Water Resources Association of Yolo County

Storm Water Resource Plan for Yolo County

Kennedy/Jenks Consultants

May 2018

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Acknowledgements

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Executive Summary

The Water Resources Association of Yolo County (WRA of Yolo County) has developed this Storm Water Resource Plan (SWRP or Plan) to inform future water management decisions and promote effective conjunctive use as well as alleviate flooding, groundwater, and water quality issues through stormwater management throughout Yolo County. This SWRP was developed in accordance with the SWRP Guidelines (see Checklist and Self-Certification in Appendix A) published by the State Water Resources Control Board (State Water Board) for the Storm Water Grant Program (SWGP), part of the Water Quality, Supply, and Infrastructure Improvement Act of 2014 (also known as Proposition 1 [Prop 1]).

ES.1 Introduction (Section 1)

The selected boundary for this SWRP is Yolo County located in northern California. Yolo County falls within the Westside-Sacramento Integrated Regional Water Management (Westside IRWM) Planning Region, which also includes four other Counties: Colusa, Lake, Solano, and Napa. Yolo County also borders the North Sacramento Valley and American River Basin IRWM Planning Regions. Coordination between the IRWM Regions and the SWRP development occurs through joint participation in meetings as well as in specific outreach.

This portion of the plan describes the development of SWRP objectives and their relationship to the Westside IRWM Plan objectives. One of the key elements of SWRP projects are that they provide multiple-benefits; therefore, acknowledgement of these multiple benefits is important to establishment of SWRP objectives. The SWRP Objectives incorporate all 24 Westside IRWM Plan Objectives, as well as three additional objectives specific to stormwater management.

ES.2 Watershed Identification (Section 2)

Yolo County makes up about 1,034 square miles of the Sacramento Hydrologic Region in northern California and includes the lower portions of both the Putah Creek and Cache Creek watersheds, as well as the surrounding low-lying drainage basins in the region, including the Colusa Basin drain (a portion of the Sacramento-Stone Corral watershed) and Lower Sacramento watershed. Yolo County also primarily encompasses the Yolo Subbasin of the Sacramento Valley groundwater basin as designated by DWR Bulletin 118 2016 Interim Update.

The SWRP presents an opportunity to address the issues identified in the Westside IRWM Plan specific to stormwater resource management in Yolo County. Challenges identified in the IRWM Plan related to stormwater management include: Habitat and Invasive Species, Infrastructure Protection, Flood Management and Other Natural Disasters, Climate Change, Water Quality, Sustaining Groundwater Resources, and Land Use.

ES.3 Water Quality Compliance (Section 3)

The quality of surface waters in the region is greatly influenced by land use practices as well as historic sources. In Yolo County, surface waters are impacted largely by agricultural use, resource extraction (i.e., mercury mining in watersheds upstream of Yolo County), and nonpoint source pollutants from urban uses. Surface waters in the SWRP area are especially impaired by mercury, boron, pesticides, and toxicity.

Implementation of this SWRP will result in projects that are consistent with the Total Maximum Daily Loads (TMDLs), National Pollutant Discharge Elimination System (NPDES) Permits, and Waste Discharge Requirements (WDRs) applicable for the watersheds within Yolo County, and comply with other plans and permits described in this section.

ES.4 Organization, Coordination, Collaboration (Section 4)

The Yolo County SWRP was developed by the SWRP Team with input by those entities participating in the Water Resources Association of Yolo County. Development of the Plan also included the participation of community stakeholders not normally involved with the WRA of Yolo County to ensure that local agencies, non-governmental organizations, nonprofit organizations, and the community are identified and consulted throughout the SWRP development. There are many on-going efforts by local agencies and non-governmental organizations to address water quantity and quality issues in Yolo County.

This SWRP will build off these efforts by the entities described in this section.

ES.5 Identification & Prioritization of Projects (Section 5)

Projects presented in this section were submitted for consideration to be included in the Yolo SWRP. A total of 28 projects were submitted; see Appendix H for blank project forms. Project review consisted of a two-part process: (1) Initial Project Screening and (2) Project Prioritization and Ranking (for implementation projects only). In total, the submitted projects met all objective categories and 24 of the 27 SWRP objectives. Individually, projects met 1-6 out of 11 objective categories and 1-8 out of 27 SWRP objectives.

Implementation of prioritized water supply projects could result in 33,627 AFY of water which could infiltrate back into the groundwater plus an additional 1,000 gpm per storm event.

ES.6 Implementation Strategy and Schedule (Section 6)

This section sets forward a proposed framework for SWRP implementation and performance monitoring to track progress, and it offers recommendations for the first two years of Plan implementation activities. This section is intended to serve as the cornerstone of critical actions the stakeholders must take to ensure SWRP program success into the future.

The SWRP for Yolo County will rely on the WRA of Yolo County, Yolo Subbasin Groundwater Agency (YSGA), and Westside-Sacramento Regional Water Management Group (RWMG) for implementation of the Plan and incorporation into the Westside-Sacramento (Westside) Integrated Regional Water Management (IRWM) Plan. Implementation of the SWRP includes incorporation into the IRWM Plan, maintenance of the Plan, obtaining applicable permits for implementation, tracking project status, and community participation.

ES.7 Education, Outreach, Public Participation (Section 7)

Since its inception in 1993, the WRA of Yolo County has a history of local stakeholder and community engagement in planning, programs and activities for water resource planning in Yolo County. The term “stakeholder” refers to representatives of agencies, nonprofit groups, nongovernmental organizations, government organizations, and private citizens interested in or affected by the development of the Plan.

Specific outreach to non-government organizations (NGOs), disadvantaged communities (DACs), economically distressed areas (EDAs) and the general public built on the efforts initiated by the WRA of Yolo County.

Section 1: Introduction and SWRP Objectives

The Water Quality, Supply, and Infrastructure Improvement Act of 2014 (also known as Proposition 1 [Prop 1]) established grant and loan programs for public agencies, nonprofit organizations, public utilities, state and federally recognized Indian tribes, and mutual water companies to support planning and implementation of water projects. One of the programs created by Prop 1 is the Storm Water Grant Program (SWGP) administered by the State Water Resources Control Board (State Water Board). Senate Bill 985 (SB 985), the Storm Water Resource Planning Act, amended the California Water Code to require development of a Storm Water Resource Plan (SWRP or Plan) in order to be eligible for grants from a bond act approved after January 1, 2014; therefore, SB 985 applies to Prop 1 and applicants seeking funding from the SWGP are required to develop a SWRP or functionally equivalent plan(s). The State Water Board developed the Proposition 1 Storm Water Resource Plan Guidelines (SWRP Guidelines; State Water Board 2015) to assist applicants with the development of their SWRP.

The Water Resources Association of Yolo County (WRA of Yolo County) have developed this SWRP to inform future water management decisions and promote effective conjunctive use as well as alleviate flooding, groundwater, and water quality issues through storm water management throughout Yolo County. This SWRP was developed in accordance with the SWRP Guidelines (see Checklist and Self-Certification in Appendix A).

1.1 Plan Development

The selected boundary for this SWRP is Yolo County (shown in Figure 1-1), located in northern California. Yolo County falls within the Westside-Sacramento Integrated Regional Water Management (Westside IRWM) Planning Region, which also includes four other Counties: Colusa, Lake, Solano, and Napa. Yolo County also borders the North Sacramento Valley and American River Basin IRWM Planning Regions. Coordination between the IRWM Regions and the SWRP development occurs through joint participation in meetings as well as in specific outreach.

The boundary selection for this SWRP originated with a discussion initiated by the Westside IRWM Coordinating Committee on 15 January 2016 to discuss general interest in preparation of a SWRP. A follow-up Coordinating Committee Special Business Meeting on 29 January 2016 resulted in the WRA of Yolo County as the only entity that had sufficient stakeholder interest and resources to pursue preparation of a SWRP. Therefore, the selected boundary focuses on the Yolo County drainages within the Westside IRWM.

1.1.1 Relation to Other Planning Efforts

There are many on-going efforts to address water quantity and quality issues in the SWRP area. First and foremost is the initiation of the WRA of Yolo County in 1993. In 2007, the WRA of Yolo County completed a local Yolo County IRWM Plan which describes Yolo County-specific topics and foundational action items, and continues to inform water management in Yolo County. Other efforts to address storm water issues include:

- FloodSAFE Yolo;
- WRA of Yolo County's Subsidence Network Monitoring;
- Westside IRWM grant to address mercury contamination in watersheds above the SWRP area; and
- Continued participation in the broader Westside IRWM.

The Westside Sacramento Integrated Regional Water Management (IRWM) Plan, published in 2013, is the most current of these documents. This plan presents a comprehensive overview of the SWRP area as well as the much larger IRWM Plan area, discusses the history and hydrology of the area, as well as its regulatory framework and water quality/quantity challenges. It also identifies water needs in the IRWM Plan area and assesses a wide variety of approaches to determine potential strategies to meet water quality and quantity goals.

The Westside Sacramento IRWM Plan draws on previous water management plans, including the Yolo County IRWM Plan developed in 2007, which discusses water issues specific to Yolo County. The Yolo County IRWM Plan was developed by the Water Resources Association of Yolo County and represents the specific water quantity (e.g. flood and fluctuating groundwater levels) issues as well as quality issues such as mercury sediments from upstream abandoned mines.

The SWRP builds on flood management modelling and planning documents created by FloodSAFE Yolo, a pilot program led by the Central Valley Flood Protection Board that includes a number of agencies in the SWRP area. The FloodSAFE Yolo Program coordinated the flood

management efforts associated with the Cache Creek Integrated Action and the Yolo County Sloughs, Canals, and Creeks Management Program identified in the Yolo County IRWM Plan. This program includes analysis of historical floods and modelling of flood scenarios in the SWRP area to identify areas that are vulnerable to flood.

Part of the SWRP area is also included in the Lower Sacramento River/Delta North Regional Flood Management Plan (FloodProtect), a study of flood preparedness in a region consisting of parts of Solano, Yolo, Sacramento, and Sutter Counties. This study provides a discussion of flood management problems and lists flood infrastructure improvements needed in each county included in the region of study. This document will help identify critical flood control needs in the SWRP area of the proposed SWRP.

Other documents related to flood preparedness within the SWRP area include:

- Flood Protect. Lower Sacramento River/Delta North Regional Flood Management Plan. July 2014. http://www.yolocounty.org/home/showdocument?id=28753
  - Covers parts of Solano, Yolo, Sacramento, and Sutter Counties. Identifies flood infrastructure needs and potential vulnerabilities in the SWRP area.
- FloodSAFE Yolo Pilot Program. "1st Annual Report (2008-2009)." September 2008. http://www.yolowra.org/irwmp_integrated_actions/1st-Annual-Report_floodSAFE_2008.pdf
  - Covers Yolo County. Discusses the formation and goals of the FloodSAFE Yolo consortium of agencies and presents results of the first few years of the program and describes planned future work. Contains maps analyzing areas impacted in various flood scenarios.
- Borcalli, Francis E. "Cache Creek and Cache Creek Settling Basin." FloodSAFE Yolo. Presentation delivered 21 November 2008.
  - Covers City of Woodland and adjacent area. Discusses flood vulnerabilities and mitigation strategies in the vicinity of Woodland, CA. Introduces the Lower Cache Creek Feasibility Investigation.
- Various flood maps covering University of California Davis Campus, Interstate 5 corridor, the City of Madison, and other areas in the vicinity show extensive flood monitoring efforts throughout the SWRP area as well as results of models of predicted and historic floods.

In addition to these large-scale planning documents, watershed-scale analysis has been conducted targeting smaller watersheds within the SWRP area:

- Yolo County Resource Conservation District conducted an in-depth study on the Willow Creek Watershed in the southwest portion of the SWRP area and included a detailed analysis of the water, soil, and ecological resources in the basin, as well as discussion of water quality problems to address.
- The City of Winters completed reports discussing storm water projects needed in the Moody Slough and Putah Creek/Dry Creek subbasins.
- The City of Woodland has completed in-depth analysis and hydrologic modeling of storm water infrastructure and natural drainage in the vicinity of the City, which has resulted in a detailed report presenting necessary storm water infrastructure improvements.

Additional reports and documents used in the development of this SWRP are listed in Section 8: References.


Northern Sacramento Valley
Yuba County
Yolo County SWRP
North Coast
Westside Sacramento
American River Basin
San Francisco Bay Area
East Contra Costa County
Eastern San Joaquin
Glenn County
Lake County
Butte County
Colusa County
Yuba County
Nevada County
Sutter County
Mendocino County
Placer County
Yolo County
El Dorado C
Sonoma County
Napa County
Sacramento County
Solano County
Marin County
San Joaquin County
Contra Costa County
Clear Lake
Indian Valley Reservoir
Lake Berryessa
North Fork Cache Creek
Bear Creek
Cache Creek
Putah Creek
South Fork Putah Creek
Sacramento River
Colusa Basin Drainage Canal
Feather River
American River
Yolo Bypass
Sacramento Deep Water Ship Channel
Woodland
Sacramento
Winters
Davis
Santa Rosa
Vacaville
Napa
Fairfield
Vallejo
Lodi
Antioch
Legend
Cities
County Boundaries
Yolo County SWRP Boundary
Westside Region
Streams
Water Bodies
Neighboring IRWM Regions
0 3 6 9
Miles
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Path: \\SFOISGDATA\Z_Drive\Projects\Westside_IRWMP\Events\2017_05_Yolo_SWRP\mxd\Figure1-1_SWRParea.mxd

Kennedy/Jenks Consultants

Storm Water Resource Plan For Yolo County

YOLO COUNTY SWRP AND NEIGHBORING IRWM REGIONS

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May 2018

Figure 1-1

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1.1.1.1 Other IRWM Plan Regions

The American River Basin Region and North Sacramento Valley Region are also embarking on SWRPs under the SWGP planning grant. Coordination between the IRWM Regions and the SWRP development occurred through solicitation to participate in meetings and provide comments on plan sections.

The Yolo County SWRP area is located at the most downstream end of the extensive Sacramento River watershed and is hydrologically connected to the Sacramento-San Joaquin Delta and the San Francisco Bay. The American River Basin IRWM Plan area is located adjacent to the Yolo County SWRP area and consists primarily of the greater part of Sacramento County directly east of Yolo County and portions of Placer and El Dorado Counties. Therefore, projects implemented as part of the SWRP for Yolo County are likely to directly impact SWRP efforts in the neighboring American River Basin SWRP area.

The Yolo County SWRP area is bounded to the north by North Sacramento Valley IRWM Region. In this Region, are two SWRP efforts: The City of Chico SWRP and the City of Redding SWRP. Both of these planning areas drain into the Sacramento River; therefore, the SWRP for Yolo County will coordinate with the two North Sacramento Valley Region SWRPs when appropriate.

1.1.1.2 Yolo Subbasin Groundwater Agency

The Yolo Subbasin Groundwater Agency (YSGA) was formed on June 19, 2017 as the Groundwater Sustainability Agency (GSA) for the Yolo Subbasin. The mission of the Yolo Subbasin Groundwater Agency is to provide a dynamic, cost-effective, flexible collegial organization to ensure compliance with State of California Sustainable Groundwater Management Act (SGMA) within the Yolo Subbasin. The YSGA will serve a coordinating and administrative role for developing the Groundwater Sustainability Plan, which is anticipated to be completed by January 1, 2022. More information on the YSGA can be found on their website: http://yologroundwater.org

As described in Section 4: Coordination and Collaboration, many of the members and affiliates of the YSGA are also stakeholders of the SWRP. Where there is a nexus between groundwater and storm water, the YSGA will support the implementation activities of the SWRP. See Section 6: Implementation Strategy and Schedule for additional details.

1.1.1.3 Storm Water Management Plans

Five agencies within the SWRP area are included in the Phase 2 Municipal Separate Storm Sewer System (MS4) permit:

- City of Davis
- University of California, Davis
- City of West Sacramento
- City of Woodland
- Yolo County

These agencies are each required to maintain an individual storm water management plan (SWMP) documenting their approach to local storm water management. Further discussion on how these agencies are complying with their individual storm water permits is provided in Section 3: Water Quality Compliance. It is anticipated that implementation of the SWRP will aid these agencies in meeting the requirements of their MS4 permits.

1.1.1.4 Concurrent Studies

There are currently two grant-funded projects underway in or near the SWRP area:

1. A project funded through the EPA's Brownfields Assessment Program and led by the Westside IRWM will involve investigating abandoned mines in the Cache and Putah Creek watersheds and developing remediation plans for sites that pose the greatest threat to water quality. This project may help elucidate and mitigate upstream contamination sources outside of the SWRP area that could facilitate meeting the Total Mass Daily Load (TMDL) for mercury within the planning area. Work on the project commenced in early 2016, and a report on brownfields is expected to be available in early 2017.

2. Funded by the Watershed Restoration and Delta Water Quality and Ecosystem Restoration Grant Programs, this project will involve collecting streamflow data in multiple tributaries to the Yolo Bypass region. The project team includes UC Davis faculty, as well as two local consulting firms with experience in environmental compliance and watershed-scale environmental management. This study will provide useful data to support hydrologic modeling of this portion of the SWRP area.

1.2 SWRP Objectives

The SWRP Guidelines (p. 17) include several mentions of the need for storm water management objectives as follows:

> "Storm water management on a watershed basis provides for a combination of storm water management objectives and multiple benefits throughout the watershed or sub-watershed. Therefore, the Plan should discuss how the ***various storm water management objectives*** within the watershed will protect or improve water quality, water supply reliability, and/or achieve other objectives. The Plan should include a discussion of the added benefits to integration of multiple storm water management strategies, as compared to stand-alone projects.
>
> ***The Plan must discuss how its objectives*** and projects fit into the broader water management goals of the applicable IRWM plan. For the purposes of receiving project implementation funding, submittal of a Storm Water Resource Plan to the applicable IRWM group (for further incorporation into an existing IRWM plan) fulfills the public agency's requirement for "incorporation." However, the State Water Board recognizes that further collaboration and coordination with other agencies within the IRWM group is essential for long-term incorporation."

This portion of the plan describes the development of SWRP objectives and their relationship to the Westside IRWM Plan objectives. One of the key elements of SWRP projects are that they provide multiple-benefits; therefore, acknowledgement of these multiple benefits is important to establishment of SWRP objectives. Potential storm water benefits include:

1. creation and restoration of wetlands,
2. riverside [riparian] habitats;
3. instream flows,
4. increase in park and recreation lands,
5. urban green space,
6. augments recreation opportunities for communities,
7. increases tree canopy,
8. reduces heat island effect,
9. improves air quality,
10. maximizes water quality,
11. maximizes water supply,
12. maximizes flood management,
13. maximizes environmental benefits, and
14. maximizes other community benefits.

1.2.1 Westside IRWM Plan Objectives

According to Water Code section 79743, the projects implemented as a result of the SWRP should also address the priorities of the local regional water management group. The Westside IRWM Plan was developed based on the Integrated Regional Water Management Guidelines for Proposition 84 and 1E, and includes 24 objectives related to water management, as described in Westside IRWM Plan Section 6.4 (page 6-4 to 6-18, WRA of Yolo County, 2013). The Westside IRWM Plan goals and objectives were identified as the major water resource issues in the region and as such, reflect water resource management values and overall priorities for the SWRP area. Therefore, it is natural that the SWRP utilizes the Westside IRWM Plan goals and objectives to further define the storm water management strategies that meet the SWRP Objectives.

1.2.1.1 Basin Plan Objectives Relevant to Storm Water

The Sacramento and San Joaquin River Basins Plan is the water quality control plan formulated and adopted by the Regional Water Quality Control Board for the Central Valley region (Central Valley RWQCB), which regulates water quality in the Westside IRWM region. The objective of the Basin Plan is to show how the quality of the surface and ground waters in the Central Valley Region should be managed to provide the highest water quality reasonably possible. The Basin Plan lists various water uses (Beneficial Uses), describes the water quality which must be maintained to allow those uses (Water Quality Objectives), and outlines an implementation plan for achieving those standards.

The objectives for the Westside IRWM region include meeting the water quality standards outlined in the Central Valley Basin Plan, and are consistent with the overarching planning goals promulgated by the Central Valley RWQCB.

1.2.2 SWRP Objectives and Benefits

The SWRP Objectives incorporate all 24 Westside IRWM Plan Objectives, as well as three additional objectives specific to storm water management that will be adopted by the Westside RWMG:

- Objective 25. Convert paved and/or impervious areas and increase tree canopy and vegetation, reducing urban heat island effects.
- Objective 26. Optimize the rural storm water conveyance system to drain and retain storm water flows as necessary. Provide proper rural drainage and keep conveyance systems clear of debris to minimize county road flooding during storm events.
- Objective 27. Enable proper rural retention and modify rural landscape to maximize groundwater recharge of excess storm water.

Appendix B presents a detailed table that shows the relationship between the IRWM Plan objectives, objectives identified by the Water Code (page 9, SWRP Guidelines), and SWRP Guideline Objectives. The SWRP Objectives will be considered in the prioritization and selection of projects in Section 5.

The SWRP Objectives will be used to achieve the following Benefit Categories:

- Water Quality
- Water Supply
- Flood Management
- Environmental
- Community

The following sections summarize the SWRP objectives and the relationship to storm water benefits. The SWRP will prioritize projects that result in multiple tangible and intangible storm water benefits minimize the resources needed to achieve these benefits, while maximizing the effective area of benefits. As described in the sections below, many of the SWRP Objectives will result in multiple benefits. A discussion of how SWRP Objectives relate to individual projects is included in Section 5.2.

1.2.2.1 Water Quality Benefit Category

The main value of the Water Quality (WQ) Benefit Category is increased filtration and/or treatment of runoff. There are nine SWRP Objectives that result in water quality benefits. Of these, eight can contribute to at least one additional Benefit Category:

1. WQ.1 can result in environmental benefits in addition to water quality benefits.
2. WQ.2 can result in water supply benefits in addition to water quality benefits.
3. WQ.3 can result in flood management and environmental benefits in addition to water quality benefits.
4. WQ.4 can result in environmental and community benefits in addition to water quality benefit category.
5. WQ.5 can result in water supply and community benefits in addition to water quality benefits.
6. WQ.6 can result in water supply, environmental, and community benefits in addition to water quality benefits.
7. WQ.8 can result in water supply and flood management benefits in water quality benefits.
8. WQ.9 can result in water supply and flood management benefits in addition to water quality benefits.

Benefits	Yolo County Storm Water Resource Plan Water Quality (WQ) Objectives
Water quality while contributing to compliance with applicable permit and/or TMDL requirements Main Benefit: ■ Increased filtration and/or treatment of runoff Secondary Benefits: ■ Nonpoint source pollution control ■ Reestablish natural water drainage and treatment	**WQ.1*** Restore native vegetation/form/function along riparian/aquatic corridors
	WQ.2* Increase adoption of agricultural Best Management Practices
	WQ.3* Manage watershed activities to reduce large erosion events
	WQ.4* Monitor state/federal Delta programs
	WQ.5* Monitor conditions/improve understanding to support sustainable groundwater basins
	WQ.6* Maintain/enhance watershed and natural resource monitoring network and information sharing
	WQ.7 Address pollutant sources to meet runoff standards and Total Maximum Daily Load (TMDL) targets
	WQ.8* Reduce public health risks by reducing contaminants in drinking water sources
	WQ.9* Meet all drinking water and wastewater discharge standards

Note:

* This Storm Water Management Objective can achieve multiple benefits as noted above.

1.2.2.2 Water Supply Benefit Category

The main value of the Water Supply (WS) Benefit Category is water supply reliability and conjunctive use. There are 11 SWRP Objectives that result in water supply benefits. Of these, seven can contribute to at least one additional Benefit Category:

1. WS.3 can result in water quality and community benefits in addition to water supply benefits.
2. WS.4 can result in water quality, environmental, and community benefits in addition to water supply benefits.
3. WS.5 can result in water quality, environmental, and community benefits in addition to water supply benefits.
4. WS.6 can result in water quality and flood management benefits in addition to water supply benefits.
5. WS.7 can result in water quality and flood management benefits in addition to water supply benefits.
6. WS. 10 can result in flood management benefits in addition to water supply benefits.
7. WS. 11 can result in flood management benefits in addition to water supply benefits.

Benefits	Yolo County Storm Water Resource Plan Water Supply (WS) Objectives
Water supply through groundwater management and/or runoff capture and use Main Benefit: ■ Water supply reliability ■ Conjunctive use Secondary Benefit: ■ Water conservation	**WS.1** Create asset management plan for key water management infrastructure
	WS.2 Meet 20% by 2020 conservation targets
	WS.3* Increase adoption of agricultural Best Management Practices
	WS.4* Monitor conditions/improve understanding to support sustainable groundwater basins
	WS.5* Maintain/enhance watershed and natural resource monitoring network and information sharing
	WS.6* Reduce public health risks by reducing contaminants in drinking water sources
	WS.7* Meet all drinking water and wastewater discharge standards
	WS.8 Provide 100% reliability of municipal and industrial water supplies
	WS.9 Provide agricultural water supplies to support a robust agricultural industry
	WS.10* Optimize the rural storm water conveyance system to drain and retain storm water flows as necessary. Provide proper rural drainage and keep conveyance systems clear of debris to minimize county road flooding during storm events.
	WS.11* Enable proper rural retention and modify rural landscape to maximize groundwater recharge of excess storm water.

Note:

* This Storm Water Management Objective can achieve multiple benefits as noted above.

1.2.2.3 Flood Management Benefit Category

The main value of the Flood Management (FM) Benefit Category is decreased flood risk by reducing runoff rate and/or volume. There are seven SWRP Objectives that result in flood management benefits. Of these, five can contribute to at least one additional Benefit Category:

1. FM.2 can result in water quality benefits in addition to flood management benefits.
2. FM.4 can result in water quality and water supply benefits in addition to flood management benefits.
3. FM.5 can result in water quality and water supply benefits in addition to flood management benefits.
4. FM.6 can result in water supply benefits in addition to flood management benefits.
5. FM.7 can result in water supply benefits in addition to flood management benefits.

Benefits	Yolo County Storm Water Resource Plan Flood Management (FM) Objectives
Main Benefit: ■ Decreased flood risk by reducing runoff rate and/or volume Secondary Benefit: ■ Reduced sanitary sewer overflows	**FM.1** Provide adequate flood protection
	FM.2* Manage watershed activities to reduce large erosion events
	FM.3 Minimize accidental wastewater spillage/discharges
	FM.4* Reduce public health risks by reducing contaminants in drinking water sources.
	FM.5* Meet all drinking water and wastewater discharge standards.
	FM.6* Optimize the rural storm water conveyance system to drain and retain storm water flows as necessary. Provide proper rural drainage and keep conveyance systems clear of debris to minimize county road flooding during storm events.
	FM.7* Enable proper rural retention and modify rural landscape to maximize groundwater recharge of excess storm water.

Note:

* This Storm Water Management Objective can achieve multiple benefits as noted above.

1.2.2.4 Environmental Benefit Category

The main value of the Environmental (EN) Benefit Category is environmental and habitat protection and improvement and increased urban green space. There are 11 SWRP Objectives that result in environmental benefits. Of these, five can contribute to at least one additional Benefit Category:

1. EN.1 can result in water quality benefits in addition to environmental benefits.
2. EN.8 can result in water quality and flood management benefits in addition to environmental benefits.
3. EN.9 can result in water supply and community benefits in addition to environmental benefits.
4. EN.10 can result in water quality, water supply, and community benefits in addition to environmental benefits.
5. EN.11 can result in community benefits in addition to environmental benefits.

Benefits	Yolo County Storm Water Resource Plan Environmental (EN) Objectives
Main Benefit: ■ Environmental and habitat protection and improvement, including; • wetland enhancement/ creation; • riparian enhancement; and/or • instream flow improvement ■ Increased urban green space Secondary Benefit: ■ Reduce energy use, greenhouse gas emissions, or provide a carbon sink ■ Reestablish of the natural hydrograph ■ Water temperature improvements	**EN.1*** Restore native vegetation/form/function along riparian/aquatic corridors
	EN.2 Quantify the extent of suitable life-cycle habitat for Threatened/Endangered/Imperiled native fish
	EN.3 Prioritize/plan/schedule improvements to suitable life-cycle habitat for T/E/I native fish
	EN.4 Increase availability of suitable life-cycle habitat for Threatened/Endangered/Imperiled native fish identified
	EN.5 Prevent colonization by quagga mussels/zebra mussels and eliminate/prevent spread of New Zealand mud snails
	EN.6 Establish invasive plant management plan
	EN.7 Implement invasive plant management plan
	EN.8* Manage watershed activities to reduce large erosion events
	EN.9* Monitor state/federal Delta programs
	EN.10* Maintain/enhance watershed and natural resource monitoring network and information sharing
	EN.11* Convert paved and/or impervious areas and increase tree canopy and vegetation, reducing urban heat island effects

Note:

* This Storm Water Management Objective can achieve multiple benefits as noted above.

1.2.2.5 Community Benefit Category

The main value of the Community (CO) Benefit Category is employment opportunities provided and public education. There are seven SWRP Objectives that result in community benefits. Of these, four can contribute to at least one additional Benefit Category:

1. CO.4 can result in water quality and environmental benefits in addition to community benefits.
2. CO.5 can result in water quality and water supply benefits in addition to community benefits.
3. CO.6 can result in water quality, water supply, and environmental benefits in addition to community benefits.
4. CO.7 can result in environmental benefits in addition to community benefits.

Benefits	Yolo County Storm Water Resource Plan Community (CO) Objectives
Main Benefit: ■ Employment opportunities provided ■ Public education Secondary Benefit: ■ Community involvement ■ Enhance and/or create recreational and public use areas	**CO.1** Provide and promote use of educational curricula for K-12 students
	CO.2 Provide educational information to encourage stewardship by public
	CO.3 Maintain and increase water-related recreational opportunities
	CO.4* Monitor state/federal Delta programs
	CO.5* Monitor conditions/improve understanding to support sustainable groundwater basins
	CO.6* Maintain/enhance watershed and natural resource monitoring network and information sharing
	CO.7* Convert paved and/or impervious areas and increase tree canopy and vegetation, reducing urban heat island effects

Note:

* This Storm Water Management Objective can achieve multiple benefits as noted above.

1.3 Plan Organization

This SWRP is divided into the following sections as outlined below:

- Section 1 – Introduction and SWRP Objectives: provides an overview of the document and identifies the storm water management objectives of this SWRP.
- Section 2 – Watershed Identification: identifies the SWRP boundary and watersheds within the planning area.
- Section 3 – Water Quality Compliance: identifies water quality issues within the major watersheds, including pollutants identified on the 303(d) list of impaired water bodies or with relevant TMDLs. This section also includes discussion of the SWRP in relation to applicable TMDL Implementation Plans (IPs) and MS4 Permits.
- Section 4 – Organization, Coordination, and Collaboration: describes the community engagement process that occurred during plan development, including identification of stakeholders, an overview of the existing Westside IRWM group, and the mechanisms used to engage stakeholders and the public in plan development.
- Section 5 - Identification and Prioritization of Projects: includes a list of previously identified projects, the process of site selection and development of SWRP projects, conceptual designs for each SWRP project, the methodology and results for quantification of water supply and water quality benefits of proposed projects, and prioritization of both SWRP and previously identified projects.
- Section 6 - Implementation Strategy and Schedule: outlines programs to assist in implementation of strategies identified in this SWRP, including community outreach during project development. This section also discusses how current monitoring required by the MS4 Permits will be utilized as part of the adaptive management process, in addition to a general schedule of SWRP milestones.
- Section 7: Education, Outreach and Public Participation.
- Section 8: References

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Section 2: Watershed Identification

As introduced in Section 1, development of this SWRP boundary started with the Westside IRWM Planning Region, and based on stakeholder interest, was focused to the drainages within Yolo County. Although there is no formalized analysis of countywide water inventories for land use planning, Water Resources Association of Yolo County (WRA of Yolo County) is the primary forum for collaboration among water managers in Yolo County. The WRA of Yolo County, a member of the Westside RWMG, provides a regional forum to coordinate and facilitate solutions to water challenges and opportunities in Yolo County, including storm water management. The WRA of Yolo County currently has 10 member agencies, which include agricultural water suppliers, urban water suppliers, groundwater managers, and flood protection providers (RWMG, 2013). Through focused meetings, these agencies can effectively interact and make key decisions to facilitate storm water management efforts within the Yolo County watersheds.

Yolo County makes up about 1,034 square miles of the Sacramento Hydrologic Region in northern California. It is also underlain completely by the Sacramento Valley Groundwater Basin. This section describes the SWRP Planning Area water resources and provides context for watershed management issues that should be addressed through implementation of this SWRP, the Westside IRWM Plan, or other county-wide or regional efforts.

2.1 Surface Water Resources

As shown in Figure 2-1, Yolo County is located within the Sacramento Hydrologic Region as defined by DWR and includes the lower portions of both the Putah Creek and Cache Creek watersheds, as well as the surrounding low-lying drainage basins in the region, including the Colusa Basin drain (a portion of the Sacramento-Stone Corral watershed) and Lower Sacramento watershed.

2.1.1 Hydrologic Boundary

The SWRP watershed delineation is based on the 12-digit (most detailed) United States Geological Survey (USGS) Watershed Boundary Dataset for subwatersheds. The key water features as indicated by the USGS subbasin boundaries (using Hydrologic Unit Code Level 8) are Cache Creek (which captures the Cache Creek watershed), Putah Creek (which captures the Putah Creek watershed), and the Sacramento River (which captures the Sacramento-Stone Corral and Lower Sacramento watersheds). The Yolo Bypass is used to manage the much larger Sacramento River watershed flood flows.

While the actual Cache and Putah Creek watersheds account for only a small percentage of the lower land area of the SWRP Area, water from Cache Creek and Putah Creek comprise a majority of the water entering Yolo County. Direct discharges to the Sacramento River from Cache and Putah Creeks are limited to larger, more significant flood events, which historically had to overtop the broad natural levees adjacent to the river. Currently, water from Cache and Putah Creek continue to pond during flood events, but the water is also managed through a series of facilities that can convey flows to the Sacramento River during high-runoff events (RWMG, 2013).

2.1.1.1 Cache Creek Watershed

The Cache Creek watershed encompasses approximately 1,165 square miles, and about 248 square miles of the watershed is located in Yolo County (approximately 21 percent). Cache Creek provides numerous benefits, including habitat and water supply. YCFC&WCD owns the Cache Creek Dam, located on Cache Creek approximately 5 miles downstream of Clear Lake outlet, and operates both Cache Creek Dam and Clear Lake in accordance with the Solano and Gopcevic Decrees. The North Fork Cache Creek subwatershed drains the area north of Clear Lake and includes Long Valley Creek, Wolf Creek, and Bartlett Creek. YCFC&WCD owns and operates the Indian Valley Dam on the North Fork Cache Creek, which forms the Indian Valley Reservoir. Indian Valley Reservoir has a total storage capacity of 300,600 AF, of which 40,000 AF is dedicated to flood control. Bear Creek drains the area to the east of the North Fork Cache Creek, and its watershed lies entirely within Colusa County. Bear Creek flows into the main stem of Cache Creek at the border of Colusa and Yolo Counties (RWMG, 2013).

After Cache Creek flows into Yolo County, it continues through the agriculturally intensive Capay Valley until it reaches the Capay Diversion Dam, where some flows are diverted into YCFC&WCD's irrigation system. Cache Creek continues downstream of Capay Dam, where it terminates in an area known as the Cache Creek Settling Basin, just upstream of the Yolo Bypass. Cache Creek is considered an intermittent stream, in that flows in the

creek are inconsistent, and there are periods particularly during the summer when no streamflow is present (RWMG, 2013).

The Cache Creek Settling Basin is a component of the Sacramento River Flood Control Project. It was designed to trap sediments carried by Cache Creek and prevent them from being deposited in the Yolo Bypass, thereby maintaining the flood capacity of the Yolo Bypass. The settling basin has an overflow into the Yolo Bypass, which allows flow to enter the Sacramento River upstream of Rio Vista in Solano County (RWMG, 2013).

2.1.1.2 Putah Creek Watershed

The Putah Creek watershed encompasses approximately 654 square miles and is 50 miles wide, extending from Cobb Mountain (elevation 4,700 feet) in Lake County to the Yolo Bypass (elevation a few feet above sea level). About 48 square miles of the watershed is located in Yolo County (approximately 7 percent). Tributaries to Putah Creek within Lake County include Harbin Creek, Big Canyon Creek, St. Helena Creek, Dry Creek, Coyote Creek, and Soda Creek. From Lake County, Putah Creek flows into Napa County and Lake Berryessa. The major tributaries within Napa County include Pope Creek, Chiles Creek, Capell Creek, and Eticuera Creek. Lake Berryessa has a storage capacity of 1,602,000 AF and is regulated by Monticello Dam, which is owned by USBR and operated by Solano County Water Agency. From the outlet of Monticello Dam, Putah Creek flows into Solano County and Yolo County, where it eventually discharges to the Yolo Bypass (RWMG, 2013).

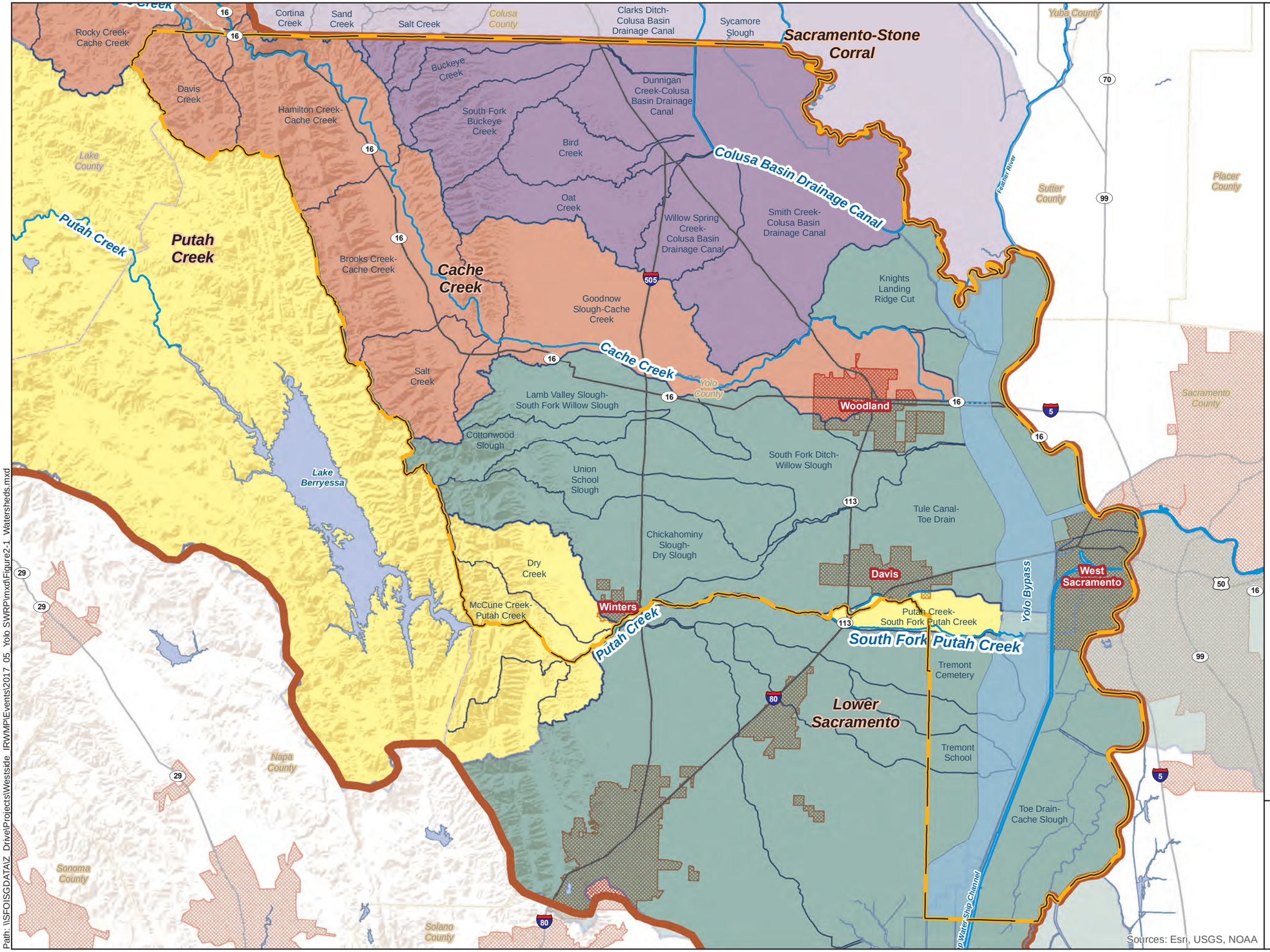
The South Fork of Putah Creek is an artificial channel constructed over a period of several decades, beginning in the 1870s. It departs from the natural creek channel about 1 mile upstream of Interstate 80 and flows directly east to the Yolo Bypass. The creek eventually abandoned its original channel (the North Fork) entirely and was named the South Fork Putah Creek for practical purposes. In the 1940s, the U.S. Army Corps of Engineers constructed levees along the lowermost 9 miles of the South Fork channel as part of the Sacramento River Flood Control Project (RWMG, 2013).

2.1.1.3 Sacramento-Stone Corral Watershed

The Sacramento-Stone Corral watershed encompasses 1,884 square miles, most of which is located outside of Yolo County. Flows in the watershed generally travel from the coastal ranges in the west towards the Sacramento River. The majority of water from the watershed is discharged to the Sacramento River outside the region; however, the southernmost portion of the watershed flows into the county via the Colusa Basin Drain. This drain is a man-made channel designed to convey irrigation drainage and storm runoff from 32 ephemeral streams to the Knights Landing outfall gates for discharge into the Sacramento River. Seven of these streams originate in the Dunnigan Hills of Yolo County (RWMG, 2013). The Sacramento-Stone Corral watershed comprises nearly 1,884 square miles in the Sacramento Valley and includes portions of Glenn, Colusa, and Yolo Counties. About 250 square miles of the watershed is located in Yolo County (approximately 13 percent).

2.1.1.4 Lower Sacramento River Watershed

The Sacramento River forms the easterly border of the County. The entire Sacramento River watershed covers approximately 27,000 square miles in Northern California, of which the Lower Sacramento River watershed makes up 1,229 square miles (approximately 4.6 percent). Yolo County, which lies near the downstream end of the Sacramento River, encompasses around 39 percent (approximately 476 square miles) of the Lower Sacramento River watershed. Because of its location and relatively small drainage area, the portion of the Sacramento River located within the county is influenced heavily by the areas outside it.



Sources: Esri, USGS, NOAA

Legend

- City Boundaries
- County Boundaries
- Westside Region
- Streams
- Projected Flow Pathway
- Water Bodies

Watersheds

- Lower Sacramento
- Sacramento-Stone Corral
- Cache Creek
- Putah Creek
- Subwatersheds

Source:
National Watershed Boundary Dataset.
U.S. Geological Survey. 04/01/2009

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Watersheds

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Figure 2-1

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2.2 Groundwater Resources

Groundwater makes up approximately 33 percent of the water supply for users in Yolo County in an average water year, and for many agricultural users and municipalities, groundwater is the only source of water supply. Some agricultural areas are fully reliant on groundwater. Municipalities such as the cities of Woodland and Davis currently obtain their drinking water supplies from well water pumped from the deeper Tehama formation. Water from the Tehama formation is of high quality, but water managers are uncertain about the sustainable yield of the aquifer.

Water stored in groundwater aquifers serve as a key water supply source in Yolo County. Thousands of groundwater wells exist within the county, and most of these groundwater wells are used to supply individual domestic demands or agricultural operations. Some of the larger towns and cities also operate municipal wells to meet or help meet urban, municipal, and industrial demands. Some of the communities within the county such as Davis, UC Davis, Woodland, and Winters have historically relied on groundwater as their sole supply source until a recent transition to surface water with the Sacramento River as the primary source. Still, maintaining sustainable groundwater aquifers that yield high quality groundwater will be crucial to meet the long-term water demands within the County.

Yolo County primarily encompasses the Yolo Subbasin of the Sacramento Valley groundwater basin as designated by DWR Bulletin 118 2016 Interim Update as shown in Figure 2-2. A small portion of Yolo County intersects the Solano Subbasin to the south. The water bearing formations of this basin generally have very high storage capacity and are essentially contained within two stratigraphic units: (1) the deeper older thick alluvial and river sediments of the Tehama formation, and (2) the younger shallower sediments, floodplain deposits, and stream channel deposits that overlie the Tehama formation (DWR B118, 2016). The sustainable yield of the Yolo Subbasin is not yet fully understood, but the DWR Bulletin 118 has not identified the subbasin as in an overdraft condition.

Groundwater quality concerns in the region relate to drinking water and irrigation uses. Constituents of concern within Yolo County include: arsenic, boron, chromium, salinity, iron, magnesium, nitrate, selenium, and total dissolved solids (TDS). In general, based on the measured levels of these constituents in wells within the county, groundwater quality meets agricultural quality standards but are exceeding or just below maximum contaminant levels (MCLs) set for drinking water.

2.3 Land Use Description

The County encompasses more than 322,000 acres (504 square miles) of land, which is dominated by agriculture and open space (with native vegetation). Agriculture makes up approximately 49 percent of the total land area, whereas urban and community developments represent only 5 percent of the total land area. Open space (44 percent of the county), provides essential habitat for native species and broad-ranging opportunities for recreation. Tourists and residents are attracted to the region's lakes, waterways, and lands for recreational activities like boating, fishing, hiking, camping, and hunting. These lands are managed by local and private entities as well as federal and state agencies such as the Bureau of Land Management (BLM), the U.S. Forest Service (USFS), and California Department of Fish and Wildlife (CDFW). Table 2-1 summarizes the existing land use classifications in the SWRP Area, and Figure 2-3 illustrates the distribution of land uses throughout the county. Figure 2-4 shows the land management agencies within Yolo County, including municipalities and tribal entities discussed in the following subsection.

Table 2-1: Yolo County Land Use Distribution

Land Use Category	Total Acres	Percent of Total
Agricultural	322,224	49.4
Communities	33,074	5.1
Water Surface	10,481	1.6
Native Riparian/Vegetation	256,920	43.7
Barren/Unclassified	1,218	<1
Total Acres	**623,917**	**100**

Source: California Department of Water Resources, Land Use Survey, Yolo County, 2008.

2.3.1 Communities

The major communities and tribal areas within the county are shown in Figure 2-4. The Yocha Dehe Wintun tribal area is located at the western side of the county. The four incorporated cities within the county are Davis, West Sacramento, Winters, and Woodland. Other unincorporated communities scattered throughout the county include Esparto, Knights Landing, Dunnigan, Monument Hills, Clarksburg, Madison, Yolo, Zamora.

Of the above communities, 12 include areas that are considered Disadvantaged Community (DAC) or Economically Distressed Area (EDA) according to DWR's definitions:

- DAC: census geographies "with an annual median household income (MHI) that is less than 80 percent of the Statewide annual MHI (PRC Section 75005(g)))." (http://www.water.ca.gov/irwm/grants/resources_dacs)
- EDA: census geographies with "a population that is ≤20,000 people; and less than 85% of the State's MHI." (https://gis.water.ca.gov/app/edas/)

Figure 2-5 shows the DACs and EDAs within Yolo County.

2.3.2 Water and Wastewater Service Providers

The county includes 45 major municipalities, special districts, and agencies with water supply, wastewater management, flood control, and other water or resource management responsibilities. It includes 14 agencies that are strictly wholesale or retail water suppliers and five (5) agencies providing both water and wastewater services. There are three (3) agencies that provide only flood control services and 11 reclamation districts that provide flood control and storm drain maintenance services. There are 12 agencies that provide other water resource coordination, and the remaining eight (8) agencies provide some combination of the above services. Figure 2-6 identifies the service areas and agency boundaries for the municipalities and agencies where data are available. See Appendix C for a listing of the water and wastewater service agencies within Yolo County, as well as brief overviews for each system.

Of the 23 county agencies that currently deliver water, nine (9) pump groundwater, seven (7) divert surface water, and seven (7) supply a combination of groundwater, surface water, and other water supply.

There are also 80 minor water systems within the county, of which 75 use groundwater as their sole source of water supply, and the remaining using either surface water or non-potable water.

2.3.3 Other Land Use Agencies

Local, state, and federal land management agencies in the county are shown in Figure 2-4 and include the following:

- Yolo County
- U.S. Bureau of Land Management
- U.S. Bureau of Reclamation
- U.S. Fish and Wildlife
- U.S. Forest Service
- California Department of Fish and Wildlife
- State Lands

2.4 Watershed Management Issues

The SWRP presents an opportunity to address the issues identified in the Westside IRWM Plan specific to storm water resource management in Yolo County. Challenges identified in the IRWM Plan related to storm water management include: Habitat and Invasive Species, Infrastructure Protection, Flood Management and Other Natural Disasters, Climate Change, Water Quality, Sustaining Groundwater Resources, and Land Use.

2.4.1 Habitat and Invasive Species

The lakes, creeks, wetlands, sloughs, and other water features throughout the region provide key habitat for many of California's well-known fish and wildlife species (see Figure 2-7). Anadromous fish migrate into the region and use its waterways for spawning. Resident and migratory waterfowl rely on the lakes and wetlands for food and nesting habitat. Changes to the landscape from agriculture, development, and flood control projects have diminished aquatic and riparian habitat over the last 150 years (RWMG, 2013).

Regional conservation areas, such as the Yolo Bypass Wildlife Area and Cache Creek Natural Area/Cache Creek Wilderness Area have been established to protect important habitats and species. Cache Creek is designated as a California Wild and Scenic River. This designation for more than 31 miles of the creek is aimed at maintaining free-flowing conditions and preserving its aquatic and riparian environment (RWMG, 2013).

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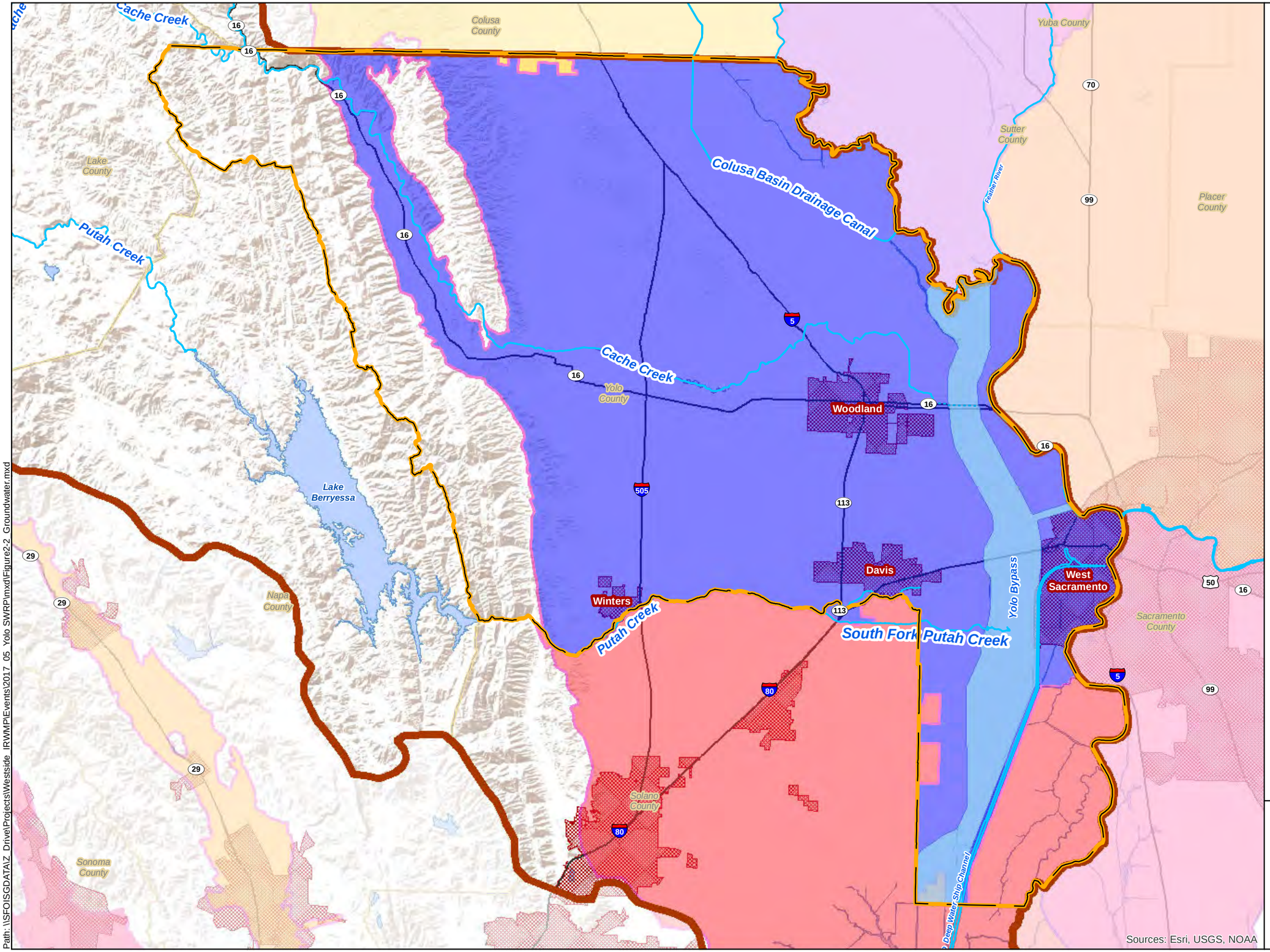

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Legend

- Yolo County SWRP Boundary
- City Boundaries
- County Boundaries
- Westside Region
- Streams
- Projected Flow Pathway
- Water Bodies

B 118 Groundwater Basins

Subbasin Name

- Colusa
- Napa Valley
- North American
- Solano
- Sonoma Valley
- South American
- South Yuba
- Sutter
- Yolo

Source:
Bulletin 118-Groundwater Basins, California Department of Water Resources (DWR), 2003

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Sources: Esri, USGS, NOAA

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DWR BULLETIN 118 GROUNDWATER BASINS AND SUBBASINS

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Figure 2-2

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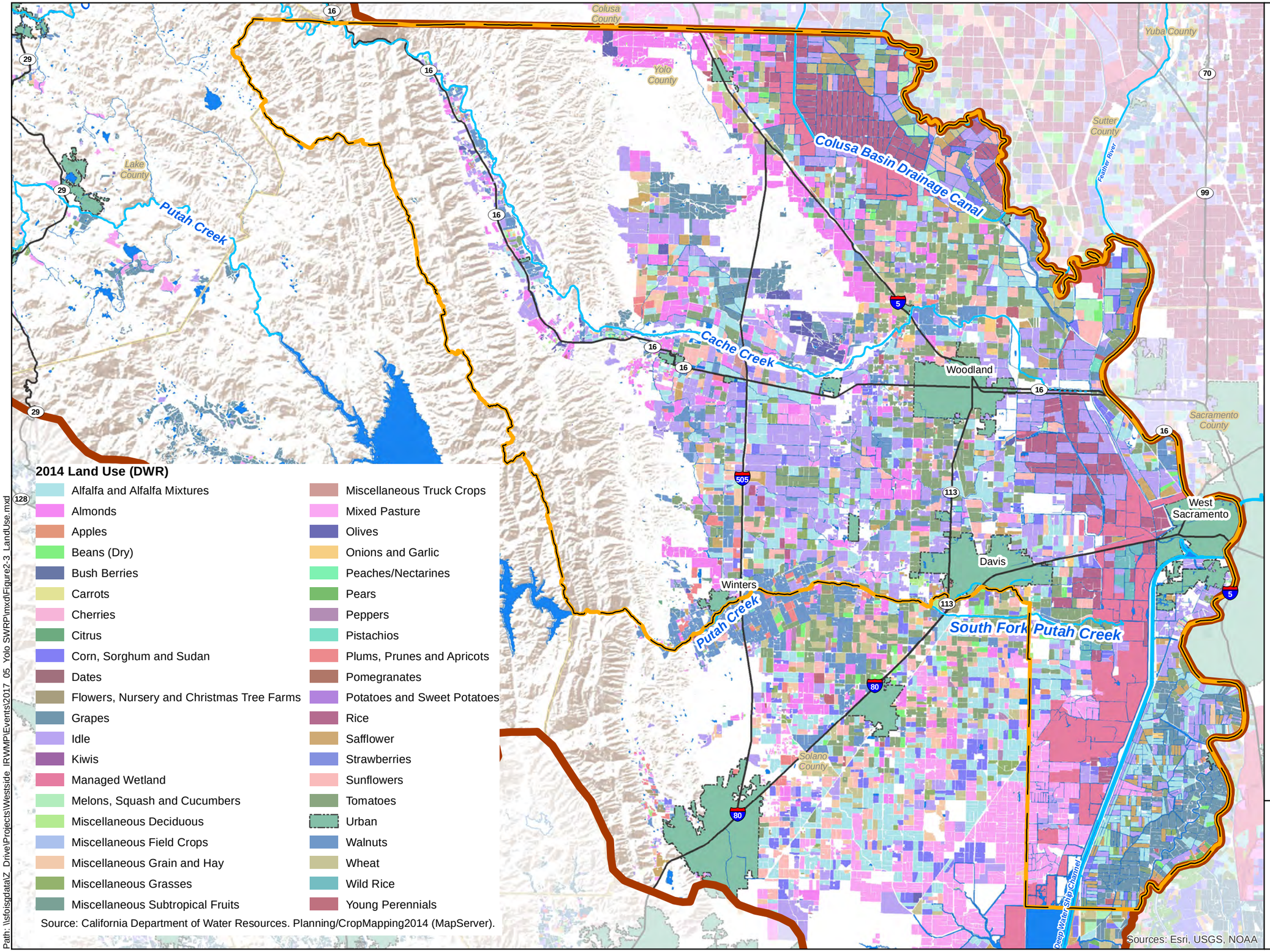

2014 Land Use (DWR)

- Alfalfa and Alfalfa Mixtures
- Almonds
- Apples
- Beans (Dry)
- Bush Berries
- Carrots
- Cherries
- Citrus
- Corn, Sorghum and Sudan
- Dates
- Flowers, Nursery and Christmas Tree Farms
- Grapes
- Idle
- Kiwis
- Managed Wetland
- Melons, Squash and Cucumbers
- Miscellaneous Deciduous
- Miscellaneous Field Crops
- Miscellaneous Grain and Hay
- Miscellaneous Grasses
- Miscellaneous Subtropical Fruits
- Miscellaneous Truck Crops
- Mixed Pasture
- Olives
- Onions and Garlic
- Peaches/Nectarines
- Pears
- Peppers
- Pistachios
- Plums, Prunes and Apricots
- Pomegranates
- Potatoes and Sweet Potatoes
- Rice
- Safflower
- Strawberries
- Sunflowers
- Tomatoes
- Urban
- Walnuts
- Wheat
- Wild Rice
- Young Perennials

Source: California Department of Water Resources. Planning/CropMapping2014 (MapServer).

Sources: Esri, USGS, NOAA

Legend

- Yolo County SWRP Boundary
- Westside Region
- Water

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Storm Water Resource Plan For Yolo County

Land Use

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Figure 2-3

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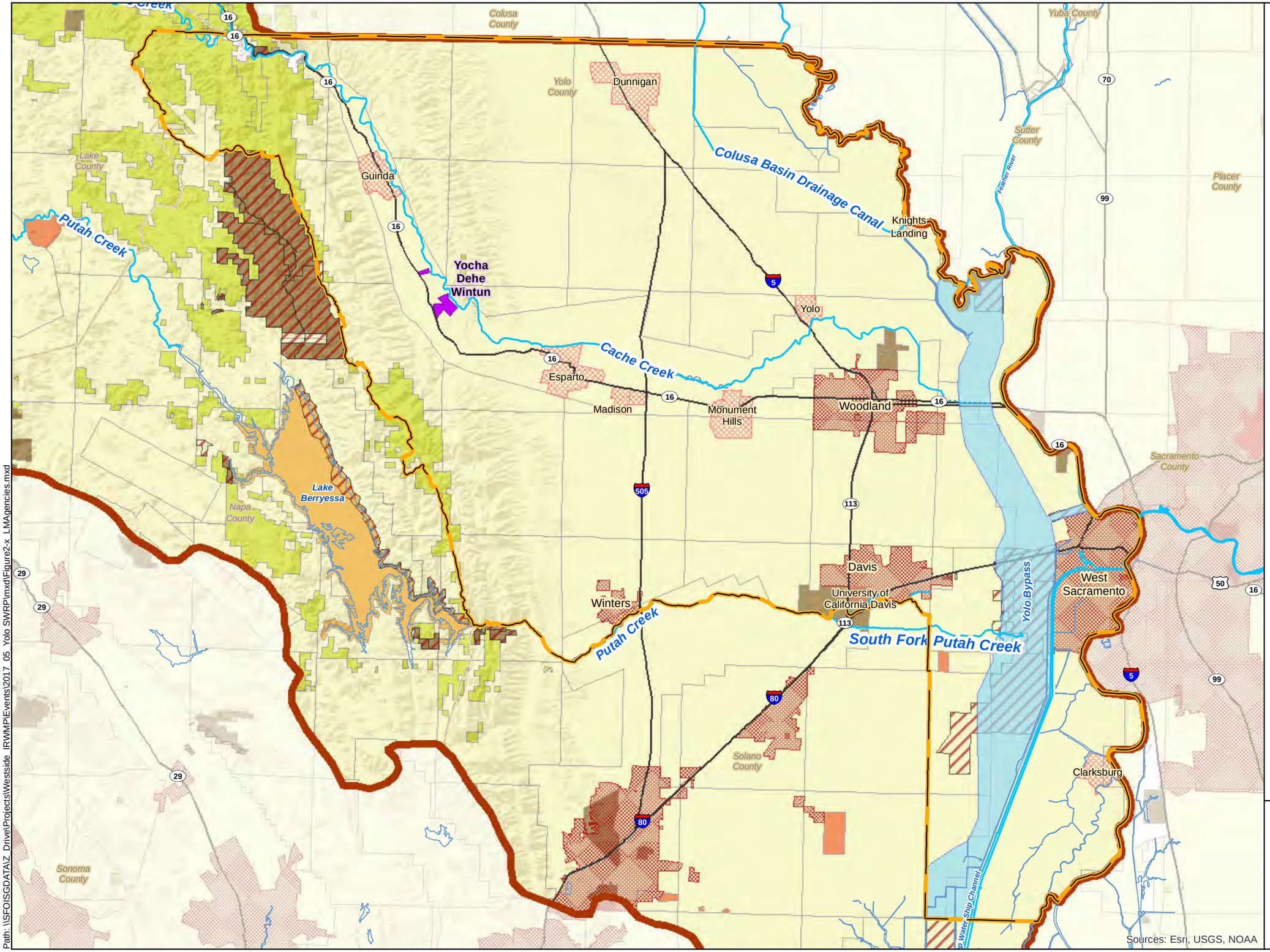

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Legend

- Yolo County SWRP Boundary
- City Boundaries
- Tribal Lands
- Unincorporated Communities
- County Boundaries
- Westside Region
- Streams
- Projected Flow Pathway
- Water Bodies

Land Management Agencies

- Bureau of Land Management
- Bureau of Reclamation
- Military
- Other State Lands
- US Forest Service
- Other/Privately Owned
- CA Dept. of Fish and Wildlife

Source:
Bulletin 118-Groundwater Basins, California Department of Water Resources (DWR), 2003

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LAND MANAGEMENT AGENCIES, CITIES, AND TRIBAL LANDS

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Figure 2-4

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DAC: Disadvantaged Community identified as a census geography "with an annual median household income (MHI) that is less than 80 percent of the Statewide annual MHI (PRC Section 75005(g)))." (http://www.water.ca.gov/irwm/grants/resources_dac.cfm)

EDA: Economically Distressed Area identified as a census geography with "a population that is ≤20,000 people; and less than 85% of the State's MHI." (https://gis.water.ca.gov/app/edas/)

Legend

- Yolo County SWRP Boundary
- City Boundaries
- Tribal Lands
- Unincorporated Communities
- Westside Region
- Streams
- Water Bodies
- Water Bodies
- EDA By Census Block Group
- EDA By Census Tract
- EDA By Census Place
- DAC By Census Block Group
- DAC By Census Tract
- DAC By Census Place

Source:
Bulletin 118-Groundwater Basins, California Department of Water Resources (DWR), 2003

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Storm Water Resource Plan For Yolo County

DISADVANTAGED COMMUNITIES (DACs) AND ECONOMICALLY DISADVANTAGED AREAS (EDAs)

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Figure 2-5

Sources: Esri, USGS, NOAA

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COLUSA COUNTY W.D.
RECLAMATION DISTRICT 108
Colusa County
Yuba County
Dunnigan Water District
Colusa Drain Mutual Water Company
Dunnigan Water Works
Tenhunfeld, Fred, Wallace Jack, Et Al
Sutter County
River Garden Farms Company
Giovannetti, B. E.
Driver, William A. Et Al
Feather River
Lake County
Colusa Basin Drainage Canal
RD 787
Heidrick, Mildred (1616)
Placer County
Yolo County
Edson, Wallace L. And Mary O.
Yolo - Zamora Water District
Heidrick, Mildred (8322)
RD 730
Putah Creek
Knights Landing Community Service District
RD 1600
Yocha Dehe Wintun
Cacheville Service District
Hershey Land Company
DESERET FARMS OF CALIFORNIA
Esparto Community Service District
Cache Creek
Knaggs Walnut Ranches
Yolo Land Trust
Madison Service District
Wild Wings Golf Community
Woodland
Wilson Ranch Partnership
Mesquite Investors, LLC And Family Real Property Limited Partnership
Yolo County Flood Control And Water Conservation District
RD 827
RD 527
RD 537
RD 2035
RD 785
Lake Berryessa
Rolling Acres Mutual Water Company
Riverby Limited
Conaway Preservation Group
Yolo County Housing Authority
West Sacramento
Davis
RD 900
Napa County
Winters
UC Davis
Putah Creek
South Fork Putah Creek
Sacramento County
RD 765
To be Transferred to Yolo County
North Delta Water Agency
RD 307
Solano County
Reclamation District No 999
RD 2068
Sonoma County
Reclamation District No 2098
Deep Water Ship Channel
Reclamation District No 2093
Sources: Esri, USGS, NOAA

Legend

- Yolo County SWRP Boundary
- Westside Region
- County Boundaries
- City Boundaries
- Streams
- Water Bodies
- ★ To be Transferred to Yolo County

Source:
Land Status, Bureau of Land Management, 2011;
California Department of Fish and Game (DFG) Owned and Operated Lands, CA Dept. of Fish and Game, 2011.

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Storm Water Resource Plan For Yolo County

Water and Wastewater Providers

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Figure 2-6

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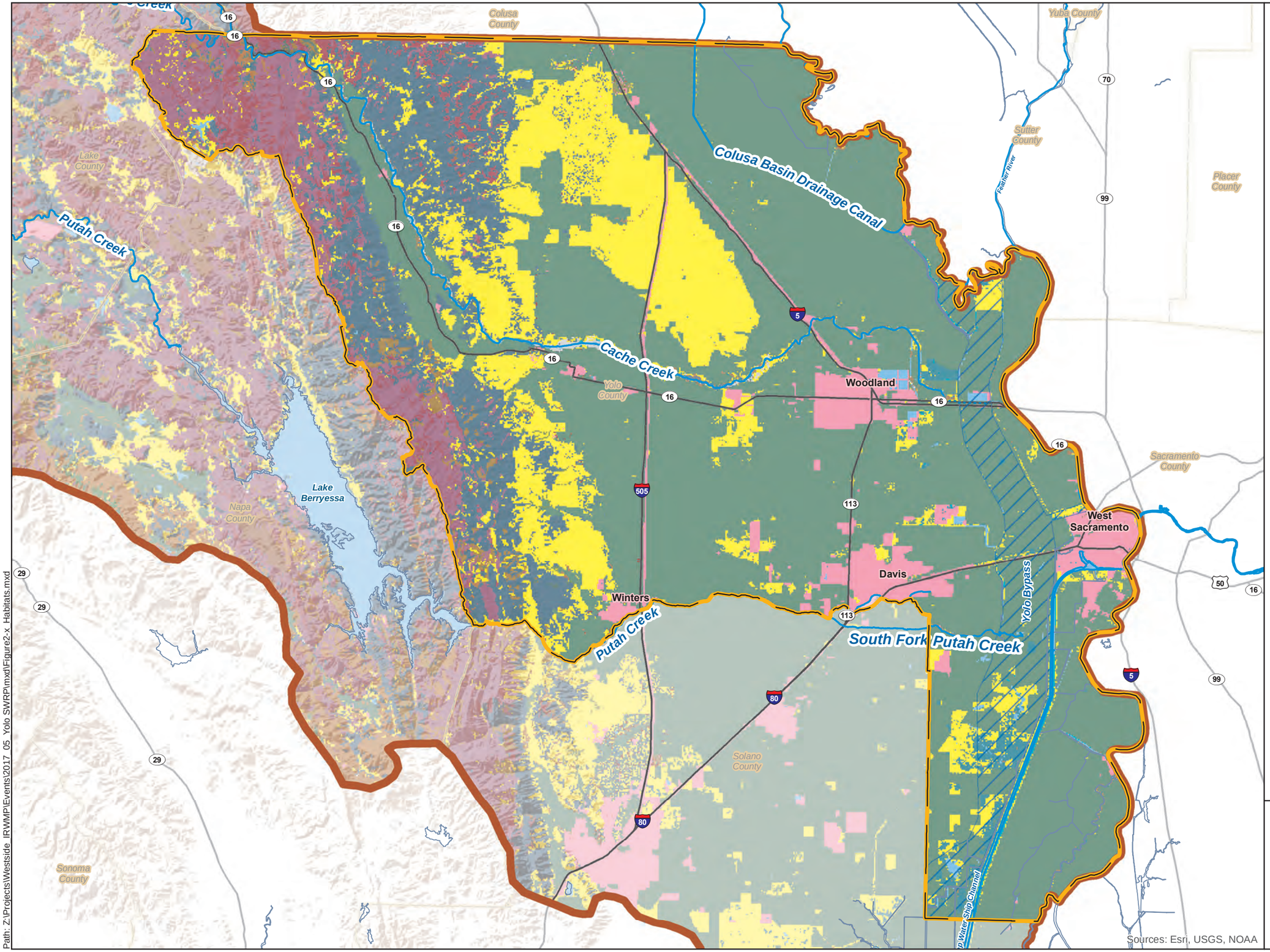

Legend

- County Boundaries
- Westside Region
- Streams
- Projected Flow Pathway
- Water Bodies

Habitats

- Agriculture
- Annual Grassland
- Barren
- Blue Oak Woodland
- Blue Oak-Foothill Pine
- Chamise-Redshank Chaparral
- Eucalyptus
- Freshwater Emergent Wetland
- Lacustrine
- Mixed Chaparral
- Montane Hardwood
- Montane Hardwood-Conifer
- Perennial Grassland
- Riverine
- Unknown Shrub Type
- Urban
- Valley Foothill Riparian
- Valley Oak Woodland
- Water

Source:
CNDDB, 2012; USFWS, 2012; ESRI, 2012; and ESA, 2012

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Storm Water Resource Plan For Yolo County

Yolo County Native Habitats

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Figure 2-7

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These conservation areas and designation, however, do not cover the entire county, and additional work is necessary to improve special status and endangered species habitat including the following objectives (RWMG, 2013):

- Increase productive floodplain connectivity,
- Improve overall fish passage,
- Expand contiguous extent of riparian canopy,
- Establish and manage additional reserves and preserves, and
- Protect vernal pools and migratory bird wintering areas.

Invasive plants present a significant challenge to the management of the county's water resources. Hence, addressing the spread of invasive species is an important component of maintaining the natural diversity of the region and helping to protect water (RWMG, 2013).

From the late 19th century to today, development of urban communities, agriculture conducted across large areas, and disturbance of the stream channels as a result of mining and construction of infrastructure has altered riparian habitat throughout the region. This disturbance has led to increased intrusion of invasive species in both terrestrial and aquatic areas, which can cause widespread impacts through the watershed. A number of invasive plants and animal species either already occur in or threaten to invade the region (RWMG, 2013). Invasive plant species of concern in the county include, distaff thistle (Carthamus lanatus), purple loosestrife (Lythrum salicaria), ravenna grass (Saccharum ravennae) and yellow flag iris (Iris pseudacorus).

The major risks to the watersheds from the spread of invasive aquatic and terrestrial plant species include (RWMG, 2013):

- Water quality impacts resulting from temperature changes due to alterations in river shading and chemical processes (increased nutrient loading, increased pH, and decreased dissolved-oxygen content)
- Water supply impacts, including reduced local availability of surface water and groundwater due to excessive evapotranspiration needs of invasive species and obstructions to water supply infrastructure due to the unmanaged growth of invasive plant communities
- Flooding risks as a result of alterations to the stream channel conveyance capacity and raised water levels during high flows
- Increased erosion as a result of decreased bank stability due to weaker root structures of invasive plant species, causing undercutting and bank collapse. Erosion also results from changes in flow patterns due to invasive plant obstructions within waterways, which can cause constrictions, higher flow velocities in certain areas, and potentially increased erosion.
- Increased fire hazards resulting from the dense growth patterns of some invasive plants, which present a significant fuel source in upland areas and decrease the ability of riparian areas to serve as natural firebreaks. Native riparian areas tend to be open networks of plants and steep and lightly vegetated banks that are poor fire fuel.
- Displacement of native habitats and associated wildlife due to water quality changes from invasive species and as a result of the species' ability to outcompete native plants, leading to the loss of food and habitat for native wildlife
- Hindered navigation for recreational activities as a result of invasive species obstructions to waterways and upland areas.

2.4.2 Infrastructure Protection

One of the ongoing challenges facing water suppliers and wastewater management agencies is aging and inadequate infrastructure. Much of the water storage and conveyance infrastructure, including the dams, canals, pipelines, and pump stations throughout the county, was built in the 1960s or earlier and could be nearing the end of its useful life. Some of the water supply systems may also require technological updates to keep pace with modern regulatory requirements and other drivers. Production groundwater wells also have a limited useful life, and groundwater producers must periodically drill replacement wells. Further, increasingly stringent water treatment requirements have required many existing and new wells to be retrofitted with groundwater treatment systems to remove contaminants and undesirable constituents such as arsenic, iron, and manganese. Many communities in the county are facing similar needs for investment in wastewater treatment facilities, and several are seeking to upgrade their flood protection infrastructure (RWMG, 2013).

As a result of the combination of aging infrastructure and rising expectations, water managers within the county must determine how they can make the significant investments required to replace and modernize aging infrastructure (RWMG, 2013).

2.4.3 Flood Management and Other Natural Disasters

Much of Yolo County is a natural floodplain. Three geographic regions with flooding issues include: Cache Creek basin/Woodland, Sacramento River corridor, Western Yolo floodplain (Madison, Esparto, Airport Slough, etc.) and Yolo County land west of the un-leveed part of the Yolo Bypass south of Putah Creek. The unincorporated area of Yolo County near Cache Creek, as well as parts of the City of Woodland, have only 10-year flood protection according to the Federal Emergency Management Agency (FEMA; WRA of Yolo County, 2007).

Yolo County contains 2015 miles of levees as part of the Sacramento River Flood Control Project, including the Yolo Bypass. The Yolo Bypass does not, and has not, functioned at design flow capacity for many years. This poses a threat to the citizens of Yolo, Solano, and Sacramento Counties if future flood events exceed the capacity of the Bypass. Geotechnical studies are necessary to determine whether some of the Yolo County's Sacramento River levees are subject to under-seepage or other potential causes of levee failure (WRA of Yolo County, 2007).

Some of the issues surrounding flood management and storm drainage within Yolo County include:

- Through seepage and under-seepage threats to Sacramento River levees
- Erosion threats to Sacramento River levees
- Inadequate funding for geotechnical studies to determine erosion, stability, and seepage threats to Sacramento River levees and subsequent repair projects
- Inadequate public outreach (need for flood insurance, understanding of evacuation plans, etc.)
- Inadequate emergency preparedness plans for levee failures
- Need to evaluate development in the floodplain (the more development, the greater the risk to public safety)
- Inadequate compensation to Yolo County for providing the City of Sacramento with flood protection. Failure of the federal and state governments to equitably address the Sacramento River Flood Control Project induced flood risks within and adjacent to the Yolo Bypass.
- Inadequate flood protection from existing Cache Creek levees.
- Erosion of existing Cache Creek levees
- Inadequate vegetation removal on Cache Creek (impedes capacity)
- Insufficient understanding of the risk of Cache Creek flooding
- Inadequate levees to protect Madison and Esparto from Lamb Valley Slough flooding
- Inadequate flood protection at the airport.

Future land use changes in the Yolo Bypass must be closely monitored to help ensure that impediments to flow do not occur that would further minimize capacity. All current and future land uses in the Bypass must be consistent with flow capacity requirements and subject to consistent State Reclamation Board enforcement. There should be no redirected hydraulic impacts as a result of the project operations, upstream development, or in-bypass projects.

2.4.4 Climate Change

Climate change could significantly impact Yolo County, impacting the ecological, environmental, and economic conditions. The potential impact of climate change should be studied and considered in planning for resource management and economic development. The following areas of concern are particularly relevant to the region (RWMG, 2013):

- Increases in peak storm water runoff flows and flood risk
- Increased evapotranspiration
- Decreased agricultural production due to changes in temperature and carbon dioxide levels
- Reductions in the habitat of riparian and aquatic species
- Decreased availability of water supplies.

2.4.5 Water Quality

High priorities for water quality include complying with discharge requirements and Basin Plan Objectives and providing water of suitable quality for the intended beneficial use (RWMG, 2013). Water quality objectives are prescribed by the Regional Water Quality Control Board in the *Water Quality Control Plan for the Sacramento River and San Joaquin River Basins* (Basin Plan) to protect the many beneficial uses of the region's waters, including municipal and domestic supply, agricultural supply, industrial supply, recreation, fishing, freshwater and wildlife habitat, and migration and spawning corridors.

The Basin Plan includes narrative and numeric water quality objectives. Waste load allocations have been, and will continue to be, adopted as part of the development of total maximum daily loads (TMDLs) for 303(d) listed waterways within Yolo County (RWMG, 2013).

Cache Creek, Colusa Basin Drain, and the Sacramento River within Yolo County all have TMDLs, and additional TMDLs are anticipated in the future for the Colusa Basin Drain, Davis Creek and Reservoir, Putah Creek, and Sacramento River. Surface water quality constituents of primary concern in Yolo County include mercury, boron, pesticides, nutrients, and fecal coliform (RWMG, 2013).

The Upper Cache Creek carries mercury-laden flows through Cache Creek to the settling basin that drains into the Yolo Bypass, which ultimately drains into the Bay Delta. Through this conveyance pathway, Cache Creek is a major contributor of mercury to the Bay Delta. Putah Creek has also been identified as a major contributor of mercury; however, the construction of Lake Berryessa has greatly reduced this contribution (RWMG, 2013).

Boron is another common source of water quality impairment for the county. Boron, a naturally occurring element in the soils of the region, dissolves in water and is carried into surface water bodies. While necessary for plant growth at low concentrations, boron in high concentrations is toxic to plants and can stunt their growth. Portions of Cache Creek, Putah Creek, Willow Slough, Willow Slough Bypass and the Tule Canal have been 303(d) listed for elevated boron concentrations that may be impairing agricultural water quality. From an end use perspective, boron in surface water is mainly a concern for irrigators in the valley who could be affected by the negative plant growth impacts (RWMG, 2013).

Pesticides are another major concern related to water quality impairment for the Westside Region. Surface waters in Yolo County are 303(d) listed for a host of pesticides that impair freshwater habitat and commercial and sport fishing beneficial uses. The source of pesticides is runoff from agricultural applications (RWMG, 2013).

Compliance with state and federal water quality programs is discussed in further detail in Section 3: Water Quality Compliance.

2.4.6 Sustaining Groundwater Resources

Groundwater is a key component of the county's conjunctive water supply portfolio. Urban areas, agriculture, and the environment in Yolo County depend upon a reliable water supply, a combination of both groundwater and surface water. In a normal year, nearly all urban water users in the county, except the City of West Sacramento, rely on groundwater as a significant source of water supply. Farmers rely on groundwater for approximately 40 percent of their supply in a normal year but rely more heavily on groundwater during drought years. In the future, urban population growth will result in an increase in water supply needs and demands from cities, unincorporated communities, and UC Davis (WRA of Yolo County, 2007).

It is unknown if the deep aquifers in the area are able to sustain current and future demands. Although agencies have tried to improve the understanding of groundwater resources through preparation of groundwater management plans and monitoring programs, much work remains to quantify the reliable, sustainable groundwater supplies available (RWMG, 2013).

Sustaining groundwater resources is also important because heavy reliance on groundwater and groundwater pumping has resulted in subsidence (consolidation of the aquifer causing decreased ground levels). Lower land surfaces resulting from subsidence of peat soils behind levees, some of which can be attributed to groundwater pumping, also contribute to flood risk because of the reduced effectiveness of the levees. Subsidence due to groundwater pumping has been detected in the northern Yolo-Zamora area of Yolo County between Zamora and Knights Landing, where subsidence is reported to be on the order of 5 feet, and the vicinity of Davis and Woodland, where subsidence is estimated at 2 or 3 feet (RWMG, 2013).

2.4.7 Land Use

The following land uses and human activities can contribute to the degradation of soils, waterbodies, and habitat and can make watershed management more difficult. Some of the listed activities have been described under several earlier topics but are additionally emphasized here because of their importance to the stakeholders (RWMG, 2013):

- Alteration of the natural landscape for any purpose, creating disturbed soils susceptible to erosion, and requiring installation of minimum control measures prescribed for NPDES storm water management permit compliance;
- Application or accidental release of potentially contaminating substances or prohibited waste discharges to water supplies, including wastewater

system overflows, septic system failures, water treatment byproducts, pest abatement, improper disposal of litter or refuse, and lack of storm water management

- Removal of natural vegetation and wildlife habitat, including destruction of wetlands, waterways, and shoreline ecologies
- Improper livestock husbandry and other poorly implemented agriculture, industry, and commercial BMPs
- Potential conflict between land and water use for: (a) recreation and tourism, (b) agriculture, and (c) opportunities to restore and preserve the environment.

In addition, urban development (parking lots, roads, and other impervious areas) contributes to increased runoff and pollution and decreased infiltration and natural creek and river flows. Methods to address these land use impacts include increasing urban greenspace, low impact development techniques such as reduced impervious area and vegetated facilities and infiltration basins for storm water runoff capture, and conversion of impervious pavement to pervious materials.

Section 3: Water Quality Compliance

The quality of surface waters in the region is greatly influenced by land use practices as well as historic sources. As discussed in Section 2.2, land use in the SWRP is approximately 44% open space, 45% agriculture, and 5% urban and community development. In Yolo County, surface waters are impacted largely by agricultural use, resource extraction (i.e., mercury mining in watersheds upstream of Yolo County), and nonpoint source pollutants from urban uses. Surface waters in the SWRP area are especially impaired by mercury, boron, pesticides, and toxicity.

Implementation of this SWRP will result in projects that are consistent with the TMDLs, NPDESs, and WDRs applicable for the watersheds within Yolo County, and comply with other plans and permits described in this section.

3.1 Activities Associated with Pollution of Stormwater and/or Dry Weather Runoff

Yolo County is within the Sacramento River Basin. Surface water from the Sacramento River and San Joaquin River Basins meet and form the San Joaquin River Delta, and ultimately drain into the San Francisco Bay. The Sacramento and San Joaquin Rivers furnish roughly 51% of the State's water supply, delivering water from the Delta to Southern California, the San Joaquin valley, Tulare Lake Basin, the San Francisco Bay area, as well as within the Delta boundaries. Water quality in the Sacramento and San Joaquin River Basins is collectively discussed in the Water Quality Control Plan for the California Regional Water Quality Control Board (RWQCB), Central Valley Region, Fourth Edition, The Sacramento River Basin and the San Joaquin River Basin (Basin Plan; RWQCB, 2016). Primary causes of pollutants to surface waters presented in the Basin Plan include urban runoff, industries, mines, agricultural runoff (RWQCB, 2016). Water quality in the SWRP area is summarized in Section 4.3 of the Yolo County IRWM Plan (WRA of Yolo County, 2007). The Central Valley Regional Water Quality Control Board (Central Valley RWQCB), as well as other state and federal regulatory and resource agencies, participated in the Westside Sacramento IRWM planning process and will likely support the effort to obtain regulatory and environmental approval for IRWM Plan actions during implementation (Section 1.2.2.3, Kennedy/Jenks, 2013).

Yolo County prepared a Stormwater Management Program (SWMP) Planning Document that primarily focused on the urbanized areas of El Macero and Willowbank (Yolo County, 2004). The cities of Davis, West Sacramento, and Woodland and the University of California, Davis prepared their own Stormwater Management Plans or SWMP Planning Documents (City of Davis, 2006; City of West Sacramento, 2003; City of Woodland, 2004; UCD, 2010).

The Basin Plan (Chapter IV, RWQCB, 2016), Yolo County IRWM Plan (Section 4.3 and 4.4, WRA of Yolo County, 2007), and the various Stormwater Management Plans and SWMP Planning Documents identify activities that can generate or contribute to the pollution of storm water or dry weather runoff, or impair the beneficial uses of storm water or dry weather runoff, such as:

- confined animal feeding operations
- agricultural drains
- urban drainage
- residential drainage
- industrial drainage
- agricultural runoff
- road construction activities
- mining
- agriculture irrigation
- logging and other harvest activities
- natural sources such as effects of fire, flood, and landslide
- landfill leachate collection system
- non-permitted direct connection and illicit discharges
- construction
- roads, streets, and highways operations and maintenance
- drainage system operation and maintenance
- waste handling and disposal
- water and sewer utility operation and maintenance

The magnitude of impact of these activities depends on the occurrence of activities within the drainage area, which is related to land uses and percentage of lands within the SWRP Planning Area. Based on the information found in Section 2.2, urban land uses and their associated activities account for a small portion of land use, while agriculture accounts for a large portion of land use in the SWRP planning area. Flooding and erosion are key concerns in Yolo County, as described in the Westside IRWM Plan, and can have a negative impact on surface water quality. The Yolo County Farm Bureau is one resource within Yolo County that provides assistance for complying with sediment and erosion requirements on irrigated lands (Yolo County Farm Bureau, 2017) and assists agricultural producers with compliance with the RWQCB Irrigated Lands Program. Mercury, in particular, is a significant source of water quality impairment and is a legacy left by the extensive mining areas upstream of Yolo County (Kennedy/Jenks, 2013).

The discussion that follows identifies specific impaired water bodies and the permits within the SWRP planning area.

3.2 TMDL and NPDES Compliance

3.2.1 TMDLs

The 1972 Clean Water Act (CWA) established strategies for managing water quality, as described in Section 3.2.1 (page 3-21 to 3-28) and Section 5.8 (pages 5-9 to 5-11) of the Westside IRMWP. To support these strategies, Section 303(d) of the CWA requires the identification of water bodies that do not meet, or are not expected to meet, water quality standards (i.e., impaired water bodies), and requires development of a total maximum daily load (TMDL) for each listing.

The Central Valley RWQCB is the state agency responsible for identifying impaired water bodies within the Central Valley region. Impaired water bodies are published by the Central Valley RWQCB in an Integrated Report to be approved by both the SWRCB and the USEPA and included on the Section 303(d) list of impaired waters requiring TMDLs. The USEPA approved the 2008-2010 303(d) list on 12 November 2010 and approved the revised 2012 303(d) list on 30 July 2015. The 2012 303(d) list is the current list; there were no updates to the 2008-2010 303(d) list for the Central Valley region.

On 20 December 2016 the Central Valley RWQCB approved and submitted the 2014 303(d) list to the SWRCB, which will replace the current 303(d) list after being approved by the SWRCB and the USEPA. The 2014 303(d) list includes updates to the Central Valley region which can be seen in Table 3-1.

TMDLs presented herein are for parameters that are included in a state general stormwater permit (municipal, industrial, and/or construction), indicating that storm water has been identified as a potential source of the parameter. Mercury, for example, is included in state general stormwater permits and is a major water quality issue in Cache Creek in Yolo County (Kennedy/Jenks, 2013). Mercury mines along the headwaters of Cache Creek, outside of the SWRP planning area, provided a significant source of mercury used in gold mining in the 19th century. SWRP storm water and erosion control projects may assist in reaching the TMDL goals by helping to minimize the erosion of mercury-contaminated soil. Additionally, the pesticide TMDL outside of the City of West Sacramento may be partially addressed by increasing the infiltration of storm water into soil.

Figure 3-1 shows the impaired water bodies located within the SWRP Planning Area and Table 3-1 presents a summary of 303(d) listed impaired water bodies in the SWRP Planning Area, towns and cities near the impaired water body, the associated pollutant(s) of concern, the potential sources as reported by the SWRCB, and the completion date for the TMDL. A more detailed list is provided in Appendix D.

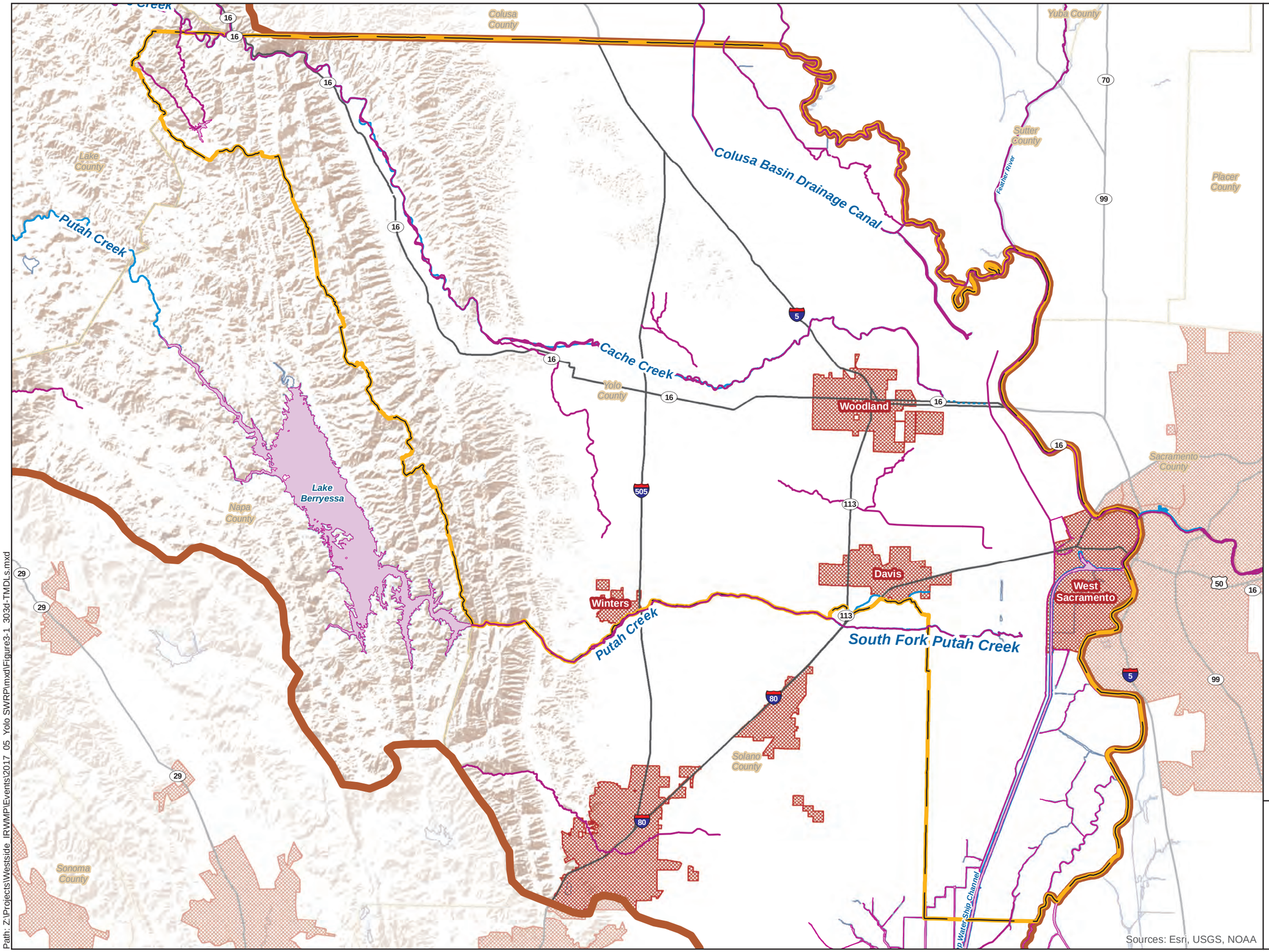
Table 3-1 Summary of 303(d) List of Impaired Water Bodies in Yolo County

303d Listed Waterbody	Pollutants																		Potential Pollutant Sources (2)
	Axinphos-methyl (Guthion)	Selenium	Carbofuran	Dieldrin	Malathion	Boron	Mercury	DDT (Dichlorodi-phenyltrichloroethane)	Diazinon	Escherichia coli (E. coli)	Group A Pesticides	Chlordane	Chlorpyrifos	Invasive Species	PCBs (Polychlorinated biphenyls)	Oxygen, Dissolved	Salinity	Fecal Coliform	Unknown Toxicity	
Cache Creek, Lower (Clear Lake Dam to Cache Creek Settling Basin near Yolo Bypass)						X (2021)	X (2007) (1)												X (2019)	The source of mercury is abandoned mines in the area. Potential sources for other pollutants are listed as unknown.
Colusa Basin Drain	X (2019)		X (2021)	X (2021)	X (2010)		X (2021)	X (2021)	X (2008)	X (2021)	X (2019)					X (2021)			X (2019)	Sources for pollutants are listed as unknown.
Davis Creek (downstream from Davis Creek Reservoir, Yolo County)							X (2017)													Sources for pollutants are listed as unknown.
Davis Creek (upstream from Davis Creek Reservoir, Yolo County)							X (2017)													Sources for pollutants are listed as unknown.
Davis Creek Reservoir							X (2017)													Sources for pollutants are listed as unknown.
Delta Waterways (northern portion)							X (2009)	X (2011)	X (2007) (1)		X (2011)	X (2011)	X (2007) (1)	X (2019)	X (2019)				X (2019)	The source of mercury is abandoned mines in the area. Potential sources for other pollutants are listed as unknown.
Delta Waterways (northwestern portion)							X (2009)	X (2011)	X (2007) (1)		X (2011)		X (2007) (1)	X (2019)			X (2019)		X (2019)	The source of mercury is abandoned mines in the area. Potential sources for other pollutants are listed as unknown.
Gordon Slough (from headwaters and Goodnow Slough to Adams Canal, Yolo County)																X (2021)				Sources for pollutants are listed as unknown.
Knights Landing Ridge Cut (Yolo County)						X(4) (2021)										X (2021)	X (2021)			Sources for pollutants are listed as unknown.
Putah Creek (Solano Lake to Putah Creek Sinks; partly in Delta Waterways, northwestern portion)						X(4) (2021)	X (2017)													The source of mercury is abandoned mines in the area. Potential sources for other pollutants are listed as unknown.
Sacramento River (Red Bluff to Knights Landing)				X (2021)			X (2021)	X (2021)							X (2021)				X (2019)	Sources for pollutants are listed as unknown.
Sacramento River (Knights Landing to the Delta)				X (2022)			X (2012)	X (2021)				X (2021)			X (2021)				X (2019)	The source of mercury is abandoned mines in the area. Potential sources for other pollutants are listed as unknown.
Sycamore Slough (Yolo County)																X (2021)				Sources for pollutants are listed as unknown.

303d Listed Waterbody	Pollutants																		Potential Pollutant Sources (2)
	Axinphos-methyl (Guthion)	Selenium	Carbofuran	Dieldrin	Malathion	Boron	Mercury	DDT (Dichlorodi-phenyltrichloroethane)	Diazinon	Escherichia coli (E. coli)	Group A Pesticides	Chlordane	Chlorpyrifos	Invasive Species	PCBs (Polychlorinated biphenyls)	Oxygen, Dissolved	Salinity	Fecal Coliform	Unknown Toxicity	
Tule Canal (Yolo County)						X (2021)				X (2021)							X (2021)	X (2021)		Sources for pollutants are listed as unknown.
Willow Slough (Yolo County)						X (2021)													X(5)	Sources for pollutants are listed as unknown.
Willow Slough Bypass (Yolo County)		X(5)			X(5)	X (2021)				X (2021)							X(5)	X (2021)	X(5)	Sources for pollutants are listed as unknown.
Winters Canal (Yolo County)									X (2021)											Sources for pollutants are listed as unknown.

Notes:
(1) Addressed by USEPA approved list.
(2) Potential sources presented are the potential sources listed on the State Water Board website, listed below.
(3) The expected TMDL completion date is presented in parenthesis.
(4) This TMDL's completion and approval schedule is different for different waterbodies. See waterbody-specific column.
(4)Delisted on 2014 303(d) Impaired Water Bodies Integrated Report
(5)Added to the 2014 303(d) Impaired Water Bodies Integrated Report

Sources:
(a) http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2012.shtml, accessed March 15, 2017.
(b) Natural sources and those not included in MS4 or general statewide storm water permits are assumed not to be applicable to storm water discharges.



Legend

- City Boundaries
- County Boundaries
- Westside Region
- Streams
- Projected Flow Pathway
- Water Bodies
- 303(d) Impaired Rivers/Streams
- 303(d) Impaired Water Bodies

Source:
2010 303(d) Listed Waters, SWRCB, 2012.

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Kennedy/Jenks Consultants

Storm Water Resource Plan For Yolo County

Impaired Water Bodies within Yolo County

K/J 1770002.00
May 2018

Figure 3-1

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3.2.2 NPDES Permits

There are several types of National Pollutant Discharge Elimination System (NPDES) permits for discharges to surface waters within Yolo County including municipal, individual, industrial and construction permits as discussed below. Table 3-2 summarizes the applicable, active NPDES permits issued for the SWRP Area; a list of the applicable, active NPDES permits is included as Appendix E. Figure 3-2 presents the permittee locations, as published on the State Water Board website, relative to impaired water bodies.

Table 3-2 NPDES Permits Issued by the Central Valley RWQCB – Yolo County

Type of Permit	Total [a]
Phase I Municipal MS4	0
Phase II Small MS4	6
Individual	2
Industrial Storm Water	102
Construction Storm Water	65

(a) Based on the State Water Board website, accessed March 15, 2017 (https://ciwqs.waterboards.ca.gov/ciwqs/readOnly/CiwqsReportServlet?inCommand=reset&reportName=RegulatedFacility)

(b) There also 46 Non NPDES Waste Discharge Requirements (WDRs) discussed in Section 3.3.1)

3.2.2.1 Municipal Permits

The CWA was amended in 1987 to include coverage for urban runoff discharges from Municipal Separate Storm Sewer Systems (MS4s) under NPDES, as described in Section 1.1 of the Yolo County SWMP Planning Document (page 1-1 to 1-2, Yolo County, 2004). Municipalities may require coverage by a Phase I or Phase II MS4 permit, depending on the municipality's population or as determined by the permitting authority. The goal of MS4 permits is to improve water quality from within municipalities and the first finding of the Phase II MS4 permit states:

> "The State Water Resources Control Board (State Water Board) finds that:
>
> 1. Storm water is a resource and an asset and should not be treated as a waste product. Managing rainwater and storm water at the source is a more effective and sustainable alternative to augmenting water supply, preventing impacts from flooding, mitigating storm water pollution, creating green space, and enhancing fish and wildlife habitat. California encourages alternative, innovative, multi-objective solutions to help use and protect this valuable resource, while at the same time controlling pollution due to urban runoff."

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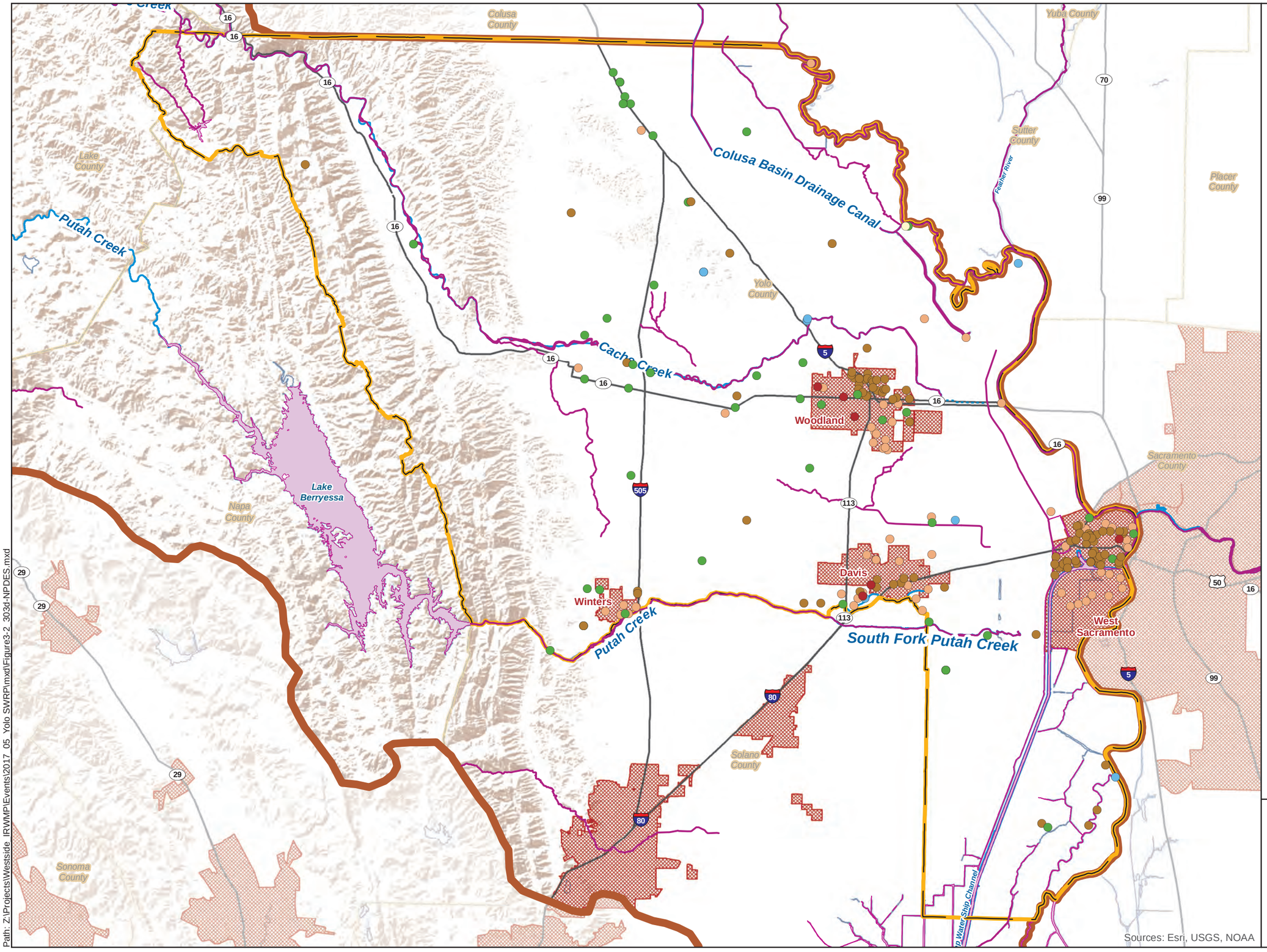

Legend

- City Boundaries
- County Boundaries
- Westside Region
- Streams
- Projected Flow Pathway
- Water Bodies
- 303(d) Impaired Rivers/Streams
- 303(d) Impaired Water Bodies

Regulated Facilities

- Construction Storm Water (64)
- Industrial Storm Water (101)
- NPDES Permit (8)
- Phase II Small MS4 (6)
- Waiver (1)
- WDR (46)

Source:
2010 303(d) Listed Waters, SWRCB, 2012. Yolo County Regulated Facilities Report, CIWQS, 2017.

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Kennedy/Jenks Consultants

Storm Water Resource Plan For Yolo County

NPDES Permits within Yolo County

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May 2018

Figure 3-2

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In California, Phase I municipalities now have individual NPDES permits administered by the Regional Water Quality Control Boards, and Phase II municipalities are covered by the General Permit for Discharges of Storm Water from Small Municipal Separate Storm Sewer Systems (Small MS4 General Permit) administered by the State Water Resources Control Board. There are no Phase I municipalities in the SWRP planning area, but there are six permittees that are required to comply with the Small MS4 General Permit (Order No. 2013-0001-DWQ):

- 40th District Agricultural Association[1]
- City of Davis[2]
- City of Woodland[2]
- City of West Sacramento
- Yolo County
- University of California Davis (UC Davis)[1]

Small MS4 General Permit compliance requires permittees to develop programs to address

- Education and Outreach
- Public Involvement and Participation
- Illicit Discharge Detection and Elimination
- Construction Site Storm Water Runoff Control
- Pollution Prevention/Good Housekeeping
- Post Construction Storm Water Management
- Water Quality Monitoring
- Program Effectiveness Assessment and Improvement
- TMDL Compliance

SWRP projects will likely aid permittees to meet some of their MS4 permit requirements in alignment with the findings of the MS4 permit. For example, UC Davis experiences major water quantity and quality issues on campus including flooding, organic loading from leaf litter in the Arboretum, and stagnant water. These issues can be resolved through potential SWRP projects such as upstream detention and a redesign of the Arboretum to increase flow rates, add flood capacity, and construct green infrastructure projects to filter storm water. The SWRP will identify these types of project implementation opportunities to address activities that contribute to the pollution of storm water and dry weather runoff.

In addition to monitoring for TMDLs listed in Attachment G, municipalities are required to monitor 303(d) impaired water bodies as part of the MS4 requirements. When implementing the SWMP, special consideration will be given to ensure 303 (d) impaired water bodies are not negatively impacted. TMDL requirements within Yolo County for 303 (d) listed bodies were discussed in Section 3.2.1 and can be found in Table 3-1.

The City of Winters has taken initial steps to develop a storm water management plan and is working towards meeting the requirements of MS4 permitting. The City of Winters is currently covered under a waiver from the MS4 Permit due, in part, to its small population size (under 10,000).

If the town of Madison constructs underground drainage facilities, a feasibility study being conducted during the implementation of this Plan, the town of Madison will be required to obtain a Phase 2 – MS4 Permit and will need to meet MS4 permitting requirements.

3.2.2.2 Individual Permits

There are four facilities in the SWRP planning area that are covered by individual NPDES permits, which are issued by the Central Valley RWQCB: City of Davis Wastewater Treatment Plant (Order No. R5-2013-0127, effective 23 November 2013), City of Woodland Water Pollution Control Facility (Order No. R5-2014-0120, effective 1 December 2014), UC Davis Center for Aquatic Biology and Aquaculture (Order No. R5-2012-0053, effective 28 July 2012), and the UC Davis Campus Wastewater Treatment Plant (Order No. R5-2014-0152, 1 February 2015). The City of Davis Wastewater Treatment Plant is allowed to discharge treated municipal wastewater to Willow Slough Bypass and the Conaway Ranch Toe Drain, which are both part of the Yolo Bypass. These discharges are classified as a major discharge. The UC Davis Center for Aquatic Biology and Aquaculture is allowed to discharge treated aquaculture wastewater at two locations, both at the South Fork of Putah Creek. These discharges are classified as minor discharges. The Orders contain requirements such as effluent limitations, compliance with the Basin Plan, monitoring and reporting requirements, and implementation of best management practices (BMPs), as

[1] The 40th District Agricultural Association and UC Davis both hold non-traditional MS4 permits used for storm water discharge from entities that are not municipalities.

[2] The Draft Order to amend Order 2013-0001-DWQ removes the TMDL requirement of the Phase II MS4 Permit for the City of Davis and the City of Woodland. The Final Order has not been released.

well as discharge prohibitions, receiving water limitations, and other provisions.

3.2.2.3 Industrial and Construction Permits

Storm water discharges associated with construction activity, industrial activity, and utilities other than water suppliers may also be covered by statewide general permits under NPDES, including the Industrial General Permit (IGP) for industrial activities and the Construction General Permit (CGP) for construction activity.

3.3 Other Permits

All projects proposed and implemented as part of the Yolo County SWRP and Westside Sacramento IRWM Plan will comply with applicable local storm water documents and ordinances, including the SWMP (Yolo County, 2004) and other Yolo County Public Works Division requirements. All projects will also comply with applicable state and federal regulations, including the California Environmental Quality Act (Public Resources Code § 21000 et seq.), the CWA, the Endangered Species Act (ESA), the Safe Drinking Water Act, applicable water rights permits and licenses, State Water Board plans and policies, State and Regional Water Board water quality control plans and policies (Wat. Code, § 10562, subd. (b)(5)), NPDES permits, Areas of Special Biological Significance Compliance Plans (State Water Board Resolution 2012-0012), conditional waivers issued by State and/or Regional Water Boards (Wat. Code, § 10562, subds. (b)(5) & (6).), and the Mosquito Abatement and Vector Control District Law (Division 3, Chapter 1 of the Health and Safety Code beginning with Article 2000; State Water Board, 2015).

3.3.1 Waste Discharge Requirements

According to the California Code of Regulations, Title 27 section 20090, there are nine categories of discharges that are regulated by the Waste Discharge Requirements (WDRs) Program: sewage, wastewater, underground injection, Regional Water Board cleanup actions, gas condensate, soil amendments, drilling waste, reuse, and waste treatment in fully enclosed units. There are a number of adopted WDR orders within Yolo County, which are listed in Appendix F and can be found on the Central Valley RWQCB website: http://www.waterboards.ca.gov/centralvalley/board_decisions/adopted_orders/index.shtml#yolo. However, waste discharge permits do not typically apply to storm water discharges, which are regulated under other permits, as discussed in Section 3.2.

Central Valley RWQCB also administers the Irrigated Lands Regulatory Program (ILRP) aimed at regulating waste discharges due to agricultural operations. The Yolo County Farm Bureau Irrigated Lands Program (Yolo ILP) is designed to help farmers in the County to protect water quality from discharges of irrigation water and storm water that enters surface water bodies and meet the requirements of the ILRP. The Yolo ILP group is part of the Sacramento Valley Water Quality Coalition (Coalition), which is responsible for fulfilling the conditions and requirements of the WDR General Order R5-2014-0030-R1 for waste discharges from irrigated lands, which includes surface water quality monitoring and analysis on the pesticides, herbicides, nutrients and other agricultural products.

Growers under the Coalition are required to prepare and have certified a Sediment and Erosion Control Plan (SECP), which will help identify erosion sources and potential locations of sediment discharge that could affect the quality of storm water and irrigation water discharges from farmlands. The SECP includes identified parcels and/or corresponding field(s) the SECP applies to, on-farm sediment and erosion management practices, site evaluation, and SECP self-certification.

3.3.2 California Health and Safety Code – Pest and Mosquito Abatement

As indicated in Section 2.2, all projects implemented from this SWRP and the Westside Sacramento IRWM Plan will comply with the Mosquito Abatement and Vector Control District Law (Division 3, Chapter 1 of the Health and Safety Code beginning with Article 2000; State Water Board, 2015). The Yolo County SWMP Planning Document includes a summary of implementation plans and schedules for complying with BMPs for illicit discharges, stormwater quality at construction sites, new and redevelopment planning, and municipal stormwater operation (Yolo County, 2004). This includes the condition that all land development applications be reviewed by the Planning and Public Works Department, which, in part, reviews proposed projects for mitigation or prevention of foreseeable health hazards or environmental degradation in the context of vector control, among other areas (Yolo County, 2004). Furthermore, the Sacramento-Yolo County Mosquito & Vector Control District has prepared a Mosquito and Mosquito-Borne Disease Management Plan, with which all projects will be required to comply (Sacramento-Yolo Mosquito and Vector Control District, 2005).

3.3.3 Modification of a River or Stream Channel

As projects in this SWRP are implemented, some projects may result in the modification of a river or stream channel. These types of projects may require additional permitting for compliance with CWA Sections 404 and 401, as well as California Department of Fish and Wildlife regulations. CWA Section 404 permits are issued by the US Army Corps of Engineers while CWA Section 401 water quality certifications are issued by the California RWQCB.

Low impact development (LID) measures are encouraged where feasible in various stormwater guidance documents prepared in the region, such as the City of West Sacramento Post-Construction Standards Plan (City of West Sacramento, 2014). Implementing LID and hydromodification controls can also reduce the impacts to river and stream channels by reducing flow duration, volume, frequency and/or peak flow rates. The Yolo County SWRP also supports LID practices in the limited acreage of urbanized areas within the planning area.

3.4 Monitoring

The Yolo County SWRP, the implementation of projects, and associated monitoring data will be tracked using a Data Management System (DMS) that takes advantage of database systems developed by statewide efforts (as described in Section 6 Implementation Schedule and Strategy). The data management approach includes collection and sharing of data through state databases, County monitoring such as through the Yolo County Irrigated Lands Program, and monitoring by municipalities with MS4 permits. Additional adaptive approaches to data management will continue to be considered. Data management and project implementation tracking is discussed further in Section 6.

3.4.1 Statewide Databases

The Yolo County SWRP will utilize state databases for the collection and management of Plan data, including such programs as:

- California Department of Water Resources (DWR) Water Data Library (WDL) – an online webservice with public access to groundwater, water quality, and surface water flow data. (http://www.water.ca.gov/waterdatalibrary/)
- California Environmental Resources Evaluation System – the State's web service for natural resources and planning data. (CERES) (http://ceres.ca.gov/)
- California Environmental Data Exchange Network -a centralized online location for sharing information about the State's surface water bodies including water quality, aquatic habitat, and wildlife health. (CEDEN) (http://www.ceden.org/)
- California Statewide Groundwater Elevation Monitoring (CASGEM) – a program to track seasonal and long-term trends in groundwater elevations in California's groundwater basins. Data is contributed by local monitoring entities or DWR groundwater data collection efforts. (http://www.water.ca.gov/groundwater/casgem/)
- California Environmental Information Catalog (CEIC) – an online directory of spatial and other types of data resources contributed by cities, counties, utilities, state and federal agencies, private businesses, and academic institutions. (http://gis.ca.gov/catalog).

In addition, as indicated previously, the SWRP area is in the Sacramento and San Joaquin River Basins, and therefore upstream of the Sacramento-San Joaquin River Delta (Delta). The Delta is collectively monitored with the San Francisco Bay by the Bay-Delta Team, staffed by the State Water Board and the Central Valley and San Francisco Bay RWQCBs. Water quality at the Delta and upstream of the Delta is monitored as part of the Delta Regional Monitoring Program. This stakeholder-driven program is currently in progress and publishes various water quality reports in accordance with the program timeline. Additional information can be found here: http://www.waterboards.ca.gov/centralvalley/water_issues/delta_water_quality/delta_regional_monitoring/index.shtml.

3.4.2 Yolo County Irrigated Lands Program (ILP)

As described in Section 3.3.1, the Yolo ILP (as part of the Coalition) includes surface water quality monitoring and analysis within the Yolo subwatershed. According to the Coalition's *Annual Monitoring Report 2016* (Larry Walker Associates, 2017[3]), the Coalition uses a "Representative Monitoring" approach to achieve the goals of the 2016 Monitoring and Reporting Plan:

[3] https://www.waterboards.ca.gov/centralvalley/water_issues/irrigated_lands/water_quality/coalitions/sacramento_valley/index.html#sacamrs

- Representative monitoring is conducted at sites in drainages representative of larger regions based on shared agricultural and geographic characteristics;
- Representative monitoring includes a cycle of two years of "Assessment" monitoring for the broader suite of ILRP analytes, followed by two years of sampling needed for Management Plan implementation (referred to as "Non-Assessment" monitoring); and
- Monitoring schedules and the analytes monitored are customized based on the characteristics of individual subwatersheds and Management Plans.

Sampling sites were selected based upon the following fundamental assumptions regarding management of non-point source discharges to surface water bodies:

1) Landscape scale sampling at the bottom of drainage areas allows determination of the presence of water quality problems using a variety of analytical methods, including water column and sediment toxicity testing, water chemistry analyses, and bioassessment;
2) Strategic source investigations utilizing Geographic Information Systems can be used to identify upstream parcels with attributes that may be related to the analytical results, including crops, pesticide applications, and soil type; and
3) Management practice effectiveness can best be assessed by coalitions at the drainage and watershed scale to determine compliance with water quality objectives in designated water bodies. Results from farm-level management practices evaluations are used to complement Coalition efforts on the watershed scale by providing crop-specific information that supports management practice recommendations.

In Yolo County the representative monitoring site is Willow Slough Bypass at County Road 102 (which becomes Pole Line Road just south of the City of Davis boundary). The Willow Slough Bypass is a large drainage including approximately 102,000 total acres. Irrigated acreage (excluding rice acreage) is approximately 66,000 acres. Predominant crops in the drainage are grain, pasture, corn, tomatoes, rice, almonds, and walnuts. Data submitted to the ILRP can be accessed through CEDEN.

3.4.3 Other Monitoring Programs

Other local monitoring programs will be utilized to the extent practical, including but not limited to:

- UC Davis's Putah Creek monitoring, as described in their Program Effectiveness Assessment and Improvement Plan (UC Davis, 2015)
- The Westside Brownfields Coalition Assessment Project (http://www.westsideirwmbrownfields.org/), which will include an assessment of mine-affected Brownfields in the Westside IRWM area, including the Cache Creek Watershed. Identification and assessment will target those Brownfield sites that (1) contaminate the watershed, (2) potentially contribute to public and environmental health concerns, and (3) inhibit reuse for open space, economic development, or other beneficial uses.

Section 4: Organization, Coordination, and Collaboration

The Yolo County SWRP was developed by the SWRP Team with input by those entities participating in the Water Resources Association of Yolo County. Development of the Plan also included the participation of community stakeholders not normally involved with the WRA of Yolo County to ensure that local agencies, non-governmental organizations, nonprofit organizations, and the community are identified and consulted throughout the SWRP development. As described in Section 1, there are many on-going efforts by local agencies and non-governmental organizations to address water quantity and quality issues in Yolo County. This SWRP will build off these efforts by the entities described in this section.

4.1 Local Agencies and Non-Governmental Organizations

SWRP development for Yolo County was initiated by the WRA of Yolo County to address storm water and dry weather runoff management for its member agencies. The WRA of Yolo County member agencies are: City of Davis, City of West Sacramento, City of Winters, City of Woodland, County of Yolo, Dunnigan Water District, Reclamation District 108, Reclamation District 2035, University of California (UC) at Davis, and Yolo County Flood Control and Water Conservation District.

In addition to WRA of Yolo County member agencies, other agencies and non-governmental organizations were invited to participate in the development of the Plan including, but not limited to: Madison Community Service District (CSD), Esparto CSD, Knights Landing CSD, and the Lower Putah Creek Coordinating Committee (LPCCC). Table 4-1 lists the organizations/stakeholders invited and participating in the development of the SWRP.

Furthermore, several broader efforts, such as FloodSAFE Yolo, FloodProtect, the Bay-Delta Conservation Plan, and other regional/statewide efforts that incorporate state and federal agencies were considered in the development of the SWRP implementation strategy (described further in Section 6).

As indicated in Table 4-1, many of the stakeholders of the SWRP are also members of the YSGA. Therefore, due to the nexus of storm water management and groundwater management within Yolo County, the SWRP will be implemented in parallel with and supported by the efforts of the YSGA. Further details on the implementation of the SWRP is provided in Section 6: Implementation Strategy and Schedule.

The entities in Table 4-1 have taken on storm water as part of their management responsibilities, including:

- Storm Water Collection/Storm Drain Systems/Storm Water Treatment
- Water Resources Management
- Water Supplier
- Flood Control/Runoff Management
- Water Quality Control
- Pollution/Sediment Control/Prevention and Associated Standards Control
- Storm Water Reuse
- Ecosystem and Watershed Restoration and Protection
- Storm Water Permits, Compliance and Enforcement
- Public Education and Outreach

4.1.1 Yolo Subbasin Groundwater Agency

The Yolo Subbasin Groundwater Agency (YSGA) was officially formed on June 19, 2017 for the purpose of acting as the Groundwater Sustainability Agency (GSA) for the Yolo Subbasin. YSGA members and affiliated parties consists of cities, water suppliers, Community Service Districts, Reclamation Districts, the Yocha Dehe Wintun Nation, Yolo County, water resource managers, private groundwater pumpers, the University of California, Davis, and other parties with initial groundwater management and associated land use jurisdiction of the Yolo Groundwater Subbasin.

Table 4-1: *Yolo County SWRP Stakeholders*

Stakeholder	Type/Classification	Interests/Responsibilities Related to Storm Water
WRA of Yolo County[2]	Non-profit organization	Includes Interests/Responsibilities of all Member Agencies
City of Davis[1,2]	Municipal water agency	Water Supplier, Water Quality Control, Storm Drain Systems, Water Resources Management, Storm Water Reuse, Pollution/Sediment Control, Ecosystem and Watershed Restoration and Protection, Public Education and Outreach
City of West Sacramento[1,2]	Municipal water agency	Water Supplier, Water Quality Control, Storm Drain Systems, Water Resources Management, Storm Water Reuse, Pollution/Sediment Control/Prevention, Ecosystem and Watershed Restoration and Protection, Public Education and Outreach
City of Winters[1,2]	Municipal water agency	Water Supplier, Water Quality Control, Storm Drain Systems, Water Resources Management, Storm Water Reuse, Pollution/Sediment Control, Ecosystem and Watershed Restoration and Protection, Public Education and Outreach
City of Woodland[1,2]	Municipal water agency	Water Supplier, Water Quality Control, Storm Drain Systems, Water Resources Management, Storm Water Reuse, Pollution/Sediment Control, Ecosystem and Watershed Restoration and Protection, Public Education and Outreach
Reclamation District 108[1,2]	Reclamation district	Water Supplier, Flood Control, Ecosystem and Watershed Restoration and Protection
Reclamation District 2035[1,2]	Reclamation district	Flood Control (Levee Maintenance; Drainage), Water Supplier (Irrigation Services)
Yocha Dehe Wintun Nation[2]	Tribe	Storm Water Collection/Treatment, Water Supplier, Storm Water Reuse, Water Quality Control, Sediment Control, Ecosystem and Watershed Restoration and Protection, Public Education and Outreach
Dunnigan Water District[1,2]	Irrigation district	Water Supplier
UC Davis[1,2]	Educational organization	Water Supplier, Water Quality Control, Storm Drain Systems, Water Resources Management, Storm Water Reuse, Pollution/Sediment Control, Ecosystem and Watershed Restoration and Protection, Public Education and Outreach
Yolo County[1,2]	Government agency	Water Quality Control, Storm Drain Systems, Water Resources Management, Storm Water Reuse, Pollution/Sediment Control, Ecosystem and Watershed Restoration and Protection, Public Education and Outreach
Yolo County Flood Control & Water Conservation District[1,2]	Government agency	Water Supplier, Storm Water Reuse, Storm Drainage Control, Flood Control, Ecosystem and Watershed Restoration and Protection
Madison CSD[2]	Community Service District	Water Supplier
Esparto CSD[2]	Community Service District	Water Supplier, Storm Drainage Control
Knights Landing CSD	Community Service District	Water Supplier, Storm Drainage Control
Lower Putah Creek Coordinating Committee[3]	Non-governmental organization	Pollution and Sediment Control/Prevention, Ecosystem and Watershed Restoration and Protection

1. Member agency of the WRA of Yolo County
2. Member of the Yolo Subbasin Groundwater Agency
3. The LPCCC represents the Boards of Supervisors of Solano and Yolo Counties; the cities of Davis, Fairfield, Suisun, Vacaville, Vallejo and Winters; Solano County Water Agency; Solano Irrigation District; Maine Prairie Water District; the UC Davis; Putah Creek Council; and riparian landowners.

4.2 State and Federal Agencies

Throughout the development of the SWRP, the State Water Resources Control Board (SWRCB) was kept informed of Plan development progress through submittal of deliverables, quarterly invoices, and notification of changes in development scope. Coordination with state agencies occurred on an as-needed basis for Plan development and implementation of specific projects.

State agencies will be contacted during future plan updates.

4.3 Community Participation

Community participation was important during SWRP development in that it fostered outreach, participation, and involvement of disadvantaged communities (DACs), local tribes, the general public, and specific audiences such as local ratepayers, developers, locally regulated commercial and industrial stakeholders, and nonprofit organizations.

SWRP development included regular meetings to review Plan content, process, and implementation. These meetings generally followed WRA of Yolo County Technical Committee Meetings.

The Yolo County SWRP serves as the foundation for the development of the SWRP for the Region's IRWM Area which will be integrated into the IRWM Plan upon its completion; the WRA of Yolo County's and Westside-Sacramento RWMG's existing governance structures, as well as the WRA of Yolo County's information distribution process, was utilized for the SWRP. Progress of the SWRP development was presented at Westside-Sacramento RWMG bi-monthly Coordinating Committee Meetings. In this way, resources were optimized and participation was maximized.

Open to the public and all other interested parties, all stakeholder meetings were announced ahead of time. Copies of meeting agendas, meeting summaries, presentations and handouts, and lists of meeting attendees are available on the project website. During these meetings, stakeholders were given the opportunity to discuss and review the content of the SWRP and to review and comment on the draft versions. See Appendix G for submitted comments and their responses.

Section 7 describes the SWRP public outreach and participation process.

4.3.1 Other SWRP Areas

The Yolo County SWRP area is bounded to the north by North Sacramento Valley IRWM Region. In this Region, are two SWRP efforts: The City of Chico SWRP (for the Big Chico Creek and Little Chico Creek Watersheds) and the City of Redding SWRP. Both of these planning areas drain into the Sacramento River; therefore, the development of the Yolo County SWRP was coordinated with the two North Sacramento Valley Region SWRPs when appropriate, and coordination will continue through the implementation of the Yolo County SWRP.

4.4 Plan Implementation

The SWRP for Yolo County will be adopted by the Westside-Sacramento RWMG and incorporated into the Westside-Sacramento IRWM Plan. The required decisions that must be made by local, state or federal regulatory agencies for Plan implementation and coordinated watershed-based or regional monitoring and visualization, including funding strategies, responsibilities, tracking, and participation is already identified and has been in place through the Westside-Sacramento RWMG and WRA of Yolo County.

Furthermore, all projects proposed and implemented as part of the Yolo County SWRP will comply with applicable town, city, and county storm water documents and ordinances, including those identified in Section 1. All projects will also comply with applicable state and federal regulations, including the California Environmental Quality Act (Public Resources Code § 21000 et seq.), the Clean Water Act, the Safe Drinking Water Act, applicable water rights permits and licenses, State Water Board plans and policies, State and Regional Water Board water quality control plans and policies (Wat. Code, § 10562, subd. (b)(5)), NPDES permits, Areas of Special Biological Significance Compliance Plans (State Water Board Resolution 2012-0012), conditional waivers issued by State and/or Regional Water Boards (Wat. Code, § 10562, subds. (b)(5) & (6).), and the Mosquito Abatement and Vector Control District Law (Division 3, Chapter 1 of the Health and Safety Code beginning with Article 2000.) (State Water Board 2015).

Implementation of the SWRP for Yolo County is discussed in greater detail in Section 6: Implementation Strategy and Schedule.

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5.1 Project Solicitation and Review Process

Projects presented in this section were submitted for consideration to be included in the Yolo SWRP. A total of 28 projects were submitted; see Appendix H for blank project forms. Project review consisted of a two-part process: (1) Initial Project Screening and (2) Project Prioritization and Ranking (for implementation projects only). The following sections describe the project review process and results.

5.1.1 Initial Project Screening

Initial Project Review consists of a sequence of questions to ultimately determine the storm water benefits resulting from implementation. In order for a project to be prioritized, a project must meet all of the following criteria:

1. A completed Westside Sacramento IRWM Plan Project Information Form
2. A completed SWRP Project Addendum
3. Project will result in immediate or downstream benefit to Yolo County
4. Project will result in more than one storm water benefit (as listed in Table 3 of the Storm Water Resource Plan Guidelines)
5. Quantification of at least two storm water benefits (as listed in Table 3 of the Storm Water Resource Plan Guidelines)

If criteria 1 or 2 are not met, the project is considered inactive and removed from the SWRP project list. If criteria 3 is not met, the project is considered a non-storm water project and removed from the SWRP project list. If criteria 4 or 5 are not met, the project is a planning or conceptual project or study and remained on the project list. If criteria 1-5 are met, the storm water project is considered ready for implementation.

All 28 submitted projects met criteria 1-3 and are summarized in the following subsection and shown in Figure 5-1.

5.1.1.1 Agricultural Stormwater Improvements

- **Project Applicant:** University of California, Davis
- **Main Benefit Categories Met:** Water Quality, Water Supply, Flood Management, Community
- **Capital Cost:** $250,000
- **Secured Funding/Source:** To Be Determined
- **Annual Operations and Maintenance Cost/Funding Source:** $10,000/To Be Determined
- **Benefit Metrics Value(s):** Storm water captured/treated (AFY/CFS)
- **Project Summary:** Agricultural runoff currently enters the storm drain system directly. This project would create retention basins and vegetated ditches to collect storm water and irrigation runoff along edges of agricultural fields.

5.1.1.2 Arboretum Waterway Wetland Restoration and Enhancement

- **Project Applicant:** University of California, Davis
- **Main Benefit Categories Met:** Water Quality, Water Supply, Flood Management, Environmental, Community
- **Capital Cost:** $4,000,000
- **Secured Funding/Source:** $3,000,000/UC Davis
- **Annual Operations and Maintenance Cost/Funding Source:** $20,000/General Fund
- **Benefit Metrics Value(s)**: 935 acres of treated storm water, 2,000 gpm of recycled water irrigation
- **Project Summary:** This project will enhance the Arboretum Waterway, which captures runoff from 900 acres of the UC Davis campus, by establishing a wetland area to treat storm water and recycled water prior to discharge to Putah Creek. This project will include establish wetlands, increase storm water retention, slope stabilization, enhance a recreation area for the public, utilize recycled water for irrigation, and create public education opportunities.

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Project No.	Project Name	Lead Agency Organization
1	Agricultural Stormwater Improvements	University of California, Davis
2	Arboretum Waterway Wetland Restoration and Enhancement	University of California, Davis
3	Bike Tunnel Landscaping Redesign for Stormwater Quality Improvement	City of Davis
4	Davis Greenbelts Landscape Conversions (Davis Greenbelts Stormwater Improvements)	City of Davis
5	Drainage Channel Feasibility Study	City of Davis
6	Dry Creek Bank Stabilization and Wastewater Re-use	Solano County Water Agency
7	Feasibility Study for Stormwater Trash Control Measures	City of Davis
8	Flood Monitoring Network Project	YCFCWCD
9	Forbes Ranch Regulating Pond	YCFCWCD
10	Knights Landing Storm Drain Project	Yolo County
11	Knights Landing Underground Drainage Study	Yolo County
12	Madison Drainage Study	Yolo County
13	Moore Siphon Reliability/Restoration Project (Moore Siphon Stormwater Improvements)	YCFCWCD
14	North Regional Pond and Pump Station	City of Woodland
15	Raise Highway 16 Out of Flood plain	YCFCWCD/Yolo County
16	Detention Pond Feasibility Study	City of Davis
17	Russel Boulevard Demonstration LID Project (Russel Boulevard Stormwater Treatment Project)	City of Davis
18	Site Survey for Converting Rocky Swales to Bioswales	City of Davis
19	Site Survey for Hardscape Conversion to Pervious Pavement	City of Davis
20	Thompson Canyon Stormwater Management	Solano County Water Agency
21	Upstream Flow Management to Prevent Madison Flooding and to Facilitate GW Recharge	YCFCWCD/Madison CSD
22	West Adams Canal Renovation and China Slough Rehabilitation Project	YCFCWCD
23	West Area Pond Redesign (West Area Pond Runoff Redesign)	City of Davis
24	Winters Bioswales Project and Habitat Enhancement	Solano County Water Agency
25	Winters North Area Stormwater Pond	YCFCWCD
26	Yolo County Drains and Sloughs -- Governance and Maintenance Study	YCFCWCD
27	Madison Farmer Field Stormwater Capture and Groundwater Recharge	Madison CSD
28	Western Sloughs Citizen Science Program	Madison CSD

Path: \\SFO\SGDATA\Z_Drive\Projects\Westside_IRWMP\Events\2017_05_Yolo SWRP\mxd\Figure5-1_ProjectLocs.mxd

Sources: Esri, USGS, NOAA, Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Sloughs w/in YCFC&WCD Boundary

Canals w/in YCFC&WCD Boundary

Yolo SWRP Boundary

Westside Region

Projects

Conceptual/Planning

Implementation

Implementation

Conceptual/Planning

0 3 6 9

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Kennedy/Jenks Consultants

Storm Water Resource Plan For Yolo County

N

Project Locations

K/J 1770002.00
May 2018

Figure 5-1

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5.1.1.3 Bike Tunnel Landscaping Redesign for Stormwater Quality Improvement

- **Project Applicant:** City of Davis
- **Main Benefit Categories Met:** Water Quality, Flood Management, Environmental, Community
- **Capital Cost:** $40,000
- **Secured Funding/Source:** None
- **Annual Operations and Maintenance Cost/Funding Source:** $0 Additional/City of Davis Budget
- **Benefit Metrics Value(s):** NA
- **Project Summary**: Redesign the current drainage and landscaping near greenbelt bike tunnels to prevent flooding from storm water. Assess the top highly-trafficked tunnels with drainage issues within the greenbelt system (sites identified by staff include the North Davis greenbelt sections of Anderson and North Star as well Mace Ranch Park by Explore it and the tunnel under Loyola). Improved drainage would include re-landscaping the areas surrounding these tunnels to prevent flood events and improve storm water quality discharges through the use of different storm water low impact design methods through infiltration, transpiration and evaporation. Each site could showcase a different method; signage near the tunnels would illustrate the project and highlight elements of the project design.

5.1.1.4 Davis Greenbelts Landscape Conversions

- **Project Applicant:** City of Davis
- **Main Benefit Categories Met:** Water Quality, Environmental, Community
- **Capital Cost:** $234,849/acre converted
- **Secured Funding/Source:** None
- **Annual Operations and Maintenance Cost/Funding Source:** To Be Determined
- **Benefit Metrics Value(s):** Increased habitat-1 acre for each site converted, potential to reach hundreds of residents per year with information on storm water quality and water conservation.
- **Project Summary**: One of the greatest assets to the Davis park system is the network of more than 60 miles of Green Belts with bike trails that connect parks and neighborhoods throughout the City. Each belt is typically between 100 to 200 feet across with an 8-foot bike path meandering through the middle. Most of the landscape consists of irrigated turf and shade trees. Large open turf areas are greatly appreciated as multi-use event areas for local neighbors, but a majority of the space is mostly utilized by the public as aesthetic while passing through on the bike path. It is these spaces that are great candidates to convert existing turf to a low water use, drought tolerant landscape with interpretive learning opportunities to show the general public ways of converting their landscapes at home.

5.1.1.5 Drainage Channel Feasibility Study

- **Project Applicant:** City of Davis
- **Main Benefit Categories Met:** Water Quality, Flood Management
- **Capital Cost:** $80,000
- **Secured Funding/Source:** None
- **Annual Operations and Maintenance Cost/Funding Source:** NA
- **Benefit Metrics Value(s):** NA
- **Project Summary:** Looking to study feasibility to enhance the five separate storm drain conveyance channels to improve evapotranspiration through design improvements. This feasibility study would provide specific ways to improve the design of the existing facilities to improve water quality for the discharges that occur from each channel. The facilities are located Citywide. The study may yield that only one channel is worthy of modification. In particular, the City would like to study the El Macero Drainage Channel in southeast Davis as it is believed to be the channel with that would benefit the most from design improvements. A map can be provided to aid in located each of these drainage channels. If project is developed an educational component can be added.

5.1.1.6 Dry Creek Bank Stabilization

- **Project Applicant:** Solano County Water Agency
- **Main Benefit Categories Met:** Environmental, Community
- **Capital Cost:** $250,000

- **Secured Funding/Source:** Lower Putah Creek Coordinating Committee Vegetation Management (Proposed)
- **Annual Operations and Maintenance Cost/Funding Source:** $5,000/ Lower Putah Creek Coordinating Committee
- **Benefit Metrics Value(s):** One to two acres of new riparian vegetation, number of enrolled landowners, reduce sediment loading along two miles of eroding banks stabilized by vegetation
- **Project Summary:** Dry Creek is a significant wildlife migration corridor that forms the western boundary of Winters with urban property to the north and east and agricultural land to the south and west. It is a deeply incised gully that is actively eroding both urban and agricultural properties. The City of Winters wastewater treatment plant is adjacent to Dry Creek at the northeastern corner of the city and could provide treated wastewater for bioengineering projects to enhance both stability of the banks and wildlife habitat along two miles of creek channel.

5.1.1.7 Feasibility Study of Stormwater: Trash Control Measures

- **Project Applicant:** City of Davis
- **Main Benefit Categories Met:** Water Quality, Flood Management, Environmental
- **Capital Cost:** $150,000
- **Secured Funding/Source:** None
- **Annual Operations and Maintenance Cost/Funding Source:** NA
- **Benefit Metrics Value(s):** NA
- **Project Summary:** Feasibility study to assess options for storm water trash control measures. This study will assess the best method(s) to help the City meet mandatory requirements for trash screening to prevent trash from entering waterways. One particular area of concern is Channel A. An option for this area is to install trash racks/debris cages in the Wildhorse Basin to address issues with trash flowing from the area directly into Channel A. There is currently no barrier between the storm water from the basin and the channel. This study would provide an assessment of potential options to comply with the trash amendment requirements of the Small MS4 permit.

5.1.1.8 Flood Monitoring Network Project

- **Project Applicant:** YCFC&WCD
- **Main Benefit Categories Met:** Water Supply – Water Supply Reliability, Flood Management
- **Capital Cost:** $350,000
- **Secured Funding/Source:** To Be Determined
- **Annual Operations and Maintenance Cost/Funding Source:** To Be Determined
- **Benefit Metrics Value(s):** Canal/slough conveyance capacity for diversion of storm water runoff into canals; increased groundwater infiltration through YCFC&WCD canals and nearby sloughs.
- **Project Summary:** This project will install four (4) elevation (or stage) staff gages in sloughs that interact with YCFC&WCD canals as well as nine (9) precipitation gages. The goal of the project is to optimize the YCFC&WCD's conveyance system through monitoring flow and precipitation. These gages will be incorporated into the YCFC&WCD's existing SCADA system. The stage gages will be used to monitor stage in the slough system and will assist YCFC&WCD's information management and decision-making process for storm conveyance through the canal and slough systems. The precipitation gages will provide data for Yolo-County agencies to distinguish the type and quantity of rainfall events, providing information on where an increase in slough capacity is needed.

5.1.1.9 Forbes Ranch Regulating Pond

- **Project Applicant:** YCFC&WCD
- **Main Benefit Categories Met:** Water Supply, Flood Management, Community
- **Capital Cost:** $700,000
- **Secured Funding/Source:** None
- **Annual Operations and Maintenance Cost/Funding Source:** $50,000/District Water Users
- **Benefit Metrics Value(s):** NA
- **Project Summary:** Develop and construct a 200 acre-feet regulating pond to reduce drainage and flood waters through the town of Madison and District canal system. Divert storm water flows to the pond through the existing conveyance. The regulating pond would provide storm water retention during the winter and would allow for groundwater

recharge in the spring and summer when capacity and water is available. The regulating pond would provide water quality benefits by allowing the sediments in the runoff to settle and lessening the transfer of pollutants and chemicals downstream. The surrounding area would have native vegetation that would promote benefits for wildlife habitat, and the property would allow for groups to visit and learn about the multi-functional project. Similar to the District's Chapman Reservoir, we would install automated gates and monitoring devices at the regulating pond that would be connected to the District's SCADA system for real-time management.

5.1.1.10 Knights Landing Storm Drain Project

- **Project Applicant:** Yolo County
- **Main Benefit Categories Met:** Water Quality, Flood Management
- **Capital Cost:** $100,000
- **Secured Funding/Source:** To Be Determined
- **Annual Operations and Maintenance Cost/Funding Source:** To Be Determined
- **Benefit Metrics Value(s):** To Be Determined
- **Project Summary:** Design and construct a new storm drain or culvert in the vicinity of 4th and Railroad streets in the community of Knights Landing. KL has historically experience standing water (localized flooding) in the northern portions of town that can be as deep as 2 feet in wet years. The new storm drainage would convey storm water to the County's existing drainage system on the east side of Railroad Street. Design and construction are proposed to be completed by Public Works.

5.1.1.11 Knights Landing Underground Drainage Study

- **Project Applicant:** Yolo County
- **Main Benefit Categories Met:** Water Quality, Flood Management
- **Capital Cost:** $100,000
- **Secured Funding/Source:** None
- **Annual Operations and Maintenance Cost/Funding Source:** To Be Determined
- **Benefit Metrics Value(s):** NA
- **Project Summary:** This project would model new underground drainage facilities for the entire Town of Knights Landing to determine location(s) for outfall to the Sacramento River or Ridge Cut Slough. Preliminarily it is estimated that the underground drainage facilities would be sized for 30-50 cfs of storm flows and the system outfall would need to be sized accordingly to prevent backup of the system. Outfall locations would also need to be evaluated to determine if the downstream capacity would be sufficient to convey this additional flow during storm events. LID strategies will be used to ensure discharge water quality does not impact the Sacramento River or Ridge Cut Slough water quality.

5.1.1.12 Madison Drainage Study

- **Project Applicant:** Yolo County
- **Main Benefit Categories Met:** Water Quality, Flood Management
- **Capital Cost:** $100,000
- **Secured Funding/Source:** To Be Determined
- **Annual Operations and Maintenance Cost/Funding Source:** To Be Determined
- **Benefit Metrics Value(s):** To Be Determined
- **Project Summary:** This project would model new underground drainage facilities for the entire Town of Madison to determine location(s) for outfall (possibly Cache Creek, the South Fork Willow Slough or Cottonwood Slough). The system outfall would need to be sized accordingly to prevent backup of the system. Outfall locations would also need to be evaluated to determine if the downstream capacity would be sufficient to convey this additional flow during storm events. LID strategies will be used to ensure discharge water quality does not negatively impact downstream water quality.

5.1.1.13 Moore Siphon Reliability/Restoration Project

- **Project Applicant:** YCFC&WCD
- **Main Benefit Categories Met:** Water Supply, Flood Management
- **Capital Cost:** $1,000,000
- **Secured Funding/Source:** District Annual Budget
- **Annual Operations and Maintenance Cost/Funding Source:** $20,000/District Annual Budget

- **Benefit Metrics Value(s):** Approximately 1 TAF/y reliable water supply, 15,000 acres of cropland stays in production, 200 AF/day of water supply for agriculture May-October (36 TAF/y)
- **Project Summary:** The Moore Siphon conveys irrigation water from the north side of Cache Creek (Alder Canal) to the south side (Moore Canal). Through the Moore Siphon, YCFC&WCD delivers water to approximately 15,000 acres of cropland (12% of its irrigation service area). This water also makes a significant recharge contribution to the City of Woodland's groundwater supply. Due to the age and exposure of the 66-inch corrugated metal pipe, as well as Cache Creek erosion issues at both ends of the siphon, the siphon well need to be replaced in the near future.

5.1.1.14 North Regional Pond and Pump Station

- **Project Applicant:** City of Woodland
- **Main Benefit Categories Met:** Water Quality, Water Supply, Flood Management, Environmental
- **Capital Cost:** $8,000,000
- **Secured Funding/Source:** Funded for 100% Construction Costs/Development Fees
- **Annual Operations and Maintenance Cost /Funding Source):** $100,000/Landscape/Lighting District Fund
- **Benefit Metrics Value(s):** Up to 120 cfs treated storm water, reliable 500 ac-ft of water during the non-rainy season, 75-acre pond vs. 75 acres of barren land
- **Project Summary:** The project involves the design and construction of an approximately 75-acre sedimentation pond and a pump station able to eventually accommodate a 120-cfs design flow. Project re-purposes an existing City evaporation pond that is no longer in use for any purpose. Currently the pond only receives nearby runoff.

  This project will add the NR Pond hydraulically into the City's storm drainage network and include:

  - Low flow training wall and inlet pipes from the Gibson Channel to the NR Pond
  - High flow weir from South Canal to the NR Pond
  - Outlet pipes from NR Pond to the South Canal
  - Pump station at the downstream terminus of the South Canal
  - Force main and outfall from the pump station to the outfall channel

5.1.1.15 Raise Highway 16 Out of Flood Plain

- **Project Applicant:** Yolo County, Town of Madison, Yocha Dehe Wintun Nation, California Department of Transportation
- **Main Benefit Categories Met:** Water Quality, Flood Management, Environmental
- **Capital Cost:** To Be Determined
- **Secured Funding/Source:** $1,200,000/County Funds
- **Annual Operations and Maintenance Cost/Funding Source:** To Be Determined
- **Benefit Metrics Value(s):** NA
- **Project Summary:** This project was initially proposed by Caltrans as flooding of Highway 16 is a chronic problem. The project was not constructed because of concerns of some farmers about grades at farm road crossings. Raising Highway 16 creates a barrier that could be used to store storm water north of the highway in detention basins/recharge ponds. Increasing the capacity of Willow Slough south of Highway 16 west of Madison is needed so that flows can be conveyed to the detention basins. Willow Slough is the source of the majority of flooding in Madison. Cottonwood Slough contributes to occasional flooding (last time was 1996) in Madison. This project could be coordinated with the Madison Canals project as other upstream diversions could benefit this project and/or the planned detention basins could be coordinated.

5.1.1.16 Detention Pond Feasibility Study

- **Project Applicant:** City of Davis
- **Main Benefit Categories Met:** Water Quality, Flood Management
- **Capital Cost:** $100,000
- **Secured Funding/Source:** None
- **Annual Operations and Maintenance Cost/Funding Source:** $0 Additional/City of Davis Budget
- **Benefit Metrics Value(s):** NA
- **Project Summary:** Looking to study feasibility for design enhancements for the seven separate storm

drain detention ponds to improve evapotranspiration and water quality in the City's discharge. This feasibility study would provide specific ways to improve the design of the existing facilities to improve water quality for the discharges that occur from each facility. The facilities are located Citywide, but all of the ponds are located north of I 80 in the northern two thirds of the City. The study may yield that only one pond is worthy of modification. In particular, the City would like to study the Core Area Pond in central Davis as it believed to be the pond that receives the most pollutants from its drainage shed. A map can be provided to aid in located each of these ponds. If project is developed an educational component can be added.

5.1.1.17 Russell Boulevard Demonstration LID Project

- **Project Applicant:** City of Davis
- **Main Benefit Categories Met:** Water Quality, Flood Management, Environmental, Community
- **Capital Cost:** $667,200
- **Secured Funding/Source:** Yes
- **Annual Operations and Maintenance Cost/Funding Source:** $0 Additional/City of Davis Budget
- **Benefit Metrics Value(s):** Treat 2,355 cu. ft. per day, up to 12,300 cu. ft. of infiltration per day, 6,225 sq. ft. habitat, 7 trees, 500-1000 volunteer hrs/yr
- **Project Summary:** The project is to be located in front of City Hall (already proposed and working its way through the City's Parks and Community Services Department) along Russell Boulevard. Russell Boulevard is one of the City's prominent east-west arterials. The project is to create a vegetated swale to treat storm water runoff on the north side of the roadway. The surface area it will treat is 43,470 square feet. It is proposed to treat drainage prior to discharge to the City's storm drain system consistent with the standards of Section E.12 of the State's Small MS4 Phase II General Permit (Permit).

5.1.1.18 Site Survey for Converting Rocky Swales to Bioswales

- **Project Applicant:** City of Davis
- **Main Benefit Categories Met:** Water Quality, Flood Management, Environmental, Community
- **Capital Cost:** $40,000
- **Secured Funding/Source:** None
- **Annual Operations and Maintenance Cost/Funding Source:** $0 Additional/City of Davis Budget
- **Benefit Metrics Value(s):** NA
- **Project Summary:** In public greenbelts and parks, convert existing rocky drainage swales into bioswales to provide environmental benefits. Convert drainage in areas that currently use rocky swales, such as in Mace Ranch Park and the housing development behind Montgomery Elementary in South Davis, to bioswales. Converting the existing rocky swales to vegetative bioswales will encourage microhabitats, beneficial insects, infiltration, transpiration, and evaporation to better showcase storm water retention techniques. Other possible sites include Evergreen Pond and North Star Park.

5.1.1.19 Site Survey for Hardscape Conversion to Pervious Pavement

- **Project Applicant:** City of Davis
- **Main Benefit Categories Met:** Water Quality, Water Supply, Flood Management, Environmental, Community
- **Capital Cost:** $40,000
- **Secured Funding/Source:** None
- **Annual Operations and Maintenance Cost/Funding Source:** $0 Additional/City of Davis Budget
- **Benefit Metrics Value(s):** NA
- **Project Summary:** Survey public parking lots that currently have impervious surfacing to assess the practicality of converting these locations to pervious pavement when they are in need of resurfacing, maintenance or redesign. Portions of the pathways near the sites could potentially highlight permeable pavers in addition to the parking lots. Projects could be planned with improvements to incorporate bioswales, low water use plants, and other low-impact design measures into any landscape changes at the site. The projects would include signage on storm water techniques implemented and information about water quality.

5.1.1.20 Thompson Canyon Stormwater Management

- **Project Applicant:** Solano County Water Agency

- **Main Benefit Categories Met:** Water Quality, Environmental, Community
- **Capital Cost:** $500,000
- **Secured Funding/Source:** None
- **Annual Operations and Maintenance Cost/Funding Source:** $10,000/ Thompson Canyon Homeowner's Association
- **Benefit Metrics Value(s):** One mile of restored creek channel and access road, lack of interruption of drinking water processing, increased fish populations measured by average time to catch a fish
- **Project Summary:** Thompson Canyon is the first tributary from the north to Lower Putah Creek downstream of Monticello Dam. It was the main source of sediment loading into Lower Putah Creek in the highest storm runoff event in the history of the Solano Project (1983). Even in average rainfall years, sediment from Thompson Canyon has buried the best trout spawning site in the Interdam Reach. The lower mile of the canyon has a legacy dirt road that contributed to catastrophic hillslope failure. The road has thirty stream crossings without properly sized culverts or rock fords and is not properly outsloped for drainage. This project would repair the stream crossings, properly outslope the road and apply gravel surface. It would also install rock vanes for grade control in the channel.

5.1.1.21 Upstream Flow Management to Prevent Madison Flooding and to Facilitate GW Recharge

- **Project Applicant:** YCFC&WCD/Madison CSD
- **Main Benefit Categories Met:** Water Quality, Flood Management, Environmental
- **Capital Cost:** To Be Determined
- **Secured Funding/Source:** None
- **Annual Operations and Maintenance Cost/Funding Source:** To Be Determined
- **Benefit Metrics Value(s):** NA
- **Project Summary:** The District proposes to manage high flows from Lamb Valley, Cottonwood and S. Fork Willow Sloughs using the existing canal system as well as other means such as upstream check dams. During storm events, Willow Slough floods the Town of Madison. The Canal system can potentially be used to convey water away from the Town of Madison and reduce flood levels while also managing peak flows through use of check dams, particularly in Lamb Valley Slough. Flow and water level monitoring could serve several purposes. GW recharge can be accomplished through canal bottoms and potential recharge/detention basins. P. 29 and 30 of the 2012 FIS describe some of the upstream channel capacity limitations and a review of FIRM maps shows several points of intersection between the sloughs and canals to be explored. This project can be coordinated with Raising Highway 16 project.

5.1.1.22 West Adams Canal Renovation and China Slough Rehabilitation Project

- **Project Applicant:** YCFC&WCD
- **Main Benefit Categories Met:** Water Supply, Flood Management, Environmental
- **Capital Cost:** $16,000,000
- **Secured Funding/Source:** None
- **Annual Operations and Maintenance Cost/Funding Source:** Unknown/Beneficiaries under an annexation process with YCFC&WCD
- **Benefit Metrics Value(s):** 10,000 AF increased surface water, 10,000 AF decreased groundwater use
- **Project Summary:** Enlargement and improvement of the Yolo County Flood Control & Water Conservation District's (District) West Adams, East Adams, and Acacia Canal system, and rehabilitation and improvement of China Slough (a natural storm drainage channel). The District's canal system would need to be modernized to allow for a "demand" system and to ensure no spills. China Slough would need to be cleaned, an operating road constructed, and installation of about eight check structures. Improvements to the canals and slough would be implemented to convey 10,000 acre-feet of surface water per year through China Slough to farmers in the Yolo-Zamora region (~4,200 acres).

5.1.1.23 West Area Pond Redesign

- **Project Applicant:** City of Davis
- **Main Benefit Categories Met:** Water Quality, Water Supply, Flood Management, Environmental
- **Capital Cost:** $100,000
- **Secured Funding/Source:** None

- **Annual Operations and Maintenance Cost/Funding Source:** NA
- **Benefit Metrics Value(s):** If the Project is implemented, 26.4 acres of open space that will be enhanced by aquatic wildlife and riparian habitat, 3.8 million gallons of treated storm water per year.
- **Project Summary:** Redesign the West Area Pond (detention basin) to utilize agricultural summer flows to enhance aquatic wildlife habitat and improve water quality. This proposal involves redirecting existing agricultural runoff through the Stonegate drainage pond and pumping it into the West Area Pond. This would enhance aquatic habitat while improving any water discharges through retention, enhancing opportunities for infiltration, transpiration and evaporation.

5.1.1.24 Winters Bioswales Project and Habitat Enhancement

- **Project Applicant:** Solano County Water Agency
- **Main Benefit Categories Met:** Water Quality, Environmental, Community
- **Capital Cost:** $195,328
- **Secured Funding/Source:** $10,000/Solano County Water Agency; $17,664.90/Individuals
- **Annual Operations and Maintenance Cost/Funding Source:** $5,000/Solano County Water Agency+Volunteers
- **Benefit Metrics Value(s):** 5 acres of habitat restored, 3 community tours, 1 classroom component
- **Project Summary:** Storm water from the town of Winters drains residential areas, business districts, and undeveloped lands into a culvert system that delivers contaminated runoff to Putah Creek and one of its major tributaries, Dry Creek. Eighteen discharge points exist, eight of which are connected directly to Putah Creek, the remaining to Dry Creek. Three main culvert delivery sites occur within the Winters Putah Creek Nature Park (WPCNP), draining approximately 200 acres of impervious lands. The storm water network drains streets, parking lots, businesses and suburban lots, over-irrigated landscapes and disturbed lands, carrying sediment, petroleum products, fertilizers, pesticides, and bacteria into Putah Creek.

  By redirecting this storm water runoff onto newly constructed floodplains of Putah Creek, water quality contaminants can be decreased through the breakdown action of sunlight, soil, plant roots and microorganisms. Moreover, the redirected water can assist in rehydrating portions of the floodplain during periods of drought and enhance riparian plant growth for the benefit of corridor wildlife. Each culvert outlet, along with the receiving floodplain landscape requires novel designs to redirect, capture, and infiltrate storm water, all involving site-specific earthworks, specialized soil treatments, appropriate vegetation, monitoring, and post-installation management.

5.1.1.25 Winters North Area Stormwater Pond

- **Project Applicant:** YCFC&WCD
- **Main Benefit Categories Met:** Water Quality, Water Supply, Flood Management, Environmental, Community
- **Capital Cost:** To Be Determined
- **Secured Funding/Source:** None
- **Annual Operations and Maintenance Cost/Funding Source:** To Be Determined
- **Benefit Metrics Value(s):** NA
- **Project Summary:** Develop and construct a 5,000 acre-feet storm water retention pond in the north area of Winters to reduce drainage and flood waters from the Chickahominy Slough. The retention pond would also be used for groundwater recharge in times when the capacity and water was available. The retention pond would provide water quality benefits by allowing the sediments in the runoff to settle and lessening the transfer of pollutants and chemicals downstream. The surrounding area would have native vegetation that would promote benefits for wildlife habitat, and the property would allow for groups to visit and learn about the multi-beneficial, multi-agency partnership. Similar to the District's Chapman Reservoir, the project would install automated gates and monitoring devices at the retention pond that would be connected to the District's SCADA system for real-time management.

  This project would offer an opportunity to measure rainfall-runoff relationships and the effectiveness of this size of retention pond in attenuating flood peaks and retaining sediment. Automation and SCADA control would allow for real-time decision making in pond operation and would allow pond stage and outlet flows to be tracked and controlled during and

following storm events. Additionally, given the right conditions and appropriate storage in the pond, groundwater percolation can be monitored and tracked to ensure groundwater recharge in the region. If successful, a similar pond could be constructed and installed to capture storm flows in the low-lying areas of Yolo County.

5.1.1.26 Yolo County Drains and Sloughs – Governance and Maintenance Study

- **Project Applicant:** YCFC&WCD
- **Main Benefit Categories Met:** Water Supply, Flood Management
- **Capital Cost:** $150,000
- **Secured Funding/Source:** None
- **Annual Operations and Maintenance Cost/Funding Source:** To Be Determined
- **Benefit Metrics Value(s):** NA
- **Project Summary:** Plan that will identify governing bodies and maintenance responsibilities involved in the County's drains, canals, and sloughs. The District and County will work together to develop a governance and maintenance study that will assist in providing effective rural storm water management responsibilities based on the defined governing bodies. Plan/investigation will initiate a legitimate storm water management program in Yolo County.

5.1.1.27 Madison Farmer Field Stormwater Capture and Groundwater Recharge

- **Project Applicant:** Madison CSD
- **Main Benefit Categories Met:** Water Quality, Water Supply, Flood Management**,** Community
- **Capital Cost:** $400,000
- **Secured Funding/Source:** To Be Determined
- **Annual Operations and Maintenance Cost/Funding Source:** NA
- **Benefit Metrics Value(s):** 300 AF - 1,100 AF per storm event (farmer fields - detention basin)
- **Project Summary:** Modify farmer fields around Madison, specifically those next to Highway 16 and those that will capture upstream flows. The two options considered include 1) 1,200 acres of farmer field modification for rainfall capture (8"-berm) and 2) modification of a farmer field near Cache Creek (maybe half of APN 049-060-017) for rainfall and storm water runoff capture a 3'- high storm water detention basin. This project will require farmer participation and advanced planning for field modification and will depend on the storm intensity. The first option will only capture rainfall and the second option will capture rainfall and allow runoff to be collected into the detention basin. The second option will require more modification to the property, additional infrastructure for channeling runoff into the basin, and a pump if the water needs to be drained from the basin.

5.1.1.28 Western Yolo Sloughs Citizen Science Program

- **Project Applicant:** Madison CSD
- **Main Benefit Categories Met:** Flood Management, Community
- **Capital Cost:** To Be Determined
- **Secured Funding/Source:** To Be Determined
- **Annual Operations and Maintenance Cost/Funding Source:** To Be Determined
- **Benefit Metrics Value(s):** TBD

Project Summary: Sloughs surrounding the Madison area are known to cause regular flooding in Madison and beyond. Namely, Cottonwood Slough, Lamb Valley Slough, the South Fork Willow Slough and the Madison Drain have been identified as sources of flooding in

Madison in various studies and reports. It seems likely that upstream mitigation to remove water before the sloughs reach Madison and Esparto, and management of the sloughs to keep them free of debris could help in alleviating flooding in the area. However, none of these channels are monitored, therefore, it is unknown what capacity these sloughs have, when that capacity is reached (during or after a storm), or what type of mitigation would be most fitting for each slough. Additionally, it is not known if the Winters Canal is also full when sloughs are full, or if it may have capacity that could be used to alleviate the sloughs when they are over flowing. The Madison CSD with its partners will develop a citizen science program where Madison residents and residents from the nearby areas will visit sloughs and canals that carry water in and around Madison following rain events. The program members will record whether they see water flowing in the sloughs and canals at previously determined locations, and record observations such as whether the channels are successfully carrying the flows, appear to be obstructed, or are overflowing. The information will be compiled in an easy to use format so that members can easily share the information with Madison CSD and others. The information will initially be used until a flow monitoring network can be developed in the sloughs, and potentially beyond. The goal is to gain a better understanding of the slough flow patterns and information that can be used to plan for flood mitigation in Madison, while also engaging and educating the community.

5.2 SWRP Objectives and Benefits

Table 5-1 and Table 5-2 summarize how the 28 projects submitted to the Yolo SWRP meet the SWRP Objectives and Benefit Categories presented in Section 1. Table 5-1, which compares the submitted projects against the SWRP objectives, provides a preliminary check to make sure that the projects submitted to the Plan are compatible with Yolo County SWRP and the Westside Integrated Regional Water Management Plan, which includes Yolo County.

In total, the submitted projects met all objective categories and 24 of the 27 SWRP objectives. Individually, projects met 1-6 out of 11 objective categories and 1-8 out of 27 SWRP objectives.

Table 5-2 provides a preliminary check to make sure that the submitted projects will result in multiple benefits related storm water and/or dry weather runoff within Yolo County. As stated in the previous subsection, projects submitted for implementation must result in at least 2 storm water benefits, in addition to providing quantification for at least 2 benefits. Eight projects identified at least one benefit in each benefit category and each identified 2-13 benefits. In total, the submitted projects identified benefits in all benefit categories (i.e., water supply, water quality, flood management, environmental, and community).

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Table 5-1: Yolo SWRP Objectives Matrix

Project Number	Lead Agency Organization	Project Title	Water Quality	Increase filtration and/or treatment of runoff	Nonpoint source pollution control	Reestablished natural water drainage and treatment	Water Supply	Water supply reliability	Water conservation	Conjunctive use	Flood Management	Decreased flood risk by reducing runoff rate and/or volume	Reduced sanitary sewer overflows	Environmental	Environmental and habitat protection and improvement	Wetland enhancement/creation	Riparian enhancement	Instream flow improvement	Increased urban green space	Reduced energy use, greenhouse gas emissions, or provides a carbon sink	Reestablishment of the natural hydrograph	Water temperature improvements	Community	Enhanced and/or created recreational and public use areas	Community involvement	Employment opportunities provided	Public education
1	University of California, Davis	Agricultural Stormwater Improvements		x	x	x		x	x			x									x			x	x	x	x
2	University of California, Davis	Arboretum Waterway Wetland Restoration and Enhancement		x	x	x		x	x			x			x					x	x			x	x	x	x
3	City of Davis	Bike Tunnel Landscaping Redesign for Stormwater Quality Improvement		x					x			x			x												x
4	City of Davis	Davis Greenbelts Landscape Conversions		x		x			x	x					x									x			x
5	City of Davis	Drainage Channel Feasibility Study		x	x	x						x															
6	Solano County Water Agency	Dry Creek Bank Stabilization and Wastewater Re-use							x						x				x	x					x		x
7	City of Davis	Feasibility Study for Stormwater Trash Control Measures		x								x			x												
8	YCFC&WCD	Flood Monitoring Network Project		x				x				x															
9	YCFC&WCD	Forbes Ranch Regulating Pond		x		x		x		x		x			x												x
10	Yolo County	Knights Landing Storm Drain Project		x	x							x	x														
11	Yolo County	Knights Landing Underground Drainage Study		x	x							x	x														
12	YCFC&WCD/Madison CSD	Madison Drainage Study		x	x							x	x														
13	YCFC&WCD	Moore Siphon Reliability/ Restoration Project						x	x	x		x															
14	City of Woodland	North Regional Pond and Pump Station		x	x			x				x			x				x					x			
15	Yolo County	Raise Highway 16 Out of Flood Plain						x	x	x		x								x				x			
16	City of Davis	Retention Pond Feasibility Study		x	x	x						x															
17	City of Davis	Russell Boulevard Demonstration LID Project		x		x			x			x			x				x					x	x	x	x
18	City of Davis	Site Survey for Converting Rocky Swales to Bioswales		x					x			x			x												x
19	City of Davis	Site Survey for Hardscape Conversion to Pervious Pavement		x								x			x							x					x
20	Solano County Water Agency	Thompson Canyon Stormwater Management		x	x	x		x	x						x									x			
21	YCFC&WCD/Madison CSD	Upstream Flow Management to Prevent Madison Flooding and to Facilitate GW Recharge		x						x		x									x			x			
22	YCFC&WCD	West Adams Canal Renovation and China Slough Rehabilitation Project						x		x		x									x						
23	City of Davis	West Area Pond Redesign		x	x			x				x			x												
24	Solano County Water Agency	Winters Bioswales Project and Habitat Enhancement		x	x	x									x								x	x			x
25	YCFC&WCD	Winters North Area Stormwater Pond		x		x		x		x		x			x												x
26	YCFC&WCD	Yolo County Drains and Sloughs -- Governance and Maintenance Study						x		x		x															
27	Madison CSD	Madison Farmer Field Stormwater Capture and Groundwater Recharge		x		x		x	x			x														x	
28	Madison CSD	Western Yolo Sloughs Citizen Science Program										x															
		Total		22	11	11		13	11	8		24	3		14	0	0	0	3	5	3	1		10	5	4	11

Table 5-2: Yolo SWRP Benefits Matrix

Project Number	Lead Agency Organization	Project Title	Education and Awareness Focus	1. Provide and promote use of educational curricula for K-12 students	2. Provide educational information to encourage stewardship by public	Habitat Focus	3. Restore native vegetation/form/function along riparian/aquatic corridors	4. Quantify the extent of suitable life-cycle habitat for Threatened/Endangered/Imperiled native fish	5. Prioritize/plan/schedule improvements to suitable life-cycle habitat for T/E/I native fish	6. Increase availability of suitable life-cycle habitat for Threatened/Endangered/Imperiled native fish identified by Objective 5.	Invasive Species Focus	7. Prevent colonization by quagga mussels/zebra mussels and eliminate/prevent spread of New Zealand mud snails	8. Establish invasive plant management plan	9. Implement invasive plant management plan	Infrastructure Focus	10. Create asset management plan for key water management infrastructure	Reasonable Use Focus	11. Meet 20% by 2020 conservation targets	12. Increase adoption of agricultural Best Management Practices	Recreation Focus	13. Maintain and increase water-related recreational opportunities
1	University of California, Davis	Agricultural Stormwater Improvements																			
2	University of California, Davis	Arboretum Waterway Wetland Restoration and Enhancement					x														
3	City of Davis	Bike Tunnel Landscaping Redesign for Stormwater Quality Improvement			x																
4	City of Davis	Davis Greenbelts Landscape Conversions			x											x		x			x
5	City of Davis	Drainage Channel Feasibility Study								x											
6	Solano County Water Agency	Dry Creek Bank Stabilization and Wastewater Re-use					x														
7	City of Davis	Feasibility Study for Stormwater Trash Control Measures					x			x											
8	YCFC&WCD	Flood Monitoring Network Project																			
9	YCFC&WCD	Forbes Ranch Regulating Pond			x																
10	Yolo County	Knights Landing Storm Drain Project																			
11	Yolo County/	Knights Landing Underground Drainage Study																			
12	YCFC&WCD with Madison CSD	Madison Drainage Study																			
13	YCFC&WCD	Moore Siphon Reliability/ Restoration Project								x		x		x		x			x		
14	City of Woodland	North Regional Pond and Pump Station														x					x
15	Yolo County	Raise Highway 16 Out of Flood Plain																			
16	City of Davis	Retention Pond Feasibility Study								x											
17	City of Davis	Russell Boulevard Demonstration LID Project								x											
18	City of Davis	Site Survey for Converting Rocky Swales to Bioswales			x																
19	City of Davis	Site Survey for Hardscape Conversion to Pervious Pavement			x																
20	Solano County Water Agency	Thompson Canyon Stormwater Management					x														
21	YCFC&WCD with Madison CSD	Upstream Flow Management to Prevent Madison Flooding and to Facilitate GW Recharge																			
22	YCFC&WCD	West Adams Canal Renovation and China Slough Rehabilitation Project																			
23	City of Davis	West Area Pond Redesign					x			x											
24	Solano County Water Agency	Winters Bioswales Project and Habitat Enhancement		x			x														
25	YCFC&WCD	Winters North Area Stormwater Pond			x																
26	YCFC&WCD	Yolo County Drains and Sloughs -- Governance and Maintenance Study														x					
27	Madison CSD	Madison Farmer Field Stormwater Capture and Groundwater Recharge			x																
28	Madison CSD	Citizen Science Program			x																
		Total		1	8		6	0	0	6		1	0	1		4		1	1		2

Project Number	Lead Agency Organization	Project Title	Risk Management Focus	14. Provide adequate flood protection	15. Manage watershed activities to reduce large erosion events	Understand Watershed Function Focus	16. Monitor state/federal Delta programs	17. Monitor conditions/improve understanding to support sustainable groundwater basins	18. Maintain/enhance watershed and natural resource monitoring network and information sharing	Water Quality Focus	19. Address pollutant sources to meet runoff standards and Total Maximum Daily Load (TMDL) targets	20. Minimize accidental wastewater spillage/discharges	21. Reduce public health risks by reducing contaminants in drinking water sources	22. Meet all drinking water and wastewater discharge standards	Water Supply Focus	23. Provide 100% reliability of municipal and industrial water supplies	24. Provide agricultural water supplies to support a robust agricultural industry	Storm Water Focus	25. Convert paved and/or impervious areas and increase tree canopy and vegetation, reducing urban heat island effects.	26. Optimize the rural storm water conveyance system to drain and retain storm water flows as necessary. Provide proper rural drainage and keep conveyance systems clear of debris to minimize county road flooding during storm events.	27. Enable proper rural retention and modify rural landscape to maximize groundwater recharge of excess storm water.
1	University of California, Davis	Agricultural Stormwater Improvements									x						x			x	x
2	University of California, Davis	Arboretum Waterway Wetland Restoration and Enhancement		x																	
3	City of Davis	Bike Tunnel Landscaping Redesign for Stormwater Quality Improvement		x				x			x										
4	City of Davis	Davis Greenbelts Landscape Conversions														x			x		
5	City of Davis	Drainage Channel Feasibility Study		x				x			x										
6	Solano County Water Agency	Dry Creek Bank Stabilization and Wastewater Re-use			x											x	x		x	x	
7	City of Davis	Feasibility Study for Stormwater Trash Control Measures		x				x			x										
8	YCFC&WCD	Flood Monitoring Network Project						x	x								x			x	
9	YCFC&WCD	Forbes Ranch Regulating Pond		x	x			x	x								x			x	x
10	Yolo County	Knights Landing Storm Drain Project		x							x	x		x						x	
11	Yolo County	Knights Landing Underground Drainage Study		x							x			x						x	
12	YCFC&WCD with Madison CSD	Madison Drainage Study		x							x			x						x	
13	YCFC&WCD	Moore Siphon Reliability/ Restoration Project																		x	
14	City of Woodland	North Regional Pond and Pump Station		x	x						x						x			x	
15	Yolo County	Raise Highway 16 Out of Flood Plain		x												x	x			x	
16	City of Davis	Retention Pond Feasibility Study		x				x			x										
17	City of Davis	Russell Boulevard Demonstration LID Project		x				x			x								x		
18	City of Davis	Site Survey for Converting Rocky Swales to Bioswales		x				x			x										
19	City of Davis	Site Survey for Hardscape Conversion to Pervious Pavement		x				x			x								x		
20	Solano County Water Agency	Thompson Canyon Stormwater Management																			
21	YCFC&WCD with Madison CSD	Upstream Flow Management to Prevent Madison Flooding and to Facilitate GW Recharge		x	x				x							x	x			x	x
22	YCFC&WCD	West Adams Canal Renovation and China Slough Rehabilitation Project		x	x			x	x								x			x	x
23	City of Davis	West Area Pond Redesign		x				x			x									x	x
24	Solano County Water Agency	Winters Bioswales Project and Habitat Enhancement																			x
25	YCFC&WCD	Winters North Area Stormwater Pond		x	x			x	x								x				x
26	YCFC&WCD	Yolo County Drains and Sloughs -- Governance and Maintenance Study		x	x			x	x											x	
27	Madison CSD	Madison Farmer Field Stormwater Capture and Groundwater Recharge		x	x			x	x								x				
28	Madison CSD	Citizen Science Program		x	x			x	x								x				
		Total		21	9		0	15	8		13	1	0	3		4	11		4	14	7

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In addition to meeting the SWRP objectives and benefits, the submitted projects include:

- Opportunities to augment local water supply through groundwater recharge or storage for beneficial use of storm water and dry weather runoff – A total of 14 of the submitted projects will result in additional water supply: Projects 1, 4, 8, 9, 14, 15, 17, 20, 21, 22, 25, 26, and 27.

The City of Woodland North Regional Pond and Pump Station project (Project 14) involves the design and construction of a 75-acre sedimentation pond and a pump station to accommodate a 120-cfs design flow. This project will re-purpose an existing City evaporation pond for treatment and detention of storm water prior to discharge to the Tule Canal.

- Opportunities for source control for both pollution and dry weather runoff volume, onsite and local infiltration, and use of storm water and dry weather runoff – All but two (Projects 15 and 28) of the submitted Projects identified runoff pollution control and volume control.

The Knights Landing Drainage Study (Project 11) would model new underground drainage facilities for the entire Town of Knights Landing. The air-tight, water-tight system reduces overland transportation in urban areas and allows for more control of the system (trash racks, clean-out boxes, and BMPs), advancing the goal of achieving improved storm drainage and reducing flooding, along with improving water quality and maintaining beneficial uses.

- Projects that reestablish natural water drainage treatment and infiltration systems, or mimic natural system functions – A total of 13 of the submitted projects would result in the reestablishment of natural water drainage and treatment: Projects 1, 2, 4, 5, 6, 9, 16, 17, 19, 20, 24, 25, and 27.

Dry Creek is eroding due to the effects of surface water storage at Lake Berryessa. Erosion has accelerated since the Solano Project was completed. The Solano County Water Agency Dry Creek Bank Stabilization and Wastewater Re-Use Project (Project 6) includes bioengineering with willows and other native vegetation can stabilize eroding banks and provide cover for migrating wildlife.

- Opportunities to develop, restore, or enhance habitat and open space through storm water and dry weather runoff management – A total of 15 of the submitted projects identified benefits related to environmental and habitat protection and improvement: Projects 1, 2, 3, 4, 6, 7, 9, 17, 18, 19, 20, 23, 24, 25, and 27.

The Winters Bioswales Project and Habitat Enhancement Project (Project 24) will redirect storm water runoff onto newly constructed floodplains of Putah Creek, which will assist in rehydrating portions of the floodplain during periods of drought and enhancing riparian plant growth for the benefit of corridor wildlife.

- Opportunities to use existing publicly owned lands and easements – A total of 17 projects will be located on lands with public ownership: Projects 1, 2, 3, 4, 5, 7, 9, 13, 14, 15, 16, 17, 18, 19, 23, 24, and 25.

The City of Davis Site Survey for Hardscape Conversion to Pervious Pavement (Project 19) will advance the goal of converting public parking lots with impervious surfacing to pervious pavement.

5.3 Evaluation and Prioritization of Projects

This section outlines the approach taken in the evaluation and prioritization of those projects identified as implementation projects. The method used in this SWRP is based upon the SWRP Guidelines (SWRCB 2015) which recommend a project prioritization and screening process that involves both tangible (i.e., quantitative) benefit and intangible benefit evaluations. As stated in Section 5.1.10, projects were initially pre-screened and resulted in the 11 projects selected for evaluation under this plan because the projects provide storm water or flood management focus with clear benefits and are located within the planning area. Three scoring categories were developed for this plan and are presented below:

1. Scoring Category 1: Two questions regarding project funding availability and project location and land access, as further described in Section 5.2.1.
2. Scoring Category 2: A multiple benefits analysis based upon the main and additional benefits provided in Table 4 of the SWRP Guidelines (SWRCB 2015), as further described in Section 5.2.2.
3. Scoring Category 3: A quantitative metrics-based benefit analysis based upon the quantitative metrics suggested in the SWRP Guidelines (SWRCB 2015), as further described in Section 5.2.3.

A total of 250 points are distributed between the three scoring categories with 80 points for Scoring Category 1; 50 points for Scoring Category 2 and 120 points for Scoring Category 3. The distribution of the total points to the three scoring categories reflects both the relative importance derived from the SWRP guidelines as well as a means of balancing the merits of each project. Points were assigned to a variety of elements within each scoring category and summed to give a total score per category as detailed in Sections 5.2.1- 5.2.3 below.

Each of the categories were then summed at the end to give a total project score. Projects were ranked based on their total scores. The scoring process is summarized in Figure 5-2.

Projects were evaluated based upon their project proposal forms submitted to the Westside IRWM and the Storm Water Addendum Form. Proponents were asked to support claims made for various benefits (both main and additional) as well as identify quantitative metrics-based benefits.

At a minimum, each project will contribute to at least two or more Main Benefits and a number of Additional Benefits as listed in Table 4 of the SWRP Guidelines.

5.3.1 Scoring Category 1 - Project Funding and Land Availability

- SWRP Guidelines (SWRCB 2015) recommend projects or programs supported by proponent entities that will create, "permanent, local, or regional funding."
  - If projects were able to secure some sort of permanent funding to achieve the claimed benefits they were assigned a yes (i.e., "Y") for a value of 40 points. Projects without any other funding commitments were assigned a no (i.e., "N") for a value of zero (0) points.
- In addition to funding, the SWRP Guidelines (SWRCB 2015) recommends projects "use existing publicly owned lands and easements" in accordance with the Water Code §10562(e).
  - Projects were assigned a yes (i.e., "Y") for a value of 40 points if land access or agreements were available and were assigned a no (i.e., "N") for a value of zero (0) points if these access or agreements weren't available.

Projects were assigned either a total of 0, 40, or 80 points for Scoring Category 1 based on the answers to the funding and project land access questions.

5.3.2 Scoring Category 2 - SWRP Multiple Benefits Analysis

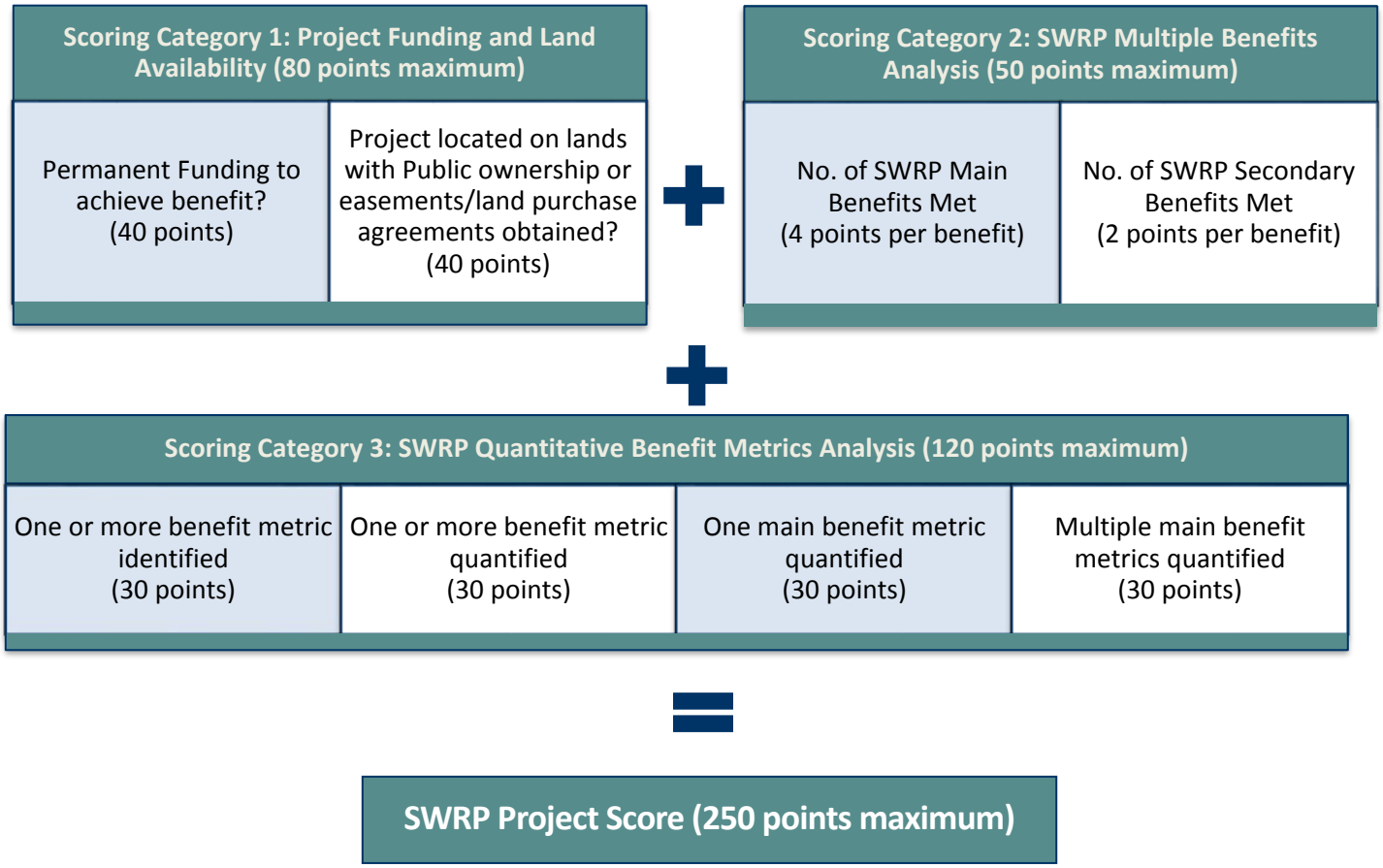
- A multiple benefit analysis was performed and is based on the main and secondary (i.e., additional) benefits list from SWRP Guidelines (SWRCB 2015).
  - Benefits which fall under five broad categories: water quality, water supply, flood management, environmental, and community.
  - The SWRP Guidelines require that projects meet "at least two or more" main benefits and as many secondary benefits as possible
    - Main benefits – 4 points each
    - Secondary benefits – 2 points each.
- Each project evaluated against each benefit.
  - Total number of main and secondary benefits, multiply by assigned point value.
  - Points totaled for each project, with a maximum of 50 points allowed for Scoring Category 2.
- After review, allow project proponent entities to defend benefits claimed for their projects as well as explain why certain benefits may be too difficult to claim and therefore would not be relevant to their project goals.

5.3.3 Scoring Category 3 - SWRP Quantitative Benefit Metrics Analysis

- Purpose: to add a quantitative metrics-based approach to capture the tangible benefits provided by each project and to demonstrate the specific benefits each project will have on the Planning Area.
  - Identifying quantitative metric(s) specific to one or more main and secondary benefits (herein referred to as "benefit metrics").
  - Identify value.
- The comparative ratings system is based on the number of benefit metrics identified, number of benefit metrics quantified, and the significance of storm water impacts. Points were assigned to each category as follows:
  - A score of zero (0) was assigned if a project was not able to identify a benefit metric with current quantifiable value or value to be calculated later.

- A score of 30 was assigned if a project could identify one or more benefit metrics however could not quantify the metric(s) at this time.
- A score of 60 was assigned if a project met the previous rating and in addition could identify one or more benefit metrics with at least one corresponding quantified value.
- A score of 90 was assigned if a project met the previous rating and in addition could identify one or more SWRP Main Benefit metrics with at least one corresponding quantified value.
- A score of 120 was assigned if a project met the previous rating and in addition could identify two or more SWRP Main benefit metrics with two or more corresponding quantified values.

Figure 5-2: Yolo SWRP Project Scoring Process



5.4 Summary of Project Prioritization and Selection

Table 5-3 presents the current prioritization of projects selected for implementation. In total, 11 projects were prioritized and ranked yielding total scores from 142 points to 238 points based on the scoring system developed in Section 5.2. The scores developed in this SWRP are for the purposes of prioritizing and ranking projects as required by the SWRP Guidelines. The purpose is to identify and develop projects with clear storm water and dry weather runoff goals that also provide multiple public water quality and supply benefits, and have been identified, prioritized, and selected based on a metrics-driven analysis. The relative prioritization of projects in this plan does not restrict any project from applying to or attaining State grant money funded by any bond measure approved by voters after January 2014, which includes Proposition 1 funding for implementation.

5.4.1 Quantification of Storm Water Management

Benefit quantification is an important measure of SWRP effectiveness. Quantification of storm water management actions show the balance between storm water as a resource and storm water as a hazard. The more that the potential storm water volume can be quantified, the more it can be put to use as a resource. Tools and methods to quantify project benefits are introduced in Section 6.

The following Subsections present the benefits anticipated as a result of the implementation of the prioritized projects in Table 5-3.

5.4.1.1 Water Quality Benefits

As presented in Section 1.4.2.1, successful implementation of the SWRP should result in the following Water Quality benefits:

- Increased filtrations and/or treatment of runoff
- Greater non-point source pollution control
- Reestablishment of natural water drainage and treatment

The following projects will result in water quality benefits:

- **Project 2: Arboretum Waterway Wetland Restoration and Enhancement**
  - Benefit: 935 acres of wetland treatment of runoff
  - Analysis: Recycled water is discharged to the Arboretum in compliance with UC Davis' Wastewater Treatment Plant (WWTP) National Pollution Discharge Elimination System (NPDES_ Permit, Order R5-2014-0152, NPDES No. CA0077895.

    Wetland area will provide natural treatment of storm water and recycled water, resulting in reduction in nitrate levels and suspended sediment and increase in dissolved oxygen.
- **Project 6. Dry Creek Bank Stabilization and Wastewater Re-use**
  - Benefit: 2 miles of sediment control
  - Analysis: The City of Winters WWTP is adjacent to Dry Creek at the northeastern corner of the City. The WWTP is regulated under Waste Discharge Requirements (WDRs) R5-2002-0136, which prescribes requirements for the discharge of treated domestic wastewater to approximately 170 acres of city owned spray fields vegetated with native grasses. Alteration of the WWTP's existing NPDES permit could provide treated wastewater for bioengineering projects to enhance both stability of the banks and wildlife habitat along two miles of creek channel.
- **Project 14: North Regional Pond and Pump Station**
  - Benefit: 120 cfs treatment prior to discharge
  - Analysis: This project will add the North Regional Pond hydraulically into the City's storm drainage network for the purposes of capturing, treating and reusing the storm water for agricultural purposes. Treatment of the storm water is in the form of settling prior to discharge via the pump station (120 cfs capacity) to the City's outfall channel. The projects will help the City meet its NPDES Permit (NPDES NO. CAS000004) by giving more control over the storm flows exiting to the City's outfall channel.

5.4.1.2 Water Supply Benefits

As presented in Section 1.4.2.2, successful implementation of the SWRP should result in the following Water Supply benefits:

- Increased water supply reliability
- Increased conjunctive use of groundwater and surface water (storm water)
- Water conservation

The following projects will maximize and/or augment water supply:

- **Project 2: Arboretum Waterway Wetland Restoration and Enhancement**
  - Benefit: Up to 2,000 gallons per minute (gpm) of reclaimed water ensures that the Arboretum's ecosystem will be sustained even in drought years
  - Analysis: UC Davis' WWTP NPDES Permit allows the WWTP to discharge up to 2,000 gpm to the Arboretum discharge point.
- **Project 4: Davis Greenbelts Landscape Conversions**
  - Benefit: About 1,200,000 gallons per year conserved per acre of turf conversion.
  - Analysis: Estimated water savings were calculated based on the assumption that half of all Davis Green Belts will be converted (1091 acres) and on the Estimated Total Water Use formula as provided in the Model Water Efficient Landscape Ordinance in Division 2, Title 23, California Code of Regulations (Revised 2015):
    - EWU (hydrozone) = [(ETo)(PF)(HA)(.62)]/(IE)

      Where,

      EWU (hydrozone) = Estimated Water Use (gallons per year)

      Eto = Reference Evapotranspiration (inches per year) = 56.72 (according to California Irrigation Management Information System Station 6 Davis)

      PF = plant factor = 0.8 for high water use turf and 0.2 for low water use shrub

      HA = hydrozone area (square feet [SF])

      (.62) = conversion factor (inches to gallons)

      IE = irrigation efficiency = 0.75 for rotator sprinkler and 0.81 for drip bubbler

      Therefore,

      $EWU_{(turf, rotator)}$ = [(56.72)(0.8)(43,560 SF/acre)(0.62)]/(0.75) = 1,600,000 gallons per year per acre

      $EWU_{(shrub, drip)}$ = [(56.72)(0.2)(43,560 SF/acre)(0.62)]/(0.81) = 400,000 gallons per year per acre of turf conversion

      Savings = 1,200,000 gallons per year per acre of turf conversion
- **Project 8. Flood Monitoring Network Project**
  - Benefit: 24,893 AF/Y of additional recharge of storm water through the YCFC&WCD's canal system.
  - Analysis: Based on an integrated water resources model for Cache Creek of a strategy to direct winter storm water runoff into the YCFC&WCD's existing unlined canals for the purposes of groundwater recharge. Locations were selected based on site visits after the storms in April 2017, November 2017, and January 2018. See Appendix I, Sections 3 and 6 for model documentation and results.
- **Project 13: Moore Siphon Reliability/Restoration Project**
  - Benefit 1: 1,000 AF/year of savings through reduction of leaks
  - Analysis 1: Field measurements by the United States Geological Survey (USGS) from 2011-2013 for Alder Canal (USGS 384125121540601), upstream of the siphon, and Moore Canal (USGS 384111121541301), downstream of the siphon, show a loss of flow of about 6-percent of average upstream flow (71 ft^3/s). Assuming flow in the canal May through October for irrigation (2,000 AFY) and that leaks due to the siphon structure accounts for half the loss of flow, rehabilitation of Moore Siphon would result in a savings of 1,000 AFY.
  - Benefit 2: 200 AF/day of water supply reliability for agriculture
  - Analysis 2: The rehabilitated siphon will have a design capacity of 200 AF/day. Rehabilitation of Moore Siphon will reduce the risk of supply interruption due to failure of the siphon.
- **Project 14: North Regional Pond and Pump Station**
  - Benefit: 500 AFY of agricultural storage
  - Analysis: Estimated annual storage is calculated using the Rational Method, which is described in the Yolo City/County Drainage Manual (floodSAFEYolo, 2010):

    Q = CiA where

    Q = rate of runoff, acre-inches per hour

    C = runoff coefficient, which is the ratio of peak runoff to average rainfall intensity = 0.59, assuming a 100-year, 10-day design storm = average rainfall intensity = 0.045 inches per hour (in/hr), assuming a 100-year, 10-day design storm (from National Weather Service Precipitation Frequency Data Server[1])

A = drainage area = 1,748 acres (based on Spring Lake Specific Plan future land use Woodland South area). Therefore,

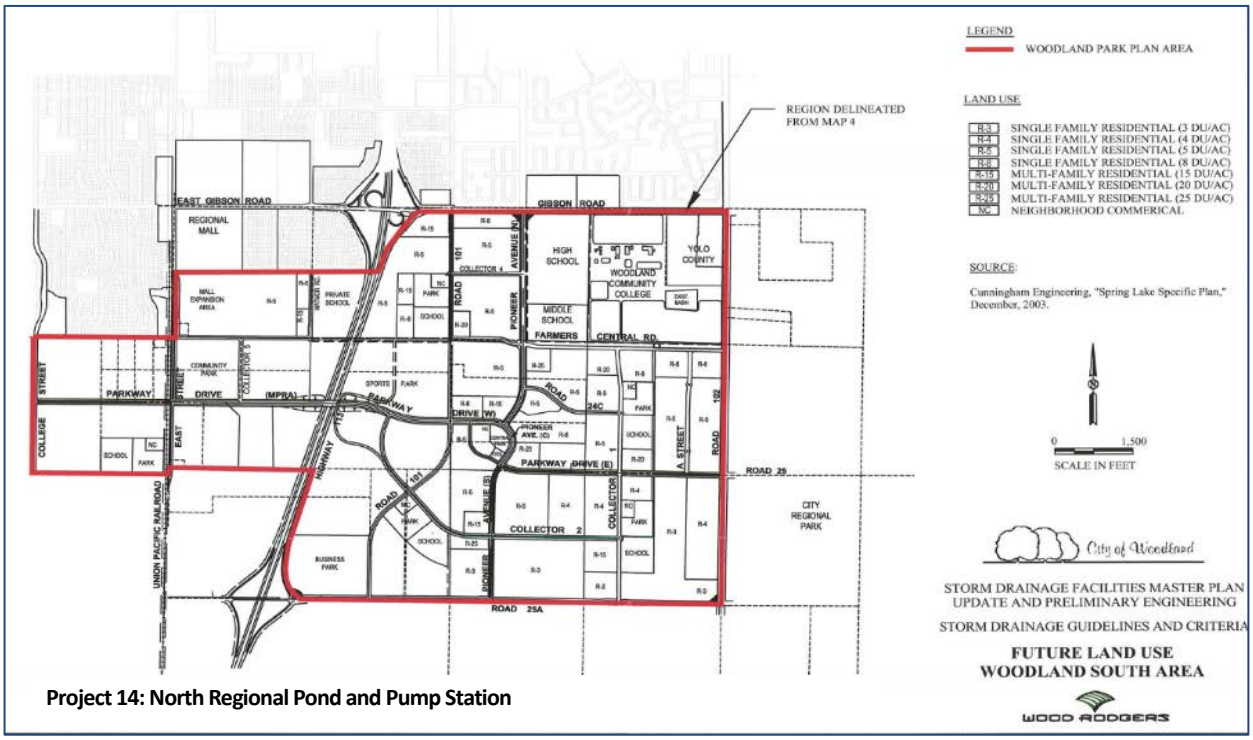
Q = 0.59 x 0.045 in/hr x 1,748 acres x 1 ft/12 inches x 24 hr / day x 10 days / year = 928 AFY

- **Project 22: West Adams Canal Renovation and China Slough Rehabilitation Project**
  - Benefit: 10,000 AF of increased surface water supply
  - Analysis: Enlargement and improvement of the YCFC&WCD's West Adams, East Adams, and Acacia Canal systems will be modernized to convey 10,000 AF of surface water per year. China Slough will be cleaned and installed with check structures to convey 10,000 AF of surface water.

- **Project 27. Madison Farmer Field Stormwater Capture and Groundwater Recharge**
  - Benefit: 300 AF - 1,100 AF per storm event (farmer fields - detention basin)
  - Analysis: Depends on the water year, but farmer field conversions to berms allows 300 AF per storm event. With 27 inches per hour infiltration rate, at least 30 hours required between storm events to dry out fields. For detention basin, 1,100 AF per storm and requires at least 5.5 days in between storms.

Collective Water Supply Benefits

Implementation of the above water supply projects could result in 33,627 AFY of water which could infiltrate back into the groundwater plus an additional 1,000 gpm per storm event.



Project 14: North Regional Pond and Pump Station

5.4.1.3 Flood Management Benefits

As presented in Section 1.4.2.3, successful implementation of the SWRP should result in the following Flood Management benefits:

- Decreased flood risk by reducing runoff rate and/or volume
- Reduced sanitary sewer overflows

The following projects will decrease risk of flood and sanitary sewer overflow:

- **Project 2: Arboretum Waterway Wetland Restoration and Enhancement**
  - Benefit: 1,800,000 cubic feet of runoff capture capacity
  - Analysis: The UC Arboretum has a 1,800,000 cubic feet of runoff capture capacity that will be maintained by this project.
- **Project 8. Flood Monitoring Network Project**
  - Benefit: Reduce flooding due to Cache Creek by diverting up to 150 cfs of storm water runoff diverted from Cache Creek to YCFC&WCD canals.
  - Analysis: Based on WEAP modeling of Cache Creek. Implementation of this project will allow YCFC&WCD to monitor the canals and sloughs during the winter and know when there is sufficient capacity available to divert flows out of Cache Creek before flows overtop its bank. See Appendix I, Section 3 for modeling description and results and Section 6 for a description of monitoring locations.
- **Project 17: Russell Boulevard Demonstration LID Project**
  - Benefit: 0.05 AF of infiltration for a 24-hour storm event
  - Analysis: By using engineered soil in the project, the anticipated infiltration rate will reach approximately 1.0 inches of water per hour. Project soils will be engineered consistent with recommended CASQA standards for vegetated swales, rain gardens, pervious paving, and storm water planters. Using this infiltration rate, it is estimated the project will capture and treat the full amount of the design storm or the 85th percentile 24-hour storm event, which is 2,080 cu. ft. of water (0.05 AF).
- **Project 27. Madison Farmer Field Stormwater Capture and Groundwater Recharge**
  - Benefit: 39,000 gpm – 128,000 gpm
  - Analysis: A 10-year, 24-hour design storm event produces 5.65 inches or an event similar to January 2017 produces 1.72 inches. Over an assumed area of 1,200 acres if farmer fields = 38,921 gpm

    1,200 acres x 43,560 square feet/acres x 144 square inches/square feet x 1.72 inches / 231 square inches to gallons / (24 hours x 60 minutes/hour) = 127,851 gpm

    1,200 acres x 43,560 square feet/acres x 144 square inches/ square feet x 5.65 inches / 231 square inches to gallons / (24 hours x 60 minutes/hour) = 127,851 gpm

5.4.1.4 Environmental Benefits

As presented in Section 1.4.2.4, successful implementation of the SWRP should result in the following Environmental benefits:

- Environmental and habitat protection and improvement
- Reduced energy use, reduced greenhouse gas emissions, and/or additional locations for carbon sinks
- Reestablishment of natural hydrographs
- Water temperature improvements

The following projects will result in environmental benefits:

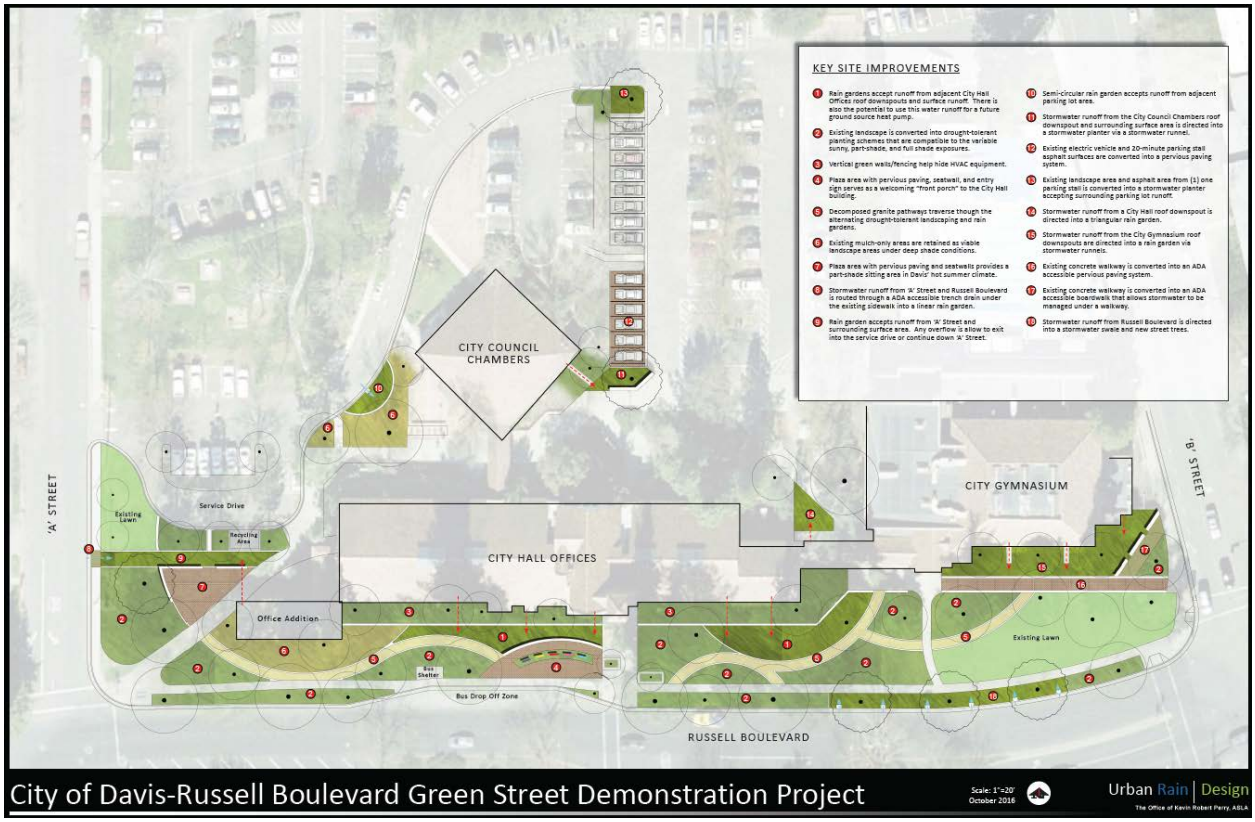
- **Project 4. Davis Greenbelts Landscape Conversions**
  - Benefit: 1 acre of enhanced habitat per project site
  - Analysis: Turf will be removed and replaced with drought tolerant native plants and a network of oak woodland and pollinator plants.
- **Project 6. Dry Creek Bank Stabilization and Wastewater Re-use**
  - Benefit: 2 acres of new riparian vegetation
  - Analysis: The project area will cover 2 acres on Dry Creek at the confluence with the Lower Putah Creek. Bioengineering with willows and other native vegetation can stabilize eroding banks and provide cover for migrating wildlife. Native vegetation is limited by summer water. The location of the Winters WWTP is ideal for a gravity flow system to

irrigate willows and other native vegetation using bioengineering methods.

- **Project 17: Russell Boulevard Demonstration LID Project**
  - Benefit 1: 6,150 square feet of enhanced habitat (including 7 trees planted)
  - Analysis 1: About 6,150 square feet of rain gardens and bioswales made up of native vegetation will be installed.
- **Project 20. Thompson Canyon Stormwater Management**
  - Benefit: 1 river mile/10,000 square feet of restored trout spawning habitat for increased fish population
  - Analysis: The lower mile of the canyon has a legacy dirt road that contributed to catastrophic hillslope failure. The road has thirty stream crossings without properly sized culverts or rock fords and is not properly outsloped for drainage. This project would repair the stream crossings, properly outslope the road and apply gravel surface. It would also install rock vanes for grade control in the channel and plant

Project 24. Winters Bioswales Project and Habitat Enhancement

- Benefit: 5 acres of habitat restoration
- Analysis: The culverts in Winters flow directly into Putah Creek with no treatment. This project will improve water quality and habitat improvement by removing sediments and other toxic materials from water before it enters the creek and will use the water to grow native species for habitat improvement adjacent to the creek. Five acres of habitat will be established, and a monitoring plan has been developed to ensure that plantings are thriving. The bioswales will capture water that is now flowing directly into Putah Creek. This water will be re-routed to be used by trees that shade Putah Creek and lower water temperature in the creek.



Project 17: Russell Boulevard Demonstration LID Project

10,000 square feet of native vegetation.

5.4.1.5 Community Benefits

As presented in Section 1.4.2.5, successful implementation of the SWRP should result in the following Community benefits:

- Increased employment opportunities
- Increased public education
- Increased community involvement

The following projects will result in community benefits:

- **Project 4. Davis Greenbelts Landscape Conversions**
  - Benefit: 1 acre of recreation area per project site
  - Analysis: Some typical turf areas along the green belt have been designated by the City of Davis as underutilized for recreation and recognize the potential of the project for water conservation, demonstration gardens, and interpretive education. Decomposed granite paths and interpretive signs will be installed and will inform the public of the benefits of the project.
- **Project 17. Russell Boulevard Demonstration LID Project**
  - Benefit 1: 1,000 volunteer hours and 3 class tours per year
  - Analysis 1: Seven partnerships with community groups for this project have been identified including the Yolo County Master Gardeners, Sierra Club, UC Davis Arboretum, Yolo Resource Conservation District, California Conservation Corp and others. The area is intended to serve as an outdoor classroom for UC Davis, the Davis Joint Unified School District and the community at large. Volunteer opportunities will be used to maintain the project site.
  - Benefit 2: 34,370 square feet of additional public use area
  - Analysis 2: The project will include increased natural habitat in the downtown core that is available to the community which will include an outdoor classroom, public art, seating area, walking tour of storm water and water conservation demonstration areas.

Project 24. Winters Bioswales Project and Habitat Enhancement

- Benefit: 3 community tours and 1 class visit per year
- Analysis: Bioswale plantings will be performed by volunteers who will be educated about why they are important and how they function.

5.5 Design Criteria and Best Management Practices

To prevent storm water and dry weather runoff pollution and increase effective storm water and dry weather runoff management, implementation of any project submitted to the Yolo SWRP will comply with the design criteria and/or best management practices specified by Yolo County and/or specific local jurisdictions and programs. Existing guidelines and programs include:

- Yolo County City/County Drainage Manual (FloodSAFE Yolo, 2010).
- Stormwater Management Planning Programs and Design Standards/Criteria for the City of Davis, the City of West Sacramento, the City of Woodland, the University of California, Davis, and Yolo County.
- Stormwater Best Management Practice Handbook, New Development and Redevelopment (California Stormwater Quality Association, 2003).

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Table 5-3: Yolo SWRP Project Prioritization and Scoring

Project Number	Project Name	Scoring Category 1: Project Funding and Land Availability				Scoring Category 2: SWRP Multiple Benefits Analysis																			
						Water Quality			Water Supply			Flood Management		Environmental					Community							
		Permanent Funding to achieve benefit? Scoring: (40 points)	Project located on lands with Public ownership? Scoring: (40 points)	Category 1 Score (80 max)	Match Provided	Increased filtration and/or treatment of runoff	Nonpoint source pollutant control	Reestablished natural water drainage and treatment	Water supply reliability	Conjunctive use	Water conservation	Decreased flood risk by reducing runoff rate and/or volume	Reduced sanitary sewer overflows	Environmental and habitat protection and improvement	Reduced energy use, greenhouse gas emissions, or provides a carbon sink	Reestablishment of the natural hydrograph	Increased urban green space	Water temperature improvements	Employment opportunities provided	Public education	Community involvement	Enhance and/or create recreational and public use areas	No. of SWRP Main Benefits Met Scoring: (4 points for each benefit)	No. of SWRP Secondary Benefits Met Scoring: (2 point for each benefit)	Total No. of Intangible Objectives-based Benefits	Category 2 Score (50 max)
2	Arboretum Waterway Wetland Restoration and Enhancement	Y	Y	**80**	Y	**x**	x	x	**x**		x	**x**		**x**	x	x			**x**	**x**	x	x	**6**	**7**	**13**	38
4	Davis Greenbelts Landscape Conversions (Davis Greenbelts Stormwater Improvements)	Y	Y	**80**	N	**x**		x			x			**x**						**x**		x	**3**	**3**	**6**	18
6	Dry Creek Bank Stabilization and Wastewater Re-use	Y	N	**40**	N						x			**x**	x		**x**			**x**	x		**3**	**3**	**6**	18
8	Flood Monitoring Network Project	N	Y	**40**	N	**x**			**x**		x	**x**											**3**	**1**	**4**	14
13	Moore Siphon Reliability/Restoration Project (Moore Siphon Stormwater Improvements)	Y	Y	**80**	N				**x**	**x**	x	**x**											**3**	**1**	**4**	14
14	North Regional Pond and Pump Station	Y	Y	**80**	Y	**x**	x		**x**			**x**		**x**			**x**					x	**5**	**2**	**7**	24
17	Russell Boulevard Demonstration LID Project (Russell Boulevard Stormwater Treatment Project)	Y	Y	**80**	Y	**x**		x			x	**x**		**x**			**x**		**x**	**x**	x	x	**6**	**4**	**10**	32
20	Thompson Canyon Stormwater Management	Y	N	**40**	N	**x**	x	x			x			**x**								x	**2**	**4**	**6**	16
22	West Adams Canal Renovation and China Slough Rehabilitation Project	Y	N	**40**	N				**x**	**x**		**x**		**x**									**4**	**0**	**4**	16
24	Winters Bioswales Project and Habitat Enhancement	Y	Y	**80**	Y	**x**	x	x						**x**				x		**x**		x	**3**	**4**	**7**	20
27	Madison Farmer Field Stormwater Capture and Groundwater Recharge	N	N	**0**	Y	**x**		**x**	**x**	**x**		**x**								**x**			**5**	**1**	**6**	22

Project Number	Project Name	Scoring Category 3: SWRP Quantitative Benefit Metrics Analysis			Project Scoring and Prioritization
		Benefit Metrics Analysis Type	Quantitative Benefit Metrics Value	SWRP Relative Benefits Scoring (0, 30, 90, 120)	SWRP Project Score (250 max) Scoring: (Sum of Categories 1, 2, and 3)
2	Arboretum Waterway Wetland Restoration and Enhancement	Treatment of stormwater runoff, recycled water for irrigation, establish wetland habitat, employment opportunities	935 acres of treated stormwater, 2,000 gpm of recycled water irrigation,	120	**238**
4	Davis Greenbelts Landscape Conversions (Davis Greenbelts Stormwater Improvements)	Prevent runoff, enhance habitat, recharge aquifers, LID signage, turf removal, enhanced green space	Public education: 385 persons/ac/yr, Water Conservation: 1.2 Mgal/yr/ac, Habitat/Enhanced Rec Space: 1 ac/site	90	**188**
6	Dry Creek Bank Stabilization and Wastewater Re-use	Provide cover for migrating wildlife, provide a shady corridor in what is now a dry gully, enhance public policy from non-conforming setbacks to effective bank stabilization, re-use treated wastewater to irrigate riparian plantings, riparian vegetation is a carbon sink, Inform Dry Creek landowners of a cost-effective bank stabilization method	1-2 acres of new riparian vegetation, Number of enrolled landowners, reduce sediment loading along two miles of eroding banks stabilized by vegetation	90+	**148**
8	Flood Monitoring Network Project	Water supply reliability, runoff diverted (flood management)	24,893 AF/Y of additional recharge of storm water through the YCFC&WCD's canal system. Reduce flooding due to Cache Creek by diverting up to 150 cfs of storm water runoff diverted from Cache Creek to YCFC&WCD canals.	120	**174**
13	Moore Siphon Reliability/Restoration Project (Moore Siphon Stormwater Improvements)	Allows for irrigation season flows to continue to 12% of District's agricultural users, allows farmers to use surface water in lieu of relying on groundwater, reduces runoff rate to upstream and downstream surrounding properties by properly conveying flows and reducing leaking, Rehabilitating the Moore Siphon will prevent current leakage.	Approximately 1 TAF/y, 15,000 acres of cropland stays in production 200 AF/day of water supply for agriculture May-October (36 TAF/y),	120	**214**
14	North Regional Pond and Pump Station	treatment of the stormwater prior to discharge to the City's outfall channel, possible transmission of stored water from NR pond to adjacent farmland, 75-acre pond vs 75-acre barren land, treating stormwater before discharge to the City's outfall channel, additional birding habitat	up to 120 cfs treated, reliably 500-ac ft of water during non-rainy season, 75-acre pond vs 75-acre barren land	120	**224**
17	Russell Boulevard Demonstration LID Project (Russell Boulevard Stormwater Treatment Project)	Increased habitat, increased infiltration, volunteer opportunities, increased green space, reestablish natural drainage,	2080 cu ft infiltration, 6,225 sq ft habitat, 7 trees, 500-1000 volunteer hrs/yr,	120	**232**
20	Thompson Canyon Stormwater Management	reduced sediment loading, infiltration strips capture more surface water and reduce runoff, infiltration strips capture more surface water and reduce runoff, enhance fishing at 5 Putah Creek fishing accesses visited by 100,000 people per year	1 river mile of restored creek channel and access road, 10,000 square feet of native vegetation established	120	**176**
22	West Adams Canal Renovation and China Slough Rehabilitation Project	Increases water supply availability and reliability to Yolo-Zamora area; and reduces dependence on groundwater, preserves groundwater supplies by providing available surface water supplies, Reduced peak discharge from storm events to region,	10,000 acre-feet increased surface water; 10,000 AF decreased groundwater use, need to study peak storm flows in this region	90	**146**
24	Winters Bioswales Project and Habitat Enhancement	Treatment of stormwater runoff, habitat improvement, community involvement (volunteering),	5 acres of habitat restored, 3 community tours and 1 classroom component.	90	**190**
27	Madison Farmer Field Stormwater Capture and Groundwater Recharge	Groundwater recharge from stormwater detention provides water supply reliability and opportunities for conjunctive use.	300 AF - 1,100 AF per storm event (farmer fields - detention basin) 128,000 gpm reduced peak runoff to the town of Madison	120	**142**

Section 6: Implementation Strategy and Schedule

This section sets forward a proposed framework for the Storm Water Resource Plan for Yolo County (SWRP or Plan) implementation and performance monitoring to track progress, and it offers recommendations for the first two years of Plan implementation activities. This section is intended to serve as the cornerstone of critical actions the stakeholders must take to ensure SWRP program success into the future.

6.1 Implementation Strategy

The SWRP for Yolo County will rely on the Water Resources Association of Yolo County (WRA of Yolo County), Yolo Subbasin Groundwater Agency (YSGA), and Westside-Sacramento Regional Water Management Group (RWMG) for implementation of the Plan and incorporation into the Westside-Sacramento (Westside) Integrated Regional Water Management (IRWM) Plan. Implementation of the SWRP includes incorporation into the IRWM Plan, maintenance of the Plan, obtaining applicable permits for implementation, tracking project status, and community participation. These activities are described in the subsections below.

6.1.1 Submittal to Applicable IRWM Plan

As described throughout this Plan, the Westside IRWM Region includes Yolo County. Therefore, this SWRP will be submitted to the Westside RWMG for incorporation into the IRWM Plan. This SWRP was developed to be consistent with the current version of the Westside IRWM Plan (2013), incorporating all of the Westside IRWM Plan objectives into the SWRP objectives, which were used to focus and evaluate projects submitted to the Plan. Therefore, implementation of the SWRP and its projects will help to further the Westside IRWM Plan's progress towards attaining its water management goals and objectives.

The Yolo County SWRP will also be submitted to the neighboring IRWM Plan Regions as identified in Section 1, the American River Basin Region and North Sacramento Valley Region.

6.1.1.1 Timeline for Submittal

The SWRP for Yolo County was completed in March 2018 and submitted to the Westside IRWM RWMG for incorporation in May 2018. It is anticipated that the Westside IRWM Plan will be updated to meet DWR's 2016 IRWM Plan Standards by summer of 2018.

6.1.1.2 Adaptive Management – Maintaining a Living Document

The SWRP is a living document and changes will be required as additional information is collected, as objectives are refined and better understood, as new projects are developed, and as the collaborative relationships among the Westside RWMG, WRA of Yolo County, YSGA and stakeholders continue to develop. Changes to the SWRP will follow a similar, publicly open and accessible process followed by this Plan and the Westside IRWM Plan's development process. The Westside IRWM will lead in the effort to change and/or update the SWRP with support from the WRA of Yolo County and YSGA, and participation from project proponents and other stakeholders. Specific protocol for changes and updates to the SWRP for Yolo County, as documented in Section 11.6 of the IRWM Plan, are summarized below:

- Making Changes to the SWRP:
  - Changes include revisions or updates to the section narratives.
  - The SWRP will be reviewed a minimum of every five years (or as needed) to determine if its content needs to be changed in a significant way other than the periodic updates or amendments of the objectives and projects.
  - If significant changes are needed, the SWRP will be revised and submitted to the RWMG for adoption into the SWRP and IRWM Plan.
- Updating and Amending the SWRP:
  - Updates and amendments specifically include changes to the project lists and refinements to the Plan objectives.
  - Refinements to the Plan objectives will be submitted to the RWMG for consideration to adopt as an amendment to the existing SWRP. Refinements will be incorporated into the SWRP and IRWM Plan a minimum of every five years (or as needed).
  - Project revisions, updates, and completions, as well as new projects, are received from stakeholders on a continual basis. The RWMG will review the Project

submittals and update the Project list on an annual basis. The updated project list will be posted on the Westside IRWM Plan website: http://www.westsideirwm.com/projects.html

6.1.2 Entities Responsible for Project Implementation

The Westside RWMG, WRA of Yolo County and YSGA (collectively called Authorizing Agencies) are responsible for implementation of the SWRP, with participation from project proponents and stakeholders.

Consistent with the IRWM Plan, the Authorizing Agencies functions include:

- Authorizing decisions using broad stakeholder agreement;
- Providing leadership for fostering cooperation, continuing coordination, tracking SWRP performance, and updating the SWRP; and
- Aiding in identifying willing agencies/organizations (with appropriate authority and financial conditions) to serve as a fiscal agency for each specific funding opportunity that is pursued.

Further description of the responsibilities of individual parties for SWRP implementation is provided in the following subsections and in Table 6-1.

6.1.2.1 Water Resources Association of Yolo County (WRA of Yolo County)

A consortium of public water purveying entities organized in 1993, the ten-member Water Resources Association of Yolo County is a nonprofit, mutual-benefit corporation created to provide a regional forum to coordinate and facilitate solutions to water management issues in Yolo County. Governed by a board of directors with a representative from each of its member agencies. The member agencies include: City of Davis, City of Woodland, City of West Sacramento, City of Winters, University of California Davis, Yolo County, Yolo County Flood Control and Water Conservation District (YCFC&WCD), Reclamation District 108, Reclamation District 2035 and Dunnigan Water District.

Maintenance and implementation of the SWRP will be led by the WRA of Yolo County. These responsibilities include:

- Encouraging public engagement and maintain a contact list of stakeholders;
- Conducting stakeholder meetings to report on and discuss the status of SWRP implementation and achieving SWRP goals and objectives;
- Soliciting project updates;
- Administering and maintain web content for public viewing;
- Pursuing grant funding for SWRP implementation, including project implementation;
- Selecting/prioritizing projects for inclusion in SWRP-related grant applications and prepare and submit grant applications;
- Working with local county and city officials and project proponents to discuss solutions if local ordinances and laws hinder or prevent implementation of a proposed project;
- Coordinating with related storm water resources management efforts including neighboring IRWM Regions and local, State, and federal agencies;
- Collecting, managing and sharing storm water and project data; and
- Setting and managing operating budget.

6.1.2.2 Yolo Subbasin Groundwater Agency (YSGA)

A Joint Exercise of Powers Agreement (JPA) was executed by and among the following public agencies for the purpose of forming a Groundwater Sustainability Agency and achieving groundwater sustainability in the Yolo Subbasin: City of Davis, City of West Sacramento, City of Woodland, City of Winters, Dunnigan Water District, Esparto Community Services District, Madison Community Services District, Reclamation District (RD) 108, RD 537, RD 730, RD 765, RD 785, RD 787, RD 827, RD 1600, RD 2035, Yocha Dehe Wintun Nation, Yolo County Flood Control and Water Conservation District, and County of Yolo.

Maintenance and implementation of the SWRP will be supported by the YSGA for those tasks considered to have a groundwater nexus. These responsibilities include:

- Encouraging public engagement and participation in the SWRP implementation;
- Soliciting project updates;
- Selecting/prioritizing projects for inclusion in SWRP-related grant applications and prepare and submit grant applications;

- Pursuing grant funding for implementation of groundwater projects;
- Coordinating with related groundwater management efforts;
- Managing and sharing groundwater data; and
- Setting and managing operating budget.

6.1.2.3 Westside RWMG

The RWMG was established through a memorandum of understanding (MOU) between Lake County Watershed Protection District, Napa County Flood Control and Water Conservation District, Solano County Water Agency, and the Water Resources Association of Yolo County.

The RWMG will support the implementation of the SWRP by:

- Leading the effort to update the SWRP, including receiving project submittals, updating project lists, reviewing and updating IRWM Plan and SWRP objectives, and updating SWRP content;
- Identifying and gathering data related to achieving IRWM Plan and SWRP goals and objectives;
- Supporting grant applications and other efforts to pursue funds for SWRP implementation; and
- Assisting in coordinating with neighboring IRWM Regions and local, State, and federal agencies.

6.1.2.4 SWRP Project Proponents

SWRP Project proponents include agencies or entities that have submitted projects they intend to sponsor during implementation and have been included in the SWRP. SWRP Project proponents, as documented in Section 11.2.1.1 of the IRWM Plan, are expected to have the following responsibilities:

- Providing project-specific information that may aid in advancing the regional objectives;
- Seeking opportunities to integrate projects to most efficiently achieve the regional objectives;
- Working with local county and city officials to review all ordinances and laws which are applicable;
- Providing updated project-specific information as necessary to reflect major project milestones (e.g., CEQA completion, 100% design, construction underway, construction complete, and project completion);
- Developing and implementing projects, collect performance monitoring data (described in Subsection 6.3.2), and report data to WRA of Yolo County annually;
- Participating in stakeholder meetings to educate others about the proponent's project(s);
- Identifying a point person for each project who will provide requested information for projects for inclusion in grant applications; and
- Complying with grant requirements, as identified by the funding agency, to qualify for grant funding.

6.1.2.5 SWRP Stakeholders

The SWRP Stakeholders introduced in Section 4 (and included in Appendix C) are a collection of people who choose to participate in SWRP implementation activities such as:

- Attending and participating in stakeholder outreach meetings;
- Reviewing and updating Plan objectives and content; and
- Assisting in the coordination with local, state, and federal agencies.

6.1.3 Federal, State, and Local Permits

This SWRP and the projects submitted to this Plan must be consistent with applicable federal and state regulations and policies, and permits implementing federal and state regulations and policies, including, but not limited to:

- Federal Permitting:
  - National Environmental Policy Act
  - Section 401 and 404 of the Clean Water Act

Table 6-1: Yolo County SWRP Implementation Responsibility Matrix

Scope	Frequency	WRA of Yolo County and YSGA	Westside RWMG	SWRP Project Proponents	SWRP Stakeholders
1. Conduct Stakeholder Meetings					
Schedule Meetings, Prepare Agendas, Prepare Content, Prepare Meeting Summaries	Annually/As Needed	Lead			Participate
2. Engage Public					
Maintain Email List	Annually/As Needed	Lead			
Send Announcements / Invitations	Annually/As Needed	Lead			
Administer Website, Update Content	Annually/As Needed	Lead			
3. Update SWRP					
Receive Project Submittals, Revise Project List	Annually	Support	Lead	Participate	
Review and Update Objectives	5 Years/As Needed	Support	Lead	Participate	Participate
Revise/Amend Plan Content	5 Years/As Needed	Support	Lead	Participate	Participate
4. Pursue Grant Funds for Implementation					
Identify Grant Opportunities	Quarterly	Lead	Support	Support	
Select Projects for Inclusion in Grant	As Needed	Lead	Support	Lead/Support	
Prepare and Submit Grant Applications	As Needed	Lead	Support	Lead/Support[1]	
Identify One or More Willing Fiscal Agent(s) to Manage Grant Funds (If Received) on Behalf of the SWRP	As Needed	Lead	Support		
5. Coordinate with Related Efforts					
Coordinate with Neighboring IRWM Regions	Annually	Lead	Support		
Coordinate with Local, State, and Federal Agencies	Annually/As Needed	Lead	Support	Support	Participate
6. Manage and Share Related Data and Information					
Gather/Synthesize Data Related to Plan Progress	Annually	Lead	Support	Support	
Report on Plan Progress	Annually	Lead	Support	Support	
Identify Data That Should Be Measured and Managed to Meet Plan Goals and Objectives (b)	Annually	Lead/Support[2]	Lead/Support[2]	Support	
Gather Data that Should Be Measured and Managed to Meet Plan Goals and Objectives (b)	As Needed	Support	Support	Lead	
Store and Manage Needed Information	Annually/As Needed	Lead	Support	Support	
7. Finance Implementation Activities					
Set Annual Operating Budget for Implementation Coordination	Annually	Lead			
Manage Expenditures of Implementation Coordination Activities	Annually/As Needed	Lead			

1. Depending on the grant solicitation, the project proponent could be the applicant and select projects for inclusion into a single agency grant application.
2. This will be coordinated with the Westside IRWM Plan annual goals and objectives update and will be led by and supported by either party depending on circumstances of the project.

- State Permitting:
  - California Environmental Quality Act
  - California Department of Fish and Wildlife Lake/Streambed Alteration Permit
  - State Water Resources Control Board plans and policies
  - Central Valley Regional Water Quality Control Board Total Maximum Daily Loads (TMDLs), National Pollutant Discharge Elimination System (NPDES), and other plans and policies
- Local Permitting:
  - City/County development and encroachment permits
  - Municipal storm water compliance
  - Local pretreatment programs
  - Other

Environmental document preparation and permitting must occur prior to construction of any project. Project proponents are responsible for obtaining the necessary permits; and they may request for assistance with federal and state permit coordination by the Authorizing Agencies, which includes member agencies that have jurisdiction over local permits.

6.1.4 Community Participation

Continuing public involvement, including interested stakeholders and the general public, is one of the most important aspects of implementing the Plan. This will be accomplished through multiple avenues of communication and engagement between the Authorizing Agencies and stakeholders. Community participation during Plan implementation will follow the same public involvement process described in Section 11.2.2 of the Westside IRWM Plan. The public involvement process is summarized below:

- Stakeholder meetings will be held annually at a minimum, or as needed to discuss/gather input of relevant topics of progress on implementation or in support of fulfilling Plan objectives.
- Stakeholder meetings will include opportunities for remote participation including conference calls, web interface, and other technologies that allow for reasonable interaction while the meeting is in progress.
- Information related to Plan implementation will be maintained and updated on the Westside IRWM website at: http://www.westsideirwm.com/
- In addition to meetings, comments and questions will be accepted via email and phone.
- Updates and meeting invitations will be distributed via the WRA of Yolo County - and YSGA-maintained stakeholder email list. Participants in the development of the SWRP for Yolo County will be added to the IRWM Plan stakeholder list.

6.1.5 Meeting Notices

This summary is not intended to be inclusive of all Brown Act requirements, but merely to provide a discussion of some of the key aspects that appear to apply to Plan implementation. The SWRP meetings will follow the Brown Act provisions.

The Brown Act is contained in Section 54950 et seq. of the *California Government Code* and sets forward specific requirements for noticing about meetings, the way meeting agendas are established, and discussions among legislative bodies outside meetings. Brown Act provisions will apply to all Authorizing Agency and stakeholder meetings. Meetings are required to be held within the County boundaries. Remote meetings (such as teleconference calls) are permitted so long as all teleconference locations are identified in the meeting notice and these locations are made available to the public. Meeting notices with agendas must be posted 72 hours prior to the meeting; special and emergency meetings are allowed with shorter notices under special circumstances. The public will be afforded opportunities to comment before or while agenda items are covered, and time will need to be set aside for members of the public to comment on items that are applicable to the Authorizing Agencies but are not otherwise agendized. All votes of the Authorizing Agencies must be cast in public. There are also special provisions for closed session meetings, such as for dealing with pending litigation and personnel issues.

There are many exemptions and other protocols to the Brown Act; details can be found in the California Attorney General's Office pamphlet *The Brown Act: Open Meetings for Local Legislative Bodies*, 2003 and other similar guidance materials.

6.1.6 Decision Making

Decisions during implementation authorized by the Authorizing Agencies will continue to be made using

broad agreement, as during Plan development. All interested participants will be invited to participate as equals during stakeholder input meetings. The WRA of Yolo County and YSGA will set agendas, interact with stakeholders, and foster collaborative decisions as shown in Table 6-1. If for some reason broad agreement cannot be reached between the Authorizing Agencies and the stakeholder group related to specific items within a reasonable amount of time and effort, the Authorizing Agencies will discuss such item(s) and then decide by majority vote how to proceed.

6.2 Resources for Implementation

Once incorporated into the Westside IRWM Plan, implementation of the SWRP will be a collaborative effort between the Authorizing Agencies. The WRA of Yolo County, YSGA and Project Proponents will lead in the effort to obtain funding for implementation with support from the RWMG.

6.2.1 Financing

Financing of a SWRP is an enormous undertaking and requires the contributions and attention of local, state, and federal agencies to ensure success. Financing of the Plan will follow the same funding strategy as documented in Section 11.4.1 of the Westside IRWM Plan, which includes two distinct tracts: funding of SWRP administration and coordination and funding of project implementation. This section highlights the anticipated funding needs for both tracks, identifies potential funding sources, and documents some of the activities that the Authorizing Agencies and others will employ to secure additional funding.

6.2.1.1 Funding of SWRP Administration

Development of the SWRP was funded by the WRA of Yolo County and the Storm Water Grant Program from the State Water Resource Control Board. However, these funds cannot be spent on plan implementation activities, so one of the first steps to implement the SWRP is to establish a budget and funding sources to support implementation coordination. These include activities undertaken by the Authorizing Agencies to plan for and conduct stakeholder input meetings, track Plan implementation (including progress towards completing plan objectives and projects), and conduct ongoing public outreach and engagement as described in the governance sections.

To accomplish these important responsibilities, the Authorizing Agencies will establish an annual operating budget for implementation coordination and manage expenditure and implementation coordination activities. This budget will be approved by the YSGA and RWMG and discussed at a stakeholder input meeting. Members of the Authorizing Agencies (and potentially other agencies/organizations within the region) may provide funds or in-kind services to ensure that the implementation coordination activities are fulfilled. The Authorizing Agencies may direct the expenditure of implementation coordination funds for any of the roles defined for the Authorizing Agencies. It is expected that the specific activities and associated budgets will be prepared by WRA of Yolo County on an annual basis. Many of the roles and activities could be handled by the WRA of Yolo County, YSGA or RWMG staff; therefore, the specific budgetary requirements may change as implementation progresses.

6.2.1.2 Project Implementation Funding

As of November 2017, 28 projects are included in the SWRP. Twenty of the projects provided funding information, with a total estimated funding need of almost $32 million. Of the 28 projects, 17 are feasibility studies and/or planning-level projects, which suggest that the overall funding needs will only increase as these projects progress and are developed into implementable projects, programs, or actions, and as other projects are added to the SWRP. Table 6-2 summarizes financing needs and the availability of capital and operations and maintenance (O&M) funding sources based on information provided by project proponents. It is recommended that this table be updated and included in the annual report each year.

Throughout the implementation phase of the SWRP, additional grant funding will become available for planning-level projects. The WRA of Yolo County and YSGA will lead in the effort to pursue grant funds for implementation, identifying grant opportunities, selecting projects for inclusion in grant applications, preparation and submittal of grant applications and identifying fiscal agents to manage grant funds on behalf of the Authorizing Agents.

A list of grant opportunities with storm water-related benefits has been generated and is included in Appendix J for reference.

Table 6-2: **Yolo County SWRP Implementation Projects Funding Needs**

Project	Project	Funding Needs				
		Project Capital		O&M		Land Needed
		Amount	Secured?[1]	Annual Cost	Source Identified?	Secured?
2	Arboretum Waterway Wetland Restoration and Enhancement	$4,000,000	90%	$20,000	Yes	Yes
4	Davis Greenbelts Landscape Conversions (Davis Greenbelts Stormwater Improvements)	$235,000	No	Unknown	Yes	No
6	Dry Creek Bank Stabilization and Wastewater Re-use	$250,000	No	$5,000	Yes	Yes
8	Flood Monitoring Network Project	$350,000	No	Unknown	Yes	Yes
13	Moore Siphon Reliability/Restoration Project (Moore Siphon Stormwater Improvements)	$1,000,000	No	$20,000	Yes	Yes
14	North Regional Pond and Pump Station	$8,000,000	Yes	$100,000	Yes	Yes
17	Russell Boulevard Demonstration LID Project (Russell Boulevard Stormwater Treatment Project)	$667,000	Yes	Minimal	Yes	Yes
20	Thompson Canyon Stormwater Management	$500,000	No	$10,000	Yes	Yes
22	West Adams Canal Renovation and China Slough Rehabilitation Project	$16,000,000	No	Unknown	No	No
24	Winters Bioswales Project and Habitat Enhancement	$195,000	50%	$5,000	Yes	Yes
27	Madison Farmer Field Stormwater Capture and Groundwater Recharge	$400,000	No	Unknown	No	No
Total Implementation Funding Needed:		**$31,597,000**				

Note:
[1]Percent secured as of August 2017

6.2.2 Decision Support Tools and Methods

Throughout the development of the SWRP for Yolo County, decision support tools and methods for benefit metrics analysis were explored and utilized to optimize opportunities for storm water management and aiding in balancing efforts between resource management and hazard management.

The tools and methodologies presented below will continue to be developed as more data is collected as part of implementation of this SWRP. A reference list of decision support tools, metrics, and data is provided in Appendix K. As the SWRP is implemented, additional decision support tools and methods may be explored and developed based on project needs.

6.2.2.1 Mapping and Geographic Data

Mapping and geographic data was used to aid in identifying existing infrastructure, natural features, and potential project locations for storm water management, including:

- Base data such as county, tribal and municipal boundaries; waterways and water bodies; and water conveyance infrastructure.
- Publicly-owned lands to show potential project sites that would avoid the additional cost and time of purchasing property or acquiring the right-of-way.
- Soil Agricultural Groundwater Banking Index (SAGBI), developed by the California Soil Resource Lab at UC Davis and University of California Agriculture and Natural Resources. SAGBI is a suitability index for groundwater recharge on agricultural land based on factors related to deep percolation, root zone residence

time, topography, chemical limitations, and soil surface condition (O'Geen et al., 2015).

The intersection of the above data is shown in Figure 6-1**Error! Reference source not found.** and can be used to identify locations for potential projects such as detention basins, recharge basins or injection wells, or runoff conveyance systems.

6.2.2.2 Water Evaluation and Planning System (WEAP)

WEAP is an integrated water resources planning tool for resource management and policy analysis using climate-driven water balance. The WEAP model provides a full accounting of water flows throughout the watershed, including rainfall-runoff modeling; climate-driven evapotranspiration; snow accumulation/melt; and groundwater-surface water interaction. Water infrastructure and demands are nested within the underlying hydrological processes which represent water demands from all sectors and programmable operating rules for infrastructure (i.e. reservoirs, weirs, etc.). Model development and results using WEAP is summarized below and documented in Appendix I.

As part of the quantitative analysis for the SWRP, SEI used the Cache Creek WEAP model to assess the long term (35 year) groundwater recharge potential from diversions of Cache Creek winter flows into the District unlined canal system. Using the 1976-2010 historical period as a baseline, the WEAP model average net change in groundwater recharge from this strategy (assuming an infiltration rate of 150 cfs) is estimated as 24,893 acre-feet (AF), varying widely across the years from a minimum of 266 AF to a maximum of 38.9 thousand AF (TAF). See Chapter 3 of Appendix I for additional details of this WEAP analysis.

In recent years, the idea of capturing winter rainfall on agricultural fields has gained ground, due to its potential to provide both flood management and water supply benefits (through groundwater recharge). SEI used the Cache Creek WEAP model to assess a what-if scenario for capturing winter rainfall on agricultural fields using 8-inch high berms surrounding potential sites. Potential sites were identified by intersecting the WEAP model's spatial configuration of crop coverage by SAGBI.

SEI's documentation of the WEAP modeling efforts includes recommendations for either progressing towards an implementation project that would result in SWRP benefits or to improve understanding of the watershed, providing additional data for WEAP model improvement. These recommendations are presented in Appendix I, Chapters 3 and 4.

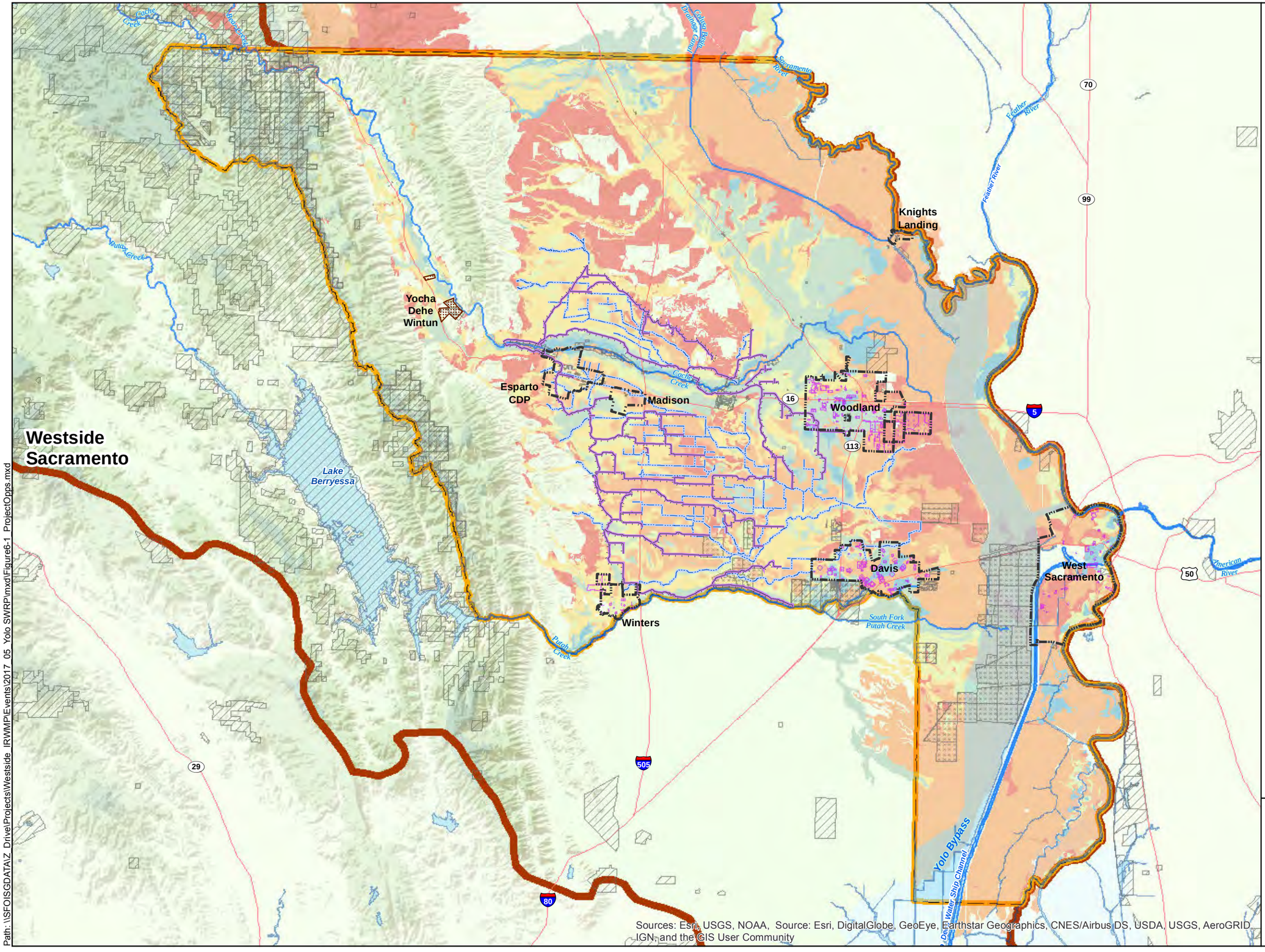
6.2.2.3 The Hydrologic Engineering Center (HEC) Hydrologic Modeling System (HMS)

HEC-HMS is a hydrologic modeling tool available by the US Army Corps of Engineers. HEC-HMS uses the input data sets for terrain, watershed delineations, landcover and soils, event precipitation, and design storm characteristics. The typical output of interest is the flow hydrograph at watershed outlets, in response to actual or design storms.

To address reports of consistent localized flooding in the area of Esparto and Madison, SEI created a HEC-HMS model for the Lamb Valley Slough, South Fork Willow Slough, Cottonwood Slough, and a small watershed that feeds into the Madison drain. The intent was to identify sources and causes of flooding to the area around the Town of Madison. Documentation of SEI's modeling efforts and results is provided in Appendix I, Chapter 2 and summarized below.

Modeling of the January 4, 2017 storm showed that a majority of the runoff originates from the upper portions of the model area (Cottonwood and South Fork Willow Sloughs above their intersection with the Winters Canal and Lamb Valley Slough above the bridge). Furthermore, Cottonwood Slough contributes the largest volume of water, both in the upstream area and overall model area, which is consistent with its area being the largest. From this modeling, SEI made the following recommendations:

1. Establish flow monitoring stations, locations recommended in Appendix I, Chapter 6.
2. Establish a Citizen Science data collection method until a flow monitoring network can be installed.
3. Implement upstream mitigation methods such as diversions, on- or off-channel detention ponds, check dams, or a combination of methods.
4. Investigate canal contributions to slough flows.
5. Implement on-farm mitigation methods to capture storm water runoff to reduce flooding by South Fork Willow Slough.



Sloughs w/in YCFC&WCD Boundary
Canals w/in YCFC&WCD Boundary
City Public Properties
County Zoning - Public
Public Agency Jurisdiction
Yolo SWRP Boundary
Westside Region

Projects

Conceptual/Planning
Implementation
Implementation
Conceptual/Planning

SAGBI - Modified

Excellent
Good
Moderately Good
Moderately Poor
Poor
Very Poor

The Soil Agricultural Groundwater Banking Index (SAGBI) is a suitability index for ground-water recharge on agricultural land. The SAGBI is based on five major factors that are critical to successful agricultural groundwater banking: deep percolation, root zone resi -dence time, topography, chemical limitations, and soil surface condition.

Modified overlay is theoretical; it shows SAGBI suitability groups when assuming that all soils with restrictive layers have been modified by deep tillage.

Source:
https://casoilresource.lawr.ucdavis.edu/sagbi/
SABGI overlay provided by
Toby O'Geen (atogeen@ucdavis.edu),
Professor & Soil Resource Specialist in
Cooperative Extension, Dept. of Land,
Air and Water Resources, UC Davis.

0 3 6 9
Miles

Kennedy/Jenks Consultants

Sources: Esri, USGS, NOAA, Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Storm Water Resource Plan For Yolo County

Geographic Information for Decision Support

K/J 1770002.00
May 2018

Figure 6-1

Path: \\SFO\SGDATA\Z_Drive\Projects\Westside_IRWMP\Events\2017_05_Yolo SWRP\mxd\Figure6-1_ProjectOpps.mxd

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6.2.2.4 Other Tools

Other tools and methodologies available for the development of implementation projects include the Rational Method, the Simple Method, and SUSTAIN, described below:

- Yolo City/County Drainage Manual, 2010: The Drainage Manual was prepared to provide consistent criteria and methodology for hydrologic and hydraulic analyses associated with storm runoff between rural and urban areas in Yolo County. This Manual can be accessed from the Yolo County Improvement Standards website (http://www.yolocounty.org/community-services/planning-public-works/public-works-division/improvement-standards) and provides the following:
  - Updated design rainfall (depth/duration/frequency and distribution patterns);
  - Rainfall-runoff parameters and methodology;
  - Criteria for addressing storm water quality;
  - Criteria for sizing hydraulic structures associated with roads and other infrastructure affecting storm runoff;
  - Hydrologic and hydraulic design criteria and guidelines for sloughs, creeks, and other anticipated types of storm drainage facilities, including direction for conveyance (peak) and storage (volume) design considerations; and
  - Tools for new development located in the unincorporated areas of the County to reduce pollutant discharge to the maximum extent practicable and to protect the beneficial uses of receiving waters.
- Modified Rational Method: The Modified Rational Method is recommended in the Yolo City/County Drainage Manual for designing local drainage facilities of limited size. The Modified Rational Method can be used to estimate runoff volumes using storm intensity, time of concentration, watershed imperviousness, and watershed size. The Yolo City/County Drainage Manual presents the equation and procedure for application for the recommended 10-year storm event.
- Simple Method: The Simple Method can be applied as a spreadsheet-based model that estimates storm water runoff pollutant loads and volumes for urban areas. Combined with characteristic pollutant removal efficiencies, it can provide a general planning estimate of likely storm pollutant reduction as a result of implementing projects at the scale of a development site, catchment or subwatershed. The technique requires a modest amount of information, including the subwatershed drainage area and impervious cover, storm water runoff pollutant concentrations, and annual precipitation to provide a general estimate of runoff volume and pollutant loading. Appendix K provides a description of the application of the Simple Method to calculate storm water runoff pollutant loads for the purposes of sizing a capture and treatment system.
- SUSTAIN: The US Environmental Protection Agency's (EPA's) System for Urban Stormwater Treatment and Analysis Integration (SUSTAIN) model focuses on the implementation of pollution control measures through green infrastructure, total maximum daily load requirements, and MS4 management practices. This system is still available for download from the EPA's website, however it is no longer supported; as a result, the SWRP development team opted to utilize the other decision support tools and methods described previously. Although this tool was not used in the development of the SWRP but was made available to the SWRP stakeholders and project proponents to assist in quantifying potential project benefits. SUSTAIN and documentation can be downloaded from the EPA website (https://www.epa.gov/water-research/system-urban-stormwater-treatment-and-analysis-integration-sustain).

6.2.3 Data Management System

Data management includes the collection, storage, processing, and sharing of information that is developed from project-specific performance monitoring. Data management for the Yolo County SWRP will adopt the strategy utilized by the Westside RWMG, as described in Westside IRWM Plan Section 11.3.2 Data Management. Water resources data are generated from multiple sources, in countless formats, and are reported in varying frequencies to jurisdictional bodies, nongovernmental agencies, water agencies, and regulators. The data management strategy is not meant to duplicate these efforts and does not serve as the central clearinghouse for this vast amount of information; rather, it has been developed to meet the following functions:

- Support the collection and sharing of information related to project implementation and progress in meeting objectives;

- Provide a means for interested stakeholders to locate needed information concerning project implementation; and
- Consider avenues to simplify the interconnection and sharing mechanisms between local and statewide data sources.

A list of data collection and monitoring programs that can be used throughout SWRP and project implementation is provided in Appendix K. This list is based on the Technical Memorandum prepared for the Westside IRWM Plan to identify information needs and potential information sources for tracking progress on the IRWM Plan objectives.[3] Appendix K is expected to be reviewed annually, and expanded, refined, and updated based on feedback received from SWRP stakeholders and project proponents. Links to access the data and monitoring programs will be maintained on the WRA of Yolo County website.

6.3 Implementation Projects and Programs

As described in Section 5, to identify and develop projects with clear storm water and dry weather runoff goals that also provide multiple public water quality and supply benefits, all projects submitted for inclusion of the SWRP for Yolo County must result in at least two storm water benefits, which can be achieved by meeting SWRP objectives introduced in Section 1.

6.3.1 Quantification of Storm Water Management

Section 5.4 summarized the projects submitted to the SWRP that were evaluated for implementation, including proposed benefit metrics analyses and expected associated quantification of benefits. In addition, quantitative analysis for the anticipated benefits was also presented.

Benefit quantification is an important measure of SWRP effectiveness. Quantification of storm water management actions show the balance between storm water as a resource and storm water as a hazard. The more that the storm water can be quantified, the more it can be put to use as a resource.

The tools and methods provided in Appendix K and discussed in the previous Subsection can be used to quantify project benefits and Plan overall benefits, as well as identify opportunities, size potential infrastructure, and communicate and educate the public.

6.3.2 Project Status Tracking

Project implementation monitoring data will be used to measure the SWRP's progress towards achieving both plans goals and objectives. As stated in Section 6.1.2, project proponents are responsible for collecting and reporting project monitoring data with the assistance of the WRA of Yolo County and YSGA.

Project-specific monitoring plans will be developed before the start of project implementation and will include the following components:

- Purpose and background for monitoring,
- Monitoring objectives,
- Description of monitoring site,
- Description of what will be monitored for each project,
- Methods for monitoring problems and their correction,
- Monitoring frequency,
- Monitoring protocols, procedures, and responsibilities,
- Reporting of data collected, and
- Procedures and funding assurances to document that the monitoring will take place during the entire monitoring period.

Additional information may be required depending on the project, and monitoring plans will need to include enough information in order to accurately evaluate project effectiveness.

It is intended that the monitoring plans will utilize Appendix K and the existing data collection and monitoring programs therein, as well as assess the ability of the existing programs to meet project monitoring needs. In this way Appendix K will continually be updated and data gaps will be identified.

It is anticipated that information collected as part of project monitoring will be shared and transferred formally through annual reporting and informally during the quarterly meetings. The data contained in the annual report will be shared with local, state, and federal

[3] Westside Sacramento IRWM Consultant Team. Technical Memorandum, Subject: Westside Sacramento IRWM Plan Information Needs, Potential Sources, and Suggested Implementation Steps for Tracking Progress on Plan Objectives. 10 April 2013.

agencies through posting to the WRA of Yolo County website.

From Section 5.4, implementation of the SWRP for Yolo County and the prioritized projects is anticipated to result in measurable benefits related to water quality, water supply, flood management, environmental, and community.

Table 6-3 presents the anticipated benefits as a result of implementation of the SWRP for Yolo County and how the projects' benefits will be measured.

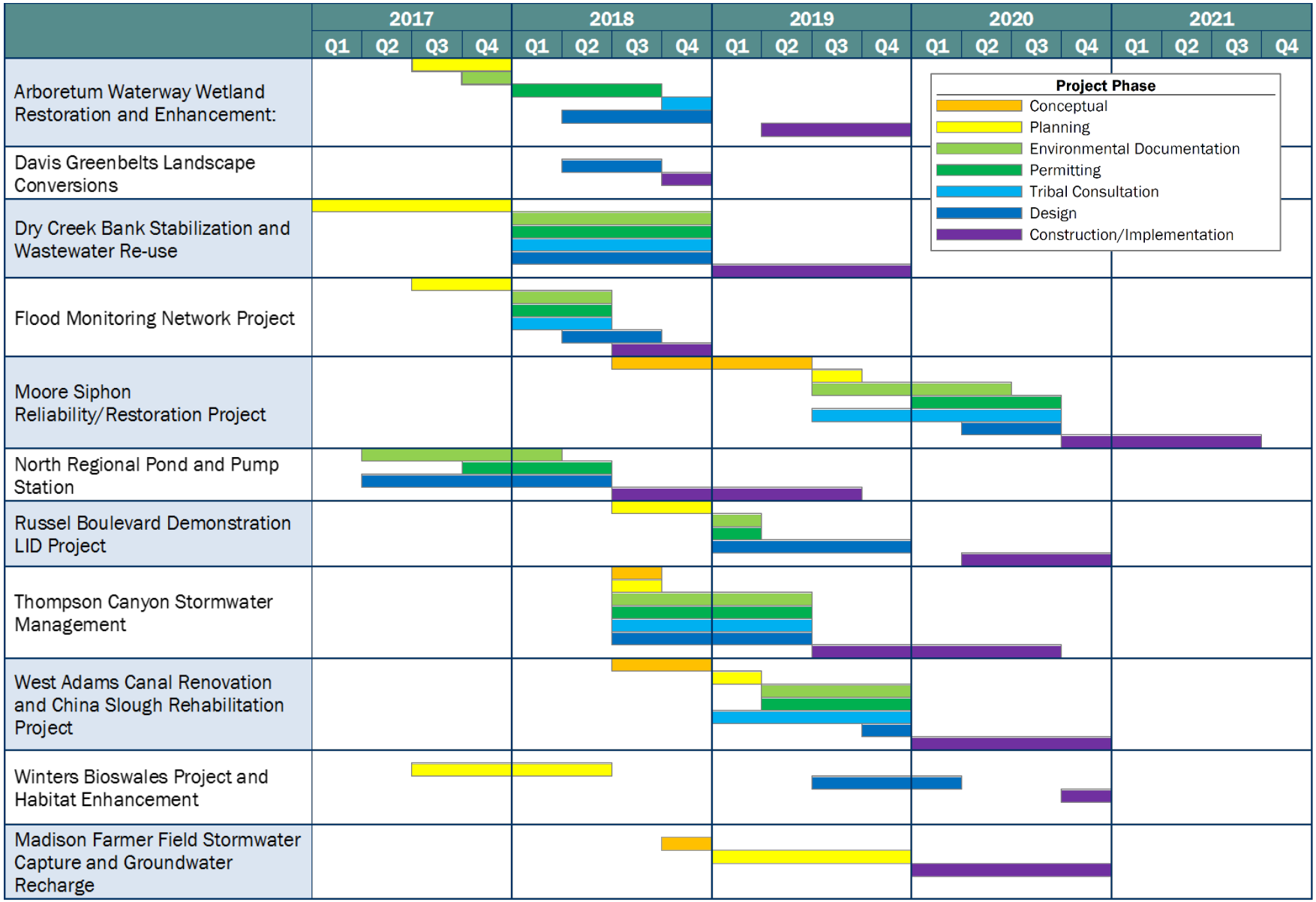
Implementation of the prioritized projects is anticipated to extend through 2021, depending on the availability of funding. Figure 6-2 presents the anticipated project timelines for those projects prioritized for implementation. It is assumed that implementation funding will be obtained prior to the Design and Construction/Implementation project phases, as applicable.

Table 6-3: **Yolo County SWRP Implementation Benefits**

Benefit Category	Project	Quantified Benefit	Performance Measure
Water Quality	2. Arboretum Waterway Wetland Restoration and Enhancement	935 acres of wetland treatment of runoff	Mapping/survey increase in vegetative cover
	6. Dry Creek Bank Stabilization and Wastewater Re-use	2 miles of sediment control	Mapping/survey of survival and growth of native vegetation
	14. North Regional Pond and Pump Station	120 cfs treatment prior to discharge	Water quality of WWTP outflow
Water Supply	2. Arboretum Waterway Wetland Restoration and Enhancement	2,000 gpm reclaimed water for arboretum irrigation/habitat	Flowmeter at WWTP discharge to Arboretum
	4. Davis Greenbelts Landscape Conversions	1,000,000 gallons/year/acre water conserved due to turf conversion	Advanced Metering Infrastructure (AMI)
	8. Flood Monitoring Network Project	24,893 AF/Y of additional recharge of storm water through the YCFC&WCD's canal system.	Stream gaging at specific locations
	13. Moore Siphon Reliability/Restoration Project	1,000 AFY of leak loss reduction due to repair of the Moore Siphon	Field measurement and engineering project report
		200 AF/day water supply reliability due to repair of Moore Siphon	Field measurement and engineering project report
	20. Thompson Canyon Stormwater Management	10,000 square feet of increased infiltration area due to native plantings	Visual monitoring/survey of survival and growth of native plantings
	27. Madison Farmer Field Stormwater Capture and Groundwater Recharge	300 AF - 1,100 AF per storm event (farmer fields - detention basin)	Rain gages and visual monitoring

Benefit Category	Project	Quantified Benefit	Performance Measure
Flood Management	2. Arboretum Waterway Wetland Restoration and Enhancement	1,800,000 cubic feet capacity to capture runoff	Visual monitoring of Arboretum Waterway to contain runoff
	8. Flood Monitoring Network Project	Reduce flooding due to Cache Creek by diverting up to 150 cfs of storm water runoff diverted from Cache Creek to YCFC&WCD canals.	Stream gaging at specific locations
	27. Madison Farmer Field Stormwater Capture and Groundwater Recharge	128,000 gpm reduced peak runoff to the town of Madison	Rain gages and visual monitoring
	17. Russell Boulevard Demonstration LID Project	0.05 AF of infiltration for a 24-hour storm event	Visual monitoring of discharge from swale
Environmental	4. Davis Greenbelts Landscape Conversions	1 acre of enhanced habitat per project site	Visual monitoring/survey of survival and growth of plantings and wildlife
	6. Dry Creek Bank Stabilization and Wastewater Re-use	2 acres of new riparian vegetation	Mapping/survey of survival and growth of native vegetation
	17. Russell Boulevard Demonstration LID Project	6,225 square feet of enhanced habitat	Visual monitoring/survey of survival and growth of plantings and wildlife
		7 trees planted	Visual monitoring/survey of survival and growth of plantings and wildlife
	20. Thompson Canyon Stormwater Management	1 river mile of restored trout spawning habitat for increased fish population	Average time to catch a trout
		10,000 square feet of habitat restoration	Visual monitoring/survey of survival and growth of native plantings
	24. Winters Bioswales Project and Habitat Enhancement	5 acres of habitat restoration	Visual monitoring/survey of plant community performance
Community	4. Davis Greenbelts Landscape Conversions	1 acre of recreation area per project site	Installation of interpretive signage
	17. Russell Boulevard Demonstration LID Project	1,000 volunteer hours and 3 class tours per year	Documentation of volunteers and class participation
	24. Winters Bioswales Project and Habitat Enhancement	3 community tours and 1 class visit per year	Documentation of tours and class participation

Figure 6-2: Yolo County SWRP Implementation Projects Timeline



6.4 Development of Future Projects

The projects in Section 6.3 were selected to be included in the SWRP for implementation based on its ability to result in storm water management benefits and objectives achieved, as well as based on if the project is ready for implementation. The remaining projects are included in this SWRP as conceptual projects that can be updated as project information (i.e. site selection, permitting, implementation cost estimates, schedule) is developed, moving them towards implementation.

In support of the development of the SWRP and benefit analysis, the Stockholm Environment Institute utilized multiple decision support tools and methods to identify possible storm water management opportunities and achieve SWRP objectives. SEI's efforts are documented in Appendix I and included:

- Modeling in the sloughs in the western portion of Yolo County to investigate regular flooding of Madison due to storm water runoff;
- Modeling of storm water conveyance using YCFC&WCD canals for groundwater recharge;
- Modeling of rainfall capture on agricultural fields;
- Review of potential farm field groundwater recharge strategies;
- Visits and photo-documentation of recommended sites for use in establishing and enhancing the existing flow monitoring network in Yolo County; and,
- Production of geographic data, HEC-HMS model files, WEAP model files, photo catalog of past flooding (high-water and rainfall runoff-driven).

SEI's efforts to support the development of the Yolo County SWRP also generated the following recommendations for future actions to address storm water management:

1) management and maintenance of storm drains at the local scale;
2) on-field management of winter runoff at the distributed, farm-field scale;
3) management of upstream storm flows in sloughs; and,
4) canal operations, because canals cut across all these scales.

These recommendations will be considered in the development of the submitted conceptual projects as well as any future projects submitted for inclusion in to the Plan.

6.4.1 December 2018 Project Updates

As a result of the development of this SWRP, efforts have continued to develop project information to address storm water runoff in and around the Community of Madison, including:

- Initial outreach to potential project stakeholders and/or partners
- Submittal of grant applications to the California Office of Emergency Services to develop project planning information
- Documentation of jurisdiction of the multiple local agencies with drainage responsibilities (see Appendix M)
- Development of project concepts for two projects, including scope, potential locations, activities, and planning -level budgets. See Appendix N for a Technical Memorandum documenting this information.

Section 7: Education, Outreach, and Public Participation

Since its inception in 1993, the WRA of Yolo County has a history of local stakeholder and community engagement in planning, programs and activities for water resource planning in Yolo County. The term "stakeholder" refers to representatives of agencies, nonprofit groups, nongovernmental organizations, government organizations, and private citizens interested in or affected by the development of the Plan.

Specific outreach to non-government organizations (NGOs), disadvantaged communities (DACs), economically distressed areas (EDAs) and the general public built on the efforts initiated by the WRA of Yolo County, as detailed in the following subsections.

7.1 Local Stakeholders

As described in Sections 2 and 4, local stakeholders included non-profit organizations, municipal water agencies, reclamation districts, government agencies, community services districts, and non-governmental organizations. All stakeholders were invited to participate in the collaborative Plan development process, regardless of whether they were members of the WRA of Yolo County.

To maximize resources, SWRP development meetings were generally held following the monthly WRA of Yolo County Technical Committee meetings. Meeting announcements, agendas, materials, and draft sections of the Plan were developed and discussed by the SWRP Team prior to sending out by email and posting to the WRA of Yolo County website at http://www.yolowra.org/projects_swrp.html. See Appendix L for meeting agendas, materials, and sign-in sheets.

In addition to holding SWRP development meetings, the SWRP Team developed a survey to gauge potential project sponsor interest in submitting projects for storm water management. The results of the survey were used to track the submittal of project forms during the project solicitation period described in Section 5. To facilitate and encourage project submittals, project development workshops were held on July 10, 2017 and July 12, 2017. The purpose of these workshops was to provide in-depth reviews of potential projects for submission to the SWRP. These meetings were open to all local stakeholders. Discussion included identifying opportunities for storm water projects, how to estimate benefits, and potential funding mechanisms.

7.2 Disadvantaged Communities

Individuals from disadvantaged, small, and rural communities and other interested groups were frequently encouraged to participate. In addition to regular SWRP meetings, an in-person workshop was held with representatives from the Madison CSD and Yolo County on July 25, 2017 to discuss storm water challenges for the Town of Madison and other DACs in the County such as Knights Landing. The SWRP Team also provided assistance to the Town of Madison and the County of Yolo in developing project concepts and benefits, as well as project forms for submittal to the SWRP.

Although no organizations specifically addressing environmental justice (EJ) concerns have been identified in the Region, conversations regarding the challenges and opportunities of the Region and especially conversations with representatives of DACs were structured to identify and include EJ concerns.

7.3 Climate-Vulnerable Communities

Because of the large agricultural production in Yolo County and the heavy reliance on groundwater, the entire County of Yolo and its stakeholders are considered vulnerable to climate change impacts. The Westside IRWM Plan identified climate change vulnerability issues and those applicable to Yolo County include:

1.4: Groundwater supplies lack resiliency after drought events.

4.5: A portion of the Region floods at extreme high tides or storm surges.

During the outreach process, project development discussion and workshops included these considerations.

7.4 Other Stakeholders

In addition to local stakeholders, outreach efforts included invitations to storm water management agencies in upstream watersheds that discharge to Yolo County.

Solano County Water Agency (SCWA) manages water supply and flood control throughout the entire county of Solano, including the Lower Putah Creek subwatershed upstream of Yolo County. One conference call was held on July 17, 2017 with the SCWA to discuss projects related to the portion of the Lower Putah Creek subwatershed that discharges to Yolo County. The Lower Putah Creek subwatershed includes Dry Creek, a significant wildlife migration corridor, and Thompson Canyon, a significant contributor of sediment.

Finally, outreach to the Westside RWMG included participation in quarterly Westside IRWM Plan coordination calls and presenting updates on the Yolo SWRP progress.

7.5 Community Participation in Plan Implementation

Public outreach is part of the overall implementation strategy for the Yolo SWRP and may also be part of the implementation of individual components of the SWRP projects. The public outreach and stakeholder involvement process used by the WRA of Yolo County to implement the Westside IRWM Plan and other projects will be used for the implementation of the Yolo SWRP and are outlined in the following subsection.

7.5.1 Outreach

The WRA of Yolo County and implementing agencies will coordinate their public outreach efforts with ongoing stakeholder involvement efforts of the Westside IRWM Plan. WRA of Yolo County member agencies are involved both as agencies that plan the Yolo SWRP and as agencies that plan and implement their own independent storm water resource management activities—both processes are moving forward concurrently.

7.5.1.1 Public Education and Participation

The WRA of Yolo County Technical Committee is the working group for WRA of Yolo County activities. The Technical Committee is responsible for implementing foundational actions and coordinating actions for implementation of the Yolo SWRP. Member agencies will be partners in implementing this plan; member or non-member agencies may sponsor and implement projects.

Technical Committee meetings are open to the public and generally the first Thursday of every month, with the third Thursday held as an additional standing meeting date as needed. Agendas are posted 72 hours before the meeting date at http://www.yolowra.org/meeting_technical.html. Technical Committee functions in relation to implementation of the Yolo SWRP is described in Section 6.

Upon completion of the final SWRP, the Project Team will present their findings to the WRA of Yolo County and Westside IRWM group. This is expected to take place over a three-month period in the first quarter of 2018.

Other public involvement opportunities include implementation and maintenance of the submitted projects. Many of the projects submitted to the SWRP include volunteer and public education components. These public involvement opportunities can begin as soon as the project is funded or completed. For example, the Winters Bioswales Project and Habitat Enhancement project relies on volunteers to maintain bioswales plantings. The volunteer program will also include education on the function and importance of the bioswale.

Members of the public interested in finding opportunities to volunteer can email info@westsideirwm.com or visit the Westside Sac IRWM Website at http://www.westsideirwm.com/projects.html.

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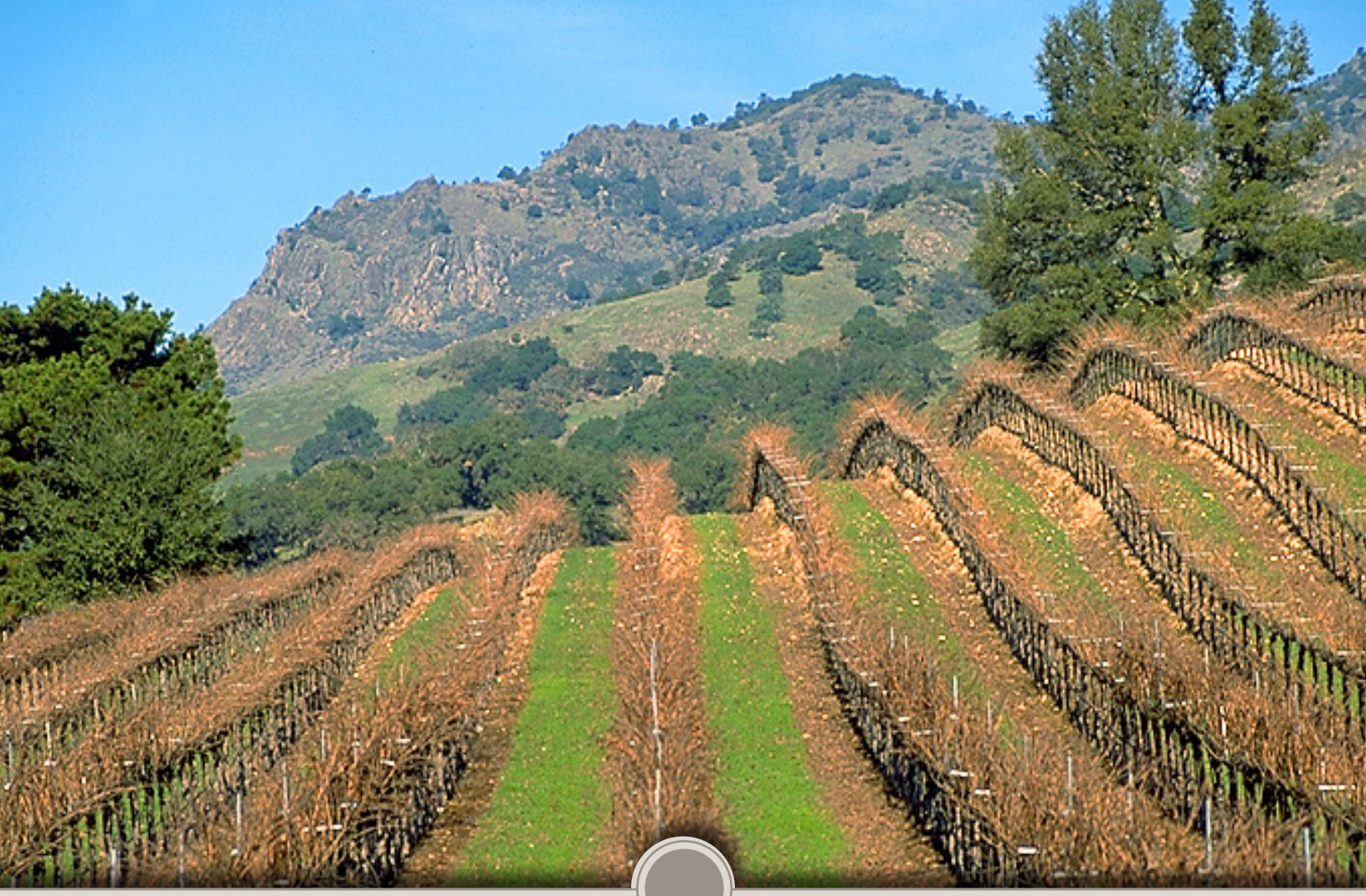

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