.3	37.7	3.29
Annual	74.4	46.0	17.33	76.3	48.8	22.03	75.3	48.1	19.30

Notes: Period of record for Davis is 1917 to 2004.
Period of record for Winters and Woodland is 1948 to 2004.

Source: Western Regional Climatic Data Center (www.wrcc.dri.edu).

In general, the prevailing wind in the Sacramento Valley is from the southwest due to marine breezes flowing through the Carquinez Strait. The Carquinez Strait is the major corridor for air moving into the Sacramento Valley from the west. Incoming airflow strength varies daily with a pronounced diurnal cycle. Influx strength is weakest in the morning and increases in the afternoon and evening hours (Delta breeze). The ozone season (May through October) in the Sacramento Valley is characterized by stagnant morning air or light winds with the delta breeze arriving in the afternoon out of the southwest. Usually, the evening breeze transports the airborne pollutants to the north out of the Sacramento Valley. During about half of the days from July to September, however, a phenomenon called the "Schultz Eddy" prevents this from occurring. Instead of allowing for the prevailing wind patterns to move north carrying the pollutants out of the valley, the Schultz Eddy causes the wind pattern to circle back south. This phenomenon causes the air pollutants to be blown south toward the Sacramento nonattainment area.

The SVAB's climate and topography contribute to the formation and transport of photochemical pollutants throughout the region. The region experiences temperature inversions that limit atmospheric mixing and trap pollutants, resulting in high pollutant concentrations near the ground surface. Generally, the lower the inversion base height from the ground and the greater the temperature increase from base to top, the more pronounced the inhibiting effect of the inversion will be on pollutant dispersion. Consequently, the highest concentrations of photochemical pollutants occur from late spring to early fall

when photochemical reactions are greatest because of more intense sunlight and the lower altitude of daytime inversion layers. Surface inversions (those at altitudes of 0–500 feet above sea level) are most frequent during winter, and subsidence inversions (those at 1,000–2,000 feet above sea level) are most common in summer.

Existing Air Quality Conditions in Yolo County

Criteria Pollutants and Local Air Quality

Ozone

Ozone is a respiratory irritant that increases susceptibility to respiratory infections. It is also an oxidant that can cause substantial damage to vegetation and other materials.

Ozone is not emitted directly into the air, but is formed by a photochemical reaction in the atmosphere. Ozone precursors, called reactive organic gases (ROG), and oxides of nitrogen (NO_x) react in the atmosphere in the presence of sunlight to form ozone. Because photochemical reaction rates depend on the intensity of ultraviolet light and air temperature, ozone is primarily a summer air pollution problem.

Ozone is a regional pollutant. Because photochemical reactions take time to occur, high ozone levels often occur downwind of the emission source. Because the predominant wind direction in the Sacramento Valley is from the south, Yolo County is a receptor of regional pollutants, such as ozone, from the Sacramento area. Ozone conditions in Yolo County therefore result from a combination of locally generated emissions and transported emissions.

State and federal standards for ozone have been set for a 1-hour averaging time. The state 1-hour ozone standard is 0.09 parts per million (ppm), not to be exceeded. The federal 1-hour ozone standard is 0.12 ppm, not to be exceeded more than three times in any 3-year period. A new federal eight-hour ozone standard has been set at 0.08 ppm.

Inhalable Particulate Matter

Particulates can damage human health and retard plant growth. Health concerns associated with suspended particulate matter focus on those particles small enough to reach the lungs when inhaled. Particulates also reduce visibility and corrode materials.

Particulate emissions are generated by a wide variety of sources, including agricultural activities, industrial emissions, dust suspended by vehicle traffic and construction equipment, and secondary aerosols formed by reactions in the atmosphere.

The federal and state AAQS for particulate matter apply to two classes of particulates: PM2.5 and PM10. The state PM10 standards are 50 micrograms

per cubic meter (μ/m^3) as a 24-hour average and 20 μ/m^3 as an annual geometric mean. The federal PM10 standards are 150 μ/m^3 as a 24-hour average and 50 μ/m^3 as an annual arithmetic mean. The federal PM2.5 standards are 15 μ/m^3 for the annual average and 65 μ/m^3 for the 24-hour average. On June 20, 2002, the ARB adopted a new annual PM2.5 standard of 12 $\mu g/m^3$.

Carbon Monoxide

CO combines readily with hemoglobin and reduces the amount of oxygen transported in the bloodstream. CO can cause health problems such as fatigue, headache, confusion, dizziness, and even death.

Motor vehicles are the dominant source of CO emissions in most areas. High CO levels develop primarily during winter when periods of light winds combine with the formation of ground-level temperature inversions (typically from the evening through early morning). These conditions result in reduced dispersion of vehicle emissions. Motor vehicles also exhibit increased CO emission rates at low air temperatures.

State and federal CO standards have been set for 1-hour and 8-hour averaging times. The state 1-hour standard is 20 ppm, whereas the federal 1-hour standard is 35 ppm. Both state and federal standards for the 8-hour averaging period are 9 ppm.

Attainment Status and Ambient Data

Yolo County does not attain the federal or state standards for ozone and the state standard for PM10 because monitored ambient levels of these pollutants exceed the ambient air quality standards. However, Yolo County does attain the state and federal standards for CO and NO_2.

The existing air quality conditions in the proposed project area can be characterized by monitoring data collected in the region. Air quality monitoring data for the most recent 3 years (2001–2003) are presented in Table Air-3. There are three air quality monitoring stations in Yolo County: UCD, monitoring station, which monitors for ozone and CO, the Gibson Road monitoring station in Woodland, which monitors for PM10 and PM2.5, and the West Sacramento station, which monitors PM10. Figure Air-1 shows the locations of the monitoring stations. Yolo County experienced occasional violations of the state 1-hour ozone standard and the federal 8-hour ozone standard during the 3-year monitoring period. The Woodland station experienced violations of the state PM10 standard and the federal PM2.5 standard, and the West Sacramento station experienced violations of the state PM_{10} Standard (this station does not monitor PM 2.5). There were no violations of the NO_2 or CO standards.

Existing Emissions Sources

Existing sources of emissions in Yolo County include industrial, agricultural, and mobile. The ARB maintains an inventory of stationary air pollutant source facilities in the state that have permits with local air districts. The ARB also maintains an air pollutant emissions inventory, categorized by source type (e.g.,

Table Air-3. Ambient Air Quality Monitoring Data at Stations in Davis, Woodland, and West Sacramento

Pollutant Standards	2001	2002	2003
Ozone (O_3) Davis Station			
Maximum 1-hour concentration (ppm)	0.100	0.121	0.098
Maximum 8-hour concentration (ppm)	0.093	0.088	0.082
Number of Days Standard Exceeded			
NAAQS 1-hour (>0.12 ppm)	0	0	0
CAAQS 1-hour (>0.09 ppm)	5	3	2
NAAQS 8-hour (>0.08 ppm)	2	2	0
Ozone (O_3) Woodland Station			
Maximum 1-hour concentration (ppm)	0.103	0.110	0.098
Maximum 8-hour concentration (ppm)	0.089	0.091	0.084
Number of Days Standard Exceeded			
NAAQS 1-hour (>0.12 ppm)	0	0	0
CAAQS 1-hour (>0.09 ppm)	3	9	3
NAAQS 8-hour (>0.08 ppm)	1	4	0
Nitrogen Dioxide (NO_2) Davis Station			
Maximum 1-hour concentration (ppm)	0.172	0.059	0.060
Average annual concentration (ppm)	0.010	0.012	0.011
Number of Days Standard Exceeded	0	0	0
CAAQS 1-hour (>0.25 ppm)			
Carbon Monoxide (CO) Davis Station			
Maximum 8-hour concentration (ppm)	3.4	1.4	0.8
Number of Days Standard Exceeded			
NAAQS 8-hour ($\geq$9.0 ppm)	0	0	0
CAAQS 8-hour ($\geq$9.0 ppm)	0	0	0
Particulate Matter (PM10)[a] West Sacramento Station			
Maximum 24-hour concentration ($\mu g/m^3$)	95	82	69
National[b] annual average concentration ($\mu g/m^3$)	27	27	23
State[c] annual average concentration ($\mu g/m^3$)	NA	NA	NA
Number of Days Standard Exceeded			
NAAQS 24-hour (>150 $\mu g/m^3$)[d]	0	0	0
CAAQS 24-hour (>50 $\mu g/m^3$)[d]	5	3	2
Particulate Matter (PM10)[a] Woodland Station			
Maximum 24-hour concentration ($\mu g/m^3$)	67	82	55
National[b] annual average concentration ($\mu g/m^3$)	23.8	26.8	20.7
State[c] annual average concentration ($\mu g/m^3$)	24.3	27.3	NA

Pollutant Standards	2001	2002	2003
Number of Days Standard Exceeded			
NAAQS 24-hour (>150 μg/m^3)[d]	0	0	0
CAAQS 24-hour (>50 μg/m^3)[d]	3	6	2
Particulate Matter (PM2.5) Woodland Station			
Maximum 24-hour concentration (μg/m^3)	57	69	31
National[b] annual average concentration (μg/m^3)	NA	10.7	8.4
State[c] annual average concentration (μg/m^3)	NA	NA	8.4
Number of Days Standard Exceeded			
NAAQS 24-hour (>65 μg/m^3)	0	1	0

Notes: NAAQS = National Ambient Air Quality Standards.
CAAQS = California Ambient Air Quality Standards.
NA = Insufficient data available to determine the value.

PM10 and PM2.5 measurements usually collected every six days.
National annual average based on arithmetic mean.
State annual average based on geometric mean.

SO_2 is not monitored at these stations because all of the state has attained the standard for many years, and it is not considered a pollutant of concern.

Sources: California Air Resources Board 2004; Environmental Protection Agency 2004.

industrial, mobile). Approximately 700 sources are under YSAQMD permit. Table Air-4 and Figure Air-2 below shows YSAQMD-permitted industrial and agricultural sources greater than 10 tons of criteria pollutants in Yolo County. Table Air-5 summarizes existing emissions in Yolo County according to the type of pollutant source.

Sensitive Land Uses

For the purposes of air quality analysis, sensitive land uses are defined as locations where people reside or where the presence of pollutant emissions could adversely affect the use of the land. Particularly sensitive receptors are those who are more susceptible to the adverse health effects of air pollution, such as children, the elderly, and the ill. Therefore, land uses with particularly sensitive receptors include childcare centers, schools, hospitals, and convalescent homes. These facilities in Yolo County are listed below in Table Air-6. In addition to the receptors in this table, there are two mobile home parks where mostly seniors reside. These are located near the freeway ramps to Interstate 5 in Dunnigan. Residential areas are shown on the Existing Land Use figures in the Land Use Element Background Report. Figure Air-2 also summarizes the relationship of known emissions sources and sensitive receptors.

Table Air-4. YSAQMD-Permitted Industrial Sources in Yolo County

Facility Name	Facility Type	Area of County
Teichert Aggregates, Inc.	Non-metallic minerals	Unincorporated
Syar Industries, Inc.	Non-metallic minerals	Unincorporated
Rinker Materials	Petroleum and coal products	Unincorporated
Farmers Grain Elevator	Agricultural	Unincorporated
Hayrico Incorporated	Agricultural	Incorporated
Leer West, Inc.	Transportation equipment	Incorporated
Skyline Corporation	Lumber and wood products	Incorporated
City of Davis Wastewater Treatment Plant	Municipal service	Unincorporated
MM Yolo Power LLC	Electric and gas services	Unincorporated
Agrium	Chemical	Unincorporated
Vertis, Inc.	Printing and publishing	Unincorporated
Port of Sacramento	Water transportation	Unincorporated
Farmer's Rice Cooperative	Food products	Unincorporated
BP West	Wholesale trade, non-durable goods	Incorporated
Pirmi	Food products	Incorporated
Fleetwood Homes of N. Cal, Inc.	Lumber and wood products	Incorporated
Gold River Mills	Food products	Incorporated
Woodland Biomass Power LTD	Electric and gas services	Incorporated
Lamson & Sessions Company	Rubber and miscellaneous plastics	Incorporated

Source: ARB emissions inventory from the Community Health Air Pollution Information System. Available: <http://www.arb.ca.gov/gismo/chapis_v01_6_1_04/chapis_v02.asp>. Accessed September 2004.

Energy Resources and Conservation

Introduction

Yolo County contains a variety of energy resources. In addition to fossil fuel resources that are located in the county, the county has the potential for the use of a variety of alternative sources of power. Use of alternative power has a strong history in the county, and, as described below, power is currently generated using a variety of sources.

Sources of Information

The following sources of information were used in the preparation of this section:

- Energy Plan for Yolo County, 1982.
- California Department of Conservation Division of Oil, Gas, and Geothermal Resources, August 31, 2004.
- California Energy Commission. 2001. California Hydroelectric Power Plants. Last updated June 29, 2001.
- Map of Geothermal Resources in California. Last updated October 24, 2002.
- California Wind Resource Potential. Last updated March 25, 2002.
- California Energy Commission Power Plant Database. Last updated July 1, 2004.

Key Terms

- **BioMass Energy** - Essentially, a decomposing landfill of waste or garbage, that gives off heat. This heat energy can be used to heat buildings or create electricity.
- **Geothermal Power** - Electricity derived from the heat trapped under the earth's surface. The most frequent example of this form of power is geysers.
- **Insolation** - The solar energy received at a place over a given period. May be expressed as sun-hours per day, langleys per hour, watts per square meter per hour, or any number of other units.
- **mW (Megawatt) [Measurement]** - 1 million watts or 1000 kilowatts. Used as the wholesale unit of measure.
- **Solar Power** - Electricity produced by harnessing the sun's radiation through either photovoltaic or solar thermal devices.

Table Air-5. Yolo County Year 2003 Emissions Summary (Tons per Day)

Category	Subcategory	Total Organic Gases	Reactive Organic Gases	Carbon Monxide	Nitrogen Oxides	Sulfur Oxides	Particulate Matter (PM10)	Particulate Matter (PM2.5)
Fuel combustion	Electric utilities	0.04	0.01	0.32	0.3	0.08	0.06	0.05
	Cogeneration	0	0	0.1	0.08	0.01	0.02	0.02
	Manufacturing and industrial	0.01	0	0.22	0.79	0.1	0.28	0.28
	Food and agricultural processing	0.34	0.3	0.88	2.66	0.04	0.24	0.24
	Service and commercial	0.03	0.01	1.1	0.82	0.03	0.07	0.07
	Fuel combustion	0.01	0.01	0.03	0.09	0	0	0
	Subtotal	0.43	0.33	2.65	4.74	0.26	0.67	0.66
Waste disposal	Sewage treatment	0	0	0.06	0.01	0.01	0	0
	Landfills	3.49	0.05	0	0	0	0	0
	Soil remediation	0.02	0.02	0	0	0	0	0
	Waste disposal	0	0	0	0	0	0	0
	Subtotal	3.51	0.07	0.06	0.01	0.01	0	0
Cleaning and surface coatings	Laundering	0.04	0.01	0	0	0	0	0
	Degreasing	0.53	0.39	0	0	0	0	0
	Coatings and related process solvents	0.68	0.66	0	0	0	0.01	0.01
	Printing	0.17	0.17	0.62	0.05	0	0	0
	Adhesives and sealants	0.08	0.07	0	0	0	0	0
	Subtotal	1.5	1.3	0.62	0.05	0	0.01	0.01
Petroleum production and marketing	Oil and gas production	0.37	0.15	0	0	0	0	0
	Petroleum marketing	7.42	1.21	0.11	0.02	0	0	0
	Subtotal	7.79	1.36	0.11	0.02	0	0	0
Industrial processes	Chemical	0.22	0.15	0.31	0.1	0	0.06	0.05
	Food and agriculture	0.12	0.12	0.01	0.01	0.05	0.87	0.42
	Mineral processes	0.09	0.09	0.24	0.06	0.05	0.65	0.4

Air-5. Continued

Category	Subcategory	Total Organic Gases	Reactive Organic Gases	Carbon Monxide	Nitrogen Oxides	Sulfur Oxides	Particulate Matter (PM10)	Particulate Matter (PM2.5)
	Wood and paper	0.04	0.03	0	0	0	0.08	0.06
	Subtotal	0.47	0.39	0.56	0.17	0.1	1.66	0.93
Solvent evaporation	Consumer products	1.47	1.23	0	0	0	0	0
	Architectural coatings and related process solvents	0.55	0.53	0	0	0	0	0
	Pesticides/fertilizers	0.9	0.9	0	0	0	0	0
	Asphalt paving/roofing	0.1	0.09	0	0	0	0	0
	Subtotal	3.02	2.75	0	0	0	0	0
Miscellaneous processes	Residential fuel combustion	0.59	0.26	3.94	0.37	0.02	0.57	0.55
	Farming operations	4.15	0.33	0	0	0	6.3	1.4
	Construction and demolition	0	0	0	0	0	9.5	1.98
	Paved road dust	0	0	0	0	0	2.48	0.42
	Unpaved road dust	0	0	0	0	0	2.18	0.46
	Fugitive windblown dust	0	0	0	0	0	3.44	0.76
	Fires	0	0	0.04	0	0	0.01	0.01
	Waste burning and disposal	0.47	0.27	3.02	0.16	0.02	0.37	0.35
	Cooking	0.01	0.01	0	0	0	0.06	0.04
	Subtotal	5.22	0.87	7	0.53	0.04	24.91	5.97
On-road motor vehicles	Light duty passenger	1.99	1.85	17.05	1.67	0.01	0.08	0.05
	Light duty truck 1	0.88	0.82	8.61	0.82	0.01	0.03	0.02
	Light duty truck 2	0.63	0.58	6.34	0.88	0	0.03	0.02
	Medium duty truck	0.34	0.31	3.29	0.51	0	0.02	0.01
	Light heavy duty gas trucks 1	0.13	0.12	0.84	0.08	0	0	0
	Light heavy duty gas trucks 2	0.02	0.02	0.15	0.02	0	0	0
	Medium heavy duty gas trucks	0.2	0.19	1.61	0.16	0	0	0

Air-5. Continued

Category	Subcategory		Total Organic Gases	Reactive Organic Gases	Carbon Monxide	Nitrogen Oxides	Sulfur Oxides	Particulate Matter (PM10)	Particulate Matter (PM2.5)
	Heavy heavy duty gas trucks		0.12	0.11	1.57	0.16	0	0	0
	Light heavy duty diesel trucks 1		0.01	0.01	0.02	0.12	0	0	0
	Light heavy duty diesel trucks 2		0.01	0.01	0.02	0.08	0	0	0
	Medium heavy duty diesel trucks		0.05	0.05	0.3	1.9	0.02	0.05	0.05
	Heavy heavy duty diesel trucks		0.39	0.34	1.3	8.38	0.09	0.17	0.14
	Motorcycles		0.12	0.12	0.98	0.02	0	0	0
	Heavy duty diesel urban buses		0.01	0.01	0.02	0.11	0	0	0
	Heavy duty gas urban buses		0.03	0.03	0.29	0.03	0	0	0
	School buses		0.01	0.01	0.14	0.1	0	0	0
	Motor homes		0.04	0.04	1.04	0.09	0	0	0
		Subtotal	4.98	4.62	43.57	15.13	0.13	0.38	0.29
Other mobile sources	Aircraft		0.03	0.03	0.83	0.02	0	0	0
	Trains		0.01	0.01	0.02	0.19	0.02	0	0
	Ships and commercial boats		0.02	0.02	0.06	0.07	0.01	0.01	0.01
	Recreational boats		0.84	0.78	4.83	0.2	0	0.05	0.04
	Off-road recreational vehicles		0.05	0.05	0.66	0.02	0	0	0
	Off-road equipment		1.02	0.92	8.35	2.34	0	0.17	0.15
	Farm equipment		0.51	0.45	2.99	3.11	0.02	0.21	0.19
	Fuel storage and handling		0.31	0.31	0	0	0	0	0
		Subtotal	2.79	2.57	17.74	5.95	0.05	0.44	0.39
Natural sources	Wildfires		0.19	0.11	2.57	0.11	0	0.5	0.44
		Grand Total	**37.69**	**15.73**	**74.99**	**26.73**	**0.59**	**28.57**	**8.69**

Table Air-6. Sensitive Receptors in Yolo County

Receptor	Address and Telephone Number	Area of County
Schools		
Alyce Norman Elementary School	1200 Anna St, Broderick, CA 916-375-7650	Unincorporated
Beamer Elementary School	525 Beamer St, Woodland, CA 530-662-1769	Incorporated
Begorra Grade Station	595 N East St, Woodland, CA 530-662-4643	Incorporated
Birch Lane Elementary School	1600 Birch Ln, Davis, CA 530-757-5395	Incorporated
Bryte Elementary School	637 Todhunter Ave, Bryte, CA 916-375-7660	Unincorporated
Cache Creek High School	14320 2nd St, Yolo, CA 530-662-4331	Unincorporated
Cesar Chavez Elementary School	1221 Anderson Rd, Davis, CA 530-757-5490	Incorporated
Children's Center	530 B St, Davis, CA 530-757-5340	Incorporated
Davis Senior High School	315 West 14th Street, Davis, CA 530-757-5400	Incorporated
Dingle Elementary School	625 Elm St, Woodland, CA 530-662-7084	Incorporated
Douglass Junior High School	525 Granada Dr, Woodland, CA 530-666-2191	Incorporated
Elkhorn Village Elementary	750 Cummins Way, Broderick, CA 916-375-7670	Unincorporated
Esparto Elementary School	17120 Omega St, Esparto, CA 530-787-3417	Unincorporated
Esparto High School	17121 Yolo Ave, Esparto, CA 530-787-3405	Unincorporated
Esparto Middle School	26058 County Road 21A, Esparto, CA 530-787-4151	Unincorporated
Esparto Unified School District	26675 Plainfield St, Esparto, CA 530-787-3446	Unincorporated
Evergreen Elementary School	919 Westacre Rd, West Sacramento, CA 916-375-7680	Incorporated
Fairfield Elementary School	26960 County Road 96, Davis, CA 530-757-5370	Incorporated
Foundation For Excellence	1616 West St, Woodland, CA 530-661-6125	Incorporated

Receptor	Address and Telephone Number	Area of County
Freeman Elementary School	126 N West St, Woodland, CA 530-662-1758	Incorporated
Gibson Elementary School	312 Gibson Rd, Woodland, CA 530-662-3944	Incorporated
Golden State Middle School	1100 Carrie St, Broderick, CA 916-375-7700	Unincorporated
Grace Valley Christian Center	27173 County Road 98, Davis, CA 530-756-5255	Incorporated
Grafton School	9544 Mill St, Knights Landing, CA 530-735-6435	Unincorporated
Greengate School	285 W Beamer St, Woodland, CA 530-666-8000	Incorporated
Holy Cross School	800 Todhunter Ave, Broderick, CA 916-371-1313	Unincorporated
Holy Rosary School	505 California St, Woodland, CA 530-662-3494	Incorporated
John Clayton School	200 Baker St, Winters, CA 530-795-6154	Incorporated
Lee Junior High School	520 West St, Woodland, CA 530-662-0251	Incorporated
Marguerite Montgomery Elementary	1919 5th St, Davis, CA 530-759-2100	Incorporated
Marguerite Montgomery Elementary	1441 Danbury St, Davis, CA 530-759-2100	Incorporated
Merryhill Schools	2650 Lillard Dr, Davis, CA 530-297-5100	Incorporated
Midtown Community School	250 Buckeye St, Woodland, CA 530-669-2347	Incorporated
North Davis Elementary	555 E 14th St, Davis, CA 530-757-5475	Incorporated
Oliver Wendell Holmes Jr. High	1220 Drexel Dr, Davis, CA 530-757-5445	Incorporated
Our Lady of Grace School	1990 Linden Rd, West Sacramento, CA 916-371-9416	Incorporated
Patwin School Age	2222 Shasta Dr, Davis, CA 530-756-1369	Incorporated
Pioneer Elementary School	5215 Hamel St, Davis, CA 530-757-5480	Incorporated

Receptor	Address and Telephone Number	Area of County
Plainfield Elementary School	20450 County Road 97, Woodland, CA 530-662-9301	Incorporated
Prairie Elementary School	1444 Stetson St, Woodland, CA 530-662-2898	Incorporated
Program For Hearing Impaired	20450 County Road 97, Woodland, CA 530-666-0161	Incorporated
Ralph Waldo Emerson Jr. High	2121 Calaveras Ave, Davis, CA 530-757-5430	Incorporated
Ramon S Tafoya Elementary School	720 Homestead Way, Woodland, CA 530-666-4324	Incorporated
Rhoda Maxwell Elementary	50 Ashley Ave, Woodland, CA 530-662-1784	Incorporated
River City High School	1100 Claredon Street, West Sacramento, CA 916-375-7800	Incorporated
Robert E Willett Elementary	1207 Sycamore Ln, Davis, CA 530-757-5460	Incorporated
Seventh-Day Adventist Church	29 Elliot St, Woodland, CA 530-662-6745	Incorporated
Shirley Rominger Intermediate	502 Niemann St, Winters, CA 530-795-6320	Incorporated
Southport Elementary School	2747 Linden Rd, West Sacramento, CA 916-375-7890	Incorporated
St. James Religious Education	200 W 14th St, Davis, CA 530-758-9000	Incorporated
St. James School	1215 B St, Davis, CA 530-756-3946	Incorporated
T L Whitehead Elementary	624 W Southwood Dr, Woodland, CA 530-662-2824	Incorporated
Valley Oak Elementary School	1400 E 8th St, Davis, CA 530-757-5470	Incorporated
Waggoner Elementary	500 Edwards St, Winters, CA 530-795-6121	Incorporated
Walnut Learning Center	175 Walnut St, Woodland, CA 530-669-1654	Incorporated
West Side Community School	1361 Merkley Ave, West Sacramento, CA 916-375-0235	Incorporated
Westfield Village Elementary	508 Poplar Ave, West Sacramento, CA 916-375-7720	Incorporated

Receptor	Address and Telephone Number	Area of County
Westmore Oaks Elementary School	1504 Fallbrook St, West Sacramento, CA 916-375-7730	Incorporated
Willow Spring Elementary	1585 E Gibson Rd, Woodland, CA 530-662-2452	Incorporated
Winters Community Christian	205 Russell St, Winters, CA 530-795-4682	Incorporated
Winters Joint Union High School	101 Grant Ave, Winters, CA 530-795-6140	Incorporated
Winters Middle School	425 Anderson Ave, Winters, CA 530-795-6130	Incorporated
Winters Unified School District	710 Railroad Ave, Winters, CA 530-795-6100	Incorporated
Wolfskill High School	4922 Bowman Rd, Winters, CA 530-795-6160	Incorporated
Woodland Christian High School	240 N West St, Woodland, CA 530-406-0237	Incorporated
Woodland Christian High School	1787 Matmor Rd, Woodland, CA 530-406-8800	Incorporated
Woodland Christian Middle School	1787 Matmor Rd, Woodland, CA 530-662-7334	Incorporated
Woodland Christian School	1616 West St, Woodland, CA 530-666-6615	Incorporated
Woodland High School	21 N West St, Woodland, CA 530-662-4678	Incorporated
Woodland Joint School District	630 Cottonwood St, Woodland, CA 530-662-0201	Incorporated
Woodland Seventh Day Adventist	29 Elliot St, Woodland, CA 530-666-6315	Incorporated
Yolo Alternative Education Center	920 Westacre Rd, West Sacramento, CA 916-375-7740	Incorporated
Yolo Regional Occupational	315 W 14th St, Davis, CA 530-753-4966	Incorporated
Zamora Elementary School	1716 Cottonwood St, Woodland, CA 530-666-3641	Incorporated
Child Care Centers/Preschools		
Abbey School	219 Court St, Woodland, CA 530-668-5521	Incorporated
Academy Montessori	1318 Chestnut Ln, Davis, CA 530-756-2258	Incorporated

Receptor	Address and Telephone Number	Area of County
Alphabet Soup Childcare	1224 Cottonwood St, Woodland, CA 530-666-4859	Incorporated
Alphabet Soup Childcare	1260 Lake Blvd, Davis, CA 530-666-4859	Incorporated
Applegate Nursery School	1701 Russell Blvd, Davis, CA 530-758-4850	Incorporated
California Human Dev Headstart	626 W Lincoln Ave, Woodland, CA 530-668-5160	Incorporated
Caring Connection Children's	703 Westacre Rd, West Sacramento, CA 916-371-3301	Incorporated
Child Development Center	2222 Shasta Dr, Davis, CA 530-756-1369	Incorporated
Child Development Center	607 E 14th St, Davis, CA 530-756-4350	Incorporated
Child Development Center	312 Gibson Rd, Woodland, CA 530-666-4822	Incorporated
Davis Community Church	412 C St, Davis, CA 530-758-2940	Incorporated
Davis Waldorf School	3100 Sycamore Ln, Davis, CA 530-753-1651	Incorporated
Davis Parent Nursery School	426 W 8th St, Davis, CA 530-757-5377	Incorporated
Davis Parent Nursery School	525 C St, Davis, CA 530-757-5375	Incorporated
Davis Parent Nursery School	1447 Danbury St, Davis, CA 530-757-5375	Incorporated
Discovery Preschool & Child	1020 F St, Davis, CA 530-756-2231	Incorporated
Graften State Preschool	9544 Mill St, Knights Landing, CA 530-735-6257	Unincorporated
Green Acre School Child Care	2890 Marshall Rd, West Sacramento, CA 916-371-3513	Incorporated
Head Start	2455 W Capitol Ave # 114, West Sacramento, CA 916-371-0201	Incorporated
Head Start of Yolo County	1850 Hanover Dr # 19, Davis, CA 530-750-2302	Incorporated
Holy Rosary Faith Formation	575 California St, Woodland, CA 530-662-5394	Incorporated

Receptor	Address and Telephone Number	Area of County
Holy Rosary Preschool	635 California St, Woodland, CA 530-668-2447	Incorporated
Holy Rosary Religious Ed	575 California St, Woodland, CA 530-662-5394	Incorporated
In-R-Care	1401 E Gum Ave, Woodland, CA 530-666-1018	Incorporated
James Marshall Parent Nursery	920 Westacre Rd, West Sacramento, CA 916-371-0405	Incorporated
Kids On Cowell	Davis, CA 530-753-6920	Incorporated
La Rue Park Child Development	50 Atrium Way, Davis, CA 530-753-8716	Incorporated
Little Friends Montessori School	1101 F St, Davis, CA 530-753-0300	Incorporated
Merryhill Country Schools	222 La Vida Way, Davis, CA 530-753-9210	Incorporated
Merryhill Schools	2650 Lillard Dr, Davis, CA 530-297-5100	Incorporated
Montessori Children's House	1738 Cottonwood St, Woodland, CA 530-662-1900	Incorporated
Montessori Country Day	1811 Renoir Ave, Davis, CA 530-753-8373	Incorporated
Montessori Country Day II	2802 Spafford St, Davis, CA 530-753-5225	Incorporated
New Life Pre-School	405 Plane Ave, Woodland, CA 530-661-0452	Incorporated
Noah's Ark Preschool	100 Woodland Ave, Woodland, CA 530-662-2527	Incorporated
Parkside Children's House	2907 Portage Bay W, Davis, CA 530-753-2097	Incorporated
Redbud Montessori	27082 Patwin Rd, Davis, CA 530-753-2623	Incorporated
Rivendell Nursery School	2661 Portage Bay E, Davis, CA 530-753-6662	Incorporated
Russell Park Child Development	400 Russell Park, Davis, CA 530-753-2487	Incorporated
Sequoia Park Preschool	726 B St, Davis, CA 530-753-0533	Incorporated

Receptor	Address and Telephone Number	Area of County
St. John's Preschool	434 Cleveland St, Woodland, CA 530-662-0764	Incorporated
St. Lukes Nursery School	515 2nd St, Woodland, CA 530-662-1853	Incorporated
St. Paul's Lutheran Church	625 W Gibson Rd, Woodland, CA 530-662-1935	Incorporated
Storybook Cottage	2475 Higgins Rd, West Sacramento, CA 916-371-4644	Incorporated
Tender Learning Care	1818 Lake Blvd, Davis, CA 530-756-5351	Incorporated
Winters Parent Nursery School	208 4th St, Winters, CA 530-795-4659	Incorporated
Woodland Parent Nursery School	655 4th St, Woodland, CA 530-662-3878	Incorporated
Woodland Preschool & Day Care	1616 West St, Woodland, CA 530-662-0994	Incorporated
YMCA Pre-School & Day Care	1300 College St, Woodland, CA 530-662-1086	Incorporated
Zamora Child Development Center	1716 Cottonwood St, Woodland, CA 530-666-1180	Incorporated
Hospitals		
Cottonwood Healthcare Center	625 Cottonwood St, Woodland, CA 530-662-9193	Incorporated
Courtyard Health Care Center	1850 E 8th St, Davis, CA 530-756-1800	Incorporated
Cowell Student Health Center	1 Shields Ave, Davis, CA 530-752-2300	Incorporated
Sierra Health Care Convalescent	715 Pole Line Rd, Davis, CA 530-756-4900	Incorporated
Stollwood Convalescent Hospital	135 Woodland Ave, Woodland, CA 530-662-9674	Incorporated
Sutter Davis Hospital	2000 Sutter Pl, Davis, CA 530-756-6440	Incorporated
Woodland Healthcare	1325 Cottonwood St, Woodland, CA 530-662-3961	Incorporated
Woodland Memorial Hospital	1207 Fairchild Ct, Woodland, CA 530-669-3937	Incorporated

Receptor	Address and Telephone Number	Area of County
Convalescent Homes		
Alderson Convalescent Hospital	124 Walnut St, Woodland, CA 530-662-9161	Incorporated
Californian Alzheimer's Residence	1224 Cottonwood St, Woodland, CA 530-666-2433	Incorporated
Covell Gardens	1111 Alvarado Ave, Davis, CA 530-756-0700	Incorporated
Cypress Acres	1366 Cypress Ln, Davis, CA 530-872-8809	Incorporated
Laura's Elder Lodge	1390 Apple Ct, Woodland, CA 530-661-0773	Incorporated
Palm Gardens Assisted Living	240 Palm Ave, Woodland, CA 530-661-0574	Incorporated
Rainbow House	1515 Coloma Way, Woodland, CA 530-669-7679	Incorporated
Rosewood Care Center	16730 County Road 87, Esparto, CA 530-787-1719	Unincorporated
Sommerset Nursing Center	2215 Oakmont Way, West Sacramento, CA 916-371-1890	Incorporated
St. John's Retirement Village	135 Woodland Ave, Woodland, CA 530-662-1290	Incorporated
University Retirement Community	1515 Shasta Dr, Davis, CA 530-747-7000	Incorporated
Woodland Skilled Nursing Facility	678 3rd St, Woodland, CA 530-662-9643	Incorporated

- **Wind Power** - The original form of wind power was the windmill, but today wind power is generated from large fans or propellers that when spun by the wind, drive turbines that in turn create electricity.

Natural Gas

According to the California Department of Conservation (California Department of Conservation 2004) there are many gas fields located within Yolo County. The 1982 Energy Plan for Yolo County (ADM Associates, Inc. 1982) listed Yolo County estimated natural gas reserves at 117,402 million cubic feet. Further research would be needed to determine the extent of present day county-wide reserves, as the data listed is from 1978, approximately twenty-six years old. However, based on the 2002 annual report of the State Oil & Gas Supervisor (California Department of Conservation 2003), nearly all of these fields have been abandoned and there are presently no identified reserves in the county. See the Soil and Mineral Resources section of this document for more information and Figure Energy-1 for locations of natural gas pipelines in the County.

Hydroelectric Energy

The Yolo County Flood Control and Water Conservation District (YCFCWCD) owns two hydroelectric plants, one at Indian Valley and one at Clear Lake (Yolo County Flood Control and Water Conservation District 2004). The hydroelectric project below Clear Lake was planned and constructed by the YCFCWCD and has a rated capacity of 1750 kW. The operation of the power plant is incidental to the District's operation of its facilities for water supply (as is the case with the Indian Valley facility). The Indian Valley hydroelectric plant was built by an independent partnership. The District acquired the hydroelectric plant from the partnership in 1999.

Geothermal Energy

According to the California Energy Commission, no Known Geothermal Resource Areas (KGRAs) are located within Yolo County (California Energy Commission 2002a).

Wind Energy

Wind power is not currently developed within Yolo County (ADM Associates, Inc. 1982), however, a portion of western Yolo County is noted on the most recent California Wind Resources map (California Energy Commission 2002b) as a wind resource area with winds between 11 and 14 miles per hour. The Yolo County Energy Plan (ADM Associates, Inc. 1982) noted this area as a wind

resource area, and indicated that large-scale application of wind power for electrical generation appears to be both technically and economically feasible.

Solar Energy

Yolo County receives abundant insolation due to the climate and latitude (ADM Associates, Inc. 1982). Potential for solar energy utilization exists in all sectors – residential, commercial, industrial, and agricultural. As fuel prices fluctuate and industry payback requirements vary, solar energy may or may not be economically viable in certain sectors or certain regions within the County (ADM Associates, Inc. 1982), but it remains an existing energy resource that may be utilized as an alternative to traditional energy sources. Further research would be needed to determine economic viability in the current economy. Davis is a center for research and innovation in solar power, and is home to a number of companies in the solar power industry.

The City of Davis currently leases the Davis Photovoltaics for Utility Scale Applications solar panels and research facility (PVUSA) to a private company for operation. Energy generated at this site goes into the energy grid and the City of Davis receives credits for the energy generated. PVUSA currently has the authorization to generate 1 Megawatt of power (California Solar Center 2002 and Gedestad pers comm.).

Cache Creek Casino Resort recently commissioned a 307.2 kW photovoltaic (PV), or solar electric, power generation station on the resort's grounds. Made up of more than 1,000 ASE 300 series modules, the installation is the largest of its type owned by a casino resort. The array will produce electricity equivalent to the requirements of about 73 homes a year for at least the next 25 years (RWE Schott Solar 2004).

Existing Power Plants

Three power plants are located within Yolo County – one oil/gas facility and two waste-to-energy (WTE) facilities. All of the plants are currently operational and within the PG&E service area. The oil/gas facility is the 3-Megawatt (MW) UCD plant, which was first brought online March 26, 1982. Primary fuel for this facility is natural gas. The 28-MW Woodland Biomass Power LTD was the first of the WTE facilities to be brought online (August 1, 1989) and uses agricultural wastes and woodwastes as primary fuel. The 2.85-MW M.M.-Yolo Power LLC Facility is the second WTE and was brought online most recently, on December 1, 1998. The primary fuel for this facility is landfill gas. (California Energy Commission 2004).

Hydrogen Fuel

UCD has a hydrogen fueling station that supports the hydrogen enriched natural gas bus and Toyota fuel cell hybrid vehicle demonstration programs (University of California, Davis 2004). The station is located at the Unitrans Maintenance Yard on Garrod Drive in Davis, California and was installed by Air Products and Chemicals, Inc. The station provides both hydrogen enriched natural gas for refueling transit buses and pure hydrogen for refueling fuel cell vehicles, and is expected to deliver more than 15 kg of hydrogen daily when both programs (transit buses and fuel cell vehicles) have all of their vehicles operating (University of California, Davis 2004).

Title 24, Part 6, California Code of Regulations

Title 24, Part 6 of the California Code of Regulations pertains to California's Energy Efficiency Standards for Residential and Nonresidential Buildings. These standards were established in 1978 in response to a legislative mandate to reduce California's energy consumption (California Energy Commission 2005). The standards are updated periodically to allow consideration and possible incorporation of new energy efficiency technologies and methods. The 2001 Standards are the current standards. The 2005 Standards will take effect October 1, 2005, and will supersede the 2001 Standards. Projects that apply for a building permit on or after this date must comply with the 2005 Standards (California Energy Commission 2005).

California's building efficiency standards (along with those for energy efficient appliances) have saved more than $36 billion in electricity and natural gas costs since 1978. It is estimated the standards will save an additional $43 billion by 2013 (California Energy Commission 2005).

Agriculture

Introduction

The purpose of this Background Report is to update the Yolo County Agricultural Element Background Report dated November 2000, which assembled data for the period up to 1998, and in some cases, 2000. Information in this update will be used for the preparation of an updated Yolo County General Plan and the related environmental document prepared for the General Plan update.

Sources of Information

The following sources of information were used in developing this report:

- Data from the California Department of Conservation, Division of Land Resource Protection, Farmland Mapping Project Update, the USDA 2002 Census of Agriculture, the Yolo County Agricultural Commissioner's Reports, 1983 to 2003, the Yolo County budget, and the 2000 Yolo County Agricultural Element Background Report.
- Conversations with farmers, the Yolo County Agricultural Commission, and the UC Farm Advisor for Yolo County, Yolo County Flood Control and Water Conservation District.
- Data developed for this report by the County Assessor and County Planning Department on parcel sizes and agricultural land uses.

Regulations That Affect Agricultural Land

The Yolo County Zoning Ordinance includes the following zoning designations for agriculture:

- **A-1: Agricultural General Zone.** This zone provides uses on lands best suited for agriculture. The minimum lot area is 20 acres. Principal permitted uses include agricultural uses (including agricultural buildings or structures), one single-family dwelling, public parks, rural recreation, and various accessory uses.
- **A-P: Agricultural Preserve Zone.** This zone preserves land best suited for agricultural use from the encroachment of nonagricultural uses. The A-P Zone is intended to be used to establish agricultural preserves in accordance with the California Land Conservation Act of 1965, as amended. Uses approved on contracted land must be consistent and compatible with the provisions of the Act. Authorized uses do not include Agribusiness Development Park Areas. The minimum lot area is 80 gross acres where the soils are capable of cultivation and are irrigated, 160 gross acres where the soils are capable of cultivation but are not irrigated, and 320 gross acres where the soils are not capable of cultivation (including rangeland and lands which are not income producing). The minimum acreage requirement for establishment of an Agricultural Preserve is 100 acres total. Principal uses include agricultural uses (including agricultural buildings or structures), one single-family dwelling, public parks, rural recreation, and various accessory uses.
- **A-E: Agricultural Exclusive Zone.** This zone provides uses for lands best suited for agriculture. The minimum lot area is 20 acres. This zone is very little used. Principal permitted uses are the same as those specified for the A-1 Zone. Conditional uses that are authorized by a Minor Use Permit upon review and approval by the Zoning Administrator, as well as conditional uses

authorized by Major Use Permit upon review and approval by the Planning Commission, are the same as those listed under the A-1 Zone above.

- **AGI: Agricultural Industry Zone.** This zone designates lands in rural areas for uses directly related to agricultural industry. There is no minimum acreage requirement, except where natural barriers, health or safety issues, environmental, or existing rail or highway facilities require.

Agricultural Mitigation Requirements

The Yolo County Zoning Ordinance was amended in 2000 to incorporate mitigation requirements for agricultural land conversion, that is, the change from an agricultural zoning classification to a non-agricultural zoning classification by County approval. Every one acre of agricultural land changed to a non-agricultural zoning classification shall be mitigated on a 1:1 ratio. Permitted mitigations are:

- Granting in perpetuity a farmland conservation easement or similar instrument to the County or another qualifying agency; or
- Payment of an in-lieu fee sufficient to purchase a farmland conservation easement or similar instrument.

Eligible lands for this mitigation must meet the following criteria:

- They must have comparable or better soil than the land being converted to non-agricultural use, based on Storie Index;
- They shall have a comparable or better water supply and any associated water rights must remain within the mitigation land;
- They must be located in Yolo County within a two-mile radius of the land being converted to non-agricultural use, or if such is unavailable mitigation land outside the two mile radius must be of equal or better conservation easement market value to the lands inside the two mile radius area;
- Land previously encumbered by any other agricultural conservation easement shall not qualify, but overlapping habitat easements may qualify.

Williamson Act Contracts

The California Legislature passed the California Land Conservation Act, better known as the Williamson Act, in 1965 to preserve agricultural and open space lands. The Act creates an arrangement whereby private landowners contract with counties and cities to voluntarily restrict land to agricultural and open-space uses. These contracts endure for an annually renewing ten-year period, during which time the property cannot be re-zoned or developed for uses other than agriculture or open space and recreation area. In turn, the land is taxed at a rate consistent

with its actual use rather than being taxed at market value. For agricultural properties, the basis is the agricultural income potential of the land.

The annually renewing ten-year period clause in the contract automatically renews the contract each year. Either party to the contract may file a "notice of non-renewal," which ends the automatic renewal; however, the property will remain subject to the contract for the remaining nine-year term of the contract. Outright cancellations and recisions of the contracts, which can be initiated only by the landowner, are subject to specific legal findings supported by substantial evidence by the county or city involved. There has been only one instance of cancellation in Yolo County throughout the 39-year history of the Williamson Act.

By state law, only land located in an agricultural preserve is eligible for a Williamson Act Contract. In Yolo County, this agricultural preserve has the zoning designation, AP, Agricultural Preserve (see above). The California Department of Conservation estimates that Williamson Act Contracts save agricultural landowners from 20 percent to 75 percent in property tax liability each year.

Acres by Zoning

Table Ag-1 presents current approximate acreages within each zone in Yolo County. As shown in Table Ag-1, A-P is the most extensively applied zone in the county, encompassing approximately 475,938 acres, followed by 133,560 acres in the A-1 zone.

Table Ag-1. Acres by Agricultural Zoning Category

Zone	Acres in 2002	Acres in 2004	Change
A-1	128,336	133,560	5,224 (+)
A-P	477,218	475,938	1,280 (-)
A-E	1,655	1,635	None
AGI	23	26	3 (+)
Total	607,232	611,159	3,927 (+)

Source: Yolo County Planning Department, September 2004. Figures for 2000 are from the *Yolo Agricultural Element Background Report*. November 2002.

Since 2000, Zone A-1 has increased 5,224 acres, up from 128,336 acres in 2000 to 133,560 acres in 2004. Since 2000, Zone A-P has decreased 1,280 acres, down from 477,218 acres in 2000 to 475,938 acres in 2004.

Parcel Size

Table Ag-2 classifies the land parcels of unincorporated Yolo County into five size groups and reports current numbers of parcels and acres in each group.

These statistics define parcels by APNs (assessors' parcel numbers), not by legal lots. It is important to note that APNs do not define legal lots, though the two may correspond; the classification of land parcels into APNs does not reflect or grant land subdivision rights.

Table Ag-2a. Parcel-Size Distribution in Unincorporated Yolo County, 2004

Parcel Size (acres)	Parcel Count	Total Acreage
< .09	505	17
.09 to < 40	6,992	49,191
≥ 40 to 100	1,278	86,200
≥ 100 to 200	964	141,629
≥ 200	880	336,127

Source: Yolo County Planning Department, September 2004.

Table Ag-2b. Change in Parcel-Size Distribution from 2000 to 2004

Parcel Size (acres)	Acreage in 2002	Acreage in 2004	Change
< 40	48,769	49,208	439 (+)
≥ 40 to 100	85,530	86,200	670 (+)
≥ 100 to 200	138,831	141,629	2,789 (+)
≥ 200	338,432	336,127	2,305 (+)

Source: Yolo County Planning Department. September 2004. Figures for 2000 are from the *Yolo Agricultural Element Background Report,* November 2000.

Parcel size is an important indicator of the viability of properties for commercial agricultural use. While some crops such as vegetable crops, wine grapes, and nursery products can be commercially grown on properties less than 40 acres in size, the principal field crops of Yolo County generally require large parcels for efficient production. Supporting data for this is available in numerous cost of production studies by the University of California Cooperative Extension, and from the Yolo County Agricultural Commissioner's farm site identification file which includes the size of each farmed field in the County. As is evident by the table, parcels larger than 100 acres dominate the acreage of Yolo County.

It is important to note that the final group, of parcels greater than 200 acres, had 338,432 acres in 1998, and thus has declined 2,000 acres in this five-year period. All the remaining groups gained some of this acreage from 1998 to 2003.

Agricultural Resources

Important Farmlands

The Natural Resources Conservation Service Division of the U.S. Department of Agriculture has classified Important Farmland in Yolo County by the following categories:

- Prime Farmland - Farmland with the best combination of physical and chemical features able to sustain long-term production of agricultural crops.
- Farmland of Statewide Importance - Farmland similar to Prime Farmland but with minor shortcomings, such as greater slopes or with less ability to hold and store moisture.
- Unique Farmland - Farmland of lesser quality soils used for the production of the state's leading agricultural crops.
- Farmland of Local Importance - Land of importance to the local agricultural economy, as determined by each county's board of supervisors and a local advisory committee.
- Grazing Land - Land on which the existing vegetation is suited to the grazing of livestock.
- Urban and Built-up Land - Land occupied by structures with a building density of at least one unit to one and one-half acres, or approximately six structures to a ten-acre parcel.

The Farmland Mapping and Monitoring Program, a part of the California Department of Conservation, tracks the acreage of these land-use categories in Yolo County and releases the *California Farmland Conversion Report* every two years to document what has changed. These reports are the source of the data in the following tables.

Table Ag-3 below indicates the acreage of Yolo County farmland that falls into each category. The table shows a loss in total net acreage from 1998 to 2002 of 12,950 acres. During that same period Urban and Built-Up land showed a total net increase of 1,631 acres, and Other Land, a net increase of 10,869 acres. This category of Other Land includes conversion of important farmlands into uses such as wildlife sanctuaries, habitat, etc.

Table Ag-3. Important Farmland Acreage in Yolo County, 1994–2002

Year	Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Grazing Land	Total
1992*	271,534	191,400	60,448	76,359	137,697	565,178
1994	270,403	18,740	60,199	73,382	142,570	565,294
1996	269,149	18,804	59,700	73,118	143,261	564,032
1998	265,916	18,204	55,245	74,301	143,384	557,050
2000	261,461	18,031	54,533	75,771	143,365	553,161
2002	261,648	18,006	54,587	66,351	143,508	544,100

* Note that figures from 1992 are not directly comparable to subsequent years due to a change in mapping methods used from 1994 onward.

Source: California Department of Conservation 2004.

Table Ag-4 below presents a detailed version of the same information in Table Ag-2 for the years 2000 to 2002. Changes in acreage have such causes as city annexation, changes in crops (which can cause farmland of one category to change into another), conversion from cultivated land to pasture or vice versa, fallowing, dry-farming, or conversion from annual crops to perennial crops.

Table Ag-4a. County Summary and Change by Land-Use Category

Land-Use Category	Total Acreage 2000	Total Acreage 2002	Acres Lost	Acres Gained	Total Acreage Changed	Net Acreage Changed
Prime Farmland	261,461	261,648	2,747	2,934	5,681	187
Farmland of Statewide Importance	18,031	18,006	977	952	1,929	-25
Unique Farmland	54,533	54,587	2,519	2,573	5,092	54
Farmland of Local Importance	75,771	66,351	10,764	1,344	12,108	-9,420
Important Farmland Subtotal	409,796	400,592	17,007	7,803	24,810	-9,204
Grazing Land	143,365	143,508	2,939	3,082	6,021	143
Agricultural Land Subtotal	553,161	544,100	19,946	10,885	30,831	-9,061
Urban and Built-up Land	25,957	27,217	312	1,572	1,884	1,260
Other Land	66,513	74,314	1,027	8,828	9,855	7,801
Water Area	7,821	7,821	0	0	0	0
Total Area Inventoried	**653,452**	**653,452**	**21,285**	**21,285**	**42,570**	**0**

Table Ag-4b. Land Committed to Non-Agricultural Use

Land-Use Category	Acres 2002
Prime Farmland	512
Farmland of Statewide Importance	38
Unique Farmland	26
Farmland of Local Importance	695
Important Farmland Subtotal	1,271
Grazing Land	129
Agricultural Land Subtotal	1,400
Urban and Built-up Land	0
Other Land	611
Water Area	0
Total Acreage Reported	**2,011**

Note: This table adds up the acreage of land expected to be developed; this is based on voluntary submissions by local governments and developers and is separate from the data in 2-2a and 2-2c.

Water Usage

Water usage by agriculture, as measured by Yolo County Flood Control and Water Conservation District, has increased in the past few years with the increased acreage of rice and alfalfa hay. Over a longer time perspective, however, water usage by agriculture has remained relatively constant. Expectations are for agricultural water usage to remain at or near current levels for the foreseeable future, although loss of productive land to development and/or fallowing due to construction of rural residences may ultimately reduce water demand and usage by agriculture in Yolo County.

Agricultural Land Use Patterns and Trends

Yolo County's agricultural landscape in 2003 is dominated by field crops, irrigated and non-irrigated (chiefly alfalfa hay, wheat, rice and safflower), as it was in 1998, when the total acres of field crops were 200,141 not including crop stubble and rangeland. Not including crop stubble and rangeland as field crops, the 2003 acreage of field crops is 233,600. This increase in field crop acres is due in large measure to a drop in processing tomato acres; the field crops are grown instead of tomatoes.

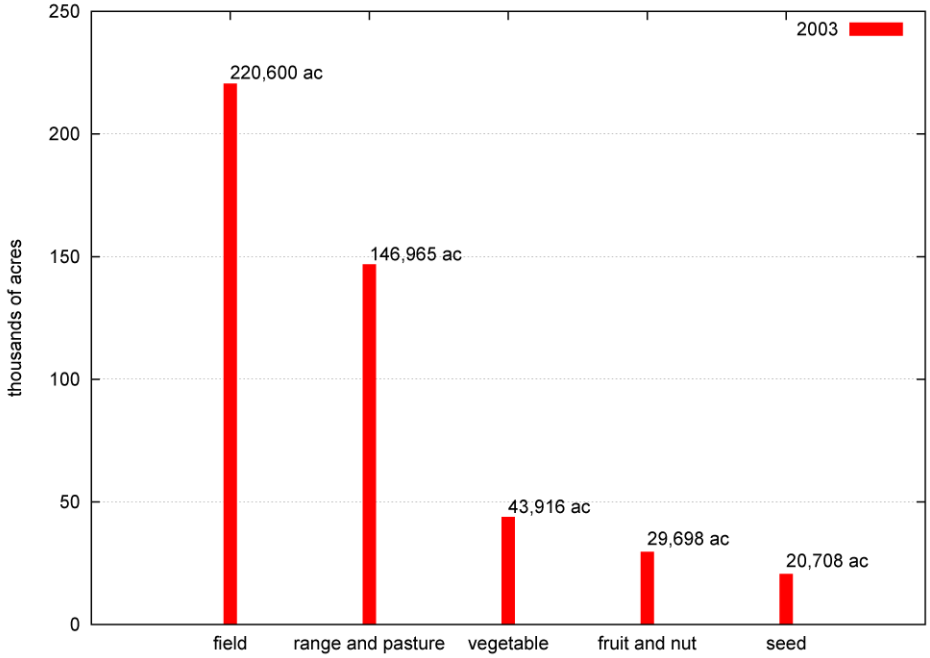
Figure Ag-1 below illustrates the relative acreages of the major five agricultural land uses in Yolo County in 2003.

Table Ag-4c. Land Use Conversion from 2000–2002

Land Use Category	Prime	Statewide Importance	Unique	Local Importance	Subtotal Important	Grazing Land	Total Agricultural Land	Urban and Built-up Land	Other	Water	Converted to Another Use
Prime Farmland	--	4	8	658	670	1	671	569	1,507	0	2,747
Farmland of Statewide Importance	2	--	1	144	147	1	148	409	420	0	977
Unique Farmland	7	1	--	162	170	332	502	61	1,956	0	2,519
Farmland of Local Importance	2,587	907	1,234	--	4,728	2,508	7,236	255	3,273	0	10,764
Important Farmland Subtotal	**2,596**	**912**	**1,243**	**964**	**5,715**	**2,842**	**8,557**	**1,294**	**7,156**	**0**	**17,007**
Grazing Land	5	0	1,037	287	1,329	--	1,329	110	1,500	0	2,939
Agricultural Land Subtotal	**2,601**	**912**	**2,280**	**1,251**	**7,044**	**2,842**	**9,886**	**1,404**	**8,656**	**0**	**19,946**
Urban and Built-up Land	63	5	11	43	122	18	140	--	172	0	312
Other Land	270	35	282	50	637	222	859	168	--	0	1,027
Water Area	0	0	0	0	0	0	0	0	0	--	0
Total Acreage Converted	**2,934**	**952**	**2,573**	**1,344**	**7,803**	**3,082**	**10,885**	**1,572**	**8,828**	**0**	**21,285**

Note: This table shows, for each land-use category, how many acres were lost and what category those lost acres became. Conversion of urban and built-up land into agricultural land or other land (312 acres total) is due to more-accurate definitions of boundaries in recent surveys than were available when the farmland mapping program began. The category "other" consists principally of wildlife habitat, for example, in the Yolo Bypass. The rightmost column is the grand total of acres that have changed from any land-use category into any other category.

Figure Ag-1. Acreages of Major Sectors in 2003



Among the leading field crops, alfalfa hay acres have increased by approximately one-third since 1998 to 55,914 acres in 2003. Alfalfa hay is likely to hover at this new higher acreage figure in the foreseeable future. Rice acres have doubled since 1998 to 37,303 in 2003, but a closer look at rice acres from 1998 to 2003 indicates substantial fluctuation year to year based on price, weather and water availability. Growth in rice acres as a continuing trend is questionable due to limitations of soil, terrain, and water availability, plus conversion of rice land to wildlife habitat. Safflower acres have fluctuated widely since 1998, achieving a high of nearly 30,000 acres in 1999, and a low of 20,674 in 2003. This primarily is due to the use of safflower as an alternate or rotation crop for tomatoes and other more valuable crops, and the contract price of safflower, which, while remaining generally stable, does occasionally spike up for a year. Notably, Yolo County is the largest producer of safflower in California. A processing plant for oil seeds, Adams Grain Co. is located just over the county line in Colusa County, on Interstate Highway 5.

Since 1998 sugar beets have completely dropped out of the field crops grown in Yolo County. No acres of beets have been planted for the past several years due to the closure of the last sugar refinery, Spreckels, in Woodland. Cotton planting has dropped dramatically from its high of over 4000 acres in 1997. Low quality lint, fetching low prices is the primary cause.

A significant portion of the county is rangeland used for grazing: 133,965 acres in 2003, down from 136,368 in 1998 (these figures include a small amount of crop stubble grazing). These lands are traditionally reported by the Yolo County Agricultural Commissioner as field crops, but they are separated here to highlight their significance as a land use in Yolo County. While they do not generate substantial gross agricultural income when compared to other crops grown in

Yolo County, their acreage is substantial. The use of this land, primarily hilly and mountainous terrain, as rangeland will persist in the future especially if Williamson Act taxation rates and zoning prohibitions on development continue in the County.

Vegetable crops, primarily processing tomatoes, are common in the Yolo County low lands or level landscape. Long the highest gross income-producing crop in Yolo County, processing tomato acreage has declined by approximately one-third since 1998 to 38,274 acres in 2003, due to loss of local canneries, and increasing costs without corresponding increase in price. One bright spot is the re-opening of the old Del Monte cannery in Woodland under the new ownership of Pacific Coast Producers, a grower cooperative. Processing tomato acreage in Yolo County is expected to remain stable at present levels for the foreseeable future, and processing tomatoes will remain an important economic crop in Yolo County. Growers expect continuing emphasis on technological improvements to production.

Fruit and nut crops acreage have increased a modest 10% since 1998 to 29,698 in 2003. The number of growers growing these crops has also increased. These high-value crops require a large capital investment during their planting and development period (they are non-productive for several years before reaching maturity), have prices subject to world demand, and are subject to global trends in planting and production. California currently enjoys a strong global market presence in almonds and walnuts, and is a significant world producer of wine grapes as well. Yolo County has established itself as a producer of good quality wine grapes, with appellations for the Clarksburg area, the Capay Valley, and the Dunnigan Hills area. Modest growth in Yolo County is expected in all three crops in the future. Wine grapes are the largest single crop in this category of Fruit and Nuts, at 10,334 acres in 2003, up from 8,410 acres in 1998. Prunes are one crop in this category that has dropped: there are 2,317 acres of prunes in Yolo County as of 2003, down from 3,248 in 1998. Despite some good years, low prices have plagued this crop during this period.

Seed crops include both certified and non-certified seed and encompass a wide variety of species, including sunflowers, small grains, and vine seeds. The acreage of seed crops in Yolo County has declined approximately 8% since 1998 to 20,708 acres in 2003. These seed crops are an important rotation crop for the row crop farmers who grow them, as the prices received are often pre-contracted, thus lowering risk to the farmer. The prices received have typically been well above the cost of production, thus making the seed crops a profitable crop to keep in the crop rotation.

Livestock produced in Yolo County is primarily beef cattle and lamb. While lamb production (number of head and dollar value) has not changed significantly from 1998 to 2003, beef cattle has seen an increase in both numbers produced and dollar value, approximately 10% more production, and approximately 37% greater value. Cattle prices fluctuate widely year to year, but an overall trend of increasing gross value in Yolo County is evident.

Milk production in Yolo County has increased nearly threefold since 1998. The 2003 gross value of milk produced in the County was $5,792,000, up from $1,553,000 in 1998. The Yolo County Agricultural Commissioner attributes this largely to expansion in the number of milking cows at existing dairies.

Plots of Historical Production and Acreage

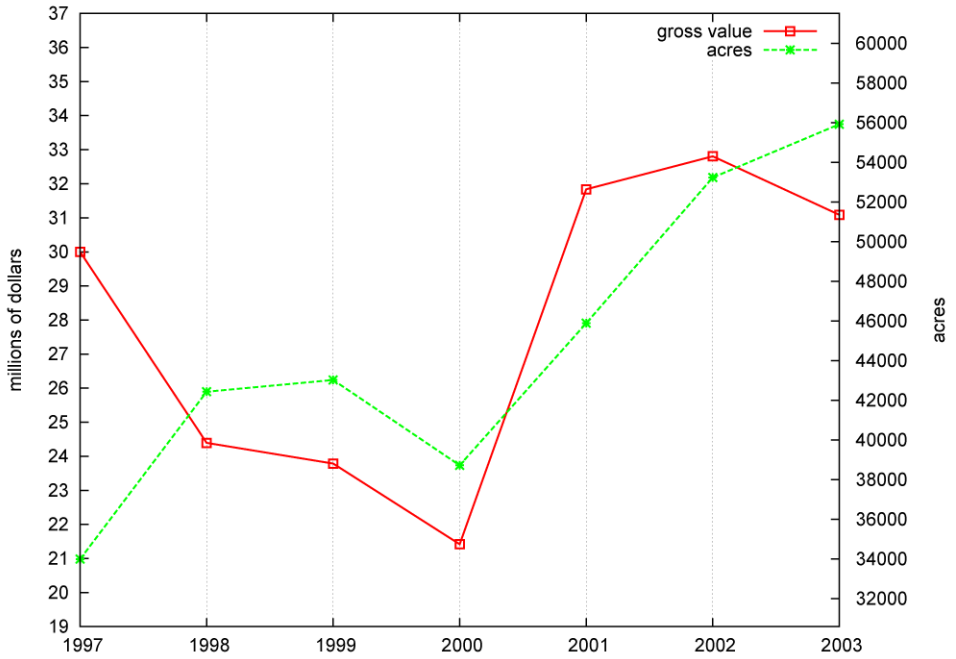
Figure Ag-2. Almonds

Note: Almonds show approximately 10% increase in acreage from 2000 to 2003. Income more than doubles, due to several years of very high prices.

Figure Ag-3. Wine Grapes

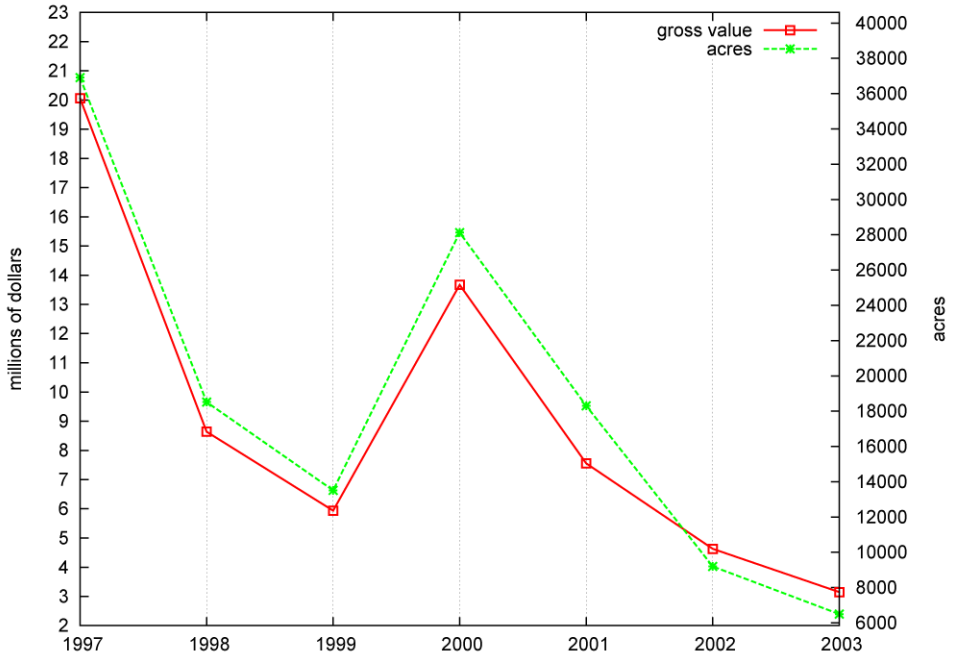
Note: Wine grapes continued to grow in acreage, up about 10% from 2000 to 2003. Income has fluctuated one-quarter to one-third annually, due to yield and price variation, especially the latter.

Figure Ag-4. Alfalfa Hay



Note: Steady growth in acres since 2000. Income showed a strong surge in 2001 due to significant price increase as well as more planted acres. Flat income since 2001 indicates falling prices.

Figure Ag-5. Field Maize



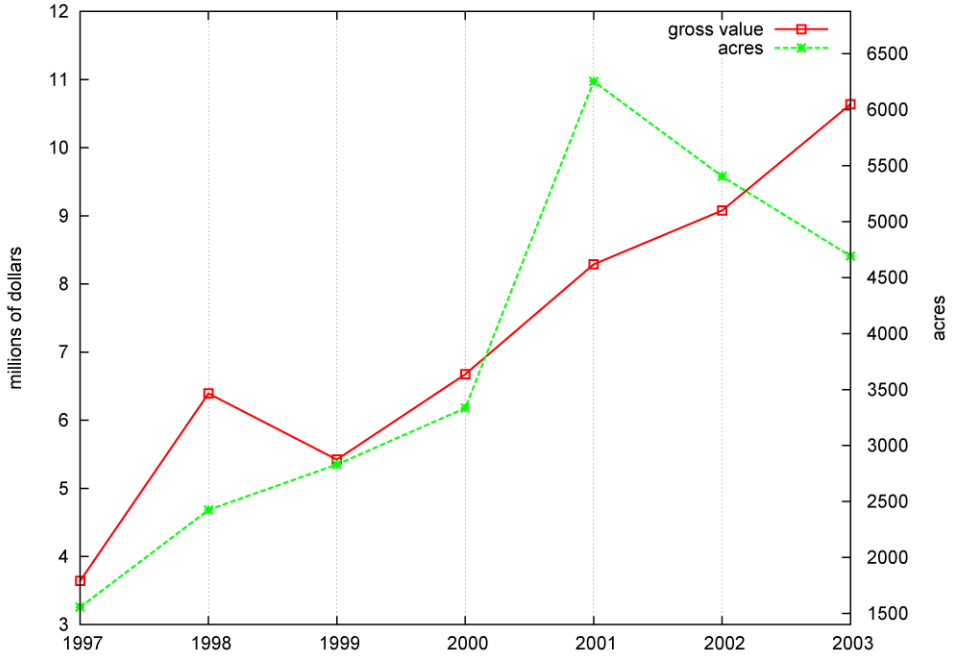
Note: Acres and gross income in sharp decline since 2000, on the order of an 80% decline over the 3-year period 2001-2003.

Figure Ag-6. Hay/Oats

Figure Ag-7. Honeydew Melons

Note: Acreage relatively stable between 3000 and 4500 acres. Income has good and poor years but concentrates in the $6-to-$8 million range since 2000.

Figure Ag-8. Organic Production



Note: Acreage was down in 2002 and 2003 from a high in 2001. There has been a steady increase in income from $6½ million in 2000 to over $10 million in 2003.

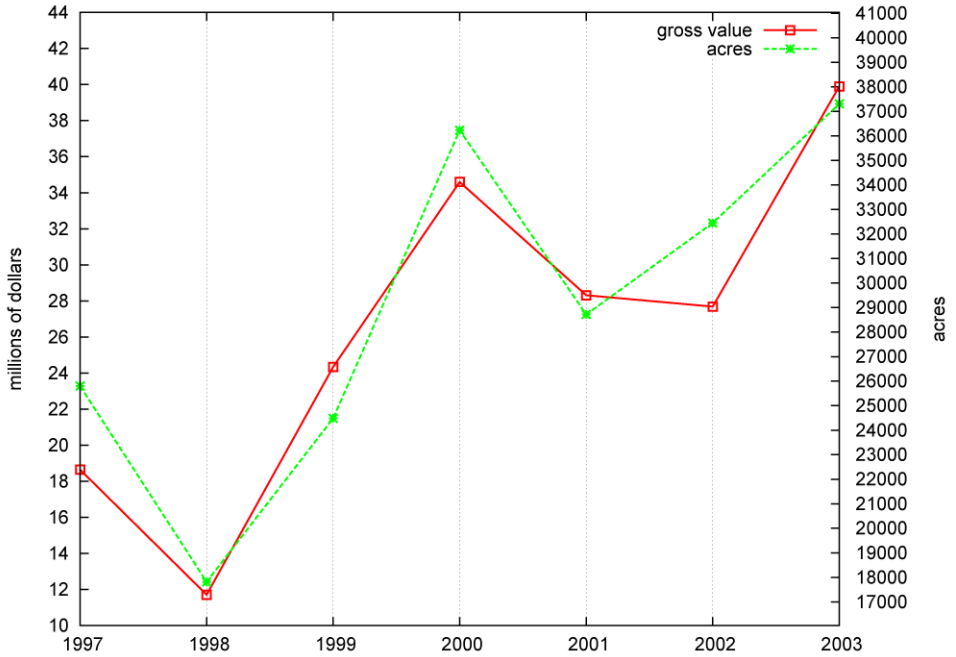
Figure Ag-9. Irrigated Pasture

Note: Acreage flat, with a trend of increasing income since 2000.

Figure Ag 10. Other Pasture

Note: Acreage trending upward since 1999. Income relatively flat at about 1¼ million over the 7-year period 1997–2003.

Figure Ag-11. Rice

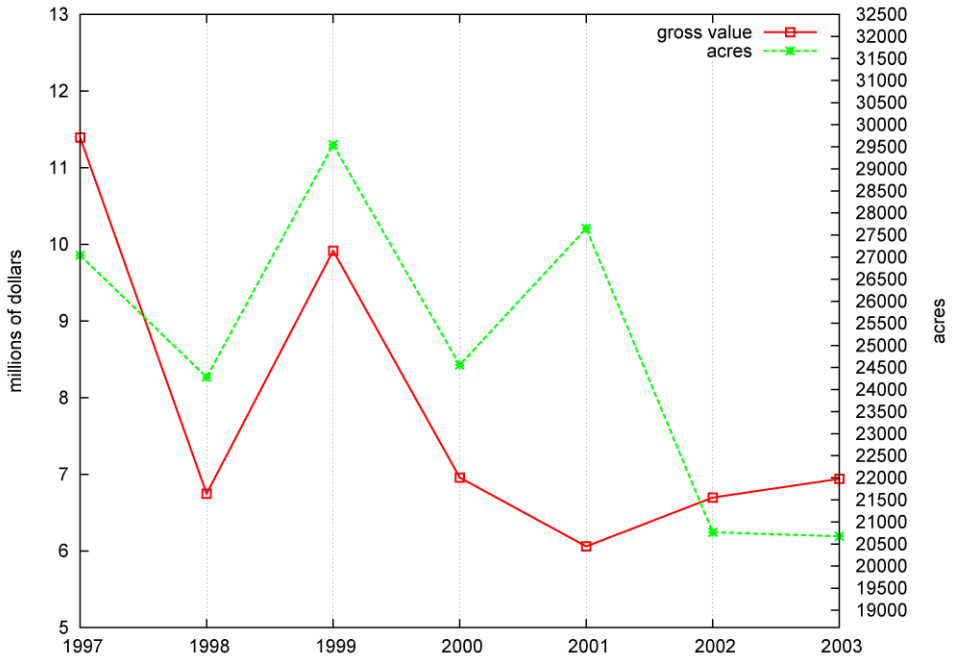


Note: Strong correlation between acreage and income for this government-subsidized crop. The yield has been relatively stable. Due to high prices caused by poor crops in competing supplier countries, 2003 was an especially good year. Note: includes seed.

Figure Ag-12. Prunes (dried)

Note: Severe acreage drop in 2000-2001 (about 50%). Good prices in 2002 and 2003 made a sharp rebound for gross income. The 2004 crop is very poor due to unfavorable springtime weather.

Figure Ag-13. Safflower



Note: Acreage and income show a fair comeback. The price has been generally stable. Acreage has varied widely year-to-year as this relatively low-cost crop serves, like wheat, as a rotation and as an absorber of acreage unclaimed by tomatoes or other high-value crops.

Figure Ag-14. Processing Tomatoes

Note: Income and acreage declining since 1996. Price and yields have been relatively stable. Increasing costs and a lack of demand by processors affect acreage and income. This is still a very significant crop on Yolo County, at about 38,000 acres and $60 million value in 2003.

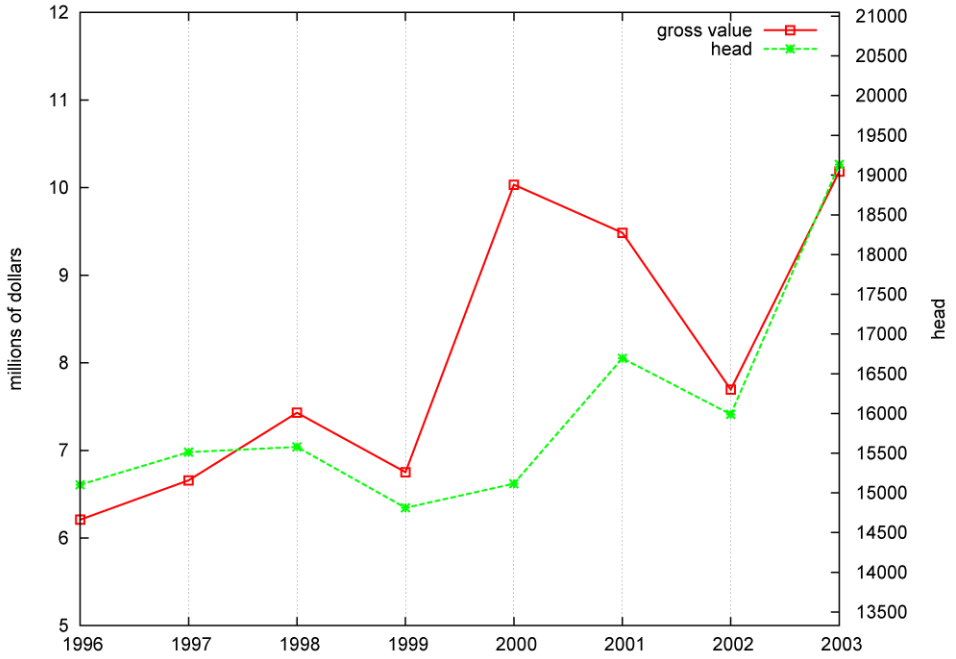
Figure Ag-15. Walnuts

Note: Acreage increasing; income is following this trend at a slower pace.

Figure Ag-16. Wheat

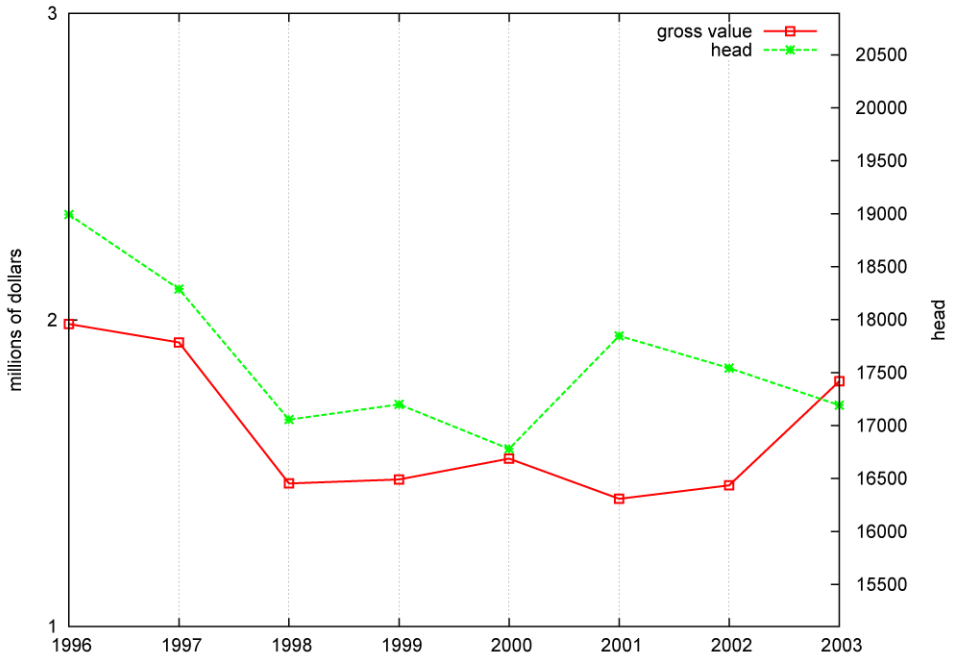
Note: This crop is grown as a rotation for other more valuable crops. Its acreage varies based on value and demand of other crops. Price does not often vary strongly (but does occasionally run up or down significantly).

Figure Ag-17. Cattle



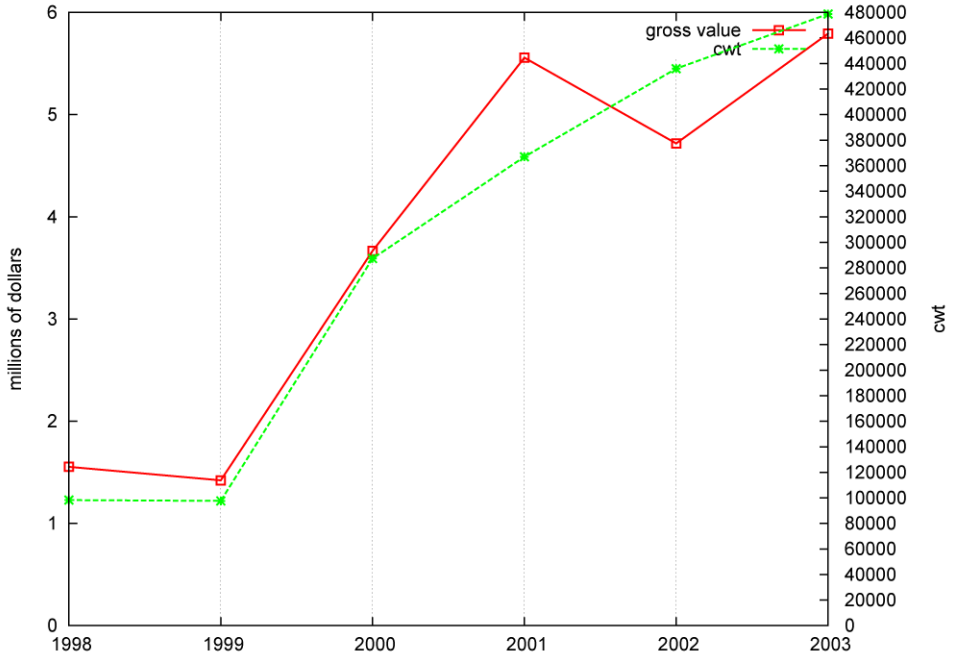
Note: Overall upward trend for both income and total number of head.

Figure Ag-18. Lambs



Note: Number of head in slow decline. Prices were down 1998-2002, but improved slightly in 2003.

Figure Ag-19. Milk



Note: Production has increased steadily and income has more-or-less followed.

Areas Identified by the Agricultural and Tourism Targeted Industry Analysis

Agricultural Technology and Business Related to Agriculture

New Technologies

New agricultural technologies identified for Yolo County in the *Agricultural and Tourism Targeted Industry Analysis Final Report,* (Yolo County 1996), are divided into two groups. The first group includes agricultural software, computer technology, and robotics, and would be used primarily by other agricultural technology companies. The second group, which would be used directly by farmers and ranchers, includes specialty fertilizers, moisture sensing equipment for irrigation control, "precision" farming based on use of geographic information systems, remote sensing, biotechnology, including biorational products and genetically engineered plants, seeds and products, and sustainable farming practices. Computer software may also be used directly by agricultural operators for business management and other purposes.

Some of the new agricultural technologies, such as "precision" farming and moisture sensing equipment for irrigation aim to increase farming efficiency by conserving water or applying just the right amount of agricultural chemicals based on highly site specific data. Others of these new technologies provide new products or techniques that have environmental benefits. Biorational products,

which manage pests through biologically based means, or non-toxic behavioral chemicals, are one such example. Sustainable farming practices, another such example, focus on techniques rather than products to deliver environmental benefits. The USDA policy goals and recommendations for small farms (National Commission on Small Farms, 1997) include recommendations emphasizing sustainable agriculture as a profitable, ecological and socially sound strategy.

The presence of UC Davis, a premier location for agricultural research internationally, positions Yolo County to be in the forefront for the continued research and application of these new technologies.

Agricultural Biotechnology

Agricultural biotechnology is identified in the *Agricultural and Tourism Targeted Industry Analysis Final Report* as the use of living organisms, including microbes, plants, and animals, or material produced from living organisms, to produce useful products such as pest and disease resistant crops, improved foods and animal vaccines. It includes enzymes produced in fermentation processes, biorational and natural pest control products, genetically transformed food and animal products, and the use of plants to produce human therapeutics. The report identified the following opportunities for business expansion in agricultural biotechnology:

- Biotechnology research and development companies
- Animal-oriented agricultural biotechnology companies
- Domestic and international seed companies
- Agricultural biotechnology production companies
- Start-up agricultural biotechnology companies
- See and chemical companies
- Advanced agricultural technologies

The *Sacramento Business Journal* lists the top 25 biotechnology companies in the Sacramento region (*Sacramento Business Journal,* "2003 Top 25 Book of Lists", December 2003). Of the 25 firms, 23 biotechnology firms are located in Yolo County. Twelve of these concentrate on agricultural biotechnology. These companies are clustered in or near Davis, Woodland and West Sacramento. The largest biotechnology firm, Seminis Vegetable Seeds, Inc., has 165 local employees.

Agricultural biotechnology was ranked second as a targeted industry in Yolo County's agribusiness attraction program in the Agriculture and Tourism Report. Competitive advantages in Yolo County include the presence of UC Davis, the existing cluster of agricultural technology companies, the diversity of crops, a receptive farming community, and proximity to the San Francisco Bay Area. Due to these factors, biotechnology development is growing in importance as an agriculturally related industry in Yolo County.

Genetically modified crops are a small portion of the crops in Yolo County overall, but their use is increasing. We do not know their actual extent, since there exists no mechanism to track the locations of genetically modified crops or measure their usage. Field maize and soybeans are the main genetically modified crops in Yolo County.

Organic farmers in Yolo County have raised a concern because federal law prohibits genetic engineering in organic crops. The concern is the possibility of cross-pollination between proximate like crops, one grown organically, one grown using genetic engineering. Such cross-pollination would de-certify the organic product, and possibly the organic parcel as well.

Agri-Tourism

According to the *Agricultural and Tourism Targeted Industry Analysis Final Report*:

> Agri-tourism is an even more recent phenomena [than eco-tourism] which is built on a strong family focus. Entrepreneurial growers and ranchers have opened their farms for day visits, overnight stays and week-long "working" vacations with foods prepared from seasonally available produce and cooked in the kitchens of host farms. Roadside fruit and vegetable stands, farmers markets, and you-pick-em gardens are all part of the movement which began among organic growers to come in to direct contact with the ultimate consumers of their produce.

The report points out that, while agri-tourism can bring outside revenues into the county, it is not labor-intensive and therefore does not generate significant additional employment. The report also notes that farm operators may be reluctant to increase traffic through areas where they live and work. The report presents the following "keys" to developing agri-tourism in Yolo County:

- **Involving Organic Farmers:** Organic farmers are motivated to market their produce directly to the public. Agri-tourism extends their opportunities to do this by bringing additional consumers to the farm rather than forcing farmers to seek out consumers. If this is successful, it will generate new revenues from tourists paying to visit or stay on farms while increasing sales of produce. Additionally, using Napa and Sonoma Valley wineries as examples, some of these farms can establish small restaurants featuring foods prepared from the fresh produce grown on the farm. Again, a significant, sustained promotional effort is needed to realize the full potential of this concept.
- **Involving University of California, Davis:** UCD is one of the nation's most important agricultural learning and research institutions. Involving it in agri-tourism activities would create significant employment and revenue-generating opportunities because of the reach and depth of its programs and reputation. Visits to the campus could be merged and coordinated with on-farm visits, educational workshops and classes to demonstrate new techniques and technologies. Given the positive relationship that exists

between the University and the county, it would seem possible to coordinate a continuing cross-promotional campaign to the benefit of both entities.

Wineries

As described in the previous section of this report, wine grapes continue to increase in acreage in Yolo County. Wine grapes and wineries were ranked first as a targeted industry for Yolo Count's agribusiness attraction program in the *Agricultural and Tourism Targeted Industry Analysis Final Report.* The report listed eight wineries located in Yolo County in 1996, and noted that most wine grapes in Yolo County are grown on contract for wineries outside the county. This may result in a growing demand for greater processing and aging capacity within appellation areas. At the time the report was published, approximately 49 percent of total acreage was located in the Clarksburg area, while 43 percent was located in Dunnigan and 8 percent outside the two areas. The two major vineyards, Bogle Winery and RH Phillips, are located in Clarksburg and Dunnigan, respectively.

Several factors give Yolo County a competitive advantage in this industry, including the UC Davis Department of Viticulture and Enology, climate, lower costs and production expenses, and lower land costs than Napa and Sonoma counties. Challenges faced by the industry include a shortage of water in the Dunnigan Hills region, high water tables in the Clarksburg area, and swings in wine-grape prices.

Food Processors

The Sacramento Business Journal lists the top 25 food processing companies in the Sacramento region (Sacramento Business Journal, "2003 Top 25 Book of Lists," December 2003). Of the 25 firms, 7 are located in Yolo County. Of these, two are wineries, two are rice mills, one processes nuts, one processes prunes, and one processes nut oils. It is noted by the Sacramento Business Journal that a Yolo County tomato cannery and a Yolo County sugar beet processor have gone out of business in the recent past.

Agricultural Economics

Agricultural Production and Gross Value

Table Ag-5 lists the top ten commodities in Yolo County in 1998 and in 2003, as reported by the Yolo County Agricultural Commissioner, ranked by total gross production, valued in dollars.

Table Ag-5. Top Ten Agricultural Commodities in Yolo County

Rank	1998 Crop	1998 Gross Value	2003 Crop	2003 Gross Value
1	Tomatoes, Processing	$87,900,000	Tomatoes, Processing	$61,189,000
2	Wine Grapes	$46,800,000	Rice	$39,899,000
3	Alfalfa Hay	$24,400,000	Wine Grapes	$37,366,000
4	Seed Crops	$20,600,000	Alfalfa Hay	$31,089,000
5	Rice	$11,700,000	Seed Crops	$17,943,000
6	Field Corn	$8,600,000	Wheat	$16,350,000
7	Walnuts	$7,600,000	Walnuts	$12,274,000
8	Almonds	$7,400,000	Almonds	$12,220,000
9	Cattle and Calves	$7,400,000	Organic Crops	$10,637,000
10	Wheat	$7,100,000	Cattle and Calves	$10,185,000

The table illustrates that processing tomatoes remain the single highest value crop in Yolo County by a substantial margin over a second tier of crops, wine grapes, alfalfa hay and seed crops. The crops ranked 2-5 have changed positions since 1998, but all remain in the top five.

In the ranks of 6-10, field corn has dropped out in 2003 due to much reduced acreage. Wheat has risen from tenth to sixth ranking crop, and organic crops have entered the ranks of the top ten in 2003 in the ninth spot.

In Table Ag-6, the data for prices of the commodities are compared for the two years 1998 and 2003. Prices are given for tons of the raw commodity, except for seed crops and cattle.

Table Ag-6. Price Comparison for Top Ten Commodities in Yolo County

Crop	1998 Price (ton)	2003 Price (ton)
Tomatoes, Processing	$53.28	$48.46
Rice	$188.94	$280.00
Wine Grapes	$755.65	$534.88
Alfalfa Hay	$96.62	$81.17
Seed Crops, value per acre	$916.19	$866.48
Wheat	$92.36	$102.75
Walnuts	$912.99	$1,036.69
Almonds	$3,161.12	$2,561.83
Organic Crops	not calculated	not calculated
Cattle and Calves, in hundredweights	$64.03	$79.94

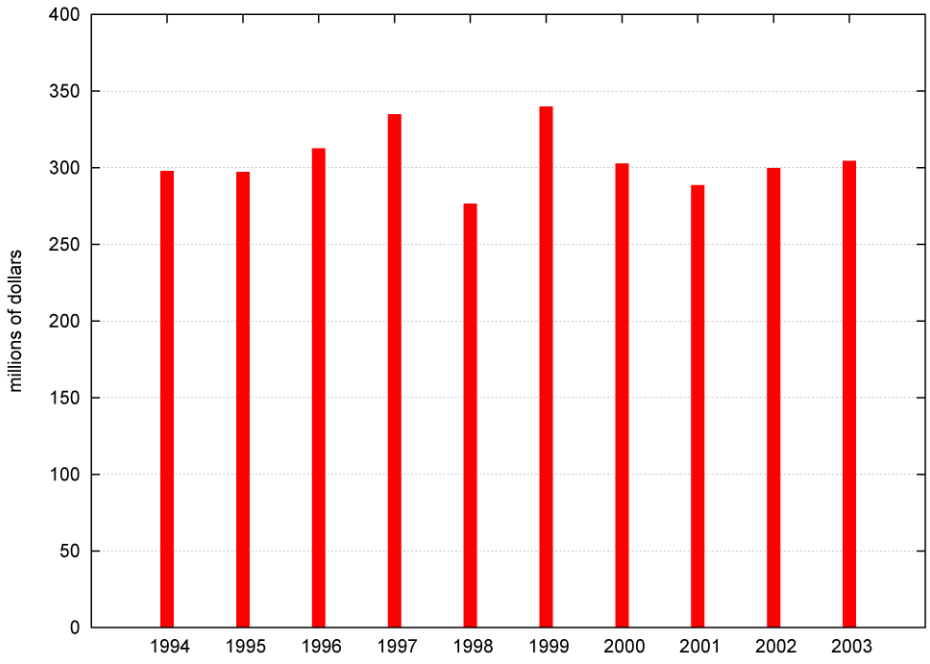
Analysis of the table reveals a key point. Of the top five crops of Yolo County in both 1998 and 2003, only rice has a higher price in 2003, and this is projected to fall in 2004. The outlook for processing tomatoes, the number one crop in Yolo County, is a relatively unmoving price in the foreseeable future. While some of the commodities listed, wheat, walnuts and cattle show increased prices, an overall upward trend cannot be predicted at this time. Importantly, increasing

production costs are forecast in the foreseeable future for most if not all commodities.

The price problem for many agricultural commodities is illustrated by the following. A July 2003 study provided by UCD Agricultural Issues Center and reported by Mike Murray, UC Farm Adviser in neighboring Colusa County, highlights the magnitude of the pricing issue affecting processing tomato growers, and this analysis can be extended to many of the crops also grown in Yolo County. The study compared prices and yield of processing tomatoes from 1974 to 2002. The adjusted price per ton for tomatoes in 1974 was $171.70 (2002 dollars) and $51.70 per ton in 2002, 30% of the 1974 price. The gross returns were $3,708.65 per acre in 1974 (2002 dollars) and $2,088.97 per acre in 2002, 56% of the 1974 value. The most recent University of California cost study on processing tomatoes in the Sacramento Valley estimated the cost to produce processing tomatoes in 2001 at $1710 per acre, and numerous necessary inputs such as diesel fuel, fertilizers, and labor have increased since 2001.

One final look at the economic condition of Yolo County Agriculture is the bar graph below, illustrating the total county agricultural production value from 1994 to 2003, a ten-year period.

Figure Ag-20. Total Value of Yolo County Agricultural Production, 1994–2003



Despite a few high years, the data indicates no growth in Yolo County's agricultural production value over the past ten years. The data, even viewed sympathetically with knowledge of decreasing acreage (565,294 acres in 1994 and 544,100 in 2004, a loss of 21,194 total acres, or 3.7%, according to the California Department of Conservation), shows that Yolo County's agricultural production is struggling to maintain even a steady state in today's economy.

Multiplier Effect

According to the Yolo County Agricultural Commissioner's 2003 *Annual Crop Report*, agricultural production figures only partially reflect the overall measure of the impact agriculture has on the local economy. Field labor, processing, transporting, marketing and other farm-related services significantly multiply the value agriculture has to Yolo County.

As noted in the November 2000 Agricultural Element Background Report, income from agriculture at the community level may be classified as primary or secondary income. Examples of primary income are farm operators' and proprietors' net cash farm income, and wages paid to hired labor. The secondary income contribution arises from primary farm income spent as household income. Also, most gross farm income is used to purchase farm business inputs and equipment. Expenditure of these dollars supports local businesses that pay wages and provide income to local proprietors. The impact of both farm household and farm business spending contributes to the secondary income as measured by the income multiplier.

When measuring the multiplier effect, an income multiplier is used to help determine the total effect of each additional dollar earned by a local household. The multiplier ranges in value from 1 to some value greater than 1. Each multiplier has two components: the initial direct income, or primary effect; and the secondary effect, which is caused by two separate forces.

The first force is the ripple effect that occurs when the farmers buy local inputs to use in their production process. The operating budget of the farms is spent either inside or outside the county. Dollars spent locally will generate an indirect effect, resulting in more personal income available to local households. Dollars spent outside the county are lost dollars, and they generate no additional impact.

The second force is the ripple effect that occurs when farm income is paid out to its employees and owners. These dollars go to people in the form of wages, interest, rents, dividends, and profits. If the recipients live locally and spend their household income locally, the dollars will have an induced effect, resulting in more personal income available to local households. If the dollars go to people who do not live or spend in the county, the dollars are lost and generate no additional income (*Estimating the Role of Production Agriculture in a County's Economy, Community Development Series*, Kansas State University, 1990).

The national earnings multiplier for agriculture is 2.18, meaning that for every primary dollar spent, $2.18 is generated in secondary income. In addition, for every farm job created, 1.97 secondary jobs are also created. This is lower than the multiplier effects of manufacturing (including food processing) and many other industries. This multiplier was confirmed in the November 2000 Agricultural Element Background Report by reference to a 1999 economic analysis of Yolo County (Economic and Planning Systems, *Yolo County Economic and Revenue Analysis*, May 1999), which concluded that the income multiplier effect for the local seed industry and for wineries is 1.8 and for food processing is 2.0.

While growth in agricultural commodity processing has remained flat or decreased in Yolo County over the past five years, consolidations in agricultural suppliers of fertilizers, pesticides, and machinery have taken place in response to reduced profit margins in agriculture.

Outlook for Agriculture

The overall mood of the agricultural industry in 2004, as this is being written, is subdued. There are bright spots such as rice, which enjoyed a high price in 2003; almonds, enjoying good prices in 2003 (and 2004); and organic production, which has increasing income even while acreage has fluctuated over the past several years. Since 1998, however, most agricultural commodities in Yolo County have been experiencing increasing production costs with no corresponding, or sustained increase in prices. In this regard, the importance of government farm programs to supplement farm income, for those farms that qualify, remains high.

Agriculture in Yolo County is increasingly burdened by environmental and other governmental regulations to which it is poorly poised to adapt because of low marginal returns on investment, the seasonal and climate-dependent nature of agriculture, and the large number of independent operators with dispersed, widely varying acreages and site conditions, varying cropping patterns, and varying management styles. A recent directive by the Central Valley Water Quality Control Board, whose area of jurisdiction includes Yolo County, has imposed new requirements on farms to test water that drains off the farm property. Leading farm organizations have conducted extensive negotiations with the Board and were ultimately allowed to organize farmers into regional watershed groups to share the high cost of water quality testing, estimated at $30,000 per sampling site. Concerns have also been raised by farmers who have converted their water pumping plants from electric motors to diesel engines to save energy costs. New regulations now require these diesel engines to be permitted, and farmers are concerned that new emissions standards will curtail their use.

A trend toward fewer, older farmers, begun a century ago, continues unabated. The United States Department of Agriculture's 2002 Census of Agriculture reports the average age of farmers in Yolo County is 56.4 years, up from 55.4 years in 1997. The Census reports that there were 1,077 farms in Yolo County in 1997, but only 1,060 in 2002. Significantly, the number of farms above 500 acres decreased from 1997 to 2003 by 25%, from 265 in 1997 to 200 in 2002. The number of large, full-time farmers is decreasing.

The overall future outlook for agriculture in Yolo County is continuation of the trends discussed above: continuation of existing land use patterns with a gradual movement towards higher value crops; decreasing number of farmers and correspondingly larger farm businesses; continued shrinking profit margins with the corresponding need to farm larger and larger tracts to maintain adequate income; clashes with a growing body of regulatory burdens; adoption of new

technology which reduces labor input while increasing capital costs. Concerns include the loss of farmland to both urban uses and wildlife habitat, and the loss of agricultural infrastructure, including processing plants and local suppliers of needed goods and services.

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